

SHEEP MOUNTAIN URANIUM PROJECT CROOKS GAP, WYOMING



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**US EPA Project Meeting
April 7, 2011**

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Introductions

Greg Adams – VP Development

Doug Beahm – BRS Engineering

Toby Wright – Wright Env. Services

AGENDA

Introductions

- Greg Adams/Titan Uranium, VP Development
- Deborah Lebow-Aal/EPA Region 8 Air Program

Introduction to Titan Uranium USA

Project Overview:

- Doug Beahm/BRS Engineering
- Toby Wright/Wright Env. Services

Issues for Discussion

- Status of 40 CFR 192 GW standards update
- Status of Active Heaps & Inactive Heaps
- Status of Process Ponds & Waste Storage Tanks



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PROJECT OVERVIEW

- **Location**
- **Project Scope**
 - **Mining**
 - **Milling**



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Sheep Mountain Project Location



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PROJECT OVERVIEW

- Site Location

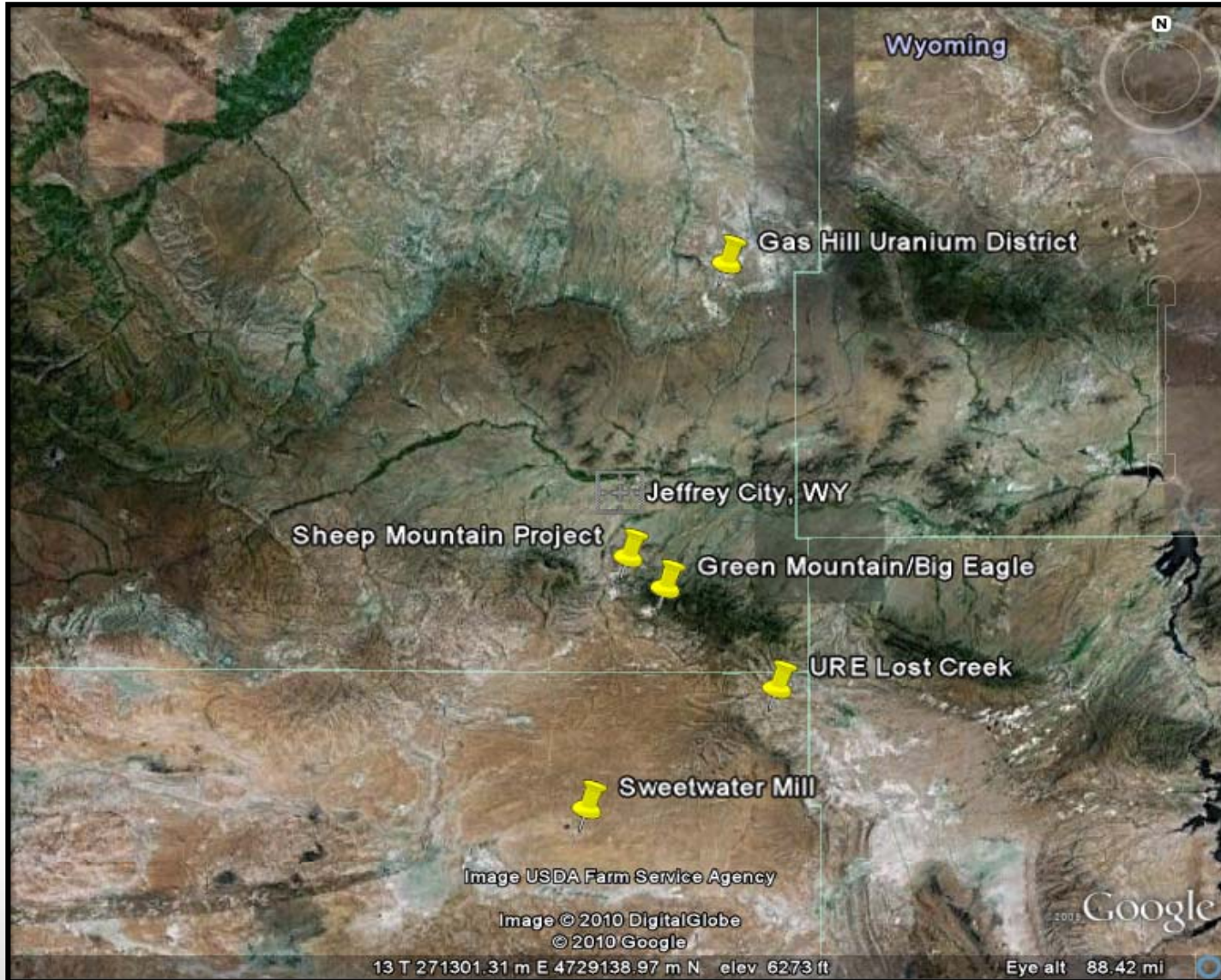
- Fremont , Wyoming
- Existing Uranium Mine Permit 381C

- Historical Operation

- Western Nuclear Crooks Gap Project
 - Mined 1956 – 1988, processed at Split Rock Mill
- US Energy
 - 1988 Sheep Mountain Underground
 - Partial reclamation since 1988, no new operation



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Titan Sheep Mountain Project:

- Mine
 - Underground and Open Pit Mining
 - Current Mine Permit (381C)
 - Updating POO, Reclamation Plan & Bond
- Uranium Recovery
 - Heap Leach with Central Processing Plant
 - Within existing WDEQ Mine Permit (381C)

Project Scope:

- Mine

- 15 Year Mine Lifecycle, may be extended

- Congo Pit Area

- Mine waste trucked to South and West waste piles
- All mine waste to be returned to pit or used in reclamation

- Sheep Mountain Underground

- To extent possible all wastes reclaimed in old mine workings
- Ore transported to the heap from underground via conveyors

Project Scope:

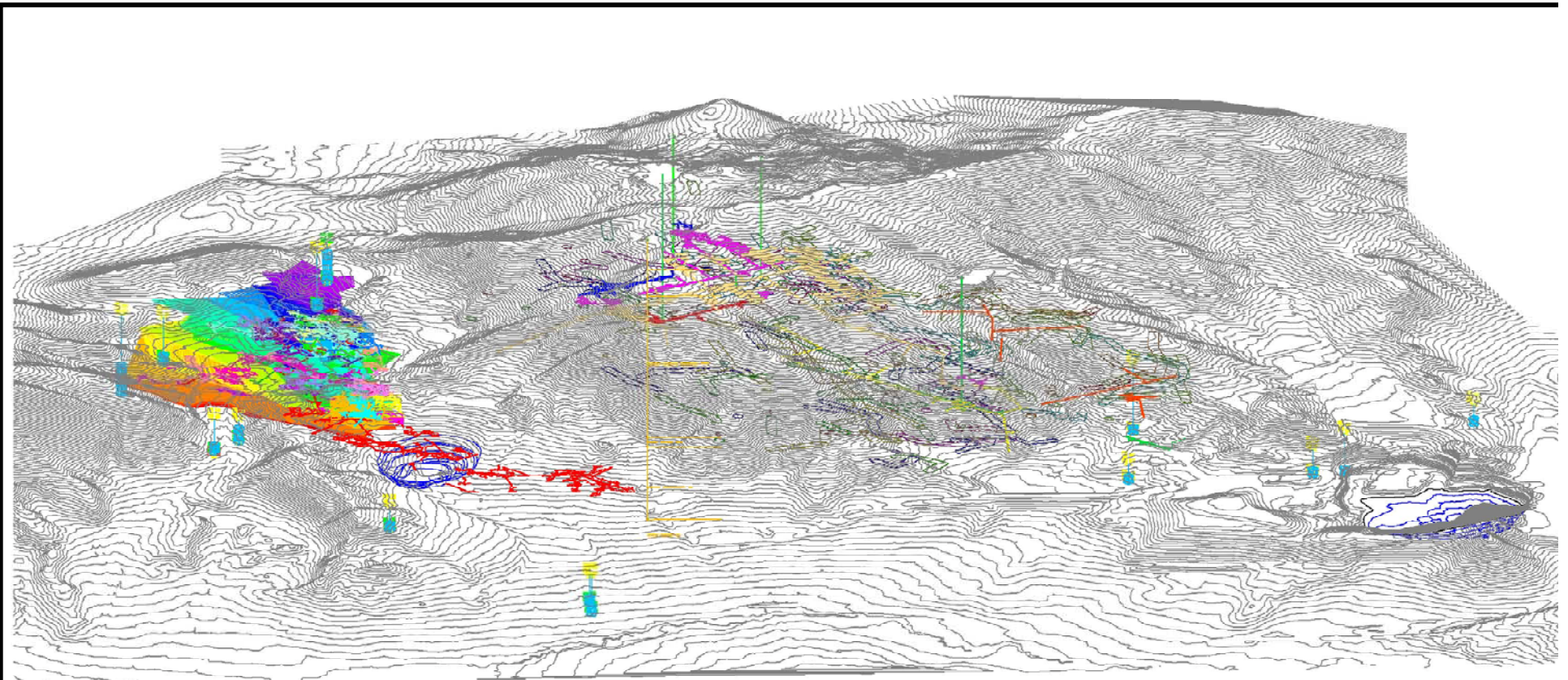
•Mill

- 15 year operational lifecycle, may be extended
- Heap Leach Pads
 - Double lined pads with leak detection, clay underliner
 - Five 16 acre cells planned (approx. 80 acre footprint)
 - Up to 50 ft lifts being evaluated
 - Sulfuric acid lixiviant
- Double lined process ponds with leak detection, clay underliner
 - Barren/Pregnant
 - Liquid waste in evaporation ponds
- Central Processing Plant
 - Solvent Extraction with IX Polishing
 - Vacuum Driers
 - Final Product is drummed yellow cake



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3D View Mining and Monitor Wells





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Status of Baseline Studies

Pre-Operational Baseline Studies Status

- Cultural Resources
- Wildlife
- Vegetation & Soils
- Surface Water
- Groundwater
- Radiological Characterization



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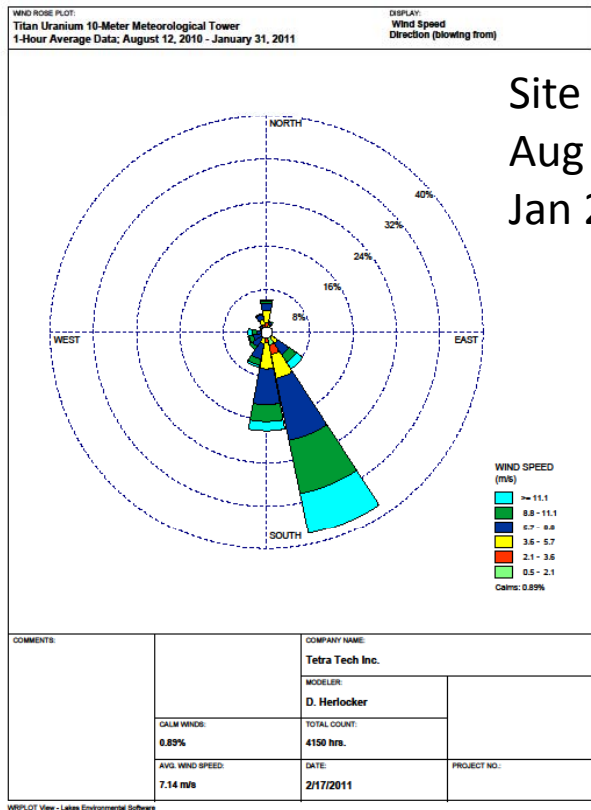
Topic Area	Status	Actions Pending
Cultural Resources	<ul style="list-style-type: none"> Reviewed existing surveys Consulted with BLM on scope of additional surveys Completed additional surveys Submitted findings to BLM 	<ul style="list-style-type: none"> BLM Review SHPO Review Incorporate results into ER
Wild Life	<ul style="list-style-type: none"> Raptor surveys complete Songbird surveys complete Waterfowl surveys complete Small mammal surveys complete 	<ul style="list-style-type: none"> Incorporate results into ER
Vegetation	<ul style="list-style-type: none"> Vegetation surveys complete No T&E Species present One BLM sensitive species found <ul style="list-style-type: none"> Limber Pine No impacted by proposed disturbance Completed 3 rounds of veg. sampling as per Reg Guide 4.14 	<ul style="list-style-type: none"> Incorporate results into ER
Soils & Sediment	<ul style="list-style-type: none"> Collected soil samples as per Reg. Guide 4.14 (surface & subsurface) Collected sediment samples as per Reg. Guide 4.14 @ SW sampling locations 	<ul style="list-style-type: none"> Incorporate results into ER
Surface Water	<ul style="list-style-type: none"> Quarterly SW flow measurements Monthly flowing SW quality sampling Quarterly Pit Lake quality sampling 	<ul style="list-style-type: none"> Data analysis Incorporate results into ER
Groundwater	<ul style="list-style-type: none"> Quarterly Sampling Reg. Guide 4.14 and WDEQ parameters 	<ul style="list-style-type: none"> Data analysis Incorporate results into ER
Meteorological	<ul style="list-style-type: none"> Continuous data since July 2010 2 m & 10 m instrumentation Instrumentation meets most Reg. Guide 3.36 requirements 	<ul style="list-style-type: none"> MILDOSE Modeling Update with 4 quarters of data
Air Quality	<ul style="list-style-type: none"> Quarterly sampling from 5 locations since July 2010 All parameters and reporting limits as per Reg. Guide 4.14 	<ul style="list-style-type: none"> Data analysis Incorporate results into ER
Socio\Env. Justice	<ul style="list-style-type: none"> Ongoing 	<ul style="list-style-type: none"> Complete analysis Incorporate results into ER

Nearest Resident

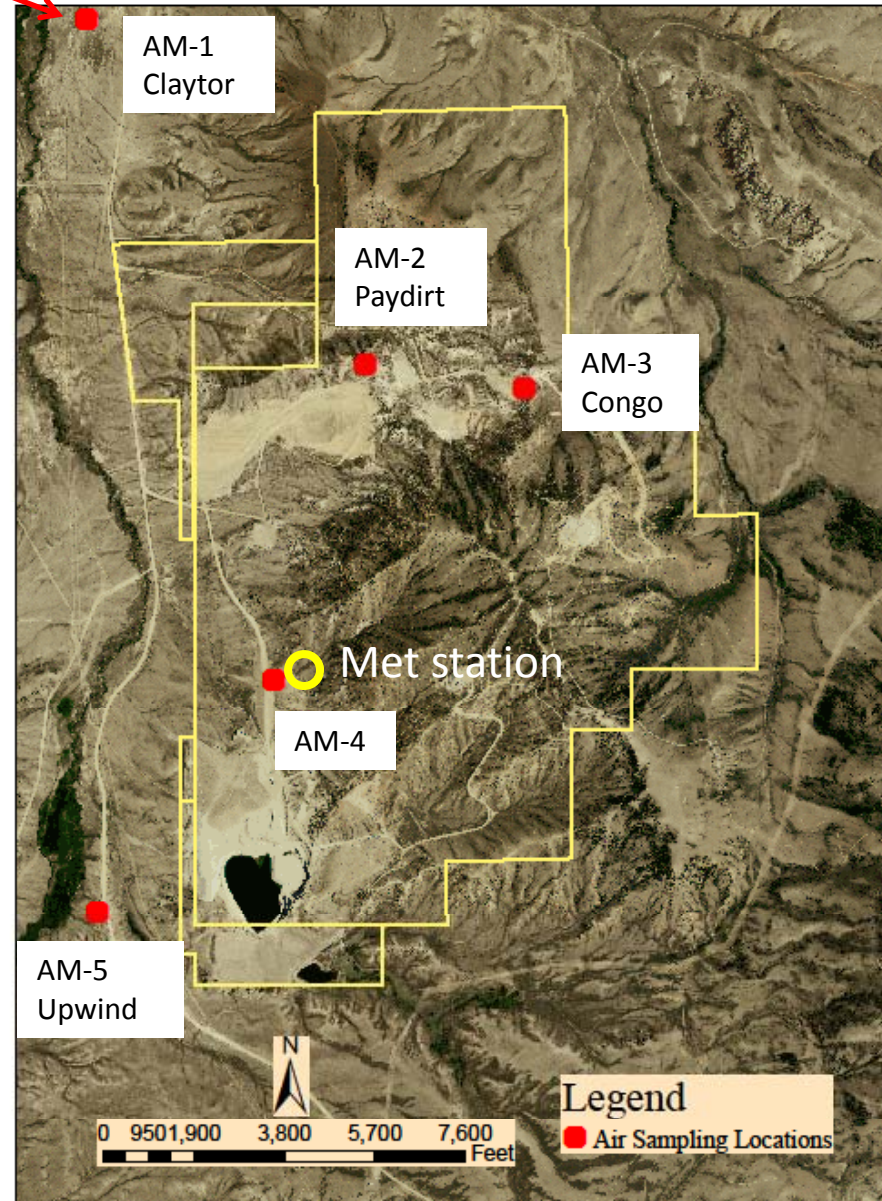


Air sampler locations:

Additional monitoring locations once radiation control boundary location is finalized



Site wind rose
Aug 2010 through
Jan 2011



Groundwater Hydrogeology

- Historical Conceptual model
 - Battle Spring Fm. host upper most aquifer
 - Fine to coarse grained sandstone with discontinuous siltstone and claystone lenses
 - Unconfined aquifer
 - Recharge from north
 - Regional discharge to south
- New Studies Ongoing
 - Sampling existing wells in place since 1988
 - Replacing historical wells abandoned in 2001
 - Evaluating aquifer properties



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Status of NRC/BLM/State Permit Applications & NEPA

Coordinating Permitting & Licensing

- NRC & BLM will develop separate EIS Documents
- Titan is planning on parallel WDEQ, BLM & NRC submittals
 - Q3 2011
 - WDEQ-LQD/BLM
 - Plan of Ops, Rec. Plan & Bond Est., Env. Report
 - NRC
 - Application with Technical Report & Env. Report
- Coordinating communications w/ NRC, BLM and WDEQ

NRC Licensing & NEPA

- Scope of NRC EIS Encompasses:
 - Milling: Heap Leach & Central Processing Plant
 - Mining is a ***Connected Action***
 - BLM would be a Cooperating Agency

Separate or combined NEPA processes require coordination and communication

- Planning Application to NRC Submittal in Q3, 2011

BLM Permitting & NEPA

- Scope of BLM EIS Encompasses:
 - Mine: open pit and underground, mine dewatering, operations, reclamation
 - Milling: Heap Leach & Central Processing Plant
 - Includes long-term disposal of 11e.(2) byproduct material, land transfer
 - BLM has indicated that they will reference rather than duplicate NEPA analyses for impacts addressed in the NRC NEPA process as much as possible
 - NRC would be Cooperating Agency
- Planning WDEQ\BLM Submittal in Q3, 2011

Separate or combined NEPA processes require coordination and communication

BLM Permitting & NEPA

- BLM anticipates publication in Q2 or Q3 2011
- Titan has submitted to BLM a draft cost recovery MOU for 3rd Party NEPA Contractor
- RFP for procurement of 3rd Party NEPA Contractor in process
 - Anticipate NEPA Contractor for bLM selection in Q2 2011



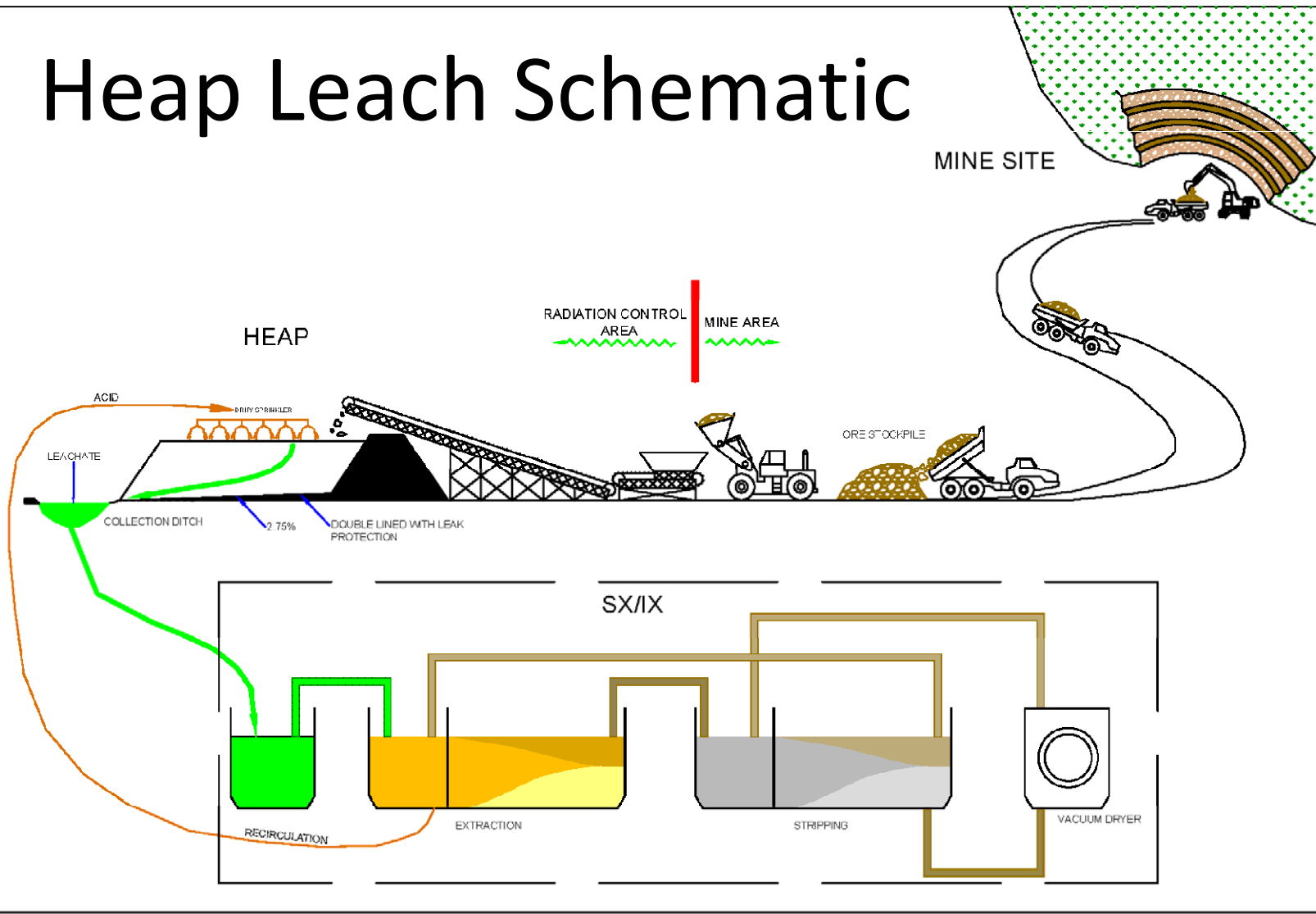
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Heap Leach Process



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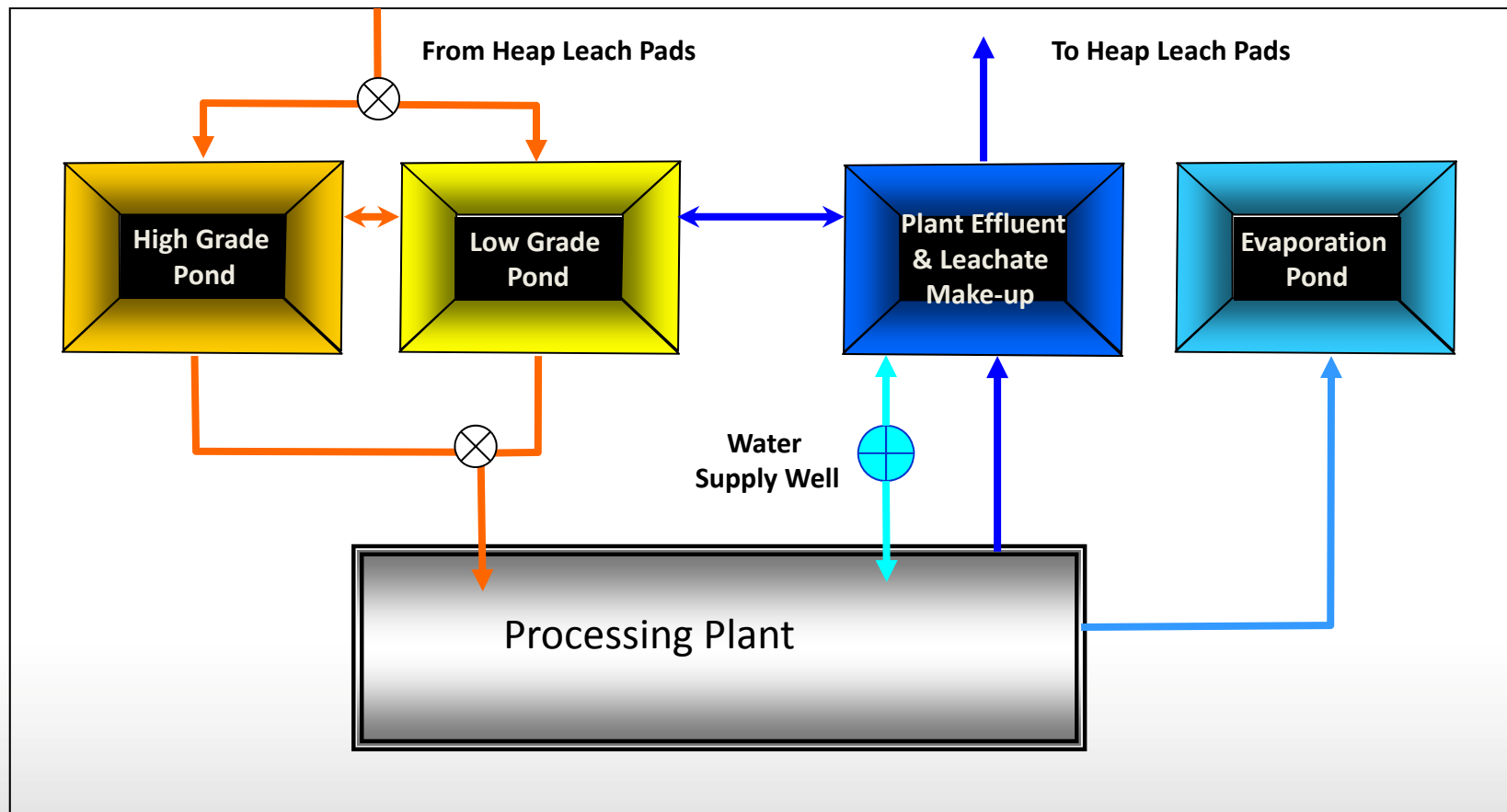
Heap Leach Schematic





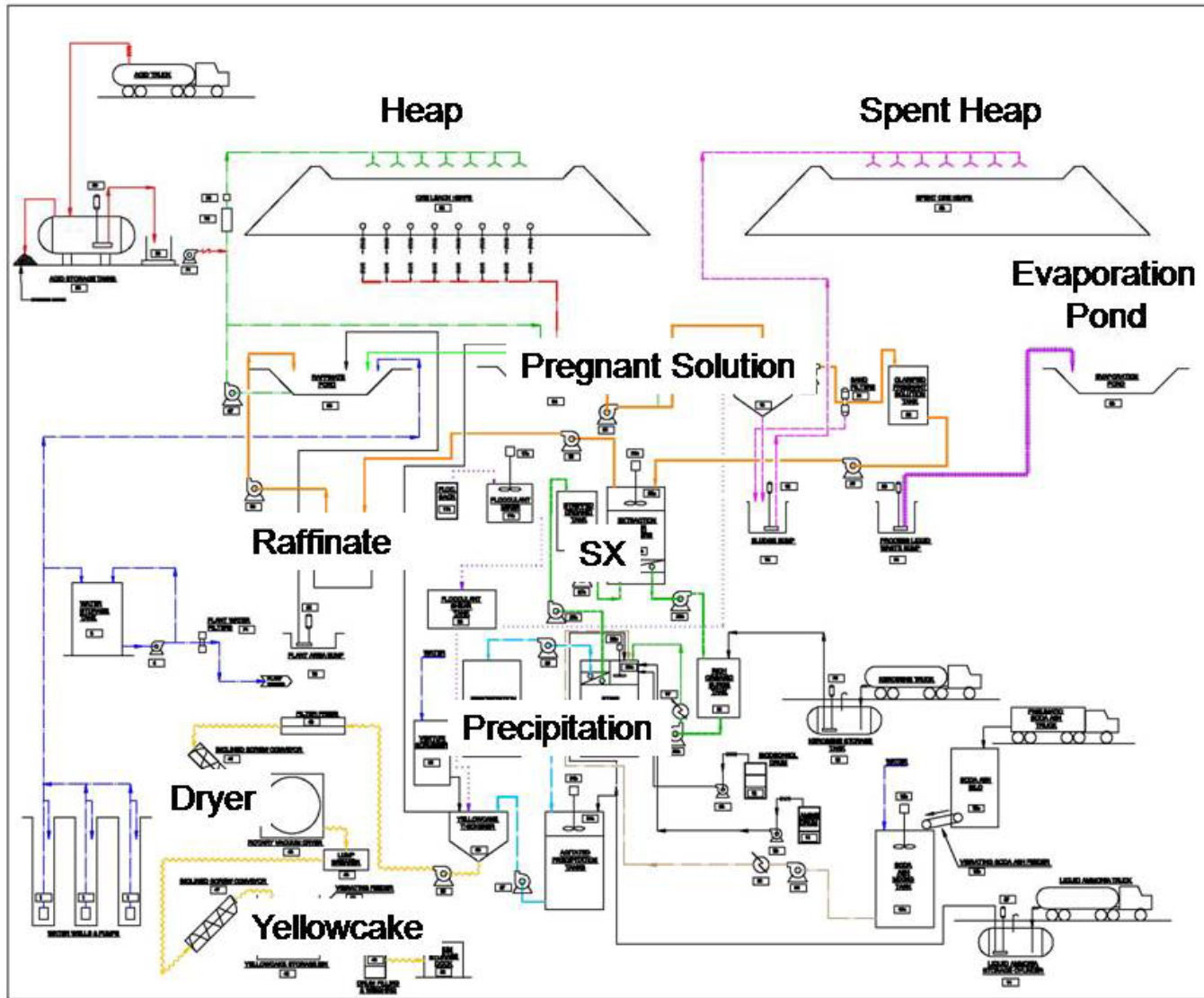
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Conceptual Recovery System Layout





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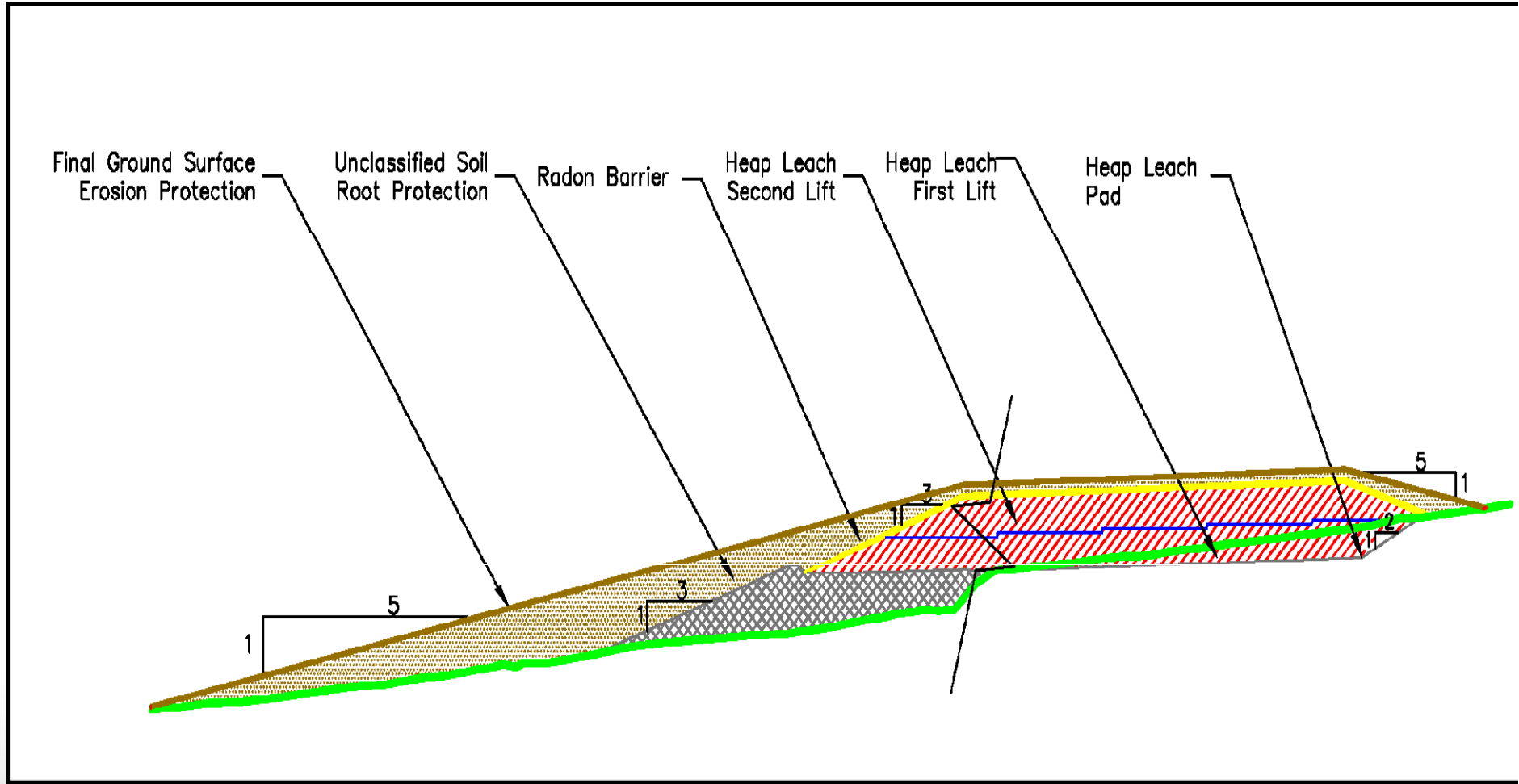


Key Points

- Active heap leach pad is part of the “mill” and the active leaching is milling
- Process Ponds are parts of the mill and will not contain any waste streams
- Milling begins with the stacking of the ore on the pad
- Milling ends when uranium recovery is complete



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Constituent	Initial Grade	Tails	Recovery	Leachate
	mg/Kg	mg/Kg		mg/L or pCi/L
Aluminum	2,920	2,810	4%	203
Arsenic	3.0	1.8	40%	1.1
Barium	10.0	10.4	-4%	0.1
Boron	4.0	3.6	10%	0.9
Cadmium	0.2	0.2	30%	0.3
Calcium	499.0	275.0	45%	445
Chromium	3.5	3.0	14%	1.1
Copper	6.0	3.4	43%	3.9
Iron	5,010	3,910	22%	498
Lead	15.0	10.9	27%	2.8
Magnesium	533	420	21%	250
Manganese	31.4	19.1	39%	10.5
Molybdenum	2.7	2.0	26%	0.0
Nickel	1.1	0.2	82%	0.8
Potassium	857	783	9%	58.0
Selenium	6.2	5.4	13%	0.0
Uranium	894	21	98%	1,047
Vanadium	4.8	3.6	25%	3
Zinc	11.3	8.6	24%	5
226Radium	237	233	2%	6,700
230Thorium	570	37	94%	587,290
210Lead	169	114	33%	29,400

Heap/ISR Comparison

•ISR

- Processing brings Formation Ground Water with elevated Radon into CPP.
- Flow rates 3,500 – 7,000 gpm

•HEAP LEACH

- 98% of radium remains in the heap
- Short lixiviant residence time in heap
- Average Flow Rate @ Sheep 350 gpm
- Low radon levels expected in leachate sent to plant

Heap/Conventional Comparison

•CONVENTIONAL MILLING PHYSICALLY ALTERS ORE

- Processing brings **ore** and associated **radium** into Mill
- Grinding reduces grain size
- Milling process separates sands and slimes
- Slimes concentrate **radium**, retain moisture, have low strength
- Resulting in lengthy process (decades) to stabilize and reclaim

•HEAP LEACH DOES NOT PHYSICALLY ALTER ORE

- 98% of radium remains in the Heap
- Heap remains comingled
 - No grinding; no sand slime separation; no concentration of radium
- Built on a liner with a positive drain
- Reclamation can proceed efficiently



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Mill Details

Heap & Pond Liner Details

Heap Cap and Cover

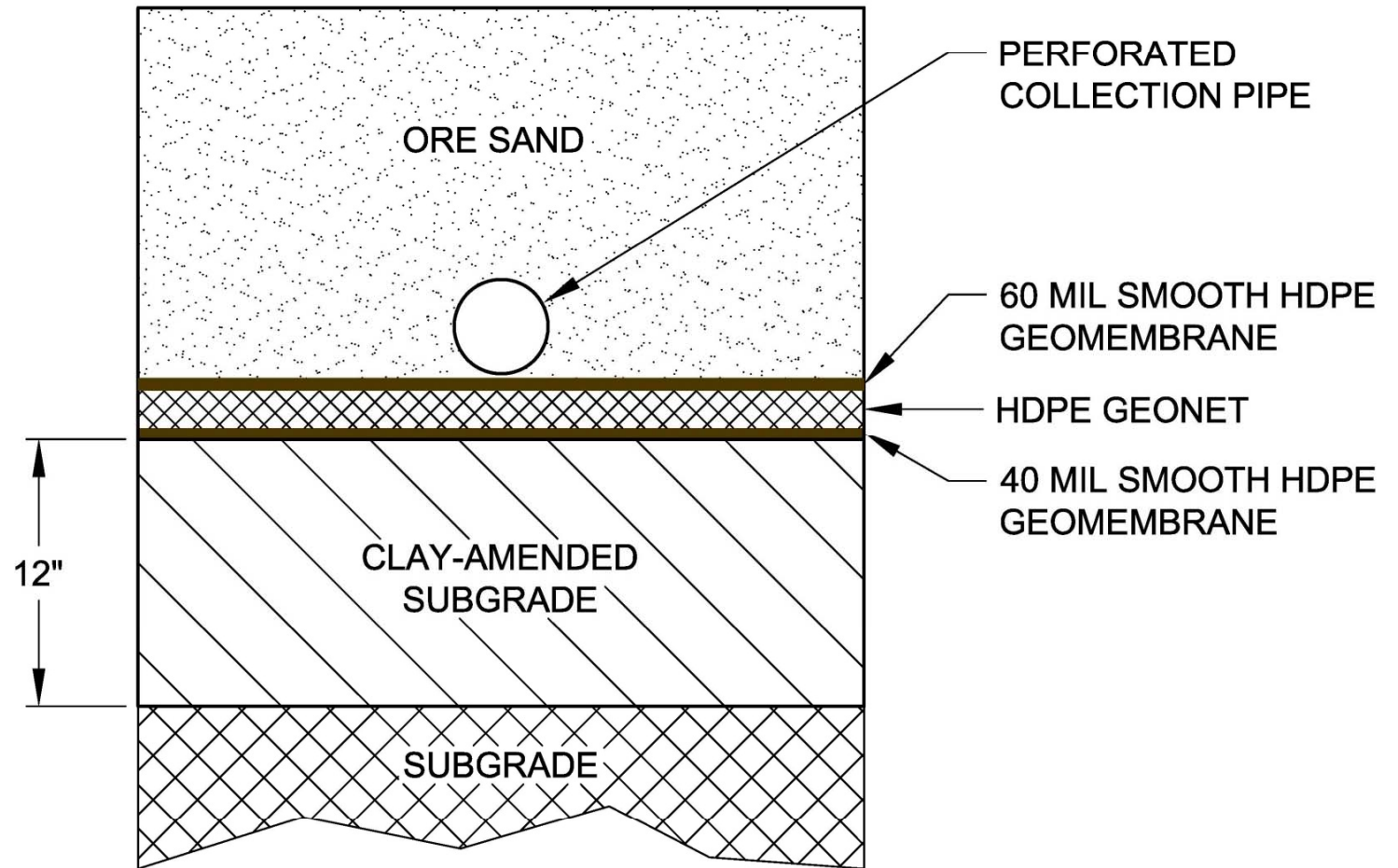
Heap Leach Facility

Heap Leach Pad

- Double lined, leak detection, clay amended sub grade
- Loading up to 2,600 tons/day, roughly 1,800 cy/day
- 25 ft lifts, maximum height 50 ft
- 200 ft wide by 1,600 ft long lifts installed via continuous stacker
- Stacking and leaching of lifts is phased to minimize amount of uncovered spent heap (tailings)
- Lixiviant is 1 normal H_2SO_4
 - applied at 0.005 gpm/sq ft
- Approx. 1.6 acres under primary leach at any one time
 - 360 gpm of leachate in process



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Mobile Grasshopper / Radial Stacking



Courtesy: Terra Nova Technologies, Inc.
Santee, CA
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Ore Stacker

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Heap Leach Facility (con't)

Active milling cycle includes:

- Stacking
- Primary leach
- “Resting” heap to enhance recovery
- Secondary leach
- Rinse
- Draindown

Once active leaching and uranium recovery is complete, heap becomes *inactive* tailings



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Heap Leach Facility (con't)

- Up to 45 acres of heap open at any one time
 - < 40 acres would be spent heap (tailings)
- A single heap leach pad (one continuous liner) may at any one time contain:
 - Open and unloaded pad
 - Un-leached ore
 - Ore under active leaching (milling)
 - Ore being “rested” between leach cycles (milling)
 - Ore being rinsed for final value recovery and heap detoxification (milling)
 - Spent ore (tailings) waiting to be covered
 - Spent ore (tailings) being covered
 - Covered spent ore (tailings)



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Conceptual Heap Sequencing

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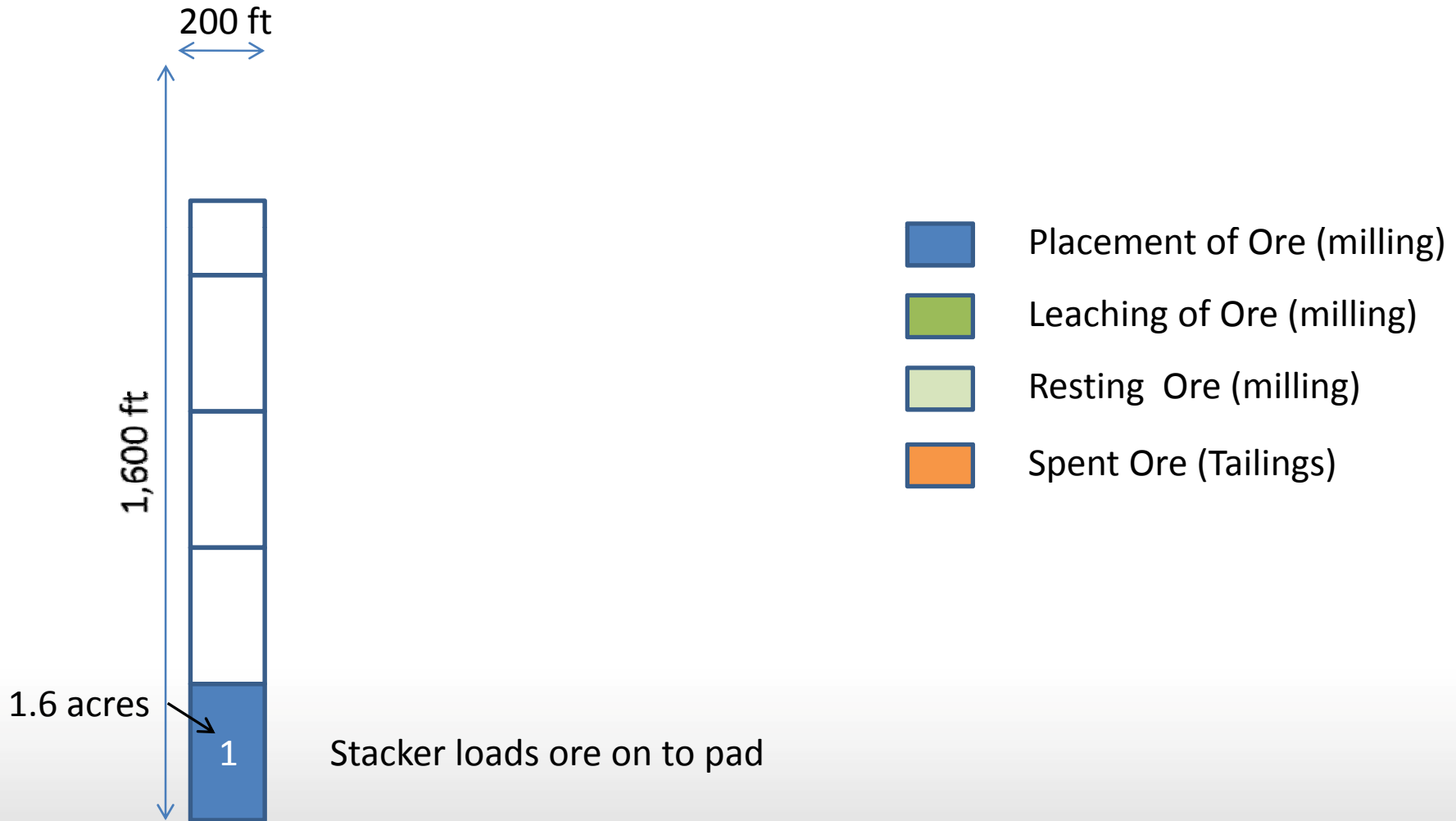
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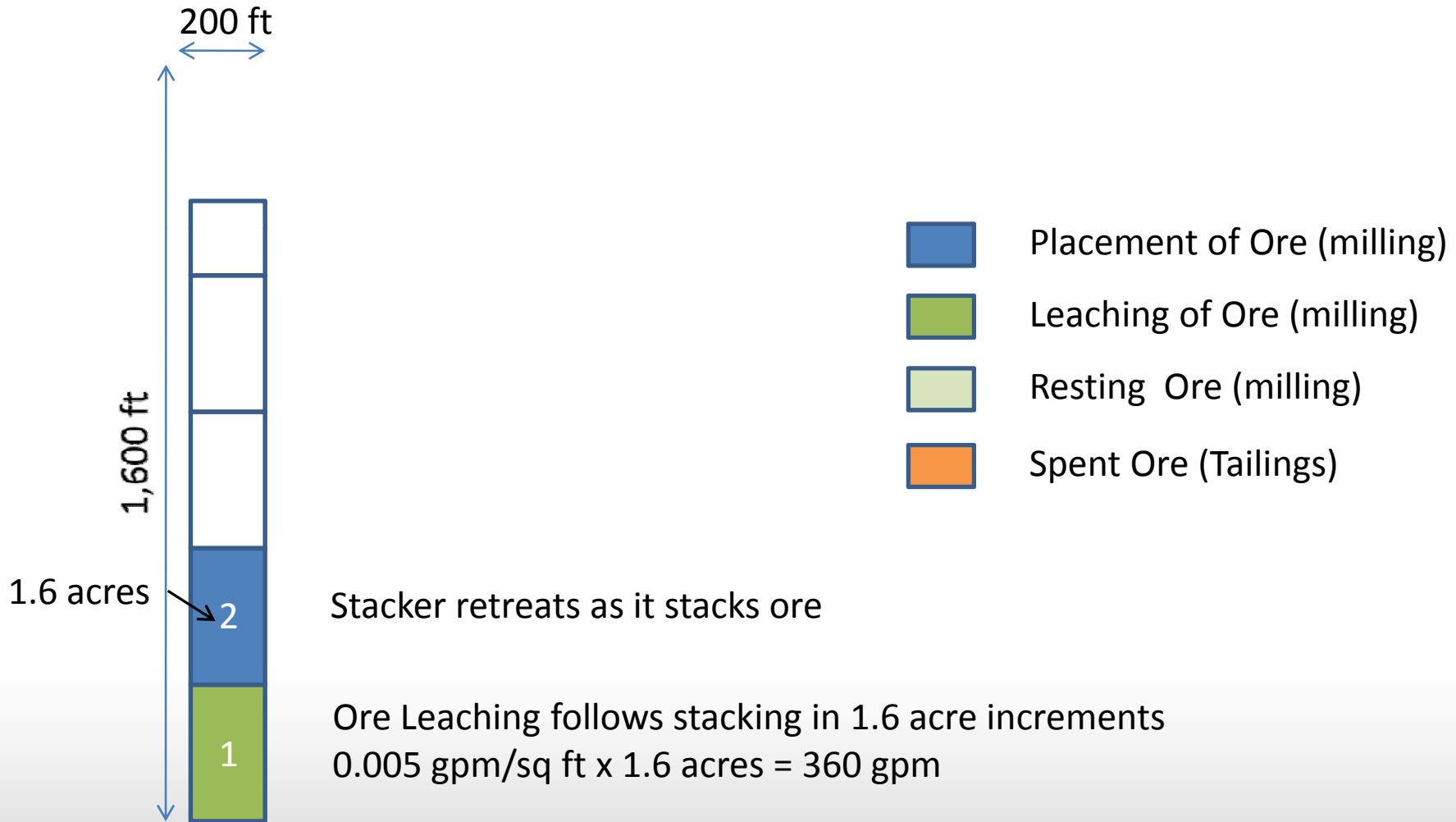
Stacking and Leaching Sequence





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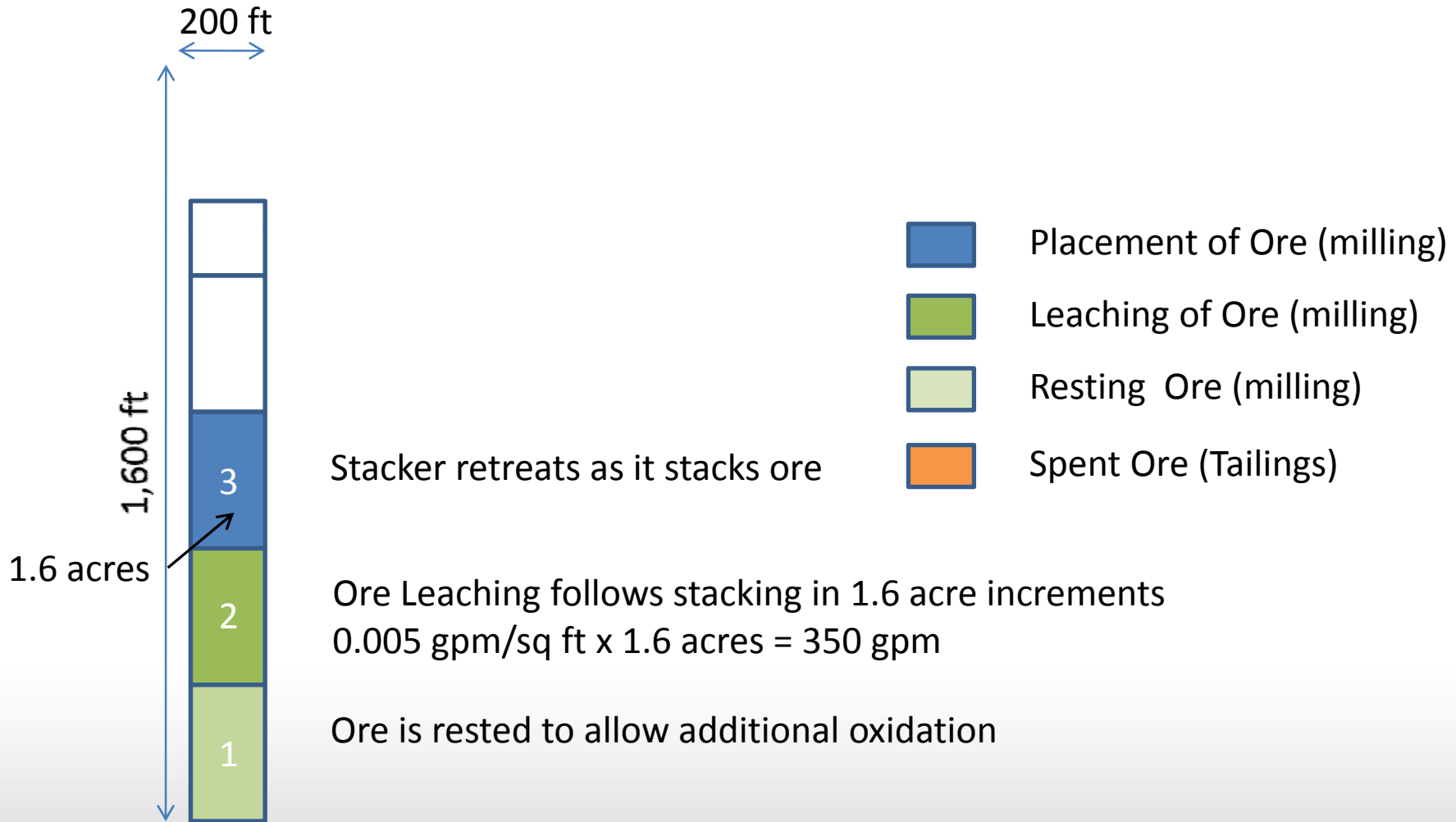
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Stacking and Leaching Sequence





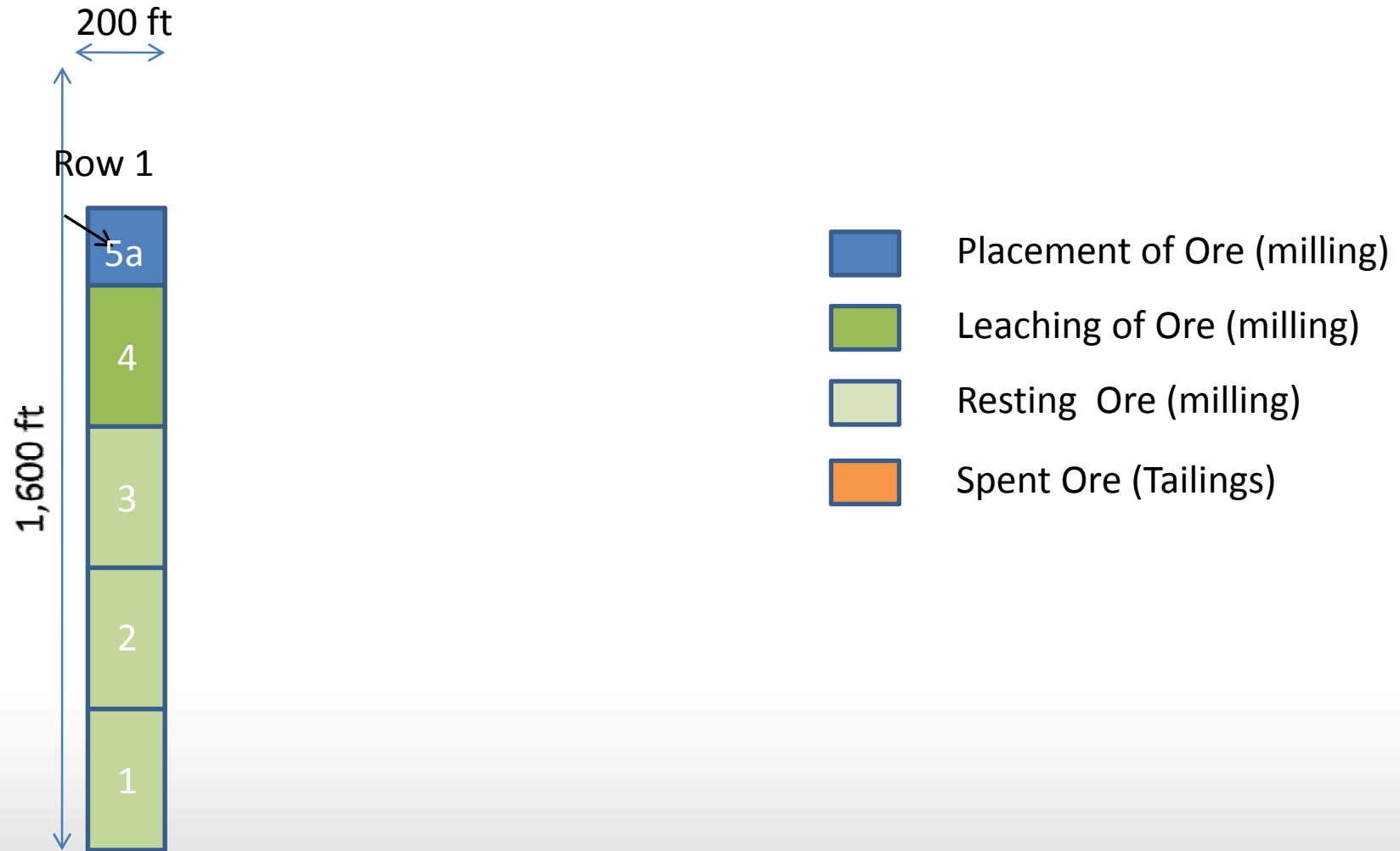
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Stacking and Leaching Sequence





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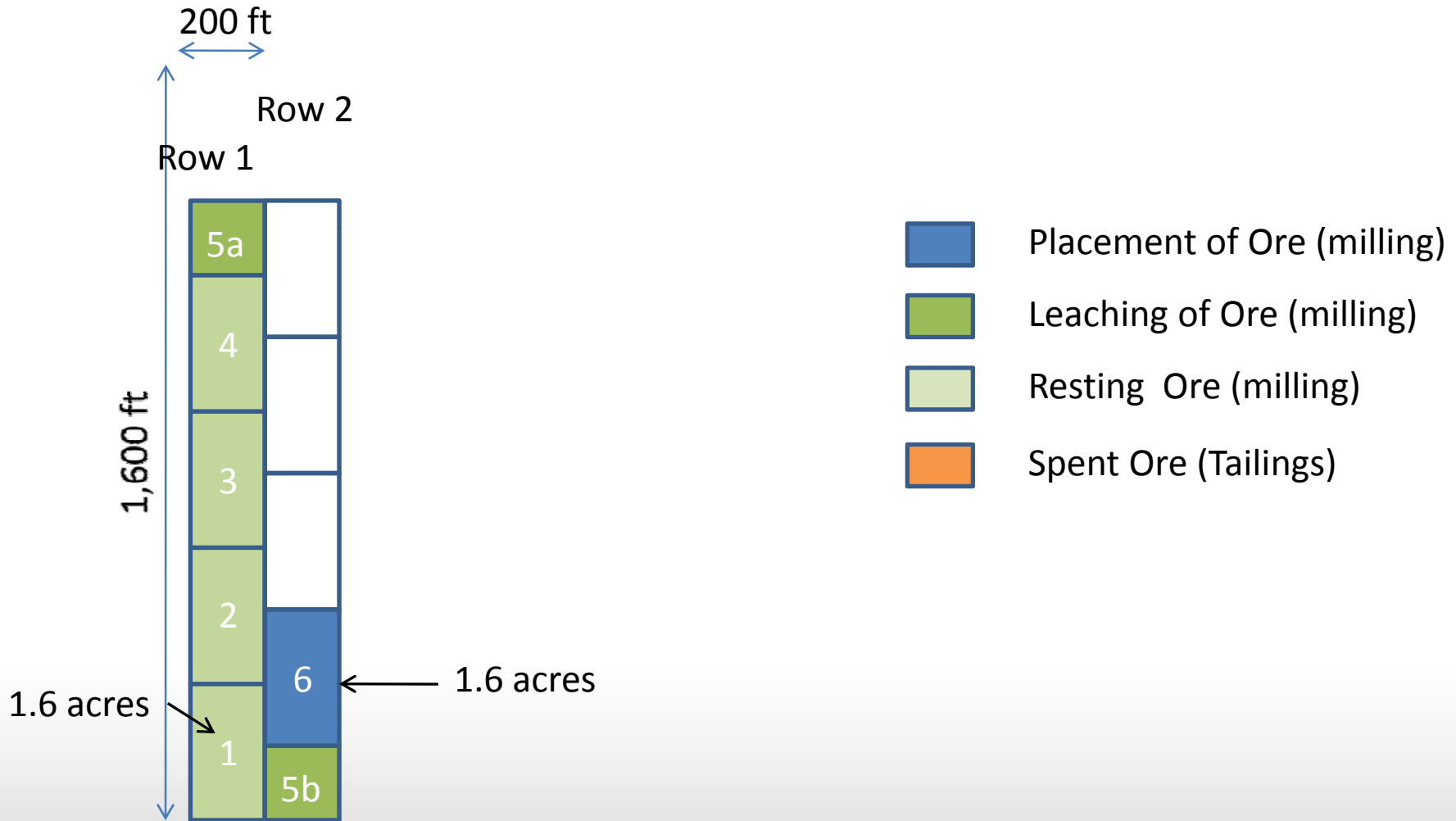
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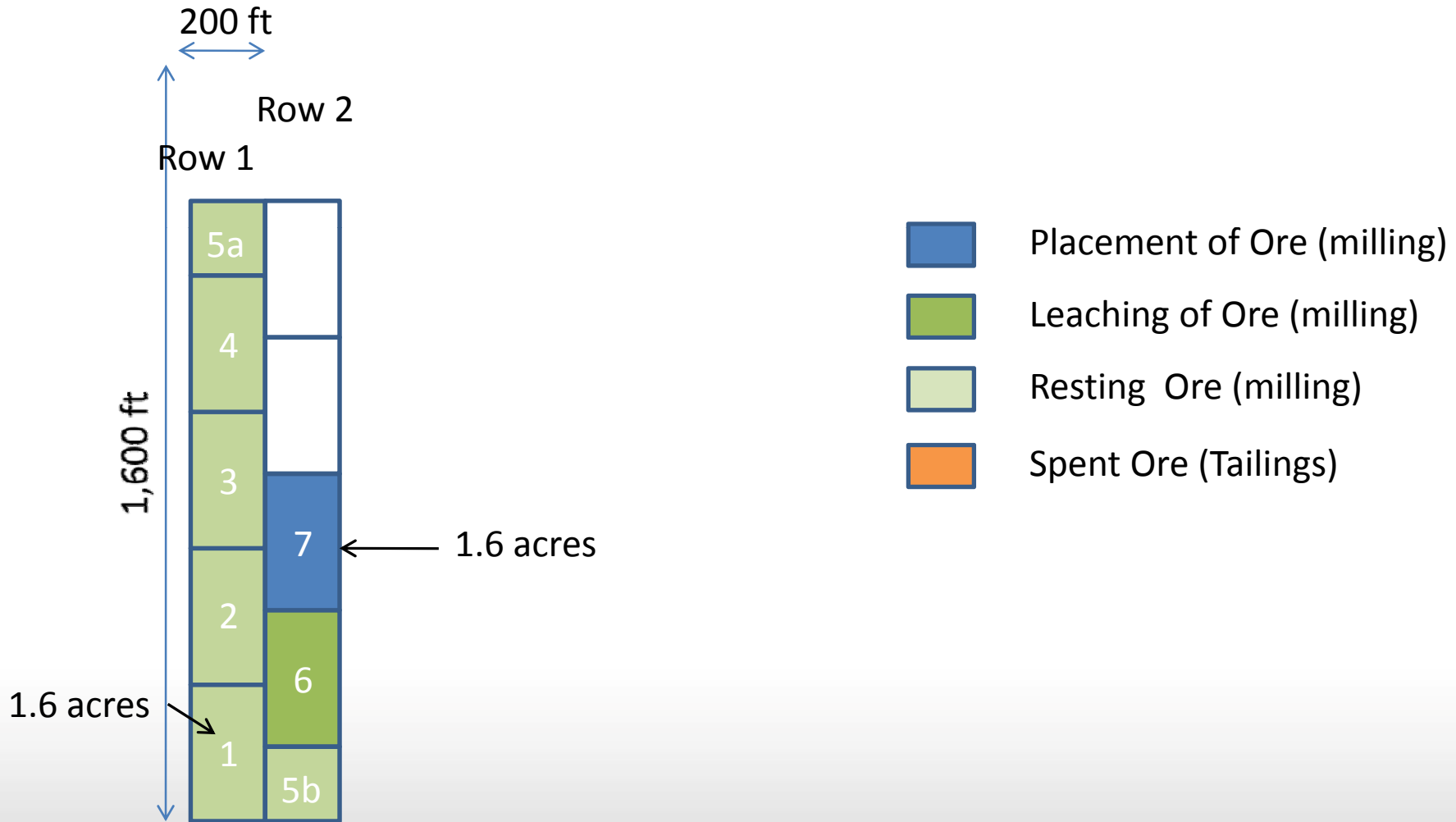
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Stacking and Leaching Sequence





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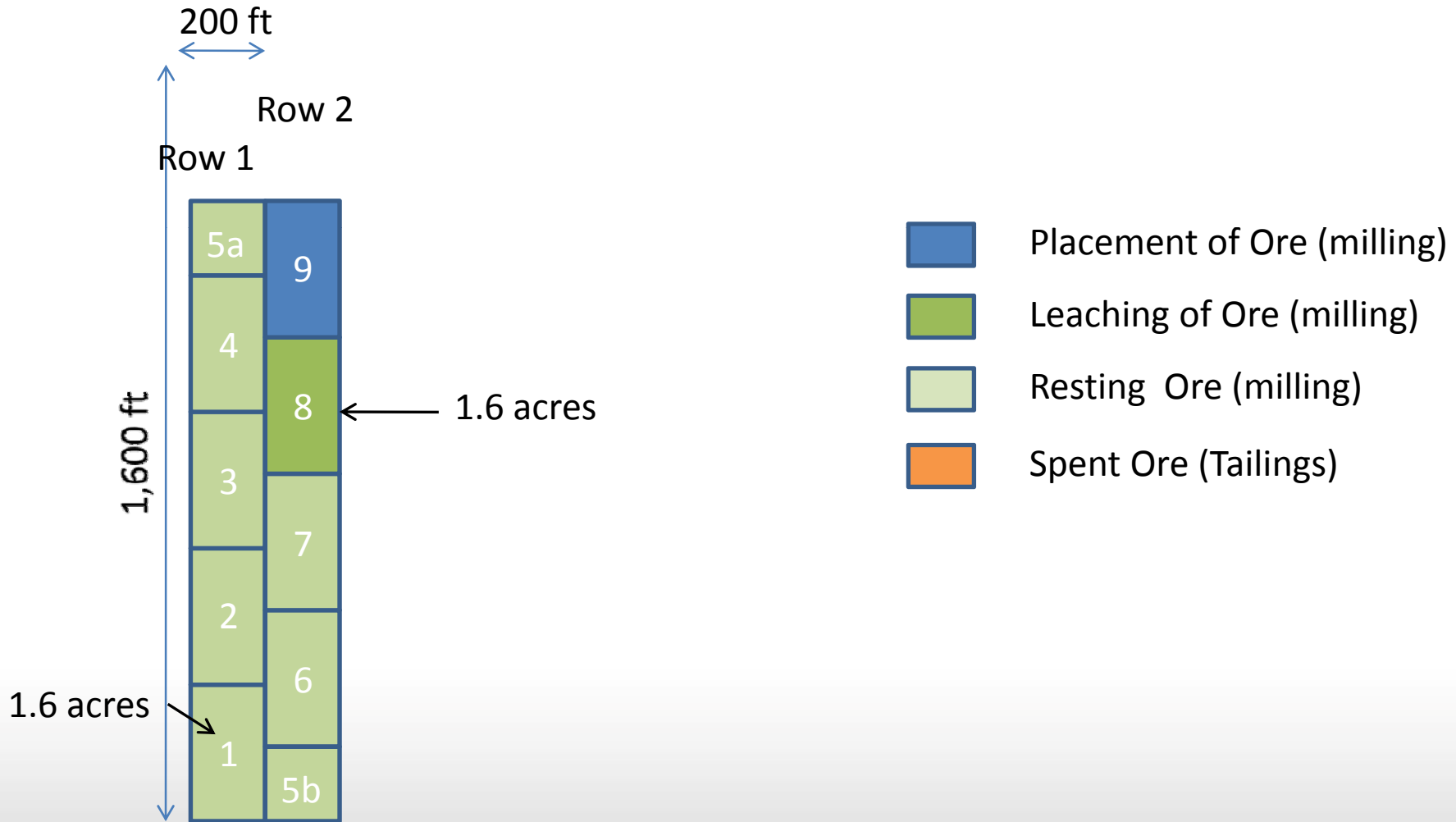
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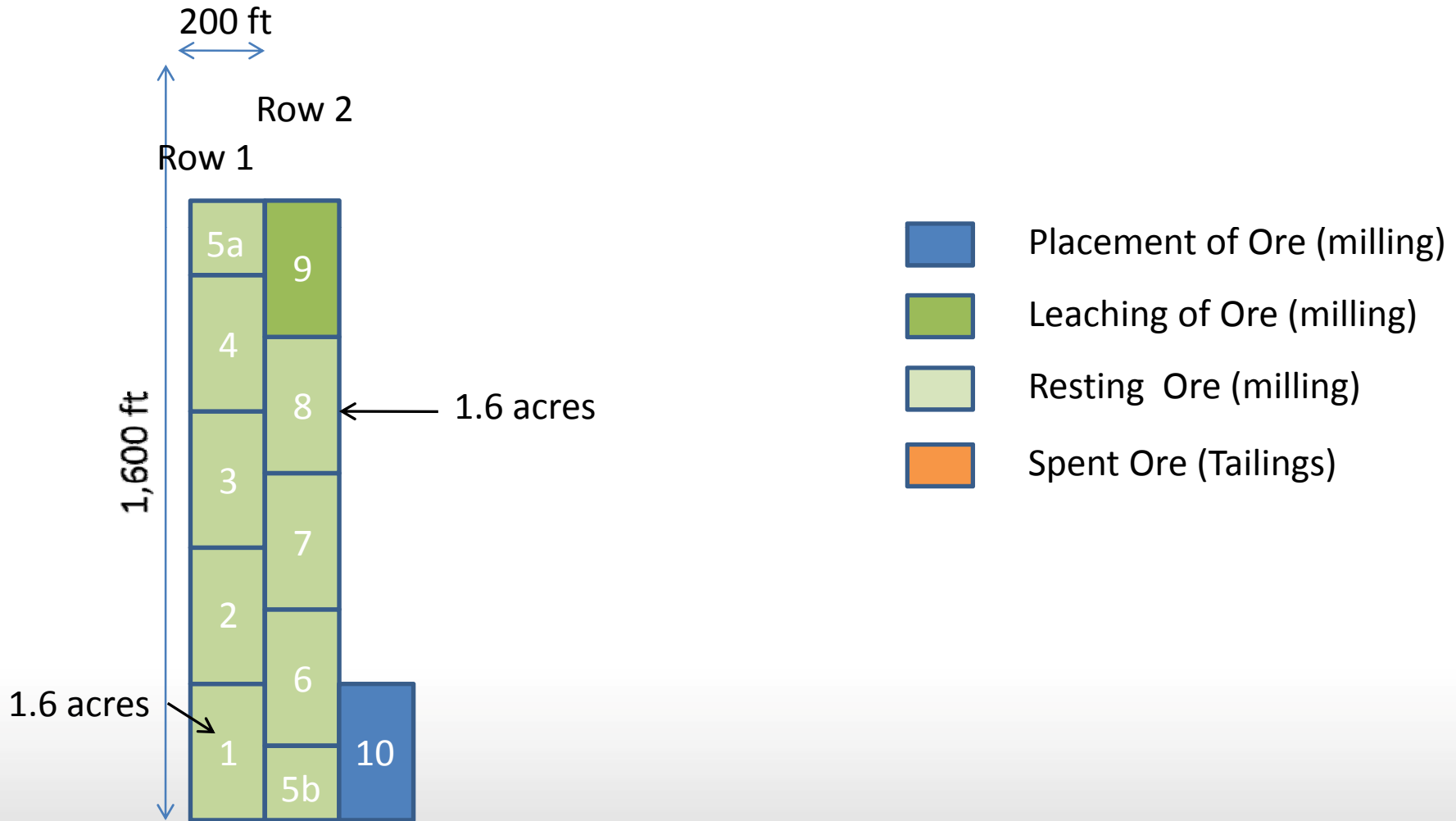
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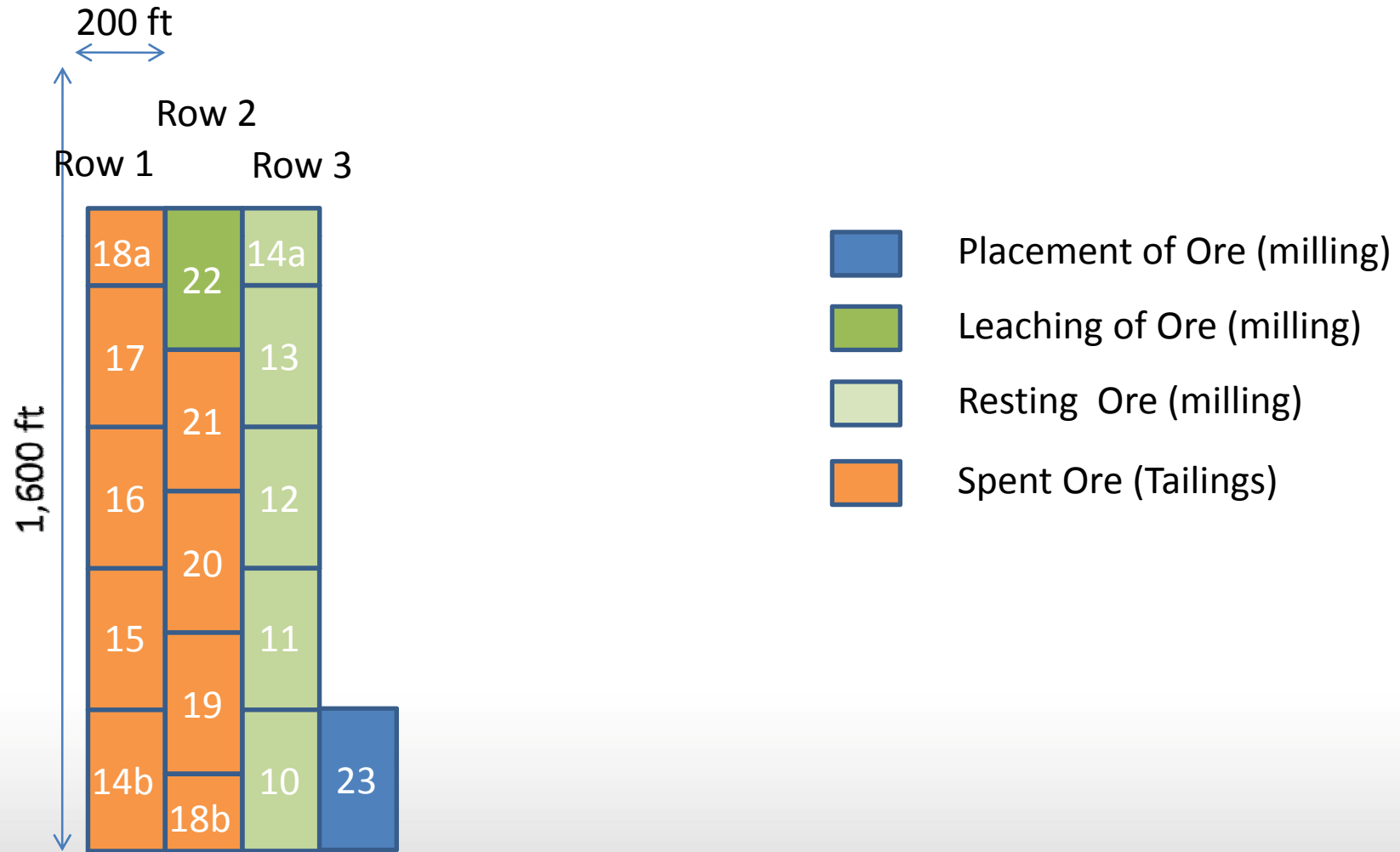
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

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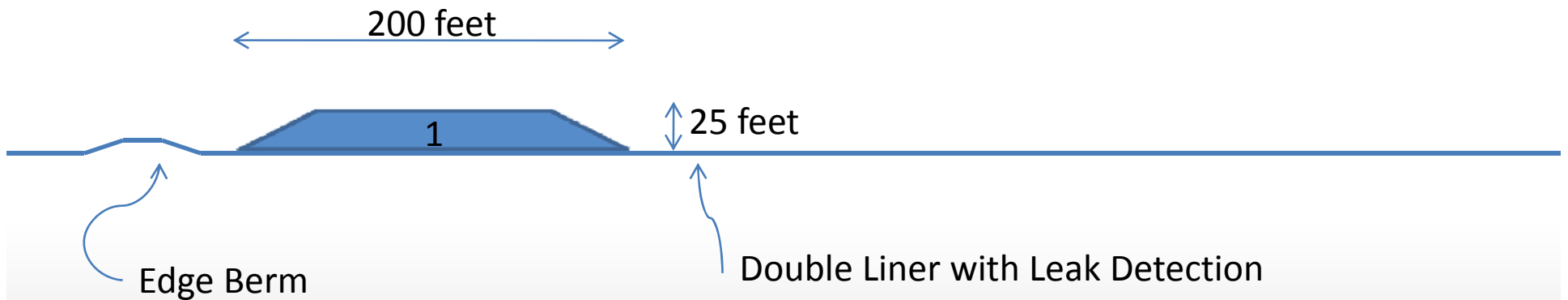
Stacking and Leaching Sequence









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-  Placement of Ore (milling)
-  Leaching of Ore (milling)
-  Resting Ore (milling)
-  Spent Ore (Tailings)









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

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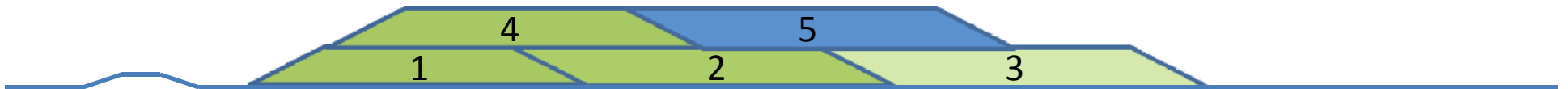
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

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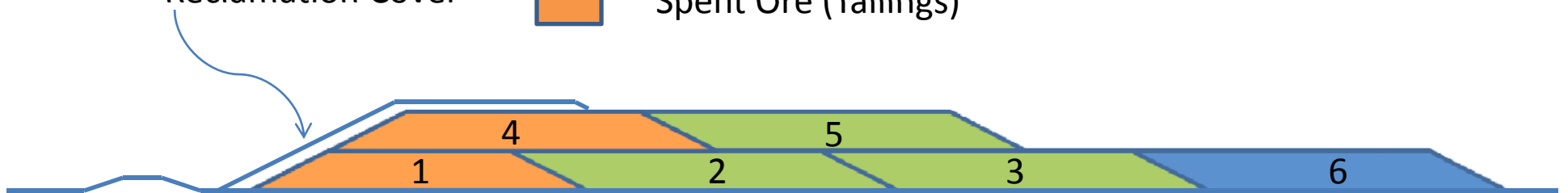




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

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Reclamation Cover

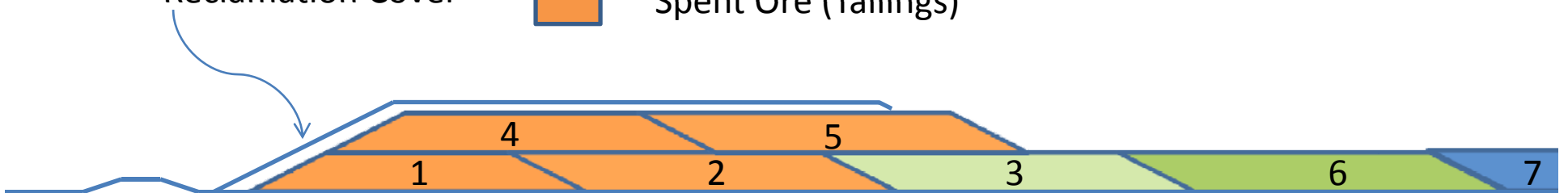




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

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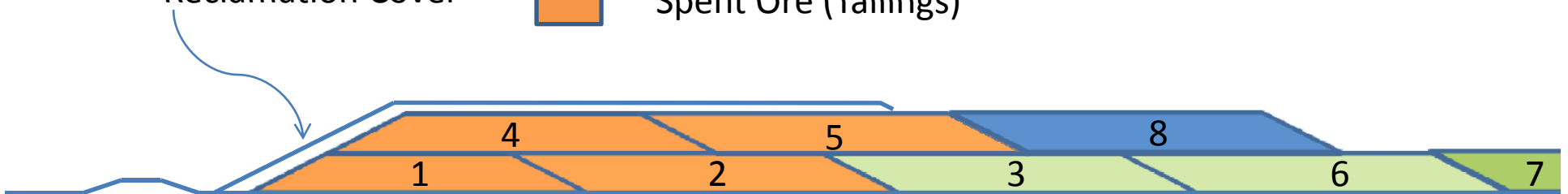




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

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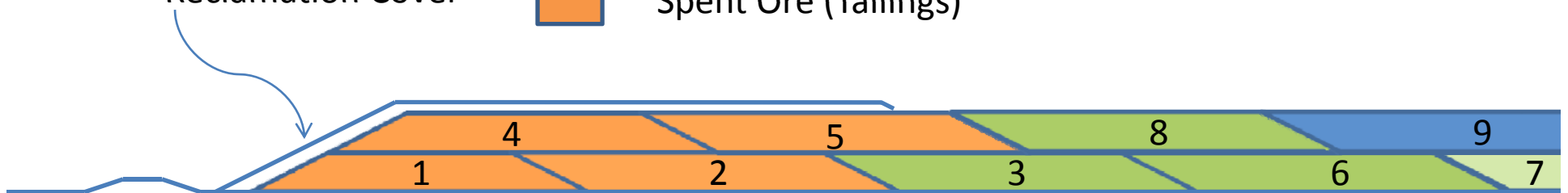




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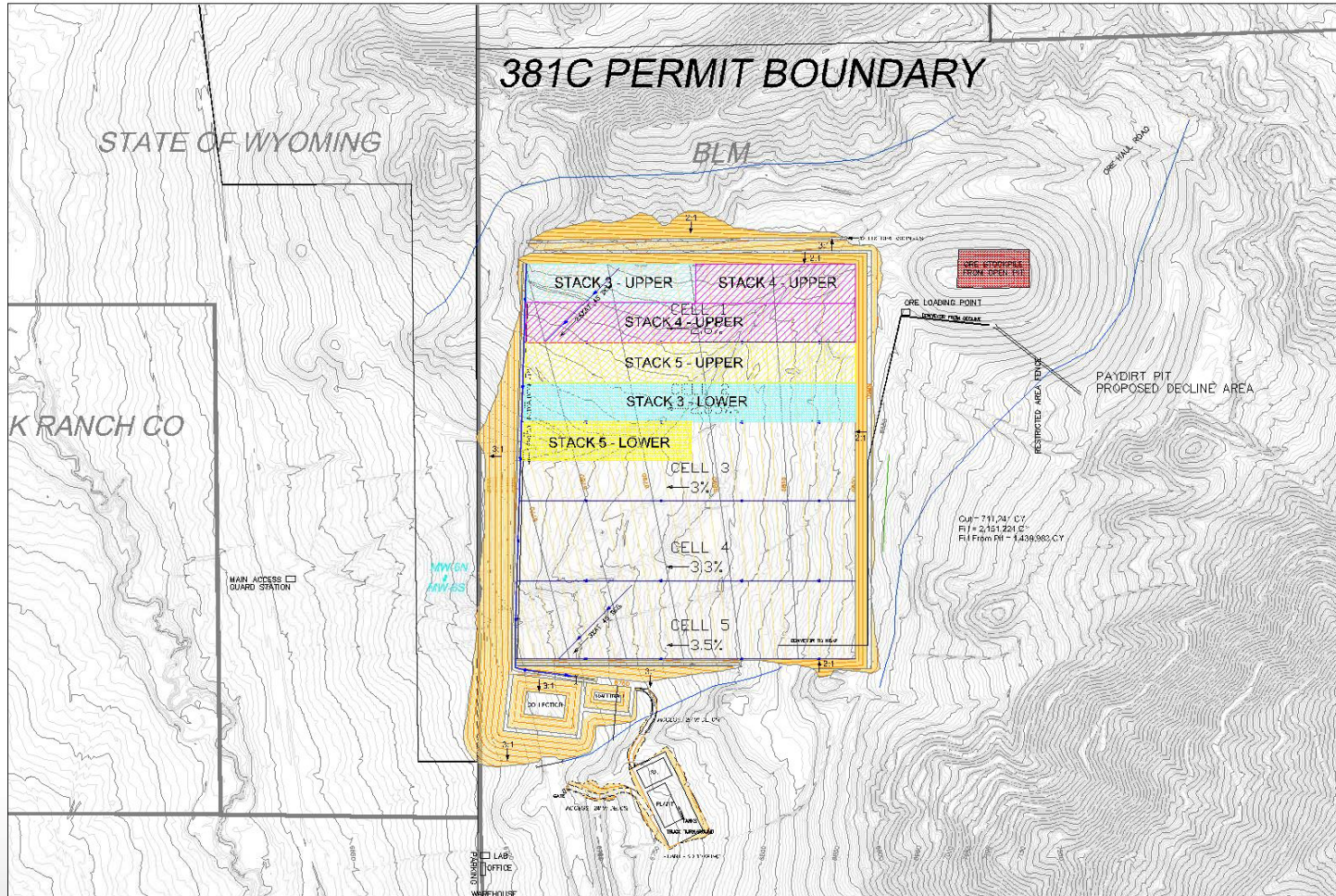
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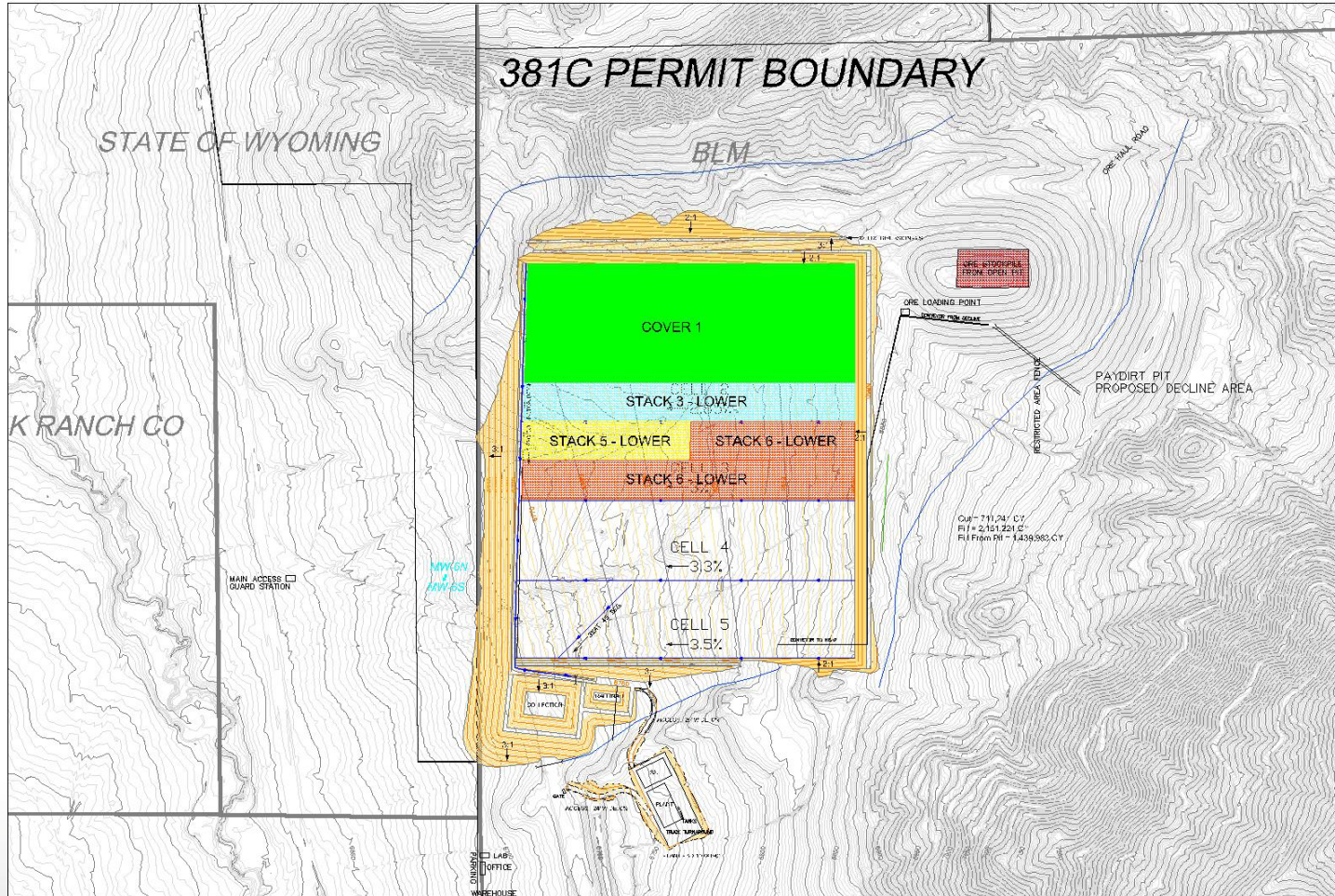


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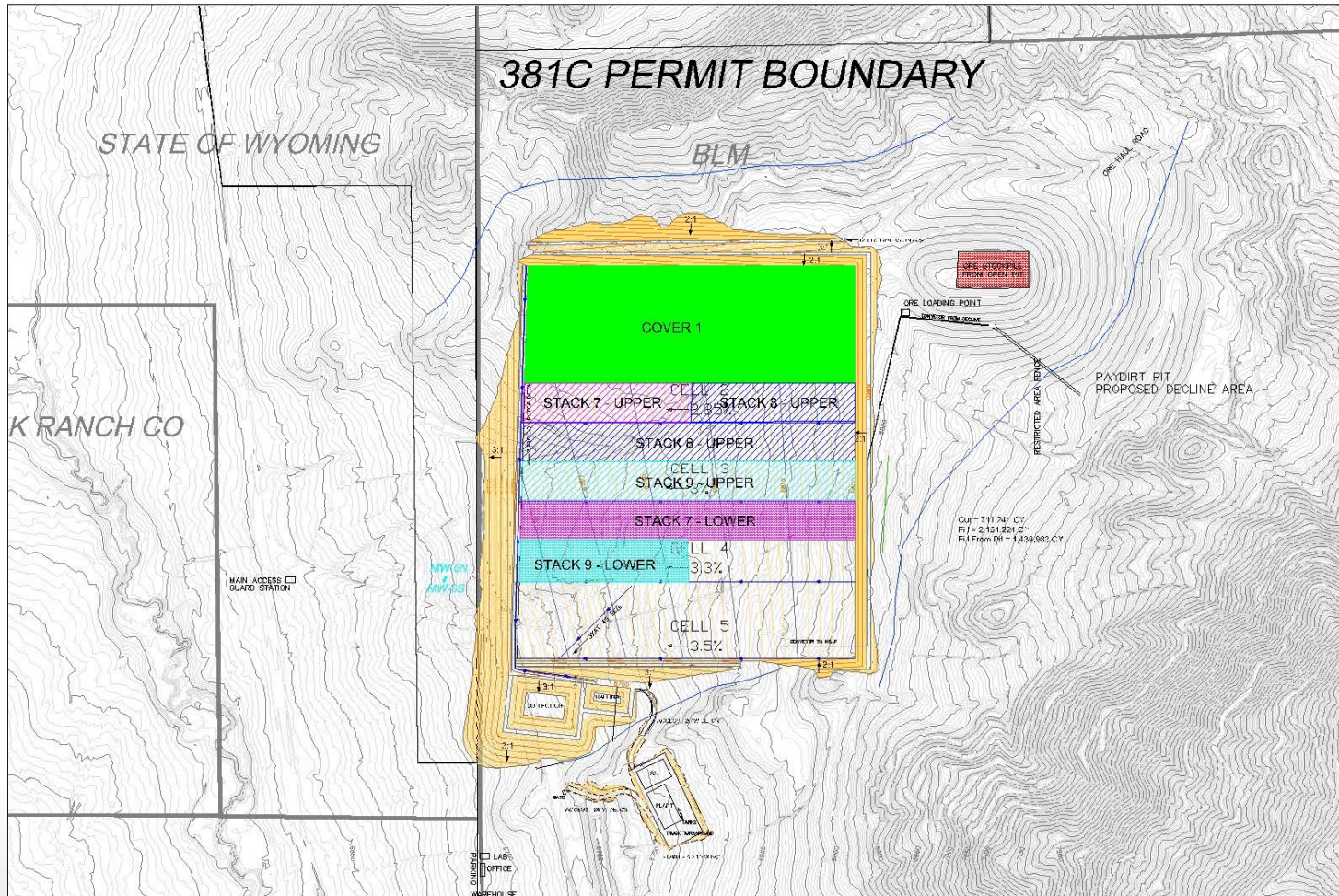
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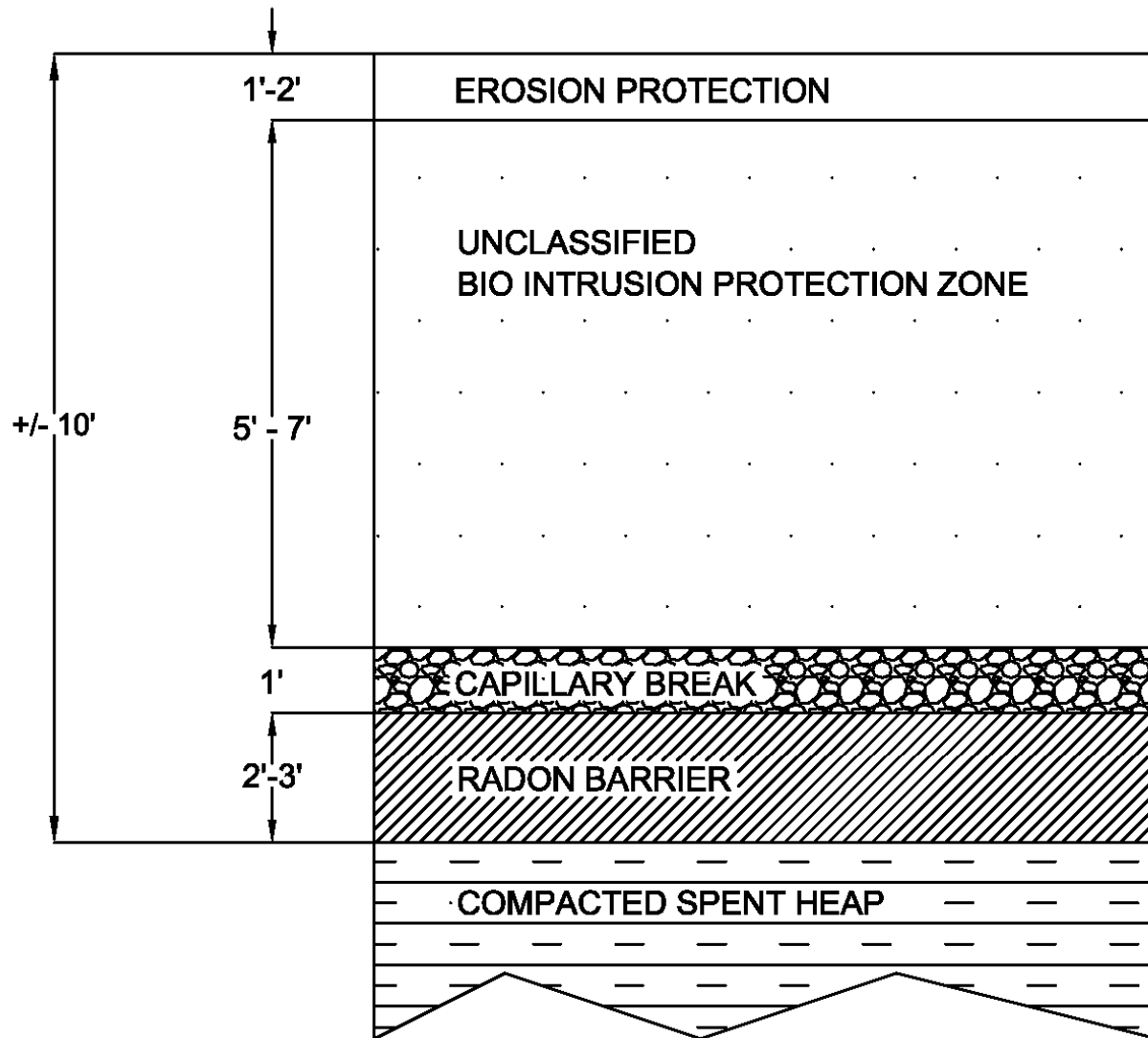
Heap Leach Facility (con't)

- Start reclamation of spent heap surface after uranium recovery (milling) of heap section is complete on individual stacking rows:

- Compaction and minor grading of heap surface
- Placement of final radon barrier
- Biointrusion layer
- Freeze/thaw protection
- Radon flux verification measurements
- Erosion protection (rip rap)



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Heap Cap and Cover Detail



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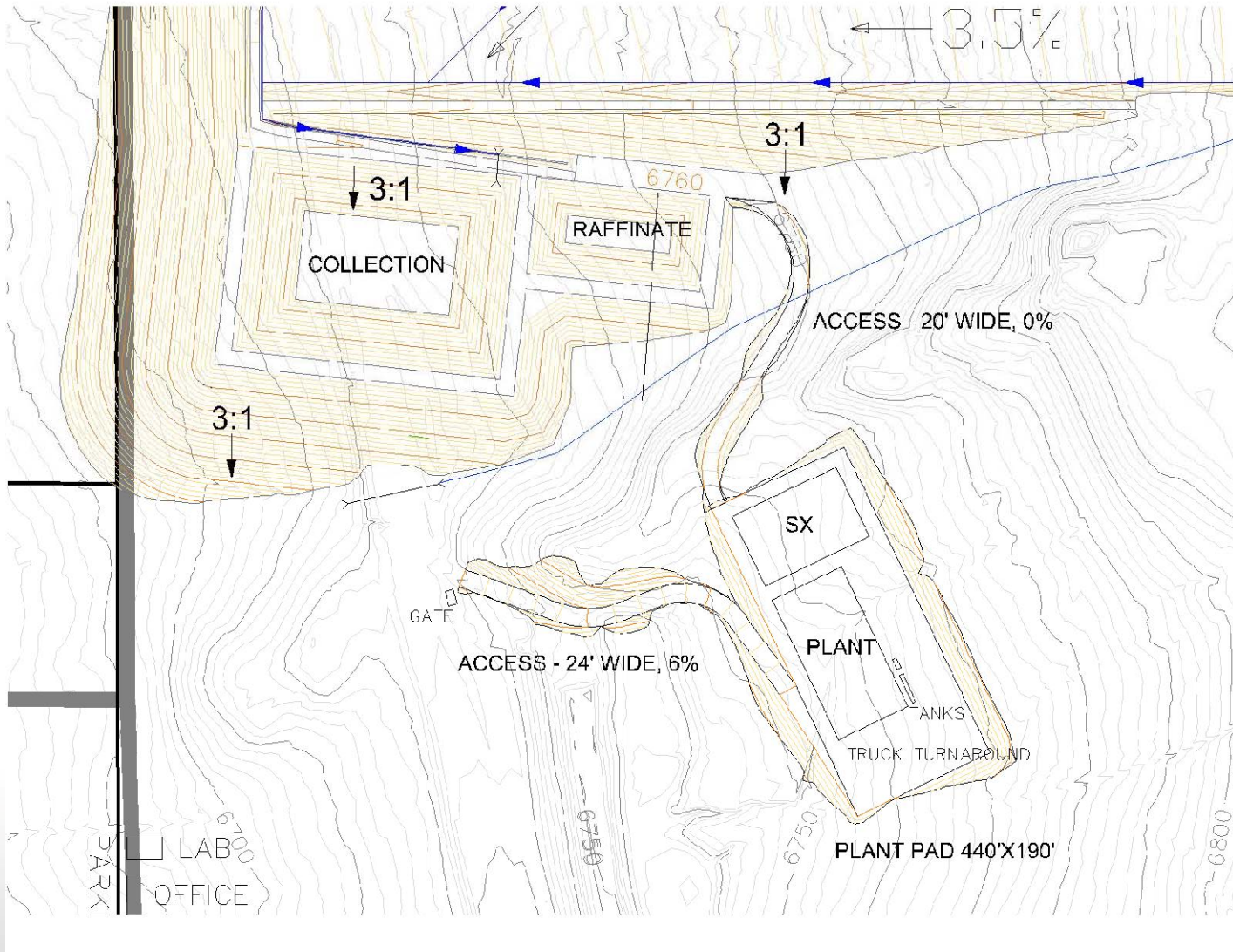
Heap Leach Facility (con't)

Process Ponds

- Double lined, leak detection, clay amended sub-grade
- Barren Pond (raffinate, lixiviant make up)
 - acid addition
 - make up water
- Pregnant Pond (collection)
 - Loaded raffinate
 - Blending of leachates for grade control
- Analogous to mill leach process tanks
- Will not contain any wastes or “tailings”
- **Active** leach pads as well as **process** ponds are part of the mill, no wastes ever present
- Only after uranium recovery is complete are tailings present



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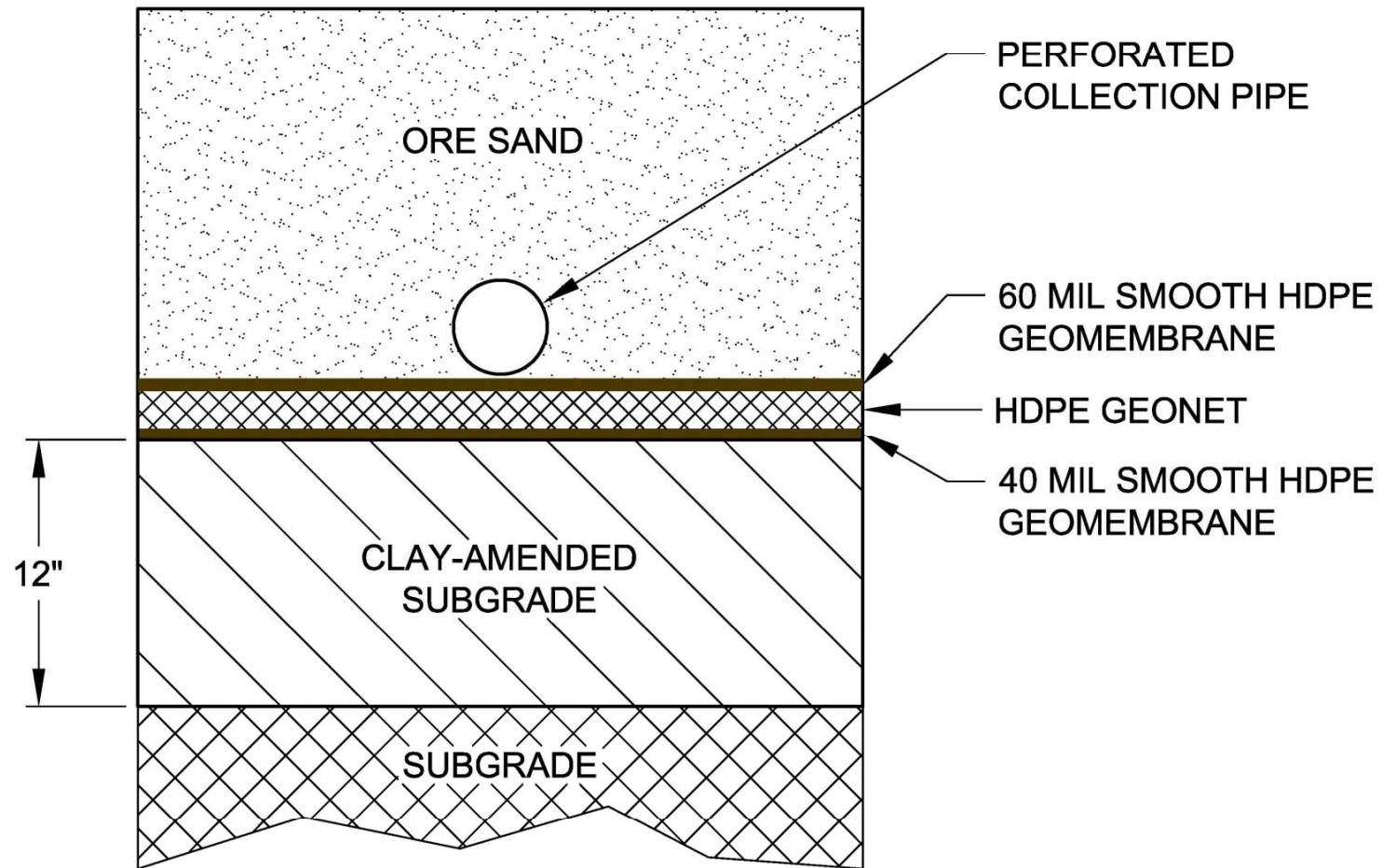
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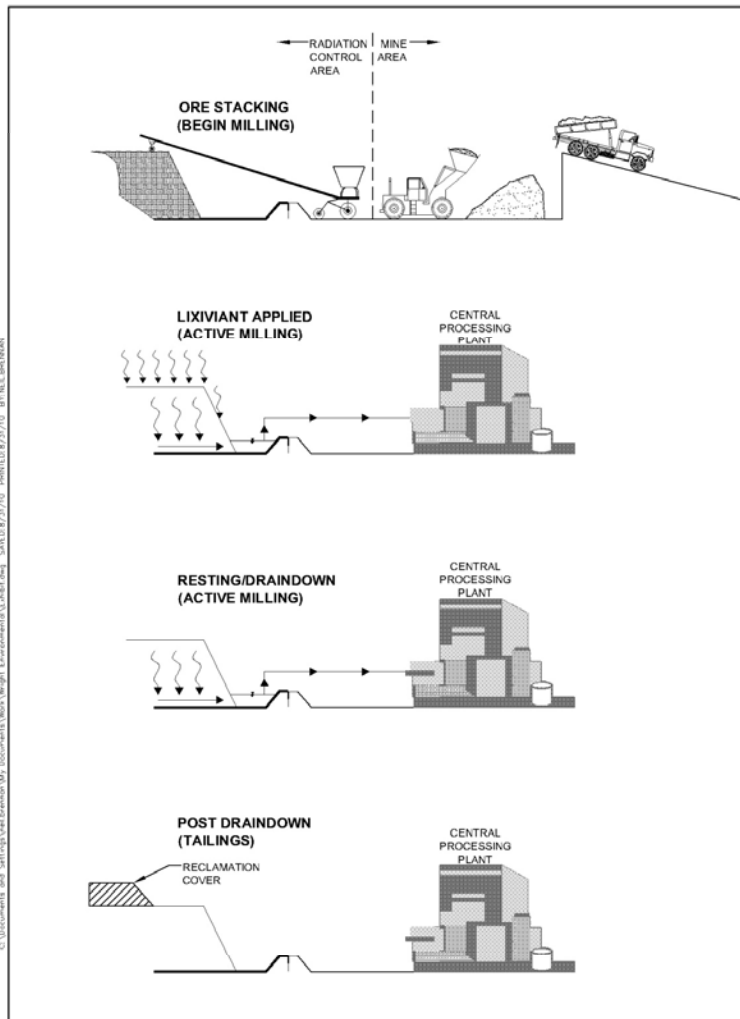
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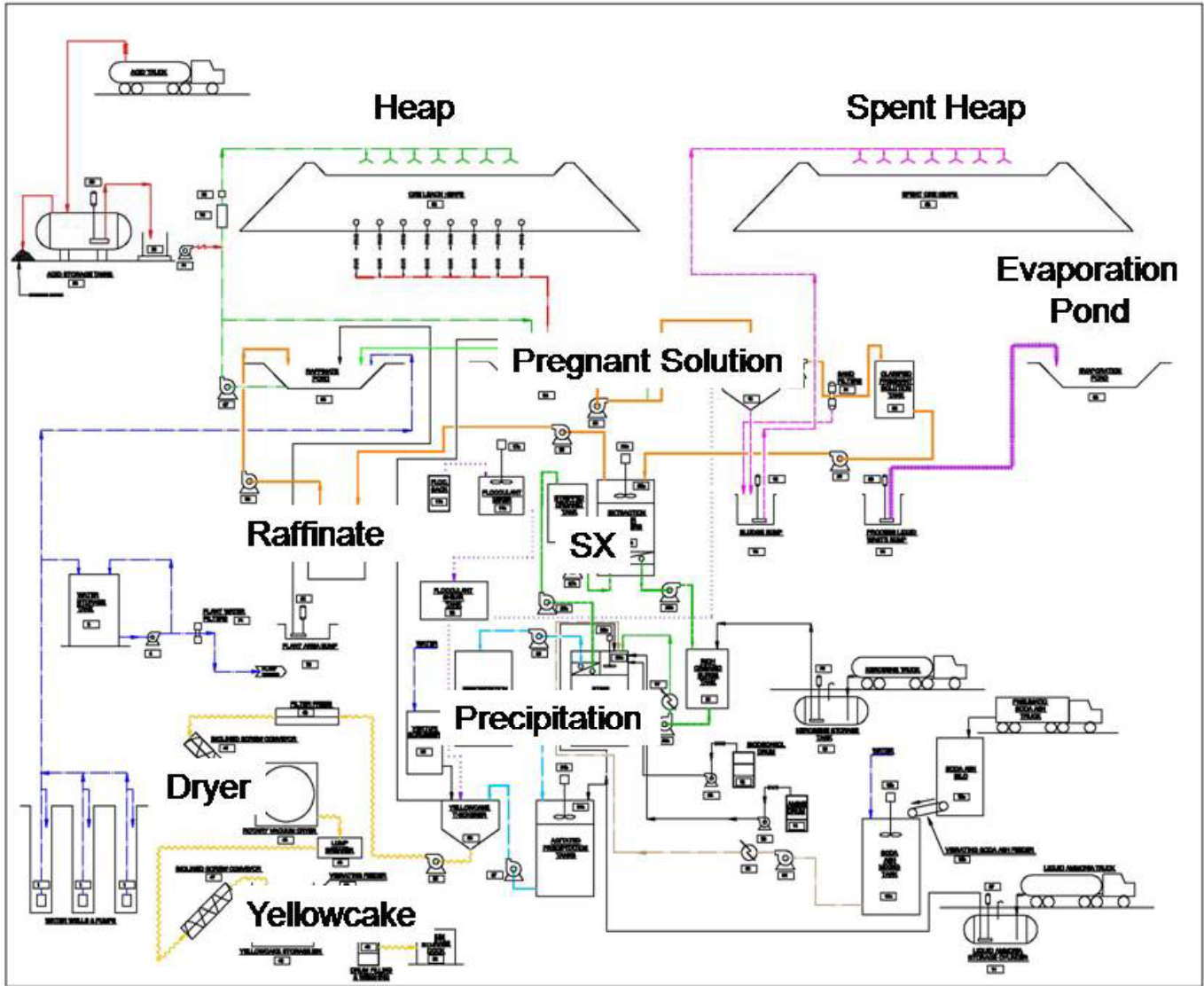


Status of Active Heaps and 10 CFR Part 61, subpart W

- Active heap is active “milling”
- Heap material during active milling is not 11e.(2) byproduct material
- Have rad. monitoring and rad. protection programs to ensure public and occupational exposures remain ALARA
- “Resting” a heap is part of active milling
- Heap becomes 11e.(2) when drain down and recovery of values is completed and the heap is inactive

Central Processing Plant

- SX
- IX Polishing
- Precipitation
- Vacuum Drying & Drumming
- Process Bleed to Tanks
- Operations
 - Process flow rates approx. 360gpm,
 - low anticipated Rn-222 levels
 - Process bleed rates of 5% to 10%
 - 18 to 35 gpm
 - 10 gpm waste stream from precipitation circuit
 - Liquid wastes will be managed in double lined evaporation ponds with leak detection and clay subliner



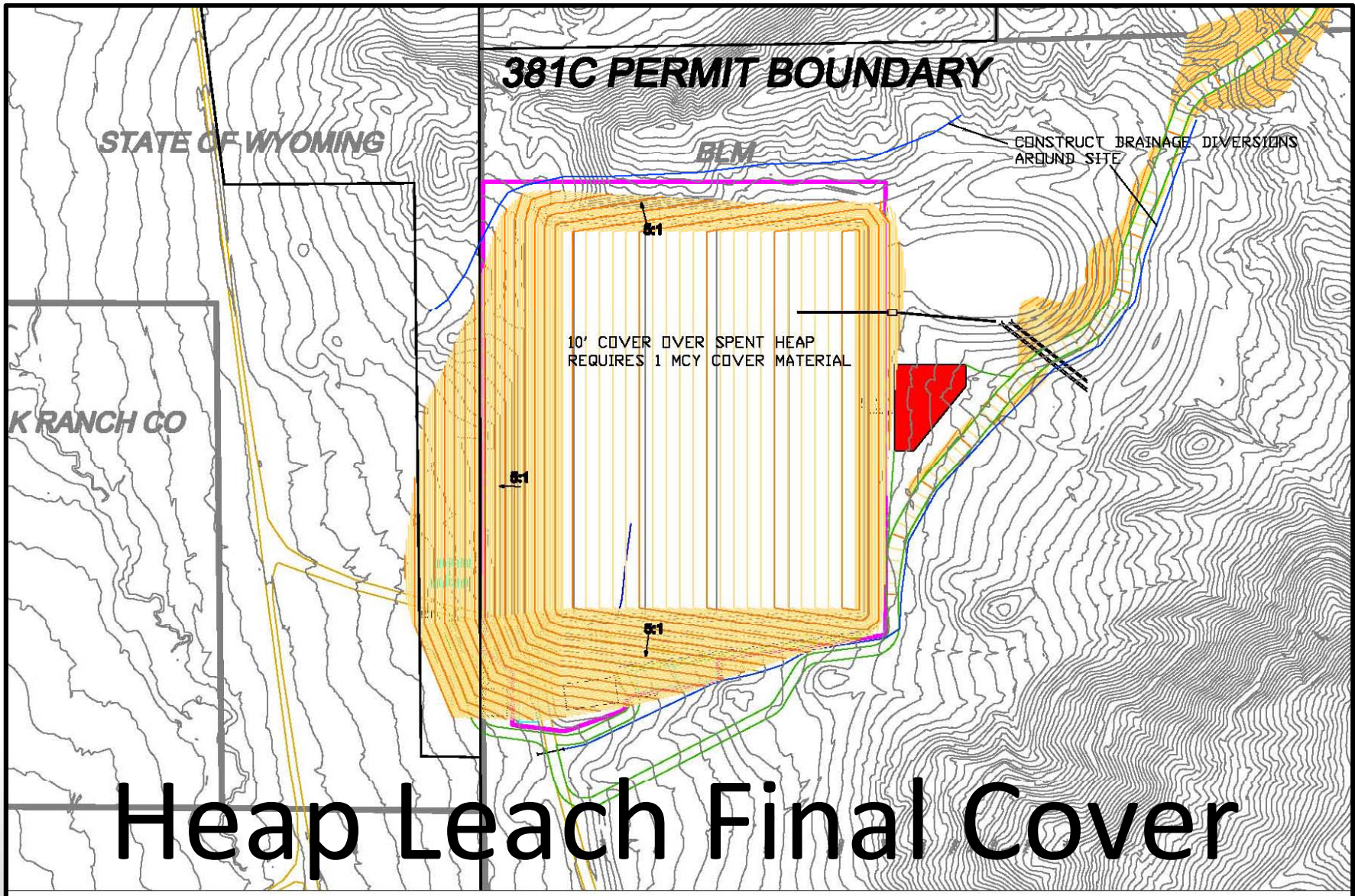


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Mine and Reclamation Planning



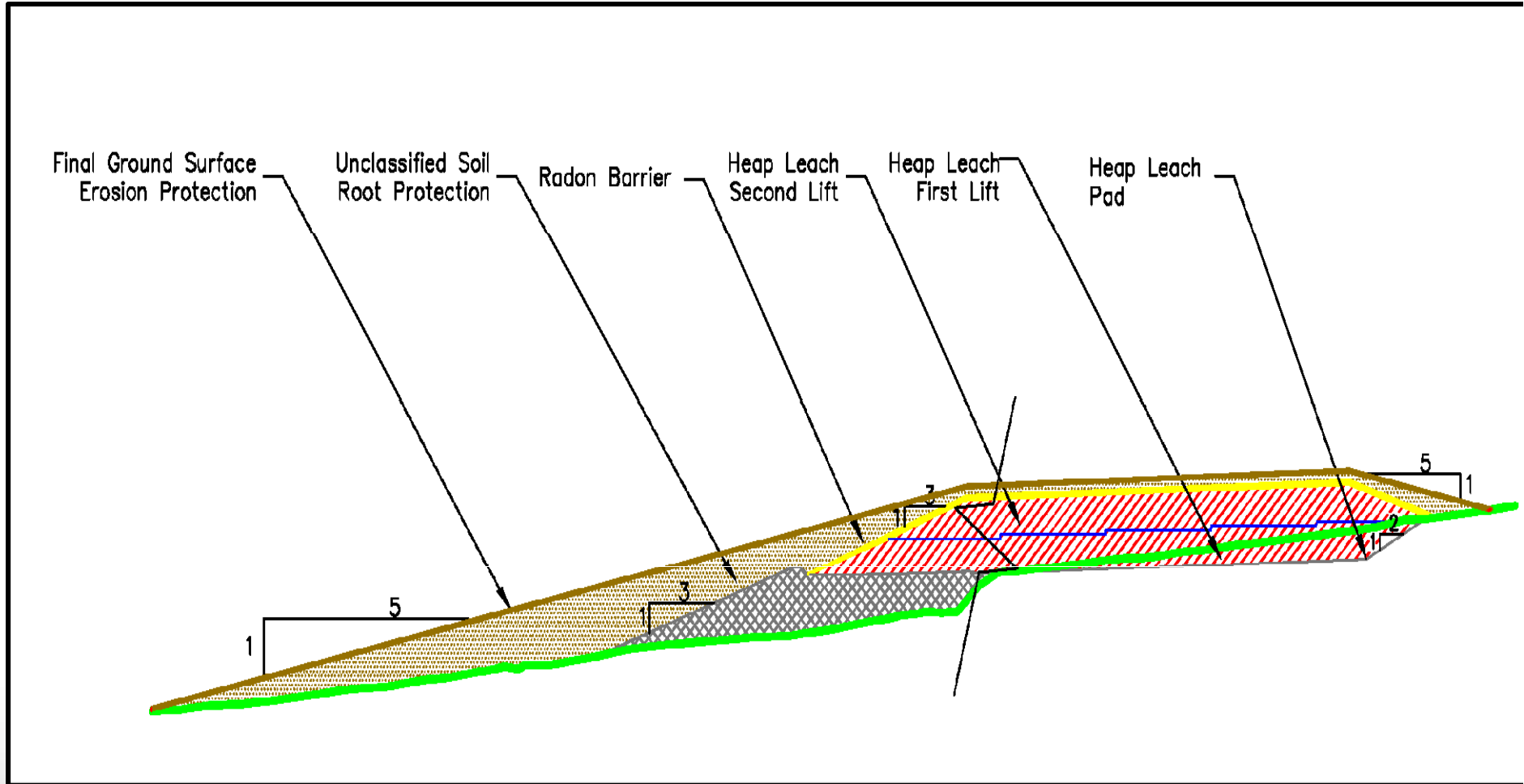
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Heap Leach Final Cover



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Items for Discussion

Issues for Discussion

- Status of 40 CFR 192 GW standards update
- Status of Active Heaps & Inactive Heaps
- Status of Process Ponds
- Other?

Our Understanding

- There are no size limits on the size of **active** heaps
- Heap pad designs are approved solely by NRC
- Process ponds that will never contain wastes are part of the mill
- Process Pond designs are approved solely by NRC
- Heap material only become tailings (11e.(2) byproduct material) once active uranium recovery is complete

Our Understanding (con't)

- Part 61, subpart W applies only to spent heap material (tailings)
- We are practicing *phased disposal* of tailings
- We are allowed no more than two 40 acre cells in area of exposed tailings
- We will have appropriate environmental monitoring and radiation programs in place to ensure compliance with 10 CFR Part 20 subpart B and subpart C requirements

40 CFR Part 61.250 (subpart W)

- (b) Continuous disposal means a method of tailings management and disposal in which tailings are dewatered by mechanical methods immediately after generation. The dried tailings are then placed in trenches or other disposal areas and immediately covered to limit emissions consistent with applicable Federal standards.
- (c) Dewatered means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight.
- (e) Operational means that an impoundment is being used for the ***continued placement of new tailings*** [emphasis added] or is in standby status for such placement. ***An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins*** [emphasis added].
- (f) Phased disposal means a method of tailings management and disposal which uses lined impoundments which are filled and then immediately dried and covered to meet all applicable Federal standards.
- Section 101(8) of the Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. 7911(8).
“Tailings” means the remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted.