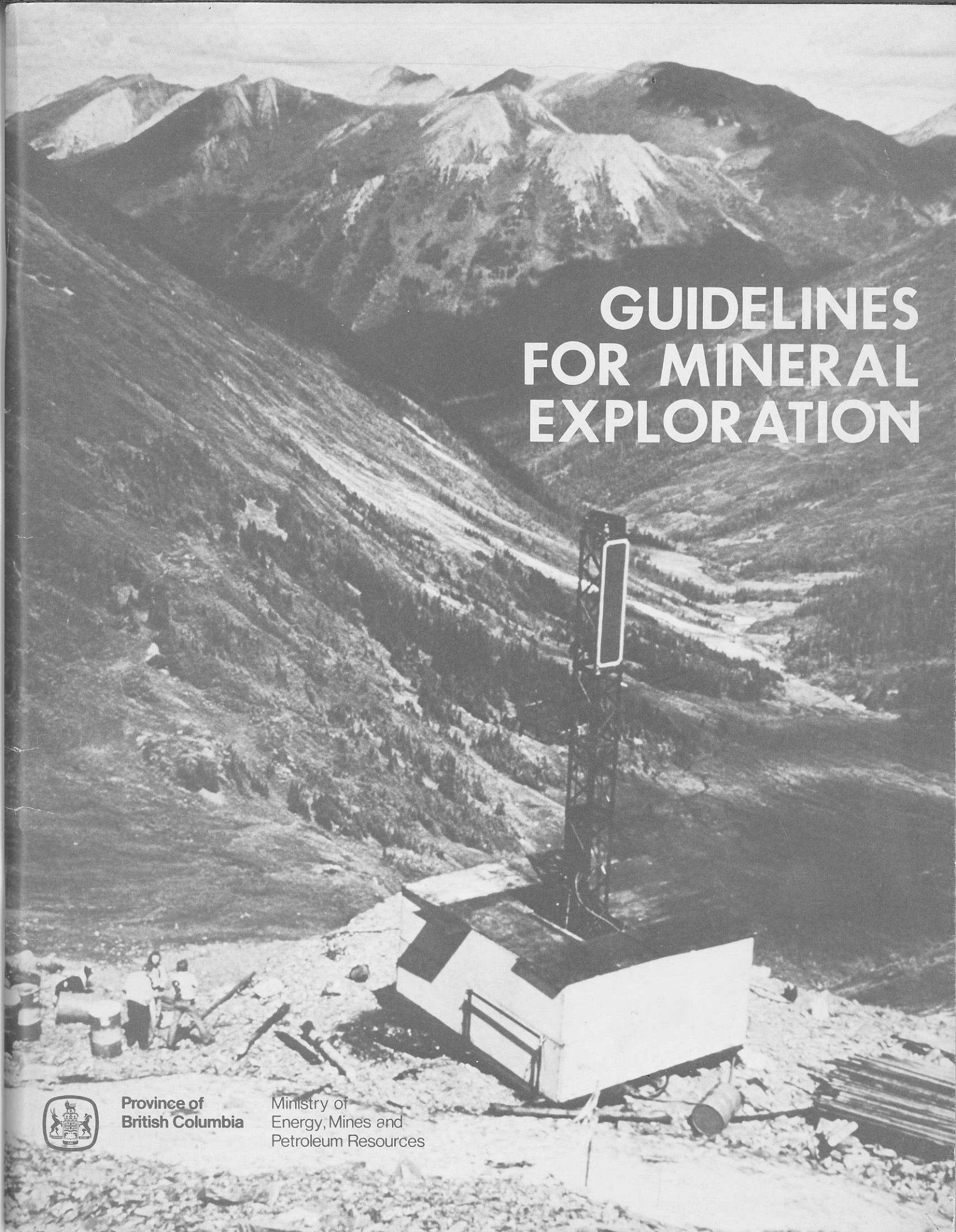
GUIDELINES FOR MINERAL EXPLORATION



Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

GUIDELINES FOR MINERAL EXPLORATION

DECEMBER 1982

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I.
INTRODUCTION

These guidelines are written to inform individuals and companies on the requirements for conducting mineral exploration in British Columbia in compliance with the *Mines Act* and in harmony and with due regard for the Province's other resources.

Exploration for uranium is not permitted in British Columbia at the time of writing of these Guidelines (Appendix A, Uranium Moratorium).

These guidelines do not outline the procedures under the *Mineral Act.* For questions concerning the *Mineral Act* contact one of the offices of the Gold Commissioner (Appendix B).

II.
LEGISLATION AND APPROVALS

There are several acts and statutes which may govern mineral exploration. The first section of this chapter outlines the approvals required by the Ministry of Energy, Mines and Petroleum Resources (MEMPR) under the *Mines Act* (Appendix C) and the referral system which is used. Approvals from other agencies may be required depending upon the location, land tenure, and nature of the exploration program; and are outlined in the second section of this chapter. Although many of these approvals will be initiated by contact with the Inspector of Mines and Resident Engineer, the responeibility for obtaining these approvals rests with the proponent.

2.1 MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES APPROVALS

To initiate all approvals and requirements of the Ministry of Energy, Mines and Petroleum Resources an operator must complete a *Notice of Work and Reclamation Program on a Mineral Property* and submit it to the Inspector of Mines and Resident Engineer. Depending upon the nature of the exploration program, up to two months may be required before all permits and approvals will be issued, therefore, applications should be initiated well before work is planned.

REQUIREMENT TO GIVE NOTICE (Section 6 (1), Mines Act)

The *Notice of Work and Reclamation Program on a Mineral Property* (Appendix D) must be received by the Inspector of Mines and Resident Engineer at least 7 days before commencing exploratory work. Providing this notice does not imply that the applicant can start work after 7 days. The applicant may only commence work when all additional approvals are received.

At least 7 days before ceasing work an operator must also give notice to the Inspector of Mines and Resident Engineer by completing and submitting a *Notice of Work and Reclamation Program on a Mineral Property.*

APPROVAL OF UNDERGROUND WORK (Section 6, Mines Act)

These procedures apply to underground exploration including the rehabilitation of workings for the purpose of surveying, mapping, sampling, and drilling and also apply to underground development work including drifting, crosscutting, raising, and drilling. These procedures do not apply to mines wishing to go into production. Requirements for mines wishing to go into production are outlined in the *Procedures for Obtaining Approval of Metal Mine Development.*

Under section 6 (2) of the *Mines Act,* the owner, agent, or Manager of the mine must have the written approval of the Chief Inspector of Mines before working underground. To obtain this approval the following information must be submitted to the Inspector of Mines and Resident Engineer for transmittal to the Chief Inspector of Mines.

- Proposed work outlined on a *Notice of Work and Reclamation Program on a Mineral Property.*
- A detailed map of present and proposed underground workings.

- A detailed plan of surface installations in relation to mine openings.
- A detailed plan of the system or method of carrying out the proposed work.

All work in and about the mine must be carried out in accordance with the *Mines Act* including the following:

- A manager must be appointed under section 25, *Mines Act.* This person may also act as a shiftboss if he has the necessary certification.
- All work must be under the supervision of a certified shiftboss (section 24). The shiftboss must ensure that all work done in and about the mine is in compliance with the *Mines Act.*
- All miners must have medicals and *Certificates of Fitness* which must be filed in the mine office.
- The ventilation system must meet the requirements of the *Mines Act* and be maintained by the manager to the satisfaction of the Inspector of Mines and Resident Engineer.
- A permit must be obtained from the Chief Inspector of Mines for each diesel engine used. Forced ventilation equipment and requirements to be detailed by description and on plans. Gas testing equipment and record book to be kept up to date by the shiftboss. Obtain *Application for a Permit to Operate a Diesel Engine Underground,* and send to the Inspector of Mines and Resident Engineer.
- To store and use explosives at a mine, written permission is required from the Inspector of Mines and Resident Engineer. Such permission is granted if the mine can and will comply with explosives and blasting regulations of the *Mines Act* and Federal *Explosive Regulations.*
- All machines must be muffled to the approval of the Environmental Control Inspector and operators must have personal hearing protection (muffs).
- All buildings must meet the requirements of the *Building Code* and *Electrical Code V.*
- First aid must be maintained in compliance with *First Aid Regulations* issued under the *Mines Act.*

APPROVAL OF RECLAMATION PROGRAM (Sections 7-11, Mines Act)

A reclamation permit must be obtained before commencing an exploration program involving surface disturbance. The procedure for obtaining this permit is outlined below and involves an application, a review by other resource agencies, establishment of special terms and conditions on the permit and placing of a performance bond. Four factors enter into consideration in determining the value of the reclamation bond: the amount of land disturbed; ease of reclamation; environmental sensitivity; and the companies' past performance. The advantages to a company maintaining a progressive reclamation program are obvious. The maximum bond is $2 500.00 per hectare of disturbance.

PROCEDURE FOR OBTAINING A RECLAMATION PERMIT

APPLICANT: Sixty days before commencing work on a mineral property, the applicant contacts the Ministry of Forests and completes and submits a *Notice of Work and Reclamation Program on a Mineral Property* to the Inspector of Mines and Resident Engineer.

MEMPR: Inspector of Mines and Resident Engineer circulates Reclamation Program to other resource agencies.

At the end of 30 days, comments are received, bonding and conditions are set, and recommendations are forwarded to the Senior Reclamation Inspector in Victoria. If any resource agencies have statutory responsibilities, and the applicant has not taken steps to fulfill these then the applicant will be notified at this

time. Chief Inspector of Mines approves program (within 60 days of the time that the application is first received).

Senior Reclamation Inspector notifies applicant of the amount of bonding.

APPLICANT: Arranges for bonding at bank and sends *Receipt and Agreement* form to Senior Reclamation Inspector.

MEMPR: Once the completed *Receipt and Agreement* form has been received, the *Reclamation Permit* is issued to the operator.

OPERATOR: Upon completion of Reclamation Program, the operator can either request return of bonding or maintain the permit in good standing.

MEMPR: If the operator requests a return of bonding then the Reclamation Inspector-Technician inspects the property and, if all terms and conditions of the permit have been met, bonding is returned.

PROCEDURE FOR MAINTAINING A RECLAMATION PERMIT

Existing permits can be amended by annually submitting a *Notice of Work and Reclamation Program on a Mineral Property* at least 60 days prior to commencement of work. The existing permit will be either amended to approve this work without an increase in security or the permittee will be asked to post an additional security. Upon receipt of this security the permit will be amended approving the proposed reclamation program.

GENERAL RECLAMATION PERMITS

General *Reclamation Permits* can be issued, upon application by letter to the Chief Inspector of Mines, to those companies which maintain a number of projects in the Province of British Columbia. This permit covers all the company's projects, thereby greatly simplifying the bonding procedure. The company is still required to submit to the Inspector of Mines and Resident Engineer, for each property, a *Notice of Work and Reclamation Program on a Mineral Property* annually and these are circulated to other resource agencies.

To renew or obtain a general reclamation permit for mineral exploration:

APPLICANT: Sends a letter to Chief Inspector of Mines, requesting a general reclamation permit (or renewal of an existing permit). This letter should include a summary of each property:

- Name of property.
- Location.
- Owner.
- Operator.

MEMPR: Reviews and sets bonding and sends applicant a copy of the proposed permit and *Receipt and Agreement* forms.

APPLICANT: Takes *Receipt and Agreement* forms to bank, deposits security, and forwards completed *Receipt and Agreement* form to Senior Reclamation Inspector.

MEMPR: Permit is then issued by Chief Inspector of Mines.

To maintain a general mineral exploration permit:

Operator, 30 days before working on a property, must annually submit *Notice of Work and Reclamation Program on a Mineral Property* to the Inspector of Mines and Resident Engineer. Properties not already included in the general reclamation permit for mineral exploration will be automatically added upon receipt of the *Notice of Work*. The *Notice* and *Program* will be circulated to other resource agencies.

Bonding and terms and conditions of the permit may be revised at any time depending upon the extent of exploration activity, comments from review agencies, and on the operator's performance record.

To terminate the permit, the operator must apply to the Senior Reclamation Inspector for release of the bond. The Senior Reclamation Inspector, upon a satisfactory inspection of all properties, will arrange for release of bond.

2.2 SUMMARY OF OTHER LEGISLATIVE REQUIREMENTS

FOREST ACT

On Crown land administered by the Ministry of Forests a free miner is required to obtain the following when necessary.

Free Use Permit —to cut and use timber for mining purposes on mineral claims
Licence to Cut —to cut timber for camp sites, roads, drill sites, portal sites
Right of Way —for roads through forest reserve land, but does not include work on mineral claims
Contact —any Forestry office or Regional Manager (Appendix B)

LAND ACT

Ministry of Lands, Parks and Housing has jurisdiction over Crown land other than that land administered by the Ministry of Forests.

Right of Way —for access roads to a mineral property but does not include roads on a mineral property
Contact —either Regional Director or District Manager (Appendix B)

WATER ACT

The Ministry of Environment, Water Management Branch issues water licences for water use from creeks, rivers, or lakes.

Contact —Regional Manager (Appendix B)

FISH AND WILDLIFE, MINISTRY OF ENVIRONMENT

There is no act governing the protection of wildlife habitats other than the Federal *Fisheries Act.* The Regional Fish and Wildlife Branch receives copies of *Notice of Work and Reclamation Program on a Mineral Property* from the Inspector of Mines and Resident Engineer. Any concerns are taken into consideration and any conflicts are usually resolved at the regional level. The company doing the exploration work may be instructed to avoid or minimize impacts on habitats or fisheries.

POLLUTION CONTROL ACT

Depending on the size of the exploration camp, sewage and garbage disposal are covered under the *Public Health Act* or *Pollution Control Act.*

Contact —Regional Manager (Appendix B)

III.
WORK GUIDELINES

All mineral exploration permits will be issued subject to these *Guidelines for Mineral Exploration.*

Based upon recommendations from other agencies, the Chief Inspector of Mines may issue a permit with special conditions and place added restrictions upon proposed activities. These may be either time restrictions to avoid conflicts with other resource users or equipment restrictions to minimize disturbance in environmentally sensitive areas.

3.1 CLEARING AND SLASH ABATEMENT

Clearing of forests and slash disposal are controlled under the jurisdiction of the Ministry of Forests. Where timber is to be cut or destroyed in exploration operations, a *Licence to Cut Timber* must be obtained from the local Ministry of Forests office. Similarly, for timber to be used in mine development, a *Free Use Permit* must be obtained. Pursuant to section 117 of the *Forest Act,* an order to abate slash hazard will be issued when required, and will generally call for slash treatments similar to the following:

CLEARING

Pre-logging of road rights-of-way is encouraged and, in some areas, may be required. In this procedure, merchantable timber, usually in lengths greater than 2.5 metres long with a top diameter over 15 centimetres is decked and later sold by the Ministry of Forests. Prelogging has been found to yield a more stable road bed and, in many cases, has substantially offset slash abatement costs.

On main roads, all trees must be felled onto the right-of-way, and those trees not utilized must be totally disposed of by burning or burying.

On temporary roads and on drilling, trenching, portals or similar sites, all trees pushed over may be disposed of by lopping and scattering. In no case shall trees be left leaning. Total disposal is required within 400 metres of where any temporary road crosses a river or permanent main road.

ABATEMENT

Burning

All burning requires a permit issued by the local Ministry of Forests office. Within the Prince George and Prince Rupert Forest Regions a permit is only required between April 15 and October 15. Periods of high fire hazard may result in the cancellation of burning permits until more favourable conditions prevail.

Material under 20 centimetres in diameter should be piled not less than 5 metres away from the forest margin and burned when weather conditions permit. Larger material may be burned in a

similar manner or, if this is not possible, bucked so that it is in close contact with the ground and windrowed at least 5 metres from the forest margin. Unburned stumps may be scattered singly along the right-of-way along with any charred material remaining after burning. In no case may debris be left bunched or in piles.

Burying

Burying is an acceptable method of slash disposal in most situations but requires a high level of supervision to ensure a satisfactory job.

Disposal areas must be cleared and a pit constructed to receive slash. Material to be buried must be cut into lengths less than 4 metres long and compacted within the pit so that nothing protrudes above ground level. Compacted piles should then be covered with at least 1 metre of mineral soil then seeded and fertilized.

Lopping and Scattering

On winter or temporary access roads, provided their width is less than 10 metres, slash may be disposed of by lopping and scattering. When this method is used, all trees felled must be limbed and the branches scattered. Boles of trees must be cut from the stump at the root crown and bucked so that they lie in close contact with the ground.

Total disposal is required within 400 metres of where winter or temporary roads cross any river or permanent road on which total disposal is required. Total disposal may be required at the discretion of the Ministry of Forests.

Chipping

Chippers have been used successfully for the disposal of slash less than 25 centimetres in diameter. When used in conjunction with prelogging the requirement for burning or burying is greatly reduced.

3.2 ROAD CONSTRUCTION

Poor road design and construction can account for a large proportion of disturbance in an exploration program. The following sections outline a number of guidelines for correct road design and construction.

DESIGN

Use existing roads whenever possible. Build the narrowest road possible consistent with safety and traffic needs. Plan for minimum permanent road length through use of main access roads and secondary tote roads.

Avoid sensitive areas. Areas may be sensitive because of conflicts with other resources or because of problems in construction or reclamation. Some examples of sensitive areas are:

- Wildlife winter ranges (southwest-facing grassy or shrubby slopes), saltlicks.
- Highly erodible areas, that is, fine-textured soils, steep slopes (Table 1).
- Areas directly visible from recreational areas.
- Streams, lakes, marshes, bogs.
- Alpine areas.

Locate roads to fit the topography, making use of natural benches, ridgetops, and flatter slopes to avoid extensive cuts and fills. This will not only reduce construction costs but will avoid the possibility of unstable cut or fill slopes.

TABLE 1. GUIDE FOR ASSESSING SOIL EROSION HAZARD

TEXTURE	SLOPE 0—3° 0—5%	3—5° 5—9%	5—17° 9—30%	17—31° 30—60%	31° 60%
Fine	Moderate	High	High	High	High
Fine to medium	Moderate	Moderate	High	High	High
Medium	Low	Low	Moderate	High	High
Medium to coarse	Low	Low	Moderate	Moderate	High
Coarse	Low	Low	Low	Moderate	High

Locate roads so that no portion of the road, including fill material lies within 50 metres of a creek or lake, except at stream crossings. The permission of an Inspector must be obtained before roads can be located within this limit.

Roads should be designed to keep grades as low as possible (Table 2).

TABLE 2. SOME APPROXIMATIONS REGARDING SLOPES

REMARKS	GRADIENT *per cent*	*degrees*	*horizontal:vertical*
Maximum for main haulage	8	5	11:1
Short pitches	10	6	10:1
Approximate two-wheel drive maximum	15	9	6:1
Maximum soil slope for vegetation	50	26	2:1
Angle of repose earth fill	67	34	1.5:1
Angle of repose loose angular rock	80	39	1.25:1

CONSTRUCTION

Proposed access routes must be inspected on foot and flagged at least 2 kilometres in advance of any construction equipment. Site specific relocations may then be made to avoid problem areas.

Clear only the minimum area, having due regard for ditching and slash disposal. Before clearing borrow pits, test the area to ensure that adequate quantities exist.

Obtain road gravel from approved locations.

Where construction must take place in unstable soils or adjacent to major steams, try to take advantage of dry weather.

In level terrain such as alpine tundra, where cuts and fills are not required, tracked vehicles should be used for access without actual road construction. Road alignments must be clearly flagged to ensure that travel is confined to selected routes. This is especially important during winter white-outs.

Stabilize fill material by:

- Removing roots, vegetation, and large rocks.
- Pulverizing large lumps of soil before compaction.
- Controlling groundwater so that the base of filled sections does not become saturated. In areas of extreme groundwater, perforated pipe encased in a crushed rock filter or an entire blanket of crushed rock should be placed under the fill.
- Depositing fill away from the high-water zones of streams. If this is not possible, rip-rap should be used to stabilize the toe of the slopes against erosion during high water.
- Constructing fill in lifts to achieve maximum compaction.

Avoid roadside slumping by:

- Reducing the slope angle of cut banks, rounding the tops of cut slopes, and falling any trees that may be undercut by erosion.
- Not disturbing the toes of cut slopes when maintaining roads.
- Stabilizing potentially unstable slopes by leaving a top dressing of light slash or by immediate seeding and/or mulching to establish vegetation cover; in difficult situations, rip-rap, terrace, or crib slopes.

Berms are to be left on roads traversing steep slopes; however, they must be breached at appropriate intervals and removed where not required so that runoff is not concentrated on the road surface.

Reduce the road width or endhaul material on steep slopes. Special equipment such as small 'cats' with U-blades may be required to reduce road width. Endhauling will require a backhoe and dump truck as well as a suitable site for waste disposal. Full bench construction is preferable on steep slopes and mandatory on slopes exceeding the angle of repose (Table 2).

WINTER CONSTRUCTION

Road construction may be permitted during winter months under certain conditions. The main deterrents to winter construction are excessive snow depths, extreme groundfrost conditions, and steep topography. Given favourable conditions, construction projects undertaken during winter may prove less damaging than construction during the summer particularly in areas where high groundwater levels can result in serious erosion and stability problems during summer months. Properly constructed ditches and culvert crossings will control groundwater and surface runoff during spring breakup, resulting in a more stable roadbed.

In forested areas, sufficient right-of-way must be cleared to facilitate removal of snow from the proposed road grade. Since this will require more clearing than normally recommended for temporary roads, winter construction should only be considered for permanent main roads.

Regulations for construction of winter roads:

- Avoid steep grades and side-slopes.
- Do not incorporate snow or ice into fill.
- Construct road with a high grade in wet areas.
- Cover road surface with rock or shale in areas of fine-textured soil.
- Install culverts and ditches as construction progresses.

DRAINAGE

Drainage design is the single most important element of road layout. Time spent, before construction, in identifying the drainage requirement of each section of road and ensuring that the appropriate machinery and materials are available will be compensated fully by savings in construction and maintenance costs.

Design

Drainage systems should be designed on a site specific basis and must be designed to handle the maximum expected runoff.

Drainage systems should be upgraded on areas of rapid runoff. High runoff will occur on:

- Areas of steep slopes.

- Areas of shallow soils.
- Areas of impervious fine-textured soils.
- Non-forested areas.
- South and west-facing slopes where snow melt is rapid.

Planning

Supply a sufficient number of culverts large enough to accommodate anticipated high water flows and sediment loads.

Mark the location, size, and type of culvert on a layout plan and give to operators.

Permanent Roads

On frequently used or permanent roads, or in highly erodible soils, a system of ditches and culverts must be installed keeping in mind the following criteria:

- Ditches and culverts must be large enough to accommodate the maximum anticipated flow. A drainage system that cannot carry the maximum runoff is worse than no system at all because the water is concentrated in one channel and can cause serious erosion. Culverts should be installed at frequent intervals to prevent a large quantity of water being discharged onto the lower slope at one time. Where necessary, spacing should be altered to avoid spilling onto unstable slopes.

  Catch basins should be constructed above culvert inlets with ditch blocks placed below the basins to direct water through the culvert (Figure 1). Be sure to clear drainage ways of all construction debris end do not allow fill material to block inlets. Rip-rap placed on the ditch block will prevent erosion or washout. Culverts should be marked with large flagged stakes so that they can be checked regularly and will not be buried by maintenance equipment.
- Keep roads crowned so that water flows into the ditches rather than collecting on the road and roll road grades to avoid long, steep hills where water will flow along the surface before entering ditches.
- Culverts should be skewed to the same degree as water bars and should have a minimum 1 per cent slope. Under conditions of high debris load or unstable deep fills, consider installing culverts along the natural slope (Figure 1). This procedure requires a long culvert which must be installed before any fill is laid but improves the self-cleaning capability of the culvert and avoids discharge onto the fill slope.
- Discharge should be directed onto stable slopes. Place rocks or other obstacles below the outlet to prevent erosion (Figure 1). Whenever possible, take advantage of low fills to release water. If, however, drainage must be discharged over a deep fill, down-spouts, usually half-culverts, should be used (Figure 1). Route all drainage onto the forest floor so that sediment can settle out before the water reaches a stream. Unmerchantable timber and slash from the road right-of-way may be windrowed along the toe of the fill slope to assist in the filtering process.
- Special care should be taken to divert drainage so that it does not collect in borrow pits or waste dumps.

Temporary Roads

On seldom used temporary roads, dips or water bars may be used for drainage and erosion control (Figure 2). These must be close enough together so that the amount of water collected can be easily diverted. Appropriate spacing of water bars on various slopes in different soils is given in Figure 2. These intervals are approximate and should be modified to avoid diverting water onto deep fills or unstable natural slopes. Water bars should be skewed to allow water to drain downhill across the road. As an extra protective measure water bars must be installed at the end of each field season along the entire road network.

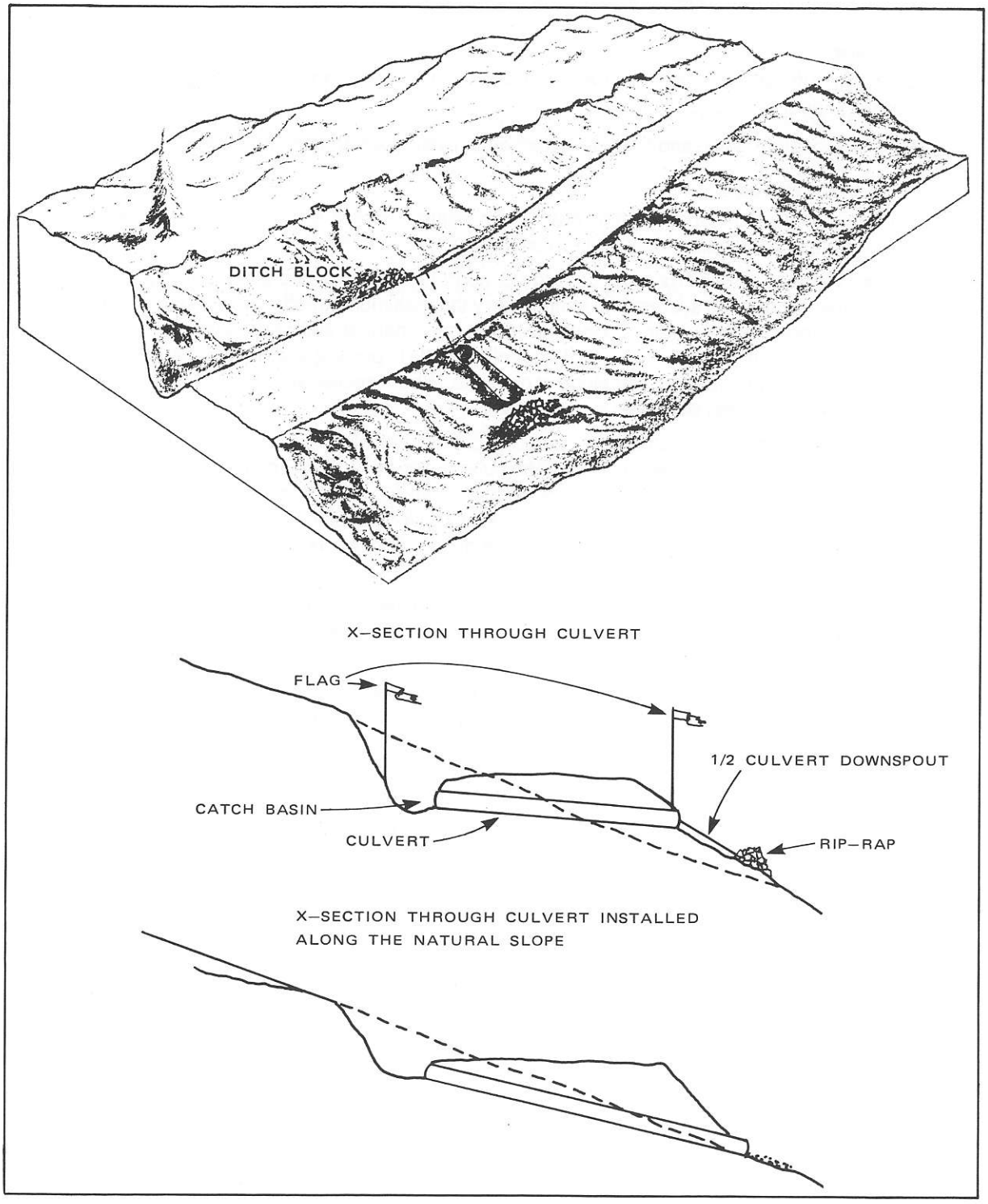
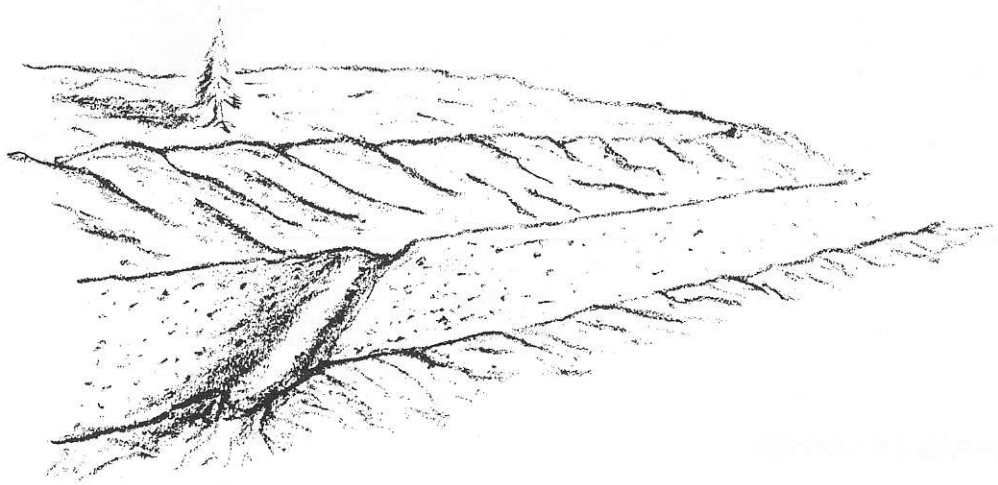


FIGURE 1

CULVERT INSTALLATION ON PERMANENT ROADS

In areas that have a low erosion hazard and where vehicle speed will be less than 30 kilometres (20 miles) per hour, roads may be outsloped (Figure 3). Outsloping allows runoff to drain directly across the road surface and avoids the necessity of constructing and maintaining a system of ditches and culverts. If outsloping is not possible, a drainage system of ditches and culverts must be used.



INTERVALS FOR WATER BARS

Slope Gradient	Erodible Soils (Silts and Clays)	Normal Soils (Loams)	Rocky Soils (Sand and Gravel)
	Metres	Metres	Metres
Under 5% (3°)	45	60	nil
5–10% (3–6°)	35	45	60
Over 10% (6°)	15	30	45

FIGURE 2

CONSTRUCTION AND LAYOUT OF WATER BARS

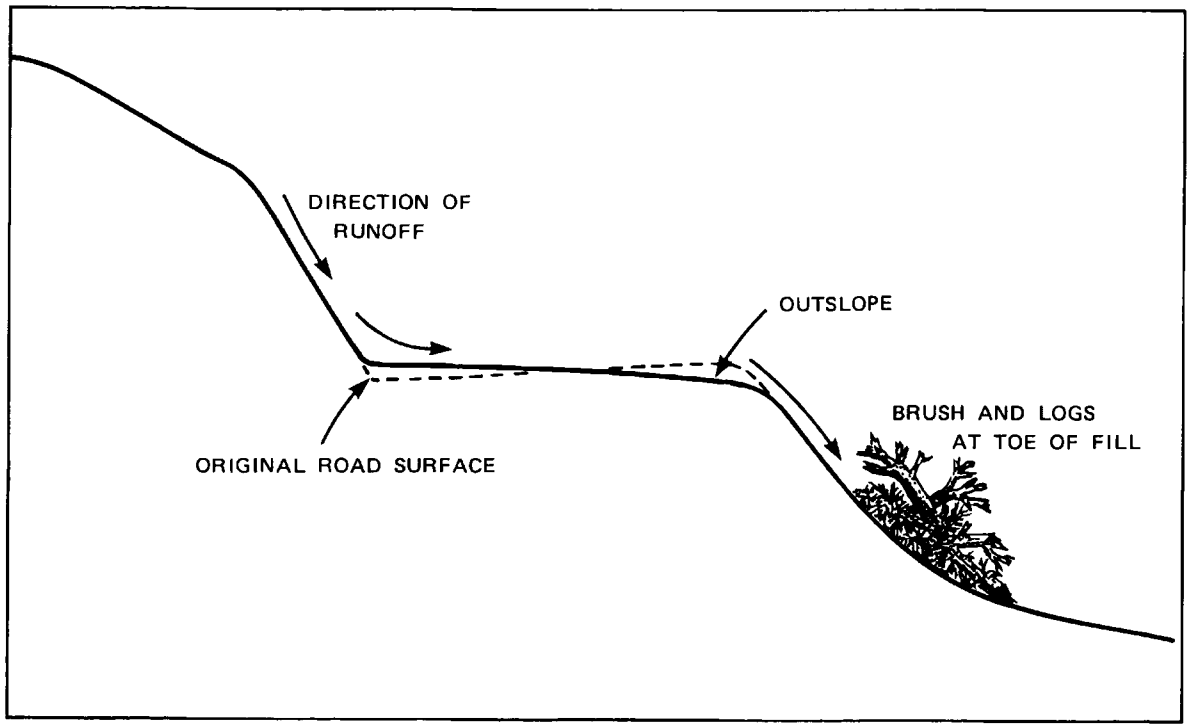


FIGURE 3

CROSS-SECTION OF AN OUTSLOPED ROAD

STREAM CROSSINGS

As in all other phases of the exploration program, stream crossings should be carefully considered in the planning stage so that problems can be identified and solved before they occur. All streams whether flowing constantly or intermittently should be crossed using one of the procedures outlined below.

Stream crossings can affect fish by blocking fish migration routes, destroying stream habitat, and silting downstream channels. Different types of crossings have different impacts on fish populations and the correct choice of structure can go a long way to protect the fishery resource. Any work that results in the harmful alteration, disruption or destruction of fish habitat is an offence under the Federal *Fisheries Act.*

General

No matter what type of crossing is to be built, keep activity in and around water courses to an absolute minimum.

Any construction in and around a stream channel will require careful supervision to ensure that debris and soil are not inadvertently pushed into the water. It has been found that the cost of extra supervision during construction in sensitive areas is strongly offset by the increased efficiency of the work and by the avoidance of problems.

Upon completion of a crossing structure, all debris must be removed from below the high water mark since it may enter the stream during heavy run-off. Clogging with debris is one of the major causes of crossing failure. Any bridge abutments or fill slopes that are constructed below high water must be stabilized with rip-rap to avoid erosion.

Do not divert water along roadside ditches from small or intermittent streams.

Bridges

Bridge crossings must be used on any streams supporting fish populations or on any stream with a channel width greater than 3 metres. Properly constructed bridges do not alter stream flow characteristics or stream habitat.

A plan for a simple log bridge suitable for crossing a small stream is given in Figure 4. This bridge can be built of local materials, perhaps utilizing trees felled during road clearing.

Figure 5 gives a bridge plan based on Ministry of Forests standards for use on larger channels. Large bridges should be engineered and built by personnel familiar with bridge construction.

Bridge construction guidelines:

- Rough-notch all crib joints to improve seating and reduce the spacing between logs. Some blocking may be necessary to prevent backfill from spilling out during floods, as loss of crib filling will lead to bridge failure. Use coarse gravel or cobbles to fill cribs as this material is less likely to erode between the logs.
- Construct bridge spans that are long enough. Many failures have occurred because of erosion caused by abutments that were extended too far into the stream channel.
- Construct the bridge so that water will be able to flow around the structure via the old backwater channels in case of a large flood. Do not build up the road in these areas.

Culverts

Even when installed in the best possible manner, culverts disrupt stream habitat and increase water velocity causing blockage to fish passage. Culvert crossings, therefore, are only recommended for small streams which do not support fish populations.

On streams not specifically designated as fish habitat, but where there is a possibility that fish exist, culverts may be used, provided that installation causes a minimum restriction to fish migration and survival. A properly installed culvert will minimize the water velocity while maintaining as many natural stream characteristics as possible.

Hanging outfalls are to be avoided. These may be caused by improper installation or by erosion at the outlet. The latter cause may be eliminated by covering the channel below the culvert with riprap.

Water velocity may be reduced by installing the culvert as level as possible while maintaining an acceptable flow. Installations should be deep enough in the existing bed to allow a sufficient depth of water in the culvert to permit fish passage.

Under cold conditions, culverts may become filled with ice. Usually iced up culverts thaw much more slowly than the adjacent stream and may cause blockage to water. This can lead to road flooding, washouts and disruption of fish passage. Larger culverts and a maintenance system for ice removal may be required in cold conditions.

Fords

The use of fords as stream crossings requires the permission of the Ministry of Environment, Fish and Wildlife Branch.

Fords may be used only on channels with coarse, cobbly beds and must be constructed to minimize sediment release when entering and leaving the ford. Ford preparations may include removing large boulders and debris from the channel but the streem bed must not be bladed or modified in any way. If a ford requires constant maintenance to remain passable, an alternate type of crossing must be used.

Fords with a constructed concrete bed have been used on small creeks with high debris loads and intermittent high discharge.

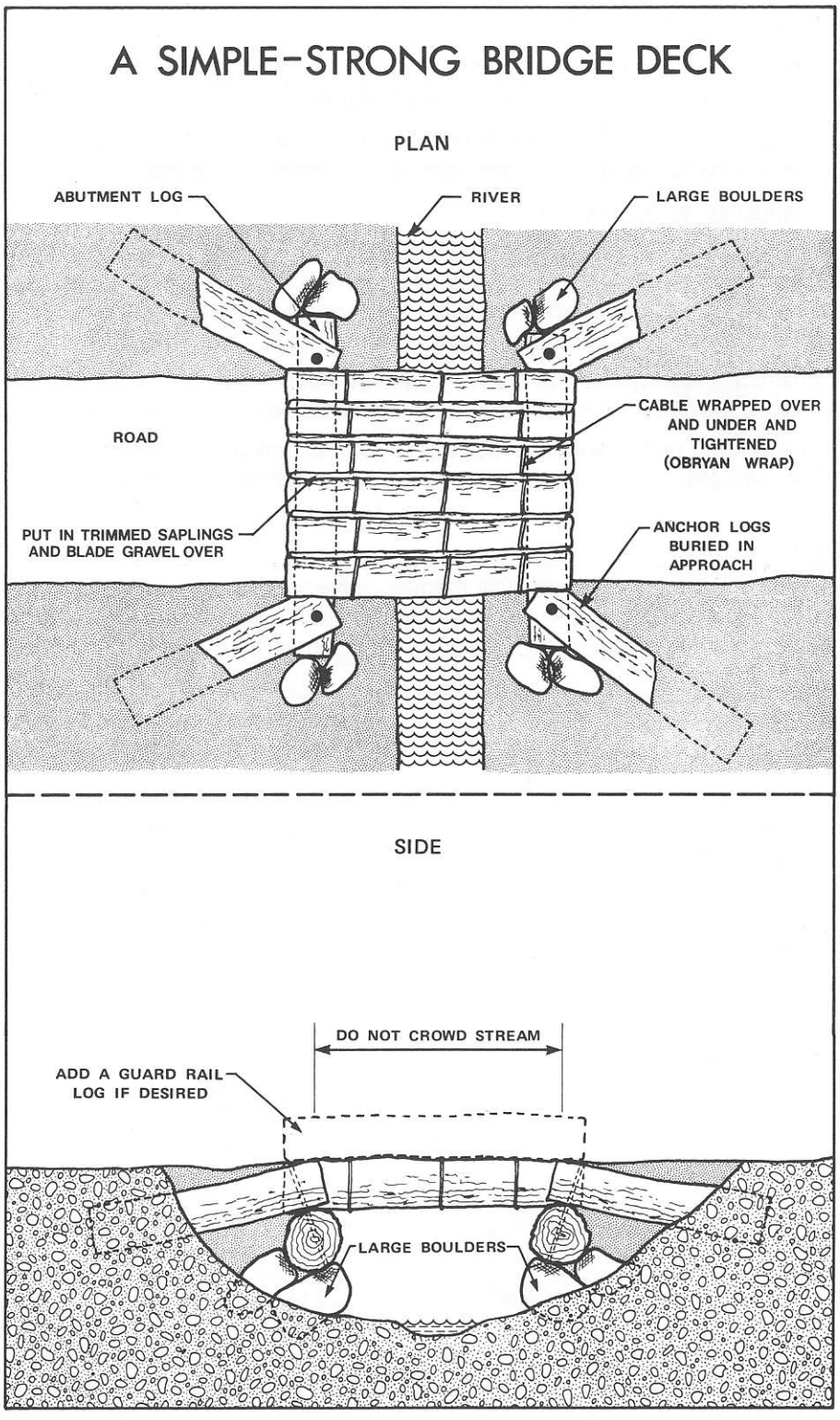


FIGURE 4

A SIMPLE TEMPORARY BRIDGE CONSTRUCTED FROM EASILY AVAILABLE MATERIALS

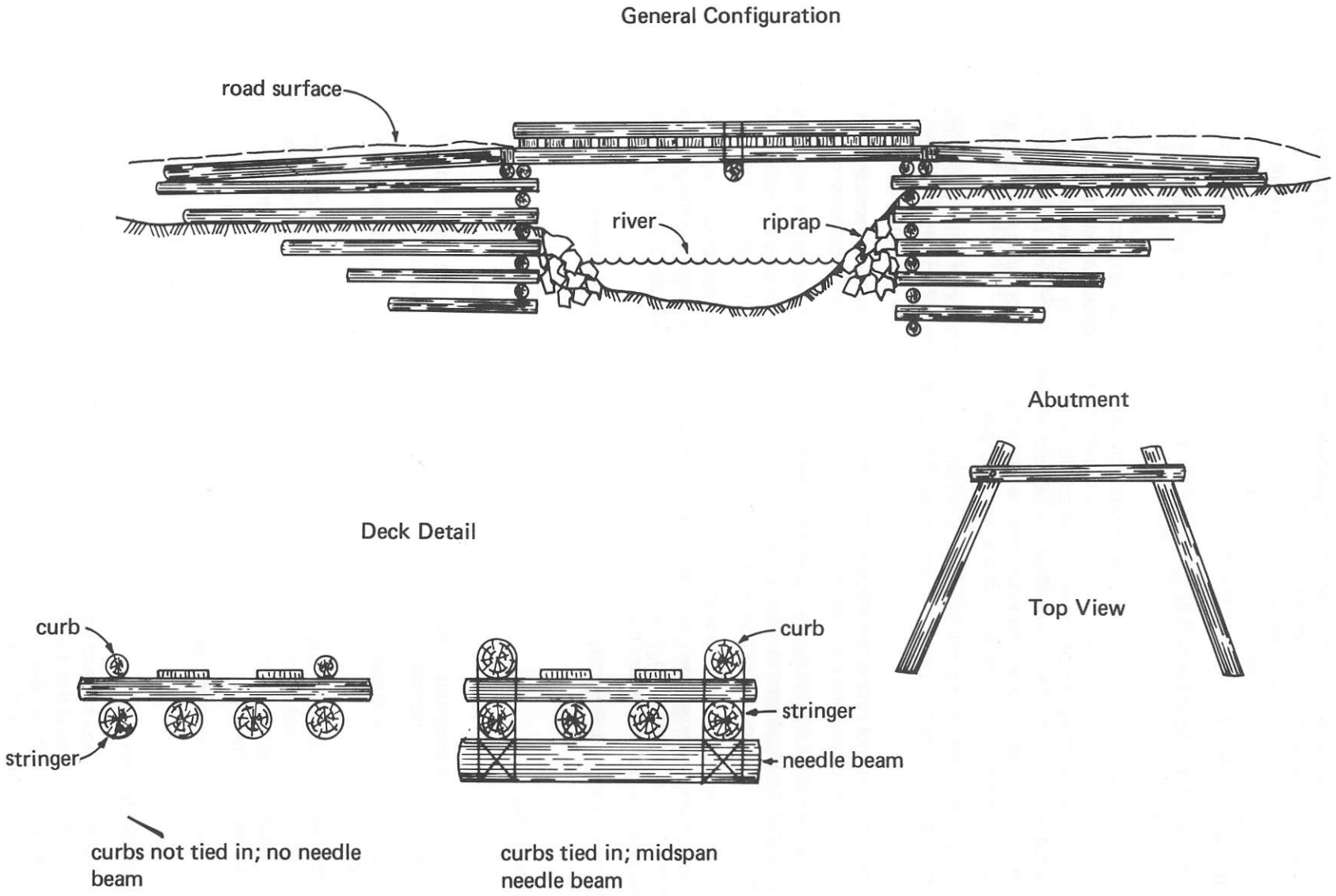


FIGURE 5

SIMPLE BRIDGE DESIGN FOR USE ON LARGER CHANNELS

Debris Bridges

Debris bridges, consisting of fill and slash pushed into a stream channel for temporary or permanent access, are not permitted.

3.3 DRILLING

The impact of drilling alone is quite small and can be minimized by proper planning and good work practices.

Although the location of drill holes is dictated by geological, geophysical, or geochemical anomalies, slight relocations are often possible to avoid problem areas. Do not locate drill sites on unstable slopes, steep terrain, or wet areas as this will significantly increase construction and reclamation difficulties. Drill holes shall not be located within 50 metres of streams or lakes except with permission of an Inspector. Use the safest but smallest possible drill pad area. Trees should be felled and bucked according to slashing guidelines.

If stripping or levelling of a drill site area is required for safe location of a drill pad, topsoil and overburden must be removed and stockpiled for use in reclamation when the drill site is abandoned.

At the completion of drilling the site should be resloped and revegetated according to the site preparation and revegetation guidelines (Chapter IV—*Reclamation Guidelines*).

An adequate closed-circuit facility must be provided for drilling mud and flocculating agents. Drill sludge shall not be allowed to enter streams, lakes, or run uncontrolled. A small well-constructed settling pond or sump a short distance down slope from the drill is usually adequate.

If, during drilling operations, any groundwater is released and flows to the surface, the drillhole location must be immediately reported to an Inspector. If, in the opinion of the Inspector, the flowing hole is creating an environmental or health hazard the hole shall be cemented or otherwise plugged to prevent the flow of water.

Helicopter access drilling may be required in environmentally sensitive areas.

3.4 TRENCHING

Trenching has, in the past, caused severe disturbance in many areas.

For all trenching programs, preplanning is necessary to identify trench sites that will give the greatest amount of information with the smallest amount of disturbance.

In all cases, trenches should be located at right angles to the strike on slopes less than 26 degrees (2:1).

Overburden, to root depth, must be segregated for use in resloping. Under no circumstances should material be cast down hill. After geological work has been completed and before the end of the season, the trench must be reclaimed and revegetated according to the *Reclamation Guidelines* (Chapter IV).

Three methods of trenching are presently in use.

HAND TRENCHING

The major advantage of hand trenching is that road access to the trench site is not necessary. This greatly decreases the disturbed area and allows trenching on sites that are not otherwise accessible by machine. Because the trench itself is small and disturbance is limited, requirements for backfilling and reclamation are greatly reduced.

BACKHOE TRENCHING

The backhoe was designed as a trenching tool.

Backhoe trenches are usually quite narrow and thus cause little disturbance. Topsoil and overburden are easily removed and stockpiled adjacent to the trench for use in resloping. The hoe, a small 'cat', or a skidder may be used for backfilling and site preparation.

Backhoe trenches greater than 1.5 metres deep must have their walls sloped back or be provided with adequate structural support to prevent collapse, if it is necessary for a person to enter for sampling or mapping.

BULLDOZER TRENCHING

Bulldozer trenching is not permitted except with perrnission of an Inspector.

3.5 UNDERGROUND DEVELOPMENT

Surface disturbanoes associated with underground development can present problems in erosion control, dump stability, and reclamation.

The following general guidelines shall be followed:

- Strip topsoil and overburden from the portal site, stockpile separately, and cover disturbances upon completion.
- Leave a minimum of 30 metres between any surface disturbance and a lake or stream.
- Provide for adequate drainage around the portal site and onto stable areas adjacent to disturbances.
- Ensure that waste rock is not placed in any watercourse.
- Portals must be closed upon completion of work or abandonment of the work site to the satisfaction of the Inspector of Mines and Resident Engineer.

IV.
RECLAMATION GUIDELINES

The following guidelines are minimum requirements and, depending upon the nature of the exploration activity and the environmental sensitivity of the area, increased standards may be required as a condition of the permit.

4.1 CAMP SITES

Camp sites which are to be abandoned shall be dismantled at the end of operations. All refuse shall be burned, buried, or removed. Pits shall be backfilled. The site shall be ripped, if necessary, to break surface compaction and revegetated.

Camp sites which are to be left for reuse shall be cleaned up. All refuse shall be burned, buried, or removed. Pits shall be filled.

4.2 TRENCHES, DRILL SITES, AND MAJOR EXCAVATIONS

All trenches, drill sites, and major excavations shall be backfilled and recontoured as nearly as possible to the previously existing slope. Stockpiled topsoil shall be spread over the site and the entire site shall be revegetated. Overland drainage shall be conducted around disturbances. Where this is not possible, erodible material must be protected by rip-rapping or other measures.

4.3 ROADS

It is important to identify those roads which can be abandoned and those roads which are necessary for future exploration. Roads that will not be used the following field season should be treated as abandoned. Some portions of the road system may be required by the Ministry of Forests for permanent fire access. It is in the operator's interest to contact the Ministry of Forests in this regard.

PERMANENT ROADS

Roads that are to be retained for permanent access shall be maintained annually.

Cut banks and fill slopes shall be revegetated.

ABANDONED ROADS

All abandoned roads should have a system of permanent erosion control. All culverts shall be removed and suitable permanent drainage structures installed. Erosion bars shall be placed at frequent intervals to ensure stability.

The requirement for recontouring roads will vary according to its location and the environmental sensitivity.

- Roads on environmentally sensitive areas will require complete recontouring.
- Roads in alpine and high subalpine areas will require the pulling back of topsoil material.
- Other roads will require ditching at their junction with permanent roads and ripping of compacted surfaces.

All abandoned roads shall be revegetated.

4.4 REVEGETATION METHODS

This section outlines revegetation treatments for the **normal** situation. Recommended seed mixtures are based upon the best available knowledge at this time. There is no guarantee that these treatments will be 100 per cent effective.

All areas must be stabilized and revegetated before return of the security bond and the operator must be prepared to reseed unreclaimed areas. Revegetation prescriptions are given for all areas of British Columbia. To determine the prescription for your area, first find the region in which you are working on Figure 6 and then refer to Appendix F. In all instances, revegetation treatments require seed and fertilizer applications.

METHODS OF SEED AND FERTILIZER APPLICATION

Broadcasting is the usual method for applying seed and fertilizer. Seed may be broadcast by hand, hand-held cyclone seeders, spreaders mounted on all terrain vehicles, or spreaders mounted on helicopters or aircraft.

Success is increased, if following broadcasting, the seed is buried by a thin layer of soil. This may be accomplished by running a tracked vehicle over the seed, or by harrowing the area. A design of a simple harrow is presented in Appendix E.

Hydroseeding is a technique whereby a slurry composed of seed, fertilizer, mulch (or soil stabilizer), and water is pumped through a nozzle and sprayed over the ground.

Agricultural seed drills can be used for seed and fertilizer applications. They are limited to well-prepared, level areas.

RECOMMENDED SEED MIXTURES

Recommended seed mixtures are presented in Appendices F and G. These mixtures often contain species that cannot be obtained locally and must be ordered from major seed suppliers in Vancouver. Check availability of seed mixes locally before commencing surface work. Table 3 gives some approximations regarding seeding and fertilizing.

TABLE 3

SOME APPROXIMATIONS REGARDING SEEDING AND FERTILIZING

1 hectare is equal to—an area 100 m by 100 m
—10,000 square metres
—2.47 acres

1 hectare is approximately equal to —1 km of road, 4-m road surface built across a slope.
—2 km of road, 4-m road surface built on level ground

1 kg is equal to 2.2 lbs.

1 lb. is equal to 0.45 kg

1 lb./acre is almost equal to 1 kg/ha

The time of seeding is important in some areas of the Province. Poor growth occurs if a frost or drought immediately follows germination.

RECOMMENDED FERTILIZER APPLICATIONS

Although applications of fertilizer may not always be necessary they are always recommended. Applications of fertilizer are relatively inexpensive when compared with the costs involved in reseeding an area, and their application ensures rapid germination and increases the chances of a successful catch.

The standard recommended fertilizer rate is 300 kilograms per hectare of 13-16-10. A more concentrated fertilizer such as 19-19-19 may be used at 200 kilograms per hectare. Apply fertilizer by broadcasting on the soil surface at the time of seeding. Heavier applications are recommended where rapid growth is desired or on high elevation zones (Appendix F).

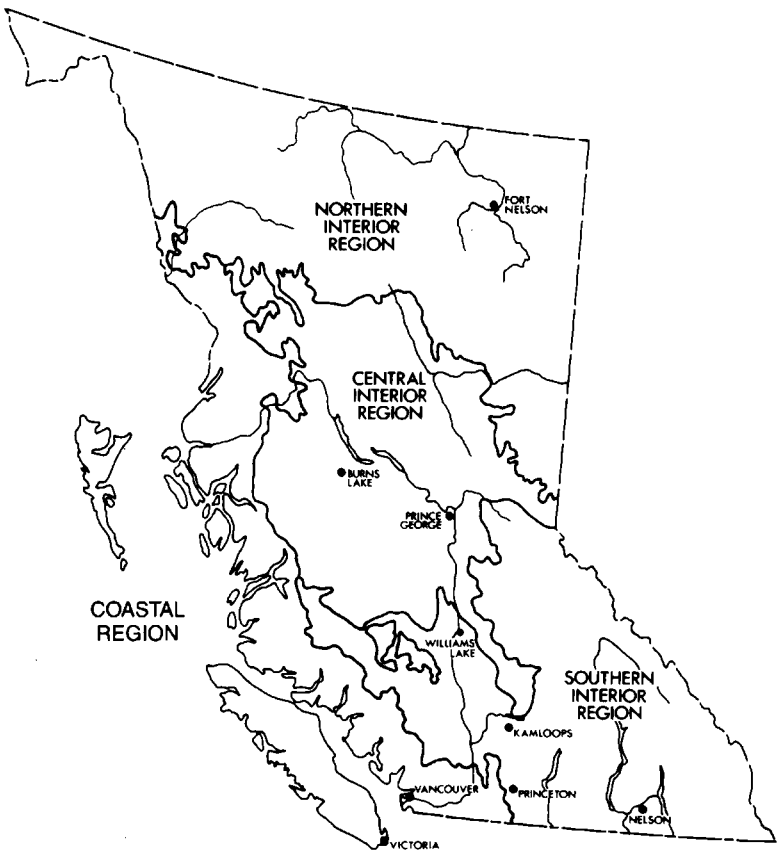


FIGURE 6

REGIONAL MAP TO BE USED IN CONJUNCTION WITH APPENDICES F AND G TO DETERMINE THE PRESCRIBED RECLAMATION TREATMENTS.

APPENDICES

Appendix

A Uranium Moratorium Regulation

B Addresses of regulatory agencies

C Mines Act, Sections 6-11

D Notice of Work and Reclamation Program on a Mineral Property

E Design for a simple pipe-stem harrow

F Recommended Reclamation treatments

G Suggested seed mixtures for use on areas disturbed by exploration activities in British Columbia.

APPENDIX A

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

SCHEDULE

Uranium Moratorium Regulation

Interpretation

1. In this regulation
"chief inspector" means the Chief Inspector of Mines under the *Mines Act;*
"explore" includes prospecting or searching for minerals by drilling, trenching, blasting or driving workings underground;
"lessee" means the holder of a placer lease issued under the *Mining (Placer) Act;*
"mineral" means mineral as defined in the *Mineral Act* and *Mining (Placer) Act;*
"mining property" means mining property as defined in the *Mineral Act* and includes a Crown granted 2 post claim;
"placer lease" means a lease issued under section 7 of the *Mining (Placer) Act.*

Mineral reserve and placer mining reserve

2. (1) The Province of British Columbia is designated as a mineral reserve and a placer mining reserve in respect of the mineral uranium.

(2) No person shall explore for, develop, mine or produce any mineral for its uranium content on the reserve created under subsection (1).

Discovery of uranium in samples

3. (1) Subject to section 4, where, during the course of exploring for a mineral, uranium is encountered which, to the knowledge of the person who encounters it, has uranium in a quantity exceeding ~~0.05~~ kg of uranium for every tonne of mineral in place, no person shall explore for any mineral on .5

(a) the mining property, or
(b) the land covered by a placer lease

where the uranium in that proportion has been encountered.

(2) A person who encounters uranium in the proportion referred to in subsection (1) shall report that fact in writing to the chief inspector within 7 days after he learns that the mineral he has encountered has uranium that exceeds the proportion referred to in subsection (1).

Discovery of uranium in ore bodies

4. Where, in the course of developing a mine or producing a mineral from a mineral body, minerals with an average grade of .01% uranium by weight are discovered, the owner, manager or agent of the mine shall

(a) order all development and production to cease, and
(b) within 7 days, inform the chief inspector that minerals containing uranium in that grade have been discovered.

Release of obligations

5. (1) Where, on or before the date that an obligation arises under section 22 (1), 33 (1), 42 (1), 45 (4) or 46 (1) of the *Mineral Act* or section 9 (1) of the *Mining (Placer) Act*, the recorded owner, lessee or an agent acting on their behalf, files a statement with the gold commissioner of the mining division in which the mining property is situated declaring that the mining property or placer lease contains uranium which the person filing the statement believes to be

(a) in a proportion greater than that referred to in section 3, or

(b) in an average grade greater than that referred to in section 4,

the recorded owner or lessee, on filing the statement, is relieved from the obligations under section 22 (1), 33 (1), 42 (1), 45 (4) or 46 (1) of the *Mineral Act* or section 9 (1) of the *Mining (Placer) Act*, as the case may be.

(2) Where a statement is filed under subsection (1), no person shall explore for or produce any mineral on the mining property or land covered by the placer lease in respect of which the statement was filed.

Carry forward of credit

6. Where, at the time

(a) a person is prohibited from exploring under section 3 (1),

(b) an order is required to be made under section 4, or

(c) a person files a statement under section 5 (1),

a holder of mining property or a lessee has recorded excess exploration and development work under section 24 (1) of the *Mineral Act* or section 10 of the *Mining (Placer) Act*, that person may carry forward the recorded excess to February 28, 1987.

Refund

7. Where

(a) a holder of mining property or a lessee files a statement under section 6, and

(b) that holder or lessee has paid money under section 22 (1) or 33 (1) of the *Mineral Act* or section 9 (1) (b) of the *Mining (Placer) Act*, after February 27, 1980 and before this regulation comes into force,

the Minister of Finance shall refund to that person the amount of the money that he paid.

Repeal

8. This regulation is repealed on February 28, 1987.

APPENDIX B

ADDRESSES OF REGULATORY AGENCIES

MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

Chief Inspector of Mines	Rm. 105, 525 Superior St., Victoria	387-3781
Senior Reclamation Inspector	Rm. 105, 525 Superior St., Victoria	387-3781
Chief Gold Commissioner	Rm. 433, 617 Government St., Victoria	387-5517

INSPECTOR OF MINES AND RESIDENT ENGINEERS

Prince George	1652 Quinn St.	562-8131 (322, 323)
Kamloops	101, 2985 Airport Drive	376-7201
Prince Rupert	Box 758, Fourth Floor, 340 Second Ave. W.	624-3245
Nanaimo	2569A Kenworth Rd.	758-8971/72
Vancouver	103, 2747 East Hastings St.	254-7171
Smithers	Bag 5000, 3793 Alfred St.	847-4411 (237)
Nelson	310 Ward St. (Mail) 403 Vernon St. (Office)	352-2211 (303)
Fernie	Box 1290, Cranbrook Rd.	423-6884

GOLD COMMISSIONER OFFICES

Alberni	4515 Elizabeth St., Port Alberni	723-3501
Atlin	Box 100, Atlin	651-7577
Cariboo	102, 350 Barlow Ave., Quesnel	775-1234
Clinton	Box 70, Clinton	459-2268/69
Fort Steele	102—11th Ave. S., Cranbrook	489-3521
Golden	Box 39, Golden	344-5221/22
Greenwood	Box 850, Grand Forks	442-8642
Kamloops	Courthouse, Kamloops	372-5233
Liard	412 Douglas Bldg., Parliament Bldgs., Victoria	387-1385
Lillooet	Box 70, Lillooet	256-7548
Nanaimo	Courthouse, Nanaimo	754-2111
Nelson	310 Ward St., Nelson	352-2211 (391)
New Westminster	100, 403—6th St., New Westminster	525-0375
Nicola	Box 339, Merritt	378-6141
Omineca	Bag 5000, Smithers	847-4411
Osoyoos	Courthouse, Penticton	493-1719
Revelstoke	Box 380, Revelstoke	837-3222
Similkameen	Box 9, Princeton	295-6957
Skeena	Courthouse, Prince Rupert	624-2121
Slocan	Box 580, Kaslo	353-2219
Trail Creek	Box 910, Rossland	362-7324
Vancouver	800 Hornby St., Vancouver	668-2672
Vernon	Courthouse, Vernon	545-2387
Victoria	411 Douglas Bldg., Parliament Bldgs., Victoria	387-1385

WATER MANAGEMENT BRANCH—REGIONAL MANAGERS

Prince George	1011 Fourth Ave.	563-1181 (236)
Kamloops	1259 Dalhousie Dr.	374-9717
Penticton	3547 Skaha Lake Rd.	493-8261
Nelson	310 Ward St.	352-2211 (327)
Surrey	10334—152A St., Surrey	584-8822
Williams Lake	3015J Glendale Dr.	392-6261 (263)
Smithers	Bag 5000, 3726 Alfred St.	847-4411 (220, 224)
Nanaimo	2569 Kenworth Rd.	758-3951

APPENDIX B—*Continued*

WASTE MANAGEMENT BRANCH—REGIONAL MANAGERS

Williams Lake	3015J Glendale Dr.	392-6261 (312)
Kamloops	1259 Dalhousie Dr.	374-9717
Prince George	1011 Fourth Ave.	563-1181
Victoria	810 Blanshard St.	387-4321
Nelson	310 Ward St.	352-2211 (339)
Penticton	3547 Skaha Lake Rd.	493-8261
Surrey	15326—103A Ave.	584-8822
Smithers	Bag 5000, 3726 Alfred St.	847-4411 (243, 321)
Nanaimo	2569 Kenworth Rd.	758-3951
Fort St. John	10142—101st Ave.	787-1111

FISH AND WILDLIFE BRANCH—REGIONAL MANAGERS

Prince George	1011 Fourth Ave.	563-1181
Kamloops	1259 Dalhousie Dr.	374-9717
Nanaimo	2569 Kenworth Rd.	758-3951
Surrey	10334—152A St., Surrey	584-8822
Nelson	310 Ward St.	352-2211 (492)
Smithers	Bag 5000, 3793 Alfred St.	847-4411 (255)
Penticton	3547 Skaha Lake Rd.	493-8261
Williams Lake	3015J Glendale Dr.	392-6261 (371)
Fort St. John	10142—101st Ave.	787-1111 (268)

MINISTRY OF FORESTS—REGIONAL MANAGERS

Prince George	1011 Fourth Ave.	564-0778 (210)
Kamloops	515 Columbia St.	374-7741 (311)
Smithers	Bag 5000, 3726 Alfred St.	847-4511
Vancouver	4595 Canada Way, Burnaby	299-9151
Nelson	518 Lake St.	354-4181 (225)
Williams Lake	540 Borland St.	398-7121

MINISTRY OF LANDS, PARKS AND HOUSING—REGIONAL DIRECTORS

Prince George	1011 Fourth Ave.	562-8131 (324)
Kamloops	348 Tranquille Rd.	554-3144
Burnaby	4240 Manor St.	438-5344 (249)
Smithers	Bag 5000, 3793 Alfred St.	847-4411 (268)
Cranbrook	828A Baker St.	489-4333
Williams Lake	172 North 2nd Ave.	392-6261 (307)
Fort St. John	220, 9900—100th St.	787-7766
Victoria	851 Yates St.	387-5011

MINISTRY OF AGRICULTURE—REGIONAL MANAGERS

Prince George	Experimental Farm Site, RR1	963-9685
Summerland	Research Station, Box 198	494-0401
Dawson Creek	1201—103rd Ave.	782-5931
Abbotsford	33780 Laurel St.	859-5281
Kamloops	162 Oriole Rd.	374-3614
Victoria	808 Douglas St.	387-5121

APPENDIX C

Work system approvals

6. (1) The owner, agent or manager shall give notice to the inspector of intention to commence work on, or to stop work in or about a mine, and, except in an emergency, the notice shall be not less than 7 days.

(2) No work, other than surface exploratory work in mines that are not coal mines, shall be commenced without the written approval of the chief inspector.

(3) Before opening or beginning to open or develop a mine, the owner, agent or manager shall file with the chief inspector a report and plan of the system suitable to the chief inspector under which it is proposed to work the mine.

(4) The owner, agent or manager shall not depart from the plan of the system to any substantial degree without the written approval of the chief inspector.

(5) The plan of the system shall

(a) be prepared taking into consideration the safety of the public and persons involved in the work,

(b) be designed so as to make it as practicable as possible in the future to mine zones affected by the plan, and

(c) in relation to a coal mine, provide for maximum possible recovery of the resources having regard to sound engineering practice.

Reclamation of surface

7. (1) The owner, agent or manager shall file with the minister a program for the protection and reclamation of the surface of the land and watercourses affected by the mine in a form and containing the information the minister may require before commencing preparatory work for production from a mine, and the program must include the particulars and maps that may be prescribed.

(2) Notice of the filing of the program under subsection (1) must be published, by the person filing it, in the Gazette and in those newspapers specified by the minister.

(3) A person affected by or interested in a proposed program submitted under this section may, within 30 days after the last date on which a notice is published under this section, make written representations to the minister.

Reclamation Advisory Committee

8. (1) A Reclamation Advisory Committee is established consisting of the chief inspector as chairman and other persons appointed by the minister.

(2) The minister shall submit the program and representations received by him under section 7 (1) and (3) to the committee which shall study them and make recommendations to the minister.

(3) After considering the recommendations of the committee and any representations made to him under section 7, the minister shall, within 60 days after the last date on which the notice referred to in that section is published,

(a) approve the program,

(b) reject the program, or

(c) after revising or amending the program, approve it in its revised or amended form,

and, where he approves a program, he shall issue a permit authorizing the work subject to compliance with the program.

(4) A permit issued under this section may contain conditions, including conditions pertaining to the future implementation of the program.

Security

9. (1) It is a condition of a permit issued under section 8, that the owner, agent or manager of a mine shall deposit as security with the Minister of Finance an amount the minister determines, but not exceeding $2 500/ha of land used or to be used for the mine and the waste disposal of the mine as set out in the approved program.

(2) The security shall be held by the Minister of Finance as security for the proper performance by the owner, agent or manager of the approved program and all the conditions of the permit in a manner satisfactory to the minister, and the security may be used, on requisition of the minister, for the purposes of subsection (6).

(3) During the entire period of production from a mine, the owner, agent or manager shall

(a) continually and progressively reclaim the surface of the land affected by the mining operation in accordance with the approved program, and

(b) if required by the minister, deposit as security in a form satisfactory to the minister, in each year, an amount that, together with the deposit under subsection (1) and calculated over the estimated life of the mine, will provide the money necessary to perform and carry out properly

(i) all the requirements of the approved program at the proper time, and

(ii) all the orders and directions of the chief inspector or an inspector respecting the execution of the approved program.

(4) If a dispute arises respecting an order or direction of the chief inspector or an inspector under subsection (3), the owner, agent or manager may appeal in writing to the minister and the minister shall, after affording the parties the opportunity of a hearing, decide the appeal.

(5) The owner, agent or manager, or an inspector, may apply to the minister for revision of the conditions of the permit issued under section 8, and, following a recommendation of the Reclamation Advisory Committee, the minister may revise the conditions.

(6) Where the owner, agent or manager fails to perform and complete the program for reclamation and the conditions of the permit in a manner satisfactory to the minister, the minister may apply all or a part of the security toward payment of the cost of the work required to be performed and completed.

(7) On the completion, discontinuance or abandonment of a mining operation, and on the minister being satisfied that this section has been complied with and that the approved program has been properly completed, the person who deposited the security is entitled to a refund of it, less any amount paid out under subsection (6).

Exercise of minister's powers by chief inspector

10. (1) This section does not apply to a coal mine.

(2) Where a substance in a mine is not a mineral as defined in the *Mineral Act,* the chief inspector has the powers of the minister under sections 8 and 9 and may, without reference to the Reclamation Advisory Committee,

(a) approve programs for reclamation and conservation of land comprising a mine and issue permits required under section 8, subject to conditions he may impose, or

(b) if he is satisfied that the protection and reclamation of the land is adequately secured and controlled under an enactment, by order, exempt that mine from this section.

(3) Sections 8 and 9 do not apply in respect of all placer mining operations, other than hydraulic monitoring, and in respect of all mines in the exploration stage, but where the chief inspector considers that the employment of mechanical equipment is likely to cause significant disturbance to the surface of the land in clearing, stripping, trenching or other operations, he may

(a) require the owner, agent or manager to file with him the program referred to in section 7,
(b) approve programs for reclamation and conservation of the land surface, and
(c) issue permits under section 8 subject to conditions he may impose.

Cancellation of permit

11. Where there is a failure to comply with the terms of a permit issued under section 8 by the minister, or section 10 by the chief inspector, and the failure continues after notice to remedy the failure, the minister or the chief inspector, as the case may be, may cancel the permit and order the owner, agent or manager of the mine to stop the mining operation and on receipt of the order the owner, agent and manager shall stop operations and close down the mine.

APPENDIX D

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

MINERAL RESOURCES DIVISION
INSPECTION AND ENGINEERING BRANCH

NOTICE OF WORK AND RECLAMATION PROGRAM ON A MINERAL PROPERTY

This form is to be completed and signed by all companies or individuals carrying out exploration work. Keep one copy and forward one copy to the Inspector of Mines and Resident Engineer.

REQUIREMENT TO GIVE NOTICE

This form provides notice pursuant to section 6(1) of the *Mines Act* and must be submitted not less than seven days before commencement of work, and not less than seven days prior to cessation of work. Providing this notice does not imply that the applicant can start work after seven days. THE APPLICANT MAY ONLY COMMENCE WORK WHEN ALL ADDITIONAL APPROVALS ARE RECEIVED.

APPROVAL OF RECLAMATION PROGRAM

This form serves as an application for a reclamation permit (section 7-11, *Mines Act*).

A reclamation permit will be required where the employment of mechanical equipment is likely to cause significant disturbance to the surface of the land. If a reclamation permit is required, work cannot commence until the signed permit is obtained which may require up to 60 days.

APPROVAL OF UNDERGROUND WORK

Under section 6(2) of the *Mines Act*, the owner, agent, or manager of the mine must have the written approval of the Chief Inspector of Mines before working underground. To obtain this approval the following information must be submitted to the Inspector of Mines and Resident Engineer for transmittal to the Chief Inspector of Mines:

(1) proposed work outlined on a *Notice of Work and Reclamation Program on a Mineral Property*,

(2) a detailed map of present and proposed underground workings,

(3) a detailed plan of surface installations in relation to mine openings, and

(4) a detailed plan of the system or method of carrying out the proposed work.

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

MINERAL RESOURCES DIVISION
INSPECTION AND ENGINEERING BRANCH

NOTICE OF WORK AND RECLAMATION PROGRAM ON A MINERAL PROPERTY

1. NAME OF PROPERTY .....
   Number of claims ..... Principal Claim Group .....

2. LOCATION: Mining Division ..... NTS Map Sheet (e.g., 82E/9E) .....
   Lat. .....°.....' Long. .....°.....' UTM: E. ..... N. .....
   Access via .....
   .....

3. OWNER: Name ..... FMC No. .....
   Address ..... City .....
   Province ..... Postal Code ..... Telephone No. .....

4. OPERATOR: Name ..... FMC No. .....
   Address ..... City .....
   Province ..... Postal Code ..... Telephone No. .....

5. EXPLORATION WORK: Indicate PROPOSED ☐ or COMPLETED ☐.
   Duration of Exploration Work: From ..... to .....
   Name of Field Manager ..... Number of men employed .....
   Geophysical ..... Geochemical .....
   Linecutting (distance, width, method) .....m^2

6. SURFACE DISTURBANCE OFF MINERAL CLAIMS
   Road Access Construction: Total length .....m Approximate width .....m Area .....m^2
   Campsites: No. of men ..... Size .....m^2
   Other (specify).....m^2

7. SURFACE DISTURBANCE ON MINERAL CLAIMS
   (a) Road Construction: Total length .....m Approximate width .....m Area .....m^2
   (b) Drilling: No. of sites ..... Maximum dimensions: Width .....m Length .....m
   Depth .....m Total disturbed area of drill sites .....m^2
   Water source ..... Method of drill mud disposal .....
   (c) Trenches: No. ..... Maximum dimensions: Width .....m Length .....m
   Depth .....m Total disturbed area of trenches .....m^2
   (d) Test Pits: No. ..... Maximum dimensions: Width .....m Length .....m
   Depth .....m Total disturbed area of test pits .....m^2
   (e) Camp Area: No. of men ..... Width .....m Length .....m Area .....m^2
   (f) Underground Exploration: Area of surface facilities .....m^2
   (g) Other (specify) .....m^2
   TOTAL OF SURFACE DISTURBANCE ON MINERAL CLAIMS .....m^2
   (1 ha = 10 000 m^2) ..... ha

8. EQUIPMENT TO BE USED IN EXPLORATION PROGRAM (List size, capacity, and number.)

(a) ..... (d) .....

(b) ..... (e) .....

(c) ..... (f) .....

9. PRESENT STATE OF THE LAND ON WHICH EXPLORATION IS PROPOSED

Present land use (agriculture, foresty, ranching, recreation, etc.) .....

Type of vegetation .....

Access roads (present use and condition) .....

Campsites, old workings (location, condition) .....

.....

10. RECLAMATION PROGRAM (Prescribed reclamation treatments are outlined in *Guidelines for Mineral Exploration.*)

Camp sites .....

Trenches, drill sites, and major excavations .....

Roads .....

Seeding: Mixture .....

Rate of application ..... kg/ha Date .....

Area seeded ..... ha Quantity of seed .....kg

Fertilizer: Type ..... Rate of application .....kg/ha

Area fertilized .....ha Quantity of fertilizer .....kg

11. SUMMARY OF AREAS DISTURBED AND RECLAIMED

Area disturbed current year ..... Previous years ..... Total to date .....

Area reclaimed current year ..... Previous years (final) ..... Total to date .....

12. DATE FOREST SERVICE ADVISED BY OPERATOR .....

Name and Title of Forest Official .....

Address .....

SIGNATURE OF APPLICANT ..... TITLE .....

Print Name ..... DATE .....

PLAN

Indicate claim boundaries, permanent watercourses, access road and distance to nearest town, proposed surface disturbances including roads, test pits, trenches, portals, drill sites, and camp sites.

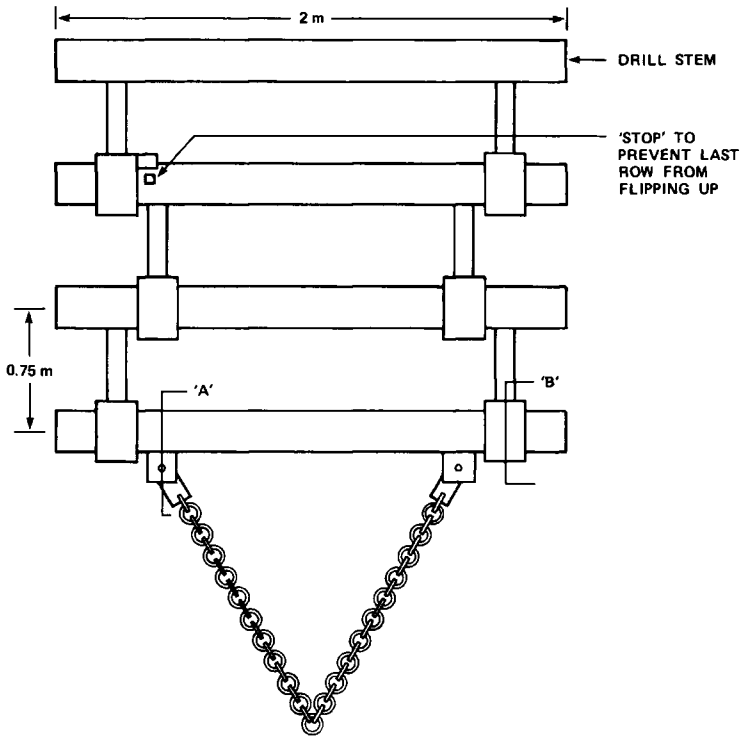
LOCATION MAP

Show nearest town and access road

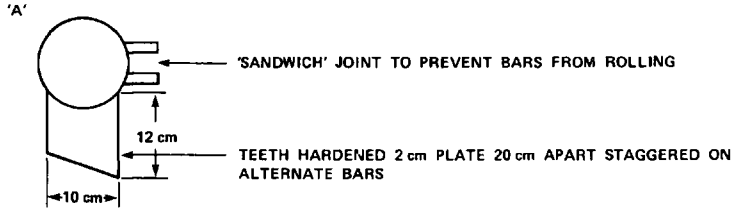
APPENDIX E

DESIGN FOR SIMPLE PIPE-STEM HARROW

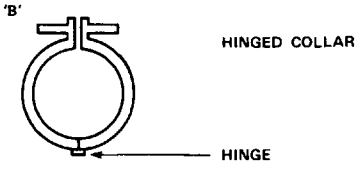
TOP VIEW



'A'



'B'



APPENDIX F—*Continued*

RECOMMENDED RECLAMATION TREATMENTS—*Continued*

SOUTHERN INTERIOR REGION

BIO-GEOCLIMATIC ZONE	DESCRIPTION	ELEVATION	RECLAMATION TREATMENTS				
			SEEDING			FERTILIZER	
			Mix-ture	Rate *kg/ha*	Timing	Type	Rate *kg/ha*
Ponderosa Pine Bunchgrass	—includes the dry river valleys of the Fraser, Thompson, Nicola, Similkameen, and Okanagan —very low precipitation, 19-36 cm (7.4-14″) —characterized by the following vegetation: ponderosa pine, bitter brush, sagebrush, and bunchgrass	270-750 m (900-2500′)	III	30	no restrictions early spring preferred	13-16-10 (19-19-19)	300 (200)
Interior Douglas Fir	—includes the majority of the dry Southern Interior below 1350 m (4500′) —precipitation low, 36-56 cm (14-22″), hot summers and cool winters —characterized by the following trees: Douglas fir, ponderosa pine, western white pine, white spruce, western red cedar, lodgepole pine, larch, aspen, black cottonwood, common paper birch, and Rocky Mountain maple	300-1350 m (1000-4500′)	IV or V	30	early spring or late fall preferred	13-16-10 (19-19-19)	300 (200)
Interior Cedar Hemlock	—includes Interior valleys, 360-1260 m (1200-4200′), east of the Selkirk Mountains —precipitation high, 56-170 cm (22-67″), warm summers and cool winters —characterized by the following trees: western hemlock, Douglas fir, western white pine, lodgepole pine, western red cedar, Engelmann spruce, white spruce, alpine fir, grand fir, black cottonwood, aspen, common paper birch, larch	360-1260 m (1200-4200′)	I	30	no restrictions	13-16-10 (19-19-19)	300 (200)
Engelmann Spruce Subalpine Fir and Montane Spruce	—includes most areas greater than 1260 m (4200′) in eastern British Columbia, south of Prince George —subalpine with moderate snow cover and severe winters; precipitation high, 41-183 cm (16-72″) —characterized by the following trees: Engelmann spruce, alpine fir, lodgepole pine, white bark pine, alpine larch, limber pine, Douglas fir, western white pine	1260-2250 m (4200-7500′)	VI	30	no restrictions	13-16-10 (19-19-19)	300 (200)
Alpine	—includes areas in southeastern British Columbia at high elevations —low stunted trees: Engelmann spruce, alpine fir, white bark pine, alpine larch, alpine meadows and tundra	greater than 2250 m (7500′)	VII	30	seed in early spring or late fall only	13-16-10 (19-19-19)	500 (400)

APPENDIX F—*Continued*

RECOMMENDED RECLAMATION TREATMENTS—*Continued*

CENTRAL AND NORTHERN INTERIOR REGION

BIO-GEOCLIMATIC ZONE	DESCRIPTION	ELEVATION	RECLAMATION TREATMENTS				
			SEEDING			FERTILIZER	
			Mix-ture	Rate *kg/ha*	Timing	Type	Rate *kg/ha*
Subboreal Spruce	—includes most of the central interior with elevation 330-840 m (1100-2800′) north of Williams Lake and south of Germansen Landing —heavy snow cover; severe winters; precipitation moderate, 40-64 cm (16-25″) —characterized by the following trees: lodgepole pine, white spruce, alpine fir, black spruce, aspen, black cottonwood, common paper birch	Central 330-840 m (1100-2800′)	V	30	no restrictions	13-16-10 (19-19-19)	300 (200)
Engelmann Spruce Subalpine Fir	—includes areas of the central interior above 1050 m (3500′) —subalpine with moderate snow cover and severe winters; precipitation high, 41-183 cm (16-72″) —characterized by the following trees: Engelmenn spruce, alpine fir, lodgepole pine, white spruce, white bark pine	Central and Northeast 1050-1650 m (3500-5500′) Northwest 900-1500 m (3000-5000′)	VI	30	no restrictions	13-16-10 (19-19-19)	300 (200)
Boreal White and Black Spruce	—includes all areas below 840 m (2800′) in the northern interior —moderate or light snow cover over deeply frozen ground; winters severe; moderate precipitation, 30-58 cm (12-23″) —characterized by the following trees: white spruce, black spruce, tamarack, alpine fir, aspen, thin-leaved mountain alder, common paper birch, black cottonwood	Northeast and Northwest 163-840 m (550-2800′)	VI	30	no restrictions	13-16-10 (19-19-19)	300 (200)
Spruce Willow Birch and Alpine	—includes all high elevation areas in the northern interior —moderate snow cover —characterized by stunted tree growth of alpine fir and scrub glandular birch; alpine tundra occurs at higher elevations	Northeast greater than 1650 m (5500′) Northwest greater than 1500 m (3500′)	VII	60	seed in early spring or late fall	13-16-10 (19-19-19)	500 (400)

APPENDIX G

SUGGESTED SEED MIXTURES FOR USE ON AREAS DISTURBED BY EXPLORATION ACTIVITIES IN BRITISH COLUMBIA

Mixture	Biogeoclimatic Zone	Species	% by wt.
I	Coastal Douglas Fir	Timothy	10
	Coastal Western Hemlock	Perennial Rye	20
	Interior Cedar Hemlock	Orchard Grass	15
	Coastal Cedars Pine Hemlock	Creeping Red Fescue	20
		Canada Bluegrass	5
		White Dutch Clover	30
II	Mountain Hemlock	Orchard Grass	40
		Creeping Red Fescue	40
		Perennial Rye	10
		White Dutch Clover	10
III	Ponderosa Pine Bunch Grass	Crested Wheatgrass	70
		Alfalfa	30
IV	Interior Douglas Fir (dry)	Streambank Wheatgrass	30
		Crested Wheatgrass	40
		Alfalfa	15
		Sainfoin	15
V	Interior Douglas Fir (wet)	Creeping Red Fescue	30
	Sub-boreal Spruce	Timothy	20
		Orchard Grass	20
		Alsike Clover	30
VI	Engelmann Spruce Subalpine Fir	Creeping Red Fescue	40
	Boreal White and Black Spruce	Timothy	40
	Montane Spruce	Alsike Clover	20
		(Red Top)	
VII	Alpine Tundra	Meadow Foxtail	10
	Spruce Willow Birch	Creeping Red Fescue	40
		Timothy	25
		Tracenta Bentgrass	10
		Alsike Clover	15

BRITISH COLUMBIA
Mining Inspection Districts and District Office Locations