



Mineral Resources Directorate, Yukon

HANDBOOK OF RECLAMATION TECHNIQUES IN THE YUKON

Yukon Placer Mining Land Use Regulations



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Guide des Techniques de Remise en État des Terres Minières au Yukon
*Règlement sur l'utilisation des terres pour l'exploitation
des placers au Yukon*

Preface

This guide was primarily prepared by
Laberge Environmental Services, Whitehorse, Yukon.

Disclaimer

This handbook is intended to assist an operator in the reclamation and/or restoration of their mining land use site. Adopting the suggestions, approaches and options outlined herein are considered to be basic management practices and will not, in any way, constitute a defence in a court of law if an operator were to be investigated and subsequently prosecuted for a violation of the *Yukon Placer Mining Act* and *Regulations* or any other legislation.

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1. Introduction

The objective of this handbook is to offer a range of options and approaches to minimizing environmental impact to the land caused by placer exploration or mining, and to provide the rationale behind them. Basic environmental standards for land use activities on claims and leases are outlined in the Operating Conditions, which form Schedule I of the *Yukon Placer Mining Land Use Regulations*.

The focus of this booklet are suggestions on how to best achieve the basic management practises that govern the Operating Conditions on all classes of exploration and mining land use on placer claims and leases. The Operating Conditions are divided into 12 headings under the regulations, ranging from conditions for revegetation and erosion control to clearing trees and brush. The Operating Conditions are meant to stand alone for Class I, and to act as benchmarks or environmental standards for Classes II, III and IV.

This booklet can be used to become familiar with the basic Operating Conditions and the environmental standards suggested by them. The operator may use the reclamation alternatives and guidelines contained within to assist in preparing an exploration and mining land use Notification or Operating Plan. The operator's own experience and knowledge of successful reclamation techniques, and consultation with the Chief of Mining Land Use and other specialists will decide the final form of a Notification or Operating Plan - not a set of prescribed solutions. In other words, do not rely exclusively on this booklet for the only methods of meeting the requirements of the *Regulations*.

The following sections in this handbook are organized along the line of the Schedule I Operating Conditions. Under each chapter, the appropriate operating conditions are repeated from Schedule I of the *Regulations*, along with supporting rationale, objectives, reclamation alternatives and guidelines. For a quick reference of the Operating Conditions, see Schedule I of the *Regulations*.

CLASSIFICATION OF PLACER LAND USE OPERATIONS

Classifications of placer exploration or mining operations are based on specified thresholds of activities, as defined by Section 4 of the *Yukon Placer Mining Land Use Regulations*. The level of environmental screening for placer exploration or mining operations increases as the potential to cause significant effects to the environment broadens from Class I to Class IV respectively. All classes of placer exploration or mining operations must comply with the Operating Conditions of Schedule I of the *Regulations*.

The characteristics which define one class from another are as summarized in the following:

Class I Operation This class is characterized by grass roots exploration activity on claims or leases such as hand shafting, line cutting, drilling, mobilization of equipment, and moving minimal amounts of overburden. Carried out in compliance with the Operating Conditions, the activities in Class I should have very little potential for effects on the environment. No prior government approval is required for Class I, but the activity will still be subject to inspection for compliance with the Operating Conditions.

Class II Operation This class includes most other activities on claims or leases associated with placer exploration such as extension of roads and trails, moving heavy equipment, preparing ground, bulk sampling, etc. Before commencing a Class II activity, the Chief of Mining Land Use must be informed through "Notification", which explains the proposed operations and what measures will be taken by the operator to minimize environmental effects.

Class III Operation This class includes extensive road building or upgrades, permanent structures, and long off-road mobilization of heavy equipment. All Class III operations require submission of a detailed exploration and mining land use Operating Plan, which must be reviewed and approved by government before proceeding. The reclamation and mitigation options and guidelines in this booklet may be useful when preparing the plan.

Class IV Operation This classification is reserved for production mining, which is in turn defined as the stage when a water licence is required under the Yukon Waters Act. When preparing the required land use Operating Plan for production mining, operators would be well advised to consider the entire placer operation. That is, plan for handling water and soil at the same time, keeping in mind that much of the exploration and mining land use considerations will go together with stream channel restoration and other components of the Yukon Placer Authorization and Water Licence Application.



Class I grass roots exploration

What is Notification? Notification is the method that allows for fast, responsible permitting of Class II placer exploration with a minimum of red tape. Each year, at least 25 days before start-up, the operator must contact government. This is done by filling out the "Notification Form", found in Schedule I of the *Regulations*, and submitting it to the Chief of Mining Land Use.

What is an Operating Plan? This is the detailed plan that must be submitted to the Chief for Class III or Class IV activities. The plan has to be reviewed within specified time limits and approved before commencing the activity. The *Regulations* specify in point form the particular information that an Operating Plan must include. Operating Plan details are further outlined in the *Guide to Mining Land Use Regulations: Policies and Procedures* booklet, available from the Mining Land Use Office.

For the purposes of this handbook, the Operating Plan must contain all of the planned activities of the placer exploration or mining operation along with a description of how the exploration and mining land use disturbance will be reclaimed and how any adverse affects to the environment will be mitigated

2. How to control erosion and encourage revegetation

Erosion control and revegetation often go hand in hand: if the soil surface is constantly unstable due to erosive forces, then revegetation can't take hold. Likewise, where plant cover is not re-established, the surface will be more subject to erosion. Most land disturbed by placer operations will successfully revegetate as long as the area is left within a reasonable range of conditions.

For Class I operations, no notification is required: simply comply with the Operating Conditions for erosion control and re-establishment of the vegetative mat.

Here are the basic Operating Conditions concerning revegetation and erosion control for placer exploration or mining land use operations, from the *Regulations*.

REGULATIONS

*Operating Conditions
for Re- establishment
of the vegetative mat*

*Operating Conditions
for Erosion Control*

All areas disturbed during an exploration or mining operation must be left by the operator in a condition conducive to successful revegetation by native plant species or other species adaptable to that environment.

All areas disturbed during an exploration or mining operation must be re-sloped, contoured, or otherwise stabilized by the operator to prevent long term soil erosion, slumping and subsidence and to comply with the conditions for re-establishment of the vegetative mat.

The first condition sets the environmental standard for all placer exploration or mining land use in regard to revegetation. The objective for revegetation of ground disturbed by placer exploration or mining, no matter what classification, is to leave the ground in such a way as to provide a good chance for successful revegetation by plant species native to the area (natural revegetation). Application of seed and fertilizer, or "assisted" revegetation, would only be required in areas unsuited to natural revegetation but having had significant vegetative cover before the land was disturbed. When seed is applied to placer exploration or mining disturbances, it should consist of native species to the extent possible in order to avoid the introduction of undesirable new species to the area.

The environmental standard for erosion control in placer exploration or mining land use is to leave slopes, excavations, and other disturbed lands in a range of conditions that will limit the incidence of gullying, sheet erosion, slumping and other instabilities. One of the objectives of controlling erosion is to prevent soil erosion and excessive sediment load to nearby streams. In general, re-sloping or re-contouring of the disturbed land will be done as a means of preparing the site for successful revegetation, which in turn prevents erosion and sediment discharge.

The measures you will take to stabilize the disturbed land and/or prepare it for revegetation will vary depending on the scale and type of activity, the soil type, and the amount of permafrost present.

**PREPARING SITES
FOR REVEGETATION**

The following are some options for controlling erosion and preparing sites for successful revegetation. Notifications and Operating Plans must include an explanation of how soil erosion will be prevented and revegetation will be accomplished. The operator may choose to adopt one or more of the examples sited in these guidelines, or else propose other site specific measures in their Notification or Operating Plan.

**Slope Contouring
Options**

Any significant amount of earth movement during placer exploration or mining will require some grade restoration or side-slope contouring. The reclamation alternatives for contouring offered below are intended for piles and side slopes resulting from any placer exploration or mining activity.

The first two alternatives are practical, easy to perform and the most commonly used applications. The last five alternatives, although they may be generally applied, should be reserved for situations where there is likely to be significant sediment load to adjacent watercourses (see guidelines for preventing stream sedimentation on page 10).



*Natural revegetation one
year after disturbance.*

RECLAMATION OPTIONS

High Ice Content Slopes
Contour to Blend with Natural Topography
Unfrozen Slopes - Coarse Soil
Unfrozen Slopes - Fine Soil
Coarse Piles
Fine Soil Piles
Low Ice Content Slopes

Options for Slope Contouring:

Side slopes with ice-rich soils, as in "black muck", may be left vertical or near-vertical to thaw and stabilize naturally. Ideally these may be undercut so that the top vegetated mat falls over and covers the exposed ice rich slope.

Side slopes and/or push piles may be contoured so as to blend with the natural topography and the top of piles and slopes may be rounded off.

Side slopes with no permafrost made up of coarse, well drained soils should be graded to a slope less than 2 horizontal: 1 vertical, and if over 15m high should be benched to prevent excessive erosion.

Side slopes with no permafrost made up of poorly drained, fine-grained soil should be graded to a slope less than 3 horizontal: 1 vertical.

Piles of coarse soils should be graded to a slope less than 2 horizontal: 1 vertical, and the top of the pile rounded off.

Piles of fine-grained soils, topsoil or organics should be graded to a slope less than 3 horizontal:1 vertical and the top of the pile rounded off.

Side slopes with less than 5 percent frost by volume should be graded to a slope less than 2 horizontal:1 vertical and the top of the slope rounded off.



An example of a coarse pile bladed to an optimum grade of less than 2:1. Fine soils bladed into surface.

RECLAMATION OPTIONS

Clear Trees First
Conserve Organic Material
Overburden Piles
Contour Overburden to Match Natural Topography

Careful planning before beginning a large scale stripping operation will ensure that the Operating Conditions for revegetation and erosion control can easily be met at the end of the placer exploration or mining operation.

Options for Stripping Operations:

- Clearing of trees and brush should take place first, in accordance with the Operating Conditions and acceptable options for removal of trees and brush.
- Topsoil and organics may be windrowed separately from overburden and left in stabilized piles, which are "guarded" if necessary to prevent erosion, for use in preparing the site for revegetation.
- Stripped overburden may be left in stable piles, sloped and contoured, at least 5 m from the edge of standing trees.
- Overburden may be stacked along the valley wall, contoured to blend with the natural topography and the top may be rounded off.

These are the operating conditions for Trenching, from the *Regulations*:

REGULATIONS

Operating Conditions for Trenching

Trenching carried out by hand or with hand-held tools must be methodical, and the trenches must be stabilized and marked in such a way as to minimize risk to the public.

When trenching with mechanized equipment, an operator shall segregate material into two piles:

1. *Vegetative mat; and*
2. *Overburden and bedrock,*

to be conserved and used for backfilling the trenches.

Trenches excavated during an exploration or mining operation with mechanized equipment must be backfilled by the operator. Overburden and bedrock shall be replaced first, followed by vegetative mat. The backfilled trench must comply with the operating conditions for re-establishment of the vegetative mat and erosion control.

The environmental standards in trenching and pit excavation are to minimize terrain hazards and promote revegetation of the site through orderly backfilling of all trenches dug by machine. Most of the instability problems in trenching arise from excavating in frozen ground or from orienting trenches parallel to steep slopes. Special care should be taken during placer exploration or mining not to have trenches or open pits turn into retrogressively failing gullies.

Reclamation standards for exploration trenching are clearly outlined within the Operating Condition itself. Suggestions for the re-establishment of the vegetative mat and erosion control are described in the following sections.

RECLAMATION OPTIONS

Backfill Trenches
Conserve Materials
Natural Revegetation
Spread Organic Material

Options for Trenching and Pit Excavation Operations:

For Class I & II activities, the trench or pit must be backfilled after sampling and before the end of the season.

Where there is no organic cover, the excavated material will be conserved for backfill.

Backfilled trenches and pits will be contoured so as to blend in with the surrounding topography, and the surface prepared for successful natural revegetation.

Trees and brush that were cleared for trenching or pits may be bucked up into suitable lengths and spread over the recontoured trench site.



All trenches or pits excavated by machine must now be backfilled.

PREPARATION FOR RE- VEGETATION

Once a disturbed site has been re-contoured, the next step is to give natural re-vegetation the best possible chance of success by leaving the soil surface in a condition that will promote plant growth. The question is whether or not a given surface will be likely to re-vegetate. Compacted surfaces, smoothly graded surfaces on slopes, and dry coarse-grained surfaces are the least likely to sustain growth. Use your experience with the site and observations of nearby operations to judge when to apply a given technique. Almost all placer deposits are covered with good material for seed stock and growth

RECLAMATION OPTIONS

medium - make the best use of organic materials by spreading conserved topsoil piles onto surfaces not likely to revegetate on their own.

The following are some suggested methods for the re-establishment of the vegetative mat:

Rip
Roughen Smooth
Surfaces

Where surface soils appear adequate to sustain growth, these areas could be prepared as follows:

- ! Compacted surfaces may be ripped to loosen the subsoil.
- ! Smooth surfaces may be roughed up by walking tracked equipment up and down the slope, or by any other acceptable means, to provide seed and moisture traps.

Spread Topsoil and
Organics
Mix Fine Soil into
Course
Apply Seed and
Fertilizer

Where surface soils appear unlikely to sustain growth, these areas could be prepared as follows:

- ! Topsoil and organic matter set aside may be bladed out onto the surface.
- ! The soil matrix may be improved by blading fine-grained soils onto coarse-grained surfaces.
- ! A native selection seed mix and fertilizer appropriate for the site characteristics and region may be applied.



*Spreading topsoil onto
coarse soils*

Many of the above alternatives may be applicable to Operating Plans, but the larger scale of Class III and IV operations may also require consideration of the following guidelines.

**GUIDELINES FOR
PREVENTING STREAM
SEDIMENTATION**

Large-scale stripping or stockpiling operations may cause discharge of unacceptable amounts of sediment to nearby water courses. To control downslope and downstream sedimentation, an Operating Plan should include measures to keep sediment-laden water caused by exploration and mining land use operations from reaching streams.

Here are some sediment control measures to consider:

- Construct a sump either by pushing up berms or by excavating depressions, or else by using existing topographic low areas to trap silt-laden run-off from unstable slopes or cut banks.
- Maintain a vegetated buffer strip or setback between the natural boundaries of streams and the operation. These setbacks can perform well as sediment traps and also serve to maintain stream bank stability and limit the destabilisation of the watercourse itself.
- Arrange windrows of slash perpendicular to the slope to trap sediment from stripped areas.
- Construct drainage ditches along the bottom of highly erosive piles or slopes to carry silt-laden run-off to either sedimentation ponds or alternative sediment traps.
- Construct benches on slopes to control erosion.

It is the responsibility of the operator to prevent exploration and mining land use operations from causing excessive downstream sedimentation.

**GUIDELINES FOR
MINING CUTS**

Placer mining pit wall stability involves the issues of safety, stability, aesthetics, and the post-mining return to a productive habitat. These are a function of soil type and amount of permafrost.

- When excavating unfrozen soils (on bench operations for example), consider removing standing timber to a location where it will be disposed of outside the ultimate cut perimeter after the cut has been abandoned and slopes have been stabilized at the natural angle of repose. When trees fall into the cut, the root wad rips up and exposes more soil to erosion. Removing trees from the cut perimeter improves aesthetics, lessens the terrain hazard, and promotes more orderly stabilization. At no time should trees and overburden material be pushed over the edge of hillsides.
- When excavating in frozen soils, consider removing the standing timber, leaving as much of the undergrowth and vegetative mat as possible, for a distance of 1 ½ times the projected depth of the cut. This will promote better thaw stabilization.

With the exception of these low steep piles of coarse soils, this site has successfully revegetated through natural processes.



- When excavating in high ice content soils (i.e. black muck), consider leaving intact the vegetation immediately outside of the cut. This has the effect of inhibiting the flow of liquefied fine organics as the wall thaws, recedes and stabilizes naturally.
- When leaving high pit walls (>10 m), consider benching or terracing to reduce risk to the public and to wildlife.
- Consideration for public and/or workers safety is a legal requirement. Plan to clearly mark by signage or flagging any cuts that pose a hazard to the public. Consider cutting off by ditching or berming any trails that lead to the mining cut.

To ensure rapid natural revegetation of these coarse dredge tailings, the operator is spreading stockpiled organics over the leveled tailings.



The management of these piles of materials greatly affects the degree to which the site will return to a self-supporting ecosystem. If left within a reasonable range of conditions, these new landforms will become very suitable habitat. In broad valleys, excellent riparian habitat can be maintained with a minimum of cost and effort. In gulches and narrow valleys containing ice-rich soils, the post-mining conditions often support more productive and diverse habitat than what existed prior to mining.



Good grade restoration of tailings and overburden. Fine soil matrix and microsites for seed trap created by dozer tracks.

GUIDELINES FOR TAILINGS AND OVERBURDEN PILES

The key to promoting successful reclamation of tailings piles and overburden piles is in grading to an appropriate slope, contouring, providing a fine soil matrix cover when needed, and providing an environment that traps seed and water. Use your experience and observations of successful reclamation in the area to create the landforms best suited to the site with a minimum of extra materials handling.

Plans will be site specific but likely fall into four main categories: gulches, narrow valleys, wide valleys, and terraces or benches. In gulches, the strategy would likely be to recontour piles to blend with the valley topography within a generous range of slope angles, and provide competent velocity barriers made up of very coarse tailings or rock, to reduce short-term sedimentation. In wider valleys, a range of options is possible, including encouraging wetland habitat, contouring ramps and dumps to create landforms more suitable for wildlife, and simple grading and spreading of stockpiled topsoil and organics to hasten plant growth.

On terraces or benches not normally considered as riparian habitats, the strategy is likely to be simply a case of keeping slope angles within some reasonable range and applying topsoil or finer textured soil covers where necessary to encourage plant growth.

Coarse dredge tailings require some special treatment to encourage re-vegetation. Due to the mining method, fines are deposited at the bottom of the pile and coarsest material on top. This soil matrix is not suitable for re-vegetation because of poor moisture retention and lack of nutrients. Blading, contouring, and compaction will improve the soil matrix.

Tailings piles and waste overburden piles should be constructed with the lowest slope angle that is practical. Round off the top and toe.

Consider pumping a portion of the sluice undersize onto the top of the coarse section as dredging progresses.

Re-blading stripped overburden or stockpiled topsoil onto coarse tailings or dredge tailings such that a maximum surface area is covered is a good method of encouraging revegetation.

Consider contouring and blading dredge tailings relatively flat.



Blading tailings with good soil matrix - likely to revegetate naturally.

3. Archaeological and burial sites

Operating Conditions for Archaeological and Burial Sites

The Operating Condition for archaeological and burial sites is as follows:

All archaeological sites and burial grounds must be avoided. If such a site is encountered in the course of an exploration or mining operation, it is to be marked, reported to the Chief and protected from further disturbance until authorization is given by the Chief.

The environmental standard in regard to archaeological sites and burial grounds to be observed at any level of exploration and mining land use activity is to avoid these sites if possible, and to stop work at the site if you encounter one.

Of note, under Section 17.2.b. of the *Yukon Placer Mining Act*, cemeteries are exempted from lands on which claims can be staked.

In order to avoid any surprises the operator should take steps to try and identify any known sites in their claim areas. Here are some ways this can be done:

- The First Nation in whose traditional territory the placer exploration or mining operation is located, and the Heritage Branch of the Government of the Yukon may be able to provide advice as to known sites (see Appendix II).
- Most burial sites have been selected as part of the Land Claims site selections for the First Nation in whose traditional territory the area is situated. All land claims selections, both final and tentative, appear on the claim maps available at the Mining Recorders office. The location of site selections through land claims is also available at the Territorial and Federal land claims offices.

Archaeological Object means an object that is the product of human art, workmanship, or use, and it includes plant and animal remains that have been modified or deposited in consequence of human activities, and is of value for its historic or archaeological significance.



4. Keeping it Clean: Cleanliness and Waste Disposal

REGULATIONS

*Operating Conditions for
Cleanliness*

The Operating Conditions for Cleanliness are relevant to waste disposal in and around placer exploration or mining camps.

Debris, equipment, fuel barrels, scrap metal or other waste at the work site shall be disposed of safely, so as not to attract wildlife, by removal, burial, or incineration, as often as is practical throughout the mining season and completely at the cessation of the exploration or mining operation.

Campsites must be kept clean and tidy.

Structures must be removed and the site restored at the end of the exploration or mining operation to a level of utility comparable to its previous level of utility.

The above conditions indicate the environmental standards for all placer exploration or mining operations where there is a campsite or waste is generated anywhere on the property. These are:

- Avoidance of land or water pollution and risk to wildlife through proper waste disposal and handling.
- Attention to aesthetics and public relations by reducing litter and waste material dumps.
- Clean-up and restoration of work areas or campsites seasonally and at the end of mining.

It would be impractical to list all of the acceptable ways and means to accomplish these goals because they will vary with the scale of operations and because many of the measures relate to public health and safety concerns: not only exploration and mining land use. What is offered in the following are guidelines which represent good environmental practice for waste disposal, cleanliness, and restoration in and around placer exploration or mining camps.

*Poor practice -
Abandonment of waste
materials after a program
is no longer allowed.*



If a large-scale camp is planned with permanent structures or more than 250 person-days per season, or the camp is situated in an environmentally sensitive area, more sophisticated measures and more consultation with the Chief of Mining Land Use will be required when developing the Operating Plan.

For a detailed guideline on camps see A User's Guide to Camp Development, published by Land Resources, DIAND.

When establishing a new camp, locate the campsite in existing clearings or abandoned camp sites where practical.

CAMP LOCATION AND LAYOUT

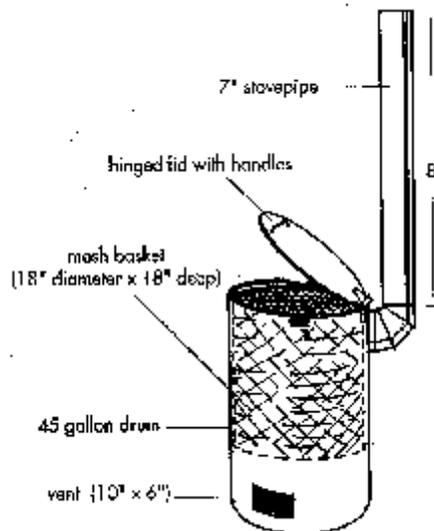
- Locate residential and office buildings no less than 30 meters from the high water mark of streams.
- Locate mechanical shops or buildings used for storage of toxic/deleterious materials no less than 30 meters from the high water mark of streams.
- Lay out buildings and other facilities on well drained soils with enough room for present and future needs;
- Locate subsurface grey water pits and/or pit privies at least 30 meters from the high water mark of streams and at least 1.2 meters above bedrock or water table. If very permeable soils are encountered, the pit privy or grey water pit should be lined with 0.6 meters of sand or silt. These measures may help to prevent downstream pollution by pathogenic (disease causing) organisms.
- A properly designed and installed sewage disposal system may be required for large camps and certainly for permanent dwellings. Complete information on private sewage disposal systems is available from Health Canada or the nearest Environmental Health office.



Good layout, competent soil, room for future needs.

CAMP OPERATION AND MAINTENANCE

- Burn combustible and odorous kitchen waste on a regular basis in an acceptable incinerator.
- A home-built incinerator should have a good venting system and mesh to suspend the garbage as well as slow burning accelerant like diesel fuel to promote a complete burn. Commercial forced-air, fuel-fired incinerators should be considered for large camps. The main thing is to incinerate the garbage, not roast it in a pit or common drum because this will only attract bears. Also, open pit burning is often forbidden due to fire hazards.
- The incineration of garbage will help to eliminate odours attractive to bears (garbage odour is the attraction in 70% of bear problems). Incineration can save money and also saves bears. More information on avoiding bear problems is available from YTG, Renewable Resources.



A simple incinerator

- Dispose of incinerator residue by burial in a designated pit or remove residue from the site. Store garbage in wildlife-resistant sealed containers until disposed of.
- Bury non-combustible waste including metal, wire, glass and plastic, on a regular basis. A mining inspector must be consulted and approve the location, method and means of burial, prior to the burial of any material.
- When non-combustible debris is buried, it should be crushed and/or compacted and then buried beneath at least 1 meter of compacted overburden to ensure erosion control and to prevent eventual exposure.

FOR SEASONAL SHUT-DOWN

- Remove all garbage in permafrost areas. Buried material in permafrost is likely to be forced to the surface by frost action.
- If practical, back haul solid waste to the nearest maintained dump.
- Avoid scattering wood debris, empty drums, junked equipment and metal waste over the claims. Remove these items from work areas regularly and keep in a secure area for final disposal.
- Remove from the camp or safely store on site any materials that may result in injury to wildlife such as wire, steel, glass and plastic.
- Either back haul all non-combustible garbage or bury on site with 1 metre of overburden. Compact overburden after burial to prevent soil erosion.
- Look around. Has solid waste been cleaned up? Have wildlife attractions been removed?

*At final abandonment,
remove all waste and all
temporary structures*



FOR FINAL CAMP ABANDONMENT

- Remove everything from the site, including all buildings, machinery, materials, fuel drums, used hydro carbons, unburied solid waste, and metal waste including junked vehicles.
- Rip or loosen compacted soil that is likely to revegetate naturally, or spread topsoil onto areas that have soils not likely to revegetate.
- Certain structures and materials may be left on site for future re-use in accordance with an approved Operating Plan.

5. Handling chemicals and fuel

REGULATIONS

*Operating Conditions for
Fuel and Chemical
Storage and Handling*

Fuel and other petroleum products and chemicals shall be stored and transferred in such a manner as to prevent spillage into a body of water or onto the surrounding land.

A fuel spill emergency plan must be in place and a copy of it posted on-site.

When the quantity of fuel in storage exceeds 4 000 L, a secondary containment facility must be constructed that is of material impervious to petroleum products and that is of sufficient size to accommodate at least 110% of the fuel, in the case of a single storage tank. If there is more than one storage tank, the secondary containment facility must be of sufficient size to accommodate 110% of the capacity of the largest tank or 10% of the total capacity of all the tanks, whichever size is greater.

Vehicles must be maintained and operated in a manner designed to prevent spills of fuel or oil.

All waste petroleum products must be safely stored on-site or be removed to a waste disposal facility approved under the Special Waste Regulations of the Environment Act of the Yukon

All fuel spills must be immediately contained, cleaned up and reported to an inspector.

In addition to the above conditions, you must also comply with the Operating Conditions for Cleanliness, which would apply to empty fuel drums and other solid waste.

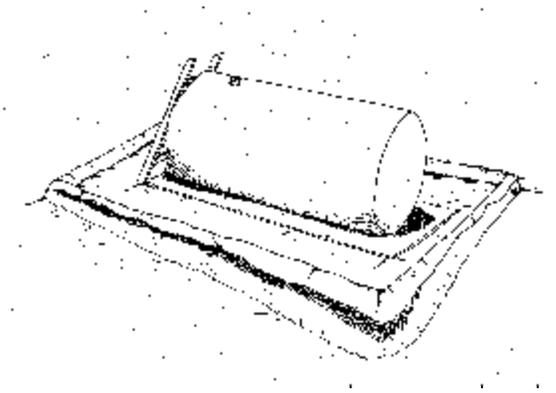
The environmental standards in handling chemicals and fuel apply to all levels of activity. These are:

- Spill prevention through proper handling, storage and contingency planning.
- Secondary containment for large volumes of stationary storage.
- Prevention of land and water pollution through proper vehicle operation and maintenance, and safe handling and disposal of waste petroleum products.

FUEL AND CHEMICAL STORAGE

Large volume, above-ground storage facilities should be provided with the capacity to contain spills. These containment facilities should be capable of handling large volume spills in order to protect adjacent lands and water. Fuel storage areas should be stable and set back greater than the minimum set back from watercourses in order to avoid spillage into the water shed.

Secondary containment of fuel storage facilities exceeding 4 000 L may be accomplished simply by constructing earthen berms and lining the containment with petroleum impermeable material.



Marking of containers will identify potential liabilities and also act as an incentive to remove empty containers from sites. Labelling of containers for all “controlled substances” under the *Hazardous Products Act* (Canada) is required under the *Workplace Hazardous Materials Information System Regulations* (WHMIS) under the *Occupational Health and Safety Act* (Yukon).

FUEL STORAGE GUIDELINES

The following are suggested ways to ensure that petroleum products and chemicals are stored and handled in as safe a manner as possible:

- Ensure that all fuel containers, regardless of size, are situated on stable ground located well above the ordinary high water mark of any watercourse.
- Leave a safe distance between fuel caches and water bodies and drainages.
- Ensure that containers with a capacity greater than 4,000 litres are located at least 30 metres from any watercourse.
- Store fuel drums in an upright position to prevent the possibility of spills and leaks.
- Ensure all containers are sealed when not in use.
- Ensure that every precaution is taken to avoid spillage during fuel transfers.

- Make sure to conduct regular checks of fuel storage containers.
- Ensure that all stationary containers with a capacity greater than 4,000 litres are provided with secondary containment.
- Ensure that all fuel containers of 200 litres or greater are clearly marked in bold print with the operator's name, the type of petroleum product contained as required under WHMIS, and the date cached if applicable.
- Ensure that a fuel spill contingency plan is posted adjacent to all fuel storage containers with a total volume of 4,000 litres or more, or a fuel storage facility exceeding 80,000 litres capacity.
- Ensure that all waste petroleum products are safely stored on site or properly disposed of.

RECLAMATION OPTIONS

<p>Secondary Containment Materials</p>
<p>Absorbent Materials</p>
<p>Store Waste</p> <p>Dispose of Waste</p>

Options for Fuel Storage:

Stationary fuel storage in excess of 4,000 litres will be provided with secondary containment made of one of the following:

- a) storage tank wall
- b) synthetic membrane filter
- c) concrete
- d) bonded masonry
- d) prepared impermeable soil layer
- e) any other acceptable material provided that it forms an impermeable barrier.

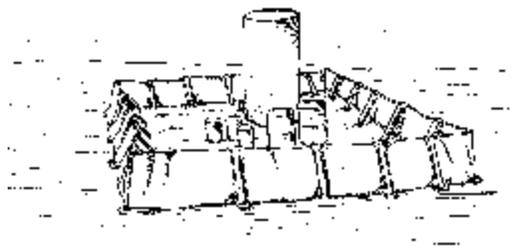
Note: An impermeable barrier is any material through which a petroleum product will not easily pass. For more information on methods of secondary containment see the Code of Practice for Aboveground Storage Tanks

On site absorbent materials will be kept on hand adjacent to stationary storage facilities. The absorbent material will be either:

- a) commercially available petroleum product absorbent material; or
- b) any acceptable alternative material that is capable of absorbing spilled petroleum products.

Waste petroleum products will be safely stored on site.

Waste petroleum products should be burned completely or stored at specific sites for later disposal at an authorized facility.



Portable secondary containment structures are an economical option for highly mobile operations.

FUEL SPILL PLANS

A fuel spill emergency plan should be simple and practical. It would include a contingency plan for the prevention, reporting, control and cleanup of accidental spills.

A posted spill contingency plan will help make everyone on site mindful of the steps to be taken to ensure safety and minimize environmental impacts. The key to responding to fuel spills is to ensure that they are isolated and not allowed to spread to adjacent land or into water bodies.

- Contain the spill into empty barrels.
- Use absorbents (manufactured or sawdust) to absorb small fuel spills.
- If conditions are appropriate, burning of spilled petroleum product may be permitted
- Spill clean-up in open water bodies may be achieved with absorbent material
- On land, earthen dikes can be used to hold fuel until removal is possible.
- Dikes should be lined with plastic to prevent seepage into the ground.

Fuel spills are reported to Environment Canada spill report number (867) 667-7244

- Have this number posted at the site.
- For all petroleum products, any quantity greater than 100 L must be reported, or, any quantity which exceeds conditions of a Water Licence.

6. Clearing Trees and Brush

REGULATIONS

Operating Conditions for Grid Line Cutting

Operating Conditions for Removal of Trees and Brush from Corridors and Clearings

Most disturbances caused by typical placer exploration or mining activities begin with clearing of trees and brush.

Cut brush must not be piled so that it blocks movement of wildlife or people.

Leaning trees created by the cutting of lines must be knocked down.

Lines must be cut by hand or with hand-held tools.

Lines must not exceed 1.5 m in width.

In making a clearing the vegetative mat must not be removed unless the purpose of the clearing is to remove the overburden.

All risk of fire hazard must be avoided.

Removed brush shall not be piled so that it blocks movement of wildlife or people.

Leaning trees created by the removal of trees and brush from corridors and clearings must be felled. When it is economically viable to do so, timber suitable for sale must be salvaged and stockpiled.

The environmental standards for cut lines are self-explanatory. If a operation requires a line wider than 1.5 m, notify the Chief, Mining Land Use and provide the justification for the wider line width.

Larger scale removal of trees and brush from corridors or clearings requires attention to these environmental objectives:

- avoiding fire hazards
- encouraging decomposition
- allowing for salvage of economically viable timber resources, or "merchantable timber"

It is not the responsibility of the operator to determine whether or not the timber which they plan to clear is "merchantable". It is up to the District Resource Management Officer to identify economically viable timber stands at the time that they review a Notification or an Operating Plan (see Salvaging Timber on page 19).

RECLAMATION OPTIONS

Brush Piles
Compaction
Burning
Burial
Salvage Timber

The following apply to clearings up to 400 m² per claim per year. Clearings beyond this threshold require an Operating Plan.

Brush piles should be located away from the edge of standing trees. These piles will not be situated so as to block existing trails used by wildlife, trappers, or other land users.

Brush piles and/or windrows may be compacted tightly to the ground surface by walking tracked equipment up onto the pile or windrow after dropping each blade load.

Brush piles and windrows may be burned in accordance with a valid Burning Permit.

Brush piles or windrows may be buried so that nothing protrudes from the ground, and covered with 1 m of placer soil and a layer of topsoil in that order.

Merchantable timber may be set aside for salvage.

SALVAGING TIMBER

For placer exploration or mining land use in general, an "economically viable timber resource" is defined as timber of a size, quality, and quantity that can be harvested economically. Since all mining land use activities requiring mechanical clearing of significant areas of timber requires either Notification or an Operating Plan, the Chief of Mining Land Use will have ample time to respond to the placer exploration or mining operation plan and advise the operator as to the presence of viable timber. If Renewable Resources (DIAND) deems the timber economically viable they may put out a Tender for bids to harvest the salvageable timber. The claim holder gives up their right to the timber at the time they record the claim, but the operator may submit a bid under a separate land use permit if he or she wishes.

Sections 47.1.b. of the *Yukon Placer Mining Act* still apply to the salvage of timber on mining claims. If there is timber surplus to needs for mining purposes, you may apply for a commercial timber permit to allow you or a third party to harvest and sell this wood. You may also deck the timber for later disposal by the Crown. Keep in mind that the removal of trees and subsequent possible salvage of timber only applies to land that must be cleared for placer exploration or mining purposes. You must demonstrate to the Chief of Mining Land Use, that the clearing is essential to the operation.

7. Getting There - Access Roads and Trails

Access roads and trails is another exploration and mining land use activity that is too broad to allow for a list of ready-made methods and solutions that could be applied to all situations. The purpose of this chapter is geared more towards understanding the impacts of building and using roads and trails, and to offer guidelines that can be useful in preparing Operating Plans.

The *Regulations* contain Operating Conditions that are related to roads and trails, along with the environmental standards suggested by them. Remember that operating conditions must be met at all times for all classes of operations.

It is important to keep in mind that the Operating Conditions and their objectives, including re-vegetation, erosion control, archaeological sites, cleanliness, and fuel storage are applicable to access road and trail work.

If you are simply using vehicles up to 20 t GVW on existing roads or trails, you must comply with the following conditions from the *Regulations*.

REGULATIONS

*Operating Conditions for
Use of Vehicles on
Existing Roads and Trails*

All vehicles must be operated within the design limits or tolerances of the road or trail. If design limits or tolerances are unknown, the operation of vehicles must not cause significant rutting or gouging to the road or trail.

*Operating Conditions for
Use of Vehicles Off the
Road or Trail*

Routes for off the road or trail use by vehicles must be be reconnoitred and used in way which that minimizes ground disturbance.

If rutting and gouging that could lead to ongoing erosion, ponding or permafrost degradation occurs, vehicle use must be suspended or relocated to ground that is capable of bearing the vehicle, and the former routes must be restored in compliance with the operating conditions for re-establishment of the vegetative mat and erosion control.

The environmental standards suggested by these conditions is to avoid serious terrain damage that might result when sections of the road are destroyed by moving heavy equipment when the surface is too soft. If the operator does cause "significant rutting and gouging" then they must restore the surface by grading the road.

If there is no road, the operator must comply with the following operating conditions when mobilizing heavy equipment to a site not connected by any road or trail:

If your operation requires the mobilization of some equipment (such as a dozer, excavator or drill) to a location on the property not connected by road, you must take care to minimize impact. If you don't scout the route first to choose the best approach, you could potentially cause considerable unnecessary disturbance to soils, vegetation and trees, and it would be your responsibility to reclaim.

RECLAMATION OPTIONS

Review Maps and
Photos, Flag Route

Scout Route, Flag

If Rutting and Gouging,
Suspend or Relocate

Provide Mushroom Pads

Raise Blade

Critical Habitat

Critical Periods, Wildlife

Travel on Ice-Rich
Ground

As in road and trail building, planning in off-road mobilization is the first and most important step. Your reconnaissance could include a review of maps and air photos, and/or aircraft fly-over. Whatever you do, scout the entire route on foot or by ATV and flag at regular intervals.

The environmental standards in off-road vehicle use are to cause as little land disturbance as possible and to avoid environmentally sensitive areas, critical wildlife habitat, and critical wildlife time periods as much as possible while you are getting the piece of equipment to and from the job site. In some cases it may be prudent to consult with a mining inspector. In order to assess whether your claims or the access to your claims occurs in an environmentally sensitive area, contact the Department of Renewable Resources, Government of the Yukon.

Options for Off-Road Vehicles:

The route may be selected by reviewing large-scale topographic maps and air photographs to select the most competent surface. The entire route may be ground truthed and flagged at regular intervals.

The entire route may be scouted on foot to select the most competent surface, and flagged at regular intervals.

If rutting and gouging that may lead to gullying, ponding, or permafrost degradation occurs, then the mobilization of the vehicle(s) may be suspended or relocated to ground capable of bearing the vehicle.

Tracked vehicles may be provided with mushroom pads to minimize terrain damage.

Dozers may travel with the blade raised so as not to rip up the vegetative mat.

Where critical wildlife habitat has been identified, the route may be changed so as to avoid the habitat.

Vehicle travel may be temporarily suspended so as to avoid disturbance to wildlife during critical periods.

When traversing ice-rich permafrost areas, the vehicle(s) may only be mobilized either when the active layer is frozen, or whenever the surface is strong enough to support the vehicle without excessive permafrost degradation.

REGULATIONS

Operating Conditions for Stream Crossings

mining operation, then you must comply with the following conditions from the *Regulations*:

Streams must be crossed in accordance with the provision of the Fisheries Act and the Yukon Waters Act.

Note that the *Yukon Waters Act* and the *Fisheries Act* combine to place a number of restrictions on crossing streams.

When crossing is necessary during off-road use of vehicles, be sure to reconnoitre the route first and note the location and bank conditions in the Notification or Operating Plan. All crossings must be at right angles to the stream.

Crossing of fish-bearing streams may be allowed under certain circumstances on the advice of the Department of Fisheries and Oceans. Don't use stream beds as access routes, especially on low gradient streams. Using stream beds as access routes in open water may result in charges pursuant to the *Fisheries Act*. Consultation with the Habitat Enhancement Branch of the Department of Fisheries and Oceans is advisable prior to crossing any stream.



*Bad practice. Clear trees
by hand, no debris in
streams.*

If crossings of streams is necessary in the course of an placer exploration or

CONSTRUCTION OF ROADS AND TRAILS

The following are some additional general guidelines that can be useful in preparing a Notification or Operating Plan for approval to construct a road or trail.

Plan Ahead! Planning is the most important step in road construction of any kind, regardless of its location, length or utility. Proper planning saves time and money and will lessen the risk of environmental impacts. A well planned route minimizes the chance of false starts and abandoned stretches off road. Planning the route means a road less prone to erosion, one that lasts longer, costs less to maintain, and requires the least amount of effort, time and expense to reclaim.

A second attempt to find a route with a dozer. Scout the route first to avoid false starts.



The following information should be provided on a Notification or Operating Plan:

- The route on a topographic map.
- The location and plotting of existing roads and trails in the immediate area.
- The location of stream crossings and bank conditions.
- The location of culverts and cross ditches.
- The standard of the road (i.e. 2-wheel drive, 4x4, trail, etc.).
- Reclamation and mitigation measures and possible alternatives.
- Start-up date.
- Maintenance Planning.

**Review Maps,
Photos, Flag**

Walk and Flag Route

Review largest scale topographic maps available, review air photographs, select route with most competent ground; reconnoitre the entire route on foot and flag the route at regular intervals.

Walk the entire route and select the most competent ground. Flag the route at regular intervals.

You must ensure that natural drainage is maintained along the entire route by installing drainage structures as the situation warrants. You must maintain proper drainage across the road. Ensure cross drainage by selecting the most appropriate technique(s) below:

- Construct outsloping grades.
- Construct cross ditches.
- Install cross drains in fills.
- Construct parallel ditches on steep slopes and uphill patches.
- Install corduroy.

The following alternatives apply only to winter access:

Ensure Cross Drainage

Start-up dates

Shut-down dates

Remove Snow Fills

High Blades

Blade Shoes

Observe Load Limits

**Suspend Use if Rutting
and Gouging**

Planned overland movement of equipment may not take place until there is adequate frost penetration and snow cover.

Overland movement of equipment will cease when the surface can no longer support the weight of vehicles without cutting.

Snow fills shall be removed from stream crossings before spring break-up.

Dozer blades will be raised so as not to cut the organic layer.

Dozer blade shoes may be used so as not to cut the organic layer.

Using Existing Roads and Trails:

Vehicles greater than 20 t GVW may only be used within notified load restrictions.

Vehicles greater than 20 t GVW may not be used when severe rutting and gouging of the route may result.

Remove Culverts
Install Earth Breakers
Scarify
Block Access

**GUIDELINES FOR ACCESS
ROADS AND TRAILS**

Abandonment of a Road or Trail:

Where culverts have been installed, they may be removed and replaced by non-erosive cross ditches.

Earth breakers may be built up on steep slopes to divert surface run-off.

Compacted surfaces may be scarified to promote revegetation.

Public access may be blocked by constructing barriers of logs, slash, berms or other acceptable means.

The following guidelines and references are offered to assist in completing a mitigation/reclamation plan for an access road or trail.

Each area within a corridor will have its own unique terrain and site specific engineering problems. Prior to ground truthing, topographic map and air photo reconnaissance should be done. Through air photo interpretation, it will be possible to predict permafrost areas (through vegetation interpretation), severity of slopes, timber size, surface material type and availability, wet areas, etc.

Active and abandoned stream channels will be obvious. Prior to construction, all photo interpretation should be verified on the ground as even an experienced photogrammetrist can make interpretation errors. Here are some guidelines to consider when selecting a route:

- Avoid areas of permafrost where practicable. In areas of discontinuous permafrost, select frost-free, south-facing slopes. Where it is impossible to avoid permafrost, select the route significantly up-slope or on ridges where bedrock is closer to the surface.
- Avoid seepage zones by routing to drier, elevated ground where practicable.
- Avoid areas of erratic slope changes necessitating extensive cut and fill requirements.
- Avoid steep slopes. Select routes to keep slopes as low as possible. Maximum grades of 8 to 10 percent are desirable, although short pitches (less than 5m) of up to 15 percent are acceptable if necessary.
- Avoid unnecessary stream crossings. Select crossings that approach the stream at right angles and cross where the channel is straight, unobstructed, well defined, and has minimum bank height.
- Avoid known archaeological and burial sites. Consult with the First Nation nearest the proposed route and the Heritage Branch. In some cases, an Government of the Yukon to find out about known sites along the route. In some cases, an archeological survey may be

called for.

- Avoid duplication of roads and trails. sites along the archaeological survey may be called for.
- Consideration should be given to all existing trails and roads in the immediate area. If at all practical, these roads and trails should be utilized rather than constructing additional ones, but make sure the old route is in an acceptable location first. Many old roads and tote trails were pushed in with little regard for the environment. Use of these routes may not be acceptable today.
- Do not use stream beds as access routes.
- Avoid construction of over-width roads. Build the narrowest road possible consistent with safety and traffic needs.
- Avoid environmentally sensitive areas, critical wildlife habitat, and critical time periods for wildlife.

Wildlife habitat in the Yukon is protected under the *Yukon Wildlife Act*. Sections 35 and 36 of the Act prevent "Damage to or Destruction of Habitat". In addition, under Section 138.3, Habitat Protection Areas may be designated by the Commissioner in Executive Council. The habitat of migratory birds is protected by the federal *Migratory Birds Convention Act*. Under Section 12i, the Governor in Council may make regulations necessary for "prescribing protection areas for migratory birds and nests, and for the control and management of those areas". *The Yukon Wildlife Act* and the *Migratory Birds Convention Act* are enforced by the Yukon Government conservation officers and by the RCMP.

Critical wildlife habitat is currently being identified by the Yukon Department of Renewable Resources. Mapping of this habitat has been carried out in some areas. Inventory of wildlife habitat is an ongoing process and maps are continually being updated.

Key habitat includes such areas as staging and nesting sites for waterfowl, nesting sites for raptors, beaver and muskrat lodges, winter range for thin horn sheep and goats, late winter range for caribou, moose, mule deer, elk and wood bison, calving and rearing areas, denning areas, mineral licks and travel corridors.

Many key habitats are only utilized for certain seasons of the year. For the duration of the year, their importance as habitat may not be obvious. Wildlife habitat may be disrupted despite the best efforts to minimize impacts to the land and vegetation. In some areas, mining land use activities may have to be curtailed in order to accommodate concerns about wildlife.

To find out more about environmentally sensitive areas, and habitat and time periods critical to wildlife, contact the Fish and Wildlife Branch of Renewable Resources.

APPENDIX I

GLOSSARY OF TERMS

Access Road means a road which provides access to a public highway or any private road.

Archaeological Object means an object that is the product of human art, workmanship, or use, and it includes plant and animal remains that have been modified by or deposited in consequence of human activities, and is of value for its historic or archaeological significance.

Archaeological Site means a place where archaeological objects are found.

Buffer Strip means a strip of vegetated land left undisturbed adjacent to a watercourse.

Clearing means an area in the forest cleared for mining or exploration.

Corridor means a path cut to accommodate a trail, water line, fuel line or power line.

Critical Habitat means habitat areas which are critical to a significant number of individuals of a species during at least part of the year.

Cross Ditch means a shallow trench excavated by hand or by dozer blade across the surface of the road in the downslope direction. Its purpose is to allow water to travel to the lower side of the road without eroding or ponding, and it also provides a barrier to vehicles.

Cross Drain means culverts or pipes placed in the road grade, set below the level of side ditches and inclined about 2% more than the road grade above.

Environmental Effect means, in respect of a project:

- (a) any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and
- (b) any change to the project that may be caused by the environment, whether any such change occurs within or outside Canada.

Environmentally Sensitive Areas means areas which are rated as high value for archaeological or historic sites, timber, recreation, watershed, wildlife and unique land forms.

Foundation means: a. the solid ground or base, natural or artificial, on which a building rests; b. The lowest load bearing part of a building, usually below ground level.

Line means a linear clearing for the purpose of carrying out a geophysical, geological or engineering survey.

Merchantable Timber means timber located on mining claims that has been determined to be of a size, quality and overall quantity that it can likely be harvested economically, all cost factors considered.

Ordinary High Water Mark means the visible high water mark of any lake, river, stream or other body of water where the presence and action of water is active such that the water level is indicated on the sill of the bed or bank of the lake, river stream or other body of water.

Overburden means barren rock material, either loose or consolidated, overlying a mineral deposit, which must

be removed prior to mining .

Parallel Ditches means long narrow excavations made in the ground by digging and which run in the same direction on opposite sides of the road.

Permafrost means ground that remains frozen through at least two consecutive winters and the intervening summer.

Permanent Structure means a surface structure suitable for indefinite use, including any buildings with a foundation.

Reclamation means the return of a site disturbed by mining and or exploration activities to a condition where it will make a suitable environment for the re-establishment of the site. Reclamation is also successful if replacement of native species which fill a similar ecological niche find the site to be suitable.

Revegetation means the re-establishment of self-sustaining vegetation of land which previously had vegetative cover.

Road means a pathway for vehicular traffic, the construction of which requires the movement of rock or earth.

Seasonal Structure means a surface structure that is dismantled and moved at the end of each mining season.

Stripping means the removal of the vegetation and overburden from a geographic area.

Sump means a manmade or natural pit, trench, hollow or cavity in the earth's surface used for the purpose of depositing waste material.

Temporary Structure means a surface structure used for more than one season which is not of permanent construction and does not include seasonal structures.

Terrain Hazard means naturally occurring geologic and geomorphic processes and unstable conditions that present a risk to life and property within a specific area.

Topsoil means the dark-coloured upper portion of a soil at the land surface, varying in depth according to soil type, and corresponding to the A Horizon.

Trail means a facility allowing entry to sites within claims which does not provide access to a public highway or any private road connecting a public highway or any private road .

Trenching means any excavation carried out on a mineral claim for the purpose of obtaining geological information.

Vegetative Mat means the organic horizon of soil which is characterized by the accumulation of organic matter or partly decomposed organic matter, derived mainly from leaves, twigs and woody materials including the root mass of living vegetation.

Watercourse means any stream, lake, pond, river, creek, spring, ravine, or swamp whether ordinarily containing water or not.

Windrow means a low bank, heap, or other accumulation of material, formed naturally by the wind or the tide, or artificially.

APPENDIX II

CONTACTS AND CORRESPONDENCE

1. Mining Land Use and Reclamation Office

LOCATION: 300 Main Street, Whitehorse, Yukon Room 320

MAILING ADDRESS: Mining Land Use Office
345-300 Main Street
Whitehorse, Yukon
Y1A 2B5

TELEPHONE NUMBERS:

Office Manager	667-3265
Chief of Mining Land Use	667-3172
Senior Mining Land Use Officer	667-3807
Mining Land Use Officer	667-3371
Mining Land Use Officer	
Environmental Geologist	667-3808
Engineer of Mines	667-3208
First Nation Liaison Officer	667-3804
Fax	667-3899
E-mail	mlu@inac.gc.ca

2. HERITAGE RESOURCES, YUKON GOVERNMENT 667-5683

3. RENEWABLE RESOURCES, YUKON GOVERNMENT 667-5295

NOTE: all numbers are Area Code 867