Appendix A

Comparison Summary and Process Flow and Logic Diagrams
Comparison Summary of Retrieval Alternatives

**Excavation**

Pass 1: Forklift/loader digs and hauls Layer A to outside pile.

Pass 2: Backhoe excavates and forklift/loader hauls Layer B to inside pile.


Pass 3, Part 2: Backhoe excavates and forklift/loader hauls Layers D and E to sorting deck. As the underburden is cleaned off, gravel is spread by the forklift/loader to harden the surface for wheel traffic.

Pass 4: Backhoe excavates and forklift/loader hauls Layer F to the sorting deck.

Pass 5: Forklift/loader backfills and compacts soil from Layer B to form Layer G. Forklift loader also places and compacts 6" of gravel (Layer H) for finished floor.

Pass 6: Overhead crane (Alt. 1) or forklift/loader (Alt.3) carries soil hopper from AGV to spread bulk soil from characterization to form Layer J over waste boxes. Compactor with blade (Alt. 1) or forklift/loader (Alt.3) spreads and compacts soil.

Pass 7: Overhead crane (Alt. 1) or forklift loader (Alt.3) carries soil hopper from AGV to spread soil from Layer A to form Layer K. Compactor with blade (Alt. 1) or forklift loader (Alt.3) spreads and compacts soil.

Pass 8: Front-end-loader backfills with outside borrow to form Layer L.

Pass 9: Front-end-loader backfills with outside borrow to form Layer L.

Closure

Pass 5: Six foot high boxes of treated waste placed on top of finished floor by overhead crane (Alt. 1) or forklift loader (Alt.3) and AGV.

Pass 6: Overhead crane (Alt. 1) or forklift loader (Alt.3) carries soil hopper from AGV to spread bulk soil from characterization to form Layer J over waste boxes. Compactor with blade (Alt. 1) or forklift loader (Alt.3) spreads and compacts soil.

Pass 7: Overhead crane (Alt. 1) or forklift loader (Alt.3) carries soil hopper from AGV to spread soil from Layer A to form Layer K. Compactor with blade (Alt. 1) or forklift loader (Alt.3) spreads and compacts soil.

Pass 8: Front-end-loader backfills with outside borrow to form Layer L.

Pass 9: Front-end-loader backfills with outside borrow to form Layer L.

Figure A-1. Retrieval methods comparison summary.
Alternative 1
Pass 3
Waste Retrieval and Underburden Excavation with Backhoe and Overhead Crane

Start Pass 3

Move backhoe into the pit at the south end or top of remaining OB (id. 5004)

Evaluate dig face radiation and excavate waste items that are within reach, including 6" of UB (Layers D and E).

Has a high rad.
source been detected or is there a waste item too large for treatment?

Place waste in retrieval box.

Has all UB within reach of the backhoe been removed?

Place high rad. item in designated container; great large object in place or move it to designated pit location before grouting.

Move retrieval box to sorting deck via overhead crane and AGV.

Move retrieval box to sorting deck via overhead crane and AGV.

Has all UB been removed from pit?

Go to Alternative 2, Pass 4 and work Pass 4 in parallel with Pass 3.

End Pass 3

Move backhoe out of pit.

Has enough UB been removed to begin floor preparation?

Move UB retrieval box to sorting deck via overhead crane and AGV.

Return an empty box to backhoe.

Has all OB within reach of the backhoe or retrieval box been removed?

Return an empty box to pit.

Is there a retrieval box full?

Is retrieval box full?

Record coordinates and characteristics of item.

Evaluate dig face radiation and excavate waste items that are within reach, including 6" of UB (Layers D and E).

Place waste in retrieval box.

Is there a retrieval box full?
Alternative 1
Pass 4
Floor Preparation with Backhoe and Overhead Crane

START
Pass 4

FROM Alternative 1, Pass 3
Enough UB has been removed down to el. 4994.5 to begin floor preparation.

Move Compactor into pit and work in parallel with Pass 3.

Backfill Layer B soil from OB staging area into pit with soil hopper attached to overhead crane, adding 2 feet of fill dirt and 6 inches of gravel (Layers G and H) to bring finished floor up to el. 4997. Backhoe moves to fill hoppers. Compactor levels and compacts fill dirt and gravel.

Continue Pass 4

Has UB backfill been completed?

Yes

Move Compactor out of pit

No

End Pass 4

Has enough floor been prepared to start returning waste boxes?

No

Go to Alternative 1, Pass 5 and work Pass 5 in parallel with Pass 4.

Yes

OE = Overburden
UB = Underburden
Compactor = CP-323 with blade

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Alternative 1
Passes 5, 6, 7 and 8
Waste Box Return with Backhoe and Overhead Crane

From Alternative 1 - Pass 4
Enough floor space has been prepared to start returning waste boxes

Use AGV and overhead crane to place boxes of treated waste on finished floor

Have enough waste boxes been returned to start backfill over boxes and to Compactor door with floor preparation?

Yes

Begin Pass 5 parallel with Pass 3. Move Compactor up to top of waste boxes and start backfill process.

No

Have all returned waste boxes been placed?

End Pass 5

End

Move equipment from pit

Begin and complete Pass 6. Backfill soil from Layer A to form Layer K, with dirt hopper and overhead crane. Add 3' of compacted dirt, bringing level up to el 5008 across whole pit. Perform this in 1' layers in concert with decontamination cycles.

Begin and complete Pass 7. Backfill soil from Layer A to form Layer K, with dirt hopper and overhead crane. Add 3' of compacted dirt, bringing level up to el 5008 across whole pit.

End Pass 6

Yes

Continue Pass 6

Using AGV and overhead crane, transfer dirt returned from characterization onto waste boxes, adding 2' of fill soil (Layer J) to bring level up to el 5005. Compactor levels and compacts fill dirt.

Has backfill over boxes completed?

End

AGV = Automatic Guided Vehicle
Compactor = CP-321 with blade
OB = Overburden

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A-7
Alternative 2
Passes 1 and 2
Overburden Removal with Front End Loader

Start

Start Pass 1
Move front end loader onto the pit (el. 5099)

Excavate top 3 feet of OB (Layer A) with FEL (down to el. 5006)

Has all OB in the pit been excavated to el. 5006?

Yes


No

Continue Pass 1

Go to Alternative 2, Pass 3.

End Pass 2

Pass 2 complete. Approximately 5 feet of OB has been removed from pit.

Move backhoe to next work area, advancing excavation to the north.

Has all OB in the pit been excavated to el. 5047?

Yes

Continue Pass 2

Has all OB within reach of backhoe been excavated to el. 5047?

No

FEL scoops and carries OB pile to OB staging area

Yes

Cover visible unstable items with soil and leave in place.

Record position of uncovered item.

FEL carries OB to outside pile

Yes

No

Backhoe excavates and places OB in a pile at el. 5006

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**Alternative 2**

**Pass 3**

Waste Retrieval with Front End Loader

![Flowchart Diagram]

- **Start Pass 3**
- From Alternative 2, Pass 2. Approximately 3 feet of OB has been removed from pit.
- Begin Pass 3, Part 1. Move backhoe onto remaining OB (dr. 569) and excavate ramp for FEL at NW corner of pit.
- Excavate remaining OB (Layer C) with backhoe on top of the OB and OB below, where FEL can scoop and load it.
- Move backhoe to next location and work OB removal in parallel with waste retrieval.
- Is all OB between backhoe and waste stream removed?
- Evaluate dig face for radioactivity and excavate waste including "C" of U1 (Layers D & E) with FEL and carry on sorting deck.
- Has a high rad source been detected or is there a waste item too large for transport?
- Carry waste and OB pile to sorting deck with FEL.
- Yes
- No
- Place high rad item in designated container, grant large object in place or move it to designated pit location before geo conteing.
- Record coordinates and characteristics of item.
- Has enough waste been removed for floor preparation to start?
- Go to Alternative 2, Pass 4.
- Go to Alternative 2, Pass 4 and work Pass in parallel with Pass 3.
- Yes
- No
- Has all waste been removed from pit?
- Yes
- No
- Go to Alternative 2, Pass 4.
- End Pass 3.

**FEL** = Front End Loader  
**U1** = Underburden  
**OB** = Overburden
Alternative 2
Passes 4 and 5
Floor Preparation with Front End Loader

Start Pass 4

Excavate and pile 2' of UB (Layer F) with

Carry UB to sorting deck

Has enough UB been removed for backfill to start?

No


Yes

Has all UB been excavated to el. 4994.5?

No

Pass 4 complete

End Pass 5

Yes

Go to Alternative 2, Pass 6

Go to Alternative 2, Pass 5 and work Pass 4 in parallel with Pass 5.

Has UB backfill beam completed?

No

Has enough floor beam prepared to start returning waste boxes?

No

Using FEL, backfill with Layer B soil from OR staging area, adding 2 feet of fill dirt and 6" of gravel (Layers G & H) to bring finished floor up to el. 4997. FEL levels and compacts the fill dirt and gravel.

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Alternative 2
Passes 6, 7, 8 and 9
Waste Box Return with Front End Loader

Start Pass 6
- From Alternative 2, Pass 5
  - Enough floor space has been prepared to start returning waste boxes

Use forklift/loader to place boxes of returned waste on prepared floor

Continue Pass 6

Have all waste boxes been returned?
- Yes
  - Pass 6 complete. Forklift/loader to help backfill
  - Move all equipment from pit

- No
  - Continue Pass 7

Have enough waste boxes been returned to start backfill on top of waste boxes and is FEL done with floor preparation?
- Yes
  - Begin Pass 7 in parallel with Pass 6
  - FEL up to top of waste boxes

- No
  - Continue Pass 7

Begin and complete Pass 8.
- Transfer soil from Layer A on top of Layer 1. Add 3' of compacted dirt (Layer K), bringing level up to el. 5008 across whole pit. Perform this in 1' increments in concert with decontamination cycles.

Has Pass 7 backfill been completed?
- Yes
  - Move FEL up to top of waste boxes

- No

Backfill on top of waste boxes with soil returned from characterization. FEL levels and compacts 2' of fill dirt to form Layer 1.

FEL = Front End Loader
OL = Overburden
Alternative 3
Passes 1 and 2
Overburden Removal with Backhoe and Forklift

AGV = Automatic Guided Vehicle
OB = Overburden

Start

- Begin Pass 1
- Move backhoe into the pit at the starting point (on top of OB - el. 5009)
- Excavate top 3 feet of OB (Layer A) within reach (down to el. 5006)
- Place OB in soil hopper
- Move soil hopper to outside pit via AGV and forklift and dump contents
- Return an empty hopper to pit
- Move backhoe to next working location
- Has all OB within reach been excavated to el. 5007?
- Has all OB in pit been excavated to el. 5007?
  - Yes: Begin Pass 2. Move backhoe back to starting point
  - Yes: Begin Pass 2. Move backhoe back to starting point
  - No: Continue Pass 1

End Pass 2
- Pass 2 complete. Approximately 5 of OB removed from pit
- Has all OB within reach been excavated to el. 5004?

Go to Alternative 3, Pass 3.

Cover visible waste items and leave in place.
Record location of uncovered waste forms.

Are waste items visible?
- Yes: Place OB in soil hopper
- No: Continue Pass 2

Move soil hopper to outside pit via AGV and forklift and dump contents

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**Alternative 3**

**Pass 3**

*Waste Retrieval and Underburden Excavation with Backhoe and Forklift*

**Flowchart Description**

- **Start**
  - Begin Pass 3, Part 1
  - Move backhoe into the pit at the south end on top of remaining OR (if 5004)

- **Excavate remaining OR between backhoe and uphole seam (Layer C)**
  - Place OR in the retrieval box
  - Is OR retrieval box full?
  - Move OR retrieval box to sorting deck via AGV and forklift

- **Continue Pass 3, Part 1**
  - Move backhoe to next working location
  - Has all UB been removed from pit?
    - Yes: Go to Alternative 3, Pass 4 and work Pass 6 in parallel with Pass 3
    - No: Move backhoe from pit

- **Evaluate all rad contamination and excavate waste items that are within reach, including 5' of UB (Layers B & F)**
  - Has all underburden within reach of backhoe in retrieval zone been removed?
    - Yes: Begin Pass 3, Part 2
    - No: Has a high rad source been detected OR is there a waste item too large for treatment?

- **Record coordinates and characteristics of areas**
  - Move retrieval box to sorting deck via AGV and forklift

- **Return an empty box to backhoe**
  - Place waste in retrieval box
  - Is retrieval box full?

- **End Pass 3**
  - Move backhoe from pit

- **Go to Alternative 3, Pass 4**

**Legend**

- AGV = Automatic Guided Vehicle
- OR = Overburden
- UB = Underburden
- LB = Landfill Burden
- A = Has a high rad source been detected OR is there a waste item too large for treatment
- LB = Llndei burden
- UB (Layer D) = Unit at location for treatment
- Move backhoe to the pit at the north end on top of remaining OR (if 5004)

**Notes**

- Approximately 5' of OR has been removed from pit.
- Has enough UB been removed to begin floor preparation?
- Has all UB within reach of backhoe in retrieval zone been removed?
From Alternative 3, Pass 3

**Floor Preparation with Backhoe and Forklift**

**Pass 4**

- Move forklift loader into pit and work in parallel with Pass 3.
- Backfill Layer B soil from OB staging area into pit with soil hopper on AGV and forklift, adding 2' of soil and 6 inches of gravel to bring finished floor up to el. 4997. Forklift levels and compacts fill dirt and gravel.

**End Pass 4**

- Move forklift loader out of pit.
- Has UB backfill been completed?

**Has enough floor been prepared to start returning waste boxes?**

**Has enough floor been prepared to start returning waste boxes?**

- Yes
  - Go to Alternative 3, Pass 5 and work Pass 5 in parallel with Pass 4
- No
  - Go to Alternative 3, Pass 5

**Alternative 3**

- Start Pass 4

AGV = Automatic Guided Vehicle
OR = Overburden
UB = Underburden
Alternative 3
Passes 5, 6, 7 and 8
Waste Box Return with Backhoe and AGV

Start  
Pass 5

Use AGV and forklift to place boxes of treated waste on finished floor.

End Move equipment from pit

Have all returned waste boxes been placed?

Have enough waste boxes been returned to start backfilling boxes and is forklift/ loader done with floor preparation?

Begin Pass 4 in parallel with Pass 5. Move forklift/ loader up to top of waste boxes and start backfill process.

Using AGV and forklift, transfer soil returned from characterization onto waste boxes, adding 2' of soil (Layer J) to bring level up to el. 5005. Forklift/ loader levels and compacts soil.

Begin and complete Pass 3. Backfill soil from Layer A to form Layer K with soil hopper and forklift. Add 1.5 of compacted soil bringing level up to el. 5008 across whole pit. Perform this in 1' layers in concert with decontamination cycles.

Has backfill over boxes been completed?

AGV = Automatic Guided Vehicle
Off = Overburden

From Alternative 3, Pass 4 Enough floor space has been prepared to start returning waste boxes.

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Appendix B

Detailed Drawings of Alternate Retrieval Facilities
NOTICE: ACCESS AND EQUIPMENT CORRIDOR NOT SHOWN FOR CLARITY.
INLET AIR DUCT

NEW CONCRETE TRACK, BELOW

MAINTENANCE AND HVAC BUILDING

UPPER RETREIVAL PLAN

SCALE 1' = 30'-0"

NOTE
ACCESS AND EQUIPMENT CORRIDORS NOT SHOWN FOR CLARITY

RELEASED FOR RECORD ONLY
DO NOT FABRICATE
FINISH GRADE

LOOKING NORTH
SOUTH ELEVATION
SCALE: 1"=20'

LOOKING WEST
EAST ELEVATION
SCALE: 1"=30'

NEW PILING, BELOW GRADE

EXISTING PILING, BELOW GRADE

RELEASED FOR RECORD ONLY
DO NOT FABRICATE
NORTH OVERBURDEN STAGING AREA
ENLARGED PLAN
SCALE 1" = 20'-0"