

CLOSING ROCKY FLATS BY 2006

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ABSTRACT

Safely accelerating the closure of Rocky Flats to 2006 is a goal shared by many: the State of Colorado, the communities surrounding the site, the U.S. Congress, the Department of Energy, Kaiser-Hill and its team of subcontractors, the site's employees, and taxpayers across the country. On June 30, 2000, Kaiser-Hill (KH) submitted to the Department of Energy (DOE), KH's plan to achieve closure of Rocky Flats by December 15, 2006, for a remaining cost of \$3.96 billion (February 1, 2000, to December 15, 2006). The Closure Project Baseline (CPB) is the detailed project plan for accomplishing this ambitious closure goal. This paper will provide a status report on the progress being made toward the closure goal. This paper will:

- provide a summary of the closure contract completion criteria
- give the current cost and schedule variance of the project and the status of key activities
- detail important accomplishments of the past year
- discuss the challenges ahead

INTRODUCTION/CLOSURE PROJECT BACKGROUND

Kaiser-Hill began work on accelerating closure of Rocky Flats in 1995 with the award of a Performance Based Integrating Management Contract, originally scheduled to expire in June 2000. Recognizing the many accomplishments of Kaiser-Hill during its management of the site and its track record for performance results in delivering contract requirements, DOE invited Kaiser-Hill to negotiate a contract in October 1999 that would take the Rocky Flats site closer to the desired final vision. On January 24, 2000, the DOE and Kaiser-Hill signed a first-of-its-kind contract to complete the Rocky Flats Closure Project by a target date of December 15, 2006, at a target cost of \$3.963 billion. This contract provides one more enabler to achieving the overall goal – return of the Rocky Flats site to a wildlife refuge, to be enjoyed by the citizens of Colorado. Figure 1 illustrates the closure project's end state.



Fig. 1 Closure Project End State

The new contract improved on the previous contract in many ways, including incorporating defined contract completion criteria that provide a clear end point for project activities, provisions which require the government to deliver certain services and items such as nuclear material and waste receiver sites and transportation system, and a commitment to a continuous annual funding level of \$657 million per year through the term of the contract.

The contract completion criteria are:

- All buildings are demolished, except continuing water treatment facilities or other structures with a DOE-declared continuing mission
- All Individual Hazardous Substance Sites are remediated or dispositioned per the Rocky Flats Cleanup Agreement (as amended October 1, 1999)
- All wastes are removed except for some materials that can be left in place, recycled, or used as fill materials in accordance with regulatory requirements
- Closure caps are used for the remediation of two old landfills, the 700-Area, and the solar ponds or these areas are otherwise remediated in accordance with the Rocky Flats Cleanup Agreement (as amended October 1, 1999)
- Building foundations, utilities, or other remaining structures, paved roads and/or parking lots are covered by a minimum of three feet of fill after final grade
- Surface water on site will meet health-based standards based on open space use calculated using methodology and toxicity assumptions utilized for the July 19, 1996, surface water action level
- Water leaving the site in Woman and Walnut Creeks meets the water quality standards established (as of October 1, 1999) by the Colorado Water Quality Control Commission

Kaiser-Hill aligned its strategic and technical approach with the goals of the closure contract in a revised closure project baseline published in June 2000 and updated in June 2001. The closure work can be categorized into four major areas: special nuclear materials stabilization and packaging; facility deactivation, decommissioning, decontamination, dismantlement and demolition (D&D); offsite shipment of special nuclear materials and waste; and environmental remediation (ER). The magnitude of the closure project is perhaps best expressed by the numbers:

- **Special Nuclear Materials Management** – stabilization, processing, and repackaging of more than 20 tons of plutonium and uranium and more than 40,000 kilograms of plutonium residues
- **Facility Deactivation and Decommissioning** – cleaning up and demolishing approximately 700 facilities totaling more than 3.5 million square feet of area, including more than 900,000 square feet of thick, reinforced-concrete plutonium buildings, more than half of which are expected to be contaminated
- **Offsite Shipment** – shipping nearly 11,000 truckloads of waste and nuclear material, as well as dispositioning thousands of containers of chemicals, items of government property, and classified documents
- **Environmental Restoration** – cleaning up and/or containing approximately 100 areas of contamination

To accomplish this massive undertaking, Kaiser-Hill developed an approach that achieves cleanup of the site on an accelerated schedule. Key elements of Kaiser-Hill's approach include:

- emphasizing safety in all activities and in all areas
- eliminating the highest risks first
- reducing the site's mortgage costs to make more funds available for mission activities
- focusing the highest attention on the activities on the critical path (i.e., those activities which, if they slip, will significantly impact project completion)
- maximizing workforce efficiency
- employing proven, innovative technologies and approaches to increase efficiency and safety

CLOSURE PROJECT STATUS

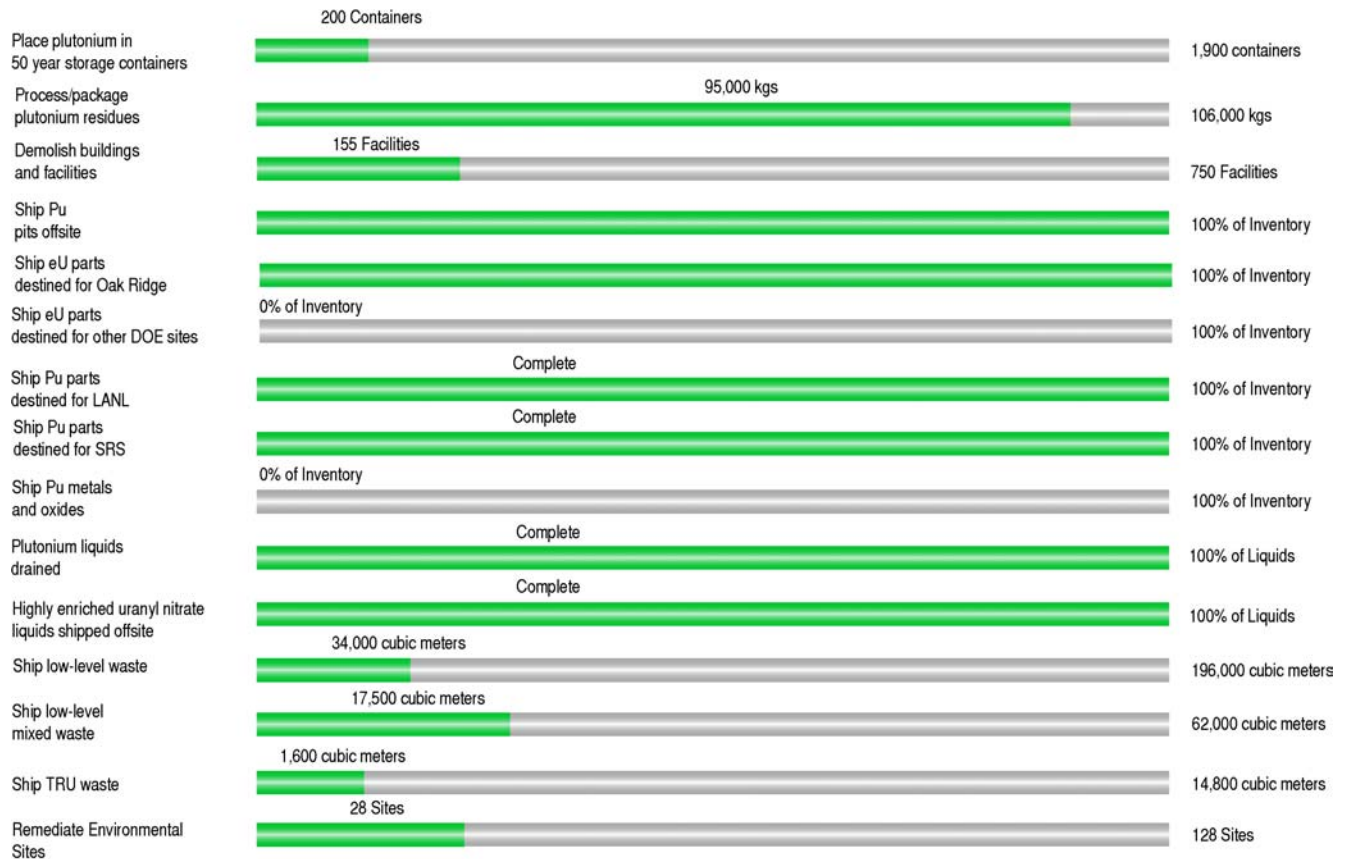
More than one-quarter of the way through the Closure Project, Rocky Flats is currently slightly under cost and slightly ahead of schedule. Kaiser-Hill remains optimistic that the project will be delivered below the target contract cost of \$3.9 billion and before December 2006. Through December 2001, the project cost and schedule performance are as follows:

- Cost variance is +\$32 million (2.8%)
- Schedule variance is +\$8.7 million (0.8%)
- 28% of target schedule has elapsed
- 23 months of 82.5 months
- 28% of the scheduled work has been completed

Kaiser-Hill also tracks several key closure project performance metrics in addition to traditional cost and schedule variance. Table I below shows the work completed on these metrics through December 2001 and how much work remains.

Table I Closure Project Performance

Closure Project Performance



In addition to the strong cost and schedule performance and progress on the Closure Project metrics, Kaiser-Hill completed a number of activities during calendar year 2001 in key areas such as: Protected Area Reduction, Decommissioning and Demolition, Residue Processing; Plutonium Stabilization and Processing, and Waste Shipping. Details on these activities follow.

Protected Area Reduction

Special nuclear materials project activities must take place in an area under strict safeguards and security, under the close watch of a large, highly trained security force. The site's security systems, personnel and containment systems must remain in place until all containerized special nuclear material has been accounted for and removed from Rocky Flats.

At Rocky Flats, special nuclear material has historically been processed and stored in the site's Protected Area, a 180-acre area where four major nuclear weapons production buildings still stand – Buildings 707, 771, 776/777, and 371. The Rocky Flats Protected Area is where a majority of the nuclear weapons components were produced.

To save money and accelerate closure, Kaiser-Hill implemented a strategy to reconfigure the Rocky Flats Protected Area from 180 acres surrounding all plutonium facilities to approximately 30 acres surrounding one plutonium facility. The benefits to site closure are enormous:

- All of Rocky Flats' most highly protected nuclear materials are consolidated into Building 371, one of the most robust and secure buildings in the country.
- The cost to maintain a Protected Area and one Material Access Area is dramatically lower than one that surrounds five Material Access Areas. Costs are redirected to accelerated closure work.
- Removing all of the highly protected nuclear materials from Buildings 771, 776/777 and 707 allows decontamination and decommissioning to proceed at full speed in these facilities.
- Reconfiguring the Protected Area allows significantly increased access to Rocky Flats' 700-Area buildings for movement of D&D personnel, equipment, and removal of the massive quantities of waste that will be generated during the D&D process.

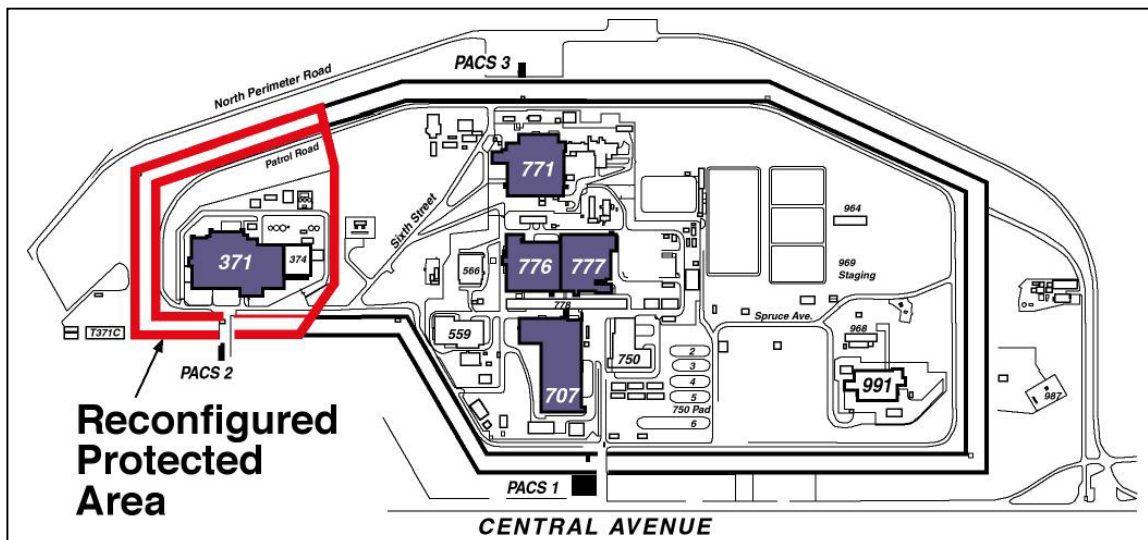


Fig. 2. Site Schematic Illustrating Protected Area Reduction

Since implementing this strategy, the two security checkpoints into the old PA, PACS 1 and 3, have been demolished. Kaiser-Hill has also removed more than 17,000 feet of perimeter fencing, 25,000 feet of razor wire, 8,200 feet of taut wire, and 8,200 feet of buried concrete barriers. Additionally, 75 percent of the high-wattage lights surrounding the old perimeter zone (totaling 50,000 watts) have been permanently turned off and three guard towers demolished.

Decommissioning and Demolition

Facility D&D includes all the activities necessary to take a facility out of operation and can involve deactivation, decommissioning, decontamination, dismantlement and demolition activities. The strategy for D&D on the Rocky Flats Closure Project has been to:

- Focus on plutonium facility D&D first
- Perform uranium and non-radiologically contaminated facility D&D to the extent permitted by funding
- Implement proven technologies and improvements to the D&D process

Early focus on plutonium facility D&D is based on two primary considerations. In some cases, D&D of a single building is estimated to take up to five years due to the presence of gloveboxes contaminated with plutonium, miles of contaminated piping and ducting that extend for tens of miles, and contamination spread throughout some of the facilities from past plutonium fires and other releases. The second consideration is to identify and remove plutonium holdup from untoward places. Various forms of plutonium are believed to be dispersed in ducts, pipes and equipment.

Emerging D&D Strategy

While the D&D strategy at Rocky Flats continues to focus on the plutonium facilities first, a revised strategy for the D&D of the lesser-contaminated or non-contaminated facilities is now being implemented. This new 'Area Plan' divides the site into five geographical areas (see Figure 3). Instead of scheduling a building here and a building there across the site for decommissioning, D&D activities in each of the areas will be tackled as a whole, and then proceed to the next area (some concurrent work will occur across the areas). This work will begin with Area 1 (the southeast portion of the site) and proceed through Area 5 (the western portion of the site). Not included in the five sections of the Area Plan is the D&D work already under way. Demolition of the Perimeter Security Zone, Building 111 and Building 333 were completed in 2001.

This strategy is designed to provide large areas to the Environmental Remediation (ER) organization to begin remediation and initial grading activities early, rather than deferring the work until later in the project. This approach will accelerate D&D in each of the areas as follows:

- Area 1, the southeast quadrant of the site, originally planned for completion in the first quarter of FY06, now scheduled for completion in the second quarter of FY03.
- Area 2, the northeast quadrant of the site, originally planned for completion in the second quarter of FY05, now scheduled for completion in the second quarter of FY04.
- Area 3, the central portion of the site outside the PA, originally planned for completion in the second quarter of FY05, now scheduled for completion in the third quarter of FY04.
- Area 4, the central portion of the site inside the PA, originally planned for completion in the second quarter of FY05, now scheduled for completion in the fourth quarter of FY04.
- Area 5, the western quadrant of the site, originally planned for completion in the fourth quarter of FY06, now scheduled for completion in the second quarter of FY05.

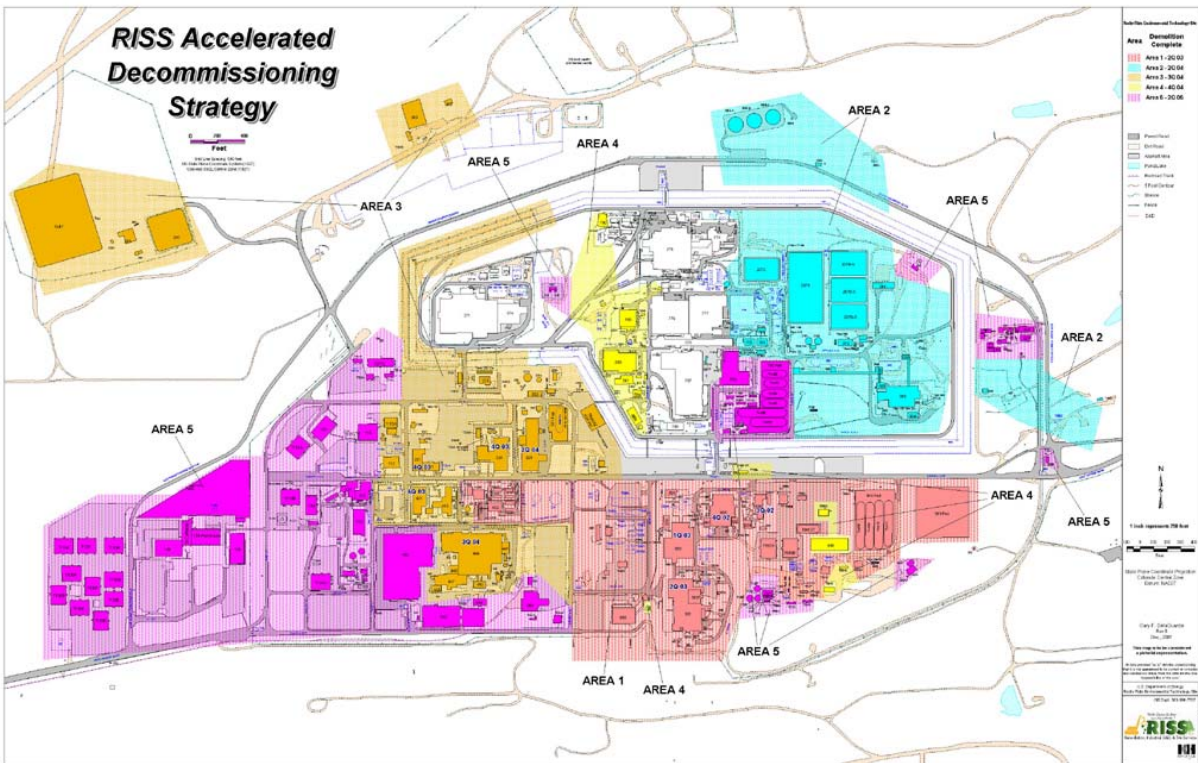


Fig. 3. D&D Strategy Map

Work is already under way in Area 1, the first section of the site planned for full decommissioning and environmental restoration. This area includes most of the 800-Area structures and some of the 400-Area structures near Central Avenue. Tents, tanks, fences, concrete barriers and any other man-made object above ground will be removed. The environment will be restored, the land graded and contoured as specified in closure agreements.

Implementing a Commercial D&D Model

Due in large part to the number of nuclear facilities that make up the DOE complex, DOE-EM work has historically been paperwork intensive and driven by extensive regulations. Requirements for non-nuclear facilities are often grouped with those of nuclear facilities, driving up costs. Kaiser-Hill was interested in applying a commercial model to demolition of these facilities and wanted to apply necessary and sufficient standards to the work activities, but avoid applying unnecessary requirements.

Faced with demolishing hundreds of uncontaminated or non-radiologically contaminated facilities, Kaiser-Hill has developed a subcontracting strategy to drastically reduce the cost of D&D for these facilities at Rocky Flats. Benchmarking to commercial practices of similar buildings in the Denver area, Kaiser-Hill determined that a number of Rocky Flats facilities could be demolished at a cost lower than their original estimate, if many of the requirements could be eliminated. Using a clause in the Department of Energy Acquisition Regulations (DEAR) from their contract, Kaiser-Hill was able to determine what safety requirements could flow down to subcontractors. Working with DOE, necessary and sufficient flow-down requirements for safety, compliance and work control were established and it was determined that Federal Acquisition Regulation (FAR) definition of commercial items could be applied to D&D activities.

Aiming to tailor the D&D approach of uncontaminated or non-radiologically contaminated facilities to more closely follow commercial practices, Kaiser-Hill released an RFP for the demolition of the site's former central administration facility, Building 111. Using the flexibility of its Closure Contract, Kaiser-Hill released the RFP with significantly reduced requirements for compliance with specific DOE directives. As a result, the number of clauses in the RFP plummeted from over 150 to 50. No DOE Orders were included, by reference, because the necessary and sufficient requirements were incorporated into the Statement of Work in plain English instead of the usual "Greek." The RFP required subcontractors to comply with health and safety requirements commonly found in the demolition of similar facilities in a commercial setting. This resulted in a number of bids from companies who have normally not bid on DOE work previously (16 total bids were received). Consequently, the resulting cost to complete the job was about one third of the original estimate.

Safety was not compromised in completion of the subcontract. Kaiser-Hill remained responsible for ensuring compliance with applicable DOE orders. Both DOE and Kaiser-Hill had stop-work authority. The success of this project means that over 80 buildings slated for D&D at Rocky Flats will benefit from this approach.

Technology Deployment

Kaiser-Hill continues to accelerate D&D activities and save money through the application of improved or new technologies. Highly contaminated equipment located in some areas poses special issues of airborne contamination and radiological control. Kaiser-Hill is in the process of dispositioning more than 900 Pu contaminated stainless steel gloveboxes, equipment and large tanks, totaling over 300,000 cubic feet. It is estimated that about two-thirds of this equipment can be economically decontaminated to low level and disposed of in cargo containers at Nevada Test Site. Kaiser-Hill is currently employing a three-tiered chemical wash system and has improved radiological instrumentation to enable gloveboxes and tanks to be characterized as low-level waste resulting in less TRU waste. This approach also reduces the need to cut apart these items and results in less operator exposure to radiation and industrial hazards.

The remaining units will have to be size reduced for shipping and disposal in Standard Waste Boxes at WIPP. Three increasingly sophisticated evolutions of cutting and rad containment systems have been developed (named ITCs after the first generation, which was an "inner tent chamber" in which hands-on mechanical cutting was done). The latest generation has recently started up, employing plasma-arc cutting operations and remote controlled manipulators for handling and packaging the equipment. Pre-plasma-arc technology for size reduction on Site was accomplished by manual crimpers and saws. The plasma arc technology, advanced containment structure, and remote operations are significantly safer, more efficient and cost effective than previous size-reduction operations, all of which contribute substantially to closure project schedule acceleration.

Residue Processing

At Rocky Flats, residues are in the form of salts, ash, wet combustibles, dry combustibles, dry inorganics, sand, slag and crucibles, and fluorides. In 1995, there was an estimated 3 metric tons of plutonium contained in 106 metric tons of residue matrix needing to be processed. Because of the varying characteristics of the residues, each residue type requires some type of processing and repackaging to meet WIPP waste acceptance criteria and safeguards requirements.

Workers at Rocky Flats recently completed the processing and packaging of more than 315 kilograms of plutonium fluoride residues. Completion of the fluorides follows two other residue successes. Workers completed the processing of 3.4 tons of sand, slag and crucibles residues in July of 2001 and over 16 tons of salt residues in November 2000. As of December 31, 2001, 90 percent of the residues have been repackaged for transport to WIPP. The plan is to complete all residue processing and repackaging by May 2002.

Plutonium Stabilization and Processing System

Rocky Flats became the first site to have a fully functional 3013 stabilization and packaging system in the DOE complex on June 14, 2001, when the first can was processed. In one of the most challenging start-up projects ever attempted at Rocky Flats, this long awaited accomplishment came only after overcoming design, installation and operational obstacles. Both DOE-RFFO and Kaiser-Hill demonstrated that the PuSPS could be safely and compliantly operated in Building 371. DOE and the DNFSB gave start-up authorization to Kaiser-Hill on June 7, 2001. One week later, the first can was processed. Over the next year, plutonium metal and oxide which remain at Rocky Flats will be packaged into 50-year storage containers (3013s). PuSPS may process and package up to 1900 cans which will be transported to a DOE receiver site for interim storage pending final disposition. Operation of the PuSPS is currently scheduled to be completed by the end of 2002.

Waste Shipping

The Rocky Flats Closure Project entails the movement of tremendous quantities of special nuclear materials, radioactive and non-radioactive wastes, documents and property off site. In particular, the movement of radioactive wastes will be a significant undertaking over the next four and one-half years. As shown in Table I, significant progress has been made in the offsite shipment of these materials, but much remains to be completed. Kaiser-Hill has demonstrated the ability to rapidly increase the amount of waste shipped each year since assuming management operations at Rocky Flats.

Much of this progress was due to a number of changes instituted by Kaiser-Hill. Some of these changes included:

- A focused management effort to increase radioactive waste shipments and reduce per kilogram costs consistent with the change in the mission of the site to one of accelerated closure
- Implementation of a program to ship directly from the point of generation rather than from interim storage locations
- A move from 55-gallon drums to large, bulk-type waste containers
- Use of DOT's regulations for shipping "Surface Contaminated Objects" for the shipment of large quantities of the Site's low-level wastes
- Use of reusable IP2 containers to ship legacy low-level waste packed in wooden crates, eliminating the need for repackaging and the cost of containers
- Significantly improved assay capability

Additionally, Rocky Flats more than doubled its TRU Waste shipping capabilities recently with the completion of the Building 440 shipping facility, which was declared operational on November 30, 2001. The new facility adds two new shipping bays to the single bay being operated in Building 664. The additional capacity will allow Rocky Flats to achieve 15 shipments to WIPP per week, with sufficient redundancy in place to avoid possible delays in removing waste.

CLOSURE PROJECT CHALLENGES

Achieving the physical completion criteria in the closure contract would be immensely challenging under any timeframe. Kaiser-Hill and the Rocky Flats employees will be performing work the size and complexity of which has never been done anywhere in the world. Developing the technical approach for the closure project baseline required taking a different look at the entire project – including work scope,

critical path, activity sequencing, resource utilization, efficiency improvement, technology deployment, and fund availability – to formulate a plan that could get the job done safely by December 2006.

Key challenges of the Rocky Flats Closure Project arise from:

- The sheer volume of work to be accomplished in a short period of time
- The fact that nuclear D&D of this complexity has yet to be performed anywhere in the United States
- The waste shipping rate planned for the project has never been attempted in the DOE complex
- Kaiser-Hill’s commitment to maintain the highest safety standards while dramatically increasing work activity and facing increased hazards.

Safety Excellence

Continued recovery and future project success in meeting the contract's target cost and schedule date is keyed to maintaining the facilities in a safe and compliant operating mode. Ongoing, joint DOE-RFFO Kaiser-Hill operation of the Safety Assessment Center (SAC) continues to provide daily evaluation of safety and compliance incidents. Since its inception in May 2001, over 1,500 events have been evaluated for safety significance, causal factors and corrective actions. Through these evaluations, the SAC provides immediate feedback to the facility health and safety representatives, which helps prevent future occurrences. Kaiser-Hill continues to drive the completion of action items in the *Sitewide Safety Improvement Plan (SSIP)*. KH believes these actions are achieving lasting improvements in safety and compliance. Kaiser-Hill is more than 90 percent complete in implementing those action items, although it is expected that new items will be added as DOE RFFO and Kaiser-Hill jointly seek continuous improvement.

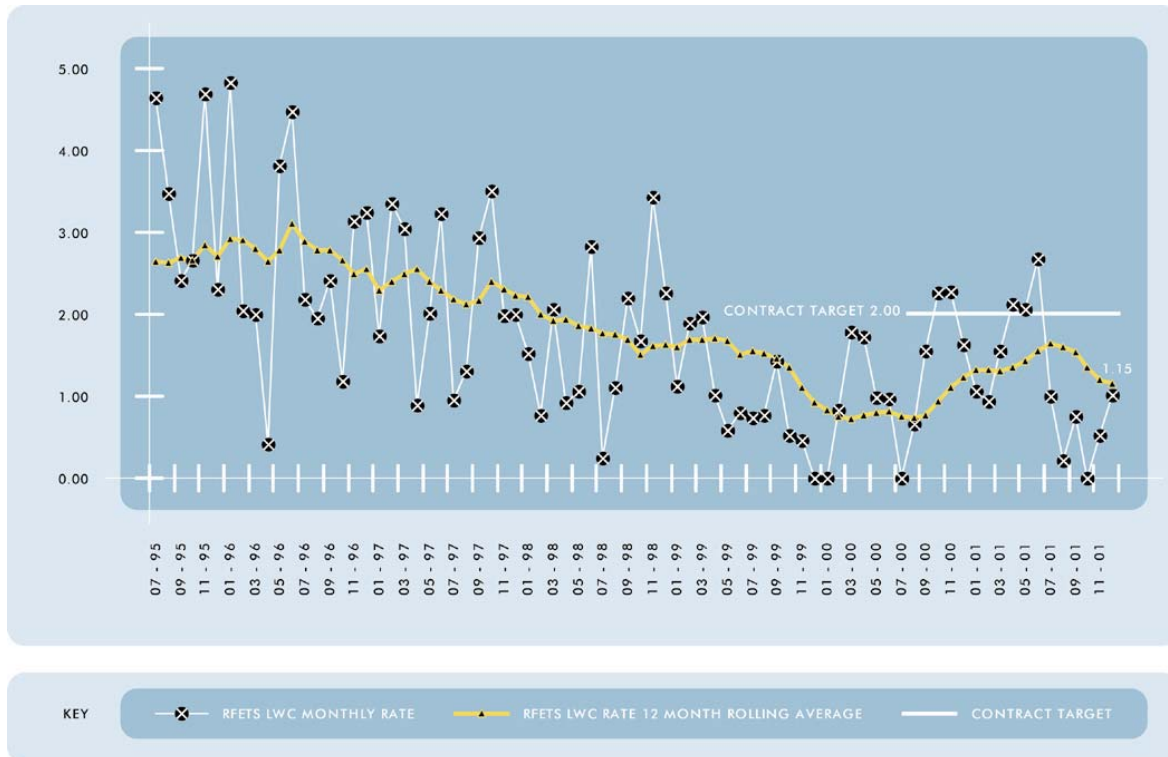


Fig. 4. Kaiser-Hill Safety Rates

Through the implementation of the SSIP, all projects have improved safety and procedural compliance awareness, processes and practices. Site leadership has focused the site on safety and compliance, the projects have carried that message to all levels, and the site has an ongoing strategy to continue this emphasis.

Nuclear Materials and Waste Shipping

Throughout the Rocky Flats Closure Project, more than 20 metric tons of special nuclear materials and more than 240,000 cubic meters of radioactive waste will be packaged and shipped off site. Nuclear materials still to be shipped off site include plutonium metals and oxides, eU and some composite materials. Wastes to be shipped off site include transuranic, low-level, low-level mixed, hazardous and sanitary wastes. Wastes to be generated will include contaminated building debris, contaminated soils from environmental cleanup, and repackaged residue wastes. In total, nearly 11,000 truckloads of waste and nuclear materials are expected to leave Rocky Flats between February 1, 2000, and December 15, 2006. In addition to waste and special nuclear materials, Rocky Flats must also disposition hundreds of thousands of pieces of government property, tens of thousands of classified documents, and thousands of containers of chemicals.

Between now and 2006, dozens of trucks each week will be headed from Rocky Flats to receiver sites in at least six states. The logistical coordination of these shipments requires a complex degree of planning, integration, and coordination at a sitewide, statewide and national level. Each of the many receiver sites must be made available and remain open to receive Rocky Flats' nuclear materials and waste.

Key shipping challenges facing Rocky Flats include:

Special Nuclear Materials

Rocky Flats continues to store significant quantities of special nuclear materials consisting mostly of plutonium and enriched uranium. These materials must be packaged in DOE-prescribed packaging and then shipped to DOE receiver sites. A key closure strategy developed by Kaiser-Hill relies on all special nuclear materials being removed from the Site no later than January 2003. Removal of these materials allows the closure of the Site's Protected Area to occur with a concomitant reduction in safeguards and security costs. Kaiser-Hill has estimated that closure of the Protected Area will result in subsequent, annual savings in excess of \$30 million per year. These savings have already been accounted for in Kaiser-Hill's closure project baseline and will be used to accelerate nuclear facility D&D, as well as waste shipping.

The site faces two major challenges to the timely removal of special nuclear materials. First, certified DT-22 containers will be needed to ship some of the other special nuclear materials stored at the site. The second major challenge is the timely availability of DOE receiver sites for Rocky Flats' special nuclear materials. Although DOE has designated receiver sites for these materials, the readiness of these facilities to receive the materials is in question.

To address these challenges, DOE EM and DP are jointly working to accelerate the certification of the shipping containers to ensure that these containers are available when needed. Additionally, DOE and Kaiser-Hill are jointly developing detailed, integrated project plans so that containers and receiver sites needs are understood. These plans will also enable the development of contingency plans, if needed, and enable decision-making.

Transuranic Waste

The designated receiver site for DOE's transuranic waste is the Waste Isolation Pilot Plant (WIPP), located near Carlsbad, New Mexico. Kaiser-Hill completed the first shipment of Rocky Flats transuranic waste to WIPP in June 1999. As of December 31, 2001, Kaiser-Hill has made 280 shipments of TRU waste to WIPP.

The closure project is generating transuranic waste through its residue repackaging program and its facility D&D activities at rates faster than it can be shipped to WIPP due mainly to limited availability of TRUPACT-II vessels. To address this challenge, DOE has ordered additional TRUPACT IIs via two suppliers. Additionally, high-volume, bulk-shipping options are being investigated to meet the transuranic waste shipping forecast.

Low-Level Mixed Waste

Kaiser-Hill estimates that approximately 45,000 cubic meters of low-level mixed waste will be generated from February 1, 2000, until closure. Much of this waste will come from environmental remediation activities (contaminated soils) and nuclear facility D&D activities. Currently, there are no DOE or commercial facilities for disposal of low-level mixed wastes above 10 nanocuries per gram. Further, before these wastes can be disposed, they must be treated to meet the requirements of the Resource Conservation and Recovery Act. Only a few low-level mixed waste streams can be treated by DOE or commercial facilities, leaving a large amount of waste that has no treatment option.

These challenges are being addressed by:

- DOE, pursuant to the NEPA Waste Management Record of Decision, is pursuing low-level mixed waste disposal options at the Nevada Test Site and the Hanford Site
- DOE and Kaiser-Hill are jointly developing detailed, integrated project plans for low-level mixed waste treatment so that the future actions are defined, costed and scheduled
- Kaiser-Hill is continuing to search for (and use) commercial capacity to treat some of the site's low-level mixed wastes

THE OUTLOOK FOR SUCCESS IN 2006

Despite the present and future challenges facing the project, Kaiser-Hill remains optimistic about the probability for success in 2006 as demonstrated by the following:

- The continued emphasis of the "Safety First" working culture, the implementation of the Site Safety Improvement Plan, and the daily operation of the Safety Assessment Center has led to safety and procedural compliance improvements at all levels of the project.
- The improved safety awareness has directly contributed to productivity gains as all the major nuclear buildings were operational during the quarter.
- The forecasted project completion date in the project's integrated, logic-based critical path schedule is December 12, 2006.