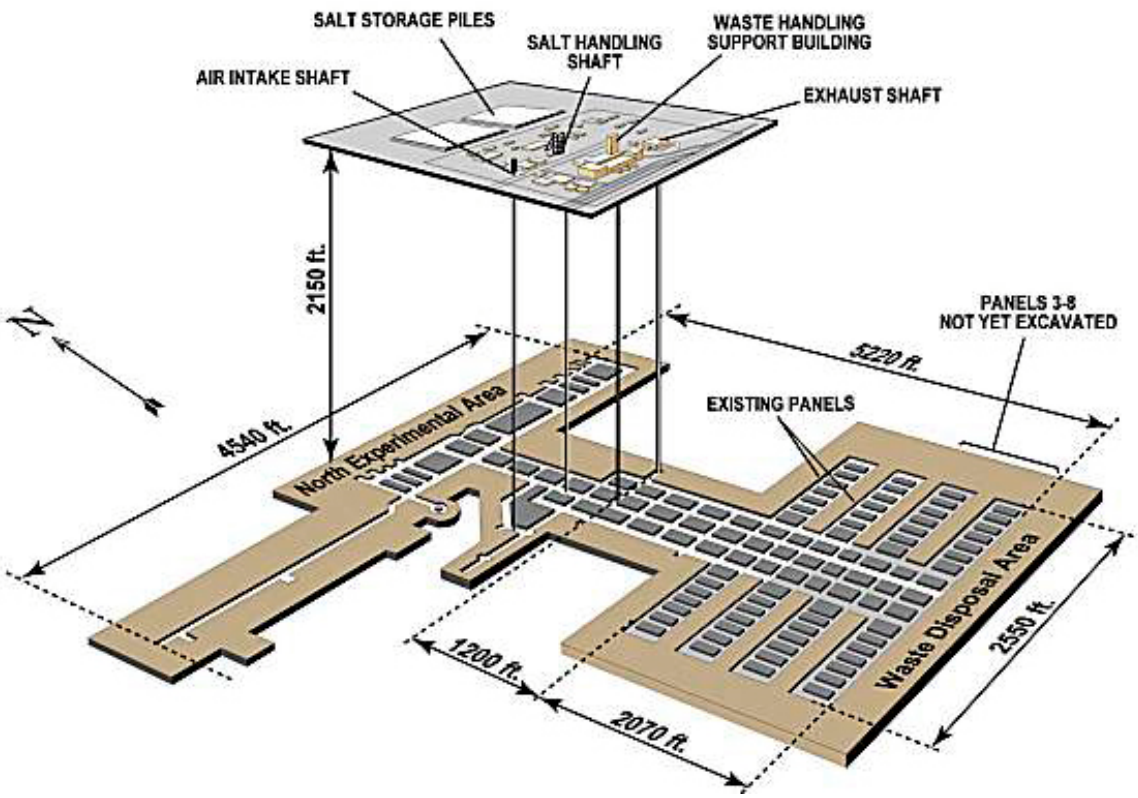
THE WASTE ISOLATION PILOT PLANT: HOW WELL IS "ACCELERATED CLEANUP" WORKING?



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Introduction, Basic Findings, and Recommendations

Introduction

More than 50 years of producing nuclear weapons generated large amounts of radioactive and hazardous chemical wastes that remain highly dangerous for thousands of generations. By 1996, the United States nuclear weapons complex had generated an estimated:

* 380,000 cubic meters (100 million gallons) of high-level waste containing 960 million curies of radioactivity;
* 220,000 cubic meters of transuranic (TRU) waste with 3.8 million curies of radioactivity;
* 3,300,000 cubic meters of low-level waste with 50 million curies of radioactivity;
* 32,000,000 cubic meters of 11e(2) byproduct material;
* 146,000 cubic meters of mixed low-level waste; and
* 79,000 cubic meters of other waste.[1]

The U.S. Department of Energy (DOE) is responsible for nuclear weapons waste. Over the past 15 years since the Environmental Management mission was established, DOE has developed various plans for managing, or cleaning up, those wastes. State and federal laws also place requirements on waste management. There has been substantial public interest and concern regarding the health and environmental impacts of the wastes, as well as how and whether they are transported from site to site.

TRU waste is defined as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives[2] greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. The majority of TRU waste is "mixed waste" that includes hazardous chemical contaminants.

TRU wastes are a small part (less than one percent) of the total waste generated by nuclear weapons production, based on both radioactivity and volume. Nonetheless, appropriate storage, transportation, and disposal of those wastes remains a technically complex undertaking, and one that costs taxpayers hundreds of millions of dollars a year. Successful management of those wastes is essential, but it is also vital to the overall successful effort to safely manage all the wastes for two primary reasons:

* TRU wastes are very long-lived so they must be isolated to protect humans essentially forever. This need for isolation drives the federal government plan to dispose of 6.2 million cubic feet (175,564 cubic meters) of TRU waste 2,150 feet underground in the world's first

[1] U.S. Department of Energy. *Linking Legacies*. DOE/EM-0319. January 1997. http://legacystory.apps.em.doe.gov/pdfs/linking/001_010.pdf. There are also 79,000,000 cubic meters of contaminated solid media (mostly soil) and 1,800,000,000 cubic meters (475 billion gallons) of contaminated ground water not included in the above list.

[2] A half-life is the time required for the activity to decrease to one-half of its initial value. Plutonium-239, a major radionuclide in TRU waste, has a half-life of 24,400 years, meaning that it maintains a significant amount of radioactivity for hundreds of thousands of years.

geologic repository – the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico. WIPP is intended to provide protection of public health and the environment for at least 10,000 years, essentially the same requirement as for the high-level waste that contains more than 95 percent of all radioactivity in weapons waste.[3]

* Since 1979 when Congress authorized WIPP, successive administrations and congresses have established laws and made commitments regarding the safety, costs, and schedules for managing TRU wastes. Success in those efforts would show the federal government's technical capability to achieve those legal commitments and promises. Conversely, lack of success undermines the government's credibility and public confidence regarding radioactive waste management, but also casts doubt on its technical capabilities.[4]

A brief review of WIPP's history shows the ebb and flow of the federal government's capabilities. WIPP was first publicly announced in August 1972; was authorized by Congress in 1979; was "cancelled" by President Carter in 1980; had construction initiated in 1981 by President Reagan with plans to begin receiving wastes by 1986; had still not opened by 1991, when its opening was prevented by lawsuits; was given specific requirements by Congress in the WIPP Land Withdrawal Act of 1992; was approved as meeting its standards by the Environmental Protection Agency in 1998; was allowed to open by a federal judge in March 1999; was issued its operating permit by the state of New Mexico in October 1999; and has received 3,795 truck shipments of waste, totaling 30,317 cubic meters of waste from eight sites by July 31, 2005.[5]

In February 2002, DOE announced its "Accelerated Cleanup" program, which is supposed to reduce cost and risk of waste management. The program includes additional funds "when a site and DOE reach agreement on an expedited schedule that shows measurable gains and can be held accountable."[6] State governments where DOE sites were located were to agree to Letters of Intent to demonstrate their commitment to the program.

Congress supported the DOE program and in the Defense Authorization Act for Fiscal Year 2003 required that DOE "shall allocate, to each site for which the Secretary has submitted to the congressional defense committees a site performance management plan, the amount of those funds that such plan requires."[7]

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[3] The Nuclear Waste Policy Act of 1982 called for exactly the same standards for high-level waste (HLW) and TRU repositories. Subsequently, because of litigation challenging the adequacy of Environmental Protection Agency (EPA) standards and the apparent inability of the designated HLW repository at Yucca Mountain in Nevada to comply with the WIPP standard, several provisions of the EPA regulations have been changed. The most recent Yucca Mountain standard was ruled invalid in by a federal appeals court in 2004. EPA expects to issue a proposed revised Yucca Mountain standard in August 2005.

[4] Both nuclear weapons and civilian nuclear programs are affected by the lack of capacity and capability for disposing of radioactive waste, including disposal sites for high-level and some other wastes.

[5] http://www.trusolutionsnm.com/WTS_Data.pdf

[6] http://www.fas.org/news/usa/2002/13102doe.htm

[7] Public Law 107-314, Section 3145(a), signed into law on December 2, 2002. http://thomas.loc.gov/cgi-bin/query/F?c107:7:./temp/~c107dfW2AB:e909728:

A major element of the DOE Accelerated Cleanup program is to dispose of TRU waste more quickly -- by 2012 – 2015, or about 20 years ahead of the current schedule. Such an approach is said to save money by reducing the operating costs of WIPP over its lifetime and by reducing waste storage costs at many of the sites. In the summer of 2002 as a major component of the "Accelerated Cleanup" program, 18 DOE sites developed Performance Management Plans (PMP) which provided some details about how wastes at those sites would be managed and about measures that could be taken to speed up clean up of the sites. At sites with TRU waste and at WIPP, the PMPs proposed various measures to change existing schedules and practices, including characterizing the waste inventory, developing new shipping containers and procedures, changing operations at WIPP, and modifying regulatory requirements.

The PMPs include specific goals and objectives that are to achieve cleanup on a quicker schedule and at a lower cost. For TRU waste, the WIPP officials developed the "Transuranic Waste" (WIPP) PMP that "implemented a holistic, comprehensive approach to planning for acceleration ... to ensure that this plan reflects an integrated approach to legacy TRU waste disposal."[8]

In addition to the Rocky Flats Plant, there are five other large TRU waste storage sites – Hanford, Idaho National Lab (INL), Los Alamos National Lab (LANL), the Oak Ridge Reservation (ORR), and Savannah River Site (SRS) – that are scheduled to send virtually all of the remaining TRU waste to WIPP over the next decade. Those five sites did prepare PMPs. The Lawrence Livermore National Laboratory (LLNL) also prepared a PMP and shipped waste to WIPP in 2005.

This report examines the PMPs of those six sites regarding TRU waste and the WIPP PMP to see how the WIPP Plan and the major individual site plans relate. The report also analyzes how well each site and WIPP are meeting the goals and milestones of the plans, discusses how well projected cost savings are justified, and reviews regulatory and other relevant issues. The analysis primarily covers the first two+ years of the plans, updating the information through at least 2004, and in some cases, up to July 2005.

The report includes separate chapters on each of the seven sites and its PMP. Each chapter includes six sections:

* A background briefly describes the site and its mission and role regarding TRU waste.
* The TRU waste inventory is examined by comparing the WIPP PMP with the site PMP, as well as comparing the inventory in other site or official documents.
* Waste shipment projections are compared with the WIPP PMP, the site PMP, and DOE's Budget Requests to Congress.
* Cost savings provided in the PMP are reviewed and analyzed.
* Regulatory compliance issues regarding TRU waste management are identified and analyzed.
* Other relevant issues are discussed.

[8] WIPP PMP, page 9. The Rocky Flats Plant near Denver, CO, shipped the majority of the waste that WIPP received during its first six years of operations. But Rocky Flats did not prepare a PMP because no acceleration was planned beyond that included in the contract and schedule for closing the site, which included shipping its TRU waste to WIPP. In April 2005, Rocky Flats completed 2,045 shipments containing 15,062 cubic meters of TRU waste to WIPP.

SUMMARY OF THE BASIC FINDINGS

TRU WASTE INVENTORY

* At every site there are differences between inventory used in the site PMP and the WIPP PMP, which are unexplained in the documents. For example, the WIPP PMP says that Hanford has 16,100 cubic meters of CH waste, while the Hanford PMP puts the total at 29,780 cubic meters.

* There are significant discrepancies in the estimates regarding the amount of TRU waste at each site in various official documents. While some of the differences are relatively small, there is a significant difference at Hanford, which has the second largest amount of TRU waste (after INL). For example, the Hanford Solid Waste Disposal Final Environmental Impact Statement of 2004 shows almost 50 percent higher volume of TRU waste than the Hanford PMP.

* The information in several PMPs does not include some of the TRU wastes actually stored at the site. For example, the LANL PMP does not include the hundreds of drums of classified material and the hundreds of cubic meters of sealed sources.

* In some cases the PMP inventory estimates are not consistent with legal or regulatory requirements or agreements. For example, at INL, there are serious discrepancies about the size of the TRU inventory between the State of Idaho and DOE, especially regarding the 25,000 to 36,000 cubic meters of buried wastes, which is the subject of ongoing litigation.

* Most of the site PMPs have no estimates about the amount of Remote-Handled (RH) TRU waste, even when the site acknowledges it has such waste and even when the WIPP PMP contains such estimates. For example, the LANL PMP does not estimate the amount of RH-TRU waste, even though DOE states that there is such waste and, indeed, plans for LANL to be the first site to ship RH-TRU wastes to WIPP. SRS does not use the term, "RH TRU waste," but rather discusses "high activity" TRU waste. Hanford, which has the largest amounts of RH waste, does not include any amounts of such waste in either the WIPP or Hanford PMP, although the WIPP PMP includes 3,235 RH waste shipments to WIPP from Hanford. Both the WIPP and ORR PMPs includes substantial volumes of RH waste, although the amounts are substantially different – 1,840 cubic meters in the WIPP PMP and 996 cubic meters in the ORR PMP.

* For Fiscal Year 2003, the WIPP PMP projected disposal of 8,939 cubic meters of CH-TRU waste; 7,542 cubic meters was actually disposed, or 84 percent of the amount planned. In Fiscal Year 2004, the WIPP PMP projected disposal of 12,366 cubic meters; 8,810 cubic meters was actually disposed, or 71 percent of the amount planned. Therefore, for the two-year period, 16,352 cubic meters of CH-waste was disposed; while the WIPP PMP had projected the amount would be 21,305 cubic meters. Thus, 77 percent of the total amount projected was actually disposed.

* Some sites met PMP milestones and some badly missed those plans. Rocky Flats shipped its CH waste to WIPP about a year ahead of schedule. SRS also exceeded the disposal amounts included in the WIPP PMP – shipping 5,525 cubic meters, as compared with the 2,132 cubic meters planned. Hanford shipped 698 cubic meters, as compared with the 666 cubic meters planned. However, INL, the site which has about half of all the CH-waste in the WIPP

inventory, shipped 909 cubic meters as compared with the 8,650 cubic meters in the WIPP PMP, or about 11 percent of what was planned. Los Alamos shipped 327 cubic meters, as compared with the 1,835 cubic meters planned.

TRU WASTE SHIPMENTS

* The number of truck shipments of waste each fiscal year to WIPP shown in the site PMPs are not consistent with the numbers shown in the WIPP PMP. These differences are not explained in the documents. In some cases the differences are large. For example, the INL and ORR PMPs include no annual shipping schedule, while the other site PMPs do have shipping schedules. However, the Hanford PMP estimates more than twice as many shipments (2,465 versus 990) during the period from 2003 to 2015 compared with the WIPP PMP. The LANL PMP estimates almost 25 percent fewer shipments (1,091 to 1,356) than the WIPP PMP during the period of 2003 to 2010. Sometimes the differences appear related to the fact that the estimates in the WIPP PMP are based on an average shipment of 35 55-gallon drums per shipments, while some of the site PMPs base shipments with 42 55-gallon drums per shipment, the full capacity for TRUPACT-II shipping containers. (Each truck's maximum capacity is three TRUPACT-II containers and each TRUPACT-II has a capacity of 14 55-gallon drums.)

* In Fiscal Years 2003 and 2004, the actual number of shipments to WIPP were significantly fewer than included in the PMPs. During those two years, WIPP received only 61 percent of the shipments included in the WIPP PMP – 1,766 actual shipments, compared with the 2,879 planned. The only site that exceeded its PMP goals was SRS; actual shipments were 424, compared with 288 in the WIPP PMP and 190 in the SRS PMP. INL sent 123 shipments, as compared with the 1,169 in the WIPP PMP (the INL PMP has no shipment numbers). LANL made 46 shipments, as compared with 248 in the WIPP PMP and 265 in the LANL PMP. Hanford's actual shipments were 109, compared with 126 in the Hanford PMP. ORR made no shipments, as compared with 74 in the WIPP PMP. LLNL made no shipments, as compared with 23 in the WIPP PMP and 32 in the LLNL PMP.

* For Fiscal Year 2005, the WIPP PMP included 1,655 shipments. The shipment schedule that DOE is using includes 1,420 shipments, but ten months through the fiscal year, there have been 774 shipments.

* The shipping estimates in the PMPs differ from the "Corporate Performance Measures" included in the annual *DOE Budget Request to Congress*, but DOE neither describes nor explains the discrepancies. In addition, the actual volume to TRU waste disposed at WIPP is not accurately reported in the Budget Request.

COST SAVINGS

* None of the PMPs include or reference baseline cost estimates against which claims of cost savings can be evaluated. For some sites, there is no actual quantification of savings. For example, the Hanford PMP states that the savings would be "tens of millions of dollars in lifecycle costs." The INL PMP includes no specified amount of cost savings for TRU waste. In

addition, the claimed cost savings are generally not detailed to particular milestones so that additional or lesser savings cannot be estimated based on actual performance.

* Given that no site included baseline costs or cost and savings estimates that described the assumptions and bases for the estimates, there are no reliable estimates of the baseline costs or how much savings might occur from the "accelerated cleanup" described in the PMPs.

* The fact that several sites are not meeting the milestones used in the PMPs should mean that some of the near-term projected cost savings will not be realized. Since some sites are behind schedule, even the pre-"accelerated cleanup" timeline, there could be increased costs above the baseline.

* In some cases, such as LLNL and LANL, some of the projected cost "savings" appear to be based on transferring the costs of waste management and environmental remediation from Environmental Management to the National Nuclear Security Administration. Such "savings" are based on accounting only, not on any savings to the taxpayers, so they should not be considered to provide any actual cost savings.

REGULATORY COMPLIANCE ISSUES

* Each PMP recognizes that each site's regulatory requirements are unique, and in some cases there is a brief mention of requirements related to TRU waste. Yet, regulatory requirements are not well integrated into the site PMPs. For example, the resolution of regulatory issues regarding the size of the TRU inventory at INL and whether any "waste incidental to reprocessing" is reclassified as TRU could have a large effect on the TRU inventory at that site. The INL PMP does not adequately address those matters.

* The PMPs do not discuss the major TRU inventory issue of high-level waste reclassification that has embroiled DOE, some states, and Congress over the past two years. The issue relates to whether some waste in tanks that store high-level waste at Hanford, INL, and SRS can be reclassified as low-level or TRU waste. Similarly, the Hanford and WIPP PMPs do not discuss the DOE plans to declare some Hanford tanks to be TRU waste. In mid 2002, DOE was preparing both the PMPs and the WIPP Recertification Application. The WIPP PMP did not include Hanford tank waste, but the WIPP Recertification Application inventory included waste from eight Hanford tanks as part of the WIPP Inventory.

* Some significant regulatory disputes between states and DOE are not addressed in the site PMPs. In addition to the disputes between the states of Washington and Idaho and DOE, the ORR PMP does not mention the significant dispute between Tennessee and DOE regarding whether Tennessee can enforce the requirements that shipments of RH TRU wastes must begin by January 2003.

* Most states have regulatory authority over hazardous wastes disposal, and thus have an interest in mixed wastes. DOE is required by federal law to have a Site Treatment Plan on radioactive

waste volumes, generation and disposal plans, including mixed wastes and mixed TRU.[9] The Site Treatment Plans reviewed were inconsistent with the PMPs.

* Some major WIPP legal and regulatory requirements are not addressed in either the WIPP or site PMPs. For example, although in its EPA certification and recertification proceedings, DOE estimates that there is more RH waste than allowed by WIPP's legal capacity, the PMPs neither reflect that excess inventory, nor do they discuss the issue.

OTHER RELEVANT ISSUES

* Transportation needs, especially for more and larger shipping containers, are included in some site and WIPP PMPs. But some vital transportation issues are not mentioned in the PMPs. For example, state concerns regarding the "single containment" TRUPACT-III for large items are not included. State concerns about routing and inspections are not adequately discussed.

* Lack of leadership is mentioned in some of the PMPs, but it is not identified as a major on-going problem. One example is LANL where the management contract is being bid. All the sites have multiple missions and generally handling TRU is not a high priority.

* Privatization is a significant issue that is not adequately discussed in the PMPs. For example, at INL and ORR, major waste treatment contracts are integral parts of "accelerated cleanup." The recent termination of the BNFL contract at the INL Advanced Mixed Waste Treatment Facility is a current example of some of the dangers of delays, and cost increases, that can occur from privatization.

* The PMPs proposal for eastern and western "hubs" did not include major, foreseeable impacts. For example, shipments from two sites to Hanford triggered a lawsuit, which has prevented further shipments, even though they are included in the PMP. Although using SRS for shipments from Mound did not result in litigation, it was a major factor in bringing additional resources to SRS (rather than to other sites) which allowed SRS to be the only site to exceed its PMP shipment estimates.

* The PMPs might have addressed not just "legacy" TRU waste, but also waste generated by future operations, and the draft WIPP PMP did include some estimates. However, none of the PMPs address the expanded TRU inventory that will result from proposed additional plutonium production either at LANL or at the "Modern Pit Facility" -- DOE's proposed replacement for Rocky Flats, which created much of the "legacy" TRU waste.

[9] Section 3021(b) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6721, as amended by Section 105(a) of the Federal Facility Compliance Act (Public Law 102-386).

RECOMMENDATIONS

* DOE, Congress, and the public need a comprehensive, integrated planning and evaluation process for managing TRU wastes. The site and WIPP Performance Management Plans (PMPs) have not provided such a process. Either the PMPs should be eliminated or they must be dramatically revised. Any new plans should at a minimum provide the following.

* Be updated at least annually to reflect actual experiences and changing circumstances. The existing PMPs are about three years old and are outdated.

* Include a TRU waste inventory that accurately reflects CH and RH wastes that are at the sites, regulatory requirements for storage, shipment or disposal, and waste classification or other disputes and uncertainties about the inventory.

* Provide shipment estimates based on the most current WIPP shipping schedule, while also including past experience regarding the amount of waste per shipment and the amount of waste by volume (in cubic meters) that will be transported or are included in contracts.

* Be consistent with annual *DOE Budget Requests to Congress* and the "Corporate Performance Measures." Currently, it is impossible for the public or Congress to know what are the performance goals, what the baseline costs of achieving them are, whether the goals are met or exceeded or not met, and how they should be revised to reflect changing conditions.

* Be subject to public input and be publicly available, both electronically and in hard copy. Adequate time for public comment would improve the quality of the plans. Public input could also increase the credibility and acceptance of the plans.

* Clearly explain any discrepancies regarding inventory, shipments, and schedules, if the WIPP plan and site specific plans are different.

* Straightforwardly discuss the alternatives for waste storage and disposal, since the highest current estimated volumes for both CH and RH waste exceed the legal capacity limits at WIPP. Issues that should be addressed include which sites should have priority for disposal of their wastes and how "excess" waste can be handled; what to do about disposal of new wastes generated by new production.

* Include projected volumes of TRU waste from proposed future plutonium pit manufacturing.

* Address transportation issues and uncertainties, including concerns about the single containment TRUPACT-III, as well as issues related to any "hubs" or "interim storage" sites for TRU wastes that are not shipped directly to WIPP, and options for transporting such wastes.

* Include regulatory requirements and matters in dispute, including how such issues are being addressed and any uncertainties about their resolution.

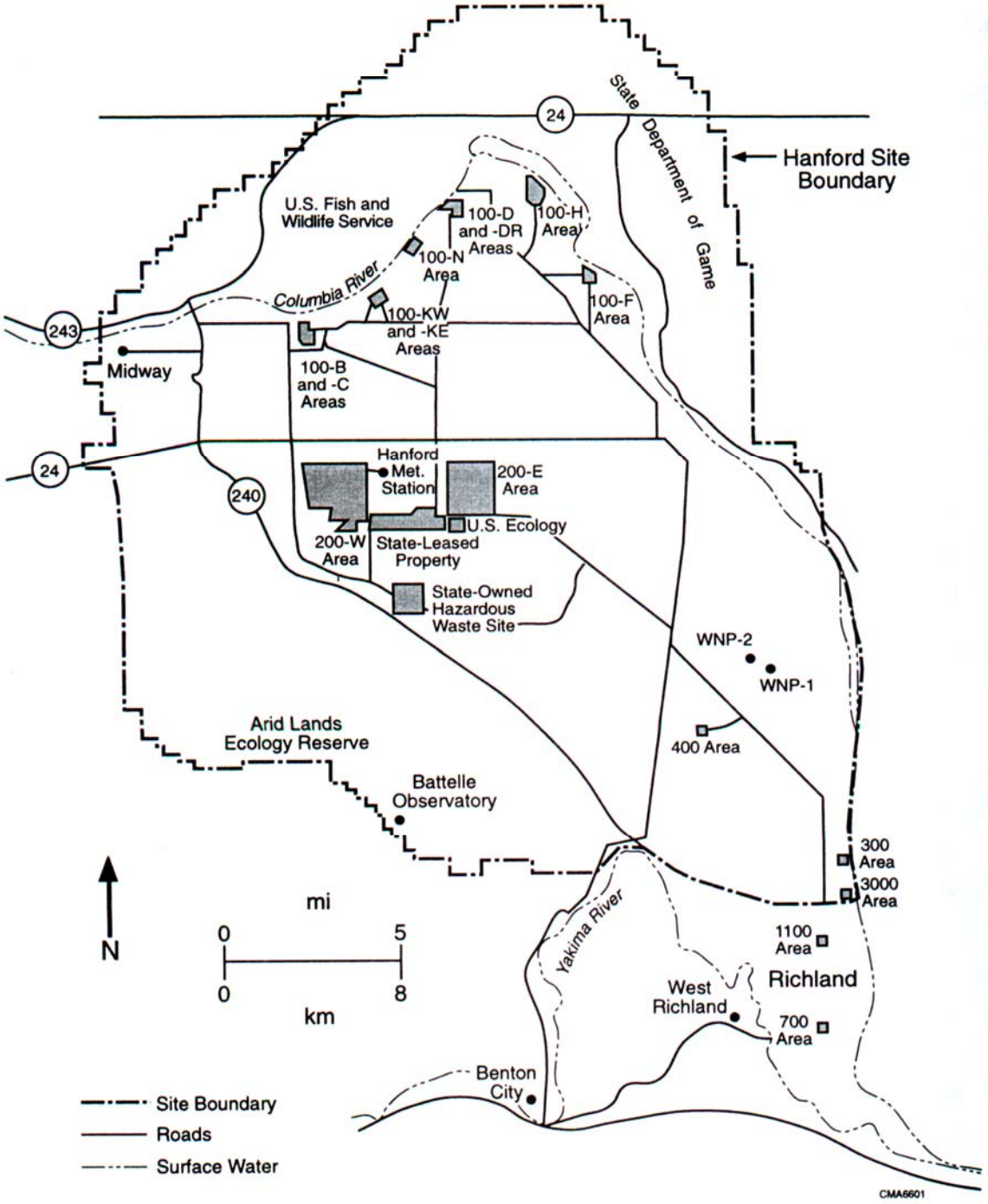
* DOE should develop lifecycle baseline cost estimates for each site and make the bases and assumptions for those costs publicly available. Any projected cost savings from "accelerated cleanup" should be compared with the baseline costs, and each major cleanup project should have a separate cost bases so that whether projected cost savings are achieved can be determined.

* DOE must develop consistent and reliable inventory estimates for both CH and RH waste on a site-by-site basis. Unless, based on those estimates, DOE determines that the current legal limits for the amount of CH- and RH-TRU waste will not be exceeded, it should publicly discuss its plans to address the projected overcapacity at WIPP, including options that it could implement.

* DOE Budget Requests to Congress should include accurate historic performance measurements and current and future year projections should be those in DOE's performance plans.

* Congress should revise the law to either require comprehensive and accurate PMPs or it should eliminate the existing legal provision that funding allocations are to be based on the PMPs. The existing PMPs are not being followed by DOE, the sites, or Congress.

* Risk Reduction should not be quantified based on the amount of TRU waste at any site, rather the site's risks should include all wastes. Any risk reduction regarding TRU waste should also include the risk increase if waste is being shipped to the site. Future waste generation at the site should also be added into any calculations of risk reduction from shipping wastes offsite.



From: DOE. *Final Waste Management Programmatic Environmental Impact Statement,* DOE/EIS-0200F, May 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Hanford Site
Performance Management Plan (PMP)

In August 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Hanford Site, located in southeastern Washington. Included in the PMP were initiatives to accelerate cleanup of the site, including initiatives to increase the rate of shipments of transuranic (TRU) waste from Hanford to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The PMP also accelerates remediation of burial grounds and waste sites in the Columbia River Corridor, closure of high-level waste tanks, cleanup of nuclear fuel facilities and wastes, and clean up of hundreds of facilities and groundwater in the Central Plateau. The PMP states that by accelerating those programs by 35 years (2070 to 2035) or 45 years (2070 to 2025), DOE will save $30 billion to $40 billion. The PMP also describes management changes being implemented to support the plan and includes interim milestones.

The DOE also prepared a PMP for the WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. The study also identifies and analyzes critical assumptions in the PMPs to determine if the forecasts are manageable and realistic.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal laws and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. WIPP is only allowed to accept CH waste at this time. Hanford has large amounts of both CH waste and RH waste, currently estimated at the second largest amounts of CH waste (Idaho National Laboratory has the largest amounts) and the largest amounts of RH waste.

Hanford Site

Hanford was created in 1943 as part of the Manhattan Project to produce plutonium for the first nuclear weapons that were tested in New Mexico and dropped on Hiroshima and Nagasaki, Japan in 1945. The site has several major contractors, including Fluor, Bechtel, CH2M Hill, and Battelle. The two DOE offices – Richland Operations Office, which handles the site except for the high-level waste (HLW) tank cleanup, and the Office of River Protection, which is responsible for the HLW tanks – together employed about 11,000 people and had a budget of about $2 billion in 2003.[1]

Hanford occupies 586 square miles of land in southeastern Washington state. The Columbia River runs through the northern portion of the site and forms its eastern boundary. The City of Richland is located on the southern boundary of the site, and the cities of Kennewick and Pasco are located less than 15 miles southeast of the site. The Yakama Indian Reservation is located about 30 miles west of the site.

Beginning in 1943, Hanford produced plutonium for U.S. nuclear weapons, including operating nine reactors, chemical separation and fuel fabrication facilities, and other related operations. Hanford has produced about 64 metric tons of plutonium, or about two-thirds of all plutonium created in the United States.[2] Most reactor and chemical separation facilities were shut down in the 1970s, but in the 1980s Hanford was involved in nuclear energy research. In 1989, Hanford was placed on the Environmental Protection Agency's National Priorities List, known as Superfund, and Hanford's environmental management programs were designated as its primary mission. Hanford's operations produced large amounts of high-level, TRU, and low-level waste. About 50 million gallons of HLW was stored in 177 tanks, many of which have leaked into the soil and ground water. More than 2,000 metric tons of spent nuclear fuel was left in water-filled basins near the Columbia River. About 750,000 cubic meters (m3) of buried or stored solid wastes is in buildings, pads, or trenches. About 270 billion gallons of contaminated ground water is spread over 80 square miles. And there are more than 1,700 waste sites and about 500 contaminated buildings.[3]

The "end state" envisioned in the Hanford PMP is that in 2035 the site would "shrink" so that "about 85% of Hanford [is] cleaned to unrestricted surface use standards, and the remaining core zone [has] gone through a closure process that is protective of human health and the environment."[4]

TRU WASTE INVENTORY

Table 1 provides TRU inventories from various sources, including the draft WIPP PMP, the WIPP PMP, the Hanford PMP, and the 2004 Hanford Solid Waste Disposal Environmental Impact Statement (EIS).

[1] http://www.hanford.gov/rl/?page=45&parent=0

[2] Hanford PMP, p. 3. Hanford PMP is available at: http://www.hanford.gov/rl/uploadfiles/Perf_Mang_rl-2002-47.pdf

[3] Hanford PMP, pp. 3-4.

[4] Hanford PMP, p. 6.

Table 1: Hanford TRU Waste Inventory
(in cubic meters-m3)

SOURCE	**Stored CH**	**Projected CH**	**Total - CH**		**Stored RH**	**Projected RH**	**Total - RH**	**Import RH under ROD(6)**	**Total RH**
Draft WIPP PMP(1)	16,100	16,200	32,300		210	940	1,150		
WIPP PMP(2)	16,100		16,100						
Hanford PMP: Retrievable I Burial Grounds	14,780								
Hanford PMP: Remainder	15,000								
Hanford PMP(3)	29,780		29,780					1,550	
WIPP Recertification(4)	16,998	13,000	29,998		4,880	9,400	14,280 6,500		
Hanford Solid Waste Disposal EIS(5)									
Burial Grounds	14,552						2,241	1,550	3,791
New + existing std containers	28,897								
New + existing non-std containers	1,357								
K-Basin Sludge	139								
PCB + caissons	118								
EIS Totals			45,064						3,791

(1) July 2003 draft TRU PMP, p. 87.
(2) WIPP PMP, p. 35 & Figure 5.0.3.
(3) Hanford PMP, Figure 15.
(4) WIPP Recertification Application, DOE/WIPP 2004-3231, Tables 4-1 and 4-2. RH totals reflect what's to be the inventory and the lesser figure is how much would be disposed to not exceed the legal limit.
(5) DOE/EIS-0286F, January 2004, Table 3.5.
(6) 69 Federal Register 39449-39455 (June 20, 2004)[Doesn't specify that all is RH waste]

Discrepancies and Analysis

The Hanford PMP and the WIPP PMP do not provide the same volumes of TRU waste, though the draft WIPP PMP had total waste estimates closer to those used in the Hanford PMP. The discrepancies are not explained in the documents, but they are very substantial. The WIPP Recertification Application (RCA) CH inventory is similar to the Hanford PMP, but is much larger (almost 50 percent) than the WIPP PMP. But for RH waste, the RCA shows much larger amounts in the inventory, more than twice as much as is allowed under the legal limits. The most recent document, the Hanford Solid Waste Disposal EIS, has much larger volumes of waste than the PMPs, almost a 50 percent increase in volumes. For RH waste, the Hanford PMP includes no volumes, while the Solid Waste Disposal EIS has larger volumes than the WIPP PMP.

In addition, the PMPs and the Hanford Solid Waste Disposal EIS ignore very large quantities of waste in the Low Level Waste Burial Ground. Independent estimates, based on DOE

documents, calculate that in addition to low-level waste in the burial grounds there could be 17,000 to 28,500 m3 of TRU.[5]

Even larger volumes of buried TRU waste in Hanford's soils are not included in the PMPs. In 2000, DOE calculated that there was 107,400 m3 of buried TRU and TRU contaminated soil at Hanford.[6]

The WIPP and Hanford PMPs do not specifically quantify the amount of TRU waste that would be imported to Hanford as part of it being the "Western Hub" for wastes to be shipped from small-quantity sites so that their cleanup is accelerated.

The large discrepancies in TRU inventory at Hanford is not limited to the PMPs, but rather is a fundamental health, safety, environmental, regulatory, and legal problem. The most recent independent discussion of the problem is Gerald Pollet's July 2004 report, done in support of this study.[7]

Another uncertain aspect of the Hanford inventory relates to the 177 high-level waste tanks. Hanford maintains that some of those tanks contain TRU waste that could come to WIPP. The exact tanks and amounts of waste in those tanks is uncertain. In its WIPP Recertification Application submitted to EPA in March 2004, DOE included 4,468.7 m3 of RH waste and 3,932.1 m3 of CH waste from the high-level waste tanks in the WIPP disposal inventory.[8]

Conclusion

Not only are the volumes reported in the PMPs inconsistent and unreliable, but Hanford does not provide consistent, reliable amounts of TRU in its major EIS's and regulatory documents. The largest discrepancies come from the fact that, until buried wastes and soils are actual exhumed, it is impossible to know exactly how much waste they contain. But without those more accurate estimates, no planning documents can adequately discuss schedules, costs or other requirements.

TRU WASTE SHIPMENTS

Table 2 identifies the shipping schedule for Contact-Handled TRU waste, based on the WIPP PMP and the Hanford PMP. It also shows actual shipments through September 30, 2004, the end of Fiscal Year 2004.

[5] Gerald Pollet. *Transuranic Waste at Hanford: Large Quantities Lost: USDOE's Plans Increase Waste and Risk While Ignoring Buried Wastes Spreading Contamination*, July 2004, p. 18.

[6] DOE, *Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities*, June 2000, Table 5. http://cid.em.doe.gov/Modules/Reporting/Summary/Buried_TRU.pdf

[7] http://www.hoanw.org/protect_washington/lostplutonium.pdf

[8] DOE/WIPP 2004-3231, RP-W013 and RP-W016 are the RH wastes, RP-W754 and RP-W755 are CH wastes. Appendix DATA, Attachment F, Annex J, pages J-RP-1 through J-RP-8.

Table 2: CH Waste Shipments 2003 - 2015 from Hanford

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	Total
WIPP PMP(1)	10	80	96	96	99	101	104	107	115	111	57	7	7	990
Hanford PMP(2)	38	88	96	96	96	232	232	232	232	232	297	297	297	2465
DOE Budget(3)	10	27	133											
Actual(4)	**37**	**72**												**121**

(1) WIPP PMP, Table 5.0-1.
(2) Hanford PMP, Figure 15 (average shipments per year, based on 35 drums/shipment (7.4 m3) as per WIPP PMP).
(3) DOE Budget Request to Congress for FY2004 & FY 2005 performance measures (7.4 m3 per shipment, even though actual amount has been less than 6.5 m3 per shipment).
(4) The total includes 3 shipments in FY00, 7 shipments in FY01, and 2 shipments in FY02.

Table 3 identifies the shipping schedule for Remote-Handled TRU waste, based on the WIPP PMP and the Hanford PMP.

Table 3: RH Waste Shipments 2003 - 2028 from Hanford

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11-20	FY21-28	Total
WIPP PMP(5)	0	0	8	10	10	10	10	65	730	339	1,182
Hanford PMP(6)											

(5) WIPP PMP, Table 5.0-2.
(6) Hanford PMP includes no information on RH shipments.

Discrepancies and Analysis

Just as there are various obvious discrepancies between the WIPP PMP and the Hanford PMP regarding inventory volumes, so too the numbers of waste shipments differ markedly. The discrepancies are not explained in the documents. The Hanford PMP includes much larger volumes of CH waste than the WIPP PMP. In fact, the actual volumes of CH waste at Hanford, if waste in the Low-Level Waste Burial Grounds and in buried waste are included, are much larger than WIPP can accommodate, unless the CH wastes at other major sites are not shipped to WIPP. Those larger volumes of waste are not included in the shipment estimates. Thus, there is a fundamental conflict between the Hanford PMP and the amount of CH waste that Hanford intends to ship to WIPP and the WIPP PMP.

In terms of performance, the actual number of shipments is not too far below what the PMPs projected, although the shipments have averaged less than 6.5 m3 of waste, substantially less than full capacity or the PMP average of 7.4 m3. The largest number of shipments are still a few years away. On the other hand, the WIPP TRU Shipping Schedule (Revision 3) for FY2004 included 109 shipments from Hanford to WIPP; the 72 actual shipments are only 66 percent of that rate.[9] During the first ten months of Fiscal Year 2005, there were 75 shipments from Hanford to WIPP. That rate is somewhat short of the goal of the PMPs, but is substantially below the rate in the DOE Budget and the 136 shipments planned in the FY2005 WIPP TRU Shipping Schedule.[10]

[9] WIPP TRU Shipping Schedule (Revision 3), 09/30/04; formerly at http://www.wipp.ws/actual_ship.pdf (which is the current shipping schedule, updated weekly).
[10] http://www.wipp.ws/actual_ship.pdf

Because the Hanford PMP does not include any information about RH-TRU waste shipments, there clearly can be no comparison with the WIPP PMP. The Hanford PMP does state that RH shipments to WIPP would not begin until 2013,[11] eight years after the schedule in the WIPP PMP. More fundamentally, since there is no accurate inventory of RH wastes at Hanford, and to be shipped to the "Western Hub," there is no reliable basis to calculate the number of RH shipments or the schedule for such shipments.

Conclusion

Because of the large uncertainties about waste inventory, the PMPs provide no reliable information on shipping volumes or schedules. However, it is clear that the 2005 schedule to begin shipping RH waste in the WIPP PMP will not be met. The CH shipping volumes and schedules in both PMPs seem very unlikely to be achieved based on performance of other DOE sites, which seem to have a higher priority than Hanford.

COST SAVINGS

The Hanford PMP estimates cost savings of $30 billion to $40 billion.[12] By far the largest saving estimated is from eliminating a second high-level waste tank treatment plant, which would save about $20 billion. The savings from accelerating CH waste shipments to WIPP come from completing some shipments by 2015 and from closing the Waste Receiving and Processing Facility (WRAP) five years early, which would save "tens of millions of dollars in lifecycle costs.[13] There is no quantification in the PMP of what additional money would be needed in the near term to achieve those long-term savings.

Analysis and Conclusion

Because the Hanford PMP does not provide specific amounts of costs savings or any basis for the estimated cost savings, it is not possible to fully analyze what savings, if any, might result. The claimed savings related to CH waste would not occur for more than 20 years and are from closing the WRAP Facility five years early, so that estimate is highly speculative, at best. Given that the actual inventory of CH and RH waste at Hanford is highly uncertain, DOE has no reliable lifecycle baseline costs, let alone reliable long-term savings from accelerated cleanup. The Hanford PMP itself admits: "The cost and schedule impacts of the waste volumes associated with the acceleration initiatives have not been determined."[14]

REGULATORY COMPLIANCE ISSUES

Hanford cleanup is governed by the Tri-Party Agreement (TPA), signed by DOE, U.S. Environmental Protection Agency, and the Washington Department of Ecology on May 15, 1989.[15] The Action Plan and milestones are updated periodically.

The Hanford PMP does not list specific regulatory requirements that have to be met or changed in order to achieve the accelerated cleanup schedule. The Hanford PMP does include as one of

[11] Hanford PMP, p. 47.
[12] Hanford PMP. p. 79.
[13] Hanford PMP. p. 47.
[14] Hanford PMP, p. A-28.
[15] http://www.hanford.gov/tpa/tpahome.htm

the Uncertainties/Assumptions that: "Regulatory agencies will approve required waste management facilities dangerous waste permit modifications and other permitting documents on a schedule to support this initiative."[16]

One aspect of the Hanford and WIPP PMPs has resulted in litigation. Both PMPs include Hanford as the "Western Hub" to which DOE sites with "small quantities" of waste would ship it to Hanford for storage, processing and repackaging, and shipment to WIPP. The WIPP PMP mentions six sites – Battelle-Columbus Laboratory (BCL), Energy Technology Engineering Center (ETEC), Lawrence Livermore, Lawrence Berkeley, General Electric-Vallecitos Nuclear Center, and Nevada Test Site - that would ship to Hanford,[17] while the Hanford PMP refers only to "other sites."[18] In December 2002, two TRU shipments from BCL in Ohio and two shipments from the ETEC in southern California arrived at Hanford. In February 2003, two more shipments arrived at Hanford from BCL. In March 2003, the State of Washington and several citizen groups filed lawsuits to stop further shipments.[19] On May 9, 2003, a federal court judge issued a preliminary injunction, stopping the proposed further shipments from Battelle-Columbus to Hanford.[20] In May, 2005, the state agreed to allow some of the BCL waste to come to WIPP, in exchange for additional restrictions.[21] In late July 2005, DOE's plans to resume shipments from BCL to Hanford were again delayed.[22]

Additionally, on November 2, 2004, almost 70 percent of Washington state voters approved Initiative 297. That law prevents Hanford "from adding more waste that is not generated from the cleanup of the site until such waste on-site has been cleaned up and is stored, treated, or disposed of in compliance with all state and federal environment laws."[23]

Thus, because of the litigation and election results, as a practical matter, the Western Hub concept in the WIPP and Hanford PMPs has not been accomplished and is unlikely to be implemented.

Many aspects of the Hanford TRU waste program require approvals or permits from the Washington Department of Ecology, US EPA, or the New Mexico Environment Department (NMED). Hanford must comply with the TPA and Washington permitting requirements. In addition, both US EPA and NMED have established regulatory requirements, especially waste characterization requirements, for WIPP. NMED has not permitted any RH waste at WIPP, and on October 29, 2004, the agency approved a WIPP permit modification that specifically prohibits any waste from the 177 Hanford tanks from being shipped to WIPP without a class 3 permit modification.[24]

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[16] Hanford PMP, p. A-27.
[17] WIPP PMP, p. 35. WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf
[18] Hanford PMP, p. 46.
[19] http://www.atg.wa.gov/releases/rel_hanford_030403.html; http://www.hoanw.org/index_page.html
[20] http://www.atg.wa.gov/hanford/OrdergrantingPI.pdf
[21] http://www.tri-cityherald.com/tch/local/story/6473387p-6353470c.html
[22] http://seattlepi.nwsource.com/local/aplocal_story.asp?category=6420&slug=WA%20Hanford%20Errors
[23] http://www.secstate.wa.gov/elections/guide/text/297.pdf
[24] http://www.nmenv.state.nm.us/wipp/finaldet1104.pdf

OTHER RELEVANT ISSUES

Transportation

As has already been noted, transporting wastes is highly controversial in Washington. Concerns relate to the numbers of cancers from accident-free shipments, to releases in case of accidents, and to the possibility of terrorist attacks on shipments.[25] Given the level of controversy and public concern, transportation issues seem dramatically under examined in the PMPs. Those issues seem likely to result in changes to actual performance.

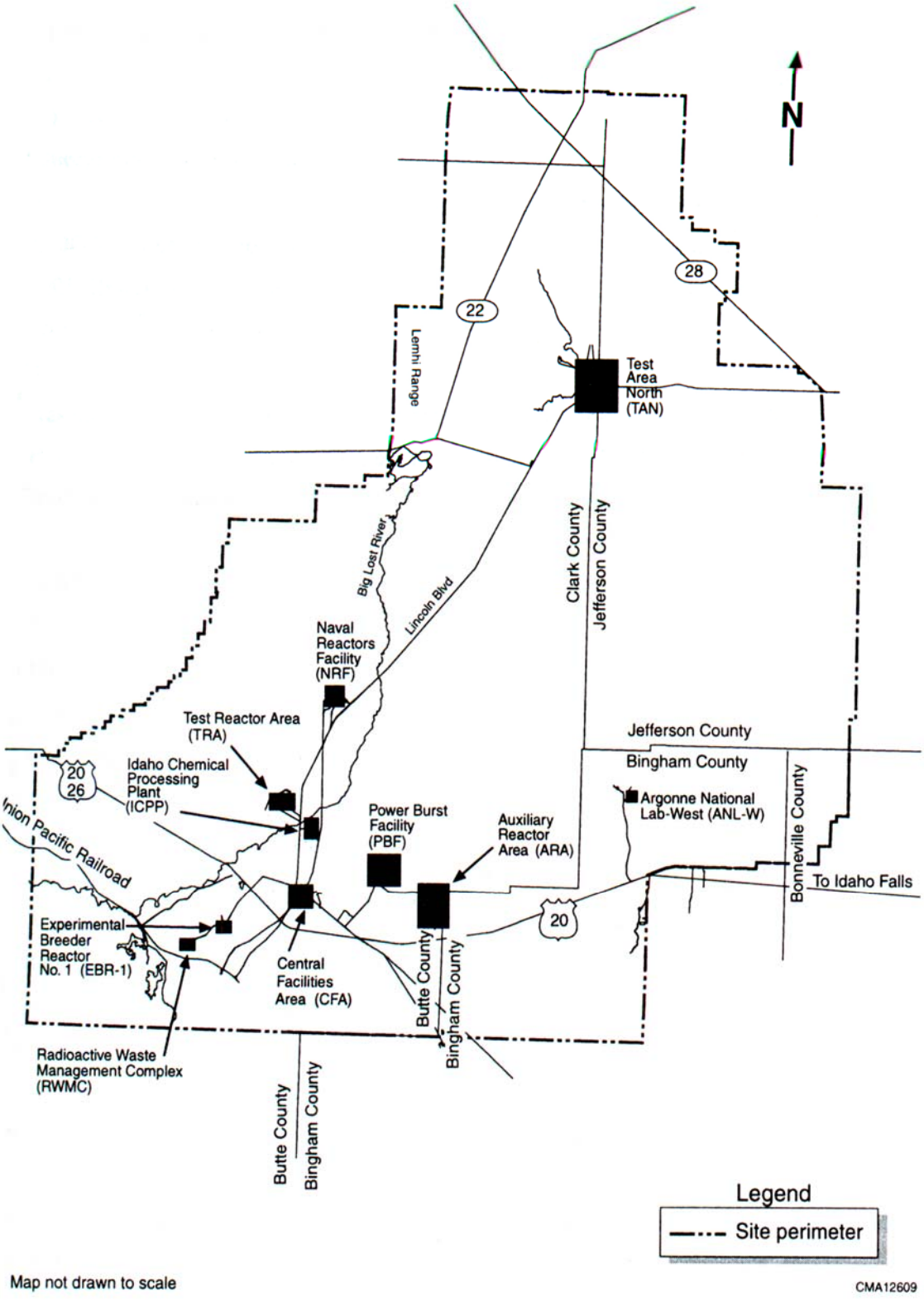
Worker Safety

Hanford has a long history on worker concerns about their health and safety and related concerns about the lack of management attention to those matters. Recent independent reports have raised concerns about current worker health problems that could be exacerbated by Accelerated Cleanup.[26]

In July 2004, the National Institute for Occupational Safety and Health released a report that showed that workers were being exposed to toxic vapors from the high-level radioactive waste tanks and that the workers should be better protected.[27]

Worker, citizen, and government concerns were not adequately factored into the Hanford PMP, and those issues are likely to impact meeting the milestones.

[25] Pollet, p. 9.
[26] http://www.whistleblower.org/article.php?did=770&scid=137
[27] http://www.cdc.gov/niosh/hhe/reports/pdfs/2004-0145-2941.pdf



From: DOE. Final Waste Management Programmatic Environmental Impact Statement, DOE/EIS-0200F, May 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Idaho National Laboratory (INL)
Performance Management Plan (PMP)

In July, 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Idaho National Engineering and Environmental Laboratory (INEEL). Included in the PMP were initiatives to accelerate cleanup of the site, including an initiative to increase the rate of disposal of transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP). Other initiatives relate to high-level waste, low-level waste, special nuclear materials, and consolidating facilities. The PMP also identifies the expected cost savings and risk reduction associated with these initiatives, as well as initial costs and potential barriers for achieving them.

The INEEL PMP identifies nine initiatives to accelerate cleanup of INEEL. DOE has estimated that it could save $19 billion by accelerating cleanup by several decades. The PMP accelerates TRU waste disposal at WIPP by from three to six years. However, it does not estimate cost savings for this activity.

The DOE also prepared a PMP for WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. Included in this comparison are any relevant documents that might shed light on discrepancies between the PMPs. The study also identifies and analyzes critical assumptions in the PMPs to determine if the forecasts are manageable and realistic.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal laws and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. INL has the largest amounts of CH waste of any DOE site, and relatively small amounts of RH waste.

Idaho National Laboratory (INL)[1]

INL was established in 1949 as the National Reactor Testing Station. Over its history, the facility has had five primary missions: nuclear reactor research and development; reactor prototype development and operator training for the nuclear navy; materials production for the US nuclear weapons complex; waste storage and disposal, primarily for the federal government; and environmental restoration following its addition to the National Priorities List in 1989.

INEEL was managed by BWX Technologies beginning in 1991. On February 1, 2005, the Battelle Energy Alliance (BWXT, Battelle, Washington Group International, Electric Power Research Institute, and the Massachusetts Institute of Technology) became the manager/operator of INL.[2] A separate contract was awarded on March 24, 2005 for CH2M-WGI to manage the Idaho Cleanup Project (ICP), which is responsible for radioactive waste treatment and disposal and environmental remediation activities.[3] INL and ICP combined have almost 6,000 employees and an annual budget of more than $1 billion.

The Site sits above the upstream end of the Snake River Plain Aquifer, the second largest unified aquifer on the North American continent. The aquifer underlies 10,000 square miles of southern Idaho's high desert plain and contains as much water as Lake Erie. It flows south-southwest five to 20 feet per day and joins the Snake River at an area called Thousand Springs. It is crucial for south central Idaho's agricultural economy and provides drinking water for 270,000 people. The Environmental Protection Agency (EPA) therefore designated it a Sole Source Aquifer in 1991.

The original land reservation for INEEL was a World War II naval gunnery range about 40 miles from Idaho Falls and 50 miles from Pocatello, Idaho. The Site has grown to cover 890 square miles. All told, nine major facility areas were built at INEEL, all surrounded by substantial buffer zones. INEEL has seen the largest concentration of nuclear reactors in the world (52), including the prototype for the USS Nautilus. It is one of the three DOE sites (along with Hanford and Savannah River Site) that reprocessed irradiated reactor fuel and now houses high-level waste.

For the purposes of this analysis, the most important facility is the Radioactive Waste Management Complex. RWMC began in 1952 as 13 acres called the NRTS Burial Ground. It now includes an 88-acre landfill surrounded by a dike called the Subsurface Disposal Area and the Transuranic Storage Area, which covers 57 ½ acres. Rocky Flats began shipping transuranic waste to INEEL in 1954, and it is the source of nearly all the TRU waste at the RWMC. Until 1970, TRU waste was buried in unlined, shallow pits, trenches, and soil vaults. According to the Ancillary Risk Assessment, Rocky Flats Plant TRU waste was buried primarily in Pits 1-6, 9-12, and trenches 1-10. Trenches 11-15 may also contain Rocky Flats TRU waste. All the barrels were removed from Pits 11 and 12 in an early retrieval.

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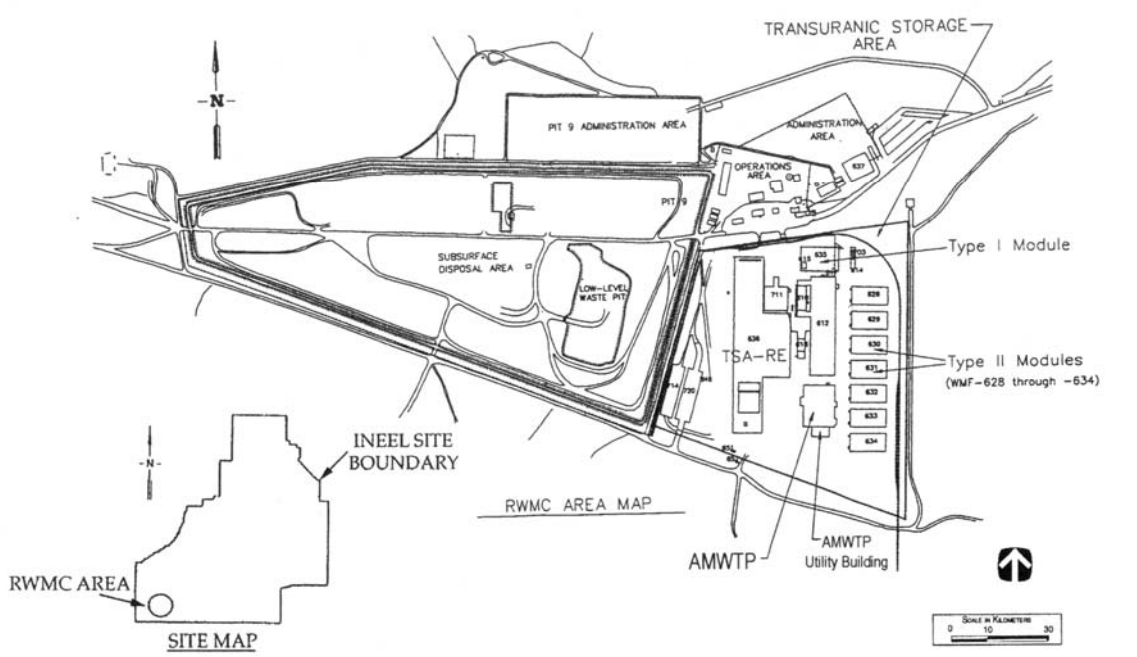
[1] The Idaho National Engineering and Environmental Laboratory (INEEL), which was previously the Idaho National Engineering Laboratory (INEL), became the Idaho National Laboratory on February 1, 2005. In this chapter, INL and INEEL are used interchangeably, as the PMP was done when the site was called INEEL. The PMP is available at: http://cleanup.inel.gov/publicdocuments/documents/EM-Performance-mgmt-plan-accelerate-cleanup.pdf

[2] http://newsdesk.inel.gov/press_releases/2005/02-01BEA_first_day.htm

[3] http://cleanup.inel.gov/news/default.cfm?ID=86



RADIOACTIVE WASTE MANAGEMENT COMPLEX

From: DOE. *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement,* DOE/EIS-0290, January 1999.

TRU waste received since 1970 was first stored on asphalt pads later covered with dirt and then with a metal weather enclosure (80% of total). Then waste was stored in 3-10a positive pressure weather enclosure and then moved to six RCRA-approved Type-2 storage facilities in 1997 (20% of total). RH-TRU is stored in underground vaults.

Public concern about nuclear waste, particularly the burial grounds, has always been high in Idaho, and political pressure led the Atomic Energy Commission to promise elected officials in 1970 that waste would be removed from above the Snake River Aquifer within a decade. By 1995, after a series of court challenges focused on INEEL's spent fuel imports, the State, the DOE, and the Department of the Navy (the owner of much of the spent fuel stored at INEEL) signed a settlement agreement that laid out a number of conditions and concessions. One of the conditions for continuing DOE spent fuel shipments to INEEL was that "all transuranic waste now located at INEL, currently estimated at 65,000 cubic meters in volume" would be removed from the state by a target date of 2015 and no later than 2018.[4] The agreement set up a series of milestones: the first TRU shipment would leave Idaho by April 30, 1999 (which was met) and 3,100 m3 would leave by December 31, 2002 (which was also met). After January 1, 2003, a "running average" of no fewer than 2,000 m3 per year would be shipped. In 2003, 195 m3 were shipped and in 2004, 387 m3 were shipped.[5] But DOE is not yet out of compliance with the condition because the agreement provides that "running average" is "any period of three years." Thus, for the years 2003 to 2005, 6,000 m3 should be shipped to WIPP.

[4] Settlement Agreement, B.1. http://web.em.doe.gov/2001_Agreements/Idaho/Colorado_vs_Batt_10-16-95.pdf
[5] WIPP WWIS Public Access Inquiry Response, July 20, 2005.

TRU WASTE INVENTORY

Table 1 provides TRU inventories from various sources, including the draft WIPP PMP, the WIPP PMP, the INEEL PMP, and other DOE and State of Idaho sources.

Table 1: TRU WASTE INVENTORIES AT INEEL
(in cubic meters – m3)

SOURCE	Stored CH	Projected CH	Total - CH		Stored RH	Projected-RH	Total - RH
Draft WIPP PMP(1)	66,700	31,300	98,000		84	620	700
WIPP PMP(2)	73,000+		73,000+				
INEEL PMP (Total TRU)(3)	65,000	Up to 4,000 WIR	65,000+			Up to 1,000 WIR	
WIPP RCA(4)	63,900	120	64,020		220	0	220
INEEL Oversight Overview (Total TRU)(5)	66,000		66,000				
Buried	36,000						
Stored	30,000						
Advanced Mixed Waste Treatment Project final EIS (includes 167 m3 RH)(6)	40,000						
INEEL presentation to NAS 12/3/2003(7)					140 fuel-based 167 defense		
WIR Calcination						1,100	
WIR Steam Reformer Alternative						830	
WIR Cesium Ion-Exchange		4,150				120	
WIR Direct Evaporation						750	
AMWTF at 6% of PMP (65,000m3)	61,100						
TRU From Other DOE Sites(8)							
Los Alamos National Laboratory (250 barrels)		1,250					
Other DOE Sites (400 barrels)		2,000					

(1) July 2002 draft WIPP PMP, p. 76.
(2) WIPP PMP, pp. 23-24. WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf
(3) INEEL PMP, July 2002, p. 29.
(4) WIPP Recertification Application, DOE/WIPP 2004-3231, Tables 4-1 and 4-2.
(5) State of Idaho 2000 Oversight Overview, p. 33. Whether TRU includes buried and stored waste is currently in litigation in federal court.
(6) DOE/EIS-0290, January 1999, Introduction and Background, section 1.2.1.
(7) Status and Path Forward for Treatment of INTEC Sodium-Bearing Waste, April 14, 2003, Alan Jines.
(8) Report to INEEL CAB, Denver, CO, March 27-29, 2003 (one drum = 0.5 m3).

Discrepancies and Analysis

While most of the documents show somewhat similar total amounts of TRU waste, a very large uncertainty has now come into play. When the settlement agreement was signed, there was a general assumption that the 65,000 m3 covered referred only to waste stored above ground, since INEEL's above ground TRU and alpha inventories have been managed identically and are commonly accepted to total 65,000 m3, give or take a bomb or two. The State contends that only about 36,000 m3 of the covered total are above ground, an estimate backed by the AMWTP Final EIS estimate that about 40,000 m3 of stored waste is TRU and the rest is alpha-LLW.[6] The

[6] DOE. *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement*. DOE/EIS-0290. January 1999, p. 1-1.

State returned to the District Court that maintains jurisdiction in the case, and the court ruled that the agreement was unambiguous that "all transuranic waste" means both stored and buried.[7] The DOE appealed the ruling to the 9th Circuit, which, which in December 2004, reversed the district court ruling and remanded case for consideration of further extrinsic evidence.

The State's political position within Idaho is unassailable, since digging up the buried waste has enjoyed broad appeal for decades. Politics and the prevailing legal uncertainty have obviously dictated what INEEL is willing to assert in documents such as the 2002 Performance Management Plan. Now, even though the DOE claims its new "Accelerated Cleanup" approach will rationalize the cleanup program, INEEL seems content to leave as much unsaid as possible and most certainly to never acknowledge the indivisibility of the stored and buried waste held by the State and the district court.

Stored. The contract for the facility that is preparing stored TRU for shipment to WIPP, the Advanced Mixed Waste Treatment Facility, mirrors the schedule laid out in the settlement agreement. In material distributed at a May 5, 2004, tour of the facility, BNFL, the owner, asserts that "the project is forecasting completing waste processing in 2013, over two years ahead of the Settlement Agreement target milestone and over five years ahead of the final milestone." But BNFL's contract has not been modified to reflect the PMP's claim that all stored TRU will be out of the state by 2012 rather than 2015 or 2018. A subset of the PMP's claim is that all the material retrieved from a small excavation from Pit 9 (89 m3, much of it non-compactable soil) will be processed at the AMWTF "prior to 2012." In another instance of mum's-the-word management, INEEL never approached BNFL to modify its contract to cover this additional waste before negotiations between DOE and the BNFL corporation ended all its U.S. contracts in 2005. Furthermore, no matter who assumes the project, BNFL's claim that the initial inventory will be processed earlier than planned must be evaluated against several deadlines already missed. For example, the PMP projects WIPP certification for the AMWTF in March 2003; in fact, it occurred a year later. The PMP projection that RH-TRU will be characterized and prepared for shipment to WIPP "as early as 2004" is clearly inaccurate, and certainly the broad claim that shipments of RH-TRU to WIPP will be completed by 2012 conveniently overlooks the 670 drums of fuel-based RH-TRU that currently are not allowed at WIPP.

Even though the only "treatment" that occurs at the AMWTF is supercompaction and then judicious packaging of high TRU content waste with alpha-LLW, the 65,000 m3 it is contracted to handle will still equal 61,000 m3 when shipped. That leaves the buried waste—estimated to be somewhere between 25,000 m3 and 36,000 m3—still on the table.

Buried. Arguably, the remediation of the Subsurface Disposal Area, where the buried TRU waste is located, is the most challenging cleanup task at INEEL, and it has certainly been marred by the most failure so far. But the final decision on what to do has not yet been made, and many of the milestones in the PMP for buried TRU waste at INEEL are only the formal process steps of CERCLA cleanup (e.g., draft feasibility study by the end of 2005), which themselves continue to slip. Nonetheless, it's notable that discussion of this "Strategic Initiative" takes less than two pages of INEEL's PMP, and all metrics for the project are "to be determined." Notable, also, is the plan's lack of connection to the TRU shipping schedules outlined for the stored TRU. The

[7] Decision, p. 23. http://www.id.uscourts.gov/ECM/dc_images/__1DD0L6MQO10130369.pdf

goal—"to complete the required remediation by 2020 or sooner regardless of the selected remedial actions"—puts this schedule far outside the timeline for the stored TRU.

Less than two years after the cursory timeline was established, the plan of attack for the burial grounds seems to have changed. INEEL has shifted its emphasis away from Pit 9 and the full-scale remediation of the burial grounds and toward addressing specific "hot spots." The State of Idaho and Environmental Protection Agency back this approach, and so far it has led to the decision to grout in place fifteen beryllium reactor blocks thought to be the source of significant Carbon-14 contamination (and the blocks' reclassification from LLW to TRU) and to focused exhumation of areas believed to contain, based on Rocky Flats shipping and INEEL disposal records, significant concentrations of TRU wastes, volatile organics that can hasten contaminant migration, and/or uranium, which poses a significant long-term risk. There are a total of 10 to 12 ½-acre sections of the SDA that might be addressed by removing TRU, VOCs, and uranium. Not all the waste removed will necessarily be high content TRU, but INEEL wants to avoid exhuming waste that does not have a path forward. WIPP has sent a mobile characterization unit to the first such exhumation, a ½ acre of Pit 4. Based only on the publicly available inventory of the pit, one can estimate that something like 600 m3 (+681 boxes and cartons of filters) will be exhumed. But that does not at all translate directly into shipments to WIPP nor does it seem to represent a large proportion of the 25,000 to 36,000 m3 of TRU waste thought to be in the burial grounds.

A number of other such removal actions are anticipated. A side effect of this effort is the probable delay in the formal decision steps for the final remediation of the SDA, which might put it even more at odds with the stated intention of completing WIPP shipments in 2012.

Waste Incidental to Reprocessing. About 900,000 gallons of liquid high-level waste are stored in underground tanks at INEEL. According to the PMP, INEEL intends to use the Waste Incidental to Reprocessing (WIR) process and reclassify this waste.[8] Waste left in the tanks would be reclassified as low-level and abandoned. The bulk of the waste will be removed, treated, and reclassified as TRU. Whether it will be contact-handled or remote-handled depends on the treatment process. At any rate, the PMP anticipates sending the WIR waste out of the state for disposal, "for example at the Waste Isolation Pilot Plant," by 2012.

Conclusion

While the WIPP and INEEL PMPs have relatively similar amounts of TRU waste, they do not include the significant uncertainties related to volumes of buried waste, Waste Incidental to Reprocessing, and RH waste.

TRU WASTE SHIPMENTS

Table 2 identifies the CH waste shipping schedule, based on the WIPP PMP and INEEL PMP. It also includes actual shipment numbers through September 30, 2004.

[8] INEEL PMP, p. 10.

Table 2: CH WASTE SHIPMENTS FROM INL TO WIPP

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
WIPP PMP(1)	439	730	768	852	1120	1120	1140	619	336	306	7430
INEEL PMP(2)											
Budget Request(3)	85	1030	1063								
Actual(4)	**85**	**38**									**633**

(1) WIPP PMP, Table 5.0-1.
(2) INEEL PMP, none, p. 20.
(3) President's Budget Request to Congress – FY2004 & FY2005.
(4) The total includes three shipments in FY99, 13 shipments in FY00, 121 shipments in FY01, and 373 shipments in FY02.

Table 3 identifies the RH waste shipping schedule, based on the WIPP PMP and INEEL PMP.

Table 3: RH WASTE SHIPMENTS FROM INL TO WIPP

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
TRU PMP(5)	0	0	7	6	71	71	442	442	441		1480
INEEL PMP(6)											

(5) WIPP PMP, Table 5.0-2.
(6) INEEL PMP, none, p. 20.

Discrepancies and Analysis

The INEEL PMP clearly does not include the annual number of shipments included in the WIPP PMP. The Budget Request to Congress for FY2004 and FY2005, have no relation to the numbers of shipments shown in the PMPs. In addition, several of the milestones in the INEEL PMP have not been met. While AMWTF did send one shipment in February 2003 in order to show that the milestone to initiate shipments by March 2003 was met, it did only 30 more shipments during 2003 and no more shipments until March 2004. The WIPP certification for AMWTF was not issued by March 2003 and the treatment operations did not begin by October 2003.

As noted above, the number of shipments have not also not met the requirements of the 1995 Settlement Agreement. As a result, and to meet the three-year goal of 6,000 m3 by December 31, 2005, INL must ship 4,765 m3 between July 1, 2005 and the end of the year. Because of the compacting and packaging being done, INL expects to calculate that about each shipment is about 20 m3 of TRU waste, so that about 240 shipments are required during that six months.[9] That shipping rate has been met by Rocky Flats in 2004 and 2005, so it is difficult but possible. However, achieving that rate requires that the AMWTF operate efficiently, which has not always been the case.

[9] Presentation by Roger Nelson (DOE Chief Scientist at WIPP) at WIPP Quarterly Meeting in Santa Fe, NM, July 20, 2005. The payload, which is the way WIPP's capacity is calculated, is about six cubic meters. Because of the weight of the compacted waste, three TRUPACT-IIs cannot be used for each shipment since that would require use of (and permits for) overweight trucks. Thus, there will be a significant discrepancy between what amount waste WIPP shows being emplaced compared with what INL claims to have shipped for purposes of meeting the Settlement Agreement.

Conclusion
As of September 30, 2004, the number of CH waste shipments from INL was 1,100 fewer than the WIPP PMP schedule. The revised schedule for FY2005 WIPP shipments is 569,[10] considerably fewer than the WIPP PMP schedule for that year. Thus, the INL shipments are at least two years behind schedule, making the 2012 milestone date to complete shipments seem highly questionable. Furthermore, as is the case during the last six months of 2005, to meet the INL goals requires delaying shipments from other sites, resulting in those sites having fewer shipments than scheduled.

COST SAVINGS

The INEEL PMP provides no specific cost savings for the TRU shipment initiative. Since $15.5 billion of the estimated $19 billion in savings is from three initiatives – tank farms, HLW and consolidation[11] – the INEEL PMP implicitly assumes a relatively small amount of savings from the TRU shipments. Any savings for TRU shipments should be minimal unless there are substantially fewer shipments than projected.

REGULATORY COMPLIANCE ISSUES

The resolution of the two regulatory/legal issues surrounding TRU waste at INL will affect the total inventory expected to be shipped to WIPP. The larger volume uncertainty rests on the State of Idaho's claim that both stored and buried TRU waste is covered by the Settlement Agreement of 1995. In January 2005 the State petitioned for a rehearing by the 9th Circuit, and that petition is pending. Even if it does not succeed and the case is in fact remanded to district court, the State seems set to continue to assert in court that the Settlement Agreement requires all buried and stored TRU waste be removed from Idaho. Questions surrounding any waste reclassified as TRU have not been entirely laid to rest by the Defense Authorization Act of 2005, which amended the Nuclear Waste Policy Act (NWPA) to allow high-level waste reclassification in Idaho and South Carolina as long as the reclassified waste remains within those states.[12] As already noted, a range of contemplated "treatment" technologies for the hundreds of thousands of gallons of waste that will be removed from INL's high-level waste tanks produce varying amounts of transuranic waste. INL is taking the unusual route of leaving the technology choice to an as-yet-unnamed private contractor. A deeper uncertainty arises from the DOE's failure to explain how it will implement the NWPA amendment and the relationship between it and Resource Conservation and Recovery Act closure plans for the tanks, which must be approved by the State of Idaho. The core uncertainty remains, of course, that the reclassification is moot at the state border, and the State of New Mexico has vigorously asserted that waste ever classified as high-level will not be disposed of at WIPP.

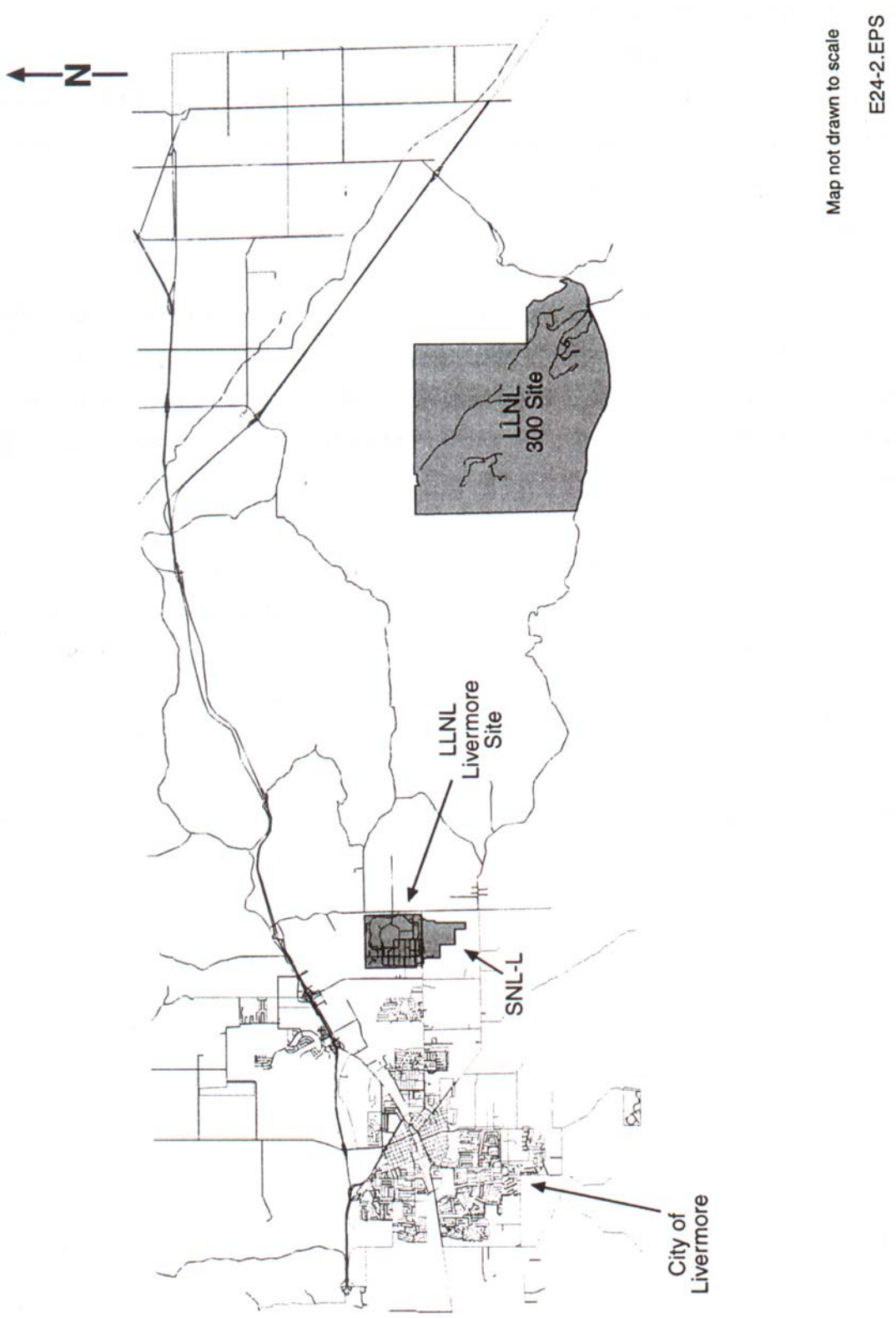
[10] WIPP TRU Shipping Schedule (Proposed Revision 4) at http://www.wipp.ws/actual_ship.pdf.
[11] INEEL PMP, pp. 47-48.
[12] http://thomas.loc.gov/cgi-bin/query/D?c108:7:./temp/~c108hPUyCg:: Public Law 108-385, Section 3116.

OTHER RELEVANT ISSUES

Because INL has existing and new missions, it is likely to generate additional transuranic waste that is not included in the PMP. In June 2005, DOE released a *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems*, DOE/EIS-0373D.[13] The preferred alternative is to consolidate all plutonium-238 operations at INL. Such a facility would generate several pounds of TRU waste each year. In addition to being new waste, not included in any INL inventory, at least some of the waste would apparently be for non-defense purposes, and therefore, not eligible for disposal at WIPP.

It is also possible that INL will be a storage site for additional TRU waste from other sites, as the AMWTF can be expanded to handle additional waste. That issue is also not discussed in the PMP.

[13] http://www.eh.doe.gov/nepa/docs/deis/eis0373d/eis0373dindex.html



From: DOE. *Final Waste Management Programmatic Environmental Impact Statement,* DOE/EIS-0200F, May 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Lawrence Livermore National Laboratory (LLNL)
Performance Management Plan (PMP)

In August 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Lawrence Livermore National Laboratory (LLNL), located in Livermore, California. Included in the PMP were initiatives to accelerate cleanup of the site, including initiatives to increase the rate of shipments of transuranic (TRU) waste from LLNL to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The PMP also laid out a strategy to accelerate the construction schedule for the site-wide remediation network, and accelerate the transfer of newly generated waste program and related facilities to the DOE's National Nuclear Security Administration (NNSA). The PMP stated that by accelerating these programs by three years (2009 to 2006), it would save $70 million. The PMP also identified the risk reduction associated with these initiatives, as well as initial costs and potential barriers for achieving them.

The DOE also prepared a PMP for the WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. The study also identifies and analyzes critical assumptions in the PMPs to determine if the forecasts and cost savings were reasonable.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal laws and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. At this time only CH waste is stored or generated at LLNL.

Lawrence Livermore National Laboratory (LLNL)

LLNL, managed and operated by the University of California, was founded in 1952 by the U.S. Atomic Energy Commission (AEC) on an 800-acre parcel just east of the City of Livermore, California. AEC is a predecessor federal agency of the U.S. Department of Energy (DOE). LLNL currently employs more than 8,000 people and has a budget of more than $1.6 billion per year.[1]

The land was federally owned and formerly used as a naval aviation training station. The site is three-miles east of downtown Livermore, and 50 miles east of San Francisco. The population of the San Francisco Bay area is approximately 6 million. In all, there are about 7 million people living within a 50-mile radius of LLNL.

Since 1952, LLNL has been used for the design of nuclear weapons, as well as related activities such as processing and testing of high explosives materials and components. These programs involve research in the areas of high-energy physics, chemistry, materials science, and engineering. Although the weapons have historically undergone full-scale nuclear testing at another site (i.e., the Nevada Test Site or NTS), activities at LLNL both past and present include testing and prototyping bomb parts on site. Those activities involve working with radioactive substances and other materials that make up nuclear warheads, such as plutonium and tritium. These radioactive substances are extremely hazardous under certain circumstances, and are extremely toxic. There have been significant releases of these contaminants to the environment due to operations and poor waste disposal practices. Plutonium has been detected above background levels in off-site areas. Tritium has routinely been found at elevated levels in local rain water and agricultural products. Chemical contaminants including volatile organic compounds (VOCs) such as trichloroethylene (TCE) and perchloroethylene (PCE), fuel hydrocarbons (FHC) and heavy metals have been released to the environment. Decades of on-going operations have resulted in significant accumulation of radiological wastes. These include TRU waste, low-level radioactive waste and mixed waste (radioactive waste mixed with chemical waste). Most of the TRU waste results from plutonium processing and research at LLNL.

LLNL is surrounded by residential dwellings, commercial and industrial businesses, and agricultural lands. The City of Livermore relies upon groundwater for a significant portion of its drinking water. Private wells and municipal wells are situated within the path of the contaminated groundwater plume originating at LLNL. The Lab was forced to close private wells in the contaminated plume and to provide drinking water to those households. Due to the discovery of contaminants in the major groundwater aquifer and its proximity to the local population, EPA placed the facility on the National Priorities List (NPL) known as Superfund in 1987. Currently, DOE is responsible for the Superfund cleanup conducted under a Federal Facility Agreement and a Record of Decision (ROD) signed in 1992. Remediation of the VOCs, tritium, metals, and other contaminants in soil and ground water is currently underway.

[1] http://www.llnl.gov/llnl/about/fact_sheet.jsp

TRU WASTE INVENTORY

Table 1 provides TRU inventories from various sources, including the draft WIPP PMP, the final WIPP PMP, the LLNL PMP, the Site Treatment Plan, the Site Wide Environmental Impact Statement, and actual shipments.

Table 1: Various TRU Waste Inventories at LLNL
(Amounts in cubic meters - m3)

SOURCE	Stored CH	Projected CH	Total - CH		Stored RH	Projected-RH	Total – RH
Draft WIPP-PMP(1)	290	1,400	1,690		0	0	0
WIPP PMP(2)	163	89	252		0	0	0
LLNL PMP(3)	180	84	264				
LLNL PMP(4)	208	84	292				
Site Treatment Plan(5)							
MTRU	206		206				
Draft Site Wide EIS(6)		420	208				
Actual Legacy Shipped(7)			**146**				
WIPP RCA(*)	350	2,100	2,450				

(1) July 2002 draft WIPP PMP, p. 92.
(2) WIPP PMP, p. 27. Also WIPP-PMP, Table 5.0-1, number of shipments (34). Therefore, at 7.4 m3 per shipment, equivalent to 252 m3. See p. 27 for inventory, p. 12 for conversion factor.
(3) LLNL PMP, p. 3, 820 drums, plus 31 oversize boxes, plus projected 100 drums (21 m3) per year, 2002-2006.
(4) LLNL PMP, p. 4, 950 drums, plus 31 oversize boxes, plus projected 100 drums (21 m3) per year, 2002-2006.
(5) The Site Treatment Plan lists Mixed TRU wastes held in storage. Table 4-3. Shipping schedule not included.
(6) Site Wide EIS, 2004. Assumes 70 m3 of new TRU generated per year through 2010.
(7) Communication with Bert Heffner, Community Relations Officer, 3/15/05, shipment of 662 drums – each shipment approximately 8 m3; and actual amounts calculated at WIPP.
(8) WIPP Recertification Application, DOE/WIPP 2004-3231, Table DATA-F-6.

Discrepancies and Analysis

The LLNL PMP did not provide volume of TRU waste - only the quantity of drums. Furthermore, the LLNL PMP provided two drum quantities. The first stated that "LLNL currently has 550 drums of TRU waste stored at EM waste management facilities. Approximately, 270 drums await transfer from generator locations".[2] The second states "Approximately 350 drums are considered ready to ship to another DOE site and will be transferred in two shipping campaigns. The remainder of approximately 700 drums of TRU Legacy waste needs to be characterized and repackaged prior to shipment to offsite for interim storage".[3] These quantities were adjusted to cubic meters (m3) by converting each 55-gallon drum to 0.208 m3. This is generally consistent with the WIPP PMP, which states that 35 drums are equivalent to 7.4 m3.[4] In addition, the Plutonium Facility generates approximately 100

[2] LLNL PMP, p. 3.
[3] LLNL PMP, p. 4.
[4] WIPP PMP, p. 12. WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf

drums of TRU waste per year.[5] Table 1 includes four years generation, beginning in mid-2002, as projected TRU. The LLNL Site Wide Environmental Impact Statement (SWEIS), which was drafted in 2004, stated that there were 1,000 drums of legacy TRU waste at the site to be qualified, packaged and shipped by the "mobile" contractor.

The LLNL inventory also included 31 oversize boxes, for which no disposal pathway is established.[6] These wastes are included in the above inventory. The LLNL PMP states that these wastes represent 5% of total TRU waste.[7] Therefore, an additional 9 - 10 m3 are stored at LLNL.[8] This amount does not conform to the WIPP PMP assumptions that each box is approximately 5.7 m3,[9] which would increase the volume substantially, with an additional 177 m3 added to the totals. These latter amounts are not included in Table 1. The LLNL PMP inventory also does not include 8 drums of classified waste mentioned in the WIPP PMP inventory.[10]

In addition to the inventory reported in the PMPs, each facility where DOE generates or stores mixed wastes is required to devise a plan for developing treatment capacities and technologies for mixed waste. This plan is known as the Site Treatment Plan (STP) and is submitted to the state agency that regulates under the Resource Conservation and Recovery Act (RCRA).[11] At LLNL, it is updated every six months. Some of the mixed waste includes mixed TRU (MTRU) waste. The STP for LLNL includes 206 m3 of MTRU waste destined for WIPP. The STP does not discuss whether these wastes are included in the TRU inventory. Discussions and correspondence with LLNL officials[12] indicate that they are not included in the list of waste streams in the PMPs.

The actual shipment of legacy waste took place between October 2004 and January 2005. A total of 662 drums were shipped, with each shipment approximately eight cubic meters. WIPP calculated that it received and disposed of 146.14 m3. LLNL continues to generate TRU waste (70 m3 per year per SWEIS proposed action).

Conclusion

Overall, the volumes reported in the PMPs for WIPP and LLNL were similar, with the exception of the quantities in the oversize boxes. If one were to consider the number of oversized boxes at LLNL (i.e., 31) and used the WIPP PMP's volume per box (i.e., 5.7 m3), there would be another 165 m3 of TRU inventory at the site. Additionally, there may be 208 m3 of MTRU waste destined for WIPP, as is identified in the Site Treatment Plan. This would nearly double the

[5] LLNL PMP, p. 3.

[6] It should be noted that the new Site –Wide EIS raises the administrative level on plutonium, specifically because there is no disposal pathway for some of the plutonium in storage. Therefore, we might expect a gradual increase of plutonium waste for which there is no disposal pathway.

[7] LLNL PMP, Section 4.1.3, p. 4 -- 95% of the TRU Legacy Waste currently in the inventory will be disposed offsite. This equates to a total reduction of ~9,500 Ci (plutonium-equivalent curies). Approximately 5% of the TRU Legacy waste inventory will remain in storage. These are the TRU wastes placed in 31 oversized boxes with no identified pathway. Oversized boxes are an issue complex-wide.

[8] Five percent of 180-208 m3 reported in the PMP is equivalent to 9-10 m3.

[9] WIPP PMP, p. 63.

[10] WIPP PMP, Section 2.6.3, p. 47 (unnumbered).

[11] Section 3021(b) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6721, as added by Section 105(a) of the Federal Facility Compliance Act (P. L. 102-386).

[12] E-mail and telephone with Bert Heffner, Community Relations Office.

inventory of waste at LLNL as identified in the PMPs.[13] The draft WIPP PMP was probably based on preliminary information and should not be considered. However, the quantity of legacy TRU shipped to WIPP is substantially less than estimated by the LLNL PMP. Under the proposed action in the SWEIS, there will substantially more waste generated and shipped. An explanation for this large discrepancy between the LLNL PMP and the recent SWEIS is that the preferred option in the SWEIS may store approximately twice the amount of plutonium than was anticipated in the PMP, thereby generating additional waste when used in experiments.

TRU WASTE SHIPMENTS

Table 2 identifies the shipping schedule, based on the WIPP PMP, the LLNL PMP, the California Energy Commission and actual shipments of legacy waste.

Table 2: TRU Waste Shipments 2003 - 2010 from LLNL

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	Total
WIPP PMP to Interim Site(1)	22	1	0	0	2	3	3	4	34
LLNL PMP(2)	16	16	16						48
California Energy Commission(3)		16	17	17	2	3	2	3	60
Budget Request(4)		16							
Actual(5)	0	0	**18**						**18**

(1) See Table 5.0-1, WIPP PMP, to interim facility or WIPP (p. 27 of WIPP PMP): 350 drums by March 2003, 420 drums by December 2003, remainder by 2010.
(2) No destination given, based on projection that each shipment contains 21 drums, 350 drums ready for first year, assume remaining 700 drums shipped between 2004-2005 (p. 5).
(3) Fact Sheet, June 2003, http://www.energy.ca.gov/nuclear/shipments.html. Assume that 50 shipments are divided equally from 2004-2006; Also, 2-3 annual shipments are estimated over the next 35 years.
(4) DOE Budget Request to Congress for FY2005 performance measures.
(5) Personal communication with Bert Heffner, community relations for LLNL. Proposed action in the SWEIS assumes 70 m3 per annum, equivalent to 8-9 shipments per year. Numbers in bold reflect actual shipments received at WIPP.

Discrepancies and Analysis

The LLNL PMP included two major milestones involving shipments. These were:[14]

- Ship the first 350 drums of TRU waste to an interim storage site by June 2003.
- Ship remaining inventory (to date) of TRU waste to an interim storage site by June 2005.[15]

In order to meet these goals, WIPP sent the Westinghouse TRU Solutions Central Characterization Project to characterize and certify the TRU waste at LLNL to meet the DOE receiver site Waste Acceptance Criteria (WAC). This mobile vendor is used by various DOE sites. It was reported in December 2003[16] that the Waste Characterization module had first arrived at LLNL and that it could take up to 6 months before the first shipment of waste was

[13] Tri-Valley CAREs has an outstanding FOIA request attempting to clarify whether MTRU and TRU are used interchangeably.
[14] LLNL PMP, p. 5.
[15] For comparison, the WIPP PMP milestone was for the first 350 drums to go to the Western Hub by March 2003 and the remaining 420 drums to either the Western Hub or to WIPP by December 20003. WIPP PMP, p. 27.
[16] Personnel communication, Bert Heffner and staff of the new Deactivation Waste Treatment Facility (DWTF) at LLNL, 12/09/03.

characterized, packaged and left the site. Actually, the first shipment did not occur until October 2004, with remaining shipments between October 2004 and January 2005. Therefore, the shipping schedule was more than one year behind schedule, although it caught up by January 2005. However, whether projected future shipments will occur on the PMP or the revised schedule is highly uncertain.

The discrepancy in the number of shipments in the WIPP PMP versus the LLNL PMP may have been due to assumptions used for the quantity of waste in an average shipment. Both PMPs assumed that CH-TRU Waste would be transported to WIPP in the Transuranic Packaging Transporter (TRUPACT-II), a reusable shipping package or cask. The LLNL PMP assumed 21 drums per shipment.[17] The WIPP PMP assumed 35 drums per shipment. The CEC assumed that each shipment is 42 drums per shipment.[18]

The LLNL PMP also assumed that an interim storage site would be used prior to shipment to WIPP. This assumption proved to be false because Hanford was not available as a Western Hub, so all TRU was shipped directly to WIPP. It is also not clear whether the availability of TRUPACT-II containers held up shipments.

Conclusion

Variations in the number of estimated TRU shipments were significant. Importantly, LLNL actually shipped much less than previously planned, but will ship much more in future years. This raises the question that some of the "1,000" drums of legacy waste had to be retained at LLNL for some reason. This discrepancy may affect cost savings and raises doubts about whether investments required to accelerate cleanup will be cost-effective.

COST SAVINGS

There are four major elements to this strategy, including:

- Accelerating the packaging and disposition of the legacy transuranic (TRU) wastes for transportation to another DOE facility and legacy Low Level and Mixed Wastes to appropriate disposal facilities;
- Accelerating cleanup of the offsite ground water plumes;
- Accelerating construction of the site wide ground water remediation network; and
- Accelerating the transfer of the Newly Generated Waste program and related facilities, including the site wide ground water remediation network to NNSA.

DOE estimates the overall cost savings of $70 million by accelerating cleanup by three years.[19] TRU in itself costs $2.1 million annually[20] ($6.3 million over 3 years). Total DOE estimated savings from accelerating radioactive waste disposal are $27 million.[21] Groundwater remediation operating costs are equivalent to $9.5 million per year ($28.5 million over 3 years), and construction costs are about $2.0 million per year ($6.0 million over three years). It is not clear

[17] LLNL PMP, Section 4.1.4 Major Milestones and Performance Matrix "Number of shipments; each shipment consisting of a minimum of 21 drums."
[18] The CEC assumes that each TRUPACT-II can hold up to fourteen 55-gallon drums. Each truck can hold up to three TRUPACT-II containers. Fact Sheet, June 2003, http://www.energy.ca.gov/nuclear/shipments.html
[19] LLNL PMP, p. 1.
[20] LLNL PMP, 4.1.2 Strategic Initiative Description.
[21] LLNL PMP, Section 4.3.1.

how these would be reduced by implementation of the LLNL PMP. For example, the last initiative involved construction of the Decontamination and Waste Treatment Facility (DWTF), which replaced existing older facilities for storing and treating radioactive and mixed wastes. This facility is operational, and it is not clear how this represents a cost saving. Accelerating groundwater treatment buildout by a maximum of three years doesn't save large sums of money, as the facilities will be operational for some time to come. The LLNL PMP does not accelerate the time required to clean up the groundwater.

The SWEIS states that NNSA is also proposing to develop the capability to load transuranic waste into pipe overpacks in the Superblock, beginning in 2005. These pipe overpacks would allow for significantly higher actinide loading into each drum for disposal at WIPP. The pipe overpack will be loaded into TRUPACT-II shipping containers, and shipped from Superblock to WIPP without increasing the nuclear material inventory or hazard levels in other LLNL facilities. Although never mentioned in the PMP, this proposal may result in cost savings by reducing the number of shipments.

Analysis and Conclusion

With budget cutbacks, these elements compete with each other for funding. More importantly, however, the bulk of DOE's estimated cost saving is merely an accounting measure: shifting operation and maintenance of the cleanup programs and waste treatment from one department of DOE to another (Environmental Management to NNSA). As for accelerating groundwater cleanup by building out the infrastructure three years faster than planned, this will only have a marginal cost effect. In the 1992 Superfund Record of Decision for LLNL, the Lab estimated that it would take 53 years to complete cleanup. While the Lab has probably surpassed the levels of mass removal than when it made that estimate, building the cleanup system out by three years should have little cost saving.

The only true savings for the Livermore would be by reducing the amount of radiological waste stored at the facility, or, perhaps, by directly shipping TRU waste from the Superblock without intermediate packaging. The amount of TRU waste in storage is relatively small compared with other radiological wastes at the site, including mixed wastes.[22] These wastes include 1499 m3 of low-level radioactive waste (LLRW) and 550 m3 of mixed low-level wastes (MLLW). TRU does, however, account for almost 95 percent of the curie content of the waste in storage.[23] However, under the proposed plan for LLNL, the estimated savings ($27 million) of waste reduction are most likely exaggerated, because NNSA will continue to generate, store and treat radiological waste. Thus, only small operating savings will occur from the reduction of antiquated storage facilities. Most operating costs of generating, storing and transporting waste from one part of the lab to another part would remain. The cost of operating the new DWTF is not included in the PMP, and this may offset any real savings. Therefore, the premise that accelerating reduction in waste inventory by transferring the TRU waste from LLNL to WIPP would significantly reduce both cost and risk is very questionable.

[22] LLNL PMP, p. 10.
[23] LLNL PMP p. 3, TRU contribute 9,500 Ci and LLW and MLLW contribute 500 Ci.

REGULATORY COMPLIANCE ISSUES

Accelerating groundwater cleanup is acceptable to regulators and stakeholders. The DWTF is permitted by the State of California and became operational in 2003. This facility allows radiological wastes to be stored and treated more effectively than they had in the past. Of the regulatory challenges, none remains more important to the acceleration of cleanup than transportation and disposal locations. Disposal locations for MLLW and LLRW may include commercial facilities in Utah and Tennessee, and other DOE sites including Oak Ridge and Los Alamos. Transportation, however, could be a regulatory barrier, as well as finding locations disposal of radiological wastes.

Transportation

Since 1988, the California Energy Commission has coordinated the State of California Nuclear Waste Transport Working Group made up of senior technical staff from nine California agencies: California Department of Health Services, Emergency Medical Services Authority, Energy Commission, Environmental Protection Agency (EPA), Fish and Game, Governor's Office of Emergency Services, Highway Patrol, Public Utilities Commission Rail Safety Branch, and the Department of Transportation. This group of agencies is coordinating California's preparation for WIPP shipments in California.[24] It should be noted that only the EPA was a signatory to the Letter of Intent committing to accelerate cleanup that is found in Appendix B of the LLNL PMP.

The CEC Fact Sheet states that "DOE estimates that there will be approximately 50 CH TRU waste shipments from the Lawrence Livermore National Laboratory in northern California, beginning in 2004. LLNL will continue to generate approximately 2-3 shipments of TRU waste annually over the next 35 years."[25] A corridor for waste currently stored at the NTS goes through California and was used for shipments from NTS to WIPP in 2005.

The routes that DOE is using for truck transport of TRU waste from the 10 defense facilities to WIPP are predominantly Interstate System highways. Federal regulations for the routing of certain large quantities of radioactive materials, called "Highway Route Controlled Quantities (HRCQ)", require the use of Interstate System highways unless states have designated alternate routes according to federal guidelines (49 Code of Federal Regulations 397). DOE has stated that as a matter of policy all WIPP shipments will be treated as HRCQ shipments. DOE has indicated that most of the TRU wastes to be transported in California will be transported in less-than HRCQ. The less-than HRCQ TRU shipments in California will not be required to follow the Interstate System of highways, thereby avoiding transport through heavily populated areas. Alternative routes that avoid high population centers have been proposed. But use of such non-Interstate routes seems to circumvent DOE policy.

OTHER RELEVANT ISSUES

Progress and Overestimation of Cost Savings

All legacy waste was removed from LLNL, although it was one year behind schedule. It is unclear how LLNL overestimated the amount of waste by nearly 50%, and raises questions about

[24] http://www.energy.ca.gov/nuclear/shipments.html, CEC Fact Sheet, updated as of December 1, 2004.
[25] Fact Sheet, June 2003, http://www.energy.ca.gov/nuclear/shipments.html

the remaining waste to be shipped to WIPP. The DWTF has been completed, although this facility was in construction long before the LLNL PMP was prepared. The new Risk-Based End Vision for LLNL, if implemented, delays the two initiatives dealing with groundwater cleanup, and does not address TRU or mixed wastes.

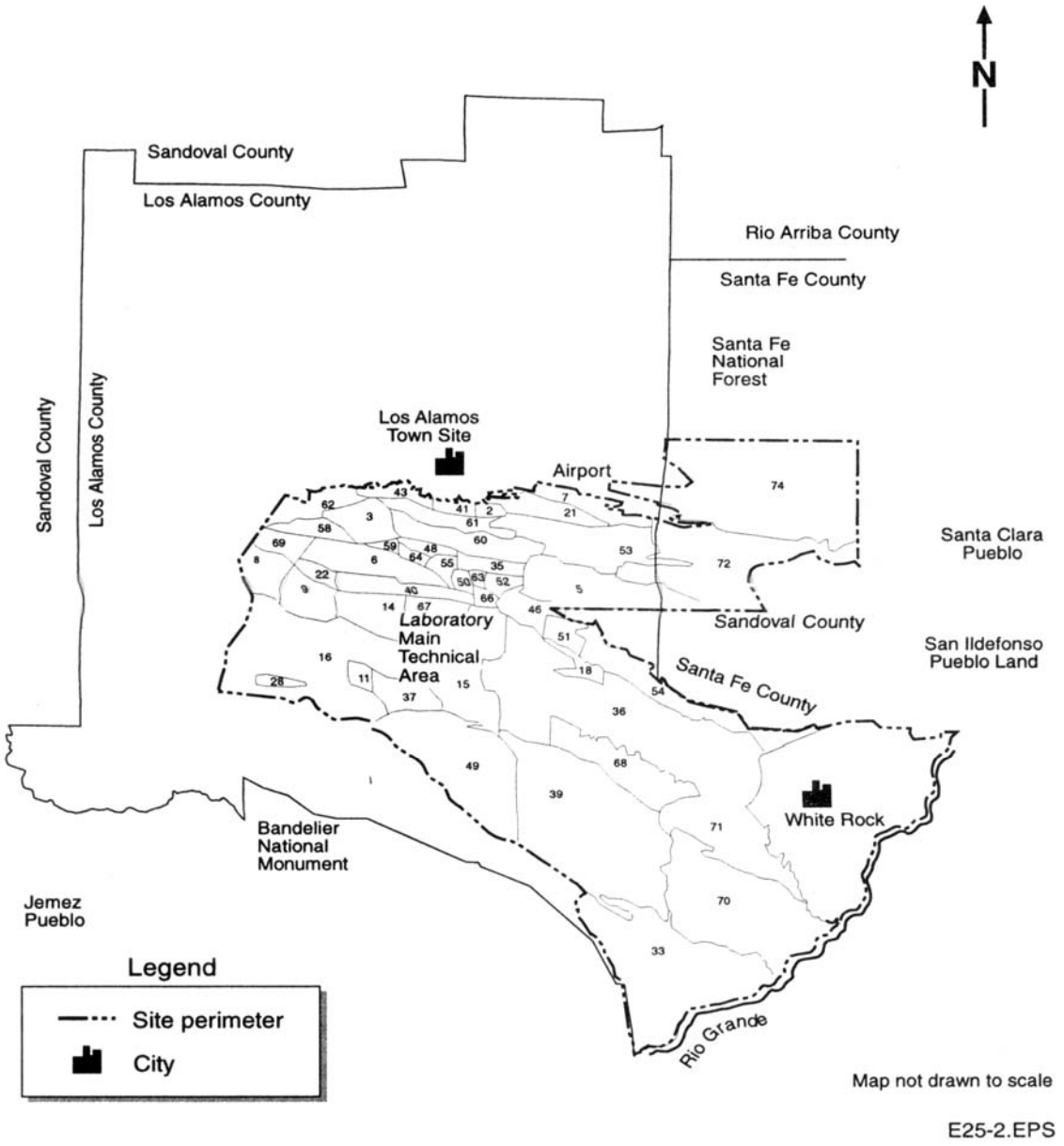
Leadership

The LANL PMP laid out some of the challenges and risks of accomplishing the accelerated cleanup. It stated that: "some challenges will require the direct support and involvement of senior DOE Headquarters personnel. These include availability of DOE capacity and the required shipping containers for transfer, interim storage and certification for final disposal at WIPP of transuranic wastes (TRU), ensuring access to the Nevada Test Site for low-level waste (LLW), and transferring newly-generated waste operations responsibility to NNSA."[26]

DOE's Oakland EM Office coordinated with other DOE sites, Carlsbad Field Office (CBFO), and State of California Energy Commission, the agency responsible for the overall coordination, and other affected regulatory agencies to ensure timely opening of the corridor for shipment of wastes from LLNL to an interim storage site. As stated previously, it is not apparent that this has been accomplished, as no interim site was used.

In 2003, DOE indicated that it must renegotiate performance measures for environmental management that provide focus and urgency to rapid risk reduction and project completion with the University of California.[27] A Final Site Wide Environmental Impact Statement (SWEIS) was released in April 2005, but did not ostensibly deal with the question of performance measures.

[26] LLNLPMP, p. 1.
[27] LLNL PMP, p. 5.



From: DOE. *Final Waste Management Programmatic Environmental Impact Statement,* DOE/EIS-0200F, May 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Los Alamos National Laboratory (LANL)
Performance Management Plan (PMP)

In July 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Los Alamos National Laboratory (LANL), located in Los Alamos, New Mexico. Included in the PMP were plans to accelerate cleanup of the site, including initiatives to increase the rate of shipments of transuranic (TRU) waste from LANL to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The PMP states that shipments of TRU waste generated before 1998 would be shipped to WIPP by 2010, or 20 years earlier than existing schedules. The PMP proposes to accelerate groundwater protection and environmental restoration work. The Plan also seeks to accelerate the transfer of some LANL properties to non-DOE entities and facilities from the Environmental Management (EM) program to the National Nuclear Security Administration (NNSA). The PMP states that by accelerating these programs by 15 years (2030 to 2015), DOE will save approximately $950 million. The PMP also describes management changes being implemented to support the plan and includes interim milestones.

The DOE also prepared a PMP for the WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. The study also identifies and analyzes critical assumptions in the PMPs to determine if the forecasts are manageable and realistic.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal laws and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem. WIPP is only allowed to accept CH waste at this time. LANL has large amounts of CH waste and smaller amounts of RH waste.

Los Alamos National Laboratory (LANL)

LANL, managed and operated by the University of California (UC), was created in 1943 as part of the Manhattan Project to develop the first nuclear weapons that were dropped on Hiroshima and Nagasaki, Japan in 1945.

LANL occupies 43 square miles of land on the Pajarito Plateau, a volcanic slope of the eastern slope of the Jemez Mountains at approximately 7,000 feet above sea level.[1] It is surrounded by San Ildefonso Pueblo, Bandelier National Monument, and the Santa Fe National Forest, as well as residential dwellings, commercial and industrial businesses, and agricultural lands. LANL's 47 Technical Areas are located on mesa tops and in canyons scattered over thousands of acres. The geology and hydrology of the site are complex. Ground water flow paths are not well defined. The rugged surface terrain, including mountains and canyons, is subject to significant runoff and erosion. Much of the area around LANL also was damaged or affected by the Cerro Grande Fire in May 2000.

The site is 25 miles northwest of Santa Fe and 60 miles north-northeast of Albuquerque, and part of the site abuts the Rio Grande. In 2000, approximately 264,000 people lived within a 50-mile radius of LANL.[2] Currently, UC employs about 8,300 people with another 3,000 contractor personnel; LANL's budget is about $2.2 billion.[3]

Since 1943, LANL has been used for the design of nuclear weapons, as well as processing and testing of high explosives materials and components. These programs involve research in the areas of high-energy physics, chemistry, materials science, and engineering. Although the weapons were tested at another site (i.e., the Nevada Test Site or NTS), activities at LANL involve working with radioactive substances and other materials that make up nuclear warheads, such as plutonium and tritium. These radioactive substances are extremely hazardous under certain circumstances, and are extremely toxic. There have been significant releases of these contaminants to the environment due to operations and poor waste disposal practices. Although DOE and LANL officials have long maintained that off-site contamination does not exist, recent sampling by citizen groups and New Mexico officials have identified that contamination may be reaching the Rio Grande, including radionuclides and high explosives.[4] Decades of on-going operations have resulted in significant accumulation of radiological wastes. These include TRU waste, low-level radioactive waste and mixed waste (radioactive waste mixed with chemical waste). Most of the TRU waste results from plutonium processing and research at LANL.

TRU WASTE INVENTORY

Table 1 provides TRU inventories from the draft WIPP PMP, the final WIPP PMP, and the LANL PMP and other documents.

[1] Because of land transfers, LANL's size is decreasing; the 43-square-mile size is used in the LANL PMP, p. 3.
[2] LANL PMP, p. 3.
[3] http://www.lanl.gov/organization/
[4] George Rice. *New Mexico's Right to Know: The Potential for Groundwater Contaminants from Los Alamos National Laboratory to Reach the Rio Grande.* July 2004. http://www.nuclearactive.org/docs/RiceReport.pdf

Table 1: TRU Waste Inventories at LANL
(Amounts in cubic meters – m3)

LANL	Stored CH	Projected CH	Total – CH		Stored RH	Projected-RH	Total - RH
Draft WIPP-PMP(1)	9,300	10,800	20,100		98	24	122
WIPP PMP(2)	9,600-10,000		9,600-10,000				
LANL PMP(3)	12,000		12,000				
LANL PMP(4)	9,200		9,200				
SNL/LRRI(5)	50		50		20		20
WIPP RCA(6)	12,270	3,300	15,570		120	0	120

(1) July 2002 draft WIPP PMP, p. 99.
(2) WIPP PMP, p. 32 shows 46,000 stored drum equivalents (each drum is 0.208 m3) or 9,568 m3 total. The WIPP PMP, Table 5.0-1, shows 1,356 shipments; therefore, at 7.4 m3 per shipment, there is 10,034 m3.
(3) LANL PMP, pp. 6 and 8.
(4) LANL PMP, p. 13, based on accelerated strategy.
(5) LANL PMP, p. 10, waste at Sandia National Lab (SNL) and Lovelace Respiratory Research Institute (LRRI) in Albuquerque, to be shipped to LANL.
(6) WIPP Recertification Application, DOE/WIPP 2004-3231, Tables 4-1 and 4-2.

Discrepancies and Analysis

The LANL PMP and the WIPP PMP do not provide the same volumes of TRU waste. The discrepancies are not explained in the documents. Although LANL will generate large amounts of additional CH waste in the future, which were estimated in the Draft WIPP PMP to be more than the existing legacy wastes, neither the WIPP nor LANL PMPs include volume estimates for that waste. The omission is apparently because of the decision to include only "legacy" waste ("waste generated and packaged before October 1998") since waste generated after that time will be the responsibility of NNSA, not Environmental Management (EM).[5]

The LANL inventory also includes 400-500 drums of classified materials with two more drums generated each year,[6] which are not mentioned in the LANL PMP. It is not clear whether that approximately 100 m3 is included either the WIPP or LANL PMP inventory.

Additionally, LANL is recovering and storing sealed sources – generally industrial instruments with radionuclides that are abandoned or damaged by their private owners. LANL considers much of that waste to be TRU, but it is not identified as part of the LANL inventory in either the WIPP or LANL PMPs. In an April 2003 report, the General Accounting Office stated that there could be more than 14,300 sealed sources.[7] In the DOE WIPP Recertification Application to EPA, the volume of the sealed sources waste stream is estimated at 618.3 m3.[8] In its permit

[5] LANL PMP, p. 1.
[6] WIPP PMP, p. 47 (unnumbered). WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf
[7] General Accounting Office. *Nuclear Nonproliferation: DOE Action Needed to Ensure Continued Recovery of Unwanted Sealed Radioactive Sources*. GAO Report 03-483, April 2003, p. 3. http://www.gao.gov/new.items/d03483.pdf
[8] DOE. *WIPP Recertification Application*. DOE?WIPP 2004-3231, Appendix DATA, Attachment F, Annex J, pp. J-LA-3 and 4.

modification request to NMED to allow those wastes to come to WIPP, DOE estimated that approximately 500 containers could be shipped from LANL to WIPP.[9]

Neither the WIPP PMP nor the LANL PMP provides estimates of RH waste volumes, even though there are substantial quantities of RH waste at LANL, as indicated by the shipment schedule in the WIPP PMP, and the WIPP Recertification Application.

Conclusion

The volumes reported in the PMPs for legacy waste are similar, if the assumptions of volume reductions are considered accurate and attainable. However, the lack of inclusion of future TRU waste generation in the WIPP and LANL PMPs is a severe omission to the DOE goal of addressing all TRU wastes.

TRU WASTE SHIPMENTS

Table 2 identifies the shipping schedule for Contact-Handled TRU waste, based on the WIPP PMP and the LANL PMP. It also shows actual shipments through September 30, 2004, the end of Fiscal Year 2004.

Table 2: CH Waste Shipments 2003 - 2010 from LANL

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10				Total
WIPP PMP(1)	81	167	167	167	167	196	196	215				1,356
LANL PMP(2)	95	166	166	166	166	142	142	48				1,091
Budget Request(3)	56	190	190									
Actual(4)	**46**	0										**71**

(1) WIPP PMP, Table 5.0-1.
(2) LANL PMP, Table 4.1.4.
(3) DOE Budget Requests to Congress for FY 2004 & FY 2005 performance measures (7.4 m3 per shipment).
(4) The total includes 17 shipments in FY99, 7 shipments in FY01, and 1 shipment in FY02.

Table 3 identifies the shipping schedule for Remote-Handled TRU waste, based on the WIPP PMP and the LANL PMP.

Table 3: RH Waste Shipments 2003 - 2010 from LANL

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10				Total
WIPP PMP(5)	0	0	17	19	40	40	40	40				196
LANL PMP(6)												

(5) WIPP PMP, Table 5.0-2.
(6) LANL PMP includes no information on RH shipments.

Discrepancies and Analysis

There is a very substantial (20 percent) difference in the number of projected shipments of CH waste between the WIPP and LANL PMPs. The discrepancies are not explained in the documents, even though both documents assume that volume reduction will occur. The LANL

[9] November 13, 2003 Permit Modification Request, p. 5. http://www.wipp.ws/rcradox/rfc/0203-SS-2-JB11-13-03.pdf

PMP states that there would be 1,500 shipments to WIPP,[10] but then includes only 1,091 in its "metrics" table.[11] There is no explanation of this inconsistency within the PMP.

Both PMPs also assume a "Quick to WIPP" program that would ship about 2,000 drums (400 m3) of high activity TRU, which purportedly include about 60% of the above-ground radioactive risk, to WIPP by mid-year 2004. As shown in Table 2, none of those shipments actually occurred, even though the essential requirement – that the Nuclear Regulatory Commission revise some shipping requirements – was approved in July 2002. Furthermore, LANL's TRU waste characterization was found to be inadequate in September 2003,[12] and shipments were halted until April, 2005.

Actual shipments during FY2003 and 2004 are far below what was projected in the PMPs. There are 46 shipments, compared with the 248 in the WIPP PMP and 261 in the LANL PMP. In the first nine months of FY2005, there have been 10 shipments to WIPP, and the goal of 166 or 167 shipments during the year will not be met.

The discrepancy in the number of RH waste shipments may be due to the fact that the LANL PMP does not assume that there will be any acceleration and cost savings. However, such an assumption is no basis to totally exclude discussion of those wastes, since the LANL PMP has a stated purpose to chart "a forward path to the EM end-state at LANL of complete removal of legacy wastes…."[13]

Of the 9,200 m3 of waste to be shipped according to the LANL PMP, the majority (5,200 m3) would be managed and packaged by the Centralized Characterization Project (CCP), which is managed and funded by the DOE Carlsbad Field Office at WIPP. Because of the inability of LANL to characterize its TRU wastes, CCP has not been located at LANL during much of 2003-2005, thus those CCP shipping goals have also not been met.

Conclusion

Variations in the number of shipments are significant. The reliability of the estimates is questionable, given the internal inconsistencies in the LANL PMP. More importantly, LANL is behind in its shipping schedule by at least two years. This will affect projected cost savings and whether investments required to accelerate cleanup will be cost-effective.

COST SAVINGS

The LANL PMP estimates cost savings of $950 million. Of that amount, $450 million is from accelerating the Environmental Restoration program.[14] The savings from accelerating legacy TRU and mixed low-level waste disposal and groundwater work are not separately calculated. All of the estimated savings come after FY2009 and are based on spending additional money prior to that date in order to reduce life-cycle baseline costs through FY2030.[15]

[10] LANL PMP, pages 6 and 8.
[11] LANL PMP, p. 13.
[12] http://www.nmenv.state.nm.us/OOTS/PR/WIPP%20Violation%201.pdf
[13] LANL PMP, p. iii.
[14] LANL PMP, p. 17.
[15] LANL PMP, p. 30.

Analysis and Conclusion

Because the LANL PMP does not provide any basis for the estimated cost savings, it is not possible to fully analyze what savings, if any, might result. It appears that at least some of the savings are from transferring management of future wastes from one DOE department (Environmental Management (EM)) to another (National Nuclear Security Administration (NNSA)). Such "savings" do not accrue to taxpayers and should not be seen as savings. More importantly, continuing production of TRU wastes actually imposes additional future costs on taxpayers, whether it is EM or NNSA that is supposed to manage, store, and dispose of the wastes.

The only real savings related to TRU waste would occur if waste actually left LANL and the costs of management, storage, and security actually ended. Since LANL has ongoing missions, especially plutonium pit production, that will continue to create new TRU waste, any real savings are minimal and could only be claimed if the costs of additional management facilities at Technical Area 54 (waste management area) are not required. Thus, the prospect of any substantial savings is questionable.

Moreover, the increased spending in Fiscal Years 2003-2004 included in the PMP did not occur. On May 2, 2002, the New Mexico Environment Department (NMED) issued a Corrective Action Order (CAO) under the New Mexico Hazardous Waste Act that stated, among other things, that LANL was not adequately managing its hazardous and mixed wastes.[16] DOE LANL and the University of California, and operator of LANL, objected to some provisions of the CAO, and filed lawsuits that, among other things, stated that the CAO exceeded NMED's regulatory authority. As a result, DOE refused to provide some of the funding for EM work that was budgeted and appropriated by Congress. In March 2004, an agreement was finally reached allowing $43 million to be released by DOE to LANL for EM work.[17]

REGULATORY COMPLIANCE ISSUES

As noted above, NMED issued an order on May 2, 2002. The LANL PMP states that a "significant benefit" of implementing the PMP is to "substantially resolve" the issues raised in that compliance order.[18] Such an outcome has not occurred. After more than two years of litigation and discussions, a revised draft final order was issued for public comment on September 1, 2004.[19] During that more than two-year period, many EM activities at LANL were slowed and the basic milestones of the PMP were not met. The new Consent Order was issued on March 1, 2005 and will require additional funding, changed schedules, and activities and is not based on, and some programs are not consistent with, the PMP.[20]

In addition, LANL's actual TRU waste shipments to WIPP were dramatically reduced from the PMP estimates as a result of LANL's violations of existing requirements.

[16] http://www.nmenv.state.nm.us/OOTS/Public%20Notices/LANL%20Order%20Final.PDF
[17] http://www.gov.state.nm.us/2004/news/march/031904_2.pdf
[18] LANL PMP, p. v.
[19] http://www.nmenv.state.nm.us/OOTS/PR/LANL%20Order%20Press%20Release.pdf
[20] http://www.nmenv.state.nm.us/hwb/lanl/OrderConsent/03-01-05/Order_on_Consent_2-24-05.pdf

In July 2004, all operations at LANL were shut down because of the loss of computer disks and an accident involving an intern.[21] The shutdown reduced the amount of TRU waste being generated, but also stopped preparations for resuming shipments to WIPP.

In 2002, DOE, EPA, and the New Mexico Environment Department (NMED) signed an Accelerated Cleanup Letter of Intent, which was to commit the agencies to accelerating cleanup at LANL. That Letter of Intent was part of the basis for the LANL PMP. However, the NMED now states that it will rely on the new Consent Order and forthcoming revised RCRA permit to guide site cleanup, not the Letter of Intent or the PMP.[22]

Conclusion

Since LANL has not been able to meet existing regulatory requirements, it should not be assumed that the various changes in requirements mentioned in the LANL PMP will be met.

OTHER RELEVANT ISSUES

Lack of Progress

There has been little apparent progress on the initiatives described in the PMP since the PMP was released on July 15, 2002. Nor has the PMP been revised to reflect actual performance and changed circumstances. The LANL PMP did not include an analysis of all of the regulatory and other issues that could impact the schedule, nor describe how a lack of progress would be addressed. The overall goal of completing shipments of legacy TRU waste to WIPP seems increasingly unlikely, given that LANL is approximately two years behind schedule.

Centralized Characterization Project (CCP)

The LANL PMP relies on the CCP to characterize and package more than 55 percent of its legacy TRU waste. As already noted, very little CCP work has been done in Fiscal Years 2003-2005 because of LANL's own operational problems. Although the CCP is operating, it is also in demand at other sites. So where the CCP operates in any year will be dependent upon decisions not made by LANL. If LANL is to meet the 2010 date for shipping its legacy TRU waste, it would appear that CCP will have to handle at least as much of the waste as is included in the LANL PMP, and in a more compressed timeframe. To do so would mean that CCP would do less work at other DOE sites, thereby slowing any accelerated schedules at those other sites.

Lack of Leadership

The PMP lays out some "significant changes in practices at UC, DOE, and regulator offices."[23] While the PMP implies that environmental restoration activities will become a higher priority of LANL and University of California officials, there is no specific evidence that has occurred. The NMED Secretary has stated publicly on several occasions that for months during 2003 he was unable to speak to the then LANL director regarding cleanup issues.

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[21] http://www.lanl.gov/worldview/news/releases/archive/04-066.shtml and http://abqjournal.com/paperboy/text/north/196290north_news07-10-04.htm

[22] Personal communication from NMED Secretary Ron Curry.

[23] LANL PMP, p. 22.

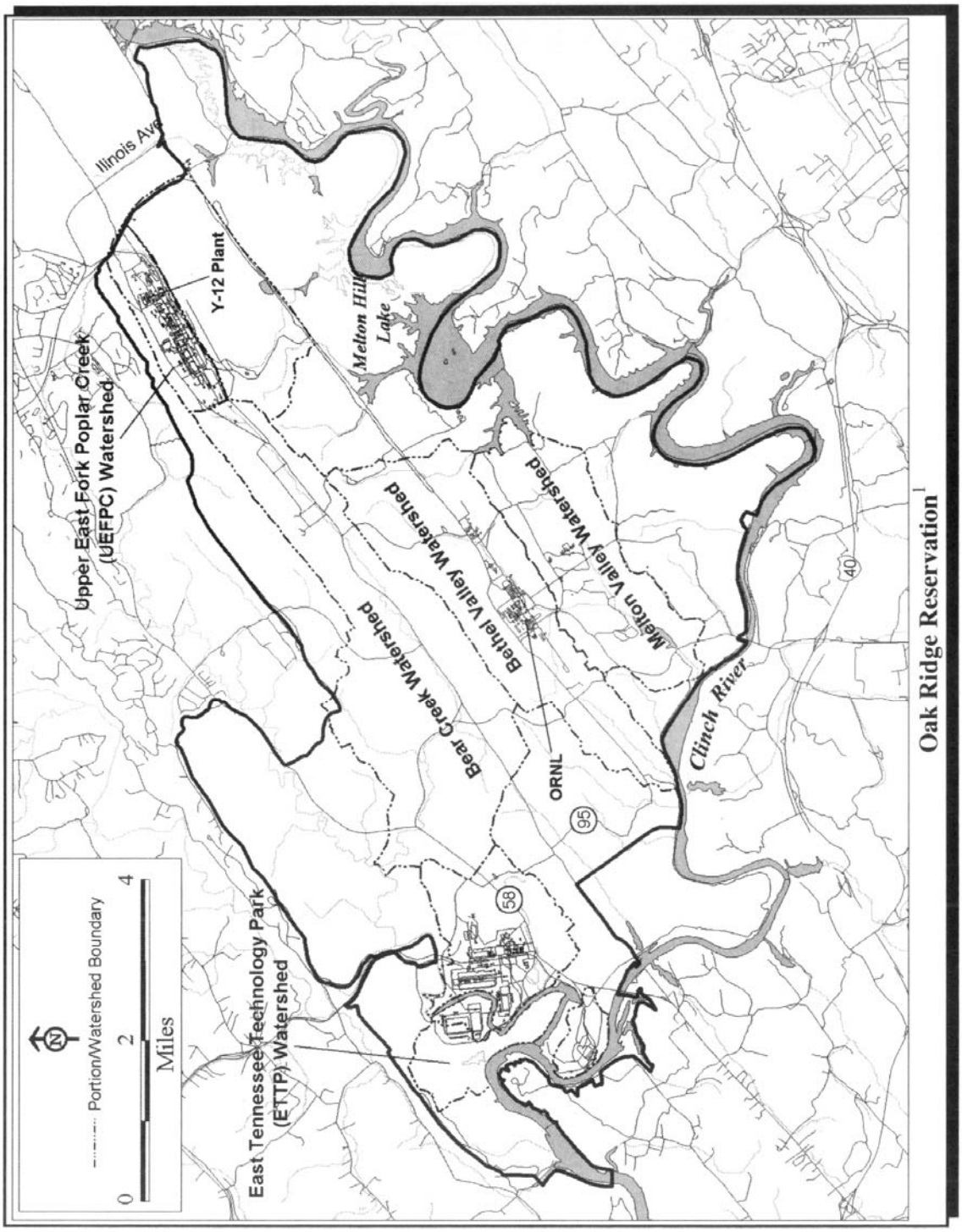
In the last months of 2004, LANL officials focused on the site shutdown and resuming operations, most of which focus on the nuclear weapons missions of the lab. Shipments to WIPP resumed on April 13, 2005, but will be at a rate of not more than two shipments per week for the next few months.[24]

In November 2005, DOE is expected to announce who the managing contractor of LANL will be for at least the next seven years. The two large bidders for the new contract are UC and Bechtel and others, and Lockheed Martin and the University of Texas and others. The new contract is to be effective on June 1, 2006.

Plutonium Production

LANL has the capability to produce certified plutonium pits for nuclear weapons and is using that capability. It is also one of the five sites being considered for the Modern Pit Facility (MPF), which would have the capability of manufacturing up to 450 plutonium pits each year for 50 years, beginning in 2020. The current plutonium pits operations and the MPF would produce large amounts of new TRU wastes, but the amounts and impacts of such production and the need for management and disposal of those TRU wastes are not included in the LANL PMP. Thus, the PMP does not include a comprehensive approach for either the current site TRU waste generation activities or the possible future activities.

[24] Personal communication from Dr. Inés Triay, Acting WIPP Manager, on April 8, 2005.



From: DOE. *A Report to Congress on Long-Term Stewardship*, DOE/EM-0563, January 2001.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Oak Ridge Reservation (ORR)
Performance Management Plan (PMP)

In August, 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Oak Ridge Reservation (ORR), located in eastern Tennessee. Included in the PMP were initiatives to accelerate cleanup of the site, including initiatives to increase the rate of treatment of transuranic (TRU) waste and its shipment to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The PMP also identifies the expected cost savings and risk reduction associated with these initiatives, as well as initial costs and potential barriers for achieving them.

The ORR PMP identifies 13 initiatives to accelerate cleanup of ORR. DOE has estimated that it will save $2.2 billion by accelerating cleanup by six years. The PMP accelerates TRU disposition by two years. However, it does not estimate cost savings for this activity. The PMP also describes these initiatives, as well as initial costs and potential barriers for achieving them.

The DOE also prepared a PMP for WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. Included in this comparison are any relevant documents that might shed light on discrepancies between the PMPs. The study also aims to identify and analyze critical assumptions in the PMPs to determine if the forecasts are manageable and realistic.

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- Background
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- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal laws and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. ORR generated and has stored for decades both CH and RH TRU waste. For many years, at least 80 percent of the stored RH TRU waste in the DOE complex was said to be at ORR.

Oak Ridge Reservation

The 35,000-acre Oak Ridge Reservation (ORR) is in eastern Tennessee, about 20 miles west of Knoxville. ORR includes three major DOE installations: the East Tennessee Technology Park (ETTP), formerly the K-25 Gaseous Diffusion Plant; the Oak Ridge National Laboratory (ORNL) in Bethel Valley, and the Y-12 National Security Complex. These installations occupy about 30 percent of the land that makes up the ORR. The remainder of ORR is designated as a National Environmental Research Park. ETTP and ORNL are part of the DOE Environmental Management (EM) program, and University of Tennessee-Battelle, LLC and Bechtel Jacobs Company are the primary contractors. Y-12 is part of the National Nuclear Security Administration (NNSA) and BWXT Y-12, LLC is the operating contractor. There are 13,000 employees and a budget in Fiscal Year 2005 of $1.8 billion, excluding Y-12.[1] NNSA provides about $900 million more for the budget and employs about 4,600 workers.[2]

Bethel Valley comprises the northern half of ORR, while Melton Valley comprises the southern half. The Clinch River runs along the southern border of ORR. The Radiochemical Engineering Development Center (REDC), built in the 1950's is situated in Bethel Valley. Many waste storage areas are located in Melton Valley. The High-Flux Isotopes Reactor (HFIR) and the Molten Salt-fueled Reactor Experiment (MSRE) were built and operated in Melton Valley.

The generation of radioactive solid, liquid, and sludge waste at ORR began in 1944 when plutonium was first separated from irradiated graphite reactor fuel as part of the Manhattan Project. The current mission of Y-12 includes responsibility for Highly Enriched Uranium and research, development, and handling of nuclear weapons secondaries. Byproducts of ORR radiochemical processing and radioisotopes production operations include a wide variety of liquid and solid radioactive wastes, including TRU wastes. Mixed-waste burial grounds, settling ponds, seepage pits and trenches, inactive tanks, abandoned underground pipelines, and surplus facilities have contaminated soils, groundwater, and surface water.[3] As a consequence, ORR has been placed on the National Priorities List, and cleanup is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Approximately 4 million cubic yards (yd3)[4] of total waste must be managed at ORR. Environmental Management (EM) must manage 3.4 million yd3 of this amount, while National Nuclear Security Agency (NNSA) and Office of Science take up the balance. Five projects at ETTP are forecast to generate approximately half of the EM waste. Legacy waste and newly generated waste volumes comprise approximately 2% of EM's total responsibility. Low-volume, high-activity wastes (e.g., transuranic wastes) as well as mixed waste and low-level wastes are generally disposed off-site.[5]

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[1] http://www.oakridge.doe.gov/key_facts.html

[2] http://www.y12.doe.gov/public/news/publicaffairs.php

[3] http://www.oakridge.doe.gov/em/euwg/bground.htm, Section 2.1 Description of the Oak Ridge Reservation.

[4] Use 0.7646 to convert cubic yards to cubic meters. Except for the background, all waste volumes are converted to cubic meters (m3).

[5] http://www.bechteljacobs.com/doeclean/pdf/cwdp.pdf *Comprehensive Waste Disposition Plan*, Bechtel Jacobs Company LLC, DOE/OR/01-2045 + D2, 3/6/03.

TRU WASTE INVENTORY[6]

There are many conflicting reports and memos that make mention of the inventory of TRU waste at ORR. The draft WIPP PMP (July 2002) estimates 2,270 cubic meters (m3) are stored with another 2,900 projected. The ORR PMP, also written in 2002 provides quantities for stored wastes between 2,294 m3 and 2,447 m3.[7] A draft Environmental Impact Statement prepared in 2000 estimated the quantity at 2,446 m3. A letter from the Oak Ridge Site Specific Advisory Board (SSAB) in 2001 put the amount of stored waste at 2,400 m3. [8] A presentation by engineers associated with ORR in 2001 gives a figure of 2,927 m3 in storage, while it projects another 3,500 m3 in the future. [9] A fact sheet produced in March 2003 gives a gross quantity of 5,300 m3.[10] Another letter from the SSAB in October 2002 gives an amount of just RH TRU at 3,800 m3.[11]

These TRU wastes fall into three classes:

- Remote-handled (RH) mixed waste sludge located in the active waste storage tanks at Melton Valley and Bethel Evaporator tanks that will be treated and disposed of at WIPP when it is permitted to accept this waste class.

- Remote-handled (RH) TRU/alpha low-level waste solids (includes some mixed waste) located in storage facilities and subsurface trenches that will be treated and disposed of at WIPP when it is permitted to accept this waste class.

- Contact-handled (CH), which consists of low-level activity solids (includes some mixed waste) located in storage facilities and subsurface trenches that will be treated and disposed of at the WIPP.

In addition, there is Supernate associated with the RH-TRU mixed waste sludge located in the active waste storage tanks and Gunite and Associated Tanks (GAAT)[12], which ORR hopes to classify as low level waste to be sent to the Nevada Test Site (NTS) for disposal.

The facilities and programs that generated solid TRU waste also the primary sources of TRU constituents to liquid low level waste (LLLW) and TRU waste sludge. LLLW was generated and diverted into underground piping and transferred to storage tanks. Some sludge residuals date back to ORNL operations in the 1940s and 1950s, although most of the RH TRU sludge volume was created during the past 30 years. The generation of TRU waste sludges was projected to cease in 2003 due to the completion of waste retrieval and closure from the remaining tanks.

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[6] *Comprehensive Waste Disposition Plan*. This source was not used in the inventory because the information in the document was inconsistent.

[7] The former is based on a gross estimate, the latter on specific estimates. The Oak Ridge PMP is available at: http://www.bechteljacobs.com/doeclean/_pu-pmp.html

[8] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2002/r3-13-02.7.PDF Oak Ridge Site Specific Advisory Board: Recommendations on Deletion of Milestones for Mixed Transuranic Wastes from the *Site Treatment Plan for Mixed Wastes on the DOE Oak Ridge Reservation*, October 2001.

[9] http://www.wmsym.org/Abstracts/2001/10C/10C-37.pdf K.M. Billingsley, K.P. Guay, J.R. Trabalka, Gl. R. Riner. *TRU Waste Management – Past, Present, and Future at Oak Ridge National Laboratory*. 2001.

[10] http://www.bechteljacobs.com/pdf/factsheets/tru_waste_facility.pdf *Transuranic Waste Treatment at Oak Ridge National Laboratory*, DOE EM Program, March 2003.

[11] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2003/r10-9-02.3.pdf, Letter from SSAB to NMED, October 10, 2002.

[12] Gunite tanks are made primarily of concrete.

Under its current missions it is estimated that ORR will generate additional significant TRU waste over the life of the facility. [13]

Table 1 provides the estimated inventory from the WIPP and ORR PMPs and other reports and letters.

Table 1: ORR TRU Waste Inventory
(amounts in cubic meters – m3)

Source	Stored CH	Projected CH	Total – CH	Stored RH	Projected-RH	Total - RH	Total TRU	Total Stored
WIPP-PMP(1)	960	2,060	3,020	1,310	530	1,840	4,860	2,270
ORR PMP(2)							2,294	2,294
ORR PMP(3)	994		994	1,453			2,447	2,447
WIPP RCA(4)	0	450	450	0	660	660	1,110	0
DEIS(5)							2,446	2,446
Fact Sheet(6)							5,400	
Symposium(7)	1,407	1,750	3,157	1,520	1,750	3,270	6,427	2,927
SSAB(8)	1,100			1,300			2,400	
Letter from SSAB to NMED(9)				3,800				

(1) July 2002 draft WIPP PMP, p. 83; final PMP does not have volumes for ORR.
(2) ORR PMP, gross number, p. 4.
(3) ORR PMP, summing elements.
(4) WIPP Recertification Application, DOE/WIPP 2004-3231, Tables 4-1 and 4-2.
(5) DEIS for Treating Transuranic/Alpha Low Level Waste at ORNL, Feb. 2000.
(6) http://www.bechteljacobs.com/pdf/factsheets/tru_waste_facility.pdf Transuranic Waste Treatment at Oak Ridge National Laboratory, Department of Energy, Environmental Management Program, March 2003.
(7) http://www.wmsym.org/Abstracts/2001/10C/10C-37.pdf TRU Waste Management – Past, Present, and Future at Oak Ridge National Laboratory. K. M. Billingsley K. P. Guay J. R. Trabalka G. L. Riner; 3,500 m3 of TRU is projected. Assume 50% of projection is RH.
(8) http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2002/r3-13-02.7.PDF Oak Ridge Site Specific Advisory Board (SSAB): Recommendations on Deletion of Milestones for Mixed Transuranic Wastes from the *Site Treatment Plan for Mixed Wastes on the DOE Oak Ridge Reservation*, October 2001.
(9) http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2003/r10-9-02.3.pdf, Letter from SSAB to NMED, October 10, 2002.

Discrepancies and Analysis

Based on **Table 1**, there is much uncertainty about the amount and type of TRU waste stored and projected for ORR. The greatest uncertainty concerns the amount of RH TRU, and projected amounts. Of most concern is the letter sent by the SSAB to New Mexico stating that ORR had 3,800 m3 of RH TRU, since that is almost three times more than other estimates. In contrast, the WIPP Recertification Application has a much lower estimate (1,100 m3) of RH waste.

Uncertainties about quantity may be exacerbated by the following issues:

[13] http://www.wmsym.org/Abstracts/2001/10C/10C-37.pdf *TRU Waste Management – Past, Present, and Future at Oak Ridge National Laboratory.*

- **RH TRU Recategorized as CH TRU and TRU Recategorized as LLW**

Much of the TRU waste was generated when the definition of TRU waste included radioactive waste with concentrations of 10 to 100 nCi/gram, or waste contaminated with non-transuranic isotopes (e.g., U-233), or with TRU isotopes with half-lives less than 20 years (e.g., Cm-244). Estimates of quantities are uncertain and will be revised as treatment and repackaging proceeds.

- **CH TRU Re-categorized as RH TRU**

Three containers from the Knolls Atomic Power Laboratory are known to contain RH TRU wastes. However, added internal shielding has reduced the dose rates at the container's surface to less than 200 mrem per hour. Because this approach was reportedly used routinely at ORNL to reduce external dose rates on containers, there is a significant potential to encounter RH TRU waste items during the treatment and repackaging of the stored CH TRU waste containers. In effect, if this were found to be common practice while repackaging CH TRU, the amount of RH TRU could rise substantially.

- **Additional TRU from Corehole 8**

In June 1991, rock core drilling at Corehole 8, located southwest of Tank W-1A, revealed contaminated groundwater with radioactivity in the uppermost portion of the bedrock. Analysis indicated that tank leaks were a contributing source to the contamination. Contaminated soils were excavated and removed under a non-time-critical removal action. During excavation approximately 100 m3 of RH TRU waste were packaged in 190 B-12 boxes and stored in storage bunkers. An additional 75 m3 was left in place, to be addressed at a later date. The tank and the TRU-contaminated soil discovered during this removal action are now scheduled to be addressed in a new action memorandum due to be started in December 2004 (Federal Facility Agreement Appendix E, 3 April 2003). A removal action report was written but was not accepted by the regulators (Tennessee Department of Environment and Conservation and Environmental Protection Agency, Region 4).[14] The Comprehensive Waste Disposition Plan of 2003 attributes 113 m3 of TRU waste to Corehole 8.

- **Additional TRU from the Molten Salt Reactor Experiment fuel salts**

The Comprehensive Waste Disposition Plan of 2003 attributes 31 m3 of waste to the MSRE.

- **Miscellaneous Tanks**

The contents of the inactive liquid LLW tanks, T-I, T-II, and HFIR, will be treated in the TRU WPF.[15] This may include more TRU waste than was originally estimated.

- **Additional Sources of TRU**

Historical operations at all three ORR sites have roughly 35,900 m3 of low-level waste, and 8,000 m3 of mixed low-level waste. This waste resides in various indoor and outdoor storage

[14] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2003/R6-11-03.12.pdf Oak Ridge Site Specific Advisory Board, Recommendation Concerning the Department of Energy Action Memorandum for the Corehole 8 Plume Source (Tank W-1A) Removal Action at Oak Ridge National Laboratory June 2003.

[15] DOE. *Comprehensive Waste Disposition Plan (CWDP) for the DOE Oak Ridge Reservation*, 3.3.3 Melton Valley Waste Disposition Overview (DOE/OR/01-2045&D2), March 2003, p. 30.

locations and must be characterized, packaged, transported, treated, and disposed to facilitate demolition and cleanup.[16] Some of this waste may be reclassified as TRU waste.

For example, the RH TRU waste sludge at ORR formed as precipitants settled out of liquid low level waste (LLLW) during storage. The active tank system and six large inactive Gunite (concrete) tanks contain the approximately 3,243 m3 of LLLW associated with the RH-TRU sludges. Some liquids may still be classified as TRU waste rather than low-level waste.

Another example is a proposal by ORR staff to add uranium 233 (U^{233}) to TRU waste.[17] This option is potentially attractive at several sites, including the Idaho National Lab and ORR because of the amount of U^{233} accessible. It is assumed that incinerator ash, particulates and liquids would be mixed with concrete and poured into TRU containers to take advantage of the void space. It is proposed that blending in fine U^{233} powder into the concrete can be accomplished, until the WIPP WAC is approached.

The WIPP PMP identifies ORR as a potential site for the "Eastern Hub" to which CH TRU waste would be shipped from Bettis Atomic Power Laboratory (BAPL) in Pennsylvania, Nuclear Fuel Services in Tennessee, and the Separations Process Research Unit in New York, and RH TRU waste would be shipped from BAPL and Knolls Atomic Power Laboratory in New York.[18]

Changing stored/projected definitions

In the WIPP Recertification, all of the waste previously classified as "stored" is included in "projected" inventory. The change in definition results from ORR plans to process the waste, which will change waste forms and amounts.

Waste Without Pathway for Disposal

The draft WIPP PMP noted that ORR is expected to generate 970 m3 of CH TRU waste and 250 m3 RH TRU waste after WIPP is closed in about 2035.[19] Since no other TRU waste disposal site is currently being planned, ORR and other sites with ongoing nuclear weapons research, development, and testing missions will continue to generate waste for which there is no proposed disposal. This issue is not discussed in the ORR PMP or the WIPP PMP.

TRU WASTE SHIPMENTS

Neither the ORR PMP, nor any of the other ORR sources that were used, identified a shipping schedule. It should be noted however, that the some sources continue treatment and repackaging of TRU waste through 2011.[20] Treatment of CH TRU is supposed to begin in 2004 and be complete by 2005. The RH TRU processing is supposed to begin in 2005 and be completed by 2010, assuming WIPP will be open to accept RH TRU wastes.[21] The amount processed is to peak in 2005. If all is shipped, then the schedule found in the WIPP PMP may be consistent,

[16] ORR PMP.
[17] C. W. Forsberg, E. C. Beahm, L. R. Dole, A. S. Icenhour, and S. N. Storch. *Disposition Options for Uranium-233, 4.6.2.1 Convert to Waste: Process with CH TRUW*. ORNL/TM-13553, C., Oak Ridge National Laboratory, June 1, 1999.
[18] WIPP PMP, p. 83 (unnumbered). WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf
[19] Draft WIPP PMP, p. 85.
[20] Life Cycle Baseline Presentation, 9/26/02.
[21] *Comprehensive Waste Disposition Plan*.

although it is not possible to establish what the shipment amounts would be from publicly available data.

Table 2 presents the WIPP PMP schedule and the schedule from the DOE Budget Requests to Congress for CH waste and RH waste shipments from ORR to WIPP.

Table 2: ORR TRU Shipping Schedule

CH WASTE SHIPMENTS											
	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
WIPP PMP(1)	18	56	40	8	8	2					132
ORR PMP(2)											
Budget Request(3)		34	24								
Actual	**0**	**0**									**0**
RH WASTE SHIPMENTS											
	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
WIPP PMP(4)	0	0	83	142	31	41	25	16	16	14	368
ORR PMP(2)											

(1) WIPP PMP, Table 5.0-1.
(2) The ORR PMP does not provide a schedule.
(3) DOE Budget Request for Fiscal Year 2005 performance measures.
(4) WIPP PMP, Table 5.0-2.

Discrepancies and Analysis
The WIPP and ORR PMPs have different schedules for waste shipments, which are not explained in the documents. Clearly, ORR is behind schedule regarding shipments of both CH- and RH wastes. While it is too early to determine whether the goals of completing CH shipments by FY2008 and RH shipments by FY2012 can be met, the historic events provide encouragement that the dates will be met.

COST SAVINGS

The ORR PMP estimates that it will save $2.2 billion on accelerated cleanup. The Accelerated Plan shows that CH-TRU removal finished by year-end 2006 v. 2008 in existing plan.[22] Of the estimated savings, it is difficult to determine what portion is attributable to accelerating disposition of TRU wastes. The baseline amounts were not available. The largest savings are due to the closure of the East Tennessee Technology Park (ETTP) and selling or leasing that land for a private industrial park. This was the site of a uranium enrichment facility and no TRU waste was stored there. ORNL and the Y-12 National Security Complex will continue to operate. Cost savings would focus on avoided costs of storing the TRU waste. The Melton Valley area, where some of the TRU waste is stored in tanks will remain a restricted waste management area. DOE plans are for 2,000,000 curies of radioactive waste to be buried in-place under 128 acres of caps, so only small savings accrue. The Molten Salt Experimental Reactor (MSRE) will be decommissioned, and there is a small amount of TRU associated with this project. Likewise, Corehole 8, an area of contaminated soil and groundwater also has a small amount of TRU. This scenario does not appear to present a large savings for accelerating TRU removal.

[22] ORR PMP, p. 22.

In addition, any cost savings will require a great deal of initial investment, although this is not specified in the PMP. Bechtel Jacobs Company signed a $1.8 billion cost plus incentive contract in 2003. They will continue as the main contractor for the site, and will assist in accelerating cleanup.[23] Foster Wheeler was awarded a $197 million contract to build and operate a waste treatment facility, which will process TRU wastes as well as other radioactive wastes. Following is a description of some of the investments and other issues that will affect the level of real cost savings.

TRU Waste Initiative Investments

Waste Treatment Facility

In 1998, DOE entered into a fixed price privatization contract with Foster Wheeler Environmental Corporation to construct, operate, decontaminate, and decommission the facility for $197 million.[24] Foster Wheeler was supposed to have the facility operational by January 2003. The Comprehensive Waste Disposition Plan [25] has 2004 as the start date. Under the contract, Foster Wheeler will construct an onsite processing facility in the Melton Valley area to treat and package the waste. Under the terms of its contract, Foster Wheeler will treat and repackage the bulk of the TRU solid waste that is considered mixed waste under RCRA, as well as low-level waste. After treatment, the transuranic wastes will be shipped to WIPP.[26] Low-level waste will be disposed of at the Nevada Test Site.

Foster Wheeler has proposed an evaporating and drying process for the RH TRU sludges and associated LLLW. The process is flexible enough to cover a wide range of waste properties. The low-temperature process will substantially reduce the waste volume, generate minimal amounts of secondary waste, and will meet the WAC of the designated disposal facility. LLLW will be pumped from the Melton Valley Storage Tanks through a double-contained above ground pipeline to the waste treatment facility. Condensate and recycled LLLW may be used during sluicing operations in the Melton Valley Storage Tanks to retrieve the RH TRU sludge.

Bechtel Jacobs Company is responsible for retrieving solid TRU waste and delivering it to the TRU Waste Treatment Facility. They will also be responsible for delivering the other TRU solid waste from existing storage facilities to the waste treatment facility at the rate specified in the Foster Wheeler proposal. Untreated TRU solid waste containers will be loaded onto a flatbed truck and hauled on roads within the ORR boundary to the Waste Treatment Facility.

Other Investments

Other activities that will require some investment relating to TRU waste include:[27]

- Stabilize and dispose of Molten Salt Reactor Experiment fuel salts as waste instead of converting the uranium-233 for potential reuse.
- Retrieve waste from the lower 22 TRU trenches in Solid Waste Storage Area 5 North. The trenches contain 204 concrete casks, 18 boxes, and 12 drums of TRU waste. This waste was

[23] ORNL, Press Release, 9/30/03.
[24] *Transuranic Waste Treatment at Oak Ridge National Laboratory*.
[25] *Comprehensive Waste Disposition Plan*.
[26] http://www.oakridge.doe.gov/media_releases/1998/r-98-020.htm Foster Wheeler Selected to Treat Oak Ridge Transuranic Waste For Offsite Disposal (5/29/98).
[27] ORR PMP.

entombed in the 1970s with the intent that it would be retrieved for ultimate disposal elsewhere. The removed waste will be segregated at the Transuranic Waste Treatment Facility.

- Repack and certify CH TRU alpha low-level solids currently stored at ORNL.
- Repack and certify RH TRU alpha low-level solids also stored at ORNL.
- Remediate Tanks T1, T2, and the High Flux Isotope Reactor tank in accord with the Bethel Valley Record of Decision selected remedy. Tank T1 contains 2,000 gallons of TRU sludge.
- Complete Corehole 8 removal action by 2008.

Competition for Decreasing Budget

The ORR PMP identifies 13 initiatives. All of the other initiatives will compete against one another, as DOE's budget tends to shrink. In order of priority these are:

1. Melton Valley: DOE has identified this area as the greatest source of offsite contaminant releases.
2. Offsite Areas: Private property with public access and risk to current industrial workers.
3. High-Risk-Reduction Projects in Bethel Valley: DOE has identified this area as the next highest sources of offsite contaminant releases.
4. ETTP: Landlord costs will be significantly reduced, freeing up funds for other remediation efforts. Contaminated soils are a source of contaminant migration to surface water and groundwater.
5. ORNL Building 3026 Demolition: This facility presents a current industrial hazard due to its deteriorated condition and requires high landlord cost.
6. MSRE: This facility is a safety hazard and requires high landlord cost.
7. Bear Creek Valley: Release of uranium to Bear Creek.
8. Bethel Valley: Soil contamination poses potential risk to workers.
9. Upper East Fork Poplar Creek: Part of Y-12 modernization program.
10. Regional Groundwater Remediation: DOE proposes delaying this work until all sources are remediated.
11. Chestnut Ridge: Onsite contamination with no known release.
12. White Wing Scrap Yard: Onsite contamination with no known release.
13. Clinch River/Poplar Creek Record of Decision: Receptor for entire Reservation; DOE proposes delaying activity until remediation of all sources is complete.

For example, closure of ETTP is one of the cornerstones of the accelerated closure plan proposed by DOE. The accelerated closure plan cites 2008 as the target date for closure. In order to close ETTP, approximately 7,000 UF6 cylinders must be removed. Important prerequisites include conversion capability to treat UF6, compensating states for emergency preparedness and transportation safety expenses and providing or funding transportation security. While funding for the UF6 cylinder project is included in the accelerated closure plan, there are many uncertainties due to the enormity of the project. These include adequate funding and adequate time for completion of the project; over-pack containers must be designed for transportation of the cylinders, and over-pack design must be approved by the Department of Transportation and the Nuclear Regulatory Commission. The involved states, including Tennessee, Ohio, and Kentucky, have not been assured that emergency management and transportation issues have been addressed; the states have not been assured that funding will be adequate for inspections,

needed response operations, and training of local and state personnel in responding to potential accidents; DOE has not made a proposal to the states regarding interstate transportation and treatment of Tennessee's 60,000 tons of UF6. Furthermore, the conversion contract award has been postponed several times putting ETTP closure planning at risk.

Fulfilling the Environmental Management Waste Management Facility (EMWMF) Record of Decision, signed in 1999, is another issue that will compete with funds for accelerated cleanup. TDEC issued an Order to develop a trust fund to ensure resources are available to conduct necessary surveillance and maintenance activities at the facility to ensure long-term environmental protection. The order requires DOE to provide $1 million per year for 14 consecutive years. DOE has been making these payments on schedule. The state of Tennessee maintains the fund. The state expects this fund to provide necessary resources for surveillance and maintenance beyond the closure date of the facility.

Prerequisites for Success

The PMP sets forth conditions, which if not met, will delay accelerated cleanup. As of now, neither of these conditions has been met. Specifically referring to TRU wastes, these include:

- Availability of WIPP to accept shipments of RH TRU wastes. (This issue is discussed in the following section.)
- Reach an agreement between DOE-EM, the National Nuclear Security Administration (NNSA), and Office of Science for the transfer of responsibility for newly generated waste and waste management.

REGULATORY COMPLIANCE ISSUES

RH Waste Disposition

Perhaps the biggest problem facing Oak Ridge is the disposition of RH TRU waste. Although the Land Withdrawal Act that established WIPP leaves room for some RH TRU waste, the permit issued by the New Mexico Environmental Department (NMED) does not allow for RH TRU disposition. [28]

The state of New Mexico and DOE have been arguing over acceptance of RH TRU by WIPP, with the federal agency applying to modify acceptance criteria, and the state issuing two Notices of Deficiency of that application. Meanwhile ORR has missed some milestones for processing of RH TRU, and some cleanup projects are being postponed.[29] For example, DOE's Oak Ridge Operations has notified the state of Tennessee of its plan to postpone until 2009 cleanup of the highly contaminated Core Hole Eight at the center of the ORNL campus.

[28] The Land Withdrawal Act, as currently amended, limits the volume of TRU waste that may be disposed of at WIPP to 175,563 m3. The volume of TRU waste in storage and anticipated to be generated, as reported by the nine sites participating in a July 2003 workshop summed to 226,521 m3. Although the site reports may have been inflated by some waste streams that are not completely characterized, there is concern that WIPP will not have capacity for all TRU waste.

[29] http://oakridger.com/stories/070903/new_20030709012.shtml , "States need to talk waste," July 9, 2003.

In October 2002, the Site Specific Advisory Board at ORR wrote a letter to NMED requesting that it approve modifications to its RCRA permit. In part that letter stated:[30]

> "Oak Ridge has the largest percentage of the 3,800 cubic meters of defense related RH-TRU waste in the DOE complex. Oak Ridge also has relatively high annual rainfall levels and shallow, inter-connected aquifers, making it an unsuitable location for the indefinite storage and disposal of RH-TRU wastes; therefore, the ORSSAB has a vested interest in the acceptance by the New Mexico Environment Department (NMED) of this permit modification request. If approved, the RCRA permit modification would allow the management, storage, and disposal of mixed RH-TRU waste at WIPP."

Again in July 2003, the SSAB sent a letter to Jessie Roberson, Assistant Secretary for Environmental Management of DOE imploring her to promote the timely acceptance of RH TRU at WIPP.[31] The letter made the following points:

- A state-of-the-art processing facility has been constructed under a privatization contract to perform characterization, treatment, and repackaging of legacy RH and CH TRU waste.
- Some of the RH TRU is stored in shallow burial in the very wet Oak Ridge environment and cannot be staged through engineered storage facilities and on to processing until the backlog is worked off.
- Processing cannot proceed until waste characterization program requirements under the pending RH TRU waste permit modification request are better understood.

Although the ORR SSAB wants priority given to the site's RH TRU waste, the existing legal limit for RH TRU waste at WIPP is 7,080 m3. Hanford has much larger volumes of RH TRU than ORR, and the total volume of RH TRU exceed WIPP's capacity. Thus, unless Congress and New Mexico agree to change the legal limits, much RH TRU waste will not be disposed at WIPP.

Site Treatment Plan[32]

For each facility at which the United States (U.S.) Department of Energy (DOE) generates or stores mixed wastes, the Resource Conservation and Recovery Act (RCRA), as amended by Section 105(a) of the Federal Facility Compliance Act (FFCA), requires DOE to devise a plan for developing treatment capacities and technologies for mixed waste. Some TRU waste at the ORR contains hazardous constituents and is managed in accordance with both DOE Orders and Tennessee Hazardous Waste Management Regulations. It is referred to as Mixed-TRU (MTRU) waste. Upon submission of a plan to the TDEC, FFCA requires TDEC to approve, approve with modification, or disapprove the plan within six months. The agency is to consult with U.S. Environmental Protection Agency (EPA), and issue an order requiring compliance with the approved plan.

The Site Treatment Plan was implemented in October 1995 through a commissioner's order, in compliance with the Federal Facility Act of 1992. This order effectively established a plan and process through negotiation between the state of Tennessee and DOE for establishing annual

[30] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2003/r10-9-02.3.pdf, Letter from SSAB to NMED, October 10, 2002.
[31] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2003/R7-9-03.14.pdf
[32] The Site Treatment Plan could not be accessed either through DOE or through the TDEC website.

mixed waste treatment milestones to eliminate the huge 138 million pound mixed waste inventory stored at Oak Ridge.

At issue is DOE's commitment to begin shipments of mixed RH TRU to WIPP beginning in January 2003. DOE informed Tennessee that based on a new interpretation of federal regulation enacted in 1996 that it will not recognize Tennessee's ability to enforcement of any sort of shipment schedule whether delayed by mutual agreement or not. Tennessee is fighting to maintain its right to enforce a schedule of shipment. Stakeholders, including the SSAB, agree with the state, because the Site Treatment Plan is enforceable.[33],[34],[35]

According to DOE, the Waste Isolation Pilot Plant Land Withdrawal Act eliminates the need for all DOE sites to treat mixed TRU waste prior to disposal at WIPP. DOE has also stated that it intends to process and dispose of mixed TRU wastes regardless of whether there is a regulatory milestone to do so, but does not want to be held to a schedule. If DOE goes forward with processing this waste, ORR will have to store processed RH TRU in concrete over-packs on a pad next to the TRU processing facility until WIPP can accept it. This would require double handling, assuming the waste is eventually transferred to WIPP.

TDEC's position is that DOE is interpreting the WIPP Land Withdrawal Act out of context and that the act refers only to WIPP and not to requirements at other DOE sites, such as Oak Ridge. TDEC points out that since enactment of the Site Treatment Plan, mixed wastes in Oak Ridge have been reduced by more than 60%. Legacy low-level wastes, which do not have state regulatory milestones, continue to accumulate. This fact leads TDEC to question if the TRU wastes will be expeditiously disposed of without a regulatory driver. In addition, the budget for the Oak Ridge Environmental Management Program has been reduced to the point that required the regulatory milestones for cleanup projects to be renegotiated with DOE, TDEC, and EPA.

Waste Processing Facility

The State of Tennessee and EPA are regulating the facility according to permits under their purview; DOE is regulating occupational safety and health and nuclear safety.

Action Memorandum for Corehole 8

The ORR is listed on the National Priorities List. As a result, the Superfund law governs cleanup of the site. Corehole 8 is identified as an area where soil and possibly groundwater have been contaminated by TRU waste. Before cleanup can occur, an Action Memorandum must be accepted by the regulators (in this case the Tennessee Department of Environmental Conservation (TDEC) and the U.S. EPA).

[33] http://www.oakridger.com/stories/052703/new_20030527024.html "TRU waste dispute rolls on" (5/27/03).
[34] http://www.oakridge.doe.gov/em/ssab/Recommendations/FY2002/r3-13-02.7.PDF Oak Ridge Site Specific Advisory Board: Recommendations on Deletion of Milestones for Mixed Transuranic Wastes from the *Site Treatment Plan for Mixed Wastes on the DOE Oak Ridge Reservation*, October 2001.
[35] The formal dispute resolution has been held in abeyance. TDEC expects CH-TRU waste treatment to begin in August 2005 and RH-TRU shipments to begin in 2008. Personal communication with John Owsley, TDEC DOE Oversight Division Director, June 3, 2005.

Other Related Regulatory Issues

- **Letter of Intent among DOE, TDEC, and EPA**

The letter of intent signed in May 2002 commits DOE to accelerate cleanup at ORR. The letter documents how the results of DOE's PMP will be used to implement a more efficient decision making process, develop integrated planning and funding requests and meet commitments under the Federal Facility Agreement (FFA) for ORR. The letter outlines plans to clean up high-risk sites by 2008 and substantially complete the balance of the work by 2016.

- **Federal Facility Agreement**

Tennessee, DOE, and EPA signed the FFA in 1992. The agreement outlines a procedure for the reservation's cleanup, including problem identification, activity scheduling and implementing and monitoring appropriate responses. Actions taken under the FFA conform to CERCLA, RCRA and other federal and state laws. Under the FFA, the three agencies agree on a cleanup schedule, with clear deadlines for cleanup milestones. EPA and the state have the authority to penalize DOE when these deadlines are missed.

OTHER RELEVANT ISSUES

Waste Treatment Facility Design

The TRU waste treatment facility may not have been adequately designed to process the waste in a timely manner. The combined baseline and optional waste volumes included in the original scope of the ORNL TRU Waste Treatment Project contract are:[36]

- 900 m3 of RH-TRU mixed waste sludge located in the Melton Valley Storage Tanks,
- 1,600 m3 of low-level supernatant associated with the TRU mixed waste sludge and also located in the tanks,
- 550 m3 of RH-TRU/alpha low-level waste solids (may consist of some mixed waste) located in bunkers and subsurface trenches, and
- 1,000 m3 of CH-TRU/alpha low-level waste solids (may consist of some mixed waste) located in metal storage buildings.

However, this same source reports the following inventory of TRU and associated low-level wastes in storage:

- 822 m3 of RH-TRU mixed waste sludge located in the active waste storage tanks at ORNL (as of 1/1/01),
- 3,243 m3 of low-level supernatant associated with the RH-TRU mixed waste sludge located in the active waste storage tanks (2,107 m3) and Gunite and Associated Tanks (GAAT) (1,136 m3) (as of 1/1/01),
- 698 m3 of RH-TRU/alpha low-level waste solids (includes some mixed waste) located in storage facilities and subsurface trenches (as of 11/00), and

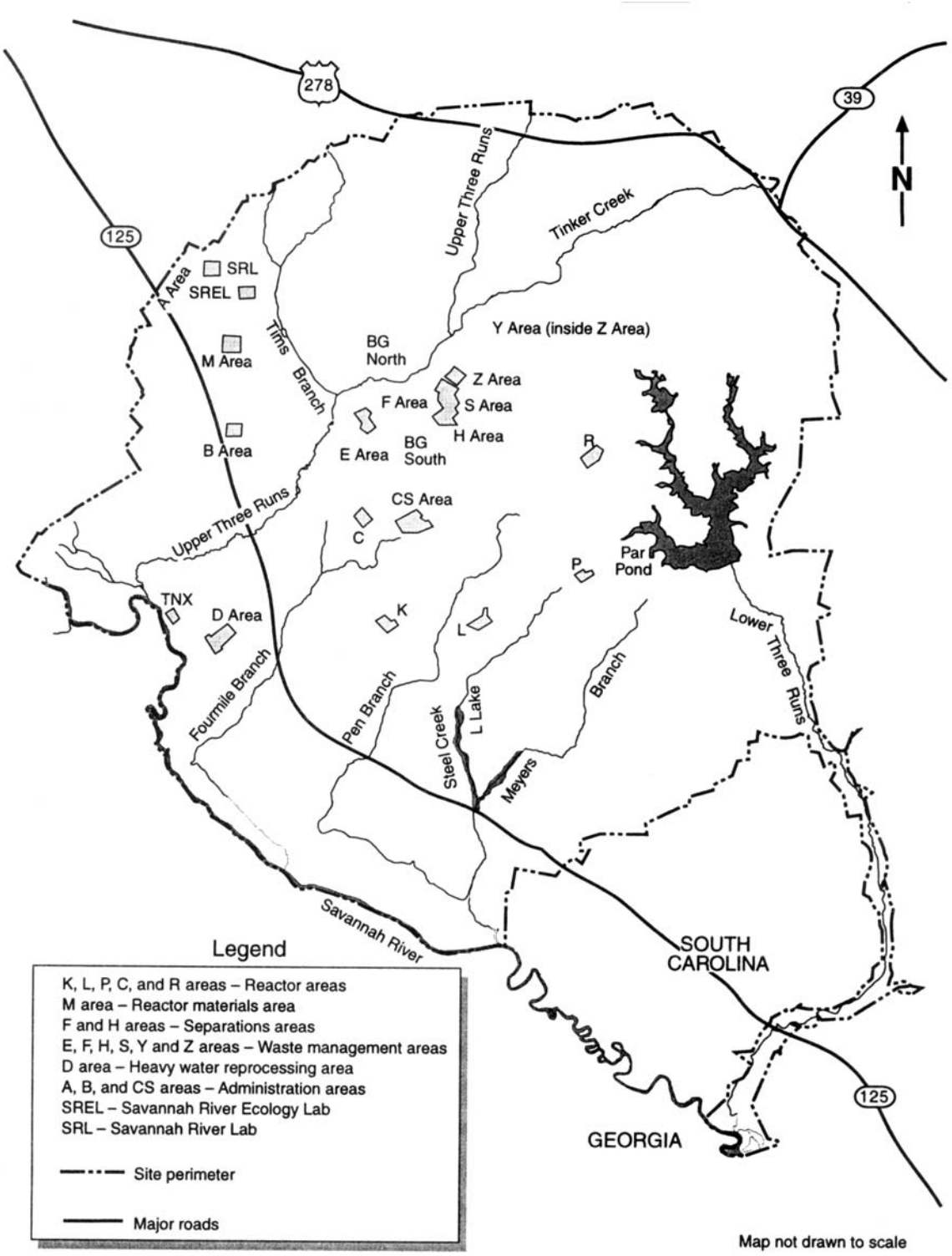
[36] *TRU Waste Management – Past, Present, and Future at Oak Ridge National Laboratory.*

- 1,407 m3 of CH-TRU/alpha low-level waste solids (includes some mixed waste) located in storage facilities and subsurface trenches (as of 11/00).

Privatization Risks

The Waste Treatment Facility was built under a "privatization initiative." The purpose was to minimize the cost and schedule by allowing the commercial sector to compete for projects that were typically within the scope of DOE. "Privatization" allows DOE to avoid a delay from "lack of sufficient funds" to cover the capital investment for the Waste Treatment Facility because the contractor would be required to front the capital investment and receive payment based on completed contract milestones. Under the terms of its contract, the contractor is also responsible for cleaning up the processing facility after its work is finished and restoring the site to its original condition.[37] Foster Wheeler will treat RH sludges and LLLW from the Melton Valley Storage Tanks. Bechtel Jacobs Company will retrieve solid TRU waste and deliver it to the Waste Treatment Facility for repackaging. Bechtel Jacobs is responsible for delivering TRU solid waste to the waste treatment facility at the rate specified in the Foster Wheeler proposal. However, if there are delays caused by unforeseen circumstances (e.g., Bechtel Jacobs has difficulty retrieving TRU solids, RH TRU cannot be shipped, the schedule will not be met, too much inventory), DOE may have to incur costs additional costs for O&M, security, and building storage facilities.

[37] http://www.oakridge.doe.gov/media_releases/1998/r-98-020.htm Foster Wheeler Selected to Treat Oak Ridge Transuranic Waste For Offsite Disposal (5/29/98).



From: DOE. *Final Waste Management Programmatic Environmental Impact Statement,* DOE/EIS-0200F, May 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Savannah River Site (SRS)
Performance Management Plan (PMP)

In August 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a Performance Management Plan (PMP) for the Savannah River Site (SRS), located in South Carolina. Included in the PMP are initiatives to accelerate cleanup of the site, including initiatives to increase the rate of shipments of transuranic (TRU) waste from SRS to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico.

The SRS PMP identifies fourteen initiatives, two of which directly involve TRU: expediting low level TRU Waste Shipments to the WIPP amd accelerating Management of High Activity TRU Waste. Other PMP initiatives include: expediting HLW processing, accelerating tank and landfill closure, managing, disposing and deactivating other nuclear materials, and accelerating groundwater cleanup programs.

The PMP states that by accelerating cleanup, DOE will save between $8 billion and $12 billion. The PMP states that by accelerating the low-activity TRU disposition by 21 years (from 2034 to 2013), life cycle costs will be reduced by $800 million. The PMP also states that by accelerating management and disposition of high-activity TRU wastes, it will reduce life cycle costs by $890 million. The PMP also describes these initiatives, as well as initial costs and potential barriers for achieving them.

The DOE also prepared a PMP for WIPP. The aim of this chapter is to see if the PMPs actually say the same thing, and to identify any significant differences between them. The study also identifies and analyzes critical assumptions in the PMPs to determine if the forecasts are manageable and realistic.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal law and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. At this time, SRS does not report any stored RH TRU waste, although there is a substantial quantity of high-activity TRU waste. In addition, WIPP officials expect that small amounts of RH TRU waste will be stored at SRS and shipped to WIPP in the future.

Savannah River Site

SRS is a 310-square mile site in western South Carolina, with the Savannah River running along its western border. The site is approximately 25 miles southeast of Augusta, Georgia and 20 miles south of Aiken, South Carolina.

The original mission at the Savannah River Plant (SRP) was for plutonium production. The mission was later enlarged to include production of tritium for hydrogen bombs, plutonium-238 for space applications, and other isotopes, such as californium-252. These production activities required five nuclear reactors that used heavy water—water enriched with deuterium—as their coolant and moderator, two aqueous separation facilities to separate the plutonium from the uranium targets, a solid/gas separation facility to separate the tritium from the lithium targets, a fabrication plant for the production of the targets, a production area for heavy water, and miscellaneous support facilities such as laboratories, power stations, shops, and a waste disposal area.[1]

At the end of the Cold War in 1989, the Savannah River Plant became the Savannah River Site (SRS) under a new contractor, Westinghouse Electric. In 2004, SRS had more than 13,000 employees and a budget of more than $1.3 billion.[2]

Waste handling became a larger part of the mission with the startup of the Defense Waste Processing Facility (DWPF) in 1992. The solid wastes have been disposed of or stored at a central point in the site that is more than five miles from any plant boundary. The "burial ground" is on a high point that has a clay soil that retards the migration of radionuclides (with the exception of tritium) to the groundwater and offsite areas. DOE plans that the burial ground used from 1953 to 1972 will be permanently sealed in 2003 under a Resource Conservation and Recovery Act (RCRA)-approved closure cap.

SRS has historically separated waste containing or suspected of containing transuranic radionuclides. While some of this waste has been buried and will be under the RCRA closure cap, substantial quantities have been stored in drums on pads for future retrieval. The pads are covered with giant tent-like enclosures to protect the drums from rain. Until recently, the quantity of waste containing transuranic nuclides was relatively low because the plutonium in the waste was recycled to meet production schedules. Most of the TRU waste at SRS contains plutonium-238, plutonium-239, neptunium-237, or americium-241.

Some TRU waste contains hazardous waste and must be managed in accordance with state and federal environmental regulatory requirements. The treatment, storage and disposal of sanitary, hazardous, mixed and mixed-TRU wastes (MTRU) are subject to regulation by Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) in accordance with the Resource Conservation and Recovery Act (RCRA). The site has regulatory commitments concerning treatment of legacy wastes, contained in the Site Treatment Plan, which was developed in response to a consent order.[3]

In the mid-1990s, SRS began a vent and purge program to insert filter vents on all of its un-vented stored drums. At the same time, programs began for sorting the post-1990 drums into

[1] A. Gibbs. *Fifty Years of Transuranic Waste at Savannah River Site (From production to cleanup)* WSRC-MS-2002-00902 Westinghouse Savannah River Company http://sti.srs.gov/fulltext/ms2002902/ms2002902.html

[2] http://www.srs.gov/general/news/newpub-rel/factsheets/srs.pdf

[3] SRS, *Site Treatment Plan*, March 2002, (pp. 4-29-30).

low-level and TRU waste, and retrieval of drums stored in earthen berms. Many of these drums of waste are now being analyzed and characterized for shipment to WIPP. Shipment to WIPP requires an Acceptable Knowledge (AK) document detailing how the waste was generated and then confirmation of the AK using sampling and analysis of waste containers. Savannah River's waste-certification analyses recently were taken over by the WIPP Carlsbad contractor and the work contracted out to accelerate the TRU waste shipments from SRS to WIPP. Speeding up the shipments allowed waste from the Mound Laboratory in Ohio to be brought to SRS for interim storage, which in turn was part of the plan to accelerate the closure date of the Mound site.

TRU WASTE INVENTORY

TRU waste at SRS is primarily either stored waste in a canyon, or is the result of analytical laboratory facilities at SRS. The SRS PMP reports that the site currently has approximately 4,896 m3 of low-activity TRU contaminated waste, composed of 24,000 drums of Pu-239 waste and low-activity Pu-238 waste and 480 polyethylene boxes. Additionally, the PMP reports that there are 5,400 cubic meters (m3) of high activity Pu-238/Pu-239 waste, including the large bulk equipment stored in black boxes, casks and other containers.[4]

The Site Treatment Plan states that there are 7,078 m3 of CH mixed TRU (MTRU) waste stored at SRS and 312 m3 projected destined for WIPP.[5] MTRU waste generated at SRS is primarily job control waste which includes combinations of plastic, paper, rubber, glassware, metal items, lead lined gloves, filters, used equipment and other contaminated materials from routine processing. Included is a small amount of ash from Rocky Flats.

The Site Treatment Plan also notes that these waste streams will be further characterized and the portion that is MTRU (>100 nCi/g) will be sent to WIPP. Estimates indicate that the some of these wastes will fall into the mixed low-level waste category. The remaining mixed low-level component may be used to blend high activity MTRU waste down to meet the transportation and packaging limits for transportation to WIPP for disposal.[6]

The 2004 update to the Site Treatment Plan includes 4,767.2 m3 of CH waste remaining at SRS as of September 30, 2004.[7] Only 17 m3 of that waste is shown as coming from Mound. By that date, SRS had shipped 5,728 m3 to WIPP.

Because there were no field measurement instruments capable of determining low concentrations of transuranic radionuclides in the early history of SRS, all waste originating in operations areas containing transuranic nuclides was stored. SRS has found that many of the containers do not meet the definition of TRU waste because they have concentrations of less than 100 nanocuries per gram. These containers could possibly be disposed of as low-level waste or TRU waste, depending on further characterization.

While some TRU may be reclassified as low-level waste, there is a considerable amount of sludge currently classified as low level waste that could be reclassified as TRU waste not accounted for in the PMP. A recent report states that:

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[4] SRS PMP, pp. 4-31 and 4-34.

[5] SRS, *Site Treatment Plan*, March 2002, Table 11.1. Although non-mixed TRU is excluded from the Site Treatment Plan, it is not clear whether MTRU waste is included in the total reported in the PMP.

[6] *Site Treatment Plan*, Chapter 4. Mixed TRU (MTRU) Waste Streams.

[7] http://sti.srs.gov/fulltext/tr94608r12/tr94608r12.pdf Page 11-12.

"Most of the waste contaminated with sludge from the H-Area Tank Farm will be categorized as low-level waste (LLW) and disposed of in the E-area Vaults (EAV). The waste does, however, have the potential to be categorized as U.S. Department of Energy-defined transuranic waste (TRU) and/or mixed waste."[8]

Table 1 provides TRU inventories from various sources, including the WIPP PMP, the SRS PMP, the Site Treatment Plan, press releases, fact sheets and Environmental Impact Statements.

Table 1: SRS TRU Waste Inventory
(Amounts in cubic meters – m3)

Source	Stored CH	Projected CH	Total CH	Stored RH	Projected RH	Total RH
WIPP PMP for SRS(1)	10,670		10,670			
SRS PMP(2)	10,296	300	10,596			
Press Release(3)			11,000			
Supp. Analysis(4)			12,000			
Technology Needs Assessment(5)			15,985			
Fact Sheet, July 2003(6)			11,232			
Site Treatment Plan(7)						
Mixed TRU	7,078	312	7,390			
2004 update(8)	4,767		4,767			
WIPP RCA(9)	13,200	2,400	15,600		23	23

(1) WIPP PMP, p. 33 & Figure 5.0.2. Also see p. 25 re: 3,500 drums of waste from Mound. That waste would add 728 m3 to the inventory.
(2) SRS PMP, p. 4-31 - 4-36. 5,400 m3 of this waste is high activity waste. The system intended to repackage much of this waste stream is a remotely operated system. However, it is not clear that any of this waste will be designated as RH. Total includes 300 m3 of TRU waste sent from the Mound site to SRS by September 2003.
(3) See http://www.srs.gov/general/news/newpub-rel/releases/TRUwaste100.pdf, Press Release, 4/14/03.
(4) http://web.em.doe.gov/trurod/trusupplement.html Supplement Analysis For Transportation Of Transuranic Waste From The Mound Plant To Savannah River Site For Storage, Characterization, and Repackaging (DOE/EIS-0200-SA02), Section 2.
(5) http://www.srs.gov/general/scitech/stcg/Needs/00-1001.htm, Technology Needs Assessment, October 2000, 30-year forecast.
(6) http://www.srs.gov/general/news/newpub-rel/factsheets/wipp.pdf, July 2003. Extrapolated from statement that 27,000 55-gallon drums contain of the TRU waste. Each drum converted to 0.208 m3. Therefore, 0.208 x 27,000 = 5,616 x 2 = 11,232 m3.
(7) SRS, Site Treatment Plan, March 2002, Section 7.1.2.2 MTRU Waste Stored Inventory, See Table 1.1.1. Does not include non-mixed TRU.
(8) http://sti.srs.gov/fulltext/tr94608r12/tr94608r12.pdf SRS, Site Treatment Plan, 2004 Annual Update, November 2004, page 11-12.
(9) WIPP Recertification Application, DOE/WIPP 2004-3231, Tables 4-1 and 4-2.

Analysis and Conclusion

The quantities of TRU waste range from low estimates in both the WIPP and SRS PMPs of about 10,600 cubic meters (m3) to almost 16,000 m3. This higher estimate is based on a

[8] Characterization of Radionuclides in H-Modified and PUREX Sludges from H-Area High Level Waste Tanks (U), Revised By R. F. O'Bryant and W. R. Weiss March 2003 WSRC-TR-2000-00249 Revision 2. See page 11.

Technology Needs Assessment, which in turn cites a 2000 Environmental Impact Statement.[9] However, most of the estimates are on the low end, near the PMP estimates.

The information concerning MTRU and some of the H-Area wastes being reclassified as TRU imparts a great deal of uncertainty into these estimates.

TRU WASTE SHIPMENTS

In order to ship TRU waste to WIPP, SRS must meet the WIPP Waste Acceptance Criteria and comply with the Resource Conservation and Recovery Act (RCRA) permit issued by New Mexico Environmental Department (NMED). Characterization of the TRU waste includes:

- Drums are assayed to determine the amount of radioactivity in the drum. This examination does not require the drum to be opened.
- Drums are X-rayed to verify that the physical contents meet WIPP waste acceptance criteria.
- A sample of the TRU drums are opened, emptied and visually inspected to verify the accuracy of x-ray results.
- Drums determined to have prohibited items are opened and the waste repackaged, without the prohibited items, prior to shipment.
- Drums undergo headspace gas sampling to detect hydrogen, methane and other volatile organic compounds.

Mobile characterization systems have been transferred to SRS, making it possible to perform necessary characterization activities. Since the majority of SRS drums were packaged prior to issuance of WIPP acceptance criteria, it is estimated that as many as 30% of SRS drums will require repackaging to remove prohibited items. Approximately half of the waste is stored in 27,000 55-gallon drums. The remaining waste is stored in non-compliant containers that will require repackaging prior to shipment.[10]

Low-Activity TRU Waste Initiative

For the low activity TRU waste initiative, the PMP plans to ship an average of 4,000 equivalent drums to WIPP per year, about 95 shipments per year, assuming 42 drums per shipment.[11] The PMP states that it "will also be necessary to enhance the payload capability of the existing TRUPACT-II units to permit the shipment of higher gram quantities of TRU waste to WIPP." However, no figure is provided for the increase in payload. Therefore, shipments are based on the older assumption of 14 drums per TRUPACT-II, three TRUPACT-II containers per shipment.[12]

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[9] Not located, perhaps because the SRS web site was out of service for some time.

[10] http://www.srs.gov/general/news/newpub-rel/factsheets/wipp.pdf

[11] SRS PMP, p. 4-32, 24,000 drums and 480 poly boxes are shipped between 2003 and the end of 2009.

[12] http://sti.srs.gov/fulltext/ms2001608/ms2001608.html E. K. Opperman, M. D. Bowers, and M. R. Hughes. *Transportation Packages to Support Savannah River Site Missions.* WSRC-MS-2001-00608. The transportation package for TRU (model TRUPACT-II) is a NRC certified Type B package with a payload capacity of 3,300 kg (14-55 gallon drums). One legal weight truck has the capacity to carry three fully loaded TRUPACT-II packages.

High-Activity TRU Waste Initiative

The site currently has approximately 5,400 m3 of high activity TRU drums and bulk containers. The plan intends to ship this approximately 80% of the inventory of TRU waste to WIPP in the new TRUPACT-III transporter via either rail or truck, with the remaining 20% undergoing significant repackaging or treatment.

Table 2 identifies the CH- and RH waste shipping schedule, based on the WIPP and SRS PMPs, and other sources.

Table 2: SRS TRU Shipping Schedule

CH WASTE	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	TOTAL
WIPP PMP(1)	144	144	144	144	148	147	147	147	66	4	5	1240
SRS PMP(2) Low-Activity	95	95	95	95	95	95	95					665
SRS PMP(3) High-Activity						25	25	25	25	25	25	150
						7 - 63	7 - 63	7 - 63	7 - 63	7 - 63	7 – 63	42-378
Total SRS PMP	95	95	95	95	95	127 - 183	127 - 183	32 - 88	32 - 88	32 - 88	32 – 88	857-1193
Press Release(4)	216	288	288	288								
Budget Request(5)	114	114	114									
Actual(6)	**185**	**239**										**447**
OTHER SITES TO SRS												
BAPL	0	0	3									
KAPL-NFS	0	0	29									
SPRU	?	?	?									
MOUND												
SRS PMP												
WIPP PMP(7)	0	0	0	0	0	0	0	0	0	0	0	0
SRS PMP	0	0	0	0	0	0	0	0	0	0	0	0
RH SHIPMENTS TO SRS(8)												
BAPL	0	0	3									
KAPL	0	0	4									
SRS PMP(3)												

(1) WIPP PMP, Table 5.0-1
(2) Based on assumption that WIPP will be able to increase acceptance rate to 34 shipments per day, SRS PMP, p. 4-31. It also assumes that it will have to enhance the payload of each TRUPACT-II container. Currently, it is assumed that the payload for each TRUPACT-II is 14 drums.
(3) 80% of HA TRU will be shipped in TRUPACT-III, 20% in TRUPACT-II. TRUPACT-III containers assumed available in 2008. Each rail shipment using TRUPACT-III containers equivalent to 9 containers - three TRUPACT-III per railcar, 3 railcars per shipment. A truck would carry only one TRUPACT-III. Therefore, if rail is not available, shipments of HA TRU would increase nine fold. High Activity TRU is never designated as RH in the SRS PMP.
(4) http://www.srs.gov/general/news/newpub-rel/releases/tru200.pdf September 22, 2003.
(5) DOE Budget Request to Congress – FY2004 and FY2005.
(6) The total includes 7 shipments in FY2001 and 16 shipments in FY2002.
(7) WIPP, PMP, Table B-1.
(8) WIPP PMP, Table 5.0-2.

Analysis

The discrepancy in the number of shipments between the WIPP PMP and the SRS PMP may be due to assumptions used for one shipment. Both PMPs assume that CH TRU Waste will be transported to WIPP in the Transuranic Packaging Transporter (TRUPACT-II), a reusable shipping package or cask. The SRS PMP assumes 42 drums per shipment. The WIPP PMP assumes 35 drums per shipment.[13] If the WIPP PMP had assumed a larger load, shipments would have decreased to approximately 120 shipments per year. However, as is evident in **Table 2**, the actual shipping rate appears to be higher than was expected in either PMP. As of April 2003, SRS was shipping at a rate of 16 shipments per month.[14] As of September 2003, this rate had increased to 24 shipments per month. In this latter Press Release, SRS states that it can sustain that rate and ship all stored TRU waste by 2006. At this rate, the site expects to finish shipping the remaining 10,000 cubic meters of currently stored waste by 2006.[15] The acceleration of the shipping is due in part to the availability of additional specially designed transport trucks to accommodate the shipments and the additional mobile characterization systems. SRS has also made several changes to its processes, including going to an around-the-clock schedule, and building a new, enhanced loading bay.[16] As shown in Table 2, the shipment rate throughout fiscal year 2004 did not sustain the 24 shipments per month rate, although it did exceed the rates included in both the WIPP and SRS PMPs.

Moreover, the goal of shipping stored waste by 2006 does not appear to be plausible given the TRU waste at SRS. Almost half of the TRU waste is stored in boxes of various sizes. Most this waste is high activity TRU waste. It was expected that TRUPACT-III containers would be required to transport this waste. These are not expected to be certified and delivered until 2007 at the earliest.[17] It is possible that the 2006 date was for low activity TRU waste. If this hypothesis is correct, then an inventory of approximately 15,000 m3 is more likely.

The high-level TRU waste initiative is based on an assumption that multiple project activities begin in 2003, with the high activity processing facility operational in 2009. It requires early funding and a revised modular approach for the facilities to process and/or treat the high-activity Pu-238/Pu-239 waste and bulk containers. This initiative would make possible use of an existing Remotely Operated Size Reduction System (ROSRS) for processing large bulk equipment or other new technology for organic destruction. The ROSRS is being obtained from Rocky Flats. This, combined with the anticipated operation of a rail transport program and new TRUPACT-III transporter, will allow SRS to complete shipment of high-activity TRU by 2013.[18] Again,

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[13] WIPP PMP p. 12, assumes that shipments will consist of: 35 drums per shipment in three TRUPACT-II by truck or 7.4 cubic meters per shipment; 1 TRUPACT-III per shipment by truck or 11.4 cubic meters per shipment; 3 TRUPACT-IIIs per railcar and 3 railcars per shipment or 102.6 cubic meters, TRUPACT-III shipments will begin in FY07. WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf

[14] Press Release, SRS, April 14, 2003.

[15] http://www.srs.gov/general/news/newpub-rel/releases/tru200.pdf Westinghouse Savannah River Company signed a new contract with the Department of Energy in 2003 for the continued management of SRS, it also agreed to goals that will accelerate cleanup of the site by 2006.

[16] Ibid.

[17] The SRS CAB recommended in May 2003 that DOE accelerate shipments of high activity TRU waste from SRS by expediting the design, certification and fabrication of the TRUPACT-III shipping containers. These containers must be designed to alleviate hydrogen gas concerns from high activity TRU. The CAB was hopeful that these shipping containers would be available to allow the first shipment of high activity TRU waste in 2005. However, the WIPP PMP assumes that TRUPACT-III shipments will begin in 2007.

[18] SRS PMP, p. 4-34.

however, with these prerequisites to begin shipment of high activity TRU in 2009, it does not appear plausible that all shipments could be completed by 2013. In fact, there is some uncertainty whether the TRUPACT-III containers will be certified in a timely manner. There is also concern that high activity waste will generate hydrogen, and there is a new project to design a container that will mitigate the effects of hydrogen.

The SRS PMP identifies some prerequisites for success of the low activity TRU waste initiative. By September 2004, SRS was to have begun operation of the following new facilities:[19]

- Enhanced characterization equipment at SRS by National TRU program, including Pu-238 assay capability.
- Provision of culvert-opening capability.
- Enhanced TRUPACT-II payload capabilities.
- Capital investment in SRS to augment existing TRU processing facilities and provide new drum repackaging and drum sort/segregate capability based on Los Alamos National Laboratory (LANL) glovebox system.

It was assumed that sufficient TRUPACT-II containers were available in 2003, after Idaho meets an initial shipment milestone to support the accelerated schedule. Mobile characterization systems were transferred to SRS, making it possible to perform the necessary tests on the accelerated number of drums.[20] The record indicates that for the low activity TRU waste, most of these goals have been met, as shipments far exceeded original estimates in the PMP.

The SRS PMP also identifies prerequisites for success of the high activity TRU initiative. These include:

- Venting the high-activity TRU waste drums beginning in the summer of 2003.
- Capital investment at SRS to provide modular high-activity TRU waste processing capability.
- The existing ROSRS can be used without major re-engineering.
- Availability of TRUPACT-III containers.

COST SAVINGS

The SRS PMP estimates that it will save $8 - $12 billion on accelerated cleanup. Of that amount, $1.7 billion is attributable to accelerating disposition of TRU wastes. It is difficult to determine how these estimates were derived. The baseline amounts were not available. Nevertheless, as a general proposition, it is difficult to understand that such large cost savings could be realized by speeding up the transference of TRU waste from one location to another. The PMP estimates shipping the TRU waste 20 years sooner than previously planned.[21] If this were to be achieved, cost savings would focus on avoided costs of storing the TRU waste. Currently, TRU waste is stored on concrete pads, or in the case of high activity TRU, is placed in covered concrete culverts on the pads. Disregarding any assumptions about discount rates, it is hard to believe that

[19] SRS PMP, p. 4-31.
[20] Press Release, SRS, April 14, 2003.
[21] The original plans called for shipping all of SRS's TRU waste to WIPP by the year 2034; the PMP calls for shipping all TRU to WIPP by 2014.

current storage costs at SRS associated with TRU are $85 million per year.[22] There are some operational costs associated with storage and maintenance, but many of these costs would not be avoided because SRS is expected to produce, store and treat nuclear materials in the future. In other words, there would be continued operations at the facility involving nuclear materials that must be safeguarded. DOE asserts that the PMP would eliminate essentially all of EM health, safety, environmental and security risks in half the time. But it apparently does not consider the costs of the activities that the landlord National Nuclear Security Agency (NNSA) would bear.

By March 10, 2004, even while claiming that the shipments of CH-TRU were 12 years ahead of the original schedule, the claimed cost savings for accelerating shipments by 20 years had been reduced to $700 million.[23] Once again, no baseline amounts were provided, nor was the basis for the cost reduction benefits explained.

In addition, any cost savings will come at a great price. For Fiscal Year 2003, activities associated with the PMP required $248 million. For later years there was no estimate. For the TRU acceleration, an extra $9 million was requested for FY2003. However, no money was requested for the high activity TRU waste initiative.

Competition for Decreasing Budget

The SRS PMP identifies fourteen initiatives, two of which directly involve TRU: expedited low-activity TRU waste shipments to WIPP and expedited management and shipments of high-activity TRU waste to WIPP. These will compete with 12 other initiatives, including: accelerate high level waste processing; accelerate tank and facility closure; accelerate Nuclear Material Facilities Consolidation and Deactivation; Accelerated SNF Disposition; optimize disposition of complex-wide plutonium bearing materials; finding a cost-effective alternative to incineration of PUREX waste; accelerate closure of the radioactive waste burial ground; and reduce contaminants in surface and groundwater. All of the other initiatives will compete against one another as DOE's EM budget shrinks, which is the administration's plan. **Table 3** provides the estimated savings of each initiative as well as the investment requested.

TRU Waste Initiative Investments

In order to meet the TRU initiatives, certain investments in plant infrastructure are required. Dates and responsibility for meeting these goals are provided, where available.[24] These improvements include:

Low Activity TRU

- Modify and augment current manual TRU processing equipment to allow greater throughput by 9/30/03.
- Provide fully operational and certified enhanced repackaging capability for TRU waste, based on LANL glovebox system by 6/30/04.
- Enhance existing characterization capability for low activity TRU, including Pu238 capability, by 7/1/04.

[22] $1,700 million savings divided by 20 years. Also, significant changes in baseline pricing assumptions outside of SRS control, such as escalation rate, cost of subcontract services, Westinghouse Savannah River Company (WSRC) pension contributions, etc., would result in project funding being inadequate.
[23] http://www.srs.gov/general/news/newpub-rel/releases/10ktrudrums.pdf
[24] See SRS PMP, Responsibility Assignment Matrix (RAM), Chapter 9.

- Obtain regulatory approval of increase to Pu limit for TRUPACT-II container by 9/30/07.
- Provide TRUPACT-II shipping containers to support accelerated shipments from SRS to WIPP.
- Facility upgrades to SRS facilities to provide aerosol can puncturing, liquid stabilization, handling and transport equipment, and a loading system for transport.

Table 3: Investments and Estimated Savings[25]

Waste Initiative	FY03 Request ($ Millions)*	Estimated Savings ($ Billions)
Expedited HLW Processing	103	5.4 - 6.4
Expedited Tank Closure	0	0.7
Nuclear Materials Consolidation and Deactivation	9	0.5
Enhanced Spent Nuclear Fuel Disposal**	15	1.0
Optimize Complex-Wide Pu Bearing Materials	34	No Estimate
Expedite Low Activity TRU Waste Shipments	8	0.8
Expedite High Activity TRU Waste Shipments	0	0.9
Alternative to Incineration of Plutonium Recovery and Extractions (PUREX) Waste	1	0.1
Closure of Radioactive Waste Burial Ground	4	0.2
Accelerate Contaminant Reduction in Fourmile Branch Stream	15	No estimate
Innovative Technologies and Improved Regulatory Processes	22	No estimate
Accelerate Decommissioning of Facilities	5	0.9
Improve Site Security Infrastructure	31	No estimate
Centralize Alarm System***	1	0.1
* Funding requests for FY04 – FY08 to be determined		
** Deferral of costs		
***Complex Wide savings		

<u>High Activity TRU Waste</u>

- Design and construct modular high-activity TRU waste processing facility, including re-build ROSRS facility by 9/30/04, deliver production-ready Handling and Segregating System for 55 gallon drums technology by 1/30/06, approve line item for high activity TRU facility by 12/30/04, and complete construction of high activity TRU facility by 9/30/08 (permitted by 9/30/05). Capital investment, including expedited line item approval to support initiation in

[25] SRS PMP, Chapter 4.

2004 is required. Success in meeting these goals relies on the assumption that the existing ROSRS can be utilized without major re-engineering.

- Provide facilities for box characterization by 9/30/07.
- Begin characterization of high-activity TRU waste and begin operation of new high-activity TRU waste processing facility (including ROSRS) by 10/1/08.
- Provide TRUPACT-II shipping containers to support accelerated shipments from SRS to WIPP by 10/1/08.
- Complete certification and delivery of TRUPACT-III containers by 9/30/07. Success depends on the assumption that TRUPACT-III containers are available.

It is difficult to make an assessment of progress on these investments, although some acceleration of CH-TRU shipments has been achieved. Some critical dates for the high activity waste initiatives are too far into the future. No funds were requested for this activity, although it represents over 50% of the TRU waste at SRS. The 2002 Site Treatment Plan states that the High-Activity MTRU Waste Facility is in the pre-conceptual phase of development and is "unfunded".

REGULATORY COMPLIANCE ISSUES

Mixed TRU (MTRU) Wastes

For each facility at which the United States (U.S.) Department of Energy (DOE) generates or stores mixed wastes, the Resource Conservation and Recovery Act (RCRA), as added by Section 105(a) of the Federal Facility Compliance Act (FFCA), requires DOE to devise a plan for developing treatment capacities and technologies for mixed waste. Some TRU waste at the Savannah River Site also contains hazardous constituents and is managed in accordance with both DOE Orders and S.C. Hazardous Waste Management Regulations. It is referred to as Mixed-TRU (MTRU) waste. Upon submission of a plan to the South Carolina Department of Health and Environmental Control (SCDHEC), FFCA requires SCDHEC to approve, approve with modification, or disapprove the plan within six months. The agency is to consult with U.S. Environmental Protection Agency (EPA), and issue an order requiring compliance with the approved plan. By 2001, SCDHEC had approved a plan for storage of the MTRU.[26] Two waste treatment processes are planned which must be permitted by the SCDHEC. It is too early to tell whether any they will face regulatory hurdles.

Category III Facility

The first is a hazard category III facility that will sort and segregate TRU waste using the Handling and Segregating System for 55-gallon drums (HANDSS-55) Technology. It will repackage waste, sample waste, and reduce (size) some waste to meet transportation limits for shipment to WIPP for disposal. For this facility, SCDHEC requires that SRS submit applicable permit application(s) for a Class III Facility by September 30, 2001 for the storage, treatment,

[26] http://sti.srs.gov/fulltext/tr94608r10/tr94608r10.pdf Savannah River Site Approved WSRC-TR-94-0608, Rev. 10, *Site Treatment Plan*, 2002 Annual Update March 2002 Volume I. Non-mixed TRU waste streams were assigned waste stream numbers SR-W074 through SR-W076. These waste streams are not included in list of waste streams in the report. (p. 1-1).

and disposal of RCRA hazardous waste. Within 12 months, SRS must initiate construction. Within 36 months, SRS must commence operations (i.e., September 30, 2004). In 2003, SRS abandoned the HANDSS-55 technology because it would not be available on schedule.[27]

Category II Facility

The second waste treatment process is a hazard category II line item facility that will treat solids, liquids, sludges, and soil wastes contaminated with alpha-emitting transuranic radionuclides for disposal. This includes, at a minimum, repackaging, sorting, size reduction, and disposal at WIPP using the current NRC-licensed type B TRUPACT-II shipping container. This process uses equipment that has been demonstrated on similar activities or the technology development is in progress to support the facility's equipment needs. For this facility, SCDHEC requires that SRS submit applicable permit application(s) for a Class II Facility by September 30, 2008 for the storage, treatment, and disposal of RCRA hazardous waste. Within 3 months, SRS must initiate construction. Within 45 months, SRS must commence operations.

MTRU Waste Certification/Characterization

MTRU waste containers require extensive characterization and certification in order to meet the WIPP waste acceptance criteria. The WIPP certification program requires characterization of the waste matrix through radionuclide assay, radiography, and headspace gas sampling for all waste containers. In addition, a representative number of containers must be opened for visual examination to confirm the characterization information. SRS has designated a portion of TRU pad 6 for the visual examination (VE) facility, which includes MTRU and MW sorting activities. The VE facility began operations in 2000, and is used to confirm the physical characteristics of the radiography results, and to sort and repackage mixed and non-mixed TRU wastes.

SRS began using a Mobile Vendor to augment current inspection/characterization capability in 2001. The Mobile Vendor provides this additional characterization and shipping capability through the use of mobile systems. Planned or proposed facilities to sort, characterize and repackage TRU and MTRU to meet WIPP Waste Acceptance Criteria (WAC) require additional regulatory development, procedures, and training.[28]

Prohibited Items

Drums determined to have prohibited items are opened and the waste repackaged, without the prohibited items, prior to shipment. Since the majority of SRS drums were packaged prior to issuance of WIPP acceptance criteria, as many as 30% of SRS drums will require repackaging to remove prohibited items. The WIPP permit issued by the State of New Mexico defines what constitutes prohibited items. If a "prohibited item" is found during x-raying, it has to be removed. SRS does not have the facilities to do this expeditiously and cannot accommodate certain types of material. SRS doesn't have the facilities necessary to open large containers and must store them until these facilities are available.

Shipping Containers

The PMP relies on successful negotiations with WIPP, the Nuclear Regulatory Commission (NRC), and other environmental agencies to revise the restrictive transportation limits of the TRUPACT-II, as has been done for shipments from Los Alamos. That is, the PMP assumes that

[27] http://www.srs.gov/general/outreach/srs-cab/mtgsums/2003/wm/030403wm.htm.
[28] *Site Treatment Plan*, Section 9.3.1 and 9.3.2.

more plutonium can be shipped in one TRUPACT-II than currently allowed. Efforts to maximize the TRUPACT-II payload are currently focusing on methods to minimize the buildup of hydrogen gas generated by radiolytic decomposition of organic materials and chemical reactions within the container.[29]

The site also has 108 large boxes, inside of which are plywood boxes and some remote manipulator sleeves. SRS does not want to open these boxes, remove the items, and repack them in another shipping container. These bulk containers cannot be shipped in a TRUPACT-II. A "TRUPACT-III, " currently being developed, would enable SRS to ship these big boxes. If SRS can get relief on opening these boxes to verify the x-ray, then SRS can put these big boxes in a TRUPACT-III for shipping. The shipping schedule is dependent on this development. The TRUPACT-III container must obtain regulatory approval, basically to meet the NRC criteria for shipping containers. DOE also considered using the "ArrowPak" shipping container for high activity drums to mitigate the hydrogen concerns. But the container seems to have been abandoned by DOE. The SRS CAB recommended that by November 19, 2003, DOE-Headquarters, working with DOE-SR and DOE-Carlsbad, develop a path forward to eliminate non-compliant items and or reduce the number of drums that are opened, sorted and segregated because of non-compliant items. The Board also requested that DOE ensure this path forward also significantly reduces or eliminates the need to remove the non-compliant items in the large containers of TRU waste. [30]

Transportation

A shipment schedule is supposed to be provided to states each year, with a mid-year update. In addition, Georgia and South Carolina state transportation agents perform an extensive vehicle and container inspection before each shipment leaves SRS to confirm the vehicle's safety. Other states along the transportation route perform similar inspections at their respective state borders. The Transportation Tracking and Communications System uses communications and satellite equipment to track each truck along its route. State emergency response and law enforcement officials can use the system to track shipments through their jurisdictions. The system also makes the appropriate notifications prior to a shipment crossing a state's border.

OTHER RELEVANT ISSUES

Storage

There are 19 TRU waste storage pads located at the burial ground. Storage containers on the pads consist mainly of 55-gallon (0.2 m3) carbon steel and galvanized steel drums. Other containers include concrete culverts that contain either 55-gallon drums or small boxes, large carbon steel boxes, steel and concrete casks, and numerous steel boxes of various sizes. Each of the 19 TRU pads is sloped to the center and to one end. This directs any liquid to a drain that is connected to a sump. The liquid in each sump is sampled, analyzed, and, if there is any

[29] http://sti.srs.gov/fulltext/ms2001608/ms2001608.html *Transportation Packages to Support Savannah River Site Missions*.

[30] SRS Citizens Advisory Board Meeting Minutes May 19-20, 2003 http://www.srs.gov/general/outreach/srs-cab/mtgsums/2003/fullboard/051903ful.htm

radioactive contamination, removed by pumping, and managed accordingly.[31] There are about 9 TRU pads with weather enclosures.

In some parts of SRS, fourteen drums are stacked two-high in groups of seven inside a concrete cylinder (i.e., a culvert). The culverts were designed to prevent water entry and to maintain a dry environment. The closed culverts are placed around the facility either on concrete pads or on a crush and run gravel bedding, and are exposed to the weather. One of the problems is the possibility of corrosion of the drums. Corrosion was not detected in the drums, and SRS estimates that long term storage of the TRU drums for 25-50 years is feasible. [32]

However, the Site Treatment Plan noted that in March 1989, SRS discovered that rainwater had infiltrated through the filter vents into some of the drums stored on concrete pads. SRS has completed dewatering of these TRU drums. On July 31, 1998, SCDHEC was notified by letter of rainwater in leakage that was discovered in 15 boxes on the TRU storage pads. These boxes have also been dewatered. [33]

Preparing TRU Waste for Shipment

A large portion of the SRS TRU waste inventory contains high activity transuranic isotopes (Pu-238 and Pu-239). The radiolysis of organic material in this waste results in hydrogen gas generation levels that exceed the limits placed upon the existing approved transportation system (TRUPACT-II) for shipment to WIPP. [34] A crucial step in preparing the waste for shipment is to vent and purge the drums to remove hydrogen and other gases that may have built up in the drums during storage. In the vent-and-purge process, a venting system that punctures the drum lid without producing a spark. The machine samples and analyzes the drum's headspace gases. The initial project to vent the 11,260 TRU waste storage containers that had been stored on pads (including 8,800 buried TRU drums that were had been stored in the late 1970s and early 1980s on storage pads and covered with soil for protection from the environment) was completed in 1999. These containers hold lower-activity TRU waste. Venting of the higher-activity TRU waste drums, which are stored in concrete culverts, has begun. During 2004, various incidents occurred that resulted in a letter being sent to DOE Headquarters by the Defense Nuclear Facilities Safety Board regarding ongoing safety problems including the possibility of explosive mixtures of gas in unvented drums.[35] The problems also resulted in a suspension of shipments to WIPP while changes were made to the process during the first months of 2005.

Packaging TRU Waste for Shipment

Approximately half of the waste is stored in 27,000 55-gallon drums. The remaining waste is stored in non-compliant containers that will require repackaging prior to shipment. Facilities and process for repackaging and characterizing non-drummed wastes are being developed. The alternatives to transporting the existing waste containers include re-packaging or treating the waste in order to use the existing TRUPACT-II. This would require opening, sorting, segregating, possibly treating, and repackaging in waste containers. The waste may then require complete re-characterization because the waste has been repackaged in a different configuration.

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[31] *Site Treatment Plan*, Chapter 7.

[32] Charles F. Jenkins. *Evaluation of Corrosion of TRU Drums During Temporary Culvert Storage in E-Area.* WSRC-TR-2002-00033 http://sti.srs.gov/fulltext/tr2002033/tr2002033.html

[33] *Site Treatment Plan*, p. 7-8

[34] http://www.srs.gov/general/scitech/stcg/Needs/00-1001.htm, Technology Needs Assessment, October, 2000.

[35] http://www.dnfsb.gov/pub_docs/srs/cor_20041214_02_sr.pdf

The net result is additional worker exposure to both radiological and hazardous contents. Additionally, as required for waste characterization, laboratory personnel must analyze contaminated waste samples. Without expanded transportation system capability, SRS greatly increases health and safety risks.

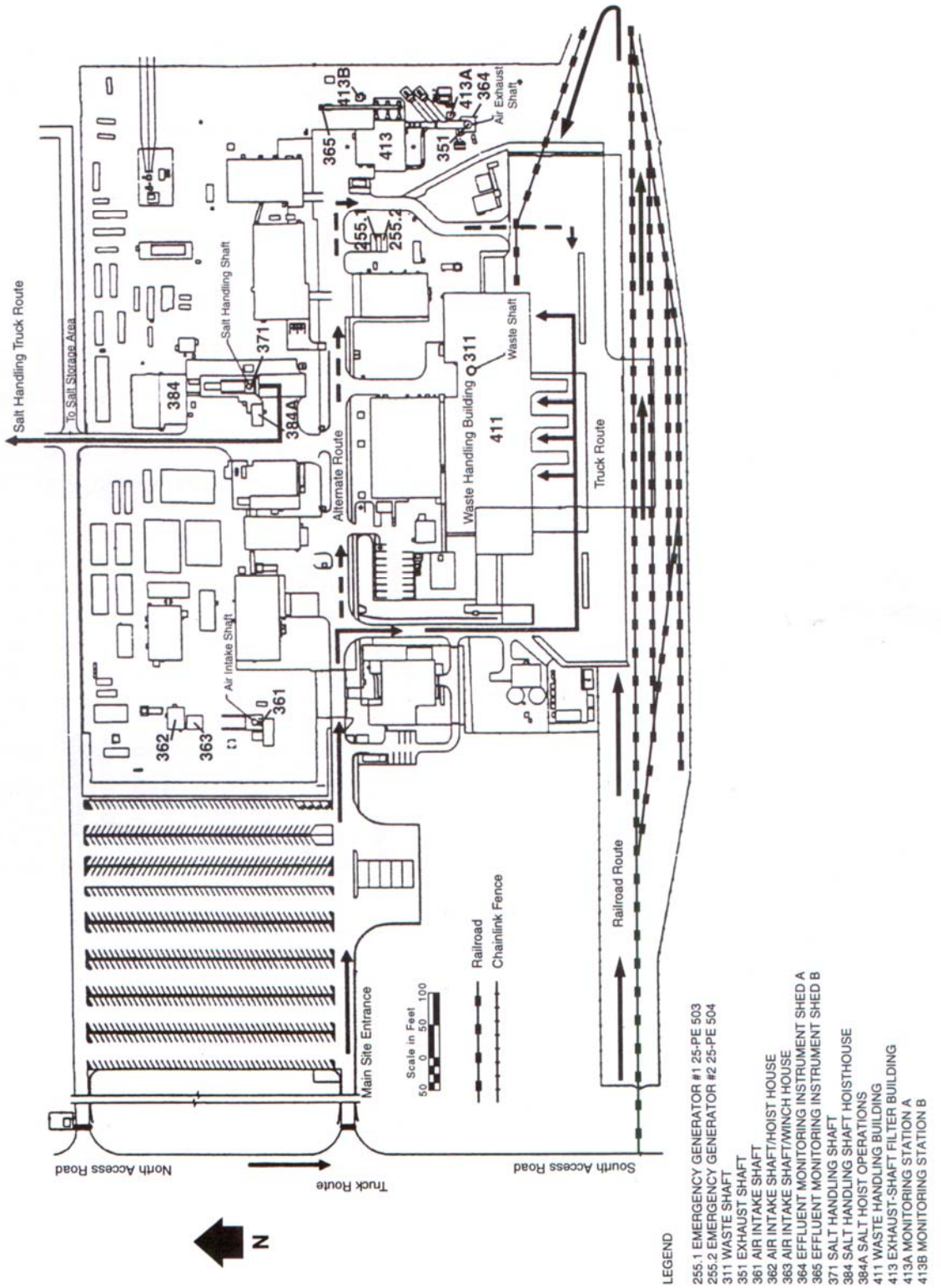
TRU Waste from Mound [36]

An agreement with the Mound Site (a DOE site near Miamisburg, Ohio, that is undergoing cleanup and closure) makes use of SRS' TRU waste handling capabilities to expedite Mound's closure. Before Mound could be closed, approximately 300 cubic meters of CH TRU waste had to be removed. Preparing this waste for WIPP, however, requires waste handling facilities and time. SRS received the final shipment by September 2003. Most of the Mound Plant TRU waste (such as pipes and waste boxes), was too large to ship in TRUPACT-II containers, and the Mound Plant does not possess the necessary facilities or equipment to reduce the size of its TRU waste. DOE needs to ship its TRU waste from the Mound Plant to another site for repackaging into TRUPACT-II containers. DOE shipped the most of the TRU waste from Mound by OHOX railcars (formerly referred to as ATMX railcars). At SRS, the TRU waste is stored, characterized, and then is to be repackaged for shipment to WIPP for disposal.

TRU Waste from other sites

The WIPP PMP identifies SRS as a potential site for the "Eastern Hub" to which CH TRU waste would be shipped from Bettis Atomic Power Laboratory (BAPL) in Pennsylvania, Nuclear Fuel Services in Tennessee, and the Separations Process Research Unit in New York, and RH TRU waste would be shipped from BAPL and Knolls Atomic Power Laboratory in New York. The other potential "Eastern Hub" is the Oak Ridge Reservation in Tennessee. Shipment of some or all of such wastes to SRS will increase the amount of waste stored, and the waste characterization requirements.

[36] http://web.em.doe.gov/trurod/trusupplement.html DOE. *Supplement Analysis For Transportation Of Transuranic Waste From The Mound Plant To Savannah River Site For Storage, Characterization, and Repackaging.* (DOE/EIS-0200-SA02).



From: DOE. *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement*, DOE/EIS-0026-S-2, September 1997.

Analysis of DOE's Accelerated Cleanup Program for Transuranic (TRU) Waste
Waste Isolation Pilot Plant (WIPP)
Performance Management Plan (PMP)

In July, 2002, as part of its Accelerated Cleanup Plan, the Department of Energy (DOE) prepared a draft Transuranic (TRU) Waste Performance Management Plan (PMP) for the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico. In August 2002, a revised TRU (or WIPP) PMP was issued. Included in the PMP were six initiatives to accelerate cleanup at 27 DOE sites by increasing the rate of disposal of TRU waste at WIPP. The expressed goal of the WIPP PMP was to complete disposal of legacy TRU waste at WIPP by 2013 (about 20 years early) and to save about $8 billion.

The DOE also prepared PMPs for most of the sites with large amounts of TRU waste to be shipped to WIPP. The major site without a PMP is Rocky Flats in Colorado, which has long planned to complete shipments to WIPP by 2005 as part of its accelerated cleanup plan to close the site by 2006. Since no acceleration was planned, no Rocky Flats PMP was prepared.

Other chapters of this report compare the site PMPs to the WIPP PMP. The aim of this chapter is to discuss the critical technical, regulatory, and cost assumptions of the WIPP PMP to see if forecasts are manageable and realistic and whether the near-term goals were achieved.

This chapter is divided into six sections:

- Background
- TRU Waste Inventory
- TRU Waste Shipments
- Cost Savings
- Regulatory Compliance Issues
- Other Relevant Issues

BACKGROUND

What is TRU Waste?

TRU waste is defined in federal law and regulations and DOE orders as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty (20) years in concentrations greater than 100 nanocuries per gram (nCi/g) of waste matrix. Two types of TRU waste are proposed for WIPP. Contact-Handled Waste (CH) is waste or waste containers whose external surface dose rate does not exceed 200 millirem (mrem) per hour at the surface of the container. Remote-Handled Waste (RH) is packaged waste with an external surface dose rate that exceeds 200 mrem per hour. RH waste has not yet been approved for storage or disposal at WIPP by the state regulatory agency, the New Mexico Environment Department (NMED), and the Environmental Protection Agency has not yet approved any site to ship RH waste to WIPP.

Waste Isolation Pilot Plant (WIPP)

The WIPP Site is a four-mile by four-mile (10,240 acres) area about 26 miles east of Carlsbad, New Mexico. WIPP is the world's first geologic repository. The annual budget is about $200 million and there are about 800 employees, about 600 with Washington TRU Solutions, the operating contractor. The major surface facility at the WIPP site is the Waste Handling Building, where waste shipments are unloaded and placed on a hoist to be taken 2,150 feet underground. The underground waste disposal rooms consist of seven rooms (approximately football field sized and 13 feet high) in each of eight panels (two additional panels are planned using the tunnels between the panels).

In August 1972, the Atomic Energy Commission announced that it was considering a site in southeastern New Mexico for a "pilot repository" for nuclear wastes from commercial power plants.[1] After the first potential site was abandoned because of technical problems, a site was chosen in 1975. WIPP was authorized by Congress in December 1979, to provide "a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission."[2] In February 1980, President Carter announced that he was canceling WIPP.[3] In January 1981, two days after the inauguration, President Reagan's DOE Secretary James Edwards announced that WIPP would be constructed and that it

> "will dispose of defense transuranic (TRU) waste stored retrievably at the Idaho National Engineering Laboratory. By approximately 1990 all existing waste stored at INEL will have been removed to WIPP, and the WIPP facility would be in a position to receive and dispose of TRU waste from other defense waste generating facilities."[4]

On July 4, 1981, construction was started on the first shaft, and major construction was completed in 1988. In 1987, Congress began considering legislation to allow WIPP to receive wastes and establish regulatory requirements for the facility. In November 1991, DOE Secretary James Watkins, tired of waiting for Congress to pass legislation, stated that he would begin shipping waste to WIPP in a week. New Mexico Attorney General Tom Udall, joined by citizen and environmental organizations, filed lawsuits that resulted in injunctions being issued by the District Court in Washington, DC.[5] In October 1992, Congress passed the WIPP Land Withdrawal Act, which was amended in 1996.[6] The WIPP Act, among other things, established capacity limits and regulatory requirements for the facility. The Environmental Protection Agency certified in May 1998 that WIPP meets its standards for waste disposal to limit releases of radioactivity for 10,000 and every five years, it must recertify that WIPP continues to meet those standards.[7] The first shipment of waste arrived at WIPP from Los Alamos National

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[1] United Press International, "Atomic Waste Disposal Site Eyed in State," *Albuquerque Journal*, August 15, 1972.
[2] Public Law 96-164, Section 213(a).
[3] President Carter Statement, February 12, 1980.
[4] WIPP Record of Decision, 46 *Federal Register* 9162 (January 28, 1981).
[5] *State of New Mexico v. Watkins*, 783 F.Supp. 628 (D.D.C. 1991) and *State of New Mexico v. Watkins*, 783 F.Supp. 633 (D.D.C. 1992).
[6] Public Law 102-579, as amended by Public Law 104-201
[7] http://www.epa.gov/radiation/wipp/background.htm

Laboratory on March 26, 1999. The NMED issued its hazardous waste storage and disposal permit on October 27, 1999.[8]

TRU WASTE INVENTORY

The 1992 WIPP Act limits the capacity of WIPP to 6.2 million cubic feet (175,564 cubic meters-m3) of TRU waste.[9] Of that volume, not more than 250,000 cubic feet (7,079 m3) can be remote-handled (RH) TRU waste, according to a 1981 Agreement with the State of New Mexico.[10] The WIPP Act has other limits on RH waste, including a limit of 5,100,000 curies, no waste with a surface dose rate of more than 1,000 rems per hour, and no more than five percent of the volume of RH waste having a surface dose rate of more than 100 rems per hour.[11] The law also specifically prohibits high-level radioactive waste or spent nuclear fuel at WIPP.[12] As a defense waste repository, all commercial nuclear wastes, including commercial TRU waste, are prohibited at WIPP.

In its Record of Decision of January 16, 1998 to open WIPP, DOE stated that WIPP would dispose of "TRU waste accumulated in aboveground storage since 1970 and TRU waste to be generated over approximately the next 35 years."[13] The Decision also stated: "DOE will comply with the requirements and waste limits in the WIPP Land Withdrawal Act, as amended, and the Consultation and Cooperation Agreement between New Mexico and the Department of Energy."[14]

The WIPP PMP contains six strategic initiatives to accelerate the waste of TRU waste disposal. The first initiative was to give priority to shipments from the Rocky Flats Environmental Technology Site and the Idaho National Laboratory.[15] Rocky Flats had established a closure date of December 15, 2006, which required that all waste, including TRU, be shipped offsite. Idaho could accelerate its shipments because the Advanced Mixed Waste Treatment Facility would begin operating by March 2003 and could make approximately 17 shipments per week.[16]

The second initiative was for the Central Characterization Project (CCP) to characterize waste at Argonne-East, Savannah River Site (SRS), and the Nevada Test Site (NTS). Argonne would then ship its TRU waste to WIPP by September 2003, NTS by June 2003.[17] CCP would accelerate TRU shipments from SRS so that TRU waste at the Mound Site in Ohio that was not characterized for shipment to WIPP could go to SRS to accommodate plans to close Mound in 2006. South Carolina agreed to accept the Mound waste so long as twice the volume of TRU

[8] http://www.nmenv.state.nm.us/wipp/index.html
[9] PL 102-579, Section 7(a)(3).
[10] *Consultation and Cooperation Agreement.* Appendix A to the Stipulated Agreement Resolving Civil Action, 81-0363JB, State of New Mexico vs. United States Department of Energy, United States District Court, Albuquerque, NM.
[11] PL 102-579, Section 7(a)(1 and 2).
[12] PL 102-579, Section 12.
[13] 63 *Federal Register* 3624 (January 23, 1998).
[14] *Id*.
[15] WIPP PMP, p. 23. WIPP PMP is available at: http://www.wipp.ws/suyw/july2002/FTWPMP.pdf
[16] WIPP PMP, p. 63 (unnumbered).
[17] WIPP PMP, p. 26.

waste left SRS (approximately 3,500 drum equivalents [73.5 cubic meters]) as came into the state from Mound.[18] CCP would also allow 770 drums to be shipped in 2003 from Lawrence Livermore to either the Western Hub site or to WIPP.[19]

The third initiative was to establish Western and Eastern Hubs to accept waste from 14 sites with relatively small amounts of waste to be later characterized and repackaged for shipment to WIPP. The PMP presumed that the Western Hub would be at Hanford and the Eastern Hub at SRS. Shipments from within New Mexico (Sandia and Lovelace Respiratory Research Instititute) and Los Alamos would also be accelerated.[20]

The fourth initiative was the WIPP Central Confirmation Facility (CCF) in which waste characterization would be done at WIPP in order to work with the hubs to accelerate waste shipments to WIPP. No specific timeframe was established for CCF to operate.[21]

The fifth initiative was to accelerate receipt of RH waste at WIPP so that the first waste would arrive by March 2005.[22]

The sixth initiative "crosscuts" included waste characterization improvements, regulatory changes, transportation improvements including TRUPACT-III and rail shipments, and plans for non-shippable, classified, and other wastes not acceptable at WIPP.[23]

The initiatives were assumed to be successful and to support receipt of all waste from Rocky Flats by 2006, all CH waste from Oak Ridge by 2008, all legacy CH waste from Los Alamos by 2010, all INL CH waste by 2012, all CH waste from SRS by 2013, and all CH waste from Hanford by 2015.

Table 1 provides the amount of CH waste from each site by volume (in cubic meters) that the WIPP PMP projected to be shipped to WIPP each year and the actual amounts of waste from each site disposed at WIPP in FY2003 and FY2004.

[18] WIPP PMP, p. 25.
[19] WIPP PMP, p. 27.
[20] WIPP PMP, pp. 22-33.
[21] WIPP PMP, pp. 37-38.
[22] WIPP PMP. p. 39.
[23] WIPP PMP, pp. 40-48 (unnumbered).

Table 1: WIPP CH WASTE DISPOSAL BY SITE BY FISCAL YEAR(1)
(Amounts in cubic meters).

Site	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Totals
Hanford	74	592	710	710	733	747	770	792	851	821	422	52	52	7326
Actual	**250**	**448**												
INL	3248	5402	5683	6305	8288	8288	8436	4581	2486	2264				54981
Actual	**567**	**342**												
LANL	599	1236	1236	1236	1236	1450	1450	1591						10034
Actual	**327**	**0**												
LLNL(2)	74	89			15	22	22	30						252
Actual	**0**	**0**												
NTS	326				30	59	111							526
Actual	**0**	**106**												
ORR		548	296	59	59	15								977
Actual	**0**	**0**												
RFETS	3537	3522	3256	2516										12831
Actual	**4017**	**4650**	**2134**											**10801**
SRS	1066	1066	1066	1066	1095	1088	1088	1088	488	30	37			9178
Actual	**2285**	**3240**												
ANL-E	89													89
Actual	**97**	**24**												
TOTAL	8939	12366	12247	11892	11441	11647	11855	8052	3825	3115	459	52	52	95942
Actual	**7542**	**8810**												

(1) From WIPP PMP, Table 5.0-1. Each shipment assumed to have 7.4 cubic meters.
(2) Shipments to Western Hub, not counted in totals for WIPP.
LLNL and ORR had no shipments to WIPP in FY2003 and FY2004.
Actual amounts from WWIS Inquiry response of July 22, 2005. WWIS is the WIPP official data source.

Analysis and Discrepancies

DOE's complex and site-by-site inventory of both existing CH- and RH-TRU waste and to-be-generated waste has varied widely for many years. The WIPP Act volume limits were based on the 1970s design capacity, even though the then existing environmental impact statement estimated the total volume of TRU waste by 2013 would be 5,598,405 cubic feet.[24]

In the Compliance Certification Application that the EPA used to certify that WIPP meets its environmental protection standards, the CH-TRU existing and projected inventory was 112,000 cubic meters (56,000 cubic meters less than the legal capacity) and for RH TRU waste it was 27,100 cubic meters (almost four times the legal limit).

In the 2004, Recertification Application to DOE, the CH emplaced at WIPP, stored, and projected CH TRU inventory was 142,700 cubic meters (27,300 m3 less than the legal limit) and for RH TRU waste it was 15,300 m3 (more than double the legal limit).

Site specific estimates vary even when much is known about the waste at a site. For example, all of the TRU waste at the Rocky Flats Plant has been shipped to WIPP, with the final shipment arriving on April 20, 2005 (months ahead of the schedule in the strategic initiative). The total shipments from Rocky Flats to WIPP were 2,045. However, in its October 1, 2004 shipping schedule for Fiscal Year 2005, the estimate was that 408 shipments would be needed for Rocky Flats; when in fact 323 shipments were actually made. As Table 1 shows, by volume, Rocky Flats shipped 10,801 cubic meters of waste after October 1, 2002, as compared to the WIPP PMP estimate of 12,953 cubic meters. That almost 20 percent discrepancy regarding the site with the

[24] DOE. *Waste Isolation Pilot Plant Final Supplement Environmental Impact Statement*, January 1990, p. 3-3.

most complete information indicates that estimates at other sites also could be substantially wrong.

The initiative related to SRS was also met and exceeded as the CCP helped ship more than double the amount of CH waste in Fiscal Years 2003 and 2004 as was included in the WIPP PMP. CCP certified 6,140 drums in FY2003 and 7,818 drums in FY2004.[25] CCP also was used to characterize waste at Argonne National Laboratory near Chicago which shipped its waste in 2003 and 2004, a few months later than scheduled, and the Nevada Test Site, which shipped some waste in 2004 and more waste in 2005, more than a year later than the WIPP PMP schedule. The establishment of eastern and western hubs occurred on only a small scale and resulted in the state of Washington and citizen groups filing lawsuits which have stopped such shipments.[26]

However, several initiatives failed badly. INL, rather than shipping the most waste of any site in FY2003 and 2004, sent only about 11 percent of the INL waste projected in the WIPP PMP. The Advanced Mixed Waste Treatment Facility (AMWTF) did not start operations in March 2003. Accelerating shipments from New Mexico sites did not occur, in fact Los Alamos National Laboratory made not one shipment in FY2004, although the WIPP PMP goal was 167. The WIPP CCF permit modification request was withdrawn by DOE after it was severely criticized by New Mexico citizen groups, NMED, and the DOE Inspector General.[27] RH waste shipments did not occur by March 2005, the WIPP PMP milestone, and it could be at least several years into the future before such shipments occur, as NMED has no schedule for a public hearing to consider the pending permit modification.[28]

During Fiscal Years 2003 and 2004, 16,352 cubic meters were shipped to WIPP, about 77 percent of the 21,305 cubic meters included in the WIPP PMP.

TRU WASTE SHIPMENTS

Table 2 identifies the shipping schedule for Contact-Handled TRU waste, based on the WIPP PMP. It also shows the number of shipments based on the *Budget Request to Congress*. Actual shipments through September 30, 2004, the end of Fiscal Year 2004, are also included.

[25] http://www.trusolutionsnm.com/WTS_Data.pdf

[26] http://www.atg.wa.gov/releases/rel_hanford_030403.html; http://www.hoanw.org/index_page.html

[27] Planned Characterization Capability at the Waste Isolation Pilot Plant, December 2002. http://www.ig.doe.gov/pdf/ig-0577.pdf. The modification request was withdrawn by a January 14, 2003 letter from WIPP Manager Inés Triay to Steve Zappe of NMED.

[28] On April 29, 2005, DOE submitted a revised permit modification that included RH waste (which was further revised on June 12, 2005. In addition to public comments, it is possible that another Notice of Deficiency and additional public comments will occur before a draft RH waste permit modification would be issued for public hearing.

Table 2: CH Waste Shipments to WIPP 2003 - 2015

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	Total
WIPP PMP(1)	1208	1671	1655	1607	1546	1574	1602	1088	517	421	62	7	7	12,965
DOE Budget(2)	555	1750	1784											
Actual(3)	**799**	**967**												**3,021**

(1) WIPP PMP, Table 5.0-1.
(2) DOE Budget Request to Congress for FY2004 & FY 2005 performance measures (based on 7.4 m3 per shipment).
(3) The total includes 32 shipments in FY99, 58 shipments in FY00, 304 shipments in FY01, and 861 shipments in FY02.

Table 3 identifies the shipping schedule for Remote-Handled TRU waste, based on the WIPP PMP.

Table 3 : RH Waste Shipments to WIPP 2003 - 2031

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12-20	FY21-31	Total
WIPP PMP(4)	0	0	119	177	153	162	517	563	522	679	343	3,235
Actual	0	0										

(4) WIPP PMP, Table 5.0-2.

TRU waste shipments can come to WIPP by highway or railroad, although no shipments have been made or are currently planned to be by railroad. All shipments must be in containers certified by the Nuclear Regulatory Commission to meet its requirements.[29] Currently certified containers for CH-TRU waste are the Transuranic Package Transporter Model 2 (TRUPACT-II) and the HalfPACT. Until June 18, 2005, no HalfPACT was used to bring any waste to WIPP. Each TRUPACT-II can hold 14 55-gallon drums (each drum can hold up to 7.4 cubic feet (0.21 m3) of waste), two standard waste boxes (each box can hold up to 66.3 cubic feet of waste), or one ten-drum overpack. Each HalfPACT can hold seven 55-gallon drums or one standard waste box. Each truck can haul up to three TRUPACT-IIs (or a combination of TRUPACT-IIs and HalfPACTs totaling three units.)

Some TRU waste (approximately 24 percent according to the WIPP PMP) is too large to fit into TRUPACT-IIs, so DOE is designing a shipping container, the TRUPACT-III for larger items. The WIPP PMP milestone is for NRC to certify the TRUPACT-III in FY 2005. However, that date will not be met, as the container is being redesigned. Current plans are for it to be tested in July 2006 and the revised application to NRC would be submitted in October 2006. Thus, it will be mid-2007 at the earliest before shipments could begin in the TRUPACT-III.

Two shipping containers -- RH-72B and the CNS 10-160B -- have been certified by the NRC for RH waste. They would be used if disposal of RH waste at WIPP is approved by the EPA and the NMED.

Analysis and Discrepancies
For some years, DOE stated that WIPP's estimated capacity is to receive 17 shipments (51 TRUPACT-IIs) per week. The WIPP PMP's acceleration plan included doubling the capacity to

[29] http://www.wipp.ws/fctshts/TRUwastecontainers.pdf

34 shipments per week by April 2003. However, there have not ever been 34 shipments in any week. The most shipments were the 967 in FY2004, or an average of fewer the 19 shipments per week. During the first nine months of FY2005, there were 699 shipments, an average of about 18 per week. Further, many shipments do not include three TRUPACT-IIs, so in many weeks, fewer than 51 shipping containers are handled, even if more than 17 shipments arrive at WIPP.

The *DOE Budget Request to Congress* not only has shipment projections that differ from the WIPP PMP, but it also includes inaccurate information about the amount of waste already shipped to WIPP. For example, the FY 2006 Budget Request said that in FY 2004, 6,953 m3 were disposed at WIPP and that as of September 30, 2004, WIPP had disposed of 21,034 m3.[30] As shown on Table 1 from the official WIPP source, 8,810 m3 were disposed in FY 2004, and that total disposal amount as of that date was 24,068 m3. Unfortunately, and a likely reason that the Budget Request contains inaccurate data, neither DOE headquarters, nor congresspersons, nor the public have ready access to the WIPP Waste Information System (WWIS), the official database for information about waste shipments and disposal. The NMED has now required DOE to provide some public access to the WWIS.[31]

COST SAVINGS

The WIPP PMP states that the current WIPP Baseline Cost through 2035, when WIPP is closed, is $16 billion and that implementation of the PMP would save about $8 billion. Those savings include:

- $3.6 billion from reducing WIPP operational costs of $180 million per year over 20 years from completing disposal of legacy TRU waste;
- $0.6 billion from mobile/modular characterization units (Central Characterization Project – CCP);
- $1.2 billion from a using a large transportation container (TRUPACT-III) and rail transportation;
- $0.5 billion from the Central Confirmation Facility (CCF) at WIPP which would reduce waste characterization costs are some DOE sites;
- $2.1 billion from eliminating regulatory requirements, primarily related to reducing or eliminating waste characterization requirements.[32]

To achieve those savings requires increased funding for WIPP through 2015. The July 2002 draft PMP stated those increased costs would be $0.7 billion ($50 million a year through 2015),[33] although the August PMP contained no quantification of the additional costs.

Analysis and Conclusions

The largest savings -- reducing site operational costs by $180 million per year over 20 years -- is based on two assumptions: 1) that legacy TRU waste disposal is completed by 2015, and 2) that

[30] http://www.mbe.doe.gov/budget/06budget/Content/Volumes/Vol_5_EM.pdf, p. 26.
[31] The public can ask questions and receive some data through the WIPP website: http://www.wipp.ws/wwis_inquiry.htm
[32] WIPP PMP, pp. 58-59 (unnumbered)
[33] draft WIPP PMP, p. 55.

operational costs for the following 20 years would be minimal to handle disposal of newly generated waste from continuing nuclear weapons production.

The first assumption is highly suspect since WIPP has a history of being behind schedule and over budget, since the Reagan administration decision to proceed with WIPP in 1981 and that it would open in 1986. Since WIPP opened more than six years ago, in five of the six fiscal years, it received less waste than projected, including FY2004, when it received about 70 percent of the PMP goal. Some sites are several years behind schedule and 2004 to 2009 are to be the peak acceleration years, according to the WIPP PMP. Such performance results occurred despite the fact that Congress provided more funding for WIPP than requested during those six years. Given that long history of less waste being disposed than projected, there is no basis to conclude that legacy TRU waste disposal will be complete by 2015.

The second assumption is also highly suspect since WIPP's budget has historically been significantly based on providing stable funding in order to support the local Carlsbad economy, regardless of the funding needing for actual WIPP performance. Thus, any presumption that operating costs two to three decades in the future are knowable, let alone reliable, should not be accepted.

Moreover, as noted in the TRU Waste Inventory section, many of the six strategic initiatives already have demonstrably failed, so that other projected cost savings have not occurred. For example, many of the waste characterization changes expected to result in significant savings have not occurred, although the April 29, 2005 permit modification request proposes major changes in the characterization requirements. In addition to concerns of NMED and New Mexico citizen groups, a National Academy of Sciences Panel rejected the DOE argument that characterization activities were too expensive and could be modified without increasing risks.[34] The proposed transportation savings are also highly speculative, especially since they are heavily dependent upon savings from the TRUPACT-III shipping container for large items. Because TRUPACT-III doesn't even have an NRC-approved design, it is not knowable what the costs of the container will be, so imputing savings given those unknowable costs is not credible or reliable. DOE has now dropped plans for rail shipments and plans to build about ten TRUPACT-IIIs, not the 20-30 included in the WIPP PMP.[35] Plans for the CCF have been dropped, so those savings will not occur.

REGULATORY COMPLIANCE ISSUES

The WIPP PMP identifies numerous regulatory changes that must occur to achieve the goals and milestones. Major changes are required in the NMED WIPP permit to change waste characterization requirements, allow the CCF at WIPP, allow RH waste disposal, among many others. None of the major proposed permit modifications have been approved, and the CCF request was withdrawn by DOE.[36]

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[34] National Research Council, *Improving the Characterization Program for Contact-Handled Transuranic Waste Bound for the Waste Isolation Pilot Plant*, January 2004, p. 3.
http://books.nap.edu/openbook/0309090903/html/index.html

[35] WIPP PMP, p. 43 (unnumbered).

[36] A revised, scaled down version of the CCP is included in the April 29, 2005 modification request.

The regulatory situation with New Mexico has been further thrown into uncertainty by the DOE proposal to reclassify some high-level tank waste at Hanford, Savannah River Site, and the Idaho National Laboratory as TRU so that it can be shipped to WIPP. New Mexico Governor (and former DOE Secretary) Bill Richardson has stated that NMED will not allow such renamed waste to come to WIPP[37] and that the proposal to do so would impact the rate that NMED would consider other major modifications and possibly whether such modifications would be approved. On October 29, 2004, NMED issued a permit modification that prevents any high-level waste sludge from coming to WIPP.[38]

The DOE high-level waste reclassification proposal also has become a significant issue in the EPA recertification.[39] As a result, the recertification has been delayed at least nine months.

OTHER RELEVANT ISSUES

Non-TRU defense waste

In addition to the HLW reclassification issue, DOE has other wastes that it may try to send to WIPP, which could impinge on costs and schedules, as well as waste inventory and shipments. At Hanford, DOE wants to send K-Basin sludges to WIPP. West Valley, New York, a facility with high-level and TRU waste from reprocessing of commercial fuel, has significant quantities of waste that DOE may try to send to WIPP, because it has no other disposal facility.[40]

Transportation

The WIPP PMP assumes that the approximately 24 percent of existing CH waste is in oversized containers that cannot fit in the TRUPACT-II shipping container will be transported to WIPP in a new shipping container, the TRUPACT-III.[41] The TRUPACT-III is being designed as "single containment," while the TRUPACT-II is "double containment" (an inner container and an outer container). The TRUPACT-I, which was designed in the 1980s was a single containment package, which was never used because of the strong criticism of such a container, which provides less safety than double containment. On March 11, 2004, eight western governors sent a letter to the Nuclear Regulatory Commission (NRC) opposing allowing single containment.[42] By proceeding with TRUPACT-III as single containment, DOE risks a very substantial delay (and additional cost) if the TRUPACT-III has to be redesigned because the test containers are not approved by NRC and if the fabricated models cannot be used or if single-containment is not accepted.

Further, even having an approved shipping container does not mean it will be in service. To have an additional shipping container, especially for drums with heavy wastes, DOE built the HalfPACT, which was approved by the NRC in 2000, but the container was not used for WIPP shipments until June 2005.

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[37] http://www.gov.state.nm.us/press/2003/oct/102803_2.pdf

[38] http://www.nmenv.state.nm.us/wipp/HLW_Approval_PR.pdf

[39] *Albuquerque Journal,* "Yank WIPP License, EPA Told," July 28, 2004, p. B2. September 21, 2004 comment letter to EPA Docket ID No. OAR-2004-0025 from citizen groups.

[40] DOE. *West Valley Demonstration Project Final Waste Management Environmental Impact Statement* (DOE/EIS-0337F), December 2003. http://www.eh.doe.gov/nepa/eis/eis0337/index.html

[41] WIPP PMP, p. 43 (unnumbered)

[42] http://www.gov.state.nm.us/2004/news/march/031504_1.pdf

Modern Pit Facility

In June 2003, DOE released a draft environmental impact statement for the Modern Pit Facility (MPF), which would manufacture plutonium pits (cores) for nuclear weapons, beginning in about 2020 and for 50 years thereafter.[43] One of the five potential sites for the MPF is WIPP. An MPF would create large amounts of TRU waste not included in the WIPP inventory (and likely exceeding the existing legal capacity limits). More importantly, siting the MPF at WIPP raises serious questions about whether the site wold continue its operations since it is incompatible with the requirements of the WIPP Act and EPA's certification.[44]

Risk Reduction

The WIPP PMP claims that accelerating cleanup of TRU waste brings "significant risk reduction."[45] Such claims are inconsistent with DOE environmental impact statements that show that leaving TRU waste stored is safer than disposing of it at WIPP over the next several decades, both because DOE claims releases from the storage sites are unlikely and waste shipments will result in injuries and fatalities from waste shipments. Further, most DOE sites have other types of waste, so removal of TRU waste may not significantly reduce the overall risk from all waste at the site. Some sites, particularly the Eastern and Western Hubs might result in increase risk at those sites because of increased amounts of waste being handled and stored and because of transportation risks.

Comparison with Previous Plans

The Carlsbad Field Office had produced the "National TRU Waste Management Plan" since 1997. Revision 2 of that plan was issued in December 2000, and provided a baseline for WIPP from Fiscal Year 2001 through Fiscal Year 2034.[46] The Plan included 17,577 shipments of CH waste to dispose of 106,623.1 m3 of CH waste, and 1,914 shipments of RH waste to dispose of 1,816.2 m3 of RH waste. The Plan included disposal of 2,958 m3 in FY2001, 6,163 m3 in FY2002, 5,123 m3 in FY2003, 6,663 m3 in FY2004, and 7,741 m3 in FY2005, which was the peak year as shipments from Rocky Flats would decrease after that time. So for the five-year period of FY2001-2005, the plan included disposal of 28,648 m3 of CH waste.

For comparison, there was 1,964 m3 of CH waste disposed in FY2001 and 5,134 m3 in FY2002. For FY2003-2005, the WIPP PMP included 33,552 m3 of CH waste. So for the five-year period of FY2001-2005, the WIPP PMP projected disposal of 40,650 m3, or more than a 40 percent increase compared with the National TRU Plan.

For FY2001 through ten months (July 2005) of FY2005, actual disposal at WIPP was 29,699 m3. At recent shipment rates projected over August-September 2005, WIPP will have disposed of about 31,100 m3 during those five fiscal years. That would amount to about 77 percent of the WIPP PMP milestones and about 9 percent more than included in the National TRU Plan.

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[43] http://www.mpfeis.com/

[44] Elizabeth Cotsworth (EPA) to Jay Rose (DOE), November 21, 2002. http://www.mpfeis.com/. Public Scoping Comments #195.

[45] WIPP PMP, p. 11.

[46] DOE. *National TRU Waste Management Plan* DOE/NTP-96-1204, Revision 2. http://www.wipp.ws/library/ntwmp/rev2/Cover.pdf