PRELIMINARY
BASIC ENVIRONMENTAL DATA

MARTIN RIVER BRIDGE

REFERENCE MILE 308 MACKENZIE HIGHWAY

DEPARTMENT OF PUBLIC WORKS
EDMONTON, CANADA

January , 1973

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Vancouver, Canada

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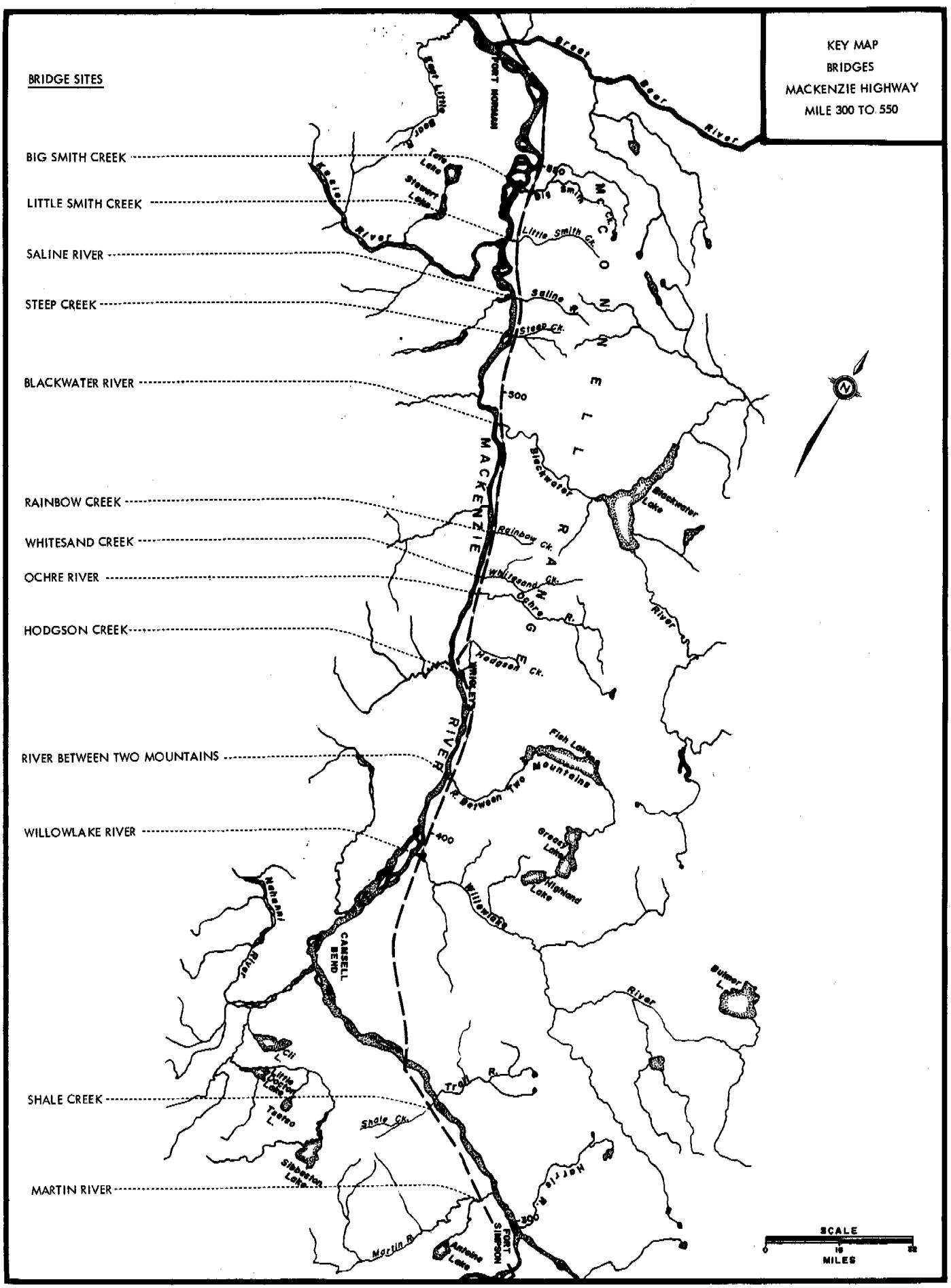
MARTIN RIVER BRIDGE
REFERENCE MILE 308

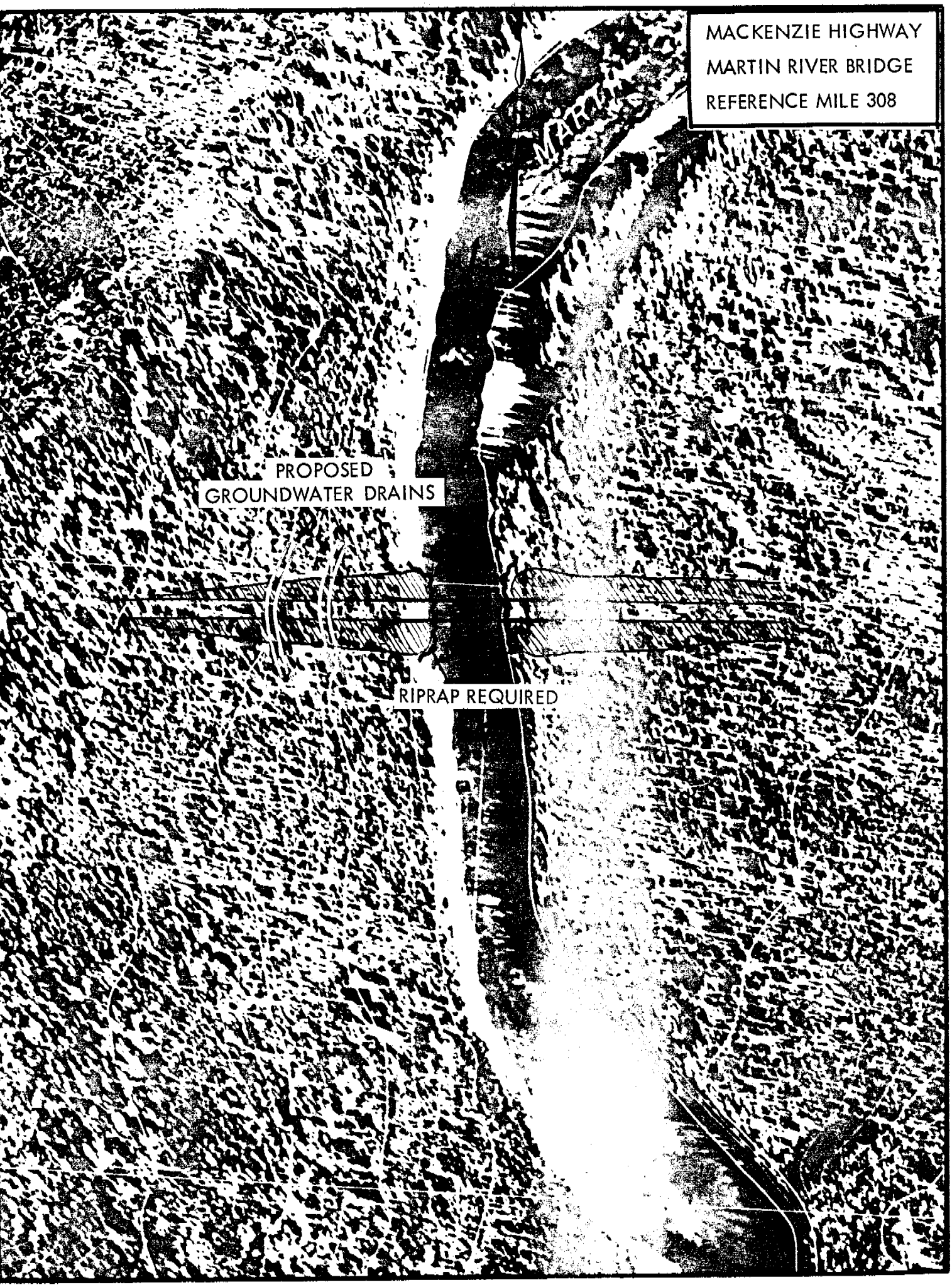
MACKENZIE HIGHWAY
NORTHWEST TERRITORIES

DEPARTMENT OF PUBLIC WORKS
EDMONTON, CANADA

JANUARY 1973

F.F. SLANEY & COMPANY LIMITED
VANCOUVER, CANADA


KEY MAP
BRIDGES
MACKENZIE HIGHWAY
MILE 300 TO 550
BRIDGE SITES
BIG SMITH CREEK
LITTLE SMITH CREEK
SALINE RIVER
STEEP CREEK
BLACKWATER RIVER
RAINBOW CREEK
WHITESAND CREEK
OCHRE RIVER
HODGSON CREEK
RIVER BETWEEN TWO MOUNTAINS
WILLOWLAKE RIVER
SHALE CREEK
MARTIN RIVER
MACKENZIE HIGHWAY
Great Bear River
Fort Liard
FORT NORMAN
Big Smith Ck.
Little Smith Ck.
Saline R.
Steep Ck.
Blackwater R.
Blackwater Lake
Rainbow Ck.
Whitesand Ck.
Ochre R.
Hodgson Ck.
Willowlake River
Fish Lake
Mountains
Two
Between
Grassy Lake
Highland Lake
Willowlake
Nahanni River
CARCELL BEND
Butner L.
Trout R.
Shale Ck.
Sibbeston Lake
Martin R.
Hottah L.
Antoine Lake
FORT SIMPSON
300
400
500
SCALE
MILES


MACKENZIE HIGHWAY
MARTIN RIVER BRIDGE
REFERENCE MILE 308
PROPOSED
GROUNDWATER DRAINS
RIPRAP REQUIRED

PART 1

BASIC ENVIRONMENTAL DATA

1.1 SURFICIAL GEOLOGY

Extreme impact: the Martin River Valley scarp is composed of aeolian sand overlying glaciolacustrine material; the wide alluvial terrace in valley floor is possibly old solifluction flows near the base of the scarp; the south facing slope is subject to near-surface solifluction and fluvial erosion.

At site, the channel is straight with some bank erosion on both sides of stream. Active alluvium includes boulders up to two feet in diameter.

The west side requires cut and fill. It is recommended that fill be placed immediately and in stages to establish frost penetration since this slope is highly susceptible to shallow solifluction flowage and possibly more extensive mass movement if preventative measures are not implemented before thaw in 1973. Fill material is readily available from sand dunes that occur in the area. If dune sand is used it must be protected from rill and gully erosion. Cut area should be treated as previously recommended, i.e., vertical cuts insulated and back-filled with course granular fill. Also, two sub-surface drains should be constructed to accommodate possible ground-water seepage.

The east side requires extensive fill. Some fill should be placed immediately to establish frost penetration and inhibit further melting of right-of-way.

Riprap is required at the base of footings and fill. The bridge design should be modified to minimize encroachment on active channel and remove footings from active channel. This is particularly relevant to the east footing of proposed bridge.

1.2 SOILS

Soil surfaces should not be disturbed on slopes. The access road to the temporary crossing should be protected from erosion after breakup. Organic soil should be saved where possible to cover the fills with a layer of moisture retentive material for rapid germination of a stabilizing cover.

Mulches of road chips, straw or emulsified asphalt may be required to stabilize seeded slopes.

1.3 VEGETATION

The east bank of the Martin River is the most stable. The vegetative mat on the west bank has been broken with predictable consequences.

The lesser vegetation should be maintained wherever possible. Cuts and fills should be stabilized as soon as completed and a seeding-fertilizing-mulching program should be initiated this spring.

1.4 WILDLIFE

The existing right-of-way slash and the temporary crossing have disturbed the wildlife to the extent that construction of the proposed high level bridge would have little further effect on animals.

A 50 foot wide fringe of the type of riparian habitat favoured by moose extends along each bank of the river. No evidence of use of the site by moose was found during December 1972.

1.5 FISH

The most serious hazard to the aquatic environment by the proposed bridge design is the proposed placement of piers at the water's edge. If steel cofferdams are used siltation will be greatly reduced. If the piers were situated at least above the low water levels of the stream, impact would be further reduced.

Associated with the bridge are the long approach fills. These have far greater importance to fish than the bridge itself, due to the potential for siltation from surface runoff. Surface water must be diverted away from the stream.

The Martin River was surveyed in 1971 by Fisheries Service crews. They found approximately 394,000 square yards of potential spawning area (gravel) in the lower 30 miles, characterized by long oxbowing stretches of slow-flowing water interspaced with rapids. The substrate consists mainly of mud, silt and boulders. Nine species of fish were captured in the river, mostly near the mouth. These include grayling, pike, broad whitefish, white sucker, char, trout-perch, goldeye, spottail shiner and slimy sculpin; none of the specimens were adults. Aquatic forms of stonefly, mayfly and caddisfly were found.

Most of the fish species listed spawn in June and July, migrating upstream from mid May. Eggs remain in the gravel until mid July, and fry stay in the streams until late October. Grayling juveniles migrate into the streams in the month of September. Whitefish, however, spawn in the fall, leaving their eggs in the gravel over winter until May. Whitefish fry remain in the streams until the following September.

Fisheries Service personnel have monitoring units upstream and downstream from the proposed bridge site to determine the effects of silt on bottom fauna.

1.6 ARCHAEOLOGY

No archaeological evidence was detected during the initial construction phase. The likelihood of an archaeological find in this locale is now remote.

1.7 LANDSCAPE - RECREATION

There is a potential for a viewpoint and possible campsite on the edge of the terrace on the Fort Simpson side of the bridge site. This involves utilizing a potential borrow pit in a sand dune.

Residents of Fort Simpson are expected to focus attention on the Martin River and the bridge. The accommodation of parked vehicles and a probable concentration of foot traffic should be anticipated.

Trails from the roadway to the valley floor should be prelocated to regulate use. The area near the mouth of the Martin River contains several large landslides of interest to visitors.

1.8 AESTHETICS

The proposed bridge design offers no particular visual interest. The use of a longer span and subsequent smaller piers would be a decided aesthetic improvement.

1.9 SOCIO-ECONOMIC

Crews constructing this bridge could easily be accommodated in Fort Simpson. This is the recommended procedure to eliminate the need to construct a camp near the site.

1.10 CONSTRUCTION

Coping with unstable ground will be a major problem. The river flows due north at this site, hence insolation to the roadbed will be uniform on both shores.

The ground ice slopes should be stabilized by placing layers of fill in winter to facilitate freezing layer upon layer. Groundwater runoff may be channelled from the site by drainage ditches filled with wood chips.

Riprap must be placed on any faces of fill beneath maximum river levels before the spring runoff. The stripped centerline should be covered by five feet of granular material to prevent further solifluction.

PART 2

ASSESSMENT

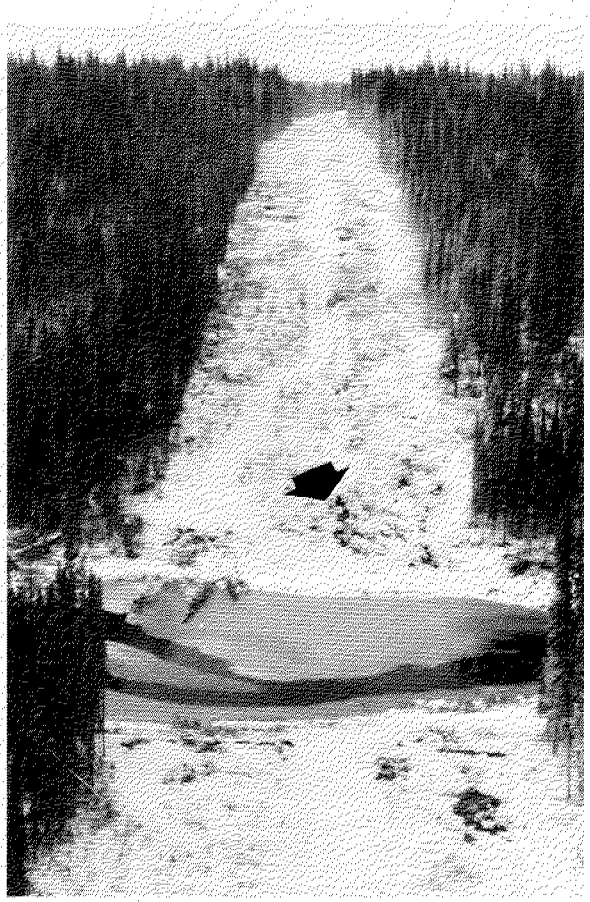
This site provided an engineering challenge in stabilizing soils with high ground ice content. At this stage of development use of the proposed crossing is a reasonable choice. Further drill data would be required before a firm plan of action could be formulated.

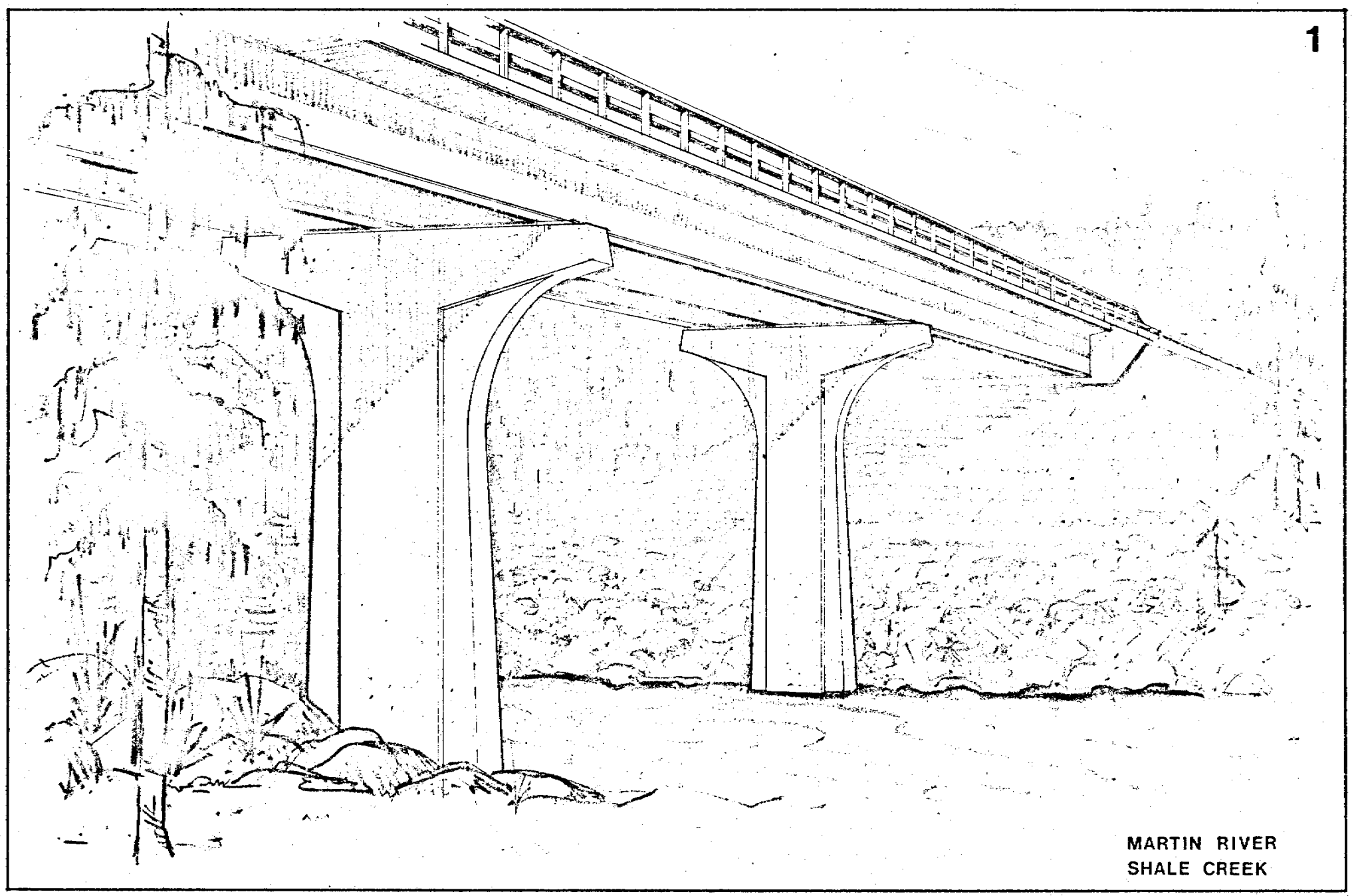
The bridge's main span should be lengthened to remove piers from the active channel for fishery and aesthetic improvement.

16.9.72. East bank of the Martin River. Vegetation is mainly black spruce with some aspen on peaty gleysol soils. Landform is an abandoned alluvial terrace mantled by silt and sand which is overlain by organic material. The upper 10 feet is believed to contain abundant ground ice, this is partly manifested by pools of water along R.O.W. as shown in photo.

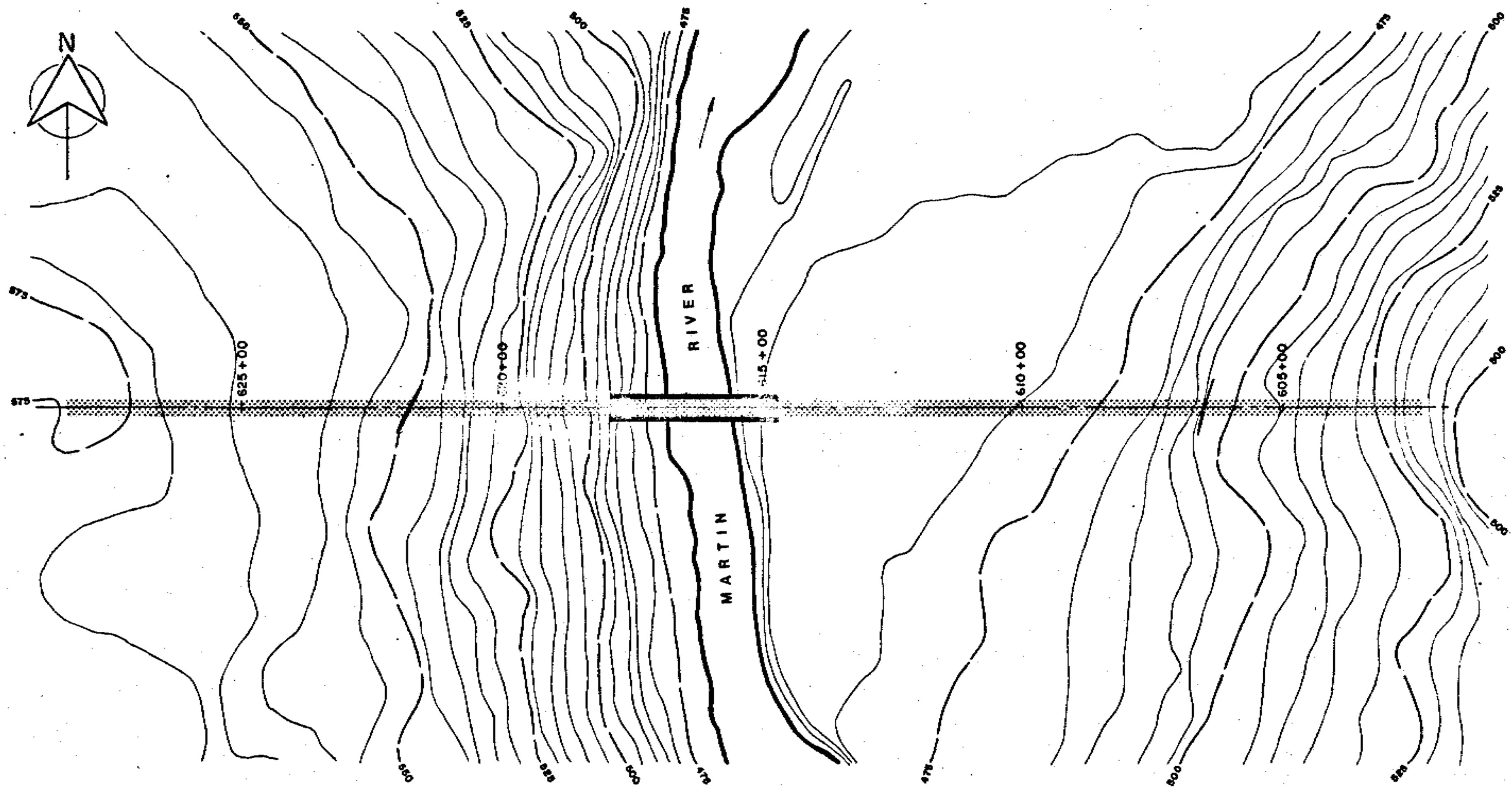
16.9.72. East bank is on the left, stream channel is straight at site; erosion and deposition appears equal on each side of stream. Bridge footings should be located above High Water and Ice Level. Rip-rap at base of footing and along base of fill will be required.

7.10.72. Martin River
Exposed bank is subject to surface solifluction. The arrow shows an area stabilized temporarily with tree limbs and tops. The slope is underlain by glaciolacustrine silt, clay and sand with possible high ice content. Further thermal erosion may result in extensive degradation. Fill should be placed immediately in layers two to three feet thick allowing time for frost penetration between applications. Slope must be treated with adequate drains to intercept groundwater seepage. Fisheries personnel have sampled aquatic insect populations both above and below the crossing site.




1
MARTIN RIVER
SHALE CREEK

2



SITE PLAN

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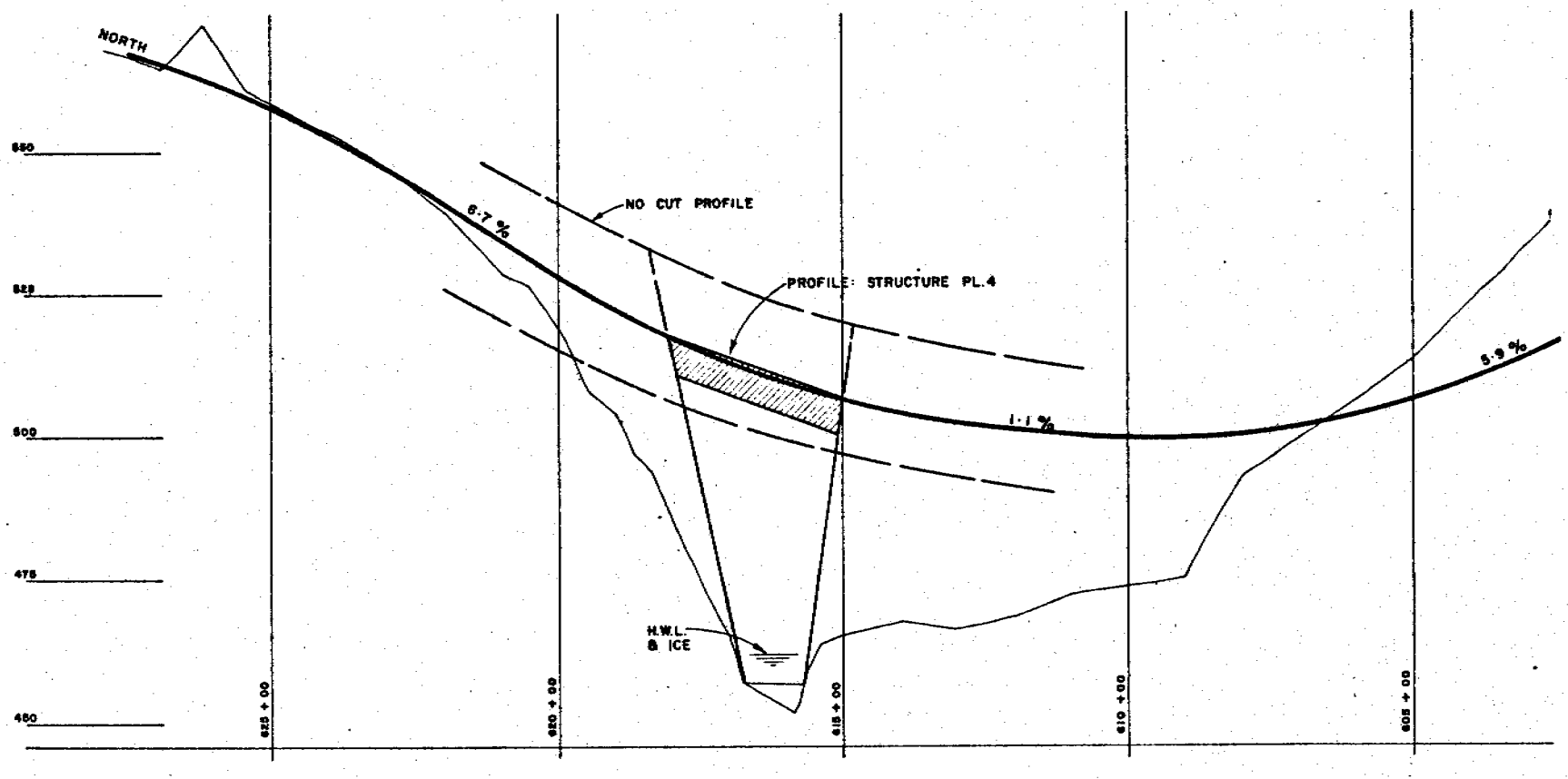
MACKENZIE HIGHWAY

MARTIN RIVER



PROFILE
VERT. 1" = 20'
HORIZ. 1" = 200'

NOTE:
ELEVATIONS ARE TO GEODETIC DATUM.
CHAINAGES REFER TO FIELD SURVEY.

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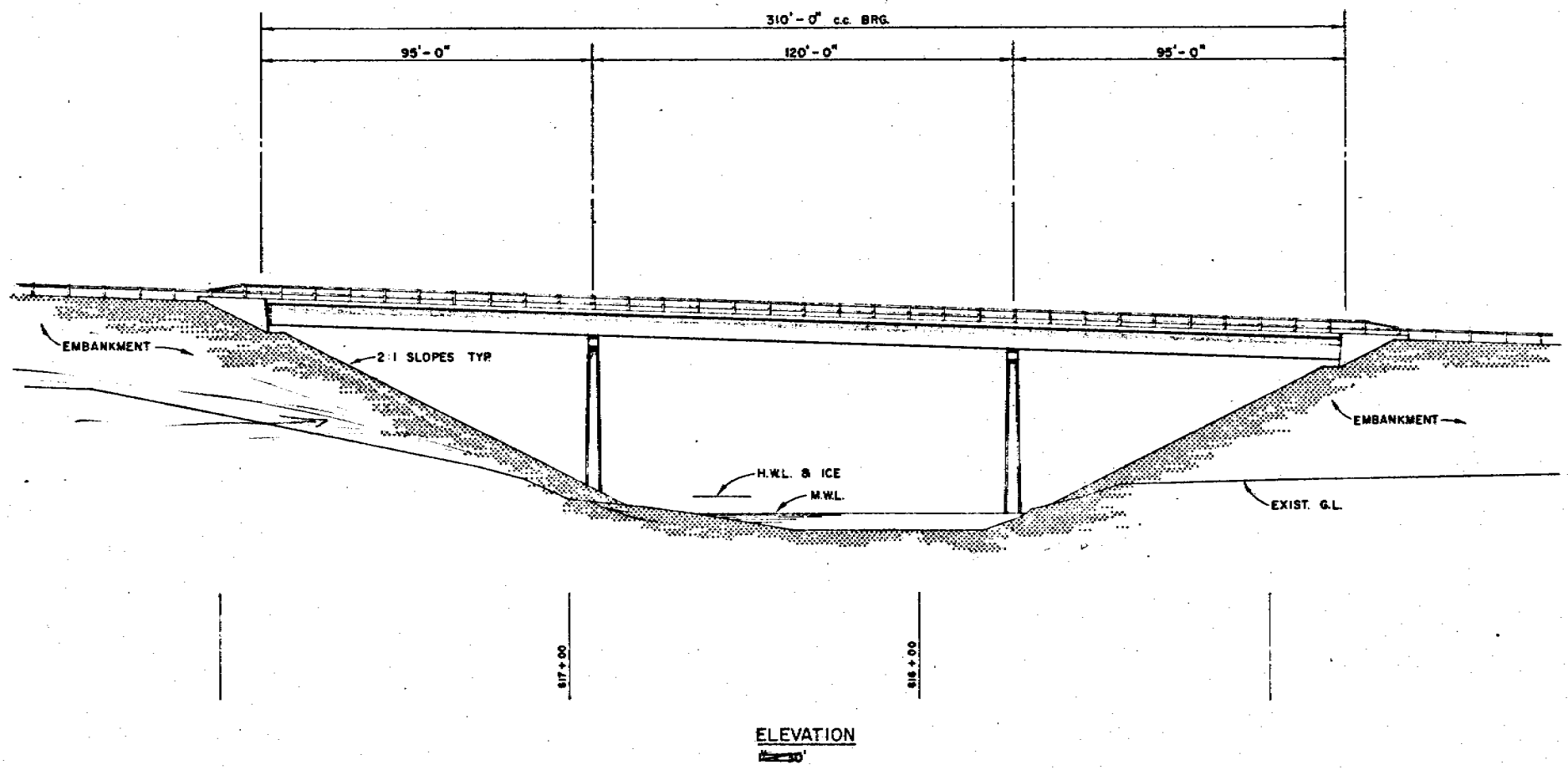
MACKENZIE HIGHWAY

MARTIN RIVER



ELEVATION

1"=30'

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