ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

Assessment of Geotechnical Stability of Residual Voids at Dawson North, Dawson Central and Dawson South Mines

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C O N T E N T S

L I S T O F T A B L E S

L I S T O F F I G U R E S

1. INTRODUCTION

Dr Sue Henderson (RPEQ 4952) of Henderson Geotech Pty Ltd was requested to provide assessment of pit wall geotechnical stability for inclusion in void closure plans for Dawson North, Dawson Central and Dawson South Coal Mines. The work was undertaken in the second half of 2023 and the first half of 2024.

The assessment described in this report was made in accordance with the principles of the DRAFT Guidelines for Assessment of Geotechnically Safe and Stable Post-Mining Landforms (Simmons et al, 2024).

1.1 Limitation

This report has been prepared by Henderson Geotech Pty Ltd for Environmental Resources Management Australia Pty Ltd (ERM) on behalf of Anglo American Steelmaking Coal Pty Ltd (Client) for the purpose of supporting preparation of Progressive Rehabilitation and Closure Plans for Dawson North, Dawson Central and Dawson South Coal Mines. No parties other than the Client and the Department of Environment, Science and Innovation are authorised to rely on this report without the prior written consent of Henderson Geotech Pty Ltd.

This report is, in part, based on information provided by the Client or by other parties on behalf of the Client (Client-supplied information) in addition to data collected by Henderson Geotech Pty Ltd from the public domain. Henderson Geotech Pty Ltd has not always verified the accuracy of such information and makes no representations regarding its accuracy. Henderson Geotech Pty Ltd is not responsible for the consequences of any error or omission in Client-supplied information.

Henderson Geotech Pty Ltd has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same specialist field for projects of a similar nature and at the time and in the jurisdiction where the services were rendered. Henderson Geotech Pty Ltd makes no warranty, express or implied.

The geotechnical stability analyses and assessment described in this report are applicable only to the scenarios and inputs also described herein. A new assessment will be required if there are:

- Non-trivial changes to the location or geometry of the planned residual voids;
- Changes to proposed post-mining land uses of the voids or adjoining lands;
- Substantial changes to the understanding of stratigraphy or geotechnical properties; or
- Substantial changes to the understanding of end-of-mining and long-term groundwater levels or long-term pit lake levels.

2. STATEMENT OF LANDFORM DESIGN INTENT

These assessments of geotechnical stability for residual voids at Dawson North, Dawson Central and Dawson South Mines were undertaken to support the 2024 Progressive Rehabilitation and Closure Plans, to demonstrate that the voids can be rehabilitated as NUMAs that will not adversely impact adjacent grazing, cropping, native ecosystem, and third-party infrastructure PMLUs for at least 50 years.

3. GEOTECHNICAL MODEL

Topographic models of the proposed final landform surfaces provided in December 2023 were examined to identify locations with proposed deepest voids, highest spoil, and void walls close to the diverted Kianga Creek, and also to cover the extent of mining from south to north. The cross-sections subsequently selected for geotechnical stability analysis are listed in Table 3-1.

Table 3-1: Cross-section locations

Section	Void	Northing	Easting start	Easting finish
Dawson South DS1	Pit 28	7240250	200000	202000
Dawson South DS2	Pit 25	7251200	199250	202000
Dawson South DS3	Pit 24	7253950	199250	202000
Pit 1324-1	Pit 19	7260450	199500	204000
Pit 1324-2	Pit 13	7269100	199750	202500
Pit 0312-1	Pit 3-12 south	7271150	198500	202500
Pit 0312-2	Pit 3-12 north	7274000	198500	202500
Pit 02	Pit 2	7283500	199400	202500
Dawson North DN1	Backfilled north	7291300	199750	202750
Dawson North DN2	Northern	7293050	198750	202750

3.1 Strata and Properties

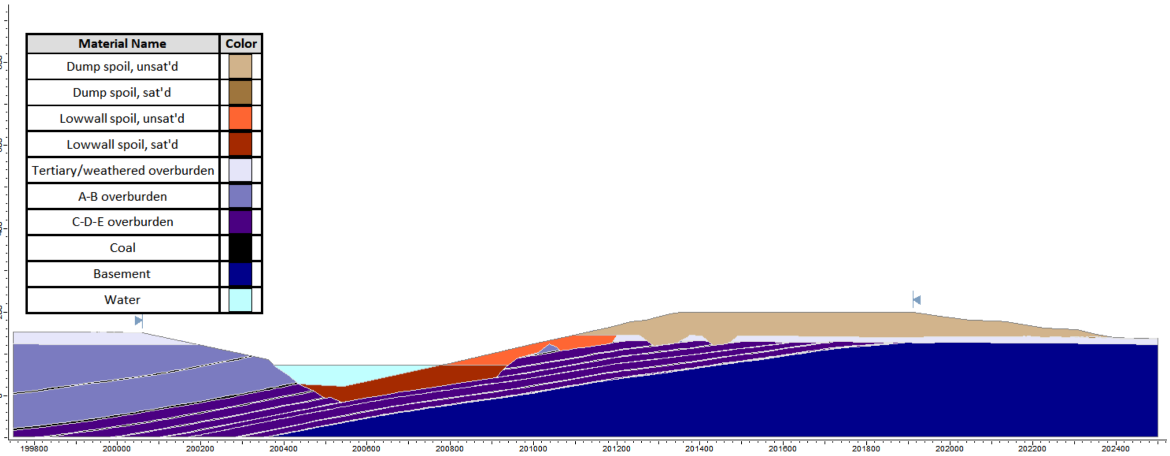
For each cross-section, the Client's geotechnical and geological departments provided base of weathering, and coal seam roofs and floors – all extracted from the site geological model – plus the current mined floor and surface topography. The surface topography and associated end-of-mining pit shells for the final landform, dated December 2023, were provided through ERM.

Strength properties were sourced from Anglo American (2022), Table 2. Some of the selected geological cross-sections showed faulting; where this occurred, an enclosing region was defined and assigned the properties of fault/shear plane material. The properties applied in the geotechnical model are summarised in Table 3-2 and an example of a cross-section set up for stability analysis is included as Figure 3-1.

Table 3-2: Material strength properties

Model Name	Unit weight (kN/m^3)	Cohesion (kPa)	Phi (°)	Anglo American Table 2 Material
Dump spoil, unsaturated	18	20	25	BMA Spoil Cat 1U
Dump spoil, saturated	20	0	18	BMA Spoil Cat 1S
Lowwall spoil, unsaturated	18	45	30	BMA Spoil Cat 2.3U
Lowwall spoil, saturated	20	18	25	BMA Spoil Cat2.3S
Tertiary/weathered overburden	18	30	28	Weathered Tertiary
A-B seams overburden	24	419	35.1	Between Weathered (SW) & Fresh Overburden
C-D-E seams overburden	24	568	36.1	Fresh Overburden
Coal	15	35	30	Coal
Fault zone	24	0	20	Fault/Shear Plane
Basement	24	568	36.1	Fresh Overburden

Figure 3-1: Sample cross-section for analysis



3.2 Groundwater Pressure Model

Piezometric heads for the shallowest aquifer were interpolated from groundwater contour plots in Klohn Krippen Berger (2024a and 2024b) and applied as total head to the western and eastern boundaries of each cross-section. Both reports included plots for end-of mining that were used directly. Contour plots for 100 years after end-of-mining were provided for Dawson Central and North voids and these were used to estimate long-term groundwater conditions. For Dawson South, only contours for end-of-mining and 1000 years later were provided so groundwater heads that were the average of these were used to approximate long-term conditions.

Long-term pit lake water levels, determined by mass void water balance modelling, were provided by ERM on schematics entitled "{number} – Final Landform Water Levels – {pit name}".

Three groundwater scenarios were applied in highwall and lowwall stability analyses for each cross-section, namely:

- dry void at end-of mining with zero pore water pressure at the lowest part of the mined floor;
- void lake at predicted long-term water level; and
- void lake at an interim water level about mid-way between dry (end-of-mining) and the long-term average.

Hydraulic properties were generally adopted from Klohn Krippen Berger (2024a), except as noted in Table 3-3. In particular, the higher permeabilities assumed here for spoil are consistent with its looser, more open, structure but may also reflect the scale difference between regional groundwater modelling and seepage modelling for stability cross-sections.

Table 3-3: Hydraulic properties

Model Name	k_h (m/s)	k_h/k_v	Comment
Dump spoil, unsaturated	3.50e-6	0.25	Vertical permeability lower than for pushed lowwall spoil
Dump spoil, saturated	3.50e-6	0.25	
Lowwall spoil, unsaturated	3.50e-6	0.50	More permeable than Tertiary / weathered overburden
Lowwall spoil, saturated	3.50e-6	0.50	
Tertiary/weathered overburden	2.31e-6	0.10	
A-B seams overburden	1.91e-8	0.10	
C-D-E seams overburden	1.91e-8	0.10	
Coal	2.75e-8	0.10	
Fault zone	1.00e-7	0.50	More permeable than coal
Basement	1.23e-9	0.10	

3.3 Potential Geotechnical Instability Mechanisms

As noted in Section 3.1, faulting was modelled using specific, lower, strength properties. The impact of other minor structures – for example bedding and general jointing – is accommodated in the rock-mass strength parameters. The geological model at the selected cross-sections did not show other major structures. It is possible that such structures might occur at cross-sections not analysed or might not yet have been discovered and incorporated in the geological model; however, any such structures would be encountered during mining operations and managed through pit wall design at that time. Consequently, it is not necessary to address them specifically in the long-term planning phase.

In this context, 2D circular and non-circular slip surfaces were considered appropriate potential failure mechanisms - circular slips are typical of relatively homogeneous spoil and sedimentary rock masses, while non-circular slips might be dictated by changes in material such as coal seams and fault zones in the highwall and endwall, and the pit floor and the saturated spoil interface in the lowwall.

Rainfall runoff over the highwalls and endwalls will be limited by exclusion works and/or flood protection landforms as necessary. The level of geotechnical profile detail available for this assessment did not suggest weak overburden strata overlain by more competent strata that could be susceptible to undercutting. On the lowwall side, rainfall runoff will mainly flow straight down the batters, with vegetation in native ecosystem and agriculture PMLUs limiting the quantity of such runoff. On these bases, it was concluded that erosion is not likely to materially affect long-term geotechnical stability.

The lack of identified major structure also suggests that, within the time frame nominated for this assessment, weathering on highwalls and endwalls is unlikely to penetrate deeply enough to cause geotechnically significant surface fretting. The open porous character of dumped spoil may allow physical weathering, such as slaking, to some depth, however, the associated strength reduction is already accommodated in the provided strength parameters.

The residual voids are either outside the modelled 1:1000 AEP floodplain and/or landforms to prevent inundation to that standard are included in the mine's final landform design. The void water balance modelling covered periods of greater than 150 years. Therefore, the effects of severe hydrological events are managed outside the scope of this geotechnical stability assessment.

3.4 Statement of Model Uncertainty

The stability assessment methodology described in Simmons et al (2024) includes a matrix to consider and score the geotechnical model, based of the quality of input data for various aspects of the model. This subsidiary assessment is included as Appendix A. In summary. the combined geotechnical and groundwater pressure model has a reliability score of 46/100 for pit walls that were completed at least five years ago and 31/100 for all other void walls. Both scores are <50/100 and the model is therefore ranked as High Uncertainty.

4. CONSEQUENCE ASSESSMENT

A consequence assessment, undertaken in accordance with Simmons et al (2024), is included as Appendix B and the outcomes are summarised as follows:

Scenario	Consequence of Geotechnical Instability
Highwall instability that extends to third party infrastructure behind crest	Medium-High
Highwall instability that extends into grazing PMLU behind crest	Medium
Highwall instability that extends creek channels or flood protection structures behind crest	Medium
Highwall instability that extends into native ecosystem PMLU behind crest	Low
Highwall instability that does not extend outside NUMA	Negligible
Lowwall instability that extends into grazing PMLU	Low
Lowwall instability that extends into native ecosystem PMLU	Low
Lowwall instability that does not extend to within 50m PMLU	Negligible

5. DESIGN ACCEPTANCE CRITERIA

Instability along potential slip surfaces is most commonly assessed using limit equilibrium analyses, with results expressed as Factor of Safety. The typical range in factor of safety adopted for slope design is 1.2 to 1.5, with the target value reduced for lower model uncertainty and/or less severe consequences. Based on assessment of the geotechnical model as High Uncertainty and the consequence levels listed in Section 4, the selected minimum factors of safety are set out in Table 5-1.

Table 5-1: Adopted design acceptance criteria

Scenarios	Minimum Factor of Safety
Instability extending into infrastructure or grazing PMLUs	1.50
Instability extending to watercourses or flood protection structures	1.50
Instability extending into native ecosystem PMLU	1.35
Instability contained within NUMA	1.25

6. STABILITY ANALYSES

Two cross-sections have been analysed using Slide2 Modeler, 2D Limit Equilibrium Analysis for Slopes. For the first cross-section – Pit 3-12 south – the lowwall was analysed using three analytical methods, namely:

- Spencer, Vertical Slices, Circular Surfaces with Auto Refine Search – suitable for homogenous materials and profiles without frequent interfaces;
- Sarma, Vertical Slices, Non-Circular Surfaces with Auto Refine Search – suitable for layered profiles where materials have strongly contrasted strength properties; and
- Sarma, Vertical Slices, Non-Circular Surfaces with Block Search – used to force the minimum factor of safety search routine to follow a narrow band of weaker material

The results of all analyses undertaken are included in Appendix C. For Pit 3-12 south lowwall, the analytical methods with auto refine search produced the same results and very similar slip surfaces, while the block search method produced the same or higher minimum factors of safety. On these bases, it was concluded that the Spencer circular method is sufficient for lowwall stability analysis going forward.

Only Sarma methods were used for the highwalls, to accommodate the interbedding of overburden, interburden and coal seams. In the two highwall sections analysed, the minimum factor of safety occurred in spoil backfill at the base of the final landform highwall, rather than through intact rock. The block search was used to force slip surfaces through coal seams, but this resulted in higher minimum factors of safety because the coal seams dip into the wall and therefore do not generally contribute to geotechnical instability. If a particular profile included faults dipping toward the void, the block search method might be advisable but otherwise, the auto-refine search for non-circular slip surfaces is considered sufficient for stability assessment.

The results of stability analyses undertaken are summarised in Table 6-1. All minimum factors of safety were greater than 1.5, which is the most stringent design acceptance criterion in Table 5-1. Consequently, it was not necessary consider whether each critical slip surface was contained within the void NUMA or extended into an adjoining PMLU. That is, all cases analysed met the required design acceptance criteria.

Table 6-1: Results of stability analyses

Location & Scenario	Minimum Factor of Safety
Pit 3-12 south lowwall	
Dry void	2.48
Intermediate pit lake	2.12
Long-term pit lake	2.10
Pit 3-12 south highwall	
Dry void	2.37
Intermediate pit lake	1.57
Long-term pit lake	1.86
Pit 25 lowwall	
Dry void	3.62
Intermediate pit lake	2.99
Long-term pit lake	2.93
Pit 25 highwall	
Dry void	3.12
Intermediate pit lake	2.12
Long-term pit lake	2.42

7. CONCLUSIONS

Cross-sections for the southern end of Pit 3-12 (Dawson Central) and Pit 25 (Dawson South), with the final landform and prime mined surfaces provided in December 2023, showed acceptable long-term geotechnical stability for the proposed post-mining land uses.

Other locations may have different geometry, faulting behind the highwall and/or different predicted long-term pit lake levels. These factors could affect geotechnical stability and therefore cross-sections at other locations should also be analysed.

8. REFERENCES

Anglo American, April 2022, Geotechnical Guidelines for Mine Planning Dawson Mine Version 2, internal document.

Klohn Krippen Berger, March 2024a, Dawson Central and North Progressive Rehabilitation and Closure Plan Groundwater Modelling Report Draft.

Klohn Krippen Berger, March 2024b, Dawson South EA Amendment Groundwater Impact Assessment Report Final.

Simmons J, Henderson S and Kennedy G, January 2024, Guidelines for Assessment of Geotechnically Safe and Stable Post-Mining Landforms, draft C34028 project report submitted to ACARP.

APPENDIX A MODEL RELIABILITY STATEMENT

Model Element	**Max.**		**Uncertainty Level**	**and Weighting**		**Score**
	Score	Introductory	High	Medium	Low	
		0.0	0.2	0.5	1.0	
Strata & landform profile information	10	Basic surfaces with unreliable or absent data	Assessment based on 'typical' regional conditions.	Geological surfaces extracted from site geological model.	Use of information such as drill logs and field mapping to define sub geotechnical units within broader geological units.	5
Structural Model	8	No information	Structure assumed typical of the region	Structure broadly understood from observation and experience at the site	Either no dominant structure OR structure well understood from mapping and drilling	4
Strata Complexity	8	No information	Strata or structure are highly variable with distance OR properties are greatly affected by moisture content.	Strata and structure do not vary rapidly with distance, AND properties not greatly affected by moisture content changes.	Strata quite uniform in thickness and properties AND structure clearly defines slip surfaces	1.6
Strength Properties	10	No information	Derived from published data for the material classifications, without specific regional data.	Derived from tests on key strata sampled from sites within the region.	Derived from site specific tests on key strata	5
Deformation Properties	4	No information, or not considered in stability assessment	Derived from published data for the material classifications, without specific regional data.	Derived from tests on key strata sampled from sites within the region.	Derived from site specific tests on key strata	0

Groundwater Pressure Model	20	No site measurements; conceptual hydrogeological assessment only	Pre-mining groundwater study OR sensitivity analyses included in stability analyses	>2 years measurement for site groundwater network, with interpretation	>2 years measurement of at least 2 piezometers at the slope in question, with associated groundwater analysis	10
Method of Analysis	10	No quantitative analyses	Able to accurately represent the failure mechanism BUT there is limited industry experience interpreting the results	Able to approximately represent the failure mechanism AND there is wide industry experience in interpreting the results	Able to accurately represent the failure mechanism AND there is wide industry experience in interpreting the results	5
Reported field performance observations	30	<2 years visual observation ***for pits not yet mined***	2-5 years visual observation	>5 years visual observation or > 2 years movement measurement ***for existing voids***	> 5 years movement measurement	0 or 15

TOTAL = 31 or 46

Rating	**Ranking**	**Safety and Stability Implications**
80 - 100	Low Uncertainty	Risk management to an ALARP standard is possible with due allowances for model elements ranked as medium or high uncertainty level
50 - 79	Medium Uncertainty	Risk management to an ALARP standard may not be possible without some combination of improvements to the model, significant increases in design acceptance criteria, or uncertainty allowances in observational stability acceptance criteria
< 50	High Uncertainty	Risk management to an ALARP standard is not likely to be possible. Assessment must be qualified accordingly, or significant improvements made to the model, significant increases in design acceptance criteria, or uncertainty allowances in observational acceptance criteria prior to finalising assessment.

APPENDIX B CONSEQUENCE CATEGORY ASSESSMENT

Consequence Category Levels and Thresholds

	N/A or Negligible	Low	Medium	High
Harm to Humans				
	People are not routinely present in the impacted area or only injuries requiring first aid are likely	Loss of life is not expected and only short-term disabling injuries are expected.	Single loss of life or long-term disabling injuries are expected	Multiple loss of life expected
Environmental Harm				
	Minor, temporary impact to the environment	Measurable impact to an area ≤ 1km^2; where remediation of damage is likely to take ≤ 1 year	Impact to an area ≤ 5km^2; where remediation of damage is likely to take ≤ 5 years	Impact to an area > 5km^2; where remediation of damage is likely to take > 5 years
Property Loss & Damage				
	Minor, temporary community impact that recovers with little intervention; Damage to property or compensation or repair costs < $0.5M	Measurable but limited community impact lasting less than six months; Damage to property or compensation or repair costs $0.5M - $10M	Serious impact on community lasting up to 12 months; Damage to property or compensation or repair costs $10M - $50M	Severe impact on community lasting more than 12 months; Damage to property or compensation or repair costs > $50M

Assessment for Dawson Mines Highwall / Endwall

Extent of Instability *(length or area affected)*	**Exposure** *(people, ecosystems & property within extent)*	**Harm to Humans**		**Environmental Harm**		**Property Loss & Damage**	
		Impacts	***Cat.***	***Impacts***	***Cat.***	***Impacts***	***Cat.***
Crest Zone							
Native ecosystem PMLU	People will not routinely access the area	People not routinely present	Negl.	Measurable impact to area <1km^2 Stabilisation work to encourage re-establishment of vegetation would take <1year	**Low**	No repair or compensation costs	Negl.
Grazing PMLU	A small number of people likely to access the area due to cattle grazing operations Property such as fencing and water troughs may be present	Single loss of life or long-term disabling injuries are possible	**Medium**	Measurable impact to area <1km^2 Stabilisation work to encourage re-establishment of grassland would take <1year	Low	Costs to replace damage property expected to be <$0.5M	Negl.
Third party infrastructure	Several people likely to access the area. Property such as buildings and equipment are present.	Multiple loss of life not expected but possible.	**Medium -High**	Minimal environmental values around infrastructure	Negl.	Damage to property or compensation or repair costs < $10M	Low
Kianga Creek	People will not routinely access the area	People not routinely present	Negl.	Measurable impact to area <1km^2 Repair work including to re-establish vegetation would take >1year	**Medium**	Damage to property or compensation or repair costs $0.5M - $10M	Low
Body of Slope							
Within NUMA	People will not routinely access the slope No property on slope	People not routinely present	Negl.	Minor impact to the environment	Negl.	No repair or compensation costs	Negl.

Extent of Instability *(length or area affected)*	Exposure *(people, ecosystems & property within extent)*	Harm to Humans		Environmental Harm		Property Loss & Damage	
		Impacts	***Cat.***	***Impacts***	***Cat.***	***Impacts***	***Cat.***
Toe Zone							
Within NUMA	People will not routinely access NUMA Low value habitat in pit lake No property in NUMA	People not routinely present	Negl.	Minor impact to the environment	Negl.	No repair or compensation costs	Negl.

Negligible consequence for geotechnical instability contained within NUMA

Low consequence for geotechnical instability that extends into Native Ecosystem

Medium consequence for geotechnical instability that extends into Agricultural land or to Kianga Creek

Medium-High consequence for geotechnical instability that extends into land containing third party infrastructure

Assessment for Dawson Mines Lowwall

Extent of Instability *(length or area affected)*	**Exposure** *(people, ecosystems & property within extent)*	**Harm to Humans**		**Environmental Harm**		**Property Loss & Damage**	
		Impacts	***Cat.***	***Impacts***	***Cat.***	***Impacts***	***Cat.***
Crest Zone							
Native ecosystem PMLU	People will not routinely access the area	People not routinely present	Negl.	Measurable impact to area <1km^2 Stabilisation work to encourage re-establishment of vegetation would take <1year	**Low**	No repair or compensation costs	Negl.
Grazing PMLU	A small number of people likely to access the area due to cattle grazing operations Grassland habitat with some shade trees, suitable for managed grazing Property such as fencing and water troughs may be present	Only short-term disabling injuries expected	**Low**	Measurable impact to area <1km^2 Stabilisation work to encourage re-establishment of grassland would take <1year	Low	Costs to replace damage property expected to be <$0.5M	Negl.
Body of Slope							
Native ecosystem PMLU	People will not routinely access the area	People not routinely present	Negl.	Measurable impact to area <1km^2 Stabilisation work to encourage re-establishment of vegetation would take <1year	**Low**	No repair or compensation costs	Negl.
Within NUMA	People will not routinely access NUMA Low value habitat on slope No property in NUMA	People not routinely present	Negl.	Minor impact to the environment	Negl	No repair or compensation costs	Negl.

Extent of Instability *(length or area affected)*	Exposure *(people, ecosystems & property within extent)*	Harm to Humans		Environmental Harm		Property Loss & Damage	
		Impacts	***Cat.***	***Impacts***	***Cat.***	***Impacts***	***Cat.***
Toe Zone							
Within NUMA	People will not routinely access NUMA Low value habitat in pit lake No property in NUMA	People not routinely present	Negl.	Minor impact to the environment	Negl.	No repair or compensation costs	Negl.

Negligible consequence for geotechnical instability in NUMA

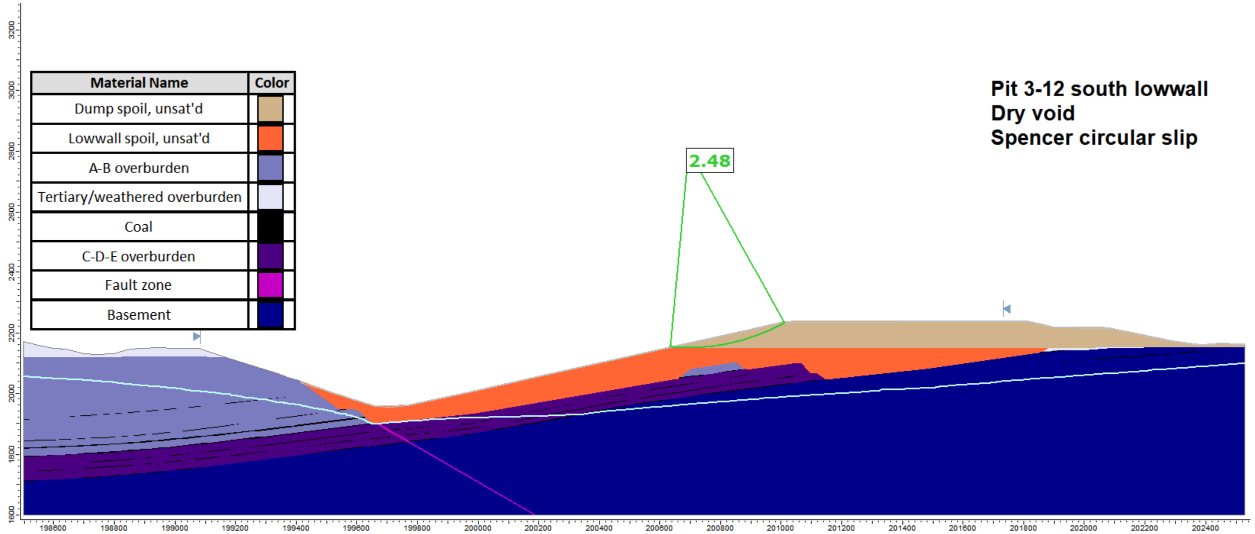
Low consequence for geotechnical instability that extends into Native Ecosystem or Agricultural Land

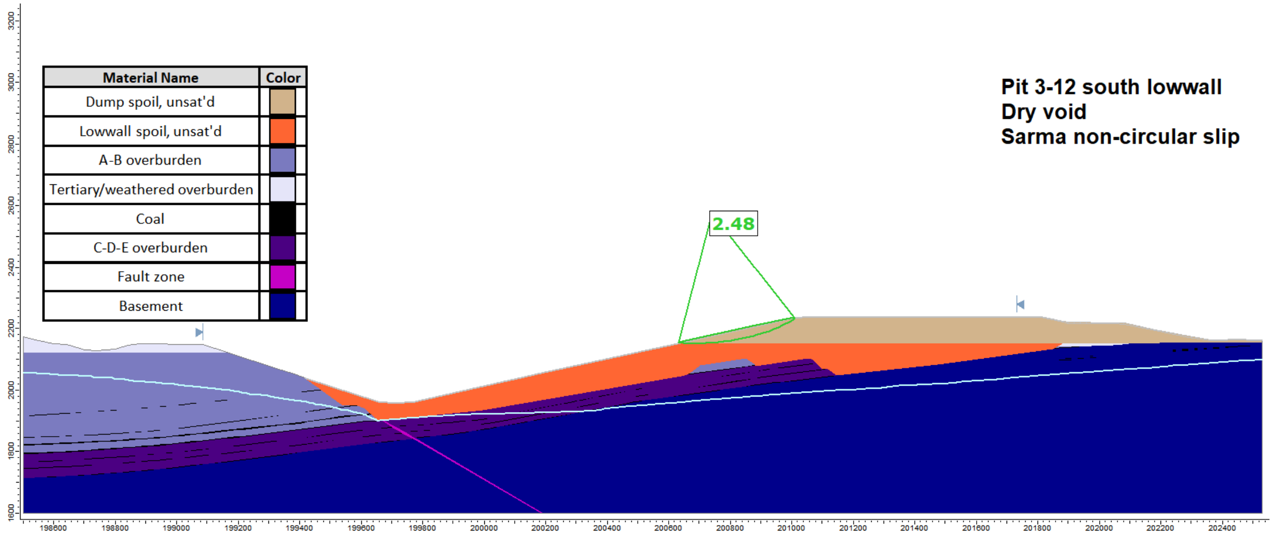
APPENDIX C STABILITY ANALYSES

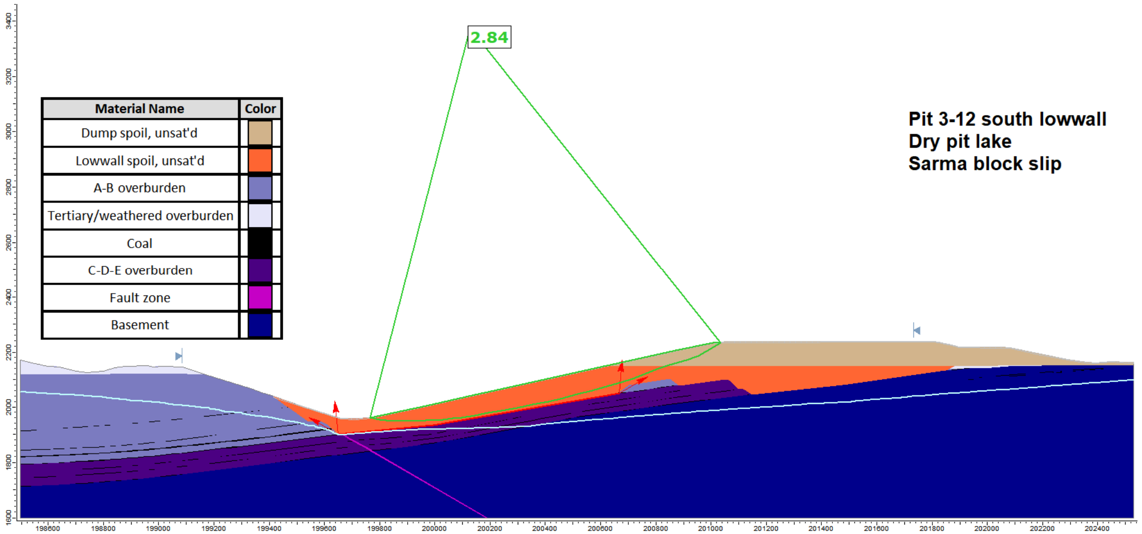
Factors of Safety from Analyses

Void	Location	Scenario	Spencer circular	Sarma non-circular	Sarma block
Pit 3-12 south	lowwall	dry void	2.48	2.48	2.84
		intermediate pit lake	2.12	2.12	2.12
		long-term pit lake	2.10	2.10	2.10
Pit 3-12 south	highwall	dry void		2.37	3.07
		intermediate pit lake		1.57	2.38
		long-term pit lake		1.86	2.59
Pit 25	lowwall	dry void	3.62		
		intermediate pit lake	2.99		
		long-term pit lake	2.93		
Pit 25	highwall	dry void		3.12	3.83
		intermediate pit lake		2.12	2.93
		long-term pit lake		2.42	2.99

Pit 3-12 south lowwall






Material Name
Color
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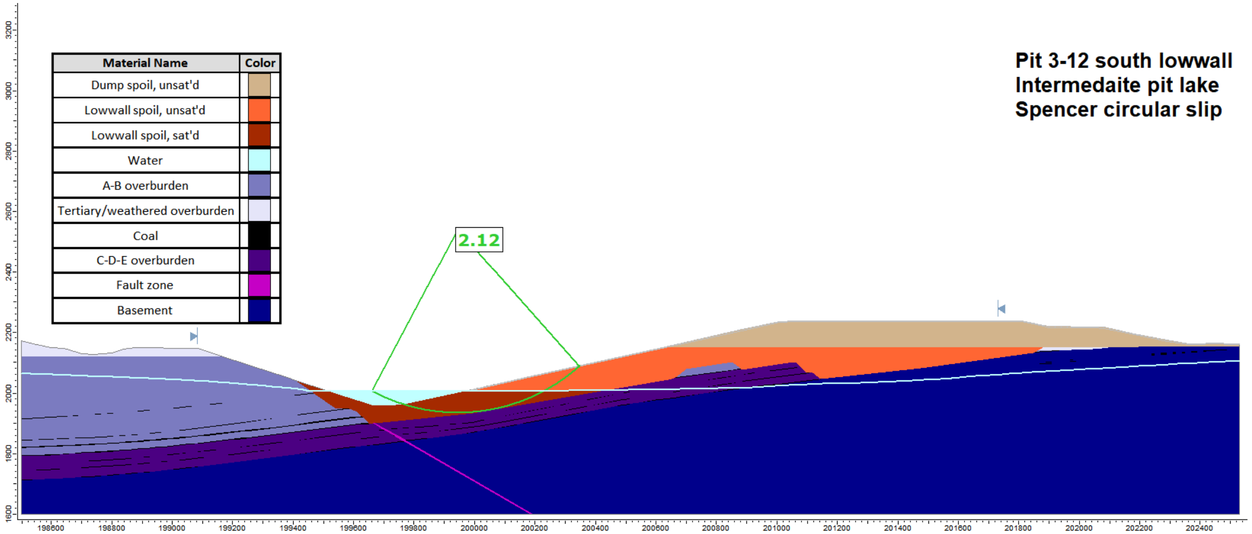
Lowwall spoil, unsat'd
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
2.84
Pit 3-12 south lowwall
Dry pit lake
Sarma block slip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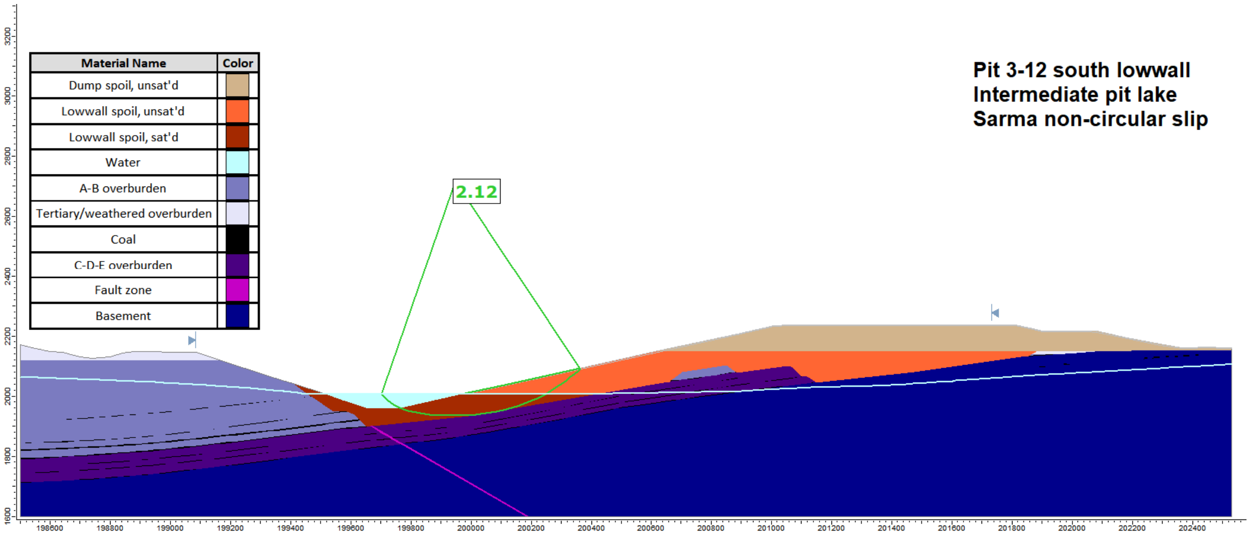
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
2.12
Pit 3-12 south lowwall
Intermedaite pit lake
Spencer circular slip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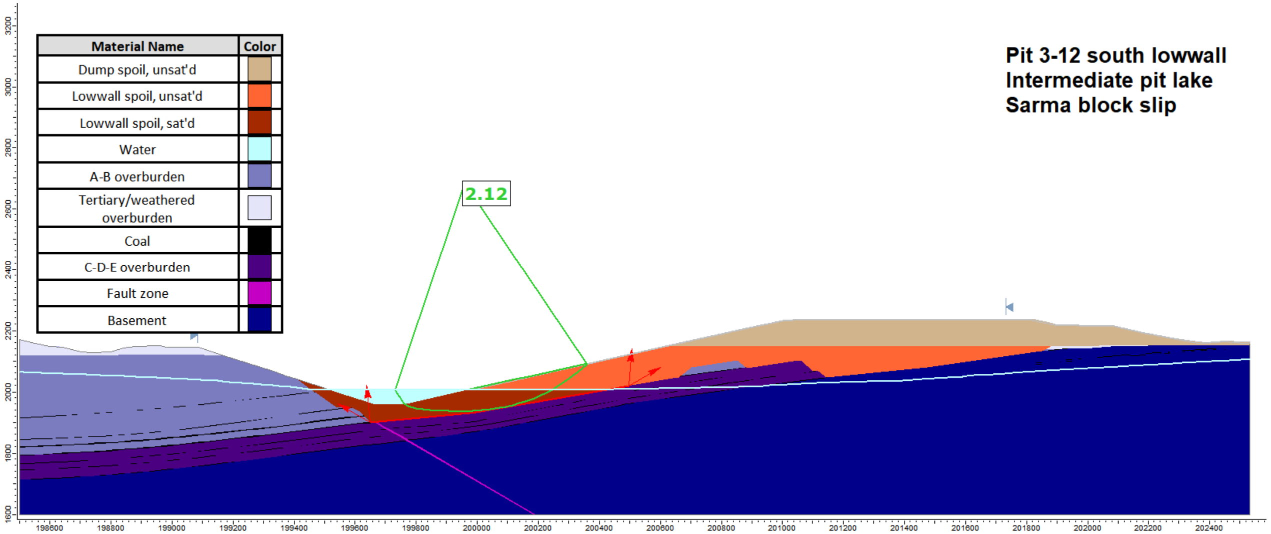
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
2.12
Pit 3-12 south lowwall
Intermediate pit lake
Sarma non-circular slip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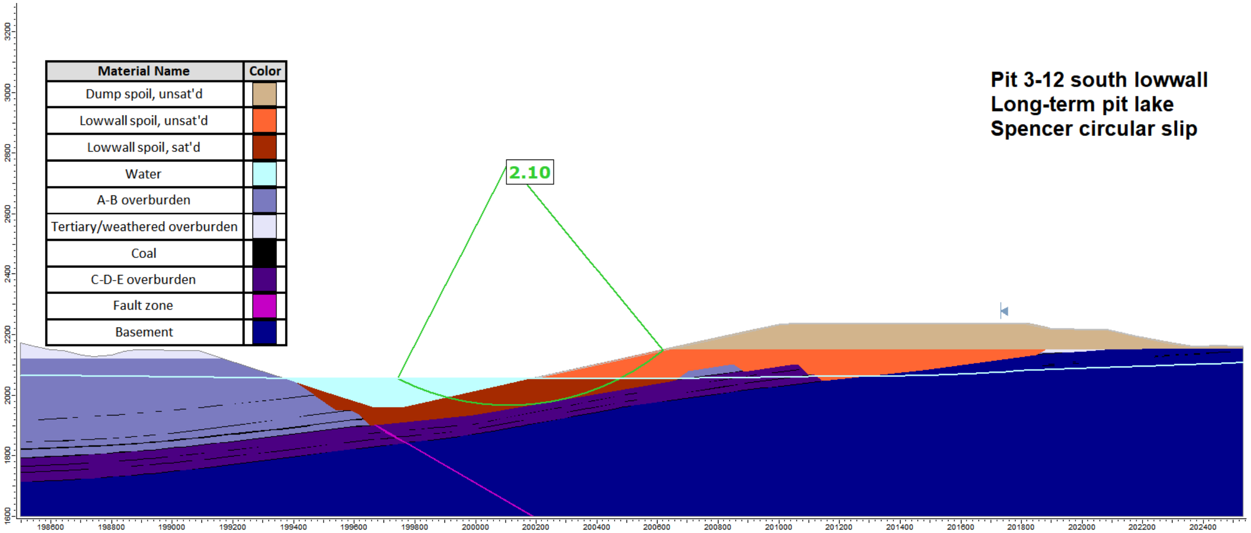
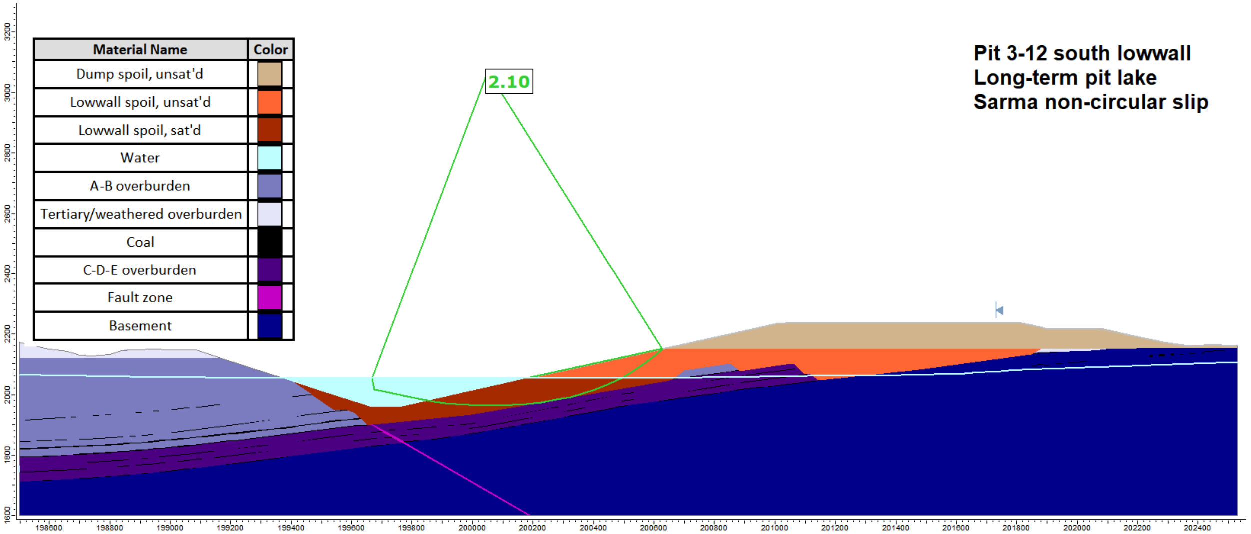
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
2.12
Pit 3-12 south lowwall
Intermediate pit lake
Sarma block slip


Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
Pit 3-12 south lowwall
Long-term pit lake
Spencer circular slip
2.10


Material Name
Color
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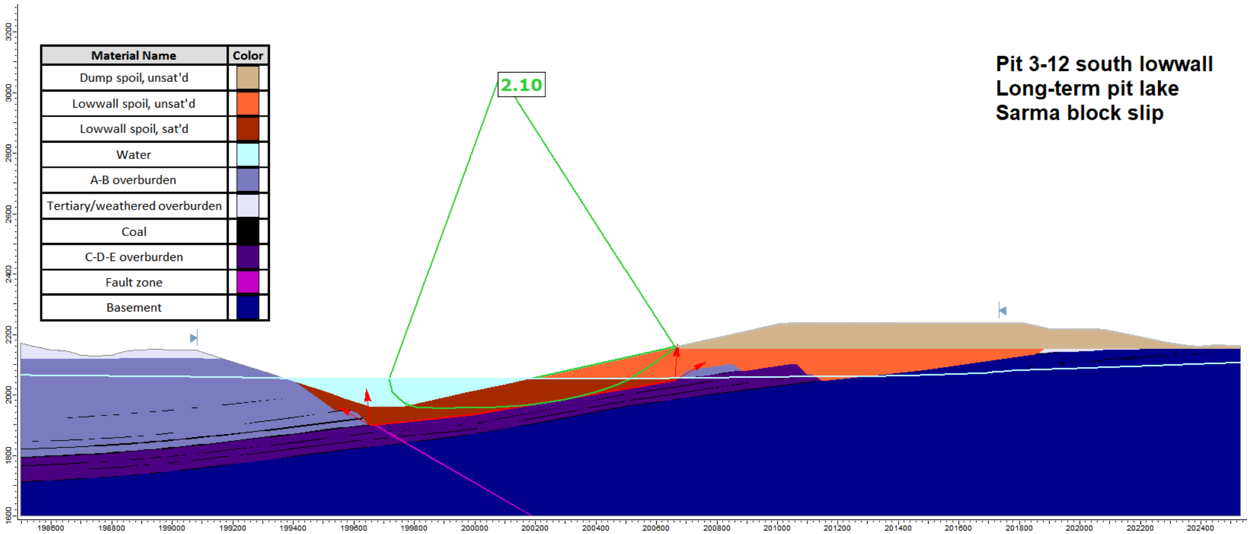
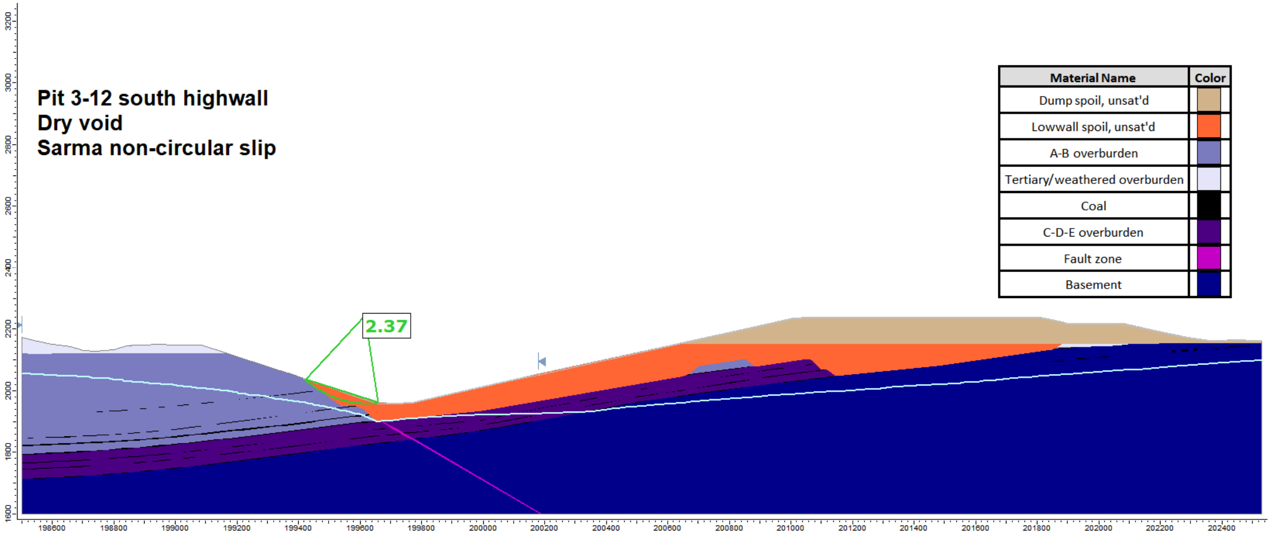
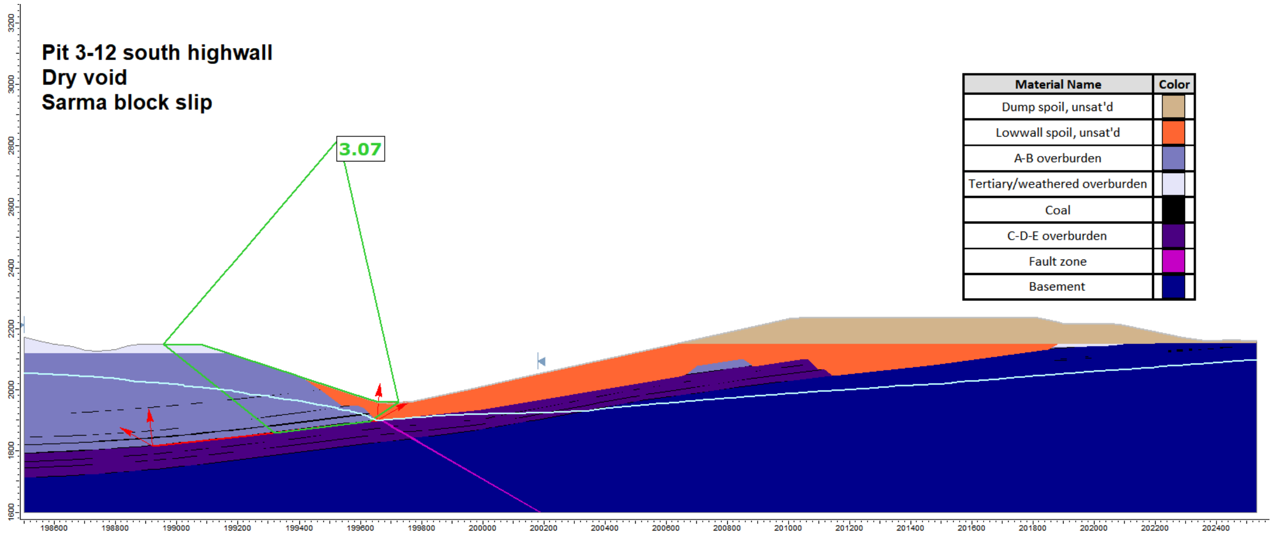
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement
Pit 3-12 south lowwall
Long-term pit lake
Sarma non-circular slip
2.10

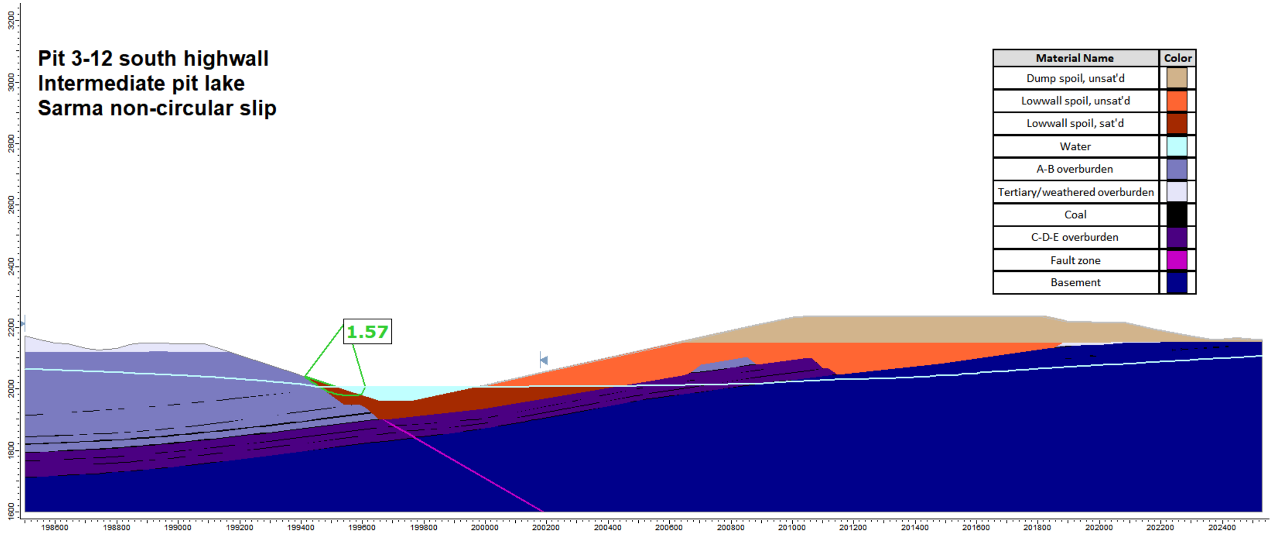


Pit 3-12 south highwall

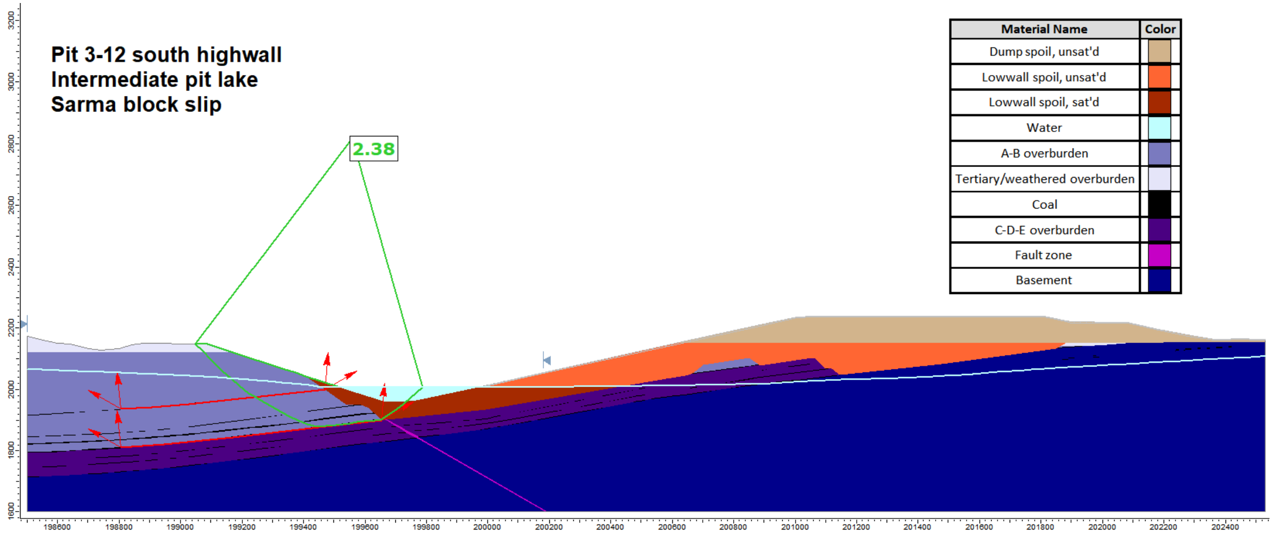


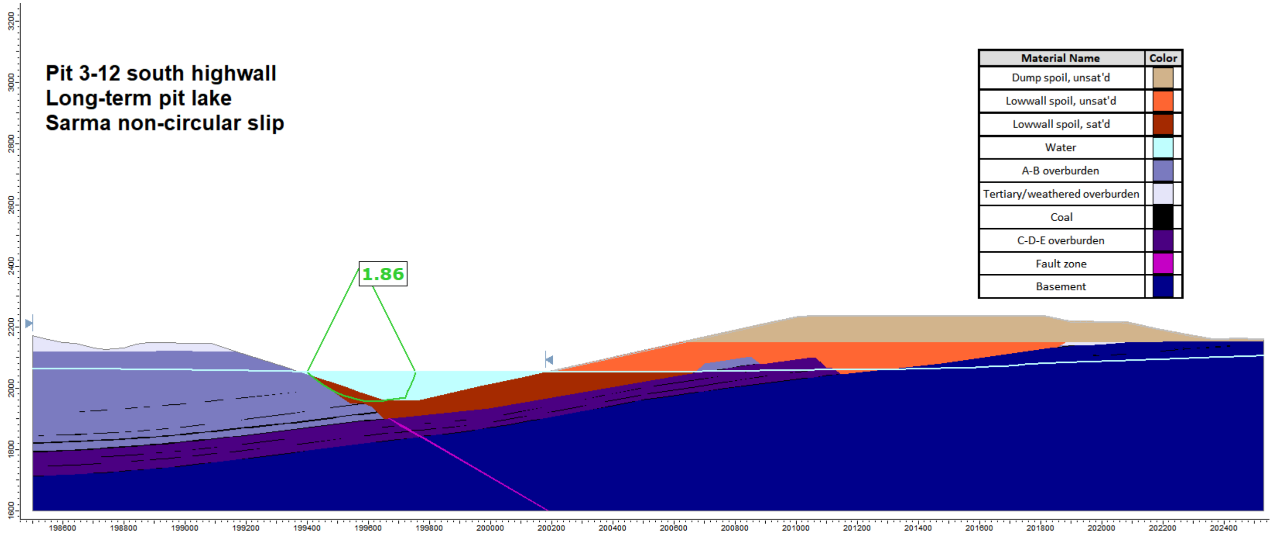


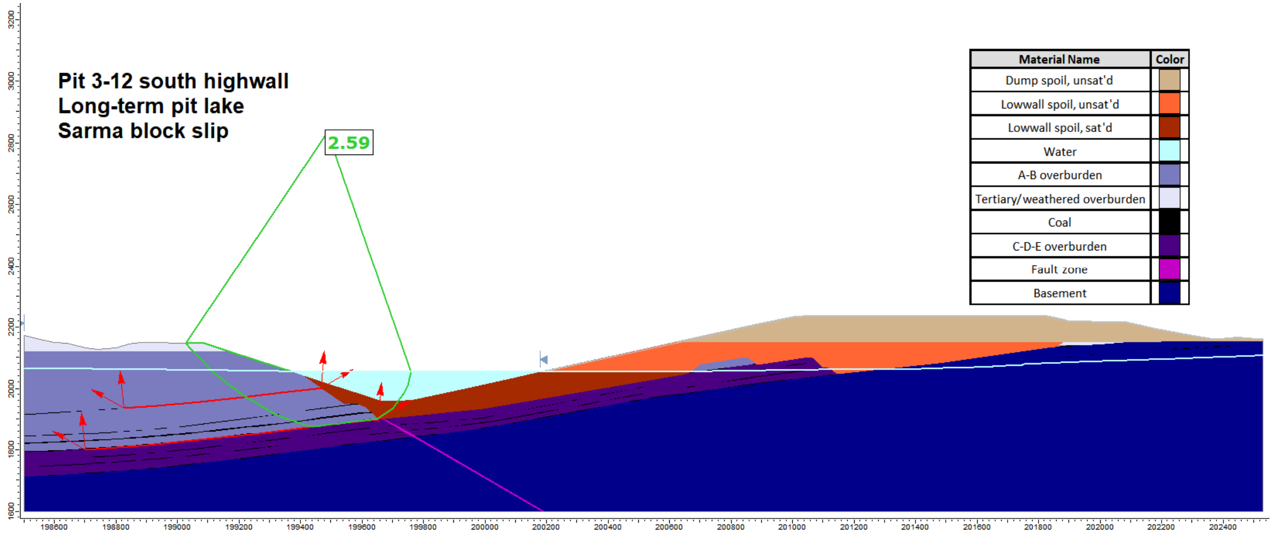
Pit 3-12 south highwall
Dry void
Sarma block slip
3.07
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement



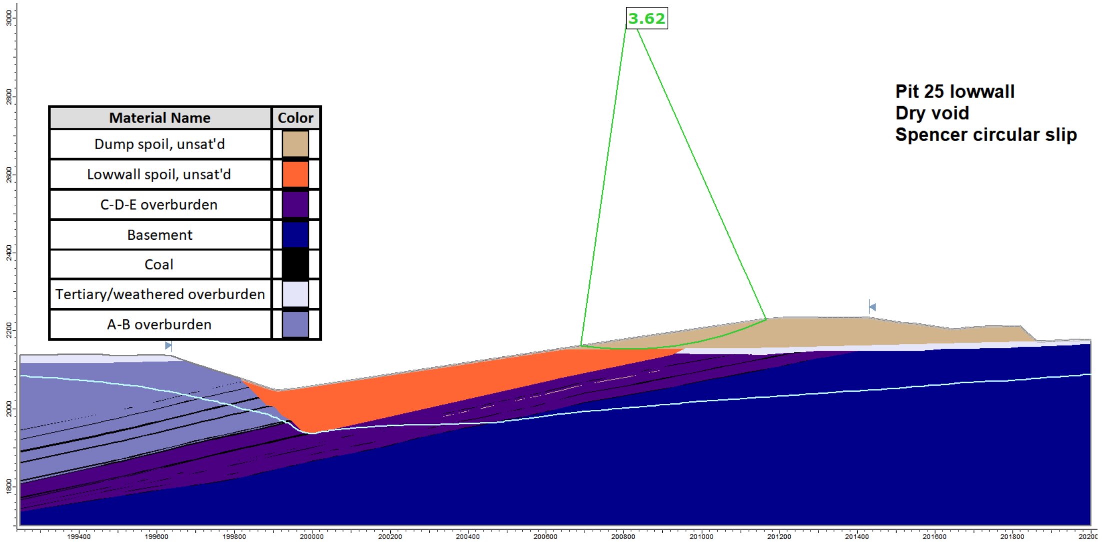
Pit 3-12 south highwall
Intermediate pit lake
Sarma non-circular slip
1.57
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement

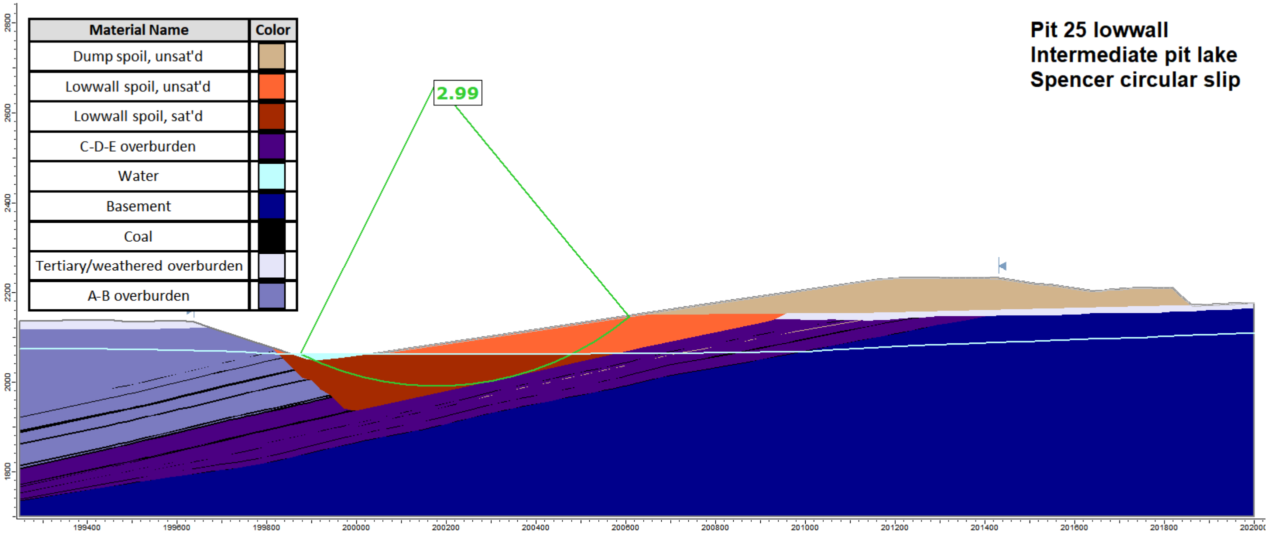

Pit 3-12 south highwall
Intermediate pit lake
Sarma block slip
2.38
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement

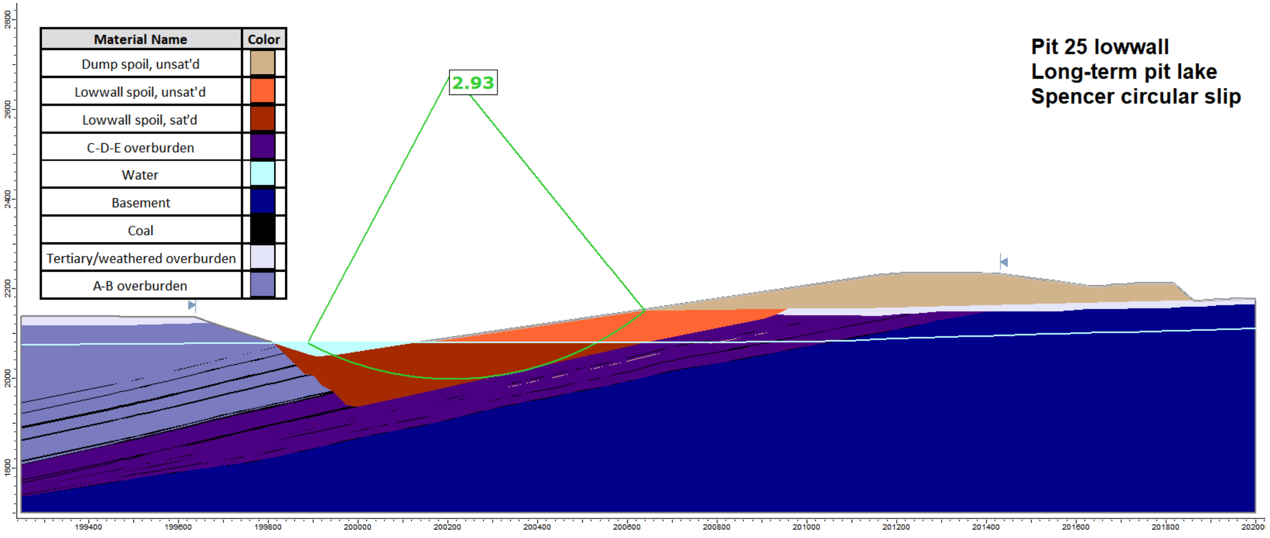

Pit 3-12 south highwall
Long-term pit lake
Sarma non-circular slip
1.86
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
Water
A-B overburden
Tertiary/weathered overburden
Coal
C-D-E overburden
Fault zone
Basement



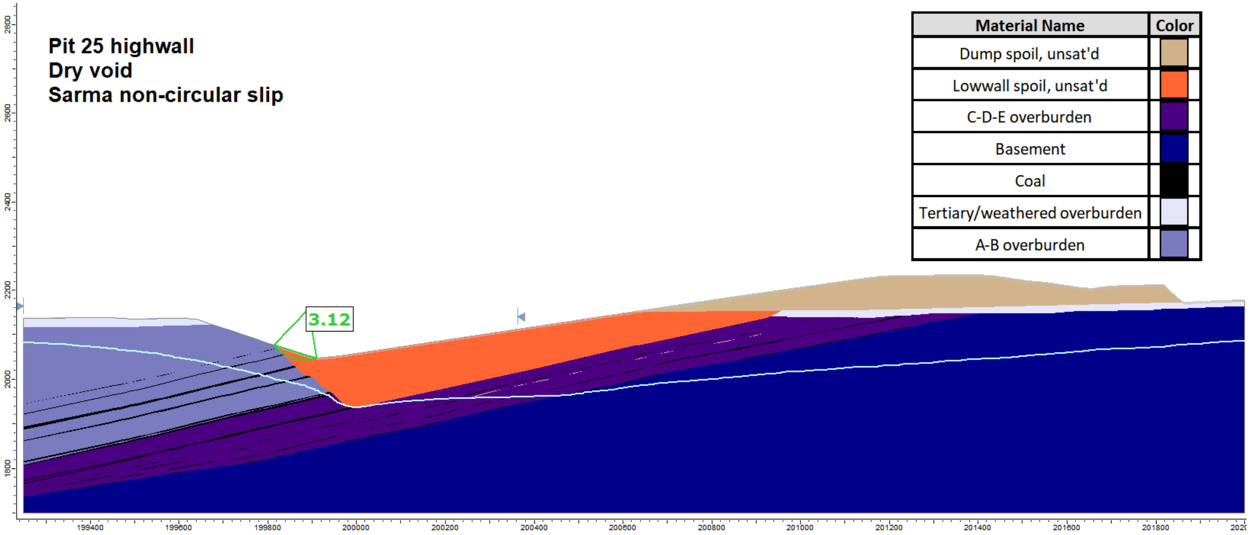
Pit 25 lowwall

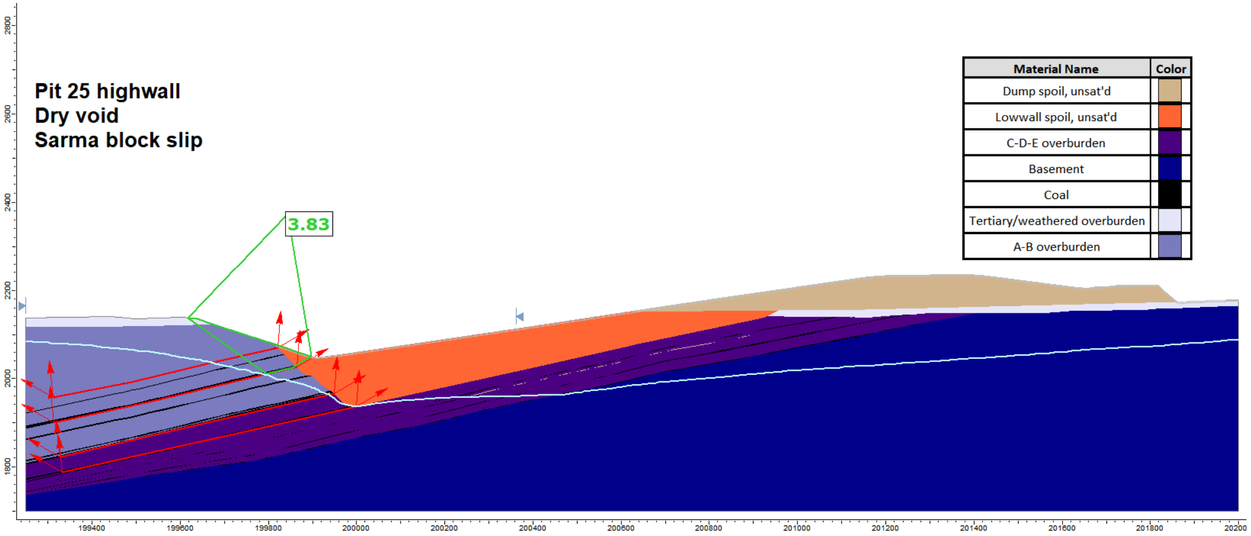


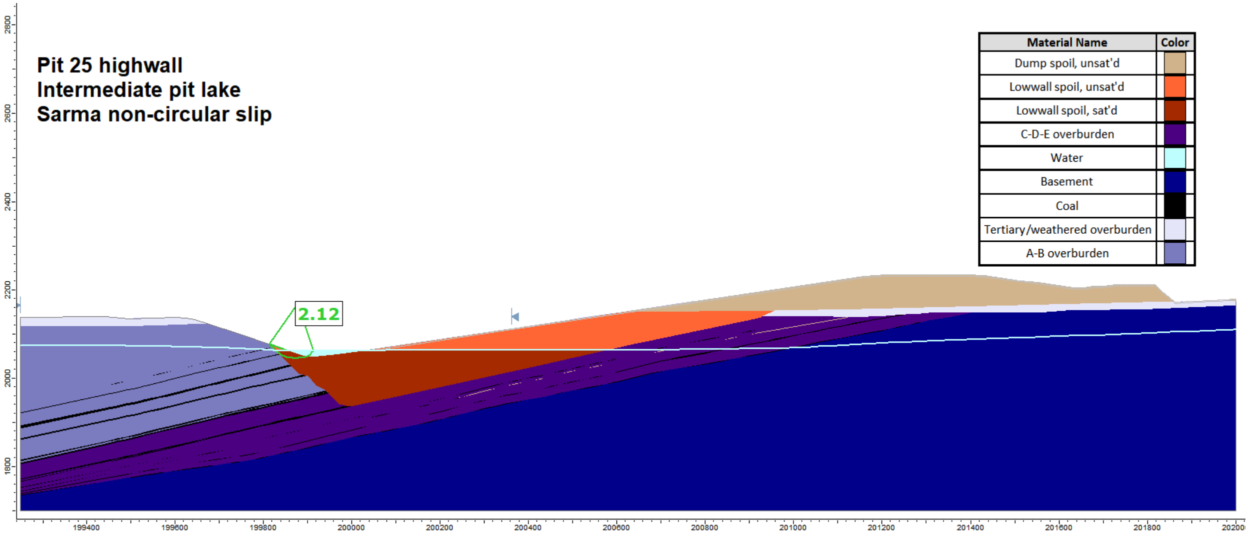

Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden
2.99
Pit 25 lowwall
Intermediate pit lake
Spencer circular slip

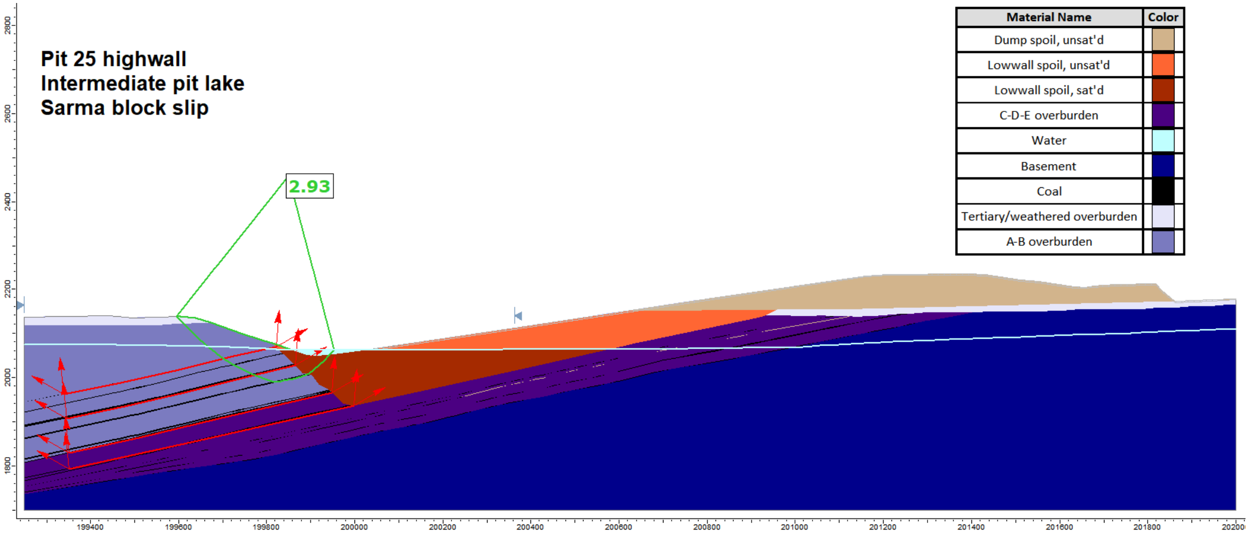

Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden
2.93
Pit 25 lowwall
Long-term pit lake
Spencer circular slip

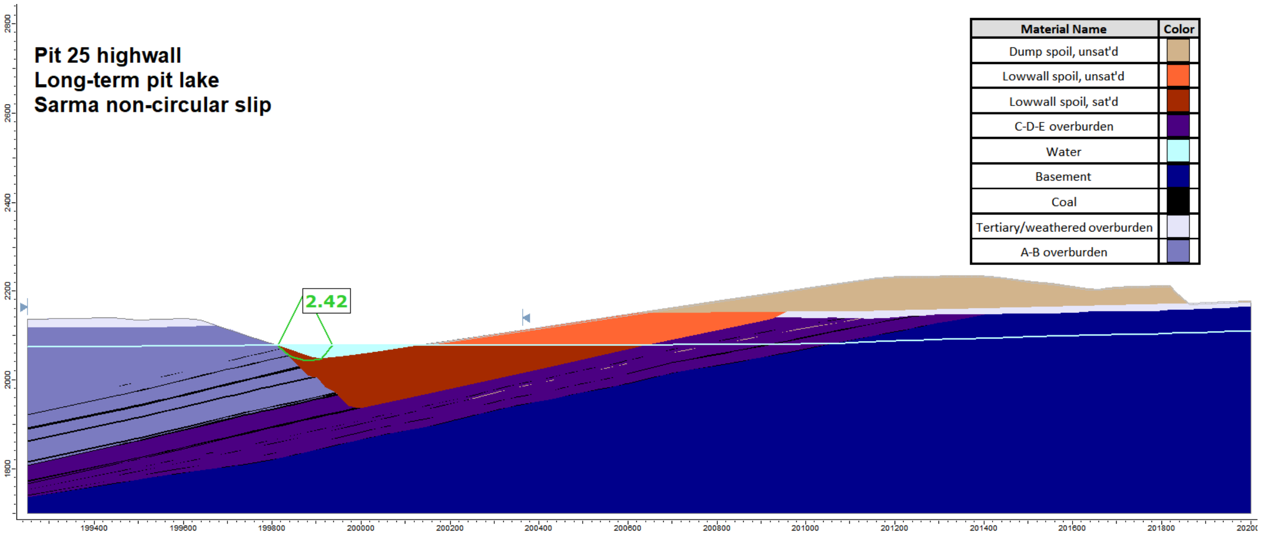
Pit 3-12 south highwall

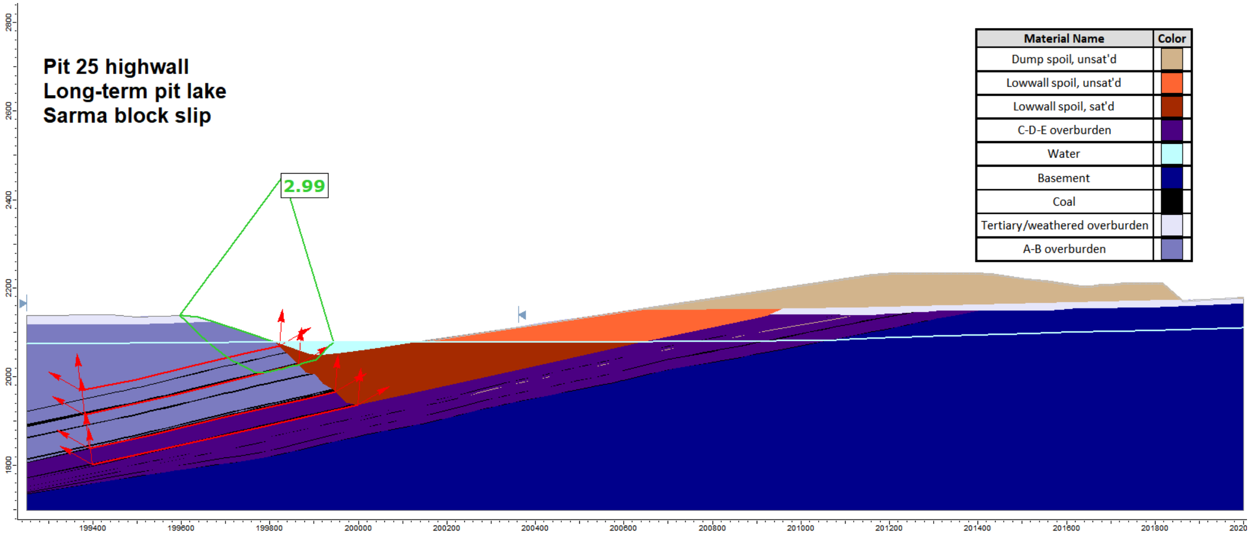





Pit 25 highwall
Intermediate pit lake
Sarma non-circular slip
2.12
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden


Pit 25 highwall
Intermediate pit lake
Sarma block slip
2.93
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden


Pit 25 highwall
Long-term pit lake
Sarma non-circular slip
2.42
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden


Pit 25 highwall
Long-term pit lake
Sarma block slip
2.99
Material Name
Color
Dump spoil, unsat'd
Lowwall spoil, unsat'd
Lowwall spoil, sat'd
C-D-E overburden
Water
Basement
Coal
Tertiary/weathered overburden
A-B overburden