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ENVIRONMENTAL PROBLEMS ASSOCIATED WITH TRANSPORTATION DEVELOPMENT IN THE MACKENZIE VALLEY

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Two major transportation developments are being considered in the Mackenzie Valley: a gas pipeline carrying refrigerated natural gas to southern markets, and a highway connecting northern communities with the existing road network in the Northwest Territories and points south. A third project, the Dempster Highway, which connects the northern Mackenzie Valley with the Yukon road system is nearing completion.

The Mackenzie Valley pipeline proposal was preceded by environmental studies by both the proponent and government agencies. The submitted preliminary plans and designs for the pipeline and highway have been assessed by various multidisciplinary groups in the government service to ascertain that environmental damage will be avoided or minimized by the planned development. In this paper, the detrimental environmental effects of the proposed developments identified by environmental scientists are summarized, and the role of the environmental scientist in mitigating the effects is examined.

IMPACTS

Terrain-Vegetation

1. Thawing of ice-rich ground will occur if the insulating vegetation cover is disturbed by traffic or construction activity. The killing of trees by the increased incidence of forest fires or on the right-of-way will accomplish the same result.

2. Freezing of previously unfrozen ground will occur around the chilled pipeline in the discontinuous permafrost zone. This may damage the pipe, causing increased maintenance activities and possibly more terrain damage, or the frozen strip may dam the drainage of wetlands.

3. Harvesting of snow for temporary winter roads, if practiced indiscriminately, will damage the surface and the vegetation, causing thermal subsidence and ponding.

Hydrology

1. Disruption of drainage will be caused by linear structures such as pipelines and roads. Frequent culverts and breaks, if not clogged or blocked

by ice, will alleviate the problem, but some channelling of surface runoff is almost inevitable.

2. Damage at river crossings by pipeline or roads present danger to the structures or the river banks due to ice scour, ice jams, higher than expected flood stages, erosion of approaches, etc. Subgrade seepage of northern rivers which freeze to the bottom will be disrupted by a chilled pipeline.

3. Water use will occur, especially during winter construction of the pipeline, for artificial snow making, testing of pipeline, and domestic consumption at work camps. Water may be scarce in the winter, as on the Yukon north slope, or may be available from small ponds. Withdrawal of large amounts of water from small ponds would seriously alter the aquatic habitat.

Aquatic Environment

1. Interference with spawning may be caused by temporary blockage of small streams by construction debris or by inadequate culverts which do not permit the passage of fish.

2. Alteration of habitat can be caused by sedimentation, removal of gravel, change in stream gradient, etc. during and after construction. Accidental oil spills and effluents from work camps may affect streams and lakes.

Wildlife

1. Interference with habitat can be caused by the berm of a pipeline or highway blocking or diverting caribou migrations. Dall's sheep are very sensitive to noise during certain periods of the year, whether from construction, traffic, aircraft noise, or compressor stations. The feeding of bears, foxes, and wolves at camps or garbage disposal areas may lead to problems and aggressiveness of the animals if they become dependent on handouts. The threat of rabies to the introduced human population may induce eradication programs.

2. Alteration of habitat of beaver and muskrat can occur if the natural drainage is changed, increasing or decreasing the water levels temporarily or permanently. Water consumption, introduction of wastes, etc. may significantly change the habitat.

3. Harrassment of rare and endangered species (peregrine falcon, eskimo curlew, whooping crane) may result because these species will become more accessible.

Environmental Quality

1. Water quality will be affected by work camps and by the influx of tourists.

2. Waste disposal may be adequately handled at large work camps, but accidental spills, leakage from lagoons, etc. are distinct probabilities. Lagoons may release nutrients long after abandonment of the pipeline.

Resource Use

1. The use of fish by increased resident and transient population will be unavoidable. Formulation and effective supervision of fish management programs present difficult problems.

2. The use of wildlife by native residents will likely be concentrated near the right-of-way because of better accessibility. Accidental kills of wildlife, especially migrating caribou, will occur on the highways. Devising and enforcing a sound game management program will be difficult.

3. Gravel, a non-renewable resource, will be used in great quantities. Although abundant in some areas, it is already scarce in certain parts of the Mackenzie Valley.

MITIGATION

The first stage in attempting to minimize the detrimental environmental impact of a project is to assess the proposal in terms of expected impacts. This is where environmental scientists, whether in the employ of the developer or a government agency, can make significant contributions toward reducing environmental disruptions to an acceptable or minimal level. Engineers and planners cannot be expected to be aware of all environmental problems, but once these are identified, they can design and plan to avoid or overcome environmentally damaging situations. The environmental assessment, however, must be based on valid data and facts, otherwise the credibility of environmental concerns will suffer.

The assessors of the proposed developments must not stop at identifying the environmental concerns, but should go one step further and suggest alternatives. Thus, it would not be sufficient to say that a structure will block fish migration with dire results on the fish population. The biologist should suggest an alternative, such as an adequate passageway, or cessation of activities during a critical period. Once again, the environmental scientist must have a firm basis for his objections and solutions, otherwise he quickly loses credibility.

The next step is to institute changes in the proposals. This may well be achieved through adequate communication, especially if a dialogue between the environmental scientists and planners can be established before an advanced stage of planning and design is reached. Often an ecologically acceptable alternative can be found that would cost no more than a destructive routing or

action. The planners would understandably be hesitant to initiate substantial changes at a late stage which would require them to start all over again. Economics play a very large role: a developer may decide to take an ecologically disruptive action even though compensation may be necessary, if this action is economically more advantageous. This strictly economic view ignores the intangible values: how much are a way of life, tradition, peace and contentment worth? In some cases, the environmental scientist may show that an ecologically sound action is less expensive in the long run than a disruptive one. It is always better to prevent a situation from occurring than to repair after the damage is done.

In many cases, regulations force the developer to adopt an ecologically acceptable course. The environmental scientist has an important role in showing why certain actions should be controlled by regulations or in developing acceptable standards for the regulations. There are many regulations applying to the proposed developments, but they are by no means comprehensive. The review of existing regulations and the formulation of new conditions and requirements is a long and difficult task.

The final step in mitigating the environmental impact is the establishment of effective control and surveillance. Both the developer and the licensing agencies may have the best of intentions, but in practice many things happen that were not planned. It is one thing to lay careful plans, but it is quite another to carry them out under often difficult circumstances. What of the bulldozer operator, working in bitter cold of the dark arctic day? How careful will he be about pushing over a few trees, or pushing some dirt into a frozen stream bed? Effective, round-the-clock control both by the developer and the licensing agencies will be necessary, perhaps with a system of fines and power to suspend the operations.

PAST EXPERIENCES

It is fair to say that government agencies were ill-prepared for the evaluation of ecological impact by both the Mackenzie Valley pipeline and highway. Study groups, task forces, and working groups were organized hastily, but too late to effectively contribute to the planning of the developments. These groups were forced to review well advanced plans, without much hope of fundamentally changing them.

The assessment processes were successful, however, in effecting some changes in construction design and routing. Examples are the development of guidelines for culverts to allow passage of fish, causing an awareness of problems associated with freezing of unfrozen soil around the pipeline, and making minor changes in the route and design of the Mackenzie Highway. However, because they were involved in the development program too late, the environmental scientists were battling the symptoms without being able to get at the cause of the problems. It would be beneficial for both the developers and the licensing agencies if environmental design were considered at the conceptual planning stage rather than later, when confrontations and costly changes can result.

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TORONTO, ONTARIO M4Y 2N9

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* SPECIAL EDITION OF NEWSLETTER/BULLETIN
ISSN. 0318-5133
VOLUME 33, No. 2