APPENDIX XI

DEVIATIONS FROM WEK'ÈEZHÌI LAND AND WATER BOARD TEMPLATE

APPENDIX XII

CONFORMANCE TABLES

APPENDIX XII-1

Conformance with 2015 Annual Closure and Reclamation Plan – Section 10

Following is a list of revisions made in Version 4.0 of the Closure and Reclamation Plan. The revision requirements are from the 2015 Annual Closure and Reclamation Plan V1.2.

#	**Revision Description**	**Status CRP V4**
1.	Address requirements from the 25 July 2016 Board Directive relating to North Inlet Sludge Management.	Please see Section 5.2.7.3.5 (page 131) and Appendix X-6.
2.	Discussion on the A418 Pit high wall	See Section 5.2.4.3.4 (page 103).
3.	Additional details to support the proposed flooding method.	Please see Appendix X-7.1 and Appendix X-7.2.
4.	A review of updated meteorological data and a discussion of whether the results impact closure planning	Update meteorological results are presented in Section 3.1.1. (starting at page 16). A description of how these results are incorporated with a climate change scenario to evaluate impact on closure designs is included in Section 5.2.1.3 (page 85).
5.	Re-visit the closure objectives for the north inlet to ensure they are closure objectives and not closure options – particularly NI-1	Please see Section 5.2.1.2 (page 83).
6.	Develop a monitoring plan, including estimated time periods.	Please see Appendix VI.
7.	Include a detailed explanation of how the mine would passively treat seepage in situ.	Please see Section 5.2.6.9 (page 125).
8.	Provide a more detailed description of risks associated with each selected closure activity. For each reclamation activity, identify the preferred contingency and significantly increase the level of detail for this contingency. Ensure all uncertainties associated with the preferred contingency are addressed. For example, if using Lac de Gras water to dilute water in the pit area is DDMI's preferred contingency, describe how this would be achieved, clearly define the environmental costs and benefits (compared to water treatment or other contingencies), and address any associated uncertainties.	Please see revised text within Section 5.2.4, 5.2.6, 5.2.7 and 5.2.8.
9.	Estimate the quantities of contaminated soils/materials expected at the end of operations, in order to facilitate the remediation of potentially contaminated material (landfarming).	Please see Section 4.4.7.7 (page 77).
10.	Provide a general description of the types and quantities of materials that the company plans to leave underground, based on available information. Also, discuss the risk that this disposal may contaminate groundwater or surface water and identify any uncertainties.	The inventory of materials to be left underground has not yet been determined. DDMI expects to advance this in the future including lessons learned from the flooding of the Snap Lake underground and regulatory practices that governed this activity. Options for disposal of processed kimberlite and possibly other inert waste also need to be included in any evaluation of risk to groundwater or surface water.
11.	Identify potential benefactors of salvaged infrastructure (e.g. buildings, tanks,equipment, supplies, crushers, generators,	Please see discussion in Section 5.2.8.3.3 (page 139).

	etc.) earlier rather than later and provide more detail about current plans and options.	
12.	Include updated predictions of water quality at closure and the duration and magnitude of residual effects using the most current information. This must include an analysis, using the most current data available, to update the 1998 runoff water quality predictions. Identify ways to reduce water quality problems associated with runoff.	Please see NCRP-WRSA Final Closure Plan (Version 1.1) Section 5.2.3.5 (page 59).
13.	Include detailed performance and post-closure monitoring plans and updated predictions of effects using the most current information. (Consider hosting a workshop or information session on post-closure monitoring prior to submission of Version 4.0 of the ICRP)	Please see Appendix VII and NCRP-WRSA Final Closure Plan Section 5.2.3.5 (page 59).
14.	Address the issue of air contaminants released to land and water during operations, in the context of closure.	Please see discussion in Section 5.2.8.3.4 (page 141).
15.	Provide the proposed revegetation procedure.	Please see discussion in Section 5.2.8.3.4 (starting at page 141) as well as the research summary in Appendix VIII-2 (starting at page 14) and Table VIII-1 (page 21). The above describes the progress to-date regarding re-vegetation procedures, however a final procedure has not been proposed. The task and schedule to complete this research is included in Appendix VIII-2 (pages 17-19).
16.	Include final design of the waste rock pile slopes and a resloping plan.	Please see Final NCRP-WRSA Closure Plan referenced in Section 5.2.5 (page 111).
17.	Provide a more detailed description of how metal uptake in revegetated plant communities will be monitored (per Water Licence condition Part L, Item 3f).	Indications from results to-date are that metals uptake in plants and lichen does not pose a risk to wildlife (Section 5.2.8.3.3 [page 138] - and Appendix VIII-2 [page 17]). While some additional work is required to confirm this (see Appendix VIII-2 [page 18]). DDMI suggests it is premature to develop specific procedures for how metal uptake in re-vegetated plants will be monitored (see Appendix VIII-2 [page 18]).
18.	Provide “a description of the Plan to assess and monitor any ground water contamination during post-closure” (Water Licence condition Part L, Item 1g).	Please see Appendix VI. Groundwater is included within Section 1.2 of each area monitoring plan as appropriate.
19.	Develop “a field-testing program and an implementation timetable to verify the effectiveness of the proposed impermeable closure cap for the Process Kimberlite Containment Facility and the Waste Rock Storage Facilities” (Water Licence condition Part L, Item 3g).	This field-testing program is no longer required as the approved closure design for the PKC no longer includes an impermeable closure cap. Please see discussion in Section 5.2.6.3.5

		(starting at page 118).
20.	Clarify how wetlands will be used for the closure of the collection ponds and the PKC Facility. Discuss whether it is imperative that wetlands develop in order to achieve the closure objectives? Discuss procedure and timetable for development of the wetland.	Please see Section 5.2.6.9 (page 125).
21.	Add "identify opportunities to enhance/diversify fish habitat in the North Inlet" to the reclamation research plan (RRP) outlined in appendix VIII-5 (assuming ongoing investigations support full reconnection of the North Inlet to Lac de Gras)	Ongoing investigations do not, at this time, support a full reconnection of the North Inlet to Lac de Gras. Please see discussion in Section 5.2.7.3.5 (page 131) and Appendix X-6.
22.	Include a closure plan for the A21 causeway (including closure objectives, preferred activities, etc.)	A21 causeway and A21 dike closure plans are included in Section 5.2.4.3.5 (starting at page 104) and Appendix X-3.
23.	Ensure that all information in section 3 of the ICRP (Project Environment) is correct and up to date (e.g., geological info, climate data, traditional use information, etc.). Refer to a number of INAC comments for specific revisions.	See updated Section 3.
24.	Include a statement that, during temporary shutdown, the stationary surface and underground mobile equipment stored within the common parking areas would have drip/spill trays placed in appropriate locations to absorb fluids which could leak.	Please see statements added in Sections 7.3.1.1 (page 152), 7.3.1.2 (page 153) and 7.3.6 (page 158).
25.	Define closure vs. post-closure.	See Section 5.1 (page 81).
26.	Include improved diagrams of the waste rock pile, as described above in the outline for the Annual ICRP Progress Report.	Please see updated Annex of Figures, discussion in Section 2.4 (page 10) and for example images in Appendix IX-4.
27.	Provide detailed and informative figures illustrating the final closure design of each mine component.	Please see updated Annex of Figures, discussion in Section 2.4 (page 10) and for example images in Appendix IX-4.
28.	Provide additional detail about long-term water treatment, including: any required changes to the existing treatment plant; implications on the post-closure requirement for fuel, chemicals, and personnel; maintenance requirements; proposed disposal location for treatment sludge; etc.	Please see Section 5.2.6.9 (page 125).
29.	List all sub-appendices in the table of contents, and include cover pages for all appendices and sub-appendices. Ensure all subsections and appendices are bookmarked correctly in pdf version of the ICRP.	Table of contents includes a list of all appendices and sub-appendices (page vii – viii) and cover pages are provided within the Appendices. Bookmarks have been added to the pdf.
30.	A description of how the Type III stockpile near the crusher will be closed if a) the material is not consumed during operation, and b) in the event of a pre-mature closure. Include as anew cost item in the RECLAIM model once ICRP V4 is approved.	Please see Final NCRP-WRSA Closure Plan V1.1 Section 5.2.3.3 (page 57) and NCRP Appendix VII (“Rock Pile” Tab).
31.	Revise the research plans to match the outline in the Board’s Closure and Reclamation Guidelines (p. 42).	Please see Appendix VIII-2 that now conforms with the MVLWB(2013) template as described on page 42. These changes have also resulted in

		changes to Task number references etc. that we acknowledge are confusing. Appendix VIII-1 provides an updated Tracking Table from that used in the 2015 Annual CRP Progress Report but retains the ICRP V3.2 reference numbering. Going forward this Tracking Table will be revised to align with the tasks now described in Appendix VIII-2.

APPENDIX XIII

EXCERPTS FROM:

ENVIRONMENT CANADA. 2009. ENVIRONMENT CANADA CODE OF PRACTICE FOR METAL MINES. PRS, 1/MM/17 E. APRIL 2009.

AND

INAC (INDIAN AND NORTHERN AFFAIRS CANADA). 2007. *MINE SITE RECLAMATION GUIDELINES FOR THE NORTHWEST TERRITORIES*. JANUARY 2007.

LIST OF TABLES

Table 1-A. General guidance on closure objectives relevant to the open-pit and underground areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Minimize access to open-pits to protect human and wildlife safety
- Allow emergency access and escape routes from flooded pits
- Implement water management strategies to minimize and control migration and discharge of contaminated drainage, and if required, collect and treat contaminated water
- Meet water quality objectives for any discharge from pits
- Stabilize slopes to minimize erosion and slumping
- Meet end land use target for resulting surface expression
- Establish original or desired new surface drainage patterns
- Establish in-pit water habitat where feasible for flooded pits
- Minimize access to underground workings and surface openings to protect human and wildlife safety
- Maximize the stability of underground workings so that there is no surface expression of underground failure
- Prevent collapse, stress transfer and flooding of adjacent mines
- Ensure that underground workings do not become a source of contamination to the surface environment
- Minimize potential for contamination and, if required, collect and treat
- Resurface, re-slope and contour surface disturbance as required to blend with surrounding topography or desired end land-use targets
- Minimize erosion, thaw settlement, slope failure, collapse or the release of contaminants or sediment
- Build to blend in with current topography, be compatible with wildlife use, and/or meet future land use targets
- Build to minimize the overall project footprint

Table 1-B. Recommendations for decommissioning of underground and open-pit mine workings from *Environment Canada Code of Practice for Metal Mines* (Environment Canada 2009).

- R506: If it is technically and economically feasible to do so, underground or in-pit infrastructure (e.g. crushers, rails, metal structures, water and air pipes) and equipment (e.g. fans and pumps) should be removed from the site. Any equipment to be left underground or in pit should be inspected and remediated as appropriate to ensure that there is no risk of leakage of any contaminants.
- R507: During the decommissioning of underground and open pit mines, any contamination associated with vehicles and equipment operations and maintenance should be identified and remediated, as appropriate.
- R508: Underground mine workings should be secured and signs should be posted warning the public of potential dangers associated with the facility.
- R509: The risk of subsidence in underground mines should be assessed. Appropriate measures should be taken to prevent subsidence in cases where the risk of subsidence is determined to be significant. The primary measure used to prevent subsidence is the backfilling of underground voids.
- R510: Open pits should be backfilled or flooded to the extent practicable to prevent unauthorized access and to protect public safety. In all cases, signs should be posted warning the public of potential dangers associated with the site.

Table 1-C. Guidance for generic options for closure of open-pits and underground mine workings from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

Open Pit Workings

- for multiple pits, sequentially backfill with wasterock and/or tailings as operations proceed
- backfill open pits with appropriate materials (e.g. waste rock, tailings)
- flood the pit (natural or accelerated)
- allow gradual slope failure of pits involving rock masses, or slope pit walls
- block open-pit access routes with boulder fences, berms and/or inulshuks (guidance from local communities and Elders should be sought)
- post warning signs (with visible symbols placed close enough so they are visible from one to another) and fences or berms around the perimeter for actively managed sites (not acceptable for remote sites into the long-term)
- long-term fencing to prevent access may only be appropriate if the mine site is located close to a community where regular access for maintenance is possible and where there is a higher risk of access by the general population
- clover slopes with rip rap thick enough to provide insulation or stabilization to minimize erosion or permafrost degradation
- Stabilize exposed soil along the pit crest or underlying poor quality bedrock that threatens to undermine the soil slope above the final pit water level
- Backbrush area to improve visibility
- Plug drill holes
- Maintain an access/egress ramp down to water level for flooded pits
- Contour to discourage or encourage surface water drainage into pits where appropriate
- Cover exposed pit walls to control reactions where necessary
- Collect waters in pit that do not meet the discharge criteria and treat passively (active treatment is not acceptable for the long term) or passively treat waters in the pit
- Breach diversion ditches and establish new water drainage channel
- Establish aquatic life in flooded pits

Underground Workings

- Seal all drill holes and other surface openings, especially those connecting the underground workings to the surface
- Backfill underground with benign tailings and wasterock
- Secure underground shafts and raise openings using concrete to ensure permanent closure;

wooden barricades are only suitable for temporary closure

- Construct a reinforced concrete wall or a plug of weakly cemented waste if the barricade is for access control only
- Flood and plug workings to control acid generation and associated reactions if appropriate (engineering designs must consider hydrostatic heads and rock mass conditions – reinforced slabs should be avoided)
- Construct pillars to retain long-term structural stability after mining activities cease and to sustain their own weight and, if applicable, the weight of unconsolidated deposits, water bodies and all other surface loads
- Permanent support boundary pillar if practical and necessary
- Avoid the use of fencing for barricades in remote northern mine sites where regular inspection is not feasible
- Use ditches or berms as barricades except in areas of continuous permafrost; where continuous permafrost exists, inukshuks, fencing or some other method may need to be considered
- Remove all hazardous materials from the underground shops, equipment and magazines (fuels, oils, glycol, batteries, explosives, etc.)
- Contour to establish natural drainage patterns and blend in with the surrounding topography or re-contour the surface to prevent natural surface and groundwater flows from becoming contaminated by mine water where appropriate

Table 1-D. General guidance on post-closure monitoring of the open-pit and underground areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

Underground Workings

- Inspect sealed areas
- Check for surface expression (subsidence) of underground failure
- Conduct geotechnical assessment of the overall safety and risk within the subsidence zone.
- Install and check thermistors where appropriate to monitor freeze-back in permafrost areas and to confirm that the ground thermal regime is not degraded
- Periodic backfilling of areas of subsidence may be required
- Inspect groundwater plumes and hydrogeology

Open-pit

- Identify areas that are not stable
- Check ground conditions to confirm permafrost conditions are being re-established as predicted
- Sample surface water and profiles of flooded ponds/pits
- Ensure that there is sufficient water supplied to maintain an appropriate water depth for flooded pits
- Sample quality of groundwater seeping from pit walls to assess potential for contamination of mine water due to melting permafrost and ARD/MLch from pit walls.
- Identify and test water management points (including seepage) that were not anticipated
- Inspect barriers such as berms, fences, signs and inukshuks

Inspect fish habitat in flooded pits where applicable

Table 2A. General guidance on closure objectives relevant to wasterock and till areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Minimize erosion, thaw settlement, slope failure, collapse or the release of contaminants or sediment
- Build to blend in with current topography, be compatible with wildlife use, and/or meet future land use targets
- Build to minimize the overall project footprint
- Develop and implement preventative and control strategies to effectively minimize the potential for ARD and ML to occur
- Where ARD and ML are occurring as a result of mine activities, mitigate and minimize impacts to the environment
- No reliance on long-term treatment as a management tool (e.g. effluent treatment facilities are not appropriate for final reclamation but may be used as a progressive reclamation tool)
- Minimal maintenance requirements in the long-term

Table 2B. Recommendations for decommissioning of wasterock piles from *Environment Canada Code of Practice for Metal Mines* (Environment Canada 2009).

- R 524: At the end of the mine operations phase, detailed inspections and assessments of wasterock piles and tailings management facilities, particularly dams and other containment structures, should be carried out. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipated post-closure conditions. Factors that should be considered include:
    - the extent of deformation;
    - the rate and quality of seepage;
    - the condition of foundations and sidewalls; and
    - design loads, which may be different after mine closure.
- R 525: At the end of the mine operations phase, comprehensive risk assessment should be conducted for mine closure to:
    - evaluate the long-term risk associated with possible failure modes for wasterock piles and tailings management facilities;
    - identify possible impacts on the environment and human health and safety in the event of a failure;
    - determine parameters critical to these failure modes and possible impacts; and
    - develop and implement long-term control strategies to manage the identified risks.
- R 527: At the end of mine operations phase, plans for management of wasterock and tailings to prevent, control and treat metal leaching and acidic drainage should be re-evaluated and revised as necessary, to ensure that they are consistent with the objectives and plans for mine closure and post closure. This evaluation should consider:
    - the results of the re-evaluation of the performance of these facilities;
    - the performance of progressive reclamation to date; and
    - possible alternative technologies for closure.

- R 529: At all mines that exist in permafrost conditions, downstream slopes of tailings containment structures should be revegetated.

Table 2C. Guidance for generic options for closure of wasterock and overburden areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Doze down crest if required or construct toe berm to flatten overall slope
- Remove weak or unstable materials from slopes and foundations
- Off-load materials from crest of the slope
- Leave waste piles composed of durable rock “as is” at the end of mining if there is no concern for deep-seated failure or erosion, and if the end land use targets can be achieved
- Cover to control reactions and/or migration (re-slope to allow for cover placement if necessary)
- Place riprap insulation/stabilization layer
- Freeze waste into permafrost
- Place potentially acid generating rock underwater or underground if available
- Place potentially acid generating within the centre of the waste pile so it is encapsulated be permafrost if conditions permit and underwater or underground disposal are not viable options
- Construct collection system to collect contaminated runoff or leachate
- Construct diversion ditches to divert uncontaminated runoff
- Install horizontal drains or pump leachate from relief wells at the toe of the slope
- Passively treat contaminated waters where necessary, active treatment is not acceptable for the long term
- Use benign waste rock as backfill in underground mine workings, to seal portals, to fill open-pits, or for construction material such as ramps or covers
- Revegetate using indigenous species or use other biotechnical measures (use of living organisms or other biological systems for environmental management) to reduce surface erosion
- Reslope, contour and/or construct ramps to facilitate wildlife access
- Use inukshuks to deter wildlife where appropriate (guidance from local communities and Elders should be sought)
- Include records of construction drawings, as-built drawings, location of landfill sites, and potential ARD material and other contaminated materials which are contained within the rock pile in the reclamation research plan.
- Control acid water at the source, preventing contaminated water flows, and allow contaminated water to be collected and treated (this would be incorporated into water management system)
- Divert or intercept surface and groundwater from ARD source

- Install covers and seals to prevent or reduce infiltration
- Induce or maintain freezing conditions to limit the formation and discharge of leachate
- Place acid generating materials in topographic lows or depressions where they are most likely to be submerged under water under natural conditions
- Mitigate consequences of ARD by the use of passive and active treatment systems, as appropriate for in-situ conditions
- Passive treatment measures include:
    - Chemical (alkali trenches, attenuation along flow path)
    - Biological (sulphate reduction, wetlands, metal uptake in plants)
    - Physical (physical removal – filtration by plants, attenuation)
- Active treatment measures may include:
    - Chemical (Lime neutralization, adsorptive process)
    - Biological (Sulphate reduction)
    - Physical (Solid/liquid separation)

Table 2-D. General guidance on post-closure monitoring of the wasterock and till areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Periodically inspect areas where stabilization measures may be required
- Periodic inspections by a geotechnical engineer to visually assess stability and performance of waste pile and cover(s)
- Periodically inspect ditches and diversion berms
- Examine ground conditions to confirm predicted permafrost conditions are being established as predicted
- Check thermistor data to determine thermal conditions within waste piles to confirm predicted permafrost aggradation/encapsulation where applicable
- Test water quality and measure volume from controlled discharge points of workings to confirm that drainage is performing as predicted and not adversely affecting the environment
- Identify water discharge areas (including volume and quality) that were not anticipated
- Inspect physical stability of the mine site to confirm that no erosion, slumping or subsidence that may expose potentially ARD/ML material to air and water are occurring
- Inspect any preventative and control measures (e.g. covers) to confirm that they minimize water and/or air exposure
- Confirm that predicted water quality and quantity of chemical reactions is occurring
- Develop monitoring locations and frequency on a site by site basis, incorporating locations where possible contaminated drainage may be generated, and where drainage may be released to the water management system or to the environment (also include downstream/down gradient locations)

Table 3A. General guidance on closure objectives relevant to the processed kimberlite containment area from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Stabilize slopes surrounding the tailings impoundment or containment system for flooded and/or dewatered conditions
- Minimize catastrophic and/or chronic release of the tailings based on associated risk
- Minimize wind migration of tailings dust
- Minimize the threat that the impoundment becomes a source of contamination (e.g. tailings migration outside of contained area, contamination of water outside of contained area)
- Blend with local topography and vegetation were appropriate
- Discourage human and wildlife access from physically and chemically unstable tailings sites

Table 3B. Recommendations for decommissioning of the processed kimberlite containment from *Environment Canada Code of Practice for Metal Mines* (Environment Canada 2009).

- R 524: At the end of the mine operations phase, detailed inspections and assessments of wasterock piles and tailings management facilities, particularly dams and other containment structures, should be carried out. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipated post-closure conditions. Factors that should be considered include:
    - the extent of deformation;
    - the rate and quality of seepage;
    - the condition of foundations and sidewalls; and
    - design loads, which may be different after mine closure.
- R 525: At the end of the mine operations phase, comprehensive risk assessment should be conducted for mine closure to:
    - evaluate the long-term risk associated with possible failure modes for wasterock piles and tailings management facilities;
    - identify possible impacts on the environment and human health and safety in the event of a failure;
    - determine parameters critical to these failure modes and possible impacts; and
    - develop and implement long-term control strategies to manage the identified risks.
- R 527: At the end of mine operations phase, plans for management of wasterock and tailings to prevent, control and treat metal leaching and acidic drainage should be re-evaluated and revised as necessary, to ensure that they are consistent with the objectives and plans for mine closure and post closure. This evaluation should consider:
    - the results of the re-evaluation of the performance of these facilities;
    - the performance of progressive reclamation to date; and
    - possible alternative technologies for closure.
- R 529: At all mines that exist in permafrost conditions, downstream slopes of tailings containment structures should be revegetated.

Table 3C. Guidance for generic options for closure of the processed kimberlite containment area from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Stabilize embankments by removing weak or unstable materials from slopes and foundations and/or construct toe berms to flatten overall slope
- Breach water retention dams and drain impoundments, avoid post closure impoundment of water when possible
- Use a natural body of water that has sufficient storage capacity to hold the tailings and also a natural unimpeded flow via the drainage outlet if a permanent water cover is used (this may not be viable if the supernatant water quality does not meet discharge water quality standards)
- Increase freeboard and/or upgrade spillway to prevent overtopping and possible erosion by extreme events
- Relocate and/or deposit tailings into underground mine workings or into flooded pits, depending on water quality considerations
- Flood to control acid generation and related reactions
- Cover to control acid generation and related reaction and surface erosion
- Promote neutralization reactions by use of alkaline materials for acid tailings
- Divert non-contact runoff away from the tailings facility to avoid contamination
- Promote freezing of tailings mass into permafrost if suitable conditions exits.
- Collect waters that do not meet the discharge criteria and treat passively, active treatment is not acceptable for the long term
- Remove structures, decant towers, pipes and drains where they already exist
- Plug decant towers, pipes, and drains with high slump (relatively liquid concrete which will flow to fill all voids) or preferably, expansive concrete, as a last resort
- Assess the soil around pipes for stability under the hydraulic gradients through the embankment, as this may be a potential zone of piping failure
- Avoid using diversion structures and ditching, especially in permafrost soils (diversion structures are not the preferred option into the long-term)
- Where diversion dams and channels are necessary, maintain them indefinitely to meet long term stability and hydraulic design requirements; design diversions and spillways for extreme events suitable for long term stability
- Provide frost protection cap over the phreatic surface for water-retaining dams
- Ditch, berm, fence or use alternative methods to deter access to motorized vehicles if compatible with end-use plans
- Establish indigenous vegetation, soil, riprap or water cover to control erosion

Table 3-D. General guidance on post-closure monitoring of the processed kimberlite containment facility from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- conduct periodic dam safety and stability reviews of structures that remain after closure
- Inspect seepage collection system for water quality flows
- Check for degradation or aggradation of permafrost for tailings containment structures where permafrost was used in the design
- Assess dust dispersion and vegetation uptake with wind dispersion of tailings

Table 4A. General guidance on closure objectives relevant to the North Inlet areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Dismantle and remove/dispose of as much of the system as possible and restore natural or establish new drainage patterns
- Stabilize and protect from erosion and failure for the long term
- Maintain controlled release from water dams, ditches and all points of water discharge to the environment
- Achieve approved water quality limits, and in the case of existing mines, implement long term treatment only if necessary and ensure that minimal maintenance is required.

Table 4B. Recommendations for decommissioning of water management and treatment systems from *Environment Canada Code of Practice for Metal Mines* (Environment Canada 2009).

- R531: At the end of the mine operations phase, water management plans should be evaluated and revised as necessary to ensure that they are consistent with the objectives and plans for mine closure and post closure. This evaluation should consider:
    - The results of an evaluation of the performance of the existing water management plan;
    - Expected changes in water flow and water balance on site; and
    - Expected changes in wastewater volume and composition

Based on this evaluation, the following should be identified:

- Water management structures, such as dams and diversion ditches, that will no longer be needed, methods to be used for decommissioning these structures, and the timing of decommissioning;
- Water management structures that will continue to be needed and any long-term maintenance or replacement requirements associated with these structures;
- Water management structures that will need to be modified, methods to be used to modify these structures, the timing of modification, and any long-term maintenance requirements associated with these structures; and
- Long-term monitoring requirements to ensure that the water management system continues to function as designed.

- R532: At sites where it is determined that long-term treatment of wastewater will be necessary during post closure, a long-term wastewater treatment plan should be developed and implemented. This plan should include the following elements:
    - Identification of roles and responsibilities of persons to be involved in operation and maintenance of the treatment system;
    - Identification of the types of treatment system to be used;
    - Identification of any by-products from the treatment system, such as treatment sludge and management plans for the disposal of those by-products;
    - Identification of routine maintenance activities to be conducted on the treatment system and the frequency;
    - Identification of monitoring to assess ongoing performance of the treatment system and the frequency;
    - Identification of reporting requirements for internal management and regulatory agencies; and
    - Description of contingency plans to address any problems associated with the treatment system.

Table 4C. Guidance for generic options for closure of water management facilities from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Water management facilities including ditching and settling ponds that are not required for long-term use should be treated and discharged, sediment should be removed and disposed of properly, and the embankments, dams and culverts should be breached if not required
- Use passive treatment systems as the preferred method for dealing with contaminated waters if it can be demonstrated to be effective
- Locate permanent spillways in competent rock
- Drain, dismantle and remove tanks and pipelines from the site or fill and cover them with appropriate materials if they are approved to remain
- Cover embankments, ditches, culverts, and other drainage channel slopes with erosion resistant material (e.g. soil, riprap, vegetation)

Table 4-D. General guidance on post-closure monitoring of the North Inlet from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Periodically inspections are required in the post-closure period to assess the performance of the existing water management structures
- Check the performance of erosion protection on embankment structures such as rip rap or vegetation and the physical stability of water management systems including permafrost integrity where applicable
- Check water quality and flows to ensure system is working as predicted
- Conduct ongoing inspection and maintenance of passive or active water treatment facilities associated with non-compliant mine water or runoff discharges
- Sample surface and groundwater if site specific conditions dictate
- Check the smell and taste of water and fish (guidance from local communities and Elders should be sought)

Table 5A. General guidance on closure objectives relevant to mine infrastructure areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Ensure buildings and equipment do not become a source of contamination or a safety hazard to wildlife and humans
- Return area to its original state or to a condition compatible with the end-use targets
- Remediate any sources of contamination that may have been created during the development and operation of the mine site in order to protect humans, wildlife and environmental health
- Prevent significant releases of substances that could damage the receiving environment
- Remediate contaminated soil such that the area is compatible with future uses of the surrounding local area
- Re-establish the pre-mining ground cover, which may involve encouraging self-sustaining indigenous vegetation growth
- Provide wildlife habitat where appropriate and feasible
- Assist with providing physical stability of mine components

Table 5B. Recommendations for decommissioning of mine infrastructure from *Environment Canada Code of Practice for Metal Mines* (Environment Canada 2009).

- R514: On-site facilities and equipment that are no longer needed should be removed and disposed of in a safe manner, unless facilities or equipment are to be preserved for post-closure land use. Efforts should be made to sell equipment for reuse elsewhere or to send equipment for recycling, rather than disposing of it in landfill facilities.
- R515: The walls of on-site buildings should be razed to the ground, except in cases where they are to be preserved for post-closure land use. Foundations should be removed or covered with a sufficient thick layer of soil to support revegetation.
- R516: If buildings are to be preserved, either as a heritage resource or for some other post-closure land use, structures and foundations should be inspected to ensure that no contamination is present. If the structures or foundations are contaminated, they should be remediated as necessary to ensure public health and safety for post-closure land use.
- R517: Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services should be removed, except in cases where it is to be preserved for post-closure land use.
- R518: The main access road to the site (or runway in the case of remote sites) and other on-site roads, as appropriate, should be preserved in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities.
- R519: Roads, runways or railways that will not be preserved for post-closure should be reclaimed:
    - Bridges, culverts and pipes should be removed, natural stream flow should be restored, and stream banks should be stabilized by revegetating or by using rip-rap.
    - Surfaces, shoulders, escarpments, steep slopes, regular and irregular benches, etc. should be rehabilitated to prevent erosion; and
    - Surfaces and shoulders should be scarified, blended into natural contours, and revegetated.
- R520: electrical infrastructure, including pylons, electric cables and transformers should be dismantled and removed, except in cases where this infrastructure is to be preserved for post-closure land use or will be needed for post-closure monitoring, inspection and maintenance. This includes infrastructure on site, as well as any off-site infrastructure owned by the mining company.
- R522: Waste from the decommissioning of ore processing facilities and site infrastructure, such as waste from the demolition of buildings and the removal of equipment, should be removed from the site and stored in an appropriate waste disposal site or disposed of on site in an appropriate manner in accordance with relevant regulatory requirements. If material is disposed of on site, the location and contents of the disposal site should be documented.
- R523: Sampling and analysis of soils and other materials should be conducted to ensure that none of the material is contaminated, e.g. with asbestos and mercury from buildings. If

contaminated materials are identified, they should be handled and disposed of in an appropriate manner in accordance with all applicable regulatory requirements.

Table 5C. Guidance for generic options for closure of mine infrastructure areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Dismantling all buildings that are not necessary to achieve the future land use target
- Raze/level all walls to the ground and remove foundations
- Cover remaining foundations with materials conducive to vegetation growth
- Remove buildings and equipment during the winter to minimize damage to the land where appropriate
- remove and dispose concrete in an approved landfill if it contains contaminants such as hydrocarbons or PCB's that may pose a hazard over time
- where approved, break or perforate concrete floor slabs and walls to create a free draining condition in order that vegetation can be established
- backfill all excavations below final grade to achieve the final desired surface contours to restore the natural drainage or a new acceptable drainage
- cover excavated sites which have exposed permafrost with a rock cap to prevent thermokarst erosion
- Bury materials in the unsaturated zone or below the active layer
- Decontaminate equipment (free of any batteries, fuels, oils or other deleterious substances) and reuse or sell (local communities may have interest in some of the materials)
- If sale or salvage or equipment is not possible, dispose of decontaminated equipment in an approved landfill or as recommended by the regulatory authorities
- Cut, shred or crush and break demolition debris to minimize the void volume during disposal
- Maintain photographic records of major items placed into landfills, as well as a plan showing the location of various classes of demolition debris (e.g. concrete, structural steel, piping, metal sheeting and cladding)
- Leave non-salvageable materials and equipment from underground operations in the underground mine upon approval from the regulatory authorities
- Remove all hazardous materials and chemicals prior to demolition to national approved hazardous material treatment facilities, recycle, reuse, or dispose of in a appropriate manner upon approval from the regulatory authorities (check for PCBs in fluorescent light fixtures, lead-based paints, mercury switches or radioactive instrument controls)
- Backhaul materials for recycling or disposal to a southern location
- Excavate and remove contaminated soil and place into a designated and properly managed containment area on-site
- Treat contaminated soil in-situ (bioremediation, soil leaching, washing, etc.)
- Immobilize contaminated soil (cement solidification, lime/silicate stabilization, etc.)

- Excavate and relocate contaminated soil to approved facilities off-site.
- Some low level contaminated soil may be used progressively to cover landfills if the entire landfill is designed to be ultimately encapsulated in permafrost
- Dispose of wastes in quarries, borrow pits, underground mine workings, tailings impoundments, and waste rock piles
- Burn domestic waste in an incinerator during operations and at closure as part of camp maintenance
- Burn waste oils, solvents and other hydrocarbons on-site with an incinerator if approved (chlorinated substances should not be burned)
- Cover landfills and other waste disposal areas with erosion resistant material (e.g. soil, riprap, vegetation)
- Divert runoff with ditches or covers
- Ditch, berm, fence or use alternative methods to limit access to waste storage areas
- Contour/blend to match the natural topography or a new desired topography and re-vegetate with indigenous species to meet end use land targets
- Consider surface application of sewage for re-vegetation
- Begin revegetation efforts as soon as possible for mine site areas/components (progressively reclaim)
- Contour, scarify, and seed are using native seed mixes to establish vegetative cover
- Apply gravel barriers or other underlying cover systems where desired to control or limit the upward movement of acidic pore water or heavy metals that may inhibit plant growth or for moisture retention near the surface
- Apply stripped/stockpiled soil or growth medium to a depth sufficient to maintain root growth and nutrient enrichments
- Incorporate organic materials, mulches, fertilizers, or other amendments based upon local soil assessment
- Establish appropriate temporary or permanent wind breaks where necessary to establish vegetation
- Transplant vegetation that would otherwise be lost to mine disturbance where feasible
- Select indigenous vegetation for reclaimed sites that have a low potential for metal accumulation
- Re-vegetate with indigenous vegetation not used by wildlife or people if uptake of metals is a concern
- Place a gravel or coarse cover to discourage vegetation growth where desired

Table 5-D. General guidance on post-closure monitoring of the Infrastructure Areas from *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

- Maintain all buildings and equipment left onsite
- Inspect disposal areas periodically to establish if buried materials are being pushed to surface as a result of frost heaving
- Maintain access infrastructure to support on-going reclamation and closure monitoring
- Monitor wildlife/fish use of area to ensure mitigation measures are successful
- Monitor other land users access and activity in the area
- Check stream crossing remediation and any degradation associated with decommissioned roads such as erosion and ponding of water.
- Carry out periodic inspections to investigate the quality of air, groundwater, discharge water, and water body sediment where contaminated soils have occurred
- Carry out periodic inspections to investigate thermal degradation, and physical stability where contaminants have occurred
- An assessment of residual contamination should be carried out to confirm the success of the remediation
- Inspect re-vegetation areas periodically following initial planting until vegetation is successfully established and self sustaining in accordance with the agreed criteria
- Conduct soil analysis for nutrients an pH until the vegetation is successfully established and self-sustaining
- Inspect vegetated areas that may be obscuring possible cracks and other problems on dams and embankments
- Inspect for root systems that are penetrating protective covers or decaying/rotting providing tunnels for water to pass through protective covers
- Identify excessive vegetation stress or poorly established areas and implement contingency measures if required.
- Sample water treatment sludge periodically to determine the chemical characteristics, sludge stability, and leachability under the proposed long-term storage conditions
- Test water quality and quantity to measure the success of the mitigation measures for waste disposal areas
- Identify and unpredicted sources of potential contamination
- Check the ground thermal regime (by means of thermistors) and cover performance to check if permafrost has aggraded into the landfill and if the seasonal active zone remains within the cover
- Check for cracking or slumping of the cover and for underlying waste material pushing its way

up through the cover