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Los Alamos Plutonium Operations FY23–FY28 Program Management Plan

December 2022

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Date: October 15, 2022
Guidance (if applicable): N/A

LANL is planning a pit production strategy to support the enduring stockpile as directed by DOE/NNSA. Presented production quantities, rates, and capacities reflect the LANL minimum. LANL is establishing the capability and capacity to produce all pits for the enduring stockpile. Therefore, any and all infrastructure investments are for the creation of a flexible manufacturing process for future pit production.

Approved:

(b)(6) Date

Los Alamos National Laboratory

Executive Summary

The Department of Energy (DOE) National Nuclear Security Administration (NNSA) plutonium missions are critical to meeting military requirements to ensure the U.S. nuclear deterrent is modern, responsive, and resilient. A major national priority is to reestablish the capability and capacity for pit production.

Los Alamos National Laboratory (LANL) is designated by NNSA as the nation's Plutonium Center of Excellence. The LANL plutonium enterprise includes an experienced and skilled workforce, high-hazard nuclear facilities and associated infrastructure, and unique plutonium processing, fabrication, and experimental capabilities. This enterprise enables the safe, secure, and compliant work with plutonium and other materials and components to fulfill the plutonium missions for the nation. The nation relies on the LANL plutonium enterprise to perform the following plutonium missions:

The nation relies on the plutonium enterprise at LANL to safely, securely, and reliably support nuclear deterrence, nonproliferation, space exploration, and actinide science.

- Produce plutonium pits for the nuclear weapons stockpile
- Produce radioisotope thermoelectric generators (RTGs) for the nuclear weapons stockpile
- Produce Pu-238 heat sources for use in space exploration and national security
- Evaluate pits and RTGs returned from the nuclear weapons stockpile to support annual stockpile assessments and inform future pit and RTG designs
- Produce plutonium components for assembly into devices for use in subcritical experiments
- Conduct fundamental science on the material properties and aging of plutonium
- Process plutonium into forms suitable for disposition to support nonproliferation goals
- Evaluate containers for safe storage of plutonium materials throughout the DOE/NNSA complex
- Recover americium for the DOE Office of Science (DOE-SC)

To better support the expansion of the pit production mission at LANL, in FY21 NNSA combined the LANL portions of the Plutonium Sustainment, Material Recycle and Recovery (MR&R), and Storage programs into a single new program called Los Alamos Plutonium Operations, which is one of several programs and line-item projects within the Plutonium Modernization program portfolio. This new program funds LANL for the scope directly related to achieving the 30 pits per year (ppy) pit production mission.

LANL manages its plutonium operations in accordance with LANL's response (dated July 22, 2021) to the memorandum from M. Thompson to T. Wyka, Prioritization of Programmatic Activities at Los Alamos National Laboratory's Plutonium Facility (PF)-4, dated June 22, 2021 (NNSA-2021-002838) and the associated Contract Officer letter dated June 24, 2021 (MAI: 33TF-2021-003031).

The timeline for the current program of record to achieve steady-state pit production is listed below:

FY23:	• Complete product realization activities to qualify the War Reserve (WR) production processes
CY2023:	• Produce the first production unit (FPU) of a WR-quality pit
CY2024:	• Produce a minimum of 10 WR pits • (b)(5)
CY2025:	• Produce a minimum of 20 WR pits
CY2026:	• Produce a minimum of 30 WR pits

(b)(5)

This Program Management Plan (PMP) addresses the critical challenges LANL faces and the actions LANL will take to expand pit production. Although the Los Alamos Plutonium Operations program is not fully responsible for all the challenges discussed in Section 2, it is a stakeholder for all of them.

In this PMP, the Los Alamos Plutonium Operations program scope is discussed in four subsections, sometimes referred to as functional areas:

Pit and Subcritical Experiments (SCE) Production—Development and production of pits and plutonium components for subcritical experiments

Plutonium Supply Chain—Purification of plutonium metal, recovery of plutonium from production byproducts and waste streams, and nuclear material storage

Operational Support and Equipment Maintenance—Services required to execute Los Alamos Plutonium Operations programmatic scope (e.g., criticality safety, radiation protection, training, and glovebox maintenance); disposition and shipment of radioactive waste; and maintenance of programmatic equipment

Capital Acquisition Projects—This subsection covers the WBS element Asset Management and refers to the establishment of technical requirements; design, procurement, installation, decontamination and decommissioning (D&D) needed to establish the process; equipment and gloveboxes (b)(5)

LANL's approach to risk management of Plutonium Operations is discussed in Section 4. Specifically, this section discusses the focused areas of risk associated with achieving FPU and the various rate productions required by this program. The processes in which risks are identified, quantified, and managed are also outlined.

This PMP covers the timeline of FY23 through FY28. Over this timeline, the program follows the rolling-wave planning structure, where detailed schedules are maintained over the nearest fiscal years, and outyears contain planning packages with less detail to balance the needs of near-term program execution with long-term Future Years Nuclear Security Program (FYNSP) planning. This PMP is part of the FY23 Horizon Plan submitted by LANL to NNSA. The planned workforce and anticipated costs from the resource-loaded Horizon Baseline P6 schedule are shown by functional areas in the following figures and tables.

(b)(5), (b)(7)(E), (b)(7)(F)

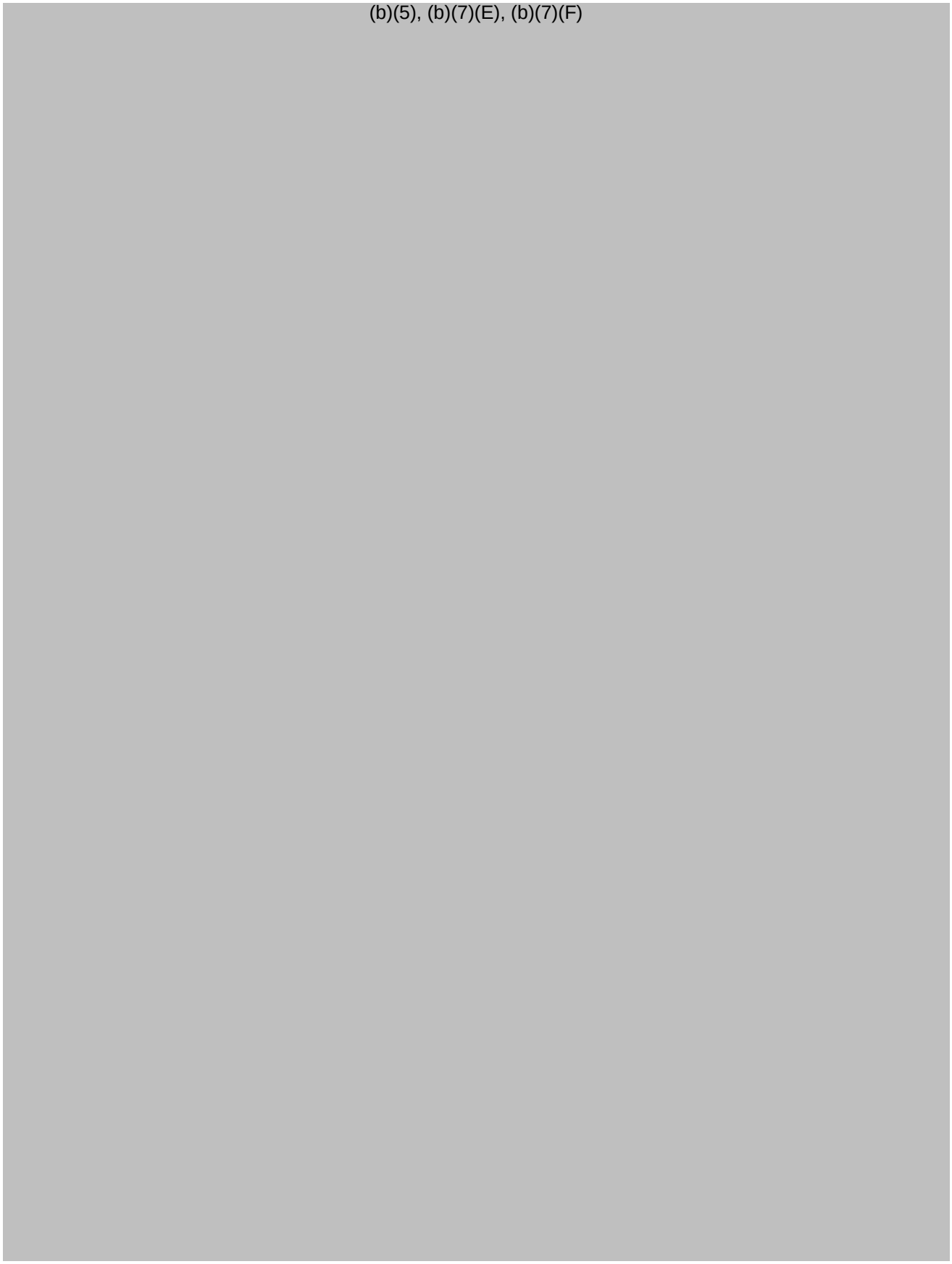

Table of Contents

Executive Summary i
Acronyms vii
Definition of Terms x
1. Introduction 1
2. Challenges 4
3. Program Management 5
4. Scope and Schedule 5
   4.1 Milestones 8
   4.2 Pit and SCE Production 12
   4.3 Plutonium Supply Chain 17
   4.4 Operational Support and Equipment Maintenance 21
   4.5 Capital Acquisition Projects 23
5. Risk Management 24
   5.1 Risk Coordination and Working Group 25
   5.2 Accounting for Risk, Concerns, and Uncertainty 25
   5.3 Risk Management – General Process 25
   5.4 Risk Management – MIE Project Process 26
   5.5 Los Alamos Plutonium Pit Production Project (LAP4) Integration Methodology 27
6. Workforce 27
7. Costs 29
8. Conclusion 30
Appendix A. Manufacturing Modernization Project (MMP) Integrated Project Plan (IPP) 31
Appendix B: WBS Dictionary 39
Appendix C. Capital Acquisition Project Descriptions 40

List of Figures

Figure 1. Pit production integrated summary schedule through FY28 3
Figure 2. Elements of the Plutonium Modernization NWBS for Los Alamos Plutonium Operations at the NNSA-designated reporting level. 7
Figure 3. Tier 1–Tier 3 milestones for the LANL-produced FPU and rate production of 10 ppy 10
Figure 4. Tier 1–Tier 3 milestones for the LANL 30ppy mission 11
Figure 5. Pit production—high-level flowsheet 12
Figure 6. LANL scope and schedule associated with the Pit PRT per the Horizon Baseline P6 schedule 13
Figure 7. Simplified rough-machined hemishell production flowsheet 14
Figure 8. Subcritical experiments—FY23–FY28 schedule 16
Figure 9. Subcritical experiments—flowsheet 17
Figure 10. Plutonium recovery—flowsheet 19
Figure 11. Plutonium metal purification—flowsheet 20
Figure 12. Plutonium Storage and NMMI—flowsheet 20
Figure 13. Equipment projects are managed using the Weapons Production Equipment Lifecycle Guide 24
Figure 14. FY23–FY28 workforce by Level 7 of the NWBS per the resource loaded P6 schedule 28
Figure 15. FY23–FY28 workforce by job classification 29
Figure 16. Estimated costs by Level 7 element of the NWBS per the resource-loaded Horizon Baseline P6 schedule 30
Figure A-1. FY22 and FY23 Production Roadmap 33
Figure A-2. FY23 and FY24 Production Roadmap 33
Figure A-3. FY24 and FY25 Production Roadmap 34
Figure A-4. FY25 and FY26 Production Roadmap 34

List of Tables

Table 1. FY23 L2 MRT Milestones for Los Alamos Plutonium Operations 8
Table 2. Group 1 equipment and infrastructure projects critical for 10 ppy 15
Table 3. Subcritical experiments—FY23-FY28 scope 16
Table 4. Plutonium Supply Chain—FY23 scope 18
Table 5. Plutonium Supply Chain—FY23–FY28 scope 19
Table 6. Description of the four top-level WBS elements and associated activities in Shared Services 21
Table A-1. Required approvals and authorizations for MMP 35
Table A-2. (b)(7)(E), (b)(7)(F) 36
Table A-3. MMS tasks required to create an electronic sales package submittal for FPU 36
Table A-4. WBS Dictionary Elements associated with MMP 37
Table A-5. Summary of estimated costs for MMP 37
Table A-6. Summary of MMP systems required for pit production capacity milestones based on the Horizon Baseline date 38
Table B-1. Description of the NWBS Level 6 elements by PMP functional area 39
Table C-1. Capital Acquisition Project Descriptions and Updates by Priority Grouping 40

Acronyms

ALARA	As Low As Reasonably Achievable
ALDPI	Associate Laboratory Directorate Plutonium Infrastructure
ALDWP	Associate Laboratory Directorate Weapons Production
AO	Authorizing Official
ARM	Active Risk Manager
ATO	Approval to Operate
BoM Book	Digital Twin
CAM	Control Account Manager
CMR	Chemistry and Metallurgy Research (Building)
cQER	Conditional Qualification Evaluation Release
CR	Continuing Resolution
CWBS	Contractor Work Breakdown Structure
CY	Calendar Year
D&D	Decontamination and Decommissioning
DA	Design Agency
DB	Drop Box
DBB	Digital Build Book
DDA	Digital Data Acquisition (system)
DOE	Department of Energy
DOE-SC	Department of Energy Office of Science
ECF	Entry Control Facility
E-ECF	East Entry Control Facility
EE	Engineering Evaluation
EM-B	NNSA Enhanced Management B
ER	Electrorefining
ECSE	Enhanced Capabilities for Subcritical Experiments
FPO	Federal Program Office
FPU	First Production Unit
FTE	Full-Time Equivalent
FY	Fiscal Year
FYNSP	Future Years Nuclear Security Program
GB	Glovebox
IATT	Interim Authorization to Test
IAW	In Accordance With
IPP	Integrated Project Plan
IWB	Incomplete Work Budget
IRG	Issues Resolution Group
KCNSC	Kansas City National Security Campus
LANL	Los Alamos National Laboratory
LAP4	Los Alamos Plutonium Pit Production Project
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level (radioactive) Waste
MC	Materials Characterization

MC&A	Material Control and Accountability
MES	Manufacturing Execution System
MIE	Major Item of Equipment
MMP	Manufacturing Modernization Project
MMS	Manufacturing Management System
MRP	Manufacturing Resource Planning (system)
MR&R	Material Recycle and Recovery
MRT	Milestone Reporting Tool
NA-10	NNSA Office of Defense Programs
NA-19	NNSA Office of Production Modernization
NA-191	NNSA Plutonium Program Office
NA-70	NNSA Office of Defense Nuclear Security
NA-90	NNSA Office of Infrastructure
NA-LA	NNSA Los Alamos Field Office
NAP	NNSA Administrative Policy
NDA	Nondestructive Assay
NDE	Nondestructive Examination
NMMI	Nuclear Material Management and Integration
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NSA	National Security Agency
NWBS	National Work Breakdown Structure
P6	Primavera 6
PA	Production Agency
PCP	Project Control Procedures
PF-4	Plutonium Facility Building 4
PMO	Program Management Office
PMP	Program Management Plan
PPI	Process Prove-In (phase in product realization process)
PPIV	Positive Personnel Identification and Verification
ppy	Pits per Year
PRT	Product Realization Team
PuE	Plutonium Enablement Programs
PuM	Plutonium Modernization
QER	Qualification Evaluation Release
RANT	Radioassay and Nondestructive Testing (Facility)
RCT	Radiological Control Technician
RLUOB	Radiological Laboratory Utility Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
ROMP	Risk and Opportunity Management Plan
RTG	Radioisotope thermoelectric generators
S&CL	Standards and Calibration Laboratory
SCE	Subcritical Experiments
SCR	System Change Request
SNM	Special Nuclear Material

TA	Technical Area
TEM	Transmission electron microscope
TRU	Transuranic
TTO	Turnover to Operations
TTP	Turnover to Production
TWF	Transuranic Waste Facility
WBS	Work Breakdown Structure
WIPP	Waste Isolation Pilot Plant
WLAN	Wireless Local Area Network
WP	Weapons Production
WR	War Reserve
XB	Introduction Box

Definition of Terms

Term or Concept	Definition
General	
Horizon Baseline	• Per the NA-191 PCPs, the Horizon Baseline is a higher fidelity expression of the FYNSP estimate. LANL uses the term "Horizon Baseline" when referring to the resource-loaded schedule in Primavera P6 (available as a P6 .XER file)
Horizon Plan	LANL uses the term "Horizon Plan" to refer to the Horizon Baseline and associated documents, such as this program management plan and other NA-191–required documents.
Plutonium Enterprise	A system of facilities, utilities, equipment, processes, materials, and workforce that enables the entirety of work with plutonium and other materials and components to deliver on the plutonium missions for the nation. • **LANL plutonium enterprise** includes TA-55 PF-4 as the focal point with RLUOB, CMR, RLWTF, LLW, TWF, RANT, WCRRF, Sigma, and other supporting facilities and capabilities across LANL that are critical to the operations in TA-55 PF-4. • **National plutonium enterprise** comprises DOE/NNSA facilities and capabilities, including LANL, LLNL, SNL, Pantex, NNSS, KCNSC, SRNL, SRPPF, SRS, WIPP, INL, PNNL, ORNL, universities, and vendors.
(b)(7)(E), (b)(7)(F)	
Turnover to Operations (TTO)	Readiness and other activities to achieve TTO after completion of construction. TTO is achieved when the declaration to startup operations is issued. For plutonium capabilities, this permits the line organization to conduct operations with plutonium.
Turnover to Production (TTP)	Process and procedure development occur to achieve TTP after TTO is achieved. For capabilities needed for WR production, the Product Realization Team concurs that Manufacturing Readiness Level 7 is achieved, as defined in Conduct Manufacturing Readiness Level Assessment (C017). After TTP is achieved, the capability can reliably support programmatic work as intended.
Workforce	
Programmatic (Direct Funded) Staff	Workers funded by a specific program to perform activities that directly benefit that program.
Overhead Support (Indirect Funded) Staff	Workers performing activities that benefit all programs. Indirect costs are collected in cost pools and distributed, or allocated, to a final cost objective based on a predetermined methodology. Examples of overhead support functions include senior management, legal counsel, human resources, finance, accounting, occupational medicine, and emergency response.
LANL Staff	Workers employed by Triad National Security, LLC (Triad) to perform programmatic (direct-funded) and overhead support (indirect-funded) scope.
Craft	Workers performing maintenance, equipment installation, and other construction across the LANL plutonium enterprise. • **LANL craft** are managed by LANL through union contracts. • **Subcontract craft** are managed by an outside company to work for LANL. Subcontract craft typically are not authorized to work inside TA-55 PF-4.

Term or Concept	Definition
Subcontractor	Workers employed by an outside company to provide services defined in a contract with Triad , such as the protective force, staff augmentation labor to temporarily supplement LANL staff, and temp-to-hire staff.
Protective Force	Subcontract staff employed by Centerra-Los Alamos to provide physical security services for LANL. The protective force does not include K-9 handlers or Pro2Serve staff.

1. Introduction

The Department of Energy (DOE) National Nuclear Security Administration (NNSA) plutonium missions are critical to meeting military requirements to ensure the U.S. nuclear deterrent is modern, responsive, and resilient. A major national priority is to reestablish the capability and capacity for pit production.

The nation relies on the plutonium enterprise at LANL to safely, securely, and reliably support nuclear deterrence, nonproliferation, space exploration, and actinide science.

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- Produce Pu-238 heat sources for use in space exploration and national security
- Evaluate pits and RTGs returned from the nuclear weapons stockpile to support annual stockpile assessments and inform future pit and RTG designs
- Produce plutonium components for assembly into devices for use in subcritical experiments
- Conduct fundamental science on the material properties and aging of plutonium
- Process plutonium into forms suitable for disposition to support nonproliferation goals
- Evaluate containers for safe storage of plutonium materials throughout the DOE/NNSA complex
- Recover americium for the DOE Office of Science

To better support expanding the pit production mission at LANL, in FY21 NNSA combined the LANL portions of the Plutonium Sustainment, Material Recycle and Recovery (MR&R), and Storage programs into a single new program called Los Alamos Plutonium Operations, which is one of several programs and line-item projects within the Plutonium Modernization program portfolio. This new program funds LANL for the scope directly related to achieving the mission of reliable steady-state pit production.

This document is the Los Alamos Plutonium Operations Program Management Plan (PMP) for FY23 through FY28. Over this timeline the program follows the rolling-wave planning structure, where detailed schedules are maintained over the nearest fiscal years and outyears contain planning packages with less detail to balance the needs of near-term program execution with long-term FYNSP planning. This PMP is part of the FY23 Horizon Plan submitted by LANL to NNSA.

NNSA has directed LANL to establish the capability to produce at least 30 WR ppy. The pit to be produced is a modified version of a pit designed by the Lawrence Livermore National Laboratory (LLNL) Design Agency (DA) that is currently in the active stockpile. The infrastructure investments and manufacturing processes LANL is establishing to achieve steady-state pit production will provide the capability to produce pits designed and maintained by both the LANL DA and the LLNL DA for the active nuclear weapons stockpile.

The LANL Production Agency (PA) is advancing the technology and manufacturing readiness levels and supporting the LLNL DA pit certification activities and engineering evaluations (EEs). This will allow LANL to

begin WR pit production in 2023 and then ramp up to reliable steady-state production. LLNL, LANL, and NNSA continue to partner extensively during the effort to achieve FPU in 2023.

(b)(5)

and LANL senior managers are working closely to tailor the product realization process to produce FPU. The path forward for FPU and rate production is currently being evaluated. This document provides the current pit production plans as of the end of FY2022. (b)(5)

2023:	(b)(5) Complete all activities to obtain approval from NNSA and the LLNL DA to begin WR production Produce FPU
2024:	Complete all remaining activities to obtain approval from NNSA and the LLNL DA to begin WR production Produce 10 WR pits
2025:	Produce 20 WR pits
2026:	Produce 30 WR pits

As LANL executes the product realization activities, it must concurrently complete equipment installations and infrastructure investments, hire and train an expanded workforce, and improve production-related business processes. LANL has determined the priority and sequence of equipment required to transition from the ability to yield FPU in 2023 to establishing a reliable capability to produce a minimum of 30 ppy.

The key FY23 activities for the Los Alamos Plutonium Operations program are listed below:

(b)(5)

Figure 1 shows the programmatic and line-item project scope funded by the NNSA offices of Defense Programs (NA-10), the NNSA Office of Defense Nuclear Security (NA-70), and the NNSA Office of Infrastructure (NA-90) to produce a minimum of 30 pits in CY2026 and then to begin reliable steady-state production.

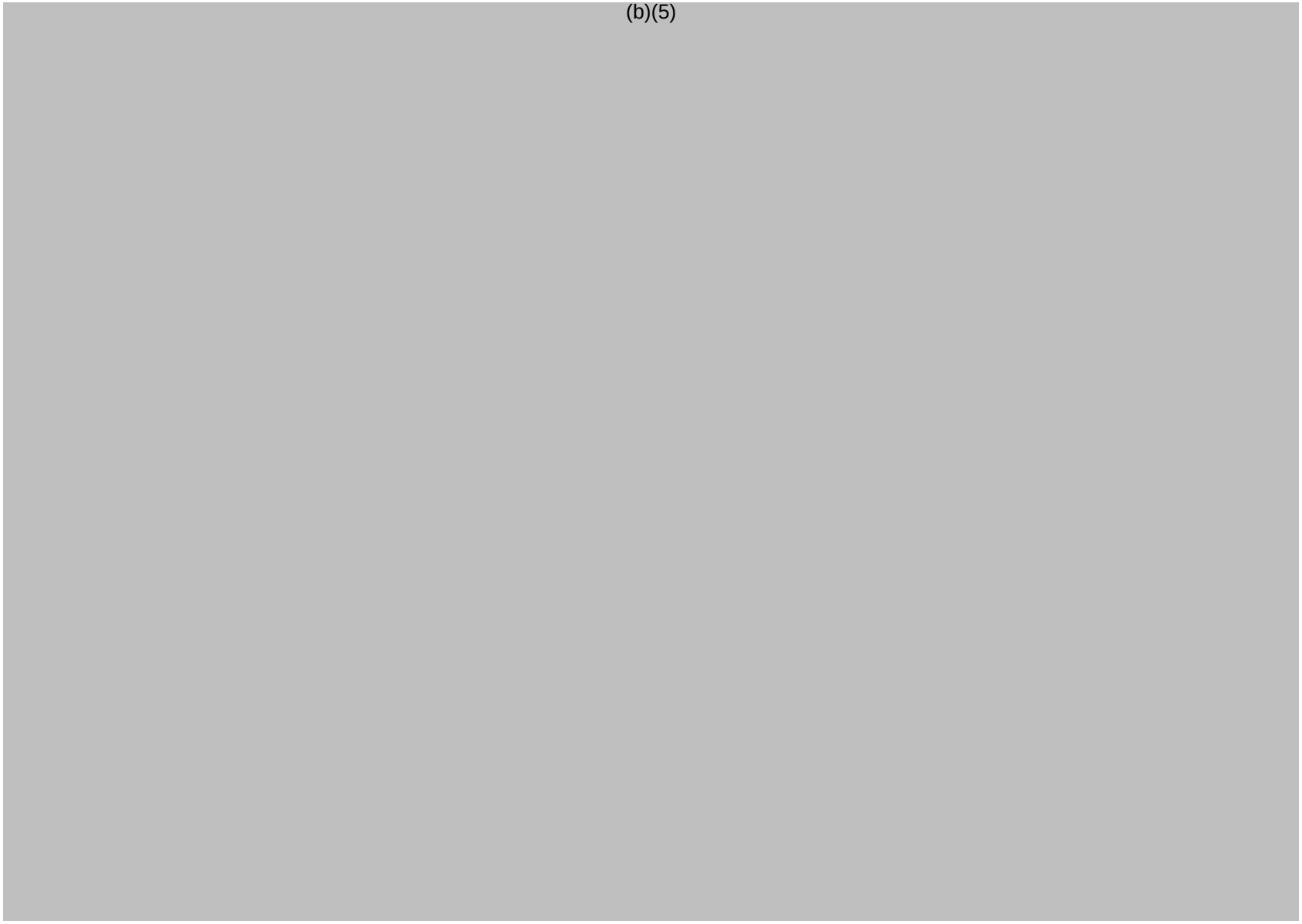

Figure 1. Pit production integrated summary schedule through FY28

2. Challenges

LANL faces several critical challenges that must be addressed to reliably expand pit production. In response to those challenges, LANL senior management has developed several actions that must be taken. Although the Los Alamos Plutonium Operations program is not fully responsible for all the challenges discussed below, it is a stakeholder for all of them.

Goal: Produce a WR pit.

(b)(5), (b)(7)(E), (b)(7)(F)

(b)(5), (b)(7)(E), (b)(7)(F)

(b)(5), (b)(7)(E), (b)(7)(F)

Goal: Establish LANL as a mature production agency with the capability to produce pits at a rate of 30 ppy.

(b)(5), (b)(7)(E), (b)(7)(F)

(b)(7)(E), (b)(7)(F)

3. Program Management

LANL manages the Los Alamos Plutonium Operations program in accordance with NA-191 program documents and other contractual requirements. The NA-191 program documents include the NA-191 Plutonium Modernization Program FY 2023 Implementation Plan issued August 11, 2022, project control procedures (PCPs), and the Risk and Opportunities Management Plan (ROMP).

As discussed in the Implementation Plan, direct managed scope is managed through the NNSA Enhanced Management B (EM-B) program management envelope, per DP-PEI. Accordingly, the performance milestones for use in contract evaluation and development of Multi-Year Site Objectives are aligned with EM-B. The status of each milestone is evaluated quarterly using the Milestone Reporting Tool (MRT).

FY23 performance will be evaluated and determined in accordance with the FY 2023 NA-191 Milestone Reporting Tool Level 2 milestones grading and exit criteria of the Implementation Plan. The NA-191 Federal Program Office (FPO) will conduct quarterly reviews of performance to these milestones and provide routine feedback on progress towards achieving the defined objectives and EM-B implementation.

LANL uses Primavera P6 (P6) to create and maintain baseline schedules, manage field execution schedules, identify resource requirements, track performance, and facilitate reporting. LANL holds budget in reserve within the Los Alamos Plutonium Operations program to provide contingency funding to manage programmatic risk and unanticipated events. Budget in reserve is not included in P6 and resides outside the WBS structure.

The FY23 Horizon Plan assumes full funding aligned with the FYNSP; in the event of a Continuing Resolution (CR), a revised Horizon Plan may be issued.

4. Scope and Schedule

The NNSA Plutonium Program Office (NA-191) has defined multiyear objectives for Los Alamos Plutonium Operations and provided a funding profile through FY28. Some of the major objectives are listed below:

Complete product realization activities to qualify the WR production processes

(b)(7)(E), (b)(7)(F)

Establish and improve infrastructure and business systems

- (b)(5), (b)(7)(E), (b)(7)(F)
-

(b)(5)

Produce WR pits to ensure modern, robust, flexible, and resilient nuclear deterrent

- CY2023: Achieve the first production unit (FPU) War Reserve (WR) pit
- CY2024: Deliver 10 WR pits
- CY2025: Deliver 20 WR pits
- CY2026 Deliver 30 WR pits
- (b)(5)

Fabricate and ship plutonium subassemblies for subcritical experiments

(b)(5)

The Plutonium Modernization national work breakdown structure (NWBS) associated with the Los Alamos Plutonium Operations program was initially defined in the NA-191 Project Controls Procedure (PCP)-01 Plutonium Modernization Program Work Breakdown Structure (WBS). Los Alamos Plutonium Operations is a subset of this NWBS. The LANL contractor work breakdown structure (CWBS) aligns with the NWBS and adds detail down to the work package level. LANL reports costs monthly at the summary account level (level 6 of the NWBS), shown in

Figure 2. Elements of the Plutonium Modernization NWBS for Los Alamos Plutonium Operations at the NNSA-designated reporting level..

The NWBS elements associated with Los Alamos Plutonium Operations program are organized into four functional areas:

- Pit and SCE Production
- Plutonium Supply Chain
- Operational Support and Equipment Maintenance
- Capital Acquisition Projects

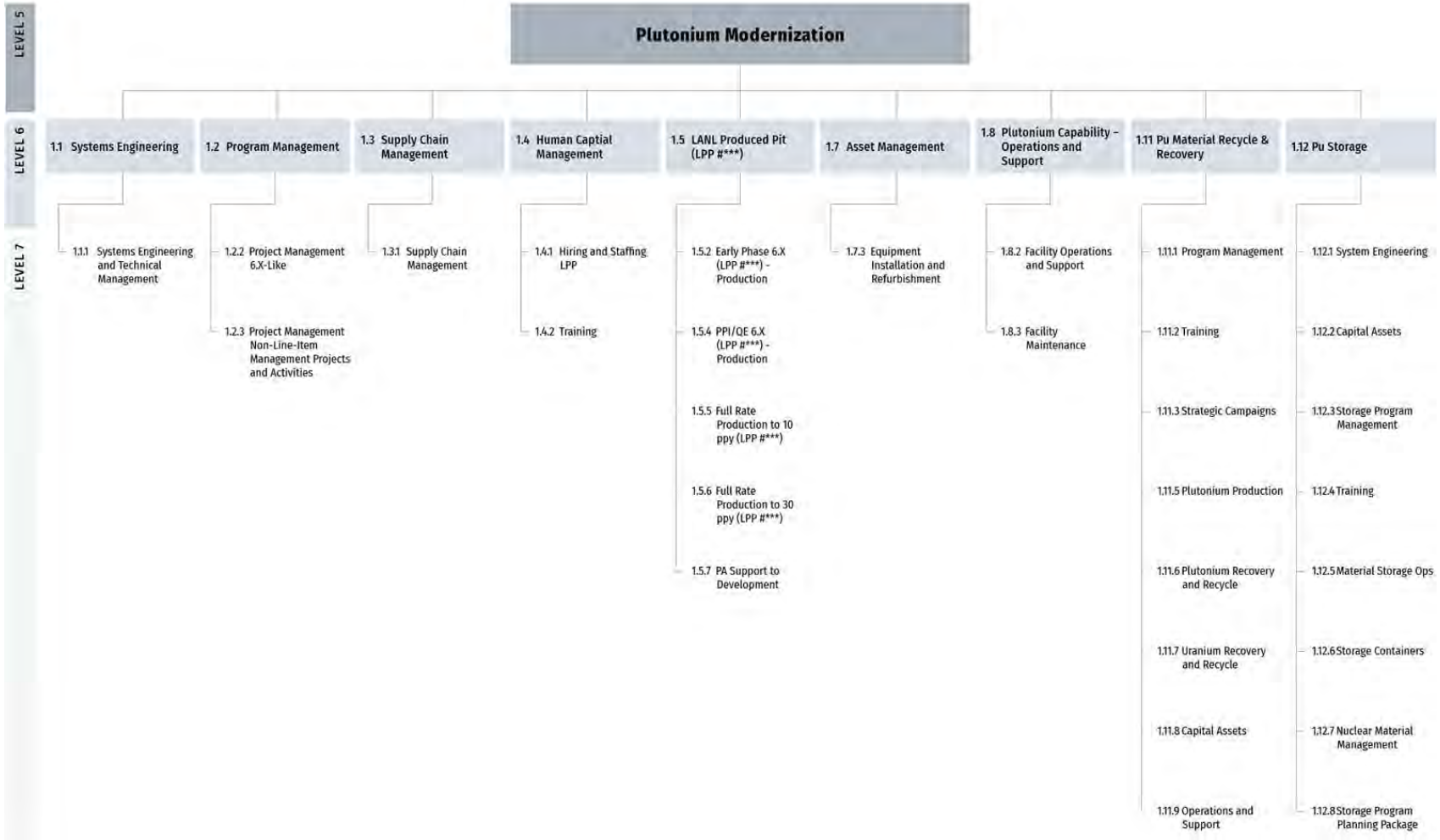

Figure 2. Elements of the Plutonium Modernization NWBS for Los Alamos Plutonium Operations at the NNSA-designated reporting level.

4.1 Milestones

NA-191 provided the FY23 Level 2 (L2) milestones, shown in Table 1, and additional Tier 1 through Tier 3 milestones (Figures 3 and 4), as defined in PCP-04, to support pit production goals. LANL identified additional Tier 2 and Tier 3 milestones, which are in the resource loaded P6 schedule. In accordance with NA-191-PCP-08 all Tier 3 milestones will be reported on monthly.

(b)(5) NNSA may divert subsequently produced WR pits to complete any remaining process qualification or pit certification requirements. LANL will produce 10 WR pits by December 31, 2024; the first 10 WR pits will include the first WR pit produced in CY2023 and any WR pits diverted for PRT use. LANL will produce an additional 20 WR pits by December 31, 2025, and another 30 WR pits, for a total of 60 WR pits, by December 31, 2026.

The following sections discuss the scope and schedule to achieve these milestones and other requirements.

Table 1. FY23 L2 MRT Milestones for Los Alamos Plutonium Operations

MRT #	Title	Grading Criteria	Exit Criteria
8057	(b)(5), (b)(7)(E), (b)(7)(F)		
8058			
8059			
8060			
8061			
8062			
8063			

(b)(5), (b)(7)(E), (b)(7)(F)

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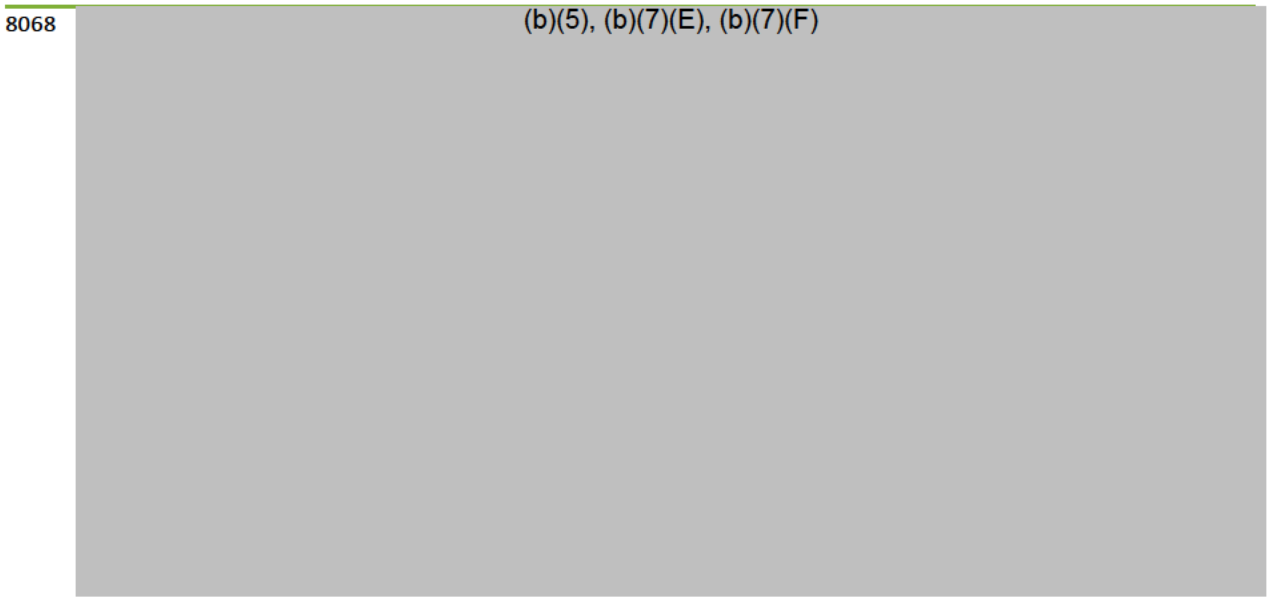
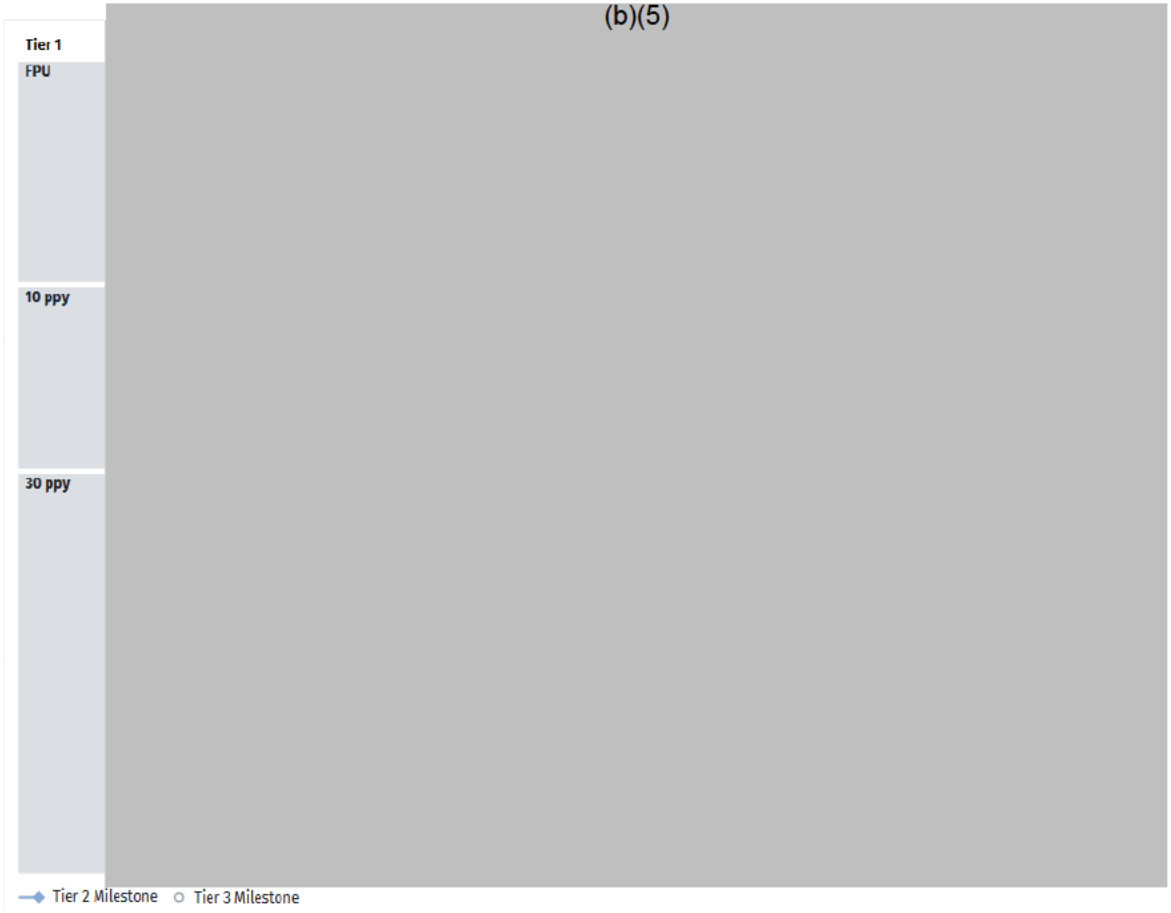




Note: T3 milestones for TTO dates are integrated with the Equipment schedule but coded as T4s in the Pu Operations file to prevent reporting misalignments

Figure 3. Tier 1–Tier 3 milestones for the LANL-produced FPU and rate production of 10 ppy.

Figure 4. Tier 1–Tier 3 milestones for the LANL 30ppy mission

4.2 Pit and SCE Production

4.2.1 Pit Production

The LLNL DA completed the product definition and documentation and released the final design and drawings of the pit. In FY23, LANL will continue to build pits, establishing the capability to produce WR pits, (b)(5) Over the next several years, LANL will ramp from FPU to a production rate of at least 30 ppy. The work to establish WR production and ramp to steady-state production provides the basis for the FY23–FY28 Horizon Baseline schedule. Figure 5 shows a simplified version of the pit production flowsheet, organized by major element.

The NNSA-chartered Pit PRT maintains the Horizon Baseline schedule for the product realization activities (b)(5). These activities include the establishment of the processes, tooling, inspection, control points, procedures, etc., to produce the pit. The product realization activities are shown in Figure 6. The LLNL DA has specified which pit production processes require evaluation and qualification by the DA through EEs. Following successful completion of the EEs, a QER will be issued to allow LANL, as the production agency, to sell the first WR pit. The scope and timelines in Figure 6 reflect baseline activities, where any scope planned but not completed in a given fiscal year is anticipated to carry over in the following fiscal year, with accompanying Incomplete Work Budget (IWB).

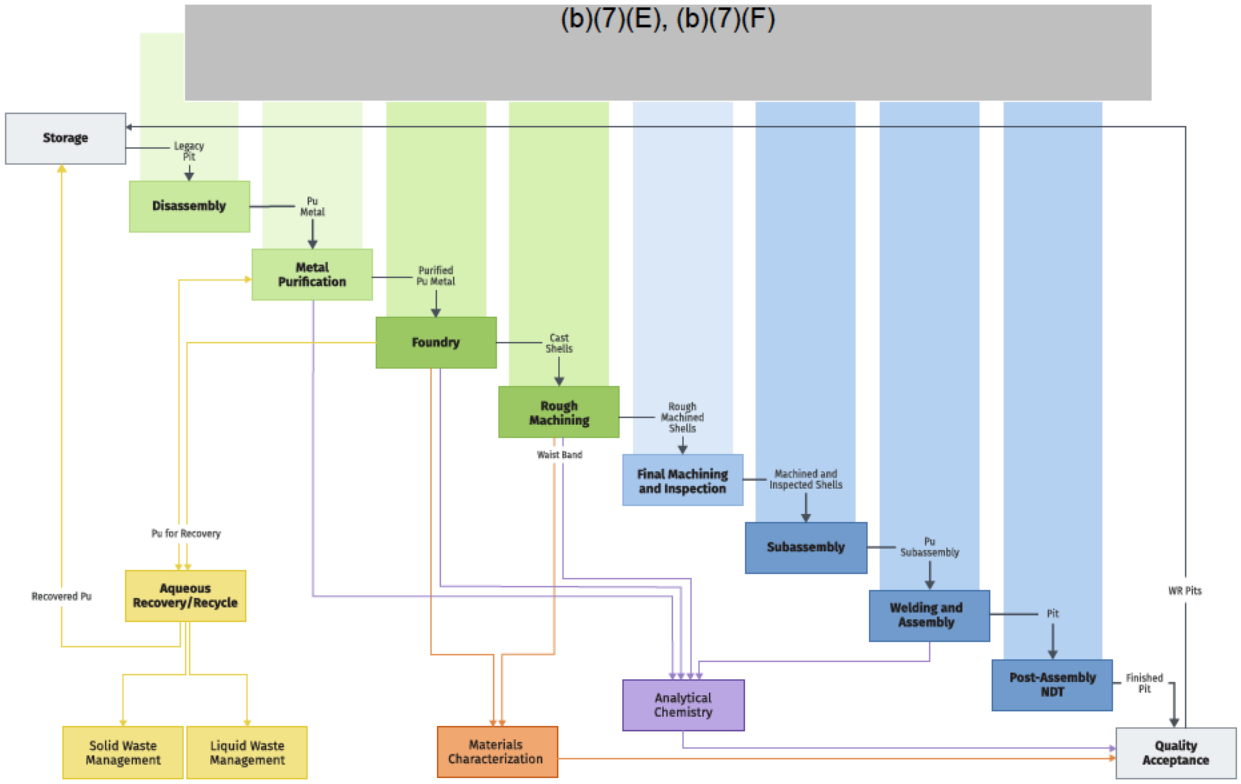


Figure 5. Pit production—high-level flowsheet

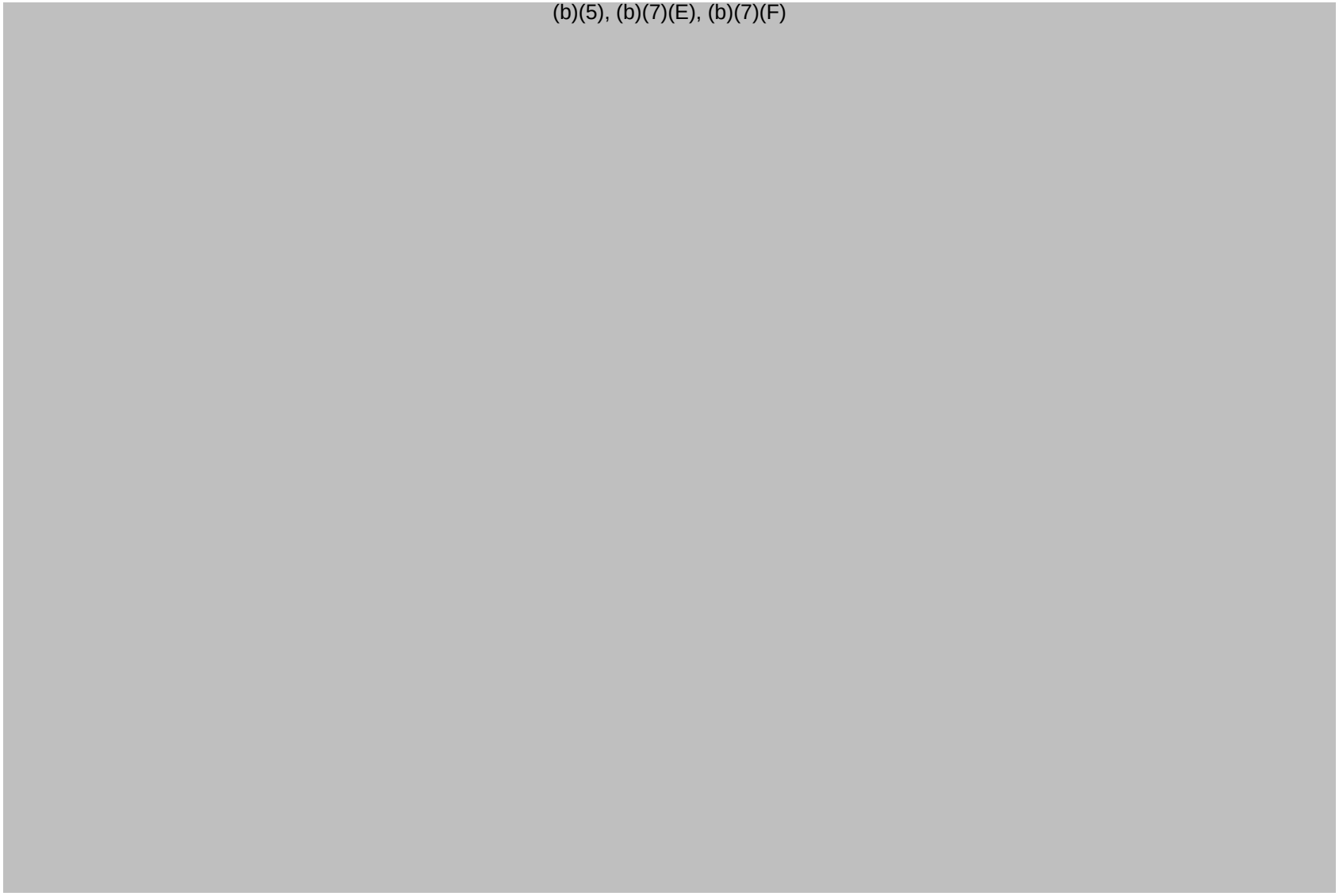


Figure 6. LANL scope and schedule associated with the Pit PRT per the Horizon Baseline P6 schedule

The planning basis used by LANL for the FY23 Horizon Baseline assumes the facilities, equipment, and processes to produce pits will be (b)(5), (b)(7)(E), (b)(7)(F) Routine maintenance and construction activities will occur during the off shift. As efforts aimed at increasing production availability and 24/7 operations mature, this basis will be adjusted as appropriate.

The planning basis for producing pits considers the anticipated yield rates and the risk of equipment and facility outages. LANL will maintain an inventory of critical sub-components and materials to mitigate lower-than-expected yield rates and possible outages. The P6 schedule (available as a P6 .XER file) incorporates the anticipated yield rates and inventory targets as well as the corresponding quantities of metal, mold sets, hemishells, and pits.

To illustrate the planning basis for production activities, Figure 7 shows the flowsheet associated with the production of rough-machined hemishells, which is a portion of the pit production flowsheet. Resources are assigned to each step in the flowsheet to support the production of one unit. The number of unit activities required is determined from production targets and anticipated yield rates that will vary from year to year as processes are matured.

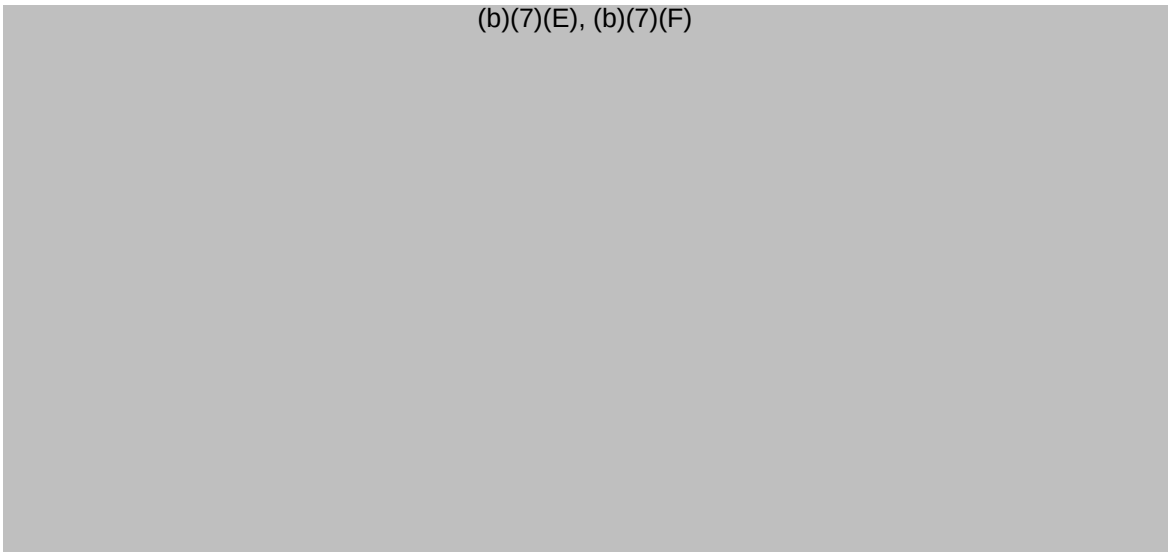


Figure 7. Simplified rough-machined hemishell production flowsheet

This approach was replicated for all elements of the flowsheet in Figure 3 to form a basis for the workforce necessary to produce pits. In general, this is hands-on work directly funded by Los Alamos Plutonium Operations to produce the pit. The overall program workforce requirements are discussed in Section 6.

In the path toward rate production, FPU is the first unit LANL will produce toward a target of 10 PPY in 2024 and at least 30 PPY in 2026. (b)(5), (b)(7)(E), (b)(7)(F)

The MIE equipment is shown in Table 2 and is incorporated into the current production horizon plan schedule.

Table 2. Group 1 equipment and infrastructure projects critical for 10 ppy

(b)(7)(E), (b)(7)(F)

4.2.2 Plutonium Components for Subcritical Experiments

The Los Alamos Plutonium Operations program funds and manages the production of plutonium articles for subcritical experiments (SCEs); this work is coordinated with the NNSA Office of Experimental Science. SCEs deliver crucial data for assessment of the current stockpile and certification of the future stockpile. These integrated experiments involve the use of high-explosive detonations to drive significant quantities of special nuclear material, typically plutonium, to weapon-relevant conditions to characterize its response.

Planning and design for the current LANL experimental series, Excalibur, is underway, (b)(5) The Excalibur series will be the first to use the U1a.03 Testbed providing new diagnostic capabilities in 6-ft confinement vessels and operating concurrently with the U1a.05 Testbed (3-ft vessels). Future diagnostic improvements in radiography and neutronic reactivity will be delivered by the Enhanced Capabilities for Subcritical Experiments (ECSE) project in the mid-2020s (the U1a .100/.104 Testbed). At that time, NA-10 (b)(5)

Los Alamos and Livermore design these experiments, fabrication involves capabilities across the NNSA Complex, and execution at the U1a Complex in Nevada is a partnership between LANL, LLNL, and NNSS. The interconnectedness of SCE operations necessitates a detailed schedule that is closely tracked across multiple sites, vendors, and suppliers. The SCE program and Los Alamos Plutonium Operations programs jointly developed the Framework for Plutonium Production at TA-55 for the Subcritical Experiments Program (LA-UR-20-27698) that formally describes the responsibilities for initiation, definition, production, packaging, and shipping of subcritical experiment plutonium articles.

SCEs are typically executed as a series involving confirmatory (non-nuclear) experiments followed by a set of similarly configured experiments with nuclear material. (b)(7)(E), (b)(7)(F)

. LANL's involvement is still to be determined. (b)(7)(E), (b)(7)(F)

(b)(5), (b)(7)(E), (b)(7)(F)

A high level pre-conceptual planning schedule was developed for (b)(7)(E), (b)(7)(F) as well as initial development activities to address production capability gaps.

The following tables and figures provide the scope, schedule, and flowsheet associated with the plutonium enterprise element of the SCE program at LANL.

Table 3. Subcritical experiments—FY23-FY28 scope

(b)(5), (b)(7)(E), (b)(7)(F)

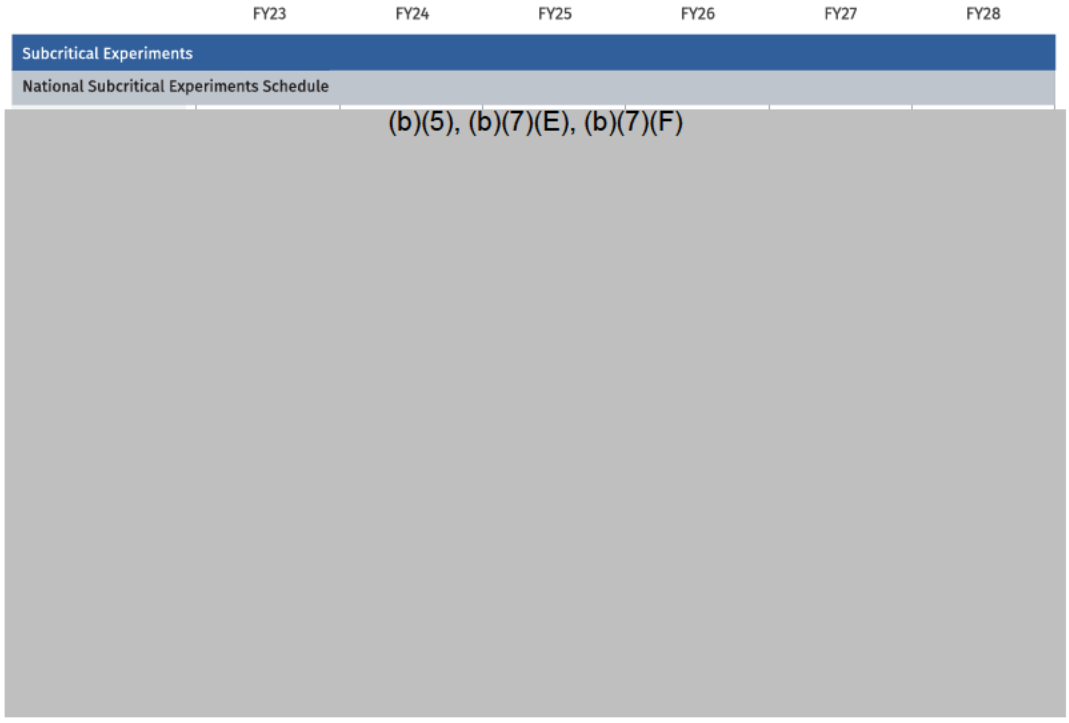


Figure 8. Subcritical experiments—FY23–FY28 schedule

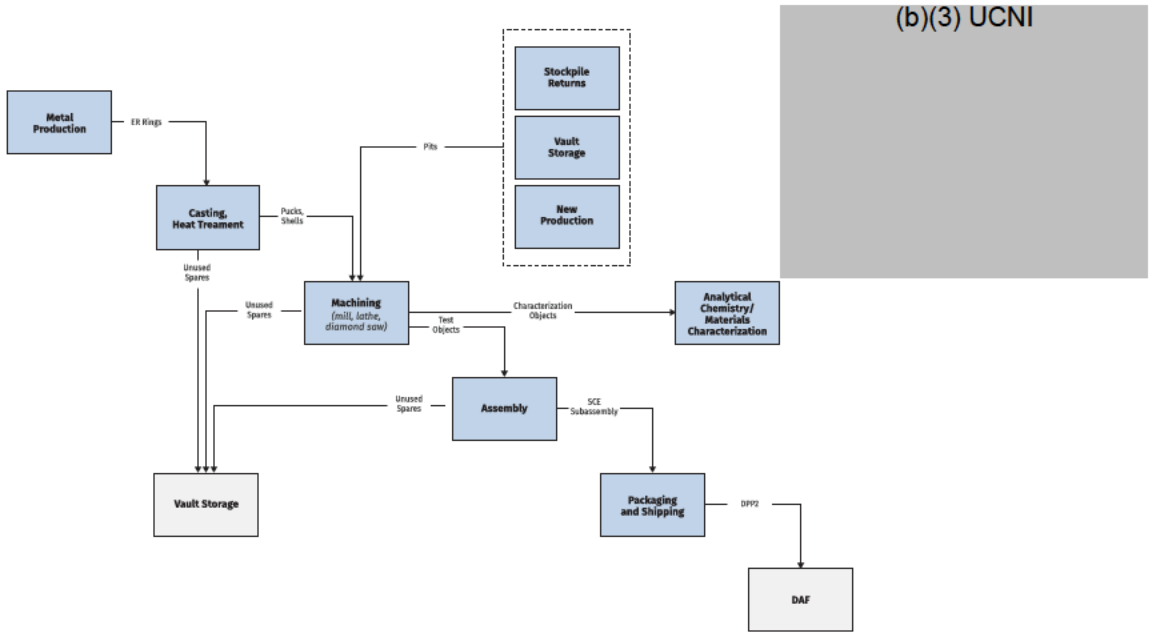


Figure 9. Subcritical experiments—flowsheet

4.3 Plutonium Supply Chain

The Plutonium Supply Chain functional element dispositions legacy nuclear materials, increases and improves nuclear material storage, and (starting in FY23) provides plutonium metal suitable for pit production. The overall scope is focused on the production, storage, recycle, recovery, and disposal of nuclear materials including newly generated byproducts from metal purification operations, to enable the pit production mission and reduce operational costs and risk. (b)(7)(E), (b)(7)(F)

In addition, specific Plutonium Supply Chain scope includes safe and secure nuclear storage capabilities, while managing storage requirements across the pit production mission. The program analyzes, prioritizes, and provides recommendations for any significant changes to existing special nuclear material (SNM) storage capabilities and uses storage health metrics to monitor and ensure effective use and continuous improvement of the storage capability at LANL. Process modeling, forecasting, and decision analysis tools are used to identify, aggregate, and time-phase storage requirements; provide lifecycle planning and formalized inventory management; and inform decisions regarding upgrades, alterations, and reconfigurations. This includes time-phased storage requirements for feed, byproduct, and product materials over at least a 15-year timeline. (b)(5), (b)(7)(E), (b)(7)(F)

A key element is the safety class containerization of the nuclear material to ensure the TA-55 Documented Safety Analysis limits are managed appropriately. The Storage element partners with programmatic "nuclear

material owners" to implement and ensure continued compliance with the DOE Manual 441.1-1 requirements for nuclear material packaging. Container design and testing (for example the SAVY-4000 container) are critical for DSA and worker safety compliance. LANL, as the design authority for the SAVY-4000 series of containers, ensures that the technical basis exists for the intended use of the SAVY container series and defines the requirements for continued surveillance and life extension activities associated with the containers.

LANL is evaluating designs as well as alternative nuclear material container and storage solutions to continuously improve both operational efficiency and worker safety, for (b)(7)(E), (b)(7)(F)

Key activities associated with the Plutonium Supply Chain include the following:

- Produce purified plutonium metal suitable for use in WR pit production at the quantities required
- Recover and recycle plutonium from legacy sources for use as metal feed
- Recycle, recover, or disposition the plutonium from newly generated byproducts from metal purification
- (b)(7)(E), (b)(7)(F)
- Establish safe and secure nuclear materials storage and containerization
- Modifying the design of the SAVY-4000 for use in a glovebox to reduce the damage ratio for material stored on the floor
- Nuclear Material Management and Integration (NMMI) provides coordination for metal supply from off-site

Tables 4 and 5 identify the scope requirements for material disposition, material recovery, vault availability, and container improvements in FY23 and FY23–FY28, respectively. Figure 10 shows the flowsheet used to recover plutonium from legacy materials and pit production byproducts. Starting in FY23, the activities associated with metal purification, shown in Figure 11, are included in the Plutonium Material Recycle and Recovery and Storage NWBS element.

Table 4. Plutonium Supply Chain—FY23 scope

(b)(5), (b)(7)(E), (b)(7)(F)

Table 5. Plutonium Supply Chain—FY23–FY28 scope

(b)(5), (b)(7)(E), (b)(7)(F)

(b)(3) UCNI

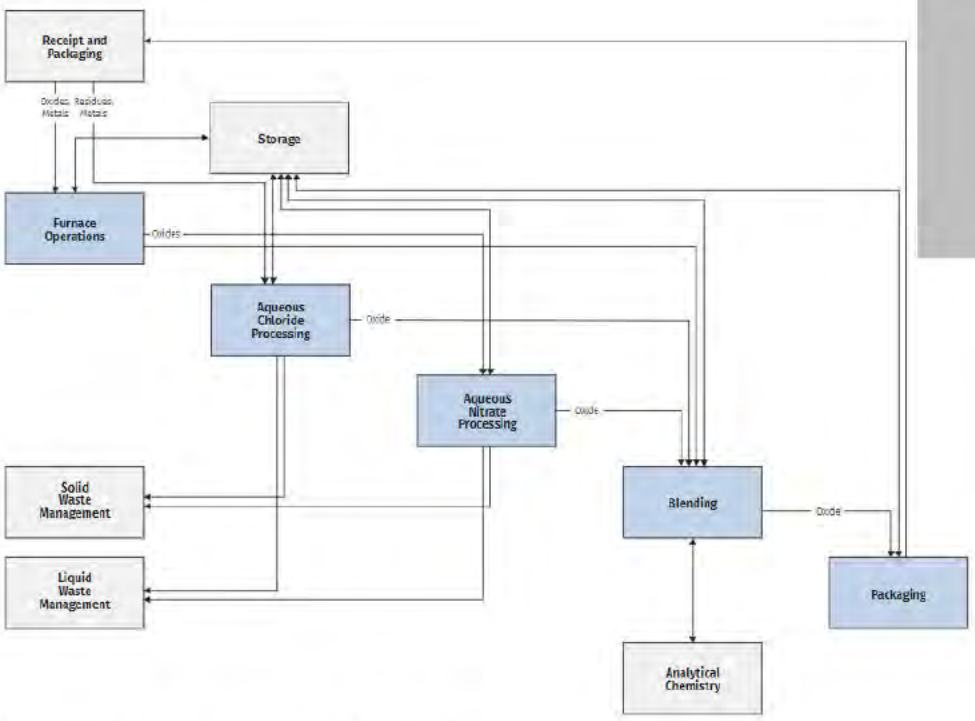


Figure 10. Plutonium recovery—flowsheet

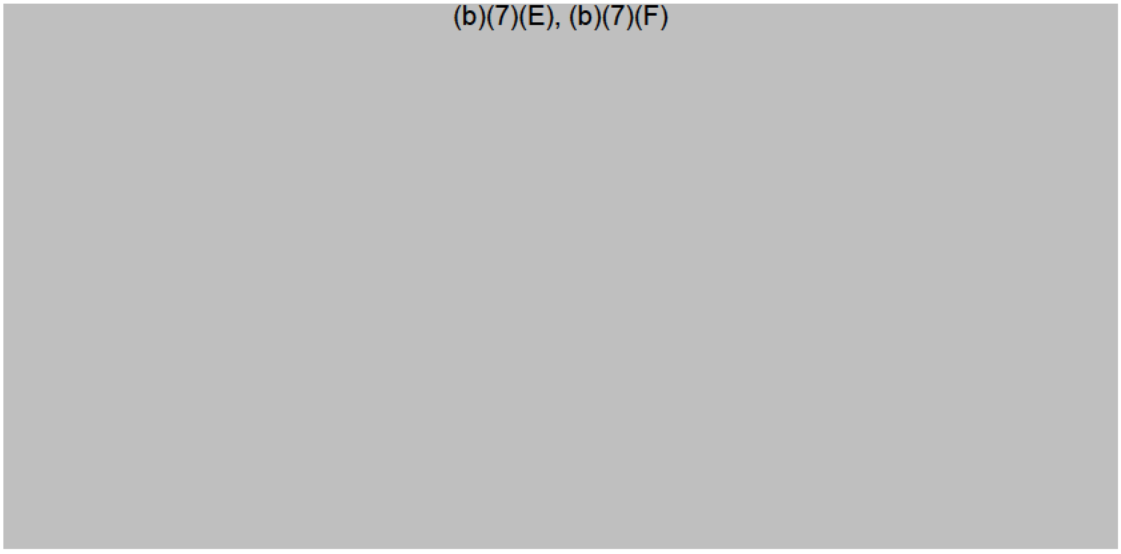


Figure 11. Plutonium metal purification—flowsheet

The LANL Nuclear Material Management and Integration (NMMI) Program coordinates and facilitates the integration of nuclear material management activities across the DOE/NNSA programs. The NMMI Program implements DOE O 410.2 requirements for the oversight, movement, transfer, reporting, lifecycle management, and ownership of all nuclear materials at LANL. The NMMI Program is also responsible for the disposition of nuclear material. The NMMI Program administers LANL's nuclear material inventory as a strategic asset for the execution of work across the breadth of the programmatic missions for the entire Laboratory, while also facilitating nuclear material safeguards and the nuclear safety programs necessary for the protection of the public. MRR, Storage, and NMMI are working together (Figure 12) to develop a material management plan that will maximize storage capacity, maintain a healthy nuclear material inventory, and ensure that all material either has a planned use or is forecasted for disposition.

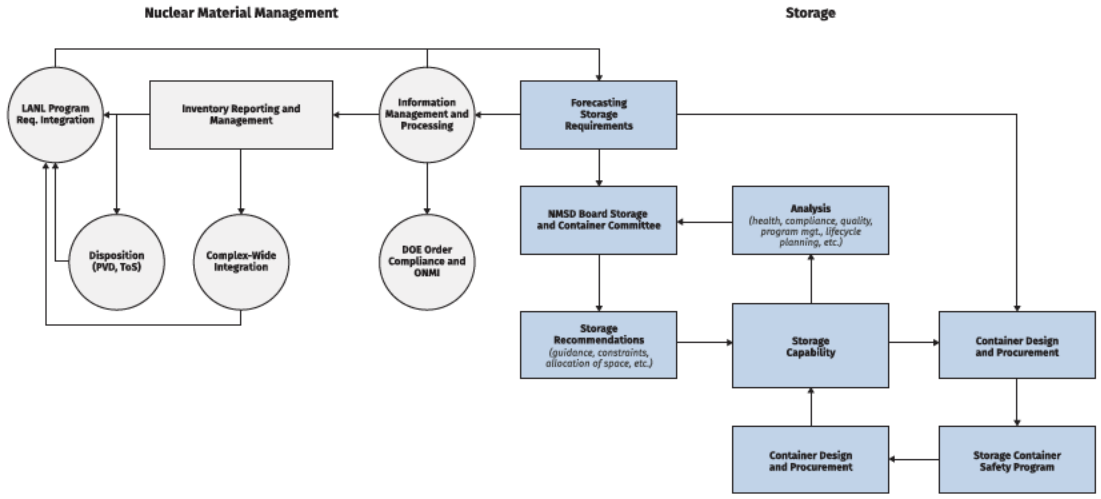


Figure 12. Plutonium Storage and NMMI—flowsheet

4.4 Operational Support and Equipment Maintenance

This functional area is part of the Plutonium Capability—Operations & Support element of the NWBS and includes operational support and maintenance of programmatic equipment used by LANL for the Los Alamos Plutonium Operations program.

4.4.1 Operations

The high-hazard nuclear facilities and associated infrastructure at LANL must be operated and maintained in a safe configuration for reliable program execution. LANL uses a tiered model to manage facility operations, maintenance, and program support.

Tier 1 functions provide core safety programs and other base capabilities to meet operational requirements so that facilities are safe and available for programmatic, maintenance, and construction work. Tier 1 functions ensure that facilities are operated and maintained in compliance with federal, state, and local requirements and policies.

Tier 2 functions provide above-base services that benefit all programs and projects. The capacity of these functions is scaled to meet the volume of planned work for all plutonium missions.

Tier 1 and Tier 2 functions are funded through a combination of funding sources and models.

NA-90 funds Tier 1 functions to maintain the base capability for all facilities within the LANL plutonium enterprise: TA-55 PF-4, RLUOB, RLWTF, CMR, LLW, TWF, RANT, WCRRF, and Sigma. This is done primarily through the NA-90 Operations of Facilities, Maintenance and Repair of Facilities, and Recapitalization programs.

Tier 2 functions are provided in many of the facilities for the plutonium enterprise at LANL. To manage the Tier 2 functions at PF-4, TWF, and RANT, LANL uses a contractually directed cost-distribution model (known as Shared Services). Shared Services distributes costs to programs and projects that operate in TA-55 PF-4 for Tier 2 functions at TA-55 PF-4, TWF, and RANT.

Shared Services is increasing capacity and improving reliability for two critical functions:

- (b)(7)(E), (b)(7)(F)
-

Elements of the Shared Services WBS are shown in Table 6. Costs are distributed based on program and project utilization of these elements. The top-level elements are divided into common functions with associated work packages.

Table 6. Description of the four top-level WBS elements and associated activities in Shared Services

Shared Services WBS Element		Description
Workforce		Tier 2 functions associated with and scalable to the number of craft and LANL staff working in TA-55 PF-4, e.g., training, facility access, and warehousing
	Training	New employee onboarding and training, TA-55 worker training, and TA-55 PF-4 worker training
	Security Systems Support	Deployed security and support for transfer of items into and out of the TA-55 protected area and Material Access Areas. Manage information related to TA-55 access and administrative controls for into the TA-55 PA and the TA-55 PF-4 Material Access Area

Shared Services WBS Element		Description
	Supply Chain Services	Provide controlled storage and distribution services Provide procurement engineering services Anti-C clothing and PPE exchange and related service contracts
	Program Management	Workforce analysis and systems engineering models of plutonium capabilities Manage the shared services office
Nuclear Material		Tier 2 functions associated with and scalable to the ownership and movement of nuclear material, e.g., MC&A, storage, containers, and shipping
	NM Management, Storage, and Shipping	Shipping and receiving of programmatic nuclear materials Nuclear material measurements of programmatic materials and inventory Vault operations for programmatic materials MC&A for programmatic operations MBA custodians for programmatic operations Provide specifications for procurement, receipt inspection, lifetime extension of NM containers
Space		Tier 2 functions associated with and scalable to TA-55 PF-4 space usage, e.g., glovebox maintenance, radiological protection, criticality safety, decontamination, and readiness
	Safety Systems and Support	Radiological protection (RCTs) for programmatic activities USQ determinations for programmatic activities Criticality safety evaluation support for programmatic activities Implement the nuclear criticality safety program for programmatic activities Industrial safety & health oversight for programmatic activities Glovebox and sharps safety program
	Institutional & Business Systems	Perform document control and records management IT and media services Identify, track, and close issues for programmatic activities Perform operational readiness services and SSW support Maintain, update, and integrate software applications for programmatic business systems
	Facility Services	Routine wipe-downs and response to contamination events Routine glovebox maintenance Gas for program operations and gloveboxes
	Scheduling and Coordination	Daily and weekly scheduling and work authorizations Job execution and facility condition
Solid Waste		Tier 2 functions associated with and scalable to the projected generation of TRU solid waste, e.g., packaging, accepting, and loading TRU waste drums for shipment
	Transuranic (TRU) Solid Waste	Packaging and closing of TRU waste containers On-site transfer, handling, and staging of TRU waste containers for shipment Nuclear material measurements of TRU waste containers Certification of TRU waste containers for shipment to WIPP Procurement of containers for shipping TRU waste to WIPP
	Low-Level Waste (LLW) and Mixed Low-Level Waste (MLLW) Solid Waste Management	LLW and MLLW management

The Shared Services office reports on its status monthly and publishes annual program management and program execution plans. Additional detail regarding Shared Services, including the cost distribution methodology, can be found in the FY23–FY28 Plan for Shared Services (LA-CP-22-20061).

4.4.2 Equipment Maintenance

LANL maintains the programmatic equipment for nuclear and nonnuclear process systems and equipment that is required for pit production. (b)(5), (b)(7)(E), (b)(7)(F)

LANL formed a Maintenance Steering Board to develop, integrate, and oversee the initiatives to improve maintenance for the pit production mission. The focus is to transition maintenance activities from operational organizations (such as the Pit Technologies division) to the Process Maintenance and Decontamination Services group, and from the day shift to the off shift. These two transitions will allow pit production activities to be performed more efficiently and without interruption on the day shift.

The maintenance goals for FY23 are listed below:

- Update the equipment maintenance strategy to support a robust preventive maintenance profile for the critical 10 ppy existing equipment
- Ensure robust maintenance plans are in place for existing critical 10 ppy equipment
- Update the failure mode effects analysis for equipment to inform maintenance plans
- Assess the risk level and life extension potential for existing equipment and incorporate future equipment replacements into the maintenance plan
- Execute preventive maintenance according to the maintenance plans
- Perform corrective maintenance to minimize equipment/system downtime
- Maintain stored programmatic equipment prior to installation
- Support the management of measurement and testing equipment between production control, warehousing, and the standards and calibration laboratory (S&CL)
- Continue to develop equipment-specific maintenance plans and associated procedures
- Continue to establish an inventory of essential spare parts at LANL
- Continue to transition from corrective to predictive and preventive maintenance
- Continue to transition from performing maintenance by the operations organization on the day shift to maintenance organization on the off shift
- Generate technical documentation for configuration management and work authorization procedures

4.5 Capital Acquisition Projects

NNSA is recapitalizing LANL facilities and equipment to modernize the capability and expand the capacity to produce pits. This is required to produce a minimum of 30 pits in 2026 and then begin reliable steady-state production. The Los Alamos Plutonium Operations program provides funding and direction for installation of the process equipment and gloveboxes required to reliably produce 10 ppy. Equipment for production rates greater than 10 ppy is primarily provided through the line-item project Los Alamos Plutonium Pit Production Project (LAP4); the cost and schedule for the LAP4 project is not discussed in this PMP.

The equipment and gloveboxes are primarily being installed in TA-55 PF-4. The scope includes D&D legacy process equipment, upgrading equipment and gloveboxes, and installing new process equipment and gloveboxes. Los Alamos Plutonium Operations will also repurpose and upgrade gloveboxes for processing newly generated residues and disposition of legacy materials from the TA-55 PF-4 vault. In addition, TA-55 PF-4 vault upgrades will ensure sufficient and robust storage capabilities for pit production. These infrastructure investments are primarily in two rooms in TA-55 PF-4 and will provide enduring and reliable support for the recycle, recovery, and disposition of plutonium from the byproducts of pit production and other NA-10 plutonium programs.

All equipment projects managed by Los Alamos Plutonium Operations will follow the sequence shown in Figure 13. The NWBS element for Capital Assets starts with project initiation and ends at Turnover to Operations (TTO). The scope and cost associated with transitioning equipment from TTO to WR are included in the NWBS elements associated with pit production. This program follows the Weapons Production Equipment Lifecycle Guide to manage capital assets. Each installation or upgrade has a date by which TTO needs to be achieved. This date is determined by assessing when it must be available for use to support pit production. These TTO need dates can be 6 months to a year earlier than when the equipment is needed for pit production to allow time after TTO to first complete TTP and then for the equipment to be approved by the LLNL DA for WR use (if required).

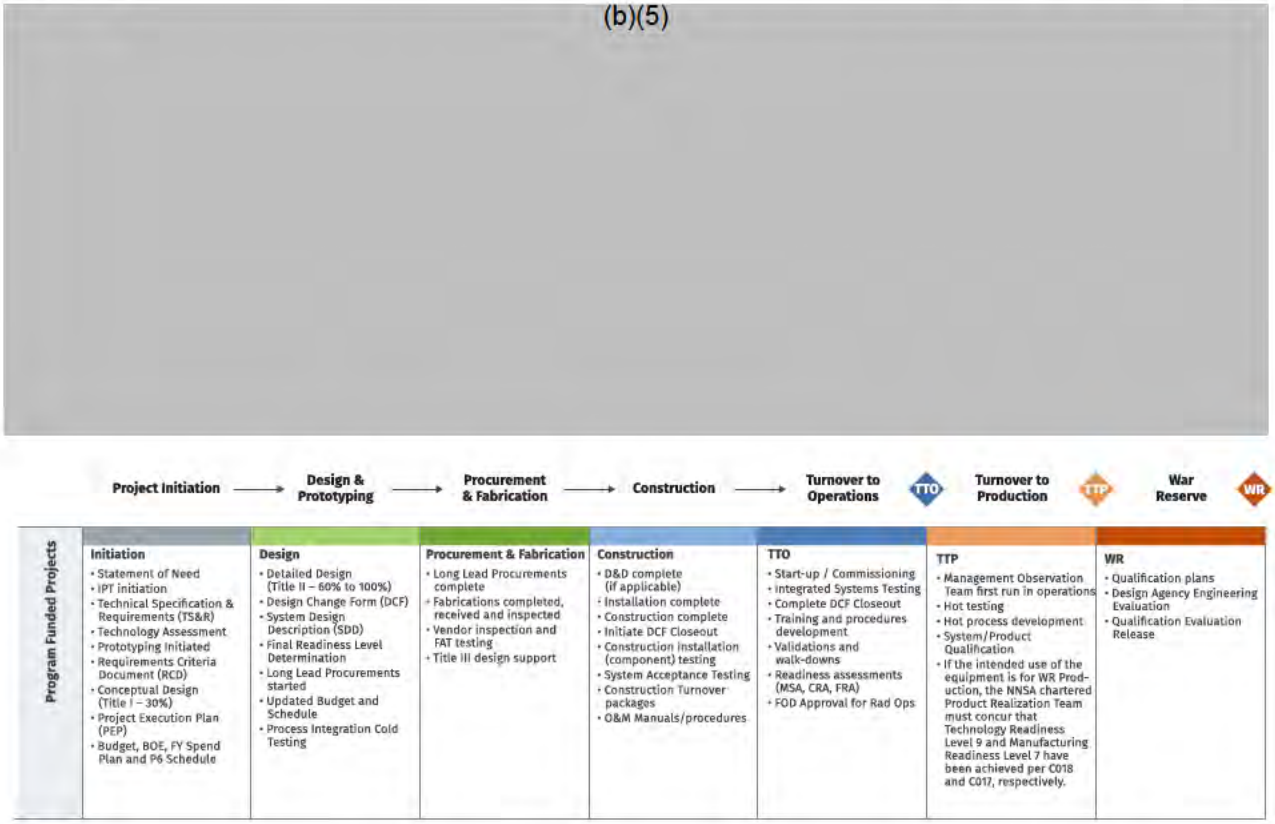


Figure 13. Equipment projects are managed using the Weapons Production Equipment Lifecycle Guide.

5. Risk Management

The purpose of Plutonium Operations Risk Management is to identify any threats or opportunities that could affect the success of the pit production mission. Additionally, this approach seeks to understand the associated impacts while establishing strong mitigation steps and controlling actions for each risk. This section addresses key features consistent with the NA-191 Risk and Opportunity Management Plan (ROMP) Revision 0 (dated February 18, 2021).

Each of the operational and project-related work efforts have various probabilities, impacts, and handling strategies that are captured in accordance with their respective governing requirements documents. Discrete risks and concern details can be found within the LANL instance to Active Risk Manager (ARM) upon request.

5.1 Risk Coordination and Working Group

Risk coordination will be governed consistent with detail contained within the NA-191 Risk and Opportunity Management Plan. Los Alamos National Laboratory has a risk manager and risk coordinator assigned to Plutonium Operations Risk Management. The Risk Manager will be responsible for all programmatic risks for each of the Plutonium Modernization (PuM) and Plutonium Enablement (PuE) programs and will coordinate risk and handling strategies with LANL enterprise risk management efforts, as necessary. The risk coordinator will govern risk and associated reporting detail as well as facilitate resolution of these risks and their associated proposed risks. Coordinator functions will be supported by Engineering Technology and Design-Process Modeling and Analysis group.

5.2 Accounting for Risk, Concerns, and Uncertainty

Plutonium Operations Risk Management manages risk and uncertainty based on requirements within the NA-191 ROMP. This includes the use of "Risks" and "Concerns" to describe discrete risk events and uncertainty-driven events, respectively. The following are the significant areas of focus for which LANL is identifying and managing program risk:

New equipment to support rate production: LANL will install the equipment to produce more than 10 pits and a minimum of 30 ppy through the line-item LAP4. The NNSA program requirements document states that the equipment required to reliably produce 30 ppy is an objective and not a threshold requirement. Consequently, (b)(5) .

Program interfaces: TA-55 PF-4 supports many programs that are critical to supporting diverse national missions. For LANL to integrate planning and successfully execute all programs, careful coordination between multiple organizations must be established to ensure maximum efficient use of the TA-55 PF-4 facility.

(b)(7)(E), (b)(7)(F)

5.3 Risk Management – General Process

As stated in the NA-191 ROMP, Plutonium Operations risks are updated monthly and consist of multiple required data points and descriptions. The NA-191 required data fields are:

- Title

- If/Then Statement
- Risk Breakdown Structure
- Risk Owner
- Risk Description
- Probability of occurrence
- 3-point cost and schedule impacts (Current Score)
- 3-point cost and schedule impacts (Target Score)
- Trigger Date
- Sunset Date
- P6 Activity ID
- Handling Strategy
- Handling Plan Title
- Handling Plan Description
- Fallback Plan Description
- Mitigation or Control Steps (includes owner, title, description, start date, due date, planned cost, actual cost, and target score)

LANL has chosen to implement multiple additional fields into ARM as a best practice for organizing and communicating risk information. These include…

Control Account Manager (CAM)
Subject Matter Experts and/or Process Engineers
Process Control Engineer
Probability Rationale
3-point Cost Impact Rationale
3-point Schedule Impact Rationale

Upcoming risk management process improvements include increased integration with the P6 schedule. Each risk currently has a P6 activity ID identified, which indicates where the risk's cost and schedule impacts will occur in the event of risk realization. Conversely, the risk team worked with the scheduling team to include a user defined field within P6 for ARM risk IDs. This will show which activities have risks associated with them and will further increase risk visibility.

5.4 Risk Management – MIE Project Process

MIE project risks (equipment associated with 10ppy, 30ppy, etc.) follow the general risk processes stated above but also use a templated approach for each risk interview. The template incorporates multiple areas of concern that are associated with most projects and often lead to discrete risks. They include:

- (b)(7)(E), (b)(7)(F)

These categories are general concerns that are captured for every project using the NA-191 ROMP Concern methodology. If a unique and identifiable root cause is identified within these concerns for a project, a discrete risk is created using NA-191 ROMP Risk methodology. This includes a detailed description of the identified failure mode, its potential impacts and mitigation actions to be taken.

5.5 Los Alamos Plutonium Pit Production Project (LAP4) Integration Methodology

Integration of the LAP4 and 10 Pit equipment installation efforts are underway currently between Associate Laboratory Directorate Weapons Production (ALDWP) and Associate Laboratory Directorate Plutonium Infrastructure (ALDPI), with ALDWP providing need date information, scoping detail, and integration potentials, and ALDPI providing execution strategies including the facilitation of planning detail supportive of installation efforts from design through turnover dates. As ongoing integration strategy efforts emerge, detail will be provided to NA-191 in the form of additional discrete risks and concerns related to the LAP4 work scope.

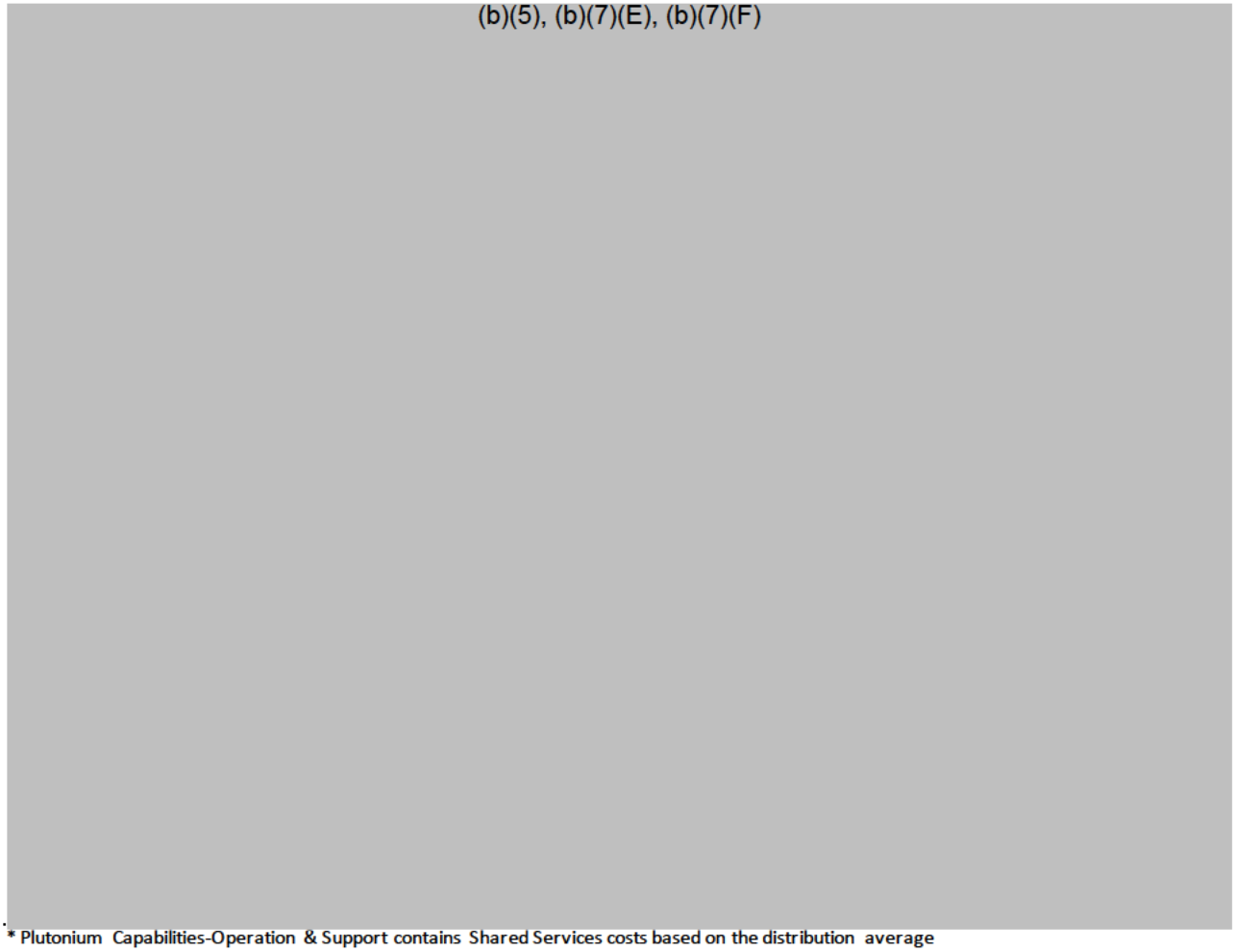
6. Workforce

Beginning in FY19, an ongoing series of LANL-wide staffing analyses was used to estimate the LANL plutonium enterprise staffing for FY20–FY27, which is being extended through FY28 in this update. These were the first analyses conducted by LANL that did not focus solely on pit fabrication labor needs but collected information for all organizations that enable the LANL plutonium enterprise and missions. The parameters and assumptions used in these analyses were based on plutonium program and project milestones and deliverables as well as expected operational conditions in TA-55 PF-4 (e.g., staff availability and TA-55 PF-4 access). (b)(7)(E), (b)(7)(F)

The workforce that is resource loaded into P6 for Los Alamos Plutonium Operations program execution is shown in Figure 14. Additional detail of the staffing analysis is provided in the Workforce Strategy for Plutonium Missions at Los Alamos National Laboratory (LA-CP-21-20695 revision expected in September 2022).

Following the rolling-wave planning approach, the resource loading in P6 is more accurate in FY23 than the outyears. The trends within a WBS element in the resources loaded in P6 are instructive to identify the elements of the WBS that must be addressed in terms of the resources required in the outyears.

The workforce shown by job classification in Figure 15 is a summary of the data at the job title level and is used by line management and HR to guide recruiting and hiring activities and initiative.



* Plutonium Capabilities-Operation & Support contains Shared Services costs based on the distribution average

Figure 14. FY23–FY28 workforce by Level 7 of the NWBS per the resource loaded P6 schedule

(b)(5), (b)(7)(E), (b)(7)(F)

Figure 15. FY23–FY28 workforce by job classification. (Chart and table do not include the workforce for the Asset Management element of the NWBS)

7. Costs

LANL has developed a resource-loaded (labor and nonlabor) schedule in P6 for FY23 through FY28 to meet the NNSA requirements for the Los Alamos Plutonium Operations program. This resource-loaded schedule provides the cost estimate by WBS element through FY28 and is the Horizon Baseline submitted to NA-191. The resource loading in P6 is more accurate for FY23 than for the outyears.

Figure 16 provides details of LANL's planned costs of the NWBS. The cost profiles in Figure 16 are derived using rolling wave planning of the Horizon Baseline, which is captured in an integrated P6 schedule through FY28. This reflects a significant increase in the planning basis fidelity from previous years. As such, the cost profiles captured in Figure 16 differ slightly from the FYNSP funding profile, where LANL and NNSA are committed to resolve any discrepancies and maintain support for the pit production mission.

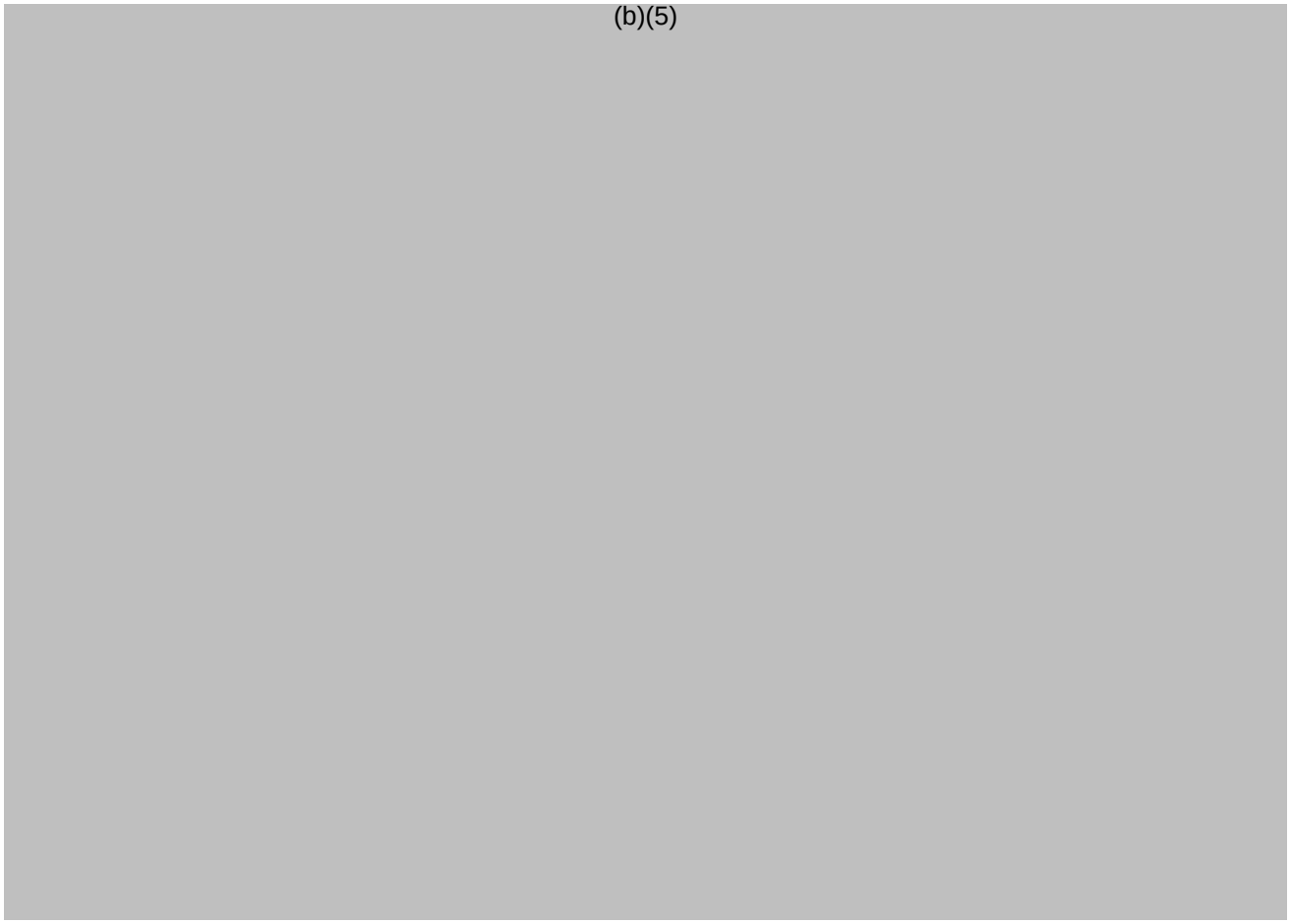


Figure 16. Estimated costs by Level 7 element of the NWBS per the resource-loaded Horizon Baseline P6 schedule (Estimated costs shown do not include Management Reserve)

8. Conclusion

Los Alamos Plutonium Operations is responsible for executing the scope directly related to achieving the 30 ppy production mission, as well as providing plutonium components for use in subcritical experiments, reducing the amount of material stored in the vaults at TA-55 PF-4 and CMR, and supporting safe and efficient storage of nuclear material by improving container designs and assessing container lifetimes.

This PMP governs the activities under the Plutonium Operations program for FY23 through FY28 and is submitted to NA-191 as part of the FY23 Horizon Plan. Over this timeline the program follows the rolling-wave planning structure, where detailed schedules are maintained over the nearest fiscal years and outyears contain planning packages with less detail to balance the needs of near-term program execution with long-term FYNSP planning. (b)(5)

Appendix A. Manufacturing Modernization Project (MMP) Integrated Project Plan (IPP)

Establishing the capacity for a reliable steady-state pit production rate requires improvements to manufacturing systems in TA-55 PF-4 to increase efficiency and reduce the risk of achieving production goals that must meet War Reserve quality requirements. A key process improvement is the Manufacturing Modernization Project (MMP), an innovative approach that uses digital manufacturing technologies to facilitate the collection, retrieval, and transfer of data for the pit production mission. The MMP is comprised of two parts: (b)(7)(E), (b)(7)(F) , as well as a suite of software elements that provide integrated data management that electronically captures product specifications, production data, and other documentation required for product acceptance and sales, and shop-floor control for production missions. The suite of software elements is referred to as the Manufacturing Management System (MMS). Both (b)(7)(E), (b)(7)(F) and the MMS are fundamental to the MMP.

This Integrated Project Plan outlines LANL's plan to implement MMP to support the production capacity requirements for the pit production mission.

A.1. Justification of Need

The NNSA-approved MMP 5-Year Plan (LA-UR-20-22454) describes ALDWP's vision for the use of digital manufacturing technologies to provide required improved program performance in achieving the 30 ppy mission. MMP includes software tools collectively called the Manufacturing Management System (MMS) that provide the actions that LANL will take to collect production data electronically for use in product acceptance. MMS, (b)(5), (b)(7)(E), (b)(7)(F)

(b)(7)(E), (b)(7)(F)

Key benefits of MMP include better communication and data accuracy, increased efficiency of operations, reduction in worker dose exposure, space utilization and construction benefits, and cost savings. Other benefits include:

- **Accuracy**: Enable TA-55 PF-4 workers to input information faster and more accurately, thereby reducing errors associated with manual data transcription. (b)(7)(E), (b)(7)(F)
- **Efficiency**: Increase the efficiency of TA-55 PF-4 workers by enabling immediate data collection, retrieval, and transfer. (b)(7)(E), (b)(7)(F)

- **Safety:** MMP will bring LANL into better accordance with DOE's nuclear safety management requirements (e.g., 10 CFR 830 and ALARA principles). MMP will assist in reducing radiation exposure to workers by decreasing the time spent collecting and transferring data. (b)(7)(E), (b)(7)(F)
- **Space utilization**: TA-55 PF-4 is a Hazard Category 2 Security Category I facility and is the nation's only full-service plutonium facility. LANL is reconfiguring rooms in TA-55 PF-4 to support expanding requirements and to execute programmatic activities more efficiently. (b)(7)(E), (b)(7)(F)
- **Cost savings**: MMS will reduce the cost associated with the acceptance and sale of the product. (b)(7)(E), (b)(7)(F)

A.2. Statement of Work

The scope of work that LANL will complete as a part of the horizon baseline plan is described below. The (b)(7)(E), (b)(7)(F) will serve as the backbone for the Manufacturing Management System (MMS) which consists of the following combination of software tools:

(b)(4), (b)(7)(E), (b)(7)(F)

- (b)(7)(E), (b)(7)(F)

The following figures provide a roadmap for the development work and implementation that are planned for each of the next four fiscal years.

Figure A-1. FY22 and FY23 Production Roadmap

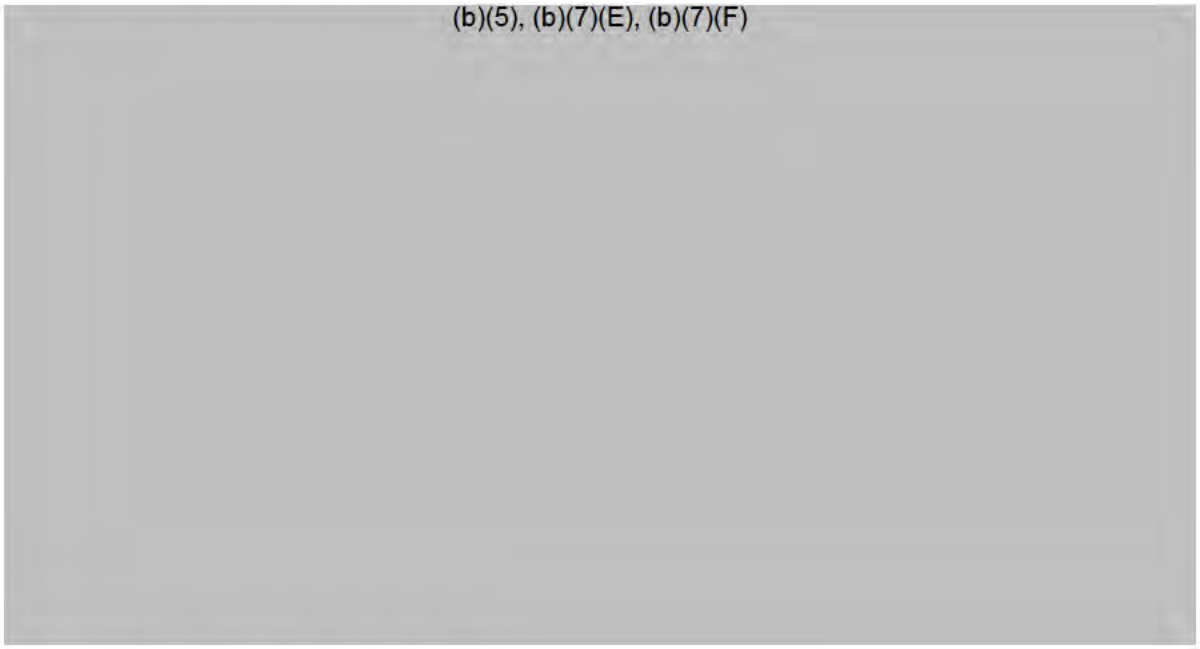


Figure A-2. FY23 and FY24 Production Roadmap

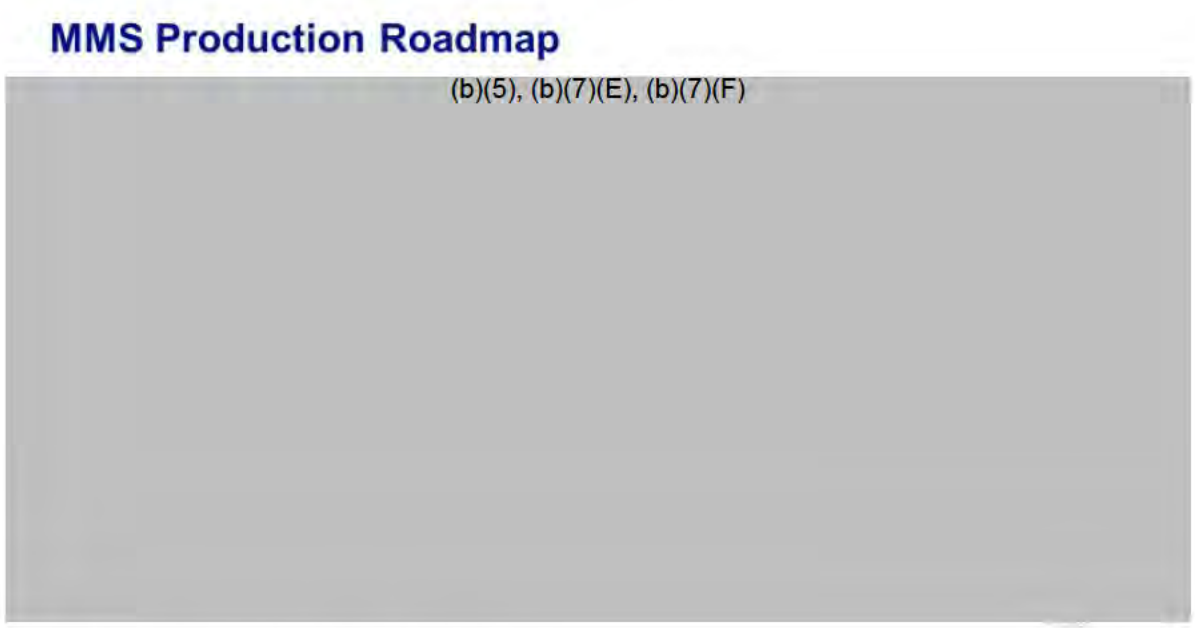


Figure A-3. FY24 and FY25 Production Roadmap

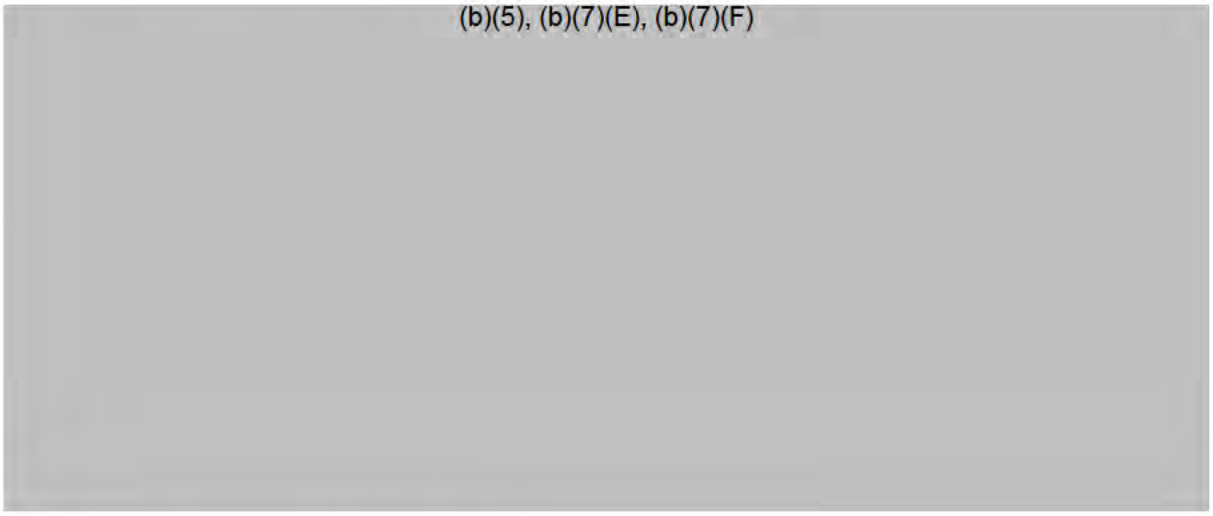


Figure A-4. FY25 and FY26 Production Roadmap

(b)(7)(E), (b)(7)(F) will bring LANL into better accordance with DOE's nuclear safety management requirements, 10 CFR 830, and ALARA principles. (b)(5), (b)(7)(E), (b)(7)(F)

Although not required to achieve the capacity milestones, DDA improves the execution towards milestones. The benefit of DDA, which will be rolled out in stages, is to further improve data quality by eliminating keyed in (transposed) data. This eliminates NCRs and schedule delays. A secondary benefit is efficiency gains from reduced data entry time. The steps to implement DDA will be incremental. The addition of DDA, while not essential, provides significant quality improvements and an opportunity to increase LANL's confidence to meet capacity missions. Currently there are five processes/equipment that have the appropriate hardware and capability to support DDA.

(b)(5), (b)(7)(E), (b)(7)(F)

A.3. Authorization Requirements

Approval and authorization requirements are determined by NNSA. LANL submits all items in **Error! Reference source not found.** to the NA-LA AO for direct approval or for routing to other approving authorities, such as NNSA or National Security Agency (NSA). LANL does not approve or authorize any packages, but LANL may perform testing and make recommendations based on these results before submitting them for approval.

Table A-1. Required approvals and authorizations for MMP

Description	Approving Authority
(b)(7)(E), (b)(7)(F)	
MMS	
Security plans for MMS: SMRP (Secure Manufacturing Resource Planning System) DDA (Digital Data Acquisition) ESP (Electronic Sales Package) DBB (Digital Build Book) SMES (Secure Manufacturing Execution System)	NA-LA AO

The following MMS components were approved to operate in a classified environment including the PF-4 hard-wired classified system on January 23, 2019, under the Secure Manufacturing Resource Planning (SMRP, CP-RMF-005) and the Secure Manufacturing Execution System (SMES, CP-RMF-007), and all will be required to (b)(5), (b)(7)(E), (b)(7)(F)

- MRP (Manufacturing Resource Planning System)
- ESP (Electronic Sales Package)
- DDA (Digital Data Acquisition)
- DBB (Digital Build Book)
- MES (Manufacturing Execution System)

(b)(5), (b)(7)(E), (b)(7)(F)

Table A-2. (b)(7)(E), (b)(7)(F)

(b)(5), (b)(7)(E), (b)(7)(F)

Table A-3. MMS tasks required to create an electronic sales package submittal for FPU

Manufacturing Management System Tasks
(b)(5)

A.4. Work Breakdown Structure (WBS) Dictionary

Los Alamos Plutonium Operations maintains a WBS dictionary that has been provided to the NNSA Plutonium Program Office (NA-191) Federal Program Director as requested. The WBS dictionary elements are divided into the National Work Breakdown Structure (NWBS) and Contractor Work Breakdown Structure (CWBS) categories. The WBS elements in this dictionary relevant to MMP are located under the Supply Chain Management summary account (CWBS 01.03.01) and the Business System Support control account (CWBS 01.03.01.03). Table A-4 lists these elements and the associated scope descriptions.

Table A-4. WBS Dictionary Elements associated with MMP

WBS Element Title	Scope Description
MMP Pit Manufacturing **NWBS:** OEB.001.002.001.001.003.001.003.002 **CWBS:** 01.03.01.03.02	The Manufacturing Modernization Project (MMP) consists of the following Manufacturing Management System (MMS) Applications: (b)(4), (b)(7)(E), (b)(7)(F) MRP – Manufacturing Resource Planning), Manufacturing Execution System), Electronic Sales Package (ESP), Digital Data Acquisition (DDA), and Digital Build Book.
(b)(7)(E), (b)(7)(F)	

A.5. Schedule and Cost Estimates

The resource loaded P6 schedule for MMP is included in the Horizon Baseline for Los Alamos Plutonium Operations, which has been approved by NA-191. The Horizon Baseline, including the WBS elements associated with MMP, is under change control and managed in accordance with LANL and NNSA requirements.

The estimated costs for the MMP WBS elements are shown in Table A-5.

Table A-5. Summary of estimated costs for MMP

(b)(5), (b)(7)(E), (b)(7)(F)

A.5.1 Milestones

The milestones shown in Table A-6 reflect the systems that must be implemented for LANL to meet the pit production rates specified by NNSA (10 ppy in 2024, 20 ppy in 2025, and at least 30 ppy in 2026).

All MMP systems, (b)(7)(E), (b)(7)(F) are required to meet the 10 ppy production goals defined by NNSA. (b)(5), (b)(7)(E), (b)(7)(F) The Horizon

Baseline P6 schedule (also known as the Horizon Plan), which has been transmitted to NA-191, provides additional detail.

Table A-6. Summary of MMP systems required for pit production capacity milestones based on the Horizon Baseline date

	Horizon Baseline Date	10 ppy	20 ppy	30 ppy
	(b)(5), (b)(7)(E), (b)(7)(F)			
MMS				
Digital Build Book (DDA)	(b)(5)			
Manufacturing Execution System (MES)				
Electronic Sales Package (ESP)				
Digital Build Book (DBB)				
Digital Twin				

MMS is included in the Pit Operations Horizon Plan and there will be cost and schedule impacts if MMS is not implemented.

- (b)(5), (b)(7)(E), (b)(7)(F)
-

LANL has a Primavera P6 resource-loaded baseline schedule under change control that contains the deliverables, timeline, and milestones to support the implementation (b)(7)(E), (b)(7)(F) The key milestones in Primavera P6 for obtaining Approval to Operate (ATO) (b)(7)(E), (b)(7)(F) are listed in Table A-2 and the MMS tasks required to create an electronic sales package submittal for FPU are listed in Table A-3.

A.6 Risk

The LANL risk management team has performed multiple risk reviews with subject matter experts to assess any risk associated with the MMS software elements (b)(7)(E), (b)(7)(F) and with the (b)(7)(E), (b)(7)(F) has also been analyzed for risk, as described in the two part risk assessment, *Information Technology Comprehensive Risk Assessment* (b)(7)(E), (b)(7)(F) (b)(7)(E), (b)(7)(F) (LA-CP-22-20109) and *(U)* (b)(7)(E), (b)(7)(F) (b)(7)(E), (b)(7)(F) (LA-CP-10090), which were submitted to the NA-LA Contracting Officer (CO) on February 28, 2022.

LANL uses Active Risk Manager (ARM) software to manage and update discrete risks associated with the Plutonium Modernization efforts. ARM allows for detailed documentation of risk impacts and mitigation actions. Additionally, all risks within ARM follow the requirements set by the NA-191 Risk and Opportunity Management Plan (ROMP) and are reported to NA-191 monthly. The risks and opportunities currently in ARM related to MMS and (b)(7)(E), (b)(7)(F) are illustrated in section 5 within the PuOps Program Management Plan (PMP).

Appendix B: WBS Dictionary

Table B-1. Description of the NWBS Level 6 elements by PMP functional area

PMP Functional Area	NWBS Element (Level 6)	Description
(b)(7)(E), (b)(7)(F)		

Appendix C. Capital Acquisition Project Descriptions

To provide the critical equipment needed to produce 10 pits in CY2024, the equipment installation strategy is focused on 11 projects designated as Group 1. Table C-1 provides an overview of the Group 1 projects as well as the other equipment projects that are in the pipeline and designated as 1A, 2, 3, and 4 based on their prioritization. The projects are also grouped by their place in the process flowsheet.

Table C-1. Capital Acquisition Project Descriptions and Updates by Priority Grouping

Group	Flowsheet	Project	Description and Updates
(b)(7)(E), (b)(7)(F)			

Group	Flowsheet	Project	Description and Updates

(b)(7)(E), (b)(7)(F)

Group	Flowsheet	Project	Description and Updates

(b)(7)(E), (b)(7)(F)

Group	Flowsheet	Project	Description and Updates

(b)(3) UCNI, (b)(7)(E), (b)(7)(F)

Group	Flowsheet	Project	Description and Updates
(b)(3) UCNI, (b)(7)(E), (b)(7)(F)			

Group	Flowsheet	Project	Description and Updates

(b)(7)(E), (b)(7)(F)

Group	Flowsheet	Project	Description and Updates
(b)(3) UCNI, (b)(7)(E), (b)(7)(F)			

Group	Flowsheet	Project	Description and Updates
(b)(7)(E), (b)(7)(F)			

Group	Flowsheet	Project	Description and Updates
		(b)(3) UCNI, (b)(7)(E), (b)(7)(F)	

Group	Flowsheet	Project	Description and Updates
(b)(3) UCNI			