



Optimization of Haulage and Regional Pillars Placement at Dishaba Mine Using Integrated Numerical Modelling

June 2026

Internal

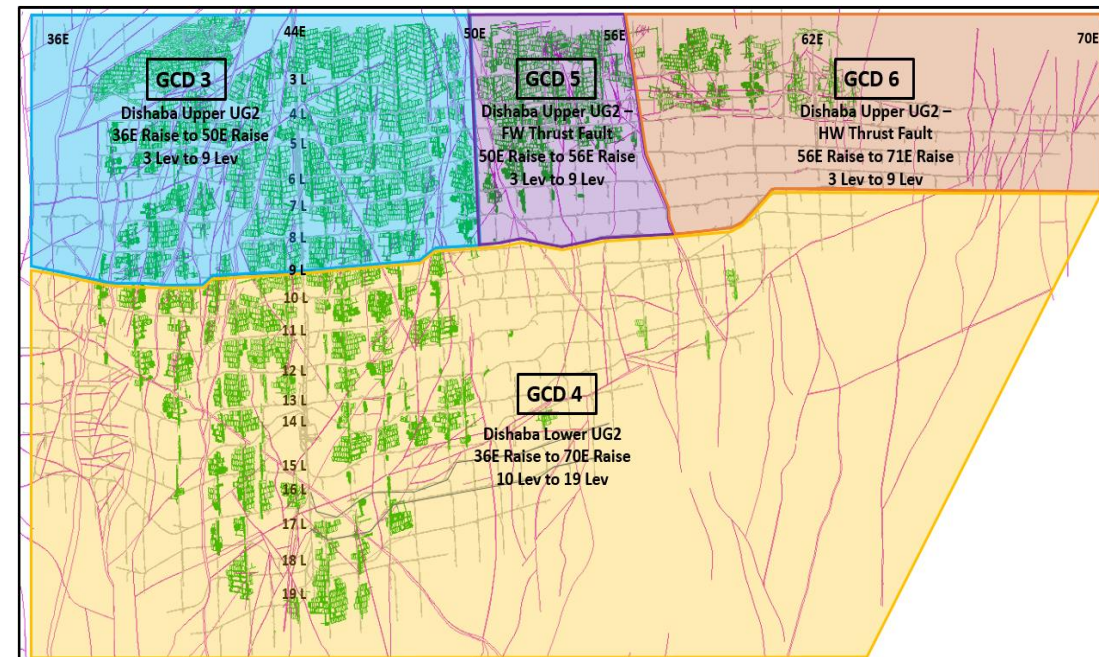
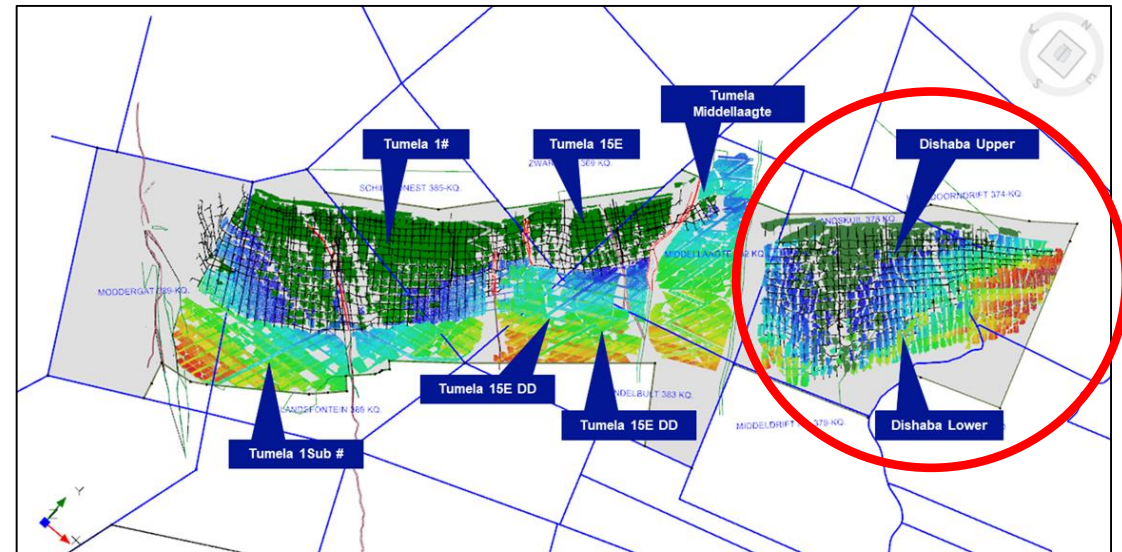


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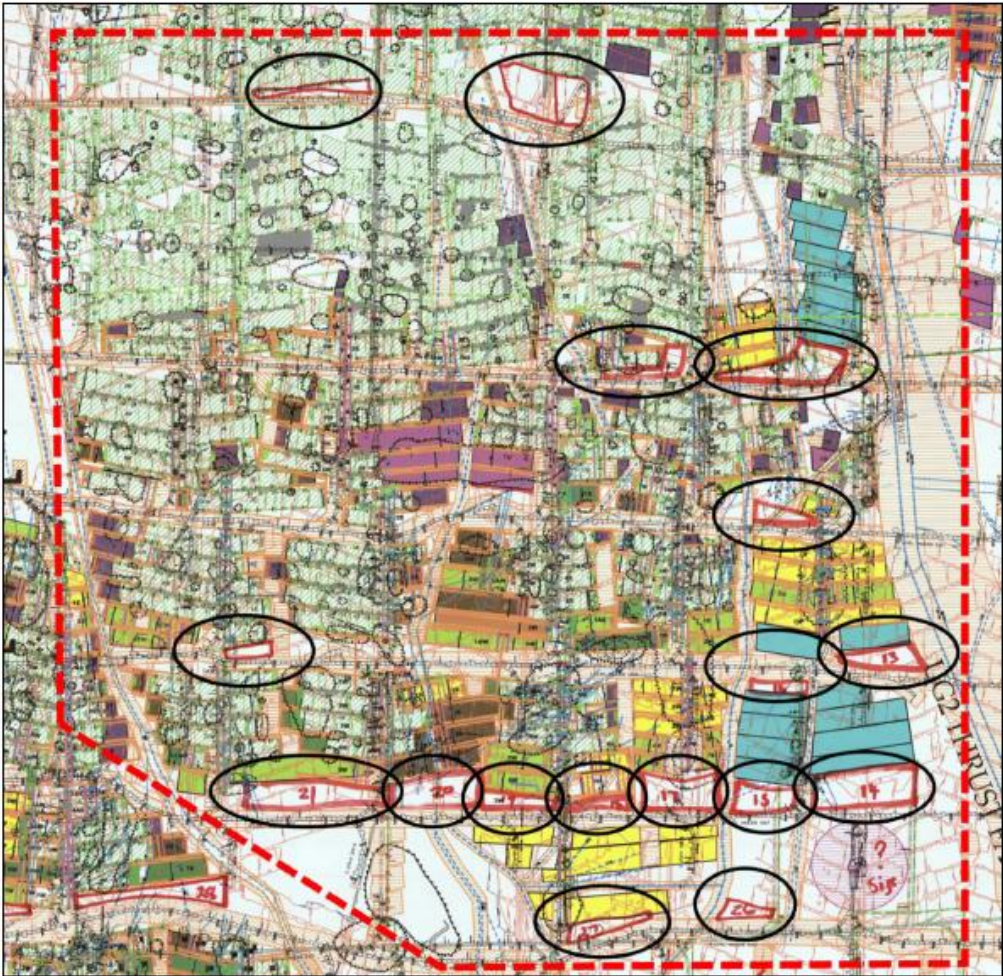
Introduction

- PGM Mine; Primarily extracting a tabular narrow UG2 reef.
- Initial extraction was Merensky focused.
- Original haulage infrastructure set-up for Merensky extraction.
 - Haulages sited close to UG2 reef.
- Intersected by multiple major geological structures.
- UG2 channel of $\pm 1.6\text{m}$, reef dip of $\pm 18^\circ$ towards SE, Strike along SW-NE.
- UG2 to Merensky middling of 35m-40m, a middling of around 20m has been recorded in some areas.
- Mining depth of up to 1000m below surface.
- Dishaba is Structurally Complex.



Historical Constraints (Problem Definition)

- Mine originally designed around a theoretical extraction ratio of ~82%.
- Over three decades, actual extraction averaged only 45– 55% due to:
 - ❖ Geological structures and geological losses
 - ❖ Mining practicalities associated with breast mining layouts and haulage protection pillars.
 - ❖ Historical ground support limitations that resulted in white blocks being left behind (no mesh or TCs)

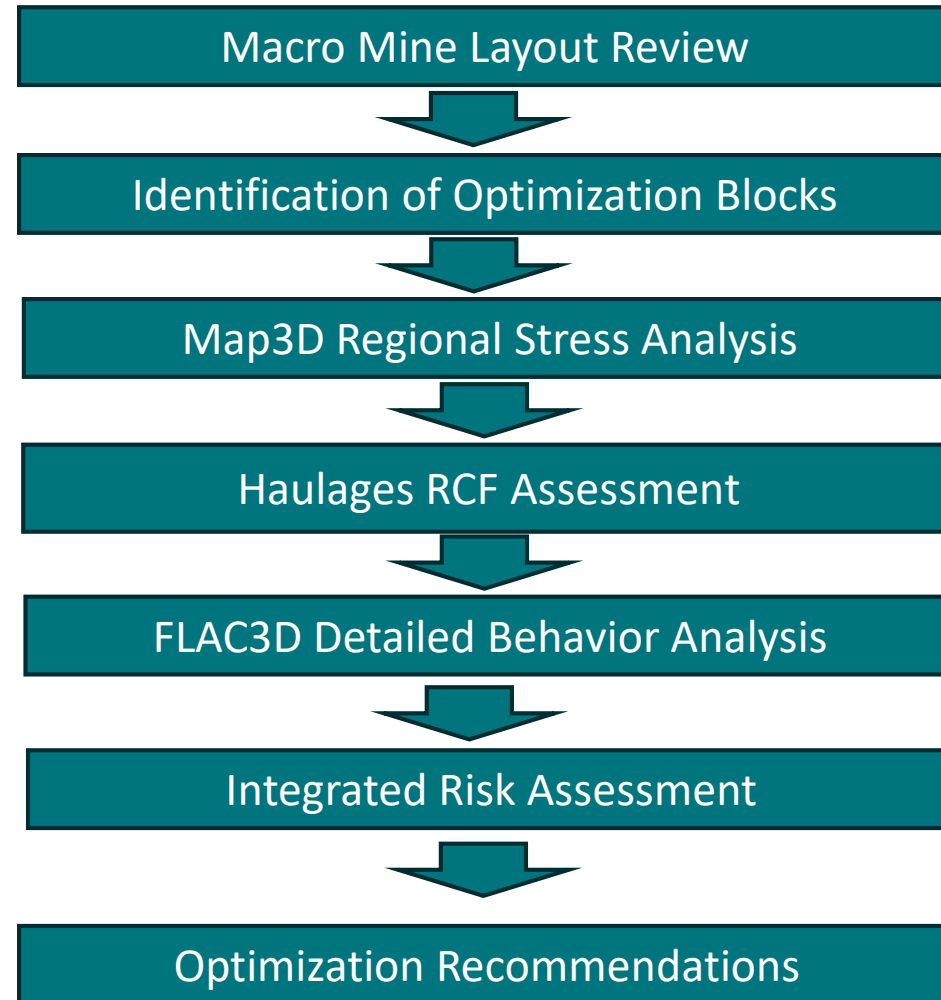


	Production Area		
	Dishaba Lower	Dishaba 44E	Dishaba 50E
Overall Extraction Ratio	42%	51%	59%

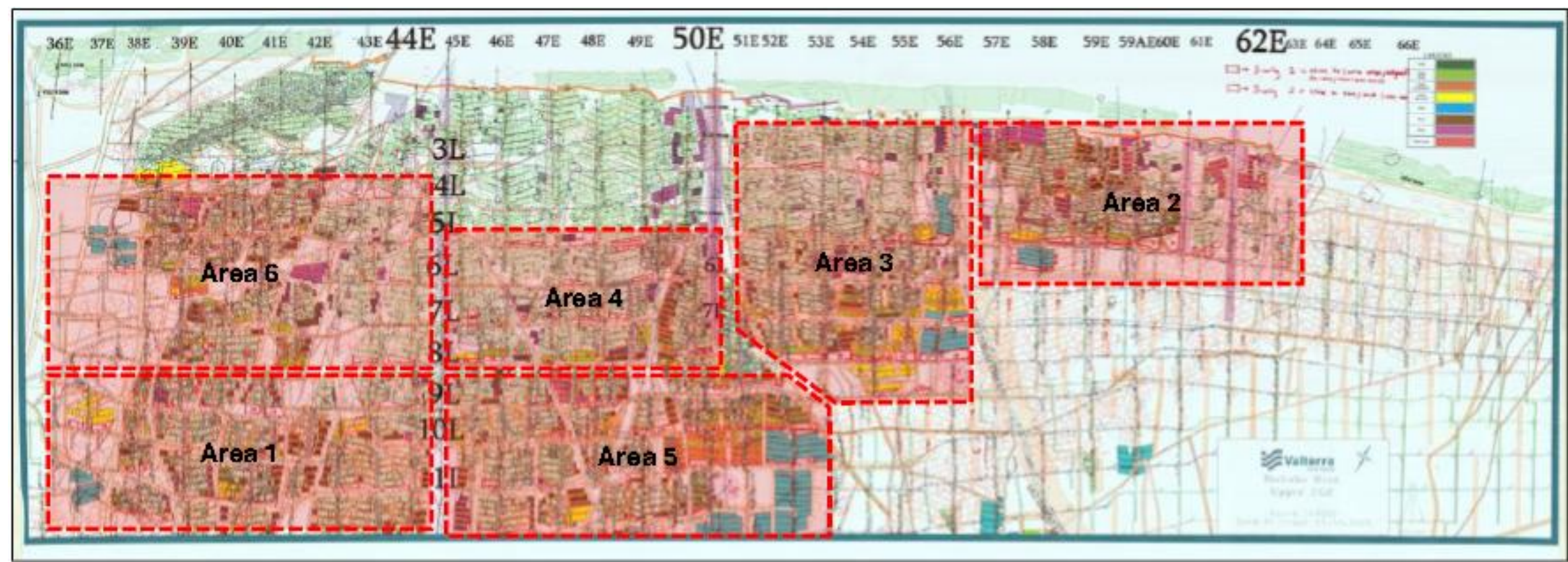
Study Objectives

- ✓ Evaluate historical mine plans (Identify potential white blocks)
- ✓ Assess regional stability using numerical analysis (Engage external Independent 3rd Party)
- ✓ Quantify geotechnical risk
- ✓ Identify optimization opportunities
- ✓ Unlock additional reserves
- ✓ Maintain acceptable ground control conditions

Methodology Overview



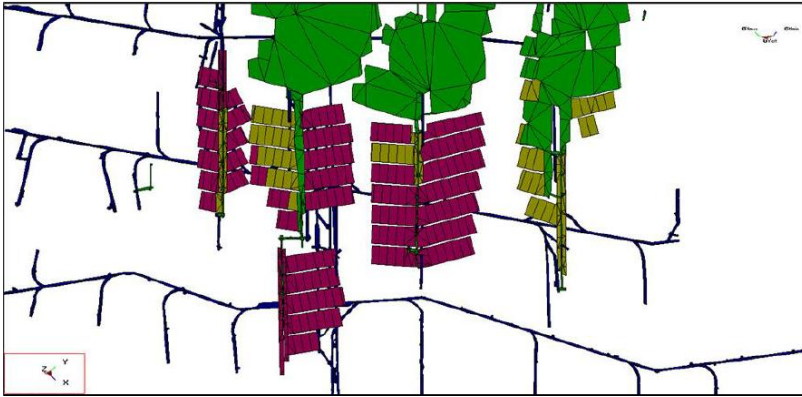
Study Areas



Why We Trust The Results?

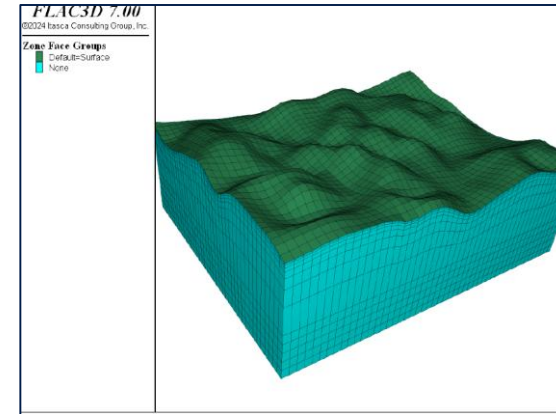
Two independent modelling approaches reached similar conclusions

MAP3d



- Regional/Field stress
- Large scale interactions
- RCF assessment

FLAC



- Closure prediction
- Pillar behaviors
- Strain analysis
- Local deformation

Understanding Rockwall Condition Factor (RCF)

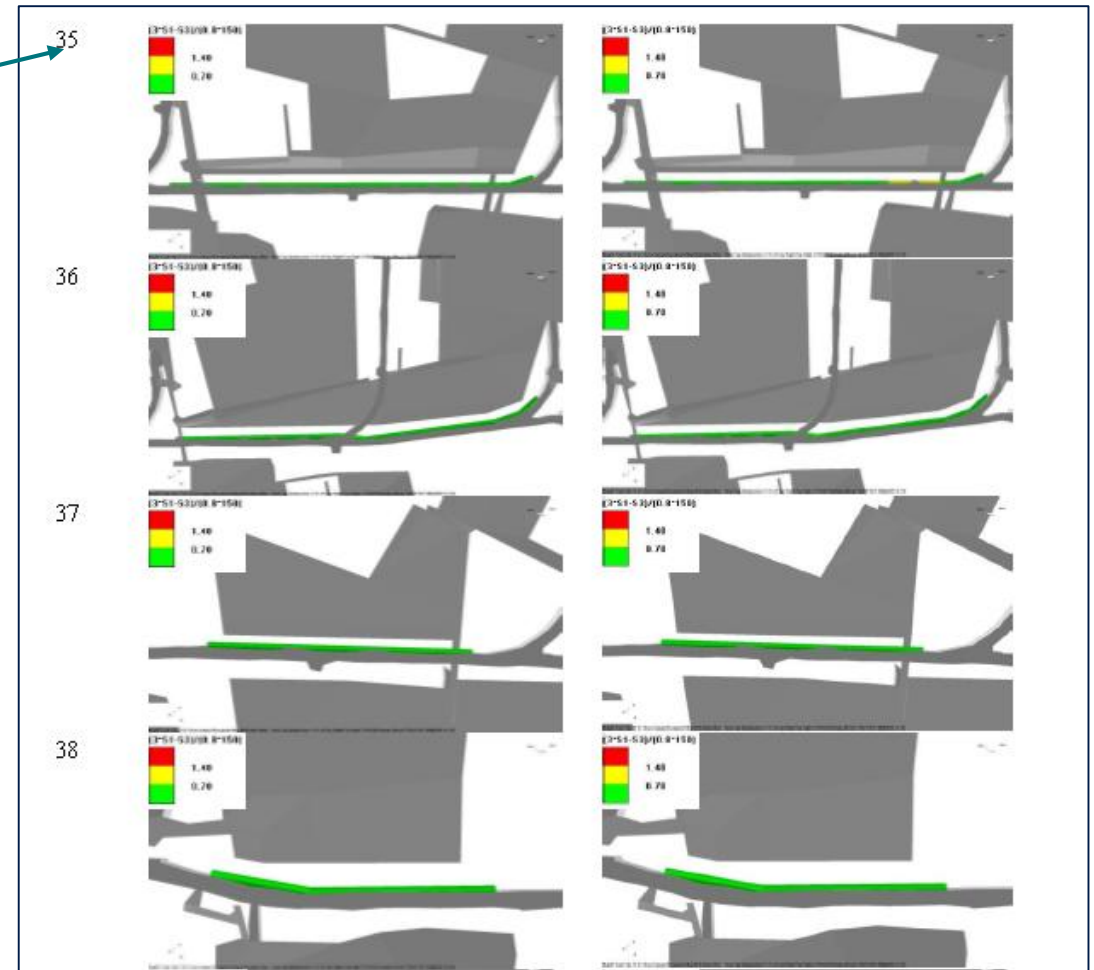
Simple traffic light graphic for tunnel stability analysis.



- Optimization only considered where final RCF remained acceptable.
- Practical benchmark: $\text{RCF} \leq 1.0$ preferred.

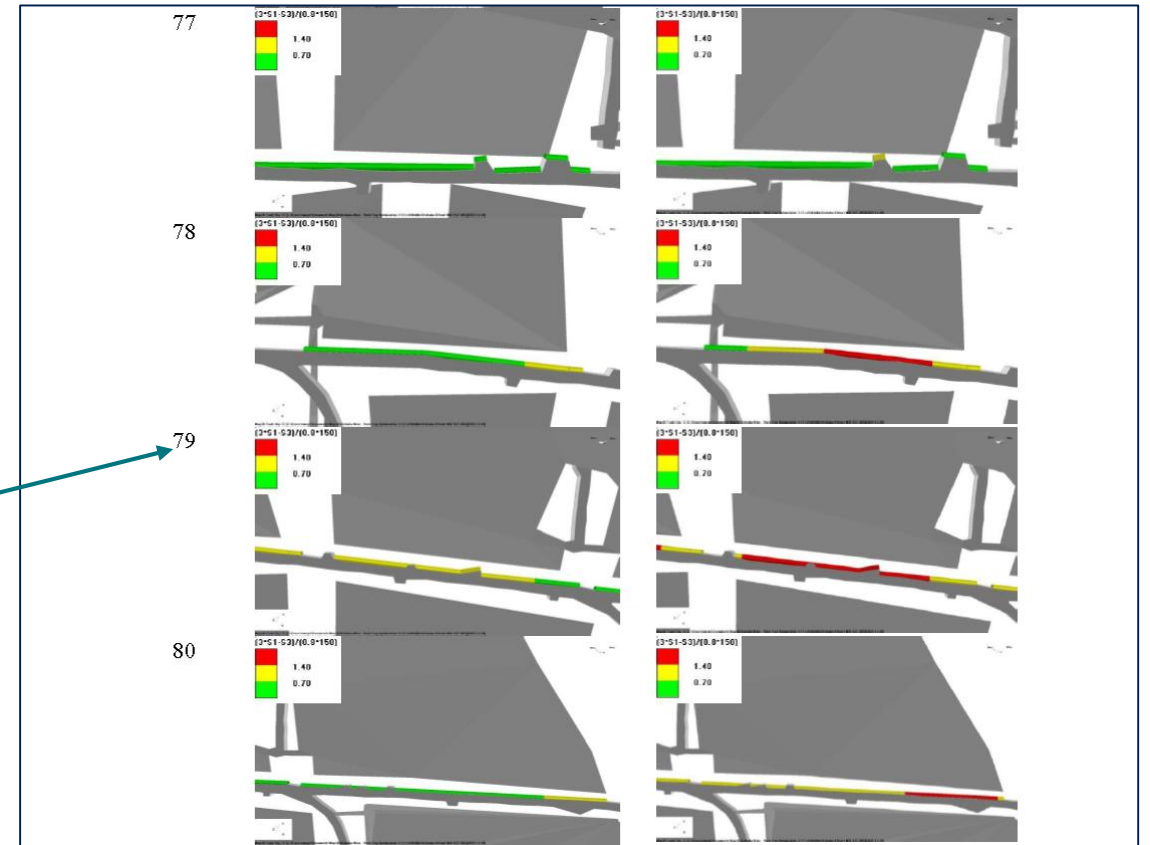
Numerical Modelling Results

Area	pillar No.	Current RCF Value	Final RCF Value	Optimized	haulage pillar Design Limit (m ²)	Optimized Beyond pillar Limit (m ²)
3	33	0,47	0,48	No	1351	0
3	34	0,16	0,2	No	6995	0
3	35	0,49	0,77	Yes	2018	423
3	36	0,34	0,48	Yes	3502	761
3	37	0,23	0,37	No	1616	0
3	38	0,28	0,37	No	788	0
3	39	0,38	0,68	Yes	340	382
3	40	0,26	0,48	Yes	2321	600
3	41	0,49	0,65	Yes	6628	904
3	42	0,54	0,71	Yes	4835	506
3	43	0,28	0,42	Yes	1738	582
3	44	0,63	0,74	Yes	1687	484
3	45	0,51	0,64	Yes	4912	627
3	46	0,54	0,66	Yes	2926	371
3	47	0,48	0,62	Yes	7117	810
3	48	0,25	0,31	yes	1434	403
3	49	0,52	0,59	Yes	743	333



Numerical Modelling Results Cont'd

Area	pillar No.	Current RCF Value	Final RCF Value	Optimized	haulage pillar Design Limit (m ²)	Optimized Beyond pillar Limit (m ²)
5	66	1,14	1,4	No	1097	0
5	67	0,56	0,62	No	1354	0
5	68	0,83	1,01	No	1590	0
5	69	0,81	0,86	No	889	0
5	70	0,39	0,43	Yes	1779,5	1793
5	71	0,59	0,8	Yes	5002	1103
5	72	0,91	1,21	Yes	1662	626
5	73	0,66	0,87	No	2266	0
5	74	0,75	1,09	No	3056	0
5	75	0,7	1,71	No	1637	0
5	76	0,25	0,44	No	969	0
5	77	0,33	0,86	No	959	0
5	78	0,71	1,55	No	1093	0
5	79	0,79	2,02	No	1184	0
5	80	0,75	1,71	No	3164	0
5	81	0,73	1,18	Yes	2280	2119



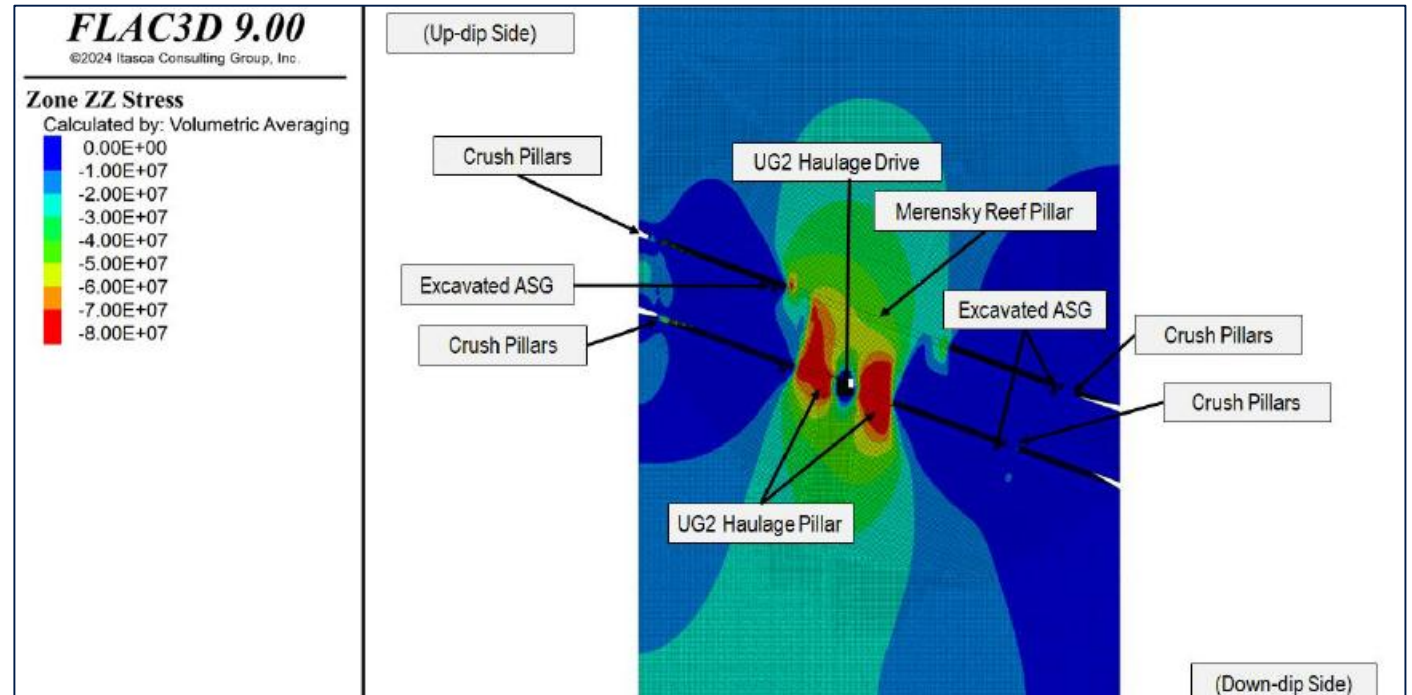
- Not every pillar was optimized
- Engineering judgement remained central

Deep Dive: Area 5- High Risk

Key findings:

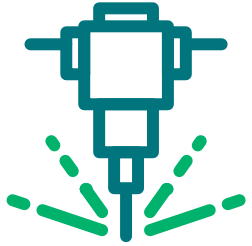
Deepest area (751 m below surface)

- Highest stresses
- Pillar stresses up to 110 MPa
- Modelled Closure up to 47 mm
- Multiple pillars with RCF >1.4



Hence: Not all opportunities should be mined

Value Unlocked



266,991 m² Potential Additional Reserve Area



1.71 Mt Additional Ore



- **~1 Year** Life of Mine Extension

Risk Controls

Optimization is implemented under control, not assumed safe by modelling alone

Before optimization, the following will take place:

- Adherence to DMPR Instruction Ref no 2026/K/PIOM-04 “Mining of White Areas”
- Update Mine Procedure on Mining of White Areas
- Engage Services of an External Independent Multi-Disciplinary Team
- Underground inspections
- Support effectiveness assessment
- Geological review
- Rock Engineering approval
- Monitoring implementation
- Ongoing review

Acknowledgements

- Dishaba Management
- Rock Engineering Department
 - Sifiso Mashile
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Thank you

Security classification

