MANAGEMENT OF EXCAVATED SOILS AT THE Y-12 PLANT

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ABSTRACT

Construction activities at the U.S. Department of Energy (DOE) Y-12 Plant* have often required the excavation or other management of soil within the facility. Because some of this soil any be contaminated, Martin Marietta Energy Systems, Inc. (Energy Systems) adopted specific policies to ensure the proper management of contaminated or potentially contaminated soil at the plant. For determining soil management options, a system is provided using applicable regulatory requirements and cost effective decisions.

The regulatory requirements associated with contaminated soil are complex and will vary according to site conditions. This Soil Management Plan provides a standardized method for managers to determine the options available for selecting soil management scenarios associated with construction activities at the Y-12 Plant. Managers can identify applicable regulatory requirements and make cost-effective, defensible soil management decisions by utilizing a system that includes area maps which identify the regulated areas and a brief description for each of the regulated areas.

INTRODUCTION

The Soil Management Plan for the U.S. Department of Energy (DOE) Y-12 Plant was developed to enhance the quality of soil management decisions in light of the regulatory requirements impacting a given management scenario. In particular, the use of decision trees and the accompanying analysis will bring consistency and logic to an otherwise inflexible system that fails to interpret individual situations. Successful use of the Plan will result in improved soil management decisions that cost less to implement, reduce liability, and increase the level of compliance currently experienced at the facility.

In its simplest form, this Plan supports the concept that each soil generating project must be viewed independently. Generalized practices result in oversimplification of the regulatory conditions and can be detrimental for the facility as well. Routine containerizing and storage of soil is expensive, can result in misclassification of the soil, and can lead to noncompliance as both Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) have limitations on certain types of storage unless covered by an extension and/or the Federal Facility Compliance Agreement (FFCA).

A decision tree and analysis have been developed for five types of contamination, as well as for soil where no contamination is suspected. For each type of soil contamination, the decision tree and analysis identifies and discusses: applicable, current regulatory requirements; sampling and analysis requirements; and management and/or disposal options available.

DECISION ANALYSIS

For completeness and to assist in ongoing efforts to address the nature and extent of contamination at the Y-12 Plant, a clean soil decision tree was created in addition to those for various regulatory programs. Although no regulatory basis for this decision tree exists (because soil located outside an area that is subject to regulation does not require testing of any kind), prudence would suggest the establishment of some level of assessment. The placement of the entire Oak Ridge Reservation on the National Priorities List (NPL) and the state Superfund list indicates that all areas within the Y-12 Plant may be suspected of containing some level of contamination. If there are indications of contamination (e.g., gross staining or strong odors) once soil excavation or movement begins, duties to report and various other cleanup requirements (e.g., underground storage tank rules) may be triggered. In the clean soil and other decision trees, reference is made to sampling and analysis for indicator parameters. This is a preliminary survey of the conditions associated with an area and is intended to indicate the presence or absence of contamination, not to fully characterize the area, such as would occur under a RCRA or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedial action.

When no contamination is known or no prior sampling and analysis has occurred, the presence or absence of contamination should be documented using a screening process consisting of two major steps. First, the location should be reconnoitered to collect information on potential sources of contamination, visibly contaminated soils, and other parameters based on professional judgment and considering the historical use of the area and its proximity to activities that might have impacted the location at some time. Second, soil samples should be collected and analyzed in a laboratory only if the initial screening indicates the likely presence of contamination. The extent of sample collection shall be based on the size of the area, what the initial screening shows, and professional judgement. The analysis will provide additional information about the nature of the contamination or will deny that contamination is present. The Clean Area Decision Tree will be followed to evaluate these locations.

* Managed by Marietta Energy Systems, Inc., for the U.S. DOE Under Contract DE-AC05-84OR 21400

Using the Master Decision Tree

Five *distinct* types of contaminated or potentially contaminated soil are expected to be present at the facility, and five decision trees have been developed to relate the regulatory requirements and options. The master decision tree should be used as a guide to the program-specific decision trees. Proper utilization of the decision trees requires that the user first read the master decision tree and then read through all applicable regulatory program decision trees. Any construction engineering plans developed for use at the facility should consider whether soil will be disturbed as a result of the plan's execution. Soil movement of any kind should be subjected to the decision trees and analysis. Figure 1 diagrams the process for managing soil under this Soil Management Plan.

Once it is determined that a given project will involve soil management, the location must be identified on area maps showing the location of regulator units and be followed by a field verification of the actual conditions. If the project will not overlap areas subject to a regulatory program, the clean soil decision tree should be reviewed. If the project will involve soil management in an area subject to a regulatory program, an alternative location should be sought. If this is accomplished, the clean soil decision tree should be reviewed to manage soil in areas where there is no suspected contamination.

In many cases where soil will be subject to regulatory programs, the option of soil replacement or putting the soil back where it came from will be available. Limitations on the use of this option exist and are discussed in more detail. However, because much of the soil excavation and movement will be due to construction activities, it may not be possible to accommodate the entire volume of soil. In these cases, the calculated volume of soil not to be returned to its original location will be subject to different management scenarios under different regulatory programs. Best management practices and other applicable parts of the Clean Water Act regulations should be reviewed to assess requirements to ensure the control of erosion or runoff due to contaminant migration. Soil movement within a regulated area (e.g., an operational unit [OU]) must be carried out by workers trained in accordance with the Occupational Safety and Health Administration's Hazardous Waste Operations and Emergency Response Standard (29 Code of Regulations [CFR]

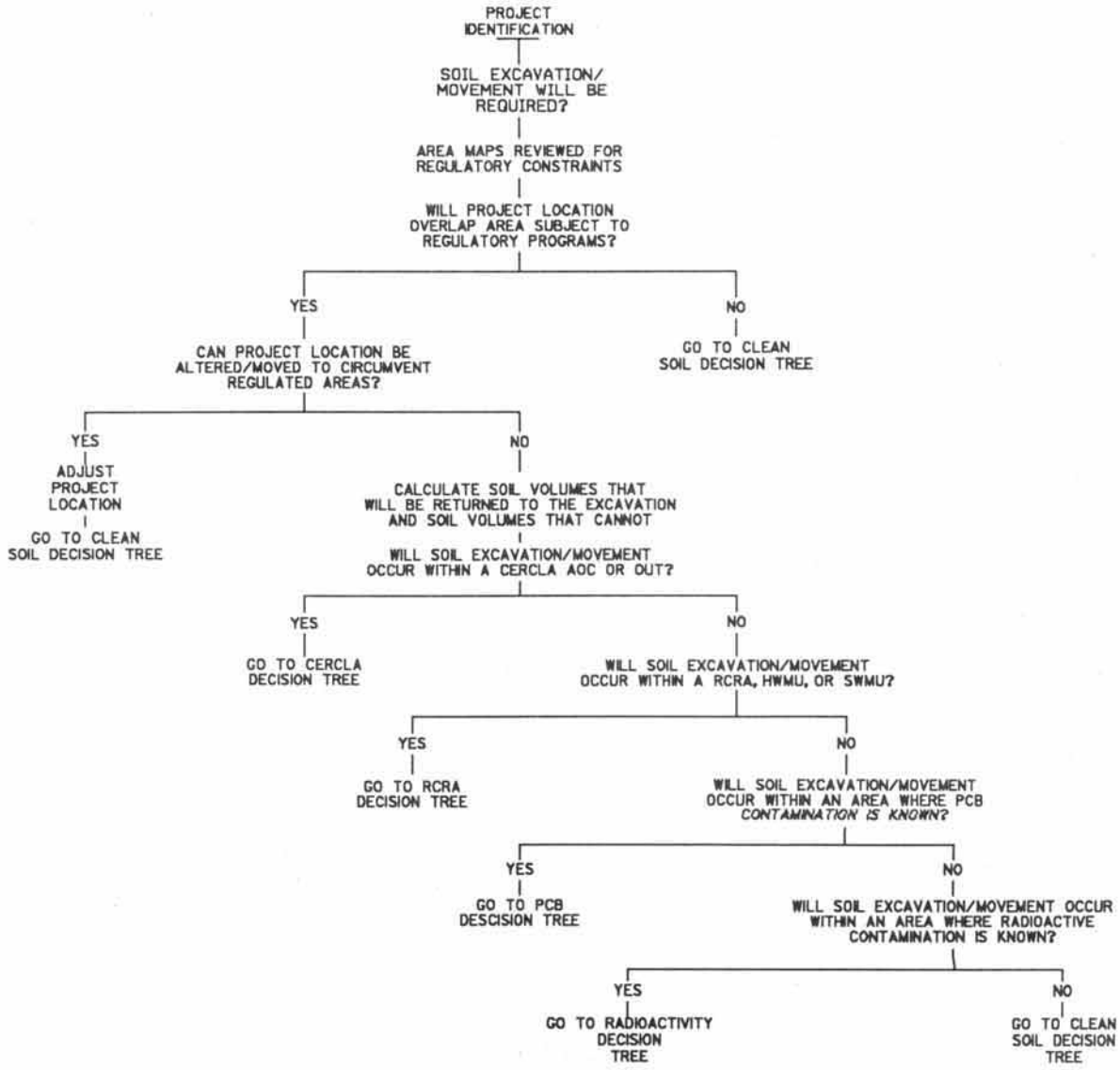

Fig. 1. Master decision tree.

1910.120(e)). Program-specific decision trees should be reviewed before continuing with the planned project.

Using the CERCLA Decision Tree

Excavation or movement of soil within an area of containment (AOC) is subject to certain constraints and allowances. An AOC can be made up of one or a number of OUs or study areas and is delineated by the boundaries of contiguous contamination. Such contamination must be continuous, but may contain varying concentrations of hazardous substances [Office of Solid Waste Directive 9347.3-05 FS, 55 FR 8758]. Depending on site characteristics, one or more AOCs may be delineated. The function of an OU is very broad, as evidenced by its definition provided in the revised National Oil and Hazardous Substance Pollution Contingency Plan (NCP), the regulations implementing CERCLA (40 CFR 300). The definition of an OU reads:

> ...a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of OUs, depending on the complexity of the problems associated with the site. OUs may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site.

Projects involving soil management will be impacted by CERCLA if they fall into a designated regulatory area, i.e., an AOC, an OU, an area slated for a removal action (RA), or an area slated for a preliminary assessment/site investigation (PA/SI) or remedial investigation/feasibility study (RI/FS). While areas where soil excavation or movement occurs may not officially be called an AOC or OU, the areas undergoing PA/SI, RI/FS or RA are potentially subject to the rules associated with operations within an AOC because of the broad definition of AOC and OU. Figure 2 diagrams the process for managing soil under CERCLA.

The implementation of a removal action (RA) indicates that an area contains contamination which poses imminent and substantial danger to public health. Any construction project planned in an area that is subject to a RA shall be reviewed to determine whether the project should be pursued. Soil excavated from an area in which a RA is pending should not be returned to the excavated area.

Specific project construction and engineering plans shall be reviewed to assess the soil volumes to be excavated, the required depths of the excavations, and the total displacement that will occur because of the project.

Soil excavated from one of the identified regulatory units may be returned to its excavation point, and the return of the soil is not considered to be placement when moving soil within a unit (55 FR 8758). The concept of placement triggers other regulatory controls, namely RCRA land disposal restriction (LDR) requirements. The Environmental Protection Agency (EPA) interprets placement to mean putting hazardous wastes into one of these units, not the movement of waste within the unit (55 FR 8759, 51 FR 40577, and 54 FR 41566). The preamble to the NCP further clarifies that normal earthmoving and grading operations within a unit would not be considered placement and thus would not trigger LDRs (55 FR 8759-60).

Soil that has been excavated from one of the identified units and that cannot go back into its original excavation due to engineering constraints may be placed in other areas within the same AOC (53 FR 51444-5). If the soil volume is greater than can be accommodated in an AOC, the excess soil must be managed as a contaminated soil and is subject to established regulatory controls. Soil that is not to be returned to the unit should undergo sampling and analysis either to confirm the constituents of concern or to make a hazardous waste determination and identify treatment requirements for LDRs.

For soil that cannot be returned to the excavation site or remain within the boundary of the AOC, other management is required. Once confirmatory sampling and analysis is performed, applicable regulatory programs must be identified and followed.

Using the RCRA Decision Tree

RCRA impacts projects involved in soil management if the project falls into any of the following regulatory areas: Hazardous Waste Management Unit (HWMU) (TN Rule 1200-1-11); Solid Waste Management Unit (SWMU) (50 FR 28712, 55 FR 30808); area of suspected contamination, listed waste; and area of suspected contamination, characteristic waste. A diagram of the process for managing soil under RCRA was developed in a similar manner as the CERCLA diagram.

Under Subtitle C of RCRA hazardous wastes, defined in TN Rule 1200-1-11.02(1)(c), are waste streams that are either listed in TN Rule 1200-1-11.02(4) or exhibit a characteristic of hazardous waste described in TN Rule 1200-1-11.02(3). Appendix 02/E to TN Rule 1200 1-11 lists hazardous constituents, sometimes called constituents of concern, which are associated with the hazardous waste listings. Presence of Appendix 02/E constituents in a waste does not automatically designate that waste as a RCRA hazardous waste, i.e., listed or characteristic. Solid wastes that are not listed as hazardous wastes and do not exhibit a characteristic of hazardous waste, may contain hazardous constituents. The uncontrolled release of hazardous constituents, via solid waste, is subject to corrective action under RCRA Sect. 3004(u).

A HWMU is defined as a contiguous area on or in which hazardous waste is placed or the largest area on or in which there is significant likelihood of mixing hazardous waste constituents in the same area. Examples of HWMUs include hazardous waste incinerators, surface impoundments, or tanks and associated piping. HWMUs are subject to RCRA permitting requirements. If a release of hazardous waste within a HWMU is suspected, soil samples should be collected and an analysis performed for release-related constituents. If a release is not suspected, soil samples would be collected and an analysis performed for indicator parameters. If the soil analyses show the presence of listed or characteristic hazardous waste remediation under RCRA is required. Contamination due to a listed hazardous waste would require the use of some combination of delisting, storage, treatment, and disposal. Soil analyses that show the presence of one or more hazardous waste characteristics in the soil would also require the use of some combination of storage, treatment, and disposal. Of course, if a listed hazardous waste or hazardous waste characteristic is not associated with the soil, management of the soil is unrestricted under RCRA.

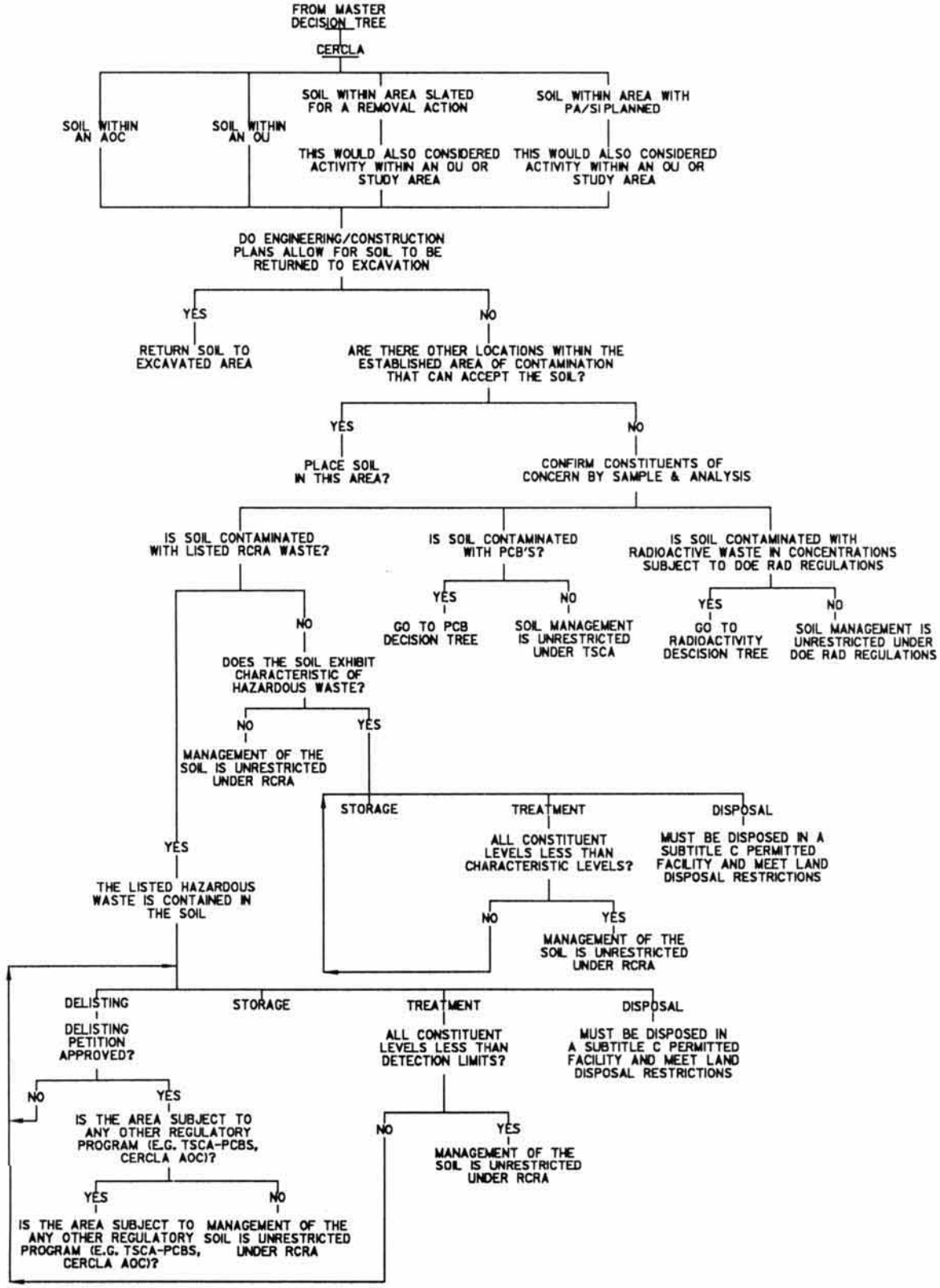

Fig. 2. Decision tree for compliance with CERCLA.

A SWMU has been identified as "Any discernable unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." Such units may include any area at a facility at which solid wastes have been routinely and systematically placed (55 FR 30808). Examples of SWMUs include tanks, container storage areas, recycling units, and loading and unloading areas. Application for a RCRA permit, or renewal of an existing permit, triggers the process by which SWMUs are identified. SWMUs are potentially subject to RCRA corrective action requirements. If a release of an Appendix 02/E constituent within a SWMU is suspected, soil samples would be collected and an analysis performed for indicator parameters.

Since an area is identified as a SWMU because of the potential for release, soil samples should be collected and an analysis performed for release-related hazardous constituents. If a RCRA Facility Investigation (RFI) has not been completed and thus specific hazardous constituents of concern are not identified, soil samples would be collected and an analysis performed for indicator parameters. When soil analyses show contamination, certain restrictions will apply to the task of excavating or moving the soil. Excavated soil that remains within the designated boundaries of the SWMU may be replaced in the excavation or elsewhere within the SWMU. Soil removed outside the SWMU boundaries, however, would require some combination of the following management options:

- Storage;
- Treatment, to detection limits for hazardous constituents specified by appropriate regulatory authorities or continued management; and
- Disposal, in a Subtitle C hazardous waste management facility or case-by-case disposal in a permitted solid waste facility.

If no contamination is detected in the excavated soil, the management of the soil is unrestricted under RCRA. Likewise, if the soil is placed back within the boundaries of the identified SWMU, the soil is not subject to management restrictions until the SWMU is remediated.

If a release within an area is suspected where soil will be excavated, soil samples should be collected and an analysis performed for constituents associated with the suspected release. If soil analyses show contamination, appropriate soil management is required. Contamination due to the presence of listed hazardous wastes requires the use of some combination of the following management options:

- Delist, if approved, subsequent management of soil is unrestricted;
- Storage;
- Treatment, to detection limits for hazardous constituents specified by appropriate regulatory authorities or continued management; and
- Disposal, in a Subtitle C hazardous waste management facility, in compliance with LDR treatment standard.

If soil analyses indicate that the soil is not contaminated with listed hazardous waste or if treatment to the detection limit is achieved and a characteristic of hazardous waste is not exhibited, management of the soil is unrestricted under RCRA. Contamination due to the presence of characteristic hazardous wastes requires the use of some combination of the above management options with the exception of delisting. If data indicate that the soil is not contaminated with characteristic hazardous wastes or treatment to below characteristic thresholds is achieved*, the management of the soil is unrestricted under RCRA.

Using the TSCA Decision Tree

The TSCA was enacted to limit the manufacture, processing, and distribution in commerce, and control the use, marking, storage, and disposal of polychlorinated biphenyl (PCB). A diagram of the TSCA process for managing PCB-contaminated soil was developed in a similar manner as the CERCLA diagram.

The source of a spill is important so that the PCB concentrations of the spilled material are known. More recent spills will have been closely managed, and information regarding concentration of spilled material may be available. In an area subject to further remediation under another regulatory program, soil with concentrations of PCBs up to 50 ppm may be returned to the excavation if approved by facility managers. The facility managers approval will be contingent upon the results of the EPA Review of a site-by-site evaluation. When the source of the PCBs is unknown, the PCB concentration in the spill is also unknown. If the PCB levels in the soil exceed 50 ppm, the soil must be stored and disposed in compliance with an agreement with the Region. Contamination due to an unknown source is not likely to be subject to the spill policy but rather to a site specific determination. Concentration of PCBs in the soil may be used to determine the proper soil management practices.

Soil contaminated with PCBs released prior to the enactment of TSCA is subject to site-by-site evaluations from the EPA Region. As such, specific management of that soil is subject to the conditions placed on the spill area by the EPA Region. Per EPA, soil contaminated with PCBs released prior to TSCA can be managed as the concentration measured in the media, not necessarily the concentration of the spill source. Concentrations in the soil of less than 50 ppm PCB may be allowed to be returned to the excavation where remediation activities are planned for the future [(40 CFR 761.120(a)(4) and (c)], provided a site-by-site evaluation has been approved by the EPA Region.

Soil contaminated with PCBs released between the enactment of TSCA and May 4, 1987 is subject to site-by-site evaluations from the EPA Region. For releases which occurred during this time, the PCB concentration as well as the source of the spill will be factors considered by EPA in the site-by-site evaluation. Releases occurring after May 4, 1987 are subject to the PCB Spill Cleanup Policy and are fully regulated. For spills of less than 50 ppm PCB, soil may be returned to the area. Soil with PCB concentrations greater than or equal to 50 ppm must be managed in compliance with

* Contained-in Policy, EPA Memorandum dated November 13, 1986, "if the [soil] is treated such that it no longer contains a hazardous waste, the [soil] would no longer be subject to regulation under Subtitle C of RCRA."

the storage and disposal requirements of 40 CFR 761 Subpart D.

Using the AEA Decision Tree

The facility's activities have centered around the use of radioactive materials. As a result, radioactive materials may be encountered during soil excavation activities. The combination of radioactive and RCRA hazardous or mixed wastes is subject to dual jurisdiction by DOE and EPA and is included in the scope of this Plan. A diagram of the process for managing soil under DOE and Atomic Energy Act (AEA) regulations was developed in a similar manner as the CERCLA diagram.

Soil contaminated with uranium at levels below 32 pCi/g is considered to be suitable for disposal on-site in the Y-12 Industrial Landfill as long as other constituents of concern are also at concentrations allowed in the on-site disposal unit. Soil that can otherwise be returned to an excavated area is not precluded from this action simply due to the presence of low level radioactive materials. Additionally, soil contaminated with only radioactive material should be managed pursuant to applicable DOE orders and policies and Energy Systems Guidance. CERCLA includes radionuclides on its Hazardous Substance List (40 CFR 302.4). While CERCLA and EPA have authority over the management of radioactive material/soil at CERCLA sites, the focus of the regulatory activity has been to incorporate or reference DOE- and other AEA-related management standards that already exist.

RCRA hazardous waste mixed with radioactive material, i.e., mixed waste, may contaminate soil at the Y-12 Plant. Soil contaminated with low level radioactive material should be analyzed for indicator parameters. Areas that contain soil contaminated with radioactive material and other waste should be assessed for widespread contamination. Where the mixture of contamination is not consistent, soil samples should be segregated, and sample locations should be noted to distinguish between areas which contain radioactive material, hazardous waste contamination, and mixed waste contamination. Soil segregation at the excavation site, will be based upon this data.

Using the Clean Area Decision Tree

Uncontaminated soil is also present at the facility. Where contamination is not known or suspected, no specific regulatory requirements apply. Due to the history and nature of operations at the facility, assumptions have been made and conservative policies established to minimize liabilities and to ensure protection of the environment. Figure 3 diagrams the process for ensuring that undiscovered contamination is detected and appropriately managed.

Due to the history of the facility, some level of screening for contamination is advisable. Because the facility is in the process of implementing large-scale CERCLA, RCRA, and AEA remediation activities, documentation of the locations and types of contamination at the facility is under development.

When soil excavation or movement will occur in areas not identified under a particular regulatory program, an analysis should be performed for indicator parameters. If contamination is not found and the soil is not located in an area subject to a regulatory program, management of the soil is unrestricted.

When soil excavation or movement will occur in areas where sampling and analysis under other regulatory programs detected no contamination, the decision tree for that regulatory program should be reviewed. If the area has had analysis performed under a regulatory program but is not subject to that program, management of the soil is unrestricted. This second condition could occur when samples were taken under a RCRA Facility Assessment, but the SWMU covering this area was dropped from the corrective action effort at the RFI stage, or where a CERCLA site has a No Further Investigation Required (NFIR) or No Further Action (NFA) status. If contamination is found, the potential source of the contamination must be determined. The presence of contamination would be due to one or a combination of the following three events: previously unknown waste management activity; release of a solid waste; and release of a hazardous waste.

Soil returned to the excavation in an area where solid wastes were released is unrestricted. If the soil could not be returned to the area from which it was removed, storage of the soil would be restricted, and disposal in a permitted solid waste landfill would be allowed on a case-by-case basis.

When no contamination is known or no prior sampling and analysis has occurred, it is appropriate to document the presence or absence of contamination by a preliminary survey of the site using certain screening methods. A visit to the location should include monitoring or testing with real-time instruments, utilizing portable testing kits for certain parameters, and/or observing the site for signs of stressed vegetation, stained soil, areas where the ground surface has been disturbed, unusual odors, and obvious sources of contamination on the ground surface. Surface water and ground water should be evaluated for any evidence of impact on the soil.

When initial screening indicates the presence of contamination, follow-up testing of soil and liquids is recommended not only to further identify the nature of contamination, but to check for false positives generated by the initial screening. Professional judgment and consideration of the historical use of the areas and their proximity to any regulated areas should be used to select the indicator parameters to be tested at each location. When contamination appears to be present, consultation among appropriate Y-12 Plant staff will be required to appropriately select the decision trees and management scenarios that will be applied to the previously undiscovered contamination.

Although the Plan provides guidance and a system for making consistent, informed, defensible, and cost-effective decisions for the management of potentially contaminated Y-12 soil, it has the following important limitations.

- A number of locations within the Y-12 facility fall within the boundaries of both an identified RCRA SWMU and a designated CERCLA AOC or OU. In general, CERCLA will be the lead program for remedial investigation (RI) and remedial action at such locations. If this continues to be the case, care should be exercised in using the RCRA decision tree to determine options for soil management in these areas so CERCLA requirements are not circumvented.
- Soil management at some locations may be subject to more than one of the developed decision trees (e.g., TSCA PCB contamination and RCRA SWMU). In most cases, management requirements will reflect the most stringent combination of requirements

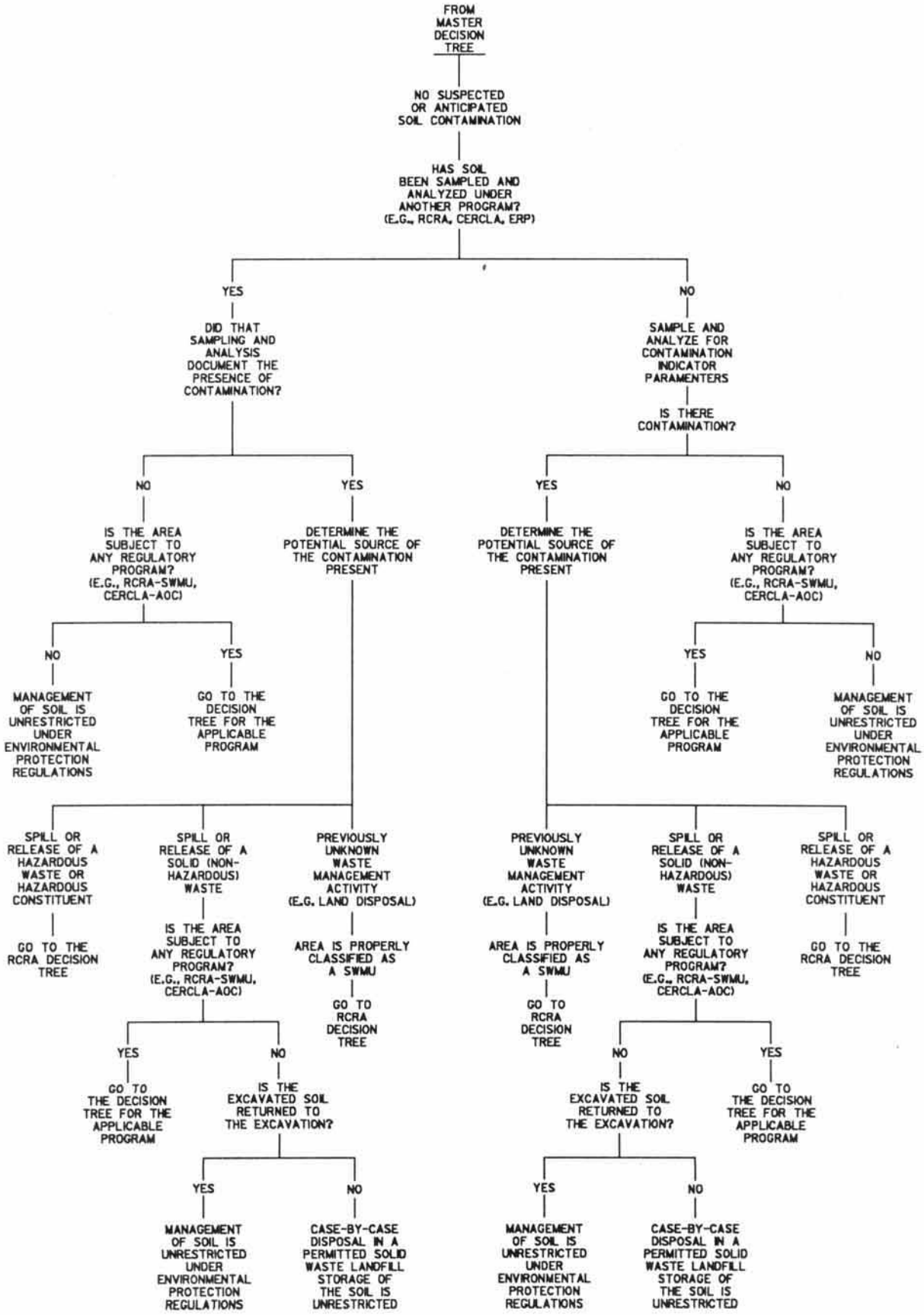

Fig. 3. Decision tree for clean areas.

because of the application of all appropriate decision trees.

- Soil management activities must always be performed pursuant to Best Management Practices provided under the Clean Water Act.
- If additional areas are identified where solid wastes have been or are managed, additional RCRA SWMUs may be included in the program. Despite the practice of transferring existing and newly identified SWMUs to the CERCLA program, the dynamics of SWMU identification will necessarily continue pursuant to RCRA.
- The number, description, and boundaries of CERCLA OUs and AOCs are also subject to change and refinement.
- The regulatory programs on which the decision trees are based are subject to change. For example, regulations implementing the RCRA corrective action program were initially proposed on July 27, 1990. Though these regulations have not been promulgated, at EPA's direction they are widely used in lieu of final rules. The program continues to operate on the basis of the proposal of July 27, 1990, EPA guidance documents, directives, and interpretive memoranda. Care must be exercised to ensure that the regulations underlying the Plan's decision trees have not changed since their preparation.
- The outcome of the DOE application for a 1-year case-by-case extension under 40 CFR 268.5 of the May 8, 1992, effective date of the LDR applicable to third third mixed wastes generated and/or stored at 31 of its facilities, including Y-12, may allow some flexibility in storage.
- The FFCA signed June 12, 1992, includes a schedule for the management of specified mixed waste contaminated with PCBs that may also allow some flexibility in storage.