OCEANAGOLD

Alternatives Analysis

Haile Mine Expansion Plan

Alternatives Agenda

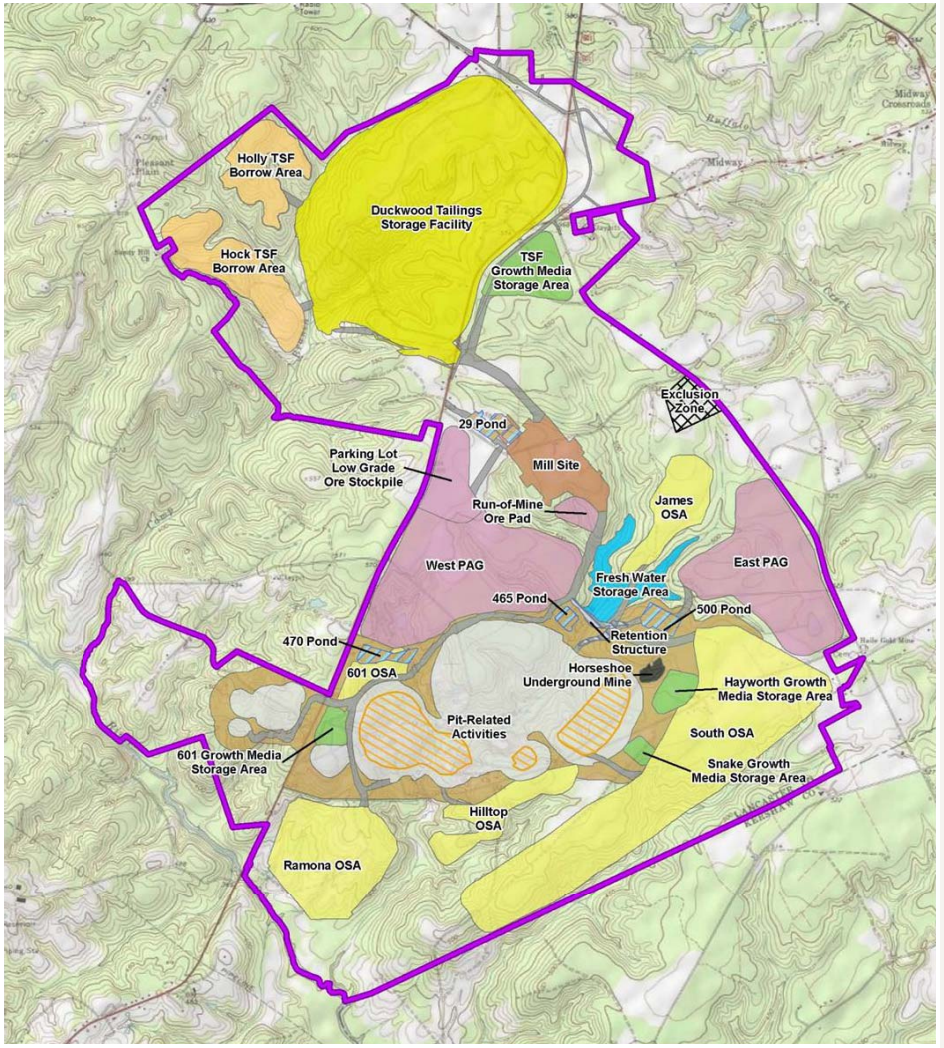
1. Introduction
2. Backfill Plan
3. Tailings Storage Facility (TSF)
4. West PAG Storage
5. East PAG Storage
6. South OSA
7. Fresh Water Storage Area

Introduction

General Geographic Constraints

- State Prison to the West
- Buffalo Creek to the North/East
- County Line to the South/East
- Town of Kershaw to the South/West

Proposed Mine Layout



Introduction

Storage Facilities in Progress in 2019

Potentially Acid Generating (PAG) Facilities

- JPAG PAG
- East PAG Phase 1

Overburden Stockpile Areas (OSAs)

- Ramona
- Hayworth
- James

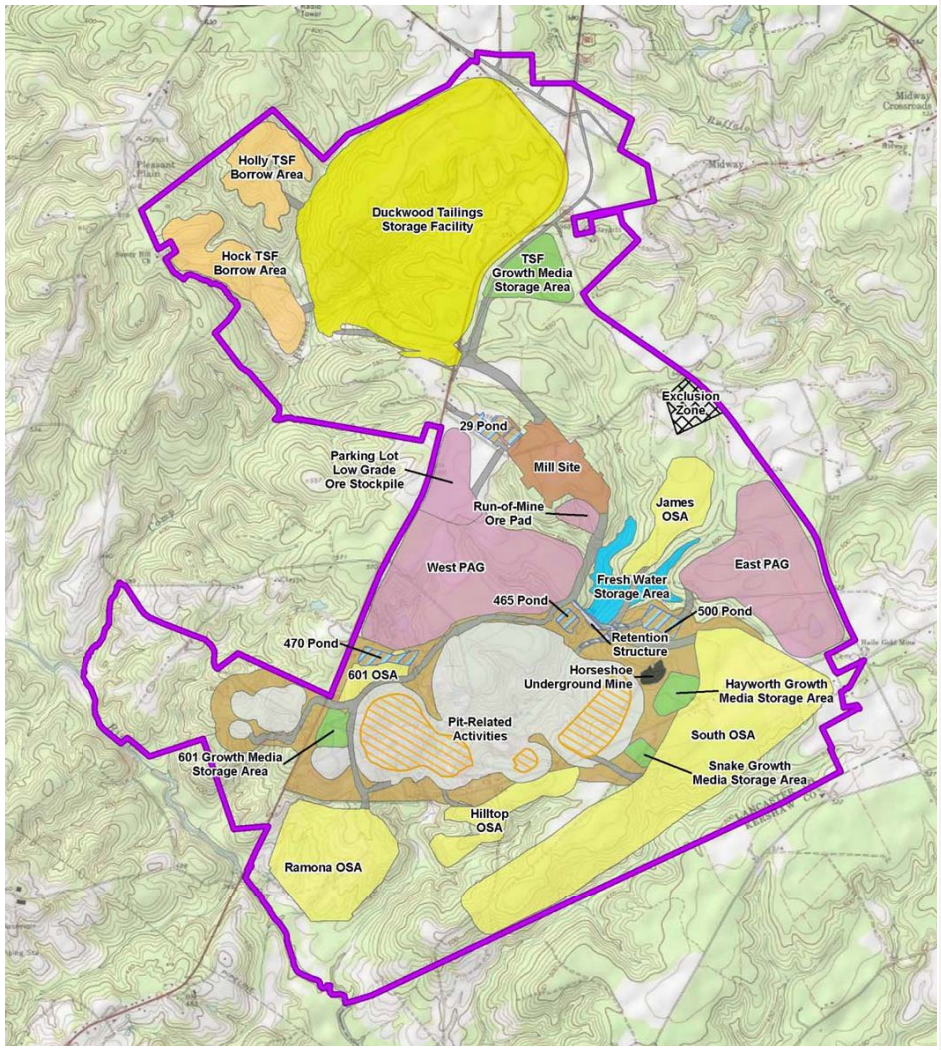
Growth Media Storage Areas (GMSAs)

- 601 GMSA
- TSF GMSA
- Snake GMSA
- Hayworth GMSA

Tailings Storage Facility (TSF)

Freshwater Detention Dam

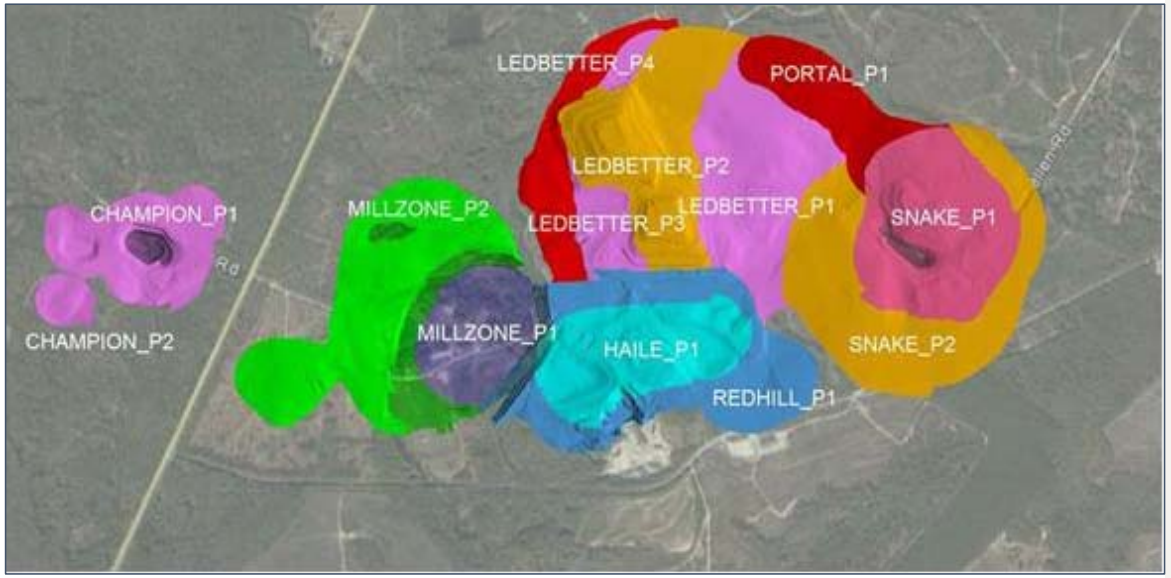
Proposed Mine Layout



Introduction

Pit Expansion Plan and Backfill Opportunities

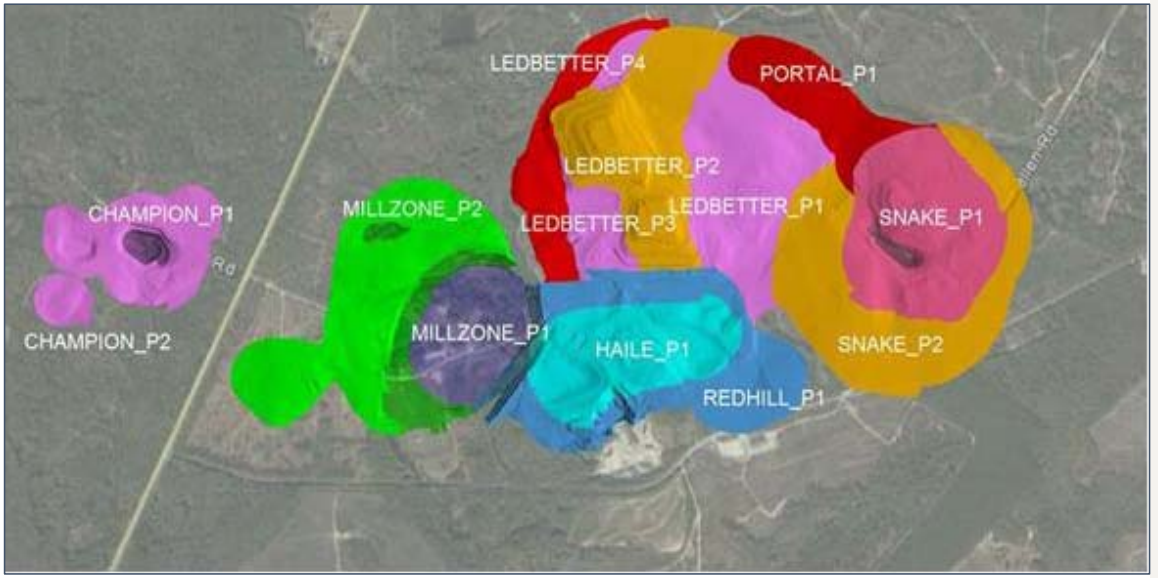
- Inter-connect Mill Zone, Haile, Red Hill, Snake, and Ledbetter Pits.
- Pit-related activities (the main source of ore) are expanded and deepened through the end of mine life.
- Limited opportunity for concurrent backfill due to safety concerns.
- Proposed plan will backfill a total of 113.5 M tons in Mill Zone (Phase 1), Haile, Red Hill, and Snake (Phases 1 and 2).



Introduction

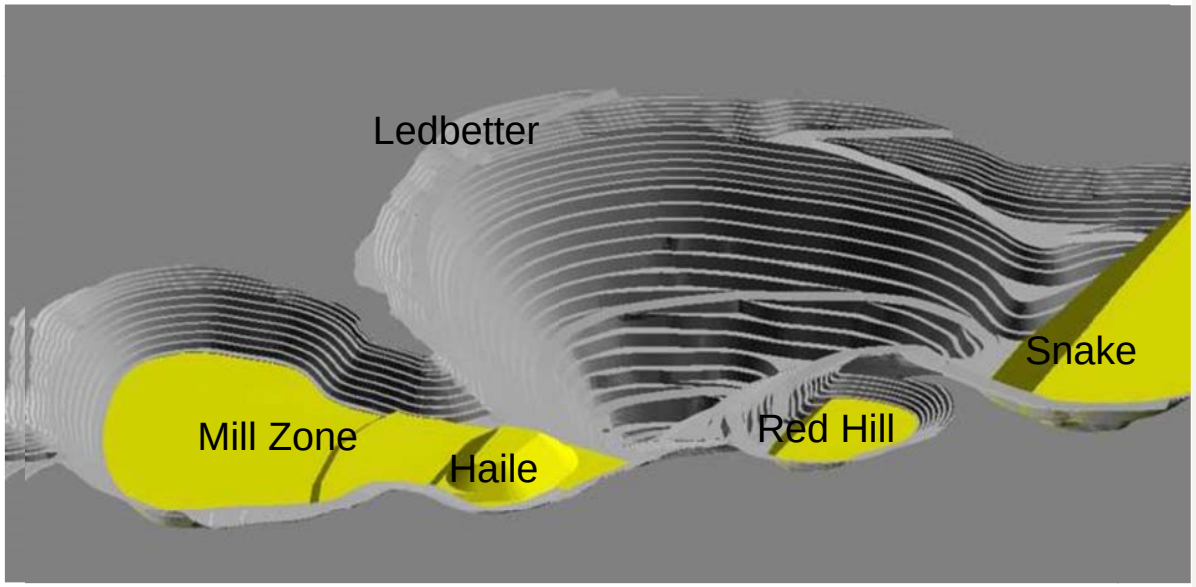
Mine Plan

Mine Plan Sequence	*Start Year*
➢ Mill Zone Pit – Phase 1	*(2016)*
➢ Snake Pit – Phase 1	*(2017)*
➢ Red Hill Pit	*(2018)*
➢ Snake Pit – Phase 2	*(2019)*
➢ Snake Pit - Phase 3 w/ Portal	*(2020)*
➢ Horseshoe U/G	*(2020)*
➢ Haile Pit	*(2021)*
➢ Ledbetter Pit – Phases 1 -3	*(2022)*
➢ Mill Zone Pit – Phase 2	*(2025)*
➢ Ledbetter Pit – Phase 4	*(2027)*
➢ Champion Pit – Phase 1	*(2029)*
➢ Champion Pit – Phase 2	*(2030)*



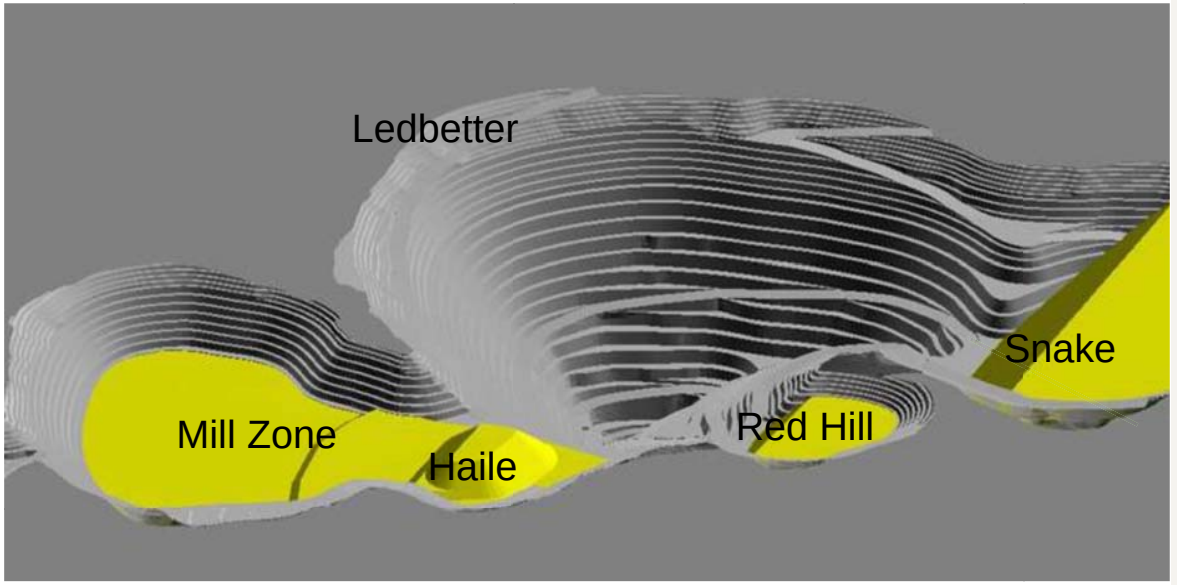
Backfill Elevations

- East Snake and Red Hill Pits will be concurrently backfilled to about 393 ft. amsl (10 ft. below final Ledbetter Reservoir water level of 403 ft. amsl).
- Haile Pit will be concurrently backfilled to about 360 ft. amsl (43 ft. below final Ledbetter Reservoir water level).
- Mill Zone will be concurrently backfilled to about 230 ft. amsl (173 ft. below final Ledbetter Reservoir water level).



Backfilling Constraints

- All Pits will be inundated by Ledbetter Reservoir except Champion (located across HW 601).
- Backfill in Snake, Red Hill, and Mill Zone Pits is tiered along the deeper Ledbetter Pit for safety because Ledbetter will be mined last.
- Haile Pit is backfilled as a knoll because access (along the southern pit rim) to Mill Zone is required late in mine life.
- Further backfill of Mill Zone Pit is not practicable because Mill Zone (Phase 2) is mined late and double-handling costs are prohibitive.



Backfilling Constraints

Pits Not Backfilled Due to Double-Handling Costs

- Ledbetter Pit and Champion Pit are not backfilled at all because they are the last pits to be mined.
- Material is not moved from OSA and/or PAG storage to backfill these pits because double-handling costs are prohibitive – generally in the $.50 to $1.00 per ton range (if not higher).
- At that cost, backfilling the more than 300 M tons of material removed from Ledbetter Pit alone could cost $300,000,000.00 (or more), and would take at least 8 to 10 years of effort after mine operations cease.

Backfilling Constraints

Importance of Pit Lake Inundation

East Snake, Red Hill, and Haile are not backfilled above the ultimate water level in Ledbetter Reservoir because:

- Backfilling them further may continuously entrain and erode the backfill (due to wave lapping) which could:
  - ✓ leave yellow PAG exposed,
  - ✓ result in sloughing of the backfill, and/or
  - ✓ undermine the water column density (and thereby undermine lake stratification).
- Having the shallow lake lobes over East Snake, Red Hill, and Haile helps to:
  - ✓ dissipate kinetic energy caused by wind, and
  - ✓ heat the surface of the lake faster to encourage and maintain stratification,

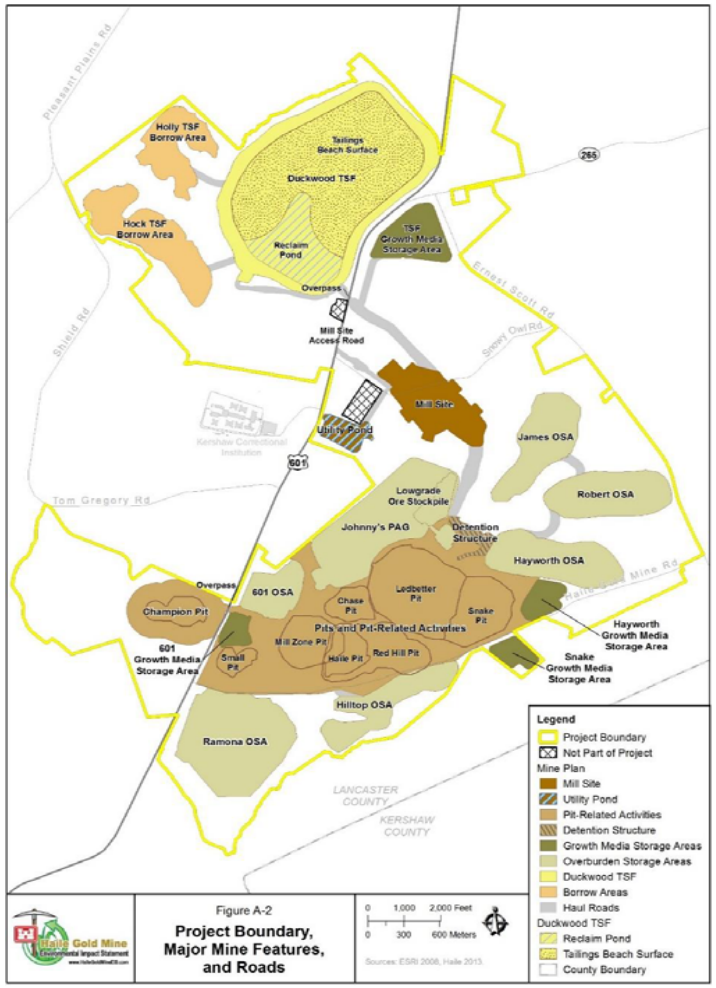
which encourage stratification of Ledbetter Reservoir.

Objectives for Assessing Aboveground Storage

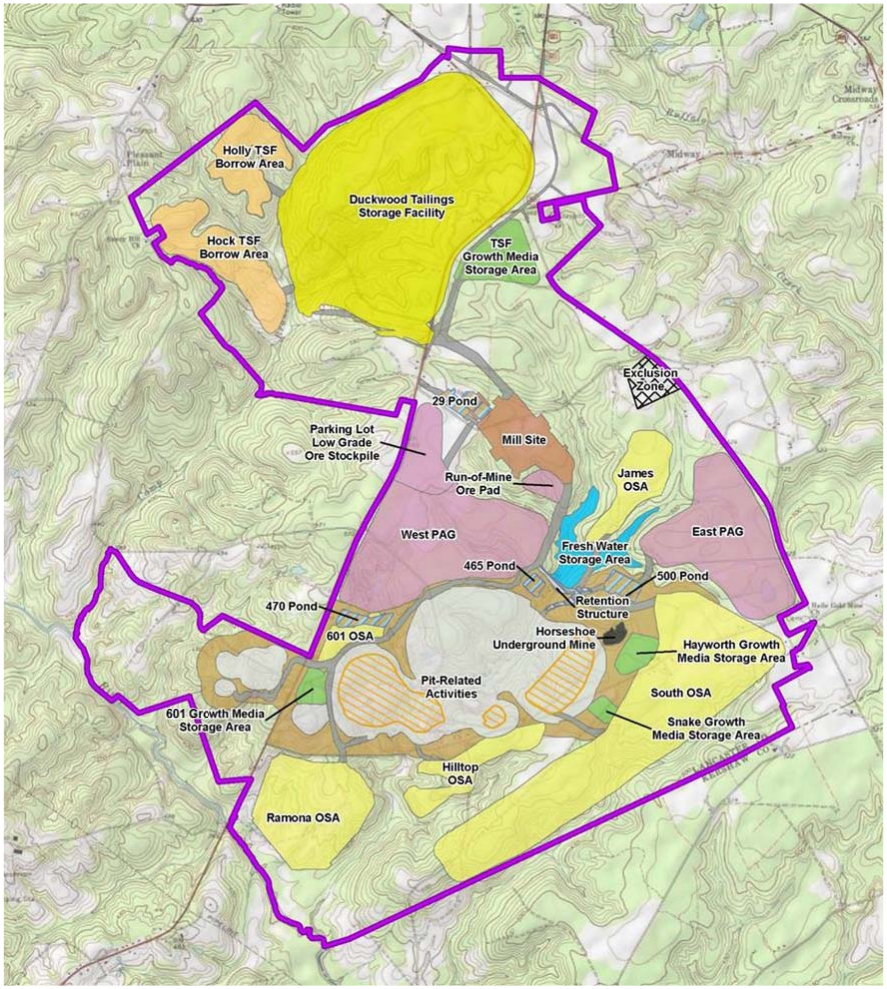
- Keep new facilities in close proximity to existing mine operations
- Maximize existing facility footprints to minimize new disturbances
- Minimize wetland and stream disturbances
- Avoid disturbance to new drainage districts
- Minimize total surface disturbance
- Minimize property acquisitions
- Minimize hauling distances
- Minimize construction and operating/maintenance cost

Overview of Changes to Aboveground Storage

Currently Approved



Proposed Mine Layout



Design Criteria

- Tailings Storage Facility (TSF)
  - *Increase capacity from 40.0 M tons to 72.0 M tons*
  - *Allow space for Reclaim Pond*
- Potentially Acid Generating (PAG) Overburden Storage Area
  - *Incorporate use of Backfilling into Pits*
  - *Increase above ground storage from 46.0 M tons to 150.1 M tons*
- Green Overburden Storage Area (OSA)
  - *Use Green Material for TSF lifts*
  - *Increase above ground OSA storage from 132.0 M tons to 207.0 M tons*
  - *Minimize disturbance in Holly and Hock Borrow Areas*
- Fresh Water Storage Options
  - *Protect open pits against flooding from run-off during extreme weather*
  - *Accommodate operational make-up water needs*

Total Overburden Storage Requirement

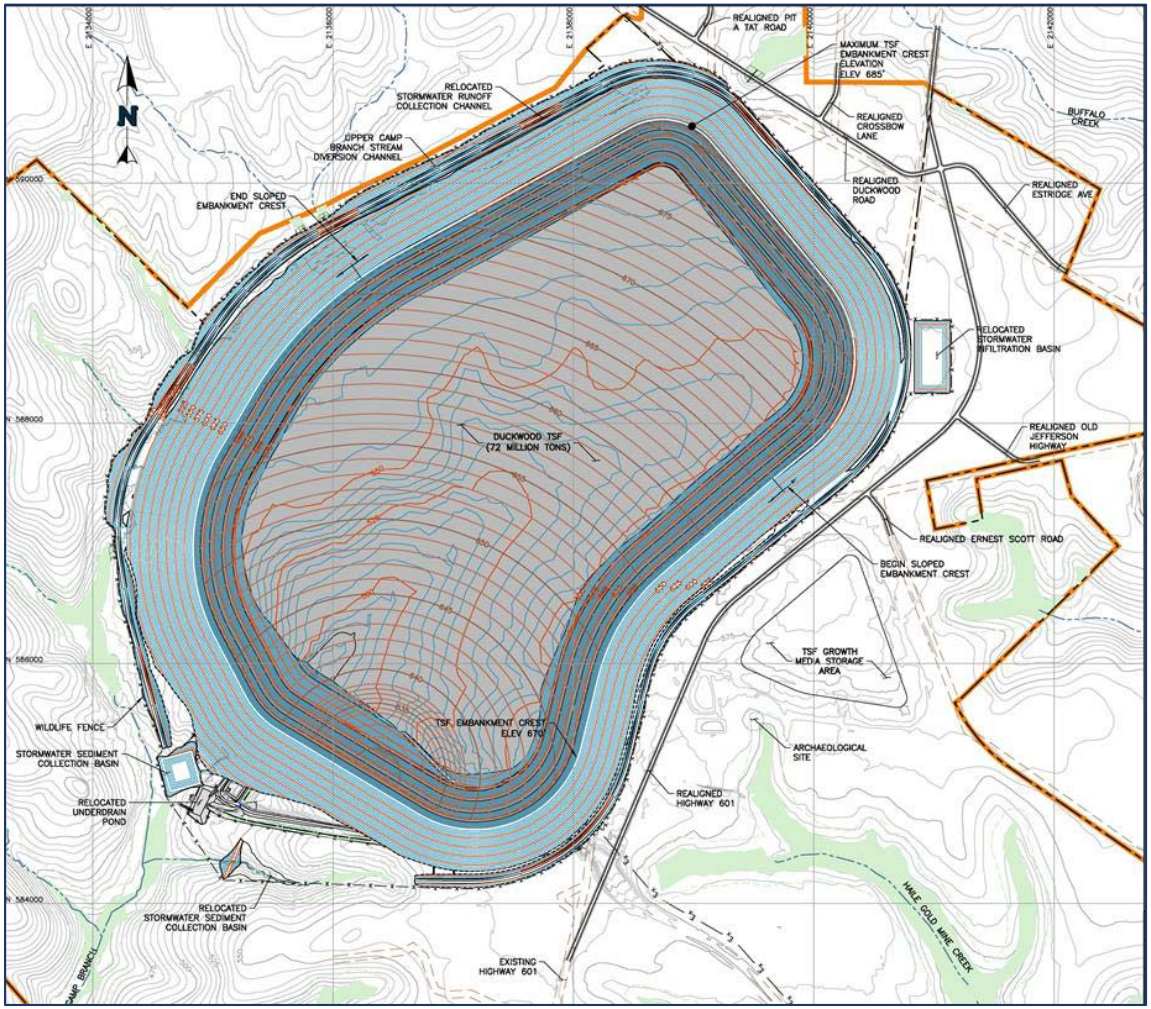
Overburden Allocation	Classification	Planned (M tons)	(%)
Backfilled In-Pit	Yellow / Green	113.5	21.5
Tailings Storage Facility Construction	Green	56.6	10.7
Overburden Storage Areas	Green	207.0	39.3
PAG Storage	Yellow / Red	150.1	28.5
Total Overburden Material		527.2	100.0

Tailings Storage Facility (TSF)

TSF Assessment Criteria

1. Increase tailings capacity from 40 M to 72 M tons
2. Minimize wetland and stream disturbance
3. Avoid disturbance to additional drainage districts
4. Minimize total land disturbance
5. Minimize pumping distance and pipeline impacts
6. Minimize visual impacts
7. Maintain minimum 100’ setback from roads and properties
8. Minimize impacts on utilities and other public infrastructure
9. Minimize property acquisitions
10. Minimize hauling distance for lift construction
11. Minimize operating and maintenance cost
12. Minimize capital cost for construction

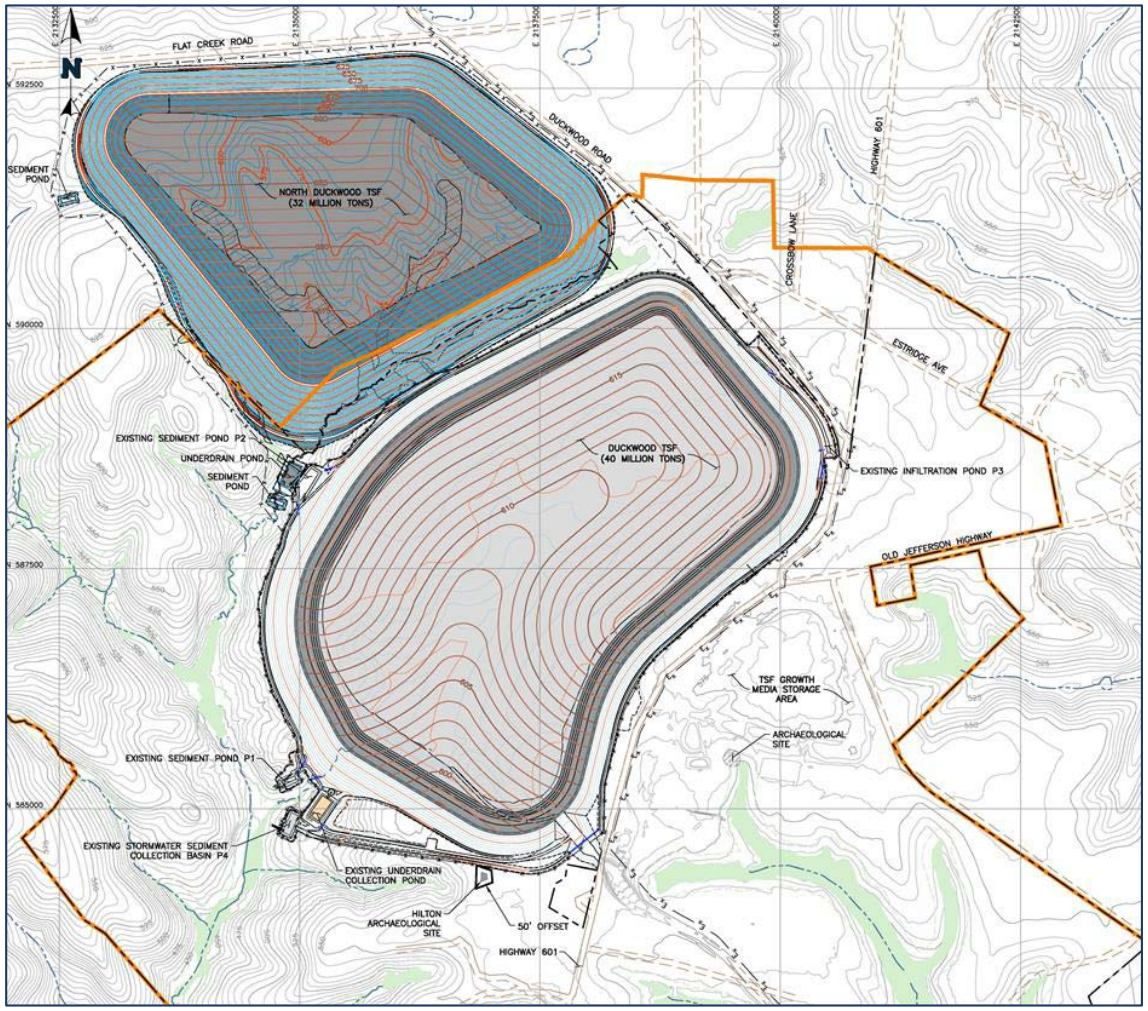
TSF Alternative #1 *(Preferred)*



Features	Existing Permit	Alt #1 Design
Total Disturbance	479 acres	632 acres
Tailings Capacity	40 M tons	72 M tons
Final Elevation	630 ft. amsl	670 ft. amsl
Distance to Plant	1.1 miles	1.1 Miles
Additional Wetlands Disturbance		13.2 acres
Additional Stream Disturbance		6,643 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

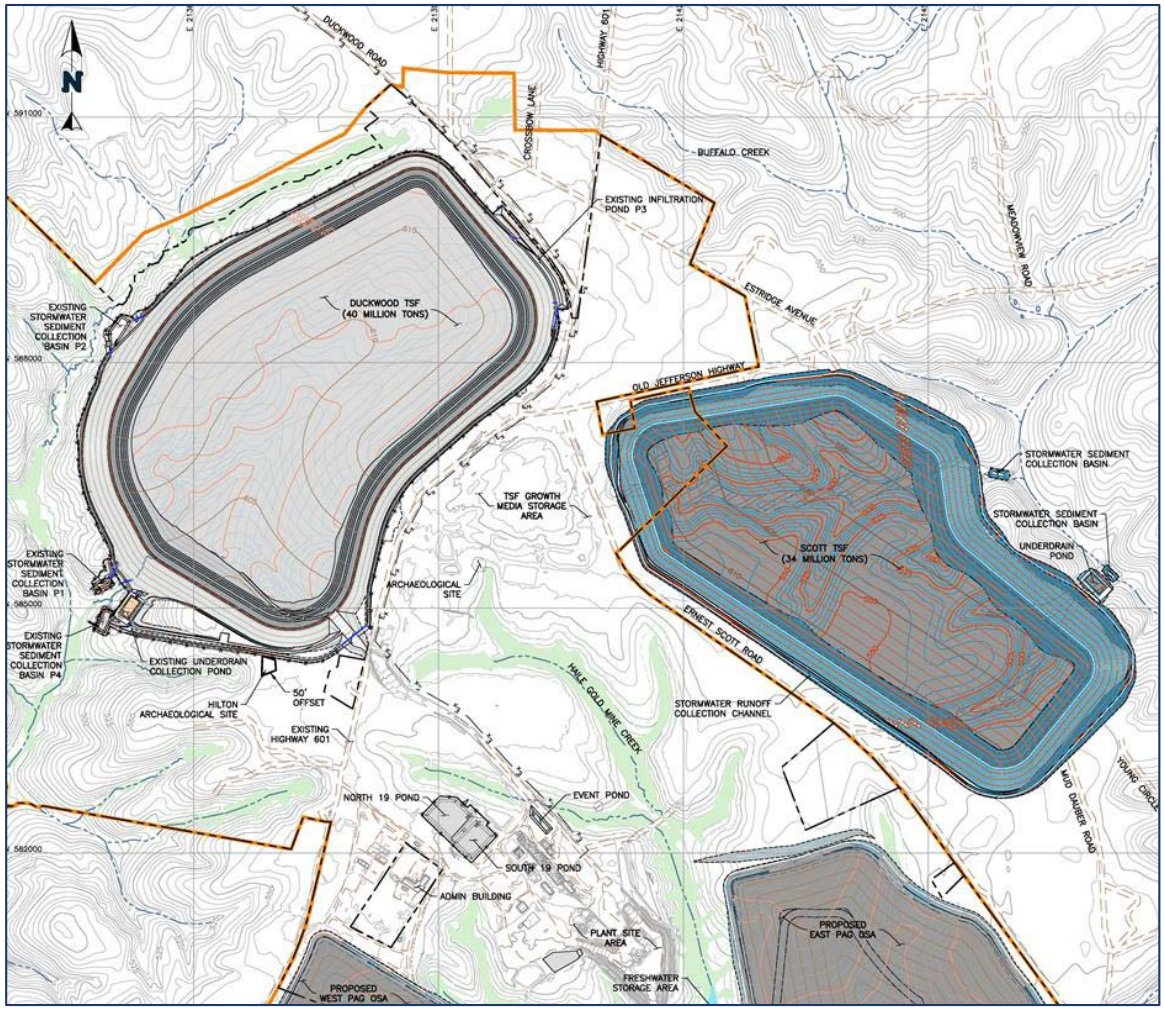
TSF Alternative #2



Features	Existing Permit	Alt #2 Design
Total Disturbance	479 acres	839 acres
Tailings Capacity	40 M tons	72 M tons
Final Elevation	630 ft. amsl	700 ft. amsl
Distance to Plant	1.1 miles	2.1 Miles
Wetlands Disturbance		30.4 acres
Stream Disturbance		7,875 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

TSF Alternative #3



Features	Existing Permit	Alt 3# Design
Total Disturbance	479 acres	899 acres
Tailings Capacity	40 M tons	74 M tons
Crest Elevation	630 ft.	630 ft.
Distance to Plant	1.1 miles	1.1 Miles
Wetlands Disturbance		38.4 acres
Stream Disturbance		8,512 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

TSF Summary Table

Alternative	Total Disturbance (acres)	Tailings Basin Area (acres)	Tailings Capacity (M tons)	Approx. Reclaim Pond/ Stormwater Storage (M gal)	Additional Wetland Disturbance (acres)	Additional Stream Disturbance (ft)	Distance from Plant (miles)	Construction Cost ($ M)
Current	479	283	40.0	1,100			1.1	
Alt 1 (Preferred)	153	301	32.0	1,100	13.2	6,643	1.1	$60.0
Alt 1 Total	632	301	72.0	1,100	13.2	6,643	1.1	
Alt 2	360	143	32.0	839	30.4	7,875	2.1	$165.1
Alt 2 Total	839	426	72.0	1,939	30.4	7,875	2.1	
Alt 3	420	228	34.0	859	38.4	8,512	1.1	$141.7
Alt 3 Total	899	511	74.0	1,959	38.4	8,512	1.1	

TSF Summary

TSF Selection – Advantages of Preferred Alternative (#1)

1. Meets tailings capacity increase requirement from 40 M tons to 72 M tons
2. Minimizes wetlands disturbance
   - *17.2 acres less than Alt #2*
   - *25.2 acres less than Alt #3*
3. Minimizes stream disturbance
   - *1,232 feet less than Alt #2*
   - *1,869 feet less than Alt #3*
4. Minimizes total land disturbance surface area
   - *207 acres less than Alt #2*
   - *267 acres less than Alt #3*

TSF Summary

TSF Selection – Advantages of Preferred Alternative (#1)

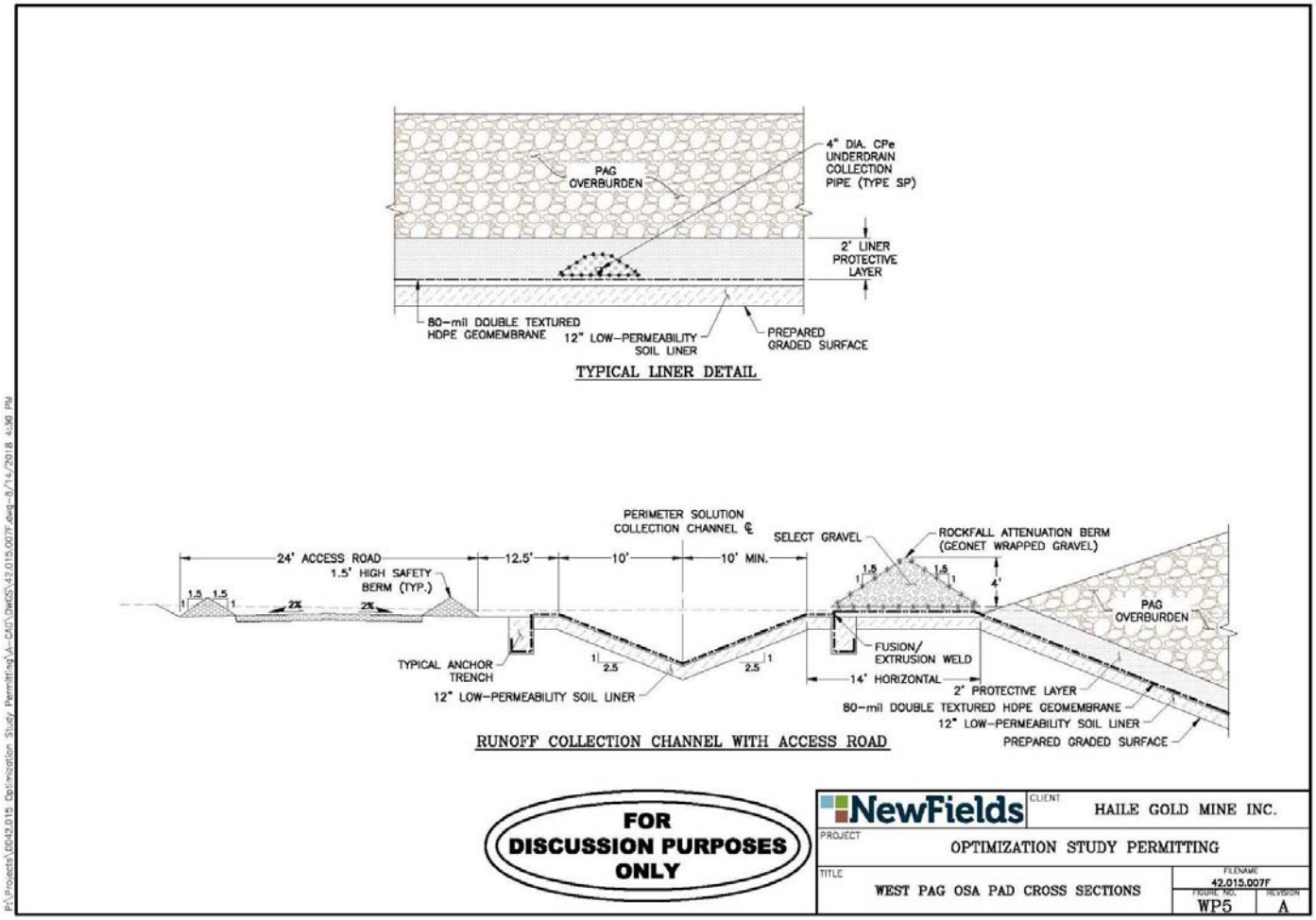
5. Avoids disturbance to additional drainage districts
   - *Alt #3 impacts Buffalo Creek*
6. Minimizes property acquisitions
   - *Approximately 35 acres of additional land required that is obtainable*
7. Minimizes hauling distance and uses existing haul roads
8. Minimizes tailings delivery pipeline length and uses existing corridor
9. Reduces capital costs
   - *$105 M less than Alt #2*
   - *$80 M less than Alt #3*

West PAG Overburden Storage Area

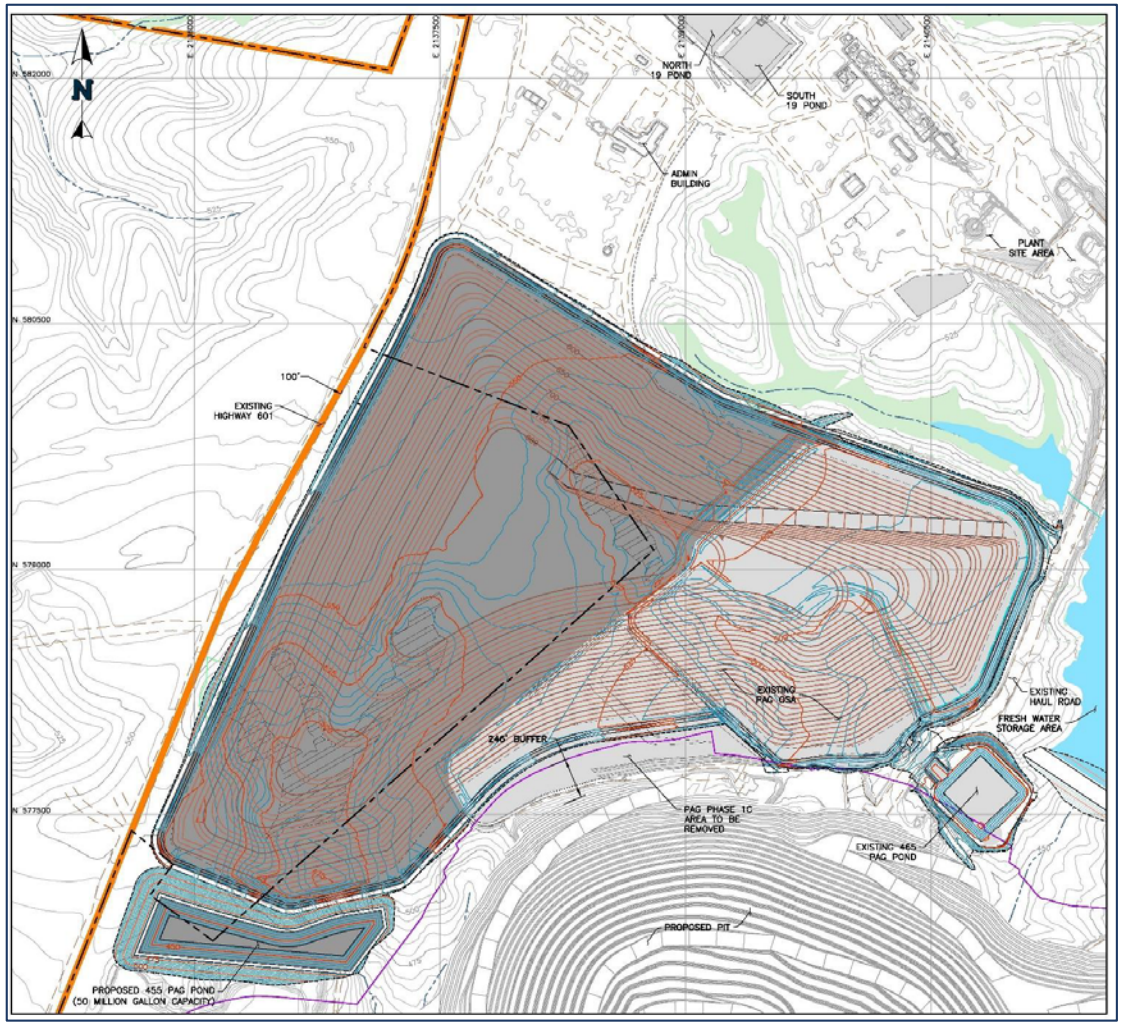
West PAG Assessment Criteria

1. Maximize storage considering constraints from existing infrastructure
2. Incorporate JPAG and Parking Lot Low-Grade Stockpile into design
3. Minimize wetland and stream disturbance
4. Avoid disturbance to additional drainage districts
5. Minimize total surface disturbance
6. Minimize hauling distance
7. Minimize visual impacts
8. Maintain minimum 100’ setback from roads and properties
9. Allow placement of closure cap
10. Minimize operating and maintenance cost
11. Minimize capital cost for construction

West PAG Overburden Storage Area



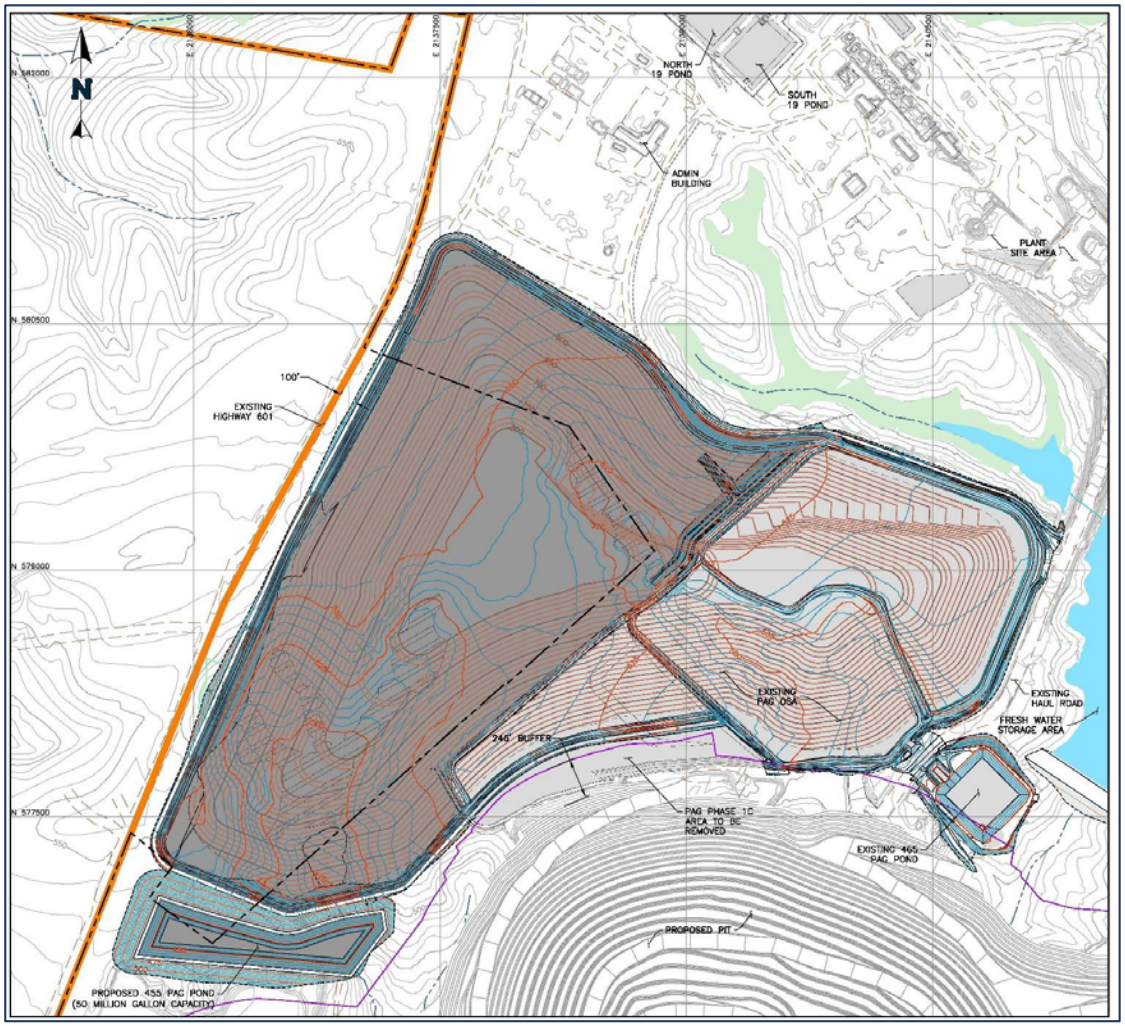
West PAG Alternative #1



Features	
Total Disturbance	209 acres
Capacity	102.2 M tons
Final Elevation	800 ft. amsl
Construction Cost	$36.6 M
Wetland Disturbance	17.2 acres
Stream Disturbance	95.9 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

West PAG Alternative #2

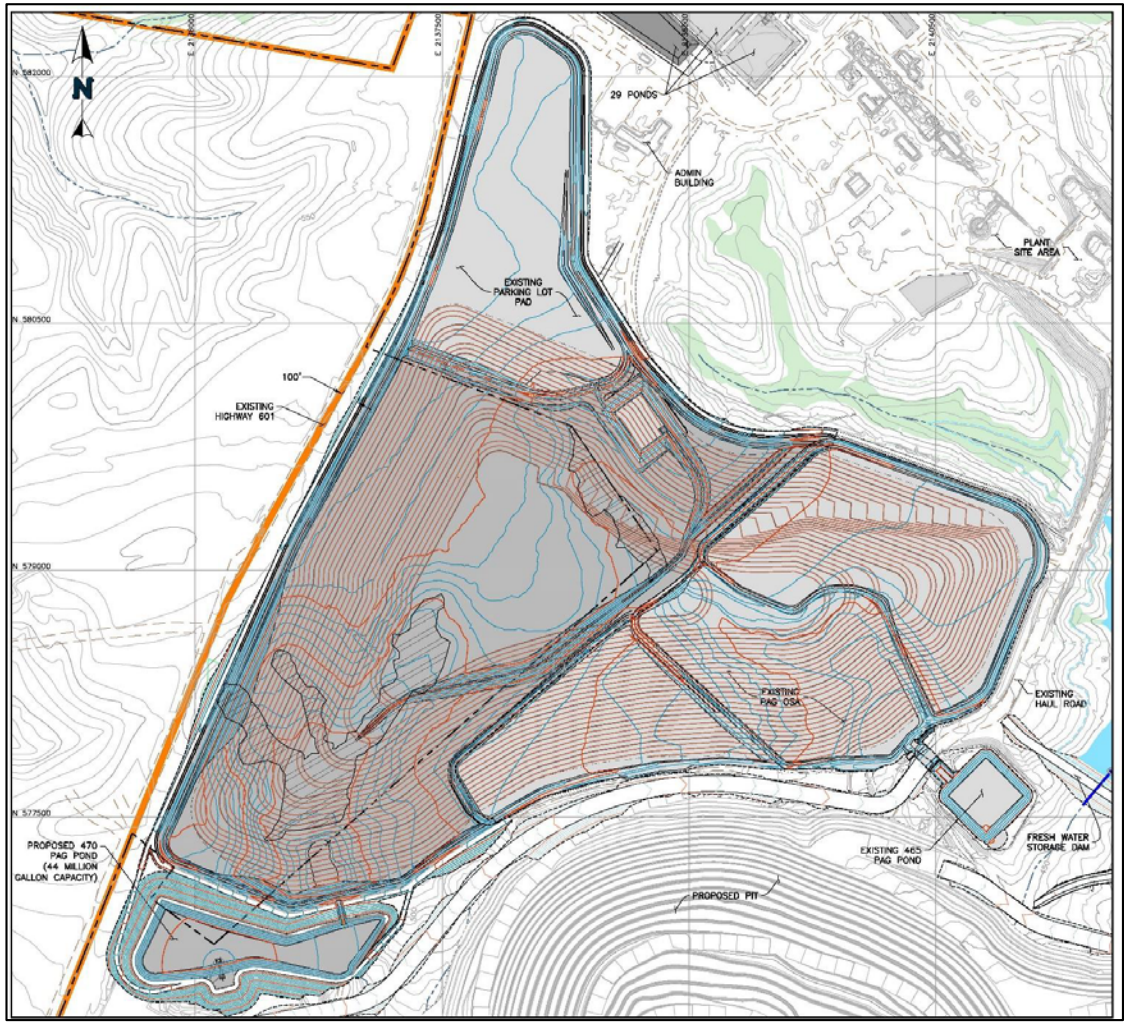


Features	
Total Disturbance	199 acres
Capacity	98.4 M tons
Final Elevation	800 ft. amsl
Construction Cost	$35.8 M
Wetland Disturbance	16.7 acres
Stream Disturbance	95.9 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

West PAG Alternative #3

(Preferred)



Features	
Total Disturbance	224 acres
Capacity	95.8 M tons
Final Elevation	800 ft. amsl
Construction Cost	$45.0 M
Wetland Disturbance	16.7 acres
Stream Disturbance	95.9 ft.

Note: Elevation on US Highway 601 at base of 601 Overpass = 577 ft. amsl

West PAG Summary Table

Alternative	Total Disturbance (acres)	Geo-membrane Lined Area (acres)	PAG Capacity (M tons)	Approx. Reclaim Pond/ Stormwater Storage (M gallons)	Additional Wetland Disturbance (acres)	Additional Stream Disturbance (ft.)	Final Elevation (ft. amsl)	Construction Cost (M USD)
Alt 1	209	218	102.2	50	17.2	95.9	800	$36.6
Alt 2	199	197	98.4	50	16.7	95.9	800	$35.8
Alt 3 (Preferred)	224	209	95.8	50	16.7	95.9	800	$45.0

West PAG Summary

WEST PAG Selection – Advantages of Preferred Alternative (#3)

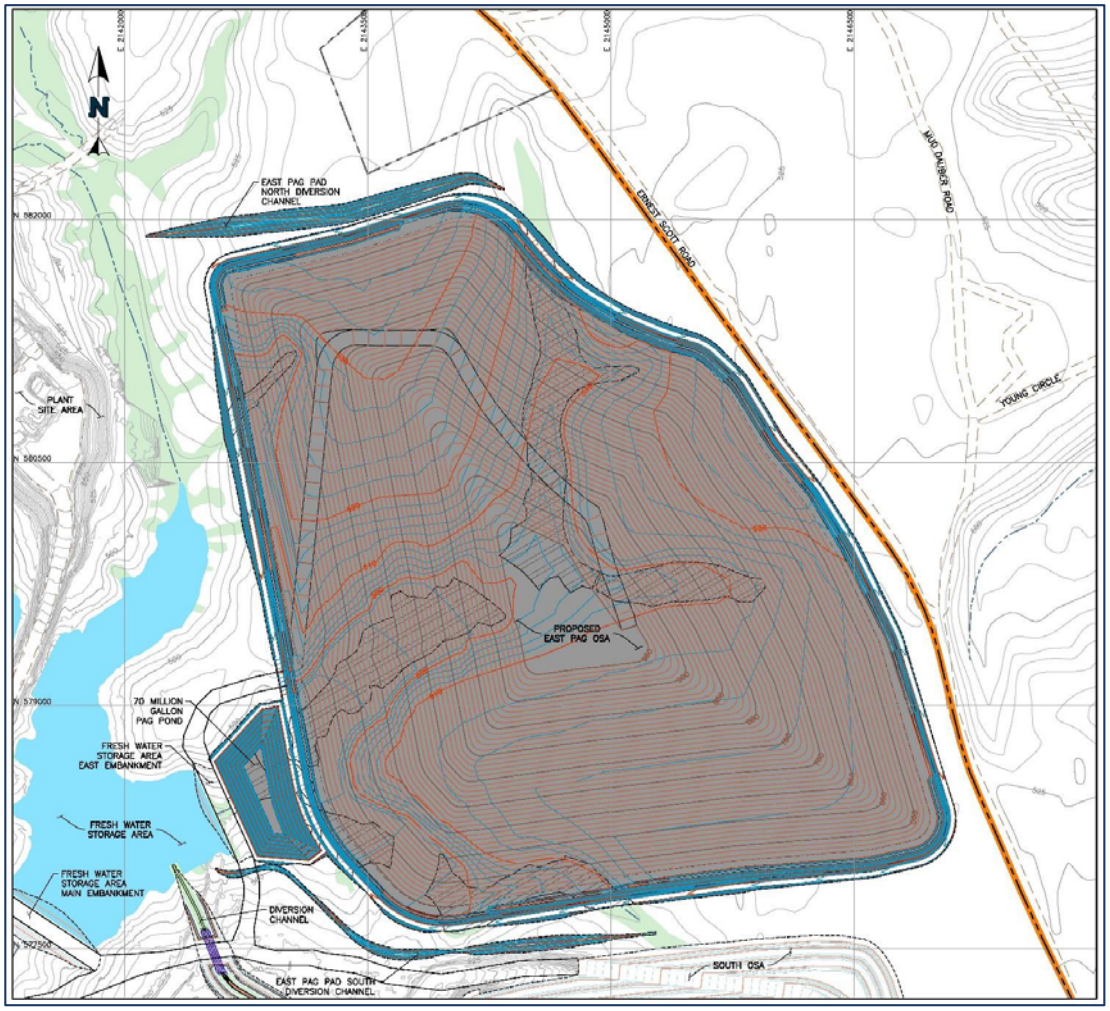
1. Increases planned PAG storage from 46 M tons to 95.8 M tons
2. Incorporates JPAG and Parking Lot Low-Grade Stockpile
3. Minimizes wetland disturbance
   - *Reduces wetland disturbance by 0.5 acres vs. Alt #1*
4. Maintains minimum setback
   - *100 feet from US 601 and adjacent properties*
   - *250 feet minimum from ultimate pits*
5. Meets all other criteria

East PAG Overburden Storage Area

East PAG Assessment Criteria

1. Increase above ground PAG storage by 54.3 M tons
2. Minimize wetland and stream disturbance
3. Avoid disturbance to additional drainage districts
4. Minimize total surface disturbance
5. Minimize hauling distance
6. Minimize property acquisitions
7. Minimize visual impacts
8. Maintain minimum 100’ setback from roads and properties
9. Allow placement of saprolite closure cap
10. Minimize operating and maintenance cost
11. Minimize capital cost for construction

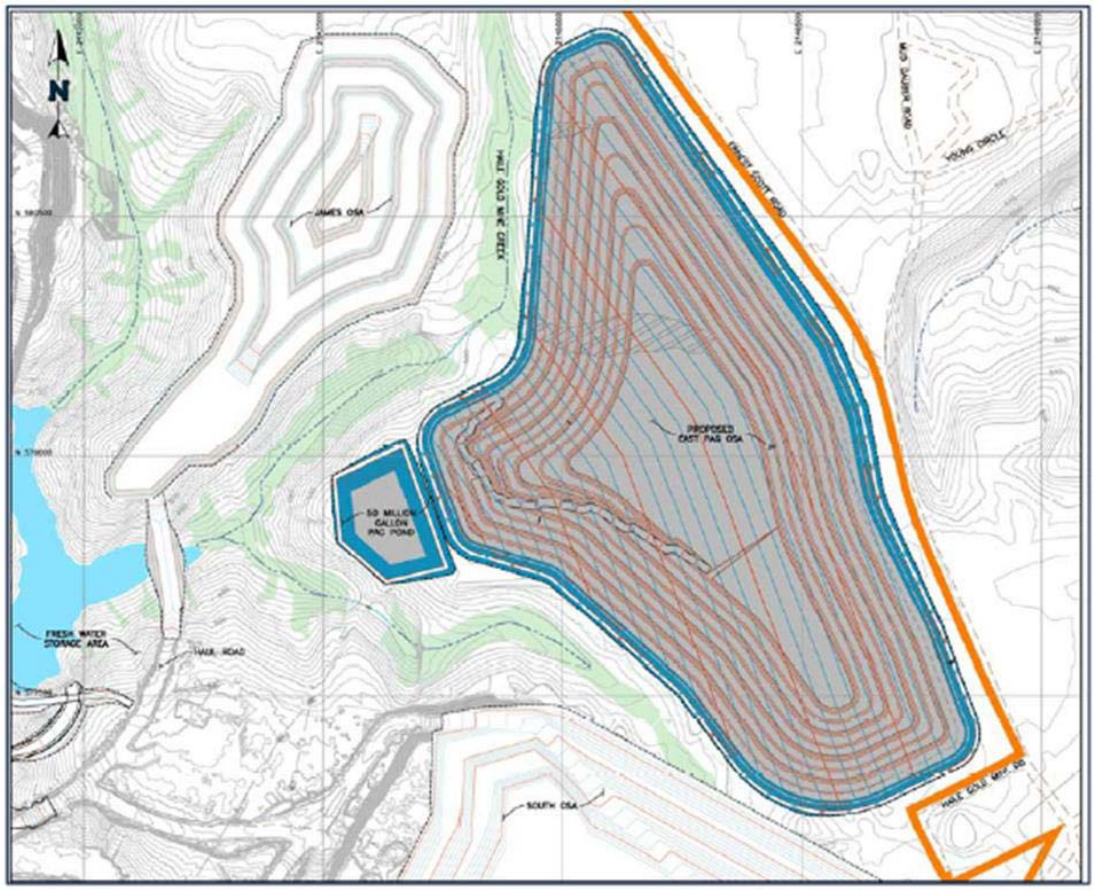
East PAG Alternative #1



Features	
Total Disturbance	355 acres
Capacity	167.0 M tons
Final Elevation	900 ft. amsl
Construction Cost	$57.4 M
Wetland Disturbance	42.3 acres
Stream Disturbance	5,431 ft.

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

East PAG Alternative #2

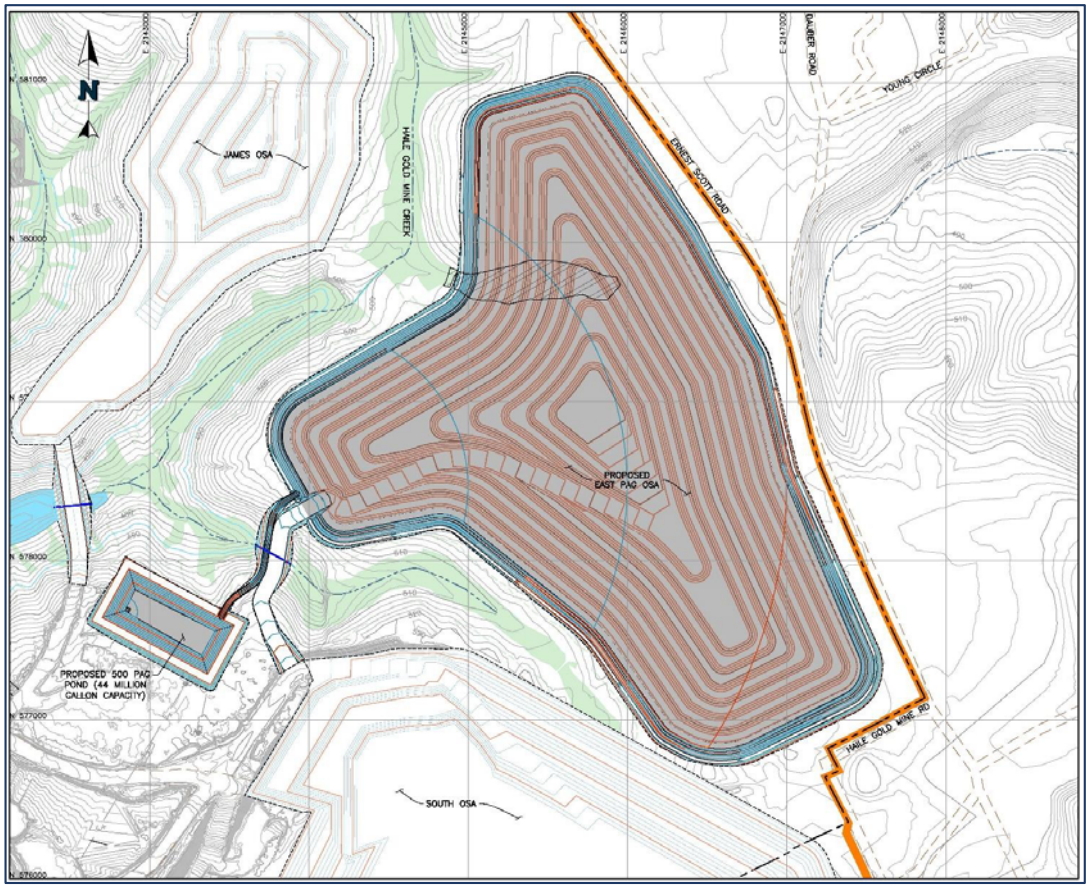


Features	
Total Disturbance	217 acres
Capacity	54.8 M tons
Final Elevation	700 ft. amsl
Construction Cost	$40 M
Wetland Disturbance	6.0 acres
Stream Disturbance	0 ft.

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

East PAG Alternative #3

(Preferred)



Features	
Total Disturbance	213.7 acres
Capacity	54.3 M tons
Top Elevation	800 ft.
Construction Cost	$30.0 M
Wetland Disturbance	4.7 acres
Stream Disturbance	0 ft.

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

East PAG Summary Table

Alternative	Total Disturbance (acres)	Geo-membrane Lined Area (acres)	Total PAG Capacity (M tons)	Approx. Reclaim Pond/ Stormwater Storage (M gallons)	Additional Wetland Disturbance (acres)	Additional Stream Disturbance (ft.)	Final Elevation (ft. amsl)	Construction Cost (M USD)
Alt 1	355	333	167.0	70	42.3	5,431	900	$57.4
Alt 2	217	198	54.8	50	6.0	0	700	$40.0
Alt 3 *Preferred*	214	145	54.3	44	4.7	0	800	$30.0

East PAG Summary

East PAG Selection – Advantages of Preferred Alternative (#3)

1. Increases planned PAG storage by at least 54.3 million tons
2. Minimizes wetland disturbance
   - *Reduces disturbance by 37.6 acres vs. Alt #1*
   - *Reduces disturbance by 1.3 acres vs. Alt #2*
3. Minimizes stream disturbance
   - *Reduces disturbance by 5,431 ft. vs. Alt #1*
4. Avoids disturbance to additional drainage districts
5. Avoids additional land acquisitions

East PAG Summary

East PAG Selection – Advantages of Preferred Alternative (#3)

6. Maintains minimum setback
   - *100 feet from Earnest Scott Road and adjacent properties*
   - *250 feet from ultimate pits*
7. Minimizes pipeline length and uses existing corridor to 29 Pond
8. Reduces capital costs
   - *Reduces costs by $27.4M vs Alt #1*
   - *Reduces costs by $10M vs Alt #2*
9. Meets all other criteria

Total PAG Summary

Location	Planned (M tons)	(%)
Backfilled In-Pit*	100.4	40.1
East PAG	54.3	21.7
West PAG	95.8	38.2
Total PAG Material	250.5	100.0

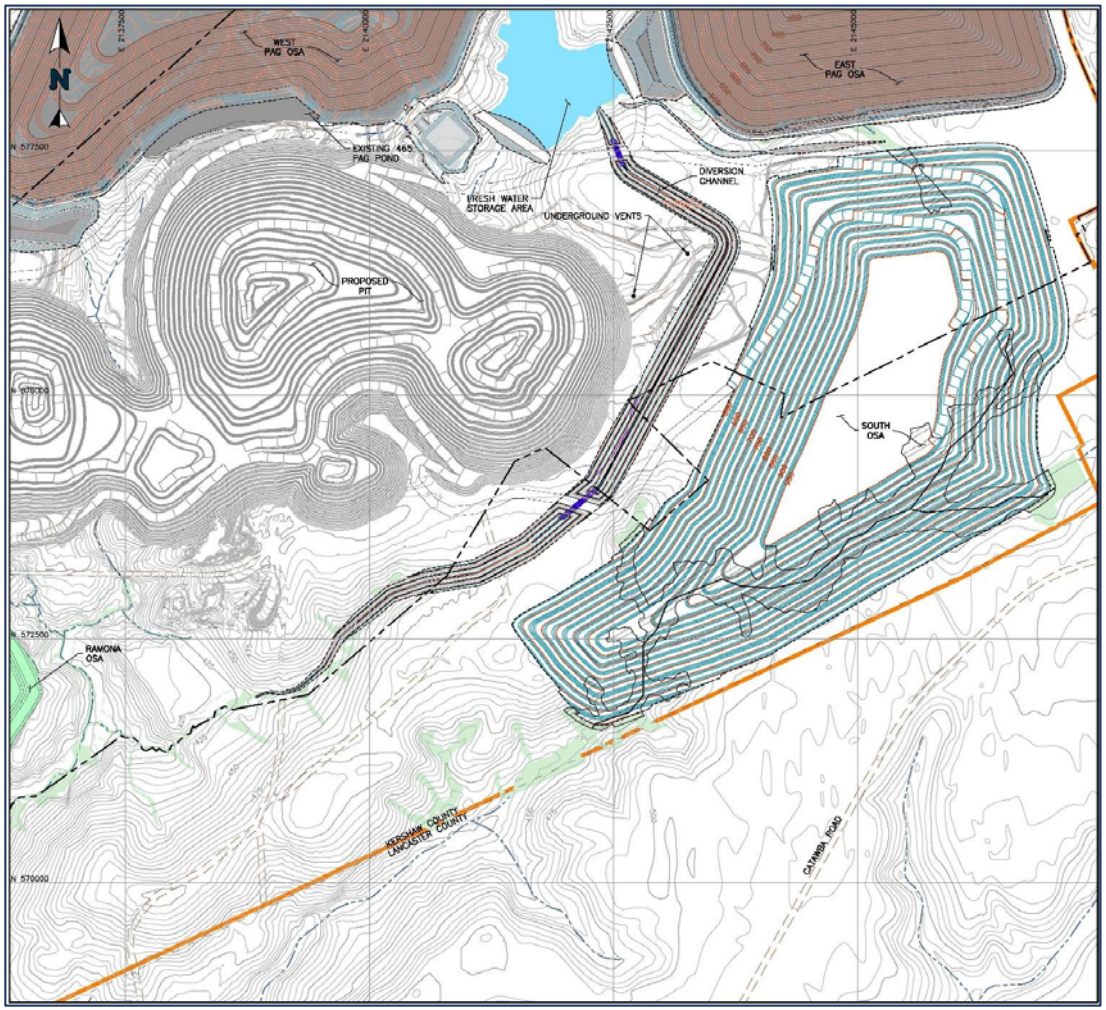
*Capacity limited by timing of mining.

South Overburden Storage Area

South OSA Assessment Criteria

1. Increase above ground storage capacity to 207 M tons *(excluding TSF)*
2. Maximize existing OSA facilities as practicable –
   - *James – 14.7 M tons*
   - *Ramona – 39.9 M tons*
3. Minimize wetland and stream disturbance
4. Minimize total surface disturbance
5. Minimize hauling distance
6. Maintain minimum 100’ setback from Lancaster / Kershaw County Line
7. Minimize visual impacts
8. Minimize property acquisition
9. Minimize operating and maintenance cost
10. Minimize capital cost for construction

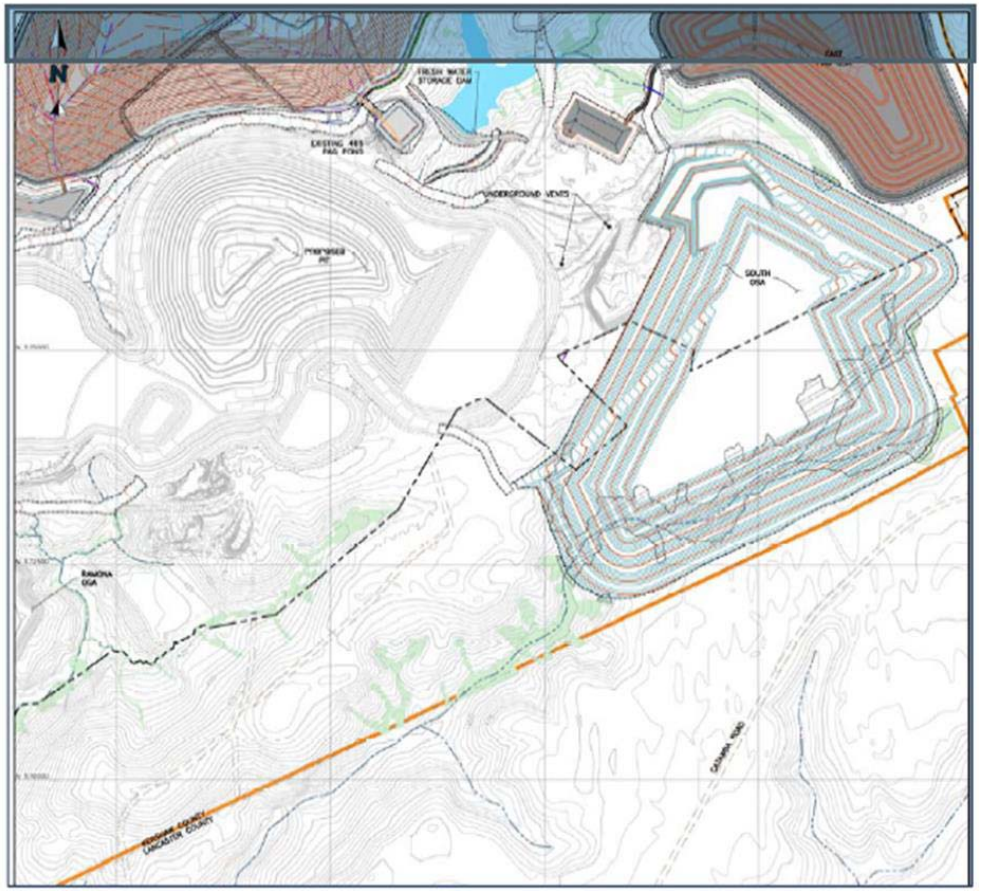
South OSA Alternative #1



Features	
Total Disturbance	395 acres
Capacity	287 M tons
Final Elevation	950 ft. amsl
Construction Cost	$6.5 M
Wetland Disturbance	70.9 acres
Stream Disturbance	8,952 ft

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

South OSA Alternative #2

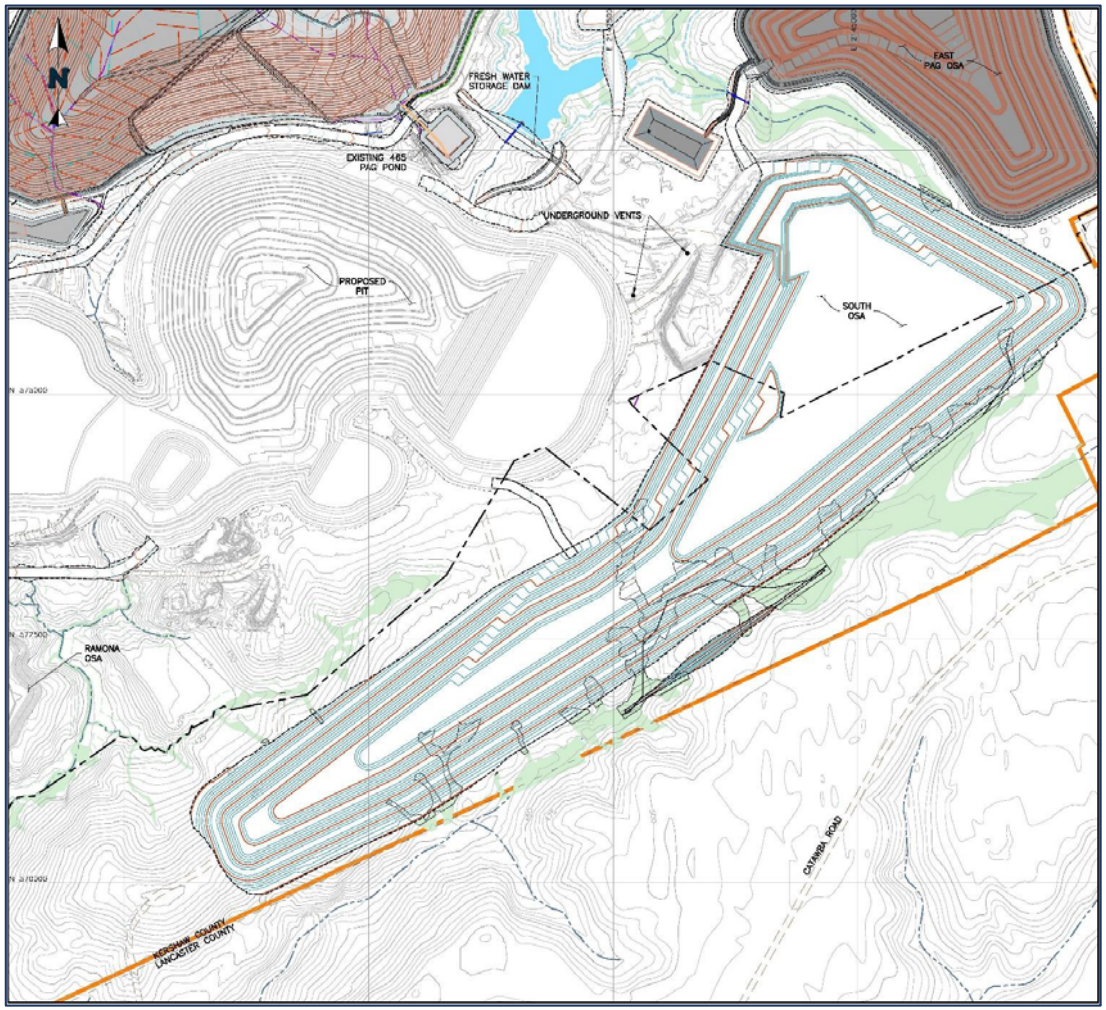


Features	
Total Disturbance	375 acres
Capacity	166 M tons
Final Elevation	820 ft. amsl
Construction Cost	$6.0 M
Wetland Disturbance	65.0 acres
Stream Disturbance	7,940 ft.

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

South OSA Alternative #3

(Preferred)



Features	
Total Disturbance	452 acres
Capacity	152.4 M tons
Top Elevation	750 ft. amsl
Construction Cost	$7.2 M
Wetland Disturbance	45.7 acres
Stream Disturbance	4,037 ft

Note: Elevation on Ernest Scott Road at Haile Gold Mine Church = 525 ft. amsl

South OSA Summary Table

Alternative	Total Disturbance (acres)	Storage Capacity (M tons)	Additional Wetland Disturbance (acres)	Additional Stream Disturbance (ft.)	Maximum Elevation (ft.)	Construction Cost (M USD)
Alt 1	395	287	70.9	8,952	950	$6.5
Alt 2	375	166	65.0	7,940	820	$6.0
Alt 3 *Preferred*	452	152.4	45.7	4,037	750	$7.2

South OSA Summary

South OSA Selection – Advantages of Preferred Alternative (#3)

1. Increases Green storage by at least 152.4 M tons
   - *Incorporates Hayworth and Replaces Hilltop OSAs*
2. Minimizes wetland and stream disturbance by allowing for design of minimally impactful East PAG
3. Minimizes wetland disturbance
   - *Reduces disturbance by 25.2 acres vs. Alt #1*
   - *Reduces disturbance by 19.3 acres vs. Alt #2*
4. Minimizes stream disturbance
   - *Reduces disturbance by 4,915 l.f. vs. Alt #1*
   - *Reduces disturbance by 3,903 l.f. vs. Alt #2*

South OSA Summary

South OSA Selection – Advantages of Preferred Alternative (#3)

5. Minimizes visual impact
   - *Reduces elevation by 200 feet vs. Alt #1*
   - *Reduces elevation by 70 feet vs. Alt #2*
6. Minimizes additional land acquisitions
7. Maintains minimum setback
   - *100 feet from Lancaster / Kershaw County Line*
   - *250 feet minimum from ultimate pits*

Total Green OSA Summary

Location	Planned (M tons)	(%)
South OSA	152.4	55.1
James OSA	14.7	5.3
Ramona OSA	39.9	14.4
Total Above Ground Storage	207.0	74.8
Backfilled In-Pit *	13.1	4.7
Tailings Storage Facility Construction	56.6	20.5
Total Green Material	276.7	100.0

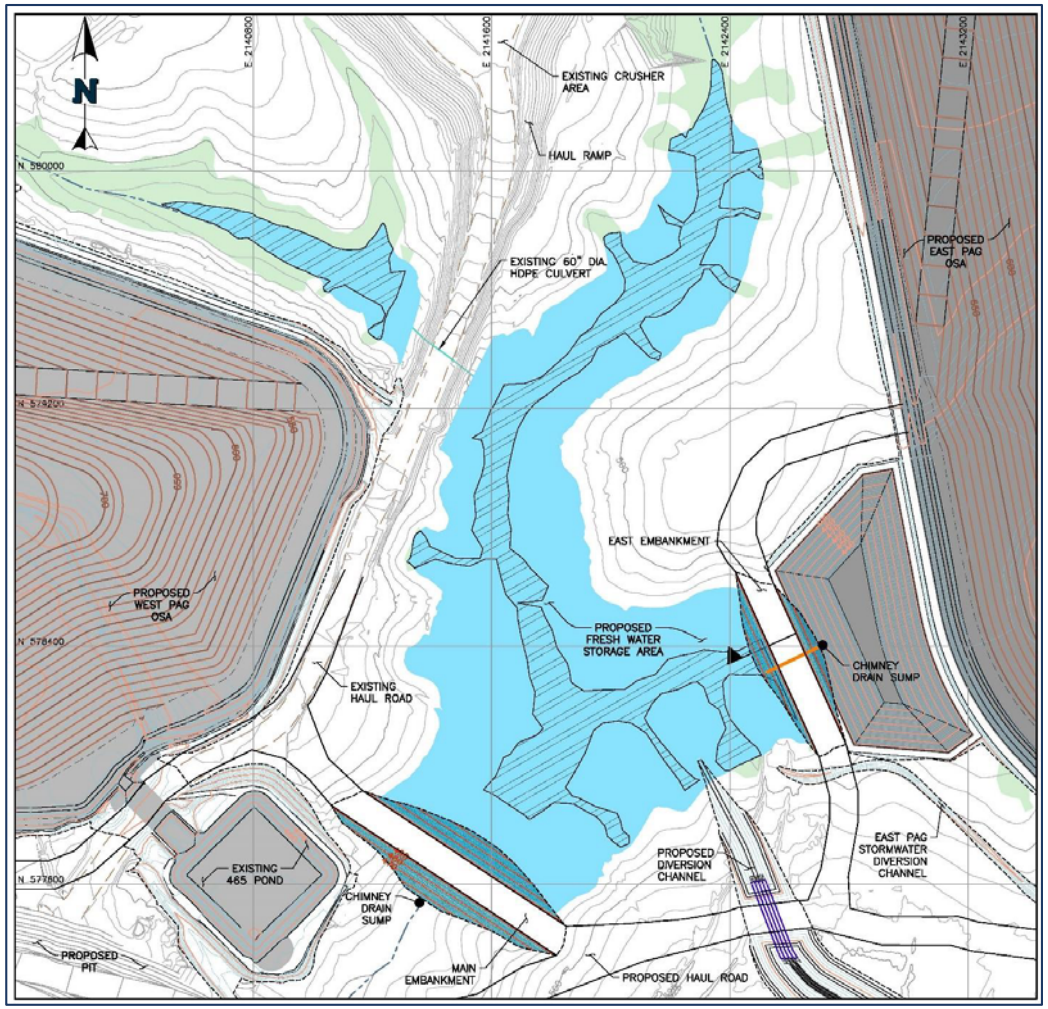
*Placement limited by timing of mining.

FRESH WATER STORAGE AREA

Fresh Water Storage Area Assessment Criteria

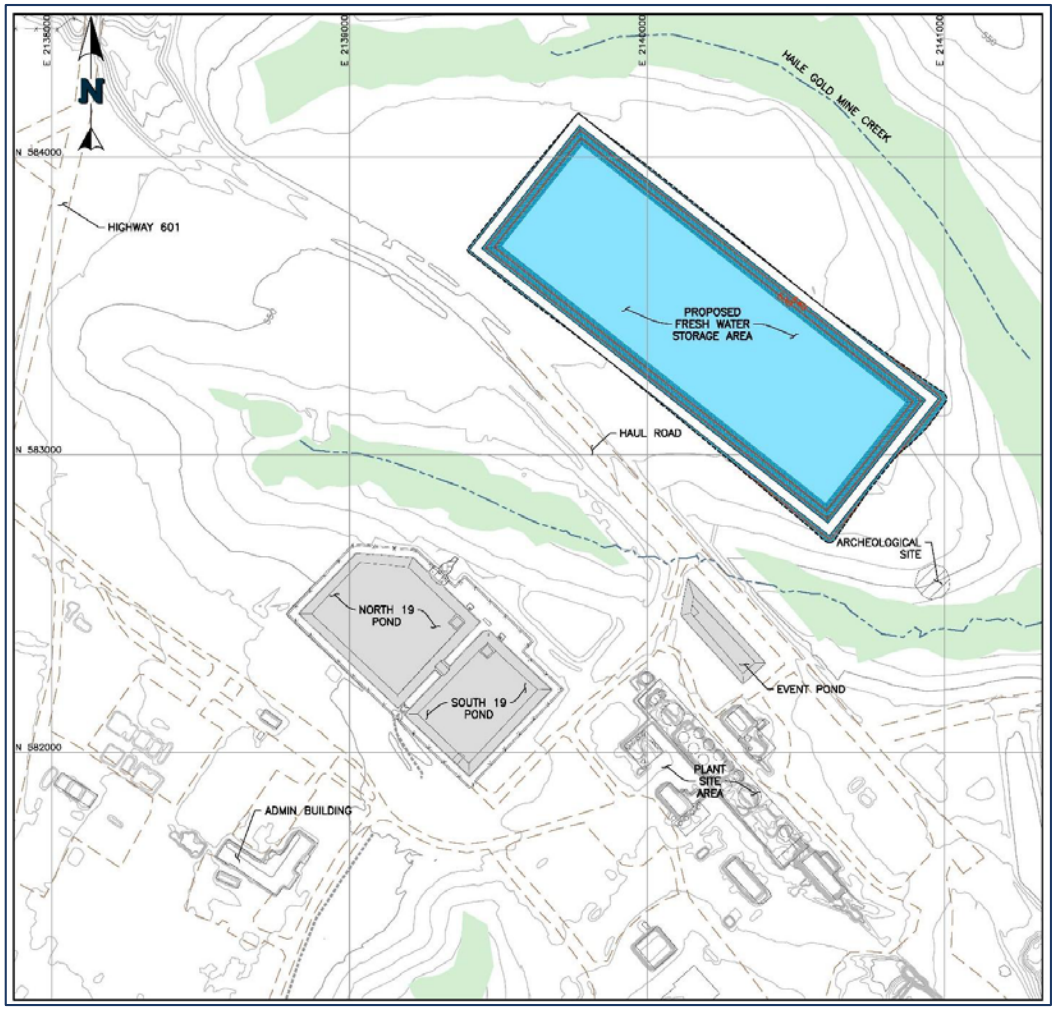
1. Provide a permanent fresh water storage solution
   - *Required for Mill during dry years*
2. Reduce potential for flooding of pits during extreme storm events
3. Maintain water flow in Haile Gold Mine Creek for aquatic life
4. Minimize wetland and stream disturbance
5. Replace permitted 50 M Gallon Utility Pond
   - *This was eliminated by Parking Lot Low-grade Stockpile*
6. Minimize cost for temporary structures

Fresh Water Storage Alternative #1



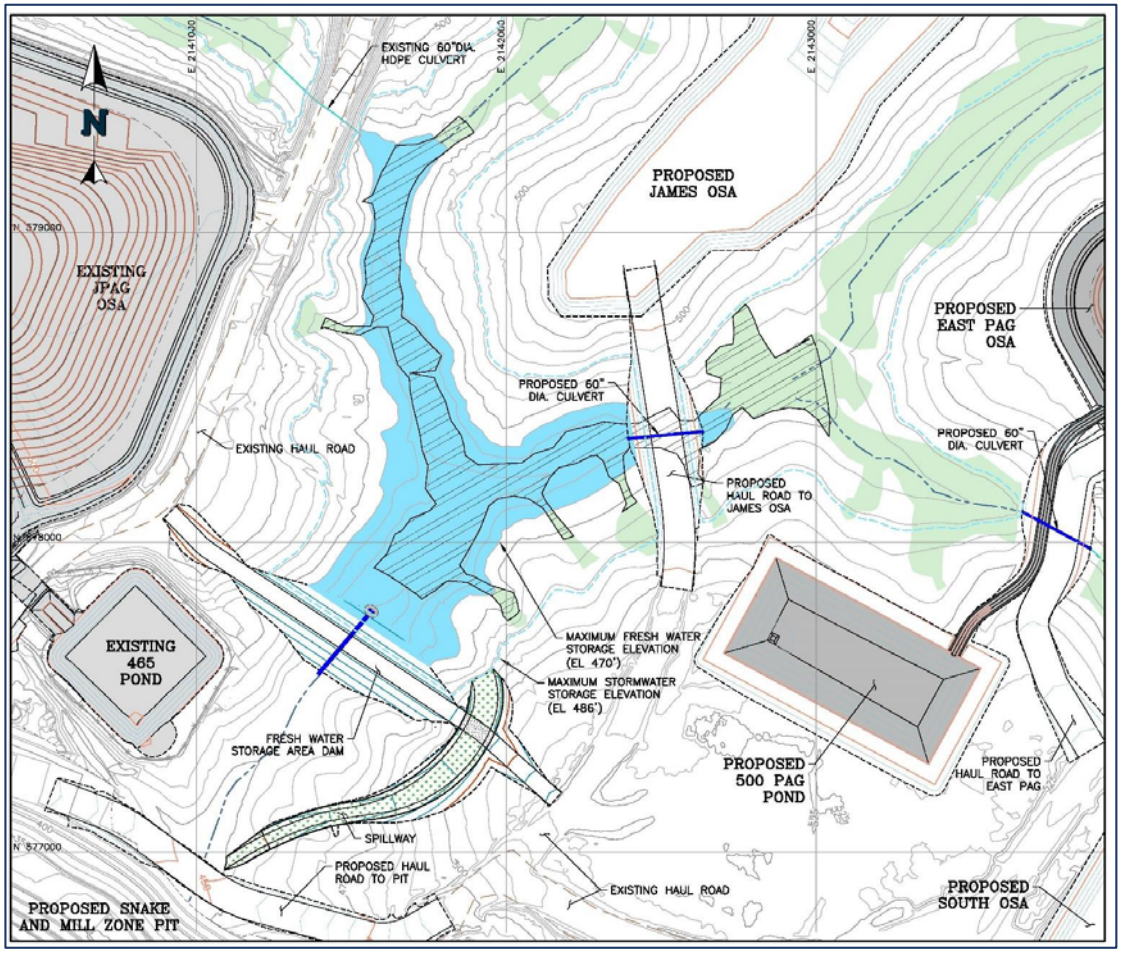
Features	
Total Disturbance	48 acres
Capacity	97 M gal
Final Dam Elevation	491.5 ft. amsl
Construction Cost	$3.7 M
Wetland Disturbance	13.5 acres
Stream Disturbance	4,875 ft

Fresh Water Storage Alternative #2



Features	
Total Disturbance	24 acres
Capacity	102 M gals
Final Elevation	545 ft. amsl
Construction Cost	$1.9 M
Wetland Disturbance	0 acres
Stream Disturbance	0 ft

Fresh Water Storage Alternative #3 *(Preferred)*



Features	
Total Disturbance	22 acres
Operating/Emergency Capacity	28/190.6 M gals
Operating/Emergency Elevation	470/493 ft. amsl
Construction Cost	$4.5 M
Wetland Disturbance*	6.0 acres
Stream Disturbance*	2,740 ft

*

Disturbance values are at Operating Elevation - 470' amsl

Fresh Water Storage Summary Table

Alternative	Total Disturbance (acres)	Storage Capacity (M gal)	Additional Wetland Disturbance (acres)	Additional Stream Disturbance (ft.)	Final Elevation (ft. amsl)	Flood Protection	Construction Cost (M USD)
Alt 1	48	97	13.5	4,875	491.5	yes with diversion channel	$3.7
Alt 2	24	102	0	0	545	no	$1.9
Alt 3 *Preferred*	22	28/190.6*	6.0	2,740	470/493*	yes	$4.5

* Emergency capacity for extreme weather conditions and temporary storage (i.e. 30 days or less post storm).
- Operating Level at 470’ amsl = 28M gallons
- Emergency Level at 493’ amsl = 190.6M gallons

Fresh Water Storage Summary

Fresh Water Storage Selection – Advantages of Preferred Alternative (#3)

1. Protects Ledbetter Pit from 100 year – 24 hour Storm Event
2. Reduces risk to personnel should pit flood
3. Reduces wetland disturbance
   - *7.5 acres less than Alt #1*
4. Reduces stream disturbance
   - *2,135 ft. less than Alt #1*
5. Provides storage 28 M gal of fresh water for Mill make-up
6. Provides water storage lost by displacement of 50 M Gallon Utility Pond (by Parking Low-Grade Stockpile)

Fresh Water Storage Summary

Fresh Water Storage Selection – Advantages of Preferred Alternative (#4)

7. Dam and Emergency Spillway serve multiple purposes as retention and/or detention structure
8. Structure provides alternative east – west traffic route for operational uses
9. Meets all other criteria

Conclusion

- Preferred OSAs and PAG facilities use extensions of pre-existing and pre-approved footprints
- Mine Plan maximizes in-pit backfilling to minimize constructing new or larger stockpiles or PAG facilities
- Selected alternatives minimize wetland and stream disturbance often at
  - *Higher construction cost - e.g., West PAG and FWSA*
  - *Higher operating cost with greater distance from operations – e.g., South OSA*
- Selected alternatives avoid disturbance to new drainage districts (e.g., Buffalo Creek drainage)
- Use of Green OSA material for TSF construction avoids disturbance to Holly and Hock Borrow Areas

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