17. Sustainability

17.1 Introduction

Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development 1987). Development is imperative to satisfy growing human needs and to improve the quality of human life. However, consideration shall be given to the quality of the environment, human well-being, and economic security when designing any development plan to ensure its sustainability (Government of Canada 2009).

In Canada, the concept of sustainable development was integrated, in 1995, into federal legislation and amendments to the *Auditor General Act* (1985), which established the office of the Commissioner of the Environment and Sustainable Development. According to the legislation, departments must prepare sustainable development strategies and set out goals, objectives, and specific commitments by which the federal government can advance sustainable development. Recently, government departments and agencies began working together to support the achievement of six government-wide sustainable development goals: clean air, clean water, reduced greenhouse gas (GHG) emissions, sustainable communities, sustainable development and use of natural resources, and governance for sustainable development. The Government of Canada introduced the *Federal Sustainable Development Act* (FSDA 2008), which received royal assent on June 26, 2008, to honour its national and international commitments to sustainable development (Government of Canada 2009).

17.2 Pacific Booker Minerals Inc. Corporate Sustainability Principles

Pacific Booker Minerals Inc. (PBM) is committed to developing the Morrison Copper/Gold Project (the Project) to be productive and profitable while ensuring the health and the safety of all its employees and the protection of the environment.

PBM's sustainability objectives are to:

- ensure the health and safety of employees, contractors, and visitors in the workplace;
- prevent pollution and minimize other adverse effects that its mining operations may cause to the environment;
- demonstrate its commitment to fostering sustainable communities;
- practice progressive rehabilitation in areas affected by its activities.

To achieve these objectives, PBM will:

- educate and train all its employees and contractors to promote the application of health, safety, environment, and sustainability principles;

- continually improve health, safety, and environmental systems by establishing and reviewing measureable objectives and targets through evaluation, auditing, and developing performance improvement plans;
- identify and engage with the stakeholders and work to take their views, customs, and culture into account throughout the Project's life cycle;
- develop a responsible mine closure plan that considers future needs of the local communities;
- seek and adopt sustainable practices in the use of natural resources, taking into consideration the protection of the local and regional biodiversity;
- maximize the reuse of materials, recycle waste, and minimize the use of consumables and raw materials.

17.3 Sustainability Assessment Methodology

The sustainability assessment for the Project was carried out to determine if the Project would have any adverse environmental effects on the capacity of renewable resources to meet the needs of present and future generations. Renewable resources that may be affected by the Project were identified and an assessment was made whether the Project will affect their sustainable use during construction, operations, and post-closure. Based on the initial assessment, specific socio-economic and environmental sustainability goals were determined. A sustainability assessment was carried out for each goal to determine whether the Project, as proposed, would meet the goals. These assessments were qualitative, using best professional judgment.

17.4 Sustainable Operations

PBM recognizes sustainability as an important goal during Project planning. PBM chose to construct a transmission line to provide electricity to the Project rather than obtaining electricity using generators that rely on fossil fuels. Electricity is available 24.9 km from the Project site. This was deemed to be the best economic and environmental choice. PBM's goal is to minimize, as much as possible, the generation of GHG emissions. The availability of electrical power close to the Project site has eliminated the need for the use of diesel generators for the production of electricity and will result in a reduction of GHG emissions.

PBM chose to process the ore using high pressure grinding rolls (HPGR) rather than the conventional SAG mill. HPGR uses approximately 50% less energy than the conventional SAG mill. There is also a significant savings in consumables as HPGR does not use steel balls or liners. As a result, there is less trucking required to the site as steel balls wear and require regular replacement. Fewer trucks result in less GHG emissions produced because of the reduction in the amount of fossil fuel used. Using fewer trucks is also more sustainable as fewer energy sources are required to construct and maintain the trucks, roads, and other aspects related to truck use.

A primary criterion for PBM's selection of the location of the Waste Rock Dump was minimizing the haul distance from the open pit. The short haul distance provided by the selected

location minimizes the consumption of fossil fuels and therefore minimizes the production of GHG emissions.

PBM's operations will rely on water for processing from pit dewatering and on reclaim water from the tailings storage facility (TSF). This is expected to eliminate the requirement for process make-up fresh water required from Morrison Lake to operate the facilities. Freshwater from Morrison Lake will be required for domestic consumption. The goal is to use fewer resources to provide a more sustainable project.

PBM will bus employees to and from the mine site and Village of Granisle. This reduces the number of vehicles on the road and reducing the fuel used. Fewer vehicles and less fuel result in fewer GHGs produced because of the reduction in the amount of fossil fuels. Using fewer vehicles is also more sustainable as fewer energy sources are required to construct and maintain the vehicles, roads and other aspects related to vehicle use.

17.5 Renewable Resources

The Project impact is such that, during construction and operations, it will reduce the availability of some renewable resources, such as timber, and reduce fishing, hunting, and trapping opportunities within the overall Project footprint. With the proposed mitigation measures, it is unlikely that renewable resources will be permanently, adversely affected by the Project, except in the TSF and pit lake. That is, the loss of the use of renewable resources during construction and operations is expected to be temporary, and generally reversible when the site is decommissioned and reclaimed. Therefore, the capacity of the renewable resources to meet the need of the present users and those of the future will be reduced in the early years following closure and reclamation but should increase with time such that these resources will be available to future generations.

17.6 Socio-economic Sustainability

Social sustainability inherently includes fostering and maintaining a sustainable economic base. As such, the terms "social" and "socio-economic" are used interchangeably in this section. In 1993, the BC Round Table (on Environment and the Economy) concluded that principles for successful sustainability include "social equity, (the meeting of) basic needs, personal development, and responsible citizenship" (Environment Canada 1993).

In general, social sustainability should balance economic, environmental, and social needs and/or interests that encompass diverse perspectives. This involves both long- and short-term planning facilitated by community leaders and members, First Nations, and relevant stakeholders.

17.6.1 Elements of Social and Socio-economic Sustainability

Social sustainability and corporate social responsibility (CSR) typically include voluntary commitments and the undertaking of activities that serve the collective interests of multiple stakeholders. Although difficult to measure because of the subjective and sometimes confidential nature of the information, according to various governmental and private institutions, social sustainability can be furthered and achieved when the following interrelated

objectives are pursued (Environment Canada 1993; Hohnan 2007):

- the maintenance of personal (physical and mental) health;
- the ability to self-provide adequate food, shelter, and clothing;
- access to rewarding and meaningful employment;
- knowledge and understanding of community and global issues;
- the ability and opportunity for creative, spiritual, and psychological expression;
- freedom to express cultural identity;
- a sense of belonging;
- community social support;
- freedom from discrimination and societal barriers;
- ensuring safety and security, and freedom from fear;
- ability to actively participate in civic affairs;
- community involvement, development, investment, and self-reliance; and
- decision-making transparency and accountability.

17.6.2 Supporting Social Sustainability Plans

PBM developed socio-economic mitigation plans, as described in the Project's Social Management Plan (SMP; Section 13.12), in consideration and support of social and community economic sustainability. Given the inter-related nature of community social values and the integrity of the natural environment, the Project's multi-disciplinary, environmental management plans are also expected to support social sustainability. Collectively, these plans are intended to ensure:

- Mitigating, monitoring, and resolving issues pertaining to local communities and the natural environment are carried out:

  This can be done by implementing a multi-stakeholder Community Sustainability Advisory Committee. The committee would create a mechanism for corporate-community communication with a mandate to identify, resolve, and monitor social and environmental issues arising from the Project.

- Contributions are made to short- and long-term community economic development:

  Where feasible, Project employees will be hired locally. Focused training will expand opportunities for local employment. Expenditures stemming from the Project and the household spending of its employees and contractors translate as increased demand for a wide range of goods and services. This fosters local business opportunities and economic development.

- Contributing to community social development is carried out:

This involves hiring a Community Liaison Manager to facilitate corporate-community communication and cultivate community partnerships that support positive social development.

- Fostering community diversity occurs:

  This can be done by hiring local First Nations and citizens with diverse cultural backgrounds and supporting cultural activities and events that celebrate and promote the sustainability of culture and heritage.

- Supporting individual and community well-being occurs:

  This can be carried out by implementing inclusive and flexible human resources policies and programs that encourage the overall health and well-being of employees and their families.

The probability of successful social sustainability is ultimately contingent on the local community's ability to create a multi-stakeholder and shared vision on what they want their community to look like in the future, from an inter-dependent social, economic, and environmental perspective.

PBM, as a major employer and stakeholder, can directly support the community's sustainability vision by upholding identified objectives and contributing to socio-economic development goals. Through implementing their socio-economic mitigation strategies, enhancement measures, and overarching SMPs, PBM is a vital participant in collaborating with local community leaders and citizens to achieve social sustainability objectives.

17.7 Environmental Sustainability

17.7.1 Air Quality

PBM will enact several policies to maintain the sustainability of climate and air quality within the Project area. The consumption of fuels (e.g., diesel, propane) and hydro-electric power will be tracked closely because these are consumables that constitute a significant portion of the annual operations budget and their tracking is required for estimating annual GHG emissions. In addition, there are several mitigation measures that will be enacted to minimize releasing GHGs and other emissions (e.g., using low sulphur diesel fuel, no idling policy, vehicle/fleet maintenance programs, minimizing the number of trips for ore, waste hauling, and consumables, and road watering to minimize fugitive dust).

Under the proposed British Columbia Ministry of Environment's (BC MOE) *Mandatory Reporting of GHG Emissions Regulation* (2008), the annual Project GHG emissions would be reported on an annual basis starting in 2012. The regulation should come into effect in early 2009. Full implementation of the cap and trade system is expected to take place in 2012. In addition to annually reporting GHG emissions, a third party (independent) verification will be required if the Project's annual GHG emissions are greater than 25,000 tonnes of carbon dioxide equivalent (CO_{2e}).

PBM has also undertaken to conserve, as much as possible, surface soils for final reclamation that will stimulate revegetation of the disturbed areas. The ultimate revegetation goal is to return the site to a forested ecosystem. The conserved soils are considered a carbon sink. These soils also contain nutrients and native seed and so their use will contribute to a more rapid and successful return of a vegetated system. The vegetation will sequester carbon in increasing amounts with time as trees mature. With the trees and understorey in place, carbon will be also be stored on the ground surface in tree litter and underground in the roots and soils. Roots naturally die back and the carbon from the roots enters the soil and contributes to the soil carbon sink. As well, a functioning ecosystem has an active microbial and soil animal population that also dies back and further contributes to the soil carbon sink. The carbon stored above and below ground represents GHG sequestration and so counters GHG emissions, providing sustainability.

17.7.2 Water Quantity and Quality

An effects assessment was completed on hydrology, surface water quality, and groundwater quantity and quality. The Project will not create significant adverse effects on the sustainability of water quantity or quality. While the Project will cause changes to surface water and groundwater flows, the mine plan has been designed to minimize the magnitude and timeframe of these changes. Similarly, changes to water quality are minimized in the mine plan and will be managed to meet regulatory requirements before entering the receiving environment to maintain environmental sustainability at the local and regional levels.

17.7.3 Wildlife

PBM supports sustainable development through adopting practices that integrate wildlife and wildlife habitat conservation. Comprehensive mitigation, management, and monitoring practices have been developed (Sections 13.10 and 14.9) to avoid and minimize disturbance to important wildlife and wildlife habitat. Specifically, habitat fragmentation across the landscape will be mitigated and minimized through the selection of the proposed TSF location (Section 15). Potential Project effects on local wildlife populations will also be mitigated through nest avoidance management (e.g., identifying and avoiding raptor, waterfowl, and forest bird nests), waste and wildlife attractant management (e.g., storage and removal of wildlife attracting materials), wildlife and road interaction management (e.g., speed limits, wildlife right-of-way, reporting wildlife observation, roadside vegetation management, dust control, and bank height management), and the development of the wildlife and transmission line interaction management plan (e.g., design considerations to minimize potential bird electrocutions). Moose will be monitored throughout the life of the Project to ensure the maintenance of the local population over the long term.

PBM, recognizing the importance of communicating and collaborating with local communities, governments, and other stakeholders, will work with others to address wildlife concerns and issues arising during Project development, operations, and closure. PBM understands the value of adaptive management and will use this approach to continually improve their environmental performance and wildlife management measures to ensure the long-term maintenance of wildlife populations and habitats.

17.7.4 Fish and Fish Habitat

PBM will enact several policies to maintain the sustainability of fish and fish habitat within the Project area. Access to the mine site will be controlled to avoid increased public fishing in Morrison Lake. As well, employees and contractors will be prohibited, within the scope of government regulations, from fishing at the mine site or along the access road. During the fall spawning period for sockeye and coho salmon, employees and contractors also will be prohibited from the shoreline of Morrison Lake at stream 44800 to avoid disturbing spawning fish (see Section 7.10). Fish habitat monitoring activities, including water balance, contaminant, and sediment monitoring, as part of the aquatic environmental management plan, will be performed throughout the life of the Project to ensure the long-term sustainability of fish and fish habitat within the Project area.

17.7.5 Terrain, Surficial Materials, Overburden, and Soils

PBM conducted an assessment of the potential Project effects on the terrain, surficial materials, overburden, and soils (Section 8.13) and has committed to a soil and overburden materials management plan and a soils and overburden materials monitoring plan (Sections 13.6, 13.7, and 14.6) as a means to minimizing the potential adverse effects on the soils and the sustainable use of the soils following closure. Poor management of the soils could prevent successful revegetation and establishment of wildlife habitat with closure. These plans include design features and alternative options to minimize disturbance to the soils, as much as possible, and to use best management and monitoring practices to handle disturbed soils and overburden materials, when disturbance is unavoidable. PBM will ensure the soils and overburden materials management and monitoring plans are undertaken diligently throughout the life of the Project. As well, PBM will carry out progressive reclamation of disturbed and exposed soils, as soon as feasible, as a means of returning the site to a sustainable ecosystem as soon as possible, recognizing that time is required to achieve a functioning vegetated ecosystem. PBM also developed a closure and reclamation plan (Section 16) to decommission and reclaim the Project site at closure and re-establish a productive land use that includes wildlife habitat.

The careful implementation of these plans will not only ensure that the post-closure land use objectives of the Project are met, but are met successfully. This will contribute to a functioning vegetated ecosystem that will be available for future generations.

17.7.6 Vegetation

PBM will take several steps to ensure the long-term sustainability of the natural vegetation and terrestrial ecosystems in the Project area. Firstly, PBM will strive to maintain the integrity of the native landscape by ensuring that invasive plant species are not introduced. The introduction of invasive species will be prevented by:

- revegetating disturbed areas immediately so that weeds (which thrive in open, disturbed areas) do not establish;
- using native plant species during revegetation, which are suited, as much as possible, to the particular ecosystem type present;

- following guidelines in the *BC Windthrow Handbook* (Stathers, Rollerson, and Mitchell 1994) during forest clearing to minimize the amount of disturbed land on which invasive plants can establish.

Secondly, PBM will manage vegetation without using pesticides or herbicides, whenever possible. Mechanically removing invasive plant species and mechanically clearing vegetation will be the preferred option for vegetation management. Mechanical, rather than chemical treatment will reduce the likelihood of toxins entering the soils and waterbodies, and thus also the likelihood of human, plant, and animal uptake.

Thirdly, sensitive and rare ecosystems, including wetlands, will be avoided, where possible, by adjusting the proposed routes and placement of roads and transmission towers. Maintaining natural vegetation buffers around wetlands and other sensitive ecosystems will help reduce erosion and sedimentation in wetlands, and will reduce the accumulation of fugitive dust from roadways and other Project sources. Finally, following mine closure, reclamation will aim to allow for the return, with time, of ecosystem types reflective of the Project area.

17.8 Summary

PBM has committed to minimizing the potential socio-economic and environmental adverse effects caused by the Project. The Company has developed comprehensive management and mitigation plans to reduce the potential for adverse effects and enhance positive outcomes, both locally and regionally, that will ensure the long-term sustainability of the site. PBM has further committed to working with communities, First Nations, and government agencies to address sustainability needs on an ongoing basis throughout the life of the Project and beyond. Proposed socio-economic and environmental management and monitoring plans will be modified to address new concerns and meet the long-term sustainability objectives of the Project. The indicators of sustainability will be assessed on an on-going basis as set out in the monitoring plans. The achievement of sustainability objectives will be documented in the annual reclamation reports and in the corporate annual reports. The overall assessment is that the proposed Project is designed to support sustainability principles, as much as possible, in an effort to meet the requirements for the Project but recognizing the needs of future generations.