



Calcine Disposition Project: Independent Analysis of Alternatives (AoA)

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June 20, 2019



EM *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

Idaho Cleanup Project

Calcine Disposition Project Scope

- Design and construct processing system using the Integrated Waste Treatment Unit (IWTU) facility to the maximum extent practical
- Retrieve calcine from bin sets and process using hot isostatic pressing (HIP) technology
 - 4,400 m³ (155,000 ft³) or 5.5 million kg (12.2 million lbs) of calcine
- Utilize Waste Acceptance System Requirements Document (WASRD) for Yucca Mountain
- Package treated waste form in canisters
- Ship off-site or place canisters in interim storage pending off-site shipment for disposition
- Current Project TPC cost range is \$0.9 B to \$2.0 B
- Critical Decision-0 Approved April 17, 2007



Calcine Project Drivers

- Settlement Agreement: “...calcine ready for disposal outside the State of Idaho by target date of 12/31/2035.”
- Federal Facility Compliance Act Site Treatment Plan Milestones:
- Procure contracts for treatment facility by 9/30/2019
 - Initiate construction by 9/30/2020
 - Conduct system testing by 3/31/2023
 - Commence operations by 3/31/2024
- NEPA Record of Decision selected Hot Isostatic Press as treatment option (December 23, 2008)(Settlement Agreement requirement)
- RCRA Part B permit for the HIP treatment process submitted to State of Idaho DEQ 11/27/2012 (Settlement Agreement requirement)



Calcine Solids Storage Facility



EM Environmental Management

safety ♦ performance ♦ cleanup ♦ closure

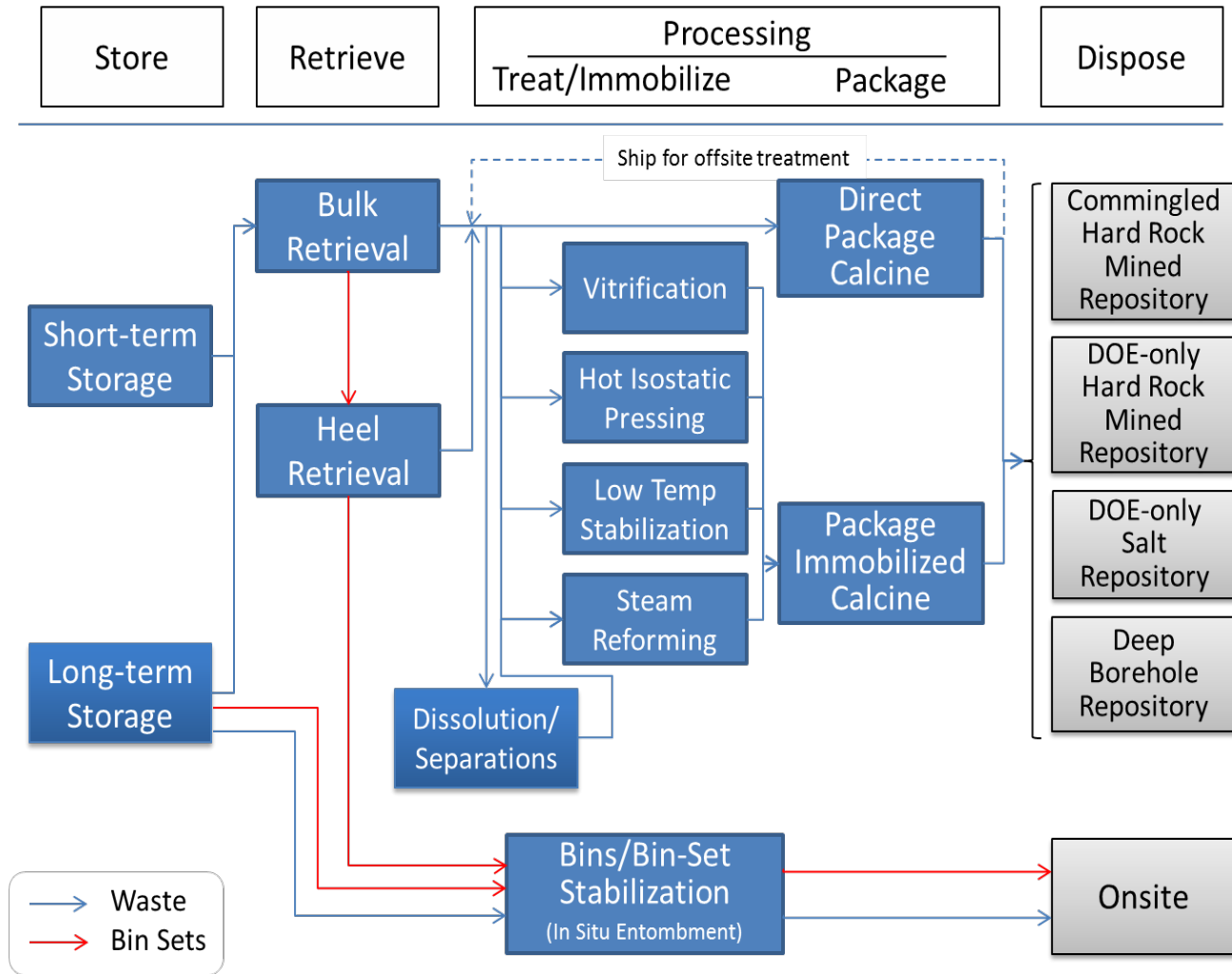
Idaho Cleanup Project

AoA Chartered Scope

- **Definition/validation of requirements for the CDP mission:** The AAT will focus its efforts on ensuring that the CDP mission requirements, and related assumptions, are well-defined and valid, such that they support the conceptual design process and successful disposition of the calcine inventory.
- **Recommendation of a disposition strategy:** The AAT will review technical, regulatory, programmatic, and other available data for each of the disposition options. A structured, technically-defensible approach will be used to identify and apply review criteria, measures, and weightings for conducting comparative evaluations of the alternatives.
- **Technology maturation requirements:** The AAT will assist in identifying technology development and equipment demonstration activities needed to mature the recommended technologies to an acceptable TRL.
- **Safety strategy:** The AAT will evaluate the overall safety strategy for the recommended disposition strategy and flowsheet.



Initial Processing/Disposition Options

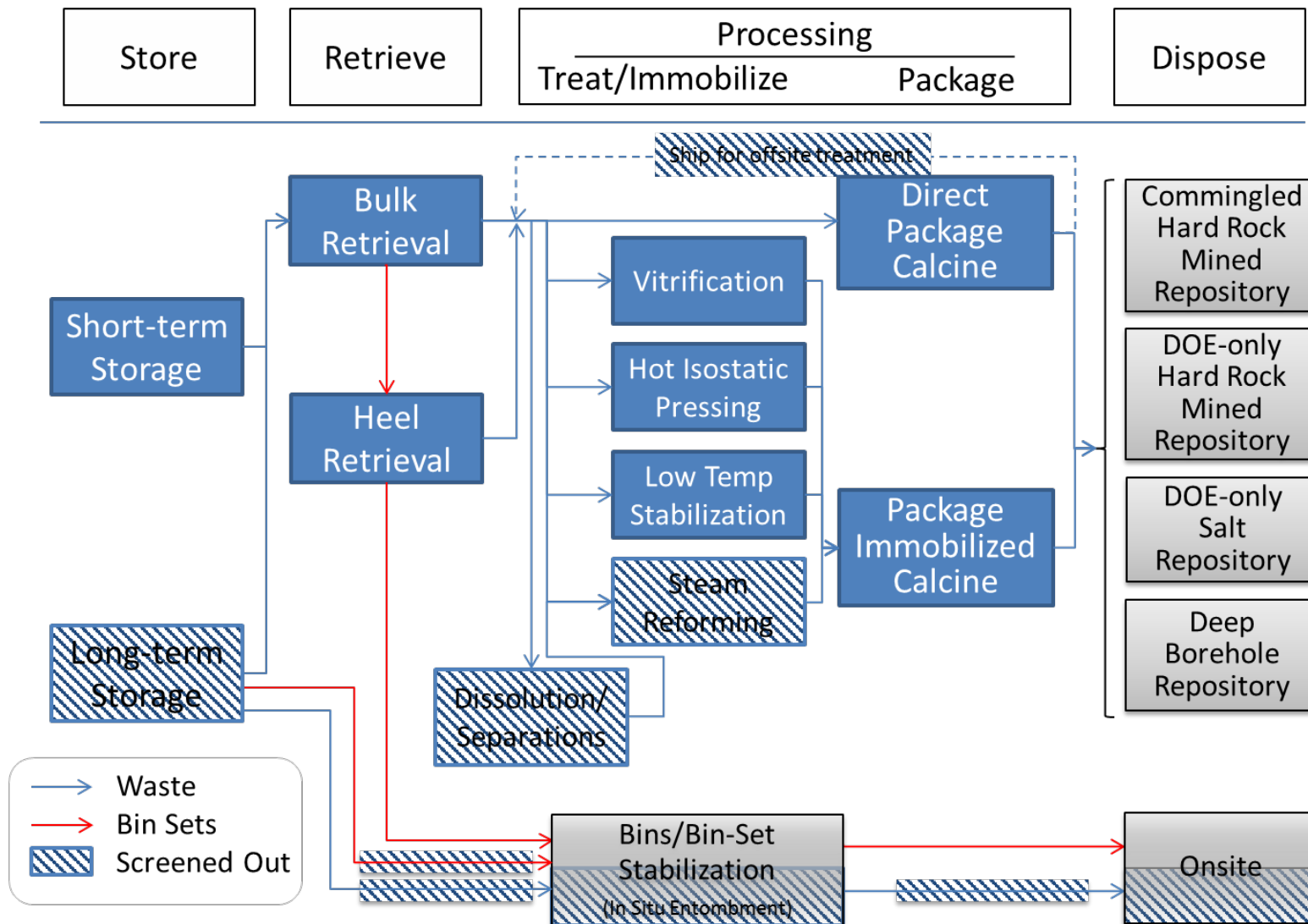


Pre-Screening Results

Alternative	Cost	Schedule	Implementability	Acceptability	Result
Package for Direct Disposal	+	+	0	—	✓
Package for Offsite Treatment	0	0	0	—	✓
Vitrification	0	0	—	+	✓
HIPing	0	0	—	0	✓
Low Temp Stabilization	+	0	0	—	✓
Steam Reforming	—	—	0	0	✗
Dissolution/Separations	—	—	—	—	✗
In Situ Entombment	+	+	0	—	✓



Alternative Scenarios



Alternative Scenarios

Combined Alternative Scenarios					
PROCESSING OPTIONS	DISPOSAL OPTIONS				
	In-place	Commingled Mined Hard Rock Repository	DOE-only Mined Hard Rock Repository	DOE-only Mined Salt Repository	DOE-only Deep Borehole
In Situ Entombment	✓				
Direct Vitrification Using JHCM in BSG		✓	✓	✓	✓
Direct Vitrification Using CCIM in Tailored Glass		✓	✓	✓	✓
Direct Vitrification Using CCIM in Glass-Ceramic		✓	✓	✓	✓
Direct HIPing with No Additives		✓	✓	✓	✓
HIPing in Glass-Ceramic		✓	✓	✓	✓
Low Temperature Stabilization in Grout		✓	✓	✓	✓
Low Temperature Stabilization in CBPC		✓	✓	✓	✓
Package for Offsite Treatment		✓	✓	✓	✓
Package for Direct Disposal		✓	✓	✓	✓



Scoring Criteria

- Safety (10%)
- Regulatory Compliance (10%)
- Technical Feasibility (27.5%)
- Operability and Maintainability (15%)
- Cost and Schedule (27.5%)
- Stakeholder Acceptance (10%)

NOTE: Team scored processing and disposal separately for each criteria



Summary Results

Processing Option	Disposal Option	Score	Relative Rank By Disposal Option
Package for Direct Disposal	Commingled Mined Hard Rock	75	1
	DOE Mined Hard Rock	78	1
	DOE Mined Salt	85	1
	DOE Borehole	80	1
Direct Vit using CCIM in Tailored Glass	Commingled Mined Hard Rock	57	2
	DOE Mined Hard Rock	59	2
	DOE Mined Salt	65	2
	DOE Borehole	61	2
Low Temp Stabilization in CBPC	Commingled Mined Hard Rock	54	3
	DOE Mined Hard Rock	56	3
	DOE Mined Salt	64	3
	DOE Borehole	60	3
HIPing in Glass Ceramic	Commingled Mined Hard Rock	53	4
	DOE Mined Hard Rock	55	4
	DOE Mined Salt	61	4
	DOE Borehole	57	4



Observations and Recommendations

- Calcine Disposition Project should be organized into two subprojects
 - Calcine retrieval
 - Calcine processing
- Waste processing highly dependent upon disposition path
 - Direct disposal ranks high overall but has regulatory issues for certain disposition paths
 - Recommend limited processing technology maturation activities to support future decision
 - Defer waste processing decisions until known disposition path
- Retrieval common element for all processing options
 - Progress can be made in advance of processing and disposition decisions to address retrieval risks
 - Recommend additional evaluation of retrieval engineering to support subproject CD-1 package

