SJE
SIMMONS-JOHNSEY
ENGINEERING, LLC

February 19, 2024

Mr. Stephen D. Miles, P.E.
Alabama Surface Mining Commission
P.O. Box 2390
Jasper, AL 35502-2390

RE: Southland Resources, Inc.
Searles Mine No. 8, P-3966, R-10

Dear Mr. Miles:

I hereby certify the enclosed detailed design plans for Slurry Impoundment No. 4 for the above referenced mine are in accordance with the Regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and as amended to date and that the information used in the enclosed design plans is true and correct to the best of my knowledge and belief.

If you have any questions or need additional information, please do not hesitate to contact our office.

Sincerely,

Simmons-Johnsey Engineering, LLC

Jared P. Johnsey, P.E.
Alabama Reg No. 33239

(205) 275-0689 brad@simmonsjohnsey.com (205) 522-2057 jared@simmonsjohnsey.com

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Simmons-Johnsey Engineering, LLC

ALABAMA REGISTERED No. 33239 PROFESSIONAL ENGINEER JARED P. JOHNSEY

Jared P. Johnsey, P.E.
Alabama Reg No. 33239

(205) 275-0689 brad@simmonsjohnsey.com (205) 522-2057 jared@simmonsjohnsey.com

Introduction:

Proposed Slurry Impoundment No. 4 is an incised pool located in the current pit created by surface mining at Searles Mine No. 8. The facility does not meet the requirements of 30 CFR 77.216 due to the fact it is incised within massive spoil fills or existing highwall on all sides. The slurry impoundment is proposed to be constructed in two (2) phases. Phase 1 will consist of storing slurry in the existing pit while maintaining the normal pool level at 458.0 MSL. Phase 1 safely contains the 100 Year – 6 Hour storm event with no spillway system. A pump will be used to maintain the normal pool level at 458.0 MSL. The water will be pumped to an approved sediment basin that has been certified to the ASMC. The Phase 1 normal pool elevation (458.0 MSL) will be flagged around the impoundment perimeter (where access is safe) to provide a clear visible marker of the normal pool level. Phase 2 will consist of constructing a concrete spillway at the Phase 2 normal pool level of 465.0 MSL. There is no proposed embankment as the existing spoil material provides the required freeboard once the spillway is cut into the spoil material. As detailed in revision R-6, entries into the abandoned Brookwood Underground Mine are exposed on the existing highwall within the pool area of Slurry Impoundment No. 4. Approved ADEM UIC Permit # ALSI5630001 allows for injection into these entries. The entries are located well below the maximum slurry elevation of Slurry Impoundment No. 4 Phases 1 and 2. Once the slurry elevation reaches the entries, it will begin flowing into the entries. This will provide more life for the slurry impoundment until the entries seal off. Slurry Cells No. 1 and 2, also approved in revision R-6, are proposed within the footprint of the proposed slurry impoundment. They have not yet been constructed and will be deleted from the permit.

General Notes:

1. There are no required construction activities for Phase 1. Phase 1 will be certified to the Regulatory Authority once these design plans have been approved and prior to pumping slurry into the Phase 1 pool area.

2. Once initial construction begins on the slurry impoundment (Phase 2), it will be constructed and certified to the Regulatory Authority within 90 days unless an extension is approved by the Director.

SLURRY IMPOUNDMENT CONSTRUCTION SPECIFICATIONS

Slurry impoundments not meeting the size requirement of 30 CFR 77.216 will be designed and constructed using the following as minimum specifications:

EMBANKMENT REQUIREMENTS

1. The minimum width of the top of the embankment shall be no less than twelve (12) feet.

2. The embankment will have a minimum front and back slope no steeper than the slopes shown on the detailed design sheet.

3. The foundation area of the embankment will be cleared and grubbed of all organic matter with no surface slope steeper than 1 horizontal to 1 vertical. The entire wet area, as measured from the upstream toe of the embankment to the normal pool level, will be cleared of trees and large brush.

4. A core will be constructed in a cutoff trench along the centerline of the embankment. The cutoff trench will be of suitable depth and width to attain relatively impervious material.

5. The embankment construction material will be free of sod, roots, stumps, rocks, etc., which exceed six (6”) inches in diameter. The embankment material will be placed in layers of twelve (12”) inches or less and compacted to ninety-five (95%) percent of the standard proctor density, as set forth in ASTM.

6. The embankment, foundation and abutments will be designed and constructed to be stable under normal construction and operating conditions, with a minimum static safety factor of 1.3 at normal pool level with steady seepage saturation conditions.

7. The actual constructed height of the embankment will be a minimum of five (5%) percent higher than the design height to allow for settling over the life of the embankment.

8. The design embankment height for temporary impoundments will be a minimum of one (1’) foot above the maximum water level anticipated from the 10 Year-24 Hour or the 25 Year-6 Hour precipitation event (whichever is greater). The design embankment height for permanent impoundments will be a minimum of one (1’) foot above the maximum water level anticipated from the 10 Year-24 Hour or the 25 Year-6 Hour precipitation event (whichever is greater).

9. For embankments constructed as point source discharges, the embankment will be constructed and keyed into undisturbed, virgin, ground if at all possible. In the event that this cannot be achieved, additional design and construction specifications will be submitted in the detailed design plans.

10. The embankment and all areas disturbed in the construction of the embankment will be seeded with a mixture of perennial and annual grasses, fertilized and mulched to prevent erosion and ensure re-stabilization. Hay dams, silt fences, rock check dams, etc. will be installed, where deemed necessary, as additional erosion prevention methods.

DISCHARGE STRUCTURE REQUIREMENTS

11. The primary spillway will be designed to adequately carry the anticipated peak runoff from the 10 Year-24 Hour precipitation event. The combination primary and secondary (emergency) spillway system will be designed to safely carry the anticipated peak runoff from a 25 Year-6 Hour precipitation event. When sediment basins are proposed in the drainage course of a public water supply, the spillway system will be designed and constructed to adequately carry the runoff from the 50 Year-24 Hour precipitation event.

12. Channel linings, for secondary (emergency) spillways will be a trapezoidal open channel constructed in natural ground and planted with a mixture of both annual and perennial grasses being predominantly fescue and Bermuda. In the event that the spillway cannot be constructed in natural ground, the spillway will be lined with riprap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).

13. When consisting of pipe, the primary spillway will be installed according to Class “C” pipe installation for embankment bedding.

14. Slurry impoundments with a single spillway system, such as a skimmer board, will be a trapezoidal open channel constructed in consolidated, nonerodable material and lined with rip-rap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).

15. The primary spillway will be designed and constructed with device to eliminate floating solids from leaving the impoundment. This device will consist of a turned down elbow when using pipe or a skimmer system when using an open channel spillway.

16. When necessary, to prevent erosion of the embankment or discharge area, a splash pad of rip-rap, durable rock, sacrete, etc. will be installed at the discharge end of the primary spillway.

17. The combined spillway systems, for slurry impoundments constructed in series, will be designed to adequately accommodate the entire drainage area.

INSPECTION, MAINTENANCE AND CERTIFICATION REQUIREMENTS

18. Inspections will be conducted regularly during construction of the slurry impoundment by a qualified registered professional engineer or other qualified person under the direction of a professional engineer. Upon completion of construction, the slurry impoundment will be certified, by a qualified registered professional engineer, to the Regulatory Authority as having been constructed in accordance with the approved detailed design plans.

19. Slurry impoundments will be inspected semi-monthly for erosion, instability, etc., with maintenance performed as necessary, until the removal of the structure or until a Phase III Bond Release is granted.

20. Slurry impoundments will be examined quarterly for structural weakness, instability, erosion, slope failure, or other hazardous conditions with maintenance performed as necessary.

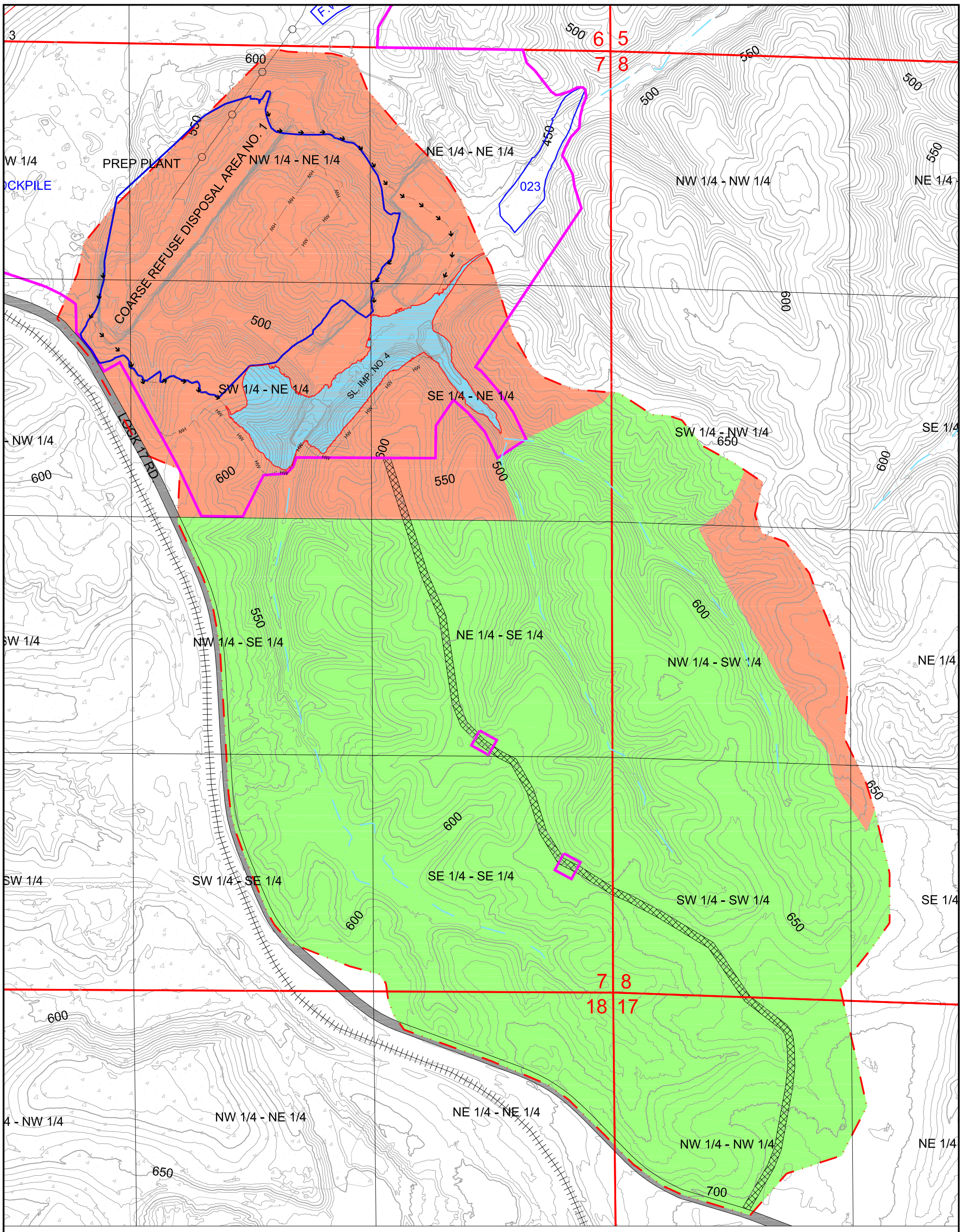
21. Formal inspections will be made annually, by a qualified registered professional engineer or other qualified person under the direction of a professional engineer, including any reports or modifications, in accordance with 880-X-10C-.20[1(j)] of the Alabama Surface Mining Regulations.

22. Retained sediment will be removed from each slurry impoundment as outlined in the design plans.

23. The slurry impoundment will be certified as constructed to the Regulatory Authority within 90 days after the start of construction unless an extension is granted by the Director.

REMOVAL REQUIREMENTS

24. Once the impoundment has reached the anticipated final volume and is no longer to be used as an impoundment, the remaining water will be removed from the impoundment by pumping or siphoning. The slurry will be allowed to dry to form a crust for equipment to travel. Once the slurry has dried, then material from the adjacent area will be used to cover the final slurry surface with four (4) feet of non-acid, non-toxic forming material. The final graded surface will be graded to drain to the existing spillway.



MAP LEGEND

- ASMC PERMIT BOUNDARY
- 500 — CONTOUR INDEX
- CONTOUR INTERVAL
- DRAINAGE DIVIDE
- DIVERSION DITCH
- PERENNIAL STREAM
- DRAINAGE COURSE
- HW — EXISTING HIGHWALL
- SL. IMP. NO. 4 — SLURRY IMPOUNDMENT, CN 100
- GRADED AND BARE, CN 81
- MOSTLY FOREST, CN 62
- PREVIOUSLY DISTURBED

CONTOUR INTERVAL 10'

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SOUTHLAND RESOURCES, INC.

SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4 WATERSHED MAP

DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	1"=500'	1 OF 1

Slurry Impoundment No. 4

Elevation-Area-Capacity Table

Elevation (ft)	Area (ac)	Capacity (ac-ft)
410.00	0.000	0.000
410.50	0.004	0.001
411.00	0.016	0.006
411.50	0.036	0.018
412.00	0.064	0.043
412.50	0.100	0.084
413.00	0.144	0.145
413.50	0.196	0.230
414.00	0.256	0.342
414.50	0.324	0.487
415.00	0.400	0.668
415.50	0.421	0.873
416.00	0.442	1.089
416.50	0.464	1.315
417.00	0.486	1.552
417.50	0.508	1.801
418.00	0.532	2.061
418.50	0.556	2.333
419.00	0.580	2.617
419.50	0.605	2.913
420.00	0.630	3.221
420.50	0.711	3.556
421.00	0.796	3.933
421.50	0.886	4.353
422.00	0.980	4.819
422.50	1.080	5.334
423.00	1.184	5.900
423.50	1.294	6.519
424.00	1.408	7.194
424.50	1.527	7.927
425.00	1.650	8.721
425.50	1.715	9.562
426.00	1.780	10.436
426.50	1.847	11.343
427.00	1.915	12.283
427.50	1.985	13.258
428.00	2.055	14.268

Elevation (ft)	Area (ac)	Capacity (ac-ft)
428.50	2.127	15.314
429.00	2.200	16.395
429.50	2.275	17.514
430.00	2.350	18.670
430.50	2.413	19.861
431.00	2.477	21.083
431.50	2.542	22.338
432.00	2.608	23.626
432.50	2.675	24.946
433.00	2.742	26.301
433.50	2.810	27.689
434.00	2.879	29.111
434.50	2.949	30.568
435.00	3.020	32.060
435.50	3.119	33.595
436.00	3.219	35.179
436.50	3.321	36.815
437.00	3.425	38.501
437.50	3.530	40.240
438.00	3.637	42.031
438.50	3.745	43.877
439.00	3.855	45.777
439.50	3.967	47.733
440.00	4.080	49.744
440.50	4.154	51.803
441.00	4.229	53.898
441.50	4.304	56.031
442.00	4.380	58.202
442.50	4.457	60.412
443.00	4.534	62.659
443.50	4.612	64.946
444.00	4.691	67.271
444.50	4.770	69.637
445.00	4.850	72.042
445.50	4.945	74.490
446.00	5.041	76.987
446.50	5.137	79.531
447.00	5.235	82.124
447.50	5.334	84.766
448.00	5.433	87.458
448.50	5.533	90.199
449.00	5.635	92.991

Elevation (ft)	Area (ac)	Capacity (ac-ft)
449.50	5.737	95.834
450.00	5.840	98.728
450.50	5.951	101.676
451.00	6.064	104.680
451.50	6.177	107.740
452.00	6.291	110.857
452.50	6.407	114.032
453.00	6.523	117.264
453.50	6.641	120.555
454.00	6.760	123.905
454.50	6.879	127.315
455.00	7.000	130.785
455.50	7.128	134.317
456.00	7.257	137.913
456.50	7.387	141.574
457.00	7.518	145.300
457.50	7.651	149.092
458.00	7.784	152.951
458.50	7.919	156.876
459.00	8.055	160.870
459.50	8.192	164.931
460.00	8.330	169.062
460.50	8.476	173.263
461.00	8.624	177.538
461.50	8.773	181.887
462.00	8.923	186.311
462.50	9.074	190.810
463.00	9.227	195.386
463.50	9.381	200.037
464.00	9.536	204.767
464.50	9.692	209.574
465.00	9.850	214.459
465.50	10.113	219.450
466.00	10.378	224.572
466.50	10.648	229.829
467.00	10.921	235.221
467.50	11.197	240.750
468.00	11.477	246.418
468.50	11.760	252.227
469.00	12.046	258.179
469.50	12.337	264.274
470.00	12.630	270.516

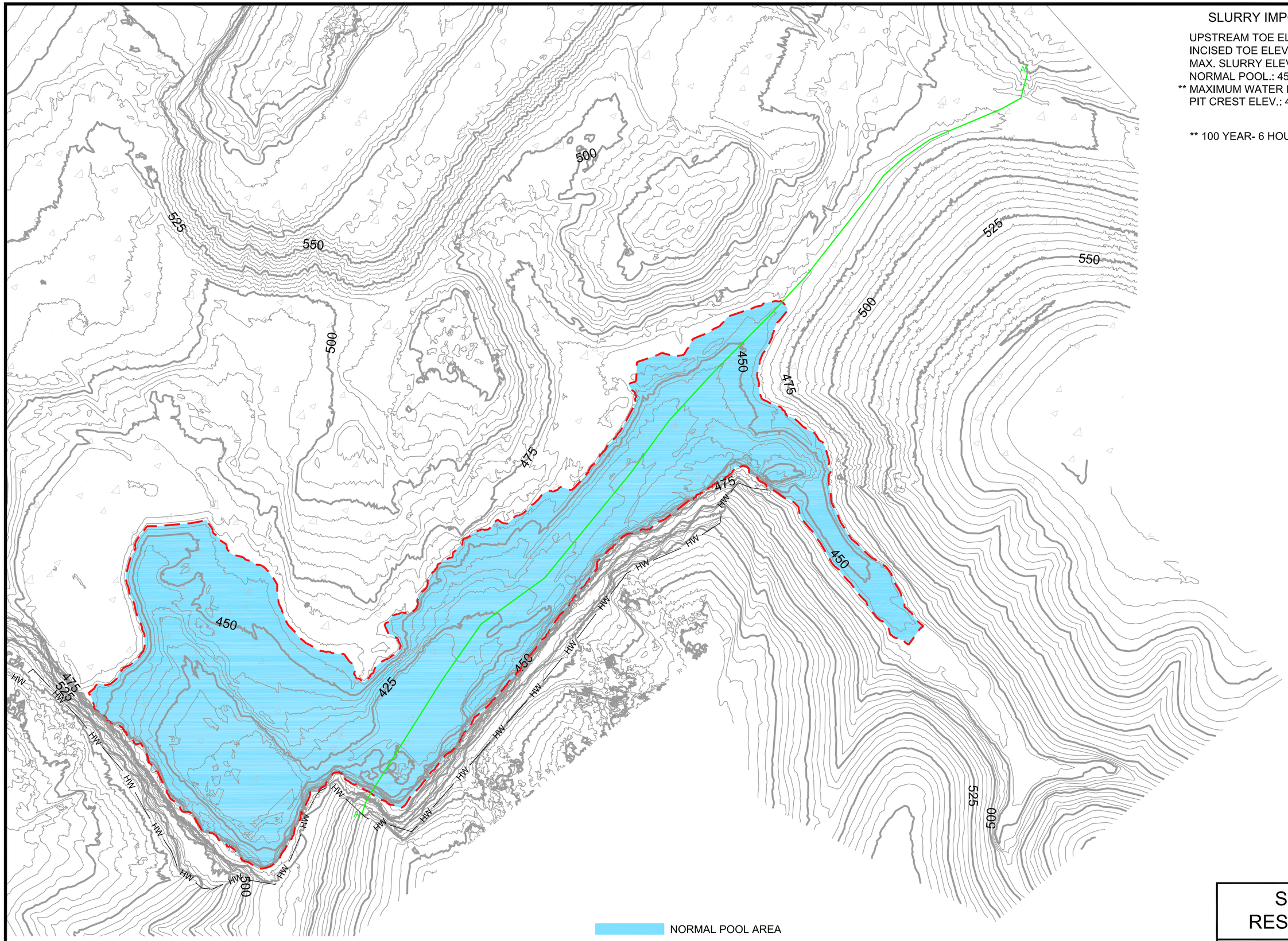
Elevation (ft)	Area (ac)	Capacity (ac-ft)
470.50	12.765	276.864
471.00	12.900	283.281
471.50	13.037	289.765
472.00	13.173	296.317
472.50	13.311	302.938
473.00	13.449	309.629
473.50	13.589	316.388
474.00	13.728	323.217
474.50	13.869	330.116
475.00	14.010	337.086

DETAILED DESIGN PLANS
SLURRY IMPOUNDMENT NO. 4 PHASE 1

SLURRY IMPOUNDMENT NO. 4

UPSTREAM TOE ELEV.: 458.0'
INCISED TOE ELEV.: 410.0'
MAX. SLURRY ELEV.: 458.0'
NORMAL POOL.: 458.0'
** MAXIMUM WATER ELEV.: 465.85'
PIT CREST ELEV.: 471.0'.

** 100 YEAR- 6 HOUR RAINFALL



CONTOUR INTERVAL 5'

NORMAL POOL AREA
PREVIOUSLY DISTURBED
EXISTING CONTOUR
520 EXISTING INDEX CONTOUR
HW EXISTING HIGHWALL
MAXIMUM SLURRY LINE

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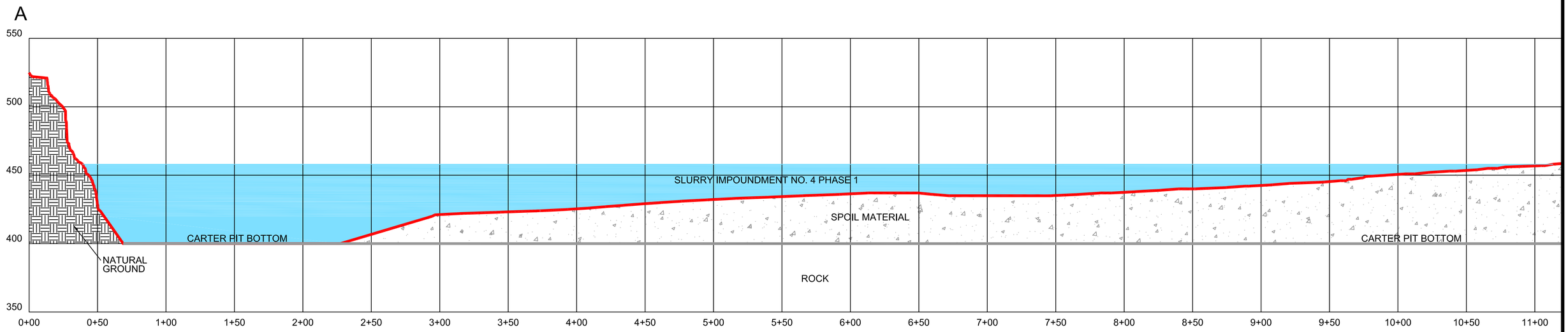
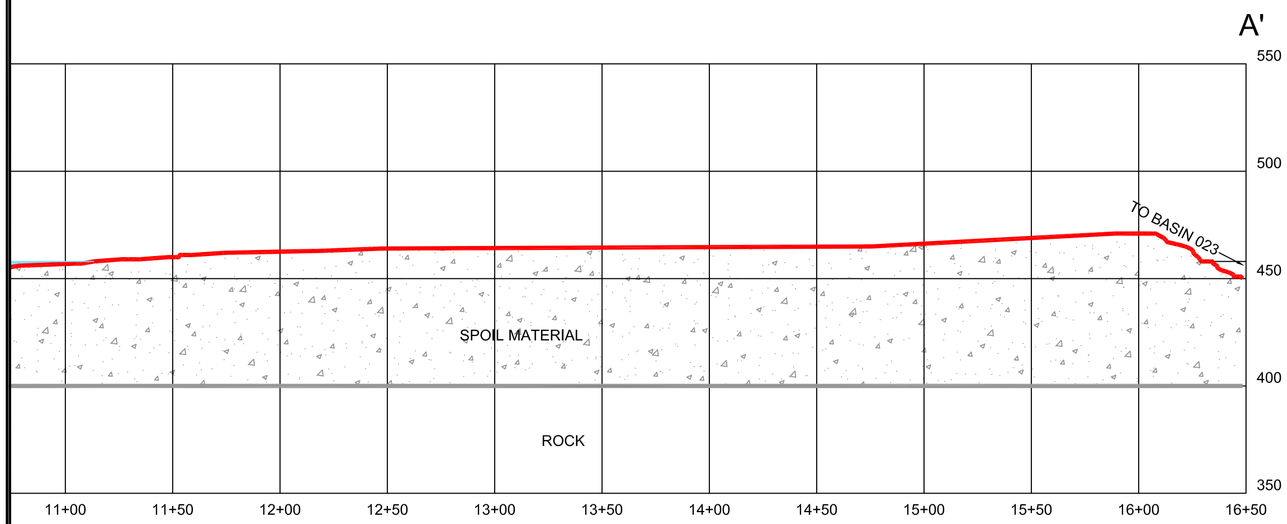
SOUTHLAND RESOURCES, INC.

SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4
PHASE 1 PLANVIEW MAP

DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	1"=100'	1 OF 1





SCALE H: 1" = 100'
V: 1" = 100'

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SOUTHLAND RESOURCES, INC.

SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4
PHASE 1 PROFILE A-A'

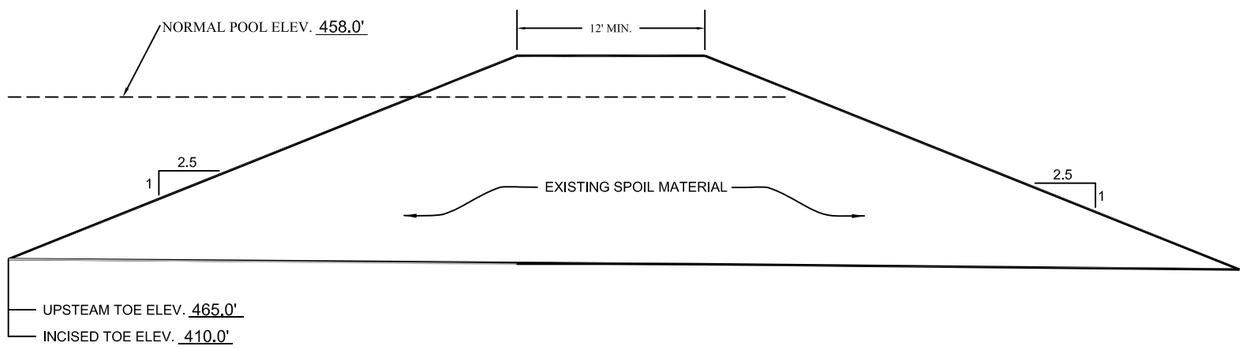
DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	1"=100'	1 OF 1

KEY BASIN PARAMETERS

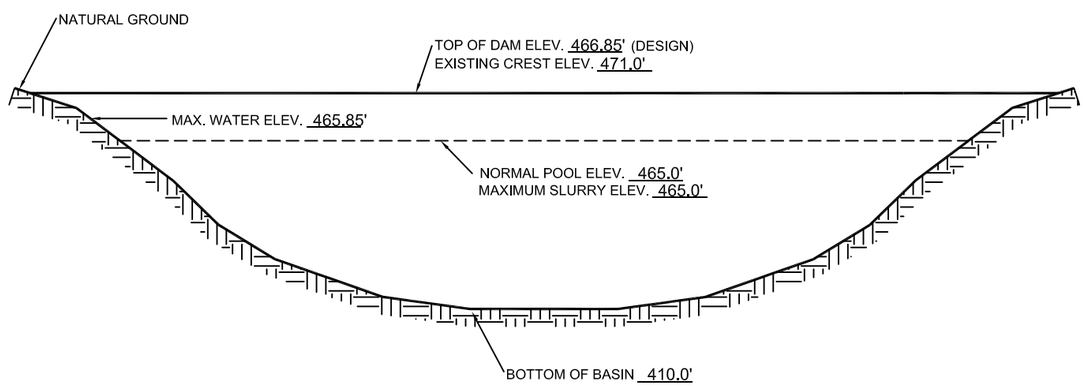
TOTAL DRAINAGE AREA	376.8	ACRES
DISTURBED AREA	124.6	ACRES
SLURRY STORAGE	152.95	AC-FT
DETENTION STORAGE	N/A	AC-FT
PERMANENT POOL CAPACITY	152.95	AC-FT
*TOTAL INFLOW	70.1	AC-FT
*TOTAL BASIN STORAGE CAPACITY	223.05	AC-FT
*PEAK INFLOW	647.86	C.F.S.

* 100 YEAR - 6 HOUR EVENT

TYPICAL EMBANKMENT CROSS-SECTION



IMPOUNDMENT PROFILE



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SOUTHLAND RESOURCES, INC.

SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4
PHASE 1 DETAIL PLAN SHEET

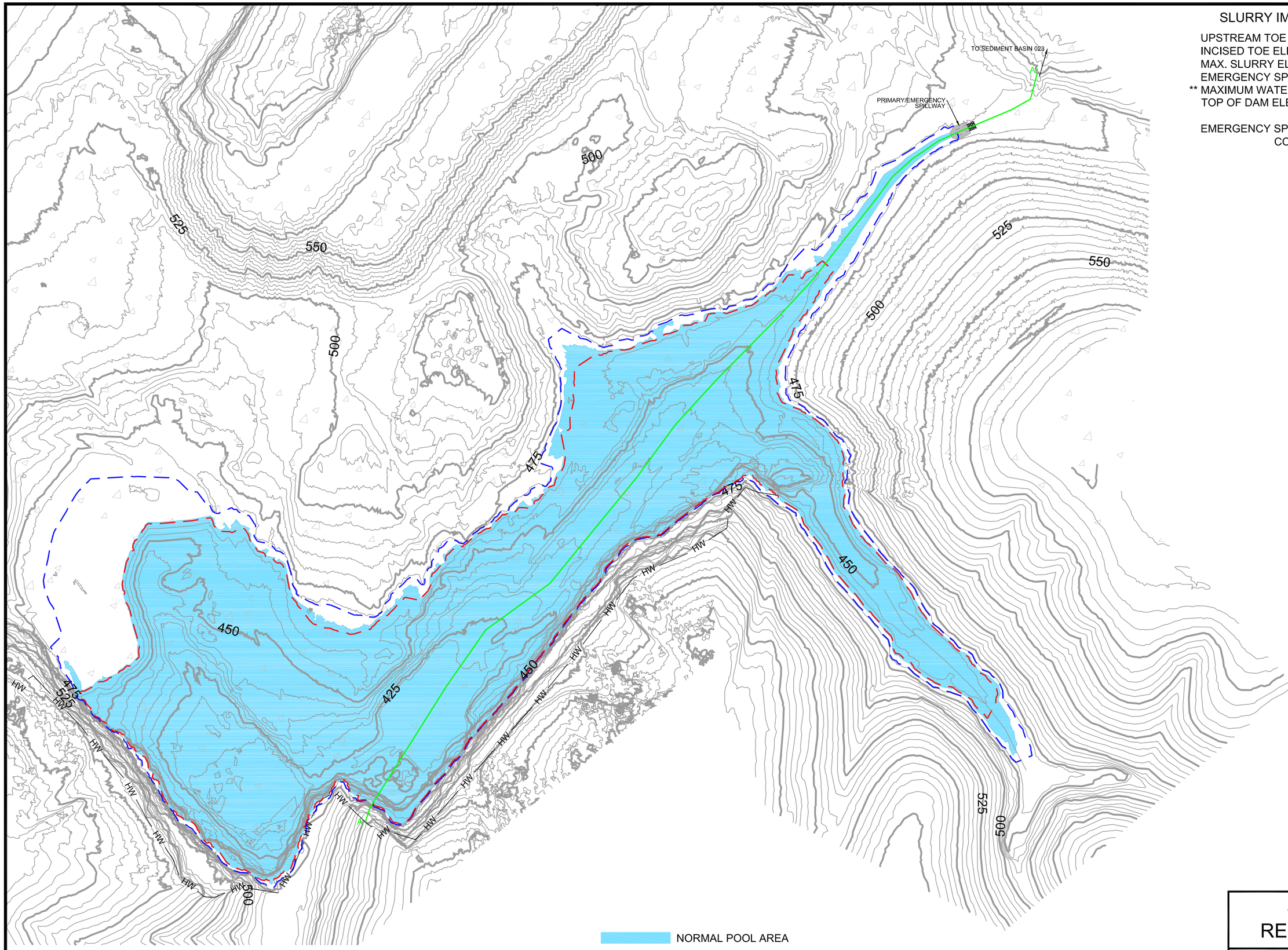
DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	NA	1 OF 1

DETAILED DESIGN PLANS
SLURRY IMPOUNDMENT NO. 4 PHASE 2

SLURRY IMPOUNDMENT NO. 4

UPSTREAM TOE ELEV.: 465.0'
INCISED TOE ELEV.: 410.0'
MAX. SLURRY ELEV.: 464.0'
EMERGENCY SPILLWAY ELEV.: 465.0'
** MAXIMUM WATER ELEV.: 467.45'
TOP OF DAM ELEV.: 468.45' DESIGN

EMERGENCY SPILLWAY: 10' WIDE TRAPEZOIDAL CONCRETE LINED OPEN CHANNEL



CONTOUR INTERVAL 5'

NORMAL POOL AREA
PREVIOUSLY DISTURBED
EXISTING CONTOUR
520 EXISTING INDEX CONTOUR
HW EXISTING HIGHWALL
MAXIMUM SLURRY LINE
4' COVER LINE
ENERGY DISSIPATOR CLASS 2 RIP-RAP MIN, 12' x 12' x 16"

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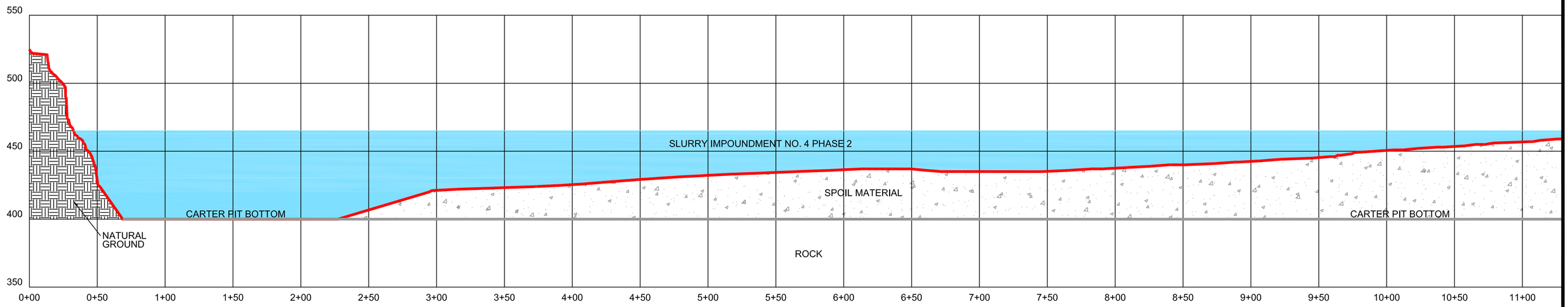
SOUTHLAND RESOURCES, INC.

SEARLES MINE NO. 8
P-3966, R-10

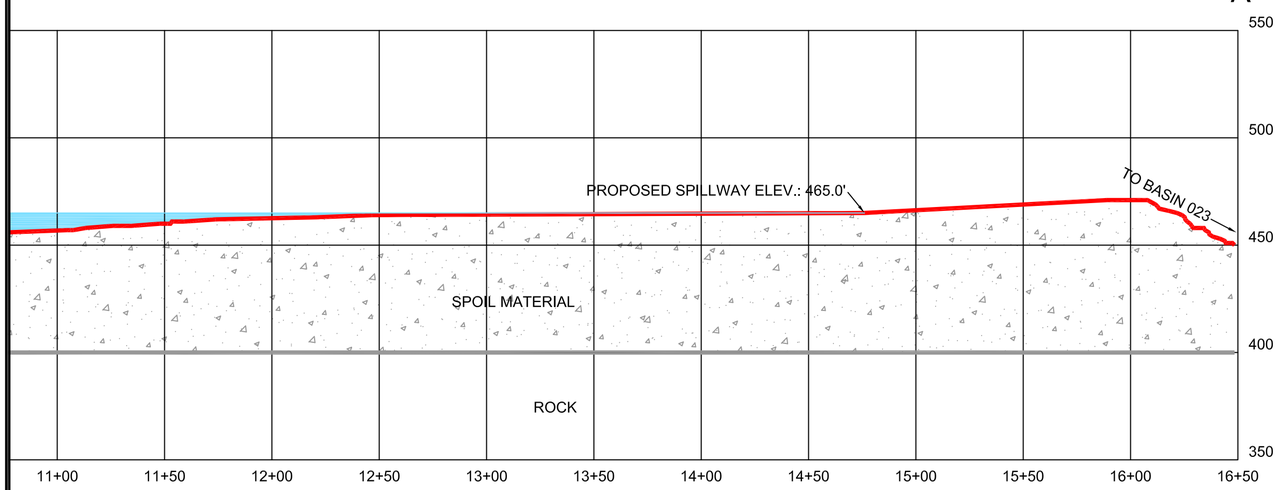
SLURRY IMPOUNDMENT NO. 4
PHASE 2 PLANVIEW MAP

DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	1"=100'	1 OF 1

A



A'



SCALE H: 1" = 100'
V: 1" = 100'

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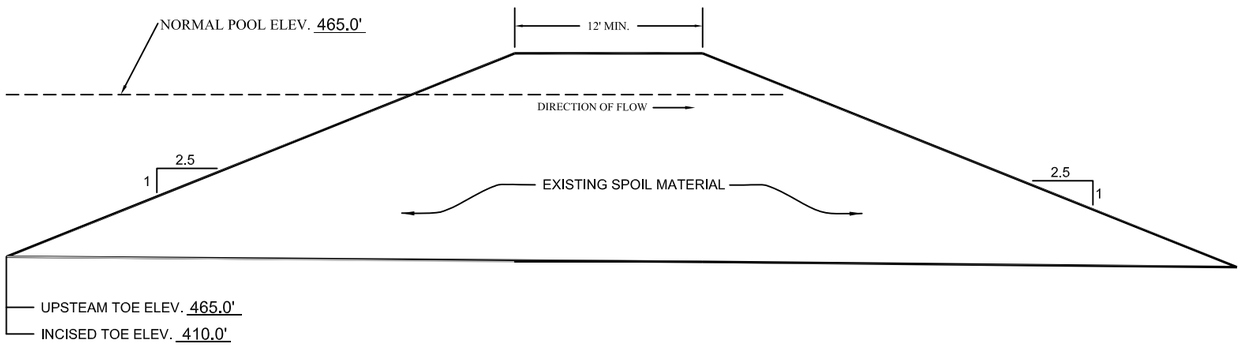
SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4
PHASE 2 PROFILE A-A'

DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	1"=100'	1 OF 1

TYPICAL EMBANKMENT CROSS-SECTION

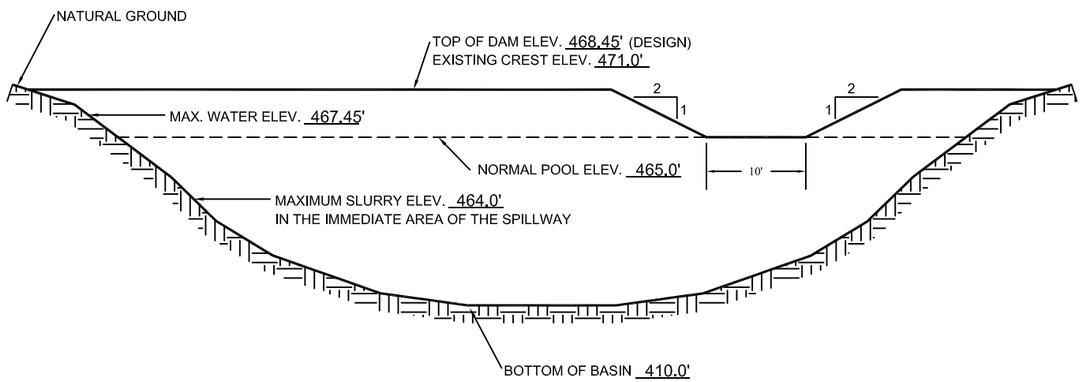


KEY BASIN PARAMETERS

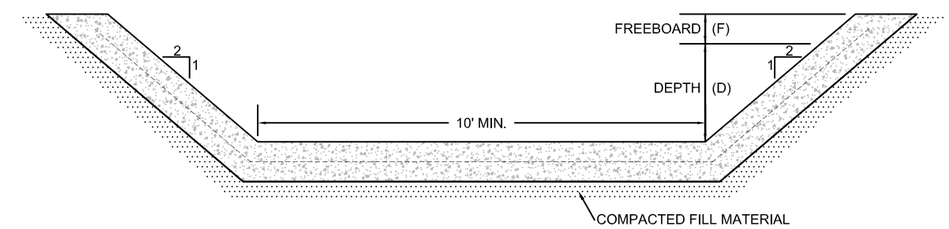
TOTAL DRAINAGE AREA	376.8	ACRES
DISTURBED AREA	124.6	ACRES
SLURRY STORAGE	204.8	AC-FT
DETENTION STORAGE	9.7	AC-FT
PERMANENT POOL CAPACITY	214.5	AC-FT
*TOTAL BASIN STORAGE CAPACITY	236.2	AC-FT
** PEAK INFLOW	510.39	C.F.S.
** PEAK OUTFLOW	137.09	C.F.S.

* 10 YEAR - 24 HOUR EVENT
** 25 YEAR - 6 HOUR EVENT

IMPOUNDMENT PROFILE

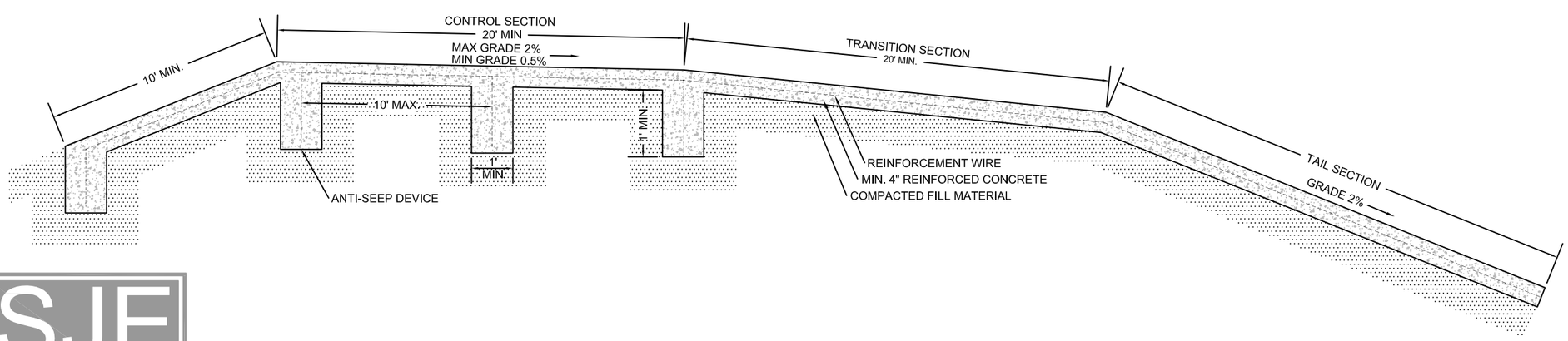


SPILLWAY CROSS SECTION



	BEGINNING OF CONTROL SECTION	END OF CONTROL SECTION	END OF TRANSITION SECTION	ENTIRE TAIL SECTION
MAXIMUM FLOW DEPTH (D)	2.45'	1.75'	1.19'	1.19'
FREEBOARD (F)	1.0'	1.0'	1.0'	1.0'
MIN. CONCRETE HEIGHT ON SIDE SLOPES (F + D)	3.45'	2.75'	2.19'	2.19'

SPILLWAY PROFILE



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SEARLES MINE NO. 8
P-3966, R-10

SLURRY IMPOUNDMENT NO. 4
PHASE 2 DETAIL PLAN SHEET

DATE:	APPROVED BY:	SCALE:	SHEET:
2/09/24	J.P.J.	NA	1 OF 1

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Spillway Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	0.5	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	137.09 cfs	
Depth:	1.75 ft	2.75 ft
Top Width:	17.02 ft	21.02 ft
Velocity:	5.79 fps	
X-Section Area:	23.69 sq ft	
Hydraulic Radius:	1.328 ft	
Froude Number:	0.86	

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Spillway Tail Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	2.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	137.09 cfs	
Depth:	1.19 ft	2.19 ft
Top Width:	14.75 ft	18.75 ft
Velocity:	9.32 fps	
X-Section Area:	14.71 sq ft	
Hydraulic Radius:	0.960 ft	
Froude Number:	1.65	

SPILLWAY CHANNEL REQUIREMENTS
SLURRY IMPOUNDMENT NO. 4 PHASE 2

1. The entire control section and tail section of the spillway will be lined with a minimum of four (4”) inches of reinforced concrete with a minimum compressive strength of 3,000 psi.

2. All concrete will be reinforced with 10 gauge, 6” x 6” welded wire. Additional reinforcement may be added to the concrete for additional strength, however, the additional reinforcement cannot be used in place of the required 6” x 6” welded wire.

SEDCAD 4 HYDROLOGY AND SEDIMENTOLOGY REPORT
100 YR – 6 HR PRECIPITATION EVENT
SLURRY IMPOUNDMENT NO. 4 PHASE 1

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Southland Resources, Inc.
Searles Mine No. 8, P-3966, R-10
Slurry Impoundment No. 4 Phase 1

100 Year - 6 Hour Rainfall Event

Jared P. Johnsey, P.E.

General Information

Storm Information:

Storm Type:	SCS-6
Design Storm:	100 yr - 6 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	96.000%	89.000%
2.0000	95.000%	74.000%
1.0000	92.000%	73.000%
0.5000	90.000%	60.000%
0.3000	88.000%	48.000%
0.2000	85.000%	40.000%
0.1000	74.000%	32.000%
0.0500	55.000%	26.000%
0.0300	44.000%	22.000%
0.0200	37.000%	18.000%
0.0100	28.000%	14.000%
0.0050	21.000%	10.000%
0.0030	15.000%	7.000%
0.0010	6.000%	2.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Slurry Imp. No. 4 Phase 1

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1*	In	376.800	376.800	647.86	70.07	36,044.4	714,539	479.39	201.30
	Out			0.00	0.00	1,494.9	0	0.01	0.01

**Denotes structures with incomplete design parameters. Results for these structures have not been evaluated, and may affect downstream structures.*

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	94.914%	0.000%
2.0000	78.962%	0.000%
1.0000	77.899%	0.000%
0.5000	64.073%	0.000%
0.3000	51.312%	0.000%
0.2000	42.804%	0.000%
0.1000	34.296%	0.000%
0.0500	27.915%	0.000%
0.0300	23.661%	0.000%
0.0200	19.407%	0.000%
0.0100	15.122%	0.000%
0.0050	10.810%	0.000%
0.0030	7.569%	0.000%
0.0010	2.177%	0.000%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Slurry Imp. No. 4 Phase 1

Structure design parameters are not specified. No results to show.

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	114.600	0.150	0.000	0.000	81.000	F	566.45	35.735
	2	252.200	0.710	0.011	0.400	62.000	S	165.29	29.350
	3	10.000	0.010	0.000	0.000	100.000	F	65.08	4.989
	Σ	**376.800**						**647.86**	**70.073**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.240	200.00	25.00	0.9000	1.0000	2	35,949.2	773,867	520.40	370.00
	2	0.320	400.00	22.00	0.0030	1.0000	1	116.0	3,988	0.89	0.65
	3	0.001	400.00	0.01	0.0001	1.0000	2	0.0	0	0.00	0.00
	Σ							**36,044.4**	**714,539**	**479.39**	**201.30**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	5.17	15.00	290.00	6.820	0.011
#1	**2**	**Muskingum K:**					**0.011**

SEDCAD 4 HYDROLOGY AND SEDIMENTOLOGY REPORT
10 YR – 24 HR PRECIPITATION EVENT
SLURRY IMPOUNDMENT NO. 4 PHASE 2

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Southland Resources, Inc.
Searles Mine No. 8, P-3966, R-10
Slurry Impoundment No. 4 Phase 2

10 Year 24 Hour Storm Event

Jared P. Johnsey, P.E.

General Information

Storm Information:

Storm Type:	DRN 58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	96.000%	89.000%
2.0000	95.000%	74.000%
1.0000	92.000%	73.000%
0.5000	90.000%	60.000%
0.3000	88.000%	48.000%
0.2000	85.000%	40.000%
0.1000	74.000%	32.000%
0.0500	55.000%	26.000%
0.0300	44.000%	22.000%
0.0200	37.000%	18.000%
0.0100	28.000%	14.000%
0.0050	21.000%	10.000%
0.0030	15.000%	7.000%
0.0010	6.000%	2.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Slurry Imp. No. 4 Phase 2

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	376.800	376.800	215.73	70.08	16,564.8	365,012	246.49	108.29
	Out			102.09	67.15	1,434.3	24,049	0.01	0.00

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	91.777%	100.000%
2.0000	76.380%	100.000%
1.0000	75.354%	100.000%
0.5000	62.009%	100.000%
0.3000	49.691%	100.000%
0.2000	41.479%	100.000%
0.1000	33.267%	100.000%
0.0500	27.108%	100.000%
0.0300	22.923%	100.000%
0.0200	18.763%	100.000%
0.0100	14.587%	100.000%
0.0050	10.427%	100.000%
0.0030	7.301%	84.324%
0.0010	2.099%	24.246%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Slurry Imp. No. 4 Phase 2

Pond Inputs:

Initial Pool Elev:	465.00 ft
Initial Pool:	9.66 ac-ft
*Sediment Storage:	204.80 ac-ft
Dead Space:	0.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
465.00	20.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	467.09 ft
H'graph Detention Time:	3.43 hrs
Pond Model:	CSTRS
Dewater Time:	2.16 days
Trap Efficiency:	91.34 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
464.00	9.537	0.000	0.000		Top of Sed. Storage
464.50	9.692	4.774	0.000		
465.00	9.850	9.659	0.000		Spillway #1
465.50	10.113	14.650	1.830	32.99*	
466.00	10.378	19.773	25.483	7.55	
466.50	10.648	25.029	53.905	7.35	
467.00	10.921	30.421	93.036	3.15	
467.09	10.973	31.444	102.092	0.80	Peak Stage
467.50	11.197	35.950	141.972		
468.00	11.477	41.618	200.972		
468.50	11.760	47.427	270.364		
469.00	12.047	53.379	350.507		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
469.50	12.337	59.475	441.772	
470.00	12.630	65.716	544.530	
470.50	12.765	72.065	659.150	
471.00	12.900	78.481	785.996	
471.50	13.037	84.965	925.421	
472.00	13.173	91.518	1,077.775	
472.50	13.311	98.139	1,243.396	
473.00	13.449	104.829	1,422.614	
473.50	13.589	111.588	1,615.750	
474.00	13.728	118.417	1,823.118	
474.50	13.869	125.317	2,045.023	
475.00	14.010	132.286	2,281.761	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
464.00	0.000	0.000
464.50	0.000	0.000
465.00	0.000	0.000
465.50	1.830	1.830
466.00	25.483	25.483
466.50	53.905	53.905
467.00	93.036	93.036
467.50	141.972	141.972
468.00	200.972	200.972
468.50	270.364	270.364
469.00	350.507	350.507
469.50	441.772	441.772
470.00	544.530	544.530
470.50	659.150	659.150
471.00	785.996	785.996
471.50	925.421	925.421
472.00	1,077.775	1,077.775
472.50	1,243.396	1,243.396
473.00	1,422.614	1,422.614
473.50	1,615.750	1,615.750
474.00	1,823.118	1,823.118

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
474.50	2,045.023	2,045.023
475.00	2,281.761	2,281.761

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	114.600	0.150	0.000	0.000	81.000	F	140.93	35.735
	2	252.200	0.710	0.011	0.400	62.000	S	77.62	29.350
	3	10.000	0.010	0.000	0.000	100.000	F	15.73	4.995
	Σ	**376.800**						**215.73**	**70.079**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.240	200.00	25.00	0.9000	1.0000	2	16,495.3	483,661	327.25	197.26
	2	0.320	400.00	22.00	0.0030	1.0000	1	76.0	3,008	1.26	0.79
	3	0.001	400.00	0.01	0.0001	1.0000	2	0.0	0	0.00	0.00
	Σ							**16,564.8**	**365,012**	**246.49**	**108.29**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	5.17	15.00	290.00	6.820	0.011
#1	**2**	**Muskingum K:**					**0.011**

SEDCAD 4 HYDROLOGY AND SEDIMENTOLOGY REPORT
25 YR – 6 HR PRECIPITATION EVENT
SLURRY IMPOUNDMENT NO. 4 PHASE 2

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Southland Resources, Inc.
Searles Mine No. 8, P-3966, R-10
Slurry Impoundment No. 4 Phase 2

25 Year 6 Hour Storm Event

Jared P. Johnsey, P.E.

General Information

Storm Information:

Storm Type:	SCS-6
Design Storm:	25 yr - 6 hr
Rainfall Depth:	5.100 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	96.000%	89.000%
2.0000	95.000%	74.000%
1.0000	92.000%	73.000%
0.5000	90.000%	60.000%
0.3000	88.000%	48.000%
0.2000	85.000%	40.000%
0.1000	74.000%	32.000%
0.0500	55.000%	26.000%
0.0300	44.000%	22.000%
0.0200	37.000%	18.000%
0.0100	28.000%	14.000%
0.0050	21.000%	10.000%
0.0030	15.000%	7.000%
0.0010	6.000%	2.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Slurry Imp. No. 4 Phase 2

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	376.800	376.800	510.39	53.59	27,911.7	715,833	479.56	209.27
	Out			137.09	51.77	2,796.8	59,584	0.03	0.02

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	95.773%	100.000%
2.0000	79.671%	100.000%
1.0000	78.597%	100.000%
0.5000	64.642%	100.000%
0.3000	51.760%	100.000%
0.2000	43.173%	100.000%
0.1000	34.585%	100.000%
0.0500	28.144%	100.000%
0.0300	23.850%	100.000%
0.0200	19.556%	100.000%
0.0100	15.240%	100.000%
0.0050	10.893%	100.000%
0.0030	7.628%	76.123%
0.0010	2.192%	21.878%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Slurry Imp. No. 4 Phase 2

Pond Inputs:

Initial Pool Elev:	465.00 ft
Initial Pool:	9.66 ac-ft
*Sediment Storage:	204.80 ac-ft
Dead Space:	0.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
465.00	20.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	467.45 ft
H'graph Detention Time:	3.69 hrs
Pond Model:	CSTRS
Dewater Time:	1.89 days
Trap Efficiency:	89.98 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
464.00	9.537	0.000	0.000		Top of Sed. Storage
464.50	9.692	4.774	0.000		
465.00	9.850	9.659	0.000		Spillway #1
465.50	10.113	14.650	1.830	32.99*	
466.00	10.378	19.773	25.483	7.25	
466.50	10.648	25.029	53.905	2.05	
467.00	10.921	30.421	93.036	1.40	
467.45	11.169	35.399	137.092	1.65	Peak Stage
467.50	11.197	35.950	141.972		
468.00	11.477	41.618	200.972		
468.50	11.760	47.427	270.364		
469.00	12.047	53.379	350.507		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
469.50	12.337	59.475	441.772	
470.00	12.630	65.716	544.530	
470.50	12.765	72.065	659.150	
471.00	12.900	78.481	785.996	
471.50	13.037	84.965	925.421	
472.00	13.173	91.518	1,077.775	
472.50	13.311	98.139	1,243.396	
473.00	13.449	104.829	1,422.614	
473.50	13.589	111.588	1,615.750	
474.00	13.728	118.417	1,823.118	
474.50	13.869	125.317	2,045.023	
475.00	14.010	132.286	2,281.761	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
464.00	0.000	0.000
464.50	0.000	0.000
465.00	0.000	0.000
465.50	1.830	1.830
466.00	25.483	25.483
466.50	53.905	53.905
467.00	93.036	93.036
467.50	141.972	141.972
468.00	200.972	200.972
468.50	270.364	270.364
469.00	350.507	350.507
469.50	441.772	441.772
470.00	544.530	544.530
470.50	659.150	659.150
471.00	785.996	785.996
471.50	925.421	925.421
472.00	1,077.775	1,077.775
472.50	1,243.396	1,243.396
473.00	1,422.614	1,422.614
473.50	1,615.750	1,615.750
474.00	1,823.118	1,823.118

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
474.50	2,045.023	2,045.023
475.00	2,281.761	2,281.761

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	114.600	0.150	0.000	0.000	81.000	F	453.59	28.283
	2	252.200	0.710	0.011	0.400	62.000	S	114.91	21.066
	3	10.000	0.010	0.000	0.000	100.000	F	55.32	4.240
	Σ	**376.800**						**510.39**	**53.589**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.240	200.00	25.00	0.9000	1.0000	2	27,846.5	764,663	513.35	363.69
	2	0.320	400.00	22.00	0.0030	1.0000	1	78.6	3,739	0.76	0.56
	3	0.001	400.00	0.01	0.0001	1.0000	2	0.0	0	0.00	0.00
	Σ							**27,911.7**	**715,833**	**479.56**	**209.27**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	5.17	15.00	290.00	6.820	0.011
#1	**2**	**Muskingum K:**					**0.011**

STABILITY ANALYSIS
SLURRY IMPOUNDMENT NO. 4

Due to the upstream toe and the primary spillway being at the same elevation, and there being no proposed embankment constructed, no stability analysis was performed.