SUSITNA HYDROELECTRIC PROJECT

ACCESS PLANNING STUDY

SUPPLEMENT

SEPTEMBER 1982

PREPARED BY:
R&M CONSULTANTS, INC.

PREPARED FOR:
ACRES

ALASKA POWER AUTHORITY

Supplement

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

TASK 2 - SURVEYS AND SITE FACILITIES

SUBTASK 2.10
ACCESS PLANNING STUDY
SUPPLEMENT

SEPTEMBER 1982

PREPARED FOR:
ACRES AMERICAN INCORPORTED

PREPARED BY:
R&M CONSULTANTS, INC.

r35/a1

EXPLANATION OF SUPPLEMENT

The Access Planning Study was published in January of 1982. It contained a detailed discussion and cost estimate for eleven different proposed access routes to the Susitna Hydroelectric Project. In March of 1982 the Susitna Hydroelectric Feasibility Report was presented by the Alaska Power Authority to the public resource agencies and organizations. The report recommended an access plan which for reasons of project schedule, would have necessitated the construction of a pioneer road prior to the FERC license being issued. The construction of a pioneer road, however, was considered unacceptable by the resource agencies and the plan was discarded. Consequently a further study was initiated in which, the evaluation criteria were refined and an additional seven alternative plans developed. One of the main issues that affected the selection and development process was the elimination of any pre-license construction. In order to meet the overall project scheduling requirements this constraint makes it necessary to secure initial access to the Watana damsite within one year of the FERC license being issued. Amongst the other important issues considered was the desire of Native organizations to have access to their lands expecially those to the south of the Susitna River, and the objective of minimizing environmental impacts.

Subsequent to the Access Planning Study of January 1982 being published the locations of the construction camps were finalized; the Watana camp being north of the Susitna River and the Devil Canyon Camp to the south. The change in camp location slightly modified the lengths of the road segments, but considering the samll difference, Plans One through Eleven were not revised.

Throughout the studies conducted subsequent to the Feasibility Report of March 1982 numerous comments have been received from interested agencies, groups and individuals. These include State resource agencies, environmental groups, local communities, Native organizations, The Alaska Power Authority and Acres American Inc. together with their specialist subconsultants. As a result of this comment and exchange of information, the seven new access plan represent a more coordinated compromise among the interested groups.

The new plans, for the most part, follow segments discussed in the original report. This supplement covers the new plans by supplementing the original report where needed. The major items found in this supplement are:

1. Additional segments needed for new plans discussed (Chapter Nine).

2. New plans discussed (Chapter Ten).

3. Segment, Terrain Unit, and Environmental Concerns maps in Appendices updated to show new routes.

4. Cost estimates generated for new plans (Appendix F).

5. Plan Eleven has been revised to include a low level crossing at Devil Canyon for access to the camp on the south side. It is now Plan 11R.

In order not to change the page numbering of the entire report, the following numbering policy has been used:

1. Where a figure or table is revised, the page number is reused.

2. Where a figure, table, or text is added at the end of the chapter, the page numbering is sequential.

3. Where a figure, table, or text is added in to the middle of a chapter, the page number of the immediately preceeding page, plus a letter are used as the new page number. For example if three new pages of text are to be inserted between Pages 10-49 and 10-50 of the original report, the three new pages will be labeled 10-49A, 10-49B, and 10-49C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT
ACCESS PLANNING STUDY SUPPLEMENT

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

r35/a8

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

SUMMARY
Alternate Access Plans
Supplement

CORRIDOR 1

CORRIDOR 2

CORRIDOR 3

WATANA DAM SITE

DEVILS CANYON DAM SITE

DENALI HWY

PREFERED ROUTE IN EACH CORRIDOR

OTHER ALTERNATES INVESTIGATED

PREPARED BY:

R&M CONSULTANTS, INC.

PREPARED FOR:

PROJECT ACCESS
LOCATION ALTERNATIVES

REVISED
FIGURE 2.1

ACRES

Plan 11

Plan 11 was revised to Plan 11R to provide access to the camp on the south side of Devil Canyon.

Plan 11R supercedes Plan 11. Plan 11R serves the entire project from the Denali Highway. No access is provided at Gold Creek. Supplies are shipped by rail to a railhead at Cantwell, then trucked to Watana via the Denali Highway, then on to Devil Canyon along the north side. Access to the South side of the damsite is via a low level crossing similar to the one found in Plan 5. This plan has the advantage of a low risk of schedule delay. The longer haul, however, makes this route the most expensive from a logistics standpoint.

Plans 12-18

These plans use modifications of the 3 basic corridor routes used in Plans 1-11.

Plan 12 is an all road, north side route that avoids the undesirable Portage Creek traverse by crossing at the mouth of Portage Creek. A low level crossing of the Susitna river is included at Devil Canyon. The road is served by railhead from Hurricane. The disadvantage of this plan is the major bridge and associated schedule delay at Portage Creek.

Plan 13 is all road, with direct access from the Alaska Railroad and Parks Highway at Hurricane, to the Watana Damsite, via a pass near the upper end of Portage Creek. A branch road serves the Devil Canyon Damsite, crossing the Susitan River near Portage Creek.

Plan 14 is a combination of road and rail. Rail is extended from Gold Creek north to a railhead on a terrace on the Susitna River. From here, road continues to both damsites on the south side of the Susitna river, crossing to the north side near Fog Creek. Access to the Parks Highway is provided by a road spur from the railhead north to Hurricane.

Plan 15 is the same as Plan 14, but deletes the road link to the Parks Highway. This lowers the construction cost and effectively eliminates public access.

Plan 16 consists of a railhead at Gold Creek, road to Devil Canyon, road from Devil Canyon to Watana, and a public access road from Hurricane to Devil Canyon. The road from Devil Canyon to Watana is on the south side to Fog Creek, then crosses the Susitna to join the camp on the north side.

Plan 17 is similar Plan 6, except that, instead of a service road on the north side, this plan has a service road that is on the south side between Devil Canyon and Fog Creek, then crosses to the northside to reach Watana. As with Plan 6, Devil Canyon is served by rail and Watana by road from the Denali Highway. Railheads are located at both Devil Canyon and Cantwell.

Plan 17A is a slight modification of Plan 17. From Fog Creek to Watana Dam, the road stays on the south side of the river.

Plan 18 is another modification of Plan 6. It includes rail access from Gold Creek to Devil Canyon, road access from the Denali Highway to Watana, and a service road between the dams on the north side. Plan 18 differs from Plan 6 in that Devil Canyon is crossed by a high level bridge, and the alignment has been improved.

CORRIDOR SELECTION
Deiscussion of Alternate Segments
Supplement

(fa) Segment 1-G

(i) Description

Segment 1-G is an alternate to a portion of 1-A from the Parks Highway to Chulitna Pass. Unlike segments 1-A and 1-F, this segment avoids Denali State Park lands and the recently surveyed Indian River Subdivision. The segment passes Chulitna Butte on the east side, follows the base of the mountains, and joins the highway and railroad at Hurricane. See Figure 9.2A

This segment is six miles long.

(ii) Line and Grade

This segment conforms with the preferred design parameters. Though longer than the portion of 1-A it replaces, the line and grade are comparable.

(iii) Drainage Features

A number of small drainages are crossed on this segment. All can be easily crossed with culverts except Granite Creek, which may require a pipe arch or small bridge.

(iv) Bridges

No bridges will be required other than the possible short span at Granite Creek, just east of the Hurricane Siding.

(v) Soils

By traversing the base of the mountains east of Chulitna Butte, this segment avoids the extensive organics encountered in 1-A. Terrain unit mapping is not yet available in this area, however, the steeper slope and better drainage definition would suggest more manageable soils.

(vi) Environmental Concerns

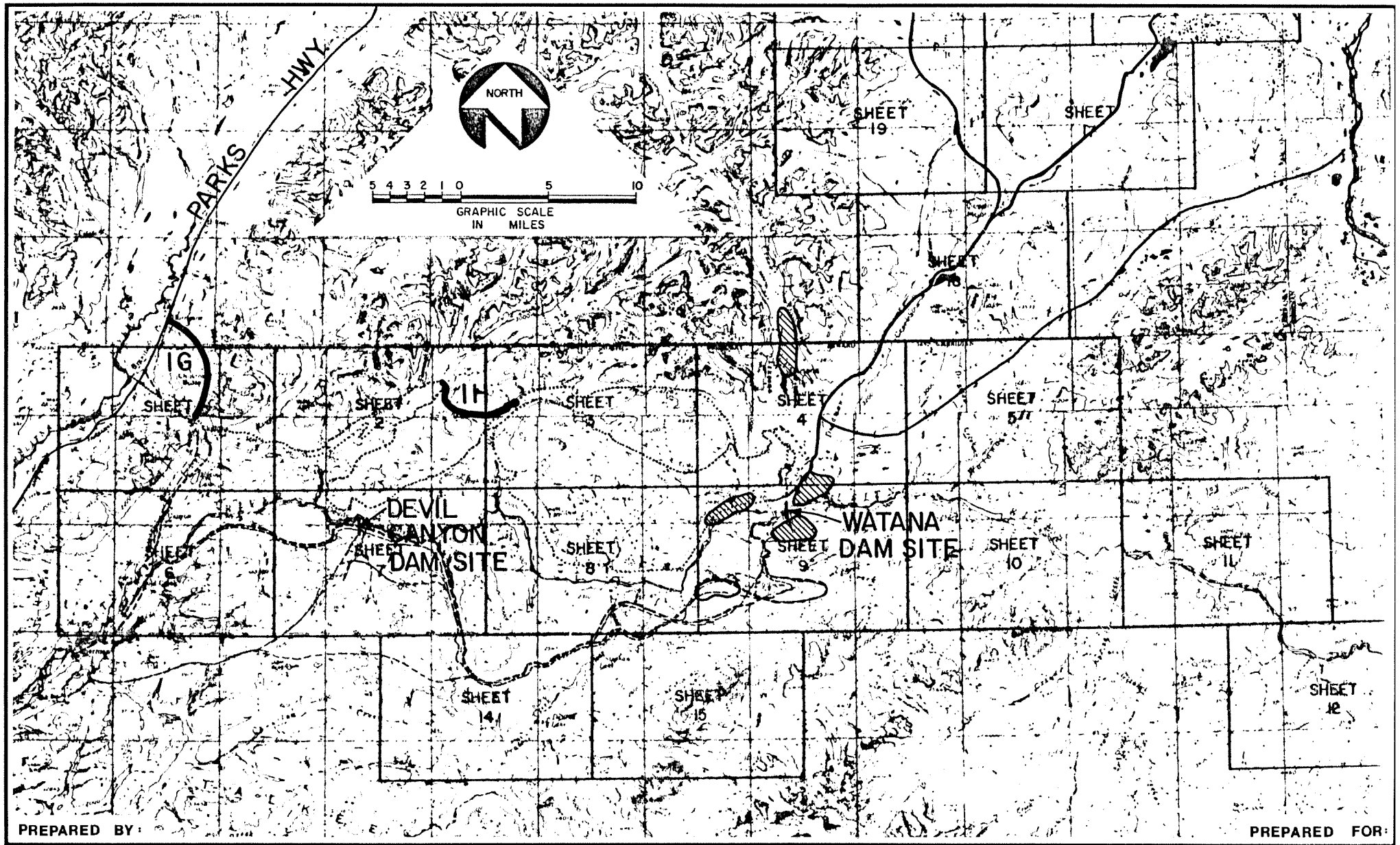
A final analysis of environmental impacts for this segment have not yet been received. The segment does alleviate the problems created by 1-A. Segment 1-G will avoid the wetlands encountered in 1-A, circumnavigate the existing cabins in Chulitna Pass, and away from the State lands that have been designated Denali State Park or Indian River Subdivision.

(vii) Segment Suitability

Segment 1-G appears to be a superior choice to the portion of Segment 1-A in the Chulitna Pass area. This cannot be confirmed, however, until aerial photography, terrain unit maps, and environmental maps are generated.

(fb) Segment 1-H

(i) Description



R&M CONSULTANTS, INC.

SUSITNA ACCESS CORRIDOR

SEGMENT 1G=6 MI. SEGMENT 1H=6 MI.

REVISED
FIGURE 9.2A

ACRES

This segment joins 1-A at the head of Portage Valley to 1-A/1-B in Devil Creek Valley. The line shortens the haul to Watana Damsite, but does not provide access to Devil Canyon Damsite. The segment is six miles in length. See Figure 9.2A.

(ii) Line and Grade

Grades will be in excess of the desired parameters. An 8% grade will be needed for one to two miles.

(iii) Drainage Features

The segment traverses a steep slope above a tributary of Portage Creek. Care must be taken to control side hill erosion as Portage Creek is an anadromous stream and the tributary paralleled may also be. No other significant drainages are encountered.

(iv) Bridges

Portage Creek will be crossed just upstream of the crossing anticipated for 1-A. The same class of bridge - approximately 200 feet long with two or three spans - should be sufficient.

(v) Soils

This segment crosses frozen basal till in the relatively flat

Portage Creek Valley, colluvium over bedrock and exposed bedrock along the steep side slopes of the Portage Creek tributary, and frozen basal till along the gentler drainage into Devil Creek. Problems with erosion and thaw settlement will be similar to those encountered in Portage Valley on 1-A.

(vi) Environmental Concerns

The major environmental impact anticipated is on the possibly anadromous tributary of Portage Creek that the route will parallel.

By shortening the route to Watana Damsite and removing the loop of road that serves Devil Canyon Damsite, this segment alleviates several major environmental concerns. There would be less impact on Portage Creek because only one side of the valley would be traversed. The valley is a fur bearer habitat and salmon spawning area. Also avoided is the potential raptor habitat in the Devil Canyon and Portage Creek confluence, and the fur bearer habitat and lodge at High Lake.

(vii) Segment Suitability

This segment's suitability is dependent on several criteria. The grade is above the desireable 6%, but only for a short distance. When joined with 1-A, Devil Canyon is bypassed, which will necessitate a separate spur road be built for the Devil Cayon Dam Construction and access. The original

Segment 1-A traversed both sides of Portage Creek, which was considered to be an unsuitably high environmental impact. By limiting the traverse to only one side, the combination of Segments 1-A and 1-H becomes suitable.

(ua) Segment 2-Q

(i) Description

This segment joins 2-I to 2-B. Presently, 2-I ends at Devil Canyon and 2-B starts there. Segment 2-Q would start on 2-I about 2 miles before the damsite, traverse Chechako Creek and its major tributary at their upstream reaches, and join 2-B about four miles southeast of the damsite. See Figure 9.8A.

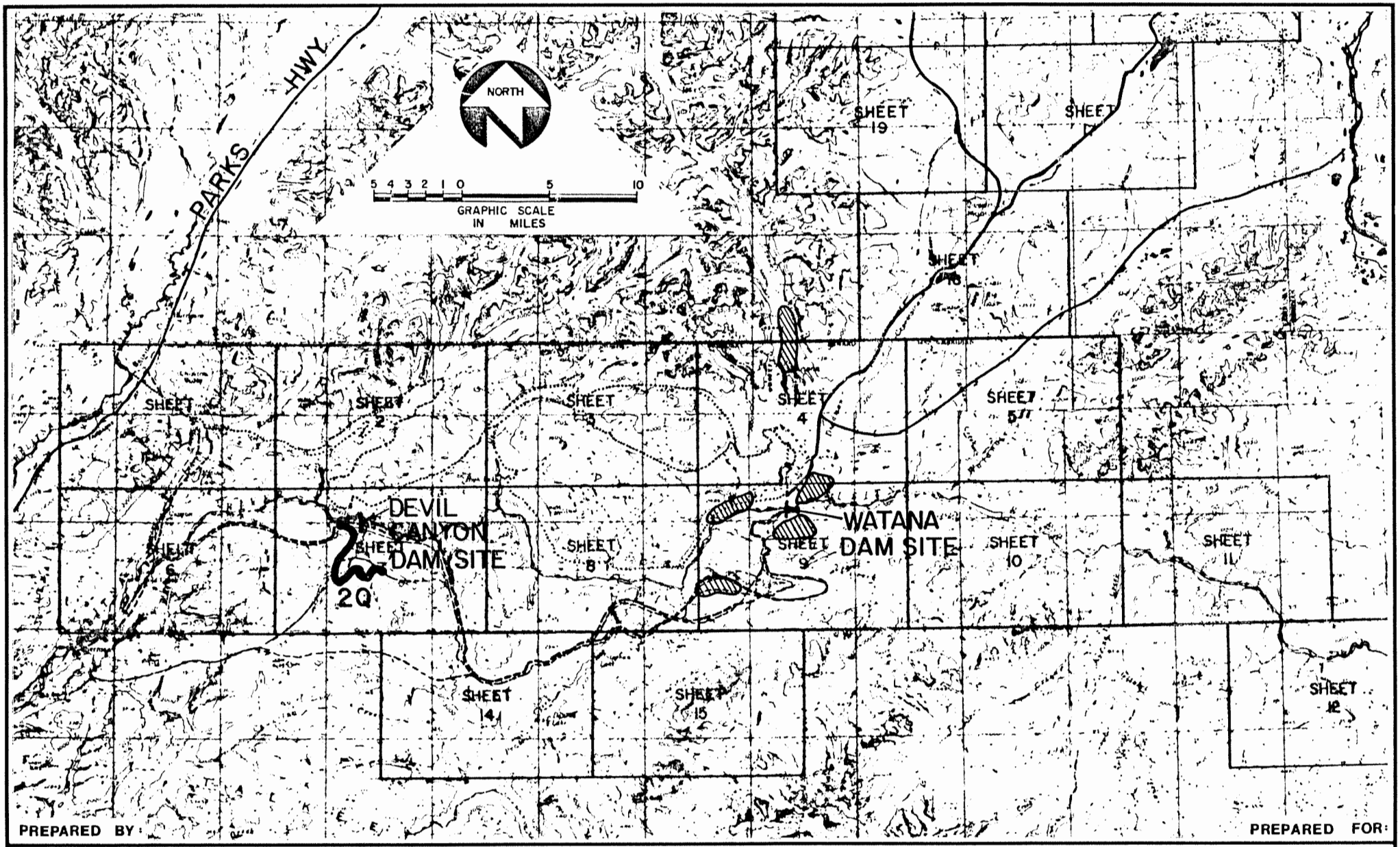
This segment is nine miles long.

(ii) Line and Grade

This segment substitutes a longer route, with maximum grades and minimum radius curves for the major bridges required on 2-B. By starting south several miles west of Devil Canyon Damsite, the unacceptably high grades found in 2-B can be avoided.

(iii) Drainage Features

As with 2-B, the alignment is on high ground and avoids most drainage conflicts.



R&M CONSULTANTS, INC.

SUSITNA ACCESS CORRIDOR

SEGMENT 2Q=9 MI.

REVISED
FIGURE 9.8A

ACRES

(iv) Bridges

Because Chechako Creek and its tributary are crossed well upstream of 2-B, the gorges are much smaller. Smaller, conventional bridges can be used.

(v) Soils

The segment traverse colluvium over bedrock and exposed bedrock. Some patches of solifluction are in the vicinity, but can be avoided. No significant probelms are foreseen.

(vi) Environmental Concerns

This segment may enter into the caribou wintering areas at the upper reaches of Chechako Creek. No other significant concerns have been noted. When used in conjunction with 2-B, as a substitute for 2-G, a raptor nesting area is avoided.

(vii) Segment Suitability

This segment combined with the east part of Segment 2-B, appears to be equally as suitable as Segment 2-G. Though it lengthens the total mileage to Watana Damsite, it eliminates the problems associated with the high bridges at Chechako Creek and neighboring gorges, extensive rock excavation, and possible construction delays.

(wa) Segment 2-RRR

(i) Description

This segment is a seven mile spur of railroad that leaves the existing tracks at Gold Creek, traverses the bluffs on the south side of the Susitna River, and ends in a railhead on a flat terrace on the south bank of the Susitna River. See Figure 9.10A

(ii) Line and Grades

By sidehill cutting into the Susitna River bluffs, the railroad remains at a low elevation with a relatively flat grade. Minimum radius curves will be needed to conform to the bluff as much as possible.

(iii) Drainage Features

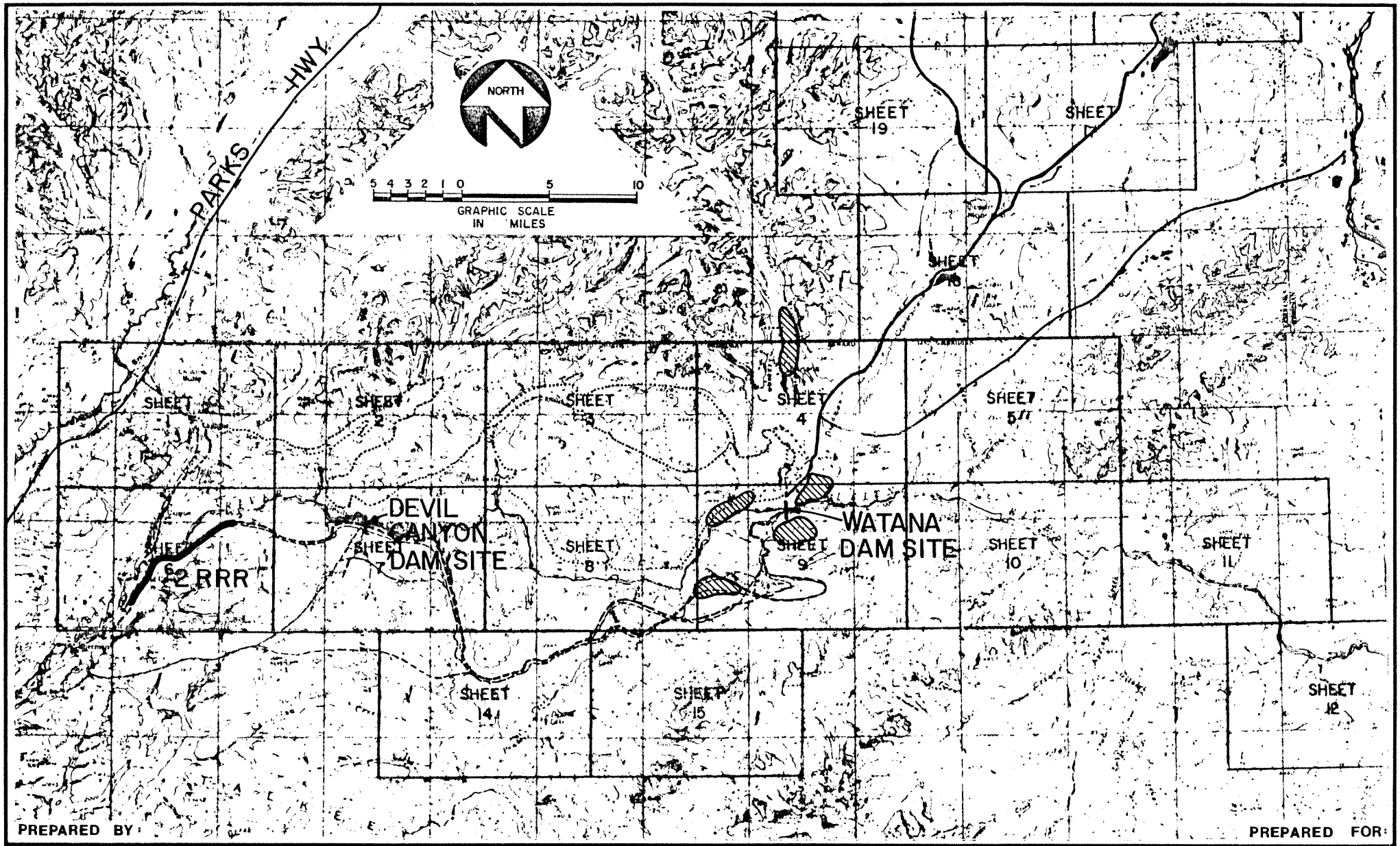
Gold Creek and several minor unnamed drainages can be crossed with culverts.

(iv) Bridges

No bridges are required on this segment.

(v) Soils

The Susitna River bluffs are composed of frozen basal till,



R&M CONSULTANTS, INC.

SUSITNA ACCESS CORRIDOR

SEGMENT 2RRR=7 MI.

REVISED
FIGURE 9.10A

ACRES

which has a relatively low slope stability. Bin walls or other soil reinforcement may be needed. The terrace and flood plain soils encountered in the beginning and end of the segment should pose no special problems.

(vi) Environmental Concerns

Both 2-RR and 2-I parallel this segment. No environmental conflicts were found when reviewing them.

(vii) Segment Suitability

This segment of railroad would be suitable to use in conjunction with a road that continues on to Devil Canyon (such as 2-I). It effectively eliminates all public access from the Gold Creek vicinity. It also precludes the use of segments 2L, 2H and 2K due to conflicting grades.

(wb) Segment 2S

(i) Description

This segment connects segment 2A in the Stephan Lake vicinity with Segment 1C by crossing the Susitna River. See Figure 9.10B. The segment is seven miles long.

(ii) Line and Grade

Maximum grades will be needed on both the north and south

banks of the Susitna River. The banks lie at 50 to 100% cross slopes, with exposed bedrock in some places on the south bank.

(iii) Drainage Features

On the south side of Susitna River, several small drainages are crossed for which culverts should be adquate.

(iv) Bridges

The Susitna River bridge will be a major high level span, with approximately 600 feet of steel truss and 2600 feet of plate girder, and over 100 feet above the present water surface. The height is necessary in order to span the future Devil Canyon Reservoir. During initial road construction, there would be sufficient room to construct a road to the bottom of the valley for a temporary low level crossing or ferry. This would speed bridge construction and avoid access delays to the Watana Damsite.

(v) Soils

The segment is largely on frozen basal till, similar to those discussed in other sections of this report.

(vi) Environmental Concerns

This area has not been studied in detail from an environ-

mental standpoint. Previous overviews of the area did not reveal any conflicts.

(vii) Segment Suitability

Segment 1-C has been deemed unsuitable for construction, alignment, and environmental reasons. However, the small piece that joins Segment 2-S to Watana Dam appears satisfactory. Segment 2-S itself is within acceptable design parameters and is deemed suitable for further consideration.

(wc) Segment 2-T

(i) Description

Segment 2-T connects 1-A just east of Indian River with Segment 2-I. Included in this segment is a major bridge across the Susitna River. The segment is seven miles long. See Figure 9.10B.

(ii) Line and Grade

The north bluff of the Susitna River will have to be side hill traversed at a maximum grade. The rest of the segment is made up of milder grades and few curves.

(iii) Drainage Features

Only minor drainages are crossed, which can be suitably

crossed with culverts.

(iv) Bridges

The bridge across the Susitna River will be similar to the one anticipated in 2-E, a 2480-foot, orthotropic steel structure with approximately twelve spans.

(v) Soils

This segment travels across frozen basal till interspersed with patches of organics. The frozen basal till should not be a significant problem over the majority of the route, since the cross slope is slight. The potential for erosion and slope failure will be as high on the Susitna River north bluff, as it is on the south bluff (see Segment 2-R, 2-I and 2-RRR)

(vi) Environmental Concerns

A detailed study was made of the environmental concerns in this area has not yet been completed. If this segment is used as a substitute for 2L or 2E, the major impact of road access to the Indian River Remote Parcel sites would be removed.

(vii) Segment Suitability

This segment is suitable for roadway construction and

compares favorably with Segment 2-L. It's major positive attribute is the circumvention of the Indian River Remote Parcel Sites.

(wd) Segment 2-U

(i) Description

Segment 2-U shortens the 1-A segment by eliminating the loop up Portage Creek. Instead, the segment crosses Portage Creek at its confluence with the Susitna River, then rejoins 1-A above Devil Canyon Damsite. See Figure 9.10B. This segment is six miles long.

(ii) Line and Grade

The portion of this segment just before and after the Portage Creek crossing has to traverse steep (50% or higher) sidehills, but all curves and grades are within the design criteria.

(iii) Drainage Features

The major drainage - Portage Creek - will be crossed with a bridge. Of the other more minor drainages, one that drains a swampy area will be difficult as the entire valley that contains it is lined with organics. This and other drainages should be possible to cross with culverts. (iv) Bridges

A major bridge is required across Portage Creek. It will be 1100 feet long, and cable stayed.

(v) Soils

The segment goes through several unavoidable areas of organics. The rest of the segment is on frozen basal till with some colluvium and exposed bedrock at the Portage Creek crossing. Construction will be similar to other areas with these materials.

(vi) Environmental Concerns

This segment deletes the long traverse up and down Portage Creek, thus avoiding impacts to salmon spawning areas, fur bearing habitat and a mining claim. The potential raptor nesting area, however, is still impacted. Also subject to possible impact is a historical site at the mouth of Portage Creek. It consists of an inscription, dated 1897, with the names of William Dickey and three other individuals. Dickey was one of the first white men in the region. It is not yet known if this site is eligible to be listed on the National Register of Historic Places. Actual construction of the Portage Creek bridge would require mitigation measures to prevent erosion into salmon spawning areas. Long-term erosion associated with segment 1-A is not anticipated.

(vii) Segment Suitability

This segment eliminates the less desirable portion of Segment 1-A, with its difficult side hill construction and

environmental impacts. The trade off is a major bridge at the mouth of Portage Creek that would impact the construction schedule by requiring two or more years to construct.

(we) Segment 2-V

(i) Description

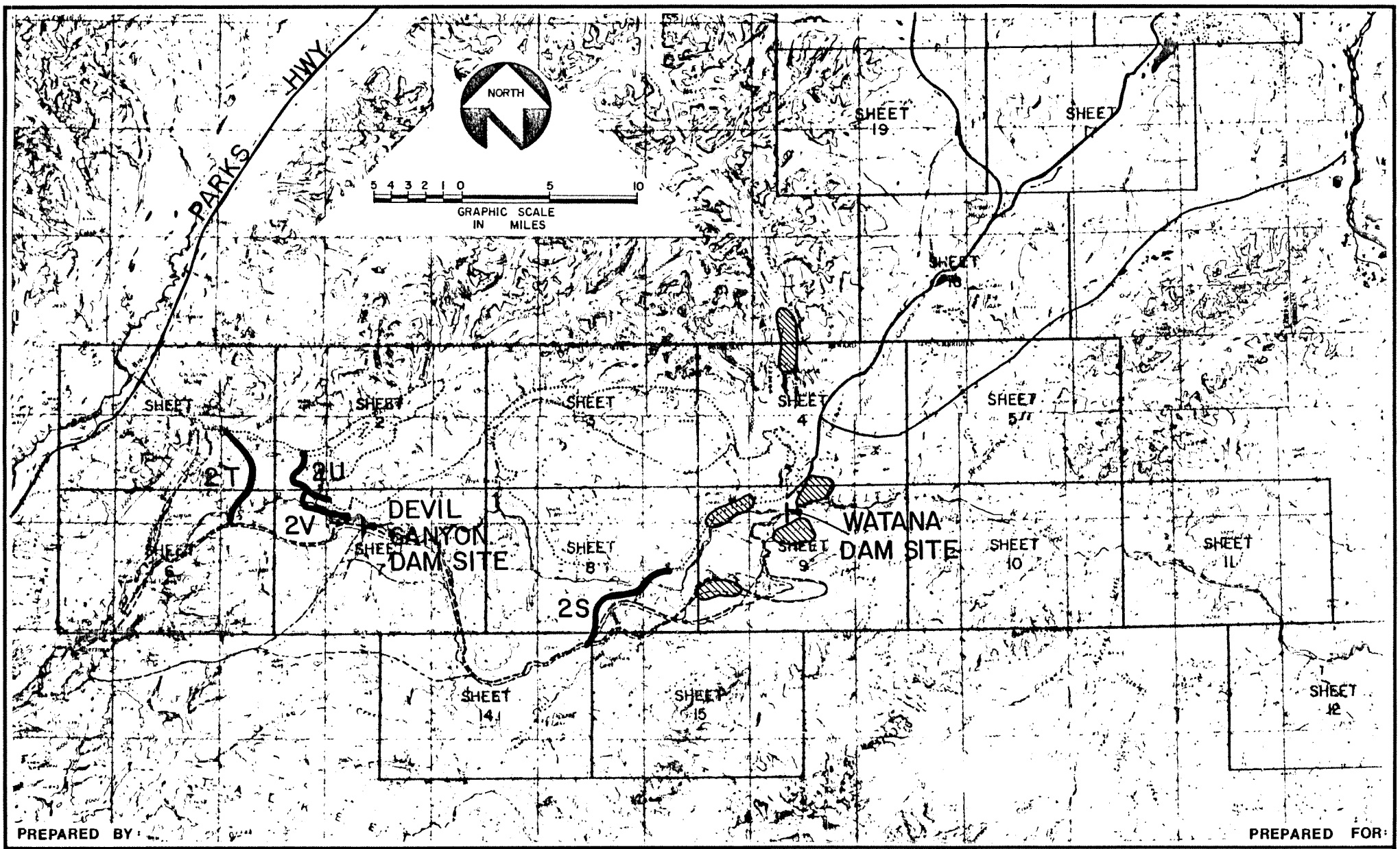
Segment 2-V is a variation of 2-U. It branches off just before 2-U crosses Portage Creek. Segment 2-V instead crosses the Susitna River, and proceeds to the Devil Canyon Damsite along the south side of the river where it joins line 2-I. This segment is four miles long. See Figure 9.10B.

(ii) Line and Grade

Maximum allowable grades and minimum curvatures are used on this segment, but it stays within the design criteria.

(iii) Drainage Features

Several ravines are crossed on the south side of Devil Canyon. Though they drain fairly small areas, the deepness of the gorges may indicate that short bridges would be cheaper than culverts under massive fills.



R&M CONSULTANTS, INC.

SUSITNA ACCESS CORRIDOR

SEGMENT 2S=7 MI. SEGMENT 2T=7 MI.
SEGMENT 2U=6 MI. SEGMENT 2V=4 MI.

REVISED FIGURE 9.10B

ACRES

(iv) Bridges

In addition to the short bridges mentioned above, a major bridge will be needed across the Susitna River. It would be a steel deck truss, 1100 feet long.

(v) Soils

The problems associated with these soils - frozen basal till, with colluvium on the steep slopes - are as discussed else where (see Segments 2-RRR in this supplement and Segment 1-A in the main report).

(vi) Environmental Impacts

The only impacts noted for this segment are on the potential raptor nesting areas found within Devil Canyon.

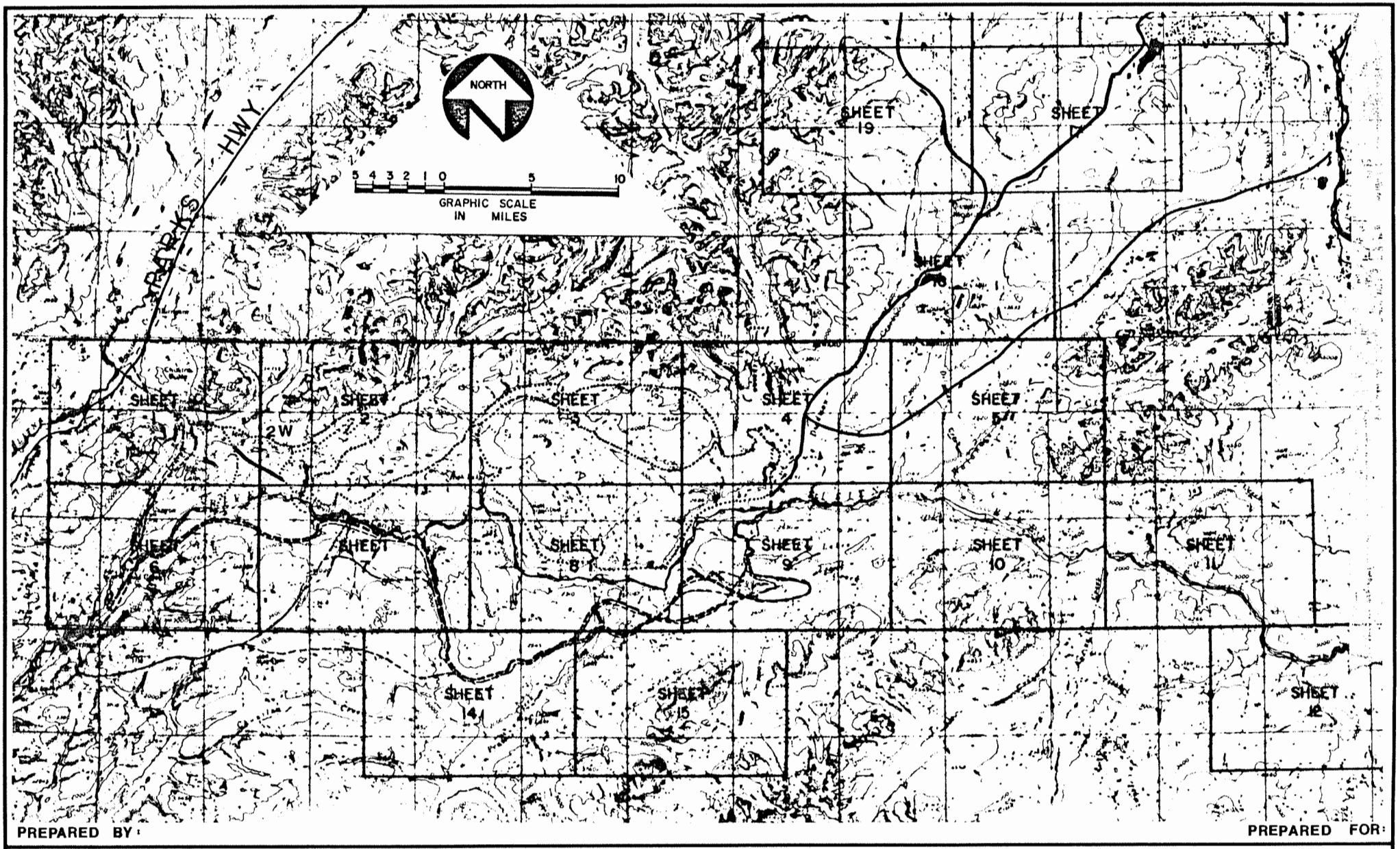
(vii) Segment Suitability

This segment is found is to be quite suitable as it meets all the design criteria and has minimal environmental impact.

(wf) Segment 2-W

(i) Description

Segment 2-W is a short connector between 2-T and 2-U.



PREPARED BY:

R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

SUSITNA ACCESS CORRIDOR
SEGMENT 2W

FIGURE 9.10C

The segment is one mile long. (See Figure 9.10C).

(ii) Line and Grade

This segment is within design criteria.

(iii) Drainage Features

No significant features are encountered.

(iv) Bridges

No bridges are needed.

(v) Soils

Soils are similar to those for Segment 2-U.

(vi) Environmental Concerns

By "short-cutting" around the north end of Segment 2-U, impact on cabins in that area is reduced.

(vii) Segment Suitability

This segment is a suitable connection between Segments 2-T and 2-U.

(za) Segment 3-D

(i) Description

The short segment starts at Line 3A near Big Lake, passes west of Deadman Mountain, and then joins Line 3C. While it shortens the overall length of road from the Denali Highway to Watana, it involves more difficult terrain. See Figure 9.11A. The line is eigtht and one half miles long.

(ii) Line and Grade

Maximum grade would be utilized over most of the length of this segment, in order to clear the pass between Deadman Mountain and the mountains to the west.

(iii) Drainage Feature

The line parallels a marshy tributary of Deadman Creek south of the pass. Several side branches would be crossed with culverts. North of the pass, the headwaters of Deadman Creek are paralleled, and crossed just before joining Line 3C. This crossing would also be via culverts.

(iv) Bridges

No bridges are required for this segment.

(v) Soils

No data available yet.

(vi) Environmental Concerns

A detailed study is not yet available on the majority of this route. The line does move slighty farther away from Deadman Lake than Line 3A, thus creating less impact on the cultural resources (ancient campsites) of the Deadman Lake/Big Lake area.

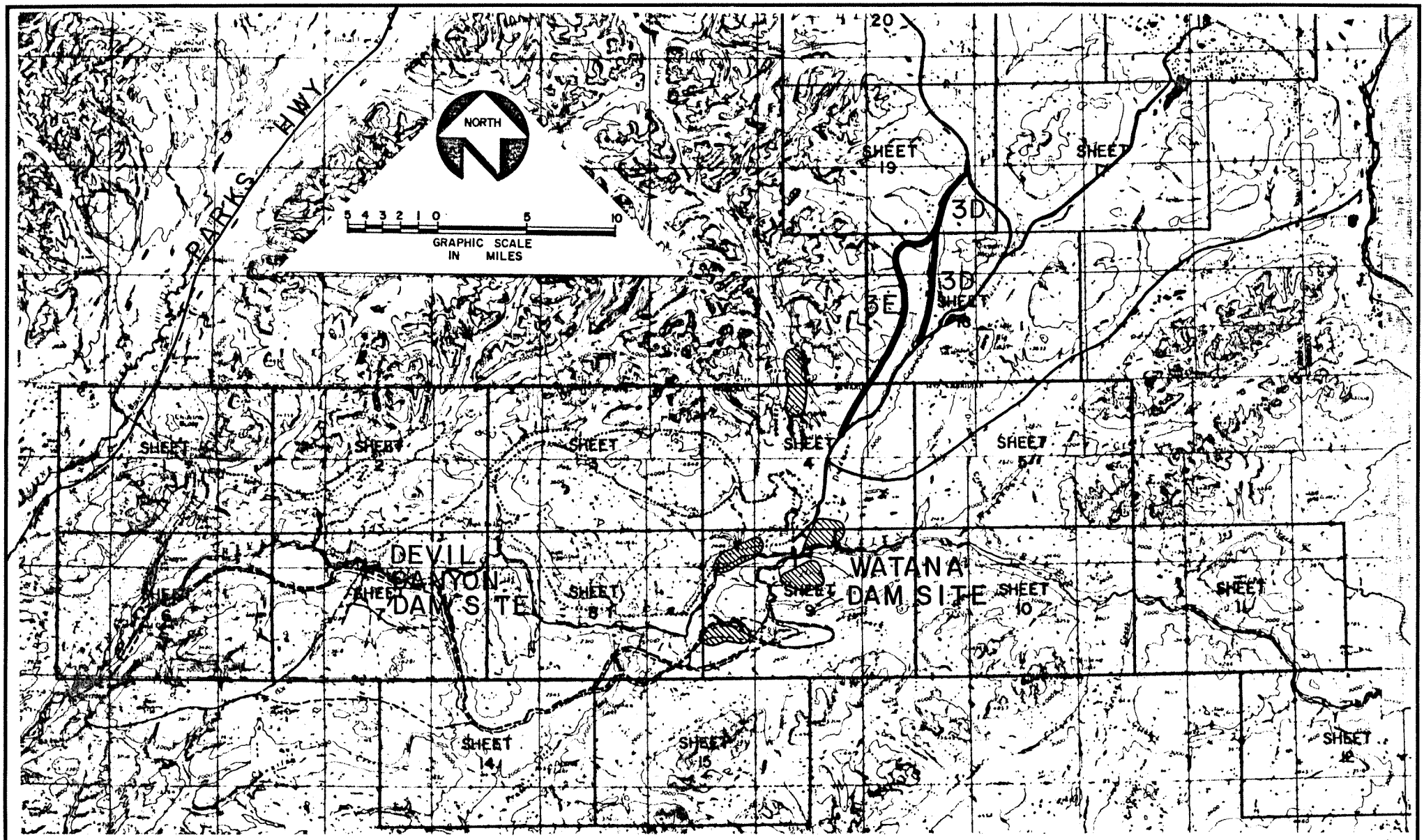
(vii) Segment Suitability

Though the segment is less desirable from an engineering and construction point of view, because of its steeper terrain, it is more favorable from an environmental standpoint and should be considered a viable alternative.

(zb) Segment 3-E

(i) Description

This segment generally parallels Segment 3-D, but is 1 mile west and traverses higher ground. The segment starts its one mile offset near Tsusena Butte and rejoins Segment 3-D at the pass west of Deadman Mountain. The length is 14.7 miles. See Figure 9-11A.



PREPARED BY:

PREPARED FOR:

R&M CONSULTANTS, INC.

SUSITNA ACCESS CORRIDOR

SEGMENT 3D=8 MI. SEGMENT 3E=15 MI.

REVISED
FIGURE 9.11A

ACRES

(ii) Line and Grade

Segment 3E is longer than 3D, has longer stretches of maximum grade, and has a 180° minimum radius curve where it crosses a tributary of Deadman Creek.

(iii) Drainage Features

Generally, the same streams are crossed as in 3D, but they are crossed at a higher (upstream) elevation.

(iv) Bridges

No bridges will be needed on this segment.

(v) Soils

No data available yet.

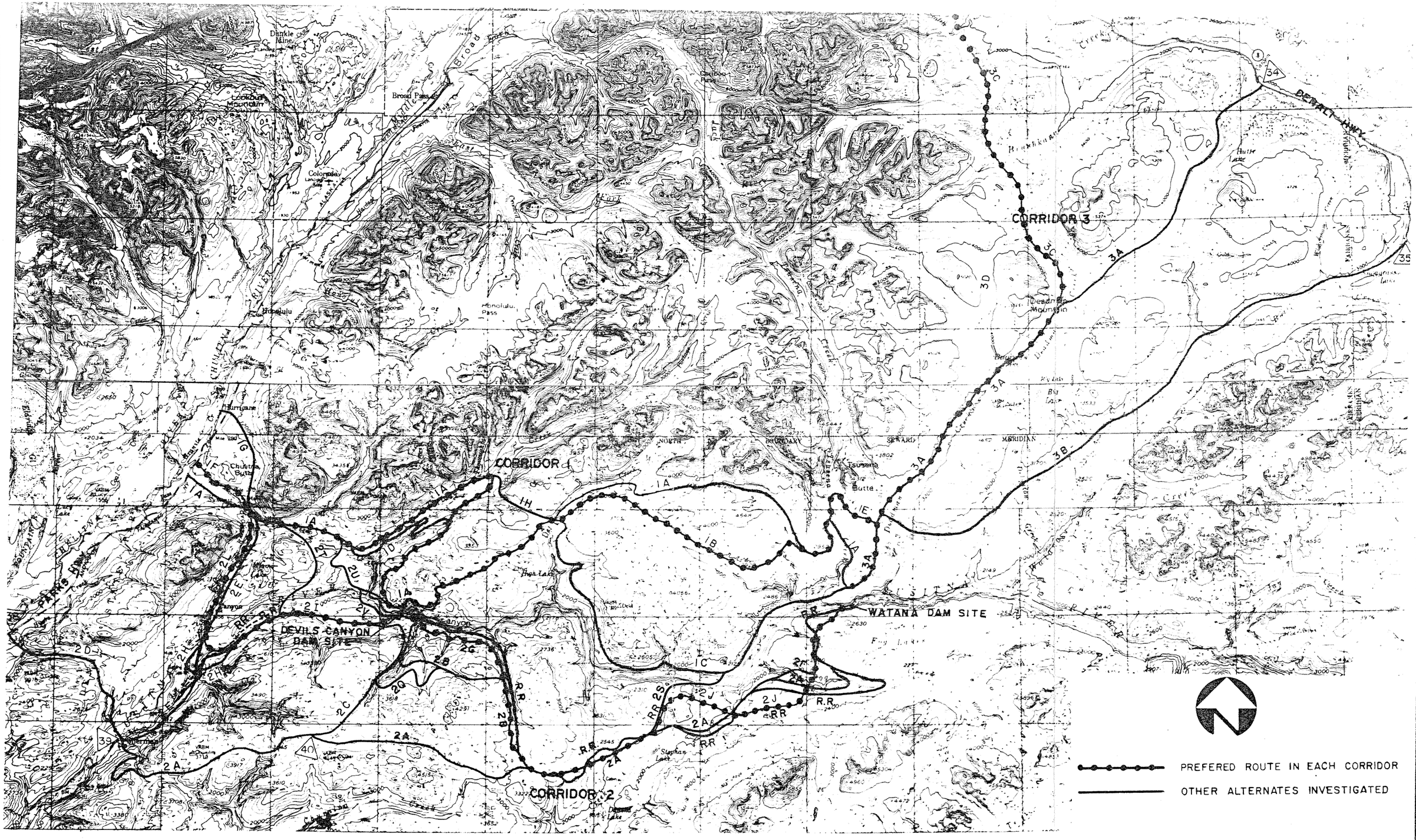
(vi) Environmental Concerns

A detailed environmental study of the area west of Deadman Mountain has not yet been completed, but it appears that this segment is more favorable from an impact standpoint. The road would be farther away from Deadman Creek, its tributaries and associated wetlands, thereby mitigating to some extent secondary impacts on waterfowl and grayling. The route also avoids the cultural resource areas around Deadman Lake and Big Lake.

(viii) Segment Suitability

This route is within the minimum design standards, but has more difficult terrain, higher elevation, and longer length than other alternatives. The higher construction costs, construction time scheduling and maintenance costs are offset by the lower environmental impacts, making this segment a viable alternative to 3D.

CORRIDOR SELECTION
Corridor Summary
Supplement



PREPARED BY:

R&M CONSULTANTS, INC.

PROJECT ACCESS
LOCATION ALTERNATIVES

PREPARED FOR:

ACRES

REVISED
FIGURE 9.12

9.4 Corridor Summary - Supplement

Plans 1 to 11R are very simple to arrange, with only one set of sections selected for each of the three main corridors. Plans 12 to 17A, however, do not fit into this same pattern. Several different sections in each corridor were considered of equal merit for further investigation and incorporation into plans. For clarity, the breakdown of segments, sections and corridors is resummarized on Table 9.4, according to the following system of ranking.

1. Corridor - denotes a wide band. The three corridors are #1 (north of Susitna River), #2 (South of Corridor #1) and #3 (Denali Highway to Watana). All study was conducted within the three proposed corridors.

2. Segment - a proposed length of road or rail that may or may not be suitable for further consideration. Some segments, such as 1-A stretch the entire length of a corridor, while others are much shorter pieces. Segments are not necessarily used in their entirety, they may be superceded at one or more places by other, more feasible, segments.

3. Section - a combination of one or more segments or pieces of segments found to be suitable for incorporation into plans.

4. Plan - a combination of one or more sections to make a complete road and/or rail facility that can serve both dams.

TABLE 9.4
CORRIDORS, SECTIONS AND SEGMENTS

Corridor	Section	Description	Segments Used
1	A-1	Parks Highway at Chulitna to Devil Canyon (N)*	1-A
	A-2	Devil Canyon (N) to Watana (N)	1-A, 1-B, 1-E, 3-A
	A-3	Parks Highway at Hurricane to Indian River Area	1-A, 1-G
	A-4	Parks Highway at Hurricane to Gold Creek Rail Spur	1-A, 1-G, 2-T
	A-5	Indian River Area to Devil Canyon (N)	2-U
	A-6	Indian River Area to Devil Canyon (S)	2-U, 2-V
	A-7	Indian River Area to Watana (N)	1-A, 1-B, 1-H, 1-E, 3-A
	A-8	Parks Highway At Hurricane to Devil Canyon (S)	1-A, 1-G, 2-T, 2-U, 2-V, 2-W
2	B-1	Parks Highway at Chulitna to Gold Creek	1-A, 1-F, 2-L
	B-2	Gold Creek to Devil Canyon (S)	2-I
	B-3	Devil Canyon to Watana (S)	2-A, 2-B, 2-F, 2-G, 2-J
	B-4	Gold Creek Rail Spur to Devil Canyon	2-I
	B-5	not used	
	B-6	Devil Canyon to Watana (N)	2-A, 2-B, 2-Q, 2-S, 1-C
	B-7	Devil Canyon to Watana (S)	2-A, 2-B, 2-F, 2-G, 2-J, 2-Q,
3	C-1	Denali Highway to Watana, east of Deadman Mt.	3-A, 3-C
	C-2	Upgrade Denali Highway	n.a.
	C-3	Denali Highway to Watana, West of Deadman Mt.	3-A, 3-C, 3-D
	C-4	Denali Highway to Watana, West of Deadman Mt.	3-A, 3-C, 3-D, 3-E
R	R-1	Gold Creek to Devil Canyon (S)	2-R
	R-2	Devil Canyon (S) to Watana (S)	2-R, 2-RR
	R-3	Gold Creek Rail Spur	2-RRR
**	D	Devil Canyon Trans-Dam Crossing	2-P
	H	Devil Canyon Low-Level Crossing	2-M
	X	High bridge at Devil Canyon	2-N

* (N) means northside, (S) means south side of Devil Canyon Dam or Watana Dam
** connections between Corridors 1 & 2 at Devil Canyon

ACCESS PLANS
Supply Sources & Shipping Options
Table Supplement

SUPPLEMENT TO TABLE 10.1
MILEAGE FROM PORTS TO RAILHEAD OR PROJECT

Rail Haul To	Miles		
	Anchorage	Seward	Whittier
Hurricane	167	280	229
Gold Creek Spur End	156	269	218

SUPPLEMENT TO TABLE 10.4
BASIC CORRIDOR SEGMENTS

Section	Description
A-3	Hurricane to Indian River
A-4	Hurricane to Gold Creek Spur
A-5	Indian River to Northside of Devil Canyon
A-6	Indian River to Southside of Devil Canyon
A-7	Indian River to Watana via Upper Portage
A-8	Hurricane to Southside of Devil Canyon
B-4	Gold Creek Spur to Devil Canyon
B-5	Not Used
B-6	Devil Canyon to Northside Watana
B-7	Devil Canyon to Southside Watana
C-1	Denali Highway to Watana, East of Deadman Mt.
C-2	Upgrade Denali Highway
C-3	Denali Highway to Watana, West of Deadman Mt.
C-4	Denali Highway to Watana, Upland & West of Deadman Mt.
R-3	Gold Creek Spur

SUPPLEMENT TO TABLE 10.5
MAINTENANCE FACTORS

Segment	Maintenance Factor
A-3	1.3
A-4	1.3
A-5	1.3
A-6	1.0
A-7	1.0
A-8	1.2
B-4	1.2
B-6	1.3
B-7	1.3
C-1	0.8
C-2	0.8
C-3	0.9
C-4	0.9
R-3	0.5

ACCESS PLANS

Supplement

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #5

ALL ROAD

REVISED FIGURE 10.5

PREPARED FOR:

ALASKA

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #8

ALL ROAD

NO PUBLIC HIGHWAY ACCESS

REVISED FIGURE 10.8

PREPARED FOR

ARCO

(k) Plan 11R

Plan 11 is hereby deleted and replaced with Plan 11R (revised).

(i) Description

This plan serves the entire project by road, from a rail head at Cantwell. Material is hauled to Watana via the Denali Highway, then to Devil Canyon along the north side, with a low level crossing at Devil Canyon damsite.

(ii) Sea Ports

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

Material would travel by rail to a rail head at Cantwell, then be transfered to trucks and driven to Watana. Material for Devil Canyon would continue along the north side to Devil Canyon, than cross Susitna River via a low level crossing to the South side of the damsite. Personnel access would be via private car.

(iv) Sections Included

This plan includes Sections A-2, C-1, C-2, H and D

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #11R

ROAD VIA WATANA

FIGURE 10.11R

PREPARED FOR:

ACRES

(v) Borrow Pits

Plan 11R uses borrow areas 7 and 8.

(vi) Cost Estimates

The estimated cost of this plan is outlined below:

Construction	$131,511,355
Camp Facilities	13,166,496
Maintenance	11,027,000
Logistics	257,903,604
Total	$413,608,455

(vii) Advantages/Disadvantages

The advantages of this plan are:

- No time constraint, as the portion of the road to Watana can be completed in one year. The portion from Watana to Devil Canyon and the low level crossing, can be completed during construction of Watana.
- Personnel access via private vehicle.
- No major bridges.
- Lowest borrow quantity of the road only plans.

The disadvantages of this plan are:

- Longest haul of all plans, resulting in highest logistics cost and highest maintenance cost, and third to highest construction cost.
- Potential environmental impacts resulting from public access to additional portions of the Nelchina Caribou Range.
- Highest total cost.

(l) Plan 12

(i) Description

This plan serves both Devil Canyon and Watana Dams by truck on the north side of the river. See Figure 10.12. The railhead is at Hurricane. A low level temporary crossing at Devil Canyon is needed to provide immediate access to the south side of the damsite.

(ii) Sea Port

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #12

REVISED

FIGURE 10.12

PREPARED FOR:

ACRES

Material would travel by rail to a railhead at Hurricane, then by truck to Devil Canyon and Watana. Personnel access would be via private car.

(iv) Sections Included

This plan includes Sections A-3 and A-5 to Devil Canyon, A-2 between the dam sites, and H, the low level crossing, to serve the south side of Devil Canyon.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

The preliminary estimated cost of this plan is outlined below:

Construction	$ 96,289,722
Camp Facilities	9,629,024
Maintenance	7,499,000
Logistics	226,085,887
Total	$339,503,633

(vii) Schedule

The major bridge on Portage Creek will cause a time delay of two years. There would be no access to the Watana damsite until the bridge is substantially completed.

(viii) Advantages/Disadvantages

The advantages of Plan 12 are:

- Personnel access via private vehicles.
- No impact to the Indian River Remote Parcels.

The disadvantages of this plan are:

- Construction schedule delays due to Portage Creek Bridge.
- A low level, substandard crossing would be needed at Devil Canyon to supply the south side of the damsite.

(m) Plan 13

(i) Description

Access Plan 13 serves both dams by truck from a railhead at Hurricane. The road is entirely on the north side, with a main route directly to Watana and a spur road to Devil Canyon.

(ii) Sea Port

Common to all plans are Anchorage and Whittier.

PREPARED BY:

R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

ACCESS PLAN #13

REVISED FIGURE 10.13

(iii) Modal Split

Material travels by train as far as Hurricane siding, then by truck to the dam sites. Personnel travel would be by private vehicle.

(iv) Section Included

The sections include A-3 and A-7 from Hurricane to Watana, with the side road A-6 to Devil Canyon. A railhead is planned at Hurricane.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

The estimated cost of Plan 13 is outlined below:

Construction	$ 82,889,180
Camp Facilities	8,288,779
Maintenance	6,344,900
Logistics	222,733,838
Total	$320,256,697

(vii) Schedule

The major advantage of this access plan is the direct routing to Watana. Although no major bridges are anticipated on the

road to Watana, there will be some construction difficulties associated with the segment traversing parallel to Portage Creek, giving this plan a medium level of risk of scheduling delay. The major bridge just down stream of Devil Canyon will not be needed until construction of Devil Canyon dam commences, thus, it is not a construction scheduling restraint.

(viii) Advantages/Disadvantages

- Low risk of schedule delays.
- All personnel access via private auto.
- Adverse environmental impacts associated with the side hill traverse of Indian River Valley.
- Third lowest construction cost.

(n) Plan 14

(i) Description

This plan includes a short rail spur from Gold Greek, along the Susitna River. The railhead joins a road that starts at Hurricane, passes the railhead, serves Devil Canyon, then continues along the south side of the Susitna River, to Watana.

(ii) Seaports

PREPARED BY: R&M CONSULTANTS, INC.

PREPARED FOR: ACRES

ACCESS PLAN #14

REVISED FIGURE 10.14

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

Material would travel by train to Gold Creek, then by smaller trains to the railhead at the end of the spur. There, they would be transfered to trucks and hauled to the two damsites. The road from Hurricane to the railhead would provide access for personnel via private autos.

(iv) Sections Included

Plan 14 includes Rail Section R-3, Road Sections B-4 and B-6 to the damsites, and Road Section A-4 to connect to the public road system.

(v) Borrow pits

No data available yet.

(vi) Cost Estimates

Construction	$120,338,513
Camp Facilities	12,033,699
Maintenance	9,493,000
Logistics	215,246,144
Total	$357,111,356

(vii) Schedule

Avoids major problems associated with the south route between dams. Major bridges at Chechako Creek and Fog Creek, heavy rock excavation and massive ice are all avoided on this variation of the southern route. The road construction is such that resupply can be achieved after the first season, however, there would be some risk of schedule delay.

The bridge across the Susitna at the railhead is not on the critical path.

The bridge across the Susitna near Fog Creek is a major, several year project, but the terrain is such that a low level crossing by ferry or temporary bridge is feasible.

(viii) Advantages/Disadvantages

The advantages of the plan include:

- Avoids major direct environmental conflicts, difficult construction and time delays associated with the alternative south route.

The disadvantages of this plan include:

- The rail spur must be built linearly, across difficult bluff terrain. Limited construction road access is feasible until the rail spur is completed.

(o) Plan 15

(i) Description

This plan is essentially the same as Plan 14, except that there is no road connection between the railhead and the Parks Highway. The plan is served by a rail spur from the Alaska Railroad at Gold Creek to a railhead 8 miles northeast, then by road from the railhead to the damsites, on the south side of Susitna River.

(ii) Sea Ports

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

Material would be shipped by rail to the railhead, then by truck to the damsites. Personnel would travel via rail shuttle to the railhead, then via bus shuttle to the damsites.

(iv) Sections Included

The sections that would be included in this plan are the Rail Spur R-3, and the Road Sections B-4 and B-6.

(v) Borrow Pits

No data available yet.

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #15

REVISED FIGURE 10.15

PREPARED FOR:

ACRES

(vi) Cost Estimates

Construction	$ 86,247,131
Camp Facilities	8,624,602
Maintenance	6,373,000
Logistics	215,246,144
Total	$316,490,877

(vii) Schedule

Same as Plan 14.

(viii) Advantages/Disadvantages

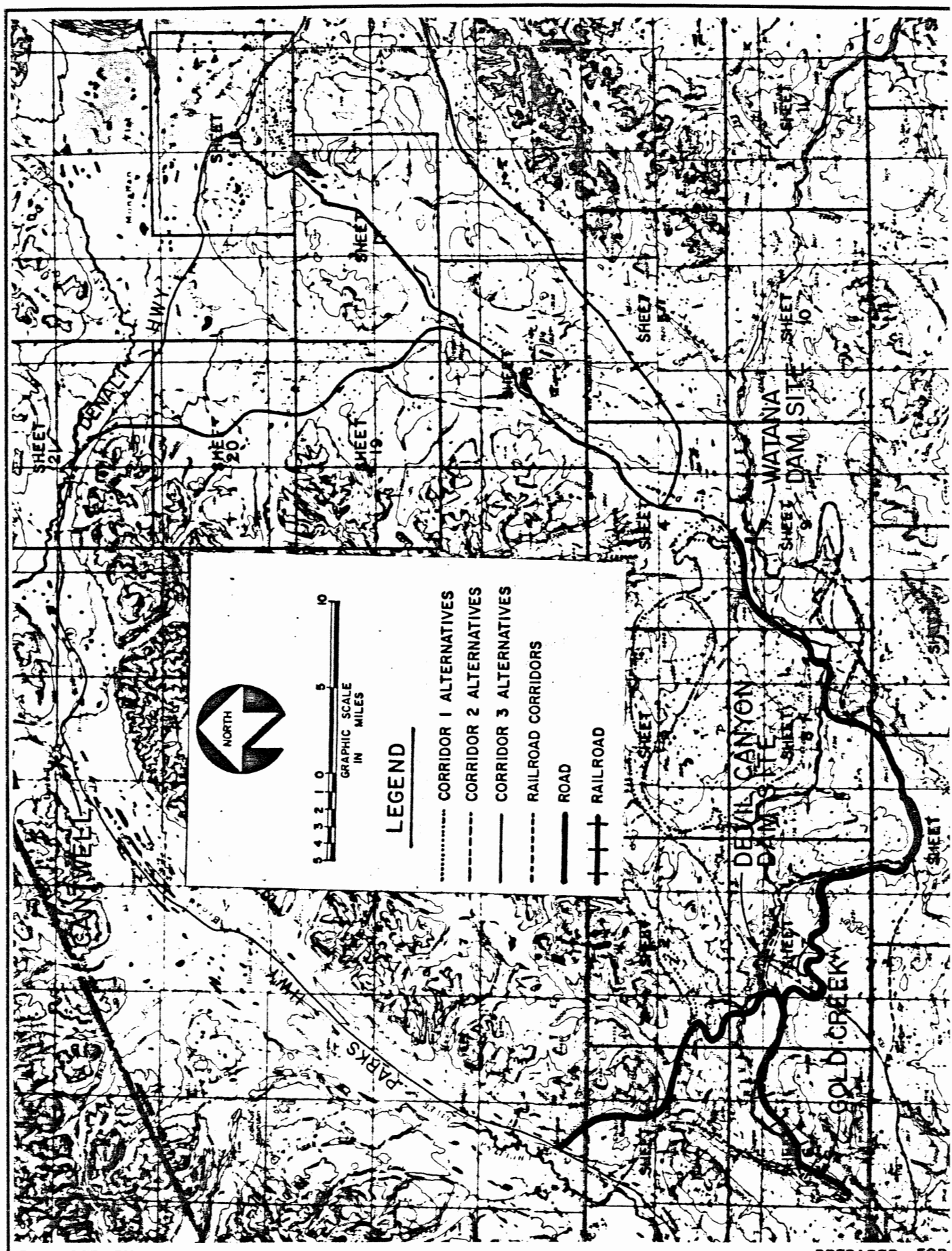
Essentially, this plan shares all the advantages/disadvantages of Plan 14, with the following exceptions:

- No access to the public.
- Lower cost due to deletion of construction of about 15 miles of road.
- No impact on the Chulitna Pass existing community in the Chulitna Pass area.

(p) Plan 16

(i) Description

This plan serves Devil Canyon by road from a railhead at Gold Creek. Watana is served by a road between the dams,



PREPARED BY:

R&M CONSULTANTS, INC.

PREPARED FOR

ACRES

ACCESS PLAN #16

REVISED
FIGURE 10.16

mostly on the south side of the river. In addition, there is a road from Hurricane to Devil Canyon. This road is for passenger vehicle traffic and truck transport if necessary.

(ii) Seaport

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

Freight is hauled from seaport to Gold Creek by rail, then by truck to Devil Canyon and Watana. Passenger vehicles use the road from Hurricane to Devil Canyon.

(iv) Sections Included

Plan 16 includes road Sections B-2 and B-6 to the dam sites, and road Section A-8 to connect to the public road system. There is a railhead at Gold Creek.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

Construction	$108,803,900
Camp Facilities	10,880,244
Maintenance	7,968,200
Logistics	215,571,651
Total	$343,223,995

(vii) Schedule

Same as Plan 14.

(viii) Advantages/Disadvantages

This plan has the same advantages and disadvantages of Plan 14, except that the bridge over the Susitna River, for Plan 16, is cheaper and will therefore lower the overall construction cost, and the small section of rail (R-3) is replaced with a road that would be easier to keep on schedule.

(q) Plan 17

(i) Description

Plan 17 is similar to Plan 4, but with a service road mostly on the southside. The service road would be on the south side from Devil Canyon to just downstream of Fog Creek, then would cross the Susitna River and follow the north bank to Watana. Devil Canyon is served by rail from Gold Creek. Watana is served by road from the Denali Highway.

(ii) Seaports

Common to all plans are Anchorage and Whittier.

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #17

REVISED FIGURE 10.17

PREPARED FOR:

ACRES

10-88

(iii) Modal Split

Watana would be served by rail to Cantwell, then truck to the damsite via the Denali Highway. Personnel would access by private vehicle. Devil Canyon would be served directly by rail, via Gold Creek. Personnel would travel via rail shuttle.

(iv) Sections Included

Plan 17 includes rail Section R-1 and road Sections C-2 and C-3, with a service road on B-6.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

Construction	$145,265,069
Camp Facilities	14,546,934
Maintenance	9,087,000
Logistics	226,772,354
Total	$395,671,357

(vii) Schedule

The risk of schedule delay is low, therefore this plan has the highest probability of being completed within one construction season.

The railroad and service road have areas of difficult construction, with major bridges, but that part of the construction is not necessary until the Devil Canyon Dam stage.

(viii) Advantages/Disadvantages

- No public access to Devil Canyon; rail shuttle needed for personnel.
- Direct access between dams for maintenance and operations staff.
- Increased public access to the area south of Denali Highway - with associated negative environmental impacts.

(r) Plan 17A

(i) Description

Plan 17A varies from Plan 17 only in the last few miles of the east end of the maintenance road. Instead of crossing the Susitna at Fog Creek, the road continues on the south side to Watana, and crosses the dam crest.

(ii) Seaports

Common to all plan are Anchorage and Whittier.

PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS PLAN #17A

REVISED FIGURE 10.17A

PREPARED FOR:

ACRES

10-69

(iii) Modal Split

Identical to Plan 17.

(iv) Sections Included

Plan 17A includes rail Section R-1 and road Sections C-2 and C-3, with a service road B-7.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

Construction	$134,969,032
Camp Facilities	13,517,304
Maintenance	9,295,000
Logistics	226,772,354
Total	$384,553,690

(vii) Schedule

Same as Plan 17.

(viii) Advantages/Disadvantages

° Though construction costs are cut by using a trans-dam crossing instead of a bridge on the

Susitna River, there will be an increase in maintenance cost.

- Increased access to the native-owned lands in the Fog Creek area which although meeting the preference of Native organizations would introduce direct environmental impacts.

- All other advantages and disadvantages are as per Plan 17.

(s) Plan 18

(i) Description

Plan 18 varies from Plan 6 only in the way it crosses Devil Canyon. The service road between the dams, on the north side, crosses Devil Canyon with a high suspension bridge downstream from the dam. As with Plan 6, Devil Canyon Dam is served by rail from Gold Creek, and Watana Dam is served by road from the Denali Highway.

(ii) Seaports

Common to all plans are Anchorage and Whittier.

(iii) Modal Split

Watana would be served by rail to a railhead at Cantwell, then trucked to the damsite via the Denali Highway. Devil

R&M CONSULTANTS, INC.

PREPARED BY:

PREPARED FOR

ACCESS PLAN #18

FIGURE 10.18

Canyon would be served by rail, via Gold Creek, with a railhead at the damsite. Personnel would travel via private vehicles to Watana, and by rail shuttle to Devil Canyon.

(iv) Sections Included

Plan 18 includes Rail Section R-1 and Road Sections C-2 and C-4, with a service road made from Section A-2 and X.

(v) Borrow Pits

No data available yet.

(vi) Cost Estimates

Construction	$137,413,171
Camp Facilities	13,535,536
Maintenance	8,167,000
Logistics	226,772,354
Total	$385,888,061

(vii) Schedule

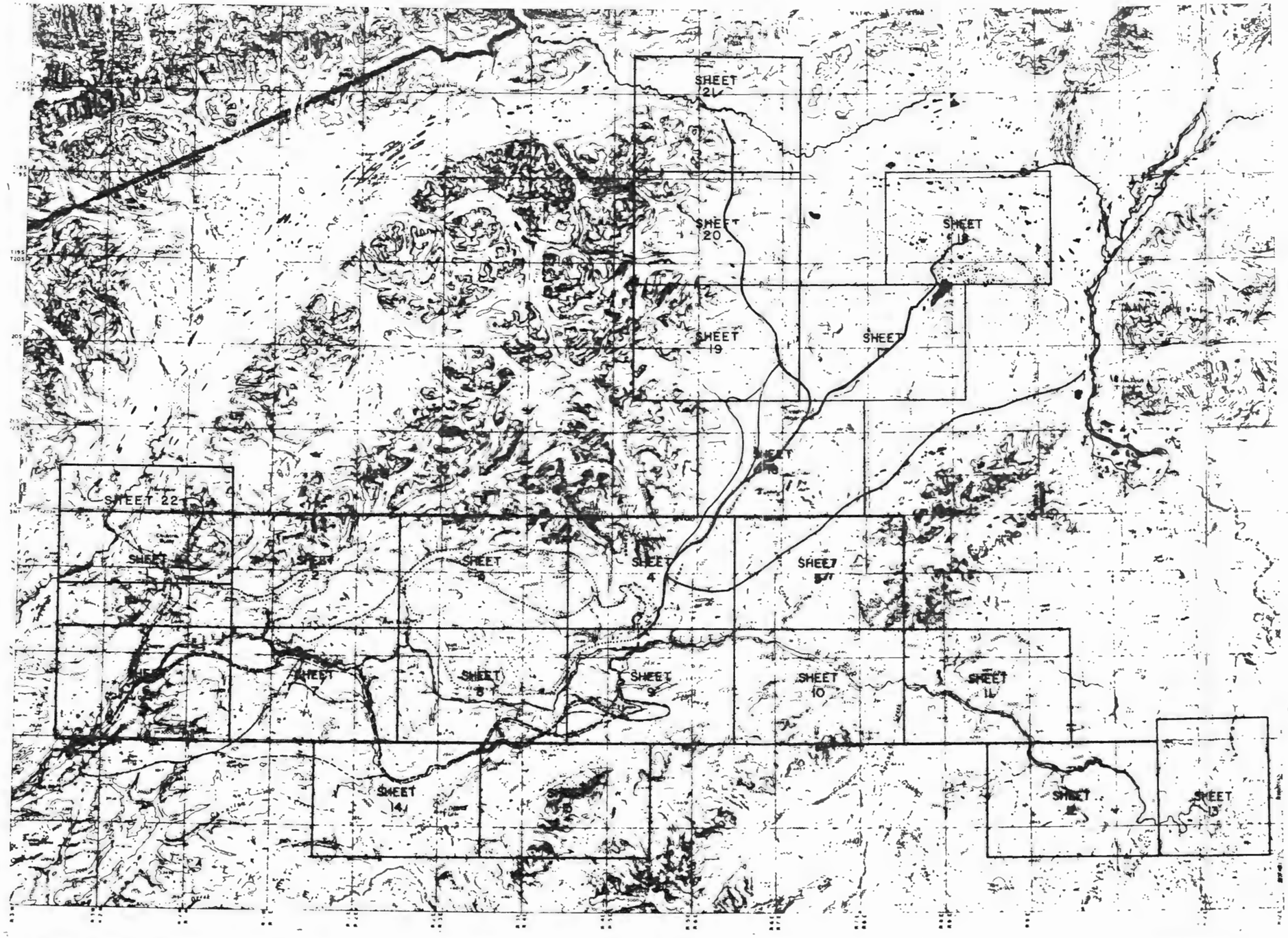
Watana can be served within one season via the road to the Denali Highway. Therefore there is no time delay. The risk of schedule delay is low, therefore this plan has the highest probability of being completed within one construction season.

(viii) Advantages/Disadvantages

Generally, Plan 18 has the same advantages and disadvantages as Plan 6. There is:

- Direct access between dams for maintenance and operations staff.
- Potential indirect impacts from increased public access.
- High construction cost due to the fact that more road is being built.
- Nedd for a rail shuttle to bring personnel to the Devil Canyon site.

APPENDIX B
Proposed Alternative Segments
Figure Revisions



LEGEND

- CORRIDOR 1 ALTERNATIVES
- CORRIDOR 2 ALTERNATIVES
- CORRIDOR 3 ALTERNATIVES
- RAILROAD CORRIDOR

NOTE

SHEETS NO. 5, 7, 11, 12, & 13 ARE OMITTED. NO ACCESS CORRIDORS ARE CONTAINED THEREIN.

PREPARED BY:

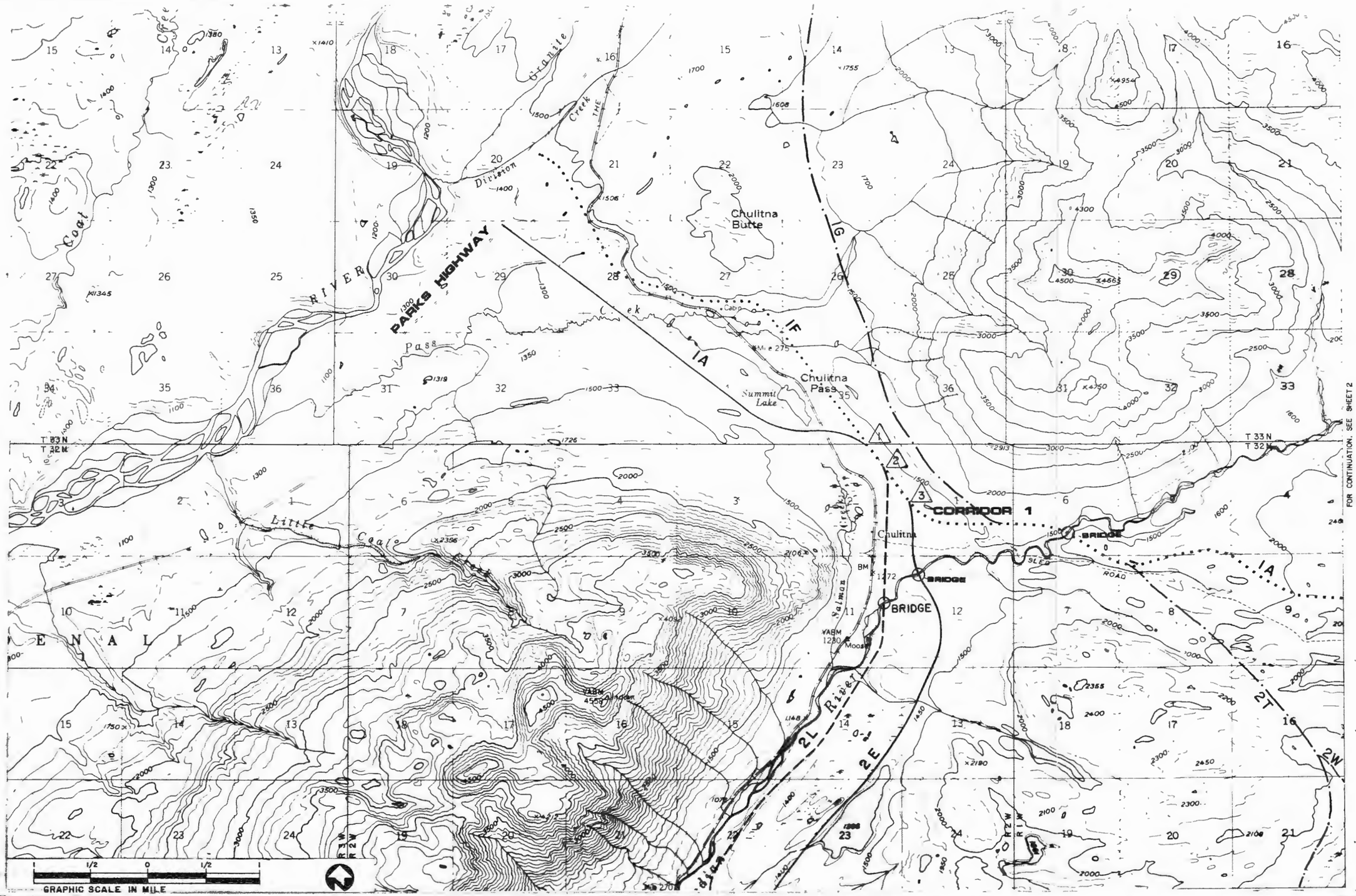
R&M CONSULTANTS, INC.

ACCESS CORRIDORS INDEX MAP

REVISED FIGURE 8.0

PREPARED FOR:

ACRES



PREPARED BY:

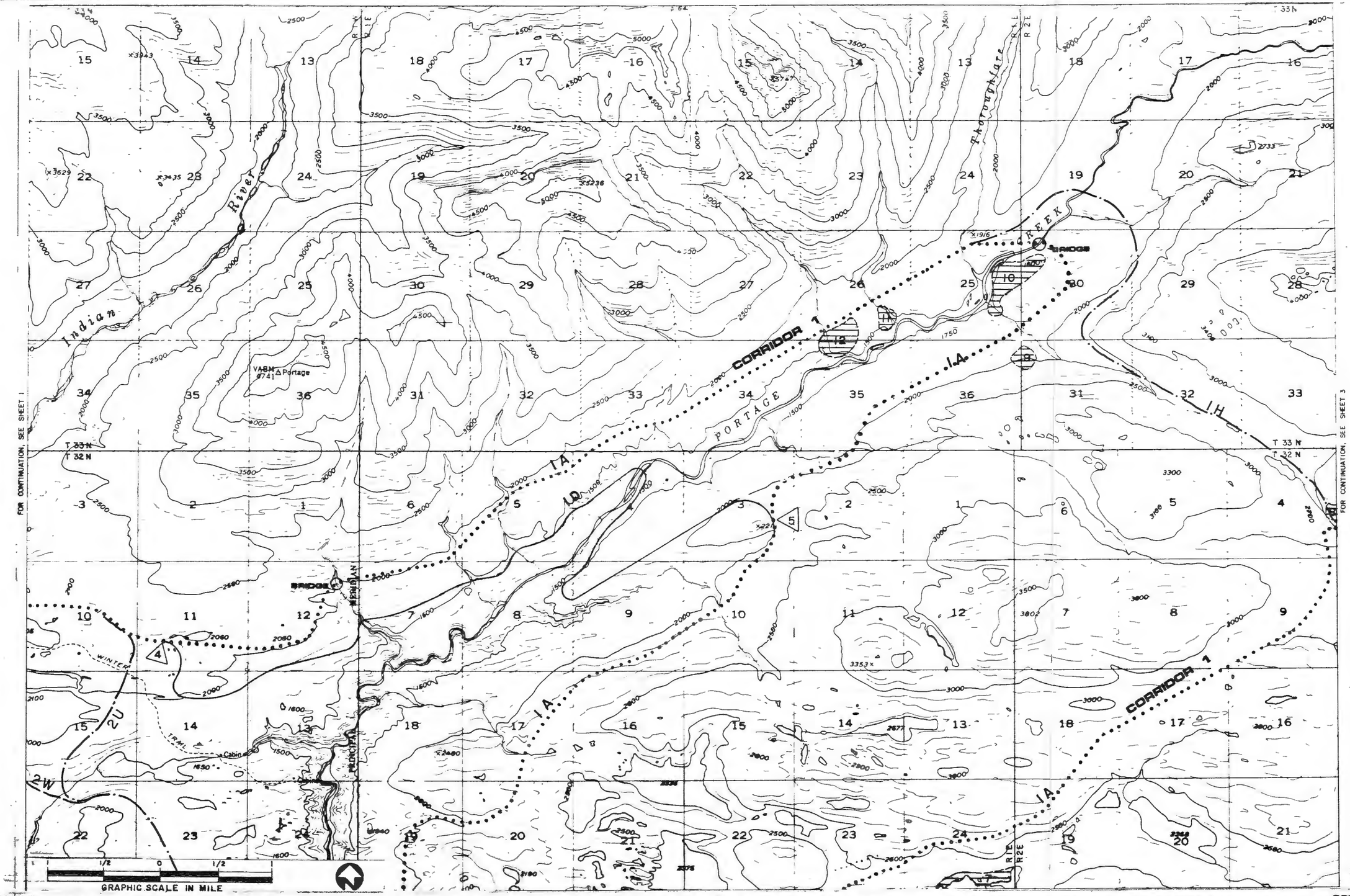
R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

ACCESS CORRIDOR ALIGNMENTS

REVISED
FIGURE 8.1



PREPARED BY:

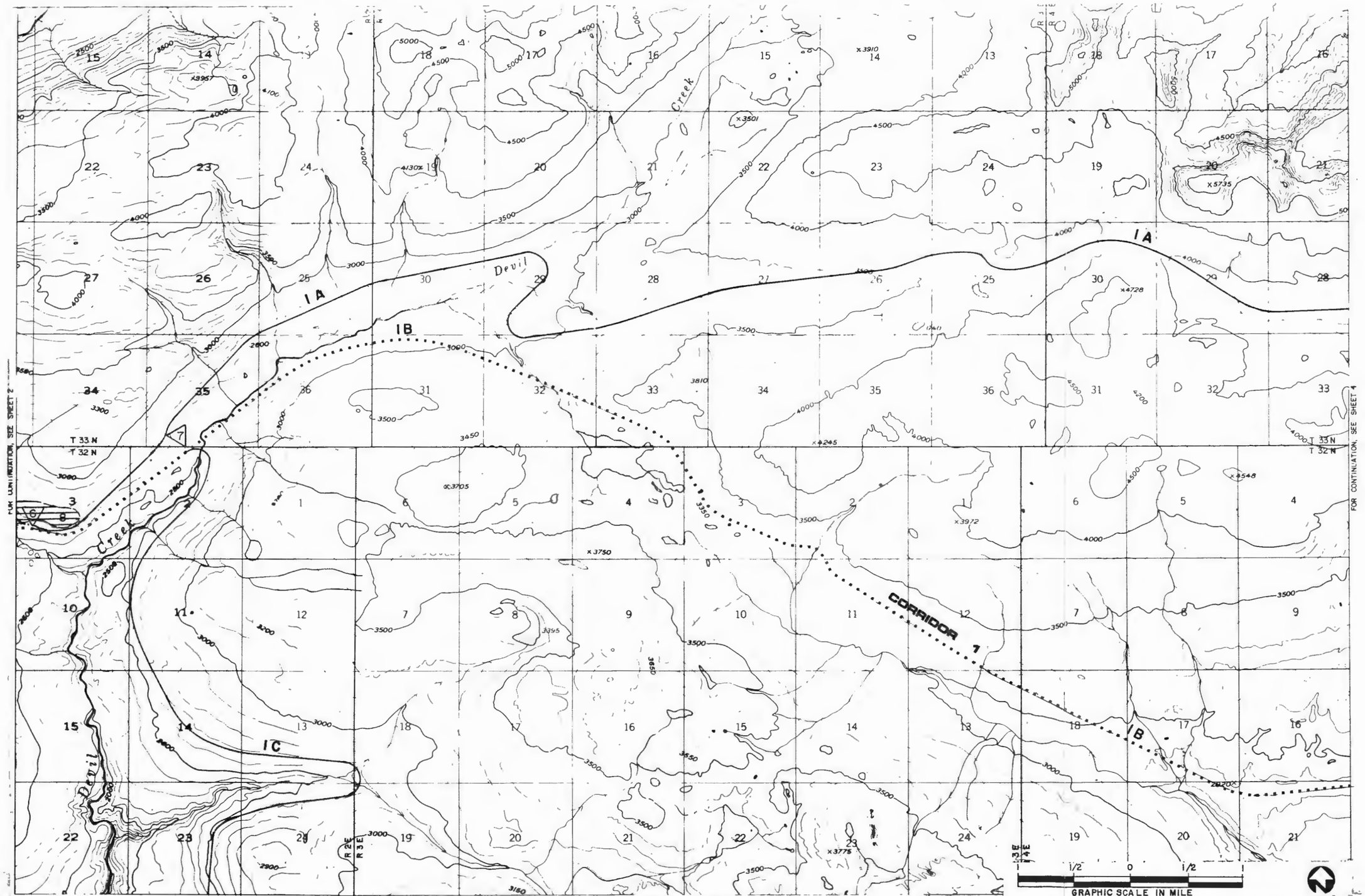
R&M CONSULTANTS, INC.

PREPARED FOR:

ACCESS CORRIDOR ALIGNMENTS

REVISED FIGURE B.2

ACRES



PREPARED BY:

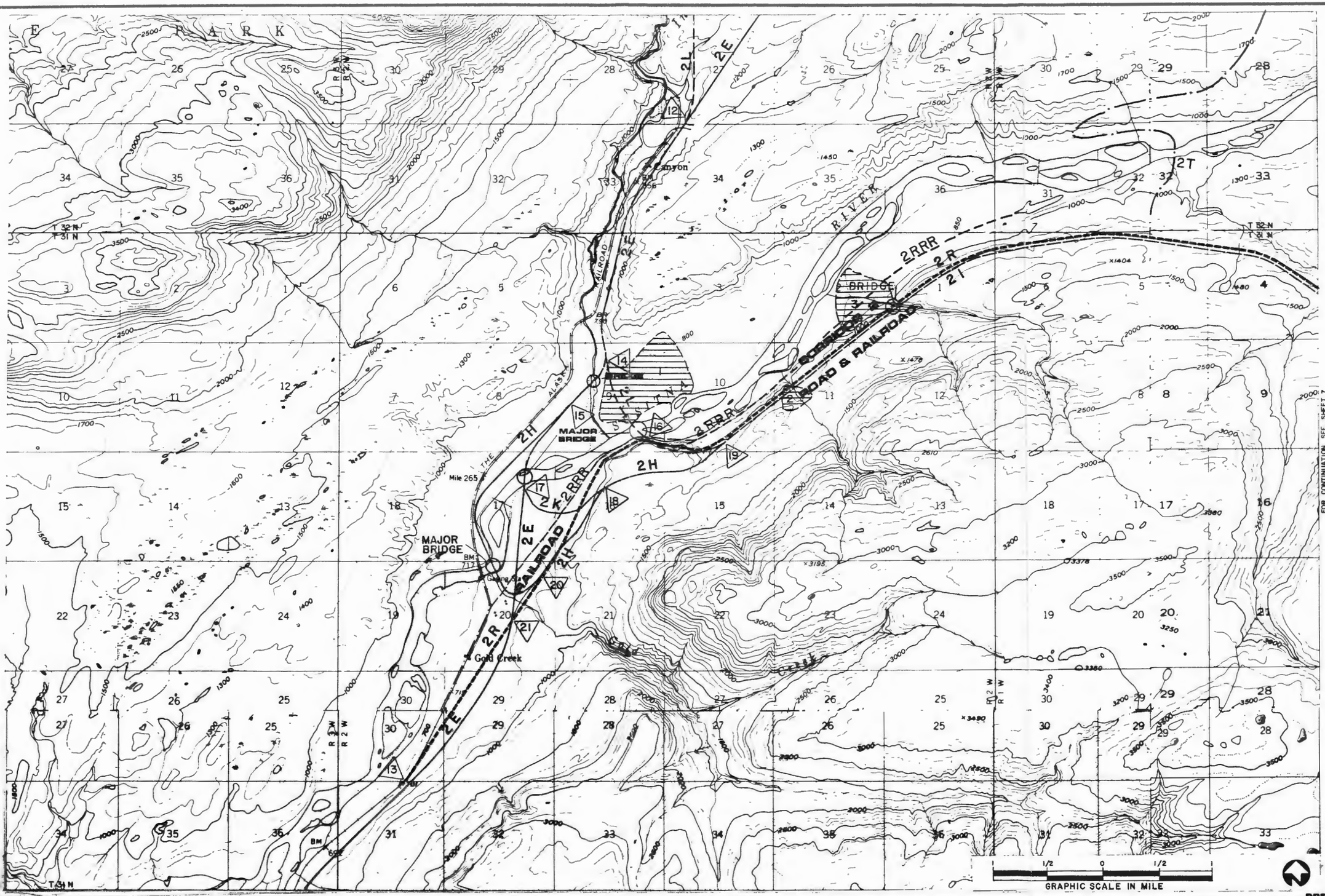
R&M CONSULTANTS, INC.

ACCESS CORRIDORS ALIGNMENTS

REVISED
FIGURE B.3

ACRES

PREPARED FOR:



PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS CORRIDORS ALIGNMENTS

REVISED
FIGURE B.6

PREPARED FOR:

ACRES

FOR CONTINUATION, SEE SHEET 2

FOR CONTINUATION, SEE SHEET 6

CORRIDOR 1

DEVIL CANYON DAM SITE

SUSITNA RIVER

CORRIDOR 2

ROAD & RAILROAD

BRIDGE

RAILROAD

ROAD

2U 2V 2R 2G 2B 2C 2D 2E 2F

T 32 N
T 31 N

R 1 W SEWARD MERIDIAN
R 1 E
R 2 E

GRAPHIC SCALE IN MILE
1/2 0 1/2

PREPARED BY:

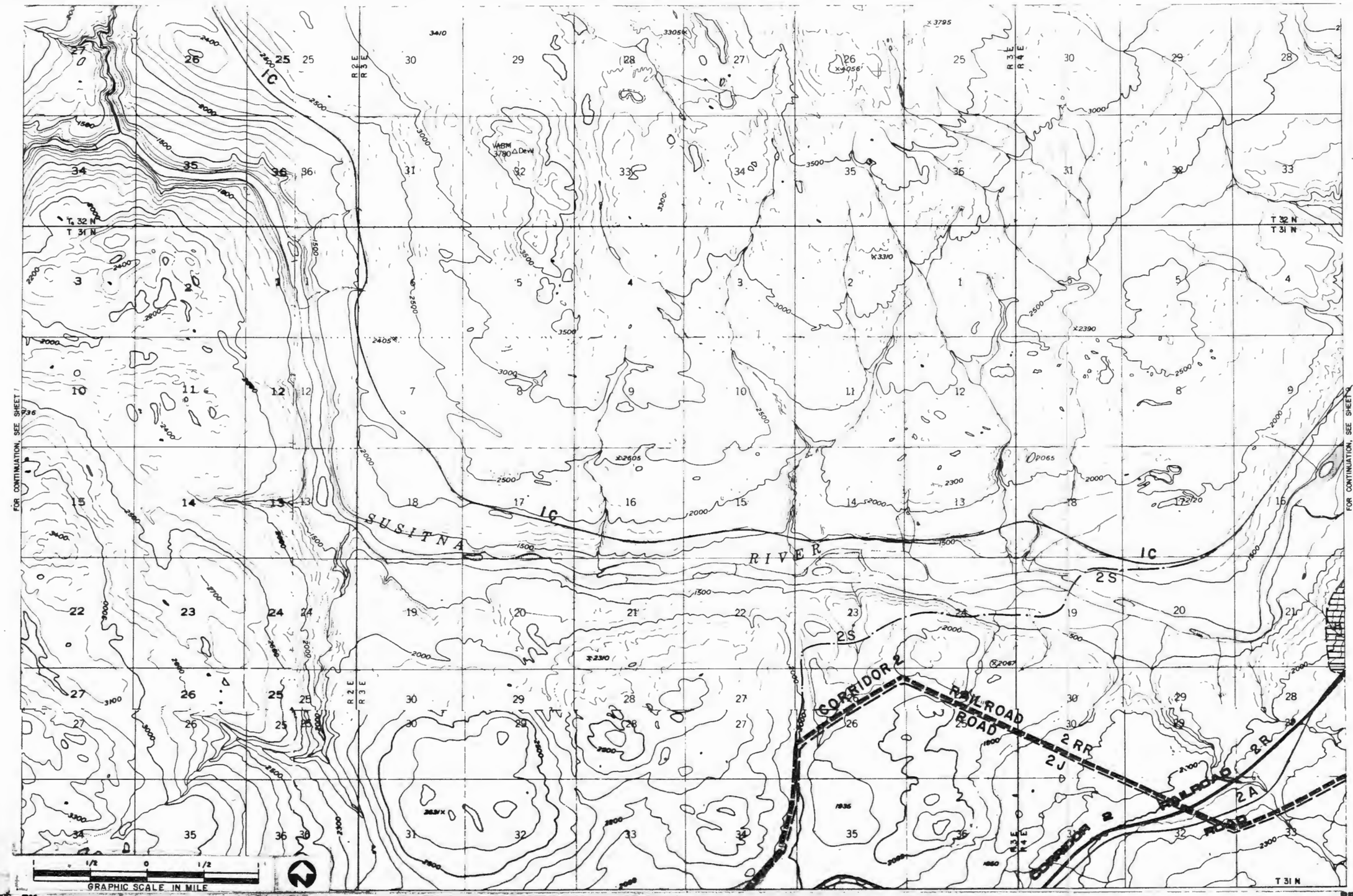
R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

ACCESS CORRIDORS ALIGNMENTS

REVISED
FIGURE B.7



PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS CORRIDORS ALIGNMENTS

REVISED FIGURE B.8

PREPARED FOR:

ACRES

PREPARED BY:

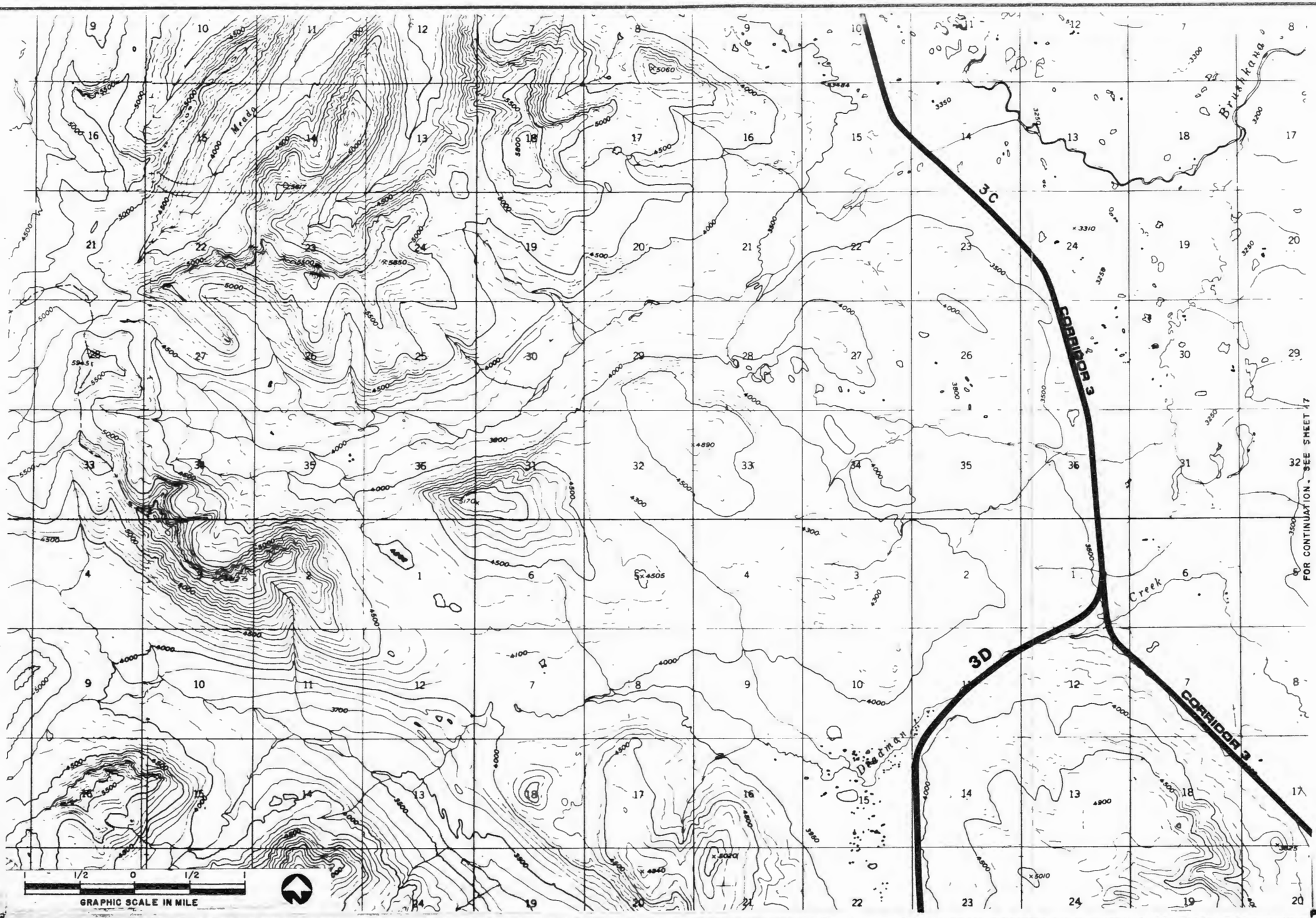
R&M CONSULTANTS, INC.

ACCESS CORRIDORS ALIGNMENTS

REVISED
FIGURE B.16

PREPARED FOR:

ACRES



PREPARED BY:

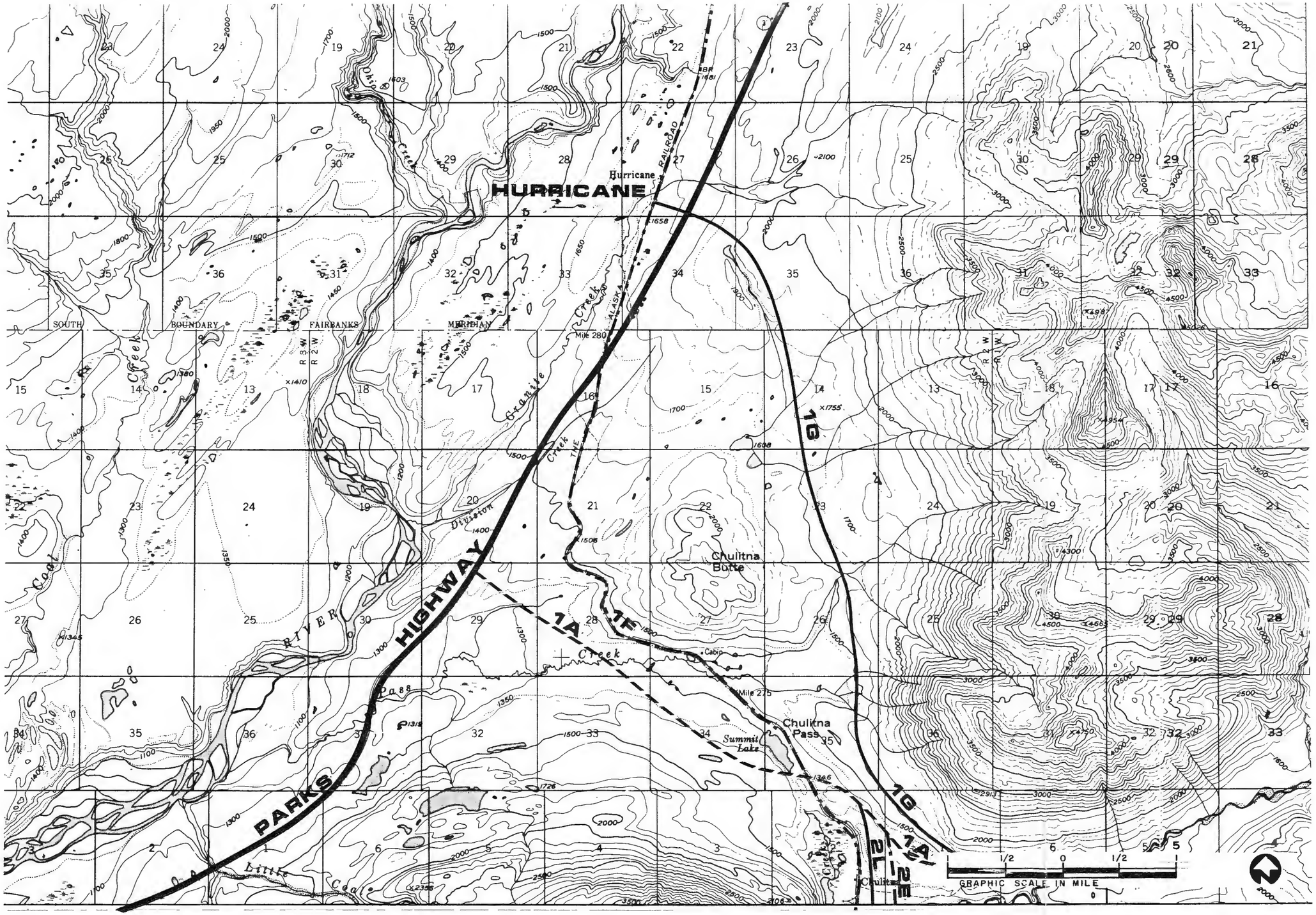
R&M CONSULTANTS, INC.

ACCESS CORRIDORS ALIGNMENTS

REVISED
FIGURE B.19

ACRES

PREPARED FOR:



PREPARED BY:

R&M CONSULTANTS, INC.

ACCESS CORRIDOR ALIGNMENTS

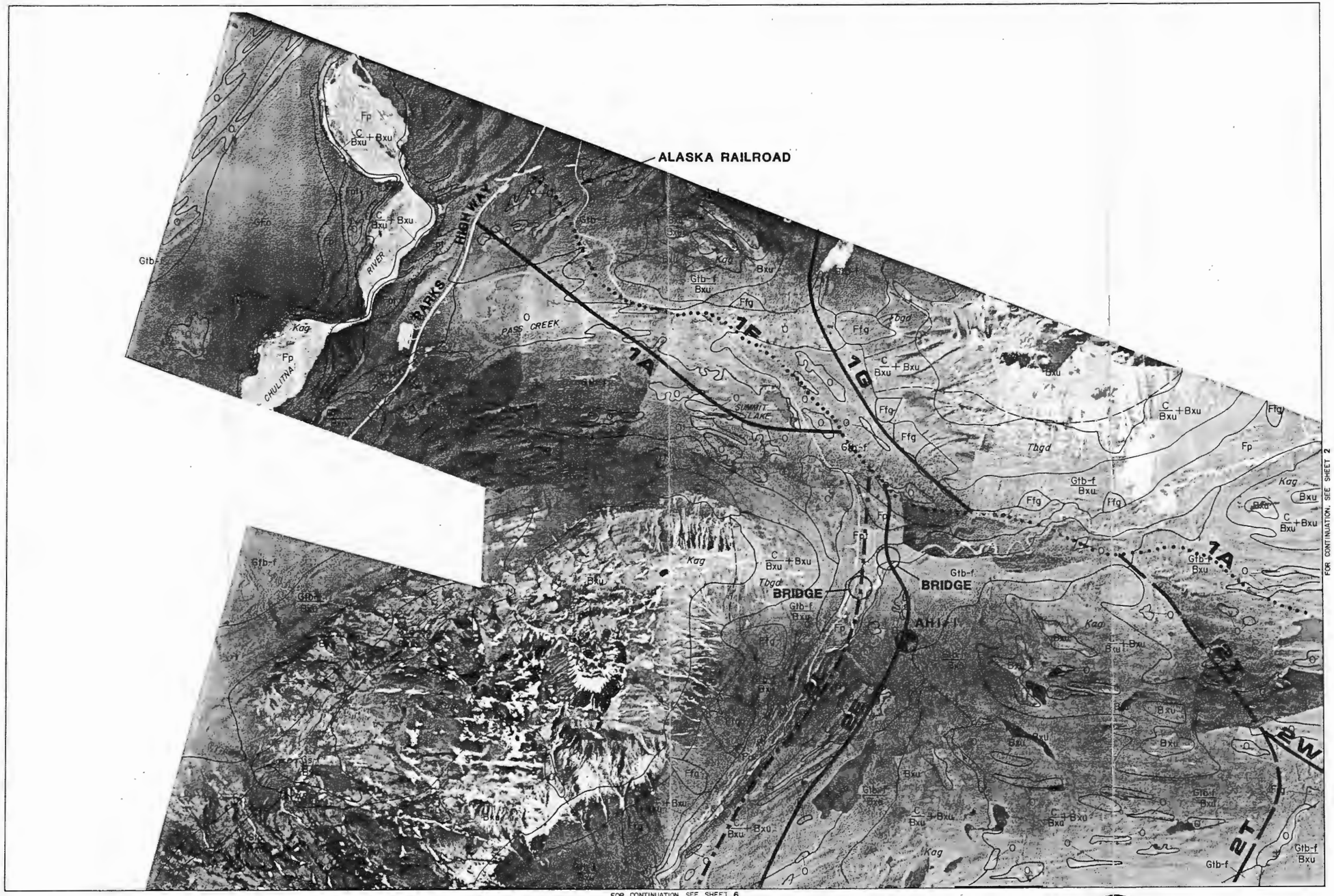
FIGURE 8.22

PREPARED FOR:

ACRES

APPENDIX D
Terrain Unit Mapping
Text Supplement
Figure Revisions

Ca - Avalanche Deposits:	A gently to steeply sloping cone shaped deposit of angular coarse grained material with a variable silt content, accumulating below avalanche chutes. Can grade into fluvial fan deposits.
Ff - Fluvial Fan:	A gently sloping cone shaped deposit of coarse granular material, with varying amounts of silt, accumulating below avalanche chutes and tributary valleys. Can include avalanche deposits and/or mudflow deposits.



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Pzv	Pzv (Pls)	Kag	Pzvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

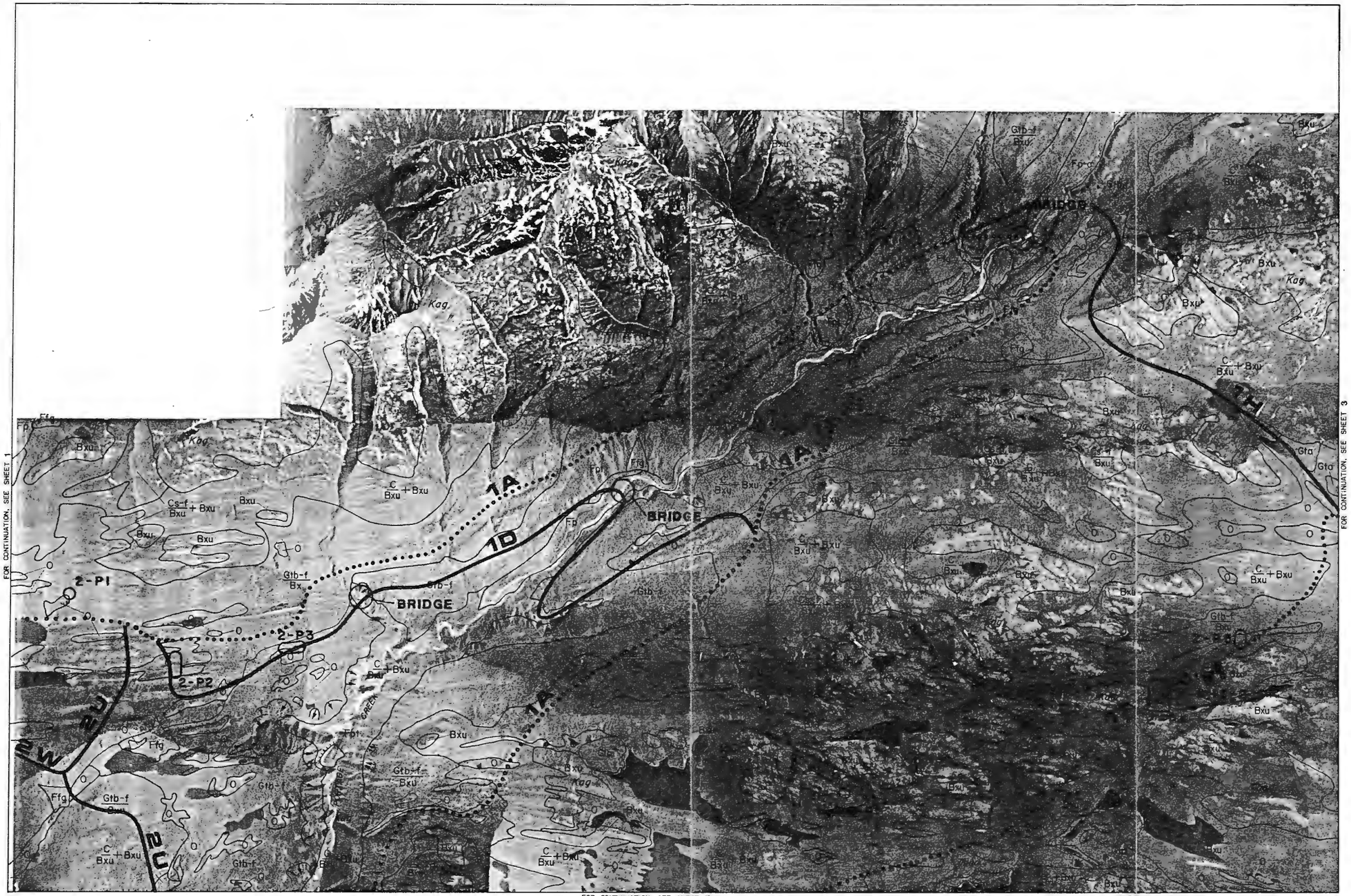
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE

DEPARTMENT | DRAWING NO. | REV.

PROJECT 052502 | SHEET 1 OF 21



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, low-grade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

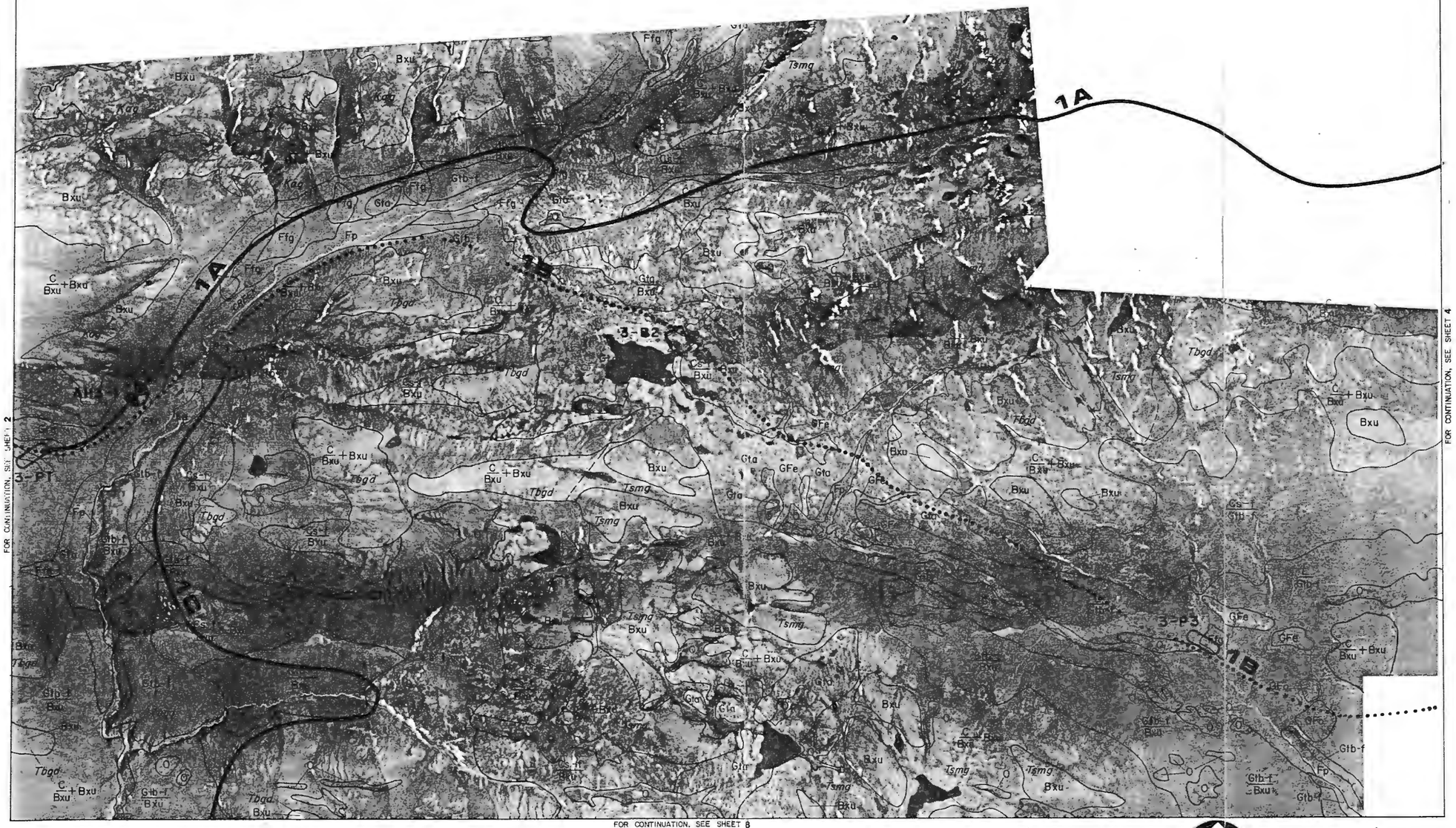
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE

DEPARTMENT | DRAWING NO. | REV.

PROJECT 052502 | SHEET 2 OF 21



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

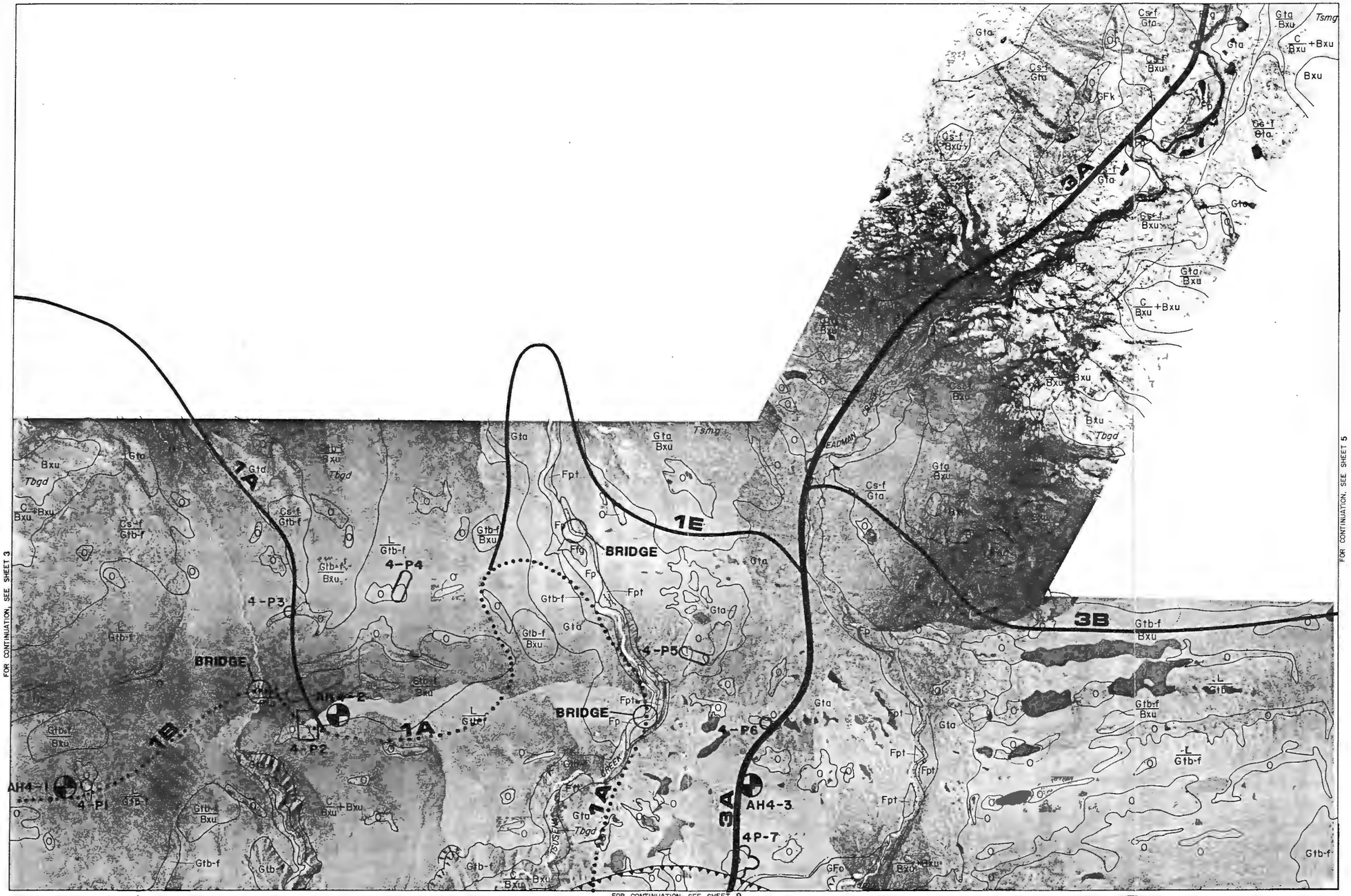
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE

DEPARTMENT | DRAWING NO. | REV.

PROJECT 052502 | SHEET 3 OF 21



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu +Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw +Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Pzv (Pls)	Kag	Pzvs
Abbreviated Descriptions	Tertiary Volcanic rocks; snallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sand-stone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of green-schist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic meta-volcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite- and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp — Slide Scar — Buried Channel — Trail — Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981

DEPARTMENT

PROJECT 052502

SCALE

DRAWING NO.

SHEET 4 OF 21

REV.

FOR CONTINUATION, SEE SHEET 1

FOR CONTINUATION, SEE SHEET 7

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgo).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981

DEPARTMENT

PROJECT 052502

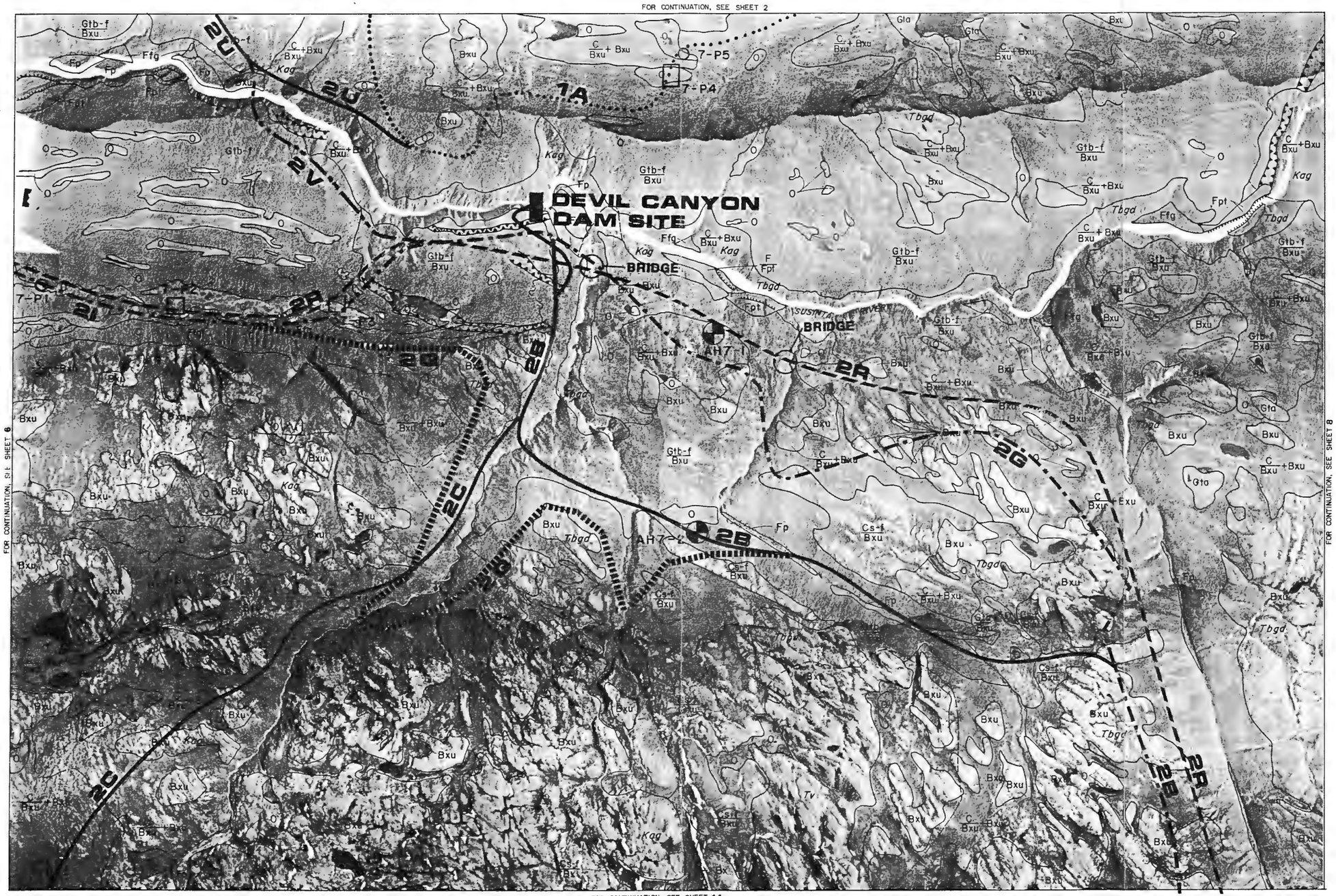
SCALE

DRAWING NO.

SHEET 6 OF 21

REV.

FOR CONTINUATION, SEE SHEET 2



FOR CONTINUATION, SEE SHEET 6

FOR CONTINUATION, SEE SHEET 8

FOR CONTINUATION, SEE SHEET 14

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981

DEPARTMENT

PROJECT 052502

SCALE

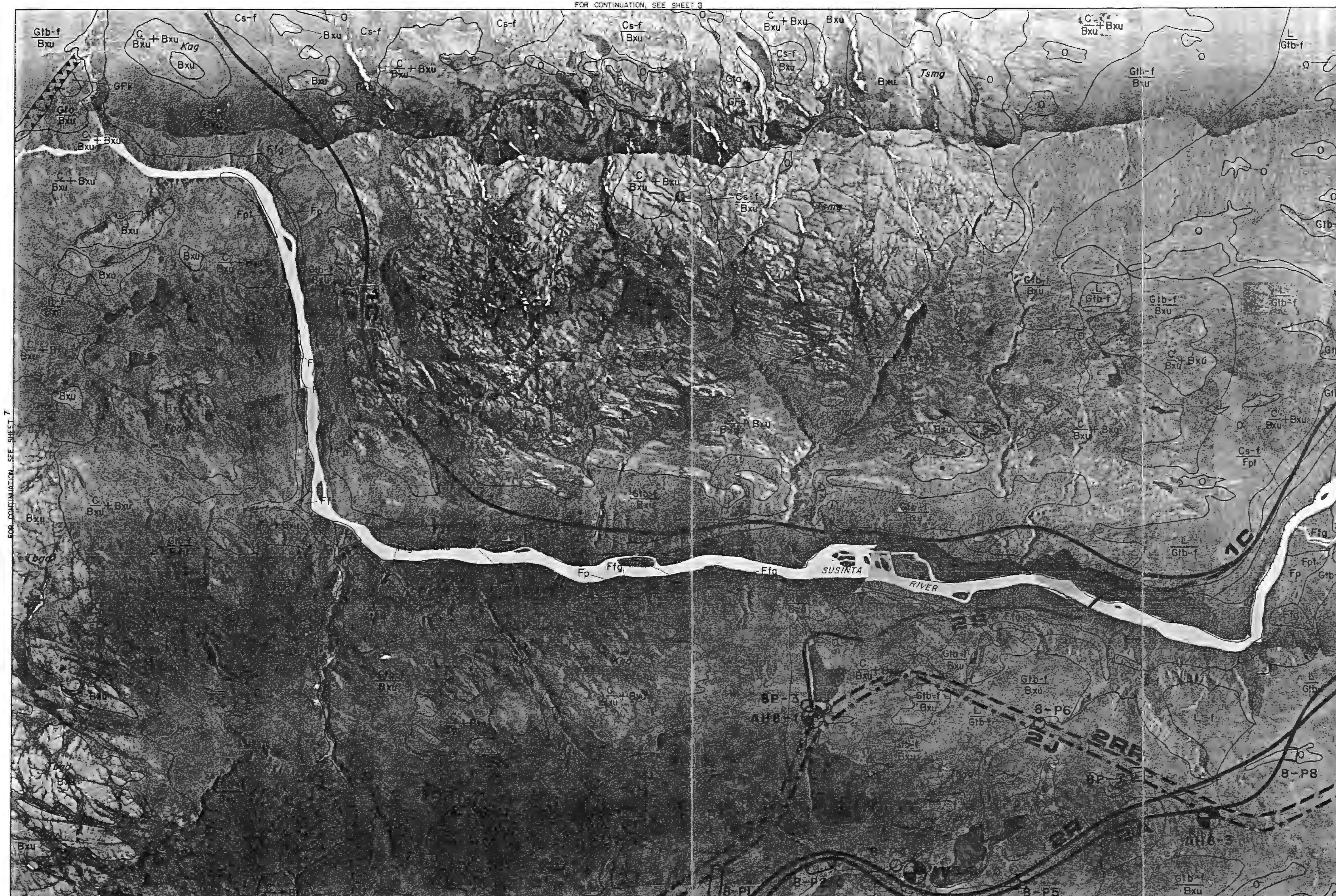
DRAWING NO.

REV.

SHEET 7 OF 21

FOR CONTINUATION, SEE SHEET 3

FOR CONTINUATION, SEE SHEET 7



FOR CONTINUATION, SEE SHEET 9

FOR CONTINUATION, SEE SHEET 14

FOR CONTINUATION, SEE SHEET 15

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFa	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gto	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	*Tv*	*Tsu*	*Tbgd*	*Tsmg*	*TKgr*	*Jam (Jtr)(Jgd)*	*Ћv*	*Pzv (Pls)*	*Kag*	*Ћvs*
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981

DEPARTMENT

PROJECT 052502

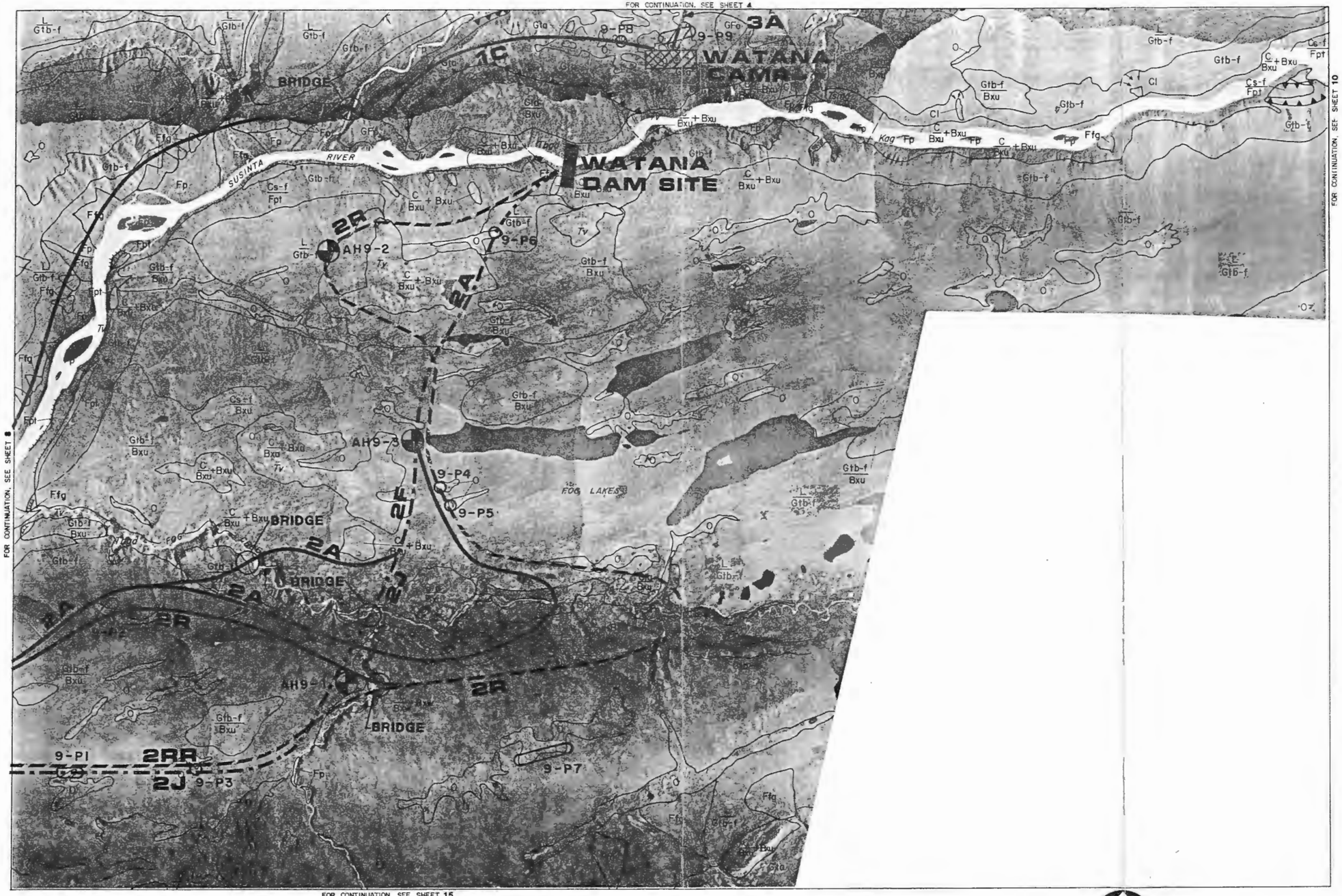
SCALE

DRAWING NO.

REV.

SHEET 8 OF 21

FOR CONTINUATION, SEE SHEET 4



FOR CONTINUATION, SEE SHEET 8

FOR CONTINUATION, SEE SHEET 10

FOR CONTINUATION, SEE SHEET 15

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of green-schist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic meta-volcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

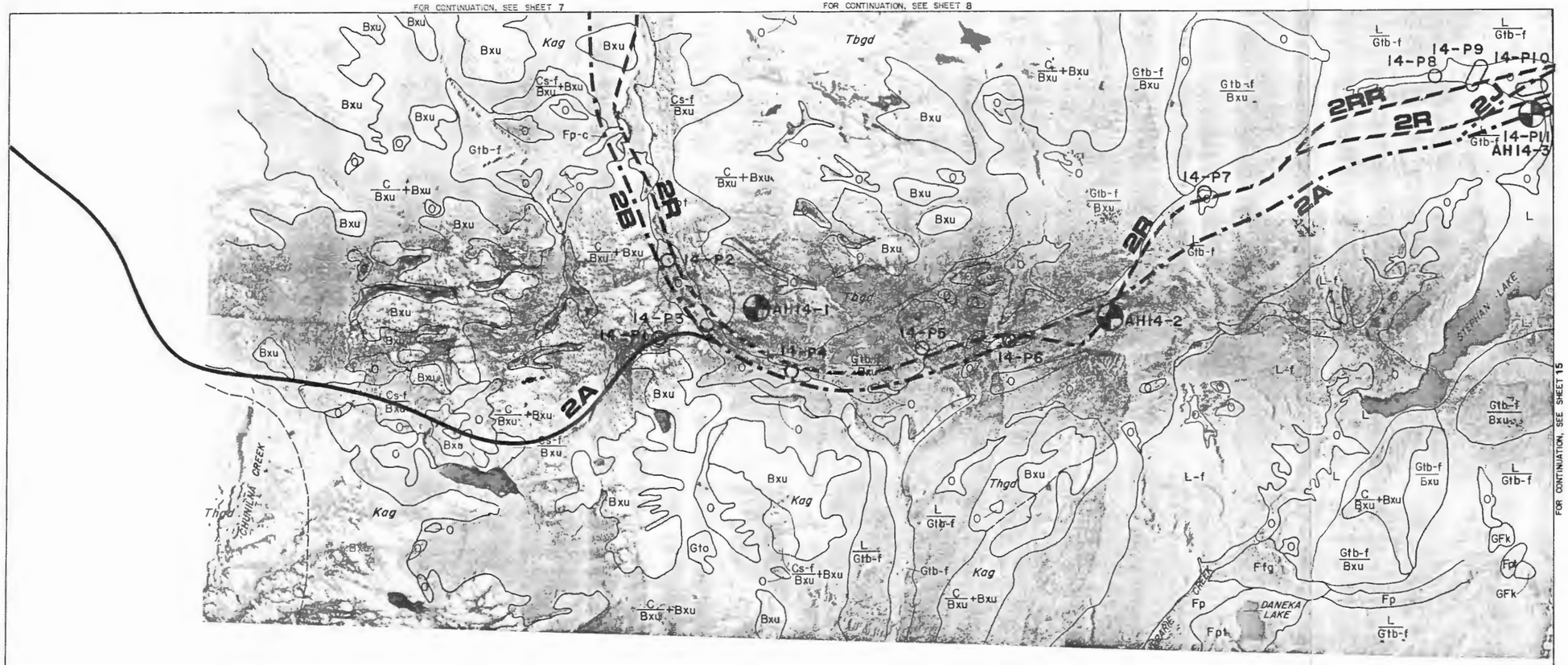
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE | DEPARTMENT | DRAWING NO. | REV. | PROJECT 052502 | SHEET 9 OF 21

FOR CONTINUATION, SEE SHEET 7

FOR CONTINUATION, SEE SHEET 8



FOR CONTINUATION, SEE SHEET 15

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu +Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw +Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 · SCALE · DEPARTMENT · DRAWING NO. · REV. · PROJECT 052502 · SHEET 14 OF 21

FOR CONTINUATION SEE SHEET 8

FOR CONTINUATION, SEE SHEET 9

FOR CONTINUATION, SEE SHEET 14

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L/Gta	Lacustrine sediments over ablation till
L/Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f/Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f/Gta	Solifluction deposits (frozen) over ablation till
Cs-f/Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f/Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f/Bxu	Frozen basal till over bedrock
Gta/Bxu	Ablation till over unweathered bedrock
C/Bxu+Bxu	Colluvium over bedrock and bedrock exposures
C/Bxw+Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	*Tv*	*Tsu*	*Tbgd*	*Tsmg*	*TKgr*	*Jam (Jtr)(Jgd)*	*Trv*	*Pzv (Pls)*	*Kag*	*Trvs*
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sand-stone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of green-schist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic meta-volcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp — Slide Scar — Buried Channel — Trail — Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

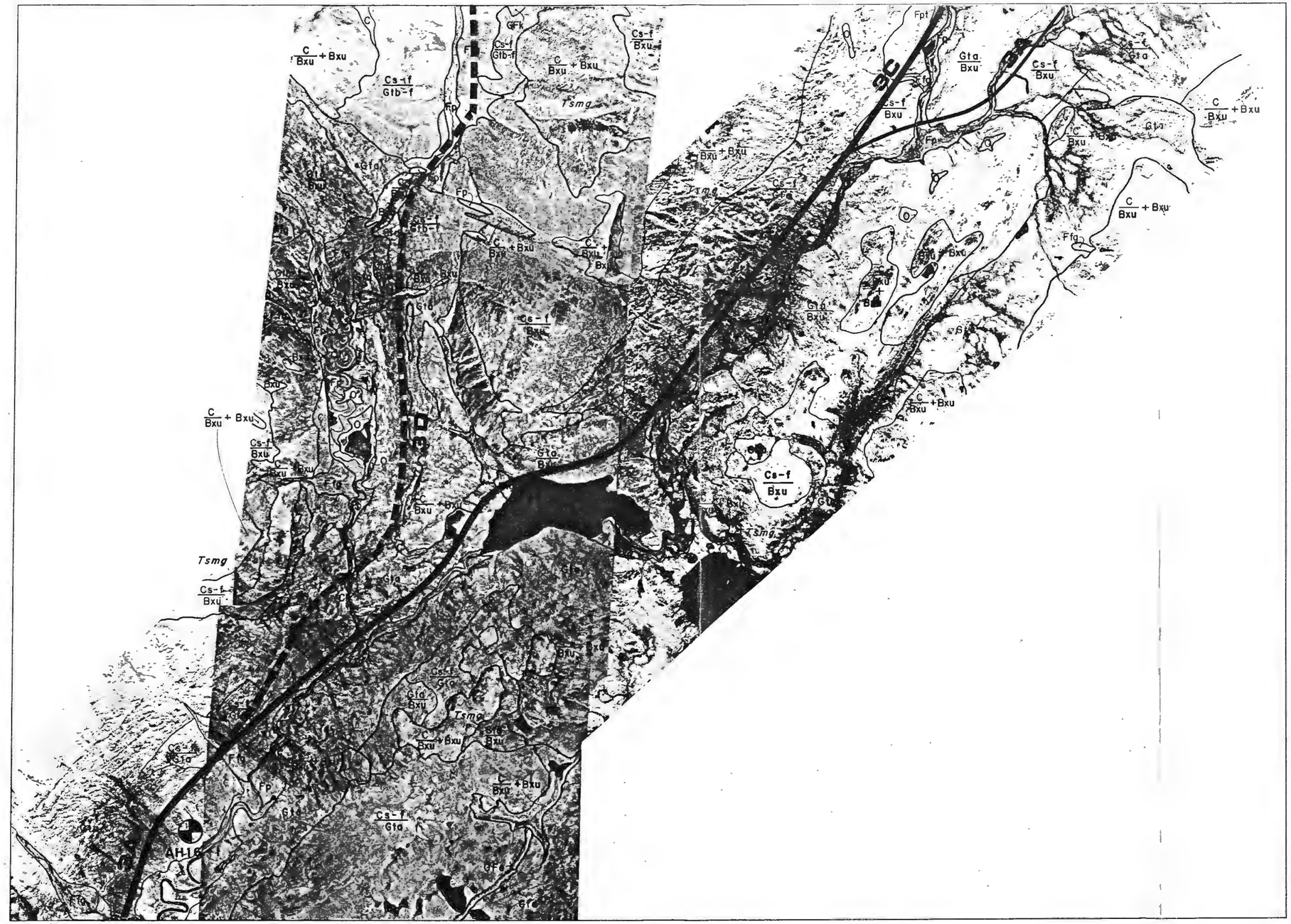
SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE | DEPARTMENT | DRAWING NO. | PROJECT 052502 | SHEET 15 OF 21 | REV.



TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide deposits
Cs-f	Solifluction deposits
Ca+Ff	Avalanche and Fan deposits
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Ff	Solifluction deposits over fluvial fan sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered, poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

0 .25 .5 1.0 1.5

SCALE 1:24,000

DATE	NO.	REVISIONS	CH.	APP.	APP.
11/82	1	ADDITION OF N-S FLIGHT LINE & MINOR REINTERPRETATION	LA	JMB	GS

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE AUGUST 1982 · SCALE AS SHOWN

DEPARTMENT · DRAWING NO. · REV.

PROJECT 253210 · SHEET 16 OF 22

DRAWING No. — SHEET OF — REV.

BRUNING 44-132 40873

Prepared By: NORTH PACIFIC AERIAL SURVEYS INC

FOR CONTINUATION, SEE SHEET 18

FOR CONTINUATION, SEE SHEET 16

Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu +Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw +Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local metalimestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, low grade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

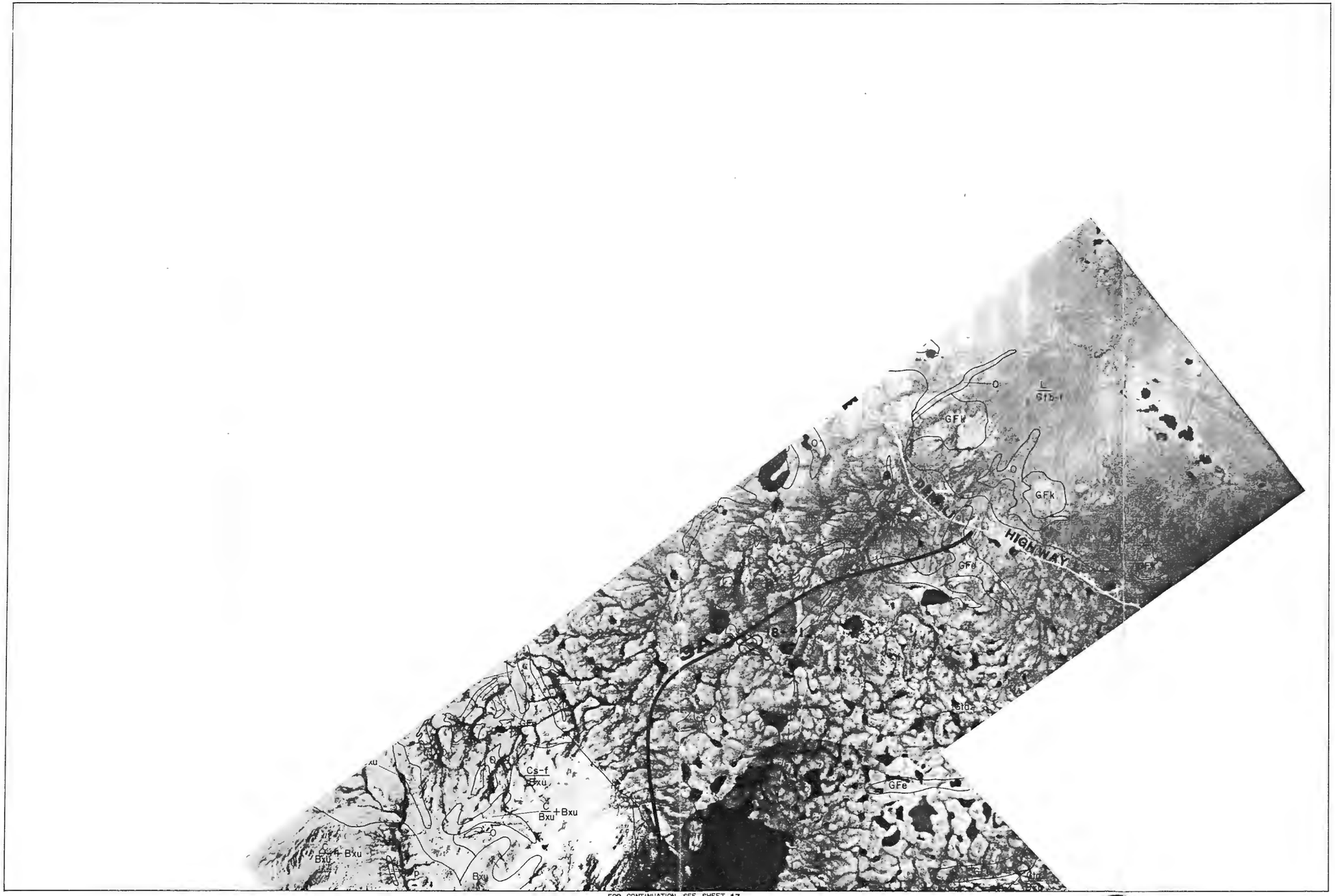
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 | SCALE

DEPARTMENT | DRAWING NO. | REV.

PROJECT 052502 | SHEET 17 OF 21



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu +Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw +Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	*Tv*	*Tsu*	*Tbgd*	*Tsmg*	*TKgr*	*Jam (Jtr)(Jgd)*	*Trv*	*Pzv (Pls)*	*Kag*	*Trvs*
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondhjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

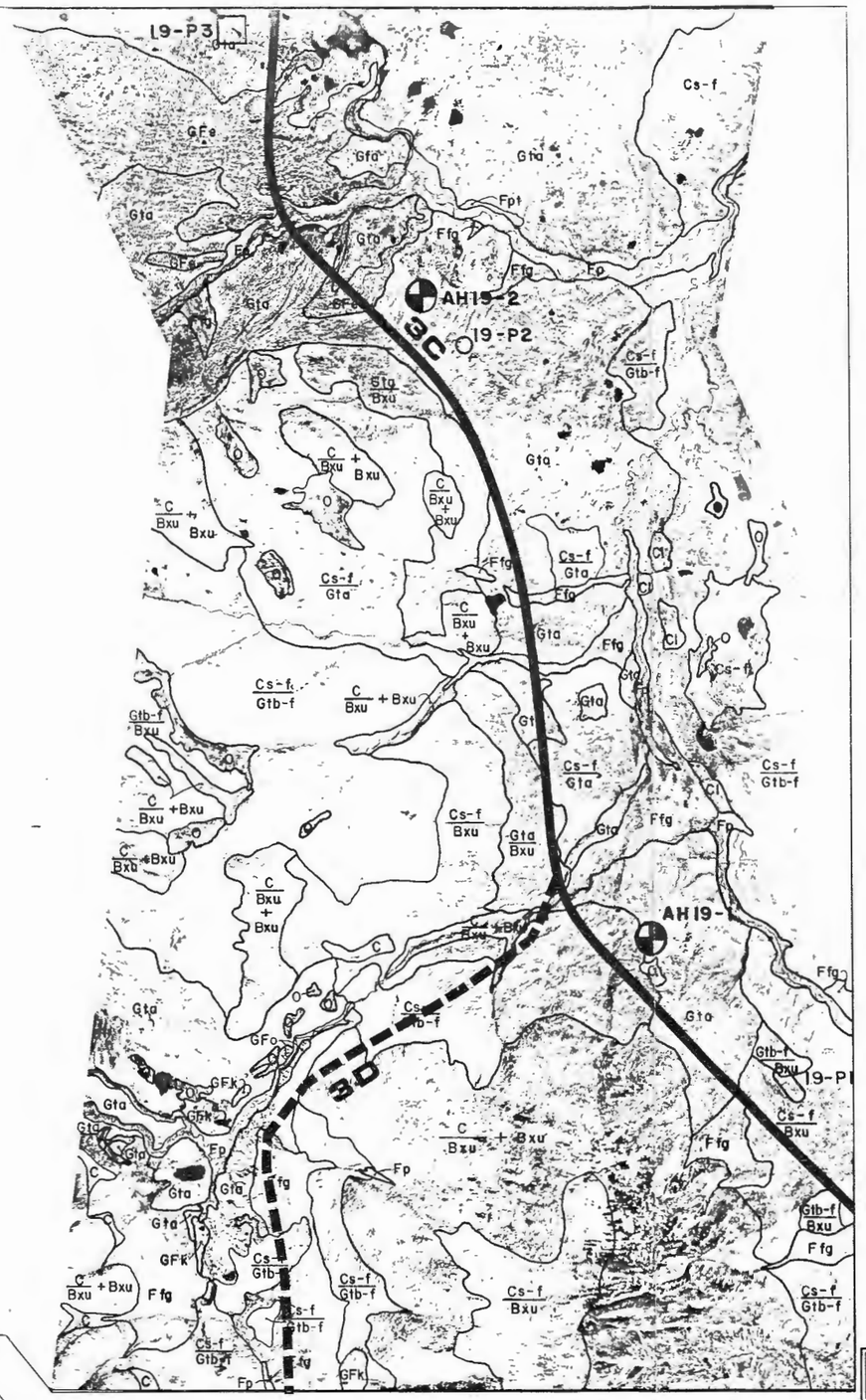
TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE APRIL 1981 · SCALE

DEPARTMENT · DRAWING NO. · REV.

PROJECT 052502 · SHEET 18 OF 21



TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide deposits
Cs-f	Solifluction deposits
Ca+Ff	Avalanche and fan deposits
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Ff	Solifluction deposits over fluvial fan sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over un-weathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered, poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marbles; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

Pzv (Pls)	Kag	Trvs
Late Paleozoic basaltic and andesitic meta-volcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

DATE	NO.	REVISIONS	CH.	APP.	APP.
11/82	1	ADDITION OF N-S FLIGHT LINE & MINOR REINTERPRETATION	LA	JMB	GS

ACRES

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE AUGUST 1982 · SCALE AS SHOWN · DEPARTMENT · PROJECT 253210 · DRAWING NO. · SHEET 19 OF 22 · REV.

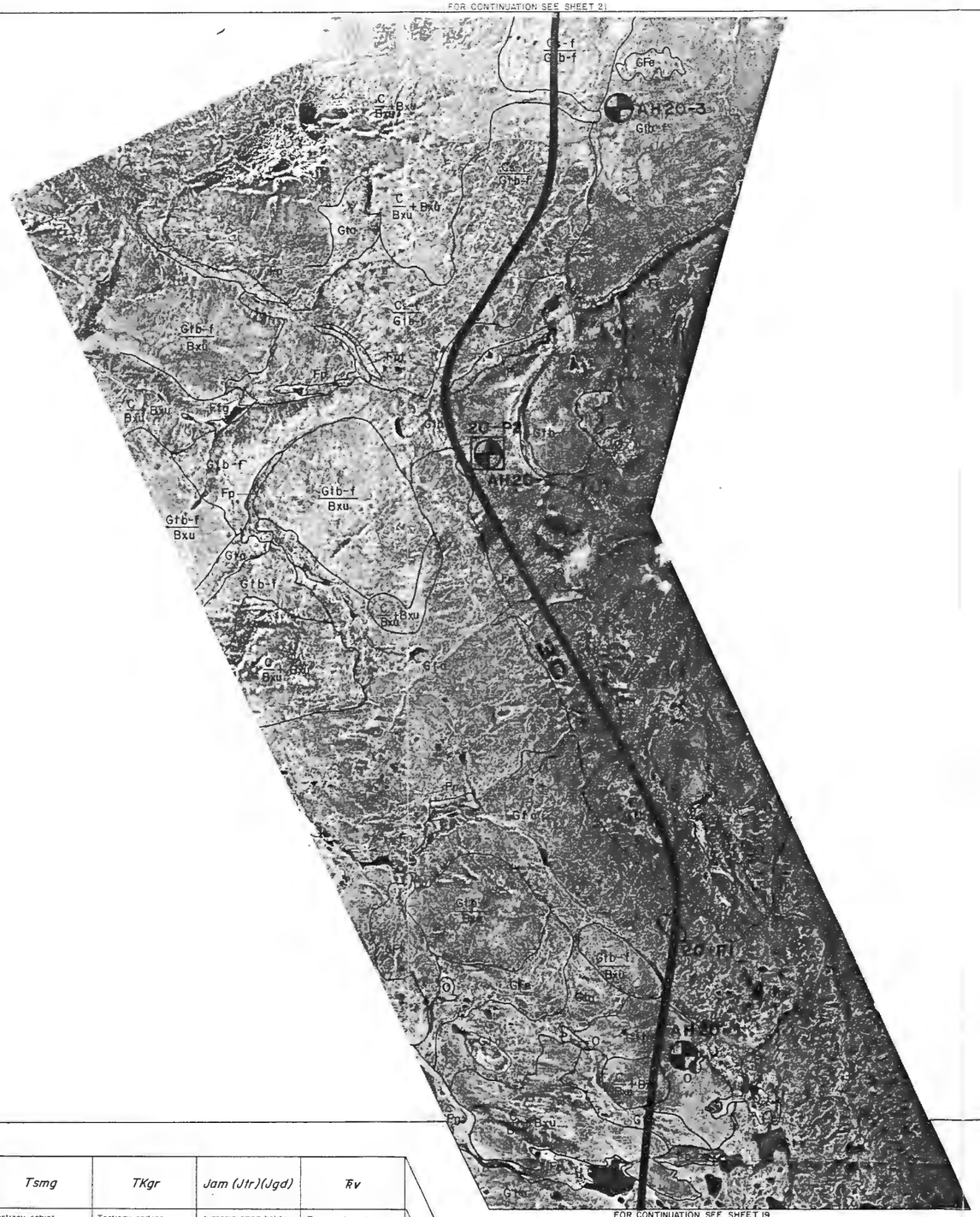
Prepared by Susitna Aerial Surveys, Inc.

DRAWING No. · SHEET OF · REV.

BRUNING 44-132 40973

APPLIED | ARCHITECTURAL | CIVIL | CONSTRUCTION | ELECTRICAL | GEOTECHNICAL | HYDRAULIC | MECHANICAL | DESIGNED | DRAWN | CHECKED

FOR CONTINUATION SEE SHEET 21



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gto	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

Pzv (Pls)	Kag	Trvs
Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local metalimestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

FOR CONTINUATION SEE SHEET 19

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP	APP.

ACRES

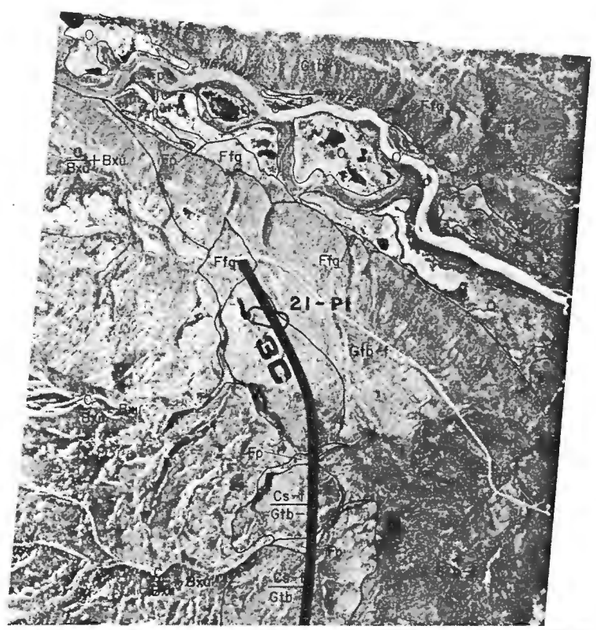
SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

DATE AUGUST 1981	SCALE
DEPARTMENT	DRAWING NO. 20 21
PROJECT 052502	SHEET OF

REV.



Terrain Unit Symbol	Terrain Unit Name
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide
Cs-f	Solifluction deposits (frozen)
Ffg	Granular alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till (frozen)
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered or poorly consolidated bedrock

FOR CONTINUATION SEE SHEET 20

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks; conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite; local hornblende granodiorite (Thgd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondjemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism.	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp Slide Scar Buried Channel Trail Rock Contact

SCALE 0 2000 4000 FEET

DATE	NO.	REVISIONS	CH.	APP.	APP.

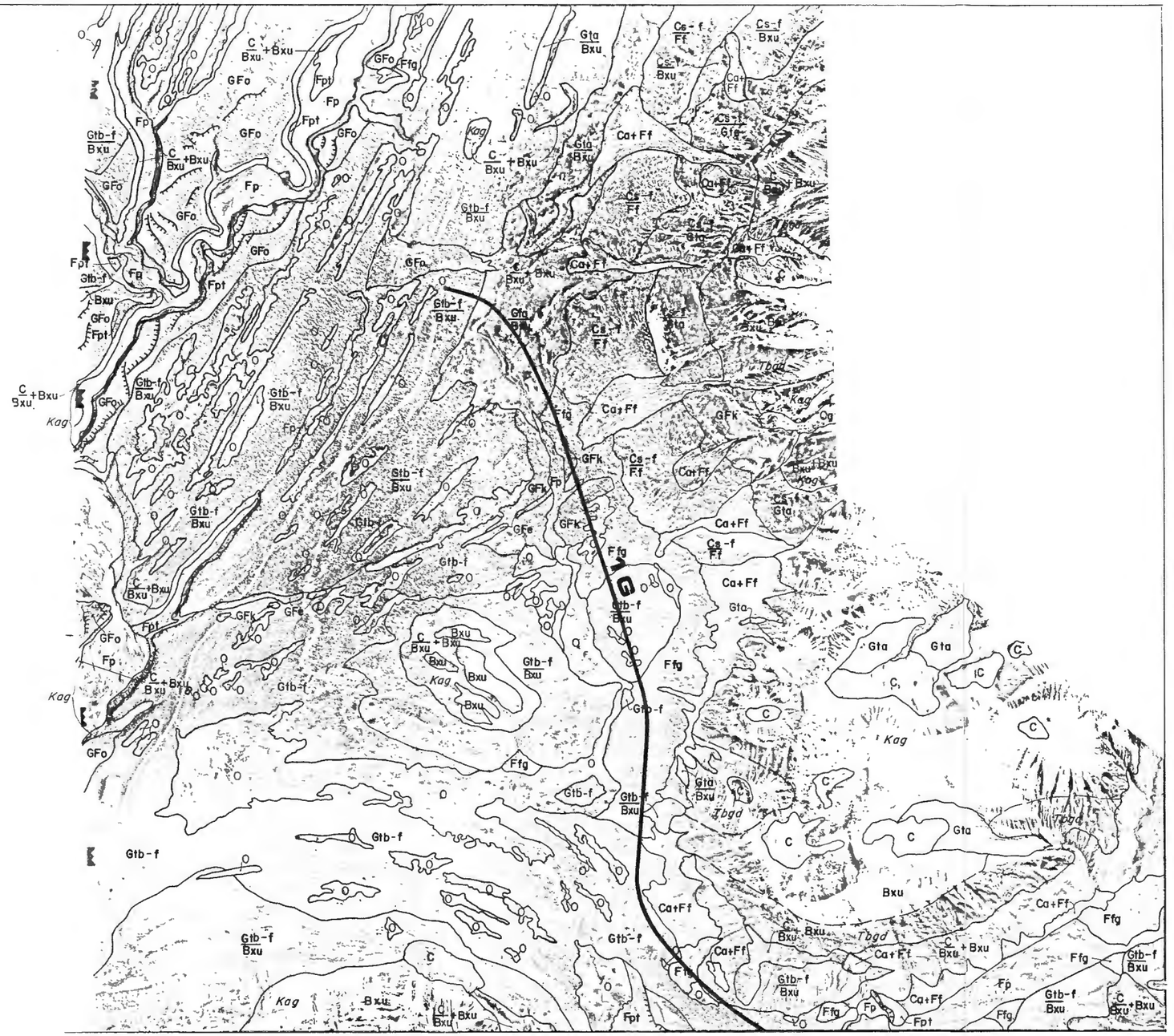
ACRES

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

DATE AUGUST 1981		SCALE	
DEPARTMENT		DRAWING NO. 21 21	REV.
PROJECT 052502		SHEET OF	



TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME
Bxu	Unweathered, consolidated bedrock
C	Colluvial deposits
Cl	Landslide deposits
Cs-f	Solifluction deposits
Ca+Ff	Avalanche and Fan deposits
Ffg	Granulac alluvial fan
Fp	Floodplain deposits
Fpt	Terrace
GFo	Outwash deposits
GFe	Esker deposits
GFk	Kame deposits
Gta	Ablation till
Gtb-f	Basal till (frozen)
O	Organic deposits
L-f	Lacustrines (frozen)
L / Gta	Lacustrine sediments over ablation till
L / Gtb-f	Lacustrine deposits over basal till
Cs-f / Gtb-f	Solifluction deposits (frozen) over basal till (frozen)
Cs-f / Gta	Solifluction deposits (frozen) over ablation till
Cs-f / Fpt	Solifluction deposits (frozen) over terrace sediments
Cs-f / Ff	Solifluction deposits over fluvial fan sediments
Cs-f / Bxu	Solifluction deposits (frozen) over bedrock
Gtb-f / Bxu	Frozen basal till over bedrock
Gta / Bxu	Ablation till over unweathered bedrock
C / Bxu + Bxu	Colluvium over bedrock and bedrock exposures
C / Bxw + Bxw	Colluvium over weathered, poorly consolidated bedrock

Bedrock Mapping Units	Tv	Tsu	Tbgd	Tsmg	TKgr	Jam (Jtr)(Jgd)	Trv	Pzv (Pls)	Kag	Trvs
Abbreviated Descriptions	Tertiary Volcanic rocks; shallow intrusives, flows, and pyroclastics; rhyolitic to basaltic.	Tertiary non-marine sedimentary rocks: conglomerate, sandstone, and claystone.	Tertiary biotite granodiorite: local hornblende granodiorite (Tngd).	Tertiary schist, migmatite and granite, representing the roof of a large stock.	Tertiary and/or Cretaceous granitics forming small plutons.	Jurassic amphibolite, inclusions of greenschist & marble; local trondiemite (Jtr) and granodiorite (Jgd).	Triassic basaltic metavolcanic rocks formed in shallow marine environment.	Late Paleozoic basaltic and andesitic metavolcanogenic rocks, local meta-limestone (Pls).	Cretaceous argillite and graywacke, of a thick deformed turbidite sequence, lowgrade metamorphism	Triassic metabasalt and slate, an interbedded shallow marine sequence.

Miscellaneous Map Symbols

Scarp · Slide Scar · Buried Channel · Trail · Rock Contact

0 .25 5 1.0 1.5

SCALE 1: 24,000

DATE	NO.	REVISIONS	CH.	APP.	APP.
9-30-82	A	PROPOSED ACCESS PLAN			

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUBTASK 5.02

PHOTO INTERPRETATION

TERRAIN UNIT MAPS

R&M CONSULTANTS, INC.

DATE AUGUST 1982 · SCALE AS SHOWN

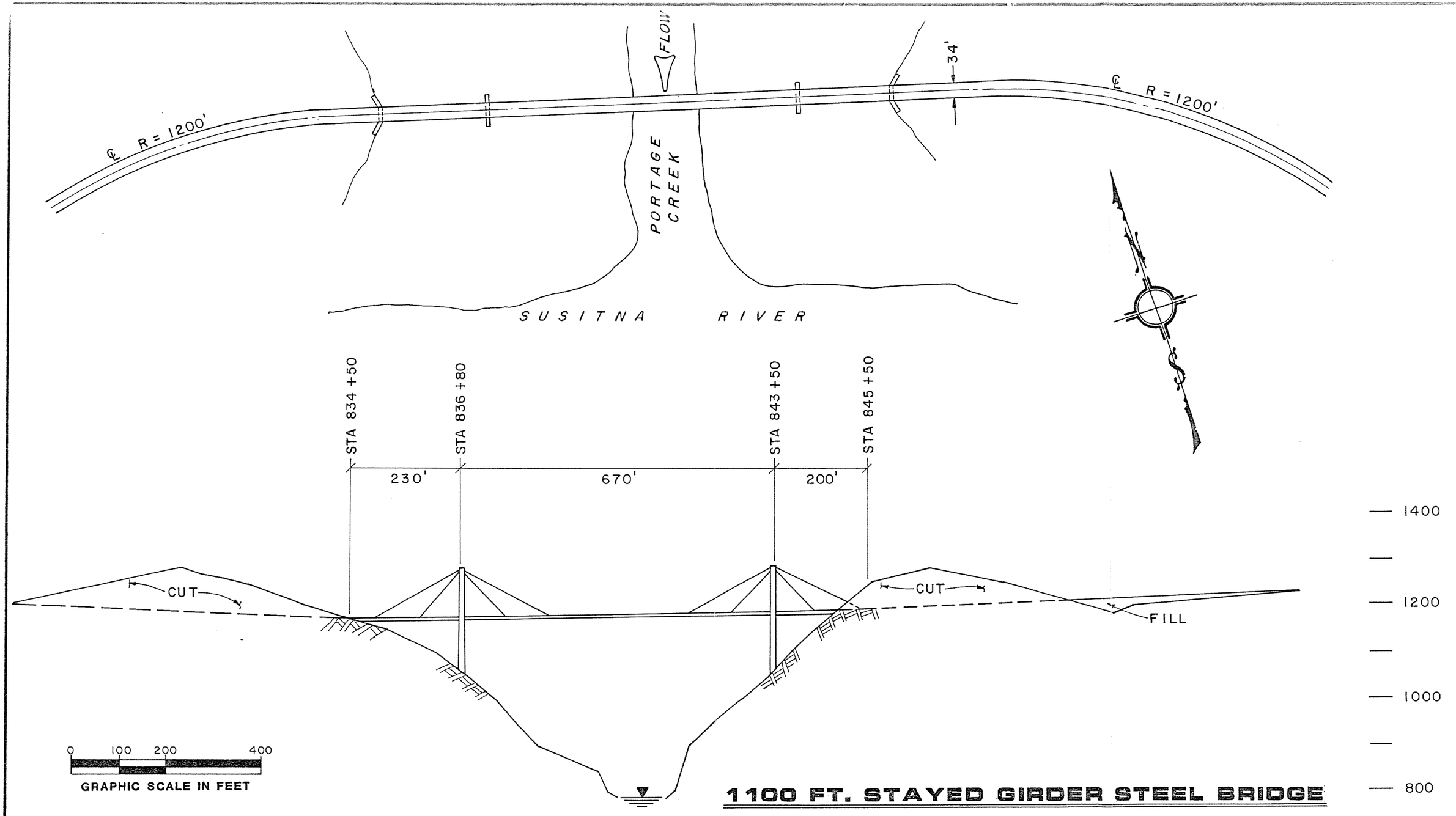
DEPARTMENT · DRAWING NO. · REV.

PROJECT 252510 · SHEET 22 OF 22

DRAWING No. · SHEET OF · REV.

BRUNING 44-132 40973

APPLIED | ARCHITECTURAL | CIVIL | CONSTRUCTION | ELECTRICAL | GEOTECHNICAL | HYDRAULIC | MECHANICAL | DESIGNED | DRAWN | CHECKED



1100 FT. STAYED GIRDER STEEL BRIDGE

PREPARED BY:

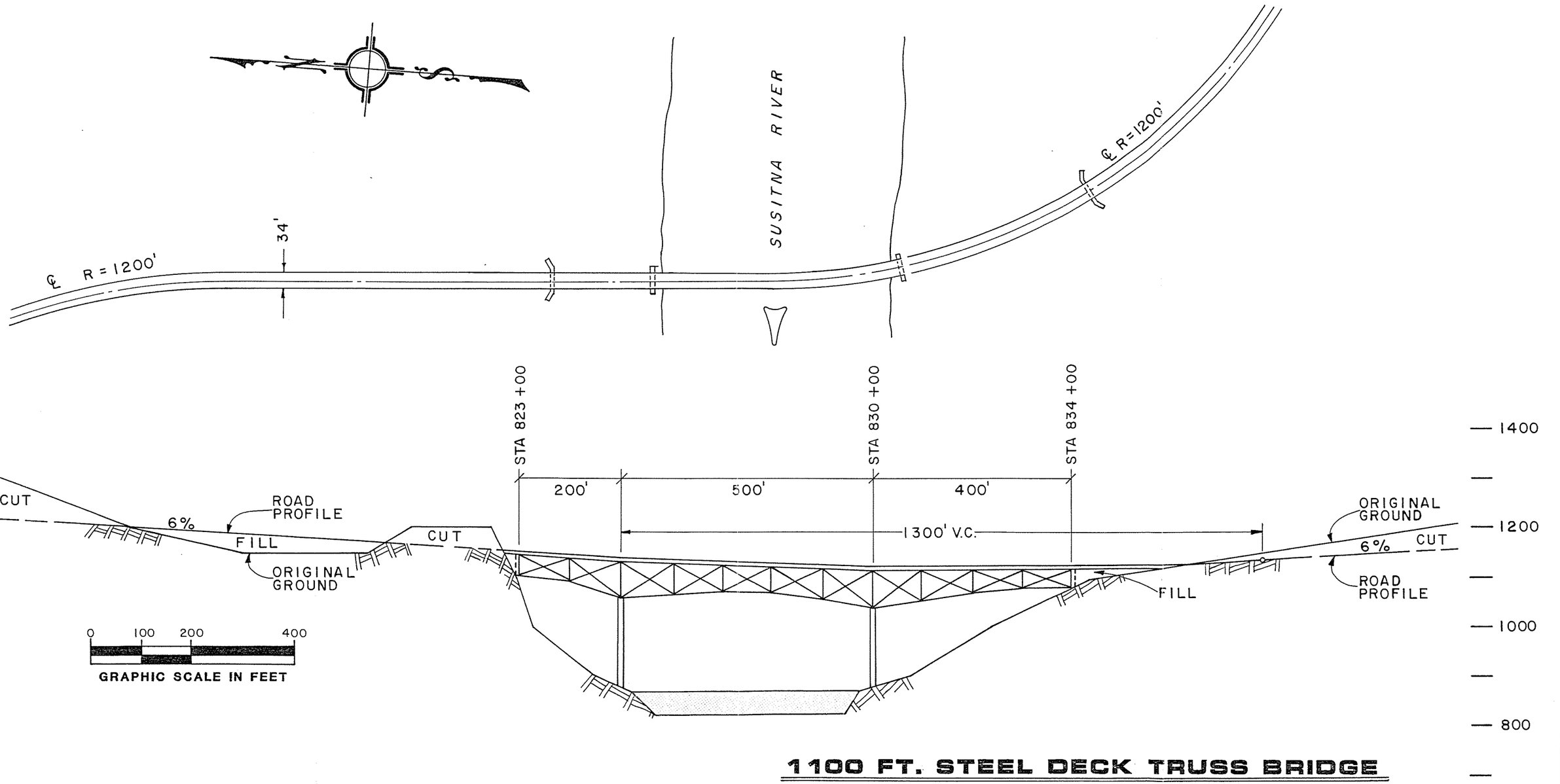
R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

PORTAGE CREEK BRIDGE AT SUSITNA RIVER

FIGURE F.5.8



1100 FT. STEEL DECK TRUSS BRIDGE

PREPARED BY:

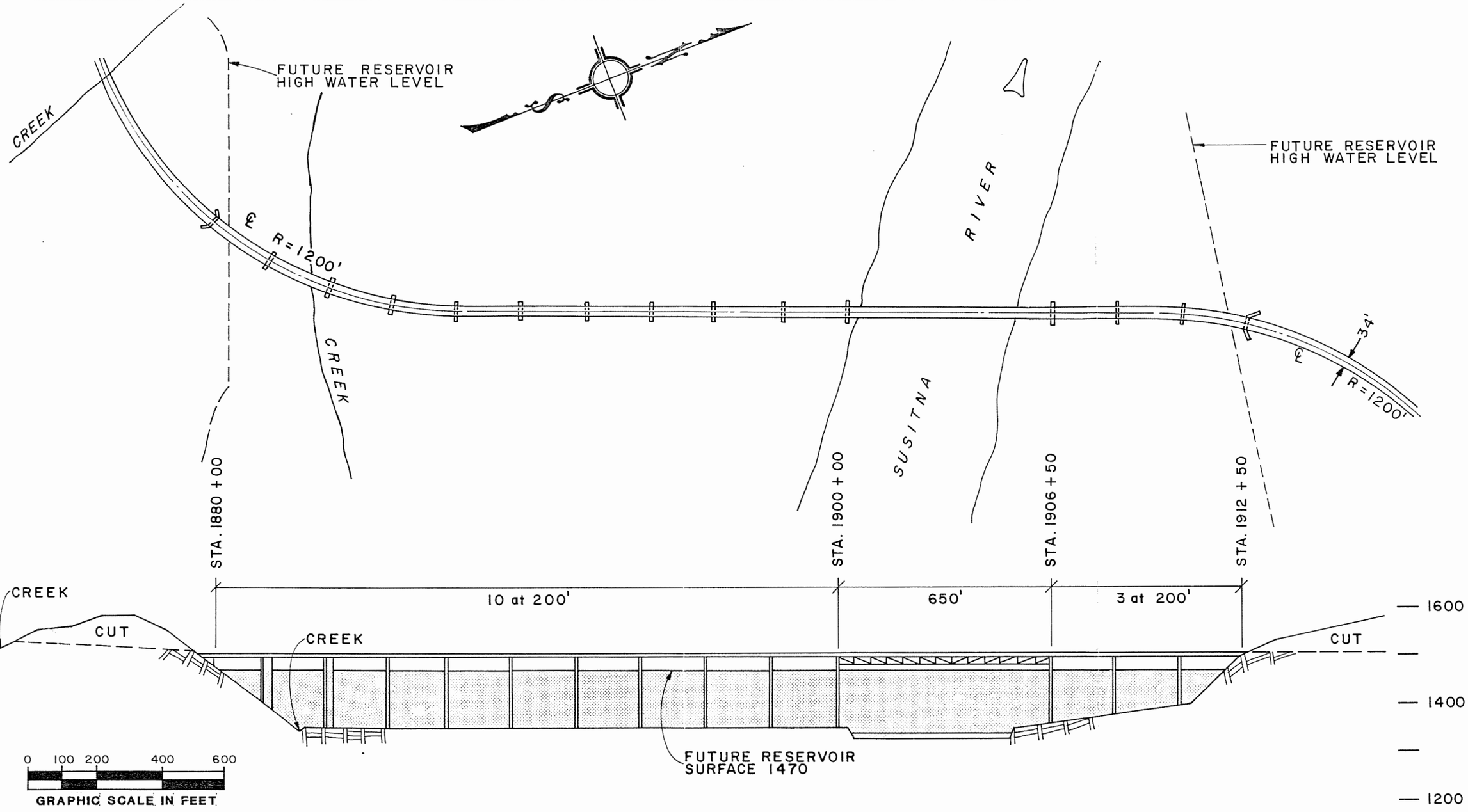
R&M CONSULTANTS, INC.

SUSITNA RIVER BRIDGE WEST OF PORTAGE CREEK

PREPARED FOR:

ACRES

FIGURE F.5.9



650 FT. STEEL TRUSS & 2600 FT. PLATE GIRDER BRIDGE

PREPARED BY:

R&M CONSULTANTS, INC.

PREPARED FOR:

SUSITNA RIVER BRIDGE SOUTHWEST OF FOG CREEK

FIGURE F.5.10

ACRES

SUPPLEMENT TO
TABLE F-7.1
CULVERTS (in lineal feet)

Size Dia.	A-3 L.F.	A-4 L.F.	A-5 L.F.	A-6 L.F.	A-7 L.F.	A-8 L.F.	B-4 L.F.	B-6 L.F.	B-7 L.F.	R-3 L.F.	C-3 L.F.	C-4 L.F.
18"	6,375	2,975	4,420	5,015	24,395	10,625	3,485	24,565	27,540	2,850	23,720	26,350
36"	400	600				500	100	300	400		100	100
42"			100	100	300	200	100	300			400	300
48"	100	100			200	100	100	100	200		600	500
54"	100	100			200	100	100	200	200	200	200	200
60"	200	200			500	200		400	200		200	300
72"					100			100	100		100	300
84"					200			400	200		200	200
96"					400			100	100		100	100
108"					200			100	100	100	200	200
120"											100	200
144"					100							
168"											100	

WATANA LOGISTIC BREAKDOWN
SUPPLEMENT TO TABLE F-10.1

	Tons	Cost $/Ton Mi	Rail Road: 18 Mi. Gold Creek To Hurricane	Rail Road: 7 Mi. Gold Creek To Spur End
Const. Equipment	16,000	0.1878	$ 54,086	$ 21,034
Explosive	20,000	0.6267	225,612	87,738
Cement	350,000	0.1565	985,950	383,425
Rein. Steel	33,000	0.2577	153,074	59,529
Rock Bolts	12,500	0.2577	57,983	22,549
Steel Support	3,600	0.2577	16,699	6,494
Mech., str., elc. equip.	15,000	0.1262	34,074	13,251
Constr. Fuel	300,000	0.1450	783,000	304,500
Camp Fuel	51,000	0.1450	133,110	51,765
Tires & Parts	21,800	0.1878	73,693	28,658
Camp Supplies	74,600	0.1262	169,461	65,902
Village	1,400	0.1262	3,180	1,237
Contingency & Misc.	196,600	0.1262	446,597	173,676
	1,095,500		$3,136,519	$1,219,758
			23	24

DEVIL CANYON LOGISTIC BREAKDOWN
SUPPLEMENT TO TABLE F-10.2

	Tons	Cost $/Ton Mi	Rail Road 18 Mi. Gold Creek To Hurricane	Rail Road 7 Mi. Gold Creek To Spur End	Rail Road 14 Mi. Gold Creek to Devil Canyon Camp
Const. Equipment	5,000	0.1878	$ 16,902	$ 6,573	$ 13,146
Explosive	3,000	0.6267	33,842	13,161	26,321
Cement	650,000	0.1565	1,831,050	712,075	1,424,150
Rein. Steel	22,000	0.2577	102,049	39,686	79,372
Rock Bolts	3,000	0.2577	13,916	5,412	10,823
Steel Support	2,200	0.2577	10,205	3,969	7,937
Mech., str., elc. equip.	13,500	0.1262	30,667	11,926	23,852
Constr. Fuel	68,000	0.1450	177,480	69,020	138,040
Camp Fuel	30,000	0.1450	78,300	30,450	60,900
Tires & Parts	18,700	0.1878	63,213	24,583	49,166
Camp Supplies	44,000	0.1262	99,950	38,870	77,739
Village	1,300	0.1262	2,953	1,148	2,297
Contingency & Misc.	205,900	0.1262	467,722	181,892	363,784
	1,066,600		$2,928,249	$1,138,765	$2,277,527
			25	26	35

r35/b4

Supplement

ROAD HAUL SEGMENT COSTS
SUPPLEMENT TO F.10-3

Item	Tons	$/Ton Mi Rate	#12 Hurricane to Devil 26 Mi	#12 Hurricane to Watana 59 Mi	#13 Hurricane to Devil 18 Mi	#13 Hurricane to Watana 52 Mi	#14 & 15 RR Spur to Devil 6 Mi	#14, 15 & 16 Devil to Watana 41 Mi	#17, 17A, & 18 Cantwell to Watana 61 Mi
All Watana	1,095,500	0.2069	-	13,372,878	-	11,786,265	1,359,954	9,293,017	13,826,196
				27		28	29	30	31
All Devil	1,066,600	0.2069	5,737,668	-	3,972,232	-	1,324,077	-	-
			32		33		34		

LOGISTICS TOTAL
SUPPLEMENT TO TABLE F.10-4

Plan 12:	Use: Water: 1, 2, 8, 9	$134,388,000
	Rail to Hurricane: 3, 4, 10, 11, 23, 25	72,587,341
	Truck to Dams: 27, 32	19,110,546
	TOTAL	$226,085,887
Plan 13:	Use: Water: 1, 2, 8, 9	$134,388,000
	Rail to Hurricane: 3, 4, 10, 11, 23, 25	72,587,341
	Truck to Dams: 28, 33	15,758,497
	TOTAL	$222,733,838
Plan 14 & 15:	Use: Water: 1, 2, 8, 9	$134,388,000
	Rail to Spur End: 3, 4, 10, 11, 24, 26	68,881,096
	Truck to Dams: 29, 30, 34	11,977,048
	TOTAL	$215,246,144
Plan 16:	Use: Water: 1, 2, 8, 9	$134,388,000
	Rail to Gold Creek: 3, 4, 10, 11	66,522,573
	Truck to Dams: 15, 19, 30	14,661,078
	TOTAL	$215,571,651
Plan 17, 17A & 18:	Use: Water: 1, 2, 8, 9	$134,388,000
	Rail to Gold Creek: 3, 4, 10, 11	66,522,573
	Rail to Cantwell: 7	9,758,058
	Truck to Watana from Cantwell: 31	13,826,196
	Rail to Devil from Gold Creek: 35	2,277,527
	TOTAL	$226,772,354

COST ESTIMATE ITEMIZATION

Supplement

Plans 11R to 18

t/y1

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.11	Pioneer Roads				
.114	Gold Creek to Watana -South A-2 Road (41.25 Mi)				
	Clearing	369	AC	$5,760.00	$2,125,440.00
	Waste Excavation	855,321	CY	4.80	4,105,540.80
	Common Excavation	619,500	CY	4.20	2,601,900.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	0	CY	6.00	0.00
	18" Culverts	9,200	LF	28.80	264,960.00
	36" + Culverts	-	LS	114,960.00	114,960.00
	Bridges	0	SF	0.00	0.00
	D-1 Base Material	222,640	TON	21.60	4,809,024.00
	Fabric	14,946	SY	3.00	44,838.00
				TOTAL	$14,066,662.80
	Maintenence	83	Mile-Years	$4,000.00	$332,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.115	Denali to Watana C Road (44.32 Mi)				
	Clearing	0	AC	$5,760.00	$0.00
	Waste Excavation	0	CY	4.80	0.00
	Common Excavation	0	CY	4.20	0.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	0	CY	6.00	0.00
	18" Culverts	0	LF	28.80	0.00
	36" + Culverts	0	LS	0.00	0.00
	Bridges	0	SF	0.00	0.00
	D-1 Base Material	0	TON	21.60	0.00
	Fabric	0	SY	3.00	0.00
				TOTAL	$0.00
	Maintenence	0	Mile-Years	$0.00	$0.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.118	Devil Canyon Low Level Crossing H Road (7.88 Mi)				
	Clearing	170	AC	$ 5,760.00	$ 979,200.00
	Waste Excavation	498,845	CY	4.80	2,394,456.00
	Common Excavation	549,417	CY	4.20	2,307,551.40
	Rock Excavation	749,641	CY	14.40	10,794,830.40
	Borrow	0	CY	6.00	0.00
	18" Culverts	5,100	LF	28.80	146,880.00
	36" + Culverts	-	LS	0.00	0.00
	Bridges	12,480	SF	180.00	2,246,400.00
	D-1 Base Material	36,966	TON	21.60	798,465.60
	Fabric	0	SY	3.00	0.00
				TOTAL	$19,667,783.40
	Maintenence	55	Mile-Years	$5,000.00	$275,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.12	Permanent Roads & Bridges				
.124	Watana to Devil Canyon - North, Road A-2, (41.25 Mi)				
	Clearing	207	AC	$ 5,760.00	$ 1,192,320.00
	Waste Excavation	681,179	CY	4.80	3,269,659.20
	Common Excavation	984,473	CY	4.20	4,134,786.60
	Rock Excavation	146,527	CY	14.40	2,109,988.80
	Borrow	73,145	CY	6.00	438,870.00
	NFS Subbase Material	424,710	CY	8.40	3,567,564.00
	Grade "A" Base Material	231,739	CY	16.80	3,893,215.20
	D-1 Base Material	96,704	TON	21.60	2,088,806.40
	A.C. Surfacing	88,557	TON	79.20	7,013,714.40
	Guardrail	6,050	LF	43.20	261,360.00
	18" Culverts	13,840	LF	28.80	398,592.00
	36" + Culverts	-	LS	179,040.00	179,040.00
	Fabric	34,874	SY	3.00	104,622.00
	Thaw Pipes	24,435	LF	43.20	1,055,592.00
	Topsoil & Seed	326	AC	3,600.00	1,173,600.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$31,619,730.60
	Maintenence	206	Mile-Years	$10,000.00	$2,060,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.125	Denali to Watana Road C, (44.32 Mi) (Plus 21.00 Mi)				
	Clearing	800	AC	$ 5,760.00	$ 4,608,000.00
	Waste Excavation	2,245,400	CY	4.80	10,777,920.00
	Common Excavation	2,450,800	CY	4.20	10,293,360.00
	Rock Excavation	41,800	CY	14.40	601,920.00
	Borrow	20,000	CY	6.00	120,000.00
	NFS Subbase Material	470,000	CY	8.40	3,948,000.00
	Grade "A" Base Material	300,000	CY	16.80	5,040,000.00
	D-1 Base Material	162,500	TON	21.60	3,510,000.00
	A.C. Surfacing	148,813	TON	79.20	11,785,989.60
	Guardrail	4,200	LF	43.20	181,440.00
	18" Culverts	30,350	LF	28.80	874,080.00
	36" + Culverts	-	LS	468,120.00	468,120.00
	Fabric	12,907	SY	3.00	38,721.00
	Thaw Pipes	28,750	LF	43.20	1,242,000.00
	Topsoil & Seed	514	AC	3,600.00	1,850,400.00
	Traffic Control Devices	69	MI	18,000.00	1,242,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$56,581,950.60
	Maintenence	980	Mile-Years	$8,000.00	$7,840,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11.R336	ROAD & RAIL FACILITIES				
.128	Devil Canyon Trans-Dam Crossing, Road D, (7.26 Mi)				
	Clearing	45	AC	$ 5,760.00	$ 259,200.00
	Waste Excavation	132,300	CY	4.80	635,040.00
	Common Excavation	114,500	CY	4.20	480,900.00
	Rock Excavation	12,200	CY	14.40	175,680.00
	Borrow	90,200	CY	6.00	541,200.00
	NFS Subbase Material	27,960	CY	8.40	234,864.00
	Grade "A" Base Material	15,260	CY	16.80	256,368.00
	D-1 Base Material	6,370	TON	21.60	137,592.00
	A.C. Surfacing	5,830	TON	79.20	461,736.00
	Guardrail	2,640	LF	43.20	114,048.00
	18" Culverts	1,785	LF	28.80	51,408.00
	36" + Culverts	-	LS	30,744.00	0.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	1,785	LF	43.20	77,112.00
	Topsoil & Seed	29	AC	3,600.00	104,400.00
	Traffic Control Devices	3	MI	18,000.00	54,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$3,583,548.00
	Maintenence	7	Mile-Years	$13,000.00	$91,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.336	ROAD & RAIL FACILITIES				
.2	Rail Facilities				
.22	Railheads				
.221	Railhead - Cantwell				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	Ton	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	15	Year	$28,600.00	$429,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
11R.63	CAMP				
.1	Camp				
.11	Pioneer Road Camp				
	Camp Facilities	-	LS	$588,000.00	$ 588,000.00
	Catering & Operation Support	70,980	Manday	39.40	2,796,612.00
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	975,000.00	975,000.00
	Catering & Operation Support	225,240	Manday	39.10	8,806,884.00
					$13,166,496.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.14 Permanent Road				
	.141 Hurricane to Indian River Road A-3, (11 Mi)				
	Clearing	184	AC	$ 5,760.00	$1,059,840.00
	Waste Excavation	506,450	CY	4.80	2,430,960.00
	Common Excavation	462,500	CY	4.20	1,942,500.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	258,600	CY	6.00	1,551,600.00
	NFS Subbase Material	113,256	CY	8.40	951,350.40
	Grade "A" Base Material	61,797	CY	16.80	1,038,189.60
	D-1 Base Material	12,894	TON	21.60	278,510.40
	A.C. Surfacing	23,615	TON	79.20	1,870,308.00
	Guardrail	10,800	LF	43.20	466,560.00
	18" Culverts	6,375	LF	28.80	183,600.00
	36" + Culverts	-	LS	70,800.00	70,800.00
	Fabric	26,890	SY	3.00	80,670.00
	Thaw Pipes	7,175	LF	43.20	309,960.00
	Topsoil & Seed	117	AC	3,600.00	421,200.00
	Traffic Control Devices	11	MI	18,000.00	198,000.00
	Bridges	6120	SF	180.00	1,101,600.00
				TOTAL	$13,955,648.40
	Maintenence	165	Mile-Years	13,000.00	$2,145,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.336	ROAD & RAIL FACILITIES				
.143	Indian River to Devil Canyon-North Road A-5, (7 Mi)				
	Clearing	108	AC	$ 5,760.00	$ 622,080.00
	Waste Excavation	293,400	CY	4.80	1,408,320.00
	Common Excavation	237,850	CY	4.20	998,970.00
	Rock Excavation	26,250	CY	14.40	378,000.00
	Borrow	262,500	CY	6.00	1,575,000.00
	NFS Subbase Material	72,072	CY	8.40	605,404.80
	Grade "A" Base Material	39,325	CY	16.80	660,660.00
	D-1 Base Material	8,205	TON	21.60	177,228.00
	A.C. Surfacing	15,028	TON	79.20	1,190,217.60
	Guardrail	5,600	LF	43.20	241,920.00
	18" Culverts	4420	LF	28.80	127,296.00
	36" + Culverts	-	LS	6,600.00	6,600.00
	Fabric	7,330	SY	3.00	21,990.00
	Thaw Pipes	4,320	LF	43.20	186,624.00
	Topsoil & Seed	66	AC	3,600.00	237,600.00
	Traffic Control Devices	7	MI	18,000.00	126,000.00
	Bridges	37,400	SF	180.00	6,732,000.00
				TOTAL	$15,295,910.40
	Maintenence	105	Mile-Years	13,000.00	$1,365,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.336	ROAD & RAIL FACILITIES				
.154	Devil Canyon to Watana - North Road A-2, (41 Mi)				
	Clearing	576	AC	$ 5,760.00	$3,317,760.00
	Waste Excavation	1,536,500	CY	4.80	7,375,200.00
	Common Excavation	1,603,973	CY	4.20	6,736,686.60
	Rock Excavation	146,527	CY	14.40	2,109,988.80
	Borrow	156,700	CY	6.00	940,200.00
	NFS Subbase Material	424,710	CY	8.40	3,567,564.00
	Grade "A" Base Material	231,739	CY	16.80	3,893,215.20
	D-1 Base Material	96,704	TON	21.60	2,088,806.40
	A.C. Surfacing	88,557	TON	79.20	7,013,714.40
	Guardrail	6,050	LF	43.20	261,360.00
	18" Culverts	23,040	LF	28.80	663,552.00
	36" + Culverts	-	LS	294,000.00	294,000.00
	Fabric	49,820	SY	3.00	149,460.00
	Thaw Pipes	24,435	LF	43.20	1,055,592.00
	Topsoil & Seed	326	AC	3,600.00	1,173,600.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$41,378,699.40
	Maintenence	328	Mile-Years	10,000.00	$3,280,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.336	ROAD & RAIL FACILITIES				
	.17 Semi-Permanent Roads				
	.178 Low Level Crossing				
	Road H, (8 Mi)				
	Clearing	170	AC	$ 5,760.00	$ 979,200.00
	Waste Excavation	498,845	CY	4.80	2,394,456.00
	Common Excavation	549,417	CY	4.20	2,307,551.00
	Rock Excavation	749,641	CY	14.40	10,794,830.40
	Borrow	0	CY	6.00	0.00
	NFS Subbase Material	0	CY	8.40	0.00
	Grade "A" Base Material	0	CY	16.80	0.00
	D-1 Base Material	36,966	TON	21.60	798,465.60
	A.C. Surfacing	0	TON	79.20	0.00
	Guardrail	0	LF	43.20	0.00
	18" Culverts	5,100	LF	28.80	146,880.00
	36" + Culverts	-	LS	0.00	0.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	0	LF	43.20	0.00
	Topsoil & Seed	0	AC	3,600.00	0.00
	Traffic Control Devices	0	MI	18,000.00	0.00
	Bridges	12,480	SF	180.00	2,246,400.00
				TOTAL	$19,667,783.40
	Maintenence	56	Mile-Years	5,000.00	$280,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.25 Railheads				
	.253 Railhead at Hurricane				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	15	Year	$28,600.00	$429,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
12.63	CAMP				
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	$962,900.00	$ 962,900.00
	Catering & Operation Support	221,640	Manday	39.10	8,666,124.00
					$9,629,024.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
13.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.14 Permanent Road				
	.141 Hurricane to Indian River Road A-3, (11 Mi)				
	Clearing	184	AC	$ 5,760.00	$1,059,840.00
	Waste Excavation	506,450	CY	4.80	2,430,960.00
	Common Excavation	462,500	CY	4.20	1,942,500.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	258,600	CY	6.00	1,551,600.00
	NFS Subbase Material	113,256	CY	8.40	951,350.40
	Grade "A" Base Material	61,797	CY	16.80	1,038,189.60
	D-1 Base Material	12,894	TON	21.60	278,510.40
	A.C. Surfacing	23,615	TON	79.20	1,870,308.00
	Guardrail	10,800	LF	43.20	466,560.00
	18" Culverts	6,375	LF	28.80	183,600.00
	36" + Culverts	-	LS	70,800.00	70,800.00
	Fabric	26,890	SY	3.00	80,670.00
	Thaw Pipes	7,175	LF	43.20	309,960.00
	Topsoil & Seed	117	AC	3,600.00	421,200.00
	Traffic Control Devices	11	MI	18,000.00	198,000.00
	Bridges	6120	SF	180.00	1,101,600.00
				TOTAL	$13,955,648.40
	Maintenence	165	Mile-Years	13,000.00	$2,145,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
13.336	ROAD & RAIL FACILITIES				
.144	Indian River to Devil Canyon-South Road A-6, (7 Mi)				
	Clearing	100	AC	$ 5,760.00	$ 576,000.00
	Waste Excavation	270,990	CY	4.80	1,300,752.00
	Common Excavation	253,050	CY	4.20	1,062,810.00
	Rock Excavation	52,500	CY	14.40	756,000.00
	Borrow	156,600	CY	6.00	939,600.00
	NFS Subbase Material	72,072	CY	8.40	605,404.80
	Grade "A" Base Material	39,325	CY	16.80	660,660.00
	D-1 Base Material	8,205	TON	21.60	177,228.00
	A.C. Surfacing	15,028	TON	79.20	1,190,217.60
	Guardrail	3,600	LF	43.20	155,520.00
	18" Culverts	5,015	LF	28.80	144,432.00
	36" + Culverts	-	LS	6,600.00	6,600.00
	Fabric	7,330	SY	3.00	21,990.00
	Thaw Pipes	5,115	LF	43.20	220,968.00
	Topsoil & Seed	59	AC	3,600.00	212,400.00
	Traffic Control Devices	7	MI	18,000.00	126,000.00
	Bridges	-	LS	2,000,000.00	$ 2,000,000.00
				TOTAL	$10,156,582.40
	Maintenence	49	Mile-Years	10,000.00	$490,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
13.336	ROAD & RAIL FACILITIES				
.145	Indian River to Watana Via Upper Portage Road A-7, (41 Mi)				
	Clearing	680	AC	$ 5,760.00	$3,916,800.00
	Waste Excavation	1,874,700	CY	4.80	8,998,560.00
	Common Excavation	1,859,500	CY	4.20	7,809,900.00
	Rock Excavation	82,500	CY	14.40	1,188,000.00
	Borrow	482,400	CY	6.00	2,894,400.00
	NFS Subbase Material	422,136	CY	8.40	3,545,942.40
	Grade "A" Base Material	230,335	CY	16.80	3,869,628.00
	D-1 Base Material	48,059	TON	21.60	1,038,074.40
	A.C. Surfacing	88,020	TON	79.20	6,971,184.00
	Guardrail	25,700	LF	43.20	1,110,240.00
	18" Culverts	24,395	LF	28.80	702,576.00
	36" + Culverts	-	LS	448,560.00	448,560.00
	Fabric	39,100	SY	3.00	117,300.00
	Thaw Pipes	26,595	LF	43.20	1,148,904.00
	Topsoil & Seed	432	AC	3,600.00	1,555,200.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	37,400	SF	180.00	6,732,000.00
				TOTAL	$52,785,268.80
	Maintenence	328	Mile-Years	10,000.00	$3,280,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
13.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.25 Railheads				
	.253 Railhead at Hurricane				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	15	Year	$28,600.00	$429,900.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
13.63	CAMP				
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	$828,890.00	$828,890.00
	Catering & Operation Support	190,790	Manday	39.10	7,459,889.00
					$8,288,779.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
14.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.14 Permanent Road				
	.142 Hurricane to Gold Creek Spur Road A-4, (16 Mi)				
	Clearing	243	AC	$ 5,760.00	$1,399,680.00
	Waste Excavation	658,850	CY	4.80	3,162,480.00
	Common Excavation	585,600	CY	4.20	2,459,520.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	488,700	CY	6.00	2,932,200.00
	NFS Subbase Material	164,736	CY	8.40	1,383,782.40
	Grade "A" Base Material	89,887	CY	16.80	1,510,101.60
	D-1 Base Material	18,755	TON	21.60	405,108.00
	A.C. Surfacing	34,350	TON	79.20	2,720,520.00
	Guardrail	14,000	LF	43.20	604,800.00
	18" Culverts	2,975	LF	28.80	85,680.00
	36" + Culverts	-	LS	82,320.00	82,320.00
	Fabric	26,890	SY	3.00	80,670.00
	Thaw Pipes	3,975	LF	43.20	171,720.00
	Topsoil & Seed	146	AC	3,600.00	525,600.00
	Traffic Control Devices	16	MI	18,000.00	288,000.00
	Bridges	90,440	SF	180.00	16,279,200.00
				TOTAL	$34,091,382.00
	Maintenence	240	Mile-Years	13,000.00	$3,120,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
14.336	ROAD & RAIL FACILITIES				
.147	Gold Creek Spur to Devil Canyon Road B-4, (6 Mi)				
	Clearing	83	AC	$ 5,760.00	$ 478,080.00
	Waste Excavation	221,600	CY	4.80	1,063,680.00
	Common Excavation	180,000	CY	4.20	756,000.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	218,400	CY	6.00	1,310,400.00
	NFS Subbase Material	61,776	CY	8.40	518,918.40
	Grade "A" Base Material	33,708	CY	16.80	566,294.40
	D-1 Base Material	7,033	TON	21.60	151,912.80
	A.C. Surfacing	12,881	TON	79.20	1,020,175.20
	Guardrail	400	LF	43.20	17,280.00
	18" Culverts	3,485	LF	28.80	100,368.00
	36" + Culverts	-	LS	31,320.00	31,320.00
	Fabric	12,200	SY	3.00	36,600.00
	Thaw Pipes	3,885	LF	43.20	167,832.00
	Topsoil & Seed	47	AC	3,600.00	169,200.00
	Traffic Control Devices	6	MI	18,000.00	108,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$6,496,060.80
	Maintenence	90	Mile-Years	12,000.00	$1,080,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
14.336	ROAD & RAIL FACILITIES				
.149	Devil Canyon to Northside Watana Road B-6, (41 Mi)				
	Clearing	578	AC	$ 5,760.00	$3,329,280.00
	Waste Excavation	1,544,900	CY	4.80	7,415,520.00
	Common Excavation	1,733,400	CY	4.20	7,280,280.00
	Rock Excavation	45,000	CY	14.40	648,000.00
	Borrow	447,600	CY	6.00	2,685,600.00
	NFS Subbase Material	422,136	CY	8.40	3,545,942.40
	Grade "A" Base Material	230,335	CY	16.80	3,869,628.00
	D-1 Base Material	48,059	TON	21.60	1,038,074.40
	A.C. Surfacing	88,021	TON	79.20	6,971,263.20
	Guardrail	25,000	LF	43.20	1,080,000.00
	18" Culverts	24,565	LF	28.80	707,472.00
	36" + Culverts	-	LS	273,840.00	273,840.00
	Fabric	41,560	SY	3.00	124,680.00
	Thaw Pipes	26,565	LF	43.20	1,147,608.00
	Topsoil & Seed	330	AC	3,600.00	1,188,000.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	115,940	SF	180.00	20,869,200.00
				TOTAL	$62,912,388.00
	Maintenence	328	Mile-Years	13,000.00	$4,264,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
14.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (including Railheads)				
	.243 Gold Creek Spur Rail				
	R-3, (8 Mi)				
	Clearing	110	AC	$ 5,760.00	$ 633,600.00
	Waste Excavation	289,440	CY	4.80	1,389,312.00
	Common Excavation	670,720	CY	4.20	2,817,024.00
	Rock Excavation	2,200	CY	14.40	31,680.00
	Borrow	86,860	CY	6.00	521,160.00
	Subballast	150,281	CY	8.60	1,292,416.60
	Grade "A" Base Material	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	TON	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Dock Lumber	16	MBF	580.00	9,280.00
	18" Culverts	2,850	LF	28.80	82,080.00
	36" + Culverts	-	LS	45,600.00	45,600.00
	Fabric	3,110	SY	3.00	9,330.00
	Thaw Pipes	3,150	LF	43.20	136,080.00
	Topsoil & Seed	42	AC	3,600.00	151,200.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	67,220	LF	140.00	9,410,800.00
				TOTAL	$16,838,682.60
	Maintenence				
	Rail	120	Mile-Years	5,000.00	$600,000.00
	Railhead	15	Years	28,600.00	$429,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
14.63	CAMP				
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	$1,203,390.00	$ 1,203,390.00
	Catering & Operation Support	276,990	Manday	39.10	10,830,309.00
					$12,033,699.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
15.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.14 Permanent Roads				
	.147 Gold Creek Spur to Devil Canyon Road B-4, (6 Mi)				
	Clearing	83	AC	$ 5,760.00	$ 478,080.00
	Waste Excavation	221,600	CY	4.80	1,063,680.00
	Common Excavation	180,000	CY	4.20	756,000.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	218,400	CY	6.00	1,310,400.00
	NFS Subbase Material	61,776	CY	8.40	518,918.40
	Grade "A" Base Material	33,708	CY	16.80	566,294.40
	D-1 Base Material	7,033	TON	21.60	151,912.80
	A.C. Surfacing	12,881	TON	79.20	1,020,175.20
	Guardrail	400	LF	43.20	17,280.00
	18" Culverts	3,485	LF	28.80	100,368.00
	36" + Culverts	-	LS	31,320.00	31,320.00
	Fabric	12,200	SY	3.00	36,600.00
	Thaw Pipes	3,885	LF	43.20	167,832.00
	Topsoil & Seed	47	AC	3,600.00	169,200.00
	Traffic Control Devices	6	MI	18,000.00	108,000.00
	Bridges	0	SF	180.00	.00
				TOTAL	$6,496,060.80
	Maintenence	90	Mile-Years	12,000.00	$1,080,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
15.336	ROAD & RAIL FACILITIES				
.149	Devil Canyon to Northside Watana Road B-6, (41 Mi)				
	Clearing	578	AC	$ 5,760.00	$3,329,280.00
	Waste Excavation	1,544,900	CY	4.80	7,415,520.00
	Common Excavation	1,733,400	CY	4.20	7,280,280.00
	Rock Excavation	45,000	CY	14.40	648,000.00
	Borrow	447,600	CY	6.00	2,685,600.00
	NFS Subbase Material	422,136	CY	8.40	3,545,942.40
	Grade "A" Base Material	230,335	CY	16.80	3,869,628.00
	D-1 Base Material	48,059	TON	21.60	1,038,074.40
	A.C. Surfacing	88,021	TON	79.20	6,971,263.20
	Guardrail	25,000	LF	43.20	1,080,000.00
	18" Culverts	24,565	LF	28.80	707,472.00
	36" + Culverts	-	LS	273,840.00	273,840.00
	Fabric	41,560	SY	3.00	124,680.00
	Thaw Pipes	26,565	LF	43.20	1,147,608.00
	Topsoil & Seed	330	AC	3,600.00	1,188,000.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	115,940	SF	180.00	20,869,200.00
				TOTAL	$62,912,388.00
	Maintenence	328	Mile-Years	13,000.00	$4,264,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
15.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (including Railheads)				
	.243 Gold Creek Spur Rail				
	R-3, (8 Mi)				
	Clearing	110	AC	$ 5,760.00	$ 633,600.00
	Waste Excavation	289,440	CY	4.80	1,389,312.00
	Common Excavation	670,720	CY	4.20	2,817,024.00
	Rock Excavation	2,200	CY	14.40	31,680.00
	Borrow	86,860	CY	6.00	521,160.00
	Subballast	150,281	CY	8.60	1,292,416.60
	Grade "A" Base Material	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	TON	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Dock Lumber	16	MBF	580.00	9,280.00
	18" Culverts	2,850	LF	28.80	82,080.00
	36" + Culverts	-	LS	45,600.00	45,600.00
	Fabric	3,110	SY	3.00	9,330.00
	Thaw Pipes	3,150	LF	43.20	136,080.00
	Topsoil & Seed	42	AC	3,600.00	151,200.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	67,220	LF	140.00	9,410,800.00
				TOTAL	$16,838,682.60
	Maintenence				
	Rail	120	Mile-Years	5,000.00	$600,000.00
	Railhead	15	Years	28,600.00	$429,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
15.63	CAMP				
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	$862,470.00	862,470.00
	Catering & Operation Support	198,520	Manday	39.10	7,762,132.00
					$8,624,602.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
16.336	ROAD & RAIL FACILITIES				
.1	Road Facilities				
.14	Permanent Road				
.142	Gold Creek to Devil Canyon B-2, (12 Mi)				
	Clearing	141	AC	$ 5,760.00	$ 812,160.00
	Waste Excavation	422,890	CY	4.80	2,029,872.00
	Common Excavation	335,935	CY	4.20	1,410,927.00
	Rock Excavation	23,625	CY	14.40	340,200.00
	Borrow	445,200	CY	6.00	2,671,200.00
	NFS Subbase Material	126,750	CY	8.40	1,064,700.00
	Grade "A" Base Material	69,160	CY	16.80	1,161,888.00
	D-1 Base Material	28,860	TON	21.60	623,376.00
	A.C. Surfacing	26,429	TON	79.20	2,093,176.80
	Guardrail	6,700	LF	43.20	289,440.00
	18" Culverts	8,410	LF	28.80	242,208.00
	36" + Culverts	-	LS	46,080.00	46,080.00
	Fabric	8,777	SY	3.00	26,331.00
	Thaw Pipes	8,845	LF	43.20	382,104.00
	Topsoil & Seed	86	AC	3,600.00	309,600.00
	Traffic Control Devices	12	MI	18,000.00	216,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$13,719,262.80
	Maintenence	180	Mile-Years	$12,000.00	$2,160,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
16.336	ROAD & RAIL FACILITIES				
.146	Huricane to South Side Devil Canyon Road A-8 (16 Mi)				
	Clearing	248	AC	$ 5,760.00	$1,428,480.00
	Waste Excavation	673,644	CY	4.80	3,233,491.20
	Common Excavation	593,330	CY	4.20	2,491,986.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	532,200	CY	6.00	3,193,200.00
	NFS Subbase Material	164,736	CY	8.40	1,383,782.40
	Grade "A" Base Material	89,887	CY	16.80	1,510,101.60
	D-1 Base Material	18,755	TON	21.60	405,108.00
	A.C. Surfacing	34,350	TON	79.20	2,720,520.00
	Guardrail	5,100	LF	43.20	220,320.00
	18" Culverts	10,625	LF	28.80	306,000.00
	36" + Culverts	-	LS	38,760.00	38,760.00
	Fabric	26,900	SY	3.00	80,700.00
	Thaw Pipes	11,725	LF	43.20	506,520.00
	Topsoil & Seed	150	AC	3,600.00	540,000.00
	Traffic Control Devices	16	MI	18,000.00	288,000.00
	Bridges	43,520	SF	180.00	7,833,600.00
				TOTAL	$26,180,569.20
	Maintenence	112	Mile-Years	12,000.00	$1,344,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
16.336	ROAD & RAIL FACILITIES				
.149	Devil Canyon to Northside Watana Road B-6, (41 Mi)				
	Clearing	578	AC	$ 5,760.00	$3,329,280.00
	Waste Excavation	1,544,900	CY	4.80	7,415,520.00
	Common Excavation	1,733,400	CY	4.20	7,280,280.00
	Rock Excavation	45,000	CY	14.40	648,000.00
	Borrow	447,600	CY	6.00	2,685,600.00
	NFS Subbase Material	422,136	CY	8.40	3,545,942.40
	Grade "A" Base Material	230,335	CY	16.80	3,869,628.00
	D-1 Base Material	48,059	TON	21.60	1,038,074.40
	A.C. Surfacing	88,021	TON	79.20	6,971,263.20
	Guardrail	25,000	LF	43.20	1,080,000.00
	18" Culverts	24,565	LF	28.80	707,472.00
	36" + Culverts	-	LS	273,840.00	273,840.00
	Fabric	41,560	SY	3.00	124,680.00
	Thaw Pipes	26,565	LF	43.20	1,147,608.00
	Topsoil & Seed	330	AC	3,600.00	1,188,000.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	115,940	SF	180.00	20,869,200.00
				TOTAL	$62,912,388.00
	Maintenence	328	Mile-Years	13,000.00	$4,264,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
16.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.25 Railheads				
	.252 Railhead at Gold Creek				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	7	Year	$28,600.00	$200,200.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
16.63	CAMP				
	.12 Access Road/Railhead Camp				
	Camp Facilities	-	LS	$1,088,040.00	$ 1,088,040.00
	Catering & Operation Support	250,440	Manday	39.10	9,792,204.00
					$10,880,244.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.15 Permanent Road				
	.155 Denali Highway to Watana, Road C-3, (40 Mile)				
	Clearing	712	AC	$ 5,760.00	$ 4,101,120.00
	Waste Excavation	1,981,270	CY	4.80	9,510,096.00
	Common Excavation	1,988,000	CY	4.20	8,349,600.00
	Rock Excavation	41,800	CY	14.40	601,920.00
	Borrow	0	CY	6.00	0.00
	NFS Subbase Material	414,820	CY	8.40	3,484,488.00
	Grade "A" Base Material	226,342	CY	16.80	3,802,545.60
	D-1 Base Material	94,450	TON	21.60	2,040,120.00
	A.C. Surfacing	86,495	TON	79.20	6,850,404.00
	Guardrail	4,200	LF	43.20	181,440.00
	18" Culverts	23,720	LF	28.80	683,136.00
	36" + Culverts	-	LS	453,720.00	453,720.00
	Fabric	12,907	SY	3.00	38,721.00
	Thaw Pipes	26,020	LF	43.20	1,124,064.00
	Topsoil & Seed	467	AC	3,600.00	1,681,200.00
	Traffic Control Devices	40	MI	18,000.00	720,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$43,622,574.60
	Maintenence	320	Mile-Years	8,000.00	$2,560,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.336	ROAD & RAIL FACILITIES				
	.16 Service Roads				
	.162 Devil Canyon to Northside Watana Road B-6, (41 Mi)				
	Clearing	578	AC	$ 5,760.00	$3,329,280.00
	Waste Excavation	1,544,900	CY	4.80	7,415,520.00
	Common Excavation	1,733,400	CY	4.20	7,280,280.00
	Rock Excavation	45,000	CY	14.40	648,000.00
	Borrow	447,600	CY	6.00	2,685,600.00
	NFS Subbase Material	422,136	CY	8.40	3,545,942.40
	Grade "A" Base Material	230,335	CY	16.80	3,869,628.00
	D-1 Base Material	48,059	TON	21.60	1,038,074.40
	A.C. Surfacing	88,021	TON	79.20	6,971,263.20
	Guardrail	25,000	LF	43.20	1,080,000.00
	18" Culverts	24,565	LF	28.80	707,472.00
	36" + Culverts	-	LS	273,840.00	273,840.00
	Fabric	41,560	SY	3.00	124,680.00
	Thaw Pipes	26,565	LF	43.20	1,147,608.00
	Topsoil & Seed	330	AC	3,600.00	1,188,000.00
	Traffic Control Devices	41	MI	18,000.00	738,000.00
	Bridges	115,940	SF	180.00	20,869,200.00
				TOTAL	$62,912,388.00
	Maintenence	328	Mile-Years	13,000.00	$4,264,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.336	ROAD & RAIL FACILITIES				
	.18 Upgrade Existing Road				
	.185 Denali Highway from Cantwell to New Road, Road C-2, (21 Mile)				
	Clearing	17	AC	$ 5,760.00	$ 97,920.00
	Waste Excavation	66,000	CY	4.80	316,800.00
	Common Excavation	264,000	CY	4.20	1,108,800.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	20,000	CY	6.00	120,000.00
	NFS Subbase Material	13,700	CY	8.40	115,080.00
	Grade "A" Base Material	51,024	CY	16.80	857,203.20
	D-1 Base Material	58,604	TON	21.60	1,265,846.40
	A.C. Surfacing	53,669	TON	79.20	4,250,584.80
	Guardrail	3,000	LF	43.20	129,600.00
	18" Culverts	4,000	LF	28.80	115,200.00
	36" + Culverts	-	LS	55,560.00	55,560.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	100	LF	43.20	4,320.00
	Topsoil & Seed	10	AC	3,600.00	36,000.00
	Traffic Control Devices	21	MI	18,000.00	378,000.00
	Bridges	1,700	SF	180.00	306,000.00
				TOTAL	$9,156,914.40
	Maintenence	168	Mile-Years	8,000.00	$1,344,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (Including Railheads)				
	.244 Gold Creek to Devil Canyon - Rail R-1, (14 Mi)				
	Clearing	162	AC	$ 5,760.00	$ 933,120.00
	Waste Excavation	407,420	CY	4.80	1,955,616.00
	Common Excavation	798,405	CY	4.20	3,353,301.00
	Rock Excavation	2,200	CY	14.40	31,680.00
	Borrow	108,500	CY	6.00	651,000.00
	Subballast	171,634	CY	8.60	1,476,052.40
	Grade "A" Base Material	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	TON	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Dock Lumber	16	MBF	580.00	9,280.00
	18" Culverts	4,850	LF	28.80	139,680.00
	36" + Culverts	-	LS	46,080.00	46,080.00
	Fabric	3,121	SY	3.00	9,363.00
	Thaw Pipes	10,100	LF	43.20	436,320.00
	Topsoil & Seed	104	AC	3,600.00	374,400.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	98,975	LF	140.00	13,856,500.00
				TOTAL	$23,581,512.40
	Maintenence				
	Rail	98	Mile-Years	5,000.00	$490,000.00
	Railhead	7	Years	28,600.00	$200,200.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.336	ROAD & RAIL FACILITIES				
	.25 Railheads				
	.251 Railhead at Cantwell				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	8	Year	$28,600.00	$228,800.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17.63	CAMP				
.12	Access Road/Railhead Camp				
	Camp Facilities	-	LS	1,454,690.00	$ 1,454,690.00
	Catering & Operation Support	334,840	Manday	39.10	13,092,244.00
					$14,546,934.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17A.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.15 Permanent Road				
	.155 Denali Highway to Watana, Road C-3, (40 Mile)				
	Clearing	712	AC	$ 5,760.00	$ 4,101,120.00
	Waste Excavation	1,981,270	CY	4.80	9,510,096.00
	Common Excavation	1,988,000	CY	4.20	8,349,600.00
	Rock Excavation	41,800	CY	14.40	601,920.00
	Borrow	0	CY	6.00	0.00
	NFS Subbase Material	414,820	CY	8.40	3,484,488.00
	Grade "A" Base Material	226,342	CY	16.80	3,802,545.60
	D-1 Base Material	94,450	TON	21.60	2,040,120.00
	A.C. Surfacing	86,495	TON	79.20	6,850,404.00
	Guardrail	4,200	LF	43.20	181,440.00
	18" Culverts	23,720	LF	28.80	683,136.00
	36" + Culverts	-	LS	453,720.00	453,720.00
	Fabric	12,907	SY	3.00	38,721.00
	Thaw Pipes	26,020	LF	43.20	1,124,064.00
	Topsoil & Seed	467	AC	3,600.00	1,681,200.00
	Traffic Control Devices	40	MI	18,000.00	720,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$43,622,574.60
	Maintenence	320	Mile-Years	8,000.00	$2,560,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17A.336	ROAD & RAIL FACILITIES				
	.16 Service Roads				
	.161 Devil Canyon to Southside Watana Road B-7, (43 Mi)				
	Clearing	698	AC	$ 5,760.00	$4,020,480.00
	Waste Excavation	1,913,213	CY	4.80	9,183,422.40
	Common Excavation	2,061,325	CY	4.20	8,657,565.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	339,413	CY	6.00	2,036,478.00
	NFS Subbase Material	442,728	CY	8.40	3,718,915.20
	Grade "A" Base Material	241,570	CY	16.80	4,058,376.00
	D-1 Base Material	50,403	TON	21.60	1,088,704.80
	A.C. Surfacing	92,314	TON	79.20	7,311,268.80
	Guardrail	3,500	LF	43.20	151,200.00
	18" Culverts	27,540	LF	28.80	793,152.00
	36" + Culverts	-	LS	198,360.00	198,360.00
	Fabric	48,900	SY	3.00	146,700.00
	Thaw Pipes	29,040	LF	43.20	1,254,528.00
	Topsoil & Seed	437	AC	3,600.00	1,573,200.00
	Traffic Control Devices	43	MI	18,000.00	774,000.00
	Bridges	42,500	SF	180.00	7,650,000.00
				TOTAL	$52,616,350.20
	Maintenence	344	Mile-Years	13,000.00	$4,472,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17A.336	ROAD & RAIL FACILITIES				
	.18 Upgrade Existing Road				
	.185 Denali Highway from Cantwell to New Road, Road C-2, (21 Mile)				
	Clearing	17	AC	$ 5,760.00	$ 97,920.00
	Waste Excavation	66,000	CY	4.80	316,800.00
	Common Excavation	264,000	CY	4.20	1,108,800.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	20,000	CY	6.00	120,000.00
	NFS Subbase Material	13,700	CY	8.40	115,080.00
	Grade "A" Base Material	51,024	CY	16.80	857,203.20
	D-1 Base Material	58,604	TON	21.60	1,265,846.40
	A.C. Surfacing	53,669	TON	79.20	4,250,584.80
	Guardrail	3,000	LF	43.20	129,600.00
	18" Culverts	4,000	LF	28.80	115,200.00
	36" + Culverts	-	LS	55,560.00	55,560.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	100	LF	43.20	4,320.00
	Topsoil & Seed	10	AC	3,600.00	36,000.00
	Traffic Control Devices	21	MI	18,000.00	378,000.00
	Bridges	1,700	SF	180.00	306,000.00
				TOTAL	$9,156,914.40
	Maintenence	168	Mile-Years	8,000.00	$1,344,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17A.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (Including Railheads)				
	.244 Gold Creek to Devil Canyon - Rail R-1, (14 Mi)				
	Clearing	162	AC	$ 5,760.00	$ 933,120.00
	Waste Excavation	407,420	CY	4.80	1,955,616.00
	Common Excavation	798,405	CY	4.20	3,353,301.00
	Rock Excavation	2,200	CY	14.40	31,680.00
	Borrow	108,500	CY	6.00	651,000.00
	Subballast	171,634	CY	8.60	1,476,052.40
	Grade "A" Base Material	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	TON	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Dock Lumber	16	MBF	580.00	9,280.00
	18" Culverts	4,850	LF	28.80	139,680.00
	36" + Culverts	-	LS	46,080.00	46,080.00
	Fabric	3,121	SY	3.00	9,363.00
	Thaw Pipes	10,100	LF	43.20	436,320.00
	Topsoil & Seed	104	AC	3,600.00	374,400.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	98,975	LF	140.00	13,856,500.00
				TOTAL	$23,581,512.40
	Maintenence				
	Rail	98	Mile-Years	5,000.00	$490,000.00
	Railhead	7	Years	28,600.00	$200,200.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
17A.336	ROAD & RAIL FACILITIES				
	.25 Railheads				
	.251 Railhead at Cantwell				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	8	Year	$28,600.00	$228,800.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
	.1 Road Facilities				
	.15 Permanent Road				
	.155 Denali Highway to Watana, Road C-4, (42 Mile)				
	Clearing	748	AC	$ 5,760.00	$ 4,308,480.00
	Waste Excavation	2,080,330	CY	4.80	9,985,584.00
	Common Excavation	2,087,400	CY	4.20	8,767,080.00
	Rock Excavation	41,800	CY	14.40	601,920.00
	Borrow	0	CY	6.00	0.00
	NFS Subbase Material	435,560	CY	8.40	3,658,704.00
	Grade "A" Base Material	237,660	CY	16.80	3,992,688.00
	D-1 Base Material	99,170	TON	21.60	2,142,072.00
	A.C. Surfacing	90,820	TON	79.20	7,192,944.00
	Guardrail	7,000	LF	43.20	302,400.00
	18" Culverts	26,350	LF	28.80	758,880.00
	36" + Culverts	-	LS	373,680.00	373,680.00
	Fabric	12,907	SY	3.00	38,721.00
	Thaw Pipes	28,750	LF	43.20	1,242,000.00
	Topsoil & Seed	490	AC	3,600.00	1,764,000.00
	Traffic Control Devices	42	MI	18,000.00	756,000.00
	Bridges	0	SF	180.00	0.00
				TOTAL	$45,885,153.00
	Maintenence	336	Mile-Years	9,000.00	$3,024,000.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
.16	Service Roads (Permanent)				
.164	Devil Canyon to Watana - North Road A-2 Mod*, (36 Mi)				
	Clearing	506	AC	$ 5,760.00	$2,914,560.00
	Waste Excavation	1,349,122	CY	4.80	6,475,785.60
	Common Excavation	1,408,366	CY	4.20	5,915,137.20
	Rock Excavation	146,527	CY	14.40	2,109,988.80
	Borrow	137,590	CY	6.00	825,540.00
	NFS Subbase Material	372,916	CY	8.40	3,132,494.40
	Grade "A" Base Material	203,478	CY	16.80	3,418,430.40
	D-1 Base Material	84,910	TON	21.60	1,834,056.00
	A.C. Surfacing	77,757	TON	79.20	6,158,354.40
	Guardrail	6,050	LF	43.20	261,360.00
	18" Culverts	23,040	LF	28.80	663,552.00
	36" + Culverts	-	LS	294,000.00	294,000.00
	Fabric	49,820	SY	3.00	149,460.00
	Thaw Pipes	24,435	LF	43.20	1,055,592.00
	Topsoil & Seed	286	AC	3,600.00	1,029,600.00
	Traffic Control Devices	36	MI	18,000.00	648,000.00
	Bridges	88,400	SF	180.00	15,912,000.00
				TOTAL	$52,797,910.80
	Maintenence	288	Mile-Years	10,000.00	$2,880,000.00

Note: A-2 Mod. includes A-2, high level x-ing to camp at Devil Canyon, and trans dam crossing at Watana.

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
	.18 Upgrade Existing Road				
	.185 Denali Highway from Cantwell to New Road, Road C-2, (21 Mile)				
	Clearing	17	AC	$ 5,760.00	$ 97,920.00
	Waste Excavation	66,000	CY	4.80	316,800.00
	Common Excavation	264,000	CY	4.20	1,108,800.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	20,000	CY	6.00	120,000.00
	NFS Subbase Material	13,700	CY	8.40	115,080.00
	Grade "A" Base Material	51,024	CY	16.80	857,203.20
	D-1 Base Material	58,604	TON	21.60	1,265,846.40
	A.C. Surfacing	53,669	TON	79.20	4,250,584.80
	Guardrail	3,000	LF	43.20	129,600.00
	18" Culverts	4,000	LF	28.80	115,200.00
	36" + Culverts	-	LS	55,560.00	55,560.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	100	LF	43.20	4,320.00
	Topsoil & Seed	10	AC	3,600.00	36,000.00
	Traffic Control Devices	21	MI	18,000.00	378,000.00
	Bridges	1,700	SF	180.00	306,000.00
				TOTAL	$9,156,914.40
	Maintenence	168	Mile-Years	8,000.00	$1,344,000.00

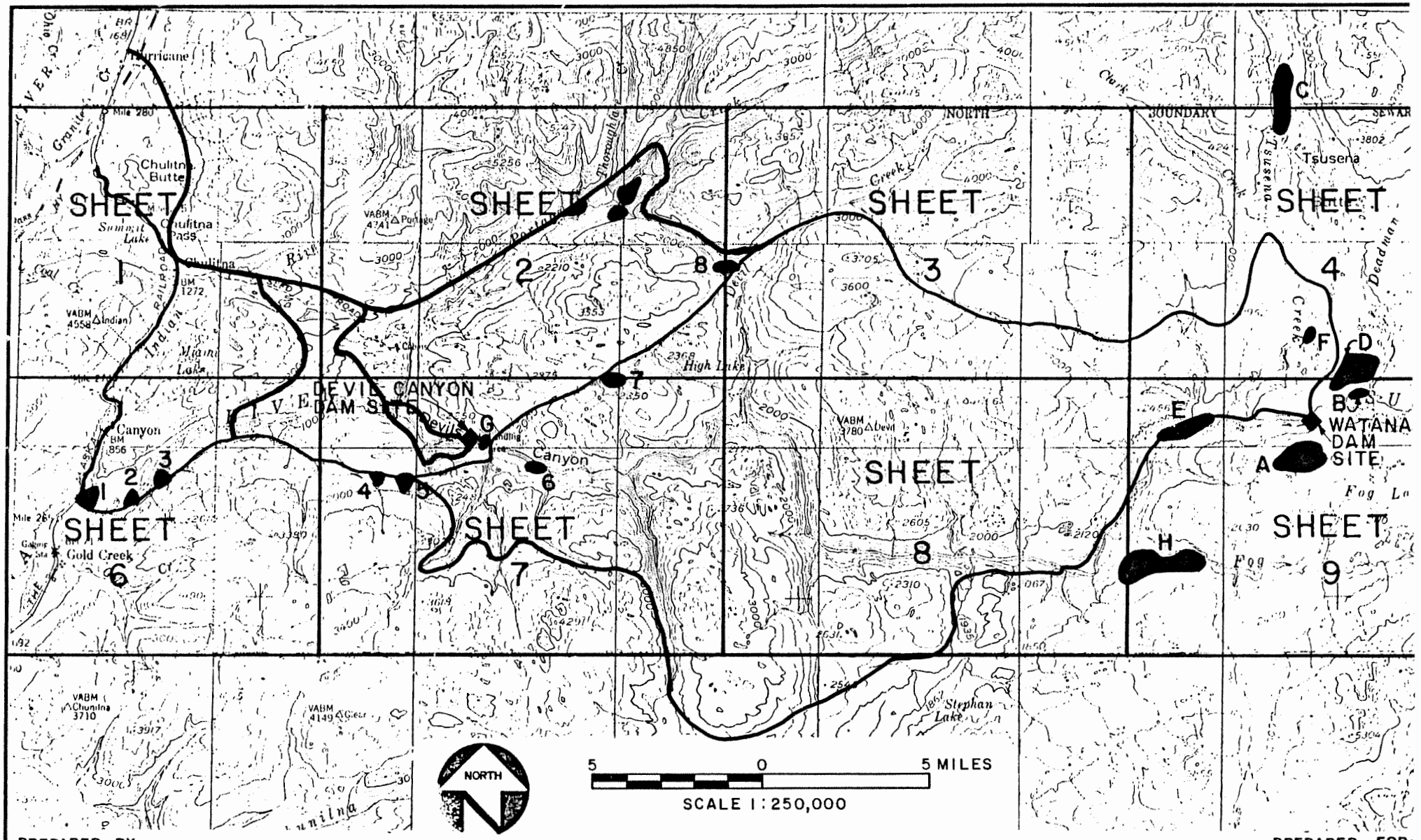
ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (Including Railheads)				
	.244 Gold Creek to Devil Canyon - Rail R-1, (14 Mi)				
	Clearing	162	AC	$ 5,760.00	$ 933,120.00
	Waste Excavation	407,420	CY	4.80	1,955,616.00
	Common Excavation	798,405	CY	4.20	3,353,301.00
	Rock Excavation	2,200	CY	14.40	31,680.00
	Borrow	108,500	CY	6.00	651,000.00
	Subballast	171,634	CY	8.60	1,476,052.40
	Grade "A" Base Material	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	TON	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Dock Lumber	16	MBF	580.00	9,280.00
	18" Culverts	4,850	LF	28.80	139,680.00
	36" + Culverts	-	LS	46,080.00	46,080.00
	Fabric	3,121	SY	3.00	9,363.00
	Thaw Pipes	10,100	LF	43.20	436,320.00
	Topsoil & Seed	104	AC	3,600.00	374,400.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	98,975	LF	140.00	13,856,500.00
				TOTAL	$23,581,512.40
	Maintenence				
	Rail	98	Mile-Years	5,000.00	$490,000.00
	Railhead	7	Years	28,600.00	$200,200.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
.25	Railheads				
.251	Railhead at Cantwell				
	Clearing	25	AC	$ 5,760.00	$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	-	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	$5,991,680.00
	Maintenence	8	Year	$28,600.00	$228,800.00

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.63	CAMP				
.12	Access Road/Railhead Camp			$1,353,540.00	$1,353,540.00
	Camp Facilities	-	LS		
	Catering & Operation Support	311,560	Manday	39.10	12,181,996.00
					$13,535,536.00

APPENDIX G
BORROW PITS

Figure Supplement



PREPARED BY:

R&M CONSULTANTS, INC.

BORROW PIT LOCATIONS

PREPARED FOR:

ACRES

REVISED FIGURE G-1

APPENDIX F

Cost Estimates

Figure Supplements

Table Revisions & Supplements

Supplement to Cost Estimate Itemizations

TABLE F.5.1
BRIDGES - PLANS 1-11R

Segment	River	Length (feet)	Cost	Figures	Section
B-1	Indian R.	180	$ 1,101,600	B.1, F.5.1	R2W T32N Sec 12
	Susitna @ G.C.	2,480	15,177,600	B.6, F.5.2	R2W T31N Sec 9
B-3	Fog Creek	1,250	7,650,000	B.9, F.5.4	R5E T31N Sec 19
	Chechako Creek	1,160	7,099,200	B.7, F.5.3	R1E T31N Sec 4
	No Name Creek	800	4,896,000	B.7, F.5.5	R1E T31N Sec 15
R-2	Chechako Creek	1,160	7,099,200	B.7, F.5.3	R1E T31N Sec 4
	No Name Creek	1,000	6,120,000	B.7, F.5.7	R1E T31N Sec 10
H	Low Level Xing	780	2,246,400	B.7	R1E T32N Sec 32
X	High Level @ D.C.	2,600	15,912,000	B.7, F.5.6	R1E T32N Sec 32

Note: All bridges 34' wide and $180/sf except RR which are 17' wide and $360/sf, and low level xing which is 16' wide and $180/sf.

TABLE F.5.2
BRIDGES -PLANS 12-18

Plan	River	Length (feet)	Cost	Figures	Section
12	Indian R.	180	$ 1,101,600	B.1, F.5.1	R1W T32N Sec 6
	Low Level Xing	780	2,246,400	B.7	R1E T32N Sec 32
	Portage Creek	1,100	6,732,000	B.7, F.5.8	R1W T32N Sec 25
13	Indian R.	180	1,101,600	B.1, F.5.1	R1W T32N Sec 6
	Upper Portage	-	2,000,000	B.2	R1W T32N Sec 12 R2E T32N Sec 30
	Susi @ Portage	1,100	6,732,000	B.7, F.5.9	R1W T32N Sec 26
14	Susi @ G.C. (Sim)	2,480	15,177,600	B.6, F.5.2	R2W T31N Sec 9
	Indian R.	180	1,101,600	B.1, F.5.1	R1W T32N Sec 6
	Susi @ Fog	3,250	19,890,000	B.8, F.5.10	R4E T31N Sec 19
	Tsusena Cr.	160±	1,000,000	B.4	R5E T32N Sec 30
15	Susi @ Fog	3,250	19,890,000	B.8, F.5.10	R4E T31N Sec 19
	Tsusena Cr.	160±	1,000,000	B.4	R5E T32N Sec 30
16	Indian R.	180	1,101,600	B.1, F.5.1	R1W T32N Sec 6
	Susi @ Portage	1,100	6,732,000	B.7, F.5.9	R1W T32N Sec 26
	Susi @ Fog	3,250	19,890,000	B.8, F.5.10	R4E T31N Sec 19
	Tsusena Cr.	160±	1,000,000	B.4	R5E T32N Sec 30
17	Tsusena Cr.	160±	1,000,000	B.4	R5E T32N Sec 30
	Susi @ Fog	3,250	19,890,000	B.8, F.5.10	R4E T31N Sec 19
17A	Fog Creek	1,250	7,650,000	B.9, F.5.4	R5E T31N Sec 19
18	High Level @ D.C.	2,600	15,912,000	B.7, F.5.6	R1E T32N Sec 32