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FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix E
Evaluation of Human Health Effects of Overland Transportation

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Appendix E
Evaluation of Human Health Effects of Overland Transportation

E.1 Introduction

The overland transportation of any commodity involves a risk to both transportation crew members and members of the public. This risk results directly from transportation-related accidents and indirectly from the increased levels of pollution from vehicle emissions, regardless of the cargo. The transportation of certain materials, such as hazardous or radioactive waste, can pose an additional risk due to the unique nature of the material itself. In order to permit a complete appraisal of the environmental impacts of the proposed action and alternatives, the human health risks associated with the overland transportation of foreign research reactor spent nuclear fuel have been assessed.

This appendix provides an overview of the approach used to assess the human health risks that may result from the overland transportation of foreign research reactor spent nuclear fuel. The appendix includes discussion of the scope of the assessment, analytical methods used for the risk assessment (i.e., computer models), important assessment assumptions, determination of potential transportation routes, and presents the results of the assessment. In addition, to aid in the understanding and interpretation of the results, specific areas of uncertainty are described, with an emphasis on how the uncertainties may affect comparisons of the alternatives.

The approach used in this appendix is modeled after that used in the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Final Environmental Impact Statement (SNF&INEL Final EIS) (DOE, 1995). The SNF&INEL Final EIS did not perform as detailed an analysis on the specific actions taken for foreign research reactor spent nuclear fuel because of the breadth necessary to analyze the entire spent fuel management program. However, the fundamental assumptions used in this analysis are consistent with those used in the SNF&INEL Final EIS (DOE, 1995), and the same computer codes and generic release and accident data are used.

The risk assessment results are presented in this appendix in terms of "per-shipment" risk factors, as well as for the total risks associated with each alternative. Per-shipment risk factors provide an estimate of the risk from a single spent nuclear fuel shipment between a specific origin and destination. They are calculated for all possible origin and destination pairs for each spent nuclear fuel type. The total risks for a given alternative are found by multiplying the expected number of

Proposed Action and Alternatives: The transportation risk assessment conducted for this EIS estimates the human health risks associated with the transportation of spent nuclear fuel for a number of management and implementation alternatives. The alternatives differ primarily in the number and location of possible ports of entry and Phase 1 management sites (storage sites that would be used until a repository was ready). The alternatives considered are described in detail in Chapter 2 of this EIS.

For transportation assessment purposes, each option is defined as an individual or pair of U.S. Department of Energy (DOE) sites used for initial management and an individual or pair of DOE sites used for final interim management. The transportation risk assessment determines risks by considering the total amount of spent nuclear fuel shipped over each representative route. The assessment takes into account differences in the physical and radiological properties of spent nuclear fuel types and characteristics of the potential routes to and between sites.

A large number of potentially applicable marine ports of entry and Canadian border crossings, including commercial and military ports on the Atlantic, Pacific, and Gulf of Mexico coasts are considered in this [illegible]

are representative points based on a qualitative judgment of previously used shipment routes (NRC, 1993). The alternatives in this EIS define the acceptance of the fuel, while the SNF&INEL Final EIS (DOE, 1995) alternative selected defines the DOE site or sites that would receive foreign research reactor independent of the radioactive nature of the cargo and would be incurred for similar shipments of any commodity. The nonradiological risks are assessed for both incident-free and accident conditions. Nonradiological risks during incident-free transportation conditions would be caused by potential exposure to increased vehicle exhaust emissions. The nonradiological accident risk refers to the potential occurrence of transportation accidents that directly result in fatalities unrelated to the shipment cargo. State-specific transportation fatality rates are used in the assessment. Nonradiological risks are presented in terms of estimated fatalities.

Transportation Modes: All spent nuclear fuel shipments have been assumed to take place either by truck or rail transportation modes. Per-shipment risk factors are presented separately for truck and rail modes. For the alternatives, risks have been calculated separately for all truck and all rail options, although the actual transportation operation for a selected alternative may involve a combination of the two modes.

Barge transport has certain disadvantages. First, barge transport limits site and port selection for both the SNF&INEL Final EIS and this EIS to Savannah River Site (available both phases) and Hanford Site (available in Phase 2 only). These sites are only served by the ports of Savannah, GA and Portland, OR, respectively. Additionally, barge transportation would require additional intermodal transfers at the port and at the site. At the port, the cask would be removed from the ocean-going vessel and moved by truck to the barge terminal for loading onto a barge. When the barge arrives at the DOE site, the cask would have to be moved to a truck for transport across the site to the receiving basin. Other reasons for not using barge transportation include DOE's lack of extensive experience in shipping casks via barge, the lack of alternative routes, and low speeds. DOE, however, has performed a scoping analysis of barge transportation to assess its relative impacts.

Receptors: Transportation-related risks are calculated and presented separately for workers and members of the general public. The workers considered are truck and rail crew members involved in the actual overland transportation of spent nuclear fuel. The general public includes all persons who could be exposed to a shipment while it is moving or stopped en route. Potential risks are estimated for the collective populations of exposed people, as well as for the hypothetical maximally exposed individual (MEI). The collective population risk is a measure of the radiological risk posed to society as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing various alternatives.

Cumulative Impacts: The cumulative impacts of the transportation of foreign research reactor spent nuclear fuel are calculated and presented as a relative proportion of those described in the SNF&INEL Final EIS (DOE, 1995). The collective dose to the general population and workers is the measure used to quantify cumulative transportation impacts.

E.3 Spent Nuclear Fuel Packaging and Representative Shipment Configurations

Regulations that govern the transportation of radioactive materials are designed to protect the public from the potential loss or dispersal of radioactive materials as well as from routine radiation doses during transit. The primary regulatory approach to ensure safety is through the specification of standards for the packaging of radioactive materials. Because packaging represents the primary barrier between the radioactive material being transported and radiation exposure to the public and the environment, packaging requirements are an important consideration for the transportation risk assessment. Regulatory packaging requirements are discussed briefly below and in Chapter 5. In addition, the representative packaging and shipment configurations assumed for this EIS are described.

E.3.1 Packaging Overview

Although several Federal and State organizations are involved in the regulation of radioactive waste transportation, primary regulatory responsibility resides with the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission (NRC). All transportation activities must take place in accordance with the applicable regulations of these agencies specified in 49 Code of Federal Regulations (CFR) Part 173 and 10 CFR Part 71.

Transportation packaging for radioactive materials must be designed, constructed, and maintained to ensure that the packages will contain and shield their contents during normal transport conditions. For more highly radioactive material, such as spent nuclear fuel, they must contain and shield their contents in the event of severe accident conditions. The type of packaging used is determined by the total radioactive hazard presented by the material within the packaging. The basic types of packaging required by the applicable regulations are designated as Type A, Type B, or "strong and tight".

"Strong and tight" packages are designed such that no radioactive material will leak or be released during transportation. They can only be used for low-specific-activity material. Type A packaging must withstand the conditions of incident-free transportation without the loss or dispersal of the radioactive contents. Incident-free transportation refers to all conditions of transportation except those that result from accidents or sabotage. Approval of Type A packaging is achieved by demonstrating that the packaging can withstand specified test conditions which are intended to simulate incident-free transportation conditions. Type A packaging, typically a 55-gallon (gal) drum or standard waste box, is commonly used to transport wastes having low activities of radioactive material.

The transportation of spent nuclear fuel requires the use of Type B packaging. In addition to meeting the standards for Type A packaging, Type B packaging must provide a high degree of assurance that even in severe accidents the integrity of the package will be maintained with essentially no loss of the radioactive

Although additional restrictions apply to package surface radiation levels, these restrictions are not important for the transportation radiological risk assessment.

The NRC recently issued revised regulations, 10 CFR Part 71, governing the transportation of radioactive materials. These regulations become effective on April 1, 1996 (NRC, 1995). The revised regulations conform with those of the International Atomic Energy Agency and current legislative requirements. The revised regulations affecting "Type B" casks require that a spent nuclear fuel transportation cask with activity greater than one million curies (Ci) be designed and 290 psi, or immersion in 200 m (656 ft) of water, for a period of not less than one hour without collapse, buckling, or allowing water to leak into the cask.

E.3.2 Packaging and Representative Shipment Configurations for Foreign Research Reactor Spent Nuclear Fuel

To conduct the overland transportation risk assessment, assumptions must be made concerning the types of packaging, transport vehicles, and shipment capacities that could be used for future spent nuclear fuel shipments. In all cases, it is assumed that spent nuclear fuel would be characterized, treated, packaged, and labeled in accordance with applicable regulations prior to shipment.

The transportation of all foreign research reactor spent nuclear fuel would take place in casks certified by foreign competent authorities and revalidated by Department of Transportation in accordance with 49 CFR 173. In addition, it is assumed that only exclusive-use vehicles would be used. Highway transportation is assumed to take place by legal weight heavy-haul combination (tractor-trailer) trucks. Rail transportation is assumed to take place by regular freight train service.

E.3.3 Description of Transportation Activities

The proposed action could involve transporting foreign research reactor spent nuclear fuel from the ports of entry (both marine ports and Canadian border crossings) to DOE sites, and could involve transporting foreign research reactor spent nuclear fuel between DOE sites. The interim management site or sites for the foreign research reactor spent nuclear fuel in the United States have been determined on the basis of the SNF&INEL Final EIS (DOE, 1995).

In this section, the assumptions and logic used to model the transportation requirements for the basic implementation of Management Alternative 1 of the proposed action are described. In general, the same assumptions are used to analyze the management and implementation alternatives. Therefore, the transportation requirements for management and implementation alternatives will be described in relation to the basic implementation.

Certain assumptions are required in order to simply and consistently describe the manner in which foreign research reactor spent nuclear fuel would be transported to the sites. The shipments were divided into east coast and west coast shipments, depending on the country of origin. Spent nuclear fuel shipments from Europe, Africa, the Middle East and parts of South and Central America were designated as east coast shipments, and all others were designated as west coast shipments. Shipments from Canada were assumed to enter the United States from either an eastern or western point of entry, depending on the Canadian point of origin. Under these assumptions, the east coast would receive approximately 535 cask shipments and the west coast approximately 186 cask shipments. Approximately 116 shipments from Canada would arrive in the eastern United States.

Regarding foreign research reactor spent nuclear fuel transportation, the SNF&INEL Final EIS (DOE, 1995) analyzes the use of any one of five candidate sites and seven distinct combinations of sites. Eight of the alternatives involve sites that could not be ready to accept spent nuclear fuel at the onset of the foreign research reactor spent nuclear fuel program. Therefore, a two-phased approach is assumed using one or both of the sites that are ready to accept spent nuclear fuel (Savannah River Site and Idaho National Engineering Laboratory) as a near-term management location. Phase 1 is defined, for the purposes of analyzing transportation, as the period of time in which shipments of foreign research reactor spent nuclear fuel are transported to a near-term management site. For analytical purposes, Phase 1 is assumed to last from the beginning of 1996 to the beginning of 2006.

The amount of fuel that would arrive in Phase 1 versus Phase 2 cannot be precisely determined at this time. In order to proceed with the risk analysis, it is necessary to make assumptions based on the available information. The total number of casks that would be required to transport the 22,700 spent fuel elements is estimated to be 837, per Appendix B. The split between Phase 1 and Phase 2 depends on the rate at which casks are received and the time the Phase 2 site(s) is ready to receive fuel. For calculational purposes, the casks are assumed to arrive at a uniform rate, and the Phase 2 site(s) is assumed to be ready 10 years after the implementation of the policy.

The disposition of foreign research reactor spent nuclear fuel during Phase 1 is analyzed in this EIS. Logically, Phase 1 could entail any one of four options: A) splitting foreign research reactor spent nuclear fuel by fuel type [TRIGA (which stands for Training, Research, and Isotope reactors built by General Atomic) to Idaho National Engineering Laboratory and Aluminum-based to Savannah River Site], B) splitting the spent nuclear fuel geographically by port of entry, C) transporting all spent nuclear fuel to Idaho National Engineering Laboratory, or D) transporting all spent nuclear fuel to Savannah River Site. Not all Phase 1 strategies are consistent with all Phase 2 strategies.

Phase 2 begins when Oak Ridge Reservation, Hanford Site, or Nevada Test Site would be ready to receive fuel from ports and, when applicable, from a DOE site being used for near-term management. In all cases, Phase 2 is dependent on decisions based on the SNF&INEL Final EIS (DOE, 1995). During Phase 2, all foreign research reactor spent nuclear fuel arriving at ports of entry would be transported to the appropriate site. Additionally, intersite shipments from the near-term management site could also be arriving at the SNF&INEL Final EIS selected site(s).

The following is a description of the shipping program, organized by SNF&INEL Final EIS (DOE, 1995) alternatives:

No Action - DOE cannot accept foreign research reactor spent nuclear fuel under this alternative.

Decentralization - Foreign research reactor spent nuclear fuel arriving on the east coast would be transported to Savannah River Site, and foreign research reactor spent nuclear fuel arriving on the west coast would be transported to Idaho National Engineering Laboratory. Since both Idaho National Engineering Laboratory and Savannah River Site are capable of receiving fuel in late 1995, there is no need for a two-phase program or intersite shipments. The total number of shipments for this alternative would be approximately 837. Savannah River Site would receive 651 casks from the east, and Idaho National Engineering Laboratory would receive 186 casks from the west. The transportation under this alternative is illustrated in Figure E-1. No intersite shipment would be anticipated under this single-phased alternative.

Figure E-1 Decentralization: Spent Nuclear Fuel to Idaho National Engineering Laboratory and Savannah River Site

1992-1993 Planning Basis - The SNF&INEL Final EIS (DOE, 1995) provides no specific guidance for foreign research reactor spent nuclear fuel. The transportation analysis in the SNF&INEL Final EIS assumed that half the foreign research reactor spent nuclear fuel would be transported to Idaho National Engineering Laboratory and half to Savannah River Site. The disposition of foreign research reactor spent nuclear fuel could correspond to Decentralization (described above), Regionalization (described below), Centralization to Idaho National Engineering Laboratory or Savannah River Site (described below), or an arbitrary split as described in the SNF&INEL Final EIS (DOE, 1995).

Regionalization - There are two distinct subalternatives under Regionalization: Regionalization by Fuel

Figure E-2 1992/1993 Regionalization by Fuel Type: TRIGA Spent Nuclear Fuel to Idaho National Engineering Laboratory and MTR Spent Nuclear Fuel to Savannah River Site

Engineering Laboratory, the transportation would be the same as that described in the Decentralization Alternative and Figure E-2. No intersite shipment would be anticipated under this single-phased alternative.

A two-phased program would be required if a site other than Idaho National Engineering Laboratory or Savannah River Site were selected as a regional site under this programmatic alternative. The remaining possible site pairs for Regionalization are Idaho National Engineering Laboratory/Oak Ridge Reservation, Nevada Test Site/Savannah River Site, Nevada Test Site/Oak Ridge Reservation, Hanford Site/Savannah River Site, and Hanford Site/Oak Ridge Reservation. Splitting fuel by both geography and fuel type was considered as a logical Phase 1 approach for each site pair, but transporting all fuel to Savannah River Site or Idaho National Engineering Laboratory for near-term management was not considered for the following reasons:

- If Idaho National Engineering Laboratory were selected as the Western Regional Site, and Savannah River Site were not selected as the Eastern Regional Site, it would not be reasonable to ship all foreign research reactor spent nuclear fuel to Savannah River Site during Phase 1. Since Idaho National Engineering Laboratory is currently capable of receiving fuel and is much closer to west coast ports, it would be unreasonable to ship all fuel across the country to Savannah River Site only to move the fuel again. However, the option to ship all MTR fuel to Savannah River Site, for onsite logistical reasons, is a logical Phase 1 option even if Savannah River Site is not an ultimate interim management location. Thus, shipment of all fuel to SRS during Phase 1 was not considered reasonable if Idaho National Engineering Laboratory were to be chosen as the Western Regional Site.

- Conversely, if Savannah River Site were selected as the Eastern Regional Site, and Idaho National Engineering Laboratory were not selected as the Western Regional Site, it would not be reasonable to ship all foreign research reactor spent nuclear fuel to Idaho National Engineering Laboratory during Phase 1. Since Savannah River Site is currently capable of receiving fuel and is much closer to east coast ports, it would be unreasonable to ship all fuel across the country to Idaho National Engineering Laboratory only to move the fuel again. However, the option to ship all TRIGA fuel to Idaho National Engineering Laboratory, for onsite logistical reasons, is a logical Phase 1 option, even if Idaho National Engineering Laboratory is not an ultimate interim management location. Thus, shipment of all fuel to Idaho Engineering National Laboratory during Phase 1 was not considered reasonable if Savannah River Site were to be chosen as the Eastern Regional Site.

Figures E-3 through E-7 show the transportation schemes for site pairs Idaho National Engineering Laboratory/Oak Ridge Reservation, Nevada Test Site/Savannah River Site, Nevada Test Site/Oak Ridge Reservation, Hanford Site/Savannah River Site, and Hanford Site/Oak Ridge Reservation, respectively. The origins of the arrows representing shipments on the figures are selected for illustrative purposes, not to show specifically selected ports. Shipments would be expected to arrive at eastern, western, and Gulf Coast ports, and from eastern and western Canada. Because of their relative proximity to eastern sites

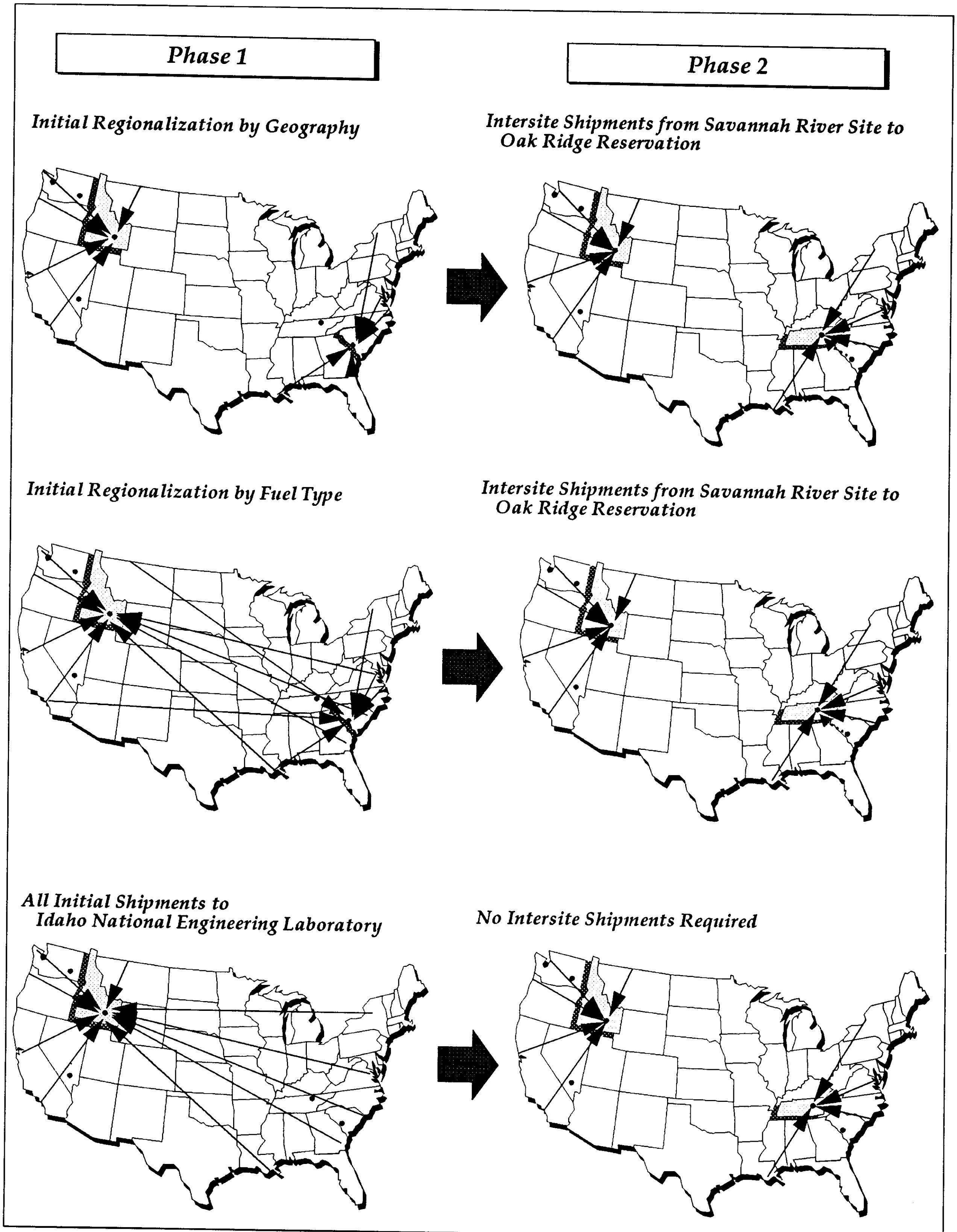
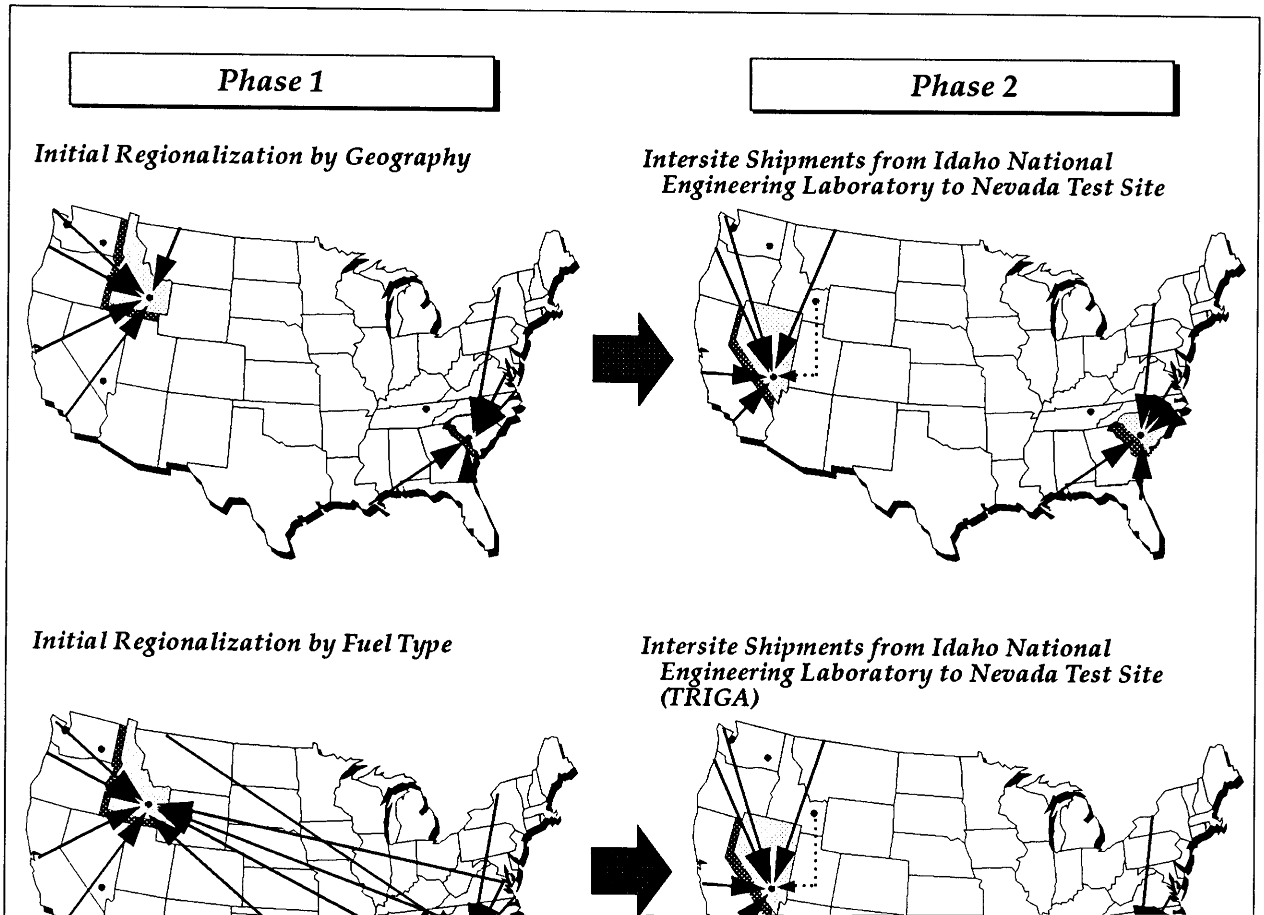
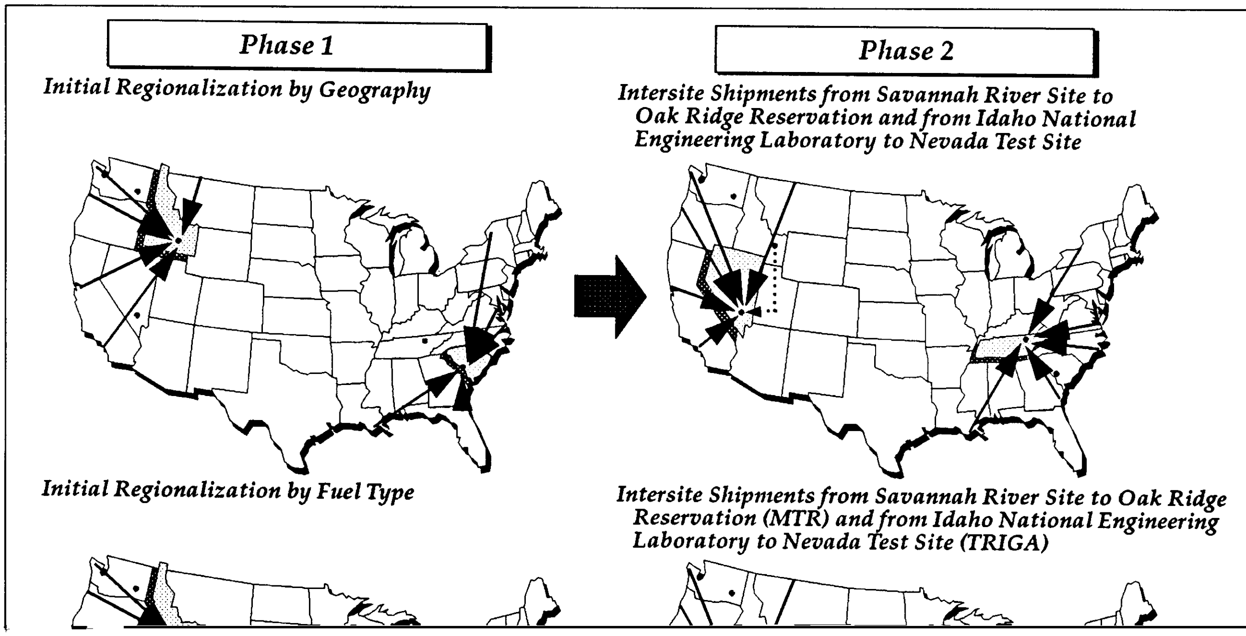
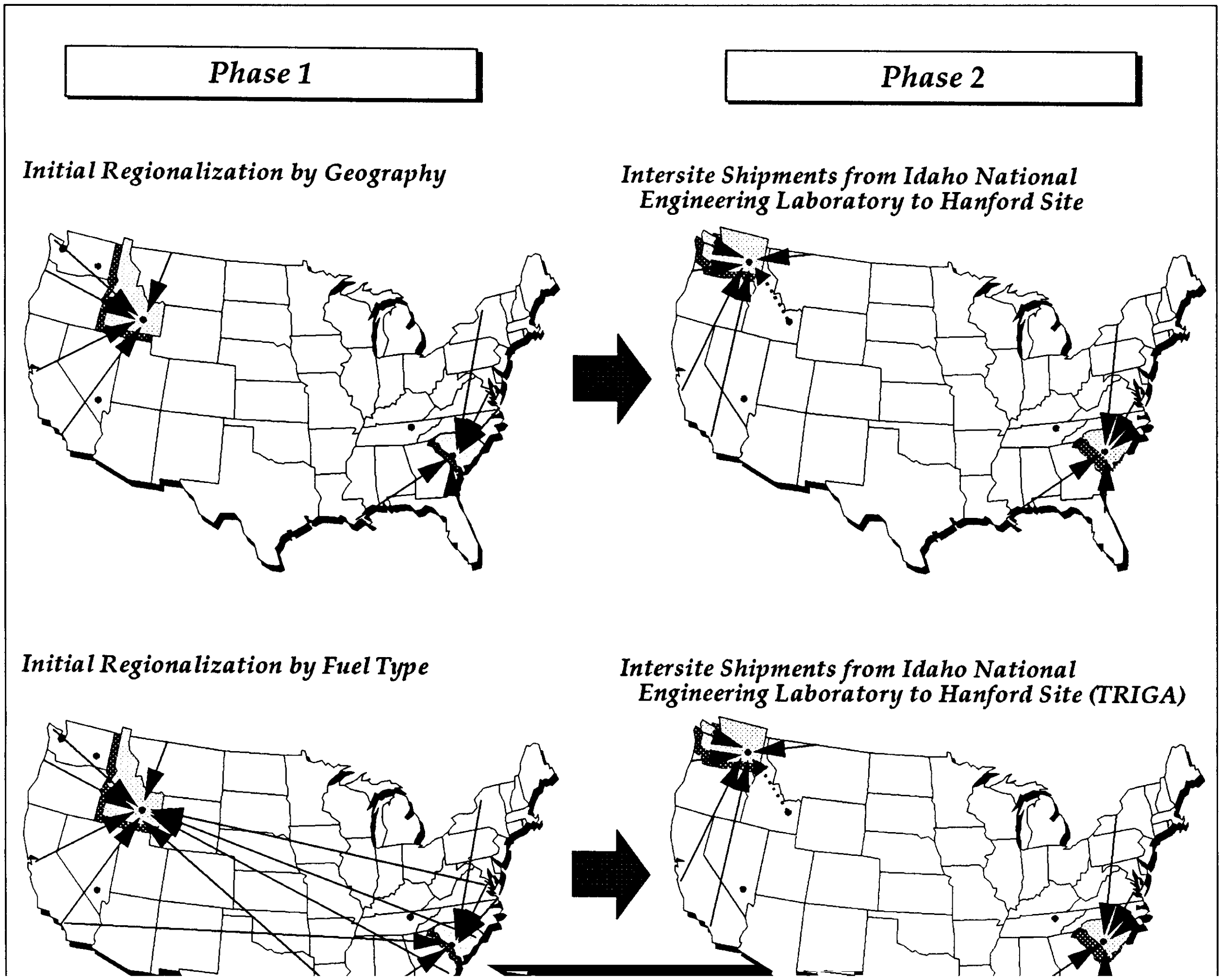


Figure E-3 Regionalization by Geography to Idaho National Engineering Laboratory and Oak Ridge Reservation


Phase 1
Phase 2
Initial Regionalization by Geography
Intersite Shipments from Idaho National Engineering Laboratory to Nevada Test Site
Initial Regionalization by Fuel Type
Intersite Shipments from Idaho National Engineering Laboratory to Nevada Test Site (TRIGA)


Phase 1
Initial Regionalization by Geography
Phase 2
Intersite Shipments from Savannah River Site to Oak Ridge Reservation and from Idaho National Engineering Laboratory to Nevada Test Site
Initial Regionalization by Fuel Type
Intersite Shipments from Savannah River Site to Oak Ridge Reservation (MTR) and from Idaho National Engineering Laboratory to Nevada Test Site (TRIGA)


Phase 1
Phase 2
Initial Regionalization by Geography
Intersite Shipments from Idaho National Engineering Laboratory to Hanford Site
Initial Regionalization by Fuel Type
Intersite Shipments from Idaho National Engineering Laboratory to Hanford Site (TRIGA)

Phase 1

Phase 2

Initial Regionalization by Geography

[illegible]

Table E-1 Shipment Summary for Regionalization Alternatives

Spent Nuclear Fuel Site Option	*Phase 1 Approach*	*Phase 1 Port-to-Site Shipments*	*Site-to-Site Shipments*[a]	*Phase 2 or Port-to-Final Site Shipments*	*Total Number of Shipments*
INEL/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51	East to ORR: 150 West to INEL: 43	963/888
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52	East to ORR: 150 West to INEL: 43	967/889
	All to INEL	644	None	East to ORR: 150 West to INEL: 43	837
NTS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to NTS: 36/15	East to SRS: 150 West to NTS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to NTS: 31/13	East to SRS: 150 West to NTS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to NTS: 43	837
NTS/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51 INEL to NTS: 36/15	East to ORR: 150 West to NTS: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52 INEL to NTS: 31/13	East to ORR: 150 West to NTS: 43	998/902
	All to SRS	644	SRS to ORR: 161/65	East to ORR: 150 West to NTS: 43	998/902
	All to INEL	644	INEL to NTS: 161/65	East to ORR: 150 West to NTS: 43	998/902
HS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to HS: 36/15	East to SRS: 150 West to HS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to HS: 31/13	East to SRS: 150 West to HS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to HS: 43	837
HS/ORR	Geographic	East to SRS: 501	SRS to ORR: 126/51	[illegible]	[illegible]

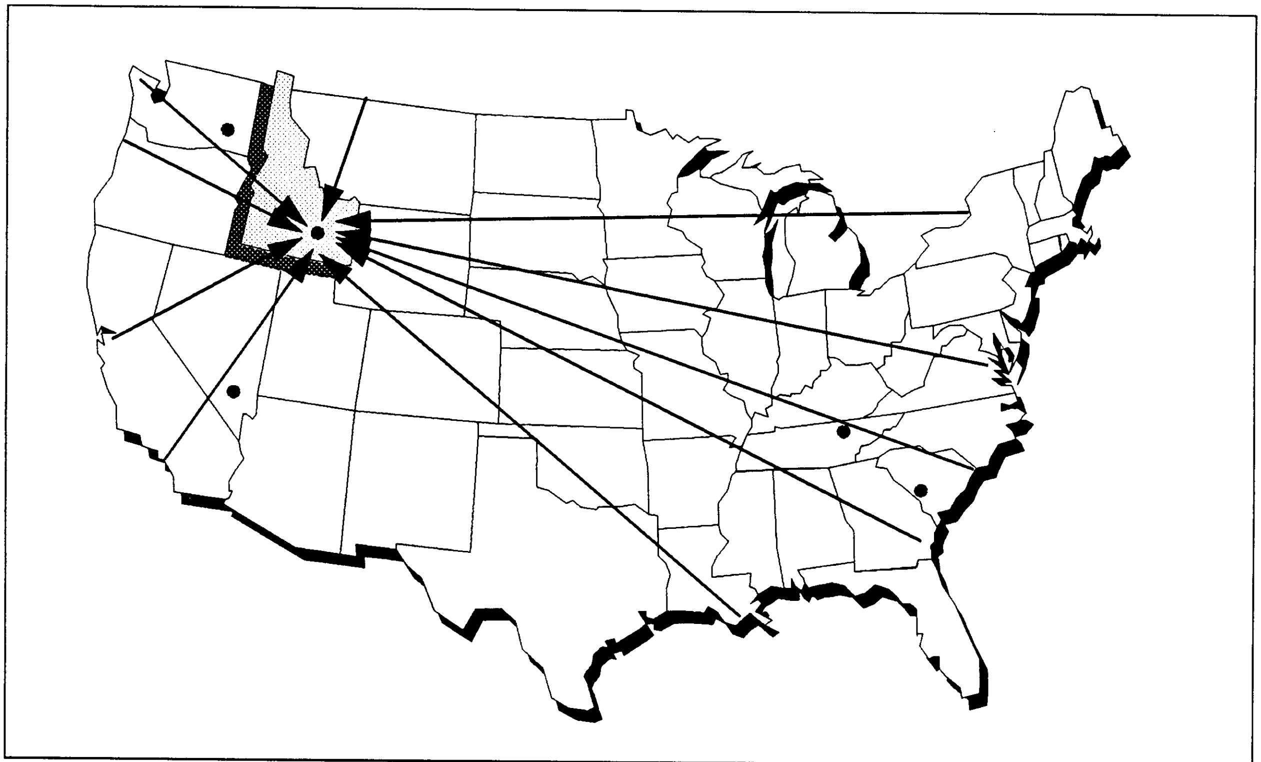


Figure E-8 Centralization to Idaho National Engineering Laboratory

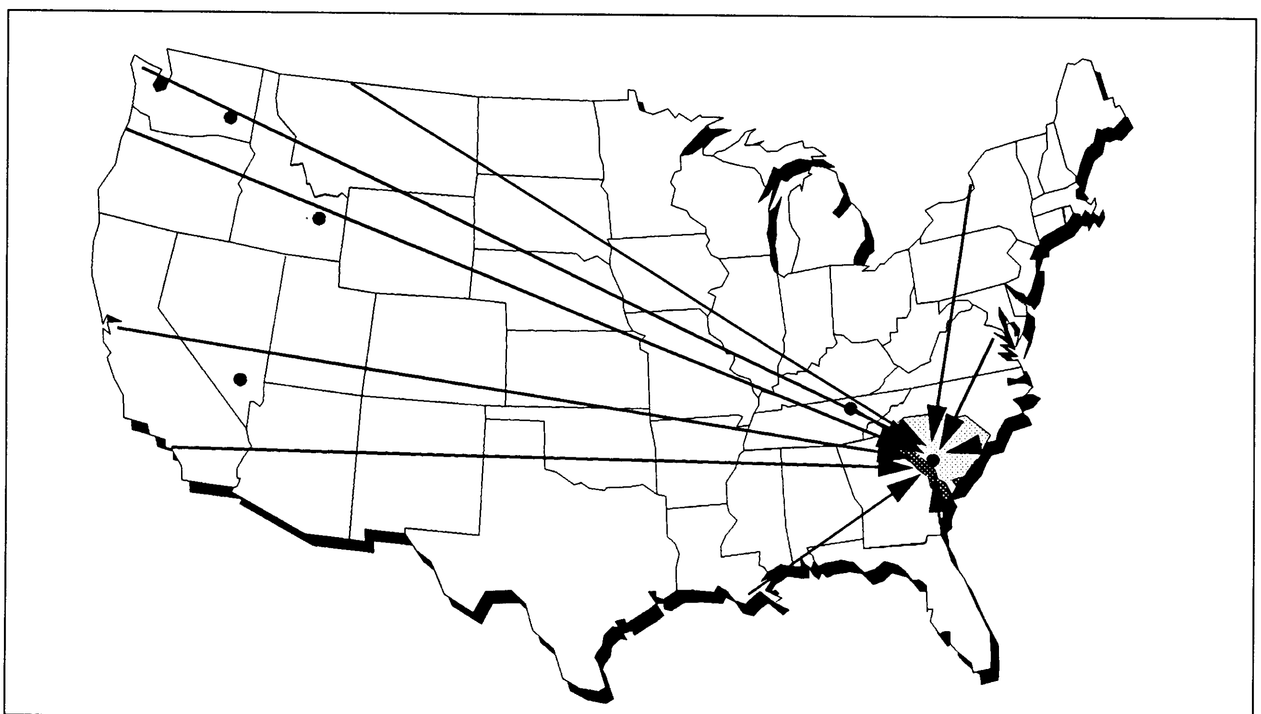
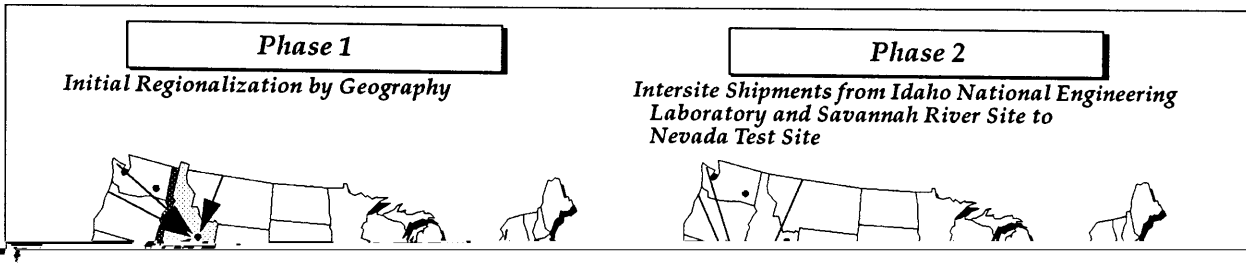
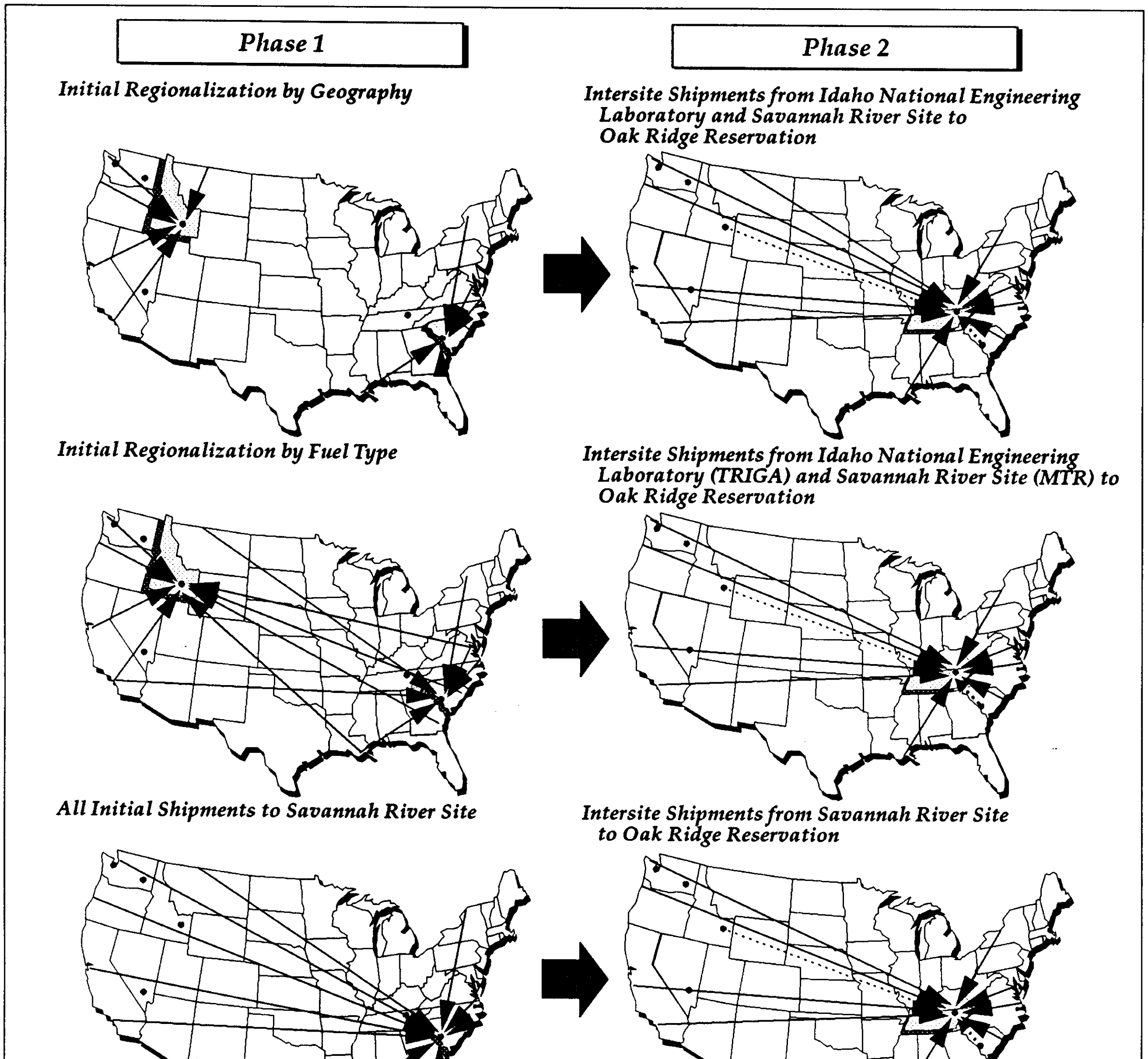


Figure E-9 Centralization to Savannah River Site


Phase 1
Initial Regionalization by Geography
Phase 2
Intersite Shipments from Idaho National Engineering Laboratory and Savannah River Site to Nevada Test Site



Phase 1
Phase 2
Initial Regionalization by Geography
Intersite Shipments from Idaho National Engineering Laboratory and Savannah River Site to Oak Ridge Reservation
Initial Regionalization by Fuel Type
Intersite Shipments from Idaho National Engineering Laboratory (TRIGA) and Savannah River Site (MTR) to Oak Ridge Reservation
All Initial Shipments to Savannah River Site
Intersite Shipments from Savannah River Site to Oak Ridge Reservation

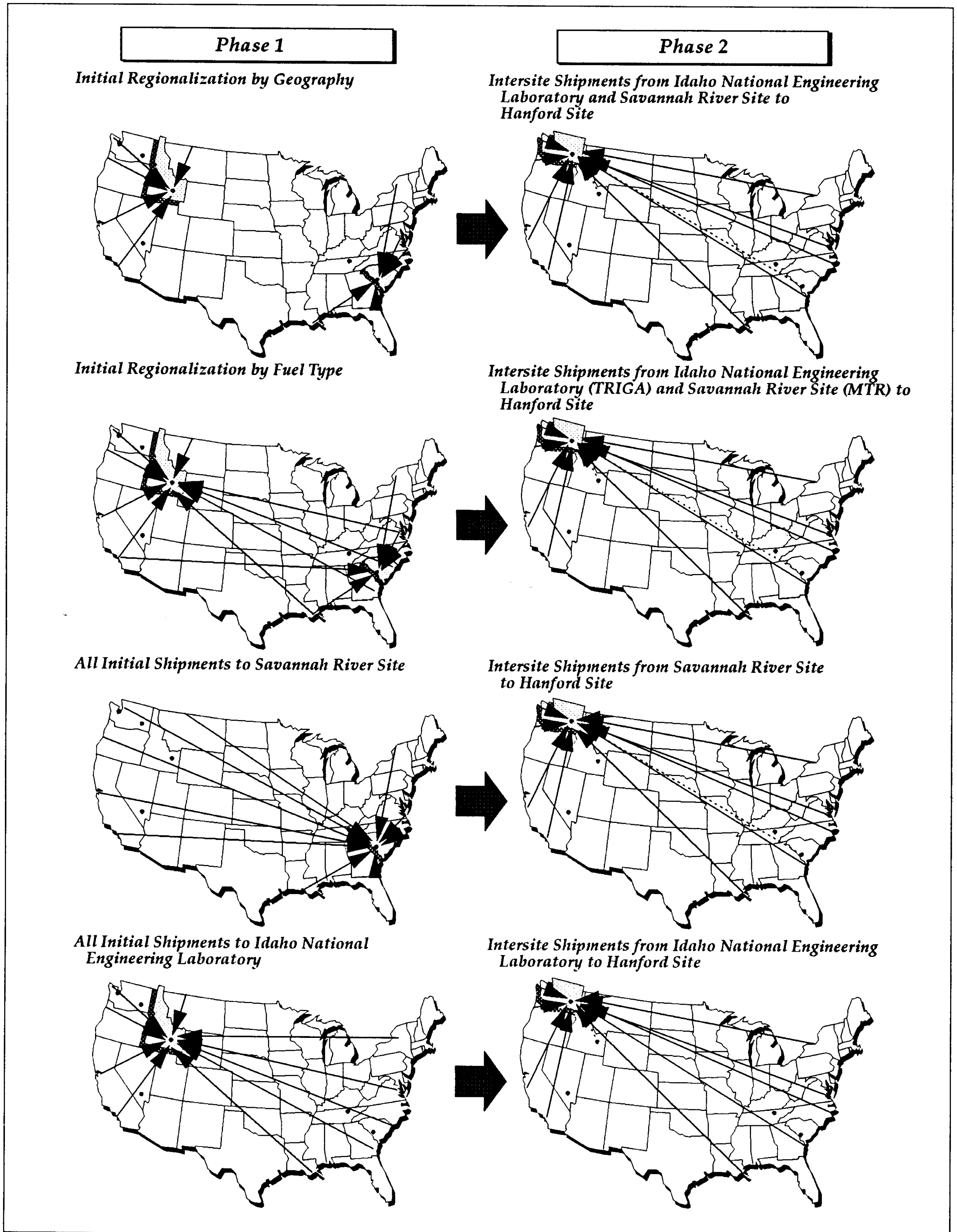


Figure E-12 Centralization to Hanford Site

Table E-2 Shipment Summary for Centralization Alternatives

Spent Nuclear Fuel Site Option	Phase 1 Approach	Phase 1 Port-to-Site Shipments	Site-to-Site Shipments[a]	Phase 2 or Port-to-Final Site Shipments	Total Number of Shipments
INEL	N/A - Single phase program			837	837
SRS	N/A - Single phase program			837	837
NTS	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
ORR	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	998/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
Hanford Site	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902

[a] *Truck/Rail shipments assuming that the truck casks used for intersite shipments are capable of carrying 4 times as much fuel and rail casks 10 times as much fuel as the shipping cask received from the foreign research reactor due to consolidation.*

INEL = Idaho National Engineering Laboratory; ORR = Oak Ridge Reservation; SRS = Savannah River Site; NTS = Nevada Test Site; HS = Hanford Site

E.4 Truck and Rail Routing Analysis

Both rail and highway shipping capabilities are available at all potential ports of entry, and each of the five DOE sites is or could be made capable of receiving foreign research reactor spent nuclear fuel transported by rail or highway. Therefore, shipment of spent nuclear fuel will be analyzed along representative highway and railway routes for all ports and SNF&INEL Final EIS (DOE, 1995) alternatives.

As discussed above, each alternative can be defined as a set of origin and destination pairs representing shipment linkages between ports of entry and interim management sites. The calculation of the overland transportation risk for an alternative depends in part on characteristics of the transportation routes between the origin and destination sites. Regulatory routing criteria and the methods used to determine representative truck and rail routes for the transportation risk assessment are described below. In addition, the route characteristics that are important for the risk assessment are summarized.

E.4.1 Routing Regulations

Department of Transportation's public highway routing regulations are prescribed in 49 CFR Part 397. The regulations' objectives are to reduce the impacts of transporting radioactive materials, to establish consistent and uniform requirements for route selection, and to identify the role of State and local governments in the routing of radioactive materials. The regulations attempt to reduce potential hazards by avoiding populous areas and by minimizing travel times. Further, they require that the carrier of radioactive materials ensure that the vehicle is operated on routes that minimize radiological risks, and that accident rates, transit times, population density and activity, time of day, and day of week are considered in determining risk.

A shipment of a "highway route controlled quantity" of radioactive material, such as spent nuclear fuel, is required by 49 CFR 397 Subpart D to use the interstate highway system except when moving from origin to interstate or from interstate to destination, when making necessary repair or rest stops, or when emergency conditions make continued use of the interstate unsafe or impossible. Carriers are required to

use interstate circumferential or bypass routes, if available, to avoid populous areas. Other "preferred highways" may be designated by any State or Tribe to replace or supplement the interstate system (DOT, 1992). Under its authority to regulate interstate transportation safety, the Department of Transportation can prohibit State and local bans and restrictions as "undue restraint of interstate

Table E-3 Summary of Route Distances for Truck and Rail Modes

Shipments to Hanford Site:				
Route[a]	Distance km (mi)	*Percentage in Zone*		
		Rural	Suburban	Urban

Shipments to Hanford Site:				
		Percentage in Zone		
Route[a]	***Distance km (mi)***	***Rural***	***Suburban***	***Urban***
Nevada Test Site	2096 (1302)	93.0	5.9	1.1
Oak Ridge Reservation	4188 (2601)	91.2	7.4	1.3
Savannah River	4754 (2953)	84.7	13.5	1.8
Sweetgrass, MT	976 (606)	91.7	6.8	1.6

Shipments to Idaho National Engineering Laboratory:				
		Percentage in Zone		
Route[a]	***Distance km (mi)***	***Rural***	***Suburban***	***Urban***
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	3910 (2441)	84.4	14.3	1.3
Charleston, SC (Wando Terminal)	3935 (2456)	84.2	14.4	1.4
Elizabeth, NJ	3858 (2396)	82.9	15.5	1.5
Galveston, TX	3077 (1911)	84.5	13.0	2.5
Jacksonville, FL	4031 (2504)	82.5	15.9	1.5
Newport News, VA	4012 (2492)	83.5	14.6	1.9
Norfolk, VA	4073 (2530)	83.1	15.1	1.8
Philadelphia, PA	3948 (2452)	81.2	17.2	1.6
Portsmouth, VA	4048 (2514)	83.1	14.8	2.1
Savannah, GA	3861 (2398)	83.3	15.1	1.6
MOTSU, NC	3875 (2407)	85.3	13.5	1.2
Wilmington, NC	4099 (2546)	84.1	14.8	1.2
Rail:				
Charleston, SC (NWS)	4046 (2513)	82.6	15.3	2.1
Charleston, SC (Wando Terminal)	4046 (2513)	82.6	15.3	2.1
Elizabeth, NJ	3967 (2464)	72.3	22.5	5.2
Galveston, TX	2972 (1846)	88.9	10.1	1.0
Jacksonville, FL	4062 (2523)	83.7	14.6	1.7
Newport News, VA	4093 (2542)	81.5	15.4	3.1
Norfolk, VA	4252 (2641)	81.8	15.2	3.0
Philadelphia, PA	3890 (2416)	73.4	21.5	5.1
Portsmouth, VA	4204 (2611)	82.1	14.9	3.0
Savannah, GA	4097 (2545)	83.6	14.8	1.6
MOTSU, NC	4278 (2657)	81.6	16.7	1.7
Wilmington, NC	4263 (2648)	81.8	16.5	1.7
From Western Ports				
Truck:				
Long Beach, CA	1575 (979)	77.7	14.2	8.1
NWS Concord, CA	1518 (943)	85.9	11.1	3.1
Portland, OR	1188 (738)	88.6	9.8	1.7
Tacoma, WA	1312 (815)	87.0	11.4	1.6
Rail:				
Long Beach, CA	1675 (1041)	81.5	10.5	8.0

Shipments to Idaho National Engineering Laboratory:				
		Percentage in Zone		
Route[a]	*Distance km (mi)*	*Rural*	*Suburban*	*Urban*
Oak Ridge Reservation	3297 (2048)	86.8	12.0	1.2
Savannah River	3721 (2311)	82.8	15.6	1.6
Sweetgrass, MT	874 (543)	94.8	4.8	0.4
Rail:				
Alexandria Bay, NY	3755 (2332)	76.4	19.1	4.5
Hanford Site	1059 (658)	91.4	7.1	1.4
Nevada Test Site	1217 (756)	92.8	5.9	1.3
Oak Ridge Reservation	3309 (2055)	90.7	7.8	1.5
Savannah River	3875 (2407)	82.8	15.2	2.0
Sweetgrass, MT	1982 (1231)	93.2	5.8	1.0

Shipments to Nevada Test Site:				
		Percentage in Zone		
Route[a]	*Distance km (mi)*	*Rural*	*Suburban*	*Urban*
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	3930 (2543)	84.5	14.1	1.4
Charleston, SC (Wando Terminal)	4098 (2558)	84.3	14.2	1.5
Elizabeth, NJ	4302 (2672)	80.5	17.2	2.3
Galveston ,TX	2998 (1862)	85.4	11.5	3.2
Jacksonville, FL	4197 (2607)	82.8	15.4	1.8
Newport News, VA	4178 (2595)	83.8	14.1	2.1
Norfolk, VA	4239 (2633)	83.4	14.6	2.0
Philadelphia, PA	4223 (2623)	80.4	17.4	2.2
Portsmouth, VA	4213 (2617)	83.4	14.3	2.3
Savannah, GA	4027 (2501)	83.6	14.6	1.8
MOTSU, NC	3956 (2457)	83.0	15.0	2.0
Wilmington, NC	4267 (2650)	84.3	14.3	1.4
Rail:				
Charleston, SC (NWS)	4741 (2945)	84.3	13.7	2.0
Charleston, SC (Wando Terminal)	4741 (2945)	84.3	13.7	2.0
Elizabeth, NJ	4661 (2895)	75.6	19.7	4.7
Galveston, TX	3148 (1955)	92.0	7.2	0.8
Jacksonville, FL	4758 (2955)	85.3	13.1	1.7
Newport News, VA	4787 (2973)	83.4	13.8	2.9
Norfolk, VA	4948 (3073)	83.6	13.6	2.8
Philadelphia, PA	4585 (2848)	76.6	18.8	4.6
Portsmouth, VA	4898 (3042)	83.8	13.4	2.8
Savannah, GA	4793 (2977)	85.2	13.2	1.5
MOTSU, NC	4973 (3089)	83.4	14.9	1.7
Wilmington, NC	4959 (3080)	83.5	14.8	1.7
From Western Ports				
Truck:				
Long Beach, CA	645 (401)	71.3	12.7	16.0
NWS Concord, CA	1146 (712)	81.8	11.3	6.9
Portland, OR	2045 (1270)	85.5	11.5	2.9
Tacoma, WA	2164 (1344)	84.7	12.6	2.7
Rail:				
Long Beach, CA	777 (483)	70.5	14.3	15.3
NWS Concord, CA	1369 (850)	77.8	16.7	5.6
Portland, OR	2301 (1429)	93.5	5.3	1.2

Shipments to Nevada Test Site:

Shipments to Oak Ridge Reservation:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
Portland, OR	4200 (2609)	87.0	11.5	1.5
Tacoma, WA	4279 (2658)	88.0	11.0	1.0
Rail:				
Long Beach, CA	4302 (2674)	86.5	9.7	3.9
NWS Concord, CA	4524 (2810)	87.5	10.4	2.2
Portland, OR	4551 (2827)	85.5	12.1	2.4
Tacoma, WA	4568 (2837)	83.7	13.3	3.0
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	1492 (927)	65.9	33.5	0.7
Hanford Site	3967 (2464)	87.8	11.0	1.2
Idaho National Engineering Laboratory	3297 (2048)	86.8	12.0	1.2
Nevada Test Site	3463 (2151)	86.9	11.5	1.6
Savannah River	610 (379)	59.1	38.5	2.4
Sweetgrass, MT	1900 (1180)	87.5	10.0	2.5
Rail:				
Alexandria Bay, NY	1565 (972)	57.5	35.7	6.8
Hanford Site	4188 (2601)	91.2	7.4	1.3
Idaho National Engineering Laboratory	3309 (2055)	90.7	7.8	1.5
Nevada Test Site	4004 (2487)	91.4	7.2	1.5
Savannah River	671 (417)	68.8	29.8	1.4
Sweetgrass, MT	3375 (2096)	83.7	13.7	2.6

Shipments to Savannah River Site:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	301 (188)	72.9	26.2	0.9
Charleston, SC (Wando Terminal)	325 (203)	71.6	26.6	1.8
Elizabeth, NJ	1325 (823)	63.8	34.2	2.1
Galveston, TX	1610 (1000)	70.5	27.0	2.5
Jacksonville, FL	607 (377)	81.5	18.4	0.0
Newport News, VA	836 (519)	71.1	26.8	2.1
Norfolk, VA	802 (498)	72.8	26.2	1.0
Philadelphia, PA	1193 (741)	62.1	34.0	3.9
Portsmouth, VA	807 (501)	72.7	26.1	1.1
Savannah, GA	403 (250)	79.1	20.8	0.0
MOTSU, NC	403 (250)	82.5	17.2	0.3
Wilmington, NC	499 (310)	75.5	24.0	0.5
Rail:				
Charleston, SC (NWS)	225 (140)	83.9	13.6	2.5
Charleston, SC (Wando Terminal)	225 (140)	83.9	13.6	2.5
Elizabeth, NJ	1404 (872)	56.2	33.0	10.8
Galveston, TX	1890 (1174)	69.6	26.2	4.2
Jacksonville, FL	417 (259)	83.7	13.7	2.6
Newport News, VA	972 (604)	69.1	28.7	2.2
Norfolk, VA	852 (529)	74.3	24.1	1.6
Philadelphia, PA	1270 (789)	60.9	31.8	7.2
Portsmouth, VA	803 (499)	75.2	23.5	1.3
Savannah, GA	184 (114)	87.9	10.9	1.2

Shipments to Savannah River Site:				
***Route*[a]**	***Distance km (mi)***	***Percentage in Zone***		
		Rural	***Suburban***	***Urban***
MOTSU, NC	615 (382)	77.9	20.5	1.6
Wilmington, NC	601 (373)	78.7	19.7	1.6
From Western Ports				
Truck:				
Long Beach, CA	3931 (2443)	78.8	18.0	3.3
NWS Concord, CA	4482 (2784)	79.4	17.2	3.3
Portland, OR	4635 (2879)	83.9	14.4	1.7
Tacoma, WA	4719 (2931)	84.8	13.9	1.3
Rail:				
Long Beach, CA	5212 (3239)	80.9	15.3	3.7
NWS Concord, CA	5123 (3182)	80.0	16.4	3.6
Portland, OR	5078 (3154)	82.0	15.4	2.6
Tacoma, WA	5096 (3165)	80.4	16.5	3.1
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	1629 (1012)	66.8	32.4	0.8
Hanford Site	4390 (2727)	84.3	14.2	1.5
Idaho National Engineering Laboratory	3721 (2311)	82.8	15.6	1.6
Nevada Test Site	3887 (2414)	83.1	15.1	1.8
Oak Ridge Reservation	610 (379)	59.1	38.5	2.4
Sweetgrass, MT	4147 (2576)	85.2	13.6	1.3
Rail:				
Alexandria Bay, NY	2062 (1281)	53.8	35.5	10.7
Hanford Site	4754 (2953)	84.7	13.5	1.8
Idaho National Engineering Laboratory	3875 (2407)	82.8	15.2	2.0
Nevada Test Site	4571 (2839)	84.5	13.5	1.9
Oak Ridge Reservation	671 (417)	68.8	29.8	1.4
Sweetgrass, MT	3903 (2424)	79.4	17.8	2.8

[a] *Route characteristics were generated using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b) for truck and rail modes, respectively.*

Table E-4 Summary of the Population Distributions Along Routes for Truck and Rail Modes

Shipments to Hanford Site:				
***Route*[a]**	***Number of Affected Persons*[b]**	***Average Persons/km²***		
		Rural	***Suburban***	***Urban***
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	550,000	7.0	342.5	2149.1
Charleston, SC (Wando Terminal)	569,000	7.0	346.1	2158.6
Elizabeth, NJ	585,000	7.8	318.3	2233.1
Galveston, TX	575,000	4.9	401.5	2139.5
Jacksonville, FL	643,000	7.1	338.6	2180.5
Newport News, VA	677,000	7.5	356.9	2254.3
Norfolk, VA	694,000	7.6	362.0	2219.3

Shipments to Hanford Site:

Route[a]	Number of Affected Persons[b]	Average Persons/km² Rural	Suburban	Urban
Wilmington, NC	556,000	7.5	330.0	2149.9
Rail:				
Charleston, SC (NWS)	731,000	6.9	354.6	2296.8
Charleston, SC (Wando Terminal)	731,000	6.9	354.6	2296.8
Elizabeth, NJ	1,380,000	7.2	355.0	2506.4
Galveston, TX	347,000	4.8	374.8	2034.6
Jacksonville, FL	657,000	6.9	343.6	2272.5
Newport News, VA	936,000	7.5	329.1	2623.1
Norfolk, VA	960,000	7.6	338.8	2592.7
Philadelphia, PA	1,350,000	7.1	358.5	2567.1
Portsmouth, VA	934,000	7.6	334.2	2608.4
Savannah, GA	641,000	7.0	343.1	2244.5
MOTSU, NC	739,000	7.7	346.1	2288.1
Wilmington, NC	736,000	7.7	346.7	2288.1
From Western Ports				
Truck:				
Long Beach, CA	617,000	7.9	381.0	2693.6
NWS Concord, CA	263,000	9.3	335.1	2159.0
Portland, OR	85,700	6.3	413.3	2088.6
Tacoma, WA	98,600	7.7	321.9	2120.5
Rail:				
Long Beach, CA	783,000	3.6	471.4	2781.1
NWS Concord, CA	419,000	7.0	368.7	2363.7
Portland, OR	99,500	6.1	450.0	2294.4
Tacoma, WA	136,000	10.6	355.9	2161.1
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	612,000	7.7	300.4	2211.8
Idaho National Engineering Laboratory	82,800	5.5	363.0	2034.6
Nevada Test Site	305,000	4.1	447.3	2176.8
Oak Ridge Reservation	429,000	6.0	351.1	2207.3
Savannah River	599,000	6.7	354.7	2198.1
Sweetgrass, MT	106,000	4.5	314.4	2152.3
Rail:				
Alexandria Bay, NY	1,170,000	7.0	360.2	2584.5
Idaho National Engineering Laboratory	95,400	4.2	373.6	1935.8
Nevada Test Site	157,000	3.5	402.3	1980.5
Oak Ridge Reservation	410,000	6.7	375.7	2220.3
Savannah River	690,000	6.8	355.8	2267.6
Sweetgrass, MT	92,400	4.1	394.4	1979.9

Shipments to Idaho National Engineering Laboratory:

Route[a]	Number of Affected Persons[b]	Average Persons/km² Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	498,000	7.4	334.0	2157.4
Charleston, SC (Wando Terminal)	518,000	7.4	338.1	2167.2
Elizabeth, NJ	536,000	8.5	315.6	2257.0
Galveston, TX	526,000	5.1	405.8	2149.1

Shipments to Idaho National Engineering Laboratory:				
Route[a]	***Number of Affected Persons***[b]	***Average Persons/km***^{2}		
		Rural	***Suburban***	***Urban***
Jacksonville, FL	576,000	7.6	332.2	2224.8
Newport News, VA	628,000	8.0	356.8	2274.7
Norfolk, VA	631,000	8.1	362.5	2220.6
Philadelphia, PA	573,000	7.9	314.9	2084.2
Portsmouth, VA	670,000	8.0	364.7	2261.3
Savannah, GA	553,000	7.3	343.2	2224.8
MOTSU, NC	463,000	8.1	327.9	2155.2
Wilmington, NC	507,000	8.1	328.1	2166.9
Rail:				
Charleston, SC (NWS)	671,000	7.6	348.5	2332.6
Charleston, SC (Wando Terminal)	671,000	7.6	348.5	2332.6
Elizabeth, NJ	1, 320,000	8.2	350.8	2528.3
Galveston, TX	286,000	5.1	365.7	2068.7
Jacksonville, FL	597,000	7.7	336.3	2312.5
Newport News, VA	875,000	8.4	321.1	2665.7
Norfolk, VA	900,000	8.5	331.7	2632.7
Philadelphia, PA	1,290,000	8.1	354.2	2592.0
Portsmouth, VA	874,000	8.6	326.6	2650.6
Savannah, GA	580,000	7.8	335.9	2284.9
MOTSU, NC	679,000	8.7	340.2	2328.4
Wilmington, NC	675,000	8.7	340.8	2328.4
From Western Ports				
Truck:				
Long Beach, CA	692,000	3.8	487.0	2641.1
NWS Concord, CA	271,000	3.5	411.6	2181.5
Portland, OR	143,000	5.6	395.0	2082.7
Tacoma, WA	157,000	6.1	336.5	2098.8
Rail:				
Long Beach, CA	722,000	3.5	484.6	2830.1
NWS Concord, CA	198,000	4.4	337.2	2293.0
Portland, OR	116,000	4.3	330.2	2222.6
Tacoma, WA	199,000	6.1	326.5	2291.5
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	564,000	8.3	296.8	2230.8
Hanford Site	82,800	5.5	363.0	2034.6
Nevada Test Site	256,000	3.9	470.3	2201.5
Oak Ridge Reservation	380,000	6.3	350.4	2237.4
Savannah River	551,000	7.2	354.4	2217.9
Sweetgrass, MT	38,900	4.3	348.1	2057.3
Rail:				
Alexandria Bay NY	1,110,000	7.9	355.3	2614.7
Hanford Site	95,400	4.2	373.6	1935.8
Nevada Test Site	96,100	3.3	384.6	2022.2
Oak Ridge Reservation	350,000	7.5	365.3	2270.2
Savannah River	630,000	7.6	349.6	2303.3
Sweetgrass, MT	134,000	4.2	338.5	2068.1

Shipments to Nevada Test Site:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban

Shipments to Nevada Test Site:

Shipments to Oak Ridge Reservation:				
Route[a]	*Number of Affected Persons*[b]	*Average Persons/km*^{2}		
		Rural	*Suburban*	*Urban*
Idaho National Engineering Laboratory	380,000	6.3	350.0	2237.4
Nevada Test Site	443,000	5.5	371.0	2291.1
Savannah River	175,000	17	318.0	2244.1
Sweetgrass, MT	346,000	6.3	336.3	2180.9
Rail:				
Alexandria Bay NY	752,000	18.2	378.0	2443.0
Hanford Site	416,000	6.7	376.0	2220.3
Idaho National Engineering Laboratory	350,000	7.5	365.0	2270.2
Nevada Test Site	413,000	6.3	394.0	2252.1
Savannah River	132,000	15.2	289.0	2164.4
Sweetgrass, MT	627,000	8.7	395.5	2256.5

Shipments to Savannah River Site:				
Route[a]	*Number of Affected Persons*[b]	*Average Person/km*^{2}		
		Rural	*Suburban*	*Urban*
		From Eastern Ports		
Truck:				
Charleston, SC (NWS)	46,200	16.3	275.0	1764.7
Charleston, SC (Wando Terminal)	65,700	15.6	306.1	2077.9
Elizabeth, NJ	316,000	17.6	277.6	2377.5
Galveston, TX	430,000	12.7	359.1	2254.1
Jacksonville, FL	46,900	13.2	211.4	1764.7
Newport News, VA	181,000	16.2	302.9	2281.5
Norfolk, VA	131,000	16.4	283.9	2007.9
Philadelphia, PA	397,000	16.5	348.5	2228.9
Portsmouth, VA	135,000	16.3	281.8	2033.1
Savannah, GA	37,300	13.6	233.4	1764.7
MOTSU, NC	34,200	15.0	213.0	1925.6
Wilmington, NC	64,700	17.7	256.7	1764.7
Rail:				
Charleston, SC (NWS)	41,200	6.8	328.6	2735.5
Charleston, SC (Wando Terminal)	41,200	6.8	328.6	2735.5
Elizabeth, NJ	903,000	14.2	353.0	2726.4
Galveston, TX	609,000	11.9	394.0	2330.3
Jacksonville, FL	72,200	10.6	290.3	2466.3
Newport News, VA	218,000	13.2	285.6	2444.8
Norfolk, VA	153,000	13.5	275.3	2469.8
Philadelphia, PA	603,000	14.0	328.8	2704.1
Portsmouth, VA	128,000	13.9	253.7	2615.8
Savannah, GA	21,300	9.6	309.0	2707.8
MOTSU, NC	99,000	12.7	260.9	2580.4
Wilmington, NC	95,500	12.8	259.6	2580.4
		From Western Ports		
Truck:				
Long Beach, CA	714,000	7.5	369.4	2905.8
NWS Concord, CA	1,040,000	7.3	378.5	2381.7
Portland, OR	686,000	6.7	365.2	2188.9
Tacoma, WA	601,000	6.8	349.2	2202.0
Rail:				
Long Beach, CA	1,280,000	6.9	359.9	2653.0

Shipments to Savannah River Site:				
Route[a]	***Number of Affected Persons***[b]	***Average Person/km*** ^{2}		
		Rural	***Suburban***	***Urban***
NWS Concord, CA	1,210,000	7.1	381.6	2369.0
Portland, OR	950,000	7.5	369.0	2246.2
Tacoma, WA	1,100,000	7.5	381.0	2300.7
From DOE Sites/Canadian Border				
Truck:				
Alexandria, Bay NY	284,000	18.0	262.7	2072.4
Hanford Site	599,000	6.7	354.7	2198.1
Idaho National Engineering Laboratory	551,000	7.2	354.4	2217.9
Nevada Test Site	613,000	6.4	368.3	2261.8
Oak Ridge Reservation	175,000	17.0	317.7	2244.1
Sweetgrass, MT	513,000	7.1	344.0	2175.8
Rail:				
Alexandria Bay, NY	1,340,000	14.8	333.1	2756.8
Hanford Site	690,000	6.8	355.8	2267.6
Idaho National Engineering Laboratory	630,000	7.6	349.6	2303.3
Nevada Test Site	692,000	6.4	363.7	2287.5
Oak Ridge Reservation	132,000	15.2	289.2	2164.4
Sweetgrass, MT	812,000	8.4	367.3	2228.5

[a] *Route characteristics were generated using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b) for truck and rail modes, respectively.*

[b] *The affected population includes all persons within 800 m (0.5 mi) of the route.*

The representative truck and rail routes were determined by using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b), respectively. These models are described briefly below.

The HIGHWAY computer program is used for selecting highway routes for transporting radioactive materials within the United States by truck. The HIGHWAY data base is a computerized road atlas that currently describes approximately 386,400 kilometer (km) (240,000 mi) of roads. A complete description of the Interstate System and all United States highways is included in the database. In addition, most of the principal State highways and a number of local and community highways are also identified. The code is updated periodically to reflect current road conditions and has been benchmarked against reported mileages and observations of commercial truck firms.

Routes are calculated within the model by minimizing the total impedance between the origin and the destination. The impedance is basically defined as a function of distance and driving time along a particular highway segment. One of the special features of the HIGHWAY model is its ability to calculate routes that maximize the use of interstate highways. This feature allows the user to select routes for shipment of radioactive materials that conform to Department of Transportation regulations, specifically 49 CFR 397 Subpart D. The population densities along a route are derived from 1990 U.S. Bureau of the Census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per km^2 (0 to 139 persons per mi^2); the suburban range is 55 to 1,284 persons per km^2 (140 to 3,326 persons per mi^2); and urban is taken as all population densities greater than 1,284 persons per km^2 (3,326 persons per mi^2).

The INTERLINE computer program is designed to simulate routing of the United States rail system. The INTERLINE database consists of 94 separate subnetworks and represents various competing rail companies in the United States. The database used by INTERLINE was originally based on Federal Railroad Administration data and reflected the United States railroad system in 1974. The data base has since been expanded and modified over the past 2 decades. The code is updated periodically to reflect current track conditions and has been benchmarked against reported mileages and observations of commercial rail firms.

The INTERLINE model uses a shortest-route algorithm that finds the minimum impedance path within an individual subnetwork. A separate routine is used to find paths along the subnetworks. The routes selected for this study used the standard assumptions in the INTERLINE model that simulate the selection process that railroads would use to direct shipments of spent nuclear fuel. The population densities along a route are derived from 1990 U.S. Bureau of the Census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per km^2 (0 to 139 persons per mi^2); the suburban range is 55 to 1,284 persons per km^2 (140 to 3,326 persons per mi^2); and urban is taken as all population densities greater than 1,284 persons per km^2 (3,326 persons per mi^2).

E.5 Methods for Calculating Transportation Risks

The overland transportation risk assessment approach is summarized in Figure E-13. The first step in the ground transportation analysis was to determine the incident-free and accident risk factors, on a per-shipment basis, for transportation of the various types of spent nuclear fuel. Risk factors, as any risk estimate, are the product of the probability of exposure and the magnitude of the exposure. Accident risk factors were calculated for radiological and nonradiological traffic accidents. The probabilities, which are much lower than one, and the magnitudes of exposure were multiplied, yielding very low risk numbers. Incident-free risk factors were calculated for crew and public exposure to radiation emanating from the cask and public exposure to the chemical toxicity of the transportation vehicle exhaust. The probability of incident-free exposure is unity (one).

Radiological risk factors are expressed in units of rem. Later in the analysis, they will be multiplied by International Commission on Radiation Protection Publication 60 (ICRP, 1991) conversion factors and estimated numbers of shipments (see Section E.7.1) to give risk estimates in units of LCFs. The vehicle emission risk factors are calculated in latent mortalities, and the vehicle accident risk factors are calculated in mortalities. The nonradiological risk factors will be multiplied by the number of shipments.

For each alternative, risks were assessed for both incident-free transportation and accident conditions. For the incident-free assessment, risks were calculated for both collective populations of potentially exposed individuals and for MEIs. The accident assessment consists of two components: 1) a probabilistic accident risk assessment that considers the probabilities and consequences of a range of possible transportation accident environments, including low-probability accidents that have high consequences and high-probability accidents that have low consequences; and 2) an accident consequence assessment that considers only the consequences of the most severe transportation accidents postulated.

The RADTRAN 4 computer code (Neuhauser and Kanipe, 1993) is used for the incident-free and accident risk assessments to estimate the impacts to collective populations. RADTRAN 4 was developed by Sandia National Laboratories to calculate population risk associated with the transportation of radioactive materials by a variety of modes, including truck, rail, air, ship, and barge.

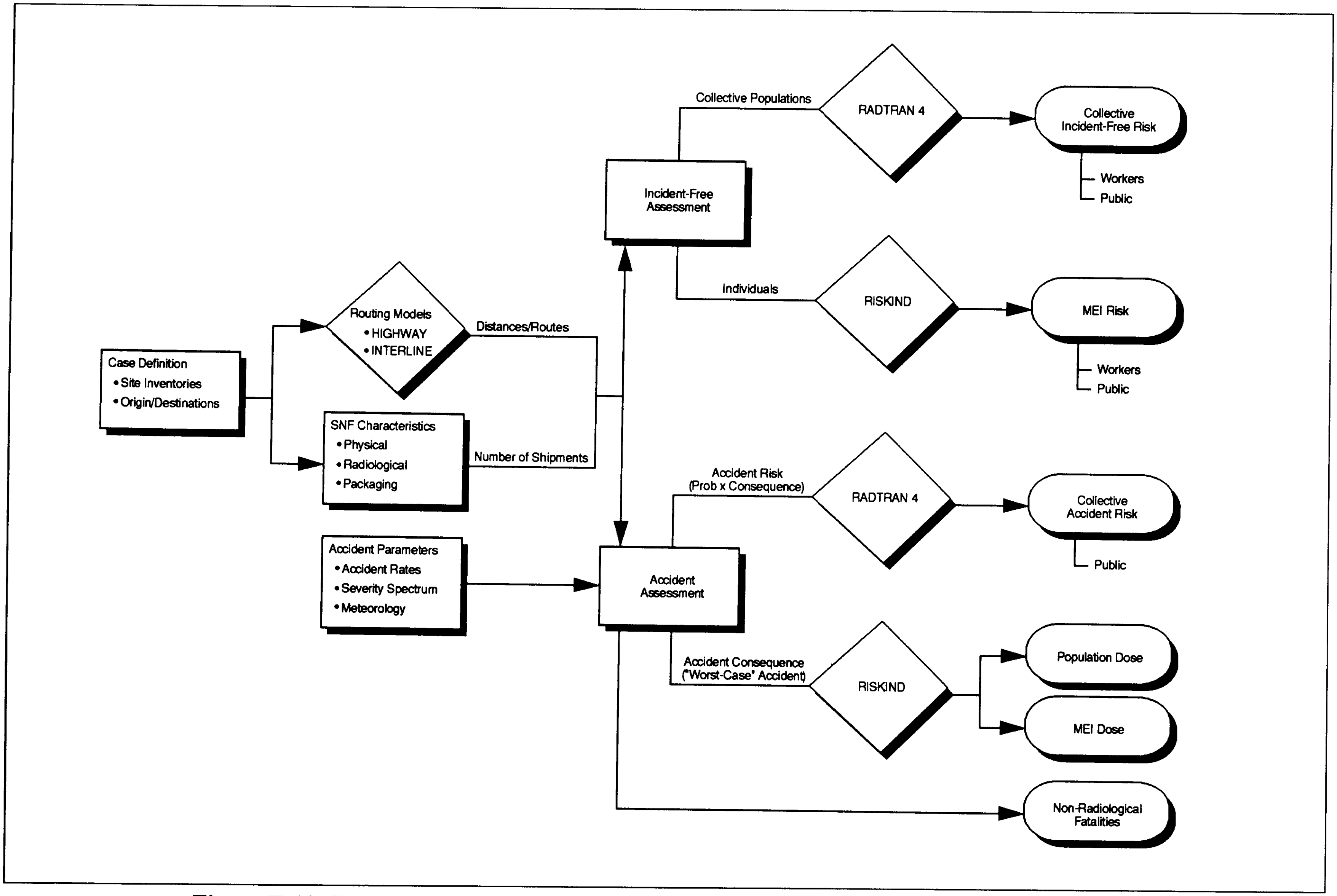


Figure E-13 Summary of the Assessment Approach for the Overland Transportation Risk Assessment

The RADTRAN 4 population risk calculations take into account both the consequences and probabilities

[illegible]

posed to society as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing the various alternatives.

The RISKIND computer code (Yuan et al., 1993) is used to estimate the incident-free doses to MEIs and

- Crew Members: Collective doses are calculated for truck and rail transportation crew members.

The doses calculated for the first three population groups are added together to yield the collective dose to the general public. The dose calculated for the fourth group represents the collective dose to workers. The RADTRAN 4 incident-free dose models are not intended to be used for estimating specific risks to individuals.

The RADTRAN 4 incident-free dose calculations are based on expressing the dose rate as a function of distance from a point source (Neuhauser and Kanipe, 1993). Associated with the calculation of incident-free doses for each exposed population group are parameters such as the radiation field strength, source-receptor distance, exposure time, vehicle speed, stop time, traffic density, and route characteristics such as population density. The RADTRAN 4 code user's manual contains derivations of the equations and descriptions of these parameters (Neuhauser and Kanipe, 1993). The values for many of the most important parameters are presented in Section E.6.

The collective incident-free risks are calculated for each specific alternative as follows. Each alternative is first defined as a set of origin and destination pairs. Representative highway and rail routes are determined for each unique pair as described in Section E.4. For each pair, RADTRAN 4 is used to calculate the collective risks to workers and the public for a single shipment based on representative radiological and physical properties of the spent nuclear fuel. These estimates for a single shipment are referred to as per-shipment risk factors. The number of shipments transported across each linkage is then determined for both truck and rail modes. The collective risks for an alternative are calculated by multiplying the number of shipments by the appropriate per-shipment risk factor.

MEI Risk: In addition to the incident-free collective population risk assessment, the risk to MEIs has been estimated for a number of hypothetical exposure events using RISKIND. The receptors include transportation crew members, inspectors, and members of the public exposed during traffic delays, while working at a service station, or living near a port of entry or DOE site.

The dose to each MEI considered is calculated with RISKIND for a given distance, duration, and frequency of exposure specific to that receptor. The distances and durations of exposure are similar to those given in previous transportation assessments and are presented in Section E.6. The exposure scenarios are not meant to be exhaustive, but were selected to provide a realistic range of potential exposure situations.

The RISKIND external dose model considers direct external exposure and exposure from radiation scattered from the ground and air. RISKIND is used to calculate the dose as a function of distance (mrem per hr for stationary exposures and mrem per event for moving shipments) from a spent nuclear fuel shipment based on the dimensions of the shipment. The code models the shipment as a cylindrical volume source; and the calculated dose includes contributions from buildup, cloudshine, and groundshine. The dose rates calculated by using RISKIND have been compared with output from existing shielding codes. The RISKIND code has been found to produce realistic but conservative results. As a conservative measure, potential shielding between the cask and the receptor is not considered.

Nonradiological Risk (Vehicle Related): Vehicle-related health risks resulting from incident-free transport may be associated with the generation of air pollutants by transport vehicles during spent nuclear fuel shipment, and are independent of the radioactive nature of the shipment. The health end point assessed under incident-free transport conditions is the excess latent mortality due to inhalation of vehicle exhaust emissions. Risk factors for pollutant inhalation in terms of latent mortality have been generated (Rao et al., 1982). These risks are $1x10^{-7}$ mortality per km ($1.6x10^{-7}$ per mi) and $1.3x10^{-7}$ mortality per km ($2.1x10^{-7}$ per mi) of truck and rail travel in urban areas, respectively. The risk factors are based on regression analyses of the effects of sulfur dioxide and particulate releases from diesel exhaust on mortality rates. Excess latent mortalities are assumed to be equivalent to LCF. Vehicle-related risks from incident-free transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar data are not available for rural and suburban areas.

Risks are summed over the entire route and over all shipments for each spent nuclear fuel case. This method has been used in several reports to calculate risks from incident-free transport. Lack of information for rural and suburban areas is an obvious data gap, although the risk factor would presumably be lower than for urban areas because of lower total emissions from all sources and lower population densities in rural and suburban areas.

E.5.2 Accident Assessment Methodology

The offsite spent nuclear fuel transportation accident analysis considers the impacts of accidents during the transportation of spent nuclear fuel by truck or rail. Under accident conditions, impacts to human health and the environment could result from the release and dispersal of radioactive material. Because of the rigorous design specifications for spent nuclear fuel shipping casks, the NRC has estimated that casks will withstand 99.4 percent of truck or rail accidents without sustaining damage sufficient to breach the cask (Fischer et al., 1987). The 0.6 percent of accidents that could potentially breach the cask are represented by a spectrum of accident severities and radioactive material release conditions. Accident analysis methodology has been developed by the NRC for calculating the probabilities and consequences from this spectrum of unlikely accidents, but it is not possible to predict where along the shipping route such accidents might occur. To provide an assessment of spent nuclear fuel transportation accident impacts, two types of analyses were performed. First, an accident risk assessment was performed that takes into account the probabilities and consequences of a spectrum of accident severities using methodology developed by the NRC (Fischer et al., 1987). The accident risk assessment used route-specific information for accident rates and population densities. For the spectrum of accidents considered in the analysis, accident consequences in terms of collective dose to the population within 80 km (50 mi) were multiplied by the accident probabilities to yield dose risk. Second, to represent the maximum reasonably foreseeable impacts to individuals and populations should an accident occur, radiological consequences were calculated for an accident of maximum credible severity in each population zone. An accident is considered credible if its probability of occurrence is greater than 1×10^{-7} per yr.

of a particular severity if an accident occurs. The more severe the accident, the more remote the chance of such an accident. Release fractions, defined as the fraction of the material in a package that could be released in an accident, are assigned to each accident severity category based on the physical and chemical form of the spent nuclear fuel. The models take into account the transportation mode and the type of packaging being considered. The accident rates, definition of accident severity categories, and release fractions used in this analysis are discussed further in Section E.6.

For accidents involving the release of radioactive material, RADTRAN 4 assumes the material is dispersed in the environment according to standard Gaussian diffusion models. For the risk assessment, default atmospheric dispersion data were used representing an instantaneous ground-level release and a small diameter source cloud (Neuhauser and Kanipe, 1993). The calculation of collective population dose following the release and dispersal of radioactive material includes the following exposure pathways:

consequences takes into account physical phenomena resulting from the fire, such as buoyant plume rise. Second, RISKIND can be used to estimate the dose to MEIs in the vicinity of an accident. The location of the MEI is determined by RISKIND [illegible]

The consequences of the most severe accidents are calculated for both local populations and MEIs. The population dose includes the population within 80 km (50 mi) of the accident site. The exposure pathways considered are similar to those [illegible]

Table E-5 Curie Content of Fully Loaded Shipping Casks for Representative Fuel Types

Isotopes	*Material Type*					
	BR-2	*RHF*	*TRIGA*	*NRU*	*HLW (1 yr)*	*Target*
Tritium	$8.64x10^{+1}$	$3.70x10^{+1}$	$1.31x10^{+1}$	$9.48x10^{-1}$	~ 0	~ 0
Krypton 85	$2.47x10^{+3}$	$1.07x10^{+3}$	$3.63x10^{+2}$	$2.71x10^{+3}$	~ 0	~ 0
Strontium 89	$4.08x10^{+4}$	$1.76x10^{+4}$	$2.75x10^{+3}$	$9.72x10^{+3}$	$3.07x10^{+6}$	$1.95x10^{+2}$
Strontium 90	$2.08x10^{+4}$	$8.93x10^{+3}$	$3.16x10^{+3}$	$2.32x10^{+4}$	$1.74x10^{+6}$	$1.58x10^{+2}$
Yttrium 90	$2.08x10^{+4}$	$8.93x10^{+3}$	$3.16x10^{+3}$	$2.32x10^{+4}$	$1.74x10^{+6}$	$1.58x10^{+2}$
Yttrium 91	$7.30x10^{+4}$	$3.14x10^{+4}$	$4.56x10^{+3}$	$2.02x10^{+4}$	$5.48x10^{+6}$	$3.69x10^{+2}$
Zirconium 95	$1.07x10^{+5}$	$4.63x10^{+4}$	$6.48x10^{+3}$	$3.38x10^{+4}$	$8.08x10^{+6}$	$5.67x10^{+2}$
Niobium 95	$2.20x10^{+5}$	$9.49x10^{+4}$	$1.28x10^{+4}$	$7.34x10^{+4}$	$1.65x10^{+7}$	$1.21x10^{+3}$
Ruthenium 103	$8.90x10^{+3}$	$3.77x10^{+3}$	$8.44x10^{+2}$	$1.44x10^{+3}$	$7.16x10^{+5}$	$3.57x10^{+1}$
Rhodium 103m	$8.90x10^{+3}$	$3.77x10^{+3}$	$8.44x10^{+2}$	$1.44x10^{+3}$	$7.16x10^{+5}$	$3.57x10^{+1}$
Ruthenium 106	$2.15x10^{+4}$	$9.16x10^{+3}$	$2.54x10^{+3}$	$1.84x10^{+4}$	$1.88x10^{+6}$	$1.49x10^{+2}$
Rhodium 106m	$2.15x10^{+4}$	$9.16x10^{+3}$	$2.54x10^{+3}$	$1.84x10^{+4}$	$1.88x10^{+6}$	$1.49x10^{+2}$
Tin 123	$4.27x10^{+2}$	$1.84x10^{+2}$	$2.71x10^{+1}$	$2.40x10^{+2}$	$5.84x10^{+4}$	$2.70x10^{+0}$
Antimony 125	$8.90x10^{+2}$	$3.81x10^{+2}$	$1.19x10^{+2}$	$9.12x10^{+2}$	$7.57x10^{+4}$	$6.51x10^{+0}$
Tellurium 125m	$2.12x10^{+2}$	$9.06x10^{+1}$	$2.87x10^{+1}$	$2.21x10^{+2}$	$1.81x10^{+4}$	$1.56x10^{+0}$
Tellurium 127m	$8.87x10^{+2}$	$3.82x10^{+2}$	$5.57x10^{+1}$	$4.42x10^{+2}$	$6.97x10^{+4}$	$5.39x10^{+0}$
Tellurium 129m	$1.89x10^{+2}$	$7.98x10^{+1}$	$2.31x10^{+1}$	$2.30x10^{+1}$	$1.59x10^{+4}$	$6.73x10^{-1}$
Cesium 134	$1.64x10^{+4}$	$4.00x10^{+3}$	$1.16x10^{+3}$	$3.54x10^{+4}$	$1.41x10^{+6}$	$6.12x10^{-1}$
Cesium-137	$2.06x10^{+4}$	$8.87x10^{+3}$	$3.19x10^{+3}$	$2.30x10^{+4}$	$1.74x10^{+6}$	$1.56x10^{+2}$
Cerium 141	$5.74x10^{+3}$	$2.44x10^{+3}$	$6.97x10^{+2}$	$6.65x10^{+3}$	$5.59x10^{+5}$	$2.03x10^{+1}$
Cerium 144	$3.12x10^{+5}$	$1.35x10^{+5}$	$2.55x10^{+4}$	$2.54x10^{+5}$	$2.49x10^{+7}$	$2.18x10^{+3}$
Praseodymium 144	$3.12x10^{+5}$	$1.35x10^{+5}$	$2.55x10^{+4}$	$2.54x10^{+5}$	$2.49x10^{+7}$	$2.18x10^{+3}$
Promethium 147	$4.83x10^{+4}$	$2.46x10^{+4}$	$7.02x10^{+3}$	$2.98x10^{+4}$	$3.70x10^{+6}$	$5.14x10^{+2}$
Promethium 148m	$7.56x10^{+1}$	$2.92x10^{+1}$	$4.68x10^{+1}$	$1.40x10^{+0}$	$7.13x10^{+3}$	$2.43x10^{-2}$
Europium 154	$6.20x10^{+2}$	$1.63x10^{+2}$	$4.18x10^{+1}$	$1.35x10^{+3}$	$6.24x10^{+4}$	$7.90x10^{-2}$
Europium 155	$1.30x10^{+2}$	$4.56x10^{+1}$	$2.27x10^{+1}$	$2.45x10^{+2}$	$1.29x10^{+4}$	$3.35x10^{+0}$
Uranium 234	$9.14x10^{-4}$	$3.74x10^{-4}$	$1.81x10^{-4}$	$1.57x10^{-3}$	~ 0	$6.81x10^{-6}$
Uranium 235	$1.38x10^{-2}$	$1.09x10^{-2}$	$7.91x10^{-3}$	$6.06x10^{-3}$	~ 0	$3.98x10^{-3}$
Uranium 238	$3.41x10^{-4}$	$2.06x10^{-4}$	$6.51x10^{-3}$	$2.67x10^{-5}$	~ 0	$7.22x10^{-5}$
Plutonium 238	$6.42x10^{+1}$	$1.03x10^{+1}$	$3.03x10^{+0}$	$2.70x10^{+2}$	$8.48x10^{+3}$	$1.60x10^{-4}$
Plutonium 239	$1.84x10^{+0}$	$8.89x10^{-2}$	$5.50x10^{-1}$	$3.32x10^{-1}$	$4.05x10^{+2}$	$2.95x10^{-2}$
Plutonium 240	$1.20x10^{+0}$	$4.21x10^{-1}$	$2.09x10^{+0}$	$2.42x10^{-1}$	$3.26x10^{+2}$	$6.85x10^{-4}$
Plutonium 241	$2.84x10^{+2}$	$6.77x10^{+1}$	$2.13x10^{+2}$	$7.09x10^{+1}$	$7.84x10^{+4}$	$7.09x10^{-3}$
Americium 241	$3.96x10^{-1}$	$9.67x10^{-2}$	$4.07x10^{-1}$	$1.24x10^{-1}$	$9.84x10^{+1}$	$1.16x10^{-5}$
Americium 242m	$1.05x10^{-3}$	$1.55x10^{-4}$	$9.00x10^{-3}$	$6.00x10^{-4}$	$6.70x10^{-1}$	$2.13x10^{-10}$
Americium 243	$4.33x10^{-3}$	$3.76x10^{-3}$	$4.38x10^{-4}$	$3.51x10^{-3}$	$1.44x10^{+1}$	$1.47x10^{-10}$
Curium 244	$1.33x10^{+0}$	$9.26x10^{-3}$	$7.14x10^{-3}$	$2.70x10^{-1}$	$1.22x10^{+2}$	$1.63x10^{-10}$
Curium 242	$1.75x10^{+0}$	$1.27x10^{-1}$	$5.25x10^{+0}$	$1.03x10^{+0}$	$9.91x10^{+2}$	$6.86x10^{-8}$

E.6.2 Shipment External Dose Rates

The dose and corresponding risk to populations and MEIs during incident-free transportation conditions are directly proportional to the assumed shipment external dose rate. The Federal regulations for maximum allowable external dose rates for exclusive-use shipments were presented in Section E.3.

The actual shipment dose rate is a complex function of the composition and configuration of shielding and containment materials used in the cask, the geometry of the loaded shipments, and characteristics of the spent nuclear fuel itself. Based on actual measurements of the dose rate outside real shipping casks, a realistic dose rate of 1 mrem per hr at a distance of 2 m (6.6 ft) was estimated, as described in Appendix F.

However, since individual casks would be expected to exceed this average value, the analysis assumes that all casks would be at the regulatory limits of 10 mrem per hr at 2 m (6.6 ft). In practice, external dose rates would vary from spent nuclear fuel type to spent nuclear fuel type and from shipment to shipment.

E.6.3 Accident Involvement Rates

For the calculation of accident risks, vehicle accident and fatality rates are taken from data provided in other reports (Saricks and Kvitek, 1994). For each transport mode, accident rates are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel of that mode in that same year. Therefore, the rate is a fractional value, with accident-involvement count as the numerator of the fraction and vehicular activity (total travel distance) as its denominator. Accident rates are generally determined for a multi-year period. For assessment purposes, the total number of expected accidents or fatalities is calculated by multiplying the total shipment distance for a specific case by the appropriate accident or fatality rate.

For truck transportation, the rates presented are specifically for heavy combination trucks involved in interstate commerce (Saricks and Kvitek, 1994). Heavy combination trucks are rigs composed of a separable tractor unit containing the engine and one to three freight trailers connected to each other. Heavy combination trucks are typically used for radioactive waste shipments. The truck accident rates are computed for each State based on statistics compiled by the Department of Transportation Office of Motor Carriers for 1986–1988. Saricks and Kvitek present accident involvement and fatality counts; estimated kilometers of travel by State; and the corresponding average accident involvement, fatality, and injury rates for the 3 years investigated. Fatalities are deaths (including crew members) that are attributable to the accident or that occurred at any time within 30 days thereafter.

Rail accident rates are computed and presented similarly to truck accident rates; however, the unit of haulage is considered to be the railcar (Saricks and Kvitek, 1994). The State-specific rail accident involvement and fatality rates are based on statistics compiled by the Federal Railroad Administration for 1985–1988. Rail accident rates include both main line accidents and those occurring in railyards. It is important to note that the accident rates used in this assessment were computed using the universe of all interstate heavy combination truck shipments, independent of shipment cargo. The cited report points out that shippers and carriers of radioactive material generally have a higher-than-average awareness of transport risk and prepare cargoes and drivers for such shipments accordingly (Saricks and Kvitek, 1994). This preparation should have a twofold effect of reducing component/equipment failure and mitigating the human error contribution to accident causation. These effects were not given credit in the accident assessment.

The modal study (Fischer et al., 1987) was the result of an initiative taken by the NRC to refine more precisely the analysis presented in NUREG-0170 (NRC, 1977a) for spent nuclear fuel shipping casks. Whereas the NUREG-0170 analysis was primarily performed using best engineering judgments and presumptions concerning cask response, the modal study relies on sophisticated structural and thermal engineering analysis and a probabilistic assessment of the conditions that could be experienced in severe transportation accidents. The modal study results are based on representative spent nuclear fuel casks that were assumed to have been designed, manufactured, operated, and maintained in accordance with national codes and standards. Design parameters of the representative casks were chosen to meet the minimum test criteria specified in 10 CFR Part 71. The study is believed to provide realistic, yet conservative, results for radiological releases under transport accident conditions.

In the modal study, potential accident damage to a cask is categorized according to the magnitude of the mechanical forces (impact) and thermal forces (fire) to which a cask may be subjected during an accident. Because all accidents can be described in these terms, severity is independent of the specific accident sequence. In other words, any sequence of events that results in an accident in which a cask is subjected to forces within a certain range of values is assigned to the accident severity category associated with that range. The accident severity scheme is designed to take into account all potential foreseeable transportation accidents, including accidents with low probability but high consequences and those with high probability but low consequences.

Each severity category actually represents a set of accidents defined by a combination of mechanical and thermal forces. A conditional probability of occurrence—that is, the probability that if an accident occurs, it is of a particular severity—is assigned to each category. The cask response regions and the fractional occurrences by accident severity category are shown in Figure E-14 for truck and rail accidents. Accidents in Region (1,1) are the least severe but most frequent, whereas accidents in Region (4,5) are very severe but very infrequent. To determine the expected frequency of an accident of a given severity, the conditional probability in the category is multiplied by the baseline accident rate. The entire spectrum of accident severities is considered in the accident risk assessment.

As discussed above, the accident consequence assessment only considers the potential impacts from the most severe transportation accidents. In terms of risk, the severity of an accident must be viewed in terms of potential radiological consequences, which are directly proportional to the fraction of the radioactive material within a cask that is released to the environment during the accident. In terms of the modal study accident characterization scheme (Figure E-15), the most severe transportation accidents correspond to those in Regions (4,1), (4,2), (4,3), (4,4), (4,5), (3,5), (2,5), and (1,5). Although these regions span the entire range of mechanical and thermal accident loads considered in the modal study, they are characterized by a single set of release fractions and are therefore considered together in the accident consequence assessment.

The conditional probability of the most severe accidents (i.e., the probability that an accident is of maximum severity, assuming that one has occurred) is found by summing the modal study conditional probabilities for the eight individual accident regions listed above. The resultant overall conditional probability is found to be 0.00000984 for truck transportation and 0.000124 for rail transportation. The stated probabilities encompass the entire spectrum of severe accidents, although over 97 percent of the severe truck accidents and nearly 100 percent of the severe rail accidents actually occur in Region (1,5), which is characterized by high thermal stresses and moderate mechanical stresses.

Structural Response (Maximum Strain on Inner Shell, %)

	R (4,1)	R (4,2)	R (4,3)	R (4,4)	R (4,5)
S_3 (30)					
	R (3,1)	R (3,2)	R (3,3)	R (3,4)	R (3,5)
S_2 (2)					
	R (2,1)	R (2,2)	R (2,3)	R (2,4)	R (2,5)
S_1 (0.2)					
	R (1,1)	R (1,2)	R (1,3)	R (1,4)	R (1,5)
	T_1 (500)	T_2 (600)	T_3 (650)	T_4 (1050)	

Thermal Response (Lead Mid-Thickness Temperature, °F)

Figure E-14 Matrix of Cask Response Regions for Combined Mechanical and Thermal Loads

Legend:

(P_t) = Probability of occurrence assuming a truck accident occurs.
(P_r) = Probability of occurrence assuming a rail accident occurs.

Structural Response (maximum strain on inner shell, %)

	R(4,1) $(P_t)1.532 \times 10^{-7}$ $(P_r)1.786 \times 10^{-9}$	R(4,2) 3.926×10^{-14} 3.290×10^{-13}	R(4,3) 1.495×10^{-14} 2.137×10^{-13}	R(4,4) 7.681×10^{-16} 1.644×10^{-13}	R(4,5) $<1 \times 10^{-16}$ 3.459×10^{-14}
S_3 (30)					
	R(3,1) $(P_t)1.7984 \times 10^{-3}$ $(P_r)5.545 \times 10^{-4}$	R(3,2) 1.574×10^{-7} 1.021×10^{-7}	R(3,3) 2.034×10^{-7} 6.634×10^{-8}	R(3,4) 1.076×10^{-7} 5.162×10^{-8}	R(3,5) 4.873×10^{-8} 6.296×10^{-8}
S_2 (2)					
	R(2,1) $(P_t)3.8192 \times 10^{-3}$ $(P_r)2.7204 \times 10^{-3}$	R(2,2) 2.330×10^{-7} 5.011×10^{-7}	R(2,3) 3.008×10^{-7} 3.255×10^{-7}	R(2,4) 1.592×10^{-7} 2.531×10^{-7}	R(2,5) 7.201×10^{-8} 1.075×10^{-8}
S_1 (0.2)					
	R(1,1) $(P_t)0.994316$ $(P_r)0.993962$	R(1,2) 1.687×10^{-6} 1.2275×10^{-3}	R(1,3) 2.362×10^{-5} 7.9511×10^{-4}	R(1,4) 1.525×10^{-6} 6.140×10^{-4}	R(1,5) 9.570×10^{-6} 1.249×10^{-4}
	T_1 (500)	T_2 (600)	T_3 (650)	T_4 (1050)	

Thermal Response (lead midthickness temperature, °F)

Figure E-15 Fraction of Truck and Rail Accidents Expected within Each Severity Category, Assuming an Accident Occurs

E.6.4.2 Cask Release Fractions

Radiological consequences are calculated by assigning cask release fractions to each accident severity category. The release fraction is defined as the fraction of the radioactive material in a cask that could be released from the package in a given severity of accident. Release fractions take into account all mechanisms necessary to create a release of radioactive material from a damaged cask to the environment. Release fractions vary according to the spent nuclear fuel type and the physical and chemical characteristics of specific radionuclides within the spent nuclear fuel. For instance, most solid radionuclides are difficult to release in particulate form and are therefore relatively nondispersible. Conversely, gaseous radionuclides are relatively easy to release in the unlikely event that the cask and spent nuclear fuel elements are compromised in an accident.

Cask release fractions are given in Table E-6. Two sets of release fractions were used in the assessment depending on the spent nuclear fuel type, consistent with the SNF&INEL Final EIS (DOE, 1995). Release fractions developed for MTR spent nuclear fuel were used for aluminum-clad fuels including BR-2, RHF, and NRU spent nuclear fuel; Release fractions for TRIGA were used for the PRR-1 spent nuclear fuel.

Table E-6 Release Fractions Spent Nuclear Fuel

Cask Response Region	*Release Fractions*[a]				
	Inert Gas	*Iodine*	*Cesium*	*Ruthenium*	*Particulate*
TRIGA Fuel:					
R(1,1)	0.0	0.0	0.0	0.0	0.0
R(1,2), R(1,3)	0.0099	0.000075	0.000006	$8.1\text{x}10^{-7}$	$6.0\text{x}10^{-8}$
R(2,1), R(2,2), R(2,3)	0.03	0.00025	0.00002	0.0000027	$2.0\text{x}10^{-7}$
R(1,4), R(2,4), R(3,4)	0.39	0.0043	0.0002	0.000048	0.000002
R(3,1), R(3,2), R(3,3)	0.33	0.0025	0.0002	0.000027	0.000002
R(1,5), R(2,5), R(3,5), R(4,5), R(4,1),					

NUREG-0170 Severity Category	Release Fraction
1	0
2	0
3	0.01
4	0.1
5	1
6	1

Source: NRC, 1977a

The values indicate that in the most severe accidents, 100 percent of the material is released from the cask; a highly conservative assumption for most solid waste forms, and somewhat conservative for a powder or cake-like material. The accident assessment also utilizes the fraction of the release that is aerosolized and the fraction of the aerosol that is respirable. The values for high-level waste and target material (assumed to behave as a loose powdered material) were taken from the recommendations provided in RADTRAN 4. These values are shown below:

Physical Waste Form	Aerosolized Fraction	Respirable Fraction
Vitrified wastes	0.000001	0.05
Chunks (i.e., calcinated target material)	0.01	0.05
Loose powders (i.e., oxidized target material)	0.1	0.05

Source: Neuhauser and Kanipe, 1993

Therefore, the maximum total respirable release fraction for the most severe accidents is 5×10^{-8} for high-level waste shipments and 0.005 for shipments of target material. The values shown above have been used in the accident calculations for shipments of target material and vitrified material for the foreign research reactor spent nuclear fuel EIS.

E.6.5 Atmospheric Conditions

Radioactive material released to the atmosphere is transported by the wind. The amount of dispersion, or dilution, of the radioactive material concentrations in the air depends on the meteorological conditions at the time of the accident. Because it is impossible to predict the specific location of an overland transportation accident, generic atmospheric conditions were selected for the accident risk and consequence assessments.

For the accident risk assessment, neutral weather conditions (Pasquill Stability Class D with a wind speed of 4 m per sec or 9 mph) were assumed. Since neutral meteorological conditions are the most frequently occurring atmospheric stability condition in the United States

For the accident consequence assessment, doses were assessed under both neutral (Pasquill Stability Class D with a wind speed of 4 m per sec or 9 mph) and stable (Pasquill Stability Class F with a wind speed of 1 m per sec or 2.4 mph) atmospheric conditions. The results calculated for neutral conditions represent the most likely consequences, and the results for stable conditions represent a "worst-case" weather situation.

E.6.6 Health Risk Conversion Factors

The health risk conversion factors used to estimate expected cancer fatalities were taken from International Commission on Radiation Protection Publication 60 (ICRP, 1991): 0.0005 and 0.0004 fatal cancer cases per person-rem for members of the public and workers, respectively. Cancer fatalities and incidence occur over the lifetimes of the exposed populations, and thus are called LCF.

E.6.7 Maximally Exposed Individual Exposure Scenarios

The risk to MEIs has been estimated for a number of hypothetical exposure scenarios during overland transportation using the RISKIND code. The receptors include crew members, departure inspectors, and members of the public exposed during traffic obstructions (traffic jam), while working at a service station, or by living near a port of entry or management site. The dose and risk to MEIs were calculated for given distances and durations of exposure. The distances and durations of exposure for each receptor are similar to those given in previous transportation assessments (DOE, 1987b; DOE, 1995), and are believed to be realistic but conservative. The exposure scenarios considered are the following:

- Crew Members: Truck and rail crew members are not assumed to be occupational radiation workers. Dose estimates are based on realistic locations and estimated travel time, and no credit is taken for shielding in addition to the cask.

- Inspectors (truck and rail): Inspectors are assumed to be either Federal or State vehicle inspectors, and are not assumed to be monitored by a dosimetry program. An average exposure distance of 3 m (10 ft) and an exposure time of 30 minutes (min) is assumed.

- Rail Yard Crew Member: A rail yard crew member is not assumed to be monitored by a dosimetry program. An average exposure distance of 10 m (33 ft) and an exposure time of 2 hr is assumed.

- Resident (truck and rail): A resident is assumed to live 30 m (100 ft) from a port or management site entrance route (truck or rail). Shipments are assumed to pass at a velocity of 24 km per hr (15 mph), and the resident is assumed to be exposed unshielded (i.e., no shielding in addition to the cask, such as that afforded by a structure.) Cumulative doses are assessed for each alternative based on the number of shipments entering or exiting the site and assuming the resident is present for 100 percent of the shipments.

- Person in Traffic Obstruction (truck and rail): A person is assumed to be stopped next to a spent nuclear fuel shipment (due to traffic, etc.). The person is assumed to be exposed (no credit is taken for radiation blocked by the individual's vehicle) at a distance of 1 m (3.3 ft) for a duration of 30 min.

- Person at a Truck Service Station: A person is assumed to be exposed at an average distance of 20 m (66 ft) for a duration of 2 hr. This receptor could be a worker at a truck stop, or a member of the public stopped at the same location.

- Resident Near a Rail Stop: A resident is assumed to live near a rail classification yard. The resident is assumed to be exposed unshielded at a distance of 200 m (660 ft) for a duration of 20 hr.

The largest uncertainty in predicting the dose to MEIs during transportation involves determining the frequency of exposure occurrences. This difficulty results from the uncertainties in future shipment schedules, route selection, and the inherent uncertainty in predicting the frequency of random or chance events. For instance, it is conceivable that an individual could be stopped in traffic next to a shipment of foreign research reactor spent nuclear fuel; however, it is difficult to predict how often the same individual would experience this event. Therefore, for the majority of receptors considered, doses are assessed on a per-event basis. To account for possible multiple exposures, ranges of realistic total doses are discussed qualitatively. One exception is the calculation of the dose to a hypothetical resident living near a port of entry or management site entrance route. For these residents, total doses are calculated based on the number of shipments entering or exiting each site for each of the alternatives.

E.6.8 General RADTRAN Input Parameters

In addition to the specific parameters discussed above, values for a number of general parameters must be specified within the RADTRAN code. These general parameters define basic shipment and traffic characteristics and are specific to the mode of transportation. The RADTRAN code user's manual (Neuhauser and Kanipe, 1993) contains derivations and descriptions of these parameters. The general RADTRAN input parameters used in the transportation risk assessment are summarized in Table E-7.

Table E-7 Summary of General RADTRAN Input Parameters

Parameter	Truck	Rail
Package type	Type B Cask	Type B Cask
Package dimension	3.2 m (10.6 ft)	3.2 m (10.6 ft)
Number of crewmen	2	5
Distance from source to crew	3 m (9.9 ft)	152 m (501.6 ft)
Velocity		
Rural	88 km/hr (55 mph)	64 km/hr (40 mph)
Suburban	40 km/hr (25 mph)	40 km/hr (25 mph)
Urban	24 km/hr (15 mph)	24 km/hr (15 mph)
Stop time per kilometer	0.011 hr/km (0.018 hr/mi)	0.033 hr/km (0.053 hr/mi)
Number of people exposed while stopped	50	Based on Suburban Population Density
Number of people per vehicle sharing route	2	3
Population densities (persons/km^2)	Route Specific (see Table E-4)	Route Specific (see Table E-4)
One-way traffic count (vehicles/hr)		
Rural	470	1
Suburban	780	5
Urban	2,800	5
Cask inventory (Ci)	(see Table E-5)	(see Table E-5)
Accident release fractions	(see Table E-6)	(see Table E-6)
Accident conditional probabilities	(see Figure E-15)	(see Figure E-15)

Source: Neuhauser and Kanipe, 1993.

E.7 Risk Assessment Results

In this section, the risk assessment results are presented for the ports of entry and management sites being considered. The collective population risk results are presented in Section E.7.1. First, the per-shipment risks results are presented in Section E.7.1.1. Then, in Section E.7.1.2, the results are analyzed, evaluated, and simplified so the different program alternatives and options can be evaluated in Section E.7.2.

The risks to MEIs during incident-free transportation conditions are provided in Section E.7.3. The accident consequence results calculated for the most severe transportation accidents are presented in Section E.7.4 for both collective populations and MEIs.

E.7.1 Collective Population Risk Results

E.7.1.1 Per-Shipment Risk Factors

Per-shipment risk factors have been calculated for the collective populations of exposed persons for shipments between all representative ports of entry and the five management sites. Results were calculated for both truck and rail modes, assuming that one cask would be shipped per truck or rail car. Additionally, the risk factors for the ports of Elizabeth, NJ; Philadelphia, PA; and Long Beach, CA are included to show the effect of using high population ports. Risk factors are included for some site-to-site routes, even though there are no shipments anticipated on these routes.

The radiological risks are presented in terms of dose per shipment for each unique route. The doses can be converted to health risks using the International Commission on Radiological Protection Publication 60 conversion factors described in Section E.6.6 (ICRP, 1991). The radiological dose per shipment factors for incident-free transportation conditions are presented in Table E-8 for crew members and members of the general public. The tabulated incident-free doses are based on the external dose rate which is conservatively assumed to be at the regulatory limit of 10 mrem per hr at 2 m. The radiological dose risk factors for accident transportation conditions are presented in Table E-9. The accident risk factors are referred to as "dose risk" because the values incorporate the spectrum of accident severity probabilities and the associated release fractions.

Table E-8 Incident-Free Dose per Shipment for All Spent Nuclear Fuel Types (Person-Rem/Shipment)[a]

Shipments to Hanford Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	$2.50x10^{-1}$	$9.26x10^{-3}$	$3.96x10^{-2}$	$5.92x10^{-1}$	$6.41x10^{-1}$
	Rail	$6.33x10^{-2}$	$2.91x10^{-2}$	$1.13x10^{-3}$	$1.70x10^{-2}$	$4.73x10^{-2}$
Charleston, SC (Wando Terminal)	Truck	$2.51x10^{-1}$	$9.61x10^{-3}$	$4.03x10^{-2}$	$5.95x10^{-1}$	$6.45x10^{-1}$
	Rail	$6.33x10^{-2}$	$2.91x10^{-2}$	$1.13x10^{-3}$	$1.70x10^{-2}$	$4.73x10^{-2}$
Elizabeth, NJ	Truck	$2.49x10^{-1}$	$9.96x10^{-3}$	$4.10x10^{-2}$	$5.82x10^{-1}$	$6.33x10^{-1}$
	Rail	$6.24x10^{-2}$	$6.03x10^{-2}$	$1.66x10^{-3}$	$1.68x10^{-2}$	$7.88x10^{-2}$
Galveston, TX	Truck	$2.05x10^{-1}$	$1.00x10^{-2}$	$3.77x10^{-2}$	$4.82x10^{-1}$	$5.30x10^{-1}$
	Rail	$5.20x10^{-2}$	$1.31x10^{-2}$	$6.59x10^{-4}$	$1.51x10^{-2}$	$2.88x10^{-2}$
Jacksonville, FL	Truck	$2.60x10^{-1}$	$1.09x10^{-2}$	$4.35x10^{-2}$	$6.05x10^{-1}$	$6.60x10^{-1}$
	Rail	$6.35x10^{-2}$	$2.58x10^{-2}$	$1.08x10^{-3}$	$1.65x10^{-2}$	$4.34x10^{-2}$
Newport News, VA	Truck	$2.57x10^{-1}$	$1.16x10^{-2}$	$4.44x10^{-2}$	$6.02x10^{-1}$	$6.58x10^{-1}$
	Rail	$6.38x10^{-2}$	$4.02x10^{-2}$	$1.25x10^{-3}$	$1.59x10^{-2}$	$5.73x10^{-2}$

Shipments to Hanford Site:						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
Norfolk, VA	Truck	2.62×10^{-1}	1.19×10^{-2}	4.50×10^{-2}	6.10×10^{-1}	6.67×10^{-1}
	Rail	6.54×10^{-2}	4.10×10^{-2}	1.28×10^{-3}	1.67×10^{-2}	5.90×10^{-2}
Philadelphia, PA	Truck	2.58×10^{-1}	1.06×10^{-2}	4.31×10^{-2}	5.94×10^{-1}	6.47×10^{-1}
	Rail	6.16×10^{-2}	5.90×10^{-2}	1.58×10^{-3}	1.68×10^{-2}	7.74×10^{-2}
Portsmouth, VA	Truck	2.61×10^{-1}	1.24×10^{-2}	4.60×10^{-2}	6.07×10^{-1}	6.65×10^{-1}
	Rail	6.49×10^{-2}	3.99×10^{-2}	1.25×10^{-3}	1.64×10^{-2}	5.76×10^{-2}
Savannah, GA	Truck	2.48×10^{-1}	1.03×10^{-2}	4.13×10^{-2}	5.82×10^{-1}	6.34×10^{-1}
	Rail	6.38×10^{-2}	2.48×10^{-2}	1.08×10^{-3}	1.66×10^{-2}	4.24×10^{-2}
MOTSU, NC	Truck	2.50×10^{-1}	9.26×10^{-3}	4.00×10^{-2}	5.94×10^{-1}	6.43×10^{-1}
	Rail	6.57×10^{-2}	2.85×10^{-2}	1.20×10^{-3}	1.71×10^{-2}	4.68×10^{-2}
Wilmington, NC	Truck	2.59×10^{-1}	9.34×10^{-3}	4.07×10^{-2}	6.13×10^{-1}	6.63×10^{-1}
	Rail	6.56×10^{-2}	2.84×10^{-2}	1.19×10^{-3}	1.71×10^{-2}	4.67×10^{-2}
From Western Ports						
NWS Concord, CA	Truck	8.06×10^{-2}	4.55×10^{-3}	1.55×10^{-2}	1.77×10^{-1}	1.97×10^{-1}
	Rail	2.77×10^{-2}	1.88×10^{-2}	4.83×10^{-4}	8.77×10^{-3}	2.81×10^{-2}
Long Beach, CA	Truck	1.19×10^{-1}	1.13×10^{-2}	2.98×10^{-2}	2.57×10^{-1}	2.98×10^{-1}

Shipments to Idaho National Engineering Laboratory:

Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Norfolk, VA	Truck	2.28×10^{-1}	1.08×10^{-2}	3.93×10^{-2}	5.24×10^{-1}	5.74×10^{-1}
	Rail	5.62×10^{-2}	3.87×10^{-2}	1.16×10^{-3}	1.43×10^{-2}	5.42×10^{-2}
Philadelphia, PA	Truck	2.24×10^{-1}	9.71×10^{-3}	3.80×10^{-2}	5.08×10^{-1}	5.55×10^{-1}
	Rail	5.24×10^{-2}	5.67×10^{-2}	1.46×10^{-3}	1.44×10^{-2}	7.25×10^{-2}
Portsmouth, VA	Truck	2.27×10^{-1}	1.15×10^{-2}	4.09×10^{-2}	5.20×10^{-1}	5.73×10^{-1}
	Rail	5.57×10^{-2}	3.76×10^{-2}	1.13×10^{-3}	1.40×10^{-2}	5.27×10^{-2}
Savannah, GA	Truck	2.15×10^{-1}	9.41×10^{-3}	3.62×10^{-2}	4.96×10^{-1}	5.42×10^{-1}
	Rail	5.46×10^{-2}	2.25×10^{-2}	9.53×10^{-4}	1.41×10^{-2}	3.75×10^{-2}
MOTSU, NC	Truck	2.11×10^{-1}	7.80×10^{-3}	3.35×10^{-2}	4.98×10^{-1}	5.40×10^{-1}
	Rail	5.65×10^{-2}	2.62×10^{-2}	1.07×10^{-3}	1.47×10^{-2}	4.20×10^{-2}
Wilmington, NC	Truck	2.25×10^{-1}	8.50×10^{-3}	3.56×10^{-2}	5.27×10^{-1}	5.71×10^{-1}
	Rail	5.63×10^{-2}	2.61×10^{-2}	1.07×10^{-3}	1.47×10^{-2}	4.19×10^{-2}
From Western Ports						
NWS Concord, CA	Truck	8.40×10^{-2}	4.84×10^{-3}	1.72×10^{-2}	1.95×10^{-1}	2.17×10^{-1}
	Rail	2.71×10^{-2}	8.71×10^{-3}	2.96×10^{-4}	7.88×10^{-3}	1.69×10^{-2}
Long Beach, CA	Truck	9.93×10^{-2}	1.28×10^{-2}	3.06×10^{-2}	2.03×10^{-1}	2.46×10^{-1}
	Rail	2.92×10^{-2}	3.48×10^{-2}	5.92×10^{-4}	1.20×10^{-2}	4.74×10^{-2}
Portland, OR	Truck	6.27×10^{-2}	2.46×10^{-3}	1.06×10^{-2}	1.53×10^{-1}	1.66×10^{-1}
	Rail	2.49×10^{-2}	5.01×10^{-3}	2.01×10^{-4}	7.23×10^{-3}	1.24×10^{-2}
Tacoma, WA	Truck	7.04×10^{-2}	2.71×10^{-3}	1.19×10^{-2}	1.69×10^{-1}	1.83×10^{-1}
	Rail	2.74×10^{-2}	8.57×10^{-3}	3.04×10^{-4}	7.71×10^{-3}	1.66×10^{-2}
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	2.16×10^{-1}	9.64×10^{-3}	3.72×10^{-2}	4.87×10^{-1}	5.34×10^{-1}
	Rail	5.10×10^{-2}	4.87×10^{-2}	1.28×10^{-3}	1.41×10^{-2}	6.40×10^{-2}
Hanford Site	Truck	4.92×10^{-1}	1.42×10^{-2}	7.63×10^{-2}	1.24×10^{-1}	1.33×10^{-1}
	Rail	2.28×10^{-1}	3.88×10^{-2}	1.76×10^{-3}	7.64×10^{-2}	1.17×10^{-2}
Nevada Test Site	Truck	6.56×10^{-1}	4.52×10^{-2}	1.40×10^{-1}	1.47×10^{-1}	1.66×10^{-1}
	Rail	2.44×10^{-1}	3.95×10^{-2}	1.84×10^{-3}	8.29×10^{-2}	1.24×10^{-2}
Oak Ridge Reservation	Truck	1.76×10^{-1}	6.45×10^{-1}	2.80×10^{-1}	4.24×10^{-1}	4.58×10^{-1}
	Rail	4.63×10^{-1}	1.41×10^{-1}	5.69×10^{-3}	1.33×10^{-1}	2.80×10^{-2}
Savannah River	Truck	2.08×10^{-1}	9.34×10^{-2}	3.50×10^{-1}	4.79×10^{-1}	5.23×10^{-1}
	Rail	5.23×10^{-1}	2.51×10^{-1}	9.56×10^{-3}	1.41×10^{-1}	4.02×10^{-2}
Sweetgrass, MT	Truck	4.25×10^{-1}	6.45×10^{-3}	5.67×10^{-2}	1.12×10^{-1}	1.19×10^{-1}
	Rail	3.24×10^{-1}	5.37×10^{-2}	2.84×10^{-3}	9.14×10^{-2}	1.48×10^{-2}

Shipments to Nevada Test Site:

Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Charleston, SC (NWS)	Truck	2.25×10^{-1}	9.15×10^{-3}	3.69×10^{-2}	5.27×10^{-1}	5.73×10^{-1}
	Rail	6.13×10^{-2}	2.95×10^{-2}	1.11×10^{-3}	1.69×10^{-2}	4.75×10^{-2}
Charleston, SC (Wando Terminal)	Truck	2.27×10^{-1}	9.50×10^{-3}	3.76×10^{-2}	5.30×10^{-1}	5.77×10^{-1}
	Rail	6.13×10^{-2}	2.95×10^{-2}	1.11×10^{-3}	1.69×10^{-2}	4.75×10^{-2}
Elizabeth, NJ	Truck	2.48×10^{-1}	1.35×10^{-2}	4.60×10^{-2}	5.53×10^{-1}	6.13×10^{-1}
	Rail	6.05×10^{-2}	6.07×10^{-3}	1.63×10^{-3}	1.66×10^{-2}	7.8×10^{-2}
Jacksonville, FL	Truck	2.35×10^{-1}	1.10×10^{-2}	4.07×10^{-2}	5.40×10^{-1}	5.91×10^{-1}
	Rail	6.15×10^{-2}	2.61×10^{-2}	1.05×10^{-3}	1.64×10^{-2}	4.36×10^{-2}
Newport News, VA	Truck	2.33×10^{-1}	1.20×10^{-2}	4.23×10^{-2}	5.37×10^{-1}	5.92×10^{-1}
	Rail	6.18×10^{-2}	4.05×10^{-2}	1.22×10^{-3}	1.57×10^{-2}	5.75×10^{-2}

Shipments to Nevada Test Site:							
Route(s)		***Crew***	***General Public***			
			Off-Link	***On-Link***	***Stops***	***Total***
Norfolk, VA	Truck	$2.73x10^{-1}$	$1.19x10^{-2}$	$4.23x10^{-2}$	$5.45x10^{-1}$	$5.99x10^{-1}$
	Rail	$6.35x10^{-2}$	$4.14x10^{-2}$	$1.2 x10^{-3}$	$1.66x10^{-2}$	$5.92x10^{-2}$
Philadelphia, PA	Truck	$2.44x10^{-1}$	$1.30x10^{-2}$	$4.49x10^{-2}$	$5.43x10^{-1}$	$6.01x10^{-1}$
	Rail	$5.97x10^{-2}$	$5.94x10^{-2}$	$1.56x10^{-3}$	$1.66x10^{-2}$	$7.75x10^{-2}$
Portsmouth, VA	Truck	$2.36x10^{-1}$	$1.27x10^{-2}$	$4.39x10^{-2}$	$5.42x10^{-1}$	$5.98x10^{-1}$
	Rail	$6.30x10^{-2}$	$4.3x10^{-2}$	$1.23x10^{-3}$	$1.63x10^{-2}$	$5.78x10^{-2}$
Savannah, GA	Truck	$2.24x10^{-1}$	$1.06x10^{-2}$	$3.92x10^{-2}$	$5.18x10^{-1}$	$5.67x10^{-1}$
	Rail	$6.19x10^{-2}$	$2.51x10^{-2}$	$1.05x10^{-3}$	$1.64x10^{-2}$	$4.26x10^{-2}$
MOTSU, NC	Truck	$2.22x10^{-1}$	$1.06x10^{-2}$	$3.95x10^{-2}$	$5.09x10^{-1}$	$5.59x10^{-1}$
	Rail	$6.38x10^{-2}$	$2.89x10^{-2}$	$1.17x10^{-3}$	$1.70x10^{-2}$	$4.70x10^{-2}$
Wilmington, NC	Truck	$2.35x10^{-1}$	$9.67x10^{-3}$	$3.86x10^{-2}$	$5.49x10^{-1}$	$5.97x10^{-1}$
	Rail	$6.36x10^{-2}$	$2.88x10^{-2}$	$1.16x10^{-3}$	$1.70x10^{-2}$	$4.69x10^{-2}$
From Western Ports						
NWS Concord, CA	Truck	$6.88x10^{-2}$	$8.04x10^{-3}$	$1.99x10^{-2}$	$1.47x10^{-1}$	$1.75x10^{-1}$
	Rail	$2.60x10^{-2}$	$1.83x10^{-2}$	$4.73x10^{-4}$	$8.17x10^{-3}$	$2.70x10^{-2}$
Long Beach, CA	Truck	$4.63x10^{-2}$	$9.79x10^{-3}$	$2.04x10^{-2}$	$8.30x10^{-2}$	$1.13x10^{-1}$
	Rail	$1.98x10^{-2}$	$3.09x10^{-2}$	$4.37x10^{-4}$	$9.63x10^{-3}$	$4.10x10^{-2}$
Portland, OR	Truck	$1.13x10^{-1}$	$6.62x10^{-3}$	$2.28x10^{-2}$	$2.63x10^{-1}$	$2.92x10^{-1}$
	Rail	$3.58x10^{-2}$	$7.38x10^{-3}$	$3.33x10^{-1}$	$1.10x10^{-2}$	$1.87x10^{-2}$
Tacoma, WA	Truck	$1.20x10^{-1}$	$6.66x10^{-3}$	$2.34x10^{-2}$	$2.78x10^{-1}$	$3.08x10^{-1}$
	Rail	$3.83x10^{-2}$	$1.09x10^{-2}$	$4.36x10^{-4}$	$1.11x10^{-2}$	$2.24x10^{-2}$
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	$2.39x10^{-1}$	$1.11x10^{-2}$	$4.21x10^{-2}$	$5.42x10^{-1}$	$5.95x10^{-1}$
	Rail	$5.83x10^{-2}$	$5.13x10^{-2}$	$1.37x10^{-3}$	$1.63x10^{-2}$	$6.90x10^{-2}$
Hanford Site	Truck	$9.91x10^{-2}$	$5.37x10^{-3}$	$1.92x10^{-2}$	$2.34x10^{-1}$	$2.58x10^{-1}$
	Rail	$3.36x10^{-2}$	$6.24x10^{-3}$	$3.08x10^{-1}$	$1.12x10^{-2}$	$1.77x10^{-2}$
Idaho National Engineering Laboratory	Truck	$6.56x10^{-2}$	$4.52x10^{-3}$	$1.40x10^{-2}$	$1.47x10^{-1}$	$1.66x10^{-1}$
	Rail	$2.44x10^{-2}$	$3.95x10^{-3}$	$1.84x10^{-1}$	$8.29x10^{-3}$	$1.24x10^{-2}$
Oak Ridge Reservation	Truck	$1.86x10^{-1}$	$7.6x10^{-3}$	$3.10x10^{-2}$	$4.45x10^{-1}$	$4.84x10^{-1}$
	Rail	$5.36x10^{-2}$	$1.68x10^{-2}$	$6.66x10^{-1}$	$1.63x10^{-2}$	$3.37x10^{-2}$
Savannah River	Truck	$2.17x10^{-1}$	$1.05x10^{-2}$	$3.80x10^{-2}$	$5.00x10^{-1}$	$5.48x10^{-1}$
	Rail	$5.96x10^{-2}$	$2.77x10^{-2}$	$1.05x10^{-3}$	$1.65x10^{-2}$	$4.53x10^{-2}$

Shipments to Oak Ridge Reservation:						
Route(s)		***Crew***	***General Public***			
			Off-Link	***On-Link***	***Stops***	***Total***
From Eastern Ports						
Charleston, SC (NWS)	Truck	$3.98x10^{-2}$	$1.73x10^{-3}$	$6.11x10^{-3}$	$8.32x10^{-2}$	$9.11x10^{-2}$
	Rail	$2.15x10^{-2}$	$6.88x10^{-3}$	$3.60x10^{-4}$	$5.33x10^{-3}$	$1.26x10^{-2}$
Charleston, SC (Wando Terminal)	Truck	$4.18x10^{-2}$	$2.09x10^{-3}$	$6.85x10^{-3}$	$8.63x10^{-2}$	$9.53x10^{-2}$
	Rail	$2.15x10^{-2}$	$6.88x10^{-3}$	$3.60x10^{-4}$	$5.33x10^{-3}$	$1.26x10^{-2}$
Elizabeth, NJ	Truck	$8.02x10^{-2}$	$4.85x10^{-3}$	$1.45x10^{-2}$	$1.53x10^{-1}$	$1.72x10^{-1}$
	Rail	$2.49x10^{-2}$	$4.30x10^{-2}$	$9.20x10^{-4}$	$7.73x10^{-3}$	$5.17x10^{-2}$
Galveston, TX	Truck	$9.53x10^{-2}$	$5.71x10^{-3}$	$1.73x10^{-2}$	$1.99x10^{-1}$	$2.22x10^{-1}$
	Rail	$2.94x10^{-2}$	$1.87x10^{-2}$	$6.28x10^{-4}$	$8.98x10^{-3}$	$2.83x10^{-2}$
Jacksonville, FL	Truck	$5.88x10^{-2}$	$2.88x10^{-3}$	$9.64x10^{-3}$	$1.17x10^{-1}$	$1.30x10^{-1}$
	Rail	$2.12x10^{-2}$	$8.80x10^{-3}$	$3.59x10^{-4}$	$6.51x10^{-3}$	$1.57x10^{-2}$
Newport News, VA	Truck	$5.68x10^{-2}$	$3.57x10^{-3}$	$1.09x10^{-2}$	$1.15x10^{-1}$	$1.29x10^{-1}$
	Rail	$2.45x10^{-2}$	$1.11x10^{-2}$	$5.45x10^{-4}$	$6.00x10^{-3}$	$1.77x10^{-2}$
Norfolk, VA	Truck	$5.63x10^{-2}$	$2.85x10^{-3}$	$9.27x10^{-3}$	$1.14x10^{-1}$	$1.26x10^{-1}$
	Rail	$2.33x10^{-2}$	$8.51x10^{-3}$	$4.56x10^{-4}$	$5.63x10^{-3}$	$1.46x10^{-2}$

Shipments to Oak Ridge Reservation:

Shipments to Hanford Site:		
Source/Route	***Truck***	***Rail***
Newport News, VA	$1.44x10^{-4}$	$3.28x10^{-5}$
Norfolk, VA	$1.47x10^{-4}$	$3.33x10^{-5}$
Philadelphia, PA	$1.31x10^{-4}$	$3.75x10^{-5}$
Portsmouth, VA	$1.49x10^{-4}$	$3.28x10^{-5}$
Savannah, GA	$1.65x10^{-4}$	$1.86x10^{-5}$
MOTSU, NC	$1.45x10^{-4}$	$2.14x10^{-5}$
Wilmington, NC	$1.51x10^{-4}$	$2.13x10^{-5}$
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	$6.54x10^{-5}$	$8.86x10^{-6}$
Charleston, SC (Wando Terminal)	$6.67x10^{-5}$	$8.86x10^{-6}$
Elizabeth, NJ	$5.59x10^{-5}$	$1.80x10^{-5}$
Galveston, TX	$4.12x10^{-5}$	$3.80x10^{-6}$
Jacksonville, FL	$7.39x10^{-5}$	$8.00x10^{-6}$
Newport News, VA	$6.21x10^{-5}$	$1.41x10^{-5}$
Norfolk, VA	$6.35x10^{-5}$	$1.43x10^{-5}$
Philadelphia, PA	$5.67x10^{-5}$	$1.61x10^{-5}$
Portsmouth, VA	$6.44x10^{-5}$	$1.41x10^{-5}$
Savannah, GA	$7.11x10^{-5}$	$8.03x10^{-6}$
MOTSU, NC	$6.28x10^{-5}$	$9.20x10^{-6}$
Wilmington, NC	$6.51x10^{-5}$	$9.15x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	$2.09x10^{-4}$	$2.86x10^{-5}$
Charleston, SC (Wando Terminal)	$2.13x10^{-4}$	$2.86x10^{-5}$
Elizabeth, NJ	$1.70x10^{-4}$	$5.82x10^{-5}$

Shipments to Hanford Site:		
Source/Route	**Truck**	**Rail**
Newport News, VA	$4.22x10^{-2}$	$1.62x10^{-2}$
Norfolk, VA	$4.27x10^{-2}$	$1.63x10^{-2}$
Philadelphia, PA	$7.31x10^{-2}$	$1.62x10^{-2}$
Portsmouth, VA	$4.25x10^{-2}$	$1.63x10^{-2}$
Savannah, GA	$4.01x10^{-2}$	$7.21x10^{-3}$
MOTSU, NC	$4.35x10^{-2}$	$7.41x10^{-3}$
Wilmington, NC	$4.07x10^{-2}$	$7.40x10^{-3}$
Galveston, TX	$2.25x10^{-2}$	$2.16x10^{-3}$
Oxidized Target Material		
Charleston, SC (NWS)	$9.91x10^{-2}$	$1.80x10^{-2}$
Charleston, SC (Wando Terminal)	$9.95x10^{-2}$	$1.80x10^{-2}$
Elizabeth, NJ	$1.68x10^{-1}$	$4.14x10^{-2}$
Jacksonville, FL	$1.02x10^{-1}$	$1.79x10^{-2}$
Newport News, VA	$1.05x10^{-1}$	$4.06x10^{-2}$
Norfolk, VA	$1.07x10^{-1}$	$4.09x10^{-2}$
Philadelphia, PA	$1.83x10^{-1}$	$4.06x10^{-2}$
Portsmouth, VA	$1.06x10^{-1}$	$4.08x10^{-2}$
Savannah, GA	$1.00x10^{-1}$	$1.80x10^{-2}$
MOTSU, NC	$1.09x10^{-1}$	$1.85x10^{-2}$
Wilmington, NC	$1.02x10^{-1}$	$1.85x10^{-2}$
Galveston, TX	$5.62x10^{-2}$	$5.40x10^{-3}$
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS, Concord CA	$4.46x10^{-5}$	$1.50x10^{-5}$
Long Beach, CA	$7.36x10^{-5}$	$1.59x10^{-5}$
Portland, OR	$1.15x10^{-5}$	$2.10x10^{-6}$
Tacoma, WA	$8.55x10^{-6}$	$2.08x10^{-6}$
RHF France Spent Nuclear Fuel		
NWS, Concord CA	$1.93x10^{-5}$	$6.47x10^{-6}$
Long Beach, CA	$3.18x10^{-5}$	$6.86x10^{-6}$
Portland, OR	$4.99x10^{-6}$	$9.08x10^{-7}$
Tacoma, WA	$3.69x10^{-6}$	$8.99x10^{-7}$
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	$6.15x10^{-5}$	$2.07x10^{-5}$
Long Beach, CA	$1.02x10^{-4}$	$2.20x10^{-5}$
Portland, OR	$1.59x10^{-5}$	$2.91x10^{-6}$
Tacoma, WA	$1.18x10^{-5}$	$2.88x10^{-6}$
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	$1.15x10^{-4}$	$5.15x10^{-5}$
Long Beach, CA	$1.90x10^{-4}$	$5.50x10^{-5}$
Portland, OR	$2.97x10^{-5}$	$7.50x10^{-6}$
Tacoma, WA	$2.46x10^{-5}$	$7.79x10^{-6}$
Calcined Target Material		
NWS Concord, CA	$4.92x10^{-3}$	$1.50x10^{-3}$
Long Beach, CA	$7.06x10^{-3}$	$1.63x10^{-3}$
Portland, OR	$1.28x10^{-3}$	$2.54x10^{-4}$
Tacoma, WA	$1.90x10^{-3}$	$3.11x10^{-4}$
Oxidized Target Material		
NWS Concord, CA	$1.23x10^{-2}$	$3.75x10^{-3}$
Long Beach, CA	$1.77x10^{-2}$	$4.08x10^{-3}$
Portland, OR	$3.21x10^{-3}$	$6.36x10^{-4}$

Shipments to Hanford Site:		
Source/Route	***Truck***	***Rail***
Tacoma, WA	$4.75x10^{-3}$	$7.80x10^{-4}$
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	$1.52x10^{-4}$	$3.76x10^{-5}$
Idaho National Engineering Laboratory	$1.00x10^{-5}$	$3.08x10^{-6}$
Nevada Test Site	$5.07x10^{-5}$	$4.62x10^{-6}$
Oak Ridge Reservation	$1.13x10^{-4}$	$1.16x10^{-5}$
Savannah River	$1.61x10^{-4}$	$1.97x10^{-5}$
Sweetgrass, MT	$2.25x10^{-5}$	$1.56x10^{-6}$
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	$6.56x10^{-5}$	$1.62x10^{-5}$
Idaho National Engineering Laboratory	$4.33x10^{-6}$	$1.33x10^{-6}$
Nevada Test Site	$2.19x10^{-5}$	$1.99x10^{-6}$
Oak Ridge Reservation	$4.86x10^{-5}$	$4.97x10^{-6}$
Savannah River	$6.94x10^{-5}$	$8.47x10^{-6}$
Sweetgrass, MT	$9.72x10^{-6}$	$6.72x10^{-7}$
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	$2.10x10^{-4}$	$5.23x10^{-5}$
Idaho National Engineering Laboratory	$1.38x10^{-5}$	$4.27x10^{-6}$
Nevada Test Site	$6.99x10^{-5}$	$6.39x10^{-6}$
Oak Ridge Reservation	$1.56x10^{-4}$	$1.62x10^{-5}$
Savannah River	$2.22x10^{-4}$	$2.73x10^{-5}$
Sweetgrass, MT	$3.11x10^{-5}$	$2.16x10^{-6}$
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	$4.99x10^{-4}$	$1.98x10^{-4}$

Shipments to Idaho National Engineering Laboratory:		
Source/Route	**Truck**	**Rail**
Galveston, TX	$8.88x10^{-5}$	$6.71x10^{-6}$
Jacksonville, FL	$1.62x10^{-4}$	$1.65x10^{-5}$
Newport News, VA	$1.37x10^{-4}$	$3.07x10^{-5}$
Norfolk, VA	$1.39x10^{-4}$	$3.12x10^{-5}$
Philadelphia, PA	$1.25x10^{-4}$	$3.54x10^{-5}$
Portsmouth, VA	$1.43x10^{-4}$	$3.07x10^{-5}$
Savannah, GA	$1.58x10^{-4}$	$1.66x10^{-5}$
MOTSU, NC	$1.34x10^{-4}$	$1.93x10^{-5}$
Wilmington, NC	$1.44x10^{-4}$	$1.92x10^{-5}$
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	$6.26x10^{-5}$	$7.96x10^{-6}$
Charleston, SC (Wando Terminal)	$6.39x10^{-5}$	$7.96x10^{-6}$
Elizabeth, NJ	$5.31x10^{-5}$	$1.71x10^{-5}$
Galveston, TX	$3.84x10^{-5}$	$2.89x10^{-6}$
Jacksonville, FL	$7.02x10^{-5}$	$7.10x10^{-6}$
Newport News, VA	$5.93x10^{-5}$	$1.32x10^{-5}$
Norfolk, VA	$6.01x10^{-5}$	$1.34x10^{-5}$
Philadelphia, PA	$5.39x10^{-5}$	$1.52x10^{-5}$
Portsmouth, VA	$6.16x10^{-5}$	$1.32x10^{-5}$
Savannah, GA	$6.83x10^{-5}$	$7.12x10^{-6}$
MOTSU, NC	$5.78x10^{-5}$	$8.30x10^{-6}$
Wilmington, NC	$6.22x10^{-5}$	$8.25x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	$2.00x10^{-4}$	$2.57x10^{-5}$
Charleston, SC (Wando Terminal)	$2.04x10^{-4}$	$2.57x10^{-5}$
Elizabeth, NJ	$1.23x10^{-4}$	$5.54x10^{-5}$
Galveston, TX	$1.70x10^{-4}$	$9.29x10^{-6}$
Jacksonville, FL	$2.24x10^{-4}$	$2.29x10^{-5}$
Newport News, VA	$1.90x10^{-4}$	$4.27x10^{-5}$
Norfolk, VA	$1.92x10^{-4}$	$4.35x10^{-5}$
Portsmouth, VA	$1.97x10^{-4}$	$4.28x10^{-5}$
Savannah, GA	$2.18x10^{-4}$	$2.30x10^{-5}$
MOTSU, NC	$1.85x10^{-4}$	$2.68x10^{-5}$
Wilmington, NC	$1.99x10^{-4}$	$2.66x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	$4.14x10^{-4}$	$8.94x10^{-5}$
Charleston, SC (Wando Terminal)	$4.21x10^{-4}$	$8.94x10^{-5}$
Elizabeth, NJ	$4.30x10^{-4}$	$2.02x10^{-4}$
Galveston, TX	$4.49x10^{-4}$	$8.47x10^{-5}$
Jacksonville, FL	$4.57x10^{-4}$	$8.36x10^{-5}$
Newport News, VA	$4.04x10^{-4}$	$1.75x10^{-4}$
Norfolk, VA	$4.09x10^{-4}$	$1.77x10^{-4}$
Philadelphia, PA	$4.44x10^{-4}$	$1.88x10^{-4}$
Portsmouth, VA	$4.17x10^{-4}$	$1.75x10^{-4}$
Savannah, GA	$4.45x10^{-4}$	$8.39x10^{-5}$
MOTSU, NC	$3.97x10^{-4}$	$9.26x10^{-5}$
Wilmington, NC	$4.13x10^{-4}$	$9.22x10^{-5}$
Calcined Target Material		
Charleston, SC (NWS)	$3.79x10^{-2}$	$6.76x10^{-3}$
Charleston, SC (Wando Terminal)	$3.81x10^{-2}$	$6.76x10^{-3}$
Elizabeth, NJ	$6.57x10^{-2}$	$1.61x10^{-2}$

Shipments to Idaho National Engineering Laboratory:		
Source/Route	***Truck***	***Rail***
Jacksonville, FL	3.91×10^{-2}	6.72×10^{-3}
Newport News, VA	4.05×10^{-2}	1.58×10^{-2}
Norfolk, VA	4.10×10^{-2}	1.59×10^{-2}
Philadelphia, PA	7.15×10^{-2}	1.58×10^{-2}
Portsmouth, VA	4.09×10^{-2}	1.59×10^{-2}
Savannah, GA	3.84×10^{-2}	6.76×10^{-3}
MOTSU, NC	4.18×10^{-2}	6.96×10^{-3}
Wilmington, NC	3.91×10^{-2}	6.95×10^{-3}
Galveston, TX	2.08×10^{-2}	1.71×10^{-3}
Oxidized Target Material		
Charleston, SC (NWS)	9.49×10^{-2}	1.69×10^{-2}
Charleston, SC (Wando Terminal)	9.53×10^{-2}	1.69×10^{-2}
Elizabeth, NJ	1.64×10^{-1}	4.03×10^{-2}
Jacksonville, FL	9.79×10^{-2}	1.68×10^{-2}
Newport News, VA	1.01×10^{-1}	3.95×10^{-2}
Norfolk, VA	1.03×10^{-1}	3.98×10^{-2}
Philadelphia, PA	1.79×10^{-1}	3.95×10^{-2}
Portsmouth, VA	1.02×10^{-1}	3.96×10^{-2}
Savannah, GA	9.62×10^{-2}	1.69×10^{-2}
MOTSU, NC	1.05×10^{-1}	1.74×10^{-2}
Wilmington, NC	9.78×10^{-2}	1.74×10^{-2}
Galveston, TX	5.21×10^{-2}	4.28×10^{-3}
	From Western Ports	
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	3.83×10^{-5}	4.00×10^{-6}
Long Beach, CA	7.40×10^{-5}	1.38×10^{-5}
Portland, OR	1.93×10^{-5}	4.94×10^{-6}
Tacoma, WA	1.66×10^{-5}	6.85×10^{-6}
RHF France Spent Nuclear Fuel		
NWS Concord, CA	1.66×10^{-5}	1.73×10^{-6}
Long Beach, CA	3.20×10^{-5}	5.96×10^{-6}
Portland, OR	8.35×10^{-6}	2.13×10^{-6}
Tacoma, WA	7.19×10^{-6}	2.95×10^{-6}
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	5.29×10^{-5}	5.53×10^{-6}
Long Beach, CA	1.02×10^{-4}	1.91×10^{-5}
Portland, OR	2.67×10^{-5}	6.84×10^{-6}
Tacoma, WA	2.30×10^{-5}	9.47×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	9.68×10^{-5}	1.42×10^{-5}
Long Beach, CA	1.85×10^{-4}	4.64×10^{-5}
Portland, OR	5.19×10^{-5}	1.85×10^{-5}
Tacoma, WA	4.88×10^{-5}	2.50×10^{-5}
Calcined Target Material		
NWS Concord, CA	3.21×10^{-3}	4.70×10^{-4}
Long Beach, CA	4.75×10^{-3}	1.18×10^{-3}
Portland, OR	3.23×10^{-3}	7.61×10^{-4}
Tacoma, WA	4.35×10^{-3}	9.55×10^{-4}
Oxidized Target Material		
NWS Concord, CA	8.05×10^{-3}	1.18×10^{-3}
Long Beach, CA	1.19×10^{-2}	2.95×10^{-3}

Shipments to Idaho National Engineering Laboratory:		
Source/Route	**Truck**	**Rail**
Portland, OR	8.07×10^{-3}	1.91×10^{-3}
Tacoma, WA	1.09×10^{-2}	2.39×10^{-3}
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	1.45×10^{-4}	3.55×10^{-5}
Hanford Site	1.00×10^{-5}	3.08×10^{-6}
Nevada Test Site	4.41×10^{-5}	2.52×10^{-6}
Oak Ridge Reservation	1.06×10^{-4}	9.48×10^{-6}
Savannah River	1.54×10^{-4}	1.76×10^{-5}
Sweetgrass, MT	1.59×10^{-5}	3.84×10^{-6}
RHF France Spent Nuclear Fuel		
Hanford Site	4.33×10^{-6}	1.33×10^{-6}
Nevada Test Site	1.91×10^{-5}	1.09×10^{-6}
Oak Ridge Reservation	4.58×10^{-5}	4.07×10^{-6}
Savannah River	6.66×10^{-5}	7.57×10^{-6}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	2.01×10^{-4}	4.94×10^{-5}
Hanford Site	1.38×10^{-5}	4.27×10^{-6}
Nevada Test Site	6.09×10^{-5}	3.48×10^{-6}
Oak Ridge Reservation	1.46×10^{-4}	1.33×10^{-5}
Savannah River	2.13×10^{-4}	2.44×10^{-5}
Sweetgrass, MT	2.20×10^{-5}	5.32×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Hanford Site	2.94×10^{-5}	1.21×10^{-5}
Nevada Test Site	1.09×10^{-4}	8.79×10^{-6}
Oak Ridge Reservation	3.16×10^{-4}	6.19×10^{-5}
Savannah River	4.34×10^{-4}	8.63×10^{-5}
Calcined Target Material		
Alexandria Bay, NY	6.55×10^{-2}	1.58×10^{-2}
Hanford Site	2.69×10^{-3}	5.83×10^{-4}
Nevada Test Site	3.10×10^{-3}	2.90×10^{-4}
Oak Ridge Reservation	3.38×10^{-2}	6.33×10^{-3}
Savannah River	3.79×10^{-2}	6.66×10^{-3}
Sweetgrass, MT	3.56×10^{-3}	8.19×10^{-4}
Oxidized Target Material		
Alexandria Bay, NY	1.64×10^{-1}	3.96×10^{-2}
Hanford	6.74×10^{-3}	1.46×10^{-3}
Nevada Test Site	7.76×10^{-3}	7.27×10^{-4}
Oak Ridge Reservation	8.47×10^{-2}	1.58×10^{-2}
Savannah River	9.49×10^{-2}	1.67×10^{-2}
Sweetgrass, MT	8.91×10^{-3}	2.05×10^{-3}

Shipments to Nevada Test Site:		
Source/Route	**Truck**	**Rail**
From Eastern Ports		
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	1.65×10^{-4}	1.99×10^{-5}
Charleston, SC (Wando Terminal)	1.68×10^{-4}	1.99×10^{-5}
Elizabeth, NJ	1.77×10^{-4}	4.12×10^{-5}
Galveston, TX	9.13×10^{-5}	5.16×10^{-6}
Jacksonville, FL	1.89×10^{-4}	1.79×10^{-5}
Newport News, VA	1.64×10^{-4}	3.21×10^{-5}

Shipments to Nevada Test Site:		
Source/Route	***Truck***	***Rail***
Norfolk, VA	$1.66x10^{-4}$	$3.27x10^{-5}$
Philadelphia, PA	$1.75x10^{-4}$	$3.68x10^{-5}$
Portsmouth, VA	$1.69x10^{-4}$	$3.22x10^{-5}$
Savannah, GA	$1.85x10^{-4}$	$1.80x10^{-5}$
MOTSU, NC	$1.65x10^{-4}$	$2.07x10^{-5}$
Wilmington, NC	$1.71x10^{-4}$	$2.06x10^{-5}$
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	$7.12x10^{-5}$	$8.57x10^{-6}$
Charleston, SC (Wando Terminal)	$7.25x10^{-5}$	$8.57x10^{-6}$
Elizabeth, NJ	$7.66x10^{-5}$	$1.78x10^{-5}$
Galveston, TX	$3.95x10^{-5}$	$2.42x10^{-6}$
Jacksonville, FL	$8.17x10^{-5}$	$7.71x10^{-6}$
Newport News, VA	$7.08x10^{-5}$	$1.38x10^{-5}$
Norfolk, VA	$7.16x10^{-5}$	$1.40x10^{-5}$
Philadelphia, PA	$7.56x10^{-5}$	$1.58x10^{-5}$
Portsmouth, VA	$7.31x10^{-5}$	$1.38x10^{-5}$
Savannah, GA	$7.98x10^{-5}$	$7.74x10^{-6}$
MOTSU, NC	$7.14x10^{-5}$	$8.91x10^{-6}$
Wilmington, NC	$7.37x10^{-5}$	$8.86x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	$2.27x10^{-4}$	$2.76x10^{-5}$
Charleston, SC (Wando Terminal)	$2.32x10^{-4}$	$2.76x10^{-5}$
Elizabeth, NJ	$2.45x10^{-4}$	$5.73x10^{-5}$
Galveston, TX	$1.26x10^{-4}$	$7.77x10^{-6}$
Jacksonville, FL	$2.61x10^{-4}$	$2.49x10^{-5}$
Newport News, VA	$2.26x10^{-4}$	$4.47x10^{-5}$
Norfolk, VA	$2.29x10^{-4}$	$4.55x10^{-5}$
Philadelphia, PA	$2.42x10^{-4}$	$5.12x10^{-5}$
Portsmouth, VA	$2.34x10^{-4}$	$4.48x10^{-5}$
Savannah, GA	$2.55x10^{-4}$	$2.50x10^{-5}$
MOTSU, NC	$2.28x10^{-4}$	$2.87x10^{-5}$
Wilmington, NC	$2.36x10^{-4}$	$2.86x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	$4.62x10^{-4}$	$9.35x10^{-5}$
Charleston, SC (Wando Terminal)	$4.69x10^{-4}$	$9.35x10^{-5}$
Elizabeth, NJ	$5.19x10^{-4}$	$2.07x10^{-4}$
Galveston, TX	$2.37x10^{-4}$	$2.44x10^{-5}$
Jacksonville, FL	$5.21x10^{-4}$	$8.77x10^{-5}$
Newport News, VA	$4.68x10^{-4}$	$1.79x10^{-4}$
Norfolk, VA	$4.73x10^{-4}$	$1.81x10^{-4}$
Philadelphia, PA	$5.17x10^{-4}$	$1.92x10^{-4}$
Portsmouth, VA	$4.81x10^{-4}$	$1.79x10^{-4}$
Savannah, GA	$5.10x10^{-4}$	$8.80x10^{-5}$
MOTSU, NC	$4.19x10^{-4}$	$9.67x10^{-5}$
Wilmington, NC	$4.78x10^{-4}$	$9.63x10^{-5}$
20 yr old vitrified HLW		
Charleston, SC (NWS)	$1.40x10^{-3}$	$2.33x10^{-4}$
Charleston, SC (Wando Terminal)	$1.42x10^{-3}$	$2.33x10^{-4}$
Elizabeth, NJ	$1.70x10^{-3}$	$5.33x10^{-4}$
Jacksonville, FL	$1.45x10^{-3}$	$2.27x10^{-4}$
Newport News, VA	$1.45x10^{-3}$	$5.06x10^{-4}$

Shipments to Nevada Test Site:		
Source/Route	*Truck*	*Rail*
Norfolk, VA	$1.47x10^{-3}$	$5.10x10^{-4}$
Philadelphia, PA	$1.73x10^{-3}$	$5.14x10^{-4}$
Portsmouth, VA	$1.46x10^{-3}$	$5.07x10^{-4}$
Savannah, GA	$1.42x10^{-3}$	$2.28x10^{-4}$
MOTSU, NC	$7.07x10^{-4}$	$2.40x10^{-4}$
Wilmington, NC	$1.44x10^{-3}$	$2.40x10^{-4}$
Galveston, TX	$4.20x10^{-4}$	$4.70x10^{-5}$
Calcined Target Material		
Charleston, SC (NWS)	$3.90x10^{-2}$	$6.78x10^{-3}$
Charleston, SC (Wando Terminal)	$3.92x10^{-2}$	$6.78x10^{-3}$
Elizabeth, NJ	$4.86x10^{-2}$	$1.61x10^{-2}$
Jacksonville, FL	$4.03x10^{-2}$	$6.74x10^{-3}$
Newport News, VA	$4.16x10^{-2}$	$1.58x10^{-2}$
Norfolk, VA	$4.21x10^{-2}$	$1.59x10^{-2}$
Philadelphia, PA	$5.03x10^{-2}$	$1.58x10^{-2}$
Portsmouth, VA	$4.20x10^{-2}$	$1.59x10^{-2}$
Savannah, GA	$3.96x10^{-2}$	$6.78x10^{-3}$
MOTSU, NC	$1.79x10^{-2}$	$6.98x10^{-3}$
Wilmington, NC	$4.02x10^{-2}$	$6.97x10^{-3}$
Galveston, TX	$1.11x10^{-2}$	$1.43x10^{-3}$
Oxidized Target Material		
Charleston, SC (NWS)	$9.76x10^{-2}$	$1.70x10^{-2}$
Charleston, SC (Wando Terminal)	$9.81x10^{-2}$	$1.70x10^{-2}$
Elizabeth, NJ	$1.22x10^{-1}$	$4.04x10^{-2}$
Jacksonville, FL	$1.01x10^{-1}$	$1.69x10^{-2}$
Newport News, VA	$1.04x10^{-1}$	$3.95x10^{-2}$
Norfolk, VA	$1.05x10^{-1}$	$3.98x10^{-2}$
Philadelphia, PA	$1.26x10^{-1}$	$3.95x10^{-2}$
Portsmouth, VA	$1.05x10^{-1}$	$3.97x10^{-2}$
Savannah, GA	$9.90x10^{-2}$	$1.70x10^{-2}$
MOTSU, NC	$4.48x10^{-2}$	$1.75x10^{-2}$
Wilmington, NC	$1.01x10^{-1}$	$1.74x10^{-2}$
Galveston, TX	$2.78x10^{-2}$	$3.57x10^{-3}$
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	$4.88x10^{-5}$	$8.09x10^{-6}$
Long Beach, CA	$5.28x10^{-5}$	$1.13x10^{-5}$
Portland, OR	$6.10x10^{-5}$	$6.48x10^{-6}$
Tacoma, WA	$5.73x10^{-5}$	$8.38x10^{-6}$
RHF France Spent Nuclear Fuel		
NWS Concord, CA	$2.11x10^{-5}$	$3.49x10^{-6}$
Long Beach, CA	$2.28x10^{-5}$	$4.89x10^{-6}$
Portland, OR	$2.64x10^{-5}$	$2.80x10^{-6}$
Tacoma, WA	$2.48x10^{-5}$	$3.62x10^{-6}$
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	$6.73x10^{-5}$	$1.12x10^{-5}$
Long Beach, CA	$7.28x10^{-5}$	$1.56x10^{-5}$
Portland, OR	$8.41x10^{-5}$	$8.96x10^{-6}$
Tacoma, WA	$7.91x10^{-5}$	$1.16x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	$1.26x10^{-4}$	$2.91x10^{-5}$

Shipments to Nevada Test Site:		
Source/Route	***Truck***	***Rail***
Long Beach, CA	$1.31x10^{-4}$	$3.77x10^{-5}$
Portland, OR	$1.53x10^{-4}$	$2.37x10^{-5}$
Tacoma, WA	$1.48x10^{-4}$	$3.02x10^{-5}$
Calcined Target Material		
NWS Concord, CA	$4.13x10^{-3}$	$9.39x10^{-4}$
Long Beach, CA	$2.42x10^{-3}$	$8.94x10^{-4}$
Portland, OR	$5.26x10^{-3}$	$9.19x10^{-4}$
Tacoma, WA	$6.39x10^{-3}$	$1.11x10^{-3}$
Oxidized Target Material		
NWS Concord, CA	$1.03x10^{-2}$	$2.35x10^{-3}$
Long Beach, CA	$6.05x10^{-3}$	$2.24x10^{-3}$
Portland, OR	$1.32x10^{-2}$	$2.30x10^{-3}$
Tacoma, WA	$1.60x10^{-2}$	$2.79x10^{-3}$
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	$1.79x10^{-4}$	$3.69x10^{-5}$
Hanford Site	$5.07x10^{-5}$	$4.62x10^{-6}$
Idaho National Engineering Laboratory	$4.41x10^{-5}$	$2.52x10^{-6}$
Oak Ridge Reservation	$1.33x10^{-4}$	$1.09x10^{-5}$
Savannah River	$1.81x10^{-4}$	$1.90x10^{-5}$
Sweetgrass, MT	$6.08x10^{-5}$	$5.38x10^{-6}$
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	$7.71x10^{-5}$	$1.59x10^{-5}$
Hanford Site	$2.19x10^{-5}$	$1.99x10^{-6}$
Idaho National Engineering Laboratory	$1.91x10^{-5}$	$1.09x10^{-6}$
Oak Ridge Reservation	$5.73x10^{-5}$	$4.68x10^{-6}$
Savannah River	$7.81x10^{-5}$	$8.18x10^{-6}$
Sweetgrass, MT	$2.63x10^{-5}$	$2.32x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	$2.47x10^{-4}$	$5.14x10^{-5}$
Hanford Site	$6.99x10^{-5}$	$6.39x10^{-6}$
Idaho National Engineering Laboratory	$6.09x10^{-5}$	$3.48x10^{-6}$
Oak Ridge Reservation	$1.83x10^{-4}$	$1.52x10^{-5}$
Savannah River	$2.49x10^{-4}$	$2.64x10^{-5}$
Sweetgrass, MT	$8.38x10^{-5}$	$7.45x10^{-6}$
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	$5.58x10^{-4}$	$1.93x10^{-4}$
Hanford Site	$1.29x10^{-4}$	$1.74x10^{-5}$
Idaho National Engineering Laboratory	$1.09x10^{-4}$	$8.79x10^{-6}$
Oak Ridge Reservation	$3.81x10^{-4}$	$6.60x10^{-5}$
Savannah River	$4.99x10^{-4}$	$9.04x10^{-5}$
Sweetgrass MT	$1.54x10^{-4}$	$2.09x10^{-5}$
Calcined Target Material		
Alexandria Bay, NY	$6.55x10^{-2}$	$1.58x10^{-2}$
Hanford	$4.74x10^{-3}$	$7.41x10^{-4}$
Idaho National Engineering Laboratory	$3.10x10^{-3}$	$2.90x10^{-4}$
Oak Ridge Reservation	$3.50x10^{-2}$	$6.35x10^{-3}$
Savannah River	$3.91x10^{-2}$	$6.68x10^{-3}$
Sweetgrass, MT	$6.29x10^{-3}$	$9.78x10^{-4}$
Oxidized Target Material		
Alexandria Bay, NY	$1.64x10^{-1}$	$3.96x10^{-2}$

Shipments to Nevada Test Site:

Source/Route	Truck	Rail
Hanford	$1.19x10^{-2}$	$1.85x10^{-3}$
Idaho National Engineering Laboratory	$7.76x10^{-3}$	$7.27x10^{-4}$
Oak Ridge Reservation	$8.75x10^{-2}$	$1.59x10^{-2}$
Savannah River	$9.77x10^{-2}$	$1.67x10^{-2}$
Sweetgrass, MT	$1.58x10^{-2}$	$2.45x10^{-3}$

Shipments to Oak Ridge Reservation:

Source/Route	Truck	Rail

Shipments to Oak Ridge Reservation:		
Source/Route	***Truck***	***Rail***
Galveston, TX	$1.75x10^{-4}$	$6.15x10^{-5}$
Jacksonville, FL	$1.26x10^{-4}$	$2.40x10^{-5}$
Newport News, VA	$1.09x10^{-4}$	$2.84x10^{-5}$
Norfolk, VA	$1.01x10^{-4}$	$2.43x10^{-5}$
Philadelphia, PA	$1.66x10^{-4}$	$5.90x10^{-5}$
Portsmouth, VA	$1.22x10^{-4}$	$2.26x10^{-5}$
Savannah, GA	$8.13x10^{-5}$	$2.43x10^{-5}$
MOTSU, NC	$9.18x10^{-5}$	$1.94x10^{-5}$
Wilmington, NC	$9.85x10^{-5}$	$1.90x10^{-5}$
Calcined Target Material		
Charleston, SC (NWS)	$4.14x10^{-3}$	$7.70x10^{-4}$
Charleston, SC (Wando Terminal)	$4.32x10^{-3}$	$7.70x10^{-4}$
Elizabeth, NJ	$8.03x10^{-3}$	$2.18x10^{-3}$
Jacksonville, FL	$5.87x10^{-3}$	$9.16x10^{-4}$
Newport News, VA	$5.46x10^{-3}$	$1.10x10^{-3}$
Norfolk, VA	$5.50x10^{-3}$	$9.94x10^{-4}$
Philadelphia, PA	$8.57x10^{-3}$	$1.59x10^{-3}$
Portsmouth, VA	$5.79x10^{-3}$	$9.45x10^{-4}$
Savannah, GA	$4.19x10^{-3}$	$9.55x10^{-4}$
MOTSU, NC	$4.78x10^{-3}$	$8.03x10^{-4}$
Wilmington, NC	$5.32x10^{-3}$	$7.89x10^{-4}$
Galveston, TX	$7.44x10^{-3}$	$2.10x10^{-3}$
Oxidized Target Material		
Charleston, SC (NWS)	$1.04x10^{-2}$	$1.93x10^{-3}$
Charleston, SC (Wando Terminal)	$1.08x10^{-2}$	$1.93x10^{-3}$
Elizabeth, NJ	$2.01x10^{-2}$	$5.46x10^{-3}$
Jacksonville, FL	$1.47x10^{-2}$	$2.30x10^{-3}$
Newport News, VA	$1.37x10^{-2}$	$2.76x10^{-3}$
Norfolk, VA	$1.38x10^{-2}$	$2.49x10^{-3}$
Philadelphia, PA	$2.15x10^{-2}$	$3.97x10^{-3}$
Portsmouth, VA	$1.45x10^{-2}$	$2.37x10^{-3}$
Savannah, GA	$1.05x10^{-2}$	$2.39x10^{-3}$
MOTSU, NC	$1.20x10^{-2}$	$2.01x10^{-3}$
Wilmington, NC	$1.33x10^{-2}$	$1.98x10^{-3}$
Galveston, TX	$1.86x10^{-2}$	$5.25x10^{-3}$
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	$1.46x10^{-4}$	$1.56x10^{-5}$
Long Beach, CA	$1.50x10^{-4}$	$2.08x10^{-5}$
Portland, OR	$1.33x10^{-4}$	$2.40x10^{-5}$
Tacoma, WA	$1.20x10^{-4}$	$2.55x10^{-5}$
RHF France Spent Nuclear Fuel		
NWS Concord, CA	$6.33x10^{-5}$	$6.72x10^{-6}$
Long Beach, CA	$6.50x10^{-5}$	$8.07x10^{-6}$

Shipments to Oak Ridge Reservation:		
Source/Route	Truck	Rail
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	$3.81x10^{-4}$	$7.68x10^{-5}$
Long Beach, CA	$3.86x10^{-4}$	$9.42x10^{-5}$
Portland, OR	$3.85x10^{-4}$	$1.25x10^{-4}$
Tacoma, WA	$3.78x10^{-4}$	$1.30x10^{-4}$
Calcined Target Material		
NWS Concord, CA	$1.77x10^{-2}$	$5.82x10^{-3}$
Long Beach, CA	$1.60x10^{-2}$	$6.15x10^{-3}$
Portland, OR	$3.65x10^{-2}$	$8.50x10^{-3}$
Tacoma, WA	$4.74x10^{-2}$	$8.59x10^{-3}$
Oxidized Target Material		
NWS Concord, CA	$4.43x10^{-2}$	$1.46x10^{-2}$
Long Beach, CA	$4.01x10^{-2}$	$1.54x10^{-2}$
Portland, OR	$9.13x10^{-2}$	$2.13x10^{-2}$
Tacoma, WA	$1.19x10^{-1}$	$2.15x10^{-2}$
	From DOE Sites/Canadian Border	
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	$6.57x10^{-5}$	$1.83x10^{-5}$
Hanford Site	$1.13x10^{-4}$	$1.16x10^{-5}$
Idaho National Engineering Laboratory	$1.06x10^{-4}$	$9.48x10^{-6}$
Nevada Test Site	$1.33x10^{-4}$	$1.09x10^{-5}$
Savannah River	$5.10x10^{-5}$	$3.67x10^{-6}$
Sweetgrass, MT	$1.21x10^{-4}$	$2.12x10^{-5}$
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	$2.84x10^{-5}$	$7.91x10^{-6}$
Hanford Site	$4.86x10^{-5}$	$4.97x10^{-6}$
Idaho National Engineering Laboratory	$4.58x10^{-5}$	$4.07x10^{-6}$
Nevada Test Site	$5.73x10^{-5}$	$4.68x10^{-6}$
Savannah River	$2.21x10^{-5}$	$1.59x10^{-6}$
Sweetgrass, MT	$5.22x10^{-5}$	$9.11x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	$9.07x10^{-5}$	$2.53x10^{-5}$
Hanford Site	$1.56x10^{-4}$	$1.62x10^{-5}$
Idaho National Engineering Laboratory	$1.46x10^{-4}$	$1.33x10^{-5}$
Nevada Test Site	$1.83x10^{-4}$	$1.52x10^{-5}$
Savannah River	$7.03x10^{-5}$	$5.08x10^{-6}$
Sweetgrass, MT	$1.67x10^{-4}$	$2.95x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	$1.77x10^{-4}$	$6.60x10^{-5}$
Hanford Site	$3.35x10^{-4}$	$7.04x10^{-5}$
Idaho National Engineering Laboratory	$3.16x10^{-4}$	$6.19x10^{-5}$
Nevada Test Site	$3.81x10^{-4}$	$6.60x10^{-5}$
Savannah River	$1.27x10^{-4}$	$1.31x10^{-5}$
Sweetgrass, MT	$3.76x10^{-4}$	$1.14x10^{-4}$
Calcined Target Material		
Alexandria Bay, NY	$1.04x10^{-2}$	$2.20x10^{-3}$
Hanford Site	$3.55x10^{-2}$	$6.78x10^{-3}$
Idaho National Engineering Laboratory	$3.38x10^{-2}$	$6.33x10^{-3}$
Nevada Test Site	$3.50x10^{-2}$	$6.35x10^{-3}$
Savannah River	$5.03x10^{-3}$	$5.03x10^{-4}$
Sweetgrass, MT	$4.51x10^{-2}$	$8.02x10^{-3}$

Shipments to Oak Ridge Reservation:		
Source/Route	***Truck***	***Rail***
Oxidized Target Material		
Alexandria Bay, NY	2.61×10^{-2}	5.51×10^{-3}
Hanford Site	8.88×10^{-2}	1.70×10^{-2}
Idaho National Engineering Laboratory	8.47×10^{-2}	1.58×10^{-2}
Nevada Test Site	8.75×10^{-2}	1.59×10^{-2}
Savannah River	1.26×10^{-2}	1.26×10^{-3}
Sweetgrass, MT	1.13×10^{-1}	2.01×10^{-2}

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
	From Eastern Ports	
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	8.42×10^{-6}	8.97×10^{-7}
Charleston, SC (Wando Terminal)	1.14×10^{-5}	8.97×10^{-7}
Elizabeth, NJ	5.89×10^{-5}	2.50×10^{-5}
Galveston, TX	8.20×10^{-5}	2.19×10^{-5}
Jacksonville, FL	9.46×10^{-6}	1.65×10^{-6}
Newport News, VA	3.16×10^{-5}	5.04×10^{-6}
Norfolk, VA	2.55×10^{-5}	3.77×10^{-6}
Philadelphia, PA	6.56×10^{-5}	1.65×10^{-5}
Portsmouth, VA	2.59×10^{-5}	3.27×10^{-6}
Savannah, GA	7.13×10^{-6}	5.84×10^{-7}
MOTSU, NC	6.37×10^{-6}	2.43×10^{-6}
Wilmington, NC	1.36×10^{-5}	2.32×10^{-6}
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	3.64×10^{-6}	3.87×10^{-7}
Charleston, SC (Wando Terminal)	4.95×10^{-6}	3.87×10^{-7}
Elizabeth, NJ	2.54×10^{-5}	1.08×10^{-5}
Galveston, TX	3.55×10^{-5}	9.46×10^{-6}
Jacksonville, FL	4.09×10^{-6}	7.13×10^{-7}
Newport News, VA	1.37×10^{-5}	2.17×10^{-6}
Norfolk, VA	1.10×10^{-5}	1.63×10^{-6}
Philadelphia, PA	2.83×10^{-5}	7.13×10^{-6}
Portsmouth, VA	1.12×10^{-5}	1.41×10^{-6}
Savannah GA	3.08×10^{-6}	2.52×10^{-7}
MOTSU NC	2.75×10^{-6}	1.05×10^{-6}
Wilmington NC	5.90×10^{-6}	1.00×10^{-6}
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	1.16×10^{-5}	1.24×10^{-6}
Charleston, SC (Wando Terminal)	1.58×10^{-5}	1.24×10^{-6}
Elizabeth, NJ	8.12×10^{-5}	3.45×10^{-5}
Galveston, TX	1.13×10^{-4}	3.02×10^{-5}
Jacksonville, FL	1.31×10^{-5}	2.28×10^{-6}
Newport News, VA	4.36×10^{-5}	6.96×10^{-6}
Norfolk, VA	3.52×10^{-5}	5.21×10^{-6}
Philadelphia, PA	9.04×10^{-5}	2.28×10^{-5}
Portsmouth, VA	3.57×10^{-5}	4.52×10^{-6}
Savannah, GA	9.83×10^{-6}	8.07×10^{-7}
MOTSU, NC	8.79×10^{-6}	3.36×10^{-6}
Wilmington, NC	1.88×10^{-5}	3.21×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	2.14×10^{-5}	3.19×10^{-6}

Shipments to Savannah River Site:		
Source/Route	**Truck**	**Rail**
Charleston, SC (Wando Terminal)	$2.89x10^{-5}$	$3.19x10^{-6}$
Elizabeth, NJ	$1.54x10^{-4}$	$8.32x10^{-5}$
Galveston, TX	$2.05x10^{-4}$	$7.50x10^{-5}$
Jacksonville, FL	$2.56x10^{-5}$	$6.32x10^{-6}$
Newport News, VA	$8.21x10^{-5}$	$1.79x10^{-5}$
Norfolk, VA	$6.71x10^{-5}$	$1.37x10^{-5}$
Philadelphia, PA	$1.70x10^{-4}$	$5.58x10^{-5}$
Portsmouth, VA	$6.80x10^{-5}$	$1.20x10^{-5}$

[illegible]	[illegible]	[illegible]

HLW Vitrified

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
	From Western Ports	
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	$1.52x10^{-4}$	$3.67x10^{-5}$
Long Beach, CA	$1.37x10^{-4}$	$3.15x10^{-5}$
Portland, OR	$1.80x10^{-4}$	$3.14x10^{-5}$
Tacoma, WA	$1.68x10^{-4}$	$3.29x10^{-5}$
RHF France Spent Nuclear Fuel		
NWS Concord, CA	$6.56x10^{-5}$	$1.58x10^{-5}$
Long Beach, CA	$5.94x10^{-5}$	$1.36x10^{-5}$
Portland, OR	$7.76x10^{-5}$	$1.35x10^{-5}$
Tacoma, WA	$7.24x10^{-5}$	$1.42x10^{-5}$
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	$2.09x10^{-4}$	$5.07x10^{-5}$
Long Beach, CA	$1.89x10^{-4}$	$4.37x10^{-5}$
Portland, OR	$2.48x10^{-4}$	$4.37x10^{-5}$
Tacoma, WA	$2.31x10^{-4}$	$4.57x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	$3.90x10^{-4}$	$1.31x10^{-4}$
Long Beach, CA	$3.51x10^{-4}$	$1.46x10^{-4}$
Portland, OR	$5.00x10^{-4}$	$1.55x10^{-4}$
Tacoma, WA	$4.96x10^{-4}$	$1.59x10^{-4}$
Calcined Target Material		
NWS Concord, CA	$1.81x10^{-2}$	$4.78x10^{-3}$
Long Beach, CA	$1.61x10^{-2}$	$1.01x10^{-2}$
Portland, OR	$4.05x10^{-2}$	$1.02x10^{-2}$
Tacoma, WA	$5.15x10^{-2}$	$1.03x10^{-2}$
Oxidized Target Material		
NWS Concord, CA	$4.54x10^{-2}$	$1.20x10^{-2}$
Long Beach, CA	$4.03x10^{-2}$	$2.53x10^{-2}$
Portland, OR	$1.01x10^{-1}$	$2.54x10^{-2}$
Tacoma, WA	$1.29x10^{-1}$	$2.57x10^{-2}$
	From DOE Sites/Canadian Border	
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	$6.60x10^{-5}$	$4.27x10^{-5}$
Hanford Site	$1.61x10^{-4}$	$1.97x10^{-5}$
Idaho National Engineering Laboratory	$1.54x10^{-4}$	$1.76x10^{-5}$
Nevada Test Site	$1.81x10^{-4}$	$1.90x10^{-5}$
Oak Ridge Reservation	$5.10x10^{-5}$	$3.67x10^{-6}$
Sweetgrass, MT	$1.67x10^{-4}$	$2.85x10^{-5}$
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	$2.85x10^{-5}$	$1.85x10^{-5}$
Hanford Site	$6.94x10^{-5}$	$8.47x10^{-6}$
Idaho National Engineering Laboratory	$6.66x10^{-5}$	$7.57x10^{-6}$
Nevada Test Site	$7.81x10^{-5}$	$8.18x10^{-6}$
Oak Ridge Reservation	$2.21x10^{-5}$	$1.59x10^{-6}$
Sweetgrass, MT	$7.23x10^{-5}$	$1.23x10^{-5}$
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	$9.11x10^{-5}$	$5.90x10^{-5}$
Hanford Site	$2.22x10^{-4}$	$2.73x10^{-5}$
Idaho National Engineering Laboratory	$2.13x10^{-4}$	$2.44x10^{-5}$
Nevada Test Site	$2.49x10^{-4}$	$2.64x10^{-5}$

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
Oak Ridge Reservation	$7.03x10^{-5}$	$5.08x10^{-6}$
Sweetgrass, MT	$2.31x10^{-4}$	$3.97x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	$1.78x10^{-4}$	$1.43x10^{-4}$
Hanford Site	$4.53x10^{-4}$	$9.49x10^{-5}$
Idaho National Engineering Laboratory	$4.34x10^{-4}$	$8.63x10^{-5}$
Nevada Test Site	$4.99x10^{-4}$	$9.04x10^{-5}$
Oak Ridge Reservation	$1.27x10^{-4}$	$1.31x10^{-5}$
Sweetgrass, MT	$4.90x10^{-4}$	$1.44x10^{-4}$
Calcined Target Material		
Alexandria Bay, NY	$1.07x10^{-2}$	$3.61x10^{-3}$
Hanford Site	$3.96x10^{-2}$	$7.11x10^{-3}$
Idaho National Engineering Laboratory	$3.79x10^{-2}$	$6.66x10^{-3}$
Nevada Test Site	$3.91x10^{-2}$	$6.68x10^{-3}$
Oak Ridge Reservation	$5.03x10^{-3}$	$5.03x10^{-4}$
Sweetgrass, MT	$4.91x10^{-2}$	$9.69x10^{-3}$
Oxidized Target Material		
Alexandria Bay, NY	$2.68x10^{-2}$	$9.05x10^{-3}$
Hanford Site	$9.90x10^{-2}$	$1.78x10^{-2}$
Idaho National Engineering Laboratory	$9.49x10^{-2}$	$1.67x10^{-2}$
Nevada Test Site	$9.77x10^{-2}$	$1.67x10^{-2}$
Oak Ridge Reservation	$1.26x10^{-2}$	$1.26x10^{-3}$
Sweetgrass, MT	$1.23x10^{-1}$	$2.42x10^{-2}$

The nonradiological risk factors are presented in terms of mortalities per shipment in Table E-10. Separate risk factors are provided for mortalities resulting from hydrocarbon emissions and transportation accidents (fatalities resulting from mechanical impact).

Table E-10 Vehicle-Related (Nonradiological) Risk Factors per Shipment to Spent Nuclear Fuel Types (Fatalities/Shipment)

Shipments to Hanford Site:			
Mode		***Emission***	***Accident***
From Eastern Ports			
Truck			
	Charleston, SC (NWS)	$1.11x10^{-5}$	$2.00x10^{-4}$
	Charleston, SC (Wando Terminal)	$1.18x10^{-5}$	$2.01x10^{-4}$
	Elizabeth, NJ	$1.31x10^{-5}$	$1.66x10^{-4}$
	Galveston, TX	$1.69x10^{-5}$	$1.50x10^{-4}$
	Jacksonville, FL	$1.44x10^{-5}$	$1.95x10^{-4}$
	Newport News, VA	$1.66x10^{-5}$	$1.80x10^{-4}$
	Norfolk, VA	$1.64x10^{-5}$	$1.83x10^{-4}$
	Philadelphia, PA	$1.42x10^{-5}$	$1.65x10^{-4}$
	Portsmouth, VA	$1.82x10^{-5}$	$1.82x10^{-4}$
	Savannah, GA	$1.36x10^{-5}$	$1.86x10^{-4}$
	Sunny Point, NC	$1.17x10^{-5}$	$1.82x10^{-4}$
	Wilmington, NC	$1.09x10^{-5}$	$2.10x10^{-4}$
Rail			
	Charleston, SC (NWS)	$2.35x10^{-5}$	$6.40x10^{-6}$
	Charleston, SC (Wando Terminal)	$2.35x10^{-5}$	$6.40x10^{-6}$
	Elizabeth, NJ	$5.58x10^{-5}$	$6.30x10^{-6}$
	Galveston, TX	$9.83x10^{-6}$	$5.00x10^{-6}$

Shipments to Hanford Site:			
Mode		Emission	Accident
	Jacksonville, FL	$2.01x10^{-5}$	$6.42x10^{-6}$
	Newport News, VA	$3.49x10^{-5}$	$6.46x10^{-6}$
	Norfolk, VA	$3.56x10^{-5}$	$6.67x10^{-6}$
	Philadelphia, PA	$5.38x10^{-5}$	$6.20x10^{-6}$
	Portsmouth, VA	$3.46x10^{-5}$	$6.60x10^{-6}$
	Savannah, GA	$1.86x10^{-5}$	$6.47x10^{-6}$
	Sunny Point, NC	$2.07x10^{-5}$	$6.70x10^{-6}$
	Wilmington, NC	$2.07x10^{-5}$	$6.68x10^{-6}$
From Western Ports			
Truck			
	Concord, CA	$7.18x10^{-6}$	$4.81x10^{-5}$
	Long Beach, CA	$2.08x10^{-5}$	$7.74x10^{-5}$
	Portland, OR	$2.67x10^{-6}$	$1.04x10^{-5}$
	Tacoma, WA	$3.06x10^{-6}$	$1.03x10^{-5}$
Rail			
	Concord, CA	$1.99x10^{-5}$	$1.99x10^{-6}$
	Long Beach, CA	$3.67x10^{-5}$	$3.32x10^{-6}$
	Portland, OR	$4.48x10^{-6}$	$5.00x10^{-7}$
	Tacoma, WA	$5.61x10^{-6}$	$7.82x10^{-7}$
From DOE Sites/Canadian Border			
Truck			
	Alexandria Bay, NY	$1.46x10^{-5}$	$1.49x10^{-4}$
	Idaho National Engineering Laboratory	$2.19x10^{-6}$	$3.07x10^{-5}$
	Nevada Test Site	$9.50x10^{-6}$	$6.38x10^{-5}$
	Oak Ridge Reservation	$9.50x10^{-6}$	$1.61x10^{-4}$
	Savannah River	$1.31x10^{-5}$	$1.81x10^{-4}$
	Sweetgrass, MT	$1.74x10^{-6}$	$4.15x10^{-5}$
Rail			
	Alexandria Bay, NY	$4.59x10^{-5}$	$6.02x10^{-6}$
	Idaho National Engineering Laboratory	$3.98x10^{-6}$	$1.38x10^{-6}$
	Nevada Test Site	$5.90x10^{-6}$	$2.72x10^{-6}$
	Oak Ridge Reservation	$1.45x10^{-5}$	$5.44x10^{-6}$
	Savannah River	$2.21x10^{-5}$	$6.18x10^{-6}$
	Sweetgrass MT	$3.98x10^{-6}$	$1.27x10^{-6}$

Shipments to Idaho National Engineering Laboratory:			
Mode		Emission	Accident
From Eastern Ports			
Truck			
	Charleston, SC (NWS)	$1.03x10^{-5}$	$1.80x10^{-4}$
	Charleston, SC (Wando Terminal)	$1.09x10^{-5}$	$1.81x10^{-4}$
	Elizabeth, NJ	$1.17x10^{-5}$	$1.46x10^{-4}$
	Galveston, TX	$1.54x10^{-5}$	$1.30x10^{-4}$
	Jacksonville, FL	$1.22x10^{-5}$	$1.75x10^{-4}$
	Newport News, VA	$1.52x10^{-5}$	$1.60x10^{-4}$
	Norfolk, VA	$1.43x10^{-5}$	$1.63x10^{-4}$
	Philadelphia, PA	$1.28x10^{-5}$	$1.45x10^{-4}$
	Portsmouth, VA	$1.67x10^{-5}$	$1.62x10^{-4}$
	Savannah, GA	$1.22x10^{-5}$	$1.66x10^{-4}$
	Sunny Point, NC	$9.53x10^{-6}$	$1.59x10^{-4}$
	Wilmington, NC	$9.50x10^{-6}$	$1.89x10^{-4}$

Shipments to Idaho National Engineering Laboratory:			
Mode		Emission	Accident
Rail			
	Charleston, SC (NWS)	$2.16x10^{-5}$	$5.26x10^{-6}$
	Charleston, SC (Wando Terminal)	$2.16x10^{-5}$	$5.26x10^{-6}$
	Elizabeth, NJ	$5.39x10^{-5}$	$5.15x10^{-6}$
	Galveston, TX	$7.91x10^{-6}$	$3.86x10^{-6}$
	Jacksonville, FL	$1.82x10^{-5}$	$5.28x10^{-6}$
	Newport News, VA	$3.30x10^{-5}$	$5.32x10^{-6}$
	Norfolk, VA	$3.37x10^{-5}$	$5.53x10^{-6}$
	Philadelphia, PA	$5.19x10^{-5}$	$5.05x10^{-6}$
	Portsmouth, VA	$3.26x10^{-5}$	$5.46x10^{-6}$
	Savannah, GA	$1.67x10^{-5}$	$5.33x10^{-6}$
	Sunny Point, NC	$1.88x10^{-5}$	$5.56x10^{-6}$
	Wilmington, NC	$1.88x10^{-5}$	$5.54x10^{-6}$
From Western Ports			
Truck			
	Concord, CA	$9.40x10^{-6}$	$5.52x10^{-5}$
	Long Beach, CA	$2.55x10^{-5}$	$6.21x10^{-5}$
	Portland, OR	$3.93x10^{-6}$	$3.62x10^{-5}$
	Sweetgrass, MT	$7.08x10^{-7}$	$2.89x10^{-5}$
	Tacoma, WA	$4.28x10^{-6}$	$3.97x10^{-5}$
Rail			
	Concord, CA	$9.08x10^{-6}$	$1.91x10^{-6}$
	Long Beach, CA	$3.48x10^{-5}$	$2.18x10^{-6}$
	Portland, OR	$5.36x10^{-6}$	$1.64x10^{-6}$
	Sweetgrass, MT	$5.06x10^{-6}$	$2.58x10^{-6}$
	Tacoma, WA	$8.62x10^{-6}$	$1.96x10^{-6}$
From DOE Sites/Canadian Border			
Truck			
	Alexandria Bay, NY	$1.32x10^{-5}$	$1.29x10^{-4}$
	Hanford Site	$2.19x10^{-6}$	$3.07x10^{-5}$
	Nevada Test Site	$8.08x10^{-6}$	$4.36x10^{-5}$
	Oak Ridge Reservation	$8.08x10^{-6}$	$1.41x10^{-4}$
	Savannah River	$1.17x10^{-5}$	$1.61x10^{-4}$
Rail			
	Alexandria Bay, NY	$4.40x10^{-5}$	$4.88x10^{-6}$
	Hanford Site	$3.98x10^{-6}$	$1.38x10^{-6}$
	Nevada Test Site	$3.98x10^{-6}$	$1.58x10^{-6}$
	Oak Ridge Reservation	$1.26x10^{-5}$	$4.30x10^{-6}$
	Savannah River	$2.01x10^{-5}$	$5.04x10^{-6}$

Shipments to Nevada Test Site:			
Mode		Emission	Accident
From Eastern Ports			
Truck			
	Charleston, SC (NWS)	$1.16x10^{-5}$	$1.92x10^{-4}$
	Charleston, SC (Wando Terminal)	$1.23x10^{-5}$	$1.94x10^{-4}$
	Elizabeth, NJ	$1.98x10^{-5}$	$1.87x10^{-4}$
	Galveston, TX	$1.90x10^{-5}$	$1.32x10^{-4}$
	Jacksonville, FL	$1.49x10^{-5}$	$1.88x10^{-4}$
	Newport News, VA	$1.79x10^{-5}$	$1.74x10^{-4}$
	Norfolk, VA	$1.70x10^{-5}$	$1.76x10^{-4}$
	Philadelphia, PA	$1.90x10^{-5}$	$1.85x10^{-4}$

Shipments to Nevada Test Site:

Shipments to Oak Ridge Reservation:		
Mode	**Emission**	**Accident**
Jacksonville, FL	2.29×10^{-6}	4.23×10^{-5}

Shipments to Savannah River Site:			
Mode		***Emission***	***Accident***
From Eastern Ports			
Truck			
	Charleston, SC (NWS)	5.15×10^{-7}	1.61×10^{-5}
	Charleston, SC (Wando Terminal)	1.19×10^{-6}	1.74×10^{-5}
	Elizabeth, NJ	5.47×10^{-6}	6.58×10^{-5}
	Galveston, TX	8.11×10^{-6}	7.15×10^{-5}
	Jacksonville, FL	3.22×10^{-8}	2.94×10^{-5}
	Newport News, VA	3.54×10^{-6}	4.57×10^{-5}
	Norfolk, VA	1.58×10^{-6}	4.45×10^{-5}
	Philadelphia, PA	9.37×10^{-6}	6.30×10^{-5}
	Portsmouth, VA	1.83×10^{-6}	4.47×10^{-5}
	Savannah, GA	3.22×10^{-8}	2.10×10^{-5}
	Sunny Point, NC	2.57×10^{-7}	2.17×10^{-5}
	Wilmington, NC	5.15×10^{-7}	2.87×10^{-5}
Rail			
	Charleston, SC (NWS)	1.46×10^{-6}	2.93×10^{-7}
	Charleston, SC (Wando Terminal)	1.46×10^{-6}	2.93×10^{-7}
	Elizabeth, NJ	3.92×10^{-5}	1.82×10^{-6}
	Galveston, TX	2.06×10^{-5}	2.46×10^{-6}
	Jacksonville, FL	2.80×10^{-6}	5.42×10^{-7}
	Newport News, VA	5.61×10^{-6}	1.26×10^{-6}
	Norfolk, VA	3.64×10^{-6}	1.11×10^{-6}
	Philadelphia, PA	2.39×10^{-5}	1.65×10^{-6}
	Portsmouth, VA	2.64×10^{-6}	1.04×10^{-6}
	Savannah, GA	5.86×10^{-7}	2.38×10^{-7}
	Sunny Point, NC	2.55×10^{-6}	7.99×10^{-7}
	Wilmington, NC	2.55×10^{-6}	7.80×10^{-7}
From Western Ports			
Truck			
	Concord, CA	2.99×10^{-5}	1.96×10^{-4}
	Long Beach, CA	2.57×10^{-5}	1.68×10^{-4}
	Portland, OR	1.60×10^{-5}	1.88×10^{-4}
	Tacoma, WA	1.21×10^{-5}	1.59×10^{-4}
Rail			
	Concord, CA	4.80×10^{-5}	6.66×10^{-6}
	Long Beach, CA	5.07×10^{-5}	6.78×10^{-6}
	Portland, OR	3.44×10^{-5}	6.60×10^{-6}
	Tacoma, WA	4.13×10^{-5}	6.62×10^{-6}
From DOE Sites/Canadian Border			
Truck			
	Alexandria Bay, NY	2.54×10^{-6}	7.47×10^{-5}
	Hanford Site	1.31×10^{-5}	1.81×10^{-4}
	Idaho National Engineering Laboratory	1.17×10^{-5}	1.61×10^{-4}
	Nevada Test Site	1.43×10^{-5}	1.74×10^{-4}
	Oak Ridge Reservation	2.96×10^{-6}	2.92×10^{-5}
	Sweetgrass, MT	1.05×10^{-5}	1.43×10^{-4}
Rail			
	Alexandria Bay, NY	5.76×10^{-5}	2.68×10^{-6}
	Hanford Site	2.21×10^{-5}	6.18×10^{-6}
	Idaho National Engineering Laboratory	2.01×10^{-5}	5.04×10^{-6}
	Nevada Test Site	2.27×10^{-5}	5.94×10^{-6}

Shipments to Savannah River Site:			
Mode		Emission	Accident
	Oak Ridge Reservation	$2.51x10^{-6}$	$8.72x10^{-7}$
	Sweetgrass, MT	$2.87x10^{-5}$	$5.07x10^{-6}$

The total risks for any alternative or option can be calculated by multiplying the number of foreign research reactor spent nuclear fuel shipments by the per-shipment risk factors provided in Tables E-8 through E-10.

E.7.1.2 Characterization of Shipment Risks

The results of the per-shipment analysis are shown in Tables E-8 through E-10. From these tables, it is clear that the incident-free dose would be much higher than the accident dose for each of the fuel types. The accident doses are based on realistic, yet conservative fuel loadings. Since most of the public dose would be from incident-free exposure, it is not overly conservative to assume, for assessment purposes, that all spent nuclear fuel can be represented by the fuel type with the highest risk factors for the remainder of the transportation analysis.

E.7.2 Evaluation of the Basic Implementation

The following sections describe the evaluation of the basic implementation of the Management Alternative 1 of the proposed action. The evaluation of the management and implementation alternatives are described in Section E.8.

E.7.2.1 Shipments

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of 837 casks from points of entry (marine ports and Canadian border crossings) to DOE facilities. The basic assumption used in determining the number of shipments is that spent nuclear fuel from countries bordering the Atlantic Ocean and Mediterranean Sea was assumed to arrive on the east coast of the United States, and spent nuclear fuel from countries bordering the Indian and Pacific Oceans was assumed to arrive on the west coast. This is conservative from an overland transportation standpoint, because, as shown in Tables E-8 through E-10, shipment to the coast nearest the management site would reduce the risk factors for the overland shipment. Additionally, this assumption is considered to be realistic because the long shipping times required to ship from the Pacific Ocean to east coast ports and from the Atlantic Ocean to west coast ports, would be costly in terms of shipping, and would tie up the world's already short supply of casks. The foreign research reactor spent nuclear fuel could arrive at any port that meets the criteria identified in Appendix D, and would be likely to arrive at a variety of these ports. The basic shipment count, by point of origin is:

	East Coast		West Coast		Totals
	Aluminum	TRIGA	Aluminum	TRIGA	
Phase 1	419	82	101	42	644
Phase 2	125	25	30	13	193
Totals	544	107	131	55	837

Several of the SNF&INEL Final EIS (DOE, 1995) alternatives involve consolidation of all spent nuclear fuel to Idaho National Engineering Laboratory and/or Savannah River Site and, therefore, are single-phase programs that would require no additional shipments. However, many of the possible options require the use of Hanford Site, Nevada Test Site and/or Oak Ridge Reservation; and, thus, would require intersite shipments. The number of intersite shipments is calculated based on the assumption that the equivalent of

10 seagoing foreign research reactor casks would fit into a single rail cask that would travel between DOE sites. Similarly, it is assumed that the contents of four foreign research reactor casks would fit into a single truck cask for intersite shipment. This is based on the distribution of cask capacities described in Appendix B. As described in Appendix B, there is considerable uncertainty in what storage mode would be used at the Phase 1 site, and therefore in what form the fuel would be for intersite shipment. Additionally, it is not clear what casks would be licensed and available when the intersite shipments would begin (approximately 2006). Therefore, these assumptions, which are neither definitely conservative nor nonconservative, are considered to be reasonable and realistic.

The number of intersite shipments for SNF&INEL Final EIS (DOE, 1995) alternatives that would require two-phased approaches varies between 13 and 161. The variation is caused by the large number of unique combinations of Phase 1 and Phase 2 approaches depending on the specific management sites selected. Additionally, the variation is affected by the assumption that larger truck and rail casks would be used for intersite shipments. The actual numbers of shipments are shown in Tables E-1 and E-2.

E.7.2.2 Evaluation Using Risk Factors

Since the fuel would actually arrive at a variety of ports, average shipment risk factors were calculated for east coast ports to each DOE site, and an average shipment risk factor for west coast ports to each DOE site. This approach does not require that a specific port be selected for analysis purposes. It instead models the average affect the foreign research reactor spent nuclear fuel acceptance policy might actually have on the public. This approach is conservative since the dose rates and curie content of the fuel used for the analyses were selected to be conservative, but as realistic as possible, since it is impossible to predict the distribution of shipments among the capable ports.

The upper and lower bound risk estimates for the foreign research reactor spent nuclear fuel policy were also calculated. The upper bound assumes that DOE chooses the acceptable port with the highest per-shipment risk factors for all shipments, and the lower bound risk estimates assume that DOE chooses the acceptable port with the lowest per-shipment risk factors. In general, the highest risk factors result from the longest shipments, and the smallest risk factors from the shortest shipments.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.013 to 0.30 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crews.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel, 2) combinations of Phase 1 and Phase 2 sites that create varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.006 to 0.071. The shipment by truck would yield higher crew exposures than the shipment by rail since the truck drivers would tend to sit closer to the cask than engineers. Doses to inspectors, security guards, and rail switchyard workers are also considered.

Truck and rail crew members are not radiation workers and, therefore, are not allowed to exceed a dosage of 100 mrem per yr. The regulatory limit for dose rate in occupied areas of the truck or train is 2 mrem per hr. Since a cross-country trip can take just over 50 hr of driving, if the radiation levels were at the maximum allowed, a driver could exceed his or her annual limit. Therefore, DOE would implement administrative controls beyond those required by Federal regulations to ensure that vehicle operators would not exceed their annual dose limits.

The public would be exposed to a small amount of radiation emanating from the cask, and also to pollutants associated with the diesel exhaust. The estimated number of radiation-related LCFs for the general population ranged from 0.007 to 0.22, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.05. The fact that all these risk numbers are less than one means that the basic implementation would be unlikely to increase the total number of individuals that die of cancer in the United States (there are approximately 300,000 cancer deaths per yr in the United States) by a single fatality.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000004 to 0.00028 LCF from radiation and from 0.001 to 0.14 for traffic fatality, depending on the transportation mode and DOE sites selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation. These risks, especially in the case of radiological accident risks, are much lower than those for incident-free transportation. The risk estimates are probabilistic, which means that they take the probability of an accident's occurring and the consequences of these accidents into account. The risk estimates indicate that the likelihood of a death or an injury from a vehicle accident not involving radiation or radioactive release would be much higher than a death from a radiation-related accident. Both indicate an expectation of less than one fatality.

The impacts of overland transportation for all alternatives and options are shown in Tables E-11 through E-19. As shown in Tables E-1 and E-2, there are 35 distinct approaches to the basic implementation of Management Alternative 1 of the proposed action. These 35 approaches are all the Phase 1/Phase 2 combinations allowed by the SNF&INEL Final EIS (DOE, 1995). Each of these 35 approaches is evaluated for three different transportation mode assumptions: 1) all shipments are on trucks, 2) that shipments from ports to sites are on trucks and intersite shipments are on rail, and 3) that all shipments are on rail. The transportation mode assumptions of all by truck and all by rail are analyzed to bound the risks of any combination of transportation modes. The third mode assumption is provided as an example of a realistic approach. Each distinct approach and mode assumption is evaluated using the average, upper bound, and lower bound risk factors.

These tables are designed to provide risk estimate factors for all expected implementation alternatives. For example, if the SNF&INEL Final EIS alternative selected is Centralization to Nevada Test Site, "Centralization" should be in the first column of each table, and "Nevada Test Site" in the second column of each table. The Phase 1 approaches available are listed in the third column. The decision as to which of the possible Phase 1 approaches would be used will be part of the foreign research reactor spent nuclear fuel policy described in this EIS. The risk estimates for the foreign research reactor spent nuclear fuel EIS policy are given for "Geographic" distribution of spent nuclear fuel during Phase 1 (to Idaho National Engineering Laboratory and Savannah River Site), for "By Fuel" distribution of spent nuclear fuel during Phase 1 (TRIGA to Idaho National Engineering Laboratory and aluminum-based to Savannah River Site), for "All to Idaho National Engineering Laboratory" during Phase 1, and for "All to Savannah River Site" during Phase 1. The risks, expressed in LCF and traffic accident fatalities are provided. These risk estimates include Phase 1 port-to-site shipments (Savannah River Site and/or Idaho National Engineering Laboratory), intersite shipments to, in this case, Nevada Test Site, and Phase 2 port-to-Nevada Test Site

Table E-11 Tabulation of Overland Transportation Risks: Basic Implementation. All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.019	0.056	0.002	0.035	0.00002

Table E-12 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine				Accidental
			Radiological		Nonradiological		Radio-logical
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1992/1993 Planning Basis	INEL/SRS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Regionalization by Fuel Type	INEL/SRS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table E-13 Tabulation of Overland Transportation Risks: Basic Implementation. All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological: Crew	Radiological: Public	Nonradiological: Emis.	Nonradiological: Traffic	Radio-logical
Decentralization	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
1992/1993 Planning Basis	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
Regionalization by Fuel Type	INEL/SRS		0.011	0.014	0.018	0.002	0.00001
Regionalization by Geography	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
	INEL/ORR	Geographic	0.009	0.013	0.010	0.003	0.00001
		By Fuel	0.012	0.016	0.015	0.004	0.00001
		All to INEL	0.015	0.018	0.019	0.005	0.00001
	NTS/SRS	Geographic	0.009	0.014	0.011	0.004	0.00001
		By Fuel	0.012	0.018	0.016	0.005	0.00001
		All to SRS	0.011	0.018	0.016	0.005	0.00001
	NTS/ORR	Geographic	0.011	0.020	0.011	0.008	0.00004
		By Fuel	0.013	0.020	0.016	0.006	0.00002
		All to INEL	0.020	0.033	0.021	0.013	0.00005
		All to SRS	0.012	0.018	0.015	0.005	0.00002
	HS/SRS	Geographic	0.008	0.011	0.011	0.002	0.00001
		By Fuel	0.011	0.015	0.016	0.003	0.00001
		All to SRS	0.010	0.014	0.015	0.003	0.00001
	HS/ORR	Geographic	0.010	0.016	0.010	0.006	0.00004
		By Fuel	0.012	0.017	0.015	0.004	0.00002
		All to INEL	0.018	0.027	0.019	0.009	0.00002
		All to SRS	0.011	0.014	0.015	0.003	0.00001
Centralization	INEL		0.016	0.016	0.023	0.004	0.00002
	SRS		0.011	0.013	0.017	0.002	0.00001
	HS	Geographic	0.023	0.052	0.015	0.026	0.00012

Table E-14 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Truck, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
1992/1993 Planning Basis	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
Regionalization by Fuel Type	INEL/SRS		0.030	0.093	0.003	0.052	0.000012
Regionalization by Geography	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
	INEL/ORR	Geographic	0.017	0.049	0.002	0.030	0.000039
		By Fuel	0.029	0.089	0.003	0.052	0.000045
		All to INEL	0.044	0.138	0.006	0.078	0.000020
	NTS/SRS	Geographic	0.014	0.043	0.002	0.026	0.000015
		By Fuel	0.027	0.084	0.003	0.048	0.000018
		All to SRS	0.025	0.075	0.003	0.042	0.000011
	NTS/ORR	Geographic	0.018	0.052	0.002	0.032	0.000048
		By Fuel	0.030	0.092	0.004	0.054	0.000052
		All to INEL	0.048	0.151	0.008	0.086	0.000055
		All to SRS	0.028	0.085	0.003	0.049	0.000053
	HS/SRS	Geographic	0.013	0.040	0.001	0.024	0.000009
		By Fuel	0.026	0.081	0.003	0.046	0.000013
		All to SRS	0.024	0.072	0.002	0.040	0.000011
	HS/ORR	Geographic	0.017	0.049	0.002	0.030	0.000041
		By Fuel	0.029	0.089	0.003	0.052	0.000047
		All to INEL	0.046	0.146	0.006	0.082	0.000029
		All to SRS	0.028	0.082	0.003	0.047	0.000052
Centralization	INEL		0.051	0.163	0.007	0.091	0.000023
	SRS		0.028	0.085	0.003	0.047	0.000012
	HS	Geographic	0.036	0.114	0.004	0.065	0.000127
		By Fuel	0.050	0.156	0.006	0.088	0.000135
		All to INEL	0.056	0.179	0.008	0.098	0.000032
		All to SRS	0.050	0.157	0.006	0.088	0.000161
	NTS	Geographic	0.034	0.105	0.005	0.065	0.000145
		By Fuel	0.047	0.146	0.007	0.087	0.000152
		All to INEL	0.056	0.177	0.009	0.100	0.000059
		All to SRS	0.047	0.146	0.007	0.087	0.000176
	ORR	Geographic	0.022	0.066	0.002	0.039	0.000063
		By Fuel	0.034	0.105	0.004	0.060	0.000065
		All to INEL	0.058	0.184	0.007	0.105	0.000122
		All to SRS	0.031	0.094	0.003	0.053	0.000053

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-15 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
			Radiological		Nonradiological		Radio-
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	logical
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.015	0.043	0.001	0.026	0.000011
		By Fuel	0.028	0.084	0.003	0.048	0.000015
		All to INEL	0.044	0.138	0.006	0.078	0.000020
	NTS/SRS	Geographic	0.014	0.040	0.001	0.025	0.000008
		By Fuel	0.027	0.081	0.003	0.047	0.000012
		All to SRS	0.025	0.075	0.003	0.042	0.000011
	NTS/ORR	Geographic	0.015	0.043	0.002	0.027	0.000012
		By Fuel	0.028	0.084	0.003	0.049	0.000016
		All to INEL	0.044	0.138	0.007	0.079	0.000023
		All to SRS	0.026	0.078	0.003	0.045	0.000016
	HS/SRS	Geographic	0.013	0.038	0.001	0.023	0.000008
		By Fuel	0.026	0.079	0.003	0.045	0.000012
		All to SRS	0.024	0.072	0.002	0.040	0.000011
	HS/ORR	Geographic	0.014	0.041	0.001	0.025	0.000012
		By Fuel	0.027	0.082	0.003	0.047	0.000016
		All to INEL	0.043	0.136	0.006	0.077	0.000023
		All to SRS	0.025	0.075	0.002	0.043	0.000016
Centralization	INEL						

Table E-16 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
1992/1993 Planning Basis	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
Regionalization by Fuel Type	INEL/SRS		0.010	0.011	0.014	0.002	0.000005
Regionalization by Geography	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
	INEL/ORR	Geographic	0.008	0.010	0.008	0.002	0.000007
		By Fuel	0.010	0.013	0.012	0.003	0.000008
		All to INEL	0.013	0.013	0.013	0.004	0.000004
	NTS/SRS	Geographic	0.007	0.010	0.008	0.003	0.000005
		By Fuel	0.010	0.013	0.013	0.004	0.000005
		All to SRS	0.009	0.014	0.012	0.004	0.000005
	NTS/ORR	Geographic	0.010	0.016	0.008	0.007	0.000036
		By Fuel	0.011	0.016	0.012	0.005	0.000015
		All to INEL	0.017	0.027	0.015	0.012	0.000039
		All to SRS	0.010	0.014	0.012	0.004	0.000009
	HS/SRS	Geographic	0.006	0.008	0.008	0.001	0.000005
		By Fuel	0.009	0.011	0.012	0.002	0.000005
		All to SRS	0.009	0.011	0.012	0.002	0.000005
	HS/ORR	Geographic	0.009	0.013	0.008	0.005	0.000036
		By Fuel	0.010	0.013	0.012	0.003	0.000009
		All to INEL	0.015	0.022	0.013	0.008	0.000013
		All to SRS	0.009	0.011	0.012	0.002	0.000008
Centralization	INEL		0.013	0.011	0.015	0.003	0.000004
	SRS		0.009	0.011	0.013	0.002	0.000005
	HS	Geographic	0.021	0.048	0.011	0.025	0.000119
		By Fuel	0.013	0.015	0.015	0.004	0.000031
		All to INEL	0.017	0.023	0.016	0.008	0.000013
		All to SRS	0.012	0.014	0.015	0.003	0.000036
	NTS	Geographic	0.020	0.044	0.012	0.025	0.000131
		By Fuel	0.013	0.018	0.016	0.006	0.000035
		All to INEL	0.019	0.028	0.017	0.012	0.000039
		All to SRS	0.013	0.016	0.016	0.005	0.000034
	ORR	Geographic	0.012	0.025	0.008	0.010	0.000041
		By Fuel	0.015	0.029	0.012	0.012	0.000028
		All to INEL	0.027	0.059	0.014	0.031	0.000106
		All to SRS	0.013	0.023	0.012	0.007	0.000009

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-17 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
1992/1993 Planning Basis	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
Regionalization by Fuel Type	INEL/SRS		0.048	0.143	0.010	0.088	0.00011
Regionalization by Geography	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
	INEL/ORR	Geographic	0.035	0.101	0.007	0.061	0.00010
		By Fuel	0.046	0.137	0.009	0.085	0.00013
		All to INEL	0.057	0.179	0.011	0.110	0.00012
	NTS/SRS	Geographic	0.034	0.101	0.007	0.060	0.00008
		By Fuel	0.046	0.137	0.010	0.083	0.00011
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	NTS/ORR	Geographic	0.036	0.105	0.007	0.063	0.00011
		By Fuel	0.048	0.142	0.010	0.087	0.00014
		All to INEL	0.062	0.194	0.012	0.118	0.00016
		All to SRS	0.046	0.136	0.010	0.083	0.00014
	HS/SRS	Geographic	0.034	0.098	0.006	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to SRS	0.043	0.127	0.009	0.077	0.00010
	HS/ORR	Geographic	0.035	0.103	0.007	0.061	0.00010
		By Fuel	0.047	0.139	0.009	0.085	0.00013
		All to INEL	0.060	0.189	0.011	0.115	0.00013
		All to SRS	0.045	0.133	0.009	0.081	0.00014
Centralization	INEL		0.065	0.205	0.012	0.126	0.00014
	SRS		0.046	0.137	0.010	0.083	0.00011
	HS	Geographic	0.055	0.169	0.010	0.100	0.00020
		By Fuel	0.067	0.206	0.012	0.124	0.00024
		All to INEL	0.070	0.222	0.013	0.134	0.00015
		All to SRS	0.068	0.209	0.013	0.125	0.00026
	NTS	Geographic	0.054	0.161	0.011	0.100	0.00023
		By Fuel	0.065	0.198	0.013	0.124	0.00026
		All to INEL	0.071	0.222	0.014	0.137	0.00018
		All to SRS	0.066	0.199	0.014	0.125	0.00028
	ORR	Geographic	0.040	0.117	0.007	0.072	0.00013
		By Fuel	0.051	0.152	0.010	0.095	0.00016
		All to INEL	0.071	0.224	0.013	0.139	0.00023
		All to SRS	0.048	0.142	0.010	0.088	0.00014

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities

Table E-18 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS	[redacted]					
1992/1993 Planning Basis	INEL/SRS	[redacted]					
Regionalization by Fuel Type	INEL/SRS	[redacted]					
Regionalization	INEL/SRS	[redacted]					
by Geography	INEL/ORR	Geographic	0.033	0.095	0.006	0.057	0.00007
		By Fuel	0.044	0.131	0.009	0.081	0.00010
		All to INEL	0.057	0.179	0.011	0.110	0.00012
	NTS/SRS	Geographic	0.034	0.098	0.007	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	NTS/ORR	Geographic	0.034	0.097	0.007	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to INEL	0.058	0.181	0.011	0.111	0.00013
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	HS/SRS	Geographic	0.033	0.096	0.006	0.057	0.00007
		By Fuel	0.044	0.132	0.009	0.081	0.00010
		All to SRS	0.043	0.127	0.009	0.077	0.00010
	HS/ORR	Geographic	0.033	0.095	0.006	0.057	0.00007
		By Fuel	0.044	0.131	0.009	0.081	0.00010
		All to INEL	0.058	0.179	0.011	0.110	0.00013
		All to SRS	0.043	0.126	0.009	0.077	0.00010
Centralization	INEL	[redacted]					
	SRS	[redacted]					
	HS	Geographic	0.044	0.129	0.009	0.076	0.00011
		By Fuel	0.055	0.165	0.012	0.100	0.00014
		All to INEL	0.068	0.212	0.013	0.129	0.00015
		All to SRS	0.054	0.161	0.012	0.096	0.00015
	NTS	Geographic	0.043	0.126	0.010	0.077	0.00012
		By Fuel	0.054	0.163	0.012	0.101	0.00015
		All to INEL	0.067	0.209	0.013	0.130	0.00015
		All to SRS	0.053	0.158	0.013	0.097	0.00015
	ORR	Geographic	0.036	0.103	0.007	0.063	0.00008
		By Fuel	0.047	0.140	0.010	0.087	0.00011
		All to INEL	0.061	0.188	0.012	0.116	0.00015
		All to SRS	0.046	0.135	0.010	0.083	0.00011

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-19 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
			Radiological		Nonradiological		Radio-
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	logical
Decentralization	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
1992/1993 Planning Basis	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
Regionalization by Fuel Type	INEL/SRS		0.013	0.020	0.031	0.003	0.00004
Regionalization by Geography	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
	INEL/ORR	Geographic	0.012	0.019	0.018	0.004	0.00003
		By Fuel	0.014	0.023	0.027	0.005	0.00004
		All to INEL	0.016	0.022	0.041	0.006	0.00005
	NTS/SRS	Geographic	0.012	0.022	0.020	0.005	0.00003
		By Fuel	0.014	0.025	0.028	0.006	0.00004
		All to SRS	0.014	0.026	0.025	0.006	0.00004
	NTS/ORR	Geographic	0.014	0.026	0.019	0.009	0.00006
		By Fuel	0.015	0.027	0.027	0.007	0.00005
		All to INEL	0.021	0.038	0.042	0.013	0.00008
		All to SRS	0.014	0.025	0.024	0.006	0.00004
	HS/SRS	Geographic	0.011	0.019	0.019	0.004	0.00003
		By Fuel	0.014	0.023	0.028	0.005	0.00004
		All to SRS	0.013	0.023	0.025	0.005	0.00004
	HS/ORR	Geographic	0.013	0.024	0.018	0.008	0.00006
		By Fuel	0.014	0.024	0.027	0.006	0.00004
		All to INEL	0.019	0.032	0.041	0.010	0.00006
		All to SRS	0.014	0.023	0.023	0.005	0.00004
Centralization	INEL		0.016	0.020	0.049	0.004	0.00005
	SRS		0.013	0.020	0.027	0.003	0.00004
	HS	Geographic	0.026	0.059	0.030	0.027	0.00015
		By Fuel	0.017	0.027	0.038	0.007	0.00007
		All to INEL	0.021	0.035	0.052	0.011	0.00006
		All to SRS	0.017	0.026	0.036	0.006	0.00007
	NTS	Geographic	0.025	0.056	0.027	0.028	0.00016

shipments. Tables E-11 through E-13 present these risk estimates using average risk parameters. Tables E-14 through E-16 provide the lower bound risk estimates, and Tables E-17 through E-19 provide the upper bound risk estimates.

E.7.3 MEI Results for Routine Conditions

The risks to MEIs under incident-free transportation conditions have been estimated for the exposure scenarios described in Section E.6.7. The estimated dose to each of the receptors considered is presented in Table E-20 on a per-event basis (person-rem per event). Note that the potential exists for individual exposures if multiple exposure events occur. For instance, the dose to a person stuck in traffic next to a spent nuclear fuel shipment for 30 min is calculated to be 11 mrem. If the exposure duration was longer, the dose would rise proportionally. Therefore, it is conceivable that a person could receive a dose on the order of 30 to 50 mrem while stopped in traffic next to a shipment. In addition, a person working at a truck service station could receive a significant dose if trucks were to use the same stops repeatedly. If a truckstop worker was present for 100 shipment stops (at the distance and duration given above), the calculated dose is on the order of 30 mrem. Administrative controls could be instituted to control the location and duration of truck stops if multiple exposures were to happen routinely.

Table E-20 Estimated Doses (Rem/Event) to MEIs During Incident-free Transportation Conditions[a, b]

Receptor		Dose to MEI	
		Truck	Rail
Workers	Crew Member	0.1 rem/yr[c]	0.1 rem/yr[c]
	Inspector	0.0029 rem/event	0.0029 rem/event
	Rail Yard Crew Member	N/A	1.3×10^{-3} rem/event
Public	Resident	4.0×10^{-7} rem/event	4.0×10^{-7} rem/event
	Person in Traffic Obstruction	0.011 rem/event	0.011 rem/event
	Person at Service Station	0.00031 rem/event	N/A
	Resident Near Rail Stop	N/A	0.000013 rem/event

[a] *The exposure scenario assumptions are described in Section E.6.6.*

[b] *Doses are calculated assuming that the shipment external dose rate is equal to the regulatory limit of 10 mrem per hr at 2 m (6.6 ft) from the shipment.*

[c] *Dose to truck drivers could exceed the legal limit of rem per yr in the absence of administrative controls.*

The cumulative dose to a resident was calculated assuming all 837 shipments arrived at a single port or management site. The cumulative doses assume that the resident is present for every shipment and is unshielded at a distance of 30 m (66 ft) from the route. Therefore, the cumulative dose is only a function of the number of shipments passing a particular point and is independent of the actual site being considered. The maximum dose to this resident, if all the spent nuclear fuel were to be shipped to a single site, would be less than 0.1 mrem. The annual individual dose can be estimated by assuming that shipments would occur uniformly over a 15-year time period.

E.7.4 Accident Consequence Assessment - Maximum Severity Accident Results

The accident consequence assessment is intended to provide an estimate of the maximum potential impacts posed by the most severe potential transportation accidents involving a spent nuclear fuel shipment.

The accident consequence results are presented in Table E-21 for the maximum severity accidents as defined in the modal study. The population doses are for a uniform population density within an 80 km- (50 mi-) radius (Neuhuser and Kanipe, 1993). The location of the MEI is determined based on atmospheric conditions at the time of the accident and the buoyant characteristics of the released plume. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site for neutral and stable conditions, respectively. The dose to the MEI is independent of the location of the accident. In general, the dose to MEIs for the most severe accidents would be less than 10 mrem. No acute or early fatalities would be expected from radiological causes.

Table E-21 Potential Doses to Populations and MEIs for the Most Severe Transportation Accidents Involving Spent Nuclear Fuel[a,b]

	Neutral Conditions[c]				*Stable Conditions*[d]			
	Population[e]		*MEI*[f]		*Population*[e]		*MEI*[f]	
Mode and Accident Location	*Dose (person-rem)*	*Consequences (cancer fatalities)*	*Dose (rem)*	*Consequences (cancer fatality)*	*Dose (person-rem)*	*Consequences (cancer fatalities)*	*Dose (person-rem)*	*Consequences (cancer fatality)*
Truck								
Urban	14	0.007	0.0024	0.0000012	120	0.06	0.0079	0.000004
Suburban	2.7	0.0014	0.0024	0.0000012	21	0.01	0.0079	0.000004
Rural	0.15	0.000075	0.0024	0.0000012	1.2	0.0006	0.0079	0.000004
Rail								
Urban	14	0.007	0.0024	0.0000012	120	0.06	0.0079	0.000004
Suburban	2.7	0.0014	0.0024	0.0000012	21	0.01	0.0079	0.000004
Rural	0.15	0.000075	0.0024	0.0000012	1.2	0.0006	0.0079	0.000004

[a] *The most severe accidents correspond to the modal study accident severity category 6 (DOE, 1995).*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation, acute cloudshine, groundshine, resuspended*

E.8 Impacts of Implementation Alternatives of the Spent Nuclear Fuel Acceptance Policy

E.8.1 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept only from Developing Nations

This implementation alternative was analyzed using the same set of assumptions as used in analyzing the basic implementation. The results are as follows:

Shipments

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of 168 casks from ports of entry to DOE facilities. The basic shipment count, by point of origin is:

	East Coast		*West Coast*		
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	*Totals*
Phase 1	31	54	15	30	130
Phase 2	9	16	4	9	38
Totals	**40**	**70**	**19**	**39**	**168**

Calculated in the same manner as described in Section E.7.2.1, the number of intersite shipments for two-phased approaches to this alternative varies between 4 and 33. The variation is caused by the wide variety of phased approaches.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.002 to 0.06 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel, 2) combinations of Phase 1 and Phase 2 sites that created varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.001 to 0.015. The estimated number of radiation-related LCFs for the general population ranged from 0.0006 to 0.045, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0002 to 0.01.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.0000001 to 0.00006 LCFs from radiation and from 0.0001 to 0.028 for traffic fatality, depending on the transportation mode and DOE sites selected. The reasons for the range of fatality estimates are the same as those described for incident-free transportation. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-22 through E-30. The analysis for this

Table E-22 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
1992/1993 Planning Basis	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
Regionalization by Fuel Type	INEL/SRS		0.0098	0.0309	0.0016	0.0182	0.000011
Regionalization by Geography	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
	INEL/ORR	Geographic	0.0040	0.0120	0.0006	0.0072	0.000009
		By Fuel	0.0087	0.0273	0.0014	0.0161	0.000012
		All to INEL	0.0096	0.0303	0.0015	0.0178	0.000010
	NTS/SRS	Geographic	0.0039	0.0120	0.0007	0.0071	0.000005
		By Fuel	0.0091	0.0285	0.0016	0.0167	0.000014
		All to SRS	0.0070	0.0215	0.0012	0.0127	0.000007
	NTS/ORR	Geographic	0.0044	0.0134	0.0008	0.0080	0.000011

Table E-23 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						

Table E-24 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological Crew	Radiological Public	Nonradiological Emis.	Nonradiological Traffic	Radio-logical
Decentralization	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
1992/1993 Planning Basis	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
Regionalization by Fuel Type	INEL/SRS		0.0027	0.0027	0.0034	0.0006	0.000003
Regionalization by Geography	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
	INEL/ORR	Geographic	0.0018	0.0023	0.0010	0.0008	0.000001
		By Fuel	0.0028	0.0035	0.0029	0.0011	0.000003
		All to INEL	0.0029	0.0036	0.0031	0.0011	0.000003
	NTS/SRS	Geographic	0.0019	0.0027	0.0011	0.0010	0.000001
		By Fuel	0.0029	0.0039	0.0030	0.0014	0.000003
		All to SRS	0.0025	0.0038	0.0025	0.0013	0.000002
	NTS/ORR	Geographic	0.0023	0.0037	0.0011	0.0017	0.000007
		By Fuel	0.0035	0.0057	0.0031	0.0023	0.000008
		All to INEL	0.0039	0.0068	0.0035	0.0028	0.000010
		All to SRS	0.0027	0.0039	0.0026	0.0013	0.000003
	HS/SRS	Geographic	0.0016	0.0017	0.0009	0.0005	0.000001
		By Fuel	0.0026	0.0029	0.0028	0.0008	0.000003
		All to SRS	0.0022	0.0028	0.0024	0.0007	0.000002
	HS/ORR	Geographic	0.0020	0.0027	0.0010	0.0011	0.000007
		By Fuel	0.0030	0.0044	0.0029	0.0014	0.000004
		All to INEL	0.0034	0.0052	0.0032	0.0019	0.000004
		All to SRS	0.0024	0.0029	0.0025	0.0007	0.000003
Centralization	INEL		0.0030	0.0028	0.0038	0.0007	0.000003
	SRS		0.0024	0.0026	0.0029	0.0005	0.000002
	HS	Geographic	0.0042	0.0089	0.0020	0.0046	0.000022
		By Fuel	0.0035	0.0048	0.0037	0.0016	0.000006
		All to INEL	0.0038	0.0056	0.0039	0.0020	0.000005
		All to SRS	0.0030	0.0036	0.0035	0.0009	0.000009
	NTS	Geographic	0.0042	0.0089	0.0020	0.0050	0.000024
		By Fuel	0.0039	0.0062	0.0039	0.0024	0.000010
		All to INEL	0.0043	0.0072	0.0041	0.0030	0.000010
		All to SRS	0.0033	0.0045	0.0035	0.0015	0.000009
	ORR	Geographic	0.0030	0.0059	0.0012	0.0030	0.000009
		By Fuel	0.0050	0.0109	0.0031	0.0056	0.000017
		All to INEL	0.0060	0.0137	0.0035	0.0074	0.000024
		All to SRS	0.0033	0.0061	0.0026	0.0026	0.000004

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-25 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipment via Truck, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
1992/1993 Planning Basis	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
Regionalization by Fuel Type	INEL/SRS		0.0080	0.0256	0.0010	0.0142	0.0000022
Regionalization by Geography	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
	INEL/ORR	Geographic	0.0029	0.0087	0.0003	0.0050	0.0000061
		By Fuel	0.0071	0.0226	0.0009	0.0127	0.0000049
		All to INEL	0.0077	0.0245	0.0011	0.0141	0.0000020
	NTS/SRS	Geographic	0.0026	0.0082	0.0004	0.0046	0.0000031
		By Fuel	0.0073	0.0232	0.0011	0.0130	0.0000064
		All to SRS	0.0058	0.0181	0.0007	0.0096	0.0000018
	NTS/ORR	Geographic	0.0032	0.0098	0.0005	0.0058	0.0000088
		By Fuel	0.0077	0.0244	0.0012	0.0139	0.0000096
		All to INEL	0.0086	0.0273	0.0014	0.0157	0.0000093
		All to SRS	0.0066	0.0202	0.0008	0.0111	0.0000103
	HS/SRS	Geographic	0.0023	0.0073	0.0002	0.0039	0.0000010
		By Fuel	0.0069	0.0221	0.0009	0.0122	0.0000030
		All to SRS	0.0056	0.0173	0.0006	0.0091	0.0000017
	HS/ORR	Geographic	0.0029	0.0088	0.0003	0.0051	0.0000068
		By Fuel	0.0074	0.0233	0.0010	0.0130	0.0000062
		All to INEL	0.0081	0.0260	0.0011	0.0147	0.0000039
		All to SRS	0.0063	0.0194	0.0007	0.0105	0.0000102
Centralization	INEL		0.0090	0.0288	0.0013	0.0164	0.0000023
	SRS		0.0068	0.0212	0.0007	0.0110	0.0000021
	HS	Geographic	0.0063	0.0201	0.0008	0.0112	0.0000215
		By Fuel	0.0100	0.0319	0.0013	0.0177	0.0000143
		All to INEL	0.0098	0.0315	0.0014	0.0176	0.0000043
		All to SRS	0.0106	0.0336	0.0013	0.0184	0.0000320
	NTS	Geographic	0.0060	0.0188	0.0010	0.0113	0.0000255
		By Fuel	0.0098	0.0312	0.0016	0.0180	0.0000189
		All to INEL	0.0098	0.0316	0.0017	0.0181	0.0000096
		All to SRS	0.0101	0.0316	0.0015	0.0183	0.0000352
	ORR	Geographic	0.0045	0.0142	0.0005	0.0080	0.0000140
		By Fuel	0.0095	0.0301	0.0012	0.0170	0.0000185
		All to INEL	0.0108	0.0348	0.0014	0.0200	0.0000232
		All to SRS	0.0074	0.0229	0.0008	0.0122	0.0000105

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-26 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						
by Geography	INEL/ORR	Geographic	0.0025	0.0078	0.0003	0.0044	0.0000011
		By Fuel	0.0070	0.0221	0.0009	0.0124	0.0000022

Table E-27 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
1992/1993 Planning Basis	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
Regionalization by Fuel Type	INEL/SRS		0.0023	0.0017	0.0021	0.0005	0.0000003
Regionalization by Geography	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
	INEL/ORR	Geographic	0.0015	0.0018	0.0004	0.0006	0.0000007
		By Fuel	0.0024	0.0026	0.0017	0.0009	0.0000006
		All to INEL	0.0024	0.0025	0.0018	0.0009	0.0000002
	NTS/SRS	Geographic	0.0015	0.0017	0.0005	0.0008	0.0000004
		By Fuel	0.0024	0.0026	0.0018	0.0011	0.0000007
		All to SRS	0.0021	0.0027	0.0018	0.0010	0.0000005
	NTS/ORR	Geographic	0.0019	0.0028	0.0006	0.0015	0.0000060
		By Fuel	0.0029	0.0044	0.0020	0.0020	0.0000053
		All to INEL	0.0033	0.0053	0.0022	0.0026	0.0000075
		All to SRS	0.0023	0.0029	0.0019	0.0011	0.0000013
	HS/SRS	Geographic	0.0012	0.0010	0.0004	0.0002	0.0000004
		By Fuel	0.0021	0.0018	0.0017	0.0005	0.0000008
		All to SRS	0.0019	0.0020	0.0016	0.0005	0.0000003
	HS/ORR	Geographic	0.0017	0.0020	0.0005	0.0009	0.0000060
		By Fuel	0.0026	0.0033	0.0018	0.0012	0.0000018
		All to INEL	0.0029	0.0040	0.0019	0.0016	0.0000022
		All to SRS	0.0021	0.0021	0.0017	0.0005	0.0000012
Centralization	INEL		0.0025	0.0017	0.0021	0.0005	0.0000002
	SRS		0.0021	0.0020	0.0021	0.0004	0.0000004
	HS	Geographic	0.0037	0.0080	0.0011	0.0043	0.0000204
		By Fuel	0.0030	0.0036	0.0023	0.0013	0.0000039
		All to INEL	0.0032	0.0042	0.0022	0.0017	0.0000022
		All to SRS	0.0026	0.0026	0.0024	0.0007	0.0000066
	NTS	Geographic	0.0037	0.0077	0.0013	0.0047	0.0000224
		By Fuel	0.0033	0.0046	0.0025	0.0021	0.0000072
		All to INEL	0.0036	0.0054	0.0026	0.0026	0.0000075
		All to SRS	0.0027	0.0032	0.0025	0.0012	0.0000064
	ORR	Geographic	0.0028	0.0055	0.0006	0.0026	0.0000075
		By Fuel	0.0047	0.0101	0.0020	0.0052	0.0000142
		All to INEL	0.0056	0.0128	0.0021	0.0069	0.0000214
		All to SRS	0.0031	0.0056	0.0018	0.0022	0.0000015

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-28 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological Crew	Radiological Public	Nonradiological Emis.	Nonradiological Traffic	Radio-logical
Decentralization	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
1992/1993 Planning Basis	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
Regionalization by Fuel Type	INEL/SRS		0.0113	0.0352	0.0024	0.0220	0.000027
Regionalization by Geography	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
	INEL/ORR	Geographic	0.0067	0.0200	0.0015	0.0117	0.000019
		By Fuel	0.0104	0.0320	0.0022	0.0199	0.000027
		All to INEL	0.0107	0.0335	0.0021	0.0211	0.000024
	NTS/SRS	Geographic	0.0069	0.0207	0.0016	0.0118	0.000017
		By Fuel	0.0110	0.0340	0.0025	0.0207	0.000029
		All to SRS	0.0099	0.0296	0.0024	0.0176	0.000024
	NTS/ORR	Geographic	0.0072	0.0215	0.0016	0.0125	0.000022
		By Fuel	0.0111	0.0344	0.0025	0.0210	0.000032
		All to INEL	0.0117	0.0368	0.0025	0.0227	0.000032
		All to SRS	0.0104	0.0310	0.0025	0.0186	0.000032
	HS/SRS	Geographic	0.0067	0.0198	0.0014	0.0113	0.000015
		By Fuel	0.0106	0.0329	0.0022	0.0201	0.000025
		All to SRS	0.0097	0.0289	0.0023	0.0173	0.000023
	HS/ORR	Geographic	0.0070	0.0206	0.0015	0.0120	0.000020
		By Fuel	0.0108	0.0333	0.0022	0.0204	0.000028
		All to INEL	0.0113	0.0355	0.0022	0.0220	0.000026
		All to SRS	0.0102	0.0303	0.0024	0.0183	0.000031
Centralization	INEL		0.0120	0.0379	0.0024	0.0240	0.000028
	SRS		0.0106	0.0319	0.0026	0.0192	0.000026
	HS	Geographic	0.0104	0.0320	0.0020	0.0188	0.000038
		By Fuel	0.0134	0.0420	0.0026	0.0257	0.000040
		All to INEL	0.0130	0.0411	0.0025	0.0254	0.000030
		All to SRS	0.0145	0.0445	0.0030	0.0267	0.000057
	NTS	Geographic	0.0102	0.0310	0.0022	0.0189	0.000043

Table E-29 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological: Crew	Radiological: Public	Nonradiological: Emis.	Nonradiological: Traffic	Radiological
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.0064	0.0190	0.0014	0.0111	0.000014
		By Fuel	0.0102	0.0315	0.0022	0.0195	0.000024
		All to INEL	0.0107	0.0335	0.0021	0.0211	0.000024
	NTS/SRS	Geographic	0.0067	0.0197	0.0015	0.0113	0.000015
		By Fuel	0.0105	0.0323	0.0023	0.0198	0.000025
		All to SRS	0.0099	0.0296	0.0024	0.0176	0.000024
	NTS/ORR	Geographic	0.0067	0.0196	0.0015	0.0113	0.000015
		By Fuel	0.0105	0.0322	0.0023	0.0198	0.000025
		All to INEL	0.0110	0.0341	0.0023	0.0213	0.000025
		All to SRS	0.0099	0.0296	0.0024	0.0177	0.000024
	HS/SRS	Geographic	0.0065	0.0190	0.0014	0.0110	0.000015
		By Fuel	0.0103	0.0316	0.0022	0.0194	0.000025

Table E-30 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	

E.8.2 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept Only from Reactors that Use Highly-Enriched Uranium (HEU)

This alternative was not analyzed for policy reasons. See Chapter 4.

E.8.3 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept Target Material

Target material is currently stored overseas as a liquid. In order to allow shipment, it must be processed into a solid form by either calcination or oxidation. Calcination results in a solid, but easily crumbled material, and oxidation results in a powder. Oxidation removes the aluminum and, therefore, would lead to fewer shipments than calcination. Shipment counts in Appendix B indicate that just over five shipments would be arriving on the east coast. However, in order to be conservative, six full shipments are used for transportation risk analysis. Similarly, the amount of material that could arrive on the west coast is much less than one full cask. The analysis conservatively assumes one full cask.

Form	*Port of Entry*		
	East Coast	*West Coast*	*Eastern Canada*
Calcinate	14	1	125
Oxidized Powder	6	1	50

Analysis of the target material and potential casks indicates that the maximum dose rate from any cask would be 0.1 mrem per hr at 2 m (3.3 ft). This low radiation level is based on the low burn-up of target material. Because of the conservative release fractions assigned to the oxidized material (see Section E.6.4.2), the results are emphasized below. The risks tabulated in this section would be added to those associated with the basic implementation of Management Alternative 1 if both aspects of the policy were to be performed.

Impacts of Incident-Free Ground Transport

The incident-free transportation of oxidized target material was estimated to result in total latent fatalities that ranged from 0.0002 to 0.003 over the entire duration of the program. The calcinated target material results are 2.5 times higher. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew. This represents an increase to the risk associated with the basic implementation.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel 2) combinations of Phase 1 and Phase 2 sites that created varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.00007 to 0.00074. The estimated number of radiation-related LCFs for the general population ranged from 0.00015 to 0.0023, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.00396.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire policy are estimated to range from 0.00023 to 0.0054 LCF from radiation and from 0.0001 to 0.013 for traffic fatality, depending on the transportation mode and DOE sites selected. The risks would be four times lower if calcinated material is transported. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-31 through E-39. The analysis for this implementation alternative is analogous to the analysis performed for the Basic Implementation (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2. The total policy risk with this implementation alternative is the sum of the values in the above referenced tables and those in Section E.7.2 describing the Basic Implementation.

Table E-40 gives the consequences for the most severe accident hypothesized if that accident were to occur at various locations. The maximum accident risks would be four times lower for calcinated material. The accident probabilities are described in Section 6 of this appendix.

E.8.4 Implementation Alternative - Implementing an Acceptance Policy for Varying Durations - Five-Year Spent Nuclear Fuel Acceptance

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of casks from ports of entry to DOE facilities. The basic shipment count, by point of origin is:

	East Coast		*West Coast*		Totals
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	
Phase 1	419	101	105	53	678

Calculated in the same manner as described for the basic implementation of Management Alternative 1, the number of intersite shipments for the two-phased approaches to this strategy varies between 8 and 184. The variation is caused by the wide variety of phased approaches.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.01 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.005 to 0.064. The estimated number of radiation-related LCFs for the general population ranged from 0.005 to 0.20, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.041.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000003 to 0.00026 LCFs from radiation and from 0.001 to 0.13 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-41 through E-49. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

Table E-32 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00042	0.00129	0.00060	0.0066	0.00352
	NTS/SRS	Geographic	0.00022	0.00061	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	NTS/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00047	0.00132	0.00077	0.0066	0.00352
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074
	HS/SRS	Geographic	0.00022	0.00061	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	HS/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00046	0.00132	0.00077	0.0066	0.00352
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074
Centralization	INEL						
	SRS						
	HS	Geographic	0.00041	0.00097	0.00125	0.0053	0.00161
		By Fuel	0.00041	0.00100	0.00129	0.0054	0.00165
		All to INEL	0.00054	0.00159	0.00094	0.0078	0.00442
		All to SRS	0.00041	0.00100	0.00129	0.0054	0.00165
	NTS	Geographic	0.00040	0.00094	0.00130	0.0054	0.00158
		By Fuel	0.00041	0.00097	0.00133	0.0055	0.00162
		All to INEL	0.00054	0.00157	0.00096	0.0079	0.00439
		All to SRS	0.00041	0.00097	0.00133	0.0055	0.00162
	ORR	Geographic	0.00025	0.00063	0.00026	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00050	0.00136	0.00115	0.0068	0.00353
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-33 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Average Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option	Routine	Accidental

Table E-34 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Truck, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
1992/1993 Planning Basis	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
Regionalization by Fuel Type	INEL/SRS		0.00022	0.00062	0.00014	0.0040	0.00070
Regionalization by Geography	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
	INEL/ORR	Geographic	0.00028	0.00078	0.00025	0.0050	0.00095
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00041	0.00126	0.00058	0.0064	0.00341
	NTS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00069
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	NTS/ORR	Geographic	0.00029	0.00079	0.00026	0.0050	0.00096
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00053	0.00163	0.00093	0.0083	0.00358
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098
	HS/SRS	Geographic	0.00022	0.00060	0.00013	0.0039	0.00069
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	HS/ORR	Geographic	0.00029	0.00079	0.00025	0.0050	0.00096
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00050	0.00156	0.00067	0.0077	0.00356
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098
Centralization	INEL		0.00048	0.00147	0.00072	0.0073	0.00426
	SRS		0.00022	0.00062	0.00014	0.0040	0.00070
	HS	Geographic	0.00071	0.00219	0.00085	0.0127	0.00369
		By Fuel	0.00073	0.00224	0.00087	0.0130	0.00375
		All to INEL	0.00058	0.00183	0.00084	0.0089	0.00443
		All to SRS	0.00073	0.00224	0.00087	0.0130	0.00375
	NTS	Geographic	0.00066	0.00197	0.00093	0.0125	0.00362
		By Fuel	0.00068	0.00201	0.00094	0.0128	0.00369
		All to INEL	0.00060	0.00188	0.00111	0.0095	0.00442
		All to SRS	0.00068	0.00201	0.00094	0.0128	0.00369
	ORR	Geographic	0.00029	0.00080	0.00026	0.0051	0.00100
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00072	0.00227	0.00093	0.0126	0.00528
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-35 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite via Rail, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological: Crew	Radiological: Public	Nonradiological: Emis.	Nonradiological: Traffic	Radio-logical
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.00024	0.00061	0.00023	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00041	0.00126	0.00058	0.0064	0.00341
	NTS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00068
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	NTS/ORR	Geographic	0.00025	0.00061	0.00024	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00046	0.00129	0.00075	0.0065	0.00343
		All to SRS	0.00025	0.00063	0.00024	0.0039	0.00073
	HS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00068
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	HS/ORR	Geographic	0.00025	0.00061	0.00024	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00045	0.00129	0.00075	0.0064	0.00344
		All to SRS	0.00025	0.00063	0.00024	0.0039	0.00073
Centralization	INEL						

Table E-36 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023
1992/1993 Planning Basis	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023
Regionalization by Fuel Type	INEL/SRS		0.00007	0.00018	0.00292	0.0001	0.00023
Regionalization	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023

Table E-37 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Truck, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
1992/1993 Planning Basis	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
Regionalization by Fuel Type	INEL/SRS		0.00024	0.00068	0.00021	0.0044	0.00080
Regionalization by Geography	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
	INEL/ORR	Geographic	0.00030	0.00084	0.00030	0.0053	0.00100
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00043	0.00131	0.00062	0.0067	0.00355
	NTS/SRS	Geographic	0.00024	0.00066	0.00019	0.0043	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	NTS/ORR	Geographic	0.00031	0.00084	0.00031	0.0054	0.00101
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00054	0.00167	0.00098	0.0086	0.00372
		All to SRS	0.00031	0.00086	0.00033	0.0055	0.00107
	HS/SRS	Geographic	0.00024	0.00066	0.00019	0.0042	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	HS/ORR	Geographic	0.00031	0.00084	0.00031	0.0054	0.00101
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00051	0.00160	0.00072	0.0081	0.00370
		All to SRS	0.00031	0.00086	0.00033	0.0055	0.00107
Centralization	INEL		0.00049	0.00152	0.00077	0.0076	0.00442
	SRS		0.00024	0.00068	0.00021	0.0044	0.00080

Table E-38 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
			Radiological		Nonradiological		
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	Radiological

Table E-39 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00008	0.00019	0.00301	0.0002	0.00025
1992/1993 Planning Basis	INEL/SRS		0.00008	0.00019	0.00301	0.0002	0.00025
Regionalization by Fuel Type	INEL/SRS		0.00008	0.00019	0.00305	0.0002	0.00026
Regionalization by Geography	INEL/SRS		0.00008	0.00019	0.00301	0.0002	0.00025
	INEL/ORR	Geographic	0.00010	0.00019	0.00276	0.0002	0.00025
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00010	0.00016	0.00242	0.0002	0.00089
	NTS/SRS	Geographic	0.00008	0.00019	0.00302	0.0002	0.00025
		By Fuel	0.00008	0.00019	0.00305	0.0002	0.00026
		All to SRS	0.00008	0.00019	0.00305	0.0002	0.00026
	NTS/ORR	Geographic	0.00015	0.00037	0.00278	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00022	0.00053	0.00278	0.0022	0.00106
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026
	HS/SRS	Geographic	0.00008	0.00019	0.00302	0.0002	0.00025
		By Fuel	0.00008	0.00019	0.00305	0.0002	0.00026
		All to SRS	0.00008	0.00019	0.00305	0.0002	0.00026
	HS/ORR	Geographic	0.00015	0.00037	0.00278	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00019	0.00045	0.00252	0.0016	0.00104
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026
Centralization	INEL		0.00012	0.00018	0.00268	0.0003	0.00111
	SRS		0.00008	0.00019	0.00305	0.0002	0.00026
	HS	Geographic	0.00051	0.00151	0.00352	0.0080	0.00258
		By Fuel	0.00020	0.00029	0.00396	0.0005	0.00086
		All to INEL	0.00021	0.00047	0.00282	0.0016	0.00127
		All to SRS	0.00020	0.00029	0.00396	0.0005	0.00086
	NTS	Geographic	0.00046	0.00132	0.00354	0.0077	0.00255
		By Fuel	0.00019	0.00028	0.00396	0.0005	0.00082
		All to INEL	0.00024	0.00055	0.00306	0.0022	0.00128
		All to SRS	0.00019	0.00028	0.00396	0.0005	0.00082
	ORR	Geographic	0.00015	0.00037	0.00279	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00041	0.00117	0.00278	0.0064	0.00275
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-40 Potential Consequences for the Most Severe Accidents Involving Shipments of Target Material[a,b]

Mode and Accident Location	*Neutral Conditions[c]*				*Stable Conditions[d]*			
	Population[e]		*MEI[f]*		*Population[e]*		*MEI[f]*	
	Dose (person-rem)	*Consequences (LCF)*	*Dose (rem)*	*Consequences (LCF)*	*Dose (person-rem)*	*Consequences (LCF)*	*Dose (person-rem)*	*Consequences (LCF)*
Truck:								
Urban	206	0.1	0.15	0.000074	1650	0.83	0.50	0.00025
Suburban	38.3	0.019	0.15	0.000074	307	0.15	0.50	0.00025
Rural	0.70	0.00035	0.15	0.000074	5.5	0.0028	0.50	0.00025
Rail:								
Urban	206	0.1	0.15	0.000074	1650	0.83	0.50	0.00025
Suburban	38.3	0.19	0.15	0.000074	307	0.15	0.50	0.00025
Rural	0.70	0.00035	0.15	0.000074	5.5	0.0028	0.50	0.00025

[a] *The most severe accidents correspond to modal study accident severity category 6 (DOE, 1994b).*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation, acute cloudshine, groundshine, resuspended inhalation, resuspended cloudshine, and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.*

[f] *The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.*

E.8.5 Implementation Alternative - Implementing an Acceptance Policy for Varying Durations - Indefinite HEU Acceptance

Since most LEU would come back within 10 years and spent nuclear fuel produced from the indefinite operation of HEU reactors is difficult to predict, it is reasonable to assume that the analysis for the basic implementation applies closely.

E.8.6 Implementation Alternative - Implementing an Acceptance Policy with Varying Financial Approaches

Table E-41 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
1992/1993 Planning Basis	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
Regionalization by Fuel Type	INEL/SRS		0.030	0.093	0.004	0.056	0.000032
Regionalization by Geography	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
	INEL/ORR	Geographic	0.017	0.051	0.002	0.032	0.000046
		By Fuel	0.032	0.099	0.005	0.060	0.000066
		All to INEL	0.050	0.157	0.008	0.090	0.000055
	NTS/SRS	Geographic	0.016	0.049	0.002	0.030	0.000022
		By Fuel	0.031	0.096	0.005	0.058	0.000041
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	NTS/ORR	Geographic	0.018	0.055	0.003	0.034	0.000055
		By Fuel	0.033	0.102	0.005	0.062	0.000074
		All to INEL	0.054	0.171	0.009	0.097	0.000092
		All to SRS	0.030	0.090	0.005	0.055	0.000072
	HS/SRS	Geographic	0.016	0.048	0.002	0.030	0.000016
		By Fuel	0.031	0.095	0.005	0.057	0.000035
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	HS/ORR	Geographic	0.018	0.054	0.002	0.033	0.000049
		By Fuel	0.033	0.101	0.005	0.061	0.000068
		All to INEL	0.053	0.168	0.008	0.095	0.000065
		All to SRS	0.030	0.090	0.005	0.055	0.000072
Centralization	INEL		0.050	0.157	0.008	0.090	0.000055
	SRS		0.027	0.082	0.004	0.050	0.000029
	HS	Geographic	0.029	0.088	0.004	0.053	0.000133
		By Fuel	0.044	0.136	0.006	0.081	0.000153
		All to INEL	0.053	0.168	0.008	0.095	0.000065
		All to SRS	0.044	0.134	0.006	0.081	0.000183
	NTS	Geographic	0.028	0.083	0.004	0.053	0.000152
		By Fuel	0.043	0.130	0.007	0.081	0.000172
		All to INEL	0.054	0.171	0.009	0.097	0.000092
		All to SRS	0.042	0.127	0.006	0.080	0.000199
	ORR	Geographic	0.020	0.060	0.003	0.038	0.000071
		By Fuel	0.035	0.108	0.005	0.065	0.000090
		All to INEL	0.061	0.195	0.009	0.114	0.000162
		All to SRS	0.030	0.090	0.005	0.055	0.000072

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-42 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						

Table E-43 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
1992/1993 Planning Basis	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
Regionalization by Fuel Type	INEL/SRS		0.009	0.011	0.015	0.002	0.000010
Regionalization by Geography	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
	INEL/ORR	Geographic	0.007	0.007	0.009	0.001	0.000008
		By Fuel	0.010	0.012	0.015	0.002	0.000013
		All to INEL	0.013	0.013	0.018	0.003	0.000013
	NTS/SRS	Geographic	0.006	0.007	0.009	0.001	0.000006

Table E-44 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
1992/1993 Planning Basis	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
Regionalization by Fuel Type	INEL/SRS		0.025	0.078	0.003	0.044	0.000010
Regionalization by Geography	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
	INEL/ORR	Geographic	0.013	0.039	0.001	0.023	0.000038
		By Fuel	0.027	0.084	0.003	0.048	0.000043
		All to INEL	0.041	0.131	0.006	0.073	0.000018
	NTS/SRS	Geographic	0.012	0.036	0.001	0.021	0.000014
		By Fuel	0.026	0.081	0.003	0.046	0.000019
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	NTS/ORR	Geographic	0.014	0.042	0.002	0.025	0.000047
		By Fuel	0.029	0.087	0.003	0.049	0.000052
		All to INEL	0.046	0.145	0.007	0.081	0.000055
		All to SRS	0.026	0.079	0.003	0.044	0.000053
	HS/SRS	Geographic	0.012	0.035	0.001	0.021	0.000008
		By Fuel	0.026	0.081	0.003	0.045	0.000013
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	HS/ORR	Geographic	0.014	0.041	0.001	0.025	0.000041
		By Fuel	0.028	0.087	0.003	0.049	0.000046
		All to INEL	0.045	0.143	0.006	0.078	0.000028
		All to SRS	0.026	0.079	0.003	0.044	0.000053
Centralization	INEL		0.041	0.131	0.006	0.073	0.000018
	SRS		0.023	0.071	0.002	0.039	0.000010
	HS	Geographic	0.024	0.075	0.003	0.044	0.000125
		By Fuel	0.039	0.121	0.004	0.069	0.000131
		All to INEL	0.045	0.143	0.006	0.078	0.000028
		All to SRS	0.040	0.123	0.004	0.070	0.000164
	NTS	Geographic	0.023	0.070	0.003	0.044	0.000144
		By Fuel	0.038	0.116	0.005	0.068	0.000149
		All to INEL	0.046	0.145	0.007	0.081	0.000055
		All to SRS	0.038	0.115	0.005	0.068	0.000180
	ORR	Geographic	0.016	0.048	0.002	0.029	0.000064
		By Fuel	0.030	0.093	0.003	0.053	0.000068
		All to INEL	0.053	0.170	0.007	0.097	0.000125
		All to SRS	0.026	0.079	0.003	0.044	0.000053

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-45 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						
by	INEL/ORR	Geographic	0.011	0.033	0.001	0.020	0.000009
Geography		By Fuel	0.026	0.078	0.003	0.044	0.000014
		All to INEL	0.041	0.131	0.006	0.073	0.000018
	NTS/SRS	Geographic	0.011	0.033	0.001	0.020	0.000006
		By Fuel	0.025	0.078	0.003	0.044	0.000011
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	NTS/ORR	Geographic	0.011	0.033	0.001	0.020	0.000009
		By Fuel	0.026	0.078	0.003	0.044	0.000014
		All to INEL	0.042	0.132	0.006	0.073	0.000021
		All to SRS	0.024	0.071	0.002	0.039	0.000014
	HS/SRS	Geographic	0.011	0.033	0.001	0.020	0.000006
		By Fuel	0.025	0.078	0.003	0.044	0.000011
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	HS/ORR	Geographic	0.011	0.033	0.001	0.020	0.000010
		By Fuel	0.026	0.078	0.003	0.044	0.000015
		All to INEL	0.042	0.132	0.006	0.073	0.000022
		All to SRS	0.024	0.071	0.002	0.039	0.000014
Centralization	INEL						

Table E-46 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.005	0.005	0.006	0.001	0.000003
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table E-47 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.027	0.078	0.005	0.046	0.00006

Table E-48 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
			Radiological		Nonradiological		
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	Radiological
Decentralization	INEL/SRS						

Table E-49 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
1992/1993 Planning Basis	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
Regionalization by Fuel Type	INEL/SRS		0.011	0.016	0.026	0.002	0.00003
Regionalization	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
by	INEL/ORR	Geographic	0.009	0.013	0.016	0.002	0.00002
Geography		By Fuel	0.011	0.016	0.026	0.002	0.00004
		All to INEL	0.013	0.016	0.039	0.003	0.00004
	NTS/SRS	Geographic	0.009	0.012	0.016	0.002	0.00002

E.8.7 Implementation Alternative - Implementing an Acceptance Policy by Taking Title at Varying Locations

The agency that has title to the spent nuclear fuel has no significant effect on overland transportation. The effects calculated for the basic implementation apply here.

E.8.8 Implementation Alternative - Implementing an Acceptance Policy and Storing Underwater

The use of underwater storage would have only minor effects on the location to which foreign research reactor spent nuclear fuel were delivered on the DOE sites. However, since there is some degree of uncertainty in the exact delivery location on all the DOE sites and intrasite transportation would be less likely, the effects calculated for the basic implementation apply here.

E.8.9 Implementation Alternative - Implementing an Acceptance Policy and Near-Term Chemical Separation in the United States

The performance of conventional or alternative chemical separation is only considered feasible at the Idaho National Engineering Laboratory and Savannah River Site sites. The requirements for overland transportation are not affected by the activities at the sites. Therefore, the impacts calculated in Section E.7 for the options to transport fuel to Idaho National Engineering Laboratory and/or Savannah River Site under the Regionalization by Fuel Type or Centralization alternatives would apply to this section. They are shown in Table E-50.

Table E-50 Tabulation of Overland Transportation Risks: Chemical Separation in the United States

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis*	*Traffic*	*Radiological*

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.020 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and, 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.009 to 0.065. The estimated number of radiation-related LCFs for the general population ranged from 0.011 to 0.21, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.003 to 0.05.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000004 to 0.00014 LCFs from radiation and from 0.002 to 0.13 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Table E-50. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

The consequences of the most severe accident hypothesized are the same as described for the Basic Implementation since the material at risk is the same.

E.8.10 Developmental Processing Capabilities

The overland transportation impacts would be based on the site selected for processing, and would be determined after that site is selected.

E.8.11 Management Alternative - Adopt a Strategy of Managing Foreign Research Reactor Spent Nuclear Fuel Overseas: Store Overseas

There would be no overland transportation impacts in the United States if this alternative were implemented.

E.8.12 Policy Alternative - Adopt a Strategy of Managing Foreign Research Reactor Spent Nuclear Fuel Overseas: Process Overseas and Ship Vitrified High-Level Waste to the United States

The total amount of foreign research reactor spent nuclear fuel could be reduced into 16 vitrified waste logs, which could be carried in 8 casks. The contents of each cask is described isotopically in Table E-3. The curie content is based on the total number of curies expected to be returned to the United States under the basic implementation of Management Alternative 1. Realistically, the logs might have to be allowed to decay at the vitrification facility until the dose rate was below the regulatory-limit. Therefore, all incident-free calculations assume the dose rate is 10 mrem per hr at 2 m (6.6 ft).

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.0002 to 0.004 over the entire duration of the program. These results are the sum of the estimated number of radiation-related LCFs to the public and the crews.

The range of fatality estimates is caused by the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.00014 to 0.001. The estimated number of radiation-related LCFs for the general population ranged from 0.00009 to 0.003, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.0005.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 1.9×10^{-7} to 5.9×10^{-6} LCF from radiation and from 0.00003 to 0.002 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-51 and E-52.

Table E-51 Tabulation of Ground Transportation Risks: Vitrified High-Level Waste Acceptance Only

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis.*	*Traffic*	*Radiological*
Ship directly to repository	Truck	Upper	0.00076	0.00240	0.00016	0.00162	5.9×10^{-6}
		Nominal	0.00072	0.00227	0.00013	0.00143	5.0×10^{-6}
		Lower	0.00053	0.00172	0.00010	0.00106	1.7×10^{-6}
	Rail	Upper	0.00020	0.00024	0.00052	0.00005	2.0×10^{-6}
		Nominal	0.00019	0.00019	0.00025	0.00005	1.2×10^{-6}
		Lower	0.00014	0.00009	0.00015	0.00003	1.9×10^{-7}
Ship to Savannah River Site, then to repository	Truck	Upper	0.00102	0.00302	0.00018	0.00196	1.0×10^{-5}
		Nominal	0.00083	0.00249	0.00013	0.00168	7.6×10^{-6}
		Lower	0.00076	0.00227	0.00011	0.00153	6.3×10^{-6}
	Rail	Upper	0.00029	0.00030	0.00035	0.00007	2.3×10^{-6}
		Nominal	0.00025	0.00021	0.00022	0.00006	1.3×10^{-6}
		Lower	0.00023	0.00018	0.00019	0.00005	9.7×10^{-7}

All risks are expressed in latent cancer fatalities during the foreign research reactor spent nuclear fuel policy, except for the Accidental - Traffic column, which is the number of fatalities during the policy.

E.8.13 Management Alternative - The Hybrid Alternative

The hybrid alternative is based on the SNF&INEL Final EIS (DOE, 1995) Regionalization by Fuel Type. The origin of shipment count is described in detail in Chapter 2 and Appendix B. The shipment count is:

	East Coast		*West Coast*		*Totals*
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	
Phase 1	212	82	101	42	437
Phase 2	63	25	30	13	131
Total	**275**	**107**	**131**	**55**	**568**

Table E-52 Potential Consequences for the Most Severe Accidents Involving Shipments of Foreign Research Reactor High-Level Waste[a,b]

	Neutral Conditions[c]				Stable Conditions[d]			
	Population[e]		MEI[f]		Population[e]		MEI[f]	
Mode and Accident Location	Dose (person-rem)	Consequences (LCF)	Dose (rem)	Consequences (LCF)	Dose (person-rem)	Consequences (LCF)	Dose (rem)	Consequences (LCF)
Truck								
Urban	121	0.06	0.09	0.000044	970	0.48	0.29	0.00015
Suburban	22.5	0.01	0.09	0.000044	180	0.09	0.29	0.00015
Rural	0.4	0.0002	0.09	0.000044	3.2	0.002	0.29	0.00015
Rail								
Urban	121	0.06	0.09	0.000044	907	0.48	0.29	0.00015
Suburban	22.5	0.01	0.09	0.000044	180	0.09	0.29	0.00015
Rural	0.4	0.0002	0.09	0.000044	3.2	0.002	0.29	0.00015

[a] *The most severe accidents correspond to the highest NUREG-0170 accident severity category (category VIII) (NRC, 1977a). It was assumed that 0.000001 of the radioactive material would be released from its packaging and 5 percent of the aerosolized release would be respirable following an accident.*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation; acute cloudshine; groundshine; resuspended inhalation; resuspended cloudshine; and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.*

[f] *The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.*

No intersite shipment is necessary for this alternative. The risk estimates are summarized in Table E-53.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.009 to 0.15 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and 2) the difference between the risk factors for the port-to-site routes.

Table E-53 Tabulation of Overland Transportation Risks: Management Alternative 3 (Hybrid Alternative)

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis.*	*Traffic*	*Radiological*
Regionalization by Fuel Type	Truck	Upper	0.037	0.112	0.008	0.069	0.000081
		Nominal	0.033	0.098	0.005	0.058	0.000035
		Lower	0.028	0.087	0.003	0.048	0.000012
	Rail	Upper	0.010	0.015	0.025	0.002	0.000030
		Nominal	0.009	0.012	0.016	0.002	0.000011
		Lower	0.008	0.010	0.013	0.002	0.000005

All risks are expressed in latent cancer fatalities during the foreign research reactor spent nuclear fuel except for the Accidental - Traffic column, which is the number of fatalities during the policy

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 4.5 x 10^{-6} to 0.000081 LCFs from radiation and from 0.0017 to 0.069 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Table E-53. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

E.8.14 Transportation Implementation Example - Ship All Foreign Research Reactor Spent Nuclear Fuel to a Single Port, Regionalization-By-Fuel-Type

All the implementation alternatives analyzed in Section E.8 have been analyzed under the assumption that all foreign research reactor spent nuclear fuel would be delivered to ports on the coast nearest to the foreign research reactor (Section E.3.3). This assumption is a reasonable approximation and simplification to a complex set of possible implementation approaches. The following section, however, presents the results of the analysis associated with overland transportation risk of transporting the foreign research reactor spent nuclear fuel from a single commercial or military port.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.008 to 0.069. The estimated number of radiation-related LCFs for the general population ranged from 0.009 to 0.213, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.002 to 0.035.

Impacts of Accidents During Ground Transportation

The cumulative transportation accident risks over the entire program are estimated to range from 0.00001

Table E-54 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments to Any Single Port, Regionalization by Fuel Type

Port	Mode	Routine				Accidental
		Radiological		Non-Radiological		
		Crew	Public	Emission	Traffic	Radiological
Charleston, SC (NWS)	Truck	0.023	0.070	0.002	0.047	0.00004
	Rail	0.008	0.009	0.011	0.001	0.00001
Charleston, SC (Wando Terminal)	Truck	0.024	0.071	0.003	0.048	0.00005
	Rail	0.008	0.009	0.011	0.001	0.00001
Galveston, TX	Truck	0.039	0.114	0.007	0.070	0.00008
	Rail	0.011	0.016	0.031	0.002	0.00003
Newport News, VA	Truck	0.031	0.093	0.005	0.060	0.00006
	Rail	0.010	0.012	0.015	0.002	0.00002
Norfolk, VA	Truck	0.031	0.091	0.003	0.060	0.00006
	Rail	0.010	0.012	0.014	0.002	0.00002
Portsmouth, VA	Truck	0.031	0.092	0.004	0.060	0.00006
	Rail	0.010	0.011	0.013	0.002	0.00002
Jacksonville, FL	Truck	0.027	0.082	0.002	0.053	0.00005
	Rail	0.009	0.009	0.011	0.001	0.00001
MOTSU, NC	Truck	0.023	0.073	0.002	0.047	0.00004
	Rail	0.009	0.010	0.011	0.002	0.00001
NWS-Concord, CA	Truck	0.069	0.213	0.019	0.127	0.00012
	Rail	0.018	0.026	0.035	0.004	0.00004
Portland, OR	Truck	0.066	0.209	0.010	0.120	0.00015
	Rail	0.018	0.021	0.027	0.004	0.00005
Savannah, GA	Truck	0.024	0.073	0.002	0.047	0.00005
	Rail	0.008	0.009	0.010	0.001	0.00001
Tacoma, WA	Truck	0.067	0.212	0.008	0.104	0.00015
	Rail	0.018	0.024	0.031	0.004	0.00005
Wilmington, NC	Truck	0.026	0.079	0.002	0.055	0.00005
	Rail	0.009	0.010	0.011	0.002	0.00001

- All of the source term resulting from an accident event is dispersed into the waterway, uniformly, over a one month period (i.e., it takes one month to recover the cask).

Barge accident statistics (Hutchinson, 1986) were used to estimate the probabilities of the accident severity classes defined in the Modal Study (Fischer et al., 1987). Barge transportation fatality statistics from Saricks and Kvitek, 1994 were used to estimate accident fatality rates. The following exposure pathways were assessed using the methodology developed by the NRC in Regulatory Guide 1.109 (NRC, 1977b):

- drinking water
- ingestion of fish
- ingestion of irrigated foods
- ingestion of meat and milk from exposed cattle
- shoreline deposits (external exposure)
- swimming (external exposure).

Collective doses were calculated for average densities for rural, suburban and urban populations, using route-specific river parameters. Additionally, MEI doses were calculated for each accident scenario in a manner analogous to that in preceding sections.

Unlike previous sections, where impacts were reported in terms of implementation of the foreign research reactor spent nuclear fuel policy, impacts are reported on a per shipment basis. As shown in Figures E-1 through E-12, the policy can be carried out in many ways, depending on the outcome of the SNF&INEL EIS (DOE, 1995) and its Record of Decision. The SNF&INEL EIS alternative that could be implemented using only barge transportation is Centralization to the Savannah River Site or the Hanford Site. All others would require various mixtures of barge transportation and overland transportation via truck or rail. Therefore, barge transportation impacts are reported on a per shipment basis and compared on that basis to shipments via truck or rail for the same origin/destination pair.

The results of the barge transportation analysis, along with comparable results from the analysis of truck and rail transportation are summarized in Table E-55.

Table E-55 Tabulation of Inland Transportation Risk Factors: Basic Implementation, Shipments via Barge to Hanford and Savannah River Sites

Alternative/ Option		*Incident Free*					*Accidental*	
		Radiological			*Nonradiological*		*Radiological*	
Port – Site	Mode	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Water-

The estimated number of radiation-related LCFs for the barge and truck crews is 6.40×10^{-7}. The number of radiation-related LCFs for handlers during handling activities (other than the initial off-load from the seagoing ship and the on-site handling) is 1.92×10^{-6} per shipment. The number of radiation-related LCFs for the general population is 4.26×10^{-6} per shipment. The number of nonradiological fatalities from vehicle emissions is 4.88×10^{-6} per shipment.

The MEI risk would be the same as that in the basic implementation of Management Alternative 1, which is 0.00052 LCF for the duration of the program. This estimate is based on the conservative assumption that one individual is involved in enough driving, handling and/or inspection to reach the regulatory limit of 100 mrem per year every year for the 13-year duration of the program.

Transportation Accidents

The barge transportation accident risks from radiation exposure are estimated to be 3.63×10^{-8} LCF per shipment. These fatalities are the sum of the estimated number of radiation-related fatalities from atmospheric and waterborne releases. The estimated number of radiation-related LCFs from atmospheric releases is 1.65×10^{-8} per shipment, and 1.87×10^{-8} per shipment for waterborne releases. The barge transportation accident risks from other accidents than radiation are estimated to be 6.6×10^{-6} fatalities per shipment.

The consequences of the maximum foreseeable offsite transportation accident are 0.0295 LCF. The likelihood of this accident is approximately 1×10^{-7}.

E.8.15.2 Evaluation of Barge Transportation from Savannah, GA to the Savannah River Site

Transportation Routes

Barge transportation from the port of Savannah, GA, up the Savannah River to the Savannah River Site was analyzed. The Savannah River Site has a barge receiving facility that could be used to off-load the casks. Handling at that facility and the onsite movement to the Receiving Basin for Offsite Fuels would not result in a significant change in calculated onsite risks (Appendix D).

Incident-Free Transportation

The incident-free transportation of spent nuclear fuel was estimated to result in 3.45×10^{-6} total latent fatalities per shipment. These fatalities are the sum of the estimated number of radiation-related and emission-related latent fatalities for the crew, handlers, and public.

The estimated number of radiation-related LCFs for the barge and truck crews is 7.64×10^{-8}. The number of radiation-related LCFs for handlers during handling activities (other than the initial off-load from the seagoing ship and the on-site handling) is 9.60×10^{-7} per shipment. The number of radiation-related LCFs for the general population is 1.94×10^{-6} per shipment. The number of nonradiological fatalities from vehicle emissions is 4.97×10^{-7} per shipment.

The MEI risk would be the same as that in the basic implementation of Management Alternative 1, which is 0.00052 LCF for the duration of the program. This estimate is based on the conservative assumption that one individual is involved in enough driving, handling and/or inspection to reach the regulatory limit of 100 mrem per year every year for the 13-year duration of the program.

Transportation Accidents

The barge transportation accident risks are estimated to be 2.12×10^{-8} LCF per shipment. These fatalities are the sum of the estimated number of radiation-related fatalities from atmospheric and waterborne releases. The estimated number of radiation-related LCFs from atmospheric releases is 5.90×10^{-10} per and have been rounded to the nearest hundred kg (220 lb) (when more than 100 kg (220 lb) were shipped). These tables do not include DOE shipments (including Naval) of spent nuclear fuel, since these shipments are not regulated by the NRC.

Table E-56 Domestic and International Spent Nuclear Fuel Shipments: 1979-1992

Year	*Domestic*		*International*		*Transient*
	Highway	*Railway*	*Export*	*Import*	

Table E-57 Summary Data for 1979-1992 Spent Nuclear Fuel Shipment Information

Year	*Number of Shipments*		*Kilograms Spent Fuel Shipped (thousands)*[a]		*Shipment Kilometers (thousands)*[b]	
	Highway	*Railway*	*Highway*	*Railway*	*Highway*	*Railway*
1979	16	11	0.1	30.2	12.9	3.7
1980	130	5	10.0	13.6	186.6	1.6
1981	81	2	7.9	6.0	62.0	0.6
1982	124	0	7.1	0.0	171.9	0.0
1983	117	0	36.6	0.0	134.6	0.0
1984	245	3	84.5	23.8	291.9	2.6
1985	135	18	74.0	119.4	114.1	14.0
1986	105	15	40.4	97.5	77.0	14.0
1987	107	15	82.3	101.4	67.3	13.5
1988	25	7	12.8	41.8	18.4	6.9
1989	16	6	0.1	30.8	26.9	2.7
1990	2	8	0.03	65.5	2.4	1.6
1991	11	10	0.1	98.4	15.5	2.4
1992	17	6	0.1	61.3	15.7	0.8
Totals	**1,131**	**106**	**356.0**	**689.7**	**1197.2**	**64.4**

Source: NRC, 1993

[a] *To convert kilogram values to pounds, multiply values given by 2.2.*

[b] *To convert kilometer values to miles, multiply by 0.62.*

Table E-58 Cumulative Transportation-Related Radiological Collective Doses and LCFs (1943 to 2035)

The transportation of foreign research reactor spent nuclear fuel, under any of the proposed options or alternatives in this EIS, is included in the calculated totals under the spent nuclear fuel shipments for SNF&INEL Final EIS Alternatives 1-5 (DOE, 1995). Proposed transportation of domestic and foreign inventory estimates are used to analyze the transportation impacts of each of the EIS alternatives. Therefore, for comparative purposes, the observed differences in transportation risks among alternatives are believed to represent unbiased, reasonably accurate estimates from current information in terms of relative risk comparisons.

The spent nuclear fuel type selected for the accident risk calculations was chosen to maximize the potential accident risk results. All accidents were analyzed for fuel that is less than 1 year old. However, much of the fuel has already been out of the foreign research reactors for more than 1 year and may not be brought back for several years. For calculations of MEIs, the cask loaded with the maximum possible amount of radioactive material should have been and was considered. However, the risk values were calculated under the assumption that all casks were loaded to this maximum value. Depending on the implementation of the program, very few, if any, of the casks would be carrying fuel as new as that used in the accident analysis. Selection of another spent nuclear fuel type, or consideration of all spent nuclear fuel types in detail, would result in accident risks less than those reported in the assessment of alternatives in this appendix.

E.10.2 Uncertainties in Casks, Shipment Capacities and Number of Shipments

The amount of transportation required for each alternative is based in part on assumptions concerning the packaging characteristics and shipment capacities for truck and rail modes. Representative shipment capacities have been defined for assessment purposes based on probable future shipment capacities. In reality, the actual shipment capacities may differ from the predicted capacities, so that the projected number of shipments, and consequently the total transportation risk, would change. However, although the predicted transportation risks would increase or decrease accordingly, the relative differences in risks among alternatives would remain about the same. It is in fact likely that DOE would deploy a large capacity truck or rail cask for large intersite shipping campaigns.

For the purposes of analysis, Phase 1 was assumed to last exactly 10 years and Phase 2 was assumed to last exactly 3 years. Realistically, the Phase 2 site may be ready somewhat sooner or later. Additionally, the fractions of the fuel arriving during each phase may not be precisely proportional to the duration of the phase. However, the risk changes are small when compared with the conservatism introduced in the radiological calculations.

The number of shipments to and from various points comes from a complex series of models of how the policy may be implemented. They are not intended to define how the policy would be implemented. Instead, they describe somewhat generally how the policy would be implemented. The risk factors for all conceivable routes between DOE sites and ports of entry are given to show that a slight deviation [illegible] some time in the future, the highway and rail infrastructures and the demographics along routes could change. These effects have not been accounted for in the transportation assessment, however, it is not anticipated that these changes would significantly affect relative comparisons of risk among the alternatives considered in the EIS.

E.10.4 Uncertainties in the Calculation of Radiation Doses

The models used to calculate radiation doses from transportation activities introduce a further uncertainty in the risk assessment process. It is generally difficult to estimate the accuracy or absolute uncertainty of the risk assessment results. The accuracy of the calculated results is closely related to the limitations of the computational models and to the uncertainties in each of the input parameters that the model requires. The single greatest limitation facing users of RADTRAN, or any computer code of this type, is the scarcity of data for certain input parameters.

Uncertainties associated with the computational models are minimized by using state-of-the-art computer codes that have undergone extensive review. Because there are numerous uncertainties that are recognized but difficult to quantify, assumptions are made at each step of the risk assessment process that are intended to produce conservative results (i.e., overestimate the calculated dose and radiological risk). Because parameters and assumptions are applied equally to all alternatives, this model bias is not expected to affect the meaningfulness of relative comparisons of risk; however, the results may not represent risks in an absolute sense.

In order to understand the most important uncertainties and conservatism in the transportation risk assessment, the results for all cases were examined to identify the largest contributors to the collective population risk. The results of this examination are discussed briefly below.

For truck shipments, the largest contributors to the collective population dose were found to be, in decreasing order of importance: 1) incident-free dose to members of the public at stops, 2) incident-free dose to transportation crew members, 3) incident-free dose to members of the public sharing the route (on-link dose), 4) incident-free dose to members of the public residing along the route (off-link dose), and 5) accident dose risk to members of the public. Approximately 80 percent of the estimated public dose was incurred at stops, 15 percent by the on-link population, and 5 percent by the off-link population. In general, the accident contribution to the total risk was negligible compared with the incident-free risk.

For rail shipments, the largest contributors to the collective population dose were found to be, in decreasing order of importance: 1) incident-free dose to transportation crew members, 2) incident-free dose to members of the public residing along the route (off-link dose), 3) incident-free dose to members of the public at stops, 4) incident-free dose to members of the public sharing the route (on-link dose), and 5) accident dose risk to members of the public. Approximately 70 percent of the estimated public dose was incurred by the off-link population, 25 percent by the population at stops, and 5 percent by the on-link population. As with truck shipments, the accident contribution to the total risk in general was negligible compared with the incident-free risk, even when the spent nuclear fuel type was selected to maximize the accident risk results.

As shown above, incident-free transportation risks are the dominant component of the total transportation risk for both truck and rail modes. The most important parameter in calculating incident-free doses is the shipment external dose rate (incident-free doses are directly proportional to the shipment external dose rate). For this assessment, it was assumed that all shipments would have an external dose rate at the regulatory limit of 10 mrem per hr at 2 m. In practice, the external dose rates would vary from shipment to shipment. Although it is conceivably possible to load a cask with enough fresh foreign research reactor spent nuclear fuel to obtain a dose rate equal to the regulatory limit, experience has shown this to be unlikely. In fact, the observed average dose rate described in Appendix B is approximately ten times lower than the regulatory limit. During the shipments of foreign research reactor to MOTSU and ultimately to Savannah River Site, the State of North Carolina detected less than 1 mrem on contact with the cask and no radiation above background at 2 m (Massey, 1994). Therefore, the incident-free risks are conservative, and would be ten times lower if calculated with the observed average dose.

Finally, the single largest contributor to the collective population doses calculated with RADTRAN was found to be the dose to members of the public at truck stops. Currently, RADTRAN uses a simple point-source approximation for truck-stop exposures and assumes that the total stop time for a shipment is proportional to the shipment distance. The parameters used in the stop model were based on a survey of a very limited number of radioactive material shipments that examined a variety of shipment types in different areas of the country (Wilmot, 1981). It was assumed that stops occur as a function of distance, with a stop rate of 0.011 h per km (0.018 h per mile). It was further assumed that at each stop, an average of 50 people are exposed at a distance of 20 m (66 ft). In RADTRAN, the population dose is directly proportional to the external shipment dose rate and the number of people exposed, and inversely proportional to the square of the distance. The stop rate assumed results in an hour of stop time per 100 km (62 miles) of travel.

Based upon the qualitative discussion with shippers of spent nuclear fuel, the parameter values used in the assessment appear to be conservative. However, data do not exist to qualitatively assess the degree of conservatism in the stop-dose model. As a practical matter, it is conceivable that DOE could take steps to control the location, frequency, and duration of truck stops if necessary. However, based on the regulatory requirements for continuous escort of the material (10 CFR 73) and the requirement for two drivers, it is clear that the trucks would be on the move essentially one-hundred percent of the time until arrival at the destination. Therefore, the calculated impacts are extremely conservative. By using these conservative parameters, the calculations in this EIS are consistent with the RADTRAN default values and the

Examination of the severe accident consequence assessment results has shown that ingestion of contaminated foodstuffs contributes on the order of 50 percent of the total population dose for rural accidents. Interdiction of foodstuffs would act to reduce, but not eliminate, this contribution.

References

DOE (U.S. Department of Energy), 1995, *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April.

DOE (U.S. Department of Energy), 1988a, *U.S. Department of Energy, External Dose-Rate Conversion Factors for Calculation of Dose to the Public,* DOE/EH-0070, Washington, DC.

DOE (U.S. Department of Energy), 1988b, *Internal Dose-Rate Conversion Factors for Calculation of Dose to the Public,* DOE/EH-0071, Washington, DC.

DOE (U.S. Department of Energy), 1987, *Analysis of Radiation Doses from Operation of Postulated Commercial Spent Fuel Transportation Systems*, DOE-CH/TPO-001, Pacific Northwest Laboratory, Richland, WA, November.

DOT (U.S. Department of Transportation), 1992, *Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials,* DOE/RSPA/HMS/92-02, August.

Doty, S. R., B. L. Wallace, and G. C. Holzworth, 1976, *A Climatological Analysis of Pasquill Stability Categories Based on 'STAR' Summaries*, National Oceanic and Atmospheric Administration, National Climatic Center, Ashville, NC, April.

EPA (U.S. Environmental Protection Agency), 1991, *Manual of Protective Actions for Nuclear Incidents,* EPA/520/1-75-001-A, Washington, DC.

Fischer, L. E., C. K. Chou, M. A. Gerhard, C. Y. Kimura, R. W. Martin, R. W. Mensing, M. E. Mount, and M. C. Wette, 1987, *Shipping Container Response to Severe Highway and Railway Accident Conditions,* NUREG/CR-4829, UCID-20733, prepared by Lawrence Livermore National Laboratory for Division of Reactor System Safety, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC.

Hutchison, B. C., 1986, *Barge Collisions, Rammings, Groundings; An Engineering Assessment of the Potential for Danger to Radioactive Material Transport Casks,* SAND85-7165, Sandia National Laboratory, Albuquerque, NM, January.

ICRP (International Commission on Radiological Protection), 1991, *1990 Recommendations of the International Commission on Radiological Protection*, Annals of the ICRP, Publication 60, Vol. 21, No. 1-3, Pergamon Press, New York, November.

Johnson, P. E., D. S. Joy, D. B. Clark, and J. M. Jacobi, 1993a, *HIGHWAY 3.1, An Enhanced Transportation Routing Model: Program Description, Methodology, and Revised User's Manual*, ORNL/TM-12124, Oak Ridge National Laboratory, Oak Ridge, TN, March.

Johnson, P. E., D. S. Joy, D. B. Clark, and J. M. Jacobi, 1993b, *INTERLINE 5.0, An Expanded Railroad Routing Model: Program Description, Methodology, and Revised User's Manual*, ORNL/TM-12090, Oak Ridge National Laboratory, Oak Ridge, TN, March.

Massey, C. D., 1994, Declaration of Charles D. Massey in the U.S. District Court for the District of South Carolina Columbia Division, State of South Carolina vs. Hazel R. O'Leary, Secretary of Energy and the U.S. Department of Energy, Case No. 3-94-2419-0.

Neuhauser, K. S., and F. L. Kanipe, 1993, *RADTRAN 4 Volume II: Technical Manual*, SAND89-2370, Sandia National Laboratories, Albuquerque, NM, August.

NRC (U.S. Nuclear Regulatory Commission), 1995, *Nuclear Regulatory Commission, 10 CFR Part 71, Compatibility with International Atomic Energy Agency (IAEA),* Federal Register, Vol. 60, No. 188, September 28.

NRC (U.S. Nuclear Regulatory Commission), 1993, *Public Informational Circular for Shipments of Irradiated Reactor Fuel*, NUREG-0725, Rev. 9, Washington, DC, March.

NRC (U.S. Nuclear Regulatory Commission), 1977a, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*, NUREG-0170, Volumes 1 and 2, Washington, DC, December.

NRC (U.S. Nuclear Regulatory Commission), 1977b, *Regulatory Guide 1.109 - Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I*, RG 1.109, October.

Rao, R. K., E. L. Wilmot and R. E. Luna, 1982, *Non-Radiological Impacts of Transporting Radioactive Materials*, SAND81-1703, Sandia National Laboratories, Albuquerque, NM, February.

Saricks, C. and T. Kvitek, 1994, *Longitudinal Review of State-Level Accident Statistics for Carriers of Intrastate Freight*, ANL/ESD/TM-68, Argonne National Laboratory, Argonne, IL, March.

Wilmot, E. L., 1981, *Transportation Accident Scenarios for Commercial Spent Fuel*, SAND80-2124, Sandia National Laboratories, Albuquerque, NM, February.

Yuan, Y. C., S. Y. Chen, D. J. LePoire, and R. Rothman, 1993, *RISKIND — A Computer Program for Calculating Radiological Consequences and Health Risks from Transportation of Spent Nuclear Fuel*, ANL/EAIS-06, Rev. 0, Argonne National Laboratory, Argonne, IL, February.

Attachment E1
Representative Routes for Overland Transportation

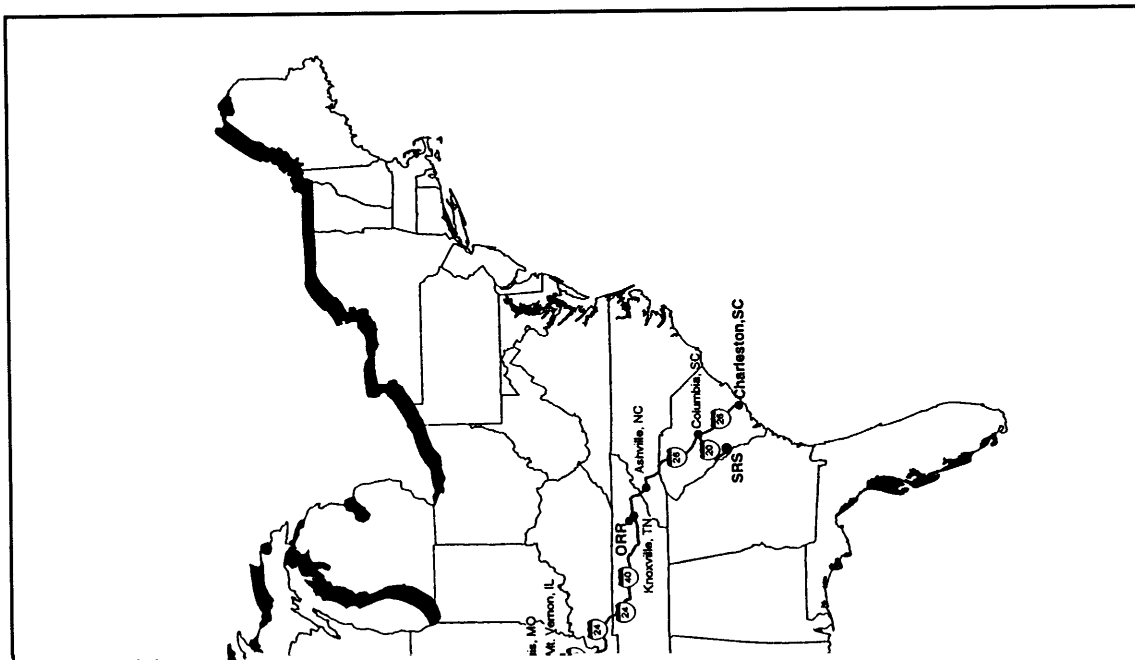
The purpose of this Attachment is to show the representative routes that are used in the risk analysis of overland transportation of foreign research reactor spent nuclear fuel. Identification of these representative routes is necessary to carry out the risk analysis described in Appendix E. The characteristics of these representative routes are used to estimate the driving time, which is needed to estimate the risk to the crew operating the truck, train, or barge and to estimate population along the route, which is exposed to small amounts of radiation emanating from the cask and could conceivably be exposed to an accident.

Representative routes between all potential ports and Canadian border crossings and all 5 DOE sites, as well as between the DOE sites, were identified. Because of the large number of routes, complexity of routes and the difficulty associated with manually tabulating population data, DOE has developed computer codes to select routes and tabulate populations. The HIGHWAY (Johnson, 1993a) code was used for the road route analysis and the INTERLINE (Johnson, 1993b) code was used for the rail and barge route analysis. The codes are described in Section E.4.

Representative routes are used in the analysis because specific routes cannot be identified in advance. A transportation route is not finalized until it has been reviewed and approved by the NRC (Massey, 1994). Therefore, the routes identified in this section are representative of the routes that may be used to ship spent nuclear fuel, but the actual routes shown may or may not be used if the policy were to be implemented. The codes used to select the representative routes automatically select preferred routes and minimize the transport time, as required by regulation. However, it is required that route selection also considers information such as the time of day and the day of week during which transportation will occur, current conditions such as adverse weather conditions (e.g., flooding, snow), track or road conditions, bridge closures, and seasonal traffic. Additionally, numerous U.S. interstates serve the Canadian border and could be used to transport spent nuclear fuel. HIGHWAY and INTERLINE cannot take these environmental, and other, conditions into account.

Specific requirements for the selection of road routes are found in 49 CFR 397, Subpart D. This regulation

The INTERLINE output, from left to right, shows the following: 1) the railroad that owns a section of the track or, in the case of barge transportation, the letters BRG, 2) the INTERLINE code number for the node, 3) the city nearest the node, 4) the state in which the node is located, and 5) the distance traveled since the last node. Transfers between rail carriers are noted by dashed lines.



Area Ports (Charleston-NWS and
anagement Sites

From: NWS CHARLESTON, SC
To : SRP BARCD 1

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		BELVEDERE	N	I20	X5	SC
U25		NORTH AUGUSTA	SE	U25	S125	SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: NWS CHARLESTON, SC
To : ID NATL ENG LAB, ID

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: NWS CHARLESTON, SC
To : HANFORD, WA

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NWS CHARLESTON, SC
To : K-25, TN

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: NWS CHARLESTON, SC
To : MERCURY, NV

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: CHARLESTON (WANDO TERMINAL), SC
To : SRP BARCD 1, SC

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		BELVEDERE	N	I20	X5	SC
U25		NORTH AUGUSTA	SE	U25	S125	SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: CHARLESTON (WANDO TERMINAL), SC
To : ID NATL ENG LAB, ID

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: CHARLESTON (WANDO TERMINAL), SC
To : HANFORD, WA

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: CHARLESTON (WANDO TERMINAL), SC
To : K-25, TN

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: CHARLESTON (WANDO TERMINAL), SC
To : MERCURY, NV

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

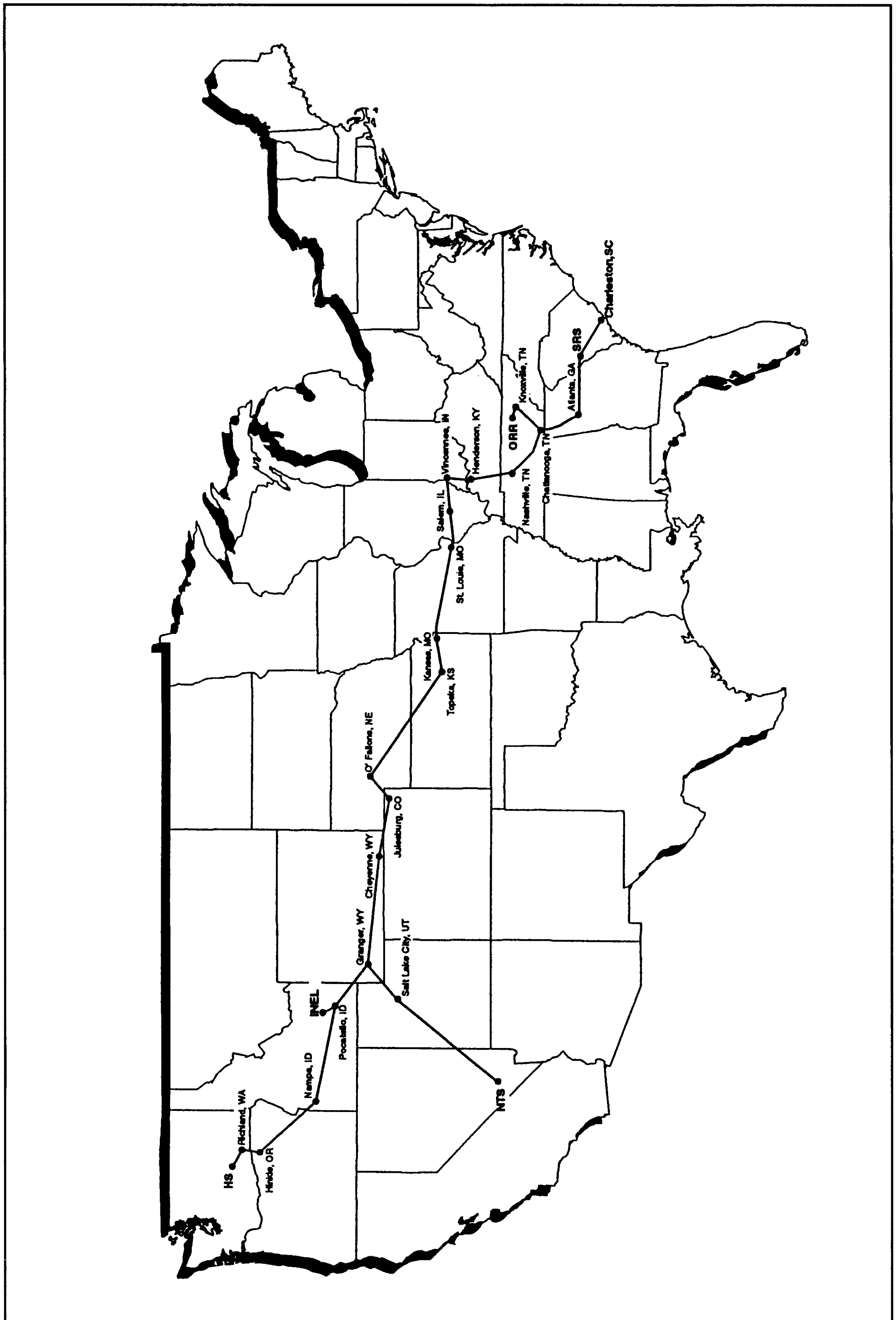


Figure E1-2 Representative Rail Routes from Charleston, SC Area Ports (Charleston-NWS and Charleston-Wando) to Department of Energy Management Sites

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: SRP, SC

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7717-DUNBARTON / WELL	SC	132.
- - -	- - -	- - -	- - -
USG	7717-DUNBARTON / WELL	SC	132.
USG	15359-SRP	SC	140.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
- - -	- - -	- - -	- - -
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
- - -	- - -	- - -	- - -
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13369-MC CAMMON	ID	2435.
UP	13370-POCATELLO	ID	2458.
UP	13336-SCOVILLE	ID	2514.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
- - -	- - -	- - -	- - -
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
- - -	- - -	- - -	- - -
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13369-MC CAMMON	ID	2435.
UP	13370-POCATELLO	ID	2458.
UP	13412-NAMPA	ID	2700.
UP	14220-PENDLETON	OR	2968.
UP	14223-HINKLE	OR	2999.
UP	13894-WALLULA	WA	3028.
UP	13964-KENNEWICK	WA	3043.
UP	13941-RICHLAND	WA	3052.
- - -	- - -	- - -	- - -
USG	13941-RICHLAND	WA	3052.
USG	16212-HANFORD S 300	WA	3060.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7675-FLORENCE	SC	98.
CSXT	7671-DILLON	SC	127.
CSXT	7470-HAMLET	NC	165.
CSXT	7472-WADESBORO	NC	190.
WSS	7472-WADESBORO	NC	190.
WSS	7462-LEXINGTON	NC	258.
NS	7462-LEXINGTON	NC	258.
NS	7478-SALISBURY	NC	275.
NS	7394-HICKORY	NC	332.
NS	7387-MARION	NC	374.
NS	7343-ASHEVILLE	NC	414.
NS	7318-MORRISTOWN	TN	494.
NS	7286-KNOXVILLE	TN	535.
NS	7288-DOSSETT	TN	560.
NS	15316-K-25	TN	581.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13568-OGDEN	UT	2382.
UP	13595-SALT LAKE CITY	UT	2417.
UP	13630-LYNNDYL	UT	2529.
UP	14766-VALLEY	NV	2846.
USG	[illegible]-VALLEY	NV	[illegible]
USG	16333-YUCCA MOUNTAIN	NV	2945.

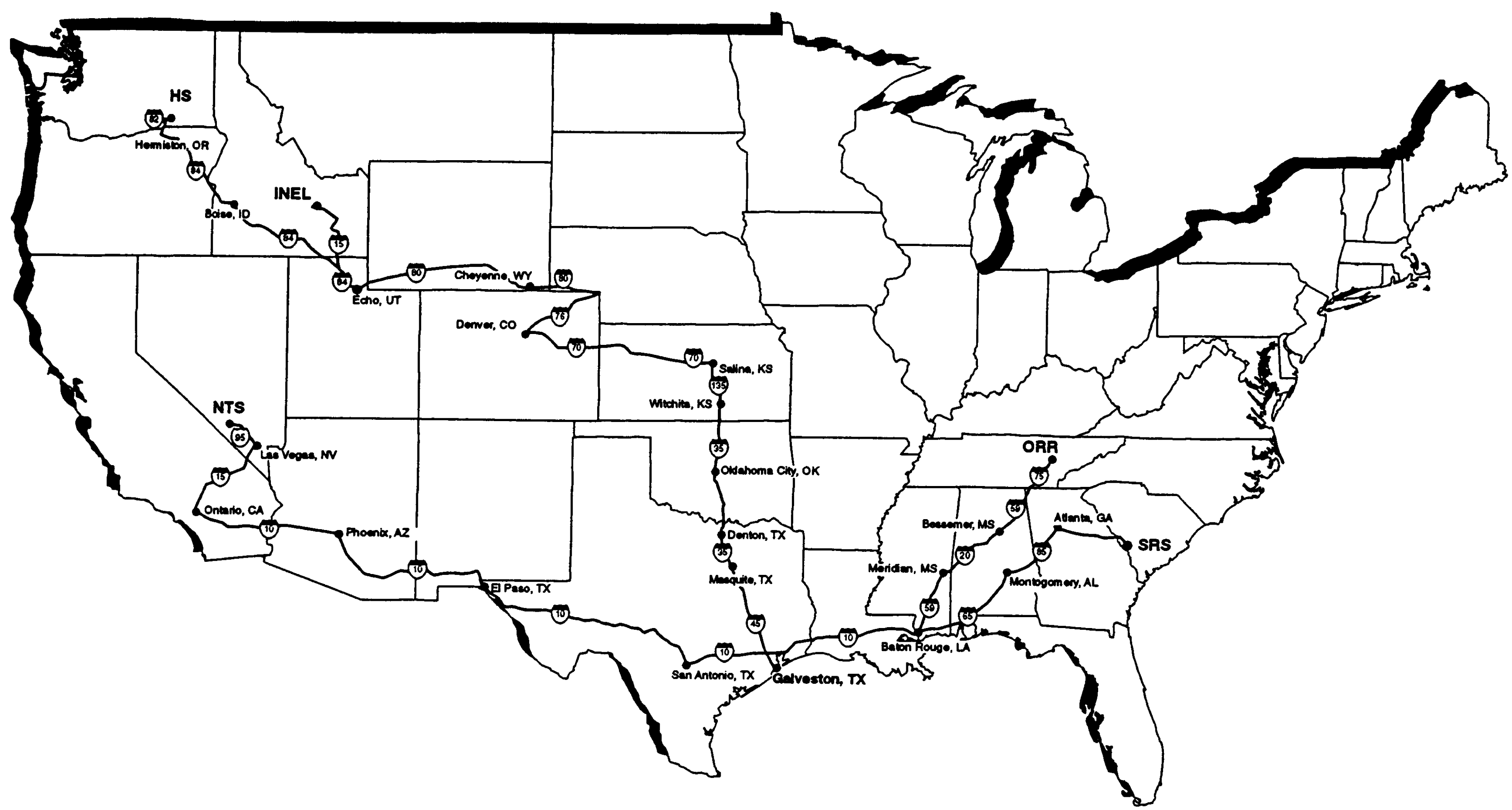


Figure E1-3 Representative Truck Routes from Galveston, TX to Department of Energy Management Sites

From: GALVESTON, TX
To : ID NATL ENG LAB

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	N	I45	I610	TX
I45		DALLAS	SE	I45	I635	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I635		DALLAS	NW	I35E	I635	TX
I35E		DENTON	S	I35E	I35W	TX
I35		OKLAHOMA CITY	S	I240	I35	OK
I240		OKLAHOMA CITY	SW	I240	I44	OK
I44		OKLAHOMA CITY	NE	I35	I44	OK
I35	I44	EDMOND	SE	I35	I44	OK
I35		SOUTH HAVEN	E	I35	U166	KS
I35 $	TKST$	WICHITA	S	I235	I35	KS
I235		WICHITA	N	I135	I235	KS
I135		SALINA	NW	I135	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: GALVESTON, TX
To : HANFORD, WA

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	N	I45	I610	TX
I45		DALLAS	SE	I45	I635	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I635		DALLAS	NW	I35E	I635	TX
I35E		DENTON	S	I35E	I35W	TX
I35		OKLAHOMA CITY	S	I240	I35	OK
I240		OKLAHOMA CITY	SW	I240	I44	OK
I44		OKLAHOMA CITY	NE	I35	I44	OK
I35	I44	EDMOND	SE	I35	I44	OK
I35		SOUTH HAVEN	E	I35	U166	KS
I35 $	TKST$	WICHITA	S	I235	I35	KS
I235		WICHITA	N	I135	I235	KS
I135		SALINA	NW	I135	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: GALVESTON, TX
To : K-25, TN

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	E	I10	I610	TX
I10		BATON ROUGE	SE	I10	I12	LA
I12		SLIDELL	NE	I10	I12	LA
I59		MERIDIAN	W	I20	I59	MS
I20	I59	BESSEMER	SW	I20	I459	AL
yI459		CENTER POINT	SE	I459	I59	AL
I59		WILDWOOD	NW	I24	I59	GA
I24		EAST RIDGE	NE	I24	I75	TN
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: GALVESTON, TX
To : MERCURY, NV

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	W	I10	I610	TX
I10		SAN ANTONIO	E	I10	I410	TX
I410		KIRBY	N	I35	I410	TX
I35	I410	SAN ANTONIO	NE	I35	I410	TX
I410		SAN ANTONIO	NW	I10	I410	TX
I10		PHOENIX	SE	I10	I17	AZ
I17		PHOENIX	W	I10	I17	AZ
I10		ONTARIO	E	I10	I15	CA
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

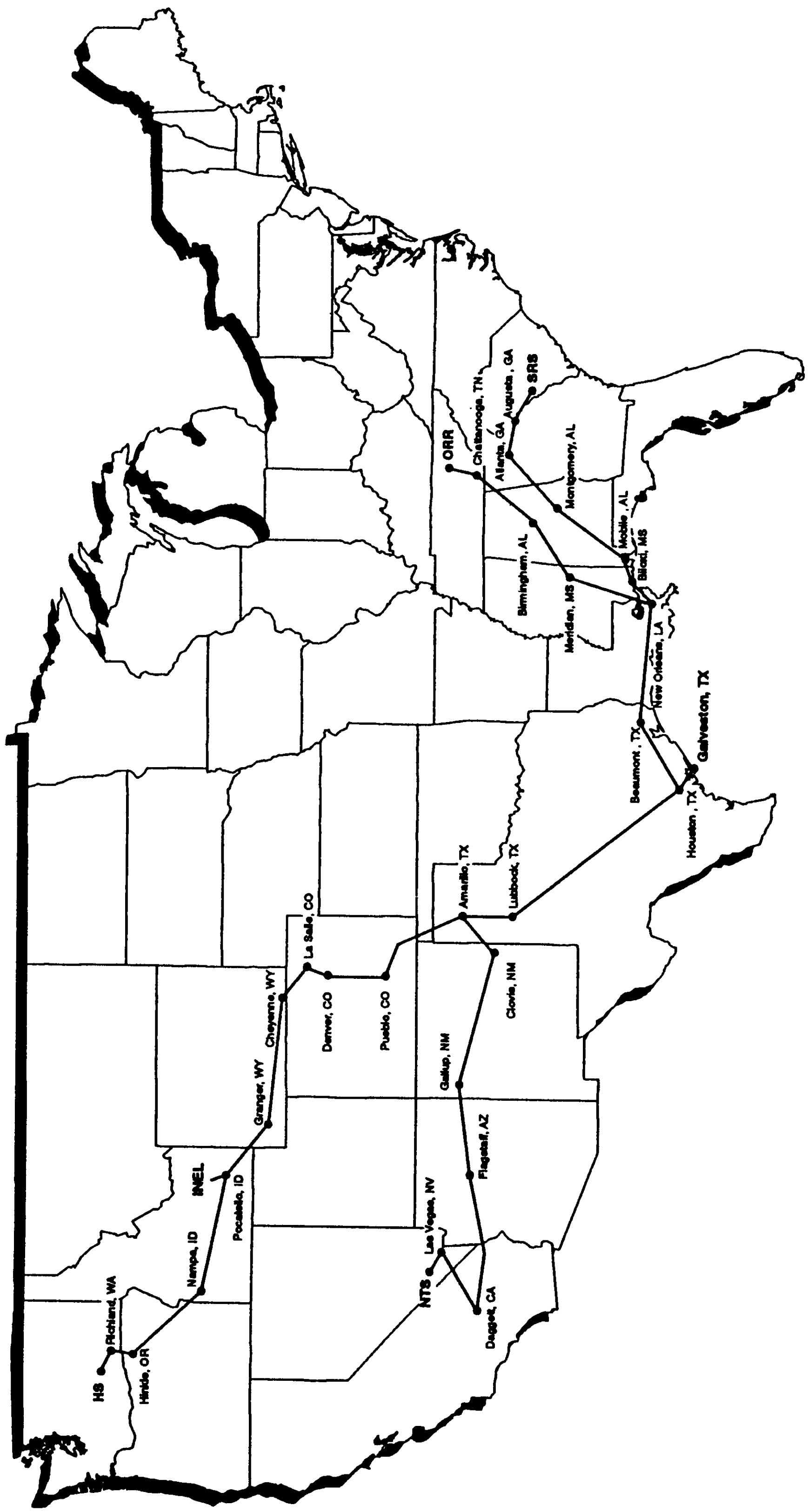


Figure E1-4 Representative Rail Routes from Galveston, TX to Department of Energy Management Sites

Route from: ATSF 13047-GALVESTON, TX
To: USG 15359-SRP, SC

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12399-HOUSTON	TX	68.
<TR>	12399-HOUSTON	TX	68.
UP	12399-HOUSTON	TX	68.
UP	12341-BEAUMONT	TX	156.
UP	9122-DE QUINCY	LA	203.
UP	9101-KINDER	LA	239.
UP	9112-LIVONIA	LA	317.
UP	8985-NEW ORLEANS	LA	446.
CSXT	8985-NEW ORLEANS	LA	446.
CSXT	8966-GULFPORT	MS	520.
CSXT	8926-BILOXI	MS	536.
CSXT	8967-PASCAGOULA	MS	553.
CSXT	8597-MOBILE	AL	592.
CSXT	8566-FLOMATON	AL	644.
CSXT	8657-MONTGOMERY	AL	769.
CSXT	8683-OPELIKA	AL	835.
CSXT	8142-LA GRANGE	GA	878.
CSXT	7914-ATLANTA	GA	954.
CSXT	7961-AUGUSTA	GA	1129.
CSXT	7732-ROBBINS	SC	1158.
CSXT	7717-DUNBARTON / WELL	SC	1167.
USG	7717-DUNBARTON / WELL	SC	1167.
USG	15359-SRP	SC	1175.

Route from: ATSF 13047-GALVESTON, TX
To: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12793-CANYON	TX	686.
ATSF	12792-AMARILLO	TX	703.
ATSF	13753-LA JUNTA	CO	963.
ATSF	13764-PUEBLO	CO	1018.
ATSF	13760-COLORADO SPRINGS	CO	1061.
ATSF	13727-DENVER	CO	1138.
UP	13727-DENVER	CO	1138.
UP	13712-LA SALLE	CO	1181.
UP	13709-GREELEY	CO	1188.
UP	13465-CHEYENNE	WY	1247.
UP	13462-LARAMIE	WY	1299.
UP	13494-GRANGER	WY	1575.
UP	13369-MC CAMMON	ID	1767.
UP	13370-POCATELLO	ID	1790.
UP	13336-SCOVILLE	ID	1846.

Route from: ATSF 13047-GALVESTON, TX
To: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12793-CANYON	TX	686.
ATSF	12792-AMARILLO	TX	703.
ATSF	13753-LA JUNTA	CO	963.
ATSF	13764-PUEBLO	CO	1018.
ATSF	13760-COLORADO SPRINGS	CO	1061.
ATSF	13727-DENVER	CO	1138.
UP	13727-DENVER	CO	1138.
UP	13712-LA SALLE	CO	1181.
UP	13709-GREELEY	CO	1188.
UP	13465-CHEYENNE	WY	1247.
UP	13462-LARAMIE	WY	1299.
UP	13494-GRANGER	WY	1575.
UP	13369-MC CAMMON	ID	1767.
UP	13370-POCATELLO	ID	1790.
UP	13412-NAMPA	ID	2032.
UP	14220-PENDLETON	OR	2301.
UP	14223-HINKLE	OR	2332.
UP	13894-WALLULA	WA	2361.
UP	13964-KENNEWICK	WA	2376.
UP	13941-RICHLAND	WA	2384.
USG	13941-RICHLAND	WA	2384.
USG	16212-HANFORD S 300	WA	2392.

Route From: ATSF 13047-GALVESTON, TX
To: NS 15316-K-25, TN

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12399-HOUSTON	TX	68.
<TR>	12399-HOUSTON	TX	68.
UP	12399-HOUSTON	TX	68.
UP	12341-BEAUMONT	TX	156.
UP	9122-DE QUINCY	LA	203.
UP	9101-KINDER	LA	239.
UP	9112-LIVONIA	LA	317.
UP	8985-NEW ORLEANS	LA	446.
NS	8985-NEW ORLEANS	LA	446.
NS	8986-SLIDELL	LA	476.
NS	8963-HATTIESBURG	MS	558.
NS	8887-MERIDIAN	MS	641.
NS	8640-BOLIGEE	AL	693.
NS	8754-TUSCALOOSA	AL	737.
NS	8739-BIRMINGHAM	AL	807.
NS	8797-GADSDEN	AL	869.
NS	7235-CHATTANOOGA	TN	957.
NS	7260-HARRIMAN	TN	1038.
NS	15316-K-25	TN	1053.

Route from: ATSF 13047-GALVESTON, TX
To: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12806-FARWELL	TX	672.
ATSF	13025-CLOVIS	NM	683.
ATSF	12995-BELEN	NM	924.
ATSF	12996-DALIES	NM	933.
ATSF	16077-GRANTS	NM	993.
ATSF	12999-GALLUP	NM	1070.
ATSF	12949-HOLBROOK	AZ	1181.
ATSF	12959-FLAGSTAFF	AZ	1276.
ATSF	12964-WILLIAMS	AZ	1305.
ATSF	12963-KINGMAN	AZ	1458.
ATSF	14663-DAGGETT	CA	1677.
- - -	- - -	- - -	- - -
UP	14663-DAGGETT	CA	1677.
UP	14762-LAS VEGAS	NV	1841.
UP	14766-VALLEY	NV	1856.
- - -	- - -	- - -	- - -
USG	14766-VALLEY	NV	1856.
USG	16333-YUCCA MOUNTAIN	NV	1955.

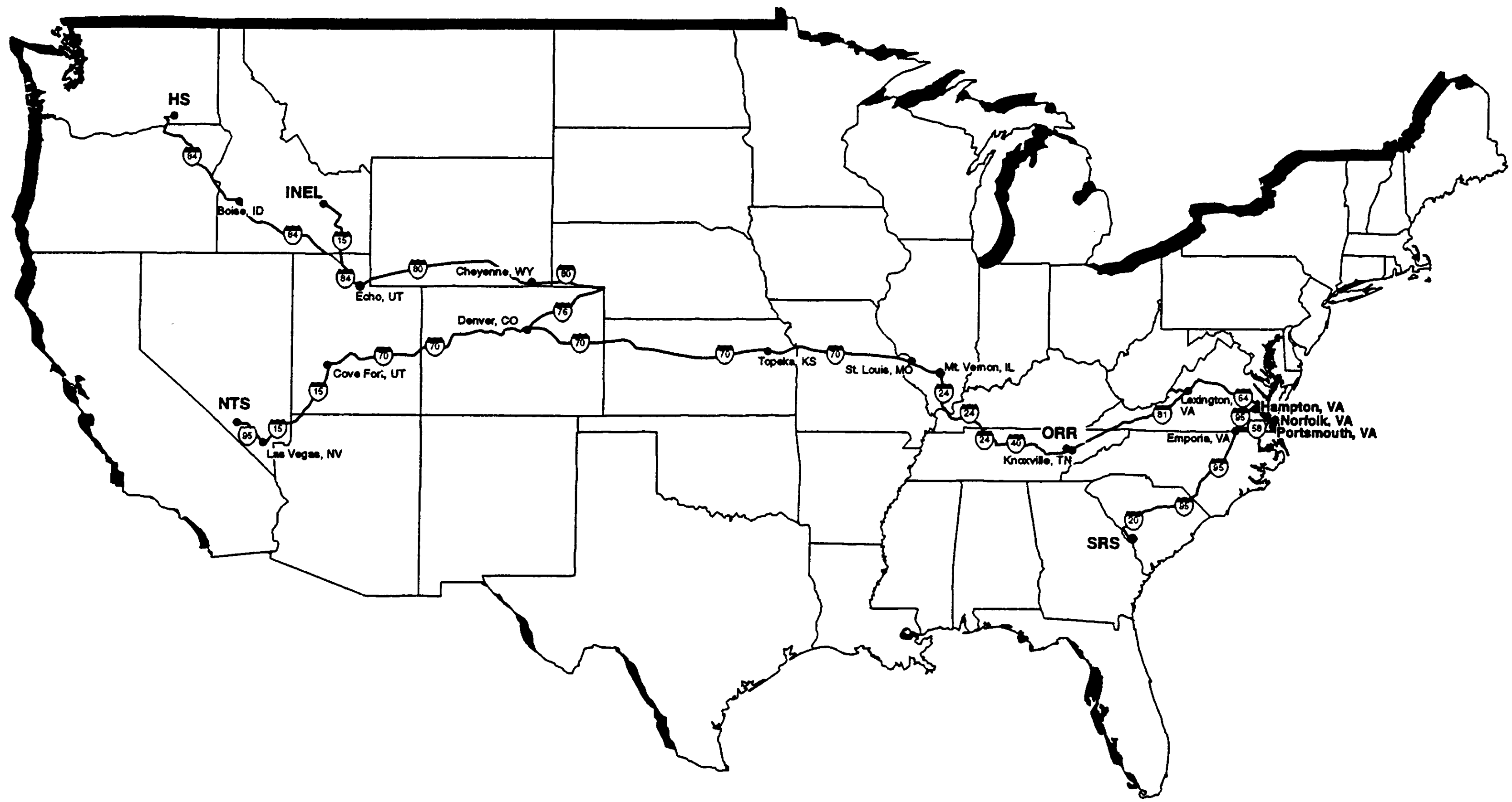


Figure E1-5 Representative Truck Routes from Hampton Roads Area Ports (Newport News, Norfolk, and Portsmouth, VA) to Department of Energy Management Sites

From: NEWPORT NEWS S I664 U60, VA
To : SRP, SC

Routing through:

NEWPORT NEWS S I664 U60 VA

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		HAMPTON	SE	I64	BRDG	VA
I64 #		WILLOGHBY BCH				VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
I230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: NEWPORT NEWS S I664 U60 VA
To : ID NATL ENG LAB ID

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: NEWPORT NEWS S I664 U60 VA
To : HANFORD, WA

Routing through:

I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NEWPORT NEWS S I664 U60 VA
To : K-25, TN

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: NEWPORT NEWS S I664 U60 VA
To : MERCURY, NV

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: NORFOLK E U13 U58 VA
To : SRP, SC

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: NORFOLK, E U13 U58 VA
To : ID NATL ENG LAB, ID

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I270		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: NORFOLK N I564 I64 VA
To : HANFORD, WA

Routing through:

		NORFOLK	N	I564	I64	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NORFOLK E U13 U58 VA
To : K-25, TN

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I85 $		MATOACA	S	I85	U1	VA
I85		SUTHERLAND	E	I85	U460	VA
U460		BURKEVILLE	E	U360	U460	VA
U360	U460	BURKEVILLE	W	U360	U460	VA
U460		FARMVILLE	S	U15	U460	VA
U15	U460	FARMVILLE	W	U15	U460	VA
U460		BEDFORD				VA
U221	U460	BONSACK		U221	S220	VA
S220A		CLOVERDALE	N	I81	U220	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: NORFOLK E U13 U58 VA
To : MERCURY, NV

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: PORTSMOUTH, VA
To : SRP, SC

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: PORTSMOUTH, VA
To : ID NATL ENG LAB, ID

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: PORTSMOUTH, VA
To : HANFORD, WA

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: PORTSMOUTH, VA
To : K-25, TN

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: PORTSMOUTH, VA
To : MERCURY, NV

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

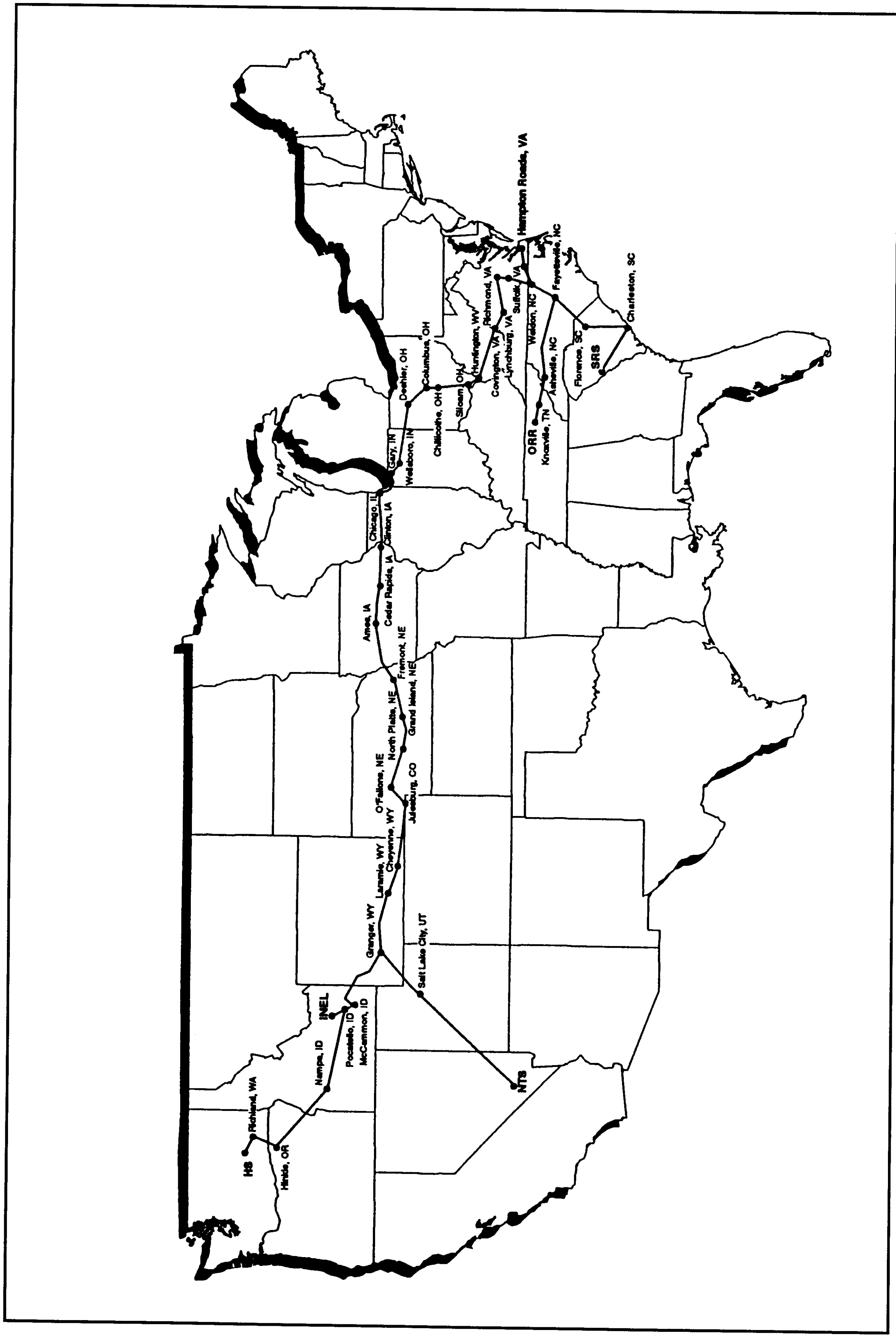


Figure E1-6 Representative Rail Routes from Hampton Roads Area Ports (Newport News, Norfolk, and Portsmouth, VA) to Department of Energy Management Sites

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6087-COLONIAL HEIGHTS	VA	97.
CSXT	6064-PETERSBURG	VA	103.
CSXT	7563-WELDON	NC	163.
CSXT	7565-ROCKY MOUNT	NC	200.
CSXT	7566-WILSON	NC	214.
CSXT	7606-FAYETTEVILLE	NC	288.
CSXT	7620-PEMBROKE	NC	317.
CSXT	7671-DILLON	SC	337.
CSXT	7675-FLORENCE	SC	366.
CSXT	7690-CHARLESTON	SC	464.
CSXT	7739-FAIRFAX	SC	558.
CSXT	7732-ROBBINS	SC	587.
CSXT	7717-DUNBARTON / WELL	SC	596.
USG	7717-DUNBARTON / WELL	SC	596.
USG	15359-SRP	SC	604.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.
CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13369-MC CAMMON	ID	2463.
UP	13370-POCATELLO	ID	2486.
UP	13336-SCOVILLE	ID	2542.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 16212-HANFORD S 300 WA

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.
CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13369-MC CAMMON	ID	2463.
UP	13370-POCATELLO	ID	2486.
UP	13412-NAMPA	ID	2728.
UP	14220-PENDLETON	OR	2997.
UP	14223-HINKLE	OR	3028.
UP	13894-WALLULA	WA	3057.
UP	13964-KENNEWICK	WA	3072.
UP	13941-RICHLAND	WA	3080.
USG	13941-RICHLAND	WA	3080.
USG	16212-HANFORD S 300	WA	3088.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6087-COLONIAL HEIGHTS	VA	97.
CSXT	6064-PETERSBURG	VA	103.
CSXT	7563-WELDON	NC	163.
CSXT	7565-ROCKY MOUNT	NC	200.
CSXT	7566-WILSON	NC	214.
CSXT	7606-FAYETTEVILLE	NC	288.
CSXT	7620-PEMBROKE	NC	317.
CSXT	7470-HAMLET	NC	348.
CSXT	7472-WADESBORO	NC	373.
WSS	7472-WADESBORO	NC	373.
WSS	7462-LEXINGTON	NC	441.
NS	7462-LEXINGTON	NC	441.
NS	7478-SALISBURY	NC	458.
NS	7394-HICKORY	NC	515.
NS	7387-MARION	NC	557.
NS	7343-ASHEVILLE	NC	597.
NS	7318-MORRISTOWN	TN	677.
NS	7286-KNOXVILLE	TN	718.
NS	7288-DOSSETT	TN	743.
NS	15316-K-25	TN	764.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.

ROUTE FROM : CSXT 6024-NEWPORT NEWS, VA
TO : USG 16333-YUCCA MOUNTAIN, NV -
Continued from Column 1

RR	NODE	STATE	DIST
CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13568-OGDEN	UT	2410.
UP	13595-SALT LAKE CITY	UT	2445.
UP	13630-LYNNDYL	UT	2558.
UP	14766-VALLEY	NV	2875.
USG	14766-VALLEY	NV	2875.
USG	16333-YUCCA MOUNTAIN	NV	2974.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13369-MC CAMMON	ID	2562.
UP	13370-POCATELLO	ID	2585.
UP	13336-SCOVILLE	ID	2641.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 16212-HANFORD S 300 WA

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13369-MC CAMMON	ID	2562.
UP	13370-POCATELLO	ID	2585.
UP	13412-NAMPA	ID	2827.
UP	14220-PENDLETON	OR	3096.
UP	14223-HINKLE	OR	3127.
UP	13894-WALLULA	WA	3156.
UP	13964-KENNEWICK	WA	3171.
UP	13941-RICHLAND	WA	3179.
USG	13941-RICHLAND	WA	3179.
USG	16212-HANFORD S 300	WA	3187.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	7565-ROCKY MOUNT	NC	125.
CSXT	7566-WILSON	NC	139.
CSXT	7606-FAYETTEVILLE	NC	213.
CSXT	7620-PEMBROKE	NC	242.
CSXT	7470-HAMLET	NC	273.
CSXT	7472-WADESBORO	NC	298.
WSS	7472-WADESBORO	NC	298.
WSS	7462-LEXINGTON	NC	366.
NS	7462-LEXINGTON	NC	366.
NS	7478-SALISBURY	NC	383.
NS	7394-HICKORY	NC	440.
NS	7387-MARION	NC	482.
NS	7343-ASHEVILLE	NC	522.
NS	7318-MORRISTOWN	TN	602.
NS	7286-KNOXVILLE	TN	643.
NS	7288-DOSSETT	TN	668.
NS	15316-K-25	TN	689.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	7565-ROCKY MOUNT	NC	125.
CSXT	7566-WILSON	NC	139.
CSXT	7606-FAYETTEVILLE	NC	213.
CSXT	7620-PEMBROKE	NC	242.
CSXT	7671-DILLON	SC	262.
CSXT	7675-FLORENCE	SC	291.
CSXT	7690-CHARLESTON	SC	389.
CSXT	7739-FAIRFAX	SC	483.
CSXT	7732-ROBBINS	SC	512.
CSXT	7717-DUNBARTON / WELL	SC	521.
USG	7717-DUNBARTON / WELL	SC	521.
USG	15359-SRP	SC	529.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13568-OGDEN	UT	2509.
UP	13595-SALT LAKE CITY	UT	2545.
UP	13630-LYNNDYL	UT	2657.
UP	14766-VALLEY	NV	2974.
USG	14766-VALLEY	NV	2974.
USG	16333-YUCCA MOUNTAIN	NV	3073.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	7565-ROCKY MOUNT	NC	95.
CSXT	7566-WILSON	NC	109.
CSXT	7606-FAYETTEVILLE	NC	183.
CSXT	7620-PEMBROKE	NC	212.
CSXT	7671-DILLON	SC	232.
CSXT	7675-FLORENCE	SC	261.
CSXT	7690-CHARLESTON	SC	359.
CSXT	7739-FAIRFAX	SC	453.
CSXT	7732-ROBBINS	SC	482.
CSXT	7717-DUNBARTON / WELL	SC	491.
USG	7717-DUNBARTON / WELL	SC	491.
USG	15359-SRP	SC	499.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13369-MC CAMMON	ID	2532.
UP	13370-POCATELLO	ID	2555.
UP	13336-SCOVILLE	ID	2611.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13369-MC CAMMON	ID	2532.
UP	13370-POCATELLO	ID	2555.
UP	13412-NAMPA	ID	2797.
UP	14220-PENDLETON	OR	3066.
UP	14223-HINKLE	OR	3097.
UP	13894-WALLULA	WA	3126.
UP	13964-KENNEWICK	WA	3141.
UP	13941-RICHLAND	WA	3149.
USG	13941-RICHLAND	WA	3149.
USG	16212-HANFORD S 300	WA	3157.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	7565-ROCKY MOUNT	NC	95.
CSXT	7566-WILSON	NC	109.
CSXT	7606-FAYETTEVILLE	NC	183.
CSXT	7620-PEMBROKE	NC	212.
CSXT	7470-HAMLET	NC	243.
CSXT	7472-WADESBORO	NC	268.
WSS	7472-WADESBORO	NC	268.
WSS	7462-LEXINGTON	NC	336.
NS	7462-LEXINGTON	NC	336.
NS	7478-SALISBURY	NC	353.
NS	7394-HICKORY	NC	410.
NS	7387-MARION	NC	452.
NS	7343-ASHEVILLE	NC	492.
NS	7318-MORRISTOWN	TN	572.
NS	7286-KNOXVILLE	TN	613.
NS	7288-DOSSETT	TN	638.
NS	15316-K-25	TN	659.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13568-OGDEN	UT	2479.
UP	13595-SALT LAKE CITY	UT	2515.
UP	13630-LYNNDYL	UT	2627.
UP	14766-VALLEY	NV	2944.
USG	14766-VALLEY	NV	2944.
USG	16333-YUCCA MOUNTAIN	NV	3043.

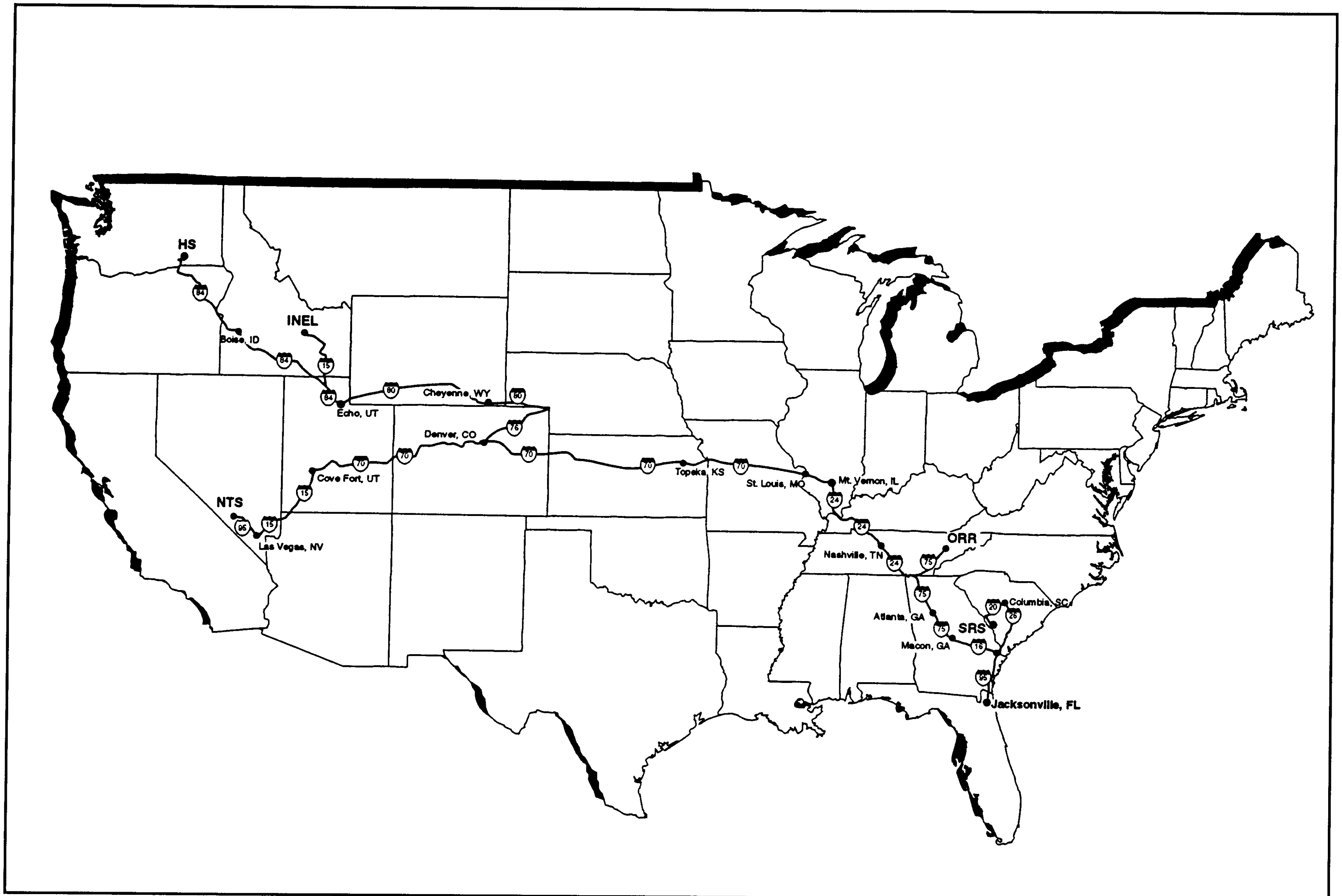


Figure E1-7 Representative Truck Routes from Jacksonville, FL to Department of Energy Management Sites

From: JACKSONVILLE, FL
To : SRP, SC

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I95		ROSINVILLE	N	I26	I95	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: JACKSONVILLE, FL
To : ID NATL ENG LAB, ID

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: JACKSONVILLE, FL
To : HANFORD, WA

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: JACKSONVILLE, FL
To : K-25, TN

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: JACKSONVILLE, FL
To : MERCURY, NV

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

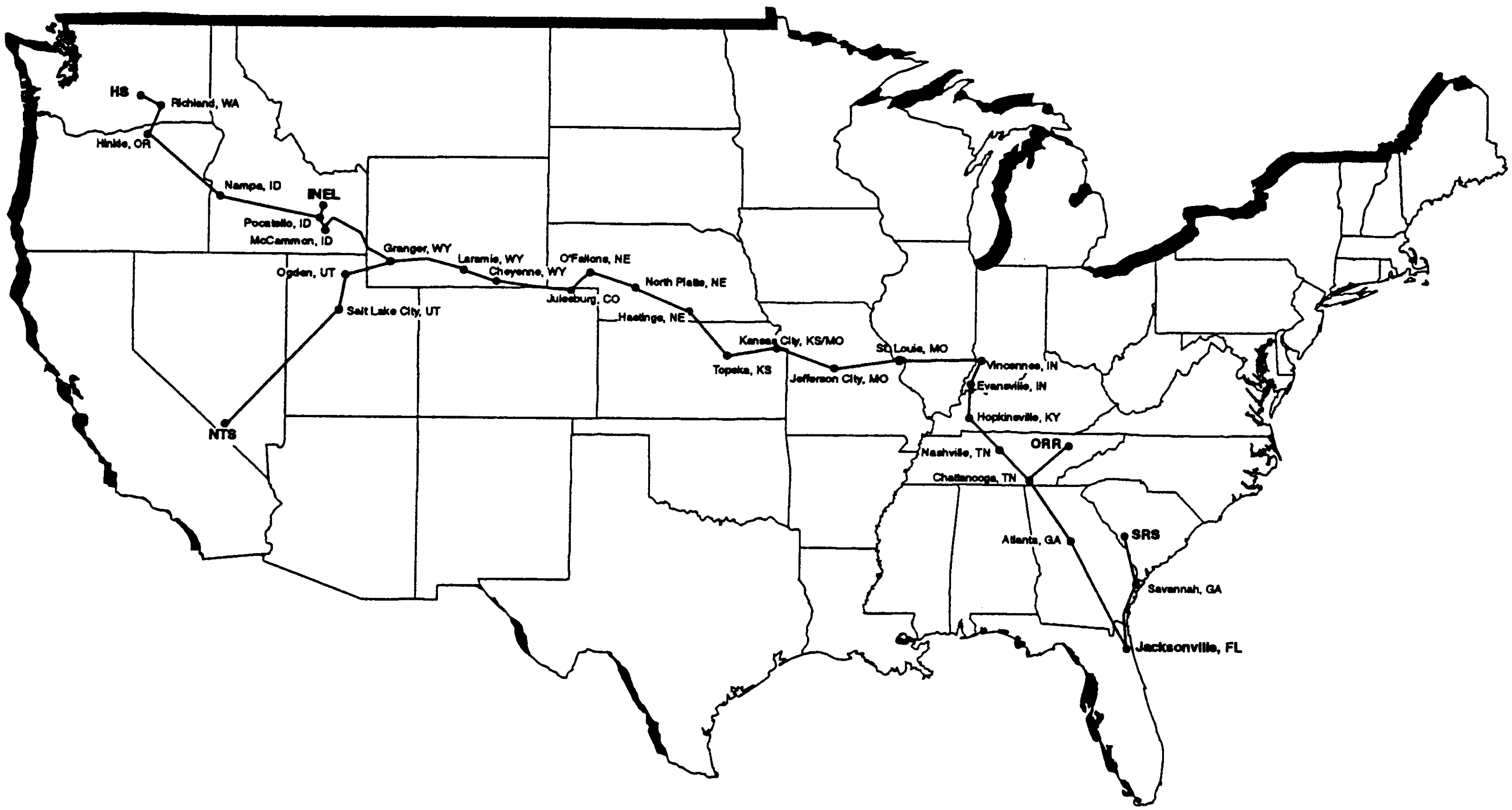


Figure E1-8 Representative Rail Routes from Jacksonville, FL to Department of Energy Management Sites

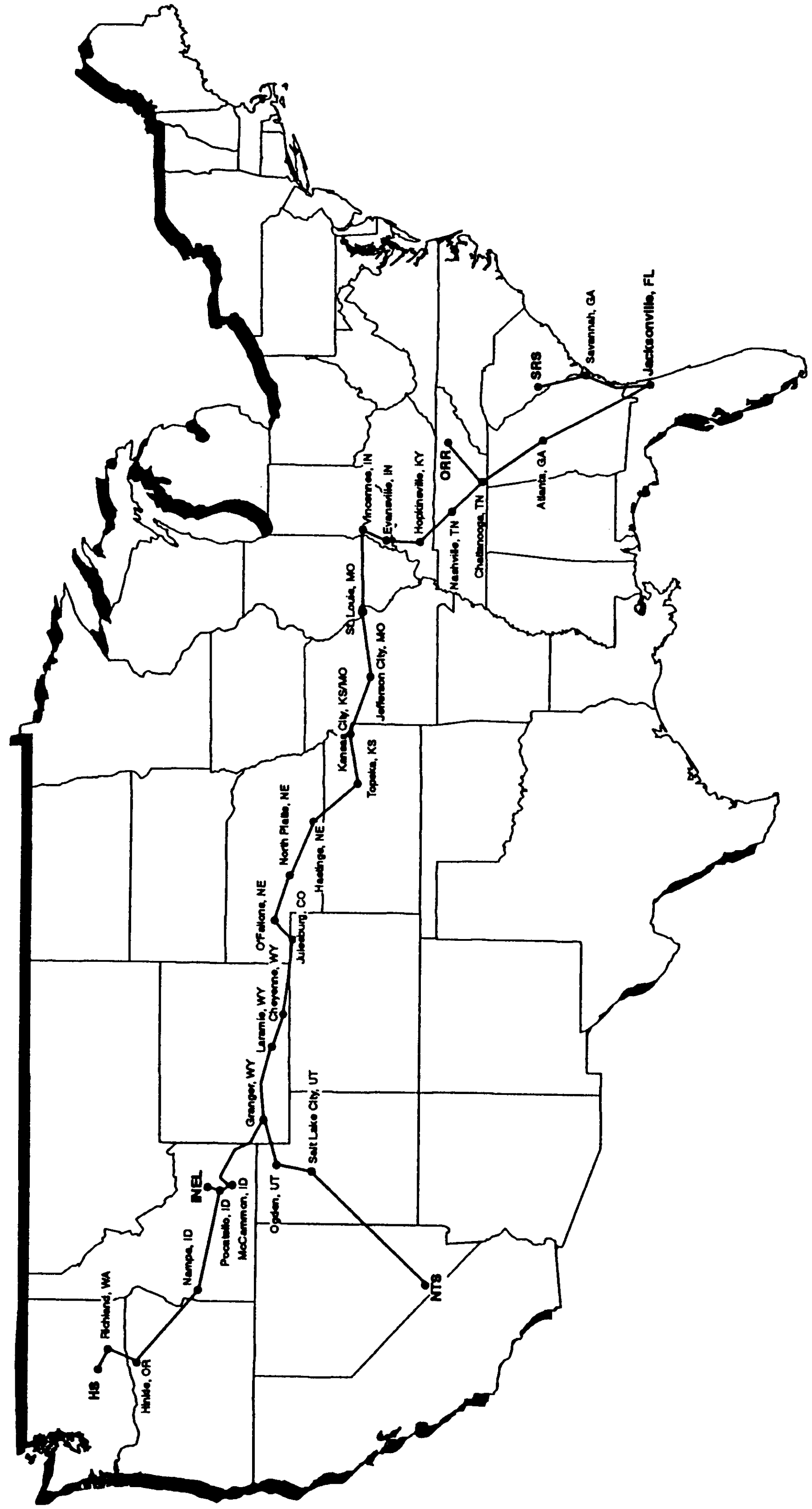


Figure E1-8 Representative Rail Routes from Jacksonville, FL to Department of Energy Management Sites

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8080-NAHUNTA	GA	64.
CSXT	8007-SAVANNAH	GA	145.
CSXT	7739-FAIRFAX	SC	213.
CSXT	7732-ROBBINS	SC	242.
CSXT	7717-DUNBARTON / WELL	SC	251.
USG	7717-DUNBARTON / WELL	SC	251.
USG	15359-SRP	SC	259.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13369-MC CAMMON	ID	2445.
UP	13370-POCATELLO	ID	2468.
UP	13336-SCOVILLE	ID	2524.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13369-MC CAMMON	ID	2445.
UP	13370-POCATELLO	ID	2468.
UP	13412-NAMPA	ID	2710.
UP	14220-PENDLETON	OR	2979.
UP	14223-HINKLE	OR	3010.
UP	13894-WALLULA	WA	3039.
UP	13964-KENNEWICK	WA	3054.
UP	13941-RICHLAND	WA	3062.
USG	13941-RICHLAND	WA	3062.
USG	16212-HANFORD S 300	WA	3070.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
- - -	- - - - - - - -	- -	- -
NS	7235-CHATTANOOGA	TN	468.
NS	7260-HARRIMAN	TN	550.
NS	15316-K-25	TN	565.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
- - -	- - - - - - - -	- -	- -
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
- - -	- - - - - - - -	- -	- -
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13568-OGDEN	UT	2392.
UP	13595-SALT LAKE CITY	UT	2427.
UP	13630-LYNNDYL	UT	2540.
UP	14766-VALLEY	NV	2857.
- - -	- - - - - - - -	- -	- -
USG	14766-VALLEY	NV	2857.
USG	16333-YUCCA MOUNTAIN	NV	2956.

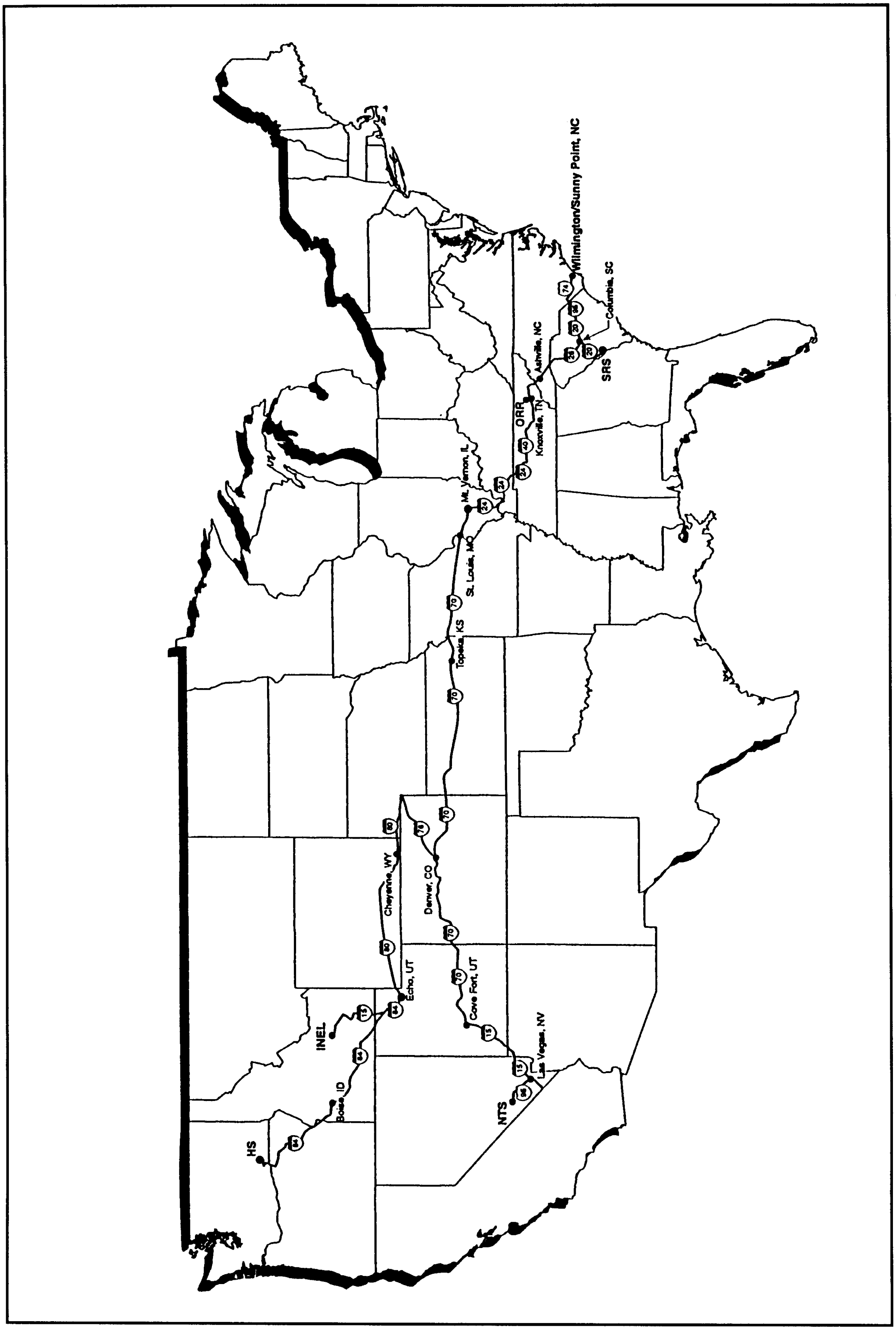


Figure E1-9 Representative Truck Routes from MOTSU, NC to Department of Energy Management Sites

From: SUNNY POINT TM, NC
To : SRP, SC

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		BENSON	NE	I40	I95	NC
I95		FLORENCE	W	I20	I95	SC
I20		MARTINEZ	E	I20	X65	GA
S28		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: SUNNY POINT TM, NC
To : ID NATL ENG LAB, ID

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: SUNNY POINT TM, NC
To : HANFORD, WA

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SUNNY POINT TM, NC
To : K-25, TN

Routing through:

		SUNNY POINT	TM			NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: SUNNY POINT TM, NC
To : MERCURY, NV

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

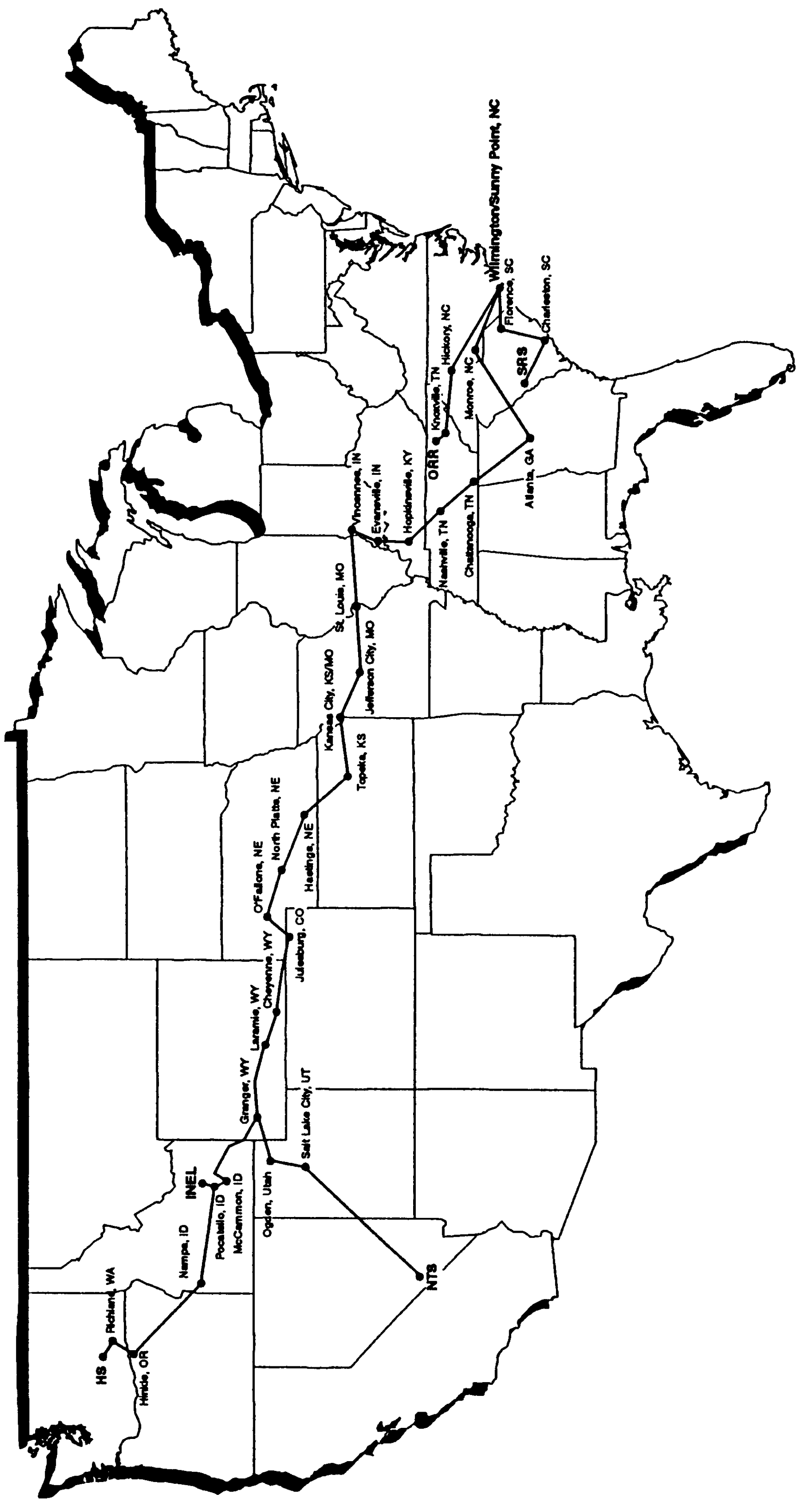


Figure E1-10 Representative Rail Routes from MOTSU, NC to Department of Energy Management Sites

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7671-DILLON	SC	115.
CSXT	7675-FLORENCE	SC	144.
CSXT	7690-CHARLESTON	SC	242.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 16212-HANFORD S 300, WA

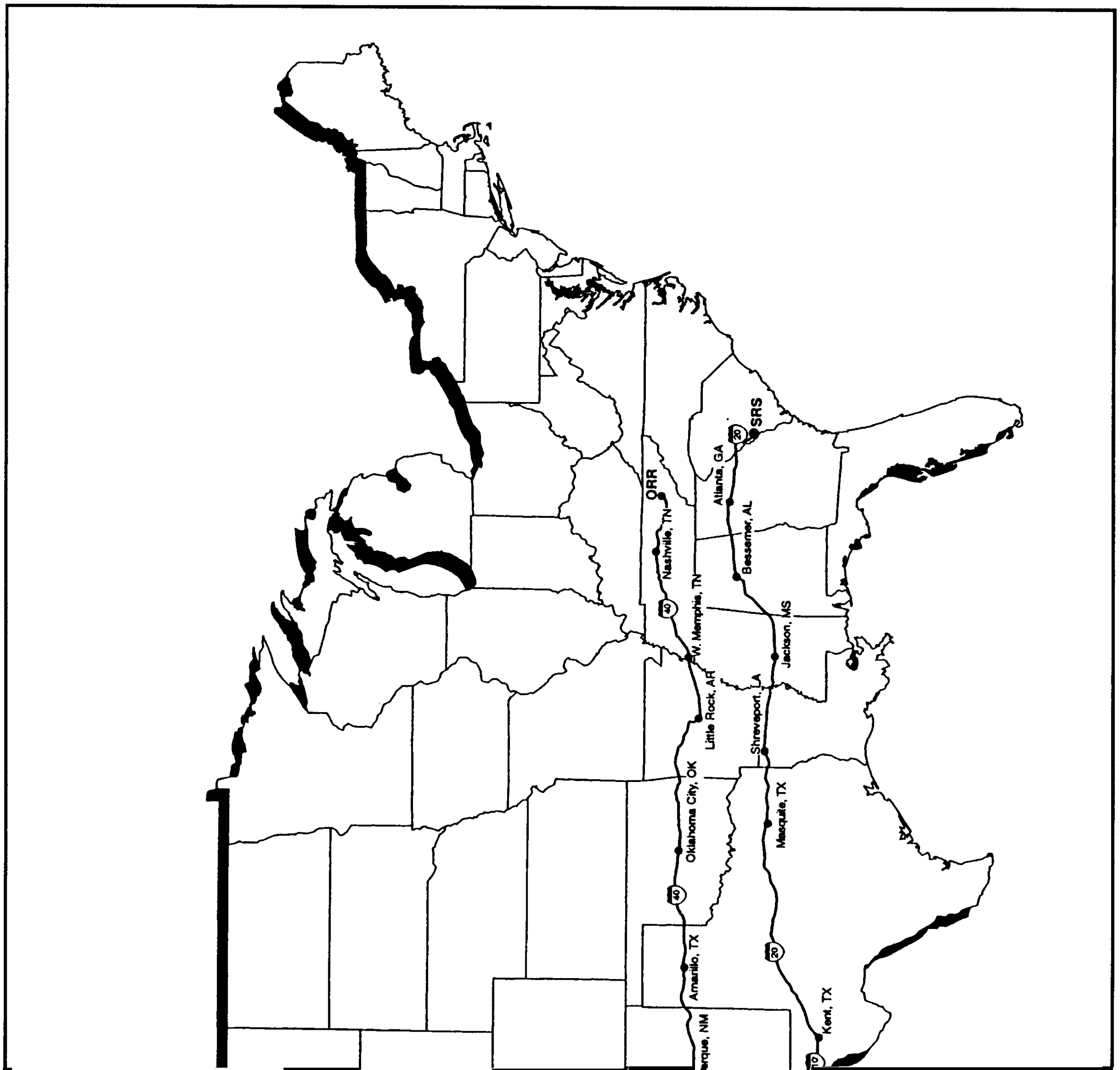
RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7406-CHARLOTTE	NC	202.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7406-CHARLOTTE	NC	202.
CSXT	7395-MOUNT HOLLY	NC	213.
CSXT	7388-BOSTIC	NC	276.
CSXT	7387-MARION	NC	303.
NS	7387-MARION	NC	303.
NS	7343-ASHEVILLE	NC	343.
NS	7318-MORRISTOWN	TN	423.
NS	16403-SEVIER YARD W EN	TN	456.
NS	16401-COSTER	TN	464.
NS	7288-DOSSETT	TN	488.
NS	15316-K-25	TN	509.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7834-CLINTON	SC	271.
CSXT	7838-GREENWOOD	SC	299.
CSXT	7956-ATHENS	GA	380.
CSXT	17420-ATLANTA BELT JCT	GA	442.
CSXT	17424-TILFORD YARD (S.	GA	450.
CSXT	7907-MARIETTA	GA	465.
CSXT	7889-CARTERSVILLE	GA	493.
CSXT	7888-DALTON	GA	544.
CSXT	7235-CHATTANOOGA	TN	581.
CSXT	7224-WAUHATCHIE	TN	587.
CSXT	7187-TULLAHOMA	TN	663.
CSXT	7201-MADISON	TN	751.
CSXT	7061-HOPKINSVILLE	KY	811.
CSXT	3839-HENDERSON	KY	876.
CSXT	3838-EVANSVILLE	IN	889.
CSXT	3812-VINCENNES	IN	939.
CSXT	4952-SALEM	IL	1017.
CSXT	10859-EAST ST LOUIS	IL	1084.
TRRA	10859-EAST ST LOUIS	IL	1084.
UP	10859-EAST ST LOUIS	IL	1084.
UP	10858-ST LOUIS	MO	1085.
UP	10860-PACIFIC	MO	1112.
UP	10656-JEFFERSON CITY	MO	1210.
UP	10616-KANSAS CITY	MO	1387.
UP	10617-KANSAS CITY	KS	1389.
UP	11823-LAWRENCE	KS	1428.
UP	11697-TOPEKA	KS	1458.
UP	11696-MENOKEN	KS	1463.
UP	11681-MARYSVILLE	KS	1538.
UP	11405-HASTINGS	NE	1646.
UP	11410-GIBBON	NE	1672.
UP	11352-NORTH PLATTE	NE	1791.
UP	11358-O FALLONS	NE	1802.
UP	13703-JULESBURG	CO	1870.
UP	13465-CHEYENNE	WY	2016.
UP	13462-LARAMIE	WY	2068.
UP	13494-GRANGER	WY	2344.
UP	13568-OGDEN	UT	2487.
UP	13595-SALT LAKE CITY	UT	2523.
UP	13630-LYNNDYL	UT	2635.
UP	14766-VALLEY	NV	2952.
USG	14766-VALLEY	NV	2952.
USG	16333-YUCCA MOUNTAIN	NV	3051.



ve Truck Routes from Naval Weapons Station, Concord, CA to
partment of Energy Management Sites

From: CONCORD NW I680 S4 CA
To : SRL, SC

Routing through:

		CONCORD	NW	I680	S4	CA
I680		DUBLIN	SE	I580	I680	CA
I580		VERNALIS	W	I5	I580	CA
I5		SAN FERNANDO	NW	I210	I5	CA
I210		POMONA	NW	I10	I210	CA
I10		PHOENIX	W	I10	I17	AZ
I17		PHOENIX	SE	I10	I17	AZ
I10		KENT	E	I10	I20	TX
I20		DUNCANVILLE	NE	I20	U67	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I20		SHREVEPORT	W	I20	I220	LA
I220		BOSSIER CITY	E	I20	I220	LA
I20		JACKSON	SW	I20	I55	MS
I20	I55	JACKSON	S	I20	I55	MS
I20		MERIDIAN	W	I20	I59	MS
I20	I59	BESSEMER	SW	I20	I459	AL
I459		IRONDALE	E	I20	I459	AL
I20		ATLANTA	W	I20	I285	GA
I285		RED OAK	E	I285	I85	GA
I285	I85	COLLEGE PARK	S	I285	I85	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: CONCORD NW I680 S4 CA
To : ID NATL ENG LAB, ID

Routing through:

		CONCORD	NW	I680	S4	CA
I680		MARTINEZ	E	I680	LOCL	CA
I680#		BENICIA	E	I680	I780	CA
I680		ROCKVILLE	SW	I680	I80	CA
I80		SALT LAKE CITY	W	I215	I80	UT
I215		N SALT LAKE		I15	I215	UT
I15		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: CONCORD NW I680 S4 CA
To : HANFORD, WA

Routing through:

	CONCORD	NW	I680	S4	CA
I680	MARTINEZ	E	I680	LOCL	CA
I680#	BENICIA	E	I680	I780	CA
I680	ROCKVILLE	SW	I680	I80	CA
I80	VACAVILLE	E	I505	I80	CA
I505	DUNNIGAN	S	I5	I505	CA
I5	TUALATIN	S	I205	I5	OR
I205	PORTLAND	E	I205	I84	OR
I84	HERMISTON	SW	I82	I84	OR
I82	WEST RICHLAND	S	I182	I82	WA
I182	RICHLAND	SE	I182	S240	WA
S240	RICHLAND	N	S240	LR4S	WA
LR4S	HANFORD				WA

From: CONCORD NW I680 S4 CA
To : K-25, TN

Routing through:

		CONCORD	NW	I680	S4	CA
I680		DUBLIN	SE	I580	I680	CA
I580		VERNALIS	W	I5	I580	CA
I5		SAN FERNANDO	NW	I210	I5	CA
I210		POMONA	NW	I10	I210	CA
I10		ONTARIO	E	I10	I15	CA
I15		BARSTOW		I15	I40	CA
I40		OKLAHOMA CITY	W	I40	I44	OK
I44		OKLAHOMA CITY	SW	I240	I44	OK
I240		OKLAHOMA CITY	SE	I240	I40	OK
I40		WEST MEMPHIS	N	I40	I55	AR
I40	I55	WEST MEMPHIS	E	I40	I55	AR
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: CONCORD NW I680 S4 CA
To : MERCURY, NV

Routing through:

	CONCORD	NW	I680	S4	CA
I680	DUBLIN	SE	I580	I680	CA
I580	VERNALIS	W	I5	I580	CA
I5	SAN FERNANDO	NW	I210	I5	CA
I210	POMONA	NW	I10	I210	CA
I10	ONTARIO	E	I10	I15	CA
I15	LAS VEGAS				NV
U95	MERCURY	S	U95	LOCL	NV
LOCAL	MERCURY				NV

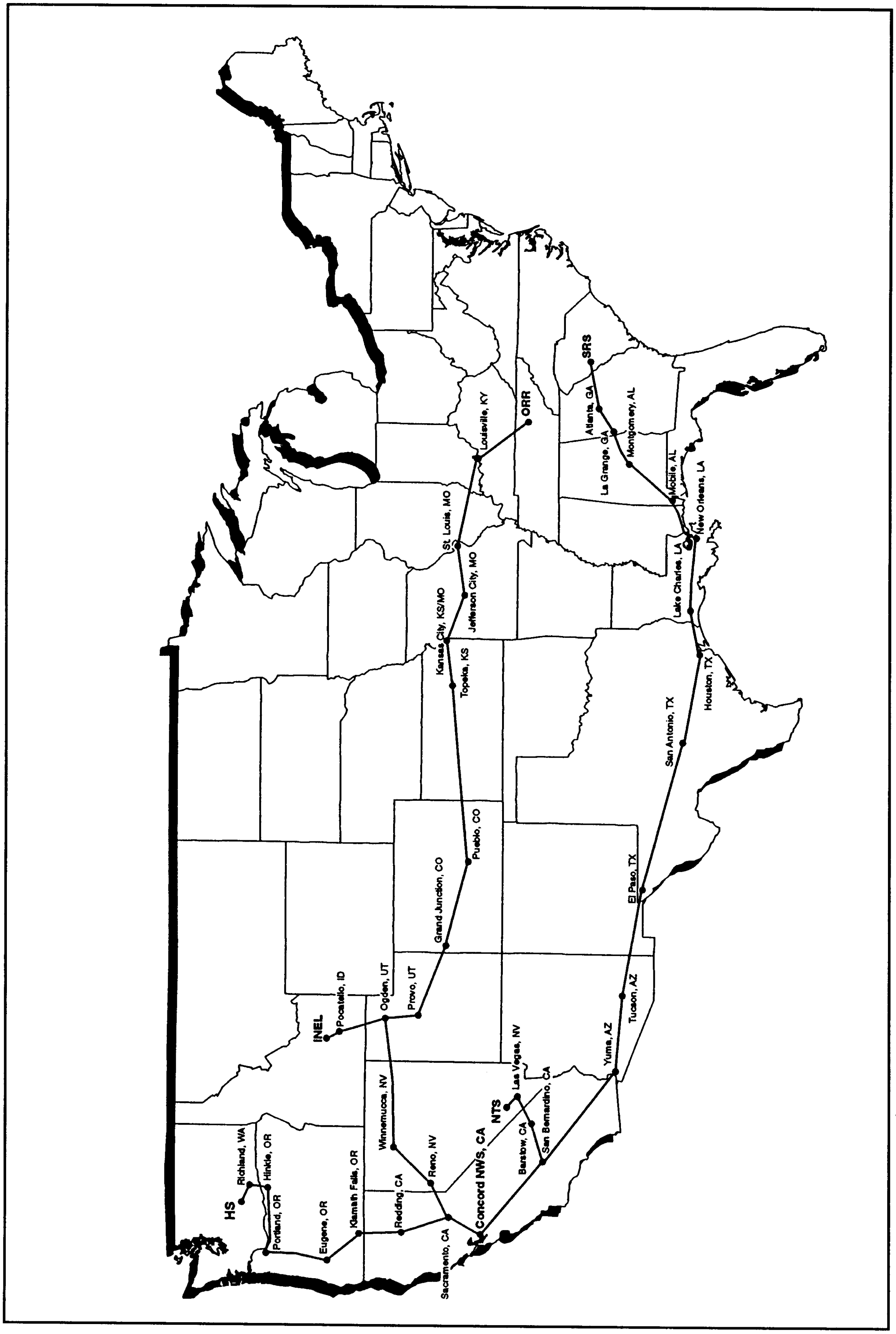


Figure E1-12 Representative Rail Routes from Naval Weapons Stations, Concord, CA to Department of Energy Management Sites

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14470-PITTSBURG	CA	14.
SP	14498-LATHRUP	CA	79.
SP	14529-MODESTO	CA	106.
SP	14570-FRESNO	CA	204.
SP	14622-BAKERSFIELD	CA	309.
SP	14621-MOJAVE	CA	374.
SP	14692-PALMDALE	CA	408.
SP	14666-SAN BERNARDINO	CA	485.
SP	12971-YUMA	AZ	679.
SP	12972-WELLTON	AZ	720.
SP	12938-PICACHO	AZ	889.
SP	12942-TUCSON	AZ	938.
SP	12877-EL PASO	TX	1248.
SP	12611-SAN ANTONIO	TX	1866.
SP	12538-FLATONIA	TX	1958.
SP	12536-EAGLE LAKE	TX	2009.
SP	12399-HOUSTON	TX	2078.
SP	12341-BEAUMONT	TX	2165.
SP	12348-ORANGE	TX	2188.
SP	9124-LAKE CHARLES	LA	2231.
SP	9113-LAFAYETTE	LA	2297.
SP	9038-THIBODAUX JCT	LA	2394.
SP	8985-NEW ORLEANS	LA	2454.
CSXT	8985-NEW ORLEANS	LA	2454.
CSXT	8966-GULFPORT	MS	2528.
CSXT	8926-BILOXI	MS	2545.
CSXT	8967-PASCAGOULA	MS	2561.
CSXT	8597-MOBILE	AL	2600.
CSXT	8566-FLOMATON	AL	2653.
CSXT	8657-MONTGOMERY	AL	2777.
CSXT	8683-OPELIKA	AL	2843.
CSXT	8142-LA GRANGE	GA	2886.
CSXT	7914-ATLANTA	GA	2962.
CSXT	7961-AUGUSTA	GA	3137.
[illegible]			
CSXT	7717-DUNBARTON / WELL	SC	3175.
USG	7717-DUNBARTON / WELL	SC	3175.
USG	15359-SRP	SC	3183.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.
SP	14409-DAVIS	CA	48.
SP	14411-SACRAMENTO	CA	62.
SP	14415-ROSEVILLE	CA	77.
SP	14383-MARYSVILLE	CA	108.
SP	14385-CHICO	CA	145.
SP	14387-TEHAMA	CA	177.
SP	14313-REDDING	CA	224.
SP	14250-KLAMATH FALLS	OR	386.
SP	14271-EUGENE	OR	579.
SP	14287-ALBANY	OR	623.
SP	14141-SALEM	OR	651.
SP	14179-PORTLAND	OR	704.
UP	14179-PORTLAND	OR	704.
UP	14197-OREGON TRUNK JCT	OR	799.
UP	14223-HINKLE	OR	891.
UP	13894-WALLULA	WA	920.
UP	13964-KENNEWICK	WA	935.
UP	13941-RICHLAND	WA	944.
USG	13941-RICHLAND	WA	944.
USG	16212-HANFORD S 300	WA	951.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.
SP	14409-DAVIS	CA	48.
SP	14411-SACRAMENTO	CA	62.
SP	14415-ROSEVILLE	CA	77.
SP	14821-RENO	NV	194.
SP	14816-SPARKS	NV	209.
SP	14812-HAZEN	NV	242.
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SP	14793-ELKO	NV	500.
SP	13568-OGDEN	UT	723.
SP	13595-SALT LAKE CITY	UT	758.
SP	13610-PROVO	UT	803.
SP	13613-THISTLE	UT	822.
SP	13646-GRAND JCT	CO	1048.
SP	13645-GLENWOOD SPRINGS	CO	1138.
SP	13673-DOTSERO	CO	1153.
SP	13764-PUEBLO	CO	1377.
SP	11673-HERINGTON	KS	1837.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14470-PITTSBURG	CA	14.
SP	14498-LATHRUP	CA	79.
SP	14529-MODESTO	CA	106.
SP	14570-FRESNO	CA	204.
SP	14622-BAKERSFIELD	CA	309.
SP	14621-MOJAVE	CA	374.
SP	14692-PALMDALE	CA	408.
SP	14666-SAN BERNARDINO	CA	485.
UP	14666-SAN BERNARDINO	CA	485.
UP	14664-BARSTOW	CA	563.
UP	14762-LAS VEGAS	NV	736.
UP	14766-VALLEY	NV	751.
USG	14766-VALLEY	NV	751.
USG	16333-YUCCA MOUNTAIN	NV	850.

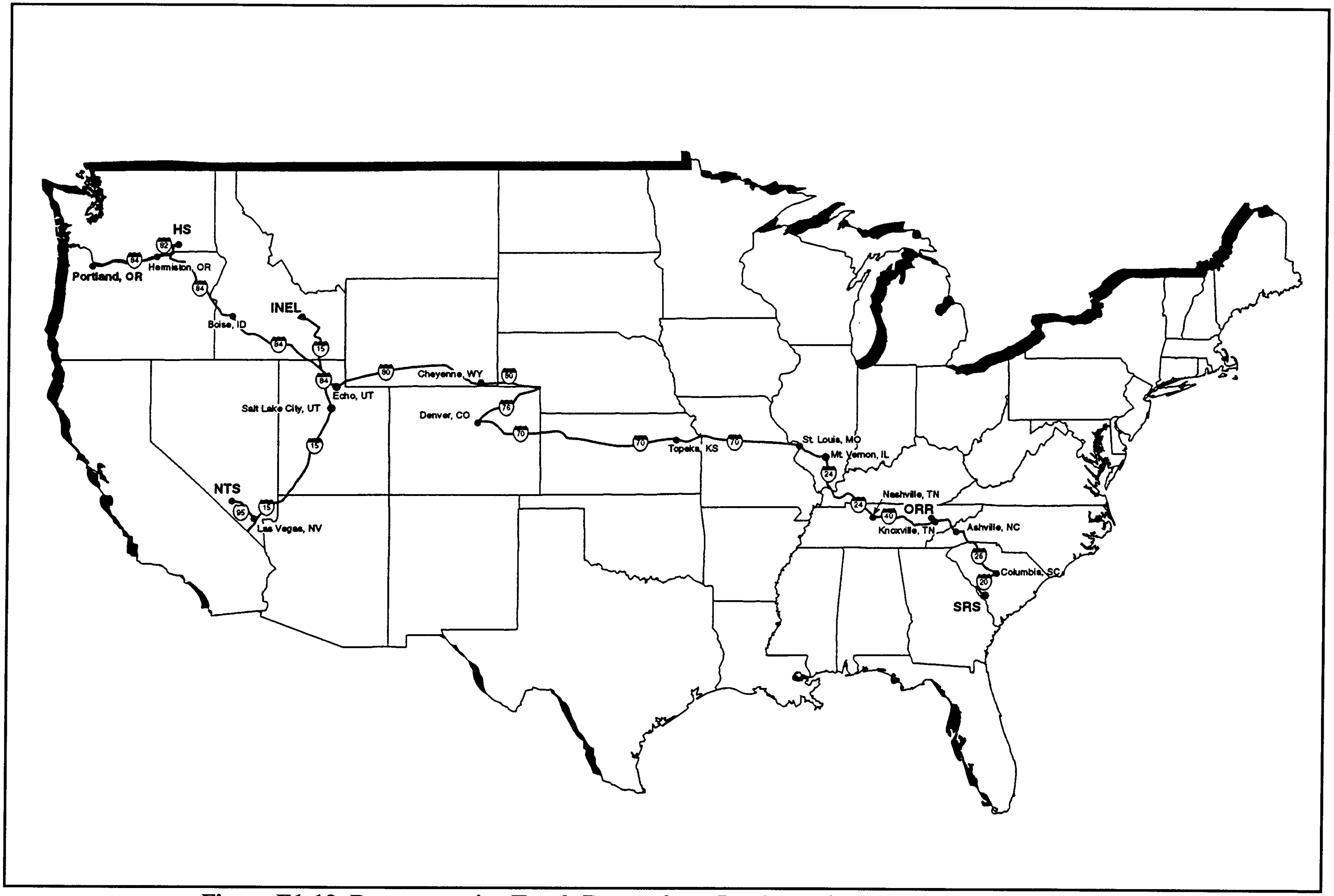


Figure E1-13 Representative Truck Routes from Portland, OR to Department of Energy Management Sites

From: PORTLAND, OR
To : SRL, SC

Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: PORTLAND, OR
To : ID NATL ENG LAB, ID

Routing through:

		PORTLAND				OR
I84		RAFT RIVER	W	I84	I86	ID
I86		CHUBBUCK	E	I15	I86	ID
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: PORTLAND, OR
To : HANFORD, WA

Routing through:

		PORTLAND				OR
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: PORTLAND, OR
To : K-25, TN

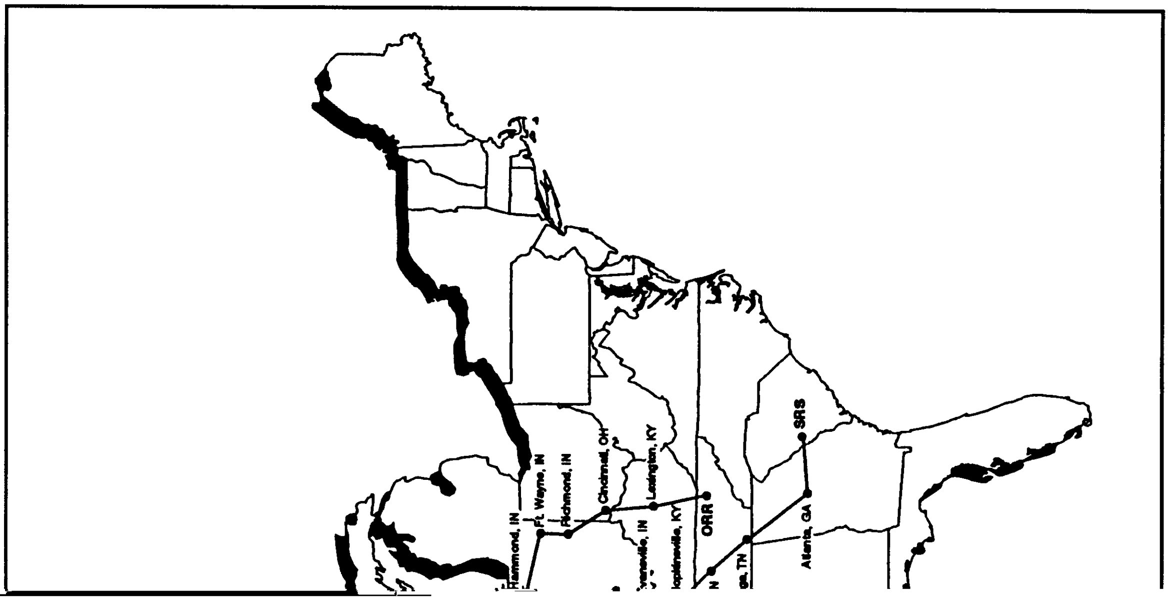
Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: PORTLAND, OR
To : MERCURY, NV

Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV



R to Department of Energy

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4223-DOLTON / RIVERDAIL		2207.
CSXT	4223-DOLTON / RIVERDAIL		2207.
CSXT	4206-CHICAGO HEIGHTS	IL	2217.
CSXT	4636-WATSEKA	IL	2268.
CSXT	4642-DANVILLE	IL	2313.
CSXT	3863-TERRE HAUTE	IN	2370.
CSXT	3812-VINCENNES	IN	2423.
CSXT	3838-EVANSVILLE	IN	2473.
CSXT	3839-HENDERSON	KY	2486.
CSXT	7061-HOPKINSVILLE	KY	2573.
CSXT	7201-MADISON	TN	2634.
CSXT	7202-NASHVILLE	TN	2644.
CSXT	7187-TULLAHOMA	TN	2723.
CSXT	7235-CHATTANOOGA	TN	2803.
CSXT	7888-DALTON	GA	2841.
CSXT	7889-CARTERSVILLE	GA	2892.
CSXT	7907-MARIETTA	GA	2924.
CSXT	7914-ATLANTA	GA	2934.
CSXT	7961-AUGUSTA	GA	3109.
CSXT	7732-ROBBINS	SC	3138.
CSXT	7717-DUNBARTON / WELL	SC	3147.
USG	7717-DUNBARTON / WELL	SC	3147.
USG	15359-SRP	SC	3155.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
UP	14179-PORTLAND	OR	0.
UP	14197-OREGON TRUNK JCT	OR	95.
UP	14223-HINKLE	OR	187.
UP	14220-PENDLETON	OR	218.
UP	13412-NAMPA	ID	487.
UP	13370-POCATELLO	ID	729.
UP	13336-SCOVILLE	ID	785.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
WCRC	13890-PASCO	WA	222.
WCRC	13964-KENNEWICK	WA	223.
WCRC	13941-RICHLAND	WA	231.
USG	13941-RICHLAND	WA	231.
USG	16212-HANFORD S 300	WA	239.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4228-BURNHAM / CALUME	IL	2211.
NS	4228-BURNHAM / CALUME	IL	2211.
NS	4076-HAMMOND	IN	2213.
NS	4064-HOBART	IN	2229.
NS	4020-ARGOS	IN	2292.
NS	3548-FORT WAYNE	IN	2351.
NS	3650-MUNCIE	IN	2415.
NS	3688-RICHMOND	IN	2460.
NS	3251-HAMILTON	OH	2515.
NS	3234-IVORYDALE	OH	2532.
NS	3228-CINCINNATI	OH	2539.
NS	6850-LEXINGTON	KY	2613.
NS	6979-DANVILLE	KY	2650.
NS	7260-HARRIMAN	TN	2812.
NS	15316-K-25	TN	2827.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4223-DOLTON / RIVERDAIL		2207.
CSXT	4223-DOLTON / RIVERDAIL		2207.
CSXT	4206-CHICAGO HEIGHTS	IL	2217.
CSXT	4636-WATSEKA	IL	2268.
CSXT	4642-DANVILLE	IL	2313.
CSXT	3863-TERRE HAUTE	IN	2370.
CSXT	3812-VINCENNES	IN	2423.
CSXT	3838-EVANSVILLE	IN	2473.
CSXT	3839-HENDERSON	KY	2486.
CSXT	7061-HOPKINSVILLE	KY	2573.
CSXT	7201-MADISON	TN	2634.
CSXT	7202-NASHVILLE	TN	2644.
CSXT	7187-TULLAHOMA	TN	2723.
CSXT	7235-CHATTANOOGA	TN	2803.
CSXT	7888-DALTON	GA	2841.
CSXT	7889-CARTERSVILLE	GA	2892.
CSXT	7907-MARIETTA	GA	2924.
CSXT	7914-ATLANTA	GA	2934.
CSXT	7961-AUGUSTA	GA	3109.
CSXT	7732-ROBBINS	SC	3138.
CSXT	7717-DUNBARTON / WELL	SC	3147.
USG	7717-DUNBARTON / WELL	SC	3147.
USG	15359-SRP	SC	3155.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
UP	14179-PORTLAND	OR	0.
UP	14197-OREGON TRUNK JCT	OR	95.
UP	14223-HINKLE	OR	187.
UP	14220-PENDLETON	OR	218.
UP	13412-NAMPA	ID	487.
UP	13370-POCATELLO	ID	729.
UP	13336-SCOVILLE	ID	785.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
WCRC	13890-PASCO	WA	222.
WCRC	13964-KENNEWICK	WA	223.
WCRC	13941-RICHLAND	WA	231.
USG	13941-RICHLAND	WA	231.
USG	16212-HANFORD S 300	WA	239.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4228-BURNHAM / CALUME	IL	2211.
NS	4228-BURNHAM / CALUME	IL	2211.
NS	4076-HAMMOND	IN	2213.
NS	4064-HOBART	IN	2229.
NS	4020-ARGOS	IN	2292.
NS	3548-FORT WAYNE	IN	2351.
NS	3650-MUNCIE	IN	2415.
NS	3688-RICHMOND	IN	2460.
NS	3251-HAMILTON	OH	2515.
NS	3234-IVORYDALE	OH	2532.
NS	3228-CINCINNATI	OH	2539.
NS	6850-LEXINGTON	KY	2613.
NS	6979-DANVILLE	KY	2650.
NS	7260-HARRIMAN	TN	2812.
NS	15316-K-25	TN	2827.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
UP	14179-PORTLAND	OR	0.
UP	14197-OREGON TRUNK JCT	OR	95.
UP	14223-HINKLE	OR	187.
UP	14220-PENDLETON	OR	218.
UP	13412-NAMPA	ID	487.
UP	13370-POCATELLO	ID	729.
UP	13369-MC CAMMON	ID	752.
UP	13568-OGDEN	UT	865.
UP	13595-SALT LAKE CITY	UT	901.
UP	13630-LYNNDYL	UT	1013.
UP	14766-VALLEY	NV	1330.
USG	14766-VALLEY	NV	1330.
USG	16333-YUCCA MOUNTAIN	NV	1429.

ROUTE FROM: BRG 16859-PORTLAND; PORT OF OR
TO: BRG 16851-RICHLAND; PORT OF WA

RR	NODE	STATE	DIST
BRG	16859-PORTLAND; PORT	OR	0.
BRG	16852-COLUMBIA/WILLAM	WA	10.
BRG	16853-VANCOUVER; PORT	WA	14.
BRG	16848-COLUMBIA/SNAKE	WA	231.
BRG	16851-RICHLAND; PORT	WA	243.

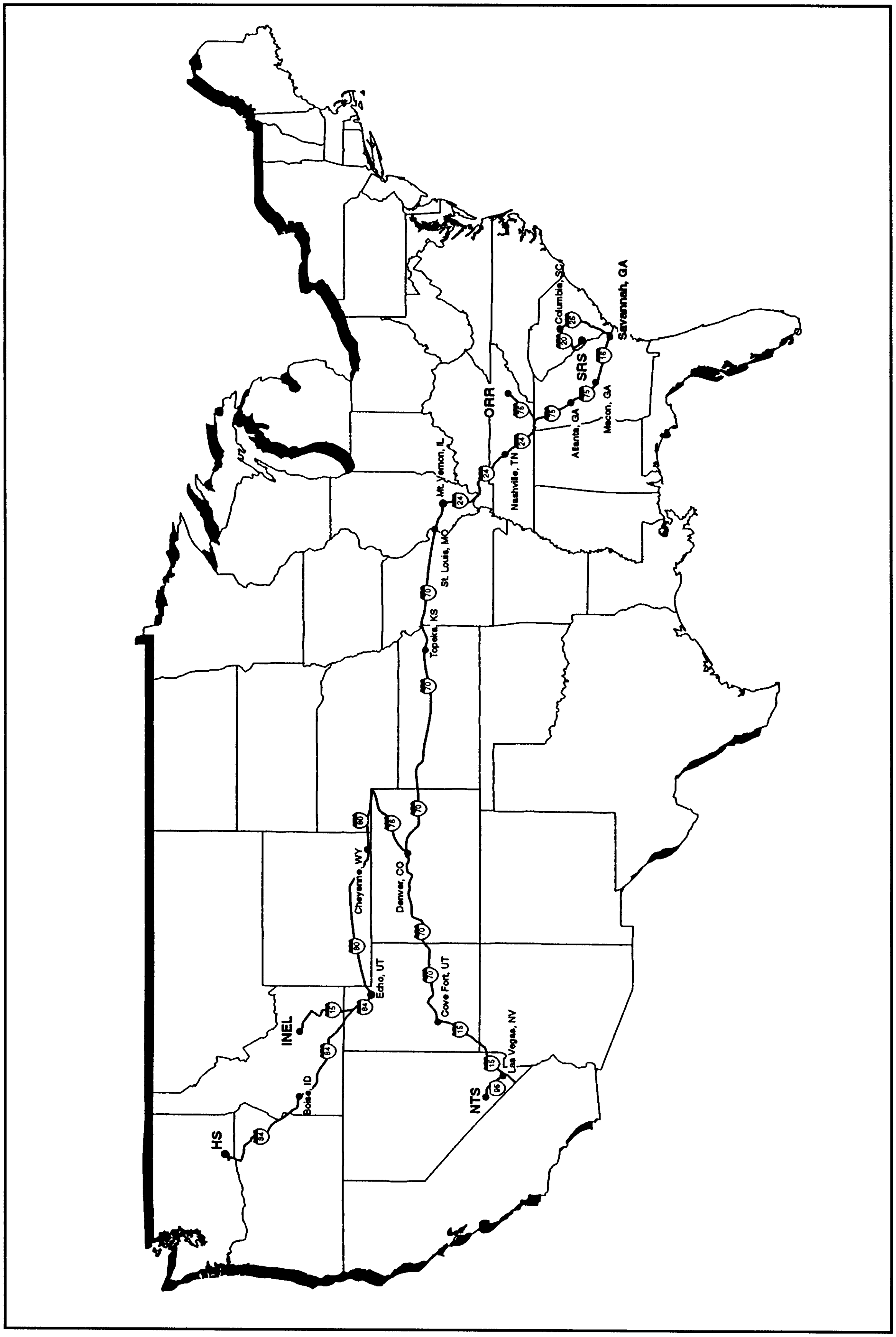


Figure E1-15 Representative Truck Routes from Savannah, GA to Department of Energy Management Sites

From: SAVANNAH, GA
To : SRP, SC

Routing through:

		SAVANNAH				GA
I16		POOLER	S	I16	I95	GA
I95		ROSINVILLE	N	I26	I95	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: SAVANNAH, GA
To : ID NATL ENG LAB, ID

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: SAVANNAH, GA
To : HANFORD, WA

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SAVANNAH, GA
To : K-25, TN

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: SAVANNAH, GA
To : MERCURY, NV

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

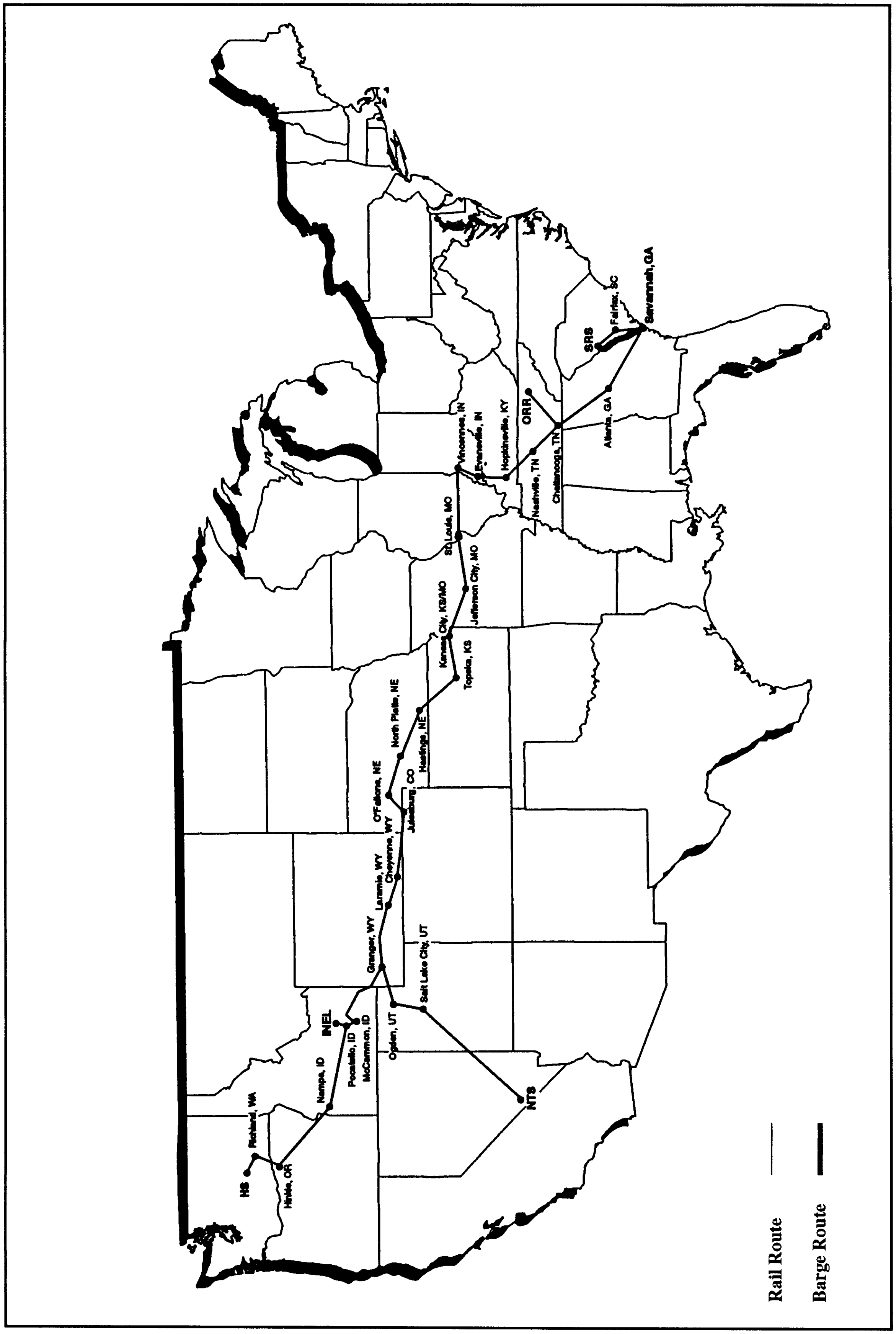


Figure E1-16 Representative Rail and Barge Routes from Savannah, GA to Department of Energy Management Sites

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	7739-FAIRFAX	SC	68.
CSXT	8007-SAVANNAH	GA	0.
CSXT	7732-ROBBINS	SC	97.
CSXT	7717-DUNBARTON / WELL	SC	106.
USG	7717-DUNBARTON / WELL	SC	106.
USG	15359-SRP	SC	114.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.
UP	10616-KANSAS CITY	MO	1318.
UP	10617-KANSAS CITY	KS	1321.
UP	11823-LAWRENCE	KS	1360.
UP	11697-TOPEKA	KS	1390.
UP	11696-MENOKEN	KS	1395.
UP	11681-MARYSVILLE	KS	1470.
UP	11405-HASTINGS	NE	1580.
UP	11410-GIBBON	NE	1606.
UP	11352-NORTH PLATTE	NE	1684.
UP	11358-O FALLONS	NE	1733.
UP	13703-JULESBURG	CO	1801.
UP	13465-CHEYENNE	WY	1947.
UP	13462-LARAMIE	WY	1999.
UP	13494-GRANGER	WY	2275.
UP	13369-MC CAMMON	ID	2467.
UP	13370-POCATELLO	ID	2490.
UP	13336-SCOVILLE	ID	2546.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.
UP	10616-KANSAS CITY	MO	1318.
UP	10617-KANSAS CITY	KS	1321.
UP	11823-LAWRENCE	KS	1360.
UP	11697-TOPEKA	KS	1390.
UP	11696-MENOKEN	KS	1395.
UP	11681-MARYSVILLE	KS	1470.
UP	11405-HASTINGS	NE	1580.
UP	11410-GIBBON	NE	1606.
UP	11352-NORTH PLATTE	NE	1684.
UP	11358-O FALLONS	NE	1733.
UP	13703-JULESBURG	CO	1801.
UP	13465-CHEYENNE	WY	1947.
UP	13462-LARAMIE	WY	1999.
UP	13494-GRANGER	WY	2275.
UP	13369-MC CAMMON	ID	2467.
UP	13370-POCATELLO	ID	2490.
UP	13412-NAMPA	ID	2732.
UP	14220-PENDLETON	OR	3000.
UP	14223-HINKLE	OR	3031.
UP	13894-WALLULA	WA	3060.
UP	13964-KENNEWICK	WA	3075.
UP	13941-RICHLAND	WA	3084.
USG	13941-RICHLAND	WA	3084.
USG	16212-HANFORD S 300	WA	3092.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
[illegible]	[illegible]	[illegible]	[illegible]
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
NS	7235-CHATTANOOGA	TN	490.
NS	7260-HARRIMAN	TN	572.
NS	15316-K-25	TN	587.

ROUTE FROM: BRG 16923-SAVANNAH RIV/ICWW, GA
TO: BRG 16932-SAVANNAH BLF L/D, GA

RR	NODE	STATE	DIST
BRG	16923-SAVANNAH RIV/ICW	GA	0.
[illegible]	[illegible]	[illegible]	[illegible]
BRG	16932-SAVANNAH BLF L/D	GA	146.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.

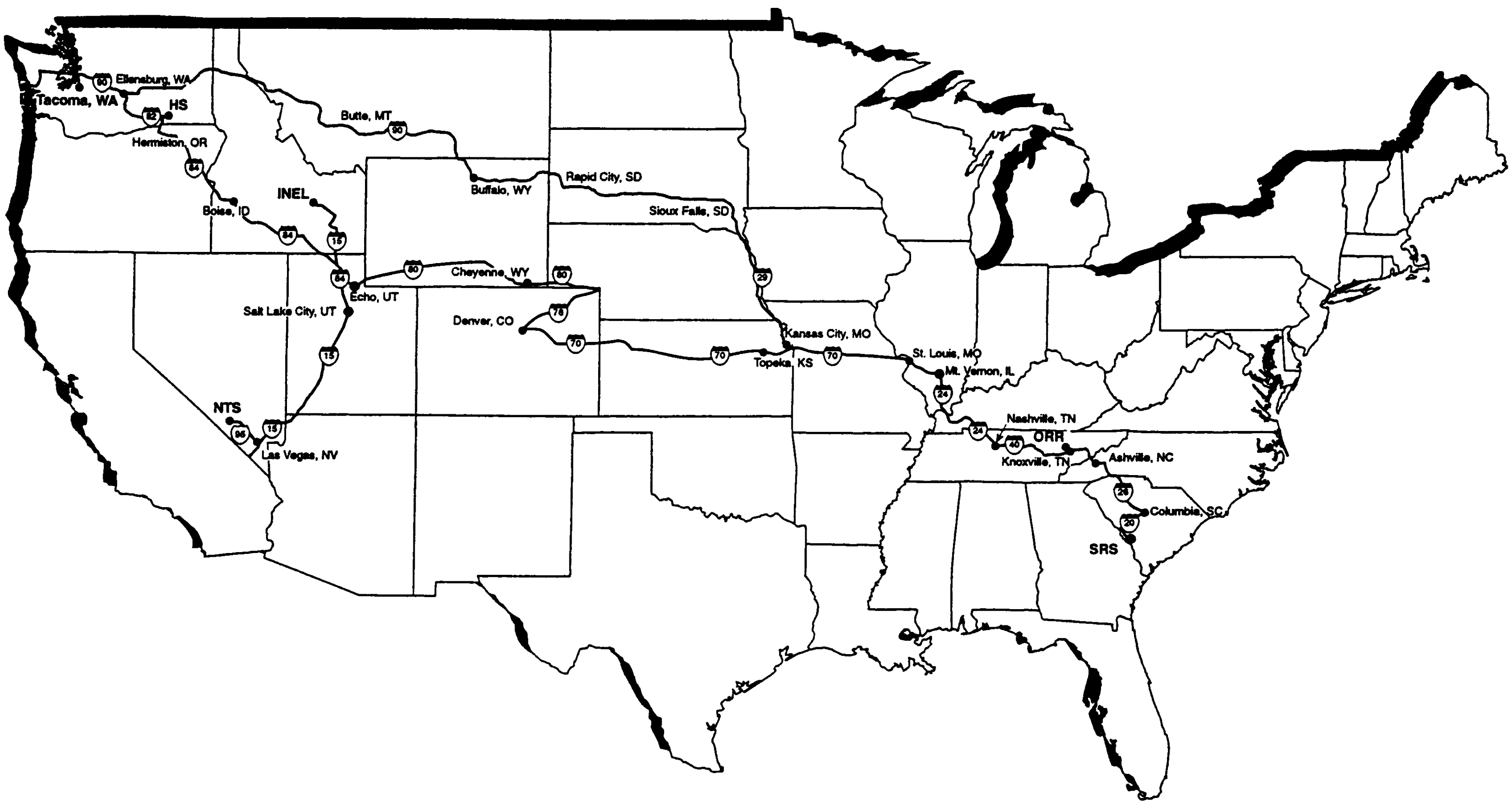


Figure E1-17 Representative Truck Routes from Tacoma, WA to Department of Energy Management Sites

From: TACOMA E I5 X135 WA
To : SRP, SC

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		BUTTE	W	I15	I90	MT
I15	I90	BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: TACOMA E I5 X135 WA
To : ID NATL ENG LAB, ID

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		HERMISTON	SW	I82	I84	OR
I84		RAFT RIVER	W	I84	I86	ID
I86		CHUBBUCK	E	I15	I86	ID
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: TACOMA E I5 X135 WA
To : HANFORD, WA

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: TACOMA E I5 X135 WA
To : K-25, TN

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		BUTTE	W	I15	I90	MT
I15	I90	BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: TACOMA E I5 X135 WA
To : MERCURY, NV

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

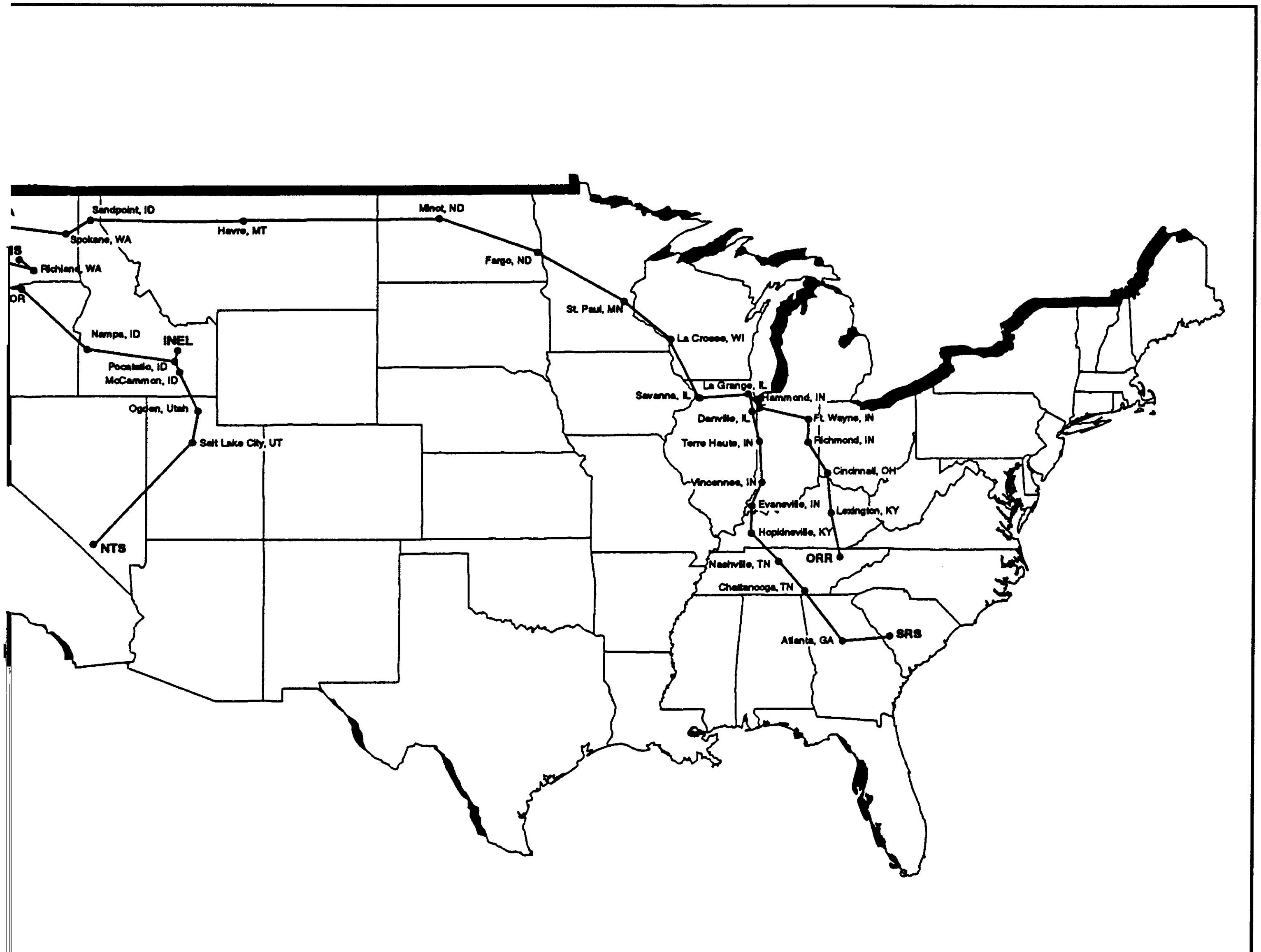


Figure E1-18 Representative Rail Routes from Tacoma, WA to Department of Energy Management Sites

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14011-SEATTLE	WA	42.
BN	14008-EVERETT	WA	74.
BN	13828-SPOKANE	WA	383.
BN	13300-SANDPOINT	ID	447.
BN	13089-SHELBY	MT	784.
BN	13168-HAVRE	MT	885.
BN	15740-WILLISTON	ND	1204.
BN	10936-MINOT	ND	1316.
BN	10935-SURREY	ND	1322.
BN	11134-CASSELTON	ND	1537.
BN	11132-FARGO	ND	1557.
BN	11131-MOORHEAD	MN	1560.
BN	9663-STAPLES	MN	1674.
BN	9671-SAUK RAPIDS	MN	1739.
BN	9826-COON CREEK	MN	1789.
BN	9798-NORTHTOWN	MN	1797.
BN	9830-ST PAUL	MN	1809.
BN	5736-LA CROSSE	WI	1930.
BN	4327-EAST DUBUQUE	IL	2041.
BN	4317-SAVANNA	IL	2081.
BN	4190-AURORA	IL	2172.
BN	4170-LA GRANGE	IL	2197.
IHB	4170-LA GRANGE	IL	2197.
IHB	4172-ARGO	IL	2201.
IHB	4163-BLUE ISLAND	IL	2213.
IHB	4223-DOLTON / RIVERDAIL		2217.
CSXT	4223-DOLTON / RIVERDAIL		2217.
CSXT	4206-CHICAGO HEIGHTS	IL	2227.
CSXT	4636-WATSEKA	IL	2278.
CSXT	4642-DANVILLE	IL	2323.
CSXT	3863-TERRE HAUTE	IN	2380.
CSXT	3812-VINCENNES	IN	2433.
CSXT	3838-EVANSVILLE	IN	2483.
CSXT	3839-HENDERSON	KY	2496.
CSXT	7061-HOPKINSVILLE	KY	2584.
CSXT	7201-MADISON	TN	2644.
CSXT	7202-NASHVILLE	TN	2654.
CSXT	7187-TULLAHOMA	TN	2733.
CSXT	7235-CHATTANOOGA	TN	2813.
CSXT	7888-DALTON	GA	2851.
CSXT	7889-CARTERSVILLE	GA	2902.
CSXT	7907-MARIETTA	GA	2935.
CSXT	7914-ATLANTA	GA	2944.
CSXT	7961-AUGUSTA	GA	3119.
CSXT	7732-ROBBINS	SC	3148.
CSXT	7717-DUNBARTON / WELL	SC	3157.
USG	7717-DUNBARTON / WELL	SC	3157.
USG	15359-SRP	SC	3165.

ROUTE FROM: BN 14100-TACOMA, WA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	14179-PORTLAND	OR	150.
UP	14179-PORTLAND	OR	150.
UP	14197-OREGON TRUNK JCT	OR	245.
UP	14223-HINKLE	OR	337.
UP	14220-PENDLETON	OR	368.
UP	13412-NAMPA	ID	636.
UP	13370-POCATELLO	ID	878.
UP	13336-SCOVILLE	ID	934.

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	13964-KENNEWICK	WA	355.
BN	13890-PASCO	WA	357.
WCRC	13890-PASCO	WA	357.
WCRC	13964-KENNEWICK	WA	358.
WCRC	13941-RICHLAND	WA	366.
USG	13941-RICHLAND	WA	366.
USG	16212-HANFORD S 300	WA	374.

ROUTE FROM: BN 14100-TACOMA, WA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14011-SEATTLE	WA	42.
BN	14008-EVERETT	WA	74.
BN	13828-SPOKANE	WA	383.
BN	13300-SANDPOINT	ID	447.
BN	13089-SHELBY	MT	784.
BN	13168-HAVRE	MT	885.
BN	15740-WILLISTON	ND	1204.
BN	10936-MINOT	ND	1316.
BN	10935-SURREY	ND	1322.
BN	11134-CASSELTON	ND	1537.
BN	11132-FARGO	ND	1557.
BN	11131-MOORHEAD	MN	1560.
BN	9663-STAPLES	MN	1674.
BN	9671-SAUK RAPIDS	MN	1739.
BN	9826-COON CREEK	MN	1789.
BN	9798-NORTHTOWN	MN	1797.
BN	9830-ST PAUL	MN	1809.
BN	5736-LA CROSSE	WI	1930.
BN	4327-EAST DUBUQUE	IL	2041.
BN	4317-SAVANNA	IL	2081.
BN	4190-AURORA	IL	2172.
BN	4170-LA GRANGE	IL	2197.
IHB	4170-LA GRANGE	IL	2197.
IHB	4172-ARGO	IL	2201.
IHB	4163-BLUE ISLAND	IL	2213.
IHB	4228-BURNHAM / CALUME	IL	2221.
NS	4228-BURNHAM / CALUME	IL	2221.
NS	4076-HAMMOND	IN	2223.
NS	4064-HOBART	IN	2240.
NS	4020-ARGOS	IN	2303.
NS	3548-FORT WAYNE	IN	2362.
NS	3650-MUNCIE	IN	2426.
NS	3688-RICHMOND	IN	2471.
NS	3251-HAMILTON	OH	2525.
NS	3234-IVORYDALE	OH	2542.
NS	3228-CINCINNATI	OH	2549.
NS	6850-LEXINGTON	KY	2623.
NS	6979-DANVILLE	KY	2660.
NS	7260-HARRIMAN	TN	2822.
NS	15316-K-25	TN	2837.

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	14179-PORTLAND	OR	150.
UP	14179-PORTLAND	OR	150.
UP	14197-OREGON TRUNK JCT	OR	245.
UP	14223-HINKLE	OR	337.
UP	14220-PENDLETON	OR	368.
UP	13412-NAMPA	ID	636.
UP	13370-POCATELLO	ID	878.
UP	13369-MC CAMMON	ID	901.
UP	13568-OGDEN	UT	1015.
UP	13595-SALT LAKE CITY	UT	1050.
UP	13630-LYNNDYL	UT	1162.
UP	14766-VALLEY	NV	1479.
USG	14766-VALLEY	NV	1479.
USG	16333-YUCCA MOUNTAIN	NV	1578.

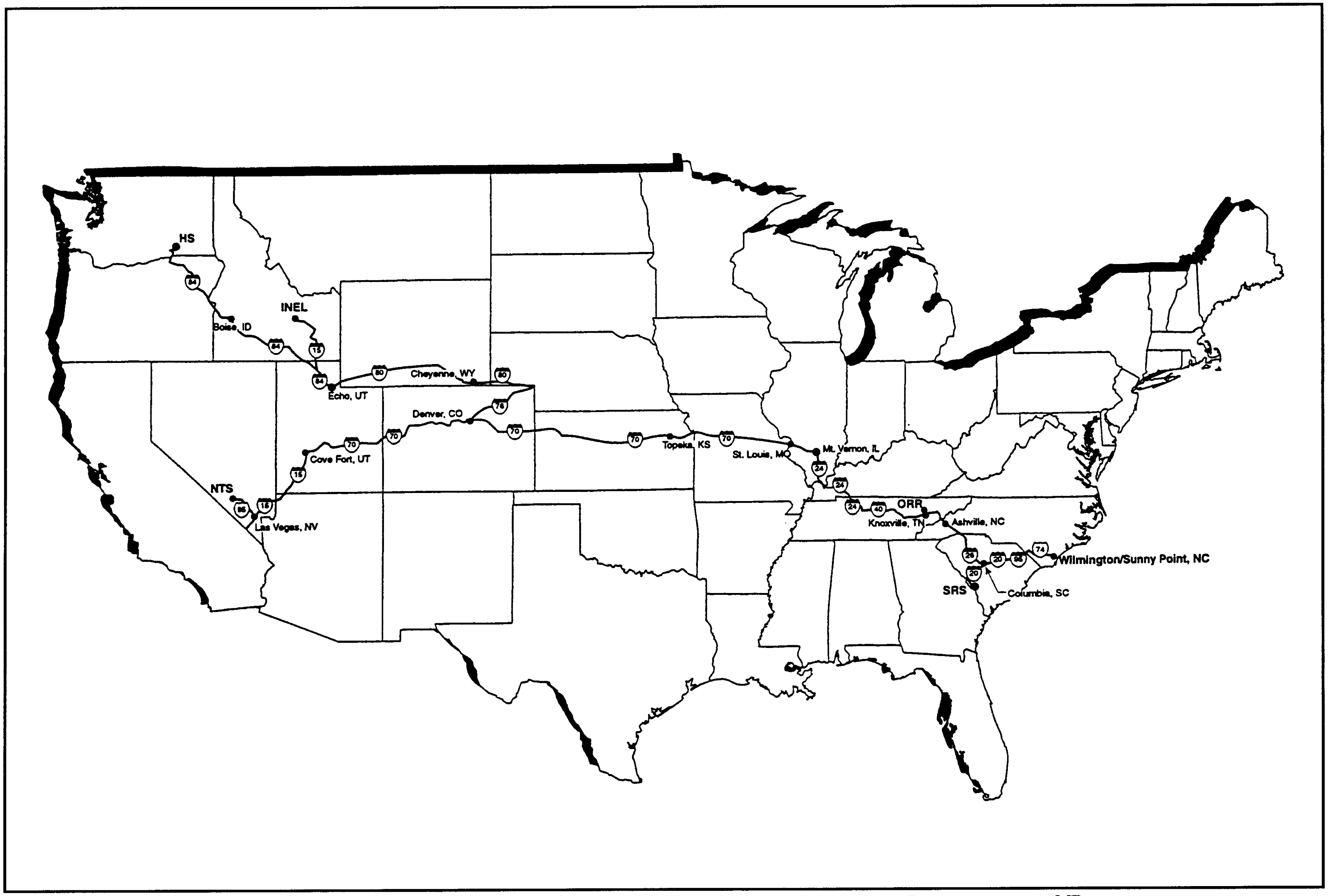


Figure E1-19 Representative Truck Routes from Wilmington, NC to Department of Energy Management Sites

From: WILMINGTON, NC
To : SRP, SC

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: WILMINGTON, NC
To : ID NATL ENG LAB, ID

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID

From: WILMINGTON, NC
To : HANFORD, WA

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: WILMINGTON, NC
To : K-25, TN

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC

From: WILMINGTON, NC
To : MERCURY, NV

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

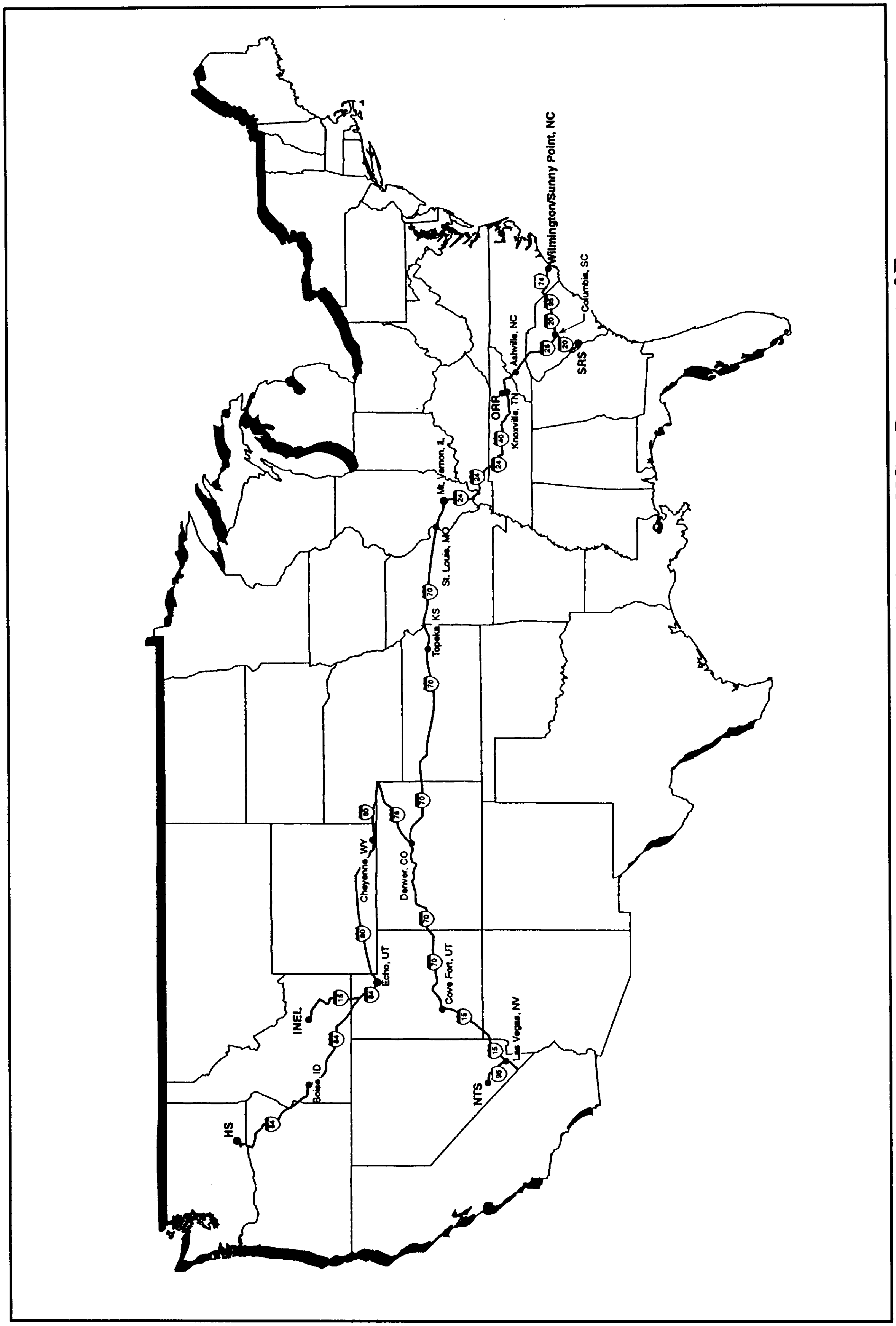


Figure E1-20 Representative Rail Routes from Wilmington, NC to Department of Energy Management Sites

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7671-DILLON	SC	106.
CSXT	7675-FLORENCE	SC	135.
CSXT	7690-CHARLESTON	SC	233.
CSXT	7739-FAIRFAX	SC	327.
CSXT	7732-ROBBINS	SC	356.
CSXT	7717-DUNBARTON / WELL	SC	365.
USG	7717-DUNBARTON / WELL	SC	365.
USG	15359-SRP	SC	373.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13369-MC CAMMON	ID	2570.
UP	13370-POCATELLO	ID	2593.
UP	13336-SCOVILLE	ID	2649.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13369-MC CAMMON	ID	2570.
UP	13370-POCATELLO	ID	2593.
UP	13412-NAMPA	ID	2835.
UP	14220-PENDLETON	OR	3103.
UP	14223-HINKLE	OR	3134.
UP	13894-WALLULA	WA	3163.
UP	13964-KENNEWICK	WA	3178.
UP	13941-RICHLAND	WA	3187.
USG	13941-RICHLAND	WA	3187.
USG	16212-HANFORD S 300	WA	3195.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7472-WADESBORO	NC	142.
WSS	7472-WADESBORO	NC	142.
WSS	7462-LEXINGTON	NC	210.
NS	7462-LEXINGTON	NC	210.
NS	7478-SALISBURY	NC	227.
NS	7394-HICKORY	NC	284.
NS	7387-MARION	NC	326.
NS	7343-ASHEVILLE	NC	366.
NS	7318-MORRISTOWN	TN	446.
NS	7286-KNOXVILLE	TN	487.
NS	7288-DOSSETT	TN	512.
NS	15316-K-25	TN	533.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13568-OGDEN	UT	2517.
UP	13595-SALT LAKE CITY	UT	2552.
UP	13630-LYNNDYL	UT	2664.
UP	14766-VALLEY	NV	2981.
USG	14766-VALLEY	NV	2981.
USG	16333-YUCCA MOUNTAIN	NV	3080.

Figure E1-21 Representative Truck Routes from Eastern Canada to Department of Energy Management Sites

From: ALEXANDRIA BAY SW I81 S12, NY
To : SRP, SC

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		CICERO	S	I481	I81	NY
I481		SYRACUSE	S	I481	I81	NY
I81		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77		COLUMBIA	NE	I20	I77	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: ALEXANDRIA BAY SW I81 S12, NY
To : ID NATL ENG LAB, ID

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: ALEXANDRIA BAY SW I81 S12, NY
To : HANFORD, WA

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: ALEXANDRIA BAY SW I81 S12, NY
To : K-25, TN

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		CICERO	S	I481	I81	NY
I481		SYRACUSE	S	I481	I81	NY
I81		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: ALEXANDRIA BAY SW I81 S12, NY
To : YUCCA MOUNTAIN, NV

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		BIG SPRINGS	SW	I76	I80	NE
I76		COMMERCE CITY	W	I25	I76	CO
I25		DENVER	N	I25	I70	CO
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		AMARGOSA VALLY		U95	S373	NV
LOCAL		YUCCA MOUNTAIN				NV

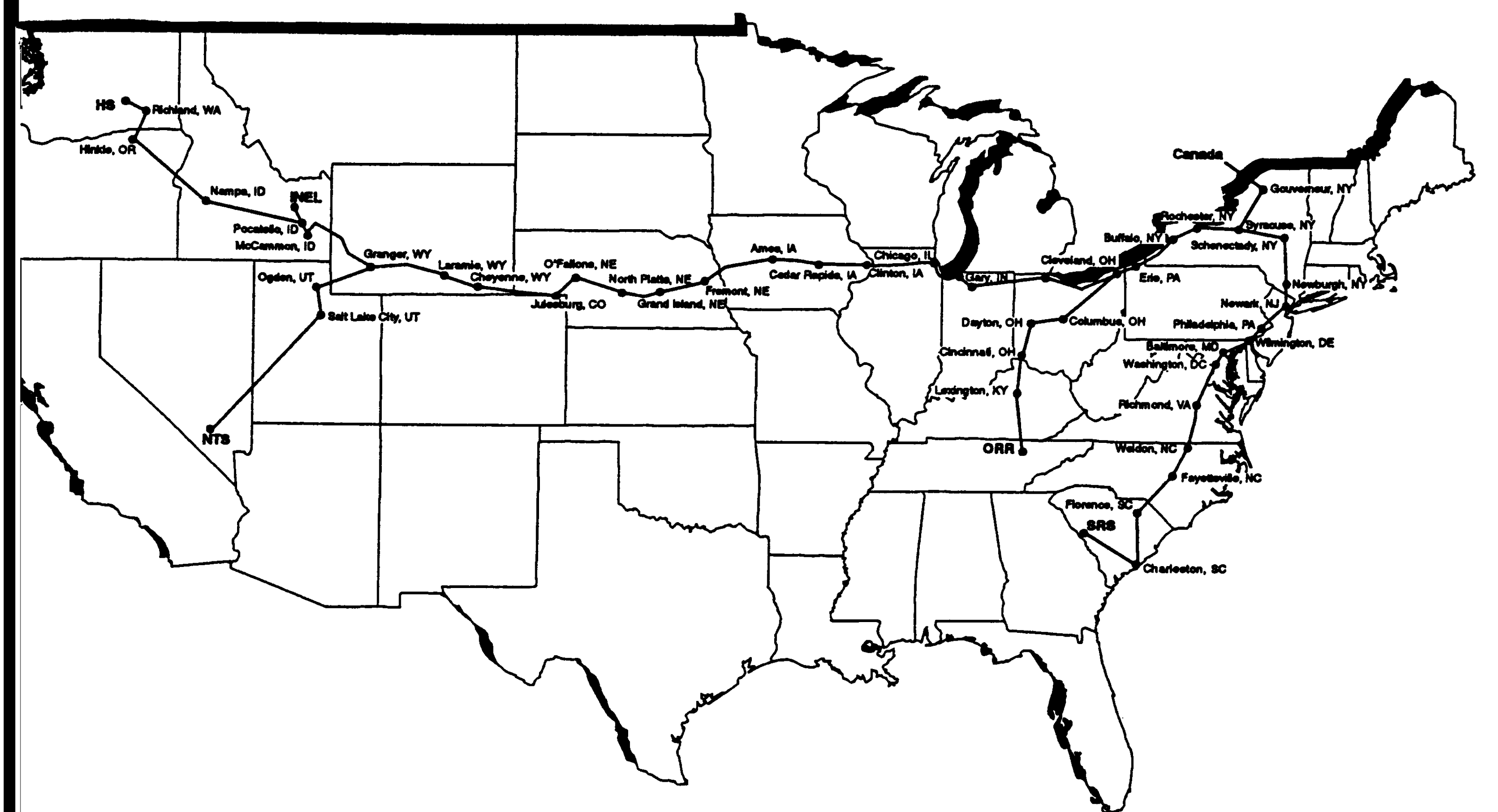


Figure E1-22 Representative Rail Routes from Eastern Canada to Department of Energy Management Sites

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	755-ROME	NY	145.
CR	756-UTICA	NY	159.
CR	706-SCHENECTADY	NY	237.
CR	700-SELKIRK	NY	259.
CR	1094-NEWBURGH	NY	334.
CR	1215-JERSEY CITY	NJ	400.
CR	1183-NEWARK	NJ	405.
CR	1230-ALDENE	NJ	411.
CR	1311-BOUND BROOK	NJ	430.
CR	1447-PHILADELPHIA	PA	492.
CR	2456-WILMINGTON	DE	529.
CR	2516-BALTIMORE	MD	593.
CR	2596-WASHINGTON	DC	627.
CR	2595-ALEXANDRIA	VA	637.
CSXT	2595-ALEXANDRIA	VA	637.
CSXT	6082-RICHMOND	VA	752.
CSXT	6087-COLONIAL HEIGHTS	VA	774.
CSXT	6064-PETERSBURG	VA	779.
CSXT	7563-WELDON	NC	839.
CSXT	7565-ROCKY MOUNT	NC	876.
CSXT	7566-WILSON	NC	890.
CSXT	7606-FAYETTEVILLE	NC	964.
CSXT	7620-PEMBROKE	NC	993.
CSXT	7671-DILLON	SC	1013.
CSXT	7675-FLORENCE	SC	1042.
CSXT	7690-CHARLESTON	SC	1140.
CSXT	7739-FAIRFAX	SC	1234.
CSXT	7732-ROBBINS	SC	1263.
CSXT	7717-DUNBARTON / WELL	SC	1272.
USG	7717-DUNBARTON / WELL	SC	1272.
USG	15359-SRP	SC	1280.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13369-MC CAMMON	ID	2252.
UP	13370-POCATELLO	ID	2275.
UP	13336-SCOVILLE	ID	2331.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
- - -	- - -	- - -	- - -
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
- - -	- - -	- - -	- - -
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13369-MC CAMMON	ID	2252.
UP	13370-POCATELLO	ID	2275.
UP	13412-NAMPA	ID	2517.
UP	14220-PENDLETON	OR	2786.
UP	14223-HINKLE	OR	2817.
UP	13894-WALLULA	WA	2846.
UP	13964-KENNEWICK	WA	2861.
UP	13941-RICHLAND	WA	2870.
- - -	- - -	- - -	- - -
USG	13941-RICHLAND	WA	2870.
USG	16212-HANFORD S 300	WA	2877.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2629-WELLINGTON	OH	466.
CR	3399-CRESTLINE	OH	504.
CR	3094-COLUMBUS (4TH ST	OH	566.
CR	3095-COLUMBUS (BROAD	OH	567.
CR	14993-COLUMBUS (BUCKEY	OH	569.
CR	3300-SPRINGFIELD	OH	611.
CR	3282-DAYTON	OH	632.
CR	3250-MIDDLETOWN	OH	652.
CR	3234-IVORYDALE	OH	677.
CR	3228-CINCINNATI	OH	684.
- - -	- - -	- - -	- - -
NS	3228-CINCINNATI	OH	684.
NS	6850-LEXINGTON	KY	758.
NS	6979-DANVILLE	KY	795.
NS	7260-HARRIMAN	TN	957.
NS	15316-K-25	TN	972.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
- - -	- - -	- - -	- - -
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
- - -	- - -	- - -	- - -
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13568-OGDEN	UT	2199.
UP	13595-SALT LAKE CITY	UT	2235.
UP	13630-LYNNDYL	UT	2347.
UP	14766-VALLEY	NV	2664.
- - -	- - -	- - -	- - -
USG	14766-VALLEY	NV	2664.
USG	16333-YUCCA MOUNTAIN	NV	2763.

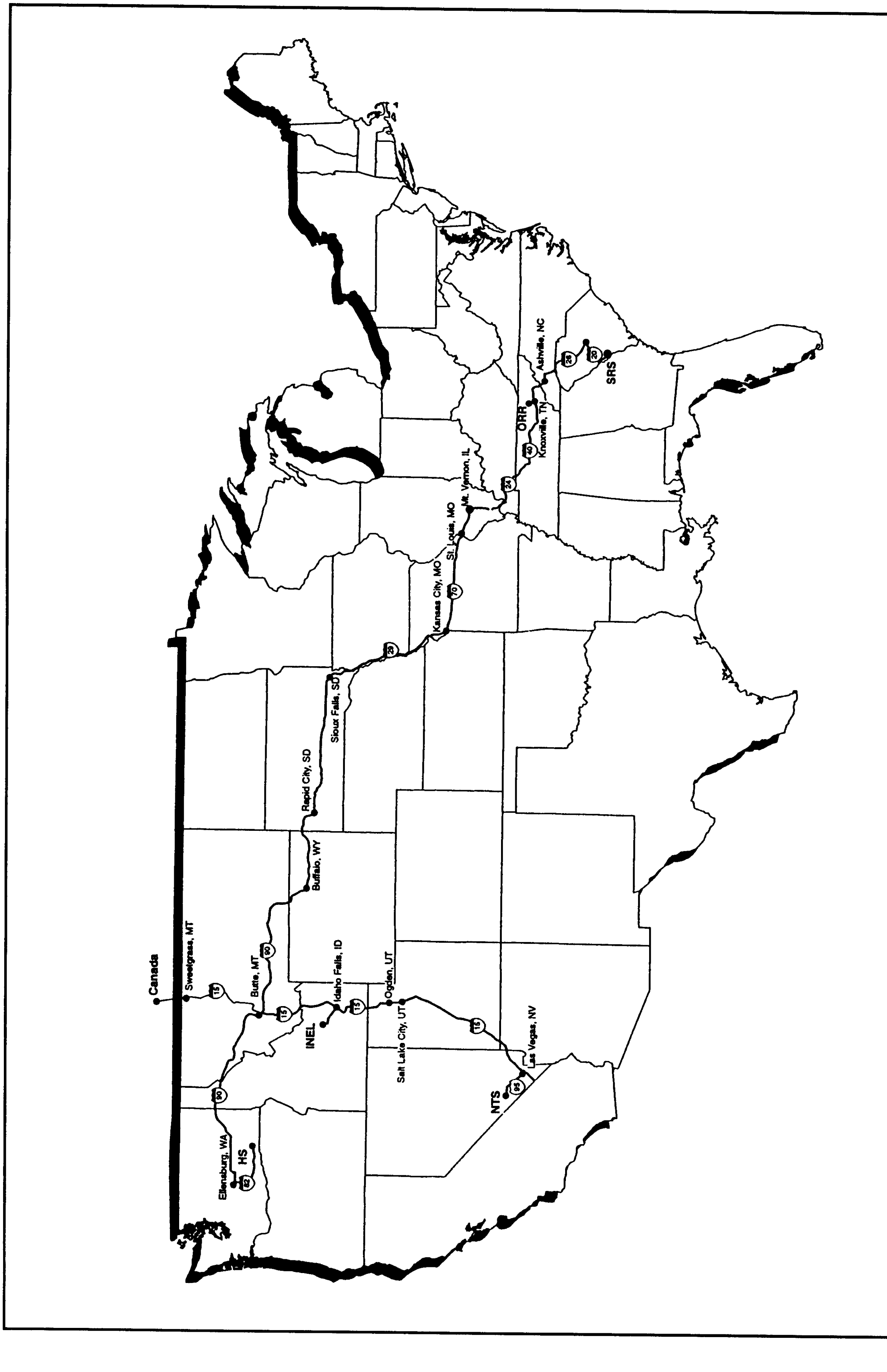


Figure E1-23 Representative Truck Routes from Western Canada to Department of Energy Management Sites

From: SWEETGRASS I15 X394 MT
To : SRL, SC

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	N	I24	I265	TN
I265		NASHVILLE	W	I265	I40	TN
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: SWEETGRASS I15 X394 MT
To : ID NATL ENG LAB, ID

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: SWEETGRASS I15 X394 MT
To : HANFORD, WA

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I90		ELLENSBURG	SE	I82	I90	WA
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SWEETGRASS I15 X394 MT
To : K-25, TN

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	N	I24	I265	TN
I265		NASHVILLE	W	I265	I40	TN
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: SWEETGRASS I15 X394 MT
To : MERCURY, NV

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		N SALT LAKE		I15	I215	UT
I215		MIDVALE		I15	I215	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

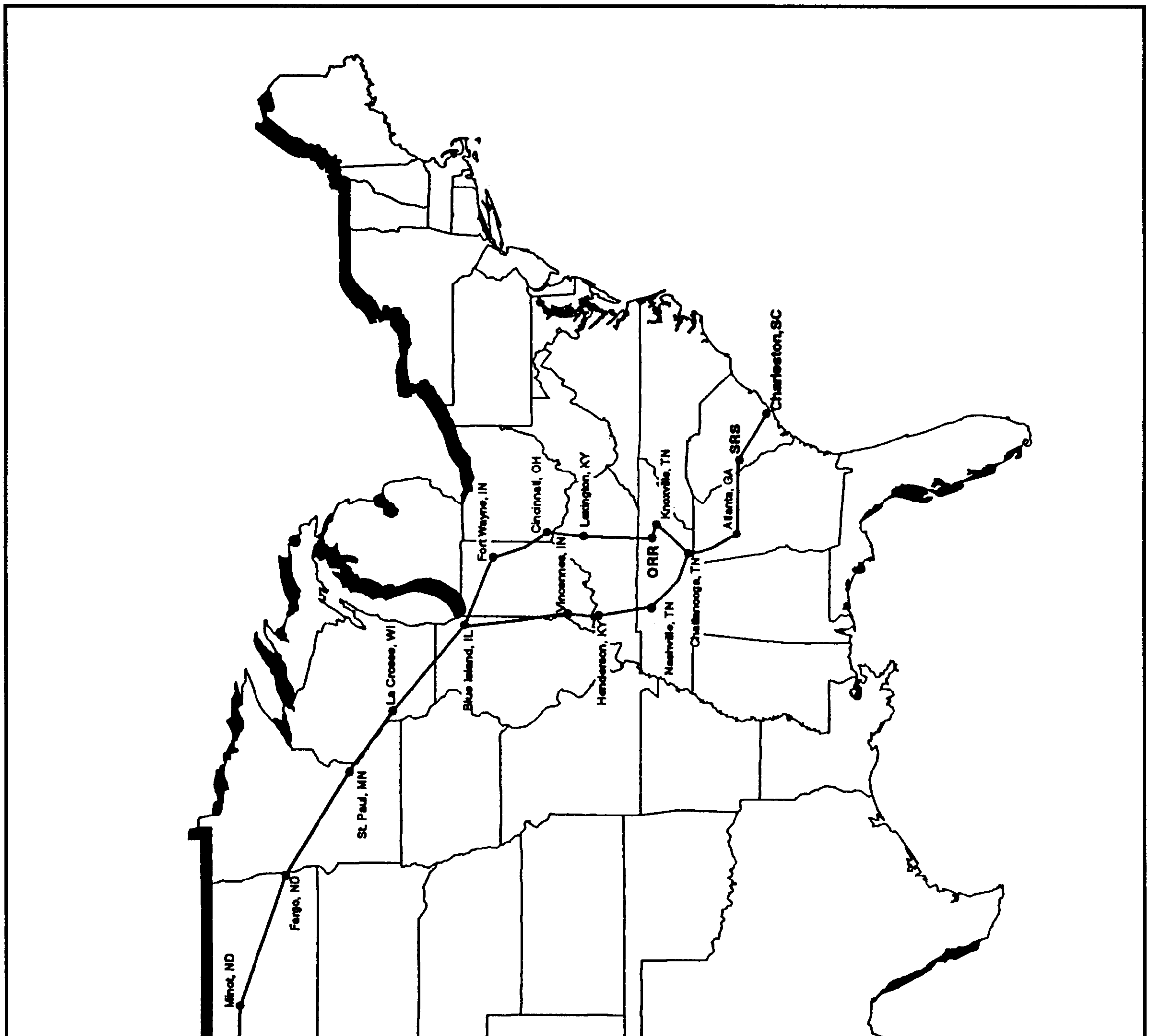


Figure E1-24 Representative Rail Routes from Western Canada to Department of Energy Management Sites

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13089-SHELBY	MT	43.
BN	13168-HAVRE	MT	144.
BN	15740-WILLISTON	ND	463.
BN	10936-MINOT	ND	575.
BN	10935-SURREY	ND	581.
BN	11134-CASSELTON	ND	796.
BN	11132-FARGO	ND	816.
BN	11131-MOORHEAD	MN	819.
BN	9663-STAPLES	MN	933.
BN	9671-SAUK RAPIDS	MN	998.
BN	9826-COON CREEK	MN	1048.
BN	9798-NORTHTOWN	MN	1056.
BN	9830-ST PAUL	MN	1069.
BN	5736-LA CROSSE	WI	1190.
BN	4327-EAST DUBUQUE	IL	1301.
BN	4317-SAVANNA	IL	1341.
BN	4190-AURORA	IL	1432.
BN	4170-LA GRANGE	IL	1457.
IHB	4170-LA GRANGE	IL	1457.
IHB	4172-ARGO	IL	1461.
IHB	4163-BLUE ISLAND	IL	1473.
IHB	4223-DOLTON / RIVERDAIL		1477.
CSXT	4223-DOLTON / RIVERDAIL		1477.
CSXT	4206-CHICAGO HEIGHTS	IL	1487.
CSXT	4636-WATSEKA	IL	1538.
CSXT	4642-DANVILLE	IL	1583.
CSXT	3863-TERRE HAUTE	IN	1640.
CSXT	3812-VINCENNES	IN	1693.
CSXT	3838-EVANSVILLE	IN	1743.
CSXT	3839-HENDERSON	KY	1756.
CSXT	7061-HOPKINSVILLE	KY	1843.
CSXT	7201-MADISON	TN	1903.
CSXT	7202-NASHVILLE	TN	1913.
CSXT	7187-TULLAHOMA	TN	1992.
CSXT	7235-CHATTANOOGA	TN	2073.
CSXT	7888-DALTON	GA	2111.
CSXT	7889-CARTERSVILLE	GA	2162.
CSXT	7907-MARIETTA	GA	2194.
CSXT	7914-ATLANTA	GA	2204.
CSXT	7961-AUGUSTA	GA	2379.
CSXT	7732-ROBBINS	SC	2408.
CSXT	7717-DUNBARTON / WELL	SC	2417.
USG	7717-DUNBARTON / WELL	SC	2417.
USG	15359-SRP	SC	2425.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
BN	13894-WALLULA	WA	605.
UP	13894-WALLULA	WA	605.
UP	14223-HINKLE	OR	634.
UP	14220-PENDLETON	OR	665.
UP	13412-NAMPA	ID	933.
UP	13370-POCATELLO	ID	1175.
UP	13336-SCOVILLE	ID	1231.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
WCRC	13890-PASCO	WA	589.
WCRC	13964-KENNEWICK	WA	590.
WCRC	13941-RICHLAND	WA	598.
USG	13941-RICHLAND	WA	598.
USG	16212-HANFORD S 300	WA	606.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13089-SHELBY	MT	43.
BN	13168-HAVRE	MT	144.
BN	15740-WILLISTON	ND	463.
BN	10936-MINOT	ND	575.
BN	10935-SURREY	ND	581.
BN	11134-CASSELTON	ND	796.
BN	11132-FARGO	ND	816.
BN	11131-MOORHEAD	MN	819.
BN	9663-STAPLES	MN	933.
BN	9671-SAUK RAPIDS	MN	998.
BN	9826-COON CREEK	MN	1048.
BN	9798-NORTHTOWN	MN	1056.
BN	9830-ST PAUL	MN	1069.
BN	5736-LA CROSSE	WI	1190.
BN	4327-EAST DUBUQUE	IL	1301.
BN	4317-SAVANNA	IL	1341.
BN	4190-AURORA	IL	1432.
BN	4170-LA GRANGE	IL	1457.
IHB	4170-LA GRANGE	IL	1457.
IHB	4172-ARGO	IL	1461.
IHB	4163-BLUE ISLAND	IL	1473.
IHB	4228-BURNHAM / CALUME	IL	1481.
NS	4228-BURNHAM / CALUME	IL	1481.
NS	4076-HAMMOND	IN	1483.
NS	4064-HOBART	IN	1499.
NS	4020-ARGOS	IN	1562.
NS	3548-FORT WAYNE	IN	1621.
NS	3650-MUNCIE	IN	1685.
NS	3688-RICHMOND	IN	1730.
NS	3251-HAMILTON	OH	1785.
NS	3234-IVORYDALE	OH	1802.
NS	3228-CINCINNATI	OH	1809.
NS	6850-LEXINGTON	KY	1883.
NS	6979-DANVILLE	KY	1920.
NS	7260-HARRIMAN	TN	2082.
NS	15316-K-25	TN	2097.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
BN	13894-WALLULA	WA	605.
UP	13894-WALLULA	WA	605.
UP	14223-HINKLE	OR	634.
UP	14220-PENDLETON	OR	665.
UP	13412-NAMPA	ID	933.
UP	13370-POCATELLO	ID	1175.
UP	13369-MC CAMMON	ID	1198.
UP	13568-OGDEN	UT	1312.
UP	13595-SALT LAKE CITY	UT	1347.
UP	13630-LYNNDYL	UT	1459.
UP	14766-VALLEY	NV	1776.
USG	14766-VALLEY	NV	1776.
USG	16333-YUCCA MOUNTAIN	NV	1875.

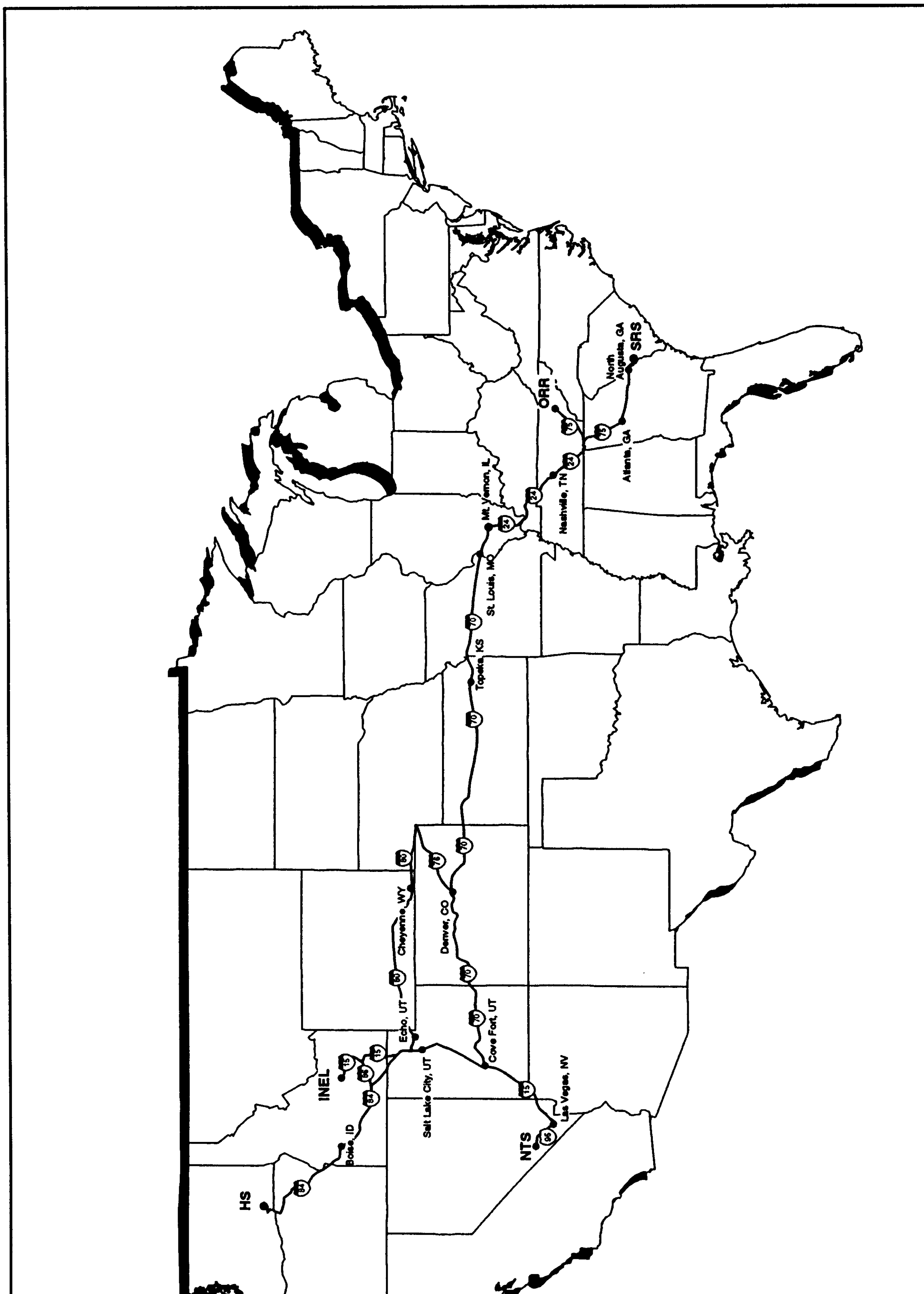


Figure E1-25 Representative Truck Routes Between Department of Energy Management Sites

From: ID NATL ENG LAB, ID
To : HANFORD, WA

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		CHUBBUCK	E	I15	I86	ID
I86		RAFT RIVER	W	I84	I86	ID
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: ID NATL ENG LAB, ID
To : MERCURY, NV

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: ID NATL ENG LAB, ID
To : SRL, SC

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: ID NATL ENG LAB, ID
To : K-25, TN

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: HANFORD, WA
To : MERCURY, NV

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: HANFORD, WA
To : SRL, SC

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: HANFORD, WA
To : K-25, TN

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: K-25, TN
To : SRL, SC

Routing through:

		K-25				TN
S58		KINGSTON	E	I40	S58	TN
I40		OAK RIDGE	S	I40	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: MERCURY, NV
To : SRL, SC

Routing through:

		MERCURY				NV
LOCAL		MERCURY	S	U95	LOCL	NV
U95		LAS VEGAS				NV
I15		COVE FORT	W	I15	I70	UT
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: MERCURY, NV
To : K-25, TN

Routing through:

		MERCURY				NV
LOCAL		MERCURY	S	U95	LOCL	NV
U95		LAS VEGAS				NV
I15		COVE FORT	W	I15	I70	UT
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

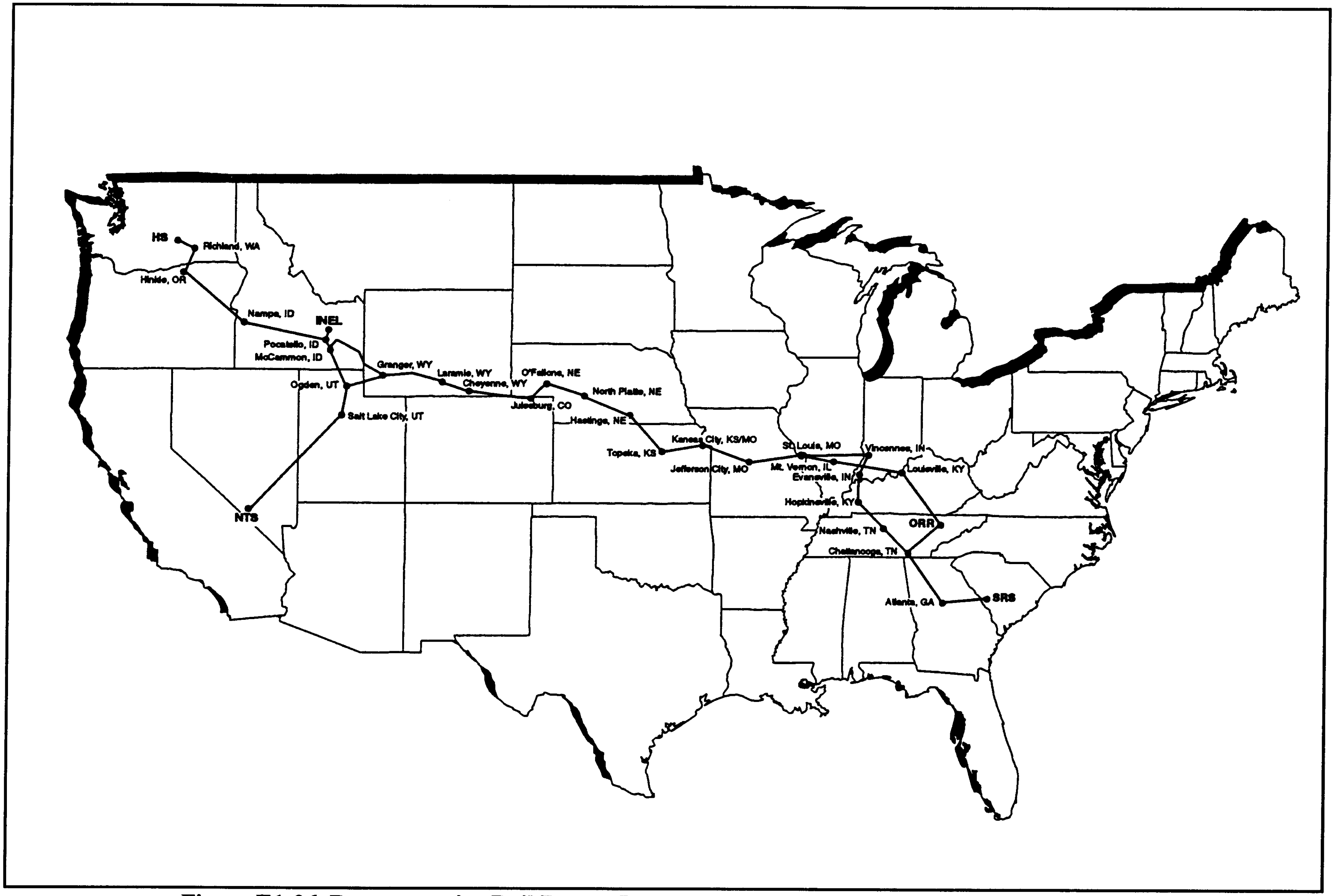


Figure E1-26 Representative Rail Routes Between Department of Energy Management Sites

ROUTE FROM: USG 15359-SRP, SC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13369-MC CAMMON	ID	2329.
UP	13370-POCATELLO	ID	2352.
UP	13412-NAMPA	ID	2594.
UP	14220-PENDLETON	OR	2862.
UP	14223-HINKLE	OR	2893.
UP	13894-WALLULA	WA	2922.
UP	13964-KENNEWICK	WA	2937.
UP	13941-RICHLAND	WA	2946.
USG	13941-RICHLAND	WA	2946.
USG	16212-HANFORD S 300	WA	2954.

ROUTE FROM: USG 15359-SRP, SC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13369-MC CAMMON	ID	2329.
UP	13370-POCATELLO	ID	2352.
UP	13336-SCOVILLE	ID	2408.

ROUTE FROM: USG 15359-SRP, SC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13568-OGDEN	UT	2276.
UP	13595-SALT LAKE CITY	UT	2311.
UP	13630-LYNNDYL	UT	2423.
UP	14766-VALLEY	NV	2740.
USG	14766-VALLEY	NV	2740.
USG	16333-YUCCA MOUNTAIN	NV	2839.

ROUTE FROM: UP 13336-SCOVILLE, ID
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
UP	13336-SCOVILLE	ID	0.
UP	13370-POCATELLO	ID	56.
UP	13412-NAMPA	ID	298.
UP	14220-PENDLETON	OR	567.
UP	14223-HINKLE	OR	598.
UP	13894-WALLULA	WA	627.
UP	13964-KENNEWICK	WA	642.
UP	13941-RICHLAND	WA	650.
USG	13941-RICHLAND	WA	650.
USG	16212-HANFORD S 300	WA	658.

ROUTE FROM: UP 13336-SCOVILLE, ID
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
UP	13336-SCOVILLE	ID	0.
UP	13370-POCATELLO	ID	56.
UP	13369-MC CAMMON	ID	79.
UP	13568-OGDEN	UT	193.
UP	13595-SALT LAKE CITY	UT	228.
UP	13630-LYNNDYL	UT	340.
UP	14766-VALLEY	NV	657.
USG	14766-VALLEY	NV	657.
USG	16333-YUCCA MOUNTAIN	NV	756.

ROUTE FROM: USG 16212-HANFORD S 300, WA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	16212-HANFORD S 300	WA	0.
USG	13941-RICHLAND	WA	8.
UP	13941-RICHLAND	WA	8.
UP	13964-KENNEWICK	WA	16.
UP	13894-WALLULA	WA	31.
UP	14223-HINKLE	OR	60.
UP	14220-PENDLETON	OR	91.
UP	13412-NAMPA	ID	360.
UP	13370-POCATELLO	ID	602.
UP	13369-MC CAMMON	ID	625.
UP	13568-OGDEN	UT	738.
UP	13595-SALT LAKE CITY	UT	774.
UP	13630-LYNNDYL	UT	886.
UP	14766-VALLEY	NV	1203.
USG	14766-VALLEY	NV	1203.
USG	16333-YUCCA MOUNTAIN	NV	1302.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
- - -	- - - - - - - - -	- - -	- - -
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13369-MC CAMMON	ID	1976.
UP	13370-POCATELLO	ID	1999.
UP	13412-NAMPA	ID	2241.
UP	14220-PENDLETON	OR	2510.
UP	14223-HINKLE	OR	2541.
UP	13894-WALLULA	WA	2570.
UP	13964-KENNEWICK	WA	2585.
UP	13941-RICHLAND	WA	2594.
- - -	- - - - - - - - -	- - -	- - -
USG	13941-RICHLAND	WA	2594.
USG	16212-HANFORD S 300	WA	2601.

ROUTE FROM: NS 15316-K-25, TN
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
- - -	- - - - - - - - -	- - -	- - -
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13369-MC CAMMON	ID	1976.
UP	13370-POCATELLO	ID	1999.
UP	13336-SCOVILLE	ID	2055.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
- - -	- - - - - - - - -	- - -	- - -
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13568-OGDEN	UT	1923.
UP	13595-SALT LAKE CITY	UT	1959.
UP	13630-LYNNDYL	UT	2071.
UP	14766-VALLEY	NV	2388.
- - -	- - - - - - - - -	- - -	- - -
USG	14766-VALLEY	NV	2388.
USG	16333-YUCCA MOUNTAIN	NV	2487.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7288-DOSSETT	TN	21.
NS	7286-KNOXVILLE	TN	46.
NS	7318-MORRISTOWN	TN	87.
NS	7343-ASHEVILLE	NC	167.
NS	7814-SPARTANBURG	SC	234.
- - -	- - - - - - - - -	- - -	- - -
CSXT	7814-SPARTANBURG	SC	234.
CSXT	7838-GREENWOOD	SC	300.
CSXT	7961-AUGUSTA	GA	371.
CSXT	7732-ROBBINS	SC	400.
CSXT	7717-DUNBARTON / WELL	SC	409.
- - -	- - - - - - - - -	- - -	- - -
USG	7717-DUNBARTON / WELL	SC	409.
USG	15359-SRP	SC	417.