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ENVIRONMENTAL CONDITIONS & THE PROPOSED DEVELOPMENT OF
RAE - EDZO, N.W.T.

Prepared By

Jack Grainge, Regional Engineer
N.W.T. Region, Medical Services
Dept. of National Health & Welfare
1401 - 10025 - 106 Street
Edmonton, Alberta

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Environmental Conditions & the Proposed Development of Rae - Edzo, N.W.T.

Purpose of Report

The main purpose of this report is to point up the impending environmental disaster which will result from the proposed development of a large town on the present site of Rae. A secondary purpose is to state a previously unexpressed explanation for the failure of the settlement in Edzo, and to propose a solution to this problem.

Introduction

Living conditions in Rae are basically insanitary for many reasons. Many of which result from the settlement being partly surrounded by a polluted, turbid, shallow lake (3 to 5 ft deep).

The water supply and garbage disposal are defective. The main problem is the fact that kitchen, human and dog wastes are discharged in the yards in which the children play, everyone walks and the dogs live. This pollution washes into the lake which is a water supply, and it is tracked into the lake, residences, and public buildings. Under these circumstances, most people in the community assimilate gross numbers of bacteria of intestinal origin. This relationship has been demonstrated by the incidence of serious intestinal diseases and deaths during recurring epidemics throughout my long experience in the settlement. During 1976, two people died of gastro-intestinal diseases.

The seriousness of this situation has been demonstrated by a few of the newspaper articles over the past contained in Appendix B and information supplied by medical officers of health contained in Appendix A.

Edzo is located 11 miles by road and 4 miles in a direct line, from Rae. It is effectively a new town, which was intended to grow, while Rae was to remain the home of the hunters and fishermen. The initial planning and construction was enthusiastic and vigorous, but later work was negligent, leading to a feeling of hopelessness. The present planners have found renewed vigor in a determination to develop Rae.

It is necessary to make a study of the long range effects of the conflicting proposals for development. Also the causes of the present impasse should be assessed so that orderly development will not be impeded further.

Water Supply, Rae

Raw water is drawn from an excavation in Marion Lake which is 70 ft x 70 ft (approximate bottom dimensions). The depth is thought to be 25 ft deep at the middle. The excavated silt & gravel soil was used for constructing the embankment. The initial purpose of the excavation was to allow infiltration, and also storage of the clear water. Unfortunately infiltration was less than that predicted by the geologist. Consequently the embankments to allow the entrance of water from

the lake.

Water is pumped from this reservoir, through a 4.5 ft diameter sand filter, chlorinated and discharged into an 8000 imp gal steel reservoir in a heated building. The water is pumped to a hydropneumatic pressure distribution system which delivers water to haulage trucks and to Arnie's Cafe, a residence owned by the proprietor of the cafe, an R.C.M.P. office and residence building and a second R.C.M.P. residence.

Water is hauled by Rix Trucking, under contract. There are two haulage trucks - 1200 and 1800 imp gal. Fire protection is provided by a haulage truck which is kept in a heated building. Supplemental fire protection is provided by the haulage trucks, at least one of which is kept full overnight.

The water is medium hard, turbid in summer and slightly colored. In other respects it is of good chemical and physical quality.

The water is subject to much contamination by wastes from people and dogs throughout the community. The rocks on which most of the community is located offer no absorption of wastes from the residences and the dogs. The silt soil on which the remainder of the community is located allows little absorption of the liquid wastes in summer, and of course, none at all in winter. The wastes which enter the lake are the contents of broken toilet bags, the wash water from most residences and dog feces.

The filtration system, which does not remove turbidity, is to be replaced by a Water Boy treatment plant manufactured by Neptune Meter Co. This is a standard plant providing coagulation, settling and filtration, which should remove the turbidity and the color.

The water is chlorinated with a chemical pump feeding a solution of calcium hypochlorite. Spare parts for the chemical pump are on hand for use in case of a breakdown. Tests are taken daily by the operator. Due to the considerable contamination of the raw water, personnel from the Department of National Health & Welfare should check the operation by making additional tests for chlorine at least once per week. The tests should be made on the water in the reservoir, and it should be no less than 0.1 mg/l.

The contract for renovations to the water plant includes a new water reservoir. It should be provided with a bottom that is sloped to an under-drain, so that it can be flushed clean. At present it is necessary for a man to enter the reservoir to clean it, and this is a source of contamination.

The reservoir should also be covered. A manhole in the cover should have a turned-up lip around the edge. The cover should have a turned-down edge to fit around the turned-up lip.

Contamination of the Water Supply, Rae

The people are critical of the source of water. Their criticism is based soundly on their observations of the wastes from their houses running into the lake, and the debris from their townsite drifting around the island towards the water source. They have been educated to relate the

frequent gastroenteritic diseases in the community to sewage pollution of their water supply; and they will continue to blame the planners, the engineers and the Dept. of National Health & Welfare for these epidemics of gastrointestinal diseases which are bound to continue.

Sewage, Rae

Sewage is collected in holding tanks from the HBC stores, the R.C. Mission, the Health Clinic, the Town Hall, Arnie's Cafe and residence buildings, and the R.C.M.P. buildings. The sewage is removed by haulage trucks under contract with Rix Trucking Ltd.

Waste water from all of the other buildings is discharged directly to the ground beside them.

This discharge presents critical public health and environmental problems, because it contains some human wastes. People and dogs track through the puddles in summer and over the ice mounds in winter. There is negligible seepage of wastes into the soil, and the excessive runoff water provides a vehicle to spread disease germs throughout the settlement and into the lake.

Toilet Sewage Bags, Rae

Toilet bags from the residences are placed alongside the road, and hauled away in an open-box truck. They are discharged over the end of a ramp, to the edge of a slough.

The disposal method is far from satisfactory, but it is difficult to suggest practical improvements. A dry dump that is covered regularly makes a better final disposal, but it is more costly and more fly-infested in summer. The water in the slough, shallow though it is, provides cover for some of the bags that become broken. Unfortunately most of the bags are in a pile, above the water level.

The offensive appearance of the site is accentuated by some of the toilet bags floating away, a hundred feet or so. However they do not reach the highway, so the mess is confined to the view of the operators and supervisors. The bags would submerge in time if they were a type which decomposes; but the decomposition of the bag would expose the contents to the air and to flies. Consequently the odors would be much stronger and the flies many times more numerous. For example, experience has shown that flies and odors at a dry toilet sewage disposal site are reduced by much more than 99% with the use of standard plastic toilet bags.

Garbage, Rae

Garbage from the residences is placed in 45 gal barrels, which are on low wooden stands alongside the road. The garbage is hauled away in a covered, low-loading type of garbage truck. The nuisance grounds is a small hill a half mile from the town, along the road to the highway. Garbage is dumped over the edge of the hill that is away from the highway, so that the garbage cannot be seen. The garbage is burned occasionally. Two or three times a year it is compacted, and covered with gravel from a pit near Russel Lake, three miles to the north.

The site is relatively well maintained. The dumping is fairly well confined. A 3 ft high picket fence has been erected along the east side in order to prevent the blowing of trash towards the road from Rae to the highway. The covering is reasonably adequate. As with most sites it could be improved by better segregation of the combustibles so that there could be better burning. However it is recognized that this adds to the cost of the haulage, and a discrete point must be chosen whereby additional effort is not worth the added benefit.

If the community expands, a similar but more distant disposal point, should be used.

Garbage and Toilet Bags, Rae

A considerable improvement in the handling and haulage of garbage and sewage bags could be effected by the use of plasticized paper garbage bags at all houses. The use of these bags is discussed on page 30 of the Sanitation Manual for Isolated Regions. Toilet bags could be tied tightly, and carefully deposited upright in the garbage bags. Large pieces of burnable trash should be discarded separately.

The plasticized paper bags should be hung outside in protective frames as shown in the photo of the Sanitation Manual, page 30.

The use of these garbage bags reduces the amount of trash that is blown (1) out of the storage barrels, (2) off the haulage truck and (3) away from the disposal site. This change of approach to garbage handling would reduce the cost of haulage by approximately 50%, because of the savings in time of handling garbage barrels and toilet bags.

If the suggestion to use these bags is not accepted, then the best alternative is to improve the present toilet bag disposal site. One way of doing this is to cover the pile of toilet bags with earth. If a drag-line were available it could be used both for making a deeper receiving body and for covering the pile of toilet bags. This suggestion is predicated upon the construction of dams so that there will be a theoretical retention time of approximately two years in a series of two ponding areas. This is somewhat in accordance with a recent recommendation by Mr. B. Van Hees, Reid Crowther & Partners.

If the community expands a more remote site should be found for this disposal.

Topography, Drainage & Soil Conditions, Rae

The two islands of the original Rae townsite are rock. Drainage was adequate prior to the construction of roads, which blocked the drainage and resulted in the forming of puddles. Wastes from the residences and contamination by the contents of broken toilet bags, result in these puddles being severely polluted.

Except for a few rock ridges at the east end, the main part of the community is flat, therefore it is not easily drained. The subsoil is mainly silt which results in the frost-heaving of culverts, buildings, roads and utilidors. In other areas where care is taken to provide a good final solution, this silt would be dug out and replaced, - for example under the roads in Alberta. Unfortunately this is a problem in Rae, and a good solution cannot be afforded. However in other similar countries where long range plans have been prepared, such as Greenland, Lapland and some communities in northern Russia, major communities are not developed on sites such as Rae. For example thousands of Greenlanders are being moved from poor sites in Greenland to good sites in West Greenland in which the communities have favorable environmental factors and economic bases. The program is experiencing some opposition and criticism; nevertheless there is no realistic long range alternative, so the program carries on.

Water Supply, Edzo

The water intake is located in West Channel, 500 ft south of the Mackenzie Highway crossing, 1000 ft from the mouth on Great Slave Lake, and 50 ft off shore. The intake consists of a half section of 6 in pipe, of which the openings are covered with a $\frac{1}{2}$ in screen.

The 90 ft long, 6 in intake pipe is supported on a double row of steel pipes, 5 ft below the low water level. It contains an electric heating cable which runs from a gate valve adjacent to the pumphouse to 10 ft off shore, a total distance of approximately 50 ft.

The water pumphouse is 16 ft x 12 ft in size. It rests on piles driven into the permafrost, however deeper piles will be required to stabilize the building. The water supply is not considered to be reliable until the building is stabilized.

The water intake discharges into the bottom of two wet wells, 1.5 diameter x 9 ft depth, in which the static water level is a minimum depth of 5 ft. Water is pumped from these wet wells by two alternately-operating deep well type turbine pumps. The water is piped to the treatment plant in town through a 4 in pipeline, with a return by means of a 3 in pipeline. The water is heated as required by diverting the flow through a steam-heated heat exchanger. The amount of the return flow is controlled by the operator, according to his experience. The temperature of the return is maintained at 40°F with the temperature drop being 1°F. The boiler has the capacity to raise the temperature to 55°F.

A float control in the reservoir electrically activates a slow opening-and-closing, motor-driven valve at the discharge end of the supply pipeline, which results in an increase or decrease of the pressure in the pipeline. This pressure differential controls the on-off switch of the supply pumps, which is located at the outlet of these pumps. The water supply line to the town consists of 2470 ft of 4 in polyethylene pipe, with a 3 in water return line laid alongside of it. Both pipelines are factory-insulated-and-covered with a 2 in thickness of polyurethane foam insulation and a polyethylene jacket. The joints are butt-fused, and jacketed with a polyethylene shrink sleeve.

The pipes are laid side by side in a 3 ft wide trench, cut into the permafrost. The subsoil is mainly sand near the intake pumphouse and shale near the treatment plant, with muskeg between the 600 and 800 ft points. There is a 6 in thickness of compacted sand bedding below the pipes, and 14 in thickness of sand surrounding and over them. The section of the pipelines which run under the highway are contained in a 60 ft length of 12 in corrugated iron culvert. The thrust blocks at the pipeline bends are made of insulating concrete.

The treatment building, size 30 ft x 24 ft, is located at the lower end of the town. Water treatment consists of filtration and chlorination. There are two pressure sand filters in parallel, each with a surface area of 15.9 sq ft.

The rate of flow through the filters is controlled by a setting of a valve to provide 30,000 imp gal of treated water per day. That is 0.66 imp gal per sq ft per minute. The filters are backwashed once per week, although the pressure across the filters never rise more than 2 psi. The filter backwash water is discharged into a manhole in the sewer system.

The chlorinator is a Wallace and Tiernan, Penwalt 125, chemical pump, feeding NTC chlorine solution to the water after filtration. There are spare parts on hand for maintenance of the chlorinator. The chlorinated water discharges to an earth-covered concrete reservoir beside the pumphouse, volume 200,000 imp gal. The chlorine level in the water in the reservoir is maintained at 0.1 mg/l.

Water is pumped into the distribution system by four deep-well-type turbine pumps. Two of these are electrically-operated, alternately-operating service pumps of 42 igpm capacity at 120 ft head. A third is a standby, electrically-operated pump of 83 igpm capacity at 120 ft head, which operates automatically when the pressure drops to a preset level. A fourth is a standby diesel-engine-driven pump of 833 igpm capacity at 165 ft head, which operates automatically when the pressure in the mains drops below a preset level.

The water mains are asbestos-cement, 6 and 8 in sizes, factory-insulated with 2 in of polyurethane foam, and protected by a polyethelene jacket. They are buried with shallow earth cover.

The fire hydrants are the on-line type. The mains are looped, and the water is recirculated back to the water plant. Twenty-nine of the service connections are heated by electrical heat trace cables. In 40 cases there is a dual service connection with a small pump in the residences, drawing water from one and discharging to the other in order to assure a constant movement of warm water.

Discussion of Water Supply, Edzo

1. The intake pumphouse rests on piles which apparently are not long enough to rest on stable ground. In order to assure that the water supply is reliable, the piles should either be extended to a deeper depth or additional deeper piles provided.

2. Generally the water has been turbid, but otherwise of good chemical and physical quality. It should be improved in quality by installing coagulation and sedimentation treatment prior to the filtration. The turbid water is objectionable from several view points, the most significant of which is occasional surges of particularly turbid water. This effect results from the turbidity settling in the mains, and later becoming stirred up when there is a surge of water use. The result is that the turbidity at times is more than 100, as described by inhabitants of the town. Note that this is well above the maximum acceptable limit of 5 units, and the objective limit of 1 unit, according to Canadian Drinking Water Standards.

3. The backwash discharge flows into a manhole of the sewer system. This constitutes a cross connection between the water and sewer systems, and it should be rectified. This can be accomplished simply by discharging the backwash to a sump, with the discharge pipe being a minimum of twice the diameter of the pipe above the top of the sump.

4. When the haulage truck is being filled at the treatment plant, the pressure of the water in the mains drops to zero, and even to negative values at the higher points in town, which are 35 ft higher than the treatment plant. This results in surges of water which stir up the sediment in the mains. Also it results in the infiltration of ground water which is subject to contamination. There is also the danger of contaminated water from fixtures such as an automatic clothes washer in one of the households at the higher levels in the town. This can be avoided in a number of ways. Probably the simplest system is to provide a switch for the haulage truck operator to operate the gas engine driven pump while he is filling a haulage tank.

Sewerage, Edzo

The sewers are concrete, size 8 in, with shallow earth cover. They are factory-insulated with 1 in polyurethane foam, and protected by a polyethylene jacket. The manholes are made of insulating type of concrete, and in addition each is provided with a layer of insulation below the cover.

The sewage flows into two sewage oxidation ponds, size 120 ft x 120 ft

x 14 ft depth. The ponds are operated generally in parallel, but the operator prefers series operation at times in the spring. There are electrical heating cables on all inlets and outlets of both ponds.

Discussion of Sewage Treatment, Edzo

The sewage treatment is inadequate according to recent standards of environmental protection. The need for additional treatment is indicated by the green color of the effluent in summer. In any case additional treatment would be required as the community grows.

A higher level of treatment can be obtained at reasonable cost by adding a third, larger pond to the system. Plans for making this construction are contained in the original design. This large pond would be located to the west of the existing two ponds.

The planned effluent discharge point for the large lagoon would be to the west of the lagoon system. This would separate the effluent discharge from the water intake by a mile or so along the shoreline, which is more than adequate in view of the large water body of North Arm.

Need for Long Range Planning for Rae - Edzo

It is time for responsible officials to take a long range view of the recurring epidemics in Rae before planning the development of Rae - Edzo. There are reasons why there is a higher incidence of gastro-intestinal diseases in Rae than any other settlement in the Canadian North, and probably in all of Canada. Officials are being completely irresponsible if they delude themselves into the belief that making minor improvements in the water supply and waste disposal will reduce the severity of these recurring epidemics. Most likely the situation will worsen considerably.

At the risk of being accused of harping about past mistakes, it is necessary to point out that since 1959 the medical officers of health and environmental engineers have been trying to convince the responsible planners and engineers that by such means they are wasting time and money and also endangering the health and lives of the people in Rae. In 1962 Dr. K.F. Butler, Medical Officer of Health for the N.W.T. and the Environmental Engineer for the N.W.T. met with the senior administrators and engineers of the N.W.T. They pointed out how the fundamentally poor site resulted in insanitary living conditions, which caused severe epidemics of gastro-intestinal diseases and resulting deaths. They also pointed out that the proposed water supply and sewerage systems would not help the situation sufficiently.

Practically every year subsequent to the construction of those systems in 1963, the Environmental Engineer for the N.W.T. pointed out to the responsible senior administrators and engineers for the N.W.T. the inadequacy of those facilities. Once again I repeat that the half

measures planned at the present time cannot correct the fundamental faults. My successors in future years will be repeating this advice again and again, because the epidemics will continue, and the Department of National Health & Welfare will continue to bear the brunt of the blame.

History of Rae

Rae is the central community of the Dogribs, whose traditional rich fishing and hunting area extends from Great Slave Lake to Great Bear Lake and from the Mackenzie River to the Coppermine River. The people migrated to this area from south of Great Slave Lake following losing a battle with Chipewyans, who gained the advantage by making a surprise attack. Edzo was the famous chief of the Dogribs, who arranged a peace treaty with Ravenhead, the chief of the Chipewyans. *Ref. Mr. Peter Baker, deceased.

In 1852 a trading post called Ft. Rae was established by the Hudson's Bay Co. on Fort Island, in Great Slave Lake. It was named in honor of Chief Factor John Rae, who travelled extensively in search of the Franklin Expedition. At an unknown date, probably following the annihilation of the Yellowknives by the Dogribs, this trading post was moved to Rae Point, ten miles south of Frank's Channel, and sixteen miles south of the present site of Rae.

Approximately at the turn of the century the Northern Trading Co. established a post at the present site of Rae. The site was near Frank's Channel, the point of convergence of the travel routes from all the hunting areas in the vast fur-rich northern hinterland. This company was able to entice the hunters to stop at this post, rather than travel another half day to the HBC post. Consequently in 1904 the HBC moved from their expansive quarters at Rae Point into small buildings on the outer island of Rae, and the R.C. Mission to its present site on the opposite island.

In 1934 the only buildings in Rae were those of an R.C. Mission, a radio station and residences of the R.C.M.P. and three traders including the H.B.C. At that time, the Indians lived in tents.

Soon thereafter the settlement began to grow like Topsy with no consideration being given to the ultimate consequences. The Mission built a 40-bed hospital in 1939, and doubled its capacity by making extensions in 1950 and 1955. Soon after the war, residences were built for a doctor, a game warden and a teacher. A two-room school was built in 1956 replacing a temporary one-room school, and later two portable one-room buildings were added.

In 1959 a power line was extended to Rae and several public buildings constructed. In 1960 an access road was built to connect with the Mackenzie Highway. Growth continued until approximately 1972 when a construction freeze was initiated. During 1976 the freeze was lifted, and ten new houses were built and many more renovated.

History of Environmental Conditions in Rae

The first sanitary investigation was made in 1938 by Mr. Aubrey Perry, Public Health Engineer, Dept. of National Health and Welfare. He stated that white and Indian permanent populations were 25 and 100 respectively, with a further 700 people trading in the posts there. He reported on the insanitary conditions which resulted from the human and household wastes flowing directly into the water surrounding these rocky islands. Unfortunately he was unable to propose safe alternatives for the water supply and wastes disposal, other than chemical toilets to be used in the 70-bed hospital which was to be constructed the following year. Two other reports in the 1950's pointed out the insanitary conditions, and offered short range suggestions to provide some improvement.

Two reports by Environmental Engineers of the Dept. of National Health and Welfare in 1959 took into consideration the long range growth of the settlement. At that time the Indian population ranged between 300 and 700. Plans were being made to construct a two-room addition to the two-room school, teachers residences, garages, workshops, bulk oil storage tanks, electric power line and a 7-mile road to the highway. The total proposed expenditure was in excess of the total value of the existing buildings at that time. The report contained a prediction of the environmental disaster which would result if the community was allowed to grow. Both reports contained recommendations for finding an alternative site for the proposed development.

The reports were supported by follow-up discussions with the engineers in Ft. Smith, and by a letter from the Chief Medical Officer of Health for the N.W.T. to the Commissioner of the Northwest Territories.

The July and August reports were followed in the fall by the first epidemic of bacillary dysentery in the settlement. More than 100 people were sick in bed and two children died. After that the medical officers of health at all levels began to press for the development of an alternative site, but the development of Rae continued. A haphazard, albeit costly improvement of the water supply in 1962, has been unsuccessful. Recurring epidemics of infectious hepatitis, dysentery, and other gastrointestinal disorders as well as a continued high incidence of ear infections among children, is an indication of the severity of the extremely insanitary environmental conditions in Rae.

During the last eighteen years, reports in the newspapers throughout Canada condemn the government at all levels and particularly the Dept. of National Health & Welfare, for the insanitary conditions. In August 1976 a coroner's jury investigating the case of a nine year old boy who died of bacillary dysentery concluded that the guilt lies with the government of the N.W.T., the hamlet of Rae - Edzo, and the Dept. of National Health & Welfare.

Gastro-Intestinal Diseases Reported at Rae¹

<u>Disease</u>	<u>Year</u>						6-Year Total
	1971	1972	1973	1974	1975	1976	
Salmonella Infections	4			1	2	2	9
Bacillary Dysentery (Shigella)	7	4	14	28	6	78 ²	137 ⁺
Infectious Hepatitis	56					1 ³	57
Gastro-enteritis (Unidentified as to type)			3	9		50 ²	62

1. Reported to a nurse or the doctor. It does not include many people who did not report to a nurse or the doctor due to considering themselves to be insufficiently sick.
2. This figure does not include many people who became sick during September at the time of an epidemic. There was no doctor in the community at the time, and records for September are missing.
3. There were also nine cases of serum hepatitis, which disease is similar to infectious hepatitis. It is usually spread by needle injections in the blood, but it seems more likely that in this case it was spread by the patients having consumed the intestinal viruses.

Epidemiology of the Gastro-Intestinal Diseases in Rae

A variety of insanitary conditions are responsible for the epidemics of gastro-intestinal diseases in Rae. The drinking water that is delivered seems to be generally condemned. The water comes from an unsafe source, receives insufficient treatment, and is subject to contamination in delivery - as is common to most delivery systems in the N.W.T. The occasional use of water from the lake in summer together with contamination of the water during storage in the residences is of much greater bacteriological significance.

The unsatisfactory disposal of wastes throughout the community combined with insanitary conditions in the homes and throughout the community are probably the major causes of the epidemics. For example washwater wastes, which contain intestinal wastes, dilute though they be, spills beside most of the residences. People and dogs walk through these wastes and children play in them. The hands and clothes of the children become contaminated by the intestinal wastes, especially on sunny days in winter, when there will be a thin skiff of water on the surface of the ice. This contamination is spread throughout the families and throughout the community.

Decision to Establish Edzo

In 1965 when consideration was being given to the construction of a large school in Rae, Medical Officers of Health and Environmental Engineers of the Dept. of National Health & Welfare considered once again the adverse long-term effects that would result from this construction at this site. They took note of the serious epidemics which had developed during past years. Predictably the epidemics had become more and more serious with each passing year as the population increased; and the situation would deteriorate further. It was obvious that the population would rise to 3000 during the lifetimes of some of the residents. The health officials were worried about the sickness and death which would inevitably result; and they were also concerned that the Dept. of National Health & Welfare would be blamed for these unavoidable consequences.

Every resident medical officer of health in Rae as far back as Dr. Joanna Pyper in 1958, openly criticized the townsite as being the basic cause for the recurring epidemics of gastro-intestinal diseases in the community. With their encouragement and that of the Regional Director of Medical Services for the N.W.T., the Environmental Engineer for the N.W.T. made visits to all officials who might be concerned - the N.W.T. administration in Fort Smith, and local representatives of all agencies. He met with the Rae Community Club, the Rae Development Committee and the Band Council. Approximately a hundred residents were in attendance at the Band Council meeting, including the administrators in Yellowknife of both the Northern Affairs and Indian Affairs Branches of the Dept. of Indian Affairs and Northern Development.

He showed slides of Rae and other communities throughout Alaska and northern Canada and pointed out desirable features in a townsite. Following the meeting, he asked for a show of hands, and there was overwhelming support for the siting of the proposed school at a better location. Chief Bruneau and several councillors stated that they had no objection. However it should be stated that in recent discussions with some of the older associates of the Chief, that at the time they were thinking that a suitable site could be found on the south shore of Russel Lake, immediately north-east of Rae.

During February, 1969, Mr. N.A. Lawrence, President, Associated Engineering Services Ltd., Edmonton, addressed the N.W.T. Council meeting pointing out the favorable features of the new site. At the meeting the Chief and Council made a submission in favor of the school being located at Rae, but not objecting to another site being chosen. A representation of the young Indians in Rae favored a site along the Mackenzie Highway, because they hoped that there would be more opportunities for employment there. The young people also requested the N.W.T. Council to establish a community at the proposed new school site on the highway where there would be opportunities for employment.

The same evening the Chief and councillors met informally with Engineers

Lawrence and Grainge. After general discussion on the meaning of the N.W.T. meeting, the Chief and Councillors stated that the school should be at the proposed new site along the highway. They decided that many people who did not have dogs, boats, and other equipment might move there.

History of Edzo

The roads in Edzo were built in 1969. Construction of the school was started in 1970. In 1970 Mr. Arnie Steinwand hired an architect who prepared plans for a store - motel - restaurant - service station - recreation complex. Unfortunately he lost this investment due to the development being delayed. In 1971 proposals were made for a shopping - service complex to be run by a cooperative, but these did not reach the planning stage.

The water and sewerage systems were built in 1970 to 1972. A well water source was tried in 1972, but later relegated to the role of an emergency supplemental supply. The major water supply system depends upon water from West Channel.

The present community consists of the day school with 400 students, a 12-bed hospital and 70 residences. The population excluding students, is approximately 270. The piped water supply lacks a treatment plant, and the pumping operation has been interrupted on occasions. The sewer system, although well designed and constructed, was allowed to freeze during the first year; however it has provided continuous service since that time.

Reasons for the Failure of Edzo

During 1969 when Edzo was first planned there was a degree of enthusiasm among the local people. All people were glad to see a large school located in the vicinity so that children could stay among their own people while in attendance. Everyone hoped that this would be conducive to children advancing further in school.

Many of the people in the settlement were pleased to see a development on the highway where they might find employment without leaving their people. The teachers, nurses and many others were pleased to move to a site where there would be less insanitary conditions.

Unfortunately the planners, having made the decision to start the construction of a new town, turned their minds to other matters. Both the Hudson's Bay Co. and Arnie Steinwand applied for permission to build a new store there. In fact for awhile the HBC operated a store in a small building which was made available to them. The building was requested by the Band Council, for other uses, and the store stopped operating.

The Band Council opposed the opening of a store by a private company, planning at the time to develop their own store there, but later they dropped the idea. Apparently noone followed up in the planning, and the

idea of a new town died rapidly thereafter.

The final negative result was obvious to everyone. The people could see no attractions for moving to Edzo. There would be no store in which to make necessary purchases, and also have a daily visit with friends and relatives. There would be no jobs as soon as the immediate construction was finished. There would be no movies and other community events, and few had cars with which to travel to Rae. Few of their friends would be there if they moved to Edzo. The drinking water, although perhaps safer, was visibly and by taste no better than the water available in Rae.

Responsibility to Other Communities

The impact of the insanitary living conditions in Rae is not confined to this one community. The outbreaks of gastro-intestinal diseases which occur in Rae periodically, spread to nearby communities and from there to others further distant. The medical officers of health in Rae and Inuvik have noticed this pattern of the spreading of gastro-intestinal diseases from Rae to Lac La Martre, Rae Lakes, Ft. Franklin, and Ft. Good Hope, in turn, and from Rae to Yellowknife and Snowdrift. Most likely there have been many cases of the diseases spreading even further, however this subject was never studied. The nurses in Rae relate how the bacteriologists in the Public Health Laboratory of the University of Alberta, refer to Rae as the cesspot of their district. They make bacteriological tests on samples of tissue, blood, urine, feces, etc., from patients throughout northern Alberta and the western and central Northwest Territories.

The planners of Rae have a responsibility to the people in other communities, so that Rae is not a regular source of contagious diseases for other communities. This objective on a world-wide basis is the main focus of the work of the World Health Organization.

Canadians are justifiably proud of Canada's support for, and co-operation with, the W.H.O. They do not want to be ashamed of a part of their country that does not support these principles.

Opinions of People in Rae and Edzo

During five days in Rae and Edzo, I spoke to as many people as possible, requesting their opinions regarding the development of Rae-Edzo. In order to focus the discussions I began each meeting with a statement that Edzo had been created to reduce the growth of Rae; and the growth of Rae would create intolerable insanitary conditions due to the flat silty soil making the operation of water mains and sewers impractical. I stated that I was anxious to learn the opinions of as many people as possible regarding the reasons for the failure of Edzo, and what can be done to revive the growth of Edzo. Opinions are summarized following. I am sorry to report that I did not have sufficient time to assess many of them.

During the construction of Edzo, many people were enthusiastic about

its establishment, especially the young people who were working on the construction work. They considered that a town near Rae, alongside the Mackenzie Highway would become a thriving town with jobs for many of the young people who would otherwise be on welfare. However at the present time most people are despondent about the development of Edzo. Most of the people I spoke to, who are on the Rae-Edzo Hamlet Council, the Rae Dogrib Band Council, or who work in the hospital, are either opposed to or in favor of the development of Edzo. Most of the rest of the people held no particular objections to the development of Edzo. Most people, regardless of their opinion, were pleasant and cooperative and offered many suggestions for the development of Edzo.

Most people stated that the two islands and the north-east end of the mainland sections of the original Rae townsite are good locations for the homes of hunters and fishermen and their families and relatives. Most of the people there live near the shore of Marian Lake. Thus they are able to store their boats and equipment near both the water and their residences. These are facts which were stated clearly by the late Chief Jimmie Bruneau and others, prior to the construction of Edzo. They were accepted by all responsible officials.

The filling in of one of the straits of water has reduced the water shoreline, but that strait was too shallow for boats in recent years.

Many people are opposed to the development of Edzo and some of these people are members of the Councils, and thus were able to block the development of Edzo. Also they have been effective in lifting the freeze on new construction at Rae.

Many people in Rae consider that regardless of their request for the 12-bed hospital to be located in Rae, it was constructed in Edzo. Some believe that the high incidence of diseases and ear infections are attributable to (1) the hospital being so far away from Rae and (2) the doctors and nurses not making house calls when people are sick. A few maintain that the hospital should be moved to Rae.

Many people maintain that the high absentee rate among the students of the Edzo School results from the children having to travel to school by bus. They state that children who are late for the bus miss a whole day of school, whereas if the school were in Rae, they would be merely a few minutes to an hour or two late.

Many people prefer to live in Rae, because there are a lesser number of flying mosquitos, due to winds from the lake sweeping unchecked through the community most of the time. The swamps around Edzo and the trees offer ideal conditions for the breeding of mosquitos and their protection from the winds. Some people stated that they prefer the lakeside scenery of Rae to the woodland scenery of Edzo.

Three people stated that a population explosion which has started, will continue for many years, because half the people are under the age of thirty. What is more the excess population of Lac La Martre, Rae Lakes and Snare

Lake will migrate to Rae. One person said that Rae will extend a long way inland, if there is no other relief for the population growth.

One person stated that officials judged the interest of the people by their own standards. They held a public meeting, but often with little announcement of the purpose. Consequently the people were unprepared and not ready with answers. Furthermore often the interpreters were picked up at the last minute, and were not the best that would have been available if there had been more notice. Also the officials had too little understanding of the Dogrib people to participate in a useful discussion of the relative merits of Rae and Edzo.

Nevertheless many people in both Rae and Edzo thought that Edzo could be a nice place to live. They freely expressed reasons why the development of Edzo was stopped, and what could be done to get it going again. Some of them stated that responsible officials in Yellowknife ignored the whole matter as soon as they had made a decision to build a school, roads, a few houses, and water and sewerage systems. Some said that the officials antagonized the people by trying to coerce them into moving to Edzo without paying any heed to the difficult problems experienced by people moving there. They found it aggravating that they could not get anyone to even listen to their grievances. For example a person in Edzo cannot even mail a stamped letter in Rae unless he is there when the post office is open, - and the hours of being open are irregular.

An important, albeit unintended, hindrance to moving to Edzo is the cost of the rent. In Rae every assistance is provided free for repairs and improvements of existing housing. People can live there free with their relatives, because there are no taxes and no charges for these improvements. Whereas there is a charge of approximately 25% of a salary for rent on the houses in Edzo. What is more the large houses require much furniture, which the people claim some cannot afford. They claim that people with large families cannot afford the rents and the furniture.

Younger people stressed the importance of sports. They pointed out that a large field for outdoor sports could be developed simply in Edzo by deciding on a location, and clearing the land of trees. Some pointed out that launching of boats and swimming could be possible on Marian Lake by constructing access roads, and building wharfs and rafts. They thought that the developers of the commercial district should incorporate a pool hall, and as a lower priority a curling rink that could be used to house a plastic lined swimming pool during summer.

The teachers and some parents stated that most Dogrib children will not take school seriously until they can see more Dogrib adults who have good jobs as a result of their higher education. The children must be able to see an opportunity for their own realization of suitable employment opportunities, which will result from their own hard work in school. The children can see that intermittent employment dismantling buildings and brush clearing, and a little hunting, trapping and fishing, are hardly worth regular school attendance and hard studying. Some do attend school regularly and study, but they are exceptions, not average.

These people consider that some meaningful steps should be taken to break the developing chain of generations of welfare recipients in Rae.

The reason most often given for the non development of Edzo was the fact that there was no store there. Those without cars could shop in Rae by using the school bus, by hitchhiking back and forth and by arranging to ride in friends' cars, but it was inconvenient. One widow living in Edzo denied that shopping in Rae by these means was particularly inconvenient.

Many people in both Rae and Edzo stated that Edzo would be a nice place to live in if there were a store, post office, cafe, service station and garage. A few thought that there should be a motel and dining room and handicraft sales for tourists and business visitors.

Some thought that lively tourist, commercial and service industries could be developed if a commercial district was developed between the settlement and the highway. This would require the development of an airport suitable for STOL planes, such as the twin Otter. They pointed out that a long flat sand ridge that is suitable for the development of an airport with runways in two directions is developable at negligible cost. The land is practically clear, and the sand ridge is said to be flat and stable, so that less than \$2000 would be needed to develop both runways. Whereas they state that \$10,000 has been spent developing an airport north of Rae, and they state it could never be made safe without costly, additional construction.

The proponents of the airport state that air service established on the highway at Edzo could service the Northland and Echo Bay Mines and Lac La Martre, Snare Lake and Rae Lakes. Both float and wheeled planes could be used. Freight to these places would not need to be hauled the last 60 miles to Yellowknife, the poorest stretch of road. They state that the airplane trip to these points would be correspondingly reduced.

A few people consider that Edzo has potential for a substantial town with an economic basis for several reasons. It is on a highway. It could have a good STOL airport, and a boat and plane dock. The soil is probably the best in the western Northwest Territories except Ft. Smith and Yellowknife. It has the beginnings of economical, extensive, reliable water and sewerage systems. They are aware of Yellowknife companies that would like to establish warehouses and businesses in Edzo in preference to increasing their investment in Yellowknife.

They suggest optimistically that they use the unused parts of the school to teach trades so that young people will be ready to fill jobs as soon as they become available.

One of the respected leaders among the Indians stated that he clearly recalls the good days, especially those of Chief Murphy, prior to 1922. That wise chief decided what was good for the common welfare. Everyone agreed, and moved to wherever the Chief told them. There was no welfare and no need for it, because everyone had enough food, warm clothes, adequate shelter, and a good measure of work and play.

With the coming of welfare in its various forms, individuals were no longer dependent upon their work and contributions to the community. People began staying in Rae the entire year because life was easier, and they enjoyed the increasing benefits, including TV recently. They paid less and less attention to the wishes of the chief, and the way of life of most people has deteriorated correspondingly.

The young people are having the most difficult time, because their whole future is in the balance. They do not know what to do; and because of this uncertainty, they behave with aimless purpose, - like the gulls. They would like to enjoy the benefits of the modern age as they see most white men doing, but few of them acquire the job-skills that are necessary to accomplish this. What is more, few of them are learning the hunting and living skills that are necessary for enjoying a bountiful life on the rivers and lakes to the north.

He believes that generally the older people would rather see the young ones change to the new way of life, than drift aimlessly. Unfortunately it is difficult for them. The Dogrib children are an uncomfortable minority in the schools in Yellowknife and Ft. Smith; and this barrier is responsible for them not staying at schools long enough to learn the trades sufficiently for them to hold jobs. He thought that a trade school and apprentice jobs should be closer to Rae.

However it has been pointed out that 150 students from Rae have graduated from grade 12 in the R.C. College in Ft. Smith.

The hospital staff stated that diseases are rampant among the residents of Rae. Many children are sick most of the time during the first two years of their lives, and are hospitalized as often as six times during that time. Better medical care could be provided at the hospital in Edzo, rather than at the health clinic in Rae. The doctors and nurses are hardworking and dedicated, otherwise they would not be there, taking the insults about not making housecalls. They are anxious to do the best work possible, and to do this it is necessary for a regular bus service to bring the patients to the hospital, rather than to the doctors and nurses in the health clinic.

They do not make housecalls because that has been proven to be an inefficient method of dispensing medical services. The high incidence of ear infections, sickness, and deaths as a result of sickness, is due to the patients not following medical instructions and the insanitary conditions in the community. The patients in fact have free taxi service 24 hours per day from their homes to a well staffed and equipped hospital. This may be the best medical assistance provided in any community in Canada.

It should be stated here that the hospital is located in Edzo to assure that wastes from the sick people will be discharged harmlessly to a sewer, and eventually be treated adequately.

List of People Interviewed in Rae & Edzo

Mr. Peter Anderson, Secretary-Manager, Rae-Edzo

Mr. Robert (Bob) Richardson, Clerk, Rae-Edzo Hamlet, Assistant Superintendent of School Board, and member of Recreation and Exhibition Committees

Mr. Dan Marion, Member of Rae-Edzo Council, HBC Manager, and partner in Rae water delivery contract

Mr. Vital Thomas, Member of Rae-Edzo Council

Mr. Ivan Fraser, Member of Rae-Edzo Council, Teacher at Edzo School

Mr. Guy Chamberlain, Member of Rae-Edzo Council, Operator of Water Supplies of Rae and Edzo and sewerage system, of Edzo

Mr. Charlie Charlo, Chief, Rae Dogrib Band Council together with two other members of the Council

Mr. Nick Football, Councillor, RDBC, together with Miss Adeline Knapton-Pain, Secretary

Father Pachot, R.C. Missionary at Rae for many years and teacher at R.C. College, Ft. Smith for many years

Father Ameroux, R.C. Missionary at Rae for many years

Mr. George Kayina, young man, trapper

Mr. Arnie Arneson and his wife, Jacquy

Mr. Rene Mercredi, Fish & Wildlife Officer, Rae

Mr. David Mathews, Principal, School at Edzo

Six teaching assistants with whom I met during recess at the school.
Fifteen members of adult education classes at the school.

Sister Monpetit, Teacher
Sister Gagnon, Teacher
Mr. Phillip Mackenzie, Teacher
Mrs. Ruth Chamberlain, Teacher

Dr. W. Kempinsky, Medical Officer of Health, Rae-Edzo
Mr. Ron Pearson, Director of Nursing, Hospital
Sister Louise Brodeur, Nurse
Miss Mary Hickey, Nurse, formerly in Snowdrift
Miss Sally McInnes, Public Health Nurse
Mrs. Louise McEvoy, Spare Cook, Hospital
Mrs. Evelyn Blondin, Cook, Hospital
Mrs. Glenna Black, Secretary, Hospital
Mrs. Marie Odel Bishop, Nursing Aid at hospital. Her husband is an R.C.M.P. special constable.

Mr. Carl Clouter, pilot
Mr. Roy Jacobsen, Wildlife Biologist, under contract with Dept. of Environment, and Judy.
Mr. Dennis Berg, trucker hauling freight for Echo Bay Mines
Mr. Dave White, trucker hauling fuel for Gulf Oil Co.
Mr. Ed Zoe and Marie Agnes Zoe

Conclusions

1. If Rae is developed, the health and economic limitations of the townsite will become more apparent with each passing year. Future

generations will regret the lack of a clear-sighted leader among all of those who are responsible for the development of Rae-Edzo at this crucial time of decision. The people will blame the government, and the incumbent officials will blame their nameless predecessors, - who now are the incumbents. It is the responsibility of the officials not to be swayed by prejudices, and disdain for the "government". It is necessary to take a clear look at developments as they might occur during the next fifty, or a hundred or more years, depending upon current fateful decisions.

Whether or not to develop Rae is a decision that will be crucial to both the health and livelihood of many thousands of people, especially to the young people and future generations.

Rae is not only an insanitary community where people must endure recurring epidemics of ear infections, diseases, and deaths from diseases, but it is also an economic backwater. Most jobs in Rae provide no future opportunities. They result from make-work programs such as clearing road sites, ski trails and hydro reservoir sites, and from hunting trips for which welfare payments provide the airplane transportation to and from the hunt.

Most young people in Rae have a difficult time breaking the barrier into steady wage employment where there are opportunities for promotions to positions with higher incomes. These opportunities will be denied them in Rae.

2. As the community of Rae grows, the public health hazard and environmentally unsound conditions will be multiplied, and unfortunately the multiplying adverse public health effects will not be confined to Rae. The epidemics which begin in Rae, spread to at least six other communities before being checked, and perhaps they affect people in two, three or more times that many communities.
3. The responsible officials may have decided to allow Rae to grow, but also they should do everything in their power to make Edzo more attractive than Rae in the eyes of all people. Edzo should be the first to receive a water treatment plant. As a first priority it should have a store, post office, cafe, airport, pool hall, large sports field, service station and garage, roads to Marian Lake and wharfs for launching float planes and boats. The surrounding swamplands should be drained to rid the community of mosquitos. Most of the foregoing will be provided by private developers at no cost to the government. The rest will not be too costly, and will in fact mean a large overall saving considering what they would cost in Rae.
4. Federal facilities such as the health clinic, and the R.C.M.P. buildings should be moved to Edzo. These buildings in Rae cannot avoid contributing to the public health hazard and en-

environmentally unsatisfactory conditions in Rae. This pollution avoidable as it is, is in contravention of federal government expressed intentions to avoid pollution by federal facilities. A contract is being let for the construction of a new R.C.M.P. building in Rae. This contract should be rewritten to specify that the building be located in Edzo.

5. Officials who hold responsible positions at the present time consider that water and sewage hauling will provide satisfactory services. Unfortunately they have not considered the costs of these programs from a long range point of view, in the light of similar demands by seventy or more communities in the Northwest Territories. They have not considered the fact that the taxpayers in the ten provinces may become aware eventually that this type of wasteful expense is a large part of the burgeoning budget of Canada.

In this respect it is unfortunate that past engineers and planners have had liberal budgets. By contrast in Greenland the budgets were smaller, and consequently the municipal engineering and planning has been considered much more carefully, and correspondingly more responsibly.

Not only will the high costs of these sanitation programs in Rae render them impractical, but the programs will be second or third rate by Canadian standards.

6. If eventually piped water and sewerage systems are built in Rae, they will be unreliable for several reasons. The soil is either rock or frost-heaving silt. Consequently costly above-ground utilidors or costly unreliable subsurface pipelines will be required. Many sewage pumping stations will be required in the residential areas. Good engineering requires a minimum of these be used, and those that are used to be located in remote locations. Witness the spoiling of swimming beaches in Yellowknife and Hay River by overflowing sewage pumping stations.
7. If Rae is allowed to grow as proposed, three quarters of the population will live so far from the shore of the lake that they will not be able to have access to it. The people who live near the shore will not want heavy traffic on their doorsteps by people who live a long distance away.
8. Better medical assistance to the residents of Rae can be provided at the hospital by operating a regular bus service between Rae and Edzo. This regular bus service would provide opportunities for the children who miss the school bus to attend school part of the day. It would also provide an opportunity for people to shop and visit in the other community.

9. Consideration should be given to the necessity for setting rental rates for houses in Edzo to prevent Edzo from becoming a "white men's town". This has occurred in many other towns in the North that were previously integrated, for example Hay River and Ft. Smith. This calamity has not yet occurred in Edzo, but it is on the brink of happening. This eventuality can be avoided by charging the Edzo residents less for water and sewage services, because the real cost is actually approximately \$100 less per month per residence. However if this reason is not accepted, then monetary concessions, whether inequitable or not, should be made in the interests of integration.

Long Range Planning for Rae - Edzo

The first step in planning the development of Rae - Edzo should be to determine the results of present planning. The planners are unintentionally deceived as to the benefits to be derived from proposed improvements in services in Rae. It is worthwhile to assess what improvements will be possible and the limitations of the benefits. It can be seen that the improvements which are possible will be ineffective in stemming the tide of recurring epidemics. Noone should be deluded by promises, without studying the causes of the epidemics and the degree to which the proposed improvements will alleviate the conditions.

No proposals short of piped water and sewer systems can alleviate the insanitary conditions satisfactorily, and it is impossible to design practical piped water and sewer systems in this site. The suggestions to develop water and sewage storage tanks at each residence are equally impractical, and any short range plans in this direction are doomed to eventual failure. What is more, much funds will be wasted that can be better used to further a plan that has hope of success.

A short range plan is little different than the promises that have been made and the sanitation projects that have been introduced since 1960. Meanwhile the epidemics have not been checked. In fact the severity of the epidemics have increased since that time. It is obvious to anyone, knowledgeable in epidemiology, who studies the matter objectively, that the severity of the epidemics will increase still further as the population of Rae increases. If a typhoid carrier visits the community, the epidemic will be much more severe, and there are typhoid carriers in Alberta and other parts of Canada who might visit Rae.

The second step is to estimate the eventual population which will be accommodated in Rae and Edzo. Based upon the current population explosion and the migration of people to Rae - Edzo from Lac La Martre, Snare Lake and Rae Lakes, the population of Rae - Edzo should double to 2800 within 15 to 20 years and reach 5000 approximately at the end of the century.

The third step is to determine what services the country can possibly afford based upon the hauled water and sewage services which are being planned at the present time. It is not likely that the economy of Rae

can change, so that welfare and government funded make-work programs will be the mainstay of this community as well as many others. The current program to provide houses costing \$50,000 each, and costly hauled water and sewage services thereafter cannot continue until every family is housed. Temporarily the planners are overwhelmed with more funds than they can spend; but they should consider the bottomless pit to which their program is headed before it is too late.

The water and sewage, and drainage problems can never be resolved at Rae, because it is unreasonable to conclude that the full cost of a final solution can ever be afforded. The peripheral attack at what seems to be the problem is nothing more than self delusions of both the planners and the people.

The final step is to make plans for a community that can be afforded, in relation to the financial needs of all the communities in the N.W.T. It is reasonable to conclude that the problems will never be solved on the site of Rae because of the poor soil conditions, the lack of slope, the poor drainage, and the contamination of the raw water for the proposed treatment plant.

Major Recommendations

1. The water supply for Edzo should not be allowed to appear to be of poorer quality than that for Rae, - because the superior bacteriological quality will not be recognized. Therefore a water treatment plant should be installed at Edzo, preferably immediately and certainly before one is installed at Rae.

2. A secondary long retention sewage lagoon for Edzo should be constructed as part of the existing lagoon system. The primary lagoons should be used alternately, each one in turn lying fallow for a year at a time.

3. A store, service station, garage, restaurant and handicraft sales shop should be installed at a highway location at Edzo. This is necessary in order to assure that Edzo is not less attractive for living than is Rae, and also to provide useful work and secure jobs.

4. Make-work and training programs for the vicinity should center as much as possible at Edzo. On-the-job training of road maintenance equipment operators, garage mechanics and in canoe manufacturing, fur garment making, etc., could be centered here more simply than they could be centered at many other remote places.

5. An airport for STOL aircraft should be constructed at Edzo, and land made available to commercial companies to use Edzo for a transshipment and warehouse center.

6. Rental charges for houses in Edzo should be adjusted in order to avoid creating a "white men's town" inadvertently.

Jack Grainge
Jack Grainge, P. Eng.
Regional Engineer