RF/ER-95-0103.UN

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PROPOSED ACTION MEMORANDUM AND DRAFT MODIFICATION OF COLORADO HAZARDOUS WASTE CORRECTIVE ACTION SECTION OF THE OPERATING PERMIT FOR ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

September 12, 1995

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Rev. 4
Document Number RF/ER-95-0103.UN

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ACRONYMS

APENS	Air Pollution Emissions Notice
CCR	Colorado Code of Regulations
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
HEPA	High efficiency particulate air
Hg	Mercury
HSP	Health and Safety plan
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
PAM	Proposed Action Memorandum
PCE	Tetrachloroethene (perchloroethylene)
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
SQL	Sample quantitation limit
TCE	Trichloroethene (trichloroethylene)
TCLP	Toxicity Characteristic Leaching Procedure
TD	Thermal desorption
VOCs	Volatile organic compounds

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1.0 INTRODUCTION

This Proposed Action Memorandum (PAM) and draft modification of the Corrective Action section of the operating permit has been prepared to enhance available information regarding storage and treatment of contaminated soils resulting from expedited cleanup activities at Individual Hazardous Substance Site (IHSS) 109, Operable Unit 2, Rocky Flats Environmental Technology Site (RFETS). IHSS 109 is also known as Ryan's pit. Ryan's pit was used as a disposal site for various organic chemicals from approximately 1966-1970. A PAM (Document Control Number RF/ER-95-0097.UN) under the Rocky Flats Interagency Agreement (IAG) has been previously prepared which focuses on source removal at Ryan's pit. This PAM addresses the proposed processing of contaminated soils using thermal desorption (TD) technology and was developed to complement the source removal PAM. This document provides specific information on contaminated soils storage, processing, equipment decontamination, health and safety, and the use of TD as a significant waste minimization opportunity. The container storage section described below is included to formalize requirements if the soil is to be in storage for greater than 90 days.

The container storage areas and the thermal desorption treatment unit discussed in this document are considered Temporary Units under 6 CCR 1007-3, 264.553. As identified under this regulation, the Temporary Unit classification applies due to the short time frame for operation of the storage and thermal desorption unit, the mobile nature of the equipment, and the small volume of soil to be treated. The activities described under this permit modification are expected to be conducted in the fall of 1995. However, due to factors such as equipment and funding availability, this permit modification is to be in place until July 1, 1996. This corrective action permit modification outlines the approach that will be taken and the applicable requirements for the removal of organic contaminants from soil at Ryan's pit. These organic contaminants are Comprehensive Environmental Response Compensation and Liability Act (CERCLA) hazardous substances and Resource Conservation and Recovery Act (RCRA) hazardous waste constituents which are contained in an environmental media (soil). Except where specifically cross-referenced, other sections of the operating permit are inapplicable to this action.

2.0 TREATMENT AND STORAGE UNITS

2.1 Storage

Contaminated soil excavated from Ryan's pit will be placed into roll-off containers prior to processing at the mobile thermal desorption unit. The contaminated soil will be managed according to the requirements listed below. These requirements generally govern the condition and compatibility of containers with waste materials and the management and inspection of the containers. After completion of the excavation activities, the roll-off containers will be moved to an area designated for processing by the mobile thermal desorption unit. Following processing and evaluation of confirmation samples, the clean soil is expected to be returned to Ryan's pit for final disposition.

The specific requirements that shall be followed to ensure proper handling of the contaminated soil while in storage are:

- All containers holding contaminated soil shall be in good condition (6 CCR 1007-3, 264.171).
- All containers holding contaminated soil will be made of, or lined with, materials that will not react with the contained material (6 CCR 1007-3, 264.172).

- All containers holding contaminated soil will remain closed during storage except when it is necessary to add or remove contaminated soil. Canvas or plastic tarpaulins may be used as a cover device to close the roll-off containers. The roll-offs will be handled in such a way as to preclude leakage or rupture at any time (6 CCR 1007-3, 264.173).

- All containers holding contaminated soil shall be inspected weekly in the period after excavation and before processing. The focus of these inspections shall be to look for leaks and for deterioration caused by corrosion or other factors. A log book documenting these inspections and all deficiencies and corrective actions shall be kept (6 CCR 1007-3, 264.174).

- Roll-off containers used for the storage of contaminated soil will be manufactured such that the base of the container will be elevated. This elevation will protect the contaminated soils within the roll-off containers from contact with precipitation caused by runoff on the land surface (6 CCR 1007-3, 264.175(c)(2)) and also allows for visual inspection for leaks.

Additional requirements will be placed on liquid organic contaminants recovered from the thermal desorption units condenser. The requirement that shall be followed to ensure proper handling of the condensate while in storage is:

- A temporary secondary containment system will be established which protects against release of recovered liquid organic contaminants into the environment. The condensing unit on the thermal desorber will be considered a container. Secondary containment will be established around this container which allows for complete capture and retainment of the entire condenser contents if the condenser were to be breached. Secondary containment will also be established for 55-gallon drums or other similar containers which contain recovered organic waste removed from the thermal desorption unit's condenser. This secondary containment will be designed and operated to contain the contents of one 55-gallon drum and a minimum of 10 percent of the liquid waste volume stored within the secondary containment. This containment will be free of cracks or gaps and will be sufficiently impervious to contain leaks. The containers within the secondary containment system will be elevated by pallets or similar devices to prevent contact with accumulated liquids. Run-on into the secondary containment system will be prevented by the walls of the system. Any spilled or accumulated liquids (including precipitation) will be removed within 24 hours after detection (6 CCR 1007-3, 264.175). Spills of organic condensate will invoke the Contingency Plan contained in Part VI of the RFETS Part B Permit.

The staging area for roll-offs containing contaminated soil and 55-gallon drums of organic waste will have signs posted and labels placed in conspicuous locations, indicating appropriate dangers.

2.2 Treatment

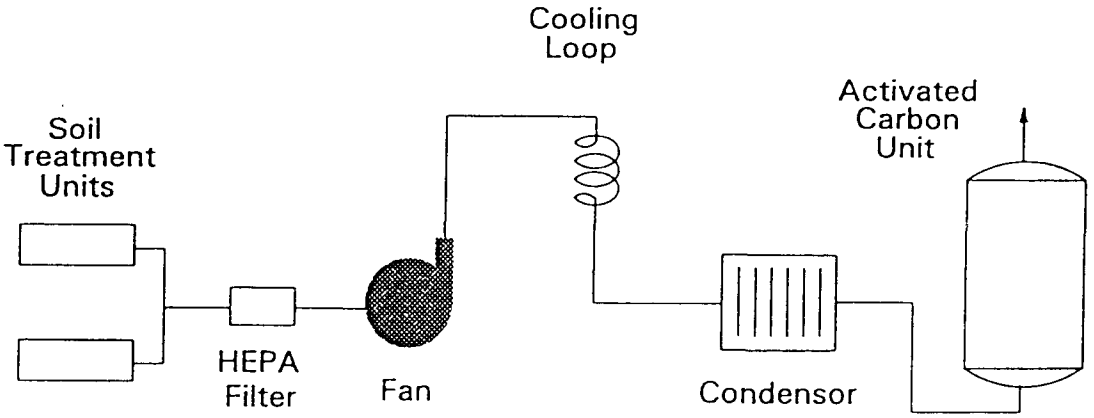
A low-temperature thermal desorption system will be used to remove volatile organic compounds (VOCs) in a non-destructive manner from soils excavated from Ryan's pit. The soils will be processed on a batch-by-batch basis by passing air through the contaminated soil to volatilize or "strip" the VOCs from the soil into the vapor phase. In addition to the air sweep, heat and vacuum will be applied to the soils to enhance the VOC-stripping process. The vapor-phase contaminants will then be recovered by condensation and activated carbon adsorption.

Additional description of the thermal desorption system components, operation, and secondary waste streams that will be generated is presented below. The operating data (i.e., batch size, temperature, etc.) presented in Subsection 2.2.1 are typical of batch-operated, low-temperature thermal desorber systems but may not describe the exact unit contracted for this task.

2.2.1 System Description and Operation

Figure 1 presents a process flow sheet of the thermal desorption process. VOC-contaminated soil is loaded into the soil treatment units in batches. Each soil treatment unit may be loaded with up to six cubic yards of soil. However, due to the high moisture content levels that may be encountered in Ryan's pit, it is anticipated that each unit will be loaded with approximately four cubic yards of soil to

Figure 1
Thermal Desorption Process Flowsheet



more efficiently strip the soil. Feedstock soil will be transferred from covered storage containers (i.e., roll-offs) to the soil treatment units with a backhoe, Bobcat, or other type of heavy machinery. The soil treatment units are constructed of heavy structural steel and are capable of supporting the weight of a backhoe or other large machinery. The structural steel construction makes the units suitable for treating soils containing hazardous waste. Prior to unloading, a storage container (e.g., roll-off) will be located as close to the desorber as possible to minimize the distance the soil will have to be moved by the backhoe or Bobcat. If free liquids are encountered during excavation activities, additional site preparation will take place to prohibit any spill of free liquids contaminating clean areas.

Soil clumps loaded into the treatment units that are greater than eight inches in diameter will be broken into smaller pieces. Low-temperature batch desorption is capable of effectively removing VOCs from soil clumps up to eight inches in diameter.

The thermal desorber may be equipped with up to four soil treatment units for maximum throughput. Because of the relatively small volume of contaminated soil associated with the Ryan's pit remediation project (approximately 200 cubic yards), the two-unit system illustrated in Figure 1 is expected to be used. Processing capability of the two-unit system is approximately 4 tons per hour (2.5 cubic yards/hour). Once loaded, the soil treatment units are closed and an air sweep is induced across the soil beds by a fan unit. The air sweep creates a slight vacuum (i.e., 700-750 mm Hg) in the soil treatment units which serves to enhance the VOC stripping rate. Stripping is also enhanced by the indirect heating of the soil. Heat is generated by burning propane (or natural gas) and passing the hot combustion gases through metal tubes located above the soil in the treatment units. Heat from the combustion gases is transferred through the tube walls to the air sweep and soil. All three heat transfer mechanisms are present: conduction, convection, and radiation. The energy input rate of the thermal desorber is approximately 1.5 million BTU per hour. This heating rate is achieved by burning approximately 28 gallons of liquid propane fuel per hour. Soil operating temperatures range from 150 to 300 degrees Fahrenheit.

The VOC contaminants contained in the air sweep/offgas exiting the soil treatment units are treated prior to discharge. First, a high efficiency particulate air (HEPA) filter is used to remove any soil particulates that may be entrained in the offgas. The offgas is then cooled by a condenser to recover the majority of water and VOC contaminants as liquids. Because the condenser produces liquid wastes, secondary containment will be provided around the condenser unit. No chemicals are added as part of the desorption process; thus, no chemical incompatibilities are anticipated. The condenser is the first unit that concentrates the desorbed contaminants. As noted above, both the VOCs and water are condensed simultaneously. Following the condensing process, the offgas is polished with vapor-phase activated carbon to recover residual VOCs prior to discharge.

The thermal desorption unit will be operated in accordance with the thermal treatment standards found in 6 CCR 1007-3, Subpart P of Section 265. Additionally, the air emission standards for process vents and equipment leaks defined in 6 CCR 1007-3, Subparts AA and BB of Section 264, will be followed as appropriate. The vendor supplying and operating the thermal desorption unit may demonstrate to the Colorado Department of Public Health and Environment that alternative temporary unit standards are appropriate. These alternative standards would then be considered part of this permit modification.

2.2.2 Waste Acceptance Criteria for Thermal Desorption Unit

Criteria are established below to ensure the safety of workers and the protection of equipment during the processing of contaminated soil. Debris, such as wood, scrap metal and glass, may be encountered during source removal activities and will not be restricted from processing as long as the debris can be sized to fit into the desorption unit. Clumps of contaminated soils will be broken up if their diameter exceeds eight inches in length to ensure that all internal volumes are treated. In addition to the general requirements stated above, the following is a list of specific items that will be prohibited from treatment with this thermal desorption unit if encountered in material removed from Ryan's pit:

- Items that are explosive as defined by the Department of Transportation (49 CFR 173.5, Subpart C);
- Items that are corrosive (6 CCR 1007-3, 261.22);

- Items that are reactive (6 CCR 1007-3, 261.23); and
- Unexpected items encountered during field activities in which unresolved questions exist regarding personnel safety or the protection of equipment.

2.2.3 Volatile Organic Compound Concentrations in Contaminated Soils

In May, 1995, four samples were collected from Ryan's pit and analyzed for volatile organic compounds. The following is a preliminary listing of the maximum concentrations detected*. Only contaminants of concern for which concentrations exceed 1 ppm are included.

Compound	Concentration (mg/kg)
1,1-dichloroethane	4.7
1,1,1-trichloroethane	430
trichloroethene (TCE)	20
4-methyl-2-pentanone	5.3 J**
tetrachloroethene (PCE)	470
toluene	310
ethylbenzene	92
xylene (total)	590

*Data are unvalidated
** J qualifier for organic detections indicates estimated result

These concentrations may be indicative of average concentrations of volatile organics within Ryan's pit. However, higher concentrations are likely, including the probability of free product. Additional sampling for volatile organic compounds will be conducted after the contaminated soil is removed from the ground prior to processing in the thermal desorption unit.

2.2.4 Performance Standards

The following performance standards are being established for removal of VOCs from soils originating in Ryan's pit. These concentration levels were taken from A Guide to Delisting RCRA Waste for Superfund Remedial Responses, Office of Solid Waste and Emergency Response Directive 9347.3-09FS, September, 1990. Soils meeting these performance standards are uncontaminated environmental media and may be returned to Ryan's pit or used as fill elsewhere.

Compound	Concentration (mg/kg)
1,1-dichloroethane	0.0114
1,1,1-trichloroethane	222.9
trichloroethene (TCE)	1.146
4-methyl-2-pentanone	1641
tetrachloroethene (PCE)	3.43
toluene	1.173E+4
ethylbenzene	4984
xylene (total)	2.177E+5

If results from laboratory analysis of after-process samples come back as non-detections, at sample quantitation limits (SQLs) exceeding the performance standards, then the processing goals are considered achieved. Soils meeting these performance standards are uncontaminated environmental media and may be returned to Ryan's pit or used as fill elsewhere, providing average radiological contamination levels do not exceed risk-based programmatic Preliminary Remediation Goals for subsurface soils. Debris processed through the thermal desorption unit will be evaluated using after-process soil samples to the same performance standards established for Ryan's pit soils. It is expected that the final disposition of debris will be consistent with the processed soils.

2.2.5 Secondary Waste Streams

The thermal desorption process described will generate several secondary waste streams. These waste streams include condenser liquids, spent HEPA filter media, and spent activated carbon. The condenser liquids will consist of free-phase organic liquids and water (i.e., two phases). Depending on the volume of recovered water, the water may be separated from the free-phase organic liquid and sent to the central treatment system, located in Building 891, or the Operable Unit 2 field treatment unit (or a combination of the two) for subsequent treatment. The other waste streams may be contaminated with low levels of organic contaminants. These waste streams, including the free-phase organic liquids, will be drummed, characterized, and shipped offsite for proper disposal as a hazardous waste, as appropriate. These waste streams are expected to be free of radiological contamination. This determination will be verified after generation and before waste is sent offsite.

Soil particulates recovered by the cyclone will be recombined with the treated soils. Waste water from decontamination activities will also be generated at the conclusion of the soil processing task. These liquids will be managed according to procedures described in the following section.

3.0 CLOSURE

This section addresses appropriate Temporary Unit closure requirements for the closure of the roll-off containers and thermal desorption treatment unit.

Following the completion of contaminated soil processing, the following materials will be removed from the thermal desorption unit:

- Soil;
- Organic condensate;
- Granulated activated carbon; and
- Used HEPA filters.

Recovered organic contaminants (organic condensate), granulated activated carbon and the used HEPA filters will all be characterized for proper disposal. Soil removed from the thermal desorption unit will be temporarily placed into previously decontaminated roll-off containers, waiting for the results of confirmation samples to evaluate the attainment of the performance standards listed in Section 2.2.4. Following evaluation, the processed, clean soils will be returned to the former trench site. The thermal desorption unit and roll-off containers will then be decontaminated according to procedure number 4-SO-ENV-OPS-FO.04, Decontamination of Equipment at Decontamination Facilities. Performance standards are part of this procedure. The decontamination procedure requires project personnel to complete an "Equipment Decontamination/Wash Checklist and Record" sheet. Project personnel must verify that equipment has been decontaminated to the levels specified in the procedure ROI 3.02, "Performance of Surface Contamination Surveys". This procedure incorporates the radiological release levels codified in 10 CFR 835, Radiation Protection for Occupational Workers. Performing radiological decontamination to the levels specified in 10 CFR 835 will ensure that all other forms of contamination are similarly removed.

Decontamination methods and solutions are described in the referenced procedure. Volumes of waste water generated during decontamination will depend on levels of contamination, the configuration of the vendors thermal desorption unit, etc. However, all efforts will be made to limit the amount of decontamination water generated, while still meeting the release standards specified in ROI 3.02.

It is expected that this large scale decontamination will take place at the site's centralized decontamination facility located in the contractor's yard. Both the roll-off containers and thermal desorption unit are expected to be returned to the owners for subsequent use after decontamination.

4.0 WASTE ANALYSIS PLAN

A task specific sampling and analysis plan has been prepared for this task (Document Control Number RF/ER-95-0107, Sampling and Analysis Plan for the Remediation of Ryan's Pit, Operable Unit 2). Elements of the plan include data quality objectives, number, types and locations of samples, and references to analytical and sampling procedures. This plan includes both pre- and post-process sampling activities and is the vehicle for collecting and analyzing volatile organic data to perform a hazardous waste determination following processing. This plan was reviewed by the Colorado Department of Public Health and Environment and the Environmental Protection Agency.

The contaminants of concern for this response action are volatile organic compounds. For the purposes of this action, these contaminants are CERCLA hazardous substances and hazardous waste constituents which are contained in an environmental media (soil). CERCLA hazardous substances are defined in Title 40 of the Code of Federal Regulations, Section 302.4 and include RCRA hazardous waste constituents (6 CCR 1007-3 Section 260.10). A hazardous waste determination will be made on the volatile organics once they are removed from the soil matrix according to 6 CCR 1007-3, Section 262.11.

At Rocky Flats, tetrachloroethene has been identified with four separate hazardous waste codes in the RFETS Part B Permit. Process information has indicated that tetrachloroethene has been generated as a spent solvent used in de-greasing, a spent solvent which was not used in de-greasing, and as a discarded, unused or off specification chemical product. In these instances, the following waste codes have been applied, respectively: F001, F002 and U210. Tetrachloroethene has also been classified as a characteristically hazardous waste with the waste code D039 which would indicate that the process that generated the waste was not "listed" by RCRA or that the waste generating process was not known and that the waste's "characteristics" were used to classify the waste.

Since disposal at Ryan's pit took place between 1966 and 1970, the original waste generation process is unknown. Therefore, when organic contaminants are recovered in the TD's condenser, an evaluation to a concentration based standard, the RCRA Toxicity Characteristic Leaching Procedure (TCLP), will be performed to classify the recovered organics. It is likely that once recovered and concentrated in the TD's condenser, the organics will exceed RCRA characteristic standards, and will, therefore, be sent offsite as a hazardous waste for proper treatment.

5.0 WASTE MINIMIZATION

Contaminated soil processed through a thermal desorption unit results in a significant reduction in waste handling and offsite disposal because of the nature of the technology. Essentially, the technology uses a low temperature heat source to volatilize organic materials (without destroying them) contained in a soil matrix. The volatile organics are separated from the soil as a gas and then redeposited in a condenser when the gases are subsequently cooled. The chemical composition of the contaminants and the mass of contaminants are not changed during the process. Following processing, the soil no longer contains the volatile organics and can be returned to the place of origin. The contaminants are removed from the thermal desorbers condenser and sent offsite for treatment and disposal as a hazardous waste. The volume of waste sent for offsite treatment is, therefore, significantly reduced over sending all contaminated soil offsite for treatment and disposal.

6.0 AIR EMISSIONS

As a result of the volatile organic compounds that will be processed during this task, an Air Pollution Emissions Notice (APENS) will be prepared for review by the Colorado Air Quality Control Commission.

7.0 TRAINING

All excavation, monitoring and processing will be performed under a task specific health and safety plan (HSP) in accordance with Occupation Safety and Health standards in 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. Training will include respirator fit tests, hazardous waste operations, and radiological training as required by the specific job function. All task-specific training requirements will be listed in the HSP and will be followed.

8.0 CONTINGENCY PLAN

Generally, Part VI of the Rocky Flats Part B permit will be followed for contingency planning purposes. However, because of the limited nature of this task, preparation of separate contingency planning documents such as an evacuation plan will be covered by the task specific health and safety plan. The task specific health and safety plan will be reviewed by all personnel working within the exclusion zone boundaries at the task site.

The contingency plan describes various criteria for classification of releases of hazardous waste. Some volatilization of organic contaminants is expected during the removal, storage and subsequent transfer of soils to the thermal desorption processing unit. This volatilization will be monitored for the duration of the project and will be considered a permitted release. However, any spills of liquid hazardous waste from primary containment will invoke the entire contingency plan contained in Part VI of the RFETS Part B Permit.