Appendix A
RL 1200 m Subsidence Assessment Report (BECK Engineering 2023a)

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Sam Draffen
Senior Environmental Advisor
Evolution Mining - Ernest Henry Mine
Cloncurry, QLD

ERNEST HENRY MINE
SLC TO 1200 LEVEL – SURFACE SUBSIDENCE ASSESSMENT

Dear Sam,

Beck Engineering Pty Ltd (BE) recently completed a mechanical-flow-hydro coupled numerical simulation of sublevel caving (SLC) to the 1200 level at the Ernest Henry mine (EHM).

The mining excavation geometry, development and production draw schedules that were used as inputs to this simulation were identical to those of other recent models that BE have performed in 2023, except for the fact that the SLC mining below the 1200 level was removed and not simulated in this latest model run. All other simulation inputs and boundary conditions were unchanged. Further details on the modelling method, inputs and specifications can be found in our prior reports to EHM, submitted earlier in 2023.

In the 1200 SLC case, the SLC mining has been simulated to a depth of approximately 958 metres below surface. The total production draw for this simulation was **66,278,309** bogged ore tonnes. Mining to the 1200 level in the main SLC is completed in 2024 Q2, according to the simulation schedule. However, SLC mining continues to take place in the southeast lens for several more years, mostly at levels well above the 1200 mRL.

This short letter summarises the main findings of the simulation with specific focus to the final spatial extent of the subsidence crater at the surface and the impact that sublevel caving has on the southern waste rock dump (SWRD).

1 MAIN FINDINGS

A selection of figures illustrating the model forecasts are presented on the following pages. The main findings of the numerical simulation for 1200 SLC mining case are:

- Cave growth continues reliably until the completion of the planned underground mining at 1200 L. Some minor airgaps (approximately equal to one sublevel height) are forecast to remain above the SE lens rings at the end of the plan.
- Once all planned underground mining is completed in both the main SLC and SE lens, the subsidence crater on the surface is forecast to have propagated a distance of **245 m** due south of the crest of the original open pit.

- The final extent of the subsidence crater does impact a portion of the southern waste dump. Approximately **1,480,773 m^3** of the waste dump material is forecast to be undercut and consumed by the cave. As the waste dump material is undercut by the caving process, it would become unstable and rill into the subsidence crater.
- The subsidence crater consists of fully broken and unconsolidated caved material. The final maximum dimensions of the subsidence crater at the surface following completion of all underground mining are forecast to be **1,200 m** in the north-to-south direction, **570 m** east-to-west at the widest point near the base of the open pit and **920 m** east-to-west at the widest point at the surface.
- A zone of disturbance to the natural ground surface and SWRD would also surround the immediate perimeter of the subsidence crater. This disturbed zone would experience strains and angular distortions which would be evident as visible tension fractures. This zone of disturbance is forecast to be contained within 150 m of the contour of *Severe* subsidence impact (see the following figures for detail).
- Subsidence impact is forecast to become *Negligible* at a distance of approximately 150 m horizontally from the edge of the subsidence crater. This strain affected zone within 150 m of the subsidence crater plus the open pit plus an additional 50 m stand-off is recommended to be used to define the minimum long-term subsidence exclusion zone. This exclusion zone forecast serves as a guide and the real exclusion zone is recommended to be based on a risk assessment of the observed subsidence limits at the time that mining is completed, or minimum legislated requirements, with physical barriers installed to prevent access.
- The cave zone is also forecast to consume some sections of the haul roads to the south and southeast of the open pit, as well as part of the laydown area.
- The southern ramp access to the main shaft headframe would be so close to the subsidence crater that continued access to the shaft via that route would likely be unsafe.
- The simulated mine re-flooding does not cause any additional cave expansion at the surface.

2 ENQUIRIES

Thank-you for the opportunity to assist EHM with this project and if you have any queries, please direct them to the undersigned.

Sincerely,

Christopher Drover
PhD MEngSc BE (Hons) BSc
Principal Engineer, Mining & Rock Mechanics

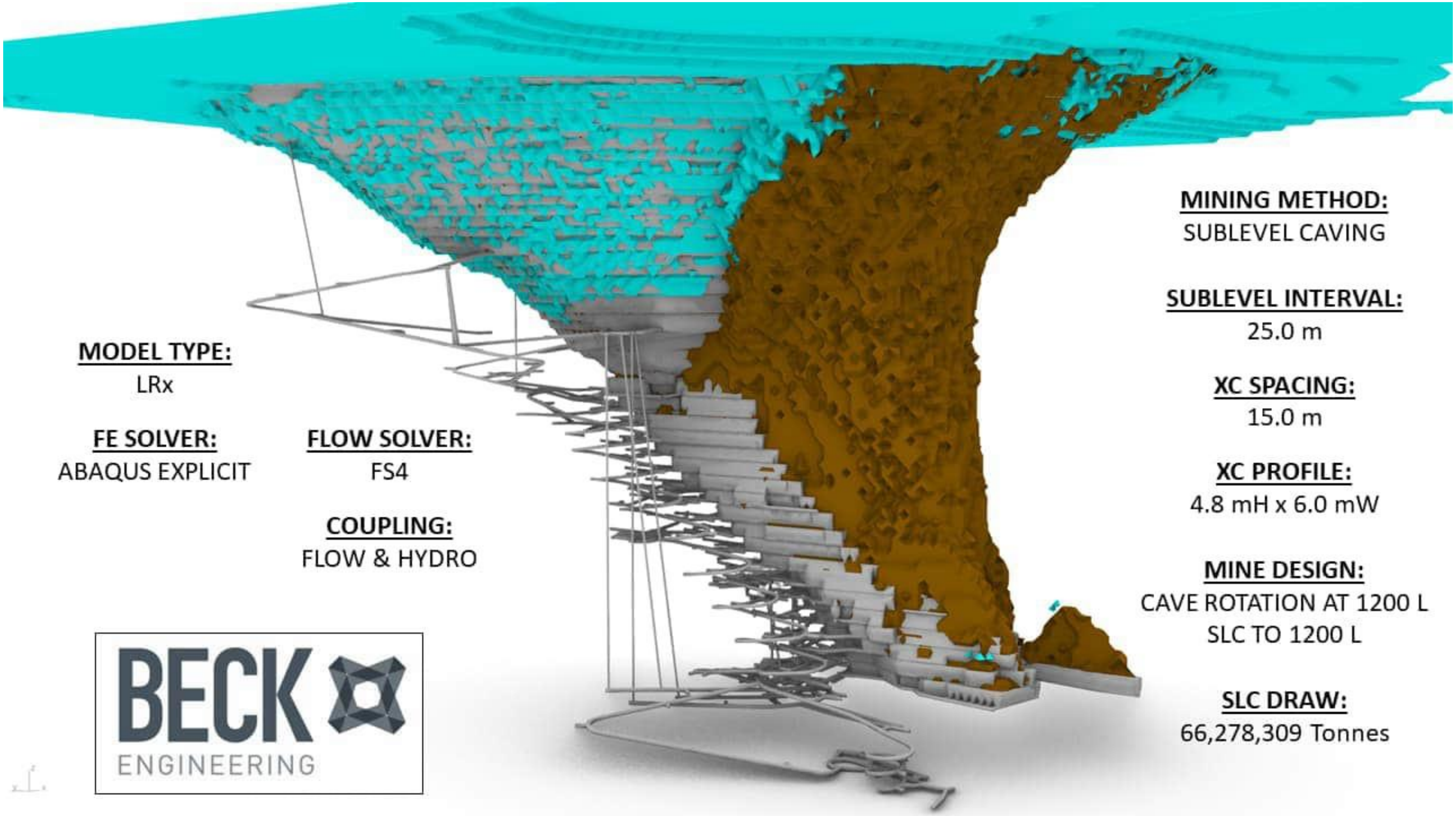


Figure 1 Simulated excavation geometry of the 1200 SLC and final cave shape.

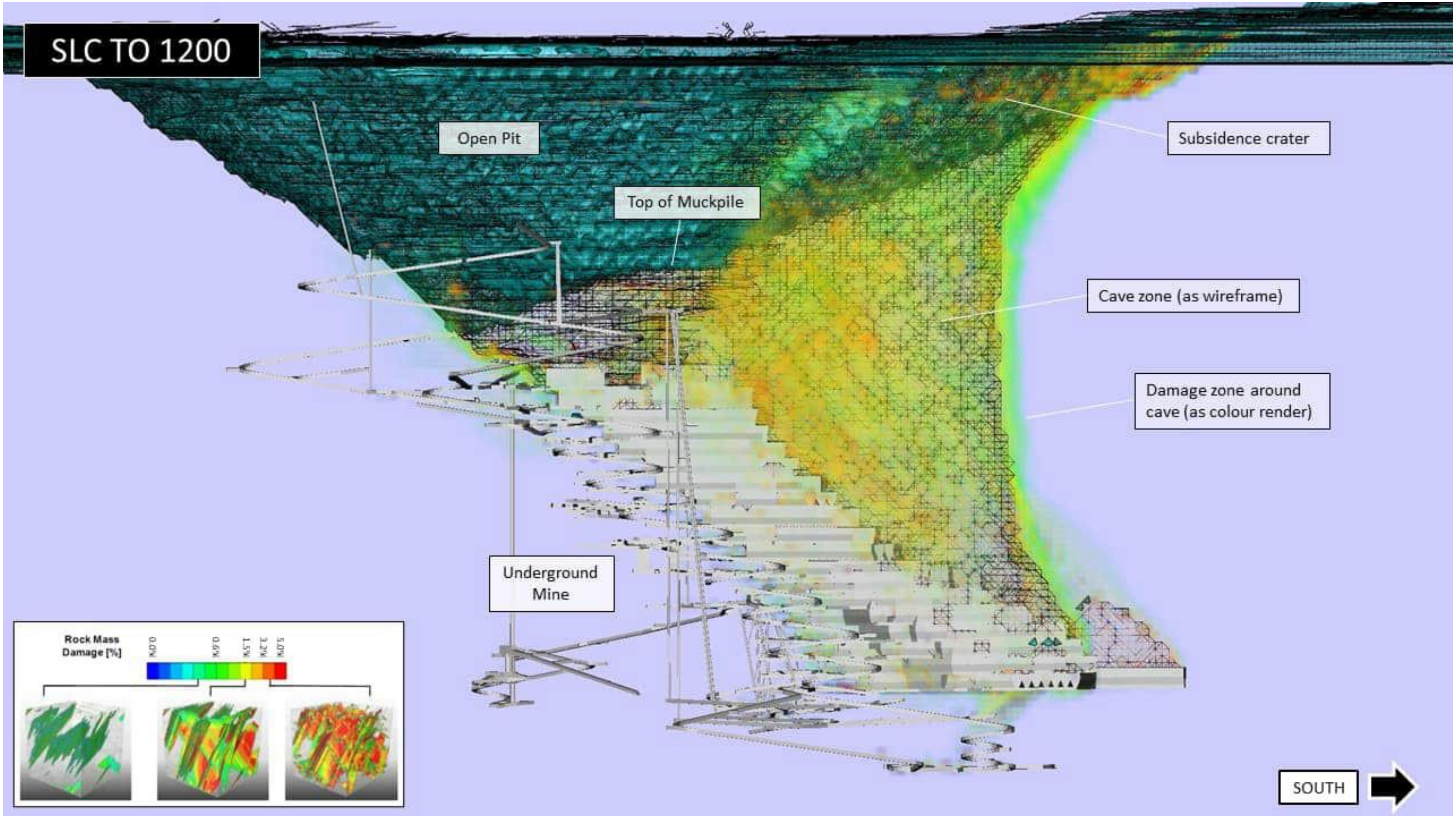


Figure 2 Cave and damage zone forecast at the completion of all underground mining (SLC to 1200 mRL), view east.

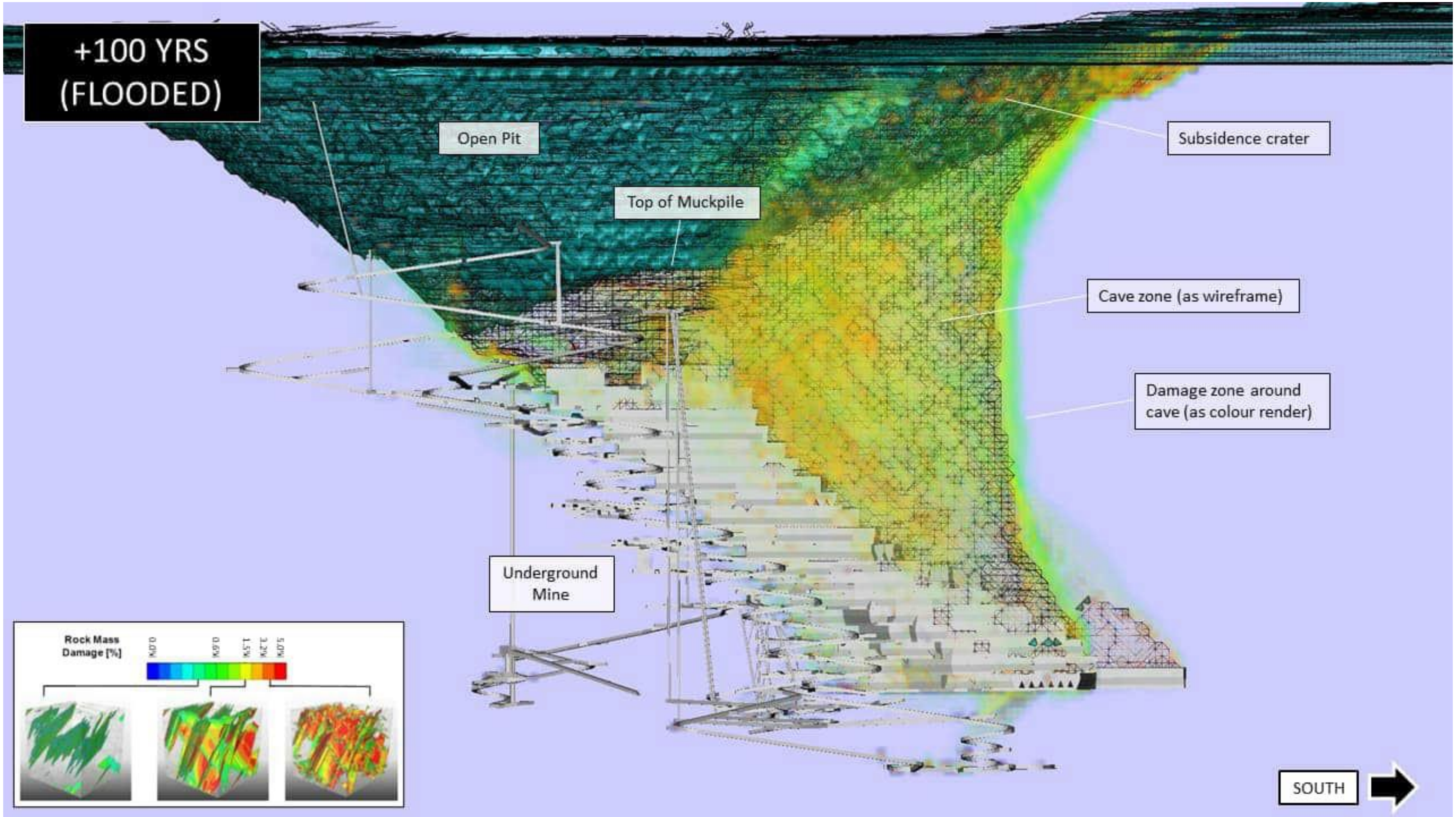


Figure 3 Cave and damage zone forecast 100 years after completion of mining (view east).

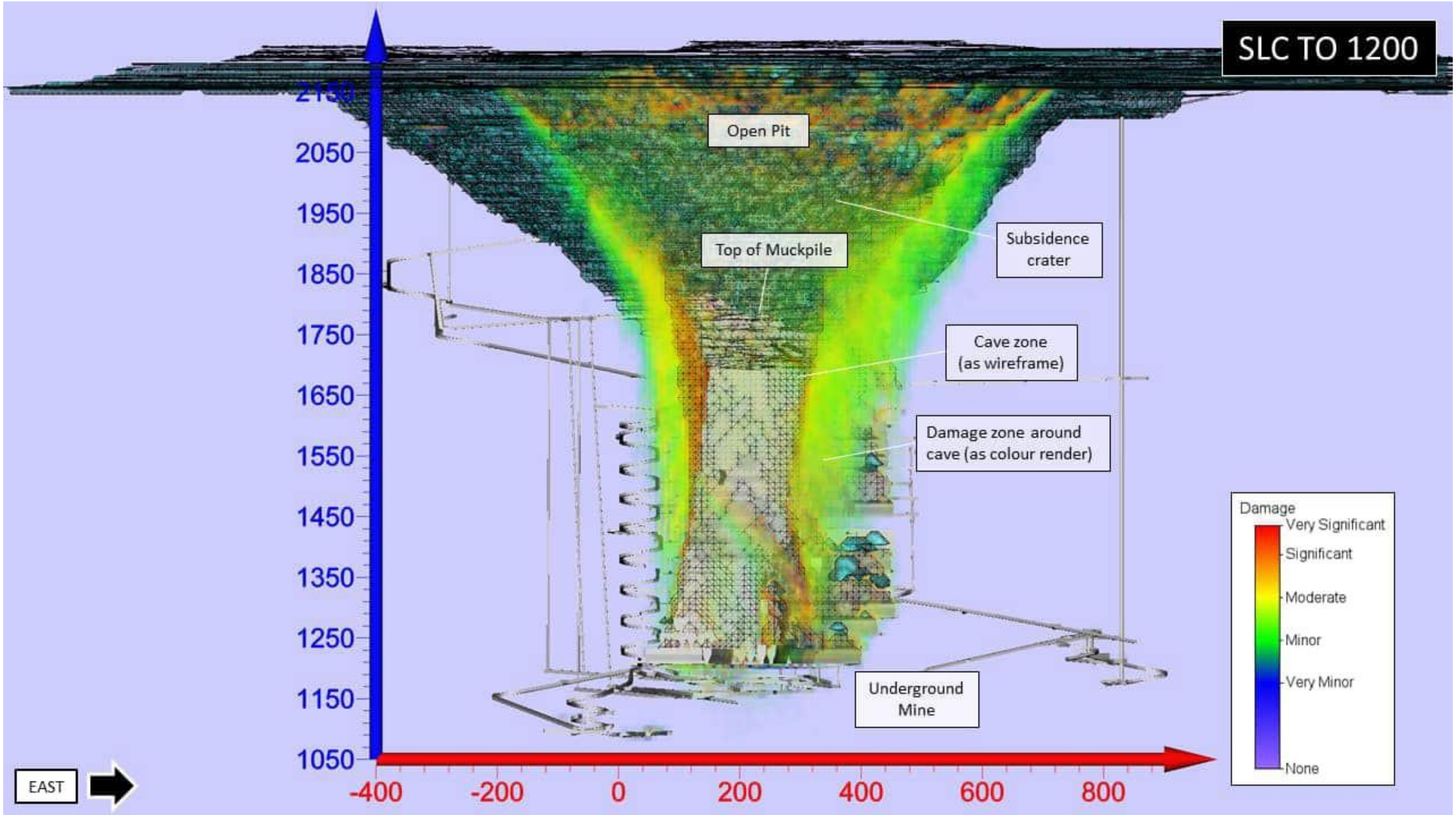


Figure 4 Cave and damage zone forecast at the completion of all underground mining (SLC to 1200 mRL), view north.

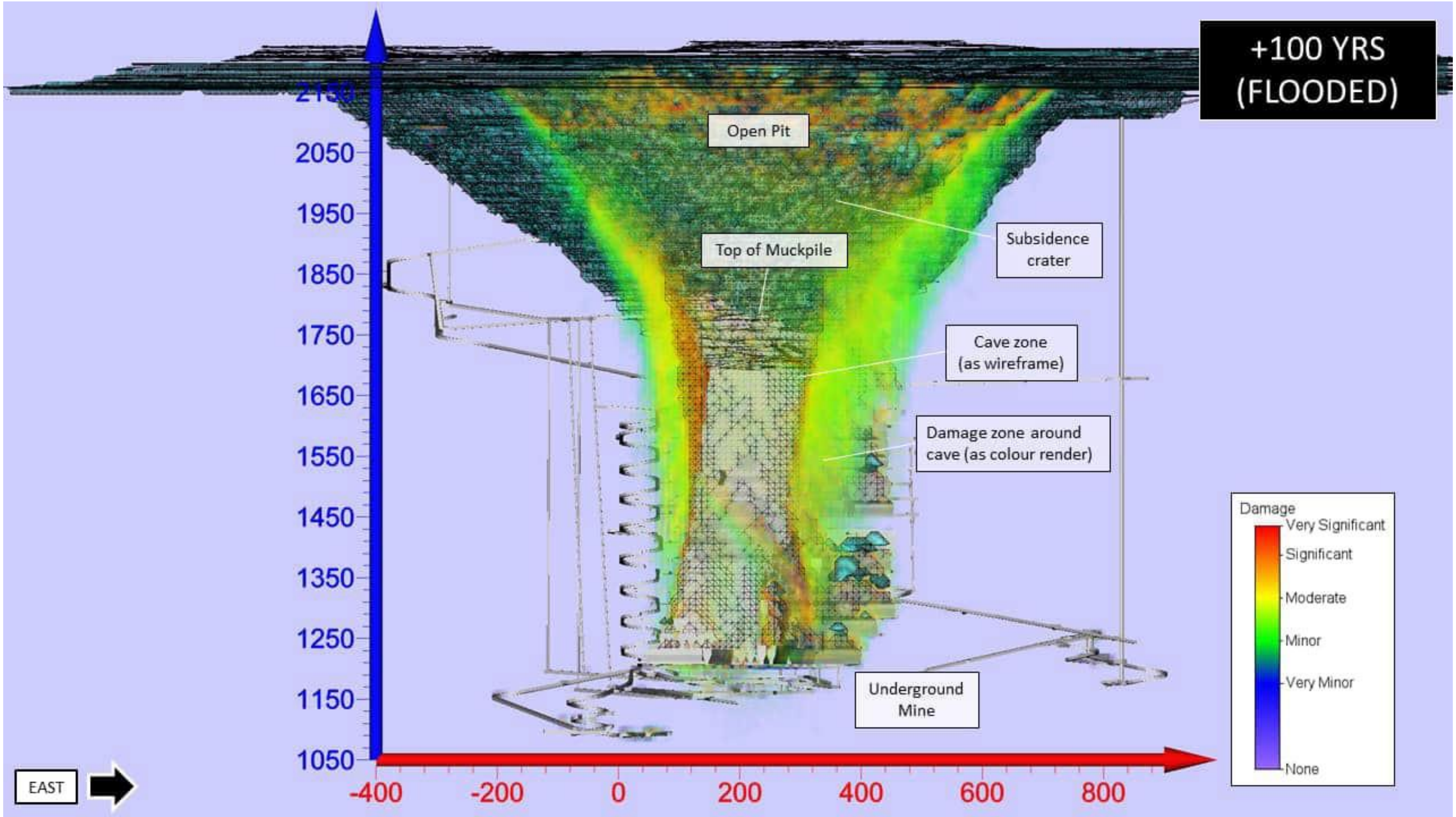
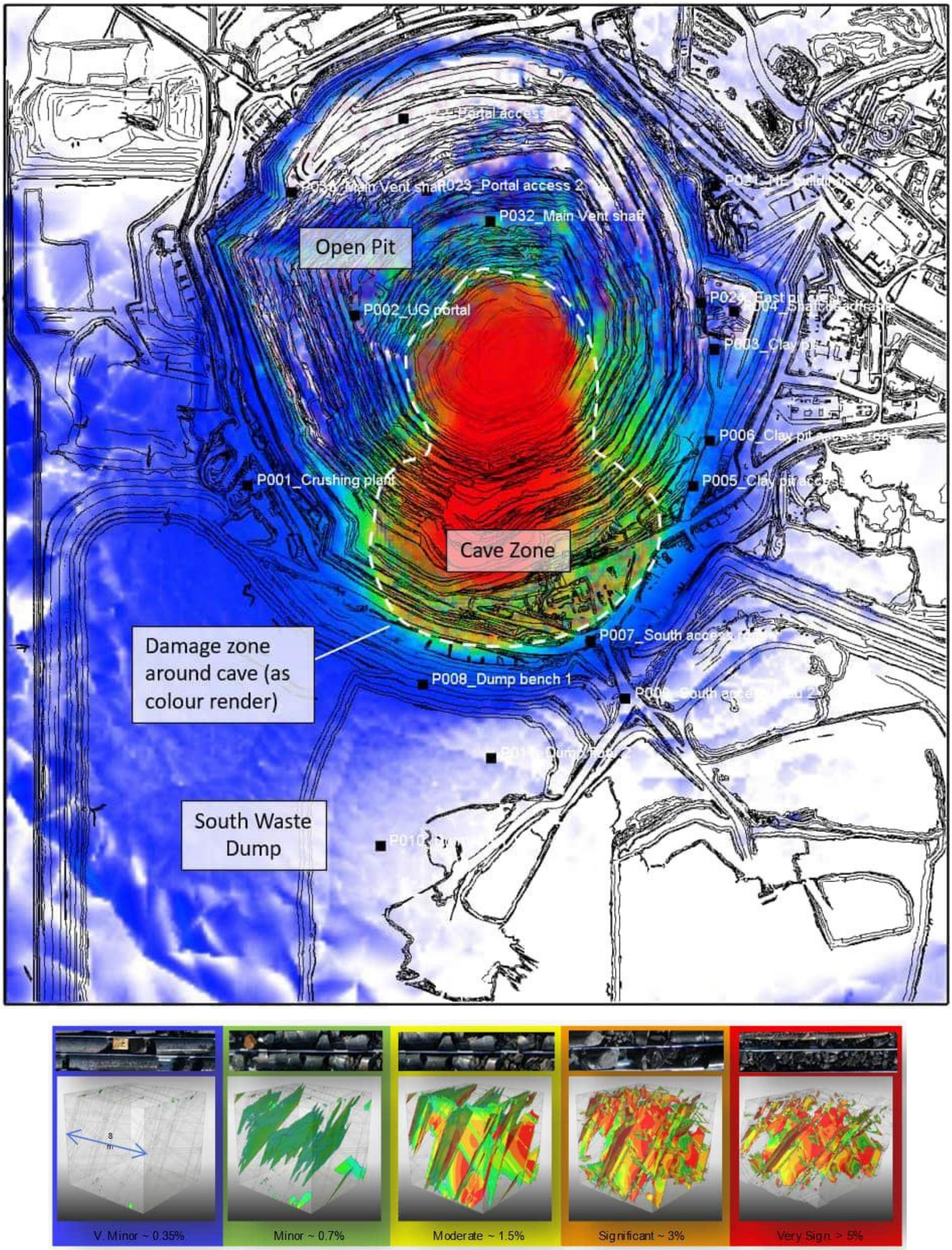


Figure 5 Cave and damage forecast after 100 years of groundwater recharge post-mining, view north.



$\epsilon_p \approx 0.35$ % $\quad \epsilon_p \approx 0.7$ % $\quad \epsilon_p \approx 1.5$ % $\quad \epsilon_p \approx 3.0$ % $\quad \epsilon_p > 5.0$ %

Figure 6 Plan view showing forecast rock mass damage and cave outline (2023 Q4).

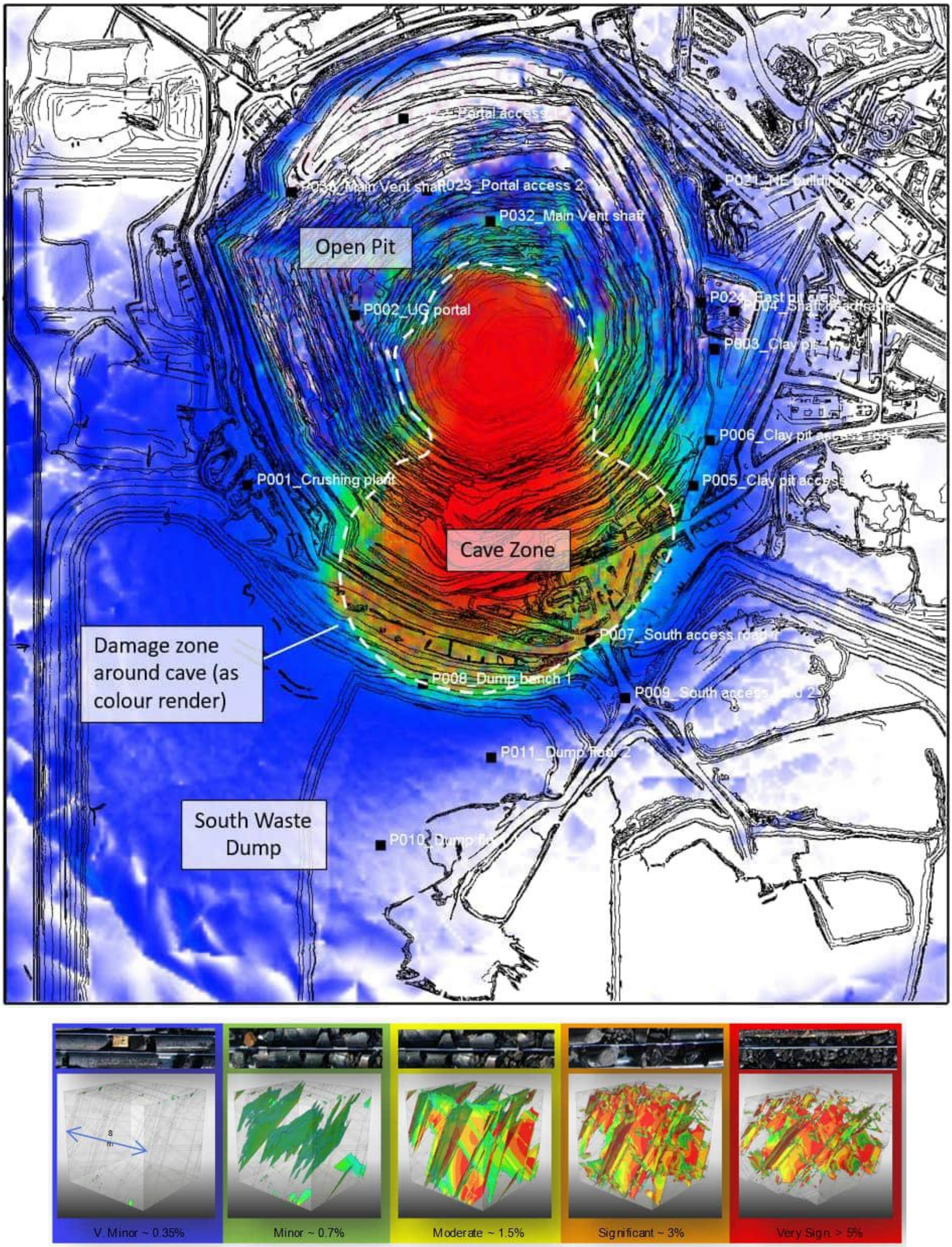


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Figure 7 Plan view showing forecast rock mass damage and cave outline (2024 Q4).

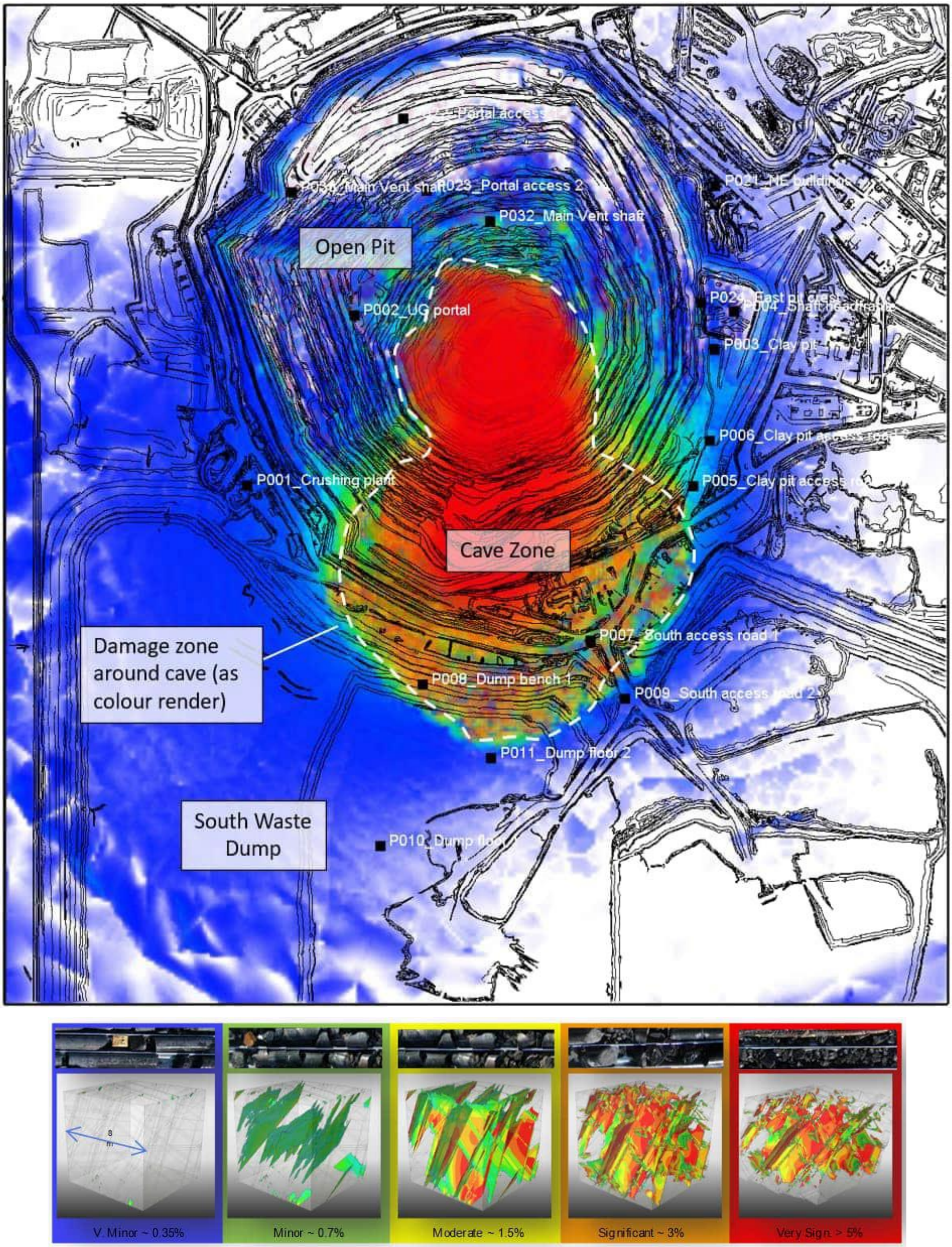

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Figure 8 Plan view showing forecast rock mass damage and cave outline at the completion of all underground mining.

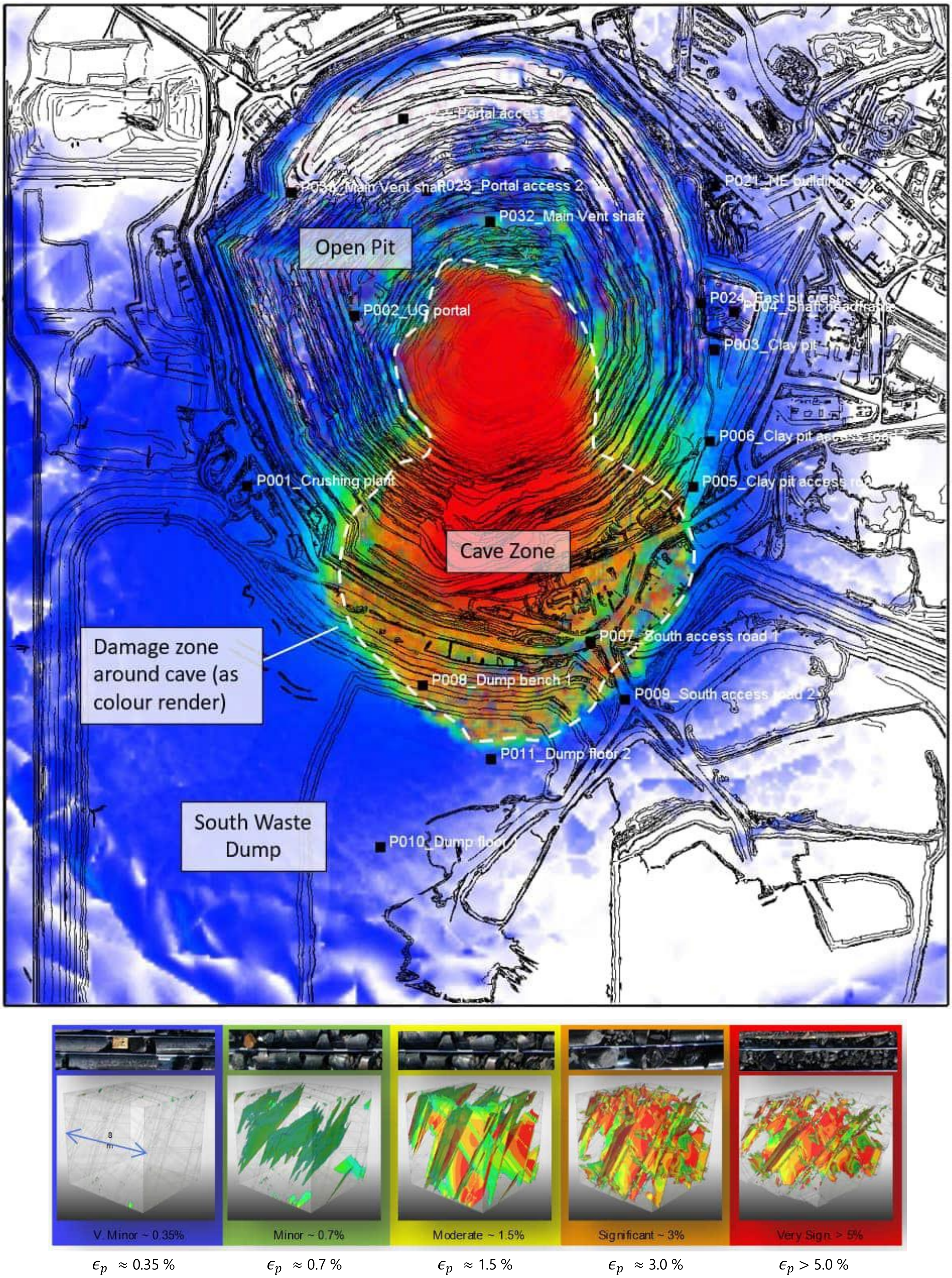

Figure 9 Plan view showing forecast rock mass damage 100 years of groundwater recharge post-mining.

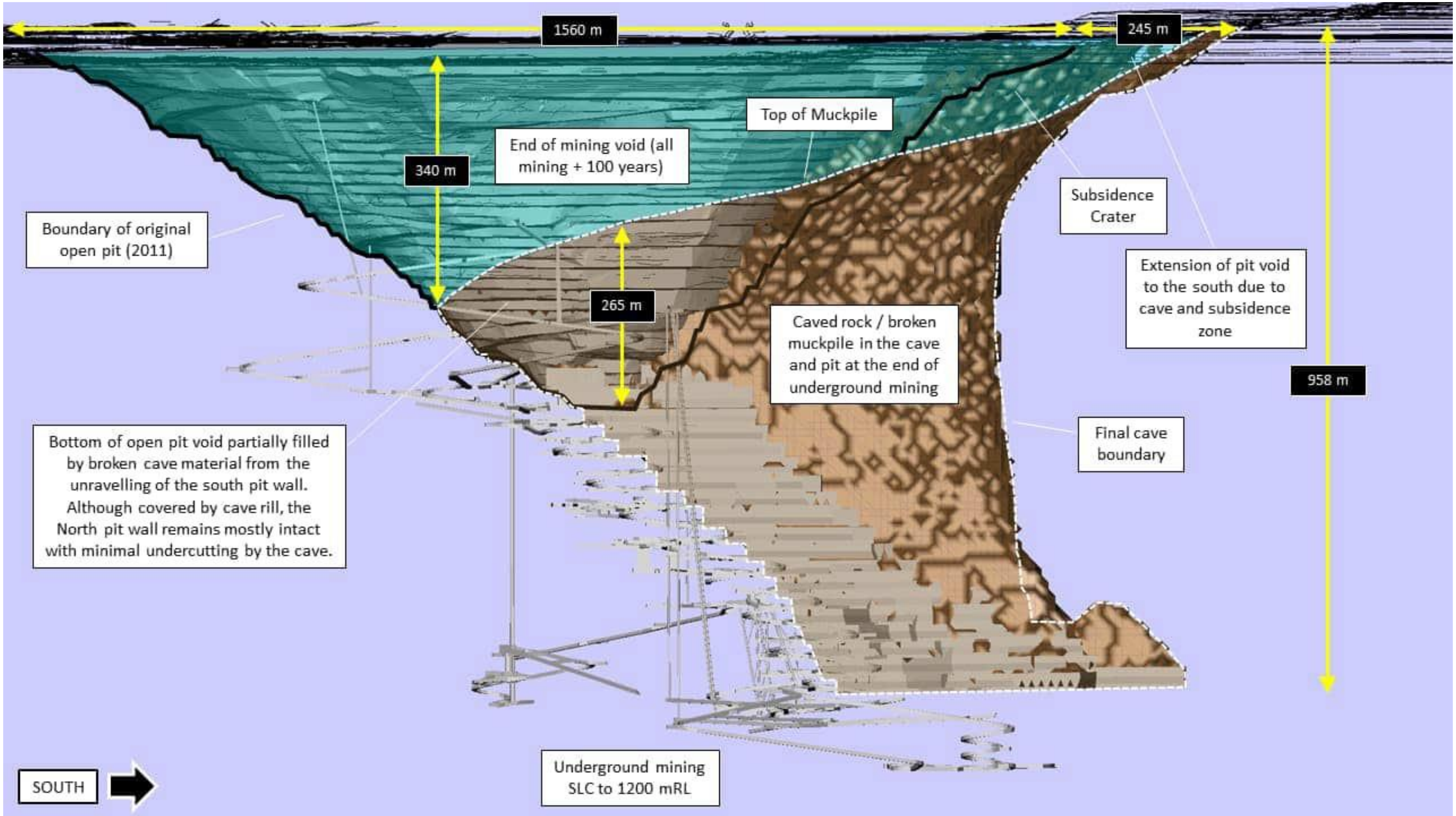

Figure 10 Final shape of the excavated mine voids and cave zone showing major dimensions, view east.

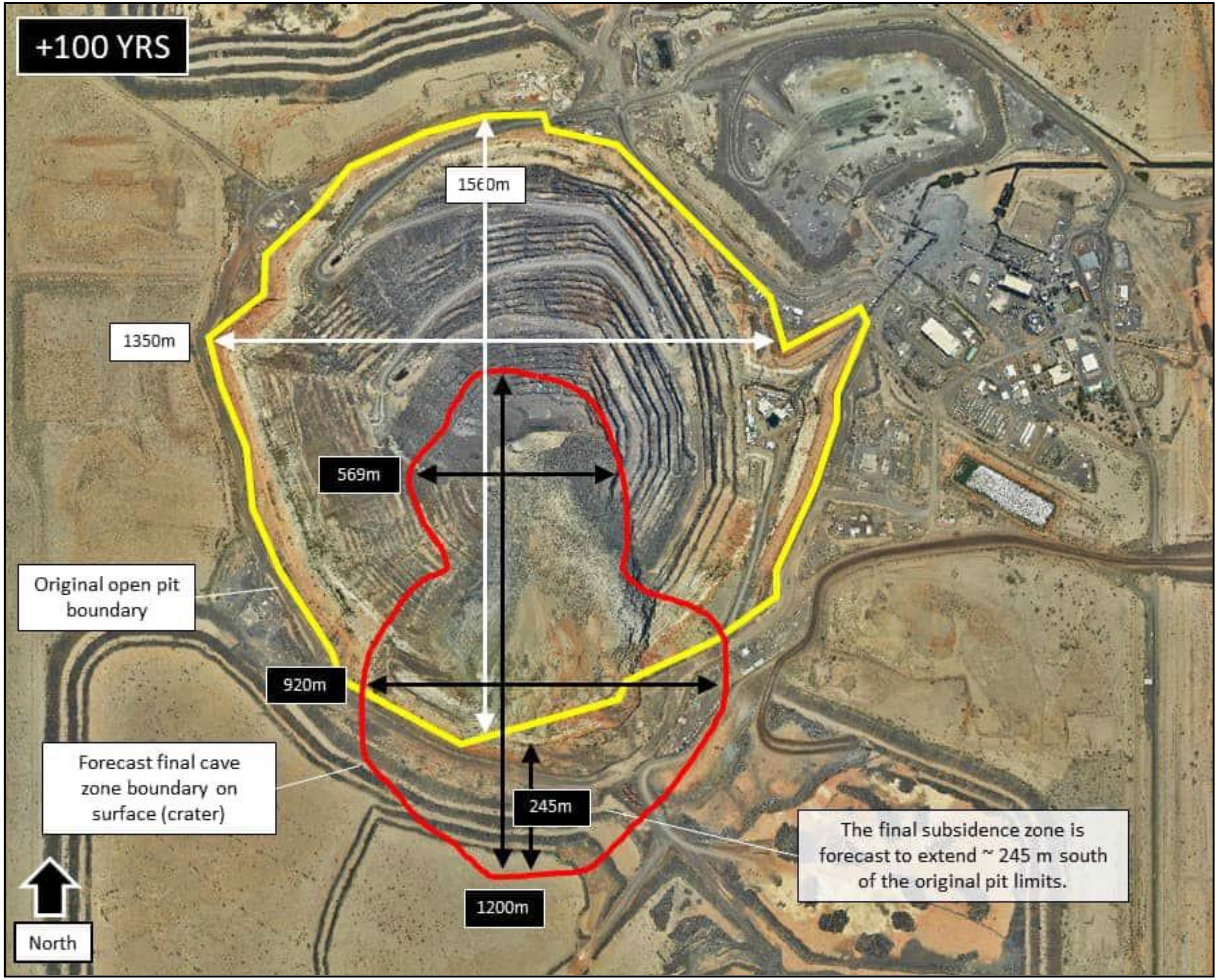

Figure 11 Final geometry of the original open pit and cave zone expression at the surface and major dimensions, top view.

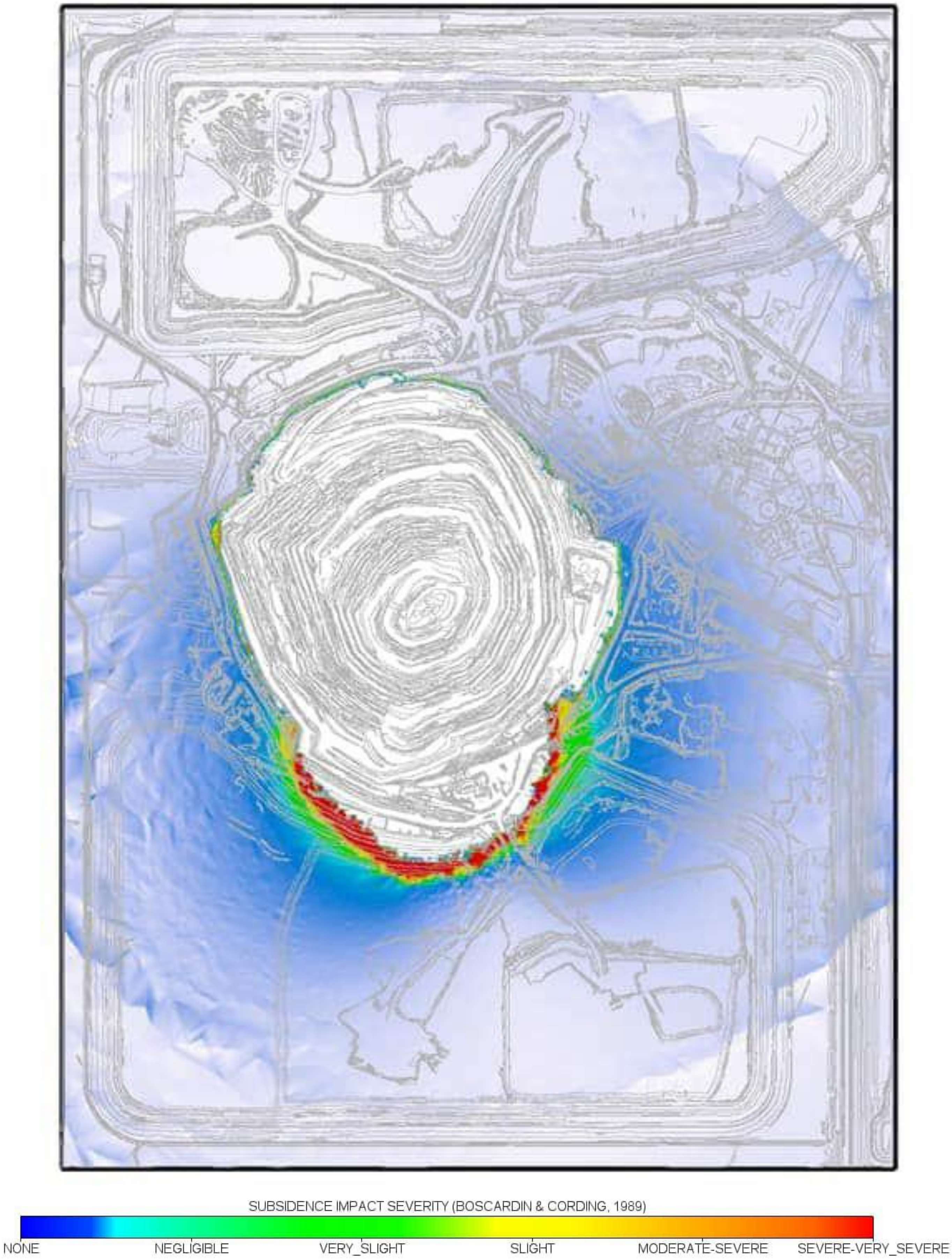

Figure 12 Surface subsidence impact severity forecast at the completion of all underground mining to 1200 L.

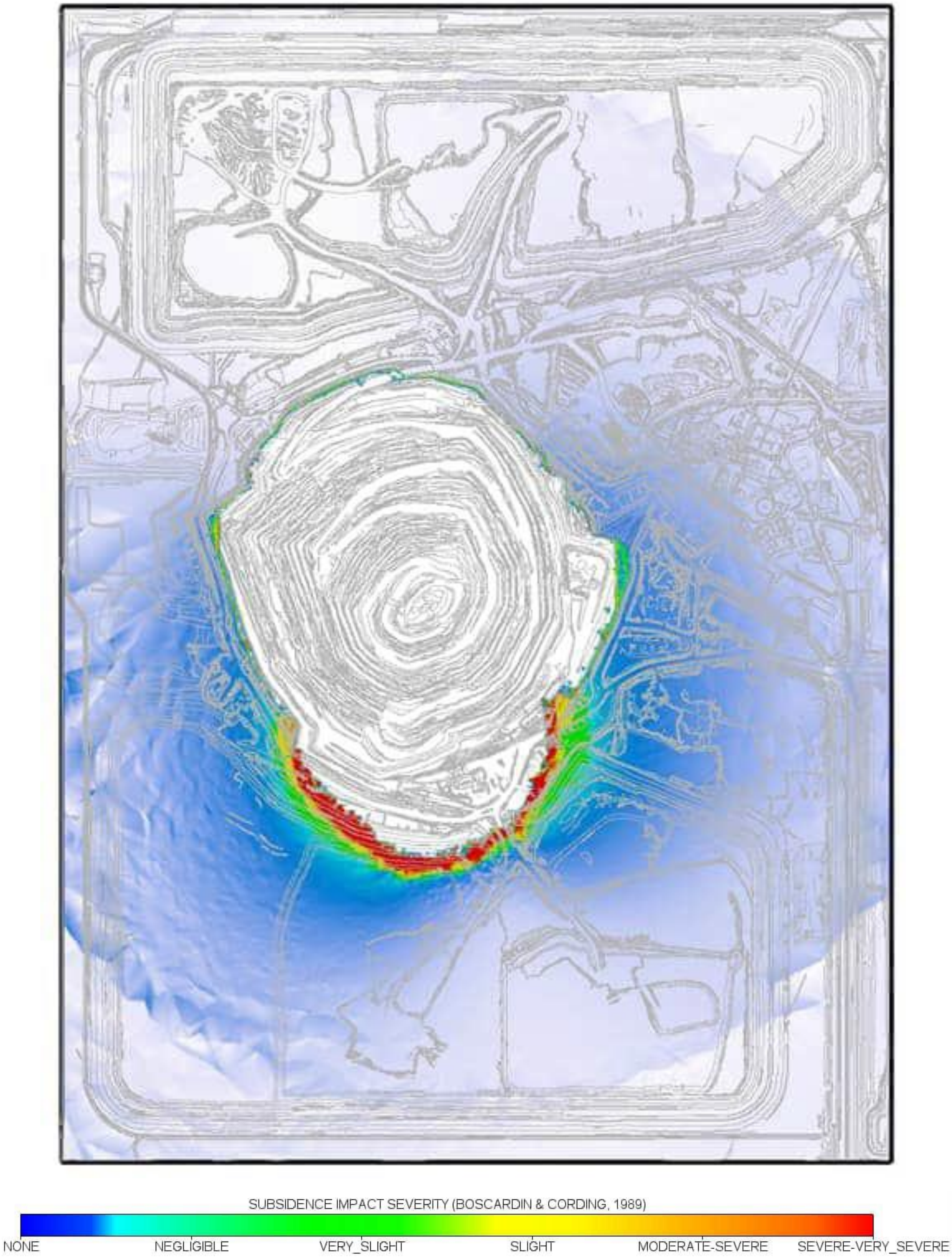

Figure 13 Surface subsidence impact severity forecast after 100 years of groundwater recharge post-mining.

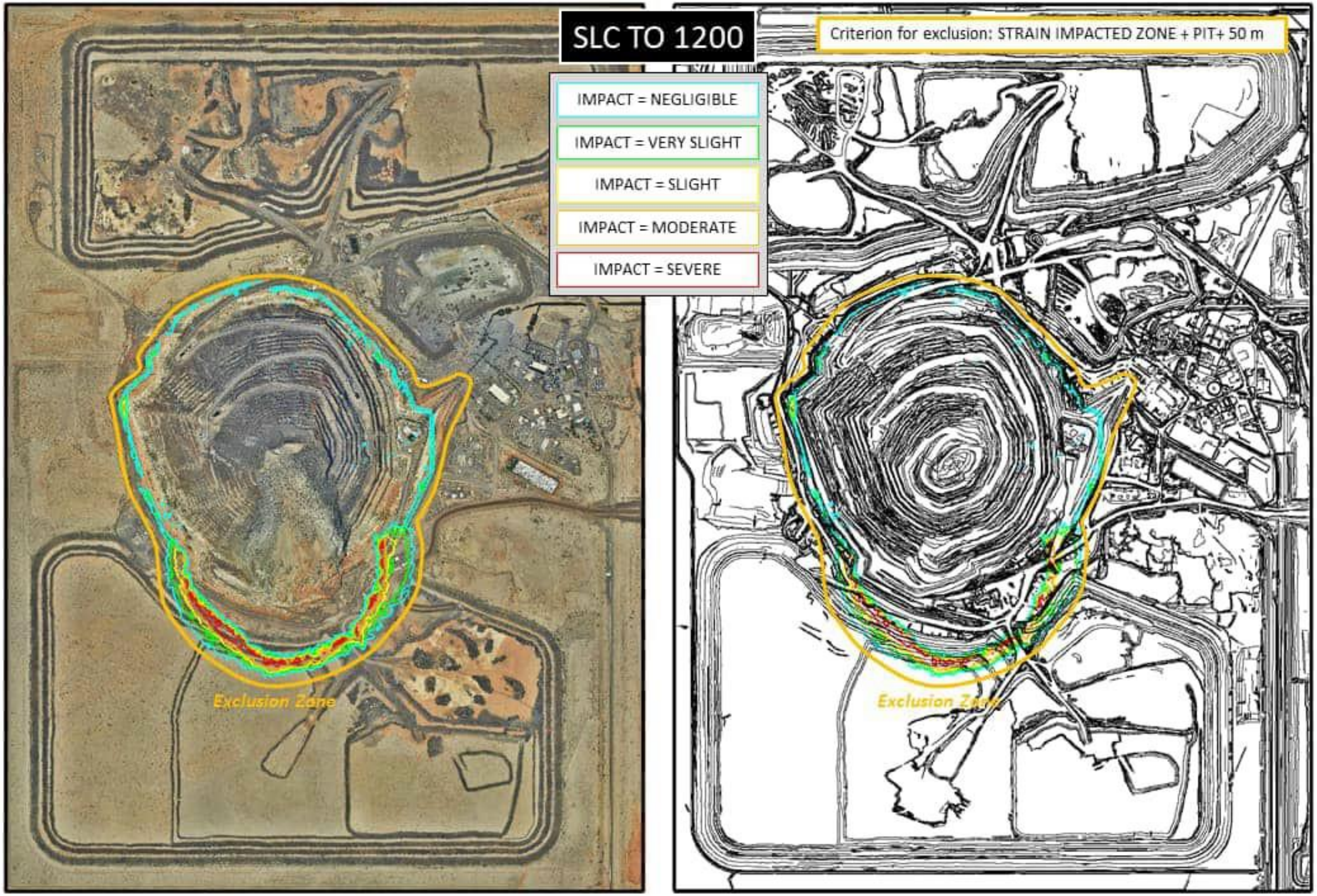

Figure 14 Contours of surface subsidence impact severity at the 2156 mRL at the end of mining and proposed long-term exclusion zone.

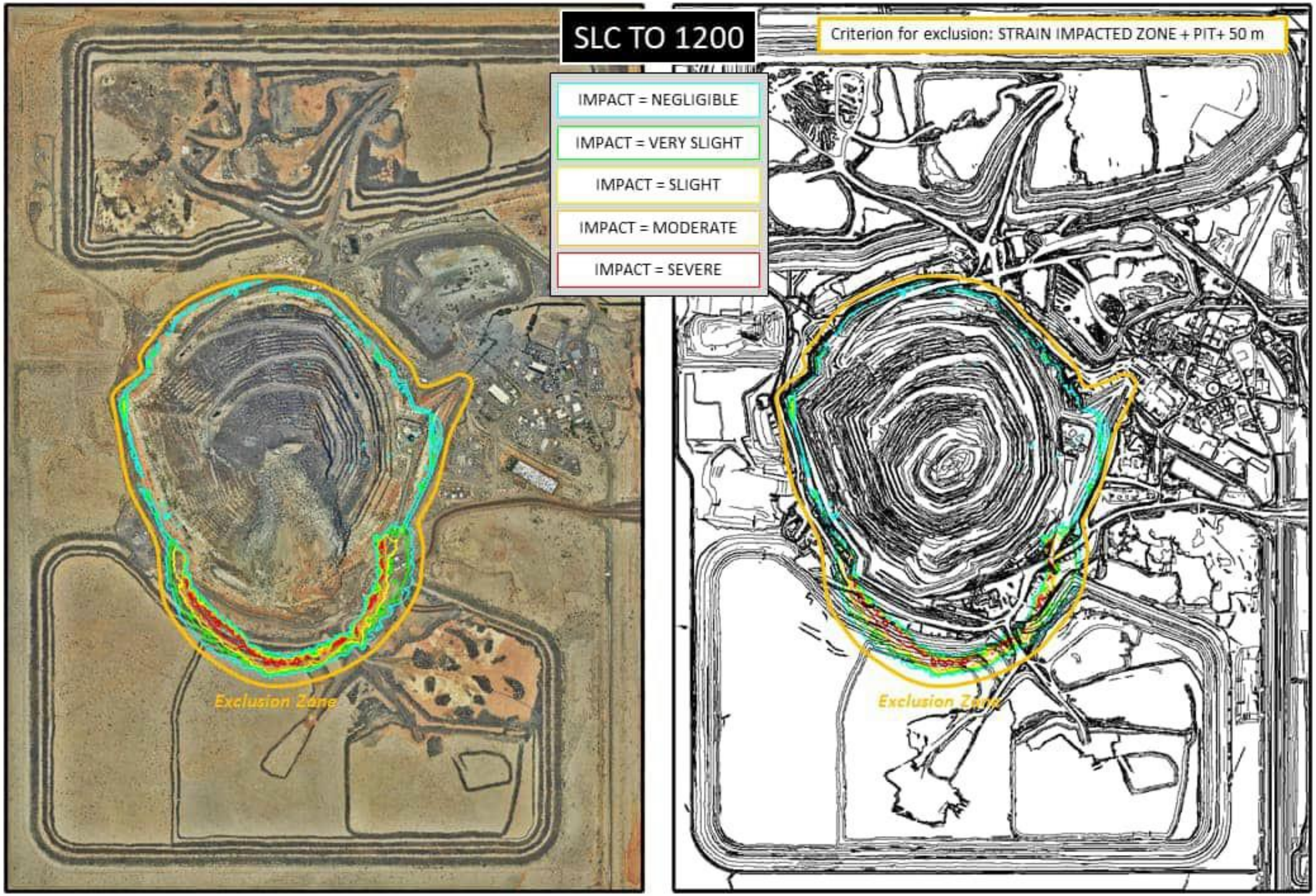

Figure 15 Contours of surface subsidence impact severity at the 2156 mRL after 100 years of groundwater recharge post-mining and proposed long-term exclusion zone.

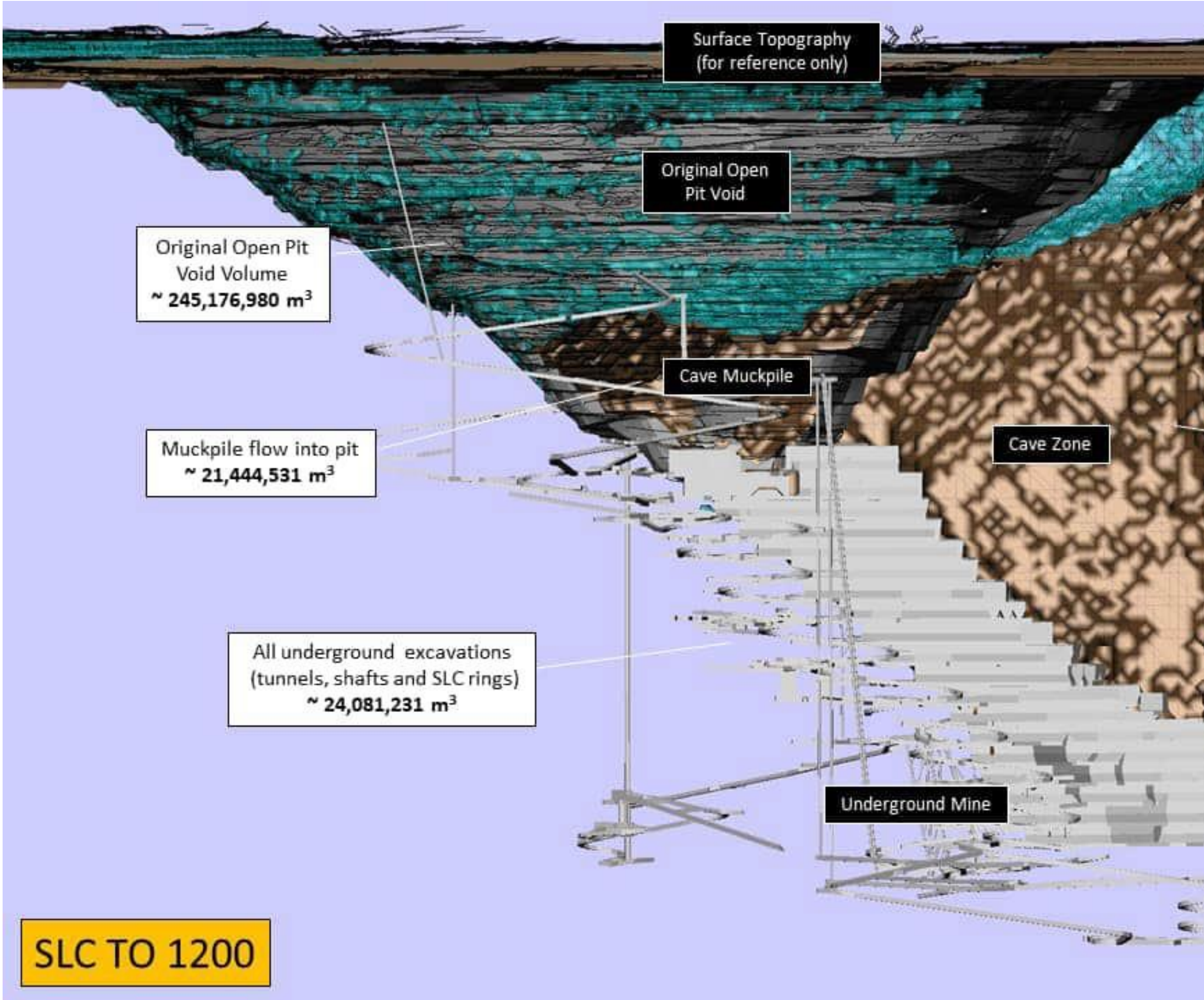

Figure 16 Mining-related voids and the cave zone and their respective volumes and the end of mining to the 1200 level.