
USACE / NAVFAC / AFCEC

UFGS-02 53 16.13 (February 2025)

Preparing Activity: USACE

Superseding

UFGS-02 53 16.13 (February 2021)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2025

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02/25

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SECTION 02 53 16.13

REMEDIATION OF CONTAMINATED SOILS BY THERMAL DESORPTION
02/25

NOTE: This guide specification covers the requirements for onsite thermal desorption of non-radioactive materials contaminated by hazardous or toxic organic wastes and by petroleum, oil, or lubricants (POL).

Adhere to [UFC 1-300-02](#) Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a [Criteria Change Request \(CCR\)](#).

PART 1 GENERAL

NOTE: This guide specification provides the framework for developing a project-specific thermal desorption specification. This guide specification should be modified as necessary for a given site, to incorporate the conditions, contaminants, thermal desorption heating method, and regulatory requirements specific to the site.

A systematic project planning approach should be employed when developing sampling procedures to demonstrate the performance of the thermal desorption treatment process, ideally through implementation of the Uniform Federal Policy for

Quality Assurance Project Plans (UFP-QAPP) or some such similar process. The sampling procedures may affect the maximum allowable size of a stockpile, and subsequently, determine the number of days required to reach this quantity based on the daily generation of the treated materials.

The thermal desorption treatment considered in this guide specification starts with the raw contaminated material; continues through preparation, feeding, stockpiling of treated contaminated material (if necessary); and ends with final disposition of the treated material (either returned to its original location, moved to an on-site designated permanent storage unit, or transported off-site for final disposal). As applicable, refer to Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL for requirements related to excavation and stockpiling of the contaminated materials; Section 31 00 00 EARTHWORK for placement of treated materials in on-site permanent storage; and Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS for requirements relevant to offsite transportation and disposal.

1.1 MEASUREMENT AND PAYMENT

1.1.1 Unit Prices

NOTE: Edit this paragraph based on whether the Contract will use a single job price or unit prices. If Section 01 20 00 PRICE AND PAYMENT PROCEDURES is in the project, move these paragraphs to that Section for editing.

If the project includes Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIALS, coordinate measurement and payment methods and contaminated material handling and stockpiling between this Section and Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIALS.

1.1.1.1 Contaminated Materials

NOTE: Use the first bracketed paragraph for measurement by volume. Use the second bracketed paragraph for measurement by weight. The unit price for thermal desorption of contaminated soils/solids should generally be based on in-situ volume. For liquids and sludges the unit of measure should be mass.

[Measure contaminated materials by the cubic meter cubic yard of contaminated material that is treated. Compute volume by the average end

area method from cross sections taken before and after excavation of contaminated material.

] Measure contaminated materials by the metric ton ton of contaminated material treated by thermal desorption. Use a properly calibrated weighing system to accurately measure the gross (bulk) weight of the contaminated material. Convert the measured gross (bulk) weight of the contaminated materials to be treated to dry weight based on the percent moisture content of representative contaminated material samples. Determine the percent moisture content in accordance with [ASTM D2216][ASTM D4643][ASTM D4959][_____]. Determine moisture content [daily][for every [500][_____] metric tons tons of contaminated material that is treated][_____].

] Unit price must include costs for materials, labor [, moisture reduction][, hauling][, stockpiling], processing and treatment, testing and analyzing, [and] operation and maintenance [, and wastes (solid, liquid and/or gaseous) treatment and disposal].

1.1.2 Single Job Prices

[1.1.2.1 Bench-Scale Treatability Studies

NOTE: Delete this paragraph if treatability studies have already been performed.

If the Government requires the Contractor to perform bench-scale treatability studies, the studies will be [included as part of base bid items][measured at the single job price][_____]. The price must include costs for labor and materials for:

- a. Preparing plans.
- b. Collecting representative contaminated materials.
- c. Conducting the studies (including sampling and analysis).
- d. Evaluating results.
- e. Report preparation.
- f. Treating and disposing of study-derived wastes.

[1.1.2.2 Field Demonstration

Payment for field demonstrations will be [included as part of base bid items][based on single job price for each field demonstration requested by the Contracting Officer and properly completed]. The price will include costs for labor and materials for:

- [a. Moisture reduction.
-] b. Hauling.
-] c. Stockpiling.
-] d. Processing and treating.

- e. Testing and analyzing.
- f. Preparing reports.
- g. Treating and disposing of wastes (solid liquid and/or gaseous) generated during field demonstrations.
- h. Other incidental work (such as manufacturers' field services, health and safety monitoring and controls, and utilities).

1.1.2.3 Other Work Items

NOTE: Coordinate this paragraph with Section 01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS. Temporary utility connections are covered in Section 01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS.

Include work items related to the work of this Section, but not included in the above paragraphs, in the base bid for treatment of the contaminated materials. Such work items include:

- a. Submittals related to operation of the thermal desorption treatment system.
- b. Mobilization and demobilization. Mobilization includes transportation of the equipment to the site, equipment erection and installation, but not start-up and operation.
- c. Site preparation in the treatment area.
- d. Configuration and installation of the treatment system.
- e. Manufacturers' field services.
- f. Environmental compliance monitoring.
- g. Health and safety monitoring and controls.
- h. Utilities required for the thermal desorption treatment, if approved by the Government as necessary for the project.

1.2 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also

use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- ASME B40.100 (2022) Pressure Gauges and Gauge Attachments
- ASME BPVC SEC IX (2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
- ASME PTC 19.3 TW (2016) Thermowells Performance Test Codes

AMERICAN WELDING SOCIETY (AWS)

- AWS B2.1/B2.1M (2021) Specification for Welding Procedure and Performance Qualification
- AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

- ASTM D2216 (2019) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4643 (2017) Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
- ASTM D4959 (2016) Determination of Water (Moisture) Content of Soil by Direct Heating
- ASTM E953/E953M (2016) Standard Practice for Fusibility of Refuse-Derived Fuel (RDF) Ash

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 30 (2024; TIA 24-1) Flammable and Combustible Liquids Code
- NFPA 31 (2024; TIA 23-1) Standard for the Installation of Oil-Burning Equipment
- NFPA 54 (2024) National Fuel Gas Code
- NFPA 58 (2024; TIA 24-2) Liquefied Petroleum Gas

Code

NFPA 82 (2024) Standard on Incinerators and Waste and Linen Handling Systems and Equipment

NFPA 211 (2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44 (2018) Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NIST SP 250 (1991) Calibration Services Users Guide

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 450/4-80/023R (1985) Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)

EPA 505-B-04-900A (2005) Intergovernmental Data Quality Task Force - Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs Part 1: UFP-QAPP Manual

EPA SW-846 (Third Edition; Update VII) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

UFP-QAPP WKSTS (2012) Intergovernmental Data Quality Task Force - Uniform Federal Policy for Quality Assurance Project Plans, Optimized UFP-QAPP Worksheets

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

[1.3 ADMINISTRATIVE REQUIREMENTS

NOTE: Delete this paragraph if the requirements are included in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS, Section 01 32 01.00 10 PROJECT SCHEDULE, or other Specification Section.

Appropriate facility personnel should be present at the pre-installation meeting if siting of the treatment facility and other associated work areas will be discussed.

1.3.1 Pre-Installation Meetings

Conduct a pre-installation meeting[and site walk-through] at least[five business days prior to the start of operations on the project][_____]. Arrange the pre-installation meeting and follow the written pre-installation meeting agenda submitted prior to the meeting. The purpose of this meeting is to identify key logistical, safety, and community concerns. The following individuals must be in attendance at this meeting: Contractor's Project Manager and Site Foreman and [Contracting Officer] [_____].

Record pre-installation meeting minutes and publish via email within 48 hours to all attendees. Re-publish the minutes within 48 hours via email pending any subsequent comments from the attendees.

1.3.2 Sequencing and Scheduling

The Government will not permit the Contractor to begin the next phase of operations until the Contractor has submitted documentation of successful accomplishment of the objectives of the previous phase of operation. Do not commence mobilization until approval of the mobilization plan as part of the Remedial Action Work Plan is received from the Contracting Officer.

1.4 SYSTEM DESCRIPTION

NOTE: Indicate if the Government knows/assumes that there are multiple dissimilar types of contaminated materials that will require different thermal desorption treatment processes. This may be based on site investigations and/or previously completed treatability studies.

The work consists of thermal desorption treatment of approximately[[_____] cubic meters [_____] cubic yards][[_____] metric tons [_____] tons] of contaminated material. Provide and operate the thermal desorption system to transfer organic compounds from contaminated materials to a gaseous stream drawn through the system. The system must consist of a process or series of processes to remove organic contaminants from the contaminated materials by heating the soil or sludge matrix. Complete removal/treatment of organic vapors in one or more air pollution control systems.

1.4.1 Design Requirements

NOTE: The first option for thermal desorption system capacity is preferred. It is more difficult to enforce schedule constraints with the second option.

Omit the third- and fourth-to-last sentences of this paragraph ("The Contractor may propose ... must be addressed in detail...") if a specific method of treatment is desired.

Provide a thermal desorption treatment system with a capacity that is[

consistent with the remedial action schedule][a minimum of[_____] kg/hr [_____] tons/hour]. Configure the treatment plant based on the contaminated material characteristics data[, the Contractor's own interpretation of the previously conducted treatability study results, [_____] , and[the bench-scale or pilot-scale treatability studies performed by the Contractor] so that the treated material conforms to paragraph PERFORMANCE REQUIREMENTS.][The treatment plant must be transportable.] The materials, components, accessories, and equipment of the treatment plant must meet their functional requirements and be compatible with the contaminants of concern and the operating conditions of each unit operation.[The Contractor may propose a treatment plant different from the treatment plant specified. Government approval of a Contractor-proposed treatment plant does not relieve the Contractor of responsibility for meeting specified requirements for safety, reliability, and performance.] Provide a safe and reliable treatment plant in compliance with the applicable codes, regulations, and specified requirements. The treatment plant must consist of the following major systems:

1.4.1.1 Primary Desorption Chamber

NOTE: The nature of the heating process may invoke other requirements if it is considered "incineration." The designer should particularly verify the ramifications of the use of a direct-fired chamber on the regulatory status.

The primary desorption chamber volatilizes the compounds of concern. The primary chamber must be[directly fired with the primary chamber operated at a pressure lower than atmospheric.][indirectly fired.][An inert carrier gas must be recycled through the desorber and stack emissions treatment system.]

1.4.1.2 Air Pollution Control System Requirements

NOTE: If site materials contain polychlorinated biphenyls (PCBs), consider eliminating the use of an afterburner to alleviate permitting problems during construction. If per- and polyfluoroalkyl substances (PFAS) are present, the designer should determine if there are any prohibitions against incineration, such as a Department of Defense moratorium or state/local regulation. An afterburner could not be used if there is any prohibition on PFAS incineration.

Provide an air pollution control system containing[an afterburner. The temperature of the afterburner must be greater than the temperature of the primary desorption chamber][an afterburner operating at a minimum temperature of [_____] degrees C [_____] degrees F][a quench followed by an adsorption type treatment system][a condenser followed by an adsorption type treatment system][_____].

1.4.1.3 Auxiliary Fuel System

1.4.1.3.1 Feed Capability

Provide an auxiliary fuel system with direct feed capability to the thermal destruction system. Provide meters, pressure gages, and controls to maintain proper operating conditions. Design must be in conformance with NFPA 30 and NFPA 31, NFPA 54 or NFPA 58, as appropriate to the fuel type.

1.4.1.3.2 Secondary Containment

Provide auxiliary fuel storage tanks with secondary containment in accordance with [Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS] [NFPA 30].

1.4.1.4 Contaminated Material Feed System

[1.4.1.4.1 Conveyors

NOTE: Use this paragraph only if there is a potential for unacceptable quantities of volatile organic chemicals (based on calculations from the Remedial Action Work Plan). This paragraph may not apply for batch-type desorption systems and may be deleted if batch treatment is anticipated.

Cover contaminated material feed conveyors and vent to the air pollution control system if calculations in the Remedial Action Work Plan indicate unacceptable quantities of volatile organic compounds (VOCs) would be released during contaminated material conveying.

]1.4.1.4.2 Support Equipment

NOTE: Address rocks, construction debris, trees, stumps, drums, barrels, etc. and oversize materials. Oversize materials are any materials too large to be compatible with the thermal desorber. Materials may be required to be shredded and treated or separated from the feed material, decontaminated and disposed on or offsite. Maximum allowable sizes to be treated in the thermal desorber should be specified.

Provide material handling and contaminated material feed systems capable of [shredding][, conveying][, pumping][, and][screw feeding] of contaminated materials, separately or in combination, to the primary chamber. Pre-treatment includes crushing or grinding and screening as required to produce material no larger than [_____] mm [_____] inch in diameter and which is otherwise compatible with the thermal desorber.

1.4.1.4.3 Capacity

Provide the contaminated material feed system such that its capacity is consistent with the capacity of the other components of the thermal

desorption system.

1.4.1.4.4 Material Measurement

NOTE: This paragraph is primarily intended to ensure that calibrated scales are being used to weigh materials, when weight is being used as the basis for measurement and payment.

Provide scales; meters; and volumetric measuring devices for measuring the contaminated materials (liquid and solid) introduced into the thermal desorption system which conform to the applicable requirements of NIST HB 44, except that the accuracy must be plus or minus[0.1][_____] percent of the quantity being measured. For scales used to measure weight of material in vehicles, provide scales of sufficient length to permit simultaneous weighing of all axle loads. For scales used to make measurement for payment, ensure the scale is certified[by an acceptable scales company representative][by the State Inspection Bureau charged with scales inspection] prior to weighing any materials. Perform a check of calibration of measuring equipment prior to initial use and at least once every[week][[_____] working days]. The requirements of this paragraph do not apply to measurement of chemical or physical data for purposes of demonstrating compliance with paragraph PERFORMANCE REQUIREMENTS.

1.4.1.4.5 Rehydration

NOTE: Final moisture content may be specified here, if appropriate.

Include provisions for rehydration, prior to storage, of material leaving the thermal desorption system to reduce fugitive emissions and to confine the materials to the proper storage area. Rehydrate treated soils to achieve a minimum moisture content of [_____] percent.

1.4.1.5 Air Supply And Pollution Control Systems

1.4.1.5.1 Air Supply

Use a forced draft (FD) blower/fan or fans to provide combustion air for the burners.

1.4.1.5.2 Induced Draft (ID) Fan

Use ID blower/fan or fans to maintain negative pressure throughout the system.

1.4.1.5.3 Fugitive Emissions Control

NOTE: Select the second bracketed option for indirectly fired units.

[Control emissions from the desorption zone by keeping the desorption zone

sealed and maintaining a desorption zone pressure lower than atmospheric pressure.][With the approval of the Contracting Officer, implement means that have been demonstrated to provide fugitive emissions control.]

1.4.1.5.4 Quench

Cool off-gases from the primary soil treatment zone to temperatures that protect downstream units and equipment.

1.4.1.5.5 Stack Emissions Control

NOTE: Indicate design wind force the stack will have to withstand. Structural design must also include seismic resistance in accordance with UFC 3-301-01, when appropriate.

The air pollution control system must be capable of controlling gaseous, solid, and aerosol type emissions to meet the performance requirements. Provide stack support in accordance with NFPA 82 and NFPA 211, as applicable. Provide vertical and lateral supports for exterior chimneys to withstand wind forces of [_____] kph [_____] mph. Provide stack sampling port and equipment for collecting discrete and composite samples with adequate access for personnel and equipment.

1.4.1.5.6 Water and Liquid Waste

Design the air pollution control system to minimize water consumption and liquid waste generation. Recirculate liquids in the air pollution control system to the maximum extent practicable prior to wasting to the liquid waste system.

1.4.1.6 Instrumentation And Controls

Provide continuous emission monitors in accordance with paragraph PERFORMANCE REQUIREMENTS and EPA 450/4-80/023R. Protect systems from damage from onsite activity.

1.4.1.6.1 Instrumentation, Sensors, Recorders, and Sampling

Provide instrumentation and equipment including sensors, local indicators, connecting devices, recorders, analyzers and components necessary to monitor and control the safe and efficient operation of the system. Provide thermometers conforming to ASME PTC 19.3 TW, with wells and temperature range suitable for the use encountered. Provide draft gauges conforming to ASME B40.100 with a diaphragm or bellows actuating system and a circular scale. The gauges must have a zero adjustment screw. Provide suitable shutoff cocks.

Provide pressure gauges conforming to ASME B40.100 that are the pressure detecting class, single Bourdon tube style, and suitable for detecting air pressure. Provide sensors in the desorption chamber or as otherwise directed. Provide thermocouples suitable for continuous operation and control at temperatures up to [1,540][_____] degrees C [2,800][_____] degrees F, accurate to 0.75 percent, and long enough to be inserted 150 mm 6 inches into the furnace. Provide thermocouples with an adjustable flange and a high-temperature metal alloy, closed-end, protecting tube suitable for insertion into the furnace without support of the projecting

end. Supply compensating lead wire 1.52 mm 16 gauge in diameter and 30 meters 100 feet long with a weatherproof braid supplied for connecting the thermocouple to the instrument. The installed unit must indicate gas passage temperatures and must control burner operation.

1.4.1.6.2 Control Room

NOTE: Consult the military installation regarding the usage of radio communications. Closed circuit TV requirements should be deleted if specified in Section 28 10 05 ELETRONIC SECURITY SYSTEMS (ESS).

Maintain a fully enclosed control room provided with system controls, instrument readouts, and data recording devices. The control room must be heated and air conditioned, permitting year round occupancy, and must meet instrumentation and control equipment manufacturer's operating specifications. If the control room is located in the exclusion zone, provision must be made for personnel using protective clothing and equipment. If the control room is located in the support zone, provide a [hard-wired][or][radio] intercommunication system with two communication channels between the control room and thermal desorption system operating area to allow control room operators to communicate with system operators.[Provide closed circuit television monitoring of operations in the control room.]

1.4.1.6.3 Redundancies

Provide fully redundant backup capability within each subsystem to safely terminate system operations at the control room and at the thermal desorption system. Provide uninterrupted continuous monitoring of the emissions and demonstrate operation in accordance with the approved operating conditions using adequate duplexing or redundancies within the instrumentation and control systems. Provide documentation of these redundancy measures.

1.4.1.6.4 Displays and Data

Locally display and record monitored parameters and excursion alarms in the control room. Maintain digital process and emissions data in the control room in the approved digital format. Maintain hard copies of recorded data and summaries of recorded data in the control room. Provide copies upon request.

1.4.1.7 Interlocks and Alarms

1.4.1.7.1 Visible Alarms

Visible alarms consist of lights on the main control panel, flashing symbols on the screen of the microprocessor controller in the control room and, for each interlock that stops the contaminated material feed system, lights at the equipment location.

1.4.1.7.2 Audible Alarms

Provide audible alarm activation for each interlock that stops the feed to the thermal processing unit.

[1.4.1.7.3 Remote Alarms

NOTE: Delete this paragraph if remote alarms are not required. Furnish the calling sequence, in priority order, at the pre-installation meeting. The Contracting Officer or a designated representative must be included in the calling sequence.

Provide auto dialing to the indicated remote locations for each interlock that stops the contaminated material feed to the thermal processing unit. The Government will provide the calling sequence and priority order.

]1.4.1.8 Utilities

NOTE: The system utilities requirements should be identified in the Contractor's design. Verify the utilities are available on-site before including the second sentence. The following information may be used as a check: the amount required for a 12,000 - 18,000 kg 15 - 20 ton per hour unit is 5 - 35 L per second 75 - 600 gpm of water, 1,200 - 2,500 kw of electricity and 30 - 60 cubic meters per minute 1,000 - 2,000 scfm of natural gas. The Contractor should verify the adequacy of the existing utilities and be responsible for the required agreements with the utility companies for usage and any required changes.

In accordance with Section 01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS, provide the utilities associated with the installation and operation of the treatment plant including, but not limited to: [telecommunications][, electricity][, water][, steam,][gas,][____], sanitary, and solid waste facilities. The[telecommunications][, electricity][, steam][, water][, gas][, sanitary][, and][solid waste facilities][____] are available at the site.

1.4.1.9 Remedial Action Work Plan

NOTE: The Designer may wish to require the Remedial Action Work Plan, UFP-QAPP, and other preconstruction submittals required under this section to be completed concurrently or with the other plans being appendices of one primary plan. This Section should be edited to reflect such a requirement if applicable.

Submit a Remedial Action Work Plan[within[200][____] calendar days after notice to proceed][not less than[60][____] calendar days prior to the anticipated start of full-scale thermal desorption of contaminated material operations]. Do not perform thermal desorption of contaminated material until the work plan is approved. Prepare[draft for Government review][draft-final for [regulatory][____] review] and final versions of the

Remedial Action Work Plan. [Allow [30][_____] calendar days for [Government] review [and [30][_____] calendar days for regulatory review].] Allow [45][_____] days for comment resolution following each review and preparing the next version of the document. Submit the following in a Remedial Action Work Plan:

- a. Flow diagram for process equipment associated with the thermal desorption system and data, including but not limited to: contaminated material stream flows; direction of material flow, including range of flow rate and range of composition, identified by lines and arrows denoting the direction and destination of the flow; material, mass and energy balances for the entire thermal desorption system.
- b. Piping and instrumentation diagram indicating: process equipment; instrumentation; piping and valves; stacks, vents and dampers; control equipment (including sensors, process controllers, control operators, valves, interlocks, alarms, and contaminated material feed cut-off systems); labels and other necessary information to correlate to the process flow diagram.
- c. Detail drawings showing dimensions of the equipment, layout of the thermal desorption system and subsystems, including location of components and onsite improvements. Drawings showing dimensions, layout, location of barriers, capacities, and placement of the stockpiles. Drawings must be to the approved scale.
- d. System schedule including dates and durations for system mobilization, start-up, Field Demonstration, interim operation, production operations, and demobilization prior to beginning site activities.
- e. Specific procedures and requirements for onsite placement of the thermal desorption system and its subsystems.
- f. Plan identifying instruments requiring calibration and describing the required calibration procedure and tolerances.
- g. List of the proposed operating conditions for process parameters to be continuously monitored and recorded. Include detailed descriptions of the Field Demonstration schedule, operating conditions and parameters, material sources, and required sampling and analyses.
- h. Include specific detailed procedures for continued operation of the system, based on the Field Demonstration results; and adjustments for variation in the contaminated material feed. Include schedule of inspection and maintenance procedures and activities.
- i. Mobilization and demobilization plan detailing specific procedures to be used for decontamination of system components, test methods for verification of decontamination, and the schedule for equipment decontamination and removal from the site. Address the requirements in paragraphs MOBILIZATION and DEMOBILIZATION.
- j. Information on function, design capacity, and expected operational capacity for the following equipment in the thermal desorption system: feed preparation equipment, feed/treated materials conveying equipment, thermal treatment equipment (primary chamber, blowers, air pollution control equipment). Equipment specifications identifying manufacturer and model number, materials of construction, interior and exterior dimensions, design limitations, and normal operating

conditions. Operating capacity and operating conditions for subsystem equipment; pumps, valves and other in-line devices; sizes of conveying and/or feeding devices; size and number of parallel components or lines.

- k. Detailed manufacturer's data on the overall controls, sequence of control, description of components, wiring diagrams, logic diagrams, control panel layouts, legends and standard symbols, sensors, process controllers, control operators, valves, alarms, interlocks and contaminated material feed cut-off systems. Data describing in detail the equipment used to monitor stack emissions, including the stack sampling probe, filters, gas transport tubing, sampling pump, moisture removal system, analyzer's calibration system, and data recorder. Instructions for use of software packages necessary to evaluate the operating data from the control system.
- l. An analysis demonstrating that the noise generated at a distance of [30][_____] meters [100][_____] feet for the following octave band frequencies: 31.5, 63, 125, 250, 500, 1000, 2000, 4000, and 8000 hertz will not exceed the approved noise levels.
- m. A determination of the maximum contaminated material feed rate which could be sustained without releasing volatile organic compounds to the air in violation of air quality regulations. This determination should be made using feed rates and contaminant concentrations typical of full scale production.
- n. Backup and redundancy analysis containing a failure mode analysis and an emergency manual that indicates responses to be taken under the following circumstances:
 - (1) Sudden loss of integrity of refractory lining.
 - (2) Puffing or sudden occurrence of fugitive emissions.
 - (3) Failure of temperature monitoring control mechanism.
 - (4) Primary burner and/or air port clogging or failure.
 - (5) Electrical power failure (primary or secondary).
 - (6) Scrubber water flow or scrubber water makeup flow out of range.
 - (7) Excessive solids deposition in the air pollution control system.
 - (8) Loss of quench water.
 - (9) Increase in gas temperature after quench zone.
 - (10) Demister operation failure.
- o. Permits, permit equivalents, and certifications in accordance with paragraph REGULATORY REQUIREMENTS. For above-listed items requiring a longer time frame, submit copies of applications and scheduled dates for receiving final approval.
- [p. Bench-Scale Treatability Study Test Report: After completion of testing, compile the data from the bench-scale treatability study and prepare a Bench-Scale Treatability Study Test Report that includes but

is not limited to, the materials, procedures, and methods used in the study; tests performed; sampling and analysis results; conclusions with supporting dialog; and proposed conditions to be tested in the Field Demonstration. Submit the Bench-Scale Treatability Study Test Report as an attachment to the Remedial Action Work Plan.]

- q. Field Demonstration Plan: Outline the planned Field Demonstration and evaluation activities. This plan must address, but not be limited to, contaminated materials characterization, proposed demonstration testing runs (including testing/operating conditions of the unit processes/operations for each run), [sampling locations,] [analyses and analytical methods,] mass balance calculation and performance evaluation [for each major piece of equipment], treated materials and waste characterization, health and safety monitoring and control, and waste treatment and/or disposal.

1.4.1.10 [Uniform Federal Policy Quality Assurance Project Plan \(UFP-QAPP\)](#)

NOTE: This Section may reference a separate Specification Section requiring preparation of a quality assurance project plan or may be excluded entirely if the requirements are part of another Specification Section.

Indicate in this paragraph if the UFP-QAPP should include any testing protocols specific to the contaminated soil matrix and thermal desorption technology (e.g., soil organic matter content, moisture content, etc.).

Prepare a Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) in accordance with the requirements set forth in [EPA 505-B-04-900A](#) and using the [UFP-QAPP WKSTS](#). Incorporate sampling and analysis requirements from this Section into the UFP-QAPP. Prepare [draft for Government review] [draft-final for [regulatory] [_____] review] and final versions of the UFP-QAPP. Allow [30] [_____] calendar days for [Government] review [and [30] [_____] calendar days for regulatory review]. Allow [45] [_____] days for comment resolution following each review and preparing the next version of the document. Submit the UFP-QAPP [within [30][_____] calendar days after notice to proceed] [at the same time the Remedial Action Work Plan is submitted] [_____] . Do not perform work at the site, with the exception of site inspection and surveys, until the UFP-QAPP is approved. Tailor the content to the requirements of the project and the site conditions.

1.4.1.11 [Bench-Scale Treatability Study Work Plan](#)

NOTE: A bench-scale treatability study may have been performed prior to development of this Specification; however, the Contractor is sometimes required to complete a treatability study prior to performing full-scale work at the site. Treatability study test results should include the proposed operating conditions to be used during full scale treatment. The test results submitted should verify that the proposed operating conditions meet

the post-treatment criteria listed in paragraph PERFORMANCE REQUIREMENTS. Consideration should also be given to the need to monitor off-gas and dust emissions during the treatability study.

Further guidance on conducting treatability studies for thermal desorption treatment can be found in the U.S. EPA's Guide for Conducting Treatability Studies under CERCLA: Thermal Desorption Remedy Selection, EPA/540/R-92/074A, September 1992.

Submit a Bench-Scale Treatability Study Work Plan within [60][_____] calendar days after notice to proceed. Do not perform the bench-scale treatability study until the work plan is approved. Prepare [draft for Government review] [draft-final for [regulatory][_____] review] and final versions of the Bench-Scale Treatability Study Work Plan. Allow [30][_____] calendar days for [Government] review [and [30][_____] calendar days for regulatory review]. Allow [45][_____] days for comment resolution following each review and preparing the next version of the document. Address the technical requirements, listed below and in paragraph BENCH-SCALE TREATABILITY STUDY, in the work plan. The technical requirements include, but are not limited to:

1.4.1.11.1 Conceptual Implementation Plan

Describe the proposed means of meeting the treatment performance requirements in paragraph PERFORMANCE REQUIREMENTS for the contaminated materials, including methods for transporting contaminated and treated materials between various stages of the treatment process.

1.4.1.11.2 Laboratory Procedures

Describe how the parent contaminated material sample will be processed to remove oversize materials, homogenized, and subdivided into aliquots for testing. Identify and justify deviations between the Conceptual Implementation Plan and Laboratory Procedures.

[1.4.1.11.3 Testing Approach

NOTE: If a UFP-QAPP is prepared and covers testing during the Treatability Study, this paragraph should be deleted or replaced with a reference to the UFP-QAPP.

Describe the testing approach which will be used to assess performance.

]1.4.2 Performance Requirements

1.4.2.1 Treatment Criteria

NOTE: The table in this paragraph should be developed on a site specific basis considering the purpose of thermal desorption in the overall strategy for managing the contaminated material. Ideally, post-treatment testing criteria will be

defined in a site-specific decision document. Post-treatment testing depends on the purpose of the thermal desorption treatment. In general, thermal desorption treatment is performed to reduce chemical concentrations for material that will remain on-site (either in-situ or in a designated permanent storage unit). In rare instances, the thermally treated material is removed for off-site disposal (e.g., where there is no room for on-site placement).

The Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method 1311 is usually the primary test for contaminated materials that are pre-treated via thermal desorption prior to off-site disposal. TCLP test results are used to verify if a contaminated material need not be managed as a hazardous waste. In some instances, such as when a contaminated material is considered a listed hazardous waste, "total" chemical testing data may be needed in addition to or instead of TCLP data.

Two approaches are provided for attaining performance criteria: meeting performance criteria for every sample of treated material (conservative approach) or meeting performance criteria on the average for all samples of treated material. The averaging approach would not be appropriate if thermal desorption treated materials are to be sent off-site for disposal, because averaging of sample results cannot be used for waste characterization to determine if a material is or is not a hazardous waste.

The "chemical properties" in Table 1 would include specific chemicals or totals of a contaminant class (e.g., PCBs) of concern. These are site- and project-specific requirements for the designer to populate in the table.

Conduct the work to ensure that treated material is evenly heated[with no clumps of intact contaminated material larger than the size specified in Table 1]. [Each sample of treated material must meet the criteria shown in Table 1.] [An average of all samples of treated material must meet the performance criteria in Table 1; no individual sample shall can be greater than[_____] [110 percent] of the criteria in Table 1 with no more than[_____] [20 percent] of the samples exceeding.]

TABLE 1 - TREATMENT CRITERIA		
PROPERTY	TREATMENT CRITERIA	TEST METHOD
Chemical Properties		
[_____]	[_____]	[_____]
Physical Properties		

TABLE 1 - TREATMENT CRITERIA		
Maximum Clump Size	[_____] mm [_____] inch	
[_____]	[_____]	[_____]

1.4.2.2 Emission Criteria

NOTE: Current federal regulations are not directly applicable to thermal desorption. The designer should perform an air pathway analysis per EP 200-1-24 and obtain the State or air quality regional requirements. Note that obtaining an actual permit would not be required at a site managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), but compliance with substantive requirements would be required. Include mass or concentration limits, as appropriate.

Do not exceed emissions criteria, as shown in TABLE 2.

TABLE 2 - EXHAUST GAS EMISSIONS CRITERIA		
COMPONENT	CRITERIA 1	CRITERIA 2
Organic removal efficiency (minimum percent)	[_____]	[_____]
Total hydrocarbons	[_____]	[_____]
Principal Organics	[_____]	[_____]
Opacity	[_____]	[_____]
Oxygen (minimum)	[_____]	[_____]
Carbon Monoxide	[_____]	[_____]
Carbon Dioxide	[_____]	[_____]
Metals	[_____]	[_____]
Particulates	[_____]	[_____]
Hydrogen chloride	[_____]	[_____]
Hydrogen fluoride	[_____]	[_____]
[Products of Incomplete Combustion (PICs)]	[_____]	[_____]

TABLE 2 - EXHAUST GAS EMISSIONS CRITERIA		
[_____]	[_____]	[_____]

1.4.2.3 Slagging Control

NOTE: The bench-scale treatability study should determine the ash fusion temperature of the feed materials in accordance with ASTM E953/E953M.

Minimize slagging by operating at [_____] degrees C [_____] degrees F less than the ash fusion temperature of the feed materials, as determined by ASTM E953/E953M.

1.4.2.4 Noise Control

NOTE: Specifications for noise controls should be covered in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. The remaining text in this note discusses noise control considerations to incorporate into Section 01 57 19. Based on the geographical location of the site, and the land uses and environment surrounding the site, the site-specific noise level requirements for the day and night operations and monitoring requirements can be identified from the state and local regulations and/or developed by interacting with the state and local agencies.

Provide a thermal desorption treatment system which meets the noise control requirements in [Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS] [_____].

1.4.2.5 Material Handling Fugitive Emissions Dust Controls

NOTE: Specifications for fugitive dust controls associated with handling (stockpiling, conveying, etc.) of untreated and treated contaminated materials should be provided in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. The remaining text in this note discusses thermal desorption technology-specific emission and dust control considerations to incorporate into Section 01 57 19. An air pathways analysis should be performed during design in accordance with EP 200-1-24 Air Pathway Analysis for the Design of Hazardous, Toxic and Radioactive Waste (HTRW) Remedial Action Projects. Depending upon the contaminants of concern in the contaminated materials, the unit processes/operations employed in the treatment plant, the amount of pollutants emitted, and the

geographical location of the site, the emission standards and limitations for certain contaminants and dust control can be identified from the following regulations including, but not limited to, National Primary and Secondary Ambient Air Quality Standards, National Emission Standards for Hazardous Air Quality Pollutants, and state and local regulations.

Based on the regulatory requirements, the proper technologies or apparatus for the emissions control if required can be determined. Upon completion of the design of the treatment plant, these emission requirements and control technologies should be defined by the design engineer.

If a performance specification is prepared, the emissions, dust sources, and contaminants of concern should meet specified requirements based on applicable regulations. Section 01 57 19 should list the emissions criteria for the contaminants of concern for each emission and dust source, and if applicable, monitoring requirements should be specified. The applicable federal, state, and local regulations should also be identified. If the specification is prepared based on detailed design, the technologies or apparatus for controlling the emissions and dust sources should also be specified.

Provide a thermal desorption treatment system with material handling practices which meet the fugitive dust control requirements in[Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS][_____].

1.5 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes

following the "G" typically are not used for Navy and Air Force projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Remedial Action Work Plan; G, [_____]

Pre-Installation Meeting Minutes; G, [_____]

Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP); G, [_____]

Bench-Scale Treatability Study Work Plan; G, [_____]

Pre-Installation Equipment Examination

Pre-Installation Examination Report

Pre-Installation Meeting Agenda

SD-03 Product Data

Startup Plan; G, [_____]

SD-05 Design Data

Adjusted Operating Conditions; G

SD-06 Test Reports

Operations Reports

Water Supply Analysis

Field Demonstration Report; G

Startup Report

SD-07 Certificates

Qualifications; G, [_____]

1.6 QUALITY CONTROL

1.6.1 Regulatory Requirements

NOTE: Include Federal, state, and local regulatory requirements; utility company regulations; and applicable codes and standards published by scientific and engineering institutions where appropriate in the body of this Section. Some of the potentially applicable Federal regulations are listed as follows:

TCLP

Recording and Reporting Occupational Injuries and Illnesses

Occupational Safety and Health Standards

Safety and Health Regulations for Construction

Permitting

National Primary and Secondary Ambient Air Quality Standards

National Emission Standards for Hazardous Air Quality Pollutants

State and Local Air Quality Standards

National Pollution Discharge Elimination System (NPDES) Discharge Limitations and Permit Procedures

Hazardous Waste Identification and Standards Applicable to Generators, Transporters, and Owners and Operators of Treatment, Storage and Disposal Facilities (TSDF)

Land Disposal Restrictions (LDRs)

Department of Transportation Hazardous Materials Program Procedures

Hazardous Materials Transportation Regulations

Standards for Protection Against Radiation

Land Disposal of Low-Level Radioactive Waste

Packaging and Transportation of Radioactive Materials

For sites addressed under CERCLA, administrative permit requirements for on-site activities are not required, though the substantive requirements may need to be met. Permitting requirements known to have substantive requirements should be listed here. If permit requirements are covered in other

specifications, delete this section.

Obtain the permits, permit equivalents, and certifications; and meet the regulatory requirements necessary for the installation, operation, and closure of the project.[Correspondence from regulatory agencies, and other relevant information, is attached to the specifications to indicate the level of effort necessary to obtain finalized permits, permit equivalents, certifications and to meet substantive regulatory requirements.]

1.6.2 Qualifications

NOTE: Requirements for the Contractor's experience should be determined and specified based on the experience, availability, and state of the thermal desorption treatment technology industry and the site-specific requirements. If thermal desorption treatment is being used for unique contaminants, consider specifically identifying contractor thermal desorption experience requirement for those contaminants in the optional bracket at the end of paragraph CONTRACTOR EXPERIENCE.

1.6.2.1 Contractor Experience

Submit evidence of successful completion of[at least one thermal desorption project][[_____] thermal desorption projects] of comparable size[and scope][at least[three][_____] thermal desorption pilot scale treatability studies, demonstration studies, or full scale remediation projects that required handling and transportation of materials contaminated with[RCRA hazardous wastes][CERCLA hazardous material][_____] using the proposed system or a similar system.

1.6.2.2 Key Personnel

Provide key personnel with a minimum of [three][_____] years of thermal desorption field experience. Include system operators, quality control personnel, and supervisory engineering and technical staff involved with the thermal desorption system operation in key personnel. Perform welding in accordance with AWS D1.1/D1.1M by welders certified to have passed qualification tests using procedures covered in AWS B2.1/B2.1M or ASME BPVC SEC IX. Require welders to retake the test when, in the opinion of the Contracting Officer, the work creates reasonable doubt as to the welder's proficiency. Submit a list of these personnel with their qualifications.

1.6.2.3 Lab Validation

Perform testing by a DoD Environmental Laboratory Accreditation Program (DoD ELAP) accredited commercial testing laboratory meeting the requirements of [Section 01 45 00 QUALITY CONTROL][_____] and approved by the Contracting Officer. Submit testing laboratory validation for the testing to be performed. Do not permit work requiring testing until the Contracting Officer approves use of the testing laboratory.

1.7 SITE CONDITIONS

NOTE: The pertinent site characterization data should be placed in the appendix of the specifications or on the drawings and referenced here. If the contaminated material to be treated contains a significant amount of debris, the available information about its extent and characterization should also be provided. Indicate the detail to which site characterization has been performed and indicate where obvious data gaps exist. The information should also include construction limits, property utilities, chemical data, geotechnical data, sampling locations, and boring logs. The locations and details (such as utility point of contact, sizes, capacities, and flows) of the utility hookups should also be provided for the Contractor's use.

Indicate if there are multiple dissimilar types of contaminated materials that will require different thermal desorption operations. Materials may be considered dissimilar based on possessing different types or relative concentrations of contaminants. Determination of dissimilar materials may be based on site investigations and/or previously completed treatability studies.

1.7.1 Existing Conditions

The existing site conditions are presented [in Appendix [____]][and][on the Drawings]. These include [physical configuration][topography][land uses][geotechnical characteristics of the contaminated materials (including [grain size analysis][total organic carbon content][pH][moisture content][bulk density][porosity)) [hydrogeology]] and [nature and extent of contamination][____]. The existing conditions presented are the result of site investigations at specific locations; variations in the existing site conditions could occur. Perform an independent interpretation of the site characterization data. Notify the Contracting Officer within [48 hours][____] if discrepancies between the data provided and actual field conditions are discovered.

[1.7.2 Results of Previously Conducted Treatability Studies

NOTE: Delete this paragraph if previous treatability studies have not been conducted.

The unit processes/operations employed in the previous treatability studies (bench and/or pilot scale) may not be the same as those proposed by the Contractor. Documentation of the previous treatability studies should provide prospective Contractors with sufficient information to prepare a detailed proposal and should include the testing materials, procedures and conditions, sampling and analytical methods, evaluation, and results.

The previously conducted treatability study documents in Appendix [_____] are for information purposes only. The results indicate that thermal desorption is capable of meeting the post treatment criteria identified in this Section. Nevertheless, perform an independent evaluation of these studies and results. If deemed necessary, perform additional studies [at the Contractor's own expense] to confirm the previously conducted treatability studies and results. Based on the Contractor's interpretation of the previous studies and results [and the Contractor's studies and results], provide a full-scale treatment plant which meets the requirements of this Section.

]PART 2 PRODUCTS

2.1 MATERIAL HANDLING EQUIPMENT

Provide equipment and storage facilities for removing, handling and storing residues resulting from thermal treatment, including treated material and solids captured by the pollution control system.

[2.2 SAMPLES OF CONTAMINATED MATERIAL FOR TREATABILITY STUDIES

NOTE: This paragraph should be included if bench-scale treatability studies are to be performed by the Contractor. Action level criteria should be specified for the purpose of collecting representative samples for bench-scale treatability studies. Table 3 should be edited based on site-specific contaminants of concern and their corresponding action levels. Additional testing may be needed to verify that physical properties (e.g. grain size, total organic content, density, porosity, moisture content) of the samples are also representative of site conditions.

To reduce the overall risk to the Government, it is strongly advised that the project team should require the Contractor to collect samples for the bench-scale treatability study unless the nature of the site prevents the Contractor from doing so. Depending on site conditions and project needs (e.g. site security, access issue, etc.), the government may provide samples to the Contractor to conduct bench-scale treatability studies..

[The Contracting Officer will provide the required samples to conduct the treatability studies.][Select sampling locations and collect representative samples to conduct the bench-scale treatability studies. Consider the existing site conditions presented in paragraph EXISTING CONDITIONS when selecting sampling locations. Coordinate the sampling protocol with the Contracting Officer before obtaining the samples.] The collected treatability study samples must have contaminant concentration levels [representative of the average concentration of the contaminants identified][and][greater than the action level criteria presented in Table 3]. Otherwise, repeat sampling until the contaminant concentration levels exceed the action level criteria. Test samples of contaminated

materials intended to be used in the bench-scale treatability studies in accordance with procedures in the [Bench-Scale Treatability Study Work Plan][and][UFP-QAPP]. Do not commence treatability studies until contaminated material sample results meet the aforementioned concentration criteria.

TABLE 3 - ACTION LEVEL CRITERIA	
PARAMETER	ACTION LEVEL CRITERIA
[_____]	[_____]

]2.3 WATER

NOTE: Two options are provided. The first option is to only allow the Contractor to use potable water. The second option allows the Contractor to use non-potable water, but includes a testing requirement to limit the chance that the Contractor supplies a water that could introduce contaminants into the treated materials. The first option is simpler, but could lead to higher project costs if the volume of water needed is significant and/or potable water sources are not readily available. When specifying the chemical contaminant criterion to be met for water, the Designer should consider if there are other standards which are more appropriate for the specific project (e.g. state groundwater cleanup criteria).

Supply water used to facilitate thermal desorption treatment.[Use only potable water from a regulated public water system.][If non-potable water is to be used, provide water that does not contain oils, acids, salts, alkalis, organic matter, solids or other substances at concentrations that could be detrimental to the successful treatment of the contaminated materials. Also characterize non-potable water prior to its use by collecting a sample from the water source and analyzing according to Table 4. Submit a [Water Supply Analysis](#) demonstrating that water meets requirements.

TABLE 4 - TREATMENT WATER CRITERIA		
ANALYTICAL METHOD NUMBER (From EPA SW-846)	ANALYSIS TYPE	CRITERION TO BE MET

TABLE 4 - TREATMENT WATER CRITERIA		
6010[and 7470A]	Metals[and Mercury]	[Less than Maximum Contaminant Level (MCL)] [_____]
8260	Volatile Organics	
8270	Semi-volatile Organics	
8082	PCBs	
1633	PFAS	
8081	Pesticides	

Within each Analytical Method, only analyze for analytes which have a [MCL] [_____].]

PART 3 EXECUTION

3.1 EXAMINATION

[3.1.1 Bench-Scale Treatability Study

NOTE: If a Treatability Study has previously been performed or is otherwise not needed, delete this paragraph. To reduce the chances of using soil samples that are not representative of site conditions, a minimum volume of 4 liters 1 gallon is recommended for each condition to be tested at the bench scale.

Complete a bench-scale treatability study in accordance with the Bench-Scale Treatability Study Work Plan and this paragraph. Perform at least [three][_____] replicate tests simultaneously for each proposed operating condition from the approved Bench-Scale Treatability Study Work Plan. Homogenize and divide the contaminated soil into replicate volumes prior to initiating testing. Do not use less than less than [four][_____] liters [one] gallon of contaminated soil in each replicate. Test samples of treated materials in accordance with the procedures in the [Bench-Scale Treatability Study Work Plan][and][UFP-QAPP].

]3.1.2 Pre-Installation Equipment Examination

Conduct a pre-installation examination of the thermal desorption treatment equipment for damage, defects, and dilapidation. Submit the results of the pre-installation examination to the Contracting Officer for review and information. The Contracting Officer may conduct an independent examination to ascertain the condition and functionality of the equipment. Based on this examination, the Contracting Officer has the right to reject the entire system or damaged, defective, or dilapidated equipment. The cost associated with equipment or control replacement or repair, and delays caused by the rejection must be borne by the Contractor. Routinely and properly inspect and maintain the equipment to provide the operation of the treatment plant as required by the Contract schedule. Schedule delays and costs due to lack of inspections and maintenance are the responsibility of the Contractor. Provide

alternate/auxiliary power source if sufficiently reliable sources are not available.

3.1.3 Infrastructure Conditions

Conduct a pre-installation examination of the on-site infrastructure, utility conduits, monitoring points, and site access constraints. Photographically document, with identifying labels, the existing condition of infrastructure and utilities, particularly for comparison to post-operation conditions. Verify locations of critical utilities that cannot be disrupted and those utilities that would potentially have significant impacts on operations and public safety. Submit a [Pre-Installation Examination Report](#) documenting the examination activity. Obtain all necessary utility clearances before initiation of subsurface work.

3.2 PREPARATION

NOTE: Coordinate the drawings to allow the best access possible to the work area. If thermal desorption treatment is part of a larger project which includes specification sections for activities such as Section 31 11 00 CLEARING AND GRUBBING and Section 31 00 00 EARTHWORK, reference to those specification sections instead. Otherwise edit this paragraph as needed.

Do not increase the size of the process area without approval of the Contracting Officer. Costs associated with area increases are borne by the Contractor, including costs of construction, demolition, and site restoration.

3.2.1 Mobilization

NOTE: Section 01 35 29.13 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES includes requirements for decontaminating equipment that has been used in contaminated zones. Modify that Section to extend decontamination/cleaning requirements to equipment being brought on-site to cover the requirements of this paragraph.

Follow the approved mobilization and demobilization plans submitted as part of the Remedial Action Work Plan. Do not mobilize the treatment plant to the site until the Remedial Action Work Plan has been approved by the Contracting Officer and the Contractor has received written confirmation. Delays caused by the Contractor's failure to meet regulatory requirements must result in no additional cost to the Government. In accordance with [Section 01 35 29.13 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES][____], the equipment which is rented and/or previously used for other site remediation must be decontaminated and tested for contaminants of concern before being brought to the site.

3.2.2 Clearing and Grubbing

NOTE: If Section 31 11 00 CLEARING AND GRUBBING is in the project, select the first bracketed option. If 31 11 00 CLEARING AND GRUBBING is not in the project, select the second bracketed option.

[Perform clearing and grubbing in accordance with Section 31 11 00 CLEARING AND GRUBBING.][Clear and grub the process area [as-indicated][as required and directed by the Contracting Officer] of all trees, stumps, downed timber, brush, rubbish, roots larger than 75 mm 3 inches in diameter, and matted roots prior to commencing operations. Saw cut concrete or asphalt pavement at the limits of removal and break, remove and dispose of the resulting debris [off Government Property][at the location indicated]. Remove fencing or other items in the process area and [salvage for reuse][dispose offsite].]

3.2.3 Foundations

NOTE: Minimum requirements should be specified in the Remedial Action Work Plan for the foundation/containment area of the treatment plant. An option is provided at the end of the paragraph to require installing a liner and berm in the location where the thermal desorption treatment plant will be constructed; this option addresses cross-contamination risk if the treatment plant is located on non-contaminated ground.

Construct equipment foundations in accordance with the approved Remedial Action Work Plan. Grade the area around the thermal desorption treatment plant so that the water drains away from the work area adjacent to the treatment area.[Construct a liner and berm surrounding the thermal desorption treatment plant. Construct the liner and berm[in accordance with the stockpile liner and berm requirements in Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL.][_____]].

3.2.4 Equipment

Use the area indicated for equipment such as:

- a. Auxiliary generator.
- b. Dewatering equipment.
- c. Pre-treatment equipment such as shredders and screens.
- d. Air emission controls and monitoring equipment.
- e. Contaminated material conveyance, preparation and loading equipment.
- f. Fuel tanks.

3.2.5 Stockpiles

NOTE: Sufficient area should be prepared for stockpiling untreated and treated contaminated materials based on consideration of equipment production rates, allowable stockpile sizes, and overall project schedule. Background sampling under the stockpiles of contaminated materials should be performed before their construction, unless previous information is adequate. Coordinate with Section **02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL**. If Section **02 61 13** is not in the project, copy stockpiling information from paragraphs **EXCAVATION WORK PLAN, GEOMEMBRANE, CONTAMINATED MATERIAL STORAGE, and SAMPLING BENEATH STORAGE UNITS** into this section.

Provide separate storage for treated material and solids captured by the pollution control system handling systems. Prepare areas for stockpiling untreated and treated contaminated materials in accordance with Section **02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL**. Provide sufficient area to stockpile [_____] [cubic meters][metric tons] [cubic yards][tons] of untreated contaminated material and [six][_____] stockpiles of [500][_____] [cubic meters][metric tons] [cubic yards][tons] of treated contaminated material.

3.2.6 Fuel System

Perform fuel system installation and testing in compliance with the applicable requirements of **NFPA 30** and either **NFPA 31, NFPA 54** or **NFPA 58**, as appropriate to the type of fuel.

3.3 INSTALLATION/ERECTION/REMOVAL

NOTE: Referenced UFGS should be edited to include only the minimum requirements applicable to a temporary installation.

Perform the installation/erection of the thermal desorption system to allow removal of the system from the site and site restoration. Erect and install the system to incur minimal damage to the existing site environment.[Complete mechanical work in accordance with the requirements of Section **23 30 00 HVAC AIR DISTRIBUTION**.][Complete electrical work in accordance with[Section **33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION**,][Section **33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION**,][and][Section **26 20 00 INTERIOR DISTRIBUTION SYSTEM**][and [_____]].][Complete plumbing work in accordance with[Section **22 00 00 PLUMBING, GENERAL PURPOSE**][, Section **40 05 13 PIPELINES, LIQUID PROCESS PIPING**][and [_____]].]

3.4 STARTUP

NOTE: To streamline the project schedule, startup requirements in this paragraph could be incorporated

into the Field Demonstration activity instead of being a standalone activity. In that case, the subparagraphs for Instrumentation Calibration, Control Interlock Demonstration, and 24-Hour Operation would need to be moved under the Field Demonstration paragraph.

Startup includes material handling systems demonstration, instrumentation calibration, [and] control interlock demonstration[, and 24-hour operation]. Demonstrate that the system is capable of processing material at the proposed feed rate and that the air pollution control system is capable of attaining the required throughput rates during startup operations. Perform startup activities using uncontaminated material.

3.4.1 Startup Plan

Submit a startup plan. Describe control system functions and specific procedures proposed to demonstrate each function and for testing the system with uncontaminated materials; formats and procedures for reporting the material handling demonstration and hot check results; proposed operating procedures for the Field Demonstration with detailed descriptions of the sampling and analysis to be performed.

3.4.2 Systems Demonstration

Demonstrate the contaminated material preparation and feed systems and the treated material and solids captured by the pollution control system handling systems. Do not perform the systems demonstration until written approval is received from the Contracting Officer. The systems and the treated material and solids captured by the pollution control system handling systems must operate continuously at the proposed maximum feed rate for 4 hours without a malfunction or shutdown related to the systems. Conduct the systems demonstration using uncontaminated material. Fugitive emissions, or "dusting" is prohibited.

3.4.3 Instrumentation Calibration

Perform instrumentation calibration to ensure that compliance-related instrumentation functions will be performed reliably and accurately. Calibrate test instruments by a recognized standards laboratory 30 days prior to testing with standards traceable to NIST SP 250. Instrumentation and control system calibrations may be witnessed by the Contracting Officer.

3.4.4 Control Interlock Demonstration

Following instrumentation calibration, demonstrate that control system interlocks and alarms are programmed correctly and are fully functional. Test each alarm point for proper response. Demonstrate alarms, interlocks, and emergency responses (activation of combustion gas by-pass system or an emergency system shut down). Operating conditions which trigger system alarms may be artificially induced in the field, or the control set points may be altered to invoke the desired response alarm. Demonstrate appropriate control system responses (including interlocks, alarms, by-pass activation and/or emergency shutdowns) to each of the specified stimuli.

3.4.5 24-Hour Operation

Place the system in operation under conditions proposed in the Field Demonstration Plan for 24 hours or the treatment of one batch (if a batch system). The system must operate without a malfunction or shutdown related to the contaminated material feed or the treated material and solids captured by the pollution control system handling systems and with the continuous emissions monitoring systems functional throughout the 24-hour operation. Begin shakedown after the 24 hour prove-out period; shakedown may be performed on contaminated materials.

3.4.6 Reporting

An interim letter-report will be acceptable with the results formally reported in the [startup report](#).

3.5 FIELD DEMONSTRATION

NOTE: The need for a formal Field Demonstration should be discussed with the Contracting Officer and would be a function of the uncertainty of the materials to be treated. For well-defined contaminants and contaminated material compositions that are known to be amenable to low-temperature thermal desorption treatment, data obtained from the bench-scale treatability or full-scale system startup should be adequate to negate the need for a formal Field Demonstration. If the contaminants/contaminated material is not known to be amenable to low-temperature thermal desorption treatment, then a formal Field Demonstration in accordance with the following requirements will need to be performed. If a formal Field Demonstration is not required, sufficient startup testing should be done to validate performance prior to ramping up to full-scale operation.

The system should not be approved for operation until acceptable removal and other operating parameters are successfully achieved during the Field Demonstration. Production operating conditions should be established from the Field Demonstration results.

Approved production operating conditions should become contract requirements.

If acceptable removal and other operating parameters are not achieved, production operations should not be approved. Results of the Field Demonstration should be analyzed, and the causes of deficiencies evaluated. The Contractor should be required to make physical and operational changes to the thermal desorption system to bring it into compliance with the required operating parameters and removal efficiencies.

If the first attempt at performing a Field

Demonstration fails, each subsequent attempt should include a separate Field Demonstration report. Second and third Field Demonstrations, if needed, should be performed at no extra cost to the Government.

Upon completion of a successful Field Demonstration, the thermal desorption system should be approved for production operations contingent on the specified operating conditions established from the successful Field Demonstration test results.

A complete Field Demonstration, regardless of similarities between treatment trains, should be conducted on each treatment train of multiple secondary treatment trains or air pollution control trains that are used with a single thermal desorption unit. Each train should be tested simultaneously to the maximum practical extent. For multiple treatment trains that will be operated under different operating conditions or different contaminated material feed rates, each proposed set of conditions should be demonstrated during the Field Demonstration.

An interim operating period should commence within 7 calendar days after receipt of the Field Demonstration test results and the issuance of interim operating conditions. The interim operating period should continue for the total number of calendar days remaining in the period of time allowed for preparation and submittal of the Field Demonstration report and the number of calendar days allowed for review and approval. Loss of potential interim operating time resulting from delays in submittal of an acceptable Field Demonstration report should be the responsibility of the Contractor. The interim operating approval should expire at the end of the period described above and operation should cease until a final production operation approval is issued. Operating conditions during the interim operating period should be determined based upon performance data obtained during Field Demonstration operations. At a minimum, these conditions should include:

a. Total mass feed should be based on the feed rate demonstrated to meet treated material quality standards during preproduction operations.

b. Desorber operating conditions should demonstrate the ability to meet treatment standards during preproduction operations.

c. Air pollution control system operating conditions should be demonstrated during the Field Demonstration to ensure compliance with all emissions standards.

d. Sampling and analysis requirements of treated materials should be in accordance with the Sampling and Analysis Plan.

Conduct Field Demonstration in accordance with the Field Demonstration Plan that is included in the Remedial Action Work Plan.

3.5.1 Schedule

Provide written notification of the anticipated date of the full Field Demonstration at least seven calendar days prior to the projected start date. Field Demonstration operations may begin upon receipt of written approval of the Field Demonstration Plan and written notification that final shake down activities have been completed and that all systems are ready to conduct a full Field Demonstration.

3.5.2 Source of Material

NOTE: Prior to implementing the field demonstration, chemical testing should generally be performed to verify that the materials to be used for the test run contain the contaminants of concern at high enough concentrations to adequately test the system. Additional testing may be warranted to verify that the physical properties of the materials are also representative of site conditions.

Obtain contaminated material used for the field demonstration from [the location specified by the Contracting Officer][_____]. Prior to performing the field demonstration, test each dissimilar type of contaminated material to be used for the field demonstration. Consider the existing site conditions presented in paragraph EXISTING CONDITIONS when selecting sampling locations. The contaminated material samples must have contaminant concentration levels [representative of the average concentration of the contaminants identified][and][greater][than the action level criteria presented in Table 5]. Otherwise, repeat sampling until the contaminant concentration levels exceed the action level criteria. Test samples of contaminated materials intended to be used in the field demonstration in accordance with procedures in the [Field Demonstration Plan][and][UFP-QAPP].

TABLE 5 - ACTION LEVEL CRITERIA	
PARAMETER	ACTION LEVEL CRITERIA
[_____]	[_____]

3.5.3 Operating Conditions

Operate all systems at the conditions specified in the Field Demonstration Plan for the duration of the Field Demonstration.

3.5.4 Field Demonstration Report

Include results of the Field Demonstration, including sample analysis data, calculations, and conclusions within [seven][14][_____] days of the completion of a Field Demonstration in the Field Demonstration report. After completion of the field demonstration, [do not process additional contaminated material until test results from the field demonstration verify that the treated material meets the criteria listed in paragraph PERFORMANCE REQUIREMENTS. Allow [14][_____] calendar days in the schedule for Government review and approval of the field demonstration report.][contaminated material may continue to be processed in an interim operations period.] At a minimum, collect sufficient data during each Field Demonstration to make the following determinations:

3.5.4.1 Quantitative Analysis of the Materials

A quantitative analysis of each contaminated feed, treated material, and pollution control system stream for each individual run for each parameter stated in the Field Demonstration Plan. Once the field demonstration has generated the required quantity of treated material, perform the tests identified in paragraph CONTAMINATED MATERIAL TREATMENT TESTING on representative samples of the treated material. If the treated materials produced during the field demonstration do not meet the criteria in the paragraph PERFORMANCE REQUIREMENTS, process an equal quantity of the same type of material using properly modified operating conditions until satisfactory results are obtained. Return the treated materials that failed the demonstration testing to the contaminated materials stockpile for re-processing during full-scale treatment.

3.5.4.2 Quantitative Analysis of the Stack Gases

A quantitative analysis of the stack exhaust gases for the concentration and mass emissions of constituents listed in paragraph EMISSION CRITERIA[and [_____]]. Continuously measure and record the stack gas velocity and the concentration of constituents listed in paragraph EMISSION CRITERIA[and [_____] in the stack exhaust gases].

3.5.4.3 Material and Energy Balances

NOTE: If the contaminated material characterization data showed negligible chloride content, delete the hydrochloric acid (HCl) requirement.

Compute the mass emission rate of particulates in accordance with 40 CFR 264, Subpart O. If the hydrochloric acid (HCl) emission rate exceeds 1.8 kg 4 pounds of HCl per hour, compute the HCl removal efficiency in accordance with 40 CFR 264, Subpart O.

3.5.4.4 Fugitive Emissions

Identification of sources of fugitive emissions and means of control of the emissions.

3.5.4.5 Continuous Measurement and Recording

Continuous measurement and recording of operating parameters as required in the approved Field Demonstration Plan.

3.5.4.6 Other Requirements

Other monitoring, sampling, and analyses required by the approved Field Demonstration Plan. Submit an Operating Plan based on the Field Demonstration results.

3.6 OPERATION

3.6.1 Dissimilar Materials and Pre-Treatment Material Handling

NOTE: Delete the bracketed text item if dissimilar materials are not known to be present at time of preparing project specifications.

Do not mix together dissimilar materials that either prior testing or field quality control observations during operations have indicated need different thermal desorption operational parameters.[Materials known to be dissimilar at the site are defined in [paragraph EXISTING CONDITIONS][_____]]. Ensure maximum moisture content of the materials to be treated does not exceed [20][_____] percent by weight.

3.6.2 Oversize Material

NOTE: An optional requirement is included if oversize material must be decontaminated before it is transported off-site for disposal.

Reduce the size of oversize contaminated material to less than [2.5 cm one inch][the maximum allowable particle size of the thermal desorption process as defined in the Remedial Action Work Plan][_____]. Treat oversize contaminated material which can be reduced to an allowable size for the thermal desorption process. Remove oversize material that cannot be reduced to an allowable size for the thermal desorption process.[Decontaminate oversize materials in accordance with the procedure developed in the Remedial Action Work Plan.] Dispose oversize material off-site in accordance with[Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIAL][_____].

3.6.3 Treated Materials

3.6.3.1 Temporary Storage of Treated Materials

NOTE: Thermal desorption is a separation process. Combining the air pollution control residuals with the treated materials may make the treated material fail performance requirements. Regulations generally allow combining prior to testing. The second option in the paragraph below applies only to thermal desorption treatment when the treated material is placed into permanent on-site storage. To prevent double handling it is preferable to place treated material directly into the permanent storage area rather than stockpiling until post-treatment

testing is completed.

Do not mix dissimilar contaminated materials, treated materials and solids captured by the pollution control system.[Separate treated material into units (stockpiles) for post-treatment testing. Unit size greater than the quantity pertaining to the most frequent quality control test is prohibited. If the test results indicate the treated materials of a stockpile meet the post treatment criteria presented in paragraph PERFORMANCE REQUIREMENTS, this stockpile of treated materials [may][must][_____] be combined with other stockpiled material which has also met the post treatment criteria.][Place treated material directly into the permanent storage unit after treatment. Place treated material such that the material from specific batches/runs can be defined and removed if it fails post-treatment testing.]

3.6.3.2 Final Disposal of Treated Materials

NOTE: If treated materials are intended to be used as on-site surficial backfill, additional requirements for properly conditioning the soils should be developed in the appropriate specification section. Without additional post-treatment conditioning, soils that have been treated by thermal desorption will generally lack adequate organic carbon content to support vegetation growth.

Dispose treated materials which meet the treatment performance requirements in paragraph PERFORMANCE REQUIREMENTS[off-site in accordance with Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS][in the designated permanent storage unit. Place treated materials in accordance with Section 31 00 00 EARTHWORK].

3.6.4 Change of Operating Conditions

NOTE: If adjustment to the thermal desorption operating parameters is required due to change in contaminated material characteristics, then the Contractor's proposed adjustments should be evaluated by the Contracting Officer for the extent of changes from the previous operating parameters. Further, price negotiation may be required based on the extent of changes from the previous operating parameters.

The following two requirements must be met in order to be considered for change of operating conditions:

- a. The physical and chemical characteristics of the contaminated materials are significantly different from the originally defined characteristics.
- b. The treatment requirements cannot be met under the current thermal desorption treatment plant design and related mix design/operating conditions.

When change of operating condition is necessary, notify the Contracting Officer before changes are made to the operating conditions. The Contracting Officer may require the Contractor to perform a field demonstration for significant changes made to the operating conditions in accordance with paragraph FIELD DEMONSTRATION, for approval. If adjustment to operating conditions is required due to change in contaminated material characteristics, submit an **adjusted operating conditions** for the extent of changes from the previous operating conditions for approval. Further, price negotiation may be required based on the extent of changes from the previous operating conditions.

3.7 FIELD QUALITY CONTROL

3.7.1 Tests

NOTE: Sampling requirements are project specific. Sampling frequency requirements and composite sampling techniques are negotiated with the regulatory agency.

Typically, treated materials from each day are stockpiled separately. Therefore, testing is normally done on a daily basis with varying composite sampling requirements.

Sample and analyze contaminated material feed, treated material, and solids captured by the air pollution control system as allowed by the permits and as specified. The post treatment testing specified in this paragraph is needed by the Government to generate documentation that the thermal desorption treatment has been accomplished in accordance with performance requirements approved by applicable authorities. The results of these tests may be used as part of the Contractor's QC program; however it is the Contractor responsibility to meet the performance requirements specified. Therefore, it is expected that the Contractor will perform additional testing and measurements to ensure that treated materials meet requirements without rejection of batches, retesting, or reprocessing.

3.7.1.1 Stack Emissions Monitoring and Sampling

Provide continuous monitoring with calibration/verification sampling as shown in TABLE 6. Record process parameters at intervals not exceeding one minute. Calibrate sensors with standards traceable to NIST and in conformance with **NIST SP 250**.

TABLE 6 - STACK EMISSIONS MONITORING AND SAMPLING SCHEDULE		
PARAMETER	OPERATING PERIOD	FREQUENCY
Oxygen	[Field Demonstration]	[continuous][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]

TABLE 6 - STACK EMISSIONS MONITORING AND SAMPLING SCHEDULE		
Carbon Monoxide	[Field Demonstration]	[continuous][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Carbon Dioxide	[Field Demonstration]	[continuous][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Total Hydrocarbon (HC)	[Field Demonstration]	[continuous][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Principal Organic	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
[Products of Incomplete Combustion (PICs)]	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Opacity	[Field Demonstration]	[Weekly][Daily][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Particulates	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Hydrogen Chloride	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]
Hydrogen Fluoride	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]

TABLE 6 - STACK EMISSIONS MONITORING AND SAMPLING SCHEDULE		
Metals	[Field Demonstration]	[in accordance with Field Demonstration Plan][_____]
	[Interim Operations]	[_____][not required]
	[Operations]	[_____][not required]

3.7.1.2 Contaminated Material Treatment Testing

NOTE: The values shown in Table 7 for frequency of testing are only examples and need to be determined on a site specific basis. Coordinate the properties in this table with the properties in paragraph PERFORMANCE REQUIREMENTS. It may be acceptable to change the number of samples during development of a UFP-QAPP, but the Designer should attempt to establish a reasonable sampling frequency in the specifications to provide a basis for the Contractor to bid the project.

Collect confirmation samples for post treatment testing in accordance with the [UFP-QAPP][basewide QAPP] and this paragraph. Analyze samples for the parameters listed in paragraph PERFORMANCE REQUIREMENTS. Collect samples for testing at a minimum frequency [provided in Table 7][_____]. Complete all other sampling and analysis activities in accordance with the [UFP-QAPP][basewide QAPP][_____] (including but not limited to sample handling, preservation, transportation, [collection][analysis] of quality control samples, data validation, and data reporting). Any deviations to sampling frequency, number of samples, or sample collection methods must be [established in the approved [UFP-QAPP][basewide QAPP]][approved by the Contracting Officer].

TABLE 7 - MATERIAL SAMPLING FREQUENCY REQUIREMENTS			
PROPERTY	MATERIAL SAMPLING FREQUENCY [cubic meter][metric ton][cubic yard][ton]		
	CONTAMINATED MATERIAL	TREATED MATERIAL	SOLIDS CAPTURED BY THE POLLUTION CONTROL SYSTEM
[_____]	One per [100][_____]	One per [100][_____]	One per [100][_____]

3.7.1.3 Retesting and Reprocessing

NOTE: An option is provided for retesting treated contaminated materials which fail to meet

performance requirements. Retesting without first reprocessing treated contaminated materials should generally be prohibited unless there is reason to believe the original test result was inaccurate due to mislabeling/mishandling of the sample or analytical error discovered during validation of laboratory results (simply believing that a sample did not reflect the treatment is not sufficient to consider a result inaccurate).

If thermal desorption treated material is being sent off-site for disposal, do not permit retesting unless there is reason to believe the original test result was inaccurate as described in the paragraph above. This is because waste characterization and disposal is based on grab sampling results, and averaging of sampling results cannot be used to determine that a waste meets regulatory disposal requirements.

Reprocess and then retest units of treated contaminated materials that do not meet the post-treatment criteria in paragraph PERFORMANCE REQUIREMENTS[or quality assurance testing]. [The Contractor may propose to retest failing units of treated contaminated soils prior to reprocessing. If the Contracting Officer approves retesting, collect and test two additional samples for the failed parameter(s). If both samples pass, re-processing the unit will not be required. If either sample fails, reprocess the unit.]

3.7.1.4 Government Quality Assurance Testing

NOTE: Consider the need for quality assurance testing on a project-by-project basis. If QA testing is unnecessary, delete this paragraph. Factors to consider include whether the Government has access to a laboratory that can analyze quality assurance samples in a timely manner to not delay the project execution. Use of quality assurance testing data use also needs to be considered. A relatively straightforward data use is to compare quality assurance sample results to the project Performance Requirements, and failing result would be treated the same way as a failing Contractor test result. A more complicated data use is to compare results from quality assurance samples and contractor quality control samples for the purpose of determining if there is meaningful disagreement between the results. In this case, procedures would need to be developed for determining when there is a meaningful disagreement between quality assurance and quality control sample results; corrective actions for when a meaningful disagreement was identified would also need to be developed. The process of defining procedures for identifying and correcting meaningful differences should be documented in a project-specific Quality Assurance Project Plan and referenced in this specification;

the process is likely to complex to be adequately defined in this specification.

Provide duplicate samples to the Government's quality assurance laboratory for Government quality assurance. Submit samples at a frequency of one set of samples per [10][_____] sets of quality control tests performed. Quality assurance samples will be tested for the same parameters as the parent quality control sample. Provide additional quality assurance samples upon request.

3.7.2 Inspections

3.7.2.1 Visual Inspections

Inspect the thermal desorber and associated equipment (pumps, valves, conveyors, pipes, etc.) for leaks, spills, fugitive emissions, and signs of tampering or mechanical failure as indicated in TABLE 8. Inspect feed materials for changes in composition and presence of particles larger than [gravel][_____] size. Visually inspect treated materials to confirm that maximum clump size is being met as defined in paragraph PERFORMANCE REQUIREMENTS.

TABLE 8 - VISUAL INSPECTION SCHEDULE	
PHASE OF OPERATION	MINIMUM INSPECTION FREQUENCY
Field Demonstration	[Once per 8-hour shift][Daily]
Interim operations	[Once per 8-hour shift][Daily]
Operations	[Daily][Weekly]

3.7.2.2 Interlocks, Automatic Cut-Offs and Alarms

Test interlocks, automatic contaminated material feed cut-off and associated alarms [weekly][_____].

3.8 OPERATIONS REPORTS

Submit operations reports [daily][weekly] for the first [10][_____] weeks, and at a frequency of [_____] thereafter. The operations reports must consist of a log of operating conditions including, but not limited to:

- a. Hours of operation.
- b. Staffing.
- c. Weather conditions.
- d. Process materials tracking schedule.
- e. Sample shipment (including chain of custody documents).
- f. Receipt of analytical results.
- g. Changes in operating parameters.

- h. Results of the testing and calibration activities.
- i. Inspection and maintenance activities.

Attach the physical and chemical test results generated onsite or received from offsite laboratories to the report. Include the following information with test results: time of sampling, location of sampling, and Contractor Quality Control (such as duplicate sample analysis, field and trip blank analysis, laboratory QC analysis) results. Perform data validation of the test results [in accordance with the project UFP-QAPP][before submittal].

3.9 DEMOBILIZATION

NOTE: If there is a separate Specification Section which provides overall requirements for demobilization/site cleanup, such as 01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS, move the requirements from this paragraph into that Section.

Follow the approved mobilization and demobilization plans submitted as part of the Remedial Action Work Plan. Demobilize to restore the site to its initial state, prior to the construction and operation of the thermal desorption treatment facilities. Do not commence demobilization until written approval is received from the Contracting Officer. Demobilization must include, but must not be limited to: [disconnecting of utility service lines,][decontamination and removal of equipment and materials,][disposal of decontamination wastes,][disposal of any residual wastewater,][removal of unused amendments and other materials,] [removal of material overlying liners,][removal of liners,][regrading and removal of berms,][demolition and disposal of the treatment pad, other foundation slabs, and paved surfaces,][_____]. [Perform post-treatment testing of soils below stockpile storage units and work area surfaces in accordance with Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL.]

-- End of Section --