

REPORT TO  
DEPARTMENT OF INDIAN AFFAIRS  
AND NORTHERN DEVELOPMENT  
ON  
SETTLEMENT OF AKLAVIK

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ASSOCIATED ENGINEERING SERVICES LTD.

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*Consulting Engineers*

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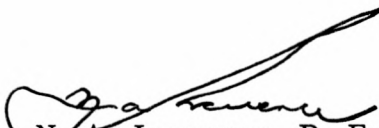
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Respectfully submitted,  
ASSOCIATED ENGINEERING SERVICES LTD.

  
N. A. Lawrence, P. Eng.,  
August 4th, 1967.

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PURPOSE

The purpose of this report is to complement the study prepared by D. F. Makale and to update the Associated Engineering Services Ltd. Report, dated August, 1963.

The primary items to be considered are:

- 1) Drainage and Road Problems;
- 2) Utilities; and
- 3) River Bank Erosion.

The need for remedial measures is sufficiently covered in the Makale Report and need not be repeated herein. It is a pleasure to report, however, that there has been a great deal of progress in dealing with some of the community problems since my first visit in 1962.

### Background -

The magnitude of the soil, drainage and road problem is so great that it was one of the primary reasons for moving the major governmental centre out of Aklavik to Inuvik.

The silt soil deposited in the delta area has all the classical disadvantages of silt as a building material. It absorbs moisture readily. Water flows freely through the intergrain voids. It contains minimal binding properties. In addition to this, permafrost conditions prevail. Thawing of the ground rarely penetrates more than one or two feet below the surface. When the surface is wet, traffic serves only to create a mud surface which can become impassible. Roads are constructed in corduoy fashion by laying down a continuous layer of logs or slabs and covering them with a wearing surface of silt approximately six inches thick.

In past years, minor amounts of gravel have been brought into the area by barge. During the winter of 1966 - 67, a fairly large stockpile of gravel was brought in by truck from the Richardson Mountain side of the delta, but as of July 1st, 1967, had not yet been spread.

After the inception of Inuvik, there was no large scale attempt to upgrade Aklavik until the past four years. Minor projects for sidewalks, corduoy roads and some drainage ditches were instituted, but these were for retaining the status quo rather than attempting to upgrade the surface conditions.

### PROPOSAL

The Makale Report puts greater emphasis on upgrading the area on the basis that, in spite of its drawbacks, it is an established permanent community.

The eight winter months are the great equalizer in the northern communities. During this period, the ground is hard and firm. Snow clearance is the major problem. Blade equipment is available in Aklavik so no concern need be felt for this period.

During the summer months, however, starting with breakup, the prevalence of water filled local depressions and of poorly performing ditches forms the greatest obstacle to upgrading surface conditions.

The Associated Engineering Services Ltd. Report of 1963 recommended a minor program to be carried out over five years to fill depressions. Some improvement has resulted, but generally, the effect has been to move the water hole from one lot to another.

If permanent improvement is to be accomplished, a much broader plan should be instituted. It will be noted from the community plan that the development area can be readily divided into approximately twelve blocks each, close to 60,000 square feet in area.

If each of these areas were progressively filled with earth properly graded with an average of one foot of earth at the front and rear and approximately 2-1/2 feet in the centre, it would be possible to drain the lots into the roadway ditches. Such a project would involve raising some of the buildings, but in general, this would not be a major undertaking.

The amount of earth required to accomplish this is approximately 4,000 cubic yards per block. The major problems are:

Firstly, the source of such fill; and

Secondly, the hauling.

There is little point in discussing the type of fill required. River silt is the only material available.

As regards source, only one source is available. This is deposited material along the east side of the airstrip. Each year, the river deposits fresh material along this bank and is forming useful ground. Sufficient space has evolved to permit the airstrip to be developed on land which did not exist fifteen years ago. It is now suggested that there is sufficient accumulation between the airstrip and the river to permit the withdrawal of 4,000 to 6,000 cubic yards of material per year. This material would be lifted from the water's edge by a dragline and stockpiled in a long windrow approximately forty feet back from the river bank. After two or three days of drying, it would be loaded and truck hauled into position.

This operation would be preceded by an organized effort to raise applicable buildings above the new earth line. There are a number of older buildings which would cause some difficulty as undoubtedly floor joints have rotted. These buildings, on examination, will be those which should be condemned in any event. Where difficulties are encountered, the deposited earth levels can be altered in a local area to accommodate individual buildings. We see no other way to literally raise this Town out of the mud except by such a major earth moving program.

In considering the economics of such action, it is noted that in southern areas the movement and spreading of 4,000 cubic yards of earth is a small project. However, considering that there is presently no equipment available in the area, this becomes a major project.

The project can only become a reality if an excavating machine adaptable as a dragline, backhoe and shovel is brought into the community on a semi-permanent basis together with two dump trucks. A bulldozer is available for spreading.

Such equipment will only be able to work for approximately two months of the year on this project, but can be usefully employed for other months in an extension of the gravel haul instituted last winter and in various other community projects.

To complement the raising of the earth level in the various blocks, the project of street improvement should be continued. In our opinion, the present practice of corduroying, together with a thin earth cover, to be followed by the application of four to six inches of gravel, is a satisfactory technique. As the silt is not a binding material, the gravel will tend to disappear and reapplications every three or four years will be required, particularly if traffic from ungravelled areas is permitted to enter the gravel areas. The plan should be to build the roads up as high as possible above existing ditch bottom.

Gravel is being trucked in winter from a site on the west side of the delta. This project should certainly be continued.

Simultaneously with this, a program to develop a more effective ditching system is required. Makale's proposals include a few revisions in the road system. These rights-of-way should be used for side ditches also.

With flat topography as exists, the only possible slope available for drainage is that which will be built into the raised lots, the raised roads and ditch bottoms sloping at approximately four feet per thousand to the river banks.



With such a desired slope, the ditches must follow the shortest possible route to the river bank.

The problem of thawing and collapse of ground in the vicinity of the storm outlets is almost insurmountable by other than constant maintenance if the outlet is on the south bank. If possible, outlets should be directed toward the east.

The annual high water in the spring often inundates most of the Town and brings with it a layer of silt which plugs culverts and fills ditches. To a large degree this is inevitable. However, it is noted that it is much easier to clean and restore these ditches to service if they are large. In most minor crossings, raised bridges form the most satisfactory crossings and good examples of these already exist throughout the Town.

To complete the complement, the present system of raised wooden side-walks should be maintained and extended. No simple solution to the problem of mud covered road crossings is possible except the cooperation of Town work crews in keeping the pedestrian crossings as free of mud as possible. The standards accepted ungrudgingly by the people of Aklavik are very low. Almost anything would be an improvement.

The improvements recommended for the summer water supply in the Associated Engineering Services Ltd. 1963 Report have now been instituted. The older smaller pipes were all removed from the streets late in 1966 and the new pipes of larger size and with simpler victaulic connections were installed. (This removal and reinstallation led to the report that the entire piped system was reinstalled each year). The older pipes were re-used to some degree in extending the system. The remainder are stockpiled at the Water Treatment Plant.

The filter system was duplicated and reinstalled in the warehouse as recommended. Several minor requirements principally concerned with chlorination were recommended by Mr. Grainge of the Federal Department of Public Health.

A concrete slab to receive a storage tank was in the process of being formed as of June 27th, 1967. This storage forms the first buffer in the supply in the event of failure in the system.

Another innovation was the construction of a plywood pumphouse mounted on a barrel raft. This floating unit is to replace the wooden tower which has served to support the lake water pumping units for the past twenty years.

The supply of water points consisting of an 8 x 10 plywood building on skids, and this in turn having a 500 gallon fibreglass storage tank and oil fired stove, was noted with interest. These are constructed so that residents may draw water by containers as they require it. Four of these units are now in service. It is the intent that four more units will be constructed and distributed throughout the settlement so as to provide a ready source of water. The tanks in these units are filled by tank truck as required.

The major drawbacks of this system lie in the filling process and problems of obtaining a good quality of water for the tank truck. Except for the summer period, water must be obtained from the river. During the breakup period and prior to the lake water being available for filtering, there is a month long period when good water is just not available. The river water is extremely silty and difficult to obtain. Most residents reserve a supply of ice for this period, but many rely on available surface water. No solution is easily available except through massive storage. The large storage tank at the school offers for that institution, a solution for that period.

For the long term solution, it is recommended that a tank of at least 100,000 gallon capacity be constructed at the site of the filter plant and that it be used primarily for this period. Serious problems of freezing are past at this time of year so, although insulation may be omitted, it is recommended so that the use of the tank may be extended as long as possible.

Filling would be by a portable temporary line from the river with the pumping timed to permit pumping from below solid ice and thus obtain a good quality of water. Water from the large tank would then be pumped through the filters and distributed by tank truck to the various water points or residences. It is our opinion that this would be a more satisfactory solution than a fixed insulated line with its inherent problems of freezing.

The same solution is reasonable also for the school during this breakup period. During the summer, the school can be served by the community summer system. During the winter, the truck haul from the river is the only reasonable solution for some years to come.

The problems of hauling water by truck tank in the winter have become the subject of some controversy at the political level. The present contractor has a skid mounted tank which is hauled behind a "cat" tractor. This unit was not being operated at the time of our trip and thus it was not possible to see if the unit was properly equipped.

The water vehicle purchased by the Department of Indian Affairs and Northern Development received very little use during the past year because preference was given to the local private contractor. While we agree with this basic free enterprise preference, there must be a firm understanding as to the standards of equipment and water handling procedures.

More important, it is a time honoured principle in the waterworks field that a community supply must not depend on one piece of mechanical equipment. In the event of even a simple mechanical failure, the Town can be left without a water supply. Therefore, we strongly recommend that until an agreement can be reached and put into effect whereby the local contractor must have two effective water hauling units other than the tank, the truck belonging to the Department of Indian Affairs and Northern Development should be kept in the community and in operating condition.

The Makale Report makes a strong case for treatment of water, particularly when it is hauled by truck or tank. There is no excuse for not chlorinating the water and the hauling contract must make this a "most important" clause.

The problems of treatment, that is, color removal, taste and odor control, can only be overcome if sufficient money is spent on a water treatment plant containing the following units in a heated enclosure:

- 1) 20,000 gallons of raw water storage;
- 2) A boiler unit - oil fired;
- 3) A small "package" coagulation and sedimentation unit;
- 4) The existing D. E. filtration units and chlorinators;
- 5) A 20,000 gallon clear water storage tank; and
- 6) A 2,000 gallon waste water tank.

The process would involve delivering water from the river to the raw water tank, heating it to approximately 45° F., passing it through the treatment unit and into the clear storage units and from there delivering it to the water points.

The cost of such a plant is estimated at \$145,000.

The existing tank truck would be an essential unit for such a plant.

The location of such a unit should be in the region of lots 23 or 24.

This is below the region of bank erosion and above the sources of pollution adjacent to the dock and oil storage area. In such a location, raw water could still be delivered to it in summer from the lake for treatment and distribution.

In winter, the opportunities for obtaining water directly from the river through either a hose or temporary insulated metal line are good. It may be possible to eliminate one half the truck haul.

We do not as yet visualize a winter piped distribution system in Aklavik.

The means of waste disposal is substantially unchanged since the adoption of the stoneboat system four years ago.

It is apparent, however, that the life of a stoneboat unit is approximately four to five years. As the initial cost, however, is approximately \$150, this is not a bad investment. It will be necessary, however, to rebuild four or five units each year. Either funds should be automatically provided for this or a much more substantial unit constructed of steel at a cost of approximately \$700 should be provided to replace the wooden units.

With the advent of built in septic tanks at the nursing station, at the new school and the RCMP office, the handling of liquid wastes (in addition to the stoneboats) is increasing the disposal problem.

For the next few years, however, we consider the tank hauling disposal method is the only economical alternative to follow.

It will be possible to run portable hose lines to the river from the school and pump the tanks out in that manner. It is to be expected, however, that this will be as laborious as the tank hauling disposal system. The route lies across the airstrip and until the disposition of this facility is determined, it will not be possible to route pipelines across it.

The disposal dump has not received any attention in the past years. Dumping is scattered along a quarter mile of road to form the greatest mess imaginable.

It should be possible with the advent of the first frozen ground conditions in the fall to push most of this material right out into the river. The problems of the



men working on disposal can be appreciated considering the very muddy spring and summer conditions.

The construction of a ramp which would form a dumping platform (as recommended in the 1963 report, sketch No. 5) is still recommended.

The concern expressed in the Makale Report on contamination of the water supply becomes real when the continuing spread of the dump is noted. The breeding of flies and insects is to be deplored. The passage of animals from the dump to the water supply lake is a possible menace.

The floating of plastic bags from the dump to the water supply lake during flood periods is not, in our opinion, a real menace although we agree it is physically possible.

Of much greater significance is the necessity of changing the habits of household hygiene throughout the community, of ensuring proper household water storage and handling facilities and of removing the dogs from the immediate vicinity of the residences.

It is noted that the school sewage tank holds 7,800 gallons with predicted discharge of 2,800 gallons per day. The private contractor now hauling sewage will have to be more efficient than in the past to handle this amount.

Some attempt has been made in the past year to limit the river bank erosion by placing log and branch "groins" along the bottom of the bank at frequent intervals. As the process of bank disintegration is tied more closely to thawing of the soil, it is doubtful if the groins will be truly effective. Nevertheless, they are worth experimenting with. Continuous and complete records of their action should be noted and distributed.

The rapidly expanding outlet from the pond to the rear of the old Roman Catholic Hospital was noted. The long term effects of permitting this outlet to continue to enlarge is difficult to visualize. High water from the river will now enter the pond more readily.

If it is watched from the point of view of preventing this outlet from becoming a regular river channel, no danger should result. Its size and form should be recorded at the beginning and end of each summer season.

As noted in the previous report, it is our opinion that there is no economic answer to the river bank erosion and the settlement must learn to live with five feet less of the south bank each year. By the same token, it is expected that the deposition on the east bank will grow at a similar rate. The development of the Town should be in that direction in a planned manner.



## Roads and Drainage -

In recognizing the fact that the Town of Aklavik is a permanent developing community, one must also acknowledge that the area requires considerable assistance to literally lift it out of the mud during the four summer months.

For this reason, it is recommended that:

- 1) A large scale earth moving project be undertaken to raise the average building lot by two feet and sloped to ensure drainage into road ditches. This will require the stationing of a mobile dragline -backhoe-shovel combination unit, together with two dump trucks in the community on a semi-permanent basis. The same units would be used for a winter gravel haul to improve road conditions;
- 2) The road improvement program should be continued; and
- 3) Ditch improvement is a continuing need with particular attention needed at the river outlet ends. Large culverts and bridges should be used wherever possible in order to facilitate cleaning.

## Water Supply -

The water supply situation has improved considerably, particularly as regards the summer supply.

Massive storage in the form of a large steel tank is the most economical method of providing potable water to the community in the two difficult periods in spring and fall.

Winter deliveries to approximately four additional water points (constructed similarly to the four now in service) by tank truck, together with

deliveries to institutional buildings, should provide adequate service if better equipment is used with either duplicate or alternate units maintained in service.

If the Makale "upgrading" plan is followed and larger monetary grants become available, the next step should be the construction of a treatment and storage plant in or adjacent to lots 23 and 24.

Waste Disposal -

It would be folly to say that the present stoneboat waste disposal method is anything but a transition stage. It needs now to be supported by a proper sewage truck complete with pumps in order to service the school, nursing station and RCMP buildings.

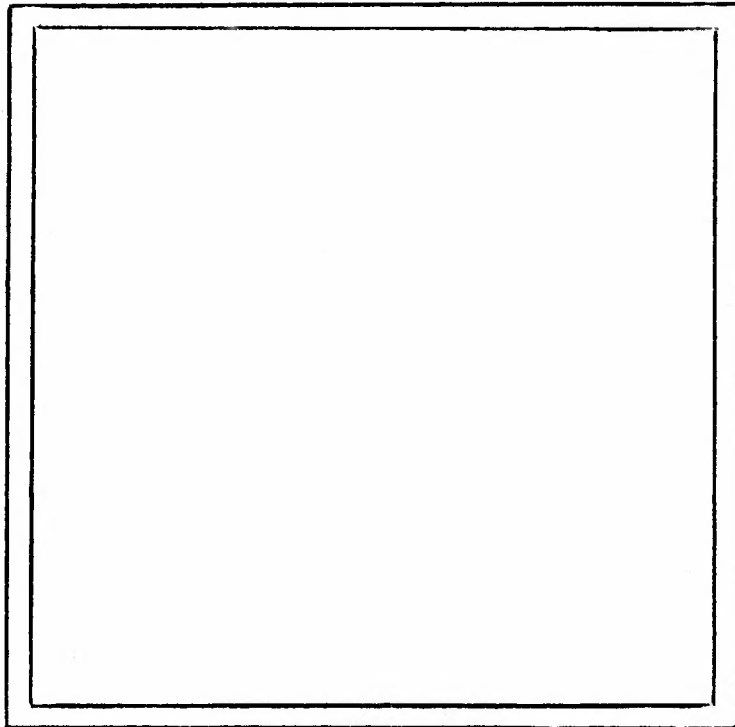
The greatest need, presently, is the construction of a ramp which will permit the dumping of waste barrels adjacent to the river. This waste would then be available for final disposal during high water.

The present practice of scattering the wastes along a third of a mile of muddy river trail should end as soon as possible.

River Bank Erosion -

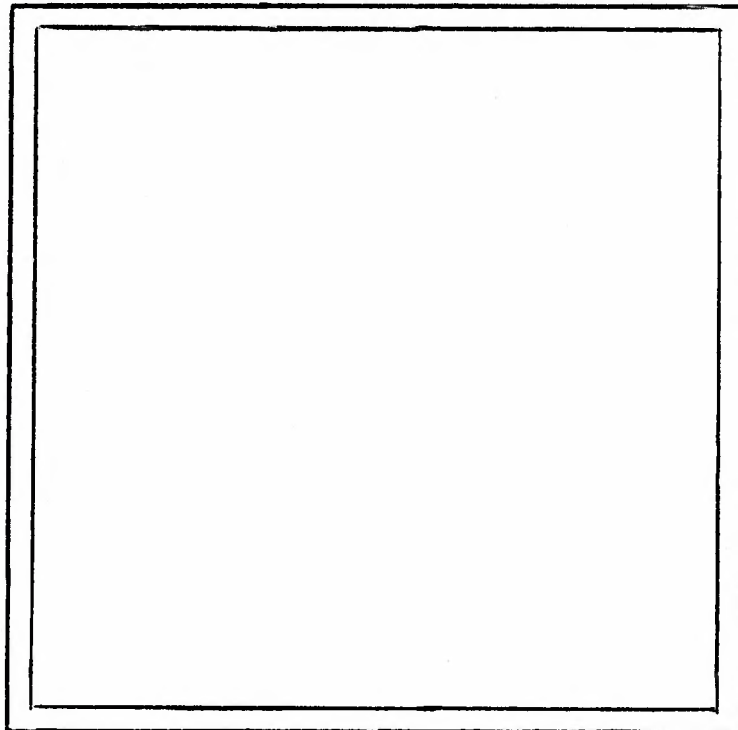
The present experiments should continue in attempting to decrease the rate of erosion.

APPENDIX A



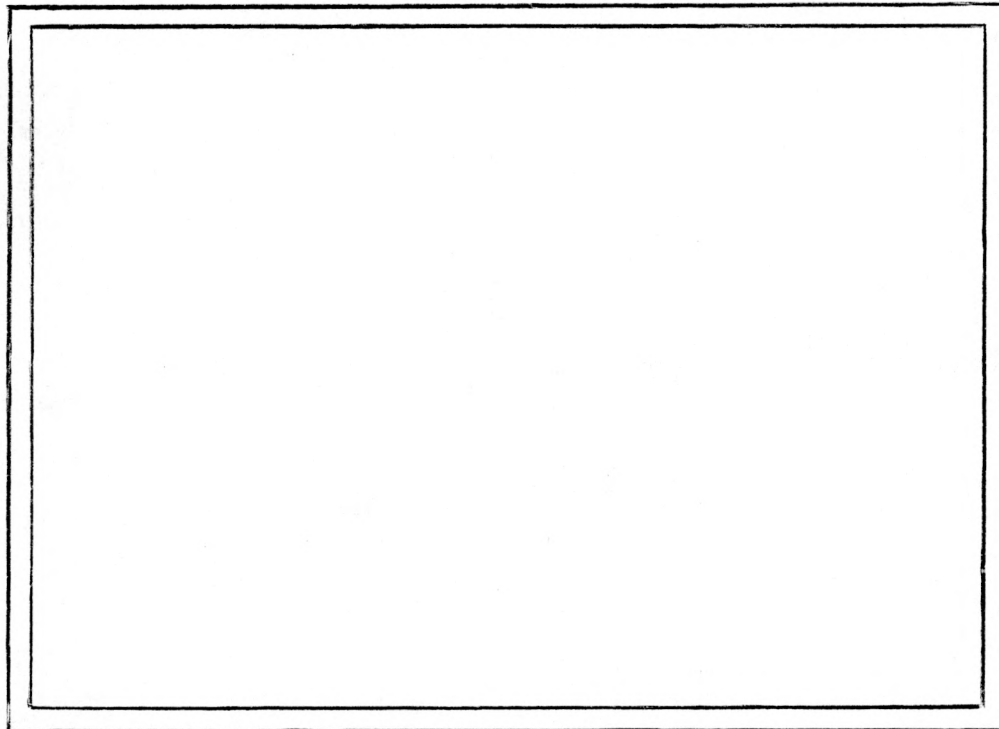
Air View from North

Row of buildings in centre are portable school units.  
Note accumulation of land and airstrip between school site and river.

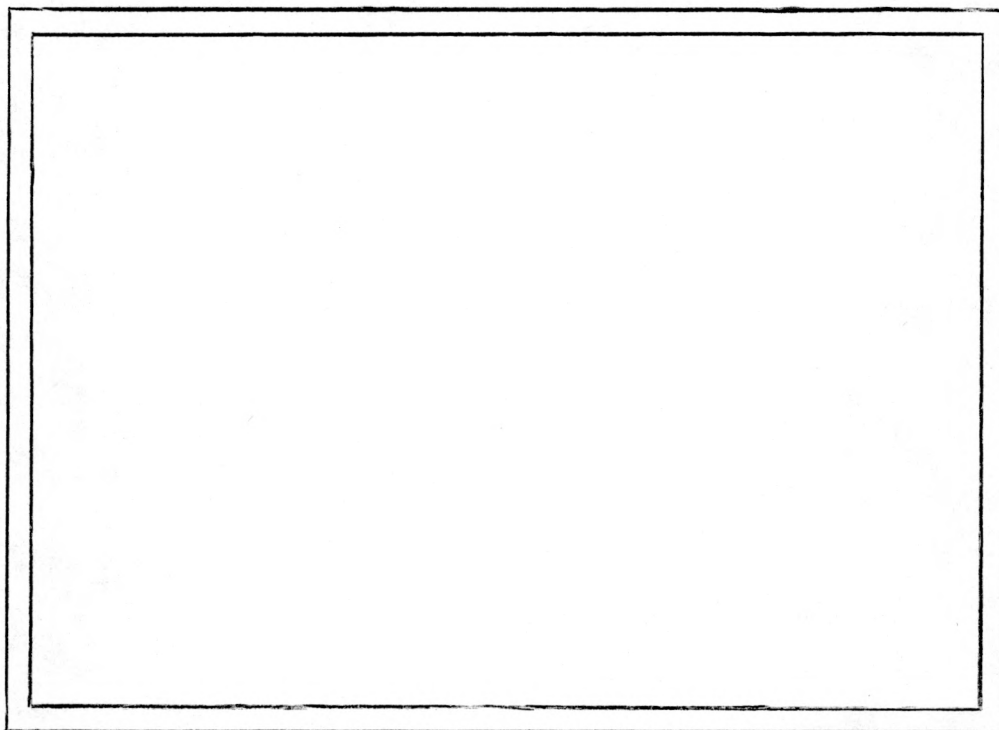


Air View from West

Showing brush groins in river on south face.  
Pot hole sloughs in foreground limit development.

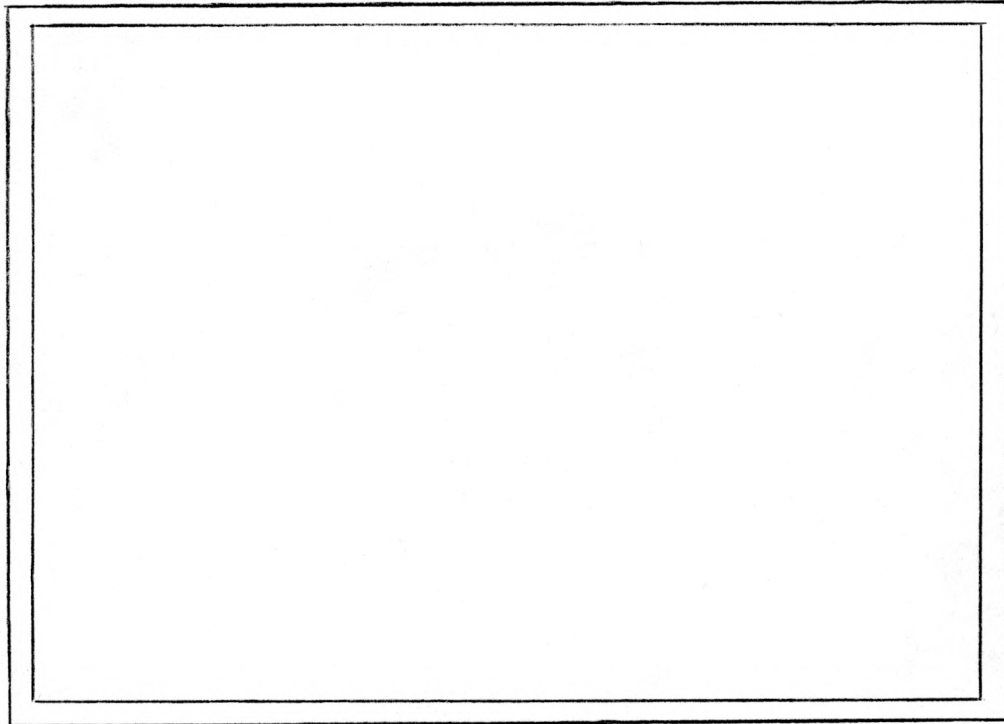


"Main" Street  
Showing summer water supply line and sidewalks,  
and lack of drainage in road ditches.

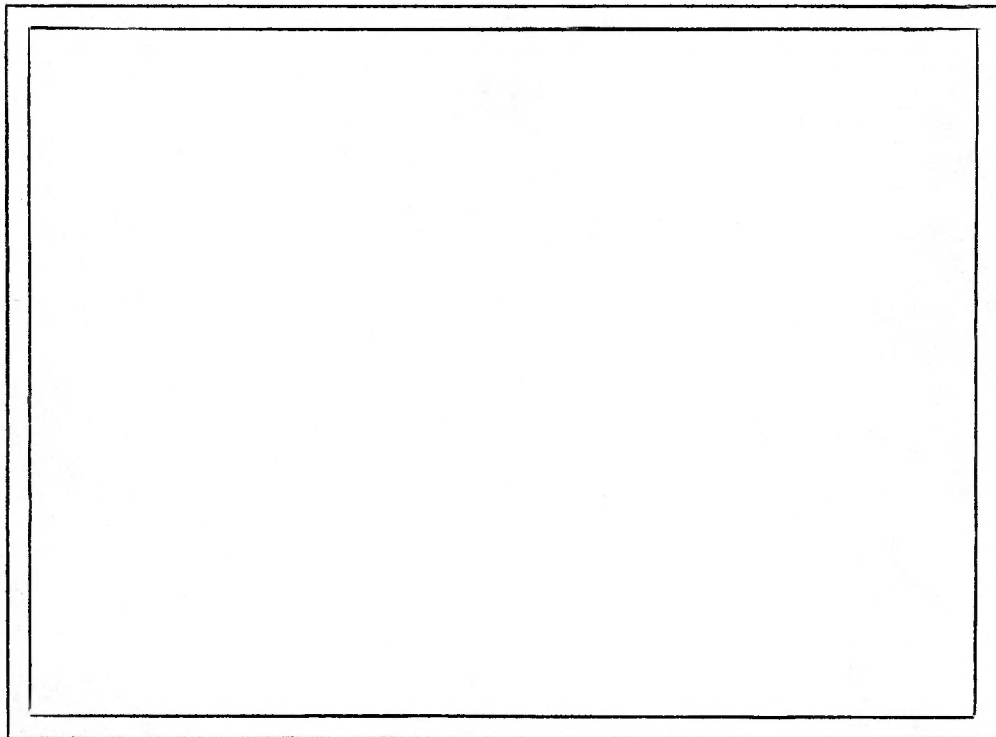


"Main" Street  
Fire hydrant in foreground.

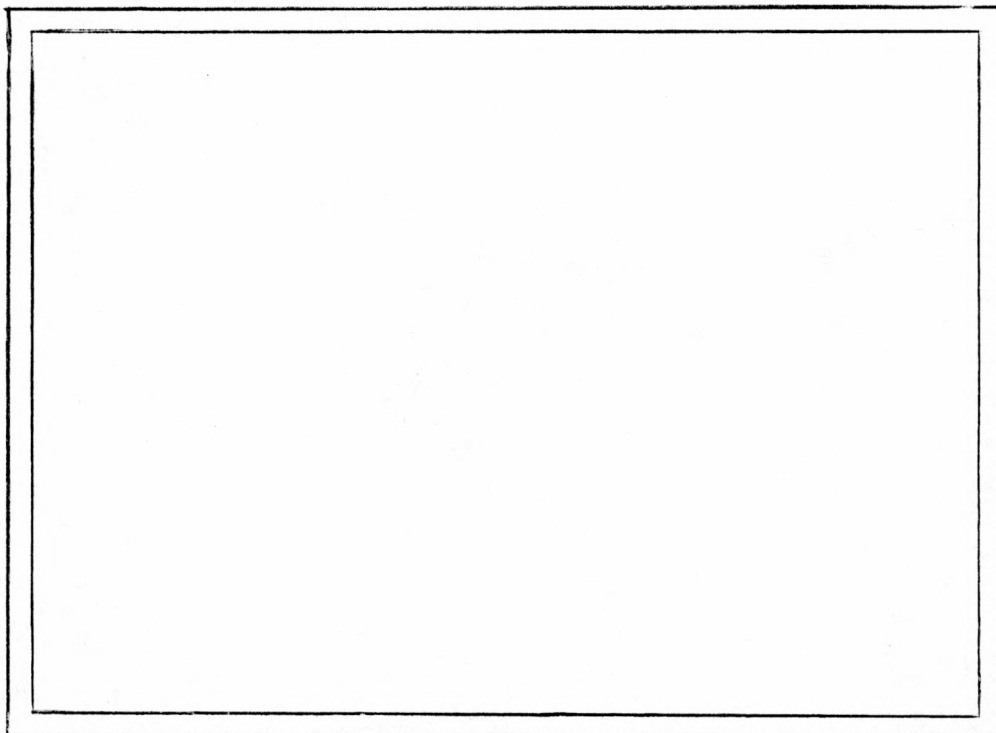




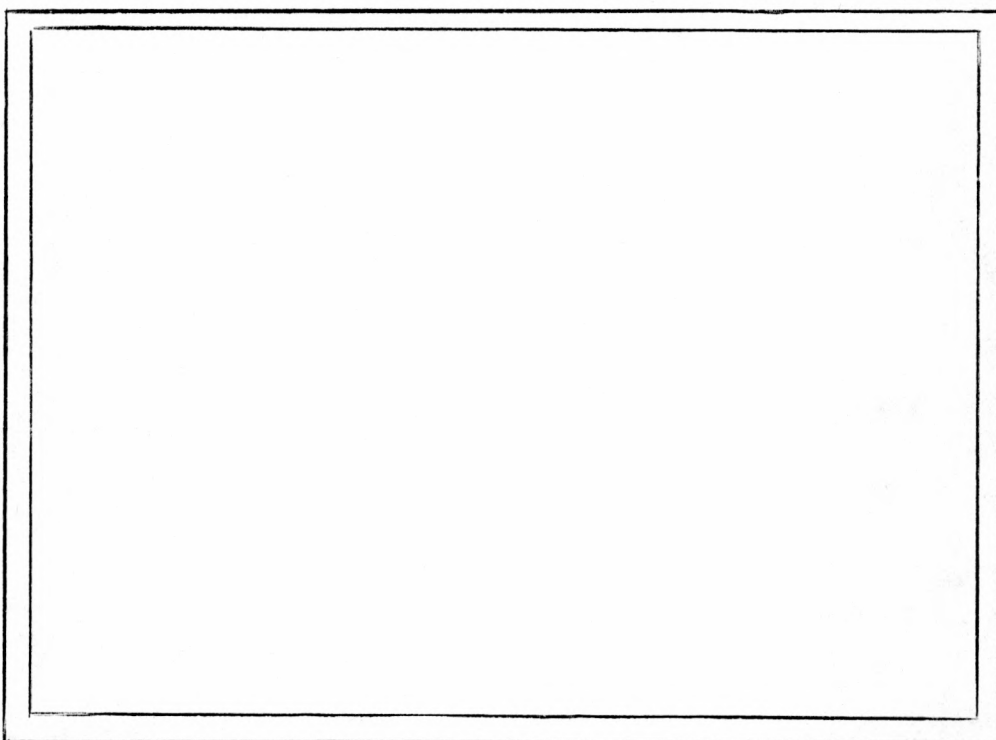
North End of "Main" Street  
Showing sidewalks, crosswalk, water line and lack of flow in ditches.



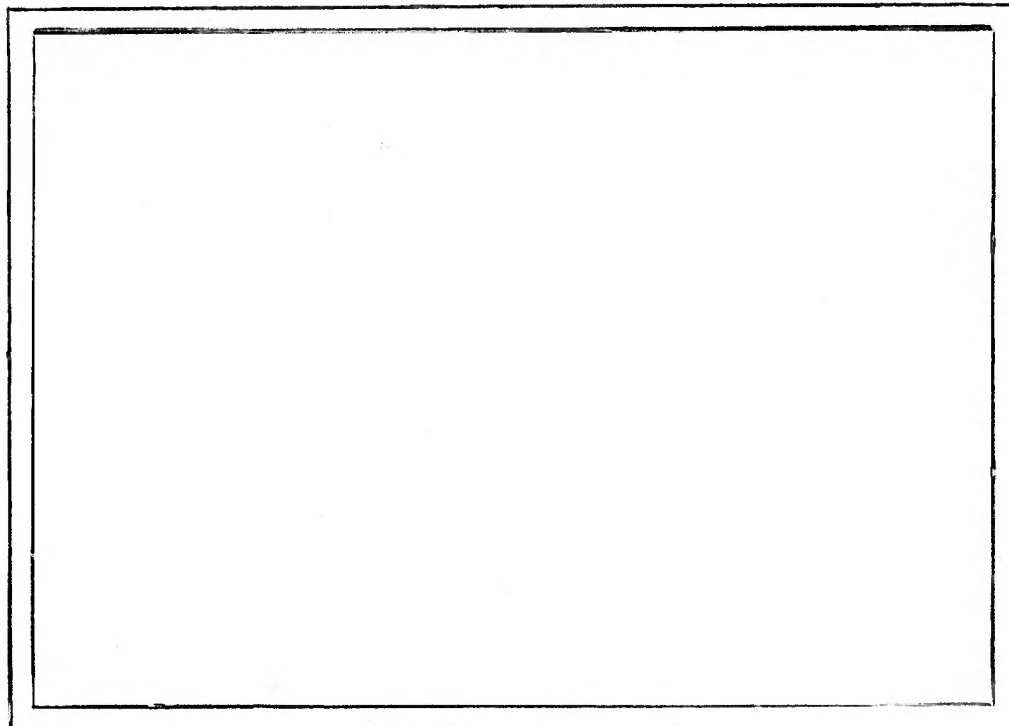
Nursing Station and Airstrip  
Typical sidewalk and road intersection.



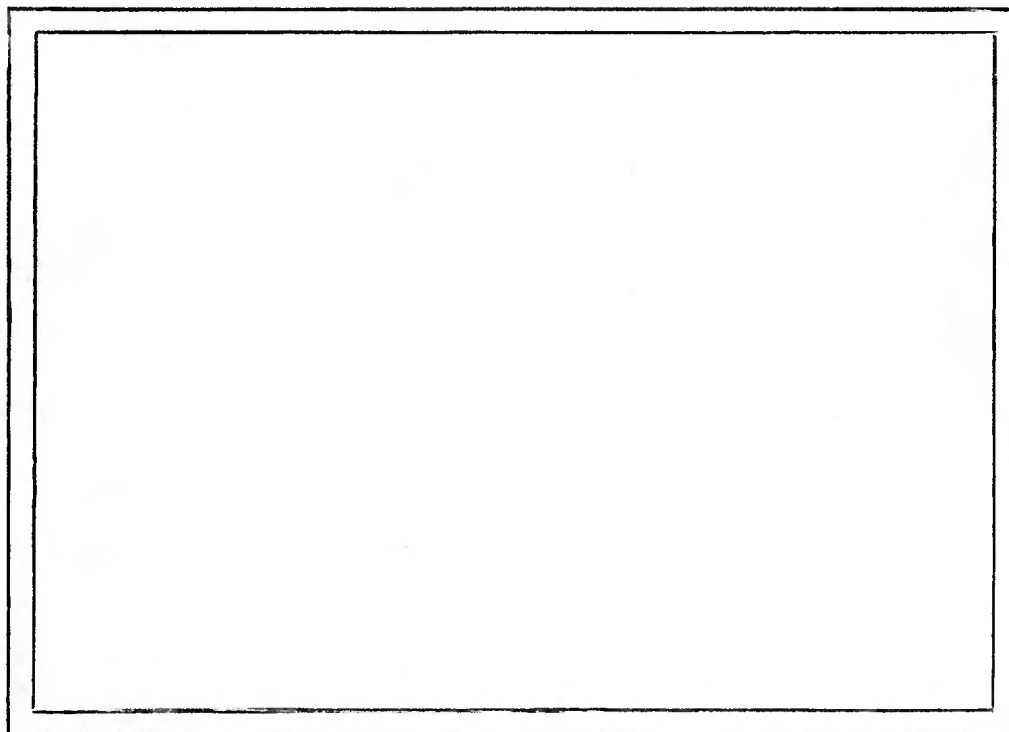
Side Road  
Showing lack of drainage and general disorganization.



Road to Water Treatment Plant  
Showing lack of grade in ditches.

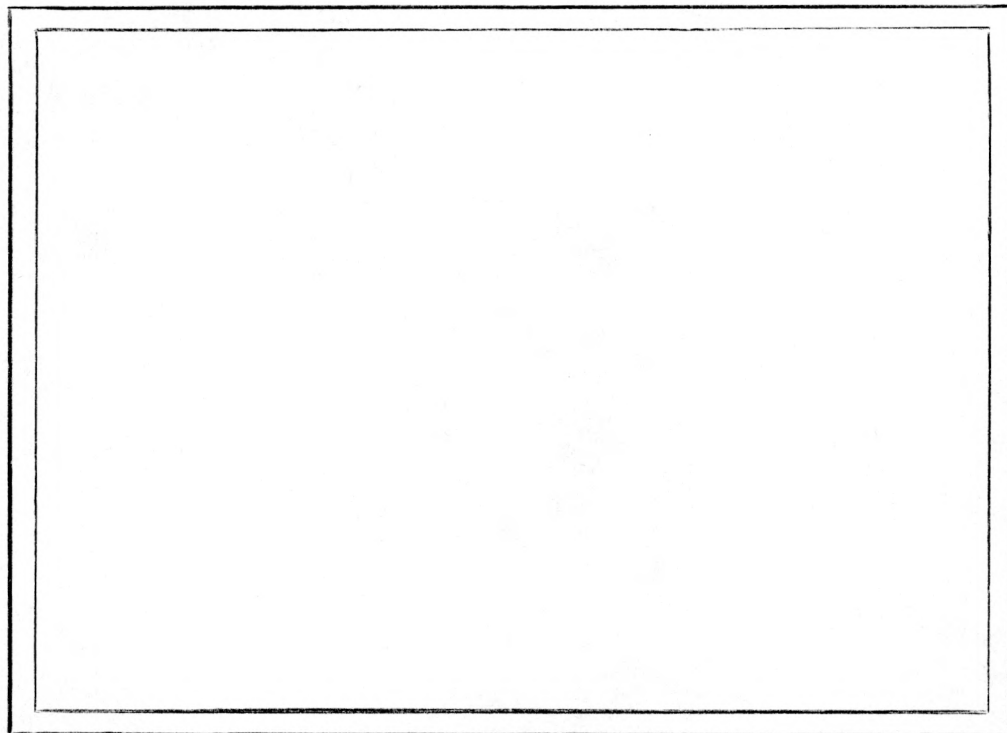


Road between School Site and Nursing Station  
Ditch generally well constructed but outlet  
plugged off and blocked by airstrip.

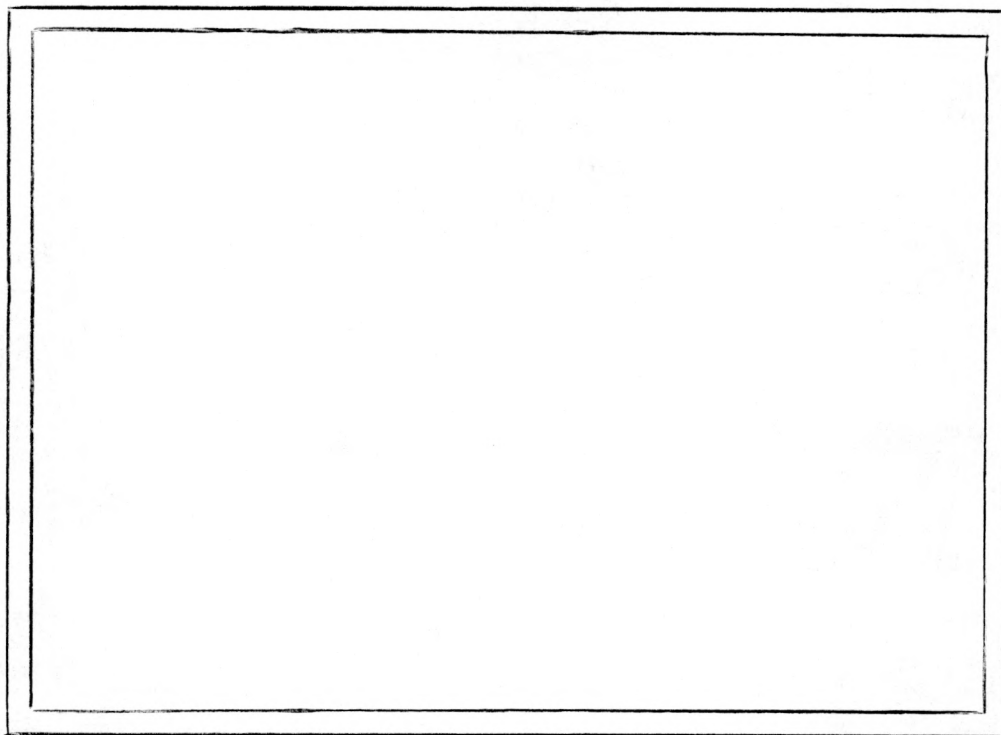


River Bank on South Side  
Showing collapse of banks by melting  
and brush "groins" designed to arrest erosion.

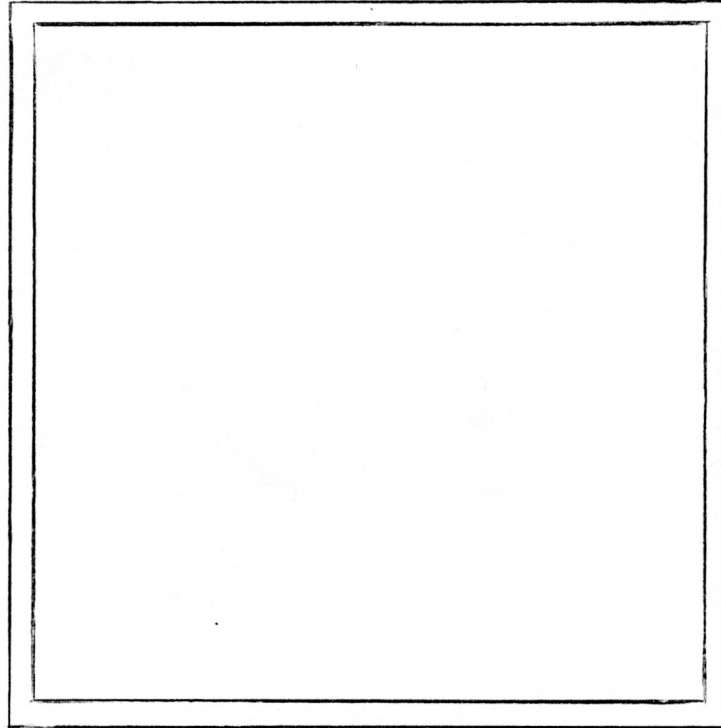




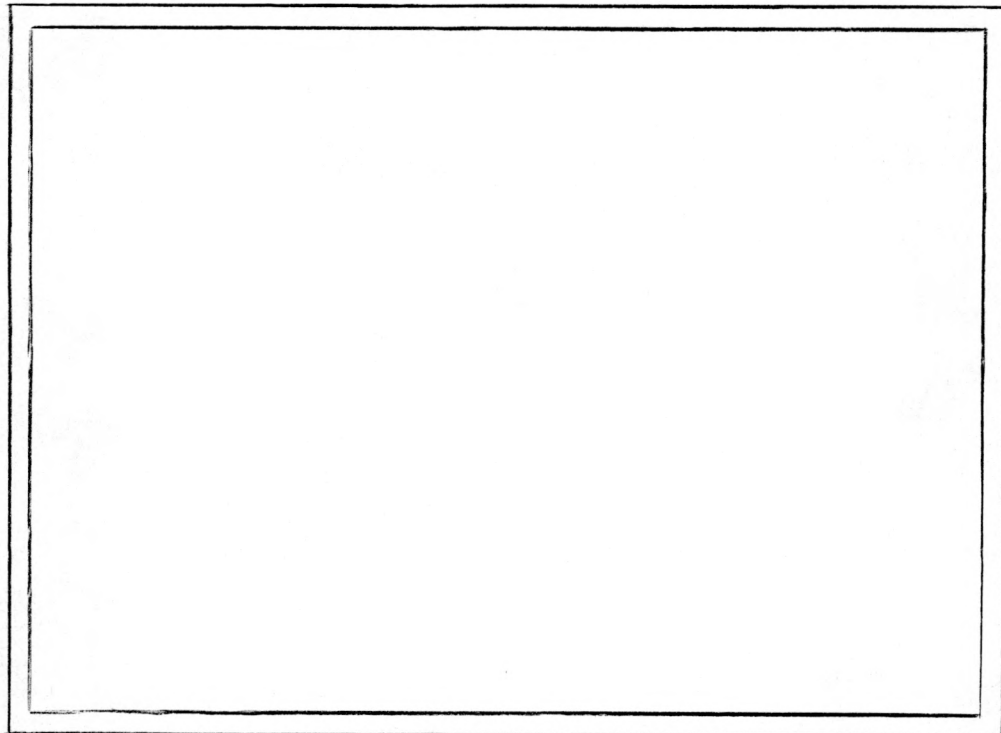
Water Point Building



Garbage Stone Boat  
Note damage to lid and general wear.  
Oil storage area in background.



New RCMP House and Water Truck



New Hudson's Bay Store on left.  
New cafe and hotel on right.  
New RCMP office on right.  
All signs of new permanence.