

The U.S. Department of Energy
West Valley Demonstration Project



**Safety Evaluation Report
For
Waste Processing and Support Activities**

WVDP-SER-001, Revision 15

March 2021

As Related to:

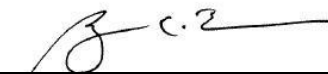

Documented Safety Analysis for
Waste Processing and Support Activities, WVNS-DSA-001, Revision 22

And

WVDP Technical Safety Requirements, WVDP-146, Revision 15

West Valley Demonstration Project
Contractor: CH2M Hill BWXT West Valley, LLC
Contract Number: DE-EM0001529

APPROVAL SIGNATURES

Bryan C. Bower		4/20/2021
	Safety Basis Approval Authority, Director West Valley Demonstration Project U.S. Department of Energy	Date
Jenifer M. Dundas		3/31/2021
	Safety and Site Programs Team Leader West Valley Demonstration Project U.S. Department of Energy	Date

PREPARED BY

Joseph C. Grice		3/31/2021
	Review Team Leader West Valley Demonstration Project U.S. Department of Energy	Date

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Acronyms and Abbreviations

A

ARF
Airborne Release Fraction
ASME
American Society of Mechanical Engineers

C

CFR
Code of Federal Regulations
CPC
Chemical Process Cell
CPC-WSA
Chemical Process Cell Waste Storage Area
CSPF
Container Sorting and Packaging Facility
CSRF
Contact Size Reduction Facility

D

D&D
Decontamination and Decommissioning
DOE
Department of Energy
DOE-WVDP
Department of Energy - West Valley Demonstration Project
DR
Damage Ratio
DSA
Documented Safety Analysis

E

EG
Evaluation Guideline

F

FRS
Fuel Receiving and Storage

H

HA
Hazard Analysis
HC
Hazard Category
HE
Hazard Evaluation
HEV
Head End Ventilation
HLW
High-Level Waste
HLWIS
High-Level Waste Interim Storage
HLWSS
High-Level Waste Storage System

K

kW
kilowatt

L

LLW
Low-Level Waste
LLW2
Low-Level Waste Water Treatment Facility
LSA
Lag Storage Area

M

MAR
Material at Risk

N

NFS
Nuclear Fuel Services, Inc.
NRC
Nuclear Regulatory Commission
NWS
North Wind Solutions, LLC

O

OEP
On-Site Evaluation Point

P

PE-Ci
Plutonium-239 Equivalent Curies
PVS
Permanent Ventilation System

R

RF
Respirable Fraction
RHWF
Remote Handled Waste Facility
RSI
Restoration Services, Inc.

S

SAC
Specific Administrative Control
SBAA
Safety Basis Approval Authority
SER
Safety Evaluation Report

SS
Safety Significant
SSC
Structure, System, and Component
STS
Supernatant Treatment System

T

TRU
Transuranic
TSR
Technical Safety Requirement

U

USQ
Unreviewed Safety Question
USQD
Unreviewed Safety Question Determination

W

WNYNSC
Western New York Nuclear Service Center
WPA
Waste Packaging Area
WTF
Waste Tank Farm
WVDP
West Valley Demonstration Project

EXECUTIVE SUMMARY

This Safety Evaluation Report (SER) serves as the U.S. Department of Energy (DOE) approval document under 10 Code of Federal Regulations (CFR) 830, Subpart B, "Safety Basis Requirements" for WVNS-DSA-001, Revision 22, "Safety Analysis Report for Waste Processing and Support Activities" and WVDP-146, "Technical Safety Requirements," Revision 15. A listing of the facilities and hazard categorization of the facilities encompassed in the Documented Safety Analysis (DSA) is provided in Section 1.3.

Documented Safety Analysis

WVNS-DSA-001 is an annual update that incorporates, as appropriate, applicable facility and operations changes previously evaluated in Unreviewed Safety Question Determinations (USQDs) USQD-18-138 through USQD-20-100.

Updates included:

- Revised to reflect demolition of the:
 - Main Plant Process Building (MPPB) Office,
 - Chemical Process Cell – Waste Storage Area (CPC-WSA), and
 - Utility Room (UR)
- Revised to update activity estimates for the Process Mechanical Cell (PMC) and the General Purpose Cell (GPC)

Technical Safety Requirements (TSRs)

The DOE Review Team reviewed WVDP-146, "WVDP Technical Safety Requirements," in concert with the review of WVNS-DSA-001. The TSR Program described in WVDP-146 is consistent with the requirements in 10 CFR 830.205 and the TSRs are appropriately derived from WVNS-DSA-001. Specific Administrative Controls (SACs) are consistent with the preventive and mitigative features identified in the Hazard Evaluation (HE) from WVNS-DSA-001 and are appropriate for known, near-term changes to waste relocation and storage operations.

Nuclear Regulatory Commission Involvement

The Nuclear Regulatory Commission (NRC) had previously been involved in the review of earlier revisions of WVNS-SAR-001 (predecessor to WVNS-DSA-001) to ensure that the activities, within hazard category (HC) 2 facilities at the WVDP were protective of the public for radiological hazards. These reviews are documented in the referenced NRC SERs. The NRC did not perform a review of this revision of WVNS-DSA-001 and WVDP-146. The most recent NRC review in 2014 indicated no outstanding issues (Letter 362890). The NRC will continue to assess the WVDP safety basis as part of NRCs ongoing monitoring visits.

In summary, the DOE review evaluated the radiological and non-radiological risks associated with operation of the facilities described in WVNS-DSA-001. This review concluded that waste processing and support activities do not present a significant impact to the safety of on-site workers, the public, or the environment and that WVNS-DSA-001, Revision 22, and WVDP-146, Revision 15, are adequate.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this SER is to document DOE's review of WVNS-DSA-001, Revision 222, "Documented Safety Analysis for Waste Processing and Support Activities," and WVDP-146, Revision 15, "WVDP Technical Safety Requirements," and to serve as the DOE's approval for these documents. The analysis contained in WVNS-DSA-001 evaluated the hazards associated with waste processing and support activities at the WVDP.

Staff from DOE-WVDP and DOE support services contractors formed the review team that reviewed WVNS-DSA-001 and WVDP-146, and prepared this SER for DOE approval. More detailed discussion of the review is provided in Section 2.

This SER indicates that sufficient DOE and other agency reviews have been completed, and subsequently, efforts have been conducted to achieve the necessary level of reliance on WVNS-DSA-001. This SER summarizes these reviews and shows that DOE has confidence in the safety basis described in WVNS-DSA-001 and WVDP-146. No Conditions for Approval were identified during this review.

1.2 Background

1.2.1 Brief History of Site

The Western New York Nuclear Service Center (WNYNSC) in West Valley, New York, was the site of the first commercial nuclear reprocessing operation in the United States. It was operated by Nuclear Fuel Services, Inc. (NFS), beginning in the early 1960s and was discontinued in the early 1970s. The reprocessing operation resulted in the generation of approximately 600,000 gallons of HLW that was stored in underground tanks; several contaminated facilities (including the highly contaminated Main Plant Process Building); and areas of localized soil and groundwater contamination.

The WVDP is located on approximately 160 acres within the 3,345-acre WNYNSC in rural Cattaraugus County, about 30 miles south of Buffalo, New York. The Project facilities include the former NFS plant and related facilities, some of which have been decontaminated (in whole or in part) and are currently in use by the WVDP, other areas currently undergoing hazard reduction activities, and several buildings and facilities constructed by the WVDP.

1.2.2 Brief Mission Recap

In 1980, Congress passed the WVDP Act (Public Law 96-368) directing the DOE to carry out a HLW management project to demonstrate solidification techniques for preparing the HLW at the WNYNSC for disposal. Vitrification was determined to be the best demonstrated available technology for the treatment of HLW and was accordingly selected as the preferred technology.

The WVDP Act directs the Secretary of Energy to undertake five major activities, as follows:

- Solidify, in a form suitable for transportation and disposal, the HLW at the WNYNSC;
- Develop containers suitable for the permanent disposal of the HLW solidified at the WNYNSC;
- Transport the HLW to an appropriate Federal repository for permanent disposal;
- Dispose of low-level radioactive waste (LLW) and TRU waste produced by the Project; and
- D&D the HLW tanks and other facilities of the WNYNSC in which the HLW was stored, the facilities used in the solidification of the HLW, and any material and hardware used in connection with the Project.

The first two activities have been completed, and 278 canisters of HLW are currently stored within vertical storage casks on the HLW Storage Pad. The Project is currently focused on the last two requirements since a federal repository for the HLW has yet to be opened. WVNS-DSA-001 describes the facilities, activities and operations associated with completion of the final two requirements.

As mission activities have been completed, the WVDP continues to move toward site closure and as such revision to controlling documents is required. The WVDP mission now focuses on decontamination and decommissioning (D&D) activities. WVNS-DSA-001 fulfills the requirements of 10 CFR 830 for a DSA and DOE-STD-1189-2016 "Integration of Safety into the Design Process" for WVDP activities.

1.3 Hazard Categorization of WVDP Facilities

In accordance with 10 CFR 830.202(b)(3), nuclear facilities at the WVDP have been categorized in accordance with DOE-STD-1027-2018, "Hazard Categorization of DOE Nuclear Facilities." Table 1 lists the nuclear facilities that are addressed in WVNS-DSA-001.

**Table 1
Nuclear Facilities Addressed in WVNS-DSA-001**

FACILITY	HC
Main Plant Process Building including: <ul style="list-style-type: none"> • HLW Interim Storage (HLWIS) • Fuel Receiving and Storage (FRS) • Vitrification Load-In Facility 	3
Waste Tank Farm (WTF) including: <ul style="list-style-type: none"> • HLW Tanks • WTF Shelter • Supernatant Treatment System (STS) Support Building • Permanent Ventilation System (PVS) • HLW Transfer Trench 	3
Lag Storage, including: <ul style="list-style-type: none"> • Lag Storage Area (LSA)-3 • LSA-4 <ul style="list-style-type: none"> ○ Container Sorting and Packaging Facility (CSPF) ○ Waste Processing Area (WPA) ○ Shipping Depot • Lag Hardstand • FRS North Yard hardstand 	3
Remote Handled Waste Facility (RHWF)	3

The analysis presented in WVNS-DSA-001 evaluated the hazards associated with waste processing and support activities. The analysis concludes that significant on-site and insignificant off-site consequences could result from abnormal or accident events, and as stated in WVNS-DSA-001 the probability of occurrence of these events is anticipated through extremely unlikely. WVNS-DSA-001 appropriately discusses the design, the physical plant as constructed, and the policies and administrative controls that are in place to prevent or mitigate the risk to workers and members of the off-site public. Additionally, WVNS-DSA-001 concludes that the HLW Storage System (HLWSS) is a below HC 3 facility.

A further discussion of the major facility hazards and the dominant accident scenarios follows below.

1.4 Summary of Major Facility Hazards and Dominant Accident Scenarios

No accident scenario analyzed in the DSA led to an off-site radiological or non-radiological release that challenged the evaluation guideline (EG) stated in DOE-STD-3009-94, Change Notice 3, and “Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis.” Therefore, waste processing operations and support activities at

the WVDP do not present a threat to public health and safety. The systematic analysis of hazards associated with WVDP facilities resulted in the identification of two generalized accident sequences requiring quantitative analysis. This is consistent with the expectations in DOE-STD-3009-94 that specifies that Hazard Category 3 facilities are not required to perform formal quantitative accident analysis. Safety significant (SS) structures, systems and components (SSCs) have been identified relative to on-site handling and storage of TRU waste. The health and safety of facility workers is also ensured through passive design features, DOE-approved programs such as the site's integrated Safety Management System, the Radiation Protection Program, and the Emergency Preparedness Program.

Radiological Events

The hazard analysis (HA) is presented in Section 3.3 of WVNS-DSA-001. The HA indicates that the postulated radiological events having the greatest potential for a health-threatening consequence are those associated with TRU waste. The DSA documents the systematic evaluation of a full spectrum of postulated facility accident events and concluded that the bounding event for the WVDP is a fuel pool fire involving an array of 504 unoverpacked TRU waste drums. The MAR and subsequent source term are thoroughly documented in WVNS-CAL-391, "WVDP Hazard and Accident Evaluation Bases." For this event, the maximum off-site dose (0.98 rem) is well below and does not challenge the radiological dose EG for the maximally exposed off-site individual (25 rem). The on-site unmitigated consequence has been conservatively calculated to be 3.3 rem at a distance of 100 meters.

To ensure on-site and off-site protection from TRU waste fires, SACs have been established in WVNS-DSA-001 and WVDP-146 that require packaging of high activity TRU waste in non-combustible containers; MAR limits for TRU waste handled outside of approved containers; use of robust overpacks for storage of high inventory TRU waste; and isolation of arrays of TRU waste from sources of liquid fossil fuel.

Nonradiological Events

The postulated non-radiological events with the most severe consequences are fires or spills of chemicals (e.g., sulfuric acid, sodium hydroxide, hydrogen peroxide) used on-site. The consequence for this event was determined to be low, meaning minor impacts to on-site personnel and environs. Therefore, quantitative assessment of these events was not performed.

Summary

In summary, there were no identified unmitigated on-site or off-site consequences exceeding the EG specified in WVNS-DSA-001, Table 3.3-3, resulting from radiological events. Non-radiological events resulted in minor on-site and off-site consequences. The occurrence of the most severe events is extremely unlikely or beyond extremely unlikely. Design features and SACs that protect the facility worker are further described in Section 4.

2.0 REVIEW PROCESS

2.1 Purpose

This section of the SER briefly discusses and summarizes the thoroughness of the process that was applied to the review of WVNS-DSA-001 and WVDP-146 and provides justification for DOE approval of the DSA and TSR documents. This section does not provide a detailed record of individual comments received during the review process.

2.2 Review Participants

Key participants in the WVNS-DSA-001 review process included federal and contractor staff from DOE-WVDP:

Name	Org.	Title
J. C. Grice	DOE-WVDP	Review Leader
C. R. Rieman	DOE-WVDP	Deputy Director
J. M. Dundas	DOE-WVDP	Safety and Site Programs Team Leader
S. C. McCabe	DOE-WVDP	Facility Representative in Training
J. J. Prowse	North Wind Solutions, LLC (NWS)	Safety and Site Programs Team
M. T. Schwippert	North Wind Solutions, LLC (NWS)	Safety and Site Programs Team

Review team member background and experience may be found in the safety basis approval authority (SBAA) approved review plan (Document 383790) for WVNS-DSA-001 and WVDP-146.

2.3 Basic Premise of the Review

The review was conducted in accordance with the SBAA approved review plan. All comments received from reviewers were tracked through resolution. Verification of adequate resolution to all comments has been documented under a program that meets the requirements of DOE Order 414.1D. These records of comment resolution are maintained as Quality Assurance records.

The participants mentioned in Section 2.2 of this SER performed in-depth, detailed technical reviews of the changes to WVNS-DSA-001 and WVDP-146. A kickoff meeting was conducted to provide a general overview of the DSA and associated facilities and operations, identify the

conclusions of the DSA, and to provide expectations for the conduct of the review. The review was conducted in accordance with an approved review plan.

The scope of the reviews encompassed all facets of WVNS-DSA-001 including: site characteristics, principal design criteria, waste confinement and management, hazards protection, consequence assessment/accident analysis, conduct of operations and quality assurance. The criteria used to evaluate WVNS-DSA-001 included the following:

- DOE Guide 423.1-1B, *Implementation Guide for Use in Developing TSRs*
- DOE Order 231.1B, *Environment Safety and Health Reporting*
- DOE Order 414.1D, *Quality Assurance*
- DOE Order 420.1C, *Facility Safety*
- DOE Order 422.1, *Conduct of Operations*
- DOE Policy 450.4A, *Integrated Safety Management Policy*
- DOE-STD-1027-2018, *Hazard Categorization of DOE Nuclear Facilities*
- DOE-STD-1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*
- DOE-STD-1120-2005, *Integration of ES&H into Facility Disposition Activities*¹
- DOE-STD-1186-2016, *Specific Administrative Controls*
- DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*¹
- DOE-STD-5506-2007, *Preparation of Safety Basis Documents for TRU Waste Facilities*
- 10 CFR 830, *Nuclear Safety Management*
- 10 CFR 830, Subpart A, *Quality Assurance*
- 10 CFR 830, Subpart B, *Safety Basis Requirements*
- 10 CFR 835, *Occupational Radiation Protection*
- 29 CFR Part 1910, *Occupational Safety and Health Standards*
- American Society of Mechanical Engineers (ASME) NQA-1, *Quality Assurance Requirements for Nuclear Facility Applications*

The NRC had previously been involved in the review of earlier revisions of WVNS-SAR-001 to ensure that the activities, within HC 2 facilities at the WVDP were protective of the public for radiological hazards, and in reviews of WVNS-DSA-001 and WVDP-146. These reviews are documented in the referenced NRC SERs. The NRC did not perform a review of this revision of WVNS-DSA-001 and WVDP-146. The NRC will continue to assess the WVDP safety basis as part of NRCs ongoing monitoring visits.

¹ The superseded version of the standard is being used consistent with Contract Requirements.

3.0 BASE INFORMATION

3.1 Purpose

The purpose of this section of the SER is to approve the adequacy of the DSA base information, including any condition of approval imposed by DOE.

3.2 Adequacy Statement

The thoroughness and adequacy of WVNS-DSA-001 base information was ultimately verified and achieved through the review/comment and comment resolution phase of the DSA development. The thoroughness of the DSA base information was verified by the detailed review from the organizations listed in Section 2.2 of the SER. As described, the review team represented an adequate mix of expertise with regard to development and implementation of the Safety Basis.

Comments from all reviewers have been resolved. Comments were resolved by incorporation into the DSA or clarification to the reviewers. No Conditions of Approval are necessary.

3.3 Synopsis of Facilities and Operation Process Features

WVNS-DSA-001 describes the facilities and operation process features related to the WVDP. The primary focus of WVNS-DSA-001 is directed to operations associated with waste management activities at the WVDP, as well as D&D activities necessary to prepare site facilities for ultimate closure.

The Main Plant Process Building is the location of the original spent nuclear fuel operations conducted by NFS. Several areas of the Main Plant Process Building contain legacy equipment and residual radioactive contamination resulting from these processes. Virtually all of the areas have now been deactivated with only a few areas requiring to be further decontaminated by the site contractor. The MPPB is currently being prepared for final facility demolition.

The Vitrification Facility (VF) was the structure that contained the equipment used for the solidification of HLW sludge created from spent nuclear fuel operations conducted by NFS. The demolition of the above grade portions of the VF was completed as part of the site closure plan.

Liquid and solid LLW treatment, processing and storage facilities are provided at the WVDP. Liquid LLW at the WVDP includes liquids resulting from area or equipment decontamination, treated solutions from flush water, and filter backwash. These waste waters are treated using equipment located in the LLW Treatment Replacement Facility (LLW2). Temporary storage of these liquid wastes is provided by four lagoon storage basins.

Interim (Lag) storage of solid LLW, hazardous waste, low-level mixed waste, and TRU waste is provided in the Lag Storage Facilities, and Satellite Accumulation Areas.

Solid waste at the WVDP is processed for volume reduction and off-site shipment. Processing facilities include the RHWF, CSPF, and the LSA-4 WPA.

The CSPF, a stand-alone facility located inside LSA-4, is used to sort, segregate, and repackage LLW, low-level mixed waste, and TRU waste. The LSA-4 WPA is a second self-contained area located inside LSA-4 that provides an additional area for waste sorting, segregation and repackaging.

The RHWF is a free-standing facility that was designed and constructed to accommodate the waste streams from D&D activities at the WVDP. The RHWF receives solid radioactive waste from other locations on the WVDP site and is used to visually inspect, sort, size reduce, segment, collect samples, and repackage waste in a manner that meets current or expected disposal requirements.

4.0 HAZARD AND ACCIDENT ANALYSIS

4.1 Purpose

The purpose of this section of the SER is to document the DOE approval of the DSA's hazard and accident analyses, including describing any Conditions of Approval imposed. No attempt is made to reproduce the HA stated in Section 3.3 of the DSA.

Since DOE-STD-3009-94 is used as the "safe harbor" approach, as listed in 10 CFR 830, Subpart B, Appendix A, Table 2, for WVNS-DSA-001, this standard serves as the primary review criteria. In addition, DOE-STD-5506-2007 has been used as it relates to TRU waste facilities' safety bases. Overall the DOE Review Team gave consideration to the following elements to judge the adequacy of the hazard and accident analyses:

- Are radioactive and chemical hazards contained within the facility identified and addressed in the hazard analysis?
- Has the facility been categorized in a manner consistent with DOE-STD-1027-2018, Change Notice 1?
- Was a full spectrum of accidents evaluated based on the scope of proposed work activities, including external man-made hazards and natural phenomena events?
- Have operational controls been selected commensurate with the level of hazard, consequences, and effectiveness in controlling the hazards?

4.2 Hazard Identification

Various sections of the DSA describe the sources of hazards remaining within the several site areas covered by the DSA. Hazards at the WVDP include non-radiological hazards associated with process chemicals and radiological hazards associated with residual facility contamination and packaged wastes. The HE documented in Table 3.3-1 of WVNS-DSA-001 identifies the non-radiological hazards at the WVDP and demonstrates that the chemicals in use at the site are of relatively small quantity and low risk. These chemicals are primarily relied upon for treatment of site influent and effluent waters and in general are of low toxicity.

Section 3.3.2 of the DSA documents the radiological hazards at the WVDP, which include surface contamination in the shielded areas of site buildings, bulk residual contamination in un-decontaminated areas of site facilities, and sources contained within the packaged LLW, TRU waste, and HLW stored in several locations throughout the WVDP.

Parameters used to determine the consequences of accidents analyzed in the DSA, including MAR, airborne release fraction (ARF) x respirable fraction (RF), and damage ratio (DR) are as recommended in DOE-STD-5506-2007 and DOE-HDBK-3010-94. Identification of the isotopic distribution is not required because the plutonium-239 equivalent curie (PE-Ci) is used. For TRU waste container accidents, DOE-STD-5506-2007, recommends a non-parametric statistical selection process for the identification of containers used in the accident scenarios involving multiple containers with limited or partial characterization. This methodology provides a reasonably bounding approach for typical TRU waste operations. DOE agrees that the WVDP approach results in a conservatively bounding source term for the accident evaluated.

The DOE Review Team concluded that hazard identification is robust and supports the hazard and accident analysis.

4.3 Hazard Categorization

Facility HCs documented in WVNS-DSA-001 are based on the total inventory in a given facility segment and the consequences of an unmitigated release following a bounding credible accident. The Facility HC was revised to reflect the changes in the updated guidance of DOE-STD-1027-2018. DOE-STD-1027-2018 was applied to segment facilities, where appropriate, and to perform a final facility hazard categorization that acknowledged the limited mobility of stabilized hazardous sources, such as those present in the site's terminal waste forms (e.g., vitrified HLW).

The categorization of WVDP facilities has been established and agreed to by DOE as HC 3 or below. WVDP nuclear facilities were previously listed in Table 1 on page 5.

4.4 Hazard and Accident Analysis

A description of the HE methodology is presented in Section 3.3.2.3 of the DSA. The overall approach used to classify accident consequences and frequencies is consistent with example methods discussed in DOE-STD-3009-94 and DOE-STD-5506-2007, including the use of risk factors as input to accident selection.

WVDP facilities typical have multiple layers of defense-in-depth:

- Passive confinement barriers
- Waste form and limited inventory
- Active confinement barriers
- Alarms and monitors

The HE identified both preventive and mitigative defense-in-depth items for each event sequence.

The fundamental aspects of worker safety and environmental protection are described in Chapter 2 associated with confinement systems and safety support systems, Chapter 4 associated with SS SSCs, Chapter 7 associated with radiation safety, Chapter 8 associated with hazardous material protection, Chapter 11 associated with occupational safety, Chapter 13 associated with human factors, Chapter 15 associated with emergency preparedness, and Chapter 17 associated with institutional safety provisions.

The greatest on-site consequence, as presented in Section 3.4.2.1.3 of the DSA, was associated with a fire involving an array of unoverpacked TRU waste drums. For this event, the maximum off-site dose (0.98 rem) is well below, and does not challenge, the radiological dose EG for the maximally exposed off-site individual (25 rem). The on-site unmitigated consequence was conservatively calculated to be 3.3 rem at the on-site evaluation point (OEP; at a distance of 100 meters).

The DOE Review Team has concluded that the accident analysis of a containerized TRU waste fire event is reasonably bounding for accidents involving TRU waste at the WVDP. The DOE Review Team recognized that TSR SACs have been established to designate SS SSCs and to

ensure worker safety in association with TRU waste. In addition, the DOE Review Team agrees that the MAR, ARF, DR, and RF values selected for use in the development of source terms and used in the accident analyses are very conservative and consistent with those specified in DOE-STD-5506-2007.

5.0 SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS

5.1 Purpose

The purpose of this section of the SER is to evaluate the bases and justification for designation of safety class or SS SSCs within WVNS-DSA-001.

5.2 Safety SSC Development

Consistent with HC 3 no safety class SSCs have been designated at the WVDP. The accident analyses demonstrate that safety class SSCs are not warranted. The greatest on-site consequence, as presented in Section 3.4.2.1.3 of the DSA, was associated with a fire involving an array of unoverpacked TRU waste drums. For this event, the maximum off-site dose (0.98 rem) is well below, and does not challenge, the radiological dose EG for the maximally exposed off-site individual (25 rem).

The results of the accident analyses associated with in-storage TRU wastes containing greater than 10 PE-Ci warrant the designation of overpacks that provide protection as SS SSCs. The SS approved overpacks provide two safety functions: fire and heat resistance, and physical protection from impact. The unmitigated consequence was conservatively calculated to be 3.3 rem at the OEP at a distance of 100 meters.

6.0 SPECIFIC ADMINISTRATIVE CONTROLS

6.1 Purpose

Operational controls are developed to reduce the frequency and/or consequence of a credible accident leading to an uncontrolled release of radioactive material. Operational controls that are credited in the HE, Table 3.3-1 of WVNS-DSA-001, serve as the basis for selection.

6.2 Derivations SACs

Derivation of TSR controls is described in Section 5.0 of the DSA. The DSA recognizes Administrative Controls that include a commitment to Safety Management Programs and SACs, discussed in Section 4.5 of the DSA, which are developed to reduce frequency and/or consequence of a credible accident. There is a direct correlation between the DSA hazard and accident analyses and the derivation of TSRs.

Applying the guidance of DOE G 423.1-1B and DOE-STD-1186-2016 the set of controls prescribed here have been reduced to the minimum set necessary to satisfy the safety criteria established for the facility. Controls selected as SACs for WVDP operations are intended to reduce the risk of a fire involving TRU waste. SACs are specified for TRU waste containerization, facility inventory control, TRU waste drum fire protection, TRU wastes container physical protection, and criteria for TRU waste areas. Derived SACs identified in WVNS-DSA-001 are provided in WVDP-146, Section 5.11. A summary of the SACs is provided:

1. TRU waste in LSA-3 and LSA-4 that is not in process shall be stored in an approved container
2. The maximum amount of activity that may be IN PROCESS in LSA-3 and LSA-4 SHALL not exceed the greater of 1.0 PE-Ci or the temporary activity limit identified in Table 4.5-1 that is specified for processing specific waste streams in LSA-4. Work control documents for activities associated with temporary limits specified in Table 4.5-1 SHALL define the time period for waste processing and SHALL be reviewed in accordance with the Unreviewed Safety Question Process program.
3. TRU waste greater than 10 PE-Ci shall be packaged within an approved overpack for storage outside of the Main Plant Process Building or the RHWF. Waste containers identified in Table 4.5-1 shall be exempt from the requirement to be in an approved overpack.
4. LSA-3 and LSA-4 equipment is limited to 60-gallons of diesel fuel

DOE agrees that these controls provide an appropriate layer of protection for the radiological and non-radiological hazards present at the WVDP.

7.0 DERIVATION OF TECHNICAL SAFETY REQUIREMENTS

7.1 Purpose

The purpose of this section of the SER is to document the DOE review and approval basis for the derivation of TSR controls as established in WVNS-DSA-001. The section also provides the basis for TSR provisions as contained in WVDP-146. The basis for the DOE review included DOE-STD-3009-94 expectations for control derivation, TSR requirements of 10 CFR 830.205, and acceptable TSR practices described in DOE G 423.1-1B, "Implementation Guide for Use in Developing TSRs" and DOE-STD-1186-2016, "Specific Administrative Controls."

7.2 Derivation of TSR Controls

Derivation of TSR controls is described in Section 5.0 of the DSA. The DSA recognizes Design Features, Administrative Controls that include a commitment to Safety Management Programs and SACs, discussed in Section 4.5 of the DSA, which are developed to reduce frequency and/or consequence of a credible accident.

Design Features

WVNS-DSA-001 acknowledges that TRU waste shall be stored in "approved containers" and that meet the criteria for a TSR design feature. WVDP-146 defines "approved containers" as containers that meet the following requirements:

- Are fabricated from a non-combustible material such as carbon steel, stainless steel, or galvanized steel;
- Have a lid in place with all bolts, snap rings, clips, or other fastening devices in place; and
- Have been procured or have otherwise been determined to be acceptable per an approved Quality Assurance program.

These features are important for worker protection following an energetic event involving TRU waste. Storage of TRU waste in an "approved container" significantly reduces the potential for fire propagation and limits the amount of alpha-emitting activity available for release during a fire involving arrays of TRU waste containers.

Also, TRU waste in storage containing greater than 10 PE-Ci shall be in "approved overpacks" and that meet the criteria for a TSR design feature. WVDP-146 defines "approved overpacks" as containers that are meet the following requirements:

- Designed for an interior surface maximum heat flux in excess of 10 kilowatt (kW)/square meter (m²) under 10 CFR 71.73(c)(4) conditions;
- Resist perforation when impacted by a 13,000 pound vehicle traveling 15 miles per hour or from a design basis tornado missile.

WVNS-DSA-001 does not indicate any facility structural design features that require coverage as TSR design features.

7.3 Provision of TSRs

The DOE review focused on TSR provisions provided in WVDP-146, which are applicable to facilities covered by WVNS-DSA-001.

The DOE Review Team agrees that no safety limits, limiting control settings or limiting conditions for operation are necessary based on the results of hazard and accident analyses. The TSR does not contain these provisions. The DOE review focused primarily on other provisions of the TSR including SACs.

8.0 SAFETY MANAGEMENT PROGRAMS

8.1 Purpose

The purpose of this section is to document the DOE review and approval basis for the safety management programs relied upon in WVNS-DSA-001.

8.2 Program List

The following list of programs identifies the principles and relationship to defense-in-depth, worker safety, and document accident scenarios:

- Safety Document Preparation – requires that nuclear facilities be evaluated to identify hazards and potential accidents with appropriate controls developed
- Worker Safety – requires that work be conducted in a manner to ensure the safety and well-being of all site workers
- Radiological Protection – requires that work be performed such that radiation exposures to workers, the public, and the environment are kept as low as reasonably achievable
- Nuclear Criticality Safety – requires that the probability of an inadvertent criticality is acceptably low
- Emergency Response – provides the direction and approach to be used to minimize the impact of any emergency upon the health and safety of workers, the public, and the environment
- Quality Assurance – provides criteria for planning, performing, and assessing the effectiveness of all project activities
- Fire Protection – requires a comprehensive fire protection program to minimize the potential for the occurrence of a fire, and a fire that causes an unacceptable on-site or off-site release; fires are the most significant initiating event identified within the DSA
- Performance Based Training – requires technical competence in job performance is established, monitored and maintained
- Maintenance – provides assurance of availability of equipment that promotes operational safety, worker health, and environmental protection
- Conduct of Operations – requires all operations are managed, organized, and conducted in a manner commensurate with the programmatic importance and potential for environmental, safety and health impact
- Waste Management – requires waste be managed to protect the public, environment, worker and to be compliant with applicable laws and regulations

9.0 TECHNICAL SAFETY REQUIREMENTS

9.1 Purpose

The purpose of this section of the SER is to document the DOE review and approval basis for the TSRs as contained in WVDP-146. The basis for the DOE review included DOE-STD-3009-94 expectations for control derivation, TSR requirements of 10 CFR 830.205, and acceptable TSR practices described in DOE G 423.1-1B, "Implementation Guide for Use in Developing TSRs" and DOE-STD-1186-2016, "Specific Administrative Controls."

9.2 Verification of Safety Control Commitments

The safety control commitments derived in WVNS-DSA-001 have been verified by DOE to be carried through to the TSR provisions in WVDP-146. Further, CH2M Hill BWXT West Valley, LLC will perform an implementation verification review prior to commencing operation under the revised safety basis.

10.0 CONDITIONS OF APPROVAL

The review of WVNS-DSA-001 concludes that the analyses documented in the DSA are adequate in both scope and detail to provide an adequate basis for controls specified in the DSA and WVDP-146. Consequently, no Conditions of Approval are required.

11.0 RECORDS

WVNS-SAR-001, Safety Analysis Report for Project Overview and General Information, Revisions 2 through 12, West Valley Nuclear Services Company, various dates.

WVNS-SAR-002, Safety Analysis Report for Low Level Waste Processing and Support Activities, Revisions 3 through 8, West Valley Nuclear Services Company, various dates.

WVNS-SAR-002, Addendum 4, Safety Analysis Report Addendum for Head End Cell Decontamination and Waste Packaging, Revision 0, West Valley Nuclear Services Company, March 1, 2002.

WVNS-SAR-003, Safety Analysis Report for Vitrification Operations and High Level Waste Interim Storage, Revisions 0 through 7, West Valley Nuclear Services Company, various dates.

WVNS-SAR-012, Safety Analysis Report for Fuel Receiving and Storage Facility, Revisions 0 through 3, West Valley Nuclear Services Company, various dates.

WVDP-SER-001, Safety Evaluation Report for Project Overview and General Information, Revision 1, September 2002.

WVDP-SER-001, Safety Evaluation Report for Low Level Waste Processing and Support Activities and the Remote Handled Waste Facility, Revision 2, February 2004.

WVDP-SER-023, Safety Evaluation Report for the Remote Handled Waste Facility, Revision 1, September 2000.

WVDP-146, West Valley Demonstration Project Technical Safety Requirements, Revision 5.

NRC Staff Safety Evaluation Report on the Dormant West Valley Reprocessing Facility, U. S. Nuclear Regulatory Commission, January 1982.

Safety Evaluation Report on the West Valley Demonstration Project Cement Solidification System, U. S. Nuclear Regulatory Commission, August 1987.

Safety Evaluation Report on the West Valley Demonstration Project Supernatant Treatment System, A Review of Safety Analysis Report, Volume III, Part D (WVNS-SAR-004 Revision 6), U. S. Nuclear Regulatory Commission, August 1987.

Safety Evaluation Report on the West Valley Demonstration Project Liquid Waste Treatment System, U. S. Nuclear Regulatory Commission, April 1988.

Safety Evaluation Report on the West Valley Demonstration Project Low Level Waste Drum Cell, U. S. Nuclear Regulatory Commission, January 1989.

Safety Evaluation Report on the West Valley Demonstration Project Supernatant Treatment System, U. S. Nuclear Regulatory Commission, September 1987.

Letter, G. C. Comfort, Jr., to T. J. Rowland, "NRC Review of Safety Analysis Report for Project Overview and General Information, WVNS-SAR-001, Revision 2, Draft G," dated July 26, 1996.

Letter, G. C. Comfort, Jr., to T. J. Rowland, "NRC Review of Safety Analysis Report for Low Level Waste Processing and Support Activities, WVNS-SAR-002, Revision 3," dated September 13, 1995.

Letter, L. W. Camper to A. C. Williams, "U. S. Nuclear Regulatory Commission Safety Evaluation Report of WVNS-SAR-002, Safety Analysis Report for Low-Level Waste Processing and Support Activities," dated October 26, 2001.

Safety Evaluation Report on the West Valley Demonstration Project Vitrification Process and High Level Waste Interim Storage, A Review of WVNS-SAR-003, Revision 2, Draft D, U. S. Nuclear Regulatory Commission, May 1995.

Letter 1760:95:09, G. C. Comfort to T. J. Rowland, "NRC Review of Safety Analysis Report for Fuel Receiving and Storage Facility, WVNS-SAR-012, Revision 0, Draft C," dated February 19, 1997.

Letter, D. M. Gillen to T. J. Jackson, "U. S. Nuclear Regulatory Commission Safety Evaluation Report on the West Valley Demonstration Project Safety Analysis Report for the Remote-Handled Waste Facility (WVNS-SAR-023, Revision 1, Draft D)," dated November 7, 2003.

West Valley Demonstration Project Act (Public Law 96 368).

Letter WD:2006:0358 (96810), L. J. Chilson to B. C. Bower, "West Valley Nuclear Services Company Responses to Department of Energy Comments on WVNS-SAR-001, Revision 11, Draft D and WVDP-146, Revision 4, Draft A," dated December 29, 2006.

Letter WD:2008:0262 (99552), J. R. Gerber to B. C. Bower, "West Valley Environmental Services, LLC Responses to the Department of Energy Comments on WVNS-SAR-001, Revision 12, Draft B, "Safety Analysis Report for Waste Processing and Support Activities" and WVDP-146, Revision 5 Draft B, Technical Safety Requirements," dated July 25, 2008

Letter WD:2009:0195 (100926), J. R. Gerber to B. C. Bower, "U. S. Department of Energy West Valley Demonstration Project (DOE-WVDP) Comments on WVNS-DSA-001, Revision 13, Draft B, and WVDP-146, Revision 6, Draft B," dated June 9, 2009.

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Letter WD:2011:0112 (105187), J. R. Gerber to R. W. Reffner, "Submittal of WVNS-DSA-001, Revision 15, Draft B, Documented Safety Analysis for Waste Processing and Support Activities, and WVDP-146, Revision 8, Draft B, Technical Safety Requirements, for Department of Energy (DOE) Approval," dated March 31, 2011.

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Letter 361198, A. Persinko to B. C. Bower, "Comments on WVNS-DSA-001, Documented Safety Analysis for Waste Processing and Support Activities, Revision 17, Draft B; and West Valley Demonstration Project Technical Safety Requirements, Revision 10, Draft B," dated August 22, 2013.

Letter WD:2013:0438 (361629), D. W. Coyne to R. W. Reffner "Contract No. DE-EM0001529, Section J-3, Item 80, Documented Safety Analysis Update, Response to DOE Comments Transmitted by Conveyance Number 80-DLVR-062613, dated September 3, 2013," dated September 12, 2013.

Letter 361919, B. C. Bower to C. Glenn, "Transmittal of Responses to NRC Comments on WVNS-DSA-001, Documented Safety Analysis for Waste Processing and Support Activities, Revision 17, Draft B; and West Valley Demonstration Project Technical Safety Requirements, Revision 10, Draft B," dated October 30, 2013.

Letter 362890, A. Persinko to B. C. Bower, "U.S. Nuclear Regulatory Commission Review of U.S. Department of Energy WVNS-DSA-001, Documented Safety Analysis for Waste Processing and Support Activities, Revision 17, Draft B; And WVDP-146, West Valley Demonstration Project Technical Safety Requirements, Revision 10, Draft B," dated January 29, 2014.

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