



CCE Award Submission

Edison Mine

Bat Friendly Progressive Rehabilitation



GOLDER



Completed Edison Open Cut Cupola – 146 mm spacing between all steel members

PROJECT SUMMARY

The historic Edison Mine property is a century-old silver mine located in a remote area of northern Ontario and has been designated as protected bat habitat for species at risk. Mining occurred for only a few years before mining ceased in 1907 leaving eight unprotected physical mine hazards on site. To eliminate any liabilities associated with the historic mine, the Eaton Corporation (Eaton) retained Golder Associates Ltd. (Golder) to design and construct three bat friendly structures able to protect the public and still allow bat habitat to remain. Innovative designs were created to address the logistical challenges of constructing these structures in a location only accessible by boat and helicopter.

INNOVATION

The historic Edison Mine property is a century-old silver mine located in a remote area of Coleman Township, 8 kilometres northwest of Latchford, Ontario. Mining occurred for only a few years before mining ceased in 1907 leaving unprotected physical mine hazards on site. To eliminate any liabilities associated with the historic mine, the Eaton Corporation retained Golder to complete the progressive rehabilitation of the property.

The progressive rehabilitation of physical mine hazards is governed by the Ontario Mining Act (O. Reg. 240/00) and Ministry of Northern Development and Mines (MNDM). Acceptable rehabilitation options include the following:

- Permanent Fencing – requires monitoring in perpetuity
- Engineered Fill – costly, requires a clear understanding of mine workings
- Engineered Caps – costly, permanent solution

EDISON MINE

The Ministry of Natural Resources and Forestry (MNRF) identified the underground mine workings as a potential location for bat hibernacula and therefore designated the mine workings as protected habitat for species at risk. Due to this classification, the three physical mine hazards (adit, shaft, open cut) connected to the underground workings were to be preserved and left open, which meant existing rehabilitation practices (i.e. capping, backfilling) could not be implemented. The remote location of the mine made fencing the most viable solution but would not satisfy Eaton's requirements of a solution that did not require monitoring in perpetuity (i.e. no fencing). Given that the conventional rehabilitation measures listed above would either inhibit access to the underground workings by bats, or were not a permanent solution, a unique engineered rehabilitation solution for these three surface openings was required.

Through a 16 month design and consultation process involving Golder, Eaton, the MNDM and the MNRF, it was determined that the three open physical mine hazards be rehabilitated with permanent engineered stainless steel bat cupolas and bat gate. Bat cupolas and bat gates are designed to preserve protected bat habitat while preventing inadvertent access to the underground mine workings.

The Ontario Mining Act does not provide specific applicable design requirements for the construction and installation of bat friendly structures. Golder was required to create a site specific cupola and bat gate design that would satisfy the MNDM and MNRF. The final design had to meet the following criteria:

- Constructed of stainless steel for longevity
- Adequately anchored to competent bedrock
- Design load that accounts for dead weight of structure, snow loading, tree impacts and vehicle (ATV/snowmobile) traffic
- Prevent inadvertent access to the mine
- Steel spacing of 146 mm as to not impede the flight path of bats

The fabrication and installation of the two cupolas and bat gate were one of the first bat friendly structures to be constructed by a private enterprise in Ontario. The project successfully protected bat habitat for species at risk and prevented inadvertent access into the underground mine workings protecting the public's safety.



Adit Bat Gate securely anchored into bedrock walls



Undulating topography created design challenges that were overcome with detailed 3D LiDAR scans



Self-propelled barge carrying critical equipment 12 km up the Montreal River



45 helicopter lifts were completed to move 25,000 lbs of material and equipment

COMPLEXITY

Bat friendly progressive rehabilitation of physical mine hazards in Ontario is a young industry practice. The Mining Act provides rehabilitation requirements pertaining to conventional rehabilitation options (i.e. fencing, backfilling and engineered caps) but does not provide specific design requirements for bat cupolas or bat gates. Golder needed to create a site specific bat cupola and bat gate design that would satisfy the MNDM and MNRF. The remoteness of the site and undulating topography made data collection and design work difficult. To aid in the design, Golder completed LiDAR scans and generated a detailed 3D model of the mine openings.

The mine site is located in a remote forested area of northern Ontario only accessible by boat followed by a 5 km hike along a historic mining trail cut through the rough terrain of northern Ontario. Given logistical challenges of the remote location, cost-effective and efficient solutions needed to be implemented to safely transport all personnel, materials and equipment to site. A barge was used to transport larger equipment (excavator, ATV's/UTVs) 12 km up the Montreal River. Once all equipment was unloaded along the shore of the river, it was driven across the rough 5 km trail to site. A helicopter was used to complete 45 lifts and transport 25,000 lbs of material and equipment required for the fabrication and installation of the two bat cupolas and bat gate. A lifting sequence had to be generated to ensure helicopter capacities were met while optimizing the delivery of all material and equipment.



Completed Edison Shaft Cupola – Complete Stainless Steel Construction

SOCIAL AND/OR ECONOMIC BENEFITS

Historic mined areas have posed many unique challenges to the public and the environment. In many cases they leave hazards requiring rehabilitation. Many of these rehabilitations are challenging and expensive depending on the size of the hazard and its location. Some historic mines have now become the habitat of bats. A number of bat species are at risk across Canada, due to white nose syndrome, and their habitat needs protecting to assist in their recovery.

The design and construction of three bat friendly structures in a remote location over a short construction schedule, (June-August) due to the migration pattern of bats, met a number of social benefits by both protecting the public from the mine hazards and then assisting with the potential survival of a species at risk.

Initial designs of the bat structures were costly due to the amounts of stainless steel material required for construction and the materials needing to be flown to site by helicopter. Modifying the initial design (size and weight of materials) allowed for reductions of material, transportation and construction time resulting in overall cost savings but still meeting the project design. All design and modifications required government agency consultation prior to construction. The design and construction of the three bat friendly structures at the historic Edison mine in northern Ontario is an example of a project that successfully protects the public from hazards and assists species at risk.

ENVIRONMENTAL BENEFITS

There are currently four species of bats in Ontario identified as species at risk and during the winter months they hibernate in abandoned underground mine workings in northern Ontario. The bats are threatened by a disease known as white nose syndrome and it disrupts their hibernation cycle causing them to burn through their body fat supplies before they can be replenished. This disruption in their hibernation cycle has decimated the bat population in Ontario.

Previous permanent mine rehabilitation practices in Ontario involved backfilling the mine workings with engineered backfill or constructing engineered caps over mine openings on surface. These practices eliminated existing mine hazards and thus protected the public but also sealed all entry and exits points into the underground mine workings. By sealing the mine openings, it destroyed potential bat habitat as the bats could no longer freely use the underground mine workings to hibernate.

The Edison Mine has been identified by the Ministry of Natural Resources and Forestry (MNRF) as a potential site for bat hibernacula. Golder designed and implemented a rehabilitation plan that would protect the public from physical mine hazards while preserving the current condition of the mine openings. By preserving the mine openings, the underground workings are still accessible to the bats and allowing them to hibernate during the winter months. Protecting habitat for species at risk is a key component in preserving and promoting their population growth.

EDISON MINE

MEETING CLIENT'S NEEDS

The Eaton Corporation required the mining property be rehabilitated to meet the requirements of the Ontario Mining Act (O.Reg. 240/00) governed by the Ministry of Northern Development and Mines (MNDM). Eaton wanted the unprotected abandoned physical mine hazards be rehabilitated with a permanent solution (i.e. no fencing) and thus removing liabilities associated with the property. The Ministry of Natural Resources and Forestry (MNRF) identified the site as protected bat habitat and therefore existing rehabilitation practices (i.e. capping, backfilling) could not be implemented.

Eaton retained Golder to safely rehabilitate the mining property to meet the requirements of both the MNDM and MNRF. The remote location of the mine site and one of the industry's first bat friendly progressive rehabilitation projects made project scheduling and budgeting very difficult. Through collaboration with several disciplines and ministries over a two and a half year project schedule, Golder safely and under budget rehabilitated the mining property to meet the requirements of the MNDM, MNRF and Eaton.



Rehabilitated Edison Mine Site



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