

***History of Low Level Radioactive  
Waste Disposal in the United States –  
FY 2012 Update***

**Fuel Cycle Research & Development**

***Prepared for  
U.S. Department of Energy  
Used Fuel Disposition Campaign  
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## **SUMMARY AND CONCLUSION**

Disposal of Low-Level Radioactive Waste (LLW) is essential to a viable nuclear enterprise, not only for power production, but also for the use of radioactive material in medicine, commerce, and research. Previously, two reports on the history of LLW management in the United States (U.S.) were prepared. One, *History and Framework of Commercial Low-Level Radioactive Waste Management in the United States* (ACNW 2007), dealt with waste regulated by the Nuclear Regulatory Commission (NRC). The other, *Fifty Years of Federal Radioactive Waste Management Policies and Practices* (Bradley 1997), dealt with Department of Energy (DOE) waste management.

The Used Fuel Disposition (UFD) Campaign managed by the U.S. Department of Energy, Office of Nuclear Energy (DOE-NE) published annual updates to augment those reports in 2010 (Wilhite and Seitz 2010) and 2011 (Seitz 2011). The plan is to publish updates annually to summarize developments each Fiscal Year (FY). There have been a number of developments related to LLW disposal in the DOE Complex, the NRC, and the commercial sector in the United States during FY 2012, including regulatory developments as well as initiating operations at a new disposal facility.

## **GREATER-THAN-CLASS C LLW ENVIRONMENTAL IMPACT STATEMENT**

The Department of Energy, Office of Environmental Management (DOE-EM) issued the Draft Environmental Impact Statement (EIS) for disposal of Greater Than Class C (GTCC) LLW for public comment in February 2011. A number of public meetings were held around the DOE Complex in April and May of 2011. The public comment period closed in June 2011, and comments are incorporated in a revision to the draft EIS. The revised draft has been prepared and final internal DOE reviews were expected to be complete by the end of FY 2012 to support re-issuing the update for concurrence in October 2012. The plan is to complete the final EIS by the end of December 2012. The final EIS is planned to include identification of the preferred alternative.

## **NUCLEAR REGULATORY COMMISSION**

The NRC staff continues to make progress on efforts related to rulemaking for site-specific analysis of unique waste streams (e.g., depleted uranium (DU) as part of a potential update to 10 CFR Part 61 and on the Branch Technical Position (BTP) on concentration averaging that were discussed in the previous LLW History reports. A number of public meetings were held in FY 2012 to seek stakeholder input on both activities. The results of these meetings are being considered for updates to the proposed rule language and the revised BTP.

The Commission provided direction to NRC staff regarding the efforts related to 10 CFR Part 61 (NRC 2012a), including the need to engage stakeholders and other members of the interested public to discuss and finalize the agency's approach and to specifically address: flexibility to use updated International Commission on Radiological Protection (ICRP) dose methodologies in site-specific analyses, a two tiered approach to time of compliance linked to the reasonably foreseeable future, flexibility to establish site-specific waste acceptance criteria (WAC), and compatibility considerations to ensure States have the flexibility in determining how to implement the requirements. Public meetings on these topics began in February of 2012 and continued through August.

A regulatory analysis is also being completed associated with the site specific assessment rule. The analysis is due at the end of September 2012. Staff must also begin drafting rule language to publish for public comment in December 2012. Additional public meetings could be held to discuss the draft rule. The final rule is due to Commissioners by July 2013 (Monitor 2012b).

The NRC issued a BTP on concentration averaging and encapsulation that applies to LLW in 1995. The current position places relatively specific limitations on averaging. A draft revision of the BTP on concentration averaging was released for feedback in February 2011. Based on feedback regarding the draft, a formal draft revision was prepared and submitted for official public comment in September 2011 (NRC 2011a).

Public feedback included a number of compliments for changes addressing operational concerns and the active efforts to engage the public. Other comments regarding the exposure scenarios that were considered in the inadvertent intrusion scenario were also received along with comments regarding practical considerations related to demonstrating homogeneity of waste streams and the need to risk-inform the approaches being used.

Comments from the public, a meeting with the Disused Source Working Group from the Low Level Waste Forum, the NRC Advisory Committee on Reactor Safeguards (ACRS) and other interested parties were considered during the development of a revised draft that was issued for public comment on June 11, 2012 (NRC 2012b). Public comments are due by October 8, 2012.

## **DEPARTMENT OF ENERGY OFFICE OF ENVIRONMENTAL MANAGEMENT**

Efforts are continuing on the update to DOE Order 435.1, *Radioactive Waste Management*, and the associated manual (DOE 2001). Drafts of the revised DOE Order/Requirements, a supporting Technical Standard, and Guides (General Requirements, High-Level Waste, Transuranic Waste, and LLW) were developed in FY 2012. The drafts were circulated for review by DOE staff and site contractors and comments were received in September 2012. The comments will be addressed with the intent to complete an updated version of the draft documents and to distribute the revised drafts for public comment early in FY 2013.

The update includes development of a technical standard to formalize guidance related to obtaining and maintaining a Disposal Authorization Statement (DAS) and efforts to address a number of other specific topics. Examples of specific topics being addressed in the update include: waste incidental to reprocessing and tank closure, clarification of expectations for waste classification, interpretation of probabilistic uncertainty analysis relative to performance objectives, in-situ closure and disposal, and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) disposal cells.

### **LOW-LEVEL WASTE DISPOSAL FACILITY DEVELOPMENTS**

Approval was received for construction of the commercial and federal disposal cells at the Waste Control Specialists (WCS) disposal facility in Texas, and construction of both cells was completed. A number of amendments were considered for the license in early 2012, including discussions regarding the need to include the waste acceptance criteria in the license. The final amendment needed to start operations was approved on April 24, 2012 and the first waste was disposed on April 27, 2012 which was comprised of Class B sealed sources.

WCS also received approval for a number of import applications in June 2012 subject to the one-year limits of 220,000 Ci and 50,000 cubic feet of imported waste. The start date for the one-year limits was established as the date of the first disposal (April 27, 2012). This provides a path forward for disposal of Class B/C LLW from generators not located in Vermont or Texas.

The license amendment authorizing WCS to open the federal disposal cell was approved in September 2012. Per statements at the RadWaste Summit in Las Vegas (September 2012), no contracts have been established for disposal of any federal wastes.

EnergySolutions is conducting a site-specific performance assessment (PA) prior to continuing disposal of DU. The draft PA was submitted to the State of Utah in June 2011. The review of the site-specific PA has not started, but a preliminary schedule for the review was prepared in August 2012 that includes a process for allocating funds, selection of a contractor and initiation of the review early in FY 2013.

EnergySolutions has also been seeking increased capacity for Class A and mixed wastes at the Clive facility. The proposal for a Class A West cell expansion was issued for public comment and the comments are being addressed. Following satisfactory resolution of the comments, the regulator would issue a license amendment that would allow construction to proceed. The Class A West cell expansion would add 87 million cubic feet of disposal capacity. Expansion of the mixed waste disposal facility has been approved, but construction of new cells is not expected for a few years given existing capacity and disposal forecasts.

The Portsmouth and Paducah Sites are in the process of considering alternatives for disposition of wastes associated with site restoration and decommissioning and demolition activities. One of the alternatives is the use of On Site Disposal Cells (OSDC) designed to meet Environmental Protection Agency (EPA) standards for Subtitle C disposal facilities for hazardous wastes. The risks associated with an OSDC are being considered as part of remedial investigation/feasibility studies (RI/FS) conducted in FY 2012 at both sites. The Draft RI/FS was completed for Paducah and submitted to the Commonwealth of Kentucky and EPA Region IV for review. Comments were received from the Agencies in September and are in the process of being addressed. Portsmouth is in the process of completing the RI/FS. Both facilities are planning to seek a Record of Decision (RoD) in FY 2013.

Idaho is pursuing development of a disposal facility that would provide long-term capacity for remote-handled LLW generated on the Idaho Site to replace the existing capacity at the Radioactive Waste Management Complex, which is planned to close in the near future. The PA was completed and approved by the Low Level Waste Disposal Facility Federal Review Group (LFRG) in FY 2012. A preliminary DAS was issued, which in conjunction with project management documentation provided the basis to move forward with formal design.

A new PA is being developed for the Environmental Restoration Disposal Facility at the Hanford Site to address large conservatisms associated with earlier analyses and to account for updated inventory estimates. The draft PA was completed in August 2012 and is undergoing internal reviews. The PA is planned to be submitted for the formal review by the LFRG later in FY 2013.

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## ACRONYMS AND ABBREVIATIONS

ACNW	Advisory Committee on Nuclear Waste
ACRS	Advisory Committee on Reactor Safeguards
ASCEM	Advanced Simulation Capability for Environmental Management
BTP	Branch Technical Position
CA	Composite Analysis
CBP	Cementitious Barriers Partnership
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CoP	Community of Practice
DAS	Disposal Authorization Statement
DOE	Department of Energy
DOE-EM	Department of Energy - Office of Environmental Management
DOE-NE	Department of Energy - Office of Nuclear Energy
DOE-RL	Department of Energy - Richland Operations Office
DU	Depleted Uranium
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FY	Fiscal Year
GAO	Government Accountability Office (formerly known as the General Accounting Office)
GTCC	Greater Than Class C
HLW	High-Level Waste
ICRP	International Commission on Radiological Protection
INL	Idaho National Laboratory
LANL	Los Alamos National Laboratory
LFRG	Low-Level Waste Disposal Facility Federal Review Group
LLW or LLRW	Low-Level (Radioactive) Waste
LLWPAA	Low-Level Waste Policy Amendments Act
MLLW	Mixed Low-Level Waste
NCRP	National Council on Radiation Protection and Measurements
NNSS	Nevada Nuclear Security Site (formerly Nevada Test Site)
NRC	Nuclear Regulatory Commission
OSDC	On Site Disposal Cell
PA	Performance Assessment
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RoD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
SRNL	Savannah River National Laboratory



SRS	Savannah River Site
TCEQ	Texas Commission on Environmental Quality
UFD	Used Fuel Disposition
U.S.	United States
WAC	Waste Acceptance Criteria
WCS	Waste Control Specialists
WIPP	Waste Isolation Pilot Plant

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## 1.0 INTRODUCTION

Disposal of Low-Level Radioactive Waste (LLW) is essential to a viable nuclear enterprise, not only for power production, but also for the use of radioactive material in medicine, commerce, and research. Previously, two reports on the history of LLW management in the United States (U.S.) were prepared. One, *History and Framework of Commercial Low-Level Radioactive Waste Management in the United States* (ACNW 2007), dealt with waste regulated by the Nuclear Regulatory Commission (NRC). The other, *Fifty Years of Federal Radioactive Waste Management Policies and Practices* (Bradley 1997), dealt with Department of Energy (DOE) waste management.

The Used Fuel Disposition (UFD) Campaign managed by the U.S. Department of Energy Office of Nuclear Energy (DOE-NE) published annual updates to augment those reports in 2010 (Wilhite and Seitz 2010) and 2011 (Seitz 2011). The plan is to publish updates annually to summarize developments each Fiscal Year (FY). In FY 2012, there have been a number of developments related to LLW disposal in the DOE Complex, the NRC, and the commercial sector in the United States, including on-going regulatory activities and initiating operations at a new disposal facility. Developments in FY 2012 are summarized for commercial disposal/NRC and DOE facilities in Chapters 2 and 3, respectively.

## 2.0 COMMERCIAL LOW-LEVEL WASTE DISPOSAL

Major events occurring in FY 2012 include the beginning of disposal operations at a new commercial LLW disposal facility operated by Waste Control Specialists (WCS) in Texas. This marked a significant milestone by providing a path for disposal of Class B/C LLW. Regulatory development activities continued at the NRC and DOE, including efforts to finalize the Environmental Impact Statement (EIS) for the disposal of Greater than Class C (GTCC) waste. Events and issues that significantly affect commercial LLW disposal in the United States include the following:

1. Start of commercial disposal operations at the WCS disposal facility in Texas,
2. Efforts to continue disposal of depleted uranium (DU) at the EnergySolutions disposal facility in Utah,
3. The EIS for disposal of greater-than-class C LLW,
4. NRC efforts related to updating the Branch Technical Position (BTP) on concentration averaging and encapsulation, and
5. NRC efforts related to address disposal of unique waste streams and a potential revision of 10 CFR Part 61.

Each of these items is discussed separately below.

## **2.1 Status of the Waste Control Specialists Disposal Facility in Texas**

WCS has been in the process of developing a LLW disposal facility in Andrews County, Texas since 1992 (Monitor 2009). The WCS site was developed with the intention to have two disposal facilities, one for LLW from the Texas-Vermont Compact and one for waste from the federal government with waste definitions consistent with the responsibilities of Compact and federal waste in the Low Level Waste Policy Amendments Act (LLWPAA). The site was licensed by the Texas Commission on Environmental Quality (TCEQ) in January, 2008 (Monitor 2008). It was the second Compact site to be licensed (the Barnwell, Beatty, and Richland sites were licensed before the Compacts were formed). The Ward Valley, California site, a Southwest Compact site (National Research Council 1995), was licensed in the late 1990s, but the facility was not constructed. WCS has been processing and storing LLW at the Andrews County, Texas facility since 1998.

A number of amendments were considered for the license in early 2012, including discussions regarding the need to include the waste acceptance criteria (WAC) in the license. The final amendment needed to start operations was approved on April 24, 2012 and the final authorization letter was sent the next day. The first waste disposed on April 27, 2012 was comprised of Class B sealed sources from Vermont. The waste was sent to WCS from Bionomics, based in Oak Ridge, Tenn., which serves generators across the country, including Texas and Vermont (Monitor 2012a).

WCS has also been seeking approval for importation of out-of-compact waste. A number of import applications were approved in June 2012 subject to the one-year limits of 220,000 Ci and 50,000 cubic feet of imported waste. The start date for the one-year limits was established as the date of the first disposal (April 27, 2012). This provides a path forward for disposal of Class B/C LLW from generators not located in Vermont or Texas.

Construction has been completed on the federal disposal cell at WCS. License amendment 18 authorizing WCS to open the federal disposal cell was approved in September 2012. Per statements at the RadWaste Summit in Las Vegas (September 2012), no contracts have been established for disposal of any federal wastes. DOE has issued a procurement for disposal of DOE complex wastes that is currently being evaluated.



*Figure 2-1 Shipment of Sealed Sources is the First Disposal at the Waste Control Specialists Commercial Facility (Courtesy: WCS)*

## **2.2 Status of the EnergySolutions Disposal Facility in Utah**

EnergySolutions completed a site-specific performance assessment (PA) to support continued disposal of DU at the LLW disposal facility located in Clive, Utah. The PA was formally submitted to the regulator on June 1, 2011. The site-specific PA is required in accordance with a rule approved by the State of Utah Radiation Control Board in April 2010. EnergySolutions currently is not permitted to receive or dispose of significant quantities of concentrated DU until a site-specific PA is approved. The site-specific PA requirement was developed to address on-going efforts at the NRC related to disposal of unique wastes (see Section 2.5). A key part of the NRC efforts is a focus on requiring site-specific PAs for disposal of unique wastes, such as DU, that were not specifically addressed when 10 CFR Part 61 was issued.

The review of the site-specific PA has not started, but a preliminary schedule for the review was prepared in August 2012 that includes a process for allocating funds, selection of a contractor and initiation of the review early in FY 2013. The review would include stakeholder interactions and a formal public comment period prior to a final determination regarding the PA for disposal of DU.

EnergySolutions has also been seeking increased capacity for Class A and mixed wastes at the Clive facility, respectively. The proposal for a Class A West cell expansion was issued for public comment. The comments were being addressed at the time of this report. Once the comments are addressed, the regulator would issue a license amendment that would allow construction to proceed. The Class A West cell expansion would add 87 million cubic feet of disposal capacity, which is estimated to provide an operating life of 25 to 30 more years. The mixed waste expansion has been approved, but construction of new cells is not expected for a few years given existing capacity and disposal forecasts. The mixed waste expansion would add roughly 5 million cubic feet of capacity.

## **2.3 Greater-Than-Class C Draft Environmental Impact Statement**

Greater-than-Class C LLW is LLW that is generated commercially and that exceeds the Class C limits in 10 CFR 61 (NRC 1982a). The LLWPAA of 1985 (Public Law 99-240) established that the federal government is responsible for disposal of GTCC LLW and that GTCC LLW is to be disposed of in a facility licensed by the NRC. Assuming that the Department of Energy is the federal agency responsible for GTCC LLW, DOE has been planning for its disposition for some time.

A draft EIS has been prepared that evaluates the potential environmental impacts associated with constructing and operating a new facility or facilities, or using an existing facility, for the disposal of GTCC LLW and GTCC-like waste. The draft EIS is currently in the process of internal reviews. The internal DOE reviews were expected to be complete by the end of FY 2012 to support re-issuing an update for concurrence in October 2012. The Final EIS is currently planned for release to the public before the end of Calendar Year 2012.

In the draft EIS, DOE evaluated five alternatives. They are

1. No Action
2. Disposal of GTCC and GTCC-like wastes in a geologic repository at the Waste Isolation Pilot Plant (WIPP) in New Mexico,
3. Disposal in a new intermediate depth borehole disposal facility
4. Disposal in a new trench disposal facility
5. Disposal in a new above-grade vault disposal facility.

The latter three alternatives were evaluated at generic regional commercial locations and at seven federally owned sites. They are the Hanford site, Idaho National Laboratory (INL), Los Alamos National Laboratory (LANL), Nevada National Security Site (NNSS, formerly the Nevada Test Site), Savannah River Site (SRS), and a site in the vicinity of WIPP near Carlsbad, New Mexico. The Final EIS is expected to include a recommendation of the preferred alternative.

## **2.4 NRC - Blending of Low-Level Radioactive Waste**

LLW is subdivided into four classes according to the concentration of certain radionuclides (NRC 1982a). These classes are designated as Class A, Class B, Class C and GTCC, in order of increasing radionuclide concentration. The classification system is based on calculations of the dose received by a hypothetical person who inadvertently intrudes into a LLW disposal facility after the prescribed 100 years of institutional control. Class A waste is waste that will not pose much risk to the inadvertent intruder. Consequently, Class A waste is not required to be stabilized. Class B waste, due to its higher radionuclide concentrations, is required to be treated to produce a physical form which is stable for 300 years. Class C waste must be stabilized and it must also be disposed of under a durable (i.e., effective for 500 years) intruder barrier. Waste that exceeds the Class C limits (i.e., GTCC waste) is the subject of the Draft EIS discussed in Section 2.3.

The issue of blending higher concentrations of LLW (Class B and C waste) with lower concentration waste (Class A waste) has come to the forefront because of the current lack of disposal access for 36 states with Class B and C radioactive waste (See Section 2.1 for one potential solution). Blending is seen as a means to combine lower classes of LLW (Class A) with higher-classes (Classes B and C) into mixtures that could be classified as Class A and would have more options for disposal.

The NRC issued a BTP on concentration averaging and encapsulation that applies to LLW in 1995. The current position places relatively specific limitations on averaging. In October 2010, the NRC directed its staff to revise the current position on blending\* to be risk-informed and performance-based. This was option 2 in SECY-10-0043, *Blending of Low-Level Radioactive Waste* (NRC 2010a). A draft revision of the BTP on concentration averaging was prepared to identify the circumstances under which large scale blending is acceptable. A public meeting was held in February 2011 to provide background on the BTP and to solicit public comments. Following the meeting an update to the draft BTP was prepared and submitted for official public comment. A revised version of the document was made available to the public in September 2011 (NRC 2011a). A workshop was held in Albuquerque, NM, in October 2011 to seek public comment.

Public feedback included compliments for changes addressing operational concerns and the active efforts to engage the public. Other comments regarding the exposure scenarios that were considered in the inadvertent intrusion scenario were also received. The 'take away' scenario was criticized as having a basis in advertent 'sealed source' related events in other countries that are not germane for a licensed disposal facility. Use of a more realistic well drilling scenario that allows for site specific considerations related to regulatory controls and drilling practices was suggested. There were also comments regarding practical considerations related to demonstrating homogeneity of waste streams.

A summary of the Albuquerque meeting is available from the NRC (NRC 2011b). The NRC had proposed to reissue the BTP for public comment prior to addressing all of the existing comments. Participants at the meeting requested that the existing version be revised to address public comments before publishing the document again for comment. This approach was accepted by NRC Staff.

NRC staff also met with the Disused Source Working Group for the Low-Level Radioactive Waste Forum in February 2012, in Dallas, Texas. The rationale for the revised BTP was explained and there were opportunities to address questions from the Working Group. The Working Group also provided formal comments. Comments from the October workshop, the Disused Source Working Group, the NRC Advisory Committee on Reactor Safeguards (ACRS) and other interested parties were considered during the development of a revised draft that was issued for public comment on June 11, 2012 (NRC 2012b). Public comments are due by October 8, 2012.

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\* Blending, as defined by the NRC is "mixing of LLRW with higher concentrations of radionuclides with LLRW with lower concentrations of radionuclides to form a final homogeneous mixture" (NRC 2010a)



## 2.5 NRC - Revision of 10 CFR Part 61 – Disposal of Unique Waste Streams

The NRC has initiated activities related to a limited rulemaking to update 10 CFR Part 61 that was discussed in the previous LLW History reports. In December 2010, NRC Staff issued SECY-10-0165, *Staff's Approach to Comprehensive Revision to 10 CFR Part 61* (NRC 2010b). Five options were identified for the possible revision of 10 CFR Part 61, including:

1. Risk-inform the waste classification framework
2. Perform a comprehensive revision of 10 CFR Part 61
3. Align 10 CFR Part 61 with international standards
4. Establish site-specific waste acceptance criteria
5. Maintain the *status quo*.

The proposed rulemaking is limited to considerations related to site-specific analyses, identifying technical requirements of the analyses, and developing guidance outlining key parameters and assumptions.

Public meetings were held in FY 2011 to seek stakeholder input regarding the potential update. One of those meetings was held jointly with a discussion of efforts to update DOE Order 435.1 and DOE Manual 435.1-1 (DOE 2001), which comprise the equivalent DOE directive for LLW. DOE and the NRC are seeking to harmonize, to the extent practical, efforts between the update to DOE Order 435.1 and the limited rulemaking on 10 CFR Part 61. The results of these meetings were considered during the development of preliminary proposed rule language and associated technical basis as well as a technical analysis supporting a definition of a period of performance included in the preliminary proposed rule. These documents were presented at a public meeting held on May 18, 2011. The public was invited to submit comments on the documents at that time. These comments have been considered as efforts continue on the proposed rulemaking.

Efforts in FY 2012 have included an emphasis on seeking broader public feedback through a number of public meetings. This approach was further supported by the Commission in SRM COMWDM-11-0002/COMGEA-11-0002 (NRC 2012a), which directed the staff to engage stakeholders and other members of the interested public to discuss and finalize the agency's approach and to specifically address the following:

- Allowing licensees the flexibility to use International Commission on Radiation Protection (ICRP) dose methodologies in a site-specific PA for the disposal of all radioactive waste.

- A two tiered approach that establishes a compliance period that covers the reasonably foreseeable future and a longer period of performance that is not a priori and is established to evaluate the performance of the site over longer timeframes. The period of performance is developed based on the candidate site characteristics (waste package, waste form, disposal technology, cover technology and geo-hydrology) and the peak dose to a designated receptor.
- Flexibility for disposal facilities to establish site-specific WAC based on the results of the site's PA and intruder assessment.
- A compatibility category for the elements of the revised rule that establish the requirements for site-specific PAs and the development of the site-specific WAC that ensures alignment between the States and federal government on safety fundamentals, while providing the States with the flexibility to determine how to implement these safety requirements.

Public meetings on these topics and the proposed rule in general began in February 2012 and continued through August 2012. Based on feedback obtained from these meetings, there is the possibility that the Commissioners could once again re-direct the staff's efforts based on that feedback.

Regulatory analysis associated with the site specific assessment rule is also being completed. The analysis is due at the end of September 2012. The analysis should provide insight regarding the choice of a limited rulemaking to replace the concept of a comprehensive revision of 10 CFR Part 61. Staff must also begin drafting rule language to publish for public comment in December 2012. Additional public meetings could be held to discuss the draft rule. The final rule is due to Commissioners by July 2013 (Monitor 2012b).

### **3.0 DEPARTMENT OF ENERGY LOW-LEVEL WASTE DISPOSAL**

A number of major DOE initiatives continued in FY 2012 and significant disposal capacity was added at DOE sites. The following items are addressed in this Chapter:

1. Update of DOE Order 435.1
2. Additional disposal capacity at Oak Ridge and Hanford
3. Completion of the new mixed waste disposal cell at the NNSS
4. Efforts to develop a new disposal cell at the Idaho National Laboratory
5. Update on the PA Community of Practice (CoP)
6. Update on the Advanced Simulation Capability for Environmental Management (ASCEM) project.

#### **3.1 Update of DOE Order 435.1**

DOE Order 435.1, Manual 435.1-1, and Guide 435.1-1 (DOE 2001)\* were developed to mitigate inadequacies in the previous DOE Radioactive Waste Management Order, DOE 5820.2A (DOE 1988). There have been a number of regulatory changes and lessons learned over the 10+ years since the implementation of DOE Order 435.1.

Drafts of the revised DOE Order/Requirements, a supporting Technical Standard, and Guides (General Requirements, High-Level Waste, Transuranic Waste, and LLW) were developed in FY 2012. The Technical Standard includes more detailed requirements for a number of specific activities, including for example: performance assessments, composite analyses, monitoring, and obtaining a Disposal Authorization Statement (DAS). The drafts were circulated for review by DOE staff and site contractors and comments were received in September 2012. The comments will be addressed with the intent to complete an updated version of the draft documents and to distribute the revised drafts for public comment early in FY 2013.

The update is addressing a number of developments that have occurred over the last 11 years, since the original DOE Order 435.1 was published, and also provides clarification as needed based on experiences and lessons learned. In addition to development of the technical standard to formalize guidance related to obtaining and maintaining a DAS, a number of other specific topics are being addressed in the update. Examples of specific topics being addressed in the update include: waste incidental to reprocessing and tank closure, clarification of expectations for waste classification, interpretation of probabilistic uncertainty analysis relative to performance objectives, in-situ closure and disposal, and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) disposal cells.

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\* DOE Order, Manual and Guide were approved on July 9, 1999. There have been two changes since then. The Order was changed on August 28, 2001 to add the National Nuclear Security Administration to the DOE Elements to which the Order applies. The Manual was changed on June 19, 2001 to remove the requirement that Headquarters is to be notified and the Office of Environment, Safety and Health consulted for exemptions for use of non-DOE treatment facilities.

### **3.2 Status of Waste Disposal Alternatives at Paducah**

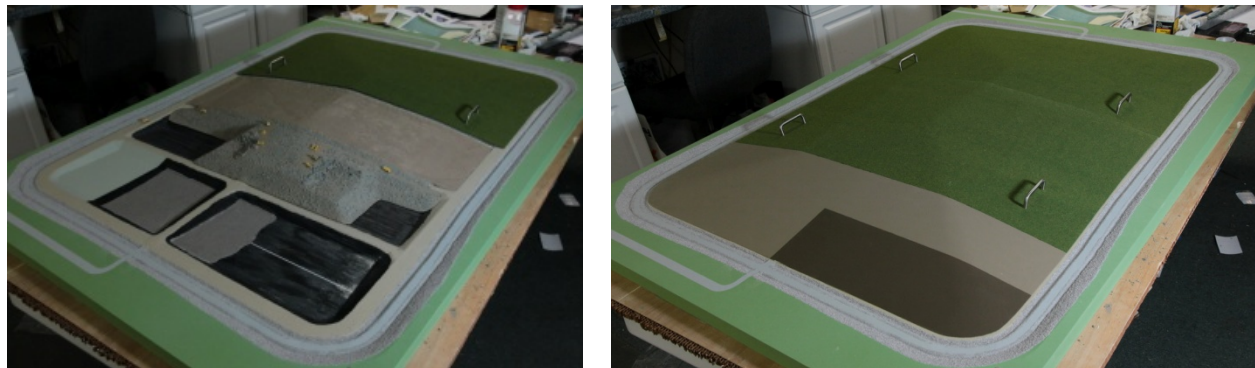
The Paducah Site is in the process of considering alternatives for disposition of wastes associated with site restoration activities. One of the alternatives is an On Site Disposal Cell (OSDC) designed to meet Environmental Protection Agency (EPA) standards for Subtitle C disposal facilities for hazardous wastes. The risks associated with an OSDC are being considered as part of a remedial investigation/feasibility study (RI/FS) that is being conducted. The modeling approaches used to assess the risks have evolved over the past few years. Discussions with the State and EPA Region IV have addressed modeling approaches and key assumptions for the risk assessment and its supporting modeling. Communications were also encouraged between the project team involved in the risk assessment and modeling work at Paducah and similar work being completed at Portsmouth (see next section).

The Draft RI/FS was completed and submitted to the Commonwealth of Kentucky and EPA Region IV for review. Comments were received from the Agencies in September and are in the process of being addressed. A revised RI/FS will be produced based on the comments, which will lead into development of a proposed plan and eventually result in a Record of Decision (RoD) for the preferred alternative. The proposed plan and RoD are expected to be completed in FY 2013.

### **3.3 Status of Waste Disposal Alternatives at Portsmouth**

The Portsmouth site is considering development of an OSDC for waste associated with decommissioning and demolition of process and support buildings and other cleanup activities at the site. Portsmouth is actively pursuing siting, characterization and modeling activities to evaluate disposal alternatives in an RI/FS under CERCLA. The RI/FS and a preliminary design package are expected to be submitted to the Ohio EPA in FY 2012, followed by development of the proposed plan and a RoD. The RoD is planned to be completed in FY 2013.

A combination of regular public communications and technical support activities were conducted in FY 2012. Regular stakeholder meetings, tours of the study area, and development of a physical model illustrating the OSDC concept (Fig. 3-1) were part of the outreach efforts. Technical activities being completed in FY 2012 included geotechnical and geochemical investigations, natural resource and habitat studies, and preliminary design and WAC development.



*Figure 3-1 Model Illustrating Features of an On-Site Disposal Cell (DOE Photo)*

### **3.4 Proposed Disposal Facility at the Idaho National Laboratory**

The Idaho National Laboratory (INL) is pursuing development of a proposed facility that would provide long-term disposal capacity for remote-handled LLW generated on the Idaho Site to replace the existing capacity at the Radioactive Waste Management Complex, which is planned to close in the near future. The specific site for the facility was selected in FY 2012 and the PA was completed and approved by the DOE Low-level Waste Disposal Facility Federal Review Group (LFRG). A preliminary DAS was issued, which in conjunction with project management documentation provided the basis to move forward with formal design. A Request for Proposals was issued for a design-build contract and the bids are currently being evaluated. The draft Composite Analysis (CA) is expected to be complete early in FY 2013 followed by the formal LFRG review.

### **3.5 Performance Assessment for the Environmental Restoration Disposal Facility at Hanford**

A new PA is being developed for the Environmental Restoration Disposal Facility at the Hanford site (Fig. 3-2) to address large conservatisms associated with earlier analyses and to account for updated inventory estimates. The modeling approach was revised in late FY 2011 to address consistency with the approach used in the Tank Closure and Waste Management EIS. The draft PA was completed in August 2012 and is undergoing internal reviews. The PA will be submitted to the Department of Energy, Richland Operations Office (DOE-RL) and the EPA for review early in FY 2013 with plans for the formal review by the LFRG later in FY 2013.

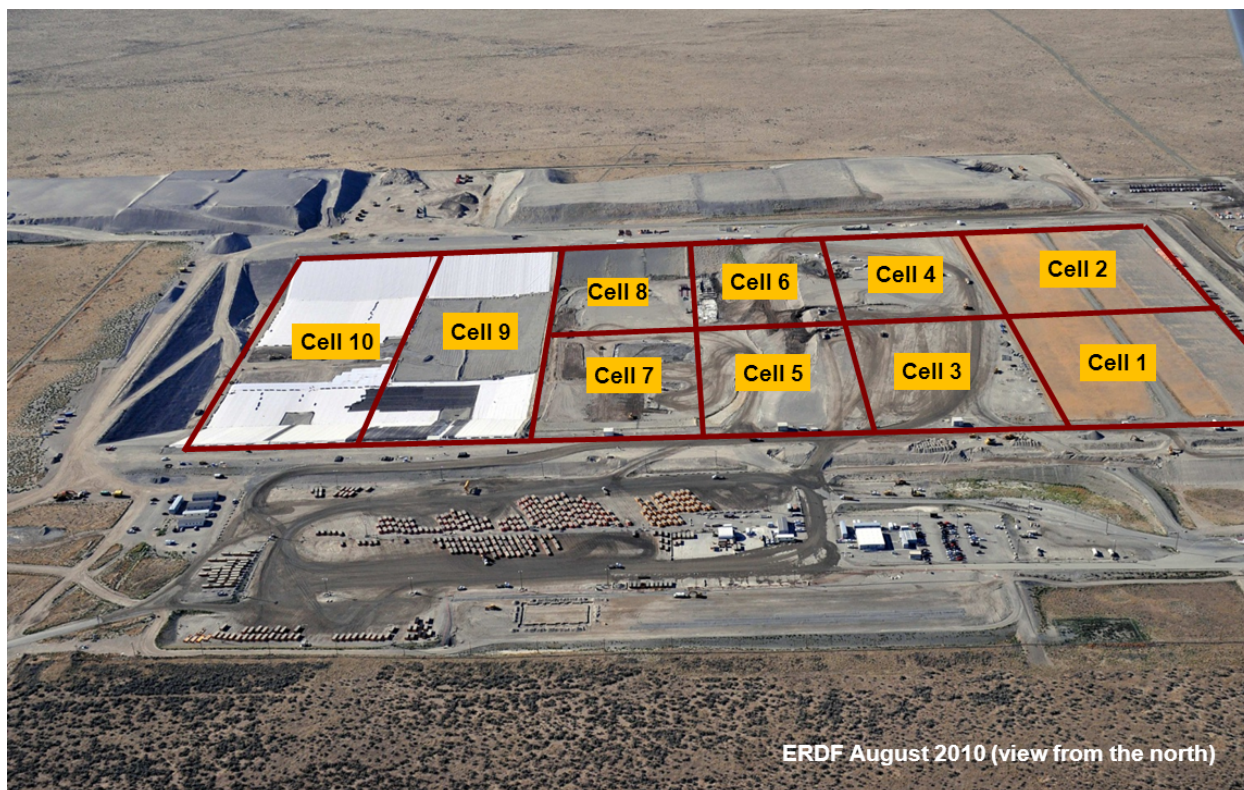


Figure 3-2 Environmental Restoration Disposal Facility at the Hanford Site (Courtesy: DOE)

### 3.6 Advanced Simulation Capability for Environmental Management

The Department of Energy, Office of Environmental Management (DOE-EM), Office of Technology Innovation and Development is supporting a multi-National Laboratory effort to develop ASCEM (Williamson et al. 2011). ASCEM is an emerging state-of-the-art scientific approach and software infrastructure for understanding and predicting contaminant fate and transport in natural and engineered systems. These modular and open-source high performance computing tools and user interfaces will facilitate integrated approaches that enable standardized assessments of performance and risk for DOE-EM clean-up and closure decisions.

In FY 2012, ASCEM completed the Phase II demonstrations of the initial tools. The Phase II demonstrations focused on showcasing the “AKUNA” toolset which integrates the different capabilities in the ASCEM platform. In FY 2013, ASCEM will also release an initial version of the code to “friendly users” for the purpose of testing in a broader audience. Development plans include incremental improvements with parallel quality assurance (QA) development leading to a version of the code with regulatory level QA expected in the 2015 time frame.

Efforts continued to engage end-users in FY 2012 in on-going interactions with the LFRG and through direct interactions with practitioners. The User Steering Committee continued to provide higher level input from a programmatic and regulatory perspective. The User Steering Committee provided formal recommendations to the ASCEM management team. A key emphasis of the recommendations was a need to identify a path forward for integration of end-users in actual applications and demonstrations of the tools. There has been a shift in focus from identification of requirements in FY 2010 to identification of opportunities for direct engagement of the developing ASCEM tools on demonstrations at the DOE sites.

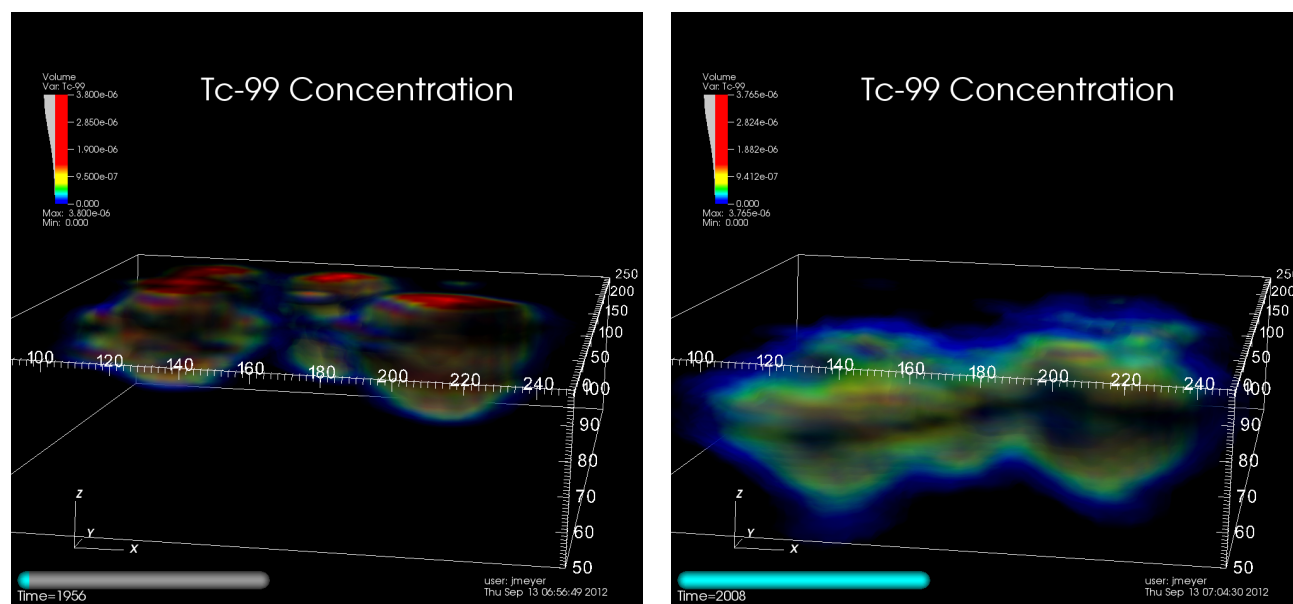


Figure 3-3 Visualization of the Evolution of a Tc-99 Plume Using the ASCEM Tools (Courtesy: DOE)

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