Sherry Sian

From: Angela_Plautz@gov.nt.ca
Sent: Tuesday, September 16, 2003 7:42 AM
To: Sherry Sian
Subject: RE: Guidelines for Ice Roads

BDY.RTF (1 KB)

BDY.RTF (2 KB)

204

Hello Sherry,

Further to your email, I have received approval from my supervisor to release the guideline entitled, "Environmental Guidelines for the Construction, Maintenance and Closure of Winter Roads in the Northwest Territories".

We request that the following disclaimer be added:

The information contained in this document is being updated on a continual basis. Any use which a third party makes of this guideline, or any reliance on decisions made based on it, are the responsibility of such third parties. The Department of Transportation, Government of the Northwest Territories, accepts no responsibilities for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Thank you,

Angela Plautz
Environmental Analyst, Environmental Affairs
Department of Transportation
Tel.: (867) 873-7103
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-----Original Message-----
From: ssian /unix [mailto:ssian@mveirb.nt.ca]
Sent: Sunday, September 14, 2003 4:36 PM
To: Angela Plautz /YK /DOT
Cc: ssian /unix
Subject: Guidelines for Ice Roads

Angela,

Did you get approval to release the guidelines to the parties for the EAs in Drybones and Wool Bay? Is there any disclaimer you want noted (i.e., Documents should used for information purposes only, etc.)?

Many thanks for dropping them off.

Sherry

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Northwest Territories

ENVIRONMENTAL GUIDELINES FOR THE CONSTRUCTION, MAINTENANCE AND CLOSURE OF WINTER ROADS IN THE NORTHWEST TERRITORIES

NORTHWEST TERRITORIES
TRANSPORTATION

ENVIRONMENTAL GUIDELINES FOR THE CONSTRUCTION, MAINTENANCE AND CLOSURE OF WINTER ROADS IN THE NORTHWEST TERRITORIES

FOR

THE DEPARTMENT OF TRANSPORTATION
GOVERNMENT OF THE NORTHWEST TERRITORIES

BY

STANLEY ASSOCIATES ENGINEERING LTD.
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October 8, 1993

Preface

This HANDBOOK is a compilation of environmental guidelines for construction, maintenance and closure of winter roads in the Northwest Territories. The Handbook recommends operating procedures that are both sensitive to the environment and practical for the field operator to achieve. Although this Handbook may have some application on winter roads throughout northern Canada, it is written primarily for winter roads built annually forming part of the transportation system operated and maintained by the Department of Transportation, Government of the Northwest Territories. As with many environmental guidelines, it is likely their implementation will enhance the environment and will save the operator money in the long run. These guidelines should be used in the field in conjunction with "A Field Guide to Ice Construction Safety", a publication again written expressly for application to the Government of the Northwest Territories (GNWT), Department of Transportation's winter road system.

The study team was guided by a Steering Committee from within the Department of Transportation headed by Mr. Nick Lawson, Environmental Analyst, Planning Division, Yellowknife; Mr. Don McEachern, Highway Superintendent North, Yellowknife and Mr. Art Barnes, Assistant Director, Hay River. Interviews were conducted with individuals knowledgeable about winter roads to identify problem areas and possible solutions. Photographs were collected from numerous sources, and were taken by various people, some of whom are known and others are unknown. We give credit and thanks to those photographers we do know or provided photos: Art Barnes; Leslie Green; Rod Gunderson; Nick Lawson; Bob McCleary; Colin Ledger; and, Ken Adam. This Handbook was prepared by Stanley Associates Engineering Ltd.'s Yellowknife office and SENTAR Consultants Ltd.'s Winnipeg office. Technical sections were written by Kenneth M. Adam, P. Eng., Ph.D.

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CHAPTER 1.0
INTRODUCTION

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1.0 INTRODUCTION

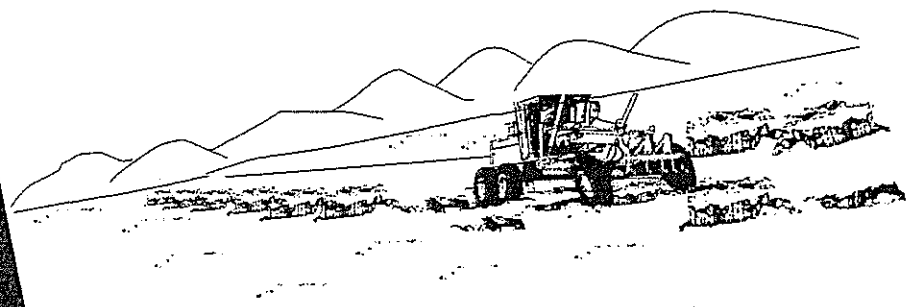
1.1 How to use the Guidelines

These environmental guidelines for the construction, maintenance and closure of winter roads are intended to be primarily used by the Department of Transportation's winter road field supervisory personnel to aid them in making correct field decisions so as to minimize adverse environmental effects resulting from winter roads. These guidelines should not be taken as absolute terms and conditions; and, they are always subordinate to all other applicable Acts, Ordinances and Regulations. The overall report is directed to all levels of winter road involvement from field personnel to policy makers.

Spills of hazardous substances and the resulting environmental impacts are very closely related to safety, particularly on winter roads constructed over ice. As a result, the reader and particularly **field personnel should have at hand together with these guidelines a copy of "A Field Guide to Ice Construction Safety", prepared by the Department of Transportation** specifically for their winter road system. Of course, the reason for this relationship between environmental impacts and safety is that if an ice road is "safe", and if speed limits on ice are adhered to, then breakthroughs should not occur; spills of hazardous materials directly into water will be avoided; and, therefore, environmental impacts such as fish kills, water contamination or introduction of contaminants directly into the food chain will be avoided.

As will be seen throughout the text, each environmental guideline is normally in response to a potential or anticipated problem. Such problems are discussed within the text along with the potential environmental effects and/or mitigation, then an environmental guideline is developed to either eliminate or mitigate the environmental impact. Therefore, although the environmental guidelines are developed within the text, they have been consolidated at the end of each chapter for the reader's convenience.

A FIELD GUIDE TO ICE CONSTRUCTION SAFETY



NORTHWEST TERRITORIES
TRANSPORTATION

The Above Publication & Environmental Guidelines Are To Be Used Together, As Safety Is Environmentally Friendly.

CHAPTER 2.0
PLANNING WINTER ROADS AND ICE ROADS

CHAPTER 2.0
PLANNING WINTER ROADS
AND ICE ROADS

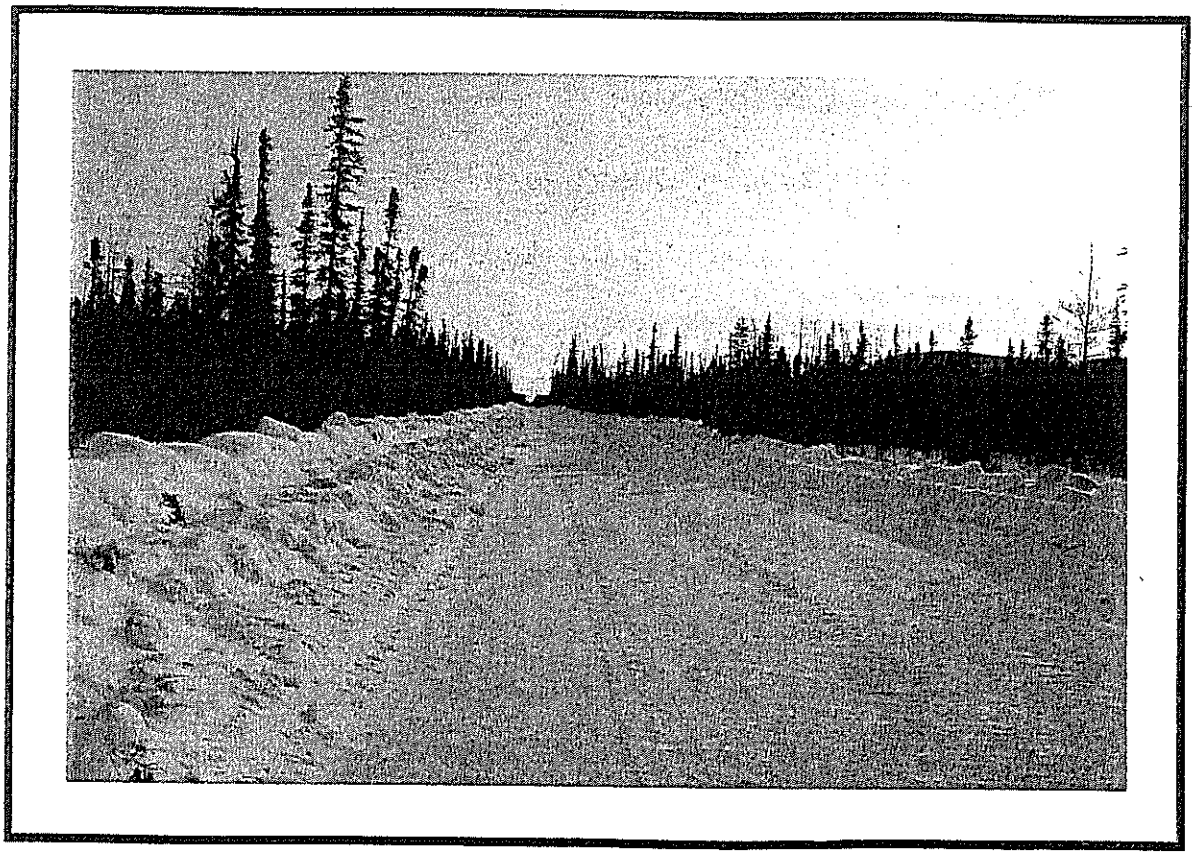
2.0 PLANNING WINTER ROADS AND ICE ROADS

2.1 Types of Winter Roads and Water Crossings

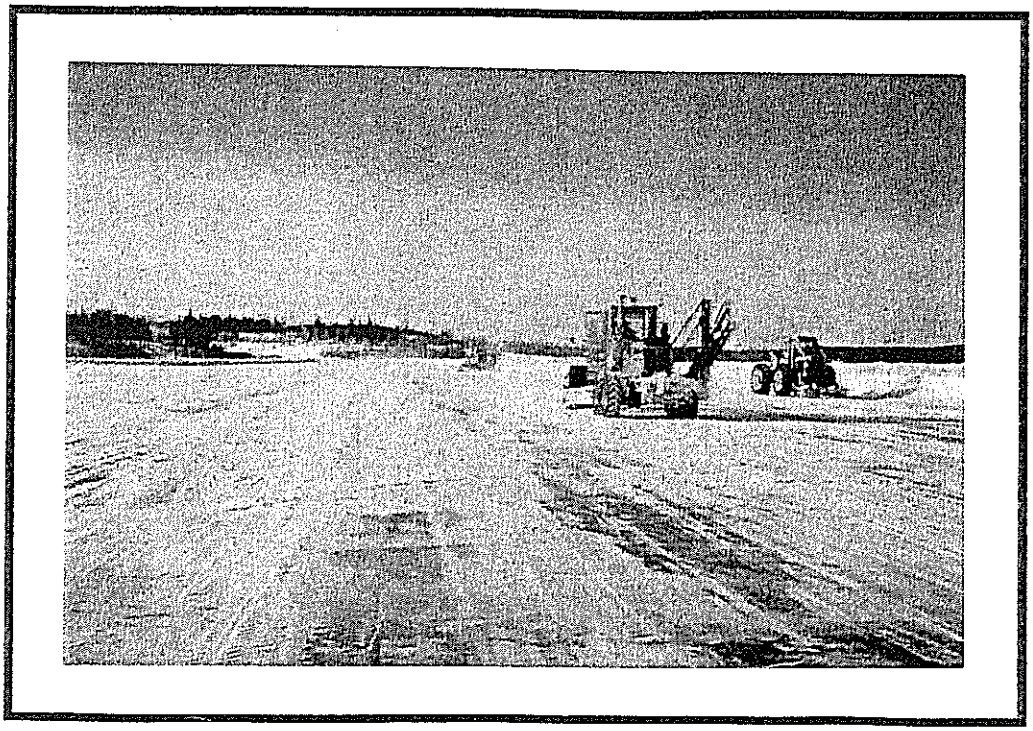
According to the classification of winter roads developed by Adam (1978), the winter roads making up the GNWT Department of Transportation's winter road system over land currently fall between perennial winter trails and compacted snow roads. A perennial winter trail has been defined as established for use over several winter seasons over an existing right-of-way. A compacted snow road is built primarily with snow as a cut and fill material compacted to establish some semblance of a constructed road grade. Over water, the GNWT winter roads are referred to as "ice roads". Adam (1978) would classify them as winter roads on ice, so as to distinguish them from solid ice roads, which are built by sprinkling or hosing water directly on the ground to fill depressions and form an ice surface of suitable thickness to support traffic. Technically, an ice road can be on either ice or over land.

It is important to know there are a wide range of types of winter roads; and, anyone working on winter roads should know the various options. Normally the higher the class, the higher the cost of construction. The lowest class of winter roads are called winter trails; followed by an intermediate class - snow roads; and, finally the highest class - ice roads. The types of winter trails are determined by their frequency of construction: a temporary winter trail being a one-season single-purpose trail such as a seismic line, whereas a perennial winter trail is built over the same right-of-way year after year or at least more than once.

There are four types of snow roads: compacted snow road, processed snow road, ice-capped snow road and artificial snow road. The processed snow road is similar to the compacted snow road defined earlier, except the snow is agitated or "processed" (such as running it through a snowblower) to reduce the size of the particles before compaction. It has been found the smaller the snow particles, the more contact points there are per unit volume and the stronger the resulting compacted snow mass. An ice-capped snow road is either compacted or processed snow road on which water has



Compacted Snow Roads Make Up Most Of The Winter Road System In The Northwest Territories.



The Rest Of The Winter Road System Is Made Up of Ice Roads, or Winter Roads On Ice.

been sprayed on the surface to bond snow particles and give added stability to the roadway. Finally, artificial snow roads are compacted snow roads built of artificial or manufactured snow hauled and dumped into place or manufactured on site. They are normally built for very specialized purposes such as pipeline construction when there is a severe lack of snow, when delays would be costly and the extra cost can be justified.

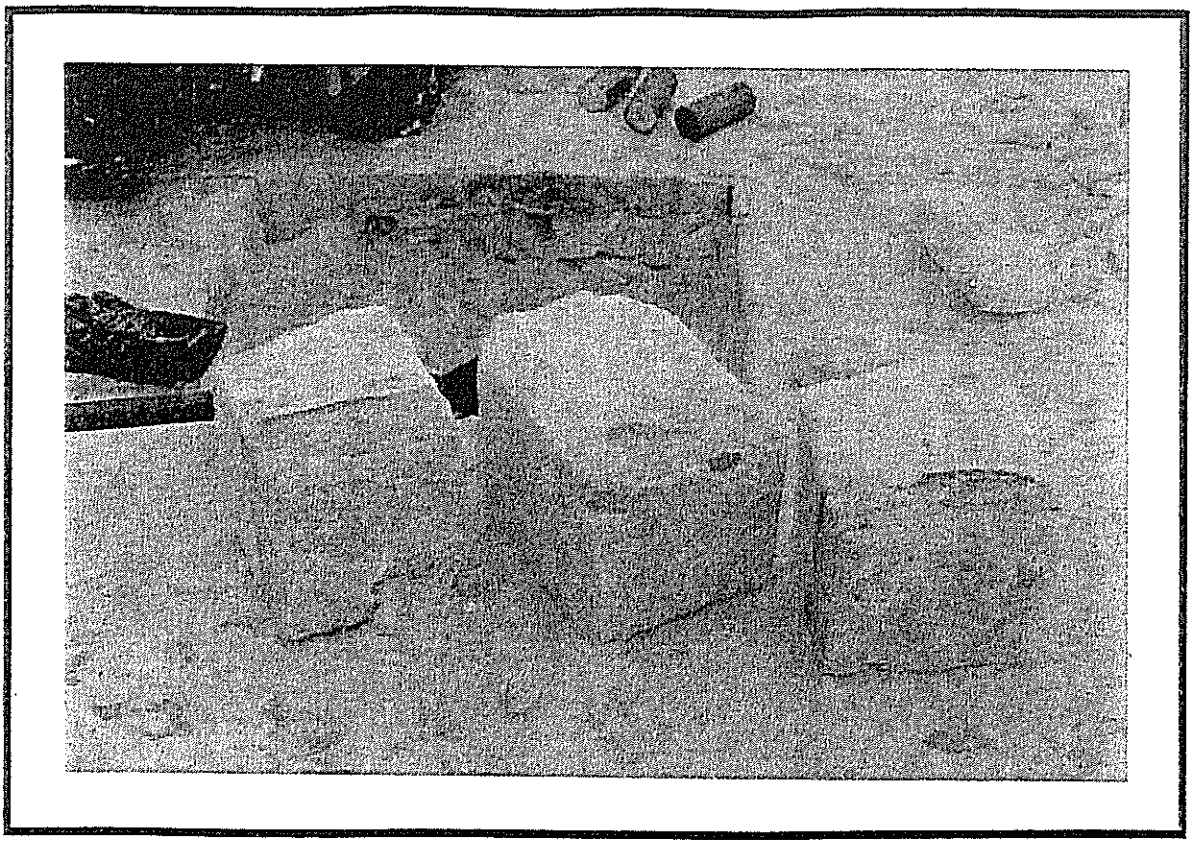
There are also four types of ice roads: winter roads on ice, solid ice roads, aggregate ice roads, and ice bridges. The winter road on ice or "ice road" as referred to by Department of Transportation personnel is a winter road built on the surface of frozen lakes or rivers, as distinguished earlier from the solid ice road formed over land by sprinkling or hosing water onto the ground surface. Aggregate ice roads are built of crushed ice (ice aggregate) hauled and end-dumped into place. Water is sprinkled or sprayed onto the surface once the road is shaped to bond the aggregate particles together. Ice bridges are natural or artificially thickened or strengthened ice surfaces used at river crossings.

2.2 Planning is Good for the Environment

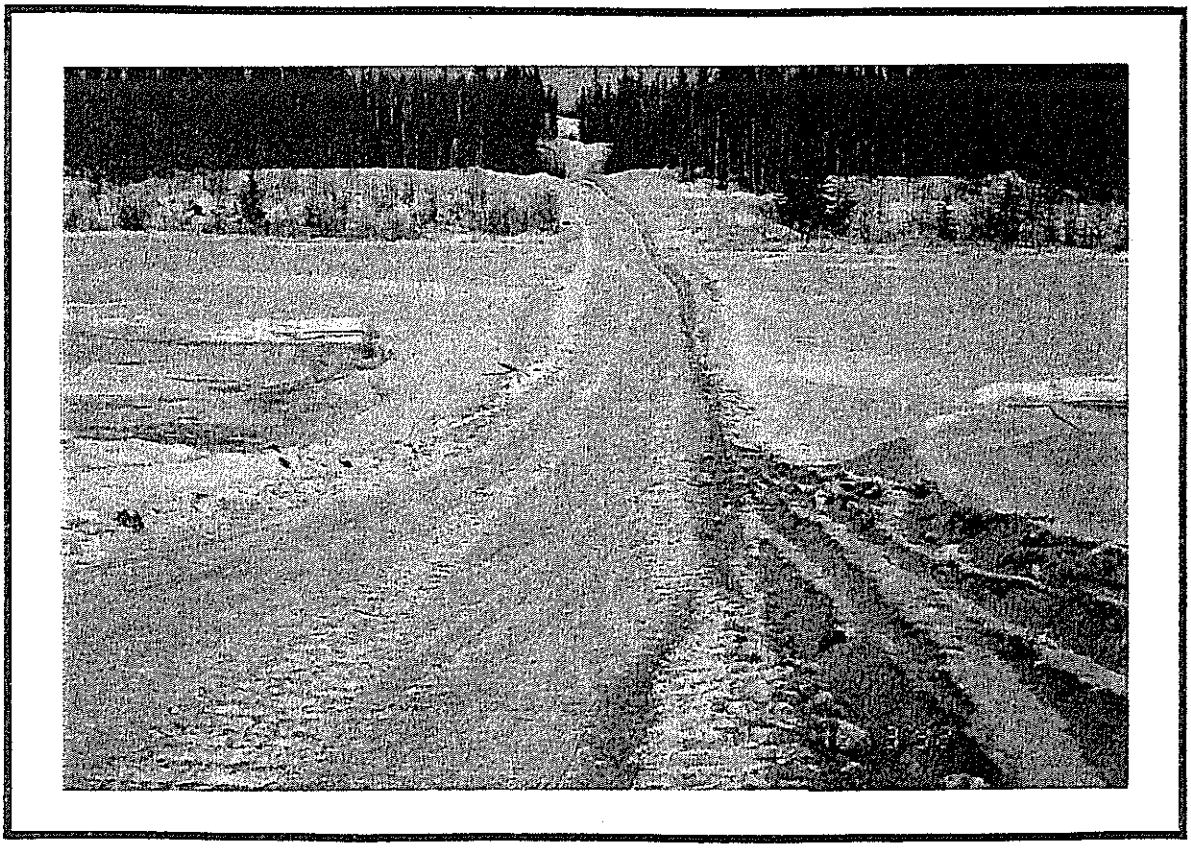
It is important to first determine the best route for a new winter road and then to minimize environmental damage along that route. It is possible, of course, to minimize environmental damage even along the worst possible route - that is, to minimize environmental damage along a maximum damage route. Therefore, **it should be apparent that good planning must be carried out to make minimizing environmental damage a meaningful objective.**

2.3 Planning a New Right-of-way

In order to properly plan a new winter road right-of-way, 1:50,000 topographic map sheets should be purchased and pasted together to form a large scale map of the area of interest. If 1:50,000 maps are not available, 1:250,000 topographic maps can be used. The latest aerial photography for the area of interest should also be obtained. All areas of Canada have been flown at one time or another, and air photos can be obtained from the National Air Photo Library, 613 Booth Street, Ottawa, Ontario, K1A 0E9. Phone (613- 995-4560). If the photos are old, talk to people familiar with the area such as Land Use officials in your area that can add information. Using the aerial photographs and topographic data on the maps, alternate routes should be sketched onto the map in pencil between the possible starting points and the end point. Normally, a straight line between the two points is drawn representing the shortest possible route. Some of the things you should look for in choosing alternate winter road rights-of-way are:



Ice-Capped Snow Roads Are Compacted Snow Roads With Water Applied To The Surface.



Ice Bridges Provide River Crossings by Providing Naturally or Artificially Thickened or Strengthened Ice Surfaces

o Take advantage of existing cut lines or trails that exist.

o **Minimize the number of creek or river crossings, as this is where most environmental damage occurs.**

o At creeks, rivers and lakes attempt to choose land to ice surface interfaces where the banks are low, and approaches are flat or gently sloped. Approaches to long water crossings or to shore should not be at right angles to shore, so that waves set up by moving vehicles do not reflect back towards the vehicle.

o Avoid known boulder fields, unstable terrain, cliffs, swamps and heavily wooded areas or other features that make construction more difficult and costly.

o Use DIAND Land Use Information Series maps to provide information on renewable resources and related human activities. Before finalizing a route, check with wildlife and heritage resource officials to avoid potential conflicts. Avoid such areas if known or identified.

o Consult with communities potentially affected by a new route or realignment.

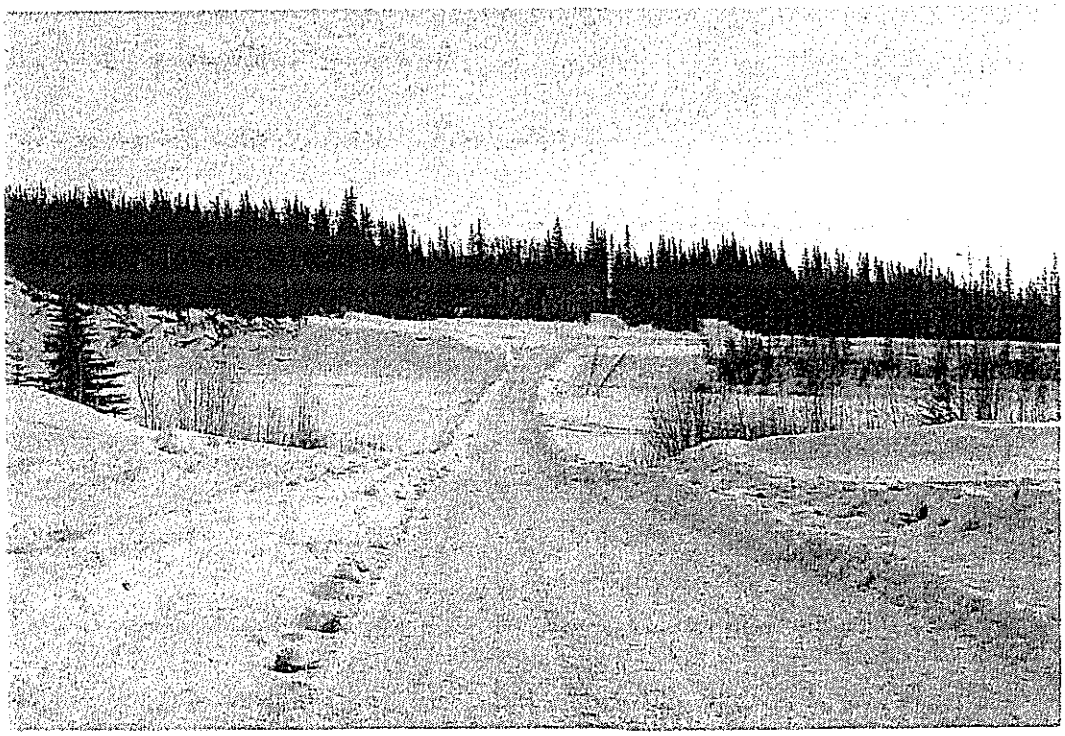
o Avoid steep slopes (greater than about 8%) and cross slopes.

o Take advantage of lake surfaces that would minimize clearing costs and reduce terrain impacts.

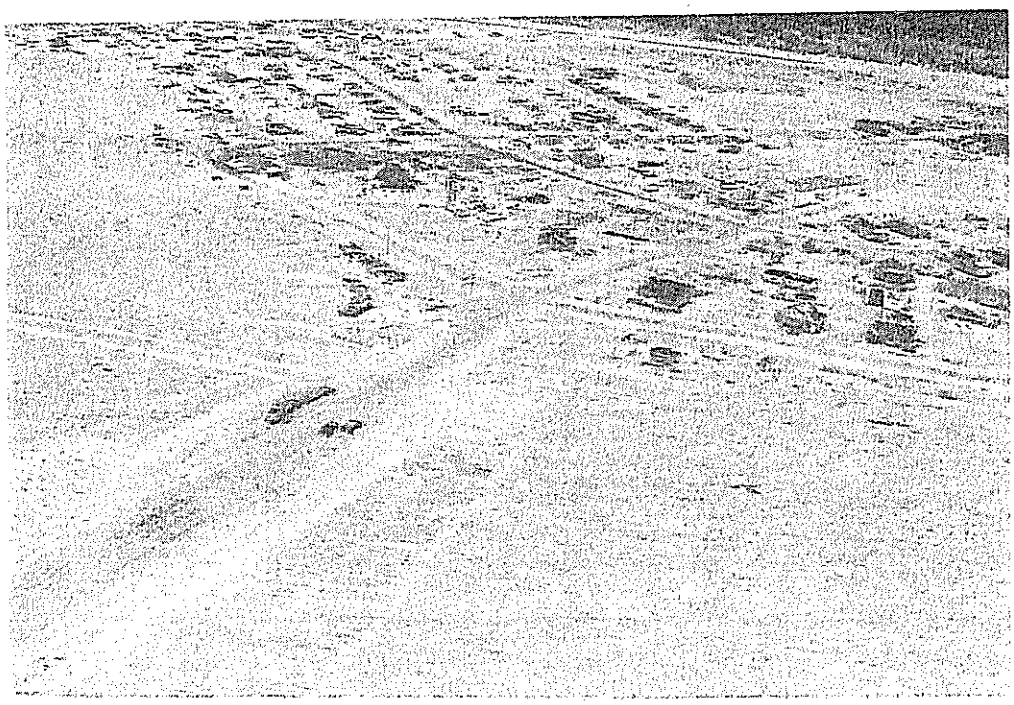
o Angle approaches to shore when approaching lakes or use a curve to minimize visual impacts.

Summer field reconnaissance, preferably by helicopter, should be used to adjust the route to avoid problems not obvious from maps and aerial photographs. Winter reconnaissance can often help identify better river crossings. Transportation Engineering Division should be consulted to avoid engineering problems requiring their expertise and assistance. Jurisdiction of the land to be crossed should be established and complete familiarity with the regulations will be required of all supervisory personnel. Contact the local Land Use Officer to obtain information of past problems with roads in the area, the location of special areas such as game sanctuaries and archaeological sites, and recommendations as to other information sources and persons knowledgeable of the area.

Once the best alternatives (normally at least three) have been identified, write down the pros and cons of each route including economic, socio-economic and environmental considerations. From this, the best alternative will normally be evident. The Department of Transportation may be requested to attend a regulatory or environmental assessment review panel hearing to defend a proposed route.



At Creeks, Rivers and Lakes Choose Shorelines Where Banks Are Low & Approaches Are Gentle, as Shown in the Foreground.



Consult With Communities Potentially Affected By a New Route or Realignment

It is advisable to contact the Department of Fisheries and Oceans (DFO) as early as possible in the planning stage to advise as to the suitability of crossing sites and/or the requirement for collection of site specific fisheries information.

The Department of Transportation is required to submit a plan showing the proposed route to the DIAND Land Resources Section where applicable, before permission is granted to construct a winter road. The District Superintendent will normally establish a contingency plan for alternate routes or road types in case unexpected field conditions are encountered.

2.4 Planning for Winter Road Construction

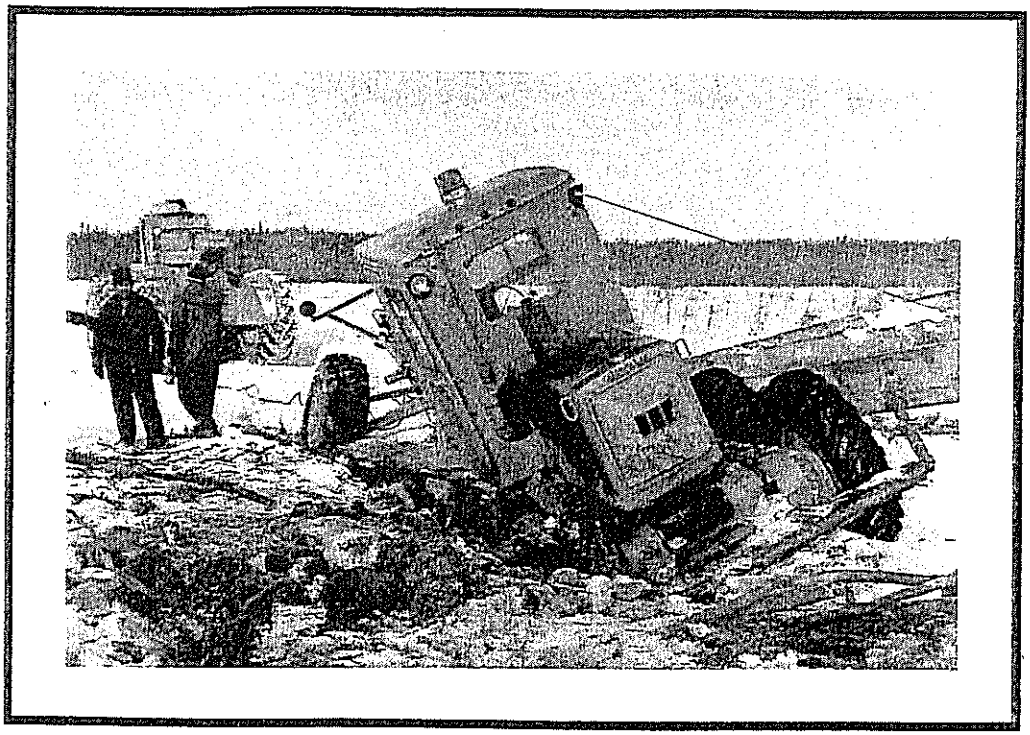
Whether on a new right-of-way or an existing right-of-way, some planning for a new season of winter road building is necessary. At minimum, a staff meeting of all those involved in the upcoming winter road season should take place to ensure: areas of responsibility are defined and known; new staff are trained and given specific instructions; and, that the chain of command is known and understood. In addition, all known problem areas for each segment of road should be identified and discussed as how to best overcome difficulties and how to minimize environmental damage.

The following sections deal with planning considerations that should be taken into account primarily before, but oftentimes during the winter road season.

2.4.1 Sensitive Areas

Most sensitive areas should normally be avoided in the initial routing of the winter road right-of-way. However, if they have not been avoided and are on or adjacent to the existing right-of-way, special care may be necessary to avoid unnecessary environmental damage. Ice-rich soils are probably one of the most sensitive areas requiring special attention during winter road construction. Sensitive terrain can normally be identified on aerial photographs by an experienced terrain analyst. Pingos, ice-wedge polygons, thermokarst and other permafrost features are normally easily identified. Ground ice is not always identifiable from surface features, and boreholes and a geotechnical investigation are normally required to identify it.

Other sensitive areas relate to fish and wildlife. Such areas are normally known by Department of Fisheries and Oceans personnel or wildlife staff within the Wildlife Section of Department of Renewable Resources, GNWT or Environment Canada. They will usually be able to tell you when to avoid certain areas or provide windows for construction and/or operation of winter roads through the area which will minimize disturbance of fish or game.



Starting Winter Roads Too Early in the Fall,

Or, Using Them Too Late In the Spring
Is Generally the Cause of Most Environmental Damage.

2.4.2 Schedule

In general, keeping environmental impacts to a minimum on winter roads after good planning depends more on schedule than any other single factor. **Starting winter road construction too early in the fall or trying to maintain winter roads too late in the spring will lead to severe terrain damage even in non-permafrost areas.** Terrain damage often will lead to erosion problems, sedimentation, possibly fisheries problems and aesthetic deterioration of an area. Keeping the roads open too late in the spring does not allow for sufficient time in the spring to effect closure of the winter road without resulting in unnecessary terrain damage.

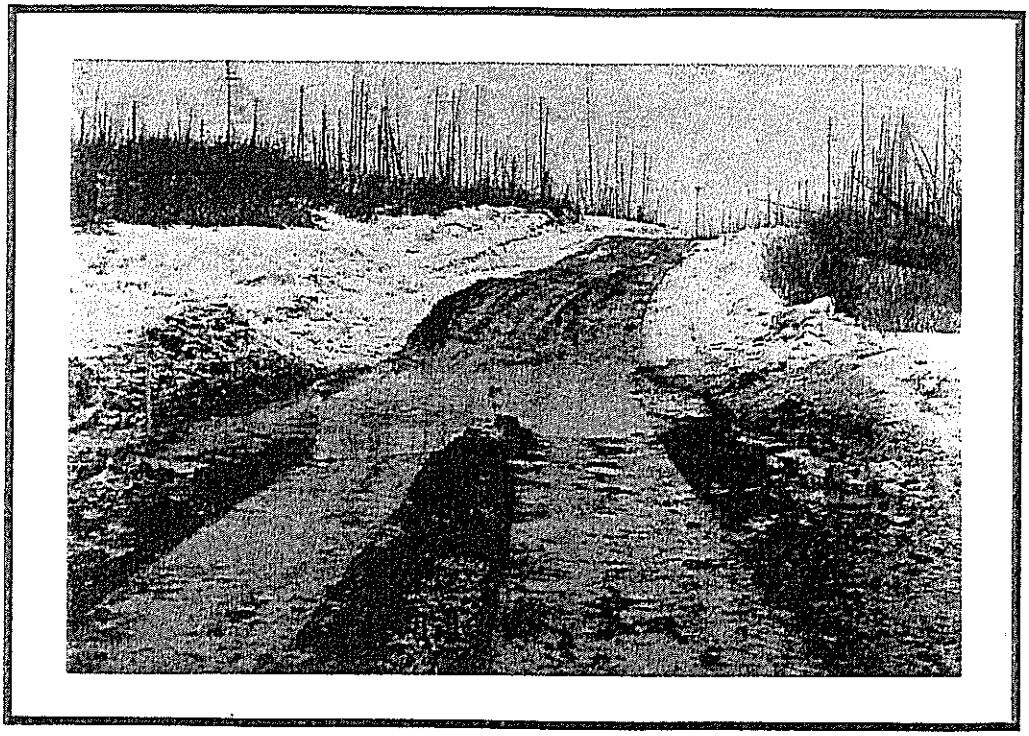
It is recognized there are advantages and disadvantages to having a flexible closing date based on environmental factors; or, for setting and publicizing a standard closure date in the spring. In either case, if it is found that cold weather exists and is forecast for a few additional days, the closure date can be extended. Presently, restricting travel to night-time only allows an estimated 4 or 5 day extension of travel. This 4 or 5 days is about the same length of time it takes to complete closure, which suggests the night-time only period be used to effect closure. Otherwise, the total winter road closure is undertaken when no-one should actually be on the winter road. This is when the bulk of terrain damage and resulting environmental impact will occur.

The advantage of a pre-set or "target" **beginning and ending date of the winter road season is it allows tentative scheduling a year in advance.** It allows the public and all healers to be notified of the dates, and it would reduce the annual problem of public and political pressure to keep the roads open until the last possible moment. **It may also allow a more effective job of closure of the winter road system, prior to the time that unnecessary terrain damage and environmental consequences result.**

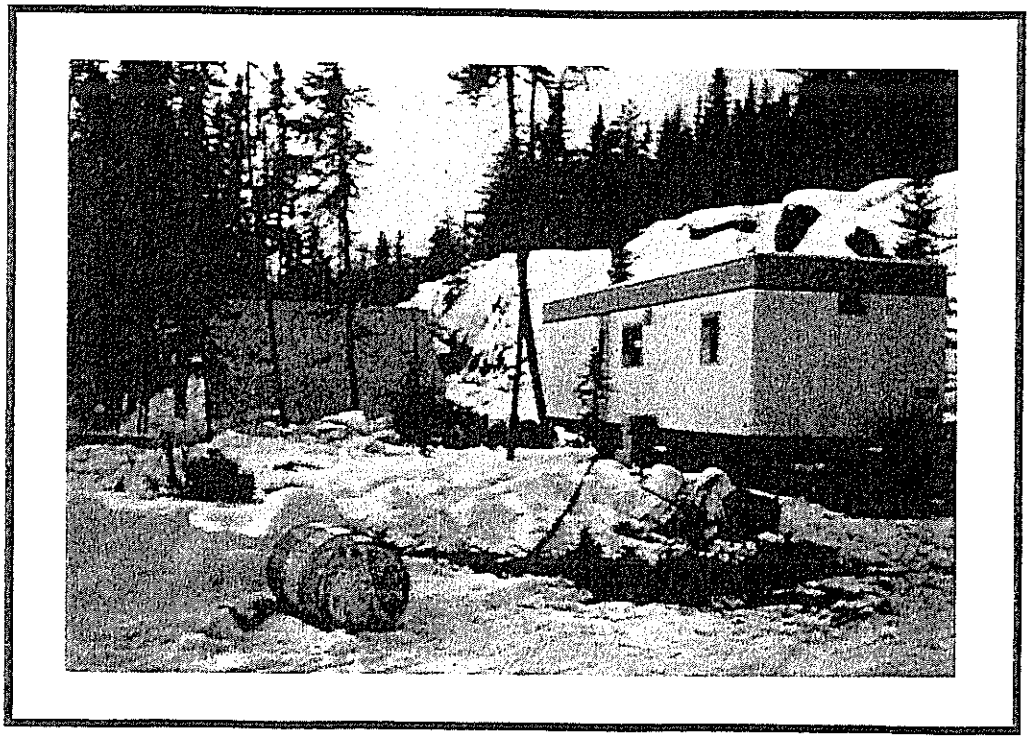
2.4.3 Camps

Camps are often located near streams to provide a good water supply and for aesthetic purposes. New campsites should be avoided and old campsites used, if possible. **When a new campsite is necessary, it should be located with a substantial set-back from a lake, river or stream (min. 30 m) and set on a compacted snow pad or gravel or sand to withstand the heavy use.** Slightly elevated sites are best, as they will tend to drain and remain dry.

Proper planning is necessary to ensure **camp garbage will be disposed of properly, which generally means provision for removal to an approved disposal site; burning; or, burial.** Garbage not disposed of properly attracts wildlife which is dangerous to the



Allow Sufficient Time In Spring For Road Closure Without It Resulting In Unnecessary Terrain Damage.



Camps Should Be Set Back From Water Bodies And Garbage Properly Disposed Of Or Transported Out. This Camp Could Be Cleaned Up By Disposing of Tree Branches and Storing Fuel Containers Properly.

wildlife and possibly camp occupants. In small camps, burning of garbage should be take place at least daily. Burial of garbage is not always allowed by the Land Use Inspector, and burial should be avoided in permafrost areas. If a camp is to stay in the same place for more than 15 days, all sewage must be deposited into a properly located and designed lagoon or covered sump. Mobile camps do not require a sump or lagoon, because if installed for such a short period as 15 days more environmental damage would result from construction than without a sump or lagoon.

2.5 Summary of Environmental Guidelines for Planning Winter Roads

o Field personnel should have at hand together with these guidelines a copy of "A Field Guide to Ice Construction Safety", prepared by the Department of Transportation.

o It is important to know there are a wide range of types of winter roads; and, anyone working on winter roads should know the various options.

o Good planning must be carried out to minimize environmental damage.

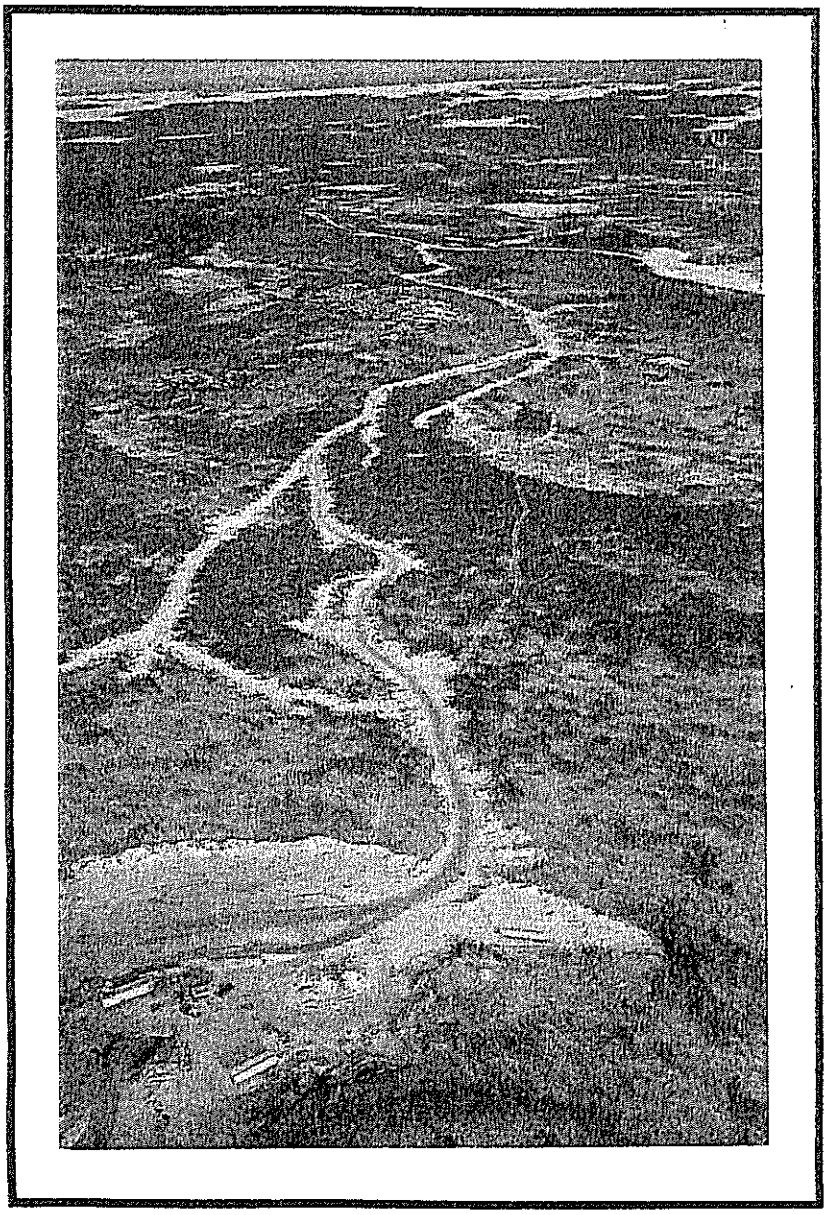
o When winter roads are being built over ice-rich soils it is important to use terrain-protective construction equipment. Also, it is more important here not to disturb the surface materials, remove or compress the organic insulating layer, and to ensure a minimum cover of compacted snow (normally 10 cm) covers the highest hummocks. Mushroom shoes on bladed vehicles are a protective measure for the terrain.

o Other sensitive areas relate to fish and wildlife. Such areas are normally known by Department of Fisheries and Oceans personnel or wildlife staff within the Wildlife Section of Department of Renewable Resources, GNWT or Environment Canada.

o Starting winter road construction too early in the fall or trying to maintain winter roads too late in the spring will lead to severe terrain damage even in non-permafrost areas.

o Allow sufficient time in the spring to effect closure of the winter road, without causing unnecessary terrain damage.

o The beginning and end of the winter road season could be tentatively scheduled a year in advance. This would allow DOT to do a more effective job of closure of the winter road system, prior to the time that unnecessary terrain damage and environmental consequences result.



Better Planning Initially Can Avoid Upgrading Later, Which Results in Numerous Abandoned Rights-of-Way.

o When a new campsite is necessary, it should be located with a substantial set-back from a lake, river or stream and set on a compacted snow pad or gravel or sand to withstand the heavy use.

o Camp garbage must be disposed of properly, which means removal to an approved disposal site; burning; or, burial.

CHAPTER 3.0
DESIGN AND CONSTRUCTION OF WINTER ICE ROADS

CHAPTER 3.0
DESIGN AND CONSTRUCTION
OF WINTER ROADS

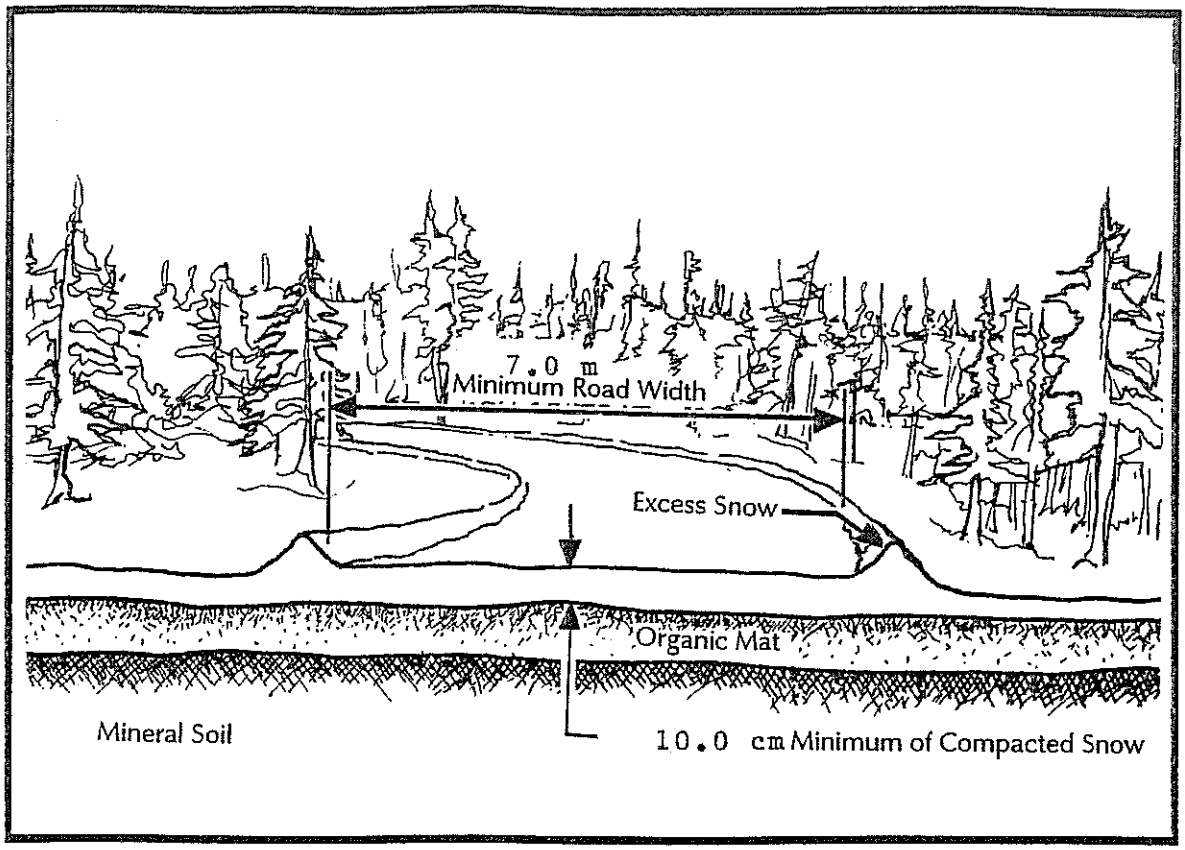
3.0 DESIGN AND CONSTRUCTION OF WINTER ROADS

3.1 Purpose of Design

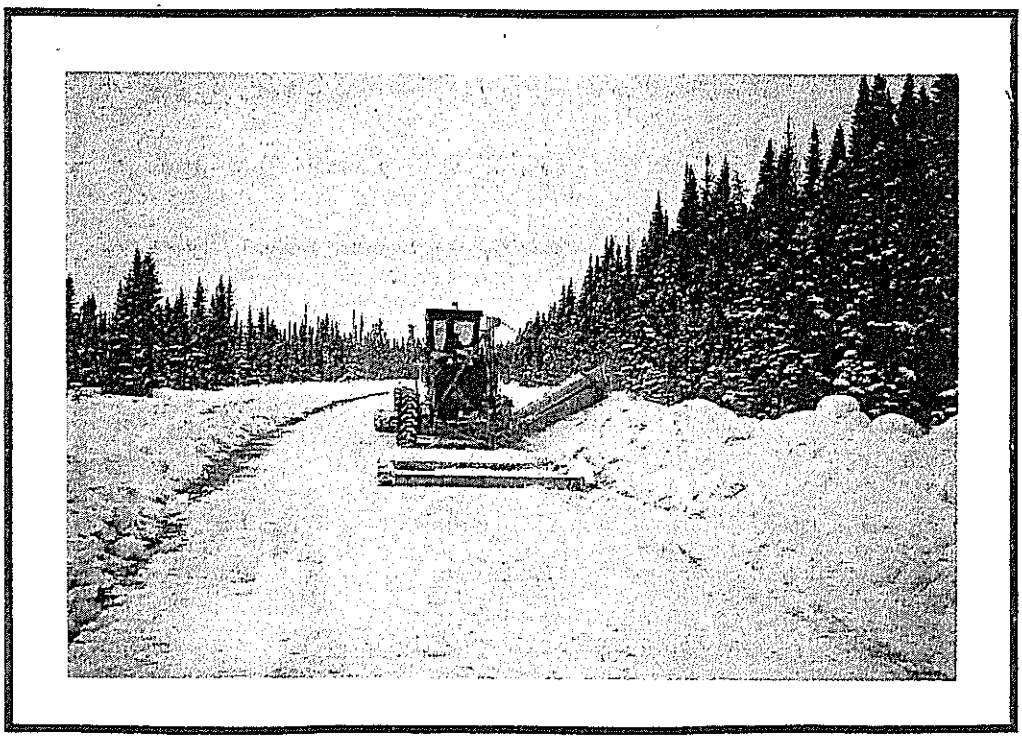
The purpose of designing a winter road is to provide road parameters (thickness, width, etc.) which protect the terrain; and, aid equipment operators during construction by giving them a more concise idea of what they are trying to in the field. Normally, all that is a required is a few typical sketches, as shown opposite. In general, what is required on a winter road is 10 cm of compacted snow over the highest hummocks along the right-of-way. Drawings of typical snow fills, culverts installations and temporary bridge installations at creek crossings should also be provided.

3.2 Choosing the Right Winter Road for the Job

Of the numerous types of winter roads discussed earlier, the GNWT winter roads are generally tending towards compacted snow roads and winter trails. When mineral soil and organics are mixed with snow windrows at the side of the right-of-way, some unnecessary terrain distrubance is occurring. In low snowfall years this is to be expected, but when there is lots of snow pushed off to both sides in windrows, the snow should be used more effectively. More of the snow should be compacted on the right-of-way and this would better protect the terrain and eliminate the mineral soil and organics that are mixed with the snow. It is recognized that this is more easily said than done, because there is a fine line in compacting snow that will strengthen under traffic as compared to being destroyed by traffic. The following section hopefully will help you to understand why certain things must be done as well as when they should be done in order to achieve the best results.



A Sketch Of A Typical Winter Road Design That Will Prevent Terrain Damage.



There Is A Fine Line In Compacting Snow That Will Strengthen Under Traffic As Compared To Being Destroyed.

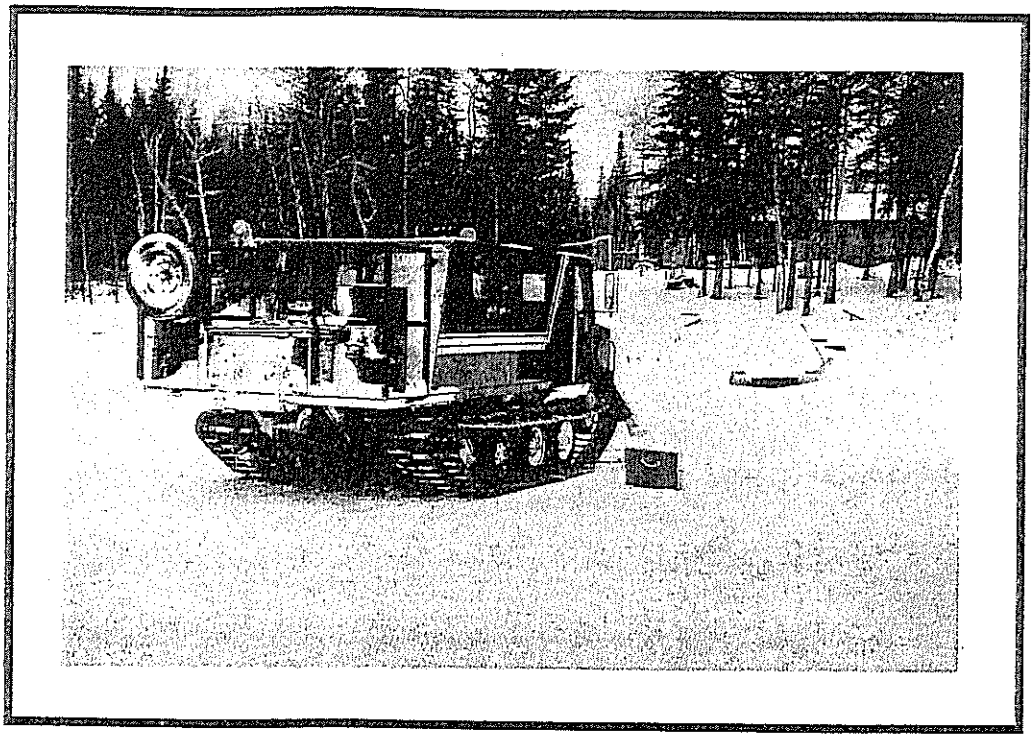
3.3 Tasks Involved in Constructing the Winter Road

On new rights-of-way, clearing of the right-of-way will be required. **Clearing activities should be limited to winter after the ground is well frozen.** This ensures most trees will break off at ground level without uprooting and destroying the vegetative mat when hit with a blade about 1 m above the ground. **Slash should be pushed to the edge of the right-of-way leaving a break between it and the natural forest. Breaks in the slash windrow should be placed every 50 m or so as wildlife crossings. Slash windrows should be tramped to reduce the volume. It is also important to ensure that slash materials are not left where they may enter into any watercourse.**

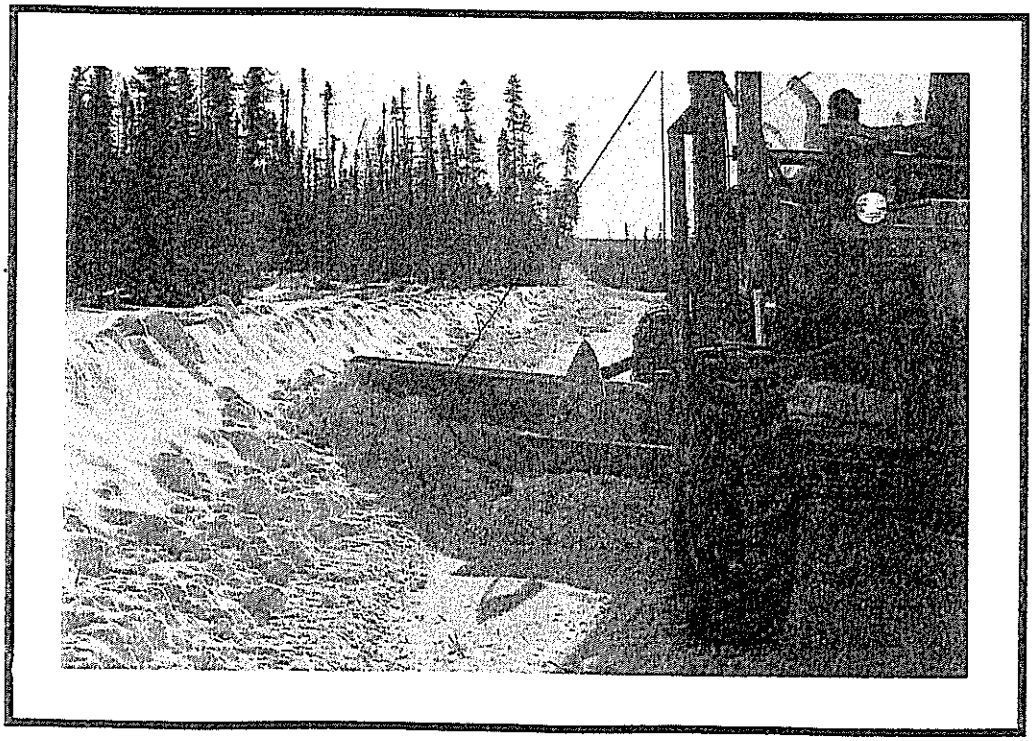
Leaving the start of construction of winter roads too late into winter is not often the best thing to do. **Particularly in high snowfall years, providing ice covers are thick enough to get light-weight vehicles across, there are advantages in tramping the snow to bring down its insulating effect.** This ensures the ground will freeze to a good depth prior to heavier equipment being necessary to remove the snow for example. Another advantage of doing this is to provide a better base on which to build up the snow road. The ideal time to do this tramping is when the temperatures are above normal. The warmer the snow, the higher its moisture content, and the better compaction and freezing if compacted at higher temperature. If snow is compacted near the melting point, nearly solid ice will result after cold temperatures resume. If snow is compacted in place on the right-of-way there would be less of it to windrow later on. Another way of stating this is that a given machine effort would be much better utilized in compacting the snow in place on the right-of-way rather than in removing it later. Another disadvantage of not beginning earlier is that by January, temperatures are so low and persistently cold that there will be very little free moisture in the snow. This makes compaction very difficult, if not in some cases virtually impossible, as in the High Arctic and Arctic Islands.

Generally, winter road construction should get under way when there is a minimum of 20 cm of snow. Tramping is effective even if there is only 5 to 10 cm. To achieve 10 cm of compacted snow over the highest hummocks, obviously more than 20 cm of snowfall would be required - at least 30 cm or more. In some areas, and in some years there may not be enough snow to do this.

In the case where there is not enough snow, all you can do is try to make the best use of the little snow that is available. This generally means the road will be rough. In critical locations, water can be sprinkled or hosed onto the road to build up a smoother running surface. Also, chipped ice or "ice aggregate" can be used to produce a level surface. However, use of water or ice aggregate and water over long segments of road would become prohibitively costly under normal circumstances.



Tramping Early Snow With Light-Weight Tracked Vehicles Will Compact the Snow And Induce Frost Penetration.



Too Much Snow Can Be Winged Off The Winter Road By Grader To Be Brought Back On Later And Compacted.

When there is too much snow, snow can be pushed off the road forming windrows along each side. Once a solid base is achieved, snow can be bladed-in by grader from the side windrows and used to fill depressions with drags and/or graders.

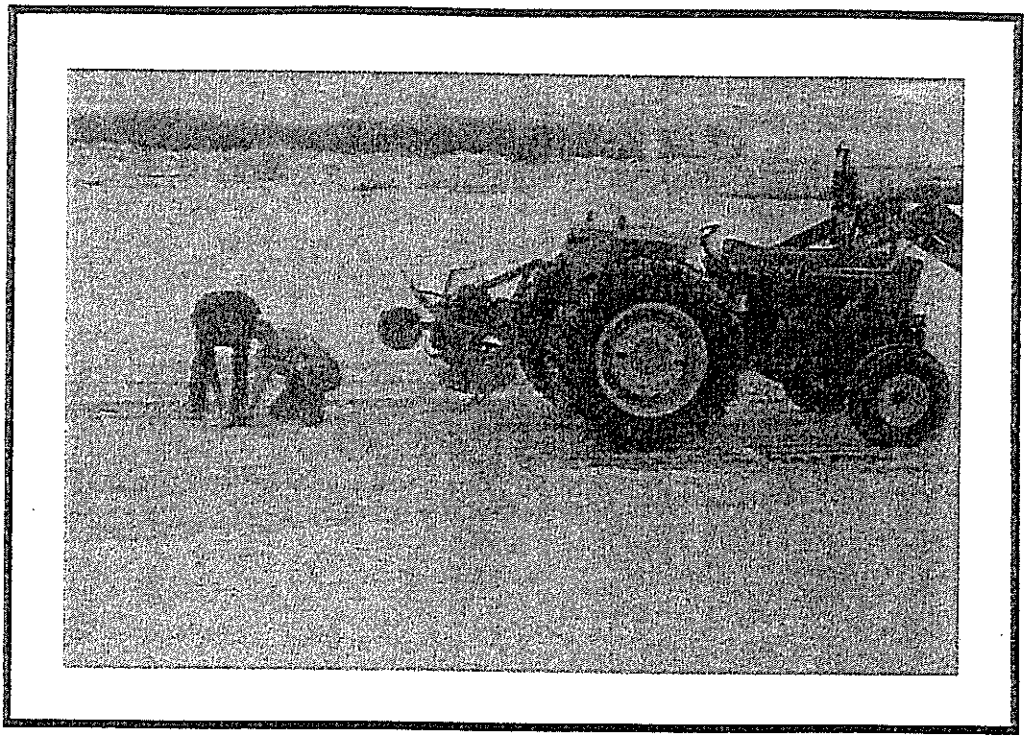
Major construction such as installation of a permanent bridge and cutting the grades of the valley slope such as has been completed at Seagrams Creek is not normally associated with winter roads. In fact, the procedure used is much more similar to permanent road construction and because of this, environmental guidelines and erosion control measures should be similar to those for permanent trail or access road construction. The reader is referred to "Environmental Operating Guidelines: Access Roads and Trails" published by DIAND (1990) and Environmental Guidelines For Access Roads and Water Crossings, Ministry of Natural Resources, Ontario. Some of the guidelines contained therein are repeated as part of the following sections.

3.4 Environmental Implications and Mitigative Measures

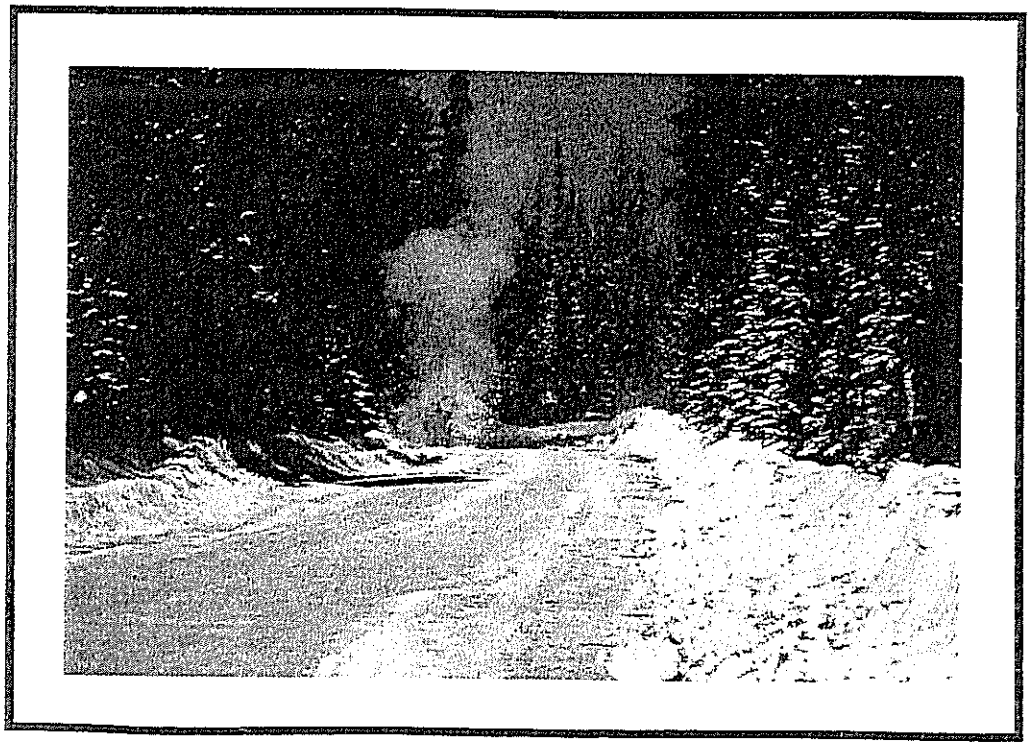
Given that the initial planning has been completed diligently, there are very few environmental impacts resulting from winter road construction if construction is done properly. Although winter roads are an alternative to all-weather roads that may reduce environmental impacts, **when they are being built over ice-rich soils it is important to use terrain-protective construction equipment. That is, low ground pressure vehicles with balloon tires or wide-track crawler tractors may be warranted. Also, it is more important here not to disturb the surface materials, remove or compress the organic insulating layer, and to ensure a minimum thickness of compacted snow covers the highest hummocks. Mushroom shoes on bladed vehicles can also be a protective measure for the terrain.**

Winter roads can be considered a mitigative measure in themselves for protecting the terrain against the wear and tear caused by wheeled vehicles. To provide this protection with winter roads, the compacted snow over the highest hummocks should be at least 10 cm thick and the low portions filled sufficiently to provide an acceptable road surface with respect to smoothness. In low snowfall years, attaining such standards may be impossible. In such cases, the little snow that is available must be used to best advantage. **Mitigative measures to be considered in low snowfall years are the use of water to spray or hose onto the roadway to build up a protective thickness of ice; the use of chipped ice or ice aggregate consolidated with water; and, collection of snow from snow collection areas or lakes and rivers.**

Another means of mitigating the condition of low snowfall, is to continually work toward upgrading the right-of-way so that a minimal amount of snow is required. For example, in Manitoba removal of boulders and rock outcrops has been undertaken for years. This reduces the amount of snow required on the right-of-way to build an acceptable winter road because the high points have been reduced by their removal. Likewise in severe



Too Little Snow Can Be Alleviated By The
Use Of Ice Aggregate For Special Purposes.



Less Snow Is Required If High Spots Such As
Small Rock Outcrops Are Removed By Blasting.

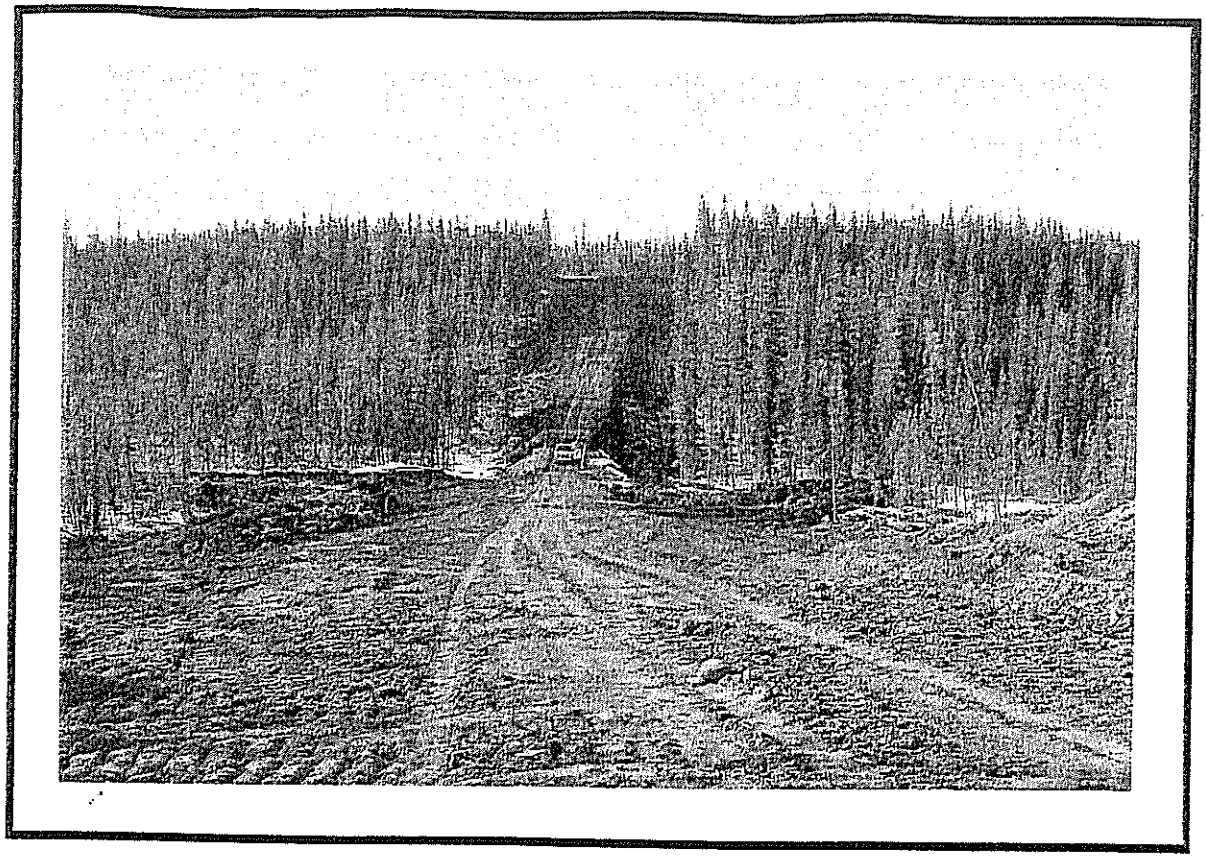
cases of rough terrain, there are cases where a permanent road grade has been built up so as to reduce or eliminate the need for snow as a fill material. However, if blasting is required for the removal of boulders and rock outcrops it should not be carried out within 15 metres of any water body that is not frozen to the bottom unless a Fisheries Authorization is obtained from DFO.

The environmental implications of building permanent bridges or culverts are many and more related to permanent road construction than normal winter road construction. Discussion on building permanent bridges or culverts follows under Design and Construction of River Crossings. In constructing cut back slopes at V-shaped valleys to improve grades, site lines and winter road construction, again the work is closer to permanent road construction than winter road construction. The greatest difference is that on winter road rights-of-way the work would normally be done in winter because access in summer would in most cases be impossible. However, because the environmental consequences of winter construction could be as serious in the following summer as summer construction, environmental guidelines of summer construction would be applicable. Two major problems could arise from cutting back slopes at V-shaped valleys: encountering ground ice; and, inducing erosion and sediment transport to the water body.

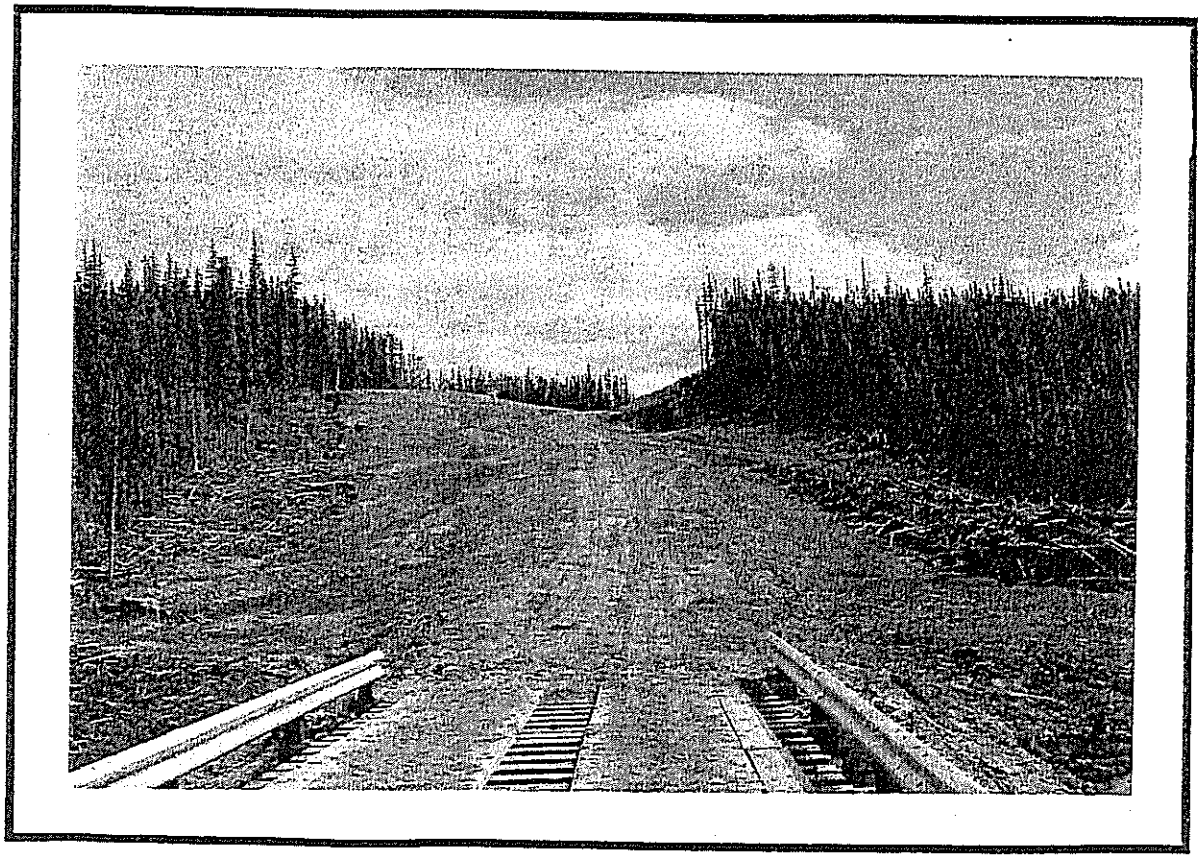
Any major work such as cutting back slopes and major excavation, should be preceded by a extensive drilling program. A drilling program will identify what soils will be encountered during the work, so erosion potential can be determined prior to opening up the slope. **More importantly, drilling will identify the likelihood of encountering ground ice and the possibility of initiating thermal erosion.** If ground ice is encountered, one option would be to expose it, allow it to melt and drain the following summer, but under supervision and with mitigative measures in place to control sediment from reaching the river. By exposing it late in the winter, and completing the work early in the following winter road season, use of the right-of-way may not be lost.

During excavation of earth materials to flatten slopes in V-shaped valleys at the river and on the approaches, materials should be excavated uphill, or away from the river. For instance, at the river a back-hoe should be used to pull material away from the river rather than having a bulldozer pushing material along and into the river or stream. Also, excavated materials should be pulled back up the hill as much as possible to keep loose material away from water. **Grading of the slopes, installation of a herring bone pattern of drains to carry drainage water into the forest mat, and a revegetation program preferably with fast-root-taking local varieties as early as possible in the spring following construction should be undertaken.** Otherwise, severe problems with erosion and sediment should be anticipated.

Eight principles of erosion and sediment control which can be used as mitigative measures have been identified (Ministry of Natural Resources, Ontario, 1988):



Major Work Such As Cutting Back Slopes At Creeks Should be Preceded By An Extensive Drilling Program



Seeding With Fast-Root-Taking Local Varieties Early In The Spring Following Construction Should Be Undertaken to Achieve Successful Revegetation as Shown.

o Fit the road to the terrain. This means avoid erodible soil sites; follow the ground contours as much as possible; and, do not construct deeper fills and cuts than the road standard requires.

o Minimize the duration of soil exposure. Complete the grading operation and revegetate as soon as possible.

o Retain existing vegetation where feasible. Grub only where construction will take place. Re-establishment of comparable ground coverage after construction can take a long time.

o Grade disturbed soil to a stable slope. A slope which is too steep to be stable will be unable to satisfactorily establish a vegetative cover until it has eroded back to a stable slope.

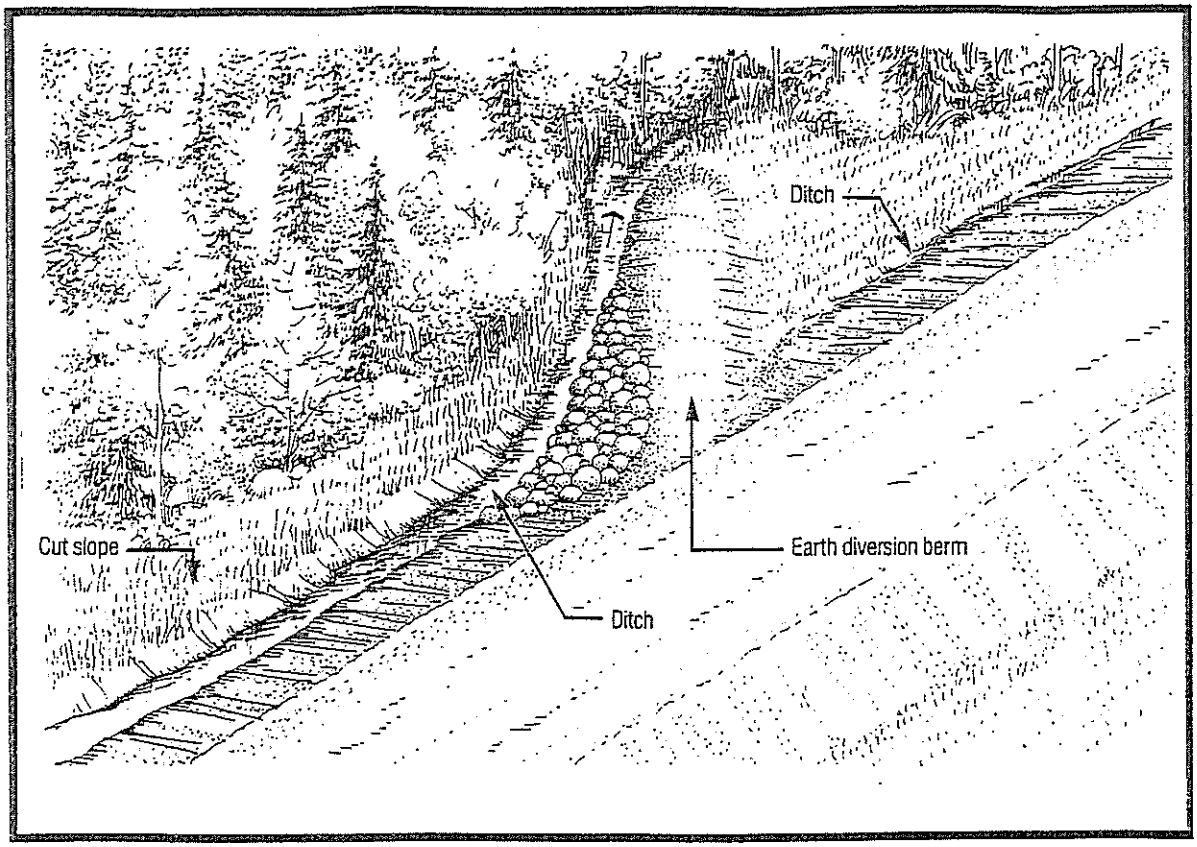
o Encourage re-vegetation. Re-vegetation will occur naturally if the slope is stable, but can be encouraged by leaving some organic material mixed in the upper-most soil layer; and, by seed or fertilizer treatments.

o Divert runoff away from exposed soil. Runoff collected along the disturbed right-of-way should be diverted to an outlet or into the forest mat off the right-of-way. The frequency of outlets should be designed to fit the ground slope involved and often will result in a "herring bone" drainage pattern.

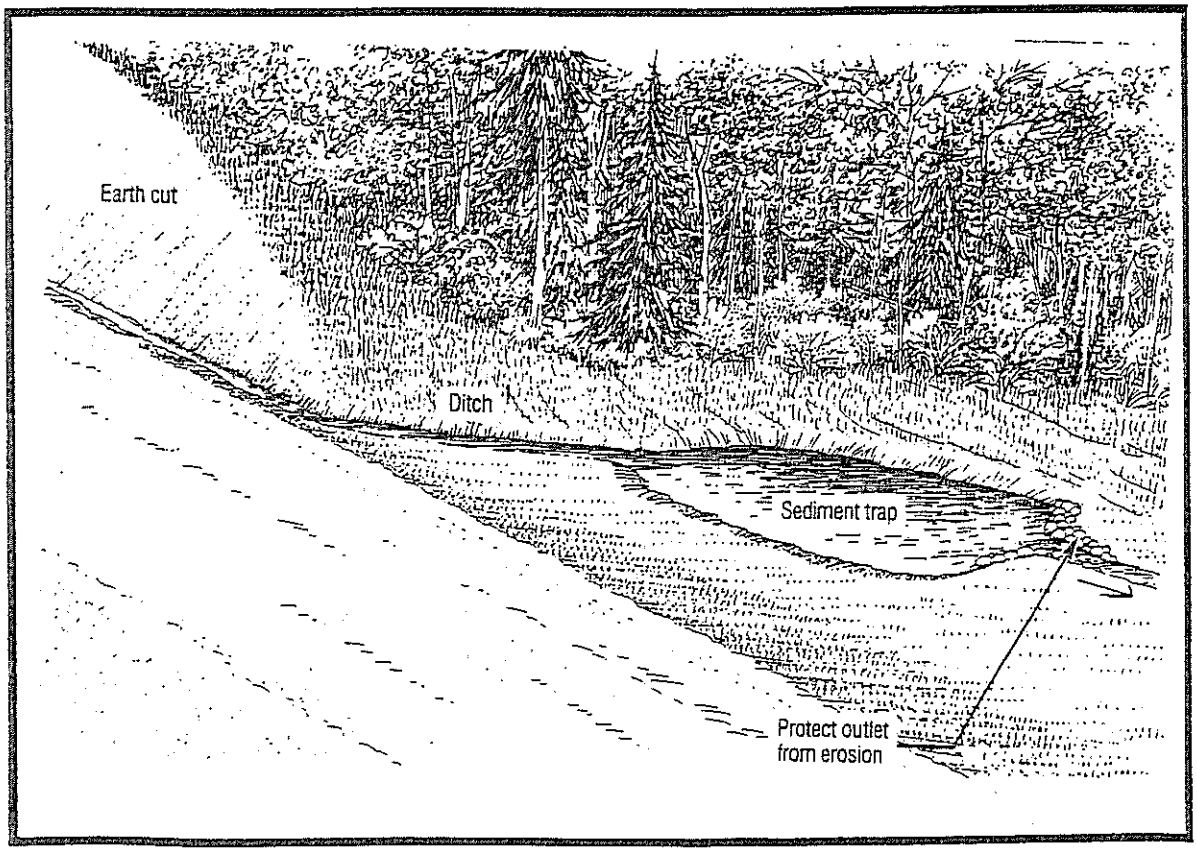
o Keep runoff velocities low to minimize the energy of flowing water. Low velocities can be induced by keeping the ditch slopes mild; lining erodible ditch bottoms with vegetation, riprap or brush; and, using check dams in ditch bottoms. Sizing the ditches to correspond with the area to be drained will tend to keep the ditch itself from eroding.

o Trap sediment before it can cause damage. Some erosion during construction is unavoidable, but it is desirable to trap sediment on land before it reaches the aquatic environment. Diverting flow onto the forest floor adjacent to the right-of-way is the most common method, where the sediment particles are filtered out through the surface vegetation and litter. Placement of a brush barrier made with slash debris on the lower slope area can also create a filter. Or, a silt fence made of geotextile fabric will pass the water through but retain the silt and sand. Sediment traps can also be made by excavating a depression downstream of the sediment source that will pond water so suspended soil can settle out. Granular material can also be used to fill gullies and slow erosion.

The reason it is so important to control erosion is that it leads to sedimentation, and possible destruction of fishery resources and habitat. In addition, it can decrease



Diverting Run-off Away From Exposed Soil And Onto The Forest Mat Aids In Preventing Erosion and Sedimentation.



Excavating Sediment Traps And Diverting The Effluent To The Forest Mat Is Even More Effective.

water quality through increased suspended solids and introduce other substances such as heavy metals, including mercury. Eroded soils carried into streams, rivers or lakes are often deposited on the bottom, which can cover and destroy fish eggs and spawning areas, or more generally degrade fish habitat.

3.5 Summary of Environmental Guidelines for Design and Construction of Winter Roads

o Clearing activities should be limited to winter after the ground is well frozen.

o Slash should be pushed to the edge of the right-of-way leaving a break between it and the natural forest.

o Breaks in the slash windrow should be placed every 50 m or so as wildlife crossings.

o Slash windrows should tramped to reduce the volume.

o Provide design sketches to machine operators so as to give them a better idea of what they are trying to build.

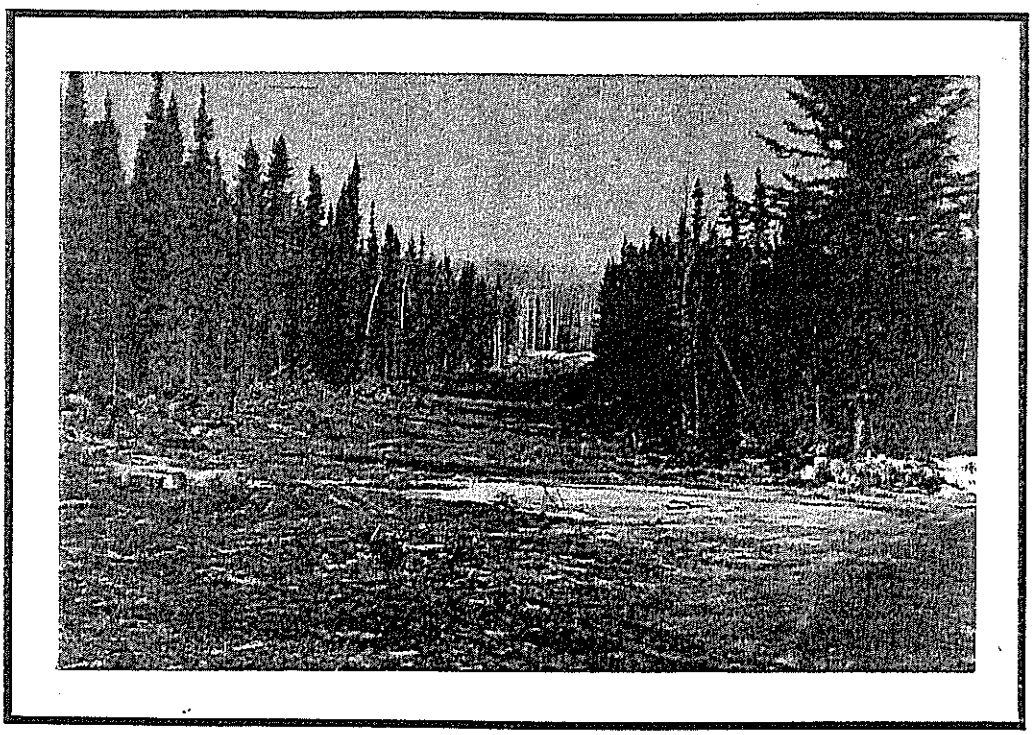
o Consider starting winter road construction much earlier in the year by compacting the snow on the right-of-way soon after significant snowfalls, first with snowmobiles and later with light-weight wide-track vehicles. By building up this base of snow, drags and blades used later will tend to cut and fill compacted snow rather than the mineral soil or organics. It must be recognized starting earlier is only practical where ice thicknesses are sufficient to permit crossing of lakes, rivers or streams.

o Another advantage of starting construction earlier is that roads could be closed earlier in the spring when most environmental damage from winter roads occurs.

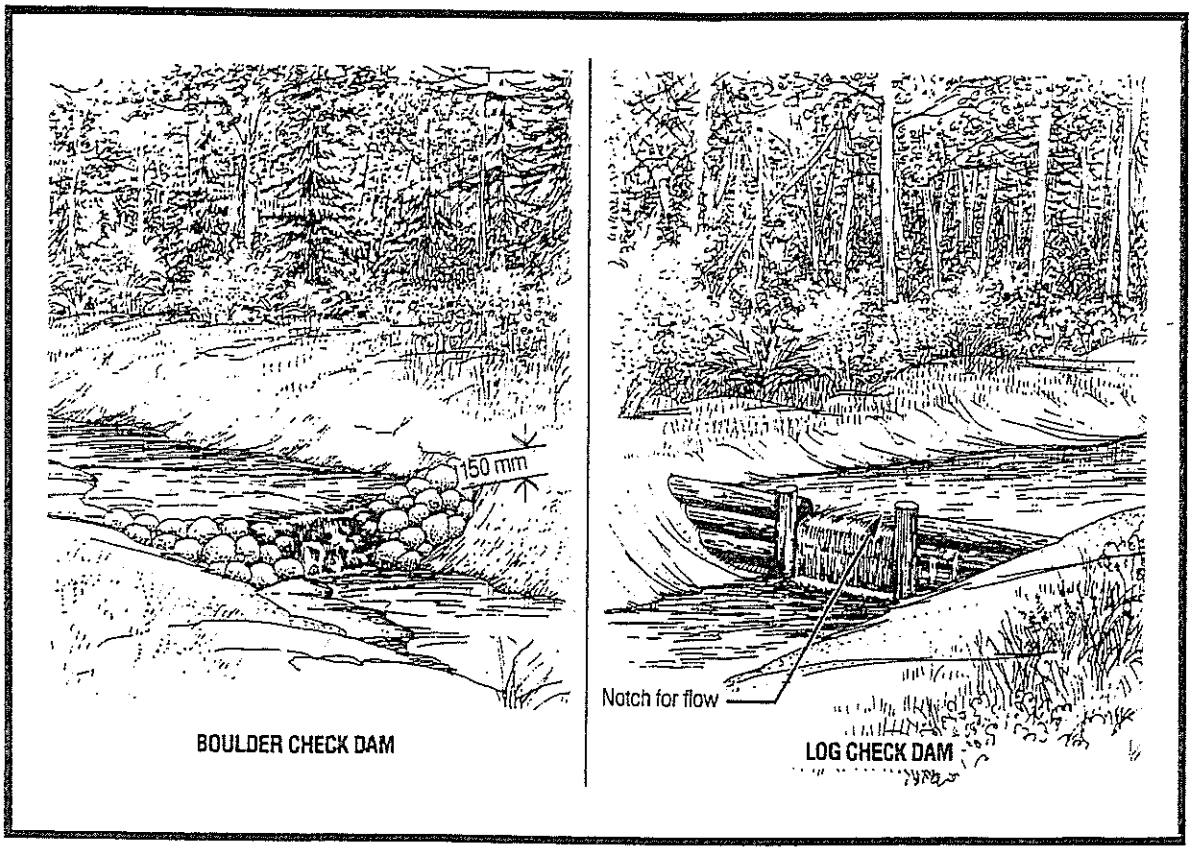
o Tramping the snow should begin as early as possible as soon as there is about 10 cm of snow on the right-of-way.

o In low snowfall years, a rough road may be inevitable, but options are to use water sprayed or hosed onto the roadway to build-up a protective thickness of ice; use chipped ice or ice aggregate consolidated with water to fill low spots; and, collect snow from snow collection areas or lakes and rivers to use as fill.

The environmental implications of cutting back slopes at V-shaped valleys are many and more related to permanent road construction than normal winter road construction.



**Clearing Activities Limited to Winter,
As This One Is, Are Best**



**Small Boulder or Log Dams Will Act As Good Sediment Traps
To Manage Surface Runoff or Drainage Ditches.**

However, because these construction activities have been incorporated into the winter road system in the NWT, some environmental guidelines that pertain are given below:

o Any major work similar to cutting back slopes at major creeks or rivers should be preceded by a extensive drilling program.

o During excavation of earth materials to flatten slopes in V-shaped valleys at the river and on the approaches, materials should be excavated uphill, or away from the river.

o Grading of the slopes, installation of a herring-bone pattern of drains to carry drainage water into the forest mat, and a revegetation program preferably with fast-root-taking local varieties as early as possible in the spring following construction should be undertaken.

o Know the eight principles of erosion and sediment control:

- Fit the road to the terrain;
- Minimize the duration of soil exposure;
- Retain existing vegetation where feasible;
- Grade disturbed soil to a stable slope;
- Encourage re-vegetation;
- Divert runoff away from exposed soil;
- Keep runoff velocities low; and,
- Trap sediment before it can cause damage.

CHAPTER 4.0
DESIGN AND CONSTRUCTION OF RIVER AND STREAM CROSSINGS

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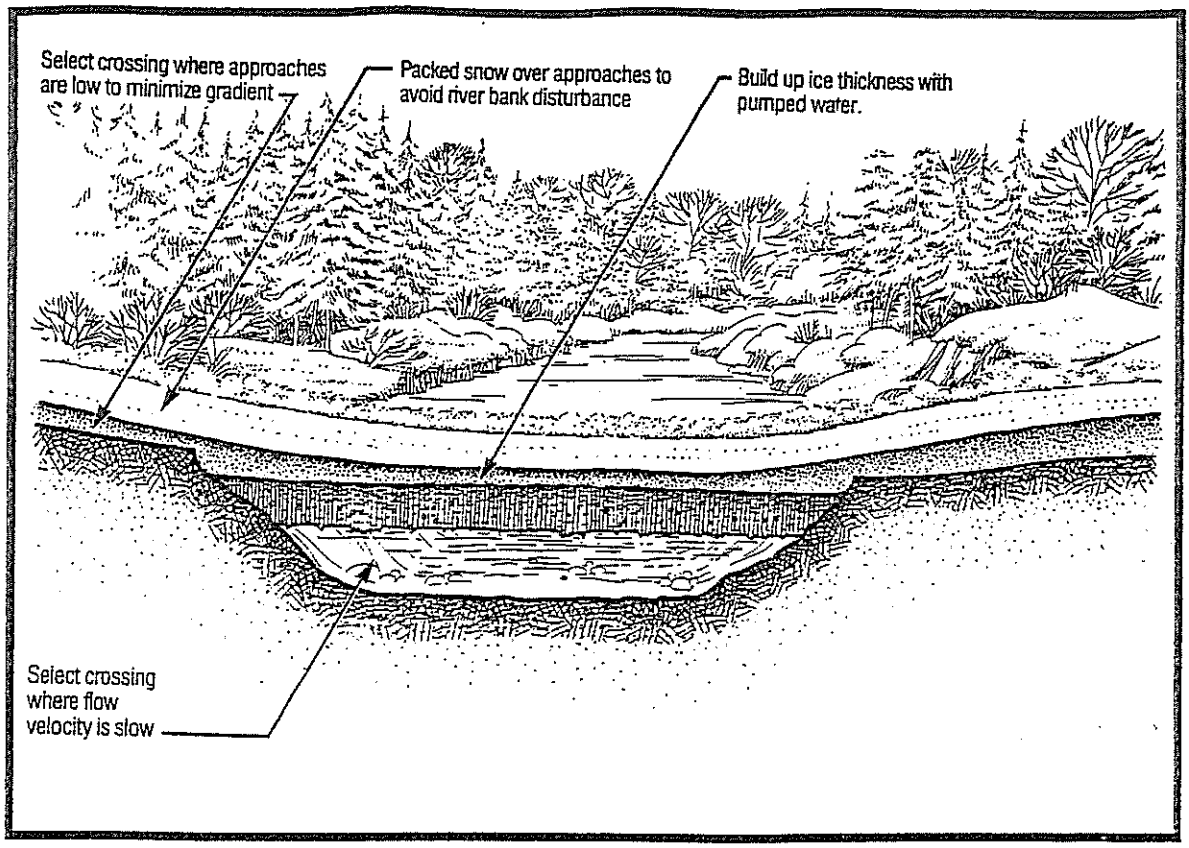
4.1 Purpose of Design of River and Stream Crossings

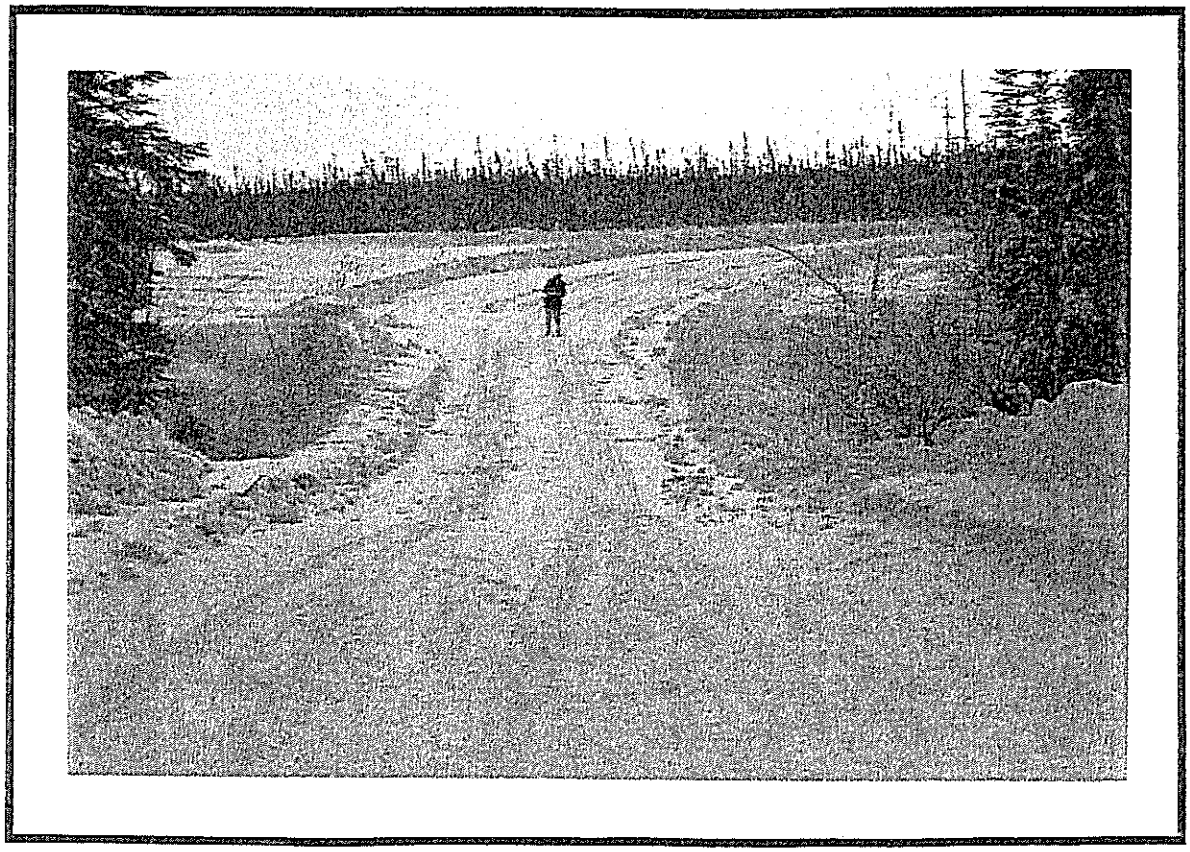
The purpose of designing river and stream crossings is to provide a drawing to aid equipment operators during construction by giving them some idea of what they are trying to achieve in the field. Normally all that is required is a few typical sketches, as shown opposite. In general, what is required are drawings of typical snow fills, culvert installations and temporary bridge installations at creek crossings. An excellent inventory of stream crossings exist in the "Stream Crossing Survey", Transportation Planning, DOT, March, 1992. (This Survey will eventually inventory the entire winter road network, but has been completed so far only from Wrigley to Norman Wells.) It describes each stream, the banks, the crossing and the site improvements as well as providing a picture and sketch of the crossing. It also comments on what needs to be done during closure.

4.2 Choosing the Right Type of Crossing for the Job

Where possible, it is best to use the natural stream or river ice thickness as the starting point for a stream or river crossing; then, build it up to the required thickness by flooding. Where this is not feasible, other types of crossings should be considered such as culverts, corduroy, culverts and corduroy, temporary bridges or even a permanent bridge. **Using several small diameter culverts is often preferable to a single large diameter culvert, so the shallow water depth is maintained, and stream breakouts do not occur.** Once the number of culverts exceed four or more, it is probably more efficient and less effort to use a temporary bridge. If the work in placing and removing a temporary bridge annually becomes excessive or if it means walking equipment across the stream, consideration might be given to positioning a permanent bridge.



Sketch of Ideal Ice Bridge Location and Construction.



Snowfills Are Useful In Streams That Are Dry or Freeze to the Bottom In Winter.

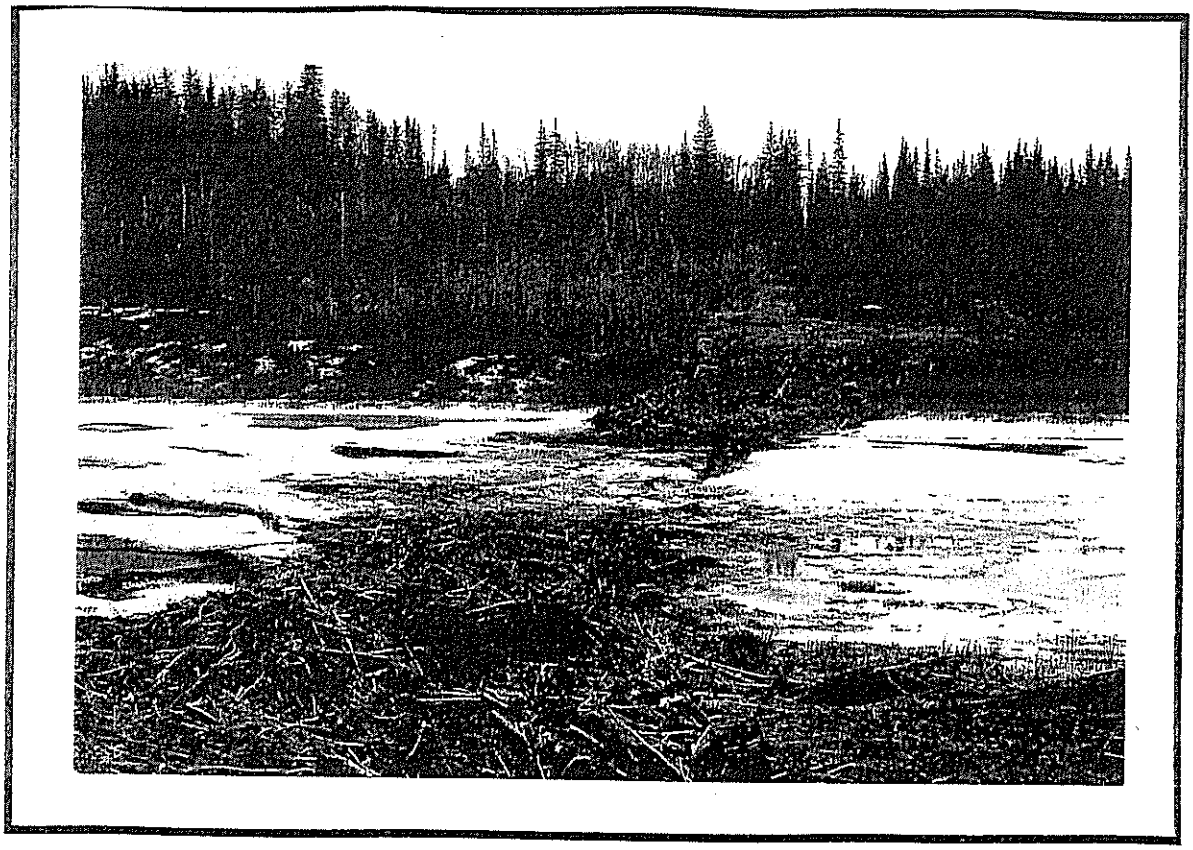
4.3 Construction of River and Stream Crossings

Where possible, it is best to use the natural stream or river ice thickness as the starting point for a stream or river crossing. Artificial thickening of the natural ice surface by flooding the surface in lifts is generally recommended, until a thickness is achieved that will carry the anticipated loads. Consult "A Field Guide to Ice Construction Safety" prepared by DOT for details of ice thickness versus load. Adding water to the surface increases the surface load, deflecting the natural ice towards the bottom, which can cut down the flow area causing water to backup and break out. Where this happens on a regular basis, other types of crossings should be considered such as culverts, temporary bridges or even a permanent bridge.

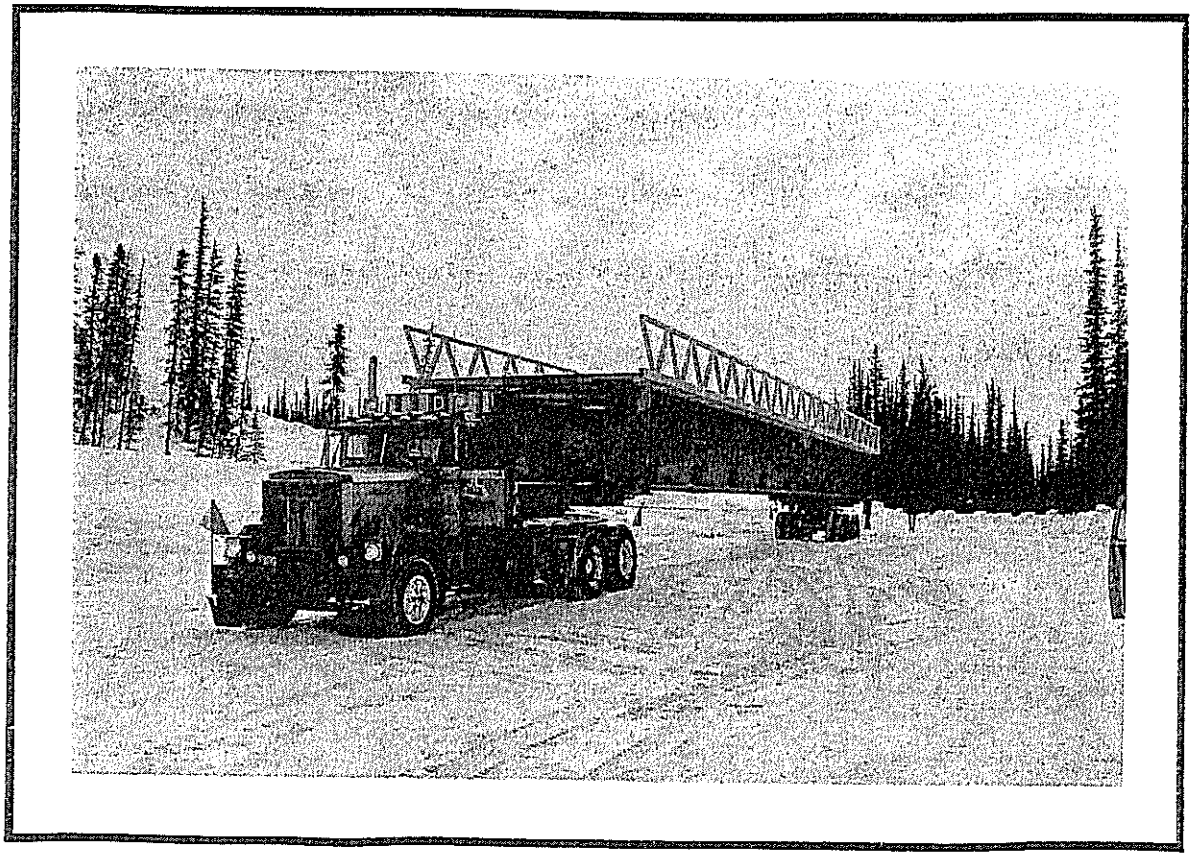
On streams that freeze to the bottom, snow fills can be used to provide a smooth crossing. Even where culverts, corduroy, culverts in combination with corduroy, or temporary bridges are used, snow fills should be used for cover or approaches. **Soil should not be used as fill material in rivers and streams.** If it is ever contemplated, even under emergency conditions **the Department of Fisheries and Oceans should be contacted prior to deposition of any extraneous material, including corduroy, into a river or stream. Snow collection areas should be used to ensure sufficient snow. A minimum buffer of at least 10 m between the clearing and any water body is recommended. A Land Use Permit is required for any in-stream or off-right-of-way activity, which can be obtained from DIAND.**

Some streams at least in certain locations never develop a solid ice cover no matter how cold the temperature gets. Such creeks on a winter road system can require special attention on an annual basis. In such cases, a culvert or a few culverts are laid in the creek bottom with long corduroy packed around the culvert(s). In cases where the stream is not used by fish, the corduroy can be left in the stream from year to year. Normally, the culverts and corduroy logs should be removed in spring as part of closure of the winter road or anchored by chains so they can be retrieved later so as to not block a stream. Since mineral soil cannot be used as fill, snow is packed over the corduroy, watered down and allowed to freeze resulting in a fairly smooth and efficient crossing.

The use of temporary structural single-lane steel bridges on winter roads is peculiar to the DOT winter roads in the NWT. They are presently in use at several crossings each winter. Use of dimensional timber or natural timber has been used for relatively short spans throughout Canada. They are particularly common for crossing pressure ridges on large lakes. Permanent bridges on winter roads are normally used only when absolutely necessary or when they are going to be incorporated into a permanent road system. They should be designed in the same manner and detail as any highway bridge, because it is the river characteristics and loads, not whether the road is temporary or permanent that is significant in the design. Permanent bridges require permanent foundations and normally require permanent approaches. In at least one case, a



Mineral Soil Or Other Foreign Materials Should Not Be Used In Rivers Or Streams.



Use Of Structural Single-Lane Bridges Is Unique To DOT's Winter Roads In the Northwest Territories.

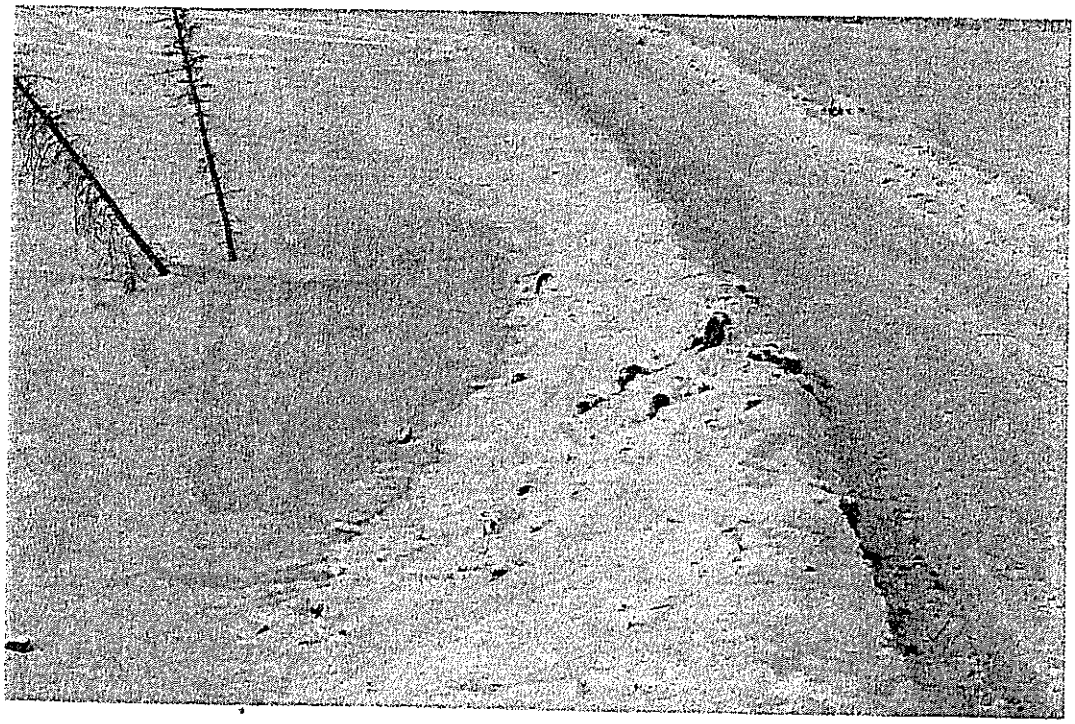
single-lane permanent bridge was constructed and the slopes on both sides of the valley have been flattened from about 18% grade down to about 12% grade. This bridge was justified on the basis of a severe overflow problem; poor vertical alignment because of the extremely steep V-shaped valley causing the dangerous meeting condition at the bottom; and, the fact that considerable damage resulted from putting in and taking out the temporary bridge annually.

Permanent bridges and culverts on winter roads are used in the NWT and other locations in Canada. **For streams which are used for fish migrating or spawning areas, permanent bridges or arch culverts, which retain the natural stream bottom and slope, are preferred over pipe culverts.** Permanent bridge structures normally would involve crib or pile-supported abutments, with single spans or multiple spans involving piers in the river. Cofferdams for bridge construction should not block more than one third of the stream at a time. Restrict clearing width, and do not grub the right-of-way between the road and bush line within 100 metres of the waterway. Preserve the vegetative cover as long as possible. Waste debris from grubbing should be hauled back and disposed of more than 100 metres from the waterway. Every effort should be made to complete water crossing construction as quickly as possible once the work begins. Limiting the duration tends to limit the environmental consequences.

Construction of water crossings should not take place during spawning or incubation periods or major fish migration periods, as determined by DFO. Work should be scheduled for the driest time of year, normally in winter or late summer. Borrow material should not be excavated from the watercourse; and, equipment and materials should be stored well back from the water's edge. Pump water should outlet into vegetative areas for filtering during de-watering operations. Equipment crossings of the river should be minimized, or eliminated by construction of a temporary bridge. If fording is necessary, water depth should be less than one metre. Approaches should be stabilized with non-erodible material to 15 metres up the bank on both sides of the ford. The natural carrying capacity of the stream bed can be increased by constructing an underwater roadbed using coarse gravel, rock fill, gabions or precast concrete. Authorization to do so would be required from DFO. The finished roadbed should be kept flush with the stream bottom to prevent erosion and permit fish passage. In no case should the water depth be restricted to 200 mm or less. The ford should not be used during fish spawning, incubation or migration periods. Any equipment crossing the ford should be mechanically sound with no oil or gas leaks.

For pier construction in open water, in which there are erodible river bottom sediments and where water quality must be protected, silt barrier curtains floating on the surface and anchored to the bottom should be installed around the work area.

Permanent Bridges On Winter Roads Should Be Properly Designed & Planned as Shown To Possibly Become Part Of A Permanent Road System.



Snowfills Alone (Without Culverts or Corduroy) Should Only Be Used Over Dry Stream Beds And Removed In Spring, to Avoid Interfering With Fish Passage

4.4 Environmental Implications and Mitigative Measures

The main purpose of river crossings other than facilitating transportation is to protect the fishery resources. Protection of the fisheries resource can be best achieved by leaving the stream or river in its natural condition, and most types of crossings try to accommodate this in varying ways. Snowfills alone (without culverts or corduroy) in the stream bed should only be used where there is no flow and they should be notched or removed to accommodate the spring break-up. Culverts and corduroy should be removed during closure of the road. Likewise, temporary bridges are removed not because they are blocking the stream or river flow, but because the temporary cribs and snowfills would not withstand the high flows of spring and summer, and if not removed the temporary bridge would become unstable and collapse across the stream. Permanent bridges once installed are probably less environmentally damaging than the annual procedure of placing and removing temporary bridges.

4.5 Summary of Environmental Guidelines for Design and Construction of River and Stream Crossings

o The Department of Fisheries and Oceans should be contacted prior to deposition of any foreign material, including corduroy, gravel or precast concrete into a river or stream.

o Snow fills alone (without culverts or corduroy) should be used only in intermittent streams. Snow fills blocking intermittent stream beds should be removed or at minimum notched prior to closure of the winter road.

o Snow collection areas should be used to ensure sufficient snow. A minimum buffer of at least 10 m between the clearing and any water body is recommended.

o A permit is required for any in-stream or off-right-of-way activity.

o Culverts and corduroy should be removed from the stream bed during closure or anchored by chain so they can be easily retrieved later, so they do not block the stream.

o Temporary structural bridge placement and removal should follow the protocol of D.O.T. Highway Maintenance Standard 271 - Winter Road Bridges in order to minimize the environmental damage during these processes.

The environmental implications of building permanent bridges or culverts are many and more related to permanent road construction than normal winter road construction.

Backhoes Rather Than Dozers Should Be Used To Remove Snowfills. Disturbing Banks Or Bottom Should Be Avoided.

Removal Of Temporary Bridges Should Be Completed Before Vehicles Tend To Rut Or Gouge The Terrain.

However, because these construction activities have been incorporated into the winter road system in the NWT, some environmental guidelines that pertain are given below:

o For streams which are used for fish migrating or spawning areas, bridges or arch culverts, which retain the natural stream bottom and slope, are preferred over pipe culverts.

o Cofferdams for bridge construction should not block more than one third of the stream at a time.

o Restrict clearing width, and do not grub the right-of-way between the road and bush line within 100 metres of the waterway, where feasible.

o Preserve the vegetative cover as long as possible.

o Waste debris from grubbing should be hauled back and disposed of more than 100 metres from the waterway.

o Every effort should be made to complete water crossing construction as quickly as possible once the work begins. Limiting the duration tends to limit the environmental consequences.

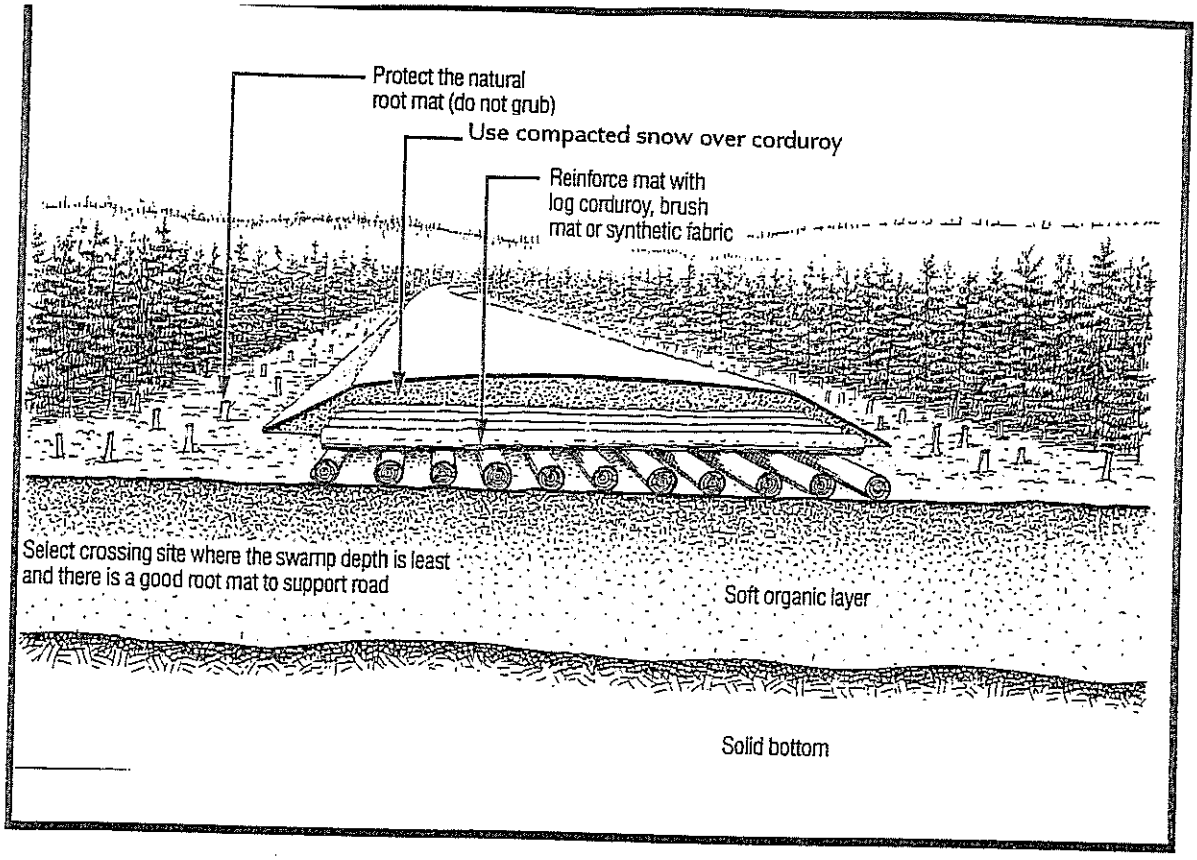
o Construction of water crossings should not take place during spawning or incubation periods or major fish migration periods, as determined by DFO.

o Work should be scheduled for the driest time of year, normally in winter or late summer.

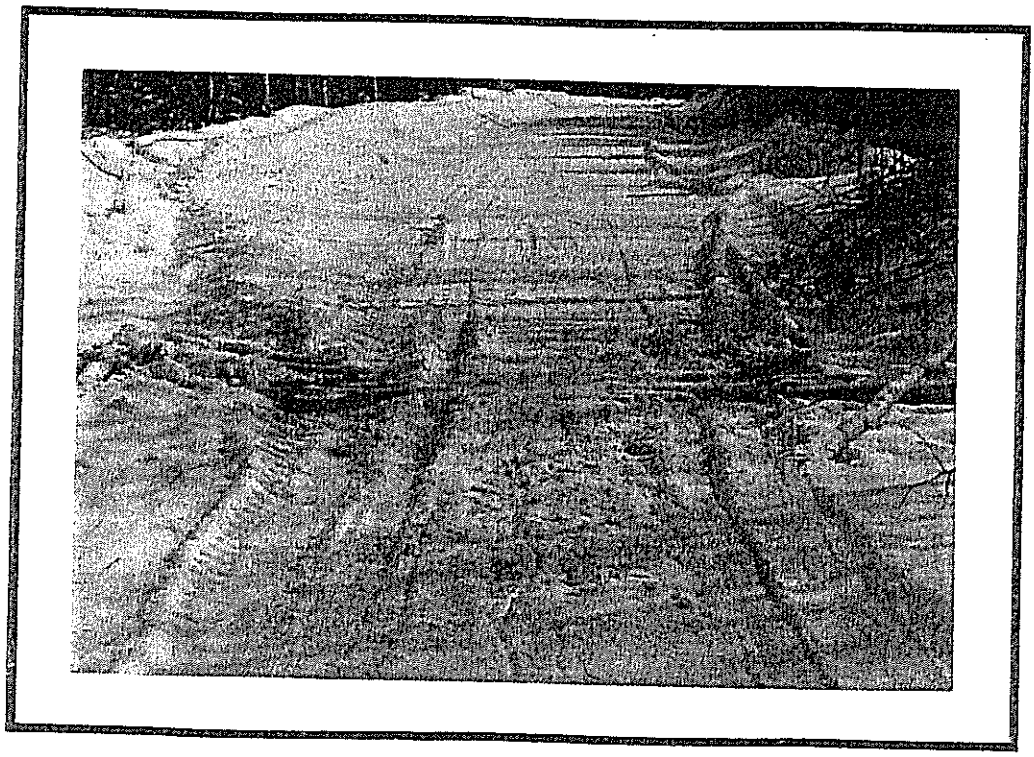
o Borrow material should not be excavated from the watercourse; and, equipment and materials should be stored well back from the water's edge.

o Pump water should outlet into vegetative areas for filtering during de-watering operations.

o Equipment crossings of the river should be minimized, or eliminated by construction of a temporary bridge.



Corduroy Can Still Be Used For Crossing Swamps Without Permission. However, Informing Department of Fisheries And Oceans Is Advised.



Corduroy In Streams Should Be Tied or Chained Together And Removed In Springtime.

CHAPTER 5.0
OPERATION AND MAINTENANCE OF THE WINTER ROAD SYSTEM

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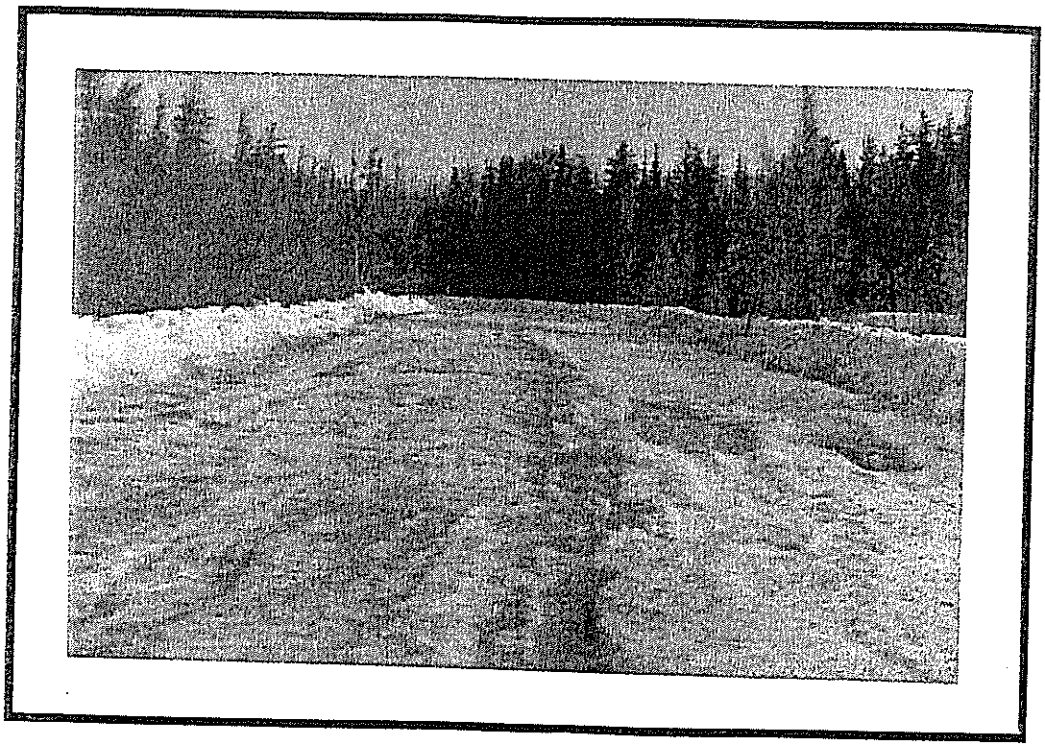
OPERATION AND MAINTENANCE OF THE WINTER ROAD SYSTEM

5.0 OPERATION AND MAINTENANCE OF THE WINTER ROAD SYSTEM

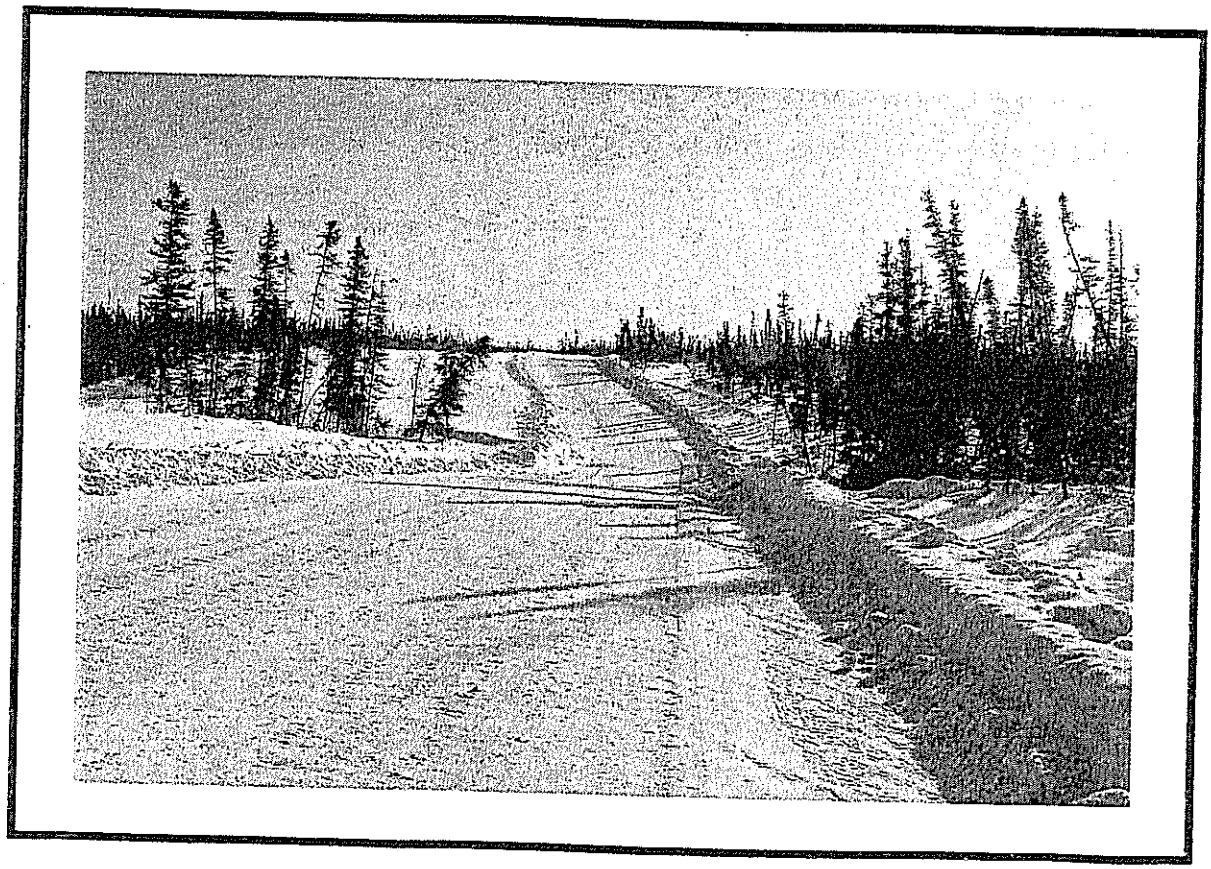
In all winter road jurisdictions surveyed, there are fewer potential environmental problems with operation and maintenance than any other aspect of winter road activities. The greatest concern relates to spills of hazardous materials, and this subject is covered separately in this report. Unseasonable thaws possibly present the greatest potential for environmental damage during operation and maintenance of the road. **Once temperatures approach 0°C increased vigilance and frequency of inspection should occur particularly if high temperatures were encountered prior to the official closing date, and the road should be shut down or traffic limited to night-time travel if there is a possibility of rutting or other signs of damaging the road.** If the higher temperatures occur after a predetermined date, according to its location, consideration should be given to closing the road and in-going traffic should be curtailed and some damage to the road accepted to get traffic already on the road out.

5.1 Tasks Involved in Operation and Maintenance

Often after winter road construction is complete, the first few vehicle passes will damage the road so that maintenance must begin almost immediately. **When winter road construction is complete, allowing it to sit idle for anywhere from four days to a week can reduce required maintenance later.** This allows the road to "set-up", much like concrete needs time to gain strength. It is known that compacted snow gains strength with time and the process is known as "sintering" or "snow metamorphism". What happens is the bonding ice between snow particles grows with time so the compacted snow gains strength with time. And, as pointed out earlier under processing of snow, the smaller the snow particles the more bonding and strength per unit volume. Waiting for these few days before allowing traffic may eliminate or reduce much of the early maintenance. During this time, if practical, only tracked or balloon-tired vehicles should use the road and if light-weight vehicles with normal tire pressures must use it they should track on different parts of the road. That is, do not follow in the path of previous traffic.



Once Temperatures Approach 0°C Increased Inspection Is Necessary To Avoid Terrain Damage or Damage To The Road.



Once the Winter Road is Completed, It Should Be Allowed to Sit Idle For A Few Days. The Compacted Snow Will Set-Up And Gain Strength Before Use.

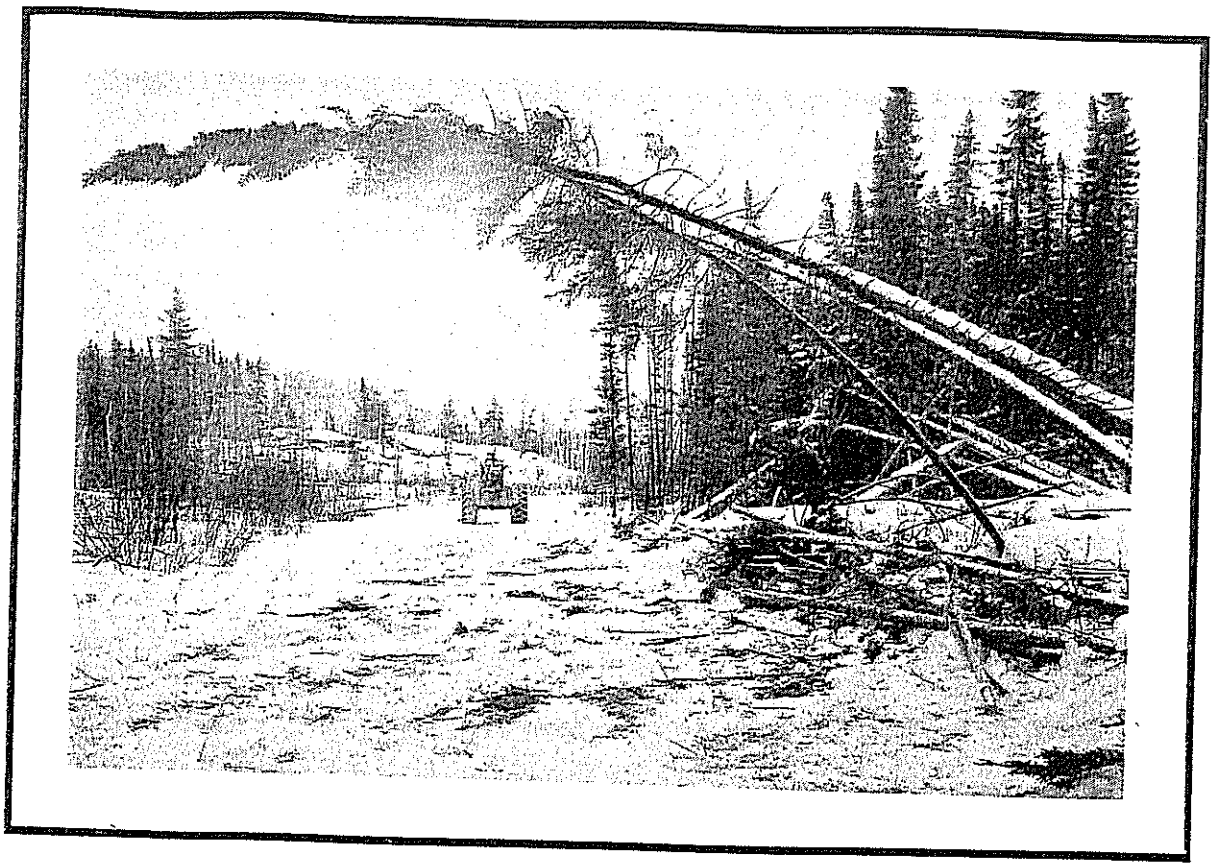
Normal traffic on a winter road will eventually cause "pounding out" of the road, which is similar to wash-boarding on a compacted earth road, except in the case of snow, the particles become separated or detached. Maintenance generally consists of grading or dragging, or both. **If mineral soil is exposed during maintenance, snow should be brought back onto the road from the side snow windrow, if available.** Keeping the road as white as possible, particularly late in the season is important not only environmentally to provide terrain protection, but to keep the road operable for as long as possible. Individual potholes that develop in snow can often be repaired easier by hand than by machine, by filling and tamping the pothole with snow until slightly higher than grade, so the surface will be nearly level when the snow is compacted by traffic. If water is available, the pothole can be filled and tamped with snow, then water added to consolidate it.

Other maintenance activities that can improve safety is timely removal of leaners and overhanging trees; and, clearing wider rights-of-way on sharp curves. The latter work reduces the degree of curve and improves sight distance. Debris from such activities should be disposed of in a proper manner, such as adding it to existing slash windrows or transporting it to a proper disposal site.

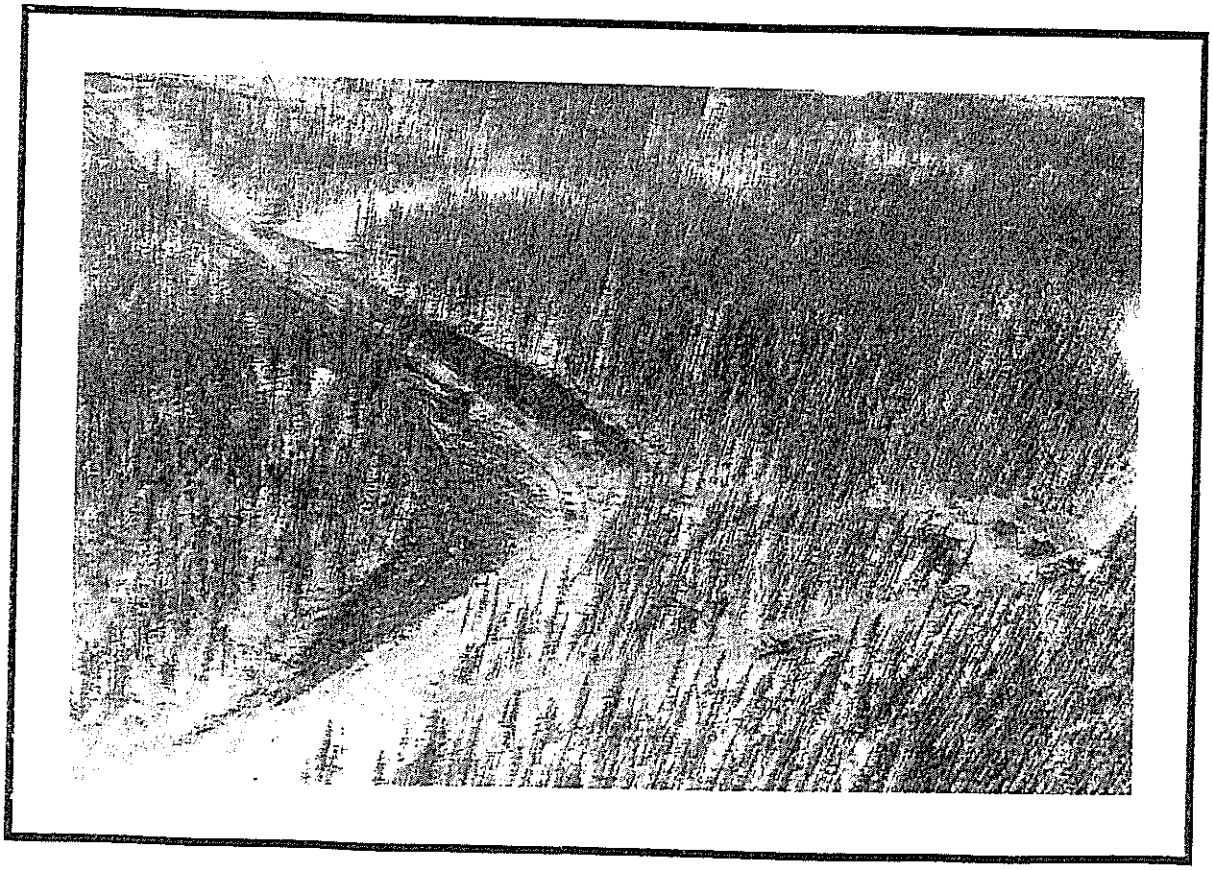
Maintenance should involve winter road inspections. Inspection duties should include timely and proper placement of flagging as warning to drivers of transport vehicles of dangerous situations. Once properly marked, contact with a maintenance crew and instructions on how to repair the failure should be outlined. Common problems can be crack development on ice roads; "pop-outs" of ice on ice roads; punch outs of ice at river crossings; punch outs of snow on overland portions; damage to bridges; and, even overturned vehicles at locations where site distance is limited among others. Single lanes such as temporary bridges or ramps over pressure ridges should be very well marked throughout the winter road season.

Regular inspections should play a role in determining when a road should be shut down. South facing slopes (North hills of a valley) are often the first to go, particularly if there is little or no shade from trees.

Overflow problems are often a troublesome maintenance task. Use of snow dykes to contain and direct flow through the bridge opening can be useful. Another method to control backup and overflow is to rip or otherwise remove ice that is blocking flow. Complete removal and rebuilding of snowfills has been found an effective solution.



Removing Leaners Improves Safety And Reduces Damage To Vehicles.



Widening the Right-of-Way at Corners Improves Safety By Reducing Degree of Curve and Improving Sight Distance.

5.2 Environmental Implications of Operating and Maintaining Winter Roads and Mitigative Measures

Environmental implications of operating and maintaining winter roads relate primarily to limiting spills and protection of the terrain. The impetus for terrain protection relates mainly to limiting erosion and sedimentation of water bodies. Although spills are covered elsewhere in this report, road anomalies such as reverse superelevation at curves; potholes; or weak ice can contribute to spills. Road conditions can be one of the causes of spills as indicated on the spill report form. It is important that DOT exercises "due diligence" by warning drivers of particular dangerous situations. In this respect, proper signing throughout the winter road system is important. In Manitoba, naming several locations on the winter road provides some warning sprinkled with comic relief. Such signs as "Zig Zag Curve", Antifreeze Creek, and "Webster's Corner", the latter named after the first (but not the last) driver to spin out at this location, provides warning, gives a relative location to drivers, and relieves boredom that can lead to accidents and/or spills.

Proper signage should include distances, turn-off signs to communities, caution signs, and suggested speed at dangerous curves and grades.

5.3 Summary of Environmental Guidelines for Operation and Maintenance Winter Roads

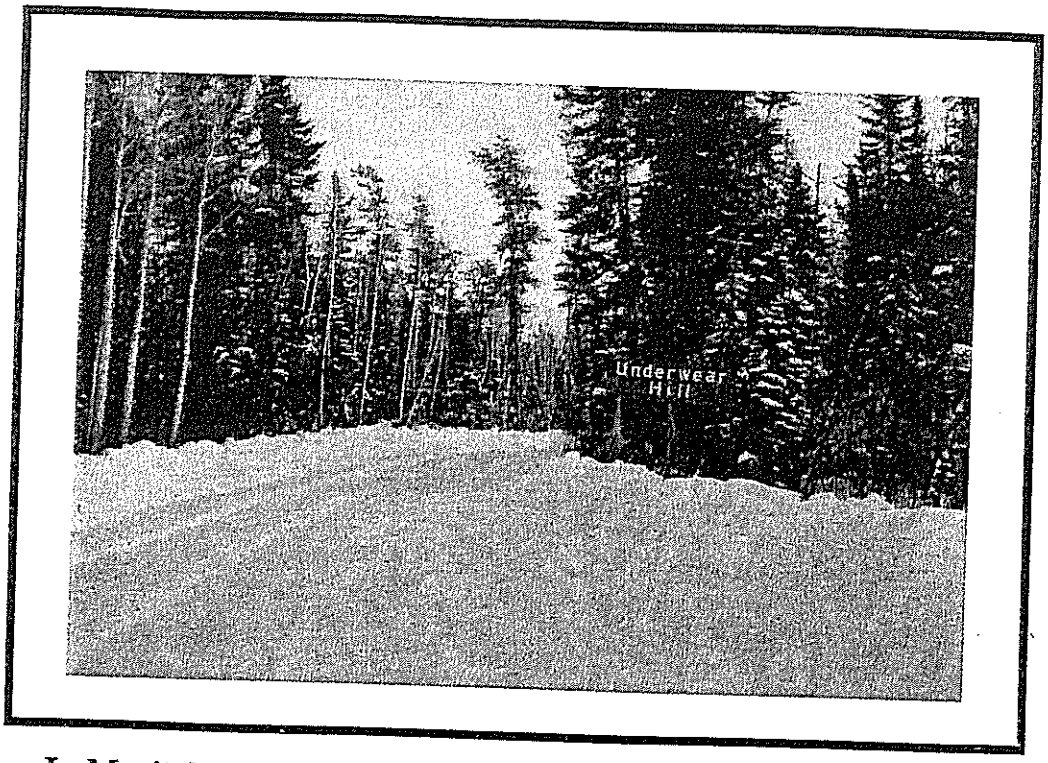
o Once temperatures approach 0°C increased vigilance and frequency of inspection should occur particularly if high temperatures occur prior to March 15, and the road should be shut down or traffic limited to night-time travel if there is a possibility of rutting or other signs of damage to the road.

o If mineral soil is exposed during maintenance, snow should be brought back onto the road from the side snow windrow, if available.

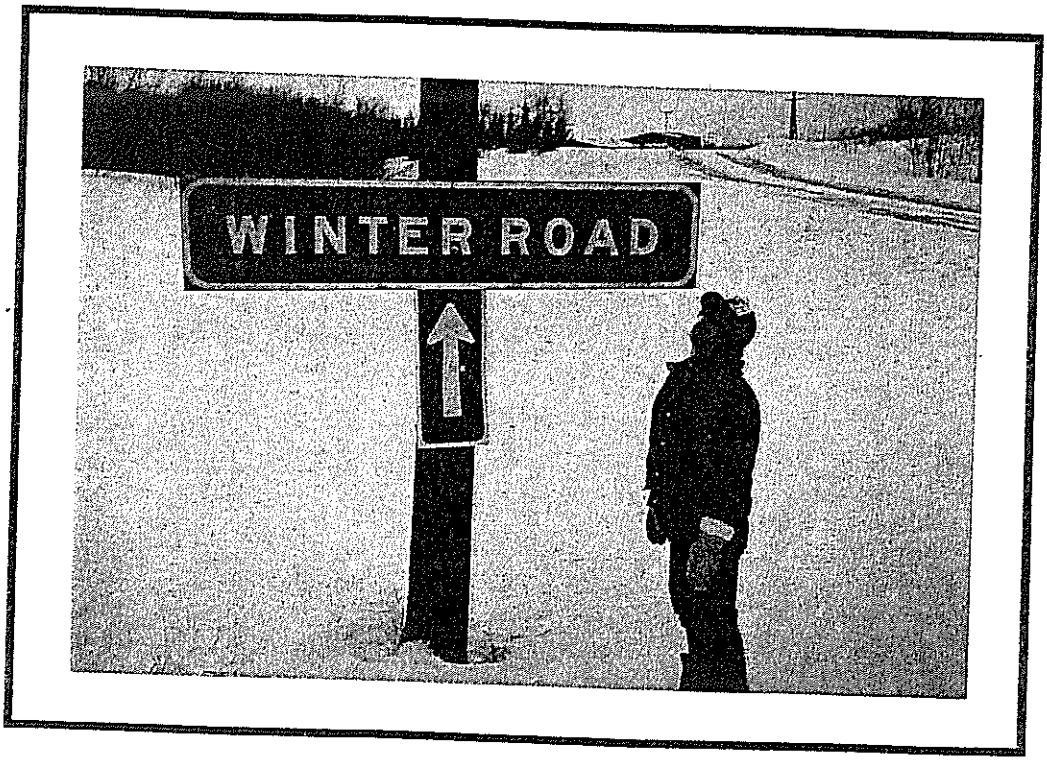
o Winter road inspection duties should include timely and proper placement of flagging or other warning devices as warning to drivers of transport vehicles of dangerous situations such as cracks in ice, "pop outs" of ice on lakes, "punch outs" on overland portions, and other dangerous situations.

o Other maintenance activities that can improve safety is timely removal of leaners and overhanging trees; and, clearing wider rights-of-way on sharp curves.

o Maintaining proper signing throughout the winter road system is important.



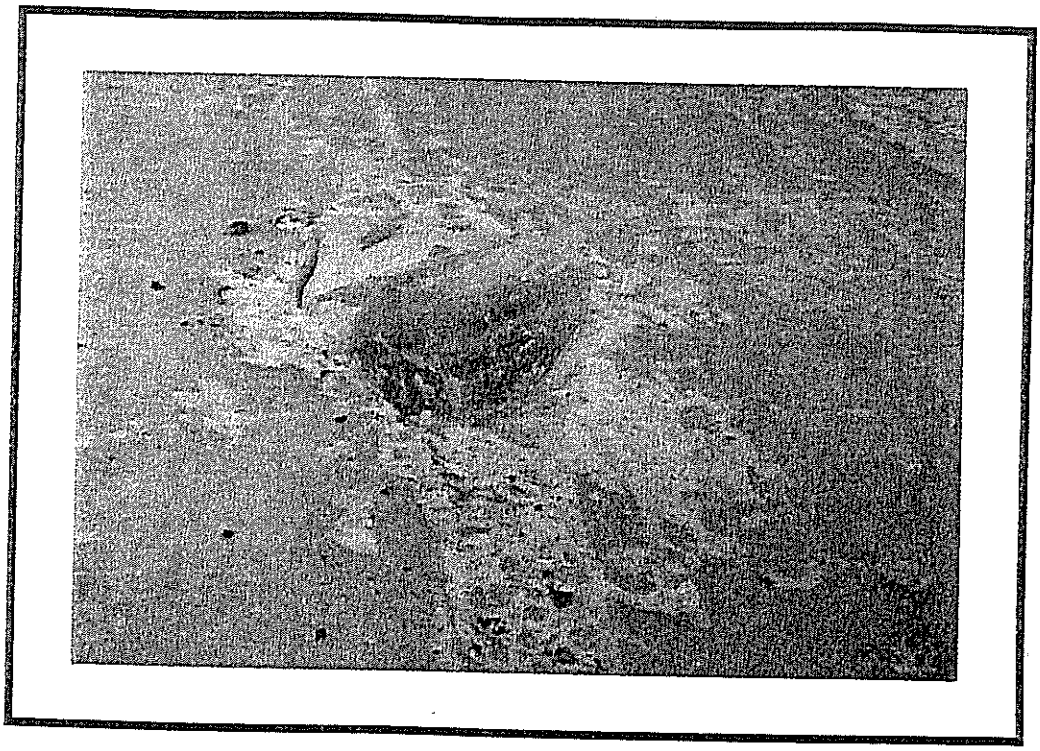
In Manitoba, Signs With A Touch of Humour Relieve Boredom, Indicate Danger, And Give Relative Location.



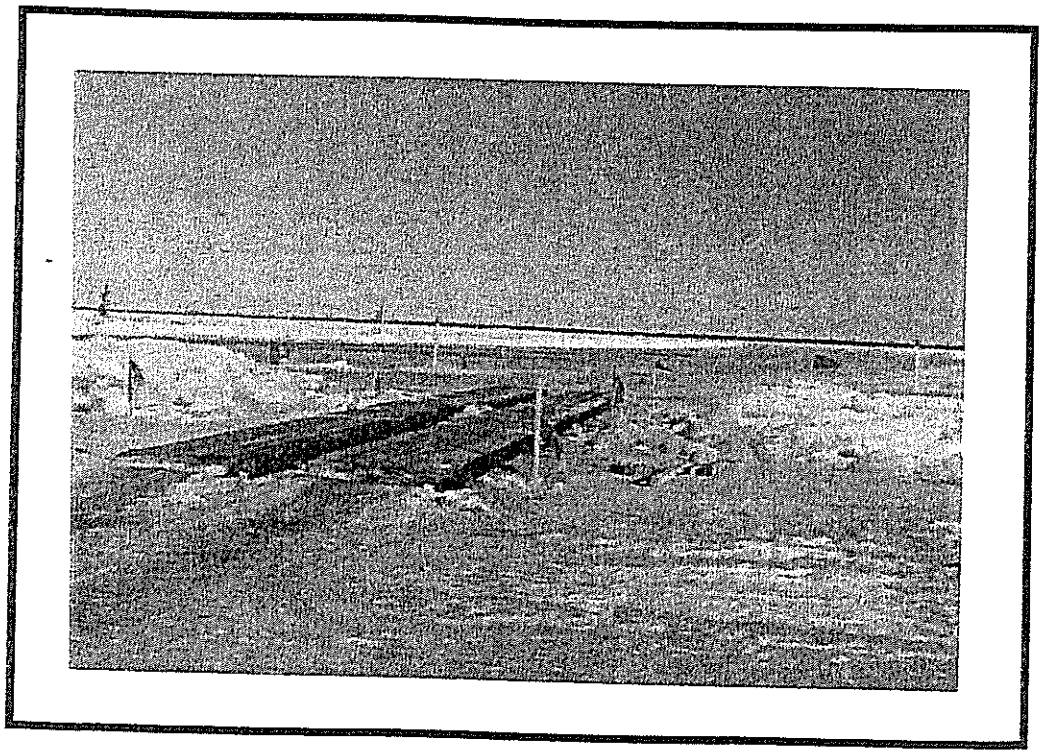
Even Serious Signage Can Be Humorous If Looked At Properly.

o Overflow problems can be controlled with snow dykes to direct flow through openings; removal of ice that is restricting flow by ripping; or by removal and rebuilding of snowfills.

o Ice profilers should be used to monitor ice thickness, particularly where flowing water might erode ice from below.



Pop-outs As Large As This (0.3 m^3)
Are Dangerous On Ice Roads.



Flagging And Tree Markers Are Used To Mark
Temporary Bridge Across Pressure Ridge.

CHAPTER 6.0
CLOSURE OF THE WINTER ROAD SYSTEM

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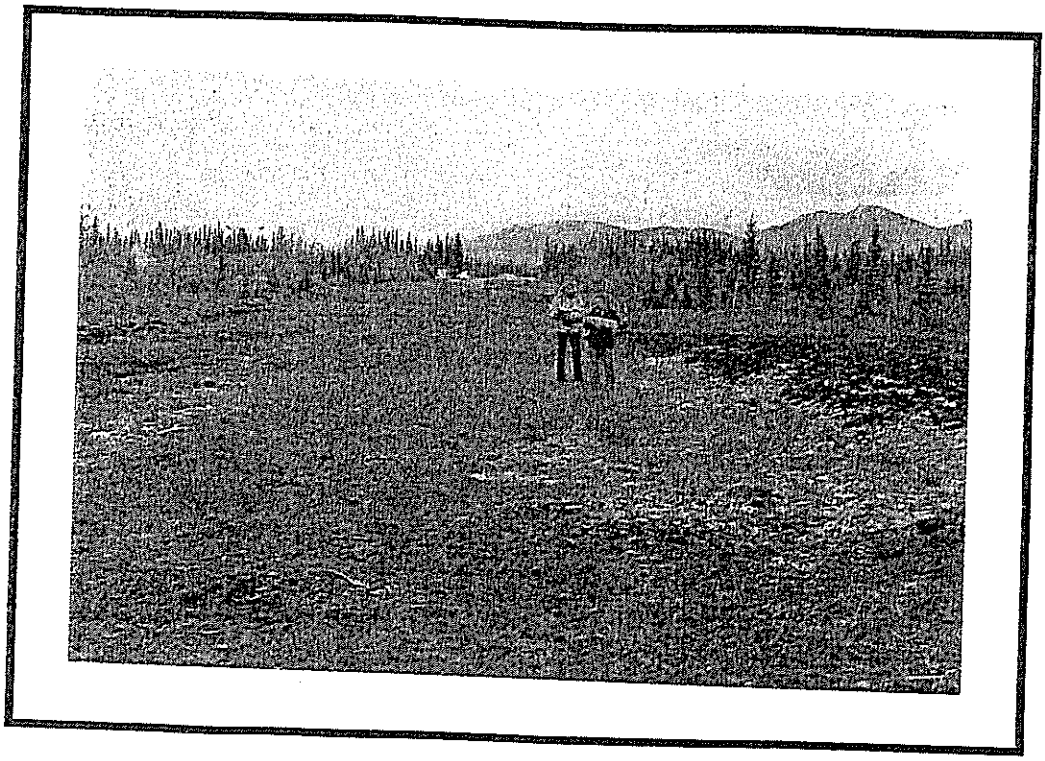
6.0 CLOSURE OF THE WINTER ROAD SYSTEM

Current D.O.T. practice with respect to closure hinges on the weather and a field and office decision that it is time to close the winter road. Unfortunately, the longest segment of winter road runs from south to north over some several hundred kilometres and the exit is at the south end. This means vehicles already on the winter road and making the last run south are heading into worsening conditions. In most years, the northern segments, particularly the ice roads, can be in excellent condition, while the south end may be completely deteriorated. Restricting travel to night-time travel only is one way to get traffic out. Since closure must essentially start in the north and work south, and since closure can take anywhere from four days to a week of work, the closure operations by D.O.T. personnel can result in substantial damage, particularly if the weather keeps deteriorating (ie. getting warmer). On segments of the winter road system not running north/south and on the more northerly segments of others, local traffic could sometimes use the local roads for an extended period after the south end becomes impassable.

Advantages of pre-setting the closure date are that it allows everyone to know ahead of time when travel or hauling has to be completed; it allows maintenance crews to put the road to bed every spring without causing additional environmental damage; and, by eliminating the start of closure after the road is impassable to others, it prevents closure work from carrying on too late into spring.

If available for a specific stream, the current "Stream Crossing Survey", Transportation Planning, DOT should be consulted for what needs to be done during closure.

Severe Damage Manifested In Rutting, Concentration of Meltwater, Erosion and Sedimentation Results From Using Winter Roads Too Late Into The Spring.



Winter Road Closure Before Terrain Damage Begins Can Leave A Right-of-Way With Good Ground Cover As Shown.

6.1 Tasks Involved in Closure

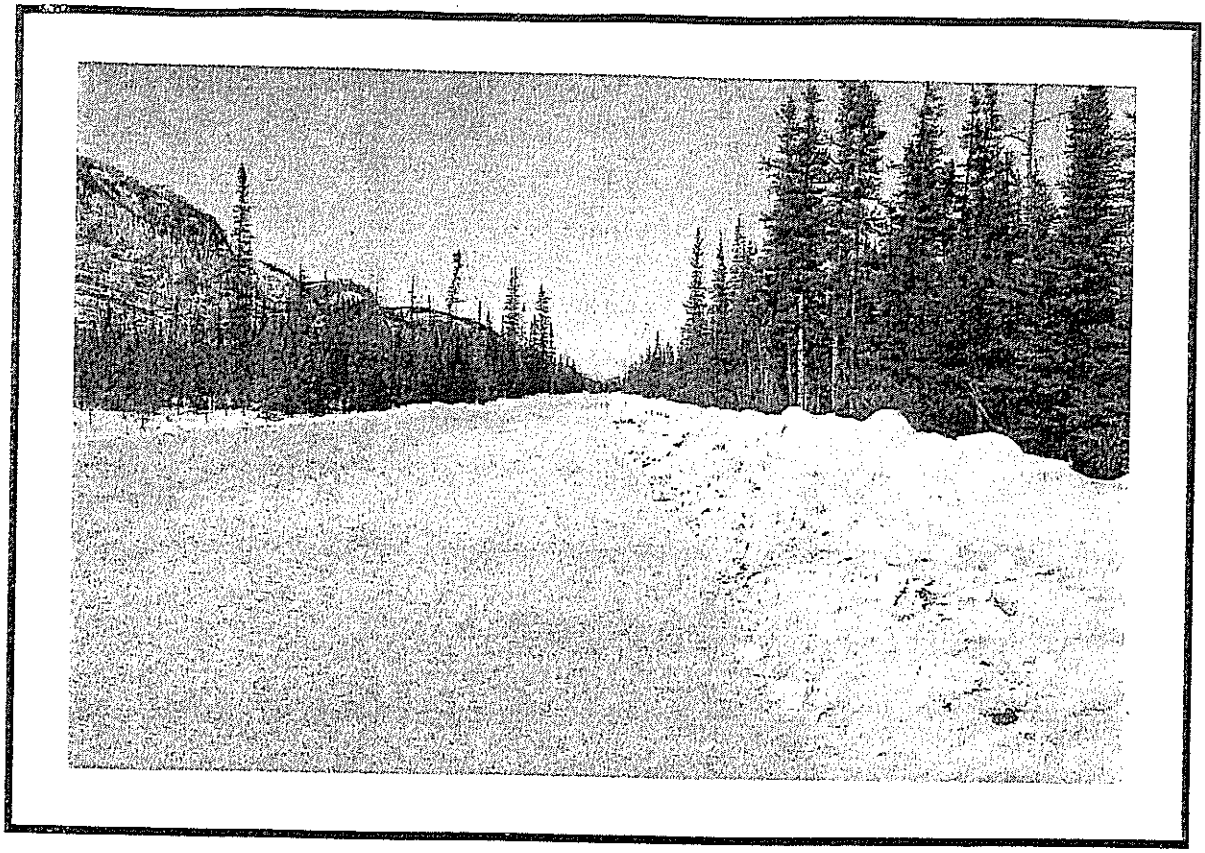
Tasks involved in closure generally consist of:

- o ensuring all traffic is ahead of the closure activities;
- o notching or removing any snowfills;
- o removal of any limbed trees or corduroy;
- o removal of culverts;
- o removal of all temporary bridges;
- o divert water away from observed erosion problems; and,
- o note areas possibly needing levelling and/or re-seeding.

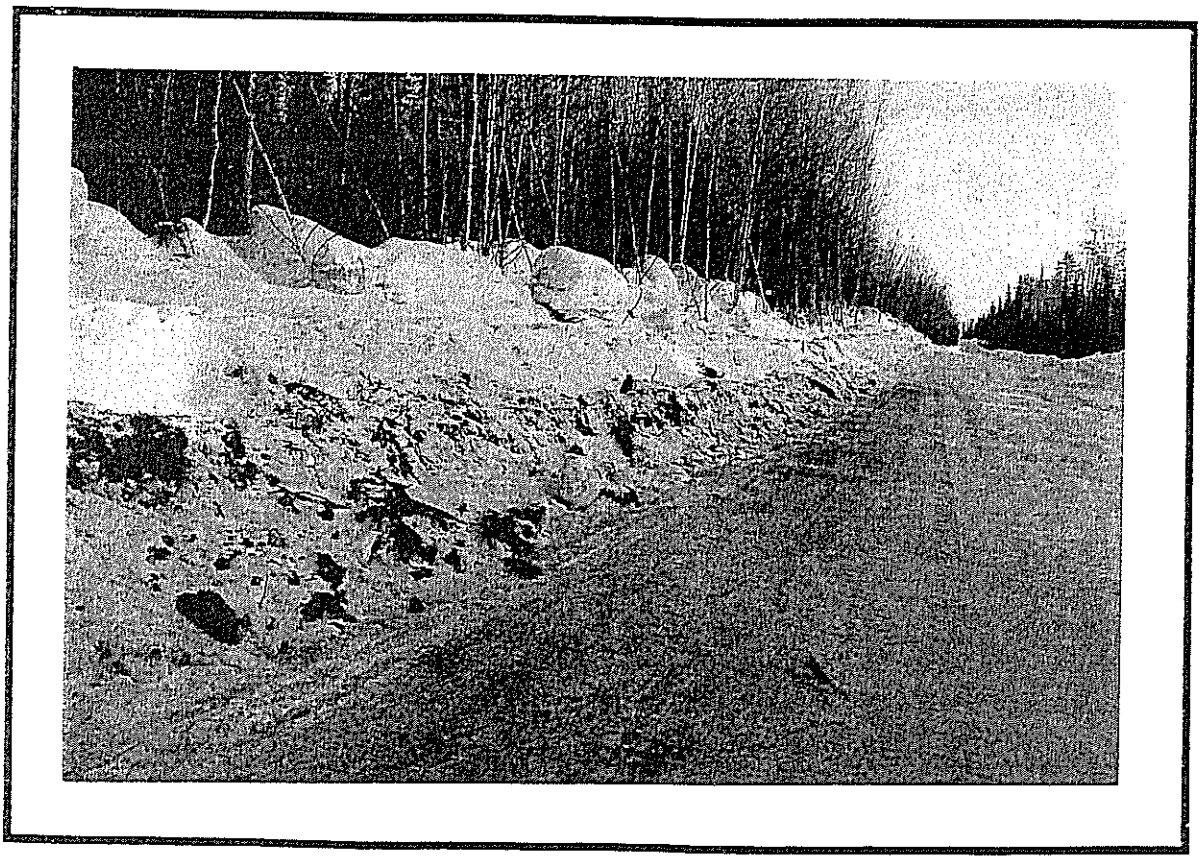
6.2 Environmental Implications of Closure

Untimely closure of winter roads is generally accepted as the potentially most environmentally damaging aspect of winter road activities. **Starting winter road construction too early in the fall and using winter roads too late in the spring has been documented 20 years ago as the main environmental concern associated with winter roads** (Adam, 1973). Starting construction too early in the fall or more accurately using equipment too heavy for the existing frozen depth of ground, causes the equipment to bog down; and, fortunately, nature tends to naturally shut such ill-timed construction down. However, in spring there is not such an effective natural-shut-down mechanism, and considerable damage, especially to terrain can result. Extending the season of a winter road for a week or more longer in spring can probably account for 90% of the environmental damage that occurs in a given year.

Again in this situation, nature provides some protection in that the ground remains frozen even though the surface becomes slushy. This is why vehicles do not sink in spring like they do in fall. **Nevertheless, severe damage in rutting, concentration of meltwater, erosion and sedimentation can result from use of winter roads too late into the spring. Especially at stream crossings the damage can be very significant since valley up-grades makes vehicles work harder intensifying rutting; steep slopes exist; the ruts tend to become gullies; and, the sediment tends to end up in the stream at the bottom of the hill.** Of course, sediment settling on fish spawning areas is a major environmental concern. But regardless of fish, the initiation of gullying and erosion should not be tolerated. Erosion should be despised by engineers; it is a sign of engineering gone wrong.



The White Appearance Of This Winter Road Indicates Adequate Protection of the Terrain.



Dark Road Surface Together With Mineral Soil And Organics In The Windrow Indicates Surface Damage Is Occurring.

In the absence of a fixed closing date, the following environmental criteria may be useful to field personnel in assessing when to shutdown a winter road:

o Once daily mean temperatures approach 0°C, it is time to become more diligent in observing signs of potential for environmental damage.

o Increased roughness of the winter road to the extent speeds have to be reduced is also an indication closure of the road may be necessary.

o Exposure of 10 to 25% mineral soil over short sections of winter road as a result of snow melting also indicates closure time is near.

o Rutting of mineral soil, particularly on slopes where gullying and erosion can occur, is an indication closure is imminent.

o Ponded water or running water either along or across the road as a result of warming temperatures indicates closure is or soon will be necessary.

o Water running across snowfills over creeks indicates closure is imminent.

o Vehicles pumping water up through holes in the road is another sign that closure is or soon will be necessary.

There is no doubt a combination of factors must be taken into account to make a final decision about road closure. However, from an environmental point of view, erring a day or two early rather than late is preferable.

This Winter Road Should Have Been Closed Earlier As There Is No Compacted Snow or Ice Protecting the Terrain, and Rutting is Occurring.

Ponded Water As Daily Mean Temperatures Approach 0°C is a Sign Road Closure is Near

6.3 Summary of Environmental Guidelines for Closure of Winter Roads

o Closure should begin at the first sign of road deterioration in spring if weather forecasts indicate warmer temperatures. Night-time travel only should be reserved strictly for getting the last vehicles out and for completing closure and transporting closure equipment.

o At first sign of road deterioration if the time of year and weather forecasts indicate colder temperatures in future, day-time traffic use should be curtailed, and night-time travel only imposed.

o Northern sections of the winter road can have later closure dates so they have a longer duration for local traffic.

o When notching any snow fills be careful not to gouge the banks or stream bottom. Use the proper equipment for the job, preferably a back-hoe.

o When removing limbed trees or corduroy be careful not to disturb the stream banks or bottom.

o When removing culverts do not disturb the stream bottom. Always store culverts above high water marks.

o When removing temporary bridges ensure there is sufficient snow under the heavily loaded vehicles so the terrain is protected when they are manoeuvring. Also, ensure gouging or other disturbance of the terrain is minimized.

o Minimize the number of crossings of the stream requiring fording by having as many vehicles as possible on the outgoing side.

o Divert water away from observed erosion problems, particularly if the erosion pattern is paralleling the right-of-way, such as following a rut down a hill. Dig a trench on a moderate slope off the right-of-way and attempt to end the trench on flatter ground or in heavy vegetation or ground cover so the water will disperse rather than having the flow concentrated.

o Note areas possibly needing levelling and/or re-seeding so that reclamation can be carried out. **Information on seed and fertilizer mixes, application rates and techniques can be obtained from your Highway Superintendent or local Land Use Offices.**

CHAPTER 7.0
SPILLS

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SPILLS

7.0 SPILLS

7.1 General

In an 11-year period there have been 23 spills on GNWT winter roads. Sixteen of the 23 spills involved hydrocarbons ranging from JP-A 4 to diesel fuel, the latter being most common. Other spills involved methanol, hydrochloric/muriatic acid, cyanide and two were of unknown substance. Therefore, on average two spills per year can be anticipated. This points out the importance of knowing what to do in the event you are involved with or come across a spill during your work or travels on the winter road system.

The GNWT has set up a system in co-operation with other levels of government, so that response to a spill can be quick and efficient with one "lead agency" with whom the responsible party must deal. To initiate the process once a spill has occurred or been identified, all one has to do is phone:

REPORT ALL SPILLS
24-Hour Spill Report Line
(403) 920-8130

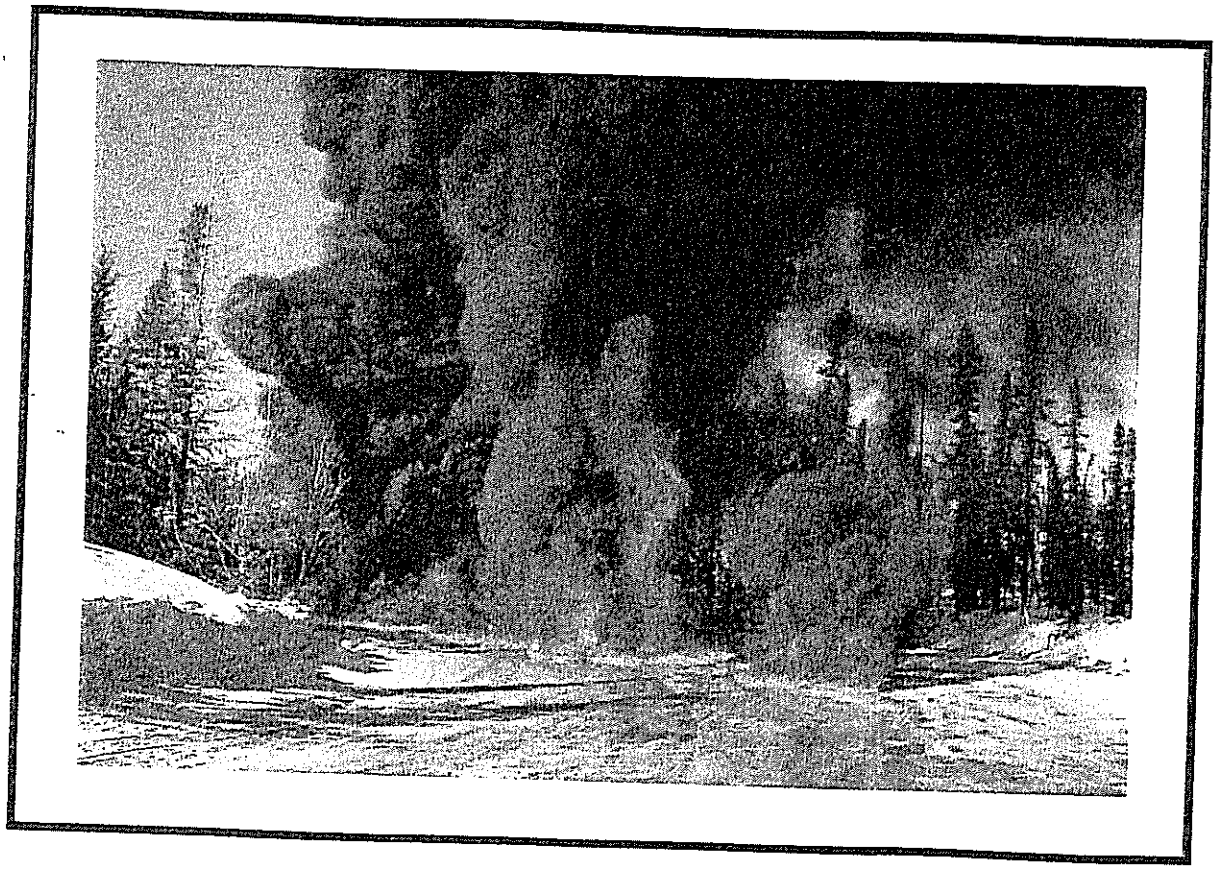
Procedures in Responding to and Reporting a Spill

1. **Ensure public and personal safety: If you cannot identify the material consider it hazardous.**

2. **Stop or reduce the flow of product at its source: Attempt this only if there is no personal danger.**

3. **Assess the seriousness of the spill.**

You Should Carry This Card In Your Wallet If You Work On The Winter Road.



Do Not Burn A Spill Unless Authority Has Been Given By the Lead Agency.

4. **Report the spill. Call the 24-Hour Spill Report Line at (403) 920-8130. Collect calls accepted. Include the following information:**
   - **location and time of spill**
   - **product and amount of spill**
   - **cause of spill and party responsible (if known)**
   - **present condition of spill site**
   - **hazards to public safety or the environment**

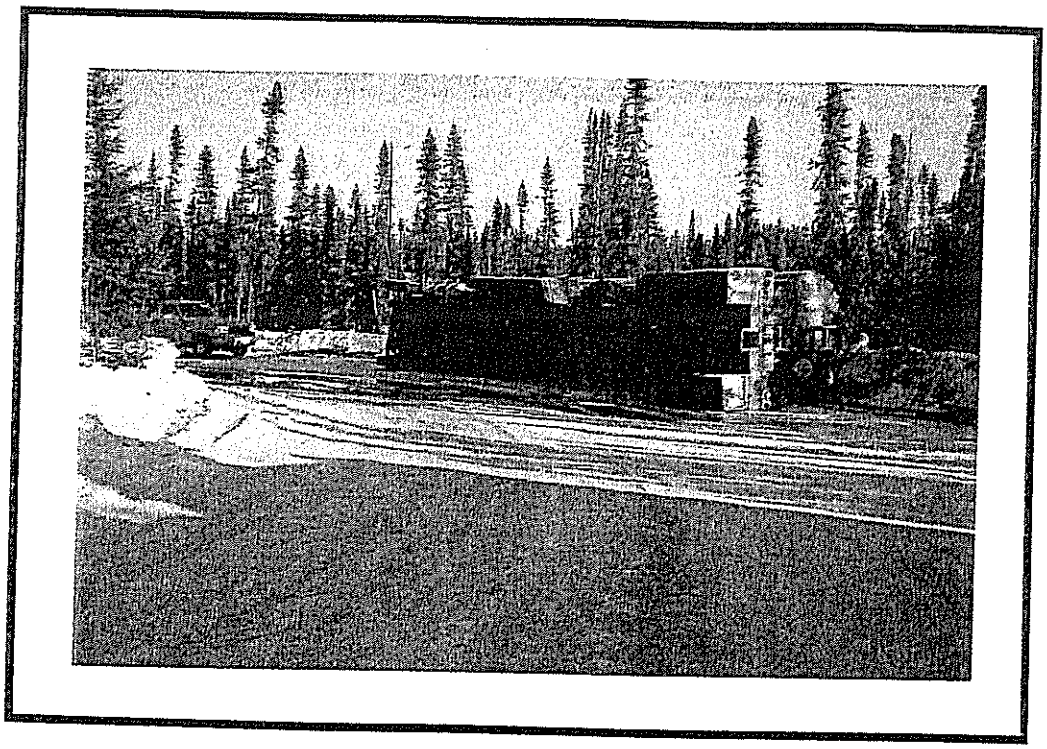
5. **Spill clean-up: The party responsible for the spill is responsible for the clean-up.**

What will happen once you have reported a spill is that the operator who takes your call will look at a manual and identify using given criteria which of several government agencies will be the "Lead Agency" or "Responding Government Agency" for this particular spill. Most often on winter roads it will be GNWT (Government of the Northwest Territories, Renewable Resources) or Indian and Northern Affairs, Northern Affairs Program (INAC/NAP); but, it could be Conservation and Protection, Environment Canada; Canadian Coast Guard; RCMP; Health and Welfare Canada; Atomic Energy Control Board; National Energy Board; or the Inuvialuit Lands Administration.

7.2 Procedures for Spills on Land

Normally the transport of hazardous materials over winter roads would occur in mid-winter when the ground is frozen; shallow ponds and drainages are frozen; and, some snow cover would be available to act as an absorbent should a spill occur. Even the surface organics would act as an absorbent and tend to keep a spill on land localized.

As indicated within the Procedures in Responding to and Reporting a Spill, once you have ensured public and personal safety, if you cannot identify the material consider it as hazardous. Also, if you have determined there is no personal danger, try to stop or reduce the flow of product at its source. Once you have reported the spill, and providing you have made positive identification of the material and that there is no personal danger to you or others, you could try to provide containment of the spill by tramping a path either by foot or by machine around the periphery of the spill; or, by building snow dykes or berms with compacted snow. This would be necessary only if it is obvious the spill is spreading laterally. Most often when you have identified the spill material as hydrocarbons (gas, diesel, etc.) it will travel along the low ground beneath the snow. The advantage of tramping around the spill site is that if you compact the snow, signs of the contaminant are more evident and you can move down-slope to try to contain the material.



Sharp Corners Are Often The Scene Of Accidents And Spills.

Fuel Spills Can Be Successfully Cleaned Up By Burning, But Under Strict Supervision.

Although it should go without saying, if the spill is gas or diesel, instruct anyone around the site not to smoke or otherwise cause the material to ignite. In some instances, intentional ignition might we used as a mitigative measure, but this should only be done under the authority and instruction of the "Lead Agency" or "Responding Government Agency".

If you even suspect the material is hazardous or if there are any symbols or signs indicating radioactivity or other hazardous material, vacate the site immediately and do not return until instructed to do so by the "Lead Agency".

7.3 Procedures for Spills in/over Water

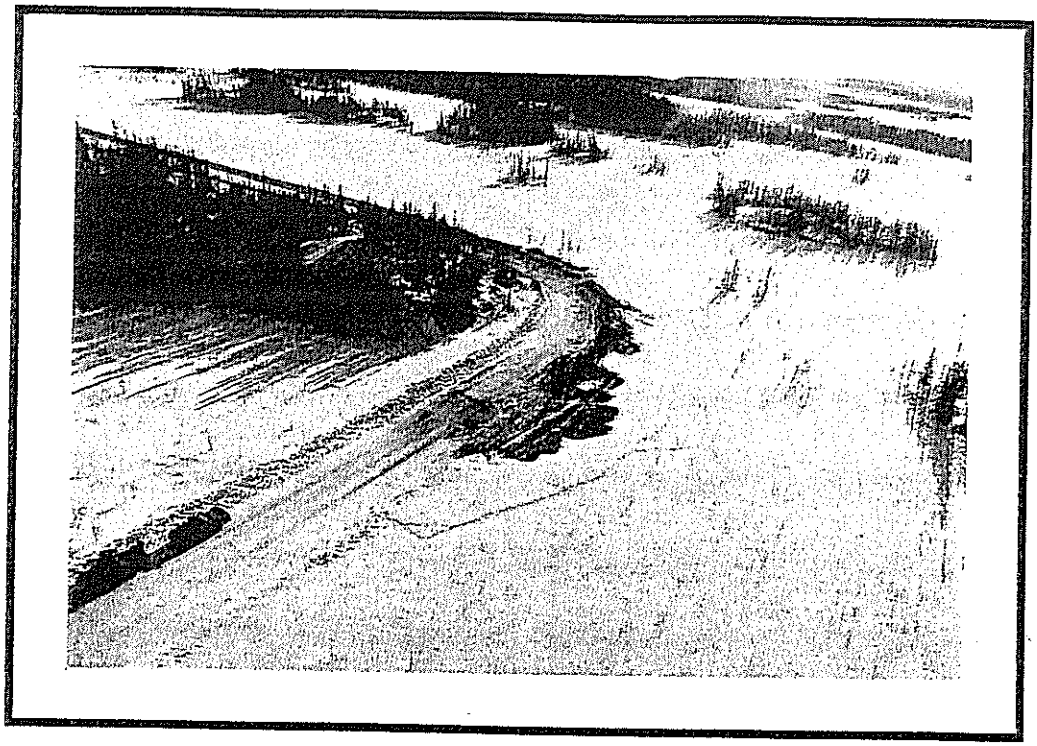
Of the 23 spills that occurred on the winter road system in an 11-year period, 8 of them (35%) occurred into or over water. Spills into or over water would generally be considered more serious than spills on land. The reason for this is that water generally would be a carrier of the contaminant and the contaminant would probably cause immediate impacts on water quality, fisheries, or the aquatic food chain. Once a contaminant reaches water it is generally more difficult if not impossible to contain or to clean-up. Often all that can be done is let nature takes its course and let dilution of the contaminant occur.

Should you come across a spill on ice, once you have ensured public and personal safety, and if you have determined there is no personal danger, try to stop or reduce the flow of product at its source. Once you have reported the spill, and providing you have made positive identification of the material and that there is no personal danger to you or others, you could try to provide containment of the spill by building a snow dyke either by foot or by machine around the periphery of the spill with compacted snow. If there are cracks in the vicinity, try to use snow dykes to keep contaminants from flowing into the cracks. As much of the spilled product as possible should be removed from the ice as quickly as possible, and stored in leak-proof containers until proper disposal can take place.

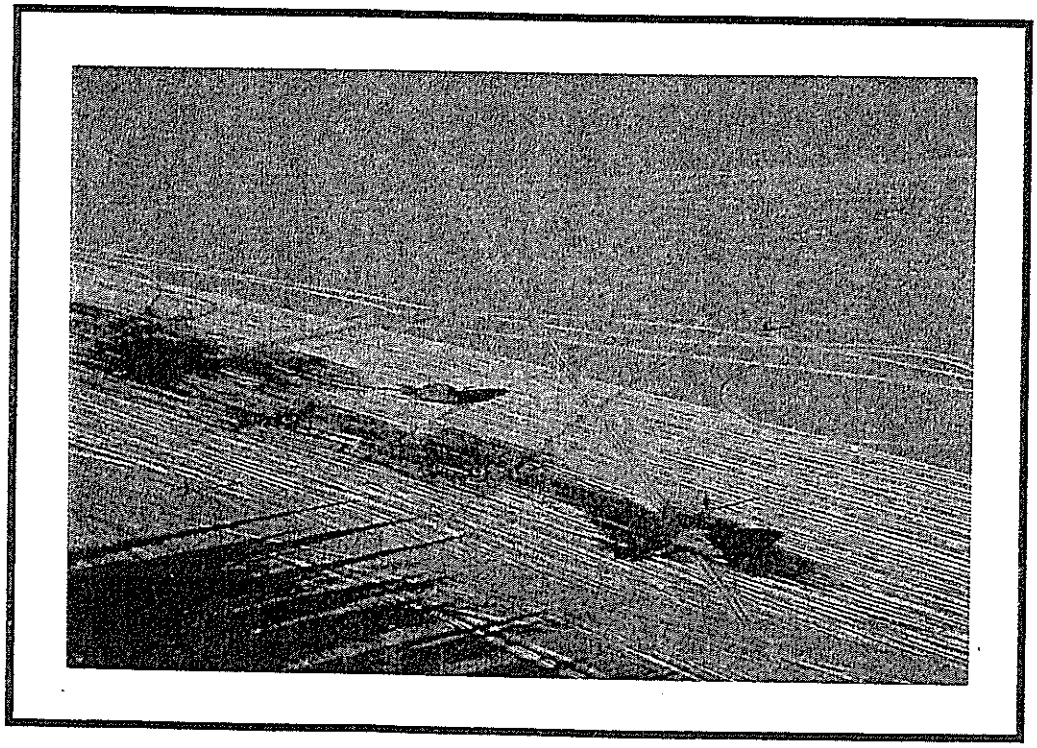
7.4 Environmental Implications of Spills

The impacts associated with spills are real. As an example, in the case of a spill of diesel fuel near a river, some of the fuel got into the water. The following summer, fish caught below a waterfall just downstream of the winter road right-of-way could not be consumed because of the taste of diesel fuel.

In general, the environmental consequences of spills depends upon the type, quantity and characteristics of the contaminant; the location of the spill; the effectiveness of



Spills On Land Are Often Naturally Confined By The Snow, or Snow Dykes Can Be Built.



Spills Over Water Are Confined To The Surface Naturally By The Ice, But Should Be Cleaned Up Immediately.

containment, recovery and clean-up of the contaminant; and, whether or not a water body is involved. Human health and safety are prime initial concerns particularly where fumes or fire are present. Drinking water supplies, fish and wildlife are potentially the longer term concerns. However, in populated areas where water contamination is possible it would be a priority to notify people in the immediate area of the spill and that their water supply may be endangered.

7.5 Summary of Environmental Guidelines for Spills

REPORT ALL SPILLS
24-Hour Spill Report Line
(403) 920-8130

Procedures in Responding to and Reporting a Spill

1. Ensure public and personal safety: If you cannot identify the material consider it hazardous.

2. Stop or reduce the flow of product at its source: Attempt this only if there is no personal danger.

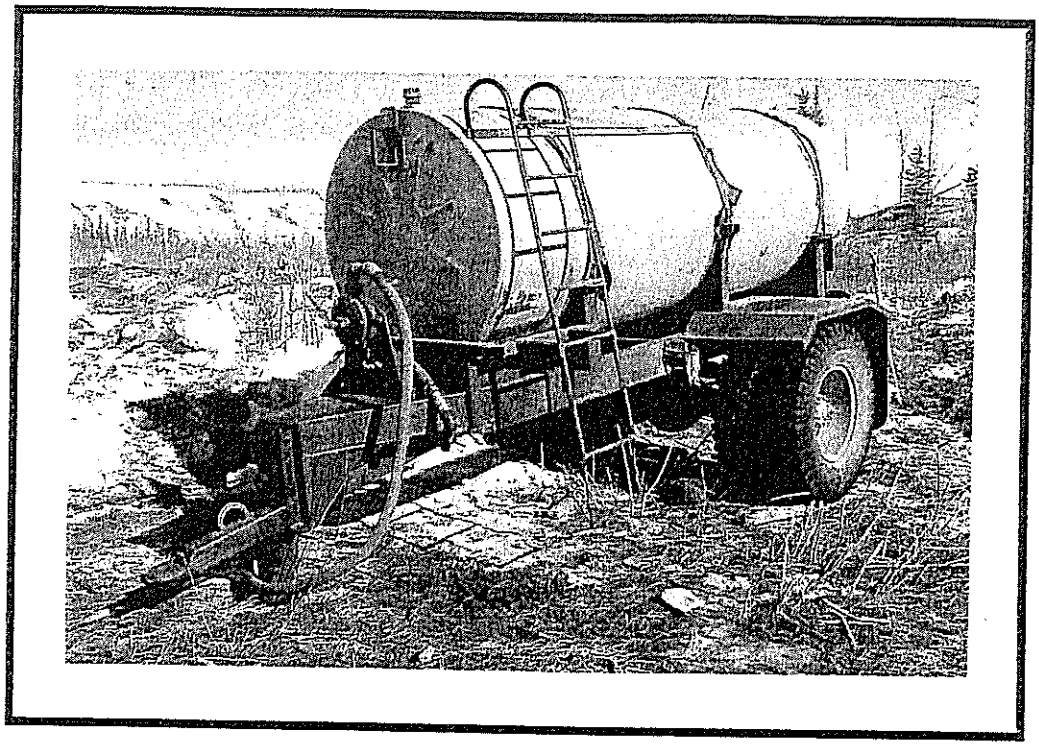
3. Assess the seriousness of the spill.

4. Report the spill. Call the 24-Hour Spill Report Line at (403) 920-8130. Collect calls accepted. Include the following information:
   - location and time of spill
   - product and amount of spill
   - cause of spill and party responsible (if known)
   - present condition of spill site
   - hazards to public safety or the environment

5. Spill clean-up: The party responsible for the spill is responsible for the clean-up.

After you have completed the first four (4) items above, providing there is no personal danger, you should further assess the situation and if judged to be beneficial or necessary:

6. Notify individuals, families, or community authorities if it is apparent a water supply may be endangered by the spill.



Fuel Storage Should Be On Level Ground, Away From Drainages And Properly Bermed, With Double Valves.

Spills Directly Into Water Cause Immediate Impacts, But Mitigation Often Has To Depend On Dilution.

7. Attempt to stay in contact the Lead Agency so that additional direction from them with respect to required action at the site can be transmitted in the early stages of the spill incident.

8. Provided there is no personal danger, attempt to contain the spill by using compacted snow dykes or by other means as directed by the Lead Agency.

REFERENCES AND SUGGESTED READING:

Adam, K.M., 1973. Norman Wells Winter Road Study. Interdisciplinary Systems Ltd., Winnipeg, Manitoba.

Adam, K.M. and Helios Hernandez, 1977. Snow and Ice Roads: Ability to Support Traffic and Effects on Vegetation. Arctic, J. of the Arctic Institute of North America, Vol. 30, No. 1.

Adam, K.M., 1978. Building and Operating Winter Roads in Canada and Alaska, Environmental Studies No. 4. Indian and Norther Affairs, Ottawa.

Adam, K.M., 1978. Winter Road Construction Techniques, Proceedings of the Conference on Applied Techniques for Cold Regions, Anchorage, Alaska.

Department of Transportation, 1993. A Field Guide to Ice Construction Safety. Government of the Northwest Territories, Yellowknife.

Department of Transportation, 1992. Stream Crossing Survey. Government of the Northwest Territories, Yellowknife.

Department of Fisheries and Oceans, 1986. Policy for the Management of Fish Habitat. Ottawa.

DIAND, 1990. Environmental Operating Guidelines: Access Roads and Trails. (Prepared by Hardy BBT Limited, Calgary) Land Resources, Northern Affairs Program. Ottawa.

DIAND, 1987. Reclamation Guidelines for Northern Canada. (Prepared by Hardy BBT Limited, Calgary) Land Resources, Northern Affairs Program. Ottawa.

DIAND, 1982. Environmental Guidelines Pits and Quarries. (Prepared by MacLaren Plansearch) Land Resources, Northern Affairs Program. Ottawa.

Environment Canada, 1981. Proceedings of Resource Roads Workshops, March 16-20, 1981. Whitehorse and Yellowknife.

Ministry of Natural Resources, 1988. Environmental Guidelines for Access Roads and Water Crossings. Government of Ontario, Toronto.

APPENDICES

APPENDICES

APPENDIX A GOVERNMENT REGULATIONS

A. Administration and Regulations

Of the more than 25 different pieces of government legislation (Acts, Ordinances and Regulations) which control land development in the north, only a few of them apply to winter roads. However, it is important that you know which ones apply and what your responsibilities are with respect to each of them. A more detailed document is in preparation by the Transportation Planning Division, Department of Transportation, GNWT entitled: "Environmental and Land Use Permitting and Approval Requirements for Department of Transportation Activities". Requirements as outlined herein have been taken largely from the March, 1993 draft of this document.

ACTS AND REGULATIONS

FEDERAL

As many as four federal acts may have relevance to winter roads: Navigable Waters Protection Act; Territorial Lands Act and Regulations; Fisheries Act and Regulations and the Policy for the Management of Fish Habitat; and, the Northwest Territories Water Act and Regulations. Relevance of each act to winter roads, who administers it, and the point of contact is presented below:

NAVIGABLE WATERS PROTECTION ACT (NWPA)

The Canadian Coast Guard (CCG) administers the NWPA, and navigable waters are defined as: "... any body of water capable , in its natural state, of being navigated by floating vessels of any description for the purpose of transportation, recreation or commerce." The NWPA is triggered with the construction of virtually any development that extends into a navigable water, including permanent bridges but not including temporary bridges or ice bridges. **The DOT's responsibility is to inform CCG of any work which extends into a navigable waterway.**

Contact: Area Officer, Navigable Waters Protection Act
Canadian Coast Guard, Western Region
Suite 620 - 800 Burrard Street
Vancouver, B.C. V6Z 2J8
Telephone: 604-631-3739 or Fax: 604-666-6721

TERRITORIAL LANDS ACT AND REGULATIONS

Administered by DIAND Lands Resources, the Act and its Regulations authorizes and regulates use of Territorial Crown lands for such things as new winter road rights-of-way, or reconstruction outside existing winter road rights-of-way. **Permits are required where there are terrestrial activities associated with Crown lands, including inland water bodies or land outside existing permitted highway rights-of-way.** Allow 42 days for a response after application for a Land Use Permit, normally issued for two years, renewable for an additional year. Contacts are by district as given below:

Yellowknife & Arctic Islands District
Yellowknife District Manager
DIAND
BOX 2250
Yellowknife, NWT, X1A 2R3
Telephone: 920-8257
Fax: 873-4114

Fort Smith District
Fort Smith District Manager
DIAND
BOX 658
Fort Smith, NWT, X0E 0P0
Telephone: 403-872-2558
Fax: 403-872-3472

Rankin Inlet District
Rankin Inlet District Manager
DIAND
BOX 129
Rankin Inlet, NWT, X0E 0G0
Telephone: 819-645-2831
Fax: 819-645-2592

Fort Simpson District
Fort Simpson District Manager
DIAND
BOX 150
Fort Simpson, NWT, X0E 0N0
Telephone: 403-695-2626
Fax: 403-695-2615

Inuvik - Norman Well District
Inuvik District Manager
DIAND
BOX 1200
Inuvik, NWT, X0E 0T0
Telephone: 403-979-3361
Fax: 403-979-2090

Baffin District
Baffin District Manager
DIAND
BOX 100
Iqualuit, NWT, X0E 0H0
Telephone: 819-979-6445
Fax: 819-979-6664

Land Resources
Regional Manager
DIAND
BOX 1500
Yellowknife, NWT, X1A 2R3
Telephone: 920-8165
Fax: 920-4669

FISHERIES ACT AND REGULATIONS, POLICY FOR THE MANAGEMENT OF FISH HABITAT

Department of Fisheries and Oceans (DFO) administers the Fisheries Act, while some sections dealing with deleterious deposits is administered by the Department of the Environment. DFO's Policy for the Management of Fish Habitat guides the Department in the administration of the habitat protection provisions of the Act. Under these provisions, the harmful alteration, disruption or destruction of fish habitat is prohibited except where authorized by DFO. Fish habitat includes spawning grounds, nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes. **The act is triggered when DOT conducts work in and/or near water, and on winter roads involving temporary bridges, permanent bridges, installation of culverts, construction of approaches, diversion and/or blockage of fish bearing streams and use of explosives in water bodies.**

Any proponent working in or near water including activities such as the construction and operation of winter roads is advised to discuss the project in advance with DFO. It is necessary for the proponent to obtain DFO's authorization where the potential for harmful alteration, disruption or destruction of fish habitat exists. The requirement to obtain a DFO authorization is the responsibility of DOT and is not part of any other land use permit terms and conditions.

For further information regarding the Fisheries Act, contact:

Fisheries and Habitat Management
Department of Fisheries and Oceans
South/Central Area
Central and Arctic Region
P.O BOX 2310
Yellowknife, NWT, X1A 2P7
Telephone: 920-6633
Fax: 873-8871

NORTHWEST TERRITORIES WATER ACT AND REGULATIONS

The Northwest Territories Water Act and Regulations are administered by the Water Board Authority. The Federal Government passed the new NWT Water Regulations on June 15, 1993 pursuant to the NWT Water Act. The new Act and Regulations will require the Department of Transportation to obtain Water Licences for some of their activities and construction projects. With respect to winter roads specifically, there is no need for a water licence for ice bridges or temporary bridges. All temporary work on winter roads such as placement of portable bridges, berming, overflow diversions with snow, ice bridge construction either by spray ice or auger method and snow bridge construction, do not require a water licence application regardless of the width of the crossing. A permit may be required for construction of permanent bridges or other in-

stream works in rivers wider than 5 metres. No water licence application is required if less than 100 m^3 (100,000 L) of water are used from one source in one day.

All inquiries regarding water licence applications should be made to:

Kevin McDonnell
Head, Regulatory Approvals
Water Resources Division
Renewable Resources and Environment
Northern Affairs Program
Telephone: 920-8238

Applications for Water Licences should be forwarded to:

The NWT Water Board
Box 1500
Yellowknife, NT
XIA 2R3

Hand deliveries can be made directly to the Water Board Office on the 9th Floor of the Precambrian Building in Yellowknife.

TERRITORIAL

As many as four departments within the GNWT could have jurisdiction over some aspect of winter road construction through Territorial Legislation, as well as the Inuvialuit Lands Administration. These include the Commissioner's Land Act and Regulations (Department of Municipal and Community Affairs); the Historical Resources Act and the NWT Archaeological Site Regulations (Department of Education, Culture and Communications, Prince of Wales Northern Heritage Centre); the Forest Management Act and Regulations (Department of Renewable Resources, Forest Management); and, the Environmental Protection Act, Department of Renewable Resources, Pollution Control Division). The Inuvialuit Land Administration Rules and Procedures would be applicable if a winter road were to cross Inuvialuit land, and would be administered under the Inuvialuit Lands Administration, Tuktoyaktuk.

COMMISSIONER'S LAND ACT AND REGULATIONS

Administered by the Department of Municipal and Community Affairs, the Commissioner's Land Acts pertains to Commissioner's land as opposed to Territorial Crown land administered by DIAND. The Act is triggered by any activity on Commissioner's land, excluding the land identified in the Public Highways Act (administered by DOT). These land use regulations require land use permits and quarry permits to control temporary land use activities on Commissioner's land. The act does not apply to inland or offshore water bodies. **Winter road rights-of-way, snow collection areas or areas used during construction for equipment or material storage on Commissioner's land should be under a Land Use Permit**, issued for a 2-year period with the potential for a one-year extension. Quarry permits are issued for one year. Proper application forms should be obtained and mailed to the following address, except for applications in taxed based Communities who should submit applications to the Senior Environmental Officer, Lands Division in Yellowknife:

Fort Smith Region
Senior Land Officer
MACA
BOX 1320
Yellowknife, NWT, X1A 2L9
Telephone: 403-920-6125
Fax: 403-920-6343

Inuvik Region
Senior Land Officer
MACA
Inuvik, NWT, X0E 0T0
Telephone: 403-979-7266
Fax: 403-979-7352

Baffin Region
Senior Land Officer
MACA
Iqualuit, NWT, X0E 0H0
Telephone: 819-979-4779
Fax: 819-979-4779

Keewatin Region
Land Officer
MACA
Rankin Inlet, NWT, X0C 0G0
Telephone: 819-645-5042
Fax: 819-645-2321

Kitikmeot Region
Lands Officer
MACA
Cambridge Bay, NWT
Telephone: 819-983-7268
Fax: 819-645-2321

All Tax Based Communities
Manager, Land Operations
Lands Division
MACA, Box 1320
Yellowknife, NWT X1A 2L9
Telephone: 920-7573
Fax: 920-6343

HISTORICAL RESOURCES ACT AND THE NWT ARCHAEOLOGICAL SITES REGULATIONS

It is DOT's responsibility to provide an Archaeological Survey of a proposed development if requested by the Prince of Wales Northern Heritage Centre (PWNHC),

who administers the Act and Regulations. In addition, if during the course of a development an historical resource is encountered, it is DOT's responsibility to safe-guard the site and ensure through consultation with PWNHC possible impacts to the site are mitigated.

o **Should you come across or uncover anything of possible historic or pre-historic significance during your work on winter roads, you should contact the following with details:**

Director, Prince of Wales Northern Heritage Centre
Department of Education, Culture and Employment
Box 1320, Yellowknife, NWT, X1A 2L9
Telephone: 403-873-7551

FOREST MANAGEMENT ACT AND REGULATIONS

Administered by the Department of Renewable Resources, Forest Management Division, it is their responsibility to protect the forest resources of the NWT and to make them available to the residents of the NWT. **If any activity of DOT will result in clearing of more than 5,000 m^3 of timber or of any amount of merchantable timber on Commissioner's land, then DOT must obtain a Timber Cutting Permit.** This could be pertinent to winter roads when clearing rights-of-way on Commissioner's land. Forestry Inspectors have the authority to issue permits, suspend operations if the licence or permit is not being adhered to, and to take the necessary action to have charges laid. The Forestry Management Division will assist DOT in determining the amount of timber on the land in question. If in doubt if you need a permit, or if you require one, contact:

Fort Smith Area
Renewable Resource Officer
Department of Renewable Resources
Fort Smith, NWT
Telephone: 872-4242

Fort Simpson Area
Renewable Resource Officer
Department of Renewable Resources
Fort Simpson, NWT
Telephone: 695-2231

Yellowknife Area
Renewable Resources Officer
Yellowknife District Office
Department of Renewable Resources
Yellowknife, NWT
Telephone: 873-7179

Norman Wells Area
Renewable Resources Officer
Department of Renewable Resources
Norman Wells, NWT
Telephone: 587-2309

Inuvik Area
Renewable Resource Officer
Department of Renewable Resources
Inuvik, NWT
Telephone: 403-979-7247

General Inquires
Director
Forest Management
Box 1320
Yellowknife, NWT, X1A 2L9
Telephone: 403-920-6405

ENVIRONMENTAL PROTECTION ACT

Administered by the Pollution Control Division, Department of Renewable Resources, the intent of this legislation is to control storage and management of fuels, hazardous wastes, and contaminants in the NWT, as well as ensuring clean-up of spills and that spill contingency plans are in place. The Pollution Control Division can lay charges in relation to pollution or release of contaminants. Contaminants is defined as: ... any noise, heat, vibration or substance ... where discharged into the environment:

i) endangers the health, safety or welfare of persons
ii) interferes or is likely to interfere with normal enjoyment of life or property
iii) endangers the health of animal life, or
iv) causes or is likely to cause damage to plant life or property.

Relative to winter roads, other than non-intentional spills of fuel, hazardous materials and the like, this act would control such things as dumping contaminated fuel or waste oil.

In the case of accidental spills, see the section herein on spills, and **if you come across a spill or are involved with a spill, the following steps should be taken:**

- **The spill must be reported to the 24-Hour Spill Line Number 403-920-8130**
- **The spill must be stopped if safe to do so**
- **The affected public must be notified of any danger**
- **The spill must be cleaned up**

Any questions or interpretations of the Environmental Protection Act can be directed to:

Manager, Land Protection
Pollution Control Division, Department of Renewable Resources
Box 1320, Yellowknife, NWT, X1A 2L9
Telephone: 403-873-0221

INUVIALUIT LAND ADMINISTRATION RULES AND PROCEDURES

Through a comprehensive land claims agreement with the federal government in 1984 and subsequent legislation the Inuvialuit gained title to over 35,000 square miles of lands in the Inuvik Region. Administered by the Inuvialuit Lands Administration, these lands are fee simple absolute and should be regarded as private lands. They are subject to Rules and Procedures, and all access to Inuvialuit land, other than casual and individual

recreation, requires a licence, permit or lease (called a right). Approval and licensing by the ILA is dependant upon the applicant consulting with and receiving the support and approval of the local Community Corporation and the Hunters and Trappers Committee.

Virtually any D.O.T. activity on Inuvialuit lands will trigger a review by the ILA, including winter road construction. At least two months are required when the application is received by the ILA for review by community groups. An application is best submitted as far in advance as possible. The ILA Rules and Procedures does not exempt the D.O.T. from requiring other permits and authorizations such as Department of Fisheries and Oceans Authorizations.

Use of ILA lands by licences or land use permits can be obtained by contacting:

Land Administrator
Inuvialuit Lands Administration
Box 290
Tuktoyaktuk, NWT X0E 1C0
Telephone: 403-977-2202
or 403-977-2466
Fax: 403-977-2467

Government and You

As an employee of the Department of Transportation, GNWT, you have certain responsibilities, just like employees of other GNWT departments or federal government departments. It is important for you to know your duties and responsibilities; but also, it is important for you and your department to fulfil your obligations to others. Good communication is probably the best means of ensuring both. If in doubt, don't be afraid to ask your superior if a certain permit is in hand or who has the responsibility to ensure the department has a certain permit. Also, if in doubt about whether a certain action requires permission or a permit from another department, talk to your superior or if unavailable, call the relevant department and find out. Many times, just making contact with other departments and being consulted by your department will build good relations and pay real dividends in the future.