BACK RIVER PROJECT
Main Application Document

October 2017

Executive Summary – English

Sabina Gold & Silver Corp. (Sabina or the Company) is required to submit to the Nunavut Water Board (NWB) a Type A Water Licence Application for a Mining and Milling Undertaking (the Application) in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (the Act) and *Nunavut Water Regulations* (Regulations) to use water, deposit waste, and conduct associated activities for the development of the Back River Project (the Project). Sabina has prepared the Application to meet the requirements outlined in the *Nunavut Agreement*, the Act, and NWB General Information Guide 4 – Completing and Submitting a Water Licence Application for a New Licence, and the NWB Mining and Milling Supplemental Information Guideline (SIG) for Mine Development MM-3.

The Project is a proposed 27-year gold project owned by Sabina within the West Kitikmeot region of southwestern Nunavut (base Figure 1). It is situated approximately 400 kilometres (km) southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 525 km northeast of Yellowknife, Northwest Territories (NWT). The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4) (base Figure 2). The closest community areas to the Project are Kingaok, located approximately 160 km north of the Goose Property, and Omingmaktok, located approximately 250 km northeast of the Goose Property.

The Project is comprised of two main areas with an interconnecting winter ice road: the Goose Property (base Figure 3) and the Marine Laydown Area (MLA) (base Figure 4) situated along the western shore of southern Bathurst Inlet. The Goose Property Potential Development Area (PDA) is predominantly on Inuit Owned Land (IOL). A winter ice road spur will also connect to Sabina's George Exploration Camp and proposed Bathurst Inlet Port and Road Project (BIPR) infrastructure.

The Project will be supported by year-round resupply by aircraft and seasonal marine resupply by open water shipping (approximately 3 to 5 vessels per year). Gold doré bars will be shipped out by aircraft.

The mine plan consists of open pits and underground mining operations supporting a 6,000 tonnes per day (t/d) milling operation using a standard gravity separation and cyanide leaching circuit to extract the gold. The current plan for combined mine production focuses on achieving average production of 350,000 ounces of gold annually. Four deposits at Goose Property (Umwelt, Llama, Goose Main, and Echo) are planned to be mined using both open pit and underground mining methods. The proposed underground mining methods include post pillar cut-and-fill, drift and fill, and longitudinal open stoping; the proposed open pit mining method is truck and shovel.

Mining will begin with open pits at the Goose Property with pre-stripping and ore stockpiling beginning in Year -2. Throughout the mine life, production from open pit mining will be supplemented by the underground mines starting with production from Llama underground in Year -1. Ore will be stockpiled to optimize mill feed grades and add flexibility to the mine plan. Project development will require establishing a Tailings Storage Facility (TSF), and four waste rock storage areas (WRSAs): Llama, Umwelt, Echo, and TSF – a WRSA over the TSF). The TSF will be located on crown land with all other infrastructure on IOL. Tailings (and potentially waste rock) will be deposited in the TSF, and two mined-out open pits: Umwelt Tailings Facility (TF), and Goose Main TF. Water will be reclaimed from the active tailings management facility for use as process water.

The life of the Project, from mobilization to post-closure, is 27 years: Mobilization and Construction Phase of 4 years (Year -4 to Year -1), Operations Phase of 10 years (Year 1 to Year 10), Closure Phase of

8 years (Year 10 to Year 18), and Post-Closure monitoring for 5 years (Year 18 to Year 23). It should be noted that the Operations Phase may be extended beyond 10 years should additional mineral deposits become economical to be developed.

Sabina has completed extensive baseline studies including terrestrial environment, wildlife (particularly caribou), marine environment, freshwater environment, atmospheric environment, human environment, and resource utilization in support of the environmental assessment and review completed by the Nunavut Impact Review Board (NIRB). The Naonaiyaotit Traditional Knowledge Project and publicly available information from NWT aboriginal groups was used by Sabina for the collection and analysis of Traditional Knowledge (TK) information used in the Environmental Impact Statement (EIS) submitted to the NIRB. Baseline and TK information form the foundation of the EIS and provided information for the development of mitigation and management plans.

Sabina has completed Final NIRB hearings on the EIS and the Final EIS Addendum to identify and assess potential environmental and social effects resulting from the Project. A ministerial decision and NIRB Project Certificate is pending. In accordance with the requirements of the Nunavut Agreement, Sabina plans to have in place an Inuit Impact Benefits Agreement and Compensation Agreement (including a Water Compensation Agreement) with the Kitikmeot Inuit Association prior to any final decision from the NWB on the Application.

Sabina has developed monitoring and management programs required to mitigate, monitor, and report on its environmental performance against the regulatory requirements contained within its operating authorizations, permits, licenses, leases consistent with the legal requirements of applicable Acts and Regulations in Nunavut. Executive summaries have been provided within each management program.

Sabina's management programs include:

- Infrastructure and Access Management Program which includes the Road Management Plan and the Borrow Pits and Quarry Management Plan;
- Water Management Program which includes the Water Management Plan;
- Waste Management Program which includes the Ore Storage Management Plan, Mine Waste Rock Management Plan, Tailings Management Plan, Landfill and Waste Management Plan, Incineration Management Plan, Landfarm Management Plan, and Hazardous Materials Management Plan;
- Emergency Response Management Program which includes the Risk Management and Emergency Response Management Plan, Fuel Management Plan, Spill Contingency Plan, and Oil Pollution Emergency Management Plan;
- General and Aquatic Effects Monitoring which includes the Environmental Management and Protection Plan, Aquatic Effects Management Plan, Conceptual Fish Offsetting Plan, Marine Monitoring Plan, and Quality Assurance/Quality Control Plan; and
- Interim Closure and Reclamation Program which includes the Interim Closure and Reclamation Plan (including vegetation management), and Interim Closure Cost Estimate.

A key closure objective is to return the operational footprint to both a physically and a chemically stable condition in the long term for the protection of people and the natural environment. Post-Closure environmental monitoring will continue until it has been verified that reclamation has successfully met closure and reclamation objectives.

Sabina intends to build a mine which is safe, environmentally responsible, and beneficial to all parties involved. Sabina will balance good stewardship in the protection of human health and the natural environment. Sabina confirms with the NWB that the Company has the financial responsibility to adequately satisfy legal requirements of the Act for issuance of a Type A Water Licence, to complete the undertaking from construction to closure, and that measures are in place or will be put in place to mitigate any adverse impacts. Sabina is committed to ongoing maintenance and restoration of the mine site in the event of future closing or abandonment of the undertaking, and is confident in assuming its responsibility, taking into account their current, ongoing, and past performance in the Kitikmeot Region, Nunavut, and Canada.

Executive Summary - Inuktitut

ᓴᐱᓇ ᒎᓗ ᐊᒻᒪ ᓯᐊᕗ ᑯᐊᐳᕇᓴᓐ (ᓴᐱᓇ ᐅᕝᕙᓘᓐᓃᑦ ᑲᒻᐸᓂ) ᑐᓂᓯᖃᑦᑕᓇᐊᖃᖅᑐᑦ ᓄᓇᕗᒻᒥ ᐃᒪᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ (NWB) ᐃᒪᐃᑦᑐᒥᑦ ᓇᓗᓇᐃᒃᑯᑎᓕᒃ A-ᒥ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒧᑦ ᑐᒃᓯᕋᐅᑎᒥ ᐅᔭᕋᕐᓂᐊᕐᓂᕐᒧᑦ ᐊᒻᒪ ᐅᔭᕋᖕᓂ ᓱᕐᑎᓇᓂᕐᐊᓂᕐᒧᑦ (ᑐᒃᓯᕋᐅᑎᓕᐊᖑᔪᖅ) ᒪᓕᒃᓯᒪᓗᑎᒃ *ᓄᓇᕗᑦ ᐃᒪᕐᒋᓐᓄᑦ ᐊᒻᒪ ᓄᓇᕗᒻᒥ ᓄᓇᐅᑉ ᖅᑳᖕᓚᓃᑦᑐᓄᑦ ᑭᓪᓕᓯᓂᐊᖅᑏᑦ ᒪᓕᒐᖓᓂᑦ* (ᒪᓕᒐᖅ) ᐊᒻᒪᓗ *ᓄᓇᕗᒻᒥ ᐃᒪᐃᑦ ᐱᖅᑯᔭᖅᒋᓐᓂᑦ* (ᐱᖅᑯᔭᐃᑦ) ᐊᑐᖅᓂᖅᒧᑦ ᐃᒪᕐᒥᑦ, ᐊᓂᑦᑎᖅᑲᑦᑕᖅᓂᖅᒥᑦ, ᐊᒻᒪᓗ ᑕᒪᐅᖕᒫᖓᔪᓂᑦ ᐱᓕᕆᖅᑲᑦᑕᖅᓂᖅᒧ ᐱᕙᓪᓕᐊᑎᑦᑎᓂᖅᒧ ᓴᓐᓂᖓᔪᖅ ᐱᓕᕆᐊᒥᑦ (ᐱᓕᕆᐊᒃᓴᖅ). ᓴᐱᓇ ᐸᖅᓇᐅᓯᐅᖅᓯᒪᕗᑦ ᑐᒃᓯᕋᐅᑎᓂ ᒪᓕᒃᓯᒪᓪᓗᑎᒃ ᒪᓕᒋᐊᓕᖕᓂᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓄᑦ *ᓄᓇᕗᒻᒥ ᓄᓇᑖᖅᓂᖅᒧᑦ ᐊᖏᕈᑎᓂᑦ* (NLCA), ᒪᓕᒐᖅᒥᑦ, ᐊᒻᒪ ᓄᓇᕗᒻᒥ ᐃᒪᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᑭᒃᑯᓕᒫᓄᑦ ᑐᓴᐅᒪᒍᑎᖏᓐᓂᑦ ᑐᑭᒧᐊᕈᑎ 4-ᒥᑦ - ᐱᐊᓂᒃᓯᓂᖅ ᐊᒻᒪ ᑐᓂᓯᓂᖅ ᐃᒪᖅᒧ ᓚᐃᓴᓐᓯᑖᕈᑎᒃᓴᓂ ᓄᑖᒧᑦ ᓚᐃᓴᓐᓯᑖᕈᑎᒃᓴᒧᑦ, ᐊᒻᒪᓗ ᓄᓇᕗᒻᒥ ᐃᒪᓕᕆᓕᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦᑕ ᐅᔭᕋᖕᓂᐊᖅᓂᖅᒧᑦ ᐊᒻᒪ ᐅᔭᕋᓕᕆᓂᖅᒧᑦ ᑐᑭᒧᐊᕈᑎᖏᓐᓂᑦ ᐅᔭᕋᖕᓂᐊᖅᕕᖕᒥ ᐱᕙᓪᓕᐊᓂᖅᒧᑦ MM-3.

ᐅᓇ ᐱᓕᕆᐊᒃᓴᖅ ᐊᖅᕌᒍᓂ 27-ᓂ ᒎᓗᓕᕆᕝᕕᐅᓂᐊᖅᓗᓂ ᓇᖕᒥᓂᕆᔭᐅᓪᓗᓂ ᓴᐱᓇᑯᓐᓂᑦ ᒫᓐᑐᖅ ᖃᑎᖅᒥᐅᑉ ᐱᖓᓐᓇᖓᓂᑦ ᓄᓇᕗᑦ ᓂᒋᐊᑕ ᐱᖓᓐᓇᖓᓂᑦ (ᐊᔾᔨᖑᐊᖅ 1). ᒫᓃᐸᓗᒃᑐᖅ 400 ᑭᓛᒥᑕ ᓂᒋᐊᓂ ᐱᖓᓐᓇᖅᓯᐊᓂ ᐃᖃᓗᒃᑑᑦᑎᐊᑉ, 95 ᑭᓛᒥᑕ ᓂᒋᐊᓂ ᐱᖓᓐᓇᖅᐸᓯᐊᓂᑦ ᑭᙵᐅᑉ ᓂᒋᖅᐸᓯᐊᓂᑦ, ᐊᒻᒪᓗ 525 ᑭᓛᒥᑕ ᐅᐊᖕᓇᖓᓂ ᑲᓇᖕᓇᖅᐸᓯᐊᓂ ᔭᓗᓇᐃᕝ, ᓄᓇᖅᓯᐊᑉ. ᐱᓕᕆᐊᒃᓴᖅ ᑯᐃᓐ ᒫᑦ ᑲᖕᒋᖅᓗᖓᓂᑦᑐᖅ (Nunavut Water Regulations, Schedule 4) (ᐊᔾᔨᖑᐊᖅ 2). ᖃᓂᖕᓂᖅᐹᖑᔪᓕ ᓄᓇᓖᑦ ᑕᒫᓂ ᐱᓕᕆᐊᒧ ᐅᑯᐊᖓᔪᑦ ᑭᙵᐅᒃ, 160 ᑭᓛᒥᑕᓗᐊᓂ ᓂᖕᒋᐊᓃᑦᑐᖅ ᒎᔅ ᓇᖕᒥᓂᖓᓂᑦ, ᐊᒻᒪᓗ ᐅᒥᖕᒪᒃᑐᒃ, ᑖᓇᓕ 250 ᑭᓛᒥᑕᓂ ᐅᐊᖕᓇᖓᓂ ᑲᓇᖕᓇᖅᐸᓯᐊᓃᓗᓂ ᒎᔅ ᓇᖕᒥᓂᖓᑕ.

ᐱᓕᕆᐊᒃᓴᖅ ᒪᖅᐱᓕᖓᔪᖅ ᐱᓕᕆᕝᕕᐅᓪᓗᐊᑕᐅᓂᐊᖅᑐᓂᑦ ᐊᒻᒪ ᐊᒃᑐᐃᔪᑎᖃᖅᐸᓗᑎᒃ ᐅᑭᐅᒃᑯᑦ ᐊᖅᑯᑎᓕᐊᖑᖅᑲᑦᑕᖅᑐᒥᑦ: ᐅᓇ ᒎᔅ ᓇᖕᒥᓂᖓ (ᐊᔾᔨᖑᐊᖅ 3) ᐊᒻᒪᓗ ᒧᓇᓐ ᒪᐃᑕᐅᓐ ᐃᓂᖓᓂᑦ (MLA) (ᐊᔾᔨᖑᐊᖅ 4) ᒫᓃᑦᑐᖅ ᐱᖓᓐᓇᖅᐸᓯᐊᑕ ᓯᕗᖓᓂᑦ ᓂᒋᖅᐸᓯᐊᓂᑦ ᑭᙵᐅᑉ ᑲᖕᒋᖅᓗᐊᑕ. ᒎ ᓇᖕᒥᓇᔭᐅᔪᖅ ᐱᕙᓪᓕᐊᔪᑎᐅᑐᐃᓐᓇᕆᐊᓕᒃ (Property Potential Development Area (PDA)) ᓇᖕᒥᓂᕆᔭᐅᓪᓚᕆᒃᑐᖅ ᐃᓄᐃᑦ ᓇᖕᒥᓂᖅ ᓄᓇᖅᑯᑎᖏᓐᓄᑦ (IOL). ᐅᑭᐅᒃᑯᑦ ᓯᑯᒥ ᐊᖅᑯᑎᓕᐅᖅᑲᑦᑕᖅᑐᑦ ᐊᒃᑐᐃᔪᑎᒃᓴᒥ ᓴᐱᓇᐅᑉ ᔪᐊᔾ ᖃᐅᔾᔭᖅᑐᓕᕆᓂᖅᒧᑦ ᑕᖕᒫᕝᕙᖕᒥᑦ ᐊᒻᒪᓗ ᑐᒃᓯᕋᐅᑎᐅᓯᒪᔪᖅ ᑭᙵᐅᒻᒥ ᐃᒃᓴᖅᕝᕙᒃᓴᖅ ᐊᒻᒪ ᐊᖅᑯᑎᓕᐅᖅᓂᖅᒧᑦ ᐱᓕᕆᐊᒃᓴᓄᑦ (BIRP).

ᐅᓇ ᐱᓕᕆᐊᒃᓴᖅ ᐊᖅᕋᒍᓕᒫᒃᑯᑦ ᐱᖅᑯᑎᖃᖅᑎᑕᐅᖃᑦᑕᖅᓂᐊᖅᑐᖅ ᖃᖓᑕᔫᑰᖅᑐᓂᑦ ᐊᒻᒪ ᐊᐅᔭᒃᑯᑦ ᐅᒥᐊᒃᑰᖅᑐᓂᑦ (ᐃᒪᓐᓇᖅᑲᐃ ᐱᖓᓱᓂ ᑕᓪᓕᒪᓄᑦ ᐅᒥᐊᓂ ᐊᑐᖅᐸᓪᓗᑎᒃ ᐊᖅᕋᒍᒧᑦ). ᒎᓗᖑᖅᑎᑕᐅᔪᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᖃᑦᑕᖅᓂᐊᖅᑐᑦ ᖃᖓᑕᓲᑯᑦ.

ᐅᔭᕋᖕᓂᐊᖅᕝᕕᖕᒧᑦ ᐸᖅᓇᐅᑎ ᐃᒪᐃᓕᖓᔪᖅ ᐃᓗᒃᑐᖅᑎᖅᓯᒪᔪᖅᑲᖅᓗᑎᒃ ᐊᒻᒪ ᓄᓇᐅᑉ ᐊᑖᒍ ᐅᔭᕋᖕᓂᐊᖅᕝᕕᑲᖅᓗᑎᒃ 6,000 ᑖᓐᓴᓂ ᐅᓪᓗ ᐊᑕᐅᓯᖅᒧᑦ ᐅᔭᕋᓕᕆᕙᓪᓗᑎᒃ ᐅᖅᕋᒋᓐᓂᖕᒋᑦᑎᒍᑦ ᑲᑕᒐᖅᑎᑕᐅᖃᑦᑕᖅᓗᑎᒃ ᐊᒻᒪ ᐃᓚᐅᖅᑕᐅᒍᑎ cyanide leaching-ᒥ ᓴᓗᒪᖅᓴᖅᑕᐅᕙᓪᓗᑎᒃ ᑕᒪᒃᑯᐊ ᒎᓘᐃᑦ ᐱᔭᐅᓇᓱᖕᓂᖕᒋᓐᓂᑦ. ᒫᓐᓇ ᐸᖅᓇᐅᑎᐅᔪᖅ ᑲᑎᓯᒪᓂᒃᑯᑦ ᐅᔭᕋᖕᓂᐊᖅᕝᕕᖕᒥ ᐱᕙᓪᓕᐊᔪᓕᕆᓂᖅ ᐱᓕᕆᐊᖅᑲᓪᓗᐊᑕᖅᓯᒪᕗᖅ ᓴᖅᑭᑦᑎᕙᓪᓕᐊᓂᖅᒥᑦ 350,000 ᐊᐅᓐᓴᓂ ᒎᓗᒥ ᐊᖅᕋᒍᑕᒫᑦ, ᑎᓴᒪᒃ ᒎᓗᒥ ᐱᓕᕆᕝᕕᐅᑲᑕᖕᓂᐊᖅᑐᑦ ᐅᕙᓃᑦᑐᑦ ᒎᔅ ᓇᖕᒥᓂᖓᓂᑦ (Umwelt, Llama, Goose Main ᐊᒻᒪ Echo) ᐸᖅᓇᖅᑕᐅᓯᒪᕗᑦ ᐅᔭᕋᖕᓂᐊᖅᕝᕕᐅᓗᑎᒃ ᑕᒪᐃᑎᒍᑦ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᓂ ᐊᒻᒪ ᓄᓇᐅᑉ ᐊᑖᒎᖅᓯᒪᓂᒃᑯᑦ. ᓄᓇᐅᑉ ᐊᑖᒎᖅᓯᒪᔪᖅ ᐅᔭᕋᖕᓂᐊᖅᓂ ᐃᒪᐃᓕᖓᔪᖅ ᐆᔭᐃᕙᓪᓕᐊᓗᑎᒃ ᑕᑕᑎᕙᓪᓕᐊᓗᑎᒃ, ᐃᖕᒋᖅᑎᓪᓗᒋᑦ ᑕᑕᑎᕙᓪᓕᐊᓗᑎᒃ ᐊᒻᒪᓗ ᑐᑭᒨᖓᔪᒥᑦ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᓂᑦ; ᐅᓇ ᑐᒃᓯᕋᐅᑎᐅᓯᒪᔪᖅ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᖅ ᐅᔭᕋᖕᓂᐊᖅᓂᖅ ᓄᓇᓯᐅᑎᓂ ᐳᐊᖅᓇᓯᓂᓪᓗ ᐊᑐᖃᑦᑕᖅᓗᑎᒃ.

ᐅᔭᕋᖕᓂᐊᖅᓂᖅ ᐱᒋᐊᖅᓂᐊᖅᑐᖅ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᓂ ᒎᔅ ᓇᖕᒥᓂᖓᓂ ᓱᖅᑎᖅᓯᒪᕚᖅᐹᓪᓗᑎᒃ ᐊᒻᒪ ᓴᕝᕚᔭᒃᓴᓂ ᑲᑎᖅᓱᐃᕙᓪᓕᐊᓗᑎᒃ ᐱᒋᐊᖅᓗᓂ ᐅᑭᐅᕆᓂᐊᖅᑕᖓᓂ ᐊᐃᑉᐸᖓᓂᑦ. ᐅᔭᕋᖕᓂᐊᕝᕕᒃ ᐱᓕᕆᐊᖑᓕᒫᖅᓂᖓᓂᑦ, ᖃᓄᐃᓕᐅᖅᐸᓪᓕᐊᓂᖅ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᖅ ᐃᓕᒋᔭᐅᓕᖅᓂᐊᖅᑐᖅ Llama ᓄᓇᐅᑉ ᐊᑖᒍ ᐱᓕᕆᐊᖑᓕᕈᓂ ᐊᖅᕋᒍᖓᓯ ᓯᕗᓪᓕᖅᐹᒥᑦ. ᓴᕝᕚᔭᒃᓴᖅ ᑲᑎᑕᐅᖃᑦᑕᖅᓂᐊᖅᑐᑦ ᐅᔭᕋᓕᕆᕝᕕᖕᒥᑦ ᑖᓐᓇ ᐅᔭᕋᓕᕆᕝᕕᐅᔪᖅ ᐱᓕᕆᑎᑕᐅᖕᒋᓐᓇᖅᑯᓪᓗᒍ ᐊᒻᒪᓗ ᐅᔭᕋᖕᓂᐊᖅᕝᕕᖕᒧᑦ ᐸᖅᓇᐅᑏ ᖃᓄᖅ ᐋᖅᑭᐊᒃᑲᓂᕈᓐᓇᖅᑯᓪᓗᒋᑦ. ᐱᓕᕆᐊᕆᔭᐅᔪᖅ ᐱᓕᕆᐊᓂᖕᒐ ᐱᑕᖅᑲᐊᖅᑲᖅᓂᐊᖅᒥᖕᒪᑦ ᐊᒥᐊᖅᑯᖅᑐᑯᓄᑦ ᐃᓂᒃᓴᒥᑦ (TSF), ᐊᒻᒪᓗ ᑎᓴᒪᓂ ᐊᑐᖕᔪᖕᒋᑦᑐᓄᑦ ᐅᔭᕋᖕᓄᑦ ᐃᓂᒃᓴᒥᑦ (WRSAs): Llama, Umwelt, Echo ᐊᒻᒪ TSF - ᐅᓇ ᐅᔭᕋᖕᓄᑦ ᐃᓂᒃᓴᖅ ᐱᓂᖅᓴᐅᓂᐊᖅᑐᖅ TSF-ᒥᑦ). TSF ᐃᓂᖅᑲᖅᑎᑕᐅᓂᐊᖅᑐᖅ ᑯᐃᓐ ᓄᓇᖅᑯᑎᖓᓂᑦ ᐊᒻᒪᓗ ᐊᓯᓕᒫᖕᒋᑦ ᐱᖅᑯᑎᒋᔭᐅᔪᑦ ᒫᓐᓇᓂᐊᖅᓗᑎᒃ ᐃᓄᐃᑦ ᓄᓇᖅᑯᑎᖏᓐᓂᑦ. ᐊᒥᐊᒃᑯᖅᑐᑯᐃᑦ (ᐊᒻᒪᓗ ᐊᑐᖕᔪᓐᓂᖅᑐᑦ ᐅᔭᕋᐃᑦ

ᑭᖑᓂᐊᒍᑦ) TSF-ᒧᐊᖅᑕᐅᕐᑲᑦᑕᕐᓂᐊᖅᑐᑦ, ᐊᒻᒪᓗ ᒪᕿᕐᓄ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒧᑦ: ᐅᓇ Umwelt Tailings Facility (TF), ᐊᒻᒪ ᒨᕝ ᒪᐃᓐᓂᒥ TF. ᐃᒪᖅ ᐅᑎᖅᑎᑕᐅᓇᔭᖅᑐᖅ ᒪᑯᓇᓐᖓᑦ ᐊᒥᐊᒃᑯᕐᓗᑯᓂ ᐱᓕᕆᕝᕕᖕᒥᑦ ᐊᑐᕐᑕᐅᓂᐊᕐᓗᓂ ᐃᒪᓕᕆᓂᕐᒧᑦ.

ᐱᓕᕆᐊᒃᓴᐅᑉ ᐱᓕᕆᔭᐅᓂᐊᕐᓂᖓ, ᐱᑎᐊᓕᕌᕐᓂᖓᓂ ᒪᑐᓂᐊᓕᕐᓂᖓᓄᑦ, ᐊᕐᕿᒨᓄ 27-ᓄ ᐋᕐᑭᒃᓯᒪᔾᖅ: ᐊᑦᑕᑕᕈᓐᓃᕐᓯᒪᓂᖓ ᐊᒻᒪ ᓴᓇᔭᐅᕙᓪᓕᐊᓂᖓ ᐊᕐᕿᒍᓄ ᑎᓴᒪᓄᑦ (ᐊᕐᕿᒍ -4 ᐅᖃᖓ ᐊᕐᕿᒍ -1), ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᑦ ᐊᕐᕿᒍ ᕐᑯᓕᓄᑦ (ᐊᕐᕿᒍ 1-ᒥ ᐊᕐᕿᒍ 10-ᒧᑦ), ᒪᑐᓂᐊᕐᓂᖓᓄᑦ ᐱᓕᕆᓂᖅ ᐊᕐᕿᒍ 8-ᓄᑦ (ᐊᕐᕿᒍ 10-ᒥᑦ 18-ᒧᑦ), ᐊᒻᒪᓗ ᒪᑐᓂᐅᕌᕐᓂᖓᓄᑦ ᖃᐅᔨᓴᕐᓂᐅᔪᖅ ᐊᕐᕿᒍᓄᑦ ᑕᓪᓕᒪᓄᑦ (ᐊᕐᕿᒍ 18-ᒥᑦ ᐊᕐᕿᒍ 23-ᒧᑦ). ᖃᐅᔨᒪᔭᕆᐊᕐᑲᖅᐳᓯ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᓂᐅᔪᖅ ᐅᖓᕙᕆᐊᖅᑕᐅᑐᐃᓐᓇᕆᐊᕐᑲᕐᓂᖓᓂᑦ ᐅᑭᐅᑦ ᕐᑯᓖᑦ ᐅᖓᑖᓄ ᐅᔭᕋᐅᔭᐃᑦ ᓇᓂᔭᐅᕙᓪᓕᐊᔪᑦ ᐱᕙᓪᓕᐊᒍᑎᐅᔪᓐᓇᕐᓂᐊᖅᐸᑕ.

ᓴᐱᓇ ᐱᐊᓂᒃᓯᓯᒪᔪᖅ ᐱᒋᐊᕈᑎᒧᑦ ᖃᐅᔨᓴᕈᑎᓂ ᐃᓚᖅᑲᖅᓗᓂ ᓄᓇᐅᑉ ᐊᕙᓗᐊᓂᑦ, ᐆᒪᔪᓂᑦ (ᐱᓗᐊᖅᑐᒥᑦ ᑐᒃᑐᓂᑦ), ᑕᕆᐅᕐᒥᐅᑕᐃᑦ ᐊᕙᓗᕐᖏᓐᓂᑦ, ᑕᓲᑦ ᐊᕙᓗᕐᖏᓐᓂᑦ, ᓯᓚᐅᑉ ᐊᕙᓗᐊᓂᑦ, ᐃᓄᐃᑦ ᐊᕙᓗᕐᖏᓐᓂᑦ, ᐊᒻᒪ ᐊᑐᒃᑲᓐᓂᕈᓐᓇᖅᑐᓕᕆᓂᕐᒥ ᐃᑲᔪᕈᑎᐅᔪᑦ ᐊᕙᑎᓕᕆᓂᕐᒧ ᖃᐅᔨᓴᕐᓂᕐᒥᑦ ᐊᒻᒪ ᕿᒥᕐᕈᐊᕐᓂᕐᒥᑦ ᐱᐊᓂᒃᑕᐅᓯᒪᔪᓄᑦ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓂᑦ (NIRB). ᓇᓗᓇᐃᔭᐅᑎ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᕐᑲᖓᓄᑦ ᐱᓕᕆᐊᒃᓴᖅ ᐊᒻᒪ ᑭᒃᑯᓕᒫᓄᑦ ᑐᓴᐅᒪᔭᐅᔪᓐᓇᖅᑐᑦ ᓄᓇᕐᓯᐊᕐᒥᑦ ᓄᓇᖃᖅᑳᖅᓯᒪᔪᓄᑦ ᐊᑐᖅᑕᐅᔪᑦ ᓴᐱᓇᒃᑯᓐᓂᑦ ᓄᐊᑦᑎᓂᕐᒧᑦ ᐊᒻᒪ ᖃᐅᔨᓴᕐᓂᕐᒥᑦ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᕐᑲᖏᓐᓂᑦ (TK) ᖃᐅᔨᔭᐅᔪᓂᑦ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᕐᖃᐅᓯᕐᓂᑦ (EIS) ᑐᓐᓂᕐᑯᑕᐅᓂᑯᑦ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓂᑦ. ᐱᒋᐊᕈᑎᐅᔪᖅ ᐊᒻᒪ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᕐᑲᖓᓂ ᑐᓴᐅᒪᔭᐅᔪᑦ ᐋᕐᑭᒃᓯᐃᓯᒪᔾᑦ ᐱᒋᐊᕈᑎᒥᑦ ᐆᒥᖓ EIS ᐊᒻᒪᓗ ᑐᓴᐅᒪᕝᔪᑎᒃᓴᖅᑲᖅᓗᑎᒃ ᐋᕐᑭᒃᓯᐃᕙᓪᓕᐊᓂᕐᒥᑦ ᐱᐅᓯᕖᓪᓕᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᒻᒪ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂᑦ.

ᓴᐱᓇ ᐱᐊᓂᒃᓯᓯᒪᔪᑦ ᑭᖑᓕᖅᐸᒥ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᕐᒥᑦᑕ ᑲᑎᒪᕝᔪᑎᕕᓂᕐᖏᓐᓂᑦ ᐆᒧᖓ EIS-ᒧᑦ ᓇᓗᓇᐃᔭᐃᓚᓱᒃᓗᑎᒃ ᐊᒻᒪ ᖃᐅᔨᓴᓚᓱᒃᓗᑎᒃ ᐊᕙᑎᕆᔭᔪᑦ ᐊᒻᒪ ᐃᓅᖃᑎᒋᖕᓂᖅᒧᑦ ᐊᒃᑐᐃᒍᑎᐅᓇᔭᖅᑐᓂᑦ ᐅᕙᓐᓂᒃ ᐱᓕᕆᐊᒧᑦ. ᒥᓂᔅᑕᓂ ᐃᓱᒪᓕᐊᕆᔭᐅᔪᖅ ᐊᒻᒪ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᕐᒥᑦᑕ ᐱᓕᕆᐊᒧᑦ ᐱᔪᓐᓇᐅᑎᖓ ᒫᓐᓇ ᐱᓕᕆᐊᕐᖑᕙᓪᓕᐊᔾᖅ. ᒪᓕᒃᓗᑎᒃ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖓᓂᑦ ᓄᓇᕗᒻᒥ ᓄᓇᑖᕐᓂᕐᒧᑦ ᐊᖏᕈᓐᓃᑦᑐᓂ, ᓴᐱᓇ ᐸᕐᓇᒃᓯᒪᔾᖅ ᐅᓇ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯ ᐊᖏᕈᑎᖓᓂᑦ ᐊᒻᒪ ᑮᓇᐅᔭᖅᑖᕈᑎᒧᑦ ᐊᖏᕈᑎ (ᐃᓚᖅᑲᖅᓗᓂ ᐃᒪᕐᒧᑦ ᑮᓇᐅᔭᖅᑖᕐᓂᕐᒧᑦ ᐊᖏᕈᑏ) ᐅᑯᓄᖓ ᕿᑎᕐᒥᐅᑦ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖕᖏᓐᓄᑦ ᓯᕗᓂᐊᒍᑦ ᑭᖑᓕᖅᐸᒥ ᐃᓱᒪᓕᐅᕆᓂᕐᒧᑦ ᐅᑯᓇᓐᖓᑦ ᓄᓇᕗᒻᒥ ᐃᒪᓕᕆᓕᕐᒧ ᑲᑎᒪᔨᓂ ᑐᒃᓯᕋᐅᑎᑎᒍᑦ.

ᓴᐱᓇ ᐋᕐᑭᒃᓯᐃᓯᒪᔪᖅ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᒍᑎᒃᓴᓂᑦ ᐊᒻᒪ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᓂᑦ, ᐱᑕᖃᕐᑯᔭᐅᓯᒪᔪᓂᑦ ᐋᕐᑭᒃᓯᐃᕙᓪᓕᐊᓂᕐᒥ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᐊᒻᒪ ᐅᓂᒃᑳᓕᐅᕐᑲᑦᑕᕐᓂᕐᒧᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᖃᓄᐃᓕᐅᕈᑎᓂ ᐅᑯᐊ ᑕᐅᑐᒃᓱᕆᑦ ᐱᕐᑯᔭᑎᒨᖓᔪᑦ ᐃᓚᐅᑎᑕᐅᔪᑦ ᐊᐅᓚᑦᑎᔪᓇᕐᓂᖅᒧᑦ ᐱᔪᓇᐅᑎᓂᑦ, ᐱᔪᓇᐅᑎᓂᑦ, ᓚᐃᓴᓐᓯᓂ, ᐊᑐᖅᑐᐊᕈᑎᓂ ᒪᓕᒃᓯᒪᔪᓂᑦ ᐱᕐᑯᔭᑎᒨᖓᔪᓂᑦ ᐊᒃᑐᐊᔪᓂᑦ ᒪᓕᒐᕐᓂ ᐊᒻᒪ ᐱᕐᑯᔭᕐᓂ ᓄᓇᕗᒻᒥ. ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐅᓂᒃᑳᑦ ᓇᐃᓈᕐᓯᒪᔪᑦ ᐃᓚᓕᐅᔾᔭᐅᓯᒪᔾᑦ ᑕᒪᐃᓐᓂ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᓂ.

ᓴᐱᓇᐅᑉ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᖏ ᐃᓚᖅᑐᑦ:

- o ᐱᕐᑯᑎᒃᓴᓄᑦ ᐊᒻᒪ ᐊᑐᐃᓐᓴᐅᓂᕐᒧᑦ ᐊᐅᓚᑦᓂᖅ ᐱᓕᕆᐊᒃᓴᖅ ᐃᓚᖅᑲᖅᓗᓂᑦ ᐊᖅᑯᑎᓂ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂ ᐊᒻᒪ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᓂ ᐊᒻᒪ ᐅᔭᕋᓕᕆᕝᕕᖕᒧᑦ ᐊᐅᓚᑦᑎᔾᔪᑎᓂ ᐸᕐᓇᐅᑎᓂ;
- o ᐃᒪᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᖅ ᐃᓚᖅᑲᖅᓗᓂ ᐃᒪᕐᒥ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂ;
- o ᐊᓂᑦᑕᕆᐊᓕᖓᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐱᓕᕆᐊᒃᓴᖅ ᐃᓚᖅᑲᖅᓗᓂ ᓴᕙᕋᔭᒃᓴᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂ, ᐅᔭᕋᖕᓂᐊᕐᕙᖕᒥ ᐊᑐᕈᓐᓃᖅᑐᓂᑦ ᐊᔭᕋᖓᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂᑦ, ᐊᒥᐊᒃᑯᕐᓗᑯᓂ ᐊᐅᓚᑦᑎᓂᕐᒥᑦ ᐸᕐᓇᐅᑎ, ᐊᓂᑦᑎᕙᒃᓴᒥ ᐊᒻᒪ ᐊᒃᑕᑯᓄᑦ ᐊᐅᓚᑦᑎᓂᕐᒥᑦ ᐸᕐᓇᐅᑎ, ᐃᑭᑦᑎᑕᕆᐊᓕᕐᓄᑦ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎ, ᓄᓇᒥ ᐋᕐᑭᒃᓯᐃᓂᕐᒥ ᐸᕐᓇᐅᑎ ᐊᒻᒪ ᕐᑯᐊᖅᑮᕐᓇᖅᑐᓂ ᐱᕐᑯᑎᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎ;
- o ᑐᐊᕕᕐᓇᖅᑐᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐱᓕᕆᐊᒃᓴᖅ ᐃᓚᖅᑲᖅᓗᓂ ᕐᑯᐊᕐᑮᕐᓇᑐᐃᓐᓇᕆᐊᓕᖓᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐊᒻᒪ ᑐᐊᕕᕐᓇᖅᑐᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂᑦ, ᐅᖅᓱᐊᓗᓕᕆᓂᕐᒥᑦ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂᑦ, ᑯᕕᔪᕐᑲᑳᓪᓚᖓᓂᕈᓂ ᐸᕐᓇᐅᑎᓂ ᐊᒻᒪ ᐅᖅᓱᐊᓗᖕᒧ ᐱᐅᔪᓐᓃᕐᓂᕐᒧᑦ ᑐᐊᕕᕐᓇᖅᑐᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒥᑦ ᐸᕐᓇᐅᑎᓂ;
- o ᑭᓯᓕᒫᓄᑦ ᐊᒻᒪ ᐃᒪᕐᒥᐅᑕᓄᑦ ᐊᒃᑐᐃᒍᑎᐅᔪᓄᑦ ᖃᐅᔨᓴᕐᓂᐅᔪᖅ ᐃᓚᖅᑎᑕᐅᖕᒥᔪᖅ ᐊᕙᑎᓕᕆᓂᕐᒥ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐊᒻᒪ ᓴᐳᔾᔨᓯᒪᓂᕐᒥ ᐸᕐᓇᐅᑎᓂ, ᐊᑐᕈᑎᓂ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂ, ᐃᖃᓗᓕᕆᓂᕐᒧ ᐸᕐᓇᐅᑎᓂ ᐊᒻᒪ ᐱᐅᓪᓚᕆᒃᑐᒃᑯᑦ ᐱᓕᕆᐊᕐᑲᕐᓂᕐᒥᑦ ᐊᒻᒪ ᐱᐅᓪᓚᕆᒃᑐᒃᑯᑦ ᐊᐅᓚᑦᑎᓂᕐᒥ ᐸᕐᓇᐅᑎᓂ; ᐊᒻᒪ

- ᓯᑕᐅᑲᓐᓄᓕᒃ ᐊᓪᓚ ᐱᐅᓯᖏᓪᓕᕆᓂᖅᑐᑎᓂᖅᓴ ᐱᓕᕆᐊᖅᑕᐃᒃ ᐃᓕᖅᑲᖅᓯᐅᑎ ᓯᑕᐅᑲᓐᓄᓯᓕᕆᓂᖅᓯᒃ ᐊᓪᓚ ᐱᐅᓯᖏᓪᓕᕆᓂᖅᑐᑦᓴᓂᖅ ᐸᖅᓂᖅᑎᑐᓂᖅ ᐊᑭᑎᓕᕆᓂᖅᓴᓐᓂᒃ ᐊᑭᑦᑕᐊᖅᑲᖅᑕᖏᓐᓄᓂᒃ..

ᑭᖓᓂᓕᖅᐸᖅᓂ ᓯᑕᐅᐊᖅᓂᖅᓴ ᐅᓇ ᐅᑎᖅᑎᖅᑎᑐᖅᓂ ᐱᓕᕆᓂᖅᓴ ᑐᒥᑎᖅᐅᐊᓂᐅ ᓴᖅᑭᑲᖅᓂᖏᓐᓄᑎᒍ ᐊᓪᓚ ᐃᓕᐅᖅᓯᒪᓂᖏᓐᓄᒍ ᐊᑯᓂᕐᒪᓂᓴ ᓴᐅᓐᓂᒃᓯᓕᓂᐊᓂ ᐊᓂᒍᑐᓴᐅᓂᖅᓴ ᐅᓴᓐᓂᒃᓯᓕᓂᐊᓂᖅᓴ ᑲᑎᒪᓂᖅ ᐅᑎᖅᑎᖅᑎᑐᓂᖅᓴ ᐊᓂᔪᓐᓇᖅᑐᐊᓂᖅᓴᓂᒃ ᑭᓇᐅᔪᖅᑐᐊᓂᖅᓴ ᓴᐅᓐᓂᒃᓱᓕᓂᖅᓯᒪᓂᖏᓐᓄᑦ ᐊᓪᓚ ᐱᐅᓯᖏᓪᓕᕆᓂᖅᑐᑎᓂᖅᓴ ᐊᑐᓵᔪᓕᕆᓂᖅᓴᓐᓂᒃ.

ᓴᐱᐊᓇ ᐃᓯᒪᑎᓴᖅᑐᖅᓴᖅ ᐅᓴᕐᓂᓕᐊᕐᓇᑕᐅᕈᒪᑦᓯᓗᑎ ᓴᔨᐊᖅᓴᒪᓐᓯᑎᑦᓯᒋᐊᕐᓂᖅ. ᐊᑭᑎᑎᓴᒥᐊᖅᑐᖅ ᐃᓯᒪᓴᖅᑎᐊᖅᑐᖅ ᐃᓇᐃᑦ ᓴᖅᓇᐃᑦᑕᐃᑕᓂᓐᓂᒃᓂᓂᓕ ᐊᓪᓚ ᓇᓇᐅ ᐃᑕᓴᔨᓐᓄᒍᑦ. ᓴᐱᐊᓇ ᓇᓇᕐᒥ ᐃᒪᑕᓚᕆᔨᑦ ᓴᖅᓇᐃᑦᑕᐃᑕᓂᓐᓂᒃᓂᓂᓕ ᐊᓪᓚ ᐱᐅᓯᖏᓪᓕᕆᓂᖅᑐᑎᓂᖅᓴ ᐅᓴᕐᓂᓕᐊᕐᓇᐃᐅ ᖃᒪᑎᑕᐅᓂᖅᓴ, ᐃᓯᒪᓕᐅᑕᓂᓐ ᐃᓐᓇ, ᖃᐅᔨᑭᑕᐊᔪᓂ ᐊᓪᓚ ᐱᑕᓚᐊᖓᔨᐃᕆᓂᖅᓂ ᖁᑎᖅᑎᐅᓂᑦ, ᓇᓇᕐᒥ ᐊᓪᓚ ᖃᓇᑕᒥ.

Executive Summary - Inuinnaqtun

Sabina Uyaagani Manilingik unalu Havilhalggit Katimayiit. (Sabina nalliak Nanminilingni Havakvit) imalu pikariakaktunik talvuna tunihillutik tahapkununga Nunavut Imaktiigut Katimayit (NWB) Kanukggitunik A Imaktiggut Naunaitkutak Atugakhanik Nungudjutilingnik Ubluinik Atuknianut Aullaktikgutikhanik Uktutikhanik uvuna Uyaagakhiukvit unalu numiktitikgivaktunik uyaaganik aktilanginik havakvit pidjutauytunik (tamna Aullaktikgutikhanik Uktutikhanik) ataniktuttauyunik tahapkunanga Nunavut Imaktiggut unalu Nunavut Kanginik Pirumiyauyunik Nunattaknikmun Malikgakhanik (tamna Malikgakhanik) unalu Nunavut Imaktiggut Malikgakhanik (Malikgakhanik) tapfumuna atukgianginik imaktiggut, ilikgiyanginik ikaakunik,unalu ataniktuklutik atadjutinik hulidjutinik talvuna aullaktikgutikhanik tahapkununa Hanningayok Havaakhautikhanik (tamna Havaakhautikhanik). Sabina upallungaikhimayut tapfumuna Aullaktikgutikhanik Ututikhanik paagutiyanginik pikariakaktunik naunaiyakhimayunik talvani Nunavut Nunattaknikmun Angiuttauvaktunik (NLCA),tamna Malikgak, unalu NWB Tamakpianganut Tukihigiarutinik Malikgak 4 – Inikhimayunik unalu Aullaktikgutikhanik Tunihiyunik Imaktiggut Naunaitkutak Atugakhanik Nungudjutilingnik Ubluinik Atuknianut Aullaktikgutikhanik Uktutikhanik talvuna Nuttamik Naunaitkutak Atugakhanik Nungudjutilingnik Ubluinik Atuknianut, unalu uyaagakhiukvit unalu numiktitikgivaktunik uyaaganik aktilanginik havakvit Atugakhautinik Tukihigiarutinik Malikgakhaniklu (SIG) talvuna Uyakhiukvit Aullaktikgutikhanik.

Tamna Havaakhautikhanik aullaktikgutikhanik uktutikhanik 27-ukiunik uyaagani manilingnik havaakhautikhanik nanminikgiyat piutigiyaniklu tahapkunanga Sabina tahamani Uataani Kitikmeot nunatutuukak talvani hivukganivyak uataani Nunavut (Ilidjuhikgiyanik 1). Talvanituk ungahiktillanganik 400 ungahiktillanga (km) hivukganivyak uataani talvanga Ikaluktutiak, 95 km hivukganivyak kivaatani tahamanga hivukgangani nungumangani Kingauk, uvunalu 525 km tununganivyak kivaatani tahapfumanga Yalunaif, Nunatsiami. Tamna Havaakhautikhanik nayuga atuklluaktauvaktuk talvani Queen Maud Gulf Kuugallialakivaktuk, Imaktikpaktunik, talvunga Kuugluakpaktut (Nunavut Imaktiggut Malikgakhanik, Naunaitkutat 4) (Ilidjuhikgiya 2). Tamna kaanitkiyauyuk nunalingni nunaini tafumunga Havaakhautikhanik tahamanga kingaukmit, talvanituk ungahiktillanganik 160 km tunnungani tahamanga Goose Nanminikgiyat Pitigiyainik, unalu Omingmaktok, talvanituk ungahiktillanganik 250 km tunnungani kivaatanivyak tahamani Goose Nanminikgiyat Pitigiyainik.

Tamna Havaakhautikhanik attautimungaktikhimayunik talvuna malgungtikhugit tahamanilluak nunani paagutiyukhanik ukiumi apkutikhanik (Ilidjuhikgiya 2): tamna Goose Nanminikgiyat Piutigiyat (Ilidjuhikgiya 3) unalu Taryumi Nayugakhainik Tutkuuktuivikhanik Tamayakhauttikhanik Nunani (MLA) (Ilidjuhikgiya 4) talvanituk uataani hinangani talvanga hivukganivyak Kingauk. Tamna Nanminikgiyat Piutigiyat Pinnahuani Aullaktikgutikhanik Nunaini (PDA) Atuktaulluakpaktunik talvani Inungni Nanminikgiyainik Nunattaknikmun (IOL). Aah ukiumi apkutikhanik pilunilu atadjuttauluni talvunga Sabina's George Kinikhianikmun Nallvakhiungnikmunlu Hunnauyakhainik Initukliit unalu aullaktikgutikhanik uktutikhanik Kingauk Kayaalvikhanik Uuhiyakvikhanik unalu Apkutikhanik Havaakhautikhanik (BIPR) hannayauyukhanik iglukpakhautikhanik.

Tamna Havaakhautikhanik pilugu ikayuktauluni tamatkiumallugu-ukiuk atugakhanik-atuktauyukhanik tingmittikut hila maliklugullu taryumi atugakhanik-atuktauyukhanik hugyailgumi umiaktuknakhikpat auyami (kafiutillanginik pingahunik talvunga talimanik umiakpaknik ukiumi atauhikmi). Uyaagani Manilingnik havakhikhimayunik dor'e aullaktittauhunguuyut tingmiakut.

Tamna uyaagakhiukvik pangnattauyunik iviktihimayunik uvuna hugyailgumi uyaagaktakvit unalu nunaap ataani uyaagaktakviulutiklu havakviulutiklu ikayuttaulutik 6,000 ukumaitilanggink ublukgaikpat (t/d)

uyaagani numiktitikginikmun aktilanginik havakviuyunik atuklutik atuktauvaktunik numiktitikgivaktunik angiyunik talvunga mikitkiyainut uvunalu tuukunaanik kuugluaktilutik atugakhanik piyangini tahapkuninga uyaagani manilingnik. Tamna tadja pangnattauyunik talvuna atautimungaktukhanik uyaagakhiukvikhanik pidjutauyukhanik uvuna 350,000 uukumailitillanginik uyaagani manilingnik ukiumi nunguyuum. Hitamanik uyaagaktakvikhanik talvani Nanminikgiyat Piutigiyat (Umwelt, Llama, Goose Main, and Echo) Pangnaiyakhimayut uyaagaktakviulutik atuklutik tamangnik nunaap kangani hugyailgumi uyaagaktakviulutik unalu nunaap ataani uyaagaktakviulutik atugakhanik. Tamna nunaap ataani uyaagaktakviulutik atugakhanik ilagiyainiklu napaakgiamik tungavikhamik kipillugu-tattiklugullu, unalu nallgunggayumik ataanungakpallialutik: tamna aullaktikgutikhanik uktutikhanik nunaap kangani hugyailgumi uyaagaktakviulutik atugakhanik akhallutinik unalu pualguttinik.

Uyakhiukviulutik aullaktiklutik hugyailgumi nunaap kangani uyaagaktaklutik talvani Goose Nanminikyat Piutigiyainik hivuagut-havakhiktaullutik unalu uyaaganik kaalikgiktikgillutik aullaktiklutik ukiungani-2. Talvunalu uyaagakhiukviugaakpaklunilu, pivalliayunik hugyailgumi nunaap kangani uyaagaktaklutik atugakhauttikhanik tapfumanga nunaap ataani uyaagaktakviulutik aullaktiklutik talvanga pivalliayunik Llama nunaap ataani uyaagaktakviulutik Ukiumi-1. Uyaaganik pilugit kaalikgiiktiklugit akliigiyauyangani numiktitikginikmun aktilanginik havakviuyunik uyaanik ilikgikattakhimayunik kanukgutillanginik unalu ilagilugit avaatingnuktunik talvunga uyaagakhiukvit pangnattauyunik. Havaakhautikhanik aullaktikgutikhanik pikariakaktunik aullaktikgutikhanik aah Tuukunanik Kuvikgakvit Hallumailgunik Imakluknik Tutkuktuivit Tamayakhautikhanik Havakvit (TSF), unalu hitamanik ikaakukvikhanik uyaaganik tutkuktuivikhanik nunaini (WRSAs): Llama,Umwelt, Echo, unalu TSF – a WRSA uvana TSF). Tamna TSF nayugakhaa talvani nunminikgiyainik nunattaknikmun pilingnik tamakpianginik alaanik hannayukhautikhanik iglukpakhautikhanik uvuna IOL. Tuukunanik Kuvikgakvit Hallumailgunik Imakluknik Havakviuyukhanik (TF), unalu Goose Nunani TF. Imaktiggut pillugu ilidjuhikgingukfaakllugu talvanga hulidjutainik tuukunanik kuvikgakvit hallumailgunik imakluknik munakgiyauyukhanik havakvit atugakhanik pivalliayunik imaktiggut.

Tamna Havakviugakpakgianggani, talvanga nuutikattaklutik inituuklinik talvungallu hivuagut-umiktikgiyukhanik, ima 27 nik ukiunik: Nuutikattaklutik inituuklinik unalu Hannayauyukhanik Iglukpakhautikhanik Naunaitkutait hitamanik ukiunik (Ukiungani -4 talvunga Ukiumi-1), Havakviuluni Naunaitkutait kulinik ukiunik (Ukiumi atuhikmik talvunga ukiunik kulinik), Umiktikgutit Naunaitkutait uvuna 8 nik ukiunik (Ukiunik kulinik talvunga 18 nik ukiunik), uvunalu Hivuagut-Umiktikgutikhanik munakgiyauyukhanik ima tallimanik ukiunik (Ukiunik 18 nik talvunga 23). Piyukhauyugalluit titikiutillugit tahapkununa Havakviuyunik Naunaitkutait pihimayunik kinguuvaktittihimayunik kaakungukkat piyukhanik kulinik ukiunik pilutikilanginik uyaagaktakhimayunik atugakhanik pihimayunik havaakhaliuknikmun talvunalu aullaktikgutikhanik.

Sabina pihimayut inikhimayunik amigaitunik nungumalingnik naunaitkutanik ihiviukhinikmun hunnauyakhainklu ilagiyainiklu aanikhakpaktakgiyaptingnik kilangmi nunaini, huraat (kauhimayaulluaktunik tuktunik), taryukmiutanik nunaini, imakgiiktunit nunaini, hilaryuami hilaanik nunaini, inungni nunaini, unalu atugakhaliuknikmun atugakhaliuknikmunlu uvuna ikayuttayukhanik tahapkununa nunaini tutkikhakhikhimayunik unalu utiutifaakpaktunik iniktikhimayunik tahapkunanga Nunavut Aviktulikiyit Katimayit (NIRB). Tamna Naunaiyautit Ingilgangnitanik Kauhimayuttukaniklu Havaakhautikhanik unalu inuvallungnut hunnaikhimayunik tukihigiarutinik tahakunanga NWT nunattaknikmun katimayit pihimayut atukhimayunik tahapkunanga Sabina talvuna katitikhimayunik unalu naunaitkutanik naunaitkutakhaniklu tukihigiarutinik Ingilgangnitanik Kauhimayuttukaniklu (TK) tukihigiarutinik atukhimayunik talvani Nunaini Aviktulikiyit Naunaitkutat (EIS) tunihimayunik tahapkununga NIRB. Nungumanginik nunalu Tk tukihigiarutinik tahapkunanga aituktuiyiinit tahapkuat EIS unalu pihimayunik tukihigiarutinik talvuna aullaktikgutikhanik uvuna kayakgilutik unalu munakgilutik pangnattauyunik.

Sabina pihimayut iniktikhimayunik Kingulikpak NIRB tuhaagakhanik tahapkununa EIS ilitukgiyauyukhanik unalu piinaktukhanik pinnahuani nunaini unalu inuhiini ihuikguttivaktunik naunaitkuttauluni talvuna Havaakhautikhanik. Aah ataniktuuttauyuk tikuahiiyukhanik unalu NIRB Havaakhautikhanik Naunaitkutak Augakhanik Nungudjutilingnik Atugakhanik atuktauyumanik. Uvuna ataniktuktauyunik tahapkununa pikariakaktunik uvuna NLCA, Sabina pangnattauyunik pilutik inikhamik Inungni Aviktulikiyit Ikayutikhanik Angiuttauvaktunik unalu Ikayuttauyunik Manikhaakhautikhanik Havaktunik Angiuttauvaktunik (ilagiyainiklu Imaktiggut Ikayuttauyunik Manikhaakhautikhanik Havaktunik Angiuttauvaktunik) tahapkuningalu Kitikmiuni Inuit Katimayit hivuagut naliinut iniktikgutinik tikuakttayukhanik talvanga NWB uvuna Aullaktikgutikhanik Uktutikhanik.

Sabina pihimayut aullaktikhimayunik munakhilutik unalu munakgiyauyukhaniklu ilihakyumihimaknikmun havaakhautikhanik pikariakaktunik talvuna kayakgilutik, munakhilutik, unalu uuniklutik talvuna nunaini hivumukpalliayunik tahapkunani kauhimayauyunik pikariakaktunik pikaktunik havakviuyunik angiuttauvaktunik, atugakhanik naunaitkutak nungudjutilingnik ubluinik atuknianut, Naunaitkutak atugakhanik nungudjutilingik ubluinik atuknianut, naunaitkutanik malikhakhanik atuktunik atugakhanik talvuna malikgalingnik pikariakaktunik aullaktikgutikhanik uktutikhanik malikgakhanik unalu Malikgalingnik talvani Nunavut. Atanik Atanguyauyunik Atanguyaulluaktuk Makpiraat Titikgakgaikhimayunik Tuhaagakhanik pihimayunik hunnaikhimayunik ilikuktunik munakgiyauyukhanik ilihakyuminikmun havaakhautikhanik.

Sabina's munakgiyauyukhanik ilihakyuminikmun havaakhautikhanik ilagiyainiklu:

- Hannayauyukhanik Iglukpakhautikhanik unalu Pinnaktukhanik Munakgiyauyukhanik Ilihakyuminikmun Havaakhautikhanik ilagiyainiklu Apkutit Munakgiyauyukhanik Pangnattauyunik unalu Algaaktakhimayunik Iluukhanik unalu Uyaagaktakvit Munakgiyauyukhanik Pangnattauyunik;
- Imaktiggut Munakgiyauyukhanik Ilihakyuminikmun Havaakhautikhanik ilagiyainiklu talvuna Imaktiggut Munakgiyauyukhanik Pangnattauyunik;
- Ikaakunik Munakgiyauyukhanik Ilihakyuminikmun Havaakhautikhanik ilagiyainiklu Uyaaganik Munakgiyauyukhanik Pangnattauyunik, Uyaagakhiukvit ikaakunik Uyaaganik Munakgiyauyukhanik Pangnattauyunik, Tuukunanik Kuvikgakvit Hallumailguk Imakluknik Munakgiyauyukhanik Pangnattauyunik, Ikaakukvit Ikuallativik Ikaakunik Munakgiyauyukhanik Pangnattauyunik, Ikaakukvit Nunami Munakgiyauyukhanik Pangnattauyunik, unalu Hivuukganaktuniklu Atugakhanik Pangnattauyunik;
- Kilamiukgutikhanik Kiuhainaktukhanik Munakgiyauyukhanik Ilihakyuminikmun Havaakhautikhanik ilagiyainiklu Kayakuttauyunik Munakgiyauyukhanik unalu Kilamiukgutikhanik Kiuhainaktukhanik Munakgiyauyukhanik Pangnattayunik, Ukhukluit Munakgiyauyukhanik Pangnattayunik, Kuviyuk Upallungaikhimadjutait Pangnattauyunik, unalu Ukhukluit Hallumailguk Kilamiukgutikhanik Munakgiyauyukhanik Pangnattauyunik;
- Tamakpianganut unalu Umayunik Imakmiutanik Ihuikgutait Munakgilugit ilagiyainiklu Nunaini Munakgiyauyukhanik unalu pirumiyauyunik Pangnattauyunik, Umayunik Imakmiutanik Ihuikgutait Munakgiyauyukhanik Pangnattauyunik, Ikaluit Iglikakvit Pangnattauyunik, unalu Nakuyakhainiklu Itkumayakhainiklu/Nakuyakhainiklu Kanukgillitaillidjutinikmun Pangnattauyunik; unalu
- Uunikgutait Umiktikgutait unalu Hallumakhinikmun Ilihakyuminikmun Havaakhautikhanik ilagiyainiklu Uunikgutait Umiktikgutait unalu Hallumakhinikmun Pangnnattayunik, unalu Uunikgutait Umiktikgutait Akikhautikhanik Naunaitkutanik.

Talvani umiktikgutait ihumadjutainik imalu utiutifaaklugit havaakviuyunik ilidjuhiinik tamangnut hulidjutainik unalu atukpakgainik kanukgittakhainik kaakungukat pirumiyauyunik inungni unalu

ilidjuhiinik nunaini. Hivuagut-Umiktikgutait nunaini munakgiyauyukhanik aullganginaktukhanik angikaaktautinnattik talvuna hallumaktikgiyukhanik iniktikhiktauyunik pagutigumik umiinakgiallakiyunik unalu hallumaktikginakgiallakiyunik ihumadjutainik.

Sabina pilutik hanalutik uyaagakhiukvikhamik ima kayaknaitumik, nunaini munaktalingnik havaktit, unalu ikayuttauyunik tamainut panaarinik ilauyunik. Sabina pilutik nallaumalugit nakuyunik havakkatigiklutiklu talvuna pirumiyauyunik inungni inuhiinilu unalu ilidjuhiinik nunaini. Sabina angikhimayut tahapkuninga NWB tamna Nanminikgiyainik Havakvit pihimayut manilikinikmun munaktalingnik havaktit nallaumayunik nakuyunik malikgak pikariakaktuniklu talvuna Malikgak tuniyauyukhanik Kanukgitunik A imaktiggut Naunaitkutak Nungudjutilingnik Ubluinik Atuknianut, iniktikgutikhanik pidjuttauyunik hunnayauyunik iglukpakhautikhanik talvuna umuktikgutait, unalu naunaitkutanik pihimayunik ilikgihimayauyunik nalliak ilikgiyauyukhanik talvuna kayakgiyauyukhanik avaatingnuktunik ihuikgutinit. Sabina ikumaanahuaktut aullakganginaktukhanik havakviulutik unalu ilidjuhikgingufaakllugit talvuna uyaagakhiukvit nunaini hulidjutainiklu hivuagut umiktilikgumik nalliak amigaitunik hulidjutainiklu, unalu ikuungitunik upallungaiyukhimayuniklu ima munaktalingnik havaktit, pilutik patitiggiyainik tadja, aullakganginaktuniklu, unalu ahiagut hivumukpalliayunik talvani Kitikmiuni Nunatutuukat, Nunavut unalu Kanatami.

Executive Summary – French

La société Sabina Gold & Silver Corp. (Sabina ou la Société) est tenue de présenter à l'Office des eaux du Nunavut (OEN) une demande de permis d'utilisation des eaux de Type A aux fins *d'extraction et de broyage du minerai* (la demande) conformément à la Loi sur les eaux du *Nunavut et le Tribunal des droits de surface du Nunavut* (la Loi) et au *Règlement sur les eaux du Nunavut* (règlement) pour utiliser l'eau, rejeter les déchets, et mener des activités connexes pour le développement du Projet aurifère de Back River (le projet). Sabina a préparé sa demande afin de répondre aux exigences décrites dans *l'Accord sur les revendications territoriales du Nunavut* (ARTN), la Loi, et dans les Renseignements généraux de l'OEN, Manuel 4 – Remplir et présenter une demande pour un nouveau permis d'eau, et le Guide d'information complémentaire sur l'extraction et le broyage du minerai dans le cadre du développement minier (MM-3) de l'OEN.

Il s'agit d'un projet aurifère sur 27 ans, proposé et développé par Sabina dans la région de Kitikmeot Ouest au sud-ouest du Nunavut (Figure 1). Il est situé à près de 400 kilomètres (km) au sud-ouest de Cambridge Bay, à 95 km au sud-est de l'extrémité sud de Bathurst Inlet, et à 525 km au nord-est de Yellowknife dans les Territoires du Nord-Ouest. Le projet se situe principalement dans le bassin du golfe de Queen Maud (Règlement sur les eaux du Nunavut, Annexe 4) (Figure 2). Les collectivités les plus proches du projet sont Kingaok, située à environ 160 km au nord de Goose Property, et Omingmaktok, située à environ 250 km au nord-est de Goose Property.

Le projet comprend deux régions principales avec routes de glace reliées : Goose Property (Figure 3) et la zone de chantier maritime (ZDM) (Figure 4) situées le long de la rive ouest de la pointe sud de Bathurst Inlet. La zone de développement potentielle (ZDP) de Goose Property se trouve principalement sur des terres inuites. Une voie de raccordement à la route de glace permettra de relier le camp d'exploration George de Sabina et l'infrastructure du projet portuaire et routier proposé de Bathurst Inlet.

Le projet sera appuyé par un réapprovisionnement à l'année par aéronef et un réapprovisionnement saisonnier maritime par expédition en eau libre (environ trois à cinq navires par année). Les lingots d'or seront transportés par aéronef.

Le plan de la mine comprend l'exploitation minière à ciel ouvert et souterraine pour supporter des activités de broyage quotidiennes de 6 000 tonnes, en utilisant un circuit de séparation par gravité et lixiviation par cyanuration standard pour extraire l'or. Le plan actuel pour cette production minière mixte se concentre sur l'atteinte d'une production moyenne de 350 000 onces d'or annuellement. Il est prévu que quatre gisements de la Goose Property (Umwelt, Llama, Goose Main, et Echo) seront exploités au moyen des méthodes d'exploitation à ciel ouvert et souterraines. Les méthodes d'exploitation souterraine proposées comprennent; étais de mine, exploitation par chambre remblayée, percement de galeries et remblayage, et abattage par chambre vide; la méthode d'exploitation à ciel ouvert proposée sera réalisée au moyen de camions et de pelles.

L'exploitation minière débutera avec les mines à ciel ouvert sur Goose Property, où seront effectués des travaux préparatoires au décapage et de stockage du minerai au cours de la deuxième année. Tout au long de la durée de vie de la mine, la production provenant de l'exploitation à ciel ouvert sera complétée par les mines souterraines, en débutant par la mine souterraine Llama au cours de la première année. Le minerai sera stocké afin d'optimiser la teneur de la matière à broyer et ajouter une flexibilité au niveau du plan minier. Le développement du projet nécessitera la création d'une installation de stockage des résidus (ISR), et de quatre aires de stockage pour les stériles (ASS): Llama, Umwelt, Echo, et ISR –

une ASS au-dessus de l'ISR). L'ISR sera située sur des terres publiques, et les autres éléments d'infrastructure seront situés sur des terres inuites. Les résidus (et peut-être même des stériles) seront stockés dans l'ISR, et deux mines à ciel ouvert épuisées : l'installation pour la gestion des résidus Umwelt (IR), et l'IR Goose Main. Les eaux seront récupérées de l'installation de gestion des résidus active pour usage à titre d'eau de traitement.

La durée de vie du projet, de la mobilisation à la post-fermeture, est de 27 années : phase de mobilisation et de construction d'une durée de quatre années (année 1 à l'année 4), phase d'exploitation d'une durée de 10 années (année 1 à l'année 10), phase de fermeture d'une durée de huit années (année 10 à l'année 18), et surveillance post-fermeture d'une durée de cinq années (année 18 à l'année 23). Signalons que la phase d'exploitation pourrait être prolongée au-delà de 10 années si l'exploitation de gisements minéraux additionnels était rentable.

Sabina a réalisé des études de base approfondies, y compris l'environnement terrestre, la faune (notamment le caribou), l'environnement marin, l'environnement d'eau douce, l'environnement atmosphérique, l'environnement humain, et l'utilisation de ressources à l'appui de l'évaluation et l'examen en matière d'environnement réalisés par la Commission du Nunavut, chargée de l'examen des répercussions (CNER). Sabina a eu recours au projet des connaissances traditionnelles de Naonaiyaotit et aux renseignements accessibles au public des groupes autochtones des T.N.-O. pour recueillir et analyser les renseignements sur les connaissances traditionnelles (CT) utilisés dans l'étude d'impact environnementale (ÉIE) présentée à la CNER. Les renseignements de base et les CT forment la base de l'ÉIE et de l'information fournie pour l'élaboration de plans d'atténuation et de gestion.

Sabina a tenu les audiences finales de la CNER sur l'ÉIE, afin d'identifier et évaluer les effets environnementaux et sociaux potentiels découlant du projet. Une décision ministérielle et un certificat de projet de la CNER sont à venir. Conformément aux exigences de l'ARTN, Sabina planifie conclure une Entente sur les répercussions et les avantages pour les Inuits et des accords de compensation (y compris un accord d'indemnisation pour l'utilisation des eaux) avec l'Association inuite de Kitikmeot avant toute décision définitive de l'OEN concernant la demande.

Sabina a développé des programmes de surveillance et de gestion requis pour atténuer, surveiller et rendre compte de sa performance environnementale face aux exigences réglementaires prévues dans ses autorisations, permis, licences et baux d'exploitation, conformément aux exigences juridiques des lois et règlements applicables au Nunavut. Des résumés ont été fournis pour chaque programme de gestion.

Les programmes de gestion de Sabina comprennent :

- Le Programme d'infrastructure et d'accès qui comprend le plan de gestion des routes et le plan de gestion des bancs d'emprunt et des carrières;
- Le Programme de gestion des eaux qui comprend le plan de gestion des eaux;
- Le Programme de gestion des résidus qui comprend le plan de gestion du stockage du minerai, le plan de gestion des stériles de la mine, le plan de gestion des résidus, le plan de gestion de la décharge et des résidus, le plan de gestion en matière d'incinération, le plan de gestion de l'installation d'épandage contrôlé, et le plan de gestion des matières dangereuses;
- Le Programme de gestion des interventions en cas d'urgence qui comprend le plan de gestion des risques et d'intervention d'urgence, le plan de gestion du carburant, le plan d'urgence en cas de déversement, et le plan d'urgence contre la pollution par les hydrocarbures;
- Le Programme de surveillance des répercussions générales et aquatiques qui comprend le plan de gestion et de protection de l'environnement, le plan de gestion des répercussions aquatiques,

le plan compensatoire à l'égard des conséquences néfastes graves pour les poissons, le plan d'assurance de la qualité / contrôle de la qualité; et

- Le Programme de fermeture provisoire et de remise en état qui comprend le plan de fermeture provisoire et de remise en état, et l'estimation des coûts pour la fermeture provisoire.

L'un des principaux objectifs de la fermeture est de restaurer l'empreinte écologique à une condition physique et chimique stable à long terme, pour la protection des personnes et de l'environnement naturel. La surveillance environnementale post-fermeture se poursuivra jusqu'à ce qu'il ait été confirmé que la remise en état a atteint les objectifs de fermeture et remise en état.

Sabina compte bâtir une mine sécuritaire, respectueuse de l'environnement, et avantageuse pour toutes les parties impliquées. Sabina fera preuve d'un juste équilibre quant à la protection de la santé humaine et de l'environnement naturel. Sabina confirme avec l'OEN que la Compagnie a la responsabilité financière de satisfaire de façon adéquate aux exigences juridiques de la Loi pour l'émission d'un permis d'utilisation des eaux de Type A, pour entreprendre les activités, de la construction à la fermeture, et que des mesures ont été mises ou seront mises en place pour atténuer toutes répercussions néfastes. Sabina s'engage à effectuer l'entretien et la restauration continus du site minier en cas de fermeture ou d'abandon du projet, et a l'assurance de sa capacité d'assumer ses responsabilités, compte tenu de sa performance actuelle, soutenue et antérieure dans la région de Kitikmeot au Nunavut, et au Canada.

BACK RIVER PROJECT
MAIN APPLICATION DOCUMENT

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Acronyms

AEMP	Aquatic Effects Management Plan
AN	ammonium nitrate
ANFO	ammonium nitrate/fuel oil
Application	Type A Water Licence Application
ARD	Acid Rock Drainage
BIPR	Bathurst Inlet Port Road
BRJV	Back River Joint Venture
CCME	Canadian Council of Ministers of the Environment
CIP	carbon-in-pulp
COG	cut-off grades
CRA	commercial, recreational, or Aboriginal
CWQG	Canadian Water Quality Guidelines
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FEIS	Final Environmental Impact Statement
GHG	Greenhouse Gas
GN	Government of Nunavut
HTO	Hunters' and Trappers' Organization
ICRP	Interim Closure and Reclamation Plan
IEAC	Inuit Environmental Advisory Committee
IIBA	Inuit Impact Benefit Agreement
INAC	Indigenous and Northern Affairs Canada
IOL	Inuit Owned Land
KIA	Kitikmeot Inuit Association
Kt	Kilotonne
LOM	Life of Mine
LSA	Local Study Area
ML	Metal Leaching
MLA	Marine Laydown Area
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NPAG	Non Potentially Acid-Generating
NPC	Nunavut Planning Commission
NRCan	Natural Resources Canada
NWB	Nunavut Water Board or Board
NWNSRTA	*Nunavut Waters and Nunavut Surface Rights Tribunal Act*

NWR	Nunavut Water Regulations
OPEP	Oil Pollution Emergency Plan
PAG	Potentially Acid-Generating
PDA	Potential Development Area
PSIR	Project Specific Information Requirements
QA/QC	Quality Assurance/Quality Control
RSA	Regional Study Area
Sabina	Sabina Gold & Silver Corp. or the Company
SIG	Supplemental Information Guide
SRK	SRK Consulting (Canada) Inc.
STP	Sewage Treatment Plant
SSWQO	Site-specific Water Quality Objective
the Project	Back River Project
the Property	Back River Property
TF	Tailings Facility
TK	Traditional Knowledge
tpd	tonnes per day
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WIR	Winter Ice Road
WMP	Water Management Plan
WRSA	Waste Rock Storage Area
WTP	Water Treatment Plant
µS/cm	microSiemens per centimetre

1. Introduction

The Back River Project (the Project) is a proposed gold project owned by Sabina Gold & Silver Corp. (Sabina) within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories. The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations [NWR], Schedule 4) (Appendix A, base Figure 1).

The Project is comprised of two main areas with interconnecting winter ice roads (WIR) (Appendix A, base Figure 2): Goose Property (Appendix A, base Figure 3) and the Marine Laydown Area (MLA) (Appendix A, base Figure 4) situated along the western shore of southern Bathurst Inlet. The majority of annual resupply will be completed using the MLA and an approximately 160 km long WIR to interconnect these sites.

The Feasibility Study for the Project, completed in June 2015, positively identified the economic viability and potential of the Project. The mine plan reflects an estimated 10 year operating mine life based on currently identified ore reserves, with a total ore feed of 19.8 million tonnes to a single Process Plant at the Goose Property. The life of the Project, from Mobilization and Construction to Operations and Closure, and Post-Closure, is 27 years as indicated in Table 1.

Mobilization and Construction activities could begin in 2018 with the staging of materials at the MLA, followed by three years of construction of the Goose Property infrastructure. For the purpose of this application, the first year of production is termed "Year 1". Production will carry on for 10 years followed by Closure activities (up to eight years). It should be noted that the Operations Phase may be extended beyond 10 years should additional mineral deposits become economical to be developed. Sabina will continue Post-Closure monitoring until closure objectives have been achieved.

Table 1. Summary Life of Mine

Phase	Project Year	Activities	Approximate Duration (years)
Mobilization and Construction	-4 to -1	Mobilization, earthworks, facilities, equipment, mine development	4
Operations	1 to 10	Mining, processing, progressive reclamation	10
Reclamation and Closure	10 to 18	Deconstruction, decommissioning, reclamation, Waste Rock Storage Area closure, water treatment	8
Post-Closure Monitoring	18 to 23	Monitoring of water quality, geotechnical, terrestrial and aquatic effects	5

The Project includes several mineral deposits at the Goose Property: Umwelt, Llama, Echo, and Goose Main. Ore will be mined using conventional open pit and underground methods and trucked to the Process Plant. Waste rock will be stored in several designated waste rock storage areas (WRSAs) on the surface, or backfilled in mined out workings. Tailings from the Process Plant will first be stored in a Tailings Storage Facility (TSF) located near the Process Plant and then backfilled in mined out open pits.

Alternatives within the Project have been evaluated according to the following criteria: technical feasibility; economic validity; potential impacts to the environment; and amenability to reclamation. Input received during community and government engagement and consultation has been considered in the alternatives assessments. As the Project planning advances, alternatives assessment criteria will also include community acceptability or preference as well as the potential for enhancing socio-economic effects.

The Project will create significant socioeconomic benefits. The total GDP impact is estimated to be over $500 million during the Construction Phase and $2.5 billion over the 10 years of production. The Project will substantially benefit Nunavut and will contribute as much as $44 million in GDP to Nunavut during the two years of construction and as much as $380 million in GDP during the Operations Phase. Construction is estimated to result in a total of about 4,300 person-years of direct, indirect, and induced employment across Canada and approximately 21,000 person-years over the 10-year Operations.

Both Project locations will have self-sufficient operating infrastructure including: accommodations, administration, laydown areas, diesel-fired power generation, emergency and medical facilities, maintenance shops, warehousing, and water and waste management facilities.

Sabina intends to build a mine that is safe, environmentally and socially responsible, and beneficial to all parties involved. Sabina will balance good stewardship in the protection of human health and the natural environment with the need for economic growth. The Project will bring much needed training and employment opportunities, as well as increased investment in services to the people of the Kitikmeot region and Nunavut as a whole.

Sabina has completed Final Nunavut Impact Review Board (NIRB) hearings on the Environmental Impact Statement (EIS) to identify and assess potential environmental and social effects resulting from the Project. On July 18, 2017, the NIRB concluded in their Revised Final Hearing Report (the Report) that the Project should now be allowed to proceed to the regulatory stage, and provided the Report with recommendations to the responsible Ministers. A ministerial decision is pending. Upon a decision from the Minister of Indigenous and Northern Affairs Canada (INAC; the Minister), it is anticipated that the NIRB will issue a Project Certificate confirming the Terms and Conditions outlined in the Report.

Sabina has prepared a Type A Water Licence Application (Application) that meets the requirements outlined in the Nunavut Agreement, the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA), and Nunavut Water Board (NWB or Board) General Information Guide 4 – Completing and Submitting a Water Licence Application for a New Licence (NWB 2010a) and the NWB Mining and Milling Supplemental Information Guideline (SIG) for Mine Development MM-3 (NWB 2010b). In addition, Sabina has taken into account the proposed Terms and Conditions outlined in the NIRB Revised Final Hearing Report (NIRB 2017) where applicable to the mandate of the NWB.

2. The Application

In accordance with the NWSRTA or Act and NWR or Regulations, Sabina is required to submit to the NWB a Type A Water Licence Application for a Mining and Milling Undertaking (Application) to use water and deposit waste and associated activities for the development of the Project. A copy of the application form is provided in as Attachment A to the cover letter submitted in support of this Application.

This Application has been prepared in accordance with the Nunavut Agreement, the NWNSRTA, and the NWR, but also takes into account the detailed guidance provided by the Board as described in Section 1. Concordance has been assessed for the requirements of the NWB Guidelines, SIG-MM3 Guide, and commitments made by Sabina during the NIRB Review of the Project. A copy of the concordance assessment of all information submitted in support of the application to the Board Guidelines is provided in Appendix B-1, Concordance Assessment.

The Application addresses the Board's *Minimum Application Requirements or Application Checklist* as shown in Table 2.

Table 2. Nunavut Water Board Application Checklist

	Requirement	Concordance
✓	General Water Licence Application	Type A General Application Form refer to Attachment A
✓	Supplemental Information Guidelines	Type A Concordance Assessment Appendix B-1
✓	Executive Summary	Main Application Document and all supporting documents listed in this section
✓	Translated Executive Summary	Main Application Document and all supporting documents listed in this section
✓	Application Fee	The application fee required by Regulation (s.11) was submitted to the Nunavut Water Board as acknowledged in Nunavut Water Board letter (January 10, 2014). Confirm paid in June, 2012.
✓	Water Use Fee	Majority of water use to be payable to KIA (Inuit Owned Land). Some sections of winter ice road are on Crown land. Water use fees that need to be paid to the Crown will be determined upon final routing of the winter ice road.

The Application includes this *General Water Licence Application* and a number of additional supporting documents containing more detailed information. These supporting documents are listed in Section 2.3 and summarized in Section 8.

All key documents related to the use of water and disposal of waste associated with the proposed Project are included as part of this Application. Sabina considers any documents submitted as part of the Nunavut Planning Commission (NPC) conformity determination and NIRB review processes, and held on their respective ftp site/public registries, to be part of this Application, in keeping with the intent of the new Regulations, section 15 (2), which states:

> *"[ ] a document received by the Board in respect of the application does not need to be kept in the register if an Act of Parliament requires that the documents be kept in a*

registry maintained by the Nunavut Planning Commission or the Nunavut Impact Review Board."

For example, Sabina has not included some of the baseline information reports submitted as part of the Final Environmental Impact Statement (FEIS) review process that may be referenced in the Application, as they are already part of the public record available to any interested party or the Board through the NIRB Public Registry File No. 12MN036. Sabina believes this position is in keeping with the spirit and objectives of the Board and its relationship with other bodies as provided in the *Act* s.36(2) and s.36(1) in relation to the NPC conformity and in relation to environmental screening/review of projects, respectively.

2.1 DEFINITION OF PROJECT SCOPE

The Project is a proposed gold project owned by Sabina located within the Kitikmeot region approximately 520 km northeast of Yellowknife, Northwest Territories and 400 km south of Cambridge Bay, Nunavut. The Project is located within the Queen Maud Gulf Watershed and Back River Watershed water management areas defined by Schedule 4 of the Regulations. The Goose Property is located predominately on Inuit Owned Land (IOL) and the MLA is located on IOL/Crown Land (Appendix A, base Figure 2).

The Project is comprised of two distinct areas connected by a WIR (Appendix A, base Figure 2):

- Goose Property (latitude 65°32'42" N, longitude 106°25'43" W) (Appendix A, base Figure 3); and
- the MLA (latitude 65°32'40" N, longitude 106°25'32" W) (Appendix A, base Figure 4).

The Project extents are provided in Table 2.1-1. Note: NTS Maps as requested 1:50,000 have been provided as required by NWB Guide 4.

Table 2.1-1. Project Extents

Project Extents	Latitude	Longitude
NW	66°42' N	107°50' W
NE	66°42' N	106°11' W
SE	65°29' N	106°12' W
SW	65°29' N	107°50' W

The activities and facilities under the scope of the Application will include the following:

- Construction:
  - Construction and Operations of up to a 6,000 tonnes per day (tpd) mill for gold recovery;
  - Construction of a TSF, associated pipelines and pumping systems for water management;
  - Construction and ongoing maintenance of all-weather airstrip;
  - Construction of a potential winter airstrip; and
  - Construction of the MLA.

- Access and Infrastructure
  - Construction and ongoing maintenance of all-weather roads (i.e., service roads, haul roads);
  - Ongoing maintenance to existing Project infrastructure; and
  - Construction and ongoing maintenance of WIR and Bathurst Inlet Port Road (BIPR) WIR connector.

- Water Use and Management:
  - Water supply for domestic uses and industrial purposes;
  - Surface water management;
  - Watercourse crossings including pipelines, channel, and bank alterations, culverts, spurs, and erosion control;
  - Flood control, diversions, alteration of flow, or storage by means of dykes or dams;
  - Runoff management from the Ore Stockpile, WRSAs, laydown areas, and other mine infrastructure; and
  - Operation and maintenance of water treatment facilities.

- Waste Disposal and Management:
  - Sewage Treatment Plant (STP) (i.e., Membrane bioreactor or equivalent) for the Goose Plant Site;
  - Pacto sewage management at the MLA;
  - Landfarms for the deposition and treatment of hydrocarbon contaminated snow and soil at the MLA and Goose Plant Site;
  - Landfills for deposition of solid waste at the Goose Plant Site;
  - Incinerators at the MLA and Goose Plant sites;
  - Waste rock disposal storage and management;
  - Tailings disposal storage and management; and
  - Treatment and management of effluent discharges.

- Material Management:
  - Operation and maintenance of treatment facilities for wastewater and hydrocarbon contaminated materials (i.e., water or soil);
  - The transportation, use, management, disposal, and treatment of petroleum, oils, and lubricants;
  - Storage and management of hazardous materials;
  - Construction and operation of fuel storage areas, dispensing storage facilities and associated secondary containment areas or berms for the bulk fuel storage facilities and day tanks;
  - Containment areas for temporary storage of hazardous/nonhazardous waste (waste transfer areas) and new product storage for drums and totes;
  - Waste sorting facilities and temporary storage facilities for hazardous wastes; and
  - Operation and handing of explosives storage and explosives manufacturing facilities.

- Monitoring
  - Regular inspection and maintenance of all earthworks and water management infrastructure; and
  - Implementation of Environmental Management and Protection Plan.

- Closure
  - Continue progressive reclamation; and
  - Implement an approved Interim Closure and Reclamation Plan (ICRP).

Note: For all development activities, in September 2017, Sabina revised the October 2014 Type B application on file with the NWB (Application no. 8BC-BRP---). Sabina expects that should the Project receive ministerial approval and be granted a Type A Water Licence, that the Type B development Water Licence scope would be integrated into the Type A Water Licence scope, where appropriate.

2.2 WATER LICENCE CONSIDERATIONS

2.2.1 Existing Water Licenses

Sabina currently holds two Type B Water Licenses that overlap with the current Project: (1) Licence 2BE-GOO1520 for Project exploration on the Goose Property; and (2) Licence 2BE-GEO1520 for exploration on the George Property and at the MLA. Sabina intends to retain both Type B Water Licenses to support ongoing exploration activities.

Some infrastructure authorized under the existing Type B Water Licence will be used to support development works and Project construction. Refer to the revised Type B application No. 8BC-BRP---- filed with the NWB in September 2017 for detailed information.

Table 2.2-1 provides a summary of existing NWB permits held by the Company.

Table 2.2-1. Existing Permits for the Project.

Licence	Expiry	Activities/Scope	Sabina consideration
2BE-GOO1520	February 18, 2020	Exploration on Goose Property	Request permit be maintained as stand-alone Type B
2BE-GEO1520	May 29, 2020	Exploration on George Property	Request permit be maintained as stand-alone Type B
2BE-MLL1217	March 26, 2017	Exploration on Wishbone-Malley Property	Request permit be maintained as stand-alone Type B
8BC-BRP ___	XX (Pending)	Mobilization/Site Preparation	To be determined

2.2.2 Proposed Term of Licence

Sabina is seeking a Type A Water Licence for a mining undertaking for a term of 14 years. The term of licence allows for the Construction and Operations of the Project. During Operations, Sabina may undertake additional technical study and feasibility analysis for bringing additional ore resources and deposits online. It is Sabina's desire to continue profitable mining for as long as possible. Ongoing feasibility assessments of the other deposits currently identified will determine the future mining schedule. Subject to positive economic valuation of mining the other deposits (see Section 5.1.3), Sabina is committed to applying for appropriate amendments as may be required to extend operations associated with the Project. Otherwise, Sabina is committed to filing a final closure plan at least one year prior to the end of term requested by this Application.

Sabina believes strongly that taking into account past performance and the current feasibility assessment for the Project, the company is financially able to complete the undertaking as presented in this Application, to mitigate any adverse impact, and to satisfactorily maintain and restore the proposed site in the event of closure or abandonment of the Project.

2.2.3 Draft Water Licence Framework

The NWNSRTA and NWR require the NWB to hold a public hearing for any Type A Water Licence Application. The NWB may, as stipulated in the Rules of Practice and Procedure for Public Hearings (May 2005), hold a pre-hearing conference and technical meeting to facilitate the final public hearing process and formulate the issues raised by interested parties to be dealt with by Board.

Sabina, in an effort to assist in resolution and clarification of the issues still to be identified by interested parties throughout the public review process, intends to provide the NWB with a draft water licence framework (Framework) following the pre-hearing conference and technical meeting for review. The framework would include:

- the standard NWB licensing requirements applicable to any undertaking;
- highlight Sabina's commitments made within the Application;
- highlight Sabina's commitments applicable to the authority of the NWB raised during the environmental review phase;
- confirm supporting management plans in the context of water licence requirements; and
- take into account Sabina's position on issues raised by parties in advance of and during the pre-hearing conference and technical meeting.

An outline of the Annual reporting requirements as requested by the NWB will be provided within the Framework. The outline will include typical/standard NWB requirements, commitments made by Sabina and direction provided under the Project Certificate related to annual reporting. As stipulated under the NWR, Sabina will file an Annual Report with the Board no later than March 31st in the year following the calendar year being reported. The Annual Report format will be developed in accordance with the Type A Water Licence and NWB guidance.

2.2.4 Type B Water Licence (Site Preparation/Mobilization/Development)

Following submission of the Application it may take up to one year before Sabina receives a Ministerial approved Type A Water Licence authorizing full development of the Project. However, since construction scheduling and implementation is dependent upon, and restricted by the seasonal sea lift to support mobilization of supplies and equipment, waiting up to a year to receive a Type A Water Licence before starting construction has significant impact on the overall Project schedule.

The regulatory framework provided in the Nunavut Agreement and the Act allows the NWB to issue interim, short-term approvals for water uses related to exploration or development work for a proposal under development impact review.

In September 2017 Sabina submitted a revised Type B Water Licence application for development works (Application No. 8BC-BRP----). Sabina expects that Type B scope of activities would be separately permitted after the Project Certificate is issued, allowing limited construction to start soon thereafter rather than waiting for other permitting issues involving mine operations to be addressed. This is a similar approach to development work completed at other Nunavut mine sites (i.e., Meadowbank Mine and Meliadine Mine).

The Type B short interim approval permitting approach could allow construction work to start in Q1 of 2018, which would be a substantial gain considering the very small window for construction in the Arctic each year. Development activities for the Project are planned to occur from Q1 2018 to Q1 of 2019 or issuance of Type A Water Licence, whichever comes first. Sabina assumes activities authorized under any

development Type B Water Licence would be incorporated into the Type A Water Licence and effective shortly after the date of Ministerial approval of the impact assessment review of the Project.

2.3 TECHNICAL REPORTS, DESIGN BASIS, AND DRAWINGS

2.3.1 Technical Reports

Technical reports to support the Application are summarized in Table 2.3-1.

Table 2.3-1. List of Management Programs and Associated Management Plans for the Project

Document	Construction	Operations and Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post-Closure
Infrastructure and Access Management Program					
Road Management Plan (SD-02)	x	x	x	x	
Borrow Pits and Quarry Management Plan (SD-03)	x	x	x	x	
Water Management Program					
Water Management Plan (SD-05)	x	x	x	x	
Waste Management Program					
Ore Storage Management Plan (SD-07)		x	x		
Mine Waste Rock Management Plan (SD-08)	x	x	x	x	
Tailings Management Plan (SD-09)	x	x	x	x	x
Landfill and Waste Management Plan (SD-10)	x	x	x	x	
Incineration Management Plan (SD-11)	x	x	x	x	
Landfarm Management Plan (SD-12)					
Hazardous Materials Management Plan (SD-13)	x	x	x	x	
Emergency Response Program					
Risk Management and Emergency Response Plan (SD-15)	x	x	x	x	
Fuel Management Plan (SD-16)	x	x	x	x	
Spill Contingency Plan (SD-17)	x	x	x	x	
Oil Pollution Emergency Plan* (SD-18)	x	x	x	x	
General and Aquatic Effects Monitoring Program					
Environmental Management and Protection Plan(SD-20)	x	x	x	x	x
Aquatic Effects Management Plan (SD-21)	x	x	x	x	
Conceptual Fish Offsetting Plan* (SD-22)	x	x		x	
Marine Monitoring Plan (SD-23)	x	x	x	x	
Quality Assurance / Quality Control Plan (SD-24)	x	x	x	x	x
Interim Closure and Reclamation Program					
Interim Closure and Reclamation Plan (SD-26)		x	x	x	x
Interim Closure Cost Estimate					

** The following plans were submitted in support of the review process but are outside the requirements and jurisdiction of the NWB and are provided as information for the reviewing agencies.*

Sabina has classified the various monitoring, mitigation, and management plans into Programs. Consistent with the direction provided by the NWB following the Pre-hearing Conference (NIRB 2014), Sabina agrees that consolidated Plans may increase effectiveness and functionality of the Plan. Sabina may implement consolidation of Plans in the future where appropriate to minimize duplication and streamline information.

Sabina will review the Plans as required to account for changes in operation and/or technology and modify the Plans accordingly or as otherwise directed by the NWB. Revisions to the Plans may be submitted in the form of an Addendum to be included with the Annual Report, complete with a revisions list detailing where significant content changes are made. The updates may take into account commitments made with respect to submissions received during the preliminary and technical review of the Application documents, as well as final submissions and issues raised during the Public Hearing Process, where applicable.

Sabina acknowledges that every Plan is to be carried out pursuant to the terms and conditions of the Licence, and any additional terms and condition imposed upon approval of a Plan by the Board (i.e., in a letter) become part of the Licence. All terms and conditions of the Licence will be integrated in the development of a Plan.

Refer to Section 7.2 and Appendix B-2 for a detailed reference list of historical research reports, baseline reports, and studies completed to date for the Project.

In addition, Sabina engaged Golder Associates Ltd. (Golder) as a third party to review several technical design reports. Golder's assessment and the reports are provided in Appendix F.

2.3.2 Design Basis and Drawings

For the purpose of the Application, consistent with the NWB Guide "*final drawings must be considered complete and include the statement "issued for construction" or other similar statement*", Sabina has submitted drawings, signed, stamped, and dated by the appropriate engineer registered with Northwest Territories and Nunavut Associated of Professional Engineers and Geoscientists as "issued for permitting". See Appendix B-3 for list of figures and drawings. Design basis and technical engineering considerations associated with specific infrastructure is contained within the appropriate management plan(s) identified in Section 2.3.1.

Sabina will submit to the Board for review and acceptance, at least sixty (60) days prior to construction or in a timeframe otherwise set by the Board, final design and for-construction drawings, stamped and signed by a Professional Engineer, for all infrastructure and/or facilities designed to contain, withhold, divert, or retain water and/or waste.

Sabina will construct and operate the proposed Mine and associated infrastructure and facilities in accordance with all applicable legislation and industry standards. Sabina will submit a Site Preparation and Construction Summary Report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes. The construction summary report will be prepared by an Engineer(s) in accordance with the following requirements:

- A description of all infrastructure and facilities designed and constructed to contain, withhold, divert or retain water and/or waste;
- A summary of activities including photographic records before, during and after construction of the facilities and infrastructure designed to contain, withhold, divert or retain Water and/or Waste;

- As-built drawings and design for facilities and infrastructure, designed and constructed to contain, withhold, divert or retain water and/or waste;
- Documentation of field decisions that deviate from the original plans and any data used to support or developed facilities and infrastructure to withhold, divert or retain water and/or waste;
- Monitoring conducted for sediment and explosives residue release from construction areas;
- Data collected from instrumentation used to monitor earthworks and the interpretation of that data;
- A discussion of any unanticipated observations including changes in risk and mitigation measures implemented to reduce risk during construction;
- An overview of any method including frequency used to monitor deformations, seepage and geothermal responses;
- A summary of maintenance work undertaken as a result of settlement or deformation of dikes and dams; and
- A summary of adaptive management principles and practices applied during the relevant phases of the Project and their overall effectiveness.

3. The Applicant

Sabina is a public Canadian mining company (SBB: TSX) that is focused on the development of its 100%-owned Project. The Certificate of Incorporation is provided in Appendix C-1. Company contact details are as follows:

Sabina Gold & Silver Corp.
1800 – 555 Burrard Street
P.O. Box 220 Vancouver, BC V7X 1M9
Tel: 604-998-4175 or 888-648-4218
Fax: 604-998-1051

A current list of officers of the company is provided in Appendix C-2.

Sabina intends to build a mine with integrity — one that is safe, environmentally and socially responsible, and beneficial to all parties involved. To meet this commitment, Sabina has commissioned numerous consultants and experts to contribute the development of the Application. A list of consultants and experts is provided in Appendix C-3.

Sabina intends to balance good stewardship in the protection of human health and the natural environment with the need for economic growth.

3.1 CORPORATE VISION

Sabina's vision is to maximize shareholder value by becoming a premier gold producer through the exploration, development and mining of our precious metals assets in politically stable mining jurisdictions.

Sabina will strive towards our goals with a focus on five principles:

- Operating with best business practices and integrity;
- Maintaining superior environmental standards;
- Fostering the development and recruiting of high caliber individuals;
- Bringing creativity and innovation to our business plans to ensure our company is fit for purpose; and
- Creating strong and respectful partnerships and relationships in the communities with which we work.

Sabina's mission is to become a significant gold producer through the successful phased development of the Back River District in Nunavut, Canada.

Sabina will deliver its mission by focusing on the following objectives:

- Developing an economically viable mine at Back River;
- Financing and construction of the Project for sustainable production;
- Continuing exploration of the Project to unlock its full potential to sustain production growth internally;

- Enhancing stakeholder value by providing enduring community benefits;
- Adhering to best safety, environmental, and employment practices;
- Maintaining prudent fiscal responsibility to facilitate achievement of superior and sustainable profit margins; and
- Building our human capital and expertise to enable us to realize opportunities to create and sustain value.

3.2 SUSTAINABLE DEVELOPMENT

Sabina regards itself as a responsible explorer and mineral developer. Sabina has in place a Sustainable Development Policy (Sabina 2016) and committed to fostering sustainable development throughout all stages of our activities. The Company continually strives to conduct operations in a manner that balances the social, economic, cultural, and environmental values and needs of the communities in which we operate.

To build on this commitment, Sabina will:

- Meet or strive to exceed all relevant legislated sustainable development requirements in the regions where we work.
- Ensure appropriate personnel, resources, and training is made available to implement our sustainable development objectives.
- Establish clear lines of responsibility and accountability throughout the company to meet these objectives.
- Implement proven management systems and procedures to facilitate our sustainable development objectives. A priority will be placed on developing and implementing management structures related to the environment, health and safety, emergency response and stakeholder engagement.
- Act as responsible stewards of the environment for both current and future generations. Sabina will make use of appropriate assessment methodologies, technologies and controls to minimize environmental risks throughout all stages of mineral development.
- Work closely with local communities and project stakeholders to understand their needs, address their concerns and provide project-related benefits to create win-win relationships. Our goal is to earn and maintain a social licence to operate at all our operations while building partnerships.
- Pursue economically feasible projects in order to generate shareholder profitability and support long-term positive socio-economic development in the regions where we work.
- Utilize a precautionary approach as it applies to potential effects from our activities. Work with employees, contractors and stakeholders to promote a culture of open and meaningful dialogue to ensure that any known or suspected departures from established protocols are reported to management in a timely manner.
- Regularly review the Sustainable Development Policy (Sabina 2016) to ensure it is consistent with Sabina's current activities and the most recent legislation.
- Continually improve our performance and contributions to sustainable development including pollution prevention, waste minimization, and resource consumption.
- Implement programs at each of our operations to monitor and report compliance and proactively address potential deficiencies in our policies and procedures.

The objectives of our sustainable development policy cannot be accomplished without the active involvement and commitment of many dedicated individuals. As such, Sabina will regularly communicate the policy and its outcomes to our employees, contractors and relevant stakeholders. Together, Sabina can foster a culture of sustainable development at Sabina.

Sabina is committed to environmentally responsible and socially acceptable exploration and mining practices. Sabina subscribes to the principles of sustainable development in mining. While mining cannot occur without an effect on the surrounding natural environment and communities, Sabina's responsibility is to limit negative environmental and social impacts and to create and enhance positive impacts.

As more large-scale resource projects push towards development, the challenges of operating in the North become more apparent. As critical mass builds and requirements for infrastructure and energy become the defining line items in a mine plan, opportunities present themselves for partnerships between industry and government.

Sabina has been operating in the Kitikmeot region for over a decade, and in that time Sabina has built strong relationships with many contractors in both Nunavut and the Northwest Territories. In 2013 alone, Sabina spent nearly $10M with Nunavut Agreement beneficiary companies.

Over the years Sabina has built strong relationships with our primary suppliers including the following northern companies:

- Nuna Logistics;
- First Air/Sakku Aviation;
- Canadian North Inc./Northerra;
- Det'on Cho Logistics/QDC Logistics;
- 5136 Nunavut Ltd. (1984 Catering); and
- Discovery Mining Services/Nunavut Expediting.

These companies, along with dozens of other smaller local northern firms, have formed the core of our business in Nunavut.

Support from these firms in meeting northern employment targets and working closely with community stakeholders has been essential to Sabina and our northern projects' success over many years.

Building and maintaining strong relationships with our contractors and local businesses will remain a core part of Sabina and the Project's success over the life of the Project. In the Business Development Plan (FEIS Volume 10, Chapter 24), Sabina commits to providing contracting and procurement opportunities within Nunavut and specifically within the Kitikmeot region. These commitments will be further defined in the Inuit Impact Benefit Agreement (IIBA) currently being negotiated with the Kitikmeot Inuit Association (KIA).

Also in the Business Development Plan, Sabina discusses the importance of Adaptive Management in establishing contracting opportunities for Inuit firms with the Project. This management approach extends further to helping to build capacity of local businesses and entrepreneurs to support not only the Project but other mining projects and opportunities in the region and beyond. This development support will focus on the following areas:

- Business management.
- Financial management.
- Performance assurance (e.g., health and safety).
- Contracts and procurement.
- Human resources management.

Sabina has operated successfully in the Kitikmeot region for over a decade, and takes pride in the business relationships we have built in the North. We look forward to continuing to build on these efforts throughout the life of the Project.

The Project provides significant opportunities for employment and training in the region.

Sabina is an active member of the Kitikmeot region community with a regional office in Cambridge Bay (established in 2012) and a full time Community Liaison Officer. Sabina has also actively engaged and consulted local communities through Project planning activities and environmental assessment processes. Sabina strives to ensure engagement with all residents of the affected communities and will continue to advance its community engagement program during the environmental assessment and permitting process for the Project, and throughout the development and operations of the mine.

An IIBA is required for the Project under the Nunavut Agreement as the Back River Property (the Property) is located on IOL. Where possible, Sabina plans to maximize local employment and contracting opportunities and is dedicated to working with community partners on training programs to prepare local residents for employment. Kitikmeot Inuit would be given the first opportunities for Project-related jobs. The total on-site workforce will reach an approximate peak operational employment of 1150 people at Goose Property with 50% on-site during Operations.

Looking to the future, Sabina, jointly with the KIA intends to form an Inuit Environmental Advisory Committee (IEAC) for the Project. The IEAC will form part of the formal agreements with the KIA. The purpose of the IEAC will be to receive and consider Project information that relates to the environment and wildlife, to provide advice to Sabina and KIA about potential environmental or wildlife impacts or concerns, to hear and attempt to resolve concerns from community members related to environmental and wildlife aspects of the Project. For additional information, refer to Section 3.6 and FEIS Addendum Appendix V3-1H Draft Terms of Reference Inuit Environmental Advisory Committee.

3.3 STATEMENT OF FINANCIAL RESPONSIBILITY

In 2009, Sabina acquired the Project from Dundee Precious Metals. The Project is 100% owned by Sabina. All rights, title, interests, liabilities, and obligations for the Project rest with Sabina.

Taking into account Sabina's past performance, Sabina confirms in this Application:

- they have the financial responsibility adequate to satisfy section 57 of the NWNSRTA, to complete the undertaking from Construction to Closure;
- measures are in place and will be put in place to mitigate any adverse impacts; and
- they are committed to ongoing maintenance and restoration of the Project in the event of future closing or abandonment of the undertaking. Sabina is confident in assuming its position, taking into account their current, ongoing, and past performance in the Kitikmeot region, Nunavut, and Canada.

A copy of Sabina's audited financial statements for 2016 fiscal year can be found in Appendix C-4 or at the following link: Financial Statements).

Sabina released a Feasibility Study (Sabina June 2015) on its 100% owned Back River Gold Project which presents a project that has been designed on a fit-for purpose basis, with the potential to produce ~346,000 ounces a year for a planned operation mine life of 10 years. At a US$1,200 gold price and a 0.87 exchange rate, the feasibility study proves the project delivers a potential after tax internal rate of return of approximately 21.7% with an initial Capital Expenditure (CAPEX) of $695 million (CDN). It should be noted that Sabina completed a second Feasibility Study in September 2015 for a smaller Project however, for the purposes of this Application the June 2015 Feasibility study for a 6,000 tpd was used as the basis.

It is estimated that the capital cost to construct and bring the proposed Mine into production will be $695 million (CDN). The construction workforce is expected to average 650 persons per year and the average operational workforce will be 800 persons. Based on an ore production rate of 6,000 tpd the average operating costs for the Project are $181.9 million (CDN) per year. Over the Life of Mine (LOM), the Project is estimated to generate federal government tax revenue in the order of $409 million, and $45 million at the territorial level.

As shown in the June 2015 Feasibility Study, the Project has Proven and Probable gold reserves of 3,047 thousand ounces for the Goose deposits. The total Measured and Indicated resources for the Back River deposits are 5,333 thousand ounces (October 2014). For additional information, refer to Section 6.3.1.

Sabina has been subject to a rigorous environmental assessment and review of the Project prior to issuance and approval of licenses/permits to authorize the Construction and Operations. This combined with Sabina's commitment to manage, mitigate and monitor throughout all phases of the Project confirms measures are in place and will be put in place to mitigate any adverse impacts.

All of Sabina's current exploration sites have up-to-date mine closure and reclamation plans. These plans define the way that Sabina will close out and reclaim each of its sites, once activities cease.

Reclamation costs have been determined as part of the closure planning and Sabina is committed to providing adequate security to cover the cost of reclamation over the LOM to ensure the closure criteria can be met. Sabina intends to apply progressive reclamation options during Operations, before Closure, to take advantage of cost and operating efficiencies by using the resources available from mine operations to reduce overall reclamation costs. Progressive reclamation enhances environmental protection and shortens the timeframe for achieving the reclamation objectives and goals, and reduces the financial security requirement (MVLWB/AANDC 2013). The Application includes an Interim Closure and Reclamation Program, which includes: an ICRP and Interim closure cost estimate (SD-26).

3.4 SECURITY

Sabina intends to fund its reclamation and water licence financial security liability for the Project through guaranteed letters of credit issued by one of the five major Canadian based banks. Security to cover:

- Government of Canada (for water related financial security against reclamation or major accident causing environmental damage as outlined under the Type A Water Licence);
- KIA (for land and water related financial security against reclamation or major accident causing environmental damage, as outlined under the Commercial and Production land use leases for IOL); and

- Fisheries and Oceans Canada (DFO) (for financial security against successful implementation of fish compensation measures as authorized by DFO).

Currently Sabina holds letters of credit are in the range of $2.2 million pledged for reclamation liability, (i.e., land use lease security, etc.) for existing exploration activities. These letters of credit are deducted from Sabina's credit lines held by the banks, and are irrevocable letters of credit.

A detailed estimate of closure and reclamation cost is provided in the ICRP Program submitted with this Application. The total estimated costs are $35,400,115.

In addition, Sabina proposed for the purpose of the development Type B Water Licence 8BC-BRP----, the NWB defer full consideration of security of project liability to the review of the Type A Water Application to the NWB to avoid potential "double bonding". Sabina completed the Type A security assessment to include all components of the Type B development works.

Consistent with the provision of the Act, Sabina intends to enter into an arrangement relating to security given the proposed mine is located predominantly on IOL. To minimize potential for over bonding of the Project, Sabina proposes a Security Management Agreement between the Minister, the KIA, and Sabina be developed for consideration by the NWB in advance of a final hearing on the Application. In addition Sabina proposed parties consider staged bonding for provision of security.

Sabina is confident that it has the economic preparedness to meet the requirements for reclamation and security for the Project.

3.5 PAST PERFORMANCE

Sabina has been actively completing mineral exploration in the Kitikmeot region since 2004 initially at the Hackett River Project and at the Project since it was acquired in 2009. Through these continued programs, Sabina has developed a robust corporate structure and workforce to support advanced exploration and continues to build toward Project development and operations.

Sabina believes that its record in Nunavut demonstrates how it has learned to incorporate environmental and socio-economic considerations successfully into the exploration activities to date. Sabina has demonstrated its ability to adaptively protect the environment and minimize the adverse impacts of its operations on the land, water, and wildlife of the area. Sabina has also fostered relationships such that it has learned to work with local communities, Inuit organizations, and government agencies in an adaptive manner to minimize, where possible, the adverse social impacts of its activities while maximizing the socio-economic benefits to the residents of the Kitikmeot region and Nunavut as a whole.

A key example of successful relationship building with local communities is the implementation of the Bernard Harbour baseline studies at Bernard Harbour (specifically at Nulahugyuk Creek). The 2016 field program integrated conservation and community-capacity objectives of the Kugluktuk Hunters' and Trappers' Organization (HTO). This was achieved by incorporating local students and community members and by designing a study that fosters education, stewardship, and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, awareness, action, and knowledge following environmental education programs, such as the program being implemented at Bernard Harbour.

3.6 TRADITIONAL KNOWLEDGE/INUIT QAUJIMAJATUQANGIT, AND CONSULTATION

Traditional Knowledge (TK) can be defined as a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission" (NIRB 2007). Traditional Knowledge studies provide a valuable way of documenting spatial and temporal patterns of hunting, harvesting, fishing, habitation, and travel in a given area. They can also provide detailed information on local ecological processes, socio-cultural patterns and institutions, spirituality, ethical, and other matters.

Sabina recognizes the inherent value of TK and the importance local communities place on its use in the environmental assessment of proposed developments. Traditional Knowledge studies provide a valuable way of documenting spatial and temporal patterns of hunting, harvesting, fishing, habitation and travel in a given area. They can also provide detailed information on local ecological processes, socio-cultural patterns and institutions, spirituality, ethical, and other matters. The FEIS made significant efforts to engage local communities through incorporation of their TK into the Project's planning and design.

Sabina has utilized six primary sources of TK: a Naonaiyaotit Traditional Knowledge Project database report for the Project; theme-based TK workshops; a report on existing and publically available Northwest Territories TK; the results of public consultation and engagement activities; a TK study on the Bernard Harbour Arctic char fishery; and other sources (i.e., local land users and field assistants).

Sabina actively worked to collect and incorporate Project-specific TK throughout the FEIS. Sabina has considered TK on an equal basis with all scientific forms of information collected for the Project.

Volume 3 of the FEIS describes Sabina's approach to TK and the methods used to collect and interpret it. More specifically, it described:

- How TK was defined and incorporated into the FEIS (including a summary table of all instances where TK was used in the FEIS);
- How Inuit Qaujimajatuqangit values were incorporated into the Project;
- TK sources utilized in the FEIS, including:
  - Naonaiyaotit Traditional Knowledge Project database report;
  - Theme-based TK workshops;
  - Report on existing and publically available TK from selected Aboriginal groups in the Northwest Territories;
  - Public consultation and engagement results;
  - TK study on the Bernard Harbour Arctic Char fishery; and
  - Other relevant sources;
- The role of TK in Project planning and design, including:
  - Baseline data collection;
  - Impact prediction;
  - Significance assessment; and
  - Development of mitigation and monitoring programs.

Specific details as to how TK has been incorporated into these activities are summarized in Volume 3, Table 3.1-1 - Uses of Traditional Knowledge in the FEIS for the Project. Additional information was provided in the FEIS Addendum Appendix FHR-NIRB-5.6(A)-Potential Effects of the Project on Traditional Activity and Land Use.

Perhaps most importantly, Sabina signed a TK Agreement with the KIA in 2012 and later partnered with them on two major TK initiatives relevant to the Project area. The first initiative was for the preparation of the Naonaiyaotit Traditional Knowledge Project database report. Signing of this agreement provided Sabina with access to TK held by the KIA in the Naonaiyaotit Traditional Knowledge Project database. The second initiative was for the execution of the theme-based TK workshops. The agreement also outlines the terms and conditions pertaining to Sabina's use of the TK. Sabina and the KIA additionally cooperated in the collection and reporting of new (or otherwise unrecorded) TK in the Project area. While Sabina and the KIA jointly developed work plans for these two studies, the KIA led all data collection and reporting activities. The first report prepared by the KIA was regional in nature and presented TK from 68 individuals from the western Kitikmeot region, while the second report was specific to the Project and presented TK from 17 elders and land users intimately familiar with the Project and/or surrounding areas. These two reports provided a substantial amount of TK on topics such as wildlife (e.g., caribou, muskox, bears, fish, and birds), other environmental components, and Inuit harvesting, culture, and land use, while following established best practice TK research methodologies.

In addition to these two studies, land user TK was collected through a number of other methods. For example, TK was collected during Sabina's community engagement program (e.g., through feedback received during public and stakeholder meetings held throughout the Kitikmeot region, beginning in 2012) and documented in a community engagement database containing some 165 topic directories. In addition, a series of land use focus groups were held with residents of Cambridge Bay, Kugluktuk, Bathurst Inlet, and Bay Chimo as a component of the Project's socio-economic studies to better understand potential Project interactions with contemporary land user activities.

A TK study was also carried out by Sabina in partnership with the Kugluktuk HTO in an effort to develop a better understanding of the Arctic Char fishery in the Nulahugyuk Creek - Hingittok Lake (Bernard Harbour, Nunavut) area. This study involved 11 individuals from Kugluktuk and Cambridge Bay and collected information to support stream restoration efforts at Bernard Harbour, which Sabina anticipates will help satisfy DFOs requirement to offset fisheries habitat effects at the Project. The study has revealed that Bernard Harbour was, and continues to be, an important land use area for a number of Inuit families. A copy of the TK study report can be found in FEIS Appendix V3-3D, while more information on Sabina's Conceptual Fish Offsetting Plan can be found in FEIS Addendum Volume 10, Chapter 21.

One area where TK was most actively considered by Sabina in the FEIS was caribou and other terrestrial wildlife. For example, TK and community feedback were used for scoping and refining the initial Valued Ecosystem Component / Valued Socio-economic Ecosystem Component list for the Project, and in the baseline against which potential effects were assessed. This baseline included TK on matters such as caribou ecology, migration, and harvesting patterns, and revealed that caribou migration routes and the location of calving areas around the Project have changed substantially over time. The use of motion-sensor wildlife cameras also provided valuable baseline information, whose placement on the land was directly informed by the advice of local Inuit land users. Sabina's final significance determinations were likewise informed by TK and every effort was made to ensure equal consideration of TK and scientific data in the conclusions that were drawn.

Finally, TK helped inform the development of mitigation and monitoring programs for the Project. These were developed primarily to minimize potential Project effects on wildlife valued by local communities or to address areas where community concerns had been raised. For example, the Project's design

utilizes WIRs (rather than all-weather roads) that preferentially cross large lakes, which helps further address public concerns related to caribou. This design choice reduces the potential for disruption to the movement of caribou and other wildlife during summer movements; minimizes loss and degradation of vegetation due to physical clearing; reduces deposition of airborne dustfall; and reduces surface compaction.

As a result of these efforts five reports were produced and provided within the FEIS (four focused on TK and one on land use and socio-economics), and the information was considered in all relevant sections of the FEIS. The referenced reports are:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report* (June 2014) (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories* (FEIS Appendix V3-3C);
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut* (FEIS Appendix V3-3D); and
- *Back River Project: 2012 Socio-economic and Land Use Baseline Report* (FEIS Appendix V8-3A).

Traditional Knowledge relevant to the Project was also provided by residents of the Kitikmeot region during Sabina's community engagement process. This information was collected (e.g., in meeting notes and reports) and later integrated into Sabina's community engagement database (containing some 165 topic directories) and FEIS submission. Over 250 engagements have been held with communities in Nunavut and the Northwest Territories on the Project. Sabina remains committed to meaningful community engagement throughout the Project's lifespan, as described in Sabina's Community Involvement Plan (FEIS Volume 10, Chapter 26).

Likewise, Inuit Qaujimajatuqangit values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. Inuit Qaujimajatuqangit consists of Inuit values, preferences, and what they consider significant; it is about the relationships between humans, animals, and the environment. It is location specific and reflects the particular conditions in specific geographic locations. Inuit Qaujimajatuqangit, although normally undocumented, is shared information within the community, and maintains the means and knowledge of living off the land, continues traditional land use activities, and promotes a cultural life style, all of which sustained Inuit for generations.

Sabina has considered available Inuit Qaujimajatuqangit/TK for all baseline studies, effect assessments, and associated mitigation and monitoring plans.

Sabina will continue active engagement with local communities and Inuit organizations, and will include additional TK, as it becomes available, in updates to the design and implementation of Project environmental programs, as the Project advances through permitting, and if approved, into, Construction, Operations, and Closure phases. This will ensure that the combination of science and TK leads to monitoring that meets the expectations of Inuit organizations, local communities, and government. Specifically, Sabina will within 120 days of the execution of the Commercial Lease with the KIA, establish an IEAC. The IEAC will:

1. provide advice to Sabina staff and KIA on potential impacts of the Operations on the environment, wildlife, fisheries, TK, traditional land use, and archaeology; and
2. provide advice to Sabina and KIA on mitigation of potential impacts on the environment, wildlife, fisheries, TK, traditional land use, and archaeology.

It is acknowledged that Sabina has a TK licence with KIA, and that while the IEAC may further facilitate the exchange of TK between the Parties, the IEAC is not intended to be the definitive provider of TK to the Parties. The IEAC will form part of the formal agreements with the KIA. For additional information regarding the IIBA refer to Section 4.3.

3.7 CONSULTATION

Public consultation, government engagement, and TK was incorporated during the development of the FEIS and FEIS Addendum. Public consultation and engagement is a legal requirement in Nunavut, an industry best practice, and an important corporate commitment. Effective public consultation and engagement helps ensure that community members are informed and knowledgeable about proposed projects, that community support for those projects is more readily obtained, and sustainable development goals are achieved. A key goal of Sabina's public consultation and engagement program has been to ensure the Company obtains a "social licence to operate", by securing the support of a majority of residents from potentially impacted local communities.

To obtain this goal, a number of process goals have been followed:

- identification and prioritization of communities and community stakeholder groups;
- developing an understanding of key community and stakeholder views regarding the Project;
- addressing community and stakeholder issues and expectations; and
- continuous improvement.

The establishment of open, respectful, and jointly beneficial relationships with local communities and stakeholders have been, and will continue to be, key priorities for Sabina. Sabina further recognizes the unique characteristics of the Inuit lifestyle and has strived to engage local communities in a culturally sensitive and appropriate manner. The Company is committed to maintaining ongoing dialogue with local communities and will continue to be open to suggestions as to how its public consultation and engagement activities can be improved.

Sabina has, and will continue to engage with the KIA, which is the primary Inuit organization with rights and responsibilities in the Project area. Kitikmeot region communities have also been a key focus of Sabina's public consultation and engagement activities. Various levels of consultation and engagement were employed by Sabina depending upon a community's proximity to the Project. The communities that have been the focus of Sabina's public consultation and engagement program include:

- Cambridge Bay (Ekaluktutiak);
- Kugluktuk (Coppermine);
- Kingaok (Bathurst Inlet);
- Omingmaktok (Bay Chimo);
- Gjoa Haven (Ursuqtuq);
- Taloyoak (Spence Bay);

- Kugaaruk (Pelly Bay);
- Yellowknife; and
- Iqaluit.

A number of Northwest Territories Aboriginal organizations have also been engaged for the Project.

Sabina's public consultation and engagement program is multi-faceted. It includes a commitment to cultural sensitivity and inclusiveness, and the use of various community engagement methods and tools. These include public meetings, meetings with key stakeholders and stakeholder groups, meetings with community advisory groups in Cambridge Bay and Kugluktuk, Project site visits, social media (e.g., websites and Twitter/email/RSS feeds), a Project newsletter, other distribution materials, establishment of a Cambridge Bay office, use of local employees and contractors including a Cambridge Bay-based Community Liaison Officer, execution of TK studies in partnership with the KIA and Kugluktuk HTO, execution of various socio-economic/environmental studies, the eventual negotiation of an IIBA with the KIA, other forms of community engagement (e.g., radio shows, trade show participation, cross-cultural training, and community advertisements), and community donations.

Sabina began its public consultation and engagement program in June 2012. Since that time, 328 meetings and major correspondences with Project stakeholders have occurred (Table 3.7-1). Meeting minutes were taken during many of Sabina's public consultation and engagement activities, and have been incorporated into a public consultation database that contains 165 topic directories. This database has been analyzed to identify key issues and concerns amongst communities and stakeholders. These can be categorized under three main themes: community benefits and engagement, employment and training, and environmental management and monitoring.

Table 3.7-1. Community Meetings and Major Correspondence, as of July 17, 2017

	Meetings	Major Correspondences	Total
Cambridge Bay	64	9	73
Kugluktuk	61	11	72
Bathurst Inlet & Bay Chimo	11	7	18
Gjoa Haven	19	5	24
Taloyoak	23	4	27
Kugaaruk	18	4	22
Other (e.g., northern trade shows & conferences, Socio-economic Monitoring Committees, newsletters)	39	13	52
Yellowknife / Other Locations in the NWT	16	25	41
Total	**251**	**78**	**329**

Key issues identified through public consultation and engagement and Sabina's commitments to addressing these issues can be found in FEIS Volume 3, Chapter 1, Section 1.6.3, and FEIS Volume 3, Chapter 1, Table 1.6-1**.**

The Public Consultation and Engagement section of FEIS Volume 3 provided a comprehensive overview of Sabina's public consultation and engagement activities for the Project. More specifically, it described:

- The purpose and goals of Sabina's public consultation and engagement program;
- Regulations and requirements pertaining to public consultation and engagement for the Project;
- Consultation and engagement with key Inuit and Aboriginal organizations in Nunavut and the Northwest Territories;
- Consultation and engagement with potentially affected communities in Nunavut and the Northwest Territories;
- Methods used in Sabina's public consultation and engagement program;
- Results of Sabina's public consultation and engagement program, including key issues that were identified and Sabina's commitments to addressing these issues; and
- Sabina's long-term commitments to public consultation and engagement (as described further in FEIS Volume 10, Chapter 26 Community Involvement Plan).

Sabina utilized industry and northern best practices to develop its public consultation and engagement program, and has received very positive feedback on its approach from community and government representatives, regulators, and other Project stakeholders to date. Approximately 185 community and stakeholder meetings on the Project were held prior to the November 2015 FEIS submission, during which a substantial amount of feedback was received by Sabina. This feedback was later input into a community engagement database and analyzed to address key issues and concerns local stakeholders had about the Project. The various plans and designs presented in the FEIS incorporated this feedback and resulted in a number of Project improvements.

Since the November 2015 FEIS submission, a total of over 251 Project-related meetings to date. Sabina has worked hard to ensure communities are given regular updates on the Project and are provided with opportunities to share feedback. For example, Sabina conducted a tour of all the Kitikmeot communities in July 2016 to explain the Final Hearing Report and describe the next steps that would be taken by Sabina. Sabina has also continued to advance the Bernard Harbour Restoration Project with the Kugluktuk HTO, hosted a Project site visit with community members in April 2016, and has participated in various other meetings and events (e.g., the annual Kitikmeot Socio-economic Monitoring Committee meeting, Kitikmeot Career Fair, Kitikmeot Mayors Conference, Kitikmeot Trade Show). As before, a significant amount of support for the Project continues be received from community stakeholders.

Sabina also visited the communities of Cambridge Bay and Kugluktuk in November and December 2016 (meeting with the public, HTOs, Community Advisory Groups, and residents of Bathurst Inlet and Bay Chimo) to describe recent improvements made by Sabina. Feedback obtained from community members was generally very positive and recommendation were fed into the appropriate mitigation plan.

While there have been a number of new engagement activities conducted since the FEIS submission, the overall approach, methods, and findings of Sabina's public consultation and engagement program have not changed. Sabina continues to build upon the positive relationships it has developed for meaningful engagement. Sabina will also maintain a public consultation and engagement program throughout the life of the Project, as described in its Community Involvement Plan.

The Government Engagement section of FEIS Volume 3 provided a summary of Sabina's government engagement program. Throughout the process, Sabina consistently sought to provide government officials with clear and comprehensive information regarding the proposed Project and the various management

and mitigation plans that support its development. Sabina also regularly communicated important Project timelines and milestones to government officials, so that they can more effectively plan their workloads and be sufficiently prepared to participate in the environmental assessment process.

To date, the goals of Sabina's government engagement program have been to:

- develop two-way communication and dialogue that builds trust and results in action;
- provide information to government officials about the Project in a timely, transparent, and accessible fashion to support government agencies in their review processes; and
- obtain information and knowledge from government agencies to help Sabina address issues and develop appropriate management and mitigation strategies.

Sabina has engaged a number of federal agencies on various occasions about the Project, including the Canadian Northern Economic Development Agency (in particular, the Northern Projects Management Office), DFO (including Canadian Coast Guard and Canadian Hydrographic Service), INAC, Environment and Climate Change Canada (ECCC), Natural Resources Canada (NRCan), and Transport Canada.

Sabina also actively engaged both territorial governments. The Government of Nunavut (GN) participated actively on a broad range of issues primarily related to wildlife and socio-economic issues. The Government of the Northwest Territories was engaged primarily on caribou issues but also more broadly.

Engagement with government officials will continue to be important not only in these review stages but also on-going as these departments and agencies provide an important regulatory and oversight function for project activities. Sabina recognizes there will be an on-going need for both formal and informal government engagement activities. Refer to FEIS Addendum Appendix V3-2A for the most updated information to document Sabina's ongoing government engagement activities.

Between the November 2015 FEIS submission and April 2016 FEIS Final Hearing, Sabina held 16 separate meetings with various officials to ensure that all issues were well understood and agreement was reached on the way forward for key issue areas. Twenty-two separate meetings were held to review actions taken by Sabina since the FEIS Final Hearing and to outline our next steps. For additional information, refer to FEIS Addendum Appendix V3-2A - Record of Meetings with Government Officials (Revised).

4. Regulatory Regime

The Project requires a Type A Water Licence from the NWB. In advance of or concurrent with the water licensing process, Sabina must obtain and/or comply with requirements of additional authorities for land use planning, environmental assessment, Inuit water rights, and any other Federal, Territorial act, regulation or guideline applicable to the Project.

The Goose Property, WIR, and MLA are located predominately on IOL, with some infrastructure on Crown land (i.e., TSF). The lead authorizing agencies for the Project are the NIRB, NWB, KIA, and INAC. The Project will require the authorization and consent for development, construction, operations, and closure of the Mine and is related facilities. These approvals will be in the form of a land use leases, production lease, and IIBA, water compensation agreements, and other forms or approvals and authorizations. A full list of applicable acts, regulations, and guidelines that govern the Project are provided in Appendix D-1.

4.1 LAND USE PLANNING AND ENVIRONMENTAL ASSESSMENT

Mine development in Nunavut is subject to land use planning conformity determination by the NPC in accordance with Article 11 of the Nunavut Agreement and the *Nunavut Planning and Project Assessment Act*. The Project is in a designated area where no land use plan exists therefore a conformity determination from the NPC is not required.

In accordance with Article 12 of the Nunavut Agreement and the *Nunavut Planning and Project Assessment Act* (Part 3) the Project is subject to development impact review.

Sabina commenced the Environmental Assessment of the Project on June 14, 2012 with the submission of a Project Proposal to the NIRB (NIRB File No. 12MN036). A summary of the procedural history for the Project is provided in Appendix D-2.

In brief, the NIRB issued a screening decision report in September 2012 to the Minister recommending the project proceed. The Minister issued a decision in support of the NIRB screening report in December 2012. The NIRB provided Project Guidelines for the production of an EIS on April 30, 2013. In January 2014, Sabina submitted a conformant DEIS which included a Draft Type A Water Licence Application for Mine Development for consideration by the NIRB and NWB, respectively.

Initially and early in the review process Sabina requested that the Project be considered by the NIRB and NWB concurrently consistent with the Detailed Coordinated Process Framework for NIRB Reviews and NWB Licensing (April 2012).

Technical Meetings, a Community Round-Table and Pre-hearing Conference on the Draft EIS were completed on November 20, 2014. Following an information request and technical review period. On December 19, 2014, the NIRB issued a Technical Meeting/Pre-hearing Conference Report Decision that included the NWB Technical Review requirements for a Type A Water Licence.

Following the receipt of the NIRB's Pre-hearing Conference Report, Sabina submitted the FEIS on November 23, 2015, which was deemed conformant to the Project Guidelines. Of note, Sabina advised NIRB that moving forward in development of a FEIS that the Project scope reduced to remove activities associated with development of George Property. In addition, Sabina no longer requested the NIRB and NWB process the application concurrently.

The Final Hearing concluded on April 30, 2016 with the KIA, GN, and all selected representatives of the Kitikmeot communities recommending that the Project should be allowed to proceed. In addition, the departments of INAC, DFO and the Canadian Coast Guard, ECCC, NRCan, and Transport Canada all confirmed that they had no outstanding issues to be addressed at the Environmental Assessment phase. On June 15, 2016 the NIRB released their Final Hearing Report to the Minister which recommended that the Project should not be approved to proceed at this time. On January 12, 2017 the Minister directed the NIRB to reconsider the Project under section 12.5.7(e) of the Nunavut Agreement due to deficiencies in the NIRB Final Hearing Report.

On February 15, 2017 Sabina submitted an FEIS Addendum to the NIRB in response to the NIRB direction letter to address issues and concerns identified by the Board, and address particular issues highlighted within the Ministers (January 12, 2017) referral letter.

A subsequent Technical Meeting was held by NIRB on May 24, 2017 (via telecom) with a Final Hearing held on May 31 to June 2, 2017 in person in Cambridge Bay, Nunavut. On July 18, 2017, the NIRB concluded in their Revised Final Hearing Report (the Report) that the Project should now be allowed to proceed to the regulatory stage, and provided the Report with recommendations to the responsible Ministers. A ministerial decision is pending. Upon a decision from the Minister, it is anticipated that the NIRB will issue a Project Certificate confirming the Terms and Conditions outlined in the Report.

4.2 NATURE OF INTEREST IN THE LAND

Nunavut mining and exploration activities are regulated by INAC. This federal department ensures compliance with the Canada Mining Regulations across the territory. There are three main types of mineral interests under the Canada Mining Regulations: a mineral claim, a prospecting permit, and a mineral lease, also referred to as mining lease. Surface rights on Crown Land are vested in the federal government and in the department of INAC. Access to and use of these surface lands requires a land use permit, licence, or commercial lease issued by the department of INAC.

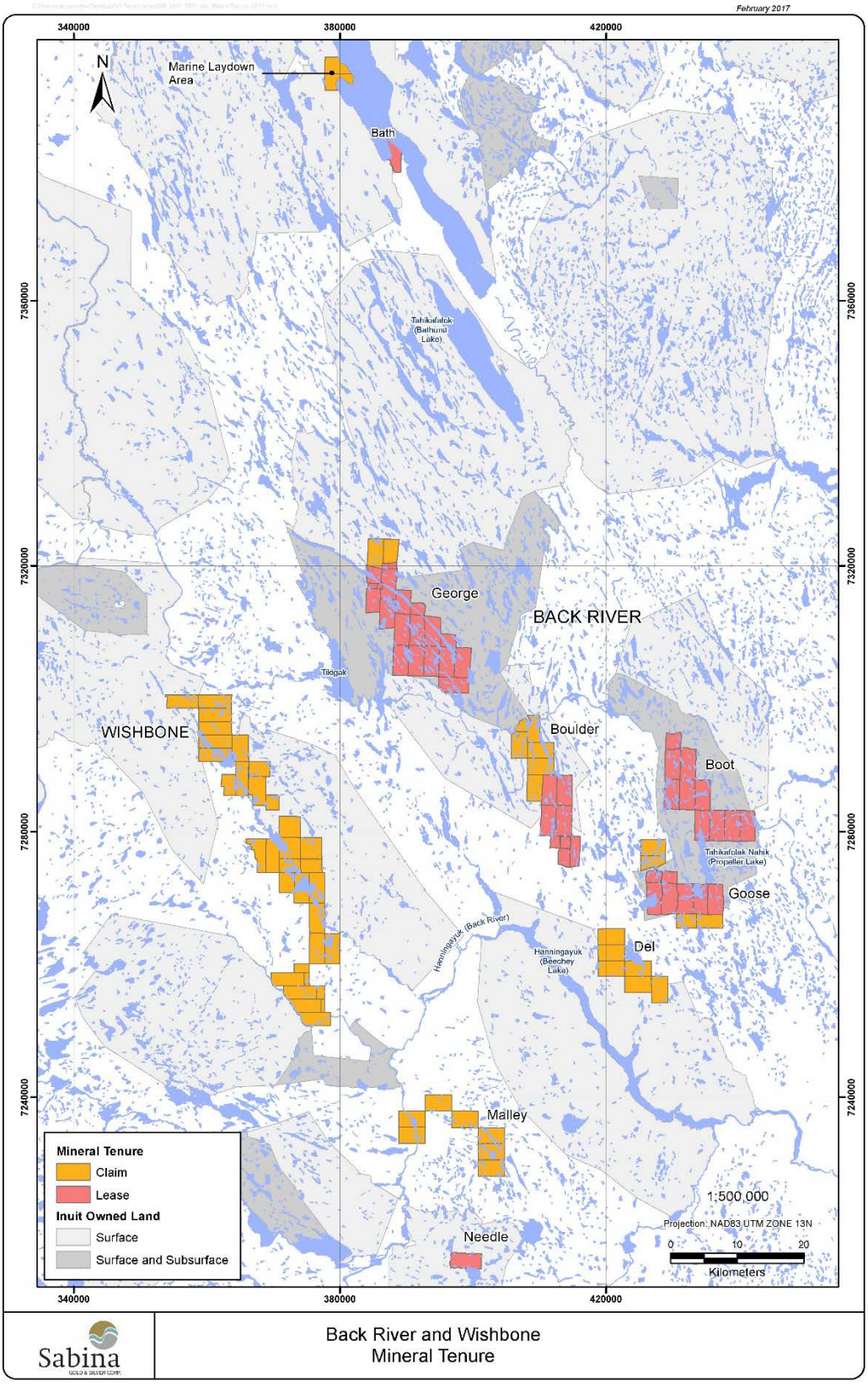
Under the Nunavut Agreement enacted in 1993, the mineral rights for about 2% of the territory have been entrusted to the Inuit. The Designated Inuit Organization under the Agreement is Nunavut Tunngavik Inc.; it negotiates terms and conditions for those blocks that are not under federal jurisdiction. The deposits at the Goose Property lie on grandfathered lease claims and on IOL sub-surface. Surface rights for IOL are vested in the KIA, which administers the access and management of the lands for the benefit of the Inuit of the region. Access to and use of surface lands requires an Inuit Land Use permit, licence, or commercial lease issued by the KIA. Table 4.2-1 provides a list of current authorizations and permits held by Sabina as of August 2017.

Table 4.2-1. Current Authorizations and Permits (as of August 2017)

Permit	Expiry (year-mo-day)	Agency	Description
KTL204C012	2017-12-12	KIA	Boulder: Staking/prospecting, exploration (ground/air geophysics), geophysical survey, gridding and drilling.
KTL204C020	2017-12-12	KIA	Boot: Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling.
KTL304C017	2017-12-12	KIA	Goose: Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, all-weather airstrip and connecting road.
KTL304C018	2017-12-12	KIA	George: Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, all-weather airstrip.
KTL312C004	2017-12-12	KIA	Wishbone/Malley: Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling
KTL304F049	2017-12-12	KIA	Winter road connecting Bathurst Inlet - Goose and George.
KTP11Q001	2017-12-12	KIA	Goose rock quarry.
KTP12Q001	2017-12-12	KIA	Goose Airstrip borrow area.
KTP12Q002	2017-12-12	KIA	George borrow quarry.
N2011F0029	2018-12-13	INAC	Winter Road connecting George-Goose.
N2017F0016	2022-07-20	INAC	Winter Road connecting Bathurst Inlet - Back River Project.
N2012C0003	2019-02-06	INAC	Wishbone-Malley Mineral Exploration activities on Crown Land
N2016C0011	2021-10-26	INAC	Back River Exploration activities.
2BE-GOO1520	2020-02-18	NWB	Goose water licence.
2BE-GEO1520	2020-05-29	NWB	George water licence.
2BE-MLL1217	2022-06-29	NWB	Wishbone-Malley water licence.

Sabina holds six claim groups in the region. These are a mix of federal mining leases and federal mineral claims, as shown in Appendix D-3 and Figure 4.2-1. All leases and claims are 100% owned by Sabina, and are currently in good standing. Sabina's mineral tenure is divided into two distinct areas: Back River and Wishbone. There are also four exploration prospects: Boot, Boulder, Del, and Bath, which cover an area of 133,470 acres or 54,040 hectares; these are shown in Figure 4.2-1.

Figure 4.2-1. Back River and Wishbone Mineral Tenure



4.3 INUIT IMPACT BENEFIT AGREEMENT AND INUIT WATER RIGHTS

Inuit Beneficiaries in the Kitikmeot region are represented by the KIA. The Project is located predominantly on IOL, the Project can only proceed with the full consent of the Inuit as provided by the KIA working with Nunavut Tunngavik Inc. As required under Article 26 of the Nunavut Agreement, Sabina must have an IIBA with the KIA prior to the commencement of the Project. In 2016, Sabina formally commenced its negotiations with the KIA on land tenure and IIBA terms for the Project. The parties continue to advance a detailed non-binding term sheet which will form the basis to finalize definitive agreements once completed. Sabina is committed to working with the KIA to complete the term sheet and the definitive agreements with an objective of formally outlining Sabina's social, economic, and environmental commitments to the people of the Kitikmeot region. Sabina believes that it is reasonable to expect, assuming that progress on the negotiations continues at the current pace, that these agreements will be successfully completed before the end of 2017 in any event no later than prior to issuance of the Type A Water Licence.

Key terms of the non-binding term sheet include:

- Surface land rights tenure and obligations, including commercial lease parameters;
- Reclamation obligations and security;
- Payments terms for surface land rights and IIBA;
- Payment terms for water and wildlife compensation;
- IIBA implementation process and ongoing communication and monitoring;
- Inuit employment objectives;
- Inuit labour relations, including employment rotation, health and safety and language objectives;
- Inuit training and education objectives, including scholarship funding objectives;
- Inuit community and cultural objectives;
- Inuit business and contracting objectives, including subcontractors; and
- Inuit environmental monitoring objectives, including identification, protection and conservation of archaeological sites and specimens.

Concurrent with the IIBA, Sabina will also need to reach a Water Compensation Agreement for the Project with the KIA in accordance with the requirements of Article 20 of the Nunavut Agreement. The Water Compensation Agreement will address Inuit Water Rights for the Construction, Operations, and Decommissioning of the proposed Mine site. Sabina is aware that the NWB is precluded from issuing a water licence for the Project if a water compensation agreement has not been reached with the KIA. Therefore, consistent with development of the IIBA, Sabina intends to finalize the Water Compensation Agreement prior to a final Type A Water Licence hearing on the Application.

The financial compensation associated with quarry and borrow material extraction will be negotiated confidentially and defined with the KIA during the regulatory process.

The Project Specific Information Requirements (PSIR) Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and commitments made by Sabina, as part of the Environment Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable KIA terms and conditions or conditions specific to this Application.

4.4 EXISTING AND OTHER USER WATER RIGHTS

Presently, there are no properties adjacent to the proposed Mine or MLA that have any influence on the Project. No trap lines have been identified within or directly adjacent to the proposed Mine or MLA footprint. No third party or individuals have been identified, or have come forward as existing or other fresh water users with rights that might be impacted by the Project. Sabina knows of no other freshwater water rights that must be secured for the Project.

4.5 OTHER REGULATORY AUTHORITIES

A full list of applicable acts, regulations, and guidelines that govern the project are provided in Appendix D-1.

Additional authorizations and/or submissions may be required to the following organizations:

- Indigenous and Northern Affairs Canada;
- Fisheries and Oceans Canada;
- Environment and Climate Change Canada;
- Natural Resources Canada;
- Transport Canada; and
- Canadian Coast Guard.

4.5.1 Indigenous and Northern Affairs Canada

Indigenous and Northern Affairs Canada manages and regulates surface and subsurface land on areas defined as "Crown" lands. In addition INAC has a role to play in water management and water quality protection of water in Nunavut as water is vested in the Crown.

The PSIR Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and Commitments made by Sabina as part of the Environmental Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable INAC terms and conditions or conditions specific to this Application.

4.5.2 Government of Nunavut

The GN authority in review of the Project is limited the regulations and legislation relevant to their jurisdiction.

To date, no issues specific to the use or water or disposal of waste into water which may overlap jurisdictions between the NWB and the GN have been raised by the GN. Sabina acknowledges that the Spill Contingency Plan takes into account GN's spill reporting regulations.

The PSIR Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and Commitments made by Sabina as part of the Environmental Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable GN terms and conditions or conditions specific to this Application.

4.5.3 Fisheries and Oceans Canada

Fisheries protection and pollution prevention measures for the Project are subject to the requirements of the *Fisheries Act* s.35(1), which states that no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal (CRA)

fishery, or to fish that support such a fishery. The Project is not expected to cause serious harm to fish that are part of CRA fisheries, or to fish that support the CRA fisheries.

Note that a *Fisheries Act* Authorization application will be prepared during the permitting phase of the Project upon continued engagement with DFO and the KIA, and concurrent with the water licence regulatory review for activities with the potential to result in Serious Harm to Fish. Concurrent with the water licence regulatory review a Final Fisheries Offsetting Plan will be produced during the permitting phase of the Project with engagement of local communities and will need to be submitted as part of the Application for Authorization under the *Fisheries Act*. The plan would be approved by DFO as a condition of their Authorization. Sabina committed to continue to work with DFO and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan. (FA-DFO-C-2). For information purposes the Conceptual Fish Offsetting Plan has been provided with the Application (SD-22).

In addition, Sabina is required to comply with s.36(3) of the *Fisheries Act*, where subject to deposits authorized by regulation, no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

Sabina is aware that under the NWNSRTA s.73 where the NWB issues a licence in respect of any water to which regulations made under subsection 36(5) of the *Fisheries Act* apply, any conditions in the licence relating to the deposit of waste in those waters shall be at least as stringent as the conditions prescribed by those regulations.

Sabina continued to work with DFO and ECCC throughout the environmental assessment process and it was confirmed under the Metal Mining Effluent Regulation (MMER), Schedule 2 designation was not required for use of Llama Lake as Llama Pit and Umwelt Lake as a Saline Water Pond. For additional information, refer to Section 5.3.4.12 (Saline Water Management). For waterbodies or portions thereof requiring listing under Schedule 2 are summarized in Section 4.5.4.

The PSIR Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and Commitments made by Sabina as part of the Environmental Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable DFO terms and conditions or conditions specific to this Application.

4.5.4 Environment and Climate Change Canada

Environment and Climate Change Canada's mandate under the *Department of Environment Act* is to preserve and enhance water, air and soil quality, conserve and protect: migratory birds, species at risk, flora and fauna, and water resources, provide meteorological information, and coordinate federal environmental policies and programs. In fulfilling their mandate ECCC is responsible for the *Canadian Environmental Protection Act*, the *Fisheries Act* – pollution prevention measures and the *Fisheries Act – Metal Mining Effluent Regulations*.

ECCC has determined that the following Project waterbodies or portions of waterbodies will require a listing under Schedule 2 of the MMER:

- Pond 6;
- Pond 7;
- Pond 8;

- Pond 9;
- the portion of Goose Inflow South that will be overprinted by the TSF;
- the portion of Goose Inflow East that will be overprinted by the TSF; and
- other ephemeral streams that will be overprinted by the TSF.

As such, Sabina must undertake the following activities in order for ECCC to recommend the necessary amendments to the MMER:

- develop an assessment of alternatives for mine waste disposal including a multiple account analysis that is developed in accordance with ECCC's *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (2013),
- develop a fish habitat compensation plan in consultation with and following the guidance provided by DFO; and
- participate in public and aboriginal consultations on the potential amendment to Schedule 2 of the MMER for the waterbodies associated with the proposed TSF.

Sabina is aware that the MLA which is approximately 130 km NNW of the Goose property is not subject to MMER, but is subject to the prohibitions of section 36(3) of the *Fisheries Act*.

Sabina has agreed to design and implement a stand-alone marine monitoring program at the MLA to identify potential impacts of the Project on the marine environment and inform adaptive management actions. The monitoring program shall be in line with the proposed monitoring in the Aquatic Effects Monitoring Plan.

The PSIR Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and Commitments made by Sabina as part of the Environmental Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable ECCC terms and conditions or conditions specific to this Application.

4.5.5 Natural Resources Canada

Natural Resources Canada is the established leader in science and technology in the fields of earth sciences, energy forests, and minerals and metals. Their mandate is to enhance the responsible development use and competitiveness of Canada's natural resources and products. For the Project, NRCan has a regulatory role as the responsible authority for the *Explosives Act* and Regulations. In addition, NRCan has provided scientific expertise on surficial geology, permafrost and terrain conditions and hydrogeology throughout the environmental assessment review of the Project.

All of NRCan's questions and concerns raised during the environmental review stage were addressed or captured within other regulatory agency agreed upon Terms and Conditions or commitments. No specific term and conditions were identified between Sabina and NRCan requiring additional follow-up leading to the Type A Water Licence.

Sabina is committed to compliance with the *Explosives Act* and Regulations. An Explosives Management Plan will be provided to NRCan for review and approval.

4.5.6 Transport Canada and Canadian Coast Guard

The Project may be subject to the *Navigation Protection Act*. Sabina has met with Transport Canada to explore the implications of applying the *Navigation Protection Act* to the Project. The *Navigation Protection Act* which came into force on April 1, 2014, is the result of the 2012 amendments made to the *Navigable Waters Protection Act*.

At this time, Sabina does not believe that the small lakes, ponds, and streams within the Project's footprint are navigable waterbodies. Transport Canada has recommended that Sabina submit a Notice of Works to the Navigation Protection Program for any dewatering so a navigation assessment can be completed on both Umwelt and Llama lakes. Sabina is committed to providing the requested information when final design details for Project components are available.

Sabina will continue to work with Transport Canada to determine appropriate mitigation measures and strategies to protect navigable waterbodies and ensure compliance with the *Navigation Protection Act*. The TSF and the WRSAs are not sited within any waterways and therefore does not have the potential to affect navigation.

Transport Canada and the Canadian Coast Guard have the expertise, jurisdiction, and mandate to advise on shipping and marine spill response, in accordance with the *Canada Shipping Act* and its regulations, which include numerous specific requirements relating to shipping in the Canadian Arctic and marine spill prevention and response.

Sabina notes that the Canadian Coast Guard is the lead federal agency for all ship-source spills or pollution incidents in water under Canadian jurisdiction. Sabina recognizes its responsibility to manage the risks effectively and to be prepared to respond in the event of a spill. Response to spills that occur during the act of shipping will be covered under the vessel's Shipboard Oil Pollution Emergency Plan. The Shipboard Oil Pollution Emergency Plan is a required document that must be reviewed and approved by Transport Canada.

The *Canada Shipping Act,* 2001, stipulates that operators of designated oil handling facilities must have an Oil Pollution Emergency Plan (OPEP). An OPEP outlines potential spill scenarios, and provides specific procedures for responding to spills while minimizing potential health and safety hazards and environmental damage. It provides instructions to guide all personnel in emergency spill response situations, defines the roles and responsibilities of management and responders, and outlines the measures taken to prevent spills, the related exercise and evaluation program, and the mechanism for regular updates to the plan. An OPEP must be reviewed and approved by Transport Canada. Since the FEIS Final Hearing, Sabina has updated the OPEP to include more detail on bulk fuel transfer spill prevention measures (OPEP Section 11.3.2), marine mammal and fish sensitivities (OPEP Section 5.3.6), spill response kit locations at the MLA (OPEP Annex 2), guidelines for responding to multiple emergencies (OPEP Section 7.7), large spills (OPEP Section 10.1), and unexpected ice conditions (OPEP Section 5.3.5).

The PSIR Tab 9 in Appendix B-1 Concordance assessment outlines agreed upon Terms and Conditions and Commitments made by Sabina as part of the Environmental Assessment Process by NIRB. The PSIR identifies where Sabina has addressed the applicable Transport Canada/Canadian Coast Guard terms and conditions or conditions specific to this Application.

5. Project Description

5.1 PROJECT DEVELOPMENT

The Project is a proposed gold project owned by Sabina within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories. The Project is comprised of two main areas: the Goose Property and the MLA situated along the western shore of southern Bathurst Inlet. The majority of annual resupply will be completed using the MLA, and an approximately 160 km long WIR will interconnect these sites.

The Feasibility Study for the Project, completed in June 2015, positively identified the economic viability and potential of the Back River Project. The mine plan reflects an estimated 10 year operating mine life based on currently identified ore reserves, with a total ore feed of 19.8 million tonnes to a single Process Plant at the Goose Property. The life of the Project, from Mobilization and Construction to Operations and Closure, and Post-Closure, is 27 years.

The Project includes several mineral deposits: Umwelt, Llama, Echo, and Goose Main at the Goose Property. Ore will be mined using conventional open pit and underground methods and trucked to the Process Plant. Waste rock will be stored in several designated WRSAs on the surface or backfilled in mined out workings. Tailings from the Process Plant will first be stored in a TSF located near the Process Plant and then backfilled in mined out open pits.

Alternatives within the Project have been evaluated according to the following criteria: technical feasibility; economic validity; potential impacts to the environment; and amenability to reclamation. Input received during community and government engagement and consultation has been considered in the alternatives assessments. As the Project planning advances, alternatives assessment criteria will also include community acceptability or preference, as well as the potential for enhancing socio-economic effects.

The Project will create significant socioeconomic benefits. The total GDP impact is estimated to be over $500 million during the Construction Phase, and $2.5 billion over the 10 years of production. The Project will substantially benefit Nunavut and will contribute as much as $44 million in GDP to Nunavut during the two years of construction, and as much as $380 million in GDP during the Operations Phase. Construction is estimated to result in a total of about 4,300 person-years of direct, indirect, and induced employment across Canada, and approximately 21,000 person-years over the 10-year operations.

Both the MLA and the Goose Property will have self-sufficient operating infrastructure including: accommodations, administration, laydown areas, diesel-fired power generation, emergency and medical facilities, maintenance shops, warehousing, and water and waste management facilities.

5.1.1 Back River Site History

The SRK 2012 Preliminary Economic Assessment Technical Report presents a complete list of historical work on the Property. The following information was sourced from this document and is summarized in Table 5.1-1 and Table 5.1-2.

The Back River Joint Venture (BRJV) owned the Property from 1982 to 2008. During this time, various companies and individuals acquired and relinquished their interests. At times, these entities were also the operators. A summary of the historical milestones of the Property is presented in Table 5.1-1.

Table 5.1-1. Historical Ownership Milestones

Dates	Milestones
1982	BRJV formed.
1985	F.W. Hill (Hill) and Esso Minerals Canada (Esso) was investor and operator.
1985 to 1986	Kerr-McGee Corp. acquired interest in BRJV and was operator in 1986.
1987 to 1996	Homestake Mineral starts to earn into BRJV and becomes operator in 1991.
1997 to 1998	Arauco (later changed name to Kit Resources) acquires BRJV.
1999 to 2002	Kinross starts to earn into BRJV and becomes operator.
2003 to 2004	Miramar starts to earn into BRJV and becomes operator.
2005 to 2008	Dundee Precious Metals starts to earn into BRJV and becomes operator.

Source: Summary by AMC Mining Consultants (Canada) Ltd. based on table provided by Sabina Gold & Silver Corp. 2015

Sabina purchased the Property from Dundee Precious Metals in 2009.

The Del claims, which are part of the current Property, were not part of the initial Property staked by the BRJV. Trigg, Woollett, Olsen Consulting Limited (TWOCL) was the founder of the BRJV. In 1986, Bow Valley Industries owned the Del claims but dropped them after a small and unsuccessful drilling program (Cater et al. 2009). The area remained inactive until Dundee Precious Metals staked 12 claims in 2008. The Del claims were subsequently sold to Sabina as part of the Property in 2009.

Table 5.1-2 summarizes the exploration work carried out by the operators.

Table 5.1-2. Historical Exploration Summary

Operator	Period	Exploration Completed	Drill Holes Completed	Reports or Studies Completed
TWOCL on behalf of BRJV	1982	Reconnaissance exploration	-	-
Back River Joint Venture	1983-1985	Gridding, geological mapping, sampling, exploration drilling, and aeromagnetic surveys	36	-
Hill and Esso	1985	Airborne magnetics and electromagnetic surveys	-	-
Bow Valley	1986	Soil sampling at Del prospect, trenching, exploration drilling	11	-
Kerr-McGee Corp.	1986	Exploration drilling	31	-
Homestake Mineral	1987-1996	Geological mapping, panel and till sampling, exploration and infill drilling, geochemical study, geophysics, legal surveying	656	Prefeasibility and Feasibility Study (George)
Kit Resources	1997-1998	Geological mapping, sampling, exploration and infill drilling	184	Resource Estimate (George)

(continued)

Table 5.1-2. Historical Exploration Summary (completed)

Operator	Period	Exploration Completed	Drill Holes Completed	Reports or Studies Completed
Kinross	1999-2002	Spectral induced polarization (IP)/resistivity survey, till sampling, geological mapping, channel sampling, soil sampling, exploration and infill drilling	126	Resource Estimate and Conceptual Study (Goose)
Miramar	2003-2004	Exploration and infill drilling	41	NI 43-101 Report
Dundee Precious Metals	2005-2008	Trench sampling, geological mapping, exploration and infill drilling, structural analysis, airborne magnetic, electromagnetic, and radiometric surveys, geochemistry and rock samples	186	NI 43-101 Report
Sabina Gold & Silver	2009-Present	Trench sampling, geological mapping, exploration and infill drilling, structural analysis, airborne magnetic, electromagnetic, and radiometric surveys, geochemistry and rock samples, baseline	2056	NI 43-101 Report (x2)

5.1.2 Current and Potential Future Development

5.1.2.1 Current Activities

Exploration activities are ongoing and will continue over the life of the Project. Existing exploration activities are regulated by the NWB under the following water licenses:

- Water Licence 2BE-GOO1520 (expires 2020-02-18); and
- Water Licence 2BE-GEO1520 (expires 2020-05-29).

Ongoing exploration is an essential component to supporting a long-term mining operation through the identification of potential future reserves. As such, Sabina proposes to maintain and separate its current exploration Type B water licenses from the Type A Water Licence Application to allow for the flexibility in water and waste management needed at the exploration stage.

Activities in the Kitikmeot region are supported by two camps – one at the Goose Property area and one at the George Property area. Sabina is also authorized to establish temporary seasonal camps, including one in the Bathurst Inlet area, to support exploration and environmental baseline programs.

Bulk goods and fuel are typically flown into the properties by aircraft. One all-weather road exists from the Goose Exploration Camp to the existing Goose Airstrip; local dirt trails comprise the rest of roads around the existing exploration camps at the Goose and George properties.

A complete list of permits, licenses, and authorizations current activities are conducted under is provided in Appendix D-1.

5.1.2.2 Potential Future Development

The infrastructure at the Goose Property and the MLA is designed to enable ongoing use and expansion beyond the currently defined operating mine life. Additional infrastructure would also be required to mine deposits at the George Property. If Sabina opts to advance the George Property, or another resource

in the future, an additional regulatory and environmental review process will likely be required. There is potential for future development, including at George Property, the expansion of existing deposits, or additional mineral deposits at Goose Property and within the regional belt.

5.1.3 Project Alternatives

The Project has considered numerous alternatives which were grouped into two categories: Tier 1 consists of those that impact significant design basis and Tier 2 ones are important but don't significantly impact the Project as a whole or its associated elements. Alternatives evaluated to be both technically, feasibly, and economically viable were further assessed for the following attributes:

- potential impacts to the environment;
- amenability to reclamation;
- community acceptability or preference; and
- socio-economic effects.

Tier 1 alternatives included:

- Project go/no-go decision;
- access and transportation alternatives for the movement of freight and personnel;
- mineral reserves and mining operations;
- ore processing and gold recovery;
- alternative for tailings management;
- alternatives for waste rock management;
- location of the main Goose Plant Site Infrastructure;
- location of the MLA;
- water management;
- power generation; and
- site reclamation and closure.

Once decisions were made on the major alternatives, a Tier 2 set of alternatives were considered, including:

- detailed site layouts for Goose Property and the MLA;
- options for quarry sites;
- emergency shelters, seasonal, and temporary camps;
- domestic waste management;
- mobile equipment;
- options for future development of other mineral deposits
- bulk fuel storage alternatives; and
- on-site accommodations and worker-related alternatives.

5.1.3.1 Tier 1 Alternatives

Project Go/No-Go decision

The decision is to proceed with mine development in the near term, as proposed herein or on a decelerated timeline. By developing the mineral resource, the potential effects and benefits predicted could be realized. This includes a multitude of socio-economic benefits to local communities supporting both traditional pursuits and the generational shift that is occurring within the Inuit community as youth show an interest in participating in the wage-based lifestyle.

Access and transportation alternatives for the movement of freight and personnel

Three options are the established standards for transporting supplies, equipment, and material in the Arctic:

- air transportation;
- marine transportation; and
- overland access via all-weather and/or WIRs.

A detailed logistics and transportation study concluded that a combination of all three options is optimal at different stages to access the Project rather than using only one method. Fixed wing aircraft would use ice airstrips and open water float access using nearby lakes and all-weather airstrips. Helicopters would also be used in specific situations. The bulk of materials and equipment deliveries will be via ocean-going freighters, tankers, and barges. Both available options of shipping routes from eastern and western seaports will be used, following the established Northwest Passage in the Arctic. The chosen route would depend on the particular shipment's origin after all costs have been considered. A WIR connection between the MLA and Goose Property will be used throughout the mine life to provide ongoing support and resupply for all Project phases. This WIR will be used primarily to transport large equipment and bulk materials from the MLA that cannot be cost-effectively or readily delivered by aircraft directly to the Goose Property. Based on technical feasibility and cost considerations, a seasonal WIR was selected over an all-weather road link. All-weather roads will be used internally on each property.

Mineral resources and mining operations

A number of gold deposits have been found across the Project. Exploration activities have identified economically feasible reserves. The four deposits located at the Goose Property are Umwelt, Llama, Goose Main, and Echo. Most of the deposits extend from surface to sufficient depth to consider a combination of open pit and underground mining methods. The geometry of these ore bodies is suitable for open pit mining based on the proximity to ground surface and economic assessment. Open pit mining using shovels and trucks is a mining method selected for the Project. It is well proven for extracting ore from such deposits. Economic analyses also determined that underground mines are viable for all four deposits. Post pillar cut-and-fill was the selected method for the Umwelt U/G, drift and fill for Llama and Goose Main, and longitudinal open stoping for Echo. Access to the underground mineralized zones could be via shaft, decline or some combination of the two; decline is the currently preferred option. Additional mine engineering and design may determine that other methods are more optimal with respect to the geometry of each ore body.

Overburden will be removed and placed in WRSAs as a development step of mining. Suitable waste rock is planned to be used for road construction, laydown areas, and construction of the water and waste management structures including the TSF Containment Dam.

Although minimizing the double handling of ore offers the benefits of simpler operations and reduced operating costs, stockpiling offers flexibility and other economic benefits. Run-of-mine ore will be stored in stockpiles adjacent to the Process Plant area at Goose Property. Mine plans have been developed to determine the volume of material and grade available to the Process Plant throughout the LOM, and can be modified to improve the mine's economics. Specifically, the proposed high-, medium-, and low-grade stockpiles may vary for their cut-off criteria as well as stored quantities. The potential of using sorting techniques to segregate low grade ore and waste may be included in the process if improving grade yields overall economic benefits.

Ore processing and gold recovery

The proposed ore processing rate is up to 6,000 tpd, which results in a 10-year mine life based on current ore reserves. This alternative provides an acceptable return on investment, and is environmentally and technically practical. Lower processing rates and the advantage of substantially smaller initial capital investment have been investigated; the feasibility study based on 3,000 tpd has demonstrated viability.

Several alternatives were considered for processing the ore. The current process flowsheet includes gravity concentration and whole ore leaching with cyanide. The optimized process may include conventional rougher flotation. Leaching followed by cyanide-in-pulp is the design basis but another alternative, cyanide-in-leach, may offer advantages. Crushing and grinding configuration and operating parameters will be optimized for grind size that will trade off costs against gold recovery downstream. The number of crushing stages and the product sizes from the ball and regrind mills offer alternatives. Additional metallurgical testing will inform such decisions when evaluated together with the respective capital and operating costs.

Reduced or more effective use of reagents and power consumption is an objective of designing and operating the process. Metallurgical testwork has resulted in lower cyanide usage without impacting gold recovery and benefitting the detoxification process. With the current flowsheet, a more efficient utilization of cyanide is achieved by grinding in cyanide. This alternative circuit adds process water containing cyanide from the tailings thickener to the ball mill circuit thereby assisting the leaching process. Recovering cyanide using a thickener and returning it to the process is a potentially viable alternative that will be investigated further. Different reagents may be required or offer advantages. This includes hydrogen peroxide and optionally using zinc sulphate in the detoxification process instead of copper sulphate. These and other possible process alternatives and optimizations provide opportunities to reduce overall cyanide (and reagents) consumption.

Alternatives for tailings management

Sabina applied the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (ECCC Guidelines) (ECCC 2011) to complete a multiple accounts analysis for tailings disposal technologies and disposal locations. The most commonly used tailings disposal options are conventional slurry tailings, thickened tailings, paste tailings, and filtered tailings. These options were assessed as part of the Waste Management Multiple Accounts Analysis that was updated in February 2016 as part of the FEIS Information Request Response Package (Sabina 2016b) and included the latest water and waste management strategies. The analysis concluded that conventional slurry tailings having a solids content of about 49% is the most appropriate method for the Project. Filtered tailings was not in contention because the small grind size from the process makes filtering the tailings impractical. Thickened and paste tailings are challenging due the complexity associated with water management in the Arctic environment.

The Waste Management Multiple Accounts Analysis also reviewed tailings disposal alternatives. Conventional slurry tailings require that available storage capacity aligns with the production rate. The

Project includes a purpose-built TSF which is used in sequence with mined-out open pits. Although there are other disposal alternatives, the wishes of the KIA to avoid subaerial tailings deposition on IOL were respected. As such, the many potential locations were shortlisted to nine, each of which were assessed for a number of technical criteria including location within the Potential Development Area (PDA), capacity, proximity, and climate-related considerations. Although the deposition sequence may change, currently tailings (and potentially waste rock) will be deposited sequentially starting in the TSF, followed by the Umwelt Tailings Facility (Umwelt Tailings Facility [TF]), and Goose Main Tailings Facility (Goose Main TF).

In future, Llama Pit, Echo Pit, and Umwelt Lake may also be used for the disposal of tailings and/or waste rock. If these other open pits or Umwelt Lake were considered for mine waste disposal, the Multiple Accounts Analysis (Sabina 2016b) and the current mitigation and management plans (including water discharge criteria) remain appropriate. Refer to the Tailings Management Plan (SD-09) for additional details on tailings adaptive management strategies.

Should contingency measures be implemented for the use of other open pits as TFs (e.g., Llama and Echo pits) or other storage locations be implemented (e.g., Umwelt Lake, man-made surface containment ponds), Sabina intends to provide the NWB notice of modification prior to the disposal of waste with the following: waste disposal quantities, volumes, disposal timing, maximum pit capacity, effects to pit closure, and appropriate mitigation and monitoring plans.

Alternatives for waste rock management

Sabina applied the ECCC Guidelines to complete a multiple accounts analysis for waste rock locations and disposal technologies. Evaluating options for waste rock management was integrated with the initial FEIS tailings Multiple Accounts Analysis (Sabina 2016b). The design was based on the current understanding of the geochemical characteristics of the waste rock, associated storage requirements, proximity to mine workings, footprints, freeze back considerations, and costs. Within the overall waste rock management system, the potential for landfarms and landfills during Construction, Operations, and Closure were also considered. The potentially acid-generating (PAG)/metal leaching (ML) mine waste material considered freeze back with a thermal non-potentially acid-generating (NPAG) cover, low permeability covers, co-disposal and co-mixing of mine waste material, and subaqueous disposal.

Encapsulation of PAG waste rock with the placement of a NPAG thermal cover is the preferred methodology. The underground mining methods require a portion of material from surface as mine backfill. This backfill material would be composed of PAG waste rock as much as practical, either sourced locally from underground development or backhauled from surface development. Four WRSAs were designed on the surface, one in close proximity to each of the ore deposits. Storing PAG rock in mined-out open pits is possible but currently challenged due to mine scheduling and the competing need to use the pits for tailings management and water management. Refer to the Mine Waste Rock Management Plan (SD-08) for additional details on waste rock adaptive management strategies.

Should contingency measures for the use of other open pits to store waste rock (i.e., Umwelt, Llama, Goose Main, and Echo pits) or other locations be implemented, Sabina intends to provide the NWB at least 60 days' notice prior to the disposal of waste and include the following: waste disposal quantities, volumes, disposal timing, maximum pit capacity, effects to pit closure, and update to the appropriate mitigation and monitoring plans.

Location of the main Goose Plant Site infrastructure

Four alternate plant site locations within the Goose PDA were evaluated; these locations were chosen as the topographic highs of the region with the expectation of having the best foundation conditions. Suitable geotechnical conditions were preliminarily confirmed in subsequent field investigations. The general selection criteria included a large and stable area to accommodate the required infrastructure that also considered the technical, environmental, and social impacts. The assessment also considered the economics and efficiencies related to distances for tailings disposal, ore haul distances, and elevation differences between the open pits, underground mines, and the Plant Site.

Location of the Marine Laydown Area

Four options were studied for locating the MLA. These locations were assessed for navigation and vessel maneuverability, bathymetry and foreshore slope, topography of the upland area, road access, airstrip, metocean conditions, berth face orientation, geotechnical conditions and ice conditions, as well as environmental acceptability, socio-economic and community preferences. The selected location was distinguished primarily for less steep terrain while providing sufficient water depth for vessels. The proposed BIPR port site could be a viable alternative but only if the Hackett River Project is developed.

Water management

Water management at Project operations includes options for surface water control and groundwater control. In both situations, water can either be diverted and excluded, or collected and pumped to treatment if needed, disposed or put to beneficial use on-site. Segregation is the first objective in managing all water. This ensures that water with specific characteristics is directed to further steps as needed, and in the most efficient and effective manner.

Surface water management

At the Project, surface water can be grouped into two categories, contact and non-contact water. Non-contact water is surface water that is not impacted by/does not contact mine workings. Contact water is surface water that may have been physically or chemically affected by mining activities; this includes runoff from waste rock, tailings, ore stockpiles, and open pits, and water associated with mill processing. Refer to the Water Management Plan (WMP; SD-05) for additional details on surface water management.

Non-Contact Water

Non-contact surface water will be intercepted and directed away from developed areas and allowed to flow to the neighbouring lakes untreated and, where necessary, diverted off-site by means of natural or man-made diversion berms, event ponds, pumped pipelines, and culverts. This water will also be used to passively flood pits as a part of Closure or progressive reclamation.

Contact Water

Contact surface water management infrastructure at Goose Property will include a network of collection berms, ponds, and sumps to collect contact water. All contact water will be intercepted, contained, analyzed, treated if required, and reclaimed to process or discharged to the receiving environment when water quality meets the discharge criteria.

Options to manage surface water at Goose Property include discharging to the environment or directing to a disposal area (Table 5.1-3). Due to water requirements within the Process Plant, surface contact water will be directed to the active tailings management facility and reclaimed thereafter for use in processing, or around the plant site, where appropriate. At the MLA, options for water management are limited to diverting and collecting water using best management practices. The infrastructure will be designed such that footprints are minimized to limit the changes to local drainage patterns. All roads and surfaces will be constructed using geochemically suitable material, and will be designed to have runoff disperse as sheet flow to minimize channelized flow.

Options for contact water storage are listed in order of preference (from most preferred or applicable, to least preferred or applicable) in Table 5.1-3, along with a discussion of the applicability of each option given the current mine plan.

Should contingency measures for contact water in open pits or other listed storage locations be implemented, Sabina intends to provide the NWB at least 60 days' notice prior to the disposal of contact water with the following: water disposal volumes, disposal timing, maximum pit/storage capacity, effects to pit closure, and update the appropriate mitigation and monitoring plans.

Table 5.1-3. Contact Water Storage Options Considered

Disposal Option/Location	Discussion of Applicability
Exhausted open pits (Umwelt, Llama, Goose Main, Echo or other open pits)	A possible temporary or final disposal option depending on water volumes and pit availability. The current mine plan intends for contact water to report to select open pits.
Closed U/G workings (Umwelt, Llama, Goose Main, Echo or other undergrounds)	A possible temporary or final disposal option. It is noted that underground workings cannot be used for contact water storage until mining of that underground is completed.
Modified natural containment area (Llama Lake or Umwelt Lake)	A modified natural containment area (for example, Llama or Umwelt Lake) could be suitable as a temporary contact water storage area and could be used for permanent contact water storage as long as any overflow meets appropriate discharge criteria. Impacts to fish and fish habitat for use of Umwelt Lake and dewatering of Llama Lake have already been assessed (refer to FOP for details). No additional impacts to fish or fish habitat would be realized as a result of using Llama or Umwelt lakes as modified natural containment areas.
Tailings Storage Facility / Tailings Facility	Using the active TSF/TF for temporary or permeant contact water storage is one of the main contact surface water management strategies considered. Supernatant from the active TSF or TF will be reclaimed for process use. The TSF or TF and the process facility can accommodate potential expected quantities and quality of the contact water. Reclaiming tailings supernatant water will reduce to demand for freshwater for Process Plant operations. While the Process Plant requires some freshwater, reclaiming tailings supernatant is necessary because local waterbodies cannot support the entire process water demand.
Man-made surface containment ponds	Man-made surface containment ponds could be constructed to manage site contact water. These ponds would be used for a short-term and ultimately redirect contact water to the active tailings facility for use as reclaim water in the Process Plant.
Local watercourses following treatment	Contact water that meets or can be treated to meet effluent discharge criteria acceptable to the NWB could be released to a local watercourse.

Groundwater management

Saline groundwater inflows are likely to be variable during development and operation of the underground mines. The Llama Pit is also believed to intersect a talik zone and is therefore expected to accumulate saline groundwater as well. Potential groundwater controls include either physical barriers to cut off inflow or an array of pumps and sumps to dewater.

Due to technical and cost considerations, physical barriers will not be used to cut off groundwater inflow as current environmental data suggests that permafrost and tight ground conditions will limit the volume of inflow. Adaptive management measures, such as grouting ahead of underground mine development, will be used if required to mitigate higher than expected groundwater pore pressures and flow rates.

Saline groundwater disposal options are listed in order of preference (from most preferred or applicable to least preferred or applicable) in Table 5.1-4, along with a discussion of the applicability of each option given the current mine plan.

Table 5.1-4. Saline Groundwater Disposal Options Considered

Disposal Option/Location	Discussion of Applicability
Exhausted open pits (Umwelt, Llama, Goose Main, Echo or other open pits)	A possible option if the future pit lake could be managed to support meromictic conditions, resisting turnover due to pit lake geometry, and therefore unlikely to result in a discharge of saline water to local freshwater streams. Currently, Llama Pit is expected to be developed as meromictic, but depending on the developing mine plan, all pits could be considered for the possibility of temporary or permanent saline water storage. In-pit tailings disposal in all pits would be prioritized over disposal of saline water. The use of exhausted open pits, along with mined-out underground mines, provide the most suitable permanent disposal locations; however, the timing of saline groundwater discharges relative to the availability of either as permanent storage may not match.
Closed U/G workings (Umwelt, Llama, Goose Main, Echo or other undergrounds)	A possible temporary or final disposal option. It is noted that underground workings are the main source of the saline groundwater and could not be used for disposal until mining of that underground is completed. The use of mined-out underground mines, along with exhausted open pits, provide the most suitable permanent disposal locations; however, the timing of saline groundwater discharges relative to the availability of either as permanent storage may not match.
Modified natural containment area (Llama Lake or Umwelt Lake)	A modified natural containment area (for example, Llama or Umwelt Lake) could be suitable as a temporary saline water storage area and could be used for permanent saline water storage as long as any overflow meets appropriate discharge criteria. Therefore, temporary storage is required, either with a modified natural containment area, or a man-made surface containment pond; both options are technically feasible and economically viable. Impacts to fish and fish habitat for use of Umwelt Lake and dewatering of Llama Lake have already been assessed (refer to FOP for details). No additional impacts to fish or fish habitat would be realized as a result of using Llama or Umwelt lakes as modified natural containment areas. Umwelt Lake is the only natural containment area currently identified that provides the estimated required storage volume (approximately 1.4 Mm^3). It is the preferred temporary saline water storage area and could be used if inflow volumes are greater than anticipated; current water management identifies Umwelt Lake as the Saline Water Pond.

(continued)

Table 5.1-4. Saline Groundwater Disposal Options Considered (completed)

Disposal Option/Location	Discussion of Applicability
Tailings Storage Facility / Tailings Facility	Reclaiming tailings supernatant is necessary because local waterbodies cannot support the entire process water demand. Supernatant pond water from the active TSF or TF will be reclaimed for the Process Plant, which could not easily tolerate the expected high salinity levels in the saline groundwater. As such, storing saline water in the active TSF/TF is not the preferred option. However, for limited time intervals (i.e. months), saline groundwater could be sufficiently diluted in the supernatant pond to warrant temporary storage. In addition, if the groundwater is better quality than currently assumed or salinity tolerances in the Process Plant are higher, saline water could be permanently stored with the supernatant pond. Once a TF is no longer used for Process Plant reclaim (i.e., tailings deposition moved to the next TF), the facility could be used to store saline water as long as an appropriate freshwater cover was maintained over existing tailings, and discharge criteria is met for overflows.
Man-made surface containment ponds	Similar to the modified natural containment area, man-made surface containment ponds could be constructed to temporarily or permanently store saline groundwater of the estimated total volume of approximately 1.4 Mm^3; this would be at a higher cost, and could increase the footprint of the surface disturbance within the Property. No additional impacts to fish or fish habitat would be realized as a result of using man-made surface containment ponds.
Local watercourses following treatment	Saline groundwater could be processed in a reverse osmosis (or similar) water treatment process for discharge to the freshwater environment. Saline water that can be treated to meet effluent discharge criteria acceptable to the NWB could be released to a local watercourse. However, such treatment produces a small volume of high salt brine that would require management and disposal.

The availability of the above options depends upon a number of factors, including timing (when the saline groundwater will be generated relative to when the appropriate storage location is available), the need for prioritizing the disposal of tailings over saline groundwater on the basis that tailings are more potentially reactive, and the fact that, unlike solid mine wastes such as tailings or waste rock, saline groundwater can be temporarily stored more easily as it can be moved (i.e., pumped) to its final disposal location with relative ease.

Selection of the available permanent storage location for saline groundwater is a function of current Project timing. As the Llama Pit and Llama underground mines will become available for storage in Year 5, this is the basis for selecting these two locations. In addition, these locations are close to the temporary saline water storage in the former Umwelt Lake. The underground workings at Goose Main, Umwelt, and Echo become available in the final year of mining and can be used to store any remaining saline groundwater, if necessary.

Options were considered for saline groundwater management without the use of Umwelt Lake including building a ring dyke containment structure, transporting connate water to Bathurst Inlet and discharging via a diffuser, as well as combining saline groundwater with the tailings supernatant reclaim water. The option to concentrate the saline groundwater to produce a smaller volume of brine requiring disposal was also considered. Should contingency measures for saline groundwater in open pits or other listed storage locations be implemented (other than what is currently captured in the mine plan), Sabina intends to provide the NWB at least 60 days' notice prior to the disposal of saline groundwater with the following: water disposal volumes, disposal timing, maximum pit/storage capacity, effects to pit closure, and appropriate mitigation and monitoring plans.

Power generation

Diesel power generation offers the most flexibility and is the only economically viable alternative given the particulars of the Project. It is the proven power supply source in the Arctic; however, there are several alternates that show potential for supplementing but not replacing diesel. As wind, photovoltaic (solar), and liquefied natural gas technologies become more mature for the Arctic, they may be economical supplements to diesel-generated power.

Site reclamation and closure

Sabina will rehabilitate the areas used for the Project to its previous standard of human utilization and natural productivity. Sabina is planning for the closure of the facilities at the end of the mine life but as much as can be completed efficiently and cost effectively will be done progressively during Operations. The current approach considers decommissioning of facilities, removal off-site of materials and equipment that can be reused or recycled, and on-site disposal of remaining materials. Hazardous materials will also be removed off-site for processing at licensed facilities. Reclamation and closure of Project components that will remain in place (such as tailings facilities and WRSAs) will ensure physical and geochemical stability, while being both environmentally and technically feasible. Another option at the end of Project life is for part, or all of the infrastructure to remain in place for other uses should there be such interest.

Should the Project enter a care and maintenance phase, the site will be managed to ensure it remains in a safe and stable condition. It is difficult to prescribe alternatives for care and maintenance closure as requirements will depend on the specific conditions present at the time. Regardless, a care and maintenance program will be created to address and manage environmental risks associated with the Process Plant facilities, equipment, tailings storage areas, WRSAs, hazardous materials, and mine operations. Public health and safety considerations and emergency response plans would continue during this phase.

5.1.3.2 Tier 2 Alternatives

Once decisions were made on the major alternatives, a second tier of alternatives was considered:

Detailed site layouts

Innumerable alternatives exist for laying out the infrastructure and facilities on the Goose Property and MLA. Optimizations for capital and operating costs, operability and maintainability, and safety will continue with ongoing engineering and could result in changing specifications, relocating, or resizing of, or combining of certain facilities.

Goose Property

Various locations were assessed at the Goose Property for the processing plant complex. The current location was selected based on the following factors: proximity to the deposits, proximity to TSF, proximity to sources of water, relatively large area of flat and elevated terrain, competent rock close to surface for good foundation conditions, and away from culturally sensitive areas. The selected site also offers the best opportunity for water management and spill containment, and reduces overall site footprint and land disturbance.

Once the Process Plant, WRSAs, and TSF were located, other infrastructure (such as the airstrip and landfarm) were located based on the following factors: proximity to the plant site, suitable ground

conditions for good foundations, minimizing project footprint, and proximity from culturally and environmentally sensitive areas.

Marine Laydown Area

The infrastructure needed at the MLA was based on the consideration of vessel and the associated shipping logistics, offloading requirements for receiving fuel and cargo, and workforce requirements. The different requirements of the viable options for transporting fuel (direct offload from tankers or barges and intermediate transfer to barges) and cargo (freighters and barges) will be accounted for. With this preferred option determined, the dock and related in-water structures, and land-based infrastructure will be determined by the ship and barge requirements incorporating costing and technical considerations with avoidance of environmental and culturally sensitive areas, and minimizing impact to foreshore marine environment and fisheries/fish habitat.

Early offloading and storage requirements during Construction and/or development may be handled with temporary laydown facilities, including storage tanks or bladders. As much of the permanent infrastructure as possible will be made operational to also serve these needs. Ongoing assessment of Construction and Operations needs will include field and design reviews.

Options for quarry sites

Quarry material will be needed for the early development of roads, airstrips, or laydown areas at the Goose Property and MLA, as well as for the ongoing construction, operations, and maintenance of infrastructure. Along the WIR alignment, efforts will be made to complete construction using snow and ice; if minor amounts of granular fill are required, potential borrow and quarry sites will be identified prior to the WIR construction. Sabina will seek appropriate land authorization from the KIA and/or INAC prior to use.

Options for quarry material include local eskers, local bedrock locations in new areas, and local bedrock locations within current mine operations footprint. The construction of the WIR may require material sourced from cut, quarry, or borrow sites.

Suitable material locations need to be physically and geochemically stable, aim to minimize transport distances, and avoid culturally and environmentally sensitive areas. The bedrock locations can be new areas outside the proposed mine workings, or areas that are accessed during regular mining operations with the waste rock directed to construction efforts rather than being placed in WRSAs. Qualified sites have been identified to supply material for both the Goose Property and MLA. Refer to the Borrow Pits and Quarry Management Plan (SD-03). Alternatives for quarry material within the PDA will be evaluated and used if necessary. If additional or alternative quarry material is needed, appropriate land use regulatory authorization(s) will be sought and the Borrow Pits and Quarry Management Plan (SD-03) will be updated to reflect the changes.

Emergency shelters, seasonal, and temporary camps

Small camps and shelters may be needed to support development, Construction, early season resupply activities, emergency, and/or exploration target areas located a distance away from the main Goose Property or MLA PDAs. They would be established for safety, environmental, and economic reasons.

The intent is not to establish a network of camps across the exploration area but to have the opportunity and flexibility to establish temporary camps as needed. The need and locations of these camps are currently undetermined; however, they are currently permitted under existing land use and water

authorizations. Emergency shelter infrastructure would be either permanently installed on a constructed pad or temporarily placed on pullouts built as part of the WIR. Shelters would be equipped with survival and communications equipment as required by weather conditions and occupational health and safety needs.

Domestic waste management

Alternatives for treating greywater and sewage are limited in Arctic conditions due to technical feasibility, operational needs, costs, and environmental considerations. Various options were considered for use independently, or in combination with each other, including using Pacto units followed by incineration of the waste and appropriate disposal of the resultant ash; direct discharge of untreated water to an approved sump; mixing untreated waste water with other effluent prior to discharge to meet discharge objectives; and treating with biological process reactors or similar biological process. The seasonal nature and smaller camp size of the MLA make a biological reactor not preferred. The MLA camp design currently employs Pacto or incinerating toilets to avoid the need for a STP. Greywater would be settled and separated of oils and grease before being discharged through a designated pipeline to the tundra, and ultimately reporting to Bathurst Inlet after attenuating.

Mobile equipment

The most practical method for excavating the ore released by blasting for the Project is mechanical shovels. Diesel-hydraulic face shovels will be used, backed up by front-end loaders to load mine haul trucks to transport ore to the primary crusher or run-of-mine stockpile, and waste rock to the WRSAs. Movement of vehicles within the pits will be monitored by a central dispatching system to ensure worker health and safety and operational efficiency.

Backhoe excavators and front-end loaders will be utilized for general earthworks, snow removal, and limited mining activity where the larger equipment may have limited access. Wheel and track bulldozers will be used for cleanup around mining activities and for control of rock on the mine benches. Graders and water trucks will be used for road maintenance and dust mitigation. Opportunities for optimizing the equipment fleets will be considered further including quantities, types, and capacities, as well as synergies between mining during Construction and Operations efforts.

Options for future development of other mineral deposits

Future development of other mineral deposits will depend on the prevailing economic environment, mineral resources and reserves, regulatory regime, and socio-economic considerations. Although Mineral Resources for both the Goose and George properties are reported, only the Goose Property resources are considered for mining currently.

There is potential for the future expansion of existing deposits at the Goose Property. All deposits within the current mine plan are open at depth and final mine development plans will vary; extensions, such as the Llama Underground extension or Umwelt Underground extension (Vault), are within the same ore bodies and deposits already defined within the Environmental Assessment.

There is also potential for future development, including at George Property, or additional mineral deposits at Goose Property and within the regional belt.

Bulk fuel storage alternatives

Temporary storage of fuel during Construction may be required before permanent storage tanks are constructed and operational. Temporary storage may include bladders and/or smaller portable fuel storage tanks. The fuel tank farms will be designed to have spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks, or 110% volume of the largest tank, whichever is greater.

During Construction at the Goose Property, fuel will be delivered by air or overland via the WIR from the MLA or a combination of both. Once Operations begins, fuel will be brought in primarily by sealift and transported from the MLA to the Goose Property over the WIR, or by air to meet operational needs. Currently the Project does not intend to overwinter a vessel as a method of storing fuel; should overwintering be necessary, all regulatory requirements would be met.

The MLA will receive fuel either by barges or tanker, and fuel will be transferred to bulk fuel storage tanks at the MLA using a floating line. The location and size of the storage tanks at the MLA is determined by ground conditions, minimizing the floating hose length, topography and elevation of area, tanker size and pumping capacity, and avoidance of environmental and cultural sensitive areas. Aboveground, field erected or shop fabricated hardwall tanks are the preferred bulk fuel storage method for environmental, technical feasibility, and cost considerations. A similar list of design criteria was considered for the fuel storage tanks at the Goose Property.

On-site accommodations and worker-related alternatives

There are a number of practical options for work schedules including two weeks on-site and two weeks off-site (two and two), four and two, and three and three. Assessment of work rotation schedules as part of logistical considerations indicated that the preferred schedule during Operations is two and two. While this is not the most cost-effective schedule, it has been found by decades of experience at remote mines to be preferred in terms of worker safety, separation from family members, having a consistent workforce that shares the same rotation, and ultimately for the retention of the mine's workforce.

It is anticipated that points of direct hire for the Project will be from the Kitikmeot communities of Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk, and potentially the seasonally used communities of Kingaok and Omingmaktok. Other communities in Nunavut, and other Canadian jurisdictions, will also be sources for employees. Sabina will employ the appropriate personnel over the Project life to meet the operational objectives and cannot limit the points of hire to the Kitikmeot region or Nunavut Territory.

Although employees will come from various communities, options for transporting to site are limited due to the current infrastructure network of the Territory. The possible routes use a central access hub in Yellowknife, central access hubs in Cambridge Bay and Kugluktuk, and a combination of these three hubs. The latter arrangement allows workers from other communities without direct flights to participate in the Project and offers the best balance of matching opportunities for the Project and the communities.

The existing facilities at the Goose Exploration Camp will be used for initial site construction efforts and for overflow capacity during peak periods in Construction or Operations. Refer to Type B development works application (Application No. 8BC-BRP----) filed with the NWB in September 2017. The permanent accommodation facilities at both the MLA and Goose Property will be pre-fabricated off-site for transport to, and assembly at, their temporary, if required, and final locations. A possible alternative to this arrangement is the use of a floating accommodations barge at the MLA. This could be for temporary or

permanent use; this decision would be based on an economic trade-off study. Any required environmental assessments would be conducted and considered in the decision.

The size of camp accommodations at the MLA and Goose Property is based on manpower estimates and execution schedules developed during the feasibility studies and FEIS. The refinement of these estimates, or a change in execution approach, could lead to a change in the number of beds required at the MLA or Goose camps. One alternative under consideration is shortening the WIR seasons by using more trucks. This option would require more truck drivers, and therefore result in an increase in the camp size at the MLA and or Goose Property.

Underground Mine Air Heating

At the underground operations, intake air will be heated during the winter months to prevent ice buildup on U/G roadways and in ventilation raises. The mine air heating systems will consist of glycol heat exchangers that use waste heat from the diesel generators at the main power plant. Alternatively, indirect fired diesel mine air heating systems may be used. Diesel mine air heating systems may also be able to use waste oil products for heat generation.

5.2 DEFINITION OF PROJECT SCOPE

The activities and facilities under the scope of the Application are described in Section 2.1.

5.3 PROJECT INFRASTRUCTURE

5.3.1 Existing Infrastructure

The Project is comprised of two main areas, the Goose Property (Appendix A, base Figure 3) and the MLA (Appendix A, base Figure 4), with an interconnecting WIR corridor with spur roads (Appendix A, base Figure 2).

The Goose Property area currently contains a 146-person all-season camp consisting of sleeping units, dry/kitchen/dining facilities, offices, core processing facility, heavy equipment storage, a maintenance shop, a fuel tank farm (13 × 75,000-L dual walled enviro tanks) and additional drummed fuel storage. The camp is powered by a 433 kW diesel-powered generator with backup. The camp is currently operated on a seasonal basis to support exploration and environmental baseline data collection, and is generally closed annually from early October to late January.

The Goose Property has a 914-m all-weather gravel airstrip that can be used year-round, and during the winter months, January to May, a 2,000-m (6,564 ft.) ice airstrip can be established on Goose Lake. During the ice-free months, float-equipped aircraft may land on lakes in the area. Refer to Section 2.2.1 and to the Type B development works application (Application No. 8BC-BRP----) filed with the NWB in September 2017 for additional information on existing activities regulated under current and proposed Type B Water Licenses.

The MLA currently contains no infrastructure.

5.3.2 Proposed Infrastructure

Both Project locations will have self-sufficient operating infrastructure including: accommodations, administration, laydown areas, diesel-fired power generation, maintenance shops, warehousing, and water and waste management facilities. Characteristics of the infrastructure to be constructed at the Goose Property and MLA are provided in Table 5.3-1 and Table 5.3-2, respectively.

Table 5.3-1. Characteristics of the Infrastructure Constructed at the Goose Property

Potential Development Area	PDA is 5358 ha with ~15% of area being waterbodies Footprint of facilities is 560 ha
Site Roads	All-weather roads (service road widths of 4.5 m or 8 m; haul road widths of 20 m) will be constructed with run-of-quarry rock placed directly onto the tundra to preserve the permafrost. Construction materials are from locally developed, geochemically suitable rock quarries. Roads will be private and not for public use.
Quarry Sites and Borrow Areas	Estimated aggregate extracted: 5 Mt Number of rock quarries: two Number of borrow areas: none
Water Management	Water supply sources: Big Lake (domestic) and Goose Lake (industrial) Umwelt Lake used as Saline Water Pond (footprint 50 ha) Saline Water pumped back underground to flood Umwelt, Llama and Goose Main U/G workings, and bottom of mined-out Llama Pit Water management ponds (excluding TSF) at Llama (1), Umwelt (2), Echo (2) and Process Plant (1)
Fuel Storage	On-site fuel tank farm consists of 3 steel tanks at 15 ML capacity. Seacans at each underground mine portal, AN facility, incinerator, boilers, and power plant.
Power Generation	Combined heat and power plant consisting of five (N + 1) diesel fired reciprocating engine generator sets. Three generators will be rated for continuous duty 6.6 MW and two generators will be rated for continuous duty 5.1 MW. Seasonal open pit dewatering will be handled by diesel pumps.
Process Plant	Ore production: 19.8 million tonnes of mill feed over 10 years. Standard gravity separation and cyanide leaching circuit.
Explosives	Ammonium nitrate/fuel oil (ANFO) facility Bulk storage area for ammonium nitrate (AN): with capacity for up to 3,900 tonnes of inert AN in seacans Explosive magazines with capacity for 32 tonnes of packaged explosives and 600 cases of detonators within 40-ft and 20-ft magazines, respectively. Bulk ANFO mixing truck. During Closure, unused explosives will be consumed on-site or removed and shipped off-site.
Laydown and Storage Area	General laydown area for material and supplies. Secure seacans for hazardous materials, e.g., mill reagents. Cold storage building.
Waste Management (other than waste rock and tailings)	Waste sorting facility – adjacent to the Process Plant. Landfill(s) – for disposal of non-hazardous, non-leaching, inorganic garbage, located in one or more Waste Rock Storage Areas. Landfarm – for treatment of hydrocarbon contaminated soils or snow. Incinerator – at camp for incineration of camp combustible waste including sewage treatment plant sludge /pacto waste (3.0 kg/person/day). Hazardous waste: temporary storage area at site. Dispose off-site in an approved facility. Used tires and machinery: Remove hazardous waste from equipment not being salvaged, clean and dispose of in active landfill or mine workings.

(continued)

Table 5.3-1. Characteristics of the Infrastructure Constructed at the Goose Property (completed)

Airstrip	An all-weather airstrip and aprons capable of servicing passenger and large cargo aircraft will be constructed at the Goose Property Area. Ice airstrips will continue to be used as required. Dimensions: up to 1,524 m long, 45 m wide. Expected number of flights: Construction: 3-4 per week Operations: 2-3 per week Closure: 2-3 per week Post-closure: 1 per month (summer season) An operations center and automated weather observation station (AWOS) will be located at the airstrip. An emergency back-up diesel generator will be located at the operations center.
Wastewater Treatment	Sewage Treatment Plant provided for 465-person camp. Membrane bioreactor plant housed in 20 ft. container with a separate sludge drying system housed in a 40-ft container. Treated effluent discharged to active tailings facility during Operations. If effluent discharge from the STP meets discharge criteria, effluent will be discharged to land. Oily water treatment plant. For light vehicle and mine maintenance shops – water treated and recycled within shop. Oil to be collected and either burned in an approved waste-heat generator or drummed and removed from site as hazardous waste.
Buildings	Process Plant and crusher buildings; Assay laboratory; explosives magazines; Detonator magazines; AN facility; Reagent storage; Core logging facility; Warehousing facility; Emergency facilities (fire and ambulance station); General maintenance building (site services); Mine maintenance and dry building; Waste management building; Light vehicle maintenance workshop; Heavy equipment maintenance workshop; Wash bay; 465-person camp complete with kitchen, Recreational facilities; Administration complex; Modular potable water treatment system; Modular sewage treatment system; Diesel power plant; Power utility building.
Tailings Management	Tailings Storage Facility (TSF) (footprint 119.1 ha, excluding pond) TSF WRSA Pond (footprint 55 ha) Tailings storage in Umwelt and Goose Main open pits (TFs)
Overburden, Waste Rock Areas and Ore stockpiles	Waste rock storage areas (WRSAs) for Umwelt (39.5 ha), Llama (37.5 ha), and Echo (1.4 ha). WRSA for Goose Main included in TSF. Overburden from quarry and mining areas to be placed in the WRSAs Ore stockpile at the Goose Plant Site. Small temporary stockpiles located at each U/G laydown.
Water Crossings	Up to five water crossings (culverts) with diameters ranging from 1.0 to 2.5 m.

Table 5.3-2. Characteristics of the Infrastructure Constructed at the Marine Laydown Area

Potential Development Area	653 ha Footprint of facilities = 20 ha
Site Roads	All-weather roads (all are service roads, widths of 4.5 m or 8 m) will be constructed on the site. Construction materials are from locally developed, geochemically suitable rock quarries. Roads will be private and not for public use.
Quarry Sites and Borrow Area	Estimated aggregate extracted: 1.3 Mt Number of rock quarries: none, cut from MLA Fuel Storage area used as fill for remaining pads. Number of borrow areas: none
Water Management	Water supply source: Bathurst Inlet - Desalination unit No water management ponds
Fuel Storage	On land storage of 60 ML (four tanks at 15 ML) Fuel delivered by sealift during open water season. Seacans as required (camp/shop facility)
Power Generation	Combined heat and power plant consisting of three (N + 1), 500 kW diesel fired reciprocating engine generator sets.
Laydown and Storage Area	Ammonium nitrate storage area: up to 3,900 tonnes inert AN in seacans
Waste Management	Landfarm – for treatment of hydrocarbon contaminated soils or snow Incinerator – at camp for incineration of combustible waste including sewage Pacto waste Hazardous waste: lined hazardous waste storage area. Hazardous waste temporarily stored then shipped off-site for ultimate disposal during annual sealift season.
Airstrip	Airstrip capable of accepting aircraft constructed on ice during winter. Access by floatplanes during open water, if necessary.
Wastewater Treatment	Oily water treatment plant. Oil to be collected and either burned in an approved waste-heat generator, or drummed and removed from site as hazardous waste.
Sewage Treatment	Waste collected from Pacto systems will be incinerated.
Buildings	Laydown areas; Explosives magazines; Reagent storage; Warehousing facility; Emergency facilities (fire and ambulance station); General maintenance building (site services); Waste management building; 75-person camp and Administration complex (workforce with contingency) complete with kitchen, dry and recreational facilities; Administration complex; Modular desalination water treatment system; Diesel power plant; Power utility building.
In Water Construction	Floating terminal barge that will accept lightering barges. There are no permanent in-water works.

The Goose Property is the hub of the Project with the Process Plant, all-weather airstrip, four open pits, four underground operations, and a camp capable of housing a maximum of 465 employees (or 611 including the existing exploration camp) during Construction and Operations. A diesel fuel tank farm will store in excess of one year's supply of fuel in up to three 15 ML tanks. A 40,000 m^2 pad has been designated for bulk storage for freight. At the AN Facility and explosives storage magazines, there will be capacity for up to 3,900 tonnes of ammonium nitrate and 32 tonnes of explosives.

The MLA at Bathurst Inlet is located approximately 130 km north-northwest of the Goose Property. It is the primary staging area for equipment, material, fuel, and other supplies required for the Construction and Operations of the Project. It is comprised of a single grounded terminal barge that will accept lightering terminal barges, laydown areas, and storage/maintenance facilities. A tank farm will contain

diesel fuel in four 15-ML field erected tanks. There will be dedicated storage for ammonium nitrate shipped in sea containers. No storage or mixing of explosives will occur at the MLA. The camp is capable of housing a maximum of 75 people during Construction and Operations.

A direct implication of the remoteness of the site is a heavy emphasis on all aspects of health and safety and the proper maintenance of the equipment and infrastructure. Equipment must be well-maintained and safety provisions must be rigorously enforced as assistance from external sources is not readily available. Thus, on-site emergency and medical facilities will be relatively self-reliant.

The MLA at Bathurst Inlet will be connected to the Goose Property by an approximately 160 km long WIR. Characteristics of the infrastructure to be constructed along the WIR are provided in Table 5.3-3

Table 5.3-3. Characteristics of the Infrastructure Construction along the Winter Ice Road

WIR Alignment	160 km total length between the Goose Property and MLA; 13-km potential spur road to the George Property. Distance on land: 42%; distance on ice: 58%. Number of waterbodies crossed: 55. Constructed and Operated annually from January until April. Winter ice roads will be private and not for public use.
Water Use	Water withdrawal will adhere to DFO's Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut guidelines (DFO 2010). Expected water use for WIR construction and maintenance is estimated to be up to 675 m^3/km/year.
Inspection and Maintenance	WIR will be inspected and maintained in accordance with the "Guidelines for Safe Ice Construction" (GNWT DoT 2015).
Emergency Shelters	Temporary or permanent shelters will be placed approximately every 60 km along the WIR alignment.

5.3.3 Mining and Milling Infrastructure

Mining infrastructure related to open pits and underground, WRSAs, ore stockpiles, and TSF are detailed in Section 6, Table 6.3-2. Milling infrastructure is detailed in Section 6.4.

5.3.4 Water Use and Management Infrastructure

Contact water is contained in event ponds and tailings management facilities, and is transferred via diversions and pumped pipelines. Non-contact water is diverted off-site through event ponds, pumped pipelines, berms, and culverts. Saline water is pumped from the underground facilities, as well as Llama Pit, and stored in the Saline Water Pond before being subsequently pumped back into mined out undergrounds or into the bottom of the Llama Reservoir.

Freshwater to support domestic and industrial uses will be sourced at the Goose Property and the MLA. Freshwater will also be required to support the Process Plant, ongoing exploration activities, WIR construction, and other activities. No water use is required for hydrostatic testing of the Goose Property and MLA fuel tanks at the respective fuel storage areas. Tanks will be commissioned using non-destructive examination techniques (e.g., tank x-ray, vacuum testing of tank floors, and air testing of fittings); this testing will be completed in accordance with API650 (API 2013).

At the Goose Property, freshwater will be sourced from Goose Lake and Big Lake. At the MLA, small volumes of seawater will be converted to freshwater using desalination. Anticipated water use, sources and volumes for the Construction, Operations, and Closure phases can be found in Table 5.3-4.

Table 5.3-4. Water Use, Sources, and Volumes during Construction, Operations, and Closure

Project Area	Water Use	Construction		Operations		Closure		Water Source
		Daily (m^3/d)	Annual (m^3/yr)	Daily (m^3/d)	Annual (m^3/yr)	Daily (m^3/d)	Annual (m^3/yr)	
Goose Property	Domestic	211	77,068	148	54,057	7	2,557	Big Lake
	Industrial/Miscellaneous - Dust Suppression and Construction Use	400	146,100	400	60,000[1]	400	146,100	Goose Lake
	Milling	200	73,000	900	328,725	-	-	Goose Lake
Marine Laydown Area	Domestic	48	17,520	48	17,520	-	-	Bathurst Inlet (marine)
	Industrial/Miscellaneous - Dust suppression and Construction Use	24	8,760	24	8,760	-	-	
Winter Ice Road	Construction Use	-	675/km	-	675/km	-	-	Multiple Sources

1) This annual volume is based on a daily use of 400 m^3/day for 5 months.

All water intakes and discharges will be designed in accordance with DFO guidelines. These pumping stations, and water intakes and discharges will be established during the Construction Phase. Water will be reused as much as feasible, with the Process Plant reclaiming an estimated average of 4,914 m^3/day from the active tailings facility. Table 5.3-5 provides a summary of site water management features for the Goose Property.

Table 5.3-5. Site Water Management Features for Goose Property

Drainage from mine workings	All open pits will be mined in permafrost, except for Llama Pit, which will be influenced by a lake talik. Most undergrounds will reach below the basal permafrost. Groundwater can be expected from Llama Pit and from undergrounds that extend below the basal permafrost at depth. Groundwater inflows into the underground mines below the permafrost are estimated as follows: Umwelt up to 600 m^3/day, Llama up to 350 m^3/day, and Goose Main up to 85 m^3/day. Llama Pit groundwater inflows are estimated up to 700 m^3/day. Short term peak inflows of 1,000 m^3/day may be encountered. Water seepage into the underground workings will be pumped to the surface for collection in the Saline Water Pond or other temporary reservoir. Water seepage from the open pits will be directed to the current tailings facility via pipe or truck for reuse.
Drainage from WRSAs and Open Pits	Collection/diversion channels and ponds will be established around waste rock storage areas. Runoff directed to open pits or directly to active tailings facility. Open pit water will be transported to the current tailings facility via pipe or trucked for reuse in milling process.
Tailings Storage Facility	No tailings discharge during Operations or Closure. Controlled release of water from open pits (and Tailings Facilities during Closure. Consolidated tailings contain 49% solids (by weight). Tailings Storage Facility is lined on upstream berm face with Geosynthetic clay liner and ROM NPAG material to protect the liner from freeze/thaw action.
Drainage from Ore Stockpile	Runoff directed to collection/diversion network will be collected and pumped or trucked to current tailings management facility.

(continued)

Table 5.3-5. Site Water Management Features for Goose Property (completed)

Milling & Processing	Water from the TSF/TF will be recycled and reused; however, fresh make-up water is required due to losses of water entrapped in tailings. This fresh water will be sourced from Goose Lake.
Sewage Treatment	Treated effluent will be discharged to receiving environment during Construction and Closure, and directed to the current tailings management facility to be used as make-up water during Operations
Maintenance	Oil water separator units and treated water is recycled for use in maintenance shop. Discharge, when required, will be directed to the current tailings facility during Operations. Oil to be collected and either burned in an approved waste-heat generator, or drummed and removed from site as hazardous waste.
AN Facility	No discharge of waste water from AN facility. Water will be pumped and trucked to an active tailings facility, or discharged if discharge criteria are met.
General Site drainage	Site drainage designed to contain potentially contaminated contact water, and divert non-contact catchment water from mine facilities.

For the Goose Property, Sabina's water management approach during Operations is to collect and move all mine contact water (open pit runoff and seepage, WRSA runoff, Ore Stockpile runoff, underground mine dewatering, etc.) to the active tailings management facility. These diversions will result in the diversion of a small percentage of natural drainage from the Goose watershed. Water collected within the tailings management facilities will be reclaimed in the Process Plant for use in ore processing.

In preparation of the site for mining of the ore deposits, diversion ditches will be constructed to divert non-contact runoff from mine workings. For each mine working, drainage patterns within the Goose Property PDA will be altered either permanently or for the LOM workings as shown in Table 5.3-6.

Table 5.3-6. Drainage Pattern Alteration at the Goose Property

Permanent Drainage	Pattern Alterations at the Goose Property
Tailings Storage Facility	Physical footprint of the facility causes permanent changes to drainage patterns. Perimeter ditches/berms/structures to intercept and divert non-contact flows away from the TSF. All precipitation and inflows to the TSF are contained and there are no releases to the receiving environment until the Post-Closure Phase. Seepage intercepted and pumped back to the TSF. Controlled release at Post-Closure; runoff directed to a single discharge location to facilitate monitoring and treatment if required.
Waste Rock Storage Areas, Landfill sites & Landfarm sites	Physical footprint of the facility causes permanent changes to drainage patterns. Perimeter ditches/berms/structures to intercept and divert non-contact flows away from waste rock areas or landfill or landfarm. All precipitation and runoff are contained, collected, and pumped to the active tailings facility. There is no release of runoff to the receiving environment until the Closure Phase. Controlled release in Closure; runoff directed to a minimal number of discharge points to facilitate monitoring and treatment if required.
Site infrastructure (plant site, stockpiles, laydown, airstrip)	Physical footprint of the facility causes permanent changes to drainage patterns. Perimeter ditches/berms/structures to intercept and divert non-contact flows away from infrastructure areas. To the extent possible (more infilling that cut), building pads are constructed on top of permafrost thus altering drainage patterns. During Closure, infrastructure is removed and surfaces are scarified to promote natural rehabilitation of disturbed areas.
Temporary Drainage	Pattern alterations at the Goose Property
Umwelt Pit	Temporary diversion of streams flowing through the current footprint of the Umwelt Pit (Year -2 to Year 10).

(continued)

Table 5.3-6. Drainage Pattern Alteration at the Goose Property (completed)

Llama Pit	Temporary diversion of streams flowing through the current footprint of Llama Pit (Year -3 to Year 9).
Goose Main Pit	Temporary diversion of streams flowing through the current footprint of the Goose Main Pit (Year 2 to Year 17).
Echo Pit	Temporary diversion of streams flowing through the current footprint of the Echo Pit (Year 4 to Year 9).

5.3.4.1 Water Works - Raw Water Intake

Freshwater required for industrial use, construction use, and operation of the Process Plant will be pumped from Goose Lake. Additional freshwater is required from Big Lake for domestic water usage. The Goose Lake and Big Lake water intakes will be designed in accordance with DFO guidelines for water intakes, and will both be constructed in Year -1. The freshwater will be sourced from the locations shown in Table 5.3-4.

5.3.4.2 Water Works - Effluent Water Discharge

Llama and Umwelt lakes will be dewatered to Goose Lake during the Construction Phase. Umwelt Lake, which has a natural capacity of 0.24 Mm^3, will be fully dewatered during Year -3. Llama Lake will be partially dewatered (0.65Mm^3) during Year -3, then temporarily used to store contact water until fully dewatered (0.75 Mm^3) in Year -1 in advance of Llama Pit mining. A portion of this water will require treatment for TSS, and possibly arsenic, before being discharged. An Effluent Discharge Pipeline will be built in Year -3 in Goose Lake and will be designed in accordance with established guidelines for water outfalls.

5.3.4.3 Water Storage and Treatment

A Water Treatment Plant (WTP) will be operational in the open water season at the Goose Property in the Construction Phase to initially dewater Llama and Umwelt lakes. Treatment is inactive between Years 1 and 5, and then begins again year-round from the Goose Main TF in Year 6 to reduce metal and suspended solids loading in the facility; this treatment water is not discharged but circulated back into Goose Main TF. Once mining is complete in Year 10, water treatment continues during the open water season from the Goose Main TF until Year 18 (Table 6.3-1).

During Construction and Closure, the treated STP effluent will discharge on a rocky outcrop south of the Goose Camp Site. This discharge will be monitored and managed in accordance with regulatory requirements defined in the Type A Water Licence.

During Operations, there will be no discharge of contact waste water at the Goose Property. All waste water generated from the STP, the maintenance facilities, and pit inflow water will be pumped to the active tailings facility. If effluent discharge from the STP meets discharge criteria for land discharge it will be discharged to land. There is a fire water storage tank at both the Goose Property and the MLA.

At the Goose Property, event ponds will be used to manage contact water during Operations; the storage capacity of these ponds is summarized in Table 5.3-7. Refer to the WMP (SD-05) for additional design details and locations. Should additional short term ponds be required within the PDA, a modification will be sought with the NWB, and the appropriate information detailing the modification provided to the NWB 60 days prior to construction.

Table 5.3-7. Goose Property Pond Capacity

Pond ID	Description	Available Capacity (m^3)
P1	Umwelt Pit Sump	n/a
P2	Umwelt WRSA Pond	30,100
P3	Ore Stockpile Pond	11,000
P6	TSF WRSA Pond	1,163,100
P7	Primary Pond	316,650
P8	Llama WRSA Pond	26,000
P9	Llama Pit Sump	n/a
P10	Goose Main Pit Sump	n/a
P11	Echo Pit Sump	n/a
P12	Echo Diversion Pond	18,000
P13	Echo WRSA Pond	61,000

The only non-event pond on-site is the Saline Water Pond, which has a defined storage capacity of 1.1 Mm^3 and will act as a storage facility during Operations until the saline water transfers to Llama Reservoir and the underground mines once mining is completed.

5.3.4.4 Water Distribution

A concern in cold regions is the need to prevent both the water and sewage lines from freezing. Heat may be added to the water or the pipelines, or continuous circulation maintained, to prevent freezing. The degree of freeze protection required depends on whether the pipes are buried or built above ground. Several methods of freeze protection may be employed such as pipeline insulation, water heating, pipeline heat tracing, or water recirculation. Insulation around pipes prevents thawing of ice-rich permafrost and consequently settling of pipes. Site layout has been designed to minimize difficulties with roads and drainage.

5.3.4.5 Water Crossings

All crossings will use culvert diameters ranging from 1.0 to 2.5 m. Typical culvert cross-sections are provided in Appendix B-3 and the WMP Figure A-17 (SD-05). Sabina will conduct a fish passage flow assessment as part of the culvert design process (wherever fish passage is required). In the design, an allowance will also be included for regular drainage culverts and road signs. Water crossings may be the subject of a DFO authorization or Letter of Advice. Sabina has committed (FA-DFO-C-3) to providing DFO with detailed site-specific plans of all fish bearing water crossings, supported by measured or modeled stream flow data, for review during the regulatory phase. No infilling of lakes or infilling of stream crossings will be required for the site road construction.

5.3.4.6 Winter Ice Road Water Use and Management

Sabina has committed to providing the bathymetry, depth, and location of the proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each water body proposed to be used for winter water withdrawal in support of the construction of the WIRs. This will be provided primarily during the regulatory phase; however, in certain cases, waterbodies may be added in the future. Water withdrawal will adhere to the following guidelines from DFO's Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010):

- In one ice-covered season, total water withdrawal from a single waterbody will not exceed 10% of the available water volume calculated using the appropriate maximum expected ice thickness;
- In cases where there are multiple users withdrawing water from a single waterbody, the total combined withdrawal volume will not exceed 10% of the available water volume;
- Only waterbodies that are more than 1.5 m deeper than their corresponding maximum expected ice thickness will be considered for water withdrawal;
- To further mitigate the impacts of water withdrawal, water will be removed from deep areas of waterbodies (>2 m below the ice surface) wherever feasible, to avoid the removal of oxygenated surface waters that are critical to over-wintering fish; and
- The littoral zone will be avoided as a water withdrawal location.

Sabina acknowledges that information related to water withdrawal sites, volumes, location, and impacts will need to be concurrently submitted for consideration and approval for use to the NWB.

In addition, Sabina committed to implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of the construction, operation, and decommissioning of WIRs, and from under ice water withdrawals. This includes adequately screening the water intakes pipes to prevent impingement and entrainment of fish (FA-DFO-T-4).

The construction of ice bridges and snow fill approaches at the land-water interface will utilize only clean, compacted snow and ice to a sufficient depth to protect the shoreline. Speed limits will be enforced to prevent ice scour along shorelines. Sabina has committed to adhering to the following DFO guidelines based upon the Nunavut *Operational Statement for Ice Bridges and Snow Fills* (DFO 2007):

- Use existing trails or WIRs wherever possible as access routes to limit unnecessary clearing of additional vegetation and prevent soil compaction;
- Construct approaches and crossings perpendicular to the watercourse wherever possible;
- Construct ice bridge and snow fill approaches using clean, compacted snow and ice to a sufficient depth to protect the banks of the lake, river or stream;
- The use of material other than ice or snow to construct a temporary crossing over any ice covered stream is prohibited under section 11 of the Northwest Territories Fishery Regulations, unless authorized by a Fishery Officer;
- Install sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and decommissioning activities and make all necessary repairs if any damage occurs;
- Operate machinery on land or on ice and in a manner that minimizes disturbance to the banks of the lake, river, or stream.
  - Machinery is to arrive on-site in a clean condition and is to be maintained free of fluid leaks;
  - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water or spreading onto the ice surface;
  - Keep an emergency spill kit on-site in case of fluid leaks or spills from machinery; and
  - Restore banks to original condition if any disturbance occurs;

- Ensure that the intakes are sized and adequately screened to prevent debris blockage and fish mortality. Mesh size will not be larger than 2.54 mm;
- Crossings do not impede water flow at any time of the year;
- When the crossing season is over, and where it is safe to do so, create a v-notch in the centre of the ice bridge to allow it to melt from the centre and also to prevent blocking fish passage, channel erosion and flooding. Compacted snow should be removed from snow fills prior to the spring freshet;
- Stabilize any waste materials removed from the work site to prevent them from entering the lake, river, or stream. This could include covering spoil piles with biodegradable mats or tarps; and
- The site should be stabilized using effective sediment and erosion control measures. In areas with permafrost, care should be exercised to ensure these measures do not cause thawing or frost heave.

Sabina remains committed to ensuring that all withdrawal of water for the construction of WIRs is completed in a manner that avoids or minimizes the potential for serious harm to fisheries. An innovative plan has been developed to identify those waterbodies that would reduce the potential effects on fish and fish habitat due to water withdrawal from lakes along the WIR. This plan includes collecting the following information to support the decision making process:

- Identify the location of and generate bathymetric maps of all potential water withdrawal source lakes along the WIR Alignment using methods based on satellite imagery;
- DFO's protocol for winter water withdrawal will be applied, where no more than 10% of the under ice volume for lakes deeper than 3.5 m will be extracted;
- Provide locations of proposed water withdrawal sites, calculate the depth, volume, maximum withdrawal limits and maximum reduction in depth for each lake;
- Identify any potential for changes in overwintering capacity for fish; and
- Identify any potential for changes to spawning shoal habitat for fall spawning fish species.

A memorandum describing Sabina's strategy in further detail can be found in Appendix E-4.

Also, in consultation with the KIA, GN, and other relevant parties, Sabina will develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan will be submitted to the NIRB prior to winter road construction. Findings from these studies will be used to inform reclamation planning as appropriate. The Vegetation Monitoring Plan has been included as Appendix H in the ICRP (SD-26).

5.3.4.7 Flood Control

Once mining activity has ceased, diversion structures will be breached and the open pits will be allowed to fill with natural drainage. The open pits will be passively filled by breaching various water management structures. Pit water will meet applicable discharge criteria and then be allowed to overtop into nearby watercourses.

Under average hydrologic conditions, Llama Reservoir will overtop in Year 13, Umwelt TF and Echo open pit mine (Echo Pit) will overtop in Year 14, and Goose Main TF will overtop in Year 18 (Table 6.3-1). There is a possibility that exposed pit walls could cause a deterioration of pit water quality. Predictions

for pit inflow water quality are presented in the WMP (SD-05). The pit water quality will be monitored until the pit is full, and in the unlikely event that the water in any of the pit lakes is not suitable for discharge, the pit lake will be batch-treated to address remaining water quality impairments. Accelerated pit filling will also be considered; this strategy will be informed by monitoring data that will be obtained during Operations.

5.3.4.8 Diversions

Diversion and collection systems will be a combination of event ponds, pumped pipelines, berms and culverts. Non-contact water will be diverted off-site to limit the volume of contact water on-site. Contact water will be collected and moved to the active tailings management facility. To preserve the permafrost, trenching or ditching will be limited wherever possible, and diversion structures will be built as above ground berms. Additional information on diversion berms, the timing of construction and decommissioning is provided in the WMP (SD-05).

The MLA will not require ponds or diversion infrastructure for water management purposes. Runoff will discharge towards Bathurst Inlet along the same flow paths as the development topography. Roads and pads will be designed to have runoff dispersed sheet flow to minimize channelized flow. Non-contact water will be diverted around infrastructure, as much as is feasible, and directed to natural downstream drainage networks to maintain local drainage patterns. Clean water and snow will be managed to restrict contribution to potentially poor quality water, and will be diverted to maintain natural drainage networks as much as possible.

All wastewater and tailings processed in the processing plant will be pumped to the active tailings management facility. Event ponds may be constructed to receive the contents of a pipeline to protect receiving waters from impacts in the event of an unexpected event or emergency resulting in the discharge of a pipeline. No direct discharge from event ponds to the environment will occur; all wastewater collected in event ponds will be directed to the active management facility as soon as practical.

5.3.4.9 Alterations in Flow

Surface water management in the open pit operations and infrastructure at the Goose Property will include a network of diversion channels to direct surface water flow away from the Project footprint, as well as a network of collection channels and sumps to collect contact water. Contact water will include water from open pit mine workings and surface water flow/stormwater from the individual project areas.

Options to manage surface water at the Goose Property include discharge to the environment, if discharge requirements are met, or directing to the active tailings management facility. Due to operational water requirements at the Process Plant, surface contact water will be directed to the active tailings management facility for use during milling.

At the MLA, infrastructure will be designed such that its footprint is minimized to limit changes to local drainage patterns. All roads and surfaces will be constructed using geochemically suitable material. Roads and pads will be designed to have runoff disperse as sheet flow to minimize channelized flow. Non-contact water will be diverted around infrastructure, as much as is feasible, and directed to natural downstream drainage networks to maintain local drainage patterns. Clean water and snow will be managed to restrict contribution to potentially poor water quality, and will be diverted to maintain natural drainage networks as much as possible.

For alterations in flow association with the TSF refer to Section 6.3.9.2

5.3.4.10 Project Dewatering

Llama Lake

Beginning in Year -3, there will be a need to partially dewater Llama Lake to allow Umwelt Pit development to start in Year -2 (Table 6.3-1). Early Construction contact water is pumped to, and stored in, the partially dewatered Llama Lake, which becomes Llama Reservoir. Contact water collected in Llama Reservoir is treated at the WTP during the open water season of Year -1; this water is then discharged into Goose Lake. It is assumed that 50% of the lake volume can be discharged directly to Goose Lake, while the remaining 50% will require treatment for total suspended solids (TSS), and potentially arsenic, prior to discharge. Llama Lake will be fully dewatered by the end of Year -1 in advance of Llama Pit mining in Year 1. Refer to Section 6 of the WMP (SD-05) for a detailed schedule of water related activities.

During the dewatering process, sediment basins will be established as required. Once complete, bottom sediments within the pit boundaries will be disposed of in the TSF. Diversion ditches and berms will be established around the perimeter of the future open pit to divert water. A dewatering plan will be prepared and approved by regulators prior to dewatering activities. This plan will include provisions for diversion of incoming flows to the Llama Lake. Refer to the WMP (SD-05) for more details on lake dewatering methodology and timing.

In advance of the dewatering, a "fish-out program" will be completed following DFO's protocols and in collaboration with local communities.

Umwelt Lake

Beginning in Year -3, there will be a need to dewater Umwelt Lake to provide storage capacity for saline water from groundwater inflows encountered during mining. It is assumed that 50% of the lake volume can be discharged directly to Goose Lake, while the remaining 50% will require treatment at the WTP for TSS prior to discharge. A dewatering plan will be prepared and approved by regulators prior to dewatering activities. This plan will include provisions for diversion of incoming flows to Umwelt Lake. Refer to Section 6 of the WMP (SD-05) for a detailed schedule of water related activities and lake dewatering methodology.

In advance of the dewatering, a "fish-out program" will be completed following DFO's protocols and in collaboration with local communities.

Underground Mine

The underground operations will extend to approximate maximum depths of 650 m from the surface and will have a peak ore production rate of approximately 2,644 kt in Year 4. Seepage water will be channeled to sumps and pumped to the surface for disposal.

5.3.4.11 Traditional Water Use and Land Use

Sabina initiated a comprehensive community engagement program in the Kitikmeot region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);

- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* (KIA 2014) (FEIS Appendix V3-3B);
- Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3C); and
- Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (FEIS Appendix V3-3D).

Traditional Knowledge related to the freshwater aquatic environment from these reports included:

- Harvesting and ecological information related to different fish species (e.g., Arctic Char, Tomcod, Lake Trout, Broad Whitefish, Arctic Cisco, Arctic Grayling, Longnose Sucker) in the Project area and broader region.
- Inuit harvesting locations on lakes and rivers in the Project area and broader region.
- Information on water sources and quality (e.g., locations on the land where Inuit obtained water, changes in water quality) in the Project area and broader region.
- Other general land use, harvesting, and ecological information relevant to the Project area and broader region.
- Land use, harvesting, and ecological information related to the Bernard Harbour area (to support planned stream restoration efforts at this location, to offset fisheries habitat effects at the Project).

Traditional Knowledge relevant to the Project was also provided by residents of the Kitikmeot region during Sabina's community engagement process. This information was collected (e.g., in meeting notes and reports) and later integrated into Sabina's community engagement database (containing some 165 topic directories) and FEIS submission. At the time of the Public Hearing, over 250 engagements or major correspondences had been held with communities in Nunavut and the Northwest Territories on the Project. Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives have been held on the Project. Sabina remains committed to meaningful community engagement throughout the Project's lifespan, as described in Sabina's Community Involvement Plan (FEIS Volume 10, Chapter 26).

Throughout these engagement activities, communities provided comments and expressed interest in the planned fish-out and dewatering of waterbodies. Their interest led to a number of suggestions and a discussion of ideas on how to best utilize the fish resource and conduct dewatering activities. A summary of topics raised during public consultation and engagement can be found in the FEIS Appendix V3-1G. Ideas raised during the community meetings included, but were not limited to, the following:

- Harvest fish during times when the fish can be used by the communities, and will stay fresh longer.
- Have a community member participate in both the Bernard Harbour offsetting and the planned fish-out.
- Use all fish for communities. Fish of lower quality (fish waste and small fish) can be provided to trappers and dog handlers for bait and food.
- Involve community members in all phases of the fish-out.
- Use methods that have been proven to work.

- Continue to involve communities during detailed design of the fish-out plan and provide adequate time for notification.

5.3.4.12 Marine Saline Water Desalinization

At the MLA, the desalination plant will pull seawater from Bathurst Inlet, and will produce a concentrated seawater discharge as a by-product of producing potable water. None of the concentrated seawater discharge will come into contact with any mining facilities, and the discharge will remain isolated. No additives are used in the desalination process. The concentrated sea water will be mixed with fresh sea water to ensure the saline water remains within 10% of the natural variation of salinity. The only change to the seawater before it is returned to the ocean is that it will have a slightly higher concentration of salt. There will be no direct discharge of treated sewage effluent, contact water or camp greywater to the marine environment (FEIS Volume 2, Chapter 4, Section 4.3.6.1).

The MLA desalination plant is designed with an intake flow rate of 33 m^3/h and a discharge rate of 30 m^3/h. Assuming the fresh seawater plant intake product has a salinity of 0, the discharge from the plant is predicted to be 10% more saline, and therefore within the Canadian Council of Ministers of the Environment (CCME) salinity guideline at the point of discharge. The discharged effluent is expected to mix in the receiving environment, and is not expected to be detectable beyond the outfall. Hence no effects from the concentration of naturally present metals in the seawater influent are expected. Baseline metal concentrations are generally low but some seasonal variation has been observed in the baseline monitoring program (FEIS Volume 7, Chapter 2, Section 2.1.5.5). A 10% increase in natural metal concentrations in the desalination effluent is not expected to be detectable in the marine receiving environment once natural variation and mixing are considered. No treatment or process chemicals will be added to the effluent stream returning to the marine environment.

During the FEIS Final Hearing, Sabina committed to design and implement a marine monitoring program at the MLA to identify potential impacts of the Project on the marine environment and inform adaptive management actions (F-ECCC-T-1). The Marine Monitoring Plan (SD-23) has been provided with the Application. Sabina is proposing the monitoring of intake water, discharge effluent, and the receiving environment for the Project during Construction, Operations, and Closure in MLA. If the proposed monitoring results are materially different than anticipated, adaptive management will be implemented (e.g., storage of water, treatment of water).

The Marine Monitoring Plan (SD-23) is provided in the Application; however, Sabina acknowledges that four federal departments have interaction or oversight with marine discharge: INAC, ECCC, DFO, and TC and not the NWB. Nonetheless, Sabina also acknowledges that the NWB can provide recommendation with respect to marine water as a member of the Nunavut Marine Council.

INAC administers the *Arctic Waters Pollution Prevention Act* and its regulations as well as the *Territorial Lands Act* and its regulations, which both include significant enforcement provisions. The *Arctic Waters Pollution Prevention Regulations* prohibit the deposit of "waste" into Arctic waters unless otherwise authorized under the *Territorial Lands Act*. Sabina is required under the *Territorial Lands Act* and its regulations to obtain an instrument before constructing the MLA, and INAC confirmed during the FEIS Final Hearing that it will include marine discharge criteria within its instrument.

ECCC administers section 36 of the *Fisheries Act* which prohibits the deposit of deleterious substances into fisheries waters, as well as the *Metal Mining Effluent Regulations*. As confirmed during the FEIS Final Hearing and acknowledged in the FEIS Final Hearing Report (NIRB 2017), ECCC has no concerns with respect to the assessment work completed by Sabina, the proposed discharge plan, or potential impact of the discharge on fish. ECCC also provided the CCME salinity guidelines to the Board for review during the FEIS Final Hearing, which details the scientific basis of the salinity guideline and supports the

assessment that the effluent from the proposed MLA desalination plant is not expected to have effects on fish and other aquatic life in Bathurst Inlet.

Sabina will also be required by DFO to comply with the *Fisheries Act* requirements respecting protection of fish habitat in regards to construction and operation of the outfall. Sabina will also be required to comply with the *Navigation Protection Act* in respect of the marine outfall, which is administered by Transport Canada. This will ensure the outfall will not interfere with marine navigation.

The regulatory authorities with oversight over the facility and discharge have all confirmed that they have no concerns with the potential for effects on the marine environment. Additional information on marine monitoring supplemental information for the Project was provided in (FEIS Addendum Appendix V7-2B) Addendum Appendix V7-2B: Marine monitoring supplemental information (NEW) (February 2017).

5.3.5 Waste Management Infrastructure (Domestic)

The waste management infrastructure for the Project will be established at the onset of mobilization and construction activities for use during Construction, Operations, and Closure.

At the Goose Property, this will consist of:

- a STP;
- an incinerator for combustion of non-hazardous and combustible wastes (including sewage sludge);
- a landfarm for the treatment of contaminated soils and snow;
- a waste sorting facility;
- one or more landfills for disposal of non-hazardous solid wastes; and
- a lined hazardous waste storage area.

At the MLA, waste management facilities will include:

- an incinerator for combustion of nonhazardous and combustible wastes (including sewage);
- a landfarm for the treatment of contaminated soils and snow;
- a waste sorting facility; and
- a lined hazardous waste storage area.

All waste products will be sorted at waste sorting facilities local to each project site. Materials will be safely stored until transported to an appropriate recycling or disposal facility. Both the MLA and Goose Property will have indoor and outdoor storage, and waste will be segregated, handled, transported, and stored appropriately to ensure containment and physical security.

Combustible wastes will be temporarily stored in dedicated bins within the waste incineration building or in proximity to the portable incinerators until incinerated. Hazardous waste and recyclable non-hazardous, non-combustible materials will be temporarily stored on-site in designated and approved storage areas. The majority of other items will be stored in the laydown yard outdoors, and in shipping containers where appropriate. This includes recyclables such as tires, electronics and electrical materials, and scrap metal. Materials designated for off-site disposal will be packaged for shipment to certified waste management facilities for subsequent treatment, recycling, and/or disposal.

The total volume of waste generated at any given time during the life of the Project will be dependent on the activities and number of site personnel at that time. An inventory of the estimated types and quantities of waste that will be generated during the various phases of the Project is presented in the Landfill and Waste Management Plan (SD-10). The specific volume of material directed to the landfill, incinerator and recycling/reuse waste stream will be controlled through standard operating procedures for waste management.

For additional information, refer to the following Waste Management Program Plans:

- Landfill and Waste Management Plan (SD-10) (includes Sewage Treatment and Effluent disposal);
- Incineration Management Plan (SD-11);
- Landfarm Management Plan (SD-12); and
- Hazardous Waste Management Plan (SD-13).

5.3.5.1 Sewage and Wastewater Treatment Facility

Goose Property

The sewage treatment facilities will be established when the permanent camp is constructed, and will be maintained for the duration of the Project. Sewage and grey water from the camps and facilities will be conveyed in heat traced pipes or trucked to pre-packaged STPs (membrane bioreactor). During Construction, treated sewage effluent will be discharged to a designated area in the terrestrial environment (see Appendix A, base Figure 3). The discharge area will be designed to minimize erosion and degradation of permafrost. Once the TSF becomes available for use, treated sewage effluent will be discharged to the active tailings facility for the operational period. During Closure, treated sewage effluent will again be discharged to a designated area in the terrestrial environment (see Appendix A, base Figure 3). Refer to Section 7.4.3 of the WMP (SD-05) and Section 7.1.4 of the Landfill and Waste Management Plan (SD-10) for details on sewage discharge location characteristics, attenuation capacity, and end of pipe locations.

While discharging on land (Construction and Closure phases), Sabina will strive to comply with the discharge requirements of the Wastewater System Effluent Regulation which is not yet applicable north of the 60th parallel. Until the Wastewater System Effluent Regulation is applicable to the North, Sabina will comply with the effluent quality criteria presented in Table 5.3-8. These discharge criteria are in line with those imposed on other mining operations within Nunavut. The discharge locations for treated sewage effluent are also are presented in this table.

Table 5.3-8. Proposed Treated Sewage Effluent Discharge Quality Criteria

Parameter	Land Discharges – Freshwater Environment MAC[1] (mg/L)	Discharges to Tailings Facilities MAC[1] (mg/L)	Land Discharges – Marine Environment MAC[1] (mg/L)
BOD_5	30	100	100
Total Suspended Solids (TSS)	35	120	120
Fecal Coliform (CFU/100 mL)	1,000	10,000	10,000
Ammonia (NH_3-N)	4[1], 8[2]		--
Phosphorus	4[1], 8[2]		--
Oil and Grease	No visible sheen	Not applicable[3]	No visible sheen
pH	between 6.0 - 9.5		between 6.0 - 9.5
Toxicity	Not acutely toxic		Not acutely toxic

1) MAC – Maximum Average Concentration
2) Maximum Grab Concentration
3) At the breach date of each tailings management facility, the discharge will need to meet Metal Mine Effluent Regulation (MMER) discharge limits.

Marine Laydown Area

Grey water and sewage will be kept separate at their sources and managed independently. Grey water will run through an oil-water separator before being discharged to the tundra. Non-toxic and low-sodium cleansing products will be selected to mitigate harm to the receiving environment. Sewage waste will be collected from Pactos and incinerated. The incinerator will be selected having this functional requirement. Both of these operations are consistent with practices at the current Goose Exploration Camp.

5.3.5.2 Incinerator

Goose Property

The incinerator will be capable of safely incinerating Class I, II, III, and IV solid wastes. Combustible solid waste such as paper, cardboard, wood, burlap cloth, fuel or oil-soaked absorbent material, semi-solid waste and food preparation waste would be burned in a dual stage, forced air incinerator. No chlorinated, hazardous or medical wastes will be fed to the incinerators. The combustible waste will be collected and stored in day bins placed at the camps, maintenance facilities and waste sorting areas. The incineration process is a batch operation, and it will operate at least once per day. The Incineration Management Plan (SD-11) provides further details on the waste incineration procedures.

The main source of domestic type solid wastes will be from the Accommodation Complex. The solid wastes, oil soaked materials, paper, etc. will come mainly from the Maintenance Shop, Warehouse, and Power Plant facilities. The design and performance of the incinerator system will comply with all applicable CSA Codes and Standards. The incinerator emissions will meet the requirements set by the CCME latest revision and other local Provincial and/or Territorial codes and standards.

Ash produced by incinerators that meet disposal criteria will be disposed of in the non-hazardous landfill in accordance with the landfill operation manual. Ash that does not meet the criteria will be stored and shipped off-site to an approved waste disposal facility. The disposal criteria to be used is specified in the Landfill and Waste Management Plan (SD-10).

Occasional open burning of acceptable waste products will be implemented and conducted in accordance with governing requirements. Sabina will not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood to prevent the deposition of waste materials of incomplete combustion and or leachate from contaminated ash residue, from impacting any surrounding waters, unless otherwise approved by the Board in writing.

Marine Laydown Area

The incinerator for the MLA will be similar to the one installed at Sabina's Goose Property Area.

5.3.5.3 Landfill

Goose Property

Non-combustible, non-hazardous materials will be landfilled in an approved on-site facility within the Umwelt and TSF WRSAs. Water diversion and collection systems will incorporate the design of the landfill, which will be designed for the life of the Project.

Proposed landfill seepage water quality criteria are presented in Table 5.3-9.

Table 5.3-9. Proposed Landfill Seepage Monitoring Water Quality Criteria

Parameters	Maximum Average Concentration (mg/L)
pH	6.0 - 9.5
As	0.5
Cu	0.3
Pb	0.2
Ni	0.5
Zn	0.5
Total Suspended Solids	15
Oil and Grease	No visible sheen

Marine Laydown Area

There is currently no proposed landfill at the MLA. Non-hazardous waste generated at the MLA that is not suitable for incineration will be stored in containers that will be transported to the landfill at the Goose Property during each WIR season, or backhauled off-site for disposal to an approved waste disposal facility.

5.3.5.4 Landfarm

Goose Property

Hydrocarbon contaminated soil, snow and ice may be treated within properly designed landfarms. The landfarm will be in use for the life of the Project and is located within a WRSA. Remediated soils will be disposed of in the WRSA or reused at site.

Landfarms will be designed with sumps for the collection of contact water; this water will be pumped through an oil-water separator or used in the landfarm to increase moisture content of materials undergoing treatment, as required. Water accumulating in the landfarm will be discharged directly to

the receiving environment if it complies with proposed discharge water criteria presented in Table 5.3-10. In the event this treated water does not meet discharge criteria, it will be pumped to the active tailings facility.

Table 5.3-10. Proposed Landfarm Pooling Water Quality Discharge Criteria

Parameter	Maximum Average Concentration (mg/L)
pH	6 – 9
Total Suspended Solids	15
Oil and Grease	15 and no sheen
Total Lead	0.001
Benzene	0.370
Ethylbenzene	0.090
Toluene	0.002
Xylene	0.300

Marine Laydown Area

A landfarm will be constructed at the MLA similar to the Goose Property Area to treat contaminated soil or snow. The pooling water will be released to the receiving environment if it complies with discharge water criteria presented in Table 5.3-10. Otherwise, treatment will be provided until discharge criteria are met.

5.3.6 Transportation Infrastructure

Logistics and establishing cost effective access to the mining sites is an important factor in the successful development of this Project. Options for access are via air, marine, or over land using winter or all-weather roads. An extensive Logistics and Transportation Study was undertaken to establish the most economical and environmentally sound means of accessing the Project site for bulk deliveries of equipment, materials, and consumables. This study concluded that the preferred methods of access are:

- Air access throughout the mine life from all-weather airstrip capable of servicing passenger and large cargo aircraft at the Goose Property. Ice and open water airstrips may also be used at the Goose Property and MLA.
- Two marine shipping routes to deliver cargo and fuel to the MLA at Bathurst Inlet, which is accessible during the open water season (before October 15 except under emergency or unforeseen circumstances).
- Winter ice roads to link the MLA to the Goose Property and George Exploration Camp and the proposed BIPR all-weather road. Material, equipment, and supplies delivered to the MLA will be transported to the Goose Property over a WIR from mid-January to April annually. See Appendix A, base Figure 2.
- All-weather on-site roads.

The Project includes a MLA located at Bathurst Inlet, approximately 130 km north-northwest of the Goose Property. As gold doré and not concentrate is the market product, gold will not be exported via the MLA but transported by outbound flights from the Goose Property. Cargo will be transported to the MLA by barges and ships originating on the Canadian East or West coasts during the open water season. The ships and barges will be self-sufficient for offloading cargo. Lightering terminal barges will be used to transfer

cargo from the vessel to the MLA terminal barge. Fuel will travel in tanker ships and/or barges, and then will be transferred through floating hose to storage tanks at the MLA. Incoming and outgoing cargo and incoming fuel will be staged at the MLA while awaiting transfer to the project sites by transport trucks on a WIR, or awaiting the appropriate ship for back-haul. Outside of the open water season, MLA activities will be limited to on-site storage and monitoring for loss prevention.

Fixed wing aircraft and helicopters are integral parts of the plan to transport people, materials, and supplies. The MLA will be able to accommodate aircraft on an ice airstrip during winter and floatplanes on open water in summer. The MLA will not have an all-season airstrip.

At the Goose Property, an all-weather airstrip and apron capable of servicing passenger and large cargo aircraft will be constructed. Ice and open water airstrips will continue to be used as required. The all-weather airstrip may be up to 1,524 m long, and 45 m wide. The airstrip will be equipped with lights and instrumentation in accordance with appropriate Federal regulations. The airstrip infrastructure will include a radio shack/communications, generator, and dispatch office.

Two WIRs will be constructed for the Project: 1) connecting the MLA and the Goose Property, and 2) connecting the George Exploration Camp and extending from there to the proposed BIPR WIR connector.

The WIRs cross both IOL and Crown land. The designated WIR PDA includes a 200 m corridor, or 100 m on either side of the road centre line. Water for WIR construction and maintenance will be from various sources along the WIR corridor that will satisfy DFO under-ice water taking protocol. The characteristics of each WIR are as follows:

Goose Property – Marine Laydown Area Winter Ice Road:

- The WIR between MLA and Goose Property will be approximately 160 km long, 10 to 30 m in width, and travel over 42% land and 58% water.
- Period of use: January to April annually to transport fuel, equipment, and supplies from the MLA to the George Exploration Camp or the Goose Property. The available trucking window is approximately 100 days. The number of Super B-train trucks needed per year ranges from 11 to 21 (depending on mine operations schedule).
- Emergency shelter(s) located mid-distance along the road.

Goose-George Exploration Camp Winter Ice Road:

- The spur road connecting the George Exploration Camp to the Goose-MLA WIR is 13 km long, and may extend 20 km farther to connect to the proposed BIPR WIR connector. The WIR will range from 10 to 30 m in width.
- Period of use: As needed, January to April annually (site preparation to closure). The available trucking window is 100 days.

Along the WIR alignment, efforts will be made to complete construction using snow and ice; if minor amounts of granular fill are required, potential borrow and quarry sites will be identified prior to the WIR construction. Sabina will seek appropriate authorization from the KIA and/or INAC prior to use.

Suitable material locations along the WIR will be geotechnically and geochemically stable, aim to minimize transport distances, and avoid culturally and environmentally sensitive areas. Options for quarry material include local eskers, local bedrock locations in new areas, and local bedrock locations within current mine operations footprint.

The on-site roads within the Goose Property and MLA will be constructed as all-weather roads. Roads will be private and not for public use. All-weather roads will be constructed with run-of-quarry rock placed directly onto the tundra to preserve the permafrost. A layer of graded surfacing material will be placed to provide a protective trafficking layer. Construction materials are assumed to be from locally developed geochemically suitable rock quarries.

For additional information, refer to the Road Management Plan.

5.3.7 Material Management and Emergency Response Infrastructure

5.3.7.1 Quarries

Goose Property

At the Goose Property Area, an estimated 5 Mt of aggregate will be required for construction. Of this 5 Mt, 1.5 Mt will be required to construct the TSF Containment Dam and 3.5 Mt will be required for the other Goose infrastructure, including roads and pads. The Airstrip Quarry contains an estimated 1.5 Mt of suitable NPAG material with an estimated withdraw of 800 ktonnes proposed for construction use. Additional material needed for roads and foundations will be sourced from the cut/fill balance at the Goose Plant Site area and open pit mining. It is currently planned that only one quarry will be developed (Airstrip Quarry); at later phases of design, this could be expanded to additional quarries and borrow sources. Only quarries with geochemically suitable material will be developed. Where feasible, NPAG waste rock from the open pit workings will be used for construction material.

Quarrying of the Umwelt Pit will begin in Year -3. Overburden removal will occur during the preparation of mining and construction activities. The site overburden and excavated material will either be handled as run of mine waste and stored accordingly, or segregated and used where possible in reclamation activities. Only geochemically suitable materials will be used for reclamation.

A quarry and borrow pit site-specific management plan will be developed for each quarry or borrow pit (refer to Borrow Pits and Quarry Management Plan; SD-03). The site-specific management plans will contain the development plan, ARD screening of the material, drainage plan, and closure plan. Runoff from quarry sites will be managed to achieve the runoff water quality presented in Table 6.3-19.

Marine Laydown Area

At the MLA, an estimated 1.3 Mt of aggregate will be required for construction. All of this material will be sourced from the MLA Fuel Storage foundation. It is currently planned that only one quarry will be developed (MLA Quarry); at later phases of design, this could be expanded to additional quarries and borrow sources. Only quarries with geochemically suitable material will be developed. The MLA will be initially developed for the use of Sabina in the Kitikmeot region. Should others want to use the facilities in the future, additional review work may be required.

Winter Ice Road

Along the WIR alignment, efforts will be made to complete construction using snow and ice. If minor amounts granular fill are required, potential borrow and quarry sites will be identified prior to the WIR construction. Should small quantities of material be required, only quarries with geochemically suitable material will be developed and Sabina will work with the land owner (KIA or INAC) to obtain the necessary approvals.

For additional information, refer to the Borrow Pits and Quarry Management Plan (SD-03).

5.3.7.2 Hazardous Material

A variety of supplies and materials classified as potentially hazardous will be required at the Project. The hazardous materials to be handled may include:

- petroleum products (fuel/lubricants/oils/greases);
- contaminated snow/water/soil (oil/fuel);
- oil and fuel filters;
- used sorbents and rags;
- hydraulic fluid;
- glycol;
- empty petroleum hydrocarbon containers and drums;
- process reagents;
- laboratory reagents;
- solvents;
- paints;
- fluorescent light tubes;
- waste equipment batteries;
- electronics and electrical materials; and
- hazardous medical waste / biomedical waste.

Large quantities of reagents, hydrocarbons and other hazardous materials will be received in Year -1. The Hazardous Materials Management Plan (SD-13) and the Landfill and Waste Management Plan (SD-10) have been developed to identify and monitor potentially hazardous materials with regards to safety and the environment. Transportation, storage, use and disposal will be considered for each stage of Project life. Safety to the workers and the surrounding communities will determine each stage of materials handling.

5.3.7.3 Fuel Storage

Goose Property

Fuel storage at the Goose Property is designed with capacity for a ten-month supply of diesel fuel for the operational year with the maximum fuel usage. Sabina will construct up to a 45 ML tank farm (three tanks at 15 ML) at the Goose Property. One 15 ML fuel tank will be erected initially to support construction while the remaining two 15 ML fuel tanks will be built the following year. There will be seacans situated throughout the Goose Property that will be utilized as day tanks at the underground mine portals, incinerator, AN facility, boilers, and power plants. The fuel tank farms will be designed to have bermed spill containment (secondary containment) with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks, or 110 % volume of the largest tank, whichever is greater. In calculating the volume, the footprint of the smaller tanks is subtracted. The above basis is consistent with the document entitled “Design Rationale for Fuel Storage and Distribution Facilities” published by the Department of Public Works of the Northwest Territories (GNWT 2006; refer to Section 4.6 of these guidelines). The lining within the bermed area of the tank farm is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., of the membrane to ensure its integrity.

Water pooling within the secondary containment area of the tank farm will be released to the receiving environment provided it complies with discharge water quality criteria presented in Table 5.3-11. Treatment will be provided for the pooling water should the water quality exceeds those criteria.

Table 5.3-11. Proposed Bulk Fuel Storage Pooling Water Discharge Criteria

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Benzene	0.370
Ethyl benzene	0.090
Toluene	0.002
Xylene	0.300
Lead	0.200
Oil and Grease	15 and no visible sheen

Refuelling stations will be equipped within a lined and bermed area to contain minor spills or leaks during refuelling. The liner (e.g., 40 mm Hypalon liner or equivalent) will be protected by aggregate bedding. Vehicles and mobile equipment will drive onto this bedding for refuelling. Fuel transfer is done by pumps.

The fuel tanks will be provided with standard instrumentation and controls to monitor and safely manage the inventory in the tanks. Fuel storage areas and vehicles will be equipped with spill kits for emergency response. Each spill kit contains the appropriate type, size and quantity of equipment for the volume/type of product present in the storage.

Marine Laydown Area

Sabina will construct up to a 60 ML land based tank farm (four tanks at 15 ML). There will be seacans utilized as a day tank at the MLA camp/shop facility or for mobilization. The fuel tank farms will be designed to have bermed spill containment (secondary containment) with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks or 110 % volume of the largest tank, whichever is greater. In calculating the volume, the footprint of the smaller tanks is subtracted. The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the Northwest Territories (GNWT 2006; refer to Section 4.6 of these guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., of the membrane to ensure its integrity.

Water pooling within the secondary containment will be released to the receiving environment provided it complies with discharge water quality criteria presented in Table 5.3-11. Treatment will be provided for the pooling water should the water quality exceeds those criteria.

Fuel will be delivered by fuel tankers or barges during the open water season. The floating hose method will be used to transfer fuel to the on-land storage tanks. An OPEP has been developed for the MLA facility. Refer to Section 4.5.6 for additional information associated to regulatory oversite requirements related to marine shipping and fuel transfer.

Several preventive measures are in place to minimize risk of spills during bulk fuel transfer including:

- The bulk fuel storage facility, pipeline and all related equipment and infrastructures are inspected prior to the bulk cargo transfer, and the inspection methods are documented as a Standard Operating Procedure.
- Complete bulk cargo transfer procedures have been established, a copy of which is found in Annex 5 of the OPEP.
- As required by the applicable legislation the ship has a comprehensive Shipboard Oil Pollution Emergency Plan and a copy of this plan has been reviewed by Sabina.
- In addition to the legislative requirements, the charterer has implemented a shipboard spill response training program and performs routine exercises in spill response operations.
- The ship carries a compliment of spill response equipment as listed in Annex 6 of the OPEP and this equipment is ready at the ship's rail at all times for deployment during cargo operations.
- Sabina oil spill response equipment is on the beach, ready for immediate deployment at all times during cargo operations.
- The workboats and trained responders are available at all times during cargo operations for spill equipment deployment.
- Standard transfer procedures include hourly inspections by workboat of the floating hose for leaks or defects.
- During transfer operations the shore manifold is manned at all times.
- A low pressure alarm is installed at the shore manifold that is highly sensitive to differences in pressure during pumping. Any loss in the system will cause a drop in manifold pressure and results in an audible alarm, which is immediately reported by the manifold personnel.
- The bulk fuel storage facility is monitored at all times by Sabina personnel during the transfer.
- The pipeline is inspected hourly on foot during the transfer operation.

The Spill Contingency Plan (SD-17) includes details of emergency response procedures for spills that could occur while transporting bulk fuel over land. The majority of over land fuel transfer will occur on the WIR; therefore, the approach to spills on snow and ice (Section 8.4.3) are outlined below:

- In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material will be limited as much as possible. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice prevents seepage of fuel into the water.

- Most response procedures for spills on land can also be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in snow or ice) slow the progression of the fuel, and also serve as containment to allow recovery of the fuel. Free product will be recovered using a vacuum, a pump, or sorbent materials. Contaminated snow and ice will be scraped up manually or using heavy equipment depending on volumes.

- Should spills enter waterways beneath ice cover, ice augers and pumps will be used when feasible to recover fuel and other materials under ice. Slots may be cut in ice over slow-moving

water to contain oil. Tiger torches may be used to burn the fuel in place, if unrecoverable by other methods and when feasible and safe to do so.

- The contaminated snow and ice will be placed in containers or within plastic lined berms on land. For contingency purposes, a contaminated snow storage site will be designated and located in close proximity to each of the main Project work sites to facilitate inspection and monitoring, in an area that will still be readily accessible once it is time to remove the snow (i.e., spring or summer), and at least 31 m away from any body of water or ditch. Once enough snow has melted, the oily water will be removed from the storage site and processed through an oil-water separator that would be mobilized to site. Hydrocarbons recovered will be burned in the camp incinerator or shipped off-site.

Refuelling stations will be equipped with a lined and bermed area to contain minor spills or leaks during refuelling. The liner (e.g., 40 mm Hypalon liner or equivalent) will be protected by aggregate bedding. Vehicles and mobile equipment will drive onto this bedding for refuelling. Fuel transfer is done by pumps.

Fuel storage areas and vehicles will be equipped with spill kits for emergency response. The Spill Contingency Plan (SD-17) identifies spill kit locations and appropriate response measures for spills. The spill kit contains the appropriate type, size and quantity of equipment for the volume/type of product present in the storage.

Sabina developed and presented additional specific management plans relating to the prevention of, and response to, any spill event including:

- Risk Management and Emergency Response Plan (SD-15);
- Fuel Management Plan (SD-16);
- Spill Contingency Plan (SD-17);
- Oil Pollution Emergency Plan (SD-18); and
- Shipping Management Plan (FEIS Volume 10, Chapter 15).

Sabina has outlined the applicable Federal and Territorial legislation and guidelines in each management plan.

5.3.7.4 Explosives Storage and Handling

Goose Property

The main storage of ammonium nitrate will be located at the Goose Property. For early construction, prepackaged explosives will be delivered by air. Larger quantities of explosives will be required during later stages in the Construction Phase and explosives will then be manufactured on-site. Larger quantities of ammonium nitrate will be delivered to the Goose Property via the WIR (tote bags within containers) and/or air freight. Up to 3,900 tonnes of ammonium nitrate will be stored at the Goose Property.

Packaged explosives and explosive detonators will be stored in approved explosive magazines located on separate pads. The powder magazine will be a 40-ft. container magazine capable of holding 32 t of explosives, while the cap magazine will be a 20-ft. container magazine capable of holding approximately 600 cases of detonators. Both magazines will be surrounded on three sides with earthen berms to prevent propagation.

The location of the Goose explosive storage and ammonium nitrate/fuel oil (ANFO) facility is shown on Appendix A, base Figure 3. The location of these facilities takes into account required separation distances as regulated by the Explosives Regulatory Division of NRCan.

Marine Laydown Area

There will be a designated storage area for ammonium nitrate that will be shipped in seacans for use at the MLA during the Construction Phase. Explosives magazines destined for the Goose Property will be used to store packaged explosives. No storage or mixing of explosives (and detonators) will take place at the MLA during Operations.

In compliance with the regulatory requirements, an Explosives Management Plan will be prepared for NRCan. Refer to Section 4.5.5 for additional detail on NRCan regulatory requirements.

5.3.7.5 Storage Facilities

Both Project locations will have designated laydown areas and warehousing for receiving, organizing, and storing incoming or outgoing materials and equipment. Before permanent infrastructure is constructed on pads, the prepared areas may be used as temporary construction laydown yards. Seacans will be placed on leveled and compacted pads and stacked to reduce pad areas. There will be three sets of seacans in circulation: one split between the southern staging ports, one at the MLA awaiting either backhaul (empty or with backhaul material) or forwarding (full) to the Goose Property, and one at the Goose Property as either storage (full) or awaiting backhaul (empty or with backhaul material) to the MLA.

Heated storage facilities at the Goose Property and MLA will be available to store goods that need to be so protected. A cold storage building will be available at the Process Plant site; all other freight will be stored in containers or in bulk. Goods that do not require protection from the elements will be stored in the laydown area adjacent to the container storage yard.

5.3.8 Accommodation and Ancillary Infrastructure

Goose Property

A camp with a single-occupancy room configuration will be used during the Construction Phase at the Goose Property to accommodate 465 workers. There will be 220 beds with a "Jack and Jill" or otherwise shared bathroom arrangement, and 245 beds will have communal bathrooms. Overflow requirements will be served by the existing 146-bed Goose Exploration Camp. Overall, Goose Property Operations will require up to 465 rooms. The camp will have a 290-seat mess hall and a recreation area.

Under the Type A Water Licence, Sabina will construct a new 465-person camp to be used for the LOM. Under the current Type B Water Licence (2BE-GOO1520), the existing Goose Exploration Camp has 146 beds available; this camp may continue to be used for exploration or overflow purposes as well as for initial Project construction. It is anticipated that a Type B Water Licence will remain in place for the life of the Project.

The camp will be constructed of modular units manufactured off-site in compliance with highway size restrictions for transportation. The camp will comply with all building and fire code requirements, and will be provided with sprinklers throughout. Heating for the camp will largely be provided by heat recovered from the Power Plant. Arctic corridors will be provided to connect the camp core facilities and dormitories with the Process Plant and Truck Shop.

A fire truck and an ambulance will be located in an Emergency Response Team building adjacent to the camp. This will be a fabric building with a compacted fill floor.

An assay laboratory will be located adjacent to the Process Plant. This facility will serve the assay, environmental, and metallurgical requirements. The lab will consist of pre-fabricated lab modules and ancillary equipment such as drying ovens, dust and fume control, and heating equipment all located inside a fabric building to provide sufficient operating space with a good (heated) operating environment.

An initial Power Plant will be installed when the camp is first built to provide power during the Construction Phase. When the full Process Plant is operational, the initial construction Power Plant will function as a source of emergency backup power.

Marine Laydown Area

A camp accommodating up to 75 workers with a single-occupancy room configuration will be used during the Construction and Operations phases at the MLA. There will be two dorms with "Jack and Jill" or otherwise shared bathroom arrangements. The dorms will be connected to the dining and recreation complex with an arctic corridor. Hydronic heating of the camp will be similar to that of the Goose Property infrastructure.

A fabric building is provided to house a pick-up truck fitted with an emergency response "camper".

5.4 KEY BASELINE CONSIDERATIONS FOR PROJECT DESIGN

5.4.1 Water Quality

Existing Conditions Summary

The freshwater environment around the Project is characterized by an extensive network of lakes and streams within a hummocky landscape, low elevation relief, and exposed bedrock uplands. Winter is characterized by extreme cold (mean monthly temperatures -33°C), and ice cover is present on lakes between October and July. Air temperatures are highest in July, reaching a mean monthly temperature of 14°C. Regional meteorological stations report total annual precipitation between 125 mm (2009) to 344 mm (2007) for the interval 2006 to 2012 (FEIS Volume 4, Chapter 3). Ice depths on waterbodies are typically 1.5 to 2 m thick, and shallow waterbodies (< 1.5 m) freeze to the bottom (Rescan 2011a, 2012a, 2013a, b).

Hydrology is snowmelt dominated, with peak flows occurring from early May to mid-June in most watersheds. Occasional rainfall-driven high flow events may occur between June and September. Winter flow is absent as streams are frozen to the sediment bed. Streams in the Project area are generally small and shallow and tend to have low flow and low water levels during summer. Many streams are ephemeral, flowing only during freshet. Lakes are a significant component of the landscape in the Project area.

High quality freshwater is considered very important to the Inuit in the area for the provision of potable water and good quality habitat for fish and wildlife. Surface water quality in lakes in the Project area is characterized as cool, clear, with sufficient dissolved oxygen to support aquatic life. Lake water is slightly acidic to neutral pH (mean less than 7.0), soft water (mean hardness less than 20 mg $CaCO_3$/L), poorly buffered (mean total alkalinity less than 10 mg $CaCO_3$/L), low levels of total dissolved solids (mean less than 35 mg/L), and low conductivity (mean less than 40 µS/cm). Water quality in the streams is similar to water quality in the lakes. Streams are classified as circum-neutral, well oxygenated, clear, with low buffering capacity (mean total alkalinity less than 10 mg $CaCO_3$/L), and soft water (mean hardness less than 20 mg $CaCO_3$/L).

Lakes and streams in the Project area are nutrient poor, with many concentrations less than the analytical detection limit; lakes and most streams are classified as ultra-oligotrophic to oligotrophic. Concentrations of total phosphorus can be variable, and in Goose Lake ranged from less than 4 to more than 35 µg/L.

Metal concentrations are typically low, with many concentrations either undetectable or less than the Canadian Water Quality Guidelines (CWQG) for Protection of Aquatic Life (CCME 1999) (Table 5.4-1). Concentrations of aluminum, cadmium, copper, iron, lead, and nickel in lakes and streams were above the CWQG in less than 10% of baseline samples, on average. Cadmium and copper concentrations in lakes, and aluminum, copper, and iron concentrations exceeded the CWQG in more than 10% of samples. Aluminum, cadmium, and copper were above the guidelines in samples from Goose Lake; cadmium and iron were above the guidelines in the Goose Lake "neck" inflow, and aluminum, cadmium, copper, and mercury were above the guidelines in the Goose Lake outflow.

Table 5.4-1. Summary of Lake and Stream Water Metal Concentrations in the Goose Property Area, 1993 to 2013

Metal	Number of Samples		Total Metal Concentration (mg/L)						% of Samples with Concentrations above CCME Guidelines*	
			Lakes			Streams				
	Lakes	Streams	Min	Mean	Max	Min	Mean	Max	Lakes	Streams
Aluminum	91	83	0.0015†	0.017	0.071	0.0045	0.036	0.16	9	12
Arsenic	91	83	0.000025†	0.00026	0.0016	0.000025†	0.00028	0.0014	0	0
Boron	91	83	0.0025†	0.0053	0.026	0.0025†	0.0074	0.078	0	0
Cadmium‡	91	83	0.000005†	0.000008	0.000044	0.000005†	0.000028	0.00022	19[a]	5[a]
Copper	91	83	0.00073	0.002	0.0068	0.00074	0.0019	0.012	35	30
Iron	91	83	0.005†	0.06	0.59	0.000025	0.000041	0.00028	3	12
Lead	91	83	0.000025†	0.00024	0.0099	0.005†	0.16	2.01	2	0
Mercury[b]	93	94	0.000005†	0.000006	0.000025[a]	0.000005†	0.000009	0.00017	0	2
Molybdenum[c]	91	83	0.000025†	0.000033	0.0002	0.000025†	0.000036	0.0002	0	0
Nickel	91	83	0.0007	0.0055	0.047	0.00084	0.007	0.055	1	2
Uranium[d]	88	78	0.000005†	0.000007	0.000032	0.000005†	0.000009	0.00003	0	0
Zinc	91	83	0.0005†	0.0024	0.019	0.0015†	0.0035	0.024	0	0

Note: Samples collected in the 2006 and 2007 programs were excluded because of high analytical detection limits.
** CCME water quality guidelines for the protection of aquatic life (CCME 1999)*
† The minimum value shown is calculated as ½ the lowest detection limit.
‡ Cadmium concentrations were less than analytical detection limits in 75% of lake samples and 57% of stream samples.
[a] Cadmium guidelines are hardness-dependent and were frequently less than analytical detection limits. Only samples with values above the analytical detection limits were considered for comparison with the CCME guidelines.
[b] Mercury concentrations were less than analytical detection limits in 99% of lake samples and 96% of stream samples.
[c] Molybdenum concentrations were less than analytical detection limits in 99% of stream samples.
[d] Uranium concentrations were less than analytical detection limits in 58% of stream samples.

Potential Water Quality Issues

Potential effects to water quality from the Project were identified from activities related to blasting (i.e., potential to increase nitrogen concentration in nearby streams), runoff from site and off-site features during the Construction Phase before water management structures are in place, and changes to downstream water quality in Post-Closure once the pits are allowed to spill over to Goose Lake.

Overall, the potential magnitude of these activities to water quality was considered to be low to moderate assuming that mitigation and best management practices are used.

A water quality model was developed to predict long-term water quality in Goose Lake (FEIS Volume 6, Appendix V6-4A). The model included inputs from the water and load balance model (Appendix E-2), which was developed on the basis of the water management strategy for the Project (i.e., once site water management infrastructure is complete, all mine contact water will not contact the freshwater environment), and inflows from all catchments contributing to Goose Lake.

During the Construction Phase, Llama and Umwelt lakes will be dewatered to Goose Lake; controls will be in place to manage the discharge water quality and minimize potential effects to Goose Lake. After the dewatering phase and through to Closure, there will be no release of mine contact water to Goose Lake; all water will be stored on-site in the pits and tailings storage facilities. For the post-dewatering to the early Closure Phase, water quality concentrations in Goose Lake are predicted to remain below aquatic life guidelines, or to be similar to baseline. Water quality in Goose Lake is predicted to change by late Closure and into the Post-Closure Phase with water quality improving through Post-Closure. Average concentrations of arsenic are predicted to exceed the CWQG in Post-Closure but not exceed the site-specific water quality objective (SSWQO) (Appendix E-1); concentrations are predicted to be higher in the southeast basin of Goose Lake near the inflow from the Goose Main pit, the TSF, and the WRSAs. Management of water in the pits and the TSF for the Project will be key to minimize effects to long-term water quality.

5.4.1.1 Site-Specific Water Quality Objective

A review of other Projects in the North, including Nunavut, show that SSWQOs are generally finalized during water licence process.

An arsenic SSWQO of 0.01 mg/L was proposed by Sabina in the FEIS (November 2015); however, the KIA requested during the NIRB impact assessment review process that Sabina revise the SSWQO following the standard CCME (2007) protocol. The FEIS Addendum (February 2017) presented a revised SSWQO of 0.028 mg/L following the CCME (2007) approach (FEIS Addendum Appendix V6-4C).

Development of the SSWQO followed the standard approach using long-term chronic exposure data for algae, aquatic plants, aquatic invertebrates, amphibians, and fish species that are known or likely to be present in the study area. The derived SSWQO is considered to be conservative and protective of aquatic life. Environment and Climate Change Canada requested that the SSWQO be derived without the amphibian data (technical comment FA-ECCC-TC-11). The revised SSWQO without amphibian data is 0.025 mg/L. The updated arsenic SSWQO is provided in Appendix E-1.

During the review process, KIA and ECCC recognized that the standardized approach was followed but were concerned with the higher proposed SSWQO of 0.028 mg/L (revised to 0.025 mg/L) as compared to the initial proposed value of 0.01 mg/L. During the final NIRB hearing in June 2017, Sabina confirmed the intent to use an arsenic SSWQO value of 0.01 mg/L for the Project (NIRB 2017), which is well below the calculated 0.025 mg/L SSWQO.

5.4.1.2 Arsenic Management

Sabina believes arsenic management, consistent with best practice, can be appropriately addressed through: understanding of the natural environment and the conditions that could cause arsenic release; management procedures to mitigate the onset of those conditions; mitigation and monitoring to verify management practices are successful; and established procedures to implement adaptive management if necessary.

Arsenic is naturally occurring in rock and already present in water within the PDA, as indicted by baseline sediment sampling (FEIS Volume 6, Chapter 5, Section 5.5.4.3):

> The baseline sampling program found naturally elevated concentrations of arsenic in lake and stream sediments throughout the [Local Study Area] LSA, including Goose Lake.

Arsenic is naturally released from exposed rock over time. Arsenic release (a type of ML) can occur in the presence of acid generation in waste rock (in material called PAG). As stated in FEIS Addendum Appendix V4-3D:

> Acid generation of waste rock occurs when sulfides, naturally occurring in the host rock are exposed to oxygen after it has been mined. This exposure results in a chemical reaction called oxidization. Depending on the type and quantity of sulfides exposed, the reaction time can vary greatly, from days to decades. Acid rock drainage (ARD) occurs if water percolates through oxidized waste rock. The resultant drainage may be acidic and contain elevated concentrations of metals that are also naturally occurring in the host rock.

Sabina is aware of this potential release of natural arsenic from the Project waste rock and from Project-generated tailings; this has been indicated by the geochemical testing completed for the Project to date (FEIS Appendix V2-7D). As outlined in the FEIS, the Project will generate two mine waste streams; waste rock and tailings. Geochemical characterization of the waste rock has confirmed that there are two waste rock types; PAG and NPAG (FEIS Appendix V2-7D).

In response to this geochemical understanding, Sabina has outlined comprehensive waste and water management and segregation measures during Construction, Operations, and throughout Closure. Key management plans that prescribe management, monitoring, and mitigation include the following:

- Borrow Pits and Quarry Management Plan (SD-03);
- Mine Waste Rock Management Plan (SD-08);
- Tailings Management Plan (SD-09);
- Water Management Plan (SD-05); and
- Interim Closure and Reclamation Plan (SD-26).

Validation and verification of the successful management plan implementation will rely on mitigation and monitoring. The acceptable limit for arsenic is outlined in the Sabina's arsenic SSWQO, which is considered protective under CCME guidelines (CCME 2007). The monitoring program, which includes arsenic management, is outlined in the Aquatic Effects Management Plan (AEMP; SD-21). For additional information, refer to the SSWQOs (Appendix E-1) and AEMP (SD-21).

Sabina would like to restate that arsenic is not added during the milling process, and naturally-occurring arsenic in the ore will not be converted to arsenic trioxide. As summarized in the NIRB Final Hearing Report, Section 4.7.3:

> Sabina noted that its proposed extraction process (conventional milling) would be different than that used at the Giant Mine (roasting) in the Northwest Territories due to differences in ore characteristics between the Back River area (non-refractory) and the Giant Mine area (refractory). Sabina added that by using conventional milling processes at the Back River Gold Mine site, naturally-occurring arsenic in the ore would not be converted to arsenic trioxide.

In addition, the placement as well as the management of Project infrastructure has been extensively considered throughout the Feasibility Study (JDS 2015). This has also been heavily considered through the FEIS, examples of which can be seen in the Integrated Mine Waste Disposal Alternatives Assessment (IR Submission, Appendix N [Sabina 2016]), as well as the updated FEIS Alternatives Chapter submitted during the information request phase (updated V2-4C [Appendix O, Sabina 2016]). These documents are specific examples of where Sabina has reviewed, considered and chosen alternatives in consideration of arsenic management, as well as other environmental, economic, and Project related factors.

5.4.2 Hydrogeology/Hydrology

Sabina would like to highlight the extensive hydrological and hydrogeological baseline data that was submitted, and made available, through the environmental assessment phase; the 14 appendices provided with the FEIS are summarized below.

- FEIS Appendix V2-7A: Hydrological Characterization and Modelling Report
- FEIS Appendix V5-2A: Cumulative Permafrost Baseline Data Report (2007 to May 2014)
- FEIS Appendix V5-2B: 2015 Sub-permafrost Groundwater Quality Baseline Report
- FEIS Appendix V5-2C: 2012 to 2013 Thermistor String Records Obtained at the Hackett River Project
- FEIS Appendix V6-1A: Back River Project: 2011 Hydrology Baseline Report
- FEIS Appendix V6-1B: Back River Project: 2012 Hydrology Baseline Report
- FEIS Appendix V6-1C: Back River Project: 2013 Hydrology Baseline Report
- FEIS Appendix V6-1D: Back River Project: 2014 Hydrology Baseline Report
- FEIS Appendix V6-1E: Effects of Proposed Development and Water Withdrawal on Hydrologic Indices of Goose and Propeller Lakes
- FEIS Appendix V6-2A: Analytical Results of the Umwelt Westbay Groundwater Sampling Program
- FEIS Appendix V6-2B: Completion Report, Westbay System Monitoring Well: 13-GSE-319
- FEIS Appendix V6-2C: 2012 Geotechnical and Hydrogeological Drilling Program Factual Data Report
- FEIS Appendix V6-2D: Geomechanical and Hydrogeological Site Investigation
- FEIS Appendix V6-3D: Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas
- FEIS Appendix V6-3F: 2014 Bathymetric Survey Report

Sabina believes a sufficient level of hydrological and hydrogeological baseline data was collected and provided during the environmental assessment phase.

5.4.3 Geochemistry/Geotechnical Characterization

Detailed geochemical characterization studies were completed to determine the ML/ARD potential of the overburden, quarry rock, waste rock, tailings, and mine workings. A comprehensive report on the ML/ARD was provided in the FEIS, and is included in Appendix E-3.

Sabina has completed multiple geotechnical and geochemical field investigations on the Project site. Table 5.4-2 provides a summary of all field drilling and test pitting programs completed to date.

Table 5.4-2: Summary of Historic Drilling and Test Pitting Programs

Date	Area	Investigation Type	Installations	Laboratory/In-Situ Testing	Reference
December 2001	South of Marine Laydown Area	6 offshore drill holes	-	Indicator testing (PSD[6], water contents, Atterberg Limits)	Nishi-Khon/SNC Lavalin 2001
August 2010	Goose Lake Airstrip	4 test pits	-	Indicator testing (PSD, water contents), Proctor Compaction	SRK (2010)
December 2011	Goose Lake Airstrip	11 drill holes in airstrip area	1 thermistor	Indicator testing, Proctor Compaction, triaxial shear strength testing	SRK (2011a)
April to August 2013[1]	Goose Property, George Property, MLA	34 drill holes at Goose Property (4 at airstrip, 4 at Goose Property[2], 4 at plant site[3], 21 in tailings area[4]); 67 hand-dug test pits (31 at Goose Property, 28 at George Property, 8 at MLA)	9 thermistors at Goose Property (4 at airstrip, 1 at plant site, 4 at tailings area)	Indicator testing	Knight Piésold (2013)
March to April, June 2015[5]	Goose Property, MLA	36 drill holes at Goose Property (3 at plant site, 9 water management holes, 3 at other planned infrastructure locations, 1 under Llama Lake, 20 at TSF); 11 drill holes at MLA (spread across the Freight and Fuel Storage, Camp, and Laydown Areas); 4 hand-dug test pits at in the MLA Fuel Storage Area	10 thermistors at the TSF	Indicator testing (PSD[6], water content, specific gravity, atterberg limits, in-situ density), pore water salinity, direct simple shear, consolidation, concrete aggregate, groundwater quality	SRK (2015a) SRK (2015b)

Source: FEIS Appendix V2-7C, Table 3

1) Program was completed in support of pre-feasibility study (PFS) to educate engineering design and was based on the mine plan at that time
2) Goose Main pit rim has changed slightly in the FS mine plan from the PFS mine plan
3) The plant site is in a different location in the FS mine plan than in the PFS mine plan
4) The tailings impoundment area (TIA) was a ring-dyke facility in the PFS mine plan and has been superceded by the FS tailings storage facility (TSF), a valley-fill facility with a Main TSF Containment Dam and small South TSF Dam far to the south of the original TIA in the FS mine plan
5) Program was completed in support of feasibility study (FS) to educate engineering design and was based on the FS mine plan
6) Particle Size Distribution (PSD).

Geotechnical and geochemical analysis was completed utilizing the above field collected data and this analysis generated the following relevant geotechnical and geochemical reports submitted and made available through the environmental assessment phase:

- FEIS Appendix V2-7C: Site-Wide Geotechnical Parameters Report
- FEIS Appendix V2-7D: Geochemical Characterization Report
  - Lithological Descriptions (FEIS Appendix V2-7D, Attachment A)
  - Overburden, Quarry, Other Excavation Area, and MLA Results (FEIS Appendix V2-7D, Attachment C)
  - Mineralogy Results for Waste Rock (FEIS Appendix V2-7D, Attachment D)
  - Trace Element Results for Waste Rock (FEIS Appendix V2-7D, Attachment E)
  - ABA Results for Waste Rock (FEIS Appendix V2-7D, Attachment F)
  - NAG Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment G)

- Humidity Cell Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment H)
- Field Barrel Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment I)
- Trace Element Analyses for Tailings (FEIS Appendix V2-7D, Attachment J)
- ABA Results for Tailings (FEIS Appendix V2-7D, Attachment K)
- Humidity Cell Test Results for Tailings (FEIS Appendix V2-7D, Attachment L)
- Process Water Quality and Aging Test Results for Tailings (FEIS Appendix V2-7D, Attachment M)
- Compilation of Regional Data (FEIS Appendix V2-7D, Attachment N)

During the FEIS Final Hearing, Sabina jointly submitted two commitments with KIA for further geochemical characterization of both tailings and waste rock (FA-KIA-C3 and FA-KIA-C4, respectively):

Sabina committed to:

- Provide the results of the blast hole cutting sampling and testing program along with other geochemical monitoring results in an annual monitoring report. For at least the first annual report, Sabina will engage a geochemical specialist to review the results and evaluate whether further changes in the monitoring or management activities is required. If such a recommendation is made, Sabina will update the WRMP accordingly. Regardless of whether such a recommendation is made, the WRMP will be updated at the time of water licence renewal.
- Test a mixture of tailings and treatment sludges to evaluate the potential for remobilization of arsenic from this material. Tests will be conducted as sludges are produced. Sabina commits to provide their proposed testing method to the KIA for review and approval prior to initiating these tests, and will provide the results of the testing in the annual monitoring report that will be submitted as part of the water licence requirements.

During the FEIS Final Hearing, KIA stated that, in consideration of the above commitments, they had no outstanding issues.

The results of the geochemical characterization completed for the Project to date are summarized as follows.

Overburden

Preliminary geochemical characterization was completed on overburden from MLA and the Goose Property in 2015. The results indicate that overburden samples from the Goose Property and the MLA have a negligible potential for ML/ARD.

Quarry Rock

Preliminary geochemical characterization was completed in 2014 on surface outcrop samples and in 2015 on near surface bedrock samples (2015) representing quarry rock that will be excavated during construction of the MLA Fuel Storage Area. These samples were described as weathered quartzite conglomerate and quartz arenite/quartzite (sandstone). The test results showed that these materials have a negligible potential for ML/ARD.

Waste Rock

Geochemical characterization has shown that all of the deposits at the Goose Property contain both PAG and NPAG waste rock. Under neutral pH conditions, some leaching of metals is expected from the PAG and NPAG waste rock. Over time, if the PAG waste rock is exposed to air and water, acidic conditions are expected to develop, resulting in increased concentrations of metals. Testing shows that this PAG material will take at least a decade to oxidize and produce ARD. The relative quantities of PAG and NPAG waste rock vary by deposit; overall, 65% of the waste rock in-situ is NPAG and 35% is PAG. However, due to operational recovery estimates and conservative waste segregation practices, 58% will be identified as PAG with the remainder (42%) being NPAG.

The waste rock management strategy for the Project is to segregate the PAG and NPAG waste rock, and to encapsulate and freeze the PAG rock under a 5-metre cover of NPAG rock. This will minimize the potential for discharge of water to the receiving environment that might exceed water quality objectives. Water and load balance modelling (Appendix E-2) has confirmed that the waste load associated with neutral ML from exposed NPAG waste rock would be low enough to ensure environmental compliance.

Tailings

Tailings geochemical characterization confirms that, with the exception of some samples from the Goose Main deposit, tailings are PAG, albeit with very slow reaction rates (Appendix E-3). All tailings samples exhibit some level of metal leaching. Therefore, tailings will be managed to prevent acid rock drainage and manage metal leaching. If needed during Operations, process water will be treated prior to discharge to the environment. Further details on water treatment can be found in the WMP (SD-05).

Water Quality Estimates

Results from the geochemical characterization program were used to estimate the chemistry of process water, and seepage and runoff that will be directly in contact with the WRSAs, ore stockpiles, pads, exposed pit walls, and exposed tailings, prior to dilution from local runoff in undisturbed areas of the catchments. The results were a key input to the water and load balance (Appendix E-2) used to predict discharge and receiving water quality from the Project, and inform the development of appropriate management plans.

Updated Kinetic Testing Results

Since submission of the FEIS, Sabina has continued to operate 19 humidity cell tests on waste rock and 2 humidity cell tests on tailings. Sabina may complete an updated report on the results and interpretation of the humidity cell tests, and at that time would include a discussion on forms of neutralization potential (NP) present in these rocks. Should that occur, this analysis will be provided to the regulators.

Geotechnical Characterization

During the environmental assessment phase, Sabina committed to further geotechnical characterization, specifically, to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program was to include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. Sabina will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process (FA-INAC-C4) (refer to the Tailings Management Plan [SD-09], Section 4.2.3).

5.4.4 Climate Change

During the FEIS Final Hearing, Sabina committed to revise the Closure and Reclamation Plan to include an adaptive management component that documents proposed monitoring and mitigation measures to ensure long-term containment of the TSF and WRSAs. The revised plan will include detail on the triggers for implementing alternative mitigation options, and will be submitted to the NWB during the water licence application process (FA-INAC-T-1). Triggers have been outlined in FEIS Addendum Volume 4, Appendix V4-3D and Appendix V4-3E; these measures will be integrated into the plans at least 60 days prior to Operations.

Sabina would like to highlight the extensive waste rock and tailings characterization, design, and closure information that was submitted, and made available through the environmental assessment phase. Specifically, the following supporting documents, Information Requests, and Technical Comments were included:

- FEIS Appendix V2-4A: Waste Management Multiple Accounts Analysis Report
- FEIS Appendix V2-7A: Hydrogeological Characterization and Modeling Report
  - Appendix B: Goose Property Talik Thermal Modeling
- FEIS Appendix V2-7C: Site Wide Geotechnical Properties Report
- FEIS Appendix V2-7D: Geochemical Characterization Report
- FEIS Appendix V2-7E: WRSA Design Report
  - Attachment A: Waste Rock Storage Area Thermal Modeling
- FEIS Appendix V2-7G: Tailings Management System Design Report
  - Appendix G: TSF Containment Dam Thermal Modeling
- FEIS Appendix V2-7H: Water and Load Balance Report
- FEIS Appendix V4-3C: Climate Change Approach Memo
- FEIS Appendix V4-3B: Climate Change Predictions
- FEIS Volume 10: Management Plans
  - Chapter 10, Site Water Monitoring and Management Plan
  - Chapter 9, Mine Waste Rock Management Plan
  - Chapter 22, Tailings Management Plan
  - Chapter 29, Mine Closure and Reclamation Plan
- FEIS Information Request Responses (February 2016)
  - F-INAC-IR-4: Tailings Management System Containment Dam Thermal Modeling
  - F-INAC-IR-7: Waste Rock Storage Areas Management Design
  - F-NRCAN-IR-1: Thermal conditions in the Tailings Storage Facility
  - F-GN-IR-2: Tailings Management and Climate Change Modelling
- FEIS Technical Comment Responses (March 2016)
  - F-INAC-TC-7: TMS Thermal Modeling Thawing n-Factor
  - F-INAC-TC-8: TMS Containment Dam Long-Term Thermal Modeling
  - F-INAC-TC-9: Waste Rock Storage Areas Management Design Long-Term
  - F-NRCAN-TC-3: Permafrost and Terrain Stability: Design of Tailing Storage Facility (TSF) - Thermal Conditions

- F-NRCAN-TC-4: Permafrost and Terrain Stability: Design of Tailings Storage Facility and Waste Rock Storage Area - Cover Thickness

Sabina's objectives for mine closure include the following (FEIS Volume 10, Chapter 29, Section 1.7):

- Design the mine for closure, through the identification of processes and forces that may act upon the mine components after the mine closure and reclamation so that they can be factored into the design and operation of the mine.
- Mine components that will remain after mine closure will be constructed or modified at closure to be physically stable.
- Mine components, including wastes, remaining after mine closure will be chemically stable.
- All practical efforts will be made to ensure that Project components that remain after closure will not require long-term active care.
- Reclamation will consider future use and aesthetics, and the site will be compatible with the surrounding lands once reclamation activities have been completed.

With a focus on these objectives, Sabina developed an approach to climate change (FEIS Appendix V4-3C), and a detailed description of the climate change projections and model variations on which this approach was founded (FEIS Appendix V4-3B).

To further mitigate concerns related to climate change, Sabina commissioned an additional review of this topic by Maritz Rykaart, PhD, PEng, Practise Lead and Principal Consultant (Geotechnical) with SRK, *Back River Project: Considering Climate Change in Tailings Storage Facility and Waste Rock Storage Areas Closure Strategy* (SRK Memo; FEIS Addendum Appendix V4-3D), and a third party peer review of SRK's methodology by Janya Kelly, PhD, Air Quality and Climate Change Specialist and Sean Capstick, PEng, Principal with Golder Associates, *Climate Change Peer Review of Back River Project Waste Rock and Tailings Closure Strategy* (the Golder Memo; FEIS Addendum Appendix V4-3E); both of these documents were appended to the FEIS addendum.

A summary of the key points discussed in both of these documents is provided below:

Best Practices in Arctic Cover Design

Based on the uncertainty associated with future projected climate change, the freezing conditions required for the proposed cover design is difficult to be guaranteed post closure. To address this concern, the proposed cover designs were compared to the cover designs of other mine sites in the Canadian Arctic, including their consideration of climate change, to demonstrate that best practices were being followed.

Freeze encapsulation covers are a well-established practice in northern Canada. These covers have been effectively implemented, or are proposed to be implemented, at least at eight other mines in Nunavut and the Northwest Territories, all of which have taken climate change into consideration.

- Nanisivik Mine, NU
- Mary River Project, NU
- Meadowbank, NU
- Ekati, NWT
- Diavik, NWT

- Snap Lake, NWT
- High Lake, NU (Proposed)
- Meliadine, NU (Proposed)

For a detailed benchmarking of the closure strategies used at these mines compared to the proposed strategy for the Project, see the SRK Memo, Section 4.4.

Through detailed benchmarking, the Project's proposed cover thickness was found to be the thickest compared to cover designs for existing Canadian Arctic mine sites. Based on this assessment, including support by a thermal modelling assessment, the SRK Memo states that any seasonal thawing proposed to take place under current and future projected climate conditions would be contained within the currently proposed 5m cover. With the seasonal thaw taking place within the cover, all intentionally encapsulated materials will remain frozen year round.

Monitoring Program to Observe Freezing Conditions

As part of the ongoing adaptive management plan, performance monitoring will be conducted to measure freeze encapsulation of the cover during Operations and through Closure. This cumulative monitoring will span 21 years and is sufficient monitoring time to inform the decision of whether the freeze encapsulation design needs to be modified or if an alternate mitigation strategy needs to be adopted (SRK Memo, Section 5.1).

This monitoring, along with the most recent projections of future climate change available, will inform whether the freeze encapsulation cover design requires modification through periodic updates to the thermal analysis modelling. Uncertainty is addressed both through the comparison to other existing Arctic mine sites, through the collection of thermal data that would be submitted with annual reports, and through the periodic updates to thermal analysis modelling incorporating the most up to date climate change projections available.

This process will be reviewed annually by an independent, appropriately qualified engineer. If the results deviate substantially from the expected freeze-back monitoring predictions, the variance will be investigated, and if appropriate, the closure strategy will be reviewed and discussed with regulators (SRK Memo, Section 5.3). This is a new, unsolicited commitment not previously stated in the FEIS, the technical review phase, nor the FEIS Final Hearing. This new commitment is meant to add further confidence for the Board that Sabina will ensure adequate monitoring is completed and adaptive management employed.

Mitigation Strategies in the Adaptive Management Plan

The focus of Sabina's adaptive management plan is on determining whether the freeze encapsulation cover design will be robust enough to maintain freezing conditions post-closure under the range of future climate projections, and on the steps to take if freezing conditions are unable to be maintained post-closure. A robust list of mitigation strategies is proposed based on existing strategies in place at other Canadian Arctic mines.

The primary strategy is to increase the cover thickness based on field measurements collected and updated thermal analysis modelling, assuming there is sufficient cover material on-site if required. If sufficient material is not available, the storage areas may be consolidated to reduce the need for cover material.

The remaining mitigation strategies involve changing the type of cover considered (water and low infiltration geomembrane) or water treatment. Water treatment would treat the surface

drainage and localized seasonal subsurface flow within the active layer emanating from the mine waste facilities.

While the proposed mitigation strategies are less sensitive to a changing climate, the cover designs will still be informed by future climate projections where appropriate, helping to address uncertainty.

Requirements for Additional Mitigation Strategies
Based on Sabina's adaptive management plan, the Project addresses the viability of maintaining freezing conditions post-closure and the uncertainty associated with climate change projections. In addition, as part of demonstrating best practices, the Project provides comparisons to existing Arctic mine sites where the proposed strategies are currently employed.

As part of the closure plan review process, under the NWB, the appropriate regulating agencies will have the opportunity to review the final closure strategy, including the comparison of the modelling and monitoring used to inform the requirement for additional mitigation strategies. There will be opportunity at this point to further refine any requirements for mitigation and what mitigation strategies are being considered. Separate to the closure plan review process, Sabina will internally review the modelling and monitoring data on a periodic basis.

Using an adaptive management approach, with regularly collected site data and the most current climate change modelling, Sabina is confident that we can continue to employ industry leading practices and implement appropriate mitigation measures should site conditions change in the future.

For additional information, refer to the Climate and Meteorology assessment (FEIS Volume 4, Chapter 3) and FHR-NIRB-4.2(A) – Effects of Climate Change on Tailings and Waste Rock Storage During Closure.

5.4.5 Tailings Storage Facility Design

During the DEIS technical review, following a request from the KIA, the TSF was moved off of IOL and on to Crown land; this TSF relocation remained within the PDA. In 2015, DFO requested additional fisheries baseline data be collected at the new proposed TSF location. Sabina honoured this request, and collected this additional baseline data in 2015; this data was provided in the FEIS Information Request Package (F-DFO-IR-1). Since the DFO request in 2015, no requests for additional baseline data have been made specific to the area of the proposed TSF.

Sabina would like to highlight the extensive TSF analysis and design that was submitted to the NIRB, and made available through the environmental assessment phase; the 16 documents provided with the FEIS are summarized below:

- FEIS Appendix V2-7E: WRSA Design Report
  - WRSA Thermal Modeling Memo (FEIS Appendix V2-7E, Attachment A)
  - WRSA Stability Analysis (FEIS Appendix V2-7E, Attachment B)
- Waste Management Multiple Accounts Analysis (Sabina 2016a)
- FEIS Appendix V2-7G: Tailings Management System Design Report
  - 2010 National Building Code Seismic Hazard Calculation (FEIS Appendix V2-7G, Appendix A)
  - Tailings Physical Characteristics Memo (FEIS Appendix V2-7G, Appendix B)
  - TSF Tailings Deposition Plan Memo (Appendix V2-7G, Appendix C)

  - TSF Containment Dam Wave Run-up and Freeboard Assessment Memo (FEIS Appendix V2-7G, Appendix D)
  - TSF Containment Dan – Seepage Rate through the Liner Memo (FEIS Appendix V2-7G, Appendix E)
  - TSF Dam Stability Analysis Memo (FEIS Appendix V2-7G, Appendix F)
  - TSF Containment Dam Thermal Modeling Memo (FEIS Appendix V2-7G, Appendix G)
  - Tailings Consolidation Modeling Memo (FEIS Appendix V2-7G, Appendix H)
  - TSF Containment Dam Geotechnical Monitoring Instrumentation Memo (FEIS Appendix V2-7G, Appendix I)

- FEIS Appendix V2-7H: Water and Load Balance Report
- FEIS Appendix V2-7I: Side-Wide Water Management Report

During the FEIS Final Hearing, Sabina made the following commitments for additional analysis and design related to the TSF:

- Sabina has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. Sabina will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process (FA-INAC-C4).
- Sabina commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process (FA-INAC-C5).

During the FEIS Final Hearing, it was the opinion of INAC that Sabina's commitment to undertake an infill geotechnical characterization program (FA-INAC-C4) resolved the agency's concerns, and that Sabina's measures were appropriate and INAC had no outstanding issues.

Sabina has gone through an extensive effort to develop a comprehensive and transparent public consultation and engagement program. This program has provided regular opportunities for local residents to learn about the Project and voice Project-related concerns. Likewise, plans for Project tailings disposal have been reviewed with community members on a number of occasions. Sabina utilized industry and northern best practices to develop its public consultation and engagement program, and has received very positive feedback on its approach from community and government representatives, regulators, and other Project stakeholders to-date. For example, as stated above, the TSF was relocated at the request of the landowner off of IOL and on to Crown land even though this was economically less favourable to Sabina.

Sabina also actively worked to collect and incorporate regional and Project-specific TK throughout the FEIS. In some instances, topics related to tailings management and climate change were discussed during this TK work.

5.4.6 Winter Ice Road Alignment

In response to TK and a request by the KIA, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones identified during two local focus group workshops (Cambridge Bay Hunter Focus Group 2012; Kugluktuk Hunter Focus Group 2012). This request was made during review of the DEIS and was captured, and honoured, in a commitment (KIA-5 from PHC Report). As a result, Sabina realigned a 5.5 km section of the winter road alignment away from the area identified. This realignment resulted in the winter road falling outside of the LSA, but 5.3 km (96%) of this relocated alignment is located on lakes. As such approximately 200 m of the 160 km WIR will need to be assessed for vegetation prior to construction (see below commitment). Air photos and remote sensed images were used to perform a table top assessment of the area. The minor deviation of the winter road alignment outside of the LSA is not expected to change the evaluation of effects nor the identification of potential effects for any of the terrestrial wildlife Valued Ecosystem Components.

Also during the review, the KIA expressed concern that Sabina would place significant fill material on the over land portions of the winter road alignment, in a similar nature as has been done with the Tibbitt to Contwoyto Ice Road in the Northwest Territories. As has been clearly stated by Sabina throughout the review, we believe the WIR can be constructed with snow and ice only. However, should minor amounts of granular fill be required, Sabina will ensure proper vegetation, archeology, and other terrestrial based assessments are completed prior to any work being completed. It should be noted that vegetation and archeological assessments have already been completed for the entire alignment with the exception of the 200 m mentioned above. Sabina will seek appropriate authorization from the KIA and/or INAC prior to use.

6. Mine Plan Overview

6.1 SUMMARY OF OPERATION ACTIVITIES (BY PROJECT PHASE)

Mine development activities will occur in four phases: Mobilization and Construction, Operations, and Closure, with additional monitoring and mitigation continuing into Post-Closure. Mobilization and Construction activities may be preceded by Development works.

Development works is defined as any construction activities as defined in Section 1.5 but specific to activities allowed under the provision of the Nunavut Agreement Article 13, Section 13.5.5 or the NWNSRTA. This phase will commence after receipt of the NIRB Final Hearing Report on the FEIS or earlier (if possible), the (new or amended) Type B Water Licence from the NWB, and the land use permits from the KIA and INAC where needed.

Mobilization and Construction is defined as any activities undertaken for the purposes of establishing or constructing components, infrastructure, and facilities required for development of a mine. Full mine site construction will commence following receipt of a Type A Water Licence from the NWB and Land Use Permit from the KIA. Construction is proposed to take approximately four years (Phase 1).

Operations is defined as the period that the Process Plant is operating and producing a commodity (i.e., gold). The mine is expected to operate for 10 years. During the mine start-up, this will include a 12-month commissioning period planned for Q4 of Y-1 to Q4 of Y1. Operations at the Project (Years 1 to 10) focus on the economic recovery of gold and delivery to market. Other activities during Operations will include ongoing exploration supported by the Project Infrastructure and ongoing progressive reclamation. Operations, Phase 2, is divided into three Stages as determined by the active tailings management facility and will occur from Year 1 to Year 10.

- Phase 2, Stage 1 – TSF – For the first two years of Operations (Years 1 and 2), a purpose-built TSF will be utilized;
- Phase 2, Stage 2 – Umwelt TF – From Years 2 to 6, the mined-out Umwelt Pit will be used for tailings deposition; and
- Phase 2, Stage 3 – Goose Main TF – From Year 6 onward, tailings will be disposed of in the mined-out Goose Main open pit mine (Goose Main Pit).

Closure (Abandonment, Reclamation, and Closure) **and Post-Closure** is defined as an Operator ceasing operations at a facility without the intent of resuming mining activities. The expectation will be that the site will be reclaimed and post-closure monitoring will continue until it can be demonstrated that the mine site is both chemically and physically stable. Closure is expected to take eight years consisting of two stages:

- Phase 3, Stage 1 (Active Closure) - Approximately two years to complete and entails the bulk of the physical closure activities.
- Phase 3, Stage 2 (Passive Closure) - Approximately six years of water treatment followed by final decommissioning of the remaining elements of the Property.

A minimum of five years of Post-Closure monitoring will follow the above phases of mine closure during which confirmation monitoring will occur. The expectation will be that the site will be reclaimed and

Post-Closure monitoring will continue until it can be demonstrated that the mine site is both chemically and physically stable.

6.2 PROJECT LIFE AND MINE LIFE

The life of the Project, from Mobilization and Construction to Post-Closure, is 27 years (Table 6.2-1). It is expected that Mobilization and Construction activities could begin as early as 2017/2018. The Operations Phase is expected to continue for 10 years, based on the mine plan proposed. Sabina will continue exploration activities in the area and further discoveries may extend the mine Operations Phase. Mobilization and Construction activities may be proceeded by development activities.

Table 6.2-1. Life of Mine

Phase Name	Activities	Duration	Project Year
Mobilization and Construction	Mobilization, earthworks, facilities, equipment, mine development	4 years	-4 to -1
Operations	Mining, processing, progressive reclamation	10 years	1 to 10
Closure	Deconstruction, decommissioning, reclamation, WRSA closure, water treatment	8 years[1]	10 to 18
Post-Closure	Monitoring of water quality, geotechnical, terrestrial and aquatic effects	5 years[1]	18 to 23

1) years do not sum due to rounding

The available mineral reserves will ultimately be exhausted, whereupon the mine will enter the Closure Phase. During this phase, which is expected to last approximately eight years, the mine, equipment, and infrastructure will be decommissioned and the site will be returned to a stable condition having no significant effect on the environment. Post-Closure monitoring will be conducted for a period of approximately five years to ensure the area remains both chemically and physically stable.

6.3 MINE DEVELOPMENT

The mine plan consists of open pit mining and underground mining at four deposits, supporting a 6,000 tpd milling operation over an estimated 10-year mine life. The four deposits are as follows:

- Umwelt (Umwelt Pit and Umwelt U/G);
- Llama (Llama Pit and Llama U/G);
- Goose Main (Goose Main Pit and Goose Main U/G); and
- Echo (Echo Pit and Echo U/G).

A summary of Project phases and stages is presented in Table 6.3-1. Key mine development and water management activities, and sequence can be found in Table 6.3-2, which summarizes the key aspects of the mining operation for the Goose Property. The layout of the Goose Property is presented in Appendix A, base Figure 3.

Table 6.3-1. Project Phases and Stages

FEIS/WL	Project Year	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Phase	1: Construction				2: Operations										3: Closure								4: Post-Closure				
	Stage/Active Tailings Facility					1: TSF			2: Umwelt TF				3: Goose Main TF			1: Active			2: Passive									
Mining[1]	Umwelt Open Pit																											
	Llama Open Pit																											
	Goose Main Open Pit																											
	Echo Open Pit																											
	Umwelt U/G																											
	Llama U/G																											
	Goose U/G																											
	Echo U/G																											
	Other Sources[3]																											
Waste Rock Placement	Construction & TSF																											
	Umwelt WRSA																											
	Llama WRSA																											
	TSF WRSA																											
	Echo WRSA																											
Water Treatment	Llama Lake [TSS, As]																											
	Umwelt Lake [TSS]																											
	Goose Main TF [TSS, As, Cu][2]												*year-round*							*open-water season*								
Dewater	Llama Lake [50%/50%]																											
	Umwelt Lake [100%]																											
Saline Water Pond	Umwelt Lake																											
Saline Water Pond Discharge	Llama U/G																											
	Llama Reservoir																											
	Goose Main U/G & Umwelt U/G																											
Passive Flooding	Umwelt TF																											
	Llama Reservoir (Meromictic)																											
	Goose Main TF																											
	Echo Open Pit																											
	Umwelt Lake																											

1) Lighter red on undergrounds denotes Development in advance of Production.
2) TSS = total suspended solids, As = arsenic, Cu = copper.
3) Other Sources are not 43-101 compliant reserves.

Table 6.3-2. Summary of Goose Property Mining Operations

General	
Umwelt Pit (Year -2 to 2)	Pit Footprint: 161,800 m^2 Maximum Pit Dimensions: 550 m x 330 m Maximum Depth: 135 m below ground surface Pit limits do not impact waterbodies. Segregation of PAG and NPAG waste rock in WRSA adjacent to Umwelt Pit – see following section, "Waste Rock Management". Open pit will be backfilled with processed tailings and water.
Llama Pit (Year 1 to 3)	Pit Footprint: 129,700 m^2 Maximum Pit Dimensions: 500 m x 300 m Maximum Depth: 135 m below ground surface Pit limits impinge on Llama Lake. Llama Lake must be isolated and drained for mine workings. Dewatering to be finished in Year -1. Llama Lake will store saline water into Closure and be recharged with freshwater on surface. Segregation of PAG and NPAG waste rock in WRSA adjacent to Llama open pit – see following section, "Waste Rock Management". At closure, mined out open pit is allowed to fill with water from adjacent stream/waterbodies.
Goose Main Pit (Year 2 to 6)	Pit Footprint: 237,400 m^2 Maximum Pit Dimensions: 700 m x 300 m Maximum Depth: 150 m below ground surface Pit limits impinge on an inflow stream to Goose Lake. This watercourse will be diverted upstream of the pit to flow around the pit and reconnect with the same Goose inflow waterbody. Segregation of PAG and NPAG waste in WRSA areas south to Goose Main Pit and on top of TSF – see following section, "Waste Rock Management". Open pit will be backfilled with processed tailings and water.
Echo Pit (Year 4 to 5)	Pit Footprint: 32,900 m^2 Maximum Pit Dimensions: 260 m x 120 m Maximum Depth: 45 m below ground surface Pit limits impinge on an inflow stream to Goose Lake. This watercourse will be diverted upstream of the pit to flow around the pit and reconnect with the same Goose inflow waterbody. Segregation of PAG and NPAG waste in WRSA adjacent to Echo Pit – see following section, "Waste Rock Management". At closure, mined out open pit is allowed to fill with water from adjacent stream/waterbodies.
Umwelt Underground (Year 2 to 10) Method: Post pillar cut and fill	Decline/Ramp: portal located at surface next to Umwelt Pit Mine Workings: trend downward ~30° from horizontal for ~1000m southeast of the Umwelt Pit Maximum Depth: 650 m below ground surface No segregation of PAG and NPAG waste rock from underground development; all underground development waste rock will be used as backfill to fill mined out stopes – see following section, "Waste Rock Management".
Llama Underground (Year 1 to 4) Method: Drift and fill	Decline/Ramp: portal located at surface next to Llama Open Pit Mine Workings: trend downward ~30° from horizontal for ~500 m southeast of the Llama Open Pit Maximum Depth: 380 m below ground surface No segregation of PAG and NPAG waste rock from underground development; all underground development waste rock will be used as backfill to fill mined out stopes – see following section, "Waste Rock Management".

(continued)

Table 6.3-2. Summary of Goose Property Mining Operations (continued)

General *(cont'd)*		
Goose Main Underground (Year 5 to 9)	Decline/Ramp: portal located at surface next to Goose Main Pit Mine Workings: to a planned depth of ~200 m located directly below the Goose Main Pit Maximum Depth: 390 m below ground surface	
Method: Drift and fill	No segregation of PAG and NPAG waste rock from underground development; all underground development waste rock will be used as backfill to fill mined out stopes – see following section, "Waste Rock Management".	
Echo Underground (Year 6 to 9)	Decline/Ramp: portal located at surface next to Echo Pit Mine Workings: trend downward ~60° from horizontal for ~350 m southeast of the Echo Pit Maximum Depth: 325 m below ground surface	
Method: Longitudinal open stoping	No segregation of PAG and NPAG waste rock from underground development; all underground development waste rock will be used as backfill to fill mined out stopes – see following section, "Waste Rock Management".	
Run of Mine (ROM) Ore Stockpile and Primary Crushing Facilities		
ROM Stockpile	Ore Stockpile maximum capacity of 3.5 Mt in area of crushing/milling facilities. The ROM Ore Stockpile will be subdivided as follows: low grade stockpile maximum 2.0 Mt; medium grade stockpile maximum 0.7 Mt; and high grade stockpile maximum 0.4 Mt (maximums do not occur concurrently).	
Primary Crushing	Located at Process Plant site with 6,000 tpd capacity Size: 4-inch (120 mm) minus	
Waste Rock Management		
Umwelt Waste Rock Storage Area (WRSA)	Footprint = 394,800 m^2 Umwelt Waste Rock: • PAG Rock: 11,607 kt • NPAG Rock: 3,390 kt	Segregation of PAG and NPAG waste rock; stockpile adjacent to Umwelt Pit. A 5 m buffer of NPAG will be placed around and on PAG during and after construction to accommodate freeze back. Some waste rock from the open pits will be repurposed and reclaimed for use as backfill for Umwelt, Llama, Goose Main, and Echo underground workings.
Llama WRSA	Footprint = 375,500 m^2 Llama Waste Rock: • PAG Rock: 10,546 kt • NPAG Rock: 5,459 kt	Segregation of PAG and NPAG waste rock; stockpile adjacent to Llama open pit. A 5 m buffer of NPAG will be placed around and on PAG during and after construction to accommodate freeze back. Some waste rock from the open pits will be repurposed and reclaimed for use as backfill for Umwelt, Llama, Goose Main, and Echo underground workings.
TSF WRSA	Footprint = 1,751,900 m^2 Goose Main Waste Rock: • PAG Rock: 10,685 kt • NPAG Rock: 17,527 kt	Segregation of PAG and NPAG waste rock; stockpile adjacent to and on TSF. A 5 m buffer of NPAG will be placed around and on PAG during Operations. Some waste rock from the open pits will be repurposed and reclaimed for use as backfill for Umwelt, Llama, Goose Main, and Echo underground workings.
Echo WRSA	Footprint = 13,800 m^2 Echo Waste Rock total: 122 kt	Segregation of PAG and NPAG waste rock; stockpile adjacent to Echo Pit. A 5 m buffer of NPAG will be placed around and on PAG during and after construction to accommodate freeze back. Some waste rock from the open pits will be repurposed and reclaimed for use as backfill for Umwelt, Llama, Goose Main, and Echo underground workings.

(continued)

Table 6.3-2. Summary of Goose Property Mining Operations (completed)

Progressive Reclamation	
Progressive Reclamation	Progressive reclamation comprises the activities executed during the Construction and Operations phases. Such activities can be undertaken as material becomes available. Among other opportunities, the large reclamation efforts will be focused on any final earthworks including: • Open Pits; • Establish partial or full boulder fences around open pits and TSF; • Install proper signage around mine openings and TSF; • Construct open pit spillways; • WRSAs; • Buildings and infrastructure will be removed as they become unnecessary during the LOM and the sites will be reclaimed as much as practicable; • Contaminated Materials and Waste Disposal; • Contaminations of soil, snow, and ice will be cleaned up immediately following the spill. Soil will be remediated and disposed of on-site in accordance with Spill Contingency Plan (SD-17); and • Hazardous wastes will be shipped off-site periodically to minimize the amount of waste requiring removal at closure.
Site Water Management Features for the Goose Property	
Drainage from mine workings	Most open pits will be in permafrost throughout their depth, except for pits that are influenced by local lake taliks. Most undergrounds will reach below the basal permafrost. Groundwater can be expected from open pits that are influenced by local lake taliks and from undergrounds that extend below the basal permafrost at depth. Groundwater inflows into the underground mines below the permafrost are estimated as follows: Umwelt at 550 m^3/day, Llama at 350 m^3/day, and Goose Main at 80 m^3/day. Short term peak inflows of 1,000 m^3/day may be encountered. Water seepage into the underground workings will be pumped to the surface for collection in the Saline Water Pond or other temporary reservoir. Water seepage from the open pits will be directed to the current tailings facility via pipe or truck for reuse.
Drainage from WRSAs and open pits	Collection/diversion channels and ponds will be established around waste rock storage areas. Runoff directed to open pits or directly to current tailings facility. Open pit water will be transported to the current tailings facility via pipe or trucked for reuse in milling process.
Tailings Storage Facility	No discharge during Operations, and controlled release during Closure. Consolidated tailings contain 49% solids (by weight). Tailings Storage Facility is lined on upstream berm face with geosynthetic clay liner with ROM NPAG material to protect the liner from freeze/thaw action.
Drainage from Ore Stockpile	Runoff directed to collection/diversion network will be collected and pumped or trucked to current tailings facility.
Milling & Processing	Water from the TSF will be reclaimed and reused, however, make-up water is required due to losses of water entrapped in tailings. This water will be sourced from Goose Lake.
Sewage Treatment	Treated effluent will be discharged to the receiving environment during Construction and Closure. Directed to the current tailings facility as make-up water during Operations.
Maintenance buildings	Oily water treatment units and treated water is recycled for use in the maintenance shop. Discharge, when required, is directed to the current tailings facility during Operations. Oil will be collected and either burned in an approved waste-heat generator or drummed and removed from site as hazardous waste.
AN Facility	No discharge of waste water from the AN facility. Explosive truck wash water treated in an evaporator.
General site drainage	Site drainage designed to: • contain potentially contaminated runoff; and • divert non-contact catchment water from mine facilities.

6.3.1 Resources and Reserves

AMC have categorized the Back River grade estimates as a combination of Measured, Indicated, and Inferred resources in accordance with the criteria set out in the Canadian NI 43-101. The Measured,

Indicated, and Inferred resources currently reported for the Llama, Umwelt, Goose Main, Echo, and George deposits are summarized in Table 6.3-3. Sabina's mineral tenures are discussed in Section 4.2.

Table 6.3-3. Back River Project Resource Estimates (October 2014)

Deposit	Tonnes (kt)	Au (g/t)	Metal (koz Au)
Measured			
Goose Main Pit	4,478	4.32	621
Goose Main U/G	110	6.24	22
Llama Pit	1,874	5.86	353
Llama U/G	110	5.72	20
Umwelt Pit	3,699	6.07	722
Umwelt U/G	1.0	9.21	0.3
Total Measured	**10,273**	**5.27**	**1,740**
Indicated			
Goose Main Pit	2,877	4.19	388
Goose Main U/G	853	7.32	201
Echo Pit	321	6.07	63
Echo U/G	596	6.17	118
Llama Pit	821	6.01	159
Llama U/G	752	8.72	211
Umwelt Pit	1,963	5.38	340
Umwelt U/G	3,387	8.92	972
George Pit	4,321	5.04	700
George U/G	2,079	6.62	443
Total Indicated	**17,969**	**6.22**	**3,593**
Total Measured and Indicated	**28,242**	**5.87**	**5,333**
Inferred			
Goose Main Pit	215	3.20	22
Goose Main U/G	429	6.83	94
Echo Underground	71	5.91	14
Llama U/G	295	6.77	64
Umwelt Pit	121	2.29	9
Umwelt U/G	1,788	11.59	667
George Pit	929	4.75	142
George U/G	3,902	6.69	840
Total Inferred	**7,750**	**7.43**	**1,851**

Notes:
CIM definitions were used for the Mineral Resources.
Open-pit Mineral Resources are constrained by an optimized pit shell at a gold price of US$1,500 /oz gold.
The cut-off grade applied to the open pit Resources is 1.0 g/t gold. The underground cut-off grade is 4.0 g/t gold for all George Mineral Resources (LCP North, LCP South, Locale 1, Locale 2, GH, and Slave), 3.5 g/t gold for Goose Main, Echo and Llama, and 4.5 g/t for the Umwelt deposit.
The George Mineral Resources were estimated within mineral domains expanded to a minimum width of 2 m for the underground Resources.
Drilling results up to December 31, 2013, are included except for Echo (new drilling to July 4, 2014) and Loc1 and Loc2 (new sampling to July 21, 2014).
The George Mineral Resource Estimates are shown for completeness however, the development of George deposits is not currently proposed in the Type A Water Licence Application.
The numbers may not add due to rounding.

To convert Mineral Resources to Mineral Reserves for the Goose Deposits (JDS Mining 2015), extraction design was undertaken, mining cut-off grades (COGs) were employed, mining dilution was added, and mining recovery factors were applied. To calculate the Mineral Reserves for the Property, mining methods and economic viability were determined for each deposit at the Goose Property. The Goose Property mineral reserves are summarized in Table 6.3.4. In addition to the 3,047 thousand ounces in reserves at the Goose deposits, the mine plan that forms the basis of the Water Licence Application assumes 581 thousand ounces of gold production will come from Other Sources (which could include additional ore added to the mine plan by extending the Goose deposits, and or through the addition of other deposits). Other Sources are not 43-101 compliant reserves.

Table 6.3-4. Total Mineral Reserves for the Goose Deposits (as of February 13, 2015)

Area	Classification	Tonnes (kt)	Au (g/t)	Contained Au (koz)
Umwelt Pit	Proven	3,104	6.08	606
	Probable	466	4.45	67
Llama Pit	Proven	1,351	6.20	270
	Probable	122	5.36	21
Goose Main Pit	Proven	3,447	4.37	484
	Probable	873	4.45	125
Echo Pit	Proven			
	Probable	112	4.60	17
Total Open Pit	**Proven**	**7,902**	**5.35**	**1,360**
	Probable	**1,573**	**4.53**	**229**
Umwelt U/G	Proven	2	8.10	1
	Probable	4,462	6.26	898
Llama U/G	Proven	82	7.02	18
	Probable	870	7.67	215
Goose Main U/G	Proven	172	4.81	27
	Probable	1,072	5.80	200
Echo U/G	Proven			
	Probable	592	5.26	100
Total Underground	**Proven**	**256**	**5.54**	**46**
	Probable	**6,997**	**6.28**	**1,413**
Total Goose Deposits	**Proven**	**8,158**	**5.36**	**1,405**
	Probable	**8,570**	**5.96**	**1,642**

Notes for open pit:

A gold price of 1,250 US$/oz is assumed.
An exchange rate of CDN$1.05 to US$1.00 is assumed.
Dilution and recovery factors are applied as per Open Pit mining method.
A COG of 1.39 g/t was used for the Umwelt Pit Mineral Reserve estimate.
A COG of 1.41 g/t was used for the Llama Pit Mineral Reserve estimate.
A COG of 1.37 g/t was used for the Goose Main Pit Mineral Reserve estimate.
A COG of 1.30 g/t was used for the Echo Pit Mineral Reserve estimate.

Notes for underground:

A gold price of 1,250 US$/oz is assumed.
An exchange rate of CDN$1.05 to US$1.00 is assumed.
Dilution and recovery factors are applied as per underground mining method.
A COG of 3.18 g/t was used for the Umwelt U/G Mineral Reserve estimate.
A COG of 3.80 g/t was used for the Llama underground Mineral Reserve estimate.
A COG of 3.77 g/t was used for the Goose Main U/G Mineral Reserve estimate.
A COG of 3.21 g/t was used for the Echo underground Mineral Reserve estimate.

6.3.2 Production Rates

The mine production schedule for the Project deposits incorporates four mineral deposits at the Goose Property (Umwelt, Llama, Goose Main, Echo). The mill feed tonnage will be sourced from a series of open pit and underground mines, and supplemented from low grade (COG to 3 g/t Au), medium grade (3 to 6 g/t Au) and high grade (greater than 6 g/t Au) ore stockpiles. Access to underground mines will be established by declines (or potentially shafts) driven outside of the pit extent to allow flexibility in mine scheduling.

The proposed ore milling rate is 6,000 tpd, which results in a 10-year mine life based on current ore reserves. This production rate provides an acceptable return on investment, and is environmentally and technically the most practical alternative given the information to date.

Financing the 6,000 tpd Project under current market conditions may be challenging for Sabina. As such, lower processing rates have been investigated conceptually at 2,000 tpd and as a feasibility study at 3,000 tpd as alternatives. The latter study yielded favourable economics with a substantially smaller initial capital investment.

Table 6.3-5 shows the 6,000 tpd open pit production schedule; Table 6.3-6 shows the underground mine production schedule; Table 6.3-7 shows the milling and ore stockpile schedule. Cut-off grades are presented in the notes section for each mining area in Table 6.3-3 Resource Estimates (October 2014). Average annual grades are presented in Table 6.3-4.

Table 6.3-5. Open Pit Mine Production Schedule

Description	Unit	Total	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Umwelt														
Waste	kt	19,942	5,376	11,568	2,957	41	0	0	0	0	0	0	0	0
Total Ore	kt	3,570	340	1,603	1,561	67	0	0	0	0	0	0	0	0
Average grade	g/t	5.86	4.70	5.18	6.68	8.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SR	w:o	5.59	15.82	7.22	1.89	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Material	kt	23,512	5,716	13,170	4,518	108	0	0	0	0	0	0	0	0
Llama														
Waste	kt	16,005	0	0	7,587	7,694	724	0	0	0	0	0	0	0
Total Ore	kt	1,473	0	0	110	910	453	0	0	0	0	0	0	0
Average grade	g/t	6.13	0.00	0.00	5.95	5.99	6.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SR	w:o	10.86	0.00	0.00	68.71	8.45	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Material	kt	17,478	0	0	7,698	8,604	1,177	0	0	0	0	0	0	0
Goose Main														
Waste	kt	27,111	0	0	0	3,514	11,307	9,508	2,770	11	0	0	0	0
Total Ore	kt	4,320	0	0	0	90	1,130	1,885	1,195	21	0	0	0	0
Average grade	g/t	4.38	0.00	0.00	0.00	5.18	4.28	4.38	4.37	7.45	0.00	0.00	0.00	0.00
SR	w:o	6.27	0.00	0.00	0.00	39.01	10.01	5.04	2.32	0.54	0.00	0.00	0.00	0.00
Total Material	kt	31,431	0	0	0	3,604	12,437	11,393	3,965	32	0	0	0	0
Echo														
Waste	kt	1,224	0	0	0	0	0	949	275	0	0	0	0	0
Total Ore	kt	112	0	0	0	0	0	45	67	0	0	0	0	0
Average grade	g/t	4.60	0.00	0.00	0.00	0.00	0.00	4.64	4.56	0.00	0.00	0.00	0.00	0.00
SR	w:o	10.92	0.00	0.00	0.00	0.00	0.00	20.90	4.12	0.00	0.00	0.00	0.00	0.00
Total Material	kt	1,336	0	0	0	0	0	994	342	0	0	0	0	0

(continued)

Table 6.3-5. Open Pit Mine Production Schedule (completed)

Description	Unit	Total	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Other Sources[1]														
Waste	kt	12,872	0	0	0	0	0	0	2,056	7,189	1,749	909	969	0
Total Ore	kt	1,289	0	0	0	0	0	0	57	678	261	73	220	0
Average grade	g/t	5.11	0.00	0.00	0.00	0.00	0.00	0.00	6.37	5.50	5.07	4.16	3.97	0.00
SR	w:o	9.99	0.00	0.00	0.00	0.00	0.00	0.00	36.04	10.61	6.71	12.45	4.40	0.00
Total Material	kt	14,160	0	0	0	0	0	0	2,113	7,866	2,010	982	1,189	0
Open Pit Summary														
Total Waste	kt	77,153	5,376	11,568	10,545	11,249	12,031	10,457	5,101	7,200	1,749	909	969	0
OP ore	kt	10,765	340	1,603	1,672	1,067	1,582	1,931	1,318	698	261	73	220	0
OP grade	g/t	5.20	4.70	5.18	6.64	6.10	4.91	4.38	4.47	5.56	5.07	4.16	3.97	0.00
Strip Ratio	w:o	7.17	15.82	7.22	6.31	10.54	7.60	5.42	3.87	10.31	6.71	12.45	4.40	0.00
Total Material	kt	87,918	5,716	13,170	12,216	12,315	13,613	12,388	6,420	7,898	2,010	982	1,189	0

1) Other Sources are not 43-101 compliant reserves.
Source: Modified from JDS 2015

Table 6.3-6. Underground Mine Production Schedule

Description	Unit	Total	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Umwelt UG														
Total Ore	kt	4,464	0	0	0	386	584	584	584	584	584	565	502	92
Average grade	g/t	6.26	0.00	0.00	0.00	5.38	7.55	7.00	6.15	6.22	6.13	5.93	5.52	5.13
Llama UG														
Total Ore	kt	952	0	0	282	231	310	130	0	0	0	0	0	0
Average grade	g/t	7.61	0.00	0.00	6.82	7.92	8.73	6.12	0.00	0.00	0.00	0.00	0.00	0.00
Goose Main UG														
Total Ore	kt	1,244	0	0	0	0	0	0	276	346	302	264	55	0
Average grade	g/t	5.66	0.00	0.00	0.00	0.00	0.00	0.00	4.89	5.14	5.33	7.71	4.85	0.00
Echo UG														
Total Ore	kt	592	0	0	0	0	0	0	0	137	204	185	66	0
Average grade	g/t	5.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.32	5.39	5.15	5.02	0.00
Other Sources UG[1]														
Total Ore	kt	1,775	0	0	0	0	0	0	0	0	453	659	542	121
Average grade	g/t	6.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.92	7.26	6.17	5.59
Underground Summary														
UG ore	kt	9,028	0	0	282	617	894	714	860	1,067	1,544	1,673	1,165	212
UG grade	g/t	6.30	0.00	0.00	6.82	6.33	7.96	6.84	5.75	5.75	5.81	6.65	5.76	5.39
UG Au	ounces	1,827,739	0	0	61,750	125,505	228,782	156,837	158,939	197,311	288,368	357,556	215,925	36,766

1) Other Sources are not 43-101 compliant reserves.
Source: Modified from JDS 2015

Table 6.3-7. Life of Mine Mill Feed and Stockpile Schedule

Description		Total	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Mill Feed Blender														
Total Mill feed from mine	kt	15,924		183	1,284	1,441	2,190	2,190	1,960	1,765	1,804	1,746	1,149	212
	g/t	6.23		9.60	8.64	6.89	6.54	5.69	5.31	5.67	5.70	6.54	5.54	5.39
	koz	3,190		56	357	320	461	401	335	322	331	367	205	37
	%	93.4%		92.0%	91.8%	91.6%	93.0%	94.0%	94.1%	94.0%	94.0%	94.0%	94.0%	93.7%
Total Mill feed from stockpile	kt	3,868		36	633	749			230	425	386	444	494	473
	g/t	3.52		9.29	7.39	4.03			1.97	1.97	1.97	1.97	1.97	3.58
	koz	438		11	150	97			15	27	24	28	31	54
	%	92.7%		92.0%	92.0%	92.0%			93.1%	93.1%	93.1%	93.1%	93.1%	93.3%
Total Mill Feed														
Process ore	kt	19,793		219	1,916	2,190	2,190	2,190	2,190	2,190	2,190	2,190	1,643	685
Process grade	g/t	5.70		9.55	8.23	5.92	6.54	5.69	4.96	4.96	5.05	5.62	4.47	4.14
Process Au	koz	3,628		67	507	417	461	401	349	349	355	395	236	91
Process Recovery	%	93.3		92.0	91.8	91.7	93.0	94.0	94.0	93.8	93.9	93.8	93.7	93.4
Stockpile														
BALANCE														
HG ore stockpile	kt		93	404									18	
MG ore stockpile	kt		123	700	749								219	
LG ore stockpile	kt		124	620	1,012	1,255	1,541	1,995	1,984	1,559	1,173	730	236	0
Stockpile	kt		340	1,724	1,761	1,255	1,541	1,995	1,984	1,559	1,173	730	473	0

Source: Modified from JDS 2015

6.3.2.1 Mining Sequence

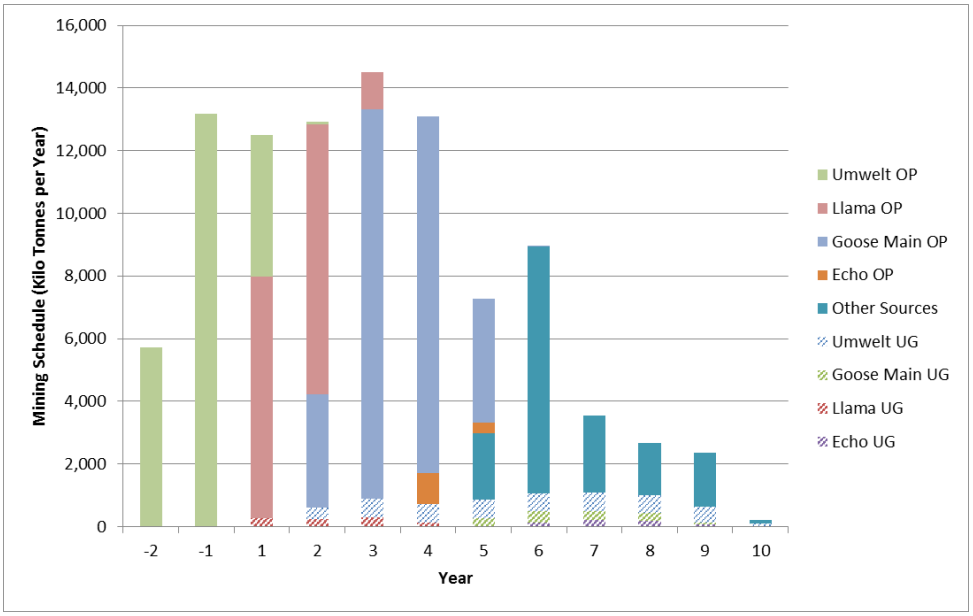
The mine plan reflects an estimated 10-year operating mine life based on currently identified ore reserves, with a total ore feed of 19.8 Mt to a single Process Plant at the Goose Property. Continued and concurrent exploration may extend beyond the projected mine life. Any significant increases to the Project may trigger a subsequent Environmental Assessment process or permitting requirements, or renegotiation of the IIBA.

The Project includes several mineral deposits: Umwelt, Llama, Echo, and Goose Main at the Goose Property. Ore will be mined using conventional open pit and underground methods and trucked to the Process Plant. Waste rock will be stored in several designated WRSAs on the surface or backfilled in mined out workings. Tailings from the Process Plant will first be stored in a TSF located near the Process Plant and then backfilled in mined out open pits.

Mining will begin with pre-stripping at the Umwelt Pit in Year -2 (i.e., during Construction). Open pit mining will then transition sequentially to the Llama, Goose Main, and Echo pits. All open pit mining at the Goose Property concludes in Year 6 when mining in the Goose Main Pit is complete. Underground ore production will begin at Llama in Year 1 and then transition to Umwelt, Goose Main, and Echo underground mines. When Llama UG production ceases at the end of Year 4, Goose Main UG starts producing, followed by Echo UG in Year 6. Umwelt UG, beginning in Year 2, will continue until Year 10. In addition to the ore identified from the Goose Deposits, it is assumed that the Process Plant will be fed ore from other sources (which could include additional ore added to the mine plan by extending the Goose deposits, and or through the addition of other deposits). Other Sources are not 43-101 compliant reserves. Figure 6.3-1 shows an annual overview of mine production by deposit.

Low-, medium-, and high-grade ore stockpiles will be established at the Goose Plant Site. An estimated mill feed and stockpile balance schedule is shown in Table 6.3-7. Refer to Tables 6.3-5 and 6.3-6 for the mining production schedules. More detail on ore management can be found in the Ore Storage Management Plan (SD-07).

Figure 6.3-1. Mine Production Schedule by Deposit



Other Sources are not 43-101 compliant reserves.
Modified from JDS 2015.

6.3.3 Open Pit Mining, Design and Infrastructure

A conventional load-haul (also known as truck and shovel) mining method was selected for all open pits included in the mining schedule. Bench height in the final pit design is 20 m for all pits. During the working stages, the waste areas will be drilled, blasted, and loaded using 10 m benches. In order to achieve the planned selectivity, 5 m benches will be used when the operation is at or near the ore zones. It is also expected that, as the knowledge of the ore body increases, certain ore zones will be recovered on 10 m benches without compromising the selectivity.

6.3.3.1 Open Pit Mining Infrastructure

Pit infrastructure will be minimal and limited to dewatering, communications, and diesel powered lighting equipment. No electrification is required. The only major structures will be the mine maintenance facilities located near the Process Plant. These maintenance facilities will include truck, tire, and welding and light vehicle shops. Explosives facilities include the AN Facility for the storage and dispensing of ammonium nitrate, and explosives magazines for the storage of packaged explosives and detonators.

Design details for water management related infrastructure including seepage and runoff control from open pits is provided in the Water Management System Design Report (see Appendix F-1).

6.3.3.2 Geotechnical Considerations and Pit Slope Stability

For the open-pit design, a series of stability analyses were carried out, including 2D numerical modelling and kinematic analyses. Ground stability was evaluated using 3D geological models along with available rock mass data and observations from on-site field work. Each deposit was divided into geomechanical domains based predominantly on modelled lithology. Potential hazards associated with structure, such as faults, low angle of rock-to-pit-wall intersection angles, and low quality zones were identified in some pit walls. In the absence of major structure, most walls show very low likelihood of instability due to the strong rock mass and relatively small pit size.

The pit slope design recommendations are presented in Table 6.3-8, which shows the recommended design maximum (or minimum) values, and those adopted for the design. Due to the generally good rock mass quality and relatively shallow depth of the pits, the approach has been to limit the bench height to 20 m and steepen bench face angles while providing sufficient berm widths to contain structurally controlled failure. The design assumes that final pit walls will include pre-split blasting to reduce blasting effects on final pit wall stability.

Table 6.3-8. Pit Slope Design Recommendations

Component		Design Value
Overburden	Overall Slope Angle	24°
	Berm Width	5 m
	Bench Height	10 m
Rock	Overall Slope Angle	37°- 55°
	Bench Face Angle	55°- 75°
	Inter Ramp Angle	42°- 55°
	Road Width	20 m
	Berm Width	8.6 m – 10 m
	Final Bench Height	20 m

Overburden material thickness is expected to average 6 to 10 m for the open pits, with a maximum thickness of 20 m at the Goose Main Pit. Thawing of frozen overburden could result in slumping and local bench-scale failures. To account for this, overburden will be designed at a maximum bench width of 5 m and maximum bench height of 10 m, giving an overall overburden slope angle of 24°. Consistent with the requirements of a Type A Water Licence, Sabina will be required to annually engage a third party geotechnical engineer to undertake inspection of all earthworks including, but not limited to, open pit, WRSAs, TFs, roads, and dams.

6.3.3.3 Open Pit Design

Detailed mine designs were undertaken on all four proposed open pits. The high-level pit shapes are shown in Table 6.3-9. Plan views of each open pit design are shown in Figures 6.3-2 to 6.3-5.

Table 6.3-9. Open Pit Dimensions

Open Pit	Length (m)	Width (m)	Depth (m)
Umwelt	550	330	135
Llama	500	300	135
Goose Main	700	300	150
Echo	260	120	45

Source: JDS 2015

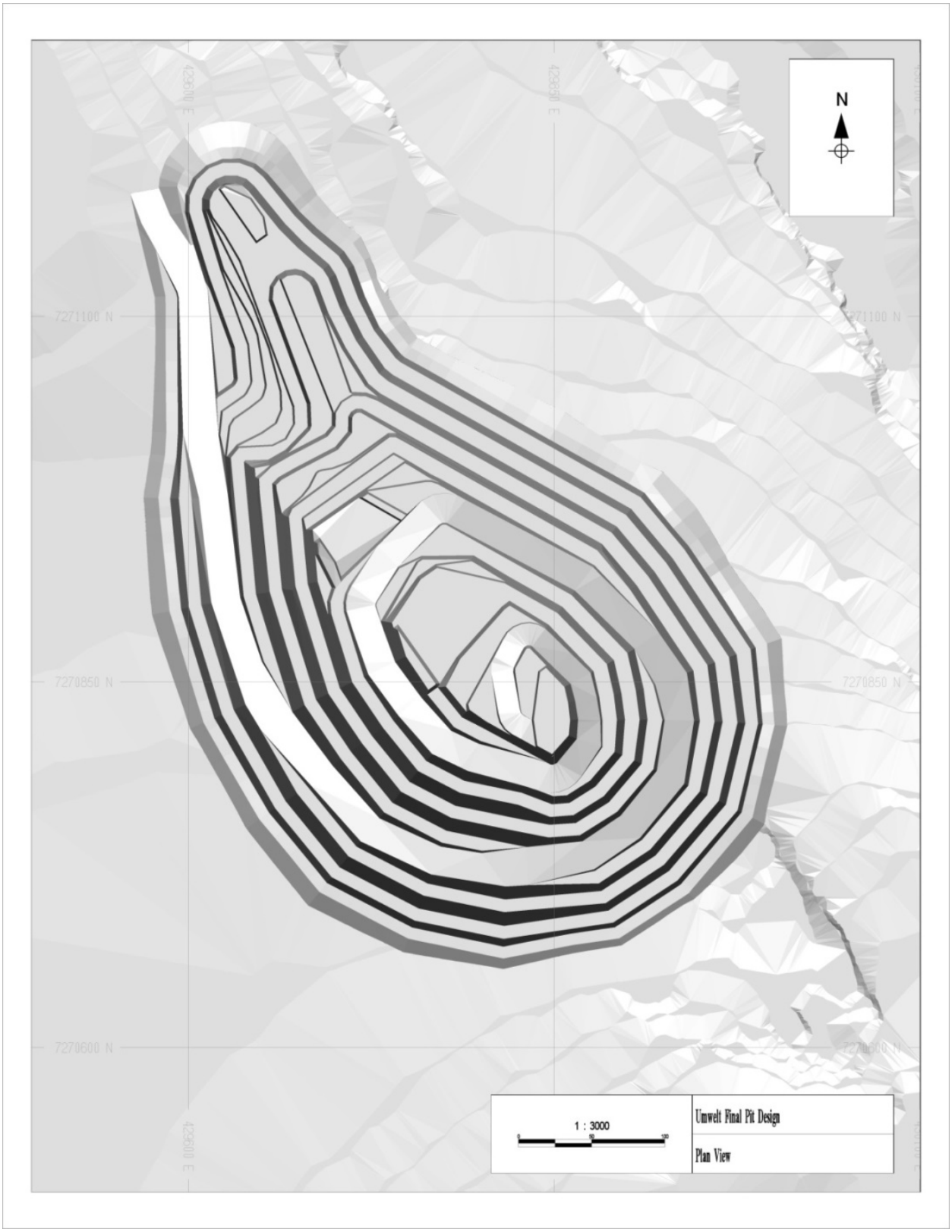
Recommendations for slope angles, based on analyses of geomechanical and hydrogeological conditions, as described in Section 6.3.3.2, were incorporated into detailed design. The general design parameters used in the various detailed pit and phase designs, including the geomechanical data described previously, are presented in Table 6.3-10.

Table 6.3-10. Pit Design Parameters

Description	Value
Ultimate Pit Design Parameters - All pits	
Bench Height (Rock)	5 m (single bench)
Final Configuration	20 m (quadruple bench)
Bench Height (Overburden)	10 m
Bench Face Angle	55°- 75°
Bench width	8.6 m - 10 m
Inter-ramp wall angle (IRA)	42°-55°
Ramp Width - double lane	20 m
Ramp width -single lane	15 m
Overall slope angle (OSA)	37°- 55°
Main Haul Road Parameters	
Reference Truck Width	5 m
Total Width for Two Lanes[1]	20 m
Maximum Ramp Gradient[1]	10%

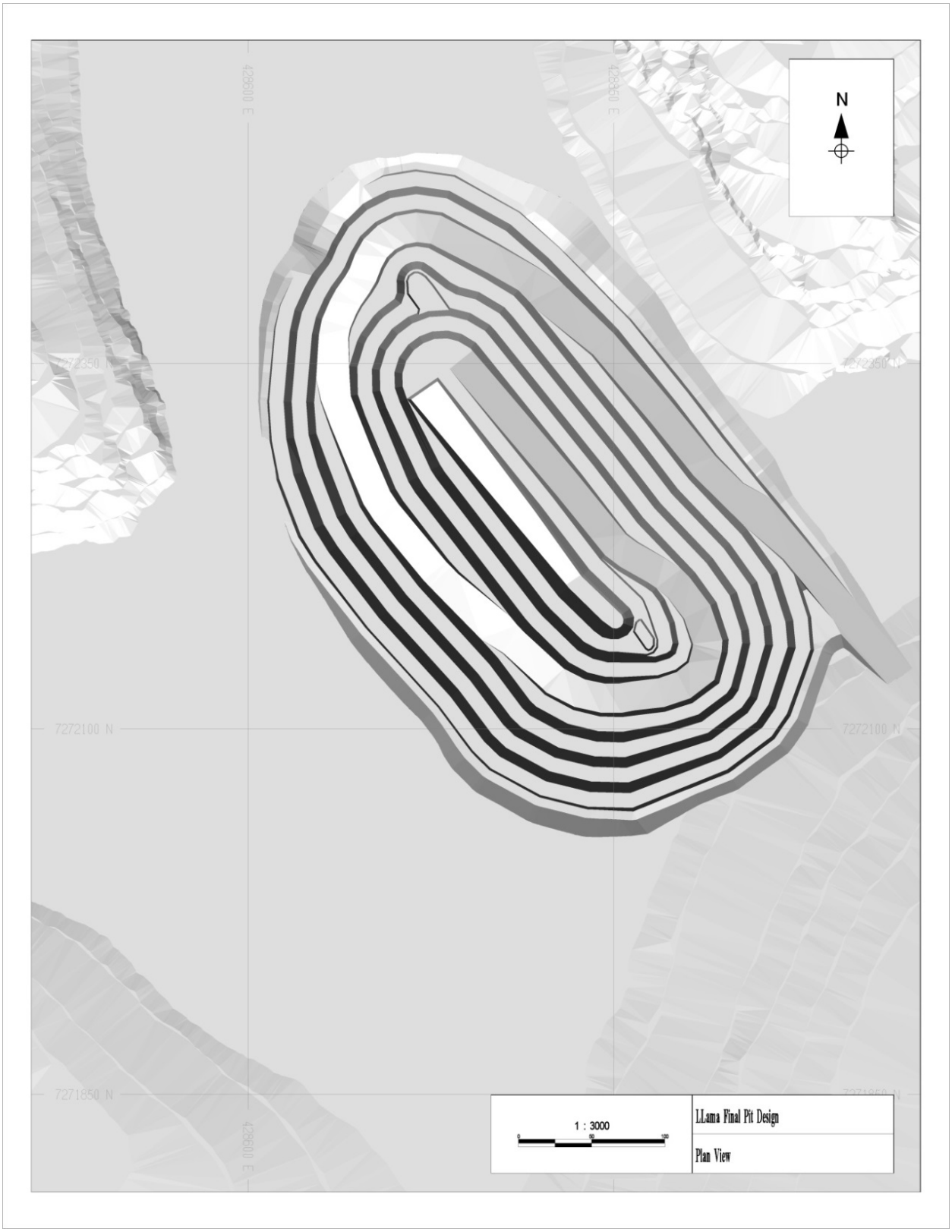
1) Pit ramp widths may be reduced from 20 m (two lane) to 15 m (single lane) and maximum grade may increase to 12% as the ramp approaches pit bottom to increase ore recovery.

Figure 6.3-2. Umwelt Pit Design



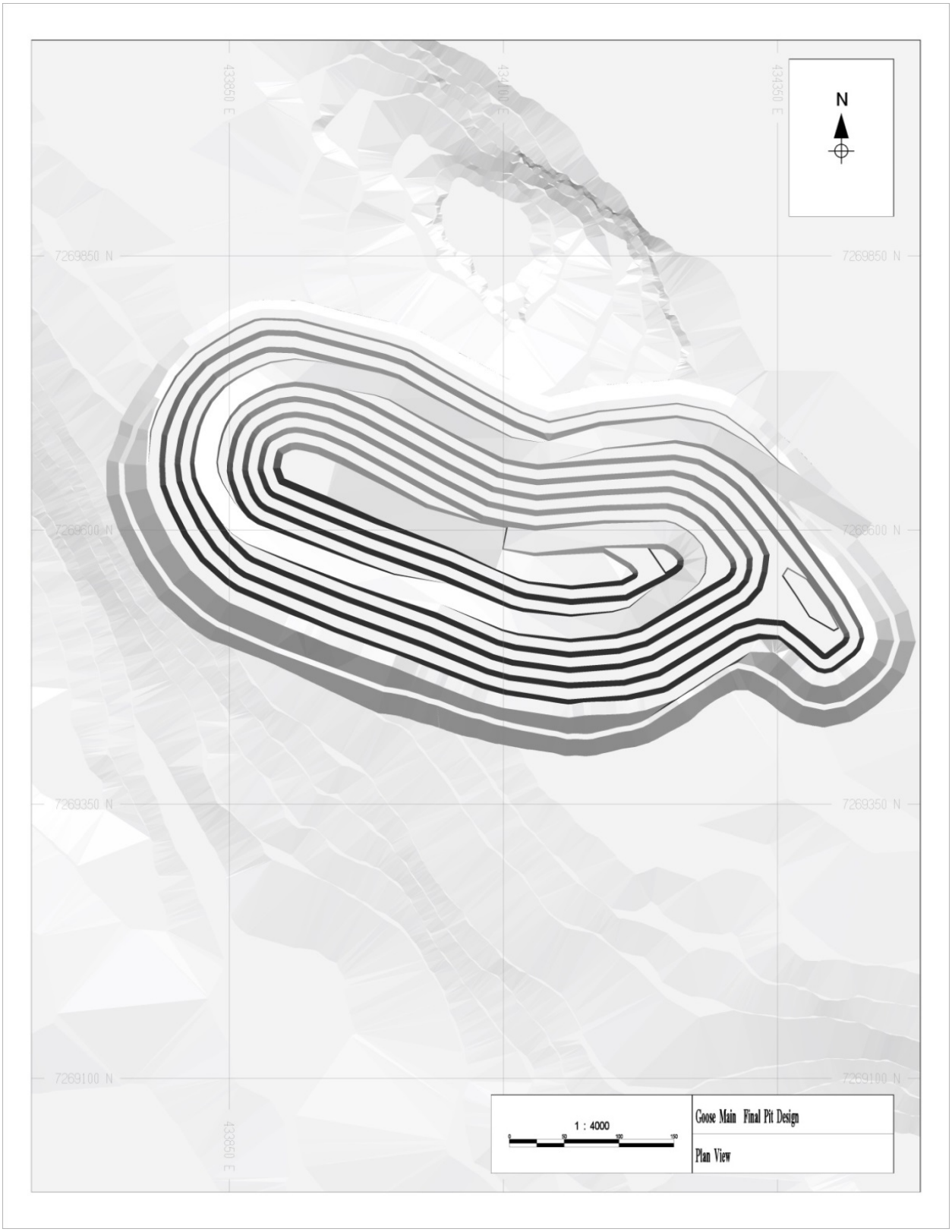
Source: JDS 2015

Figure 6.3-3. Llama Pit Design



Source: JDS 2015

Figure 6.3-4. Goose Main Pit Design



Source: JDS 2015

Figure 6.3-5. Echo Pit Design

Source: JDS 2015

6.3.3.4 Unit Operations and Equipment

A summary of the open pit mining unit operations and equipment are as follows:

Drilling: production drill is planned to be performed on 10m benches (selective mining of 5 m benches is also planned) using 250 mm diameter holes. Wall control and pre-splitting holes will be drilled using 115 mm holes.

Blasting: conventional blasting will be performed with ANFO and pre-splitting explosives. Based on the results of geomechanical and hydrogeological work, water-resistant explosives are not anticipated to be required. The estimated powder factors and column charges are 0.26 kg/t and 372 kg, respectively for both ore and waste (JDS 2015). Smaller charges may be required initially at the Goose Main Pit due to its proximity to fish spawning habitat in Goose Lake.

Loading: primary loading is planned to be performed by diesel-powered front shovels with a 7 m^3 bucket. A wheel loader with a 7-m^3 bucket and a 4-m^3 excavator would be used for secondary loading, rehandle and shovel support.

Hauling: Primary haulage is planned to be with 64-t payload haul trucks (CAT 775G or equivalent).

Support Equipment: standard wheel dozers, water trucks, motor graders, and track dozers are included in the mining plan.

Dewatering and water management associated with open pits is addressed in Section 6.3.3.6. Details of planned dust monitoring and mitigation can be found in Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17). Detailed equipment lists can be found in Section 6.3.5.

6.3.3.5 Hydrogeology

Preliminary groundwater inflow estimates were developed (Appendix F-5) to facilitate the mine design work. These estimates were based on the latest mine plan, hydraulic conductivity estimates, thermistor data, and other field programs. A brief summary is provided in this section.

Table 6.3-11 presents the predicted yearly average inflows for the Umwelt U/G, Llama open pit and underground mines, and the Goose Main underground mine (Goose Main U/G). No inflows are listed for Umwelt Pit, Goose Main Pit, Echo Pit or Echo underground mine (Echo U/G) because these mines are all entirely within permafrost and as such, no groundwater inflows are expected.

Table 6.3-11. Goose Property Groundwater Inflows

Year No.	Inflow [m^3/d]			
	Umwelt Underground	Llama Underground	Llama Open Pit	Goose Main Underground
-2	0	0	0	0
-1	0	168	0	0
1	0	334	120	0
2	89	350	109	0
3	543	264	702	0
4	440	246	Interpolated	0
5	596	0	Interpolated	0
6	498	0	Interpolated	21
7	405	0	Interpolated	85
8	359	0	Interpolated	77
9	329	0	Interpolated	64
10	312	0	Interpolated	0

Highlighted grey cells illustrate underground pre-production development period and blue cells illustrate mining period.

6.3.3.6 Open Pit Water Management and Pit Dewatering during Mining Operation

During Operations, runoff and seepage will occur during the summer period and are not expected to produce large quantities of water. Pit inflow (seepage) is expected at Llama Pit as it overlies an open talik; flows are estimated to average 300 m^3/day, with a maximum of 700 m^3/d. All other pits are developed fully in permafrost, and as such, no other open pits are expected to have significant inflows. Water pooling in the open pits (from surface runoff or snow melt) will be channeled to collection ponds (sumps) within the pit and pumped to the active tailings facility.

Once mining activity has ceased, diversion structures will be breached and the open pits will be allowed to fill with natural drainage. There is a possibility that exposed pit walls could cause a deterioration of pit water quality. Predictions for pit inflow water quality are presented in Water and Load Balance Report (Appendix E-2).

The pit water quality will be monitored until the pit is full. Should monitoring indicate a trend in ARD release, accelerated filling of the pit will be considered.

6.3.4 Underground Mining, Design, and Infrastructure

The Project has four deposits that have the necessary grade, continuity, and tonnage to be considered for underground mining: Umwelt, Llama, Goose Main, and Echo. These deposits are located at the Goose Property.

All of the underground mines will be located below open pits. An open pit/underground crossover review was performed for each deposit to determine the most economic depth of transitioning from open pit to underground mining.

6.3.4.1 Access and Decline Infrastructure

The underground deposits at the Project are planned to be accessed via declines (or potentially shafts) driven from surface typically 4.5 m wide by 5.0 m high at a -15% gradient. The declines or shafts would be used for haulage of ore and waste, and access of personnel, equipment, materials, and services. They are also planned to be used as an exhaust airway. The locations of the decline portals were chosen to ensure environmental offset limits from streams and lakes are maintained.

Underground portals are driven from surface, rather than pit bottom, to provide flexibility in mine scheduling and reduce risk of flooding. Grading of the portal laydown pad or diversion berms will be used if required to prevent runoff entering portals. Runoff from underground laydown pads will be treated as contact water as described in the WMP (SD-05).

To access the ore bodies, level access crosscuts and attack ramps are planned to be developed off the decline at a 4.5 by 5.0 m profile. All infrastructure development which is not planned to be used as an access (i.e., remucks, ventilation drifts, and sumps) were designed at a 4 m by 4 m profile.

Underground access portal locations are shown on the Goose Property layout provided in Appendix A, base Figure 3.

6.3.4.2 Underground Mining Method and Stope Design

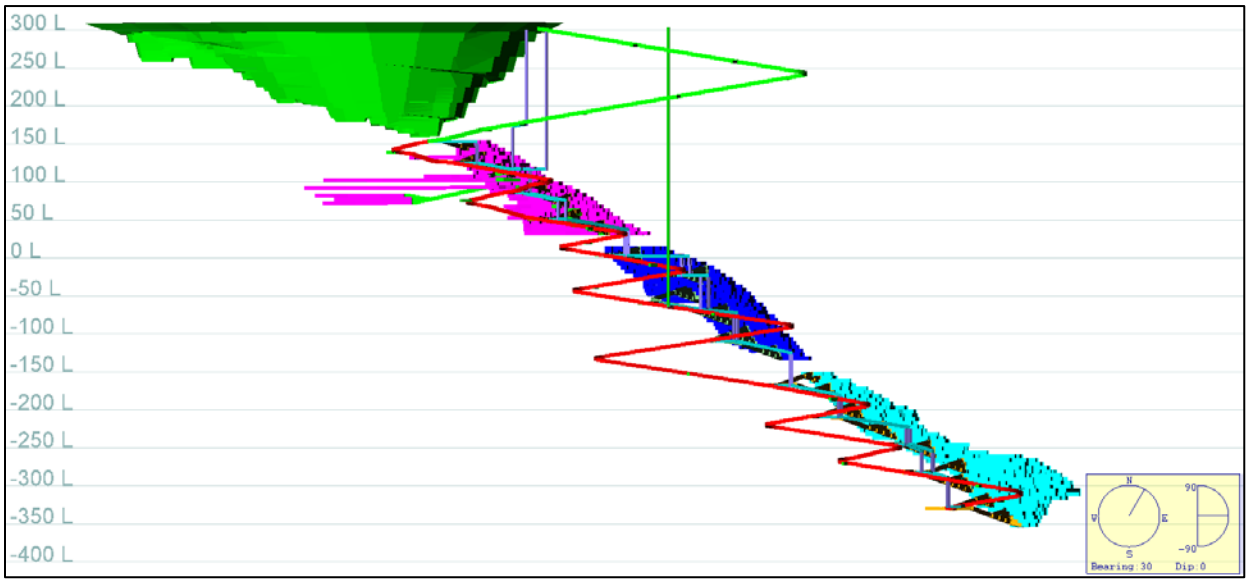
The most suitable underground mining method was selected for each deposit based on the known characteristics, such as grade, dilution, dip, continuity, thickness, etc.

Mining methods involving cemented backfill have been avoided because of the high freight costs to bring such large quantities of cement to the remote site. If future studies prove the economic and technical feasibly of using cemented backfill in select underground mining areas, alternative mining methods will be considered. Uncemented rock fill requires an overhand mining strategy. Sill pillars in ore are required to allow concurrent mining of multiple blocks.

The post pillar cut and fill method was selected for the Umwelt deposit due to its shallow dip. Other bulk mining methods, like long-hole stoping, would create unstable hanging-wall exposures of the weak Middle Mudstone. Post pillar cut and fill mining limits the hanging-wall exposure and allows the installation of ground support. High production rates can be attained with this mining method. Access development at the Umwelt U/G is planned to consist of a decline from surface to 640 m depth. Level access crosscuts are designed to be located every 40 to 50 m vertically and include a remuck and sump on each level. Figure 6.3-6 shows the underground mine design for Umwelt.

All the other deposits at the Property are steeply dipping and could be amenable to longitudinal open stoping methods. Longitudinal open stoping was selected for Echo, which has favourable geotechnical conditions and good continuity within the ore zones.

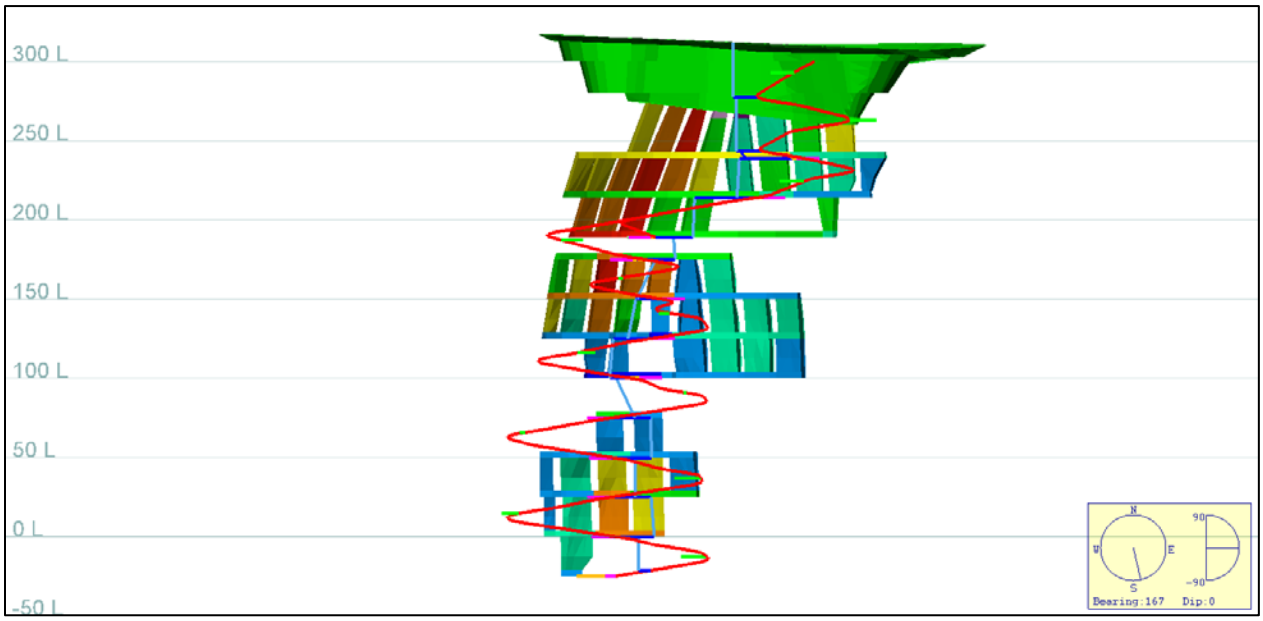
Figure 6.3-6. Umwelt Underground Operation Design (Long Section)



Source: JDS 2015

The decline at Echo is planned to extend from surface to 325 m depth. Twelve levels would be spaced 25 m vertically. Three mining blocks are planned to be separated by two sill pillars. The level accesses are planned to generally connect to the midpoint of each sill drift. Sill drifts would follow the ore zone, providing top and bottom access to the stopes. Figure 6.3-7 shows the underground mine design for Echo.

Figure 6.3-7. Echo Underground Operation Design (Long Section)

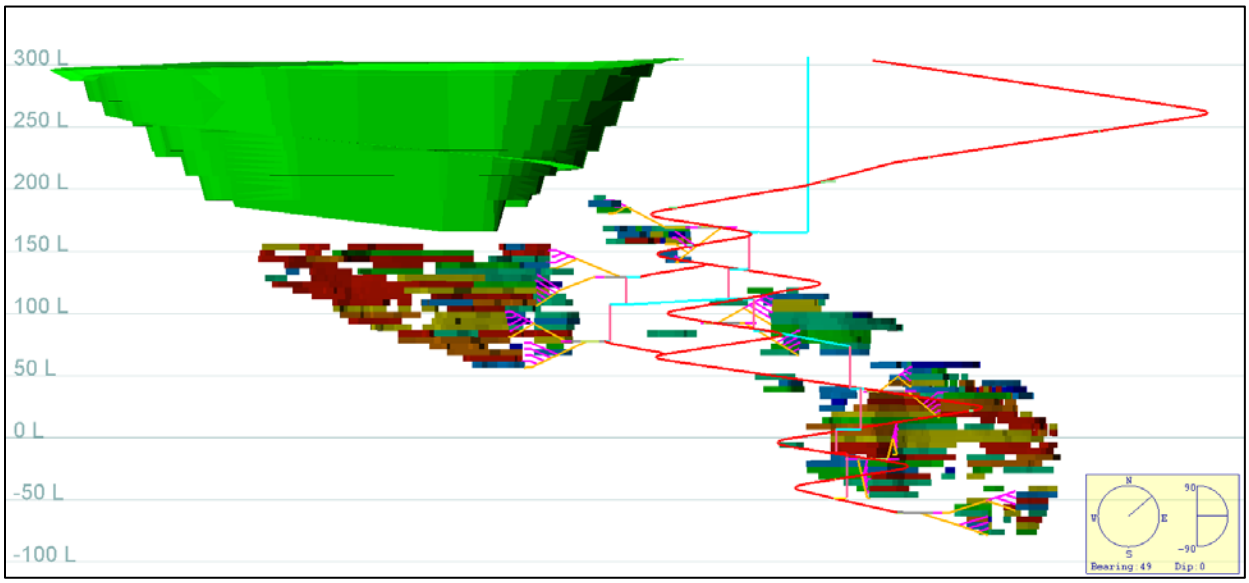


Source: JDS 2015

At Llama and Goose Main, drift and fill (DF) mining was chosen instead of longitudinal open stoping with consideration to geotechnical conditions which may cause excessive hanging-wall dilution from the Middle Mudstone, and due to the irregular geometry of the mineralization.

The Llama deposit is designed to be accessed by decline from surface to 365 m depth. The access development between decline and orebody would follow the same design criteria as Umwelt. Seven access levels have been planned. The ventilation circuit would consist of a single FAR, which would be raisebored from surface and drop raised in the lower sections of the mine. Figure 6.3-8 shows the underground mine design for Llama.

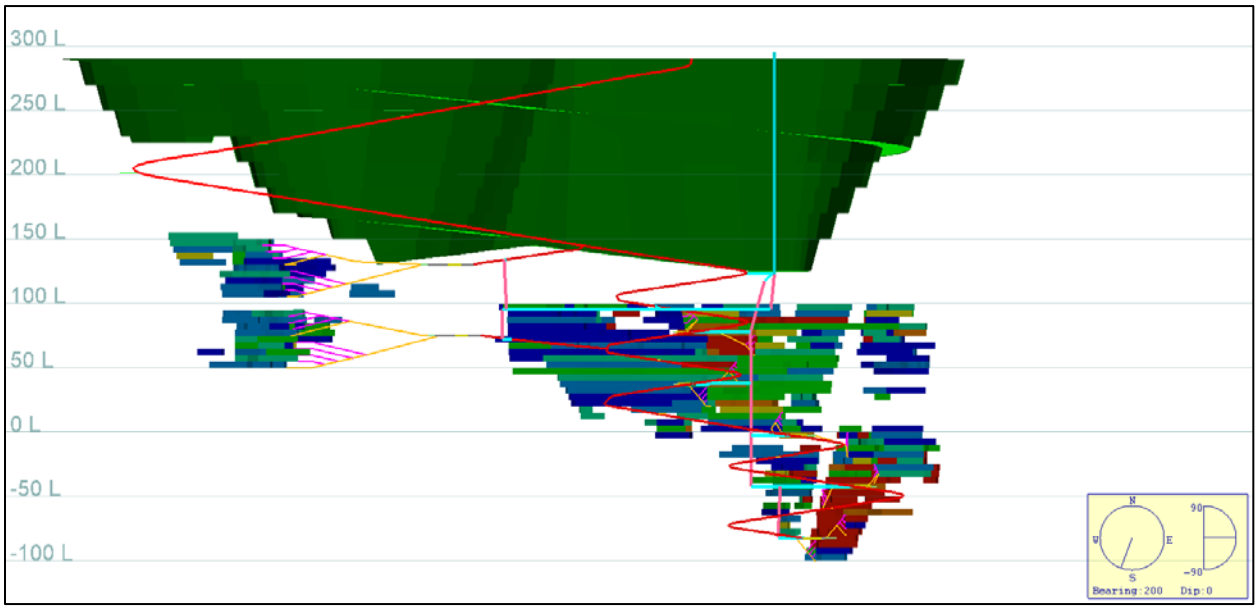
Figure 6.3-8. Llama Underground Operation Design (Long Section)



Source: JDS 2015

Access development at Goose Main is designed to be very similar to Llama with a decline from surface to 375 m depth. There would be seven access crosscuts for mining of multiple parallel ore zones. The ventilation circuit would consist of a single FAR, again developed by a combination of raiseboring and drop raises. The eastern mining block would be ventilated using a 4 m by 4 m ventilation transfer drift. Figure 6.3-9 shows the underground mine design for Goose Main.

Figure 6.3-9. Goose Main Underground Operation Design (Long Section)



Source: JDS 2015

6.3.4.3 Pillar Design

Geotechnical design recommendations were developed for each deposit, based upon the available data and the selected mining methods. This included achievable stope spans, expected mining dilution, sill pillar, rib pillar, and crown pillar dimensions, ground support standards, and access development placement. Underground and open pit designs were completed by taking these recommendations into account (JDS 2015).

Additional detailed information on select engineering areas (underground and open pit mine design, cut/fill slope design, MLA design, and road and airstrip design) may be found in Sabina's Feasibility Study (June 22, 2015) located on the SEDAR website (http://www.sedar.com/).

6.3.4.4 Waste Rock and Backfilling

The selected underground mining methods require backfill to maintain ground stability and to provide a work base for the equipment on the next cut above. The primary source for backfill material is planned to be development waste from the underground mines. At each underground operation, there will be a net shortage of backfill material. The shortfall will be made up by utilizing PAG waste rock from the open pit operations. Using waste rock for backfilling would reduce the surface environmental impact, since PAG material would be permanently stored underground. Unconsolidated waste rock is planned to be used to eliminate costs for cement.

During pre-production, underground waste rock is planned to be hauled to surface and stored on a temporary backfill stockpile on the laydown pad close to each underground portal. Upon commencement of underground production, development waste would be hauled by the underground trucks directly to the area requiring backfill. When there is no backfill from underground development faces available, the temporary waste stockpile on surface would be used as the backfill source. When all the underground development waste is depleted, open pit haul trucks are planned to transport waste rock from the open pits to the portal stockpile, as required.

6.3.4.5 Underground Mine Ventilation

Ventilation systems for the underground operations are designed to dilute and remove dust, diesel emissions and blasting fumes, and maintain compliance with Nunavut mine regulations. Ventilation networks were modelled in Ventsim software for each underground mine, based on the detailed mine designs.

Airflow requirements for each underground operation were based on the expected diesel emissions of the underground mining fleets. According to Nunavut mining legislation, "the ventilation quantity shall be at least 0.06 m^3/s for each kW of the diesel powered equipment operating at the work site" (*Mine Health and Safety Act*, Section 10.62 (2)).

Mobile equipment lists were compiled for when each mine would be in full production. The power rating of each piece of equipment was determined, and then utilization factors, representing the equipment in use at any time, were applied to estimate the amount of air required. Ventilation losses, ranging from 15 to 20% depending on the complexity of the ventilation network, were applied to determine total ventilation requirements.

Prior to establishing the primary ventilation system, consisting of a fresh air raise and main fan, all the air required for advancing the decline is planned to be supplied by auxiliary ventilation. Steel ducting and fans would be installed to provide at least 38 m^3/s of air to the decline face. Once the first ventilation raise is established, the duct and fans would be stripped out of the decline and reused for development of the next underground operations.

Auxiliary fans are planned to be used to ventilate the advancing development and active production levels. Fans and ducting would be removed on retreat and used again on the next cut, stoping sublevel, or advancing face.

At the underground operations where groundwater inflows are expected, intake air would require heating during the winter months to prevent ice build-up on roadways and in ventilation raises. The deposits that are expected to require mine air heating are Umwelt, Llama, and Goose Main. At these mines, the intake air will be heated to a temperature of approximately + 2°C. The mine air heating system at Umwelt would consist of glycol heat exchangers, using waste heat from the diesel generators at the main Power Plant. Llama and Goose Main would be heated by indirect fired diesel heaters. This approach may also be used for Umwelt. To save on mine air heating costs at Goose Main, mining below the permafrost would be delayed towards the end of the mine life. Goose Main would be only heated during the final year of mining.

Heating calculations based on average site temperatures and modelled intake air flows were used to estimate fuel requirements for mine air heating. At Llama, the expected annual consumption of diesel for mine air heating is 2.26 million litres, and at Goose Main it is estimated at 2.36 million litres.

Echo U/G, which is 100% in permafrost, would not be heated to save capital and operating costs, but would rely instead on a brine system to keep service water from freezing during the winter. Calcium Chloride would be mixed in a brine plant on surface and distributed through service water piping throughout the mine. Arctic mines such as Raglan and Ekati have used brine systems for many years. This approach may be used at the other underground mines if deemed technically and economically preferable.

6.3.4.6 Underground Mine Dewatering

Groundwater inflows are only expected at Umwelt, Llama, and Goose Main U/G mines. Analysis suggests that the -2°C temperature isotherm should be used to delineate the base of permafrost; inflows are anticipated where mine working extend below this isotherm, which correlates to about 320 to 350 mbgs. The average groundwater inflow rates per year are provided in Section 6.3.3.5. In mining areas above the -2°C temperature isotherm, no groundwater inflows are expected.

Mine dewatering must accommodate groundwater inflows in mining areas below the permafrost, as well as inflows from drills and other equipment on all mining elevations. Mine dewatering will be achieved using a combination of submersible and horizontal pumps located throughout the working levels. The pumps will handle mine water via multiple lifts throughout the mine to minimize the pump size and power requirements.

Twin 43 kW submersible pumps are planned to be installed at specific dewatering sumps at 90 m vertical intervals with staged pumping to surface. The second pump at each sump would be used as a backup in case of failure or if peak inflows occur. Drain holes are designed to be utilized in the access crosscut sumps, draining to the closest dewatering sump.

For decline and production development, a face pump will be deployed to pump water to a nearby sump. This sump will transfer water via the raise system to sumps on higher elevations, in a staged configuration, for discharge to surface. Reticulation will be heat-traced, as required.

Management of Saline Water

Due to the depth of the Umwelt, Llama, and Goose Main U/G mine operations, the operations are anticipated to extend below the basal permafrost and intersect the regional groundwater system. Inflow is also expected from Llama open pit as it overlays an open talik. Groundwater inflows to these undergrounds and Llama Pit are anticipated to be saline. This water will be collected and pumped to the Saline Water Pond. During Closure, this water will be pumped into mined-out underground workings, as well as the mined-out Llama Pit to create a meromictic lake in Llama Reservoir.

6.3.4.7 Underground Mine Services

Underground infrastructure includes mine dewatering (discussed in Section 6.3.4.6), compressed air, service water supply, fuelling and vehicle maintenance, and explosives storage (discussed in Section 6.3.4.8).

The underground operations will not include mine-wide compressed air systems and all mobile drilling equipment (including jumbos, bolters, and cable bolters) will be equipped with on-board compressors. Local compressed air will be supplied by portable compressors for activities such as powering mechanized raise climbers, or spot bolting with jacklegs for small rehabilitation work.

Service water for underground is planned to be used mainly for drilling, dust suppression, and washing of development faces. Water will be supplied from a 55,000 L service water tank close to the portal and would be gravity fed to the underground work areas via 100 mm diameter pipelines. Pressure reduction valves will be installed along the decline as needed. The service water tank would be refilled with underground mine water or by a Site Services water truck.

The unheated mines are planned to use brine instead of water. Brine at a concentration of 13% would be used in the winter months; a 2% brine concentration will be used during the summer months. It is assumed

that each heating season lasts for six months. The heated mines would have small brine plants installed during initial decline development until the mine air heaters are operational.

A fuel station for underground mobile equipment is planned to be located near each of the mine portals. Haul trucks, LHDs, and smaller mobile equipment would be refuelled at the beginning of each shift at surface. The fuel tank would be refilled by Site Services on a regular basis.

No permanent underground fuel and lube stations are planned. A Maclean FL3 fuel and lube truck would be shared between underground operations at the Goose Property. The fuel and lube truck is planned to have a capacity of 4,500 L of fuel and 1,000 L of oil and lube. Mobile equipment such as bolters and jumbos would be refilled by the fuel and lube truck from the main surface fuel facility.

6.3.4.8 Underground Mine Explosives

The handling and manufacture of explosives will be contracted out to a licenced operator. This operator will be responsible for obtaining licenses and permits associated with the use, manufacture and storage of explosives.

ANFO required for underground mining will be manufactured and bagged in one tonne totes utilizing bagging equipment located in the ammonium nitrate shop. The bagged ANFO will then be transported to the various underground mines for use in blasting operations. ANFO required for open pit blasting will be mixed on a bulk ANFO truck at the blast hole. The bulk ANFO truck will take on ammonium nitrate from the ammonium nitrate silo and fuel oil from the fuel tank at the Goose AN Facility. A truck wash facility will be located within the AN Facility.

The underground mines will store quantities of packaged explosives to meet the mine's needs for up to seven days. Day boxes would be used as temporary storage for daily consumption. Two underground magazines are planned at each operation to separately store explosives and detonators. Each magazine will be located in a bay off the decline. Access would be controlled with lockable gates. The magazines will be equipped with fire extinguishers, wooden shelves, and a concrete floor.

6.3.5 Mining Equipment

6.3.5.1 Open Pit Equipment

To determine the number of equipment units required for each major fleet, productivities were calculated based on estimated annual operating hours and mechanical availability. Annual operating hours varied by fleet due to associated availabilities and operating inefficiencies. An annual summary of the fleet requirement for open pit mining is shown in Table 6.3-12.

Table 6.3-12. Fleet Sizes for Open Pit Mining

Type	Size	Year											
		-2	-1	1	2	3	4	5	6	7	8	9	10
Production Drill-MD 6240	152 mm to 270mm	2	2	2	2	2	2	2	2	1	1	1	-
Small Drill-MD 5125	115 mm	1	1	1	1	1	1	1	1	1	1	1	-
Haul Truck-Cat 775G	65 t	11	10	10	13	14	14	11	12	6	6	5	3
Shovel-Cat 6015	7 m^3	2	2	2	2	2	2	2	2	1	1	1	1
Excavators-Cat 390	4 m^3	1	1	1	2	2	2	2	2	1	1	2	1
Loader-Cat 988	7 m^3	1	1	1	1	1	1	2	2	1	1	1	1
Track Dozers -D9	5 m	0	1	1	1	1	1	1	1	0	0	0	0
Track Dozers-D8	4 m	3	2	2	3	3	3	3	2	2	2	2	1
Wheel Dozer -Cat 824	4.2 m	1	-	1	1	1	1	1	1	1	1	1	1
Grader-Cat 14m	4.2 m	3	2	2	3	3	3	3	3	2	2	1	1
Water truck - Cat 775	65 t	1	1	1	1	1	1	1	1	1	1	1	1

6.3.5.2 Underground Equipment

The selection of underground mining equipment is based on the mining methods, drift and stope dimensions, production rate, and operating and capital costs. Since the overall LOM is nearly 10 years, it was assumed that only new equipment would be purchased. Over time, the equipment is planned to be rebuilt or replaced, as recommended by the manufacturers.

A summary of selected mobile equipment for the underground operations at the Project is shown in Table 6.3-13.

Table 6.3-13. Underground Production and Development Equipment List

Item	Description	Year											
		-2	-1	1	2	3	4	5	6	7	8	9	10
Haulage Truck (30 t)	Sandvik TH430	2	5	9	9	8	10	14	17	16	14	5	2
LHD 6.0 yd^3 (10 t)	Sandvik LH410	1	3	4	4	4	5	8	8	8	8	3	1
LHD 3.7 m^3 (6.7 t)	Sandvik LH307	0	1	3	3	3	3	3	3	3	3	1	0
Jumbo (2 boom)	Sandvik DD421-60	1	3	4	4	4	5	7	8	8	6	2	1
Diamond Drill	Boart Longyear LM55	0	1	1	1	0	1	1	1	1	1	0	0
Production Drill Large	Sandvik Solo 311-7	0	0	0	0	0	1	4	4	4	4	2	0
Production Drill Small	Boart Longyear Stopemaster	1	0	1	1	1	1	0	0	1	0	1	1
Rockbolter	Maclean 928 Scissor	1	3	6	6	6	7	10	11	10	8	4	1
Shotcreting Machine	Maclean SS3	1	1	1	1	1	1	2	2	2	2	2	1
ANFO Loader	Maclean AC2 ANFO	1	2	3	3	3	3	6	6	6	6	3	1
Boom Truck	Maclean BT3	1	2	2	2	2	2	4	4	4	4	2	1
Mechanics Truck	Toyota Landcruiser	1	2	2	2	2	2	4	4	4	4	2	1
Fuel-Lube Truck	Maclean FL3	0	1	1	1	1	1	2	2	2	2	2	0
Supervisor/Service Vehicle	Toyota Landcruiser	0	1	1	1	1	1	2	2	2	2	2	0

(continued)

Table 6.3-13. Underground Production and Development Equipment List (completed)

Item	Description	Year											
		-2	-1	1	2	3	4	5	6	7	8	9	10
Electrician Vehicle	Toyota Landcruiser	0	1	1	1	1	1	2	2	2	2	2	0
Scissor Truck	Maclean SL3	1	2	2	2	2	3	6	6	6	5	2	1
Forklift/Telehandler	Cat TH407C	1	1	1	1	1	1	2	2	2	2	2	1
Utility Vehicle / Nipper	Toyota Landcruiser	1	2	2	2	2	2	3	3	3	3	2	1
Portable Welder	Lincoln Electric Classic 300 HE EPA	0	1	1	1	1	1	2	2	2	2	2	0
Personnel Carrier	Toyota Landcruiser	1	2	2	2	2	3	6	6	6	6	2	1
Grader	Cat 12M	1	1	1	1	1	1	2	2	2	2	2	1
Front End Loader (Surface)	Cat 966K	1	1	1	1	2	2	4	4	4	4	3	1

6.3.5.3 Surface Support Equipment

A fleet of mobile site support equipment is utilized to provide support to operations at each of the three sites (i.e. Goose site, MLA, and WIR). A list of site support equipment for each site is provided in Table 6.3-14.

Table 6.3-14. Surface Equipment List

Equipment Description	Equipment Quantity (Peak LOM)	
	Goose	MLA
3/4 T Ambulance / Rescue - Ford F450	2	1
1 T Diesel Crew Cab Pick-up - Ford F350	13	1
2 T Diesel Pick-up (Blaster's Box) - Ford F550	2	0
2 T Diesel Pick-up c/w Heated Van - Ford F550	1	0
5 T Flat Deck Truck	2	1
10 T Fuel Truck - Western Star 4900 SA (Custom)	2	0
20T Picker Truck - Western Star 4900 XD	2	0
Fuel / Lube Truck - Western Star 6900 (Custom)	2	0
Welding / Service Truck - Ford F550 (Custom)	4	1
5 T Pumper - Fire Truck	2	0
100T Lowboy Trailer	2	0
Roll Off Truck c/w deck, water tank, vacuum tank, garbage bins	2	0
Dump Truck 10m^3 capacity- Western Star 4900	1	1
Winch Tractor with 60T Winch	2	1
Tri-Axle Single Drop, Scissor Neck Trailer	2	1
44 Passenger Bus - Freightliner	3	0
Excavator (~1.0 m^3) CAT 320DL	1	0
Vibrating Packer - Cat CS56	1	0
Tool Carrier - Cat 930H (Old IT28)	3	0
Tool Carrier - Cat 966K (c/w Attachments)	2	1

(continued)

Table 6.3-14. Surface Equipment List (completed)

Equipment Description	Equipment Quantity (Peak LOM)	
	Goose	MLA
Skid Steer Loader (1 m^3)	3	1
5 T Fork Lift Zoom-Boom - Terex GTH-5519	2	1
Tire Manipulator Attachment for 966k	2	1
Container Handler - Taylor TXLC975	2	2
Track Dozer - CAT D6T	1	4
30 tonne Articulated Trucks CAT 730	2	0
Mobile Crushing/Screening Plant	1	0
165T Crawler Crane	1	0
Mobile Crane - RT90 - Grove RT890E	2	0
Pipe Fusing Machine (Able to Fuse 28" DR17)	1	0
Pipe Fusing Machine (Able to Fuse 12" DR11)	1	0
Diesel Lake Dewatering Pumps	7	0

Modified from JDS 2015

6.3.6 Explosives and Ammonium Nitrate Storage

During Construction and Operations, ANFO will be used as the explosive for mine development. Explosive products will be stored on-site in accordance with territorial and federal regulations. Ammonium nitrate will be shipped and stored on-site in tote bags within seacans. Prepackaged explosives will be flown into site. Ammonium nitrate will be mixed with diesel oil on-site to make ANFO explosive as needed.

More detail on explosives management can be found in the Explosives Management Plan (FEIS Volume 10, Chapter 13).

6.3.6.1 Explosives Storage

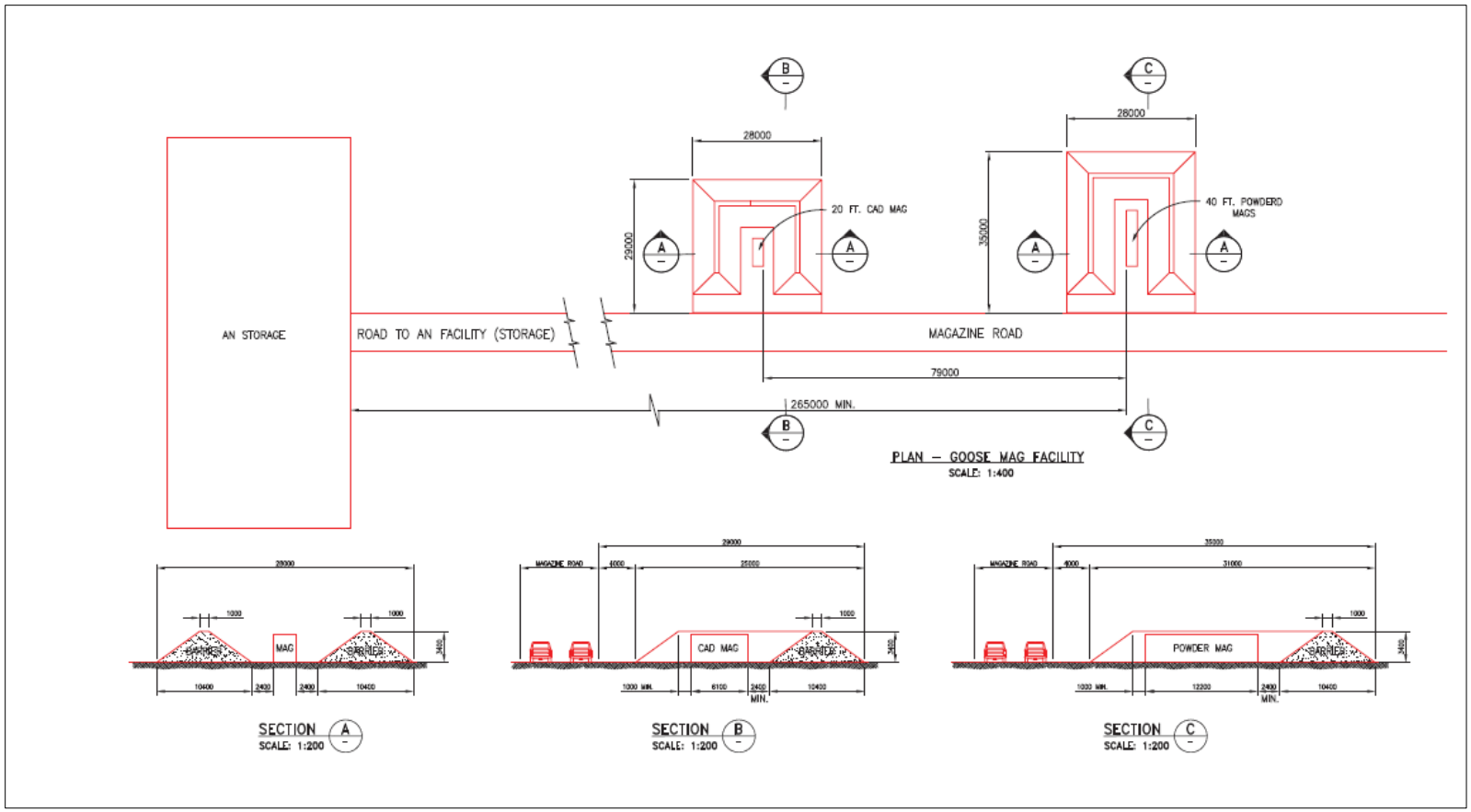
The main storage of ammonium nitrate will be located at the Goose Property at the AN Facility laydown pad. A temporary storage area (for transit) will also be developed at the MLA. Ammonium nitrate will be delivered by sealift and stored at the MLA until it can be transported to the Goose Property via the WIR and/or air. The quantities of ammonium nitrate stored are as follows:

- MLA: up to 3,900 tonnes. Transportation to Goose Property will take place during the winter months, once the WIR is ready for use.
- Goose Property – up to 3,900 tonnes.

Packaged explosives and explosive detonators will be stored in approved explosive magazines located on separate pads at the Goose Property (Figure 6.3-10). No packaged explosives will be stored at the MLA during Operations. Prepackaged explosives will be flown into site.

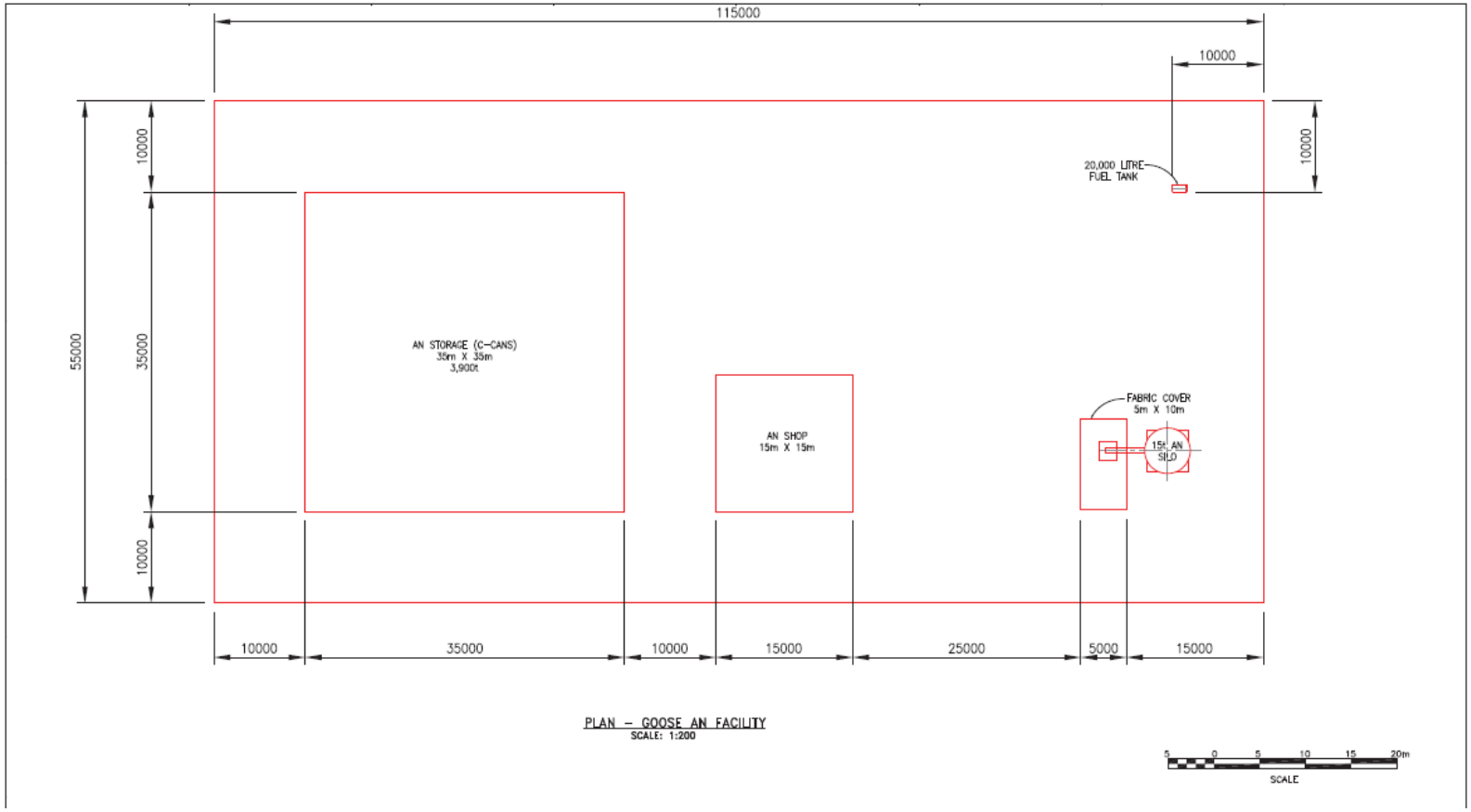
Bulk AN will be stored in tote bags within seacans. Prior to use, AN will be augured from the tote bags into a 30 tonne silo at the AN Facility (Figure 6.3-11). ANFO required for underground mining will be manufactured and bagged in one-tonne totes utilizing bagging equipment located in the AN Facility. Fuel oil will be stored in a 20,000 litre double-wall fuel tank also located on the AN Facility pad.

The underground mines will store quantities of packaged explosives to meet the mine's needs for up to seven days. Day boxes would be used as temporary storage for daily consumption. Two underground magazines are planned at each operation to separately store explosives and detonators. Each magazine will be located in a bay off the decline. Access will be controlled with lockable gates. The magazines would be equipped with fire extinguishers, wooden shelves, and a concrete floor.



Source: JDS 2015

Figure 6.3-10. Goose Property AN and Explosives Storage Preliminary Design Plan and Sections



Source: JDS 2015

Figure 6.3-11. Goose Property AN Facility Preliminary Design Plan View

6.3.6.2 AN Facility and Transportation to Work Sites

The handling and manufacture of explosives will be contracted out to a licensed operator. This operator will be responsible for obtaining licenses and permits associated with the use, manufacture and storage of explosives.

ANFO required for underground mining will be manufactured and bagged in one-tonne totes utilizing bagging equipment located in the AN shop. The bagged ANFO will then be transported to the various underground mines for use in blasting operations. ANFO required for open pit blasting will be mixed on a bulk ANFO truck at the blast hole. The bulk ANFO truck will take on ammonium nitrate from the AN silo and fuel oil from the fuel tank at the Goose AN Facility. A truck wash facility will be located within the AN Facility. Explosive truck wash water will be treated in an evaporator.

6.3.6.3 Ammonia Management

Sabina and the explosives supplier will adopt best management practices for transport, storage and use of explosives. Together with water management, spill prevention, and spill response, these measures lower the potential for ammonium contamination in the receiving environment. More information on explosives use and handling can be found in the Explosives Management Plan (FEIS Volume 10, Chapter 13). More information on spill response can be found in the Spill Contingency Plan (SD-17) and the explosives supplier's Emergency Response Assistance Plan.

The Water and Load Balance Report (Appendix E-2) and WMP (SD-05) have been developed, and will be implemented, to assist in ensuring that runoff does not have an adverse impact on the receiving environment. The management plan includes:

- consideration of potential sources of ammonia, among other contaminants;
- estimates of all contaminants loading; and
- water management strategies to ensure water entering the receiving environment meets discharge criteria.

Sabina expects that the Type A Water Licence will define regulated discharge requirements for site runoff. Therefore, monitoring of runoff from explosives and ammonium nitrate storage areas will be undertaken.

6.3.7 Ore Management

A fleet of 64-tonne trucks will move ore from the open pits and underground mines to the Ore Stockpile located at the Goose Plant Site. Ore will be sorted based on ore grade into one of three stockpiles on the same stockpile pad northwest of the Process Plant: low-grade (LG), mid-grade (MG), or high grade (HG). The Process Plant mill feed will be made up of ore from stockpiles and ore fed directly from the open pit and underground mines.

The ore stockpiles will be built in a series of lifts in a "bottom-up" approach similar to WRSAs. Foundation design is defined in Site-Wide Geotechnical Properties Report (Appendix F-2). Thermal modelling was conducted to support the WRSA design which shows short- and long-term thermal stability of underlying permafrost will be achieved. Because of the similar design, these principles have been applied to the stockpile foundation design. See the WRSA Design Report (Appendix F-3) for more details. For additional information related to ore storage management refer to the Ore Storage Management Plan (SD-07).

6.3.7.1 Ore Grade and Quantities

An estimated mill feed and stockpile balance schedule is shown in Table 6.3-7. Refer to Table 6.3-5 and Table 6.3-6 for the open pit and underground mining production schedules, respectively.

6.3.7.2 Ore Handling and Stockpiling

Ore will be fed to the primary crusher, a vibrating grizzly - primary jaw crusher system, by front end loader from the stockpiles or dumped directly from haul trucks. The size of the ore will be further reduced in the secondary crushing circuit by a cone crusher. The resulting fine ore will be transported in a covered conveyor to the enclosed Fine Ore Stockpile. Reclaim belt feeders located underneath the fine Ore Stockpile will draw material from the stockpile onto a covered conveyor which feeds the Process Plant.

Dust associated with the stockpiles is not expected to be significant. Crushing and screening operations will be conducted in fully enclosed units to prevent dust dispersion. Details of planned dust monitoring and mitigation can be found in Section 6.3.4.5, and in the Air Quality Monitoring and Management Plan.

6.3.7.3 Ore Stockpile Design

Infrastructure foundation preparation recommendations produced by SRK as a result of geotechnical investigations and thermal modeling for the Goose Property for unheated infrastructure such as ore stockpiles, where some differential settlement is acceptable, include:

- 1.0 m compacted ROQ rock-fill pad (or geochemically suitable waste rock) on top of undisturbed grade.
  - Maximum rock size limited to 0.9 m.
- 150 mm of 2” minus topping directly on top of rock-fill pad for trafficability (no need for intermediate 6” minus layer).

Table 6.3-15 provides key design features of the ore stockpiles and ore stockpile pad.

Table 6.3-15. Key Ore Stockpile Design Parameters

Parameter	Ore Stockpile Pad	Goose Plant Stockpile
Pad thickness/ maximum stockpile height (m)	1	100
Approximate thickness of lifts (m)	-	10
Assumed side slopes for ore and pad	1.3H:1V	1.3H:1V (2:1 max.)
Design footprint (m^2)	135,000	135,000
Volume (m^3)	92,000	1,563,000
Mass (tonnes)	200,000	3,500,000

More detail on the geotechnical and geothermal investigations and results are presented in the Site-Wide Geotechnical Properties Report (Appendix F-2).

6.3.7.4 Temporary Ore Stockpiles

Temporary ore stockpiles for the short-term storage of underground ore will be created on the laydown pad of each underground mine near the portal. Underground mine haul trucks will dump ore onto these temporary stockpiles so it can be loaded into the larger open pit mine haul trucks to be trucked to the Ore Stockpile at the Goose Plant Site. Runoff from the underground mine laydown pads and temporary ore stockpiles will be collected and managed as contact water as described in the WMP (SD-05). The location of underground mine laydown areas and portals are shown in Appendix A, base Figure 3.

6.3.7.5 Physical and Chemical Stability of the Ore

SRK Consulting (Canada) Inc. (SRK) completed geochemical characterization studies to assess the ML/ARD potential of ore and waste rock. The characterization program included additional test work and further data interpretation intended to supplement previous work by Rescan Environmental Services Ltd. (Rescan 2014a).

Water quality predictions suggest that the majority of stockpiled ore will be processed before ML/ARD occurs. More detail of the physical/chemical properties, and ML/ARD characteristics of the ore is presented in the Ore Storage Management Plan (SD-07); the detailed ML/ARD characterization of the ore is presented in Geochemical Characterization Report (Appendix E-3). Predicted runoff water quantities and qualities from the ore stockpile and the ore stockpile pad are incorporated in the Water and Load Balance Report (Appendix E-2).

6.3.7.6 Runoff and Seepage Management

Runoff and seepage from the ore handling facilities will be collected in the Ore Stockpile Pond. The collected water will be managed with other mine contact water. Refer to the water management summary in Section 6.3.10 and the WMP (SD-05) for more details.

6.3.7.7 Options for Ore Management

Although minimizing the double handling of ore offers the benefits of simplistic operations and reduced operating costs, stockpiling offers flexibility and other economic benefits. Direct feeding mined material to the crushing plant, without the use of a stockpile, can result in a critical bottleneck and does not optimize the Project finances.

6.3.8 Waste Rock Management

The current mine production schedule produces approximately 64 Mt of waste materials (overburden and waste rock), approximately 58% of which is anticipated to be characterized as PAG. Waste rock and overburden produced during mining will be stored in engineered WRSAs located close to each of the open pits (Appendix A, base Figure 3). There will be four WRSAs at the Goose Property as follows:

- Umwelt WRSA: Located to the east of the proposed Umwelt Pit and U/G mines.
- Llama WRSA: Located to the east and south of the proposed Llama open pit and underground mines.
- TSF WRSA: Located to the south of the proposed Goose Main Pit, placed on top of the TSF once it is no longer in use. The majority of this material will be sourced from the Goose Main Pit.
- Echo WRSA: Located to the east and north of the proposed Echo Pit and U/G mines.

Approximately 3 Mt of PAG waste rock has been slated for use as underground mine backfill.

Overall waste material disposal criteria have been developed for all three of waste rock types produced at the Project: overburden, PAG waste rock, and NPAG waste rock. The waste disposal criteria are outlined below:

- PAG and NPAG waste rock will be placed in lifts in a "bottom-up" approach to maximize stability and promote aggregation of permafrost.
- Ultimate side slopes for all areas should be less than 3H:1V (with the exception of Echo, which will have side slopes of 2.4H:1V), but angle of repose interim slopes with suitable setbacks are acceptable.
- PAG waste rock will be capped with, a final lift of 5 m of NPAG waste rock.
- Overburden stockpiles will be co-disposed with PAG waste rock, with ultimate placement at least 20 m from the outer edge of the WRSAs.
- Some overburden that has been deemed geotechnically and geochemically suitable will be used at Closure as part of the 5 m cover on some WRSAs.

For additional information refer to the Mine Waste Rock Management Plan (SD-08).

6.3.8.1 Overburden Management

Exploration, geotechnical, and overburden drill data on the Goose Property indicates overburden thicknesses ranging from 0 to 25 m. Thicker sequences of overburden occur in the Goose Main Pit, Llama Pit, and Goose Airstrip areas. Preliminary data also indicates bedrock on surface in many areas. Little to no organic material is present on the surface, and the upper 1 to 2 m of rock is expected to be frost shattered.

Geochemical test results indicate that overburden material is consistently NPAG. Due to the overburden physical properties, it is currently assumed that some of this material may be unsuitable for construction purposes. However, during Closure it is possible that some of this overburden will be used as a portion of the cover material on the WRSAs.

Quarrying of the Umwelt Pit will begin in Year -3. Overburden removal will occur during the preparation of mining and construction activities. The site overburden material and excavated material will either be handled as run of mine waste and stored accordingly, or segregated and used where possible in reclamation activities. Only geochemically suitable materials will be used for reclamation. A description of the waste rock classification is summarized in Table 6.3-16 and presented in the Mine Waste Rock Management Plan (SD-08). An overview of waste rock and overburden disposal over the LOM is presented in Table 6.3-17.

A quarry and borrow pit site-specific management plan will be developed for each quarry or borrow pit. Each site-specific management plan will contain the development plan, ARD screening of the material, drainage plan, and closure plan for the respective quarry or borrow pit. Runoff from quarry sites will be managed to achieve the runoff water quality presented in Section 5.4.1.

Table 6.3-16. Waste Rock Classification

Scenario	Pit	Quantity ('000s)			Distribution %[1]	
		PAG	NPAG	OVB	PAG	NPAG
In-situ Quantities	Umwelt	9,490	9,163	1,289	51%	49%
	Llama	7,479	7,490	1,037	50%	50%
	Main	3,663	20,693	2,755	15%	85%
	Echo	192	782	250	20%	80%
	Total	20,823	38,127	5,331	35%	65%
75% of NPAG recovered except 0% in Lower Iron Formation and 50% in Umwelt/Llama Upper Iron Formation	Umwelt	13,053	5,600	1,289	70%	30%
	Llama	10,548	4,421	1,037	70%	30%
	Main	10,101	14,255	2,755	41%	59%
	Echo	584	389	250	60%	40%
	Total	34,286	24,665	5,331	58%	42%

1) Distribution does not include overburden (OVB), which is NPAG.

6.3.8.2 Geotechnical Information for Waste Rock Storage Areas

Geotechnical information was collected at the proposed WRSAs during the 2015 field season. Exploration, geotechnical, and overburden drill data on the Goose Property indicate overburden thicknesses ranging from 0 to 25 m. Thicker sequences of overburden occur in the Goose Main Pit, Llama Pit, and Goose Airstrip areas. Preliminary data also indicates bedrock on surface in many areas. Little to no organic material is present on the surface and the upper 1 to 2 m of rock is expected to be frost shattered.

More detail on waste rock management and WRSA design can be found in the Mine Waste Rock Management Plan (SD-08).

6.3.8.3 Waste Rock and Quarry Material Requirements for Project Infrastructure

An estimated 5 Mt of aggregate will be required for Construction at the Goose Property. Of this 5 Mt, 1.5 Mt will be required to construct the TSF Containment Dam and 3.5 Mt will be required for the other Goose Property infrastructure including haul roads connecting mine workings, pads for mine infrastructure and laydown, Goose Airstrip, fuel storage and other containment areas, and water management structures.

A portion of this material (800,000 tonnes) will be sourced from the Airstrip Quarry, which is estimated to contain 1.5 Mt of suitable NPAG material. Additional construction material will be sourced from the cut/fill balance of the Goose Plant Site area, and NPAG waste rock from open pit mining.

At the MLA, an estimated 1.3 Mt of aggregate will be required for construction of service roads, laydown pads, infrastructure foundations, and fuel storage and other containment areas. All of this material will be sourced from the MLA Fuel Storage foundation (MLA Quarry). It is currently planned that only one quarry will be developed at the MLA; at later phases of design, this could be expanded to additional quarries and borrow sources. Only quarries with geochemically suitable material will be developed.

Table 6.3-17. Waste Rock Disposal Schedule

	Location	Mine	Waste Type	Total ('000s)	Year of Operations											
					-2	-1	1	2	3	4	5	6	7	8	9	10
GOOSE	Construction, TSF, & Umwelt WRSA	Umwelt Open Pit	OVB	1,289	1,289	0	0	0	0	0	0	0	0	0	0	0
			NPAG	5,601	1,292	3,458	831	21	0	0	0	0	0	0	0	0
			PAG	13,052	2,796	8,110	2,126	20	0	0	0	0	0	0	0	0
	Llama WRSA	Llama Open Pit	OVB	1,037	0	0	1,037	0	0	0	0	0	0	0	0	0
			NPAG	4,422	0	0	2,019	2,175	228	0	0	0	0	0	0	0
			PAG	10,546	0	0	4,532	5,519	496	0	0	0	0	0	0	0
	TSF WRSA & Echo WRSA	Goose Main Open Pit	OVB	2,754	0	0	0	2,362	392	0	0	0	0	0	0	0
			NPAG	14,255	0	0	0	685	6,683	5,575	1,309	3	0	0	0	0
			PAG	10,101	0	0	0	466	4,232	3,933	1,461	8	0	0	0	0
		Echo Open Pit	OVB	250	0	0	0	0	0	250	0	0	0	0	0	0
			NPAG	389	0	0	0	0	0	286	103	0	0	0	0	0
			PAG	584	0	0	0	0	0	412	172	0	0	0	0	0

6.3.9 Tailings Storage

The mine plan includes 10 years of mining operations with about 19.8 Mt of ore processed at a rate of 6,000 tpd. Based on an assumed density of 1.2 tonnes per cubic metre, the required tailings storage capacity is in the order of 16.5 million cubic metres (Mm^3).

The tailings management system at the Goose Property will entail deposition of tailings at three separate locations. The initial 2 years of production will be deposited in a purpose-built TSF located about 2 km south of the Goose Main Pit. Tailings deposition will then transition to in-pit deposition into the mined-out Umwelt Pit (referred to as Umwelt TF) for a period of about four years. Finally, tailings deposition moves to the mined-out Goose Main Pit (referred to as Goose Main TF), for deposition during the remaining four years of the mine life. This is summarized in Table 6.3-18 below; note that some facilities have additional capacity than is currently planned for use; as Operations develops, these timelines and use of the below facilities may shift.

Table 6.3-18. Tailings Deposition Location Summary

	Period (Year and Quarter)	Tailings (Mt)	Tailings (Mm^3)
TSF	Y-1 Q4 to Y2 Q3	3.8	3.1
Umwelt TF	Y2 Q4 to Y6 Q3	8.6	7.2
Goose Main TF	Y6 Q3 to Y10 Q2	7.4	6.2
Total Project	Y-1 Q4 to Y10 Q2	19.8	16.5

Geotechnical instrumentation will be installed in the TSF embankment and foundation during Construction. The instrumentation will be monitored during the construction and operation of the TSF to assess performance and to identify conditions differing to those assumed during design and analysis. Amendments to the ongoing designs and/or remediation work will be implemented to respond to the changed conditions, should the need arise.

For additional information, refer to the Tailings Management Plan (SD-09) and Section 5.4.5 Tailings Storage Facility Design.

6.3.9.1 Tailings Storage Facility Operations – Tailings Deposition Strategy

Numerous mines have operated, or currently operate, tailings facilities in cold regions under severe winter (freezing) conditions. From these operational mine experiences, design and operating considerations have been developed for the Project, which include:

- Shape the tailings storage surface (during summer tailings deposition) to provide a winter pond that can be maintained "localized" in one area or specific areas of the facility.
- Concentrate winter tailings discharge from a single, relocate-able, point. This will tend to channelize the flow and move it through and under the ice cover, where the solid/liquid separation occurs. This prevents sheet tailings flow over the ice (and freezing of water and subsequent ice entrainment in the tailings).
- Store sufficient water in the tailings facility prior to freezing, to provide for all anticipated ice and pore water losses during winter (i.e., develop and maintain a good water/ice balance).
- The potential for dusting can be exacerbated during cold winter conditions as a “freeze drying” process tends to destroy capillary tensions in partially saturated sand materials, making it more susceptible to dusting. Appropriate provisions will be required to prevent dusting such as

increasing the freeboard height and installing sediment control fencing along the embankment crests downwind of the prevailing wind.

6.3.9.2 Seepage Control

Containment Dam Concept

A frozen foundation dam allows for construction of a conventional dam on the deep permafrost foundation, while making use of the permafrost conditions to seal the water retaining feature of the dam with the foundation. A low permeability core dam is not suitable for the Project as there are no known area of contiguous, low permeability soils on the Property, and Arctic conditions pose great challenges for the construction of low permeability cores. The decision was therefore made to construct the TSF containment dam as a frozen foundation rockfill dam (built from run-of-mine waste rock) with a geosynthetic liner. For this concept to function, the liner will be frozen into the key trench permafrost, and over the life of the structure, the foundation will not thaw deep enough to compromise this seal. Refer to Tailings Management Plan (SD-09) and Appendix F-4 for additional details.

Seepage and Runoff Collection

The inferred foundation conditions at the TSF containment dam are not conducive to constructing seepage collection ditches or drains. Seepage collection will therefore be done by constructing a berm downstream of the dam. The berm will incorporate an impermeable liner keyed into permafrost. Depending on the quality of the water, seepage may be directed to sumps from where it will be pumped back into the TSF supernatant pond or discharged to the environment, as appropriate.

6.3.9.3 Tailings Water Recycle Circuit – Ice Formation

The active tailings facility (being the TSF or one of the TFs) will also serve as the main source of reclaim water for the Process Plant. Supernatant liquid from the settled tailings, and runoff from precipitation and snowmelt collected in the TSF or TFs will be managed and pumped back to the Process Plant. The free water will be drawn from beneath the ice.

6.3.9.4 Consolidated Tailings Chemistry

Tailings geochemical characterization confirms that the tailings are PAG, with very slow reaction rates and a potential for metal leaching, with the exception of some samples from the Goose Main deposit. Therefore, tailings will need to be managed to prevent acid rock drainage and manage metal leaching. During Operations, it is likely that the process water will need to be treated prior to discharge to remove ammonia, arsenic, and copper.

Exposed tailings beaches are likely to be an ongoing source of sulphate and arsenic leaching, and if they are left exposed for an extended period (estimated to be decades), pH changes may result in increased concentrations of other trace elements. However, the development of acidic conditions is expected to be delayed considerably by the cold temperatures, with the alkalinity from the deposition of fresh tailings helping to maintain neutral pH conditions.

Detailed ML/ARD characteristics of the tailings, waste rock, and ore are presented in the Geochemical Characterization Report (Appendix E-3). Predictions of tailings pore water chemistry are presented in the Water and Load Balance Report (Appendix E-2).

6.3.9.5 Monitoring of the Tailings Storage Facility

The TSF will be controlled and monitored using a formalized procedure that is incorporated into the mine's Environmental Management System (EMS). Geotechnical instrumentation will be installed in the tailings embankment and foundation during construction, and utilized over the life of the Project. The instrumentation will be used to monitor and assess embankment performance, and to identify any conditions different to those assumed during design and analysis. Amendments to the ongoing designs and/or remediation work will be implemented to respond to the changed conditions, should the need arise. Key control and monitoring subject areas will include:

- inspections of the TSF with regard to performance monitoring, tailings deposition, water management and control, and quality of effluent;
- construction controls, including the use of a construction management program;
- procedures for dust control; and
- quality assurance and quality control measures for operations, monitoring, and inspections.

Procedures related to the environmental management of the TSF will be clearly documented, together with the roles and responsibilities of relevant staff. This documentation will be revised as needed to ensure that it is up to date and accurate, and it will be maintained throughout the Operations and Closure phases.

Sabina will adopt the guidelines developed by the Mining Association of Canada, entitled *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities* (2005), which provides useful guidance in documenting staff roles and management procedures, including:

- roles and responsibilities of personnel assigned to the TSF;
- procedures and processes for managing change;
- the key components of the TSF;
- procedures required to operate, monitor the performance of, and maintain the facility to ensure that it functions in accordance with its design, meets regulatory and corporate policy obligations, and links to emergency planning and response; and
- requirements for analysis and documentation of the performance of the facility (i.e., third party independent inspection annually).

For additional commitments with respect to TF geotechnical characterization and facility design refer to Section 5.4.2, Section 5.4.3, and Section 5.4.5.

6.3.10 Environmental Management

The assessment of environmental impacts of Project activities was completed in detail in the Environmental Assessment phase. The mitigation measures proposed here are a result of the EIS. For additional information related to the environmental assessment of potential impacts and proposed mitigation measures refer to the FEIS submitted to the NIRB. The FEIS and FEIS Addendum can be accessed on the NIRB public registry.

A summary of on-site water management including strategies, design criteria, systems, and control structures related to mine development are presented below. For additional detail refer to the WMP (SD-05).

Mine contact water is water that must be managed after contacting site workings, ore or mine wastes. This includes discharges from the TSF (none are planned during Operations), runoff from ore stockpiles and WRSAs, and water that has been pumped from open pits during mine Operations. At the Goose Property, mine contact water will be treated to levels specified in the MMER or to CCME Freshwater Aquatic Life guidelines prior to release at the final discharge point. A SSWQO for Arsenic has been established and a SSWQO for Copper will be developed (refer to Section 5.4.1 and Appendix E-1).

Sabina will meet water quality objectives for entry into receiving waters (Goose Lake). Discharges to the environment are expected during construction associated with dewatering of lakes, and in Year 18 from Goose Main TF. The water quality objectives will be consistent with the CWQG for the Protection of Freshwater Aquatic Life (CCME 2013) and SSWQOs developed in line with the CCME (2007) framework. Sabina committed to derive a SSWQO for arsenic in a way that is satisfactory to both the KIA and ECCC prior to the first technical meeting as part of the NWB water licensing process. A memo outlining a proposed value for Arsenic at 0.01 mg/L is provided in Appendix E-1. During the FEIS, Sabina proposed at SSWQO for copper at 0.0042 mg/L; Sabina will work with regulators to further develop a SSWQO for copper if required.

6.3.10.1 Water Management System

At the Goose Property, mine infrastructure and upstream catchments were delineated for the Project based on existing topography, footprints of mine infrastructure, and the WMP (SD-05). The entire mine infrastructure area at the Goose Property will be 4.8 km^2, which is 6 % of the total Goose Lake watershed; all roads and surfaces will be constructed using geochemically suitable material. A total of 14 prediction nodes were utilized in the water balance to describe the hydrology and water quality effects from the Project.

Site water is categorized into three types:

- Contact water, which is impacted by mine workings (waste rock, ore stockpile, pits, tailings, etc.);
- Non-contact water, which is runoff from undisturbed areas; and
- Saline water, which is the groundwater inflows to mining areas.

Each category of water is managed separately throughout each Project phase. Contact water is contained in event ponds and tailings management facilities, and is transferred via diversions and pumped pipelines. Non-contact water is diverted off-site through event ponds, pumped pipelines, berms, and culverts. Saline water is pumped from the underground facilities and stored in the Saline Water Pond, and then during Closure is pumped back into mined-out underground workings or into the bottom of the Llama Pit, which is then named the Llama Reservoir.

A WTP will be operational in the open water season at the Goose Property in the Construction Phase to initially dewater Llama and Umwelt lakes to create storage for contact water and saline water, respectively. Treatment is inactive between Years 1 and 5, but begins again year-round at the Goose Main TF in Year 6 to reduce metal and TSS loading in the facility. Once mining is complete in Year 10, water treatment continues during the open water season from the Goose Main TF until the Property is closed in Year 18.

Site runoff from the Plant Site area and pads is expected to contain suspended solids, and/or oils and grease from heavy equipment. General site runoff will meet the discharge criteria presented in Table 6.3-19.

Table 6.3-19. Site Runoff Discharge Criteria

Parameter	Maximum Average Concentration (mg/L)	Grab Sample Maximum Concentration (mg/L)
TSS (Construction)	50[1]	100[1]
Oil and Grease	No visible sheen[2]	No visible sheen[2]
pH	Between 6.0 and 9.5[2]	Between 6.0 and 9.5[2]

1) Source: Part E, Item 13 of 2BE-GOO1520
2) Source: Department of Environment, Government of Nunavut (2011). pH range narrowed for conservatism.

The MLA does not require any pond or diversion infrastructure for water management purposes. A desalination plant will produce domestic and industrial water, and greywater will be discharged to the tundra.

6.3.10.2 Open Pit

During Operations, accumulated precipitation into all four open pits will be collected using in-pit sumps and pumped to water management ponds.

The Primary Pond is eventually pumped to the Umwelt TF once mining in Umwelt is complete and tailings deposition begins there. The water and load balance model accounts for the possible salinity of the Llama Pit inflows into the Primary Pond and ultimately the Umwelt TF. The Echo Diversion Pond, Echo WRSA Pond, Primary Pond, and Ore Stockpile Pond are eventually breached. The Echo Pit will be allowed to fill with non-contact water from the South, and will eventually discharge into the Echo stream and Goose Lake.

To eliminate or reduce the potential for adverse effects on air quality during all phases of the Project, a site-wide Emissions Reduction Strategy Plan, a Dust Reduction Plan, and an Incineration Management Plan (SD-11) have been developed and are described in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

Dust will be managed for environmental and safety reasons by methods including spraying water or approved chemical suppressant as needed on roads, regular cleaning of equipment, erecting windbreaks or fences, and training for staff. An effective blast pattern control will help minimize dust generation during blasting.

6.3.10.3 Geotechnical and Structural Monitoring

Regular visual inspection of pit slopes, WRSAs, and ore stockpiles will occur to identify, document, and mitigate risks of any hazards such as localized failure or slumping. The frequency of these inspections will vary with the activity level. Regular inspections will occur during construction of the WRSAs and the ore stockpile pad, and during Operations when pits are being mined and WRSAs and ore stockpiles are being built up or drawn from. Inspection frequencies may be reduced as activities are reduced.

During pit development, a pit wall monitoring program, including geotechnical structural mapping, will be implemented to confirm design assumptions and to rapidly detect any unexpected condition for follow-up, and identify adaptive measures to be undertaken.

Consistent with the requirements of a Type A Water Licence, Sabina will require a third party geotechnical inspection of all earthworks including, but not limited to, open pit, WRSAs, tailings facilities, roads, and dams. Sabina has adopted and is committed to undertaking an annual third party

inspection consistent with the principles outlined in the Mining Association of Canada guideline summarized in Section 6.3.9.5.

6.3.10.4 Underground

Average groundwater inflows during the Operations Phase have been estimated for Umwelt (379 m^3/d), Llama (283 m^3/d), and Goose Main (50 m^3/d) underground mines. Echo is not expected to produce any groundwater. Inflows to the same mines have been estimated to be as high as 596 m^3/d, 350 m^3/d, and 85 m^3/d, respectively. Total dissolved solids concentrations from the underground mine inflows are expected to be between 15,000 mg/L and 30,000 mg/L, particularly at the Umwelt and Goose Main deposits (SRK 2015c).

Groundwater accumulating in the underground mines will be pumped to the Saline Water Pond during the operational LOM. If surface storage of groundwater inflows is required in advance of the Saline Water Pond being available, other small contact water ponds may be temporarily utilized. At Closure, water from the Saline Water Pond will be pumped back into the underground mines and to the bottom of Llama Pit to create a meromictic lake.

Air quality and temperature in the underground workings will be controlled through ventilation to protect worker health. See Section 6.3.4.5 for more information on mine ventilation design.

6.3.10.5 Ore Stockpiles

During Operations, runoff water from the low-grade, mid-grade, and high-grade ore stockpiles will be collected in the Ore Stockpile Pond and will be pumped or trucked to the TSF or active TF. The water quality of the runoff is expected to be similar to that of runoff from the WRSAs.

The runoff collection facilities constructed for the ore stockpiles will apply the same design criteria as has been developed for the WSRAs in terms of managing extreme flows. Additional detail on waste rock management is provided in the Mine Waste Rock Management Plan (SD-08), and water management is addressed in the WMP (SD-05).

Dust from the run-of-mine ore stockpiles is not expected to be meaningful given the large size of the ore coming from the pit. Crushing and screening operations will be conducted in enclosed units to minimize dispersion of ore dust. The fine Ore Stockpile will be enclosed. Dust will be monitored at the site as described in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17), and in the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during stockpiling and transferring operations, additional dust mitigation measures will be applied as identified in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

6.3.10.6 Waste Rock and Overburden Storage Areas

For identification, monitoring, and management of PAG material, a blast hole monitoring program will be implemented to identify PAG and NPAG material and to direct it to the appropriate location within each of the WRSAs. The procedures used to identify and segregate PAG and NPAG waste rock are similar to the procedures that are used to identify and segregate ore in the mining operations. Key aspects will include sampling and testing to identify and delineate zones of PAG and NPAG material in advance of blasting, and communications and tracking protocols to ensure that the PAG and NPAG materials are placed in appropriate locations within the WRSAs.

Seepage and runoff from the WRSAs will be collected in perimeter ditches/berms and directed to collection ponds. During Operations, runoff from the WRSAs at the Goose Property will be pumped to the

TSF or active TF, and reclaimed to process or treated prior to discharge. Runoff and seepage management from the WRSAs is detailed further in the WMP (SD-05).

Collection ponds will continue to operate and collect runoff from the WRSAs into the Closure Phase until the collected runoff meets discharge criteria. During the Active Closure Stage, and while the collection ponds remain operational, collected runoff at the Goose Property will be directed to the appropriate TF. Once runoff can be demonstrated to meet applicable limits, the ponds will be decommissioned in accordance with the ICRP.

The collection ponds constructed for the WRSAs will apply appropriate design criteria in terms of managing extreme flows. Detail on WRSA water management is addressed in the WMP (SD-05).

Due to the large size of run of mine rock stored in WRSAs, dust from the WRSAs is not expected to have a significant impact; however, dust will be monitored and managed as appropriate. In the unlikely event that an unacceptable amount of dust is generated from end-dumping or front-loading during WRSA operations, additional dust mitigation measures will be applied as identified in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

6.3.10.7 Tailings Management Facilities

The TSF will store both tailings solids and supernatant water for the first two years of Operations. As development continues, the mined-out open pits of Umwelt and Goose Main will be used to store tailings and supernatant water. These facilities are named the Umwelt TF and Goose Main TF. The three tailings repositories will be used as storage for all Goose Property contact water derived from the pits, WRSAs, and ore stockpiles. While each tailings management facility is active, it will also serve as the main source of reclaim water for the Process Plant, which will average 4,900 m^3/d.

A seepage analysis of the TSF liner predicts that minor seepage through the embankment of the TSF is expected. The TSF WRSA Diversion Berm, constructed downstream of the TSF, will collect surface runoff and sub-surface seepage through the active layer, and pump it back to the TSF.

Dust from the TSF and TFs is not expected to have a significant impact; however, dust will be monitored and managed to the best extent possible. The TSF will be operated with a water cover during Operations to supply the Process Plant; however, a small tailings beach will be exposed that can generate wind-blown tailings.

Further details on environmental management practices related to tailings management can be found in the Tailings Management Plan (SD-09).

6.3.10.8 Explosives

Environmental protection measures relating to the storage and handling of explosives include the applicable water and air quality guidelines (e.g., MMER and CCME) and guidelines such as DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (DFO 1998). Estimates of AN, nitrite, and nitrate loading from blasting residue can be found in Section 4.2.7 of the Water and Load Balance Report (Appendix E-2). Water will not be released to the receiving environment unless water licence criteria are met. No effects on fish (i.e., fish and incubating eggs) are expected to occur from pressure changes and vibrations from blasting and excavation, as the closest fish-bearing lakes will be at sufficient setback distance from any blasting area (i.e., beyond the setback distances recommended in the guidelines).

The *Transport of Dangerous Goods Act* sets regulations for the safe transport of explosives and AN. Best practices detailed in Section 6 Safe Handling Procedures and Mitigation, and adaptive management

measures outlined in Section 8 will help reduce the risk of spills during storage, transport and use of explosives.

Proper blast design and execution will help minimize NOx emissions and nitrate losses in blasts. Blast areas must be cleared of smoke, dust and gases before anyone is permitted to re-enter them. A designated employee will be assigned to monitor the air quality at each working location to ensure appropriate air quality is met. This information will be collected after each blast, or as required per Health and Safety Regulations. The records of monitoring will be submitted to the site Safety Supervisor.

In the event that wildlife enter the mining area during blasting activities, blasting will be suspended until wildlife have either moved to safe zones or been deterred from the area.

6.3.11 Existing Operations

Facilities at the Project currently exist to support ongoing exploration programs. As Project development advances, it is anticipated that these activities will continue across the currently identified properties, and any future mineral occurrences.

These activities are supported by two camps – one at the Goose Property Area and one at George Property Area. Sabina is also authorized to establish temporary seasonal camps, including Bathurst Inlet area, to support exploration and environmental baseline programs.

The Goose Property Area currently contains a 146-person all-season camp consisting of sleeping units, dry/kitchen/dining facilities, offices, core processing facility, heavy equipment storage, a maintenance shop, a fuel tank farm (13 × 75,000-L dual walled enviro tanks) and additional drummed fuel storage. The camp is powered by a 433 kW diesel-powered generator with backup. The camp is operated on a seasonal basis and is generally closed annually from early October to late January.

The Goose Property has a 914-m all-weather gravel airstrip that can be used year-round and is suitable for small DASH-sized turboprop aircraft. During the winter months (January to May), a 2,000 m (6,564 ft) ice runway can also be established, and during the ice-free months, float-equipped aircraft may land on lakes in the area.

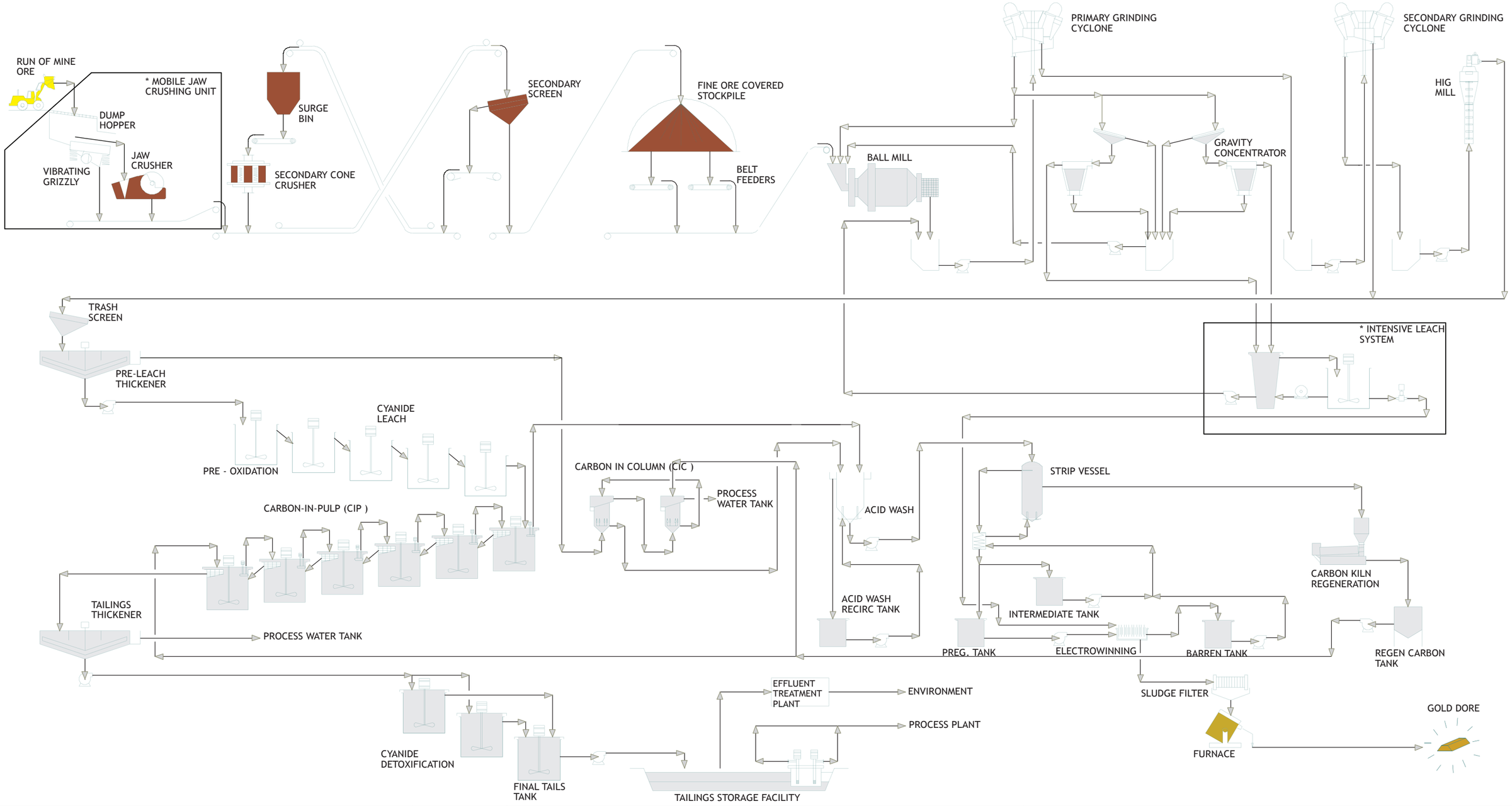
Bulk goods and fuel are typically flown into the Properties by aircraft or hauled by Cat-train from a supply barge located at Bathurst Inlet. No significant roads exist at site; only local dirt trails are present around the existing exploration camps at the Goose and George properties.

All existing operations are conducted under permits, licenses, and authorizations as identified in Section 4.

6.4 MILLING OPERATIONS

Test work completed to date indicates that all Back River deposits are similar in their metallurgical characteristics. The gold occurrence suggests a reasonable gravity recovery with a fine-grained nature and association with arsenopyrite and pyrite minerals.

The simplified flowsheet of the milling process is presented in Figure 6.4-1. Note, in the future, flotation may be added to this process.



Source: Hatch (2015).

Figure 6.4-1

Sabina GOLD & SILVER CORP.

HATCH

					DRAFTSPERSON	A. MCLEAN	2014-08-11
					DESIGNER	K. LEE	2014-08-11
					CHECKER	G. RITSON	2015-03-11
					DESIGN COORD.	L. ROLANDI	2015-03-11
					RESP. ENG.	K. LEE	2015-03-11
					LEAD DISC. ENG.	K. LEE	2015-03-11
2	GENERAL REVISION	AM	GR	2015-03-11	ENG. MANAGER	G. SCHWAB	2015-03-11
1	GENERAL REVISION	AM	GR	2014-10-09	PROJ. MANAGER	G. SCHWAB	2015-03-11
0	ISSUED FOR USE	AM	GR	2014-09-05	CLIENT	W. CARSON	2015-03-11

Approved for Use

BACK RIVER FEASIBILITY STUDY

BACK RIVER GENERAL OVERALL PROCESS FLOW DIAGRAM

NTS

DWG. No. H347084-0000-05-030-0100

3

6.4.1 Crushing and Grinding

The ore will be crushed in two stages then ground in a ball mill and a fine ore mill. Metallurgical test work to date suggests grinding to approximately 50 µm followed by whole ore leaching will provide good recoveries. Gravity concentration will recover coarse gold as a unit operation after ball milling. The gravity product will be intensive leached.

6.4.2 Leaching and Gold Recovery

After crushing and grinding, gold will be recovered by leaching followed by a carbon-in-pulp (CIP) circuit. The leach circuit will continue with carbon elution, electrowinning and smelting to produce gold bullion.

6.4.3 Treatment of Leach Residue

Leaching the milled material as part of gold recovery will use cyanide solution. The process facilities will include a cyanide detoxification plant that will reduce the cyanide concentration prior to release to the tailings facilities. Residue from the CIP circuit will be pumped to a 27-m diameter high-rate thickener to recover residual cyanide and water. The thickener overflow will flow by gravity to the process water tank for reuse as dilution water in the process. The underflow of the thickener will be sent to the cyanide detoxification circuit prior to being pumped to the TSF or TFs (TF – mined out open pits) where suspended solids will consolidate. The tailings from the leaching circuit is anticipated to have elevated ammonia content. The supernatant water from the TSF or TFs will be pumped back to the Process Plant for reuse in the process.

6.4.4 Cyanide Detoxification

The underflow from the tailings thickener will be pumped to a cyanide detoxification circuit. The residual cyanide in the underflow of the thickener will be decomposed by a sulphur dioxide (SO_2)/air oxidation process. Sodium metabisulphite will be fed into two agitated tanks to produce SO_2, and process air will be sparged into the bottom of the tanks before the slurry reports to the final tailings tank. The cyanide detoxification tanks will be located outdoors. SO_2 gas alarms/monitors will be provided to monitor SO_2 concentration in the areas.

6.4.5 Reagents

The reagents used in the process will include:

- CIP and Gold Recovery:
  - slaked or hydrated lime ($Ca(OH)_2$);
  - sodium cyanide (NaCN);
  - activated carbon;
  - sodium hydroxide (NaOH);
  - lead nitrate ($PbNO_3$);
  - hydrochloric acid (HCl);
- Cyanide Destruction:
  - sodium metabisulphite;
  - copper sulphate ($CuSO_4$);
  - slaked lime ($Ca(OH)_2$);
- Others:
  - flocculant; and

- antiscalant.

All the reagents will be prepared in contained areas in proximity to the points of application and close to available storage for the feed stock. The reagent storage tanks will be equipped with level indicators and instrumentation to ensure that spills do not occur during operation. Appropriate ventilation and fire and safety protection will be provided at the facility.

The liquid reagents (including HCl and antiscalant) will be added in the undiluted form to the required process circuits via individual metering pumps.

All the solid type reagents (CaO, NaOH, $PbNO_3$, NaCN, $CuSO_4$, and sodium metabisulphite) will be mixed with fresh water to a solution strength of 10 to 25% in respective mixing tanks, and stored in separate holding tanks before being added to various addition points by metering pumps. The lime slurry will be distributed to various addition points through a closed pressure loop.

Flocculant will also be delivered to the site in solid form. The flocculant will be prepared in a packaged preparation system, including a screw feeder, a flocculant eductor, and mixing devices. The flocculant mixing system will run automatically based on the solution level in the holding tank. The mixed solution will be transferred and stored in an agitated flocculant holding tank. Flocculant will be made up to a 0.5% solution strength and added via metering pumps to the leach feed thickener and tailings thickener.

Cyanide monitoring/alarm systems will be installed at the cyanide preparation and leaching areas. Emergency medical stations and emergency cyanide detoxification chemicals will be provided at the areas as well. Further details on cyanide management can be found in the Hazardous Materials Management Plan (SD-13).

6.4.6 Process Plant Water Consumption

The circulation water load between the active tailings management facility and the Process Plant will be in the range of 4,800 m^3/day. Tailings will be pumped to the active tailings management facility as a slurry containing 49% solids. The tailings will settle and consolidate in these facilities. The water content of the consolidated tailings will be in the range of 36 to 40% water and the ponded supernatant will be returned to the Process Plant for use as process water. Expected water losses and the water balance for the TSF and TFs are discussed in the Water and Load Balance Report (Appendix E-2).

6.4.7 Process Plant Power Consumption

The Process Plant peak power consumption is expected to be in the order of 25 MW, which accounts for the ore process from grinding through utilities.

6.4.8 Storage and Transportation of Final Product

Refined gold doré bars will be the final product. The gold bars will be stored in a secure section of the Process Plant and transported off-site via air on a semi-weekly basis.

6.4.9 Environmental Management

The WMP (SD-05) provides water management and environmental protection measures related to water management for the Process Plant.

6.4.9.1 Surface Water

Surface water in the Goose Plant Site catchment will drain to a local sump, which will discharge to the Ore Stockpile Pond to the northwest, and be treated as contact water as per the WMP (SD-05). Mine

contact water is water that must be managed after contacting site workings, ore or mine wastes. At the Goose Property, mine contact water will be treated to levels specified in the MMER or SSWQOs prior to release at the final discharge point.

Further detail on environmental management practices related to surface water can be found in the WMP (SD-05).

6.4.9.2 Process and Reclaim Water

Water intake structures will be constructed in Goose and Big lakes to supply domestic, industrial, and process make-up water. Water quantity thresholds will be established by the NWB within Sabina's Type A Water Licence. Recycled process water for the Process Plant, called reclaim water, will be sourced from the active tailings management facility to reduce freshwater requirements. In the FEIS, Sabina has identified the following thresholds:

- Winter water use from lakes will not exceed 10% of the available water calculated with an appropriate ice thickness, as outlined in the DFO winter water withdrawal protocol (DFO 2010);
- Intakes in fish-bearing waters will be equipped with fish screens in accordance with DFO's water intake guideline (DFO 1995); and
- Water meters will be installed to monitor water consumption and facilitate the development of detailed, site-specific management strategies to reduce water consumption.

The process facilities will include a tailings thickener and cyanide detoxification plant that will reduce the water content and cyanide concentration prior to release to the tailings facilities. Residue from the CIP circuit will be pumped to a 27 m diameter high-rate thickener to recover residual cyanide and water. The thickener overflow will flow by gravity to the process water tank for reuse as dilution water in the process. The underflow of the thickener will be sent to the cyanide detoxification circuit prior to being pumped to the active tailings management facility where suspended solids will consolidate.

Further detail on environmental management practices related to process water can be found in the WMP (SD-05).

6.4.9.3 Reagents

All reagents will be prepared in contained areas in proximity to the points of application, and close to available storage for the feed stock. The reagent storage tanks will be equipped with level indicators and instrumentation to ensure that spills do not occur during operation. Appropriate ventilation and fire and safety protection will be provided at the facility.

Further detail on environmental management practices related to reagents can be found in the Hazardous Materials Management Plan (SD-13) and Spill Contingency Plan (SD-17).

6.4.9.4 Tailings Management

The main environmental concerns related to tailings storage are the potential for dust to spread to the surrounding land and water, as well as the effects of runoff and seepage on local water quality. Progressive reclamation is also considered as it presents an important opportunity to reduce environmental liabilities associated with mine Closure while the mine is in Operations.

A seepage analysis of the TSF liner predicts that minor seepage through the embankment of the TSF is expected. The TSF WRSA Diversion Berm, constructed downstream of the TSF, will collect surface runoff and sub-surface seepage through the active layer, and pump it back into the TSF.

This process will continue into the Closure Phase but will be reduced to negligible seepage over time with the cessation of tailings deposition and the removal of the supernatant pond. Placement of the final cover will promote the aggradation of permafrost into the tailings over time.

Water (supernatant) contained in the TSF and the two TFs will be reclaimed and reused in the Process Plant, a net consumer of water. Discharges from the TSF are not planned while it is operational, and supernatant will be removed prior to the TSF being converted into a WRSA.

Dust from the TSF and TFs is not expected to have a significant impact; however, dust will be monitored and managed to the best extent possible. The TSF will be operated with a water cover during Operations to supply the Process Plant; however, a small tailings beach will be exposed that can generate wind-blown tailings.

Further details on environmental management practices related to tailings management can be found in the Tailings Management Plan (SD-09).

6.4.9.5 Dust

Ore crushing operations, material handling and wind erosion are sources of dust emissions associated with crushing and stockpiling of ore for mineral processing. To mitigate the risk of dust emission from these sources, crushing will occur in contained buildings, outdoor conveyors will be covered, and the Fine Ore Stockpile will be covered.

Further details on environmental management practices related to dust emissions can be found in the Ore Storage Management Plan (SD-07) and Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

6.5 Site Population and Employment

The expected average employment at the Goose Property during Construction, Operations, and Closure is 650 personnel, 800 personnel and 20 personnel, respectively. Not all employees will be on-site at the same time; employees will work on a fly-in/fly-out shift rotation basis. During Construction and Operations at the Goose Property, the expected workforce will be accommodated in a 465-person camp built during the Construction Phase. Any additional workers would be accommodated in the existing 146-person exploration camp. A fully-functional, modular, 20-person camp (complete with associated support facilities) will be constructed at the Goose Property to accommodate personnel during the Closure and Post-Closure phases. At the MLA, a 75-person camp will be constructed for use during the summer shipping seasons during Construction, Operations, and Closure.

The Project will provide a number of direct, on-site job opportunities. Total direct employment for the Mobilization and Construction Phase is estimated at 1,494 person-years for Canada, including 233 person-years for Nunavut. Total direct employment for the Operations phase is estimated at 6,968 person-years for Canada, including 1,659 person-years for Nunavut.

7. Environmental Setting

7.1 REGIONAL AND LOCAL SITE CONDITIONS

The Project is a proposed development by Sabina of a mixed open-pit and underground gold mine in the West Kitikmeot region of Nunavut. The Project is composed of two main areas: the Goose Property Area and the MLA. The closest unincorporated communities are Kingaok (160 km north) and Omingmaktok (250 km northeast).

Specific details on the regional and local site conditions can be found in the FEIS on the NIRB public registry site NIRB File No. 12MN036. A summary is provided below.

7.1.1 Climate, Air, and Noise

For additional information related to Climate, Air and Noise refer to Volume 4 of the FEIS and FEIS Addendum.

7.1.1.1 Climate

The Project is located in the West Kitikmeot region of Nunavut, in the Takijuq Lake Upland Ecoregion of the Southern Arctic Ecozone. The climate in the area is characterized by extremes. The Project area experiences relatively low amounts of precipitation, but due to sub-zero temperatures for the majority of the year, also experiences high snow accumulation. Summer is a season of nearly perpetual sunlight, while winter is dominated by night, twilight, and extreme cold. Due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains), wind speeds are generally high.

Recent literature (Lemmen et al. 2008) suggests that mean annual temperature may increase in Canada's North by approximately 2.0ºC in the short-term (2010 to 2030) and by approximately 6.0ºC in the long-term (2070 to 2100). The projected increase in mean annual air temperatures would lead to effects on the regional cryosphere. This would likely include alterations to sea, river, and lake ice regimes, and winter snow pack, especially during shoulder seasons of spring and fall, as well as to permafrost conditions.

Average annual precipitation is also expected to rise in the northern regions. Lemmen et al (2008) predicts that total annual precipitation could increase from 5 to 8% in the short-term (2010 to 2030) and 15 to 30% in the long-term (2070 to 2100), compared to baseline levels (1961 to 1990).

Current scientific knowledge does not allow for the effects of the individual project phases on climate change to be assessed. The Project is therefore assessed in terms of greenhouse gas (GHG) emissions produced and compared with sector, provincial, federal, and international levels.

The majority of GHGs from the Project will be generated by on-site diesel combustion (to power equipment). However, there will also be indirect emissions associated with shipping and aircraft use. The GHG emissions associated with land use change are not considered significant as there will be no deforestation and the Project footprint is minimal. There are also expected to be minimal changes in permafrost as all-weather roads will be constructed with run-of-quarry rock placed directly onto the tundra to preserve the permafrost. The effects of dust on reducing the albedo are also expected to be minimal as off-site roads will be WIRs and therefore will generate very little dust. The total estimated GHG emissions for the Project are similar to other mines in the area. On a national level, these emissions are expected to be very small, and compared with global emissions they can be considered insignificant.

To mitigate GHG emissions for the Project, Sabina commits to establishing annual targets and implementing Best Management Practices for GHG emissions and potential reductions throughout Operations. These best management practices include designing haul roads to minimize the distance travelled; using underground mining which will reduce GHGs emitted through excavating and hauling waste rock; using heat recovery system(s) to utilize otherwise waste heat from the power generation process; considering energy conservation features in equipment procuring and selection of processing types; and minimization vehicle and equipment idling.

An assessment of GHG emissions will be carried out annually to determine whether reporting is required. Sources of GHG emissions (e.g., fuel use for power, mobile and stationary equipment operation) will be monitored and resultant data will be used for GHG assessments. Results from the monitoring programs will be reviewed annually to determine if any trends are evident and if target criteria are being met. The need for any corrective actions to on-site emission management or installation of additional control measures will be determined on a case-by-case basis.

7.1.1.2 Air

The air quality in the West Kitikmeot of Nunavut can generally be classified as pristine. Local emissions are limited to stationary (power generation and heating) and mobile sources (trucks, snowmobiles, all-terrain vehicles, etc.) operated by local residents in the few communities within the West Kitikmeot region. Mines operating in Nunavut and the Northwest Territories outside of the West Kitikmeot region represent the only major industrial emission source. Because of the limited local emission sources, long-range transport of air contaminants is the main influence on ambient air quality. The atmospheric boundary layer in the Arctic is generally very stable and surface inversions occur frequently. As a result, dispersion of air contaminants can be less effective in the Arctic than in other regions.

Comprehensive baseline field programs were conducted to support the assessment of the Project. Total suspended particulates (TSP) matter, particulate matter (PM_{10}), respirable particulate matter ($PM_{2.5}$), nitrogen oxide (NOx as NO_2), sulphur dioxide (SO_2), and carbon monoxide (CO) were all below the relevant federal or territorial ambient air quality standards or guidelines. Acid deposition results were below the critical load guidelines at the majority of monitoring locations.

Activities associated with the Project have the potential to generate emissions of criteria air contaminant and also lead to dust and acid deposition. The main sources of emissions associated with the Project are stack emissions, vehicle exhaust emissions, fugitive dust emissions from vehicles travelling on unpaved roads, emissions associated with blasting and aircraft emissions. An air quality modelling study was conducted to characterize the highest concentrations of air quality indicators (NO_2, SO_2, CO, TSP, PM_{10}, $PM_{2.5}$, dust deposition and acid deposition) within the atmospheric LSA. The two LSAs for the Project encompass the area around the Goose Property PDA, with boundaries of approximately 10 km in all directions from infrastructure and a smaller LSA around the MLA.

The assessment also described the mitigation and management activities planned to reduce or eliminate potential effects on air quality. Mitigation measures include: energy efficiency measures, measures to reduce fuel use, the use of water or dust suppression fluids to reduce dust from unpaved roads, transported material and equipment in the crushing facility, and the use of emission control systems such as wet scrubbers, baghouses, and filters.

The modelling study indicates that air quality concentrations will actually be lower than the predicted levels for much of mine life, however, a worst case approach was utilized where the residual effects are considered for the peak levels for the Project duration. For the anticipated peak activity year, the residual effects are predicted to be negative with a moderate magnitude. For this year, the study predicts

that while concentrations of dust deposition will be below the objectives/standards at all locations and that acid deposition exceedances will be contained within the PDAs, the remaining six air quality indicators (TSP, SO_2, CO, NO_2, $PM_{2.5}$, and PM_{10}) showed exceedances outside the PDA, and thus will have residual effects after mitigation. However, these residual effects are restricted to the LSAs, are reversible and of moderate magnitude. In addition, there are no potential cumulative effects on air quality.

To ensure potential adverse effects on the environment have been minimized, mitigated and/or managed, an Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) was developed. The intent of the plan is to outline the requirements for air quality monitoring, control and mitigation. The plan includes applicable legislation and guidelines, control measures to avoid, control, and mitigate potential adverse effects on air quality and GHG emissions associated with all phases of the Project, a monitoring plan to collect on-site air quality, GHG and meteorological data to allow for an adaptive approach to air quality and GHG management.

7.1.1.3 Noise

The existing noise and vibration environment is pristine with no significant nearby anthropogenic noise or vibration sources. With the exception of readings taken near the current exploration camps, all baseline readings were comparable to estimated baseline levels for quiet, rural areas as given in the Alberta EUB Directive 038 (EUB 2007), which considers a quiet rural area with day-night sound levels due to human-made sounds to be below 45 dBA.

Construction and Operations of the Project will introduce noise and vibration sources largely in the form of construction equipment, haul vehicles, blasting, and vehicle and aircraft traffic. A review of the potential Project interactions with noise and vibration identified nine potential effects that may occur. These nine potential effects were: sleep disturbance (humans), interference with speech communications (humans), complaints (humans), high annoyance (humans), noise-induced rattling (humans), noise-induced hearing loss (humans), cosmetic and structural damage of buildings (humans), loss of habitat (wildlife), and disturbance (wildlife).

The assessment describes the mitigation and management activities planned to reduce or eliminate potential effects on noise and vibration. Mitigation measures include: ensuring equipment is fitted with appropriate mufflers and silencers, limiting activities such as blasting and take-off and landing of aircraft to certain times of the day, and housing stationary sources in building or using enclosures, berms, acoustic screening and shrouding. The results of quantitative noise modelling for the peak activity year show that predicted noise levels are below the criteria for interference with speech communications (humans), complaints (humans), high annoyance (humans), noise-induced rattling (humans) and noise-induced hearing loss (humans). Similarly, there are not expected to be any cosmetic and structural damage of buildings (humans) effects from Project-generated vibration. However, noise levels are predicted to exceed relevant criteria for loss of habitat (wildlife) and disturbance (wildlife) at various identified receptors due to construction and operation activities, blasting, road traffic and aircraft movements. In addition, noise levels from mine Construction and Operations are predicted to temporarily exceed the sleep disturbance (humans) criteria at the proposed location of the Goose camp. Therefore, three potential effects would remain as residual effects after mitigation: sleep disturbance (humans), habitat loss (wildlife) and disturbance (wildlife). Residual effects of the Project on wildlife are described further under the Wildlife Section.

The predicted residual effect of the Project on noise and vibration (sleep disturbance for humans) is limited to within the Project footprint, with a moderate magnitude as noise levels are predicted to exceed the criteria for sleep disturbance by less than 5 dBA, and reversible within the life span of the

Project. Contingent on the implementation of mitigation measures outlined in the Noise Abatement Plan, the significance of this residual effect is predicted to be *Not Significant*. There are also no potential cumulative effects on noise and vibration.

7.1.2 Terrain, Permafrost, Soils, and Vegetation

For additional information related to Terrain, Permafrost, Soils and Vegetation refer to Volume 5 of the FEIS and the FEIS Addendum.

7.1.2.1 Terrain

The Project is located in an area dominated by gently undulating or rolling landscapes with numerous kettle lakes connected by streams. Terrain elevation ranges between 300 and 700 masl and slope gradients rarely exceed 7%. Uplands are typically covered by morainal materials (51% of the total PDA) deposited on Precambrian, sedimentary, metamorphic or intrusive rocks. Glaciofluvial (14%), organic (6.4%), marine (8.5%), and lacustrine (1.1%) deposits are less common.

Exposed bedrock occurs over 2.6% of the PDA. The thickness of mineral soils overlaying bedrock (overburden) is the highest in plains and very gently sloping areas (average of 10.6 m) and decreases in rolling and undulating landscapes (average of 4.8 m).

A number of distinct landform types, including eskers, morainal rocky ridges, and boulder fields exist throughout the terrestrial Regional Study Area (RSA).

7.1.2.2 Permafrost

The Project is located within the continuous permafrost region of western Nunavut. A seasonally thawed active layer is present immediately beneath ground surface, with a mean maximum depth of approximately 2 m and a mean annual temperature that averages -6.5°C. Subsurface temperatures are perennially below 0°C at depths up to approximately 500 m below ground surface, except beneath some surface waterbodies. At the Goose Property, open taliks that connect to the deep groundwater are inferred to be present beneath waterbodies with widths greater than 200 m and water depths exceeding 1.3 m. Cryopegs are inferred to be present at the base of the permafrost and adjacent to deep taliks, as the groundwater beneath the permafrost has been shown to be hypersaline.

It is expected that most of the areas dominated by colluvium, weathered bedrock, eolian, bedrock, and marine deposits will display relatively low sensitivity to surface disturbance. However, organic surficial deposits and riparian zones, where fluvial material is covered by organic veneers, are likely to exhibit high susceptibility to surface disturbance, which may result in permafrost or ice lens degradation. Similarly, morainal deposits located on slopes or in low topographical positions are expected to have high ice content and as such display high susceptibility to surface disturbance.

Cold climate is also associated with several soil phenomena. Thermokarst typically occurs in wetlands as a system of very irregular hummocks and hollows, which form as a result of frost heaving and ice accumulation on the bottom of organic horizons. Frostboils are typically circular (1 to 3 m in diameter) upwellings of mud that are created by frost heaving. The presence of permafrost and annual cycles of freezing and thawing results in poor development of soils. About two-thirds of the inspected soils have been classified as Static Cryosols and one-third as Turbic Cryosols. The Project soil conditions are discussed further in the following section.

The Project is expected to interact with the permafrost environment where excavations, landfilling, and changes to ground thermal conditions will occur. Infrastructure that may interact include the open pits

and underground mines, TSF, WRSAs, roads, water management infrastructure, and buildings. The following impacts may occur:

- TSF. The TSF Containment Dam will rely on an impermeable liner incorporated into the dam fill and keyed into the permafrost foundation to achieve the required water retention properties. Therefore, it is imperative to maintain the frozen state of the key trench. Modeling suggests that the thaw beneath the TSF will not extend into the key trench. Once the dam is breached and the facility is no longer used for water storage, permafrost will aggrade (expand upwards) into the materials being stored in the TSF.
- Pits and Underground mines. In general, pits and underground mines are not expected to thaw permafrost during the operational phase. The local subsurface temperatures are expected to persist within underground mines. Open pits will expose deeper bedrock to ambient air temperatures, likely resulting in the development of an active layer with an annual freeze/thaw cycle. Flooding of the pits at closure will result in the development of a talik beneath each pit.
- WRSAs. Permafrost aggradation is expected to occur within and beneath earth-fill infrastructure, including the WRSAs, and the roadbeds of local site roads (SRK 2015b). Permafrost degradation will be minimized by appropriately insulating the ground with construction fill and by ensuring extra thermal protection between heat-producing structures and the ground.

7.1.2.3 Soils

Baseline soil samples within the LSA and RSA show that most soils have a low proportion of coarse fragments (below 30%) and low surficial stoniness (below 15%) and are moderately coarse (loam, sandy loam, fine sandy loam). Mineral soils in the terrestrial RSA are predominantly acidic (median pH is 5.9, range from 4.7 to 6.8). In general, soil metal concentrations in the LSA do not exceed CCME guidelines.

Soil disturbance associated with the Project that potentially may lead to erosion is expected only within the PDAs, as the development activity will be confined to these areas. It is assumed that the entire area of the PDAs is lost for the duration of the Project life (FEIS Project Description Volume 2, Section 4.2); therefore, the effects of Project activities on soils were assessed only for the Closure Phase.

The Closure Phase will be associated with the increased potential for soil erosion. In newly decommissioned/reclaimed areas where soil surface is disturbed or devoid of vegetation, the most fertile surficial fractions of soil may be lost due to wind erosion. Wind erosion of exposed soils may also result in dust and sediment entering waterways.

Exposed mineral soils are also sensitive to water erosion. For example, the ice rich surficial materials, once excavated and stockpiled, will thaw, process which is associated with of the release of seepage and sediment. Soil erosion can also occur on disturbed slopes during spring snow/ice melt and during rainfall events. Even on relatively flat terrain, exposed finer soils may be susceptible to splash erosion, which can result in a loss of soil structure and crusting of the surface, thereby impeding development of seeded protective vegetation.

Areas dominated by bedrock and glaciofluvial deposits are expected to exhibit relatively low erosion potential. Morainal deposits are expected to display variable but generally higher erosion potential; especially if soil disturbance takes place on slopes exceeding 5% or if the soil is stockpiled. When disturbed, deposits currently covered by organic horizons may display high erosion potential due to typically finer mineral soil textures and shallow active layer above the permafrost. Disturbance of the surficial protective organic layer could lead to permafrost degradation and land subsidence (Racine and Ahlstrand 1991).

Streams in the LSA are generally well protected against current levels of stream bank erosion. Fluvial deposits are generally coarse, contain high proportion of coarse mineral fragments, and are often covered by a tough organic layer reinforced by a network of intertwined root systems. Construction work in the riparian zones is expected to temporarily increase stream bank erosion potential, but mitigation measures for erosion control will be in place.

Soil disturbance leading to soil compaction is expected only within the PDAs. During Closure, increased machinery traffic will lead to soil compaction. Within the growing season, when soils are not frozen, most tundra soils are highly sensitive to compaction associated with even light intensity of traffic over the soil surface (Rescan 2011b). Compaction results in significant soil temperature changes, degradation of the organic horizon, and reduction of pore space between soil particles, which in turn limits water, nutrient, and air movement in the soil, leading to a decline in soil fertility and reduction in plant establishment and growth. In the Arctic, soil compaction can also lead to ground surface subsidence due to thawing of ice-rich permafrost (Racine and Ahlstrand 1991). Areas dominated by bedrock and glaciofluvial deposits are expected to exhibit relatively low susceptibility to compaction, whereas wetlands and tundra located in lower topographic positions (e.g., lower slopes, slope toes, depressions, and valley floors) are most vulnerable.

The mitigation and management measures designed to eliminate or minimize potential Project effects on soils include:

- Minimizing the Project area of impact.
- Establishing contact water collection ditches/berms, constructing sediment ponds, limiting land disturbance to a practical minimum, reducing water velocities across the ground through surface texturing and re-contouring, and progressively rehabilitating and stabilizing disturbed land surfaces to minimize erosion.
- Protecting exposed landscape surfaces will be by the installation of covering material such as riprap, aggregate, or rolled erosion control products.
- Installing synthetic permeable barriers and/or fibre rolls to reduce runoff velocities and retain sediments;
- Installing check dams, gabions, and energy dissipation structures to reduce flow velocities in channels.
- Maintaining and repairing any machinery prior to use that has the potential to result in a fluid release or leak.

7.1.2.4 Vegetation

Terrestrial ecosystem mapping and rare plant surveys were conducted in 2012 within the vegetation and terrestrial wildlife LSA. Vegetated ecosystems, constituting 73% of the LSA, are dominated by mesic tundra, dry-sparse tundra, and moist shrub-dominated tundra. The mesic tundra association, comprising nearly one-third of the LSA, is characterized by extensive areas dominated by dwarf woody shrub species, with a highly variable component of herbs, graminoids, mosses, and lichens. Sparsely vegetated ecosystems, constituting nearly 9% of the total LSA, typically occur on thin morainal veneers or exposed bedrock, windswept esker crests, blocky tundra, marine beaches and other barren sites that limit vegetation establishment. Non-vegetated ecosystems, constituting approximately 18% of the LSA, are dominated by freshwater lakes and ponds. Special landscape features, identified for their importance as wildlife habitat or potential to support rare plant species, include esker complexes, cliffs, bedrock outcrop and lichen-dominated ecosystems, riparian ecosystems, wetland ecosystems, and marine beaches and old beach heads. A total of 890 plant species identifications were made during the terrestrial

ecosystem mapping and rare plant field surveys within the LSA and RSA. The largest species group in the identified flora is that of the vascular plants, followed by the macrolichens. Ninety rare plant species were identified and were mainly found close to the shoreline of Bathurst Inlet throughout the LSA and RSA. No invasive plant species were found in the LSA during the 2012 field surveys.

Potential Project effects on vegetation and special landscape features included the direct loss or degradation of vegetation or special landscape features. The mitigation and management measures designed to eliminate or minimize potential Project effects on vegetation and special landscape features include: minimizing the Project footprint, using winter roads, and reducing fugitive dust where possible.

Following the application of mitigation and management measures, two residual effects were identified: vegetation loss, and special landscape feature loss. These residual effects are a result of the assumption that the entire PDAs would be lost. In reality, the area of vegetation/special landscape feature loss will be much less as it will be confined to the final footprint of the Project. The magnitude of the anticipated residual effects is expected to be low, the duration long term, the frequency is once but continuous/permanent, and the residual effects would be confined to within the Project footprint (PDA). The residual effects were assumed to be irreversible; however, there may be some recovery after closure. Contingent on the implementation of mitigation measures outlined in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) and the WMP (SD-05), the significance of residual effects for vegetation and special landscape features is predicted to be Not Significant.

A potential cumulative effects assessment was conducted because residual Project effects were predicted. The reasonably foreseeable George Property projects, Hackett River Project, and BIPR Project would each have spatial and/or temporal overlap with the terrestrial RSA. In addition to the Project residual effect of vegetation loss within the PDAs, an estimated 556 hectares of cumulative nibbling loss within the terrestrial RSA could result from development of infrastructure and roads associated with the proposed George Property projects, Hackett River Project, and BIPR Project. The magnitude of the anticipated cumulative effect is expected to be low (less than 1% of the RSA), the duration long-term, the frequency is once but continuous/permanent, and the cumulative effect would be confined to within the project footprints of each project. The significance of the residual cumulative effect (vegetation loss) for the vegetation and special landscape features is predicted to be *Not Significant*. The Project residual effects and cumulative effects were confined to the PDA and the project footprints of potential future projects within the RSA.

During the FEIS Final Hearing, Sabina committed to:

- In consultation with the KIA, GN, and other relevant parties Sabina shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road construction. Findings from these studies will be used to inform reclamation planning as appropriate (FA-GN-C-25). For additional information refer to Section 5.4.6 and Section 8.6.3.
- To implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operation, and decommissioning for all fish-bearing water crossings. Sabina acknowledges these measures include, but are not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection of riparian vegetation, and other forms of bank stabilization. (FA-DFO-T-7)

Sabina believes that sufficient baseline vegetation data was collected and made available during the environmental assessment. Sabina has undertaken extensive vegetation baseline studies as outlined in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Volume 5, Appendix V5-4A). Some of the highlights of this study include:

- Conducting soils and vegetation mapping of a very large LSA of 134,370 ha defined by the local the watersheds;
- Developed an ecological classification system for the area that links soil types with vegetation communities;
- Classified terrain, soils and ecological communities for the entire LSA;
- Conducted 817 field plots to ground truth the mapping, including the PDA, MLA, winter road and control sites; and
- Conducted rare and invasive plant surveys using a qualified botanist.

7.1.3 Wildlife

For additional information related to wildlife environmental assessment refer to Volume 5 of the FEIS and the FEIS Addendum. Environmental effects and proposed mitigation measures for protection of wildlife including: caribou, grizzly bears, muskox, wolverine and furbearers, migratory birds, seabirds/seaducks, raptors, and ringed seals were fully assessed by the NIRB.

7.1.4 Groundwater (hydrogeology)

For additional information related to Groundwater refer to Volume 5 and 6 of the FEIS and the FEIS Addendum.

The Project lies within the continuous permafrost zone of the continental Canadian Arctic and as such, groundwater is present deep below the continuous permafrost layer (e.g., > 400 m below surface). Water present in the active layer above the permafrost, is thawed during the summer only, and it can interact with surface waters in general. There is minimal connection between the surface active layer and deep groundwater flow regimes due to the presence of the thick low-permeability permafrost. The deep sub-permafrost groundwater is hydraulically connected with the surface water and the active layer via open taliks (also called through taliks) beneath large lakes, such as below Goose Lake.

Structural features in the bedrock, such as the northwest-southeast trending faults commonly found at the Goose Property, may act as preferential flow pathways for groundwater in taliks and beneath the permafrost. In general, the deep groundwater flows from higher elevation large lakes to lower elevation large lakes. Therefore, the flow direction can be inferred from the surface elevation of the large lakes that overlie open taliks.

Preliminary results of groundwater sampling during baseline studies indicate that the deep groundwater is more saline than seawater, with total dissolved solid concentrations of 47,000 mg/L and higher, and has elevated levels of chloride and select trace metals.

The continuous permafrost found throughout the Goose Property is expected to limit interaction of the groundwater with the Project. However, all components of the groundwater environment (active layer, talik, and subpermafrost groundwater) are expected to interact with the Project to some degree.

The active layer may interact with Project components located on the ground surface. Changes to flow patterns within the active layer would be similar to those within the surface water (Section 7.1.6.3) as flow in the active layer is governed by topography.

A closed talik may form beneath the TSF or the Saline Water Pond due to the introduction of heat from the ponds. The extent of these taliks will be dependent on the temperature and size (width and depth) of the pond. The permafrost is thought to contain high-salinity water which would be released into a mobile state when thawed. However, the talik beneath the TSF and the Saline Water Pond will be hydraulically isolated due to the construction of dams (and related permafrost aggradation into the dams resulting in frozen cores) around the down-gradient facility perimeters and the presence of continuous permafrost at depth.

The faces of the open pit mines would freeze in response to the excavation, dewatering, and exposure to cold atmospheric air temperatures. A period of geothermal transience would occur following initiation of excavation and dewatering, with development and thickening of a frozen layer beneath the deepening excavation each winter. No ML/ARD is expected to contact the groundwater due to dewatering (as needed) and development of an ice layer beneath. Flooding of the open pits would result in the thaw of pit faces and would isolate the exposed bedrock from further oxidation.

The Umwelt, Llama, and Goose Main U/G mines will penetrate through the permafrost and contact the groundwater in the basal cryopeg and beneath the permafrost. The Echo U/G will not penetrate through the basal permafrost, and as such, no groundwater inflows are expected in this mine. A mine inflow study for the three underground mines penetrating permafrost was conducted and found that these underground mines are expected to behave as local groundwater sinks when being dewatered, with groundwater flowing within the fractures radially towards the mine. No ML/ARD is expected to contact the groundwater while the underground mines are operational due to dewatering and the resulting radial-inward groundwater flow. Water extracted from underground will be pumped to the Saline Water Pond. Flooding of a mine would result in the resurgence of taliks and would isolate the exposed bedrock from further oxidation.

7.1.5 Geology and Mineralogy

The Goose PDA is located over the northeastern corner of the Slave and Churchill Geologic Provinces. The MLA is underlain by Lower to Middle Proterozoic sedimentary rocks of the Kilohigok Basin, part of the Bear Geologic Province. Glacial material deposited after the Quaternary Wisconsin Glaciation covers much of the Archean Geological Provinces. Glacial deposits are predominantly comprised of moraine type deposits (glacial till), which mostly consist of sand and variable amounts of silt.

The Goose Property consists of a package of variably folded and faulted sedimentary rocks. Greywacke and subordinate mudstone surround and variably interbed with silicate banded iron formation and oxide banded iron formation. Gold mineralization tends to be hosted in the lower iron formation unit. The sedimentary package is cross-cut by mafic dikes, lesser volumes of felsic dikes, and volumetrically insignificant quartz veins.

Gold mineralization is most often associated with sulphide minerals, particularly arsenopyrite, and visible gold is found almost exclusively in zones with abundant arsenopyrite. Other sulphide minerals (pyrite and pyrrhotite) are typically enriched in a halo in the banded iron formation and greywacke around the arsenopyrite-rich ore zones.

The mafic dikes have very low sulphide contents and are largely devoid of gold mineralization.

7.1.6 Surface Water Quality and Sediment Quality

For additional information related to surface water quality and sediment quality refer to Volume 6 of the FEIS and the FEIS Addendum.

7.1.6.1 Freshwater Water Quality

The lakes and streams in the Goose Property LSA are typical of Arctic freshwater systems. Surface waters have relatively low quantities of dissolved solids and metals, which is likely due to the geology of the area. The lakes and streams are generally soft and poorly buffered, with pH values ranging from slightly acidic to neutral. Lakes and streams typically have low quantities of suspended solids and are clear. Dissolved oxygen concentrations are often high in streams and lakes, but some environments experience oxygen concentrations less than the CCME water quality guidelines during periods of restricted water mixing under the ice (lakes) and low flow conditions in summer (streams). Similarly, nutrient concentrations are low and most lakes and streams are ultra-oligotrophic to oligotrophic.

Metal concentrations in lakes and stream are usually low, but are occasionally elevated due to the proximity to metal mineralization in the local geology. As a result of naturally elevated metal concentrations and the generally soft waters of the lakes and streams, the concentrations of cadmium and copper are occasionally greater than the CCME water quality guidelines for the protection of freshwater aquatic life.

Potential Project-related effects on the freshwater water quality include Project activities that could alter the following indicators for water quality: pH, TSS, nutrients, metals, hydrocarbons, BOD, chlorine, and cyanide. Eleven potential effects were identified as a result of the Project:

- construction and decommissioning activities;
- WIRs;
- site contact water;
- mine contact water;
- water use;
- quarries and borrow pits;
- explosives;
- fuels,
- oils and polycyclic aromatic hydrocarbons;
- treated sewage discharge; and
- dust deposition.

Mitigation and management measures will be in place to control these pathways, and therefore minimize or eliminate potential Project effects on freshwater water quality. The WMP (SD-05) along with Project design features such as using geochemically suitable material for roads and pads will eliminate or reduce potential effects to freshwater water quality. Contact water is contained in event ponds and tailings management facilities, and is transferred via diversions and pumped pipelines. It is treated prior to discharge from site.

- Establishing contact water collection ditches/berms, constructing sediment ponds, limiting land disturbance to a practical minimum, reducing water velocities across the ground through surface

texturing and re-contouring, and progressively rehabilitating and stabilizing disturbed land surfaces to minimize erosion.

- Maintaining a setback distance of 31 m from creeks and streams and preserve vegetative buffers to limit impacts on water quality.
- Use dust skirts on conveyors and apply dust suppression measures.
- Routinely inspect the effectiveness of water management structures.

Following the application of mitigation and management measures, four residual effects were identified: sediment introduction to surface waters as a result of site Mobilization and Construction, and Decommissioning, water quality changes due to site contact water, water quality changes due to mine contact water, and changes in water quality because of the residues of explosives. The magnitude of the anticipated residual effects was expected to be low to moderate, the duration short to long term, sporadic in nature, and confined to within the Goose Property LSA. The residual effects were also anticipated to be reversible. Contingent on the implementation of mitigation measures, the significance of residual effects for freshwater water quality was predicted to be Not Significant.

7.1.6.2 Freshwater Sediment Quality

The lakes in the Goose Property LSA are comprised of fine materials such as silts and clays (> 89% composition) with generally low levels of organic matter. Streams are composed of coarser materials with the sediments in the LSA made up mainly of sand (43 to 53%), with small proportions of gravel- and silt-sized particles (22 to 29%). Arsenic and copper sediment concentrations are naturally above CCME sediment quality guidelines at several lakes and streams within the Goose Property LSA.

Potential effects on freshwater sediment quality include Project activities that could alter the following indicators for sediment quality: particle size, nutrients and organic carbon, metals, and hydrocarbons. The potential effects from Project activities were assessed based on potential interaction pathways with the freshwater environment, including runoff, water withdrawals, treated discharge, and aerial deposition. Mitigation and management measures will be in place to control these pathways, and therefore minimize or eliminate potential Project effects on freshwater sediment quality. The WMP (SD-05) along with mitigation measures to avoid erosion will eliminate or reduce potential effects to freshwater sediment quality.

Following the application of mitigation and management measures, four residual effects were identified: sediment introduction to freshwater sediments as a result of construction and decommissioning, sediment quality changes due to site contact water, sediment quality changes due to mine contact water, and sediment quality changes because of explosives residues. The magnitude of the anticipated residual effects was expected to be low to moderate, the duration short to long term (confined to the life of the Project), sporadic in nature, and confined to within the Goose Property LSA. The residual effects were also anticipated to be reversible. Contingent on the implementation of mitigation measures, the significance of residual effects for freshwater sediment quality was predicted to be Not Significant.

7.1.6.3 Marine Water Quality

The water in southern Bathurst Inlet was typical of pristine Arctic marine waters, with low concentrations of nutrients, suspended solids, and metals. Nutrients are lower in the open-water surface layer than at depth or during the winter due to enhanced biological uptake (e.g., phytoplankton) and freshwater dilution through ice melt and freshwater inflow. Metal concentrations were generally below the CCME guidelines for the protection of marine and estuarine aquatic life and were often undetectable. Near-shore sites by stream outflows or in areas of shallow bathymetry sometimes had elevated levels of

suspended material and metal concentrations. Cadmium was the only naturally elevated metal above CCME marine water quality guidelines in the LSA. Deep water dissolved oxygen concentrations were occasionally below the CCME dissolved oxygen guideline of 8 mg/L, which is common in deep fjords where deep water renewal is slow and organic material is continually re-mineralized.

Potential Project effects on the marine water quality included shipping activities; sediment introduction to water as a result of construction, and reclamation; site contact water; winter roads; explosives; fuels, oils, and polycyclic aromatic hydrocarbons; discharges; and dust deposition.

The potential effects from these activities were assessed based on their potential interaction pathways with the marine environment, including runoff, contact and physical effects (shipping), treated discharge, and aerial deposition. The mitigation and management measures designed to control these pathways, and therefore minimize or eliminate potential Project effects on the marine water quality included: minimizing vessel speeds and restricting vessels to deeper waters, using geochemically suitable material for roads and pads, adhering to regulatory guidelines for treated discharges, and using best management practices for the storage, transport, and use of fuels, explosives, and hazardous materials as well as for dust suppression and incineration.

Following the application of mitigation and management measures, three residual effects were identified: marine water quality changes due to shipping (propeller wash), sediment introduction to marine waters as a result of construction and reclamation activities, and marine water quality changes due to site contact water. The magnitude of the anticipated residual effects is expected to be low, the duration short to medium term (confined to the life of the Project), sporadic in nature, and confined to within the marine LSA. The residual effects are also anticipated to be reversible. Contingent on the implementation of mitigation measures, the significance of residual effects for marine water quality is predicted to be Not Significant.

For additional information on marine monitoring refer to Section 8.5.4 and the Marine Monitoring Plan (SD-23).

7.1.6.4 Marine Sediment Quality

The sediment environment in Bathurst Inlet is generally a function of water depth and physical processes, where shallower, near-shore areas are subjected to increased erosion and re-suspension due to the interaction of the wind-driven water currents and the seabed. Thus, the shallower sediments (< 5 m) in Bathurst Inlet were composed of coarser sand substrates (60 to >95%) than the finer silts and clays found in the deeper waters 100 m from shore (50 to 90%). Sediments near the MLA within the LSA were sandy (> 75%), particularly in the near-shore environment where the majority of Project activities will occur.

Metal concentrations in marine sediments were strongly correlated to the relative abundance of silt and clay particles, and therefore were generally greater in the deeper waters. Naturally elevated concentrations of arsenic, chromium, and copper were observed in the deeper sediment samples and were often greater than the CCME sediment quality guidelines for the protection of aquatic life. Sediment metal concentrations near the MLA were observed to be naturally low, as expected because of the relative dominance of sand-size particles.

Potential Project effects on marine sediment quality shared the same pathways and mitigation and management measures as outlined for marine water quality. The primary pathways between the Project activities and the marine sediment quality were identified as runoff, contact and physical effects (shipping), discharge, and aerial deposition. The same mitigation and management measures would be applied as described above in the marine water quality section.

Following the application of mitigation and management measures, three residual effects were identified: marine sediment quality changes due to shipping (propeller wash), sediment introduction to the marine environment as a result of construction and reclamation activities, and marine sediment quality changes due to site contact water. The magnitude of the anticipated residual effects is expected to be low, the duration short to medium term (confined to the life of the Project), sporadic in nature, and confined to within the marine LSA. The residual effects are also anticipated to be reversible. Contingent on the implementation of mitigation measures outlined in the AEMP (SD-21) and the WMP (SD-05), the significance of residual effects for marine sediment quality is predicted to be *Not Significant*.

For additional information on marine monitoring refer to Section 8.5.4 and the Marine Monitoring Plan (SD-23).

7.1.7 Hydrology

Surface hydrology is governed by the Arctic nival regime where peak flow discharges during the spring, shortly after air temperature rises above freezing. In small basins, these high flows can last as little as a few days. Peak flow typically occurs immediately after ice break-up in lakes and channel reaches, especially in the smaller basins.

Due to the presence of permafrost, small streams do not receive groundwater contributions, and flow discharges from these basins may cease after freshet until the late summer rains begin. For rivers draining larger watersheds, the freshet peak may be delayed relative to smaller drainages as snowmelt from upper portions of a watershed is routed through the drainage network.

Precipitation events in the late summer and early fall may lead to a second hydrographic peak, but this is generally of lower magnitude than the freshet peak. Channel freeze-up typically occurs between late October and early November. In smaller drainage basins, stream channels typically freeze to their bottom, with zero flow occurring in winter. In very large catchments and larger lake outlets, flow energy and water turbulence may sufficiently maintain streamflow and prevent downstream reaches from freezing completely.

There is a general consensus in the scientific community that the earth's climate is changing. The magnitude of warming and increases in precipitation in the Arctic are expected to be large relative to the rest of the planet (ACIA 2005). For northern Canada, mean annual temperature may increase by approximately 2.0ºC for the years 2010 to 2030, and by approximately 6.0ºC for years 2070 to 2100, compared to 1961 to 1990 conditions. Over the same time periods, precipitation could increase from 5 to 8% and 15 to 30%, respectively.

The expected duration of the Project is currently 27 years (4 years Mobilization and Construction, 10 years Operations, 8 years Closure, and 5 years Post-Closure) and could potentially be impacted by climate change. The following changes could occur:

- *Changes to the Active Layer.* The Project lies in the zone of continuous permafrost. By 2050, active layer thickness is expected to increase by less than 15 cm for areas without a thick insulating organic layer, which is typical for the Project area. The thickness of the active layer is largest in the summer. However, because most runoff in the Project area is typically snowmelt-derived and runs off quickly during the freshet, the active layer will still be thin during the freshet. Therefore, while climate change will likely affect the timing of thaw, and the maximum summertime thickness of the active layer, the active layer will always be thin during the freshet, and therefore soil storage changes (which will be more prevalent in the later summer months) will not be as influential.

- *Changes to Runoff.* Impacts of climate change on runoff near the Project area are difficult to predict because of the spatial and temporal variability in observed precipitation and air temperature and a general lack of scientific knowledge (Arctic hydrologic processes are only moderately well understood). Despite these uncertainties, most predictions of the impacts of climate change on Arctic river flow show increases in runoff and discharge in the 21st century, although the amount of increase varies greatly.
- *Changes to Winter Flow.* Winter flows have the potential to markedly increase in the Arctic and Subarctic. Flow under ice may also extend in duration under warmer climate scenarios. However, due to the small size of the watersheds in the Project area, it is unlikely that winter flow currently occurs in any Project area streams and it is considered unlikely that anticipated warming during the Project lifespan would lead to winter flow in the Project area.
- *Hydrologic Impacts of Extreme Weather Events.* The intensity of precipitation during extreme events is predicted to increase. From a hydrologic perspective, increased rainfall is important because runoff ratios are high in extreme events. In large rainfall-runoff events, the surface can saturate, flow pathways can connect, and water runs off quickly and efficiently. An increase in extreme events could increase sediment transport, cause channel aggradation, erosion, avulsion, and extreme flows. These changes have the potential to negatively impact water management structures and project infrastructure, such as aggradation or erosion of diversion channels or event ponds.

Project activities that could have potential effects on hydrology include: site water management activities (including water withdrawal from lakes, water diversions and storage, modification of natural drainages, and lake dewatering) and WIR construction and maintenance. The potential effects from these activities were assessed using two indicators: streamflow and lake volumes.

The mitigation and management measures designed to eliminate or reduce the potential effects on surface hydrology included: modelling for and establishing water withdrawal limits; confinement of infrastructure to local watersheds; management of non-contact water, contact water, and saline water; and following DFO's measures to avoid causing harm to fish and fish habitat.

Following the application of mitigation and management measures, two residual effects were identified: change in streamflows, and change in lake volumes. The magnitude of the anticipated residual effects is expected to be low, the duration medium term (confined to the life of the Project), continuous in nature, and confined to within the PDA or LSA. The residual effects are also anticipated to be reversible. Contingent on the implementation of mitigation measures outlined in the WMP (SD-05), the significance of residual effects for hydrology is predicted to be Not Significant.

For additional information related to surface water quality and sediment quality refer to FEIS, Volume 6 – Freshwater Environment and FEIS, Volume 7 – Marine Environment.

7.1.8 Fish and Fish Habitat

For additional information related to Fish and Fish Habitat refer to Volume 6 and 7 of the FEIS and FEIS Addendum.

Following the 2016, NIRB Final Hearing, Sabina compiled additional information regarding Rascal Stream Fishway and Bernard Harbour (FEIS Addendum Appendix V6-6H-Bernard Harbour Report and Baseline). The Rascal Steam Fishway memorandum is attached in Appendix F-6 and provides supplemental information related to the study area, construction, mitigation and monitoring, culvert installation and water quality. For additional information, refer to Section 8.5.3.

7.1.8.1 Freshwater Fish

Habitat

The freshwater fish/aquatic habitat comprises both the physical habitat and the biological resources that sustain the productivity of freshwater fisheries species and the diversity of freshwater fish communities. Within the Goose Property LSA, there are permanent barriers to fish migration along the stream between Pond A and Giraffe Lake and along the stream between Umwelt Lake and Goose Lake. Habitat quality for rearing and spawning Arctic Grayling (*Thymallus arcticus*) is generally best in the reaches immediately upstream and downstream of lakes. High quality habitat is present at Rascal Stream East and Goose Inflow South, the stream system connecting Rascal and Goose lakes. This stream contains small cobble and gravel that supports Arctic Grayling spawning and rearing, as well as providing a migratory corridor between lakes with overwintering habitat.

Large lakes such as Propeller and Goose lakes provide the majority of year-round fish habitat for locally abundant fish species such as Lake Trout (*Salvelinus namaycush*) and Arctic Grayling within the LSA. These deep lakes have sufficient oxygenated water to sustain fish populations during the ice-covered season. In contrast, shallow lakes (< 2 m) and streams freeze completely during the winter and are unavailable as overwintering habitat.

The assessment of potential effects on freshwater fish/aquatic habitat involved the direct effects of Project activities on the physical habitat of freshwater fish. Potential indirect effects are addressed as part of the freshwater water quality and sediment quality assessments. Project activities that have the potential to directly affect freshwater fish/aquatic habitat include the loss of lake, pond and stream habitat due to lake dewatering, development of open pits, water withdrawal for domestic and process use, water management activities, a TSF, water intake and discharge pipe construction, airstrip and road crossings and winter road construction. The primary mitigation measure to avoid potential effects on freshwater fish/aquatic habitat is the siting of infrastructure to avoid freshwater fish habitat wherever feasible. The Goose Plant Site, Ore Stockpile, and WRSAs have been located to avoid fish-bearing waters. Another key mitigation measure is the establishment of maximum water volume uses which have been based on protecting critical life stages of fish in Goose, Propeller, and Big lakes. Unavoidable losses of fish habitat (e.g., loss of Llama Lake due to Llama Open Pit and loss of Umwelt Lake due to Saline Storage Pond) will be compensated through the implementation of the Conceptual Fish Offsetting Plan. Therefore, no residual effects are anticipated on the freshwater fish/aquatic habitat.

Freshwater Fish Communities

The freshwater fish communities in the Goose Property LSA are typical of inland, headwater regions of the Canadian Arctic. Lake Trout (*Salvelinus namaycush*) was the dominant species, followed by Round Whitefish (*Prosopium cylindraceum*), Arctic Grayling (*Thymallus arcticus*), Slimy Sculpin (*Cottus cognatus*), and Ninespine Stickleback (*Pungitius pungitius*). Other species found within the LSA include Burbot (*Lota lota*) and Lake Whitefish (*Coregonus clupeaformis*). No Arctic Char (*Salvelinus alpinus*) have been captured within the Goose Property LSA, although they are likely present within the freshwater RSA.

Potential Project-related effects on freshwater fish communities focused on the two abundant freshwater species in the Goose Property LSA, Lake Trout and Arctic Grayling. The main potential Project-related effect to these species is direct mortality with subsequent decreases in population abundance. The following potential Project activities could contribute to the direct mortality and decreased population abundance of Lake Trout or Arctic Grayling: lake dewatering, building of winter roads, construction of the Project footprint, water withdrawal for domestic and process use or winter road

construction, and blasting with explosives. The primary mitigation measure to avoid potential effects on Lake Trout and Arctic Grayling is the siting of infrastructure to avoid freshwater fish habitat wherever feasible. The accommodations area and Process Plant, Ore Stockpile, and WRSAs have all been located to avoid fish-bearing waters. Another key mitigation measure is the establishment of maximum water volume uses that are been based on protecting critical life stages of fish in Goose, Propeller, and Big lakes. Unavoidable losses to these freshwater fish species (e.g., loss of Llama Lake due to Llama Open Pit and loss of Umwelt Lake due to Saline Storage Pond) will be compensated through the implementation of the Conceptual Fish Offsetting Plan.

Following the application of mitigation, management and balancing the loss of fisheries productivity through offsetting, no residual effects are anticipated on freshwater fish (Lake Trout and Arctic Grayling).

7.1.8.2 Marine Fish

Habitat

The marine fish/aquatic habitat comprises both the physical habitat and the biological resources that sustain the productivity of marine fisheries species and the diversity of marine fish communities. The shoreline of the LSA and the southern section of the RSA are dominated by a shallow water shelf, which extends to a depth of approximately 10 m and a distance of 120 m offshore. Beyond this, the bottom descends steeply to depths greater than 40 m. The substrate in the intertidal zone is dominated by cobble and gravel, while deeper areas feature more mud and silt. Based on nearshore surveys and TK, potentially important habitat areas for marine and anadromous fish were identified in the LSA and RSA. The outlet of some rivers are important habitat for Arctic Char (*Salvelinus alpinus*), with some of these areas acting as migratory pathways for anadromous Arctic Char. Intertidal gravel beaches and shallow gravel beds are important spawning habitats for Capelin (*Mallotus villosus*).

The assessment of potential Project-related effects on marine fish/aquatic habitat involved the direct effects of Project activities on the physical habitat of marine fish. Potential indirect effects are addressed as part of the marine water quality and sediment quality assessments. Project activities that have the potential to directly affect marine fish/aquatic habitat include shipping effects and the project infrastructure footprint (Lightering Terminal Barge, one water intake pipe, and one discharge pipe).

Mitigation measures to eliminate or reduce potential effects to the marine fish/aquatic habitat include limiting the amount of in-water construction, following DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat, enforcing speed limits for ships navigating through the RSA, and implementing measures to eliminate or reduce potential effects to water quality and sediment quality.

Following the application of mitigation and management measures, two residual effects were identified: effect on Marine Fish/Aquatic Habitat due to the in-water footprint of the Lightering Terminal Barge; and effect due to the in-water footprint of the construction of the intake and discharge pipes. The magnitude of the anticipated residual effects is expected to be negligible, the duration medium term (confined to the life of the Project), sporadic in nature, and confined to the footprint of the works. The residual effects will be immediately reversible due to recolonization of benthic invertebrates requiring no intervention. The probability of these residual and cumulative effects occurring is likely; however, they are predicted to be Not Significant**.**

Marine Fish Community

The marine fish community of Bathurst Inlet is characteristic of Arctic marine ecosystems and includes marine, anadromous, and freshwater/estuarine species. Many of these species play important roles in the ecological and cultural health of the area. Dominant species include Fourhorn Sculpin (*Myoxocephalus quadricornis*), Capelin (*Mallotus villosus*), Pacific Herring (*Clupea pallasii*), and Starry Flounder (*Platichthys stellatus*). None of the species sampled during the baseline studies are threatened or endangered. Arctic Char (*Salvelinus alpinus*) were not captured during baseline studies, but are presumed to occur in the LSA due to the presence of char spawning rivers and streams in the marine RSA.

Potential Project effects on the marine fish community focused on Arctic Char and include potential direct mortality from in-water construction of pipes and the barge terminal, population effects from introduced species carried by ballast water, vessel propeller wash, and underwater noise from shipping activities. Mitigation measures to eliminate or reduce potential effects to the marine fish community include limiting the amount of in-water construction, eliminating ballast water exchange, and enforcing speed limits for ships navigating through the RSA.

Following the application of mitigation and management measures, one residual effect was identified: effects of shipping noise on marine Arctic Char populations. The magnitude of the anticipated residual effect is expected to be low, the duration medium term (confined to the life of the Project), sporadic in nature (3 to 5 ships per open-water season, depending on the Project phase), and confined to the marine RSA. The residual effect will be reversible as it will end when shipping associated with the Project ends. Contingent on the implementation of mitigation measures, the significance of the residual and cumulative effects for marine fish communities as assessed for Arctic Char is predicted to be *Not Significant*.

7.2 STUDIES

The Project has a long history in the Kitikmeot region, from grass roots exploration to the environmental baseline and assessment work to submission of the Application. Table 5.1-1 provides a summary of the historical ownership milestones and Back River site history.

Since 1982, various owners and operators have accumulated a wealth of information on the site and Project area. A summary of the scientific research studies, TK studies, technical documents compiled to date by Sabina in preparing the FEIS and Type A Water Licence is provided in Appendix B-2.

For a summary of the procedural history to date beginning with submission of a Project Description to the NIRB in 2012, refer to Appendix D-2.

8. Environmental Impacts, Mitigation, and Monitoring

Sabina's EMS provides a framework for the environmental impacts, mitigation, and monitoring activities to be implemented through the life of the Project. The EMS incorporates the strategies employed for adaptive management using the precautionary principle to pursue the goals of sustainable development. Within this framework, individual management plans have been designed to address all aspects of the company's activities and contain the detailed mitigation measures and monitoring programs to be implemented throughout the life of the Project in order to eliminate or minimize adverse effects. The EMS also verifies that standard operating procedures reflect legal requirements pertaining to the Project, and that conditions set at the time of the Project's authorizations as well as requirements pertaining to the relevant laws, regulations, and permits are met. All Project employees and contractors are required to comply with these management plans. The reporting and documentation requirements for these management plans, auditing, and process of management review and revisions are all specified in the EMS. The EMS will offer enough flexibility to respond to the monitoring results in a timely fashion to reduce or eliminate potential adverse residual effects to the natural and socio- economic environments.

Key elements of these plans are execution and accountability within the Company's organization to ensure that the objectives of the plan are met. As the Project advances though its various phases of development (Construction, Operations, and Closure), the on-site organizational structure of the site management team will change. However, the fundamental commitments made by the Company as embodied in the management plans will remain. Furthermore, the process of continual improvement (review and adaptive management) may also introduce occasional changes for some components of the management plans. In essence, the management plans are tools designed to manage change while ensuring that the Company's objectives and environmental commitments are achieved.

Sabina does not expect the core content of these management plans to change significantly over the life of the Project. However, certain sections of each plan will be updated regularly including the following:

- changes in regulations affecting the Project;
- roles and responsibilities - will adapt to the evolving organizational structure on-site and off-site;
- monitoring requirements, objectives, and thresholds will be adapted on the basis of annual review of monitoring information collected in previous time period (adaptive management); and
- changes in reporting requirements as directed by the licensing authority.

In addition, Sabina may continue to enhance document structure and formatting to align with operational and reporting requirements.

The mitigation measures applied to the Project are based on best management practices and are expected to prevent or minimize adverse effects on the receiving environment, and ongoing monitoring will inform Sabina of their effectiveness. If any unforeseen adverse effects are identified during the life of the Project, measures will be taken to correct them and prevent them from occurring in the future. Adaptive management is an iterative approach based on a learning process gained from monitoring which improves long-run management outcomes. Sabina is committed to implementing effective mitigation measures and to use an adaptive management approach to ensure mitigation measures are optimized.

The list of Management Plans and their applicability through the life of the Project is presented in Table 8.1 and submitted as part of this Application.

Table 8.1. List of Management Programs and Associated Management Plans for the Project

Document	Construction	Operations and Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post-Closure
Infrastructure and Access Management Program					
Road Management Plan (SD-02)	x	x	x	x	
Borrow Pits and Quarry Management Plan (SD-03)	x	x	x	x	
Water Management Program					
Water Management Plan (SD-05)	x	x	x	x	
Waste Management Program					
Ore Storage Management Plan (SD-07)		x	x		
Mine Waste Rock Management Plan (SD-08)	x	x	x	x	
Tailings Management Plan (SD-09)	x	x	x	x	x
Landfill and Waste Management Plan (SD-10)	x	x	x	x	
Incineration Management Plan (SD-11)	x	x	x	x	
Landfarm Management Plan (SD-12)					
Hazardous Materials Management Plan (SD-13)	x	x	x	x	
Emergency Response Program					
Risk Management and Emergency Response Plan (SD-15)	x	x	x	x	
Fuel Management Plan (SD-16)	x	x	x	x	
Spill Contingency Plan (SD-17)	x	x	x	x	
Oil Pollution Emergency Plan (SD-18)	x	x	x	x	
General and Aquatic Effects Monitoring Program					
Environmental Management and Protection Plan (SD-20)	x	x	x	x	x
Aquatic Effects Management Plan (SD-21)	x	x	x	x	
Conceptual Fish Offsetting Plan (SD-22)	x	x		x	
Marine Monitoring Plan (SD-23)	x	x	x	x	
Quality Assurance / Quality Control Plan (SD-24)	x	x	x	x	x
Interim Closure and Reclamation Program					
Interim Closure and Reclamation Plan (including Interim Closure Cost Estimate) (SD-26)		x	x	x	x
Vegetation Monitoring Plan	x	x			
Conceptual Fish Out Plan	x				

Preliminary discussion of the Project management plans is presented in the following sections. For full details refer to the complete Management Plan.

8.1 INFRASTRUCTURE AND ACCESS MANAGEMENT PROGRAM

The Infrastructure and Access Management Program includes:

- the Road Management Plan (SD-02); and
- the Borrow Pits and Quarry Management Plan (SD-03).

8.1.1 Road Management Plan

The Road Management Plan (SD-02) outlines construction, operation, and management of access and transportation for the Project including construction, operations, and closure of an all-weather airstrip, all-weather roads, and WIRs.

All-weather roads will be constructed at Goose Property and the MLA and will consist of haul and service roads allowing operations to continue year-round. The roads will be designed to protect the permafrost regime. At water crossings, bridges and/or culverts will be designed to handle a 1-in-100-year event.

The proposed all-weather Goose Airstrip will be classified as a "registered aerodrome" and be designed to recommended standards and practices. The design considers environmental and archaeological factors in the airstrip alignment.

Inspection and maintenance of the all-weather roads will include:

- Regular inspections that will look out for:
  - seasonal freeze and thaw (summer months);
  - signs of accumulation of ponded water;
  - grading of gravel roads; and
  - condition of culverts and stream crossings.
- Maintenance and repair of any issues arising from the inspections.
- In areas or times prone to high dust levels, mitigation measures such as grading, placement of coarser gravel, and/or watering of the road surface will be used to reduce dust levels.
- Snow clearing.

Ice roads will be constructed over land and ice where environmental conditions permit and will be designed to carry legal highway loads. The roads will be operational from January to April each year.

Ice roads will be inspected and maintained in accordance with the "*Guidelines for Safe Ice Construction*" published by the Northwest Territories Department of Transportation (2015).

Sabina's traffic management and road safety regulations will address:

- General Regulations for Use of the WIRs;
- Rules of the Road, including:
  - speed restrictions;
  - security/policing;
  - drug, alcohol, and firearms;
  - littering and refuse disposal;

- safety restrictions and equipment;
- hours of works/log book;
- designated refuge and rest areas;
- communications;
- spills and dangerous/emergency situations;
- stopping on lakes/water crossings; and
- wildlife.

Reclamation of the haul and service roads will follow the completion of mining. Where possible, progressive reclamation will lead to roads being reclaimed after they are no longer needed. Decommissioning of the roads will involve restoring natural drainage (removing culverts, bridges, and other obstructions) and stabilizing slopes where there is potential for erosion.

8.1.2 Borrow Pits and Quarry Management Plan

The purpose of the Borrow Pits and Quarry Management Plan (SD-03) is to ensure sound management of borrow and quarry material, explosives, dust, and water in order to minimize the impacts to the local environment during the life of a quarry. The main environmental concerns related to quarry operations are the potential for ML/ARD and/or TSS on downstream water quality, as well as potential for dust emissions, and protection of the permafrost.

The primary purpose of borrow and rock quarries is to support construction and operation of all-weather airstrips, all-weather roads, and camp operations/enhancements at Goose Property and the MLA.

It is estimated that at Goose Property, 5 Mt of aggregate will be required for Construction. A portion of this material will be sourced from the Airstrip Quarry; it is estimated that there is approximately 125,000 m^3 of available material in this existing permitted quarry area. Additional construction material necessary for construction will be sourced from the cut/fill balance of the Goose Plant Site area and from open pit mining.

The MLA will require aggregate for the construction of service roads, laydown pads, infrastructure foundations, and fuel storage and other containment areas. This material will be sourced from the MLA Fuel Storage Area foundation (MLA Quarry) and will be used to fill all other infrastructure areas. To reduce the overall volume of fill required Sabina proposes to use swamp mats or rig mats at the MLA.

The borrow pit and quarry locations were assessed by the geotechnical properties of the material, the geochemistry (must be NPAG for construction use) and ARD/ML potential, available volume of material, proximity to infrastructure, and avoidance of environmentally sensitive (e.g., fish and fish habitat) and culturally sensitive (e.g., archaeological) areas.

The proper implementation of best management practices will ensure sound management of borrow and rock quarry material, explosives, and freshwater which will help to minimize potential impacts to the environment during the life of a quarry.

Surface drainage, water, and dust management procedures will be implemented at all quarry/borrow locations. Monitoring plans to access ML/ARD potential, water quality, pit stability, permafrost, and wildlife will be implemented for the quarry areas.

When quarry operations are complete, the overall reclamation objective for the quarry/borrow areas is to return the site to a natural condition that blends in with the existing topography and surrounding landscape.

8.2 WATER MANAGEMENT PROGRAM

The Water Management Program includes:

- the Water Management Plan (SD-05).

8.2.1 Water Management Plan

The WMP (SD-05) describes the procedures necessary to manage the quality and quantity of water interacting with Project components throughout the mine life. It includes management practices that limit the potential for adverse impacts to receiving waters, to aquatic ecosystems, and to fish and fish habitat. The Plan applies to Construction, Operations, Closure, and Post-Closure, and it includes the Goose Property, the MLA, and the WIRs connecting these locations.

Water Management includes:

- Water Intake management. This includes limits on the seasonal and annual water extractions and the design of intake structures with fish screens and mitigation measures against erosion.
- Sewage treatment and disposal.
- General site runoff. Site water is categorized into three types: contact water (water impacted by mine workings), non-contact water (water from undisturbed areas) and saline water (groundwater inflows to mining areas). Each category is managed separately:
  - Contact water is contained in event ponds and tailings management facilities, and is transferred via diversions and pumped pipelines. It is treated prior to discharge from site.
  - Non-contact water is diverted off-site through event ponds, pumped pipelines, berms, and culverts.
  - Saline water is pumped from the mining facilities and stored in the Saline Water Pond, which during Closure is pumped back into mined-out underground workings.

A monthly operational and closure water balance was developed to optimize the water management strategy and tailings deposition schedule, and to evaluate water treatment needs during Operations and Closure to meet water quality guidelines.

Site-specific drainage plans will be developed and implemented to monitor the quality of collected mine water and seepage from sediment ponds, WRSAs, and the TSF. These drainage plans will:

- indicate the locations of mine water and seepage sampling stations and mine waste areas;
- provide water sampling, handling and analysis protocols; and
- provide a seepage/runoff water database that is updated as sampling is undertaken.

Water management during Closure relates to ongoing camp operation, passive filling of open pits, runoff control from WRSAs, and recirculation water treatment within the Goose Main TF. The Plan will continue to be implemented until the contact water meets site-specific discharge limits and receiving water quality objectives. At this point, passive discharge to the environment will be possible.

Water management care and maintenance activities will include:

- monitoring to check and report on the performance, status, and safety of water management facilities;
- inspection of pipelines (tailings and reclaim water) for flow and hydraulic integrity;
- monitoring of water quality and level of retention in tailings management facilities, collection ponds and polishing ponds; and
- inspection of drainage ditches, berms, and dikes for sediment accumulation and bank erosion and damage.

Environmental Protection Measures include:

- water usage and conservation measures;
- sediment and erosion control measures;
- dust control;
- ongoing ARD/ML testing;
- consideration of climate change; and
- monitoring programs.

8.3 WASTE MANAGEMENT PROGRAM

The Waste Management Program includes:

- the Ore Storage Management Plan (SD-07);
- the Mine Waste Rock Management Plan (SD-08);
- the Tailings Management Plan (SD-09);
- the Landfill and Waste Management Plan (SD-10);
- the Incineration Management Plan (SD-11);
- the Landfarm Management Plan (SD-12); and
- the Hazardous Materials Management Plan (SD-13).

8.3.1 Ore Storage Management Plan

The scope of this plan focuses on the management (i.e., handling and storage) of ore. The main environmental concerns related to ore storage are associated with the effects of runoff on local water quality and the potential for dust to spread ore fines on the surrounding land and water.

There will be one main Ore Stockpile at the Goose Property located to the northwest of the Process Plant and temporary stockpiles on the laydown areas near underground portals.

Geochemical testing has shown that portions of the ore may have ML and ARD potential. Water quality predictions suggest that the majority of stockpiled ore will be processed before ML/ARD occurs. As a precaution, water in contact with the ore stockpiles will be managed through the site water management system and collected and treated, if required, before discharge.

Dedicated collection ponds will collect the runoff from the ore stockpiles. The contact water in the collection ponds will be pumped or trucked to the TSF or active TF.

Dust from the ore stockpiles is not expected to be meaningful given the size of the ore coming from the pit. Crushing and screening operations will be conducted in enclosed units to minimize dispersion of ore dust. Dust will be monitored at the site and in the unlikely event that an unacceptable amount of dust is generated during stockpiling and transferring operations, additional dust mitigation measures will be applied.

Regular ore stockpile inspections will be conducted that will include:

- measurement, recording, and reporting of the number of truckloads and tonnage of ore hauled and stockpiled;
- monitoring stockpile construction and operation;
- evaluating the effectiveness of runoff collection measures; and
- surveying the extents of stockpiles.

Air and water quality monitoring and reporting will be conducted as described in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) and the WMP (SD-05), respectively. Based on the monitoring findings, regular evaluations of the Plan will be conducted. The Plan may be updated if found to be appropriate.

8.3.2 Mine Waste Rock Management Plan

The Plan applies to the Construction and Operations phases of the Project during which time waste rock will be produced, as well as Closure and Post-Closure. The main environmental concern related to waste rock is the potential for ML/ARD, and therefore potential effects of seepage and runoff on local water quality, as well as dust emissions on the surrounding land and water.

Waste rock and overburden will be produced during mining and will be stored in four engineered WRSAs located close to each of the open pits. The waste rock management strategy for the Project is to ensure that in the long term, all PAG material is fully encapsulated within the permafrost to minimize the potential for contaminants of concern seeping into the receiving environment. To ensure the PAG remains frozen, it will be covered with a layer of NPAG sufficiently thick to host the active layer.

During Construction and Operations, there is potential for elevated concentrations of sulphate, ammonia, nitrate, and arsenic in seepage and runoff that comes into contact with the WRSAs. Therefore, seepage and runoff will be managed according to the WMP (SD-05). Over time, it is expected that permafrost will aggrade into the PAG rock, which will greatly reduce the rates of oxidation and eliminate interaction with seepage. At Closure, the water in contact with the NPAG cover material will be acceptable for direct discharge.

Implementation of the selected waste rock management strategy will require a dedicated blast hole monitoring program to identify PAG and NPAG material, and instruction to direct these materials to the appropriate location within each of the WRSAs.

Dust from the WRSAs is not expected to be meaningful given the size of the waste rock generated from the pits. Dust will be monitored at the site and in the unlikely event that an unacceptable amount of dust is generated during stockpiling and transferring operations, additional dust mitigation measures will be applied.

Regular WRSA inspections will be conducted that will include:

- measurement, recording, and reporting of the number of truckloads and tonnage of waste rock hauled and stockpiled;
- monitoring of WRSA construction and operation;
- evaluating the effectiveness of runoff collection measures;
- sampling and testing to verify that the geochemical characteristics of waste rock within the NPAG areas of the WRSAs are within expected ranges; and
- installing ground temperature monitoring instrumentation to ensure that PAG waste rock is encapsulated in permafrost.

Runoff water quality monitoring will be conducted as described in the WMP (SD-05) and additional testing frequency details will be provided in the Type A Water Licence Application. Based on the monitoring findings, regular evaluations of the Plan will be conducted. The Plan may be updated if found to be appropriate.

8.3.3 Tailings Management Plan

The Tailings Management Plan (SD-09) covers operational procedures, the implementation of environmental protection measures, and monitoring of the effectiveness of mitigation. The Plan applies to the Construction, Operations, Closure, and Post-Closure phases as tailings will be permanently disposed of on the Property. The main environmental concerns related to tailings storage are the potential for dust to spread to the surrounding land and water, as well as effects of runoff and seepage on local water quality.

Tailings will be discharged to multiple facilities, and tailings storage management dictates how water is managed on the Project. The Operations Phase is described in stages according to the tailings storage and water management plans, as follows:

- Stage 1 – TSF – For the first two years of Operations (Years 1 and 2), a purpose built TSF will be utilized;
- Stage 2 – Umwelt TF – From Years 2 to 6, the mined-out Umwelt Pit will be used for the tailings deposition; and
- Stage 3 – Goose Main TF – From Year 6 onward, tailings will be disposed of in the mined-out Goose Main Pit.

After tailings deposition transitions from the TSF to the Umwelt TF, the TSF will be converted to a WRSA (namely, the TSF WRSA) and used to dispose of PAG and NPAG waste rock.

Geochemical characterization confirms that, with a few the exceptions, tailings are PAG. All tailings samples exhibit some level of metal leaching. At Closure, NPAG waste rock will be used to cover tailings material. The resulting aggradation of permafrost will minimize infiltration and development of ML/ARD conditions.

The TSF is designed for the following:

- permanent and total confinement of tailings solids;

- collection of tailings pore water and runoff water from within the TSF for recycling to the Process Plant;
- minimizing seepage losses to the environment to minimize adverse downstream water quality impacts;
- designing for Closure;
- the inclusion of freeboard allowance for ice entrainment, storm water management, wave run-up, potential embankment settlement, and other contingencies;
- the inclusion of monitoring features for all aspects of the facility; and
- a Dam Classification of "High" has been selected for the TSF based on the impact to environmental and cultural value.

For tailings deposition in the open pits, the open pits will be readily convertible to TFs and will operate similar to the TSF.

The TFs will be filled to a maximum of 5 m below the overflow elevation to ensure that sufficient water passively accumulates to form a permanent water cover at closure. If necessary, water from the TFs will be treated prior to discharge until such time as the discharge meets water quality objectives for the external receiving environment.

Dust from the TSF and TFs is not expected to make a significant impact; however, dust will be monitored and managed to the best extent possible. The TSF will be operated with a water cover during Operations to supply the Process Plant, and therefore a small tailings beach will be exposed that could generate wind-blown tailings. In the unlikely event that an unacceptable amount of dust is generated from a lack of ice or water cover on the tailings, additional dust mitigation measures will be applied.

Routine inspections of the TSF during the construction and operations of the facility will include:

- monitoring of the tailings discharge and tailings beach formation;
- monitoring of the tailings supernatant water level;
- visual inspections of the tailings embankment and downstream seepage; and
- monitoring geotechnical instrumentation installed in the TSF Containment Dam embankment and foundation over the life of the Project.

Runoff water quality monitoring will be conducted as described in the WMP (SD-05) and will be prescribed in the Type A Water Licence. Based on the monitoring findings, regular evaluations of the Plan will be conducted and updated as required.

8.3.4 Landfill and Waste Management Plan

The scope of the Landfill and Waste Management Plan (SD-10) includes management of non-hazardous waste, recyclables, and treated sewage, at the MLA and Goose Property. Separate waste management strategies will be prepared for the various mine wastes (waste rock and tailings) as well as any hazardous waste products which may be produced through different components of the Project.

The specific breakdown of wastes is as follows:

- Combustible non-hazardous waste. Discarded materials in a solid, liquid, or semi-solid form that can be safely incinerated. Such wastes do not pose a risk to human or environmental health.

Examples include domestic food wastes, cardboard and paper, (unpainted) lumber scraps, domestic refuse, and damaged bulk containers. This waste will be sent to the incinerator or, in the case of the untreated wood and cardboard, burned in a regulated burn pit.

- Non-combustible non-hazardous wastes. Discarded materials in a solid, liquid, or semi-solid form that cannot be burned or recycled. Such wastes do not pose a risk to human or environmental health. The types of waste generated within this category include waste concrete and other construction wastes such as steel, wire, roofing, and asphalt. This waste will be landfilled.
- Recyclable materials. This waste will be temporarily stored on-site and ultimately shipped off-site.
- Treated Sewage Waste. Domestic sewage and greywater will be produced by toilets, showers, laundry facilities, janitorial services. This waste will be managed at the STP.
- Hazardous Waste. This waste will be temporarily stored on-site and ultimately shipped off-site.
- Other wastes. Includes: medical waste, used oil and waste fuels, and incinerator ash.
- Contaminated soil and oily water from hydrocarbon spills. This waste will be treated on-site in landfarms.

Waste management will begin in a waste sorting facility and be directed to the relevant facility.

8.3.4.1 Landfill

A landfill will be required during Construction, Operations, and Closure of the Project for the disposal of non-hazardous, solid industrial wastes that cannot be reused, recycled or recovered (or incinerated) as per the waste management hierarchy. The landfills will be operated as industrial dry waste landfills. Inert waste material intended for disposal in the landfills includes plastics, wood, fiberglass insulation, roofing, asphalt, concrete, ceramics, small rubber items, clothing, glass, small appliances (batteries removed), ash, bricks, and waste asbestos, and vehicles (liquids, grease, and electronics removed).

The landfill(s) will be located within the of the Umwelt and TSF WRSAs, which will have water management monitoring criteria applied so any seepage will be managed as part of the overall water management system. Project landfill(s) will be capped and progressively closed as final elevations are achieved. The total waste volume generated will dictate the ultimate dimensions of each landfill. Designs will allow flexibility to accommodate layout extension or contraction within the confines of each respective WRSA.

The quality of leachate from the landfill sites will be controlled by the rigorous controls placed on the materials to be landfilled. Leachate will be sampled and monitored in conformance with Water Licence requirements.

8.3.4.2 Sewage Treatment

Sewage at the Goose Property will be treated using a membrane bioreactor or similar, designed to accommodate the maximum number of personnel on-site during peak periods. Sewage sludge generated by the STP will be directed to the incinerator. The incinerator proposed for use at the Goose Property is designed to incinerate sewage sludge, and incinerator emissions will be monitored as described in the Incineration Management Plan (SD-11).

Because of the smaller camp capacity at the MLA, incinerating toilets will be used or collected sewage will be incinerated. Ash from incineration will be contained in drums and will be either backhauled to

the Goose Property for disposal in the landfill, or will be backhauled by sealift to a licensed disposal facility off-site.

8.3.5 Incineration Management Plan

The objectives of incineration management are to:

- select appropriate incinerators based on the characteristics and quantity of waste;
- locate incinerators at appropriate sites;
- operate incinerators to achieve optimal combustion and avoid the formation of dioxins, furans, and mercury in the combustion process;
- implement incinerator operational practices; and
- document frequency and incinerator operating parameters and demonstrate compliance with applicable regulations for environmental protection.

The Project will utilize state-of the art incinerators capable of satisfying all criteria required under the relevant regulations. Weights and waste types will be recorded and mixed appropriately to maximize combustion efficiency.

The incinerators at the Goose Property and the MLA will be located away and downwind from the main camp buildings. Ash generated at Goose Property will be disposed in the nearest landfill, or tailings management facility. Ash generated at MLA will be containerized and backhauled to either Goose Property or off-site for disposal.

The following environmental protection measures will be implemented as a part of the Incineration Management Plan (SD-11):

- Waste reduction, reuse, and recycling initiatives to minimize the quantity of waste to be incinerated or directed to the landfill.
- Reducing the presence of dioxins, furans and mercury in emissions. These substances are toxic, persistent and subject to bio-accumulation.
- Safely and efficiently, burn oil and waste fuel to minimize the level of contaminants in emissions.
- Ensure incinerator ash produced will be non-hazardous by ensuring that the incinerated material excludes all hazardous waste. An ash testing protocol will be implemented to ensure that the ash is suitable for landfill disposal. If the concentration of trace metals exceeds Guidelines, the ash will be sent to a licensed hazardous waste disposal facility.

8.3.6 Landfarm Management Plan

The scope of the Landfarm Management Plan (SD-12) includes hydrocarbon contaminated soil, snow, and ice at the MLA and Goose Property. The landfarm is a bioremediation treatment that uses naturally occurring microorganisms to metabolize and breakdown petroleum hydrocarbons in soils.

The Goose Property landfarm will be located adjacent to the Goose Plant Site. The MLA landfarm will be located at the construction laydown area and will consist of one cell for landfarming and a second cell for hazardous materials storage.

Contaminated soils will be excavated and transported to the landfarm facility in dump trucks or in roll-off containers. Because of the different levels of bioremediation methods for soils based on grain size,

soils and rock material with grain size less than 2.5 cm will be treated separately from larger-grained material in the landfarm. Remediation of soils and rocks will be through aeration and nutrient amendment. After two seasons of treatment in the landfarm, degradation rates will be assessed to estimate the total remediation time required for PHC contaminated soil under these conditions. When remediated, soils will be removed from the facility and can be used for construction purposes such as normal overburden or stacked in the WRSA.

Petroleum hydrocarbon contaminated snow and ice will be placed in a designated area of the landfarm and treated as contact water after snowmelt. After snowmelt, the contaminated water will be pumped through the site's oil-water separator to remove PHC residue. The treated water will then be discharged to the site water management system.

8.3.7 Hazardous Materials Management Plan

The Hazardous Materials Management Plan (SD-13) provides information on hazardous material management including the environmental hazards, safe handling requirements, transportation, storage, and disposal at the Project site.

The typical types of hazardous materials that will be located at the Project site include:

- used petroleum products or new fuel/lubricants/oils/greases;
- contaminated snow/water/soil (oil/fuel);
- oil and fuel filters;
- used sorbents and rags;
- hydraulic fluid;
- empty petroleum hydrocarbon containers and drums;
- glycol;
- sodium cyanide and other process reagents;
- tailings supernatant containing cyanide and elevated metals;
- laboratory reagents;
- solvents and paints;
- fluorescent light tubes;
- electronics and electrical waste;
- waste equipment batteries;
- hazardous medical waste; and
- kitchen grease.

Each hazardous material will be handled and disposed of in accordance with information found within its respective safety data sheet. All personnel working on the Project will undertake formal training.

The main hazardous waste storage facility will be located at the MLA with temporary hazardous waste storage areas at the Goose Property. A detailed inventory of hazardous materials and dangerous goods will be kept and all hazardous materials will be contained in designated containers appropriate for their Workplace Hazardous Materials Information System hazard classification. All hazardous materials will be

transported to and from site by commercial carriers. Sabina will ensure that all hazardous materials will be shipped to approved hazardous waste disposal facilities.

8.4 EMERGENCY RESPONSE MANAGEMENT PROGRAM

The Emergency Response Management Program includes:

- the Risk Management and Emergency Response Plan (SD-15);
- the Fuel Management Plan (SD-16);
- the Spill Contingency Plan (SD-17); and
- the Oil Pollution Emergency Plan (SD-18).

8.4.1 Risk Management and Emergency Response Plan

The Risk Management and Emergency Response Plan (SD-15) is designed to provide an assessment of the potential risks associated with the Project and establish an organizational structure and procedures for effective response to emergencies. The scope of this Plan includes the Goose Property, the MLA, and the connecting WIRs. Potential emergencies associated with access to the Project by air are also included.

The personnel directly linked to emergency response operations will receive training to familiarize themselves with the Risk Management and Emergency Response Plan (SD-15), Explosives Management Plan (FEIS Volume 10, Chapter 13), Spill Contingency Plan (SD-17), OPEP (SD-18), and Hazardous Materials Management Plan (SD-13) on a regular basis according to their duties and responsibilities.

The process of identifying and managing risk, as well as the appropriate mitigation measures in the event of accident or malfunction, is ongoing and involves:

1. Identify hazards – natural and human-made;
2. Evaluate likelihood or frequency (probability);
3. Evaluate consequences (severity); and
4. Evaluate risk –based on probability and consequences.

Mitigation strategies to reduce the probability and consequences of any accidents and malfunctions include:

- reducing probability of occurrence of the event (e.g., reinforcement of structures);
- reducing consequences of the event (e.g., increased setbacks from sensitive sites); and
- developing system redundancies (e.g., backup systems).

The following equipment will be available strategically around all Project sites in the event of an emergency:

- Fire Protection Equipment;
- First Aid and Medical Equipment; and
- Spill Response Equipment.

The plan describes on-site systems for on-site and external communication, muster points, and surveillance procedures. It also describes the emergency response procedures for the following emergencies: medical, fire/explosions, air emergency, hazardous material spills, and natural hazards.

8.4.2 Fuel Management Plan

Diesel fuel is an essential commodity for the ongoing operation of the Project and a range of accidents and malfunctions may result in fuel spills. Sabina has developed specific management plans to address transportation and storage of fuel as well as procedures for field refuelling.

Fuel storage facilities will be constructed at the MLA and Goose Property. Fuel will travel in tanker ships and/or barges to the MLA. Fuel will be transported from the MLA to the Goose Property via the WIR.

Arctic grade diesel fuel will predominantly be used by mining equipment, motor vehicles, and power generation. Limited quantities of propane will be used in maintenance facilities for smaller motorized equipment and machinery, and in the accommodation complex for meal preparation. Environmental protection measures will be employed to the proper transportation, inspection, storage, transfer, and use of all petroleum products.

Several preventive measures are in place to minimize risk of spills during bulk fuel transfer including:

- The bulk fuel storage facility, pipeline and all related equipment and infrastructures are inspected prior to the bulk cargo transfer and the inspection methods are documented as a Standard Operating Procedure.
- Complete bulk cargo transfer procedures have been established, a copy of which is found in Annex 5 of this OPEP.
- As required by the applicable legislation the ship has a comprehensive Shipboard Oil Pollution Emergency Plan and a copy of this plan has been reviewed by Sabina.
- In addition to the legislative requirements, the charterer has implemented a shipboard spill response training program and performs routine exercises in spill response operations.
- The ship carries a compliment of spill response equipment as listed in Annex 6 of the OPEP and this equipment is ready at the ship's rail at all times for deployment during cargo operations.
- Sabina oil spill response equipment is on the beach, ready for immediate deployment at all times during cargo operations.
- The workboats and trained responders are available at all times during cargo operations for spill equipment deployment.
- Standard transfer procedures include hourly inspections by workboat of the floating hose for leaks or defects.
- During transfer operations the shore manifold is manned at all times.
- A low pressure alarm is installed at the shore manifold that is highly sensitive to differences in pressure during pumping. Any loss in the system will cause a drop in manifold pressure and results in an audible alarm, which is immediately reported by the manifold personnel.
- The bulk fuel storage facility is monitored at all times by Sabina personnel during the transfer.
- The pipeline is inspected hourly on foot during the transfer operation.

The Fuel Management Plan (SD-16) has been updated to include more detail on the safe handling and storage of fuel. Specifically, more information has been added to roles and responsibilities (Section 5), potential environmental effects (Section 7.6), environmental monitoring (Section 8) and mitigation and adaptive management (Section 9).

The Spill Contingency Plan (SD-17) includes details of emergency response procedures for spills that could occur while transporting bulk fuel over land. Sabina acknowledges that the majority of over land fuel transfer will occur on the WIR; therefore, the approach to spills on snow and ice (Section 8.4.3) are outlined:

> In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material is to be limited as much as possible. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice prevents seepage of fuel into the water.
>
> Response to spills on snow and ice includes the general procedures previously detailed. Most response procedures for spills on land may be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in snow or ice) slow the progression of the fuel and also serve as containment to allow recovery of the fuel. Free product is recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice is scraped up manually or using heavy equipment depending on volumes.
>
> Should spills enter waterways beneath ice cover, ice augers and pumps will be used when feasible to recover fuel and other materials under ice. Slots may be cut in ice over slow-moving water to contain oil. Tiger torches may be used to burn the fuel in place, if unrecoverable by other methods and when feasible and safe to do so.
>
> The contaminated snow and ice is placed in containers or within plastic lined berms on land. For contingency purposes, a contaminated snow storage site will to be designated and located in close proximity to each of the main Project work sites to facilitate inspection and monitoring, in an area which will still be readily accessible once it is time to remove the snow (i.e., spring or summer), and at least 31 m away from any body of water or ditch. Once enough snow has melted, the oily water can be removed from the storage site and processed through an oil-water separator that would be mobilized to site. Hydrocarbons recovered will be burned in the camp incinerator or shipped off-site.

8.4.3 Spill Contingency Plan

The Spill Contingency Plan (SD-17) focuses on likely spill scenarios and outlines the required response for each type of spill. The plan focusses on two types of spills: major spills **(**an accidental release into the environment that has the potential for significant adverse impact) and minor spills (a hazardous chemical spill not involving toxic, reactive, or explosive chemicals, in a situation that is not life threatening, nor poses immediate risk to the receiving environment).

Training, awareness, inspections, and good housekeeping habits will be used to prevent spills. However, in the event of a spill the following equipment will be available: heavy equipment and aircraft, appropriately sized spill kits, and spill response equipment.

Spill response depends on the nature and location of the hazardous material spilled. The applicable MSDS will be consulted to ensure that the materials are being handled safely and appropriately. The general spill response is as follows:

- determine and control the spill source;
- prevent the spread of the spill;
- protect sensitive ecosystems and resources; and
- clean up and report the spill.

8.4.4 Oil Pollution Emergency Plan

The OPEP addresses the potential spill scenarios associated with ship to shore transfer of fuel and refuelling of storage tanks. The OPEP adheres to requirements of the *Canada Shipping Act* and the associated Oil Handling Facility Regulations.

The operations at the MLA is designed so that a rapid response to a spill incident can be carried out. All equipment and resources are strategically placed near the beachfront, directly at the MLA operation site. Responders, workboats and other support equipment are on standby during all facility operations.

Bulk fuel deliveries will take place during the open shipping season. Other than these transfers, no other port operations involving fuel are anticipated at the MLA.

The response to spills begins immediately when the spill has been detected. General spill procedures include:

- immediately warn other personnel working near the spill area;
- evacuate the area if the health and safety of personnel is threatened;
- determine and control the spill source;
- prevent the spread of the spill;
- protect sensitive ecosystems and resources; and
- clean up and report the spill.

The OPEP must be reviewed and approved by Transport Canada on an annual basis.

8.5 GENERAL AND AQUATIC EFFECTS MONITORING PROGRAM

The General and Aquatic Effects Monitoring Program includes:

- the Environmental Management and Protection Plan (SD-20);
- the Aquatic Effects Management Plan (SD-21);
- the Conceptual Fish Offsetting Plan (SD-22);
- the Marine Monitoring Plan (SD-23); and
- the Quality Assurance / Quality Control Plan (SD-24).

8.5.1 Environmental Management and Protection Plan

Sabina's EMS provides a framework for the environmental and socio-economic monitoring activities to be implemented through the life of the Project. The system incorporates the strategies employed for adaptive management using the precautionary principle to pursue the goals of sustainable development. Within this framework, individual management plans have been drafted to address all aspects of the company's activities and contain the detailed mitigation measures and monitoring programs that will be implemented throughout the life of the Project in order to eliminate or minimize adverse effects.

The EMS also verifies that standard operating procedures reflect legal requirements pertaining to the Project, and that conditions set at the time of the Project's authorizations as well as requirements pertaining to the relevant laws, regulations, and permits are met. All Project employees and contractors are required to comply with these management plans. The reporting and documentation requirements, auditing, and processes for management review and revisions are all specified in the EMS. This system will offer enough flexibility to respond to the monitoring results in a timely fashion to reduce or eliminate potential adverse residual effects to the natural and socio- economic environments.

8.5.2 Aquatic Effects Management Plan

The AEMP (SD-21) describes the Project elements designed to minimize/ eliminate potential adverse effects on the freshwater environment. The Plan describes and presents the planned mitigation and adaptive management measures, and the processes for adaptive management.

The primary mitigation approach will be to minimize the number and magnitude of pathways through which Project activities can adversely affect the aquatic environment. The Project has used design and alternatives analysis to control potential effects and will use relevant best management practices to further mitigate or eliminate effects on the freshwater environment. Mitigation methods include:

- site water management;
- sediment and erosion control;
- fish and fish habitat protection from blasting;
- fish-out program; and
- routine inspection and monitoring.

The AEMP (SD-21) will be implemented to monitor the receiving aquatic environment around Project infrastructure and activities. Results from the monitoring will be used to determine if existing mitigation and management measures are adequate and provide an opportunity for adaptive management on an annual basis. Components of the AEMP (SD-21) are:

1. determine the short and long-term effects in the aquatic environment resulting from the Project;
2. evaluate the accuracy of Project effect predictions;
3. assess the effectiveness of mitigation and management measures on Project effects;
4. identify additional mitigation measures to avert or reduce environmental effects due to Project activities; and
5. comply with MMER requirements, should an Environmental Effects Monitoring program be triggered.

Sabina is committed to developing the AEMP and adaptive management thresholds in conjunction with the KIA prior to the technical meeting associated with the NWB Type A Water Licence review process.

8.5.3 Conceptual Fish Offsetting Plan

The purpose of the Conceptual Fish Offsetting Plan is to summarize anticipated Project effects on fish and fish habitat, and outline a proposed conceptual plan to offset the serious harm to fish.

Although mitigation measures will be in place to avoid or minimize the potential effects of the Project on fish and fish habitat, adverse effects may remain and lead to residual serious harm to fish. Predicted adverse effects include:

- habitat losses and residual harm to fish; and
- losses in fisheries productivity.

An offset option has been proposed to enhance the use of the Bernard Harbour system by Arctic Char. Preliminary assessments and studies have been carried out with promising results. At least one year of baseline monitoring and up to four years of evaluation monitoring over a period of 10 years will be required to validate this offsetting proposal. In the event the performance of this plan does not meet expectations, alternate channel design options or additional habitat enhancements will be investigated and applied. If necessary, an alternate project will be identified and implemented, with an associated monitoring plan, to achieve the offsetting commitments for fisheries losses at the Project.

A complementary measure to the offsetting plan is data collection and scientific research; the research investments may contribute up to 10% of gains to offset losses and reduce uncertainty associated with predicted gains from the offset option. These research investments include:

- fish-out history database;
- Bernard Harbour TK Study; and
- Arctic Char movement study.

A fish-out program will be carried out for any lakes that are lost as a result of the Project. This program will also include data collection to gather information on lake productivity.

Since the time of the FEIS Final Hearing, Sabina has continued to advance baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) in preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Project. The 2016 Bernard Harbour Report and Baseline was attached to the FEIS Addendum Appendix V6-6H. Sabina has also revised Conceptual Fish Offsetting Plan; this is presented in FEIS Addendum Volume 10, Chapter 21. Sabina has also compiled additional information on the design, construction, and operation, and monitoring program of fish passage mitigation via Rascal Stream West (Appendix F-6).

The purpose of this Conceptual Fish Offsetting Plan is to summarize anticipated serious harm to fish based on the assessment provided in the FEIS, and to describe the offsetting option to counterbalance any unavoidable serious harm to fish, as defined in the *Fisheries Act*. In accordance with the federal *Fisheries Act* (1985), Sabina continues to follow DFO guidance to protect CRA fisheries. DFO's recommended model incorporates a hierarchy of objectives to first avoid serious harm through project design. Where avoidance of serious harm could not be achieved, the Sabina committed to mitigate serious harm through a comprehensive list of approved best management practices and operational standards. Lastly, where Project activity could not be avoided or mitigate serious harm, a fisheries offsetting plan

was developed fully counterbalance losses in fisheries productivity with gains in productivity elsewhere in the landscape. The Conceptual Fish Offsetting Plan for the Project is also the result of continued community and regulatory engagement associated with the Project. In addition to the offsetting plan, a number of mitigation measures will be in place for the Project to avoid or minimize the potential effects on the productivity of the CRA fishery. These mitigation measures will be supplemented by the use of adaptive management, as required.

The final plan will be based on feedback from both the KIA and DFO and would ultimately be approved by DFO as a condition of the Authorization required for the development of the Project.

DFO has the expertise, jurisdiction, and the mandate to ensure that impacts to fish and fish habitat are minimized, and to consider plans for offsetting residual impacts, all in accordance with the *Fisheries Act* and its regulations.

8.5.4 Marine Monitoring Plan

The Marine Monitoring Plan (SD-23) describes the Project elements designed to minimize/ eliminate potential adverse effects on the marine environment. Sabina acknowledges that NWB's mandate with respect to marine water rests as member of the Nunavut Marine Council; as such, this plan is provided with the Application as follow-up to the Environmental Assessment and for general overall context of the Project. The Plan describes and presents the planned mitigation and adaptive management measures, and the processes for adaptive management.

The primary mitigation approach will be to minimize the number and magnitude of pathways through which Project activities can adversely affect the marine environment. The Project has used design and alternatives analysis to control potential effects and will use relevant best management practices to further mitigate or eliminate effects on the marine environment. Mitigation methods include:

- site water management;
- sediment and erosion control;
- fish and fish habitat protection from blasting; and
- routine inspection and monitoring.

The Marine Monitoring Plan (SD-23) will be implemented to monitor the receiving aquatic marine environment around Project infrastructure and activities. Results from the monitoring will be used to determine if existing mitigation and management measures are adequate and provide an opportunity for adaptive management on an annual basis. Components of the Marine Monitoring Plan (SD-23) are:

1. determine the short- and long-term effects in the marine aquatic environment resulting from the Project;
2. evaluate the accuracy of Project effect predictions;
3. assess the effectiveness of mitigation and management measures on Project effects;
4. identify additional mitigation measures to avert or reduce environmental effects due to Project activities.

Sabina is committed to developing the Marine Monitoring Plan and adaptive management thresholds in conjunction with the INAC, ECCC, and KIA prior to the technical meeting associated with the NWB Type A Water Licence review process.

At the FEIS Final Hearing, Sabina committed to:

- design and implement a marine monitoring program at the MLA to identify potential impacts of the project on the marine environment and inform adaptive management actions.
- In consultation with INAC, ECCC, and KIA, the Proponent commits to developing a marine environmental monitoring program, in a stand-alone plan, with a greater level of detail and rationale prior to construction, with enough lead time to address monitoring gaps.

8.5.5 Quality Assurance / Quality Control Plan

Quality Assurance and Quality Control (QA/QC) are vitally important to ensuring that the monitoring programs yield accurate and reliable results. The objective of the QA/QC plan (SD-24) is to assure that the chemical data collected are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. A QA/QC plan (SD-24) has been developed for the proposed Project to provide procedures and requirements for field sample collection, laboratory requirements, and data verification.

Exploration assays will be handled externally; however, the samples will be crushed and prepared at the Project assay laboratory. Most of the environmental assaying will also be done externally. The proposed assay laboratory at the Mine site is not an accredited laboratory but will be used periodically for "real-time" results for some parameters like pH, TSS, and Weak Acid Dissociable Cyanide. These results are for observational purposes and do not meet the standards of an accredited laboratory.

8.6 INTERIM CLOSURE AND RECLAMATION PROGRAM

The Interim Closure and Reclamation Program includes:

- the Interim Closure and Reclamation Plan (SD-26);
- the Interim Closure Cost Estimate; and
- Vegetation Monitoring Plan (Appendix H of the ICRP; SD-26).

8.6.1 Interim Closure and Reclamation Plan

The development of interim closure and reclamation measures is consistent with best management practices, and is integrated with the planning phase of the Project. The ICRP (SD-26) identifies measures to be taken during the Operations Phase that are aimed at progressive reclamation of disturbed areas of each mine location. Interim closure will be carried out in a way that prevents or minimizes impacts and risks to the environment and human health after closure. These strategies identify site-specific objectives for interim closure and the intended post-closure land use for the site. The ICRP (SD-26) details the processes that will be used to decommission and reclaim the mining properties, including:

- mining and ore processing facilities;
- site infrastructure; and
- water and waste management facilities, including diversion structures, WRSAs, and tailings storage facilities.

The ICRP should be reviewed and revised as necessary throughout the mine life cycle. The plan will become more detailed by incorporating, to a greater degree, all activities related to mine development and taking into greater consideration the existing site conditions and monitoring results as the Project evolves.

Progressive reclamation is defined as the opportunistic reclamation activities completed during the operational phase of a project. Progressive reclamation can increase efficiencies by utilizing available mining resources to conduct reclamation activities during the revenue-generating phase of a project. Progressive reclamation typically reduces risks, final closure costs, as well as the overall timeframe for achieving closure objectives.

Progressive reclamation activities can be undertaken as material becomes available and disturbed areas are no longer required. Among other opportunities, the large reclamation efforts will be focused on any final earthworks including:

- filling open pits;
- establishing partial or full boulder fences around open pits and TSF;
- installing proper signage around mine openings and TSF;
- constructing open pit spillways;
- constructing and closing WRSAs;
- buildings and infrastructure will be removed as they become unnecessary during the LOM and the sites will be reclaimed as much as practicable;
- contaminations of soil, snow, and ice will be cleaned up and soil will be remediated and disposed of on-site in accordance with Spill Contingency Plan (SD-17); and
- hazardous wastes will be shipped off-site periodically to minimize the amount of waste requiring removal at closure.

Monitoring programs will be designed and implemented during mine closure to ensure that closure activities and associated environmental effects are consistent with those predicted in the FEIS and to ensure that the objectives of mine closure are being met. Monitoring activities may include many of the monitoring activities conducted during the mine Operations Phase. Monitoring of aquatic and terrestrial ecosystems will continue until work associated with mine closure is complete. Post-Closure monitoring will also be conducted after Closure to ensure that closure and rehabilitation measures are functioning as designed in accordance with applicable regulatory requirements.

8.6.2 Interim Closure Cost Estimate

Reclamation costs have been determined as part of the closure planning and Sabina is committed to providing adequate security to cover the cost of reclamation over the LOM to ensure the closure criteria can be met. Sabina intends to apply progressive reclamation options during Operations, before Closure, to take advantage of cost and operating efficiencies by using the resources available from mine operations to reduce overall reclamation costs. Progressive reclamation enhances environmental protection and shortens the timeframe for achieving the reclamation objectives and goals, and reduces the financial security requirement (MVLMB/AANDC 2013).

The Interim Closure Cost Estimate has been prepared in a manner consistent with the principles respecting mine site reclamation and implementation found in the Mine Site Reclamation Policy for Nunavut (AANDC 2002). In addition, Sabina confirms the cost estimate was completed using the most recent version of the RECLAIM model (RECLAIM Version 7.0, March 2014).

Consistent with the principles for mine site reclamation security (AANDC 2002), Sabina has:

- Estimated total final security for reclamation required at any time during the LOM should be equal to the total outstanding reclamation liability for land and water combined (calculated at the beginning of the work year, to be sufficient to cover the highest liability over that time period);
- Based the costs of having the necessary reclamation work done by a third-party contractor;
- Included a contingency factor appropriate to the work to be undertaken;
- Applied a recognized methodology for calculating reclamation costs (i.e., RECLAIM Version 7.0, March 2014);
- Or is considering alternate forms for security that protects government interests and objectives (i.e., Security arrangement consistent with legislative amendments to the NWNSRTA assented to on June 18, 2015);
- Expectation that the Type A Water Licence and other regulatory instruments and to ensure minimal potential for double bonding that an "agreement" may be more appropriate (Refer to Section 3.4 for further details); and
- Expectation that Sabina will qualify for credit on approved progressive reclamation and the value of financial security will be adjusted accordingly in a timely manner.

For additional details on Sabina's intent for provision of security, refer to Section 3.4.

8.6.3 Vegetation Monitoring Plan

For additional visibility on mitigation and monitoring measures associated with the protection of vegetation, the new Vegetation Monitoring Plan (Appendix H of the ICRP; SD-26) includes specific sections on each topic. Refer to the Section 8 for mitigation measures, and Section 6 for monitoring measures within this plan. In addition, the Vegetation Monitoring Plan quantifies impacts from planned annual construction and operation of the WIR (Appendix H of the ICRP; SD-26).

Sabina will consider revegetation and reclamation measures as the Project moves forward into Construction and Operations. During the FEIS Final Hearing, Sabina repeated their commitment to ongoing revegetation and reclamation research (FA-NSMA-TC-13).

In the ICRP (SD-26), Table B-023 provides proposed progressive reclamation activities that will be evolved during the Operations Phase of the Project before permanent Closure.

It is also stated in the closure objectives related to achieving physical stability (FEIS Volume 10, Chapter 29, Section 1.7) that:

As part of this ICRP, potential revegetation of disturbed sites, including active revegetation, seeding, and soil amendment, were reviewed. At this time, active revegetation of the Property as part of closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the ICRP.

Potential research studies to inform revegetation during progressive reclamation and Closure could include any numerous topics. The progress of these possible options would be dependent on the advancement of Project plans and closure plans and timing:

- Substrate and plant species selection trials: trials to identify appropriate local native species mixes for revegetation on reclaimed soils. The goal of this research would be to select native species that are suitable for revegetation of various soil conditions expected on reclaimed areas.

- Soil and plant processes research: identification of the soil processes, and biological, physical, and chemical conditions that are required to successfully regenerate native plants. This would be a comparative study of undisturbed sites and reclaimed soils to identify soil amendments to improve plant establishment.
- Monitoring of progressive revegetation of large footprint areas to provide adaptive feedback to revegetation activities. The goal of this will be to improve revegetation success and long-term site stability and land capability."

Sabina reiterates their commitment to research substrate and plant species selection trials, soil and plant processes, and progressive revegetation monitoring.

9. References

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Appendix A: base Figures

(see file 171002 2AM-BRP----MAD App A_baseFigures-IMLE.pdf)

Appendix B-1: Concordance

(see file 171002 2AM-BRP----MAD App B-1_Concordance-IMLE.pdf)

Appendix B-2: Technical Reports

(see file 171002 2AM-BRP----MAD App B-2_RepReferences-IMLE.pdf)

Appendix B-3: Design Drawings

Figure No.	Figure Title	Management Plan
4.1-1	Goose Property Area Road Infrastructure	Road Management Plan
4.1-2	All-weather Road and Watercourse Crossing Typical Cross Sections	Road Management Plan
4.2-1	Goose Property Proposed Quarry Locations and Extents Plan View	Borrow Pits and Quarry Management Plan
4.2-2	MLA Proposed Quarry Location Plan View	Borrow Pits and Quarry Management Plan
A-01	Goose Property Catchments	Water Management Plan
A-02	Goose Property Pumping and Culvert Schematic	Water Management Plan
A-03	Phase 1 Construction Year -3 to Year -1	Water Management Plan
A-04	Phase 2, Stage 1 TSF Operation Year -1 to Year 2	Water Management Plan
A-05	Phase 2, Stage 2 Umwelt TSF Year 2 to Year 6	Water Management Plan
A-06	Phase 2, Stage 3 Goose Main TF Year 6 to Year 10	Water Management Plan
A-07	Phase 3 Closure Year 11 to Year 18	Water Management Plan
A-08	Phase 4 Post-Closure Year 19+	Water Management Plan
A-09	Marine Laydown Area Phase 1 & 2 Construction and Operations Year -4 to Year 10	Water Management Plan
A-10	Marine Laydown Area Phase 3 & 4 Closure & Post-Closure, Marine Laydown Area (Year 11+)	Water Management Plan
A-11	General Arrangement (Sheet 1 of 2)	Water Management Plan
A-12	General Arrangement (Sheet 2 of 2)	Water Management Plan
A-13	South-west Llama Reservoir Diversion Berm Plan and Profile	Water Management Plan
A-14	Llama WRSA Containment Dam Plan and Profile	Water Management Plan
A-15	Typical Dam Sections	Water Management Plan
A-16	Typical Dam Sections	Water Management Plan
A-17	Typical Berm and Culvert Sections	Water Management Plan
A-18	Fresh Water Intake Typical Plan and Section	Water Management Plan
A-19	Treated Water Discharge Typical Plan and Section	Water Management Plan
A-20	STP Treated Water Discharge Plan and Section	Water Management Plan
A-21	Limnology and Bathymetry Sampling Conducted in the Goose Property Area for the Back River Project, 1994 to 2013	Water Management Plan
A-22	Proposed Surface Water Monitoring Locations Goose Property Area, Back River Project	Water Management Plan
A-23	Proposed Surface Water Monitoring Locations Marine Laydown Area, Back River Project	Water Management Plan
5.3-1	Ore Production Schedule	Ore Storage Management Plan
5.3-2	Ore Stockpile Sizes	Ore Storage Management Plan
5.3-1	Distribution of PAG, Uncertain, NPAG, and Low Sulpher Waste Rock Samples According to Stratigraphic Unit and Deposit Groupings	Mine Waste Rock Management Plan
A-01	Waste Rock Storage Areas and WRSA Water Diversions and Ponds	Mine Waste Rock Management Plan
A-02	Goose Property Waste Rock Storage Areas at Closure – Plan View	Mine Waste Rock Management Plan
A-03	Goose Property Waste Rock Storage Areas at Closure – Typical Cross Sections	Mine Waste Rock Management Plan
A-01	TSF Containment Area Plan View Year 2	Tailings Management Plan
A-02	TSF Containment Area Plan View Year 6	Tailings Management Plan

A-03	TSF Containment Dam Plan View and Profile View	Tailings Management Plan
A-04	TSF Containment Dam Typical Cross Section A (Shallow Bedrock) Year 1	Tailings Management Plan
A-05	TSF Containment Dam Typical Cross Section B (Deep Overburden) Year 1	Tailings Management Plan
A-06	TSF Typical Cross Section with Full Supply Level Year 2	Tailings Management Plan
A-07	TSF Containment Dam Typical Freeboard Section (Year 2)	Tailings Management Plan
A-08	TSF Containment Dam Geotechnical Instrumentation Plan, Profile and Typical Cross-Section Year 1	Tailings Management Plan
A-09	Typical TSF WRSA Cross-Section Section DD Year 6	Tailings Management Plan
A-01	Umwelt WRSA Landfill	Landfill and Waste Management Plan
A-02	TFS WRSA Landfill	Landfill and Waste Management Plan
A-03	Marine Laydown Area Waste Management Infrastructure	Landfill and Waste Management Plan
A-04	Goose Property Waste Management Infrastructure	Landfill and Waste Management Plan
A-05	Goose STP – Typical Layout	Landfill and Waste Management Plan
A-01	Goose Property Waste Management Infrastructure	Landfarm Management Plan
A-02	Marine Laydown Area Waste Management Infrastructure	Landfarm Management Plan
A-03	Goose Property Area Landfarm Concept Plan	Landfarm Management Plan
A-04	Goose Property Area Landfarm Concept Sections and Details	Landfarm Management Plan
A-05	Marine Laydown Area (MLA) Landfarm Concept Plan	Landfarm Management Plan
A-06	Marine Laydown Area (MLA) Landfarm Concept Sections and Details	Landfarm Management Plan
7.1-1	Marine Laydown Area General Arrangement with Spill Kit Locations	Hazardous Materials Management Plan
7.1-2	Goose Property General Arrangement with Spill Kit Locations	Hazardous Materials Management Plan
7.1-3	Goose Plant Site Layout with Spill Kit Locations	Hazardous Materials Management Plan
5-1	Sabina Emergency Response Organization Chart	Risk Management and Emergency Response Plan
8.1-1	Marine Laydown Area General Arrangement with Spill Kit Locations	Risk Management and Emergency Response Plan
8.1-2	Goose Property General Arrangement with Spill Kit Locations	Risk Management and Emergency Response Plan
8.1-3	Goose Plant Site Layout with Spill Kit Locations	Risk Management and Emergency Response Plan
6.1-1	Marine Laydown Area Preliminary Fuel Storage Plan and Section	Fuel Management Plan
6.1-2	Goose Property Preliminary Fuel Storage Plan and Section	Fuel Management Plan
4-1	Sabina Spill Response Organization Chart	Spill Contingency Plan
7.2-1	Marine Laydown Area General Arrangement with Spill Kit Locations	Spill Contingency Plan
7.2-2	Goose Property General Arrangement with Spill Kit Locations	Spill Contingency Plan
7.2-3	Goose Plant Site Layout with Spill Kit Locations	Spill Contingency Plan
7.2-1	Marine Spill Response Organizational Chart	Oil Pollution Emergency Plan
1.1-1	Continual Improvement Model	Environmental Management and Protection Plan

1.1-2	Hierarchy of Environmental Management System	Environmental Management and Protection Plan
11-1	Adaptive Management Response Framework	Environmental Management and Protection Plan
4.3-1	Proposed AEMP Sampling Locations, Goose Property Area, Back River Project	Aquatic Effects Management Plan
4-1	Proposed Marine Monitoring Locations, Marine Laydown Area, Back River Project	Marine Monitoring Plan
4.4-1	Goose Property Mine Production (Ore and Waste) Schedule by Deposit	Interim Closure and Reclamation Plan
4.4-2	Project Phases and Stages	Interim Closure and Reclamation Plan
A-01	General Project Site Layout Location Plan	Interim Closure and Reclamation Plan
A-02	Goose Property General Arrangement Plan at End of Project Operations	Interim Closure and Reclamation Plan
A-03	MLA General Arrangement Plan at End of Project Operations	Interim Closure and Reclamation Plan
A-04	Sabina Mineral Tenure Map	Interim Closure and Reclamation Plan
A-05	Goose Property Area Disturbance Footprint	Interim Closure and Reclamation Plan
A-06	Marine Laydown Area Disturbance Footprint	Interim Closure and Reclamation Plan
A-07	Goose Property General Arrangement Plan at End of Closure (Year 18)	Interim Closure and Reclamation Plan
A-08	MLA General Arrangement Plan at End of Closure (Year 11+)	Interim Closure and Reclamation Plan
A-09	Goose Property Post-Closure General Arrangement Plan (Year 19+)	Interim Closure and Reclamation Plan
A-10	Goose Property Area Orthophoto of Existing Conditions	Interim Closure and Reclamation Plan
A-11	Marine Laydown Area Orthophoto of Existing Conditions	Interim Closure and Reclamation Plan
A-12	Goose Property Underground Operations Design	Interim Closure and Reclamation Plan
A-13	Goose Property Area Fish Management Infrastructure	Interim Closure and Reclamation Plan

Appendix C-1: Certificate of Incorporation

(see file 171002 2AM-BRP----MAD App C-1_CertIncorp -IMLE.pdf)

Appendix C-2: List of Officers of the Company

Table C-2-1. List of Officers, Sabina Gold & Silver Corp.

Bruce McLeod, Director, President and Chief Executive Officer 1800-555 Burrard Street Vancouver, BC V7X 1M9 Ph: (604) 998-4175 Direct: (604) 998-4176 Email: bmcleod@sabinagoldsilver.com
Matthew Pickard, Vice-President, Environment &Sustainability 1800-555 Burrard Street Vancouver, BC V7X 1M9 Ph: (604) 998-4175 Direct: (604) 484-8967 Email: mpickard@sabinagoldsilver.com
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Angus Campbell, Vice-President, Exploration 1800-555 Burrard Street Vancouver, BC V7X 1M9 Ph: (604) 998-4175 Direct: (604) 998-4183 Email: acampbell@sabinagoldsilver.com
Nicole Hoeller, Vice-President, Communications 1800-555 Burrard Street Vancouver, BC V7X 1M9 Ph: (604) 998-4175 Direct: (604) 998-4179 Email: nhoeller@sabinagoldsilver.com

Appendix C-3: List of Consultants and Experts

Table C-3-1. List of Consultants

Golder Associates Ltd. 16820 107 Avenue, Edmonton, AB, Canada, T5P 4C3
SRK Consulting Oceanic Plaza, 22nd Floor, 1066 West Hastings Street, Vancouver, BC, V6E 3X2
Navenco Marine Inc. 350 boul. Ford, Suite 130, Chateauguay, Quebec, J6J 4Z2

Appendix C-4: Financial Statement

(see file 171002 2AM-BRP---- MAD App C-4_FinancialStatement-IMLE.pdf)

Appendix D-1: Acts, Regulations, and Permits

Table D-1-1: List of Permits, Licenses, and Authorizations Required for Project

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Nunavut Impact Review Board	Nunavut Agreement Article 12 Nunavut Planning and Project Assessment Act (S.C. 2013, c. 14, s. 2)	Project Certificate	Required to obtain requisite permits and approvals to proceed with Project	Sabina aims to obtain a Project Certificate from NIRB by Q2/Q3-2016
Kitikmeot Inuit Association	Nunavut Agreement Article 26	Inuit Impact and Benefits Agreement	Required to proceed with Project	Sabina aims to conclude successful negotiation of an IIBA after receiving a Project Certificate. Compensation agreements may form part of the IIBA.
	Nunavut Agreement Article 20	Inuit Water Rights Compensation Agreement	May be required	
	Nunavut Agreement Article 6	Wildlife Compensation Agreement		
	Nunavut Agreement	Inuit Owned Lands - Commercial Land Use Lease	Access surface IOL to develop mine	Sabina intends to submit its commercial land use and quarry concession permit applications to the KIA once NIRB has issued a positive final hearing report to the Minister. Submission timing: mid-2016
		Inuit Owned Lands - Quarry Concession Licenses	Extract aggregate on IOL	
Nunavut Water Board	Nunavut Agreement Article 13 *Nunavut Waters and Nunavut Surface Rights Tribunal Act* Nunavut Waters Regulations	Type A and B Water Licenses	Required for water use and waste disposal	Sabina intends to submit its Type A Water Licence in Q2/Q3 of 2016. Sabina plans to utilize its existing Type B Water Licenses or new licenses with already screened activities for initial construction activities, if necessary.
Indigenous and Northern Affairs Canada	*Territorial Lands Act* Canadian Mining Regulations	Prospector Licence Mineral leases	To obtain and hold subsurface mineral rights	Sabina intends to submit its land use and quarry permit applications to INAC once NIRB has issued a positive final hearing report to the Minister. Sabina plans to utilize its existing land use permits and/or will apply for new interim land use permits to support initial construction, to address delays in receipt of leases, if necessary.
	Territorial Land Use Regulations	Crown Land - Class A and Class B Land Use Permits	Access surface Crown lands for initial Project development, prior to obtaining leases	
		Crown Land - Land lease and Waterlot lease	Access surface Crown lands for the Project life	
	Territorial Quarrying Regulations	Crown Land - Quarry Lease/Permit	Extract aggregate on Crown Land	

(continued)

Table D-1-1: List of Permits, Licenses, and Authorizations Required for Project (continued)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Transport Canada	*Navigation Protection Act*	Approval and/or Exemption	Construction of works in navigable water to protect navigation channels	Sabina will seek feedback from Transport Canada on potential impacts to navigation during review of the FEIS, and will submit formal applications under the *Navigation Protection Act* for relevant in-water works once detailed engineering has been completed. Submission timing: 2016
	Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations		Approved Oil Pollution Emergency Plan (OPEP)	Conceptual OPEP included with this FEIS for Transport Canada comment. Formal submission of the OPEP to Transport Canada for approval will follow detailed engineering.
	Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations		Approved Ship Oil Pollution Emergency Plan (SOPEP)	Formal submission of the SOPEP to Transport Canada for approval prior to shipping
Fisheries and Oceans Canada	*Fisheries Act* (Section 35(2))	Authorization under Paragraph 35(2)(b) of the *Fisheries Act*; required if serious harm to fish cannot be avoided. In instances in which serious harm to fish can be avoided, DFO may provide a letter of authorization in addition to compliance with Measures to Avoid Causing Harm to Fish and Fish Habitat.	Project activities directly removing or altering fish habitat: full lake dewatering, culvert installations, dam construction in watercourses, stream flow reductions and potential water and sediment quality changes.	Sabina's application for an Authorization under the *Fisheries Act* presented as Appendix V12-1D of the DEIS will be finalized after receiving a Project Certificate.
Environment Canada	*Fisheries Act (Section 36)* Metal Mining Effluent Regulations	Schedule 2 Amendment	Deposit of tailings in fish-bearing waters	Should Sabina require a Schedule 2 Amendment Sabina intends to submit its request in the first half of 2016.

(continued)

Table D-1-1: List of Permits, Licenses, and Authorizations Required for Project (continued)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Natural Resources Canada	*Explosives Act* and Regulations Blasting Permits Explosive Magazine Permits Radio Licensing	Licence for a Factory and Magazine	Required for construction of explosives factories and magazines and storage of explosives	Sabina's explosives contractor (once contracted) will obtain the requisite licence(s).
GN Culture and Heritage	Nunavut Archaeological and Palaeontological Sites Regulations (Nunavut) *Nunavut Historical Resources Act*	Archaeology Permit	Required to conduct archaeology surveys and to mitigate cultural/heritage resources	Archaeological permit applications will be submitted to the GN-CH by March 31 by Sabina's consulting archaeologist for survey or mitigation field work planned for the upcoming summer.
Nunavut Research Institute	*Scientist Act* (Nunavut)	Scientific Licenses: Land and Water Social and Traditional Knowledge	Undertake non-biological and non-cultural heritage baseline and monitoring studies	Sabina or its consultants will obtain the requisite scientific licenses as required prior to and during the life of the Project.
GN Environment	*Environmental Protection Act* (Nunavut) Spill Contingency Planning and Reporting Regulations(Nunavut)	Approval of Spill Contingency Plan		Sabina will submit its Spill Contingency Plan for approval as part of the Type A Water Licence Application. Submission timing: mid-2016
	Environmental Protection Act (Nunavut)	Hazardous Waste Generator		Sabina is currently registered as a hazardous waste generator
	Wildlife Act (Nunavut)			Sabina or its consultants will obtain the requisite wildlife research permits as required prior to and during the life of the Project.
GN Health and Social Services	*Public Health Act* (Nunavut) Camp Sanitation Regulations (Nunavut)	Approval of camp facilities	Construction and operation of camp, medical facilities, buildings and propane storage	Prior to construction and occupancy
	Emergency Medical Aid Act (Nunavut)	Medical facilities approval		

(continued)

Table D-1-1: List of Permits, Licenses, and Authorizations Required for Project (completed)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
GN Community and Government Services	Building Codes (Nunavut)	Building Permits	Construction and operation of camp, medical facilities, buildings and propane storage	Prior to construction and occupancy
	Fire Prevention Act (Nunavut) Fire Prevention Regulations (Nunavut) Propane Cylinder Storage Regulations	Approval of camp facilities and propane storage		
Worker's Safety and Compensation Commission of Nunavut - Mine Health and Safety	*Explosives Use Act* (Nunavut) Explosive Use Regulations (Nunavut)	Authorization to store and use explosives	Required to store detonators in a magazine	Sabina's explosives contractor (once contracted) will obtain the requisite authorization(s).
	Mine Health and Safety Act (Nunavut) Mine Health and Safety Regulations (Nunavut)	Authorization to store and use explosives	Required to store detonators in a magazine	
	Worker's Compensation Act (Nunavut) Workers Compensation Regulations (Nunavut)	Authorization for Activities	Required to proceed with Project activities	Sabina is currently authorized to conduct business in Nunavut. Confirmation will be sought from WSCC if changes to this authorization are required for mine development. Sabina's contractors will be required to seek approval to work in Nunavut.

Notes:
IOL = Inuit Owned Land

Appendix D-2: Procedural History

Table D-2-1. NIRB Procedural History

Date	Action
2011	Sabina initiates Environmental Assessment process
14 June 2012	Sabina submits project proposal directly to the NIRB
1 August 2012	NIRB issues public notice of Screening
5 September 2012	NIRB receives comments of the project from interested parties
25 September 2012	NIRB issues screening decision report to the AANDC Minister
17 December 2012	Minister issues decision to NIRB regarding screening report
17 December 2012	NIRB provided notice and distributes Minister decision to interested parties
21 December 2012	NIRB provides initial direction, procedural clarification and request for comments on project scope to/from interested parties
2-13 February 2013	NIRB hold public scoping session in various communities
18 March 2013	NIRB issues final scope, revised Draft EIS Guidelines
5 April 2013	NIRB issues Public Scoping Meetings Summary Report
9 April 2013	NIRB confirms guideline development workshop unnecessary
30 April 2013	NIRB issues to Sabina Guidelines for the Preparation of the Environmental Impact Statement
20 January 2014	Sabina submits Draft Environmental Impact Statement (DEIS)
11 February 2014	NIRB accepts DEIS as complete and conforms to Guidelines and initiates technical review period for the DEIS
13 March 2014	Interested Parties submitted information requests (IR's)
7 April 2014	NIRB issues direction and IR's to Sabina for response
23 July 2014	Sabina response to IR's
31 July 2014	NIRB initiates 60 day technical review
29 September 2014	Interested parties provided Technical comments to NIRB
14 October 2014	NIRB provides Sabina with technical review comments from all federal and territorial interested parties
17 October 2014	Sabina provides overview response to technical comments submission deadlines
24 & 30 October 2014	Sabina provided response to technical comments
17-19 November 2014	NIRB held Technical Meetings and Pre-hearing Conference (TM/PHC)
9 December 2014	NIRB issue TM/PHC Decision (includes Appendix 3: NWB Technical Review Submission regarding Sabina DEIS dated 18-December 2014)
18 December 2014	NWB issues Appendix 3 to the NIRB PHC Decision (see previous)
January 2015	Sabina initiated the development of the Final Environmental Impact Statement (FEIS)
3 July 2015	Sabina advised NIRB that project scope reduced to remove activities associated with development of George Property.
23 November 2015	Sabina submits final FEIS to the NIRB
23 November 2015	NIRB initiates compliance check the EIS guidelines and PHC Decision
8 December 2015	NIRB confirms FEIS submitted generally complies
23 December 2015	NIRB issues notice of public hearing
15 January 2016	Parties deadline for submission of Information Requests
25 January 2016	NIRB confirms suitability of IR's submitted

(continued)

Table D-2-1. NIRB Procedural History (completed)

Date	Action
12 February 2016	Sabina to provide initial response to IR's
29 February 2016	NIRB issues Draft Hearing Agenda
7 March 2016	NIRB's deadline for final technical comments
21 March 2016	NIRB issues Final Hearing Agenda
24 March 2016	NIRB deadline for submission of evidence (technical presentations) for use at the Hearing
8 April 2016	NIRB deadline for translated technical presentations
25 - 30 April 2016	NIRB Final Public hearing held in Cambridge Bay
15 June 2016	NIRB Final decision to the Minister
12 January 2017	Minister Decision issued to NIRB
15 February 2017	Sabina submits FEIS Addendum
24 May 2017	NIRB holds Technical Meeting (via Telecom)
31 May – 3 June, 2017	NIRB Final Public hearing held in Cambridge Bay
18 July 2017	NIRB Final decision to the Minister
Pending	Minister Decision issued to NIRB
Pending	NIRB hold Project Certificate development meeting
Pending	NIRB issues final Project Certificate to Sabina

Appendix D-3: Land Tenure

Table D-3-1. Land Tenure (as of August 10, 2017)

Project/ Prospects	Tenure Number	Hectares (ha)	Tenure Type	Registered Ownership as of August 10th, 2017	Expiry / Renewal Date
Goose	3694	417.60	Federal Mining Leases (9)	100% in good standing	16-Oct-2017
	3695	409.95			16-Oct-2017
	3696	1076.87			16-Oct-2017
	3697	1100.95			16-Oct-2017
	3698	1072.82			16-Oct-2017
	3699	1003.22			16-Oct-2017
	3700	1083.75			16-Oct-2017
	5750	922.00			19-May-2019
	5751	614.00			19-May-2019
	F94558	800.06	Federal Mineral Claims (2)	100% in good standing	09-Sep-2016*
	K19901	629.00			23-Sep-2017*
	K19902	87.68	Federal Mineral Claims (2)	Pending	27-Aug-2018
	K19903	112.18			27-Aug-2018
George	3562	69.48	Federal Mining Leases (20)	100% in good standing	9-Nov-2017
	3598	394.16			28-Dec-2017
	3599	821.11			28-Dec-2017
	3600	1008.88			28-Dec-2017
	3601	1097.91			28-Dec-2017
	3602	1027.90			28-Dec-2017
	3603	1078.08			28-Dec-2017
	3604	450.01			28-Dec-2017
	3605	1036.81			19-Dec-2017*
	3606	1074.04			19-Dec-2017*
	3607	1033.97			19-Dec-2017*
	3608	1057.61			19-Dec-2017*
	3649	1046.92			19-Dec-2017*
	3650	200.08			28-Dec-2017
	3651	1042.07			28-Dec-2017
	3653	1074.85			19-Dec-2017*
	3677	536.53			16-Oct-2017
	3729	111.01			16-Oct-2017
	3730	749.88			16-Oct-2017
	5707	1865.06			25-Nov-2017
Boot	3552	1,029.12	Federal Mining Leases (10)	100% in good standing	29-Dec-2017*
	3553	1,036.00			29-Dec-2017*
	3554	1,092.65			29-Dec-2017*
	3555	1,014.38			29-Dec-2017*

(continued)

Table D-3-1. Land Tenure (as of August 10, 2017) (completed)

Project/ Prospects	Tenure Number	Hectares (ha)	Tenure Type	Registered Ownership as of August 10th, 2017	Expiry / Renewal Date
	3609	1,081.32			29-Dec-2017*
	3612	1,079.70			29-Dec-2017*
	3613	1,024.26			29-Dec-2017*
	3678	1,060.68			16-Oct-2017
	3679	1,001.60			16-Oct-2017
	3724	541.47			16-Oct-2017
Boulder	3466	300.28	Federal Mining Leases (8)	100% in good standing	18-Nov-2017
	3557	1,012.12			30-Dec-2017*
	3558	1,051.37			30-Dec-2017*
	3559	1,048.54			30-Dec-2017*
	3560	1,099.53			30-Dec-2017*
	3691	259.81			16-Oct-2017
	3692	456.49			16-Oct-2017
	3693	670.56			16-Oct-2017
	K12027	903.26	Federal Mineral Claims (6)	100% in good standing	4-Oct-2022
	K12028	1,008.07			4-Oct-2022
	K12029	948.99			4-Oct-2022
	K12030	938.06			4-Oct-2022
	K12033	290.56			4-Oct-2022
	K12034	733.70			4-Oct-2022
Bath	5152	982.37	Federal Mining Lease (1)	100% in good standing	10-Mar-2018
	F94554	649.93	Federal Mineral Claims (2)	100% in good standing	9-Sep-2016*
	F94555	549.97			9-Sep-2016*
Del	K10862	965.98	Federal Mineral Claims (6)	100% in good standing	12-Sep-2018
	K10863	965.98			12-Sep-2018
	K10866	965.98			12-Sep-2018
	K10867	965.98			12-Sep-2018
	K10869	964.77			12-Sep-2018
	K10870	975.70			12-Sep-2018

** Renewal in progress.*
Source: Sabina Gold & Silver Corp. 2017

Appendix E-1: Site-specific Water Quality Objective for Arsenic

(see file 171002 2AM-BRP----MAD App E-1_SSWQOArsenic-IMLE.pdf)

Appendix E-2: Water and Load Balance Report

(see file 171002 2AM-BRP---- MAD App E-2_WaterLoadBalanceRpt -IMLE.pdf)

Appendix E-3: Geochemical Characterization Report

(see file 171002 2AM-BRP---- MAD App E-3_GeochemCharactRpt-IMLE.pdf)

Appendix E-4: Winter Ice Road Fish Habitat Memo

(see file 171002 2AM-BRP----MAD App E-4 _WIRFishHabitat -IMLE.pdf)

Appendix F-1: Water Management System Design Report

(see file 171002 2AM-BRP----MAD App F-1_Site-WideWaterMgmtRpt-IMLE.pdf)

Appendix F-2: Site-Wide Geotechnical Properties Report

(see file 171002 2AM-BRP----MAD App F-2_GeotechDesignRpt -IMLE.pdf)

Appendix F-3: WRSA Design Report

(see file 171002 2AM-BRP----MAD App F-3_WRSADesignRpt-IMLE.pdf)

Appendix F-4: Preliminary Tailings Management System Design Report

(see file 171002 2AM-BRP----MAD App F-4_TailsMgmtSystemDesign -IMLE.pdf)

Appendix F-5: Hydrogeology Characterization and Modelling Report

(see file 171002 2AM-BRP---- MAD App F-5_HydrogCharactModelRpt-IMLE.pdf)

Appendix F-6: Rascal Stream Fishway Memo

(see file 171002 2AM-BRP----MAD App F-6_RascalStreamFishway-IMLE.pdf)

Appendix F-7: Technical Review of Water, Waste Rock, and Tailings Management/Design

(see file 171002 2AM-BRP----MAD App F-7_TechReview-IMLE.pdf)