PERFORMANCE DEMONSTRATION TEST PLAN
DESOTEC - PARKER FACILITY

PREPARED FOR:

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REVISION: 5
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ACRONYMS AND ABBREVIATIONS

acfm	Actual cubic feet per minute
APC	Air pollution control
ASTM	American Society for Testing and Materials
AWFCO	Automatic waste feed cutoff
Btu	British thermal unit
CAA	Clean Air Act
CARB	California Air Resources Board
CEM or CEMS	Continuous emission monitor or Continuous emission monitoring system
CFR	Code of Federal Regulations
cm	Centimeters
COPCs	Compounds of potential concern
cu. ft.	Cubic foot
CVAAS	Cold vapor atomic absorption spectroscopy
DC	Direct current
DRE	Destruction and removal efficiency
dscf	Dry standard cubic foot
dscfm	Dry standard cubic feet per minute
EPA	United States Environmental Protection Agency
ft	Feet
GC/FID	Gas chromatography/flame ionization detector
GC/MS	Gas chromatography/mass spectrometry
gpm	U.S. Gallons per minute
gr	Grain (equals 1/7000 pound)
HAP	Hazardous air pollutant
HHERA	Human Health and Ecological Risk Assessment
HPLC	High performance liquid chromatography
hr	Hour
HRGC/HRMS	High resolution gas chromatography/high resolution mass spectrometry
HWC MACT	Hazardous Waste Combustor Maximum Achievable Control Technology regulations
ICP	Inductively coupled plasma spectroscopy
in	Inch
in w.c.	Inches of water column (pressure measurement)
L	Liter
Lb	Pound
LVM	Low volatile metal
mg	Milligram
ml	Milliliter
MTEC	Maximum theoretical emission concentration
NDIR	Non-dispersive infrared
ng	Nanogram
NVOC	Nonvolatile organic compound
P&ID	Piping and instrumentation diagram
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl

PCDD/PCDF	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans
PDT	Performance Demonstration Test
PDTP	Performance Demonstration Test Plan
PDTR	Performance Demonstration Test Report
PFD	Process flow diagram
PIC	Product of incomplete combustion
PLC	Programmable logic controller
POHC	Principal organic hazardous constituent
ppmv	Parts per million by volume
ppmvd	Parts per million by volume, dry basis
PSD	Particle size distribution
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RF	Reactivation Furnace
scfm	Standard cubic feet per minute
SEM	Scanning electron microscope
sq. ft.	Square feet
SVM	Semivolatile metal
SVOC	Semivolatile organic compound
TCDD	Tetrachloro dibenzo-p-dioxin
TEQ	Toxicity equivalent (related to 2,3,7,8-TCDD)
TIC	Tentatively identified compound
TOE	Total organic emissions
TSCA	Toxic Substances Control Act
ug	Microgram
VOA	Volatile organic analysis
VOC	Volatile organic compound
VOST	Volatile organic sampling train
WESP	Wet electrostatic precipitator

1.0 INTRODUCTION

1.1 FACILITY AND BACKGROUND INFORMATION

Desotec US LLC (Desotec) operates a carbon reactivation facility (the facility) located in the Colorado River Indian Tribes (CRIT) Industrial Park near Parker, Arizona.

Desotec purchased the facility in June 2023 from Evoqua Water Technologies LLC (Evoqua), from which USEPA transferred the permit. The terms “Desotec” or “facility” used within this document and attachments may be used interchangeably and directly refer to facility operations, regardless of ownership/operatorship. CRIT is a co-Permittee under the Permit by virtue of its ownership of the land on which the facility is located and its status as a lessor of that land to Desotec; CRIT is not intended for inclusion in the preceding terms.

Evoqua previously completed the performance demonstration test (PDT) in October 2022 and remained in continual discussions with USEPA Region 9 regarding the scope of a subsequent retest in the following months prior to and after the sale of the facility. After various discussions, submissions, and eventual dispute resolution filings, including a January 16, 2024 Dispute Resolution Notice and USEPA’s subsequent July 15, 2024 decision, the facility is pursuing a complete retest. Various sections contained within this plan have been revised and clarified to avoid future disputes as well as amended to incorporate requested changes from USEPA’s July 15, 2024 dispute resolution decision and subsequent communications through February 2026.

The facility treats spent activated carbon that has been used by industry, state, tribal and federal government agencies, and municipalities for the removal of organic compounds from liquid and vapor phase process waste streams. Once the carbon has been used and is spent, it must be either disposed of or reactivated at a facility such as operated by Desotec. A Carbon Reactivation Furnace (RF) is used by Desotec to reactivate the spent carbon. Some of the carbon received at the Parker facility is designated as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) regulations. Much of the carbon received at the facility is not a RCRA hazardous waste, as it is either not a characteristic or listed waste.

The RF is not a hazardous waste incinerator. “Hazardous waste incinerator” is defined in 40 CFR Part 63, Subpart EEE as a “device defined as an incinerator in § 260.10 of this chapter and that burns hazardous waste at any time." (40 CFR 63.1201). "Incinerator" is defined in 40 CFR 260.10 as "any enclosed device that: (1) Uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer or carbon regeneration unit, nor is listed as an industrial furnace; or (2) Meets the definition of infrared incinerator or plasma arc incinerator. (emphasis supplied)". The RF does not qualify as an incinerator and instead is designated by Subpart X of the RCRA regulations as a Miscellaneous Unit. According to 40 CFR 264.601 of the Subpart X regulations, permit terms and provisions for a Miscellaneous Unit must include appropriate requirements of 40 CFR Subparts I through O and Subparts AA through CC, 40 CFR 270, 40 CFR 63 Subpart EEE, and 40 CFR 146.

Accordingly, and since Subpart X lacks any specific or unique PDT provisions, several areas of the Permit and the PDTP incorporate various provisions from these aforementioned sources, including relevant parts from 40 CFR 63 Subpart EEE.

Based on conditions V.I.1.c.i and V.I.1.c.ii of the RCRA Permit, Desotec will test the RF to demonstrate performance in accordance with the emission standards shown in Table V-1 of the RCRA Permit, which are consistent with the requirements of 40 CFR 63 Subpart EEE. These emission standards are more stringent than the RCRA hazardous waste incinerator emission standards of 40 CFR 264 Subpart O. The regulations at 40 CFR 63.1219(a) and (c) Subpart EEE are often referred to as the Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT) standards. This terminology will be used in this document.

1.2 TEST PLAN PURPOSE AND ORGANIZATION

The purpose of this Performance Demonstration Test Plan (PDTP) is to identify and document the necessary process details; sampling, analytical, and QA/QC procedures; and anticipated operating conditions necessary for demonstration of compliance with the applicable RCRA permit requirements, and for demonstration of continuing compliance with those standards.

To best address the requirements for demonstrating that the RF can operate within the parameters and limits established by the applicable RCRA Permit requirements the PDTP has been organized into the following major sections:

1.0 INTRODUCTION
2.0 FEED STREAM DESCRIPTION
3.0 ENGINEERING DESCRIPTION
4.0 TEST DESIGN AND PROTOCOL
5.0 SAMPLING, ANALYSIS, AND MONITORING PROCEDURES
6.0 TEST SCHEDULE
7.0 OPERATING PERMIT OBJECTIVES
8.0 TEST REPORT

ATTACHMENTS

A - QUALITY ASSURANCE PROJECT PLAN
B – CALCULATIONS
C – PROCESS ENGINEERING INFORMATION
D – WASTE ANALYSIS PLAN
E – CONTINUOUS MONITORING SYSTEMS PERFORMANCE EVALUATION TEST PLAN

1.3 PROCESS OVERVIEW

The carbon reactivation process consists of a multiple hearth reactivation furnace, a natural gas fired afterburner used to destroy organic contaminants desorbed from the carbon, a wet quench, venturi scrubber, packed bed scrubber, and wet electrostatic precipitator (WESP).

1.4 TEST OBJECTIVES AND APPROACH

The PDTP has been prepared to provide comprehensive performance testing of the RF unit to demonstrate compliance with the permit emissions and performance standards that are shown in RCRA Permit Condition V.I. and Table V-1[1] such as Destruction and Removal Efficiency (DRE) and particulate matter emission concentration. The PDT will be performed while processing normal feed materials, which have been augmented with metals, chloride, and organics to simulate operation at or beyond the current RCRA Permit limits. The objectives of the PDT are as follows:

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[1] Please see Section 1.7 for additional clarifications and amendments regarding “permit limits”.

1. Demonstrate Compliance with the RCRA Permit and the permit operating limits set forth in RCRA Permit Condition V.I and Table V-1. The operating parameter limits are listed in Column 3 of Table V-1. The Performance Standards are listed in Column 2 of Table V-1.
    - Demonstrate a DRE of greater than or equal to 99.99% for the selected principal organic hazardous constituents (POHCs).
    - Demonstrate stack gas carbon monoxide concentration less than or equal to 100 ppmv, dry basis, corrected to 7% oxygen.
    - Demonstrate stack gas hydrocarbon concentration of less than or equal to 10 ppmv, as propane, dry basis, corrected to 7% oxygen.
    - Demonstrate a stack gas particulate concentration less than or equal to 0.013gr/dscf corrected to 7% oxygen.
    - Demonstrate that the stack gas concentration of hydrogen chloride (HCl) and chlorine (Cl_2) are no greater than 32 ppmv, dry basis, corrected to 7% oxygen, expressed as HCl equivalents.
    - Demonstrate that the stack gas mercury concentration is less than or equal to 130 μg/dscm, corrected to 7% oxygen.
    - Demonstrate that the stack gas concentration of semivolatile metals (cadmium and lead, combined) is less than or equal to 230 μg/dscm, corrected to 7% oxygen.
    - Demonstrate that the stack gas concentration of low volatility metals (arsenic, beryllium, and chromium, combined) is less than or equal to 92 μg/dscm, corrected to 7% oxygen.
    - Demonstrate that the stack gas concentration of dioxins and furans does not exceed 0.40 ng/dscm, corrected to 7% oxygen, expressed as toxic equivalents of 2,3,7,8-TCDD (TEQ). This is the applicable standard, shown in Table V-1 Column 2 and 3 of the RCRA Permit, since the gas temperature entering the first particulate matter control device is less than 400°F.
    - Demonstrate an emission rate of SO_2 corresponding to an annual emission rate of less than or equal to 30 tons per consecutive 12-month period.
    - Demonstrate an emission rate of NOx corresponding to an annual emission rate of less than or equal to 22 tons per consecutive 12-month period and develop a NOx emission factor in terms of mass of NOx emitted per volume of natural gas consumption.

2. Confirm or Establish Revised RCRA Permit Operating Limits (As referenced in Table V-1, column 3 of the RCRA Permit.)

    Control Parameters that influence DRE:

    - Demonstrate maximum feed rate for spent activated carbon.
    - Demonstrate minimum afterburner gas temperature.

- Demonstrate maximum combustion gas velocity (or a suitable surrogate indicator).

Feed rate limits:

- Demonstrate maximum total chlorine/chloride feed rate.
- Demonstrate mercury emissions compliance via Maximum Theoretical Emission Concentration (MTEC).
- Demonstrate system removal efficiency (SRE) for semivolatile and low volatility metals so feed rate limits can be confirmed by extrapolation from test results.
- Confirm/Establish appropriate operating limits for the air pollution control system components.

3. Gather Information for Use in a Site-Specific Human Health and Ecological Risk Assessment (HHERA).

- Measure emissions of an expanded list of metals, including hexavalent chromium, and an expanded list of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).
- Measure emissions of hydrogen chloride and chlorine.
- Measure emissions of specific volatile and semivolatile products of incomplete combustion (PICs), a.k.a., products of incomplete destruction (PIDs).
- Measure emissions of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF).
- Measure emissions of polycyclic aromatic hydrocarbons (PAHs).
- Measure emissions of polychlorinated biphenyls (PCBs).
- Measure emissions of specific organochlorine pesticides (OCPs).
- Measure emissions of total volatile, semivolatile, and nonvolatile organics.
- Measure the stack gas particle size distribution.

1.5 TEST PROTOCOL SUMMARY

To accomplish the PDT objectives, (i.e., demonstrating that the unit will meet all applicable RCRA Permit performance and emissions standards) a single test condition representing “worst case” operations of minimum temperature, maximum combustion gas velocity (minimum residence time), and maximum waste feed rate will be performed. “Worst case” therefore means intentionally operating at or beyond the current RCRA Permit operating parameters and/or limits.

To provide assurance of three complete data sets to evaluate compliance and for risk assessment modeling, the test will consist of four replicate sampling runs. In this context, the term “sampling run" or "test run" means an entire day of testing in accordance with the PDTP and includes all sampling trains, furnace and APC system operating conditions, and spiking conditions identified in the PDTP. Samples and data from all four test runs will be analyzed and reduced.

The purpose of the fourth test run is an allowance for the following during any test run: 1) possible loss or damage to all or portions of any sample(s) or sample fraction(s), 2) rejection of a specific sample(s) due to sampling or analytical data quality reasons, or 3) deviation/closeness to the system operational targets. Desotec's intent is to select three test runs that are 100% complete for demonstrating compliance. Data from the three selected runs, the first three test runs or any combination of three of the four test runs, will be used to demonstrate compliance with the RCRA permit conditions and risk assessment data collection requirements. Should Desotec elect to exclude a test run for Item 3 above, or should there be data quality issues or incomplete samples with a particular sample data set (Item 1 or Item 2 above), valid data for the additional or "extra" test run may be substituted and used for compliance demonstration and/or risk assessment modeling. In the event that conditions (1), (2), or (3) above invalidate or potentially invalidate a test run, Desotec will substitute the entire data set from the additional test run in place of the invalid test run. EPA's approval will be required prior to substituting any portion of a test run. Compliance with the current associated RCRA permit OPLs, or possible establishment of new OPLs, will be reconciled in accordance with 40 CFR 63.1209(i) as may be necessary.[2]

The sampling and monitoring protocols that will be utilized during the PDT are summarized as follows:

- Spent Activated Carbon Feed - total chlorine/chloride, ash, heating value, elemental (C, H, N, O, and S), moisture, volatile organics, semivolatile organics, and target metals (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn).
- Stack gas particulate, HCl, and Cl_2 using EPA Method 5/26A.
- Stack gas target volatile organics using volatile organic sampling train (VOST), SW-846 Method 0030.
- Stack gas target semivolatile organics using SW-846 Method 0010.
- Stack gas target organochlorine pesticides (OCPs) using a second and separate SW-846 Method 0010 sampling train.

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[2] For simplicity, "four test runs" or "four replicate runs" are referenced hereinafter within the PDTP and incorporate and align to the same principles of this discussion. EPA regulations and associated guidance only require three runs for demonstrating compliance. While the fourth run is wholly optional, Desotec does intend to conduct four test runs. Desotec only needs to provide three test runs to demonstrate compliance with the RCRA permit. However, Desotec may substitute the additional test run in place of a potential test run failure, due to conditions (1), (2), or (3) above, if needed.

- Stack gas PCDD/PCDFs, PCBs, and PAHs using EPA Method 23 (March 2023).
- Stack gas total volatile organics using SW-846 Method 0040.
- Stack gas total semivolatile and nonvolatile organics [a.k.a., total chromatographable organics and gravimetric organics (TCO/Grav)] using SW-846 Method 0010.
- Stack gas target metals (Al, Sb, As, Ba, Be, Cd, total Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, and Zn) using EPA Method 29.
- Stack gas hexavalent chromium using SW-846 Method 0061.
- Stack gas particle size distribution (PSD) using a second and separate Method 5 sampling train with a smooth surface polycarbonate filter compatible with scanning electron microscopic (SEM) analysis.
- Stack gas CO and O_2 by permanently installed CEM according to the protocols in the Appendix to 40 CFR 63, Subpart EEE; Performance Specification 4B of 40 CFR 60, Appendix B.
- Stack gas total hydrocarbons (as propane) by temporary CEM according to EPA Method 25A and the protocols in the Appendix to 40 CFR 63, Subpart EEE.
- Stack gas Sulfur Dioxide (SO_2) and Nitrogen Oxides (NOx) by temporary CEM according to EPA Methods 6C, and 7E, respectively.
- Scrubber blowdown - target volatile organics, semivolatile organics, and metals (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn).

1.6 DEVELOPMENT OF RCRA PERMIT LIMITS

Desotec is required to comply with operating limits (applicable whenever RCRA hazardous spent activated carbon is in the reactivation furnace) in its RCRA Permit to ensure that the RF system complies with the applicable USEPA environmental performance standards at all times that RCRA hazardous spent activated carbon is being treated. Under the HWC MACT, the regulations establish a comprehensive list of regulated parameters at 40 CFR 63.1209 (j) through (p) which are used to ensure continuing regulatory compliance, and are incorporated into the RCRA permit. Other RCRA permitting guidance documents also suggest certain RCRA Permit limits and means for establishing those limits. The intention of this PDT is to verify the adequacy of the existing RCRA Permit limits and not to establish new limits. However, Desotec and/or EPA may request to modify the current RCRA Permit limits based on, and following review of, the PDT results. Using afterburner temperature as an example, if the facility operates the afterburner at a temperature substantially lower than the PDT target and demonstrates DRE compliance, the facility may elect to request to amend the RCRA Permit's operating limit to a new, lower value.

Conversely, if the facility operates the afterburner at a temperature substantially higher than the test target and demonstrates DRE compliance, the EPA may elect to amend the RCRA Permit's operating limit to a new, higher minimum value. In the aforementioned examples, since DRE compliance was demonstrated in both instances, neither test failed. Should new RCRA Permit limits be requested, the basis for changes will be in accordance with Section 7.2 of this PDTP. The PDTP Section 7.2 approach for establishing operating limits generally follows the specifications of 40 CFR 63 Subpart EEE and guidance for RCRA incinerator permits and is consistent with the methodology used to establish the original RCRA Permit limits from the 2006 PDT.

1.7 TEST PLAN DEVELOPMENT AND CONDUCT OF THE PERFORMANCE DEMONSTRATION TEST

A condition of the current RCRA permit requires a PDTP (including a Quality Assurance Project Plan [QAPP] and Sampling and Analysis Plan [SAP] with Data Quality Objectives [DQOs]) to be submitted for approval following the effective date of the RCRA Permit. Following approval of the PDTP, Desotec is to conduct the PDT and an associated risk assessment based on the PDT results. In response to this RCRA Permit requirement, Desotec selected Focus Environmental Inc. to provide permitting assistance, overall project management, and preparation of the PDTP. Focus Environmental Inc. is an independent engineering firm headquartered in Knoxville, Tennessee, and has no affiliation with Desotec other than its contract to conduct the permitting activities for the Parker facility. Focus Environmental was responsible for the 2006 PDTP development and testing implementation at the Desotec facility in Parker, AZ.

Desotec will select qualified and experienced performance testing contractors and laboratories to conduct all aspects of the PDT, including overall test management, stack gas sampling, laboratory analysis, data review, calculation of results, and test reporting. These firms will be independent contractors having no affiliation with Desotec other than their contract to conduct the testing services for the Parker Facility.

1.8 PDTP AMENDMENTS AND CLARIFICATIONS

The following sections discuss amendments to the previous PDTP and/or provide clarification related to the planned test objectives and associated test activities.

1.8.1 Terminology

The following terms are defined herein for clarification and used throughout the PDTP:

"Permit Limits" are described generally as the currently-established RCRA Permit operating limits or parameters for which the facility is subject under normal operating conditions. Also known as *"operating limits*", they do not apply during testing periods designed to intentionally duplicate and/or exceed various normal operating parameters.

For clarification, the Permit contains two distinct tables that each contain *"limits"* and *"parameters"* and are titled somewhat similarly: "Table V-1- Performance Standards and Operating Parameter Limits" and "Table V-2 – Operating Limits and Parameters".

- Table V-1 contains two sets of values: (1) performance standards that namely contain emission limits that must be demonstrated during testing events (e.g., 99.99% DRE and various metals and other pollutants with emission limits expressed in concentration units), and, (2) the corresponding "operating parameter limits" that include maximum feed rate limits expressed in mass rate units that must be maintained during normal operations and were established from prior testing which demonstrated compliance with the corresponding emission limit.
- Table V-2 contains "control parameters" that are summarized as equipment setpoints with upper and/or lower bounds for which exceeding during normal operations is not permissible, however are intentionally duplicated or exceeded during testing in order to provide "worst case" conditions.

Similar to the Permit, this PDTP also refers to these tables' values interchangeably as "permit limits", "operating parameters", "operating limits", and/or "control parameters". For clarification, within the PDTP where reference is made to "the objective of the PDT is demonstrating compliance with permit limits", this is referring to the "emission standards" or "performance standards" that are explicitly mentioned in Permit Table V-1 (first column) and described exactly in PDTP Section 1.4 Numeral "1". These emissions standards are indeed relevant, do apply during testing, and must be demonstrated during the test. However, their corresponding, existing feed rates do not apply and may be exceeded during testing.

Other instances within the PDTP mention that "operating limits do not apply during testing as the test intentionally operates in worst case conditions and testing periods intentionally exceed various normal operating parameters". This instead refers to the "Control Parameters" (specifically the "Group A1 Parameters") contained in Permit Table V-2. Certain Group A1 Control Parameters do influence DRE performance and emissions compliance (e.g., temperature, flow rate, feed rate) and do have normal operating permit limits. However, Group A1 Parameter limits do not apply during testing periods. The PDTP specifically delineates targets and anticipated testing ranges in order to demonstrate compliance with the applicable DRE performance and emissions standards. PDTP Table 4-2 clarifies and presents the various parameters and their corresponding "permit limits", "test targets", and "anticipated testing ranges", for which definitions are presented below.

"Testing targets" are the numerical values of various parameters (e.g., temperature, flow rate, pH, etc.) which the PDT aims to achieve during testing and maintain as close as possible during testing. However, the PDT is not required to operate exactly at the target value for the entire duration of each test run. The inability of an average to be precisely on target within a run or as an average of runs does not render a test invalid nor require a full retest. The testing target is not a limit; operational variability both within each test run and among all test runs may/will extend above and below the target.

"Anticipated testing ranges" are the numerical bounds which span above and below the testing target for which operating during testing is acceptable and permissible. This accounts for acceptable variation both within a test run and between sampling runs. Table 4-2 presents the current permit limits, test targets, and anticipated testing ranges.

"Replicate sampling runs": the samplings runs will be "replicate" to the extent the system is operated at substantially similar conditions and include measurement of the same parameters, use the same sampling methods, use the same types of equipment, and/or otherwise pursue the same objectives. While the testing targets and anticipated testing ranges will be unchanged during each run, the data that is collected within each test run (e.g., flow rate, temperature, injection rate) will include variation within each minute, hour, test run, and test day, as noted in several USEPA guidance documents. Each run will yield minimum, maximum, and average values for various parameters. Given the complexity of the system(s) and numerous variables, the chances of any test run producing identical values is unlikely, if not impossible. Such variation does not constitute a test failure provided compliance is achieved. This approach to conducting testing and evaluating test results is explicitly mirrored from EPA's guidance manual "Handbook: Guidance on Setting Permit Conditions and Reporting Trial Burn Results"[3], which is also cited in the RCRA Permit. The guidance specifically states: *"Variations are unacceptable only if they result in a failure to meet performance standards."*

1.8.2 Spiking Rate

Organic DRE is a performance measurement. As such, there is no particular injection target percentage (100% or otherwise) of the target POHC(s) (e.g., lb/hr) that disqualifies any test run, so long as the DRE objective can be calculated. If there is too little spiking compound injected, then the risk exists that there will not be enough target compound in the stack emissions to calculate 99.99% DRE. Conversely, if a spiking compound feed rate is "too high", there is risk that the system could be incapable of destroying at the required 99.99% DRE. Per RCRA guidance and HWC MACT regulations, no rounding or averaging of DRE results is allowed; each test run must independently demonstrate ≥99.99% DRE to be considered "passing". The target POHC feed rates are based on in-stack detection limits, expected stack flow rate, and required performance (% DRE) with an allowance (i.e., testing range) for discernibly determining performance, e.g., 5-10X variability factor (99.995-99.999% DRE). Accordingly, in the appropriately designed test program, the target POHC spiking/feed rate includes consideration of variability in system performance and POHC emissions measurement. Provided that the POHC feed rate is sufficient to discernably determine DRE, the exact rate is subjective – in that it can vary. While not negating the factual accuracy of these statements, for purposes of this PDT, Desotec agrees to operate within the "Testing Ranges" delineated in Table 4-2 of the PDT Plan.

Similar to DRE, no particular injection target percentage (100% or otherwise) disqualifies any test run. Metals spiking rates are also subjective to the extent that the feed and emission rates allow for calculation of system removal efficiency (SRE). This is because both RCRA guidance and

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[3] While the RF is not an incinerator, much of the fundamental PDT principles are modeled from this handbook, which states: "Data can vary in three ways: 1. Variations with time within a single run; 2. Variations between repeats of the same nominal operating conditions; 3. Variations due to changes in the operating conditions about the nominal operating point. Incinerators do not operate under totally steady conditions. Thus, most parameters vary somewhat with time over the course of a single test run. The effects of this type of variation on the specification of permit limits are dealt with in Chapter 2. Random factors make it impossible to repeat exactly the same nominal operating point. Results from repeats, of the same nominal operating point should be averaged to yield a single mean value for each control parameter and other performance."

HWC MACT regulations allow for extrapolation of the test demonstrated feed rates based on measured SRE. Additionally, unlike DRE, actual spiking rate is subjective; “passing” results are achieved so long as the average of the test runs meets the emissions standard.

With regard to chlorine feed rate, native and spiking rates are not subjective. The test demonstrate total feed rate (native plus spiked) is the established limit. There is no provision in either the RCRA guidance or HWC MACT regulations for extrapolation. However, like metals emissions, “passing” results are achieved so long as the average of the test runs meets the emissions standard.

All organic compound, metals, and chlorine spiking will be performed via continuous metering of solvents and solutions. Metering of these materials will be from drums and containers on scales. The feed rates of the respective spiking materials will be determined via loss of mass per unit time. Weights will be recorded manually on log sheets at ten (10) minute intervals during each test run. The scales are upscale and downscale calibrated before and after the test. Calibration documentation for each scale used will be included in the spiking report. The accuracy standard for the scales is +0.1 lb as noted in Table 5-1 of the QAPP. Net feed rates of spiked constituents will be calculated using manufacturer’s assay for technical grade materials and per run sample analysis of prepared solutions. The constituent feed rates will be within the ranges specified in Table 4-2 of the PDTP.

Ample spiking materials, including contingency, will be obtained for the test. Desotec can share the spiking material planning with EPA. Desotec has consistently suggested following HWC MACT as guidance for conducting the PDT. As has been previously stated, metal constituent feed rates for determining performance do not necessarily require feeding at the permitted limits, e.g., spiking SVM at the RCRA permit limit for purposes of demonstrating compliance. Lesser metal feed rates can be used and potential *“permitted”* metals feed limit values extrapolated from the test data. If the *“extrapolated values”* are less than the current RCRA permit values, then the RCRA permit can be administratively updated based on the PDT results. For organic DRE, so long as the feed and emission rates of the target POHCs are sufficient to demonstrate the required performance, the exact feed rate being less, more, or exactly the PDT plan feed rate is irrelevant. Following HWC MACT as guidance, the only regulated emission constituent that is limited to the actual PDT feed rate is chlorine.

Desotec expects to control all spiking to within of the proposed target values noted in Table 4-2 of the PDT Plan during each test run, particularly for metals and chorine. Sufficient spiking materials will be obtained and provided to assure adequate amounts for ramping to test conditions, conditioning of the system prior to commencing the test run, and at least one full run of contingency. Note however for the organic constituent spikes, provided the feed rate and resulting emissions are sufficient to assess DRE, the actual feed rates are fungible. While not negating the factual accuracy of these statements, for purposes of this PDT, Desotec agrees to operate within the "Testing Ranges" delineated in Table 4-2 of the PDT Plan.

The spiking rate of *"0.35 [lb/hr] as Cd"* previously contained in Table 4-2 of the 2022 PDTP appears to be an unintentional and typographical error. The current RCRA Permit SVM feed rate limit is 0.10 lb/hr based on the 2006 PDT. The intended target rate for the 2022 PDT was 0.10 lb/hr. The SVM target rate is corrected in this PDTP.

1.8.3 Calibration

The facility will calibrate the Critical Process Instruments (contained in Table 3-1) in accordance with the facility's Continuous Monitoring System Evaluation Test Plan (Permit Appendix XXIV) prior to the PDT and as close to the testing date as reasonably feasible. Due to numerous logistical considerations, and to allow time in the event of necessary part repair(s) and/or replacement(s), the facility cannot commit to EPA's requested calibration one week prior to testing. The facility will aim to complete the calibration activities approximately 30-60 calendar days prior to testing (for which some may occur closer to the testing date) and will correlate any key metrics utilizing stack testing equipment immediately prior to test. Desotec will share calibration results with Region 9 prior to the test.

1.8.4 Stack Gas Flow Rate Certification, and Corroboration:

Given the intermittent and infrequent reading issues experienced by the facility's in-stack flow meter during the previous tests in 2006 and again in 2022, Desotec intends to implement the following:

- Approximately one week prior to the PDT, and per USEPA request Desotec will perform Performance Specification 6 (PS-6) relative accuracy (RA) testing using EPA Method 2 as the reference method (RM) with a RA target of no greater than 20 percent per Equation 2-6 from Section 12.5 of PS-2 and average RM in the denominator.[4]

- Daily Pre-Test Reading: Measure stack flow using EPA Method 2 and compare the calculated flow to the stack flowmeter's average readings during the sampling period. The target difference between the EPA Method 2 and average stack flow instrument readings is $\le$10.0%.
- Daily Post-Test Run Data Reduction: After each test run, compare the average of the stack flow instrument HRA values during the test run to the average of the average flows measured by the four (4) concurrently operated semivolatile organic sampling trains (EPA Method 23 and three SW-846 Method 0010-variants). The target difference between the average of the HRA values measured by the stack flow instrument and the average of the average sampling train values is $\le$10.0%.

If $\le$10% corroboration cannot be achieved with the pre-test readings, the facility will enact the troubleshooting methods and Corrective Action Request process delineated in Section 14.0 of the QAPP. If daily post-testing calculations identify discrepancies >10.0%, Desotec will utilize the least favorable (most conservative) values for relevant data needs to confirm/demonstrate compliance with the permit stack flow rate limit.

The stack flow instrument data are not used for any emissions calculations, or demonstration of performance or emissions compliance. The flow data as measured by the discrete and respective sampling trains will be used to calculate and demonstrate compliance with all performance and emission standards.

In the event that the primary in-stack flow meter has intermittent reading issues and/or experiences variability with potential to render the data unusable: 1) the facility will enact measures to resolve the issue as described in Section 14.0 of the QAPP, and 2) if reasonable measures cannot resolve the issue, the facility will follow the hierarchy of a) the in-stack flow meter and b) the stack sampling train measurements[5] to provide usable flow data for a given test

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[4] Desotec has agreed to conduct a PS-6 certification which is ordinarily required for CERMS and CEMS, despite the flowmeter not meeting the definition of either. Additionally, the PS-6's Seven-day Calibration Drift Test is also not applicable as the flowmeter does not meet any of the "analyzer" definitions within the referenced sections, nor has the capability to operate as such. Desotec also agrees to provide during test days daily checks (e.g., both pre/post-test) as described above to verify and correct for any stability/range issues beyond 10% after certification occurs, thereby meeting the essence of what calibration drift aims to accomplish.

[5] Isokinetic sampling train flow rate measurements are governed by EPA Method 2. See 40 C.F.R. Appendix A-1 to Part 60. EPA Method 2 is recognized as a reference method for stack flow velocity measurement. See 40 C.F.R. Appendix B to Part 60 Performance Specification 6 -- Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources.

run. A partial and/or full retest of affected test runs could result from reading issues or variability with any of the aforementioned devices if the issue(s) could not be resolved by the troubleshooting and resolution activities outlined in the PDT Plan/QAPP and also if the issue(s) result in the inability to collect usable data and/or demonstrate compliance.

1.8.5 Potential Equipment Failures:

The Test Manager will pause an individual test run if one of the facility instruments listed on Table 3-1 experiences an issue which results in an inability to read and/or record the parameter value for which it is designed to produce. Desotec will engage troubleshooting activities to render the instrument operational as soon as reasonably possible. Once operational, the Test Manager will resume the test run. Should any facility or stack testing equipment present an immediate health or safety issue or function in a way that jeopardizes accurate data collection, the Test Manager or Desotec may pause testing. There is no limit to the frequency or duration of pauses during a test run.

While unlikely, should any other unforeseen circumstance occur that is not identified within the PDTP (and specifically within QAPP Table 14-1) for which clear, safe, and practical resolution is undocumented, the Test Manager will present options for resolution. The Test Manager will gain real time verbal approval from Desotec, CRIT, and EPA representatives and will document consent via the Corrective Action Request form. By approval of the PDTP, EPA representatives agree to make personnel available that are authorized to confirm such resolutions in real time. Dependent upon the severity of any unforeseen and/or catastrophic system, mechanical, or equipment failure that results in the inability to collect accurate data and/or samples could result in curtailment of the specific test run. Should that test condition yield unusable data, only that test run will be repeated once the issue has been resolved. A failure of a single sampling train, single test run, and/or any other limited test condition does not result in the requirement to complete an entirely new PDT (See Section 8.5.2).

1.8.6 Good Faith Resolutions

To foster a cooperative environment with open dialogue and swift resolutions, the Test Manager and Desotec representatives and contractors are committed to open communication throughout each test run, so long as it does not unnecessarily impede the tedious attention required to perform certain functions. Such open communication may take the form of simple, informal, and/or unscheduled daily verbal updates before, during, and/or after test runs. Should any plant equipment and/or stack testing equipment issue arise that has the direct potential to negatively impact data collection or sample collection in conflict to the methods prescribed in the PDTP, all issues will be discussed with available/present team members and documented in the Test Manager notes. Accordingly, all parties agree to act in good faith to identify same-day observations and/or disclose concerns to the entire team to ensure timely resolution. By approval of the PDTP, EPA representatives and EPA contractors commit to the same obligations.

1.8.7 SSMP

The Startup-Shutdown Malfunction Plan (SSMP) is an administrative document that describes various preventative and reactive measures to be performed during the operation of the facility, as well as documentation requirements. The purpose of the SSMP is to assure compliant operation and establish a protocol for process improvement when unexpected events occur. Most of these principles still apply during PDT conditions, while others are rendered not applicable by virtue of specific PDT conditions and purposes. Discussion below compares the approach, definitions, and preventative/responsive actions of the SSMP within the context of the objectives and protocols of the PDT. Relevant excerpts from the SSMP include the italicized sections below, with the corresponding PDT evaluation, applicability, and approach:

“The presumption is that startup, shutdown, and malfunction events have a higher chance of excess emissions or operating limit exceedances compared to normal operation.”

…

“A malfunction is defined as any sudden, infrequent, and not reasonably preventable failure of air pollution control, monitoring equipment, process equipment, or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. The emission limitations refer to the CO standard and various parameter operating limits.”

…

“For the purposes of documenting the duration of an exceedance as a result of a malfunction, the exceedance will begin once an emission standard or operating limit is exceeded while spent carbon is in the multiple hearth. The exceedance will end once the spent activated carbon has cleared the multiple hearth furnace or once the emissions and operating parameters are reestablished within their respective permit limits, whichever occurs sooner.”

As previously explained in the “Permit Limits” section above, Permit Table V-1 performance and emissions standards are maintained and are required to be achieved during testing, for which the PDT intentionally aims to demonstrate compliance.

However, the anticipated test target values and ranges for the PDT are at or exceed current Permit limit values contained in Table V-2 Group A1 Control Parameters. The Table V-2 values govern normal, non-testing operations. During the testing periods, the RF must operate over a range of conditions so that the established Permit operating limits can be demonstrated. The PDTP cites the HWC MACT rule at 63.1207(h) which expressly allows current operating parameter limits (established under 63.1209) to be waived during subsequent performance testing. Therefore, the process related interlocks are expanded during the testing periods, which will allow the desired operating limits to be demonstrated during uninterrupted testing. Accordingly, an equipment issue that intentionally or involuntarily has the potential to create an operating condition in conflict with Permit Table V-2 cannot meet the definition of a “malfunction” as defined by the SSMP.

Furthermore, while the emission limits are required to be met, the proof of a compliance demonstration with an emission limit is normally determined several weeks after testing, upon receipt of the laboratory analyses results. Thus, in absence of Table V-2 applicability, there are limited instances during the testing which would classify a situation as “creating a potential emission limit exceedance”, that would otherwise not exist during normal operations when governed by the Table V-2 operating limits.

“Indication that a potential malfunction is occurring or has occurred may be signaled by:

- *Exceedance of an emission standard or operating limit*
- *Alarm*
- *Automatic waste feed cutoff*
- *Inspection or general observation of operational data”*

…

“For the purposes of this plan, equipment problems that do not or could not cause an exceedance will not be considered a malfunction. Determining whether an equipment problem is a malfunction may require additional review of the process data and circumstances surrounding the event.”

Discussion and applicability of emission standards/limits are described above. During testing, automatic waste feed cutoffs (AWFCO) are rendered not applicable as the interlocks are expanded. Alarms, inspections, rigorous observations, and/or other process data anomalies encountered during the PDT will be immediately investigated, evaluated, and reconciled in accordance with the PDT's aforementioned "Potential Equipment Failures" section as well as the PDT QAPP. As reiterated by the SSMP, equipment problems that do not or could not cause an exceedance will not be considered a malfunction.

"This SSMP was developed to be both proactive and reactive to malfunctions. Malfunctions involving process equipment, instrumentation/CMS, and the process control system were included in the malfunction evaluation. After identifying these potential malfunctions, proactive measures were identified that would be expected to prevent these malfunctions from occurring as well as the reactive procedures that provide instructions for operating and controlling the system in the event that the malfunctions actually occurred. The primary work product of this team consists of a spreadsheet entitled "Potential Malfunctions From the Spent Activated Carbon Reactivation Furnace That May Result in Emission Exceedances".

There are enumerated preventative measures outlined in SSMP Table 3-3. Most utilize procedures and best practices that ensure equipment is properly maintained and operated, which are still relevant and applicable. Other preventative measures include utilizing AWFCO and interlocks. Since these other items are intentionally expanded during testing, these measures would be rendered not applicable by design of the PDT.

There are also reactive measures outlined in SSMP Table 3-3. Most yield a reaction statement that includes: "*If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction."* Since the *preventative* AWFCO is expanded, the reactive response will also be nullified in these instances (e.g., the carbon feed will continue for uninterrupted testing). However, as previously described, any unique condition will be investigated, evaluated, and reconciled in accordance with the aforementioned "Potential Equipment Failures" section as well as the QAPP. If one of the specific malfunctions identified in SSMP Table 3-3 does occur, it will be troubleshooted and documented in accordance with the SSMP and PDT. The Plant Manager and the Test Manager will evaluate and determine if the condition can negatively impact data retrieval, sample collection, and/or test performance. The test will continue if the issue is determined to have negligible impact to these categories.

SSMP Table 3-3 includes an example (Item #59) related to the “stack” that indicates a potential malfunction of: “*failure of flow control instrument causes high stack gas flow rate”* for which the preventative measure indicates: *“(1) Interlocks are set to stop spent activated carbon feed at the permitted parameter limit. (2) The stack flowmeter is on a calibration and inspection checklist. (3) Inspection by operators and/or maintenance personnel.”* The Reactive Response indicates*: “If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.”*

As an example, consider a scenario in which the current in-stack flow meter experiences infrequent outages and/or intermittent “zero” readings, despite undergoing calibration and corroboration prior to the PDT. By following the outlined steps in the “PDTP Amendments and Clarifications” section above, both activities would qualify as reasonable preventable maintenance measures.

The SSMP applies to some of the preventative measures including: (Preventative #2) as the flowmeter is indeed on a calibration and inspection checklist (and it has undergone additional and more frequent calibration for PDT purposes than otherwise prescribed by the SSMP); and (Preventative #3) as the operators are both inspecting and observing the flowmeter throughout the PDT – above and beyond the rate described within the SSMP.

However, the portions of Item #59 in the SSMP which are rendered not applicable include: the prescribed potential “malfunction” is not met as a “zero” reading cannot be categorically classified as “causing high stack gas flow rate” since calibration and corroboration would have already yielded confirmed values; the interlocks (Preventative #1) are intentionally expanded and therefore irrelevant; and, the manual stop (Reactive) will not be employed, as the PDT describes efforts to resolve the issue without pausing/stopping the feed. Furthermore, the fundamental portion of the “malfunction” definition (“various parameter operating limits”) could also not be inherently met since high stack flow rate AWFCO is included within Table V-2 is among the operating parameters intentionally being exceeded during testing.

If the stack flowmeter scenario as earlier described is encountered during the PDT, the situation will be troubleshooted and resolved as described in the aforementioned sections (Stack Gas Flow Rate Certification and Corroboration, Potential Equipment Failures, and QAPP), and documented accordingly.

In summary, if an event occurs during the PDT that clearly meets all portions of the "malfunction" definition, the SSMP will be followed to the extent that it does not intentionally negate the inherent purposes of the PDT. The facility does not anticipate engaging the interlocks beyond the expanded setpoints, the AWFCO, or other manual stops of the carbon feed during the PDT, though may pause testing during troubleshooting activities. Proper documentation will be maintained.

1.8.8 Hourly Rolling Averages

The HWC MACT (40 CFR 63.1201) indicates that "Rolling average means the average of all one-minute averages over the averaging period." However, since the facility's permit limit is administered as an hourly rolling average (HRA) as noted by Region 9, the facility will evaluate compliance during the PDT using the average of the test run averages on an HRA basis, per EPA's request. One-minute averages (OMA) are not intended to be utilized to demonstrate compliance for permit compliance nor in testing, though will be provided in the report appendices. The following data values will be provided:

- OMA system data: direct download from the system
- HRA system data: direct download from the system, correlated to the same time period that corresponds with the OMA data, and used for the PDTR
- HRA calculated values: HRA values calculated using OMA system data

Should there exist discrepancies between the downloaded and calculated HRA values, the facility will utilize the more conservative (i.e., less favorable) HRA values for relevant temperature and flow data needs.

Specific to EPA's comments, there are two afterburner thermocouples (TE-464A/B) that provide afterburner temperature data, which are included in the equipment list subject to calibration prior to the PDT (Table 3-1). Within the bottom of the afterburner there is one (1) location that holds two (2) thermocouples; this is a dual element within the same, single thermal well. The elements have similar naming conventions within the system; both contain "TE 464" and one has a prefix and one has a suffix. Their use and purpose differ and is as follows:

- "Afterburner" thermocouple ("TE 464-A/B"): used for "control" purposes; this fires the afterburner. Without it the AB doesn't turn on. It has a daily monitoring log and has a continuous live signal. This is not used for compliance OMA/HRA purposes and is not provided in OMA/HRA format.
- "Waste Feed Cutoff" thermocouple (aka "Other" or "AVG_MIN_TE-464"): used for "ongoing compliance purposes", "waste feed cutoff", and "HRA" values (which are calculated from OMA).

These thermocouples undergo on-site verification/calibration of the transmitter accuracy via a third-party certified handheld unit and read as similar as possible given tolerances. Only the "second" thermocouple is relevant for providing OMA/HRA data. The facility and equipment manufacturer has established a 5% acceptable tolerance threshold. A recent verification of the thermocouple used for compliance purposes yielded results that confirmed that the thermocouples were well within the 5% tolerance.

The PDT Report will include raw data extracted/downloaded from the facility's SCADA[6] system. It will show three columns and provide values for each minute during the test as shown below.

Time	**Afterburner**	**Compliance OMA**	**Compliance HRA**
	Temperature	**Afterburner**	**Afterburner**
	°F	**°F**	**°F**
	TE-464	**AVGMIN**	**AVGHR**
Dynac Point Name	TE-464-AB	AVGMIN_TE-464	AVGHR_TE-464
10/20/2025 9:00	1,884	1,851	1,877
10/20/2025 9:01	1,900	1,861	1,877
10/20/2025 9:02	1,917	1,875	1,876
10/20/2025 9:03	1,932	1,888	1,877

1. The first column ("Afterburner") stems from the burner control TE-464A/B thermocouple and is not used for compliance purposes. The values reported are the OMA values from the burner control TE-464-A/B.
2. The second column ("Compliance OMA") stems from the AVGMIN_TE-464 thermocouple used for compliance monitoring purposes. It captures data 12 times per minute (every five seconds) and provides the averaged value for the corresponding one-minute period.

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[6] Supervisory Control And Data Acquisition systems are widely used to monitor and control process through the use of sensors, hardware, and software to collect, transmit, convert, and present date for real-time operator use.

3. The third column (“Compliance HRA”) takes the 60 most recent OMA values from AVGMIN_TE-464 and averages them and provides an HRA value per minute. This is the value that will be reported for the PDT and for compliance monitoring purposes (i.e., waste feed cutoff [WFCO]).

One would expect to be able to recreate (i.e., calculate HRA) from the OMA values, however there will be – at <u>all times</u> – a negligible percentage difference (e.g., ~<1%) between a manual recreation vs. the system’s displayed HRA value.

This is explained because the thermocouple does not read values in degrees Fahrenheit but rather follows a signal pathway through the SCADA system, which is a three-part system comprised of:

1) the thermocouple itself or other device that transmits a signal (e.g., millivolts) to the translator (i.e., signal generator) where it is converted to milliamps (e.g., range of 4-20 milliamps);
2) the Programable Logic Controller (PLC) that reads that signal as a value of 0 – 4,095 (unitless value) and conducts mathematical calculations to derive OMA unitless signals into HRA unitless signals; and
3) the operator workstation servers that interpret signals to a functional value (e.g., degrees Fahrenheit) that is visually displayed on Operation Room workstation monitors, and compliance reporting.

Within the “translation location” there is <u>negligible rounding</u> that occurs. (i.e., The processor is not designed to recognize nor record decimal points. Values – up to four decimal places – are rounded and only whole integers are utilized as the final value). This occurs in real time for both OMA and HRA. Regardless of these persistent and negligible system-generated differences due to signal rounding, the facility will utilize the **<u>final HRA</u>** column to determine compliance as this is linked to the compliance instrument.

The source of misunderstanding in the 2022 test stems from the 2022 data query report labeled OMA and HRA in the PLC:

- The <u>OMA</u> report was querying the data from 464-A/B thermocouple and labeling it as OMA data
- The <u>HRA</u> report from 2022 was querying data from thermocouple AVG_MIN_TE-464.

Despite showing differences in the calculated values (attributed to the explanation above), during the 2022 PDT both the 464-A/B and AVG_MIN_TE-464 thermocouples were still and actually within the expected calibration tolerances.

As discussed above, future tests will institute the thermocouple calibration within tolerance and future PDT reports will submit OMA and HRA data, both from the same thermocouple AVG_MIN_TE-464, which will be within the permissible tolerance from TE-464-AB.

1.8.9 Sampling Train Leak Checks

Desotec notes the space constraints on the testing platform for access to the some sampling ports. To the extent that structural integrity and safety will allow, the facility will address, alter, and/or temporarily remove any obstructions that may prevent the completion of sampling train leak testing procedures in accordance with standard protocols. If modifications cannot be achieved for structural integrity or safety considerations, by virtue of unmovable equipment, limited ports available for sampling, and/or other unforeseen circumstances, the leak check protocol will be adapted/modified and limited only to such affected ports. If a sampling train fails a leak check, the facility will repeat the impacted sampling train limited to only the operating condition/emissions associated with the subject sampling train.

2.0 FEED STREAM DESCRIPTION

2.1 FEED STREAM CHARACTERISTICS

The feed streams for the Desotec RF are described in the following sections.

2.1.1 Spent Activated Carbon

An aqueous slurry of spent activated carbon is the only material treated in the RF. The facility treats spent activated carbon that has typically been used for treating industrial and municipal wastewater, groundwater, surface water, process materials, or for air pollution control. Constituents in the streams being treated are adsorbed onto the surface and into the internal pores of the activated carbon. The activated carbon is said to be "spent" when it has adsorbed a certain amount of chemicals. The amount of chemicals adsorbed will vary from site to site, but generally the organic loading is no greater than 0.3 pounds of chemicals per pound of dry activated carbon. The organic loading on an average basis is much lower than the 0.3 pounds per pound of activated carbon maximum loading. Average loading data for the period from 2018 through 2020 indicated a range of 0.0073 to 0.0098 pounds of organic per pound of dry carbon, with an overall weighted average of 0.0082 pounds of organic per pound of dry carbon.

The number of different regulated constituents adsorbed on the activated carbon from a given source depends on the composition of the stream being treated. The list of organic constituents that may be adsorbed on spent carbon is very extensive, and includes, but is not limited to, volatile organic compounds, polycyclic aromatic hydrocarbons, phthalates, amines, and pesticides. Activated carbon is not customarily used to remove metals from a waste stream, although, low concentrations may be expected in the spent carbon. Actual facility data for the spent activated carbon is included in Tables 2-1 and 2-2. Overall characterization data in Table 2-1 are based on historical values, with total organic content shown on an as-fed basis. Specific metals and organic contaminant data in Table 2-2 were compiled from plant records spanning the period from 2018 through 2020, and show concentration ranges for individual shipments of spent carbon.

The spent activated carbon will be received, stored, and handled as per the Waste Analysis Plan located in the facility's RCRA Permit. A copy of the Waste Analysis Plan is included as Attachment E for reference. The plant has strict acceptance criteria for the carbon to be treated.

The facility does not accept infectious wastes, spent carbon containing regulated levels of radioactive wastes (as regulated by the Nuclear Regulatory Commission), or spent carbon exhibiting the characteristics of corrosivity or reactivity. Additionally, Desotec does not accept spent activated carbon that is classified as a dioxin-listed hazardous wastes (i.e., those carrying EPA Waste Codes F020, F021, F022, F023, F026, and F027), nor containing PCBs[7].

2.1.2 Auxiliary Fuels

The only auxiliary fuel used for the RF is natural gas. Typical characteristics of natural gas are included in Table 2-3.

2.2 FEED STREAM MANAGEMENT

The feed stream management of the spent carbon is described in the following sections.

2.2.1 Storage

Spent carbon is received by truck in containers (i.e., drums, vessels, supersacks, roll-off bins, etc.) or in tank trucks. Following inspection and acceptance at the facility, containerized spent carbon is unloaded in the unloading and receiving area where it is inspected and sampled. If the load is accepted for treatment, the containerized spent carbon is either transferred into one of the four spent carbon storage tanks via a feed hopper or moved to the Container Storage Area.

Spent carbon received in large containers, such as roll-offs and slurry trailers, is typically transferred directly to the spent carbon storage tanks through a feed hopper. Spent carbon received in smaller containers, such as drums, is typically moved to the container storage area in the containers in which it was received and subsequently transferred to the spent carbon storage tanks. The containerized spent carbon is transferred to the storage tanks via a hopper because it cannot be pumped directly from the container to the storage tank. Water is added as the carbon passes through the hopper to facilitate removal of the spent carbon from the hopper via an eductor. The carbon is transferred to the storage tanks as a water-carbon slurry.

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[7] In accordance with Permit Modification 009, Condition II.H.5.: “The Permittees shall not accept, store, consolidate or treat any of the following: (d) Any wastes containing polychlorinated biphenyls (PCBs).” Therefore, there will be no PCB bearing carbon treated during the PDT nor will spiking with PCB occur, though stack gas will be analyzed for PCBs per USEPA’s request.

The tank trucks carrying the bulk loads are retained in the unloading and receiving area and the spent carbon is inspected and sampled. If the shipment is accepted for treatment, the spent carbon is transferred in slurry form to one of the four process storage tanks, directly or through a feed hopper. Water used in the transfer process is supplied from the recycle water system which consists of two recycle water storage tanks and associated valves and piping. The recycled water is periodically monitored and pH-adjusted, when required, for corrosion control. From the process storage tanks, the carbon is transferred in slurry form to the Carbon Reactivation Furnace (RF).

2.2.2 Blending

Blending of the spent carbon is required to control the concentration of chlorine and chlorides present in the feed material to maintain compliance with Desotec's wastewater discharge limit for TDS. For example, if a load of spent activated carbon is received with a high chlorine concentration, this material is added in small portions to the bulk low-chlorine spent activated carbon in the feed tanks.

Table 2-1. Spent Activated Carbon Characterization Summary

Constituent/Property	Units	Value	
		Typical	Range
Organic Constituents (a)			
Total organics	wt%	0.8	0.5 - 1.0
See Table 2-2 for specific organics			
Inorganic Constituents			
Water	wt%	43.5	30 - 50
See Table 2-2 for other inorganics			
Elemental Composition (b)			
Carbon (from spent carbon)	wt%	94.5	70 - 99
Carbon (from organic adsorbed on carbon)	wt%	2.9	1.6 - 25
Hydrogen	wt%	0.4	0.2 - 8
Oxygen	wt%	0.5	0.3 - 5
Nitrogen	wt%	0.1	0.06 - 0.5
Sulfur	wt%	0	<0.1
Phosphorous	wt%	0	<0.1
Chlorine/chloride	wt%	1.5	0 - 5
Bromine/bromide	wt%	0	<0.1
Fluorine/fluoride	wt%	0	<0.1
Iodine/iodide	wt%	0	<0.1

(a) - As fed basis (wet)
(b) - Dry basis (as received)

Note: The information presented in this table is considered typical but should not be considered limiting. Feed rates and operating parameters will be adjusted to compensate for changes in waste properties or characteristics.

Table 2-2. Spent Activated Carbon Metals and Organic Constituent Data Summary [1]

		Concentration (ppm)			
Constituent	**CAS**	**Maximum**	**Minimum**	**Average**	**Shipments**
1,1,1,2-Tetrachloroethane	630-20-6	2,300.00	2,300.00	2,300.00	2
1,1,1-Trichloroethane	71-55-6	10,800.00	0.01	721.47	72
1,1,2,2-Tetrachloroethane	79-34-5	1,625.00	0.87	175.50	51
1,1,2-Trichloroethane	79-00-5	21,800.00	0.01	1,529.96	154
1,1-Biphenyl	92-52-4	3,900.00	0.86	1,759.89	10
1,1-Dichlorethane	75-34-3	14,000.00	0.00	520.19	221
1,1-Dichloroethene	75-35-4	13,100.00	0.00	1,915.79	273
1,1-Dichloroethylene	75-34-5	6,200.00	0.03	3,549.24	11
1,2-Dichlorobenzene	95-50-1	71.50	0.08	18.25	23
1,2,3-Trimethylbenzene	526-73-8	0.01	0.01	0.01	1
1,2,4,5-Tetrachlorobenzene	95-94-3	11.80	11.80	11.80	7
1,2,4-Trimethylbenzene	95-63-6	2,240.00	0.02	514.83	88
1,2-Dibromoethane	106-93-4	1,375.00	0.80	374.09	24
1,2-Dichloroethane	107-06-2	102,000.00	0.00	2,018.95	310
1,2-Dichloroethene	540-59-0	1,490.00	0.00	60.91	31
1,2-Dichloropropane	78-87-5	855.00	6.47	229.55	19
1,3 Hexachlorobutadiene	87-68-3	690.00	0.07	519.95	12
1,3,5-Trimethylbenzene	108-67-8	1,010.00	0.16	305.53	74
1,3-Butadiene	106-99-0	5.80	5.80	5.80	42
1,3-Dichlorobenzene	541-73-1	14.80	14.80	14.80	7
1,3-Dichloropropane	142-28-9	67.80	24.10	33.81	9
1,4-Dichlorobenzene	106-46-7	37.00	0.11	10.91	19
1-Methylnaphthalene	90-12-0	5.80	0.63	2.57	8
2,4-Dimethylphenol	105-67-9	121.00	0.57	59.13	25
2-Chloroethyl vinyl ether	110-75-8	26,500.00	26,500.00	26,500.00	1
2-Hexanone	591-78-6	0.16	0.16	0.16	3
2-Methylnaphthalene	91-57-6	11,000.00	0.77	1,302.84	69
2-Methylphenol	95-48-7	208.00	0.17	61.43	41
4,4'-DDD	72-54-8	0.02	0.02	0.02	3
4,4'-DDE	72-55-9	0.16	0.16	0.16	3
4,4'-DDT	50-29-3	0.03	0.03	0.03	3
4-Methylphenol	106-44-5	436.00	0.17	87.70	60
Acenaphthene	83-32-9	3,000.00	0.21	661.20	35
Acenaphthylene	208-96-8	8,100.00	0.40	1,396.38	32
Acetone	67-64-1	1,252.00	0.02	237.72	65
Acetophenone	98-86-2	10.00	0.02	0.71	54
Acrylonitrile	107-13-1	11,500.00	11,500.00	11,500.00	1
Aldrin	309-00-2	0.18	0.00	0.03	19
Alpha-BHC	319-84-6	3.71	0.05	0.97	4
Alpha-Chlordane	5103-71-9	0.10	0.10	0.10	3
Aluminum	7429-90-5	3,200.00	3,200.00	3,200.00	1
Anthracene	120-12-7	1,600.00	15.00	440.20	25
Antimony	7440-36-0	1.00	0.28	0.73	7
Aroclor 1242 (PCB) [2]	53469-21-9	27.00	27.00	27.00	1
Aroclor 1248 (PCB) [2]	12672-29-6	4.20	1.91	2.67	3
Arsenic	7440-38-2	140.00	0.00	5.55	198
Atrazine	1912-24-9	0.08	0.08	0.08	30
Barium	7440-39-3	440.00	1.78	63.62	264
Benz(a)anthracene	56-55-3	37.00	1.30	9.92	34
Benzaldehyde	100-52-7	4.20	0.28	0.85	36
Benzene	71-43-2	68,000.00	0.00	1,065.06	2,303
Benzo(a)pyrene	50-32-8	7.10	0.90	4.44	7
Benzo(b)fluoranthene	205-99-2	1.50	1.50	1.50	3
Benzo(g,h,i)perylene	191-24-2	0.23	0.23	0.23	3
Benzo(k)fluoranthene	207-08-9	0.73	0.73	0.73	3

Table 2-2. Spent Activated Carbon Metals and Organic Constituent Data Summary

		Concentration (ppm)			
Constituent	**CAS**	**Maximum**	**Minimum**	**Average**	**Shipments**
Benzoic Acid	65-85-0	7.20	7.20	7.20	2
Benzyl Alcohol	100-51-6	0.72	0.72	0.72	10
Beryllium	7440-41-7	1.34	0.06	0.61	59
beta-BHC	319-85-7	0.69	0.69	0.69	1
Bis (2-ethylhexyl) phthalate	117-81-7	6.33	0.15	0.91	56
Bis(2-chloroethyl)ether	111-44-4	8.50	0.17	3.41	13
Bromodichloromethane	75-27-4	302.00	0.02	7.98	154
Bromoform	75-25-2	307.00	6.15	241.97	30
Bromomethane	74-83-9	2.40	2.20	2.38	24
Butyl benzyl phthalate	85-68-7	0.21	0.21	0.21	3
Cadmium	7440-43-9	905.00	0.06	47.60	77
Carbazole	86-74-8	8.10	8.10	8.10	3
Carbon Disulfide	75-15-0	133.00	0.30	23.01	15
Carbon Tetrachloride	56-23-5	152,000.00	0.01	12,529.55	219
Chlorobenzene	108-90-7	42,100.00	0.00	3,976.66	75
Chlorobromomethane	74-97-5	0.39	0.39	0.39	1
Chloroethane	75-00-3	5,405.00	0.05	2,368.36	21
Chloroform	67-66-3	59,000.00	0.00	1,771.06	523
Chloromethane	74-87-3	870.00	0.06	53.12	102
Chromium	7440-47-3	77.00	0.14	7.66	210
Chrysene	218-01-9	36.00	4.00	12.90	23
cis-1,2-Dichloroethene	156-59-2	22,500.00	0.01	1,430.57	232
Cobalt	7440-48-4	131.00	0.27	16.55	106
Copper	7440-46-4	71.70	6.00	20.05	120
Cyclohexane	110-82-7	250.00	0.03	68.95	39
delta-BHC	319-86-8	0.74	0.39	0.65	4
Dimethyl phthalate	131-11-3	0.41	0.41	0.41	2
Dibenzofuran	132-64-9	230.00	230.00	230.00	3
Dibromochloromethane	124-48-1	252.00	0.05	24.63	72
Dibromomethane	74-95-3	0.74	0.74	0.74	4
Dibutyl Phthalate	84-74-2	0.17	0.02	0.04	35
Dichlorodifluoromethane	75-71-8	26.00	0.81	19.70	4
Dicyclopentadiene	77-73-6	270,000.00	0.09	156,315.79	38
Dieldrin	60-57-1	0.05	0.00	0.01	19
Diethylphthalate	84-66-2	0.21	0.21	0.21	3
Dinitrobutyl Phenol (Dinoseb)	88-85-7	0.61	0.61	0.61	1
Di-n-octyl phthalate	117-84-0	469.00	0.58	293.34	8
Endosulfan Sulfate	1031-07-8	0.29	0.29	0.29	3
Endrin	72-20-8	0.09	0.09	0.09	3
Endrin aldehyde	7421-93-4	0.05	0.05	0.05	3
Endrin ketone	53494-70-5	0.06	0.06	0.06	3
Ethylbenzene	100-41-4	46,900.00	0.00	538.74	1,504
Fluoranthene	206-44-0	380.00	40.00	124.16	25
Fluorene	86-73-7	5,800.00	0.24	867.21	35
Freon 113	76-13-1	2,700.00	0.04	632.06	16
gamma-Chlordane	5566-34-7	0.12	0.12	0.12	3
Hexachloroethane	67-72-1	165.00	0.38	148.54	10
Hexane	110-54-3	13.70	13.70	13.70	10
Hexavalent Chromium	18540-29-9	3.50	3.50	3.50	7
Indeno[1,2,3-cd]pyrene	193-39-5	0.20	0.20	0.20	3
Iron	7439-89-6	13,000.00	13,000.00	13,000.00	1
Isophorone	4098-71-9	91.00	91.00	91.00	1
Isopropyl Ether	108-20-3	0.01	0.01	0.01	1
isopropylbenzene	98-82-8	1,740.00	0.25	154.44	99

Table 2-2. Spent Activated Carbon Metals and Organic Constituent Data Summary

		Concentration (ppm)			
Constituent	**CAS**	**Maximum**	**Minimum**	**Average**	**Shipments**
Lead	7439-92-1	114.00	0.20	5.68	372
Lindane	58-89-9	0.95	0.95	0.95	1
Magnesium	1309-48-4	6,290.00	810.00	5,421.25	24
Manganese	7439-96-5	1,900.00	63.90	323.81	38
m-Cresol	108-39-4	436.00	0.17	87.70	60
Mercury	7439-97-6	30.90	0.00	1.32	72
Methyl acetate	79-20-9	5.56	5.56	5.56	2
Methyl ethyl ketone	78-93-3	936.00	0.03	74.13	92
Methyl isobutyl ketone	108-10-1	2.73	0.41	1.57	4
Methyl tert-butyl ether	1634-04-4	924.00	0.03	73.44	92
Methylcyclohexane	108-87-2	200.00	5.38	126.71	28
Methylene chloride	75-09-2	13,700.00	0.03	1,413.30	186
Molybdenum	7439-98-7	23.50	0.15	2.08	72
m-Xylene	108-38-3	24,200.00	0.02	892.32	489
Naphthalene	91-20-3	8,600.00	0.03	548.47	99
n-butylbenzene	104-51-8	39.20	1.57	5.17	15
Nickel	7440-02-0	47.00	0.20	9.72	171
Nitrobenzene	98-95-3	0.50	0.50	0.50	6
N-Nitrosodiphenylamine	86-30-6	270.00	67.00	89.56	18
n-propylbenzene	103-65-1	1,110.00	0.00	163.16	72
o-Xylene	95-47-6	10,100.00	0.01	344.69	462
PCB-1260 [2]	11096-82-5	0.66	0.17	0.42	2
Pentachlorophenol	87-86-5	71.40	0.55	28.89	5
Phenanthrene	85-01-8	6,900.00	0.01	1,361.43	35
Phenol	`	435.00	0.01	68.12	79
p-Isopropyltoluene	99-87-6	156.00	0.80	13.84	29
Potassium	2023695	400.00	400.00	400.00	1
p-Xylene	106-42-3	24,200.00	0.02	891.50	489
Pyrene	76165-23-6	820.00	21.00	229.72	25
Pyridine	110-86-1	410.00	0.73	378.52	13
sec-butylbenzene	135-98-8	164.00	1.29	19.15	26
Selenium	7782-49-2	10.40	0.19	0.83	102
Silver	7440-22-4	3.53	0.03	0.30	87
Styrene	100-42-5	117,000.00	0.00	2,919.88	228
Sulfide	18496-25-8	4.00	4.00	4.00	3
Tetrachloroethylene	127-18-4	242,000.00	0.00	16,758.49	513
Toluene	108-88-3	98,500.00	0.00	1,051.70	1,701
trans 1,2-Dichloroethene	156-60-5	1,300.00	0.02	111.66	76
Trichloroethylene	79-01-6	160,000.00	0.00	7,291.90	526
Trichlorofluoromethane	75-69-4	2,010.00	0.16	161.24	21
Vanadium	7440-62-2	48.80	1.21	14.37	98
Vinyl acetate	108-05-4	0.50	0.50	0.50	2
Vinyl Chloride	75-01-4	1,400.00	0.00	102.57	218
Xylene	1330-20-7	7,000.00	0.00	276.32	999
Zinc	7440-66-6	241.00	1.23	39.03	113

Notes:

[1] Data summary from calendar years 2018 through 2020.

[2] Desotec no longer accepts carbon containing PCBs.

Table 2-3. Typical Characteristics of Natural Gas

Constituent/Property	Units	Value	
		Typical	Range
Organic Constituents			
Methane	vol%	93.7	93.4 - 93.9
Ethane	vol%	3.3	2.8 - 3.6
Propane	vol%	0.5	0.5
i-Butane	vol%	0.07	0.06 - 0.1
n-Butane	vol%	0.09	0.08 - 0.1
i-Pentane	vol%	0.03	0.02 - 0.05
n-Pentane	vol%	0.02	0.02 - 0.03
Hexane (plus)	vol%	0.05	0.04 - 0.06
Hydrogen sulfide	ppmv	<1	0 - 1
Carbonyl sulfide	ppmv	0.04	0 - 0.1
Dimethyl sulfide	ppmv	0.4	0 - 0.9
t-Butylmercaptan	ppmv	0.2	0 - 0.8
Methyl t-butyl disulfide	ppmv	0.02	0 - 0.05
Cyclopentane	ppmv	10	9 - 11
Methylcyclopentane	ppmv	27	25 - 28
Cyclohexane	ppmv	31	29 - 33
Methylcyclohexane	ppmv	30	25 - 37
Hexanes	ppmv	199	155 - 265
Heptanes	ppmv	74	54 - 100
Octanes	ppmv	48	32 - 65
Nonanes	ppmv	17	10 - 26
Decanes	ppmv	4	2 - 6
Undecanes	ppmv	1.5	1 - 2
Dodecanes	ppmv	<1	0 - 1
Benzene	ppmv	18	8 - 28
Toluene	ppmv	10	10 - 11
Ethyl benzene	ppmv	0.7	0 - 1.7
m-Xylene	ppmv	2.4	2 - 3
o-Xylene	ppmv	0.8	0.75 - 0.87
p-Xylene	ppmv	0.6	0.4 - 0.7
Inorganic Constituents			
Water	vol%	~0	~0
Carbon dioxide	vol%	0.9	0.7 - 1.0
Nitrogen	vol%	1.4	1.4 - 1.5
Oxygen/Argon	vol%	0.03	0.03 - 0.04
Ash	vol%	~0	~0
RCRA Metals			
Arsenic	ug/m^3	<0.2	<0.2
Barium	ug/m^3	<0.05	<0.05
Cadmium	ug/m^3	<0.01	<0.01
Chromium	ug/m^3	<0.01	<0.01
Lead	ug/m^3	<0.05	<0.05
Mercury	ug/m^3	<0.01	<0.01
Nickel	ug/m^3	<0.5	<0.5
Other Metals			
Cobalt	ug/m^3	<0.1	<0.1
Copper	ug/m^3	<0.3	<0.3
Manganese	ug/m^3	<0.2	<0.2
Vanadium	ug/m^3	<0.2	<0.2
Physical/Chemical Properties			
Physical Form	NA	Vapor	
Viscosity (if liquid)	cSt	NA	NA
Heating Value	Btu/scf	1028 - 1033	1030
Vapor Specific Gravity	NA	0.593 - 0.595	0.594
Elemental Composition			
Carbon	wt%	74.8	
Hydrogen	wt%	24	
Oxygen	wt%	0	
Nitrogen	wt%	1.2	
Sulfur	wt%	0	
Chlorine/chloride	ug/m^3	<1.6	
Bromine/bromide	ug/m^3	~0	
Fluorine/fluoride	ug/m^3	~0	
Iodine/iodide	ug/m^3	~0	

Source: "Analysis of Trace Level Compounds in Natural Gas"
Gas Research Institute, Document Number GRI-99/0111
February, 2000

Note: Arsenic and mercury, which are occasionally found at ppmv or sub-ppmv levels in some raw natural gas wells, were not detected in processed and distributed natural gas. Chromium, nickel, cobalt, vanadium, etc. are not naturally-occurring and were not detected. The concern expressed in some reports regarding the possibility that these metals may be picked up by natural gas flowing through the gas delivery system was not corroborated. The lack of metals found in this study suggest that the metals found in earlier work were due to carryover from combustion systems which had been fired using other fuels (coal and/or oil).

3.0 ENGINEERING DESCRIPTION

A block flow diagram of the carbon reactivation process is shown in Figure 3-1. Spent carbon slurry is fed from the Furnace Feed Hopper into a dewatering screw where the carbon is dewatered prior to introduction into the Carbon Reactivation Furnace (RF). Water from the dewatering screw is returned to the recycle water storage tank. The RF is a multiple hearth furnace consisting of five hearths. The spent carbon is introduced into the top hearth and flows downward through the remaining four hearths. Reactivated carbon exits the bottom hearth through a cooling screw. The RF is equipped with a primary combustion air fan and two shaft cooling fans. Natural gas burners are provided to ensure adequate heat input to the reactivation unit for all of the spent carbons that are reactivated at the facility. The hot gases generated in the RF flow upward through the hearths and exit from the topmost hearth and are routed to an afterburner to ensure the thermal oxidation of any organic matter that is not oxidized in the reactivation unit. The afterburner is equipped with two burners that utilize natural gas as the fuel source. From the afterburner, the gases are quenched by direct water contact and routed through a variable throat venturi scrubber for particulate matter control. From the venturi scrubber, the gases are routed to a packed bed scrubber for acid gas control. From the packed bed scrubber, the gases flow through a WESP, used for fine particulate matter and metals control. From the wet electrostatic precipitator, the gases are routed through a stack to the atmosphere. The motive force for moving the gases through the air pollution control system is supplied by an induced draft fan located between the WESP and stack.

A pH-controlled scrubbing medium (water and caustic solution) is supplied to the air pollution control system from the scrubber water system. The pH is continuously monitored to ensure efficient acid gas removal in both the quench/venturi scrubber and the packed bed scrubber. Caustic is added based on the pH of the scrubber water.

The air pollution control equipment uses a closed loop recycle water system. Periodically, a portion of the scrubber water in the system is discharged (blowdown) in order to prevent the excessive build-up of total dissolved solids in the scrubber water system.

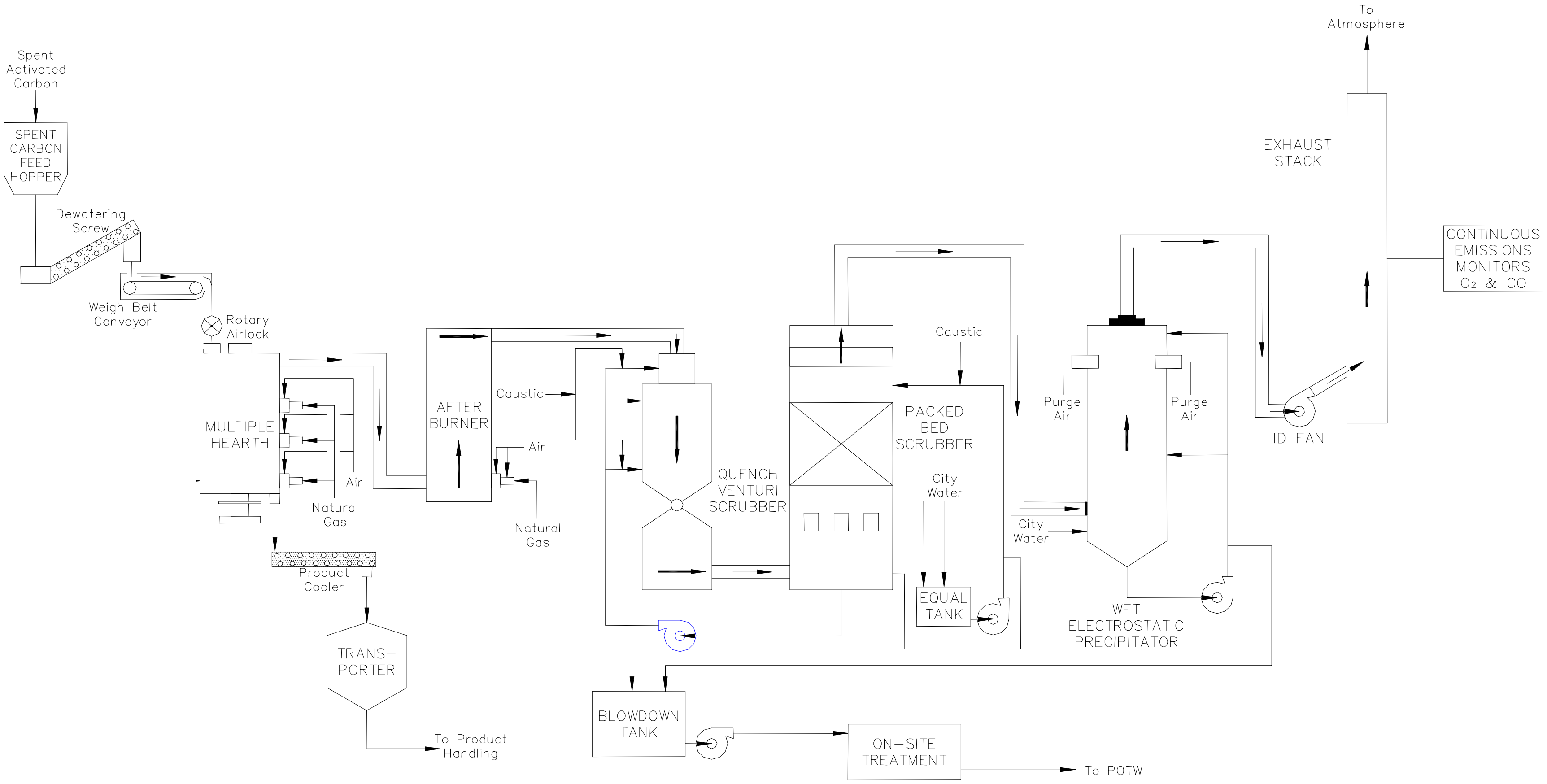

Figure 3-1. Carbon Reactivation Furnace System Block Flow Diagram

Scrubber blowdown from the RF air pollution control equipment is either discharged directly to the Publicly Owned Treatment Works (POTW) or is treated in a RCRA-exempt wastewater treatment unit, and then discharged to the POTW. The discharge to the POTW is continuously monitored for pH, total dissolved solids, flow, and temperature to ensure compliance with the discharge limitations found in the facility's industrial wastewater discharge permit.

3.1 THERMAL TREATMENT SYSTEM

The thermal treatment system is a multiple hearth furnace, consisting of five hearths followed by an afterburner. Spent carbon is introduced into the top hearth of the reactivation unit and flows downward through the remaining four hearths. The top two hearths are unfired hearths. Hot combustion gases generated in the bottom three hearths are used to complete the dewatering of the spent carbon. The bottom three hearths are fired hearths where the reactivation process occurs. Rabble arms, with teeth, each connected to a rotating center shaft, are located above each hearth. The rabble teeth plow the carbon material across the hearth surface and towards drop holes. The carbon falls through the drop holes to the next lower hearth, and eventually to the outlet of the reactivation unit. Reactivated carbon exits the bottom hearth through a cooling screw. The RF is equipped with a primary combustion air fan, and two center shaft cooling fans. Natural gas burners are provided to ensure adequate heat input to the reactivation unit for all carbons that are reactivated at the facility.

3.1.1 Type, Manufacturer's Name and Model Number

The RF is a multiple hearth furnace consisting of five hearths and an afterburner manufactured by Hankin Environmental Systems, Inc. The Hankin multiple hearth furnace is a 12’10 ¾” O.D. x 5 Hearths was originally designed to nominally reactivate 2,760 lb/hr of spent carbon feed. Drawings and specifications for the multiple hearth furnace and afterburner are presented in Attachment C.

3.1.2 System Capacity

The RF unit is currently authorized to reactivate 3,049 pounds per hour of spent carbon feed based on the 2006 PDT.

3.1.3 Thermal Treatment and Combustion Chamber(s)

Following dewatering the spent granular carbon is fed to the top section of the multiple-hearth furnace. In the pre-drying and drying zones (the top hearths) the water retained in the pores and on the surface of the carbon is evaporated by the counter-current flow of hot combustion gases. The temperature of the carbon is raised to approximately 210°F. Upon application of heat, water will evaporate freely when the particle temperature goes over 200°F. The adsorbed water is freed at temperatures of approximately 212°F to 230°F.

Upon the application of heat to the particles at temperatures over 600°F, the high molecular weight organic impurities will crack to produce gaseous hydrocarbons, hydrogen and water vapor which escape the pores of the granular carbon while some fixed carbon is retained in the pores of the granules. In these pre-heating and decomposition zones (middle hearths) the temperature of the carbon is increased to about 750°F in a virtually oxygen-free atmosphere. Under these conditions the adsorbed organic impurities in the pores of the carbon are pyrolyzed and all volatile materials are driven off.

The afterburner is a self-supporting vertical cylindrical chamber approximately 33 feet high with an inside refractory diameter of approximately 5 feet. The design incorporates a mixing zone, choke ring and a minimum residence time at temperature of greater than one second. The afterburner shell is constructed of steel plate and is internally lined with firebrick and castable insulation. The afterburner is equipped with two low NO_x burners, which utilize heated combustion air. The afterburner chamber is fitted with a total of six air injection nozzles which are placed to provide combustion air and turbulence to promote the oxidation of organic materials in the flue gas. The afterburner is designed to thermally oxidize greater than 99.99 percent of all organic matter entering the afterburner in the furnace off gas. A cross-section of the afterburner and the specification for the afterburner can be found in Attachment C. Actual material usages will be those listed in the specification or their functional equivalent.

3.1.4 Residence Time Determination

The residence time for the solid carbon in the Carbon Reactivation Furnace is 38 minutes at a shaft speed of approximately 1 rpm.

3.2 BURNER AND FEED SYSTEMS

Six natural gas burners are installed in the RF, two per hearth on hearths 3, 4, and 5. Two natural gas burners are installed in the afterburner.

3.2.1 Burner Description

The six burners installed in the RF are North American Manufacturing Company burners (NA 6422-6) or their functional equivalent. The two burners installed in the afterburner are North American Manufacturing Company burners (NA 6514-8-B) or their functional equivalent. Literature describing these burners can be found in Attachment C. Materials of construction of these burners are listed in the literature.

3.2.2 Spent Activated Carbon Feed System

The spent activated carbon feed system to the RF consists of a feed hopper, a dewatering screw, and a weigh belt conveyor. The spent carbon/recycle water slurry is discharged from the feed hopper to the dewatering screw via a control valve. The dewatered spent carbon is discharged from the dewatering screw on to the weigh belt conveyor, which is used to measure the feed rate to the RF.

3.2.3 Auxiliary Fuel System

The six burners in the RF and the two burners in the afterburner are fired with natural gas, supplied by the local utility company via pipeline.

3.2.4 Combustion Air

Combustion air is supplied to the six RF burners and two afterburner burners by a combustion air blower. The blower is designed to supply approximately 351,600 ACFH of preheated combustion air. Fan specifications are located in Attachment C.

3.3 REACTIVATED CARBON HANDLING SYSTEM

The reactivated carbon exiting from the RF is a product. The reactivated carbon is discharged from the RF into a screw cooler and from the screw cooler through an enclosed conveyor system into one of three reactivated carbon product storage tanks. From the reactivated carbon storage tanks, the reactivated carbon product is transported through an enclosed conveyor to a product packaging facility. At the product packaging facility, the reactivated carbon is removed from the storage tanks and placed in appropriate containers for shipment to customers.

Scrubber blowdown from the RF air pollution control equipment is treated in a RCRA-exempt wastewater treatment unit or discharged directly to the POTW. The discharge to the POTW is continuously monitored for pH, total dissolved solids, flow, and temperature to ensure compliance with the discharge limitations found in the facility's industrial wastewater discharge permit.

3.4 AIR POLLUTION CONTROL (APC) SYSTEM

The APC system for the RF includes a quench/venturi scrubber, a packed bed scrubber and a wet electrostatic precipitator. Exhaust gases from the thermal treatment system are continuously routed through the APC equipment, and cannot by-pass the APC equipment under any circumstances. The individual components of the APC equipment are described in the following sections.

3.4.1 Quench/Venturi Scrubber

The Quench/Venturi Scrubber is a dual-purpose device used to rapidly quench the hot combustion gases exiting the afterburner and to remove particulate matter. The quench section uses water sprays to cool the afterburner exit gas to the point of adiabatic saturation (approximately 170 to 190°F). The venturi scrubber has an adjustable throat, and is a low energy, vertical down flow type. The throat area is adjusted by a pneumatic cylinder actuator and an electro/pneumatic positioner. The remotely adjustable throat is automatically controlled to maintain a constant pressure differential. The venturi scrubber is located directly below the quench section and is connected by a flooded elbow to the packed bed scrubber. The elbow incorporates a water-filled gas impact section directly beneath the throat to prevent erosion of the shell. The water supply for quench and venturi irrigation is recirculated scrubber water at a total flow of approximately 7.5 gpm/1000 ACFM.

The design data and equipment descriptions for the quench/venturi scrubber as well as a description of the physical dimensions of the venturi scrubber section can be found in Attachment C. Actual material usages will be those listed therein, or their functional equivalent.

3.4.2 Packed Bed Scrubber

The packed bed scrubber consists of a vertical up flow and cylindrical disengaging section followed by a packed bed section and mist eliminator. The bottom portion of the scrubber is used to separate entrained water droplets from the gas prior to entering the packed section of the scrubber.

The packed bed scrubber is designed to remove a minimum of 99 percent of the incoming hydrogen chloride.

The design data and equipment description for the packed bed scrubber as well as a description of the physical dimensions of the packed bed scrubber can be found in Attachment C. Actual material usages will be those listed therein or their functional equivalent.

3.4.3 Wet Electrostatic Precipitator

The wet electrostatic precipitator (WESP) is a vertical hexagonal tube design with self-irrigating tubes. The WESP consists of inlet gas distribution to promote even distribution of the process gas flow entering the WESP, inlet and outlet plenums and a collecting electrode tube bundle. The WESP is equipped with outboard high voltage insulator compartments which include a purge air system, high voltage distribution-support grids, high intensity rigid tube type charging/precipitating discharge electrodes, high voltage power supply (transformer/rectifier and controller) system, ground sticks, safety key interlocks, warning labels, and electronic control logic equipment and valving.

The WESP, in conjunction with the venturi scrubber, is designed to achieve a maximum outlet particulate matter grain loading of 0.013 grains/dscf adjusted to 7 percent oxygen.

The design data and equipment description for the WESP as well as a description of the physical dimensions of the WESP can be found in Attachment C. Actual material usages are those listed therein or their functional equivalent.

3.4.4 ID Fan

A variable speed induced draft fan is provided to exhaust combustion gases from the furnace and afterburner and through the air pollution control system. Design specifications for the fan can be found in Attachment C. Actual materials of construction will be those listed in the specification or their functional equivalent. The ID Fan controls the flow of gases through the entire process and is directly related to the operating limits on stack gas flow rate. The stack gas monitoring device is described in Table 3-1. Permit limits (including stack gas flow rate) are presented in Table 7-1. Expanded Interlock limits to be in place during testing periods are shown in Table 7-2.

3.4.5 Stack

The treated gas stream is exhausted to the atmosphere via a 110-foot-high stack with an inside diameter of two feet and a gas outlet that is 19.75 inches in diameter. The stack is equipped with ports for continuous emissions monitoring, stack gas flow rate monitoring, and exhaust gas sampling. A stack drawing is provided in Attachment C. Actual materials of construction will be those listed in the specification or their functional equivalent. Additional sampling ports may be installed for the extensive sampling to be conducted during this PDT. A stack sampling port location drawing is included in Attachment C.

3.5 PROCESS MONITORING, CONTROL, AND OPERATION

The facility is equipped with a programmable logic control (PLC) system which monitors and/or controls process variables to ensure proper facility operation. The RF system is equipped with instrumentation to monitor and control process flows, temperatures, and pressures, and to transmit signals to the main control system. The automation system has the capabilities of controlling valves, motors, pumps, and fans as well as alarming and initiating waste feed cutoff interlocks if process conditions deviate from established limits.

Figure 3-2 shows the location of pertinent instrumentation related to RCRA Permit compliance. Complete Piping and Instrumentation Diagrams (P&IDs) are included in Attachment C. It is important to note that these drawings include many components of the facility that are exempt from permitting under various provisions of RCRA. These components are provided for informational purposes and ease of review only, and they are not intended to become regulated components of the facility. Information concerning the major process instruments associated with regulatory compliance is presented in Table 3-1. Instrument tag numbers correspond to the designations shown on the P&IDs. Calibration schedules are based on manufacturer’s recommendations and Desotec operating experience.

Process monitoring and emissions monitoring performed for regulatory compliance is conducted on a continuous basis in accordance with USEPA definitions of continuous monitors.

A “Continuous Monitor” is a device (or series of devices) which continuously samples the regulated parameter without interruption, evaluates the detector response at least once every 15 seconds, and computes and records the average value at least every 60 seconds, except during periods of calibration or as otherwise allowed by the applicable regulations or guidelines. For many parameters, rolling averages are calculated.

A “Rolling Average” is defined as the arithmetic mean of a defined number of the most recent one-minute average values calculated by the continuous monitor. For example, an HRA would incorporate the 60 most recent one-minute average values. As each new one-minute average value is computed, the least recent of the 60 values is discarded and a new hourly rolling average is calculated and recorded. 12-hour rolling averages (THRA) use 720 one-minute average values rather than 60. The one exception to “rolling average” compliance in the RCRA Permit is the spent activated carbon feed rate. The spent activated carbon feed rate limit is a totalized 1-hour block average. A “1-hour block total” is the total amount of feed that occurs during a given “clock hour”. The continuous feed rate monitoring system sends a reading to the process computer every 5 seconds, and the total feed rate for the hour is summed from the individual readings across the current clock hour. At the top of each hour, the current 1-hour block total is recorded (i.e., functioning as a totalizer, it reports the sum during the hour), then the total is reset, and the next 1-hour block total computation begins. For purposes of the PDT, the differentials of the one-minute recorded total feed values will be used to calculate effective one minute average values for each minute during the test period as follows: [minute (n+1) lbs – minute (n) lbs] X 60 min/hr = one-minute average feed rate (lbs/hr).

Two subsets of continuous monitoring systems are employed on the RF: process continuous monitoring systems (CMS) and continuous emissions monitoring systems (CEMS). The following is a discussion of each type of continuous monitoring system.

F1	Spent Activated Carbon Feed Rate
F2	Quench/Venturi Scrubber Recycle Flow Rate (Total)
F3	Packed Bed Scrubber Recycle Flow Rate
F4	Scrubber Blowdown Flow Rate
F5	Stack Gas Flow Rate
P1	Venturi Scrubber Pressure Differential
F6	**Natural Gas Flow**
P2	Packed Bed Scrubber Pressure Differential
A1	Packed Bed Scrubber pH
A2	Stack Gas Carbon Monoxide
A3	Stack Gas Oxygen
E1	WESP Secondary Voltage
T1	Afterburner Temperature

See Table 3-1 And P&IDs For Additional Details

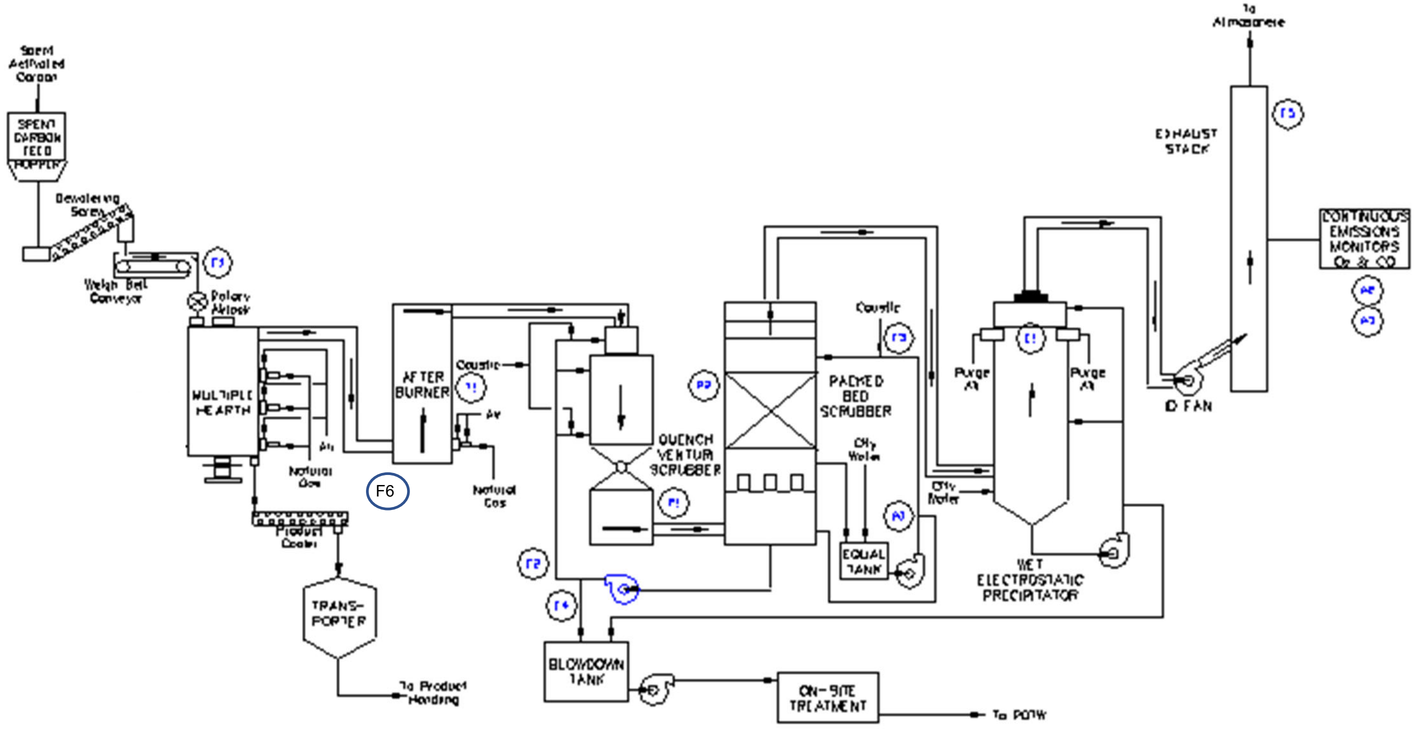

Figure 3-2. Location of Critical Process Instruments

Table 3-1. Critical Process Instruments

Parameter	Identification Number of Sensor/Transmitter (a)	Instrument Type	Units	Instrument Operating Range	Calibration frequency	Averaging	AWFCO (Y/N)
Feed rate of spent activated carbon	WE/WT-427	Weigh cell	lb/hr	0-6000	Semi-annually	1-hr Block	Y
Total feed rate of chlorine/chloride	Computer	Calculated	Lb/h	NA	NA	THRA	N
Total feed rate of mercury	Computer	Calculated	lb/hr	NA	NA	THRA	N
Total feed rate of SVM	Computer	Calculated	lb/hr	NA	NA	THRA	N
Total feed rate of LVM	Computer	Calculated	lb/hr	NA	NA	THRA	N
Afterburner gas temperature	TE-464A/B	T/C	F	0-2400	Semi-annually	HRA	Y
Hearth #5 temperature	TE-457-A and CD	T/C	F	0-2400	Semi-annually	HRA	Y
Natural gas flow rate	NA	Utility gas meter	MCF	-	By utility company	NA	NA
Venturi scrubber pressure differential	PDIT-556	Pressure sensor	in w.c.	0-50	Annually	HRA	Y
Venturi/Quench scrubber recycle liquid flow rate (Total Flow)	FI-562 (Total of FE/FIT-553, 554, & 555)	Sum of Magnetic flow meters (Dynac Function)	gpm	0-656	Annually	HRA	Y
Packed bed scrubber pH	AE/AIT-590	pH probe	pH	0-14	Quarterly	HRA	Y
Packed bed scrubber recycle liquid flow rate	FE/FIT-552	Magnetic flow meter	gpm	0-200	Annually	HRA	Y
Packed bed scrubber pressure differential	PDIT-560	Pressure sensors	in w.c.	0-10	Annually	HRA	N
Scrubber blowdown flow rate	FE/FIT-605	Magnetic flow meter	gpm	0-691	Annually	HRA	Y
WESP secondary DC voltage	EI-558	Voltmeter	kVDC	0-80	NA	HRA	Y
Stack gas flow rate	FE/FIT-700	Ultrasonic flowmeter	acfm	0-12,000	Semi-annually	HRA	Y
Stack gas carbon monoxide (b)	AE-575	Nondispersive infrared CEMS	ppmvd @7% O_2	0-100 0-1000	Daily/ Quarterly/ Annually	HRA	Y
Stack gas oxygen (b)	AE-576	Paramagnetic CEMS	vol%, dry	0-25	Daily/ Quarterly/ Annually	None	N

RA = Rolling average.

(a) Instrument identification from P&IDs.

CEMS calibrations include daily zero and span check, quarterly cylinder gas audit, and annual performance specification test.

3.5.1 Process Continuous Monitoring System (CMS)

Figure 3-2 shows the general location and function of the temperature, pressure, and flow indicating and control devices for the carbon reactivation system. The specifications for these devices are shown in Table 3-1.

The following is a discussion of each type of process monitoring and control to be performed in the RF system for regulatory compliance purposes.

Spent Activated Carbon Feed Rate

The flow rate of the spent activated carbon is monitored and controlled using a weigh belt conveyor and carbon slurry feed valve. When the feed valve is open, carbon slurry drops into the dewatering screw and is then discharged onto the weight belt conveyor, which feeds the carbon to the RF. The feed rate control system consists of a weigh cell, weight transmitting element, weight indicating controller, variable timed open/closed carbon slurry feed valve, and continuous weight feed rate recorder. The desired spent activated carbon feed rate is achieved by the control system adjusting the time that the carbon slurry feed valve is open and closed. Automatic waste feed cutoff interlocks stop the weigh belt conveyor which stops the feed of carbon to the RF.

Regulated Constituent Feed Rates

The total feed rate of total chlorine/chloride, mercury, semivolatile metals (the combination of cadmium plus lead), and low volatility metals (the combination of arsenic, beryllium, plus chromium) will be continuously monitored and recorded in accordance with the HWC MACT regulations. This will be accomplished by the process computer which continuously monitors the flow rate of spent activated carbon, and multiplies that flow rate by the constituent concentration, which is input to the computer whenever the feed stream characterization is updated. The waste characterization is updated in accordance with the procedures in the facility Waste Analysis Plan (WAP). A copy of the WAP is included in Attachment E for reference. If a regulated constituent is believed to have the potential to be present in the spent activated carbon, but is not detected by the relevant analysis, then the detection limit for that constituent will be used in the calculation. If a constituent is not expected to have the potential to be present in the spent activated carbon, then the concentration of that constituent will be set as zero. This determination is made by plant management based on experience with the various spent activated carbons received at the facility and the historical presence or absence of specific metals.

Afterburner Temperature

The RF afterburner combustion temperature is continuously measured by thermocouples located in the afterburner chamber. The automatic temperature controller accepts the signal from the thermocouple and manipulates the auxiliary fuel feed rate. The automatic waste feed cutoff interlock is activated during low temperature conditions.

Hearth #5 Temperature

The RF Hearth #5 temperature is continuously measured by thermocouples located just above the hearth. The automatic temperature controller accepts the signal from the thermocouple and manipulates the auxiliary fuel feed rate. The automatic waste feed cutoff interlock is activated during low temperature conditions.

Natural Gas Flow Rate

The flow rate of natural gas is determined daily from readings taken at the utility gas meter. A reading is taken once per day and recorded in the operating log. In accordance with RCRA Permit Condition V.C.6.c, the natural gas consumption is totaled monthly and is used to calculate the NOx emissions using the facility-specific emission factor, which is determined from data collected during the PDT.

Venturi Pressure Differential

Venturi scrubber pressure differential is measured and controlled as an indicator of the energy supplied for particulate matter removal. A minimum pressure differential is necessary for proper control efficiency. The pressure differential is continuously measured by a pressure differential indicator with pressure taps located at the inlet and outlet of the venturi. The pressure differential is controlled by changing the position of the venturi throat control valve elements. A low venturi pressure differential will trigger an automatic waste feed cutoff.

Quench/Venturi Scrubber Liquid Flow Rate

The recycle flow rate is continuously monitored using magnetic flow meters in the recycle water lines. A minimum recycle water flow rate is maintained in order to provide sufficient cooling and scrubbing water for particle removal. A low total recycle flow rate will initiate an automatic waste feed cutoff.

Packed Bed Scrubber pH and Flow Rate

The packed bed scrubber recycle pH and the flow rate of recycled liquid to the packed bed scrubber influence the effectiveness of acid gas removal. The pH is measured continuously by an in-line pH probe installed in the recycle liquid piping. The recycle flow rate is continuously monitored using a magnetic flow meter in the recycle water line. Either low pH or low packed bed scrubber recycle flow rate will initiate an automatic waste feed cutoff.

Packed Bed Scrubber Pressure Differential

The differential pressure across the packed bed is measured as an indicator of proper liquid and gas distribution in the tower. The pressure differential is continuously measured by a differential pressure element with taps located at the inlet and outlet of the packed bed scrubber. Low pressure differential will trigger an automatic waste feed cutoff.

WESP Secondary Voltage

Although the HWC MACT regulations do not require monitoring of any WESP performance indicators, Desotec will monitor the secondary voltage as an indicator of proper collection of fine particles and metals. Low WESP secondary voltage will initiate an automatic waste feed cutoff.

Scrubber Blowdown Flowrate

In order to conserve water, Desotec recycles most of the liquid from the air pollution control system. In order to prevent the buildup of dissolved solids, Desotec bleeds water from the system. As water is bled, fresh makeup water is added. The APC system blowdown flow rate is continuously monitored using a magnetic flowmeter, and a low flow rate will trigger an automatic waste feed cutoff.

Stack Gas Flow Rate

The flow rate of stack gases is used as the indicator of combustion gas velocity prescribed by the applicable regulations. A flow sensor located in the stack provides the direct flow measurement. High stack gas flow rate will initiate an automatic waste feed cutoff.

3.5.2 Continuous Emissions Monitoring System (CEMS)

The exhaust gases are continuously monitored for carbon monoxide and oxygen content as an indicator of proper operation of the combustion process. To ensure these monitors are functioning properly, they are calibrated according to the protocols specified in the Appendix to 40 CFR 63 Subpart EEE, and Performance Specification 4B of 40 CFR 60 Appendix B. High CO will initiate an automatic waste feed cutoff interlock.

The oxygen analyzer is an Ametek FCA-Control paramagnetic analyzer. The carbon monoxide analyzer is a Thermo Environmental Model 48, non-dispersive infrared monitor having a dual range of 0-100 ppm and 0-1000 ppm.

Performance specifications for the CEMS are shown in Table 3-2. Additional specifications, as well as a drawing of the sampling system can be found in Attachment C.

Table 3-2. CEMS Performance Criteria (a)

Monitor/Test	Performance Criteria	Reference	Notes
Carbon Monoxide Monitor			
Calibration Drift	≤ 3 % of span	PS 4B, 4.2	For 6 out of 7 days; low and high range
Calibration Error	≤ 5 % of span	PS 4B, 4.4	At all 3 test points
Response Time	≤ 2 minutes	PS 4B, 4.5	
Relative Accuracy	≤ 10 % of RM Mean	PS 4B, 4.3 (PS 4A, 2.5)	or 5 ppm, whichever is greater [b]
Oxygen Monitor			
Calibration Drift	≤ 0.5 % O_2	PS 3, 2.2	For 7 consecutive days
Calibration Error	≤ 0.5 % O_2	PS 4B, 4.5	At all three test points
Response Time	≤ 2 minutes	PS 4B, 4.5	Longest of the upscale and downscale averages
Relative Accuracy	NA	BIF [c]	Incorporated into CO RA test

PS - Performance Specification, RM - Reference Method

a) Original reference for performance criteria is Performance Specification 4B.
b) If the average concentration of CO in the emissions is < 10 ppmv (I.e., < 10 % of the 100 ppmv standard), compliance with the RA criteria has been demonstrated if the RM demonstrates that CO emissions are < 10 ppmv.
c) 40 CFR 266, Appendix IX, Paragraphs 2.1.4.6 and 2.1.5.3

3.5.3 Safety and Automatic Waste Feed Cutoffs

The control system includes an automatic waste feed cutoff (AWFCO) system that stops the feed of spent activated carbon when normal operating conditions are at or near limits necessary to comply with specific RCRA Permit conditions. In addition, the spent activated carbon feed is automatically stopped if the range of the measurement instrument is exceeded or if there is a malfunction of the continuous monitoring system.

For example, sudden changes in organic loading that could negatively impact performance are indicated by an increase in carbon monoxide concentration which is monitored by the AWFCO. Similarly, a large “surge” in chlorine feed rate would be indicated by a sudden drop in scrubber pH, which is also monitored and connected to the AWFCO. Violation of the limit for either of these monitored parameters will shut down the carbon feed to the RF. Metals and noncombustible matter emissions are controlled by the wet scrubber and WESP. Their efficiency is not strongly impacted by inlet loading, and operating limits on pressure differential and liquid flow rate for the venturi, and voltage and stack gas flow rate for the WESP are in place. The carbon feed to the RF is automatically stopped if any of these operating limits are exceeded.

A listing of the AWFCO parameters is provided in Table 3-3 that are applicable during normal, non-testing operations. When any of these parameters deviate from the established limit, an electronic signal from the control system will stop the carbon weigh belt feeder. Anticipated limits for these and other RCRA Permit conditions are discussed in Section 7.0 of this plan.

On a monthly basis, during RF operations, the AWFCO system will be tested. Each of the regulatory AWFCOs will be tested by using a control system console to input a software value which corresponds to an exceedance of the RCRA Permit limit. Verification will then be made that the control system, in response to the test input, sends out a signal to trigger AWFCOs. It should be noted that during the brief period of time when the AWFCO parameters are being tested, regulatory AWFCOs will be precluded. A maximum time limit of one minute per test for each parameter will be imposed so as to minimize AWFCO downtime. Non-regulatory AWFCOs will not be affected by the test.

Table 3-3. Automatic Waste Feed Cutoff Parameters

Automatic Waste Feed Cutoff Parameter	**Action**	
	Stop Spent Activated Carbon Feed	**Alarm**
High-high spent activated carbon feed rate	✓	✓
Low-low afterburner combustion gas temperature	✓	✓
Low-low Hearth #5 temperature	✓	✓
Low-low venturi scrubber pressure differential	✓	✓
Low-low quench/venturi total liquid flow rate	✓	✓
Low-low packed bed scrubber pH	✓	✓
Low-low packed bed scrubber liquid flow rate	✓	✓
Low-low scrubber blowdown flow rate	✓	✓
Low-low packed bed scrubber pressure differential	✓	✓
Low-low WESP secondary voltage	✓	✓
High-high stack gas flow rate	✓	✓
High-high stack gas carbon monoxide	✓	✓
AWFCO system malfunction	✓	✓

3.6 PROCEDURES TO RAPIDLY STOP WASTE FEEDS AND CONTROL EMISSIONS

3.6.1 Rapidly Stopping Spent Activated Carbon Feeds

The RF is controlled by a process control computer. Desotec – under normal operations – implements alarms and waste feed cutoff interlock setpoints[8] which will automatically stop the feed of spent activated carbon before any RCRA Permit limits are exceeded. In the event any of these preprogrammed operating setpoints are reached, the computer will take automatic action to stop the carbon weigh belt conveyor to immediately stop spent activated carbon feed to the system. The same action to cease spent activated carbon feed can be activated from the control room by operating personnel. These actions do not necessarily constitute a shutdown of the RF; only a stoppage of spent activated carbon feed. The RF will normally operate on auxiliary fuel after spent activated carbon feed is ceased, to maintain operating temperature.

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[8] Facility equipment utilize interlock setpoints during normal operations, however as described elsewhere, the interlocks will be expanded during testing periods, which will allow the desired operating limits to be demonstrated during uninterrupted testing.

3.6.2 Shutting Down the System

RF system shutdowns may occur for two reasons:

1. A loss or malfunction of systems or controllers critical to maintaining performance standards and operating requirements.
2. A scheduled shutdown for normal maintenance or other operational purposes.

In the event of a system failure, the RF system is equipped with spent activated carbon feed and fuel shutoff mechanisms which fail to the “safe” (closed or off) position. Critical automation equipment or instrumentation failures will result in automatic stoppage of spent activated carbon feed and partial or complete system shutdown, depending on the severity of the failure or malfunction. Operations personnel have the ability to initiate an emergency system shutdown manually from the control room, although a controlled shutdown is preferred. Complete shutdown of the RF system can be undertaken as required in an orderly fashion to allow for a proper rate of cooling. Desotec maintains standard operating procedures including those for normal shutdown of the RF system. Normal and emergency system shutdown procedures are summarized in Attachment C.

3.6.3 Controlling Emissions During Equipment Malfunctions

The RF system is totally sealed to prevent fugitive emissions under all operating or malfunction conditions. Equipment shells and interconnecting ductwork are free from openings or gaps. Emissions from the spent activated carbon feed point are prevented through the use of a rotary air lock on the multiple hearth furnace feed port. Emissions from the rotating parts in the multiple hearth are prevented by a sand seal. Reactivated carbon product handling is totally enclosed. Daily inspections are conducted in accordance with the inspection procedures of the RCRA Permit. Process gases are always directed through the emissions control equipment, and there are no provisions to bypass the air pollution control system. In addition, the emissions control equipment is among the last equipment to be taken off-line under any circumstance. In the event of an equipment malfunction affecting RF system performance, spent activated carbon feed is automatically discontinued. Stopping the spent activated carbon feed immediately eliminates the flow of untreated material into the RF system, however since the spent activated carbon takes 38 minutes to travel through the reactivation furnace hearths, a slight potential for emissions remains during this time. To the greatest extent possible, the afterburner and emissions control equipment will continue to operate while the malfunction is corrected. Spent activated carbon feed may be resumed once operating conditions have been returned within the RCRA Permit limits. If the malfunction cannot be corrected in a reasonable time frame or requires the unit to be taken offline, the reactivation furnace, afterburner, and APC systems will be shut down in an orderly fashion according to standard operating procedures. Spent carbon feed will not resume until the malfunction has been corrected and the entire RF system has been returned to operating conditions within the permitted limits.

3.6.4 Emergency Safety Vent Operations

The Desotec RF design does not require or utilize an emergency safety vent. Process gases are always directed through the emissions control equipment, and there are no provisions to bypass the air pollution control system.

4.0 TEST DESIGN AND PROTOCOL

4.1 REGULATORY REQUIREMENTS

A Carbon Reactivation Furnace is used by Desotec to reactivate spent activated carbon. Some of the carbon received at the Parker Facility is designated as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) regulations. Much of the carbon received at the facility is not a RCRA hazardous waste, as it is either not a characteristic or listed waste. The RF is not a hazardous waste incinerator. “Hazardous waste incinerator” is defined in 40 CFR 63, Subpart EEE, as a “device defined as an incinerator in §260.10 of this chapter and that burns hazardous waste at any time.” (40 CFR 63.1201). “Incinerator” is defined in 40 CFR 260.10 as “any enclosed device that: (1) Uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer or carbon regeneration unit, nor is listed as an industrial furnace; or (2) Meets the definition of infrared incinerator or plasma arc incinerator (emphasis supplied)”. The RF does not qualify as an incinerator and instead is designated by Subpart X of the RCRA regulations as a Miscellaneous Unit. According to 40 CFR 264.601 of the Subpart X regulations, RCRA Permit terms and provisions for a Miscellaneous Unit must include appropriate requirements of 40 CFR Subparts I through O and Subparts AA through CC, 40 CFR 270, 40 CFR 63 Subpart EEE, and 40 CFR 146.

Based on 40 CFR 264.601, Desotec will test the RF to demonstrate DRE performance and emissions compliance in accordance with the standards of 40 CFR 63 Subpart EEE applicable to existing incinerators at 40 CFR 63.1219. The DRE performance requirement is the same as the RCRA 40 CFR 264 Subpart O. However, the emission standards are more stringent than the RCRA hazardous waste incinerator emission standards of 40 CFR 264 Subpart O. The PDT will demonstrate continuing compliance with its RCRA Permit using an approach which generally follows the specifications of 40 CFR 63 Subpart EEE and guidance prepared for RCRA incinerator permits. The test protocol set forth in this PDTP is consistent with the manner by which the current RCRA Permit operating limits were established based on the 2006 PDT.

As stated above, Desotec will test the RF to demonstrate DRE performance and emissions compliance in accordance with the emission standards of 40 CFR 63 Subpart EEE applicable to existing incinerators. According to 40 CFR 63.1201, an existing source under Subpart EEE is any affected source, the construction or reconstruction of which commenced on or before April

19, 1996. Part 63, Subpart A, defines "commenced", with respect to construction or reconstruction, as either (a) undertaking a continuous program of construction or reconstruction, or (b) entering into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or reconstruction.

Desotec signed a Trade Contract (No. 21-4527-AF) with Hankin Environmental Systems, dated October 17, 1995, to construct RF-2 (the currently operating RF unit). The contract was signed by Stephen McDonough (Hankin) and Mark Hepp (of the Desotec Parker Facility's previous parent company). A Purchase Order was written on December 27, 1995 to construct the concrete pad for RF-2, with actual pad construction beginning on December 29, 1995. The multiple hearth was erected in January 1996. Desotec has dated pictures showing the construction process. Startup occurred July 11, 1996. Consequently, Desotec had clearly entered into a contractual obligation to undertake the construction of RF-2 well before April 19, 1996, and under a continuous program of construction, the unit was completed within a reasonable period of time. Additionally, being in existence prior to April 20, 2004, RF-2 is an existing source as defined in the 2005 HWC MACT Final Replacement Standards at 40 CFR 63.1201(a) *Definitions*. As noted at 40 CFR 63.1206(a)(1)(ii)(A) of HWC MACT, the existing unit emissions standards at 40 CFR 63.1219(a) and (c) apply and are incorporated into the current RCRA permit.

Since this RF system qualifies as an existing unit if it were subject to Subpart EEE, the appropriate emission standards for this unit are the standards for existing incinerators under the HWC MACT regulations of 40 CFR 63, Subpart EEE. The existing RCRA permit is consistent with these requirements, thus PDT objectives are tied to demonstrating compliance with the RCRA Permit requirements contained in Condition V.I. Specific requirements are summarized as follows:

- Demonstrate a DRE of greater than or equal to 99.99% for the selected principal organic hazardous constituents (POHCs).
- Demonstrate stack gas carbon monoxide concentration less than or equal to 100 ppmv, dry basis, corrected to 7% oxygen.
- Demonstrate stack gas hydrocarbon concentration of less than or equal to 10 ppmv, as propane, dry basis, corrected to 7% oxygen.
- Demonstrate a stack gas particulate concentration less than or equal to 0.013 gr/dscf corrected to 7% oxygen.

- Demonstrate that the stack gas concentration of hydrogen chloride (HCl) and chlorine (Cl_2) are no greater than 32 ppmv, dry basis, corrected to 7% oxygen, expressed as HCl equivalents.
- Demonstrate that the stack gas mercury concentration is less than or equal to 130 μg/dscm, corrected to 7% oxygen.
- Demonstrate that the stack gas concentration of semivolatile metals (cadmium and lead, combined) is less than or equal to 230 μg/dscm, corrected to 7% oxygen.
- Demonstrate that the stack gas concentration of low volatility metals (arsenic, beryllium, and chromium, combined) is less than or equal to 92 μg/dscm, corrected to 7% oxygen.
- Demonstrate that the stack gas concentration of dioxins and furans does not exceed 0.40 ng/dscm, corrected to 7% oxygen, expressed as toxic equivalents of 2,3,7,8-TCDD (TEQ). This is the applicable standard, shown in Table V-1 Column 2 and 3 of the RCRA Permit, since the gas temperature entering the first particulate matter control device is less than 400°F.
- Demonstrate an emission rate of SO_2 corresponding to an annual emission rate of less than or equal to 30 tons per consecutive 12-month period.
- Demonstrate an emission rate of NOx corresponding to an annual emission rate of less than or equal to 22 tons per consecutive 12-month period, and develop a NOx emission factor in terms of mass of NOx emitted per volume of natural gas consumption.

In addition to the demonstration of specific regulatory and RCRA Permit emission requirements, Desotec's RCRA permit mandates the performance of both a HHERA, in accordance with EPA policy. As such, the performance test has been developed to include specific data gathering activities for use in the risk assessments. For this facility, those risk assessment data gathering activities are:

- Measure emissions of an expanded list of metals, including hexavalent chromium, and an expanded list of VOCs and SVOCs.
- Measure emissions of hydrogen chloride and chlorine.
- Measure emissions of specific volatile and semivolatile products of incomplete combustion (PICs), a.k.a., products of incomplete destruction (PIDs).
- Measure emissions of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF).
- Measure emissions of specific polycyclic aromatic hydrocarbons (PAHs).
- Measure emissions of polychlorinated biphenyls (PCBs)
- Measure emissions of specific organochlorine pesticides (OCPs).
- Measure emissions of total volatile, semivolatile, and nonvolatile organics.

- Measure the stack gas particle size distribution.

4.2 TEST OBJECTIVES AND APPROACH

The PDTP has been prepared to demonstrate RF unit compliance with the current RCRA Permit standards and gather data for use in a site-specific HHERA. The objectives of the PDTP are to demonstrate regulatory compliance with standards such as DRE and particulate matter emissions concentration (described above), while operating at “worst case” conditions processing normal feed materials, which have been augmented with metals, chloride, and organics, to establish as otherwise necessary permitted operating parameter limits (OPLs) to be included in the RCRA Permit.

4.3 TEST PROTOCOL

To accomplish the PDT objectives (i.e., demonstrating the unit meets the applicable RCRA Permit performance and emissions standards), a single test condition representing “worst case” operations of minimum temperature, maximum combustion gas velocity (minimum residence time), and maximum spent activated carbon feed rate will be performed.

The purpose of the fourth test run is an allowance for the following during any test run: 1) possible loss or damage to all or portions of any sample(s) or sample fraction(s), 2) rejection of a specific sample(s) due to sampling or analytical data quality reasons, or 3) deviation/closeness to the system operational targets. Desotec’s intent is to select three test runs that are 100% complete for demonstrating compliance. Data from the three selected runs, the first three test runs or any combination of three of the four test runs, will be used to demonstrate compliance with the RCRA permit conditions and risk assessment data collection requirements. Should Desotec elect to exclude a test run for Item 3 above, or should there be data quality issues or incomplete samples with a particular sample data set (Item 1 or Item 2 above), valid data for the additional or “extra” test run may be substituted and used for compliance demonstration and/or risk assessment modeling. In the event that conditions (1), (2), or (3) above invalidate or potentially invalidate a test run, Desotec will substitute the entire data set from the additional test run in place of the invalid test run. EPA’s approval will be required prior to substituting any portion of a test run. Compliance with the current associated RCRA permit OPLs, or possible establishment of new OPLs, will be reconciled in accordance with 40 CFR 63.1209(i) as may be necessary.

A summary description of the testing conditions, analytical parameters, and sampling methods follows:

4.3.1 Test Conditions ("Worst-Case" Operations)

Sampling and monitoring protocols that will be utilized while carrying out the performance test are summarized as follows:

- Spent Activated Carbon Feed - total chlorine/chloride, elemental (C, H, N, O, S, moisture), volatile organics, semivolatile organics, and target metals (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn).
- Stack gas particulate, HCl, and Cl_2 using EPA Method 5/26A.
- Stack gas target volatile organics using VOST, SW-846 Method 0030.
- Stack gas target semivolatile organics using SW-846 Method 0010.
- Stack gas target organochlorine pesticides using a second and separate SW-846 Method 0010 sampling train.
- Stack gas PCDD/PCDFs, PCBs, and PAHs using EPA Method 23.
- Stack gas total volatile organics using SW-846 Method 0040.
- Stack gas total semivolatile and nonvolatile organics [a.k.a., total chromatographable organics and gravimetric organics (TCO/Grav)] using SW-846 Method 0010.
- Stack gas target metals (Al, Sb, As, Ba, Be, Cd, total Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, and Zn) using EPA Method 29.
- Stack gas hexavalent chromium using SW-846 Method 0061.
- Stack gas particle size distribution (PSD) using a second and separate Method 5 sampling train with a smooth surface polycarbonate filter compatible with scanning electron microscopic (SEM) evaluation.
- Stack gas CO and O_2 by permanently installed CEM according to the protocols in the Appendix to 40 CFR 63, Subpart EEE; Performance Specification 4B of 40 CFR 60, Appendix B.
- Stack gas total hydrocarbons (as propane) by temporary CEM according to EPA Method 25A and the protocols in the Appendix to 40 CFR 63, Subpart EEE.
- Stack gas Sulfur Dioxide (SO_2) and Nitrogen Oxides (NOx) by temporary CEM according to EPA Methods 6C, and 7E, respectively.
- Scrubber blowdown - volatile organics, semivolatile organics, and total metals (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn)

4.4 FEED MATERIAL CHARACTERISTICS

4.4.1 Description and Composition of Spent Activated Carbon

Spent activated carbon is the only material treated in the RF. Historical spent activated carbon profile data is presented in Tables 2-1 and 2-2. Actual spent activated or reactivated carbon available at the time of testing will be treated during the PDT. The spent activated carbon will be augmented, as discussed below, by the addition of POHCs (principle organic hazardous constituents), other organic surrogates, chlorine/chloride, and metals, as needed to achieve the test objectives. The expected composition of the spent activated carbon, as fed to the RF during the PDT, is summarized in Table 4-1. Based on available stockpiles, spent activated carbon, reactivated carbon, and/or a blend of both carbons may utilized for testing. For simplicity within the PDTP “spent activated carbon” is used hereinafter to refer to any carbon used for testing purposes.

4.4.2 Expected Constituent Levels in Natural Gas, Process Air, & Other Feed Streams

In addition to the spent activated carbon, Desotec feeds natural gas to the burners in the multiple hearth furnace and afterburner and preheated ambient air for combustion to assist in the reactivation process. The preheated ambient air is not expected to contain regulated constituents. Organics in the natural gas burned at the facility will have a negligible impact on organic emissions from the stack. Natural gas may contain low concentrations of metals, as shown in Table 2-3. These metals concentrations are so low that their contribution to emissions is negligible, and will not be considered further.

Table 4-1. Planned Performance Test Feed Characteristics

Component/Property	**Units**	**Typical Spent Activated Carbon**	**POHC Spiking Material**	**Organic Surrogate Material**	**Metals Spiking Material**	**Composite Feed Material @ 2,900-3,300 lb/hr Total**
Feed method	Type	Conveyor	Pump	Pump	Pump	Mixture
Description	State	Granular carbon slurry	Organic liquid	Organic liquid	Aqueous Solution or Mineral Oil Dispersion	Final Feed
Granular carbon content	wt%	55 - 60	0	0	0	53 - 58
Total chlorine/chloride content	wt%	0.7 – 0.9	62.4	Trace	0	4.9-5.7
Water content	wt%	40 - 45	0	0	0	38 - 43
Mercury concentration	mg/kg	0 – 0.2	0	0	0	0 - 0.2
Semivolatile metal concentration	mg/kg	3 - 4	0	0	Spike @ 0.10 lb/hr	306-349
Low volatility metal concentration	mg/kg	10 - 15	0	0	Spike @ 0.35lb/hr	1,071-1,222
POHC concentration (at 50 lb/hr each)						
Monochlorobenzene (wt%)	wt%	Trace	100	0	0	1.5-1.7
Tetrachloroethene (wt%)	wt%	Trace	100	0	0	1.5-1.7
Organic surrogate mix concentration (at 48 lb/hr)						
Toluene (wt%) (24 lb/hr)	wt%	Trace	0	50	0	0.73-0.83
Naphthalene (wt%) (8 lb/hr)	wt%	Trace	0	16.7	0	0.24-0.28
Acetone (wt%) (8 lb/hr)	wt%	Trace	0	16.7	0	0.24-0.28
1,4-Dichlorobenzene * (8 lb/hr)	wt%	Trace	0	16.7		0.24-0.28

Note: All characteristics are approximate, as fed basis, and represent targets for the test.

* Desotec plans to use para-dichlorobenzene [(a.k.a., 1,4-dichlorobenzene or para-dichlorobenzene (PDCB)] as the organochlorine pesticide (OCP) surrogate spike. PDCB will be blended in the organic surrogate mixture spike. PDCB is a Class 1 POHC on the EPA Thermal Stability Ranking.

4.4.3 POHC Selection Rationale

The RF system exclusively treats spent activated carbon. A wide variety of organic contaminants may be present on the carbon, thus Desotec needs flexibility to treat carbon containing any RCRA Appendix VIII Hazardous Constituent or CAA HAP except for carbons classified as dioxin wastes (EPA Waste Codes F020, F021, F022, F023, F026, or F027) or containing PCBs. The compounds to be used as POHCs during the PDT were selected for their ability to demonstrate the effectiveness of the unit in destroying compounds that are equal or more thermally stable than other compounds, and are thus equal or more challenging to treat, than those currently found on the facility-permitted spent activated carbon. This provides assurance that the unit will be effective for all of the spent carbon contaminants.

EPA has developed the Thermal Stability Ranking system based on laboratory studies conducted under low oxygen conditions in a non-flame environment. The EPA's Thermal Stability Ranking has divides organic compounds into seven (7) thermal stability classes, with Class 1 compounds being the most stable, and Class 7 compounds being the least thermally stable.[9] The EPA Thermal Stability Ranking is structured on the principle that if a combustion system is successful in destroying compounds in a particular class, it is appropriate to assume that other compounds within the same and lower classes will be destroyed at efficiencies equal to or greater than the efficiencies demonstrated.

A review of Desotec's spent activated carbon characterization information shows that compounds from several thermal stability classes, including Class 1, may be present on the spent activated carbon. Desotec has chosen to demonstrate the DRE of monochlorobenzene (a Class 1 compound) and tetrachloroethene (a Class 2 compound) as the Principal Organic Hazardous Constituents (POHCs) during the PDT. Monochlorobenzene was chosen since it is a compound present on spent activated carbon received at the Parker Facility, thus its use is representative of normal operations. Monochlorobenzene is readily available and less hazardous to handle than many other Class 1 compounds for spiking into the furnace during the PDT. Monochlorobenzene is an aromatic compound and will also provide a source of organic chlorine to challenge the system during the performance test. Desotec believes that its choice of monochlorobenzene as

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[9] Appendix D, Designating Principal Organic Hazardous Constituents, Guidance on Setting Permit Conditions and Reporting Trial Burn Results, EPA/625/6-89/019, January 1989.

a POHC represents the most significant challenge possible to the thermal destruction capabilities of the RF unit.

Tetrachloroethene is a per-chlorinated aliphatic compound that is present in the largest percentage of any organic contaminant on spent activated carbon received at the Parker Facility. It represents a significant source of organic chlorine to the system, and was chosen as a POHC so the test would include both an aromatic and an aliphatic compound.

Since the selected POHC compounds rank among the most difficult to destroy on the EPA Thermal Stability Ranking and represent a variety of aromatic and aliphatic compounds, successful DRE demonstration should allow Desotec to treat spent activated carbon represented by the waste codes in Section C of the facility's RCRA Permit. Desotec will spike monochlorobenzene and tetrachloroethene, as needed for both DRE demonstration and as sources of organic chlorine.

Samples of the spent activated carbon, collected before spiking, will be analyzed for POHC content (as well as the full range of properties and contaminants discussed in Section 5.5). The spent activated carbon feed POHC analyses and carbon feed rates will be used to determine the feed rate of native POHC, if any. Desotec will utilize the services of a spiking contractor to provide additional POHC spiking. The spiked POHCs will be provided as technical grade materials by the contractor for metering directly into the furnace. The manufacturer's assay and the spiking logs will be included in the PDT Report, and will be used to determine the POHC spike rate. For the DRE calculation, the POHC feed rates will include the native POHC in the spent activated carbon feed and the spiked POHC. All calculations used in spiking, POHC DRE evaluations, etc., will be included in the PDT Report.

In summary, the POHCs monochlorobenzene and tetrachloroethene were chosen for the following reasons:

1. Spent activated carbon received at the facility contain Class 1 (most thermally stable) organics. Thus a Class 1 POHC (monochlorobenzene) was chosen to demonstrate DRE with a compound that is equally or more thermally stable than the constituents shown in

Desotec's waste characterization on Table 2-2. Monochlorobenzene is actually present on some of the carbon received at the facility, thus strengthening its selection as a POHC.

2. Tetrachloroethene is a prevalent organic contaminant on the spent activated carbon received at the facility, thus tetrachloroethene was chosen as a POHC.
3. A wide variety of organic compounds are present on the spent activated carbon received at the facility. Some are straight chain (aliphatic) organic compounds, while others have cyclic structures (aromatic compounds). For this reason, both an aromatic (monochlorobenzene) and an aliphatic (tetrachloroethene) organic were selected as POHCs.
4. The POHCs will be spiked during the test in substantially higher concentrations than normally found on the spent activated carbon received at the facility, thus ensuring that organics present even at high concentrations are adequately destroyed.

4.4.4 Feed Material Specifications for the Test

While a wide variety of organic compounds can be on the spent activated carbon, and the specific constituents and concentrations vary over time according to the generator, the actual material fed to the RF is quite homogeneous. As stated earlier, organic compounds can account for up to 0.3 pounds per pound of dry carbon from a given generator. However, when added to other more lightly loaded carbons, and processed for feeding, the actual feed material is typically low in organics. Based on actual feed data, the feed stream is predominantly carbon granules (~56 to 57 wt%, wet basis) which are wet from the slurrying and subsequent de-watering process (~43 wt% water). Average loading data indicated a range of 0.0073 to 0.0098 pounds of organic per pound of dry carbon, with an overall weighted average of 0.0082 pounds of organic per pound of dry carbon. On a wet (as fed) basis, the organic loading accounts for only about 0.2 to 0.4 wt% of the total feed. The variability in the feed is thus restricted to only this 0.2 to 0.4% of the total material.

For purposes of this test, the feed materials must support Desotec's need to demonstrate DRE for selected POHCs, demonstrate SRE for representative metals, and demonstrate maximum total chlorine/chloride feed rate. The feed materials must also support the gathering of emissions data for the risk assessment, with the emissions data ideally being reasonably representative of the long-term operation of the RF system. Since the PDT will be conducted under "worst case conditions", however, emissions measured during the PDT are expected to be overestimated compared to long-term normal operating conditions.[10] The most desirable situation would be if carbon could be received and stockpiled from a number of sources such that the test feeds would contain sufficient quantities of POHCs, metals, chlorine, and other organics for use during the test. Unfortunately, Desotec has limited capacity for stockpiling materials, and cannot control when various generators send spent activated carbon for treatment, nor if the quantity of spent activated carbon on-hand will be sufficient for conducting the PDT. In light of this situation, Desotec will feed actual spent activated carbon available on-site to the greatest extent possible, but will use reactivated carbon to the extent needed to meet maximum total carbon feed rates for the duration of the PDT. In addition, Desotec will supplement the carbon with POHCs, metals, chlorine, and other organics to meet the test objectives.

The spiked materials will be metered onto the spent activated carbon feed between the feed weigh belt and rotary airlock just before the feed drops into the reactivation furnace. This location will ensure that all the spiked materials enter the RF with the carbon. An injection manifold will be constructed to accommodate spiking the materials directly on the spent carbon feed. This approach minimizes the potential loss of spiking materials through immediate volatilization and/or spillage. Spiking materials should not be introduced any farther upstream, as some spiking material could be retained in the water used to slurry the carbon. In summary, introduction of spiking materials at the planned location will ensure delivery of the measured amount of each spiked material to the RF and prevent loss to and contamination of the recycled water used upstream to slurry the carbon feed.

Per EPA suggestion, the system pressure at the planned spiking material injection location at the weigh belt location was measured and determined to be >0.007 inches of water vacuum. This value correlates to the minimum facial velocity required in Method 204 Permanent (PTE) or Temporary Total Enclosure (TTE) for Determining Capture Efficiency (i.e., more negative to ensure capture efficiency). This is the exact location where spiking occurs, which is immediately above the rotary airlock and everything downstream enters the afterburner. Thus, any fugitives

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[10] Since the PDT will be conducted under "worst case conditions", emissions measured during the PDT are expected to be overestimated compared to long-term normal operating conditions. Using PDT emissions data in the risk assessment will thus help ensure that risks will not be underestimated. But if PDT data known to overestimate emissions are combined in a risk assessment with many other highly conservative inputs, this can result in vastly overestimated results, beyond the true distribution of plausible exposures and thus not consistent with, EPA's goal of evaluating "reasonable maximum exposures". (USEPA. 1991. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Standard Default Exposure Factors. OSWER Directive 9285.6-03. And, USEPA. 1992. Guidelines for Exposure Assessment. EPA/600/Z-92/001 May 1992.)

consumed under negative pressure are therefore captured and in accordance with the principles of Method 204. This demonstrates that risk of any fugitives from spiking location have been adequately minimized, and all such material is under the negative pressure and will be captured within the system and the downstream afterburner. This pressure will be checked again and recorded once prior to testing.

Feed composition targets for the PDT are shown in Table 4-1. Constituent feed rates and target process operating conditions for all four runs of the PDT are shown in Table 4-2.

Table 4-2. Performance Test Target Operating Conditions

Test Parameter	Units	RCRA Permit Limit	Testing Target (c)	Testing Range (c)
Spent activated carbon feed rate		≤ 3,049	3,100	2,900 - 3,300
Auxiliary fuel feed rate	NA	As needed	As needed	As needed
Total chlorine/chloride feed rate	lb/hr	~60	~60	55 - 65 from POHC spike
Metals feed rates				
Mercury (native from spent activated carbon) (a)		< 1.8E-03	< 1.8E-03	0 - 1.8E-03
Total SVM (Cd + Pb)	lb/hr	0.10	0.10	0.09 - 0.11 as 50/50 mass blend of Cd and Pb spike (e)
Total LVM (As + Be + Cr)	lb/hr	≤ 1.5	0.35	0.31-0.39 as Cr spike (e)
POHC feed rate		NA	Trace	Trace
Monochlorobenzene (from spiking)	lb/hr	NA	50	45-55 (d)
Tetrachloroethene (from spiking)	lb/hr	NA	50	45-55 (d)
Organic surrogate mixture feed rate (@ 48 lb/hr total mix)				
Toluene (from spiking)	lb/hr	NA	24	22-26
Naphthalene (from spiking)	lb/hr	NA	8	7-9
Acetone (from spiking)	lb/hr	NA	8	7-9
1,4-Dichlorobenzene (from spiking) (b)	lb/hr	NA	8	7-9
Afterburner gas temperature	deg F	≥ 1,760	1,750	1,700 - 1,800
Hearth #5 temperature	deg F	≥ 1,350	1,350	1,275 - 1,450
Venturi scrubber pressure differential	inwc	≥ 18	19	16 - 21
Venturi scrubber recycle liquid flow rate	gpm	≥ 75	75	70 - 90
Packed bed scrubber recycle liquid flow rate	gpm	≥ 63	63	55 - 90
Packed bed scrubber pH	pH	≥ 4.4	5	3.5 - 7
Packed bed scrubber pressure differential	inwc	≥ 0.1	0.75	0.05 - 1.5
Scrubber blowdown flow rate	gpm	≥ 58	58	45 - 70
WESP secondary voltage	KVDC	≥ 22	24	21 - 26
Stack gas flow rate	acfm	≤ 9,550	9,500	8,000-10,500
Stack gas CO	ppmv, @7%O_2, dry	≤ 100	100	0 - 99
Stack gas THC	ppmv as propane, @7%O_2, dry)	≤ 10	10	0 - 9.9

Notes:
(a) Based on typical spent activated carbon characteristics. Actual value may vary slightly.
(b) Desotec plans to include 1,4-dichlorobenzene as a surrogate for organochlorine pesticide (OCP) in the organic surrogate mixture spike. 1,4-dichlorobenzene is a Class 1 compound on the EPA Thermal Stability Ranking.
(c) Note: Target conditions are identical for each run. Normal process variations around these targets are expected and permissible within the anticipated testing ranges.
(d) Provided that the POHC feed rate is sufficient to discernably determine DRE, the exact rate is subjective. Desotec agrees to perform within this range.
(e) Actual spiking rate is subjective; “passing” results are achieved so long as the average of the test runs meets the emissions standard. Desotec agrees to perform within this range. A spiking solution mix of lead-to-cadmium ratio will be used nominally around 50/50 (e.g., minor variations unlikely beyond 60/40).

The POHCs, monochlorobenzene and tetrachloroethene, will be spiked into the reactivation furnace in sufficient quantities for DRE demonstration and to add chlorine to the feed.

A 50/50 w/w cadmium and lead will be spiked as a representative metal for the determination of semivolatile metal (SVM) SRE (e.g., minor variations unlikely beyond 60/40). Spiking will be sufficient to ensure detection in the stack gas sample, and so that metal feed rate extrapolation can be reliably accomplished.

Chromium will be spiked as a representative metal for the determination of low volatility metal (LVM) SRE. Spiking will be sufficient to ensure detection in the stack gas sample, and so that metal feed rate extrapolation can be reliably accomplished.

Based on a review of the organic constituents commonly found on the spent activated carbon routinely treated at Desotec, and based on the relative availability and handling safety considerations of these materials, Desotec will spike a mixture of organic compounds into the reactivation furnace to act as surrogates for the various classes of compounds routinely treated. This will ensure that the carbon fed during the test contains representative types, and higher than normal quantities, of organic compounds, in addition to those native to the spent carbon, and gives the feed materials the potential to produce a range of representative combustion products so that the risk assessment emissions data from the PDT will encompass a wide range of combustion-related constituents.

Desotec examined organic contaminant data for the spent activated carbon spanning the period from 2018 through 2020. These data have been presented earlier in Table 2-2 of this PDTP. The majority of organic compounds received are distributed among the following major chemical types:

- Chlorinated compounds (aromatic and aliphatic)
- Cyclic and polycyclic compounds
- Oxygenated compounds (ketones, aldehydes, alcohols, etc.)
- OCPs

Based on this evaluation, Desotec has selected compounds representing each type of chemical identified above, to be spiked onto the carbon during the PDT. These compounds will serve as surrogates for the broader list of chemicals received.

As mentioned above, monochlorobenzene and tetrachloroethene will be spiked as POHC. However, these compounds also represent the aromatic and aliphatic chlorinated compounds. In addition to the POHCs, Desotec has chosen the following organic surrogates:

Toluene: This compound is prevalent in the spent activated carbon received at the Parker Facility (it is present in over 10% of all the carbon received at the facility) and represents aromatic non-halogenated organics. Toluene is a Class 2 compound on the EPA Thermal Stability Ranking.

Naphthalene: This compound represents polycyclic organics and has been present in 99 shipments of carbon to the Parker Facility between 2018 and 2020, representing over 840,000 pounds of spent activated carbon. Naphthalene is a Class 1 compound on the EPA Thermal Stability Ranking.

Acetone: This compound was selected to represent oxygenated organics. It was received 65 times during the period from 2018 through 2020, representing over 366,000 pounds of spent activated carbon. Acetone is not listed on the EPA Thermal Stability Ranking.

OCP Surrogate: Desotec receives – albeit rarely – spent activated carbon containing OCPs. Most OCPs are no longer in commercial use in the USA. Desotec proposes to use 1,4-dichlorobenzene, another Class 1 compound on the EPA Thermal Stability Ranking as a surrogate for OCP during the PDT. The selected compound will be blended with the organic surrogate mixture spike and metered onto the carbon and measured in the emissions during the PDT. Most of the potential OCPs are Class 4 or lower ranked compounds on the EPA Thermal Stability Ranking.[11] The spiked OCP compound will serve the dual purposes of the PDT program to both demonstrate compliant operation and also provide emissions data for evaluation in the HHERA.

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[11] Appendix D, Designating Principal Organic Hazardous Constituents, Guidance on Setting Permit Conditions and Reporting Trial Burn Results, EPA/625/6-89/019, January 1989.

EPA desires that Desotec include an organochlorine pesticide (OCP) compound in the mix of spiked organic chemicals during the PDT. All 21 of the PDT program target list of OCP compounds are banned from commerce in the USA. Therefore, these chemicals are only available as analytical laboratory standards, which are limited to gram, milligram, and microgram quantities, which are insufficient for spiking needs. Based on the expected destruction efficiency and emission concentration detection limits, the PDT program requires nominally two (2) kilograms of any of the target OCPs. Of the 21 target compounds, one (1) is Class 2, six (6) are Class 4, three (3) are Class 5, and three (3) are Class 7 compounds on the EPA Thermal Stability Ranking. The other eight (8) compounds are not included in the ranking. The October 2022 PDT used Lindane and successfully demonstrated >99.99% DRE. However, Desotec and its testing consultant have been unable to identify a commercial source for Lindane in the required quantities. The same is true for Aldrin and Dieldrin, two other OCPs previously considered with EPA during the development of the 2022 PDTP. Therefore, Desotec proposes using an additional Class 1 chlorinated chemical from the EPA Thermal Stability Ranking as a surrogate for OCP. The proposed OCP surrogate compound is 1,4-dichlorobenzene. 1,4-dichlorobenzene was historically used a fumigant pesticide and bactericide, and is readily available commercially. The highest on the EPA Thermal Stability Ranking among the target OCP compounds is Class 2 (4,4'-DDE, CAS No. 72-55-9). The proposed surrogate compound is a Class 1 compound determined by EPA to be more difficult to destroy than any of the potential actual OCP compounds.

These compounds to be spiked represent aromatics, aliphatics, chlorinated compounds, non-chlorinated compounds, pesticides, as well as both volatile and semivolatile organics. As noted above, the PDT will be conducted under “worst case conditions” – conditions that will be skewed even further towards overestimating emissions for compounds that are spiked into the RF along with the spent carbon. As a result, emissions measured during the PDT for spiked compounds will not reflect long-term normal operating conditions.

As shown on Table 4-1, and discussed above, the typical spent activated carbon metals concentration ranges from about 13 to 19 mg/kg. Spiking during the test will increase this concentration to between 240 to 280 mg/kg (over a fifteen-fold increase). Similarly, the total organic concentration of typical spent activated carbon is between 0.2 to 0.4 wt%, while the carbon used for the test will have the total organic concentration increased to approximately 3.5 to 5 wt% (over a ten-fold increase). The use of actual spent activated carbon will provide a variety of compounds which will produce representative emissions, and these compounds and their relative concentration may vary during the test (just as in normal operations) due to the limited ability to stockpile and blend. However, the addition of metals and organic surrogates is so much in excess of the expected native concentrations on the carbon, that any variability will be overshadowed by the spiking. The moisture content of the spent activated carbon is relatively consistent, however, it can vary somewhat depending on the absorption of water in the slurrying system. If the water content of the carbon changes and more water vapor is delivered to the afterburner, the system compensates by firing more natural gas in the burner to maintain the temperature setpoint. If the carbon contains less water, then it will dry faster in the multiple hearth furnace and deliver less water to the afterburner and less natural gas is used to maintain the temperature setpoint. This condition results in a longer gas residence time in the afterburner since the total amount of combustion gas (primarily water vapor plus combustion products from natural gas firing) is lower. Further, the moisture content of the spent activated carbon has little to no impact on the RF's ability to destroy organic contaminants, nor does it impact the APCS' ability to remove acid gases, particulate matter or metals from the flue gas. The RF is designed with multiple hearths which allow the spent activated carbon to be treated in several stages to effectively heat the carbon, dry it, and volatilize contaminants. The afterburner receives the gases from the multiple hearths and provides sufficient temperature, oxygen, mixing, and residence time for destruction of the organics. Inorganic contaminants pass through the afterburner and are treated in the APCS.

The current RCRA permit LVM feed rate limit is 1.5 lb/hr. This limit is an extrapolated value based on the 2006 PDT where the chromium spiking rate was also 0.35 lb/hr. The target for total LVM (As + Be + Cr) for this PDT is the same 0.35 lb/hr. This rate does allow for residual native material on the carbon and is appropriately lower than the permit limit due to exceptionally low historical data. For perspective, the proposed spiking rate for LVM of 0.35 lb/hr is ~19X higher than historical monthly records (2012-present) showing an actual average feed rate of 0.018 lb/hr.

The current RCRA permit SVM feed rate limit is 0.10 lb/hr. This limit is based on the 2006 PDT where the lead spiking rate was also 0.10 lb/hr. The target for total SVM (Cd + Pb) for this PDT is the same 0.10 lb/hr. For perspective, the proposed spiking rate for SVM of 0.10 lb/hr is ~17X higher than historical monthly records (2012-present) showing an actual average of feed rate 0.006 lb/hr. The proposed PDT LVM and SVM spiking rates are both adequate and appropriate.

Thus, the overall composition of the carbon feed will be quite homogeneous during the four runs of the PDT. Further, Desotec expects no significant variation in process operating conditions due to variability of the native carbon constituents, thus providing appropriate data for permitting decisions.

4.4.4.1 Chloride Content

The data presented in Table 4-1 include the target total chlorine/chloride content for the performance test carbon feed stream. The typical spent activated carbon contains varying amounts of organic chlorine associated with chlorinated organics adsorbed onto the carbon.

To demonstrate maximum total chlorine/chloride feed rate during the performance test, Desotec intends to spike chloride sources into the reactivation furnace. The chloride will be provided by the POHCs (monochlorobenzene and tetrachloroethene).

4.4.4.2 Metals Content

The data presented in Table 4-1 includes target performance test metal feed rates for the spiked and native metals.

Two approaches will be used in establishing the metals operating limits, based on a review of expected spent activated carbon compounds and the HWC MACT provisions for establishing metals feed rate limits:

Desotec will meet mercury limits which utilize the MTEC concept, where it is conservatively assumed that all feed mercury is emitted from the system. Based on the results of the performance test, Desotec will calculate a maximum mercury feed rate which will ensure compliance with the MTEC, and will continuously calculate the mercury feed rate to ensure that the limit is complied with. Since this approach does not take credit for actual removal across the APC system, it is the most conservative assumption for the low levels of mercury in the feeds.

A 50/50 w/w of cadmium and lead will be spiked during the test to determine the SRE for semivolatile metals. Chromium will be spiked during the test to determine the SRE for low volatility metals. These SRE values can be used as the basis for establishing RCRA Permit feed rate limits for the semivolatile and low volatility metals. The native metals content of the spent activated carbon feed is expected to be similar to that shown in Table 2-1 and is negligible relative to the target spiking rates for cadmium/lead and chromium.

4.4.5 POHC, Organic Surrogate, and Metal Spiking

A spiking system will be used for POHC, organic surrogate, and metals addition to the spent activated carbon feed. Five (5) separate spiking systems will be used: 1) monochlorobenzene, 2) tetrachloroethene, 3) the organic surrogate mixture, 4) cadmium and lead, and 5) chromium. Each spiking system will consist of a variable speed, positive displacement pump (or equivalent system) that will transfer the spiking materials from containers onto the spent activated carbon just as it enters the RF. Mass flow meters (and backup electronic scales) will be provided for each spiking material system so that a weighed amount of material will be metered into the RF and quantified for each test run. Technical grade POHCs and organic surrogates will be used as needed. Cadmium and lead will be spiked 50/50 w/w as an aqueous solution of cadmium nitrate [$Cd(NO_3)_2$] and lead nitrate [$Pb(NO_3)_2$]. Similarly, chromium will be spiked as an aqueous solution of a hexavalent chromium (potassium or sodium dichromate).

Specifications for the spiking materials will be provided by the spiking contractor. Calculations showing that the planned POHC feed rates are adequate to demonstrate the required DRE are presented in Attachment B. Metals spiking rates have been selected to allow for detection in the stack gas so that a rational SRE value can be determined. Based on the SRE, the metal feed rates may be extrapolated upwards to attain metals feed rate limits for the RCRA Permit. Metal spiking rate calculations and anticipated RCRA Permit feed rate limits, derived from extrapolation are shown in Attachment B.

Desotec will utilize the services of a spiking contractor to provide each of the spiking materials and to perform spiking operations during the test. The manufacturer's assay will be used as certification of the composition of technical grade materials, e.g., monochlorobenzene. Such technical grade materials will not be sampled during the PDT. The contractor's certification of composition of the prepared spiking materials, e.g., aqueous solutions, will be provided in the spiking report and used to set spiking material feed rates during the PDT. Samples of the prepared spiking materials will be collected during each test run and analyzed to verify constituent feed rates. In all cases, the spiking logs will be used to determine the respective spike rates.

4.5 OPERATING CONDITIONS

Planned process operating conditions and feed rates are summarized in Table 4-2.

4.5.1 System Operation to Achieve Steady State Conditions

Carbon in the multiple hearth section of the RF has a residence time of 38 minutes. Test materials must be fed to the system for at least one residence time to ensure that the system is operating on test material only. There is no other "hold up" of feeds in the system and there is little in the way of "surge capacity" in the APC system, thus there is little "conditioning" necessary to bring the system to steady state conditions. The process should be operated at test conditions for at least one hour prior to beginning a test run in order to allow the rolling averages and steady state to be established. Spiking will be started at least 38 minutes, but nominally one hour before the beginning of testing (i.e., one furnace residence time).

"Steady State" conditions will be achieved by bringing the system to the desired test conditions, and then operating the system at the desired test conditions (including any spiking operations) for a period of at approximately one hour prior (e.g., > 38 minutes) to the beginning of each test run. Steady state periods exist prior to the actual sampling period. Normal process fluctuations are expected during the test periods, just as during normal operations. Typically, short term fluctuations of 10 to 20 percent of the "steady state" testing targets are considered normal for thermal treatment systems; however, some parameters may experience even greater fluctuations while still being considered acceptable. Desotec operations personnel and the test manager will closely monitor operations during the test periods and will make any necessary determinations regarding the acceptability of process fluctuations and adjustments necessary to maintain system operation within the target values noted in Table 4-2.

The PDT is conducted under reasonable worst case conditions for the express purpose of establishing limits that cannot be exceeded. The regulations recognize that a certain amount of variability is expected, which is the reason for establishing many limits on a rolling average basis. This allows for short term low magnitude variability, but guards against longer term or higher magnitude variations which might have a detrimental impact on performance. Once the absolute limits are established, the facility will operate at significantly more restrictive conditions to ensure that the normal variability of the process does not result in exceeding those limits and causing a waste feed cutoff situation. As with normal operations, some degree of variability is also expected to occur during the PDT.

5.0 SAMPLING, ANALYSIS, AND MONITORING PROCEDURES

The following paragraphs discuss the planned sampling and analyses during the PDT. Quality Assurance and Quality Control (QA/QC) procedures, including details regarding sample collection, packaging, shipment and storage, and analysis and precision data quality objectives (DQOs) are described in the Quality Assurance Project Plan (QAPP) located in Attachment A.

5.1 SAMPLING LOCATIONS AND PROCEDURES

Sample collection points are shown on Figure 5-1. Sample collection locations, equipment, methods, and frequency are summarized in Table 5-1. The types of analyses planned for the performance test samples are outlined on Table 5-2. Analytical methods and procedures to be used for each sample are summarized in Table 5-3. Alternative methods may be used with the prior approval of the EPA.

Figure 5-1. Sampling Point Locations

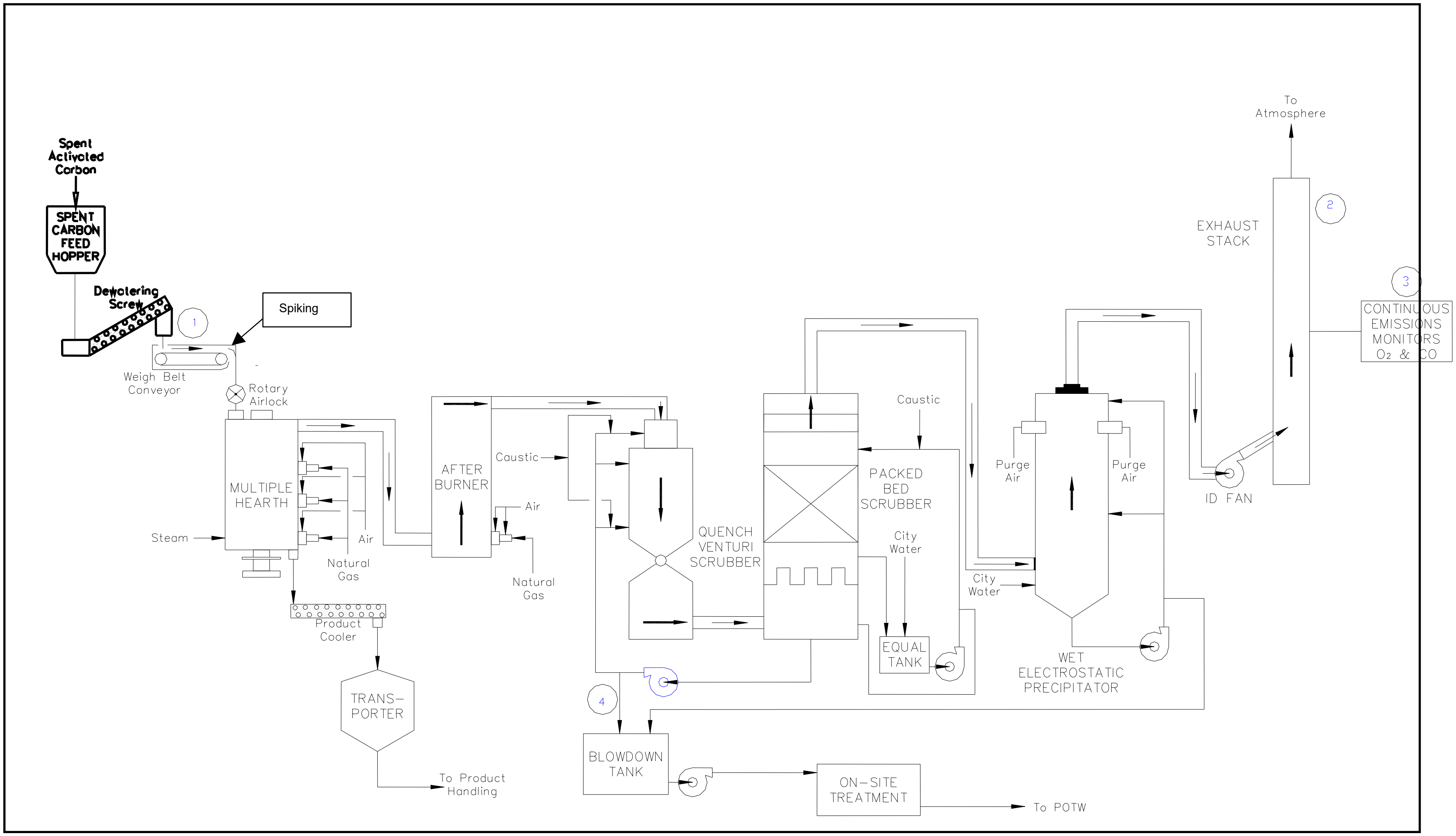

Table 5-1. Sample Collection Locations, Equipment, and Methods

Location [a]	Sample Name Number	Access	Equipment	Sample Size	General Procedure/Frequency	Reference Method [b]
Feed (1)	Spent Activated Carbon (1-Volatiles) (1-Semivolatiles) (1 – Metals) (1 - Properties)	Conveyor	Teflon scoop 4L glass wide-mouth jar, 250 ml jar (VOA) 1L glass bottles with Teflon lined lids	1 scoop per grab; 250 ml volatiles 1L semivolatiles 1L properties 1L metals	Collect a grab sample at each 30-minute interval during each test run. Grab samples will be combined in a plastic pail to build a run composite. Collect samples for analysis from the homogenized composite at the end of the test run.	SW-846, Vol. II, Chapter 9, Section 9.3
Stack (2)	Stack gas M29	Port	EPA Method 29 multiple metals sampling train	Minimum 120 minutes [c,d]	Collect integrated sample for metals and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5, and 29.
Stack (2)	Stack gas M0061	Port	SW-846 Method 0061 hexavalent chromium sampling train	Minimum 120 minutes [c,d]	Collect integrated samples for hexavalent chromium and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW846-0061
Stack (2)	Stack gas M5/26A	Port	EPA Method 5/26A sampling train	Minimum 120 minutes [c,d]	Collect integrated sample for particulate, hydrogen chloride, and chlorine. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5, and 26A
Stack (2)	Stack gas M0010-SV	Port	SW-846 Method 0010	Minimum 3 dry standard cubic meters [c,d]	Collect integrated sample for semivolatile organics and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW846-0010.
Stack (2)	Stack gas M0010-P	Port	Combined SW-846 Method 0010, sampling train	Minimum 3 dry standard cubic meters [c,d]	Collect integrated sample for OCPs, and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW846-0010; CARB Method 429.

Table 5-1. Sample Collection Locations, Equipment, and Methods

Location [a]	Sample Name Number	Access	Equipment	Sample Size	General Procedure/Frequency	Reference Method [b]
Stack (2)	Stack gas M0010-TOE	Port	SW-846 Method 0010 sampling train	Minimum 3 dry standard cubic meters [c,d]	Collect integrated samples for total semivolatile organics, total nonvolatile organics, and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5; SW846-0010; EPA TOE Guidance
Stack (2)	Stack gas M23	Port	EPA Method 23 sampling train	Minimum 3 hours and 2.5 dry standard cubic meters [c,d]	Collect integrated sample for PCDD/PCDFs, PCBs, and PAHs, and moisture. Measure stack gas velocity, pressure, and temperature. Collect bag samples or use CEM for oxygen and carbon dioxide.	EPA Methods 1 through 5; EPA Method 23.
Stack (2)	Stack gas M0030	Port	SW-846 Method 0030 volatile organic sampling train	4 tube pairs per run; 40 minutes per tube pair. Up to 20 liters of stack gas per tube pair	Collect four pairs of sorbent tubes and stack gas condensate for volatile organics during each run.	SW846-0030 (VOST)
Stack (2)	Stack gas M0040	Port	SW-846 Method 0040 sampling train	25 – 50 liters	Collect representative sample through a heated sample probe and filter; through a condenser and into a Tedlar bag. Transport dried sample and condensate to GC/FID.	EPA Methods 1 through 5; SW846-0040; EPA TOE Guidance.
Stack (2)	Stack gas M5 for PSD analysis	Port	SEM analysis of Method 5 filter and residue	Maximum of 1-minute at each sampling traverse point [c,d]	Separate scanning electron microscopy of smooth surface polycarbonate particulate filter and desiccated/evaporated acetone rinse residue to determine particle size distribution.	EPA Methods 1 through 5; SEM particle count and relative sizing.
Stack (3)	Stack gas CEMS	Port	Temporary CEMS THC	Continuous	Continuously monitor stack gas for total hydrocarbons during each run	EPA Method 25A
Stack (3)	Stack Gas CEMS	Port	Temporary CEMS SO_2	Continuous	Continuously monitor stack gas for sulfur dioxide during each run	EPA Method 6C
Stack (3)	Stack Gas CEMS	Port	Temporary CEMS NOx	Continuous	Continuously monitor stack gas for nitrogen oxides during each run	EPA Method 7E

Table 5-1. Sample Collection Locations, Equipment, and Methods

Location [a]	Sample Name Number	Access	Equipment	Sample Size	General Procedure/Frequency	Reference Method [b]
Stack (3)	Stack gas CEMS	Port	Installed CEMS CO	Continuous	Continuously monitor stack gas carbon monoxide during each run.	40 CFR 63 Subpart EEE Appendix; PS 4B
Stack (3)	Stack gas CEMS	Port	Installed CEMS O_2	Continuous	Continuously monitor stack gas oxygen during each run.	40 CFR 63 Subpart EEE Appendix; PS 4B
Scrubber Blowdown (4)	Scrubber Blowdown (2-Volatiles) (1-Semivolatiles) (1 – Metals)	Tap	40 ml vials; 4L glass jug, 1L glass bottles with Teflon lined lids	40 ml VOA ~200 ml per grab; 1L semivolatiles 1L metals	Collect one 40 ml VOA vial at each 30 minute interval; Collect a ~200 ml grab sample at each 30-minute interval during each test run. VOA samples will be managed as discrete samples. Grab samples will be combined in a glass jug to build run composite. Collect samples for analysis from the homogenized composite at the end of the test run.	SW-846, Vol. II, Chapter 9, Section 9.2

Notes:

[a] Refer to Figure 5-1 of the Comprehensive Performance Test Plan.

[b] "SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.
"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"CARB" refers to California Air Resources Board Methods.
"PS 4B" refers to Performance Specification 4B, 40 CFR 60.

[c] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[d] Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide analysis to determine stack gas molecular weight (EPA Method 3)
- Performing stack gas velocity, pressure, and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train (EPA Method 4)

Table 5-2. Analyses Planned for Performance Test Samples

Sample Name	Analyses	Rationale
Spent activated carbon	Elemental (C,H,O,N,S, moisture), ash, and heating value	Feed stream characterization
	Chloride content	Establish chloride feed limits, waste characterization
	Total metals	Establish metals feed limits, waste characterization
	POHCs, other organics	Determine DRE, waste characterization
Stack gas M0010-SV	Semi-volatile organics, oxygen, carbon dioxide, temperature, flow rate	Gather emissions data for semivolatile organics for use in the risk assessment
Stack gas M0010-P	OCPs, oxygen, carbon dioxide, temperature, flow rate	Gather emissions data for OCPs for use in the risk assessment
Stack gas M0010-TOE	Total semivolatile and nonvolatile organics, moisture, oxygen, carbon dioxide, temperature, flow rate	Gather emissions data for total semivolatile and nonvolatile organics for use in the risk assessment
Stack gas M23	PCDD/PCDFs, PCBs. and PAHs oxygen, carbon dioxide, temperature, flow rate	Gather PCDD/PCDFs, PCBs, and PAHs emissions data for demonstration of emissions performance and for use in the risk assessment
Stack gas M0030	POHCs, other volatile organics	Gather POHC emissions data for calculation of DRE, and gather volatile organic emission data for use in the risk assessment
Stack gas M0040	Total volatile organics	Gather total volatile organic emissions data for use in the risk assessment
Stack gas M5/26A	Particulate, HCl, Cl_2, moisture, oxygen, carbon dioxide, temperature, flow rate	Gather particulate matter and HCl/Cl2 emissions data for demonstration of emissions performance and for use in the risk assessment
Stack gas M29	Multiple metals, moisture, oxygen, carbon dioxide, temperature, flow rate	Gather metals emission data for demonstration of emissions performance and for use in the risk assessment
Stack gas M0061	Hexavalent chromium, moisture, oxygen, carbon dioxide, temperature, flow rate	Gather hexavalent chromium emissions data for use in the risk assessment
Stack gas M5 for PSD	Particle size distribution	Gather stack gas particle size distribution data for use in the risk assessment
Stack gas CEMS	Oxygen, carbon monoxide, total hydrocarbons, sulfur dioxide, nitrogen oxides	Demonstrate emissions performance; Develop facility-specific NOx emission factor

Table 5-2. Analyses Planned for Performance Test Samples

Sample Name	Analyses	Rationale
Scrubber Blowdown	Volatile organics, semivolatile organics, total metals	Evaluate fate of metals and organics

Table 5-3. Summary of Performance Test Analytical Procedures and Methods

Sample Name	Analysis	Samples per Run	Total Field Samples for Analysis	Preparation Method (See Note 1)	Analytical Method (See Note 1)
Spent Activated Carbon	Volatile Organics	1	4	Purge & Trap (SW846-5035)	GC/MS (SW846-8260)
	Semivolatile Organics	1	4	Solvent extraction (SW846-3542)	GC/MS (SW846-8270)
	Chloride	1	4	SW846-5050	Ion chromatography (SW846-9056)
	Total metals	1	4	Acid digestion (SW846-3050)	ICP (SW846-6010 or 6020) & CVAAS (SW846-7470 for Hg)
	Elemental	1	4	NA	(ASTM D5373) with (ASTM D3176) as an alternate Sulfur by SW856-5050/9056
Stack gas M0030	VOCs + TICs (tenax + tenax/charcoal tubes) (Note 2)	(Note 3)	(Note 3)	Thermal desorption, trap (SW846-5041A)	GC/MS (SW846-8260)
	VOCs + TICs (condensate) (Note 2)	1	4	Purge and trap	GC/MS (SW846-8260)
Stack gas M0040	Total VOCs	1	4	Purge and trap for condensate Direct injection for gas	GC/FID (Guidance for Total Organics, App. A and E)
Stack gas M0010-SV (low res analysis)	Semivolatile Organics & TICs (Note 4)	1	4	Solvent extraction (SW846-3542)	GC/MS (SW846-8270)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)

Table 5-3. Summary of Performance Test Analytical Procedures and Methods

Sample Name	Analysis	Samples per Run	Total Field Samples for Analysis	Preparation Method (See Note 1)	Analytical Method (See Note 1)
Stack gas M0010-P (high res analysis)	OCP (Note 5)	1	4	Solvent extraction (SW846-3542)	GC (SW-846-8081 & TO-4A)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)
Stack gas M0010-TOE	Total SVOCs	1	4	Solvent extraction (SW846-3542)	TOC GC/FID (Guidance for Total Organics, Appendix C)
	Total NVOCs	1	4	Solvent extraction (SW846-3542)	Gravimetric Method (Guidance for Total Organics, Appendix D)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)
Stack gas M23	PCDD/PCDF. PCB, & PAH (Note 7)	1	4	Solvent extraction (EPA Method 23)	HRGC/HRMS (EPA Method 23)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)
Stack gas M29	Metals (Note 8)	1	4	Acid digestion (SW846-3050)	ICP (SW846-6010 or 6020) & CVAAS (SW846-7470 for Hg)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)

Table 5-3. Summary of Performance Test Analytical Procedures and Methods

Sample Name	Analysis	Samples per Run	Total Field Samples for Analysis	Preparation Method (See Note 1)	Analytical Method (See Note 1)
Stack gas M0061	Hexavalent chromium	1	4	NA	Ion chromatography, post-column reactor (SW846-7199)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)
Stack gas M5/26A	Hydrogen chloride/Chlorine	1	4	NA	Ion chromatography (SW846-9056)
	Particulate	1	4	NA	Gravimetric (EPA Method 5)
	Moisture	1	4	NA	Gravimetric (EPA Method 4)
	Temperature	1	4	NA	Thermocouple (EPA Method 2)
	Velocity	NA	NA	NA	Pitot tube (EPA Method 2)
	Oxygen, Carbon dioxide	(Note 6)	(Note 6)	NA	Analyzer or CEM (EPA Method 3A)
Stack gas M5 PSD	Particle size distribution	1		NA	Scanning electron microscopic evaluation of the M5 filter and acetone rinse residue.
Stack gas temporary CEMS	THC, SO_2, and NOx	(Note 9)	(Note 9)	NA	Extractive Analyzers, EPA Method 25A, 6C, and 7E
Stack gas Installed CEMs	Carbon Monoxide	(Note 9)	(Note 9)	NA	Extractive Analyzers, 40CFR 63 Appendix
	Oxygen	(Note 9)	(Note 9)	NA	Extractive Gas Analyzers, 40 CFR 63 Appendix

Table 5-3. Summary of Performance Test Analytical Procedures and Methods

Sample Name	Analysis	Samples per Run	Total Field Samples for Analysis	Preparation Method (See Note 1)	Analytical Method (See Note 1)
Scrubber Blowdown	Volatile Organics	1	4	Purge & Trap (SW846-5035)	GC/MS (SW846-8260)
	Semivolatile Organics	1	4	Solvent extraction (SW846-3542)	GC/MS (SW846-8270)
	Total metals	1	4	Acid digestion (SW846-3020)	ICP (SW846-6010 or 6020) & CVAAS (SW846-7470 for Hg)

Note 1: "ASTM" refers to American Society for Testing and Materials, Annual Book of ASTM Standards, Annual Series.
"SW846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and updates.
"EPA Methods" (Methods 1 through 5 and 23) refer to New Source Performance Standards, Test Methods and Procedures, App. A, 40CFR 60.

"Guidance for Total Organics" refers to EPA/600/R-96/036, March, 1996.

Note 2: Volatile Target Compounds as listed in this Test Plan, plus tentatively identified compounds.

Note 3: During each sampling run, 4 pairs of VOST tubes (8 samples) will be collected, but only 3 pairs (6 samples) will be analyzed. The extra tube pair provides a contingency in case of breakage or other event that could require analysis of the extra tube pair. Analysis of each tube in each tube pair will be conducted separately.

Note 4: Semivolatile Target Compounds as listed in this Test Plan, plus tentatively identified compounds.

Note 5: Organochlorinated pesticide (OCP) target compounds as listed in this Test Plan.

Note 6: One set of gas bag samples collected during each stack traverse for analyzer analysis, or CEM.

Note 7: Polycyclic Aromatic Hydrocarbon (PAH) and polychlorinated biphenyls (PCB) target compounds as listed in this Test Plan

Note 8: Metal Target Compounds as listed in this Test Plan.

Note 9: Installed CEMs sampling and analysis is continuous during each run.

5.1.1 Spent Activated Carbon Feed

Spent activated carbon feed samples will be collected during each test run. Spent carbon samples will be collected every 30 minutes and composited over the run. The feed samples collected will be analyzed for the parameters as indicated in Tables 5-2 and 5-3. Samples for analysis will be collected from the run composite at the end of each run. Analytical methods are referenced in Table 5-3. Analyses of the spent activated carbon are performed to document the feed materials properties and conditions to include assessing possible significant native contributions of metals and organics.

Section 5.2 of USEPA trial burn guidance notes analysis of the system as: "A quantitative analysis of the scrubber water (if any), ash residues, and other residues for estimating the fate of the trial POHCs." [12] This notation only indicates the "fate"; there is not guidance that indicates, nor is it appropriate to suggest, that any remaining spiking materials that may remain on reactivated carbon should be considered as part of the overall SRE calculation, which aims instead to evaluate the facility's air pollution control system. Accordingly, there will be no evaluation and/or correlation of such reactivated carbon analytical results to the SRE calculation.[13]

5.1.2 Spiking Materials

POHC, Organic Surrogate, and Metals Spiking Feedstock Samples

POHC material will be pumped from portable containers into the RF, using metering pumps. The POHC injection point will be downstream of the point where spent activated carbon feed samples are collected. The POHC spiking rate will be determined using mass flow meters (primary measurement) and digital scales (backup measurement). Logs of the mass flow rate and differential weights will be maintained at a minimum of 10-minute intervals.

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[12] Source: Handbook: Guidance on Setting Permit Conditions and Reporting Trial Burn Results (EPA/625/6-89/019); Volume II of Hazardous Waste Incineration Guidance Series, Section 5.2, Page 60; USEPA, January 1989.

[13] Based on the spiking injection location and conditions, Desotec believes nearly all of the spiked POHCs, metals, and organic solvents will be dispersed and evaporated into the combustion gas and carried directly into the afterburner and emissions control equipment. Although some of the spiked materials, particularly metals, may be transferred to and discharged from the RF with the reactivated carbon, similar analyses of the reactivated carbon to assess the fate as it relates to SRE is not warranted or appropriate. The intent of the PDT is not to perform a mass balance on the carbon nor to evaluate the spiked materials that may remain on the carbon. The presence of native species on the feed carbon and/or spiked materials on the react carbon does not negate and/or influence the performance/effectiveness of the facility's air pollution control system, nor negate the overall PDT purpose which is to demonstrate air emissions compliance measured through the stack, at the demonstrated feed rate (PDTP Table 4-2), and compliant with the permit limits (Permit Table V-1). Metals typically do remain on carbon, which does not negatively influence the absorption characteristics of the reactivated carbon.

In addition to the POHCs, a mixture of organic surrogates will be spiked separately into the RF. These materials are being added to ensure that the test is conducted with a variety of organic compounds which have the potential to produce a wide variety of combustion products, indicative of the range of materials to be treated at the Desotec Parker Facility. The organic surrogate spiking rate will be determined using mass flow meters (primary measurement) and digital scales (backup measurement). Logs of the mass flow rate and differential weights will be maintained at a minimum of 10-minute intervals.

Metals will be metered as necessary into the RF at an adjacent location to the POHC and organic surrogate spiking points. The metals will be supplied as aqueous solutions . The metal solution injection point will be downstream of the ports where spent activated carbon feed samples are collected. The amount of each metal solution spiked will be determined using mass flow meters (primary measurement) and digital scales (backup measurement). Logs of the mass flow rate and differential weights will be maintained at a minimum of 10-minute intervals.

Desotec will utilize the services of a spiking contractor to provide the POHCs, organic surrogates, and metals spiking materials and to conduct the spiking. The manufacturer's assay and spiking contractor's certification of composition of the spiking materials and the contractor's spiking logs will be used to determine the respective spike rates. Samples of the prepared spiking materials (e.g., metals and organic solutions) will be collected once during each test run for confirmation analysis. Technical grade materials for which there is a manufacturer's assay, e.g., monochlorobenzene, will not be sampled or analyzed.

5.1.3 Stack Gas

The PDT will be performed using multiple stack sampling trains simultaneously, thus necessitating multiple sampling levels on the stack and multiple sampling ports. Each of the isokinetic sampling trains measure stack velocity, temperature, and moisture. Stack drawings showing the sampling platform levels and the sampling port locations are provided in Attachment C. Isokinetic sampling trains (e.g., those that collect include collection and analysis of particulate matter such as Method 5/26A, Method 29, Method 0010, and Method 23) will be operated at locations that meet the criteria of EPA Method 1.

5.1.3.1 Stack Gas Volatile Organics

A Volatile Organic Sampling Train (VOST) (SW-846 Method 0030), will be used to determine the stack gas emissions of the POHCs (monochlorobenzene and tetrachloroethene) for DRE determination. Four pairs of VOST tubes will be collected during each sampling run, but only three will be analyzed. The fourth tube pair will serve as an archive set in the case of breakage during shipment or laboratory handling. The VOST tubes will be analyzed using SW-846 Method 5041/8260.

In addition to the POHCs, the VOST samples will be analyzed for other volatile organic compounds. These analyses will be used to determine emissions of volatile organic compounds for use in the risk assessment. The target volatile organic compounds are listed in Table 5-4. Analyses will be performed using SW-846 Method 8260. In addition to the target analyte list, analyses will include identifying non-target analyte peaks, which are referred to as tentatively identified compounds (TICs). A discussion of TIC identification and quantitation, along with overall quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.2 Stack Gas Particulate Matter, HCl, and Cl_2

The stack gas will be sampled for particulate matter, HCl, and Cl_2 using EPA Method 5/26A. Particulate filters will be analyzed per EPA Method 5 procedures. Impinger solutions will be analyzed for chloride ion per SW-846 Method 9056 to determine the emissions of HCl and Cl_2. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.3 Stack Gas Multiple Metals

Stack gas will be sampled for multiple metals using EPA Method 29. Metals will be analyzed by SW-846 Method 6010 [Inductively Coupled Argon Plasma Spectroscopy (ICP or ICAP)] or Method 6020 [Inductively Coupled Argon Plasma Spectroscopy/Mass Spectroscopy (ICP-MS or ICAP-MS)]. Mercury will be analyzed using Cold Vapor Atomic Absorption Spectroscopy (CVAAS) using SW-846 Method 7470. Target metal analytes are shown in Table 5-5. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.4 Stack Gas Hexavalent Chromium

Stack gas will be sampled for hexavalent chromium using SW-846 Method 0061. Analysis is according to SW-846 Method 7199. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.5 Stack Gas Semivolatile Organics

The stack gas will be sampled to determine the emissions of the semivolatile organic compounds for use in the risk assessment. Stack gas will be sampled for target semivolatile organic compounds (SVOCs) and semivolatile TICs using a SW-846 Method 0010 sampling train. The extract from the analytical preparation of each Method 0010 sampling train will be analyzed for SVOCs by SW-846 Method 8270 [gas chromatograph/mass spectrometry (GCMS)]. The target SVOC analytes are presented in Table 5-6. In addition to the SVOC target analyte list, analyses will include identifying non-target analyte peaks (TICs) based on the nearest internal standard and library search. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.6 Stack Gas Organochlorine Pesticides

The stack gas will be sampled for emissions of organochlorine pesticides (OCPs) using a separate SW-846 Method 0010 sampling train. The extract from the analytical preparation of each Method 0010 sampling train will be analyzed for OCPs by SW-846 Method 801/Method TO-4A gas chromatograph (GC) analysis. The target OCP analytes are presented in Table 5-7. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.7 Stack Gas Method 23 PCDD/PCDFs, PCBs, and PAHs

Stack gas samples will be collected for PCDD/PCDFs, PCBs, and PAHs using an EPA Method 23 sampling train. Analysis of PCDD/PCDF, PCB, and PAH analyses are conducted by high resolution GC/MS according to EPA Method 23. PCDD/PCDF, PCB, and PAH target analytes are shown in Tables 5-8, 5-9, and 5-10. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.8 Stack Gas Total Semivolatile and Nonvolatile Organics

For the risk assessment, the performance test program includes determining the Total Organic Emissions (TOE) using the procedures in "*Guidance for Total Organics*" EPA/600/R-96/036, March 1996. The stack gas will be sampled for total semivolatile organic compounds (Boiling Points from 100°C to 300°C) and nonvolatile organic compounds (Boiling Points greater than 300°C) using a separate SW-846 Method 0010 sampling train. No isotopically labeled sampling surrogates will be spiked to the XAD-2 resin used in this sampling train. The dichloromethane extracts of the pooled components of the sampling train will be used to determine the Total Chromatographable Organics (TCO) using Gas Chromatography/Flame Ionization Detector (GC/FID). The marker compounds are n-heptane and n-heptadecane because their boiling points are 98°C and 302°C, respectively.

The nonvolatile organics will be determined by a gravimetric procedure known as GRAV from the same pooled dichloromethane extract of the Method 0010 train components as the semivolatile organic components. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.9 Stack Gas Total Volatile Organics

For the risk assessment, stack gas will be sampled for total volatile organic compounds (Boiling Points <100°C). Tedlar bag samples of stack gas will be collected and measured for total volatile organics by field gas chromatograph (GC) according to SW-846 Method 0040. Emphasis will be made on the identification of n-C_1 - C_7 hydrocarbons. In addition, the volatile organics collected in the condensate trap of the SW-846 Method 0040 will be analyzed by purge and trap GC/FID. Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.3.10 Particle Size Distribution

The risk assessment requires the collection of particle size distribution data on the stack gas particulate emissions. A separate Method 5 sampling train using smooth surface polycarbonate filters will be used to collect samples for particle size distribution analysis. The M5 particle filters will be Quality assurance procedures are presented in the QAPP (Attachment A).

5.1.4 Scrubber Blowdown Samples

Samples of the scrubber blowdown stream will be collected every 30 minutes during each test run. VOA samples of the scrubber blowdown will be collected and handled as discrete samples. VOA samples will be composited in the laboratory immediately prior to analysis. Grab samples of the scrubber blowdown for the other analyses will be composited in the field to form one sample per run from which samples for analysis will be prepared at the end of each test run. Analytical methods are presented in Table 5-3. Quality assurance procedures are presented in the QAPP (Attachment A).

5.2 ANALYTICAL PROCEDURES

Table 5-3 presents a description of the analytical methods to be used during the performance test.

5.3 MONITORING PROCEDURES

During the performance test, the stack gas will be continuously monitored by installed CEMS using the following procedures:

- Stack gas carbon monoxide by non-dispersive infrared (NDIR) analyzer.
- Stack gas oxygen by paramagnetic analyzer.

CEMS performance testing will be completed prior to conducting the PDT. Stack gas CO and O_2 monitors will be operated during the PDT according to the protocols of the Appendix to 40 CFR 63 Subpart EEE, and Performance Specification 4B of 40 CFR 60 Appendix B. The stack gas monitors will be checked daily during the performance test for calibration stability in accordance with Desotec's standard operating procedures. Quality assurance procedures are presented in the QAPP (Attachment A).

Also during the performance test, the stack gas will be continuously monitored for total hydrocarbons, as propane (EPA Method 25A) using a portable monitor supplied by the stack testing contractor.

In compliance with the requirements of the Parker Facility's current RCRA permit, stack gas continuous monitoring will be conducted during the PDT for SO_2 (EPA Method 6C) and for NOx (EPA Method 7E) using portable monitors supplied by the stack testing contractor.

5.4 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

Attachment A contains a Quality Assurance Project Plan for the PDT.

5.5 EMISSION VALUES FOR USE IN RISK ASSESSMENT

A risk assessment requires input of an extensive array of site-specific data in addition to information outlined in USEPA guidance. Emission rates from the facility stack are one key type of site-specific data used in a risk assessment. They are necessary for the calculation of concentrations in air and other environmental media. These concentrations ultimately are carried forward in the risk assessment to calculate potential risks.

Three main sources of information are relied on to calculate stack emission rates for the risk assessment: 1) the PDT results; 2) proposed permit limits; and 3) if applicable, chemical feed rates and a conservative DRE if a chemical has been demonstrated to be present in spent carbon but is not measured during the PDT.

Some details and mechanics of the HHERA are specifically and intentionally added to this and other PTDP sections to illustrate how PDTR data, normal operating data, and existing permit conditions are utilized within the HHERA. This section, and any mention of the HHERA within the PDTP, does not constitute the HHERA Work Plan, which is required to be submitted to EPA following approval of the PDTR in accordance with Permit Condition V.I.4.

5.5.1 Emission Rates Based on PDT Results

For compounds measured in the PDT which do not have permit limits, emission rates are calculated from the PDT results. With the exception of VOCs, for each analyte, the emission rate is calculated as the measured stack gas concentration from that analyte's sampling train multiplied by the stack gas flow rate measured from the same sampling train. For VOCs, the stack gas flow rate measured using a concurrently operated isokinetic sampling trains (e.g., average of the EPA Method 23 and the three SW-846 Method 0010 variants) will be used.

An underlying consideration in using PDT data for emission rates is USEPA's concept of "reasonable maximum exposures" which translates to ideally relying on emission rates that reflect actual facility operations.[14] The PDT will not, however, evaluate actual expected operations, but rather operations under difficult conditions intended to inflate potential emissions above levels expected under normal facility operating conditions. This is particularly true for compounds that are spiked into the RF during the test. This means that emission rates calculated from PDT test results will overestimate emissions compared to the goal of USEPA's "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities" (HHRAP) guidance which is to

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[14] USEPA guidance states, "Experience has shown us that in order to evaluate both acute and chronic reasonable maximum exposure estimates, the potential emissions evaluated in the risk assessment need to be based on *actual operating scenarios that may occur under the terms of the permit*." Similarly, USEPA guidance also states: "We encourage you to use existing and site-specific information throughout the risk assessment process in order to properly evaluate *actual regulated operations* for any particular combustor. We generally recommend conservative default assumptions only when they will provide confidence that ensuing permit limits will be health protective." (USEPA. 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA 530/R-05-006. Italics emphasis added.)

reflect actual regulated operations.[15] Overestimated emissions will lead to overestimates of calculated air and environmental concentrations and potential risks to human health.

As described above, multiple independent isokinetic sampling trains will be used in the PDT test, with each train concurrently measuring stack gas flow rates and also collecting air samples for chemical analysis. Results measured from the sampling trains will then be used to calculate emission rates for the risk assessment. (Another use of the PDT data is to demonstrate compliance with specific regulatory performance standards which is discussed elsewhere in this document.)

Many of the emissions determinations being made during the PDT are for risk assessment purposes rather than to demonstrate compliance with specific regulatory performance standards. Emission rates for the HHERA will be calculated from the PDT data across sampling runs. Consistent with USEPA guidance regarding reasonable maximum exposures, and recognizing that the PDT will test the facility under “worst case” conditions, the average stack gas concentration across three valid test runs will be used to calculate emission rates for evaluation of potential chronic (long-term) risks in the risk assessment. The maximum stack gas concentration from three valid test runs will be used to calculate emission rates for evaluation of potential acute (short-term) risks in the risk assessment, based on USEPA directions from the prior risk assessment.[16] The maximum of three emission rates from a stack test are typically used to reflect short-term conditions in an acute risk assessment and the average of three emission rates are used to reflect longer-term conditions for a chronic risk assessment. When calculating emission rates from PDT data, the stack gas flow rate used will be the average measured during the PDT from the PDT sampling trains across the three valid test runs (i.e., for both acute and chronic emission rates).

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[15] USEPA. 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA 530/R-05-006 (emphasis added).

[16] The prior risk assessment consisted of the following reports: 1) Risk Assessment for the Siemens Water Technologies Corp. Carbon Reactivation Facility in Parker, Arizona (July 2007); 2) Response to USEPA Region IX Comments on the Draft Siemens Water Technologies Corp. Carbon Regeneration Facility Risk Assessment (March 2008); and 3) Executive Summary (March 2008).

5.5.2 Emission Rates Based on Permit Limits

For compounds with specific enumerated permit limits (e.g., particulate matter, HCl/Cl_2, mercury, SVM, and LVM), emission rates are calculated as stack gas flow rate multiplied by permit limit stack gas concentration. The PDT-measured stack gas concentrations for compounds with permit limits are not used to calculate emission rates for the risk assessment. Rather, for this emission rate calculation, following USEPA guidance related to "reasonable maximum exposures" and "actual operating scenarios," the stack gas flow rate will be an average stack gas flow rate under actual (i.e., normal) operating conditions. This method for calculating emission rates for compounds with permit limits was also used in the prior risk assessment for the facility.[17]

Some compounds with permit limits have a permit limit set as the sum of more than one compound. For example, the permit limit for SVM (sum of cadmium and lead) is based on the sum of these two compounds. For compounds whose permit limit is based on the sum of concentrations for more than one compound, the emission rate for each compound will be conservatively set at 100% of the total proposed permit limit. This 100% assumption will overestimate emission rates. This is because the permit limit cannot be exceeded, so if cadmium and lead were each present at 100% of the permit limit, the sum of the emissions for these two compounds would exceed the permit limit. An alternative could be to assume each compound is present at 50% of the permit limit, which would ensure the permit limit is met. However, for the purposes of ensuring that potential risk are not underestimated, even though this is not realistic, the 100% assumption for each compound will be used.

5.5.3 Emission Rates for Compounds Not Measured During the PDT

Approved and validated stack gas sampling and analytical methods are not currently available for a few of the compounds which, based on the previous risk assessment conducted for this facility, may be identified as COPCs (Compounds of Potential Concern) in the risk assessment. As was done in the previous Risk Assessment, Desotec will estimate the emission rate of these compounds, by assuming that they are present in the spent activated carbon fed during the PDT at the "average" concentration shown in the feed stream characterization (Table 2-2), and applying the average DRE determined for the test.

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[17] In the prior risk assessment, conducted in 2007, emission rates for compounds with permit limits were calculated using the average stack gas flow rate from February - April 2007 combined with the permit limit stack gas concentration.

5.5.4 Flow Rates Used in Risk Assessment

Stack gas flow rates are used in two general ways in a health risk assessment - to calculate emission rates and to calculate a stack gas exit velocity for use in air dispersion modeling. Importantly, no single value for stack gas flow rate is used for all parts of the assessment. For clarification, the methods used to calculate stack gas flow rates for emission rate derivation and for air dispersion modeling are reviewed here.

As noted above, when calculating emission rates directly from PDT measured stack gas concentration and mass emission rate data, the stack gas flow rate used will be the average measured during the PDT from the PDT sampling trains across the three test runs (i.e., for both acute and chronic emission rates). The PDT stack gas concentrations will not be combined with stack gas flow rates measured by the facility's installed in-stack flow meter and/or other methods used to corroborate the in-stack flow meter during testing. Because the PDT will be performed under challenged facility operating conditions which are not reflective of normal operations, the in-stack flow meter data is not relevant for calculating flow rates for emission rate derivation. This means that the in-stack flow meter, and/or other methods used to corroborate the in-stack flow meter during testing, have no bearing on the calculation of emission rates based on PDT measured stack gas concentration data used in the risk assessment. When calculating emission rates for compounds with permit limits, however, stack gas flow rates measured during actual normal facility operations will be used along with permit limit stack concentrations. This is the commonly accepted method for calculating emission rates for compounds with permit limits and was used in the prior risk assessment.

Flow rates are also used for air modeling, to calculate stack gas exit velocity (in meters per second, or m/sec), which is an input for the modeling. The air modeling is intended to reflect dispersion and deposition of emissions under normal operating conditions, and thus use of actual normal flow rates is appropriate.

5.5.5 Selection of Compounds for Evaluation in the Risk Assessment

A Risk Assessment Work Plan will be developed for the upcoming Risk Assessment, and part of that work plan development activity will be to identify a list of compounds to be evaluated. It is expected that the list of compounds selected for evaluation in the future risk assessment will be similar, but not necessarily identical, to the list included in the original risk assessment. Further, the development of the emission rates to be used in the Risk Assessment is expected to be done in a manner similar to that used in the previous Risk Assessment, as described above.

In the original risk assessment completed in March 2008, over 170 compounds were evaluated in detail. The emission rates of these compounds used in the Risk Assessment were determined using the same general methods described above:

1. Emission rate calculated from stack sampling and analysis during the PDT.
2. Emission rates equal to the permit limit. (Note that these compounds were sampled and analyzed during the PDT, but since all measured emissions were below the permit limits, the emission rate used in the Risk Assessment for these compounds were actually higher than were measured during the PDT.)
3. Emission rate estimated based on historical feed data and DRE.

The compounds that were included in Categories 1 and 2 above included 95 that were detected in stack emissions during the PDT plus approximately 80 compounds that were sampled for but not detected in the PDT. Of the total list of compounds evaluated in the prior Risk Assessment, only seven (7) could not be evaluated based on the stack sampling and analyses performed during the PDT, due to the inability of the available methods to either accurately identify or quantify those compounds. Since the risk assessors believed that those seven (7) compounds should be included in the risk evaluation, their emissions were estimated based on historical data regarding their concentration on spent carbon received at the facility and the DRE of difficult to destroy organic compounds demonstrated during the PDT. This is the same approach that is being proposed for the upcoming PDT/HHERA. These are the compounds in Category 3, above.

The seven compounds from the original Risk Assessment that could not be accurately identified and/or quantified by the stack sampling and analytical methods were:

- 1-Hexane (n-hexane) (CAS No. 110-54-3)
- Acrylic Acid (CAS No. 79-10-7)
- Dioxane (1,4) (CAS No. 123-91-1)
- Ethylene Glycol (CAS No. 107-21-1)

- Methyl methacrylate (CAS No. 80-62-6)
- Methyl tert-butyl ether (CAS No. 1634-04-4)
- Propylene oxide (CAS No. 75-56-9).

Because the emission rates for these compounds were based on estimates as described above, this potentially introduced a degree of uncertainty into the Risk Assessment, which was thoroughly discussed in the Risk Assessment Report. If a similar situation occurs during the upcoming Risk Assessment, it too, will introduce a degree of uncertainty, which will be thoroughly evaluated and discussed in the Risk Assessment.

The original Risk Assessment identified 20 compounds that were “risk drivers” for either cancer or non-cancer health effects from stack emissions. None of the seven compounds mentioned above were risk drivers.

Table 5-11 presents a list of possible COPCs for the upcoming Risk Assessment, based on the list from the original Risk Assessment. This list will be revised as appropriate based on the new PDT results. Table 5-11 also identifies the basis for how each compound’s emission rate was derived for use in the prior Risk Assessment. These methods are expected to similarly be used in the upcoming risk assessment. Three categories of emission rate derivation are given, corresponding to the three categories discussed above. It must be noted that since the Risk Assessment Work Plan has not yet been developed for the upcoming Risk Assessment, the information in this table is preliminary, and is subject to change.

Table 5-4. Stack Gas Volatile Organic Target Analytes

Volatiles	CAS Number
Acetone	67-64-1
Benzene	71-43-2
Bromobenzene	108-86-1
Bromodichloromethane	75-27-4
Bromochloromethane	74-97-5
Bromoform (Tribromomethane)	75-25-2
Bromomethane (Methyl Bromide)	74-83-9
Butylbenzene, n-	104-51-8
Butylbenzene, sec-	135-98-8
Butylbenzene, tert-	98-06-6
2-Butanone [Methyl Ethyl Ketone (MEK)]	78-93-3
Carbon Disulfide	75-15-0
Carbon Tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chlorodibromomethane	124-48-1
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane (Methyl Chloride)	74-87-3
2-Chlorotoluene	95-49-8
4-Chlorotoluene	106-43-4
Cumene (Isopropylbenzene)	98-82-8
1,2-Dibromoethane [Ethylene dibromide (EDB)]	106-93-4
Dibromomethane	74-95-3
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
1,2-Dichloroethene (cis-)	156-59-2
1,2-Dichloroethene (trans-)	156-60-5
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9
2,2-Dichloropropane	594-20-7

Table 5-4. Stack Gas Volatile Organic Target Analytes

Volatiles	CAS Number
1,1-Dichloropropene	563-58-6
1,3-Dichloropropene	542-75-6
Ethylbenzene	100-41-4
2-Hexanone	591-78-6
Isopropyl toluene, p-	99-87-6
Methyl Isobutyl Ketone (4-methyl-2-pentanone) (MIBK)	108-10-1
Methylene Chloride	75-09-2
Propylbenzene, n-	103-65-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-3
1,2,3-Trichlorobenzene	87-61-6
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane (Freon 11)	75-69-4
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl Chloride	75-01-4
o-Xylene	95-47-6
m- & p- Xylenes	108-38-3 & 106-42-3
Xylenes (total)	1330-02-7

Table 5-5. Stack Gas Metal Target Analytes

Metal	CAS Number
Aluminum	7429-90-5
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Lead	7439-92-1
Manganese	7439-96-5
Mercury	7439-97-6
Nickel	7440-02-0
Selenium	7782-49-2
Silver	7440-22-4
Thallium	7440-28-0
Vanadium	7440-62-2
Zinc	7440-66-6

Table 5-6. Stack Gas Semivolatile Organic Target Analytes

Semivolatiles	CAS Number
Acetophenone	98-86-2
Aniline	62-53-3
Benzidine [a]	92-87-5
Benzoic Acid	65-85-0
Benzyl alcohol	100-51-6
Bis(2-chloroethoxy) methane	111-91-1
Bis-(2-chloroethyl) ether	111-44-4
Bis(2-ethylhexyl) phthalate	117-81-7
4-Bromophenyl-phenyl ether	101-55-3
Butylbenzylphthalate	85-68-7
Carbazole	86-74-8
4-Chloroaniline	106-47-8
4-Chloro-3-methylphenol	59-50-7
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
4-Chlorophenyl-phenyl ether	7005-72-3
Dibenzofuran	132-64-9
Di-n-butylphthalate	84-74-2
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
3,3’-Dichlorobenzidine	91-94-1
2,4-Dichlorophenol	120-83-2
Diethyl phthalate	84-66-2
2,4-Dimethylphenol	105-67-9
Dimethylphthalate	131-11-3
4,6-Dinitro-2-methylphenol	534-52-1
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Di-n-octyl phthalate	117-84-0
Hexachlorobenzene	118-74-1

Table 5-6. Stack Gas Semivolatile Organic Target Analytes

Semivolatiles	CAS Number
Hexachlorobutadiene	87-68-3
Hexachlorocyclo-pentadiene	77-47-4
Hexachloroethane	67-72-1
Isophrone	78-59-1
2-Methylphenol (o-Cresol)	95-48-7
3-/4-Methylphenol (m-/p-Cresol)	108-59-4 & 106-44-5
Cresol (total)	108-59-4, 106-44-5, & 95-48-7
2-Nitroaniline	88-74-4
3-Nitroaniline	99-09-2
4-Nitroaniline	100-01-6
Nitrobenzene	98-95-3
2-Nitrophenol	88-75-5
4-Nitrophenol	100-02-7
N-nitrosodimethylamine	62-75-9
N-Nitrosodiphenylamine	86-30-6
N-Nitroso-di-n-propylamine	621-64-7
2,2’-oxybis (1-Chloropropane)	108-60-1
Pentachlorobenzene	82-62-8
Pentachloronitrobenzene	82-68-8
Pentachlorophenol	87-86-5
Phenol	108-95-2
Pyridine	110-86-1
1,2,4-Trichlorobenzene	120-82-1
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2

Notes:
[a] Benzidine will be reported as a tentatively identified compound (TIC) if positive results are exhibited in the emissions samples.

Table 5-7. Stack Gas OCP Target Analytes

OCP	CAS Number
4,4'-DDD	72-54-8
4,4'-DDE	72-55-9
4,4'-DDT	50-29-3
Aldrin	309-00-2
α-BHC	319-84-6
β-BHC	319-85-7
γ-BHC (Lindane)	58-89-9
δ-BHC	319-86-8
α-Chlordane (cis-)	5103-71-9
δ-Chlordane (trans-)	5103-74-2
Dieldrin	60-75-1
Endosulfan I	959-98-8
Endosulfan II	33213-65-9
Endosulfan sulfate	1031-07-8
Endrin	72-20-8
Endrin aldehyde	7421-93-4
Endrin ketone	53494-70-5
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Methoxychlor	72-43-5

Table 5-8. Stack Gas Dioxin/Furan Target Analytes

Dioxin/Furan Compounds	CAS Number
2,3,7,8-TCDD	1746-01-6
Total TCDD	41903-57-5
2,3,7,8-TCDF	51207-31-9
Total TCDF	55722-27-5
1,2,3,7,8-PeCDD	40321-76-4
Total PeCDD	36088-22-9
1,2,3,7,8-PeCDF	57117-41-6
2,3,4,7,8-PeCDF	57117-31-4
Total PeCDF	30402-15-4
1,2,3,6,7,8-HxCDD	57653-85-7
1,2,3,4,7,8-HxCDD	39227-28-6
1,2,3,7,8,9-HxCDD	19408-74-3
Total HxCDD	34465-46-8
1,2,3,6,7,8-HxCDF	57117-44-9
1,2,3,4,7,8-HxCDF	70648-26-9
1,2,3,7,8,9-HxCDF	72918-21-9
2,3,4,6,7,8-HxCDF	60851-34-5
Total HxCDF	55684-94-1
1,2,3,4,6,7,8-HpCDD	35822-39-4
Total HpCDD	37871-00-4
1,2,3,4,6,7,8-HpCDF	67562-394
1,2,3,4,7,8,9-HpCDF	55673-89-7
Total HpCDF	38998-75-3
OCDD	3268-87-9
OCDF	39001-02-0

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
1	1	2-monochlorobiphenyl	2051-60-7
2	2	3-monochlorobiphenyl	2051-61-8
3	3	4-monochlorobiphenyl	2051-62-9
4	4	2,2’-dichlorobiphenyl	13029-08-8
5	5	2,3-dichlorobiphenyl	16605-91-7
6	6	2,3’-dichlorobiphenyl	25569-80-6
7	7	2,4-dichlorobiphenyl	33284-50-3
8	8	2,4’-dichlorobiphenyl	34883-43-7
9	9	2,5-dichlorobiphenyl	34883-39-1
10	10	2,6-dichlorobiphenyl	33146-45-1
11	11	3,3’-dichlorobiphenyl	2050-67-1
12	12	3,4-dichlorobiphenyl	2974-92-7
13	13	3,4’-dichlorobiphenyl	2974-90-5
14	14	3,5-dichlorobiphenyl	34883-41-5
15	15	4,4’-dichlorobiphenyl	2050-68-2
16	16	2,2’,3-trichlorobiphenyl	38444-78-9
17	17	2,2’,4-trichlorobiphenyl	37680-66-3
18	18	2,2’,5-trichlorobiphenyl	37680-65-2
19	19	2,2’,6-trichlorobiphenyl	38444-73-4
20	20	2,3,3’-trichlorobiphenyl	38444-84-7
21	21	2,3,4-trichlorobiphenyl	55702-46-0
22	22	2,3,4’-trichlorobiphenyl	38444-85-8
23	23	2,3,5-trichlorobiphenyl	55720-44-0
24	24	2,3,6-trichlorobiphenyl	55702-45-9
25	25	2,3’,4-trichlorobiphenyl	55712-37-3
26	26	2,3’,5-trichlorobiphenyl	38444-81-4
27	27	2,3’,6-trichlorobiphenyl	38444-76-7
28	28	2,4,4’-trichlorobiphenyl	7012-37-5
29	29	2,4,5-trichlorobiphenyl	15862-07-4
30	30	2,4,6-trichlorobiphenyl	35693-92-6
31	31	2,4’,5-trichlorobiphenyl	16606-02-3
32	32	2,4’,6-trichlorobiphenyl	38444-77-8
33	33	2’,3,4-trichlorobiphenyl (2,3’,4’-trichlorobiphenyl)	38444-86-9
34	34	2’,3,5-trichlorobiphenyl (2,3’,5’-trichlorobiphenyl)	37680-68-5
35	35	3,3’,4-trichlorobiphenyl	37680-69-6
36	36	3,3’,5-trichlorobiphenyl	38444-87-0
37	37	3,4,4’-trichlorobiphenyl	38444-90-5
38	38	3,4,5-trichlorobiphenyl	53555-66-1
39	39	3,4’,5-trichlorobiphenyl	38444-88-1
40	40	2,2’,3,3’-tetrachlorobiphenyl	38444-93-8

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
41	41	2,2’,3,4-tetrachlorobiphenyl	52663-59-9
42	42	2,2’,3,4’-tetrachlorobiphenyl	36559-22-5
43	43	2,2’,3,5-tetrachlorobiphenyl	70362-46-8
44	44	2,2’,3,5’-tetrachlorobiphenyl	41464-39-5
45	45	2,2’,3,6-tetrachlorobiphenyl	70362-45-7
46	46	2,2’,3,6’-tetrachlorobiphenyl	41464-47-5
47	47	2,2’,4,4’-tetrachlorobiphenyl	2437-79-8
48	48	2,2’,4,5-tetrachlorobiphenyl	70362-47-9
49	49	2,2’,4,5’-tetrachlorobiphenyl	41464-40-8
50	50	2,2’,4,6-tetrachlorobiphenyl	62796-65-0
51	51	2,2’,4,6’-tetrachlorobiphenyl	68194-04-7
52	52	2,2’,5,5’-tetrachlorobiphenyl	35693-99-3
53	53	2,2’,5,6’-tetrachlorobiphenyl	41464-41-9
54	54	2,2’,6,6’-tetrachlorobiphenyl	15968-05-5
55	55	2,3,3’,4-tetrachlorobiphenyl	74338-24-2
56	56	2,3,3’,4’-tetrachlorobiphenyl	41464-43-1
57	57	2,3,3’,5-tetrachlorobiphenyl	70424-67-8
58	58	2,3,3’,5’-tetrachlorobiphenyl	41464-49-7
59	59	2,3,3’,6-tetrachlorobiphenyl	74472-33-6
60	60	2,3,4,4’-tetrachlorobiphenyl	33025-41-1
61	61	2,3,4,5-tetrachlorobiphenyl	33284-53-6
62	62	2,3,4,6-tetrachlorobiphenyl	54230-22-7
63	63	2,3,4’,5-tetrachlorobiphenyl	74472-34-7
64	64	2,3,4’,6-tetrachlorobiphenyl	52663-58-8
65	65	2,3,5,6-tetrachlorobiphenyl	33284-54-7
66	66	2,3’,4,4’-tetrachlorobiphenyl	32598-10-0
67	67	2,3’,4,5-tetrachlorobiphenyl	73575-53-8
68	68	2,3’,4,5’-tetrachlorobiphenyl	73575-52-7
69	69	2,3’,4,6-tetrachlorobiphenyl	60233-24-1
70	70	2,3’,4’,5-tetrachlorobiphenyl	32598-11-1
71	71	2,3’,4’,6-tetrachlorobiphenyl	41464-46-4
72	72	2,3’,5,5’-tetrachlorobiphenyl	41464-42-0
73	73	2,3’,5’,6-tetrachlorobiphenyl	74338-23-1
74	74	2,4,4’,5-tetrachlorobiphenyl	32690-93-0
75	75	2,4,4’,6-tetrachlorobiphenyl	32598-12-2
76	76	2’,3,4,5-tetrachlorobiphenyl (2,3’,4’,5’-tetrachlorobiphenyl)	70362-48-0
77	77	3,3’,4,4’-tetrachlorobiphenyl	32598-13-3
78	78	3,3’,4,5-tetrachlorobiphenyl	70362-49-1
79	79	3,3’,4,5’-tetrachlorobiphenyl	41464-48-6
80	80	3,3’,5,5’-tetrachlorobiphenyl	33284-52-5
81	81	3,4,4’,5-tetrachlorobiphenyl	70362-50-4
82	82	2,2’,3,3’,4-pentachlorobiphenyl	52663-62-4

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
83	83	2,2’,3,3’,5-pentachlorobiphenyl	60145-20-2
84	84	2,2’,3,3’,6-pentachlorobiphenyl	52663-60-2
85	85	2,2’,3,4,4’-pentachlorobiphenyl	65510-45-4
86	86	2,2’,3,4,5-pentachlorobiphenyl	55312-69-1
87	87	2,2’,3,4,5’-pentachlorobiphenyl	38380-02-8
88	88	2,2’,3,4,6-pentachlorobiphenyl	55215-17-3
89	89	2,2’,3,4,6’-pentachlorobiphenyl	73575-57-2
90	90	2,2’,3,4’,5-pentachlorobiphenyl	68194-07-0
91	91	2,2’,3,4’,6-pentachlorobiphenyl	68194-05-8
92	92	2,2’,3,5,5’-pentachlorobiphenyl	52663-61-3
93	93	2,2’,3,5,6-pentachlorobiphenyl	73575-56-1
94	94	2,2’,3,5,6’-pentachlorobiphenyl	73575-55-0
95	95	2,2’,3,5’,6-pentachlorobiphenyl	38379-99-6
96	96	2,2’,3,6,6’-pentachlorobiphenyl	73575-54-9
97	97	2,2’,3’,4,5-pentachlorobiphenyl (2,2’,3,4’,5’-pentachlorobiphenyl)	41464-51-1
98	98	2,2’,3’,4,6-pentachlorobiphenyl (2,2’,3,4’,6’-pentachlorobiphenyl)	60233-25-2
99	99	2,2’,4,4’,5-pentachlorobiphenyl	38380-01-7
100	100	2,2’,4,4’,6-pentachlorobiphenyl	39485-83-1
101	101	2,2’,4,5,5’-pentachlorobiphenyl	37680-73-2
102	102	2,2’,4,5,6’’-pentachlorobiphenyl	68194-06-9
103	103	2,2’,4,5’,6-pentachlorobiphenyl	60145-21-3
104	104	2,2’,4,6,6’-pentachlorobiphenyl	56558-16-8
105	105	2,3,3’,4,4’-pentachlorobiphenyl	32598-14-4
106	106	2,3,3’,4,5-pentachlorobiphenyl	70424-69-0
107	107/109	2,3,3',4',5-pentachlorobiphenyl	70424-68-9
108	108/107	2,3,3',4,5'-pentachlorobiphenyl	70362-41-3
109	109/108	2,3,3',4,6-pentachlorobiphenyl	74472-35-8
110	110	2,3,3’,4’,6-pentachlorobiphenyl	38380-03-9
111	111	2,3,3’,5,5’-pentachlorobiphenyl	39635-32-0
112	112	2,3,3’,5,6-pentachlorobiphenyl	74472-36-9
113	113	2,3,3’,5’,6-pentachlorobiphenyl	68194-10-5
114	114	2,3,4,4’,5-pentachlorobiphenyl	74472-37-0
115	115	2,3,4,4’,6-pentachlorobiphenyl	74472-38-1
116	116	2,3,4,5,6-pentachlorobiphenyl	18259-05-7
117	117	2,3,4’,5,6-pentachlorobiphenyl	68194-11-6
118	118	2,3’,4,4’,5-pentachlorobiphenyl	31508-00-6
119	119	2,3’,4,4’,6-pentachlorobiphenyl	56558-17-9
120	120	2,3’,4,5,5’-pentachlorobiphenyl	68194-12-7
121	121	2,3’,4,5’,6-pentachlorobiphenyl	56558-18-0
122	122	2’,3,3’,4,5-pentachlorobiphenyl (2,3,3’,4’,5’-pentachlorobiphenyl)	76842-07-4

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
123	123	2’,3,4,4’,5-pentachlorobiphenyl (2,3’,4,4’,5’-pentachlorobiphenyl)	65510-44-3
124	124	2’,3,4,5,5’-pentachlorobiphenyl (2,3’,4’,5’,5-pentachlorobiphenyl)	70424-70-3
125	125	2’,3,4,5,6’-pentachlorobiphenyl (2,3’,4’,5’,6-pentachlorobiphenyl)	74472-39-2
126	126	3,3’,4,4’,5-pentachlorobiphenyl	57465-28-8
127	127	3,3’,4,5,5’-pentachlorobiphenyl	39635-33-1
128	128	2,2’,3,3’,4,4’-hexachlorobiphenyl	38380-07-3
129	129	2,2’,3,3’,4,5-hexachlorobiphenyl	55215-18-4
130	130	2,2’,3,3’,4,5’-hexachlorobiphenyl	52663-66-8
131	131	2,2’,3,3’,4,6-hexachlorobiphenyl	61798-70-7
132	132	2,2’,3,3’,4,6’-hexachlorobiphenyl	38380-05-1
133	133	2,2’,3,3’,5,5’-hexachlorobiphenyl	35694-04-3
134	134	2,2’,3,3’,5,6-hexachlorobiphenyl	52704-70-8
135	135	2,2’,3,3’,5,6’-hexachlorobiphenyl	52744-13-5
136	136	2,2’,3,3’,6,6’-hexachlorobiphenyl	38411-22-2
137	137	2,2’,3,4,4’,5-hexachlorobiphenyl	35694-06-5
138	138	2,2’,3,4,4’,5’-hexachlorobiphenyl	35065-28-2
139	139	2,2’,3,4,4’,6-hexachlorobiphenyl	56030-56-9
140	140	2,2’,3,4,4’,6’-hexachlorobiphenyl	59291-64-4
141	141	2,2’,3,4,5,5’-hexachlorobiphenyl	52712-04-6
142	142	2,2’,3,4,5,6-hexachlorobiphenyl	41411-61-4
143	143	2,2’,3,4,5,6’-hexachlorobiphenyl	68194-15-0
144	144	2,2’,3,4,5’,6-hexachlorobiphenyl	68194-14-9
145	145	2,2’,3,4,6,6’-hexachlorobiphenyl	74472-40-5
146	146	2,2’,3,4’,5,5’-hexachlorobiphenyl	51908-16-8
147	147	2,2’,3,4’,5,6-hexachlorobiphenyl	68194-13-8
148	148	2,2’,3,4’,5,6’-hexachlorobiphenyl	74472-41-6
149	149	2,2’,3,4’,5’,6-hexachlorobiphenyl	38380-04-0
150	150	2,2’,3,4’,6,6’-hexachlorobiphenyl	68194-08-1
151	151	2,2’,3,5,5’,6-hexachlorobiphenyl	52663-63-5
152	152	2,2’,3,5,6,6’-hexachlorobiphenyl	68194-09-2
153	153	2,2’,4,4’,5,5’-hexachlorobiphenyl	35065-27-1
154	154	2,2’,4,4’,5,6’-hexachlorobiphenyl	60145-22-4
155	155	2,2’,4,4’,6,6’-hexachlorobiphenyl	33979-03-2
156	156	2,3,3’,4,4’,5-hexachlorobiphenyl	38380-08-4
157	157	2,3,3’,4,4’,5’-hexachlorobiphenyl	69782-90-7
158	158	2,3,3’,4,4’,6-hexachlorobiphenyl	74472-42-7
159	159	2,3,3’,4,5,5’-hexachlorobiphenyl	39635-35-3
160	160	2,3,3’,4,5,6-hexachlorobiphenyl	41411-62-5
161	161	2,3,3’,4,5’,6-hexachlorobiphenyl	74472-43-8
162	162	2,3,3’,4’,5,5’-hexachlorobiphenyl	39635-34-2

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
163	163	2,3,3’,4’,5,6-hexachlorobiphenyl	74472-44-9
164	164	2,3,3’,4’,5’,6-hexachlorobiphenyl	74472-45-0
165	165	2,3,3’,5,5’,6-hexachlorobiphenyl	74472-46-1
166	166	2,3,4,4’,5,6-hexachlorobiphenyl	41411-63-6
167	167	2,3’,4,4’,5,5’-hexachlorobiphenyl	52663-72-6
168	168	2,3’,4,4’,5’,6-hexachlorobiphenyl	59291-65-5
169	169	3,3’,4,4’,5,5’-hexachlorobiphenyl	32774-16-6
170	170	2,2’,3,3’,4,4’,5-heptachlorobiphenyl	35065-30-6
171	171	2,2’,3,3’,4,4’,6-heptachlorobiphenyl	52663-71-5
172	172	2,2’,3,3’,4,5,5’-heptachlorobiphenyl	52663-74-8
173	173	2,2’,3,3’,4,5,6-heptachlorobiphenyl	68194-16-1
174	174	2,2’,3,3’,4,5,6’-heptachlorobiphenyl	38411-25-5
175	175	2,2’,3,3’,4,5’,6-heptachlorobiphenyl	40186-70-7
176	176	2,2’,3,3’,4,6,6’-heptachlorobiphenyl	52663-65-7
177	177	2,2’,3,3’,4’,5,6-heptachlorobiphenyl (2,2’,3,3’,4,5’,6’-heptachlorobiphenyl)	52663-70-4
178	178	2,2’,3,3’,5,5’,6-heptachlorobiphenyl	52663-67-9
179	179	2,2’,3,3’,5,6,6’-heptachlorobiphenyl	52663-64-6
180	180	2,2’,3,4,4’,5,5’-heptachlorobiphenyl	35065-29-3
181	181	2,2’,3,4,4’,5,6-heptachlorobiphenyl	74472-47-2
182	182	2,2’,3,4,4’,5,6’-heptachlorobiphenyl	60145-23-5
183	183	2,2’,3,4,4’,5’,6-heptachlorobiphenyl	52663-69-1
184	184	2,2’,3,4,4’,6,6’-heptachlorobiphenyl	74472-48-3
185	185	2,2’,3,4,5,5’,6-heptachlorobiphenyl	52712-05-7
186	186	2,2’,3,4,5,6,6’-heptachlorobiphenyl	74472-49-4
187	187	2,2’,3,4’,5,5’,6-heptachlorobiphenyl	52663-68-0
188	188	2,2’,3,4’,5,6,6’-heptachlorobiphenyl	74487-85-7
189	189	2,3,3’,4,4’,5,5’-heptachlorobiphenyl	39635-31-9
190	190	2,3,3’,4,4’,5,6-heptachlorobiphenyl	41411-64-7
191	191	2,3,3’,4,4’,5’,6-heptachlorobiphenyl	74472-50-7
192	192	2,3,3’,4,5,5’,6-heptachlorobiphenyl	74472-51-8
193	193	2,3,3’,4’,5,5’,6-heptachlorobiphenyl	69782-91-8
194	194	2,2’,3,3’,4,4’,5,5’-octachlorobiphenyl	35694-08-7
195	195	2,2’,3,3’,4,4’,5,6-octachlorobiphenyl	52663-78-2
196	196	2,2’,3,3’,4,4’,5,6’-octachlorobiphenyl	42740-50-1
197	197	2,2’,3,3’,4,4’,6,6’-octachlorobiphenyl	33091-17-7
198	198	2,2’,3,3’,4,5,5’,6-octachlorobiphenyl	68194-17-2
199	201/199	2,2’,3,3’,4,5,5’,6’-octachlorobiphenyl	52663-75-9
200	199/200	2,2’,3,3’,4,5,6,6’-octachlorobiphenyl	52663-73-7
201	200/201	2,2’,3,3’,4,5’,6,6’-octachlorobiphenyl	40186-71-8
202	202	2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	2136-99-4
203	203	2,2’,3,4,4’,5,5’,6-octachlorobiphenyl	52663-76-0

Table 5-9. Stack Gas Target PCB Target Analytes

PCB No. [1]	BZ/IUPAC No. [2]	PCB Chemical Structure Name [3]	CAS No. [4]
204	204	2,2’,3,4,4’,5,6,6’-octachlorobiphenyl	74472-52-9
205	205	2,3,3’,4,4’,5,5’,6-octachlorobiphenyl	74472-53-0
206	206	2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	40186-72-9
207	207	2,2’,3,3’,4,4’,5,6,6’-nonachlorobiphenyl	52663-79-3
208	208	2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	52663-77-1
209	209	2,2’,3,3’,4,4’,5,5’,6,6’-decachlorobiphenyl	2051-24-3

Notes:

1. The PCB congener number is from Method 1668C and Chemical Abstract Services.
2. The BZ number is from Ballschmiter and Zell (1980). The IUPAC number, when different from the BZ, follows the recommended changes to the BZ number per Schulte and Malisch (1983) and Guitart et al. (1993).
3. The chemical structure names are from Ballschmiter and Zell (1980). IUPAC nomenclature structure names are listed in parenthesis when different from the BZ name (source CAS Registry).
4. Chemical Abstract Service Registry number (source CAS Registry and 1668A Table 1).

Table 5-10. Stack Gas PAH Target Analytes

PAH	CAS Number
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo(b)fluoranthene	205-99-2
Benzo(k)fluoranthene	207-08-9
Benzo(g,h,i)perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(e)pyrene	192-97-2
Chrysene	218-01-9
Dibenzo(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Indeno(1,2,3-cd)pyrene	193-39-5
2-Methylnaphthalene	91-57-6
Naphthalene	91-20-3
Perylene	198-55-0
Phenanthrene	85-01-8
Pyrene	129-00-0

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
Metals and Inorganic Compounds		
Aluminum	7429-90-5	Category 1
Antimony	7440-36-0	Category 1
Arsenic	7440-38-2	Category 2
Barium	7440-39-3	Category 1
Beryllium	7440-41-7	Category 2
Cadmium	7440-43-9	Category 2
Chromium	7440-47-3	Category 2
Chromium, hexavalent	7440-47-3	Category 1
Cobalt	7440-48-4	Category 1
Copper	7440-50-8	Category 1
Lead	7439-92-1	Category 2
Manganese	7439-96-5	Category 1
Mercuric chloride	7487-94-7	Category 2
Mercury, elemental	7439-97-6	Category 2
Nickel	7440-02-0	Category 1
Selenium	7782-49-2	Category 1
Silver	7440-22-4	Category 1
Thallium	7440-28-0	Category 1
Vanadium	7440-62-2	Category 1
Zinc	7440-66-6	Category 1
Chlorine	7782-50-5	Category 2
Hydrogen chloride	7647-01-0	Category 2
Volatile Organic Compounds (VOCs)		
Acetone	67-64-1	Category 1
Acrylic Acid [a,c,d] (B.P. 139°C)	79-10-7	Category 3
Acrylonitrile [a,c]	107-13-1	Category 1
Benzene	71-43-2	Category 1
Bromobenzene	108-86-1	Category 1
Bromodichloromethane	75-27-4	Category 1
Bromochloromethane	74-97-5	Category 1
Bromoform (Tribromomethane)	75-25-2	Category 1
Bromomethane (Methyl Bromide)	74-83-9	Category 1
Butylbenzene, n-	104-51-8	Category 1
Butylbenzene, sec-	135-98-8	Category 1
Butylbenzene, tert-	98-06-6	Category 1
2-Butanone [Methyl Ethyl Ketone (MEK)]	78-93-3	Category 1
Carbon Disulfide	75-15-0	Category 1
Carbon Tetrachloride	56-23-5	Category 1
Chlorobenzene	108-90-7	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
Chlorodibromomethane	124-48-1	Category 1
Chloroethane	75-00-3	Category 1
Chloroform	67-66-3	Category 1
Chloromethane (methyl chloride)	74-87-3	Category 1
2-Chlorotoluene	95-49-8	Category 1
4-Chlorotoluene	106-43-4	Category 1
Cumene (Isopropylbenzene)	98-82-8	Category 1
1,2-Dibromoethane [Ethylene dibromide (EDB)]	106-93-4	Category 1
Dibromomethane	74-95-3	Category 1
Dichlorodifluoromethane	75-71-8	Category 1
1,1-Dichloroethane	75-34-3	Category 1
1,2-Dichloroethane	107-06-2	Category 1
1,1-Dichloroethene	75-35-4	Category 1
1,2-Dichloroethene (cis-)	156-59-2	Category 1
1,2-Dichloroethene (trans-)	156-60-5	Category 1
1,2-Dichloropropane	78-87-5	Category 1
1,3-Dichloropropane	142-28-9	Category 1
2,2-Dichloropropane	594-20-7	Category 1
1,1-Dichloropropene	563-58-6	Category 1
1,3-Dichloropropene	542-75-6	Category 1
2,5-Dimethylheptane [a,c,d] (B.P. 140°C)	2216-30-0	Category 1
2,5-Dimethylfuran [a,c,d] (B.P. 93°C)	625-86-5	Category 1
Ethylbenzene	100-41-4	Category 1
1-Hexane (n-hexane) [a,c,d] (B.P. 69°C)	110-54-3	Category 3
3-Hexen-2-one [a,c,d] (B.P. 140°C)	763-93-9	Category 1
2-Hexanone	591-78-6	Category 1
Iodomethane [a,c]	74-88-4	Category 1
Isopropyl toluene, p-	99-87-6	Category 1
Methylene chloride	75-09-2	Category 1
Methyl Isobutyl Ketone (4-methyl-2-pentanone) (MIBK)	108-10-1	Category 1
Methyl methacrylate [a,c]	80-62-6	Category 3
2-Methyl octane [a,c,d] (B.P. 118°C)	3221-61-2	Category 1
Methyl tert-butyl ether (MTBE) [a,c,d] (B.P. 56°C)	1634-04-4	Category 3
3-Penten-2-one, 4-methyl [a,c,d] (B.P. 129°C)	141-79-7	Category 1
Propylbenzene, n-	103-65-1	Category 1
Propylene oxide [a,c,d] (B.P. 95°C)	75-56-9	Category 3
Styrene	100-42-5	Category 1
1,1,1,2-Tetrachloroethane	630-20-6	Category 1
1,1,2,2-Tetrachloroethane	79-34-5	Category 1
Tetrachloroethene	127-18-4	Category 1
Tetrahydrofuran [a,c]	109-99-9	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
Toluene	108-88-3	Category 1
1,2,3-Trichlorobenzene	87-61-6	Category 1
1,1,1-Trichloroethane	71-55-6	Category 1
1,1,2-Trichloroethane	79-00-5	Category 1
Trichloroethylene	79-01-6	Category 1
Trichlorofluoromethane (Freon 11)	75-69-4	Category 1
1,2,3-Trichloropropane	96-18-4	Category 1
1,2,4-Trimethylbenzene	95-63-6	Category 1
1,3,5-Trimethylbenzene	108-67-8	Category 1
1,1,2-Trichloro – 1,2,2-trifluoroethane (Freon 113) [a,c]	76-13-1	Category 1
Vinyl Acetate [a,c]	108-05-4	Category 1
Vinyl Chloride	75-01-4	Category 1
Xylene, o-	95-47-6	Category 1
Xylene, m-	108-38-3	Category 1
Xylene, p-	106-42-3	Category 1
Semivolatile Organic Compounds (SVOCs)		
Acetophenone	98-86-2	Category 1
Aniline	62-53-3	Category 1
Benzaldehyde [a,c,d] (B.P. 179°C)	100-52-7	Category 1
Benzidine [a]	92-87-5	Category 1
Benzoic Acid	65-85-0	Category 1
Benzoic acid, methyl ester [a,c,d] (B.P. 199°C)	93-58-3	Category 1
Benzonitrile [a,c,d] (B.P. 191°C)	100-47-0	Category 1
Benzyl alcohol	100-51-6	Category 1
Bis(2-chloroethoxy) methane	111-91-1	Category 1
Bis-(2-chloroethyl) ether	111-44-4	Category 1
Bis(2-ethylhexyl) phthalate	117-81-7	Category 1
4-Bromophenyl-phenyl ether	101-55-3	Category 1
Butylbenzylphthalate	85-68-7	Category 1
Carbazole	86-74-8	Category 1
4-Chloroaniline	106-47-8	Category 1
4-Chloro-3-methylphenol	59-50-7	Category 1
2-Chloronaphthalene	91-58-7	Category 1
2-Chlorophenol	95-57-8	Category 1
4-Chlorophenyl-phenyl ether	7005-72-3	Category 1
Dibenzofuran	132-64-9	Category 1
Di-n-butylphthalate	84-74-2	Category 1
1,2-Dichlorobenzene	95-50-1	Category 1
1,3-Dichlorobenzene	541-73-1	Category 1
1,4-Dichlorobenzene	106-46-7	Category 1
3,3’-Dichlorobenzidine	91-94-1	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
2,4-Dichlorophenol	120-83-2	Category 1
Diethyl phthalate	84-66-2	Category 1
2,4-Dimethylphenol	105-67-9	Category 1
Dimethylphthalate	131-11-3	Category 1
2,5-Dione, 3-hexene [a,c,d] (B.P. 213°C)	17559-81-8	Category 1
1,2-Diphenylhydrazine [a,c,d] (B.P. 229°C)	122-66-7	Category 1
1,3-Dinitrobenzene [a,c]	99-65-0	Category 1
4,6-Dinitro-2-methylphenol	534-52-1	Category 1
2,4-Dinitrophenol	51-28-5	Category 1
2,4-Dinitrotoluene	121-14-2	Category 1
2,6-Dinitrotoluene	606-20-2	Category 1
Di-n-octyl phthalate	117-84-0	Category 1
Dioxane (1,4) [a,c]	123-91-1	Category 3
Diphenylamine [a,c]	122-39-4	Category 1
3-Ethyl benzaldehyde [a,c,d] (B.P. 214°C)	34246-54-3	Category 1
4-Ethyl benzaldehyde [a,c,d] (B.P. 221°C)	4748-78-1	Category 1
Ethylene Glycol [a,c,d] (B.P. 199°C)	107-21-1	Category 3
Ethylidene acetone (3-penten-2-one) [a,c,d] (B.P. 124°C)	625-33-2	Category 1
Hexachlorobenzene	118-74-1	Category 1
Hexachlorobutadiene	87-68-3	Category 1
Hexachlorocyclo-pentadiene	77-47-4	Category 1
Hexachloroethane	67-72-1	Category 1
Isophorone	78-59-1	Category 1
2-Methylphenol (Cresol, o-)	95-48-7	Category 1
3-Methylphenol (Cresol, m-)	108-39-4	Category 1
4-Methylphenol (Cresol, p-)	106-44-5	Category 1
2-Nitroaniline	88-74-4	Category 1
3-Nitroaniline	99-09-2	Category 1
4-Nitroaniline	100-01-6	Category 1
Nitrobenzene	98-95-3	Category 1
2-Nitrophenol	88-75-5	Category 1
4-Nitrophenol	100-02-7	Category 1
N-Nitrosodimethylamine	62-75-9	Category 1
N-Nitrosodiphenylamine	86-30-6	Category 1
N-Nitroso-di-n-propylamine	621-64-7	Category 1
9-Octadecenamide [a,c,d] (B.P. 443°C)	301-02-0	Category 1
2,2'-oxybis (1-Chloropropane)	108-60-1	Category 1
Pentachlorobenzene	608-93-5	Category 1
Pentachloronitrobenzene	82-68-8	Category 1
Pentachlorophenol	87-86-5	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
Phenol	108-95-2	Category 1
Phosphine imide, P,P,P-triphenyl [a,c,d] (B.P. 405°C)	2240-47-3	Category 1
Pyridine	110-86-1	Category 1
Tetrachlorobenzene, 1,2,4,5- [a,c,d] (B.P. 246°C)	95-94-3	Category 1
1,2,4-Trichlorobenzene	120-82-1	Category 1
2,4,5-Trichlorophenol	95-95-4	Category 1
2,4,6-Trichlorophenol	88-06-2	Category 1
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	83-32-9	Category 1
Acenaphthylene	208-96-8	Category 1
Anthracene	120-12-7	Category 1
Benzo(a)anthracene	56-55-3	Category 1
Benzo(b)fluoranthene	205-99-2	Category 1
Benzo(k)fluoranthene	207-08-9	Category 1
Benzo(g,h,i)perylene	191-24-2	Category 1
Benzo(a)pyrene	50-32-8	Category 1
Benzo(e)pyrene	192-97-2	Category 1
Chrysene	218-01-9	Category 1
Dibenzo(a,h)anthracene	53-70-3	Category 1
Fluoranthene	206-44-0	Category 1
Fluorene	86-73-7	Category 1
Indeno(1,2,3-cd)pyrene	193-39-5	Category 1
2-Methylnaphthalene	91-57-6	Category 1
Naphthalene	91-20-3	Category 1
Perylene	198-55-0	Category 1
Phenanthrene	85-01-8	Category 1
Pyrene	129-00-0	Category 1
Organochloro Pesticides (OCPs)		
1,2-Dibromo-3-chloropropane [a,c]	96-12-8	Category 1
4,4'-DDD	72-54-8	Category 1
4,4'-DDE	72-55-9	Category 1
4,4'-DDT	50-29-3	Category 1
Aldrin	309-00-2	Category 1
BHC, alpha-	319-84-6	Category 1
BHC, beta-	319-85-7	Category 1
BHC, gamma- (Lindane)	58-89-9	Category 1
BHC, delta-	319-86-8	Category 1
Chlorobenzilate [a,c]	510-15-6	Category 1
Total Chlordane (alpha- + beta-)	57-74-9	Category 1
Diallate [a,c]	2303-16-4	Category 1
Dieldrin	60-57-1	Category 1
Endosulfan I	959-98-8	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
Endosulfan II	33213-65-9	Category 1
Endosulfan sulfate	1031-07-8	Category 1
Endrin	72-20-8	Category 1
Endrin aldehyde	7421-93-4	Category 1
Endrin ketone	53494-70-5	Category 1
Heptachlor	76-44-8	Category 1
Heptachlor epoxide	1024-57-3	Category 1
Methoxychlor	72-43-5	Category 1
PCDDs/PCDFs (Dioxins and Furans)		
2,3,7,8-TCDD	1746-01-6	Category 2
2,3,7,8-TCDF	51207-31-9	Category 2
1,2,3,7,8-PeCDD	40321-76-4	Category 2
1,2,3,7,8-PeCDF	57117-41-6	Category 2
2,3,4,7,8-PeCDF	57117-31-4	Category 2
1,2,3,6,7,8-HxCDD	57653-85-7	Category 2
1,2,3,4,7,8-HxCDD	39227-28-6	Category 2
1,2,3,7,8,9-HxCDD	19408-74-3	Category 2
1,2,3,6,7,8-HxCDF	57117-44-9	Category 2
1,2,3,4,7,8-HxCDF	70648-26-9	Category 2
1,2,3,7,8,9-HxCDF	72918-21-9	Category 2
2,3,4,6,7,8-HxCDF	60851-34-5	Category 2
1,2,3,4,6,7,8-HpCDD	35822-46-9	Category 2
1,2,3,4,6,7,8-HpCDF	67562-39-4	Category 2
1,2,3,4,7,8,9-HpCDF	55673-89-7	Category 2
Total OCDD	3268-87-9	Category 2
Total OCDF	39001-02-0	Category 2
Polychlorinated Biphenyls (PCBs)		
2-monochlorobiphenyl	2051-60-7	Category 1
3-monochlorobiphenyl	2051-61-8	Category 1
4-monochlorobiphenyl	2051-62-9	Category 1
2,2’-dichlorobiphenyl	13029-08-8	Category 1
2,3-dichlorobiphenyl	16605-91-7	Category 1
2,3’-dichlorobiphenyl	25569-80-6	Category 1
2,4-dichlorobiphenyl	33284-50-3	Category 1
2,4’-dichlorobiphenyl	34883-43-7	Category 1
2,5-dichlorobiphenyl	34883-39-1	Category 1
2,6-dichlorobiphenyl	33146-45-1	Category 1
3,3’-dichlorobiphenyl	2050-67-1	Category 1
3,4-dichlorobiphenyl	2974-92-7	Category 1
3,4’-dichlorobiphenyl	2974-90-5	Category 1
3,5-dichlorobiphenyl	34883-41-5	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
4,4’-dichlorobiphenyl	2050-68-2	Category 1
2,2’,3-trichlorobiphenyl	38444-78-9	Category 1
2,2’,4-trichlorobiphenyl	37680-66-3	Category 1
2,2’,5-trichlorobiphenyl	37680-65-2	Category 1
2,2’,6-trichlorobiphenyl	38444-73-4	Category 1
2,3,3’-trichlorobiphenyl	38444-84-7	Category 1
2,3,4-trichlorobiphenyl	55702-46-0	Category 1
2,3,4’-trichlorobiphenyl	38444-85-8	Category 1
2,3,5-trichlorobiphenyl	55720-44-0	Category 1
2,3,6-trichlorobiphenyl	55702-45-9	Category 1
2,3’,4-trichlorobiphenyl	55712-37-3	Category 1
2,3’,5-trichlorobiphenyl	38444-81-4	Category 1
2,3’,6-trichlorobiphenyl	38444-76-7	Category 1
2,4,4’-trichlorobiphenyl	7012-37-5	Category 1
2,4,5-trichlorobiphenyl	15862-07-4	Category 1
2,4,6-trichlorobiphenyl	35693-92-6	Category 1
2,4’,5-trichlorobiphenyl	16606-02-3	Category 1
2,4’,6-trichlorobiphenyl	38444-77-8	Category 1
2’,3,4-trichlorobiphenyl	38444-86-9	Category 1
(2,3’,4’-trichlorobiphenyl)		Category 1
2’,3,5-trichlorobiphenyl	37680-68-5	Category 1
(2,3’,5’-trichlorobiphenyl)		Category 1
3,3’,4-trichlorobiphenyl	37680-69-6	Category 1
3,3’,5-trichlorobiphenyl	38444-87-0	Category 1
3,4,4’-trichlorobiphenyl	38444-90-5	Category 1
3,4,5-trichlorobiphenyl	53555-66-1	Category 1
3,4’,5-trichlorobiphenyl	38444-88-1	Category 1
2,2’,3,3’-tetrachlorobiphenyl	38444-93-8	Category 1
2,2’,3,4-tetrachlorobiphenyl	52663-59-9	Category 1
2,2’,3,4’-tetrachlorobiphenyl	36559-22-5	Category 1
2,2’,3,5-tetrachlorobiphenyl	70362-46-8	Category 1
2,2’,3,5’-tetrachlorobiphenyl	41464-39-5	Category 1
2,2’,3,6-tetrachlorobiphenyl	70362-45-7	Category 1
2,2’,3,6’-tetrachlorobiphenyl	41464-47-5	Category 1
2,2’,4,4’-tetrachlorobiphenyl	2437-79-8	Category 1
2,2’,4,5-tetrachlorobiphenyl	70362-47-9	Category 1
2,2’,4,5’-tetrachlorobiphenyl	41464-40-8	Category 1
2,2’,4,6-tetrachlorobiphenyl	62796-65-0	Category 1
2,2’,4,6’-tetrachlorobiphenyl	68194-04-7	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
2,2’,5,5’-tetrachlorobiphenyl	35693-99-3	Category 1
2,2’,5,6’-tetrachlorobiphenyl	41464-41-9	Category 1
2,2’,6,6’-tetrachlorobiphenyl	15968-05-5	Category 1
2,3,3’,4-tetrachlorobiphenyl	74338-24-2	Category 1
2,3,3’,4’-tetrachlorobiphenyl	41464-43-1	Category 1
2,3,3’,5-tetrachlorobiphenyl	70424-67-8	Category 1
2,3,3’,5’-tetrachlorobiphenyl	41464-49-7	Category 1
2,3,3’,6-tetrachlorobiphenyl	74472-33-6	Category 1
2,3,4,4’-tetrachlorobiphenyl	33025-41-1	Category 1
2,3,4,5-tetrachlorobiphenyl	33284-53-6	Category 1
2,3,4,6-tetrachlorobiphenyl	54230-22-7	Category 1
2,3,4’,5-tetrachlorobiphenyl	74472-34-7	Category 1
2,3,4’,6-tetrachlorobiphenyl	52663-58-8	Category 1
2,3,5,6-tetrachlorobiphenyl	33284-54-7	Category 1
2,3’,4,4’-tetrachlorobiphenyl	32598-10-0	Category 1
2,3’,4,5-tetrachlorobiphenyl	73575-53-8	Category 1
2,3’,4,5’-tetrachlorobiphenyl	73575-52-7	Category 1
2,3’,4,6-tetrachlorobiphenyl	60233-24-1	Category 1
2,3’,4’,5-tetrachlorobiphenyl	32598-11-1	Category 1
2,3’,4’,6-tetrachlorobiphenyl	41464-46-4	Category 1
2,3’,5,5’-tetrachlorobiphenyl	41464-42-0	Category 1
2,3’,5’,6-tetrachlorobiphenyl	74338-23-1	Category 1
2,4,4’,5-tetrachlorobiphenyl	32690-93-0	Category 1
2,4,4’,6-tetrachlorobiphenyl	32598-12-2	Category 1
2’,3,4,5-tetrachlorobiphenyl (2,3’,4’,5’-tetrachlorobiphenyl)	70362-48-0	Category 1
3,3’,4,4’-tetrachlorobiphenyl	32598-13-3	Category 1
3,3’,4,5-tetrachlorobiphenyl	70362-49-1	Category 1
3,3’,4,5’-tetrachlorobiphenyl	41464-48-6	Category 1
3,3’,5,5’-tetrachlorobiphenyl	33284-52-5	Category 1
3,4,4’,5-tetrachlorobiphenyl	70362-50-4	Category 1
2,2’,3,3’,4-pentachlorobiphenyl	52663-62-4	Category 1
2,2’,3,3’,5-pentachlorobiphenyl	60145-20-2	Category 1
2,2’,3,3’,6-pentachlorobiphenyl	52663-60-2	Category 1
2,2’,3,4,4’-pentachlorobiphenyl	65510-45-4	Category 1
2,2’,3,4,5-pentachlorobiphenyl	55312-69-1	Category 1
2,2’,3,4,5’-pentachlorobiphenyl	38380-02-8	Category 1
2,2’,3,4,6-pentachlorobiphenyl	55215-17-3	Category 1
2,2’,3,4,6’-pentachlorobiphenyl	73575-57-2	Category 1
2,2’,3,4’,5-pentachlorobiphenyl	68194-07-0	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
2,2’,3,4’,6-pentachlorobiphenyl	68194-05-8	Category 1
2,2’,3,5,5’-pentachlorobiphenyl	52663-61-3	Category 1
2,2’,3,5,6-pentachlorobiphenyl	73575-56-1	Category 1
2,2’,3,5,6’-pentachlorobiphenyl	73575-55-0	Category 1
2,2’,3,5’,6-pentachlorobiphenyl	38379-99-6	Category 1
2,2’,3,6,6’-pentachlorobiphenyl	73575-54-9	Category 1
2,2’,3’,4,5-pentachlorobiphenyl	41464-51-1	Category 1
(2,2’,3,4’,5’-pentachlorobiphenyl)		Category 1
2,2’,3’,4,6-pentachlorobiphenyl	60233-25-2	Category 1
(2,2’,3,4’,6’-pentachlorobiphenyl)		Category 1
2,2’,4,4’,5-pentachlorobiphenyl	38380-01-7	Category 1
2,2’,4,4’,6-pentachlorobiphenyl	39485-83-1	Category 1
2,2’,4,5,5’-pentachlorobiphenyl	37680-73-2	Category 1
2,2’,4,5,6’’-pentachlorobiphenyl	68194-06-9	Category 1
2,2’,4,5’,6-pentachlorobiphenyl	60145-21-3	Category 1
2,2’,4,6,6’-pentachlorobiphenyl	56558-16-8	Category 1
2,3,3’,4,4’-pentachlorobiphenyl	32598-14-4	Category 1
2,3,3’,4,5-pentachlorobiphenyl	70424-69-0	Category 1
2,3,3',4',5-pentachlorobiphenyl	70424-68-9	Category 1
2,3,3',4,5'-pentachlorobiphenyl	70362-41-3	Category 1
2,3,3',4,6-pentachlorobiphenyl	74472-35-8	Category 1
2,3,3’,4’,6-pentachlorobiphenyl	38380-03-9	Category 1
2,3,3’,5,5’-pentachlorobiphenyl	39635-32-0	Category 1
2,3,3’,5,6-pentachlorobiphenyl	74472-36-9	Category 1
2,3,3’,5’,6-pentachlorobiphenyl	68194-10-5	Category 1
2,3,4,4’,5-pentachlorobiphenyl	74472-37-0	Category 1
2,3,4,4’,6-pentachlorobiphenyl	74472-38-1	Category 1
2,3,4,5,6-pentachlorobiphenyl	18259-05-7	Category 1
2,3,4’,5,6-pentachlorobiphenyl	68194-11-6	Category 1
2,3’,4,4’,5-pentachlorobiphenyl	31508-00-6	Category 1
2,3’,4,4’,6-pentachlorobiphenyl	56558-17-9	Category 1
2,3’,4,5,5’-pentachlorobiphenyl	68194-12-7	Category 1
2,3’,4,5’,6-pentachlorobiphenyl	56558-18-0	Category 1
2’,3,3’,4,5-pentachlorobiphenyl	76842-07-4	Category 1
(2,3,3’,4’,5’-pentachlorobiphenyl)		Category 1
2’,3,4,4’,5-pentachlorobiphenyl	65510-44-3	Category 1
(2,3’,4,4’,5’-pentachlorobiphenyl)		Category 1
2’,3,4,5,5’-pentachlorobiphenyl	70424-70-3	Category 1
(2,3’,4’,5’,5-pentachlorobiphenyl)		Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
2’,3,4,5,6’-pentachlorobiphenyl	74472-39-2	Category 1
(2,3’,4’,5’,6-pentachlorobiphenyl)		Category 1
3,3’,4,4’,5-pentachlorobiphenyl	57465-28-8	Category 1
3,3’,4,5,5’-pentachlorobiphenyl	39635-33-1	Category 1
2,2’,3,3’,4,4’-hexachlorobiphenyl	38380-07-3	Category 1
2,2’,3,3’,4,5-hexachlorobiphenyl	55215-18-4	Category 1
2,2’,3,3’,4,5’-hexachlorobiphenyl	52663-66-8	Category 1
2,2’,3,3’,4,6-hexachlorobiphenyl	61798-70-7	Category 1
2,2’,3,3’,4,6’-hexachlorobiphenyl	38380-05-1	Category 1
2,2’,3,3’,5,5’-hexachlorobiphenyl	35694-04-3	Category 1
2,2’,3,3’,5,6-hexachlorobiphenyl	52704-70-8	Category 1
2,2’,3,3’,5,6’-hexachlorobiphenyl	52744-13-5	Category 1
2,2’,3,3’,6,6’-hexachlorobiphenyl	38411-22-2	Category 1
2,2’,3,4,4’,5-hexachlorobiphenyl	35694-06-5	Category 1
2,2’,3,4,4’,5’-hexachlorobiphenyl	35065-28-2	Category 1
2,2’,3,4,4’,6-hexachlorobiphenyl	56030-56-9	Category 1
2,2’,3,4,4’,6’-hexachlorobiphenyl	59291-64-4	Category 1
2,2’,3,4,5,5’-hexachlorobiphenyl	52712-04-6	Category 1
2,2’,3,4,5,6-hexachlorobiphenyl	41411-61-4	Category 1
2,2’,3,4,5,6’-hexachlorobiphenyl	68194-15-0	Category 1
2,2’,3,4,5’,6-hexachlorobiphenyl	68194-14-9	Category 1
2,2’,3,4,6,6’-hexachlorobiphenyl	74472-40-5	Category 1
2,2’,3,4’,5,5’-hexachlorobiphenyl	51908-16-8	Category 1
2,2’,3,4’,5,6-hexachlorobiphenyl	68194-13-8	Category 1
2,2’,3,4’,5,6’-hexachlorobiphenyl	74472-41-6	Category 1
2,2’,3,4’,5’,6-hexachlorobiphenyl	38380-04-0	Category 1
2,2’,3,4’,6,6’-hexachlorobiphenyl	68194-08-1	Category 1
2,2’,3,5,5’,6-hexachlorobiphenyl	52663-63-5	Category 1
2,2’,3,5,6,6’-hexachlorobiphenyl	68194-09-2	Category 1
2,2’,4,4’,5,5’-hexachlorobiphenyl	35065-27-1	Category 1
2,2’,4,4’,5,6’-hexachlorobiphenyl	60145-22-4	Category 1
2,2’,4,4’,6,6’-hexachlorobiphenyl	33979-03-2	Category 1
2,3,3’,4,4’,5-hexachlorobiphenyl	38380-08-4	Category 1
2,3,3’,4,4’,5’-hexachlorobiphenyl	69782-90-7	Category 1
2,3,3’,4,4’,6-hexachlorobiphenyl	74472-42-7	Category 1
2,3,3’,4,5,5’-hexachlorobiphenyl	39635-35-3	Category 1
2,3,3’,4,5,6-hexachlorobiphenyl	41411-62-5	Category 1
2,3,3’,4,5’,6-hexachlorobiphenyl	74472-43-8	Category 1
2,3,3’,4’,5,5’-hexachlorobiphenyl	39635-34-2	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	CAS Number	Basis for Stack Emission Rate [b]
2,3,3’,4’,5,6-hexachlorobiphenyl	74472-44-9	Category 1
2,3,3’,4’,5’,6-hexachlorobiphenyl	74472-45-0	Category 1
2,3,3’,5,5’,6-hexachlorobiphenyl	74472-46-1	Category 1
2,3,4,4’,5,6-hexachlorobiphenyl	41411-63-6	Category 1
2,3’,4,4’,5,5’-hexachlorobiphenyl	52663-72-6	Category 1
2,3’,4,4’,5’,6-hexachlorobiphenyl	59291-65-5	Category 1
3,3’,4,4’,5,5’-hexachlorobiphenyl	32774-16-6	Category 1
2,2’,3,3’,4,4’,5-heptachlorobiphenyl	35065-30-6	Category 1
2,2’,3,3’,4,4’,6-heptachlorobiphenyl	52663-71-5	Category 1
2,2’,3,3’,4,5,5’-heptachlorobiphenyl	52663-74-8	Category 1
2,2’,3,3’,4,5,6-heptachlorobiphenyl	68194-16-1	Category 1
2,2’,3,3’,4,5,6’-heptachlorobiphenyl	38411-25-5	Category 1
2,2’,3,3’,4,5’,6-heptachlorobiphenyl	40186-70-7	Category 1
2,2’,3,3’,4,6,6’-heptachlorobiphenyl	52663-65-7	Category 1
2,2’,3,3’,4’,5,6-heptachlorobiphenyl (2,2’,3,3’,4,5’,6’-heptachlorobiphenyl)	52663-70-4	Category 1
2,2’,3,3’,5,5’,6-heptachlorobiphenyl	52663-67-9	Category 1
2,2’,3,3’,5,6,6’-heptachlorobiphenyl	52663-64-6	Category 1
2,2’,3,4,4’,5,5’-heptachlorobiphenyl	35065-29-3	Category 1
2,2’,3,4,4’,5,6-heptachlorobiphenyl	74472-47-2	Category 1
2,2’,3,4,4’,5,6’-heptachlorobiphenyl	60145-23-5	Category 1
2,2’,3,4,4’,5’,6-heptachlorobiphenyl	52663-69-1	Category 1
2,2’,3,4,4’,6,6’-heptachlorobiphenyl	74472-48-3	Category 1
2,2’,3,4,5,5’,6-heptachlorobiphenyl	52712-05-7	Category 1
2,2’,3,4,5,6,6’-heptachlorobiphenyl	74472-49-4	Category 1
2,2’,3,4’,5,5’,6-heptachlorobiphenyl	52663-68-0	Category 1
2,2’,3,4’,5,6,6’-heptachlorobiphenyl	74487-85-7	Category 1
2,3,3’,4,4’,5,5’-heptachlorobiphenyl	39635-31-9	Category 1
2,3,3’,4,4’,5,6-heptachlorobiphenyl	41411-64-7	Category 1
2,3,3’,4,4’,5’,6-heptachlorobiphenyl	74472-50-7	Category 1
2,3,3’,4,5,5’,6-heptachlorobiphenyl	74472-51-8	Category 1
2,3,3’,4’,5,5’,6-heptachlorobiphenyl	69782-91-8	Category 1
2,2’,3,3’,4,4’,5,5’-octachlorobiphenyl	35694-08-7	Category 1
2,2’,3,3’,4,4’,5,6-octachlorobiphenyl	52663-78-2	Category 1
2,2’,3,3’,4,4’,5,6’-octachlorobiphenyl	42740-50-1	Category 1
2,2’,3,3’,4,4’,6,6’-octachlorobiphenyl	33091-17-7	Category 1
2,2’,3,3’,4,5,5’,6-octachlorobiphenyl	68194-17-2	Category 1
2,2’,3,3’,4,5,5’,6’-octachlorobiphenyl	52663-75-9	Category 1
2,2’,3,3’,4,5,6,6’-octachlorobiphenyl	52663-73-7	Category 1

Table 5-11. Potential COPCs and Emission Rate Basis (Based on Prior Risk Assessment)

Compound (Chemicals of Potential Concern or COPC)	**CAS Number**	**Basis for Stack Emission Rate** [b]
2,2’,3,3’,4,5’,6,6’-octachlorobiphenyl	40186-71-8	Category 1
2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	2136-99-4	Category 1
2,2’,3,4,4’,5,5’,6-octachlorobiphenyl	52663-76-0	Category 1
2,2’,3,4,4’,5,6,6’-octachlorobiphenyl	74472-52-9	Category 1
2,3,3’,4,4’,5,5’,6-octachlorobiphenyl	74472-53-0	Category 1
2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	40186-72-9	Category 1
2,2’,3,3’,4,4’,5,6,6’-nonachlorobiphenyl	52663-79-3	Category 1
2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	52663-77-1	Category 1
2,2’,3,3’,4,4’,5,5’,6,6’-decachlorobiphenyl	2051-24-3	Category 1
Combustion Gases		
Sulfur dioxide	7446-09-5	Category 2
Nitrogen dioxide	10102-44-0	Category 2

Notes:

[a] Reported as a tentatively identified compound (TIC) if found

[b] Category 1 compounds were sampled and analyzed during PDT. Emission rate was based on sampling and analytical results.
Category 2 compounds were sampled and analyzed during PDT. Emission rate was based on permit limit.
Category 3 compounds could not be accurately identified and/or quantified with PDT stack gas sampling and analytical methods. Emission rate was estimated from waste characterization data and DRE.

[c] Not a standard Eurofins analyte.

[d] Boiling point is noted for listing. Compounds with boiling points of 140°C or less are listed as VOCs. Compounds with boiling points greater than 140°C are listed as SVOCs.

6.0 TEST SCHEDULE

6.1 PLANNED TEST DATE

Following approval of the test plan, Desotec needs to accumulate carbon necessary for conducting the test, and needs to schedule the delivery of spiking materials, and consider the availability of sampling and analytical contractors. Desotec may conduct limited preliminary testing prior to conducting the formal PDT. Permit limits do not apply during any testing events, including the PDT and any pre-test(s). The pre-test will involve operating the RF system at the same conditions proposed for the PDT. The scope of any pre-test sampling and analysis will be a subset of the PDT sampling and analyses. Depending on the results of the initial pretest, additional pretests may be performed. The preliminary testing will be used to confirm that the proposed PDT conditions are attainable and appropriate for meeting the objectives of the testing program. Preliminary testing will also allow Desotec and its contractors to identify and correct any difficulties with the sampling, analytical, or QA/QC procedures specified in this test plan. Any modifications or corrective actions will be implemented using the Corrective Action procedures given in Section 14.2 of the Quality Assurance Project Plan (Attachment A). Regulatory agency representatives will have the opportunity to provide input on any proposed corrective actions, if necessary.

The facility believes that, depending on contractor and consultant schedules, it can be ready to conduct testing within 90 days of PDTP final approval. Desotec will notify EPA at least 60 days before the planned date for starting the PDT. The performance testing will be conducted over a period of approximately six (6) consecutive days. Due to the potential health and safety hazards to the personnel performing the testing from ambient temperatures exceeding 100°F, testing will not be performed between May 15 and September 30.

Day 1 – Equipment setup and system readiness confirmation; Site safety training; Establishment of lines of communications among PDT stakeholders.
Day 2 – Test Run 1
Day 3 – Test Run 2
Day 4 – Test Run 3
Day 5 – Test Run 4

Day 6 – Contingency/equipment demobilization; review and documentation of any corrective actions. Each of the four test run days are planned to be replicate, as previously defined. A detailed daily schedule for the test days is presented in Table 6-1.

Table 6-1. Anticipated Daily Schedule for Performance Test

Clock Time	Activity
07:00	Begin bringing the system to the target operating conditions Testing crew arrives on site and begins setting up for testing
07:30	System is at operating conditions. Pre-test Flowmeter Corroboration.
08:30	System has been at the target test conditions for at least 38 minutes. Testing crew has completed velocity measurements and leak checks Ready to start first traverse with Method 23 and Method 0010 sampling trains Ready to start first traverse with Method 29 and Method 0061 sampling trains Ready to start first traverse with Method 5/26A sampling train Method 0030 and Method 0040 sampling apparatus setup and ready to begin sampling
08:30	Start first sampling traverse and first Method 0030 tube set
09:10	Complete first Method 0030 tube set
09:20	Start second Method 0030 tube set
09:30	Complete first traverse of Method 29 and Method 0061 sampling trains Complete first traverse of Method 5/26A sampling train
09:30 to 09:40	Conduct post-traverse leak checks of Method 29, Method 0061, and Method 5/26A sampling trains. Check pH of absorbing solution in Method 0061 sampling train. Switch sampling port locations of Method 29, Method 0061, and Method 5/26A sampling trains Conduct post-port change leak checks of Method 29, Method 0061, and Method 5/26A sampling trains
09:40	Start second traverse of Method 29 and Method 0061 sampling trains Start second traverse of Method 5/26A sampling train
10:00	Complete second Method 0030 tube set
10:06	Complete first traverse of Method 23 and Method 0010 sampling trains
10:06 to 10:30	Conduct post-traverse leak checks of Method 23 and Method 0010 sampling trains Switch sampling port locations of Method 23 and Method 0010 sampling trains Conduct post-port change leak checks of Method 23 and Method 0010 sampling trains
10:30	Start second sampling traverse for Method 23 and Method 0010 sampling trains. Start third Method 0030 tube set
11:10	Complete third Method 0030 tube set
11:20	Start fourth Method 0030 tube set
11:30	Complete second traverse of Method 29 and Method 0061 sampling trains Complete second traverse of Method 5/26A sampling train
11:30 to 11:40	Conduct post-traverse leak checks of Method 29, Method 0061, and Method 5/26Asampling trains Prepare trains for removal from stack
12:00	Complete fourth Method 0030 tube set
12:06	Complete second traverse of Method 23 and Method 0010 sampling trains
12:06 to 12:30	Conduct post-traverse leak checks of Method 23 and Method 0010 sampling trains
12:15	Start Method 5 PSD sampling (first traverse, maximum one minute per traverse point)
12:27	End Method 5 PSD sampling (first traverse)
12:30 to 13:30	Remove all isokinetic sampling trains from stack
12:35	Start Method 5 PSD sampling (second traverse, maximum one minute per traverse point)
12:47	End Method 5 PSD sampling (second traverse)
13:30	Complete Method 0040 sample collection. Post-Test Run Flowmeter Corroboration and Data Reduction
13:30 to 18:30	Recover Method 0010, Method 23, Method 29, Method 0061, and Method 5/26A sampling trains, package samples, and prepare for next sampling day
18:30	Sampling crew departs site

Note: Schedule repeated each sampling day.

6.2 DURATION OF EACH TEST

The performance test will consist of four replicate sampling runs at a single test condition. The RF will be fed test materials 1 to 2 hours before a sampling run, and will be stabilized at test conditions at least 1 hour before a sampling run. This will establish steady operation at process test conditions. Each test run is anticipated to have a duration of 5 to 7 hours, including port changes.

6.3 QUANTITY OF SPENT CARBON TO BE REACTIVATED

Spent activated carbon will be fed to the RF for up to an estimated 6 to 9 hours per day over a period of four (4) testing days, assuming no interruptions. Allowing for 12 hours of spent activated carbon feed each test day (as a contingency), plus one extra contingency day (12 additional hours), the approximate amount of spent activated carbon used for testing purposes is182,940 pounds (3,049 lb/hr * 60 hours).

6.4 DETAILED SCHEDULE OF PLANNED TEST ACTIVITIES

A planned schedule for a typical testing day is presented in Table 6-1.

6.5 PRELIMINARY TESTING

Desotec may conduct preliminary testing prior to the formal PDT. The purpose of any such preliminary testing will be to verify that the planned Performance Demonstration Test operating conditions, as well as the planned spiking, sampling, and/or analytical methods are appropriate and yield acceptable results. A further goal of preliminary testing is to ensure that any test team interaction, coordination, or logistics issues are addressed prior to conducting the formal test.

Tables 4-1 and 4-2 show the anticipated feed materials, compositions, feed rates, and operating conditions planned for the test. Preliminary testing, if conducted, will be targeted to achieve the same conditions as shown in Tables 4-1 and 4-2. Process and emissions sampling and analysis for the PDT are summarized in Tables 5-1, 5-2, and 5-3. Preliminary testing, if conducted, will utilize all, or a portion, of these same sampling and analytical methods.

7.0 OPERATING RCRA PERMIT OBJECTIVES

The intention of this PDT is to verify the adequacy of existing permit limits and not to establish new limits. However, Desotec and/or EPA may request to alter permit limits based on, and following review of, test results and could propose new RCRA Permit operating limits for the RF system that assure continuing compliant performance with the RCRA Permit Conditions, including Table V-1 Columns 2 and 3. RCRA Permit operating parameters will be established from the operating conditions demonstrated during the test; manufacturer's recommendations; good operating practice, or on the results of the risk assessment.

Table 7-1 summarizes the current operating limits. During the testing periods the RF needs to be able to operate over a range of conditions so the target operating limits can be achieved. Therefore, the process related interlocks will be expanded during the testing periods, which will allow the desired operating limits to be demonstrated during uninterrupted testing. The HWC MACT rules (that are used a guidance for Subpart X facilities) state that operating parameter limits can be waived during both PDT testing periods and pre-testing periods. These regulations at 40 CFR 63.1207(h) state:

> *Current operating parameter limits established under §63.1209 are waived during subsequent comprehensive performance testing.*
>
> *Current operating parameter limits are also waived during pretesting prior to comprehensive performance testing for an aggregate time not to exceed 720 hours of operation (renewable at the discretion of the Administrator) under an approved test plan or if the source records the results of the pretesting.*

While this regulation would allow the RF to waive all operating limits during testing and pretesting, Desotec proposes to maintain the interlocks in place, but to expand their setpoints to allow for anticipated process variability so the target operating conditions can be achieved during the testing and pretesting periods. Should process conditions deviate significantly from previously established limits, then the interlocks will function to stop spent activated carbon feed to the RF.

In order to achieve the desired conditions and demonstrate operations at the limits shown in Table 7-1, the interlock setpoints for certain operating parameters will be set somewhat wider during testing periods. The recommended interlock setpoints during testing and pretesting periods are presented in Table 7-2. The following sections present a discussion of each parameter.

7.1 CONTROL PARAMETERS

During normal operations, Desotec maintains limits on several operational control parameters as an indication that the RF system will continue to operate in compliance with all permit conditions. Control parameters are grouped into categories:

- Group A1 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. Group A1 parameter limits are established from test operating data, and are used to ensure that system operating conditions are equal to or are more rigorous than those demonstrated during the test. During the test periods (pretest and performance test), interlocks for Group A1 parameters will be expanded during the testing periods, which will allow the desired operating limits to be demonstrated.
- Group A2 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. Group A2 parameter limits are established based on regulatory requirements rather than on the test operating conditions, e.g., the maximum stack CO concentration. Interlocks for Group A2 parameters will be expanded during the test periods.
- Group B parameters are continuously monitored and recorded, but are not required to be interlocked with the automatic waste feed cutoff system. Operating records are required to ensure that established limits for these parameters are not exceeded. The Group B parameter limits are established based on the operation of the system during the test.
- Group C parameters are continuously monitored and recorded, but are not required to be interlocked with the automatic waste feed cutoff system. Group C parameter limits are based on manufacturer's recommendations, operational safety, and good operating practice considerations rather than on the test operating conditions, e.g., the minimum packed bed scrubber pressure differential.
- "Other Parameters" have been established in the RCRA Permit to control emissions of SO_2 and NOx. These parameters are not continuously monitored or recorded during routine operations, but will be continuously monitored and recorded during each run of the PDT. Compliance with these limits will be demonstrated during the test. Continuing compliance is demonstrated in accordance with Table V-1 of the RCRA Permit for SO_2, and in accordance with Table V-1 and Permit Condition V.C.6.c of the RCRA Permit for NOx.

Table 7-1. RCRA Permit Operating Conditions

Control Parameters[a]	**Current RCRA Permit Limit**	**Comments**[b]
GROUP A1 PARAMETERS		
Maximum spent carbon feed rate (lb/hr)	3,049	Block hour AWFCO
Minimum afterburner temperature (°F)	1,760	Hourly rolling average AWFCO
Minimum venturi scrubber pressure differential (in. w.c.)	18	Hourly rolling average AWFCO
Minimum quench/venturi scrubber total liquid flow rate (gpm)	75	Hourly rolling average AWFCO
Minimum packed bed scrubber pH	4.4	Hourly rolling average AWFCO
Minimum packed bed scrubber liquid flow rate (gpm)	63	Hourly rolling average AWFCO
Minimum wet scrubber blowdown flow rate (gpm)	58	Hourly rolling average AWFCO
Minimum WESP secondary voltage (kVDC)	22	Hourly rolling average AWFCO
Maximum stack gas flow rate acfm	9,550	Hourly rolling average AWFCO
GROUP A2 PARAMETERS		
Maximum stack gas carbon monoxide (ppmvd, @7% oxygen)[c]	100	Hourly rolling average AWFCO
Minimum hearth #5 temperature (°F)	1,350	Hourly rolling average AWFCO
GROUP B PARAMETERS		
Allowable hazardous constituents	All except wastes identified in RCRA permit condition II.H.5	Class 1 POHC demonstrated to meet 99.99% Destruction and Removal Efficiency.
Maximum total chlorine and chloride feed rate (lb/hr)	60	12-hour rolling average
Maximum mercury feed rate (lb/hr)	1.8E-03	12-hour rolling average
Maximum semivolatile metal (Cd + Pb) feed rate (lb/hr) [Allowable mass feed rate based on the 2006 test demonstrated feed rate of 0.10 lb/hr]	0.10 (1.0E-01)	12-hour rolling average
Maximum low volatility metal (As + Be + Cr) feed rate (lb/hr) [Allowable mass feed rate based on the 2006 test demonstrated feed rate of 0.35 lb/hr extrapolated to the emissions limit of 92 ug/dscm]	1.3 (1.3E+00)	12-hour rolling average
GROUP C PARAMETERS		
Minimum packed bed scrubber pressure differential (in. w.c.)	0.10	Hourly rolling average
OTHER PARAMETERS		
Maximum SO_2 emissions (tons/yr)	30	30 tons per consecutinve 12-month period
Maximum NOx emissions (tons/yr)	22	22 tons per consecutive 12-month period

(a) Group A1 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. The values for the Group A1 parameters will be based on the performance demonstration test operating conditions.

Group A2 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. The values for the Group A2 parameters are based on regulatory standards or good operating practice rather than performance demonstration test operating conditions.

Group B parameters are continuously monitored and recorded, but are not interlocked with the automatic waste feed cutoff system. Values for the group B parameters are based on the performance demonstration test operating conditions.

Group C parameters are continuously monitoring and recording, but are not interlocked with the automatic waste feed cutoff system. The values for the Group C parameters are based on manufacturer’s specifications and/or operational and safety considerations rather than performance demonstration test operating conditions.

“Other Parameters” are established from RCRA Permit Conditions. SO_2 emissions are limited based Table V-1 of the RCRA Permit. NOx emissions are limited based on Table V-1 and Permit Condition V.C.6.c of the RCRA Permit.

(b) AWFCO = Automatic waste feed cutoff.

(c) AWFCO interlock will not be active during the daily CEM calibration period.

Table 7-2. Interlock Setpoints During Test Periods

Control Parameters	Interlock Setpoint	Comments[a]
GROUP A1 PARAMETERS		
Maximum spent carbon feed rate (lb/hr)	3565	Block Hour AWFCO
Minimum afterburner temperature (°F)	1600	Hourly rolling average AWFCO
Minimum hearth #5 temperature (°F)	1175	Hourly rolling average AWFCO
Minimum venturi scrubber differential pressure (inwc)	16	Hourly rolling average AWFCO
Minimum quench/venturi scrubber total liquid flow rate (gpm)	60	Hourly rolling average AWFCO
Minimum packed bed scrubber pH	3.0	Hourly rolling average AWFCO
Minimum packed bed scrubber liquid flow rate (gpm)	50	Hourly rolling average AWFCO
Minimum wet scrubber blowdown flow rate (gpm)	40	Hourly rolling average AWFCO
Minimum WESP secondary voltage (kVDC)	19	Hourly rolling average AWFCO
Maximum stack gas flow rate acfm	11,500	Hourly rolling average AWFCO
GROUP A2 PARAMETERS		
Maximum stack gas carbon monoxide (ppmvd, @7% oxygen)[b]	115	Hourly rolling average AWFCO

(a) AWFCO = Automatic waste feed cutoff.

(b) AWFCO interlock will not be active during the daily CEM calibration period.

7.2 DEVELOPMENT OF UPDATED RCRA PERMIT LIMITS

As previously mentioned the intention of this PDT is to verify the adequacy of existing permit limits and not to establish new limits. However, Desotec and/or EPA may request to alter permit limits based on and following review of test results. Should new permit limits be requested, the basis for changes will be in accordance with the following sections. New or modified operating limits will be based on three, or possibly four, valid test runs.

In addition to establishing specific operating limits, Desotec has limits on the types of waste which can be accepted in the RF. Since Desotec will demonstrate performance while treating a Class 1 (most thermally stable) compound, it is expected that Desotec will be permitted to treat spent activated carbon having EPA waste codes as represented in the facility's RCRA Permit. Specific prohibitions are expected for wastes containing PCBs and those wastes listed with the waste codes F020, F021, F022, F023, F026 or F027.

7.2.1 Group A1 Parameters

Group A1 parameter limits are based on the results of the performance test. The following parameters are proposed as Group A1 parameters for the RF system.

7.2.1.1 Maximum Spent Carbon Feed Rate

The performance test will be conducted in order to demonstrate the maximum feed rate of spent activated carbon. The spent activated carbon feed rate will be monitored on a continuous basis. The maximum allowable spent activated carbon feed rate will be established from the mean of the average feed rates demonstrated during each run of the performance test. The feed rate limit will be monitored as 1-hour block total. A "1-hour block total" is the total amount of feed that occurs during a given "clock hour". The continuous feed rate monitoring system sends a reading to the process computer every 5 seconds, and the total feed rate for the hour is summed from the individual readings across the current clock hour. At the top of each hour, current 1-hour block total is recorded, then the total is reset, and the next 1-hour block total computation begins. The use of a "block hour" for certain parameter monitoring has been used historically and has been incorporated into the RCRA permit.

7.2.1.2 Minimum Afterburner Temperature

The performance test will be conducted to demonstrate the minimum afterburner temperature with maximized combustion gas flow (minimum residence time), since these conditions are least favorable for DRE. Organic emissions are also being measured for risk assessment purposes since it is expected to represent worst case conditions for organic emissions. Combustion gas temperature will be monitored in the afterburner on a continuous basis. Based on successful demonstration of DRE during the performance test, the minimum temperature limit will be based on the average of the test run "Average" HRA temperature values demonstrated during each run of the performance test. The RCRA Permit limit is expected to be continued to be administered as an HRA. The selection of this value (as illustrated in the blank table below) is supported by both the HWC MACT and Region 9's requests.[18]

Parameter	Units	Permit Limit	Statistic	Run 1	Run 2	Run 3	Average
Afterburner Temp	Deg F HRA	1760	Average				**#**
			Maximum				
			Minimum				
			Std. Dev				

= PDT objective and administered as an HRA for permit compliance.

7.2.1.3 Minimum Venturi Scrubber Differential Pressure

The performance test will be conducted to demonstrate the minimum venturi scrubber differential pressure. Venturi scrubber differential pressure will be monitored on a continuous basis. Based on successful demonstration of particulate control during the performance test, the minimum venturi scrubber differential pressure limit will be based on the mean of the minimum hourly rolling average values demonstrated during each run of the performance test. The RCRA Permit limit is also expected to be an hourly rolling average value.

7.2.1.4 Minimum Quench/Venturi Scrubber Recycle Liquid Flow Rate

The performance test will be conducted to demonstrate the minimum quench/venturi scrubber recycle flow and maximum stack gas flow, thus establishing a *de facto* minimum liquid to gas

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[18] While selection of the "average of the test run averages" is supported by the HWC MACT EEE (40 C.F.R. § 63.1209(j)(1) and (k)(2)), 40 C.F.R. § 63.1201 indicates that "Rolling average means the average of all one-minute averages over the averaging period." However, since the facility's permit limit is administered as an HRA as noted by several Region 9 submissions, the facility will evaluate compliance during the PDT using the average of the test run averages on an HRA basis. One-minute averages are not intended to be utilized to demonstrate compliance for permit compliance nor in testing, though will be provided in the PDT Report appendices. Desotec will ensure calibration of applicable equipment to ensure proper readings.

ratio. Quench/Venturi scrubber flow and stack gas flow will both be monitored on a continuous basis. Based on successful demonstration during the performance test, the minimum quench/venturi scrubber recycle liquid flow rate limit will be based on the mean of the hourly rolling average values demonstrated during each run of the performance test.

7.2.1.5 Minimum Packed Bed Scrubber pH

The performance test will be conducted to demonstrate the minimum packed bed scrubber pH at maximum total chlorine/chloride feed rate. Scrubber pH will be monitored on a continuous basis. Based on successful demonstration of HCl and Cl_2 control during the performance test, the minimum packed bed scrubber pH limit will be based on the mean of the minimum hourly rolling average pH values demonstrated during each run of the performance test. The RCRA Permit limit will be administered as an hourly rolling average.

7.2.1.6 Minimum Packed Bed Scrubber Recycle Liquid Flow Rate

The performance test will be conducted to demonstrate the minimum packed bed scrubber recycle flow rate and maximum stack gas flow, thus establishing a *de facto* minimum liquid to gas ratio. Packed bed scrubber recycle flow and stack gas flow will both be monitored on a continuous basis. Based on successful demonstration of HCl and Cl_2 control during the performance test, the minimum packed bed scrubber recycle liquid flow rate limit will be based on the mean of the hourly rolling average values demonstrated during each run of the performance test.

7.2.1.7 Minimum Scrubber Blowdown Flow Rate

The performance test will demonstrate minimum scrubber blowdown flow rate, in order to demonstrate worst case conditions for solids buildup in the scrubbing system. In order to conserve water, Desotec recycles most of the liquid from the air pollution control system. However, in order to prevent the buildup of dissolved solids in the recycled water, a certain amount of the water must be purged (or blown down) from the system. As water is purged from the system, fresh makeup water is added. The minimum scrubber blowdown flow rate limit will be based on the mean of the hourly rolling average values demonstrated during each run of the performance test.

7.2.1.8 Minimum WESP Secondary Voltage

Although the HWC MACT regulations do not require any indicator of performance in an electrically enhanced emissions control device, Desotec believes that it is appropriate to establish a performance indicator. Accordingly, WESP secondary voltage (expressed as KVDC) will be used as the indicator of continuing WESP performance. The minimum value will be established from the mean of the minimum hourly rolling average secondary voltage values demonstrated during each run of the performance test. The secondary voltage value will be based on an hourly rolling average.

7.2.1.9 Maximum Combustion Gas Velocity (Stack Gas Flow Rate)

The stack gas flow rate (expressed as actual cubic feet per minute) will be used as the indicator of combustion gas velocity. The maximum stack gas flow rate will be established from the average of the test run "Maximum" HRA stack gas flow rate values demonstrated during each run of the performance test. The combustion gas velocity is proposed as an hourly rolling average limit to dampen normal variations in flow. The selection of this value (as illustrated in the blank table below) is supported by both the HWC MACT and Region 9's requests.[19]

Parameter	Units	Permit Limit	Statistic	Run 1	Run 2	Run 3	Average
Stack Flow	ACFM (HRA)	9550	Average				
			Maximum				#
			Minimum				
			Std. Dev				

= PDT objective and administered as an HRA for permit compliance.

7.2.2 Group A2 Parameters

Group A2 parameter limits are interlocked with the automatic waste feed cutoff system, but are not based on the results of the performance test. The following parameters are proposed as Group A2 parameters for the RF system.

7.2.2.1 Maximum Stack Gas CO Concentration

The maximum hourly rolling average stack gas CO concentration will be maintained at or below 100 ppmv corrected to 7% oxygen (dry basis) during the PDT. Desotec expects to obtain a RCRA Permit limit specifying a maximum allowable stack gas carbon monoxide concentration of 100 ppmv hourly rolling average corrected to 7% oxygen, dry basis, based on the regulatory limit.

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[19] While selection of the "average of the test run averages" is supported by the HWC MACT EEE (40 C.F.R. § 63.1209(j)(2) and (k)(3)), 40 C.F.R. § 63.1201 indicates that "Rolling average means the average of all one-minute averages over the averaging period." However, since the facility's permit limit is administered as an HRA as noted by several Region 9 submissions, the facility will evaluate compliance during the PDT using the average of the test run averages on an HRA basis. One-minute averages are not intended to be utilized to demonstrate compliance for permit compliance nor in testing, though will be provided in the PDT Report appendices. Desotec will ensure calibration of applicable equipment to ensure proper readings.

7.2.2.2 Minimum Hearth #5 Temperature

The minimum Hearth #5 temperature is set based on good operating practice in order to ensure that organics have been adequately desorbed from the reactivated carbon product.

7.2.3 Group B Parameters

7.2.3.1 Maximum Chlorine/Chloride Feed Rate

Desotec will feed chlorine/chloride at the maximum anticipated rate during the performance test. Assuming that the stack gas HCl/Cl_2 concentration meets the applicable standard, the final limit for total chlorine/chloride feed rate should be expressed as a 12-hour average based on the mean of the chlorine/chloride feed rate values demonstrated during each run of the test.

7.2.3.2 Maximum Mercury Feed Rate

Due to the low amounts of mercury expected in the spent activated carbon, Desotec will comply with the mercury standard by calculating and complying with a 12-hour rolling average MTEC, conservatively assuming no mercury removal across the APC system. The MTEC is complied with as a maximum mercury feed rate limit. This limit will be calculated from the performance test data by using the stack gas flow rate and oxygen concentration, and the maximum allowable stack gas mercury concentration based on the RCRA permit. The feed rate limit is determined assuming that all mercury is emitted.

7.2.3.3 Maximum Semivolatile Metals Feed Rate

Desotec will determine the feed rate and emission rate of the semivolatile metals cadmium and lead during the performance test. A maximum semivolatile metal feed rate is established for the total combined cadmium and lead feed rates as a 12-hour rolling average. This limit will be based on the mean of the average semivolatile metals feed rates, and the emission rate of semivolatile metals, demonstrated during each run. The total semivolatile metal feed rate during the test will be supplemented by spiking of 50/50 w/w cadmium and lead as needed. The test results may be extrapolated upwards to the allowable RCRA permit concentration limit, using the equations presented in Section 7.2.5 below.

7.2.3.4 Maximum Low Volatility Metals Feed Rate

Desotec will determine the feed rate and emission rate of the low volatility metals arsenic, beryllium, and chromium during the performance test. A maximum low volatility metal feed rate is established for the total combined arsenic, beryllium, and chromium feed rates as a 12-hour rolling average. This limit will be based on the mean of the average low volatility metals feed rates, and the emission rate of low volatility metals, demonstrated during each run. The total low volatility metal feed rate during the test will be supplemented by spiking of chromium as needed. The test results may be extrapolated upwards to the allowable RCRA permit concentration limit, using the equations presented in Section 7.2.5 below.

7.2.4 Group C Parameters

Group C parameters are determined from information other than the test results. These parameters and how the limits are to be established are described below.

7.2.4.1 Minimum Packed Bed Scrubber Pressure Differential

A minimum pressure drop across the packed bed scrubber will be established as a limit, based on past operating experience.

7.2.5 Extrapolation of Metals Feed Rate Limits

As allowed by the HWC MACT regulations, Desotec plans to feed representative metals to the RF system during the PDT and to establish feed rate limits by extrapolating upward from the test results. Desotec proposes to feed 50/50 w/w cadmium/lead and chromium representative of the semivolatile and low volatility metal groups, respectively. Since these metals are representative of the metal volatility groups, the test data can be used to calculate a SRE for each of these metals which can then be applied to their respective metal volatility group. Extrapolated metals feed rates may be calculated based on the following:

- The documented spiking rates of cadmium/lead and chromium
- Detectable native feed rates of LVM and SVM, and
- Method 29 measured emissions concentrations of LVM and SVM.

System removal efficiency will be calculated using the following equation:

$$SRE = \left[1 - \frac{\dot{m}_{i,out}}{\dot{m}_{i,in}} \right] \times 100\%$$

where:

$\dot{m}_{i,in}$ = mass feed rate of metal i.

$\dot{m}_{i,out}$ = mass emission rate of metal i.

The calculated maximum feed rate limit for each metal volatility class can be used to establish feed rate limits for each group using the following equation:

$$FR_{LIMIT} = FR_{PDT} * (ES/EC_{PDT})$$

where:

FR_{LIMIT} = Maximum allowable feed rate limit of SVM or LVM (lb/hr)
FR_{PDT} = Feed rate of SVM or LVM demonstrated during the PDT (lb/hr)
ES = HWC NESHAP emissions standard for SVM or LVM (µg/dscm corrected to seven percent oxygen)
EC_{PDT} = Emissions concentration of SVM or LVM demonstrated during the PDT (µg/dscm corrected to seven percent oxygen)

Because metals SREs are non-linear relative to the metals feed rates[20], proposed upward extrapolation of the demonstrated metals feed rates to the HWC MACT allowable emissions standard assures ongoing compliance with the HWC MACT standards. If necessary, the test data can also be used to establish appropriate risk-based feed rate limits for other individual metals of concern based on their volatility and risk-based emission limits.

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[20] *Technical Implementation Document for EPA's Boiler and Industrial Furnace Regulations*, Section 10.5.2, EPA-530-R-92-011 (PB92-154 947), March, 1992

8.0 TEST REPORT

The final PDT Report (PDTR) will be submitted to EPA within 90 days after completion of the test. The final report will be a comprehensive test report that contains a discussion of the test objectives; sampling, analysis, and QA/QC activities performed; summaries of process operating conditions; the results of the test determinations; and proposed RCRA Permit conditions.

In accordance with RCRA Permit Condition V.I.3.a, b, and c, the PDT Report will specifically address the following.

The PDT Report will include an assessment as to whether the operating parameters and emission limits set forth in Module V have been demonstrated with specific reference to the performance standards and operating parameter limits set forth in Module V of the RCRA Permit at Table V-I – Performance Standards and Operating Parameter Limits.

The PDT Report will include an assessment as to whether the operating parameters and emission limits set forth in Module V have been demonstrated with specific reference to the Group A1, Group A2, Group B and Group C parameters set forth in Module V of the RCRA Permit at Table V-2 – Operating Limits and Parameters.

The PDT Report will also include:

- The results of the required CMS and CEMS Performance Tests
- The analysis of the parameters evaluated in accordance with RCRA Permit Condition V.I.1
- Confirmation that the methods and performance specifications identified in the PDTP were employed during performance testing.

The planned outline of the report is shown in Figure 8-1.

Figure 8-1. Example Performance Test Report Outline

- EXECUTIVE SUMMARY
- TEST PROGRAM SUMMARY
  - Engineering Description
    - General Description
    - Residence Time Determination
    - Burner Description
    - Spent Carbon Systems
    - Auxiliary Fuel System
    - Air Pollution Control System
    - Process Monitoring System (CMS)
    - Continuous Emissions Monitoring System (CEMS)
    - Automatic Waste Feed Cutoff System
  - Summary of Test Plan and Objectives
  - Test Implementation Summary
    - Deviations from the Test Plan
- PROCESS OPERATIONS
  - Process Operating Conditions
  - Feed Material Characteristics
  - Feed Material Spiking
  - Effluent Characteristics
- COMPLIANCE RESULTS
  - POHC Destruction and Removal Efficiency
  - Particulate Emissions
  - Hydrogen Chloride and Chlorine Emissions
  - Metals Emissions
  - Stack Gas Oxygen, Carbon Monoxide, and Total Hydrocarbons
  - Dioxin and Furan Emissions
- QUALITY ASSURANCE/QUALITY CONTROL RESULTS
  - QA/QC Activities and Implementation
    - QA Surveillance
    - Sample Collection
    - Sample Analysis
    - Process Instrumentation
    - Stack Sampling Equipment
    - Laboratory Analytical Instrumentation
  - Audits and Data Validation
  - Calculations
  - Conclusions

Figure 8-1. Example Performance Test Report Outline

ANTICIPATED RCRA PERMIT OPERATING CONDITIONS

Development of Operating Limits
Specific Control Parameters

RECOMMENDED EMISSIONS DATA FOR USE IN RISK ASSESSMENT

Metals
Hydrogen Chloride and Chlorine
Particle Size Distribution
Speciated Volatile Organics
Total Volatile Organics
Speciated Semivolatile Organics
Total Semivolatile and Nonvolatile Organics
Dioxins and Furans
Speciated PAHs
Speciated Organochlorine Pesticides

APPENDICES

A. Process Operating Data
B. Test Manager's Log
C. Spiking Report and Certificate of Analysis for Spiking Material
D. Process Instrument Calibration Data
E. Continuous Emissions Monitoring Data
F. Sampling Report
G. List of Samples
H. Analytical Report
I. Calculations
J. Documentation to Support Metals Extrapolation
K. Data Validation Report
L. Corrective Action Requests

Specific determinations to be made based on the test results include, but are not limited to the following:

8.1 RCRA PERMIT COMPLIANCE DETERMINATIONS

8.1.1 Destruction and Removal Efficiency for the Designated POHCs.

The DRE determination will be made using the following equation:

$$DRE = \left[1 - \frac{W_{out}}{W_{in}}\right] \times 100$$

where:

$DRE =$ Destruction and Removal Efficiency (%)
$W_{in} =$ Mass feed rate of POHC
$W_{out} =$ Stack gas mass emission rate of POHC.

8.1.2 Particulate Matter Emission Concentration

The particulate matter emission concentration will be determined in terms of milligrams of filterable particulate matter per dry standard cubic meter of stack gas, corrected to 7 percent oxygen by volume, dry basis.

8.1.3 Metal Emission Concentrations

The stack gas emission concentration of mercury, semivolatile metals (total combined cadmium and lead), and low volatility metals (total combined arsenic, beryllium, and chromium) will be determined in terms of micrograms of metal per dry standard cubic meter of stack gas, corrected to 7 percent oxygen by volume, dry basis.

8.1.4 System Removal Efficiency for Specific Metal Groups

In addition to determining the metal emission concentrations, for purposes of extrapolating metal emission rates and feed rates upwards to determine the appropriate metal feed rate limits, Desotec will determine the SRE of Semivolatile Metals (cadmium and lead combined) and of Low

Volatility Metals (arsenic, beryllium, and chromium combined). The formula for SRE is analogous to that used for DRE:

$$SRE = \left[1 - \frac{M_{out}}{M_{in}}\right] \times 100$$

where:

$SRE =$ System Removal Efficiency (%)
$M_{in} =$ Mass feed rate of metal (or metal group)
$M_{out} =$ Stack gas mass emission rate of metal (or metal group).

8.1.5 Hydrogen Chloride and Chlorine Emission Concentration

The total combined stack gas emission concentration of hydrogen chloride and chlorine will be determined in terms of parts per million hydrogen chloride equivalents by volume, corrected to 7 percent oxygen by volume, dry basis.

8.1.6 Polychlorinated Dibenzo-p-Dioxin and Polychlorinated Dibenzofuran Emission Concentration

The stack gas emission concentration of PCDD/PCDF will be determined in terms of nanograms of 2,3,7,8-TCDD toxic equivalents (TEQ) per dry standard cubic meter of stack gas, corrected to 7 percent oxygen by volume, dry basis.

8.1.7 Carbon Monoxide Emission Concentration

The concentration of carbon monoxide in the stack gas will be continuously monitored and reported in terms of parts per million by volume, corrected to 7 percent oxygen by volume, dry basis.

8.1.8 Total Hydrocarbon Emission Concentration

During each test run where DRE is being determined, the stack gas total hydrocarbon emission concentration will also be determined in terms of parts per million propane by volume, corrected to 7 percent oxygen by volume, dry basis. Total hydrocarbons as measured by EPA Method 25A are wet and not oxygen corrected. EPA Method 4 moisture data from concurrently operated isokinetic sampling trains and oxygen data from EPA Method 3A will be used to correct and report total hydrocarbons in parts per million by volume, corrected to 7 percent oxygen by volume, dry basis.

8.1.9 Sulfur Dioxide and Nitrogen Oxides Concentration

The concentration of sulfur dioxide and nitrogen oxides in the stack gas will be continuously monitored and reported during the PDT in terms of parts per million by volume, corrected to 7 percent oxygen by volume, dry basis. These values will then be converted to a mass emission rate for comparison to the emission rate limits set in the RCRA permit. The natural gas consumption and the emission rate of NOx during the PDT will be used to calculate a facility-specific NOx emission factor in terms of mass of NOx emissions per unit volume of natural gas consumption.

8.2 OTHER STACK GAS EMISSION DETERMINATIONS

In addition to the regulatory compliance emission determinations, the following stack gas emission determinations will be made:

Stack Gas Parameter	Units
Stack gas flow rate	dscfm, dscm/min, acfm, acm/min
Stack gas velocity	ft/s, m/s
Stack gas temperature	°F, °C
Stack gas moisture content	vol%
Stack gas oxygen concentration	vol%, dry
Stack gas carbon dioxide concentration	vol%, dry
Stack gas dry molecular weight	lb/lb-mol
Particulate matter emission rate	lb/hr, g/s
Hydrogen chloride emission rate	lb/hr, g/s
Chlorine emission rate	lb/hr, g/s
Metals emission rates (Al, Sb, As, Ba, Be, Cd, Cr (total), Cr (VI), Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn)	lb/hr, g/s
PCDD/PCDF emission rate (each 2,3,7,8-substituted congener, and total TEQ)	lb/hr, g/s
Speciated volatile organic compound emission rate (each target analyte plus each TIC)	lb/hr, g/s
Speciated semivolatile organic compound emission rate (each target analyte plus each TIC)	lb/hr, g/s
Total volatile organics emission rate (subset of TOE)	lb/hr, g/s
Total semivolatile organics emission rate (subset of TOE)	lb/hr, g/s
Total nonvolatile organics emission rate (subset of TOE)	lb/hr, g/s
Organochlorine pesticides emission rate (each target analyte)	lb/hr, g/s
PAH emission rate (each target analyte)	lb/hr, g/s
Particle size distribution	Mass fraction of various particle size ranges

Emissions concentrations measured via CEMS will be corrected as needed for moisture using Method 4 data from concurrently operated isokinetic sampling trains and oxygen using concurrent Method 3A CEMS data. Stack flow data from concurrently operated isokinetic sampling trains will be used to calculate and report CEMS data in mass emissions where required. The stack flow data from the concurrently operated isokinetic sampling trains that span all or most of the sampling run time, e.g., the average values from the four Method 0010 variants, will be used for mass emissions calculations.

8.3 FEED AND EFFLUENT DETERMINATIONS

The following feed and effluent material determinations will be made:

Carbon Feed Parameter	Units
Spent carbon feed rate	lb/hr, kg/h
Spent carbon chlorine/chloride concentration	mg/kg
Spent carbon metals concentration (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn)	mg/kg
Spent carbon POHC concentration	mg/kg
Spent carbon volatile organic concentration	ug/kg
Spent carbon semivolatile organic concentration	ug/kg
Total feed rate of chlorine/chloride	lb/hr
Total feed rate of metals (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn)	lb/hr
Total feed rate of each POHC	lb/hr
Scrubber Blowdown Parameter	**Units**
Scrubber blowdown volatile organic concentration	ug/l
Scrubber blowdown semivolatile organic concentration	ug/l
Scrubber blowdown total metals concentration (Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Tl, V, Zn)	mg/l

8.4 PROCESS DATA

The following process data points will be continuously monitored and recorded. HRA values for each parameter listed will be presented in an appendix to the report, while the average, minimum, and maximum values recorded during each run will be summarized within the body of the report.

Process Parameter	Units
Spent carbon feed rate	lb/hr
Afterburner temperature	°F
Natural gas consumption	mcf
Venturi scrubber pressure differential	in. w.c.
Quench/Venturi scrubber liquid flow rate	gpm

Process Parameter	Units
Packed bed scrubber pH	pH
Packed bed scrubber liquid flow rate	gpm
Packed bed scrubber pressure differential	in. w.c.
Scrubber blowdown flow rate	gpm
WESP secondary voltage	kVDC
Stack gas flow rate	acfm

8.5 REPORTING OF INTERMEDIATE RESULTS

EPA has requested that Desotec report certain intermediate data to EPA during the test and prior to submittal of the final test report. Desotec will comply with those requests as follows.

8.5.1 Daily Process Data

Desotec will provide EPA's on-site observer with either flash drives or hard copy printouts (at the option of the EPA observer) representing the HRA process operating data for the parameters described in Table 7-1. These data, from the previous day's test activities, will be provided at the beginning of the following day. Prior to the first day of testing, Desotec will provide the previous day's data for these same monitors, as well as their most recent calibration results.

8.5.2 Unfavorable Performance Demonstration Test Results

If Desotec determines, during the course of compiling the PDT data, that DRE or any of the emission standards were not met, or if other unfavorable results have occurred, EPA will be notified as soon as practical following Desotec's confirmation of such an occurrence. Desotec and EPA will work together to develop appropriate corrective actions to resolve any such situation.

Applicable RCRA guidance makes clear that limited retesting is appropriate where there is a failure to meet a limited subset of standards:

> *"Three replicate runs are recommended for each specific set of incinerator operating conditions. … This provides added assurance that the incinerator* can repeatedly meet the *standards. If the incinerator fails only some of the standards (e.g., only particulate), measurement of only those standards that failed can be considered for a retest, provided that the key operating conditions remain the same and that any modification to the incinerator would not negatively affect the unit's ability to comply with the other performance standards."*[21]

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[21] Source: Handbook: Hazardous Waste Incineration Measurement Guidance Manual (EPA/625/6-89/021); Volume III of Hazardous Waste Incineration Guidance Series, Section 2.1, Page 3; USEPA, June 1989.

The HWC MACT (40 CFR 63, Subpart EEE, Section 63.1209(i)) prescribes how to reconcile operating data and establish operating limits from multiple or disparate tests:

> *"When an operating parameter is applicable to multiple standards. Paragraphs (j) through (p) of this section require you to establish limits on operating parameter based on comprehensive performance testing to ensure you maintain compliance with the emission standards of this subpart. For several parameters, you must establish a limit for the parameter to ensure compliance with more than one emission standard. An example is a limit on minimum combustion chamber temperature to ensure compliance with both the DRE standard of paragraph (j) of this section and the dioxin/furan standard of paragraph (k) of this section. If the performance tests for such standards are not performed simultaneously, the most stringent limit for a parameter derived from independent performance tests applies."*

Desotec is planning to conduct a total of four replicate test runs. Samples and data from all four test runs will be analyzed and reduced. Three of the four test runs will be used to demonstrate compliance and provide emissions data for use in the risk assessment modeling. Should there be data quality issues or incomplete samples with a particular sample data set (e.g., loss or damage to all or portions of the sample fractions from a specific sampling train), the data for the corresponding sampling trains from the other three valid runs will be substituted and used for compliance demonstration and/or risk assessment modeling.

The purpose of the fourth test run is an allowance for the following during any test run: 1) possible loss or damage to all or portions of any sample(s) or sample fraction(s), 2) rejection of a specific sample(s) due to sampling or analytical data quality reasons, or 3) deviation/closeness to the system operational targets. Desotec's intent is to select three test runs that are 100% complete for demonstrating compliance. Data from the three selected runs, the first three test runs or any combination of three of the four test runs, will be used to demonstrate compliance with the RCRA permit conditions and risk assessment data collection requirements. Should Desotec elect to exclude a test run for Item 3 above, or should there be data quality issues or incomplete samples with a particular sample data set (Item 1 or Item 2 above), valid data for the additional or "extra" test run may be substituted and used for compliance demonstration and/or risk assessment modeling. In the event that conditions (1), (2), or (3) above invalidate or potentially invalidate a test run, Desotec will substitute the entire data set from the additional test run in place of the invalid test run. EPA's approval will be required prior to substituting any portion of a test run.

Compliance with the current associated RCRA permit OPLs, or possible establishment of new OPLs, will be reconciled in accordance with 40 CFR 63.1209(i) as may be necessary.

8.5.3 Modification of Planned Performance Test Operating Conditions

Should preliminary testing of the RF system, or other information lead Desotec to propose a change of target process operating conditions or to modify the test protocol after approval of the test plan, Desotec will implement such changes through the use of a Corrective Action Request (CAR) as described in Section 14.2 of the QAPP (Attachment A). Such CAR will require approval of Desotec, the test manager, CRIT, and EPA.