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BOREAL
Consulting Services Ltd.

NANSEN ROAD ENGINEERING & CONSTRUCTION

PRELIMINARY STUDY

July 1988

For:

Archer, Cathro & Associates Ltd.

By:

BOREAL CONSULTING SERVICES LTD.
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BOREAL
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July 14, 1988
File: 186-001-40

Mr. A. Archer, P.Eng.
Principal
Archer Cathro & Associates
Box 4127
Whitehorse, Yukon
Y1A 3S9

Dear Sir:

RE: Preliminary Engineering & Construction Study for the Mt. Nansen Road from Carmacks to Approximately Km. 55

We are pleased to submit herewith the Nansen Road Study as outlined in the terms of reference.

Our recommendations come within a tote road status. Upgrading this road to RLU 60 status would entail extensive surveys and design and, accordingly, a much greater time frame.

We appreciate the opportunity to have worked on this project and trust this meets your requirements. Should there be any queries, please call us at your convenience.

Yours very truly

BOREAL CONSULTING SERVICES LTD.

W.D. Clark.

Des Clark, C.E.T.

for
L. Whelan
Managing Director

DC/ks

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SOURCES OF INFORMATION

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1.0 HISTORICAL

Captain Henry Seymour Back and his party discovered gold on Nansen Creek in July, 1899. He returned to the region with a large prospecting party in 1907. The Discovery Claim was staked by Back's son, Frank H. Back, and Tom E. Bee on the 13th June 1910. Captain Back named the mountain and the creek in honour of the famous Norwegian Arctic explorer, Fridtjof Nansen.

Access to the area was then by an Indian trail from Carmacks. The trail was a winding foot path which was located along the general route of the existing trail. The earliest recorded access upgrading was carried out by Frank Back and Tom E. Bee in the early summer of 1912 (Appendix A - letter of June 21st, 1912, Tom Bee to G. Black, Esq.).

The archival information contained in Appendix A is interesting in that it contains the names of well known personages of the day, such as Seymour Rowlinson (Rowlinson Creek), W. L. Phelps, George Black, A. H. Cameron and others.

There does not seem to be any archival information on the Nansen Creek Trail (road) from October, 1924 until the present. However, it is evident from the records that governmental financial support of the Nansen Road was in place as early as 1911-1912.

FIGURE 1.1

NANSEN CREEK ROAD STUDY

SCALE: 1: 250,000

BOREAL Consulting Services Ltd.

2.0 ENGINEERING ROAD RECONNAISSANCE

2.1 Introduction

In March, 1988, Boreal Consulting Services Ltd. was commissioned by Archer, Cathro & Associates to carry out a brief engineering reconnaissance of the Nansen Road in order to assess the road's condition and make preliminary engineering and construction estimates for potential upgrading of the access.

A two-day field examination was carried out in late June. The access study started at the Nansen Road cutoff immediately north of the Bailey bridge across the Nordenskiold River and finished approximately 200 meters south of the Back Creek camp at G.R. 6881000 m north - 391000 m east, Map Sheet 115-I/3, 1:50,000 scale. The Bailey bridge across Rowlinson Creek and the abandoned airfield at 6878000 m north - 392000 m east, Map Sheet 115-I/3 were also examined and included in this report.

The Nansen Road has a carriageway which averages 6 meters in width and we are informed that the R.O.W. is 90-91 meters (200 ft.) wide.

2.2 Observations

During the field study, there were six major considerations; namely, vertical alignment, horizontal alignment, roadbed conditions, the bridge crossing at Rowlinson Creek, the Victoria Creek crossing and the abandoned Nansen airstrip.

2.2.1 Vertical Alignment

The vertical alignment of the road is not considered to be of major concern as the steepest pitches were between 12 and 14 percent and of short duration. There are many minor knolls which could be cut down on a "cut to fill" basis, thereby improving sight distance in many places. It is suggested that the above are of relatively minor concern and could be carried out in phases over a period of time.

2.2.2 Horizontal Alignment

The horizontal alignment in the first 25 kilometers from Carmacks is, in places, less than desirable. Several cut banks on the inside of sharp curves obscure sight distance. The combination of sharp curvature and poor sight distance dictate safe speeds of 20-30 km/h on some of the more extreme locations. Throughout the route, there are curves with poor sight distance due to timber and/or bush.

2.2.3 Roadbed Conditions

Generally, the roadbed condition is markedly improved since the writer's first trip into Nansen over 3 years ago. The Yukon Territorial Government maintenance of the road has made obvious improvements to the roadbed condition in many places.

Throughout the length of the route, particularly from Km. 15 to the end of the study, there are many locations where drainage requires improvement. Typically, these include culvert replacement, addition of culverts to existing structures, new culverts, culvert cleanout and/or extension(s) to existing structures and, in many places, the placement of adequate fill over existing culverts to prevent crushing. Numerous

locations require ditching. In some locations with steep cut banks on one side, ditching will only cause bank failure.

There is a 6-7 km section of the road beyond Rowlinson Creek which, when wet, is very slippery (see "Discussion and Recommendations").

The following, in point form, are observations made during the reconnaissance related to road drainage and roadbed conditions. The kilometer locations were obtained using the truck's odometer. The collected data herein was used to form a preliminary estimate of engineering and construction costs.

- Km. 13.1: Existing 12"Ø CMP. requires extension of inlet and approximately 15 m^3 import material over top of culvert location.
- Km. 14.8: This area requires a culvert (400 mm Ø) for cross drainage.
- Km. 16.3: This has an existing 400 mm Ø culvert which requires lowering approximately 0.2 m. There are some signs of incipient grade failure, thus, it may require 20-30 m^3 imported fill for repairs.
- Km. 19.2: Has an existing 400 mm Ø CMP with the inlet crushed. This needs repair and also requires 20-25 m^3 of road material which may be found adjacent to site.
- Km. 20.7: Has an existing 400 mm Ø CMP which requires lowering and extension. The grade should be raised 0.3 m. The grade material can be gained by cutting down adjacent road grade.
- Km. 25.1: Has a major creek crossing with the culverts embedded in a deep fill. There are two culverts (1000 mm and 900 mm Ø) deep in the fill. There is a 24" Ø overflow culvert closer to the road surface.

  Indications are that this fill or a portion of it has been washed out and rebuilt. Rip rap or armour is required on the deep culvert ends.

  There is a good source of pit run material on both sides of this creek. This water course crossing may require a major design change in the future.
- Km. 28.8: Has a low area requiring approximately 100-120 m^3 of imported fill to raise the grade.

- Km. 29.5: Requires minor cross drainage. A set of 12" Ø CMPs removed from elsewhere could be employed here.

- Km. 29.7: Has a 36" Ø and a 24" Ø culvert with inadequate fill over top.

- Km. 30.6: Has an existing 18" Ø CMP. This location requires the removal of the existing culvert with replacement by a 600 mm Ø CMP set at a lower invert elevation than the existing 18" Ø CMP.

- Km. 32.8: Has an existing 48" Ø CMP and approximately 10-20 m away has two 24" Ø CMPs, one of which is in failure. The 48" Ø CMP is being crushed through lack of fill over the overt in the centre and is improperly placed for drainage catchment. The 24" Ø CMP 10 m away is located well for catchment but is of inadequate size.

  It is recommended that the 24" Ø CMPs be removed and replaced by the existing 48" Ø CMP if the former is salvagable. If not practicable, then replacement should be with a metric culvert comparable in capacity to the 48" Ø CMP. The grade requires raising by 0.3 - 0.4 m and will require approximately 100-120 m of fill through this location.

- Km. 33.1: Has an existing 24" Ø CMP which is functioning well, however, requires approximately 30-40 m^3 of import to raise the grade over and adjacent to the structure.

- Km. 33.7: Requires cross drainage. A 400 mm Ø CMP is recommended with possibly a supplement of 20 m^3 imported fill.

- Km. 34.1: Has a 16" Ø CMP which requires minor extension and requires 0.3 m of cover. Import is estimated at 40-50 m^3 and can possibly be taken as close as 80 m away.

- Km. 35.8: Requires an alignment improvement.

- Km. 36.3: Has a 800 mm Ø CMP in place. Twinning this CMP with another 800 mm Ø CMP is recommended as well as the import of enough fill to cover this location with 0.3 m of fill. The imported fill may be obtained 100 m west of this area.

- Km. 36.5: Has an 18" Ø CMP in place which requires the installation of a 600 mm Ø CMP. Cutting of the road which bisects a knoll 40-60 m east of this location should provide approximately 200 m^3 of fill required for this site.

- Km. 38.2: The road could have its alignment shifted left, or brushed out to improve site distance.

- Km. 41.2: Requires the extension of both ends (1.5 m) of an existing 36" Ø CMP. This area contains a possible quarry source of rock. (See borrow pit list.)

- Km. 42.7: Has an existing 24" Ø CMP which requires cover and a general grade raise. The required 100 m^3 fill could be cut to fill from the road immediately east of this point.

- Km. 43.1: Requires minor cross drainage. Possibly a 12" Ø CMP removed from another location would be suitable.

- Km. 43.5: Requires 100 m^3 of fill over and surrounding an existing 24" Ø CMP. The fill is obtainable in the immediate area.

- Km. 44.4: Requires the installation of 4-600 mm Ø CMP, possibly supplemented with 30-40 m^3 imported fill. Imported fill is close by.

- Km. 44.8: Constitutes a major creek crossing with a deep fill containing a 36" Ø CMP. There is 24" Ø CMP overflow culvert with its overt barely covered by the road crown. Examination indicates the likelihood of past problems with this crossing. It is recommended that a 1000 mm Ø CMP be installed beside the existing 36" Ø CMP and that the 36" Ø structure be extended 2.5 m on both the inlet and outlet ends. The road carriageway is just over 4 m in width at the narrowest point in the fill and the shoulders show sign of incipient failure. As well, the fill material has steeper than a 1-1/2:1 fill. Accordingly, it is recommended that the road be widened at this point and the side slopes formed to a more stable angle of repose. Rip rap or armour should be placed around culvert ends and slope toes with special attention to CMP inlets and the upstream toe of the fill. It is suggested that heavy rip rap (shot rock) placed initially in a bed about the toe of the slope (at the appropriate off set to accommodate the proposed angle of repose) would enhance the efforts to widen the carriageway and flatten the side slopes. Proper fill estimates would require a detailed survey; however, a cursory estimate indicates a minimum requirement of 150-200 m^3 of fill which may be acquired adjacent to the site. This does not include the heavy rip rap which will have to be imported from elsewhere. (See Km. 41.2, possible quarry source - borrow pit list.)

- Km. 45.1: Has an existing 12" Ø CMP which requires a 2 m inlet extension.

- Km. 45.5: Has an existing 20" Ø CMP which is functioning well and requires no work at present.

- Km. 45.8: Requires replacement of the existing 12" Ø CMP with a 600 mm Ø CMP of 25 m in length.

- Km. 45.9: Has incipient grade failure due to saturation of the road grade. The existing 12" Ø CMP should be replaced with a 600 mm Ø CMP and 30-40 m^3 of road fill imported.

- Km. 46.2: Has a 4" Ø wood stave pipe buried deep (outlet) in the fill. It is recommended this be replaced with a 600 mm Ø CMP.

- Km. 46.4: Requires replacement of a 16" Ø CMP with a 600 mm Ø CMP. Ditching is also required at this location.

- Km. 46.7: Has a 40" CMP in place. The structure is within unstable fill. Recommendations include removal of the culvert, excavation of the existing grade, replacement with course pit run (approximately 300 m^3 volume), replacement of the 40" CMP at the appropriate grade and rip rap the inlet and outlet ends. Ditching in this location is also required.

- Km. 47.0: Requires replacement of the existing 12" Ø CMP with a 600 mm Ø CMP. Repairs and cover will require an estimated 30 m^3 of imported material. Ditching in this area is also required.

- Km. 47.1: Has a 12" Ø CMP in place which requires replacement with a 600 mm Ø CMP. Grade repairs will require approximately 20 m^3 of road material.

- Km. 47.2: Requires replacement of an existing 12" Ø CMP with a 600 mm Ø CMP. Widening and grade repairs will require approximately 50 m^3 of material.

- Km. 47.4: Has an existing 12" Ø CMP which requires excavation of the inlet.

- Km. 47.6: Has an existing 12" Ø CMP. Replace with a 600 mm Ø CMP. Grade repairs and widening will take approximately 100 m^3 of fill. Minor ditching is also required.

- Km. 48.6: Requires removal of an existing 14" Ø CMP with replacement by a 600 mm Ø CMP and approximately 100 m^3 of fill for grade repairs and raising. The fill required is available adjacent to this site.

- Km. 48.9: Has a 12" Ø CMP in place which requires replacement with a 400 mm Ø CMP. Forty m^3 is estimated for grade fill and repairs and is available adjacent to the site.

- Km. 55.4: Has an existing 36" Ø CMP in good condition. It is recommended that this culvert be excavated and the invert(s) lowered. The grade requires raising with an approximate quantity of 350 m^3 through a low area. Fill could be hauled a short distance from Victoria Creek at Km. 53.2.

Some road surfaces west of Rowlinson Creek are excessively slick during wet weather. These sections are estimated to be 6-7000 m total in length. These surfaces require a thin spread of course sand or fine pit

run with particular import given to curves and steep grades. It is estimated that these particular sections may require 2000-2500 m^3 of material.

Due to the small time frame of the field study, only major or obvious drainage problems were assessed. Accordingly, measurements of culverts and quantity estimates are cursory and preliminary in nature.

Although ditching has had sparse mention, it is of course integral with the drainage scheme. In general terms, approximately 25-30% of the Nansen Road requires various degrees of ditching improvement.

2.2.4 Rowlinson Creek Bridge

The Bailey bridge at Rowlinson Creek was examined during the field study. Its structural type or configuration was determined, the components and their condition noted and the banks and bank seats examined. Although the deck width was not determined, we assume this bridge to be "Standard Widened Bailey" (SWB) or an Extra Widened Bailey Bridge (EWBB). Observations in point form are as follows:

- The bridge is of "double single" (D.S.) configuration with light construction in that there are only two transoms per 10 ft. bay of bridge (Class 40).
- Span is 70 ft. from end bay post to post.
- Deck has transverse timber (2") on stringers with in line decking (2") forming a double trackway.
- Transom clamp(s) missing.
- West landing bay transom is being stressed and has sustained damage through live load end reaction.
- Inadequate grillage or bearing plates under all end posts.
- Improper bearings too close to slope line of each bank.

- Most sway bracing is non-existent and what is in place is not properly installed.
- Paint flaking on many bridge members.
- No grease in pin hole truss attachments.
- The wetted perimeter (high water) is estimated at 14-15 m under the bridge.
- The existing wetted perimeter (June 26) is approximately 6 m wide with pools 1-1.5 m deep, under and immediately adjacent to the bridge.
- The banks appear stable and contain growths of grasses and dwarf willow.

2.2.5 Victoria Creek Crossing

Victoria Creek is presently crossed by fording the creek. The ford is approximately 30 m in width (length of travel) and has a stable bottom of 200 mm minus alluvium. Both approaches are stable with minimum grades.

There has been a raised road bed constructed in the past, immediately north and adjacent to the fording point. It appears as though this construction was in preparation for a bridge crossing; however, there is no historical information supporting this or the pre-existence of a bridge at this location. (See Appendix `B´ - Photographs.)

2.2.6 Abandoned Nansen Airstrip

This area was examined on the 25th of June. The airstrip is approximately 1000 m long and 40 m wide. The strip has a fine sand surface with a sedge and dwarf willow regrowth of approximately 0.3-0.5 m in height. The surface appears stable and there were no indications of scouring through runoff or river inundation.

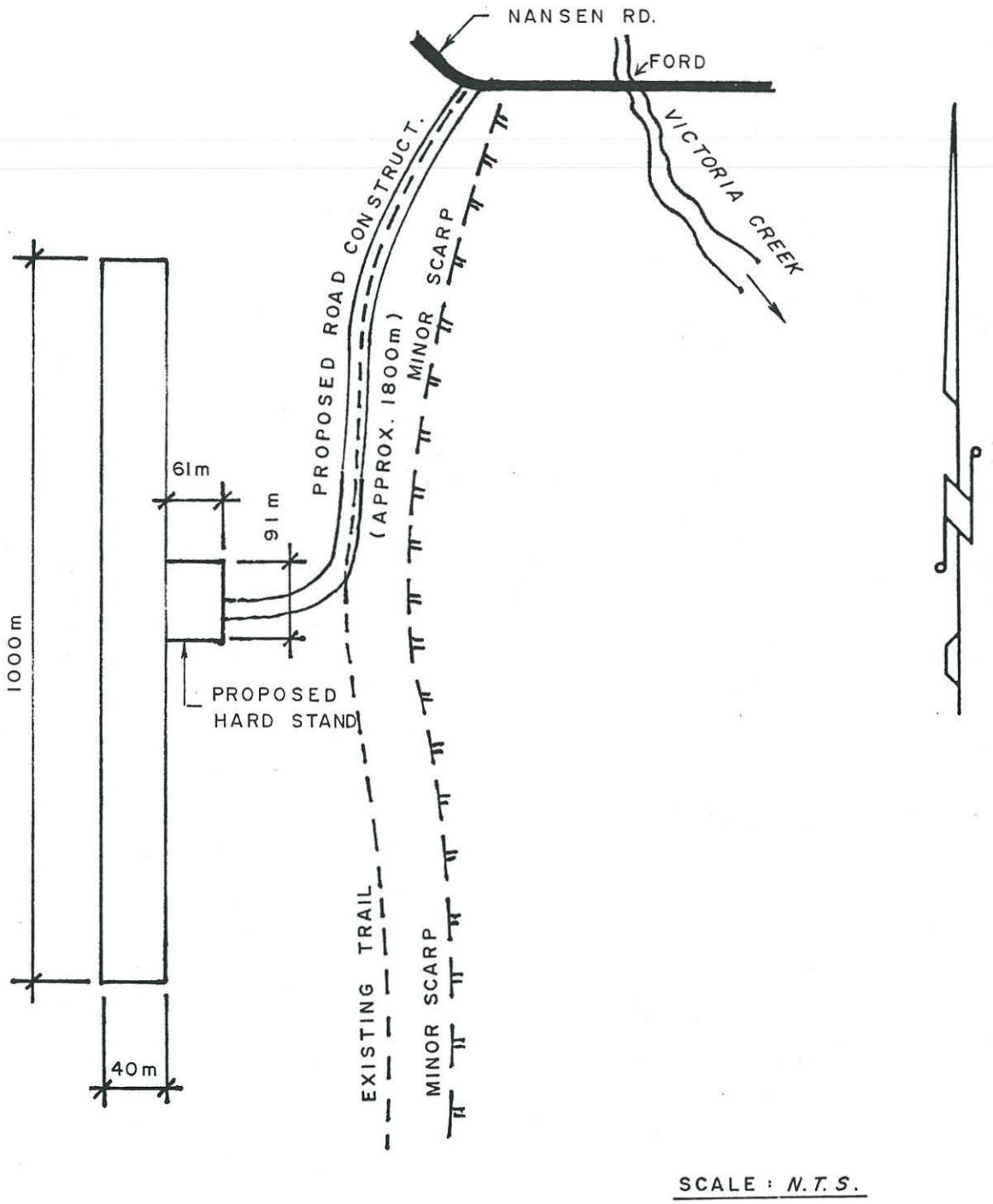
The runway has a 1% grade throughout and is located in a north-south alignment. The facility is in the Victoria Creek valley with ideal approaches north and south. Hazards to navigation (VFR) are minimal and the closest are two hills, namely, one in the southeast quadrant, 1500 m from centre line at 1130 m A.S.L. and another in the northwest quadrant, 2800 m from centre line at 1240 m A.S.L. The runway is at the 1040 m elevation. Hazard levels in the event of overrun or engine failure on takeoff are minimal to moderate for the valley grade is similar to the runway grade with low growths of dwarf willow and no terrain irregularities such as gullies or knolls. Flora each side of the runway limits consists of sedges and dwarf willow with growths of spruce (3-6 m high) at 300 m+ distance away.

The most stable existing access to the runway is gained immediately west of the Victoria Creek Crossing, thence southward on a narrow track roughly paralleling the strip approximately 300-400 m east of the runway's east limit. This track runs along the west edge of a minor scarp created by Victoria Creek's historic channel and is said to be part of a route, used long ago, to gain access to the north end of Aishihik Lake. The access route has not been cut into or built up, yet appears stable. This route, from Victoria Creek to the south end of the runway is approximately 2800-3000 m in length and is cleared to an average width of 4-5 m.

There are other routes to the strip with departures from the Nansen Road further to the northwest of the Victoria Creek crossing, however, these were not examined due to their greater length and poor condition.

As a point of interest, conversation with some "oldtimers" indicates the airstrip had historical winter use. The runway was packed using large horse-drawn corrugated rollers in tandem. This apparently was the more expedient means of winter maintenance as snow removal equipment was not available.

FIGURE 2.1



SCALE : *N.T.S.*

NANSEN AIRSTRIP (EXISTING & PROPOSED)

BOREAL Consulting Services Ltd.

3.0 BORROW SOURCES

The following, in point form, are borrow areas noted during the field study of the Nansen Road on the 25th and 26th of June, 1988.

It must be noted that reserves remaining and material types were not determined by this reconnaissance due to the shortage of time and the preliminary nature of the study.

Km. 3.6	Gravel right hand side (north) 100 mm
Km. 5.7	Gravel right hand side (north) 200 mm
Km. 22.9	Borrow area right hand side (north) Pit run (course) appears to be in good supply
Km. 25.1	Creek crossing, gravels both sides
Km. 25.5	Pit run - used by YTG
Km. 34.5	Potential borrow area - weathered/fractured rock
Km. 34.7	Potential borrow area - weathered/fractured rock
Km. 41.2	Possible rock quarry source on north side and immediately east of creek crossing
Km. 42.9	Established borrow area - appears to be fair pit run with possibly 6-7% passing 200
Km. 53.2	Victoria Creek - potential sources for road and airfield. May be some problem finding good percentage of fines

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 General

Due to the preliminary and general nature of this study, no attempt will be made in this report to comply strictly to Geometric Road Design Guidelines such as R.T.A.C. The Nansen Road's present condition and dimension(s) come closest to but not within the modified R.L.U. 60 for Yukon Highways.

The intent of this report is to generally identify certain areas requiring improvement(s) and provide preliminary estimates for engineering and construction costs.

4.2 Vertical Alignment

The grades on the Nansen Road are generally moderate. There are some pitches from 11-14%, however, these are of short duration (distance) and do not pose a major problem. However, in the first 25 km of the road, some grades combined with sharp blind corners slow heavy traffic enough to present a degree of difficulty and potentially hazardous conditions in wet or icy periods.

There are some minor knolls throughout the road which when cut down will improve sight distance. Some of these problems will be solved under a drainage improvement scheme as these knolls will be "cut to fill" as part of the culvert and drainage improvements. Other knolls not dealt with under the drainage works could be manipulated under the ongoing

maintenance program. If the former are dealt with under a quantity contract, the road must be surveyed and the grades designed for contract control.

The recommendations concerning some of the above shall be combined under Section 4.3, Horizontal Alignment.

4.3 Horizontal Alignment

As described above, the first 25 km of the road has some areas where blind curve and grade conditions present difficulty, particularly for heavy long loads. There are other areas throughout the road where the horizontal alignment could be improved by widening, minor relocation and/or brushing out the inside to provide greater sight distance. It is suggested that these areas may not constitute the immediate requirement for a survey and engineering design of the entire road. We recommend that each of these areas be examined in the company of the YTG maintenance superintendent, assessed and limits marked for survey. Each of these areas could have an arbitrary chainage and be well referenced in order that each area could be incorporated with a chainage equation should a total road survey be carried out in the future. It is felt that this method may minimize survey and engineering costs and provide an economical alternative which may leave greater funds for actual improvements on the ground. This type of approach will be reflected in the preliminary estimates contained herein.

4.4 Roadbed Conditions

Observations made during the field trip indicate that improvements to the drainage of the road bed are of crucial importance to the continued integrity of the Nansen Road. Accordingly, we recommend that drainage improvements be a major concern when upgrading this route, regardless of the ultimate design level or phasing of construction. The bulk of culvert replacement, repairs and new installation occurs in a 30 km section, namely, between Km. 25.1 and Km. 55.4. Our preliminary study revealed 39 locations requiring road and drainage work, however, this is not to say that other minor sites do not exist. The list as contained in Section 2.2.3 herein has been used as a basis for estimation of the culvert work with associated work such as ditching and fill material for each specific site.

Although the scope of this study did not allow for specific ditching quantities which would require a more detailed study, it is estimated that 20-25% of the road length could use ditch improvements with the use of an appropriate grader. This will be reflected in our estimates.

It was noted, where deep fill sections cross a steep gully, some culverts have a steep grade in order to place the outlet invert as close to the outside toe as possible. It is suggested that, when these culverts are replaced, some of them could be placed at a flatter grade with the incorporation of a half culvert spillway. This may minimize excavation into the bottom of the subgrade and reduce installation costs whenever possible.

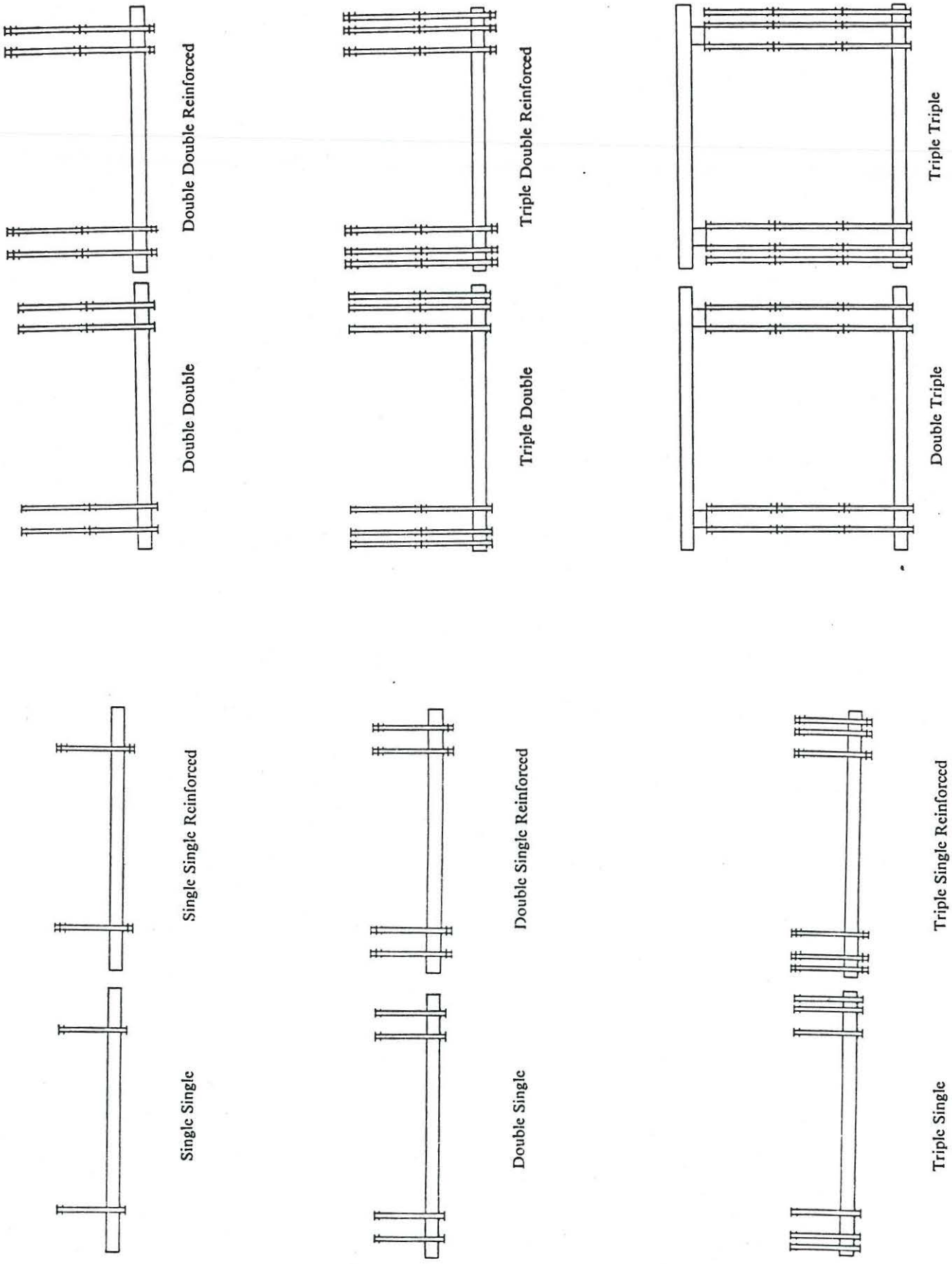
There is a total of approximately 6-7 km of road surface west of Rowlinson Creek which is slick when wet. It is recommended that these areas receive a surface coating of fine pit run or course sand which could be mixed with the existing surface material. This material may be found in the Rowlinson Creek Valley. (See Section 4.8, "Borrow Sources".)

In some short sections ditching at the toe of a steep cut bank will only promote further bank failure and the refilling of the ditch. Most of these sections are not "through" cuts so that drainage can be promoted by a cross fall section to the outside where the horizontal alignment permits this.

4.5 Rowlinson Creek Bridge

The Bailey bridge crossing of Rowlinson Creek was examined in some detail as the bridge is critical to the Nansen area access. The Bailey bridge was a 1940's design intended originally for military use in tactical usage during warfare. Its flexibility of design and configuration as well as its ease in transport and construction made it useful through all phases, from the assault to rear echelon resupply. Eventually, due to its characteristics, this bridge was and is being used throughout the world as a temporary or semi-permanent bridge. Bailey design criteria was obtained from Public Works Canada in order to determine the load limits of the existing bridge configuration. As previously described herein, the bridge is of a "double single" configuration (unreinforced) with a light transom design and 70 ft. in length.

FIGURE 4.1



BAILEY BRIDGE COMPONENT DESIGN CONFIGURATIONS

BOREAL Consulting Services Ltd.

TABLE 4.1

TABLE OF BENDING MOMENTS AVAILABLE FOR LIVE LOAD. TONS, FEET.
EXTRA WIDE BAILEY. TIMBER DECK.

Feet	S.S.	D.S.	S.S.R.	T.S.	D.S.R.	D.D.	T.S.R.	T.D.	D.T.	D.D.R.	T.T.	T.D.R.
10	406	—	—	—	—	—	—	—	—	—	—	—
20	395	—	—	—	—	—	—	—	—	—	—	—
30	376	772	791	—	—	—	—	—	—	—	—	—
40	345	735	760	—	—	—	—	—	—	—	—	—
50	315	688	721	1079	—	—	—	—	—	—	—	—
60	273	629	673	1012	1431	—	—	—	—	—	—	—
70	224	561	617	934	1348	1420	2114	2225	—	—	—	—
80	167	481	552	843	1252	1319	2000	2101	—	—	—	—
90	102	392	478	741	1144	1204	1869	1962	—	—	—	—
100	30	291	396	626	1023	1076	1724	1805	2421	2734	3859	4292
110	—	180	304	499	889	934	1563	1633	2235	2569	3624	4086
120	—	58	205	360	743	778	1387	1444	2030	2388	3373	3860
130	—	—	96	209	584	609	1195	1238	1808	2192	3096	3613
140	—	—	—	46	412	426	955	1016	1568	1981	2798	3347
150	—	—	—	—	227	230	766	778	1311	1753	2477	3062
160	—	—	—	—	30	21	529	523	1035	1510	2134	2757
170	—	—	—	—	—	—	276	251	742	1251	1769	2432
180	—	—	—	—	—	—	—	—	431	977	1382	2087
190	—	—	—	—	—	—	—	—	102	687	973	1723
200	—	—	—	—	—	—	—	—	—	381	542	1339
210	—	—	—	—	—	—	—	—	—	—	88	936
220	—	—	—	—	—	—	—	—	—	—	—	512
230	—	—	—	—	—	—	—	—	—	—	—	69
240	—	—	—	—	—	—	—	—	—	—	—	—
250	—	—	—	—	—	—	—	—	—	—	—	—

TABLE OF SHEAR FORCES AVAILABLE FOR LIVE LOAD. TONS.
EXTRA WIDE BAILEY. TIMBER DECK.

Feet	S.S.	D.S.	S.S.R.	T.S.	D.S.R.	D.D.	T.S.R.	T.D.	D.T.	D.D.R.	T.T.	T.D.R.
10	26	—	—	—	—	—	—	—	—	—	—	—
20	25	—	—	—	—	—	—	—	—	—	—	—
30	24	53	23	—	—	—	—	—	—	—	—	—
40	23	51	22	—	—	—	—	—	—	—	—	—
50	21	49	20	77	—	—	—	—	—	—	—	—
60	20	46	19	75	44	83	—	—	—	—	—	—
70	18	44	17	72	42	80	68	—	—	—	—	—
80	17	42	15	70	39	78	65	—	—	—	—	—
90	15	40	14	67	37	75	62	105	—	—	—	—
100	14	38	12	65	34	72	59	101	70	68	97	96
110	—	36	10	63	32	70	56	98	67	65	93	92
120	—	34	9	60	29	67	53	95	64	62	89	88
130	—	32	7	58	27	64	50	92	61	59	85	84
140	—	—	—	55	24	62	47	88	58	56	81	80
150	—	—	—	53	21	59	44	85	55	53	77	76
160	—	—	—	51	19	57	41	82	52	50	74	72
170	—	—	—	49	16	54	38	79	49	47	70	68
180	—	—	—	—	—	51	35	75	46	44	66	63
190	—	—	—	—	—	—	—	72	43	40	62	60
200	—	—	—	—	—	—	—	69	40	38	58	57
210	—	—	—	—	—	—	—	65	37	34	54	53
220	—	—	—	—	—	—	—	—	—	—	51	49
230	—	—	—	—	—	—	—	—	—	—	—	45
240	—	—	—	—	—	—	—	—	—	—	—	—
250	—	—	—	—	—	—	—	—	—	—	—	—

Note: As Bailey components and design are in imperial measure, accordingly, all reference in this section shall be in imperial measure; i.e. a ton will equal the old "long ton" of 2,244 lb.

A design check of the existing structure using a worst case scenario of a heavy load on 5 axles was carried out. Calculations of centre of gravity, shear and bending using 70,000 lb. maximum on the rear axle group of a low boy/tractor configuration show that this case goes far beyond the capabilities of the existing bridge component configuration.

This case load, given a standard low boy and tractor (5 axles - 1 front, 2 drivers and 2 trailer groups) dimension, transmits a total live load and impact (axle) shear of 52 long tons and a total bending moment (live load and impact) of 767.84 Tons ft.

As can be seen from the design load table(s), the existing configuration will take 42 Tons in shear while the bending moment available is 561 Tons ft. It must be noted that these tables were manipulated originally to indicate remaining or live load in that the dead load has already been accounted for.

It is difficult to say whether our design live load (worst case) has ever been applied to the structure, however, we do know that the landing bay transom on the west end has been bent and is torqueing about its X axis. It is thought that the damage is the result of a combination of shear and live load end reaction.

It is felt that the immediate and short term integrity of the structure is of concern and suggest that work be carried out as soon as possible.

These works are in point form as follows:

- Replacement of missing transom clamp(s)
- Tightening of all bracing components in sequence. i.e. rakers, bracing frames, transom clamps and sway braces
- Replacement of missing sway braces - every bay of bridge requires these. The sway braces are critical to the health of this structure. When carrying out the sway bracing operation, each bay should receive incremental tightening throughout all bays of the bridge in the same period of time.

Long term recommendations include an upgrading of the bridge's class or configuration. We suggest that the bridge be converted to a double single reinforced configuration (D.S.R. in tables). This entails the application of chord reinforcement (top and bottom) of all trusses with the exception of trusses contained in each landing bay (the first bay of bridge at each end of the bridge). The D.S.R. configuration also requires the application of 4 transoms per 10 ft. bay; therefore, two more transoms per bay will be required.

Due to the poor bearing situation at each end of the bridge, it is recommended that rock filled cribs be constructed. This will serve three functions; namely, to stabilize the bank under and forward of the bank seats, and to provide adequate surface under the end post bearings for improved load transfer to the soil. The third function served will be discussed in the following.

It will be noticed that the D.S.R. configuration yields a dramatic increase in available bending but actually decreases available shear by 2 Tons due mostly to the reinforcement component dead load. The third function served by the crib structures would be to mitigate to some degree the shear, in that blocking could be placed under the landing bay(s) transoms and the bottom chords of the trusses. This may reduce the effective span by 10-20 ft. total.

Live load and reaction may also be reduced by placing close fitting timber bracings between the transoms of the first bay of bridge on each end.

Dependent on factors such as the bridge's condition and traffic volumes, the structure may be reinforced in two ways; namely, by cantilever de-launch and construction in situ.

If the structure has not been stressed excessively, it may be possible to reinforce in situ with the use of chord jacks and a small crane or backhoe for hoisting materials. The de-launch, construction and re-launch situation is the least desirous of the two, however, a short access somewhere adjacent and a ford will probably be required for detour in any case. An adjacent fording point constructed prior to bridge work could also be used in the future where overloads could be dismounted, moved across the ford and remounted beyond the other end of the bridge.

It is recommended that the bridge have signing pertaining to load limits and entry speed. We suggest that the bridge have regular inspection and maintenance. These activities include the following in point form:

- Spray penetrating oil/rust inhibitor into truss pin holes around the pin edges and follow up with a heavy grease application at the truss/pin interface to minimize water entry.
- Check all bracing members (in sequence) for tightness. i.e. rakers, bracing frames, transom clamps and sway braces.
- If bridge has chord reinforcement, check all chord bolts for torque.
- Paint where needed.
- Check for decking shear. If any shear is apparent, then the stringers across the transoms must be checked for failure.
- Examine support structures from top to bottom. i.e. end posts, end post bottoms and end post bearings for shear, bearing plates and mud sills or grillage under bearing plates for failure.

4.6 Victoria Creek

As described previously, Victoria Creek is crossed by means of a ford. Although the writer is not aware of spring conditions, the ford appears stable and able to handle the traffic presently using the road.

It is not within the scope of this report to examine or make recommendations for a crossing structure as this area will require a detailed survey and analysis. It can be said that any structure in this location will require considerable rip rap or armour around the structure and on the east bank for some distance upstream. This crossing point is on a curve and also a transition point from a narrow channel on the upstream side to a widened and braided area downstream.

4.7 Nansen Airstrip

As described in Section 2.2.6, the abandoned Nansen runway is 1000 meters long and 40 meters wide and the surface is composed of fine sand and silty sands.

We recommend the construction of a road of approximately 1800 meters in length following the route described in Section 2.2.6 of this report. The existing trail would be departed from approximately one-half the distance down the airstrip, then due west to enter the east side of the proposed hard stand/parking area (see Figure 2.0).

The following are further recommendations based on general observations.

Liaison with air operators indicates that the present runway dimensions and grade are sufficient for traffic at gross weight for aircraft such as the DC-3, Twin Otter and Islander. These aircraft are commonly used in the Yukon so it seemed appropriate to base requirements on these machines.

The runway should receive 0.1-0.15 m of watered and compacted pit run and the proposed 61 m x 91 m hard stand/taxi and parking area 0.2-0.25 m of watered and compacted pit run.

It is proposed that the approximately 1800 m of access road be covered by 0.2 m of compacted pit run and be of 7 m in width.

The existing track is stable and should only require the application of the fill material in order to set the road crown slightly above the existing grade. The hard stand and 3-400 m of road will require a very shallow cut and clear operation to remove the duff and dwarf willow.

It is suggested that the runway limits be marked with international orange coloured structures which duplicate the presently used markers employed by YTG for runway limits. A wind sock of regulation size and height above ground should be installed half way down the runway or, if the operator is using "straight in" approaches, the pilots may prefer a sock easily seen in approaches from the north or south. These wind socks could be placed 200 m inside each end with the south approach having the sock on the left or west side and the north approach on the left or east side.

4.8 Borrow Sources

In Section 3.0 of this report, borrow areas were identified by kilometer. Most of these sources are already in use by the YTG maintenance crew. It is beyond the scope of this study to examine the materials in each pit and assign a task suitability for each. It is recommended that this information be gathered, particularly in areas where the material is most needed. As well as materials identification, potential reserves may be estimated as well.

Borrow areas should be searched for and developed in the Rowlinson Creek and Victoria Creek areas. These sectors require the greatest two single sources of materials.

It is anticipated that some effort may be required in the Victoria Creek area to find materials with enough fines to constitute a binding agent. The materials readily observed in this area were very clean.

Km. 41.2 may have potential for a rock quarry. This type of material would be useful for rip rap.

Most existing borrow areas appear to be within the road R.O.W. Most proposed or potential areas are also within the R.O.W. It is anticipated that a quarry area at Km. 41.2, the Rowlinson Creek area and the Victoria Creek area may require borrow pit development beyond the R.O.W. limits. These areas will require land use licences once the exact location of good materials is determined. Accordingly, the costs of exploration and pit development have not been included in the cost estimates.

5.0 CONSTRUCTION AND ENGINEERING ESTIMATES

5.1 Construction Equipment Rates

The listed equipment rates are based on published base cost in Northern British Columbia. The actual estimated rate would be the base rate plus 20% profit.

		Base Rate/h	+20%/h
Dozer:			
D7H (or equiv.)	215 hp.	$120.00	$144.00
D7G (or equiv.)	200 hp.	$110.00	$132.00
D7F (or equiv.)	200 hp.	$105.00	$126.00
Loader:			
966 (or equiv.)	4.25 yd^3	$97.00	$116.00
980B (or equiv.)	4.50 yd^3	$99.25	$119.10
Backhoe:			
225 (or equiv.)	48,000 lb.	$104.00	$124.80
225 (or equiv.)	65,000 lb.	$120.00	$144.00
Grader:			
14G (or equiv.)	w/ scarifier	$84.00	$100.80
Vibratory Roller:			
C.P. 553 (Cat)		$70.00	$84.00
Tampo R 5410		$81.50	$97.80
Water Truck:			
(w/ onboard pump)	5,000 I.gal.	$69.00	$82.80
Dump Truck:			
(end dump)	10 m^3	$55.00	$66.00

Note: Mob/demob. prices estimated at $3.00/km (mounted) and $1.90/km (unmounted) from Whitehorse to Km. 55 on the Nansen Road (and return).

5.2 Drainage Sites

There are 39 points for work targets. Of these, 4 are major and 35 are minor.

Of the minor sites, 2 of these can be completed per day (road closure factor on 6 m width of road surface).

For the 4 major sites, 2.75 days or 27.5 h each should be allowed.

Minor Sites (35 sites at 2 per day)	
18 days (10 h each) ($754.00/h, machinery)	$135,792.00
18 days (10 h each) ($115.00/h, lab. & sup.)	20,700.00
Major Sites	
11 days (10 h each) ($754.00/h, machinery)	82,940.00
11 days (10 h each) ($115.00/h, lab. & sup.)	12,650.00
Mob/demob. Machinery	
5 machines mounted @ $3.00/km (442 km, return)	6,630.00
2 machines unmounted @ $1.90/km (442 km, return)	1,679.60
	$260,391.60

Note: The above estimate includes ditching and road work at each specific drainage site noted. The $754.00/h includes 2 dump trucks. The mob/demob. under this section should suffice for the entire operation. i.e. Sections 5.3, 5.4 and 5.5.

5.3 General Road Work

This work includes resurfacing, ditching, brushing out curves and cutting banks on corners.

Resurfacing: (fine pit run or course sand) 7000 m length @ 0.05 m thickness. Quantity = 2,100 m^3

4 trucks @ 10 m^3 each with total cycle of 60 m^3/h			
Therefore, 35 h (4) ($66.00/h)	=	truck	$ 9,240.00
1 vibratory roller			
Est. 25 h ($97.80/h)	=	compaction	2,445.00
1 water truck			
Est. 20 h ($82.80/h)	=	water	1,656.00

1 loader				
Est. 40 h ($119.10/h)		=	loader in pit	4,764.00
1 grader				
Est. 40 h ($100.80/h)		=	grading	4,032.00
Total resurfacing cost:				**22,137.00**

Ditching: Estimate 30,000 m length (includes both sides)

Estimate grader progress @ 500 m/h. Therefore,			
30,000 m/500 m = 60 h ($100.80)	=	grader	6,048.00
Foreman for ditching and resurfacing			
Say, 100 h @ $45.00/h	=	foreman	4,500.00
Total ditching cost:			**10,548.00**

Brushing out corners:	
Labour and equipment	9,000.00
Transport and/or burning of felled material	12,000.00
Total brushing of corners:	**21,000.00**

Cutting of banks on curves:	
Trucks (2) (80 h each @ $66.00/h)	10,560.00
Dozer (1) (80 h @ $144.00/h)	11,520.00
Grader (1) (30 h @ $180.00/h)	5,400.00
Loader (1) (80 h @ $119.10/h)	9,528.00
Backhoe (1) (40 h @ $144.00/h)	5,760.00
Foreman (80 h @ $45.00/h)	3,600.00
Total bank cutting:	**46,368.00**

TOTAL GENERAL ROAD WORK:	**$100,053.00**

Note: Estimating the cost of cutting banks and brushing out corners is difficult without a detailed survey and design.

5.4 Nansen Runway

Required quantities of pit run:

Runway	1000 x 40 x 0.15 m	6000 m^3
Hard stand/parking	61 x 91 x 0.20 m	1110 m^3
Access road	1800 x 7 x 0.20 m	2520 m^3
Total Fill:		9630 m^3

Trucks:

Est. 4 end dumps of 10 m^3 capacity at cycle of 25 m^3/h each = 100 m^3/h delivery total.
A time frame of 96.3 h is required.

Therefore, 96.3 h x 4 x $66.00/h	=	truck cost	$ 25,423.00
Water Truck: Est. 36 h @ $82.80/h	=	water cost	2,980.80
Grader: Est. 45 h @ $100.80/h	=	grading cost	4,536.00
Loader: Est. 100 h @ $119.10/h	=	loader at pit	11,910.00
Vibratory Roller: Est. 40 h @ $97.80/h	=	compaction	3,912.00
Foreman: 100 h @ $45.00/h	=	supervision	4,500.00
TOTAL CONSTRUCTION COST:			**$ 53,261.80**

Note: This estimate does not include the cost of developing a borrow pit in the Victoria Creek area.

5.5 Rowlinson Creek Bridge

This estimate is based on reinforcing of the double single Bailey bridge to a double single reinforced configuration in situ. It also includes the construction of two rock filled timber cribs for bank seat improvements and the construction of a ford and access as an alternate crossing. Due to many unknowns at this point the estimate does not include cribbing materials or Bailey components.

Bailey construction:

Labour	4 men x $35.00/h each x 85 h	$ 11,900.00
Foreman	1 man x $45.00/h x 85 h	3,825.00
Crane or backhoe	$150.00/h x 55 h	8,250.00
Loader	$119.10/h x 10 h	1,190.00
Dump truck	2 x $66.00/h x 10 h	1,320.00
Hand tools - chord jacks, bridging jacks, etc., say		1,000.00
Total Bailey construction:		**27,485.00**

Ford and alternate access:

Dozer	$144.00/h x 10 h	1,440.00
Loader	$119.10/h x 10 h	1,191.00
Dump trucks	2 x $66.00/h x 15 h	1,980.00
Grader	$100.80/h x 3 h	302.40
Compactor	$97.80/h x 3 h	293.40
Labourer	1 x $35.00/h x 10 h	350.00
Foreman	1 x $45.00/h x 10 h	450.00
Total ford and alternate access:		**6,006.80**

TOTAL ROWLINSON CREEK BRIDGE: **$ 33,491.80**

Cost Summary:

5.2	Drainage sites	$260,391.60
5.3	General road work	100,053.00
5.4	Nansen Airstrip	53,261.80
5.5	Rowlinson Creek Bridge	33,491.80
	Flag person for entire project	28,000.00
TOTAL COST:		**$475,198.20**

Note: This estimate does not include costs for meals and accommodation for the construction crew or the costs for exploration and development of borrow pits. The cost of special radio communications and media advertising has not been accounted for.

5.6 Engineering Estimate

5.6.1 Project Management

Senior Engineer	$ 4,200

5.6.2 Pre-Construction Surveys & Layout:

Survey and layout for bush clearing areas	6,000.00
Survey and layout for bank cutting areas	7,200.00
Survey and layout for airstrip, hard stand and access	2,400.00
Survey and layout for ford and access at Victoria Creek	720.00
Total Survey and Layout:	16,320.00

5.6.3 Inspection Services:

This includes a senior inspector and one junior inspector/survey assistant.

Inspection services (2 men) for 60-day period at 10 h/day	36,000.00

Note: Inspection services will include supplementary construction surveys, daily construction and progress reports supplemented with photography, liaison with client and liaison with mining community.

Vehicle and expendable survey materials (60 days)	2,700.00
Total Surveys and Inspection Services:	55,020.00
Construction Report with photographs	1,000.00
TOTAL ENGINEERING:	**$ 60,220.00**

Note: This estimate does not include meals or accommodation.

6.0 YTG MAINTENANCE EXPENDITURES 1984-1988

Territorial records indicate maintenance expenditures as follows:

1984-85	$ 17,000.00
1985-86	61,000.00
1986-87	29,000.00
1987-88	22,900.00
Total:	$129,900.00

7.0 ROAD CLASSIFICATION

Due to the preliminary nature of the study, this report recommends upgrading of the Nansen Road to a degree short of R.T.A.C. standards within a tote road status. Upgrading the road to an R.L.U. 60 design standard would require a complete road preliminary survey, borrow pit exploration, road design, layout surveys according to design, a contract with specifications and extensive inspection.

8.0 ENVIRONMENTAL CONSIDERATIONS

The existing road appears to have minimal environmental impact. The proposed upgrading program contains no major realignments or widening. Improvements to the existing drainage works will enhance road bed stability and minimize maintenance works. This will reduce detritus and suspended solids introduced into water courses as a result of yearly maintenance.

The ford at Victoria Creek was examined briefly during a rainy period. There was no noticeable flooding. This is probably due to the relatively short fetch to the creek's headwaters. Passage of traffic over the ford does not induce siltation due to the coarse clean bottom of the fording point.

9.0 CONSTRUCTION ORGANIZATION

The works organization on this program is critical in that traffic flow should have minimal disruption. It is inevitable that the road will not be passable to traffic occasionally. There are three major locations where culvert installation is required within deep fill sections. The bridge crossing at Rowlinson Creek presents another case of particular concern. It is hoped that a ford with short access diversion will be successful in order to maintain traffic flows through this sector and minimize costs associated with the bridge works.

Pre-contract advertising and daily communication facilities will be important to the mining community. It is suggested that a radio telephone contact be available in the contractor's field office in order that the mining community may have daily information on conditions or closures. Radio contact between each job site and the contractor's field office would complete this communications network.

Some provision for medical evacuation in the case of a construction or mining accident should be arranged. During a road closure, helicopter evacuation could be carried out if there is a machine available out of Carmacks. If a rotary winged machine is not available, the construction on the airstrip and its access should be carried out prior to any road closures. This will provide facility for medical evacuation with the use of a fixed wing aircraft.

10.0 MINING AND EXPLORATION ACTIVITY (NANSEN AREA)

Ninety percent of the Nansen Road alignment is contained within Map Sheets 115-I/1, 115-I/2 and 115-I/3. It is anticipated, however, that access improvement will affect the surrounding areas. These areas (map sheets) are as follows:

115-I/1, 115-I/2, 115-I/3, 115-I/4, 115-I/6, 115-I/7, 115-I/8
115-H/14, 115-H/15, 115-H/16

Figures 10.1 to 10.5 inclusive indicate the latest record of holdings under the Quartz Act. In addition, the Whitehorse Mining Recorder's Office has indicated that there are up to 40 separate placer operations or claims holders in the area. Twenty to thirty of the placer operations are in various stages of exploration and/or development.

There is considerable hard rock exploration underway as of this writing. Some of these operations are listed below.

Property	Owner	Work Program
Nansen	B.Y.G. - Chevron	12,300' of diamond drilling. Bulldozer and excavator trenching. Rehabilitation of underground workings.
Goulter	Aurchem	5,000' diamond drilling.
Vic	Kerr Addison, Chesbore States	5,000' diamond drilling, excavator trenching.
Tawa	B.Y.G. - Chevron	1,500' diamond drilling, extensive dozer and excavator trenching and road construction.
Daws	Noranda	Surface exploration, excavator trenching.

REFERENCE FOR 1:250,000 SCALE CLAIM OWNERSHIP MAPS
NORTHERN AFFAIRS - YUKON TERRITORY — REVISED TO: 20 MAY 88 — WHITEHORSE MINING DISTRICT - NTS 115-H; I

MAP	REF.	CLAIMS	EXPIRY	OWNER
115-H-12	1	PATCH 1-16	15 Oct. 1991	Hudson Bay Exploration & Development Co. Ltd.
		HATCH 7; 9; 13-16; 19; 21; 23; 25-30; 32; 34	15 Oct. 1991	Hudson Bay Exploration & Development Co. Ltd.
		THATCH 16; 18; 29-32	27 July 1991	Hudson Bay Exploration & Development Co. Ltd.
		CATH 1 FR.; 2-4	26 Aug. 1988	Hudson Bay Exploration & Development Co. Ltd.
	2	HIK 1-24	10 Aug. 1989	Kerr Addison Mines Ltd.
115-H-13	1	ALO Block (see 115-I-4)		
115-H-16	1	POWER 6-10	13 Nov. 1988	A.M. Carlos
		POWER 21-26	13 Nov. 1988	Glen Harris
		PLUME	29 June 1988	Fred R. Dorward
115-I-1	1	CLIFFSIDE AGATE	3 June 1991	Fred R. Dorward
	2	PEL 1-8	19 Mar. 1989	Dominion Explorers Inc.
	3	COAL AGATE	6 Aug. 1988	Fred R. Dorward
	4	NAT	6 Aug. 1988	Fred R. Dorward
115-I-2		ROBERT 1-54 (see 115-I-3)		
		NULEE 1-126	30 May 1989/90/91	G. Dickson
		JS 1-152	22 May 99/90/90/91	G. Dickson
	2	FIELD 1-30	15 Feb. 1989	Archer, Cathro & Associates Ltd.
	3	WOLF 1Fr.-2Fr.; 9; 11	Apr./June 1988	R.A. Granger
	4	OP 1-4	26 Feb. 1989	David Pugh
	5	DUR claims (see 115-I-3)		
115-I-3	1	LEASES		
	2	JEFF 1-5; 7; LAURA 9; JOANNE	6 Feb. 1994/95	Chevron Minerals Ltd.
	3	DOME 1-22; 25-28; 33-43; 47-66; 78-84;	6 Feb. 1994-97	Chevron Minerals Ltd.
		PEBBLE 1-8	7 Mar. 1989	Glen Harris
	4	DD 1-48	6 Feb. 1994	Chevron Minerals Ltd.
	5	HIW 1-8; 9Fr.-17Fr.	6 Feb. 1995/97	Chevron Minerals Ltd.
	6	BULL 1-6; 7-8; 9-28	28 Feb. 1990/91/94/95	Archer, Cathro & Associates Ltd.
		OX 1-20	20 Dec. 1990	Gordon Dickson
	7	VIC 1-118	15 Aug./27 July 1991	Kerr Addison Mines Ltd.
	8	TAWA 1-28	3 Jan. 1990/91/93	Consolidated BRX Mining & Petroleum Ltd.
		TAWA 65-67; 72=79; 83-90	3 Jan. 1990/91/93	Archer, Cathro & Associates Ltd.

FIGURE 10.1

REFERENCE FOR 1:250,000 SCALE CLAIM OWNERSHIP MAPS
NORTHERN AFFAIRS - YUKON TERRITORY — REVISED TO: 20 MAY 88 — WHITEHORSE MINING DISTRICT - NTS 115-H; I

MAP	REF.	CLAIMS	EXPIRY	OWNER
115-I-3	9	ETZEL 1-50	26 Sep. 1989	Gordon Dickson
	10	J. BILL 1-32	28 Feb. 1996	Archer, Cathro & Associates Ltd.
	11	ICT 1-36	6 Feb. 1995	Archer, Cathro & Associates Ltd.
	12	RAT 1-40	28 Feb. 1991/95	Gordon Dickson
	13	GOLDY 1-6; 13-14; A-J	28 Feb. 1991	Landmark Corporation
		DUR 1-22	26 May 1996	Dominion Explorers Inc.
	14	VG 1-8	20 Dec. 1988	Kerr Addison Mines Ltd.
	15	WEDGE 1-17;	Oct. 1988/Sep. 88-94	Gordon Dickson
		BIT 1-5	23 June 1989	Aurchem Exploration Ltd.
	16	ROW No. 1-24	24 Nov. 1988	Noranda Exploration Co. Ltd.
	17	NULEE (see 115-I-2)		
		J.S. (see 115-I-2)		
		ROBERT 1-54; 55-58; 59-72	26 Sep. 1988/89	Gordon Dickson
	18	GOLDEN FLOAT (9 claims)	6 June 1988	R. Granger/B. White
	19	DIC 1-63	11 Sep. 1988	Kerr Addison Mines Ltd.
	20	ONLY 1-30	12 Sep. 1988	Kerr Addison Mines Ltd.
	21	EEK 1-18	6 Feb. 1995	Archer, Cathro & Associates Ltd.
	22	ONT 1-43; 44-61	6 Feb. 1995	Archer, Cathro & Associates Ltd.
	23	BRAD claims	28 Feb. 1991/2 July 95	Dominion Expolers Inc.
	24	TBR 1-8	6 Reb. 1995	Arhcer, Cathro & Associates Ltd.
		MOON 1-4	6 Nov. 1989	Gordon Dickson
	26	TOAST 1-36	16 June 1990	Gordon Dickson
		DIC 1-63	11 Sep. 1988	Kerr Addison Mines Ltd.
	27	TAWA 67-71; 25Fr-26Fr.; 27-34; 47-63	3 Jan. 1991/94/95	Archer, Cathro & Associates Ltd.
		35Fr.-36Fr.; 72-79; 83-90		
	28	JAM 1-16	3 July 1988	Eugene Curley
	29	BUTTER 1-12	5 Oct. 1988	Eugene Curley
	30	DOWS Group	8 Jan/9 Mar. 1989	Noranda Exploration Co. Ltd.
	31	BOO Claims (see 115-I-6)		
115-I-3/6	1	GOLDY 1-14; 22-31	28 Feb. 1991	Dominion Explorers Inc.
		GOLDY A; B; C; D; E; F; G; H; I; J	28 Feb. 1991	Dominion Explorers Inc.
		BRAD claims	28 Feb. 1995	Dominion Explorers Inc.
115-I-4	1	ALO 1-50	19 Mar. 1989	Archer, Cathro & Associates Ltd.
	2	TOAST claims (see 115-I-3)		

FIGURE 10.2

REFERENCE FOR 1:250,000 SCALE CLAIM OWNERSHIP MAPS
NORTHERN AFFAIRS - YUKON TERRITORY — REVISED TO: 20 MAY 88 — WHITEHORSE MINING DISTRICT - NTS 115-I

MAP	REF.	CLAIMS	EXPIRY	OWNER
115-I-5	2	CASH 1-13; FOX 3; 34; BEAR 5	1 Feb. 1989/90	Nordac Mining Corp.
		CASH 17-24; 26;	10/24 Dec. 1988	Nordac Mining Corp.
		CASH 28-38	25 Jan. 1990	Nordac Mining Corp.
	3	NEX 15-16; 29-; 48-50	19 Dec. 1988	Nordac Mining Corp.
	4	NEWT 1-163	14 Feb. 89/90/91	Archer, Cathro & Associates Ltd.
	5	LILYPAD 1-429	14 Feb. 1989/90/91	Archer, Cathro & Associates Ltd.
5/6	7	ERL 41-42; 67-68; 91-94; 116; 118; 120; 138-150; 164-170; 191-206; 216-234; 237-268; 269-274	2 Apr. 1990	Archer, Cathro & Associates Ltd.
115-I-6	1	LEASES		
	2	SHEARZONE 1-2; VINDICATOR 1-2; EXCELSIOR 1-3; PROTECTION; MARGARETE; GOLDSTAR FR.; PEERLESS; AUGUSTA, PROGRESS 1-2; LIBERTY (see 115-F-16) GREENSTONE 1-4; 5-6FRS.; 7-10	12 Dec. 1991	Archer, Cathro & Associates Ltd.
	3	GNAT 38-39; 44; 46; 48; 73; 75; 77	29 Jan. 1993	Arctic Red Resources Corp.
	4	REVENUE 3-9; 11; 13-16 HOMESTAKE 1-2; REVENUE COPPER 1-8; ADDITION 1-5; ADD 5-6; AU 1-7	15 Oct. 1995	Nordac Mining Corp.
	5	NUCLEUS 1-141	19 Feb. 1989/93/94	Archer, Cathro & Associates Ltd.
	6	DART 1-6	25 Oct. 1990	Noranda Exploration Co. Ltd.
	7	HI 1-15; 17; 19; 21-28; 30; 37; 39-48; 55; 57-64; 66-68; 70-71; 76-78Fr.	22/29 Sep. 1988	United Keno Hill Mines Limited
	8	PAULINE	12 Dec. 1988	Pauline LePage
		BEST 1-6	23 July 1988	Guder Mining Exploration
	10	HAPPY 1-4	4 Dec. 1990	Maingold Limited
		HAPPY 5-8	12 Aug. 1990	Glen L. Harris
	11	FIL (see 115-I-7)		
	12	NITRO 1-24; 25-50	1 Mar. 1989	Archer, Cathro & Associates Ltd.
	13	EYM 1-46; 47-81	5 Mar. 1989	Archer, Cathro & Associates Ltd.
	14	GOLDY claims (see 115-I-3)		
	15	KITZA 1-6	6 Nov. 1988	Craig Hart

FIGURE 10.3

REFERENCE FOR 1:250,000 SCALE CLAIM OWNERSHIP MAPS
NORTHERN AFFAIRS - YUKON TERRITORY — REVISED TO; 20 MAY 88 — WHITEHORSE MINING DISTRICT - NTS 115-I

MAP	REF.	CLAIMS	EXPIRY	OWNER
115-I-6	15	NAT 1-29; 30Fr.-33Fr.	29 Jan. 1992	Archer, Cathro & Associates Ltd.
	16	ACK 1-39	5 Mar. 1989	Arctic Red Resources Corp.
	17	ELEPHANT 1-14	22 May 1994	Noranda Exploration Co. Ltd.
		ELEPHANT 15-13	20 Oct. 1995	Craig Hart
		ELEPHANT 19-20	20 Oct. 1995	Noranda Exploration Co. Ltd.
		RAG 1-24	30 Nov. 1990	R. Granger/J. Hogan
		RAG 25-26; 27Fr-28Fr. MAY 1-3	30 Nov. 1990	R. Granger
	18	MEC 1-8	19 Feb. 1991	Archer, Cathro & Associates Ltd.
	19	KEN 11-12	27 June 1989	Glen Harris
		NEK 1-8	19 Aug./10 Sep. 1989	R.A. Granger
	20	ERL 1-274	2 Apr. 1990	Archer, Cathro & Associates Ltd.
	21	RICK 1-14; CABAGE 1-11; 13-14; 17-24 NAT 1-29; 30Fr.-35Fr.	19 Mar. 1989	Archer, Cathro & Associates Ltd.
	22	ANGUS 1-24	6 Apr. 1993	Archer, Cathro & Associates Ltd.
	23	DARB 5-8, BRAD E	7 Aug./88/8 Sep. 92	R.A. Granger/Dominion Explorers Inc.
		SUBTRACT 1 FR.; 2-31	15 Oct. 1992	Archer, Cathro & Associates Ltd.
		BY NORDAC 1-6	29 Jan. 1993	Archer, Cathro & Associates Ltd.
	24	SWAG 1-17	30 Mar. 1989	Ronald Stack
		WINDY CITY (see 115-I-7)		
	25	TIPI 1-2	16 Oct. 1988	Gordon McIntyre
	26	OUT 1-16	27 Aug. 1988	Ronald Stack
	31	BOO 1-65	31 Aug. 1988/89/	Bill Harris/Ron Stack/Glen Harris
115-I-7	1	LEASES		
	2	DUN 1Fr.-3Fr.	9 Mar. 1991	Archer, Cathro & Associates Ltd.
		BOY 20; 22; 24; 51-58; 83; 85; AC 2-3 Fr.	9 Mar. 1991	Archer, Cathro & Associates Ltd.
	3	TINTA 1-4; 5-8; 9-12; 13-72; 41-48; 49-56; 57-72	22 Nov. 1989/90	Silver Tusk Mines Ltd.
	4	MOON 1-84; 92; 94; 96; 98-106	6 May 1988/89/90	United Keno Hill Mines Ltd.
	5	FIL 23-80; 88; 90; 108-111; 113	18 June 88/89/90/91	United Keno Hill Mines Ltd.
	6	STU 31-34; 55-58; 73; 77-90; 97-100; 102 104; 106; 108; 123-192	1988/89/93/94/95	United Keno Hill Mines Ltd.
	7	POON 1-4	13 Sep. 1988	United Keno Hill Mines Ltd.
	8	WAR 22	9 Mar. 1989	Archer, Cathro & Associates Ltd.
	10	NOON 1-134	23 May 1988/90/91	United Keno Hill Mines Ltd.

FIGURE 10.4

REFERENCE FOR 1:250,000 SCALE CLAIM OWNERSHIP MAPS
NORTHERN AFFAIRS - YUKON TERRITORY — REVISED TO: 20 MAY 88 — WHITEHORSE MINING DISTRICT - NTS 115-I; J

MAP	REF.	CLAIMS	EXPIRY	OWNER
115-I-7	22	WINDY 1-48	7 Mar. 1989	Stakers
	12	CITY 1-16	30 Mar. 1989	Ronald Stack
115-I-7/8	1	TOOT 1-18	6 July 1988	United Keno Hill Mines Ltd.
115-I-9	1	MAIN 1-20	7 Aug. 1989	Noranda Exploration Co. Ltd.
115-I-10	1	LTR 5; 7; 9; 17-32	19 Sep. 1990	Douglas Baird
		LTR 33-40	30 July 1991	Douglas Baird
115-I-11	1	LEASES (MINTO, ETC.)		
	2	MINTO 19-34; 37-44; 53-64; 69; 72-73	1 Mar. 1989	Asarco Inc./Consolidated Silver
		MINTO 75-94; 94Fr.-95Fr.	1 Mar. 1989	Standard Mines Ltd.
	3	DEF 1-87	8 Sep. 1989	United Keno Hill Mines Limited
115-I-12	1	TORO 1-56	18 Dec. 1992	David Waugh
	2	SAM (see 115-J-9)		
	4	ITN 1-48; 60-63	19 Mar. 1993	Archer, Cathro & Associates Ltd.
	5	HAY 1-22	7 Aug. 89/4 Sep. 1988	Noranda Exploration Co. Ltd.
115-J-8	1	LILYPAD BLOCK (see 115-I-5)		
	2	SHADOW 1-24	16 July 1988	Kerr Addison Mines Ltd.
	3	FOG 1-24	7 July 1989	Kerr Addison Mines Ltd.
115-J-9	2	SAM 1-35; 37-128;	2 Oct. 1995	Hayes Resources Inc.
	3	SWEDE 1-6	2 Oct. 1995	Hayes Resources Inc.
	4	KOE 1-44	2 Oct. 1995	Hayes Resources Inc.
	5	OKE 66; 68; 71-76	12 Dec. 1992	Kerr Addison Mines Ltd.
	8	TIN (see 115-I-12)		
115-J-9/10	7	DAH 1-22; 25-49; 50Fr.-50Fr.; 60-66;	19 Mar. 1993	Archer, Cathro & Associates Ltd.
		68-70; 71-91	11 June 1989	Archer, Cathro & Associates Ltd.
115-J-10	2	LOST 1Fr.-3Fr.	25 Dec. 1995	Casino Silver Mines Ltd.
	3	JOE 21-24; 90-104; 91Fr.-96Fr.	8 Oct.93/25 Dec. 1995	Casino Silver Mines Ltd.
		CAT (LEASES)		
		CAT 22Fr.; 47-48Fr.; 57Fr.; 62Fr.; 1-22	2 Aug./25 Dec.93/94/95	Casino Silver Mines Ltd.

FIGURE 10.5

There are various other small operators carrying out exploration programs as well.

11.0 GENERAL

As of this writing, the southwest and central Yukon have received approximately 9 days of above average precipitation. A high volume of heavy traffic is reportedly doing damage to the Nansen Road.

As mentioned in Section 4.5 (Rowlinson Creek Bridge crossing), we recommend that initial or preliminary work be carried out in order to mitigate damage which we feel has already occurred. This situation may only compound itself. According to reports, there have been many very heavy loads on the bridge even after our examination of the structure. These loads include drilling equipment, D-8 dozers and heavy excavators, some of which have been mounted on a standard 5-axle configuration. If the initial work will take some time, it is suggested that the structure be signed accordingly and a ford constructed in order that overloads may be dismounted and walked across Rowlinson Creek.

APPENDIX `A´

Historical Records

GENERAL MERCHANDISE

Commissioner for Taking Affidavits in and for the Yukon Territory.

SEYMOUR ROWLINSON,

POST OFFICE

E. R.

CARMACKS August 7th 1911.
Via White Horse, Y. T.
Canada.

Mr Macfarlane,

Sup't of Roads.

Dawson, Y.T.

Dear Sir:-

I have just received a letter from Mr Philps, in which he says it is intirely in your hands if any monies are to be spent on any roads in the Yukon Territory, and that I was mistaken in what he (Mr Philps.) said last spring, wher I understood that $500.00. was to be spent on the Nansen Creek Trail, there is quite a lot of freight to go Nansen this winter, Boilers Provisions, & ct Ct, and Mr Philps tells me he has writen you asking if you would not allow $500.00. from the contingent road account for this trail, and I am now also requesting that you endeavor to do something for this trail this year, if a few of the steep hills could only be graded down a little it would be a great help, to the miners, Mr L. Burwash was out to Nansen and I have no doubt that he would give you any information you wished as he was over the trail and made a rough map of the country between Carmacks and Nansen,

Trusting you will see your way clear to do something for the trail and not put us off again for another year, as was done in 1910.,

Yours truly.

Seymour Rowlinson

W. L. PHELPS,
BARRISTER, SOLICITOR,
NOTARY, &c.

CODE:
BEDFORD McNEIL.

WHITEHORSE, Aug 14th, 1911
YUKON TERRITORY.

Mr D R Macfarlane

Supt Public Works

Dawson Y.T.

DearSir:-

I have had several enquiries from Carmacks about a road into Nansen Creek and they sate there are several boilers and a quantity of supplies to be freighted in to the Creek this fall and winter and that about $500. would place the road in condition to get this freight in. I believe the miners there have done considerable work on the road and as it is an active creek something should be done for them this fall if at all possible. I thought they would see you when you were there and you would decide then if the money should be spent. I believe L Burwash has been over the road and could give you the necessary information about it. Could you not take this money out of the contingent road account? The money appropriated for the Whitehorse District has been exhausted

Yours truly

W L Phelps

Office of
Superintendent of Public Works

Ref. No.

Dawson, Y. T., August, 19th, 1911 191

Dear Sir:-

In reply to yours of 7th, instant beg to say that I referred the matter of granting $500.00 out of contingent Account to be applied to the Carmack-Nansen trail to the Administrator and he has been pleased to approve of my recommendation, and I sent you the following wire today:-

" Authorize expenditure not to exceed Five hundred"
" dollars Carmacks-Nansen Trail, work can start "
" immediately, writing.

Confirming my telegram would request that you place in charge of this work some reliable man, one who has the interests of the prospectors in that locality at heart in order that the best results may be attained.

Am sending you herewith Pay-Roll forms, which will require to be made out in duplicate, also signed, and on receipt of same duly certified by the man in charge , chequ will be mailed to cover.

Your obedient servant.

David Mackelvie

Superintendent Works & Buildings.

Seymour Rowlinson Esq

Carmacks, Y. T.

GENERAL MERCHANDISE

Commissioner for Taking Affidavits in and for the [illegible] Territory.

364

SEYMOUR ROWLINSON,

POST OFFICE

E. R.

CARMACKS August 21st 1911.
Via White Horse, Y. T.
Canada.

David R, Macfarlane, Esq.

Dawson, Y.T.

Dear Sir:-

I beg to acknowledge the receipt of your Telegram of the 19th inst, Authorizing expenditure of not to exceed Five Hundred Dollars on Carmacks-Hansen Trail, I thank you very much on behalf of the Hansen Creek miners for your kindness in this matter, and Mr Tom E, Bee, will get some of the miners together and will start work in a few days.

Yours truly.

Seymour Rowlinson

GENERAL MERCHANDISE

Commissioner for Taking Affidavits in and for the [illegible] Territory.

SEYMOUR ROWLINSON,

POST OFFICE

E. R.

CARMACKS August 31st 1911.

Via White Horse, Y. T.
Canada.

Dear Sir:-

Your kind letter of the 19th inst came tohand last night, also the Pay-Roll forms, which I will see are made out as per your request, Tom E, Bee, I have put in charge of the work which will start in a day or so, just as soon as he gets a few men, tools and ot togeather.

I will keep you posted from time to time as to how they are geting along and the amount of work done,

Your obedient servant.

Seymour Rowlinson

David R, Macfarlane, Esq.

Sup't Works and Buildings.

Dawson, Y.T.

GENERAL MERCHANDISE

Commissioner for Taking Affidavits in and for the [illegible] Territory.

SEYMOUR ROWLINSON,

POST OFFICE

E. R.

CARMACKS Via White Horse, Y. T. Canada. September 18th 1911.

David, McFarlane, Esq.

Sup't Works & Buildings.

Dawson, Y.T.

Dear Sir:-

I beg to report to you that Mr Tom E, Bee, and his men have done some splendid work on the Carmacks-Hansen Creek Trail, with his men, they have graded around the first hill one mile from Carmacks which always had to be Block & Tackled up with any kind of a load last winter, leveled off sidling places and cut out all bad turns all along the trail, graded around four very steep pitches, in the first four miles put in two bridges at Glazier Creek, and they will now be through in a day or so, and will then get Mr Tom E, Bee. to send you a statement of the whole of the work done.

Your obedient servant.

Seymour Rowlinson

Carmacks - Y. T.
Sept - 25th 1911.

D. Macfarlane.
Supt. Works & Buildings
Dawson. Y. T.

Sir

I beg to submit this report of the work done on the Carmacks - Nansen trail with the $500.00 granted for this purpose.

The worst part of this trail is between Carmacks & Cougar Lake a distance of ten miles, - Last winter we had to double trip as far as this lake on account of the bad hills & pot-holes & one hill, about a mile from Carmacks one had to use a block & tackle to get up. - This hill I graded around & several other steep pitches I also graded; bad stumps were removed and bad bends in the trail straightened; I had a man with a maddock doing nothing else but ~~soon~~ leveling off the road. A small bridge was built at glacier creek - two miles south of Cougar Lake. - I estimate we graded on the sidehills at least 500 yards of trail. Of course with the development of this district, many further

improvements are necessary on this road but I think with the amount of work done this summer, a team will be able to start from Carmacks with its full load, thereby saving one day over the previous year in not having to relay to Cougar Lake.

Trusting this to be satisfactory.-

I am - Sir

Your obedient Servant

Tom. E. Bee.

Foreman Carmacks-Nansen Roadwork

2624

Dawson Yukon Terr.
June 18th 1912

Geo Black Esqr.
Commissioner Yukon Terr

Dear Sir

I understand there was Two Thousand Dollars appropriated by the Council for a Trail from Carmacks landing on the left limit of Yukon River. To Nansen Creek a distance approximately about fifty Miles As the present Indian Trail winds. There was a winter Road Cut through two years ago. connecting with a Chain of Lakes in a very round about way and which is of very little benefit in the Summer Months. Now I understand there is some one going up shortly to commence repairs on this winter Road, and will certainly consume a portion of this appropriated Amount Now Sir I would suggest an amendment to this Move. I was over the route to Nansen and Victoria Creeks. Myself. last July and noted the lay of the Country in general. And in my firm opinion it would be to the advantage of all concerned in the Nansen Creek District. That if a good live Man who understands Road and Trail Making. Go through and Blaze out a Trail in the most direct route possible to connect with Victoria and Nanson Creeks. Cut the same out say Ten or Twelve feet wide So that pack Animals can get through with Supplies. So that the Miners can fully determine the Values in the District. Previous to any further Money being Spent on the Road. When the Creeks in that Vacinity prove the Justifycation of a Road then they have the most direct route

to improve as requirements demand and to serve all Seasons of the Year? I understand that there is Eighty Three Claims already Recorded in that District. Besides there is Many favorable looking gulches in the near proximity of Hansen which I would say is well worth prospecting

I am Convinced that this proposed trail can be made to Cover the distance between Carmacks and the mouth of Hansen Creek in approximately from Thirty Eight to Forty two miles and should be accomplished for a Trifle less than the amount Appropriated

Another point of interest. which you will please pardon me for drawing your attention to. is that generous offer which the White Pass Made to the Council to furnish Teams at the rate of $1.50 for Each Horse or $9.00 per day for Team and driver. The difference between this liberal offer and that which the Government has paid ~~for~~ Teams heretofore and will likely be the case on the Roads at the present Time will amount to a handsome Sum this Sum to be appropriated in the way of Wages for individual prospectors and Miners who may be Employed on the Government Roads This will Enable them to pursue their prospecting to a more Thorough Purpose — Trusting that you will see fit to favor this Course

Yours Very Truly
A. H. Cameron
Dawson

June 21st, 12.

A. H. Cameron, Esq.,

Dawson, Y.T.

Sir,-

Replying to yours of 18th inst. containing suggestions as to route of trail to Nansen Creek, and as to proposition of the White Pass to have the Government employ its teams and men, the trail to Nansen will be laid out by Mr. Walter Shaw, a prospector and miner who has been in that district for some years and who has spent a long time prospecting and mining in this country, and to whose interest it is that the money appropriated for the building of this trail be expended to the best advantage. Mr. Shaw will employ the miners residing and working in that district to do the work, and I have no doubt will select a desirable route and have the work satisfactorily done. As to the proposition of the White Pass Company to supply horses for Government road construction for their feed, they to appoint the road foreman and supply the drivers, the matter will have careful consideration.

Your obedient servant,

Commissioner.

964

Carmadks Y.T.

June 21st 1912.

G. Black Esq.

Commissioner of The Yukon Territory

Dawson .Y.T

Sir.

I would like to draw your attention to the present Nansen Creek Trail,which was cut altogether at the e xpense of my partner Frank Back & myself;we spent over a Thousand Dollars in actual cash on this trail,not counting our own time.I spoke to Mr Henderson during July 1910 who was then Commissioner and he promised to help us on this trail.I also spoke to Mr Lowe our Council Member who also promised me help,but we never received any remuneration in any shape or form.

I might say that if it had not been for the cutting of this trail it would have been impossible for any of the Miners to have got any freight into this Creek & now that this district is showing up so good I would like to ask you for your support in aiding us to at least get a Thousand Dollars as part remuneration for the expense to which we went.

In conclusion I would like to say that with the showing that has been made in this district,probalities are that the Government would have had to cut this Trail themselves this year and I do not believe they could have put in 40 Miles of trail at any less cost.

Thanking you in anticipation of your support in this matter.

I am. Sir Your's truly Tom E. Bee

June 28th, 12.

Mr. Tom E. Bee,

Carmacks, Y.T.

Sir,-

Replying to your letter of 21st. inst. re your claim for remuneration by the Territorial Government for consideration of a trail to Hansen Creek, I have no authority to pay any such claim until it is first authorized by the Yukon Council. I would advise you to put the matter in the hands of the Councillors of your district, Messrs. Martin & Phelps, and I will lay the matter before the Council at its next session. In the meantime it would be well to furnish me with further particulars as to the work done.

Your obedient servant,

Commissioner.

DO NOT WRITE ABOUT MORE THAN ONE SUBJECT IN THE SAME LETTER.

WRITE LEGIBLY YOUR FULL NAME AND ADDRESS.

IN YOUR REPLY PLEASE QUOTE THIS

FILE No. 364.

Office of the Gold Commissioner

of the Yukon Territory,

DAWSON, Y. T.,

October 18, 1923.

Sir:

I beg to acknowledge receipt of your letter of the 1st instant, respecting the Nansen Creek Trail, for which please accept my thanks.

Mr. Mack wired me on the 13th instant, advising that it would require $250.00 or $300.00 to clear the trail. In view of the information furnished however, by you, I authorized him to expend not in excess of $200.00 in improving the trail in question.

Your obedient servant,

Gold Commissioner.

Howard McMillan, Esq.,
Agent to the Mining Recorder,
Carmacks, Y. T.

Do not write about more than one subject in the same letter.

Write legibly your full name and address.

In your reply please quote this

File No. 364.

Office of the Gold Commissioner

of the Yukon Territory,

DAWSON, Y. T.,

October 18, 1923.

Sir:

I beg to acknowledge receipt of your telegram of the 13th instant, as follows:

"Nansen trail completely covered timber for four miles recent storms caused great deal more burnt timber to fall. Think can clear for between two fifty and three hundred dollars. Please answer to-day."

and to confirm my reply of the same date as follows:

"You are hereby authorized expend not in excess of Two Hundred Dollars clearing Nansen Trail."

As you are aware, there was no vote put through the Council for improvements to Nansen Creek Trail so that any moneys expended in that connection must be drawn from the Road Contingency Fund which is not large. It is only the urgency of the matter that warrants my authorizing any expenditure on this trail. I trust that you will be able to make it passable with the amount authorized.

Your obedient servant,

Gold Commissioner.

C.P. Mack, Esq.,
Carmacks,
Yukon Territory.

Carmacks Y.T.

Nov 21st 1923.

G.P. Mackenzie.
Gold Commissioner
Dawson Y.T.

Dear Sir

As Per your Letter Oct 18. 1923 On Nov 1st I started to clear the Nansen trail & have finished to day. We cleard all fallen timber also rebuilt two bridges & have started to make A new Crossing on Little Nansen Creek as it is impossible to crossen the old road we will finish the crossing at our own expence as we have not taken in on the road. We have put in on this work 27 days

Thanking you
Resp. C.R. Mack

DO NOT WRITE ABOUT MORE THAN ONE SUBJECT IN THE SAME LETTER.

WRITE LEGIBLY YOUR FULL NAME AND ADDRESS.

IN YOUR REPLY PLEASE QUOTE THIS FILE NO. 364.

Office of the Gold Commissioner

of the Yukon Territory,

DAWSON, Y. T.,

November 29, 1923.

Sir:

I beg to acknowledge receipt of your letter of the 21st instant, reporting on the work done by you on the Nansen Creek Trail.

In reply I enclose herewith cheque in your favour for the sum of $202.50, in payment of the twenty-seven days work on the said trail.

Your obedient servant,

Gold Commissioner.

Encl.

C.P. Mank, Esq.,
Carmacks,
Yukon Territory.

Carmacks Y.T.
17th Oct 1924

G.P. MacKinzey
Gold Commissioner
Dawson Y.T.

Dear Sir

As the Nansen road is blocked (blocked) by some heavy (heavy) fallen (fallen) timber and there is A bridge (bridge) at Lake Creek washed (washed) out I am in hopes (hopes) you will allow me what time it will require to put the trail in shape (shape) for the teams (teams). The heavy winds (winds) under hor blown down considerable (considerable) timber (timber) where the fire was one year ago.

I will hope (have to) to take one man with me to help on bridge.

This work will require about Two days work for Two men

Thanking you Resp C.P. Mack.

DO NOT WRITE ABOUT MORE THAN ONE SUBJECT IN THE SAME LETTER

WRITE LEGIBLY YOUR FULL NAME AND ADDRESS

IN YOUR REPLY PLEASE QUOTE THIS

FILE NO.....

OFFICE OF THE GOLD COMMISSIONER

OF THE YUKON TERRITORY

DAWSON, Y.T.,

October 25, 1924.

Sir:

Replying to your letter of the 17th instant in which you ask to be authorized to perform certain work on the Hansen Road. When the Superintendent of Roads returns to Dawson, I shall refer this matter to him, and you will be communicated with in due course.

Your obedient servant,

Acting Gold Commissioner.

C.P. Mack, Esq.,
Carmacks,
Yukon Territory.

APPENDIX `B´

Photographs of Typical Work Areas and Borrow Pits

1. Km. 16.3. Drainage work site

2. Km. 5.7. Borrow Pit

3. Km. 22.9. Borrow pit

4. Km. 21.4. Drainage work target

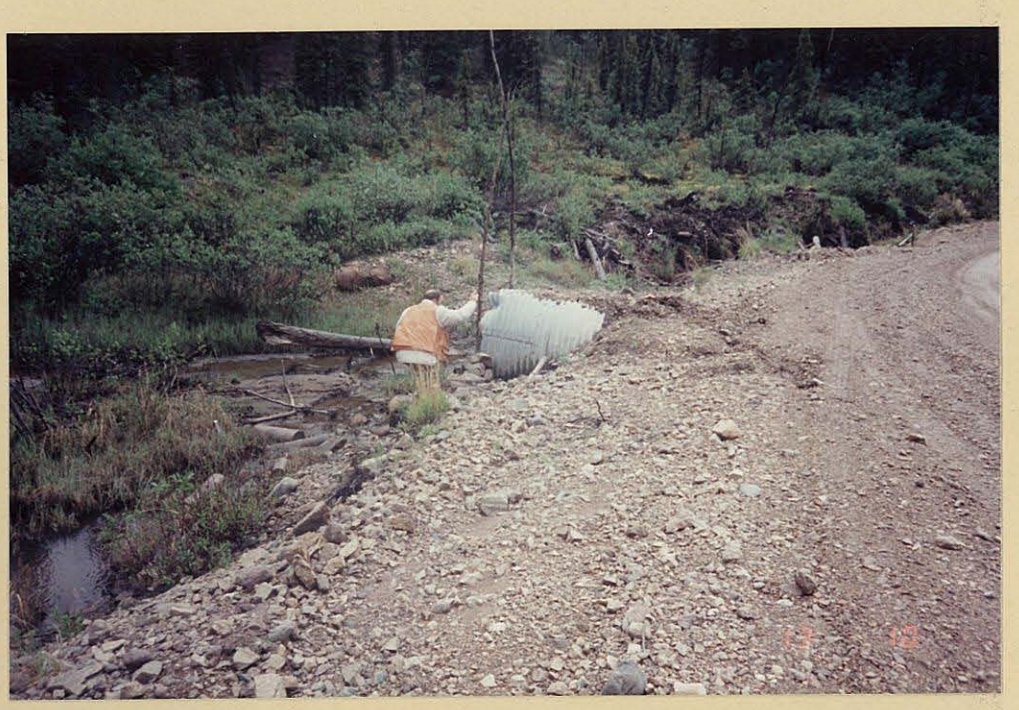
5. Km. 30. Rowlinson Creek, 70-ft.
Bailey bridge D.S.

6. Km. 30. West Bank

7. Km. 30. Rowlinson Creek Bridge - missing transom clamp

8. Km. 30. Rowlinson Creek Bailey bridge

Note: Stressed transom forward of crib.



9. Km. 32.8. Drainage works target

10. Km. 25.1. Drainage work target

11. Km. 36.3. Drainage work site

12. Km. 44.8. Drainage work site

13. Km. 44.8. Drainage work site

14. Km. 46.7. Drainage work site

15. Km. 42.9. Borrow pit

16. Km. 44.8. Drainage work site (major target)

17. Km. 53.1. West aspect from east bank of ford at Victoria Creek

18. Km. 53.1. Looking upstream from east bank of Victoria Creek

19. Km. 53.1. Looking east to west immediately north of ford centreline. Note previous approach development on far bank (west) in left background. Victoria Creek

20. Km. 53.1. South southwest aspect from east bank looking downstream. Ford crossing photo centre. Victoria Creek

APPENDIX `C´

Geometric Road Design Standards

GEOMETRIC ROAD DESIGN GUIDELINES

These are the recommended minimum guidelines for design of Yukon highways. Designs should not be restricted to the minimum if a better standard can be achieved at little or no extra cost. In areas where severe economic penalty would be paid to achieve the minimum then a design of lesser standard may be incorporated.

CLASS		RAU 90	RCU 80	RLU 60		
SADT		400<	<400	<400		
DESIGN SPEED km/h		90	80	60		
Right of Way (m)		60	60	60		
Width Surface (m)		~~9~~ 11	9	8		
Grade (m)		#as req'd	10	8		
Minimum Radius (m)		700	500	230		
With Spiral (m)		300	230	120		
SAG. K		40	30	10		
CREST K		85	55	20		
Gradient Max. %		6	8	11		
Ditch. %		0.5	0.5	0.5		
Lane width		3.5	3.5	3.5		
Shoulder width		2.0	1.0	0.5		
Ditch width		3.5-1.0	3.5-1.0	3.5-0		
Side Slope Up to	3m	4:1	3:1	3:1	7:1	Approaches
Over	2m	2:1	2:1	2:1	2:1	
Back Slope		2:1	2:1	2:1	¼:1	Rock
Ditch Slope		20:1	20:1	20:1		
Crown % Grade		4	4	4	4	1) shoulder
BST		4	4	4	5	2) on curves shoulder same as super elev.
Asphalt		3	-	-	4	
TRUCK CLIMBING LANE*						
Speed Reduction		20	30	-		
Accel Taper (m)		190	170	-		
Approach Taper (m)		90	90	-		
Min Length (m)		250	200	-		

*using R.T.A.C. B.2:4a & B.2:4b

Note: Based on RTAC - with some reduction of standard.

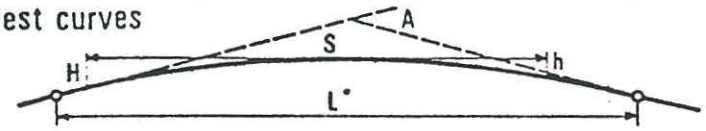
TABLE A

vertical curvature for minimum stopping sight distance

B.2.7

L – length of vertical curve in metres
A – algebraic difference in grades percent
S – minimum stopping sight distance in metres
H – height of drivers eye 1.05m
h – height of object
$K - \frac{L}{A}$

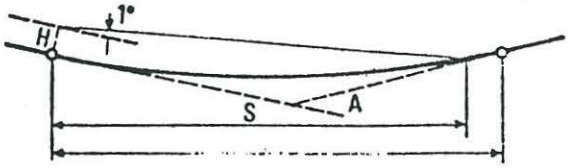
crest curves



design speed (km/h)	stopping sight distance (m)		crest, K (m)	
	minimum (a)	desirable (b)	minimum (c)	desirable (d)
40	45	45	4	5
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35
80	140	150	35	55
90	170	180	55	85
100	200	210	70	110
110	220	240	85	140
120	240	260	105	170
130	260	280	120	200
140	270	300	130	220

* L in metres should be not less than design speed in kilometres per hour
(a) based on fixed perception reaction time of 2.5 s
(b) based on variable perception reaction time of 2.5 s at 40 km/h to 3.5 s at 140 km/h
(c) based on fixed perception reaction time and tail light height of 380 mm
(d) based on variable perception reaction time and object height of 150 mm

sag curves



L – length of vertical curve in metres
A – algebraic difference in grades percent
S – minimum stopping sight distance in metres
H – height of head lamps 0.6 m
1° – angle of light beam upward from plane of vehicle
$K - \frac{L}{A}$

design speed (km/h)	stopping sight distance (m)	sag, K (m) minimum	
		headlight control	comfort control
40	45	7	4
50	65	11	6
60	85	20	10
70	110	25	15
80	140	30	20
90	170	40	20
100	200	50	25
110	220	55	25
120	240	60	30
130	260	65	
140	270	70	

* L in metres should be not less than design speed in kilometres per hour centripetal acceleration 0.3 m/s^2