The U.S. Department of Energy Formerly Utilized Sites Remedial Action Program: Ensuring Protectiveness and Preserving Knowledge—10351

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ABSTRACT

This presentation offers four case studies to illustrate the breadth of long-term surveillance and maintenance (LTS&M) activities required to successfully implement the Formerly Utilized Sites Remedial Action Program (FUSRAP). The U.S. Department of Energy (DOE) Office of Legacy Management determines eligibility for remediation under FUSRAP and provides LTS&M for remediated sites. The U.S. Army Corps of Engineers performs assessments and remediation for the FUSRAP sites.

The case studies included in this presentation are sites in Middlesex and New Brunswick, New Jersey; Richmond, California; and Lewistown, New York. These case studies demonstrate how the various elements of FUSRAP are integrated to fulfill U.S. government responsibilities for maintaining protection of human health and the environment in perpetuity at eligible and remediated FUSRAP sites. Lessons drawn from FUSRAP experience are applicable to other LTS&M programs within DOE and at other agencies that have stewardship responsibilities.

INTRODUCTION

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) and the U.S. Army Corps of Engineers (USACE) implement the Formerly Utilized Sites Remedial Action Program (FUSRAP) to maintain protectiveness at sites that were involved in Manhattan Engineer District (MED) and early U.S. Atomic Energy Commission (AEC) programs. DOE and USACE are responsible for separate portions of FUSRAP implementation, as directed by Congress [1, 2]. DOE determines if a site is eligible for remediation under FUSRAP, and USACE is responsible for assessment and any necessary remediation of a site. DOE assumes responsibility for long-term surveillance and maintenance (LTS&M). Roles and responsibilities are defined in a Memorandum of Understanding [3]. DOE is currently responsible for managing 30[1] remediated FUSRAP sites.

All DOE activities are conducted with the primary goal of preserving current and future protectiveness of a site for which DOE is responsible. Other goals include returning contaminated properties to beneficial reuse and making information available to stakeholders about past and current site conditions.

[1] This includes the Middlesex North, NJ, Site, which the USACE is reviewing and will formally include in FUSRAP if they determine that a preliminary assessment is appropriate and the Office of Management and Budget has been notified of the addition to USACE scope.

DOE's LTS&M responsibilities also include creating and maintaining a durable knowledge base for FUSRAP sites. Information maintained by DOE includes documentation of previous operations, assessments, and remediation. DOE evaluated more than 600 candidate sites and found that all but 46 sites were ineligible for FUSRAP remediation; DOE maintains documentation of the basis for those determinations. DOE also evaluates new information such as land use changes and contractual documentation to reevaluate protectiveness and eligibility. DOE responds to stakeholder requests for information about FUSRAP sites and conducts other stakeholder support functions, such as participating in regulator forums and providing public information through the Internet. In implementing its FUSRAP responsibilities, DOE utilizes resources with expertise in radiological assessments, risk, regulatory compliance and law, public affairs, real property, and records and information management. Effective functioning of the program requires close coordination with USACE and regulators. Program systems are designed to preserve knowledge for future stewards.

CASE STUDIES

Referral of the Middlesex North, NJ, Site

This study involves the Middlesex Municipal Landfill in Middlesex, New Jersey. The landfill had been used for disposal of local municipal waste. In 1948, AEC disposed of soil containing spilled uranium ore in the landfill. The radiological contamination was removed in the 1980s under FUSRAP. In response to an inquiry from the State, DOE confirmed the presence of additional radiological material. In accordance with the Memorandum of Understanding, DOE referred the site to USACE to determine if additional remediation under FUSRAP is required. Fig. 1 shows the municipal landfill as it appears today.

Fig. 1. The former Middlesex Municipal Landfill is currently an undeveloped open field surrounded by urban development.

Report of contamination—In March 2008, the New Jersey Department of Environmental Protection (NJDEP) contacted DOE about conducting a gamma survey of the remediated portion of the site and investigating an area on the south end of the property found to have elevated gamma exposure rates. In June, NJDEP transmitted results of a radiological survey of the site showing elevated gamma dose rates at the south end of the property [4]. The Borough of Middlesex had conducted the survey in support of redeveloping the former landfill into a recreation facility.

Reports indicated that the contamination at the landfill was originally discovered in 1960 during civil defense exercises, and the extent was defined on the basis of surveys and first-hand knowledge of the disposal that had occurred in 1948. Some radiological contamination had been removed in 1960, and clean soil was placed over the contaminated area to reduce dose rates to limits acceptable at the time. Aerial and vehicle-mounted gamma surveys conducted in the 1970s did not indicate contamination on the south portion of the property. (These surveys were effective in locating contamination on several vicinity properties.) Therefore, detailed radiological surveys of the south portion of the property apparently had not been conducted in conjunction with the 1980s remedial action. No records of field activities were available, and the evaluation relied on summary reports. Characterization and remediation were restricted to a 2-hectare (5-acre) area on the north portion of the property where the legacy contamination was known to have been dumped.

DOE contacted with a radiological support contractor with FUSRAP remediation experience to conduct the survey of the entire property to confirm the presence of radiological contamination and demonstrate that the remediated portion of the site remained protective. The presence of contamination on the site had to be confirmed before DOE could make a referral decision.

The former IV lead, a certified health physicist, confirmed that any residual contamination was probably in the form of discrete pieces of uranium ore originating from the Middlesex Sampling Plant. During remediation, soil that met the area-averaged radium-226 cleanup limit of 5 picocuries per gram above background in the top 15-centimeter (6-inch) layer of soil [5] was segregated for use as backfill. Some of the segregated soil was placed on the surface of the remediated area. Occasional pieces of ore were found during the verification survey and were picked up by the IV team, as documented in the verification survey report [6]. The potential remained for additional pieces of ore to be located near or on the surface of the remediated area. The former IV lead confirmed that the verification survey was restricted to the remediated area on the north portion of the property.

Confirmation—DOE had been informed by NJDEP that Borough officials wished to commence work on the recreation facility. DOE contacted Borough officials to inform them of the preliminary research findings and to arrange access to the property and conduct a confirmatory survey. A second landowner, the Middlesex Presbyterian Church, was also contacted and granted access to conduct the survey.

DOE designed a radiological survey to identify residual radioactive contamination on the municipal landfill property. Positive identification of MED- or AEC-related radiological

contamination would constitute the basis for referral of the site to USACE for additional assessment and remediation. [7].

The survey specification included a scan of 100 percent of the surface of the accessible portions of the property using gamma scintillometers. Anomalies would be sampled and analyzed for principal uranium decay series radionuclides, gamma spectrometry, and alpha spectrometry. Sample locations would be excavated 15 centimeters and checked again for gamma radiation. The contractor generated a survey plan, which was reviewed and accepted by DOE and provided to NJDEP for comment.

The site consists of a generally level parcel overgrown with grass and weeds. DOE retained their New Brunswick site grounds keeping contractor to cut the vegetation to less than 10 centimeters (4 inches) tall. The east side is defined by Bound Brook, and the wooded area along the brook was inaccessible.

DOE prepared survey base maps with a 30-meter (100-foot) grid. The health physics subcontractor established the grid in the field. In September 2008, the subcontractor conducted the instrument survey and collected seven soil samples. The survey and sample results confirmed the presence of contamination in discrete areas in the south portion of the site, and also confirmed that the remediated portion of the site remained protective [8]. DOE presented the survey results to Borough officials at a public meeting on February 3, 2009.

Referral—On the basis of the survey results, DOE referred the Middlesex Municipal Landfill to USACE for assessment and remediation [9].

Disposition of the New Brunswick, New Jersey, Site

From 1948 to 1977, AEC, the Energy Research and Development Administration, and DOE operated the New Brunswick Laboratory as a general radiological chemistry and assay facility. Contaminated soil from the Middlesex Municipal Landfill was used to backfill an abandoned railroad spur in 1960.

Remediation of the site under FUSRAP began in the late 1970s. This entailed removing buildings and infrastructure in several phases between 1978 and 1983. The contaminated backfill in the railroad spur was remediated in 1996.

Regulatory Closeout—DOE completed remediation of the New Brunswick site before 1997 but had not completed certification when remediation responsibility was assigned to USACE. NJDEP reviewed final site conditions and determined that arsenic in one sample of the soil used to backfill the former railroad spur exceeded the state standard of 20 milligrams per kilogram. The State required that DOE prevent disturbance of the area through implementation of a deed notice in accordance with State regulations.

DOE developed the deed notice, which identified the affected area, presented concentrations of hazardous materials, and designated the clean soil backfill used to restore the excavation to grade as an engineered control [10]. With NJDEP concurrence in the instrument, DOE recorded the

deed notice in the public record. NJDEP issued a finding that the remedial action within the DOE-owned property required no further action [11].

On the basis of pending regulatory closeout, DOE engaged the General Services Administration to offer the 2.3-hectare (5.6-acre) parcel for sale. The General Services Administration conducted a public auction and a prospective buyer made the earnest money deposit to secure the right to purchase the property.

As a result of a final review of site documentation, NJDEP requested that DOE attempt to replicate a 1982 sample result that indicated elevated radionuclide concentrations in a manhole in the sanitary sewer serving the former New Brunswick Laboratory. The sewer is located in the public right-of-way adjacent to the DOE-owned property. The historical sample was collected at a crack in the base of the manhole; the manhole was where a lateral line serving the former laboratory tied in to the main line. The lateral sewer line had been removed from within the DOE-owned property and sealed at the property line. A reconnaissance visit in fall 2008 found that the lateral line had been sealed at the manhole, as well. Records indicated that the trench containing the lateral line on the DOE property was not contaminated, but the clay pipe was disposed of as radiologically contaminated material to avoid the cost of performing release surveys; no radiological data of the pipe joints or interior were reported. Therefore, while evidence pointed to there being no radiological contamination of the pipe surfaces, no data were available to demonstrate the pipe was not contaminated.

As presented in the 1986 report, DOE indicated that no further action was taken where the sample was collected and that there was no unacceptable risk to workers or the public resulting from the elevated activity.

DOE designed a survey to identify the presence of radioactive contamination inside and outside the manhole and submitted it to NJDEP for concurrence. The survey was performed in March 2009. A certified radiological control technician entered the manhole and conducted a surface scan over 100 percent of the interior surface to detect alpha, beta, and gamma radiation. The survey included measuring dose rates and collecting static measurements and smear samples on a one-meter grid. DOE also dug two soil borings alongside the manhole exterior to collect a continuous soil sample from the surface to the top of the impermeable shale layer beneath the base of the manhole (Fig. 2). Gamma activity was measured in the boring, and the core was scanned for anomalous radiation. Each boring was sampled at the depths representing the base of the manhole and the bottom of the soil/top of the shale for analysis.

Fig. 2. Starting soil boring next to the manhole at the New Brunswick, NJ, Site.

During the survey, NJDEP representatives visited the site and requested that DOE collect a sample of sediment in a storm sewer drop inlet where above-background radioactivity had been detected in a 1982 sample. DOE collected a sediment sample and submitted it for laboratory analysis.

No above-background radiation was detected in field measurements. Laboratory analysis was conducted for gamma- and alpha-emitting radionuclides and none were found exceeding background levels. DOE submitted the investigation results to NJDEP in a report and requested that the conditional no further action finding issued for the DOE-owned property be amended to indicate no further action is required for any property associated with the New Brunswick site [12]. DOE also informed the prospective buyer that no radioactive contamination was found associated with the sewer and that the buyer could proceed with utility tie-ins. The buyer was advised to avoid disturbing the remaining portion of the abandoned lateral sewer line.

Pending regulator concurrence that remediation is complete, DOE intends to notify the New Jersey Department of Transportation, the owner of the right-of-way in which the sewer is located, and the Middlesex County Department of Public Works and other underground utility owners in the area that the abandoned lateral line should be shown on their maps and should not be disturbed. These agencies will be asked to contact DOE if the lateral becomes accessible so

DOE can conduct release surveys and, if necessary, properly manage the abandoned clay sewer pipe. DOE is required by NJDEP regulations to submit a biennial certification that the DOE-owned property remains protective, and DOE will look for signs of disturbance of the abandoned lateral line at those times as a best management practice.

The sale of the site was concluded on November 2, 2009. The property will be redeveloped for industrial use.

Eligibility Review for the Former Stauffer-Temescal Site in Richmond, California

DOE was contacted by the Office of the Mayor of Richmond, CA [13]. The City was redeveloping an industrial area formerly used for research and manufacturing. A consultant was conducting environmental assessment research. The mayor asked DOE to review and respond to a conclusion reached by the City's consultant that historical radiological surveys demonstrating that the site was not contaminated were not conducted where historical activities had taken place.

DOE found that this site had been screened for eligibility for remedial action under FUSRAP [14]. The eligibility evaluation determined that operations had been conducted at the site in support of MED or early AEC activities. The Hanford, WA, Site had contracted for electron beam melting and cladding research in support of fuel element design and construction. However, records indicated that the process was well controlled, and no contamination resulted from the operations. Essentially all uranium shipped to the site for research was removed.

A personal contact at Oak Ridge, TN, had access to documentation that demonstrated that the location of the research had been properly surveyed and found to be free of contamination. State regulators concurred in this conclusion. DOE added the documentation to the site record and closed the inquiry [15].

Evaluation of Conditions at the Completed Niagara Falls Storage Site, NY, Vicinity Properties

Beginning in the 1940s, MED and AEC stockpiled residues from uranium-ore processing at the former 1,750-acre Lake Ontario Ordnance Works. Most of the original site was transferred to private and public parties. DOE retains ownership of the remaining 77.3-hectare (191-acre) Niagara Falls Storage Site (NFSS).

DOE included 26 properties near the NFSS in FUSRAP because of the presence or potential to find radiological contamination. By 1997, the residues from 23 properties were consolidated into an interim disposal cell on the NFSS property. Some residual material was left in place under application of supplemental limits in verified areas if the residues did not pose unacceptable risk to human health or the environment [16].

USACE is proceeding with investigation and development of a final remedy for the remaining three vicinity properties and the NFSS proper. USACE is also conducting additional environmental remediation under Department of Defense authority. The NFSS and associated vicinity properties have a high level of public interest.

Stakeholder Inquiry—DOE received an inquiry from a stakeholder in March 2009, asking DOE to demonstrate that the Central Drainage Ditch poses no risk to local residents. The Central Drainage Ditch is a large structure that conveys storm water from the site to a creek that empties into Lake Ontario. The stakeholder's concern was based on a presentation by a local group who contended that the annual dose from the remediated ditch exceeded regulatory limits.

DOE Research and Evaluation—DOE evaluated site records documenting the Central Drainage Ditch conditions at the time of verification. Summary reports were available, which indicated that, of 7,500 systematic verification samples collected, seven individual soil samples exceeded the limit of 5 picocuries per gram of radium-226 in soil [5]. Field data were not available for review of gamma activities, but the contamination occurred in discrete pieces, and the elevated soil sample results likely indicated that pieces of the residual ore material were included in the sample. In the 1986 site closure report, DOE determined the dose would be less than the most stringent regulatory limits. Therefore, DOE had approved the application of supplemental limits to the residual radiological contamination.

In responding to the inquiry, DOE found that the dose calculated by the stakeholder group appeared to have assumed continuous exposure, every hour of every day, at the location of highest activity. These conclusions were reported to the stakeholder, USACE, and state regulators.

DOE visited the NFSS and the Central Drainage Ditch in September 2009. The ditch is overgrown and contains standing water. Access to portions of the ditch immediately downstream of the NFSS is restricted by fencing maintained by the landowner. Therefore, DOE concluded that the potential for harmful exposure is remote.

DOE conducted follow-on work to become familiar with documentation of site protectiveness. This entailed review of records for a subset of the completed vicinity properties. The properties were selected for evaluation on the basis of potential access, concerns about final radiological conditions, or other stakeholder interest. As part of this evaluation, DOE assessed the completeness of the records collection and interviewed former IV staff who worked on the properties. DOE communicated with state and federal regulators to capture and address any concerns about protectiveness. DOE also evaluated more general sitewide documentation, including USACE reports of investigations, to extrapolate specific site findings to conclusions about documentation and protectiveness for all completed vicinity properties.

Preliminary findings indicate

- Field data are no longer available;
- Other data and documentation gaps were identified, and DOE is searching for missing documents;
- Final site conditions are adequately documented to be protective; and
- DOE should continue to be available to stakeholders and ensure that appropriate information is available to the public.

At the time of this writing, DOE will complete the evaluation and document findings in a report scheduled for release in March 2010.

Stakeholder Support—DOE has begun a program of stakeholder support for the 23 completed NFSS vicinity properties. DOE attended USACE public meetings in June and September 2009. DOE and USACE staff discussed concerns about the completed vicinity properties with state and federal regulators. At USACE invitation, DOE addressed the public at a stakeholder meeting in December 2009. The DOE presentation described work to confirm and demonstrate protectiveness of the completed vicinity properties and provided contact information.

LESSONS LEARNED

General lessons from these case studies and from other FUSRAP stewardship activities include the following:

- DOE should maintain communication with stakeholders. At most completed FUSRAP sites, final conditions allowed for unrestricted use, and little ongoing interest is occurring. At other sites, especially those where supplemental limits were applied, DOE should continue to remain visible and available to respond to stakeholder concerns and ensure ongoing protectiveness.
- DOE records are the basis for documenting eligibility decisions and protectiveness. The collections must be complete, accessible, and protected for use by future stewards. Confirmed gaps should be documented to inform future stewards of material that is no longer available.
- DOE still has access to individuals with personal knowledge of DOE FUSRAP eligibility determinations and remediation activities. That knowledge should be captured for use by future stewards.
- FUSRAP activities require support from staff with a full range of technical and administrative expertise.

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