

1. 1. The first step in the process of the scientific method is to ask a question.
 2. 2. The second step is to do background research.
 3. 3. The third step is to form a hypothesis.
 4. 4. The fourth step is to test the hypothesis.
 5. 5. The fifth step is to analyze the data.
 6. 6. The sixth step is to draw a conclusion.
 7. 7. The seventh step is to communicate the results.
 8. 8. The eighth step is to repeat the experiment.
 9. 9. The ninth step is to publish the results.
 10. 10. The tenth step is to use the results to make a prediction.

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TASK 9

0020

Access Roads - Haul Road
Geotechnical
Factors



Design Calculation Cover Sheet

PROJECT No. P5700

FILE No. P5700.14.09

SERIAL No. 0020

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PROJECT TITLE SUSITNA HYDROELECTRIC PROJECT

ALASKA POWER AUTHORITY

DEPARTMENT GEOTECH-BUFFALO

CALCULATIONS FOR: ACCESS ROADS-HAUL ROAD

GEOTECHNICAL FACTORS

(Backup assumptions to confirm verbal to F. Tuth 10/30/81)

ORIGINAL BY L. DUNCAN

DATE 10 / 30 / 81

CHECKED BY

DATE 1 / 1

REV No.	BY	DATE	CHECKED	DATE
		<u>1 / 1</u>		<u>1 / 1</u>
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Contents: 1) Cover Sheet

2) Calc Criteria Sheet
listing pertinent, major
GT assumptions, primarily
from personal experience
in Alaska.

1 pg
4 pgs

APPROVED BY

PROFESSIONAL ENGINEERS
SEAL

XC to DWL, JF, TWE, DM 11/2/81

ORIGINAL COPIES PLACED IN MAIN FILE ON CLOSURE OF PROJECT

BY [Signature]

DATE 15 / MAR / 82

TOTAL No. OF SHEETS 5

Attached-comment by TWE on REM out 2 pgs.



Calculation Criteria, Data

and References - SUSITNA HEP

ACCESS ROADS - HAUL ROAD

GEOTECHNICAL FACTORS

Project No. P5700

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Haul Roads only: (includes sections of main access roads used for hauling access road material)

To account for permafrost alluvial and clayey areas that will not free drain, recommended an assumption of 5% of road to be placed on a geotextile. Since heavy haul trucks will be used, recommended Railroad weight wovens fabric, such as Fibretex (Grown zellerbach) Grade 400

Mirafi (Celanese Fibers) Grade 600 X.

Fabric weight = 0.05 #/SF.

Called Mirafi (212-7648224) to get info:

Cost FOB anywhere lower 48 states (national price structure) 11¢/SF. Can sew up to 100' wide in factory (for large job add 1¢/SF), pile in accordion fold on pallets in 300 LF piles - sew by portable stitcher in field to join ends. With 10 man crew, about 1 LF/min can be laid. ~~Fabric~~

My check on his est - Say use FEL w/ Forks to lay out accordion strip @ .5 mph = 7' / min or 42 min to lay out 300 LF. Say 10 min turnaround to fetch another pallet from a flatbed = 1 hr / 300 LF

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Calculation Criteria, Data
and References - SUSITNA HEP
ACCESS ROADS - HAUL ROAD
GEOTECHNICAL FACTORS

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Crew to unfold - say 5 men, will be 4' wide
folds = 20 folds / 80' road width. Crew should
be able to unfold one fold at 3 mph / man
= 4' ft / man-minute. With 300 LF of 20 folds, 6000 LF
of unfolding = 1500 man-minutes. To meet a
one LF / min laying rate, need 5 men - check.

Sewing will take 2 men, at 5' / min, to do 80 LF
about 20 minutes with setup.

So: To speed operation - say 10 men on unfolding crew
∴ about 2 1/2 hours to unfold. Use FEL for
spreading of fill as well, and use sewers as
in folders most of time. ∴ Assume 10 man
unfolding crew for estimate, who will usually
be laborers doing brushing, etc on majority of
road, which does not need fabric.

Production method - cannot drive on fabric
before fill placement, must use sand or rounded
sandy gravel for first 1' of fill. Use end dump
and dozer or grader spreading, back truck
over fill to dump on fabric.



Calculation Criteria, Data and References

-SUSITNA HREP
ACCESS ROADS-HAZZ ROAD
GEOTECHNICAL FACTORS

Project No. P5702

File No. P5700.14.09

Serial No. 0020

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General Road Criteria - BT Assumptions from personal experience & reading, another construction. to

- 1) Assume not less than 10 culverts/mile, to drain uphill ditches. Culverts not $< 18"$, preferably $24"$. Imbed in subgrade so cover $> 18"$ in all cases, also $\geq$ diameter in all cases.
- 2) Assume fill extension w/ culvert to $10'$ beyond normal culvert cutoff point, for added runoff of standing water and icing beyond toe of fill. End of culvert will need to be at least $3'$ above ground surface at outlet to provide freefall for freezup and icing.
- 3) Prefer $> 2\%$ gradient on culverts, to reduce icing in culvert.
- 4) On slopes with overburden. excavation not to rock, assume OB will reside at average $1V:2H$ slopes, some will need cobble & gravel protection from erosion. For cuts in overburden and alluvium, assume $10'$ undriven shoulder to provide downslope stability, room for protective berm, freeback protection for road from deep frost penetration. Will need drainage to prevent pore pressure build-up.



Calculation Criteria, Data

and References SUSITMA HEP

ACCESS ROADS - HAUZ ROAD

GEOTECHNICAL FACTORS

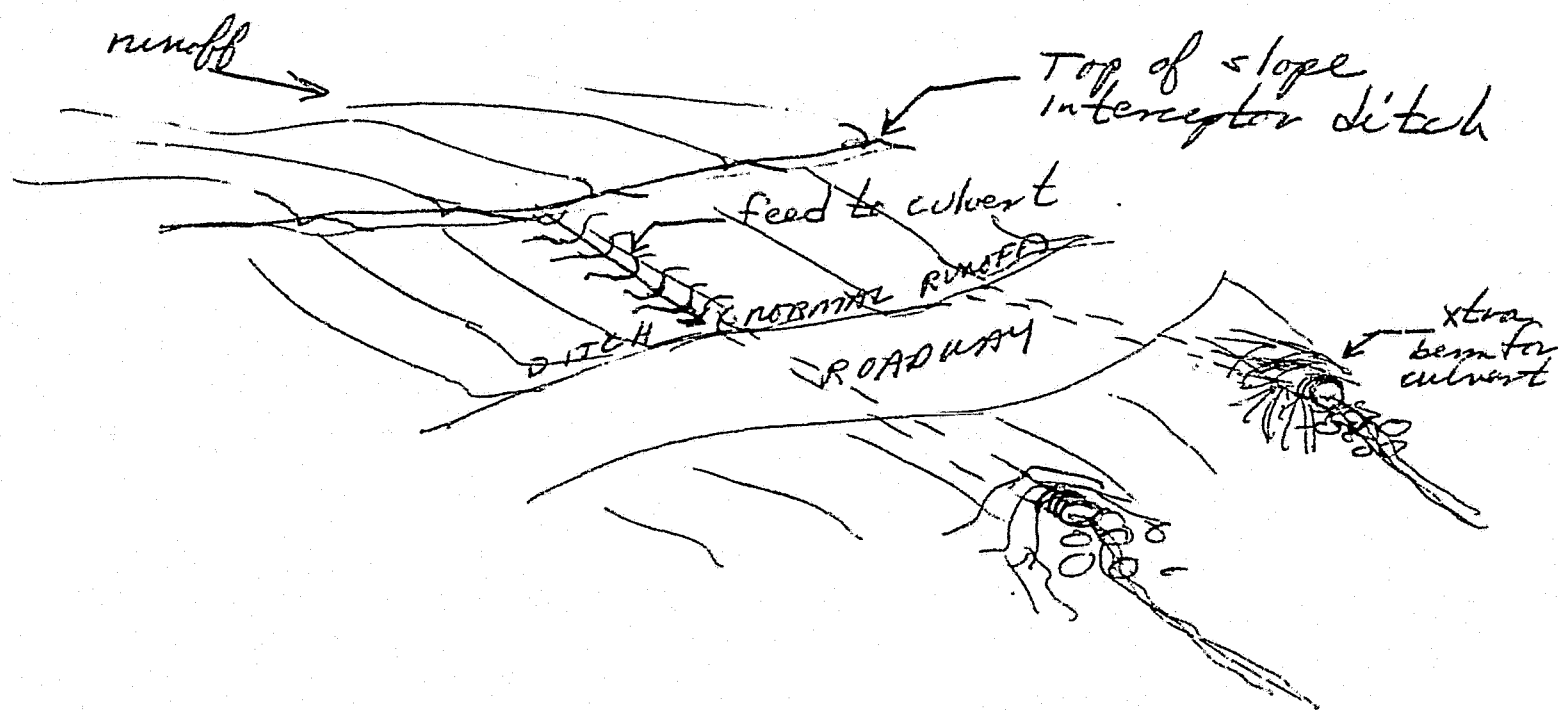
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- 5) Assume uphill drains on all cuts, to intercept water at top of cuts, feeders to culverts.



- 6) Per references & experience, and Mirafi sales rep! Their charts go off scale on 25T trucks, about 35K / wheel, 34" / ft - so recommend for estimating in boggy areas (the 5% of total length) use 4' of fill.

11/3/81

TO: LANCE DUNCAN

FROM: TOM GWOZDEK

SUBJ: HAUL ROADS - GEOTECHNICAL FACTORS.

In reference to your memo to F. Toth of 10/30/81, all your assumptions and information in the memo is in the same "ball park" as the access road studies to date. For your information the studies completed on the access road by REM have the following points.

- On the segments of roads closest to Watana they have allowed for fabric for between 5% and 10% of the road. REM have used a unit price of \$2.50 SY of fabric installed.

- The following are average figures for the culverts.

18" - 650 L.F./MILE

42" - 5 L.F./MI

60" - 10 L.F./MI

108" - 3 L.F./MI

They have used a unit price of \$24.00 L.F. for 18" culvert and also have added \$36.00 L.F. for "thaw pipes". The L.F. of the pipes has been only slightly less than the L.F. of 18" culvert for the segment. (The roadway is typically 44' wide, including shoulders)

- The unit prices quoted do not include the 20% contingency.