MANAGEMENT TECHNIQUE FOR ACHIEVING LDR COMPLIANCE WITH RE-CLASSIFICATION OF MIXED WASTES

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ABSTRACT

Characterization of mixed waste is a required activity for successful waste management. Waste analysis is necessary to attain proper storage, to treat mixed wastes to meet Land Disposal Restrictions, to prepare applications for waste treatment permits under the Resource Conservation and Recovery Act, and to assure that disposal site waste acceptance criteria have been met.

Some of the wastes generated at the U.S. Department of Energy's Rocky Flats Plant have been conservatively categorized as mixed wastes. Certain wastes may already meet the Land Disposal Restrictions, or be radioactively contaminated only. Knowing this information can reduce waste treatment requirements.

Because of the cost and time required to develop waste treatment technologies, accurate waste characterization is vital. Characterization activities need to be incorporated in an implementation model to assist management in scheduling and tracking critical activities. Such a model has been developed for mixed wastes at the Rocky Flats Plant which lists and tracks all activities required to achieve compliance with the Land Disposal Restrictions and disposal site waste acceptance criteria.

INTRODUCTION

As part of a Federal Facilities Compliance Agreement (FFCA-II) with the Environmental Protection Agency (EPA), a Comprehensive Treatment and Management Plan (CTMP) was developed which presents how the U.S. Department of Energy (DOE) intends to bring the Rocky Flats Plant mixed wastes into compliance with the Land Disposal Restrictions (LDR) contained in 40 CFR 268 of the EPA regulations. Additional goals for mixed waste management include compliance with DOE Orders while preparing the waste for shipment and disposal. This includes meeting DOT packaging requirements and disposal site waste acceptance criteria (WAC).

When the Resource Conservation and Recovery Act (RCRA) was first implemented at DOE facilities, wastes were classified as either radioactive, hazardous, mixed, or non-radioactive/non-hazardous based on process knowledge and limited grab sampling. The purpose for the original classification was to meet a 1986 Compliance Agreement and to prepare RCRA Part A and B permit applications.

The initial classification of waste streams was based primarily on process knowledge. This resulted in a conservative assessment. When hazardous chemicals were known to have been used in a process at any point in the past, all the resulting wastes from that process were considered to be mixed wastes. Since there was no way to prove that molecular levels of listed hazardous waste constituents were not still present, all additional wastes produced from the same process facilities were assumed to be mixed wastes.

This conservative classification of wastes has resulted in an increased waste inventory which must be managed under the CTMP. According to the LDR, it is necessary to treat hazardous and mixed wastes in order to store them beyond one year, and in order to dispose of them in RCRA land disposal units (which do not have an approved No-Migration Petition in accordance with 40 CFR 268.6.)

In a short time, process knowledge of the hazardous constituents for newly generated mixed wastes improved; however, the stored wastes still lacked complete information regarding their hazardous constituents.

Since delisting is the standard procedure for removing a waste from a RCRA permit application, according to state regulation, delisting was the first action discussed. The CDH has authority in Colorado for reviewing delisting petitions, but it takes a formal public rulemaking to have a petition approved. This is a time consuming process since it requires sampling and analysis of the waste in question as well as a risk assessment to determine environmental and public impact from all constituents in the waste (not just from the RCRA hazardous constituents.)

At the present time, EPA and CDH are willing to review sampling and analysis plans for wastes which are likely to meet LDR. Future regulatory actions in response to the outcome of the sampling and analysis cannot be anticipated at this time; however, significant time and money can be saved if some wastes do not have to be treated to meet LDR. Only treatment for meeting disposal site WAC would have to be considered.

COMPLIANCE PATHS

The DOE plan for low level mixed (LLM) waste characterization, treatment, packaging, certification and shipping is contained in the CTMP which was developed in response to FFCA-II requirements. The CTMP was submitted to EPA in June of 1992, and a CTMP Implementation Model (Model) was developed by Fluor Daniel to provide DOE with a management tool for costing, scheduling, assigning responsibilities, and tracking compliance against CTMP milestones addressed in the FFCA-II.

Four compliance paths were identified in the CTMP, and all are being investigated at this time:

- Path A is the compliance path based on characterization for the purpose of identifying wastes which already meet LDR. Wastes could be delisted via this path if the results of sampling and analysis indicated the absence of hazardous constituents. All LLM wastes will require characterization, but only eleven LLM wastes are candidates for this compliance path at the present time.
- Path B addresses commercially available or DOE planned off-site treatment facilities which could be

RCRA permitted (and NRC licensed as necessary) to receive and treat specific LLM wastes.

- Path C addresses the development of waste treatment technologies, and construction and operation of treatment systems to treat the LLM wastes at the Rocky Flats Plant.
- Path D addresses the DOE Mixed Waste Integrated Program in which a centralized treatment facility is being considered for treatment of all of DOE's LLM wastes, not just the LLM wastes from the Rocky Flats Plant.

IMPLEMENTATION MODEL

The CTMP Model contains a Work Breakdown Structure (WBS) for each compliance path. The WBS was developed in accordance with DOE Order 4700.1, "Project Management System", and includes the regulatory requirements which must be addressed during the process of mixed waste management. A process logic was first developed to assure that the WBS followed an established logical sequence during its construction. Logic ties were then indicated to assure appropriate sequencing of activities during their scheduling.

At the highest level of the WBS is LDR Compliance, other waste management programs, the waste information system, the waste minimization program and overall program management. The second level contains activities for compliance Paths A, B, C, D, technology development, treatment system development, and waste characterization activities.

The goal of the compliance paths is to verify or treat the LLM wastes to meet LDR and the Nevada Test Site WAC. Thus, compliance is not achieved until a waste can be packaged for shipment to the Nevada Test Site, or stored further in an LDR compliant manner.

CTMP milestones were included in the Model. In fact, the model was first developed in an unconstrained manner. Funding and time were included for the present year since this information was available. In this way, out-year milestones fell where they were likely to occur. This information was necessary to prepare for negotiations with regulators for changes to the out-year milestones assigned in the FFCA-II.

The CTMP Model contains a WBS of six levels with nearly 3,000 elements. (Fig. 1 summarizes the WBS down to three levels.) The elements have been coded in a manner which is compatible with the scheduling system used by DOE's prime contractor, EG&G-RFI.

Each element has been scheduled and resource loaded. A Responsibility Assignment Matrix and an Organizational Breakdown Structure have been integrated with the WBS elements. In this way, each element represents a work product and print-outs specify who is responsible for generating that work product.

Reports related to schedules and costs can easily be generated from the Model. For instance, reports can be obtained for any time period regarding actions to be performed, actions completed, milestones met and milestones which will not be met. Reports can be issued which indicate critical actions to be accomplished on which future activities depend.

The impact of funding and milestone changes can be readily assessed and reports can be released showing how much funding has been spent, how much is left and how much is still needed for any time period of interest. The impact of funding changes will indicate which milestones will be delayed. This action enables DOE to determine if the proposed changes should be allowed.

The CTMP Model will generate the first draft of DOE-required fiscal year work packages, provide input to the respective five year plans, generate compliance progress reports, supply a justification for changing milestones, and provide CTMP managers with a tool to measure progress while identifying activities which are holding up progress.

Activity information can be presented by a waste identifier, by waste groupings, by treatment technologies or by treatment system. EG&G-RFI indicated a preference for waste form; therefore, the structure of the print-outs has been designed to provide this type of presentation. The CTMP Model is contained in files generated with Paradox, Primavera and Lotus software programs which reside on personal computers.

As progress is made on treatment technology development, the Model will reflect activity completions through a simple update process. Key Decision (KD) points were included in the Model, thus progress toward any KD point can be measured at any time.

Model documentation for decisions regarding selection of treatment technologies can be readily generated since a list of assumptions was developed along with the Model. As a result, changes to the Model and to the assumptions on which it is based are recorded and retained.

INTEGRATION WITH CHARACTERIZATION

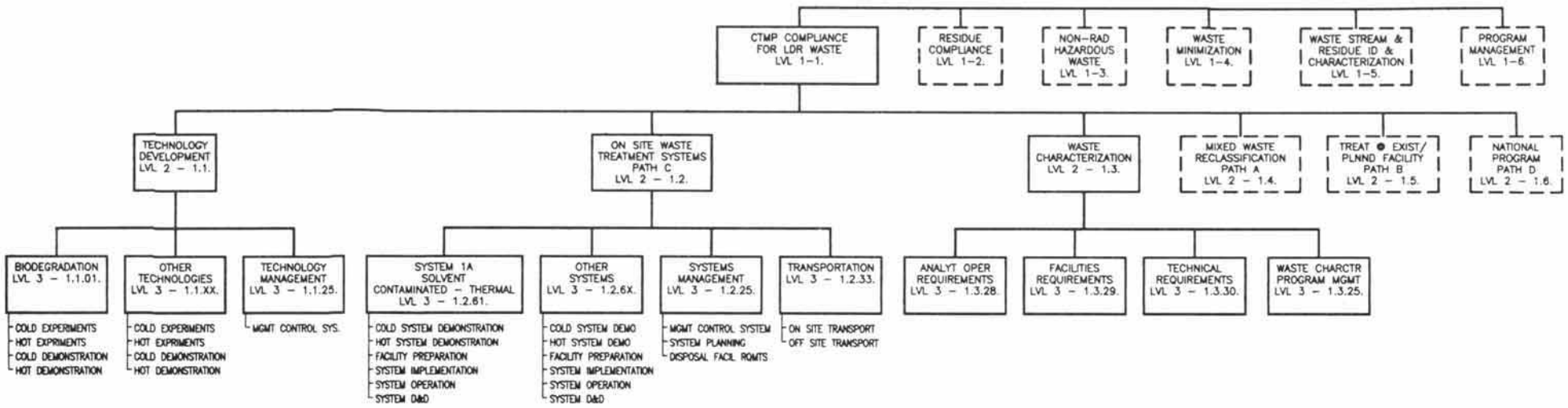
The CTMP Model addresses the steps required to provide characterization of the LLM wastes as needed for all compliance paths. For instance, waste information is needed by the scientists developing the treatment technologies. The scientists need to measure the success of a technology in meeting one or more of the goals of the CTMP.

Information is needed to determine if any of the LLM wastes already meet LDR, and only need treatment to meet the WAC. When a LLM waste meets LDR, it can be stored as LDR compliant waste until it can be certified and prepared for shipment to a mixed waste disposal site when one is open. Waste information is also needed to prepare a RCRA permit application for operation of the mixed waste treatment systems in accordance with 40 CFR 264.13(a).

Since information on the LLM wastes is needed at different times for different purposes, a flow diagram for LLM waste characterization was developed (See Fig. 2) The flow diagram served as the underlying logic for development of the WBS levels below the waste characterization block on the CTMP WBS. The elements assigned to this section of the WBS assure that waste characterization information is obtained in support of all compliance paths.

The flow diagram is specific to Rocky Flats and includes the steps for budgeting, methods development (where needed), sampling and analysis plan preparation, regulatory reviews (including reviews by CDH and EPA, and approval by the disposal site operator,) development of analytical laboratory capability, data validation, report preparation and submission of information to the various organizations in need of the information.

The resulting WBS elements will be scheduled and cost estimated in accordance with historical experience. From this data, schedule impacts from delayed characterization activities will be readily obtained.



CANDIDATE TECHNOLOGIES WBS IDENTIFICATION

01 - BIODEGRADATION
02 - CATALYTIC OXIDATION
03 - CEMENTATION - TTPU ASH
04 - CHEMICAL OXIDATION (ALKALINE CHLORINATION)
06 - FLUIDIZED BED UNIT
07 - MEDIATED ELECTROCHEMICAL OXIDATION
08 - MICROWAVE SOLIDIFICATION
10 - NITRIC ACID RECYCLE
11 - OFF-GAS CAPTURE & TREATMENT
12 - POLYMER SOLIDIFICATION - MACRO ENCAPSULATE
13 - POLYMER SOLIDIFICATION - NTTP
14 - REAL TIME MONITORING AND TREATMENT - FBU
15 - VOLATILIZATION / STEAM CLEANING
16 - SUPERCRITICAL CO2 EXTRACTION
17 - SUPERCRITICAL H2O OXIDATION
18 - UV OXIDATION
19 - HOT NITROGEN STRIPPING
20 - PRETREATMENT TECHNOLOGIES
21 - CEMENTATION - B374 NEWLY GENERATED SALTS
22 - CEMENTATION - B374 NEWLY GENERATED SLUDGES
23 - REAL TIME MONITORING & TREATMENT - MICROWAVE
24 - OFF-GAS CAPTURE & TREATMENT - FBU
26 - SILENT DISCHARGE PLASMA
27 - CONTROLLED AIR INCENERATION
40 - CEMENTATION - NTTP
41 - CEMENTATION - MISCELLANEOUS
42 - CEMENTATION - B374 BACKLOGGED SLUDGES
46 - POLYMER SOLIDIFICATION - B374 NEWLY GENERATED SLUDGES
47 - POLYMER SOLIDIFICATION - B374 BACKLOGGED SLUDGES
48 - POLYMER SOLIDIFICATION - TTPU ASH
49 - POLYMER SOLIDIFICATION - MISCELLANEOUS
50 - POLYMER SOLIDIFICATION - EXTRUSION B374 NEWLY GENERATED SALTS

TREATMENT SYSTEMS IDENTIFICATION & WBS IDENTIFICATION

1A - SOLVENT CONTAMINATED - THERMAL TREATMENT - 1.2.61.
1B - SOLVENT CONTAMINATED - INCENERATION ALTERNATIVES - 1.2.62.
2 - SOLIDIFIED BYPASS SLUDGES - 1.2.63.
3 - MISCELLANEOUS WASTE FORMS - 1.2.64.
4A - BUILDING 374/774 SALTS - 1.2.65.
4B - BUILDING 374/774 SLUDGES - 1.2.66.
5 - SURFACE ORGANICS, LEADED GLOVES, BULK LEAD - 1.2.67.
6 - SOLOR POND CLEANOUT (NUS/HALIBURTON) - 1.2.68.

Fig. 1. Summary level work breakdown structure.

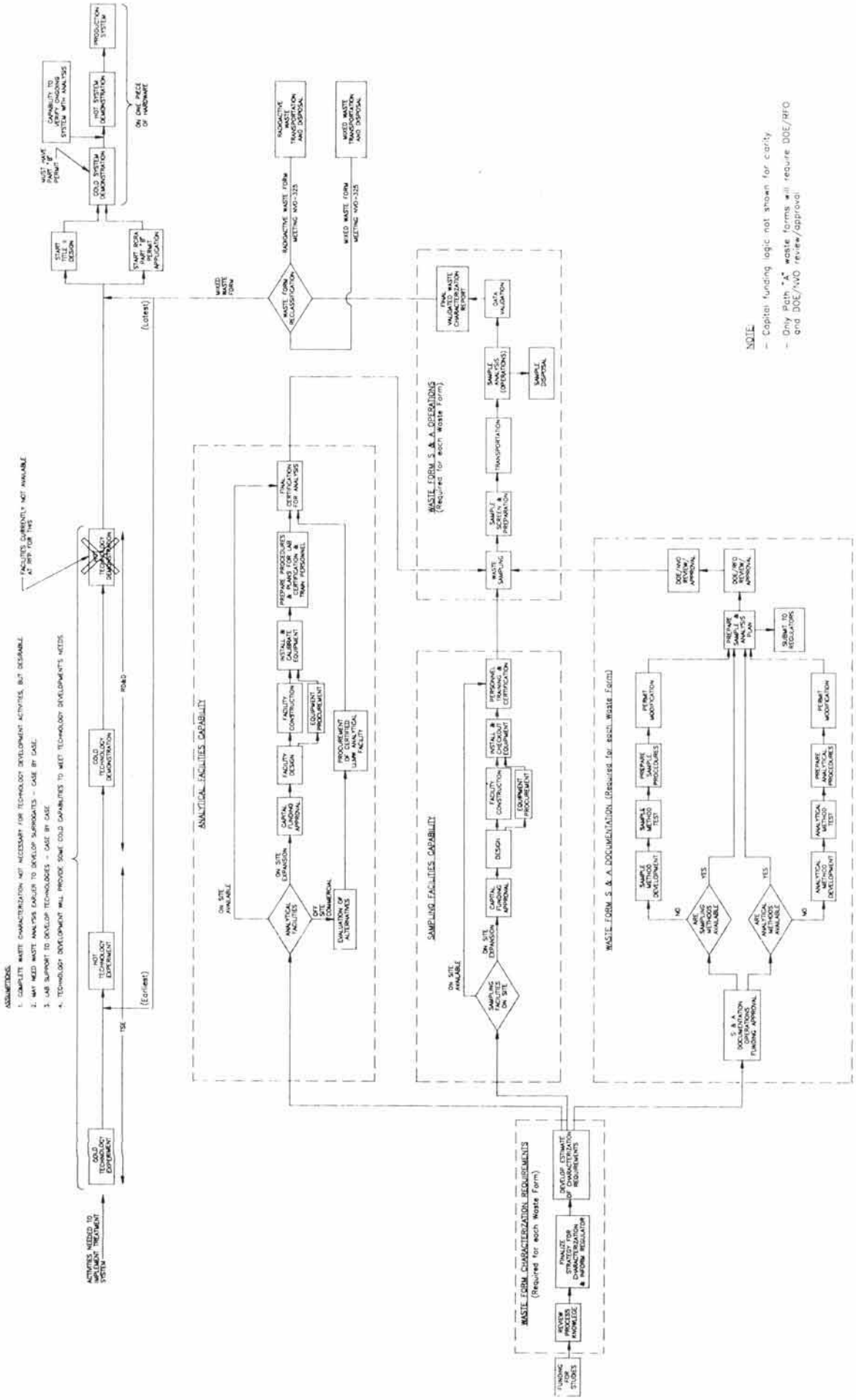


Fig. 2. CTMP waste characterization logic (analytical support) for technology development.

Schedule flags for required waste information have been added to the CTMP WBS. In this way, each print-out of schedule activities will indicate that characterization information is needed at a particular point in time. If the information is not supplied, a schedule delay will occur. Such delays can be projected by the Model and justifications for proposed schedule changes are provided to the CTMP program manager.

The flow diagram for characterization and the need for different types of waste information made it apparent that certain LLM waste forms should be characterized first. In fact, a priority list for waste characterization was developed by those individuals who needed LLM waste information.

The priority list for characterizing LLM wastes was based on fourteen factors which reflected the concerns of various CTMP participants. These factors included: waste matrix, degree of homogeneity, generation rate and volume, volume in inventory, proposed compliance path, existing analytical data, available process knowledge, number of sampling plans required, proposed treatment technology and system assignments, available methods for analysis, and EPA hazard codes.

The final priority ranking was most influenced by cost benefit, time and volume considerations. Sampling and analysis plans are now being developed for the highest priority LLM wastes.

CONCLUSION

Development of a CTMP implementation model provides the program manager with a tool which integrates the scope, schedule, responsible organizations and individuals, and the resource requirements of a complex waste management program. Such a model enables the CTMP program manager to assess impacts from changes in funding and schedules. The Model provides expenditure forecasts, provides work package information, allows tracking of progress, and justifies establishment of achievable compliance milestones.

The Model integrates the characterization activities with a schedule to provide the CTMP program manager with a list of critical activities which must be funded and accomplished immediately. This is the first step in coordinating the actions required by many organizations to achieve the ultimate goal of disposing of the LLM wastes.

REFERENCES

1. EPA and DOE-RFO, Federal Facilities Compliance Agreement, Docket No. RCRA (3008) VIII-69-25, May 1991.
2. DOE-RFO, "Comprehensive Treatment and Management Plan," Version 1.3, June 9, 1992.
3. Fluor Daniel, Inc., "Comprehensive Treatment and Management Plan Implementation Model," Revision 1, December 1992.
4. DOE NVO-325, Revision 1, "Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements," June 1992.
5. DOE Order 4700.1, "Project Management System", as revised.

LIST OF ACRONYMS

EPA	Environmental Protection Agency
CDH	Colorado Department of Health
CTMP	Comprehensive Treatment and Management Plan
DOE	Department of Energy
DOT	Department of Transportation
FFCA	Federal Facilities Compliance Agreement
KD	Key Decision (points)
LDR	Land Disposal Restrictions
LLM	Low Level Mixed Waste
MODEL	CTMP Implementation Model
NRC	Nuclear Regulatory Commission
RCRA	Resource Conservation and Recovery Act
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure