ADDING VALUE BY USING AN INNOVATIVE APPROACH: RECYCLING AND DISPOSAL OF ASHLAND FUSRAP MATERIALS AT A LICENSED URANIUM MILL

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ABSTRACT

During World War II, the Manhattan Engineering District (MED) utilized facilities in the Buffalo, N.Y. area to extract natural uranium from uranium-bearing ores. Some of the sandy byproduct material left from the ores (MED byproduct), containing low levels of uranium, thorium, and radium, was deposited on land currently owned by the Ashland Oil Company, now known as Ashland 1. Some of the same material was later moved to a nearby disposal site known as Ashland 2. Both sites are in Tonawanda, New York. The mixing of this byproduct with soil ultimately increased the volume of radiologically contaminated soil. Tasked to clean up MED waste sites throughout the United States under the Formerly Utilized Sites Remedial Action Program (FUSRAP), the U.S. Department of Energy (DOE) conducted several site investigations, and evaluated remedial alternatives, during the 1980s and early 1990s. In 1993, the DOE proposed a solution for its Tonawanda, New York sites that involved on-site containment of the radiologically emplaced material. Due to overwhelming public opposition to this plan, it was not implemented and other alternatives were investigated.

In FY 1998, Congress transferred the cleanup management responsibilities to the United States Army Corps of Engineers (USACE, or the Corps) with the charge to commence cleanup promptly. USACE worked with the local community near the Tonawanda site, and after considering public comment, selected the remedy calling for removing soils that exceed the site-specific cleanup standard, and transporting the contaminated material to an off-site location licensed to manage this type of material. The selected remedy is protective of human health and the environment, complies with Federal and State requirements, and meets commitments to the community.

As a rule, the Corps performs a formal Value Engineering (VE) Study on all projects with cost estimates greater than $2 million. A proposal to consider recycling of FUSRAP 11e.(2)-like uranium byproduct materials, as an option to direct disposal, was proffered in a FUSRAP VE study in 1998. Consistent with this proposal, the contractor selected to perform the cleanup activities, IT Corporation (IT), the Total Environmental Remediation Contractor (TERC) for the USACE in the region, was tasked to provide the best value clean-up results that meet all of the criteria established in the Record of Decision for the site. To this end, rather than focusing solely on disposal-only options, IT also evaluated options that included possible beneficial reuse; effectively reducing the cost associated with disposal as well.

During the solicitation process, International Uranium (USA) Corporation (IUC), the operator of the White Mesa Uranium Mill, a Nuclear Regulatory Commission (NRC)-licensed mill near

Blanding, Utah, responded with a proposal to perform uranium extraction on the excavated materials. The Mill's proposal was selected as the best value as it provided beneficial use of the material consistent with the Resource Conservation and Recovery Act (RCRA) intent to encourage recycling and recovery, while also providing the most cost-effective means of material disposal. Such recycling encourages conservation of energy and natural resources, while realizing the benefit of reduced disposal costs.

Remediation of the Ashland 2 site began in spring of 1998. Excavation and shipment of material from the Ashland 2 site continued through February 1999, and recycling of the material commenced November 16, 1998 after a majority of the material had been received at the Mill, and ended in the first quarter of 1999. Remediation of the Ashland 1 site began in mid-June of 1999, and shipment of material will continue through spring of 2001. Recycling of the material is currently expected to commence in mid-2001.

Challenges that were met for the Ashland 2 project, and are being met to implement the Ashland 1 project include: (1) identifying the best-value location to accept the excavated material; (2) meeting regulatory requirements, through IUC obtaining an NRC license amendment to accept and process the material as an alternate feed in a licensed uranium mill; (3) excavating and preparing the material for shipment, then shipping the material to the Mill for uranium recovery; and (4) processing the material, followed by disposal of tailings from the process in the Mill's NRC-licensed uranium tailings facility as 11e.(2) byproduct material. For the Ashland FUSRAP sites, the Corps is meeting these challenges while remediating the sites in an environmentally protective and safe manner, and gaining the added value of environmental and cost benefits of using recycling as an alternative to direct disposal. In addition, use of the VE concept is expected to result in a total avoidance of $15 to $20 million in additional Federal taxpayer costs, while reducing the radioactivity of the byproduct requiring disposal, and providing for environmentally protective disposal of such byproduct.

INTRODUCTION

During World War II, the Manhattan Engineering District (MED) utilized facilities in the Buffalo, N.Y. area to extract natural uranium from uranium-bearing ores. Some of the sandy byproduct material left from the ores (MED byproduct), containing low levels of radioactivity, was deposited on land currently owned by the Ashland Oil Company. As part of a facility expansion between 1974 and 1982, approximately 6,000 cubic yards of the deposited MED byproduct, containing thorium, uranium, and radium, was moved from the first site, now known as Ashland 1, to a new disposal area, now known as Ashland 2. However, the placement of MED byproduct at the Ashland 1 site left an area of radiological contamination to be removed from the site. In addition, other construction activities were undertaken over the intervening years further mixing the MED byproduct with soil. These activities ultimately increased the volume of radiologically contaminated soil significantly.

The U.S. Department of Energy (DOE) was tasked to clean up MED waste sites throughout the United States under the Formerly Utilized Sites Remedial Action Program (FUSRAP). During the 1980s and early 1990s, the DOE conducted several site investigations and evaluated remedial alternatives. In 1993, the DOE proposed a solution for its Tonawanda, New York sites that involved on-site containment of the radiologically emplaced material. Due to overwhelming public opposition to this plan, it was not implemented and other alternatives were investigated. In FY 1998, Congress transferred the cleanup management responsibilities to the United States Army Corps of Engineers (USACE, or the Corps) with the charge to commence cleanup promptly.

PROJECT OVERVIEW

USACE worked with the local community near the Tonawanda site, and after considering public comment, selected the remedy known as Alternative 2A in the Proposed Plan. A Record of Decision (ROD) for the Ashland 1 and 2 sites was signed on April 20, 1998. The chosen remedy calls for the removal of soils that exceed 40-picocuries/gram (pCi/g) thorium(230). The soil exceeding the cleanup standard was to be transported to an off-site location that was licensed to manage this type of material. The selected remedy is protective of human health and the environment, complies with Federal and State requirements, and meets commitments to the community.

U.S. Army Corps of Engineers Value Engineering Approach

As a rule, the Corps performs a formal Value Engineering (VE) Study on all projects with cost estimates greater than $2 million. A proposal to consider recycling of FUSRAP 11e.(2)-like uranium byproduct materials, as an option to direct disposal, was proffered in a FUSRAP VE study in March of 1998. Consistent with this proposal, the contractor selected to perform the cleanup activities, IT Corporation (IT), who is the Total Environmental Remediation Contractor (TERC) for USACE in the region, was tasked to provide the best value clean-up results that met all the criteria established in the ROD. To this end, rather than focusing solely on disposal-only options, USACE and IT also evaluated options that included possible beneficial reuse; effectively reducing the cost associated with disposal as well.

During the solicitation process, International Uranium (USA) Corporation (IUC), the operator of the White Mesa Uranium Mill, a Nuclear Regulatory Commission (NRC)-licensed mill near Blanding, Utah, responded with a proposal to perform uranium extraction on the excavated materials. The Mill's proposal was selected as the best value as it provided beneficial use of the material consistent with the Resource Conservation and Recovery Act (RCRA) intent to encourage recycling and recovery, while also providing the most cost-effective means of material disposal. Such recycling encourages conservation of energy and natural resources, while realizing the benefit of reduced disposal costs.

Ashland 2 and Ashland 1 Remediation Schedules

Remediation of the Ashland 2 site began in mid-May of 1998, with excavation of the soil commencing on July 10, 1998. On July 24, 1998, the first flatbed rail car left the Ashland 2 site bound for the Mill, carrying approximately 80 tons of MED-contaminated soils in four intermodal containers. Excavation and shipment of material from the Ashland 2 site continued through February 1999, and recycling of the material commenced November 16, 1998 after a majority of the material had been received at the Mill and ended first quarter 1999. Remediation of the Ashland 1 site began in June of 1999, with excavation of the soil commencing on 14 June. On 22 June, the first flatbed rail car left the Ashland 1 site bound for the Mill, carrying 88 tons of MED-contaminated soils in four intermodal containers. Excavation and shipment of material from the Ashland 1 site is ongoing, with nearly 123,000 CY of material shipped by December of 2000. Shipments are expected to be completed near the end of the first quarter of 2001 and recycling of the material is currently expected to commence in mid-2001, after all of the Ashland 1 material has been received at the Mill.

Details of these uranium recycling and byproduct disposal projects include (1) meeting regulatory requirements through IUC obtaining NRC license amendments to accept and process the material as alternate feed in a licensed uranium mill; (2) identifying the best-value location to accept the excavated material; (3) excavating and preparing the material for shipment, then shipping the material to the Mill for uranium recovery; and (4) processing the material, followed by disposal of tailings from the process as 11e.(2) byproduct material in the Mill's NRC-licensed uranium tailings facility. Processing of the Ashland 2 and Ashland 1 FUSRAP materials at the White Mesa Mill is yielding substantial cost avoidance, beneficial recovery of source material, and environmentally protective disposal of byproduct material.

ORIGIN AND HISTORY OF THE ASHLAND 2 AND 1 FUSRAP MATERIALS

During World War II the MED utilized the Linde facility in Tonawanda, N.Y. to extract natural uranium from uranium-bearing ores. Some of the sandy MED byproduct material left from the ores, containing low levels of radioactivity, was deposited on land currently owned by the Ashland Oil Company. As part of a facility expansion between 1974 and 1982, approximately 6,000 cubic yards of the deposited MED byproduct, containing low levels of thorium, uranium, and radium, was moved from the first site, known now as Ashland 1, to a new disposal area, now known as Ashland 2. However, the placement of MED byproduct at the Ashland 1 site left an area of radiological contamination to be removed from the site. In addition, the mixing of the byproduct with soil as it was moved ultimately increased the volume of radiologically contaminated soil at both of the Ashland sites.

DESCRIPTION OF THE MATERIAL

The material is a predominately granular soil situated above the native clay soil and the water table. Radioisotopes, including thorium at levels up to 3,200 pCi/g at Ashland 2 and 16,750 pCi/g at Ashland 1; and uranium at levels up to 800 pCi/g at Ashland 2 and 1,575 pCi/g at Ashland 1; were distributed throughout four- and six-acre sites at depths as great as 12 and 11 feet at Ashland 2 and 1, respectively. Interspersed throughout the thorium- and uranium-contaminated material at Ashland 2 and 1 was radium at levels averaging about 150 and 225 pCi/g, respectively. In order to both expedite and enhance the precision of excavation, the decision was made to use radium as a surrogate, as it was more identifiable using real-time field instruments, and to follow up with analytical tests.

During excavation at Ashland 2, as was anticipated in the Remedial Investigation (RI) Report and in the excavation plan, portions of the site were found to contain some debris or oily-appearing wastes. The debris consisted of concrete, tires, hoses, boards, and drums. The oily-appearing material was examined and determined to be oil and asphalt by-products. It was also determined that none of this material met the regulatory definition of being "listed" hazardous waste under RCRA. The implication of this determination is discussed below under "Regulatory Considerations".

The total volume of soil that was excavated and shipped from Ashland 2 was approximately 44,500 CY, while the total from Ashland 1 will be approximately 127,000 CY.

REGULATORY CONSIDERATIONS

Regulatory issues included amendment of the Mill's NRC license to accept these alternate feed materials, and a review of the data on hazardous constituents potentially in the materials.

NRC Guidance for Acceptance of Alternate Feed at Licensed Uranium Mills

On August 15, 1997, the NRC issued its "Final Position and Guidance on the Use of Uranium Mill Feed Material Other Than Natural Ores" ("Alternate Feed Guidance"). Under this policy the NRC permits licensees to process alternate feed material (material other than natural ore) in uranium mills provided that:

- The feed material meets the definition of "ore" which is "a natural or native matter that may be mined and treated for the extraction of any of its constituents or any other matter from which source material is extracted in a licensed uranium or thorium mill". This would include processing ores that have been previously beneficiated for other minerals and which are now outside of the owner's legal or technical ability to further process.
- The feed material does not contain listed hazardous waste. Environmental Protection Agency (EPA) regulations that implemented RCRA exempt those potential alternate feed materials that exhibit only a characteristic of hazardous waste (ignitable, corrosive, reactive, toxic) from hazardous waste classifications by providing that byproducts that are being reclaimed are not regulated as hazardous waste (40 CFR 261.2c(3)).
- The ore is being processed primarily for its source material content. Recent judicial pronouncements have held that an ore is being processed primarily for its source material content if it is being processed at a licensed uranium mill and it is reasonable to expect that uranium will be extracted from the material.

The White Mesa Mill, for example, processes "natural" (i.e., mined, native) uranium ores, and uranium-bearing "alternate feed materials" for recovery of uranium, often followed by recovery of additional minerals. These alternate feed materials are generally processing byproducts from other extraction procedures. For the Ashland FUSRAP materials, the NRC granted IUC amendments to the Mill's NRC license for these particular alternate feeds in June of 1998 and February of 1999. This feed-specific amendment approach is being revised to a more flexible, performance-based acceptance standard. This will eliminate the need for individual amendments such as those obtained for the Ashland FUSRAP materials.

Review of Hazardous Constituent Data

Extensive testing was conducted and historical documents were reviewed to determine if the Ashland 2 and Ashland 1 materials had the potential to be listed or characteristic wastes under RCRA. The results, which were coordinated with both the New York State Department of Environmental Conservation and the Utah Department of Environmental Quality, resulted in a determination that no RCRA regulated material was shipped to IUC. While EPA regulations that implement RCRA would have allowed characteristic waste to be processed at the Mill (RCRA allows for processed byproduct material to be exempt from hazardous waste requirements because it is being recycled or reclaimed) the determination that the Ashland FUSRAP materials did not fall into this category was further evidence of the environmental protectiveness of this disposal option.

COST CONSIDERATIONS

For these two projects, IT was challenged by USACE to develop cost-effective and timely disposal options as part of the site cleanup. The first step was to identify licensed disposal locations in the U.S., along with their disposal criteria. During the solicitation process, the idea of looking at innovative locations or methods was pursued. The material to be removed from the Ashland FUSRAP sites had several limiting characteristics. The first was that the soils could not be treated at the site, so any treatment, if it were to be performed, would have to take place elsewhere. Second, the range of thorium contamination varied from levels as low as 35 pCi/g to as high as 16,750 pCi/g, which, when combined with the added content of lower levels of uranium and radium, limited the number of sites in the United States capable of accepting the material from these two sites. Through interaction with IUC, it was discovered that they could process these waste streams for the purpose of uranium recovery, and then dispose of the resulting tailings as 11e.(2) byproduct material in their fully lined, NRC-licensed disposal facility. In separate solicitations for each of the two sites, IT requested proposals from five vendors in the U.S., and IUC provided the best value. Also, the opportunity to reduce the overall radioactive constituents in the final disposal location was considered to provide an alternative that is better for the environment.

During the excavation process at Ashland 2, areas that appeared to be oily were observed in the soil. Further investigation revealed that during the past years, oil refinery byproducts and asphalt had been deposited adjacent to, and partially into, the same area as the MED material. In accordance with the Sampling and Analysis Plan (SAP), confirmatory sampling was conducted. The analyses provided data sufficient to conclude that the chemical constituents were not indicative of the presence of listed hazardous waste; therefore, as discussed below under regulatory considerations, recycling and disposal at IUC was allowed for the soil materials affected by these constituents. As excavation continued at both sites, a sizable amount of debris (concrete, tires, wood, etc.) was encountered. As the IUC Mill is capable of processing and handling certain forms of debris, no major changes in the disposal option were necessary for management of a significant portion of the debris. The costs also remained the same. Also, there are no restrictions imposed by the Mill on the moisture content of the material, provided that the materials were shipped in accordance with DOT requirements. There are also no surcharges relating to moisture content.

After all the materials were transported to IUC for processing, the savings associated with IUC's ability to accept different categories of material from Ashland 2 were tabulated. The cost avoidance to the government ranged from $12 to $16M when compared to the direct-disposal options. In addition, after all the Ashland 1 materials have been transported to IUC for processing, the savings associated with IUC's ability to accept different categories of material will be tabulated, and it is expected that the cost avoidance to the government should range from $3 to $4M when compared to the direct-disposal options.

EXCAVATION, TRANSPORTATION, RECEIVING, AND STORAGE

Upon receipt of the NRC license amendments, the shipping and manifesting requirements could be simplified. As the material was classified as an alternate feed source, the transportation requirements followed where those in 29 CFR. The shipping requirements were streamlined to meet the needs of 29 CFR and IUC. Both needs were met using less paperwork with fine-tuned data, thus saving many man-hours on the projects, while still ensuring safe transport of the materials. In addition to transportation requirements, operations at the Ashland sites had to meet all water and air emission standards. Full time air monitoring stations were established, and soil and erosion control measures were undertaken to preclude any runoff problems. Half-acre decontamination areas were established in the work zones to clean equipment. Most importantly, all aspects of human health and safety requirements were established and enforced.

Workers involved in excavation wore radiation monitors. In addition, the entire sites were surrounded by full-time air monitoring equipment to confirm that the construction process generated no off-site exposures. Decontamination trailers were established for access and egress into the excavation locations. Also, the sites were secured by a guard force and an eight-foot chain link fence. These jobs are being completed with no lost time accidents, and with all regulatory requirements being met.

The excavation task at the Ashland FUSRAP sites was straightforward. First, the sites were radiologically surveyed, and as per the SAP, an additional 15 surface soil samples were taken from each site to confirm the field survey findings and the absence of listed hazardous chemical contamination. Construction of soil and erosion control structures, haul roads, perimeter air sampling systems, a load out pad, and decontamination pads were completed. Excavation then began in lifts using rough terrain excavators and off-road dump trucks.

After scanning confirmed no external contamination, the soil was transported using off-road dump trucks via constructed haul roads to the rail site approximately one-half of a mile away. A concrete and asphalt loading facility was constructed along a rail spur to speed the loading and unloading of intermodal containers. The rail spur was used for both Ashland 2 and 1 and was dedicated to construction activities. Prior to loading each intermodal container, a radiation analysis of the soil was conducted by the on site field laboratory and a bill of lading for each container was developed in accordance with 29 CFR. As noted above, the soil was shipped as alternate feed material rather than waste. The designation of alternate feed material allows for a simpler streamlined shipping documentation system that results in secondary cost savings, while still ensuring safe transport of the material.

The soil is transported by rail to off-load sites in southern, Utah and trucked to the White Mesa Mill near Blanding, Utah for processing. A round trip per rail car averages about 23 days. An added benefit of this rail transport scenario is that no demurrage results due to the quick off-load and reload of intermodal containers at the Utah site.

The SAP includes confirmatory sampling of each 500 CY of excavated soil to ensure that the material contains no listed hazardous wastes. IUC also conducts confirmatory sampling of the material received at the Mill to confirm the absence of listed hazardous wastes, at a frequency of one sample per 100 CY for the first 1,000 CY, and thereafter at a rate of one sample per 500 CY.

Chemical and radiological data collected are provided to IUC and to the State of Utah. The total amount of soil shipped from Ashland 2 was approximately 44,500 CY, and for Ashland 1 may be approximately 127,000 CY, with the last of the soil expected to be excavated and shipped by spring of 2001. Following completion of the excavation of Ashland 2, the site was sampled to confirm adherence to the ROD, and then backfilled and seeded. The State of New York Department of Environmental Control was provided split samples for their independent analysis of the excavated areas. The Corps was a joint participant in the final status survey using the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) method prior to backfill activities. In accordance with the USACE construction quality control program, IT completed their initial quality control walk-over and MARSSIM analysis and the Corps performed a QA evaluation process. The multiple reviews and checks ensure that the site meets the ROD requirements and a final status survey report is then made. The foregoing is also currently being performed at the Ashland 1 site as portions of the excavation are completed.

Intermodal containers received at the White Mesa Mill are weighed and stockpiled into 500 CY lots for sampling and analysis. Containers are lined with a 3-mil plastic liner to aid in containment of the soil and assist in protection of the container shell, which ultimately makes decontamination of the container easier. In addition to the confirmatory sampling described above to ensure that the material contains no listed hazardous waste, individual 500 CY lots are sampled and analyzed for constituents that could pose unforeseen problems in the milling process. Samples are also obtained to conduct amenability tests to determine processing conditions.

MILL PROCESS

The White Mesa Mill was permitted and constructed in the early 1980s, originally to process uranium and vanadium ores from the historic Colorado Plateau mining district, and later from the high-grade breccia pipe mines in northern Arizona. Throughout its operating history, the Mill has demonstrated the flexibility to adapt to wide variations in ore grades and processing parameters, resulting in exceptional recoveries of uranium and vanadium values from over three and one-half million tons of native ores. The Mill circuit can operate at leach temperatures up to 90 degrees centigrade and pH levels as low as 0.5, utilizing sulfuric acid. More recently, the Mill has demonstrated recoveries of 90 percent of contained tantalum/niobium values using a combination of sulfuric and hydrochloric acid leach. The Mill has eight high capacity thickeners, which are capable of being configured into groups or series of parallel stages. Three separate solvent extraction (SX) circuits and an ion exchange (IX) circuit are capable of handling aqueous flows up to 800 gallons per minute. Final products can be dewatered, dried, or calcined at temperatures up to 650 degrees centigrade. The Mill is operated by a seasoned professional and operations staff, some of whom have been at the facility since its startup in spring of 1980.

Amenability Testing

Soil samples are tested to determine the optimum processing conditions for recovery of uranium values. Based on IUC's prior Ashland 2 experience and amenability testing that has been done on Ashland 1 material, the material will be treated using a sulfuric acid leach with moderate heat. Leach solutions will be washed and then the uranium recovered through a resin IX system. Based on the Ashland 2 experience, IX is more effective than the SX process.

Process Description

The soil (ore) material is introduced into the milling process by use of a trommel screen which breaks up large lumps and washes and removes any organic material. The ore from the trommel screen is then pumped to the pulp storage tanks at a 35-50% density, by weight. The ore slurry is then leached for approximately 2-4 hours in an atmospheric leach utilizing sulfuric acid. The slurry is then transferred to liquid/solid separation where the solids are washed and discharged to the tailings ponds at 30-40% density. The solution bearing the uranium values is clarified and then fed to the IX circuit, where the uranium values are further concentrated and purified. The concentrated strip solution from the IX circuit is neutralized with anhydrous ammonia to precipitate the uranium values. The precipitated uranium is then dewatered and calcined to make a U_3O_8 product.

By product Management

Waste streams that result from the ore processing are discharged from the washing circuit in the form of a 30- to 40-percent solid/liquid slurry. The slurry is pumped to the Tailings Management System where the solids are allowed to settle and the liquids are evaporated or recycled back to the Mill for use as wash water. Liquid tailings from the IX circuit are also pumped to the tailings system and evaporated or recycled.

Long-Term Care and Monitoring

The tailings or wastes generated during the process will be disposed of as 11e.(2) byproduct material in impoundments which are subject to stringent regulatory criteria set forth in 10 CFR Part 40, Appendix A.. These requirements conform to EPA's active mill tailings site regulations set forth at 40 CFR Part 192. The Appendix A criteria impose soil and groundwater protection standards for radioactive and nonradioactive (hazardous) waste constituents that provide protection equivalent to that provided by RCRA. Indeed, with respect to potential impacts of byproduct material to groundwater, the White Mesa Mill tailings facility offers an exceptional degree of protection in that these uranium mill tailings impoundments are separated from the nearest aquifers by at least 1,000 feet of impermeable rock. In addition, the long-term management and monitoring of uranium mill tailings facilities is regulated under the Uranium Mill Tailings Radiation Control Act (UMTRCA), which requires measures sufficient to provide reasonable assurance of stability without active ongoing maintenance for at least 200 years and as long as 1,000 years, far beyond the regulatory horizon of RCRA. Unlike RCRA facilities, UMTRCA requires that upon closure, title and custody of the 11e.(2) byproduct material impoundments will be transferred to the DOE (or the State) which, in turn, will become an NRC licensee with the primary responsibility for perpetual maintenance and surveillance of such sites. As of this time, no State has expressed any interest in accepting custody to 11e.(2) tailings sites, so it is highly likely that the DOE will become the long-term custodian and licensee of such sites. Post-closure funds will be transferred from the NRC to the DOE at the time of the license transfer, providing a long-term surveillance fund for perpetual management and monitoring, at no cost to the Government.

EMPLOYEE RADIATION SAFETY

Because the level of radiological components in these FUSRAP ores are no greater than in conventional uranium/vanadium ores and other alternate feed materials that the Mill processes, no extraordinary health and safety precautions beyond the existing Radiation Health and Safety Program are required. The normal programs include monitoring and control of dust on the ore pad and continuous monitoring of employees for exposures throughout the milling process.

SUMMARY AND CONCLUSIONS

After the DOE experienced overwhelming public opposition to the 1993 proposed plan for on-site containment of the radiologically emplaced material at the Tonawanda sites, other alternatives were investigated. Working with the public, the USACE selected a remedy that gained public support and positive involvement by the local community, and that is protective of human health and the environment, complies with Federal and State requirements, and meets commitments to the community. This commitment required that the soil not be treated at the site, so any treatment, if it were to be performed, would have to take place elsewhere. However, the large range of radionuclide contamination levels limited the number of sites in the United States capable of accepting the material.

A proposal to recycle FUSRAP 11e.(2)-like uranium byproduct material was proffered in a FUSRAP Value Engineering study in March 1998. Consistent with this proposal, alternatives to direct disposal were investigated by IT and the Buffalo District for these projects. IT was tasked to provide the best value clean-up results that meet all the criteria established for the site. IT met this objective by not focusing solely on disposal-only options, but by also evaluating options that included possible beneficial reuse; effectively reducing cost associated with the disposal as well. By exploring options, IT located a means by which to process the waste streams at a licensed uranium mill for the purpose of uranium recovery, and then dispose of the byproduct in the Mill's fully-lined, NRC-licensed disposal facility. Recycling the Ashland FUSRAP materials through a licensed uranium mill was selected as the best value as it provided beneficial use of the material consistent with RCRA's intent to encourage recycling and recovery, while also providing the most cost-effective means of material disposal. Such recycling encourages conservation of energy and natural resources, and realizes the benefit of reduced disposal costs. For the Ashland FUSRAP sites, use of the VE concept avoided approximately $15 to $20 million in additional Federal taxpayer costs, while reducing the radioactivity of the byproduct requiring disposal, and providing for environmentally protective disposal of such byproduct. The Corps was able to use the savings to expediate remediation of the Ashland 1 and 2 FUSRAP materials. In addition, more than three times the volume of contaminated material was remediated at the Ashland 2 site, as compared to initial estimates, with less than a 50 percent increase in cost.

Challenges that were overcome to complete these projects included (1) meeting regulatory requirements through IUC obtaining an NRC license amendment to accept and process the material as an alternate feed in a licensed uranium mill; (2) identifying the best-value location to accept the excavated material; (3) excavating and preparing the material for shipment, then shipping the material to the Mill for uranium recovery; and (4) processing the material, followed by disposal of tailings from the process in the Mill's NRC-licensed uranium tailings facility. These challenges are being met with no lost-time accidents, while gaining the added value of environmental and cost benefits of using recycling as an alternative to direct disposal.