APPENDIX III.11

DECOMMISSIONING AND RECLAMATION PLAN
SNAP LAKE DIAMOND PROJECT
NORTHWEST TERRITORIES

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1.0 INTRODUCTION

1.1 Background

This document provides the conceptual decommissioning and reclamation (D/R) plan for the Snap Lake Diamond Project. For each component of the project (*e.g.*, mine, quarries), it includes a summary description, the closure strategy, and a conceptual reclamation plan. This D/R plan describes the areas of disturbance that require reclamation, summarizes the proposed strategy and schedule for D/R of each area, and outlines the work to be carried out. The specific details of the mine closure plan will evolve as mining progresses. Consequently, the plan will be updated regularly during the mine life.

De Beers Canada Mining Inc. (De Beers) is committed to reducing the residual environmental effects at the site upon mine closure. The mine plan has been developed in conjunction with this phased D/R plan. All surface facilities will be designed to minimize reclamation requirements following mine closure, and to enhance the natural recovery of the areas affected by mining. A significant portion of the proposed D/R will be carried out during the operations phase of the project.

Full-scale underground mining will commence in 2005 and will continue until 2026. Mine decommissioning will be undertaken between 2026 and 2028, and mine post closure monitoring will be carried out subsequent to mine decommissioning. Decommissioning will begin at the end of the construction phase and continue through the operation and closure phases. Post-closure activities will be limited to monitoring.

1.2 Objectives and Issues

Decommissioning and reclamation activities will form an integral part of the mine operating plan, and will be completed in a progressive manner during the life of the project. The mining, mine waste management, and site water management plans have been developed to facilitate progressive reclamation during operations.

The objectives of the D/R plan are as follows:

- to protect public health and safety;
- to establish conditions that will allow the land to return to a stable state that will reflect the surrounding environment; and,
- to minimize the need for long-term monitoring and maintenance by establishing physical and chemical stability of disturbed areas.

The D/R plan will comply with the conditions of permits, regulations, guidelines, and industry standards. The following principles have been established to guide the development of the overall D/R plan:

- plan and implement in accordance with regulations;
- apply cost-effective, appropriate, and practical practices;
- conduct studies to predict post-closure environmental effects;
- maintain a program of progressive reclamation as an integral part of project operations; and,
- continue to review site activities to minimize impacted areas.

The following activities will be implemented to address key D/R plan issues for this project:

- Minimize acid rock drainage (ARD) potential with the placement of the majority of the potentially acid generating (PAG) waste rock back underground as high strength backfill. Alternatively, it will be disposed of under a thick layer of processed kimberlite (PK) in the base of the north pile. The successful implementation of this strategy should minimize the requirement for long-term (post-closure) surface water and groundwater monitoring.

- Ensure the physical stability of all mine waste and water management facilities to prevent dust or transport of sediments. Placement of a cap of non-potentially acid generating (non-PAG) rock over the entire surface of the north pile will prevent dust and minimize potential for erosion of PK material deposited in the north pile. Placement of a cap of sand or non-PAG rock over sediments in all ponds used for water management will prevent movement of sediments out of these facilities.

- Maximize underground disposal of waste rock and PK by employing these materials in high strength concrete and paste backfill. This will minimize the requirement for surface containment (and subsequent reclamation) of these materials.

- Maximize water recycle within the process plant and minimize water content in PK disposed of on surface by producing an un-cemented paste. This minimizes the requirement for the construction (and subsequent reclamation) of surface water storage facilities.

1.3 Revegetation Considerations

Low-growing lichens represent a large percentage of the local plant community and their inconspicuousness often give vast areas the appearance of barren ground. Nonetheless, low-growing or stunted vascular plants do occur as individuals in sporadic patches, or as mats, where microhabitats provide suitable growing conditions. The presence, distribution, and diversity of both vascular and non-vascular plant species is more evident in surface depressions, along riparian habitats, and in other landscape areas with irregular topographical relief (*e.g.*, Snap Lake shoreline). Microhabitats in these areas are able to support physically larger plant species and a more diverse flora community, as a result of organic and inorganic soil accumulation, availability of macronutrients and moisture, warmer surface temperature, and reduced susceptibility to desiccation or structure damage (*i.e.*, protected from direct wind damage or snow/soil particle abrasion).

Revegetation considerations in northern areas must meet the challenges and limitations associated with cool short summers, low precipitation levels, cold winters, permafrost, and other biotic and abiotic influences that are not always readily identifiable or controllable. These factors collectively combine to influence plant morphogenesis and, as a result, growth and establishment are often slow and stochastic. Additional limitations that confront revegetation programs in the north are the limited availability of a suitable growth media, a still infant understanding of indigenous plant phenology and associated seral succession processes, and the general absence of endemic plant seeds or other propagules in sufficient quantities for use in large-scale planting or seeding.

Combined with the limitations mentioned above, there are few occurrences of successful and well-documented revegetation programs in northern latitudes, especially for large-scale disturbances, that can be scrutinized for direction. Consequently, it is difficult to identify a comprehensive revegetation plan and misleading at this time to provide assurance that this component of the reclamation objective will be met. Rather, it is more practical to identify a management objective or goal, and then implement a revegetation plan that is flexible and can adapt to successes and failures identified during studies and monitoring conducted in the operation phase. Emerging technology and techniques will also be implemented as they become available.

To simply adopt and apply revegetation program techniques from southern locals to northern areas with the assumption that the same success and objectives will be achieved would be misguided. Nonetheless, certain physical techniques and measures that have been utilized in other areas to assist revegetation efforts can be applied. These techniques may include the addition of soil amendments, recontouring, terracing, surface roughening, grooved/serrated slopes, rock check dams, diversion ditches, and erosion blankets.

The primary revegetation management objective will be to create a stable landscape that will encourage natural colonization, encroachment, and regeneration of endemic plant species. The first stage will involve recontouring roads, the airstrip, quarries, and ponds to promote terrain stability and to approximate a pre-disturbance profile. Rock pile creation shall be minimized during operation to minimize injury potential to migrating wildlife. Recontouring will lead to structural and spatial variation in the microtopography that can provide safe sites for seed germination and enhance seedling survival by creating favourable water and temperature conditions. In addition, variations in microtopography can trap soil particles, organic material, seeds, and other propagules. Also, roughening of the surface increases the boundary layer and reduces air movement close to the surface, thus helping to protect seedlings from wind erosion.

Test plots will be prepared to evaluate the application and suitability of various reclamation techniques on the different ecological land classes disturbed during mine construction and operation. This evaluation will include assessing the physical aspects of revegetation such as recontouring, erosion control techniques, seedbed preparation, surface roughening, use of soil amendments (*e.g.,* mulch and fertilizers) and other identified measures that will collectively encourage or promote natural secondary succession. The two bulk sample pits, which will be reclaimed early in the mine life, will provide an opportunity to establish test plots during operations.

Since natural revegetation tends to be slow and stochastic, a common practice or component of revegetation programs is seeding or planting disturbed sites. The objective of assisted revegetation is to compress and accelerate secondary succession; to enhance plant establishment and aesthetics; to provide erosion protection; to provide forage and wildlife habitat; and to offer some degree of control over species performance and composition within the plant community. Historically, tame or exotic/alien species were used for this purpose due to their availability, low cost, and predictability in regards to viability and stand establishment. However, there was little regard to the ecological setting to which they were introduced and how they may alter or otherwise modify natural processes and community structure. Today, with a growing knowledge of inter-species relationships and desire to maintain the ecological integrity of the natural biota, the preference is to use endemic species when applying seed mixtures to assist revegetation programs.

Though preferred, there are inherent limitations associated with using endemic species. These include the limited availability of seeds in commercial quantities, difficulties in storing and applying the seed, erratic production of viable seed, and limited information on species ecology and ecosystem processes. Seeds are often unpredictable in regards to germination, viability, emergence, and survivability. These limitations become especially evident in northern areas where there has been little application, documentation, and research pertaining to the use of endemic species in large-scale revegetation programs.

Test or experimental plots will also be used to assess various seed mixtures and their application on different growth media. This will include evaluating the feasibility and practicality of collecting seeds from local species, followed by strategic planting of the seeds or seedlings. Species such as blueberry (*Vaccinium* spp.) and crowberry (*Empetrum* spp.) are often early colonizing species and may be suitable for seed collection and subsequent use in assisted vegetation efforts. Likewise, in riparian habitats or where a high water table exists, willows (*Salix* spp.) collected on-site can be readily used for site stabilization and revegetation. Willow stakes, wattles, and fascines, as well as willow brush boxes and brushlayering, have all been successfully used as a biotechnical soil stabilization and revegetation technique in a variety of diverse landscapes and climatic settings.

Although the reclamation plan will encourage a natural, secondary succession of indigenous plant species within disturbed areas, intermediate steps may be required to control soil and slope stability over an appropriate time period to permit natural revegetation. In addition, rock slopes or other site features may not permit revegetation, consequently alternative reclamation methods will be assessed and used to ensure long-term stability. Where growth media exist, one such option may include seeding erosion prone sites with an annual cereal, or short-lived, non-aggressive cultivar species, or hybrid, sterile annual (*e.g.*, wheat X wheatgrass, trade name Regreen™). The benefits of these species include: providing immediate erosion control; the species will die-out after a few growing seasons and will not out compete with regenerating or colonizing endemic species for resources; space between plants stems will offer safe-sites for endemic seedlings; the standing plant material will help control ground level air and surface soil temperature; and the dead and decaying biomass generated by the cover crop will contribute organic material to the growth media.

A single, all encompassing revegetation technique for the entire mine site is not realistic or achievable, and the revegetation program must be flexible. For example, implementation of a specific revegetation technique for open spruce forest may not be completely transferable to a site with a heath/boulder vegetation class. The lack of natural soil at the Snap Lake site, outside of low-lying marsh areas, is a constraint that will affect all revegetation efforts. Consequently, results from the test/experimental plots will allow De Beers to develop and identify revegetation techniques and procedures that can be applied, on a wider scale, to the specific and various ecological land classes within the landscape matrix. In some cases, (*e.g.*, areas such as where lichens are the dominant ground cover) promotion of natural secondary succession over an extended temporal period may be the best option. Conversely, in riparian habitats or other sites where the growth medium is favourable, assisted revegetation efforts (*i.e.*, seeding or planting) have proven to be effective in accelerating the temporal element associated with ecosystem succession.

1.4 Climate Change Considerations

The primary tool used to predict possible global warming scenarios are general circulation models (GCMs). These models are used to simulate world climate where carbon dioxide concentrations in the atmosphere are double pre-industrial levels. These models are in general agreement on a global scale but results are less consistent for regional predictions. The models indicate a general warming trend over western and northern areas of Canada but there are inconsistencies about locations and the degree of change to precipitation and temperature. The following section highlights a recent document prepared by Environment Canada (1998), and assesses possible implications to the Snap Lake Diamond Project.

GCMs indicate that by 2100, winter temperatures may increase by 5ºC to 7ºC for the Arctic mainland. Summer temperatures are predicted to increase by 5ºC. Arctic precipitation for the area north of Great Slave Lake may increase by 10%, 0% to 10%, 10% to 20%, and 10% to 20% during the winter, spring, summer and fall, respectively.

In terms of hydrology, climate change may effect evaporation/evapotranspiration, runoff and storage, and permafrost. The time period at which the aforementioned changes may be expected to occur may be beyond the operating life of the mine but, given the uncertainty associated with the models and potential implications to decommissioning, the discussion is relevant.

Surface runoff is far more important than subsurface flows in permafrost areas. Permafrost is relatively impermeable, limiting water storage in the ground and restricting infiltration of snowmelt waters. Runoff often occurs as overland flow and extensive wetlands often develop. It follows that increases in precipitation should result in more water available for runoff. However, increases in permafrost degradation will occur with warmer temperatures, increasing subsurface storage. Evaporation will also increase with warmer temperatures. The overall effect on runoff is unclear though runoff during the thaw season may be reduced and flows during the summer are expected to increase.

In permafrost, the near surface portion is referred to as the active layer, which is subject to thawing during the summer. This zone can extend to depths of approximately 8 metres (m) in the area of the project site as measured in thermistors installed during site investigations. The active layer may deepen to approximately twice the current depth under a warmer temperature regime.

Regionally, it is thought that the boundary between the continuous and discontinuous permafrost zone may shift northward by several hundreds kilometres (km) under warming conditions. Warming conditions are expected to delay freezeup and advance breakup, reducing the ice cover period by up to one month. For Great Slave Lake, estimates indicate that the breakup data may be advanced by two weeks but freezeup dates may be unchanged.

The effect of global warming on the project is somewhat indeterminate given uncertainty regarding model predictions about the degree of climate change and the time periods over which changes may occur. However, the only permanent structure that will be left on site at closure that has the potential to be affected by global warming is the north pile. The potential effect of climate change on this structure is address in Section 10.2.2 of the environmental assessment (EA) Section 10.2, Geology and Terrain.

2.0 CLOSURE PLAN

The existing conditions at the project site are shown on Figure 1.2-3 in Section 1 of the EA. The overall site plan at the end of operations is shown on Figure 3.1-3 in Section 3.1 of the Project Description. Key aspects of the closure plan will focus on the reclamation of the north pile. The appearance of the north pile at the end of the operation phase is shown in Figure III.1-4 in the North Pile Development Plan (Appendix III.1). The north pile will contain a limited quantity of PAG waste rock from the development of the underground workings during the initial four years of mining as well as PK produced during milling of kimberlite ore. Other aspects of the closure plan involve the reclamation activities associated with the roads/airstrip, esker quarries, and buildings and infrastructure. The following sections outline the closure concepts for the main elements of the project.

For all surface disturbances listed below, results from the test/experimental plots will allow De Beers to develop and identify revegetation techniques and procedures that can be applied specifically to the various ecological land classes within the landscape matrix. The techniques best suited for the airstrips and roads may not be suitable for the process plant site. Each project element requiring revegetation will be addressed separately during closure to insure the most appropriate technique is utilized.

2.1 Roads and Airstrip

2.1.1 Description

Dedicated site roads are described in the Project Description (Section 3.8.2 of the EA) and shown on Figures 3.1-3 and 3.1-4 of the EA. The airstrip is also shown on Figure 3.1-3 and described in Section 3.8.1 of the Project Description.

2.1.2 Closure Strategy

The reclamation of roads and the airstrip will focus on the restoration of natural drainage patterns by removing fills and culverts, contouring to minimize erosion and sedimentation, and minimizing hazards to wildlife. The majority of the road/airstrip abandonment will be undertaken during the decommissioning phase of the project.

2.1.3 Reclamation Plan

All site roads, which are not required for post closure monitoring, will be decommissioned and reclaimed. The remaining roads will be reclaimed at the conclusion of the post-closure monitoring program.

The airstrip will be reclaimed near the end of the decommissioning phase of the project and will include the removal of culverts and contouring for the purposes of eliminating potential hazards to wildlife.

Reclamation may involve scarifying and loosening the top surface to facilitate natural revegetation. Where erosion or sedimentation is a concern, the surface will be re-contoured. Culverts or stream crossing structures will be removed and natural drainage will be re-established.

2.2 Quarries

2.2.1 Description

Over the life of the mine, three separate quarry locations have been identified within the ultimate footprint of the north pile. A fourth quarry will be located approximately 9-km south of the project site. Construction and maintenance materials (sand) will be extracted from the esker located south of the project site. The material will be brought from this quarry to the mine site by a winter road that will be established as required, using an existing winter road alignment. Material for site construction, maintenance, and closure will be obtained from the quarries.

The quarries are described in the Project Description (Section 3.7.3 in the EA) and the Quarry Management Plan (Appendix III.5). The quarries are shown in Figures III.5-1 and III.5-2 in the Quarry Management Plan (Appendix III.5).

2.2.2 Closure Strategy

Since all quarries located on-site will be backfilled with PK during the operation of the mine, closure of the quarries will not be a separate issue as the quarries will be within the footprint of the north pile. The three granite quarries will be restricted to the north pile to minimize the disturbance to the project footprint. The reclamation of the esker quarry will focus on the restoration of natural drainage patterns, revegetation, and re-contouring to minimize erosion, sedimentation, and hazards to wildlife.

2.2.3 Reclamation Plan

The reclamation of quarries will involve the removal of all mobile and stationary equipment. The slopes of the esker quarry will be stabilized and contoured to blend with the surrounding landscape.

The three granite quarries will be decommissioned at different times during the operation phase as PK and waste rock are deposited in the north pile. The first two quarries, which will be used primarily during the construction phase will be filled early in the operation phase. The third quarry will be filled at the end of the operation phase as the north pile is completed. Since the north pile will be situated on top of these quarries, their decommissioning will be included in the north pile decommissioning and reclamation.

Stockpiles of rock and esker material on-site will be depleted during the last years of operation. Remaining material will be spread and contoured to blend with the surrounding landscape.

Since the esker quarry is away from the mine and is a unique situation in terms of revegetation concerns, a separate test-plot program is proposed for the esker quarry. The results of this program will be used to develop site-specific techniques that can be applied at closure.

2.3 Underground Mine

2.3.1 Description

A ramp from the existing single portal located on the northwest peninsula about 200-m east of the processing plant will be used to access the main entrance to the underground mine (Figure 3.1-4 in the Project Description). A raise (3 m x 3 m) to the surface on the northwest peninsula will serve as a second means of egress from the mine (Figure 3.1-4). Two exhaust raises (3 m x 3 m) will be located north of Snap Lake, where the ore body is located beneath land (Figure 3.1-4). A brief description of the underground mine plan is available in the Project Description (Section 3 of the EA).

2.3.2 Closure Strategy

The closure strategy for the underground mine involves salvaging underground equipment and associated infrastructure. Unsalvageable underground infrastructure will be left underground. In addition, surface infrastructure, as well as scrap materials will be disposed of underground. Then all underground openings will be sealed.

2.3.3 Reclamation Plan

Following completion of underground mining activities, all salvageable equipment will be removed. All openings to underground, including the four proposed ventilation raises, and the conveyor and access ramps, will be sealed. The ventilation raises will be permanently sealed using a reinforced concrete cap, cast in place over the opening. The access ramps may be sealed with broken rock and/or concrete.

2.4 North Pile

2.4.1 Description

The north pile, which is the disposal facility for PAG waste rock, PK, and inert solid waste, will be constructed on northerly sloping terrain along the west arm of Snap Lake. The eastern edge of the pile will be adjacent to the water management pond (WMP) and process plant facilities; the north pile will extend westward for a distance of about 2.7 km. The north pile is shown in Figure 3.1-3 in the Project Description and Figure III.1-4 in the North Pile Development Plan (Appendix III.1).

The overall surface containment facility will be constructed in three stages, the starter cell, the east cell, and the west cell. This will allow progressive closure of the facility as each cell reaches the design elevation.

Containment for the north pile will be provided by a starter berm, which will be raised as required over the life of the mine. For the starter cell, the starter berm will be constructed of compacted fine rockfill or general fill. The starter berm for the east cell and the west cell will be constructed of compacted coarse-grained PK. Each raise of the berms will be constructed of compacted PK with a covering of non-PAG granite on the downstream face.

2.4.2 Closure Strategy

The closure strategy for the north pile involves removal of the PK paste distribution system and ensuring long-term chemical and physical stability of the waste materials. Characterization testing indicates that the PK is chemically stable. However, some of the waste rock, which may be placed in the base of the north pile, is PAG. In order to prevent oxidation of the waste rock, a thick cover of PK will be progressively placed over the rock during the operation phase.

The PK is subject to physical weathering when exposed to the atmosphere. Therefore, a cover of non-PAG granite will be placed over the entire facility to minimize weathering and erosion of the PK materials. The north pile is designed to be stable with or without freezing, thus climate change (*e.g.*, warming trend) will not affect the structure of the north pile.

2.4.3 Reclamation Plan

The north pile will be progressively reclaimed over the life of the mine, such that the requirement for reclamation activities will be minimal during the final years of operation and post closure. Placement of a cap of non-PAG granite over the deposited PK will be completed progressively over the life of the mine operation. This rock will be obtained from quarries developed within the footprint of the north pile. These progressive reclamation activities will minimize closure construction requirements on cessation of mining activities and reduce the closure costs associated with the facility.

During operation of the north pile, some settlement of the surface of the pile may occur after placement of the cap. Efforts will be made during the operating period to grade and contour the surface of the pile to minimize any potential for ponding of water on the pile surface. Closure of the north pile is expected to be completed in 2027 with the placement of the final rock cap. Revegetation activities are not proposed for the north pile rock cap.

Cross-sections through the north pile at various stages of the life of the project are shown on Figures III.1-1 to III.1-3 of the North Pile Management Plan (Appendix III.1). The configuration of the north pile at the end of the operation phase is shown on Figure III.1-4. The sequencing plan for closure is shown on Figure III.1-7.

Upon closure of the facility, the PK paste distribution system including all piping will be removed. In addition, sump pumps and associated piping and infrastructure will be removed from the perimeter of the pile. Salvageable materials will be de-mobilized from the site. Non-salvageable materials will be disposed of underground.

The final surface will be graded to produce localized mounds consistent with the surrounding topography and to ensure that water will drain off the pile. A stockpile of non-PAG granite will be provided for maintenance purposes, including contouring the final surface, during the closure period. Any material not required for maintenance will be contoured into the surrounding topography at the end of the closure phase.

After completion of the cover, a stable surface will develop and the suspended solids content of runoff water is expected to diminish substantially. The runoff water will continue to be directed towards existing small lakes where sedimentation of the remaining suspended solids will occur. When acceptable water quality is confirmed, the outlets of the lakes will be restored to pre-construction conditions, and water can then discharge to Snap Lake along natural drainage paths.

2.5 Water Management Facilities

2.5.1 Sedimentation Ponds, Sumps, and Ditches

2.5.1.1 Description

Perimeter ditches and sumps will be used to intercept any seepage or runoff from the outside slopes of the north pile. Figure III.1-4 in the North Pile Development Plan (Appendix III.1) shows the runoff flow path at the end of the operation phase. In addition, internal sumps/sedimentation ponds will be developed within the north pile footprint at various stages of operation to collect runoff and seepage from within the pile. External sedimentation ponds will be developed in existing small natural waterbodies around the north pile.

Perimeter ditches around the north pile will be lined on the side furthest from the north pile as well as on the bottom if broken ground is encountered, in order to minimize seepage. All sumps constructed along the perimeter ditch system will be fully lined. Lining material may include high-density polyethylene, geocomposite clay liner, shotcrete, or concrete.

The external seepage and runoff collection ponds will receive all of the surface runoff in contact with the exterior of the north pile. Uncontaminated upstream runoff will be diverted around the pile and discharged directly into an adjacent watercourse and/or Snap Lake. Water collected in the ponds will be pumped to the water treatment plant.

The yard area around the main facilities will be constructed to drain into the WMP or a north pile sump. For other remote yard areas, collection sumps will be constructed to collect surface runoff. These sumps will have a filter cloth liner to allow release of filtered water to the environment.

2.5.1.2 Closure Strategy

The sumps and ditches will be required during the closure period to collect runoff from the north pile and to allow water quality monitoring to be conducted. Following closure of the north pile, these facilities will no longer be required.

The closure strategy will be to decommission the sumps and sedimentation ponds and to restore drainage patterns.

2.5.1.3 Reclamation Plan

Closure of the ditches, sumps, and sedimentation ponds will be completed following closure of the north pile. Decommissioning of the ponds and ditches will involve the removal of all liner materials from the ponds and ditches and re-contouring of the underlying base and berm materials. Liner materials will be disposed of in the underground workings. A cover of sand or non-PAG rock will also be placed over any deposited sediment in the sedimentation ponds to prevent erosion of these sediments. Re-contouring will be carried out to re-establish natural drainage patterns and to minimize potential for erosion.

2.5.2 Water Management Pond

2.5.2.1 Description

The processed kimberlite containment (PKC) facility constructed for the advanced exploration program will become the WMP (Figure 3.1-4 in the Project Description). Containment for the WMP is provided through two dams (Dam 1 and Dam 2).

Dam 1 is located at the south end of the WMP, and cuts off the natural drainage channel to Snap Lake. Dam 2 is located at the north end of the WMP and provides containment across a topographic low at that location. Both structures were constructed to a crest elevation of 452 m during construction for the advanced exploration program. Both dams will be raised by 2 m to crest elevation of 454 m.

The dams are constructed as rock fill structures with an upstream geomembrane liner to minimize seepage. A key trench was excavated at the upstream toe of both dams, through the frost shattered bedrock, down to intact rock. The geomembrane liner is keyed into the intact rock through the use of a compacted sand-bentonite mixture.

With the construction of the water treatment plant, the WMP will be used to collect site surface runoff and to provide storage of water in the event of an operating problem with the water treatment plant. Further information on the WMP is provided in Section 3.6.6.3 in the Project Description.

2.5.2.2 Closure Strategy

The requirement for the WMP will be reduced following completion of underground mining. However, the WMP will be maintained to collect runoff from the north pile and the plant site area during the decommissioning phase, and to allow water quality monitoring to be conducted. Following completion of decommissioning activities on the plant site, it is expected that the WMP will no longer be required.

2.5.2.3 Reclamation Plan

Closure of the WMP will be carried out following decommissioning of the plant site. The pond will be temporarily drained. A layer of sand or non-PAG granite will then be placed over the bottom of the pond to prevent erosion of any fine sediment which have been deposited in the pond. Following placement of the cover layer and when the WMP water quality is shown to meet discharge criteria, the two dams will be breached. Liner materials will be removed from the upstream face of each structure and disposed of underground. Dam fill materials will be re-contoured to blend with the natural topography. The re-contouring will be carried out to minimize the potential for erosion. The edges of the pond will be contoured to provide the re-establishment of riparian vegetation.

2.6 Buildings and Infrastructure

2.6.1 Process Buildings, Accommodations, and Ancillary Facilities

2.6.1.1 Description

The key buildings on the mine site include the main process plant, paste backfill plant, concrete production facilities, service complex, and accommodations complex (refer to Figure 3.1-4 in the Project Description). The paste-fill plant will be part of the processing plant.

The two-storey service complex (Figure 3.1-4 in the Project Description) will be constructed to house administration, training room, mud room, change rooms, laundry facilities, showers, lunch rooms, first aid, equipment services, welding, machine and fabrication shops, and a warehouse and shipping/receiving area. A 350-person permanent camp complex of modular construction will be located as shown on Figure 3.1-4.

The main power plant and an emergency power plant will be located near the process plant (Figure 3.1-4). All site support facilities are described in Section 3.7 in the Project Description

The existing camp facilities constructed for the advanced exploration program will be expanded to provide accommodation for the construction crews. Existing power, water supply, and sewage disposal systems will be used for the construction camp.

2.6.1.2 Closure Strategy

The closure strategy includes removing all buildings and equipment. Site grading will be carried out to complete site reclamation.

2.6.1.3 Reclamation Plan

Salvageable buildings, surface structures, and equipment will be dismantled and de-mobilized from the site. Non-salvageable buildings and structures will be dismantled or demolished and disposed of underground. Concrete foundations and floor slabs will be removed to 1 m below the original ground level and demolition rubble will be disposed of underground.

The potential for contamination of the ground in the area of the process plant, power plant, camp and service complex will be assessed. Any required clean-up will be completed and then a cover of clean material will be placed where buildings and equipment were located. The entire area will be graded and contoured to blend with the surrounding topography.

2.6.2 Storage

2.6.2.1 Description

Storage facilities for fuel, explosives, cement, dry goods, and equipment are described in Section 3.7.2 of the Project Description. Three 12.5-million litre (L), single-walled, welded steel tanks, combined with the existing 3.3-million L storage facility (Figure 3.1-4), will store the diesel fuel required for full-scale production. The fuel truck unloading facility will include a concrete pad and spill containment sump. A secondary containment area, protected by gravel berms and liners, will be provided to contain potential fuel spills. Two envirotanks will be installed at the airstrip and one envirotank will be located at the emulsion plant.

The explosives manufacture and storage facilities are shown in Figure 3.1-3 of the Project Description. They will consist of an explosives manufacturing plant, a cold storage building with a cement floor and approved explosives magazines. Cement will be stored in unheated storage structures as shown on Figure 3.1-4. A pre-engineered, unheated building with an approximate area of 600 square metres (m^2) (Figure 3.1-4) will provide storage of dry goods and equipment.

2.6.2.2 Closure Strategy

The closure strategy involves removing all aboveground storage tanks (AST), structures, and shallow foundations.

2.6.2.3 Reclamation Plan

The ASTs will be dismantled and de-mobilized from the site. The AST foundations, containment berms, and liner materials will be removed. The potential hydrocarbon impact to soil will be assessed and remediated as required. The containment berms will be removed and the area re-graded.

All salvageable buildings, materials, and equipment will be dismantled and de-mobilized from the site. Liner materials will be removed and disposed of underground. Foundations for the structures and tanks will be demolished to 1-m below the original ground level. Demolition rubble will be disposed of underground. A layer of clean fill will be placed over the sites and graded to blend with the surrounding topography.

2.6.3 Solid Waste Management

2.6.3.1 Description

The solid waste management facilities on site will incorporate a fenced waste transfer storage area located at the plant site, an oil-fired incinerator and waste storage building, and landfill and land farm sites located within the north pile area. These facilities are described in Section 3.5.3 of the Project Description and shown on Figure 3.1-4.

2.6.3.2 Closure Strategy

The closure strategy involves removal of the incinerator and associated waste handling equipment. The landfill site and the land farm will be reclaimed as part of the north pile closure.

2.6.3.3 Reclamation Plan

The incinerator and waste handling equipment and associated structures will be dismantled. All salvageable equipment and structures will be de-mobilized from site. Non-salvageable equipment, materials, and structures will be disposed of underground. Concrete foundations will be removed to 1-m below the original ground surface and the demolition rubble will be disposed of underground.

The potential for contamination of the ground in the immediate area of the incinerator and waste handling facilities will be assessed. Any required remediation of the site will be completed. Upon completion of remedial activities, a cover of clean granular material or crushed non-PAG rock will cover the site. The area will be re-graded to blend with the surrounding topography.

Operation of the landfill site will include regularly placing a cover of PK over the solid wastes disposed of in the landfill. Upon closure of the site, all remaining solid waste materials will be covered with a thick layer of PK. A 0.5-m thick cap of non-PAG rock will cover the PK to minimize the potential for PK erosion.

Biological treatment of any contaminated materials will be completed in the land farm area. Upon completion of the biological treatment, a cap of PK will be placed over the land farm area. A final 0.5-m thick cap of non-PAG granite will be placed on top to minimize the potential for weathering and erosion of the PK.

2.6.4 Water and Sewage Treatment

2.6.4.1 Description

Water Treatment Plant

The water treatment plant (Figure 3.1-4 in the Project Description) will be constructed in phases (described in Section 3.6.7 of the Project Description). During mining operations, the plant will have an initial capacity of 10,000 cubic metres per day (m^3/d) and, as required, will be expanded to a capacity of 20,000 m^3/d.

The discharge from the water treatment plant will be piped directly to a discharge diffuser structure (Figure 3.1-4) within Snap Lake. The portion of the line that could be subject to ice damage will be protected within a steel casing.

Sewage Treatment Plan

The sewage treatment plant (described in Section 3.6.8 of the Project Description) will be based on sequencing batch reactor technology (similar to the current plant in use at the construction camp). The treated effluent will be combined with the effluent from the water treatment plant to form a combined discharge. Upon completion of the sewage treatment plant, the sewage from the existing construction camp will be pumped to the new plant for treatment. The existing plant at the construction campsite will be decommissioned. The sewage sludge from the treatment plant will be incinerated.

2.6.4.2 Closure Strategy

The closure strategy involves removal of the water treatment plant and the sewage treatment plant. The site will then be graded to blend with surrounding topography.

2.6.4.3 Reclamation Plan

The water treatment plant and sewage treatment plant will be dismantled. The diffuser structure and associated pipelines will be removed. All salvageable equipment and structures will be de-mobilized from the site. Non-salvageable equipment, materials, and structures will be disposed of underground. Concrete foundations will be removed to 1 m below the original ground surface and the demolition rubble will be disposed of underground.

The potential for contamination of the ground in the immediate area of the facilities will be assessed. Any required remediation of the site will be completed. Upon completion of remedial activities, a cover of clean granular material or crushed non-PAG rock will be placed in the area of the facilities. The sites will be graded to blend with the surrounding topography.

2.6.5 Water Supply and Distribution

2.6.5.1 Description

The water intake and pump house will be located on the north shore of the northwest peninsula (Figure 3.1-4 in the Project Description). The intake will consist of a rock filled embankment constructed out from the shore as described in Section 3.6.4 of the Project Description. The storage tank, main overland supply pipeline, and water distribution system are also described in Section 3.6.4.

2.6.5.2 Closure Strategy

The closure strategy involves removal of all pumping equipment and water lines.

2.6.5.3 Reclamation Plan

The reclamation plan for these facilities includes the removal of wells and pipes within the potable water intake embankment. The embankment will be left in place and contoured to maximize shoreline habitat. Water discharge facilities will also be removed. It is anticipated that this will include salvaging all pumping equipment including piping, control systems, and wiring. Emergency power supplies associated with heat tracing equipment will also be salvaged. All salvageable equipment and materials will be de-mobilized from the site. All non-salvageable equipment and materials will be disposed of underground.

3.0 POST CLOSURE MONITORING

On-site drainage into Snap Lake will be monitored for pH, total suspended solids (TSS), and heavy metals. Pond water will also be monitored. Monitoring will be used to demonstrate the effectiveness of reclamation and closure techniques. Water sampling will continue until the results for all parameters reach the range of values observed in baseline studies. If unacceptable readings of TSS, metals, or pH are observed, the potential cause will be identified and remedied.

This sampling will occur during the spring freshet and periodically during the warm weather period. Sediments will also be monitored once a year in the fall.

The thermal regime in the vicinity of the dams will be monitored. The post-closure presence of permafrost will reduce permeability in bedrock and the north pile containment berms. The stability of the containment berms will be monitored. Visual inspections of the north pile will also be required to identify areas of settlement, disrupted drainage, or erosion.

In general, groundwater monitoring will not be necessary (or possible) in permafrost areas. If deemed necessary, localized summertime monitoring of flow in the active zone may be implemented.

4.0 REFERENCES

Environment Canada. 1998. *Responding to Global Climate Change in Canada's Arctic*. Volume II of Canada Country Study: Climate Impacts and Adaptation. Environmental Adaptation Research Group. Downsview, Ontario.

5.0 UNITS AND ACRONYMS

UNITS

km	kilometre
L	litre
m	metre
m^2	square metre
m^3/d	cubic metre per day

ACRONYMS

ARD	acid rock drainage
AST	aboveground storage tank
D/R	decommissioning and reclamation
De Beers	De Beers Canada Mining Inc.
EA	environmental assessment
GCM	general circulation model
non-PAG	non potentially acid generating
PAG	potentially acid generating
PK	processed kimberlite
PKC	processed kimberlite containment
TSS	total suspended solids
WMP	water management pond