FINDING OF NO SIGNIFICANT IMPACT
FOR THE PROPOSED SALE
OF RADIOACTIVELY CONTAMINATED NICKEL INGOTS
LOCATED AT THE PADUCAH GASEOUS DIFFUSION PLANT
PADUCAH, KENTUCKY

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has prepared an environmental assessment (EA) to evaluate the impacts from the sale of 8,500 radioactively contaminated nickel ingots (9,350 short tons) to Scientific Ecology Group, Inc. (SEG) in Oak Ridge, Tennessee. The nickel ingots currently held in open storage at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, would be decontaminated by SEG and resold by SEG in the international market. The purpose of the DOE action is to remove a nonessential asset from storage while achieving financial gain. Selling the nickel would remove it from open storage, where its radionuclide and metals content are potential environmental hazards, and would provide DOE with funds to process other scrap materials. In addition to the financial value it provides, the proposed action would make additional space available at PGDP for other activities and eliminate maintenance and surveillance costs for the nickel storage area. Based on the analysis in the EA, DOE has determined that the proposed action is not a major federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act of 1969 (NEPA). Therefore, the preparation of an environmental impact statement is not required, and the Department is issuing this Finding of No Significant Impact.

COPIES OF THE EA ARE AVAILABLE FROM:

Department of Energy Reading Room
55 Jefferson Circle
Oak Ridge, Tennessee 37830
(423) 576-1216

FOR FURTHER INFORMATION REGARDING THE DOE NEPA PROCESS CONTACT:

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Environmental Protection Division
U.S. Department of Energy—Oak Ridge Operations
200 Administration Road
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PROPOSED ACTION: The proposed action is for DOE to negotiate a sole-source contract to sell its inventory of radioactively contaminated nickel ingots stored at PGDP to SEG. SEG was selected by a competitive qualification process in which they demonstrated their ability to effectively and efficiently reduce radionuclide contamination present in the nickel ingots. SEG would resell the decontaminated nickel to a Spanish company for use in making stainless steel products for industrial use. Spanish regulations allow the acceptance of recycled scrap metal with low activity levels (up to 74 Bq/g); however, the decontaminated nickel would have residual levels far less than the regulations allow (between 0.3 and 20 Bq/g). Combining the nickel with other metals to make stainless steel would further reduce the activity of the end product. Restriction on end use in Spain would be regulated by the Nuclear Security Council of the Spanish government.

Specific activities within the proposed action would include: (1) constructing three new buildings [1,150 m^2 (12,800 ft^2) total] in a currently developed area at SEG's Bear Creek Road site to house the nickel processing and decontamination facilities; (2) handling, packaging, and loading the ingots at PGDP; (3) transporting the ingots from PGDP to Oak Ridge; (4) decontaminating the nickel ingots at SEG; (5) managing the process emissions, effluents, and wastes at SEG; (6) loading and shipping the decontaminated nickel to Spain; and (7) end use of the decontaminated, but residually radioactive, nickel. The spent ion exchange resins containing the contaminants from the nickel processing would be neutralized, dewatered, and further treated, as necessary, to render the low-level waste nonhazardous. DOE would assume responsibility for the decontamination waste. The containerized waste would be transported to a licensed commercial or DOE disposal facility.

ENVIRONMENTAL IMPACTS: The potential adverse environmental impacts of the proposed action are insignificant. Minimal impacts to biota, natural resources, and humans would be expected based on evaluation of socioeconomics, air and water quality, soils, and ecological receptors (including threatened and endangered species). No floodplains, wetlands, or historic properties listed on or potentially eligible for listing on the National Register of Historic Places would be affected. Transportation risk as a result of accidents would be very low for the proposed action. Based on risk calculations, no casualties would be expected. Release of contamination during a transportation accident would not occur because the nickel ingots are massive and not readily sheared or splintered, and the decontamination waste would be solid and packaged in Department of Transportation-approved containers for transport. Radiological impacts to human health and safety for both workers and the public would be within limits established by applicable federal and state agencies. Health and safety procedures followed at SEG would minimize exposure to workers. The public would not be exposed to radiation during transport of either the ingots or the decontamination waste because the beta radiation emitted by the primary contaminants is of relatively low energy and would be absorbed by the transport container, and the public would not come into close contact with unshielded material either during transport or processing. Use of stainless steel products manufactured in Spain using the decontaminated nickel would result in little exposure to the population (a collected effective dose equivalent of 0.4 person-rem). DOE's policy of keeping radiation exposures to the public, the environment, and workers as low as reasonably achievable (ALARA) was specifically addressed in evaluating the proposed action. The analysis indicates the proposed action would result in a net benefit, would minimize exposures related to the action, and would prevent exposures exceeding applicable limits.

ALTERNATIVES CONSIDERED: The no-action alternative was considered in accordance with NEPA regulations and provided a baseline for comparison with the proposed action and alternatives. The no-action alternative would continue the open, aboveground storage of the nickel ingots at PGDP. Continued storage of the ingots would hinder characterization of the site to determine whether remediation would be necessary and would not meet DOE's ALARA principle because the potential spread of contaminants would not be minimized. Continued open storage would not constitute best management practice because no control of surface runoff from the ingots is in effect. In addition, the economic value of the nickel for the government would not be gained. Therefore, this alternative was not selected.

Four other alternatives to the proposed action were considered and rejected from further evaluation: (1) internal recycle; (2) reprocessing for unrestricted release (domestic or foreign); (3) improved storage; and (4) direct disposal. Lack of appropriate technologies, regulatory constraints, and economic considerations resulted in these alternatives not being considered for further evaluation in the EA.

DETERMINATION: The proposed sale of the radioactively contaminated nickel ingots does not constitute a major federal action significantly affecting the quality of the human environment as defined within the meaning and purpose of the National Environmental Policy Act of 1969. This finding is based on analyses in the EA. Therefore, an environmental impact statement for the proposed action is not required and DOE is issuing this Finding of No Significant Impact.

Issued at Department of Energy-Oak Ridge Operations, Oak Ridge, Tennessee, this 23rd day of April, 1996.

James C. Hall

Manager, Oak Ridge Operations Office

RESPONSE TO COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT

PROPOSED SALE OF RADIOACTIVELY CONTAMINATED NICKEL INGOTS LOCATED AT THE PADUCAH GASEOUS DIFFUSION PLANT PADUCAH, KENTUCKY

JULY 1995

Number	Location	Comment	Response
Amy S. Fitzgerald, Ph.D., Executive Director **LOC, Inc.: Oak Ridge Reservation Local Oversight Committee** **August 15, 1995**			
1.		The notice published in the Oak Ridger on July 17, 1995 did not explain to whom comments on the draft environmental assessment should be submitted.	We apologize for the oversight and appreciate your effort to determine the appropriate individual to contact.
2.		The analysis of 30 out of 4,250 batches (or 8,500 ingots, since it is not clear that the buttons were from separate batches) may not be sufficient to characterize the entire inventory of nickel ingots.	Sample results show there is very little variability in the contamination within the ingots; for example, Appendix F (now Appendix E) shows 95% of the samples were ≤2.13 ppm. As stated in the Executive Summary, DOE acknowledges the characterization is insufficient for release for unrestricted use. However, the nickel is sufficiently characterized for reprocessing because the decontamination process includes numerous quality assurance steps to ensure that the nickel sold would have contaminant levels below 20 Bq/g (<1 ppb).

Number	Location	Comment	Response
3.		The process to be used by the proposed vendor, as well as the resultant waste require more complete description and analysis in order to assess community impacts.	The level of detail used in the EA in Sect. 2.1 to describe SEG's decontamination process is considered by DOE to be appropriate for the level of analysis required to evaluate impacts. Because the process is proprietary, any further detail is not available for public dissemination.
4.		The environmental assessment needs to address long-term storage and disposition of the waste. This is necessary for a Finding of No Significant Impact (FONSI); if this is not possible, then an environmental impact statement may be appropriate.	As a result of comments on the EA, DOE proposes that stabilized residual wastes would be shipped to a licensed commercial or DOE facility for disposal. The text of the EA has been modified in Sect. 2.1 and throughout the document to describe residual waste disposal rather than waste storage.
5.		From the draft EA, it appears that the vendor profits from the resale of nickel on the international market, while the DOE stores the radioactive waste at the K-25 Site. Who owns the waste, the vendor or DOE? Is the waste "mixed" or "radioactive"? Why is the DOE responsible for taking the waste if the vendor "purchases" the material?	DOE sells the nickel to the vendor for reprocessing. The residual waste is radioactive, not mixed. DOE proposes to specify that residual wastes generated from nickel decontamination would remain the responsibility of DOE. DOE chooses to maintain responsibility for the waste. See also Appendix A and the response to Comment 40 for an explanation of DOE's net economic benefit.
6.		Radioactively contaminated ion-exchange resins are the same type of waste that the vendor is proposing to treat for the commercial nuclear power plant industry. The vendor should examine the feasibility of treating the waste stream from the Ni decontamination process using this technology to further reduce the volume and mobility of the waste.	Sect. 2.1 in the EA explains that the vendor would further treat the waste stream.

Number	Location	Comment	Response
Don Dills, Commissioner Tennessee Department of Environment and Conservation August 11, 1995			
7.		Please note our specific concerns related to the potential storage of the residual waste by-products produced by the nickel ingot decontamination process. We do not want to present our concerns as a barrier to the functional operation of Oak Ridge DOE facilities or to the opportunities that these facilities provide. However, we are concerned about waste storage involving this proposal at the K-25 Site. On behalf of the state of Tennessee, it is our position that Alternative One, the proposed action considering storage of nickel ingot waste should not be considered in the preparation of the final EA.	The EA has been modified to reflect that DOE proposes that the residual waste would be shipped to a licensed commercial or DOE disposal facility instead of being stored at the K-25 Site. Subsequently, DOE's discussions with TDEC have confirmed the acceptability to TDEC of this approach.
Michael H. Mobley, Division of Radiological Health Tennessee Department of Environment and Conservation August 11, 1995			
8.		When discussing occupational exposures at SEG, radiological emissions and effluents, Tennessee's *State Regulations for Protection Against Radiation* should be referenced, not the U.S.N.R.C., EPA regulations, or EPA programs.	Text has been changed in the Executive Summary and Sect. 1.2 to incorporate reference to the NRC requirements as implemented by Tennessee regulations.
9.	p. xiv, line 8	Other inappropriate references	Text has been changed in the Executive Summary and Sect. 1.2 to incorporate reference to the NRC requirements as implemented by Tennessee regulations.
10.	p. 4, lines 4, 6, 7, 35, 36	Other inappropriate references	Text has been changed in the Executive Summary and Sect. 1.2 to incorporate reference to the NRC requirements as implemented by Tennessee regulations.

Number	Location	Comment	Response
11.	p. 11, lines 14, 15	The NRC does not license any LLW disposal sites. All licensed are by states.	Text in the EA has been modified as suggested.
12.	p. 13, line 7	Envirocare is licensed by the State of Utah!	Text modified to indicate that Utah, as an NRC agreement state, licenses Envirocare.
13.	p. 21, lines 9-19	The release of radioactive air emissions is controlled by *State Regulations for Protection Against Radiation* and conditions of the license issued by the Division of Health, Tenn. Dept. of Environment and Conservation.	Text has been modified as suggested.
14.	p. 27, lines 14, 47, 48	See above comment relative to air emissions.	Text has been modified as suggested.
15.		This specific process at SEG is not currently licensed by the Division of Radiological Health. SEG has licensed R&D work to prove the process, and it is not anticipated that any insurmountable licensing issues exist.	Text has been added to the EA stating that a license would be required from the Division of Radiological Health before operation of the process.
16.		Under transportation, it should be noted that the shipper must possess a Shipper's license issued by the Division of Radiological Health, Tennessee's Dept. of Environment and Conservation, in order to have the material received at a Tennessee licensed facility.	Text has been added to the EA in Sect. 4.1.7.2 stating that a Shipper's license would be obtained from the State prior to any shipments of the ingots.
17.		Once again, an EA has been prepared for DOE that illustrates the lack of understanding of the regulatory regime that governs the possession, use, transport, transfer, or disposal of radioactive materials in the commercial arena.	Please see responses to Comments 8 through 16.

Number	Location	Comment	Response
Earl C. Leming, Director DOE Oversight Division Tennessee Department of Environment and Conservation August 10, 1995			
18.		After review and research, the Division cannot concur with Alternative 1 which is the proposed action for this project. First, we are disappointed DOE failed to give the State of Tennessee proper notification as required by the NEPA process. For instance, our office received the draft environmental assessment before receiving a notification letter.	The EA has been modified to reflect that DOE proposes that the residual waste would be shipped to a licensed commercial or DOE disposal facility instead of being stored at the K-25 Site. Subsequently, DOE's discussions with TDEC have confirmed the acceptability to TDEC of this approach. The State of Kentucky was notified because that is where the nickel ingots are located. The long history of this project, commencing in 1988, is the probable explanation for the absence of a recent notification of the State of Tennessee. As the scope of the proposed action changed over a period of several years, the letter of notification probably should have been revised and reissued. DOE apologizes for this oversight.
19.		Second, the State of Tennessee opposes the use of the Oak Ridge Reservation for interim or long-term storage of wastes from offsite except for special needs to protect human health, the environment, or national security. It is our position that any wastes transported from other DOE facilities to the Oak Ridge Reservation for treatment must have any and all residual wastes returned to the facility of origin or transported to an approved disposal site.	The EA has been modified to reflect that DOE proposes that the residual waste would be shipped to a licensed commercial or DOE disposal facility instead of being stored at the K-25 Site.

Number	Location	Comment	Response
20.		DOE is proposing to store 1,500 to 1,900 drums of waste, generated by a private facility which is subject to NRC and State of Tennessee waste management requirements, at the K-25 Site until a decision on the ultimate disposition of the waste is made based on DOE's Waste Management Programmatic Environmental Impact Statement. The Programmatic Waste Management EIS has not yet been released to the State of Tennessee for review and comment. In addition, consideration must be given to the federal life cycle costs for storage, treatment, and disposal of the waste for this proposed project.	The EA has been modified to reflect that DOE proposes that the residual waste would be shipped to a licensed commercial or DOE disposal facility instead of being stored at the K-25 Site.
21.	p. xiii, exec. summary, line 11	"The nickel decontaminating process specified in SEG's technical proposal is considered the best available technology..." This information is based on the 1988 technical proposal by SEG. There is no mechanism or effect identified in the EA that ensures that this is still the best available technology. This assurance must be made before any further action is considered. There may be technology now available that is more economical and efficient. As an example, alternatives should include the use of the nickel in catalytic waste recycling and treatment processes such as Molten Metal. Contaminated nickel could be used in the molten bath to produce a corrosion resistant waste metal ingot ("stainless") which would be better suited to permanent disposal.	Based on current knowledge, no other commercial process has yet demonstrated the efficacy of the nickel decontaminating process described in the EA. According to studies documented by H.W. Hayden, Ph.D., Lockheed Martin Energy Systems metallurgist (September 12, 1995), there are 3 process schemes for decontaminating nickel. Only SEG's process has been demonstrated at both the bench scale and pilot scale. The goal is not "to produce a corrosion-resistant waste metal ingot...better suited for disposal." The goal is sale and reuse of a valuable commodity and the concomitant removal of an ongoing storage cost for the contaminated nickel ingots. Disposing the nickel results in loss of the economic value of that commodity.

Number	Location	Comment	Response
22.	p. xiii, exec. summary, lines 18-22	The proposal to store 1,500 to 1,900 drums of contaminated waste material at K-25 without providing specific details of when and where final disposition of materials will occur is inconsistent with the "cradle to grave" principles associated with hazardous waste. Provide more information on the ultimate disposition of the waste generated by the decontamination process.	As documented in the EA, the residual waste resulting from nickel decontamination is not a hazardous waste. The EA has been modified to indicate DOE proposes that the waste will be stabilized and shipped to an off-site, licensed disposal facility.
23.	p. xiii, exec. summary, lines 24-30	Would any of the processes generate mixed waste?	Sect. 2.1 describes the processing in accordance with TDEC regulations resulting in nonhazardous, low-level radioactive residual wastes. As noted above, DOE proposes these wastes would be disposed at a licensed commercial or DOE disposal facility.
24.	p. xiii, exec. summary, lines 32-38	The direct sale of nickel ingots from Paducah, Kentucky to the foreign market appears to have merit. The Draft EA does not mention the direct sale of nickel ingots to foreign markets. It is possible that such a transaction would allow DOE to minimize the amount of low-level waste associated with the decontamination of nickel while generating revenues from the sale of ingots to the foreign market.	The ingots are sufficiently characterized for SEG's decontamination process but not for direct release. The average contamination level of 535 Bq/g exceeds the current acceptance criteria for foreign markets.

Number	Location	Comment	Response
25.	p. xiii, exec. summary, lines 34-36	"Release of nickel by DOE for unrestricted use without reprocessing was not considered reasonable because the nickel is not well characterized for public use. Additional characterization would be expensive." The cost of additional characterization should be included in the EA, as well as the additional benefits that would correspond to working with better characterized material for all the alternatives.	The sentence has been revised to read: "Release of nickel by DOE for unrestricted use without reprocessing was not considered reasonable because the level of contaminants in the nickel presents too high a risk for public use." The nickel is sufficiently characterized to know that free domestic release without reprocessing is not reasonable. Better characterization of the nickel would produce no additional benefits; this is a low-level radioactive material that would still require the same materials handling. Each of the alternatives can be adequately evaluated based on current characterization data. Therefore, the cost of additional characterization (~$1 million) cannot be justified. This cost has been included in Sect. 2.6.1.
26.	p. 1, Sect. 1.1	The purpose and need should not include the specific proposal to sell surplus radioactively contaminated nickel to SEG, but should address the broad requirements or desires for this DOE action.	The purpose and need are explained in the second paragraph of this section. The first paragraph, a description of the proposed action (Alternative 1, described more fully in Sect. 2.1), includes the reference to SEG because that is part of the proposed action.

Number	Location	Comment	Response
27.	p. 4, Sect. 1.3, lines 35-37	"SEG assures compliance with the DOE notices and regulations on radiation protection and all applicable federal, state, local, and foreign regulations." SEG as a contractor must comply with applicable regulations; however, it is the responsibility of DOE to ensure SEG complies with DOE orders (since there is no legal authority to levy fines against violations of DOE orders). DOE's quality assurance strategy for the thorough decontamination and final characterization of this material needs to be included in the EA. Also, explain how SEG is going to ensure compliance with a foreign country's regulations. The EA needs to identify the Spanish company proposed for the purchase of nickel. The safety and compliance history of this company needs to be reviewed and assurances made that its quality control measures meet reasonable standards.	DOE's contract with SEG, via their technical proposal, contractually obligates SEG's operations to comply with applicable DOE orders (see Sect. 1.3). In addition, DOE will have the opportunity to audit SEG's activities related to this contract on a periodic basis for compliance with provisions of the contract. Regarding SEG's compliance with foreign regulations, SEG is regulated by the state of Tennessee as an NRC agreement state. Any proposed sale by SEG on the international market would be governed by applicable state and federal regulations relevant to a licensed and permitted operation facility. Assuring the safety and compliance history of a foreign commercial company is beyond the scope of an environmental assessment of DOE's proposed action. DOE's proposed action is sale of nickel to SEG. DOE would not determine SEG's buyer. Any successful buyer(s) would be subject to the regulations of the country in which they operate. The seller (SEG) is subject to the requirements of TDEC and NRC for international trade and transport.
28.	p. 4, Sect. 1.3	The statement that "This environmental assessment evaluates the potential impacts from all aspects of the proposed action," is erroneous. Only by the means of a complete Environmental Impact Statement may all the potential impacts of a project be addressed.	Statement revised; "all aspects of" was deleted.

Number	Location	Comment	Response
29.	p. 10, Sect. 2.1, line 21	"For liability reasons, DOE would assume responsibility for the decontamination waste." The EA needs to describe the liability reasons and the justification for assuming responsibility for this waste. Also, the EA should be clear whether or not DOE will take ownership of the decontamination waste.	DOE proposes to assume responsibility for disposition of the decontamination waste.
30.	p. 11, Sect. 2.4, lines 13-19	If direct disposal of the nickel was the selected alternative, the waste would be characterized as mixed waste. Provide information on factors that DOE would have to consider for ultimate disposition of this mixed waste.	Factors that would influence the direct disposal of the ingots include determining whether the ingots were appropriately classified as a low-level radioactive waste (LLW) or a mixture of LLW and regulated hazardous materials (mixed). The exact classification would have little influence on the disposal; both LLW and mixed wastes would meet the waste acceptance criteria at the selected licensed disposal facility.
31.	p. 15, Sect. 3.2.1, para. 1	The sentence is awkward. State that the SEG area is predominantly rural..., and not "SEG is predominantly rural."	Text modified as suggested.
32.	p. 15, Sect. 3.2.1, para. 2	Provide proof for the statement that the transient population within 50 miles of the ORR consists primarily of employees of DOE contractors, or omit this statement.	The 50 miles was a typographical error. Text in the EA has been changed to 8 km and 5 miles.

Number	Location	Comment	Response
33.	p. 17, Sect. 3.2.6, lines 7-17	The first sentence in the paragraph stating "No federally listed threatened or endangered species of plant and animal..." is not correct. According to Appendix A of the document, "Approach for Performing Ecological Risk Assessments for the U.S. Department of Energy's Oak Ridge Reservation: 1994 Revision" (ES/ER/TM-33/R1), there are several federally listed threatened or endangered species located on the ORR. Revise the necessary sentences. Include in the EA a discussion of State listed threatened or endangered species that could be effected adversely.	Appendix A cited refers to T&E species on the ORR. However, this action would not occur on the ORR. The sentence has been revised to read, "No federally listed threatened or endangered species of plant or animal is expected to occur on the SEG property; because of the extensive development and disturbance on the site, suitable habitat is not present." Added in Sect. 4.1.6: "Federally or state-listed threatened or endangered species are not expected to be adversely affected because construction associated with the proposed action would occur in currently developed areas."
34.	p. 19, Sect. 4.1, lines 38-40	The net economic gain, listed as 17.8 million dollars, should reflect the cost of storage, transportation, and final disposition of the 12,730 ft^3 of low level radioactive waste from the decontamination process. In addition, is the current market value of nickel ($3.25/lb) applicable to nickel containing radioactive contamination for this Alternative?	DOE would pay the transportation costs (~$180,000) and disposal costs (~$204,000) for the residual decontamination wastes. Table A.1 has been modified to reflect these costs. Because the nickel is not virgin metal, its reprocessed value is discounted approximately 35-40% from the market price. Based on an inventory of 9,350 short tons and a discounted price of $2.72/lb from the market price of $4.18/lb (the value in September 1995), the gross value of the nickel is $50.9 million. The text has been revised to reflect this value.
35.	p. 19, Sect. 4.1, para. 5	Would more extensive characterization (required for unrestricted release without reprocessing) really be more expensive than $43 million?	Additional characterization would not guarantee that free release would be possible, in either the domestic or foreign market.
36.	p. 19, Sect. 4.1.2	The document fails to contain a confirmation letter of no archaeological or cultural resources impacts from the Tennessee State Historical Preservation Officer.	Because SEG is a private company, consultation with the Tennessee SHPO is not required.

Number	Location	Comment	Response
37.	p. 27, Sect. 4.1.8.2	It is stated "The radiological exposure to the public results from routine decontamination operations at SEG is limited by the remote location of the facility, which is not close to residences..." Provide the distance to the closest residence from the SEG facility.	The distance (approximately 1 mile to the west) has been added to the text of the EA.
38.	p. 33, Sect. 4.1.9, para. 6	Census tract 201 appears to be an area where African Americans are disproportionately affected. Provide information to show that the African American population of 36.8%, that is enormous when compared to the East Tennessee population percentage, is not being disproportionately impacted by this proposed project.	Executive Order 12898 requires that DOE identify and address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Potential dose and risk to members of the public would be very low, so there would be no disproportionate adverse effects on minority or low-income populations because there are no adverse effects.
39.	p. 33, Sect. 4.1.9, para. 6	Provide information that shows that area in which 40% of the population is below the poverty line is not being disproportionately impacted, even if guidance doesn't clearly define it to be an impoverished community.	See response to preceding Comment 38. There are no adverse effects to human health or the environment, so there would be no disproportionate adverse effects.

Number	Location	Comment	Response
40.	p. 41, Sect. 5.1, lines 41-44; p. 42, lines 1-11	This information is not clear as to exactly what permits are required and which exemptions apply. Permit requirements are stated that come from an unreferenced translation. The EA must clarify all restrictions and potential restrictions that apply to the nickel and products made from the nickel. The Draft EA gives the net economic gain (SEG's) as 17.8 million dollars. However, the costs to DOE are not clearly identified. The EA should include the: • estimated price DOE will get for the sale of the ingots to SEG • DOE's costs of loading/unloading and transporting the ingots • costs associated with the Dept. of State's involvement with this project • costs associated with the NRC's involvement with this project • DOE's costs associated with the storage of this material • and any other related costs associated with this project. These costs should be compared with the overall benefit of the proposed action. If the financial benefit does not significantly outweigh the costs, than the project should be dropped. The 60 million dollars worth of nickel should be used as an incentive to the private sector (including international players) and to DOE to develop a more economical method for its decontamination. Storage costs are nominal for this material; there is no justifiable driver for the hurried release of this material at the taxpayer's expense.	Appendix G (now Appendix F) discusses permit requirements; reference to Appendix F added. SEG does not receive $7.9 million. Their profit is built into the cost of decontaminating the nickel ingots, which is currently estimated to be ~$43 million. DOE receives much of its benefit as processing of existing inventories of contaminated scrap metal located at the three gaseous diffusion plants. The value of this processing is estimated to be $7.9 million, less the cost of transport and disposal of residual waste. Cash transfer is expected to be minimal. This estimate is based on the current nickel market; the value can go up or down with the metals market. The nickel market is currently rising, so the net benefit to DOE is rising. SEG, not DOE, would incur the costs of loading/unloading and transportation of the ingots; these costs are included in the $43 million. DOE would take responsibility and bear the costs of transporting and disposing the residual wastes. These costs would total ~$204,000 for disposal and ~$180,000 for transportation. These costs have been included in Table A.1. The costs associated with NRC and Dept. of State involvement would be negligible. The proposed action has been changed so that storage of the residual wastes by DOE is no longer included in the proposed action. Appendix A summarizes ALARA considerations, one of which is an analysis of net economic benefit.

Number	Location	Comment	Response
41.	p. A-3, App. A, para. 1	The ALARA philosophy is a complex issue and further evaluation of cost-benefit ratios should be conducted to support any final decision. Criterion (2) is weakly supported by the chart on page A-4 because the "benefits of the alternatives" figures are based on the assumption that 100% of the original volume of the nickel would be available for resale after decontamination. Is the feedstock diminished in the decontamination process and if so, what percentage of the nickel would be available for resale after decontamination? What effect would the remaining contamination have on the sale price of the nickel? How would fluctuations in price affect the "benefit of alternative" figure?	Yes, the feedstock is marginally diminished (<1%) by the decontamination process. The unreclaimed nickel (residual waste) is disposed. The remaining contamination would have essentially no effect on the sale price of the nickel. Fluctuation in the value of the nickel would result in changes to the net economic benefit accruing to DOE.
42.	p. A-3, App. A, para. 4	Omit bullets, and discussion and conclusions, because a determination of overall significance will be made in a Finding of No Significant Impact or a determination to prepare an EIS.	The bullets, discussion, and conclusions are not a determination of overall significance or insignificance. Appendix A summarizes ALARA considerations, one of which is an analysis of net benefit (see your preceding comment, #40). A FONSI or a determination to prepare an EIS is based on an evaluation of the impacts of the proposed action, not on the results of the cost/benefit analysis.
43.	p. E-3, App. E	Provide NEPA documentation for the storage of low-level waste for the nine areas listed in Appendix E.	Appendix E has been removed from this document as no longer relevant. Residual waste will be disposed, not stored.
44.	p. F-3, App. F	Provide more information on the characterization of the nickel ingots. Were 30 sample ingots used to characterize all 8,500 contaminated ingots? Were the levels found in each of the 30 buttons considered homogenous with the entire ingot?	Information on the characterization of the ingots is included in Appendix F (now Appendix E). See responses to Comment 2 and Comment 35. Yes. Yes.

Number	Location	Comment	Response
Transportation Comments			
45.	p. 7, sect. 2.1, par. 3	It is stated, "The nickel ingots would be sold "as is," and SEG would be responsible for transportation in accordance with applicable Department of Transportation requirements defined in 40 CFR. The EA should be clear who will act as the shipper of the Nickel Ingots, if SEG does not act as the shipper.	SEG or its agent will act as shipper.
46.	p. 22, sect. 4.1.7.1	Document fails to provide information on the loading and unloading procedures along with an accident analysis of each action under proposed Alternative 1. Also provide information on loading and unloading procedures of waste from SEG to the K-25 Site along with accident analysis.	Accident analyses for activities involved in this proposed action are discussed in Sect. 4.1.8.1, Occupational Worker. This section also discusses activities associated with loading, with the assumption that unloading would have similar risks. "Unloading" has been added to the text.
47.	p. 22, sect. 4.1.7.2	Provide information on the accidental radiological release associated with transporting waste from the decontamination process to K-25 Site.	Risk from radiological exposures is exceedingly small. Because there are no gamma emitters identified in the waste, no routine exposures are anticipated from the shipment. Radiological accident risks from shipping the waste to Envirocare (as an example) were assessed using the RADTRAN 4 code. The estimated radiological risk is 0.01 person-mrem for the entire waste shipment, which corresponds to 5×10^{-9} latent cancer fatalities. This information has been added to the EA.

Number	Location	Comment	Response
48.	p. 21, sect. 4.1.7.3	The document fails to address loading and unloading operations and accident analysis at SEG during transportation to a seaport. The document fails to identify which means of transportation would be used. Also, provide information on consultations with the other states through which the material would be transported.	Accident analyses for activities involved in this proposed action are discussed in Sect. 4.1.8.1, Occupational Worker. This section also discusses activities associated with loading, with the assumption that unloading would have similar risks. Sect. 4.1.7.3 states that the nickel would be shipped either by truck or by rail. Shipment by truck is the more conservative risk scenario and the one used in the EA. The states would be notified as part of the transportation license process for shipping radioactive material.
49.		Discuss who would assume the responsibility for transporting ingots by rail to Envirocare. Also, the document fails to indicate how the states through which the ingots would be transported would be notified of this proposed project.	For the direct disposal alternative, DOE would have responsibility for shipping the ingots to the off-site, licensed disposal facility. The states would be notified as part of the transportation license process for shipping radioactive material.
J.W. Walton, Director Division of Air Pollution Control Tennessee department of Environment and Conservation August 1, 1995			
50.		The major impact to air quality in the area would be fugitive dust and equipment emissions from the construction of buildings to house the nickel decontamination facility. Radionuclide emissions are a concern, but the most appropriate agency to comment on this issue is the Division of Radiological Health.	Air quality impacts have been addressed as appropriate.
51.		A construction permit will be required prior to commencing to build the facility that will house the decontamination process.	A statement to this effect has been added to the EA in Sect. 4.1.5.

Number	Location	Comment	Response
Caroline P. Haight, Director Division of Waste Management Department for Environmental Protection Commonwealth of Kentucky			
52.		The principal concern of the proposal is the management of wastes generated via the decontamination of the nickel ingots. The final disposal location of decontamination waste generated by the SEG's facility in Tennessee is not stated. The document states that the waste will be stored at the K-25 plant. The Commonwealth of Kentucky would like assurances from DOE that this waste will not be returned to the PGDP in the future.	As a result of comments on the EA, DOE proposes that stabilized residual wastes would be shipped to a licensed commercial or DOE facility for disposal. The text of the EA has been modified in Sect. 2.1 and throughout the document to describe residual waste disposal rather than waste storage.

DOE/EA-0994

ENVIRONMENTAL ASSESSMENT

PROPOSED SALE OF RADIOACTIVELY CONTAMINATED NICKEL INGOTS LOCATED AT THE PADUCAH GASEOUS DIFFUSION PLANT PADUCAH, KENTUCKY

OCTOBER 1995

U.S. Department of Energy
Oak Ridge Operations
Oak Ridge, Tennessee

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Prepared by
Science Applications International Corporation
Oak Ridge, Tennessee

Prepared for
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ENVIRONMENTAL ASSESSMENT

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RADIOACTIVELY CONTAMINATED NICKEL INGOTS
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PADUCAH GASEOUS DIFFUSION PLANT
PADUCAH, KENTUCKY

OCTOBER 1995

Prepared by
Science Applications International Corporation
Oak Ridge, Tennessee
under contract 77B-99069C

Prepared for
Lockheed Martin Energy Systems, Inc.
Environmental Restoration Program

for the
U.S. Department of Energy
under contract DE-AC05-84OR21400

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APPENDIXES

FIGURES

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ACRONYMS

ALARA	as low as reasonably achievable
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
Energy Systems	Lockheed Martin Energy Systems, Inc.
EPA	U.S. Environmental Protection Agency
FR	*Federal Register*
HEPA	high-efficiency particulate air
IAEA	International Atomic Energy Act
KPDES	Kentucky Pollutant Discharge Elimination System
PGDP	Paducah Gaseous Diffusion Plant
SAIC	Science Applications International Corporation
SEG	Scientific Ecology Group, Inc.

ABBREVIATIONS

^{210}Po	polonium-210
^{237}Np	neptunium-237
^{239}Pu	plutonium-239
^{241}Am	americium-241
^{3}H	hydrogen-3
^{99}Tc	technetium-99
Bq/g	becquerel/gram
°C	degrees Celsius
cm	centimeter
°F	degrees Fahrenheit
ft	foot (feet)
ft^2	square feet
ft^3	cubic feet
g	gram
ha	hectare
in.	inch
kg	kilogram
km	kilometer
lb	pound
m	meter
MeV	megaelectron-volt
mrem	millirem

GLOSSARY

Air kilometer: Distance in kilometers as measured by closest proximity, regardless of routes by road, river, or rail.

Attainment area: Area that meets air quality criteria for specific contaminants established by EPA.

Benthic macroinvertebrates: Macroscopic invertebrates found on or near the bottom of a stream, lake, or ocean.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. The acts created a special tax that goes into a trust fund, commonly known as Superfund, to investigate and remediate abandoned or uncontrolled hazardous waste sites.

Decontamination: The removal or reduction of radioactive or hazardous contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques to achieve a stated objective or end condition.

Derived Concentration Guide (DCG): The concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 mrem (1 mSv).

Direct disposal: Placement in a disposal facility without interim storage or further actions on the material. Disposal is the disposition of materials with the intent that the materials will not enter the environment in sufficient amounts to cause a health hazard.

Embayment: A body of water resembling a bay, sometimes formed when streams or rivers enter a slow-moving, larger body of water, for example, a lake.

Environmental assessment: A written environmental analysis that is prepared pursuant to the National Environmental Policy Act to determine whether a federal action would significantly affect the environment and thus require preparation of a more detailed environmental impact statement.

Finding of No Significant Impact: A document prepared by a federal agency pursuant to the National Environmental Policy Act that presents the reasons why a proposed action would not have a significant impact on the environment and thus would not require preparation of an environmental impact statement. A Finding of No Significant Impact is based on the evidence contained in the environmental assessment.

Floodplain: A flat or nearly flat surface that may be submerged by floodwater.

Ingot: A mass of metal shaped into a bar or block usually through a melting operation.

Metal smelting: Melting metal, typically to separate (refine) the metal components.

Scrap metal: Metal no longer needed for its original intent but still of value.

Short ton: A unit of weight (2,000 lb) commonly used in the United States. A metric ton (1,000,000 grams or 2,204 pounds) is the comparable metric unit.

Socioeconomics: Characteristics and/or data involving a combination of human, social, and economic factors.

Threshold limit value: 8-hour time-weighted average concentration of chemical substances to which, it is believed, workers may be exposed daily without adverse effect.

Transient population: People who travel through, but do not reside in, an area.

Wetland: An area that is regularly saturated by surface water or groundwater and subsequently is characterized by vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, marshes, and estuaries.

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) proposes to sell 8,500 radioactively contaminated nickel ingots (9,350 short tons*), currently in open storage at the Paducah Gaseous Diffusion Plant (PGDP), to Scientific Ecology Group, Inc. (SEG) for decontamination* and resale on the international market. SEG would take ownership of the ingots when they are loaded for transport by truck to its facility in Oak Ridge, Tennessee. SEG would receive approximately 200 short tons per month over approximately 48 months (an average of 180 ingots per month).

The nickel decontamination process specified in SEG's technical proposal is considered the best available technology and has been demonstrated in prototype at SEG. The resultant metal for resale would have contamination levels between 0.3 and 20 becquerel per gram (Bq/g). The health hazards associated with release of the decontaminated nickel are minimal. The activity concentration of the end product would be further reduced when the nickel is combined with other metals to make stainless steel.

Low-level radioactive waste from the SEG decontamination process, estimated to be approximately 382 m^3 (12,730 ft^3), would be shipped to a licensed commercial or DOE disposal facility. If the waste were packaged in 0.23 m^3- (7.5 ft^3-) capacity drums, approximately 1,500 to 1,900 drums would be transported over the 48-month contract period.

Several alternatives to the proposed action were considered and carried through evaluation of impacts:

Alternative 2—Reprocessing for Unrestricted Release by DOE
Alternative 3—Improved Storage of the Ingots at PGDP
Alternative 4—Direct Disposal of the Ingots
Alternative 5—No Action (Continued Open Storage at PGDP)

Two alternatives were identified and eliminated from further consideration. Internal reuse of the nickel within DOE was considered speculative because no near-term uses were identified. Release of the nickel by DOE for unrestricted use without reprocessing was not considered reasonable because the level of contaminants in nickel presents too high a risk for public use. Additional characterization would be expensive. The nickel is sufficiently characterized for Alternatives 1 and 2 because the decontamination process includes quality assurance steps to ensure that the nickel sold for public use would have contaminant levels below 20 Bq/g.

Minimal impacts to biota, natural resources, and humans are projected under all the alternatives based on the evaluation of socioeconomics, environmental justice issues, air and water quality, soils, and ecological receptors (including threatened and endangered species and wetlands). No floodplains or wetlands would be affected by the proposed action or alternatives.

*Terms defined in the Glossary are marked with an asterisk at their first occurrence in the text.

Transportation risk as a result of accidents would be very low for alternatives involving transport. Based on risk calculations, ≤0.057 casualties would be expected. Release of contamination during a transportation accident would not occur because the nickel ingots are massive and not readily sheared or splintered, and the decontamination waste would be solid and packaged for transport.

Radiological impacts to human health and safety for both workers and the public would be within limits established by DOE and U.S. Nuclear Regulatory Commission requirements as implemented by Tennessee's State Regulations for Protection Against Radiation. Health and safety procedures followed at SEG would minimize exposure to workers. The public would not be exposed to radiation during transport of either the ingots or the decontamination waste because the beta radiation emitted by the primary contaminants is of low energy (0.101 MeV) and would be absorbed by clothing, transport containers, or the nickel itself. Use of stainless steel industrial products using the decontaminated nickel would result in little exposure to the population (a collective effective dose equivalent of 1.5 person-mrem). Unrestricted public use of the decontaminated nickel in the United States would result in low doses (collective effective dose equivalent of 42 person-mrem). Both end use scenarios would contribute effectively zero excess fatal cancers in the affected populations.

DOE's policy of keeping radiation exposures to the public, the environment, and workers as low as reasonably achievable has been specifically addressed in evaluating the alternatives and is discussed in Appendix A. The analysis presented in Appendix A indicates the proposed action would result in a net benefit, would minimize exposures related to the action, and would prevent exposures exceeding applicable limits. The net economic benefit to DOE would be approximately $7.9 million. Details of the cost/benefit analysis are provided in Appendix A.

1. INTRODUCTION

1.1 PURPOSE AND NEED

The U.S. Department of Energy (DOE) is proposing to sell surplus, radioactively contaminated nickel currently stored at its Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky, to Scientific Ecology Group, Inc. (SEG), Oak Ridge, Tennessee, for processing to reduce the concentration of radionuclides in the nickel. The decontaminated* nickel would ultimately be resold by SEG in the international market.

The purpose of this action is to remove a nonessential asset from storage while at the same time achieving financial gain. Selling the nickel would remove it from open storage, where its radionuclide and metals content are potential environmental hazards, and would provide DOE with funds to process other scrap materials. In addition to the financial gain it provides, the proposed action would make additional space available at PGDP for other activities and eliminate maintenance and surveillance costs for the nickel storage area.

1.2 BACKGROUND

Approximately 8,500 radioactively contaminated nickel ingots* [2,200 lb or 1 metric ton each] are stored at PGDP (Fig. 1), which is operated by Lockheed Martin Energy Systems (Energy Systems) under contract to DOE. The nickel was originally in shapes/forms that were "classified" for national defense reasons. In 1981-1985 the nickel was melted and cast into ingots to remove its "classified" status. During processing, surface radioactivity was distributed throughout the ingots. After recasting, the ingots were double- and triple-stacked aboveground and uncovered in an area referred to as the C-746-H4 Nickel Ingot Storage Pad (Storage Pad in this environmental assessment*), a restricted-access, fenced area of approximately 0.56 ha (1.4 acres) (Fig. 2).

During the recasting process, samples were taken from 30 ingots. Results of the sample analyses are given in Appendix E. Analyses indicated the following concentrations of radionuclides:

	Average (Bq/g)	Maximum (Bq/g)
Total Uranium	0.049	0.280
Technetium-99	535.	2650.

Neptunium-237 (^{237}Np) was detected in only five samples; the average and maximum concentrations were 0.021 and 0.031 Bq/g, respectively. One sample had a plutonium-239 (^{239}Pu) concentration of 0.011 Bq/g (Williams 1986).

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*Terms defined in the glossary are marked with an asterisk at their first occurrence in the text.

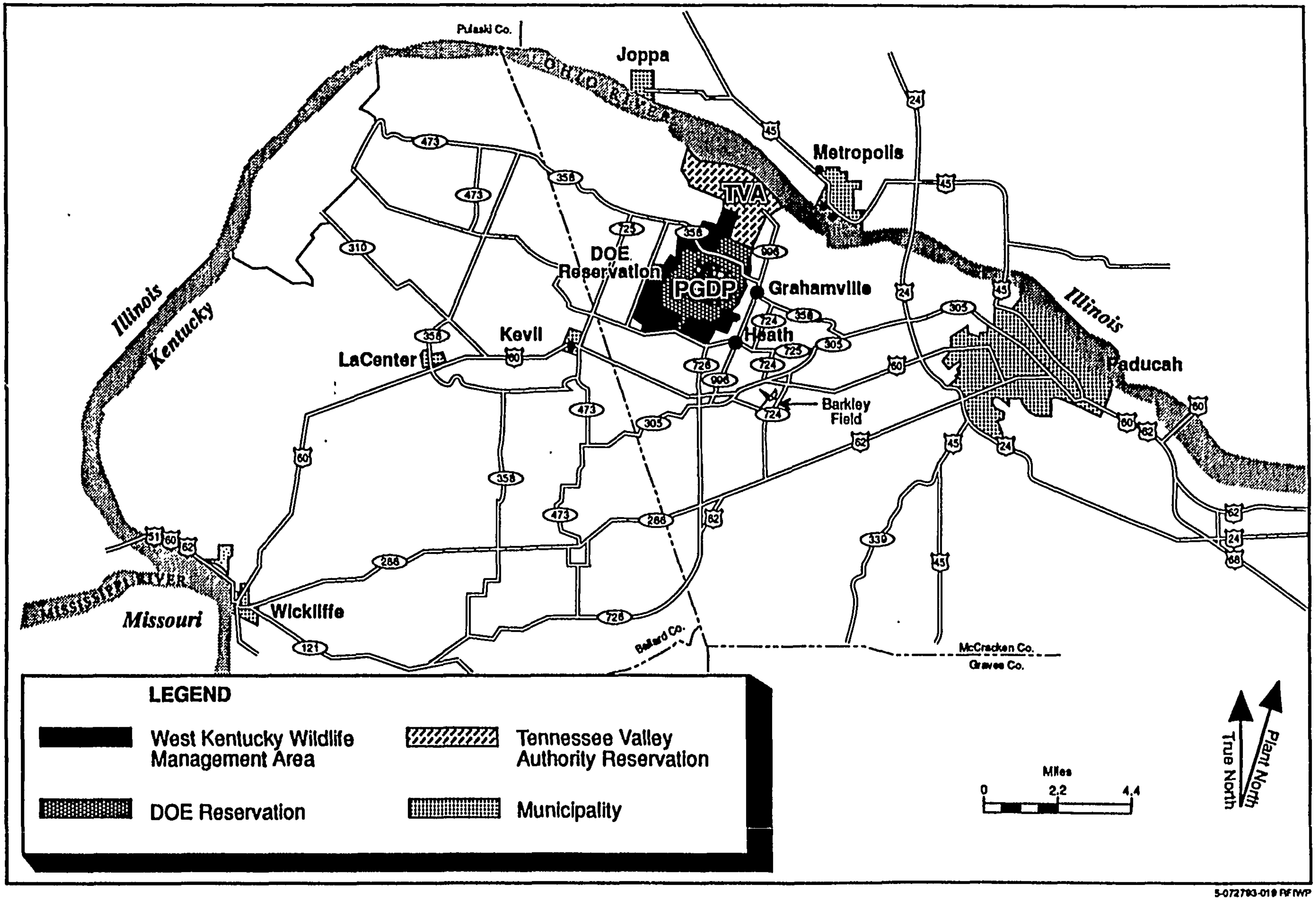

Fig. 1. Location of Paducah Gaseous Diffusion Plant.

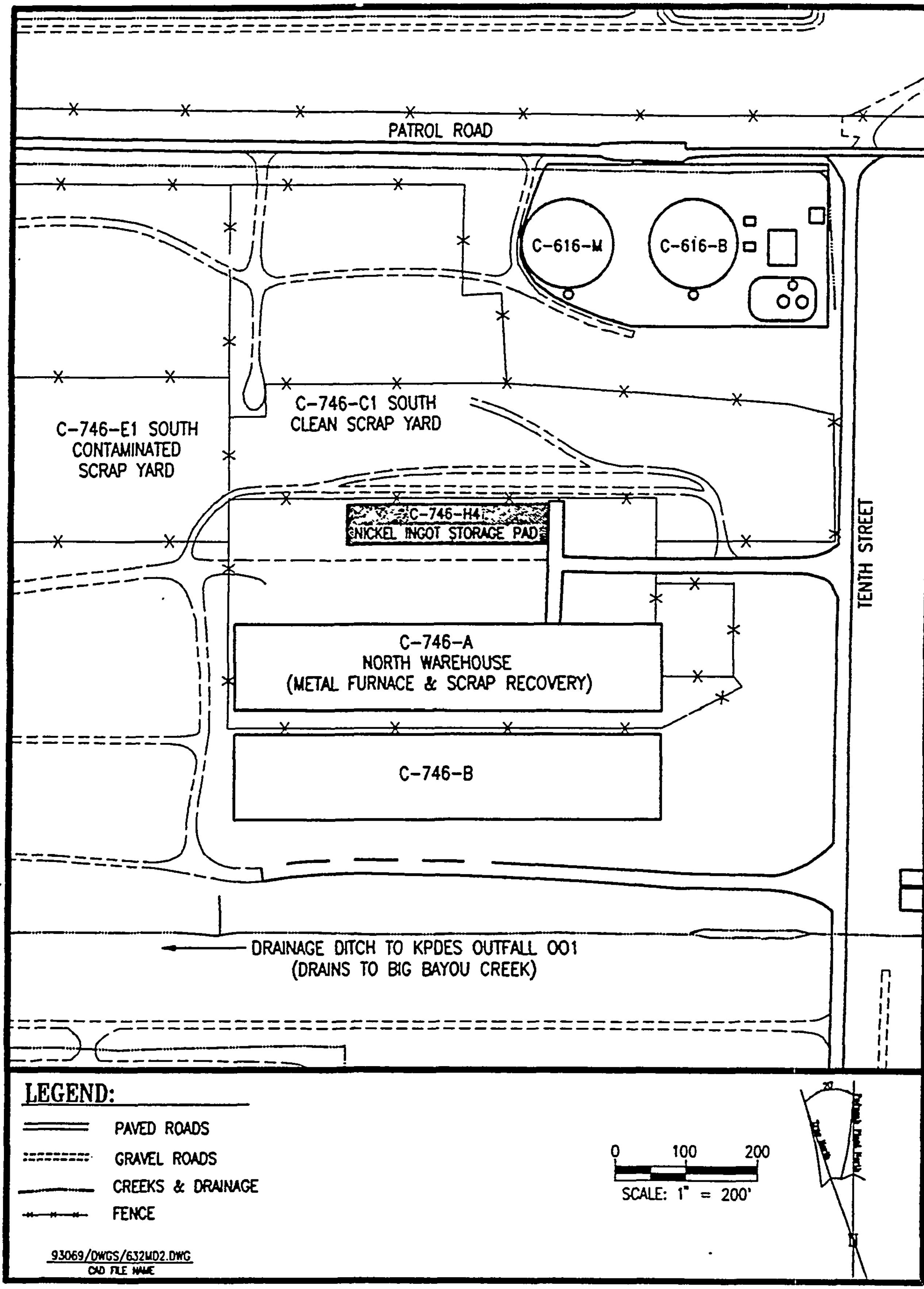

Fig. 2. Location of the C-746-H4 Nickel Ingot Storage Pad at PGDP.

The ingots are not regulated under the Resource Conservation and Recovery Act because they are intended for recycle and a demonstrated recycling option exists (40 *CFR* 261.6 and Tennessee Hazardous Waste Management Regulations 1200-1-11). Secondary wastes resulting from treating the ingots are addressed in Sect. 2.1. The radioactive contaminants are regulated under applicable federal and state regulations, either by the U.S. Nuclear Regulatory Commission or an agreement state. The U.S. Nuclear Regulatory Commission requirements as implemented by Tennessee's State Regulations for Protection Against Radiation would apply to any domestic commercial facility or organization external to DOE. DOE regulates source, by-product, and special nuclear materials at its facilities through DOE Orders pursuant to the Atomic Energy Act.

Personnel exposures from current storage practices are in compliance with the limits of DOE Order 5480.11 and 10 *CFR* 835 for occupationally exposed individuals and DOE Order 5400.5 for members of the general public.

DOE has investigated the feasibility of decontaminating the stored nickel. Three companies, including SEG, were awarded contracts in 1986 by the DOE Oak Ridge Operations Office to demonstrate processes to decontaminate the nickel (as well as some other metals). None of the companies was able to decontaminate the nickel (with respect to ^{99}Tc) within the time and funding constraints of the original contract. In a pilot program of their own funding, SEG subsequently demonstrated success in removing ^{99}Tc from the nickel using a processing option not available to them during the earlier demonstration phase. DOE requested proposals in 1988 for decontamination and disposition of the nickel, and SEG was the only company to submit a proposal. SEG would use an electrodecontamination process, which is considered the best available technology for removing higher levels of ^{99}Tc from volumetrically contaminated nickel (EPA 1994). DOE and SEG have maintained good faith negotiations on their proposal since its submittal in 1989. DOE proposes to sell the nickel to SEG for decontamination and resale by SEG to an international buyer.

1.3 SCOPE OF THE ANALYSIS

This environmental assessment evaluates the potential impacts from the proposed action and alternatives to the proposed action. Many of the activities evaluated are beyond DOE regulatory authority because they would be performed by SEG, a corporation licensed and monitored by the State of Tennessee. However, DOE's contract with SEG would specify adherence to the terms of SEG's technical proposal to decontaminate the nickel. In its proposal, SEG assures compliance with DOE notices and regulations on radiation protection (for example, DOE Orders 5400.5, 5480.6, and 5480.15, and 10 *CFR* 835) and all applicable federal, state, local, and foreign regulations. Thus, to provide for a comprehensive analysis, SEG activities are evaluated in this environmental assessment.

PGDP has been added to the U.S. Environmental Protection Agency's (EPA's) National Priorities List; the site will be evaluated for remediation options under the Comprehensive Environmental Response, Compensation, and Liability Act through an interagency agreement currently under negotiation with the EPA and the State of Kentucky*. Site characterization and, if necessary, remedial action in the Storage Pad area would be addressed in separate environmental documentation.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVE 1—PROPOSED ACTION

The proposed action would be comprised of these activities:

- handling, packaging, and loading the ingots at PGDP;
- transport from PGDP to SEG;
- constructing new buildings at SEG;
- decontaminating the nickel at SEG;
- managing process emissions, effluents, and wastes at SEG;
- transport of decontamination waste to a licensed commercial or DOE disposal facility;
- loading and shipping decontaminated nickel to the buyer; and
- end use of the decontaminated, but residually radioactive, nickel.

DOE proposes to sell its inventory of radioactively contaminated nickel ingots stored at the Storage Pad at PGDP through a sole-source contract with SEG, a wholly owned subsidiary of the Westinghouse Electric Corporation. The sale of the decontaminated nickel ingots would be in accordance with SEG's operating license and applicable requirements.

The current proposal is for SEG to resell the decontaminated nickel to a Spanish company for use in making stainless steel products for industrial use. A metals broker in the United States would assist SEG with international transfer requirements and negotiations with the Spanish buyer. Spanish regulations allow the acceptance of recycled scrap metal with low activity levels (up to 74 Bq/g); however, the decontaminated nickel would have residual levels far less than the regulations allow (between 0.3 and 20 Bq/g). Combining the nickel with other metals to make stainless steel would further reduce the activity of the end product. There would be restrictions on end use in Spain; the nickel could not be used to make personal items such as cookware, toys, earrings, or domestic tools as these are prohibited uses regulated by the Nuclear Security Council of the Spanish government.

SEG would take delivery of approximately 200 short tons* per month over a 48-month time period (approximately 180 ingots per month). The nickel ingots would be sold "as is," and SEG would be responsible for transportation in accordance with applicable Department of Transportation requirements defined in 49 *CFR*. SEG would load the nickel ingots into Department of Transportation-approved steel transport boxes designed for low-specific activity material and place them on SEG flatbed trucks for delivery to its facility located in Oak Ridge, Tennessee (Figs. 3 and 4). Once loaded, the nickel ingots would become the property and responsibility of SEG. If SEG acts as the shipper, SEG would take ownership of the nickel upon release from PGDP. Prior to receipt of the nickel, SEG would construct three new buildings [1,150 m^2 (12,800 ft^2) total] in currently developed areas at the SEG Bear Creek Road site to house the facilities for the nickel processing and decontamination.

The SEG electrolytic decontamination process, the details of which are proprietary, was demonstrated in prototype at SEG and is diagrammed in simplified form in Fig. 5. The use of electrolytic decontamination would eliminate high chemical consumption, minimize waste generation, and produce high-quality nickel. A license for the decontamination process would

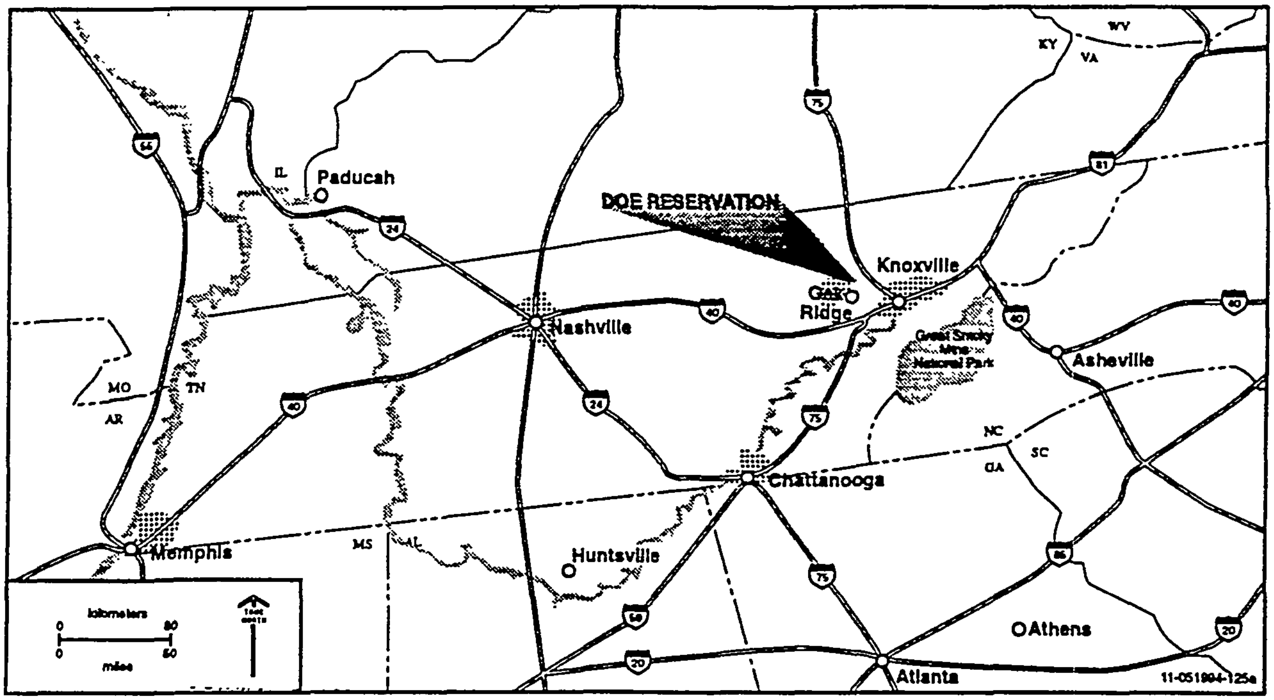

Fig. 3. Location of Oak Ridge, Tennessee in relation to Paducah, Kentucky.

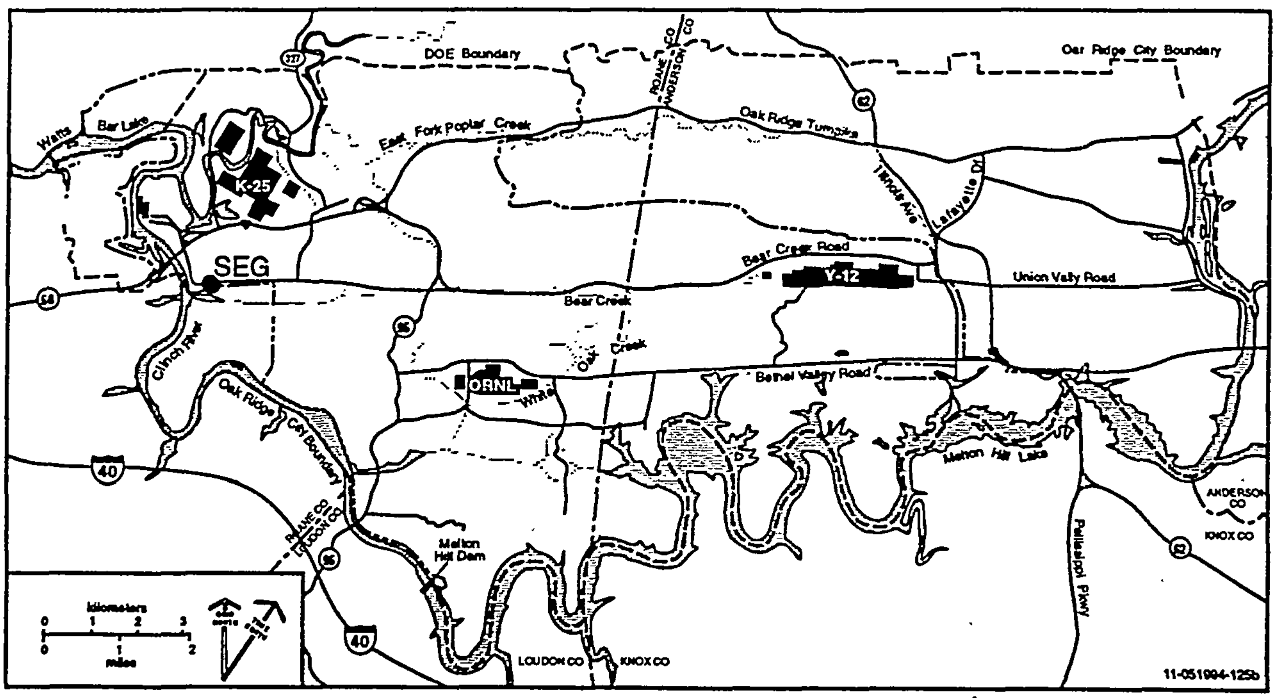

Fig. 4. Map showing DOE's Oak Ridge Reservation, the location of the three major installations, and SEG.

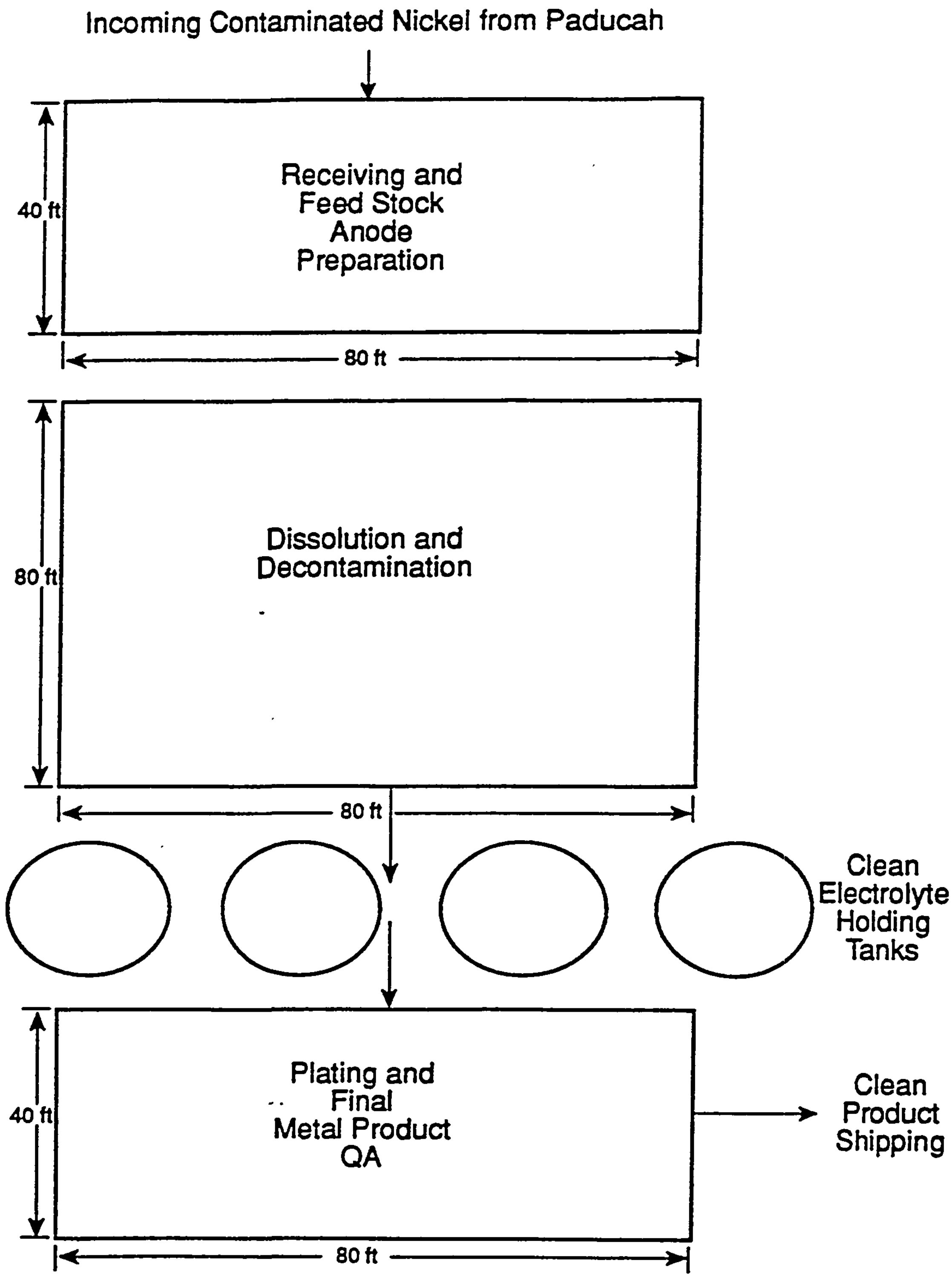

Fig. 5. Simplified description of the SEG decontamination process.

be required from the Division of Radiological Health, Tennessee Department of Environment and Conservation, prior to operation.

SEG's processing of the nickel would begin with characterization of the nickel for initial quality assurance. The ingots would then be melted and cast into pellets followed by dissolution of the nickel in either a sulfate or chloride electrolyte. Decontamination of the dissolved nickel electrolyte then would be performed using ion exchange resins, followed by the plating of decontaminated nickel as cathodic plates. After processing by SEG, the nickel would still be slightly radioactively contaminated, with the total contamination being in the range of 0.3 to 20 Bq/g (a 96 percent or greater reduction in contamination). The radioisotope remaining would be principally ^{99}Tc, with trace or undetectable quantities of low-enriched uranium, ^{239}Pu, and ^{237}Np. Final quality assurance/quality control analysis of the nickel plates would be performed prior to shipping to ensure that plated nickel is $\leq$20 Bq/g. The cathodes would then be transported by truck to a port on the Gulf or Atlantic seaboard assumed in this analysis to be Savannah, Georgia and shipped to Spain.

The spent ion exchange resins containing the contaminants from the nickel processing would be neutralized, dewatered, and further treated, as necessary, to render the waste nonhazardous. The waste would then be solid as defined by the U.S. Nuclear Regulatory Commission in 10 *CFR* 61. All waste treatment would be conducted according to the terms of SEG's license from the State of Tennessee Division of Radiological Health which includes provisions for treatment of hazardous secondary waste to achieve a nonhazardous waste form. Approximately 382 m^3 (12,730 ft^3) of nonhazardous, low-level, radioactively contaminated waste would be produced. DOE would assume responsibility for disposition of the decontamination waste. The containerized waste [about 1,500 to 1,900 drums, each with a 0.23 m^3 (7.5 ft^3) capacity] would be transported in trucks by SEG or its agent to a licensed commercial or DOE disposal facility. For the purpose of this analysis, the commercial facility is assumed to be Envirocare, Inc. (Clive, Utah), and the DOE disposal facility to be the Hanford Site, located near Richland, Washington.

2.2 ALTERNATIVE 2—REPROCESSING FOR UNRESTRICTED RELEASE BY DOE

This alternative would involve decontamination of the nickel by SEG, return of the decontaminated metal to DOE, and release of the nickel by DOE for unrestricted use in the United States. This alternative differs from the proposed action only in the end use scenarios; use of the nickel would not be restricted as it would be in Spain because the United States has not established use restrictions or acceptance standards for residually contaminated metals. DOE could release the decontaminated nickel through the procedure described in Sect. II.5c(6) of DOE Order 5400.5, Radiation Protection of the Public and the Environment. Release of the decontaminated nickel would require demonstration of minimal health risk, approval of the Assistant Secretary of DOE, and agreement by the appropriate State agency that the nickel does not warrant regulation as a radioactive material. The nickel is assumed to be used in a range of products similar to the actual uses of nickel in the United States. These scenarios are described in detail in Sect. 4 of this environmental assessment.

2.3 ALTERNATIVE 3—IMPROVED STORAGE

The improved storage alternative would involve storing the nickel ingots indefinitely in a specially designed and engineered structure to prevent the potential release of radioactive contamination to the environment. For this analysis, the structure is assumed to be a 1,107 m^2 (12,000 ft^2) metal building on a concrete slab. The actions within this alternative would include the physical removal of the ingots to a staging area, construction of the storage structure, and placement of the ingots in the new structure.

2.4 ALTERNATIVE 4—DIRECT DISPOSAL

In the direct disposal* alternative, the radioactively contaminated nickel ingots would be disposed of as low-level radioactive waste. Under current U.S. Nuclear Regulatory Commission regulations (10 *CFR* 61) and DOE Order 5820.2A, this type of waste may be disposed of in near-surface disposal facilities, including engineered shallow land trenches or other suitable disposal facilities. Site activities would include physical removal of the ingots, transportation, and disposal at a permanent waste disposal facility. For the purpose of this analysis, the commercial disposal facility is assumed to be Envirocare, Inc. (Clive, Utah), and the DOE facility to be the Hanford Site located near Richland, Washington.

2.5 ALTERNATIVE 5—NO-ACTION

Under the no-action alternative, DOE would continue the open, above-ground storage of the nickel ingots at the Storage Pad. Routine monitoring of the ingots and occasional grounds maintenance would continue. The nominal cost of maintaining the Storage Pad is incorporated into PGDP's overall environmental, radiological, monitoring, and waste management activities.

2.6 ALTERNATIVES CONSIDERED AND REJECTED FROM FURTHER CONSIDERATION

2.6.1 Release for Unrestricted Use without Reprocessing

This alternative would involve DOE release of the nickel ingots in their current form to the commercial nickel market in the United States. To consider this a reasonable option, more extensive characterization of the contamination in the ingots would be required, which is an expensive activity estimated to cost more than $1 million. The sampling that has already been done is sufficient to characterize the contaminants prior to decontamination, but not for direct release for public use because the level of contaminants in the nickel presents too high a risk without reprocessing. The decontamination process considered in this environmental assessment involves testing contaminant levels at several steps in the process and testing the final product prior to release, thus the contaminant level is assured of being below a preestablished benchmark (20 Bq/g). The release without reprocessing alternative is not considered reasonable and is not considered further.

2.6.2 Internal Recycle

The internal recycle of the nickel ingots would involve the reuse of the material within DOE facilities and/or programs. However, DOE currently has no internal uses for the nickel and hypothetical future uses have implementability constraints (e.g., use of the nickel in making stainless steel containers for storage/disposal would require special production facilities that do not exist). Because no near-term internal uses have been identified, the internal recycle alternative is considered speculative and will not be considered further in this assessment.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section describes the potentially affected environment at PGDP and SEG. No description of the environment at Envirocare, Inc. or the Hanford Site, the disposal locations considered in the proposed action and direct disposal alternative, are included in this section. In accordance with Title 10 *CFR* Part 51, the impacts of disposal of waste at these sites have been evaluated prior to licensing by Utah and Washington, U.S. Nuclear Regulatory Commission agreement states.

3.1 PADUCAH GASEOUS DIFFUSION PLANT

PGDP is located on a 544 ha (1,350 acre) reservation in western Kentucky in McCracken County, approximately 5.6 km (3.5 miles) south of the Ohio River and 32 km (20 miles) east of the confluence of the Ohio and Mississippi Rivers. The city of Paducah, about 16 km (10 miles) to the east, is the closest municipality to PGDP (see Fig. 1).

3.1.1 Regional Demography

The population within an 80-km (50-mile) radius of PGDP is about 300,500 persons. Of these, about 39,500 live within 16 km (10 miles) of the plant and about 104,000 live within 32 km (20 miles). The unincorporated communities of Grahamville and Heath are located 2 to 3 km (1.2 to 1.9 miles) east of the plant. Portions of 28 counties, 11 of which are in Kentucky, 4 in Missouri, 10 in Illinois, and 3 in Tennessee, are included within an 80-km (50-mile) radius of the plant. The largest cities in the region are Paducah, Kentucky, located approximately 16 air kilometers* (10 miles) east of the plant, and Cape Girardeau, Missouri, located approximately 64 air kilometers (40 miles) to the west (U.S. Department of Commerce 1991).

3.1.2 Land Use, Archaeological/Cultural Resources

The area surrounding PGDP is predominantly rural with open fields, forested land, and intermittent agricultural activities. Immediately surrounding much of the PGDP Reservation is the West Kentucky Wildlife Management Area, which serves as an active recreational area. Bordering PGDP to the northeast, between the plant and the Ohio River, is a Tennessee Valley Authority reservation site of the Shawnee Steam Plant (see Fig. 1). The Kentucky Ordnance Works, a trinitrotoluene production facility, was operated during World War II in an area of PGDP that is now the West Kentucky Wildlife Management Area.

The Storage Pad is located northwest of the main plant area on the north side of the C-746-A Warehouse and is surrounded by a chain-link fence (see Fig. 2). This area has been highly disturbed by past construction and current operation and maintenance activities.

Because of the highly disturbed nature of this area, no intact archaeological or cultural resources remain that would be eligible for the National Register of Historic Places. This has been confirmed by consultation with the Kentucky State Historic Preservation Officer (Appendix C).

3.1.3 Water Quality

PGDP is located within the drainage areas of Big Bayou and Little Bayou creeks, which meet about 4.8 km (3 miles) north of the site and discharge into the Ohio River. PGDP is located on a local drainage divide; surface flow is east-northeast toward Little Bayou Creek and west-northwest toward Big Bayou Creek. Big Bayou Creek is a perennial stream that flows toward the Ohio River along a 14.5-km (9-mile) course that passes along the western boundary of the plant. Little Bayou Creek, an intermittent stream, flows north toward the Ohio River along a 10.5-km (6.5-mile) course that includes parts of the eastern boundary of the plant. Effluents from PGDP operations constitute about 85 percent of the normal flow in Big Bayou Creek and 100 percent in Little Bayou Creek (Energy Systems 1993a).

Surface runoff from the Storage Pad is to the drainage ditch located approximately 213.4 m (700 ft) to the south (Fig. 2). This ditch discharges to Big Bayou Creek at Kentucky Pollutant Discharge Elimination System (KPDES) Outfall 001. Surface runoff from several other areas and from some roof, floor, and sink drains also discharge through Outfall 001 (Energy Systems 1993b). The limits for nickel were not exceeded at Outfall 001 in the 1992 monitoring year. No specific effluent limits are indicated for radiological parameters in the KPDES permit; however, eight continuous flow outfalls at PGDP, including Outfall 001, are monitored weekly for radionuclides. The maximum and average levels for ^{99}Tc at Outfall 001 in 1992 were 77 and 22.75 pCi/L, respectively. The annual average for 1992 was a small percentage (0.02 percent) of the Derived Concentration Guide* for ^{99}Tc specified in DOE Order 5400.5.

3.1.4 Climate and Air Quality

Paducah is located in the humid continental zone. Summers are generally dry; precipitation occurs mainly in the spring and fall. Winters are characterized by moderately cold days; the average temperature during the coldest month, January, is about 1.7°C (35°F). Summers are warm and humid; the average temperature in July is about 26°C (79°F). Yearly precipitation averages about 120 cm (47 in.). The prevailing wind direction is south-southwest (Energy Systems 1993b).

McCracken County, in which PGDP is located, is an attainment area* with respect to National Ambient Air Quality Standards (Kentucky Division for Air Quality 1993). Ambient air sampling is performed by PGDP to provide surveillance of airborne pollutants to the off-site environment. Pollutants sampled by PGDP include particulate radionuclides (gross alpha and gross beta) and gaseous fluorides. These contaminants are sampled continuously and analyzed weekly. Off-site ambient concentrations of radionuclides and fluorides at PGDP are well within the standards set by EPA and the Kentucky Division for Air Quality (Kentucky Division for Air Quality 1992).

3.1.5 Ecological Resources

The PGDP is surrounded by the characteristic forest and grassland communities typical of western Kentucky. A more complete description of the flora and fauna of PGDP and surrounding environs can be found in Final Environmental Impact Assessment of the Paducah Gaseous Diffusion Plant Site (Battelle 1982). More recent field surveys have been performed and final reports are being prepared (U.S. Army Corps of Engineers 1993).

The Storage Pad has been continually disturbed by human activities. No natural habitat is present. The Storage Pad is not located in any floodplain* (Connor 1993) and no wetlands* are present, as evidenced by the lack of hydrophytic vegetation. Consultation with the U.S. Fish and Wildlife Service (Appendix D) confirmed that there are no federally listed or proposed listed endangered or threatened species within the PGDP property impact area.

3.2 SEG OAK RIDGE SITE

The SEG Bear Creek facility [approximately 14.8 ha (36.7 acres)] is located within the corporate limits of the city of Oak Ridge in Roane County, Tennessee, and is adjacent to the DOE Oak Ridge Reservation, which consists of approximately 14,300 ha (35,300 acres) and contains three major operating facilities: the Oak Ridge K-25 Site, the Oak Ridge National Laboratory, and the Oak Ridge Y-12 Plant (see Fig. 4). The SEG facility is located at 1560 Bear Creek Road, 12.1 km (7.5 miles) west of the Y-12 Plant in Bear Creek Valley and 1.6 km (1 mile) south of the K-25 Site.

3.2.1 Regional Demography

Except for the city of Oak Ridge (pop. 27,000), the land within 8 km (5 miles) of the Oak Ridge Reservation, and thus the SEG area, is predominantly rural and is used largely for residences, small farms, and cattle pasture. Fishing, boating, water skiing, and swimming are favorite recreational activities in the area. A major urban center, Knoxville (pop. 165,000) is located about 40 km (25 miles) to the east. The approximate location and population of the other nearby towns are Oliver Springs (pop. 3400), 11 km (6.8 miles) to the northwest; Clinton (pop. 9000), 16 km (10 miles) to the northeast; Lenoir City (pop. 6100), 11 km (6.8 miles) to the southeast; Kingston (pop. 4600), 11 km (6.8 miles) to the southwest; and Harriman (pop. 7100), 13 km (8 miles) to the west (Energy Systems 1993a).

The transient population* within 8 km (5 miles) of the Oak Ridge Reservation consists primarily of employees of DOE contractors but also includes people involved in other industrial activities, significant recreational activities, health care facilities, and those traversing the area casually or on personal business. In 1992, the total employment for all contractors of DOE Oak Ridge Operations was 18,532 (DOE 1993a). In December 1992, the employment at the three major facilities was: Y-12 Plant—6,575; Oak Ridge National Laboratory—6,106; and the K-25 Site—3,239 (DOE 1993b).

3.2.2 Land Use, Archaeological/Cultural Resources

Land use within 80 km (50 miles) of the Oak Ridge Reservation and the SEG facility is primarily rural, except for Knoxville and the city of Oak Ridge. Residential, recreational, agricultural, commercial, and small industrial properties are present. SEG is located in the Clinch River Industrial Park, a small industrial park near the Clinch River that is surrounded by the Oak Ridge Reservation and land owned by the Tennessee Valley Authority that is currently open and undeveloped.

The SEG property was previously surveyed for the presence of these resources when the property was sold by the Tennessee Valley Authority and the city of Oak Ridge. The property is now mostly developed and the new buildings would be constructed on currently developed land.

3.2.3 Geology and Soils

Soil on the SEG property is classified as an upland soil—"Apison very fine sandy, eroded slope phase" (Swann et al. 1942). The soil survey has not been formally updated since its publication and the classifications used may be archaic. The description of the soil presented in the survey text, however, is useful; the Apison series is described as well-drained, shallow over bedrock, strongly acid, comparatively low in natural fertility, low in organic matter, and highly susceptible to accelerated erosion. Typical depth to bedrock in the eroded slope phase is 7.6 to 30.5 cm (3 to 12 in.). Apison soils are derived from interbedded shale and sandstone and are underlain in part by these rocks.

3.2.4 Water Quality

Surface water draining from the SEG property flows into Grassy Creek and, within 457.2 m (500 yd), flows into the Grassy Creek embayment* of the Clinch River. The headwaters of Grassy Creek are approximately 2.4 km (1.5 miles) east of SEG in Bear Creek Valley. Water quality is considered good; Grassy Creek is a "second-order, frequently intermittent stream . . . with a diverse benthic invertebrate fauna and fish species richness appropriate for its size. Grassy Creek is a reference for the benthic invertebrate and fish community tasks of the remedial activity for Bear Creek and is the primary reference for the fish community task of the K-25 Biological Monitoring and Abatement Program" (Pounds et al. 1993). The reference locations on Grassy Creek are all upstream of the SEG site.

3.2.5 Climate and Air Quality

The Oak Ridge area has a temperate, continental climate. Summers are warm and humid; winters are typically cool. Spring and fall are transitional seasons, normally warm and sunny. Severe weather—such as tornadoes or high winds, severe thunderstorms with damaging lightning or precipitation, extreme temperatures, or heavy precipitation—is rare. Average annual precipitation is approximately 140 cm (55 in.). The Oak Ridge area has one of the lowest average wind speeds in the United States. Local terrain is the dominant influence on daily wind patterns and contributes to the low average wind speed. Prevailing wind directions are up-valley (from the southwest) and down-valley (from the northeast). The Oak Ridge area is an attainment area with respect to National Ambient Air Quality Standards for all criteria pollutants (sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead) (Energy Systems 1993a).

3.2.6 Ecological Resources

Plant communities in the Oak Ridge region are characteristic of those found in the intermountain regions of Appalachia from the Allegheny Mountains in southern Pennsylvania to the southern extension of the Cumberland Mountains in northern Alabama. The dominant association on the Oak Ridge Reservation is oak-hickory forest, which is most widely distributed on ridges and dry slopes. The SEG property is on the valley floor, which was formerly in agricultural use. The Atomic Energy Commission (the predecessor agency of DOE) planted trees on formerly cultivated land acquired as part of the Oak Ridge Reservation. Most of the SEG property is covered with buildings or parking lots [approximately 13.4 of the 15.2 ha (33 of the 37.6 acres) are developed]; the remaining vegetation is primarily on the east end of the property and is either 30-to 40-year-old open pine plantation with a mixed hardwood understory or natural pine and mixed hardwood.

No federally listed threatened or endangered species of plant or animal is expected to occur on the SEG property; because of the extensive development and disturbance on the site, suitable habitat is not present. Two plant species that occur on land adjoining SEG (owned by Tennessee Valley Authority) are candidates for federal listing as threatened: Appalachian bugbane *(Cimicifuga rubifolia)* and spreading false-foxglove *(Aureolaria patula)*. Another plant species present on the Tennessee Valley Authority land is listed by the State of Tennessee as of special concern: Carey's saxifrage *(Saxifraga careyana)* (Cunningham et al. 1993). The candidate species occur on the north-facing slope of Chestnut Ridge, which runs south of the SEG property and parallel to Bear Creek Road, and on Grassy Creek, which flows west at the base of the ridge. Habitats for the three species on Tennessee Valley Authority land are not present on the SEG property.

Standard engineering controls would be used during the decontamination process to prevent evaporative losses; fumes from acid dissolutions and other processes that cause the generation of hydrogen gas would be collected and diluted. Air quality would be monitored to check the effectiveness of the engineering controls. Stack effluent would be filtered through a high-efficiency particulate air (HEPA) filter system. SEG's stack emissions are controlled by State Regulations for Protection Against Radiation and conditions of the license issued by the Division of Radiological Health, Tennessee Department of Environment and Conservation. SEG has not yet applied for a permit for the proposed nickel decontamination facility, so there is not a specific emission limit for the process. However, the permit would require compliance with the state regulations, which prohibits release of radionuclides to the ambient air in amounts that would cause a member of the public to receive in any year an effective dose equivalent or greater than 10 mrem/year. For nonradioactive contaminants, the majority of sources of emissions at SEG have a particulate emission limit set by the State of Tennessee at 0.01 lb/hr of general particulate (Cole 1995). Monitoring would be performed in the stack and at the HEPA filters to verify the efficiency of the engineering controls and to ensure compliance with all air quality regulations and permitted emission levels.

4.1.6 Ecological Resources

The proposed action would have no impacts on ecological resources in the PGDP area. The storage area would be used for another DOE function after the ingots were removed; therefore, it would not revert to natural habitat. Because the contamination within the ingots is not known to act as a source of contamination to the environment, no known benefits to local biotic systems would result from removal of the ingots. Individual organisms (e.g., insects and reptiles) that might be exposed to the contaminated ingots by living around them could benefit from removal of the ingots.

The construction of the nickel processing facility would not result in the loss of habitat at the SEG Oak Ridge site. The new processing buildings would be constructed on disturbed land (a parking lot). Federally or state-listed threatened or endangered species are not expected to be adversely affected because construction associated with the proposed action would occur in currently developed areas.

4.1.7 Transportation

Total accidents and casualties (injuries and fatalities) were estimated for shipments of ingots by truck between PGDP and SEG, shipment of the decontaminated nickel between SEG and a seaport at Savannah, Georgia, and transportation of processing waste by truck or rail from SEG to Envirocare, Inc. (Clive, Utah) or the Hanford Site. Fatalities during transportation of processing waste by truck from SEG to a storage facility at the K-25 Site were also estimated. Packaging of the ingots, processing waste, and decontaminated nickel would meet the requirements of Department of Transportation regulations specified at 49 *CFR*. "Total vehicle miles of travel" is used as a measure of accident exposure for each destination. Accident rate data are combined with measures of accident exposure to determine the accident potential associated with transporting this material. The potential for contamination to spread during an accident is negligible because the low-level radiation in the nickel is distributed throughout massive, solid ingots and cannot spill like a liquid or become airborne like a dust. The processing waste would be spent ion exchange resins that would be dewatered and further treated as necessary by SEG to render the waste solid and nonhazardous to satisfy 10 *CFR* 61, Licensing Requirements for Land Disposal of Radioactive Waste. Thus, release during an accident is not considered further in this assessment.

External radiation hazard during transportation of the ingots to SEG, the processing waste to a disposal facility, and the decontaminated nickel to Spain is not considered a plausible pathway because the principal contaminant in the material is ^{99}Tc, which emits relatively weak beta particles [0.101 megaelectron-volt (MeV)] during radioactive decay of ^{99}Tc to a stable isotope (Ruthenium-99) (U.S. Department of Health, Education, and Welfare 1970). Although exhaustive measurements have also revealed a very weak gamma emission (Knolls Atomic Power Laboratory 1984), from the radiation protection point of view this emission is considered nonexistent (e.g., International Commission on Radiological Protection 1983; EPA 1993). The range of beta particles in dry air is about 30 cm/MeV (Brady and Holum 1988); thus, the beta particles emitted by ^{99}Tc would travel approximately 9 cm (3.5 in.) in dry air. Beta particles are easily blocked by clothing worn by a potential receptor or any objects between the source and receptor. Even upon close body contact with the source, such beta particles can barely penetrate the outer layer of skin to cause any significant radiological risk. Thus, the impact of ^{99}Tc via the external pathway is practically nonexistent, and no further evaluation of the risk from external exposure is considered in this environmental assessment.

4.1.7.1 Transport of ingots

For the purpose of this analysis, it is assumed that a total of 20 ingots would be packaged and loaded at PGDP onto a 14-m (45-ft) flatbed trailer, creating a total payload of 18,144 kg (44,000 lb) for each shipment to SEG. This shipment weight, when added to the weight of the tractor and semi-trailer, would result in a total weight well within the required maximum legal weight limit of 36,288 kg (80,000 lb) for tractor and semi-trailer transport. Using these assumptions, 425 shipments would be required to transport this material by truck. Approximately nine shipments would be made per month to provide the ingots in the 200-ton allotments to be specified in the proposed contract. The route of transport would be State Route 64 to I-24, to I-265, to I-40, to State Route 58, to Powerhouse Road and Bear Creek Road. The distance for each highway class to be traveled and the associated accident and casualty rates are shown in Table 1. A shipper's license issued by the Division of Radiological Health, Tennessee Department of Environment and Conservation, would be obtained prior to shipment.

Based on a total exposure of 0.1284 million vehicle miles of travel and casualty rates per highway class, as shown in Table 1 (Office of Technology Assessment 1988), it would be expected that a total of 0.038 casualties (effectively zero) could occur during shipment of this material by truck.

4.1.7.2 Transport of decontamination waste

Transport of the decontamination waste to Envirocare, Inc. or the Hanford Site would be by rail and would be performed by SEG or its agent. Transport would first involve truck shipments between SEG and the K-25 Site rail loading facility. It is assumed that 30 drums would be moved in an enclosed truck or container for each trip. To transport the 1,500 to 1,900 drums of waste, 57 truck trips would be required. The distance from SEG to the K-25 Site is 8 km (5 miles) [16 km (10 miles) roundtrip] on rural minor arteries or nonpublic roads within the K-25 Site; thus, 912 km (570 miles) would be traveled. Applying the accident rates in Table 1 for

Table 1. Accident and casualty rates for highways to be traveled during transport of nickel ingots

Route	Miles Per Trip	Highway Class	Accident Rate[a]	Casualty Rate[a]	Total VMT[b] (Million)	Total Accidents	Casualty Accidents
SR 64	3	Rural Minor Artery	0.97	0.48	0.0013	0.0012	0.0006
I-24	126	Rural Interstate	0.77	0.27	0.0536	0.0412	0.0145
I-265[c]	15	Urban Interstate	2.79	0.55	0.0064	0.0178	0.0035
I-40	143	Rural Interstate	0.77	0.27	0.0608	0.0468	0.0164
SR 58	10	Rural Minor Artery	0.97	0.48	0.0043	0.0041	0.0020
Powerhouse Rd to Bear Creek Rd	5	Rural Minor Artery	0.97	0.48	0.0021	0.0021	0.0010
TOTAL	302				0.1284	0.1133	0.0381

[a] Accident and casualty rates are per million vehicle miles traveled. Rates are from Office of Technology Assessment 1988.
[b] Vehicle miles traveled.
[c] The routing from I-24 on the north side of Nashville, Tennessee, to I-40 on the east side of Nashville involves the transfer to/from three different interstates (I-65, I-265, and I-24) in the span of approximately 10 miles.

rural minor arterial results in an estimated 0.0006 total number of accidents and 0.0003 casualty accidents (Table 2), which is effectively zero.

The rail distance between the K-25 Site and Envirocare, Inc. was determined to be 3,267 km (2,030 miles) (Fig. 6). It is assumed that 80 drums of waste can fit into a single boxcar and that five or six boxcars would be shipped at a time, resulting in a total of 4 shipments [or 13,068 km (8,120 miles)]. The total rail accident rate is assumed to be 11.88 accidents per million miles traveled (NRC 1985). This results in an estimated total number of rail accidents of 0.0965. Based on a fatality accident rate of 0.045 per million miles traveled (Cashwell et al. 1989), the estimated number of fatality accidents is 0.0004 (Table 2).

The rail distance between the K-25 Site and the Hanford Site was determined to be 4,215 km (2,619 miles) (Fig. 7). Multiplying the miles traveled times the rail accident rate of 11.88 accidents per million miles traveled results in an estimated 0.1245 total rail accidents. Based on the rail fatality accident rate of 0.045 per million miles traveled, the estimated number of rail fatality accidents is 0.0005 (Table 2).

Risk from radiological causes are exceedingly small. Because there are no gamma emitters identified in the decontamination waste, no routine exposures are anticipated from the shipment. The radiological accident risks were assessed using the RADTRAN 4 code (Neuhauser and Knipe 1994) using the accident release data developed by the Nuclear Regulatory Commission (NRC 1977). The estimated radiological risk is 0.01 person-mrem for the entire waste shipment, which corresponds to 5×10^{-9} latent cancer fatalities.

4.1.7.3 Transport of decontaminated nickel to a seaport

The decontaminated nickel would be transported either by truck or rail to a seaport on the eastern coast of the United States, assumed in this analysis to be Savannah, Georgia, for shipment to Spain. For the purpose of this analysis, truck transport is considered. Accident risk for rail transport, given as estimated casualties, would be similar to but lower than truck transport casualties.

The nickel would be transported from SEG in 20-ton lots and 10 shipments per month for 4 years. To transport 2400 tons of decontaminated nickel each year, 120 truck shipments would be required annually for a 4-year total of 480 shipments. The distance to Savannah from SEG is approximately 458 miles. The majority of the distance traveled would be on rural interstate highways. The estimated total number of accidents is 0.2347 and the estimated number of casualty accidents is 0.0684 (Table 3).

4.1.8 Human Health and Safety

4.1.8.1 Occupational worker

Activities associated with loading the ingots at PGDP and unloading at SEG would comply with DOE regulations on employee health and safety (e.g., DOE Orders 5480.1B, 5480.11, and 5480.6 and with 10 *CFR* 835), and a health and safety plan commensurate with the hazards for this project would be developed and implemented at PGDP prior to initiation of loading by SEG.

Table 2. Accident and casualty rates for miles traveled during transport of decontamination waste or ingots to disposal

Transport	Miles Per Trip	Accident Rate[a]	Casualty Rate[a]	Total VMT[b] (Million)	Total Accidents	Total Casualties
Transport of Decontamination Waste to Disposal						
Truck Route (SEG to K-25 Site rail loading facility)	10[c]	0.97	0.48	0.00057	0.0006	0.0003
Rail Route (K-25 Site to Envirocare, Inc.) See Fig. 6	2030	11.88	0.045[d]	0.0081	0.0965	0.0004
Rail Route (K-25 Site to Hanford Site) See Fig. 7	2619	11.88	0.045[d]	0.0105	0.1245	0.0005
Transport of Ingots to Disposal						
Rail Route (PGDP to Envirocare, Inc.) See Fig. 9	2000	11.88	0.045[d]	0.024	0.2851	0.0011
Rail Route (PGDP to Hanford Site) See Fig. 10	2291	11.88	0.045[d]	0.0275	0.3266	0.0012

[a] Rate per million miles traveled. Source: Office of Technology Assessment (1988).
[b] Vehicle miles traveled.
[c] Roundtrip.
[d] Fatality rate rather than casualty rate. Rate per million miles traveled. Source: Cashwell et al. (1989).

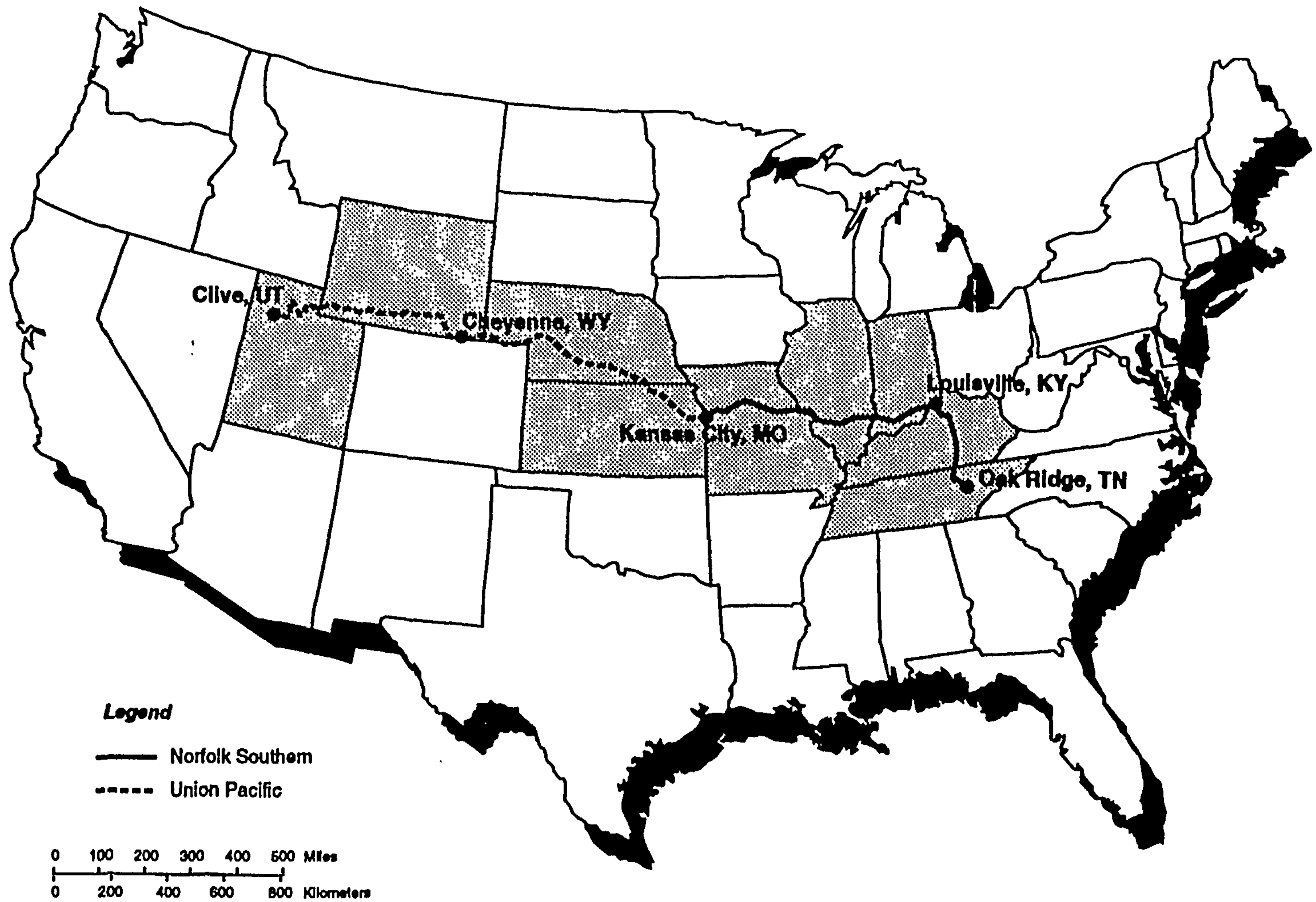

Fig. 6. Rail route from K-25 Site to Envirocare, Inc.

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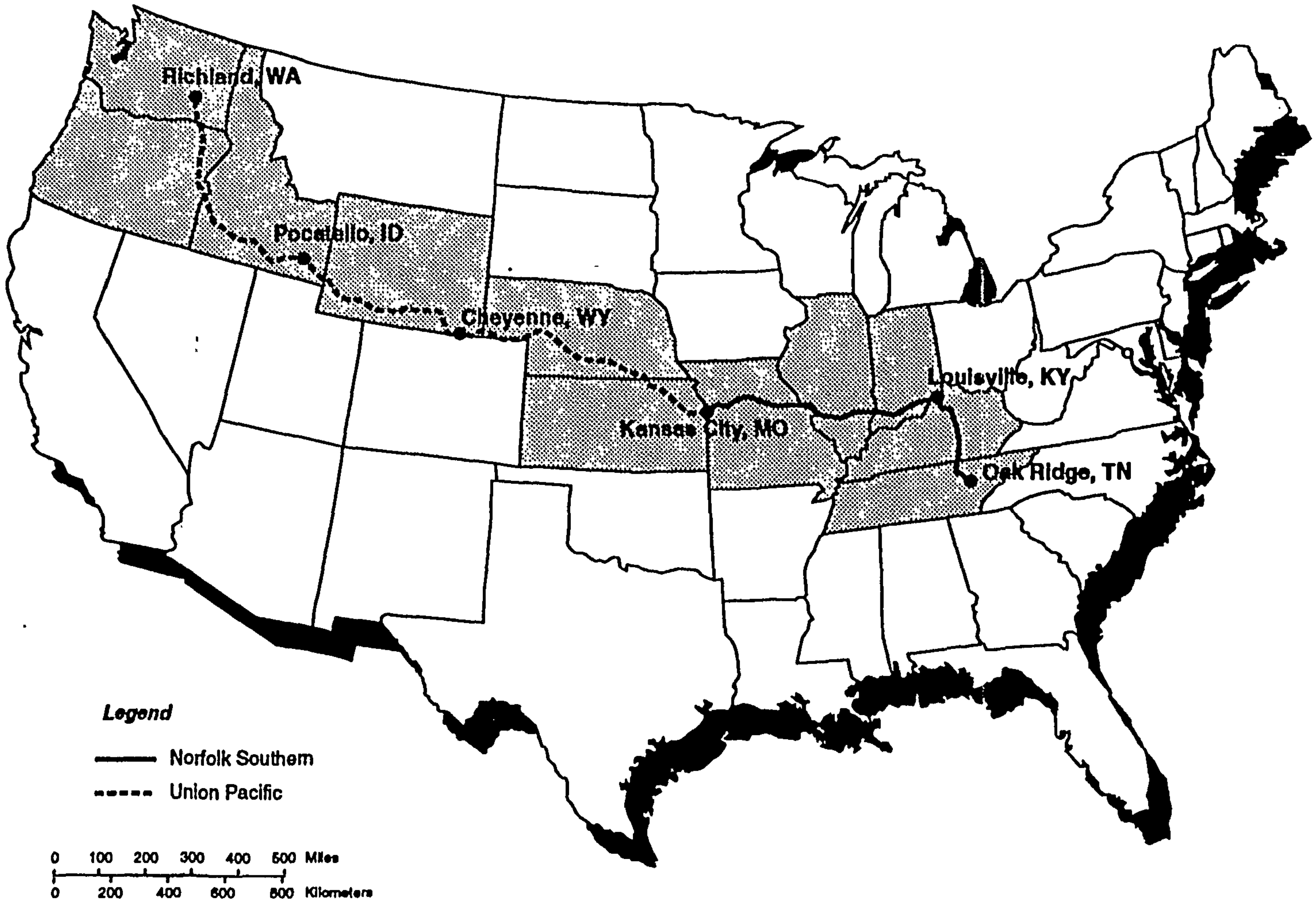

Fig. 7. Rail route from K-25 Site to Hanford Site.

9-091895-009

Table 3. **Accident and casualty rates for highways to be traveled during transport of decontaminated nickel to a seaport**

Route	Miles Per Trip	Highway Class	Accident Rate[a]	Casualty Rate[a]	Total VMT[b] (Million)	Total Accidents	Casualty Accidents
E I-40	15.0	Rural Interstate	0.77	0.27	0.0072	0.0055	0.0019
S I-75	73.0	Rural Interstate	0.77	0.27	0.0350	0.0270	0.0095
S I-75	10.0	Urban Interstate	2.79	0.55	0.0048	0.0134	0.0026
S I-75	74.4	Rural Interstate	0.77	0.27	0.0357	0.0275	0.0096
S I-75	20.0	Urban Interstate	2.79	0.55	0.0096	0.0268	0.0053
E I-285	27.5	Urban Interstate	2.79	0.55	0.0132	0.0368	0.0073
S I-75	73.0	Rural Interstate	0.77	0.27	0.0350	0.0270	0.0095
E I-16	10.0	Urban Interstate	2.79	0.55	0.0048	0.0134	0.0026
E I-16	155.0	Rural Interstate	0.77	0.27	0.0744	0.0573	0.0201
TOTAL	457.9				0.2198	0.2347	0.0684

[a] Accident and casualty rates are per million vehicle miles traveled. Rates are from Office of Technology Assessment 1988.
[b] Vehicle miles traveled.

Nonradiological hazards associated with decontamination of the nickel ingots would be typical of hazards at any electroplating facility. These activities could result in accidents that could injure workers. Processes such as feedstock preparation, electrolyte preparation (by acid dissolution), electroplating, and associated waste management activities would be performed. These activities present occupational health and safety concerns normally associated with industrial processing facilities, such as accidents involving operation of industrial machinery and mechanical material handling equipment. Other potential impacts involve slip, trip, and fall hazards; noise; chemical hazards, including inhalation of toxic materials and burns from contact with acids; hazards resulting from HEPA filter failure; the low-probability potential of a hydrogen explosion should the hydrogen dilution system fail; and electrocution.

Risks would be related to the number of person-hours required to complete the action. SEG would decontaminate the nickel ingots over a 4-year period. The annual fatality accident rate for "safe" industries, which include manufacturing operations such as SEG, is 1 or less per 10,000 workers (NCRP 1987). Thus, the risk to the 20 projected workers decontaminating the nickel would be low.

During the nickel decontamination process, hydrogen gas is expected to be generated at the dissolution and the electrowinning tanks. The primary method of eliminating hydrogen buildup in these areas is through localized ventilation using high air volume and flow rates to dilute the explosive gas and carry it to the off-gas scrubber system.

In the event the localized ventilation system fails (e.g., power outage or equipment failure), area hydrogen or combustible monitors would indicate if explosive levels of hydrogen exist and result in immediate shutdown of the process. General building ventilation would then remove any buildup of hydrogen gas. A backup generator would provide power to the general building ventilation system in case of total power failure.

Employee health and safety at SEG is governed by all appropriate requirements outlined by the Occupational Safety and Health Administration. Occupational hazards are minimized by strict compliance with applicable requirements. The SEG Oak Ridge facility has been inspected by the Tennessee Occupational Safety and Health Administration on two occasions. Tennessee is an agreement state with regard to the U.S. Nuclear Regulatory Commission and all pertinent environmental safety and health agencies that affect SEG operations.

Radiological Exposure—SEG Workers

In addition to the nonradiological risks associated with nickel processing, workers would be exposed to contaminated materials throughout the action. The principal mode of radiation exposure would be internal exposures from inhalation and ingestion of airborne contamination resulting from processing operations. The bulk of the radionuclide contamination in the nickel ingots is ^{99}Tc, a low-energy beta emitter. As discussed in Sect. 4.1.7, ^{99}Tc would not present an external irradiation hazard. Surface exposure measurements of the ingots indicate that at 0.6 cm (0.25 in.), external radiation levels are very low, below detection (Energy Systems 1994).

The constraining scenario (i.e., highest exposure) in the decontamination process has been identified as the sectioning of ingots for initial feedstock preparation. Dose was estimated using a cutting scenario, which is a conservative representation of the pelletization process currently planned by SEG. Assuming an air concentration of 1×10^{-3} g/cm^3 and the same contaminant concentration as in the ingots, a full-time worker is estimated to receive an exposure of 0.00036 mrem/year. In this case, the worker is assumed to wear a respirator with a particulate filtration efficiency of 0.99. Assuming that the full-time worker stayed on the same job for the 4 years of nickel processing, the total exposure would be 0.0014 mrem, which corresponds to a potential lifetime fatal cancer risk of 7×10^{-10}. For an estimated four workers to complete this task, the collective exposure would be 0.006 person-mrem and the excess fatal cancers about 0.000000003, effectively zero. For comparison, about 1 in 3 Americans will develop cancer from all sources, and it is estimated that 60 percent of all cancers are fatal (American Cancer Society 1992); this translates to a baseline risk of about 0.2 fatal cancers in the general population, or 1 in 5. Thus, the excess risk of cancer for workers processing nickel is many times less than the existing risk of cancer for the general population having no exposure to the nickel processing.

Actual exposures would be maintained as low as reasonably achievable through application of SEG's Radiation Protection Program, which is regulated by the State of Tennessee Department of Environment and Conservation, Division of Radiological Health. The specific regulations for "Standards for Protection Against Radiation" are provided in the Tennessee Regulations SPAR Chapter 1200-2-5.

SEG maintains a written Radiation Protection Program designed to comply with applicable regulations as well as to prevent employees and the general public from unnecessary or inadvertent exposures to radiation. In addition to regulatory and access controls, SEG has incorporated several engineering features, such as ventilation systems, shielding, remote handling equipment, area monitoring, and waste collection and processing systems, to reduce personnel exposures to radiation and radioactive material. SEG's ALARA program requires a detailed health physics review for each task performed under a Radiation Work Permit.

Occupational exposures are monitored at SEG through use of personal dosimetry, health physics surveys, and bioassay programs. Employees routinely involved in melting radioactively contaminated scrap metal at this facility have annual monitored exposures of less than 250 mrem/year from all processes conducted at the facility. Radionuclide concentrations in the nickel ingots are not significantly different from or greater than radionuclide contamination in scrap metal currently smelted at SEG. Because decontamination of nickel ingots at this facility would be by electrorefining, airborne emissions would be significantly lower and would not be expected to produce annual exposures to workers in excess of currently measured exposures. The average annual exposure at SEG is well below Tennessee's State Regulations for Protection Against Radiation exposure limit for workers of 5 rem/year. Currently, bioassay indicates that internal exposures are below detectable limits for all radionuclides assayed (Davis 1993).

Radiological Exposure—Smelter Workers

Under the proposed action, the nickel would be reused following the decontamination process. The most plausible scenario of nickel application is smelting with iron into nickel steel (which is corrosion resistant) in a commercial smelter. In general practice, about a 15 percent nickel content is typical for the alloy (Sibley 1985). Thus, for a nickel inventory of 9,350 tons, a total of 62,330 tons of nickel steel is expected as product, which would bring the average level of ^{99}Tc in the product steel to 1.8 Bq/g. The constraining scenario for this process has been identified as the caster worker. The assumptions follow the International Atomic Energy Agency (IAEA) 111 Report (IAEA 1992), where the workers are subject to the inhalation and inadvertent ingestion pathways. The smelting process is assumed to take place in a commercial smelter; because smelter workers are not considered to be radiation workers, no protection such as respirators is assumed. The potential dose to a full-time worker is estimated to be 0.01 mrem/year. Assuming that a worker stays on the same job for 4 years of processing, the total dose would be 0.04 mrem, which translates into a lifetime fatal cancer risk of 2×10^{-8}. The estimated population dose for workers would be about 0.3 person-mrem over 4 years of processing which is about 0.00000002 excess fatal cancers in the affected population, effectively zero. As explained in Sect. 4.1.8.1, this excess risk to workers processing nickel is many times less than the risk of cancer in the general population, who are not exposed to the nickel.

4.1.8.2 Public exposure

Members of the general public would not be exposed to external radiation during transport of the nickel ingots, the decontamination waste, or the decontaminated nickel cathodes, as described in Sect. 4.1.7.

Radiological Exposure from Processing at SEG

The radiological exposure to the public resulting from routine decontamination operations at SEG is limited by the remote location of the facility, which is approximately 1 mile to the east of the nearest residences, and by use of HEPA filtration systems to prevent the release of material to the air. Emissions from SEG are regulated according to Tennessee's State Regulations for Protection Against Radiation. The regulatory limit for effective dose equivalent to a member of the public is 10 mrem/year (40 *CFR* 16.102). For calendar year 1993, SEG's radionuclide emissions were calculated to result in a whole body dose to the nearest receptor of 5.8×10^{-2} mrem/year, or less than 1 percent of the standard (SEG 1994). Decontamination of nickel ingots at the SEG facility would not be likely to affect this estimate because electrorefining processes would not release airborne radioactive contaminants.

Radiological Exposure in Spain

The current proposal is for SEG to resell the decontaminated metal to a Spanish company for use in making stainless steel products for industrial use. As discussed above, the smelted steel product from the subject contaminated nickel would contain an estimated ^{99}Tc concentration of 1.8 Bq/g. Because Spanish regulations do not allow the production of personal items such as cookware, toys, earrings, or domestic tools from recycled metal, the likely end uses of such steel products are industrial equipment and machinery. Also, because such steel is quite resistant to corrosion, it is highly unlikely that ^{99}Tc in the steel could become dispersed or available for human intake, either by inhalation or ingestion, through the normal use of such end products under ambient environmental conditions. Thus, on the basis of these considerations and the fact that external exposure is also an unlikely route of exposure, no radiological impacts are expected to result from implementation of this alternative.

The impact of atmospheric releases to a member of the public from a smelter in Spain producing stainless steel is estimated to be 9×10^{-6} mrem/year. The population dose from such releases is estimated to be 0.3 person-mrem/year for a populated urban environment. Over 4 years of processing, the collective population dose would be 1.2 person-mrem, which corresponds to 0.0000006 excess fatal cancers in the affected population, effectively zero.

Radiological impacts for the proposed action and alternatives are summarized in Table 4. Appendix A provides discussion of the proposed action relative to DOE's ALARA policy.

4.1.9 Environmental Justice

Executive Order 12898 requires federal agencies to achieve environmental justice "to the greatest extent practicable" by identifying and addressing "disproportionately high and adverse human health or environmental effects of its...activities on minority populations and low-income populations . . ."

Census data on areas near SEG have been examined to identify any low-income or minority populations that could be affected by the proposed action. The census tracts for the city of Oak Ridge are shown in Fig. 8. The population distribution by race in these census tracts is shown in Table 5.

In census tract 201, 36.8 percent of the population is black; in the other census tracts, the black population ranges from 1.4 to 6.5 percent of the total. The other non-white and Hispanic populations are less than 6 percent in each census tract, and no tract has a substantially larger percentage of these populations. With these data, tract 201 is identified as the community with the highest percentage of minority households. The 1989 household income by census tract is shown in Table 6. The 1994 Federal Poverty Guideline on income levels by size of family unit for all states (except Alaska, Hawaii, and the District of Columbia) is shown in Table 7 (59 Federal Register 6277).

Although the 1994 Federal Poverty Guideline defines a low-income *household*, there is no guidance available yet on what would comprise a low-income *community*; that is, what percentage of the total households in the community have incomes in the poverty range. Another concern in identifying a low-income community is the availability of data. For the census tracts near SEG, no data on household income by household size are available. As shown in Table 6, the available data, which are from a report prepared by the city of Oak Ridge, list households by income level and census tract but without information on household size. Therefore, this analysis uses two reference points for considering whether low-income communities are located near SEG.

First, the analysis uses the Federal Poverty Guideline income level of $14,800 for a family of four; this is very close to the $14,999 break point used in the available data, as shown in Table 6. Second, the analysis uses the State of Tennessee median household income level of $24,807, which is based on 1990 census data; this is very close to the $24,999 break point used in the available data, as shown in Table 6.

In tract 201, 55 percent of the households have incomes less than $24,999 and 34 percent have incomes less than $14,999. In tract 205, 58 percent of the households have incomes less than $24,999, and 40 percent have incomes less than $14,999. In other tracts, more than 50 percent of the households have incomes greater than the Tennessee median income. Also, less than 30 percent of the households in the other tracts have incomes of less than $14,999. Based on

Table 4. Estimated radiological impacts by alternatives for the disposition of contaminated nickel ingots

Impact Group	Alternative 1 Proposed Action	Alternative 2 Release by DOE	Alternative 3 Improved Storage	Alternative 4 Direct Disposal	Alternative 5 No Action
Maximum lifetime individual, worker					
Excess fatal cancer risk	7×10^{-10}	7×10^{-10}	None	Not estimated	None
Dose equivalent	0.0014 mrem	0.0014 mrem	—	—	—
Collective, worker					
Excess fatal cancers	0.00000002	0.00000002	None	Not estimated	None
Dose equivalent	0.04 person-mrem	0.04 person-mrem	—	—	—
Collective, transport worker					
Excess fatal cancers	None	None	None	None	None
Dose equivalent	—	—	—	—	—
Maximum lifetime individual, public					
Excess fatal cancer risk	2×10^{-8}	2×10^{-8}	None	5×10^{-7}	None
Dose equivalent	0.04 mrem	0.04 mrem	—	1 mrem	—
Collective, public					
Excess fatal cancers	0.0000008	0.00002	None	Not estimated	None
Dose equivalent	1.5 person-mrem	43.5 person-mrem	—	—	—
Collective from transportation, public					
Excess fatal cancers	None	None	None	None	None
Dose equivalent	—	—	—	—	—

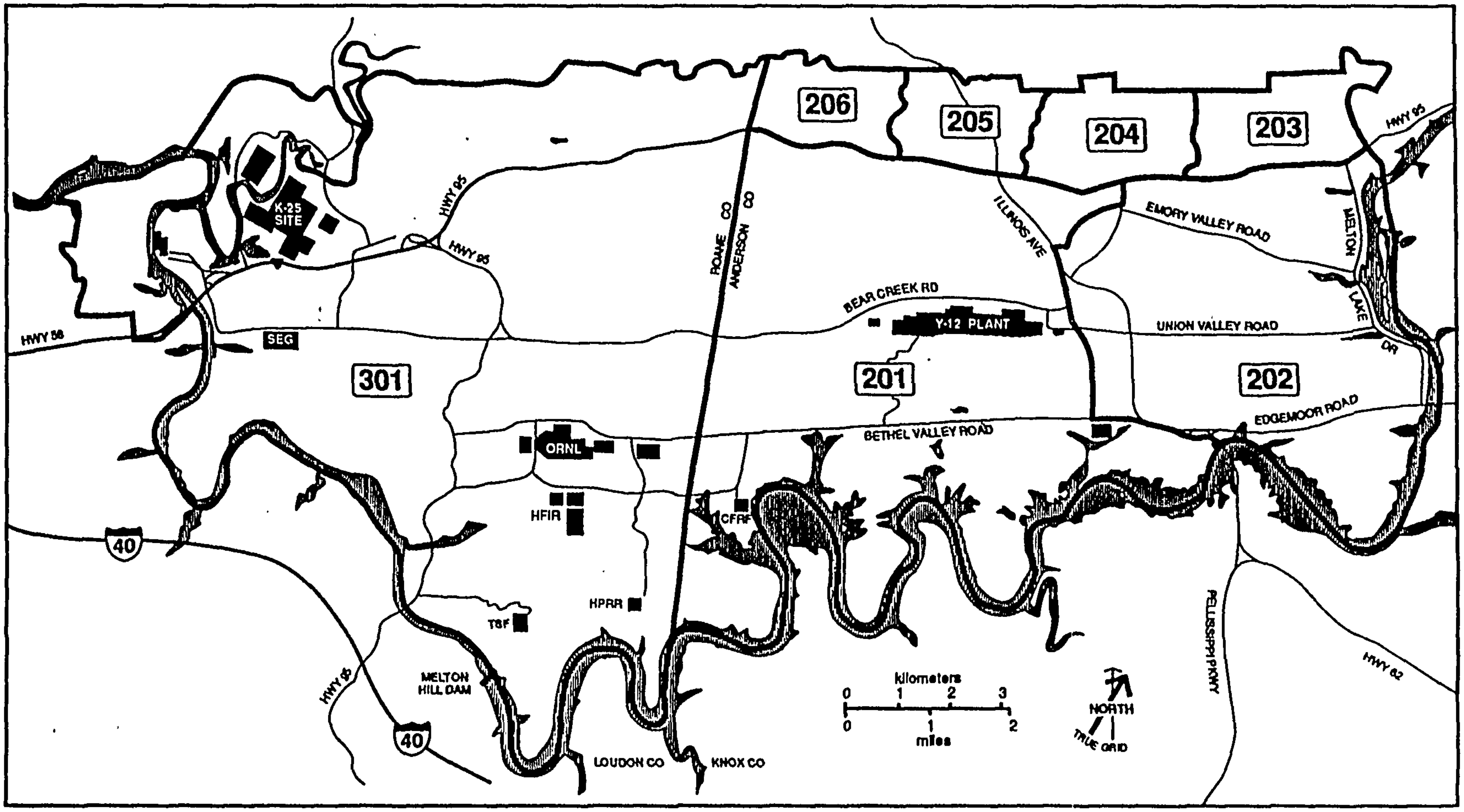

Fig. 8. City of Oak Ridge, census tracts 1990.

Table 5. 1990 population distribution by race in census tracts in the vicinity of SEG[a]

		White		Black		Other Non-white		Hispanic[b]	
Tract	Total Population	Pop.	%	Pop.	%	Pop.	%	Pop.	%
201	2,767	1,520	58.5	1,019	36.8	128	4.6	24	0.9
202	6,260	5,814	92.9	230	3.7	21	3.5	68	1.1
203	4,533	4,232	93.4	232	5.1	69	1.5	26	0.6
204	4,544	4,228	93.0	249	5.5	67	1.5	44	1.0
205	3,932	3,625	92.2	255	6.5	52	1.3	28	0.7
206	2,707	2,463	91.0	158	5.8	86	3.2	33	1.2
301	2,563	2,423	94.3	37	1.4	143	5.6	13	1.4
Total	27,306	24,405	89.4	1,936	7.0	761	2.8	236	0.9

[a] City of Oak Ridge 1994.
[b] Hispanic origin may be any race and is included in other totals.

Table 6. 1989 household income by census tract[a]

	Census Tract						
Income Range	201	202	203	204	205	206	301
Less than $5,000	135	145	40	146	218	7	11
$5,000 - 9,999	191	268	114	271	200	14	23
$10,000 - 14,999	133	138	198	177	246	33	0
$15,000 - 24,999	281	346	359	344	299	129	57
$25,000 - 34,999	217	332	397	335	275	154	39
$35,000 - 49,999	173	411	445	401	209	221	137
$50,000 - 74,999	170	638	258	342	140	254	367
$75,000 - 99,000	20	198	88	86	43	161	213
$100,000 or more	29	161	35	32	23	81	117
Total	1,349	2,637	1,934	2,134	1,653	1,054	964

[a] City of Oak Ridge 1994.

Table 7. 1994 Federal Poverty Guideline on income levels by size of family unit for all states[a]

Size of Family Unit	Poverty Guidance
1	$7,360
2	9,840
3	12,320
4	14,800
5	17,280
6	19,760
7	22,240
8	24,720

[a] Excludes Alaska, Hawaii, and the District of Columbia.

these data, tracts 201 and 205 are identified as having the highest percentage of low-income or minority households in areas near SEG.

As discussed in Sect. 4.1.8.2 and summarized in Table 4 of this environmental assessment, potential dose and risk to members of the public would be very low. Although tracts 201 and 205 do have a higher percentage of low-income and minority households in the vicinity of SEG, there are no significant environmental impacts or human health risks. Therefore, this analysis does not indicate disproportionate effects on low-income and minority populations.

4.2 ALTERNATIVE 2—REPROCESSING FOR UNRESTRICTED RELEASE BY DOE

The potential impacts of implementing Alternative 2 are the same as the proposed action, with the exception of public exposure from end use of products made from the decontaminated nickel. There are no regulations governing use of residually contaminated metal in the United States.

4.2.1 Human Health and Safety

While Spanish regulations prohibit use of this nickel in consumer products such as a frying pan, a plausible risk assessment exposure pathway from a consumer end product is the use of a frying pan (which would be subject to elevated temperatures due to heating), as discussed in the IAEA 111 Report (IAEA 1992). For this scenario, the potential exposure pathway is assumed to be through ingestion of ^{99}Tc from a corroded frying pan. An estimated 8 percent of steel production is used for manufacturing appliances (Sibley 1985), and 1 percent is assumed to be made into frying pans. Because stainless steel is corrosion resistant, the corrosion rate is assumed to be 10 percent of the conservatively based corrosion rate for carbon steel of 0.13 mm/year used by the IAEA (1992). Even this lower corrosion rate (i.e., 0.013 mm/year) is believed to be conservative because a general corrosion rate of stainless steel has been reported to be about 0.1 mil (Shreir et al. 1992) (i.e., 2.5×10^{-3} mrem/year), under outdoor, natural environmental conditions. The estimated individual ingestion dose through use of a frying pan is estimated to be 3×10^{-5} mrem/year. Assuming a 4- to 20-year possession of a frying pan, the individual dose would range from about 1×10^{-4} mrem to 5×10^{-4} mrem, which corresponds to a lifetime fatal cancer risk from 5×10^{-9} to 2.5×10^{-8} (Table 4). The estimated maximum collective dose for the frying pan scenario is 42 person-mrem, or about 0.00002 excess fatal cancers in the affected population, which is effectively zero. For comparison, about 1 in 3 Americans will develop cancer from all sources, and it is estimated that 60 percent of all cancers are fatal (American Cancer Society 1992); this translates to a baseline risk of about 0.2 fatal cancers in the general population, or 1 in 5.

4.3 ALTERNATIVE 3—IMPROVED STORAGE OF THE INGOTS

Implementing Alternative 3 would involve construction of a metal storage building on a concrete slab in the current Storage Pad location. Because construction would take place in a currently developed area, no direct impacts to flora and fauna would occur. Erosion control measures such as silt fences and berms would reduce sediment loading in Big Bayou Creek. No archaeological or historical resources would be affected and no change in land use would occur. Air quality impacts would be similar to any small construction project where some grading and site preparation activities occur; however, these are not expected to be harmful to workers at PGDP or the public.

4.3.1 Socioeconomics

Total estimated cost of implementing this alternative is \$188,419. Approximately half of this amount is for 4,000 hours of labor. The building would likely be constructed by a subcontractor, and Alternative 3 may result in a small benefit to the local economy. Construction of the storage building is not expected to result in new residents, and no additional demands on public services would be expected. Annual surveillance and maintenance cost for this alternative are estimated to be \$4,860.

4.3.2 Human Health and Safety

As discussed above, no external dose is expected from the nickel ingots, and no plausible internal pathway exists that could lead to inhalation or ingestion through storage of the ingots, thus no radiological impact from storage of the ingots would occur.

4.4 ALTERNATIVE 4—DIRECT DISPOSAL OF THE INGOTS

Under Alternative 4, the ingots would be disposed of in lined cells at a licensed disposal facility, assumed to be Envirocare, Inc. (Clive, Utah). Impacts of disposal have been evaluated during licensing and will not be addressed in this environmental assessment. The environmental effects plausible for this alternative would be on human health and safety.

4.4.1 Socioeconomics

Transporting the ingots by rail to Envirocare, Inc. is estimated to cost $1.13 M ($10,000 per dedicated boxcar and 113 boxcars would be required). Disposal at the facility would cost approximately $578,000 ($\$16/ft^3$ of waste and the volume of the ingots is 36,125 ft^3). Total cost of this alternative would be $1.708 M.

4.4.2 Human Health and Safety

Transport of the ingots to Envirocare, Inc. or the Hanford Site would be by rail; the proposed routes are shown in Figs. 9 and 10. The rail distance between PGDP and Envirocare, Inc. is estimated to be 3,219 km (2000 miles) and the ingots are assumed to travel in 12 shipments [or 38,623 km (24,000 miles) traveled]. This results in an estimated 0.2851 total rail accidents and 0.0011 rail fatality accidents (Table 2). The rail distance between PGDP and the Hanford Site is estimated to be 3,687 km (2,291 miles). Total rail distance traveled would be 44,243 km (27,492 miles). This results in an estimated 0.3266 total rail accidents and 0.0012 rail fatality accidents (Table 2).

The impacts on human health from burial of the ingots was calculated using the RESRAD code (Yu et al. 1993). One percent of the nickel is assumed to be corroded and uniformly dispersed in the soil. The waste barrier is assumed to be breached following termination of the facility licensing period. Under these conditions, the peak dose to a member of the public is estimated to be 1 mrem/year, which is a lifetime fatal cancer risk of about 5×10^{-7}. For comparison, the baseline risk of fatal cancers in the general population is about 1×10^{-2}, or 1 in 5, a rate many times higher than that estimated for public exposure to the nickel.

Collective dose is difficult to project for this alternative because there are large uncertainties in projecting population exposure scenarios and defining the affected population. Projections of collective dose for the direct disposal alternative are complicated by the fact that for all alternatives the nickel would ultimately go to disposal, whether as ingots or processing waste to a disposal facility or as industrial or commercial products that are discarded in a landfill. Collective dose resulting from disposal would vary temporally and spatially for the alternatives but the impacts of disposal to the population are comparable. Reporting collective dose resulting from disposal only for Alternative 4 is not reasonable. Based on the very small collective dose for the other alternatives, collective dose for Alternative 4 would also be inconsequential and will not be considered further.

4.5 ALTERNATIVE 5—NO-ACTION

For continued open storage, no impacts to land use and archaeological/cultural resources, or air quality would be expected and are not discussed further in this section.

4.5.1 Socioeconomics

The socioeconomic conditions of the Paducah area would not change with implementation of the no-action alternative. Continued storage of the nickel ingots would not require any change in the number of personnel at PGDP.

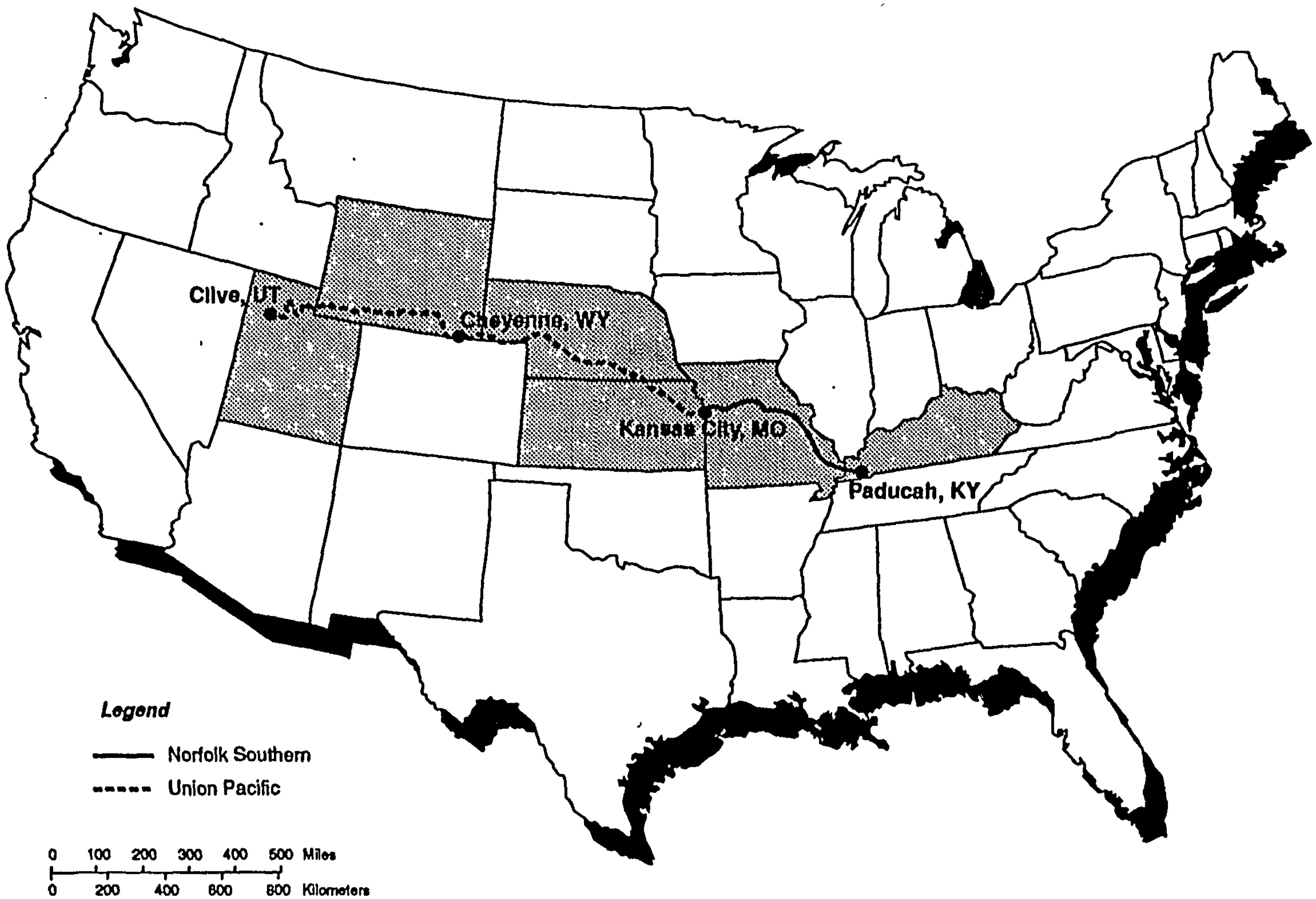

Fig. 9. Rail route from PGDP to Envirocare, Inc.

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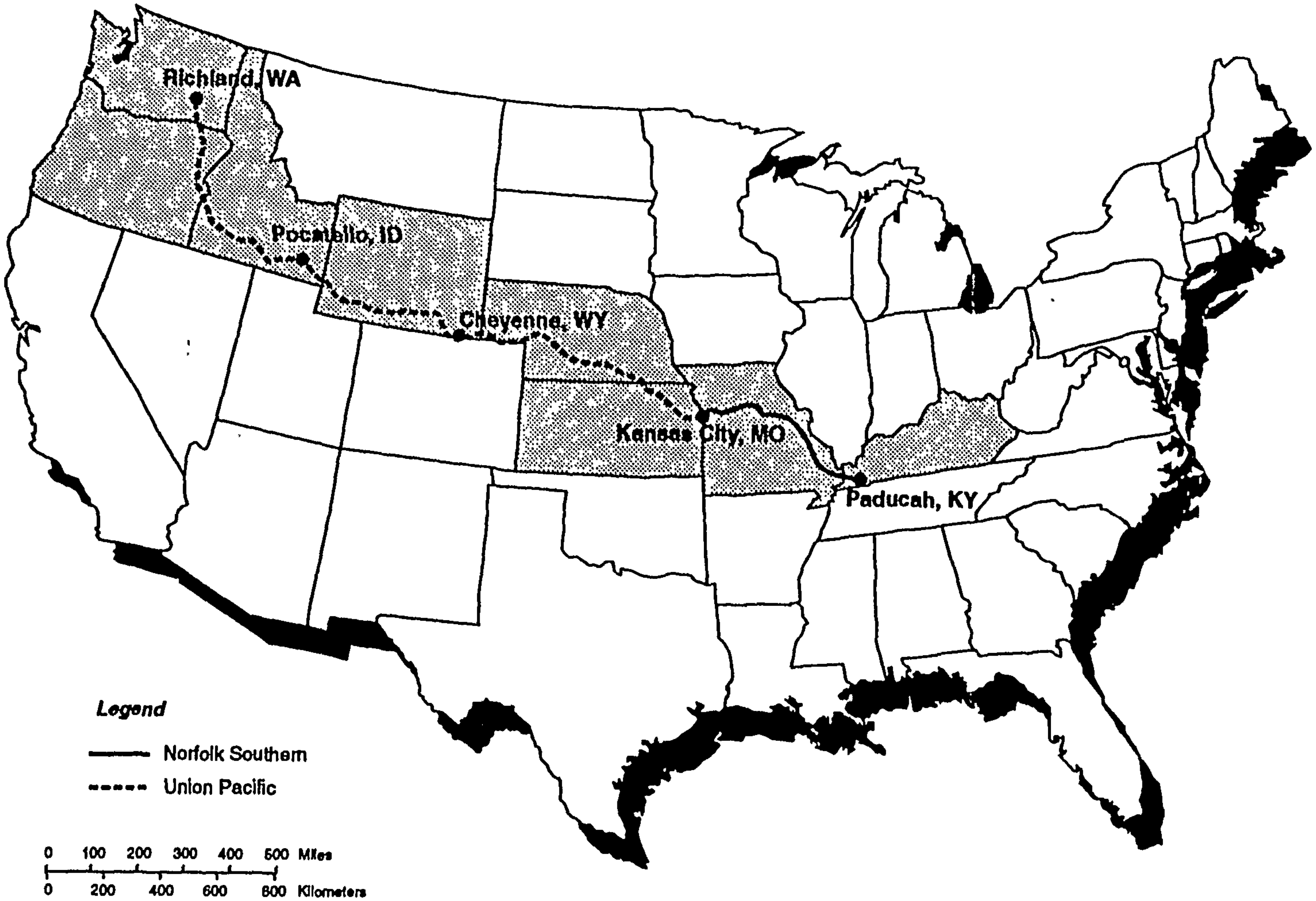

Fig. 10. Rail route from PGDP to Hanford Site.

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Selection and implementation of the no-action alternative would result in cost for continued surveillance and maintenance of the nickel at approximately $6,110/year for industrial hygiene surveys.

4.5.2 Geology and Soils

The potential for soil contamination, either from past activities at PGDP or from storage of the nickel ingots, exists in the vicinity of the current Storage Pad. The continued storage of the ingots would hinder characterization of and potential remediation of the soils in the Storage Pad area.

4.5.3 Water Quality

No adverse impacts to groundwater or surface water have been identified for the no-action alternative. The continued open storage of the nickel ingots could result in the transport of contaminants to surface water; however, the potential for this to occur is considered low because the contamination is throughout the ingots rather than at the surface, and nickel is insoluble in water except in an oxidized form, which exists only in a thin layer at the surface of the ingots.

4.5.4 Ecological Resources

Although current open storage of the ingots is not considered best management practice, there is no evidence that ecological receptors are being exposed to contaminants from the ingots. The ingots are stored in an industrial setting that is devoid of natural habitat. If contaminants are being released from the ingots, the most likely receptors, other than soil microbes, would be aquatic organisms. The KPDES outfall receiving runoff from the ingot storage area is 001, which discharges to Big Bayou Creek. Monitoring data from Outfall 001 in 1992 indicate that nickel and other metals did not exceed permit levels (Energy Systems 1993b). Ecological monitoring of biota in Big Bayou Creek indicates the presence of fish communities associated with degraded conditions; however, elevated temperature and chlorine and a high level of suspended solids are considered the most likely contributors because these parameters exceeded the KPDES permit levels during the previous 3 monitoring years (Energy Systems 1993b). Given the monitoring data available, there is no evidence that the ingots are currently harming ecological receptors.

4.5.5 Human Health and Safety

Access to the Storage Pad is currently limited to those occasions when materials are moved within the facility or when inspections of the area are performed. Persons potentially exposed to contaminated materials could be maintenance workers, monitoring technicians, and site employees. The majority of contamination is caused by the presence of ^{99}Tc, which radioactively decays by emission of low-energy beta particles. A recent routine radiological survey indicated that surface exposures are below detection (Energy Systems 1994). No plausible pathways of exposure to workers or the public are present.

Employee health and safety at the Storage Pad is governed by all appropriate regulations and requirements, including site procedures (e.g., DOE Orders 5480.1B, 5480.6, 5480.11, and 10 *CFR* 835).

Nonradiological worker hazards are negligible and would not be expected to increase, provided activities at the Storage Pad do not change.

Currently, no public hazard is associated with storage of nickel ingots at PGDP. However, current storage does not constitute best management practice as required under the KPDES permit for PGDP because no controls of surface runoff are currently in effect.

4.6 POTENTIAL CUMULATIVE IMPACTS

Cumulative impacts are the effects on the environment that could result from the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts could result from individually minor, but collectively significant, actions taking place over a period of time (40 *CFR* 1508.7).

Evaluating cumulative effects requires bounding the analysis in space and time and defining the resources considered most at risk. Identifying the resources most at risk helps to determine appropriate spatial and temporal boundaries. Based on the alternatives considered in this environmental assessment, water quality, air quality, and human health and safety are the only entities potentially at risk from additive effects.

For the purpose of this analysis, spatial bounding is considered in three tiers: the site of the action; local area; and the region. The sites considered are SEG, PGDP, and the K-25 Site. The local area is defined as the Oak Ridge Reservation (for actions at SEG and K-25 Site) or the Paducah Reservation for actions at PGDP. The region is defined as the southeastern United States. Regional effects are expected only when site-specific and local effects are identified.

The time span considered in this evaluation of cumulative effects is 5 years. Local planning documents used to identify actions with potential additive effects typically project 5 years in the future. Ecological resources, which are usually less well protected by regulations than human health, are not expected to be affected by the alternatives in this environmental assessment, so limiting the evaluation to 5 years is reasonable.

4.6.1 Water Quality

Some adverse impacts to the surface water quality of Grassy Creek and Big Bayou Creek could occur during construction of buildings at SEG and PGDP, although erosion, runoff, and stormwater controls would be expected to minimize the impact. None of the area on the Oak Ridge Reservation in the Grassy Creek watershed is currently proposed for use by DOE (DOE 1993d); thus, it is unlikely that other construction projects in the watershed would contribute sediment load during building construction at SEG.

4.6.2 Air Quality

Fugitive dust and equipment emissions would occur during construction of the nickel processing buildings at SEG or the new storage building at PGDP. Other construction projects or activities requiring heavy equipment could add to these emissions. However, no construction projects are planned by DOE for the nearby area on the Oak Ridge Reservation; therefore, no cumulative impacts to air quality resulting from fugitive dust or equipment emissions would be expected for the SEG area. SEG would be adding another source of air emissions by constructing and operating the nickel decontamination facility. These emissions would be additive to other SEG emissions and other local sources. SEG is in an area of attainment for ambient air quality criteria and the new emissions are small relative to permit limits and are not expected to result in cumulative exceedance of any air quality parameter over the next 5 years.

4.6.3 Human Health and Safety

Occupational radiation exposures would be small. Releases of radioactive contaminants to the environment during processing would be small; SEG expects to maintain emissions at less than 10 percent of permitted levels, as they do for their other processes at the Bear Creek Road facility. Long-term, but extremely low-level, radiation doses to the public would result from implementation of Alternatives 1 and 2. These doses would be an insignificant fraction (1/10,000th) of the dose from natural background radiation. The resultant impacts would be indistinguishable in the exposed population. Therefore, no measurable long-term impacts would be expected.

January 1, 1993, Regulations for Sanitary Protection Against Ionizing Radiation, Appendix V, Section 6 went into effect and codified the same exemption for contaminated nickel with the following exceptions (unreferenced translation):

> The use of contaminated nickel or steel for the fabrication of toys and personal accessories (e.g., earrings) is prohibited.
>
> Contaminated nickel is prohibited in the fabrication of prostheses, sanitary products (e.g., toilet paper), domestic tools (e.g., kitchen utensils, pans, etc.), and construction material, unless the use of the nickel or steel in the fabrication of those products can be justified to the Spanish Nuclear Safety Council.

According to the Sanitary Protection regulation, the importation of contaminated nickel is not restricted; however, the destination and use of the final product must be considered.

The U.S. Nuclear Regulatory Commission has recommended that DOE notify the Department of State to formally notify Spain of the proposed sale of the nickel. DOE has complied with this recommendation (see Appendix F).

The transport of radioactive materials in the United States must meet Department of Transportation requirements for shipping radioactive materials in accordance with 49 *CFR*. Department of Transportation exemptions for scrap loads are available, but must be requested by contacting the appropriate state radiation control office.

5.2 DOMESTIC RELEASE

Alternative 2 considered in this environmental assessment involves decontamination of the nickel by SEG, return of the nickel to DOE, and release of the processed nickel for unrestricted use. DOE could release the nickel for unrestricted use as described in DOE Order 5400.5, Section II.5c(6). This section of the Order states that although no generic guidance is currently available for release of volumetrically contaminated material for unrestricted use, such materials may be released if "criteria and survey techniques are approved by EH-1." This refers to the need for approval from the Assistant Secretary for Environment, Safety, and Health for release of such material to any organization or entity not licensed by the U.S. Nuclear Regulatory Commission.

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U.S. Army Corps of Engineers 1993. *Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area, McCracken County, Kentucky. Volume III, Threatened and Endangered Species.* October 1993. Draft Report.

U.S. Bureau of Census 1994. Statistical Abstract of the United States: 1994, 114th edition, Washington, D.C.

U.S. Department of Commerce, Bureau of the Census 1991. *1990 Census of Population and Housing Public Law 94-171 Data,* Washington, D.C., April.

U.S. Department of Health, Education, and Welfare 1970. *Radiological Health Handbook,* Bureau of Radiological Health, U.S. Department of Health, Education, and Welfare, January.

Waldrup, C. 1993. Personal communication from C. Waldrup, SEG, Oak Ridge, Tennessee, to M. Cunningham, SAIC, Oak Ridge, Tennessee, September.

Williams, J.L. 1986. Letter from J. L. Williams, Energy Systems, Paducah, Kentucky, to W. Stagg, Babcock and Wilcox, Lynchburg, Virginia, October.

Yu, C. et al. 1993. *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0,* ANL/EAD/LD-2, Argonne National Laboratory, Argonne, Illinois, September.

Code of Federal Regulations

Title 10 *CFR* Part 20, "Standards for Protection Against Radiation."

Title 10 *CFR* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Title 10 *CFR* Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

Title 10 *CFR* Part 110, "Export and Import of Nuclear Equipment and Material."

Title 10 *CFR* Part 835, "Occupational Radiation Protection."

Title 40 *CFR* Part 61, Subpart I, "National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission and Federal Facilities Not Covered by Subpart H."

Title 40 *CFR* Parts 1500-1508, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act."

Title 49 *CFR*, "Regulations Relating to Transportation."

DOE Orders

DOE Order 5400.5, Radiation Protection of the Public and the Environment, February 8, 1990.

DOE Order 5480.1B, Environment, Safety, and Health Program for the Department of Energy Operations, September 23, 1986.

DOE Order 5480.6, Safety of Department of Energy-owned Nuclear Reactors, September 23, 1986.

DOE Order 5480.11, Radiation Protection for Occupational Workers, December 21, 1988.

DOE Order 5480.15, Department of Energy Laboratory Accreditation Program for Personnel Dosimetry, December 14, 1987.

DOE Order 5820.2A, Radioactive Waste Management, September 26, 1988.

7. PERSONS AND AGENCIES CONSULTED

Kentucky Heritage Council
The State Historic Preservation Office
300 Washington Street
Frankfort, Kentucky 40601

Nuclear Security Council
Sor Angelea de la Curz, 3
28020 Madrid
Spain

Dewey Large
Walter Hipsher
Catherine Waldrup
Scientific Ecology Group
P.O. Box 2530
1560 Bear Creek Road
Oak Ridge, Tennessee 37831-2530

U.S. Department of the Interior
Fish and Wildlife Service
446 Neal Street
Cookeville, Tennessee 38501

U.S. Nuclear Regulatory Commission
Exports, Security, and Safety Cooperation
Office of International Programs
Washington, D.C. 20551-001

8. LIST OF PREPARERS

This environmental assessment was prepared by Science Applications International Corporation (SAIC) under contract to Lockheed Martin Energy Systems, Inc., Oak Ridge, Tennessee. Energy Systems and DOE provided technical review. The following personnel contributed significantly to the preparation of this document:

Name	Degree	Role	Affiliation
Chuck Pergler	M.S. Range Management	Project Leader	SAIC
Maureen Cunningham	M.S. Botany	Technical Leader	SAIC
S.Y. Chen	Ph.D. Nuclear Engineering	Risk Assessment	Argonne National Laboratory
Calvin Wenzel	B.S. Biology	Impact Assessment	SAIC
Mike Deacon	B.S. Environmental Studies	Impact Assessment	SAIC
Bill Cahill	B.S. Geology	Project Manager	DOE-Oak Ridge
Mike Jugan	M.S. Engineering	Project Manager	DOE-Oak Ridge
Roy Sheely	M.B.A. Quantitative Methods	Nickel Recycle Project Manager	Energy Systems
Marialice Wilson	M.S.L.S. Biomedical Information	Technical Review	SAIC
Andrea Campbell	M.S. Biology	Technical Review	DOE-Oak Ridge
Patricia Phillips	B.S. Zoology	Technical Review	DOE-Oak Ridge

APPENDIX A

ALARA CONSIDERATIONS

Appendix A

ALARA Considerations

Federal requirements (DOE Orders and 10 *CFR* regulations) and national and international standards recommend that exposures to radiation be maintained as low as reasonably achievable (ALARA). The ALARA philosophy and process is described in several recent standards issued by the International Commission on Radiological Protection (ICRP) (1982, 1989, & 1991), and these recommend that any practice involving radiation exposure be examined to determine (1) whether it is justified, i.e., whether it will result in a net benefit; (2) how to minimize exposure by optimizing cost and dose reduction and (3) whether the resultant exposures will be within the regulatory limits. The ALARA principle is the mechanism by which recommendations are made to achieve criterion (2).

The radioactively contaminated nickel addressed by this environmental assessment was produced by a "justified" activity (i.e., uranium enrichment activities, which have produced a net benefit to society), so criterion (1) is met. All the dose equivalents estimated in the alternatives are well below the regulatory limit of 100 mrem/year (DOE 1991), thus criterion (3) is met. Optimization of radiation protection, i.e., the ALARA determination, criterion (2), is the only remaining consideration and is essentially complementary to the purpose of the environmental assessment, which is to determine the best alternative for disposition of the nickel. The dose equivalents associated with the proposed action and the alternatives are estimated in Sect. 4 of this environmental assessment. This appendix presents an evaluation of the proposed action and each alternative relative to the ALARA principle.

The monetary equivalent value for a unit of collective dose can vary. Typical values assigned range from $1,000 per person-rem to $10,000 per person-rem, though values outside the range have also been considered. For application in the ALARA analysis that follows, $10,000 per person-rem (DOE 1991) was used, recognizing that the use of $1,000 per person-rem makes no impact on the ALARA determination or the cost-benefit analyses. This is due to the fact that the potential individual and collective doses to the public from the alternatives are so low that the monetary equivalent cost of the doses is insignificant to other factors. As a result, it was not considered reasonable to spend resources to better define the monetary equivalent per unit dose for this application.

A summary of the costs and benefits of the alternatives is presented in Table A.1. Additional benefits of Alternatives 1 and 2 would include:

- Environmental consequences, e.g., air emissions, water quality, energy use, and traffic associated with the mining and processing of nickel ore to produce an equivalent quantity of nickel would be averted;

- Valuable, and expensive, low-level radioactive waste burial space for material that is actually classified as radioactive waste would be preserved;

Table A.1. Costs and benefits of the proposed action and alternatives

	Alternative 1 Proposed Action	Alternative 2 Reprocessing for Unrestricted Release	Alternative 3 Improved Storage	Alternative 4 Direct Disposal	Alternative 5 No Action
Collective dose (person-mrem)	1.5	10	0[a]	Not estimated	0[a]
Monetary equivalent of collective dose[b]	($15)	($100)	0[a]	No monetary equivalent available[c]	0[a]
Benefit/(cost) of alternative (1995 dollars)	$7.9 M[d]	$7.9 M	($188,412) one time expenditure ($4,860) annual expenditure	($1.708 M)[e] one time expenditure	($6,110) annual expenditure
Resultant monetary equivalent savings/(expenditures)	$7.9 M minus $15	$7.9 M minus $100	($188,412 + $4,860/year for as long as the nickel remains in storage)	($1.708 M)	($6,110/year for as long as the nickel remains in storage)

[a] No plausible exposure pathways exist for this alternative. Inhalation or ingestion of contaminants would not occur and external exposure is effectively zero (see Sect. 4.1.7).

[b] The monetary equivalent of collective dose equivalent is calculated using the value of $10,000 per person-rem. This value allows comparison between the "cost" of the radiation exposure and other costs and benefits.

[c] No estimate of collective dose is available. See Sect. 4.4.2 of text for explanation.

[d] This is the value of the nickel after decontamination cost ($43 M) has been considered. This value does not include DOE's cost of transporting ($180,000) and disposing ($204,000) of residual waste. The $43 million includes SEG's cost of loading/unloading and transport of the nickel ingots. The price of nickel has fluctuated over the last several years between $2.50 and $4.25/lb. Because the nickel is not virgin metal, its reprocessed value is discounted from the market price. Based on an inventory of 9,350 short tons and a discounted price of $2.72/lb from the market price of $4.18/lb (the value in September 1995), the gross value of the nickel is $50.9 million. For this analysis, the discount is assumed to be 35%; however, the actual discount will be negotiated in finalizing the sales contract with the vendor.

[e] This is the cost of transporting and disposing of the ingots in a licensed disposal facility.

- Compliance with the DOE waste minimization and pollution prevention policy would be achieved; and

- Nickel, a valuable resource, would be preserved.

DISCUSSION AND CONCLUSIONS

Optimization means determining the alternative which has the minimum total cost. This infers maximizing the benefit. The total cost, in such studies, includes the monetary equivalent for collective dose and any other considerations to the extent they can be quantified in terms of a cost equivalent. The relative insignificance of the collective dose for the alternatives considered in this environmental assessment eliminates health as a significant factor in deciding on a course of action. Clearly the proposed decontamination and recycle options are preferred from ALARA considerations, not only on the basis of cost considerations, but also in consideration of the other "additional benefits" listed above. In this case, both the individual and collective doses to the public and to workers are too small to be a consideration for selecting any of the options.

APPENDIX B

STORM WATER DISCHARGE PARAMETERS

Appendix B

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
Rule 1200-4-10.04

Parameter Reporting Levels for Storm Water Discharges

Effluent Parameters	Report (1) Levels (mg/L)	Minimum Measurements Frequency	Sample Type
Biochemical Oxygen Demand (5-Day)	50	Annually	Composite
Chemical Oxygen Demand	100	Annually	Composite
Total Suspended Solids	200	Annually	Composite
Ammonia as Nitrogen	4	Annually	Composite
Oil and Grease	15	Annually	Grab
pH Range (2)	4.0 to 9.0	Annually	Grab
Floating Material, Color Foam, Oil Sheen	—	Annually	Visual Observation
Priority Pollutant (3)	(4)	Annually	(5)

Footnotes:

(1) Pollutant levels exceeding a report level shall be reported to the Tennessee Division of Water Pollution Control within 30 days after the discharger becomes aware of the results. The discharger shall provide the Division with an explanation of the pollutant's origin. Monitoring results shall be submitted on the storm water monitoring report form.

(2) pH values outside the range of 4.0 to 9.0 standard units shall be considered to exceed the report level and shall be reported as such.

(3) Priority pollutants, for the purpose of this rule, means a toxic pollutant identified in Tables II and III of 40 *CFR* Part 122, Appendix D (1990). Priority pollutants need only be analyzed if they are identified in Part (7)(b)2.

(4) Report levels are the criterion maximum concentrations (CMC) for fish and aquatic life established in Tennessee Department of Environment and Conservation, Rule 1200-4-3. Where no CMC is established, the report levels are 0.100 mg/L for volatiles, acid extractables, and base neutrals; 0.010 mg/L for pesticides, polychlorinated biphenyls, and 2,3,7,8-TCDD dioxin; or 1.0 mg/L for any other parameters. For metals, CMC shall be figured based on a hardness of 100 mg/L as $CaCO_3$.

(5) Cyanide and the volatile fraction of the total toxic organic compounds shall be sampled by grab sample. All other priority pollutants shall be sampled by composite sample.

APPENDIX C

KENTUCKY HERITAGE COUNCIL
NO EFFECT DETERMINATION

Education and Humanities Cabinet

KENTUCKY HERITAGE COUNCIL
The State Historic Preservation Office

Brereton C. Jones
Governor
Sherry K. Jelsma
Cabinet Secretary

David L. Morgan
Executive Director
and SHPO

September 29, 1993

Mr. Calvin R. Wenzel
Science Applications International Corporation
800 Oak Ridge Turnpike
P.O. Box 2502
Oak Ridge, Tennessee 37831

Re: Proposed Sale of Nickel Ingots, Paducah, McCracken County, Kentucky

Dear Mr. Wenzel:

Thank you for your letter concerning the above referenced project. Our review of this project indicates that an archaeological survey will not be required. The proposed project will have no effect on any property listed in or eligible for listing in the National Register of Historic Places. Therefore, I have no objections.

If you have any questions concerning this project please feel free to contact David Pollack of my staff at 502-564-7005.

Sincerely,

David L. Morgan, Director
Kentucky Heritage Council and
State Historic Preservation Officer

DLM-DP

300 Washington Street
Frankfort, Kentucky 40601

Telephone (502) 564-7005
FAX (502) 564-5820

APPENDIX D

U.S. FISH AND WILDLIFE SERVICE CORRESPONDENCE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, Tennessee 38501

September 30, 1993

Ms. Nancy K. Hendrix-Ward
NEPA Program Manager
Department of Energy
P.O. Box 2001
Oak Ridge, Tennessee 37381

Dear Ms. Hendrix-Ward:

The Fish and Wildlife Service has reviewed your letter of September 27, 1993, regarding the C-746-H4 area of the Paducah Gaseous Diffusion Plant (PGDP), McCracken County, Kentucky. Our records do not indicate the presence of federally listed or proposed listed endangered or threatened species within the PGDP property impact area. Therefore, we do not anticipate any adverse effects from the loading and removal of the nickel ingots.

Because the project also entails transportation of about 8,500 rather large (2,200 lbs.) nickel ingots, we recommend that the Department of Energy have an appropriate contingency plan prepared in case of a transportation accident. Also, this office should be notified should such an accident occur during the course of this project.

We appreciate the opportunity to provide comments. Please notify this office (and provide a copy of the Environmental Assessment) when the project is completed. If you have any questions, please contact Allen Robison of my staff at 615/528-6481.

Sincerely,

Jodi Jenkins

Jodi Jenkins
Acting Field Supervisor

018895

APPENDIX E

RESULTS OF ANALYSES ON 30 SAMPLES OF NICKEL

Appendix E

Summary of Nickel Analyses

A copy of the original radiochemical analysis of samples is provided in this appendix. The cover letter from J.L. Williams to W. Stagg indicates that the analyses were performed on "button" samples. When the nickel was dismantled from the uranium enrichment cascades, the nickel was cut into pieces and later melted in a furnace at the Paducah Gaseous Diffusion Plant. Each heat or batch of nickel melted was cast into two ingots. Small samples of the molten metal from each heat were also cast; these are called buttons.

The average contaminant level of ^{99}Tc, the primary contaminant present, is 0.85 ppm (535 Bq/g) and the standard deviation is 0.83. The maximum level of ^{99}Tc detected is 4.21 ppm (2650 Bq/g), however, 95 percent of the samples were $\leq$2.13 ppm (1341 Bq/g).

MARTIN MARIETTA

ΊΤΙΝ MARIETTA ENERGY SYSTEMS, INC.

POST OFFICE BOX 1410
PADUCAH KENTUCKY 42001

October 17, 1986

Mr. William Stagg
Babcock and Wilcox
Lynchburg Research Center
P.O. Box 11165
Lynchburg, Virginia 24506-1165

Dear Mr. Stagg:

As requested in our telephone conversation on October 15, 1986, I have enclosed a copy of the analysis report of buttons representing thirty (30) nickel ingots. These ingots are currently in storage at the Paducah Gaseous Diffusion Plant. Please note that the analyses were performed on button samples and not on the ingots themselves.

The letters shown in the first column indicates the origin of the metal (G = Goodyear Atomic; P = Paducah; and OR = Oak Ridge).

If I can be of further assistance, please call (502) 444-6311, Ext. 319.

Sincerely,

J. L. Williams
Material Terminal Management
Paducah Gaseous Diffusion Plant

JLW:bsc

Enclosure

cc/enc: R. C. Baker
M. R. Jugan - DOE
A. N. Sevi
File - NoRC

.ADIOCHEMICAL ANALYSIS REPOR

SAMPLE ORIGINATOR SMELTER – K ADAMS

NI BUTTONS 6-24-85

	Button #	237 NP PPB	239 PU PPB	99 TC PPM		PI	TOTAL U PPM	% of U 235U
F	110-111	<0.5	<0.005	0.69			1.2	1.15
F	127	<0.5	<0.005	0.56			1.9	1.05
F	131	<0.5	<0.005	0.75			1.4	0.95
F	203	<0.5	<0.005	0.73			1.3	1.36
F	208-209	<0.5	<0.005	0.82			1.5	1.20
F	212-213	<0.5	<0.005	0.72			0.6	1.22
F	254	<0.5	<0.005	0.79			1.3	1.27
F	286	<0.5	<0.005	0.91			2.3	1.28
F	292	<0.5	<0.005	0.96			0.3	1.15
F	295	<0.5	<0.005	1.07			0.6	1.15
D	750	<0.5	<0.005	0.53			2.8	0.61
D	885	0.6	.005	0.69			12.6	0.60
	1234	0.8	<0.005	0.41			2.4	0.67
D	1424	<0.5	<0.005	1.30			3.2	0.67
D	1680	<0.9	<0.005	1.88			2.4	0.57
D	1889	0.6	<0.005	1.05			0.9	0.68
P	2268	<0.5	<0.005	2.13			1.4	0.64
D	2503	1.2#	<0.005	2.00			1.6	0.67
D	2695	<0.5	<0.005	0.98			1.5	0.66
D	3128	0.9	<0.005	4.21			3.3	0.86
R	886	<0.5	<0.005	0.22			0.7	1.06
R	1148	<0.5	<0.005	0.26			1.2	0.75
R	1711	<0.5	<0.005	0.19			0.6	0.84
R	1891	<0.5	<0.005	0.26			0.9	0.72
R	2144	<0.5	<0.005	0.24			0.2	1.01
R	2164	<0.5	<0.005	0.51			1.0	0.95
R	2574	<0.5	<0.005	0.19			1.1	0.90
	2821	<0.5	<0.005	0.19			1.3	1.04
R	3025	<0.5	<0.005	0.16			0.2	1.12
R	3488	<0.5	<0.005	0.12			0.6	0.98

APPENDIX F

DEPARTMENT OF STATE NOTIFICATION OF SALE OF NICKEL

PRIORITY

UNCLASSIFIED

OUTGOING

Department of State

PAGE 01 OF 02 STATE 047867 250153Z 003531 SS41411
INFO. PMSC(01) NIS(01) PMNE(01) NEC(01) NEP(01) EXP(02)
-------------------------- 25/0425Z A2 NIKE (TOTAL COPIES: 007)

ORIGIN PM-00

INFO LOG-00 ACDA-17 AID-00 AMAD-01 CEA-01 CEQ-01 CIAE-00
CIP-00 COME-00 CTME-00 C-01 OASY-00 DINT-01 DODE-00
DOEE-00 ITCE-00 EB-00 EXME-00 EUR-00 E-01 FRB-01
HA-09 H-01 TEDE-00 INR-00 ITC-01 L-03 ADS-00
NRC-01 NSAE-00 NSCE-00 OES-09 OMB-01 OPIC-01 PRS-01
SNP-00 SP-00 SS-00 STR-01 TRSE-00 TEST-00 T-00
USIE-00 EPAE-00 /058R

DRAFTED BY: PM/NE:RSENSENEY:RSK
APPROVED BY: EUR/RPE:SEDONNELLY
EUR/WE:SMCGINNESS PM/NE:KORLANDO...
PM/NE:CHEWSTEAD L/PM/N:KTIGHSMITE
NRC/OIP:RHAUBER/EHEMBY DOE/AN:RGOOREVICH
EUR/RPE:NTOWKSWICK DOE/EM:JLILLY
--------------------231226 250166Z /38

P 250152Z FEB 94
FM SECSTATE WASHDC
TO AMEMBASSY MADRID PRIORITY
INFO AMEMBASSY BRUSSELS PRIORITY

UNCLAS STATE 047867

BRUSSELS FOR USEC

E.O. 12356: N/A
TAGS: ENRG, ETRD, ETTC, KSCA, SP, US
SUBJECT: POSSIBLE TRANSFER TO SPAIN OF SLIGHTLY

CONTAMINATED NICKEL METAL

1. THIS IS AN ACTION MESSAGE. EMBASSY IS REQUESTED TO ADVISE THE GOS OF THE POSSIBLE TRANSFER FROM THE U.S. TO SPAIN OF NICKEL WHICH CONTAINS TRACE QUANTITIES OF RADIOACTIVE MATERIALS. THE EMBASSY IS ALSO REQUESTED TO DETERMINE, IF POSSIBLE, WHETHER THIS MATERIAL WILL MEET SPANISH AND/OR EUROPEAN COMMUNITY ACCEPTANCE CRITERIA FOR IMPORT FOR RE-USE IN COMMERCIAL APPLICATIONS. THE U.S. DEPARTMENT OF ENERGY (DOE) CURRENTLY POSSESSES THE NICKEL AND HAS NOT, AS YET, DECIDED TO RELEASE IT FOR EXPORT. RESPONSE SHOULD BE DIRECTED TO THE DEPARTMENT, ATTN: PM/NE: R. SENSENEY, TO THE NUCLEAR REGULATORY COMMISSION, ATTN: OIP, E. HEMBY, AND DEPARTMENT OF ENERGY, ATTN: AN-40: R. GOOREVICH.

2. THE PROPOSED EXPORT INVOLVES 10,000 TONS OF NICKEL THAT WAS CONTAMINATED WHEN USED AS DIFFUSION BARRIERS IN U.S. DOE GASEOUS DIFFUSION ENRICHMENT PLANTS. SCIENTIFIC ECOLOGY GROUP, INC. (SEG) IS A U.S. COMPANY WORKING WITH DOE TO DEMONSTRATE THAT A SIGNIFICANT PORTION OF THE

RADIOACTIVE CONTAMINANTS CAN BE REMOVED FROM THE NICKEL. AFTER FURTHER PROCESSING, ACCORDING TO SEG, THE REMAINING CONTAMINANTS WILL BE PRIMARILY TECHNETIUM-99 WITH TRACE AMOUNTS OF LOW ENRICHED URANIUM, NEPTUNIUM-237, AND PLUTONIUM-238. SEG HAS PROPOSED THAT THE NICKEL WILL THEN BE EXPORTED TO SPAIN FOR FABRICATION INTO STAINLESS STEEL COMPONENTS BY THE ACERINOX STEEL COMPANY.

3. THE EXPORT OF CONTAMINATED NICKEL SCRAP METAL IS

CONTROLLED BY THE U.S. NUCLEAR REGULATORY COMMISSION (NRC) TO THE EXTENT THAT THE NICKEL CONTAINS RADIOACTIVE CONTAMINANTS. HOWEVER, THE NRC REQUIRES NO SPECIFIC LICENSE FOR THE EXPORT OF THESE SMALL AMOUNTS OF RADIOACTIVE MATERIAL. THE EXPORT OF THE NICKEL WOULD NOT BE COVERED BY THE ZANGGER TRIGGER LIST, THE NSG DUAL-USE

STATE 047867 250153Z 003531 SS41411

LIST, THE IAEA LIST, OR THE COMMERCE CONTROL LIST.

4. GIVEN CURRENT POLITICAL AND SOCIAL SENSITIVITY TO THE HANDLING OF RADIOACTIVE CONTAMINATED MATERIAL, IT IS POSSIBLE THAT THE PROPOSED TRANSFER COULD RAISE CONCERNS. GIVEN THAT NO SPECIFIC EXPORT LICENSE IS REQUIRED FOR THE EXPORT OF THIS MATERIAL FROM THE U.S., IT IS POSSIBLE THAT NO SPECIFIC IMPORT LICENSE IS REQUIRED IN OTHER COUNTRIES, SUCH AS SPAIN. THE POSSIBILITY, THEREFORE, EXISTS THAT THE GOS MAY BE UNAWARE OF THE IMPORT UNTIL WELL AFTER THE TRANSFER HAS TAKEN PLACE. THE NRC, AS A COURTESY TO ITS REGULATORY COUNTERPART IN SPAIN, IS SENDING THE MESSAGE CONTAINED IN PARA 5, BELOW, THE SPANISH NUCLEAR SAFETY COUNCIL (CSN). THIS WILL ENSURE THAT THE REGULATORY AND SAFETY ARM OF THE GOS IS AWARE OF THE POSSIBILITY OF THIS TRANSFER.

5. BEGIN TEXT OF NRC MESSAGE TO CSN:

MR. JAVIER REIG, ADMINISTRATOR AND
HEAD OF THE SYSTEMS LICENSING DIVISION
CONSEJO DE SEGURIDAD NUCLEAR
JUSTO DORADO, 11
MADRID, SPAIN
FAX: 34-1-346-05-88

SUBJECT: POSSIBLE EXPORT TO SPAIN OF SLIGHTLY CONTAMINATED NICKEL.

A U.S. COMPANY, SCIENTIFIC ECOLOGY GROUP, INC. (SEG)' HAS BEEN INVOLVED FOR SEVERAL YEARS IN SALVAGING CONTAMINATED SCRAP METALS FROM GASEOUS DIFFUSION ENRICHMENT PLANTS OWNED BY THE DEPARTMENT OF ENERGY (DOE). OF IMMEDIATE

INTEREST IS SOME 10,000 TONS OF SLIGHTLY CONTAMINATED, HIGH PURITY NICKEL. IN A CURRENT PROJECT, SEG HAS BEEN WORKING WITH DOE TO DEMONSTRATE THAT, BY FURTHER PROCESSING THE NICKEL TO REDUCE THE RESIDUAL CONTAMINATION, THE NICKEL COULD BE SOLD FOR RE-USE IN THE SECONDARY METALS INDUSTRY. THEIR OBJECTIVE IS TO REDUCE CONCENTRATIONS OF RESIDUAL RADIOACTIVITY TO A TOTAL OF 0.3 TO 12 BQ/GRAM. THE PRINCIPAL ISOTOPE PRESENT WOULD BE TECHNETIUM-99, WITH TRACE OR UNDETECTABLE QUANTITIES OF LOW-ENRICHED URANIUM, PLUTONIUM-239, AND NEPTUNIUM-237.

SEG HAS ASKED THE NRC TO ADVISE THEM ON THE EXPORT REQUIREMENTS FOR SENDING THE SLIGHTLY CONTAMINATED NICKEL TO SPAIN. THEY HAVE DESCRIBED POSSIBLE SHIPMENTS OF 200 TONS OF NICKEL PER MONTH, OR 2,400 TONS PER YEAR' OVER A 48-MONTH PERIOD, TO THE ACERINOX STEEL COMPANY IN SPAIN FOR RECYCLING INTO STAINLESS STEEL ALLOYS. ACCORDING TO SEG, THE ACERINOX STEEL COMPANY WOULD MELT THE NICKEL WITH SCRAP STEEL AND OTHER NICKEL, RESULTING IN A 100-TIMES DILUTION OF THE CONCENTRATIONS OF RESIDUAL RADIOACTIVITY.

NRC'S CURRENT REGULATIONS ALLOW EXPORTS OF CONTAMINATED

METALS FOR RE-USE IN COMMERCIAL APPLICATIONS, BUT SUCH TRANSACTIONS, OF COURSE, ARE ALSO SUBJECT TO ACCEPTANCE AND CONTROL BY THE IMPORTING COUNTRY. IN THIS REGARD, THE AMERICAN EMBASSY IN MADRID WILL CONSULT WITH THE SPANISH GOVERNMENT PRIOR TO ANY EXPORTS OF CONTAMINATED NICKEL TO SPAIN TO CONFIRM THAT THE MATERIAL WILL MEET SPANISH AND/OR EUROPEAN COMMUNITY ACCEPTANCE CRITERIA. SEG ALSO HAS BEEN INSTRUCTED TO ADVISE US A FEW WEEKS PRIOR TO EACH PLANNED SHIPMENT SO WE MAY KEEP YOU INFORMED.

WE DO NOT KNOW, WITH CERTAINTY, THAT SEG AND DOE WILL DECIDE TO EXPORT ANY NICKEL TO SPAIN, OR WHEN THE FIRST

Department of State

EXPORT MIGHT BE PLANNED. IN ANY EVENT HOWEVER, WE WOULD BE PLEASED TO RECEIVE YOUR COMMENTS ON THE ACCEPTABILITY OF THE NICKEL FOR RE-USE IN SPAIN, AS DESCRIBED ABOVE, OR ANY OTHER POINTS YOU WOULD LIKE TO MAKE.

SINCERELY,

DONALD HAUBER, ASSITANT DIRECTOR
EXPORTS, SECURITY, AND SAFETY COOPERATION
OFFICE OF INTERNATIONAL PROGRAMS
U S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555
FAX: 301-504-2395

END TEXT OF NRC LETTER. CHRISTOPHER