

## THE URANIUM MILL TAILINGS REMEDIAL ACTIONS PROJECT:

### A PROGRESS REPORT ON DOE'S CLEANUP PROGRAM

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#### ABSTRACT

In late 1978, Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." Title I of the Act instructed the Department of Energy to perform remedial actions at designed inactive uranium mill tailings sites.

The Department established the Uranium Mill Tailings Remedial Actions (UMTRA) Project Office to implement remedial actions at twenty-four (24) sites, in cooperation with the affected States, Indian tribes, Nuclear Regulatory Commission, and owners of the sites. The UMTRA Project Office began remedial actions at the first site in 1983, and all sites are planned to be cleaned up by 1993. Numerous vicinity properties located near the designated sites are also undergoing remedial actions. All of this work is being performed in accordance with Environmental Protection Agency cleanup standards.

#### INTRODUCTION

In November 1978, the U.S. Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978". Title I of the law instructed the Department of Energy (DOE) to stabilize and control the uranium mill tailings at selected inactive sites in a safe and environmentally acceptable manner. The Act directed the DOE to perform remedial actions in cooperation with the affected States and Indian tribes.

The Act stated that the remedial actions are to be performed in accordance with standards issued by the Environmental Protection Agency (EPA) and the licensing requirements of the Nuclear Regulatory Commission (NRC). The EPA issued the final remedial action standards in January 1983 and they became effective two months later. The Act included a provision that DOE is to complete the total remedial action program within seven years of the effective date of the standards, i.e., March 1990. However, due to budget restraints, DOE will be unable to complete the program in 1990. Hence, Congress is being requested to extend the life of the project until 1993 in order that all sites can be cleaned up. DOE provides ninety percent of the funds for remedial action, with the affected States paying the remaining costs. When remedial actions are performed at sites on Indian tribal lands, however, 100 percent of the costs are borne by the Federal Government.

Twenty-four inactive uranium mill tailings sites were designated by the DOE as eligible for remedial actions under Public Law 95-604. The sites are: Canonsburg, Pennsylvania; Salt Lake City and Green River, Utah; Riverton and Spook, Wyoming; Lowman, Idaho; Belfield and Bowman, North Dakota; Lakeview, Oregon; Ambrosia Lake, New Mexico; Monument Valley, Mexican Hat and Shiprock on the Navajo Indian Reservation; Tuba City on the Navajo and Hopi Indian Reservations; Durango, Grand Junction, Gunnison, Maybell, Naturita, New Rifle, Old Rifle, Slick Rock (UC) and Slick Rock (NC), Colorado; and Falls City, Texas. In addition, the DOE is responsible for cleaning up the contaminated vicinity properties around these 24 sites as well as the vicinity properties at Edgemont, South Dakota. Vicinity properties are defined as

properties contaminated with radioactive materials originating from the designated tailings sites.

The DOE established the Uranium Mill Tailings Remedial Actions Project Office (UMTRA-PO) in Albuquerque, New Mexico to implement the Congressional mandate of Public Law 95-604. The Project Office has two main contractors which are providing assistance in carrying out the Project. Jacobs Engineering is the Project's Technical Assistance Contractor (TAC) and Morrison Knudsen-Ferguson is the Remedial Action Contractor (RAC). The TAC provides support services to the Project Office, e.g., preparing conceptual and preliminary designs, developing conceptual plans and remedial action plans, gathering and analyzing additional data, preparing the environmental documents and providing public information on the Project. The RAC develops the final designs and engineering specifications, issues construction contracts and performs the construction management activities.

#### EPA and NRC Requirements

In early 1983, the EPA issued the standards which govern the disposal of residual radioactive materials from inactive uranium processing sites. For the stabilized tailings pile, the radon emissions are not to exceed 20 picocuries/meter<sup>2</sup>/second. The disposal of the radioactive material must be done in such a manner that there is a reasonable expectation that the limits in the standards will be maintained for at least 200 years and preferable 1,000 years. In addition, the EPA issued final standards for cleaning up buildings and open lands that were contaminated with tailings. Finally, the EPA did not issue numerical ground or surface water standards or limits, but instead the agency allowed the use of applicable Federal and State regulations and site specific considerations to govern water protection measures. However, in September 1985, the Tenth Circuit Court of Appeals remanded the water protection portion of the inactive tailings standards. The Court directed the EPA to issue general application standards, thereby basically eliminating the use of site specific standards. In order to continue Project progress, the DOE has developed an interim plan to deal with water protection at the remedial action sites pending EPA promulgation

of new regulations. Basically, the DOE will use the numerical concentration limits originally proposed in the draft Title I regulations, except for the elements of uranium and molybdenum. Since there are no Federal drinking water standards for uranium and molybdenum, the DOE will use State drinking water standards for these two elements. If State standards do not exist, the State, NRC and EPA will be consulted regarding acceptable limits for these constituents.

The NRC is also involved in establishing requirements for remedial actions. The NRC concurs in all major remedial action decisions and will issue a license for the maintenance and monitoring of UMTRAP disposal sites.

#### Cooperative Agreements

Prior to performing engineering design and remedial actions at a particular tailings site, a Cooperative Agreement must be developed and signed between the DOE and the affected State or Indian Tribe. The Cooperative Agreement establishes the ground rules and procedures for implementing remedial actions at a site and is a good-faith effort to enter into and complete remedial actions. Cooperative Agreements have been signed by the DOE with all the States or Indian Tribes in the program: Pennsylvania, North Dakota, South Dakota, Utah, Oregon, Colorado, Wyoming, Idaho, New Mexico, Texas, Navajo Indian Reservation and Hopi Indian Reservation.

#### Site Remedial Actions

The status of several of the sites where remedial actions have begun or will begin soon is provided below.

##### o Cannonsburg

The site at Canonsburg, Pennsylvania was the first location to undergo remedial actions. Cleanup activities began in October 1983 and were completed at the end of 1985 on the 30-acre site. The 400,000 tons of contaminated material structures on the site, which had previously housed an industrial park, were demolished and buried.

A fabric-lined sedimentation basin was constructed to retain flood waters from a 10-year 24-hour storm event. Waste water from decontamination activities such as site dewatering and equipment and truck wash-down was also directed to the sedimentation basin.

Being in a wet environment and thus unable to rely solely on evaporation, the Canonsburg site required a water treatment plant. This plant treated the contaminated water prior to its discharge into Chartiers Creek, which is adjacent to the site. The plant treated major contaminants from heavy metals to radium.

Perimeter ditches were constructed to collect and divert run-off water to the sedimentation basin. The ditches were built around most of the site except for one area which was at a low elevation and had all of its contaminated material removed. During the digging activities on this latter area, rainwater was collected in the excavated area and pumped into the sedimentation basin. Clean fill material was used to bring this area back up to grade, and it has no restrictions on its use and is not within the containment fence.

A clay-lined encapsulation cell was constructed on the site to hold the more highly contaminated

material, whose radium content exceeded 100 picocuries per gram. An area was excavated to hold this clay-lined cell. A three-foot thick clay layer totally encapsulates the contaminated material.

The cover of the encapsulation cell consists of (1) three feet of a clay-based radon barrier, (2) nine inches of a sandy bedding material to reduce the velocity of any ingressing rainwater to as not to erode the radon barrier, (3) one foot and two feet of riprap on the top and sides, respectively, and (4) one foot of topsoil and a vegetative cover. The portion of the site other than the encapsulation cell was covered by two feet of clay-based radon barrier material and a vegetative cover. The top six inches of the two feet of radon barrier were loosely packed to allow root penetration.

Finally, a buried riprap wall was constructed to prevent Chartiers Creek from encroaching onto the site. The rock wall has a two horizontal to one vertical (2:1) slope and goes to a depth of 15 feet below grade.

##### o Shiprock

Shiprock was the second site where remedial actions began. Construction effort began in September 1984 on the stabilization-in-place design, and closing ceremonies were held in October 1986. Nearly two million cubic yards of contaminated materials were recontoured, regraded and stabilized on a 76-acre impoundment area. Above the tailings are approximately 6.4 feet of the radon barrier consisting of a fine silt. A 6-inch bedding layer of sandy silt material was placed on top of the radon barrier, and a 1-1/2 foot rock layer was placed on top of the impoundment structure. The pile is approximately 50 feet in height.

##### o Salt Lake City

The Vitro site of Salt Lake City consists of 128 acres which are actually located in the city of South Salt Lake. The total volume of tailings and associated contaminated materials is approximately 2,700,000 cubic yards. The decision was made in 1983 to select relocation to the alternate site at Clive as the preferred course of action for the Salt Lake City tailings.

The remedial action consists of excavating the tailings and transporting all contaminated materials to Clive, which is 85 road or rail miles to the west of Salt Lake City. Clean fill material is being brought into the Vitro site to raise the ground to grade level after the tailings are removed. The Vitro site will be released for unrestricted use since it will be totally decontaminated. At the Clive site, burial is partially below grade, and the excavated soil is being used to cover the tailings. As the tailings are being emplaced in the excavated cavity, seven feet of soil are used to cover the pile. A rock cover to provide protection against erosion is then placed over the radon soil cover.

The State of Utah is responsible for the project management of the Vitro Project. Utah developed the final engineering design, issued the request for bids, selected the prime subcontractor and is managing the work performance. In addition, Utah is liable for more than 10% of the costs if project costs escalate above the initial estimates.

Through a competitive selection process, Argee Corporation was chosen as the prime subcontractor for the Vitro project. Argee began work in February 1985,

and while the contract does not expire until February 1988, Argee's plan of operation called for completion of remedial actions by May 1987. The mode of transportation is by rail since Union Pacific Railroad is a subcontractor to the Argee effort. Argee has used two trains of 75 rail cars each, with each rail car hauling approximately 100 tons of contaminated material.

Early in the program Argee experienced problems with its hopper/conveyor belt system at Clive. To unload the tailings, a rollover system was installed which tipped over the train cars. Underneath this rollover system, an area was excavated, and a hopper/conveyor belt system was installed to receive and carry the dumped tailings out of the excavated area to a stockpile location. However, the conveyor system proved to be a bottleneck in the operation since both debris, such as pieces of concrete, and the wet tailings, which had a tendency to clump together, continuously jammed up the conveyor system. Since this significantly delayed operations, Argee decided to totally remove the conveyor and have the rail cars dump tailings directly into the excavated pit. A front-end loader then loads the tailings into scrapers which carry the tailings to the impoundment area.

In early 1986, Argee filed a claim for \$8.2 million over and above its fixed price contract of \$38.5 million. Argee contended that Utah misrepresented the physical conditions at the Vitro and Clive sites. Principally, Argee stated the moisture levels of the tailings and the Clive subsoils were higher than they expected from perusing the Plans and Specifications. The State of Utah's response was the relevant data were available (particularly in DOE documents) and an experienced bidder would have investigated the situation on its own. The claim was settled just before it was to go before an arbitration panel. The amount of \$3.625 million was agreed to be paid to Argee in addition to the fixed price contract amount. A \$100,000 bonus was also to be paid for each month Argee completed the work prior to July 1987.

While a great deal of progress was made by the end of 1986, continued conflicts between Utah and Argee brought the project to a halt in December 1986. It was agreed by Argee and Utah that the company would demobilize its efforts in December. A financial settlement was reached that ended Argee's work. Utah is planning to issue a new contract to a firm which has previously performed work at Salt Lake City vicinity properties and on the adjacent Central Valley treatment facility property. Utah is currently negotiating with this new firm to complete the transporting (by truck) of the remaining tailings to the disposal site as well as complete the closure of the tailings pile at Clive. The total effort should be finished by the late Summer of 1987.

#### o Lakeview

Lakeview was the fourth site where remedial action was initiated. The tailings are being relocated to an area called the Collins Ranch site, which is seven miles from Lakeview. It was decided to move the tailings due to a combination of seismic and geothermal considerations. There is considerable geothermal activity around the present Lakeview site, and it is in somewhat of a seismically active area. It was felt that a seismic event could fracture the rock layer beneath the pile,

thereby forming a conduit for a geothermal geyser beneath and through the tailings pile. This was deemed an unacceptable risk since the EPA longevity standard could not be assured. A scientifically rigorous alternate site selection process was performed, and the Collins Ranch site was selected as the disposal site. The design includes partial below grade burial of the tailings.

In order that small local contractors could have a greater opportunity to bid on some of the remedial action work, four bid packages were issued by the RAC. The first package involved most of the work: relocation by truck and stabilization of the tailings at Collins Ranch. But three small packages covering cleanup of the mill area, construction of temporary fences, and relocation of uncontaminated wood chips (a byproduct from the lumber mill on-site) were also issued.

The work began in July 1986 and was halted in late November 1986 as part of the planned Winter shutdown due to inclement weather conditions. The wet, cold weather had a substantially adverse impact on decontaminating the trucks in a timely manner.

During the 1986 construction season, the disposal pit at the Collins site was totally excavated and the geochemical flow barrier or liner was emplaced and compacted. Of the projected 662,000 cubic yards of contaminated material, approximately 27% or 180,000 cubic yards were relocated to the Collins location. The subcontractor hauled the tailings during one 12-hour shift per day, 7 days a week. Effort will be restarted in April 1987 and is expected to be completed by the late Autumn of 1987.

#### o Durango

The 2.5 million tons of tailings and contaminated materials at Durango will be relocated by truck 3.5 miles from the present site to an area called Bodo Canyon. The disposal location is in a small valley on the top of a drainage divide. Groundbreaking for the project took place in December 1986. During the 1986-87 Winter, drilling on the pile is expected to determine the radium and thorium content in and under the tailings piles and raffinate ponds. The remedial action effort will begin in earnest in the Spring of 1987 and continue until the Autumn of 1990. There are three main construction contracts, which cover the relocating and stabilization of the tailings, fencing, and demolition of structures. Similar to the case at Lakeview, the latter two contracts were separated from the main package in order that small local firms would have a greater chance of performing some of the work.

The design of the disposal area includes partial below grade burial, a clay liner, a 6-foot radon barrier, and a rock erosion barrier on the top and sides of the disposal structure.

Since the site is in a wildlife management area, a wildlife mitigation plan was written which requires certain controls, such as limits on construction times and vehicle speeds. Some Indian archaeological sites were discovered at the disposal site, and all artifacts were removed prior to construction. At present, the fate of the stack of the old mill is still unresolved. Some local citizens wish for the stack to remain, but DOE wishes to demolish the stack because it is structurally unstable and substantial costs would be incurred to decontaminate it.

#### o Riverton

The Riverton tailings site is located on private land within the boundaries of the Wind River Indian Reservation. After an extensive and lengthy site assessment and data gathering program, the DOE determined that stabilization-in-place (SIP) was technically feasible. The site lies on a plain between the Wind River, and flood waters from the Probable Maximum Flood would impinge upon the stabilized pile. However, through the use of engineered features such as a rock skirt around the site and a riprap cover, a high confidence level could be achieved that the EPA longevity standards would be met. Nevertheless, the State of Wyoming expressed reservations about the stabilization-in-place option. Wyoming felt that relocation of the tailings to a pile with an active Title II license would enable the tailings to be removed from the vicinity of Riverton and the Shoshone and the Arapahoe Indian Tribes, as well as allow the consolidation of two piles into one pile.

The State issued a contract to a Colorado engineered firm to conduct an independent evaluation of the SIP option. The major finding of this special study was that SIP was feasible, provided some minor modifications were incorporated into the DOE design. Nevertheless, the State with Indian and some local citizen sentiment continued to support relocation.

A private company, American Nuclear Corporation (ANC), owns an active Title II site in the Gas Hills approximately 45 miles from Riverton. ANC submitted a proposal to relocate the tailings to its contrasts with a SIP cost of \$15.3 million. The State of Wyoming submitted a proposal, based on the ANC proposal, which provides extra Wyoming funding over and above the required 10% State share of total costs. This is necessary insofar as DOE has demonstrated that SIP is technically feasible, and the selection of another more costly option would require additional State funding. At the time this paper was prepared, a decision by the DOE on the Wyoming proposal was imminent. If the relocation option is selected, several specifics regarding the cost arrangement have to be resolved. An additional issue concerns NRC's and Congress' positions. NRC concurrence is required; and since the ANC proposal would result in commingling Title I and Title II tailings, there are legal obstacles that would have to be surmounted. NRC concurrence is expected, however. Also, Congressional notification may be required before such a commingling could take place. Remedial actions may begin as early as the last half of 1987.

#### o Grand Junction

The environmental phase of the Grand Junction project, i.e., issuance of the Final Environmental Impact Statement and Record of Decision, is expected to be completed in the late Winter of 1987. The preferred option is to transport by truck the 3.1 million cubic yards of tailings, which are now on the banks of the Colorado River, to a location called Cheney Reservoir, which is 18 miles south of the town. The proposed partial below-grade burial at the disposal site is on a flat mesa above the flood plain. Phase I of the project will commence in the Spring of 1987 and involve general construction activities such as demolition of structures at the site and construction of a water treatment plant, evaporation ponds and temporary fences. Phase II of the Project will be performed by a separate contractor, will begin in the Spring of 1988 and will consist of the relocation and stabilization portion of the project. It is expected that the project will be completed by

September 1991. Total project costs are expected to be approximately \$56 million.

#### o Tuba City

The site at Tuba City is on land which is under ownership dispute between the Navajo and Hopi Indian Tribes. The remedial action work was divided into two phases. Phase I, which was performed in 1986, consisted of demolishing the old mill building and foundation on the site. Phase II deals with stabilization of the 1,400,000 cubic yards of tailings in their current location. The design consists of recontouring the pile and covering the pile with a local soil radon cover and riprap. Phase II will start in the Spring of 1987 and be completed in 18 months. Total project costs, excluding possible groundwater restoration costs which are discussed below, are expected to be approximately \$10 million.

A major unknown in the Tuba City Project is the impact of groundwater contamination. Approximately 110 acres of contaminated groundwater, consisting of one billion gallons, exist under the pile. The contaminated plume has elevated levels of nitrates, sulfates and gross alpha. The plume is projected to migrate over the next 400 years to Moenkopi Wash, which is about 9,000 feet from the pile. When the EPA issues its final standards covering groundwater, an evaluation will have to be performed to determine if aquifer restoration is required. The cheapest restoration option is an additional \$6 million, with other options costing several times that amount. Hence, the final project costs could be substantial.

#### o Ambrosia Lake

Remedial actions are expected to begin on the Ambrosia Lake site in the Summer of 1987. The tailings pile contains 2,700,000 cubic yards of tailings; and the total volume of contaminated materials is 4,600,000 cubic yards which also includes 570 acres of adjacent, windblown material and contaminated soils. The pile will be recontoured, regraded and consolidated with a 3-1/2 foot radon cover and one and 2-1/2 feet of rip-rap on the top and sides of the stabilized pile, respectively.

An important consideration at this site is the issue of hazardous wastes. There are more than 300 drums of 55 gallons each on the mill site, with approximately half being empty. The remaining 150 drums contain various levels of liquids, with most being petroleum based. There are also two storage tanks which are approximately 1/2 full of carrier solvent. PCB's in transformers are present, and asbestos which are probably contaminated with radionuclides are located in the mill building. It is planned to bury the asbestos in the tailings pile, but the non-radioactive hazardous wastes will be removed to a hazardous waste site. The present site owner, United Nuclear Corporation (UNC), has been requested to remove the hazardous waste, but UNC does not claim responsibility for the wastes since they maintain the wastes were there when they acquired the site. Discussions are continuing with UNC to resolve this matter.

Remedial actions may not be completed until 1990 because preloading to cause consolidation of the pile may be required, thereby delaying work on the pile.

#### Vicinity Property Remedial Actions

An extremely important part of the remedial actions program is the cleanup of off-site or vicinity

properties. These vicinity properties are defined as having elevated radiation levels due to the presence of tailings and associated radioactive materials from the designated tailings sites. Salt Lake City vicinity properties were the first to begin remedial actions in 1981. Vicinity properties are located at all the sites and include single-family and multi-family residences, businesses and open lands.

The vicinity property clean-up is complete at Shiprock and Canonsburg, with one exception. The

vicinity property at Burrell, Pennsylvania, which is approximately 80 miles from Canonsburg, is having its contaminated materials stabilized-in-place rather than relocated back to the Canonsburg site. Remedial actions at Burrell will be completed in 1987. Vicinity properties are also presently undergoing remedial actions at Grand Junction, Durango, Salt Lake City Lakeview and Edgemont. A total of approximately 4,850 vicinity properties are contaminated at all of the sites, with 4,150 of these properties at Grand Junction.