DOE/EIS-0549

Final Environmental Impact Statement for the Surplus Plutonium Disposition Program

December 2023

K-Area at Savannah River Site

PF-4 at Los Alamos National Laboratory

National Nuclear Security Administration

U.S. Department of Energy
National Nuclear Security Administration

Summary

DOE/EIS-0549
December 2023

FINAL

ENVIRONMENTAL IMPACT STATEMENT FOR THE SURPLUS PLUTONIUM DISPOSITION PROGRAM

Summary

COVER SHEET

Responsible Federal Agency: U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA)

Title: Final Environmental Impact Statement for the Surplus Plutonium Disposition Program (Final SPDP EIS) (DOE/EIS-0549)

Locations: New Mexico, South Carolina, Texas, and Tennessee

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This document is available for viewing and downloading on the NNSA NEPA Reading Room Website (https://www.energy.gov/nnsa/nnsa-nepa-reading-room), the DOE NEPA website (https://www.energy.gov/nepa/doeeis-0549-surplus-plutonium-disposition-program), the Savannah River Site website (https://www.srs.gov/general/pubs/envbul/nepa1.htm), and the Los Alamos National Laboratory website (https://www.lanl.gov/environment/public-reading-room.php).

- ***Abstract:*** The National Nuclear Security Administration (NNSA), a semi-autonomous agency organized in 2000 within the United States (U.S.) Department of Energy (DOE),[1] works to prevent nuclear weapon proliferation and reduce the threat of nuclear and radiological terrorism around the world. NNSA's Office of Defense Nuclear Nonproliferation works globally to prevent state and non-state actors from developing nuclear weapons or acquiring weapons-usable nuclear or radiological materials, equipment, technology, and expertise. Among other missions, NNSA is engaged in a program to disposition U.S. surplus weapons-grade plutonium (referred to in this Surplus Plutonium Disposition Program Environmental Impact Statement (SPDP EIS) as "surplus plutonium"). NNSA has prepared this document (DOE/EIS-0549) pursuant to the *National Environmental Policy Act* of 1969 (NEPA) (42 United States Code 4321 et seq.), to evaluate the potential environmental impacts of the disposition of plutonium that is surplus to the defense needs of the United States.

  DOE's purpose and need for action is to safely and securely disposition plutonium that is surplus to the Nation's defense needs so that it is not readily usable in nuclear weapons.

[1] In this SPDP EIS, DOE's NNSA is referred to as NNSA for the sake of brevity.

- ***Preferred Alternative:*** NNSA's Preferred Alternative to meet the purpose and need is implementation of the dilute and dispose strategy for the full 34 metric tons of surplus plutonium (DOE 2018c). The effort would require new, modified, or existing capabilities at the Pantex Plant, Los Alamos National Laboratory, Savannah River Site, Y-12 National Security Complex, and the Waste Isolation Pilot Plant facility. Four sub-alternatives to the Preferred Alternative are considered in this environmental impact statement (EIS). The sub-alternatives differ based on the location (Los Alamos National Laboratory or Savannah River Site) for the processing activities. The sub-alternatives were selected so that the analyses presented in this EIS would bound the impacts (including impacts from transportation) that would occur if either site or a combination of the sites was used (i.e., if some of the 34 metric tons of surplus plutonium is processed at one site and the remainder is processed at the other site).
- ***Public Involvement:*** In preparing this Final SPDP EIS, NNSA considered comments received during the scoping period (December 16, 2020 through February 18, 2021), during the public comment period on the Draft SPDP EIS (December 16, 2022 through March 16, 2023), and late comments received after the close of the public comment period but prior to May 2023. NNSA held in-person public hearings in Aiken, South Carolina (January 19, 2023), Carlsbad, New Mexico (January 24, 2023), and Los Alamos, New Mexico (January 26, 2023). In addition, NNSA held an internet-based virtual public hearing (with telephone access) on January 30, 2023. This Final SPDP EIS contains revisions and new information based in part on comments received on the Draft SPDP EIS. Volume 3 contains reproductions of comments, summaries of the comments, and NNSA's responses to the comments. NNSA will use the analysis presented in this SPDP EIS, as well as other information, in preparing a Record of Decision regarding the disposition of 34 metric tons of surplus plutonium.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

ABBREVIATIONS AND ACRONYMS

ac	acre(s)
AROD	Amended Record of Decision
C&P	characterization and packaging
CCO	criticality control overpack
CH	contact-handled
CH-TRU	contact-handled transuranic
DHF	Drum Handling Facility
DOE	U.S. Department of Energy
EIS	environmental impact statement
FR	*Federal Register*
ft	foot (feet)
GHG	greenhouse gas
HEU	highly enriched uranium
kg	kilogram(s)
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LLW	low-level (radioactive) waste
m^3	cubic meter(s)
mi	mile(s)
MLLW	mixed low-level radioactive waste
MOX	mixed oxide
MT	metric ton(s)
NASEM	National Academy of Sciences, Engineering and Medicine
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NPMP	non-pit metal processing
OST	NNSA Office of Secure Transportation
Pantex	Pantex Plant
PDP	pit disassembly and processing
PEIS	programmatic environmental impact statement
PF-4	Plutonium Facility-4
ROD	Record of Decision
SPD EIS	*Surplus Plutonium Disposition Final Environmental Impact Statement* (1999)
SPD SEIS	*Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015)
SPDP	Surplus Plutonium Disposition Program
SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
TA	Technical Area

TRU	transuranic
TRUPACT-II	Transuranic Package Transporter Model-II
U.S.	United States
VTR	Versatile Test Reactor
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant
Y-12	Y-12 National Security Complex

CONVERSION TABLE

Metric to English			English to Metric		
Multiply	**by**	**to get**	**Multiply**	**by**	**to get**
Area					
Square meters	10.764	square feet	square feet	0.092903	square meters
Square kilometers	247.1	acres	acres	0.0040469	square kilometers
Square kilometers	0.3861	square miles	square miles	2.59	square kilometers
Hectares	2.471	acres	acres	0.40469	hectares
Concentration					
Kilograms/square meter	0.16667	tons/acre	tons/acre	0.5999	kilograms/square meter
Milligrams/liter	1[(a)]	parts/million	parts/million	1[(a)]	milligrams/liter
Micrograms/liter	1[(a)]	parts/billion	parts/billion	1[(a)]	micrograms/liter
Micrograms/cubic meter	1[(a)]	parts/trillion	parts/trillion	1[(a)]	micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	pounds/cubic feet	pounds/cubic feet	0.016018	grams/cubic centimeter
Grams/cubic meter	0.0000624	pounds/cubic feet	pounds/cubic feet	16,018.5	grams/cubic meter
Length					
Centimeters	0.3937	inches	inches	2.54	centimeters
Meters	3.2808	feet	feet	0.3048	meters
Kilometers	0.62137	miles	miles	1.6093	kilometers
Radiation					
Sieverts	100	rem	rem	0.01	sieverts
Temperature					
Degrees Celsius (C)	Multiply by 1.8 and then add 32	degrees Fahrenheit (F)	degrees Fahrenheit (F)	Subtract 32 and then multiply by 0.55556	degrees Celsius (C)
Velocity/Rate					
Cubic meters/second	2,118.9	cubic feet/minute	cubic feet/minute	0.00047195	cubic meters/second
Grams/second	7.9366	pounds/hour	pounds/hour	0.126	grams/second
Meters/second	2.237	miles/hour	miles/hour	0.44704	meters/second
Volume					
Liters	0.26417	gallons	gallons	3.7854	liters
Liters	0.035316	cubic feet	cubic feet	28.316	liters
Liters	0.001308	cubic yards	cubic yards	764.54	liters
Cubic meters	264.17	gallons	gallons	0.0037854	cubic meters
Cubic meters	35.315	cubic feet	cubic feet	0.028317	cubic meters
Cubic meters	1.3079	cubic yards	cubic yards	0.76456	cubic meters
Cubic meters	0.0008107	acre-feet	acre-feet	1,233.49	cubic meters

Metric to English			English to Metric		
Multiply	**by**	**to get**	**Multiply**	**by**	**to get**
Weight/Mass					
Grams	0.035274	ounces	ounces	28.35	grams
Kilograms	2.2046	pounds	pounds	0.45359	kilograms
Kilograms	0.0011023	tons (short)	tons (short)	907.18	kilograms
Metric tons	1.1023	tons (short)	tons (short)	0.90718	metric tons
English to English					
Acre-feet	325,850.7	gallons	gallons	0.000003046	acre-feet
Acres	43,560	square feet	square feet	0.000022957	acres
Square miles	640	acres	acres	0.0015625	square miles

(a) This conversion is only valid for concentrations of contaminants (or other materials) in water.
Note: Conversion factors have been rounded to an appropriate number of significant digits for each conversion given the order of magnitude of the conversion.

S.1 Introduction

The National Nuclear Security Administration (NNSA), a semi-autonomous agency organized in 2000 within the United States (U.S.) Department of Energy (DOE),[2] works to prevent nuclear weapon proliferation and reduce the threat of nuclear and radiological terrorism around the world. NNSA's Office of Defense Nuclear Nonproliferation works globally to prevent state and non-state actors from developing nuclear weapons or acquiring weapons-usable nuclear or radiological materials, equipment, technology, and expertise. Among other missions, NNSA is engaged in a program to disposition U.S. surplus weapons-grade plutonium (referred to in this Surplus Plutonium Disposition Program Environmental Impact Statement [SPDP EIS] as "surplus plutonium"). NNSA has prepared this document (DOE/EIS-0549) pursuant to the *National Environmental Policy Act* of 1969 (NEPA), as amended (42 United States Code 4321 et seq.), to evaluate the potential environmental impacts of the disposition of plutonium that is surplus to the defense needs of the United States.

> "Disposition" for radiological materials is defined as the process of disposal, which results in conversion to a form that is substantially and inherently more proliferation-resistant than the original form.

In 1994, after the end of the Cold War, the President of the United States declared 52.5 metric tons (MT) of plutonium to be surplus to the defense needs of the Nation (GAO 2019|p. 2, footnote 6). In 2007, the United States declared an additional 9 MT of plutonium to be surplus. In 2000, discussions that had begun in the 1990s culminated in the United States and the Russian Federation signing the *Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation* (Plutonium Management and Disposition Agreement) (United States of America and Russian Federation 2000). The two nations agreed to each dispose of no less than 34 MT of weapons-grade plutonium in forms unusable for nuclear weapons. Despite Russia's purported unilateral suspension of the Plutonium Management and Disposition Agreement, the United States remains committed to the safe and secure disposition of 34 MT of surplus weapons-grade plutonium, so it can never again be used for nuclear weapons (IPFM 2016; DOS 2020; DOS 2021)[3]. The 34 MT of surplus plutonium evaluated for disposition in this SPDP EIS is a subset of the 61.5 MT of surplus plutonium described above (52.5 MT plus 9 MT).

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[2] In this SPDP EIS, DOE's NNSA is referred to as NNSA for the sake of brevity.

[3] Only reports prior to 2022 are referenced in the text because the reports in 2022 and 2023 (DOS 2022; DOS 2023) did not contain information on the Plutonium Management and Disposition Agreement. The Department of State's 2023 publication indicated that the Plutonium Management and Disposition Agreement will no longer be covered in the *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Covenants Report* "unless a significant issue is newly identified".

Plutonium is a heavy radioactive metallic element with the atomic number 94. Trace amounts of plutonium exist in nature, but most of it is produced artificially by neutron bombardment of uranium. Plutonium has 23 isotopes with atomic mass numbers ranging from 228 to 246 and half-lives up to 80.8 million years (NCBI 2023). The radionuclides that are the main sources of occupational and environmental exposures from surplus plutonium disposition are plutonium-239, plutonium-240, plutonium-238, and americium-241, a decay product of plutonium-241 (LANL 2023|p. 2-6|). Americium-241 builds up in activity as plutonium-241 decays. Plutonium-240 is largely indistinguishable from plutonium-239, and they are included together for radiation dose calculations using the notation plutonium-239/240.

Most forms of plutonium, including plutonium-239/240, emit high-energy alpha particles and low-energy gamma and x-rays as they decay. Alpha particles have a short range (inches in air) and can easily be stopped by other materials. The energy from the gamma rays and x-rays is of low intensity, and as a result, the external dose is low (ATSDR 2023|Section 3.1|). However, when plutonium is inhaled, it can become lodged in the lung tissue and cause scarring of the lungs as it kills surrounding lung cells, leading to lung disease and cancer. Particles of plutonium can be carried to other parts of the body through the blood and can concentrate in the kidneys, bones, spleen, and liver, thus also exposing these organs to alpha radiation. Ingested plutonium is not as serious a threat since the stomach does not absorb it easily (EPA 2023; CDC 2015). Americium-241 has similar characteristics to the plutonium isotopes but is a larger source of external radiation than plutonium.

Plutonium isotopes are fissionable; the atom's nucleus can easily split apart when struck by a neutron. Plutonium isotopes also undergo spontaneous fission to various extents, and neutrons emitted during these processes are included in the external dose estimates included in this EIS. The configuration and geometry of surplus plutonium must be strictly controlled during operations and transport to prevent inadvertent criticality, where the neutron emissions produce a chain reaction with spontaneous emission of radiation and energy that can be hazardous to nearby workers.

The surplus plutonium that NNSA plans to disposition includes material sourced from both pit and non-pit plutonium. A pit is the central core of a nuclear weapon that principally contains plutonium or enriched uranium. The plutonium contained in the pit is termed "pit plutonium." Non-pit surplus plutonium may be in metal or oxide form or may be associated with other materials that were used in manufacturing and fabricating plutonium for use in nuclear weapons.

Weapons-grade plutonium is largely plutonium-239, and contains no more than 7 percent plutonium-240 (DOE Order 410.2, Change 1 2014). A different range is used in the Plutonium Management and Disposition Agreement *(United States of America and Russian Federation 2000)*: a ratio of plutonium-240 to plutonium-239 no greater than 0.10; approximately equal to 9 percent plutonium-240.

Surplus plutonium has no identified programmatic use and does not fall into any of the national security reserve categories.

Since the 52.5 MT of plutonium was declared surplus in 1994, DOE and NNSA have studied many methods and prepared several NEPA reviews to evaluate alternative means of assuring that surplus plutonium would never again be used for nuclear weapons. Table S-1 provides an overview of the previous NEPA reviews and decisions. A list with detailed descriptions of these NEPA reviews is provided in Appendix A.

Table S-1. Overview of *National Environmental Policy Act* Reviews and Decisions Related to Surplus Plutonium Disposition

Year	NEPA Reviews and Decisions	Summary
1996	DOE/EIS-0229 - Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement (DOE 1996)	Evaluation of dispositioning up to 50 MT of surplus plutonium
1997	62 FR 3014	ROD to pursue immobilization and MOX fuel approaches for disposition
1998	DOE-1207 - Pit Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities (DOE 1998)	Evaluation of the environmental consequences of the ARIES, a pit disassembly and conversion demonstration project at LANL. Plutonium oxide produced from the ARIES system was designated for disposition via MOX fuel.
1999	DOE/EIS-0283 - Surplus Plutonium Disposition Final Environmental Impact Statement (DOE 1999)	Evaluation of dispositioning up to 50 MT of surplus plutonium
2000	65 FR 1608	ROD to disposition up to 50 MT of surplus plutonium at Savannah River Site and construct a MOX Fuel Fabrication Facility, a Pit Disassembly and Conversion Facility, and an Immobilization Facility
2002	67 FR 19432	AROD to cancel the Immobilization Facility
2003	68 FR 20134	AROD to change the amount of surplus plutonium to be fabricated into MOX fuel from 33 MT to 34 MT
2015	DOE/EIS-0283-S2 - Surplus Plutonium Disposition Supplemental Environmental Impact Statement (DOE 2015a)	Evaluation of dispositioning surplus plutonium (13.1 MT) not previously assigned a disposition path; updated analyses for surplus plutonium (34 MT) previously decided to be fabricated into MOX fuel
2016	81 FR 19588	ROD to implement the dilute and dispose strategy to prepare 6 MT of non-pit surplus plutonium (part of the 13.1 MT) for disposal at the WIPP facility
2016-2019	DOE 2018c; DOE 2018d; NNSA 2018; NRC 2019	In response to an independent cost estimate for the MOX Fuel Fabrication Facility, the Secretary of Energy halted construction of the MOX fuel project in May 2018. On October 10, 2018, NNSA issued a Notice of Termination to CB&I AREVA MOX Services, LLC. The notice terminated the contract for construction of MFFF and began the process of ceasing construction operations and preserving MFFF and associated structures. On February 8, 2019, the U.S. Nuclear Regulatory Commission terminated the construction license for MFFF.
2020	DOE/EIS-0283-SA-4 - Supplement Analysis for Disposition of Additional Non-Pit Surplus Plutonium (DOE 2020)	Evaluation of the dilute and dispose strategy to prepare up to an additional 7.1 MT of non-pit surplus plutonium for disposal at the WIPP facility

Year	NEPA Reviews and Decisions	Summary
2020	85 FR 53350	AROD to implement the dilute and dispose strategy to prepare up to 7.1 MT of non-pit surplus plutonium for disposal at the WIPP facility
Present	DOE/EIS-0549 - Surplus Plutonium Disposition Program Environmental Impact Statement	Evaluation of the dilute and dispose strategy to prepare 34 MT surplus plutonium for disposal at the WIPP facility

AROD = Amended Record of Decision; FR = *Federal Register*; LLC = Limited Liability Company; MFFF = MOX Fuel Fabrication Facility; MOX = mixed oxide; NEPA = *National Environmental Policy Act*; NNSA = National Nuclear Security Administration; ROD = Record of Decision; WIPP = Waste Isolation Pilot Plant.

This SPDP EIS is tiered from the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE 1996), the *Surplus Plutonium Disposition Final Environmental Impact Statement* (SPD EIS [DOE 1999]), and the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015 SPD Supplemental EIS or 2015 SPD SEIS [DOE 2015a]).

In 2020, NNSA issued the *Supplement Analysis for Disposition of Additional Non-Pit Surplus Plutonium* (DOE 2020). In this document NNSA determined that proposing to disposition up to 7.1 MT of non-pit surplus plutonium was not a substantial change in the action analyzed in the 2015 SPD SEIS to disposition 7.1 MT of pit plutonium, and that the potential environmental impacts had been sufficiently analyzed. On August 28, 2020, NNSA amended its previous decision in the April 2003 Amended Record of Decision (AROD) for the SPD EIS (68 FR 20134) to include preparation of up to an additional 7.1 MT of non-pit surplus plutonium for disposal as contact-handled (CH) transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP) (85 FR 53350). NNSA based the AROD on the analysis in the 2015 SPD SEIS as described in the 2020 Supplemental Analysis. The 7.1 MT of non-pit surplus plutonium to be sent to the WIPP facility as CH-TRU waste is part of the 34 MT of surplus plutonium that NNSA had decided to disposition by fabricating it into mixed oxide (MOX) fuel for use in commercial reactors. The disposition of that 34 MT is the subject of this SPDP EIS. In the same 2020 AROD, NNSA also decided that non-pit metal processing (NPMP) may be performed at either Los Alamos National Laboratory (LANL) or Savannah River Site (SRS).

Figure S-1 summarizes the various plutonium disposition paths decided to date for plutonium that was declared surplus by the United States in 1994 and 2007. The figure displays 61.5 MT of plutonium, which was part of the excess plutonium declarations. In addition, the figure includes 0.9 MT non-pit metal and oxide with the Declarations' 5.1 MT non-pit metal and oxide, for a total of 6 MT. This 0.9 MT originated outside of the United States and thus was not considered with the Declarations. With 0.9 MT, the total accounted for in the figure is 62.4 MT.[4]

Figures similar to Figure S-1 were published in the 2015 SPD SEIS (DOE 2015a) and in the National Academies of Sciences, Engineering, and Medicine 2020 (NASEM) *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant* (NASEM 2020|Figure 2-1|), but Figure S-1 differs slightly from those prior versions. In some cases (i.e., MOX fuel fabrication), the disposition paths indicated in the 2015 SPD SEIS figure have since changed, and the new paths are

[4] The 2015 SPD SEIS (DOE 2015a) analyzed the 0.9 MT of non-pit metal and oxide that originated outside of the United States along with the 5.1 MT of non-pit metal and oxide that was part of the 1994 Declaration.

reflected here.[5] The Surplus Plutonium Disposition Program (SPDP), which is the subject of this SPDP EIS, involves 34 MT of surplus plutonium. If additional quantities are proposed for emplacement in WIPP, the NNSA will prepare the appropriate NEPA review.

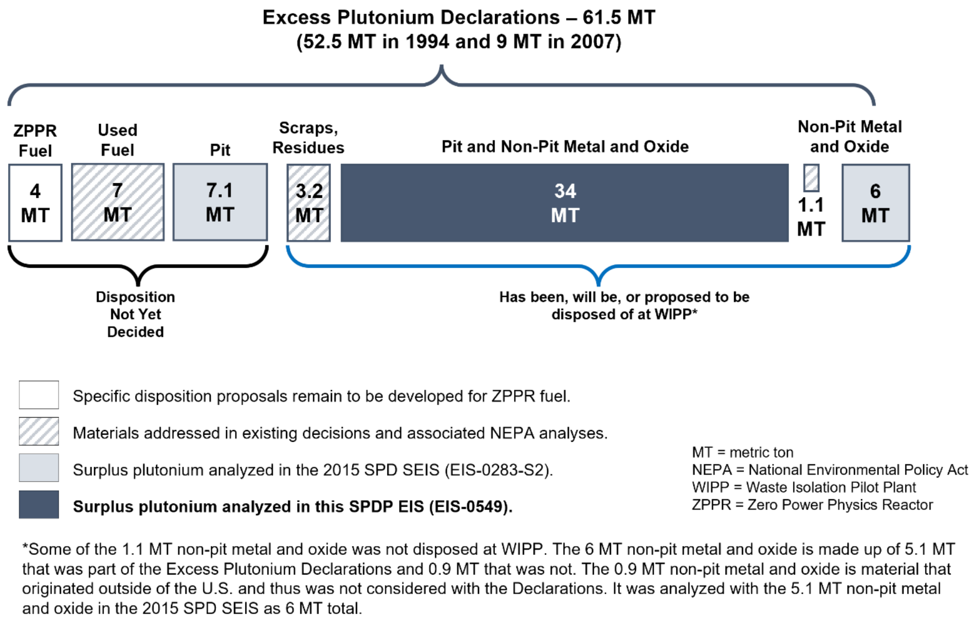

Figure S-1. Current Disposition Paths for Surplus Plutonium

S.2 Purpose and Need for Action

NNSA's purpose and need for action is to safely and securely disposition plutonium that is surplus to the Nation's defense needs so that it is not readily usable in nuclear weapons.

Since the end of the Cold War in the early 1990s and the Presidential declarations of surplus fissile materials, DOE has been charged with the disposition of surplus plutonium. Over the last 25 years, NNSA has studied many alternative technologies and locations for plutonium disposition.

NNSA needs to disposition 34 MT of surplus plutonium in a safe and secure manner and in a reasonable time frame at a cost consistent with programmatic priorities and fiscal realities. To achieve this, NNSA must use mature methods and proven technologies that are based on processes requiring minimal research and engineering development.

[5] The NASEM Report (NASEM 2020) determined that 48.2 MT of surplus plutonium is designated for WIPP. The NASEM Report determination included 7.1 MT of pits for which no disposition decision has been made and excluded 3.2 MT of surplus plutonium that was emplaced in WIPP prior to 2010. The total amount of surplus plutonium described in this SPDP EIS (Figure S-1) for WIPP emplacement differs from the NASEM Report, because the category shown in Figure S-1 as "has been, will be, or is proposed to be emplaced in WIPP" excludes the 7.1 MT of pits and includes the 3.2 MT surplus plutonium previously emplaced in WIPP, which results in a total of 44.3 MT surplus plutonium for WIPP emplacement.

S.3 Public Involvement

S.3.1 Public Scoping

Scoping is a process required for preparation of an EIS, which helps to determine the scope of issues for analysis in an environmental impact statement (EIS), including identifying significant issues and eliminating nonsignificant issues from detailed study (40 CFR Part 1501). Scoping provides an opportunity for the public, governmental entities including Native American Tribes, and other stakeholders to provide comments directly to the Federal agency about the alternatives and issues to be addressed in the EIS. The scoping phase and the public review of the Draft EIS are two opportunities for public input on the content of the EIS (Figure S-2).

Figure S-2. The EIS Process Showing Opportunities for Public Involvement During Scoping and Review of the Draft EIS

On December 16, 2020, NNSA published a Notice of Intent in the *Federal Register* (FR; 85 FR 81460) announcing a 45-day public scoping period ending February 1, 2021 and subsequently extended to February 18, 2021 for this SPDP EIS. The Notice of Intent also provided information regarding NNSA's overall NEPA strategy related to fulfilling the purpose and need to disposition 34 MT of surplus plutonium. Considering the public health concerns at the time, NNSA held virtual public scoping meetings on January 25 and 26, 2021, to discuss the SPDP EIS and to receive comments on the potential scope of the SPDP EIS. In addition to the scoping meetings, NNSA encouraged members of the public to provide comments via U.S. postal mail, email, or telephone. NNSA received 279 comment documents related to the project scope during the public scoping process.

NNSA considered all comments received during the public scoping process including some received after the close of the comment period, when preparing the SPDP EIS. The summary of the comments, including an indication of how NNSA addressed the comments, was published in the Draft SPDP EIS.

S.3.2 Public Comments on the Draft

In accordance with NEPA regulations, the Draft SPDP EIS was provided to the public for comment on December 16, 2022, with the publication of a Notice of Availability in the *Federal Register* (87 FR 77096). Publication of the U.S. Environmental Protection Agency's Notice of Availability (87 FR 77106) started a 60-day public comment period that initially ran until February 14, 2023, and was extended an additional 30 days until March 16, 2023, based on requests from the public. The Environmental Protection Agency announced the comment period extension in a February 10, 2023, notice in the *Federal Register* (88 FR 8843). NNSA held in-person public hearings at locations near SRS, the WIPP facility, and LANL on January 19, 24, and 26, 2023 and held a virtual public hearing on January 30, 2023, to present preliminary findings and to provide the public, governmental entities, including Native American Tribes, and other stakeholders with the opportunity to comment on the Draft SPDP EIS.

The Notice of Availability encouraged members of the public to provide comments on the Draft EIS. The options for submitting comments on the Draft EIS included email, U.S. postal mail, leaving a voicemail using a designated phone number, providing oral comments via speaking at a public hearing, or submitting written comments via a comment form at the in-person public hearings. Comments were accepted beyond the end of the comment period. NNSA considered all comments equally, regardless of the method by which they were provided.

A total of 121 pieces of correspondence were received from individuals, interested groups, and Federal, State, and local agencies during the public comment period on the Draft EIS. Accounting for campaign submittals, duplicate submittals, and non-comment submittals (e.g., questions regarding the schedule), the 121 comment documents included 86 unique submittals and four public meeting transcripts. Comment analysis identified 816 unique comments within the 90 pieces of correspondence. The primary topics identified in the public comments include:

- Need for a programmatic EIS and updated site-specific EISs for each of the sites involved.
- Concerns about the purpose and need, including concerns related to the disposal of surplus pits while making new ones.
- Concerns about the dilute and dispose strategy and questions or suggestions about pursuing other alternatives.
- Concerns or proposed changes related to the scope and content of the EIS.
- Concerns regarding over-commitment of the disposal capacity at WIPP, including concerns about perceived deviations from WIPP's original mission.
- Concerns related to the adequacy of tribal engagement.
- Requests for additional public involvement opportunities.
- Resource-area specific concerns and questions.
- Concerns about accidents at individual sites and along the transportation routes.
- Support for the proposed action, preferred alternative, and/or specific sites.
- Opposition to the proposed action, preferred alternative, and/or specific sites.

After considering the public comments received, the NNSA revised the Draft SPDP EIS. The primary changes to the Final SPDP EIS that resulted from public comments include:

- Clarification regarding whether proposed construction areas and footprints were selected to minimize environmental impacts.
- Clarification regarding compliance with the requirements of the least environmentally damaging practicable alternative.
- Clarification that no discharge of dredged or filled materials into the waters of the United States is planned.
- Clarification regarding assumptions used in technical calculations and analyses.
- Clarification related to pit and non-pit plutonium terminology and descriptions.
- Clarification that the throughput in each facility is found in Table B-2 of Appendix B.
- Background information related to plutonium and americium-241.
- Clarification of the various plutonium disposition paths decided to date for plutonium that was declared surplus by the United States

- Updated radiological health information to address potential impacts to surrounding communities.
- Information related to soil quality and plutonium monitoring.
- Information related to climate change impacts, adaptation, and resilience planning.
- Updated and expanded information related to traffic in the vicinity of LANL.

NNSA has also provided responses to comments in Volume 3 of this Final SPDP EIS. Volume 3 provides a more detailed description of the public comment process and copies of correspondence received on the Draft SPDP EIS.

In addition to changes made in the Final EIS as a result of the public comments, NNSA has also made changes to the Final EIS to update the environmental baseline information, update analyses based on more recent information, correct inaccuracies, make editorial corrections, and clarify text. A brief list of major changes includes:

- Incorporated recently available updated census data (multiple sections, including Sections 4.1.2.9 and 4.1.3.9)
- Incorporated updated information received from the sites (primarily LANL and SRS)
- Updated information based on the most recent Annual Site Environmental Reports
- Added information related to affordable housing at LANL
- Updated accident analysis calculations based on new assumptions and an updated version of the MELCOR Accident Consequence Code System software.

S.3.3 Tribal Interactions

NNSA invited 24 Native American groups with ties to the land on or in the vicinity of the SRS and LANL sites to participate in government-to-government consultations and offered briefings on this SPDP EIS. The initial briefing meeting was held on December 6, 2022. The Pueblo de San Ildefonso requested an additional briefing consultation meeting to discuss the program and potential impacts of SPDP. The meeting with the San Ildefonso Pueblo leadership and attorneys was held on January 31, 2023. Tribal interactions are described further in Sections 5.4.1 and 5.4.2.

S.4 Proposed Action

NNSA proposes to implement the dilute and dispose strategy for 34 MT of surplus plutonium to safely and securely disposition the surplus plutonium such that it could never again be readily used in a nuclear weapon. The dilute and dispose strategy includes processing surplus plutonium to plutonium oxide, diluting it with an adulterant to inhibit plutonium recovery, and disposing the resulting CH-TRU waste at the WIPP facility. Studies conducted over the last several years have identified the dilute and dispose strategy as being a technically mature and cost-effective alternative for surplus plutonium disposition (DOE 2014; Hart et al. 2015; Mason 2015). DOE's Plutonium Disposition Working Group in its report, *Analysis of Surplus Weapon Grade Plutonium Disposition Options* (DOE 2014), indicated that although the dilute and dispose strategy does not change the isotopic composition of the plutonium, it does meet two of the attributes for minimizing accessibility and reuse through physical and chemical barriers. The physical barrier is its placement 2,150 ft below the Earth's surface in an underground salt rock formation at the WIPP facility and the chemical barrier is the adulterant.

> The dilution process combines the plutonium oxide with an adulterant that contains nonhazardous inorganic materials to form a chemically stable matrix suitable for plutonium disposition.

NNSA evaluated this alternative in the 2015 SPD SEIS (DOE 2015a) and decided to use the process to prepare 6 MT of non-pit surplus plutonium for disposal as CH-TRU waste at the WIPP facility (81 FR 19588). NNSA also decided to use the process to prepare up to an additional 7.1 MT of non-pit surplus plutonium (85 FR 53350) for disposal as CH-TRU waste at the WIPP facility based on the analysis in the 2015 SPD SEIS as described in the 2020 Supplement Analysis (DOE 2020).

To provide a comprehensive analysis in this SPDP EIS, NNSA includes the impacts of dispositioning up to 7.1 MT of non-pit surplus plutonium using the dilute and dispose strategy, for which NNSA has already made a decision, as announced in the 2020 AROD (85 FR 53350). The 7.1 MT of non-pit surplus plutonium is also considered here as part of the 34 MT of surplus plutonium and is analyzed for the Preferred Alternative. However, because the impacts of dispositioning up to 7.1 MT of non-pit surplus plutonium have already been analyzed and a disposition pathway was assigned in the 2020 AROD, the 7.1 MT of non-pit surplus plutonium is also analyzed in this SPDP EIS as part of the No Action Alternative.

S.5 Alternatives for Disposition of Surplus Plutonium

S.5.1 Alternatives Considered for Detailed Analysis in this SPDP EIS

As discussed in Section S.1, NNSA prepared a programmatic environmental impact statement (PEIS) in 1996 (DOE 1996) that was followed by several NEPA reviews that tiered from the PEIS to evaluate alternative means of assuring that surplus plutonium can never again be readily used in a nuclear weapon. The most recent document tiered from the PEIS was published in 2020 (DOE 2020).

The analyses in the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* PEIS (DOE 1996), SPD EIS (DOE 1999), and the 2015 SPD SEIS (DOE 2015a) evaluated multiple alternatives for the dispositioning of surplus plutonium. Some alternatives, including MOX fuel and immobilization, are not reevaluated in this EIS because of the absence of significant new circumstances or information that would change the results of the previous evaluations (see Section S.5.2). The analysis related to the consideration of alternatives that is presented in the PEIS and subsequent tiered documents is incorporated by reference in this SPDP EIS, which concentrates on issues specific to the dilute and dispose strategy.

Two alternatives are analyzed in detail in this SPDP EIS—the Preferred Alternative, consisting of four sub-alternatives, and the No Action Alternative. Both alternatives use the dilute and dispose strategy and both address up to 7.1 MT of non-pit surplus plutonium that NNSA previously decided to dispose of (85 FR 53350) using the dilute and dispose strategy. NNSA's Preferred Alternative is to use the dilute and dispose strategy for 34 MT of surplus plutonium comprised of both pit and non-pit plutonium, as shown in Figure S-3. The No Action Alternative is continued management of the 34 MT of both pit and non-pit plutonium, including the disposition of up to 7.1 MT of non-pit plutonium using the dilute and dispose strategy based on a previous NNSA decision (85 FR 53350). The Preferred Alternative is the only alternative evaluated that meets the purpose and need.

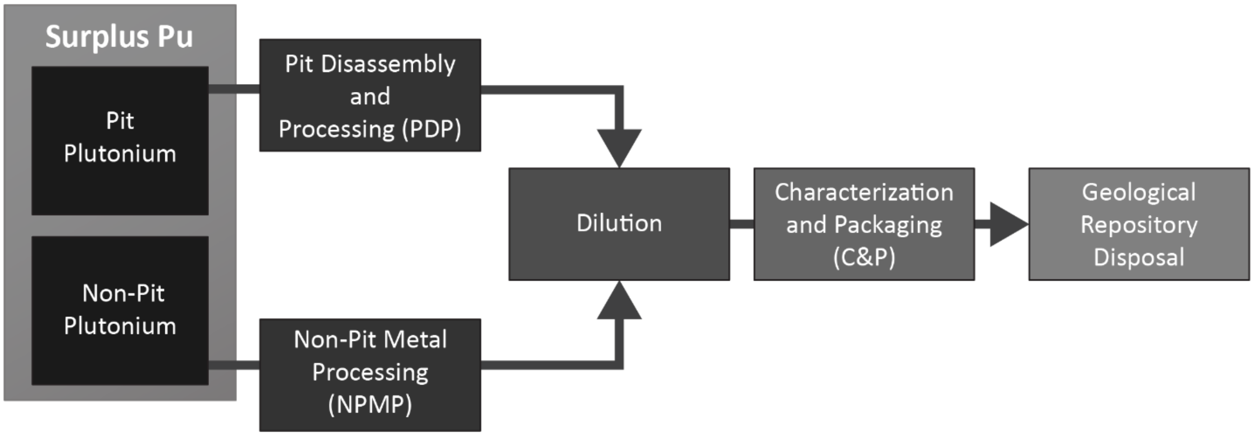

Figure S-3. High-Level Overview of Dilute and Dispose Strategy Process

The strategy of diluting plutonium oxide with an adulterant and disposing the resultant CH-TRU waste at the WIPP facility was previously demonstrated using non-pit plutonium during the closure of the Rocky Flats Environmental Technology Site (Mason 2015|p. 26|; 68 FR 20134; DOE 2002). The dilute and dispose strategy was also evaluated as a viable approach for dispositioning 13.1 MT of surplus plutonium in the SPD Supplemental EIS (2015 SPD SEIS; DOE 2015a). The strategy was selected and is currently being used to disposition 6 MT of non-pit surplus plutonium (81 FR 19588) and up to 7.1 MT of non-pit surplus plutonium (85 FR 53350).

The steps in the dilute and dispose strategy include:

Pit packaging and shipping – Surplus plutonium pits are packaged at the Pantex Plant (Pantex) and shipped for processing to either LANL in New Mexico, or SRS in South Carolina. This only occurs for the Preferred Alternative.

Pit Disassembly and Processing (PDP) – Surplus plutonium pits are disassembled to segregate the plutonium from other materials. The plutonium metal is oxidized in furnaces located in gloveboxes to form plutonium oxide powder. Some pit plutonium has already been processed into oxide (DOE 2008|p. 2-62|; LANL 2023|Section 2.12.1.2|). PDP only occurs under the Preferred Alternative.

Decontamination, oxidation, and shipment of HEU – Highly enriched uranium (HEU) from pit disassembly is decontaminated, oxidized, packaged, and shipped to the Y-12 National Security Complex (Y-12) in Tennessee (LANL 2023|Sections 1.1.2.1, 2.15.1.2.2|). This only occurs under the Preferred Alternative.

NPMP – Non-pit surplus plutonium in a metal form is processed by oxidation in furnaces located in gloveboxes to form plutonium oxide. Processing the non-pit surplus plutonium can take place in the same gloveboxes or in different gloveboxes from the processing of the pit plutonium. Some of the non-pit surplus plutonium is already in an oxide form and does not need to be processed prior to dilution.

Preparation and packaging of plutonium oxide – The plutonium oxide from PDP and/or NPMP is either moved to a second set of gloveboxes at the same site for dilution or it may be packaged and shipped to another site for dilution.

Dilution of plutonium oxide – The plutonium oxide from PDP and/or NPMP is diluted in a set of gloveboxes by blending the plutonium oxide with an adulterant to reduce the plutonium concentration and inhibit plutonium recovery. The dilution process combines the plutonium oxide with an adulterant that contains nonhazardous inorganic materials to form a chemically stable matrix suitable for plutonium disposition. The multi-component adulterant is designed to impede recovery of the surplus plutonium such that the waste form complies with DOE requirements for termination of safeguards (NNSA 2022).

Characterization, packaging, and shipment of diluted plutonium oxide CH-TRU waste[6] – After dilution, the composition of the adulterated plutonium oxide mixture (CH-TRU waste) is analyzed or "characterized" using radiography and nondestructive assay analysis. The purpose of the characterization process is to verify that the resulting diluted plutonium oxide, which is packaged as CH-TRU waste, complies with the WIPP facility Waste Acceptance Criteria (WAC) for disposal. DOE will verify that the TRU waste stream is of defense origin and that the TRU waste meets the WIPP WAC by performing nondestructive assay and evaluating acceptable knowledge (information related to how the TRU waste stream was created and managed). An initial waste certification audit of the SPDP diluted plutonium oxide CH-TRU waste packaging program will be scheduled and conducted by the DOE's Carlsbad Field Office and technical assistant contractor at the appropriate time, with approval of the final audit report by the New Mexico Environment Department. The U.S. Environmental Protection Agency will also perform an inspection and provide approval of characterization equipment and controls. If the SPDP diluted plutonium oxide CH-TRU waste packaging program passes the audit, then the waste can be certified to indicate that it meets the WIPP WAC before it is shipped to the WIPP facility.

Preparation and packaging of job control waste – Job control wastes of various kinds are packaged for shipment and disposal. This includes gloves or other materials used in the above processes that become contaminated with TRU material. The CH-TRU job control waste must also meet the WIPP WAC.

Disposal of job control and diluted plutonium oxide CH-TRU waste at the WIPP facility – The CH-TRU waste that is disposed at the WIPP facility is tracked by an audited Nuclear Quality Assurance compliant waste data system and procedures.

The Preferred Alternative requires all of the above steps. The No Action Alternative does not require pit packaging and shipping, PDP, or decontamination, oxidation, and shipment of HEU because only non-pit surplus plutonium is processed in the No Action Alternative.

S.5.1.1 Preferred Alternative

The Preferred Alternative is to disposition 34 MT of surplus plutonium using the dilute and dispose strategy described in Section S.4. This 34 MT consists of both surplus pit and non-pit forms of plutonium. As discussed in Section S.4, some of the non-pit and pit plutonium is already in oxide form and a portion of the 34 MT has an existing Record of Decision (ROD) for disposal. NNSA has already decided to disposition up to 7.1 MT of non-pit surplus plutonium using the dilute and dispose strategy (85 FR 53350). The exact amounts of pit and non-pit forms of plutonium that compose the 34 MT are safeguarded, so they cannot be delineated further. Therefore, to bound the impacts, the analysis in this

[6] The WIPP facility is authorized to accept TRU waste that was generated from atomic energy defense activities. All CH-TRU wastes described in this SPDP EIS are defense-related wastes. Throughout this SPDP EIS, the defense-related TRU wastes described as shipped from LANL or SRS to WIPP are referred to as CH-TRU waste.

SPDP EIS evaluates the impacts of dispositioning 34 MT of surplus plutonium in pit form and the impacts of dispositioning 7.1 MT of non-pit surplus plutonium. These amounts were selected so that the analysis of impacts would cover the full environmental effects of dispositioning the 34 MT regardless of the final proportion of surplus pit plutonium or non-pit plutonium. By evaluating the impacts of dispositioning 34 MT of surplus pit plutonium and 7.1 MT of non-pit plutonium, NNSA will provide a conservative assessment of the impacts of completing the 34 MT mission.

> To bound the impacts, the analysis in this SPDP EIS evaluates the impacts of dispositioning 34 MT of pit plutonium and 7.1 MT of non-pit plutonium. However, there is only 34 MT of surplus plutonium to be dispositioned.

The activities that are part of the Preferred Alternative would occur at five DOE sites—Pantex in Texas, LANL in New Mexico, SRS in South Carolina, Y-12 in Tennessee, and the WIPP facility in New Mexico (see Figure S-4).

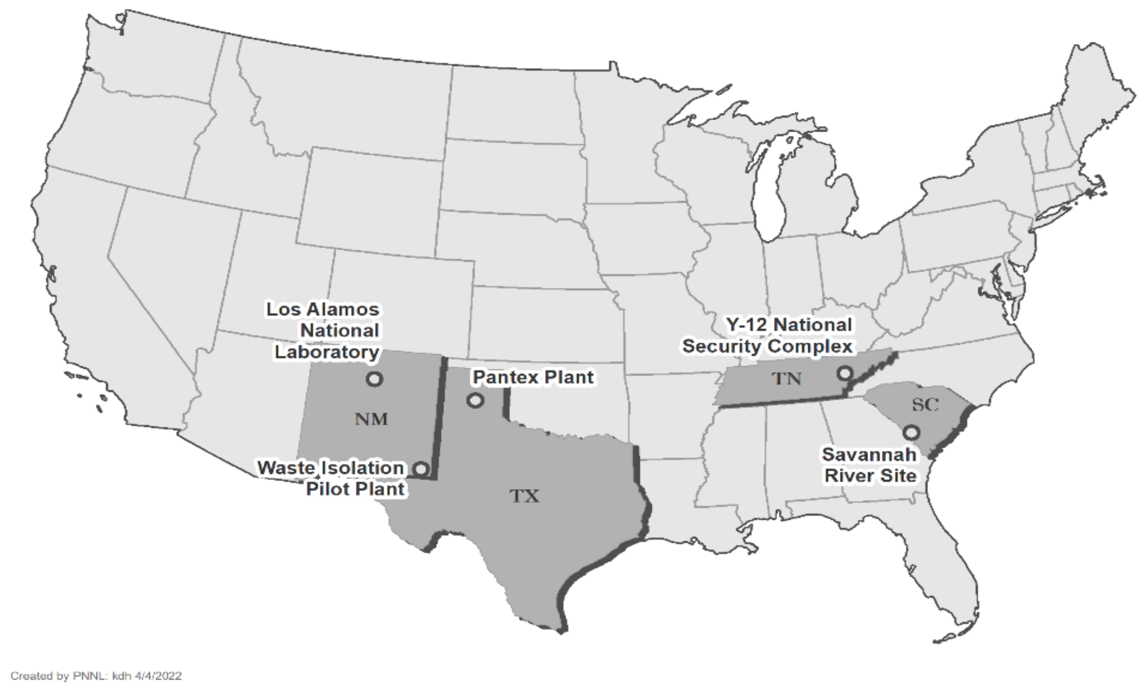

Figure S-4. Locations of Major Facilities Included in this SPDP EIS

S.5.1.1.1 Overview of Preferred Alternative by Sub-Alternative

NNSA has developed four sub-alternatives for the Preferred Alternative based on the location of the activities, as described below and shown in Figure S-5 through Figure S-8. In the figures, the arrows between storage and processing or between the processing steps indicate movement of material or waste between sites (e.g., Pantex to LANL) or between different capabilities or facilities for each of the sub-alternatives. Table S-2 illustrates the activities that occur at each site under each of the four sub-alternatives that are considered in this SPDP EIS. For all sub-alternatives, pits are stored at Pantex prior to their disassembly and processing. The sub-alternatives were defined so that the analyses presented in this EIS bound the impacts that would occur from processing a portion of the 34 MT at either LANL or SRS and the remainder of the 34 MT at the other site.

Table S-2. Location Summary of Activities in Each Sub-Alternative of the Preferred Alternative

	Base Approach	SRS NPMP	All LANL	All SRS
Pit Packaging and Shipping	Pantex	Pantex	Pantex	Pantex
PDP	LANL	LANL	LANL	SRS
Decontamination, oxidation, and shipment of HEU to Y-12	LANL	LANL	LANL	SRS
NPMP	LANL	SRS	LANL	SRS
Preparation, packaging, and inter-site shipment of plutonium oxide	LANL	LANL	NA	NA
Dilution of plutonium oxide	SRS	SRS	LANL	SRS
C&P of diluted plutonium oxide CH-TRU waste for shipment to the WIPP facility	SRS	SRS	LANL	SRS
Packaging and shipment of CH-TRU job control waste to the WIPP facility	LANL and SRS	LANL and SRS	LANL	SRS
Disposal of diluted plutonium oxide CH-TRU waste and CH-TRU job control waste	WIPP	WIPP	WIPP	WIPP

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; Pantex = Pantex Plant; PDP = pit disassembly and processing; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

BASE APPROACH SUB-ALTERNATIVE

Under the Base Approach Sub-Alternative (Figure S-5), NNSA evaluates the impacts of shipping 34 MT of pit plutonium from Pantex to LANL and disassembling and processing the 34 MT of pit plutonium at LANL with subsequent shipment of the decontaminated and oxidized HEU to Y-12. In the Base Approach Sub-Alternative, NNSA also evaluates the impacts of processing up to 7.1 MT of non-pit surplus plutonium in the same capability used for PDP at LANL. This sub-alternative relies on expanding existing capabilities at LANL in the Plutonium Facility (PF-4) for PDP and NPMP. The resulting plutonium oxide from the surplus pit and non-pit plutonium would be shipped to K-Area at SRS, where it would be diluted and characterized and packaged as CH-TRU waste for shipment to and disposal at the WIPP facility.

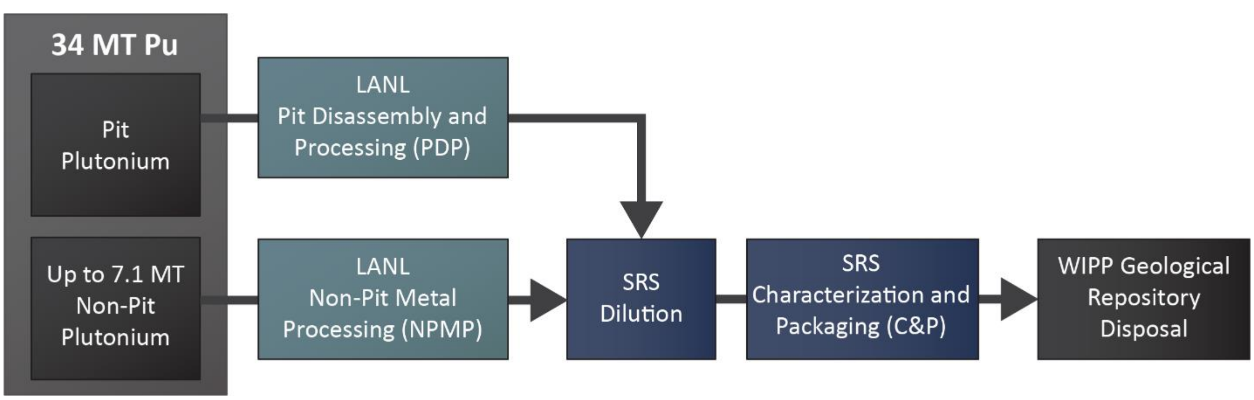

Figure S-5. Preferred Alternative – Base Approach Sub-Alternative

SRS NPMP SUB-ALTERNATIVE

The SRS NPMP Sub-Alternative is shown in Figure S-6. This sub-alternative is similar to the Base Approach Sub-Alternative. NNSA analyzes the impacts of shipping 34 MT of pit plutonium from Pantex to LANL and disassembly and processing of the 34 MT of pit plutonium in an expanded existing facility (PF-4) at LANL. In the SRS NPMP Sub-Alternative, NNSA also analyzes the subsequent shipment of the decontaminated and oxidized HEU to Y-12. PDP is followed by shipment of the resulting plutonium oxide to SRS (K-Area). Unlike the Base Approach Sub-Alternative, the SRS NPMP Sub-Alternative does not analyze NPMP at LANL. Instead, it evaluates the impacts of processing up to 7.1 MT of non-pit surplus plutonium at SRS's K-Area either in Building 105-K or in a modular system adjacent to the building. Similar to the Base Approach Sub-Alternative, the SRS NPMP Sub-Alternative considers the impacts of dilution and characterization and packaging (C&P) of the diluted plutonium oxide CH-TRU waste in SRS's K-Area for shipment to and disposal at the WIPP facility.

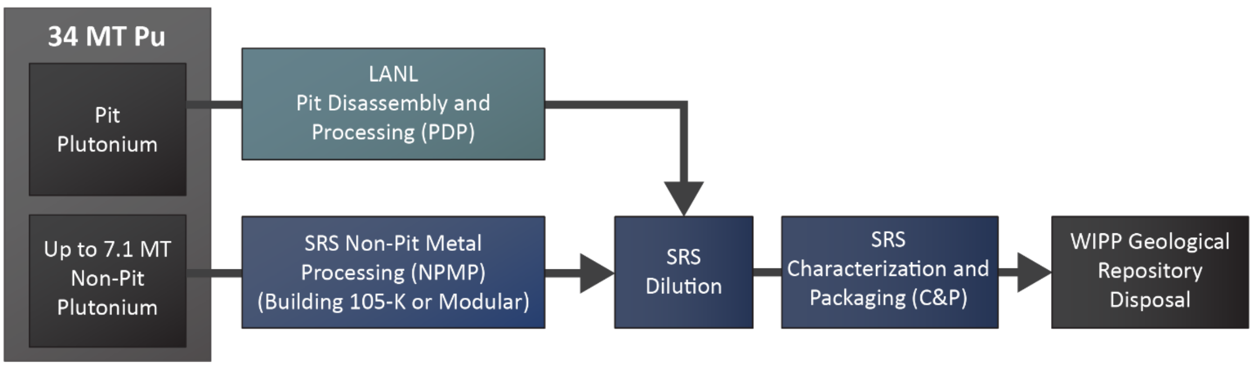

Figure S-6. Preferred Alternative – SRS NPMP Sub-Alternative

ALL LANL SUB-ALTERNATIVE

The All LANL Sub-Alternative is shown in Figure S-7. This sub-alternative considers only capabilities at LANL for the entire disposition pathway. Similar to the Base Approach Sub-Alternative, under the All LANL Sub-Alternative, NNSA analyzes the impacts of shipping 34 MT of pit plutonium from Pantex to LANL and disassembly and processing of the 34 MT of pit plutonium in an expanded existing facility (PF-4) at LANL with subsequent shipment of the decontaminated and oxidized HEU to Y-12. In the All LANL Sub-Alternative, NNSA also evaluates the impacts of processing up to 7.1 MT of non-pit surplus plutonium at LANL in PF-4. Unlike the Base Approach Sub-Alternative, the resulting plutonium oxide would remain at LANL for dilution and C&P before shipment to and disposal at the WIPP facility as CH-TRU waste.

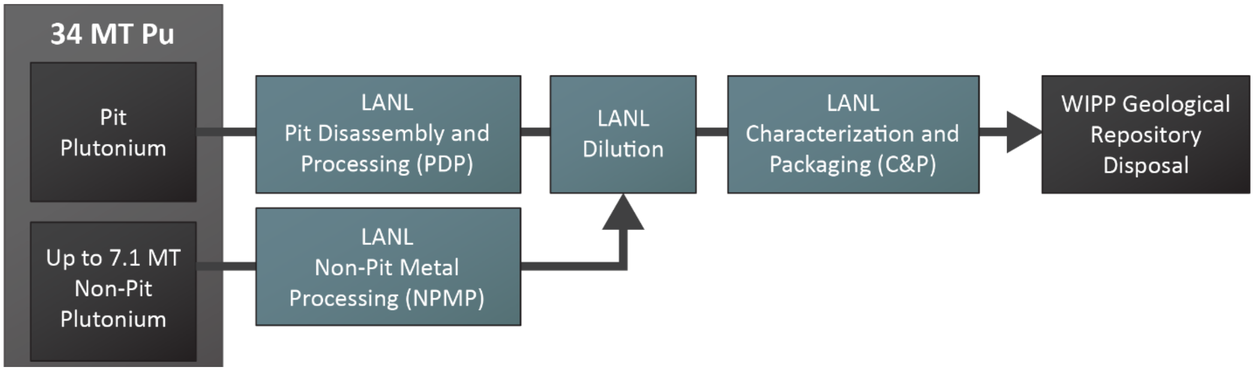

Figure S-7. Preferred Alternative – All LANL Sub-Alternative

ALL SRS SUB-ALTERNATIVE

The All SRS Sub-Alternative is shown in Figure S-8. NNSA would only use capabilities at SRS. Under this sub-alternative, NNSA analyzes the impacts of shipping 34 MT of pit plutonium from Pantex to SRS and the disassembly and processing of the 34 MT of pit plutonium in a new capability installed at SRS in either K-Area or F-Area. In the All SRS Sub-Alternative, NNSA also analyzes the subsequent shipment of the decontaminated and oxidized HEU to Y-12 as well as the impacts of processing up to 7.1 MT of non-pit surplus plutonium at SRS using the same new capability used for PDP. The resulting plutonium oxide would remain at SRS for dilution and C&P before shipment to and disposal at the WIPP facility as CH-TRU waste.

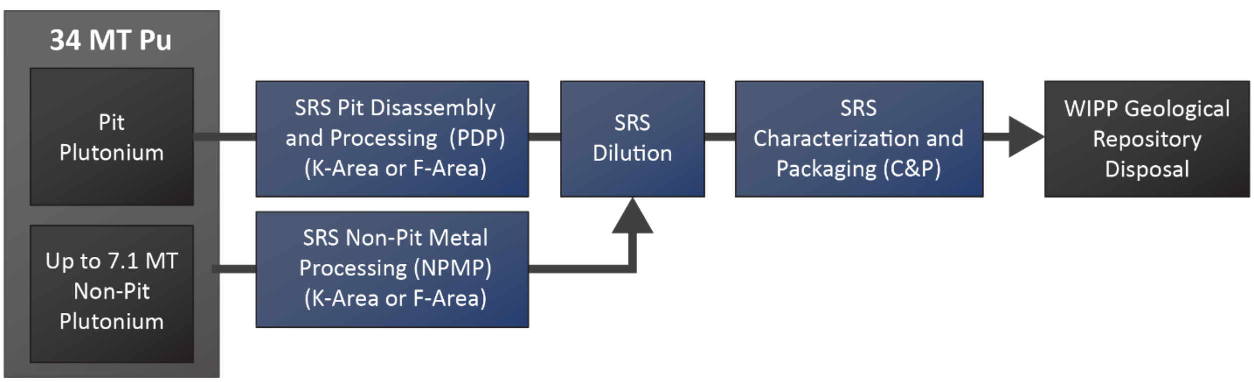

Figure S-8. Preferred Alternative – All SRS Sub-Alternative

S.5.1.1.2 Overview of the Preferred Alternative by Site

The operational activities in each step of the Preferred Alternative are described in the following sections, organized by site. These sections also describe the construction and/or modification activities that would be necessary to build the operational capabilities. Some of the capabilities at LANL and SRS are in an early planning stage. As such, the analyses in this EIS are based on the best available information. Additional details about the facilities and the throughputs that are assumed for the analyses are provided in Appendix B. A discussion of the transportation that occurs between each site follows at the end of this section.

PANTEX

NNSA decided to consolidate the storage of surplus pit plutonium at Pantex (e.g., 62 FR 3014; 62 FR 3880; 67 FR 19432). Transportation of surplus plutonium to consolidated storage at Pantex is discussed in *The Final Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2018b), incorporated herein by reference. Under the Preferred Alternative, pits stored at Pantex would be packaged in Type B packages[7] for shipment (CNS 2019), via the NNSA's Office of Secure Transportation (OST) transporter, to either LANL or SRS for disassembly and processing. Integration of additional packaging line(s), if needed, would occur in existing facilities at Pantex to support planned pit packaging and shipping rates. Packaging of pits for shipment to LANL or SRS is a continuation of ongoing activities that were previously reviewed (DOE 2018b) and is not reanalyzed in this SPDP EIS.

LOS ALAMOS NATIONAL LABORATORY

The activities that could occur at LANL for the Preferred Alternative are summarized in Table S-3 for the Base Approach and SRS NPMP Sub-Alternatives. No activities occur at LANL in the All SRS Sub-Alternative aside from the transportation activities described at the end of this section.

Table S-3. Activities that Could Occur at LANL in Each Sub-Alternative of the Preferred Alternative

Activities	Base Approach	SRS NPMP	All LANL	All SRS
PDP	**Yes**	**Yes**	**Yes**	No
Decontamination, oxidation, and shipment of HEU to Y-12	**Yes**	**Yes**	**Yes**	No
NPMP	**Yes**	No	**Yes**	No
Preparation and packaging and shipment of plutonium oxide to SRS	**Yes**	**Yes**	No	No
Dilution of plutonium oxide	No	No	**Yes**	No
C&P of diluted plutonium oxide CH-TRU waste for shipment to the WIPP facility	No	No	**Yes**	No
Packaging and shipment of CH-TRU job control waste to the WIPP facility	**Yes**	**Yes**	**Yes**	No

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

Construction at Los Alamos National Laboratory

The Preferred Alternative would include construction and modification activities to expand the existing PDP capability (DOE's Advanced Recovery and Integrated Extraction System Oxide Production Program) in the PF-4 building located in LANL's Technical Area 55 (TA-55). The construction and modification activities would include the addition of new or modified gloveboxes, material entry hoods, and other upgrades to increase throughput. These activities would occur largely inside the PF-4 building and would expand the current space used for PDP from 5,200 ft^2 to 6,800 ft^2 (LANL 2023|Sections 1.1.2.1, 1.1.2.2|).

[7] Type B packages are designed in accordance with Federal Regulations (49 CFR Parts 100-177) for transporting materials and wastes that could be a radiation hazard to the environment or the public if the contents were released.

NNSA would construct new facilities to support the increased activities in PF-4 for the Base Approach Sub-Alternative, the SRS NPMP Sub-Alternative, and the All LANL Sub-Alternative (Figure S-9 and Figure S-10). These facilities include a Logistical Support Center, a separate office building, a warehouse, a security portal, and a weather enclosure at the loading dock of PF-4 (LANL 2023|Section 1.1.2|). The office building and warehouse would be built on undisturbed land in TA-52. The other structures would be built in industrial areas in TA-55. The All LANL Sub-Alternative would require modifications to PF-4 to increase throughput for PDP and install the dilution capability. The expansion would increase the floor space from the existing 5,200 ft^2 to 8,400 ft^2 (LANL 2023|Section 1.1.2.1|). NNSA would construct a new Drum Handling Facility (DHF) to support the C&P of diluted plutonium oxide CH-TRU waste for shipment to and disposal at the WIPP facility (LANL 2023|Section 1.1.2.2|). The building functions, size, locations, and acreage of land disturbed in TA-55 and TA-52 are presented in Table S-4. Utilities for the new facilities would also be installed.

Table S-4. New Facilities to Be Constructed and Land Disturbed Under the Preferred Alternative[(a)] at LANL

Structure/Laydown Areas	Function	Location	Facility Footprint or Area Size[(b)] ft^2 (ac)
Drum Handling Facility	Characterization, packaging, shipment to the WIPP facility	TA-55	20,000 (0.46)
Warehouse	Storage	TA-52	18,000 (0.41)
Parking area	Parking by warehouse	TA-52	12,600 (0.29)
Security portal	Vehicle/pedestrian security checkpoint	TA-55	4,620 (0.11)
Parking area	Parking by security portal	TA-55	3,000 (0.069)
Road extensions	Access to security portal, parking area, and Drum Handling Facility	TA-55	13,000 (0.30)
Road extension s	Access to office building and Warehouse	TA-52	4,800 (0.11)
Weather enclosure	Weather covering for the loading dock of PF-4 in TA-55	TA-55 adjacent to PF-4	4,100 (0.094)
Laydown areas in TA-55	Laydown areas would contain portable office trailers, construction equipment, supplies, and infrastructure	Various locations in TA-55	123,000 (2.8)
Laydown areas in TA-52	Laydown areas	Various locations in TA-52	10,200 (0.23)
Logistical Support Center	Offices, meeting rooms, and locker rooms	TA-55 separate from, but adjacent to, PF-4	10,800 (0.25)/floor (2 floors)[(c)]
Office Building	Offices	TA-52	12,000 (0.28)/floor (2 floors)[(c)]
Parking area	Parking by office building	TA-52	12,600 (0.29)

LANL = Los Alamos National Laboratory; PF-4 = Plutonium Facility; SRS = Savannah River Site; TA = Technical Area; WIPP = Waste Isolation Pilot Plant.

(a) No construction or land disturbance would occur at LANL under the All SRS Sub-Alternative.

(b) Conversions from square feet to acres may not equate because of rounding.

(c) Structures with multiple floors only have the area listed for one floor, because land disturbance is based on the footprint rather than total cumulative area.

Source: LANL 2023|Figures 1-11, 1-12, Sections 1.1.2, 2.8.1, 2.8.2|.

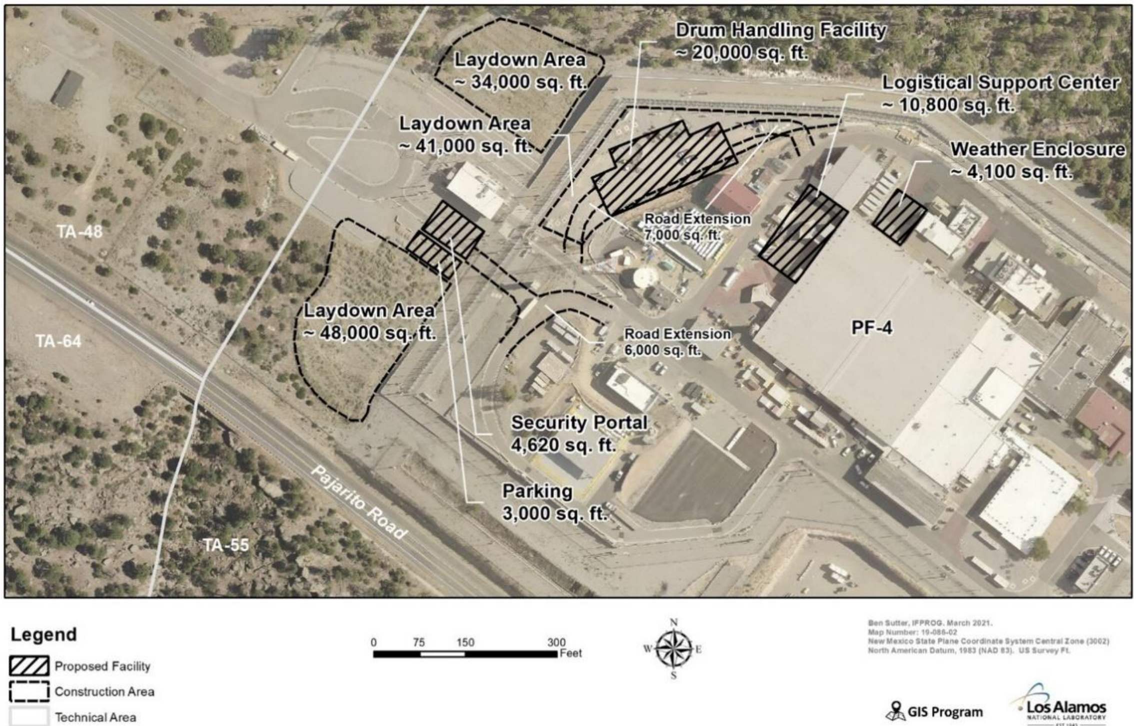

Figure S-9. Potential Facility and Laydown Area Locations at TA-55 (LANL 2023|Figure 1-11|)[8]

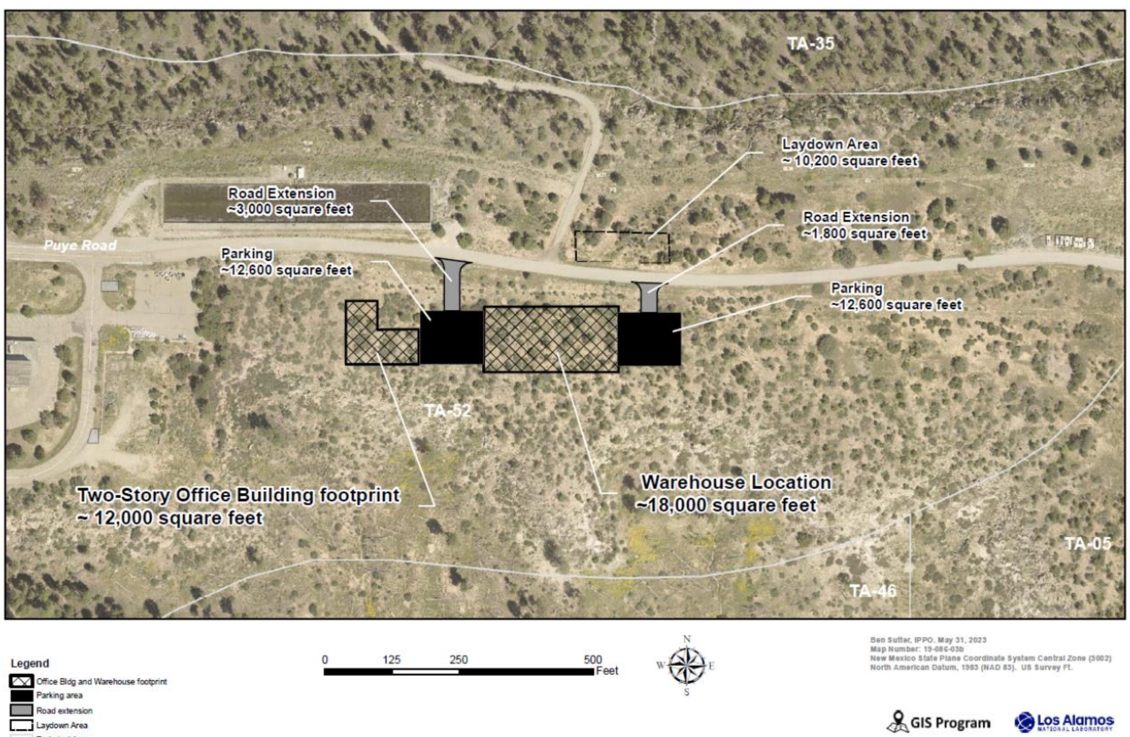

Figure S-10. Potential Facility and Laydown Area Location at TA-52 for the Office Building and Warehouse (LANL 2023|Figure 1-12|)

[8] The Drum Handling Facility would be constructed only for the All LANL Sub-Alternative.

Operations at Los Alamos National Laboratory

The operations activities for all three sub-alternatives occurring at LANL under the Preferred Alternative would include PDP in PF-4. Pit disassembly would be conducted in a series of gloveboxes (Figure S-11) using a pit cutter or a lathe.

Figure S-11. Gloveboxes

Processing activities would also occur in gloveboxes and use furnaces to heat up the plutonium until it turns into an oxide. Similar PDP activities already occur in PF-4 for smaller amounts of plutonium (DOE 2008|p. 2-62|; LANL 2023|Section 2.12.1.2|). HEU recovered during pit disassembly would be decontaminated, oxidized, and prepared for shipment to DOE's Y-12 at Oak Ridge, Tennessee (LANL 2023|Sections 1.1.2.1, 2.15.1.2.2|). For the Base Approach Sub-Alternative and the All LANL Sub-Alternative, NPMP would occur in gloveboxes installed as part of the PDP capability in PF-4.

For the Base Approach and NPMP Sub-Alternatives, after processing, the resulting plutonium oxide would be packaged in PF-4 into Type B packages and loaded into an appropriate OST Transporter (LANL 2023|Sections 2.15.1.2.3|) for shipment to SRS. Some of the job control waste, specifically waste such as gloves from gloveboxes and other waste from inside gloveboxes, would be classified as CH-TRU waste and packaged for shipment in the Transuranic Waste Facility at LANL and shipped to the WIPP facility for disposal.

In the All LANL Sub-Alternative, plutonium oxide would be diluted in PF-4 (LANL 2023|Section 1.1.2.2|). The oxide could be a product of processing activities at LANL or could be from material that already exists in oxide form. The oxide would be blended with an adulterant in blend cans (Figure S-12) within dedicated gloveboxes to reduce the plutonium concentration and inhibit plutonium recovery.

Figure S-12. Blending of Plutonium Oxide and Adulterant in a Blend Can

Mixers would be used to assure uniform mixing and dilution within the blend cans. After blending with the multicomponent adulterant, the resulting mixture would be placed in a shielded container and the lid would be press fit. Compressing the blended adulterant and plutonium oxide mixture into the shielding container helps to minimize the container size and the mass of shielding required (NNSA 2022). After dilution, the plutonium oxide is considered to be CH-TRU waste. The container of diluted plutonium oxide CH-TRU waste would be removed from the glovebox and packaged in a can/bag/can configuration inside a convenience can (Figure S-13).

Figure S-13. Diluted Plutonium Oxide CH-TRU Waste Packaged in a Can/Bag/Can

Neutron counters and gamma spectrometers would be used to assay the diluted plutonium oxide CH-TRU waste in the convenience can. After the assay is completed, up to two convenience cans could be placed in a criticality control container. The criticality control container would be loaded into a criticality control overpack (CCO) container (LANL 2023|Section 2.15.2.2|) (Figure S-14). In addition, integrated assay systems would be used (LANL 2023|Section 1.1.2.2|) as approved by the DOE Carlsbad Field Office/WIPP for assay of CH-TRU job control waste.

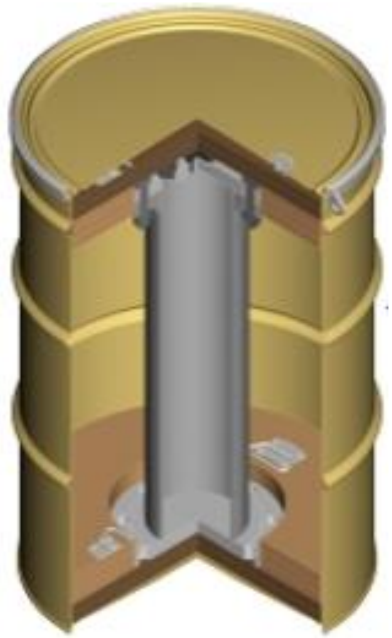

Figure S-14. CCO

In the All LANL Sub-Alternative, plutonium in diluted oxide form would be characterized and packaged in a newly constructed DHF at LANL for shipment to and disposal at the WIPP facility (LANL 2023|Section 1.1.2.2|). C&P of small amounts of diluted plutonium oxide CH-TRU waste could occur in PF-4 until the DHF becomes operational (LANL 2023|Section 1.1.2.2|). Once the DHF is operational, these processes could be transferred, and the C&P rate would be increased. However, for analysis, it is assumed that the CCOs containing the diluted plutonium oxide CH-TRU waste would be moved to the new DHF for C&P. The characterization process is conducted as approved by the DOE Carlsbad Field Office/WIPP to verify that the diluted plutonium oxide CH-TRU waste complies with the WIPP WAC (DOE 2022b) for disposal as CH-TRU waste at the WIPP facility. Waste characterization would include radiography and nondestructive assay analysis of each loaded CCO. Characterization is conducted by personnel certified by the WIPP facility and the process can be modified as approved by the DOE Carlsbad Field Office/WIPP. After characterization, CCOs would be packaged in approved TRU waste transportation containers (e.g., Transuranic Package Transporter Model-II [TRUPACT-II]) (Figure S-15 and Figure S-16) and shipped to the WIPP facility for disposal. Each TRUPACT-II can be loaded with up to 14 CCOs (LANL 2023|Section 2.12.2|). Three TRUPACT-II containers can be loaded on a TRUPACT-II transporter (SRNS 2023|Section 20.1). CH-TRU job control waste could also be packaged and transported to the WIPP facility from the Transuranic Waste Facility (see Section B.1.2.4 in Appendix B) for disposal (LANL 2023|Section 1.8, Table 1-5|).

Figure S-15. Drums Loaded into a TRUPACT-II for Transport

Figure S-16. TRUPACT-II Transporter Used for Shipping CH-TRU Waste to the WIPP Facility

SAVANNAH RIVER SITE

The activities that could occur at SRS for the Preferred Alternative are summarized in Table S-5. No activities occur at SRS under the All LANL Sub-Alternative aside from transportation activities.

Table S-5. Activities that Could Occur at SRS in Each Sub-Alternative of the Preferred Alternative

Activities	Base Approach	SRS NPMP	All LANL	All SRS
PDP	No	No	No	**Yes**
Decontamination, oxidation, and shipment of HEU to Y-12	No	No	No	**Yes**
NPMP	No	**Yes**	No	**Yes**
Preparation, packaging, and intra-site shipment of plutonium oxide between F-Area and K-Area	No	No	No	**Yes**
Dilution of plutonium oxide	**Yes**	**Yes**	No	**Yes**
C&P of diluted plutonium oxide CH-TRU waste for shipment to the WIPP facility	**Yes**	**Yes**	No	**Yes**
Packaging and shipment of CH-TRU job control waste to the WIPP facility	**Yes**	**Yes**	No	**Yes**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

Construction at Savannah River Site

The dilution and C&P capabilities in the Base Approach Sub-Alternative of the Preferred Alternative do not require any construction activities at SRS. The construction activities for the dilution capability were evaluated in the 2015 SPD SEIS (DOE 2015a) and are not considered to be a part of the action evaluated in this SPDP EIS. Construction of the K-Area Characterization and Storage Pad was analyzed as a separate action (DOE 2017) to support C&P of the 6 MT of surplus plutonium DOE already decided to dilute and dispose of at the WIPP facility (81 FR 19588). Construction was categorically excluded from further NEPA review (SRNS 2023|Section 1|), and therefore, is not evaluated in this SPDP EIS.

For the SRS NPMP Sub-Alternative, two options are being considered. The first option involves modifications in Building 105-K in K-Area to install capabilities for NPMP (SRNS 2023|Section 1|). Because the modifications would occur inside Building 105-K, no land-disturbing activities are anticipated. The second option is a modular system that would be constructed and tested offsite and then assembled adjacent to Building 105-K. The modular system would be placed on concrete pads that are approximately 4,500 ft^2 and are located close to Building 105-K. The land required for the modular system, including a perimeter security barrier, is 14,450 ft^2 (0.33 ac) in a 170 ft by 85 ft perimeter configuration within a previously disturbed industrial area (SRNS 2023|Section 3.2|).

For the All SRS Sub-Alternative, two options are also being considered. Construction activities at SRS could take place to install PDP and NPMP capabilities at SRS in either Building 226-F (the Savannah River Plutonium Processing Facility [SRPPF]) located in F-Area or in Building 105-K located in K-Area. Plans for construction activities at both sites are in the early stages, and the exact locations within the buildings are not known. For this EIS analysis, NNSA assumes that adequate space is available in F-Area for PDP and NPMP as well as interim storage for incoming and outgoing surplus plutonium. However, because the facility design is incomplete, available total square footage in Building 226-F (SRPPF) is not known at this time. Additional support systems within the building would include active confinement ventilation; heating, ventilation, and air-conditioning; radiation monitoring; criticality alarm system; safeguards and security system; electrical; fire detection; suppression and water collection system; compressed gas and air systems; and gas supply.

Based on a preliminary study for the K-Area option, NNSA assumes that the processing equipment would be installed in the disassembly basin area in Building 105-K. To prepare the disassembly basin area for installation of equipment and support systems, a process similar to the one used for decommissioning the disassembly basin in C-Reactor would be used (SRNS 2013). The radioactive water that is currently in the disassembly basin would be removed using forced evaporation, which requires pumping the water to multiple diesel-fired evaporators where it would be heated and vaporized. Existing components and scrap would remain in the basin along with the evaporation equipment once dewatering has been completed. The disassembly basin would be filled with structured grout, which would form the floor for the installation of the processing equipment and gloveboxes. Additional support systems similar to those listed above for PDP and NPMP in F-Area would also be installed.

Construction of additional support facilities such as warehouses or office buildings outside of Building 226-F or Building 105-K would be needed to support PDP and NPMP capabilities in F-Area or K-Area. The number of buildings is not known at this time for either F- or K-Area but would likely include warehouses, mechanical shops, equipment storage and waste storage locations, parking lots, and emergency generator buildings to supply power to critical safety systems in the event of a power outage. In total, approximately 20 ac of previously disturbed land in F- or K-Areas would be used for buildings as well as any needed temporary construction and laydown areas. Total building footprints for support facilities in F-Area or K-Area are assumed to be 10 ac (not including the existing Buildings 226-F or 105-K).

Operations at Savannah River Site

PDP at SRS is only considered for the All SRS Sub-Alternative. The other sub-alternatives rely on LANL's capability for completion of the PDP activities. In the All SRS Sub-Alternative, PDP and NPMP would occur at SRS in either Building 226-F (SRPPF) located in F-Area or in Building 105-K in a manner similar to that described previously for LANL.

In the Base Approach Sub-Alternative, plutonium oxide from PDP and NPMP would arrive from LANL and be placed in Building 105-K in preparation for the dilution step (SRNS 2023|Section 1|). After unpacking, the plutonium oxide would be transferred to gloveboxes (Figure S-11) to be diluted.

In the SRS NPMP Sub-Alternative, PDP would occur at LANL, so plutonium oxide from the processing of pits would arrive from LANL in the same manner as discussed for the Base Approach. However, NPMP would occur at SRS instead of LANL. The processing of non-pit surplus plutonium in gloveboxes could be located in two possible locations at SRS: Building 105-K in K-Area (SRNS 2023|Section 1|) or in a modular system placed adjacent to Building 105-K. After NPMP, the resulting plutonium oxide would be removed from the furnace and placed in a convenience can and removed safely from the NPMP glovebox and then introduced into the dilution glovebox (SRNS 2023|Section 3.1|).

The gloveboxes for dilution would also be located in Building 105-K. The plutonium oxide would be blended with an adulterant, as previously described for LANL. The diluted plutonium oxide CH-TRU waste would be characterized and packaged in K-Area at the existing Characterization and Storage Pad. The C&P and shipment process currently used at SRS is identical to that described previously for LANL. CH-TRU job control waste would be processed through existing facilities in E-Area (SRNS 2023|Section 20.3|).

Y-12 NATIONAL SECURITY COMPLEX

During PDP, surplus plutonium pits would be disassembled to segregate the plutonium from other materials such as HEU. HEU would be decontaminated, oxidized, and shipped to the Y-12 National Security Complex in Oak Ridge, Tennessee. The storage and disposition of weapons-grade fissile materials, such as HEU, occur at Y-12 and are discussed in the *Final Site-Wide Environmental Impact Statement for the Y-12 National Security Complex* (DOE 2011), incorporated herein by reference.

WASTE ISOLATION PILOT PLANT

The WIPP facility is the only waste repository authorized for permanent disposal of TRU waste generated by *Atomic Energy Act* defense activities in the United States. The TRU and mixed TRU wastes must meet WIPP WAC before they can be shipped to and disposed of at the WIPP facility (DOE 2022b).

Activities following the transportation of the CH-TRU waste to the WIPP facility include receiving, unloading, waste transfer, and disposal. These activities are described and analyzed in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997|Section 3.1.3|) and are not reevaluated in this document. Similar activities would occur at the WIPP facility until it reaches the WIPP Land Withdrawal Act total TRU waste volume capacity limit, regardless of whether waste from the activities discussed in this SPDP EIS is sent to the WIPP facility. DOE has authorized WIPP to use fiscal year 2050 as a planning assumption for a closure date for project management plans related to capital asset projects and other strategic planning initiatives (DOE 2015b). Therefore, NNSA has chosen to use fiscal year 2050 as the date for completion of the 34 MT mission described in this EIS. NNSA estimated operational durations based on throughputs (as discussed in Appendix B) that would result in mission completion in fiscal year 2050. Throughput rates are based on currently available planning data including operating experience and estimates of the operational capability.

TRANSPORTATION

Offsite transportation is described separately because the impacts from these activities would not occur at one specific site, but instead would occur along the transportation route. Transportation methodologies are further described in Appendix E. The following offsite transportation routes are analyzed for the sub-alternatives considered in the Preferred Alternative:

- **Shipping construction materials to LANL and SRS**. Materials to support construction and modification activities would generally be shipped from locations within 30 mi of the site under all sub-alternatives.
- **Shipping adulterant to LANL or SRS**. Adulterant would be shipped from a commercial vendor to either LANL or SRS. The shipping distance is assumed to be 3,000 mi under all sub-alternatives.
- **Shipping pits from Pantex to LANL or SRS**. Pits would be shipped from Pantex to LANL under the Base Approach, SRS NPMP, or All LANL Sub-Alternatives. Pits would be shipped from Pantex to SRS under the All SRS Sub-Alternative.
- **Shipping non-pit surplus plutonium from SRS to LANL or LANL to SRS**. Non-pit surplus plutonium including non-pit metal and some previously processed non-pit oxide would be shipped between sites as appropriate for processing and/or dilution.

- **Shipping plutonium oxide from LANL to SRS**. Plutonium oxide from pit processing would be shipped from LANL to SRS for dilution under the Base Approach and SRS NPMP Sub-Alternatives. Plutonium oxide from the processing of non-pit surplus plutonium at LANL would also be shipped to SRS under the Base Approach Sub-Alternative.
- **Shipping HEU from LANL or SRS to the Y-12 National Security Complex**. After PDP at LANL or SRS, HEU would be shipped to Y-12 under all sub-alternatives.
- **Shipping byproduct material from SRS to LANL**. After PDP at SRS, byproduct material would be shipped to LANL under the All SRS Sub-Alternative if required.
- **Shipping diluted plutonium oxide CH-TRU waste from LANL or SRS to the WIPP facility**. After C&P, the diluted plutonium oxide CH-TRU waste would be shipped from LANL or SRS to the WIPP facility as CH-TRU waste under all sub-alternatives.
- **Shipping CH-TRU job control waste from LANL and SRS to the WIPP facility**. CH-TRU job control waste would also be shipped from SRS and LANL to the WIPP facility. CH-TRU job control waste would be shipped from LANL to the WIPP facility under the Base Approach, SRS NPMP, and All LANL Sub-Alternatives. CH-TRU job control waste would be shipped from SRS to the WIPP facility under the Base Approach, SRS NPMP, and All SRS Sub-Alternatives.
- **Shipping low-level radioactive waste (LLW), mixed low-level radioactive waste (MLLW) and other job control wastes from LANL and SRS to offsite locations**. LLW generated at SRS would be disposed of onsite at SRS (SRNS 2023|Section 20.3|). LLW generated at LANL and MLLW generated at LANL could be shipped to commercial disposal facilities, such as EnergySolutions in Utah or Waste Control Specialists in Texas or to the DOE Nevada National Security Site (NNSS) near Las Vegas, Nevada (LANL 2023|Section 2.12.3|). For purposes of analysis in this SPDP EIS the offsite facility was assumed to be the NNSS near Las Vegas.[9]

S.5.1.2 No Action Alternative

NNSA's No Action Alternative for dispositioning 34 MT of surplus plutonium, shown in Figure S-17, is the continued management of 34 MT of surplus plutonium. This includes (1) continued storage of pits at Pantex, (2) the continued plutonium mission at LANL to process up to 400 kg of actinides (including surplus plutonium) a year (DOE 2008|p. 2-62|), and (3) disposition of up to 7.1 MT of non-pit surplus plutonium for which the disposition decision, using the dilute and dispose strategy, was announced in NNSA's 2020 AROD (85 FR 53350).

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[9] A very small quantity of MLLW is expected to be generated at SRS for the All SRS Sub-Alternative. For the purposes of analysis, NNSA assumes it would be transported to NNSS.

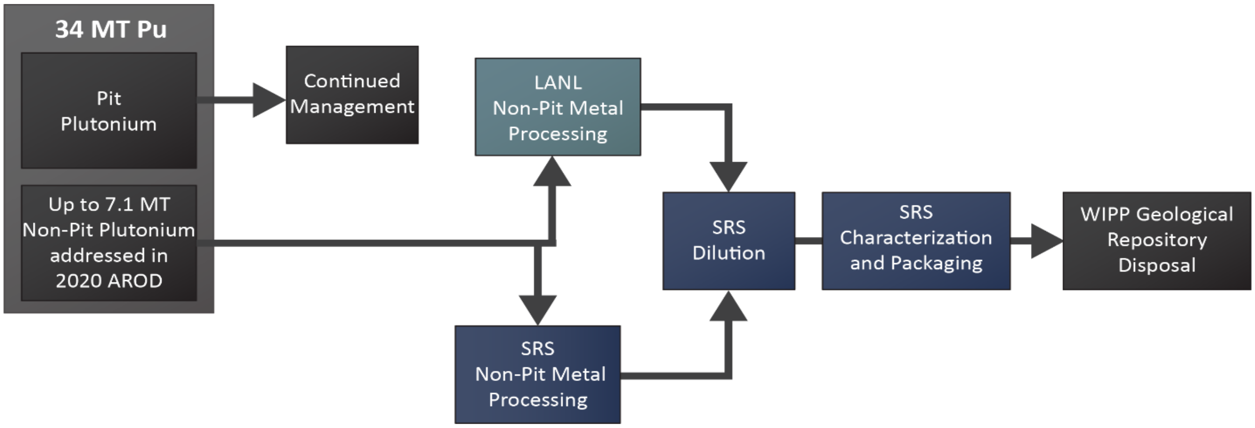

Figure S-17. No Action Alternative

NPMP of up to 7.1 MT could be performed in the existing furnaces installed in gloveboxes at LANL's PF-4 or in a NPMP capability that would be built at Building 105-K in K-Area at SRS. If NPMP occurs at LANL, the resulting plutonium oxide would be shipped to SRS for dilution and C&P. Shipments of plutonium oxide would be packaged in Type B packages and loaded into an OST Transporter for shipment to SRS (LANL 2023|Section 2.15.1.2.3|). If processing occurs at SRS, the resulting plutonium oxide would be transferred to a glovebox in Building 105-K for dilution.

After dilution, CCOs of diluted plutonium oxide CH-TRU waste would be characterized and packaged at SRS in approved TRU waste transportation containers (e.g., TRUPACT-II) and shipped from K-Area to the WIPP facility for disposal (SRNS 2023|Section 20.1|). CH-TRU job control waste, including waste such as gloves from gloveboxes and other waste from inside gloveboxes, would be classified as CH-TRU waste and packaged and transported through E-Area at SRS for disposal at the WIPP facility (SRNS 2023|Section 20.3|).

The activities that could occur at LANL or SRS under the No Action Alternative are summarized in Table S-6. The operational activities in each step of the No Action Alternative are described in the following sections, organized by site. These sections also describe the construction or modification activities that would be necessary to build the operational capabilities. Additional details about the facilities are in Appendix B.

Table S-6. Location Summary of Activities under the No Action Alternative

Activities	NPMP at LANL Option	NPMP at SRS Option
NPMP	LANL	SRS
Preparation, packaging, and shipment of plutonium oxide to SRS	LANL	NA
Dilution of plutonium oxide	SRS	SRS
C&P of diluted plutonium oxide CH-TRU waste for shipment to the WIPP facility	SRS	SRS
Packaging and shipment of CH-TRU job control waste to the WIPP facility	LANL/SRS	SRS
Disposal of diluted plutonium oxide CH-TRU waste and CH-TRU job control waste	WIPP	WIPP

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant.

S.5.1.2.1 Pantex

Under the No Action Alternative, surplus plutonium pits at Pantex would remain in storage under its existing management plan. The No Action Alternative does not affect the ongoing shipping from Pantex to LANL to support the ongoing processing of up to 400 kg/yr of actinides (includes plutonium) at PF-4 at LANL (DOE 2008|p. 2-62|).

S.5.1.2.2 Los Alamos National Laboratory

Construction of new facilities at LANL would not be required for the No Action Alternative.

Operations at LANL for the No Action Alternative would be similar to those described for the Preferred Alternative for NPMP (Section S.5.1.1.2). NPMP would be performed in existing gloveboxes in PF-4, which is in TA-55, using existing furnaces. Plutonium oxide would be packaged in Type B packages and loaded into an OST Transporter adjacent to PF-4 for shipment to SRS (LANL 2023|Sections 1.1.2.1, 2.15.1.2.3|). CH-TRU job control waste resulting from NPMP would be packaged and loaded for shipment to the WIPP facility for disposal.

S.5.1.2.3 Savannah River Site

NPMP at SRS would be conducted in a new NPMP capability installed in K-Area at SRS at Building 105-K. No new land-disturbing construction activities would occur at SRS to support NPMP (SRNS 2023|Section 11|). However, activities to replace, modify, or install equipment currently in K-Area would occur, as necessary.

NPMP at Building 105-K in K-Area would be conducted using furnaces, as discussed in Section S.5.1.1.2. The resulting plutonium oxide would be placed in appropriate containers (DOE 2018a) and transported to the dilution capability gloveboxes located in Building 105-K. The dilution and C&P processes and locations used for plutonium oxide from LANL or SRS would be the same as those described for the Preferred Alternative. After characterization, CCOs would be packaged in approved TRU waste transportation containers (e.g., TRUPACT-II) and shipped from SRS to the WIPP facility for disposal. CH-TRU job control waste would also be packaged and transported to the WIPP facility for disposal through E-Area.

S.5.1.2.4 Waste Isolation Pilot Plant

As discussed in Section S.5.1.1.2, the WIPP facility is the only waste repository authorized for permanent disposal of TRU waste generated by *Atomic Energy Act* defense activities. TRU and mixed TRU wastes must meet the WIPP WAC before they can be shipped to and disposed of at the WIPP facility (DOE 2022b).

Activities following the transportation of the CH-TRU waste to the WIPP facility, including receiving, unloading, and waste transfer and disposal, are described and analyzed in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997|Section 3.1.3|), and are not reevaluated in this document.

S.5.1.2.5 Transportation

Offsite transportation is described separately because the impacts from these activities would not occur at one specific site, but instead would occur along the transportation route. Transportation methodologies are further described in Appendix E. The following offsite transportation routes are analyzed for the No Action Alternative:

- **Shipping adulterant to SRS**. Adulterant would be shipped from a commercial vendor assumed to be located 3,000 mi from SRS.
- **Shipping non-pit surplus plutonium from SRS to LANL or LANL to SRS**. Non-pit surplus plutonium, including non-pit metal and some previously processed non-pit oxide, would be shipped between sites as appropriate for processing and/or dilution.
- **Shipping plutonium oxide from LANL to SRS**. If processing of up to 7.1 MT of non-pit surplus plutonium occurred at LANL, then the resulting plutonium oxide would be shipped from LANL to SRS for dilution.
- **Shipping diluted plutonium oxide CH-TRU waste from SRS to the WIPP facility**. After C&P, diluted plutonium oxide CH-TRU waste would be shipped from SRS to the WIPP facility.
- **Shipping CH-TRU job control waste from LANL and SRS to the WIPP facility**. CH-TRU job control waste would be shipped from LANL and SRS to the WIPP facility.
- **Shipping LLW, MLLW, and other job control wastes from LANL and SRS to offsite locations**. LLW generated at SRS would be disposed of onsite at SRS (SRNS 2023|Section 20.3|). LLW and MLLW generated at LANL could be shipped to commercial disposal facilities such as EnergySolutons in Utah or Waste Control Specialists in Texas or to NNSS, a Federal site in Nevada. For purposes of analysis in this SPDP EIS the offsite facility was assumed to be the NNSS near Las Vegas.

S.5.2 Alternatives Considered and Dismissed from Detailed Study

NNSA has considered many alternatives for the dispositioning of surplus plutonium in studies, technology reviews and previous NEPA analyses. Most were ultimately dismissed from detailed study in those analyses. Table S-7 describes such alternatives and the reasons DOE dismissed them in the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE 1996). Similarly, Table S-8 describes such alternatives considered in the *Surplus Plutonium Disposition Final Environmental Impact Statement* (SPD EIS; DOE 1999), and Table S-9 describes the additional alternatives considered in the 2015 SPD SEIS (DOE 2015a). The reasons for dismissal given in these tables are those that were given at the time of publication. However, NNSA has reviewed the reasons for dismissal and finds them to be valid today, unless otherwise noted.

Table S-7. Alternatives Considered and Dismissed in the S&D Programmatic EIS

Disposition Alternative[a]	Reason for Dismissal from Detailed Study
Radiation barrier alloy for indefinite storage – forming a plutonium-beryllium compound	Unsuitable material form for a civilian waste repository. Requires reconversion of material to remove plutonium and process it into a repository-compatible waste form.
Injection into continental magma	Immature technology. Licensing and regulatory aspects are undefined and uncertain. Environmental safety and health concerns exist.

Disposition Alternative[(a)]	Reason for Dismissal from Detailed Study
Emplacement in sub-seabed	Immature technology. Licensing and regulatory aspects are undefined and uncertain. Schedule is uncertain. Increased opportunities for vessel accidents in which material could be lost at sea.
Launching to deep outer space	High risk (accidents). Accident risk and potential dispersal of radioactive materials are higher than other options. Chances of recovering material lost during an accident are lower. Expensive and time-consuming to complete.
Direct immobilization with radionuclides in borosilicate glass and use of a retrofitted Defense Waste Processing Facility	Expensive and disruptive. Installing a specifically designed melter for plutonium immobilization would require major retrofitting of the existing equipment in the Defense Waste Processing Facility at SRS because of criticality concerns. This would interfere with the Defense Waste Processing Facility mission to stabilize and treat high-level waste.
Reactor and accelerator options: • Accelerator conversion using a molten salt target • Accelerator conversion using a particle bed target • Accelerator driven using a modular helium reactor • Particle bed reactor • Molten salt reactor	Immature technology. Technical immaturity of options and lengthy development and demonstration effort to bring them to a "viable and practical status and enable disposition options to be initiated with certainty".
Consuming in modular helium reactors	Immature technology. Less technically mature than other available options for using mixed oxide fuel in operating water-cooled reactor plants.
Advanced liquid metal reactors with pyroprocessing	Expensive and time-consuming. Requires an advanced liquid metal-cooled reactor that has not been developed.
Direct emplacement in HLW repository without immobilization	Because of proliferation concerns, a determination of acceptability of this waste in a HLW repository is highly unlikely to be reached in a timely manner. Additional security would be required until the repository is sealed.
Dispose surplus plutonium at the WIPP facility	Regulatory concerns. Assumed that this option would exceed capacity at the WIPP facility and would require amendment of the Waste Isolation Pilot Plant Land Withdrawal Act and implementing documents. Note: A WIPP facility permit modification and an EPA planned change request allow for accounting of the volume of TRU waste in an overpacked container as the waste volume allowed by the WIPP Land Withdrawal Act (NMED 2018), rather than the volume of the entire overpacked container (volume of waste plus empty space in the container). As a result, the apparent lack of unsubscribed disposal capacity is no longer a constraint. Therefore, in this SPDP EIS, NNSA is evaluating the impacts of disposing of diluted plutonium oxide CH-TRU waste at the WIPP facility.
Hydraulic fracturing	Not technically viable; of high risk. No assurance of technical feasibility and no engineered barrier exists to prevent leakage into subsurface aquifers.

Disposition Alternative[a]	Reason for Dismissal from Detailed Study
Injection of slurry into deep wells	High risk (environmental and health). No engineered barrier to prevent leakage into subsurface aquifers. Would pose unacceptable environmental safety and health risks.
Melting into crystalline rock	Not technically viable. Uncertainties related to criticality and difficulty in assuring enough heat would be available from the spent fuel commingled with surplus plutonium to melt the rock.
Disposal under ice caps	Not technically viable; of high risk. Poses unacceptable environmental health and safety risks because of the instability of ice caps in Greenland and Antarctica. Low likelihood of obtaining an Agreement with Denmark or revising the current international treaty for Antarctica.
Seabed disposal and controlled dilution in oceans	Regulatory, environmental, health, and safety concerns. Contrary to domestic and international laws, treaties, and policies.
Underground nuclear detonation	Regulatory, environmental, health, and safety concerns. Considered unreasonable because compliance with regulatory and licensing requirements is very uncertain. Compliance with environmental safety and health regulations is unlikely and this option may undermine national and international policy related to the Comprehensive Test Ban Treaty.
Naval nuclear fuel – using plutonium fuel in naval reactor plants	Regulatory concerns and time-consuming. Processes and facilities necessary for this option cannot be declassified, thus eliminating the possibility of transparent confirmation of the process or final condition by international inspections as required by DOE international obligations and commitments. Could not be accomplished in a reasonable time frame because the number of new fuel loadings in naval reactor plants is so small.
Reprocessing using plutonium fuel in existing or new evolutionary advance light water reactors with chemical reprocessing of spent fuel	Expensive, time-consuming, and security concerns. Specific stages of the processing and handling are more vulnerable to theft and diversion of the material. Time and cost required to design and construct reprocessing plants is greater than for plants that are available and do not have the vulnerability concerns.
Advanced liquid metal reactor with recycle and reuse of metallic alloy fuel elements	Immature reactor concept. Development of liquid metal reactors/integral fast reactors is no longer being pursued because of the U.S. nonproliferation policy to not develop technologies that rely on plutonium recycling.
Glass material oxidation and dissolution system	Immature technology and time-consuming. Time required to complete the necessary research and development is longer than for other alternatives and options.
Euratom mixed oxide fuel reactor use	Institutional complexities and security concerns. Institutional complexities related to transportation, security, and geopolitical factors.

CH-TRU = contact-handled transuranic; DOE = U.S. Department of Energy; EIS = environmental impact statement; EPA = U.S. Environmental Protection Agency; HLW = high-level radioactive waste; NNSA = National Nuclear Security Administration; SPDP = Surplus Plutonium Disposition Program; S&D = storage and disposition TRU = transuranic; WAC = Waste Acceptance Criteria; WIPP = Waste Isolation Pilot Plant.

(a) Technologies may have changed with time, but these changes are not addressed in this document.

Source: DOE 1996|p. 2-10 to 2-15|.

Table S-8. Alternatives Considered and Dismissed in the SPD EIS

Disposition Alternative	Reason for Dismissal from Detailed Study
Deep-borehole direct disposition or immobilized disposition	Regulatory and siting concerns. Institutional uncertainties associated with the siting of borehole facilities make timely implementation of this alternative unlikely. New legislation and regulations, or clarification of existing regulations, may be necessary.
Electrometallurgical treatment	Immature technology. The technology is less mature than vitrification or ceramic immobilization.
MOX fuel irradiation in a partially completed light water reactor	Expensive, time-consuming, and regulatory concerns. Offers no advantages over existing reactors for plutonium dispositioning and would involve higher costs, greater regulatory uncertainties, higher potential environmental impacts from construction, and less timely commencement of dispositioning actions.
MOX fuel irradiation in an evolutionary advanced light water reactor	Expensive, time-consuming, and regulatory concerns. Offers no advantages over existing reactors for plutonium dispositioning and would involve higher costs, greater regulatory uncertainties, higher potential environmental impacts from construction, and less timely commencement of dispositioning actions.

EIS = environmental impact statement; MOX = mixed oxide; SPD = Surplus Plutonium Disposition.
Sources: DOE 1999|p. 2-11 to 2-13|; 62 FR 3014|p. 3029|.

Table S-9. Alternatives Considered and Dismissed in the 2015 SPD SEIS for 13.1 MT of Surplus Plutonium that Were Not Included in the Previous SPD EIS or the S&D Programmatic EIS

Disposition Alternative	Reason for Dismissal from Detailed Study
Ceramic can-in-canister approach for immobilizing plutonium	The program was cancelled in 2002 because of budgetary constraints. Subsequently, further refinement of the technology was stopped, and DOE infrastructure and expertise associated with this technology have not evolved or matured.
Dispositioning of plutonium using the H-Canyon/HB-Line and Defense Waste Processing Facility	This approach was considered viable for up to 6 MT; however, there was insufficient high-level radioactive waste with the characteristics needed to vitrify the entire amount of surplus plutonium to be dispositioned.
Disposal of plutonium at a secondary repository similar to the WIPP facility	The WIPP facility was considered to have sufficient capacity to accommodate dispositioning of the entire amount of surplus plutonium based on the *Annual Transuranic Waste Inventory Report – 2012* (DOE 2012), published after the Draft SPD SEIS was issued; therefore, a secondary repository was not necessary and the 2015 SPD SEIS WIPP Alternative was revised. Note: DOE evaluates the need for disposal facilities periodically, and as that need changes, additional repositories may become available, but at this time none are envisioned.
Outsourcing plutonium dispositioning activities to foreign entities	Sending U.S. pits or plutonium from pits to a foreign country would involve significant nonproliferation and national security concerns.
Modification of the MFFF to incorporate pit disassembly and conversion	The 2015 SPD SEIS included an analysis of an alternative that considered plutonium processing (conversion) in a modified MFFF, but did not consider pit disassembly because of security, design,

Disposition Alternative	Reason for Dismissal from Detailed Study
	and licensing considerations. Note: Because the MOX project was cancelled, these concerns are no longer considerations. Therefore, in this SPDP EIS, NNSA is reevaluating housing PDP activities in Building 226-F or Building 105-K. This alternative is considered as part of the All SRS Sub-Alternative in this SPDP EIS, as discussed in Section S.5.1.1.1.

CH = contact-handled; DOE = U.S. Department of Energy; EIS = environmental impact statement; MFFF = MOX Fuel Fabrication Facility; MOX = mixed oxide; NNSA = National Nuclear Security Administration; PDP = pit disassembly and processing; SEIS = Supplemental Environmental Impact Statement; SPD = Surplus Plutonium Disposition; SRS = Savannah River Site; S&D = storage and disposition; TRU = transuranic; WIPP = Waste Isolation Pilot Plant.

Source: DOE 2015a|p. 2-14 to 2-19|.

Two additional alternatives were considered but dismissed in this SPDP EIS:

- **Use of plutonium as feedstock for fuel in the Versatile Test Reactor (VTR)**. DOE recently considered the use of surplus plutonium as feedstock for preparation of fuel for the proposed VTR (DOE 2022a). On July 22, 2022, DOE issued a ROD for the VTR EIS. DOE decided to construct and operate a VTR at the Idaho National Laboratory (87 FR 47400). DOE has not decided whether to establish VTR driver fuel production capabilities at the Idaho National Laboratory, SRS, or a combination of the two sites. DOE is considering the use of surplus plutonium as feedstock for preparation of fuel for the VTR (DOE 2022a). However, the VTR is in the early stages of design, and although a Final EIS and ROD have been issued, the details related to making surplus plutonium available as a VTR feedstock are not currently known. In addition, while Congress has previously authorized funding for the VTR, no funding has been provided in fiscal year 2022 or 2023. Therefore, an alternative that considers VTR as a potential disposition path for surplus plutonium would be speculative and is premature at this time. If DOE proposes in the future to make a portion of its surplus plutonium inventory available as feedstock for VTR driver fuel, the VTR Program would be responsible for any technical activities and process changes that may be necessary to accept this source of feedstock. Any changes to allow use of surplus plutonium as feedstock for VTR fuel production would be the subject of future NEPA analysis.
- **Demilitarization and direct disposal of pits.** This alternative was not considered further because it does not meet the nonproliferation goals set forth in the purpose and need, as described in Section S.2, to safely and securely disposition plutonium that is surplus to the Nation's defense needs so that it is not readily usable in nuclear weapons.

Two additional sub-alternatives to the Preferred Alternative were also not considered for further detailed analysis:

- **Pantex Greenfield Sub-Alternative in this SPDP EIS**. NNSA considered a Pantex Greenfield Sub-Alternative for the disposition of surplus plutonium. This sub-alternative would require the construction and operation of greenfield facilities for PDP, NPMP, dilution, and C&P. This sub-alternative was considered, but found to be unreasonable and dismissed from detailed analysis for the following reasons:
  - <u>Lack of Adequate Waste Support Facilities</u> – Pantex does not have waste management facilities that can support the amount of LLW and TRU waste that would be generated for PDP, NPMP, dilution, and C&P of 34 MT. The Pantex Supplement Analysis (DOE 2018b) does not include numbers for TRU waste disposal and the quantity of LLW waste currently generated at Pantex is

significantly lower than that estimated for SPDP. Support facilities for waste may be needed in addition to the facilities where PDP, NPMP, dilution, and C&P occur.

- Significant Increase in Staffing Levels – This SPDP EIS estimates between 549 and 844 operations workers would be needed at Pantex (based on the estimated LANL staffing levels in the All LANL Sub-Alternative and estimated SRS staffing levels under the All SRS Sub-Alternative, respectively, for the years when project employment and expenditures are highest). This would be an increase of between 14 and 20 percent over the current Pantex staffing level of 3,800 workers, as shown in the Pantex Supplement Analysis (DOE 2018b). This does not include the additional staff needed for construction.
- Lack of Plutonium Processing Experience – Pantex does not have experience processing plutonium and would need to build an entirely new capability from the ground up.
- Insufficient Infrastructure – Significant changes in infrastructure would likely be needed to accommodate the additional staff and the new facilities. This additional site infrastructure would increase the time and cost to complete the project.
- Design and Construction Timing Challenges – The timeline for design and construction of new facilities is unknown and based on previous NNSA experience it would extend well beyond the desired schedule for dispositioning the 34 MT. In addition, the costs for incorporating the required support facilities and infrastructure would be high.
- The ceramic can-in-canister approach that was previously considered and dismissed, as shown in Table S-9, was also not considered an option for Pantex. In addition to the reasons for dismissal in Table S-9, high-level radioactive waste does not exist at Pantex. High-level radioactive waste in liquid form would have to be transported to Pantex from another site, and a new vitrification facility would have to be designed, constructed, and operated at Pantex.

- **Waste Solidification Building (WSB) Option for the All SRS Sub-Alternative in this SPDP EIS**. NNSA also considered a third option for the All SRS Sub-Alternative to the Preferred Alternative: use of the WSB at SRS to house the PDP capability. This option was considered but dismissed from further evaluation because costly and time-consuming upgrades to WSB infrastructure would be necessary to support PDP mission capabilities. In addition, none of the infrastructure needed to make the WSB a stand-alone Category 1 security facility exists. The cost to establish that infrastructure would be very high, thus making the use of the WSB fiscally challenging. However, if the decisionmakers were to select the WSB for the PDP mission, the potential environmental impacts would be similar to those identified in this EIS for inclusion of the PDP capabilities in Building 226-F (SRPPF), as both are radiologically clean facilities and are located near each other within F-Area at SRS.

S.6 Methodologies Used to Develop the SPDP EIS

This section describes the methods NNSA used to assess the potential direct and indirect impacts of the proposed action of this SPDP EIS. This EIS evaluates the potential environmental impacts of both alternatives within a defined region of influence for each of the resource areas discussed in Section 4.0. It relies on information that is available from DOE sites for similar activities that are ongoing, specifically PDP that has been occurring at LANL and the dilution process occurring at SRS for the 6 MT of non-pit plutonium, which is not part of the 34 MT analyzed in this EIS but which uses the same processes.

NNSA sent Data Call Requests to Pantex, LANL, and SRS and asked for information related to the parameters that were needed to complete the analysis for this SPDP EIS. The sites responded with Data

Call Responses (CNS 2019, LANL 2023, SRNS 2023) that provided information including the amount of land that would be used for buildings; assumed releases to the air; the number of staff (including radiation workers) required for each different part of the process; and the amount of waste that would be generated. References were also provided to document assumptions in the Data Call Responses.

NNSA used a combination of the references and the Data Call Responses to develop the EIS. In cases where there was uncertainty or disagreement between documents, the analysis was completed using assumptions that were documented. Specific areas of uncertainty are discussed in Section 4 of the EIS or in Appendices D (Accidents) or E (Transportation).

S.7 Decisions to Be Supported by this EIS

Upon completion of this SPDP EIS, NNSA will issue a ROD, proceeding with either the continued management of the 34 MT of surplus plutonium as described under the No Action Alternative, or the disposition of the 34 MT of surplus plutonium using the dilute and dispose strategy as described under the Preferred Alternative. NNSA has analyzed impacts so that it could decide to implement some or all aspects of the Preferred Alternative and its sub-alternatives at one or more sites. This could be accomplished by using strategies such as building similar capabilities at different sites or supplementing activities at one site using a similar capability at another site or at another location within the same site.

S.8 Summary of Environmental Consequences of the Alternatives

This section provides the reader with an understanding of the differences between the Preferred and No Action Alternatives as well as the differences between the sub-alternatives of the Preferred Alternative. Table S-10 summarizes the potential environmental consequences that would be expected as a result of the alternatives considered in this SPDP EIS. This table is intended to help the reader quickly compare environmental consequences across sub-alternatives and options. Table S-10 has columns for each sub-alternative and the options of the Preferred Alternative and the No Action Alternative. It contains rows for each resource area analyzed in this SPDP EIS, separated when relevant into construction and operations. The content in each row may be numbers associated with a key category of environmental consequence (i.e., acres of land disturbed, risk of a latent cancer fatality (LCF), number of LCFs, cubic meters of waste generated) or may be a narrative summary. In cases where environmental consequences would be the same across multiple sub-alternatives or options, cells of the table may be merged to display a single environmental consequence. A full discussion of the impacts for all resources is found in Section 4.0 of Volume 1. Appendix C in Volume 2 contains the detailed potential environmental impacts broken out by activity and site (LANL and SRS), as well as impacts across the sites under each of the alternatives and sub-alternatives.

As summarized in the table below, at LANL, impacts from the surplus plutonium disposition activities evaluated in this SPDP EIS would be negligible to minor on land use and visual resources, air quality, noise, geology and soils, water resources, human health (chemical use), and waste management. At SRS, impacts from surplus plutonium disposition activities evaluated in this SPDP EIS would be negligible to minor on land use and visual resources, air quality, noise, geology and soils, water resources, human health (chemical use), and waste management. Cumulative impacts are summarized in Section S.9.

S.9 Summary of Cumulative Impacts

Potential cumulative impacts were assessed for each resource within a region of influence specific to that resource at both LANL and SRS. Potential cumulative impacts for the associated resource areas range from none to minor for all resource areas except for cultural resources, transportation, and air quality, which are discussed below and in Section 4.2 of Volume 1.

Potential cultural resources cumulative impacts may occur because cultural resources are considered nonrenewable. Although guidance documents (the Programmatic Agreement and Cultural Resources Management Plan) address identification, evaluation, and mitigation of National Register of Historic Places eligible resources, if activities under the Preferred Alternative, No Action Alternative, or any other action cause the inadvertent destruction or loss of any National Register of Historic Places eligible or potentially eligible historic resources, the result may cause an adverse effect through National Historic Preservation Act Section 106 and could substantially contribute to cumulative impacts within the LANL or SRS region of influence.

Potential transportation cumulative impacts may arise from offsite transportation throughout the United States. Under the Preferred and No Action Alternatives evaluated in this SPDP EIS, doses to the worker and the general population would be less than 330 and 350 person-rem, respectively, and no latent cancer fatalities (LCFs) (0.2) would be expected. When combined with past, present, and reasonably foreseeable future actions, the collective worker dose was estimated to be 430,000 person-rem (260 LCFs), as discussed in the cumulative analysis in Section 4.2.3.4. The collective general population dose was estimated to be 440,000 person-rem (260 LCFs). The total number of LCFs (among the workers and general population) estimated to result from radioactive material and waste transportation over the period between 1943 and 2073 is 520, or an average of about 4 LCFs per year (DOE 2015a|Table 4-48|). The transportation-related LCFs represent about 0.0007 percent of the overall annual number of cancer deaths in the United States in 2019. Most of the cumulative risk to workers and the general population would be due to the general transportation of radioactive material and waste unrelated to activities evaluated in this SPDP EIS. Potential transportation cumulative impacts may also arise from traffic fatalities. In the United States, the average number of highway traffic fatalities was 34,860 per year for the 10-year period from 2010 through 2019 (DOT 2021|Table 2|). It is estimated that there could be an additional increase in the number of traffic fatalities of up to 1 (0.3 to 0.6) under the Preferred Alternative and none (0.1) under the No Action Alternative over about 30 years.

Potential air quality cumulative impacts may arise from emissions of greenhouse gases (GHGs) associated with activities under the Preferred or No Action Alternatives, including transportation. GHG emissions under the Preferred and No Action Alternatives would be 89,000 and 10,000 MT carbon dioxide equivalent total, respectively. Global GHG emissions were estimated to be 34.8 billion MT of carbon dioxide equivalent in 2020 (ICOS 2021). Although estimates for GHG emissions were developed for each alternative, there is uncertainty in evaluating longer-term emissions levels and the relationship between GHG sources and sinks over a long timeframe. Climate change effects resulting from GHG emissions are global in scale, and there is no guidance for how to quantify whether or to what extent local GHG emissions contribute to observed regional trends or how they contribute to future climate change. Additionally, emissions of ozone-depleting substances from the activities under the Preferred or No Action Alternatives would be very small and would represent a negligible contribution to the destruction of the Earth's protective ozone layer.

Table S-10. Comparison of Alternatives - Summary

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
	Construction							
Land Disturbance (ac)	5.1	5.1	5.4	5.1	20	20	0	(c)
	Operations							
	No land disturbance is anticipated during operations.							
	Construction and Operations							
Visual	Proposed new facilities would be built away from the site boundaries and would be structurally similar to, and blend in with, the existing viewscapes.						(c)	(c)
	Construction							
Geologic Materials Used (sand, gravel, crushed stone) (yd^3)	30,000	30,000	30,000	41,000	260,000	260,000	0	(c)
	Operations							
	No geologic materials are used during operations.							
	Construction and Operations							
Water Resources	Construction and operations water use at either site is anticipated to be less than 1 percent of the current site water use and less than 3 percent of available capacity. Thus, only minor impacts to groundwater resources are expected for either alternative. Stormwater runoff would be managed at both sites to minimize the effects of construction and operation on surface waters receiving discharge. Treated sanitary wastewater discharge would be less than 4 percent of the expected flow in the receiving stream at LANL and less than 0.5 percent of the flow in the receiving stream at SRS. Thus, only minor impacts to surface water quality are expected for either alternative. At LANL, impacts on the wastewater treatment capacity are minimal with respect to present and ongoing operations. At SRS, site operations associated with all activities under both the Preferred and No Action Alternatives would have minimal impacts on wastewater treatment capacity once a project to tie the K-Area into the CSWTF is completed.							

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[(b)] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[(b)] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
				Construction				
Air Quality	Fugitive dust would be generated during construction and construction equipment would generate emissions, including non-radiological HAPs at LANL. No construction would occur at SRS.	Fugitive dust would be generated during construction and construction equipment would generate emissions including non-radiological HAPs at LANL. Minor construction activities and impacts would occur at SRS.		Fugitive dust would be generated during construction and construction equipment would generate emissions including non-radiological HAPs at LANL.	Fugitive dust would be generated during construction and construction equipment would generate emissions including non-radiological HAPs at SRS.		Minor construction activities and impacts would occur at SRS.	No construction activities would occur at either LANL or SRS.
				Operations				
	Operations are not expected to produce additional air emissions at LANL. At SRS emissions would result from the use of diesel generators. Emissions associated with dilution activities are expected to produce negligible non-radiological HAPs.			Operations are expected to produce minimal additional air emissions at LANL. No additional diesel	SRS emissions would result from the use of diesel generators. Emissions associated with dilution activities are expected to produce negligible non-radiological HAPs. There is expected to be a minor increase in emissions for PDP due		Operations are not expected to produce additional air emissions at LANL. At SRS emissions would result from the use of diesel generators and dilution activities. Emissions associated with dilution	

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[(b)] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[(b)] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Air Quality				generators required for operational activities.	to the use of additional backup diesel generators.		activities are expected to produce negligible non-rad HAPs.	
Noise	**Construction and Operations** Construction and Operations noise levels at sites are anticipated to be similar to current operations beyond the site boundaries.							
Ecological Resources	**Construction**							
	Activities have the potential to affect Mexican spotted owl and the Jemez Mountains salamander. LANL would conduct a Section 7 consultation under the Endangered Species Act. No construction activities at SRS.	Activities have the potential to affect Mexican spotted owl and the Jemez Mountains salamander. LANL would conduct a Section 7 consultation under the Endangered Species Act. Construction activities at SRS are minor and would have negligible impact on ecology or on protected species		Activities have the potential to affect Mexican spotted owl and the Jemez Mountains salamander. LANL would conduct a Section 7 consultation under the Endangered Species Act.	Impacts at SRS would occur in previously disturbed areas and are unlikely to affect protected species including the red-cockaded woodpecker or the smooth purple cone flower.		No impact	No impact

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
	Operations							
Ecological Resources	Background noise and light levels could affect Mexican spotted owl but are unlikely to affect habitat for the Jemez Mountains salamander. LANL would conduct a Section 7 consultation under the Endangered Species Act for the Mexican spotted owl and the Jemez Mountains salamander; impacts at SRS would be negligible to ecological resources and would not affect the red-cockaded woodpecker or the smooth purple cone flower.			LANL would conduct a Section 7 consultation under the Endangered Species Act for the Mexican spotted owl and the Jemez Mountains salamander.	Impacts at SRS would be unlikely to affect the red-cockaded woodpecker or the smooth purple cone flower.		No impact	No impact
Human Health	**Construction - Worker – highest risk of LCF for project duration**							
	0.001	0.001	0.001	0.001	0	0.0001	0.0005	None[c]
	Operations - Worker – highest risk of LCF for project duration							
	0.005	0.007	0.005	0.007	0.005	0.005	0.007	0.007
	Construction - Workforce – total number of LCFs							
	0 (0.008)	0 (0.009)	0 (0.008)	0 (0.01)	0 (0)	0 (0.003)	0 (0.0007)	None[c]
	Operations - Workforce – total number of LCFs							
	2 (2.4)	3 (2.9)	3 (2.5)	2 (1.8)	2 (2.4)	2 (2.4)	1 (0.8)	1 (0.8)

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Human Health	**Construction - Public – MEI total risk of LCF**							
	(d)	(d)	(d)	(d)	0	3×10^{-8}	(d)	None[c]
	Operations - Public – MEI total risk of LCF							
	3×10^{-8}	3×10^{-8}	3×10^{-8}	6×10^{-8}	2×10^{-9}	2×10^{-9}	4×10^{-10}	8×10^{-9}
	Construction - Public – Population number of LCFs							
	(d)	(d)	(d)	(d)	0 (0)	0 (0.002)	(d)	None[c]
	Operations - Public – Population number of LCFs							
	0 (0.0001)[e]	0 (0.0002)[e]	0 (0.0002)[e]	0 (0.0002)	0 (0.00008)	0 (0.00008)	0 (0.00002)	0 (0.00004)[e]
	Operations Bounding Accidents – Noninvolved Worker maximum LCF Risk[f]							
	0.1	0.06	0.06	0.1	0.004	0.004	0.004	0.1
	Operations Bounding Accidents - Public – MEI maximum LCF Risk[f]							
	0.004	0.003	0.003	0.004	0.0001	0.0001	0.0001	0.004
	Operations Bounding Accidents - Public – Population maximum LCFs[f]							
	0 (0.2)	0 (0.1)	0 (0.3)[g]	0 (0.2)	0 (0.1)	0 (0.09)	0 (0.08)	0 (0.2)
Cultural Resources	**Construction**							
	Activities have the potential to affect archaeological resources and historic buildings. Determination of effects would utilize the NHPA Section 106 process in the Programmatic Agreement and the Cultural Resources management Plan and would be followed by the NNSA Los Alamos Field Office as would the Archaeological Resource Management Plan and associated Programmatic Agreement at SRS.							No impact because existing equipment is being used.

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[(b)] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[(b)] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
	Operations							
	There would be no impact on cultural resources during operations. The LANL CRMP and the SRS Archeological Resource Management Plan of the Savannah River Archeological Research Program has controls in place to minimize or mitigate impacts on resources during operations.							
Socioeconomics	**Construction – Direct Employment (FTE in Peak Year)**							
	116	194	146	139	525	525	78	(c)
	Operations – Direct Employment (FTE in Peak Year)							
	917	1,030	955	549	1,016	1,016	212	246
	Construction – Total ROI Employment (FTE in Peak Year)							
	221	418	290	263	1,092	1,092	197	(c)
	Operations – Total ROI Employment (FTE in Peak Year)							
	2,761	3,054	2,860	1,794	4,084	4,084	567	650
	Construction – Direct Earnings ($Million in Peak Year)							
	19.4	38.9	26.9	23.2	131.3	131.3	19.5	(c)
	Operations – Direct Earnings ($Million in Peak Year)							
	599.4	630.2	607.2	513.7	714.3	714.3	57.7	110.5
	Construction – Total ROI Earnings ($Million in peak year)							
	23.6	47.9	31.5	28.2	176.7	176.7	24.3	(c)
	Operations – Total ROI Earnings ($Million in peak year)							
	778.6	810.2	789.3	703.1	1,025.3	1,025.3	60.1	142.7

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[(b)] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[(b)] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
	Construction – Direct Output ($Million in peak year)							
Socioeconomics	20.3	39.6	26.6	24.2	168.5	168.5	19.3	(c)
	Operations- Direct Output ($Million in peak year)							
	1,481.3	1,514.2	1,492.4	1,428.8	1,481.3	1,481.3	70.3	266.3
	Construction – Total ROI Output ($Million in peak year)							
	36.3	73.4	48.4	43.3	306.8	306.8	37.1	(c)
	Operations – Total ROI Output ($Million in peak year)							
	2,195.3	2,254.5	2,215.3	2,027.7	2,837.7	2,837.7	122.5	396.2
	Construction – Electricity Use (MWh/yr)							
Infrastructure[(h)]	160	160	160	160	16,000	16,000	minimal	(c)
	Operations – Electricity Use (MWh/yr)							
	19,000	21,000	21,000	9,400	53,000	53,000	4,200	5,200
	Construction – Electricity Peak Load (MW)							
	0.02	0.02	0.02	0.02	1.8	1.8	minimal	(c)
	Operations – Electricity Peak Load (MW)							
	2.5	2.7	2.8	1.1	6.4	6.4	0.55	0.67
	Construction – Fuel Use (gal/yr)							
	54,000	58,000	55,000	69,000	300,000	540,000	4,000	(c)
	Operations – Fuel Use (gal/yr)							
	7,200	14,000	14,000	0	180,000	180,000	3,000	1,500

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Infrastructure[h]	**Construction – Water Use (millions of gal/yr)**							
	2.6	3.6	3.1	2.6	1.1	2	1	(c)
	Operations – Water Use (millions of gal/yr)							
	5.3	6.3	6.3	2.5	8.6	8.6	1.8	1.4
	Construction – Sewage Generation (millions of gal/yr)							
	0.055	1.1	0.56	0.055	1.1	1.1	1	(c)
	Operations – Sewage Generation (millions of gal/yr)							
	5.3	6.3	6.3	2.5	8.6	8.6	1.8	1.4
Waste Generation	**Construction – CH-TRU Waste (job control waste) (m^3)**							
	69	170	69	110	0	0	110	(c)
	Operations – CH-TRU Waste (job control waste) (m^3)							
	2,000	2,200	2,300	1,600	2,000	2,000	170	200
	Construction – LLW (m^3)							
	360	360	360	560	0	12,000	0	(c)
	Operations – LLW (m^3)							
	23,000	25,000	26,000	17,000	23,000	23,000	2,400	2,200
	Construction – MLLW (m^3)							
	4.8	4.8	4.8	7.4	0	210	0	(c)
	Operations – MLLW (m^3)							
	42	42	42	89	42	42	0	3.7

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Waste Generation	**Construction – Liquid LLW (m^3)**							
	0	0	0	0	0	0	0	(c)
	Operations – Liquid LLW (m^3)							
	65,000	65,000	65,000	65,000	65,000	65,000	0	0
	Construction – Solid Hazardous Waste (m^3)							
	2.4	2.4	2.4	3.1	45	6,600	0	(c)
	Operations – Solid Hazardous Waste (m^3)							
	6.6	6.6	6.6	6.8	6.6	6.6	0.0	0.7
	Construction – Solid Non-Hazardous Waste (m^3)							
	210	280	280	280	1,000	6,900	66	(c)
	Operations – Solid Non-Hazardous Waste (m^3)							
	14,000	16,000	16,000	1,500	14,000	14,000	1,600	1,400
Environmental Justice	**Construction and Operations**							
	No disproportionately high and/or adverse impacts on minority or low-income populations affected by activities at either the LANL or SRS sites are expected.							
Offsite Transportation Impacts[j]	**Construction - Traffic Fatalities Risk from Non-Radioactive Hazardous Waste Construction Materials Shipments**							
	(i)	(i)	(i)	(i)	0.24	0.24	0	0
	Operations - Incident-Free Crew Impact (LCFs) from Operational Radioactive Materials Shipments							
	0 (0.2)	0 (0.2)	0 (0.2)	0 (0.08)	0 (0.2)	0 (0.2)	0 (0.03–0.04)	0 (0.03–0.04)

Area of Impact	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Offsite Transportation Impacts[j]	**Operations - Incident-Free Population Impact (LCFs) from Operational Radioactive Material and Waste Shipments**							
	0 (0.2)	0 (0.2)	0 (0.2)	0 (0.08)	0 (0.2)	0 (0.2)	0 (0.03–0.04)	0 (0.04–0.05)
	Operations - Radiological Accident Impact (LCFs) from Operational Radioactive Material and Waste Shipments							
	0 (0.0001)	0 (0.0001)	0 (0.0001)	0 (0.000001)	0 (0.00006)	0 (0.00006)	0 (0.00003–0.00005)	0 (0.00005–0.00007)
	Operations - Traffic Fatalities Risk from Operational Radioactive Material and Waste Shipments							
	1 (0.6)	1 (0.6)	1 (0.6)	0 (0.3)	1 (0.6)	1 (0.6)	0 (0.1)	0 (0.1)
	Operations - One-Way Distance Traveled (million km) for Operational Radioactive Material and Waste Shipments							
	12	12	12	6.9	12	12	2-2.2	2.5-2.7
Global Commons	**Total Greenhouse Gas Emissions (MT)**							
	28,000	30,000	30,000	18,000	84,000	87,000	9,000[k]	
	Social Cost of Greenhouse Gases ($)							
	360,000–4,100,000	370,000–4,300,000	370,000–4,300,000	230,000–2,600,000	1,100,000–12,000,000	1,100,000–13,000,000	110,000–1,300,000[k]	

CH-TRU = contact-handled transuranic; CRMP = Cultural Resources Management Plan; CSWTF = Central Sanitary Wastewater Treatment Facility; FTE = full time equivalent (employee); HAP = hazardous air pollutant; LANL = Los Alamos National Laboratory; LCF= latent cancer fatality (the risk of LCF in an individual and the number of LCF in an exposed population); LLW = low-level radioactive waste; MEI = maximally exposed individual; MLLW = mixed low-level radioactive waste; NHPA = National Historic Preservation Act; NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; PA = Programmatic Agreement; PDP = pit disassembly and processing; ROI = region of influence; SPDP EIS = Surplus Plutonium Disposition Program Environmental Impact Statement; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) No construction/modification activities are anticipated.

(d) LCFs to the public and the MEI from construction activities for all sub-alternatives other than the All SRS Sub-Alternative were not calculated because doses and corresponding LCFs to workers at the site were extremely low and the expectation is that a negligible dose and corresponding LCF would be received by the MEI and other members of the public. See Table C-17 for details of the differences in construction LCFs for sub-alternatives.
(e) Population doses and the resulting LCFs are split between LANL and SRS. The population LCF at any one site will be lower than the total LCF shown.
(f) Beyond-design-basis accidents are not included in this table. See Appendix D for more detail.
(g) The maximum LCF for the population in the vicinity of LANL is 0 and the maximum LCF for the population in the vicinity of SRS is 0.
(h) Differences in electricity are based on the estimated facility needs at the two facilities. Diesel and other fuel types are not expected to be used at LANL as there will be no additional generators required.
(i) The All SRS Sub-Alternative involves the largest quantity of construction material and number of hazardous waste shipments when compared to the other Preferred Alternative sub-alternatives (as discussed in Appendix E of this SPDP EIS). The elements of proposed construction activities are discussed further in Sections 4.1.2 and 4.1.3 of this SPDP EIS. Therefore, the impacts under the other sub-alternatives are less than those provided for the All SRS Sub-Alternative.
(j) The cited operational radioactive material shipments and impacts for the Preferred Alternative are only those related to the processing of the pit plutonium. The shipments and the related impacts for processing non-pit plutonium under the Preferred Alternative are within the bounds cited under the No Action Alternative.
(k) Value based on the maximum number of kilometers traveled for the two No Action Alternative options; see Table 4-33.

Sources: Information is summarized from the applicable subject areas in Section 4 and cross-site tables in Appendix C.

S.10 References

This section provides citations for all references used in this SPDP EIS Summary and includes URLs for references that are available on the Internet at the time of publication. NNSA recognizes that URLs may change or become broken links over time due to the dynamic nature of the Internet. NNSA is committed to maintaining existing links to our NEPA documents and references to the extent possible. If a link to an NNSA document becomes broken, NNSA will endeavor to fix the link in a timely manner. References that are not available online are available from NNSA upon request if NNSA determines that they may be released to the public (e.g., they contain no classified information or otherwise protected materials). Please see the Cover Sheet of this SPDP EIS for details about how to request additional information.

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