U.S. Department of Energy
Office of Civilian Radioactive Waste Management

YUCCA MOUNTAIN PROJECT

Underground Facilities Design and Operations

Presented to:
Nuclear Waste Technical Review Board Panel on the Waste Management System

Presented by:
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U.S. Department of Energy

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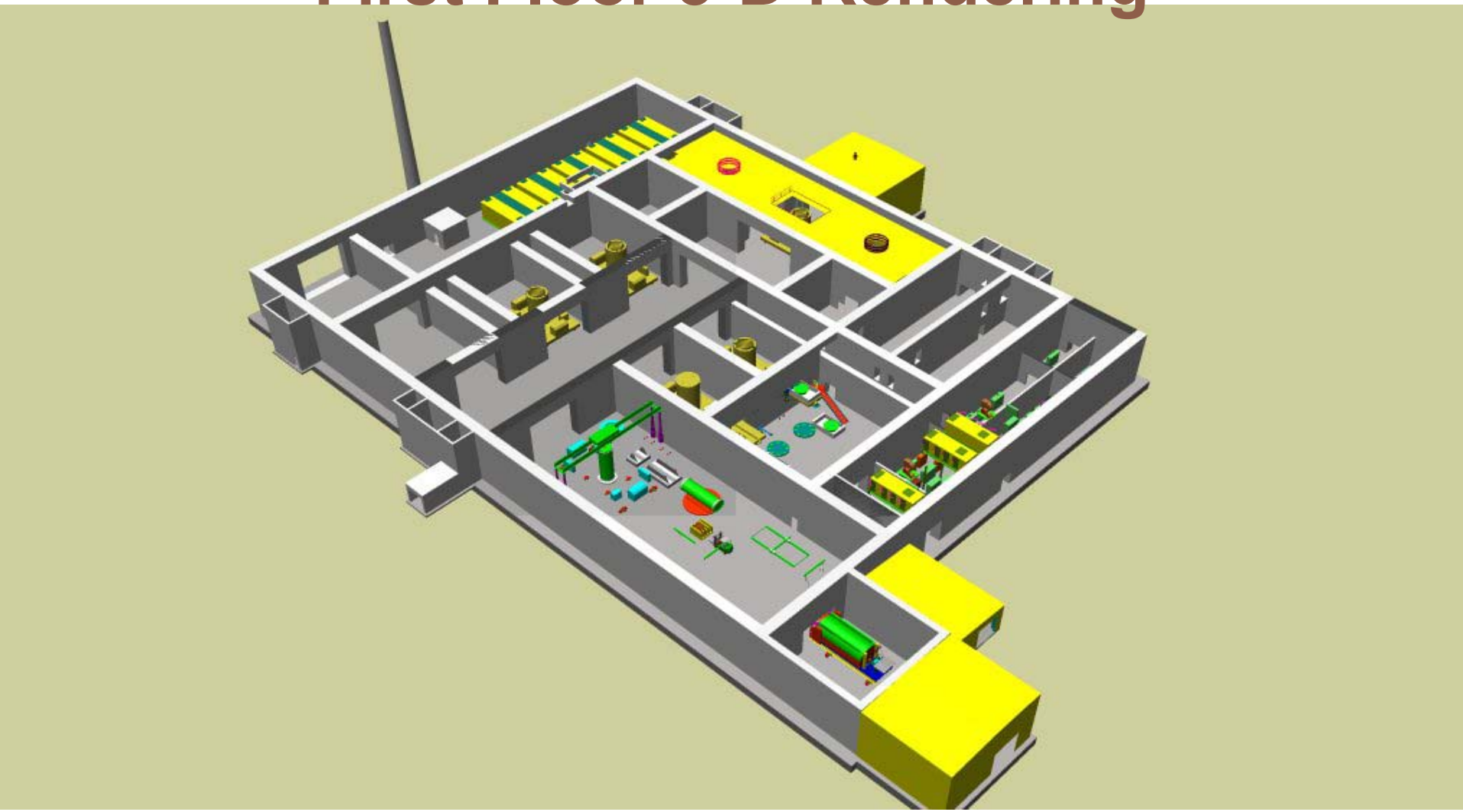
Las Vegas, Nevada

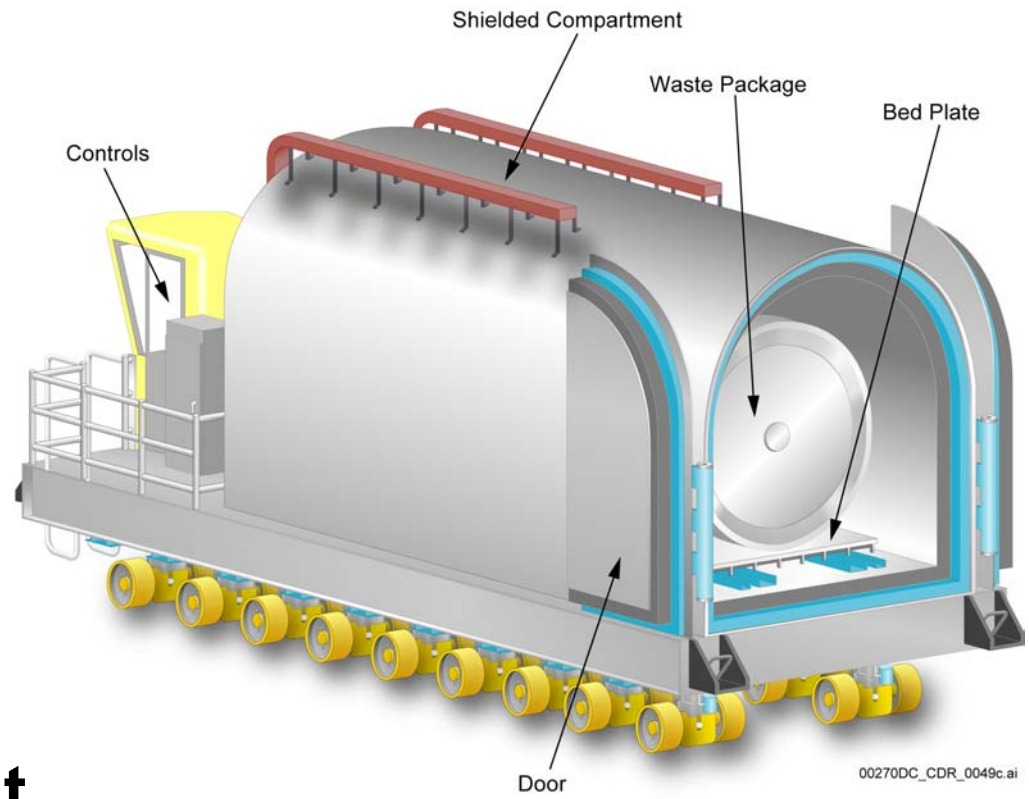
Dry Transfer Facility #1
First Floor 3-D Rendering



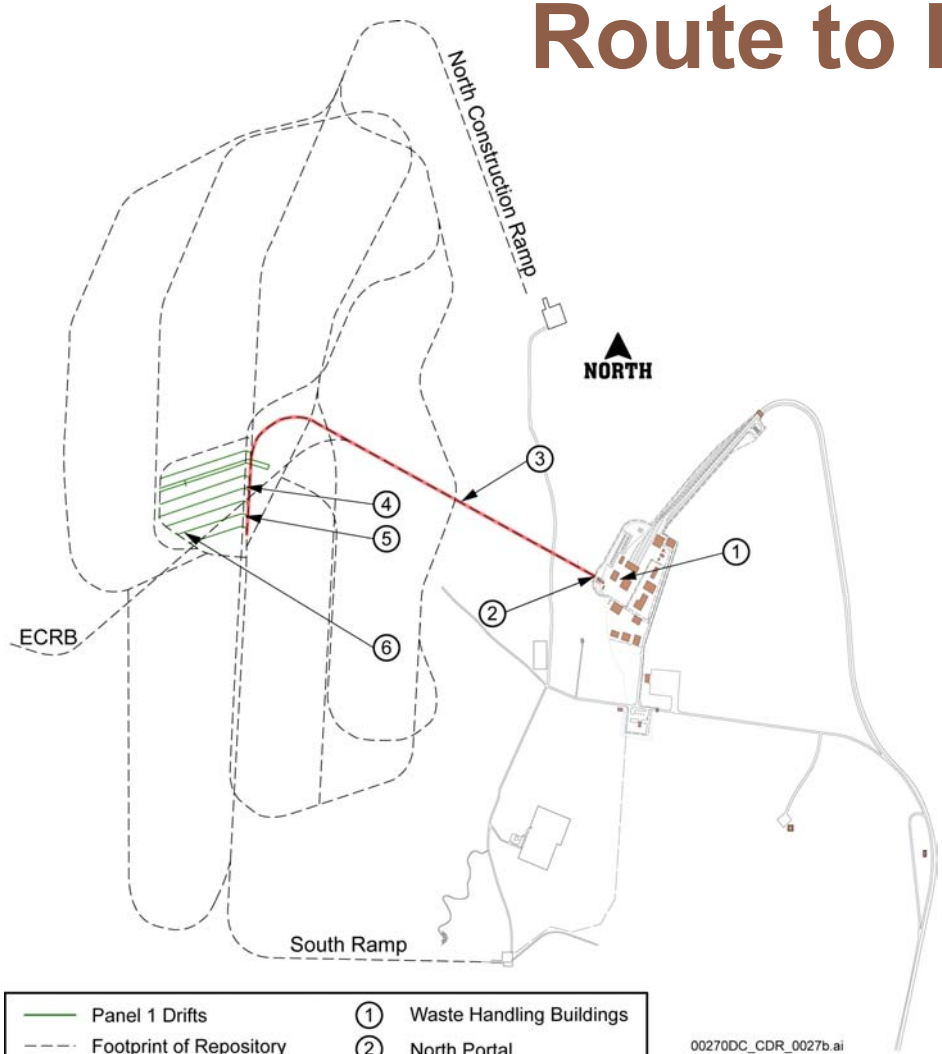
YUCCA MOUNTAIN PROJECT

Waste Package Transporter

- Carries one Waste Package (WP)
- WP on a pallet and bed plate
- Transporter is shielded
- Operated remotely
- Carries WP from surface to loading dock in emplacement drift

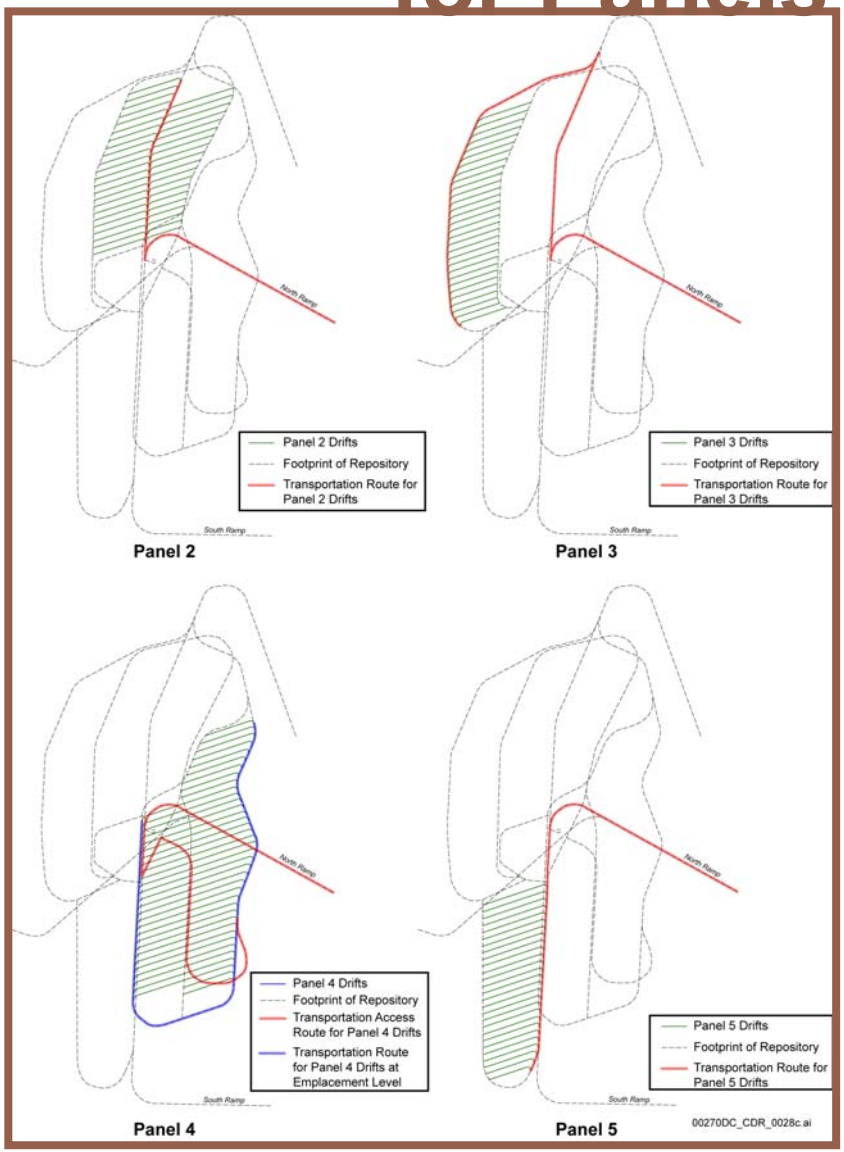


Waste Package Transporter Route to Panel 1



- **Predetermined routes**
- **Emplacement location based on thermal management procedures and operational considerations**

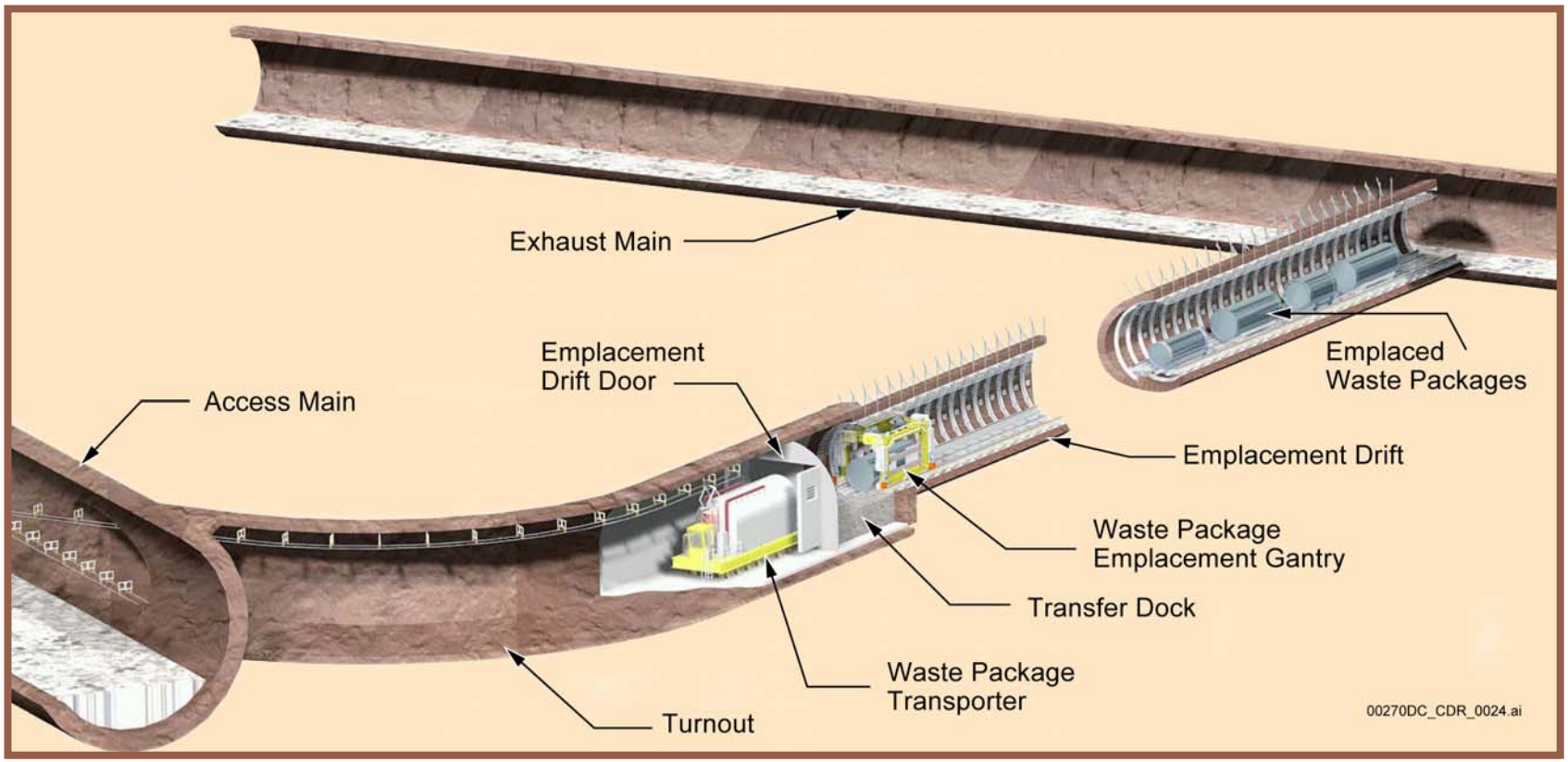
Waste Package Transportation Routes for Panels 2, 3, 4, and 5



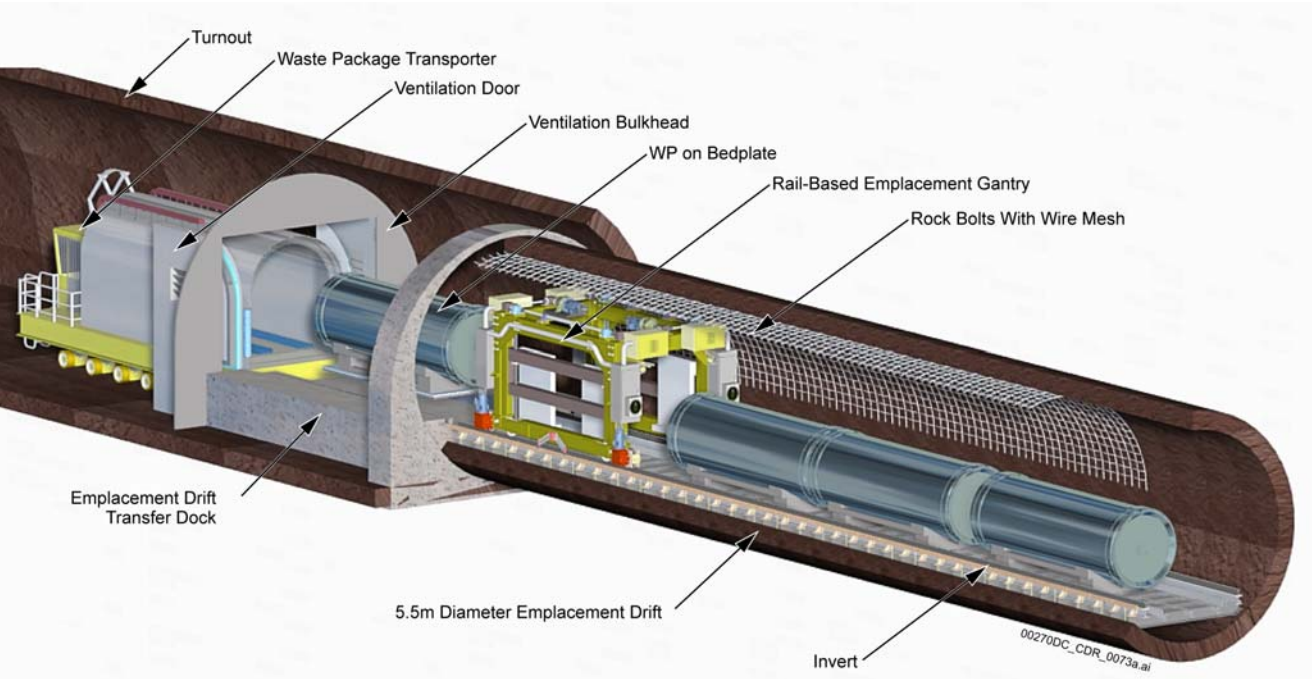
- Transportation routes for Panels 1, 2, 3, and 5 are at a single emplacement level
- Transportation route for Panel 4 is to a lower level

Waste Package Transporter Route Information

Waste package emplacement starts at the exhaust end of the drift and proceeds towards the turnout until the drift is fully loaded.



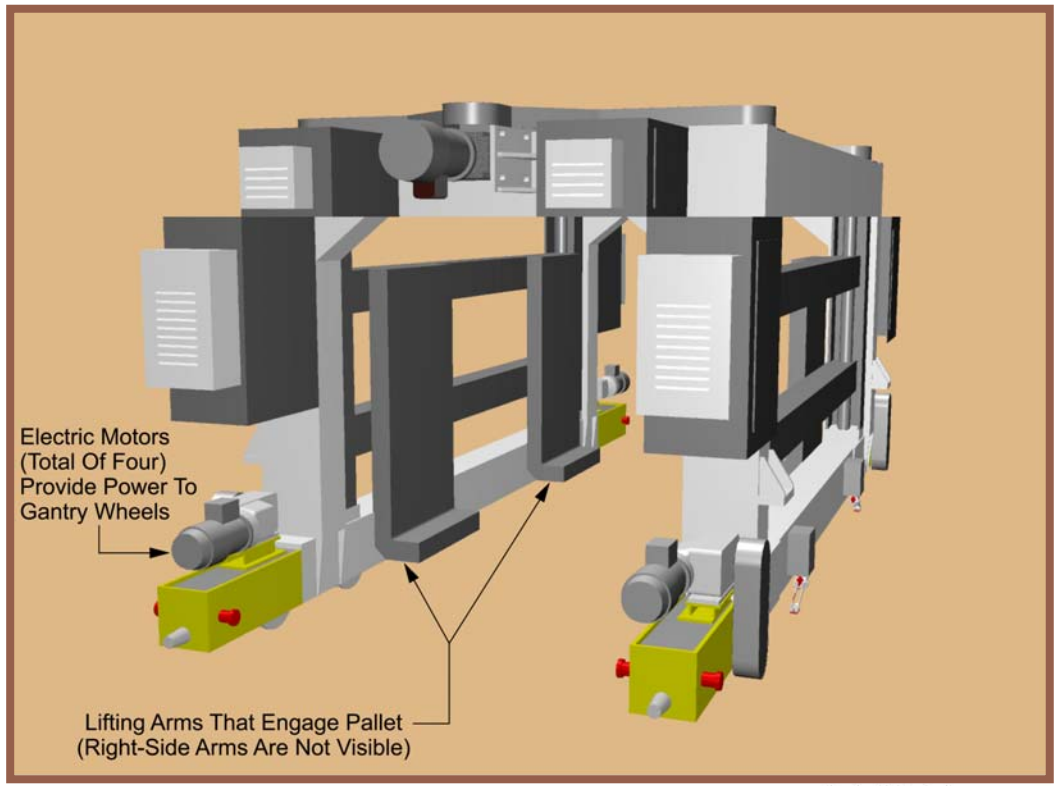
Waste Package Transporter Unloading at Transfer Dock



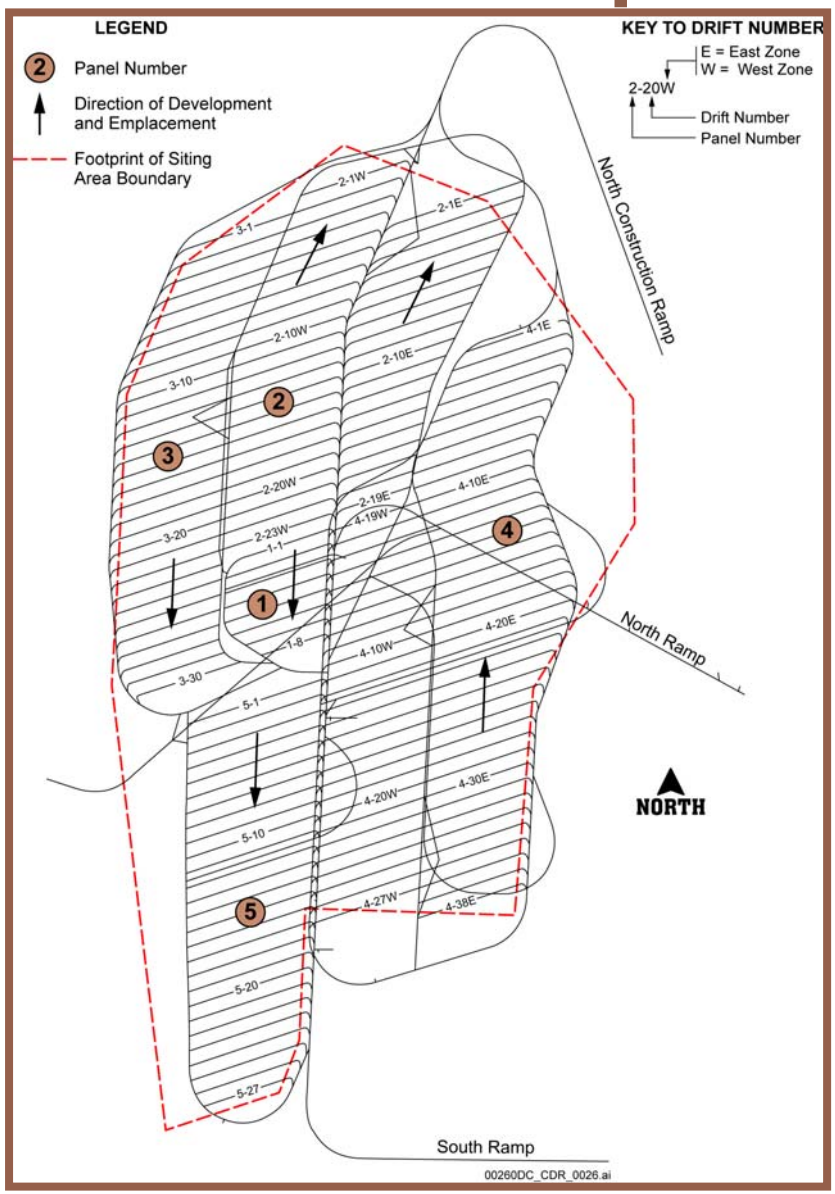
- WP on pallet moves to transfer dock via a bed plate on rollers
- Bed plate moved by rigid chains mounted on transporter
- Gantry straddles WP and lifts it up

Waste Emplacement Gantry

- Four vertical lifting arms
- 1 Meter displacement
- Lift pallet and place on floor
- Electric operated
- Remotely operated
- Data gathering and transmitting equipment
- Control computers
- TV cameras
- Lights
- Fire detection and suppression systems



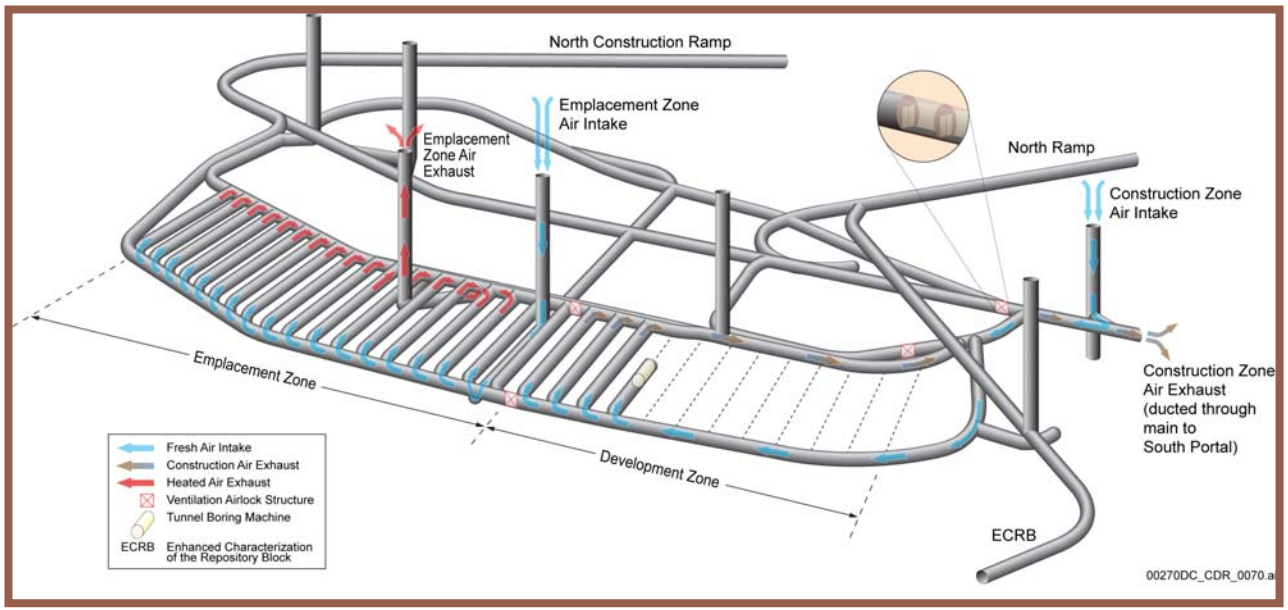
Repository Layout



- **Capacity of 70,000 metric tons of heavy metal (MTHM) in Panels 1, 2, 3, and 5**
- **Excess capacity contingency for:**
  - **Thermal management**
  - **Areas of inadequate rock quality**

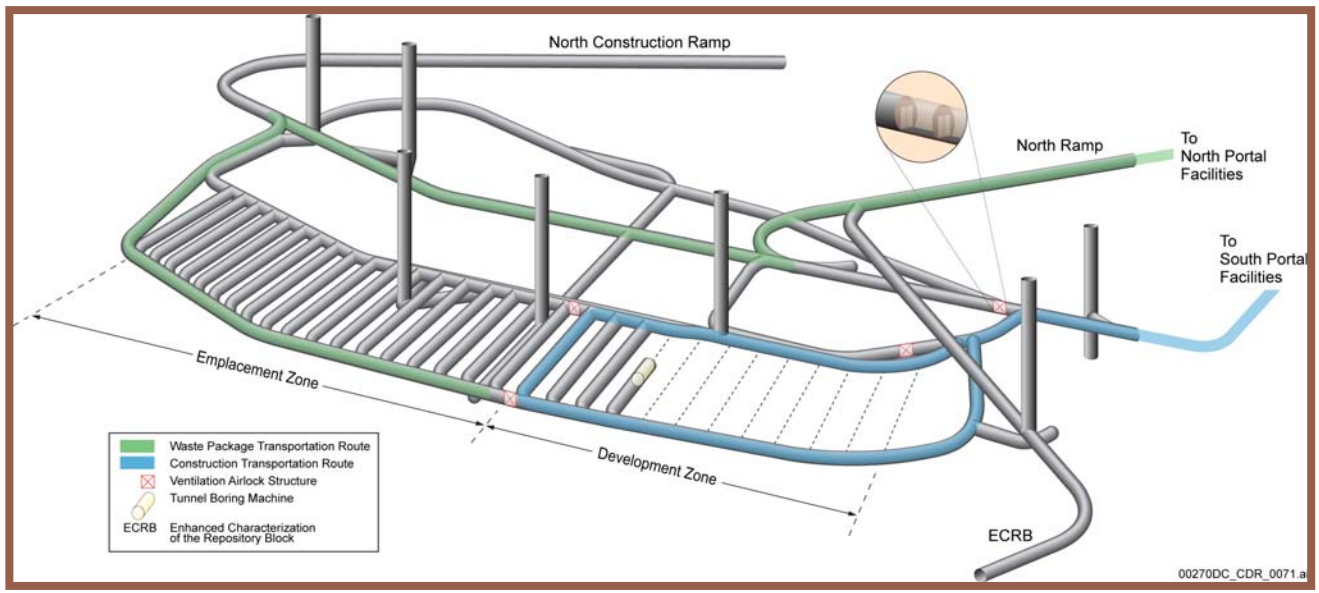
Concurrent Development and Emplacement

- **Features supporting concurrent development and emplacement:**
  - **Airlocks between facilities**
  - **Separate Intake and Exhaust Airways**

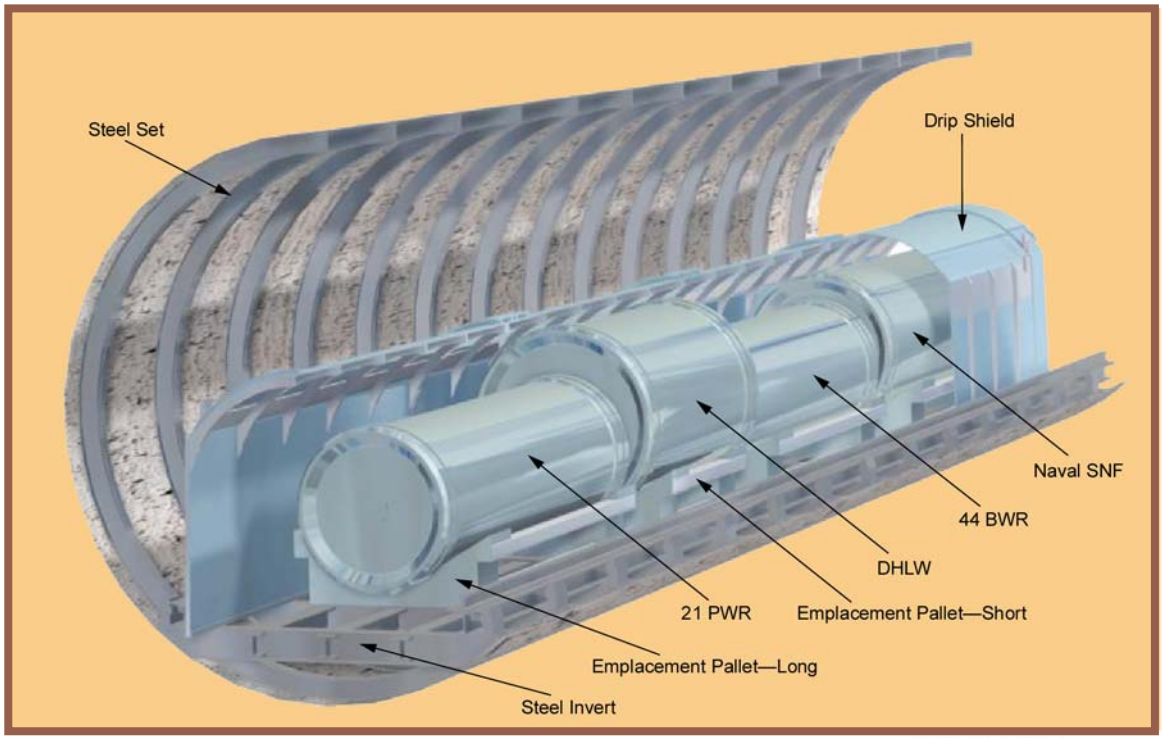


Transportation Routes for Concurrent Activities

- North Ramp used solely for emplacement activities
- North Construction Ramp used solely for construction
- South Ramp used solely for construction



Final Waste Package Configuration at Closure



Drawing Not To Scale
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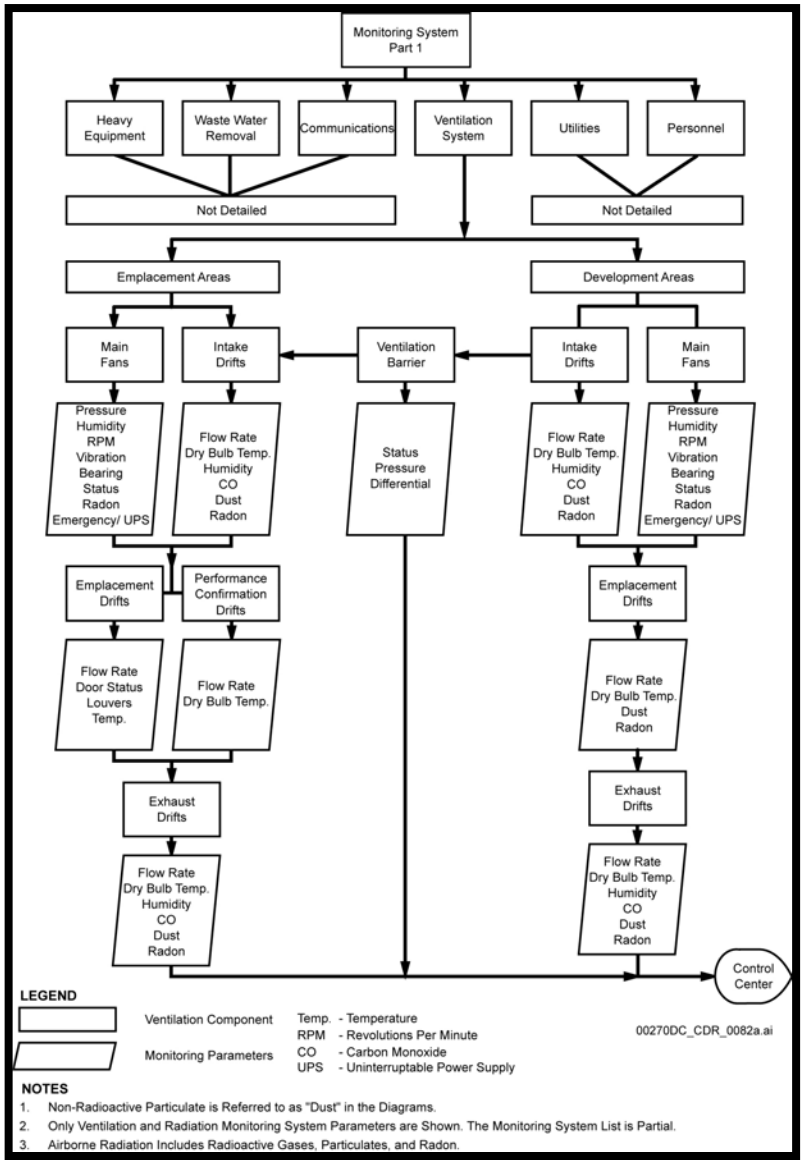
One size drip shield accommodates all sizes of waste packages.

Retrieval

- **Possible reasons for retrieval**
  - **Public health and safety**
  - **Environmental concerns**
  - **Recovery of valuable contents**
- **Must be retrievable on a reasonable schedule**
- **Must maintain capability of retrieval for a minimum of 50 years after start of emplacement**

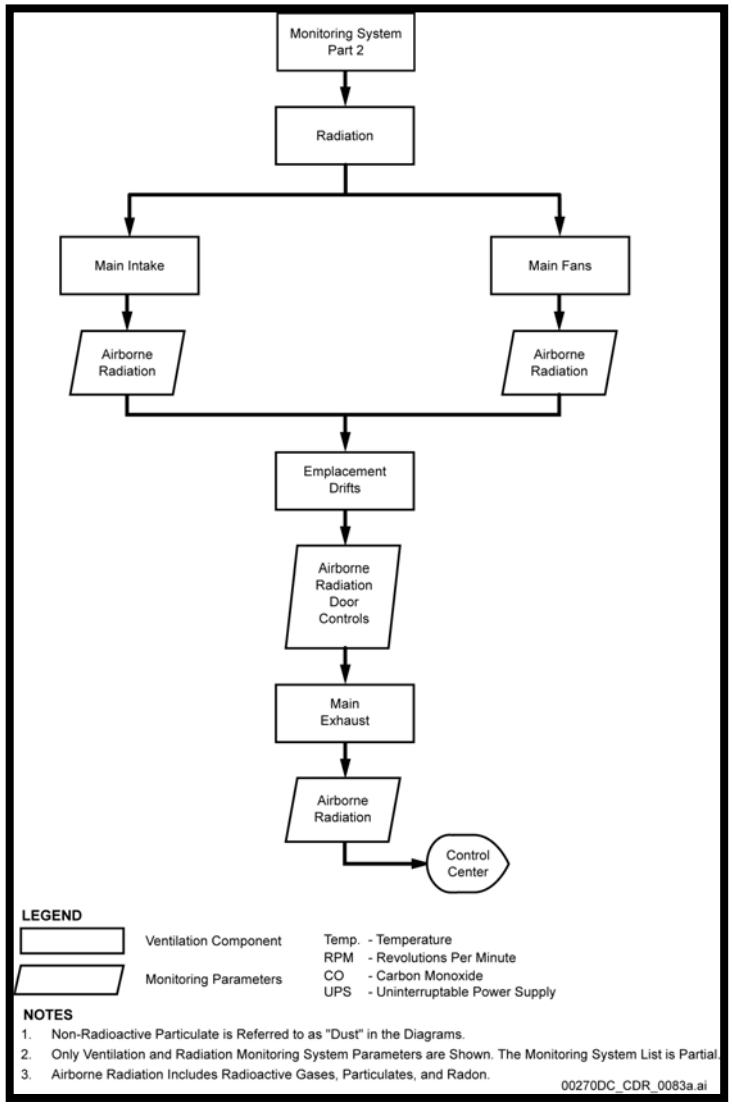
Operational Monitoring



- **Ventilation system continuously monitored for:**
  - **Critical component function and performance**
  - **Parameters of airflow at many locations throughout the repository**
  - **Only ventilation and monitoring system parameters are sketched**
  - **The monitoring system list is partial**
  - **Nonradioactive particulate is referred to as "dust" in these diagrams**

Operational Monitoring

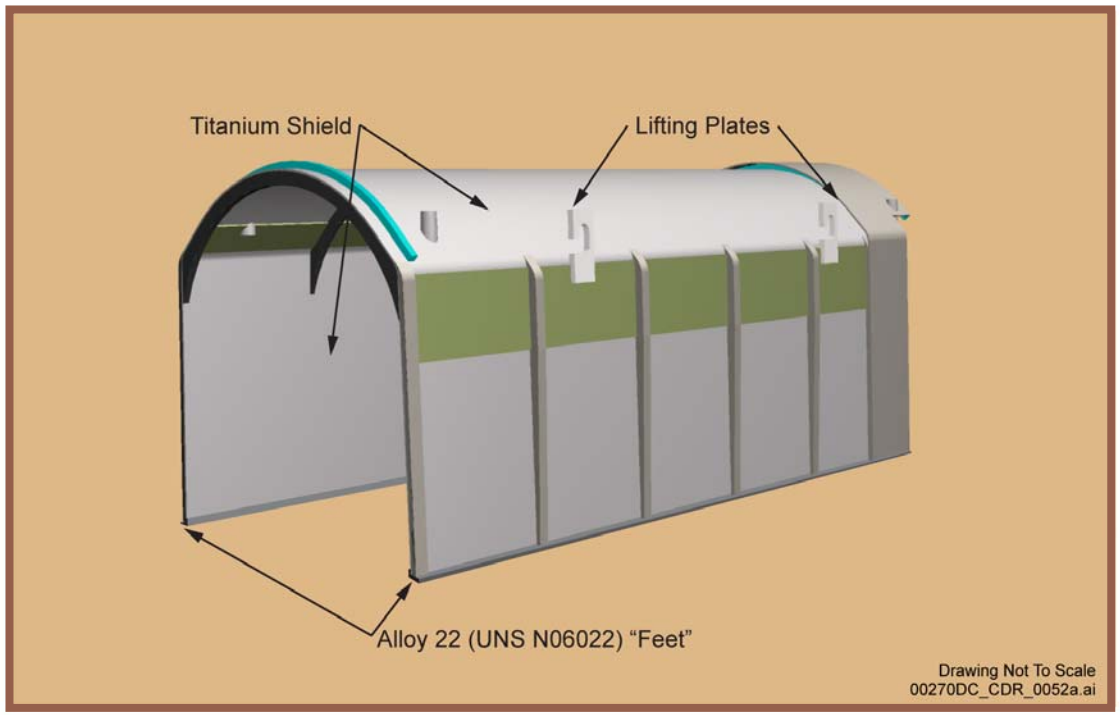
(Continued)



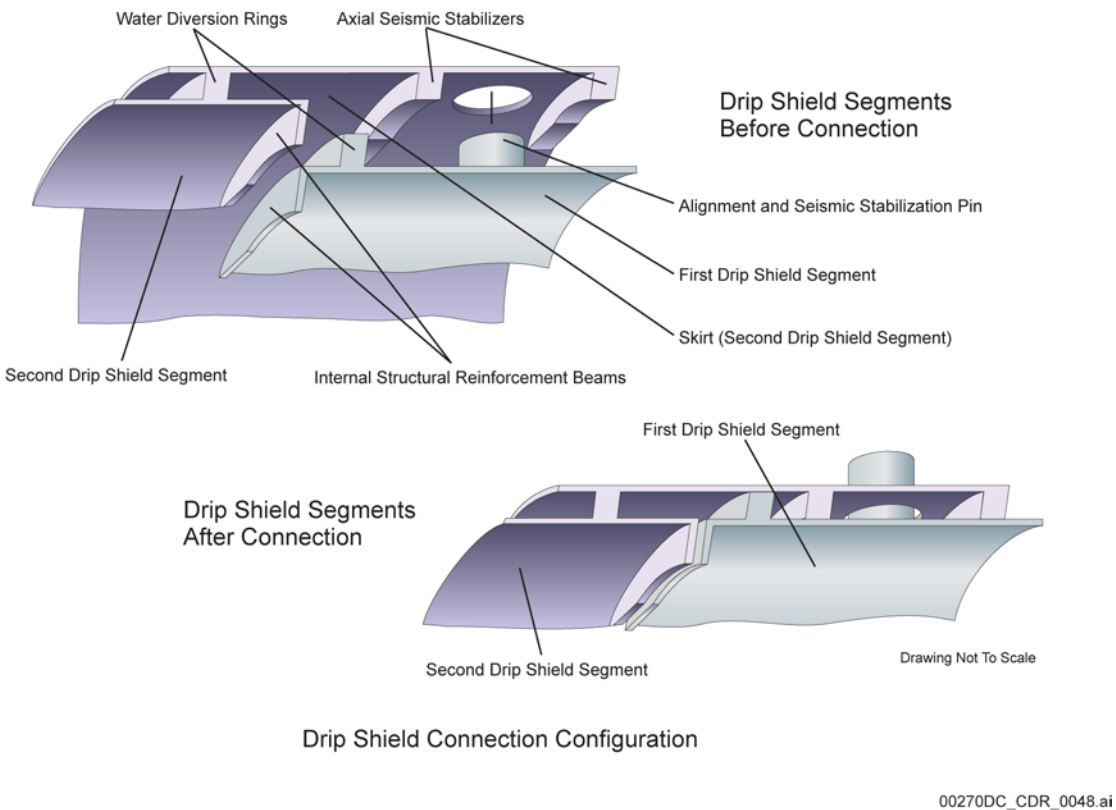
Monitoring of repository ventilation includes measurements of airborne radioactivity at all intake and exhaust points.

Drip Shield

The drip shield is a self-standing structure built from structural grade titanium.



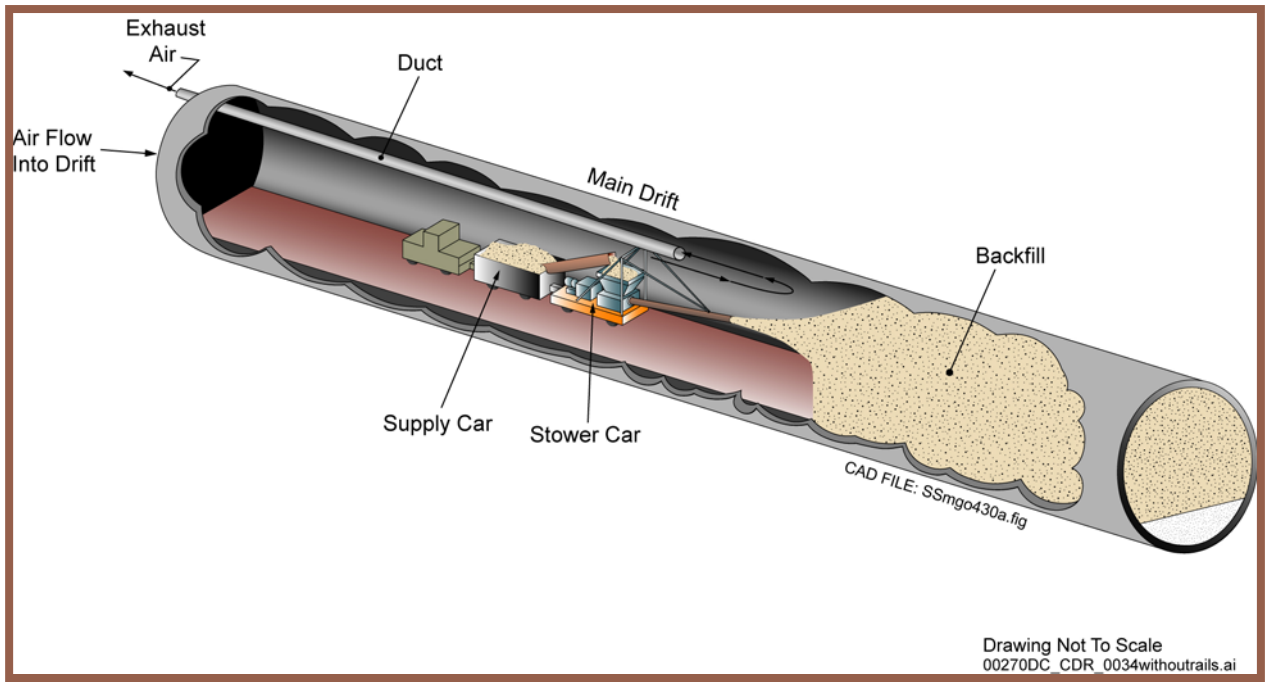
Drip Shield



- **Drip shield has a raised section at one end that overlaps and interlocks with the adjacent drip shield**
- **Built-in water diversion rings keep moisture from migrating along the drip shield interface area**

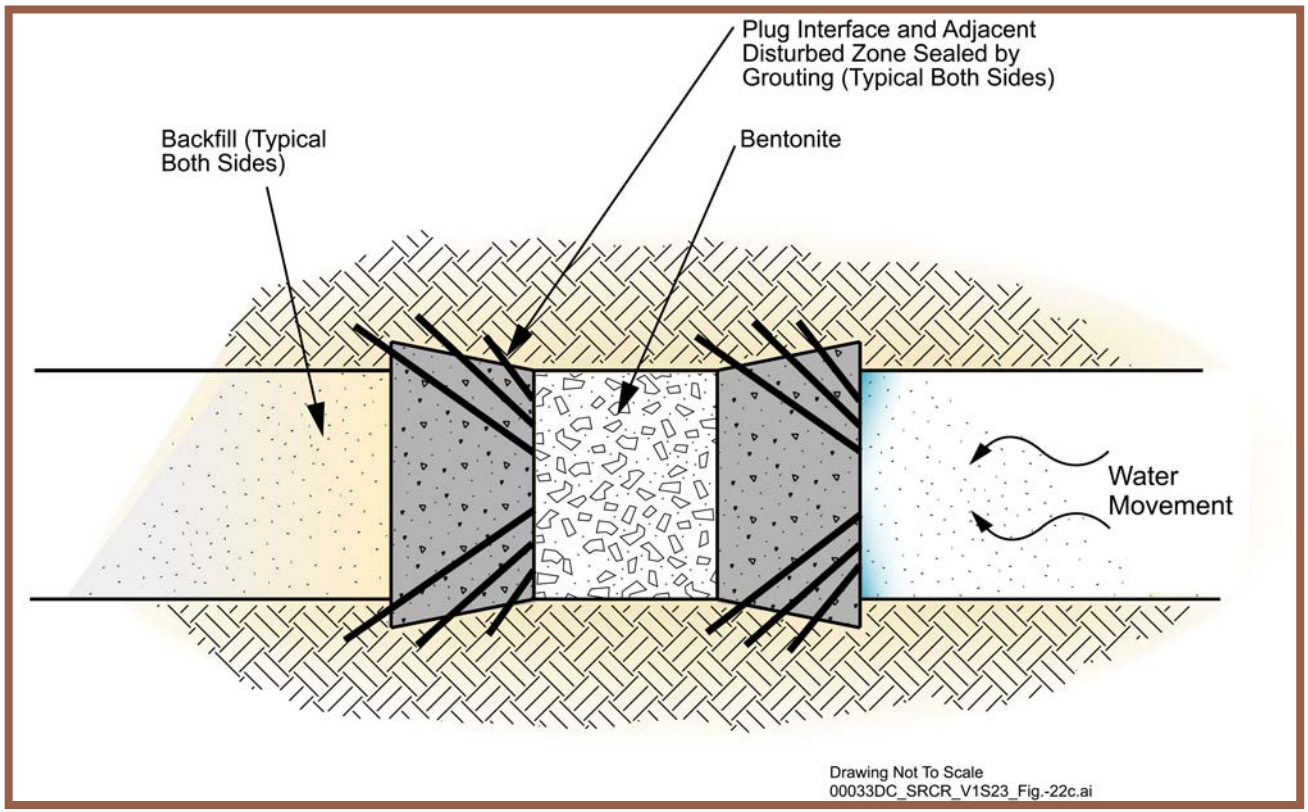
Conceptual Closure Backfill Operations

Repository closure activities include backfilling of the ramps and main drifts with granular material.

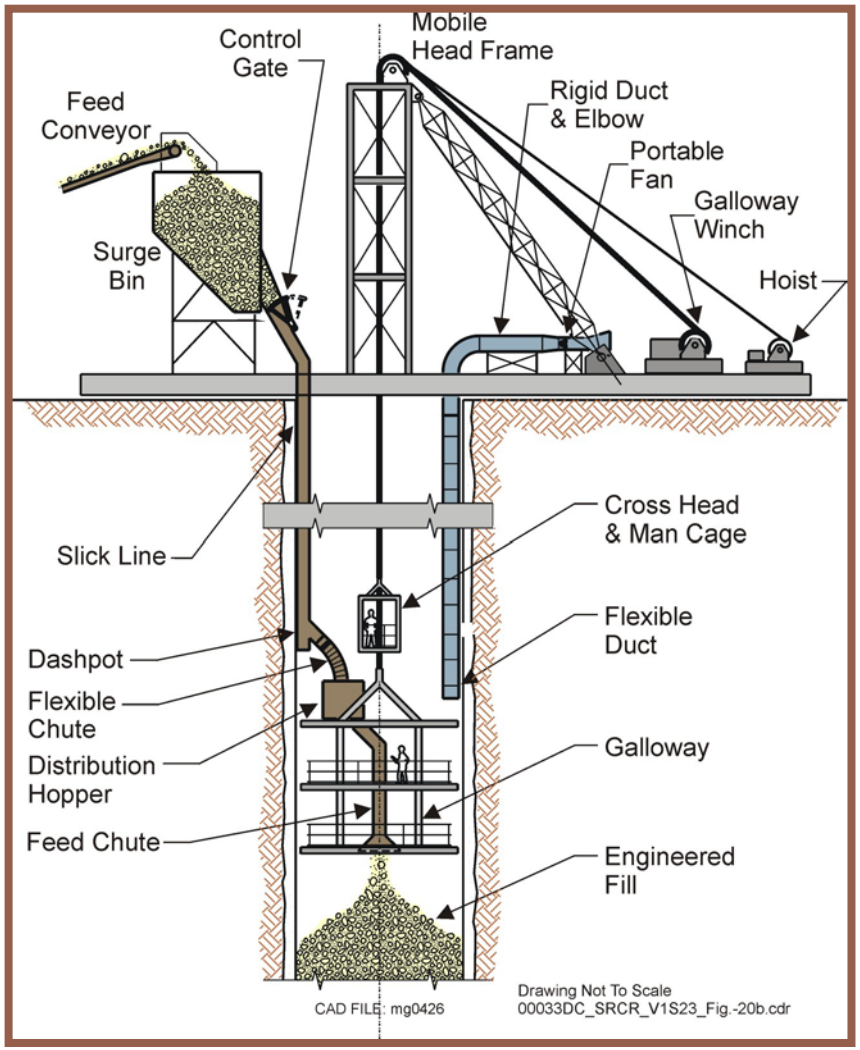


Conceptual Underground Ramp Sealing

Dual concrete seal plugs are one of the proposed closure and sealing features for the repository ramps.

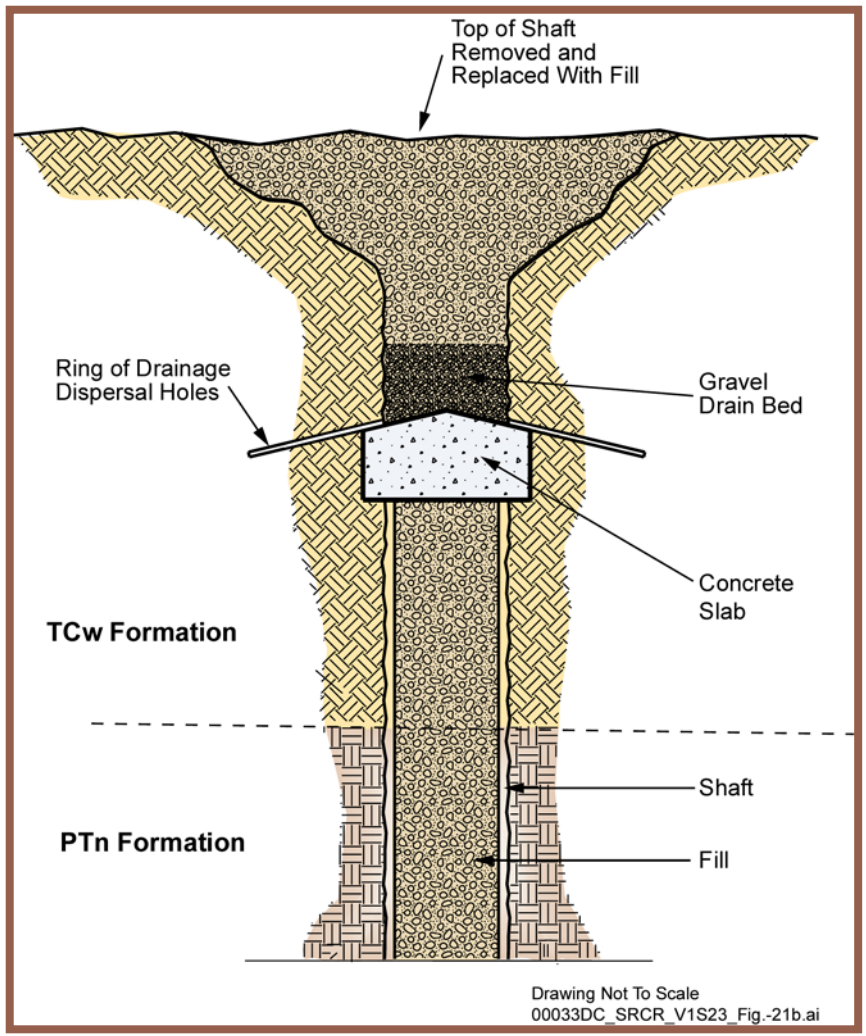


Conceptual Shaft Backfill Operations



Intake and exhaust shafts will also be backfilled with granular material as part of the repository closure activities.

Conceptual Shaft Sealing Operations



- **Location of shaft plugs depend on characteristics of the geologic strata**
- **Located in fractured rock strata with a higher permeability than the underlying strata, to promote dispersion of surface water inflows into the rock formation**