

Why Cleanup Acceptance Is Running into Conflicts - Off-site Disposal Versus On Site Disposal¹ 19068

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ABSTRACT

For years the U.S. Department of Energy (DOE) identified several sites to receive shipments of various types of wastes. However, with the backlog at the Waste Isolation Pilot Plant (WIPP), the inability to license Yucca Mountain, and the agency's desire to expedite cleanup, DOE is trying to "dispose of" or "store" more waste belonging to the Federal government on-site. Some states and communities that were "promised" disposal of DOE's waste in geologic repositories and licensed landfills in arid locations, are now being told that on-site disposal is the best path forward. Competition for resources is forcing more sites to focus on near term cost savings of on-site disposal, rather than develop comprehensive life-cycle estimates representing a more realistic picture of costs associated with isolating radioactive and other hazardous materials on-site in perpetuity. The paper explores the issues and possible solutions in a case study on proposed on-site disposal of DOE waste, and concludes that DOE needs community support and community acceptance to successfully implement the agency's cleanup mission. Ongoing dialogue with the community saves both time and money but more importantly, cooperation helps ensure that effective long-term cleanup occurs.

INTRODUCTION

The U.S. Department of Energy (DOE) manages the largest environmental cleanup program in the world. The federal agency is responsible for cleaning up more than 107 sites across the United States, with a geographic area as large as the states of Delaware and Rhode Island combined. [1] DOE has completed work at 91 sites, with the remaining 16 active sites generating extremely large volumes of various types of radioactive and chemical waste left over from the Manhattan Project and Cold War eras.

Several of DOE's closed sites (Fernald, Weldon Springs, and Rocky Flats) have on-site waste disposal landfills, or "cells," that were constructed as part of the cleanup remedy, and where radioactive and other hazardous wastes remain. The regulatory drivers for these facilities are primarily the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as "Superfund," and the Resource Conservation and Recovery Act (RCRA). The DOE's Office of Legacy Management (LM), created in 2003, is responsible at these sites for long-term surveillance and maintenance, records management, and for ensuring that post-closure responsibilities are met. [2]

Several of DOE's largest sites with active cleanup programs---Oak Ridge, Savannah River, and Hanford, also have on-site engineered landfills for "legacy" waste generated from past production activities. These landfills were constructed pursuant to CERCLA are managed by the DOE Environmental Management program at each site.

Since 2012, DOE officials in Oak Ridge have been actively pursuing the construction of a second on-site

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landfill to dispose of radioactive, hazardous, and toxic wastes, including mercury-contaminated demolition debris. The agency is concerned that space is running out in their existing CERCLA landfill and cannot accommodate the large volumes of waste that are expected to be generated from the cleanup program over the next decade. DOE recently issued a proposed plan for the second landfill for public comment.

One of the criteria required by CERCLA to be considered in the decision-making process is “Community Acceptance.” Numerous concerns about DOE’s proposed plan have been raised by citizens, federal and state regulators, local officials, and environmental scientists. The following sections provide the background and examine issues affecting community acceptance of DOE’s proposal for additional on-site disposal.

BACKGROUND

The DOE’s Oak Ridge Reservation (ORR) site covers approximately 33,500 acres and is located almost entirely within the corporate limits of the City of Oak Ridge, Tennessee. The City of Oak Ridge, with a population of approximately 30,000 is 92 square miles and is in two counties, Anderson County and Roane County.

The site consists of three large industrial production facilities constructed as part of the World War II-era Manhattan Project: the Oak Ridge National Laboratory (formerly known as the X-10 Site), a research facility that includes nuclear reactors and ongoing energy, materials and computational research, and biological and environmental programs; the East Tennessee Technology Park (ETTP), the location of the former K-25 production facility that enriched uranium-235 by gaseous diffusion and now the focus of DOE’s “Reindustrialization Program,” and the Y-12 Plant, a production facility that formerly enriched uranium-235 by an electromagnetic process, and currently disassembles nuclear weapon components, processes nuclear materials, and performs other functions related to energy and national defense programs.

The ORR was designated a National Priorities List Superfund site in 1989 pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). Site operations generated a variety of radioactive, non-radioactive, and mixed (radioactive and non-radioactive) hazardous wastes, most of which were containerized and buried below ground or stored in buildings on site.

According to the U.S. Environmental Protection Agency (EPA) “Leakage from buried wastes, stored wastes, and operational activities from these facilities has resulted in hundreds of contaminated areas across the ORR site. Most contamination is located within DOE-controlled property where public access is restricted. However, site wastes have also contaminated surface water and sediment outside ORR’s property boundaries, including the Lower East Fork Poplar Creek, the Poplar Creek/Clinch River and the lower Watts Bar Reservoir of the Tennessee River. In total, site contaminants have affected 82 river miles of the Clinch River and the Clinch River arm of the Watts Bar Reservoir. The contaminants are mostly located in river and lake bottom sediments. Dredging is prohibited in these areas unless approved by the EPA and TDEC.” [3]

The Tennessee Department of Environment and Conservation (TDEC), along with DOE and the U.S. Environmental Protection Agency (EPA) constitute the parties to Tennessee’s Federal Facilities Agreement (FFA), a compliance agreement that sets forth the terms, framework, and enforceable schedule for the federal government’s environmental cleanup program in Oak Ridge. The site schedule to complete long-term cleanup activities, mainly remediation of contaminated groundwater, is currently set for 2047. [3]

EXISTING ON-SITE DISPOSAL

In 1999, the three parties signed a Record of Decision (ROD) to construct the Environmental Management Waste Management Facility (EMWMF) CERCLA Waste Cell on the ORR in Oak Ridge. The EMWMF is a land disposal facility that serves as the on-site landfill for cleanup waste from the ORR. The facility is authorized to receive low-level radioactive waste and wastes regulated under the Resource Conservation and Recovery Act and Toxic Substances Control Act from CERCLA-regulated cleanup work. The ROD called for the design, construction, operation and closure of an on-site earthen disposal cell and its supporting facilities, located in East Bear Creek Valley. [4]

Most federal construction projects require a comprehensive analysis pursuant to the National Environmental Policy Act (NEPA). A DOE policy established in 1994, however, allows NEPA values to be incorporated into CERCLA-related projects in order to streamline analyses and expedite cleanup activities. Thus, the 1999 EMWMF ROD was based on CERCLA criteria as analyzed in DOE's 1999 Remedial Investigation/Feasibility Study. The nine criteria are:

- Overall protection of human health and the environment;
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance. [4]

The City of Oak Ridge's Environmental Quality Advisory Board (EQAB) reviewed the DOE's proposed plan for on-site disposal in early 1999. The EQAB is a volunteer board, comprised of Oak Ridge citizens, that was created by the city to serve as an advisory body to City Council on matters contributing to a quality environment. [5]

Upon review of DOE's proposed plan, EQAB members concluded that it would be better for the City in the long term if no waste remained on the Oak Ridge Reservation. Recognizing, however, that it would be challenging for DOE's remedial actions to remove all the federal government's waste, the members believed that DOE's proposal for on-site disposal deserved the support of the community. The citizens' board recommended that the City accept DOE's proposed plan, *provided that the DOE mitigate some of the possible adverse consequences for the Oak Ridge community*. [6] The following provisions, as set forth by the citizens' board, were included in the City Council resolution:

- Monies saved by disposing of CERCLA waste locally instead of sending it out of state should be spent in Oak Ridge on activities such as accelerating cleanup projects, conducting more extensive cleanups, funding long-term stewardship of waste sites, and supporting Oak Ridge's economic development.
- A mechanism should be established to assure funding for perpetual care of the facility, such as requiring DOE to pay a fee into a state-managed investment account for every cubic foot of material placed in the cell. Financial assurance should be provided not only for routine maintenance activities, but also to cover the potential costs of contingencies, including the cost of compensation for any parties by unexpected failures and emergency response needs of the City.

- Funding should be provided to compensate Oak Ridge, now and in the future, for economic losses and costs related to the negative public perceptions associated with the presence of the disposal facility and other residual contamination. Compensation is needed both for opportunities lost due to negative public perceptions and for the costs of public education efforts to counter negative perceptions.
- The City understands that the recommended mitigation measures may require congressional authorization and/or promulgation of new regulations, but deems these measures necessary if Oak Ridge is to accept the permanent presence of radioactive and hazardous waste. [7]

In the public comment period on DOE's proposed plan, other local stakeholders and organizations raised questions about the expected life-cycle of the facility, and whether DOE had been thorough in its cost analysis when comparing on-site versus off-site disposal. In the DOE responsiveness summary, the agency stated that

The cost criterion is only one of nine CERCLA evaluation criteria that must be considered when evaluating remedial actions, per the NCP. Based on the information presented in the RI/FS, the on-site disposal alternative appears to be the best alternative when evaluated under the CERCLA criteria. This evaluation includes the modifying criteria of *state acceptance and community acceptance*. (Emphasis added) [4]

The ROD stated that the on-site disposal facility would handle most future-generated CERCLA waste, to include low-level radioactive waste (LLW), "RCRA-defined hazardous waste," Toxic Substance Control Act (TSCA) waste, and mixed waste; the total capacity of the on-site cell was projected to be between a minimum of 357,000 cubic yards on the low-end conceptual design, and 1.7 million cubic yards on the high end. [4].

The EMWMF opened in 2002 on a 120-acre site and currently contains five active disposal cells, totaling the size of more than 20 football fields. Since the time the ROD was signed in 1999, the DOE has issued several amendments, called "Explanations of Significant Differences." (ESD) The first of these decision documents was issued within a year of the original ROD; the modification, agreed to by the State of Tennessee and the EPA, allowed DOE to bury classified waste in the landfill. Another ESD supported the construction of a \$20 million "Haul Road," that facilitated transportation of waste across the ORR to minimize use of public roads. In 2010, DOE issued another ESD, providing for the construction of a sixth waste cell, raising the capacity of the EMWMF to approximately 2.2 million cubic yards. [9]

The sixth cell has been constructed and DOE began placing waste there in June 2018. [10] Typical waste placed in the facility originates from contaminated soils, dried sludge and sediment, dismantled building debris, scrap piles, and personal protective equipment. [4] [8] [11] During the federal FY 2018 (October 1, 2017 through September 30, 2018) period, the EMWMF received 6,305 low-level radioactive and hazardous waste shipments, accounting for 73,510 tons, from cleanup projects at ETTP, ORNL, and Y-12. [11]

In addition, in FY2018 EMWMF operations collected, analyzed, and disposed of approximately 3.19 million gallons of leachate at the ORNL Liquid and Gaseous Waste Operations facility. Approximately 10.04 million gallons of contact water were released to the storm water retention basin after laboratory analyses determined the water met discharge standards. [11]

SECOND ON-SITE LANDFILL PROPOSED

Although the sixth and final cell of the EMWMF raised the capacity for on-site disposal to approximately 2.2 million cubic yards, the landfill has been deemed insufficient by DOE to handle the total volume of CERCLA waste expected to be generated during the life of the cleanup program. The most recent annual report regarding EMWMF estimates at 95% confidence limit that the facility will be filled to capacity in the mid-2020s, while the demand for total waste to be disposed at the on-site facility is 3.6 million cubic yards through 2043. [8]

In 2011, DOE assigned the responsibilities of landfill management and operations to a new environmental cleanup contractor. The contractor is responsible for operating and maintaining the EMWMF for disposal of waste from all ORR CERCLA projects and activities to include:

- Placement of received waste materials in compliance with all approved operating requirements and the Record of Decision.
- Operation and maintenance of the facility, including closure of existing cells, in compliance with all applicable environmental regulations and the Record of Decision.
- Management of the EMWMF waste acceptance criteria (WAC) process in accordance with approved plans and procedures to maintain compliance with stakeholder agreements while maximizing the cost-effective use of the EMWMF capacity.
- Waste lot profile preparation assistance, and review and approval of WAC compliance for all waste generating projects.
- Integration of waste generation forecast information from all generating projects into Waste Generation Forecasting and Waste Shipment Forecasting systems.
- Preparation of the annual Capacity Assurance Remedial Action Report (CARAR) summarizing EMWMF utilization during the previous year and forecasting remaining capacity and utilization rates. [12]

In September 2012, the DOE's Oak Ridge Office (ORO) released the document *Remedial Investigation/Feasibility Study for Comprehensive Environmental Response, Compensation, and Liability Act, Oak Ridge Reservation Waste Disposal, Oak Ridge, Tennessee (DOE/OR/01-2535&D1)* to examine the possible construction of a second Low Level Radioactive Waste Disposal Facility on the Oak Ridge Reservation to dispose of CERCLA-related waste. The DOE's preferred alternative was stated as the construction of a second landfill, the proposed Environmental Management Disposal Facility (EMDF), which is the focus of the September 2012 Remedial Investigation/Feasibility Study (RI/FS). [13]

The DOE followed the same process the one the agency used to site the EMWMF. Unlike a typical remediation process, which would evaluate alternatives for cleaning up a specific contaminated site, the agency used the 2012 RI/FS to develop, screen, and evaluate alternatives for selecting an option about disposal of future-generated CERCLA waste. The alternatives for waste disposition were evaluated with respect to the nine criteria to address the statutory requirements of CERCLA, and were then analyzed

individually against each criterion and then compared against one another to determine their respective strengths and weaknesses and to identify the key trade-offs that must be balanced for the ORR site. The results were described in the DOE's RI/FS, with the construction of the EMDF as the preferred alternative. [13]

The EPA and TDEC, as parties to the FFA, reviewed the draft document. During 2012 and 2013, DOE, the EPA and TDEC met multiple times and were unable to resolve their respective issues with the Draft 1 RI/FS. A second draft of the RI/FS was transmitted by DOE to EPA and TDEC in June 2013. Pursuant to the Federal Facilities Agreement, the EPA in August 2013, initiated an informal dispute with DOE over disagreements between the agencies and where EPA deemed the DOE's responses as insufficient. [14] The three agencies met multiple times during 2013 and 2014, but were still unable to resolve their differences on the D2 RI/FS. [15] Among concerns identified by the regulators were the proposed site's hydrological environment, radiological waste control, treatment and discharge requirements for contact water, and leachate treatment. [16]

From a community standpoint, city officials understood that the decision to build a second landfill could have a significant impact on the City of Oak Ridge, as well as the greater metropolitan region. Therefore, a decision should be made with as much information as possible to educate local officials and the public, and with meaningful engagement by the affected community. While the CERCLA process focuses primarily on toxicological impacts to the immediate environment, it does not require the detailed, robust socioeconomic analysis as prescribed by NEPA. The NEPA, along with its implementing regulations, requires consideration of potential human impacts of proposed federal actions, including socioeconomic impacts, cultural and cumulative impacts, and off-site effects. [17]

To that end, the City of Oak Ridge issued a Request for Proposals (RFP) in 2014 to qualified vendors to perform a Community Impact Assessment (CIA) of DOE's second on site radioactive waste disposal facility, which was proposed to be located on federal property in the city limits. Since the proposed EMDF would be a permanent facility that will require perpetual surveillance and maintenance, information regarding the potential human impacts of the project on the affected host community needed to be gathered and analyzed for DOE's, EPA's, and TDEC's analysis of the CERCLA-based **Community Acceptance** criterion to be valid and reliable.

The City awarded a contract to a firm in mid-2014 to prepare the CIS. The study, which was issued in September 2015, included:

- A technical review of the DOE's 2012 Remedial Investigation/Feasibility Study (RI/FS), which identifies potential environmental impacts to the Oak Ridge community;
- A life cycle cost analysis of the proposed facility that incorporates additional factors/alternatives not evaluated in the DOE RI/FS such as short and long-term economic opportunity costs, and costs and benefits associated with alternatives not considered in the RI/FS; and
- An analysis of factors that would assist the Oak Ridge community in determining whether the community could accept the proposed EMDF. The analysis will include NEPA-type criteria such as potential human impacts, socioeconomic impacts, cultural and cumulative impacts, and off-site effects.
- A review of DOE's third RI/FS draft, which was transmitted by DOE to EPA and the State in April 2015. [15]

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- Comments from citizens who attended public meetings sponsored by the City during the project period.

The contractor's findings were detailed in a report issued to the City in the fall of 2015. The contractor concurred with several aspects of DOE's proposal to construct the EMDF:

- The proposed EMDF cost of \$.81 B is essentially half the cost of DOE's estimate for off-site disposal.
- The proposed EMDF site location is appropriately zoned Controlled Industrial and is within an area of Bear Creek Valley that already contaminated.
- The site's proposed location would allow use of the \$20 million "haul road" constructed several ago to transport waste from demolition sites to the EMWMF. [18]

However, the report also identified many "Issues of Concern" related to the DOE proposal for additional onsite disposal. Among the concerns:

- DOE did not undertake a detailed risk assessment for the on-site disposal alternative. Instead, the agency prepared a prospective assessment of risk based on the type, quantity and concentration of waste contaminants that the agency presumed would be disposed.
- The proposed EMDF site does not meet the agency's criteria specified in the RI/FS for surface water impacts and sites with unfavorable topography.
- The reliance upon ground water modeling, coupled with limited groundwater and geotechnical investigation, presents difficulty in determining actual site suitability.
- The proposed EMDF site does not meet Nuclear Regulatory Commission (NRC) requirements that disposal sites should be located in areas with low population density and limited growth potential.
- The DOE's life cycle cost analysis did not include an examination of short-and long-term economic opportunity costs. Socio-economic data for Oak Ridge clearly demonstrates that land areas immediately adjacent to the ORR are more economically distressed than those further from the reservation. Additional study is required to better quantify the degree of impacts to the City of Oak Ridge. [18]

The City held several public workshops and meetings to discuss the results of the Community Impact Assessment, and provided the document to DOE, EPA, and the State of Tennessee for review and comment.

STATUS AND DISCUSSION

Between 2015 and 2017, the parties to the Federal Facilities Agreement---DOE, EPA, and the State of Tennessee---could not agree that information provided in DOE's various versions of the RI/FS was sufficient to assess the suitability of a second on-site disposal facility, the proposed EMDF.

In May 2017, DOE initiated a formal dispute under the FFA to move the CERCLA process forward to

issue a Proposed Plan, the document that would describe DOE's preferred alternative leading up to a Record of Decision. In July 2017, a joint statement was issued by members of the Dispute Resolution Committee of the EPA and TDEC asserting that DOE

has failed to provide TDEC or EPA with an adequate RI/FS report that satisfies CERCLA and provides assurance that the proposed EMDF would be protective of human health or the environment and comply with federal and state environmental laws that are 'applicable' or 'relevant and appropriate.' [19]

In December 2017, the FFA parties signed a Dispute Resolution Agreement (DRA), which memorialized the terms and conditions to be met in order for the DOE to proceed with issuance of a Proposed Plan. The parties agreed that the Proposed Plan would identify a different site than the one previously proposed by DOE immediately adjacent to the existing landfill, the EMWMF. The Central Bear Creek Valley (Site 7C) would be identified as DOE's preferred location for additional onsite disposal of CERCLA mixed low level radioactive waste on the Oak Ridge Reservation. [20]

Another key provision of the DRA was the stipulation that DOE's Proposed Plan would include a Field Sampling Plan (FSP), approved by EPA and TDEC, to implement data collection for Site 7C. The results would be included in the Proposed Plan, and be used in selecting the disposal remedy. [20]

DOE issued the Proposed Plan for public comment in September 2018. The FSP, which was approved for public release in March 2018, was included as Appendix B of the document. [21]

City of Oak Ridge officials reviewed the document, as did the City's Environmental Quality Advisory Board and the contractor that had conducted the Community Impact Assessment. Numerous concerns were identified and transmitted to DOE by the City in December 2018. Among the top concerns:

- Site testing is incomplete to make a landfill site selection. DOE indicates that site 7C is the most appropriate location for the proposed EMDF, but then states that more study is required and the landfill design may need to be changed. In addition, the proposed site is a greenfield, unlike the area adjacent to the EMWMF, and will thus permanently eliminate options for future use of the site.
- The Proposed Plan fails to adequately detail DOE's plan for remediation and disposal of Mercury wastes. The management, treatment, storage, and disposal of Mercury is of utmost concern to the community, as Mercury contamination at Y-12 has been prioritized as the highest environmental risk on the Oak Ridge Reservation. The estimated total historical release of mercury to air, surface water, and soil at Y-12 is more than 2 million pounds. [22]
- A complete description of the Waste Acceptance Criteria (WAC) for placement of wastes in the proposed EMDF should be included in the Proposed Plan. The waste characterization process must also be explained. The approach taken by DOE denies the host community and the public an opportunity to understand and comment on the type of waste that would be permitted to be disposed.
- DOE's life cycle cost comparisons for onsite versus offsite disposal are incomplete. The proposed plan does not incorporate cost savings from guaranteed waste volume shipments to off-site landfills. Nor does the agency examine potential socioeconomic impacts, to include loss of future growth, and cumulative impacts associated with permanent loss of natural resources and stigma associated with nuclear waste disposal.

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- In the Proposed Plan, DOE is seeking several regulatory waivers, including Toxic Substances Control Act (TSCA) Landfill Siting Requirements, and State of Tennessee’s Radioactive Waste Disposal Rule. The placement of low-level nuclear and hazardous waste in a water rich environmental setting where site conditions would not meet regulatory requirements is of very significant concern. [23]

The DOE held two public information sessions in Oak Ridge during the fall of 2018, and a formal public hearing on November 7, 2018. The overwhelming majority of the comments made by attendees at the hearing were in opposition to DOE’s Proposed Plan for additional on-site disposal. [24]. The DOE participated in a City of Oak Ridge-sponsored work session on November 27, 2018. Numerous topics were addressed, but the lack of detailed information available at this stage in DOE’s process did not ameliorate the City’s concerns.

DOE’s public comment period for the Proposed Plan ended in early January 2019. If the process proceeds as planned, the agency is scheduled to issue a draft Record of Decision in late spring 2019.

A systematic examination of the process and events leading up to the issuance of the DOE’s Proposed Plan reveal several key factors that may be contributing to the conflicts DOE is experiencing as the agency seeks to site and construct a second landfill in Oak Ridge.

First, the agency may be suffering a loss of credibility in the minds of some in the community, which can serve to undermine public trust and confidence. The agency pledged in 1999 that the EMWMF would provide all the onsite disposal needed to clean up the Oak Ridge Reservation. In addition, the DOE’s Proposed Plan for the EMWMF stated that the landfill would not dispose of classified waste. Yet within a year of the signing of the ROD, the agency issued an Explanation of Significant Difference (ESD) document that authorized the disposal of classified waste in the EMWMF. This action added significant short-term and long term costs to the onsite disposal project. Safeguards and Security Plans had to be developed and implemented, and the costs associated with security and surveillance post-closure were added.

Also contributing to the concerns regarding a second landfill are the issues associated with the construction and operation of the EMWMF landfill. In its review of DOE’s initial proposal for the proposed EMDF, EPA staff requested a summary of “lessons learned” from EMWMF design, construction, and operations to include:

- a. Underdrain retrofitting and monitoring
- b. The design permeability effect on decreasing leachate collection and increasing storm water collection
- c. Post ROD decision to design for contact storm water handling, monitoring and treatment
- d. Leachate storage and shipment to permitted facilities on the ORR
- e. Action leakage rate
- f. Operational decision to preclude RCRA listed waste even though the remedy was based on disposal of listed wastes. [25]

Citizens have expressed frustration that the use of clean fill and soils in the EMWMF took up valuable and expensive space that is now needed for future cleanup. Material disposed there, particularly during early operations, was suitable for disposal in sanitary landfills. These concerns are carrying over into the current landfill discussions, with many wondering if DOE can effectively oversee the management of the proposed EMDF.

Third, DOE has not made a compelling scientific case that additional on-site disposal will be safe, be protective of human health and the environment, or reduce the toxicity or mobility of mercury waste. Nor can the agency at this point in the process demonstrate compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Questions, and lack of detailed information related to the WAC, treatment, encapsulation, and disposal of mercury, along with water management, all contribute to the agency's inability to garner state or community acceptance.

Fourth, the reluctance of DOE to examine the potential socioeconomic and opportunity costs of onsite disposal is a source of conflict, as is the seeming unwillingness of the agency to solicit current cost estimates from contractors who could transport the waste off-site to licensed disposal facilities in more arid locations.

Finally, there is the recognition that neither DOE, nor regulators, nor host communities have much long-term experience with engineered onsite disposal of radioactive and hazardous waste. The EMWFMF has not reached a 20- year operational level, and yet must be managed in perpetuity. What will the long-term effectiveness of the facility be in fifty, 100, or 200 years, and who will pay for the management over the very long time horizon during which the landfill's contents will still be hazardous? These are important questions that will influence the degree of conflict in onsite landfill decisions.

CONCLUSION

This case study has examined key issues surrounding the acceptance of on-site disposal of radioactive and hazardous waste on the DOE's Oak Ridge Reservation. While the process is ongoing, several preliminary conclusions can be drawn.

- The City of Oak Ridge and other stakeholders recognize that the federal government has a problem to solve. They want to help solve the problem, but the CERCLA process and the Federal Facilities Agreement do not provide the City a formal seat at the table. Decisions are being made that will affect the Oak Ridge community for hundreds of years into the future.
- Community and Stakeholder engagement early in the decision-making process is essential. The initiative taken by the community to systematically evaluate the DOE's proposals and technical documents has been instrumental to determining whether community acceptance can be achieved.
- Risk-based decisions are inherently uncertain, and must be made at the community level, as each site is different. The community must be provided the science, technology, tools and resources to understand the human health and environmental risks, both in the near term and long term.
- The process must include meaningful education and discussion on waste acceptance criteria, which can facilitate community acceptance of certain types of waste, but also clearly show DOE which waste must be disposed off-site.
- DOE should re-evaluate its cleanup contracts to decouple performance bonuses from the schedule for on-site disposal of CERCLA waste. Considering the lack of technical information and site characterization at this stage in the process, incentive based contracting places too many constraints and excessive pressure on the agency, its contractors and regulators to make a near-term decision that may not be in the long-term best interests of the community or the federal government.

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- Research should continue to examine case studies where communities have been more actively engaged in decision making. DOE should consider expanding/reconvening the agency’s On-Site Disposal Working Group to help foster communication and assess onsite disposal performance across the DOE complex. [27] Sites such as Rocky Flats will require protective action forever, and much is to be learned as stakeholders are just at the front end of the learning curve.
- In the end, DOE needs *community support and community acceptance* to successfully implement the agency’s cleanup mission. Ongoing dialogue with the community saves both time and money but more importantly, cooperation helps ensure that effective long-term cleanup occurs.

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