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ENVIRONMENTAL IMPACT ASSESSMENT FOR A RADIOACTIVE WASTE FACILITY - A CASE STUDY

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ABSTRACT

A 77-ha site, known as the Niagara Falls Storage Site (NFSS) and located in northwestern New York State, holds about 190,000 m^3 of soils, wastes, and residues contaminated with radium and uranium. The facility is owned by the U.S. Department of Energy (DOE).

The storage of residues resulting from the processing of uranium ores started in 1944, and by 1950 residues from a number of plants were received at the site. The residues, with a volume of about 18,000 m^3, account for the bulk of the radioactivity, which is primarily due to Ra-226; because of the extraction of uranium from the ore, the amount of uranium remaining in the residues is quite small. The Ra-226 content of the residues, which accounts for about 95% of the total Ra-226 content at the site, was estimated to be about 1,830 Ci.

A number of waste management actions (such as waste transfer, waste consolidation, and renovation of storage buildings), as well as several environmental compliance actions, were taken over the years to minimize the potential of contamination transport from the site and to reduce any impacts on the human environment in the area. However, concerted remedial action planning started in earnest in 1981, after a 1980 radiological survey of the site and nearby properties. Since then,

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a number of interim remedial actions have been taken, culminating in the completion of an Interim Waste Containment Facility (IWCF) in 1986, where almost all the contaminated materials are now consolidated in a 3.2-ha diked containment area with an interim clay cap. A program of environmental monitoring (radon levels, gamma radiation levels, and radionuclide concentrations in surface water, sediments, and groundwater) has been in place for several years.

The environmental impact assessment process for the long-term management of the contaminated materials started when a Notice of Intent was published on February 1, 1983. Public scoping meetings were held in February 1983. A draft Environmental Impact Statement (EIS) was issued for public review and comment in August 1984, and a final EIS was published in April 1986. The environmental impacts of several alternatives were assessed. Long-term management of the waste at NFSS in perpetuity was identified as the preferred alternative. A Record of Decision was issued by DOE in August 1986.

An analysis of the environmental impact assessment and environmental compliance actions taken to date at this site and their effectiveness are discussed. This case study provides an illustrative example of the complexity of technical and nontechnical issues for a large radioactive waste facility.

SITE SETTING AND HISTORY

The subject of this case study, the Niagara Falls Storage Site (NFSS), is owned by the U.S. Department of Energy (DOE) and is located in northwestern New York within the Township of Lewiston in Niagara County, approximately 6.4 km south of Lake Ontario and 16 km north of the city of Niagara Falls (Figure 1). Major highway transportation routes in the area are the State Route 93 to the north, U.S. Route 104 to the south, and Robert

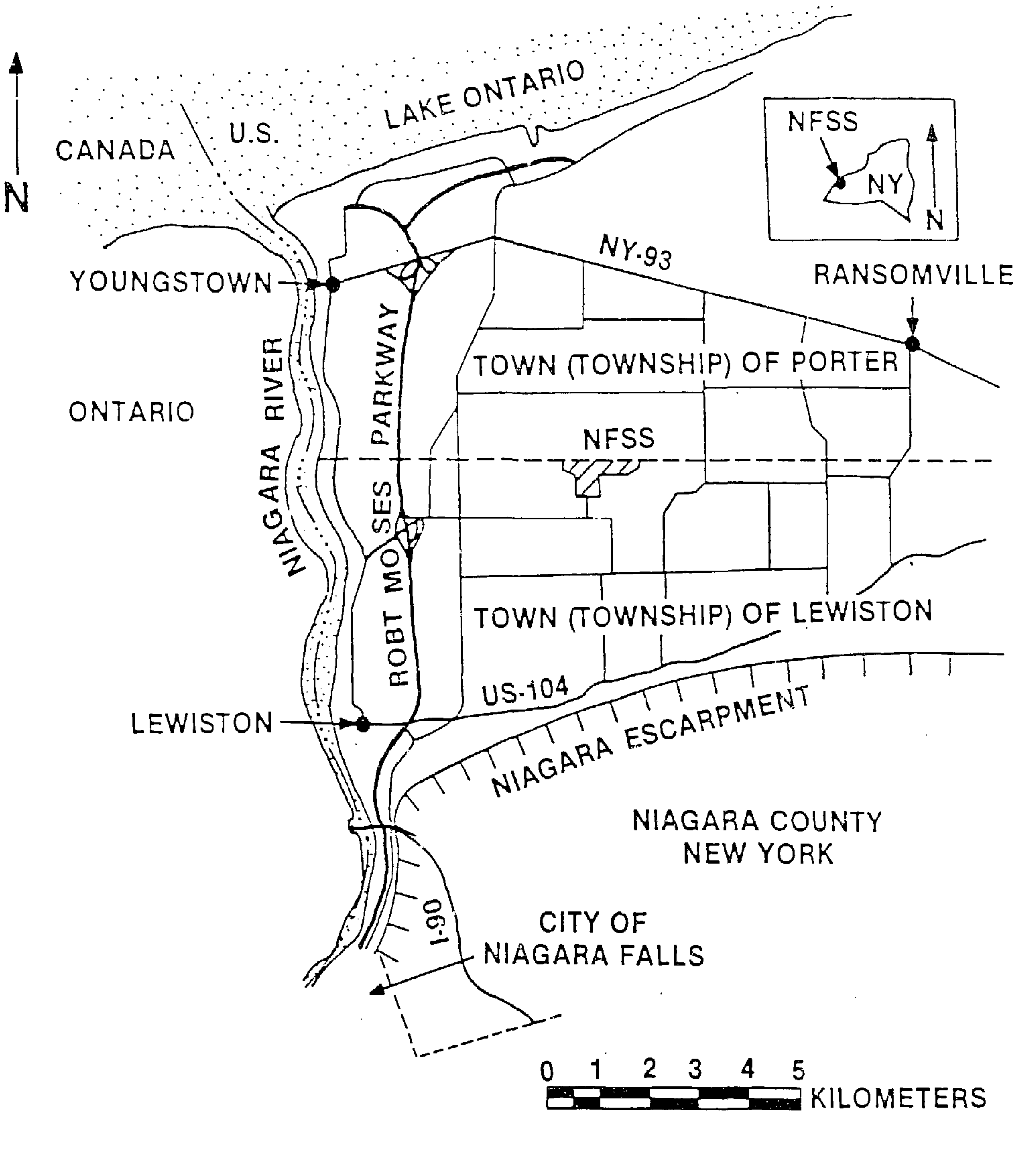

FIGURE 1 Location of NFSS

Moses Parkway to the west. The site occupies approximately 77.4 ha and is located in a generally rural setting. The current configuration of the NFSS is shown in Figure 2 (the locations of storage buildings no longer in existence are marked as "old buildings"). Access to the site is restricted by a 2.1-m-high fence that encloses the DOE property. The site is bordered by a hazardous waste disposal site, a sanitary landfill, and land that is currently vacant. The nearest permanent residence is 1.1 km southwest of the site.

The climate of the NFSS area is classified as humid continental; normal temperatures range from -3.9 to 24.4°C during the year, and the mean annual precipitation is 80 cm. Wind is predominantly from the southwest, with an average monthly wind speed ranging from 15.9 to 23 km/h. The site is generally level, sloping gently to the northwest. Soils at the NFSS are predominantly silty loams underlain by clayey glacial till and lacustrine clay.

All surface water from the site discharges via the Central Drainage Ditch and its tributary ditches into Four Mile Creek, located northwest of the site. Groundwater is present in an aquifer at the bedrock surface (the primary aquifer beneath the site), in sand-gravel lenses, and in saturated clay zones at depths of 1.5 to 6 m. The groundwater most likely discharges into the northern reaches of the Niagara River close to Lake Ontario (1).

Lake water and river water are the predominant sources of potable water in the area surrounding the NFSS; approximately 90 percent of the population in Niagara and Erie Counties uses these sources. Water from Lake Erie serves 65 percent of the population, and water from the upper Niagara River serves 25 percent of the population. Communities north of the Niagara Escarpment, including Lewiston and Porter townships, receive much of their water from these sources (2). Groundwater is used to supply approximately 10 percent of the population in Niagara and Erie Counties. The primary uses are for small domestic and farm supplies in rural areas.

The primary areas of population near the NFSS are the towns of Lewiston (population 16,200), Niagara (population 9,650), Porter (population 7,250), and Niagara

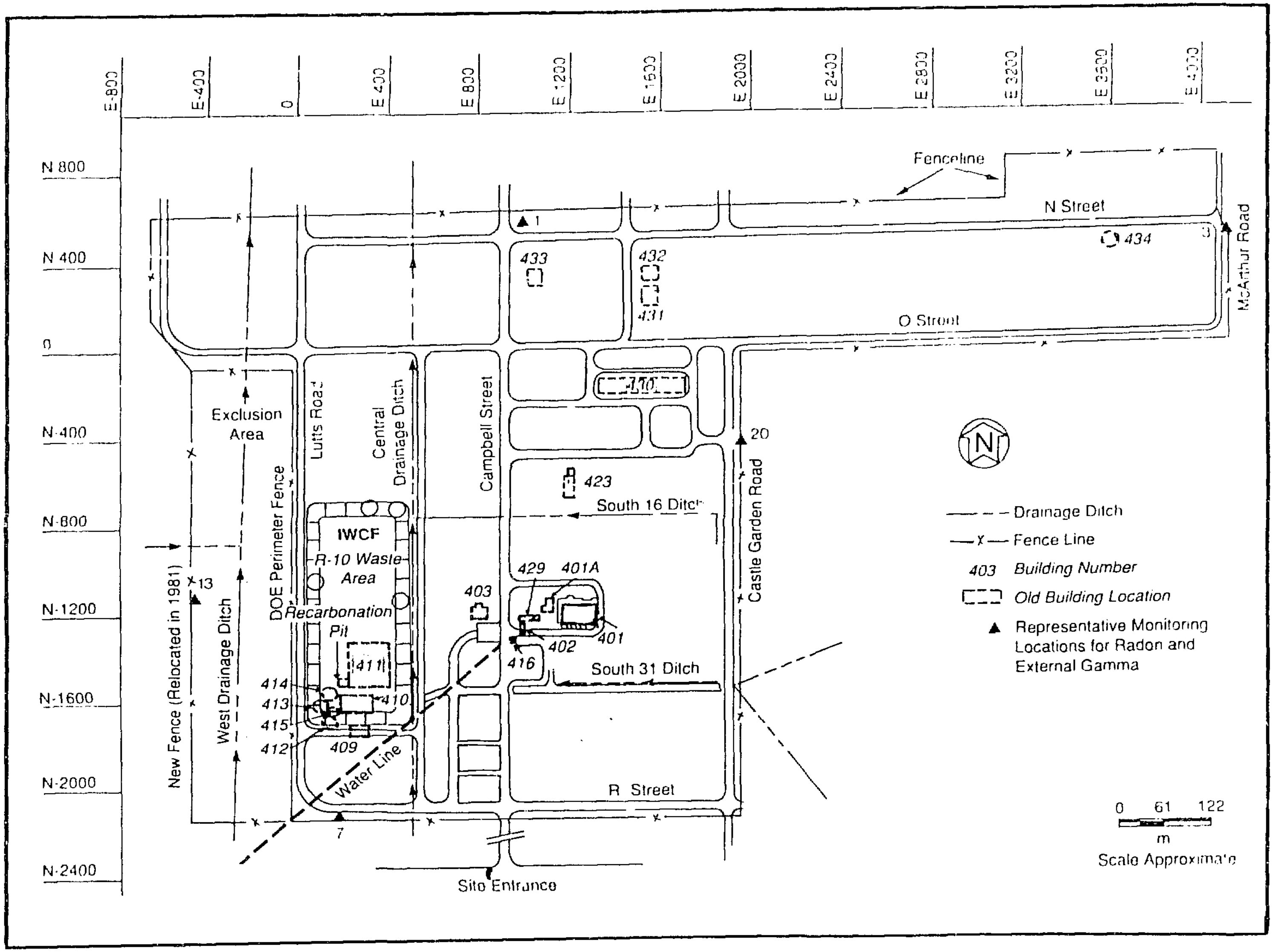

FIGURE 2 Current Configuration of NFSS

Falls City (population 71,400). Almost three-fourths of the 227,000 people residing in Niagara County live in urban areas. The population density in Niagara County in 1980 was approximately 170 persons/km² (2). Land uses immediately adjacent to the site are varied.

The NFSS is a remnant of the original 612-ha site that was used during World War II by the Manhattan Engineer District (MED) project and was a portion of the U.S. Department of the Army's Lake Ontario Ordinance Works. Except for enriching operations involving nonradioactive boron-10 during the periods 1954 to 1958 and 1964 to 1971, the site's major use from 1944 to the present has been for the storage and transhipment of radioactive residues produced as by-products of uranium processing during the MED project and subsequent Atomic Energy Commission (AEC) projects. The site is currently managed by the DOE under its Surplus Facilities Management Program.

The composition of residues and waste materials at the NFSS has been reported in reference (2). The primary radionuclides are radium-226, uranium-238, and associated radioactive decay products. The major contaminant is radium-226. Materials stored at the site consist of low-grade residues and by-products from the Linde Air Products Division of the Union Carbide Corporation in Tonawanda, New York (L-30, L-50, and R-10 residues) and from the Middlesex Sampling Plant in Middlesex, New Jersey (F-32 residues). The L-30 and L-50 residues were stored in Buildings 411, 413, and 414, and the F-32 residues and associated iron cake were stored in an open area north of Building 411 (Figure 2). The small quantity of Middlesex sands resulting from decontamination activities at the Middlesex Sampling Plant was stored in Building 410. From 1950 to 1952, the K-65 residues were transferred to a renovated concrete water tower (Building 434).

About 190,000 m^3 of contaminated soils, wastes, and residues is stored at NFSS. The inventory of residues stored at the site is as follows (3): 3,891 tn K-65, 8,227 tn L-30, 1,878 tn L-50, 138 tn F-32, and 8,235 tn R-10. About 2 tn of Middlesex sands is also stored at the site. The residues, with a volume of about 18,000 m^3, account for the bulk of the radioactivity, which is primarily radium-226. The K-65 residues, which account for about 95 percent of the radium-226 content in the residues, are estimated to contain about

1,830 Ci of radium-226, based on the most recent concentration data available (4). The amount of uranium remaining in the residues and wastes after extraction of uranium from the ores is quite low: <30 Ci in the residues and <1 Ci in wastes (2).

ENVIRONMENTAL COMPLIANCE AND NEPA PROCESS AT NFSS

The National Environmental Policy Act (NEPA), which was enacted in 1969, provides the basic national charter in the United States for the protection of the environment. It is implemented by Executive Orders 11514 and 11991 and the Council on Environmental Quality regulations of 1978 (40 CFR 1500-1508). The major goal of NEPA is to restore and maintain the quality of the human environment. It requires the preparation of an Environmental Impact Statement (EIS) for all major federal actions that may significantly affect the quality of the human environment. An action or a project is determined to be in the "significant" category, based on the context and the intensity of impacts. If the project is found to have no significant impact, a Finding of No Significant Impact (FONSI) is issued following an environmental assessment, and the environmental process ends. For significant actions, an EIS is required.

Preparation of an EIS starts with the publication of a Notice of Intent (NOI) in the Federal Register. Then, a scoping process takes place, during which the agency must invite public participation and participation by other agencies and interested parties. Issues to be analyzed are determined and an EIS implementation plan is prepared. Through site and environmental characterization, the necessary data are gathered and the impacts of various alternatives are assessed. Following review of a preliminary draft, a Draft Environmental Impact Statement (DEIS) is issued. The DEIS is issued for review to all federal, state, and local agencies having jurisdiction over the proposed action as well as to any person, organization, or agency requesting it. The minimum comment period is 45 days. The final EIS must respond to all comments, and it must be circulated to all entities on the required circulation list of the DEIS, as well as to any person, agency, or other organization that submitted substantive comments on the draft. The EIS is filed with the

U.S. Environmental Protection Agency (EPA), and a list of impacts is published in the Federal Register.

No decision on the proposal is made before 90 days after the publication of the notice of a draft EIS or 30 days after the publication of the notice for a final EIS, whichever occurs later. Then, a Record of Decision (ROD) identifying the environmentally preferable alternative is prepared and issued. Engineering design and implementation of the remedial action then follow.

In 1980, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as "superfund" was enacted. CERCLA was substantially amended through the Superfund Amendments and Reauthorization Act (SARA) of 1986, which provided for increased Superfund funding, set more stringent remedial action standards, and gave EPA greater response power. CERCLA Section 104 authorized EPA to recover the cleanup costs of a hazardous site from the potentially responsible parties (PRPs). Also, SARA Title III established a new federal Community Right-to-Know Law.

Section 120(a)(1) of CERCLA as amended requires that federal departments and agencies must comply procedurally with CERCLA in the same manner and to the same extent as nongovernment entities. Thus, remedial action at DOE sites has to satisfy the requirements of both NEPA and CERCLA.

Under CERCLA, a remedial investigation/feasibility study (RI/FS) must be prepared to support the decision-making process for evaluating remedial action alternatives. Consistent with the EPA guidance for conducting an RI/FS, a Work Plan for the site should be prepared and it should contain a summary of information currently known about the site, present a conceptual site model that identifies potential routes of human exposure to site contaminants, identify data gaps, and summarize the process and proposed studies that will be used to fill the data gaps.

It is current DOE policy to integrate the requirements of CERCLA and NEPA processes for response actions at sites for which it has responsibility. Under this policy, the

CERCLA process is supplemented, as appropriate, to meet the procedural and documentational requirements of NEPA.

All interim remedial actions at the NFSS site were conducted under NEPA prior to the enactment of SARA in 1986. The remedial actions that involved transfer and consolidation of residues and wastes, stabilization actions, and other control measures were analyzed with respect to their impacts prior to implementation. The documents prepared under NEPA were Action Description Memoranda (ADMs). For the long-term management of the radioactive residues and wastes at the NFSS, the NEPA process began with a Notice of Intent (NOI) to prepare an EIS published by the DOE in the Federal Register (48(22):4522) on February 1, 1983.

The DOE conducted a scoping process to determine the alternatives to be analyzed in the EIS, the significant issues to be analyzed in depth, and the issues to be eliminated from further detailed study. Both technical and public scoping input were considered. Public input included presentations made at two public meetings held in Lewiston, New York, on February 17 and 19, 1983; presentations made at a public meeting held in Oak Ridge, Tennessee, on October 19, 1983; and letters received by DOE regarding the scope of the EIS. Technical input during the scoping process was received from Bechtel National, Inc., Argonne National Laboratory, DOE Operations Offices at Oak Ridge and Richland, DOE Headquarters, and state agencies (New York State Department of Environmental Conservation, Department of Labor, and Department of Health).

An analysis of the scoping process comments showed that very few comments were received from private citizens. About half of all comments were from government organizations and about half from organized public-interest and environmental groups. As a result of the public and technical input during the scoping process, a fourth alternative was added (to the three in the NOI). The key issues/concerns included potential radiological health effects, potential human intrusion, radiological contamination of the oceanic environment, and synergistic effects (radiological contaminants from the NFSS and chemical contaminants from nearby hazardous waste facilities). Several issues, such as psychological impacts, were considered beyond the scope of the EIS.

A draft EIS was prepared and issued for public review and comment on August 17, 1984. Forty-two written comments and twenty-two oral comments were received. The final EIS was published in April 1986 (2). The DOE and EPA held a meeting on August 8, 1986, regarding the ROD for NFSS.

The DOE issued a ROD on August 27, 1986, and it was published in the Federal Register (51(172):31797) on September 5, 1986, entitled as Record of Decision for Remedial Actions at the Niagara Falls Storage Site, Lewiston, New York. The EPA has not provided full concurrence with this ROD.

From the beginning of the scoping process, with formal scoping meetings, community relations to date have included several news releases, media tours and media visits, briefings to Town Boards and other groups, and 15 access agreements.

IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The EIS prepared for the long-term management of radioactive residues and wastes (2) considered four main alternatives, with two or more subcases for three of the alternatives. The EIS used the term "long-term management" instead of "disposal" because of recognition of the need for continuing management into the future. The primary contaminant in the NFSS materials is Ra-226; the K-65 residues account for bulk of the Ra-226 inventory. The Ra-226 concentrations and the Ra-226 inventory used in the EIS are shown in Table 1.

The analyses of environmental impacts for each alternative considered three time frames: action period (0-10 years), maintenance and monitoring period (10-200 years), and long term (200-1000 years). For the long term, the analyses included two cases: (a) loss of monitoring, maintenance, and corrective actions, but institutional controls (access restriction and federal government ownership) remain intact; and (b) loss of all controls.

Table 1 Ra-226 Concentrations and Inventory Used in EIS

Material	Volume (m^3)	Average Concentration of Ra-226 (pCi/g)	Ra-226 Inventory (Ci)
<u>Residues</u>			
K-65	3,000	220,000	775
L-30	6,000	12,000	90
F-32	500	300	0.1
L-50	1,500	3,300	6
SUBTOTAL	11,000	67,000	871
<u>Wastes</u>			
R-10 area, including R-10 residues	45,000	95	5.2
Contaminated soils, contaminated portions of containment system, plus 20% contingency on nonresidue materials	134,000	16	2.6
SUBTOTAL	179,000	36	7.8
TOTAL	190,000	3,800	879

Source: Reference (2).

The alternatives analyzed in the EIS were as follows:

1. No action

2. Long-term management at NFSS
   - 2a. With modified containment
   - 2b. With modified containment plus modified form

3. Long-term management at other sites
   - 3a. At Hanford, Washington
   - 3b. At Oak Ridge, Tennessee

4. Off-site storage of residues with wastes at NFSS or ocean disposal
   - 4a. Residues at Hanford, wastes at NFSS
   - 4b. Residues at Hanford, ocean disposal of waste
   - 4c. Residues at Oak Ridge, wastes at NFSS
   - 4d. Residues at Oak Ridge, ocean disposal of waste

The no action alternative provided the baseline case.

The environmental impacts for each alternative were assessed with respect to the following: (a) projected injuries/deaths from transportation and from occupational activity; (b) additional radiological health effects for the general public and the workers; (c) additional radiological health effects at year 1000 (assuming loss of control at 200 years and erosive land use); (d) time to erode cap (assuming loss of control at year 200); (e) on-site well contamination for Ra-226 (at year 1000), and the time to reach maximum concentration; (f) Rn-222 releases from buried waste and residue (until year 201, and at year 1000); (g) land use commitment; and (h) the ocean disposal impacts. A complete discussion of the impacts is available in the EIS (2). A summary of the radiological impacts in terms of doses to general public is quoted in Table 2. Technical aspects of the various alternatives were also analyzed including the estimated costs for the action period

Table 2 Estimated Doses to the General Public for Various Alternatives

Alternative	Cumulative Doses to General Public (Whole Body) (person-rem) Action Period	Cumulative Doses to General Public (Whole Body) (person-rem) Maintenance & Monitoring Period	Cumulative Doses to General Public (Whole Body) (rem/yr/million persons) At Year 1000 (loss of all controls)
1	<0.001	<0.001	0.065
2a	<0.001	<0.001	<0.001
2b	18	<0.001	<0.001
3a	120	2.5	0.39
3b	69	<0.001	<0.001
4a	62	23	3.3
4b	470	23	3.3
4c	43	<0.001	<0.001
4d	450	<0.001	<0.001

Source: Reference (2).

and the costs for perpetual care. In addition, the Federal and State laws and regulations that may be potentially applicable to various alternatives were compiled.

For the alternatives involving the removal of the materials to off-site locations, estimates were made of the transportation requirements and the space requirements for waste management at the off-site locations. For alternative 3a it was estimated that about 16,000 truckloads would need to be transported on major interstate highways over a distance of approximately 4,100 km through 11 states. About 57 ha would be required for management of these materials at Hanford. For alternative 3b, the same amount of material would be transported over approximately 1,300 km crossing five states. About 24 ha would be needed at Oak Ridge for waste management. For alternative 4a, it is estimated that residues would be transported in 1,600 truck trips and about 22 ha would be required at Hanford. The wastes would remain at the NFSS and will be covered with a long-term cap. For alternative 4b, the wastes would be excavated, transported to docks in New York/New Jersey harbor area, loaded into barges, and disposed off at the Ocean Waste Disposal Site. For alternative 4c, the residues would be transported to Oak Ridge and stabilized and covered with a long-term cap; about 33 acres would be needed for waste management. The wastes would remain at NFSS, similar to alternative 4a. For alternative 4d, the residues would be transported to Oak Ridge and managed there, similar to alternative 4c, but the wastes would be disposed of at the Ocean Disposal Site, similar to alternative 4b. For the alternatives involving transportation to off-site locations, both radiological and nonradiological impacts are much higher than the alternatives that do not include transportation of residues or wastes. The impacts in terms of projected injuries and deaths related to transportation are much more significant than the radiological impacts.

A comparison of Action Period estimated cost reported in the EIS (2) ranges from $3.2 million to $18 million for alternative 2, from $67 million to $260 million for alternative 3, and $13 million to $99 million for alternative 4.

A detailed comparison of the various alternatives is available in the EIS (2). Alternative 2 (i.e., long-term management at NFSS) was identified as the preferred alternative.

EFFECTIVENESS OF THE INTERIM REMEDIAL ACTIONS

Over the past 10 years, various steps have been taken at the NFSS to minimize potential radiological risks, to upgrade storage buildings, and to consolidate wastes. The overall effect of these actions has been to reduce the radon release levels from above DOE guidelines to near background levels. In 1984, work began on the consolidation of the waste; following this activity, gamma exposure rates declined sharply to stable, low levels after 1986 when the Interim Waste Containment Facility (IWCF) was completed (Figure 3).

While the EIS process for the long-term management of the residues and the wastes was initiated in February 1983, the interim actions at the NFSS were addressed in a series of Action Description Memoranda (ADM) (5-8). Under NEPA, limited-scope remedial actions can be addressed through an ADM that supports a Memorandum to File (MTF) stating that impacts from the actions will be clearly insignificant. An ADM addresses only the remedial action alternative and does not include a screening of the various alternatives. It does not require public comment.

The interim remedial actions at the NFSS have been successful in achieving the intended objectives, and their effectiveness has been confirmed by the environmental monitoring results over the past several years. The site is in compliance with the DOE radiation protection standards. A brief summary of the environmental monitoring results and a chronology of the interim remedial actions and their effectiveness are discussed below.

Gamma exposure and inhalation of radon are considered the only plausibly significant exposure pathways for an individual at or near the NFSS. Figures 4 and 5 show the decline in radon exposures and gamma exposure rates, respectively, during the years when the interim remedial actions were taken, eventually culminating in waste consolidation in the IWCF. The data in these figures are annual average values, and only data for representative boundary locations are shown. The radon data include background

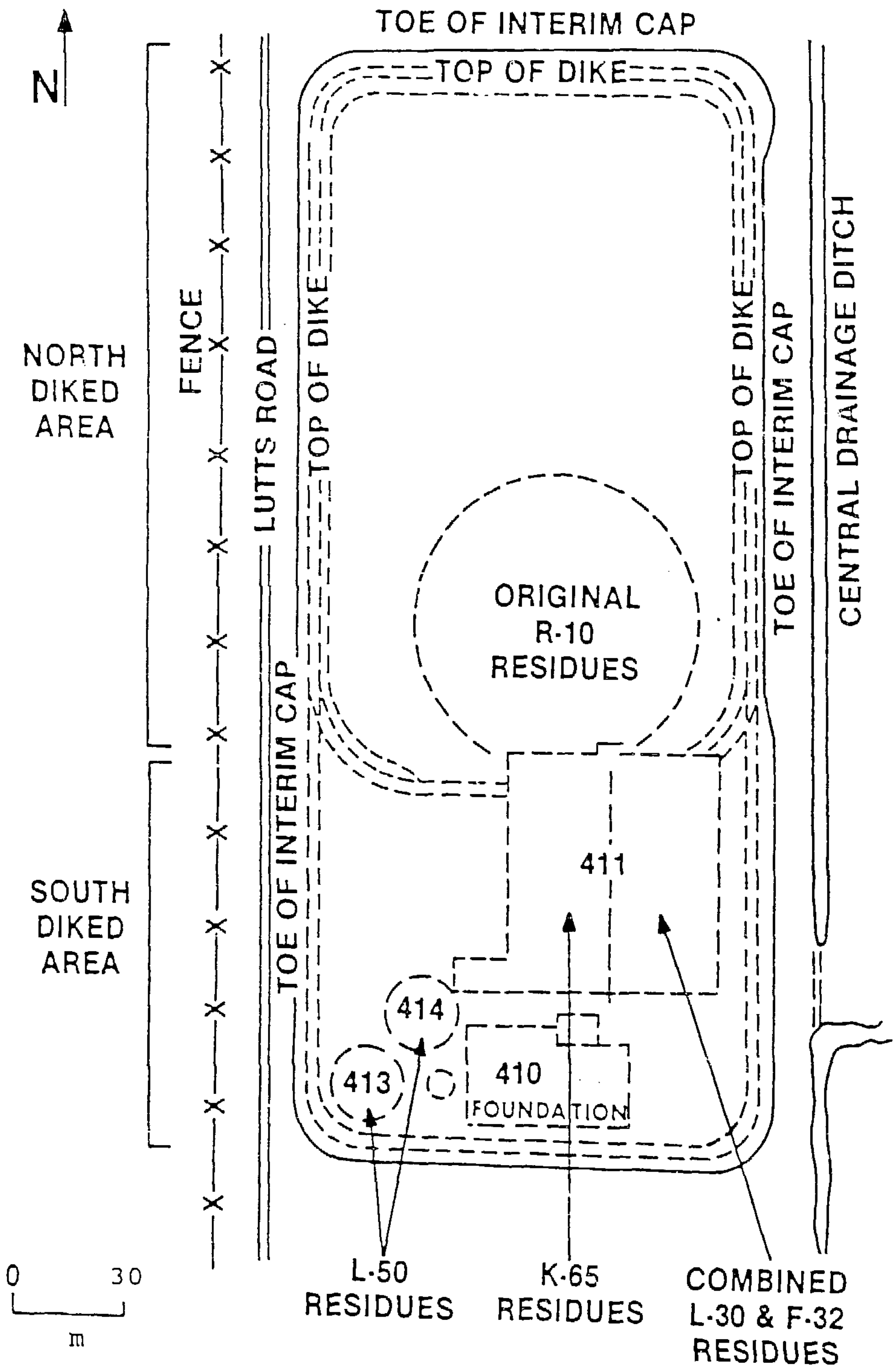

FIGURE 3 Plan View of the Interim Waste Containment Facility

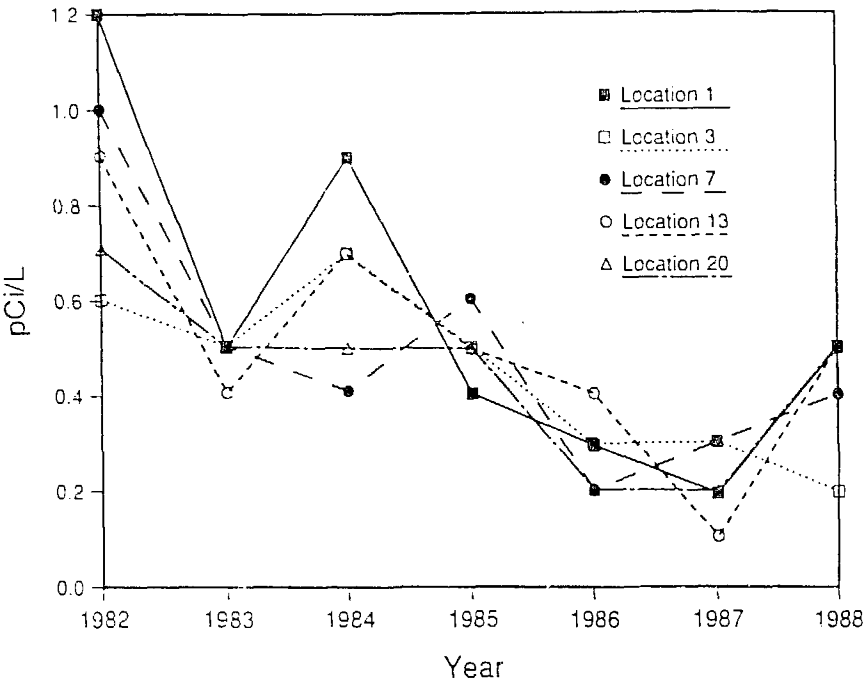

FIGURE 4 Radon Levels at Representative Boundary Locations

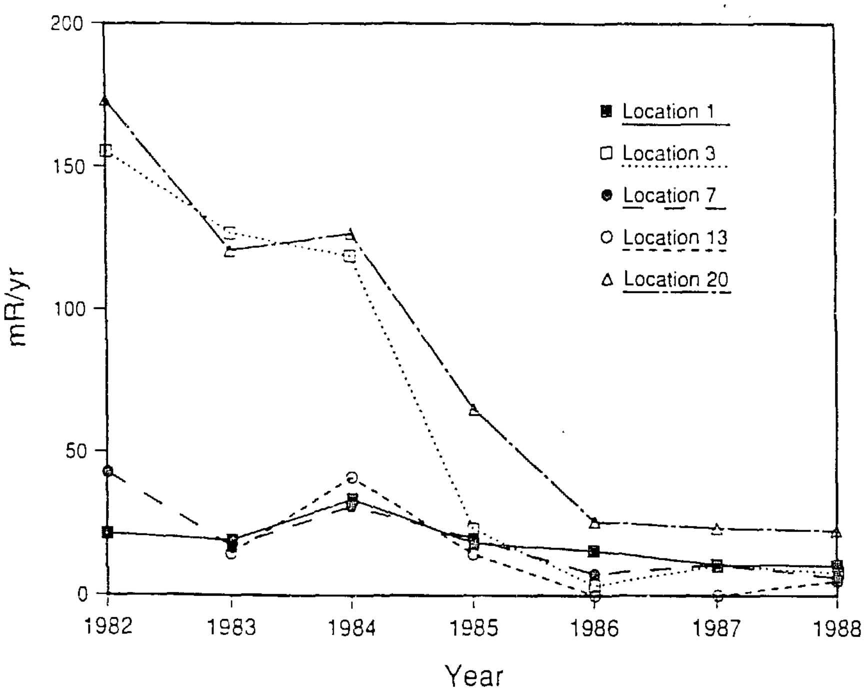

FIGURE 5 Gamma Exposure Rates at Representative Boundary Locations

levels, which have ranged form 0.3 to 1 pCi/L over the past several years. The gamma exposure rate data reflect values that can be attributed to the NFSS; that is, the background levels (ranging from 64 to 91 mR/yr) have been subtracted from the measured readings. The monitoring network currently consists of 35 radon detectors and 33 thermoluminescent dosimeters for measuring gamma radiation levels. Average annual concentrations of total uranium in surface-water samples taken at a location where the Central Drainage Ditch exits the NFSS have decreased form 108 pCi/L in 1982 to stable values after 1986 (10 pCi/L in 1988) (Figure 6). Radium concentrations at the same location have remained low, about 1.5 pCi/L or below (Figure 7). In sediment samples taken in 1988, the average concentrations were 2 pCi/g (dry) for uranium and 0.9 pCi/g for radium, which are near background levels. Groundwater concentrations of total uranium and radium have generally remained stable (Figures 6 and 7). For example, along the eastern and western edges of the northern boundary of the NFSS, the concentration of uranium is about 4 pCi/L and that of radium about 0.4 pCi/L. Only one well located on the western perimeter of the IWCF has shown elevated uranium concentrations (about 55 pCi/L). An investigation conducted in 1988 (9) has shown that the well is located in a sand lens and that the radioactive contamination is possibly associated with contaminated solids in or near the well. The current groundwater monitoring network consists of 48 on-site wells.

The chronology of the interim remedial actions began after Battelle Columbus Laboratories conducted a radiological survey of the NFSS in 1979. The report of this survey (3) served as a basis for initial interim remedial action planning for the site. Bechtel National, Inc. (BNI), has acted as DOE's project management contractor and implemented interim remedial actions at the site since 1981. BNI currently maintains the site and conducts environmental monitoring (9). Access to the site is restricted by a 2.1-m high fence that encloses the DOE property.

Since 1980, various steps have been taken at the NFSS to minimize potential radiological risks and prevent migration of residues. In the fall of 1980, the vent at the top of Building 434 (the former water tower in which the K-65 residues were stored) was capped to reduce radon emissions to the environment. Also during 1980, pipes penetrating

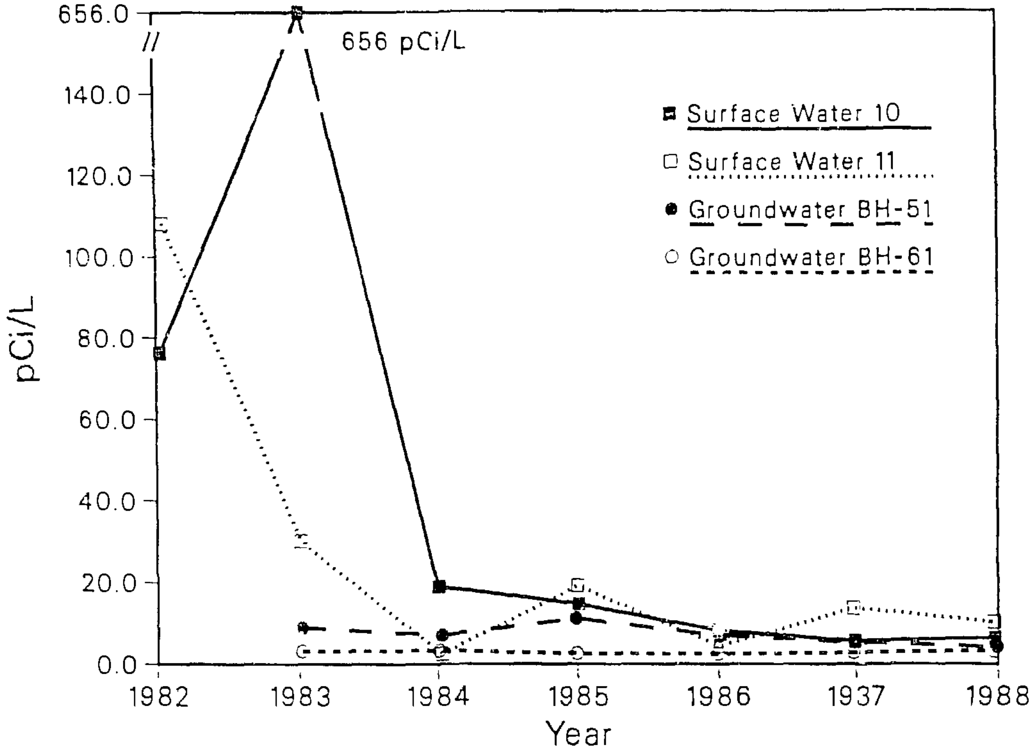

FIGURE 6 Total Uranium Concentrations in Surface Water and Groundwater at Representative Locations

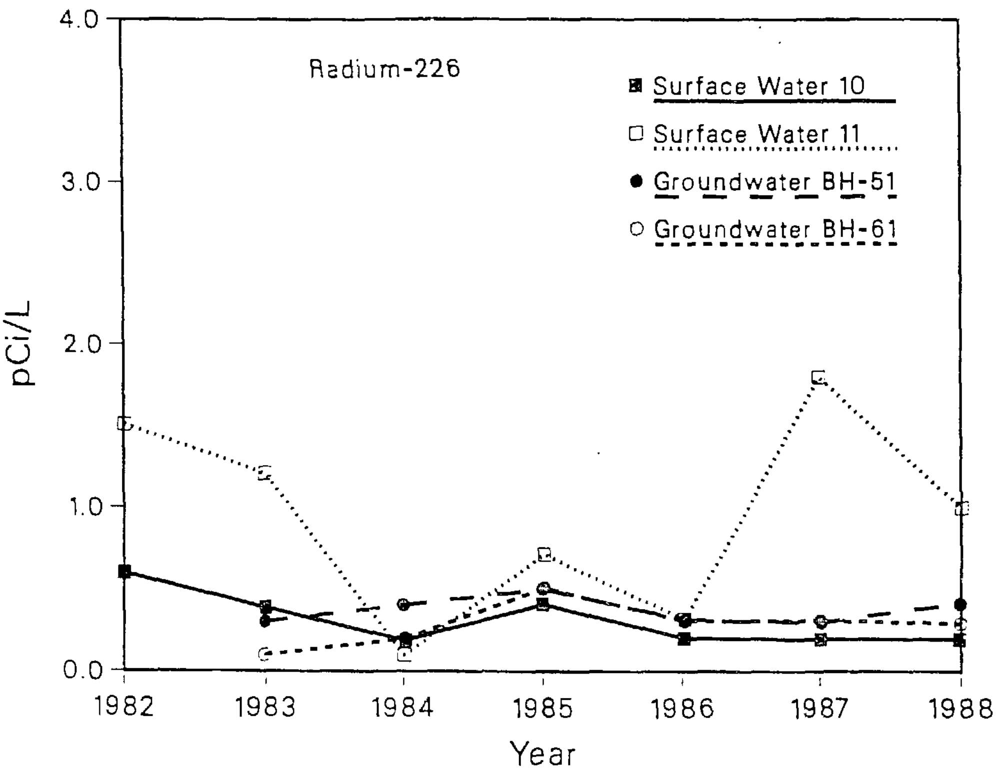

FIGURE 7 Radium Concentrations in Surface Water and Groundwater at Representative Locations

the walls of the residue storage buildings were sealed or resealed, as necessary, to prevent radionuclide migration.

Because radon levels at the site's western boundary, with average concentrations in the range of 5 to 7 pCi/L (10), were exceeding the DOE limit of 3 pCi/L (11), the site fence was relocated approximately 152.4 m to the west in mid-1981, creating an exclusion area to protect the public from exposure to higher radon levels. Radon levels at the new boundary were well below applicable guidelines. In 1981, remedial action was performed on a triangular-shaped vicinity property adjacent to the NFSS, and approximately 342 m^3 of excavated contaminated material was placed in storage at the NFSS.

To further reduce the levels of radon emanating from the site, Buildings 413 and 414 (used for storing the L-50 residues) were upgraded and sealed in 1982. Also in 1982, to prevent further migration of residues, contaminated soil near the R-10 pile was moved onto the pile, and a dike and cutoff wall were constructed around the R-10 area. The R-10 pile was then covered with an ethylene propylene diene monomer (EPDM) liner, which markedly reduced radon emanation from the R-10 area. This action effectively reduced radon concentrations at the old site boundary (along Lutts Road) to levels that were below the DOE guidelines.

In 1983 and 1984, the EPDM liner was removed, additional contaminated soils and rubble from on-site and off-site areas were placed on the pile, and the pile was covered with the first layer of the interim clay cap. These actions constituted the origin of the IWCF. In 1984, 93 percent of the K-65 residues was transferred from Building 434 to Building 411 inside the IWCF.

During 1985, transfer of the K-65 residues from Building 434 to the IWCF was completed. Activities during 1985 also included demolition of Building 434, completion of remedial action on vicinity properties near the site, and continuation of the installation of the cap over the waste in the IWCF. These activities involved excavating approximately 10,640 m^3 of contaminated materials from on-site and off-site areas, transferring 1,102 m^3 of building rubble to the IWCF, and discharging 12 million liters of treated, impounded water in accordance with New York State Department of Environmental Conservation (NYSDEC) permit requirements. In 1986, another 25.8 million liters of contaminated water were treated and released, and four of the six water treatment ponds were reduced to grade.

The interim cap over the IWCF was completed in late 198[illegible]. The facility covers an area of 4 ha and is enclosed within a dike and cutoff wall, each constructed of compacted clay (Figure 3). The cutoff wall extends a minimum of 45 cm into an underlying gray clay unit. The dike and cutoff wall, in conjunction with the engineered earthen cap, enclose the waste in a clay envelope that provides a barrier to migration of waste constituents. Pollution control measures were applied during construction of the IWCF. These included the use of typical engineering controls (e.g., use of sedimentation barriers in excavation areas and batch discharges of treated, impounded surface water, in accordance with NYSDEC requirements). In 1987, the impounded water in the remaining two ponds (38.8 million liters) was treated and released. These two ponds were reduced to grade, and the NFSS was closed. The site is currently inactive, except for environmental monitoring and surveillance, and maintenance of the IWCF.

CURRENT ISSUES AND LESSONS FROM THE CASE STUDY

The interim remedial actions conducted under separate limited-scope documentation (ADMs) have been effective in reducing potential radiological risks. The radioactive materials have been consolidated in an interim waste containment facility. Completion of the EIS process from the NOI to the ROD has taken about five years. EPA has not provided full concurrence with the ROD issued by DOE. The long time scale for the process and the difficulties in achieving environmental compliance consensus necessitate interim remedial actions in large projects. These interim actions can go a long way in achieving immediate health and safety objectives while the environmental analysis, compliance, and documentational process for the long-term management or disposal of the wastes slowly moves along. During the time period required for the completion of a major EIS, changes in environmental laws and regulations can occur that can necessitate amendments to documents and decisions.

At the NFSS, one technical issue that arose since the issuance of the EIS in 1986 is the availability of newer data (4) that approximately double the curie content of K-65 residues. The EIS used an average concentration of 220,000 pCi/g for Ra-226 in K-65 residues (these data used in the EIS relate to the characterization work done in 1981 [3]), while additional sample analyses results showed this concentration to be 520,000 pCi/g.

As a result of this new information, the total Ra-226 content of the K-65 residues is estimated to be 1,830 Ci as compared to 879 Ci used in the EIS. From a reevaluation of the dose analysis in EIS, it was concluded (4) that, since gaseous Rn-222 releases were the only significant exposure pathways to general public and burial of residues at depths of more than 6 m precludes releases of radon, the increased radium concentration of buried K-65 residues will not affect the radiological dose. The EPA was informed of these conclusions (4). The estimated total volume of the residues (K-65, L-30, L-50, F-32, and R-10) is about 18,000 m^3. Whether an addendum or revision to the EIS is necessary has not been determined. The EIS may need updating because in 1991 it will be five years since its issuance.

Other developments have occurred since the publication of the EIS. In 1988, several isolated areas of residual radioactivity were excavated and placed in temporary storage. This material will remain in temporary storage until the IWCF is reopened so that additional material can be added. At the present time, all of the residual radioactivity on-site has been remediated, with the exception of one localized area suspected to be both radioactively and chemically contaminated. Presence of potential mixed waste raises a new and complex issue of compliance with the Resources Conservation and Recovery Act (RCRA).

The enactment of SARA in 1986 raises the issue of CERCLA compliance for further interim removal actions at the site and the overall remedial action for the long-term management of the contaminated materials or their disposal.

The Secretary of Energy has issued a new policy (SEN-15-90) effective February 5, 1990, regarding the DOE compliance with NEPA. This interim guidance will apply until replaced by revisions to DOE Order 5440.1C and other DOE guidelines. This new policy eliminates the MTFs from future use after September 30, 1990. However, for certain actions, it is possible to obtain categorical exclusions from NEPA compliance.

A number of issues remain open, and the environmental compliance process continues to evolve. This necessitates addressing new issues as they arise and revisiting some of the old issues. Interagency dialogue and agreements are key to the completion of the environmental compliance process for large projects such as the NFSS.

CONCLUSIONS

The NFSS case study shows that the environmental compliance process for remedial actions at a radioactive site is a prolonged one. From the NOI to the ROD, it is not unusual for the process to take five to seven years. Completion of analyses and the EIS documentation, and its review and approval, require major and protracted efforts. It is important to implement and maintain a strong community relations program. It is equally important to maintain a continuous dialogue with all agencies involved in the remedial project. At the NFSS, the DOE issued a ROD in August 1986; however, EPA has not fully concurred with the ROD. Availability of additional data since the publication of the EIS results in approximately doubling the total Ra-226 curie content in the materials. This and other factors may necessitate a revision or addendum to the EIS.

A number of interim remedial actions have been conducted at the NFSS over the past several years under ADMs. These have included capping of vents, sealing of pipes, transfer and consolidation of waste, upgrading storage buildings, and construction of an IWCF. The interim remedial actions taken at the NFSS provide an example of successful actions that can be undertaken within the existing environmental laws and regulations. Such actions are especially important because of the prolonged EIS process for the long-term options for the radioactive wastes, including disposal.

An analysis of the environmental monitoring results shows that the interim remedial actions at the NFSS have been effective in minimizing potential radiological impacts.

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