

DECOMMISSIONING THE DOE'S OLDEST FACILITY VIA A CERCLA REMOVAL ACTION

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ABSTRACT

If a DOE audience was questioned about what was the oldest DOE facility to be decommissioned, various answers could include: the Hanford B Reactor, the University of Chicago stadium, or even the radium and uranium sites dating back to Madam Curie's experiments. Who would believe that the DOE decommissioned a facility constructed in 1827, and modified in 1895?

The Miami-Erie Canal was constructed in 1827-1835 to carry barge traffic from Lake Erie to the Ohio River at Cincinnati. A one (1) mile section of the canal adjacent to the DOE Mound site was contaminated by Plutonium-238 in 1969. DOE with input from a group of stakeholders, decided in 1994 to voluntarily conduct a clean up pursuant to Section 104 of CERCLA. The story of the canal cleanup covers several notable issues.

INTRODUCTION

The U.S. Department of Energy's Mound Plant was part of the Nuclear Weapons complex and is located in Miamisburg, Ohio, which is approximately fourteen (14) miles south of Dayton in southwestern Ohio. It was the first permanent Atomic Energy Commission facility which was built in 1948 and began operations that same year. Mound's initial mission involved Polonium-210 and evolved to include explosive detonators, Tritium and Plutonium-238. The Plutonium-238 was used primarily in the Radioisotopic Thermal Generator (RTG) program which provided electric power for NASA's Apollo and Galileo space missions among others.

Community Park, owned by the city of Miamisburg, is adjacent to the western boundary of the plant. It is separated from the Mound Plant by a rail line owned by Conrail. The park had a swimming pool (since replaced by a new pool at a different location), tennis and basketball courts and playground facilities. The Miami-Erie Canal runs along the western boundary of the park. The Canal was constructed in 1827-1835 to carry barge traffic from Lake Erie to the Ohio River at Cincinnati. Active use of the canal ended after a flood of the Great Miami River in 1913. Approximately 75% of the storm run off from the Mound Plant was discharged into the canal to flow into the Great Miami River.

A waste transfer line associated with the RTG program ruptured in 1969. Liquid waste contaminated with Plutonium-238 soaked into the soil around the rupture. The acidic waste solution was neutralized by the soil and the Plutonium attached itself to the clay fraction of the soil. Heavy rains hindered cleanup of the soil and then generated runoff that transported the contaminated soil off site. The abandoned canal received the storm runoff and the suspended sediment and thus became contaminated with Plutonium-238.

Mound Plant personnel sampled the soil in the canal to characterize the nature and extent of the contamination. The bulk of the Plutonium was found in the top two feet of silt and extending down to four feet. Concentrations measured in the canal ranged up to 4560 pCi/g. The inventory of Plutonium-238 present in the one-mile section of the contaminated canal was calculated to be 5.2 Ci.

STAKEHOLDER INVOLVEMENT

The Mound Plant was placed on the Superfund National Priority List in 1989. The DOE subsequently signed a CERCLA Federal Facility Agreement with US EPA and Ohio EPA. Therefore, CERCLA requirements for clean-up criteria and for public involvement applied to remediation of the canal. Additionally, the Miami-Erie Canal was the only known off-site contamination at the Mound Plant. Further, the location of the Canal within the City Park and close to residential areas deserved special emphasis on community relations. The DOE recognized the importance of public involvement in the Canal cleanup. The DOE assembled a Focus Group of stakeholders to facilitate public involvement.

The stakeholders group for the Canal cleanup included representatives of DOE, EG&G Mound Applied Technologies (operating contractor), U.S. EPA, Ohio EPA, Ohio Department of Health, ATSDR, City of Miamisburg, Miami Conservancy District (owner of part of the canal), Conrail (owner of property adjoining the canal), Miami Valley Regional Planning Commission, the local environmental action group MESH, and other local residents. The DOE and ATSDR had completed three different health and risk assessments that showed that the contamination in the canal presented no hazard to the public under existing conditions. Therefore, the DOE first asked the Focus Group whether or not the canal should be cleaned up. DOE, with input from the Focus group, decided in 1994, to voluntarily remediate the Canal pursuant to Section 104 of CERCLA. The DOE and Focus Group recognized two key factors:

Plant operations were scheduled to end when the site was turned over to the City for economic development. Although the DOE presence and oversight would soon end, the DOE responsibility for the contamination would not. Regulators would require a thorough and costly RI/FS if a removal were not performed with the possibility that a clean up would still be required.

The next hurdle was to reach agreement on a clean up goal. How clean is clean enough? Clean-up precedents at Mound included: Historical D&D clean-up at Mound to 100 pCi/g, plus ALARA goals of 25 pCi/g. Risk-based guideline values calculated with site-specific input parameters at 55 pCi/g for 10^{-5} excess cancer risk for an on-site commercial worker. After much discussion, agreement was reached on a risk-based goal that was calculated according to U.S. EPA RAGS (Risk Assessment Guidance for Superfund) documentation. A recreational scenario with an eight-hour per week exposure for thirty years was used to calculate the goal. The recreational scenario was consistent with the location of the canal within the City Park.

The stakeholders agreed to a cleanup goal of 75 pCi/g of Plutonium-238 at the 95% confidence limit of the mean with no sample to exceed 150 pCi/g. Exposure to this concentration would result in a probability of an increased risk of cancer incidence of one in one million. An ALARA

component for the clean up was also included. Based on existing data, an excavation plan would be prepared which would show the intended excavation of all contamination that was above 25 pCi/g. Achievement of the cleanup goal would be demonstrated by verification sampling that would be based on EPA guidance. The DOE also agreed to applicable or relevant and appropriate (ARAR) goals for other contaminants of concern, based on their historical use at the Mound Plant. These included inorganic chemicals, organic chemicals, and radionuclides.

The cleanup goals were used as the engineering design basis to estimate the project cost and schedule. These were established at \$25 million and two years, respectively.

HISTORICAL PRESERVATION ISSUES

The canal was constructed in the early 1800s but historical preservation issues were not significant. The configuration of the canal had been extensively modified between its abandonment in 1913 and the clean up in 1995. The canal itself had essentially no historical value. An archaeological evaluation found no areas of significance. An adjacent city well house dated to the early 1930s was evaluated for historical value and had none. A railroad access road bridge was the only structure that required some mitigation, but for aesthetic and not historical value.

The railroad access road was constructed adjacent to the canal and included a sandstone block bridge with the construction date (1895) inscribed on one block. The Mound's runoff formerly went under the bridge and the sediment under the bridge was contaminated. Approximately 45 blocks were removed during the cleanup and most had fixed contamination in excess of release criteria. The DOE evaluated the cost-effectiveness of cleaning the blocks and decided to dispose of them as radioactive waste. The few clean blocks were saved at the request of the local historical preservation society. The blocks were incorporated into the bridge as part of a bike path along the canal. The block inscribed "1895" was displayed prominently in the new bridge.

ENGINEERING ISSUES

A substantial amount of preparatory work was done before excavating contaminated sediment. The storm water discharge from the plant had to be rerouted so that the canal could be dewatered. The canal had to be cleared of a significant amount of brush and trees that had grown up over the years. An access road had to be built so that the contaminated soil could be hauled back onto plant site for disposition without use of public roads. A good portion of this work was to take place on property owned by others.

The first order of business was to gain access to the property from the owners. The owners were the City of Miamisburg, the Miami Conservancy District and Conrail. These negotiations took over six months to complete because of the liability issues. In order to gain complete access, condemnation proceedings against the Conrail Corporation were necessary.

The safety of the operations was a major concern of the stakeholders. They asked how would those living adjacent to the park be protected during the removal action? Would curiosity cause

individuals to enter the work area and be injured by the excavating equipment either during or after work hours? Provisions for dust control, fencing and security patrols were made to satisfy these concerns. In addition, two continuously operating air samplers were added along the western boundary of the canal to augment the two air samplers already existing in the canal area.

The final disposition of the contaminated soils was also of concern to the stakeholders. The majority wanted the soil shipped to an appropriate burial site while a small number did not approve of shipping it to another state. The DOE evaluated a proprietary technology for treating the soil with a leach solution. It would have reduced the volume of waste required to be shipped for burial by over 50%. This approach was abandoned when the stakeholders would not agree to allow the "clean" soil, after treatment, to be placed back in the canal or back on the plant site.

INNOVATIONS AND CLEAN UP STRATEGY

Several innovative approaches were implemented during this clean up which allowed it to proceed smoothly and with a minimum of lost time and unnecessary delays. The establishment and involvement of the Focus group from the beginning of the clean up, including the early planning stages, made gaining concurrence of the regulators much simpler because their customer, the public, was on board from the beginning. Questions could be asked and answered at regularly scheduled meetings. The public was made to feel part of the process and minimized questions and delays once the fieldwork was underway.

The site contractor, EG&G Mound (succeeded by Babcock & Wilcox of Ohio), dedicated personnel to work solely on the Canal project. The team included everyone who worked on the project from the project manager to the field personnel. The team included salaried as well as hourly personnel and they were designated to work on this project. This increased the efficiency of the operation since training of new personnel was not a continuing effort and disruption. Suggestions of the field workers were often implemented and generally resulted in improved operations.

Heavy equipment was purchased and designated for this project. Articulating haulers with a retractable cover were used to move the soil from the canal to an on site soil staging area. These haulers had never been used at Mound before and proved to be very efficient for this project. A soil staging area was established at the former location of an above ground fuel oil tank site. The location had two convenient features. One was the dike designed to contain leakage from a ruptured oil tank. The dike was suitable to control run-off from the contaminated soil stockpile. The location was also adjacent to the on site rail spur.

Rail transportation was a significant cost improvement over Mound's historical mode of operations. The DOE had previously required DOE sites to send their waste to DOE owned disposal sites. Mound had shipped its Low Specific Activity (LSA) waste to the Nevada Test Site (NTS) by truck. The unit transportation cost for truck transport is more than for rail transport, but NTS did not have a rail siding. Permission was granted to Mound to ship this LSA waste to a private site in Utah.

Plutonium-238 is an alpha emitter and has only several low energy gamma ray emissions. No field instruments exist which can detect Plutonium-238 at the clean-up goal concentration. The best instrument available is the sodium iodide FIDLER (Field Instrument for Detection of Low Energy Radiation). An experienced Radiation Control Technician (RCT) can use a FIDLER to detect in the range of approximately 300 pCi/g of Plutonium-238. Mound has developed a Soil Screening capability to enable instrumental detection of Plutonium-238 at approximately 25 pCi/g which is well within the clean up goal for this project. This capability uses sodium iodide detectors in a fixed geometry and normally resides in a counting laboratory on plant site. Mound decided to set up a dedicated mobile laboratory with this counting capability close to the canal site. The mobile laboratory made it possible to have one day turn around for samples. This efficiency allowed decisions to be made quickly regarding whether excavation activities were complete and could move on to the next area.

The geodetic surveying of sample locations can be time consuming. The mobile lab data was paired with location data from a satellite based Geographic Positioning System (GPS). These data pairs were transmitted to a Geographic Information System (GIS) to plot the data on a grid map representing a 50 foot length of the canal. The visual presentation simplified interpretations and decisions.

During the removal, a real time data collection system was evaluated. This system used calcium fluoride detectors in conjunction with a positioning system attached to an excavator boom. The positioning system maintains a constant elevation above the ground surface and transmits the data to a PC for manipulation and plotting. The system had the potential for eliminating the collection of soil screening samples but could not demonstrate the desired sensitivity of detecting less than 75 pCi/g.

Sampling and analysis costs were a critical issue at two different steps in the canal project. The first was the anticipation of an RI/FS estimated at up to \$7 million. This had been considered in the decision to remediate the canal as a CERCLA removal action. Second, the cost of verification samples drove the verification protocol. It would have been cost-prohibitive to verify the cleanup of individual grids to the agreed cleanup criteria. Instead, all of the samples collected along the one (1) mile length of the canal were "pooled" into a single sample population. That meant that the canal clean up would pass or fail as a single unit, without the opportunity to revisit individual grids. This "risky" decision saved over \$2 million.

UNANTICIPATED CONTAMINATION

The original project scope anticipated the excavation and disposal of soil. Contamination of concrete was unanticipated. Quick decision making was required when 3 different contaminated concrete features were encountered, in order to keep cleanup crews working. The contaminated sandstone at the 1895 bridge was also unanticipated.

Two of the concrete features were encountered in the canal channel. One was a bridge pier and one was a concrete spillway. Fixed contamination was found in each case, at levels above DOE free release criteria. The DOE performed a cost-benefit analysis and it was less expensive to

dispose of the relatively small volume of concrete as radioactive waste than to decontaminate the surface.

The third concrete feature was a Conrail railroad trestle. The concrete had apparently been contaminated when sediment was dredged from the canal and piled against the trestle. The disposition of this feature was problematic because of its massive nature and because it was an essential part of a Conrail main line. It would have been difficult and expensive to demolish and replace the trestle. The trestle was 100 hundred years old and it was feared that local decontamination by scabbling would damage its integrity.

The trestle concrete was sampled and its bulk activity was well below soil cleanup criteria on an activity/mass basis. A site-specific risk assessment was completed and confirmed that the concrete could be left in place and meet CERCLA clean-up criteria (10^{-5} to 10^{-6} excess cancer risk). This decision was confirmed with US EPA and Ohio EPA. The fixed contamination levels exceeded the free release criteria in 10 CFR 835, Subpart D. It was decided that the latter was no longer applicable as soon as the CERCLA cleanup was complete. This decision was possible because the concrete contamination was at a location off the DOE property.

Another type of “unanticipated” contamination was the contaminated sediment clinging to the roots of certain large trees along the west bank of the canal. The project engineer had originally proposed to remove the trees because of the high likelihood of contamination among the roots. The local city had requested that the trees remain for aesthetic reasons, so they were bypassed on the first excavation of the west bank. Samples confirmed the presence of the contamination, so the trees had to be removed and the west bank had to be excavated. This “detour” extended the project schedule by about 2 months.

CONCLUSIONS

The clean up of Plutonium-238 contamination in a city park was completed in a timely fashion. The early involvement of all the stakeholders, including regulators, property owners, neighbors and citizens groups, was instrumental in this accomplishment. Several innovative approaches also aided the effort. Over 35,000 cubic yards of contaminated soils was removed from the canal located in a city park and shipped to Utah for disposal. This was approximately 50% more than the originally estimated volume, but it was accomplished within the budget estimate of \$25 million and within the time schedule allotted.