PermaFix®
environmental services
A Nuclear Services and Waste Management Company

Perma-Fix Northwest Richland Inc.
Limited Part 70 License
Material Control and Accounting

nuclear technical waste

PFNW Attendees

Richard Grondin
Executive Vice President Waste Treatment Operations

Curt Cannon
Vice President & General Manager

Dakin Utley
Radiation Safety Officer

Enercon Talisman Division SMEs

Purpose

Discuss PermaFix Northwest (PFNW) facility approach and regulatory strategy regarding Material Control and Accounting (MC&A)

PermaFix Environmental Services

- $100M company nuclear services company
- Leading provider of waste management services with over 30 years of experience
- Addressing problematic waste streams with no existing pathway for disposition
- Long-standing relationships with government agencies including DOE, NRC, and NNSA

PFNW Complex Overview

- Purchased by PermaFix in 2007
- Operating for over 20 years under a radioactive materials license issued by the Washington Department of Health
- >500k Manhours without OSHA reportable accident
- Processes Mixed Waste from DOE and commercial facilities
- PFNW manages and treats both low level and mixed low level radioactive wastes in two separately licensed facilities

PFNW Complex Aerial View

Mixed Waste Facility

PROCESS NUMBER	PROCESS NAME
SB-04	BENCH SCALE WASTE TREATMENT SYSTEM
SB-13	SHREDDER SYSTEM
SB-15	AEROSOL CAN PUNCTURING SYSTEM
SB-18-04	IN-BARREL COMPACTION SYSTEM
SB-18-05	IN-BARREL COMPACTION SYSTEM
SB-18-06	DRUM COMPACTION SYSTEM
SB-18-07	SUPER COMPACTION SYSTEM
SB-22	LOW CAPACITY MIXING SYSTEM
SB-23	IN-CONTAINER MIXING SYSTEM

COLOR CODE LEGEND:

CURRENT ROOM NUMBER

= PROCESS AREA ≤ 450 GRAMS

= STORAGE AREA ≤ 600 GRAMS

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PERMAFIX NORTHWEST RICHLAND, INC.
2025 BATTELLE BLVD.
RICHLAND, WA

PERMAFIX NORTHWEST FACILITY
MIXED WASTE BUILDING 13
AERIAL PHOTO WITH ROOM LOCATIONS

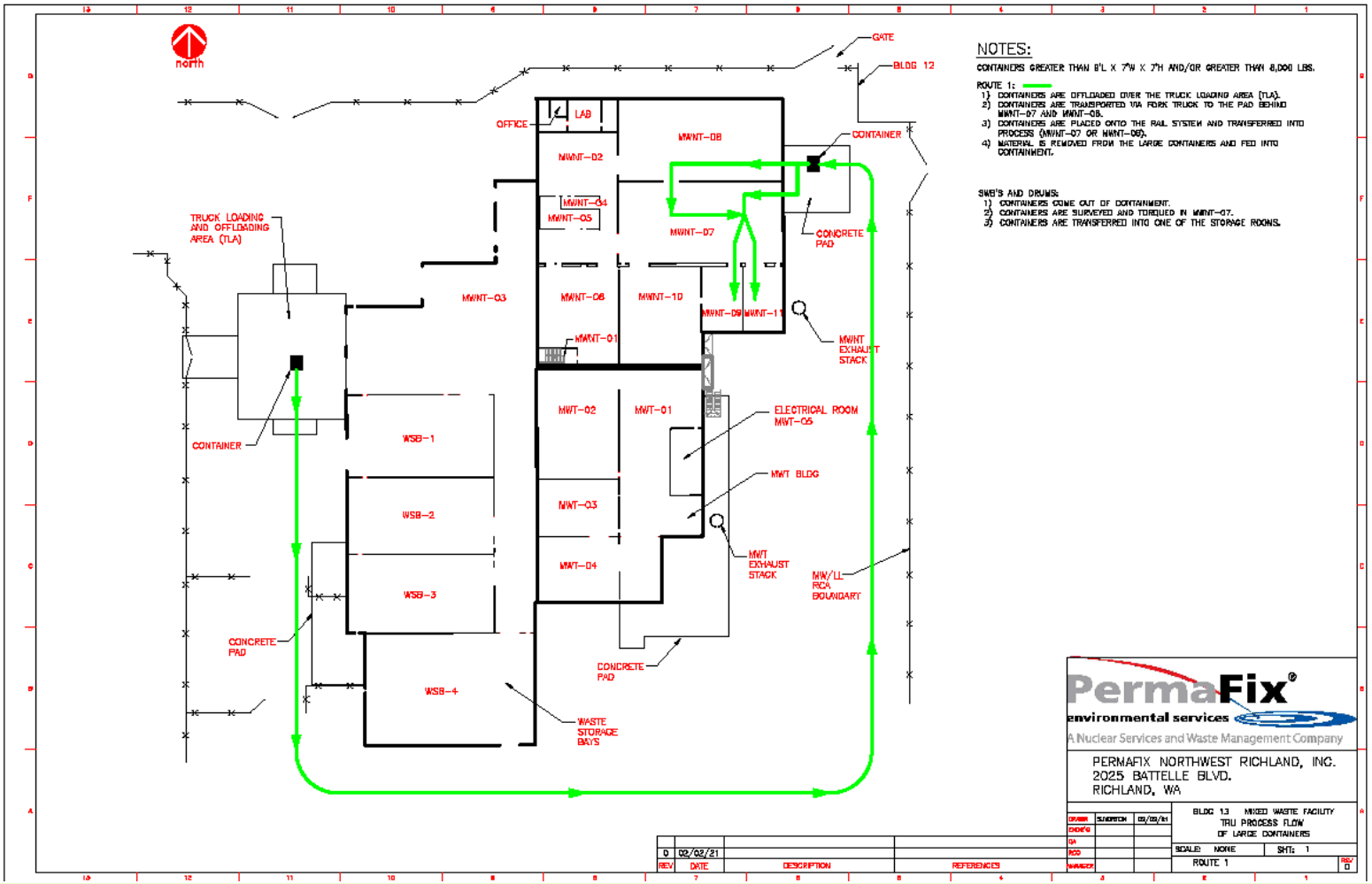
	BY	DATE
DRAWN	S.NORTON	
CHKD		
QA		

SCALE: NONE SHT: 1
MW-BLDG13-AERIAL VIEW-001 REV 0

Existing Mixed Waste Processes

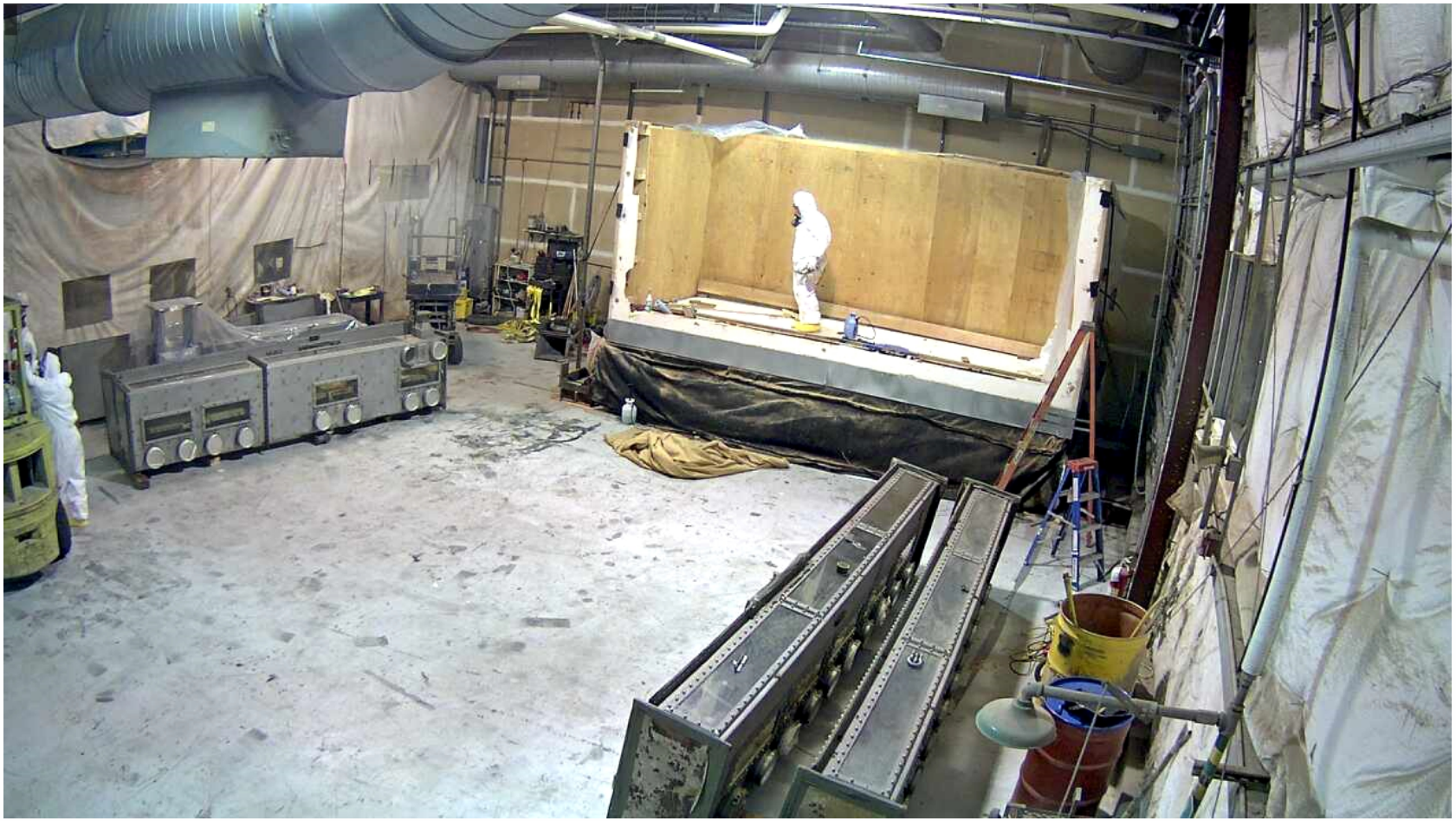
- Waste receive and inspected
- Waste segmented, resized and packaged for subsequent disposal by waste generator
- Non-conforming items removed
- Stabilization of small quantities of incidental liquids and solids is also performed
- No chemical conversions or thermal treatment of SNM
- Batch processing only
- Processed waste returned to waste generator for ultimate disposal

Mixed Waste Handling



Open Overpack

Staged for Volume Reduction



Volume Reduction

PFNW Part 70 License

- WDOH radioactive materials license limits SNM possession to 200 Pu-239 equivalent grams
- PFNW to process similar DOE wastes with higher levels of SNM contamination
  - Proposed 600-gram Pu-equivalent SNM possession limit / 450-gram process area limit (600 grams is SNM of moderate strategic significance)
  - SNM not in pure bulk form – dispersed throughout waste with other radioactive materials
- No change or modification to existing physical processes

PFNW Part 70 License

- A limited Part 70 license is necessary due to the Part 150 constraints on Agreement State licensing of SNM
- 600 Pu-equivalent gram limit is applicable to the Mixed Waste Facility in total
  - 600 Pu-equivalent gram limit is specifically applicable to packaged material in storage, material in process equipment, and material holdup in support systems
  - 450 Pu-equivalent grams operational limit applies to the large component segmentation and packaging shop
  - Existing 200-gram operational limit applies to other process rooms in facility

PFNW Part 70 License

- Application based on guidance provided in NUREG-1520 Rev. 2, SRP for Fuel Cycle Facilities License Applications
- Based on nature of work and characterization of the waste, three exemptions will be requested

10 CFR 70, Subpart H Exemption

- Facility does not meet requirements of 10 CFR 70.60
- Criticality scoping study identified physical and operational constraints
- Formal Criticality Safety Evaluation (CSE) will demonstrate the conservatism of the 600-gram Pu-equivalent SNM possession limit, and the 450-gram process area limit
- CSE will demonstrate subcriticality based on system parameters
- Discussed during September 16th public meeting

10 CFR 73.67(d) Exemption

- An exemption from certain physical security requirements in 73.67(d) related to preventing theft of the SNM will be requested based on the inability to separate or extract the SNM from the waste
- These physical characteristics of the waste stream make loss, theft, or diversion of SNM extremely unlikely.
- To be discussed on November 4th, 2021

10 CFR Part 74, Subpart D Exemption

DOE Waste

- Waste Characterization
  - Waste consists of metals, plastic, cloth and other materials with varying levels of surface contamination
  - Highly variable waste densities within the waste packages with heterogenous SNM distribution
  - Relatively low concentrations of SNM within the matrix (typically $< 10^{-3}$ SNM grams per gram of waste)
  - Mixed fission and activation products comingled with the SNM.
  - To be conservative, SNM mass amounts are overestimates
- Because contents are not amenable to precise modeling, non-destructive assay (NDA) measurement uncertainties are large

DOE Waste Characterization

- Waste characterized under the current DOE waste management program
- Assigned values are conservatively based on incremental NDA measurement and / or process knowledge of waste items
- Manifest documentation reviewed and accepted by PFNW prior to shipment

Process Activities

- Processing of waste by PFNW consists primarily of sorting / repackaging for volume reduction
- Repackaging of the waste by physically reconfiguring the waste items can significantly alter NDA measurement results.
  - Typical processing activity can involve segmenting a glovebox and repackaging it as stacked, relatively flat slabs of metal and plexiglass
  - Contamination distribution typically varies by a factor of five (or more) between glovebox walls and tops, relative to the glovebox floor
- Accordingly, inbound SNM values are used for outbound shipments, allocated by waste mass

Part 74 Exemption

- § 74.45 provides the MC&A measurement and measurement quality control requirements for SNM of moderate strategic significance
- The physical and radiological characteristics of the waste materials significantly impact the ability to perform accurate measurements of the SNM content
- PFNW will propose an exemption from certain requirements of Subpart D of Part 74
- As an alternative, the focus of PFNW's MC&A program will be management and control of the waste, from receipt to return to the DOE generator

Compensatory Measures

- Handling and processing of the mixed waste is captured on video, with video retention driven by processing commitments to customers
- All waste handling activities are conducted using the two-man rule.
- Use of tamper-indicating devices
- Waste mass balances will be used to demonstrate that all SNM that is received at the PFNW facility is returned to the generator
- PFNW additionally returns processing-related secondary waste materials to the generator

Application Content

- NUREG-1520 identifies 13 MC&A program areas of concern for Category II facilities
- Application will provide an assessment of each applicable program area (as described in the next slides)

NUREG-1520 Program Areas

1. PFNW will develop a management structure that permits effective functioning of the MC&A system
2. Physical and radiological characteristics of the waste materials to be received and processed render NDA measurements of the bulk material impractical
3. Measurement-control is not practicable for the waste processing operation
4. Use of statistics is not practicable as no NDA is performed
5. Physical inventories will be conducted at a minimum 9-month frequency

NUREG-1520 Program Areas

6. Item-control system
   - Procedures will be developed to address removals of mass from inbound waste packages (e.g., non-conforming waste items) and additions to outbound waste packages (e.g., used PPE)
   - Non-conforming waste items may be separately packaged for return to the generator
   - SNM will be apportioned by waste mass in order to ensure accurate accounting of SNM
7. Procedures will compare shipper and receiver measured package masses for inbound and outbound packages
8. MC&A program will be included in an annual licensed program assessment

NUREG-1520 Program Areas

9. Procedures shall include verification that shipper tamper-indicating seals are intact
10. Designation of material balance areas, item-control areas, and custodians
    - The PFNW facility occupies a small footprint and utilizes very simple processes
    - The facility is a single material balance area and a single item control area
11. PFNW will develop procedures for investigating and resolving indications of loss, theft, diversion, or misuse of SNM

NUREG-1520 Program Areas

12. PFNW will maintain information that would aid in the investigation and recovery of missing SNM in the event of an actual loss of SNM
13. PFNW shipment and inventory control procedures will explicitly address records of SNM inventory, including documenting receipt, shipment, disposal, and current inventory of the SNM held under license

Questions?