

Robotics Revive Mine in Crisis

INTRODUCTION

After a catastrophic collapse at a Limestone Mine in Tennessee, operations were left crippled, with mine authorities deeming the site too dangerous to allow any person access in order to assess the damage.

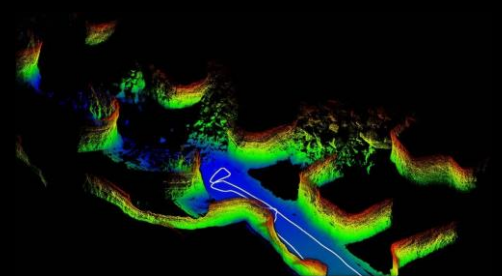
The only way to assess the mine workings was using the Explora Series of robots, which managed to provide the insights needed to re-open the mine within days, not months, saving millions worth of downtime and costly clearance operations.

The Collapse

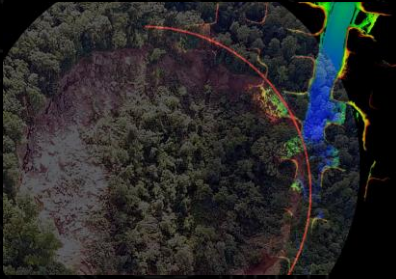
The disaster occurred at a large mine in Tennessee, that primarily produces limestone using a room-and-pillar method which extends up to 2km into the mountain.

Early in the morning on August 13, 2021, the mine supervisor on shift heard a sound he had never heard in his 16 years working in a mine.

“Like rain coming off the pillars,” the manager said. “At that moment something just dawned on me, and I started an evacuation. At 6:40 everyone was accounted for, and at about 6:59 and 48 seconds, the mine collapsed.”



The Challenge of Assessing the Damage



Providing an Impossible Solution



The US Mine Safety and Health administration (MSHA) quickly determined that the 250m across and 30m deep surface subsidence area left by the collapse was too dangerous for a person to explore. A robotic solution, however, wouldn't be easy either.

With no comms network or power underground after the incident, it was virtually impossible to send a robot more than a hundred meters into the mine.

In collaboration with PBE Communications, Rajant, and KAARTA, a solution was engineered using the Explora Series of ground robots. 10 Explora XL robots were fitted with KAARTA LiDAR, Visual Inspection cameras, and Rajant breadcrumb mesh network AC points, building a long network of communications that extended at one point up to 1.7km down into the mine, the deepest remote operation ever achieved.

Several Explora XL robots were fitted with high-powered PTZ cameras and lights to provide visual assessments of the environment, with one being fitted with a camera on a Telescopic arm to see over bunds. A LiDAR system was also fitted, to provide a 3D point cloud of the environment to collect geospatial information.

Explora XL provided a robust, high payload capacity robotic platform, that was able to navigate through debris to map the extent of the collapse.

This allowed the geotechnical teams access to live LiDAR and Camera feeds from the safety of the surface, enabling the mine to be cleared for re-entry within a week of ADR arriving on site.

THE RESULTS

Mine collapses can be catastrophic for mine operators. The combination of lost revenue due to downtime, costly mine rescue and clearance services, and the final cost of remediation will often cost no less than tens of millions to operators, multiplied by the length of time that it takes to return to normal operations. These impacts often flow onto communities, who are dependent on local industries for their economies.

Being able to use Explora to provide immediate insights into the condition of the mine without exposing human operators to danger not only saved millions in costs for the operator and the local community but did so while ensuring all personnel were safely separated from hazards.

0
LIVES
LOST

\$70+ Million
POTENTIAL SAVING

1.7km
REMOTE
OPERATION

CONCLUSIONS

High-risk and time-sensitive operations such as mine safety clearances pose difficult challenges for mine operators to deal with. Often compromises must be made between the safety of personnel or lost revenue in order to return a mine to functional within the shortest period of time possible.

In these high-risk scenarios, having a robust, field-tested robotic platform with a high payload capacity is the only sensible way to get operations back on track, with no compromise to safety.

**DISCOVER
SOLUTIONS**

For a video of the event, click [here](#).