

**HARDROCK PROJECT
Final Environmental Impact
Statement / Environmental
Assessment**

Chapter 25.0:
Benefits of the Project

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25.0 BENEFITS OF THE PROJECT

Greenstone Gold Mines GP Inc. (GGM) is committed to developing the Project in a sustainable manner contributing to a healthy environment, economy, and local communities. The following sections describe the predicted environmental, economic, and social benefits of the Project.

25.1 BENEFITS OF PROJECT CHANGES

Project design is an iterative process, and refinements have been made throughout the environmental assessment (EA) process, resulting in the designs and configurations presented in the Final Environmental Impact Statement/Environmental Assessment (EIS/EA).

Since the filing of the initial Project Description and Addendum and the release of the Draft EIS/EA (refer to Chapter 3.0 for additional information on these milestones), additional consultation was facilitated by having information available on potential effects, mitigation, and follow-up monitoring. Engineering designs have also advanced accordingly and will continue to evolve as detailed engineering and permitting move forward. In light of the results of consultation and studies undertaken since the beginning of the EA process, the conceptual design of the Project has been refined to consider the various environmental and engineering constraints and opportunities, and input from stakeholders, government agencies and Aboriginal communities.

A summary of key refinements that have been made to the Project design, including the resultant benefit to the environment, Aboriginal communities, and stakeholders, are listed in Table 25-1 and cover Project changes made during the pre-Draft EIS/EA (i.e., each stage of the EA process prior to the circulation of the Draft EIS/EA) and post-Draft EIS/EA (i.e., following the circulation of the Draft EIS/EA) periods.

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Table 25-1: Summary of Updates to the Project Design

Change to Project Design	EIS/EA Phase		Additional Information	Benefits to the Environment, Aboriginal Communities and Stakeholders
	Pre-Draft EIS/EA	Post-Draft EIS/EA		
Setbacks				
Setbacks from waterbodies.	-	✓	Removed infrastructure, where possible, from the 120 metre (m) reserve for surveyed claim to lease areas. Increased setbacks from Southwest Arm Tributary (including the Goldfield Creek Diversion) for Project infrastructure including waste rock storage area (WRSA) D and B.	Avoided or reduced the potential for adverse environmental effects on surface water, groundwater, land and resource use, and fish and fish habitat.
Tailings Management Facility (TMF)				
Refinements to the size and configuration of the TMF.	✓	✓	Avoided unnecessary disturbance of watercourses and fish habitat, including avoiding the infilling of Lake A-322. Shifted location of TMF reclaim pond away from the dams and Kenogamisis Lake.	Avoided or reduced the potential for adverse environmental effects on surface water, groundwater, and fish and fish habitat.
Modifications to the TMF construction and operation sequence.	✓	-	Addressed regulatory closure objectives and requests from Aboriginal communities to plan for closure and carry out progressive rehabilitation by developing the TMF in two separate cells. Incorporated seeding of the surface of the TMF to develop a vegetated cover to improve aesthetics, reduce the potential for surface erosion, and reduce the interaction between runoff and the tailings surface.	Avoided or reduced the potential for adverse environmental effects on surface water and groundwater. Created an opportunity to test and refine the closure plan during operation.
Historical Tailings				
Addition of long-term geotechnical stability measures for historical tailings.	-	✓	Identification of stability measures (i.e., buttress, berms and subsurface seepage collection) for the historical MacLeod tailings and logistics for handling and transfer of historical tailings to the TMF.	Avoided or reduced the potential for adverse environmental effects on surface water and groundwater.

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	Pre-Draft EIS/EA	Post-Draft EIS/EA		
Temporary Camp				
Confirmation of the need and location of the temporary camp.	✓	✓	Refinement of the location to the south side of Old Arena Road, farther from an existing residential area.	Avoided or reduced the potential for adverse environmental effects on the acoustic environment and community services and infrastructure.
Removal of temporary sewage treatment plant (STP) effluent discharge to Barton Bay.	-	✓	The temporary camp will be connected to the municipal wastewater system.	Avoided or reduced the potential for adverse environmental effects on surface water.
Water Management Facilities				
Siting of water management facilities.	✓	✓	Siting of the seepage, contact water, and subsurface seepage collection systems (i.e., ponds and ditching) to collect seepage and runoff from Project components.	Avoided or reduced the potential for adverse environmental effects on surface water, groundwater and fish and fish habitat.
WRSAs				
Identification of contingency WRSAs.	✓	-	Identified in the event that the foundation conditions of primary WRSAs are deemed not suitable for anticipated capacities. May also be used in the event that waste rock volumes are higher than expected or increase based on refinements to ore processing as mining advances.	N/A

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	Pre-Draft EIS/EA	Post-Draft EIS/EA		
Refinements to the WRSA deposition schedule.	✓	-	Updated the waste rock deposition approach to maintain the front nine holes and clubhouse of the existing public golf course for as long as possible.	Avoided or reduced the potential for adverse environmental effects on community services and infrastructure.
Refinements to the WRSAs.	-	✓	Increased setbacks from the Goldfield Creek diversion and Kenogamisis Lake. Redesigned a portion of WRSA A located over the historical MacLeod tailings for use as overburden storage and provided an enhanced cover to increase runoff and reduce infiltration through the historical MacLeod tailings thereby reducing potential effects on water quality from the historical tailings.	Avoided or reduced the potential for adverse environmental effects on surface water and groundwater.
Aggregate Sources				
Identification of aggregate sources.	✓	✓	Identification of aggregate sources in proximity to Project activities to provide aggregate and fill materials for construction and ongoing maintenance activities (i.e., reducing haul distance).	Avoided or reduced the potential for adverse environmental effects on the atmospheric environment.
Goldfield Creek Diversion and Offset Plan				
Refinements made to watercourse diversion.	✓	✓	Maintained existing flow through the northern portion of Goldfield Lake. Reduced the overall environmental effects on flow regimes, water transfer between subwatersheds, fish and fish habitat. Created a diversion pond (over 7 hectares), over 2.5 kilometres of channel and two backwater areas to manage flow and sediment control. Fluvial geomorphology studies were conducted as a result of consultation input, and contributed to the design of the backwater areas.	Avoided or reduced the potential for adverse environmental effects on fish and fish habitat and surface water.

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	Pre-Draft EIS/EA	Post-Draft EIS/EA		
Power Supply and Associated Infrastructure				
Identification of additional and backup power sources for the Project during both construction and operation.	✓	-	Power for construction activities was confirmed, and will be from a temporary grid connection and/or temporary diesel generators. Five generating sets will be used to meet average and peak power demands of 48.5 megawatts during operation. Two generating sets will provide standby capacity.	N/A
STP and Effluent Treatment Plant (ETP)				
Change in location of the temporary construction treated effluent discharge location.	-	✓	The location of the temporary construction treated effluent discharge was moved from the Central Basin to the Southwest Arm of Kenogamisis Lake.	Avoided or reduced the potential for adverse environmental effects on surface water and fish and fish habitat.
Confirmation of preferred freshwater intake and treated effluent discharge locations.	✓	-	The location for the freshwater intake and treated effluent discharge was confirmed.	N/A
Provincial Infrastructure				
The future locations of provincial facilities have been refined.	-	✓	Adjustments to the location of the Ministry of Transportation (MTO) Patrol Yard were made in consultation with the MTO. Adjustments to the locations of the Hydro One Networks Inc. access road and transmission/ distribution line avoided a wetland.	Avoided or reduced the potential for adverse environmental effects on vegetation communities.

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	Pre-Draft EIS/EA	Post-Draft EIS/EA		
Modification of the Highway 11 realignment.	✓	-	Identified a 500 m safety offset buffer surrounding the open pit associated with blasting.	Optimized safety for the public travelling along the realigned Highway 11.
Open Pit				
Refinements to the size and configuration of the open pit.	✓	✓	Refinements to the open pit were made based on ongoing Project planning and engineering design.	N/A
Modification to the number and location of ore stockpiles.	✓	✓	Reduced the number of ore stockpiles from two to one, and moved the stockpile closer to the process plant.	N/A
Refinement to the number of years required to fill the open pit during closure.	-	✓	Refinements were made as a result of ongoing Project planning and engineering design. Maximized the use of contact water to fill the open pit. Groundwater levels recover more quickly (i.e., with reduced timelines for open pit filling) during closure as the open pit fills to form a pit lake.	Avoided or reduced the potential for adverse environmental effects on surface water and groundwater.

NOTES:

- ✓ Change identified
- No change identified
- N/A Not applicable

25.2 SUMMARY OF ENVIRONMENTAL BENEFITS

The environmental studies completed in support of the Final EIS/EA have improved the overall understanding of the existing environment, and in particular the current effects of historical mining activity. Based on an assessment of the potential effects on the existing environment, the following environmental benefits are predicted as a result of the Project.

- Removal of portions of the historical MacLeod and Hardrock tailings:
 - Historical tailings are currently contributing to existing water quality effects in Kenogamisis Lake through runoff and groundwater discharge. As part of Project activities, a portion of the historical tailings will be removed, including 22 percent (%) of the historical MacLeod tailings and 77% of the historical Hardrock tailings. These historical tailings will be excavated and moved to the TMF, reducing the loadings to Kenogamisis Lake and resulting in improvements to water quality compared to baseline conditions.
- Enhanced cover for the historical MacLeod high tailings:
 - A portion of the historical MacLeod high tailings area has been designed as a storage area for overburden. An enhanced cover system that incorporates a layer of rock over the existing tailings to help improve stability and provide a drainage layer will be installed. The overburden will be stockpiled and sloped in a manner that promotes runoff and reduces infiltration with a layer of overburden remaining in perpetuity. The enhanced cover system will reduce infiltration through the historical MacLeod tailings and subsequent groundwater discharge, thereby decreasing loadings to Kenogamisis Lake compared to baseline conditions.
- Subsurface seepage collection system for historical MacLeod high tailings:
 - A subsurface seepage collection system will be implemented to collect both short-term seepage anticipated during construction and highway embankment preloading, and long-term seepage (operation and closure/post-closure) from the historical MacLeod high tailings.
- Open pit dewatering:
 - During operation, 100% of the groundwater originating from beneath the historical tailings, WRSA A and WRSA B, 59% from WRSA C, and 94% from the ore stockpile will be directed to the open pit where it will be collected and either reused to support mill demand, or be treated through the ETP before discharging to the Southwest Arm of Kenogamisis Lake. This change in groundwater flow direction during operation will reduce the current loading to Kenogamisis Lake associated with the historical tailings, and is predicted to have a positive effect on water quality over time in Kenogamisis Lake, in particular Barton Bay and Central Basin.

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Rehabilitation measures to address the historical MacLeod and Hardrock tailings have been incorporated into the Project, including removal of portions of the historical MacLeod and Hardrock tailings and installation of an enhanced cover system and a subsurface seepage collection system for the historical MacLeod high tailings. These rehabilitation measures are expected to improve overall water quality in Kenogamisis Lake compared to existing conditions.

25.3 SUMMARY OF ECONOMIC BENEFITS

The benefits of constructing and operating the Project for Ontario and Canada include economic development and diversification, and job creation. The Project will provide tax revenue for the Municipality of Greenstone, as well as for the provincial and federal governments. These revenues can then be used to support public services, such as health care, education, and infrastructure. Based on a study of spending estimates, the Project is expected to have a positive effect on the economies of local communities, the District of Thunder Bay, the Province of Ontario, and the Government of Canada. The following economic benefits are predicted as a result of the Project.

- Project employment:
 - The Project will create 35,600 person-years (PYs)¹ of employment (including direct, indirect, and induced effects) in Canada during construction, operation, and active closure. The Project will create 26,600 PYs of employment in Ontario during construction and over its operating life. On average, the Project will result in the equivalent of 1,225 jobs in Ontario in each of the approximately 23 years from construction through active closure. Of these, 385 jobs per year would be directly associated with the Project. On average, another 350 jobs will result elsewhere in Canada during construction, operation and active closure.
- Project contributions to government revenues:
 - During the approximately 23 years from construction through active closure, the Project will directly and indirectly create \$242 million in revenues (undiscounted) for the Government of Ontario. This is equivalent to an average of about \$11 million per year. Total revenues for the Government of Canada would amount to \$215 million, or an average of about \$10 million per year.

¹ Employment effects during construction are described in terms of person-years (PYs). A PY is equivalent to one person working full-time (2,080 hours per year) for one year. However, the construction employment estimates include people working on a full-time, part-time and seasonal basis.

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- Project contributions to provincial and federal economic activity:
 - During the approximately 23 years from construction through active closure, the Project will directly and indirectly increase economic activity, as measured in terms of Gross Domestic Product (GDP), by \$3.1 billion in revenues (undiscounted) for Ontario. This is equivalent to an average of about \$142 million per year. The Project's total contribution to the GDP in Canada will amount to \$6.3 billion from construction through active closure, or an average of about \$286 million per year.
- Benefits to the local and regional economy:
 - The Project will affect both the local and regional economies primarily through spending on labour, goods and services. Local and regional businesses, including Aboriginal-owned businesses, stand to benefit from successful bids to supply the Project with goods and services.
- Expenditure on labour, goods and services:
 - Total Project expenditure on labour, goods and services in the local area is expected to be approximately \$480 million from construction through active closure.
 - Project operation (inclusive of sustaining capital) is also expected to create 305 jobs for local businesses that supply goods and services to the Project.
 - Consumer purchases by the Project workforce will create an additional 180 jobs in local retail and service businesses.
 - Project-related employment could reduce the local rate of unemployment, which was 16.5% in 2011, by more than six percentage points.
 - For the regional economy, which consists of the District of Thunder Bay, Project expenditures on labour, goods and services from construction through active closure are expected to be approximately \$1.9 billion. Project operation (inclusive of sustaining capital) is expected to create 55 jobs for businesses that supply goods and services to the Project and 30 jobs in retail and service businesses.
- Municipal property taxes:
 - Based on its experience with other mining projects, GGM expects that it will pay property taxes to the Municipality of Greenstone while the Project is operating, although the exact amount of municipal taxes has yet to be negotiated between GGM and the Municipality of Greenstone.

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- Contracting and employment opportunities:
 - GGM will implement measures to enhance contracting and employment opportunities for local and regional residents and businesses, including Aboriginal-owned businesses. Project expenditures on labour, goods and services during construction and operation will result in a positive effect on economy by supporting local and regional businesses and allowing them to build capacity and experience in the mining supply and services sector.

25.4 SUMMARY OF COMMUNITY AND SOCIAL BENEFITS

GGM is dedicated to establishing productive local partnerships that contribute to achieving development goals identified by the community, to address local priorities and concerns, and to have communities benefit from the Project. The following social benefits are predicted as a result of the Project:

- Increased labour force capacity:
 - GGM will identify and promote local residents and Aboriginal communities to acquire the necessary skills to help them qualify for Project employment, particularly during the operation phase of the Project.
- Reduced unemployment:
 - Hiring of local workers can reduce the local unemployment rate by more than six percentage points (i.e., from 16.5% in 2011 to the equivalent of 10.2% in 2011).
- Increased personal and family income:
 - Project employment will provide relatively high income for workers and their families, especially for residents of the Municipality of Greenstone, local Aboriginal communities and the District of Thunder Bay.
- Increased income for regional businesses:
 - Project purchases of goods and services will provide expansion and diversification opportunities for businesses in the Municipality of Greenstone, businesses operated by local Aboriginal people and businesses in the District of Thunder Bay. GGM has and will continue to work with local and Aboriginal-owned businesses on Project contract opportunities regarding the supply of goods and services, particularly for the operation phase of the Project.