

GAO

Report to the Chairman, Committee on
Governmental Affairs, U.S. Senate

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NUCLEAR HEALTH AND SAFETY

Environmental Problems at DOE's Idaho National Engineering Laboratory



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**Resources, Community, and
Economic Development Division**

B-242334

February 12, 1991

The Honorable John Glenn
Chairman, Committee on
Governmental Affairs
United States Senate

Dear Mr. Chairman:

As requested, we are reporting on environmental problems at the Department of Energy's (DOE) Idaho National Engineering Laboratory (INEL). As agreed with your office, this report provides information on (1) the more serious environmental problems identified at INEL facilities, including their impact on the environment and DOE's operations, and (2) difficulties DOE has encountered in managing the site's environmental problems. INEL, as you know, is a key nuclear research center as well as one of the principal sites in DOE's nuclear weapons complex.¹ Various INEL facilities generate, store, and dispose of a variety of radioactive, hazardous, and mixed wastes.²

Results in Brief

DOE and the Environmental Protection Agency (EPA) have identified many environmental problems at INEL. The more significant problem areas include (1) lack of adequate secondary containment—such as double-lining—in underground pipes and tanks that transport and store mixed wastes; (2) problems related to the treatment and storage of mixed wastes, such as storing these wastes without having EPA-approved treatment technologies available; and (3) releases of radioactive and hazardous contaminants into the soil, groundwater, and drinking water beneath INEL.

Some of these problems have adversely affected DOE operations and/or the environment. For example, the lack of secondary containment for underground pipes that transfer radioactive liquid wastes at the Idaho Chemical Processing Plant—which reprocesses spent nuclear naval fuel—have kept the plant shut down since July 1989. Continued shut-down of the plant could adversely affect the processing of spent naval

¹The complex consists of numerous major facilities around the country that are involved in the design, testing, and production of nuclear materials and weapons.

²Mixed wastes contain both radioactive and hazardous constituents.

fuel, thereby restricting the Navy's nuclear fleet operations.³ In regard to effects on the environment, past waste disposal practices have resulted in releases of radioactive and hazardous contaminants into the Snake River Plain aquifer beneath INEL.

A number of delays have occurred in environmental cleanup and compliance programs at the site. According to DOE officials, these delays have been attributable in part to ongoing negotiations among DOE, EPA, and the state of Idaho. However, DOE's operations office at INEL has also identified ineffective DOE and contractor organization and planning as contributing to these delays. The operations office has made organizational and staffing changes to more effectively manage the site's handling of environmental problems. The office is also focusing closer management attention on negotiating environmental solutions with EPA and the state of Idaho. To date, little physical cleanup has begun on the more than 200 inactive waste sites at INEL. The success of the cleanup, which will likely cost billions of dollars, and INEL's management efforts will ultimately depend on a continued environmental commitment by DOE over many years.

Background

Established in 1949, INEL performs a variety of nuclear-related research and materials production activities within an 890-square-mile desert site in southeast Idaho. Principal operating facilities include the Idaho Chemical Processing Plant, which reprocesses spent naval and research nuclear fuel and other fuels to recover the remaining enriched uranium for re-use. The plant also converts the high-level radioactive liquid waste resulting from the fuel reprocessing operation into a solidified granular form by high-temperature drying—a process known as calcining. The radioactive calcined waste is currently stored at INEL.

Another major operating facility is the Radioactive Waste Management Complex, which disposes of low-level contaminated waste generated at INEL. The Complex also prepares and stores radioactive and hazardous transuranic wastes⁴ from INEL and other DOE locations for eventual disposal in DOE's planned Waste Isolation Pilot Plant in New Mexico. Other DOE activities located at INEL include several reactor testing areas, a

³As of September 1990, the projected date for resumption of full plant reprocessing operations was July 1991.

⁴Transuranic wastes are any wastes contaminated with radioactive elements heavier than uranium at levels greater than 100 nanocuries per gram. (A nanocurie is one-billionth of a curie.) Typical waste forms are glassware, equipment, tools, gloves, clothing, and soil.

naval reactor testing and training facility, and the Argonne National Laboratory-West, a reactor technology research facility.

For several decades, radioactive and mixed wastes have been generated and disposed of at INEL. In 1984, DOE's facilities were held to be subject to the Resource Conservation and Recovery Act (RCRA) requirements that hazardous wastes be handled, stored, and disposed of in an environmentally acceptable manner. In 1987, DOE recognized that the hazardous constituents in its mixed wastes generally were covered by RCRA regulations. INEL's hazardous waste activities are regulated by EPA in accordance with RCRA and other federal environmental laws.⁵ EPA has cited INEL during the latter part of the 1980s for environmental violations (see app. III).

Serious and Costly Environmental Problems Exist at INEL

Many serious environmental problems have been identified at INEL. Major problem areas include (1) lack of adequate secondary containment for pipes and tanks; (2) problems related to the treatment and storage of mixed wastes, such as storing these wastes without having EPA-approved treatment technologies available; and (3) releases of radioactive and hazardous contaminants into the ground and the Snake River Plain aquifer. Some of these problems have kept key DOE operations shut down. DOE estimates that correction of these problems will likely cost billions of dollars and take decades of DOE effort.

Lack of Adequate Secondary Containment

Under RCRA regulations, facilities' pipes and tanks that handle hazardous wastes must have adequate secondary containment, such as double-lining, to prevent leakage (40 C.F.R. 265.193). However, numerous underground pipes and tanks that are used to transfer and store mixed wastes at INEL's chemical processing plant do not meet this standard. The pipes and tanks are subject to the standard although, according to DOE, they were installed at the plant before DOE sites were held to be subject to RCRA. According to an INEL operations office official, the piping containment issue is the primary reason the plant has remained shut down for over a year.

In July 1989, INEL officials discovered that a section of an underground cast-iron condenser drain pipe at the plant had corroded through. According to a contractor's investigation report, the pipe corroded

⁵In April 1990, EPA delegated to the state of Idaho authority to regulate RCRA-related hazardous waste activities within its borders.

because its cast-iron composition was chemically incompatible with the corrosive waste it carried. Because the pipe lacked secondary containment as required under RCRA regulations, some waste probably leaked into surrounding soil. However, as of December 1990, DOE had not determined how much waste might have entered the soil. DOE planned to obtain soil samples to determine the extent of possible contamination but had not yet implemented its plans because they are included in ongoing INEL cleanup negotiations with EPA and the state of Idaho. (See app. II.)

In addition to the corroded drain pipe, a DOE official said that about 6,000 feet of piping carrying high-level mixed wastes throughout the plant were found not to have secondary containment. As a result, the plant—which was already shut down for maintenance—has been kept shut down so that the pipes can be upgraded to meet RCRA's containment standards. DOE is replacing the single-lined piping, which is to be abandoned in place. In most cases the replacement involves routing new and existing single-lined pipes indoors at the plant. Secondary containment will be provided by stainless-steel-lined floors beneath the pipes.

In November 1990, the state of Idaho, which is overseeing INEL's upgrade plans, approved them with the stipulation that within a year the Department submit a plan to further upgrade the pipes' secondary containment—in particular at locations where the single-lined pipes pass through concrete walls.⁶ DOE estimates costs of about \$25 million to \$30 million to upgrade the piping. However, DOE acknowledges that this dollar figure will increase considerably if major contamination from the condenser drain pipe is discovered or if other contamination from pipes is found.

Another major RCRA-related containment problem involves waste storage tanks. Of most concern are eleven 300,000-gallon underground waste storage tanks at the chemical processing plant's tank farm. These stainless steel tanks are used to store the highly radioactive acidic wastes resulting from the nuclear fuel reprocessing operation before the wastes are calcined into a solidified granular form. The tanks were cited for incompatible secondary containment as a result of a June 1989 EPA inspection at the plant. The tanks have a form of secondary containment

⁶DOE negotiations with the state have in part been responsible for delays in restarting the plant.

because they are encased in individual concrete vaults designed to contain leaks. However, EPA determined that the vaults do not meet secondary containment standards because of material incompatibility with liquids stored in the tanks.

DOE plans to replace all 11 tanks with a lesser number of new tanks. Although INEL has no evidence of past leakage, all of the existing tanks may violate containment standards because of the material incompatibility problem, and five of them are considered especially vulnerable. This is because their containment vaults consist of several concrete panels, grouted at the seams, that are more likely to leak or to breach in a major earthquake than the six other tanks, which have continuously poured, or seamless, concrete vaults. DOE has submitted to the regulators its compliance plan for correcting the tanks' problems, which call for replacement of the five most vulnerable tanks by fiscal year 1997. Four new tanks with stainless-steel-lined concrete vaults are to be built, and the old tanks are to be drained, cleansed, and then abandoned in place. Based on projections of future needed capacity for the other six tanks, DOE may replace them by fiscal year 2002.

According to operations office officials, the replacement of these tanks will be expensive. DOE estimates that replacement of the first five tanks with four new tanks will cost about \$296 million. For the remaining tanks, DOE projects an additional \$290 million will be needed to replace their capacity. As with the underground pipes, these cost estimates could rise considerably if contamination caused by faulty containment is discovered or if the old tanks need to be removed rather than abandoned in place. Removing the tanks, which DOE currently considers hazardous and unnecessary, could cost several hundred million dollars more.

Treatment and Storage Problems

Under RCRA, EPA has published detailed requirements for the treatment and storage of hazardous wastes (40 C.F.R. 260, 264, 265, 268, 270, et al.). At both the Chemical Processing Plant and the Radioactive Waste Management Complex, as well as at other INEL locations, DOE has identified problems associated with storing its mixed wastes. The problems involve, among other matters, the storage of (1) mixed wastes without having EPA-approved treatment technologies available, (2) stored nuclear fuels that may qualify as mixed wastes subject to RCRA requirements, and (3) mixed transuranic wastes in configurations that do not meet RCRA storage requirements. According to several DOE officials, these

issues could ultimately result in RCRA-related lawsuits and/or shutdowns of other INEL facilities if they are not resolved.

Land Disposal Restricted Storage

Federal land disposal restrictions under RCRA state that certain hazardous wastes must be treated to EPA standards or with EPA-approved technologies before disposal. These wastes can be stored only to accumulate sufficient quantities to facilitate treatment, recovery, or disposal (40 C.F.R. 268, subparts D and E). These restrictions were phased in by EPA in stages from November 1986 through May 1990, and they apply to a variety of mixed wastes that have been generated and stored at INEL.

Some INEL mixed wastes are presently stored subject to the restrictions, including mixed transuranic wastes that have been produced during cleanup operations. Another category of wastes found at INEL—those that were scheduled to be land-disposal restricted as of May 1990—was granted a 2-year variance by EPA. As of May 1992, INEL will not be able to store these wastes unless it develops an acceptable treatment technology for them or obtains a further variance from EPA. For example, at the chemical processing plant INEL is storing large quantities of high-level radioactive liquid and calcined wastes containing substances such as cadmium, lead, and mercury. A DOE official at INEL said that these wastes will be subject to land-disposal restriction in May 1992.

To deal with INEL's mixed waste land disposal problems—which also affect other DOE sites—DOE, EPA, and the state of Idaho plan to negotiate an agreement that would allow continued generation and storage of the wastes at INEL while treatment technologies are being developed. According to a DOE report on mixed waste storage and disposal, a treatment facility for most of INEL's mixed transuranic wastes will be available in 1993. To dispose of the calcined high-level mixed wastes stored at the chemical processing plant, INEL is studying both glass and glass/ceramic treatment technologies (i.e., vitrification) that may cost hundreds of millions of dollars and may not be developed and operational until about 2012.

Storage of Fuels in Possible Violation of RCRA

A second RCRA-related storage issue at INEL involves nuclear fuels that may contain hazardous constituents. Under RCRA, DOE was required to seek permits to continue various operations involving the handling, treatment, storage, and disposal of hazardous wastes (42 U.S.C. 6901 et seq.). DOE did not include the nuclear fuel storage operations at INEL in its permit applications because it did not identify the fuels as mixed wastes subject to RCRA—these fuels are classifiable as special nuclear

materials under the Atomic Energy Act. In this regard, DOE did not originally consider any of the materials in the fuels to be subject to RCRA, even though some of the fuels stored at INEL contain hazardous constituents such as cadmium, silver, metallic sodium, or metal carbides.

DOE is now reconsidering its position on the status of the stored fuels at INEL. According to a DOE headquarters official, the Department hopes to finalize such a position early in 1991 and present it to the regulators.⁷ The official said that it was difficult to estimate INEL's potential costs if the site's nuclear fuels are to be considered wastes and be stored in strict accordance with RCRA. DOE documents indicate that if these fuels are subject to RCRA, INEL may be storing them in violation of the law. Violations could include, among other matters, not having identified these operations in its permit applications or not meeting inspection requirements.

Storage of Mixed Transuranic Wastes in Violation of RCRA

A third important RCRA storage issue at INEL involves mixed transuranic wastes at the Radioactive Waste Management Complex. These wastes are generated at INEL or have been shipped from other DOE sites to INEL for storage.⁸ Departmental Order 5480.11 requires that radioactive wastes be stored so that worker exposures to sources of radiation are as low as reasonably achievable. In line with this requirement, thousands of cubic meters of transuranic wastes are stored above ground at the complex in densely packed configurations (5 barrels high, 20 barrels wide, and 20 to 25 barrels deep) intended to minimize exposure to the radiation emitted from the barrels.

However, according to EPA, these configurations violate RCRA regulations. These regulations require that aisle space be maintained to allow unobstructed movement of personnel or emergency equipment (40 C.F.R. 265.35). In January 1990, EPA issued a notice of noncompliance to the DOE operations office at INEL that cited the densely configured storage of these barrels.

According to DOE, it is in the final stage of negotiations with EPA and the state of Idaho on a plan for storing and inspecting the barrels of transuranic wastes, including constructing additional buildings to store the wastes in a less dense configuration to improve the ability to inspect the

⁷This issue also has implications for other DOE sites that store nuclear fuels.

⁸INEL currently stores over two-thirds of all transuranic wastes generated by DOE facilities nationwide.

barrels in their current configuration. DOE has estimated that the cost to resolve this issue could exceed \$100 million. •

INEL Operations Have Contaminated Soil, Groundwater, and Drinking Water

Under RCRA and other environmental laws, facilities are required to protect soil, groundwater, and drinking water from contamination by radioactive, hazardous, and mixed wastes. Before these laws were passed and later held to be applicable to DOE, INEL used deep injection wells and percolation ponds to dispose of billions of gallons of wastewater containing hazardous and radioactive wastes, as well as shallow-earth pits to bury millions of cubic feet of radioactive wastes. DOE officials have identified over 200 inactive waste sites at INEL—some of which could be a continuing source of contamination to the Snake River Plain aquifer.

Although not classified by DOE as immediately life-threatening, some of the environmental contamination problems, such as the following, are considered serious by the Department.

- At the waste management complex, large quantities of transuranic and low-level radioactive wastes and solidified organic wastes were buried in shallow-earth pits until 1970. As a consequence, plutonium may have migrated as far as 110 feet below the surface, and carbon tetrachloride, a hazardous contaminant, has migrated about 600 feet down to the Snake River Plain aquifer. When first detected in 1987, the level of carbon tetrachloride exceeded the drinking water standard, but more recent tests showed the contaminated level to be below the standard.⁹
- At the test reactor area, a wastewater injection well was used to deposit tons of hazardous chromium directly into the Snake River Plain aquifer from about 1964 to 1972. When detected at a monitoring well in 1987, the level of chromium was over 5 times above the drinking water standard.
- At the northern test area, over many years four injection wells disposed of hazardous wastes into the Snake River Plain aquifer. Trichloroethylene contamination levels above the drinking water standard have been found in two drinking water wells at this location.

INEL improved its waste disposal practices in the latter part of the 1980s and is taking steps to clean up these and numerous other areas of contamination. According to a DOE official at INEL, at the waste management complex DOE is experimenting with different technologies to remove the

⁹Drinking water standards are used to provide a perspective on the degree of contamination that exists at these sites.

sources of the plutonium and carbon tetrachloride contamination and to restore the environment. Under the terms of a 1987 RCRA agreement with EPA, INEL's major wastewater injection wells have been closed—the last in 1989—and several percolation ponds are to be closed in the future. At the northern test area, a treatment process has been installed that reduces the trichloroethylene content in the drinking water to a safe level at the tap, and DOE is planning to clean up the hazardous contamination.

DOE has not estimated the total costs that would be involved in cleaning up all of INEL's inactive waste sites, but partial estimates indicate the cost will be substantial. For the next 6 fiscal years, DOE projects environmental cleanup and restoration costs for INEL at about \$432 million. This includes \$252.1 million for buried waste at the Radioactive Waste Management Complex, \$53.6 million for test reactor area contamination, and \$26.8 million for northern test area contamination. (See app. I.) In addition, a DOE official at INEL estimates that one restoration alternative at the waste management complex, in situ vitrification, could ultimately cost as much as \$500 million, and another alternative, removal of the buried wastes to other locations, could cost as much as \$2 billion and take until the year 2012 to complete.

Environmental Management Problems at INEL Are Beginning to Be Addressed

Because of the significant environmental problems that have been identified at INEL, the site faces an immense cleanup and compliance challenge. Although DOE's operations office at INEL is addressing many of these issues, delays in meeting compliance schedules as well as delays in restarting operations at the chemical processing plant have raised concerns about the adequacy of environmental management at the site. As a result, DOE has taken recent steps to correct the site's environmental management problems.

A number of delays have occurred related to environmental cleanup and compliance activities at INEL. For example, there have been delays in implementing the cleanup program mandated by a 1987 agreement with EPA. The program schedule established as part of the agreement has been modified several times since 1987, various characterization and monitoring activities are months behind the schedules originally established, and little physical cleanup of many of the site's contamination problems has begun. In addition there have been delays of several months, from February to July 1991, in efforts to fully restart the chemical processing plant due to problems with plans to bring the plant's underground piping system into RCRA compliance.

According to DOE, these delays have been in part related to ongoing environmental compliance negotiations among DOE, EPA, and the state of Idaho. According to DOE analyses and some DOE headquarters and operations office officials, regulatory reviews by EPA and the state of Idaho have not met established time frames and EPA and the state have occasionally differed on the steps needed to achieve environmental compliance. Nevertheless, an October 1989 operations office internal assessment of the site's progress in complying with the 1987 environmental agreement with EPA pointed out that implementation delays were in part related to ineffective DOE and contractor program organization and planning. It also questioned whether DOE was giving sufficient management attention to cleanup activities mandated in the 1987 agreement.

DOE's Office of Naval Reactors has also expressed recent concerns about the Department's ability to restart nuclear fuel reprocessing in a timely manner so that naval nuclear fleet operations will not be seriously affected. In an August 27, 1990, letter to the Office of Management and Budget, the Secretary of Energy acknowledged the importance of INEL's fuel reprocessing role by stating that "delays at Idaho would significantly impact the ability to process spent naval fuel, thereby severely restricting the operating capability of the Navy's nuclear fleet." This office is also concerned about DOE's ability to control the rising costs of upgrading, restarting, and operating the plant. These costs are projected to almost double over the next 4 years, from about \$126 million in fiscal year 1990 to about \$249 million in fiscal year 1994.

In response to concerns about delays in implementing the 1987 agreement with EPA, the operations office at INEL has reorganized its management of compliance issues to give them more visibility and has added technical expertise to deal with environmental matters. The operations office and DOE headquarters are also addressing the environmental management issues that have kept the chemical processing plant shut down. Under departmental policy, plant operations will not be resumed until environmental compliance is achieved there. DOE offices have begun internally reporting monthly in writing to the Secretary of Energy on the plant's restart status and the environmental issues involved in the restart, have undertaken a restart cost study at the plant and prioritized costs to be budgeted for fiscal year 1991, and are holding weekly conference calls among headquarters and field staff on restart matters.

These DOE efforts to address environmental management and oversight issues at INEL are at an early stage of implementation and it is too soon

to determine their effectiveness. For example, Naval Reactors headquarters officials told us that while recent DOE management changes related to restarting the chemical processing plant represent definite improvements, they remain concerned about further plant restart delays that could occur because of the many other environmental issues that still need to be resolved. Moreover, INEL has not had benefit of a comprehensive review of its management activities. DOE has conducted such reviews, called "tiger team" assessments, at many of its major facilities. INEL is scheduled for a tiger team assessment in the summer of 1991.

The management task at INEL is formidable. A May 1990 internal assessment at INEL identified several management problems as causes of continuing environmental deficiencies at the site, including inadequate program policies and implementation, a lack of management attention given to such matters as tracking and timely resolution of compliance deficiencies, inadequate procedures and training, and a lack of qualified personnel. DOE undertook the self-assessment at INEL from April to May 1990 to prepare for the upcoming tiger team visit. According to DOE, INEL has begun addressing the numerous problems identified in this self-assessment. (See app. III.)

Conclusions

INEL has many serious environmental problems, some of which have affected DOE operations and/or the environment and many of which will be costly and time-consuming to resolve. Although DOE is taking management steps to more effectively address the many environmental issues at INEL, it is too early to determine their effectiveness. To date, little physical cleanup at the site has begun. The extent of the site's environmental problems is still being studied and remedies being determined, and compliance negotiations with EPA and the state of Idaho are continuing. DOE's success in the task ahead will depend ultimately on its ability to continue to carry out over many years, and within available resources, a program of sound environmental management at INEL—a program that demonstrates a sustained commitment to expeditiously and effectively resolving the site's environmental problems.

Our review focused on the more serious environmental problems at INEL, as determined through interviews with DOE headquarters and INEL operations office officials, as well as with EPA, state of Idaho, and environmental group representatives; reviews of official files and reports; and visits to INEL facilities and activities. A more detailed discussion of the

objectives, scope, and methodology of this review is included in appendix IV.

We discussed the facts in this report with DOE officials and they generally agreed with the facts as presented. We incorporated their views as appropriate. As requested, we did not obtain official agency comments on a draft of the report. The review was conducted between January and December 1990 in accordance with generally accepted government auditing standards. Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to other appropriate Senate and House committees; the Secretary of Energy; the Administrator, EPA; the Governor of Idaho; and other interested parties. Major contributors to this report are listed in appendix V. If you have any questions or need additional information on the report's contents, please call me on (202) 275-1441.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Victor S. Rezendes". The signature is fluid and cursive, with the first name being the most prominent.

Victor S. Rezendes
Director, Energy Issues

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Abbreviations

DOE	Department of Energy
EPA	Environmental Protection Agency
GAO	General Accounting Office
INEL	Idaho National Engineering Laboratory
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Pollutants
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act

Environmental Cost Estimates for INEL

According to Department of Energy (DOE) estimates, the environmental problems at the Idaho National Engineering Laboratory (INEL) would likely cost billions of dollars to correct. In recent years DOE has made considerable progress in estimating various environmental costs at INEL and other sites in the nuclear weapons complex. At the time of our review, however, DOE had not fully estimated the costs for INEL because

- in many cases, DOE had not yet determined if environmental violations or damage had occurred, or the specific remedial actions it would take and
- in other cases, DOE, the Environmental Protection Agency (EPA), and/or the state of Idaho were negotiating what environmental actions, if any, needed to be taken.

Table I.1 shows available DOE estimates of (1) the costs over an 8-year period—from fiscal year 1989 to fiscal year 1996—to address selected environmental problems discussed in the body of this report and (2) the total costs to address these problems.

**Appendix I
Environmental Cost Estimates for INEL**

Table I.1: Eight-Year and Total Costs to Address INEL Environmental Problems Discussed in This Report

Dollars in millions		
Problem	Costs, 1989-96 ^{a,c}	Total Costs ^{b,c}
Secondary Containment		
Underground pipes and related improvements	\$26.5	\$30
First five underground waste storage tanks	291.9	296
Remaining six underground storage tanks	80.5	290
Treatment and Storage		
Land disposal restrictions	^d	^e
Stored nuclear fuels	^d	^e
Dense pack storage of transuranic waste	^d	13–100
Assessment and/or Cleanup		
Buried waste at the waste management complex	252.1	500–2,000
Contamination at the test reactor area	53.6	^e
Contamination at the northern test area	26.8	^e

^aFrom activity data sheets supporting DOE's 5-year environmental restoration and waste management plans. For the six problems whose costs are included in the table, the combined total is about \$731 million, including estimated construction and operating costs of about \$112 million for fiscal years 1989-91.

^bINEL estimates. For the five problems whose costs are included in the table, the combined total ranges from about \$1.1 billion to \$2.7 billion.

^cAccording to a DOE official at INEL, dollars for fiscal years prior to 1992 are based on the year of expenditure, while budgeted costs for fiscal year 1992 and future years are based on fiscal year 1992 dollars.

^dNot shown in activity data sheets. DOE did not have an estimate of the cost.

^eINEL did not provide an estimate of the cost.

As table I.1 shows, DOE did not have estimates of costs for some problems discussed in this report. In addition, for some other problems, the estimates provided were very broad since some costs, such as those for INEL's treatment and storage problems, cannot be estimated accurately until DOE reaches agreement with EPA and/or state of Idaho regulators. For other problems, such as those relating to secondary containment, DOE's cost projections could rise considerably if major contamination is found or if existing pipes or tanks have to be removed rather than left in place.

Details on Pipe Corrosion and Potential Mixed Waste Contamination at the Chemical Processing Plant

In July 1989, INEL officials discovered that a section of an underground cast-iron condenser drain pipe at the chemical processing plant had corroded through. The pipe was used to transfer mixed waste—liquid condensate from fuel processing equipment—to collection tanks. According to a DOE investigation report, DOE installed the cast-iron pipe in about 1983 to replace a stainless steel one. The condensate carried by the pipe consisted of water and small amounts of acidic (nitric) or caustic (sodium hydroxide) constituents and radionuclides such as iodine and ruthenium. According to DOE, the pipe corroded because its cast-iron composition was chemically incompatible with the corrosive condensate it carried.

Because the pipe lacked secondary containment as required in regulations, some waste probably leaked into surrounding soil. However, as of December 1990, DOE had not determined how much condensate may have entered the soil. DOE planned to obtain soil samples to determine the extent of possible contamination but had not yet implemented its plans. According to a DOE official at INEL, sampling plans are included in a proposed interagency agreement for INEL which the operations office is in the final phase of negotiating with EPA and the state of Idaho. The timing for sampling will be determined based upon the formal ranking process within the agreement.

A DOE operations office official estimated costs of about \$250,000 to characterize the location and find any contamination that may have been caused by the corroded condenser drain pipe. He added that this dollar figure could increase considerably depending on the results of characterization.

INEL Environmental Problems Found in a 1990 Self-Assessment

In the latter part of the 1980s, EPA found INEL to be out of compliance with federal environmental laws, including the Resource Conservation and Recovery Act (RCRA).¹ The body of this report discusses the more significant compliance problems at the site. In addition to these problems, a wide range of problems of varying degrees of importance have been identified at the site. To illustrate the extensive nature of these problems, this appendix lists the environmental findings shown in a recent INEL self-assessment. The assessment was made in April and May 1990 by a team of DOE and DOE-contractor personnel at INEL in preparation for a DOE "tiger team" visit to the site.²

Included in the report are 113 environmental findings related to air and water protection, radiation protection, waste management activities, cleanup of inactive hazardous waste sites, protection against toxic and chemical materials, National Environmental Policy Act issues, quality assurance, and other issues.³ The internal review covered all INEL facilities at the Idaho Falls site except the Naval Reactors Facility. According to an INEL official, the facilities are addressing these findings in expectation of an upcoming tiger team visit in the summer of 1991.

In the report, 71 environmental findings represent conditions that, in the judgment of the assessment team, are potential areas of noncompliance with the requirements of federal or state of Idaho environmental regulations and/or DOE orders.⁴ These findings are listed in the next sections. The report does not prioritize the findings' seriousness and points out that because of the limited time and resources available to conduct the assessment, the results should not be viewed as a comprehensive evaluation of all INEL operations, facilities, or disciplines. According to DOE officials, many of these deficiencies have been or are being corrected.

¹For example, in 1987, DOE signed a consent order and compliance agreement with EPA that requires DOE to clean up numerous identified environmental problems at the site. In November 1989, because of waste disposal into the Snake River Plain aquifer groundwater that flows beneath the INEL site, according to a DOE official, EPA placed INEL on its National Priorities List for Superfund cleanup. In January 1990, EPA issued to INEL a notice of noncompliance, citing 28 violations of RCRA requirements.

²Tiger teams consist of assessment personnel who visit a site and assess its environmental, safety, and health compliance.

³In addition to the 113 environmental findings, the report contains 317 safety and health findings.

⁴Forty-two other findings in the report represent conditions that the team believed do not meet "best management" practices.

Air Protection

- Amounts of asbestos removed from buildings during renovations are not reported to EPA as required.
- Facilities that have the potential to emit air contaminants were constructed without the proper permits having been obtained.
- Not all responsible INEL officials are notified as required when new air permits containing restrictions affecting their operations are obtained.
- INEL procedures to implement revisions to the National Emission Standards for Hazardous Air Pollutants (NESHAPs) are inadequate. For example, INEL has not identified a procedure for determining the need for EPA approval of the site's NESHAPs-related activities.
- INEL is following a state of Idaho regulation allowing open burning of hazardous wastes, but may thereby be violating a second, contradictory state regulation against open burning.
- INEL is using unapproved methods to sample particulate concentrations in the ambient air.

Water Protection

- Two DOE contractors' environmental monitoring plans are inadequate. For example, one plan has not been updated since it was developed in 1986.
- Personnel served by INEL on-site drinking water systems are not being notified as required of the hazards of lead in drinking water.
- No provisions exist to protect against lead materials and solder contaminating potable water systems during construction or repair.
- Samples from the sewage treatment plant are not being preserved in accordance with procedures.
- Plans, drawings, and permit applications for ponds or lagoons are not being submitted by contractors to DOE's operations office for approval.
- Present groundwater and perched water monitoring wells were not constructed in accordance with RCRA or Idaho well construction standards.
- Inadequate procedures exist to ensure the proper abandonment of monitoring wells.
- Contractors' systems to inspect and test systems for potable water crossconnect and backflow prevention devices are deficient.
- INEL's procedures to analyze drinking water do not comply with EPA guidelines.
- Quarterly analyses for volatile organic compounds in drinking water did not meet state or contractor requirements.
- INEL contractor and Argonne National Laboratory-West drinking water plans have several procedural deficiencies.
- Groundwater protection management and groundwater monitoring plans have not been developed as required.

- Liquid effluent streams to percolation ponds and sewage lagoons are not fully characterized.
- Procedures to notify the state of Idaho of violations, failures, unauthorized releases of contaminants, and other abnormal incidents are inadequate. For example, the DOE operations office has no formal procedures in place requiring these types of notifications.
- The INEL Research Center lacks formal procedures requiring documentation of effluent monitoring.
- State permits required for nine deep injection wells were not obtained.
- One of INEL's drinking water systems lacks a required chlorine leak detection system.
- Several deficient procedures and/or incorrect analyses were performed on INEL's drinking water.
- Potable water pump houses do not meet state drinking water requirements.
- Water containing tritium in excess of concentration levels permitted by state of Idaho regulations has been discharged from the advanced test reactor and Argonne National Laboratory-West.
- Past and present INEL operations have contaminated the Snake River Plain aquifer with radionuclides and organic and inorganic compounds, and many of INEL's hazardous waste disposal sites could be continuing sources of aquifer contamination.
- DOE contractors are not reporting environmental effluent data to INEL's industrial waste management information system as required.

Radiation Protection

- Several INEL facilities have nonexistent or deficient ambient air monitoring programs.
- Contaminated liquid effluent discharges to a percolation pond were inadequately monitored.
- INEL lacks comprehensive environmental monitoring plans.
- Various site environmental reports are inadequate in format and content.
- Effluent-monitoring equipment at the central respirator laundry facility was incorrectly located.
- Dose assessment data in an annual report were not being collected according to EPA protocols.
- Dose assessments are not made using written procedures or are not tested to verify data accuracy.

Waste Management

- Security measures at the mixed waste storage facility are inadequate. For example, signs are not posted warning unauthorized personnel of dangers at the facility.
- Secondary containment and assessment of tank integrity has been inadequate.
- Hazardous wastes at several INEL locations were not being picked up within time requirements.
- INEL is storing land-disposal-restricted wastes in violation of EPA regulations.
- Nonexistent, incomplete, or deficient characterization of radioactive, hazardous, and mixed wastes has occurred at several INEL facilities.
- Lead bricks were found lying beside a road.
- Copies of RCRA contingency plans have not been provided to emergency response personnel.
- RCRA waste management programs have not been fully developed and implemented.
- Substandard munitions are being improperly stored in an explosive storage area.
- Hazardous waste drums are being stored near an electrical junction box.
- Radioactive and hazardous injection well wastes are being improperly stored. For example, aisle space and spill response equipment are inadequate.
- In some cases, RCRA waste storage requirements are not being complied with. For example, accumulation requirements are not being followed, and container markings are inadequate.
- Hazardous wastes at several INEL satellite accumulation area facilities are not being properly managed. For example, logbooks are incomplete and “no smoking” signs are lacking.
- Hazardous wastes are being incompletely characterized and improperly discarded.

Cleanup of Inactive Waste Sites

- Closure plans are not being reviewed and revised in a timely manner—delays of several weeks are occurring.
- Decontamination and decommissioning activities are not being conducted in compliance with the 1987 Consent Order and Compliance Agreement.
- Hazardous waste materials produced during characterization activities are being improperly managed—storage and disposal requirements are not being met.
- INEL’s administrative records relating to the 1987 Consent Order and Compliance Agreement with EPA are inadequate and incomplete. For example, they are not centralized and complete.

- Community relations plans are not being approved before an activity is begun, and are being implemented when an activity is already under way.

Protection Against Toxic and Chemical Materials

- Coordination of Superfund Amendments and Reauthorization Act (SARA) reporting is deficient.
- Bunkers containing hazardous munitions do not have required safety records in the work area.
- Toxic containers at the test reactor area are being stored on the floor, in violation of regulations.
- Information on hazardous chemicals is not being reported by DOE to state and local officials every 90 days as required by SARA.
- Information on nonresearch chemicals is not being reported by DOE to state and local officials as required by SARA.
- Records of required quarterly inspections of toxic polychlorinated biphenyl (PCB) capacitors are missing.
- PCB wastes are being stored in excess of the 30-day limit specified in regulations implementing the Toxic Substances Control Act.
- Pesticide containers and residue are being improperly dumped.

National Environmental Policy Act (NEPA) Issues

- INEL's site-wide environmental impact statement is inadequate. For example, many site facilities are not included in the statement.
- DOE contractors' policies and procedures related to compliance with the National Environmental Policy Act are inadequate. For example, contractors do not have written NEPA implementation procedures consistent with the latest DOE requirements.
- INEL lacks a documented process for complying with the National Environmental Policy Act.

Quality Assurance

- Quality assurance plans at several INEL facilities are missing or incomplete.
- Analytical methods at several INEL laboratories were not reviewed on time, and configuration control procedures did not follow DOE guidelines.
- Numerous deficiencies in standards and calibration exist at several INEL laboratories.

Other Issues

- INEL's environmental self-assessment, reporting, and tracking are less than adequate. For example, facilities' environmental findings are not formally tracked and reported.

**Appendix III
INEL Environmental Problems Found in a
1990 Self-Assessment**

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- INEL lacks a sufficient staff of qualified personnel to ensure effective implementation of environmental programs.
 - DOE Idaho Operations Office orders that prescribe environmental, safety, health, and quality assurance requirements are not current, do not accurately reflect DOE orders, and provisions for timely updating and issuance are not in place.

Objectives, Scope, and Methodology

As a result of discussions with the office of the Chairman, Senate Committee on Governmental Affairs, we evaluated environmental problems at DOE's Idaho National Engineering Laboratory to obtain information on

- the more serious environmental problems at the site, including their impact on the environment and DOE's operations and
- difficulties DOE has encountered in managing the site's environmental problems.

As agreed, we focused in particular on problems at major INEL facilities, including the Idaho Chemical Processing Plant and the Radioactive Waste Management Complex, and on compliance problems related to RCRA. We were not asked to provide a comprehensive discussion of all of INEL's environmental problems or an overall assessment of the site's environmental management. However, we obtained and included in the report information on a variety of environmental problems at the site and on important management issues relating to them. Environmental issues at the Naval Reactors Facility, located at INEL and managed by DOE's Office of Naval Reactors, were not included in the scope of our work. Concurrently, we are evaluating environmental, safety, and health issues at Office of Naval Reactors facilities throughout the United States for another congressional requester.

To determine which site environmental problems were the most serious, we interviewed DOE and DOE-contractor managers, engineers, and environmental specialists at the Idaho Operations Office in Idaho Falls, Idaho, and at the INEL site; EPA Region X officials in Seattle, Washington, and its field office in Boise, Idaho; and officials of the state of Idaho's Department of Health and Welfare in Boise. In addition, we discussed INEL's environmental problems and planned solutions with officials at DOE headquarters in Washington, D.C., and its offices in Germantown, Maryland; at the Naval Reactors Facility and the U.S. Geological Survey at INEL; and with representatives from two environmental groups in Boise—the Idaho Council on Industry and the Environment and the Snake River Alliance.

At these locations we also reviewed official files, published and unpublished reports, correspondence, and other documentation. Documents we examined included (1) RCRA and other federal and state legislative and regulatory requirements; (2) environmental agreements made among DOE, EPA, and the state of Idaho; and (3) DOE estimates of the cost and time needed to resolve the site's compliance, contamination, and other

environmental problems. We also visited INEL facilities such as the chemical processing plant and the radioactive waste management complex; observed the site's production, waste treatment and disposal, and research activities; and examined various facilities and operations identified as having problems with environmental compliance or as being sources of environmental contamination. We discussed the facts presented in the report with DOE officials at the Idaho Operations Office and at headquarters and incorporated their views where appropriate. However, as requested, we did not obtain formal, written comments on this report from DOE or other parties. We conducted our review from January through December 1990 in accordance with generally accepted government auditing standards.

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