

HARZA-EBASCO

Susitna Joint Venture  
Document Number

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SUSITNA HYDROELECTRIC PROJECT

EXTERNAL REVIEW BOARD MEETING #1

JANUARY 22 - 24, 1981

INFORMATION PACKAGE - VOLUME II

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SUSITNA HYDROELECTRIC PROJECT

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INFORMATION PACKAGE - VOLUME II

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- Project Status Report, January 1981
- Support Material To Tasks 4 and 5 - Seismic Studies & Geotechnical Exploration
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### VOLUME II

- Copies of Slides Presented by Acres

**SUSITNA HYDRO PROJECT  
PRESENTATION TO APA BOARDS - JANUARY 22, 1981**

**9:30 a.m.: Project Overview (J. Lawrence, Acres Project Manager)**

Thank you Eric and good morning ladies and gentlemen. Acres and those of our subcontractors present are pleased to be given this opportunity to participate in these meetings. I will begin by introducing the staff.

Mr. Chuck Debelius is Deputy Project Manager, Mr. Jim Gill is our Anchorage Resident Manager, supervising project activities in Alaska, Dr. John Hayden is Technical Study Director, Dr. Don McDonald is a senior member of Acres staff who is chairman of our in-house technical review panel, Mr. Virendra Singh, Supervisor of geotechnical studies, Stewart Thompson, Supervisor of geologic studies and Kevin Young, Supervisor of environmental Studies. Representing our subcontractors I am also pleased to introduce Dr. Jon Lovegreen, . . . and Dr. Maury Power of Woodward Clyde Consultants and Mr. Jeff Barnes and Dr. Vince Lucid of Terrestrial Environmental Specialists.

At this point I would like to summarize the philosophy of the Acres Plan of Study for Susitna, the organization of the study team and the basic approach to the study. The basic objectives of the POS are:

1. Assess the technical, economic and financial feasibility of the Susitna Project to meet future power needs of the Railbelt Region.
2. Evaluate the environmental consequences of designing and constructing the Susitna Project.
- and 3. Subject to establishing project feasibility, file a completed license application with the Federal Energy Regulatory Commission

The study was conceived as a 30 month effort commencing in January 1980 and culminating in June 1982 with submission of the license application to the Federal Energy Regulatory Commission for development of the Susitna Hydroelectric Project. I would like to stress once more that the decision to submit this application will be predicated on establishment of technical and economic feasibility of the project, on a determination that the environmental impact of the development will not be unacceptable and that the project development will be in the best interest of the State of Alaska for meeting the future power needs of the Railbelt Region.

In this regard the State legislature has mandated that reports be submitted by the Power Authority in March 1981 and April 1982 to justify respectively, continuation of studies and submission of the license application, on the basis of the results of studies undertaken.

To undertake the many complex and interrelated specialist aspects of the study, Acres has assembled in-house a group that we call Task Supervisors. We will be discussing later today the specific project tasks. I have already introduced introduced some of the key participants.. Other Task Supervisors not present are individually responsible for supervision of the remaining study activities including hydrology, project design development, transmission, licensing, and marketing and finance. Task Supervisors have at their disposal the necessary support staff and company specialists to assist in accomplishing their study goals. Those of us that are here will act as spokesmen for those who are not.

To complete the project team, Acres has also entered into a number of subcontracts with appropriate specialist firms. These are:

- R&M - To undertake field surveys, and to provide assistance in hydrologic and geotechnical field work and studies
- CIRI/H&N - for camp construction and operation and assistance in permitting and land status studies

- FM&A - providing consulting services on management of camp construction, operation and logistical planning and project management cost estimating and scheduling activities
- WCC - to provide consulting services on load forecasting and on seismologic and earthquake studies and field exploration
- TES - undertaking, together with a number of Alaska-based and other specialist sub-consultants, the project environmental studies.
- RWR&A (IECO) - providing consulting services on transmission line corridor selection and preliminary design

The Alaska Department of Fish and Game, through RSA's directly with the Power Authority is also providing services in assembling field data on fisheries and big game.

When originally conceived, the Plan of Study or POS was subdivided into thirteen separate activities or Tasks. The scope and responsibility for some of these Tasks has since been modified. Notably, detailed studies of alternatives to the Project, originally under Acres Task 1, were terminated in June of 1980 and are now the subject of a separate study by others. Task 1 has therefore been confined to a review by Acres and its subcontractor WCC of the Railbelt energy forecasts prepared by the Institute of Social and Economic Research, and development of peak load forecasts for the Region. As a result of this change, the scope of Task 6 design development studies was also modified to include the early system generating planning data necessary to support the establishment of appropriate sizing and timing of the Susitna Project, and comparison of alternative Susitna Basin developments.

The scope of Task 8 transmission studies was also modified to take account of separate studies of a transmission intertie between Anchorage and Fairbanks. The responsibility for Task 12 public participation was also transferred directly to the Power Authority under the able direction of Ms. Nancy Blunck.

This concludes my introductory remarks on the Susitna Plan of Study and the study team. After the break we will discuss in more detail the objectives, scope and progress to date of the following Tasks.

- Task 3 Hydrology (by Dr. John Hayden of Acres)
- Task 4 Seismic studies (by Virendra Singh of Acres)
- Task 5 Geotechnical Exploration (by Jim Gill of Acres)
- Task 7 Environmental studies (by Kevin Young of Acres)

To provide a logical sequence for these presentations, we will start with the seismic and geotechnical studies, followed by hydrology, environmental and transmission. After lunch, Chuck Debelius, John Hayden and I will describe our efforts to date under Task 6 in which we have been studying the Susitna Basin development potential, alternatives and selection of the preferred development plan.

#### Break

#### Tentative Schedule (after break):

10:10 A.M.	Virendra Singh	30 min.	Task 4
10:40	Jim Gill	30 min.	Task 5
11:10	John Hayden	15 min.	Task 3
11:25	Kevin Young	25 min.	Task 7

Brief summaries  
of objectives, scope,  
progress to date &  
remaining work.

#### Lunch

1:00 P.M.	<u>Power Alternatives</u> (Tasks 1 and 6) Objectives of Task 1 activities Description of Subtasks
45 min. (C. Debelius)	Results of ISER studies Results of WCC studies Presentation of forecasts for use in Task 6 studies

Power Alternatives (cont.)

Objectives of Task 6 Generation Planning Studies  
Description of Subtasks  
Existing generation  
Thermal alternatives  
Hydro alternatives  
Approach to analysis  
Assumptions of cost and escalation  
Treatment of uncertainty

1:45 p.m.

Susitna Basin Development (Task 6)

60 minutes  
(J. Hayden)

Objectives of Task 6 Studies  
Alternative Basin developments considered  
Merits and demerits of individual sites  
Staged development alternatives  
Initial screening process

Break

3:00 p.m.

Economic Comparison of Alternatives

60 minutes

Basin development sequences considered  
Results of OGP analysis  
Optimum economic development

4:00 p.m.

Overview & Summary (Task 6)

30 minutes  
(J. Lawrence)

Summary of Task 6 Studies  
Development selection procedures  
Remaining Task 6 Studies

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# GUERRILLA PLAN OF STUDY

STATISTICS LEGAL!

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ENVIRONMENTAL SERVICES

**FEASIBILITY  
ENVIRONMENTAL  
LICENCE  
APPLICATION**

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by ACRES with

R&M CRI/H&N

FMI&A TES

WCC RUR&A

ADF&G

APA

EXTERNAL  
REVIEW  
PANEL

GENERAL  
MANAGER

DEPUTY P.M.  
C.A. DEBELIUS

GENERAL  
MANAGER

GENERAL  
MANAGER

LICENSING AND  
FINANCING  
C.A. DEBELIUS

GENERAL  
MANAGER

ALASKA  
RESIDENT  
MANAGER  
J.D. GILL

GENERAL  
MANAGER

FINANCING  
J.G. WARNOCK  
LICENSING  
P.M. HOOVER

ALASKA  
PROJECT  
SVC.  
BROWNFIELD

GENERAL  
MANAGER

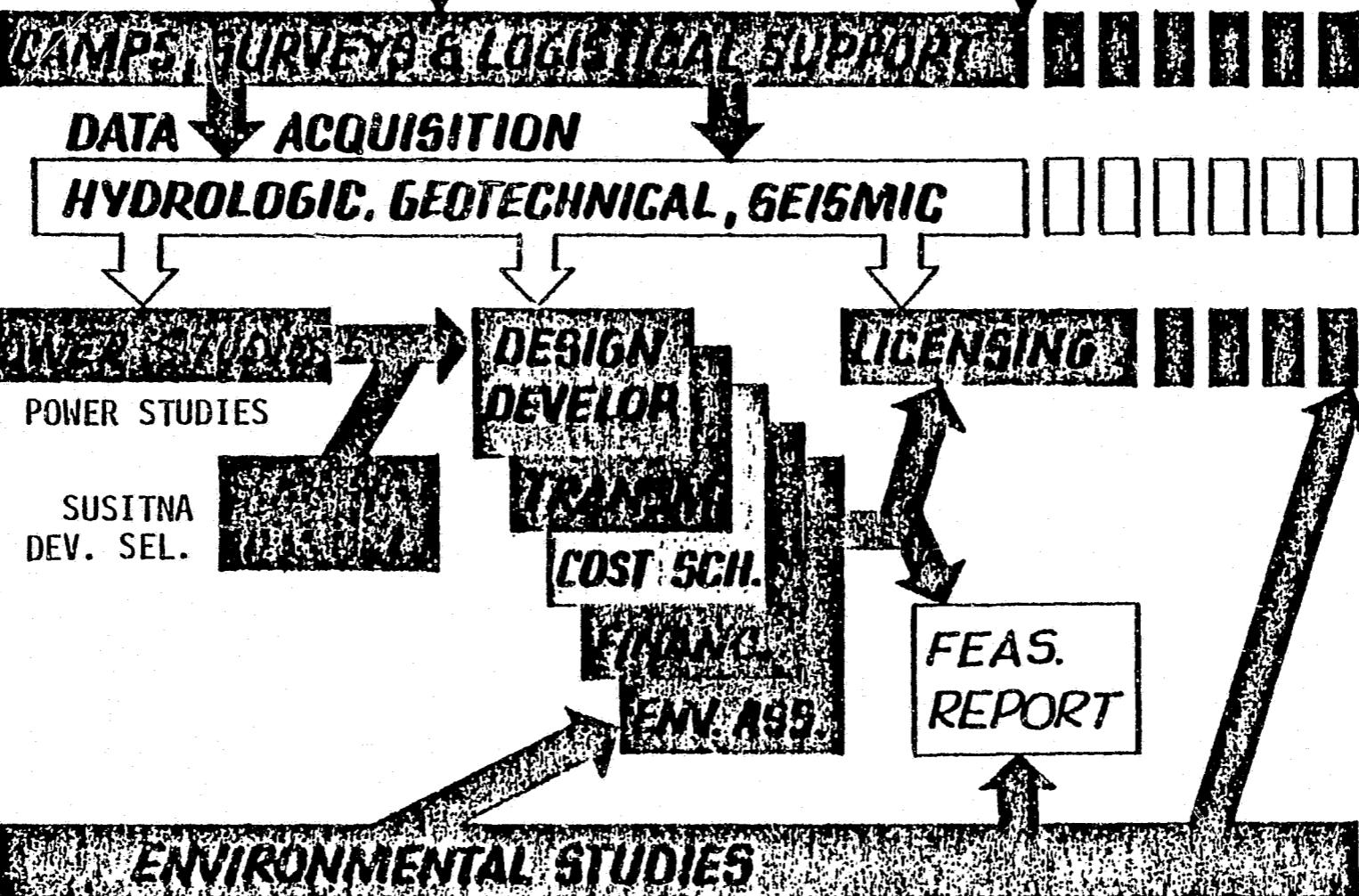
PLAN OF STUDY

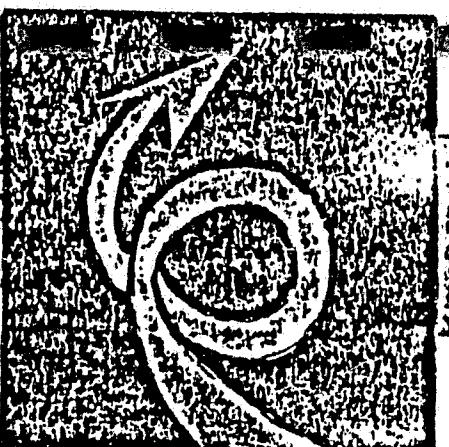
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JAN 80  
START

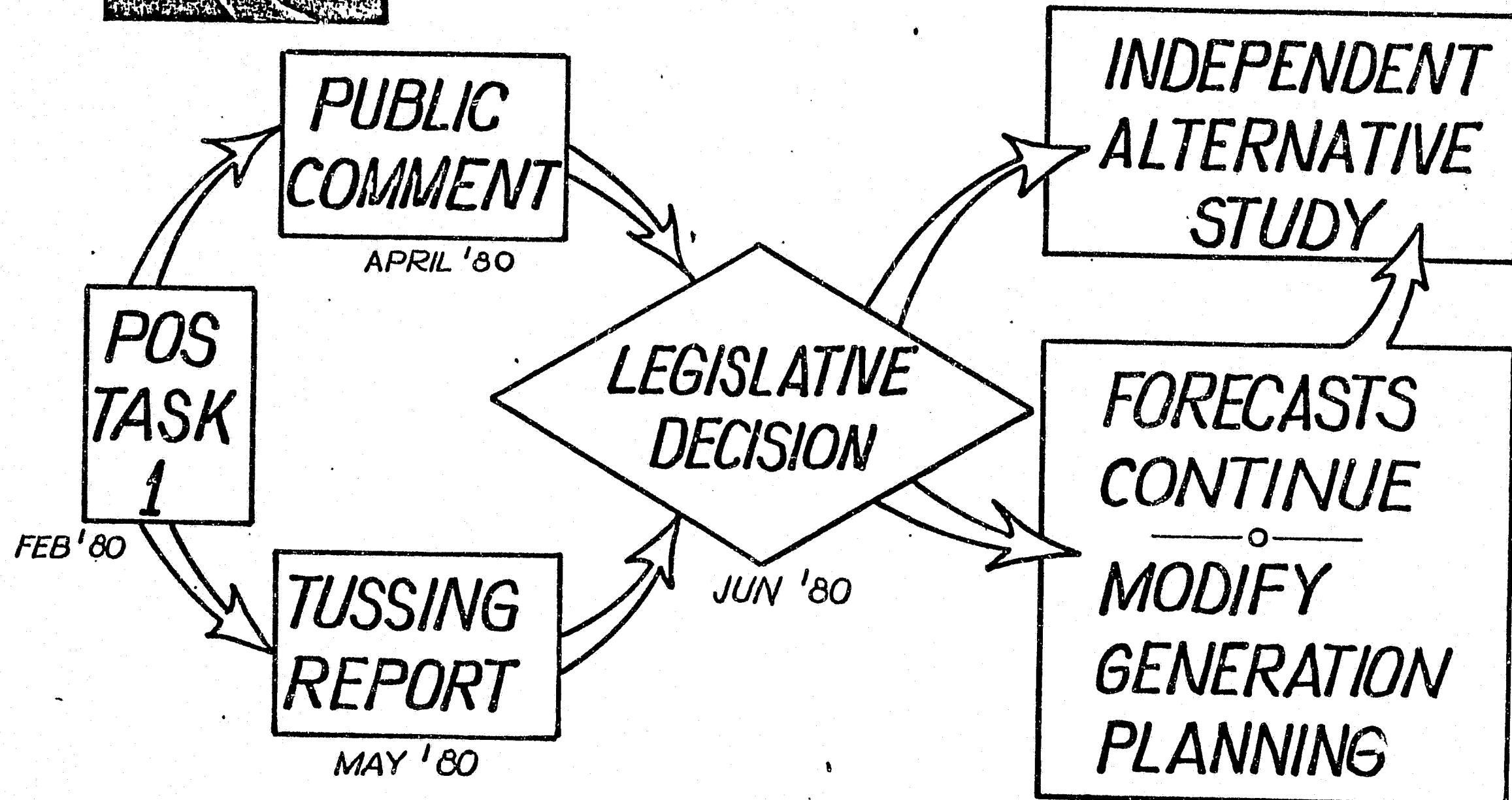
MAR 81  
CONTINUE ?

APR 82  
SUBMIT LICENSE ?





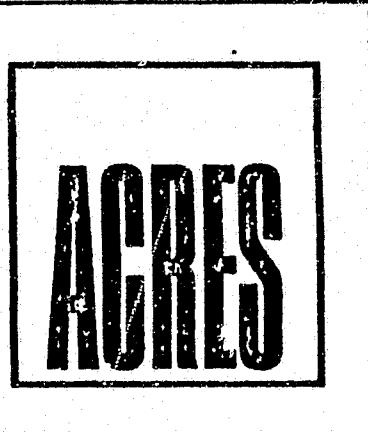
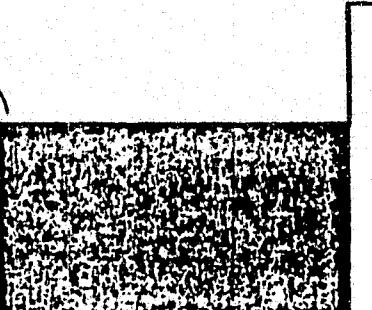
# POS EVOLUTION



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## PROJECT DECISION CRITERIA

- VALID LOAD FORECASTS ?
- ACCEPTABLE SEISMIC RISK ?
- ACCEPTABLE ENVIRONMENTAL IMPACTS ?
- MOST ECONOMIC ALTERNATIVE ?
- FINANCIAL FEASIBILITY ?



## LICENSING REQUIREMENTS

- NEED FOR POWER
- MOST VIABLE ALTERNATIVE
- ADEQUATE DESIGN
- REALISTIC COSTS
- METHOD OF FINANCING
- REQUIRED REVENUE FLOW

**ACRES****ASKS**

- 1 POWER STUDIES
- 2 SURVEYS & CAMPS
- 3 HYDROLOGY
- 4 SEISMIC STUDIES
- 5 GEOTECHNICAL EXPL.
- 6 DESIGN DEV.
- 7 ENVIR. STUDIES

- 8 TRANSMISSION
- 9 COSTS & SCHEDS.
- 10 LICENSING
- 11 MARKETING & FIN.
- 12 PUBLIC PART.
- 13 ADMINISTRATION

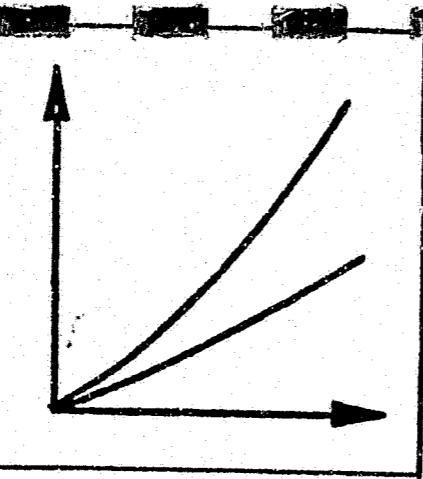
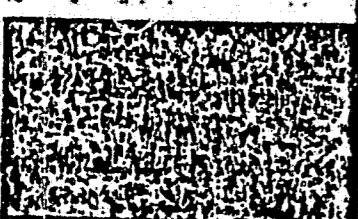
POWER STUDIES



REVIEW ISER

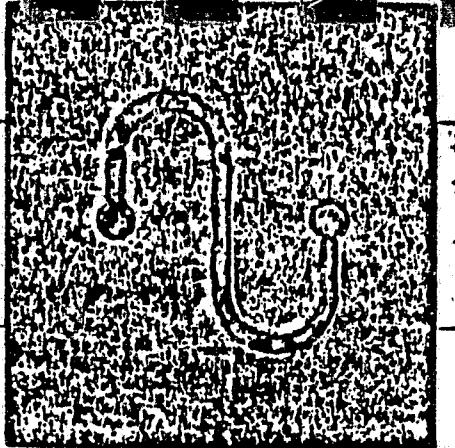


PEAK DEMAND



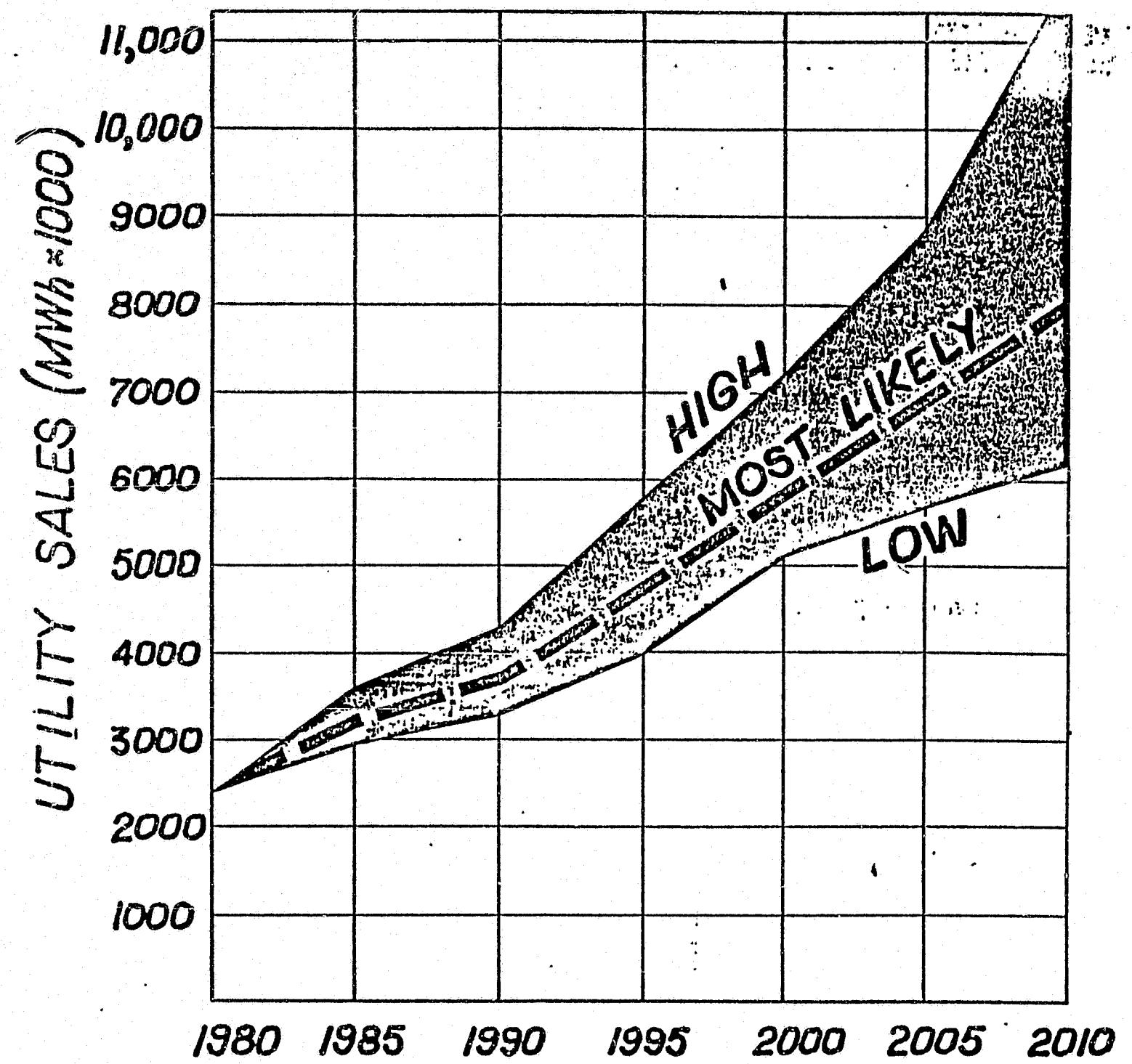
## I.O/I.SER PROJECTIONS

- END-USE MODEL.
- SOME DATA GAPS.
- CONSIDERS CONSERVATION.
- INCLUDES PLANNED DEVELOPMENTS.
- "MOST LIKELY" CASE LESS THAN HISTORICAL.

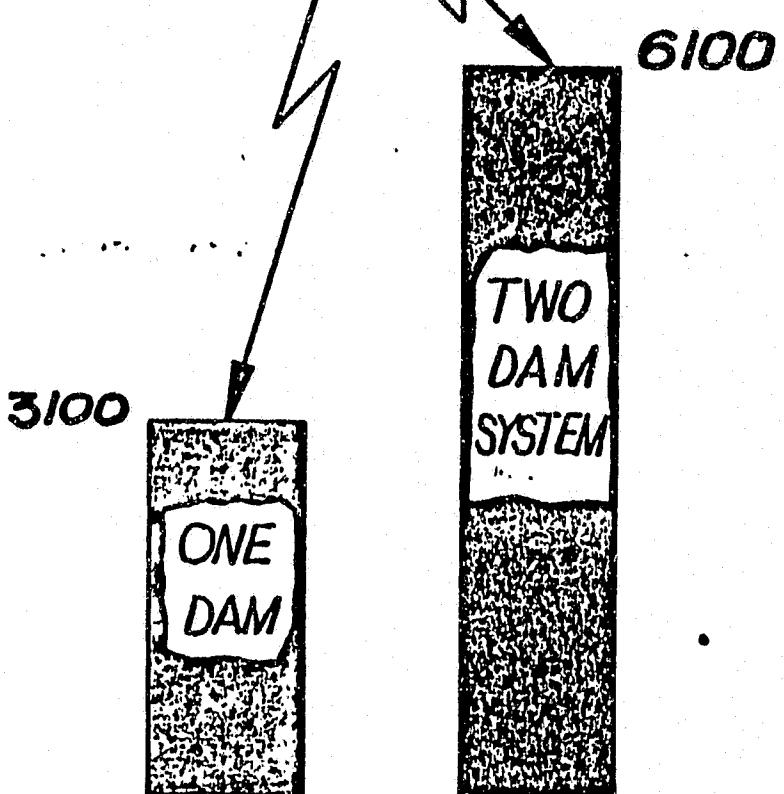


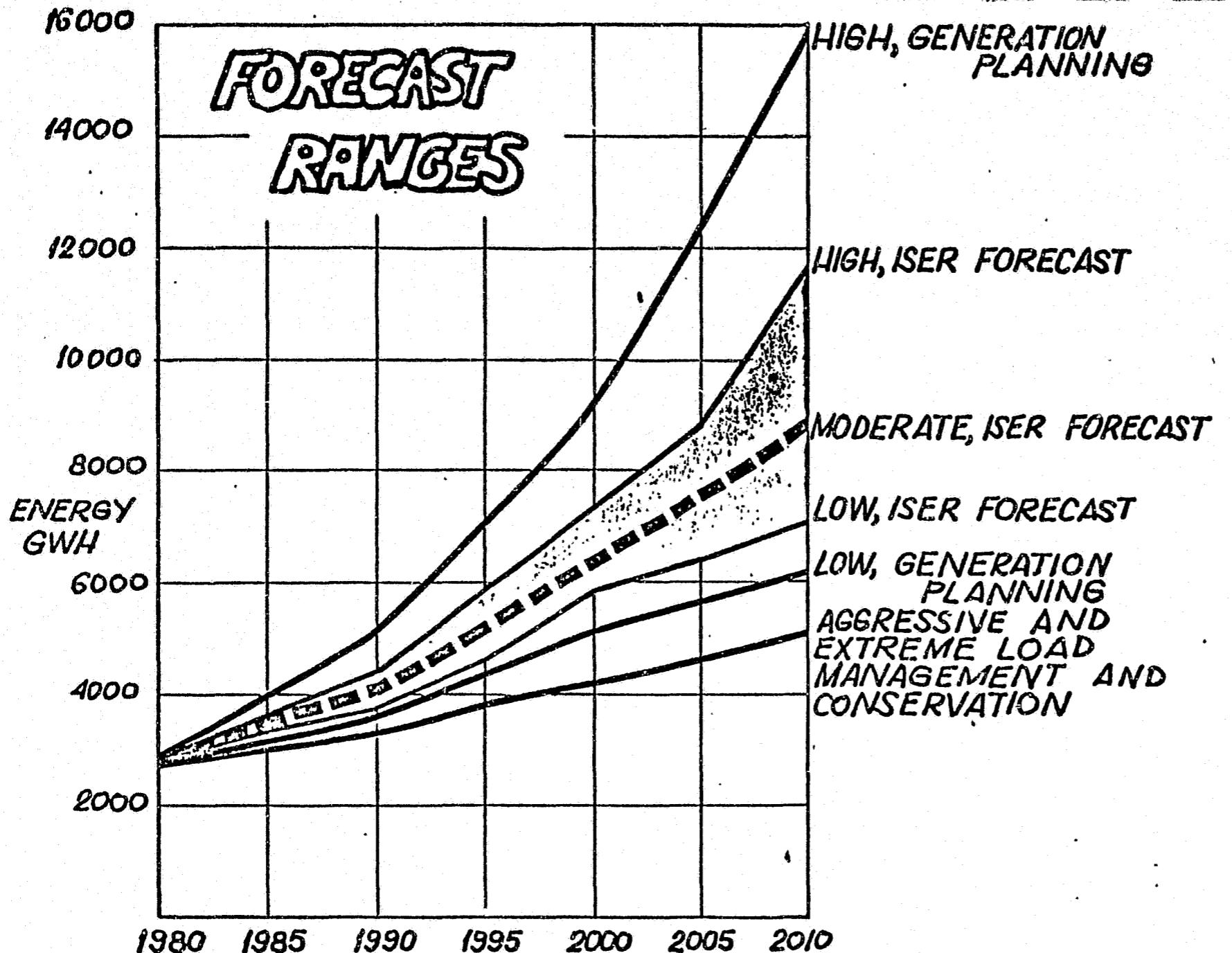
## 102 LOAD FORECASTS

- PEAK LOADS
- LOAD SHAPE
- LOAD DURATION

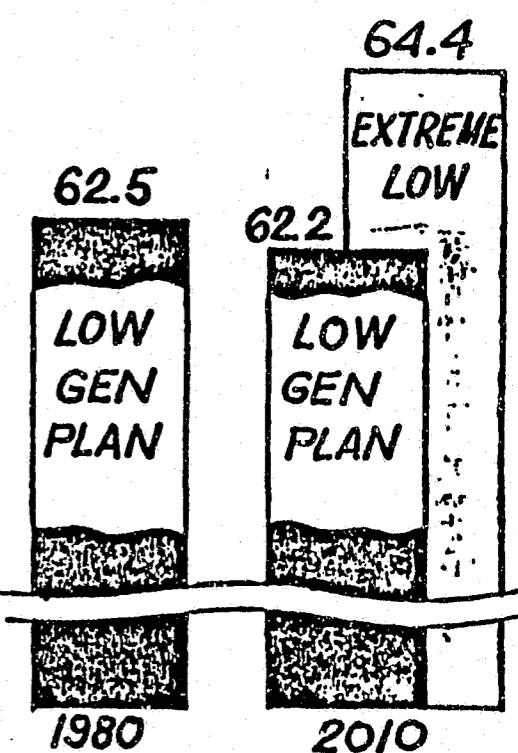


### REPRESENTATIVE SUSITNA POTENTIAL

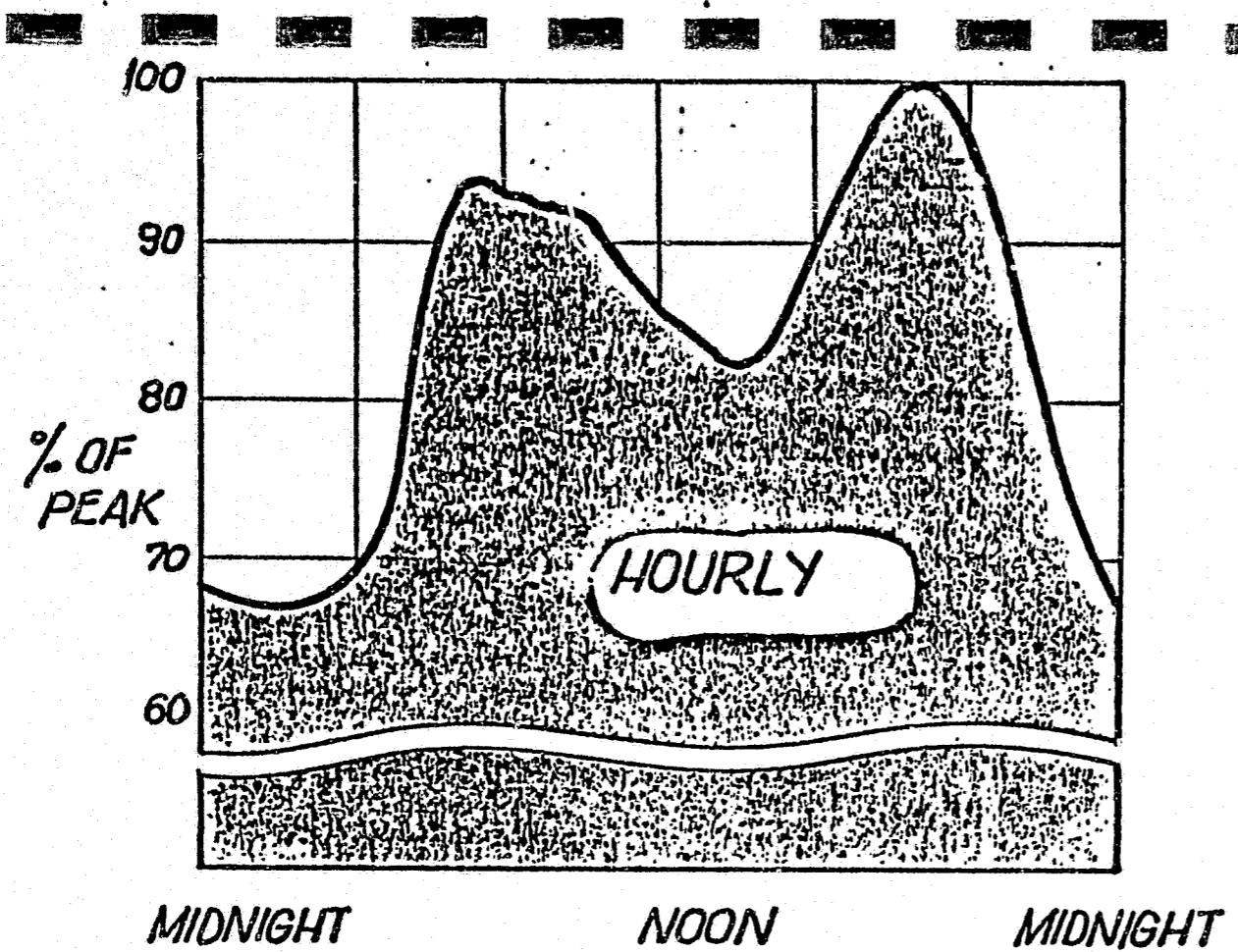




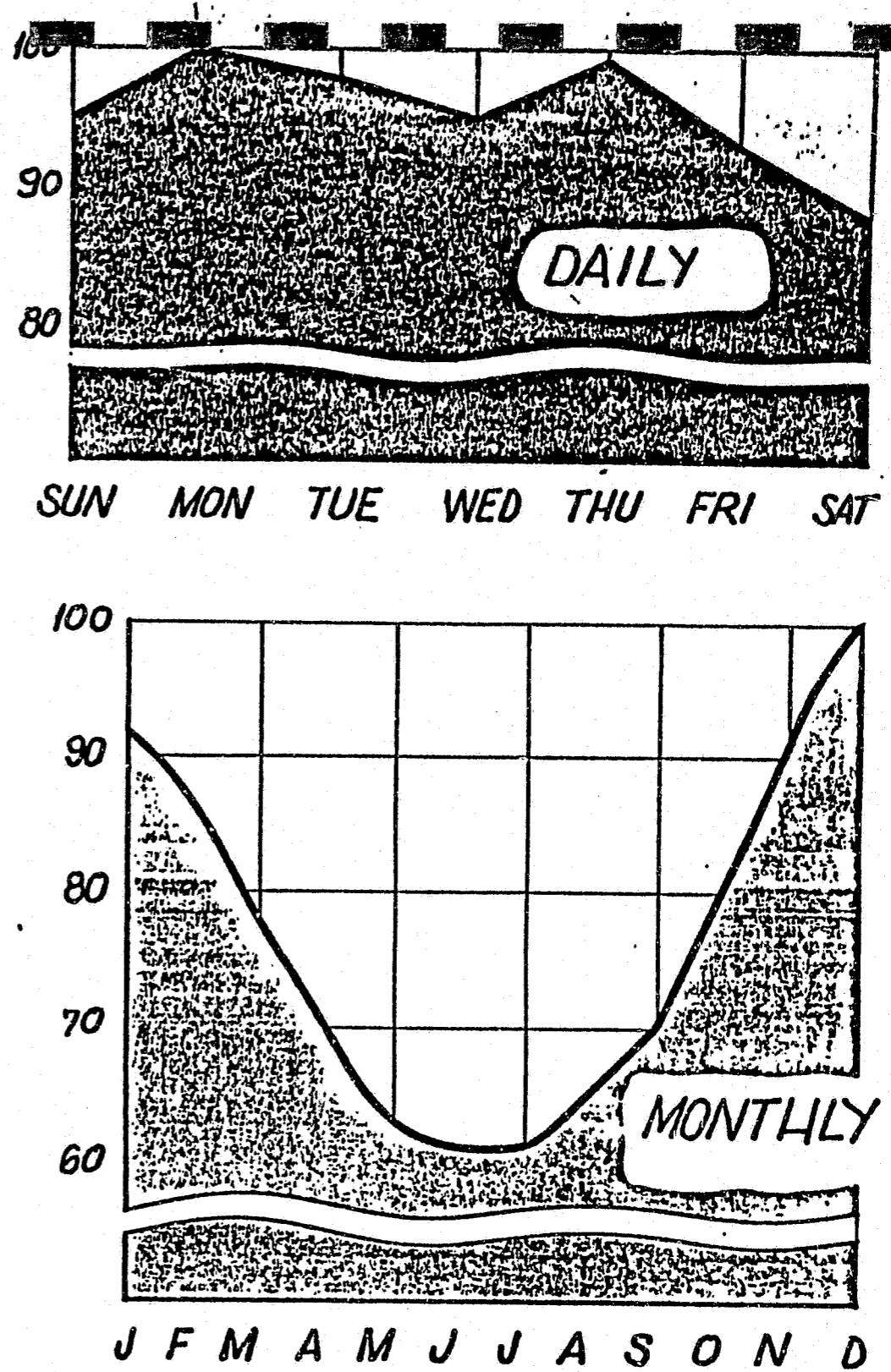
## LOAD FACTORS

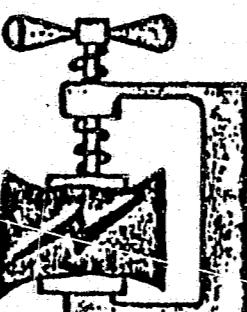


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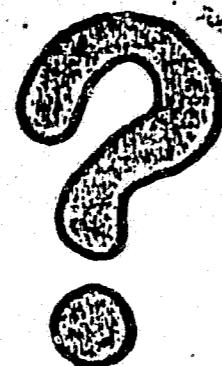
## REPRESENTATIVE LORD VARIATIONS



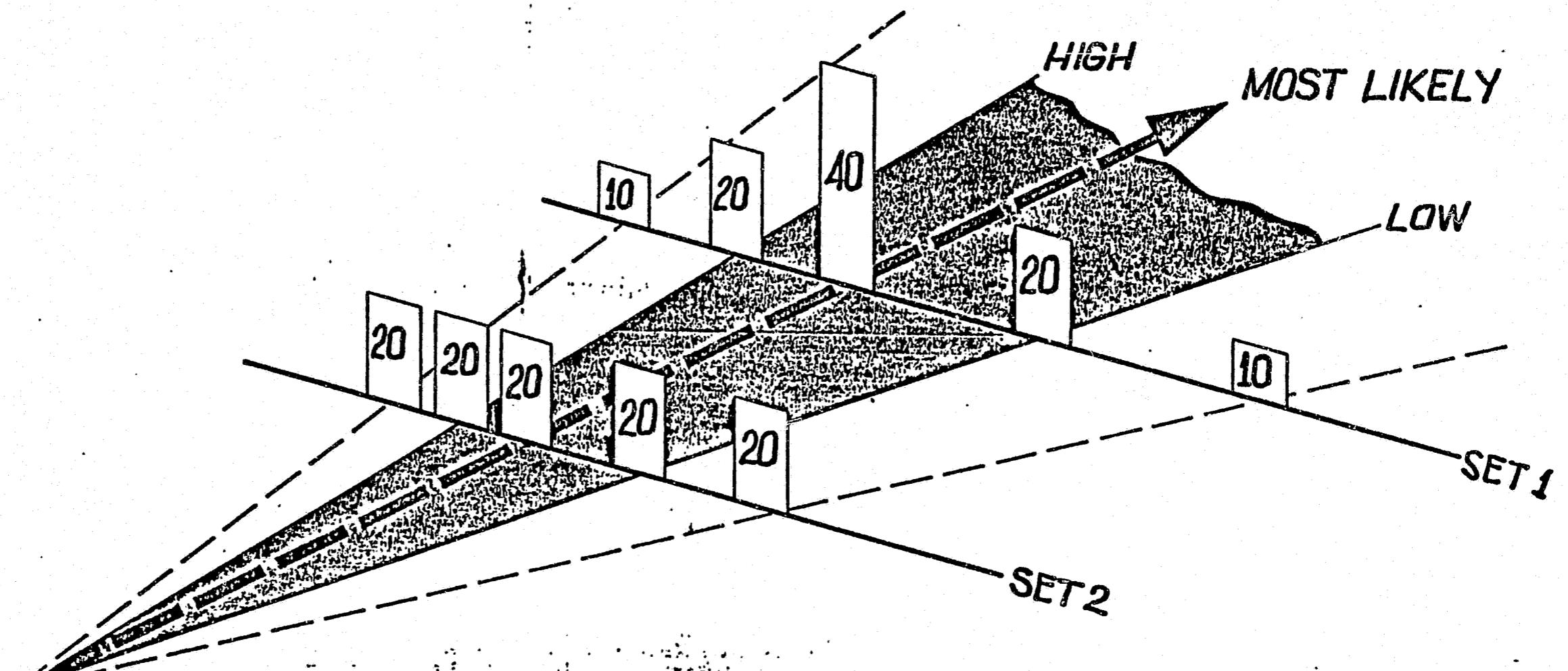


## CONSERVATION + LOAD MGMT

FORECAST	% GROWTH		MEASURES
	ENERGY	LOAD	
ISER LOW	3.16	2.90	90% APPLIANCE EFFICIENCY STANDARDS NEW HOUSING STANDARDS NEW INDUSTRIAL STANDARDS
ENERGY PROBE	2.70	2.73	MORE STRINGENT THAN NOW IN STATE LEGISLATURE
LOW GEN PLAN	2.71	2.73	STRONG CONSERVATION WITH LEGISLATIVE ACTION
EXTREME LOW	2.10	2.00	AGGRESSIVE AND EXTREME CONSERVATION AND LOAD MANAGEMENT



# HANDLING UNCERTAINTY



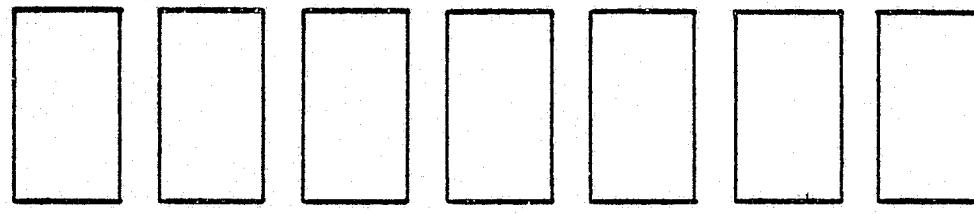
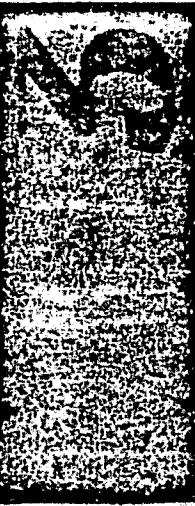
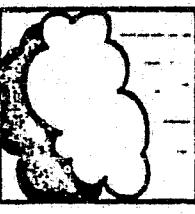


**MURKIN & ASSOCIATES**

- CAMPS & LOGISTICS**
- ACCESS FACILITIES**
- SURVEYS & MAPPING**
- FIELD RECONNAISSANCE**
- RESERVOIR CLEARING**
- SLOPE STABILITY**



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TASK 3 - HYDROLOGY

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OBJECTIVES

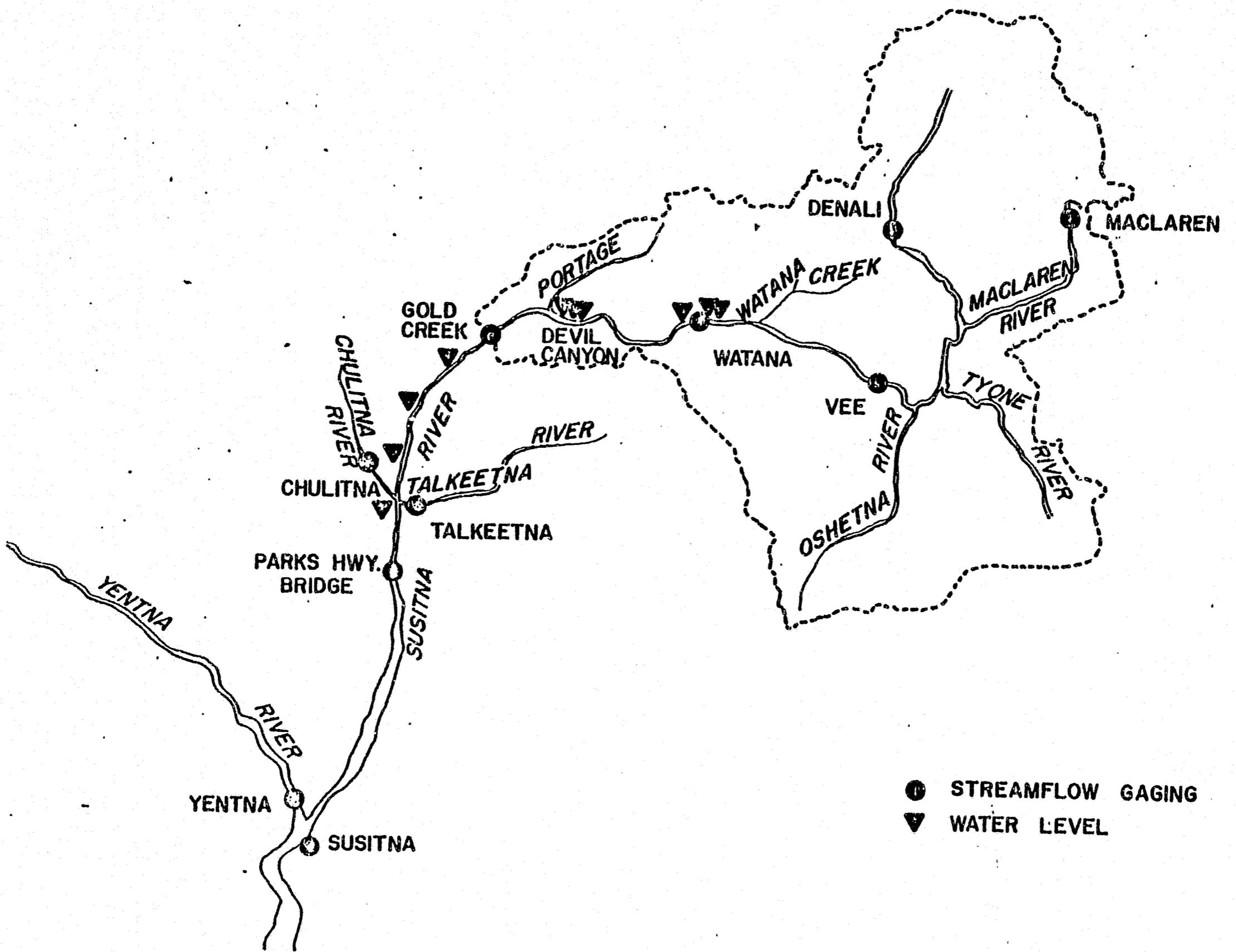
UNDERTAKE ALL NECESSARY

- HYDROLOGIC
- HYDRAULIC
- ICE
- CLIMATIC

STUDIES

**ACTIVITIES IN PROGRESS**

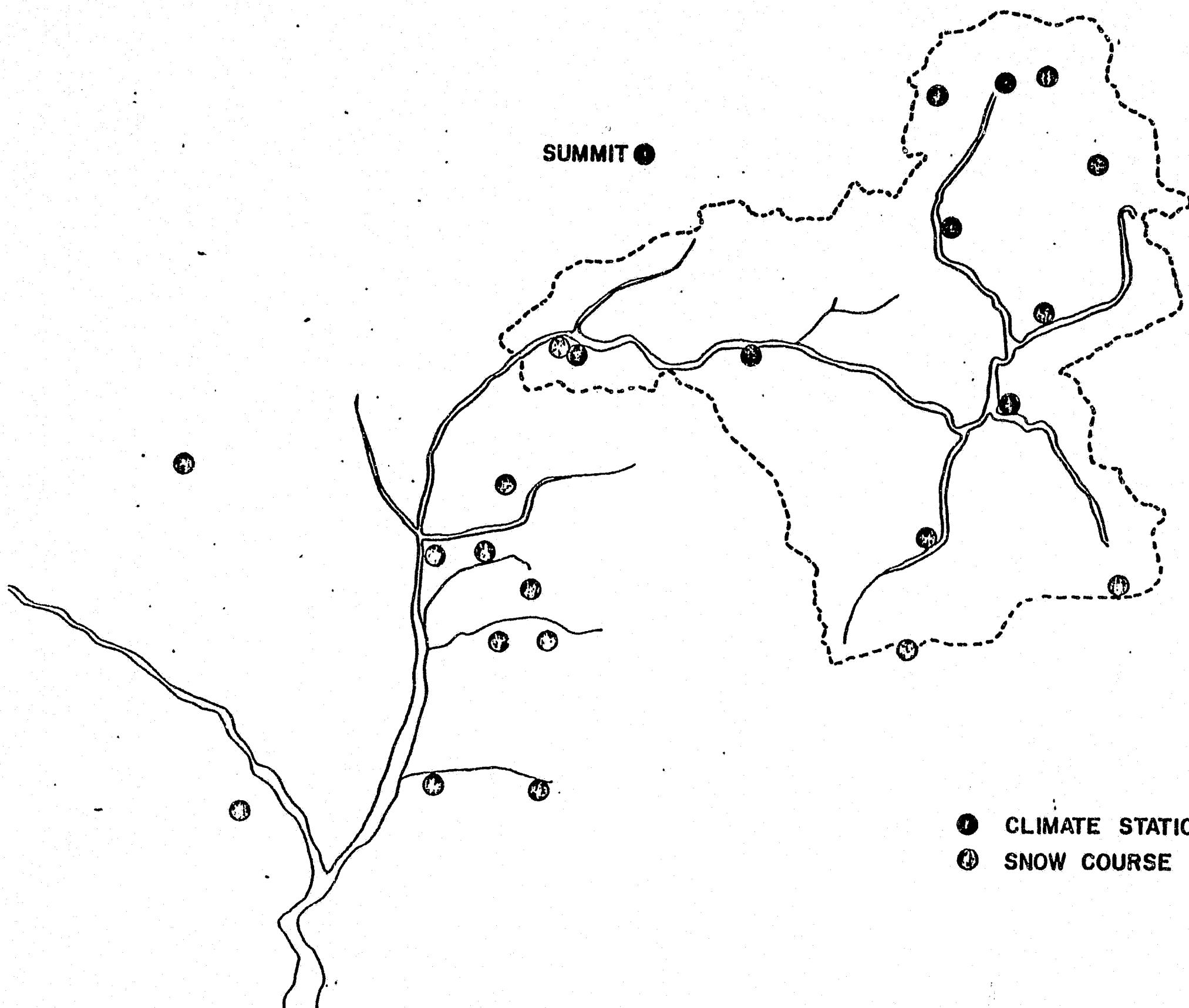
- DATA INDEX
- FIELD DATA
- WATER RESOURCES
- FLOOD
- CLIMATIC STUDIES FOR TRANSMISSION
- LOWER SUSITNA



STREAM FLOW AND WATER LEVEL STATIONS

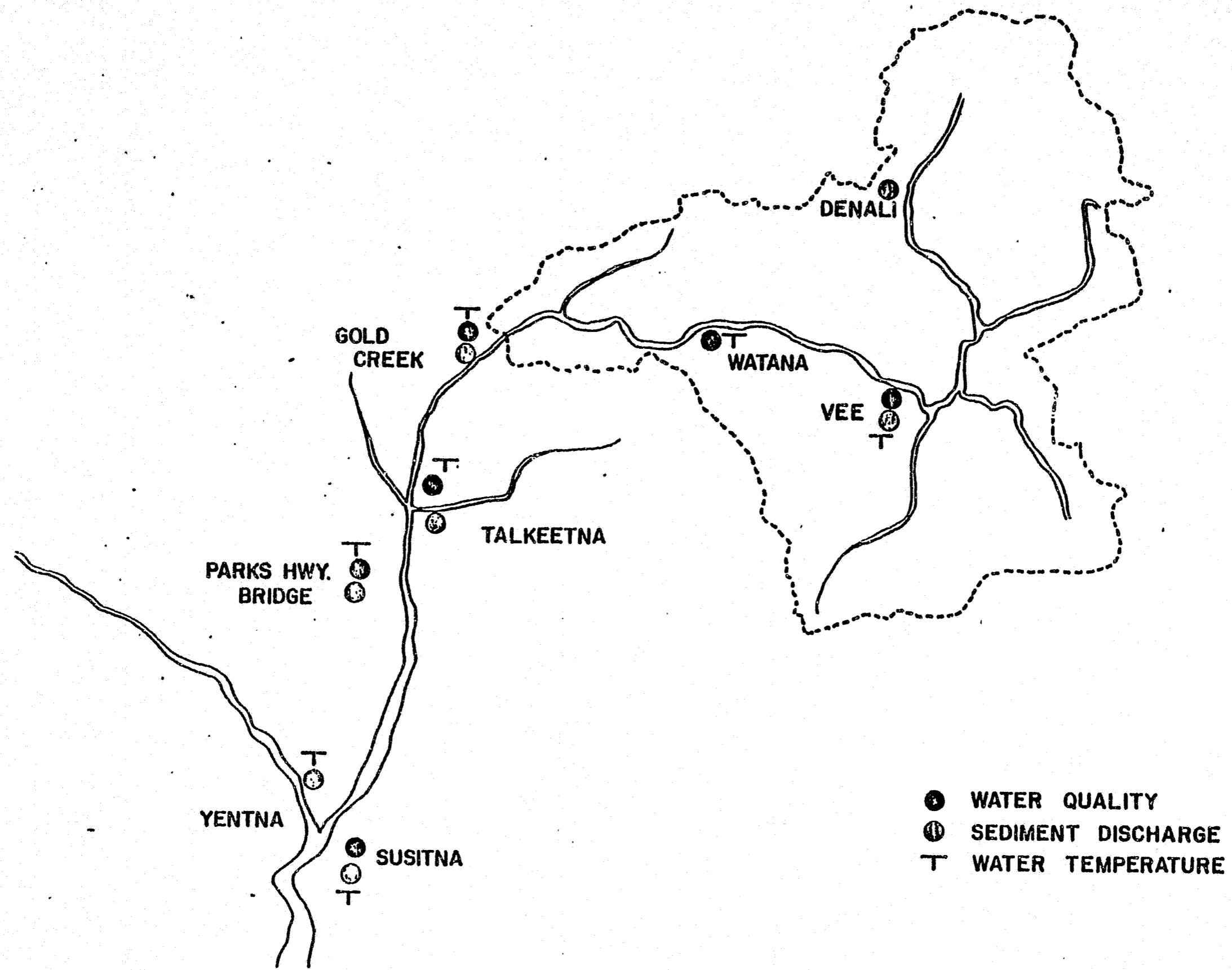
HEALY

SUMMIT



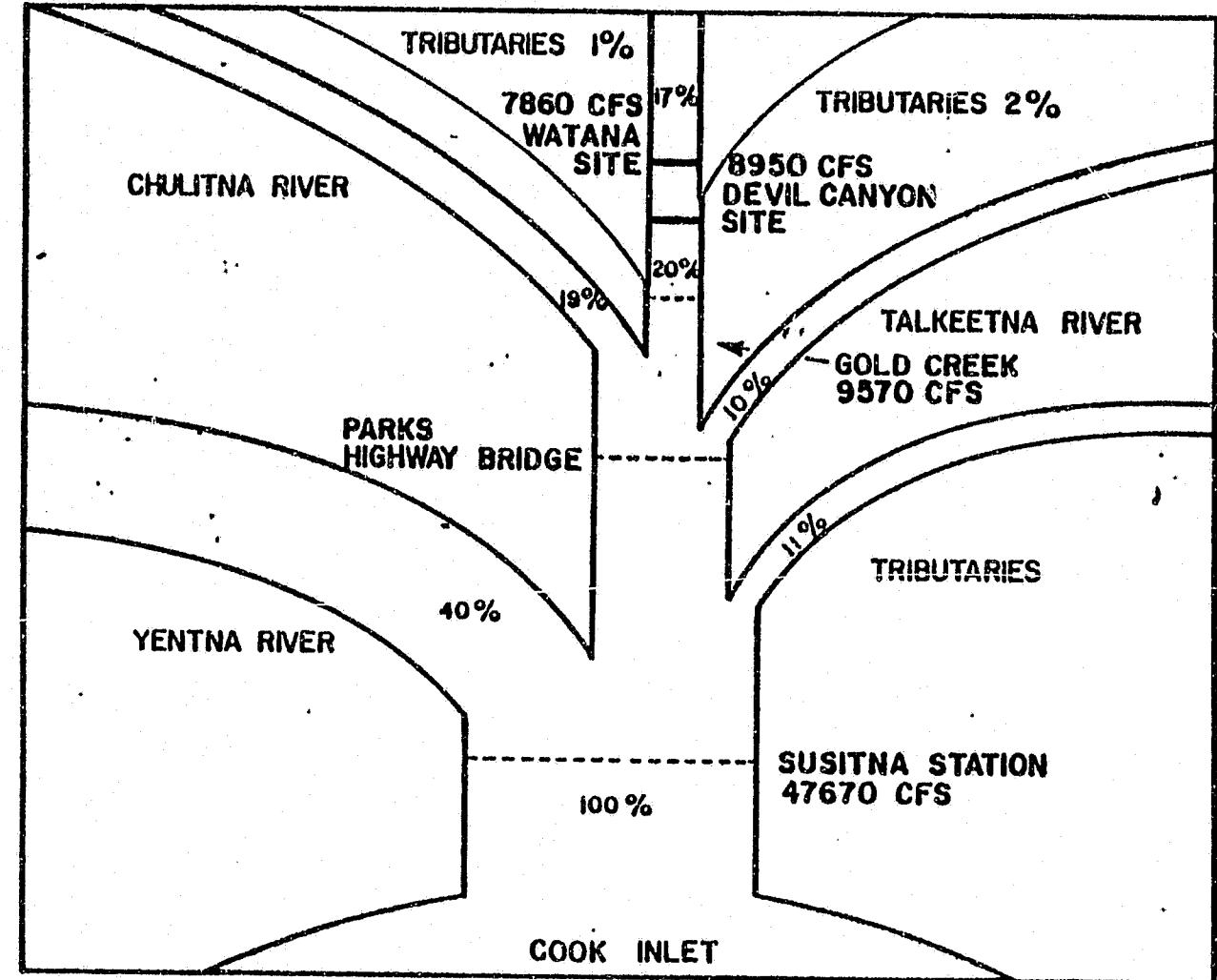
- CLIMATE STATION
- SNOW COURSE

CLIMATE AND SNOW COURSE STATIONS

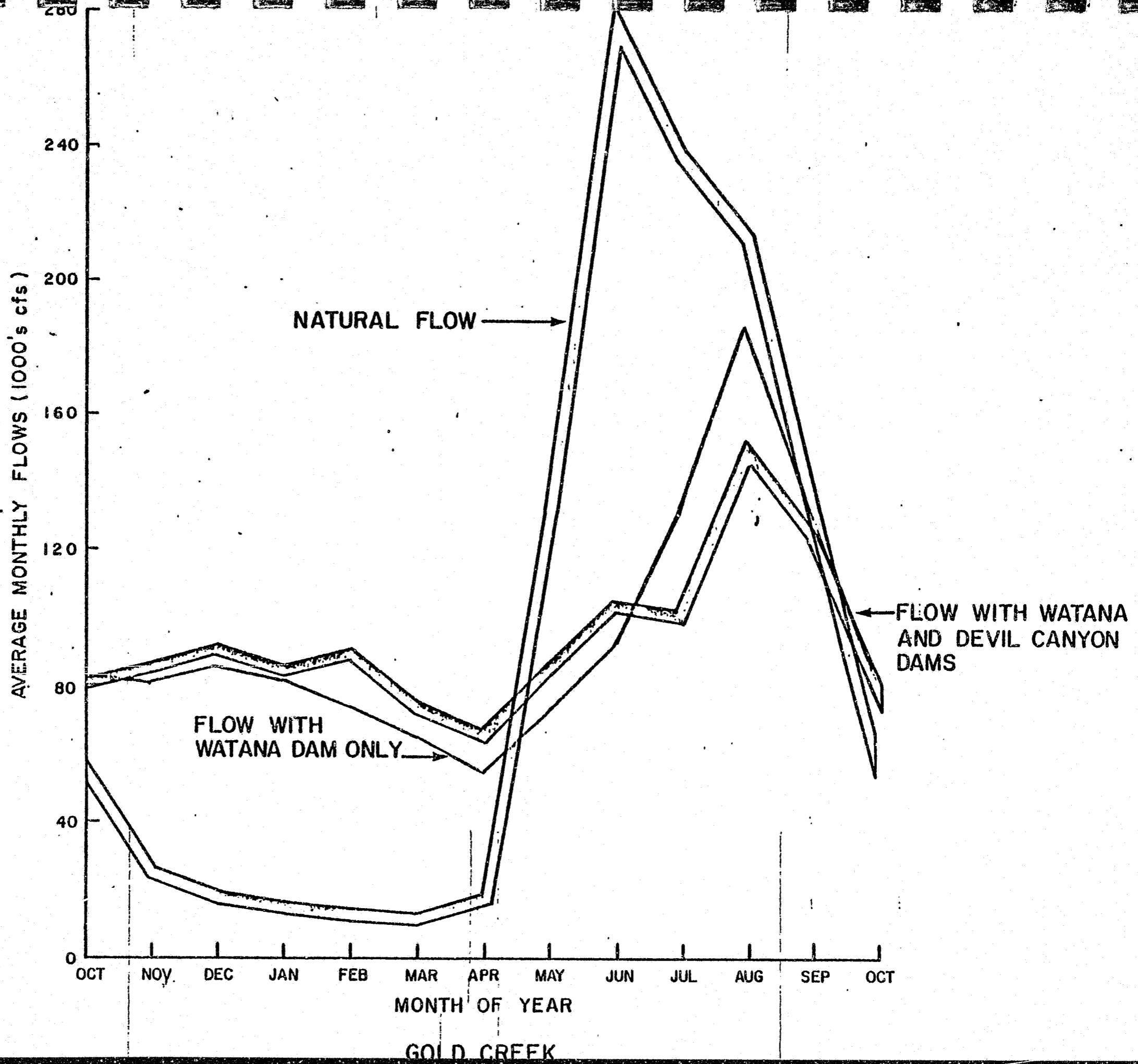


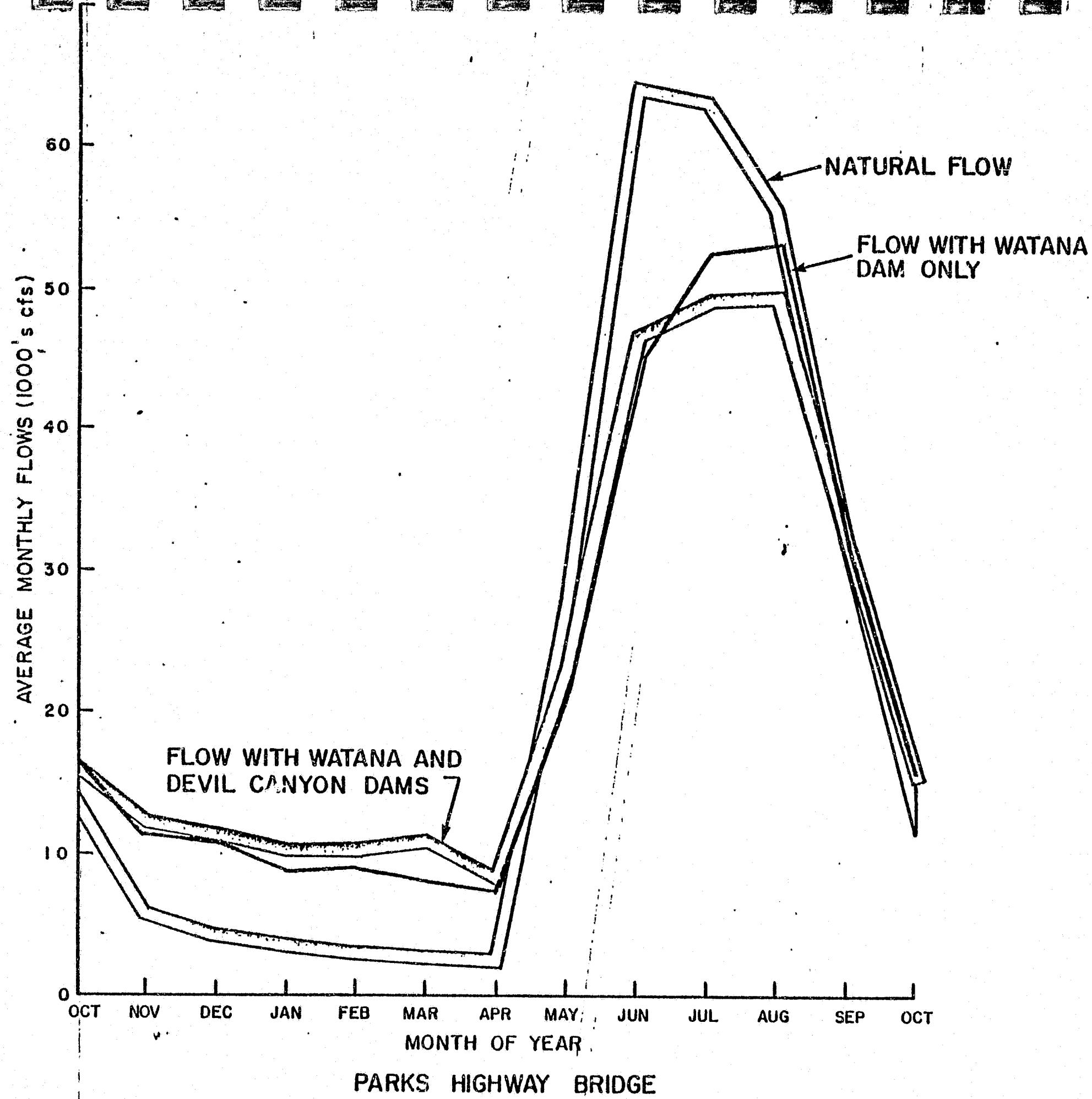
WATER QUALITY STATIONS

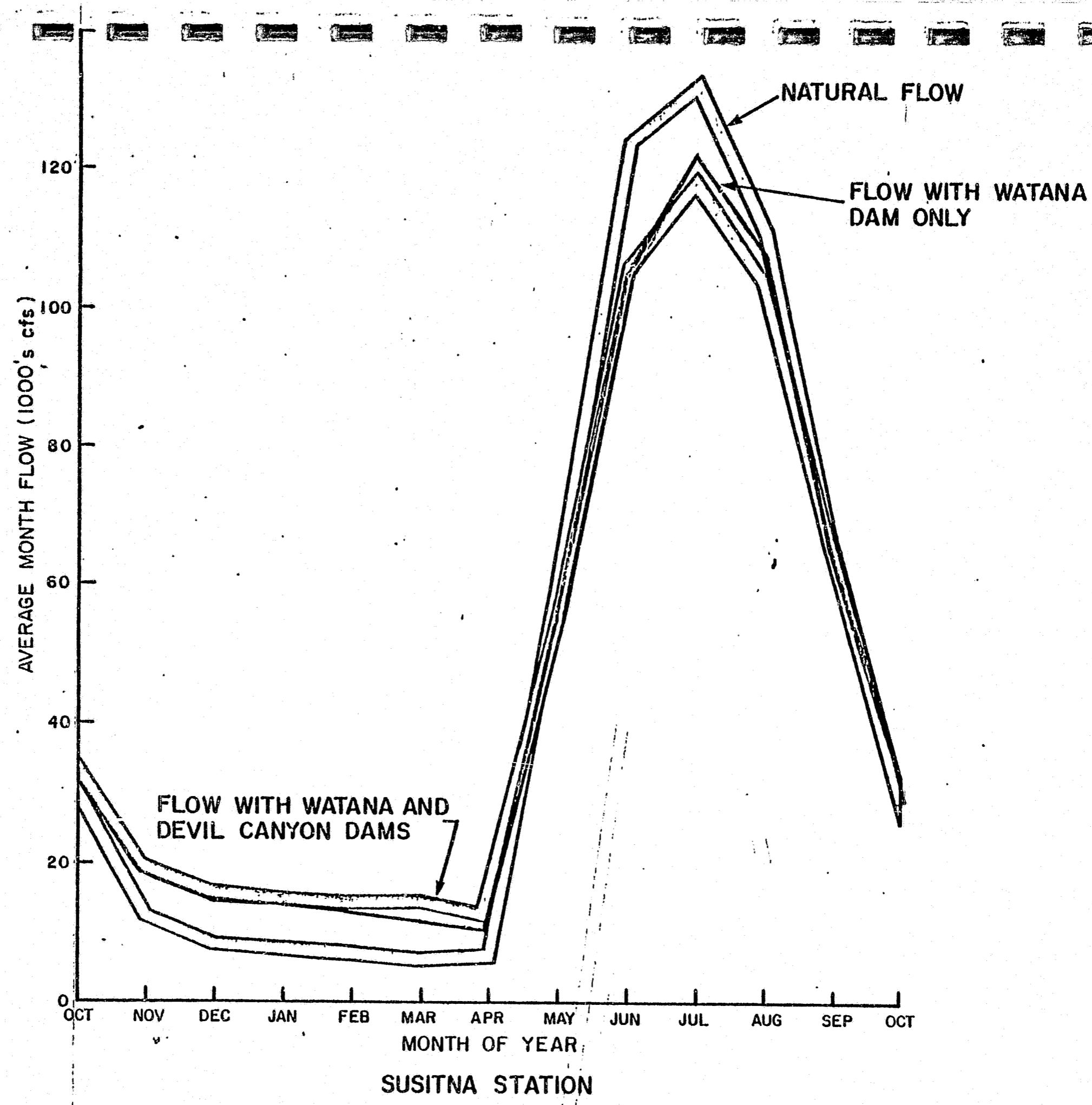
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FLOW CONTRIBUTION OF TRIBUTARIES





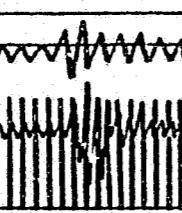


<u>MONTH</u>	<u>AVE. WATER TEMPERATURE °F</u>	<u>TOTAL SUSPENDED SOLIDS (MG/1)</u>
JANUARY	32.0	N/A
FEBRUARY	32.0	76
MARCH	32.0	10
APRIL	32.0	3
MAY	37.8	626
JUNE	43.5	843
JULY	49.0	1164
AUGUST	48.2	966
SEPTEMBER	44.5	164
OCTOBER	38.6	27
NOVEMBER	33.9	4
DECEMBER	32.0	4

BASED ON USGS MEASUREMENTS.

N/A - NOT AVAILABLE

WATER TEMPERATURE AND SUSPENDED SEDIMENT LOAD AT  
GOLD CREEK



# SEISMICITY

- DATA REVIEW
- MONITORING PROGRAMS
- RECONNAISSANCE
- GROUND MOTIONS
- DAM STABILITY
- INDUCED SEISMICITY
- SOIL FAILURE
- REPORTS

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AGRES

**TASK 4 - SEISMIC STUDIES**

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TASK 4 - SEISMIC STUDIES

OBJECTIVES - TASK 4

- ESTABLISH EARTHQUAKE DESIGN CRITERIA
- ASSESS THE IMPACT OF RESERVOIRS ON SEISMICITY
- EVALUATE STABILITY (PRELIMINARY) OF DAMS UNDER EARTHQUAKE
- ASSESS STABILITY OF SOILS ALONG TRANSMISSION LINE AND ACCESS ROUTES

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### STUDY APPROACH

- 1980 STUDIES

- REVIEW OF AVAILABLE DATA
- MICROSEISMIC NETWORK
- SEISMIC GEOLOGY RECONNAISSANCE
- PLANNING OF 1981 STUDIES

- 1981 STUDIES

- DETAILED FIELD STUDIES
- DEFINITION OF EARTHQUAKE DESIGN CRITERIA
- EVALUATION OF DAM STABILITY
- ASSESSMENT FOR RIS
- STABILITY OF SOILS

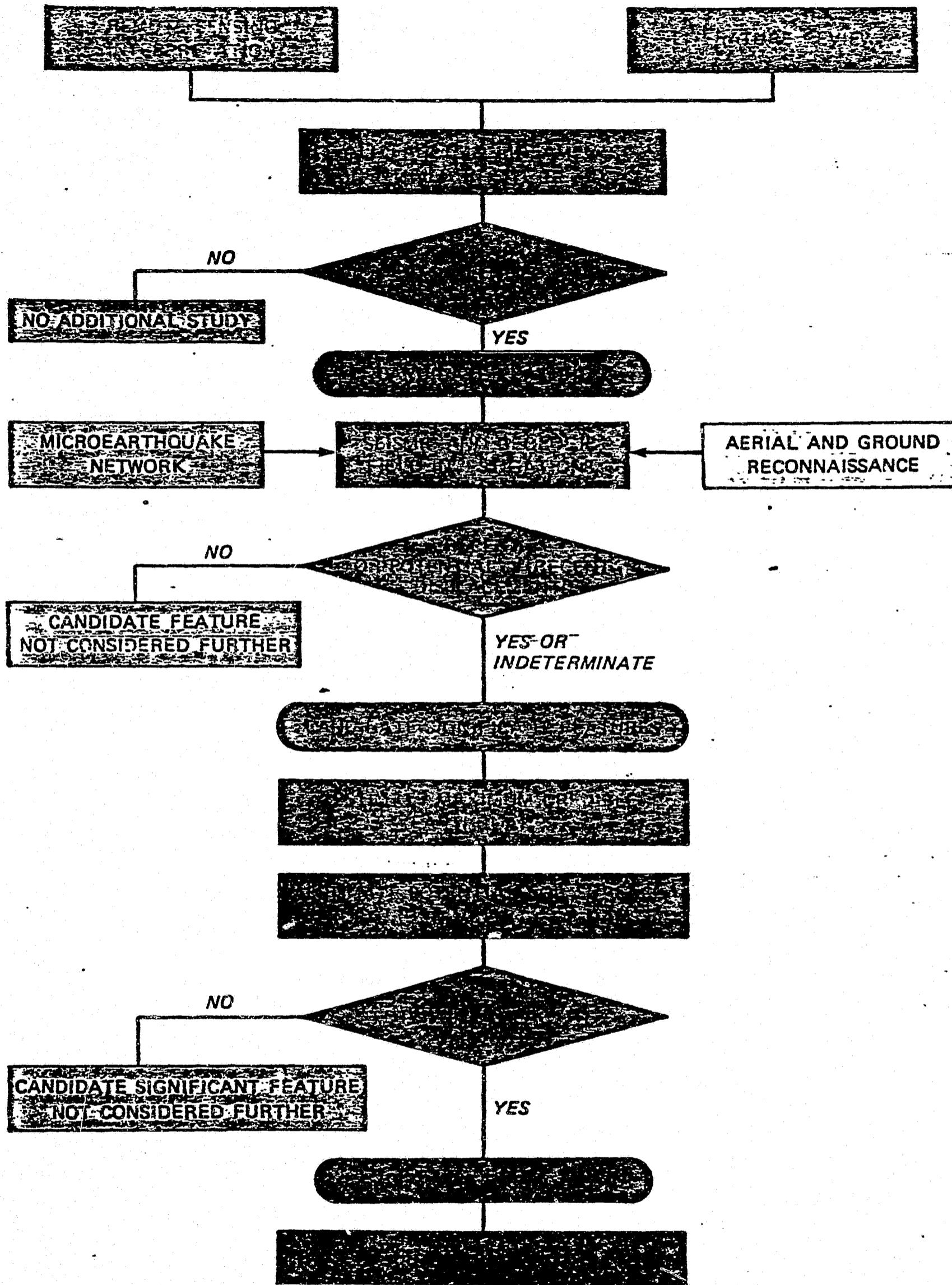
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**1980 ACTIVITIES**

- REVIEW OF AVAILABLE DATA
- SHORT TERM SEISMOLOGY
- PRELIMINARY RIS
- REMOTE SENSING IMAGE ANALYSIS
- SEISMIC GEOLOGY RECONNAISSANCE
- EVALUATION AND REPORTING
- PRELIMINARY GROUND MOTION STUDIES
- PRELIMINARY ANALYSIS OF DAM STABILITY

## METHODOLOGY

- COLLECT AND REVIEW
  - GEOLOGICAL, SEISMOLOGICAL AND GEOPHYSICAL DATA
  - REMOTE SENSING AND HIGH ALTITUDE IMAGERY
  - BLACK AND WHITE AERIAL PHOTOGRAPHS
- IDENTIFY ALL FAULTS AND LINEAMENTS
- SCREEN OUT FEATURES WHICH ARE NOT SIGNIFICANT
- CONDUCT AERIAL AND GROUND RECONNAISSANCE
- INSTALL/OPERATE MICROSEISMIC NETWORK
- SELECT FEATURES SIGNIFICANT TO THE SITE
  - TO DETERMINE THE IMPACT ON PROJECT
  - RELATE WITH MICROSEISMIC DATA
- IDENTIFY FAULTS/FEATURES FOR 1981 STUDY

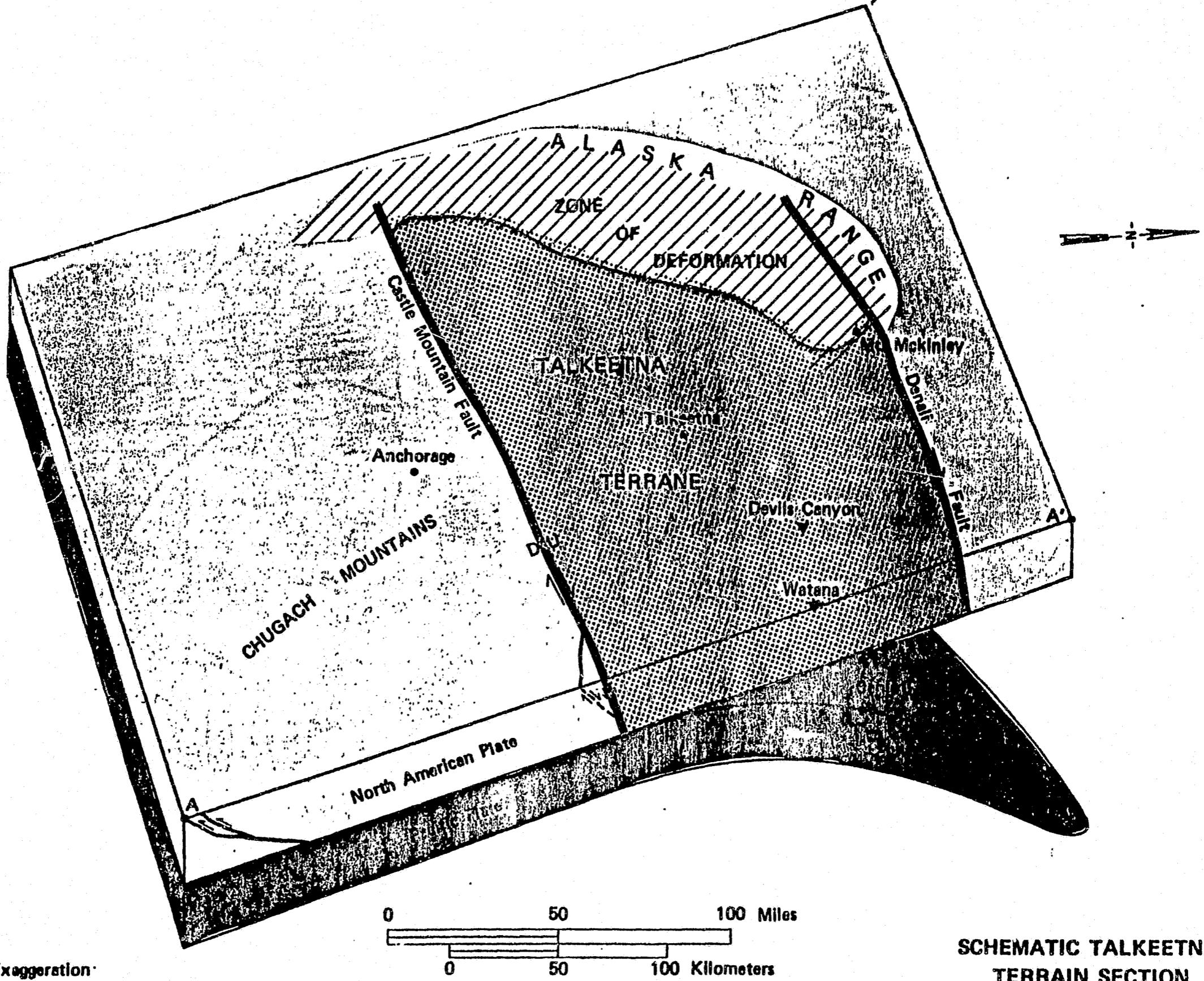


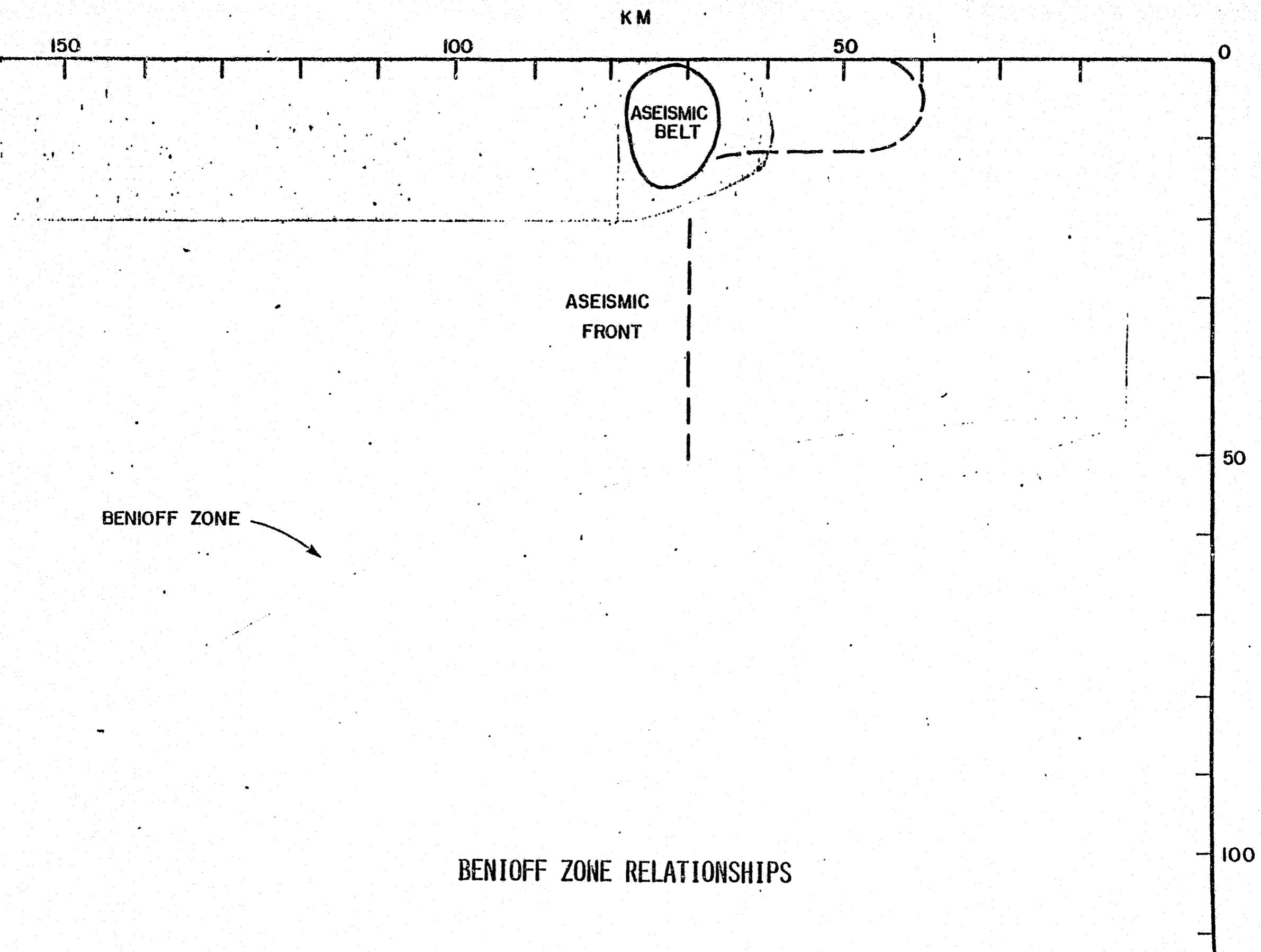
1980 SEISMIC FAULT GEOLOGY FLOW DIAGRAM

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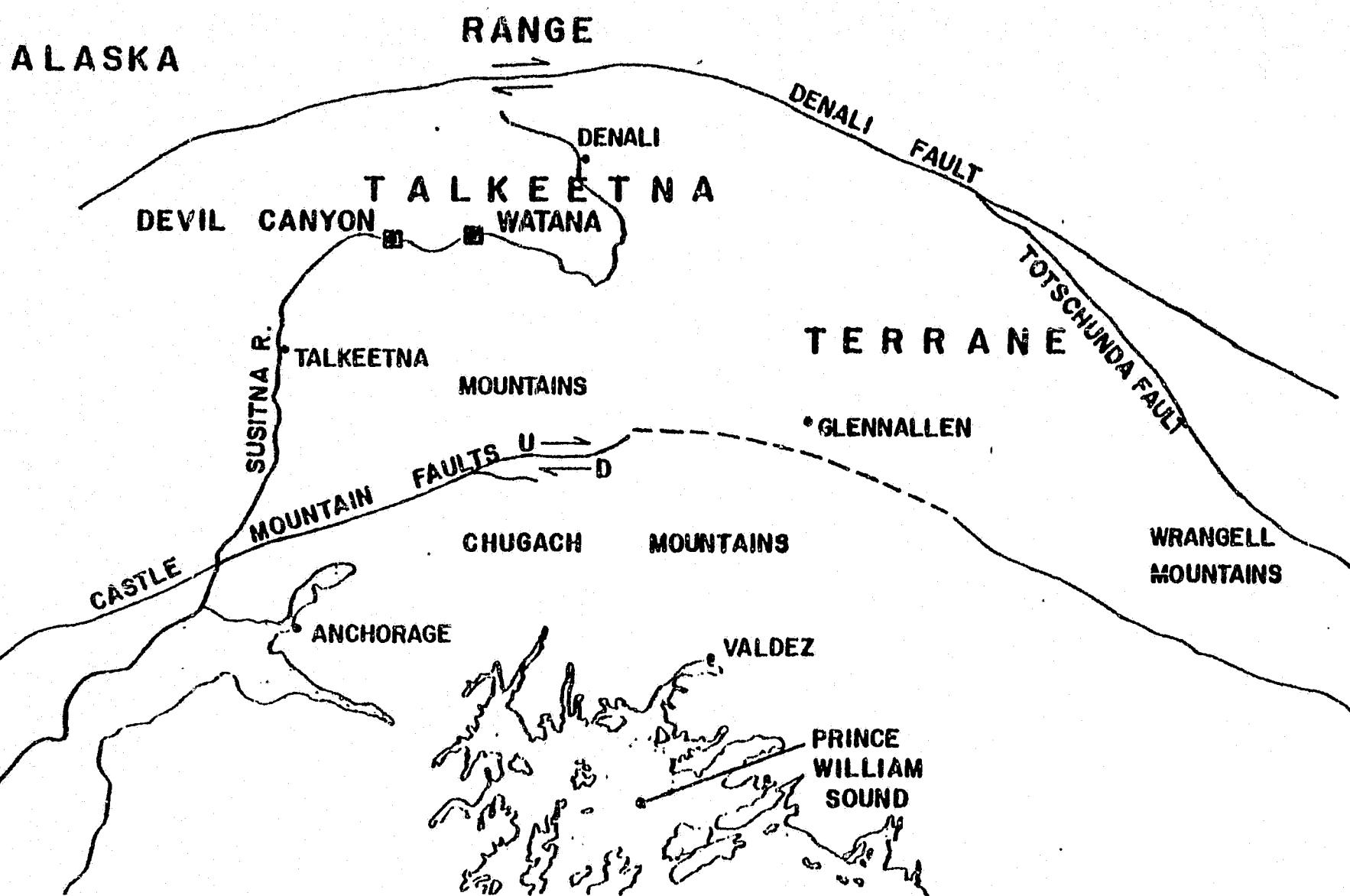
### MICROEARTHQUAKE STUDY OBJECTIVES

- LOCATIONS AND FOCAL DEPTHS OF MICROMEARTHQUAKES
- STYLE OF FAULTING
- STRESS ORIENTATION
- GEOLOGIC ASSOCIATIONS OF MICROMEARTHQUAKES
- SOURCE AND WAVE PROPAGATION CHARACTERISTICS





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SUSITNA PROJECT SEISMIC SETTING

ACRES

▲ HUR  
DEVIL CANYON SITE X  
▲ CNL  
▲ DPC  
▲ DCR  
▲ SBL  
WATANA SITE X  
▲ GRB  
▲ UPG  
▲ TKR  
▲ DED  
WAC  
▲ JAY  
▲ KOS

0 10 20 30  
SCALE IN MILES

MICROSEISMIC NETWORK

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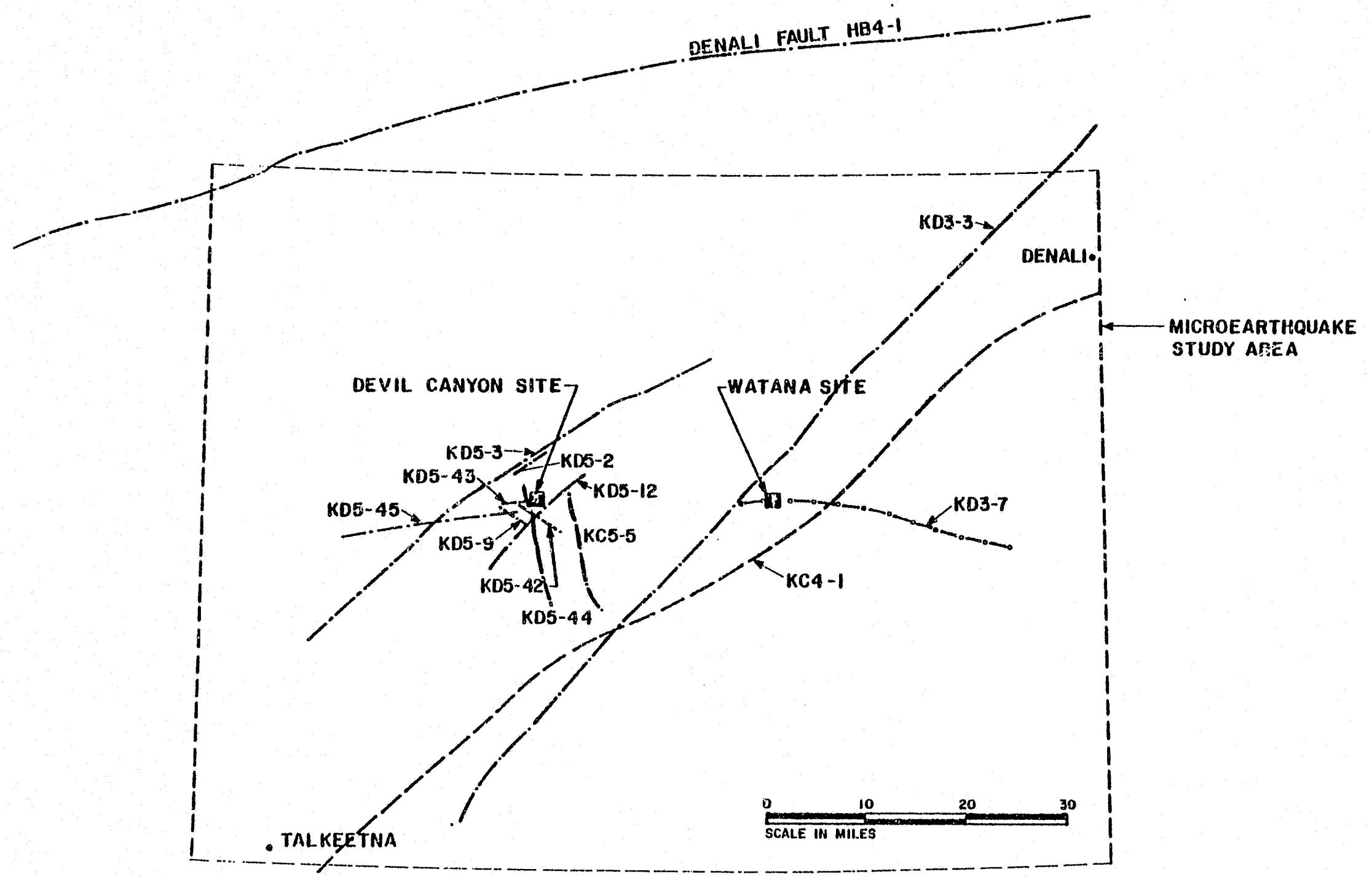
## PRELIMINARY FINDINGS

- LARGEST REPORTED HISTORICAL EVENT (1929)  
6.25 M @ 35 TO 45 MILES
- ONLY 4 EVENTS GREATER THAN 5 M  
(1904-1980 AUGUST)
- MICROEARTHQUAKES NOT RELATED TO FEATURES
- NO EVIDENCE OF RECENT MOVEMENT ON TALKEETNA TERRAIN FEATURES

TENTATIVE 1981 STUDIES

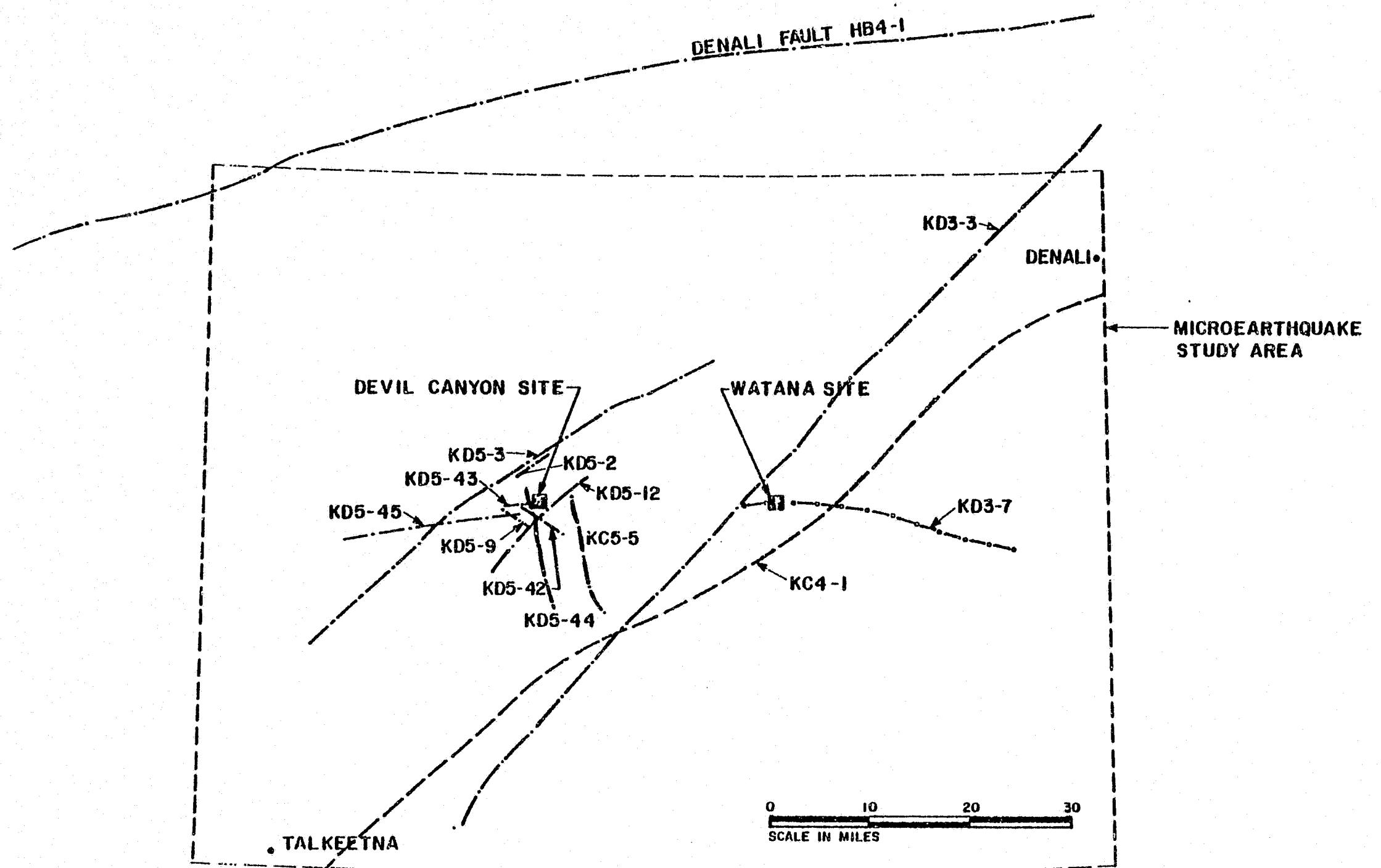
- DETAILED FIELD STUDY OF 13 FEATURES
- STUDY OF LOW SUN ANGLE PHOTOGRAPHY
- ASSESSMENT OF SEISMICITY
- ASSESSMENT OF RIS
- DEFINITION OF EARTHQUAKE PARAMETERS
- ASSESSMENT OF DAM STABILITY
- ASSESSMENT OF SOIL STABILITY

ACRES

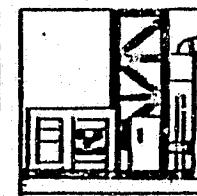
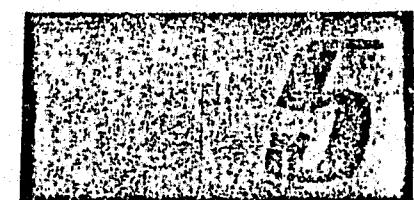


FEATURES SELECTED FOR 1981 STUDIES

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FEATURES SELECTED FOR 1981 STUDIES



# DATA REVIEW AND PROGRAMMING

- DATA REVIEW
- PHOTO INTERPRETATION
- PROGRAM DESIGNS
- EXPLORATION - 1980
- EXPLORATION - 1981
- DATA COMPIRATION



## OBJECTIVES

- DETERMINE GEOLOGIC AND GEOTECHNICAL DATA
- LOCATE CONSTRUCTION MATERIAL

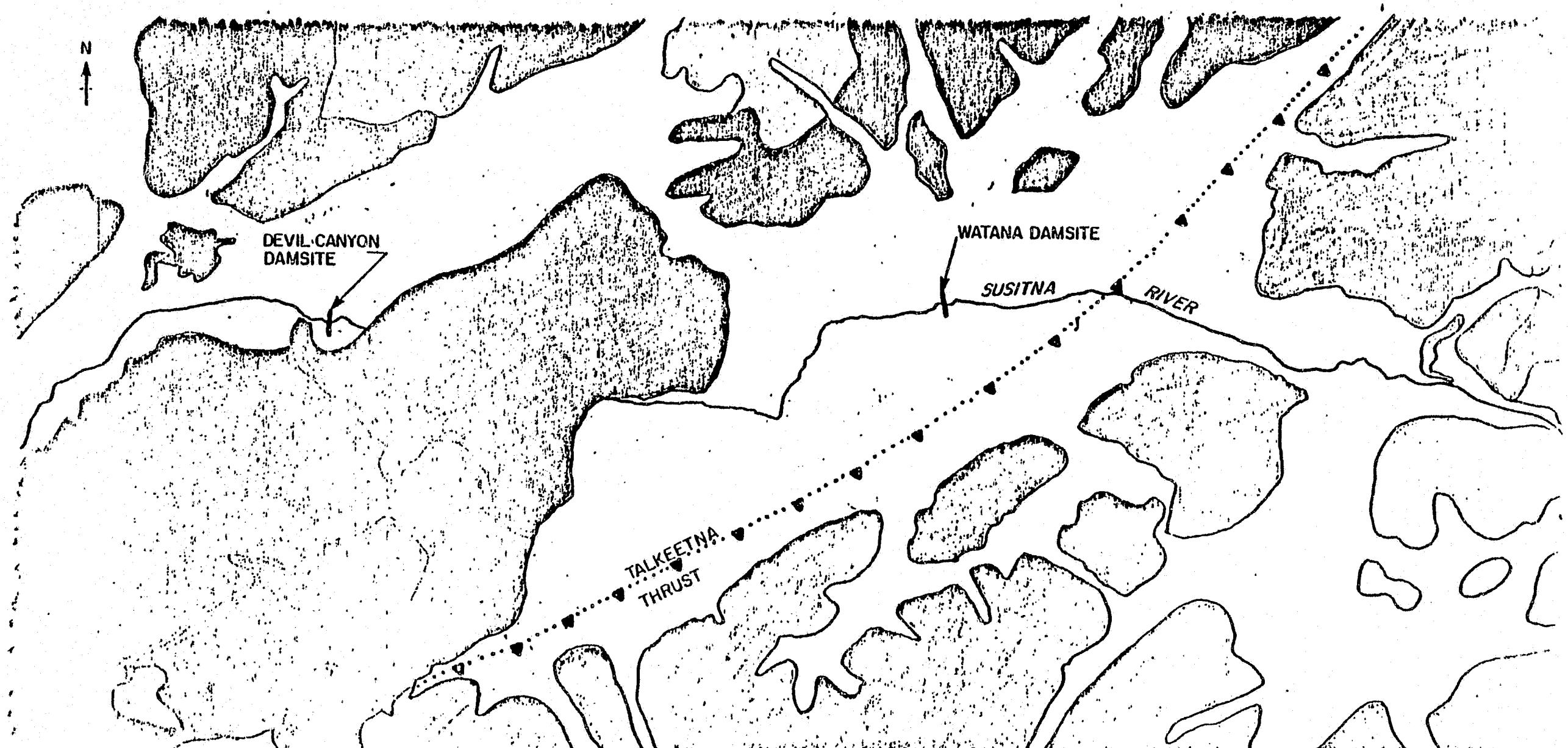
## APPROACH

- COLLECTION AND REVIEW OF AVAILABLE DATA
- AERIAL PHOTO INTERPRETATION
- EXPLORATORY PROGRAM (1980)
- EXPLORATORY PROGRAM (1981)
- ANALYSIS OF DATA

## TASK 5 - GEOTECHNICAL EXPLORATIONS

LEGEND

[Symbol: White Box]	QUATERNARY UNDIVIDED
[Symbol: Hatched Box]	TERTIARY SEDIMENTARY ROCK
[Symbol: Dotted Box]	TERTIARY IGNEOUS ROCKS
[Symbol: Cross-hatched Box]	CRETACEOUS SEDIMENTARY ROCKS
[Symbol: Diagonal-hatched Box]	JURASSIC IGNEOUS ROCKS
[Symbol: Vertical-hatched Box]	TRIASSIC / PERMIAN SEDIMENTARY ROCKS



0 3 6 12  
Scale in Miles

SUSITNA BASIN REGIONAL GEOLOGY



## WATANA SITE

- RECONNAISSANCE DATA, USBR, USACE
- USACE, 1975-78

28 BORINGS

27 TEST PITS

18 AUGER BORINGS

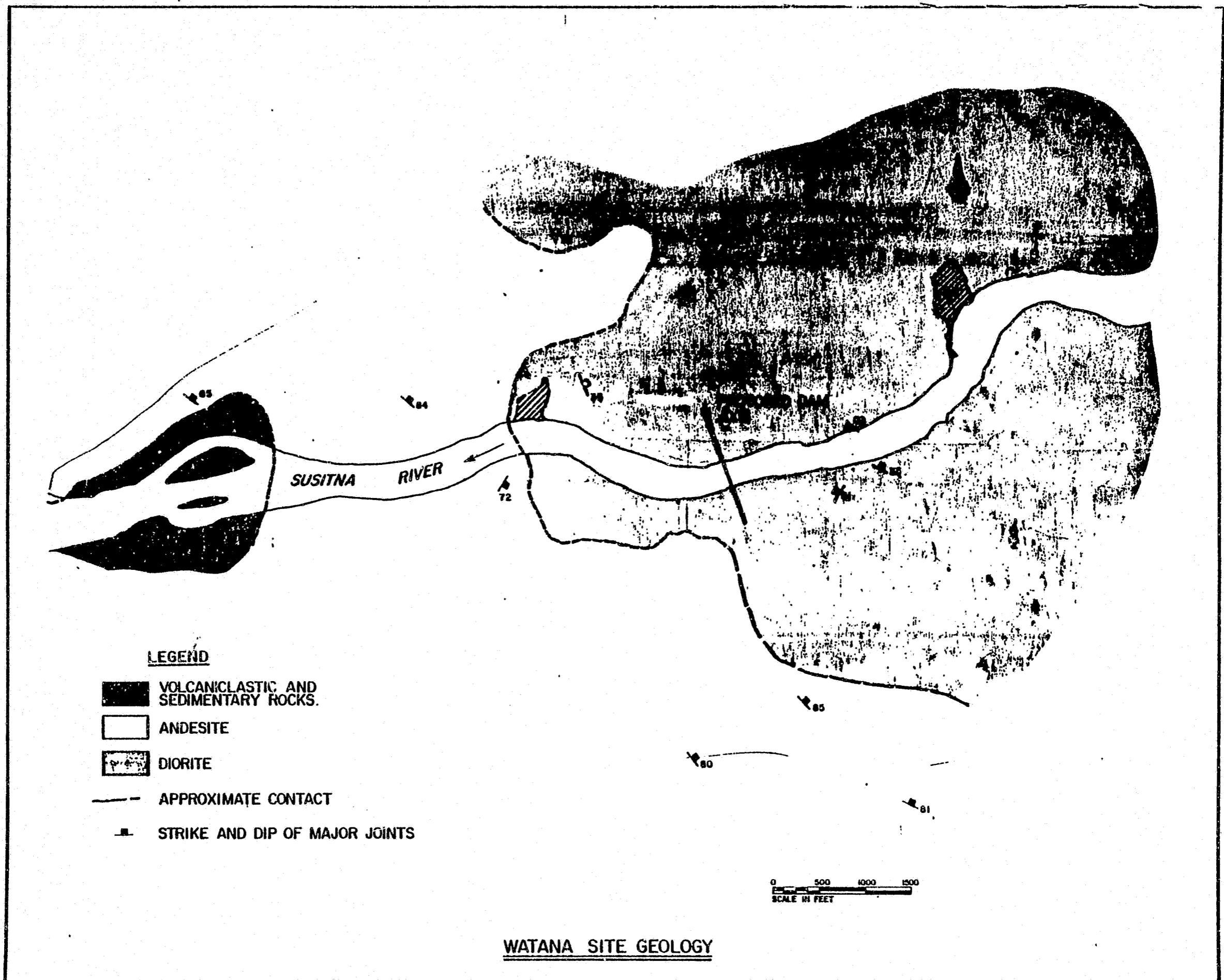
701.65 L.F. SEISMIC REFRACTION SURVEY

- INSTRUMENTATION

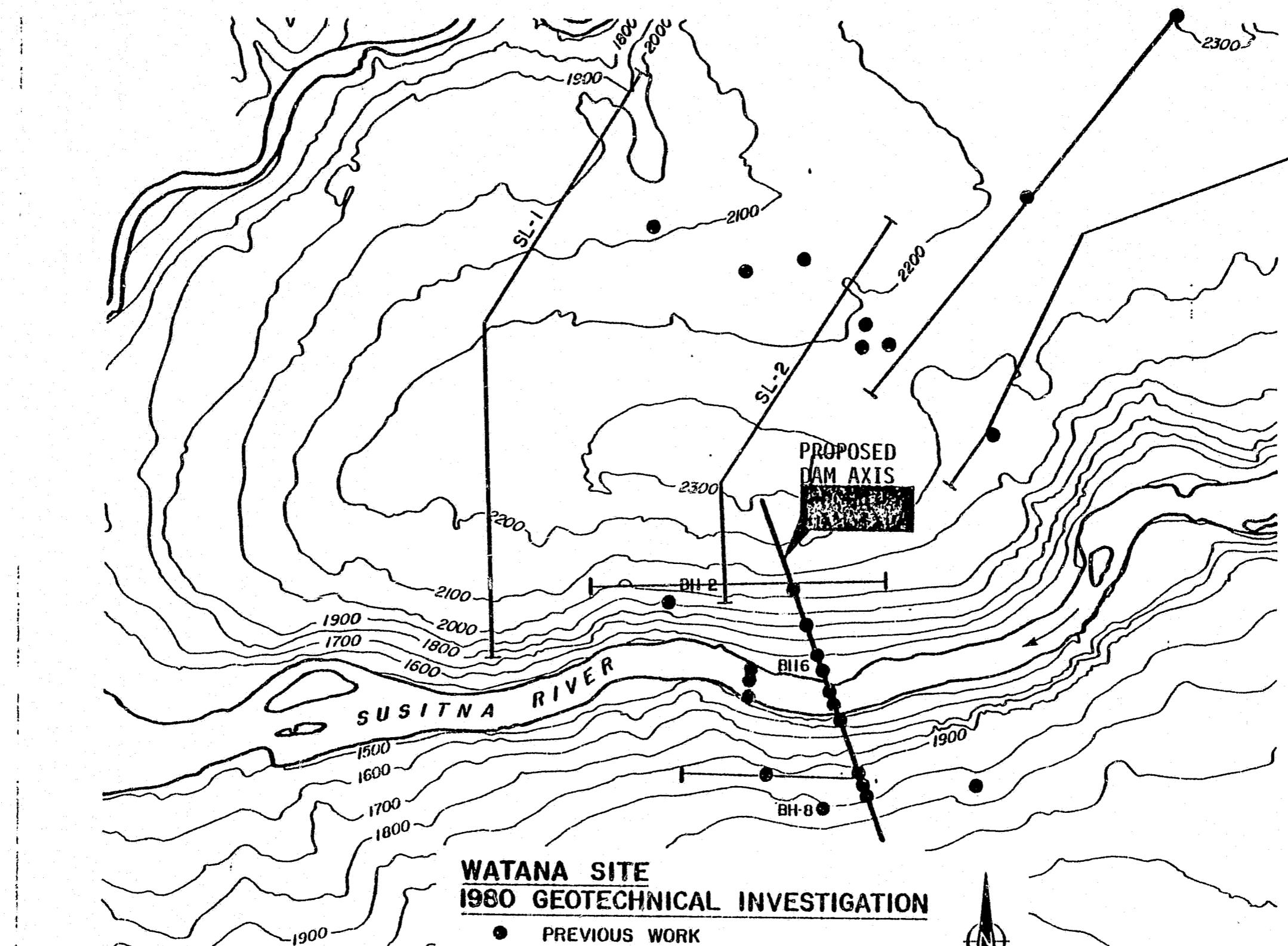
10 PIEZOMETERS

13 TEMPERATURE PROBES

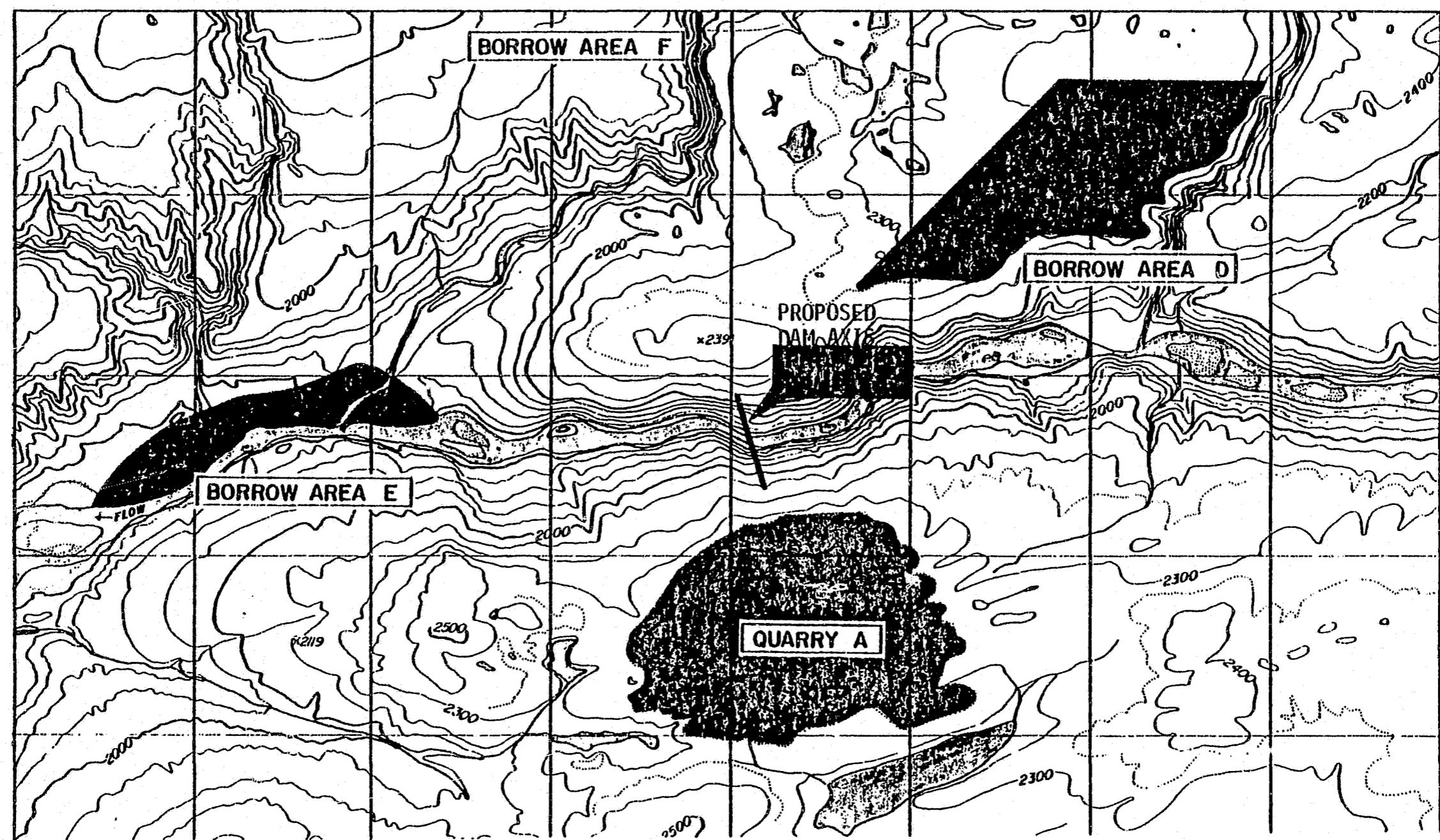
## TASK 5 - SUMMARY OF PREVIOUS WORK



ACRES

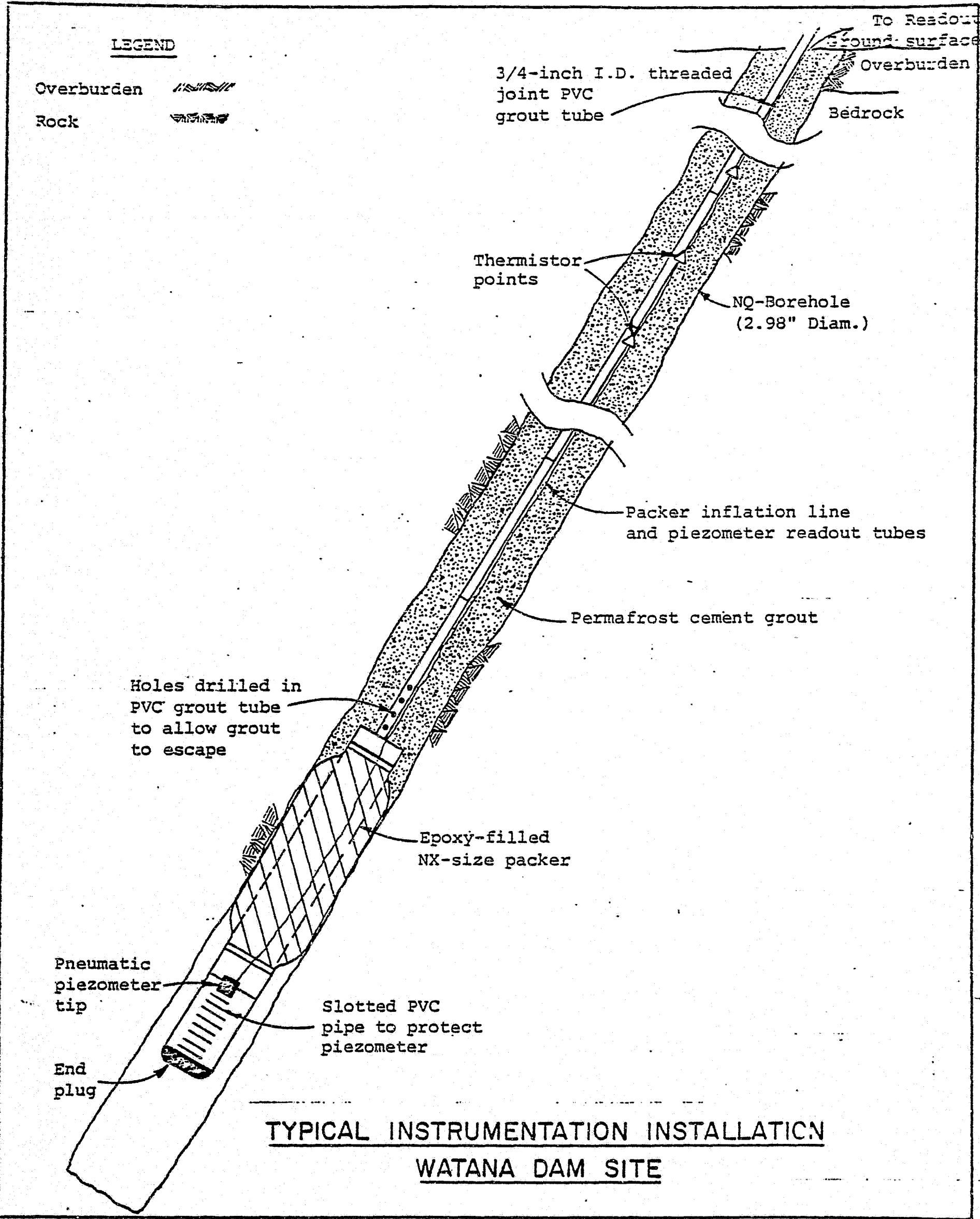


ACRES

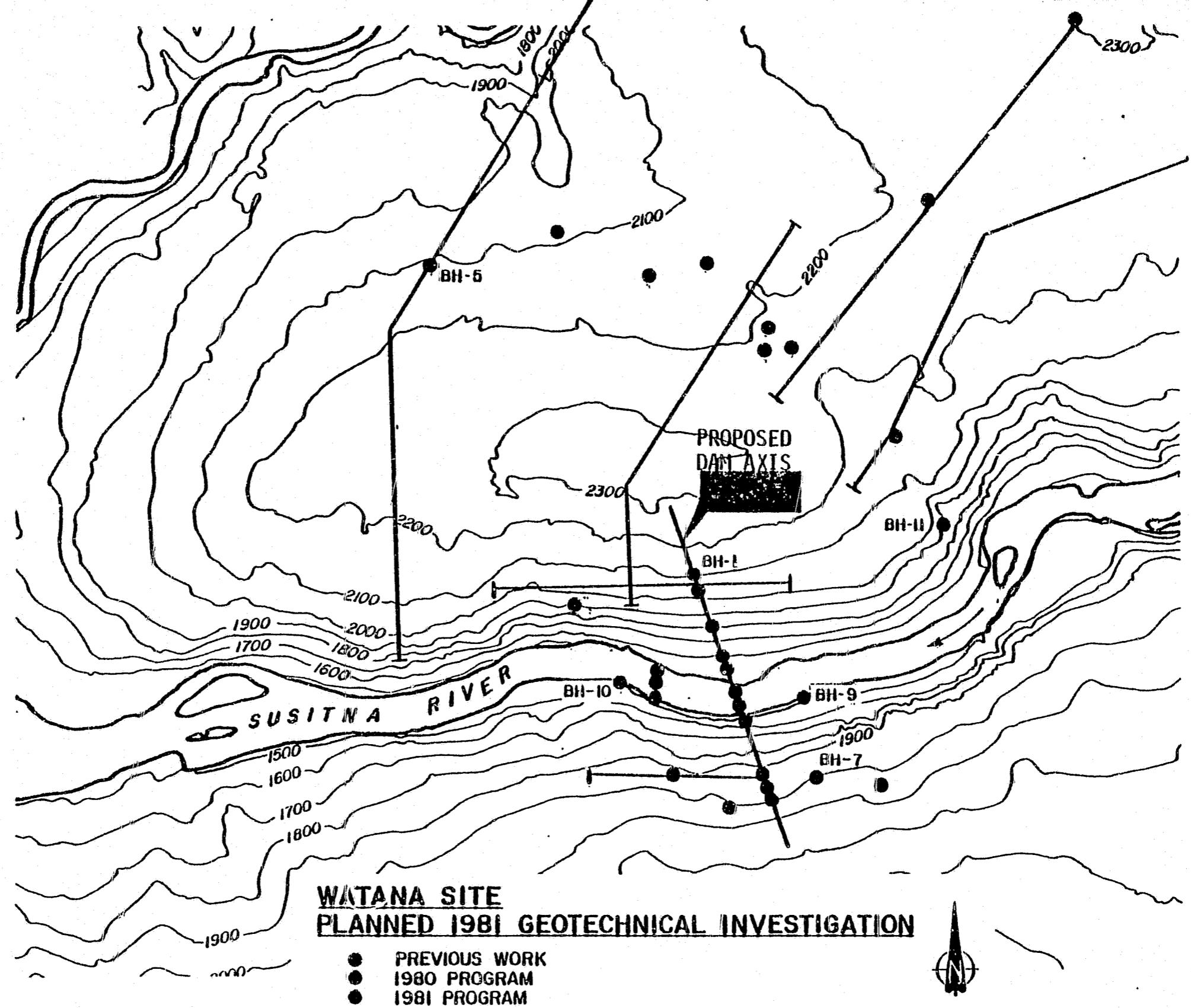


WATANA SITE  
BORROW AREA INVESTIGATION





ACROS



ACDES

## DEVIL CANYON SITE

- RECONNAISSANCE DATA, USBR, USACE
- USBR, 1957-58

22 BORINGS

19 TEST PITS

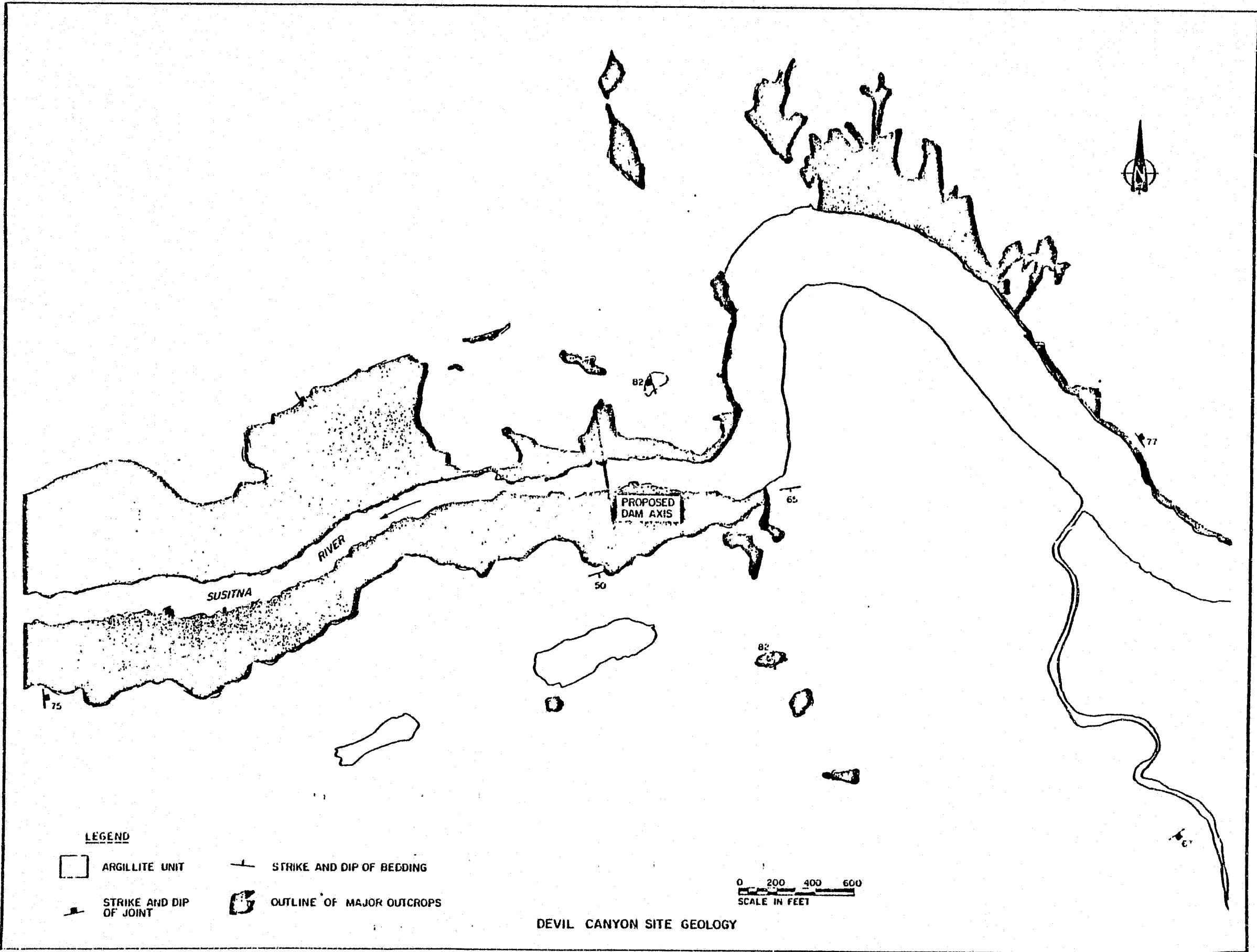
2200 L.F. SEISMIC REFRACTION SURVEY

1100 L.F. SEISMIC REFRACTION SURVEY

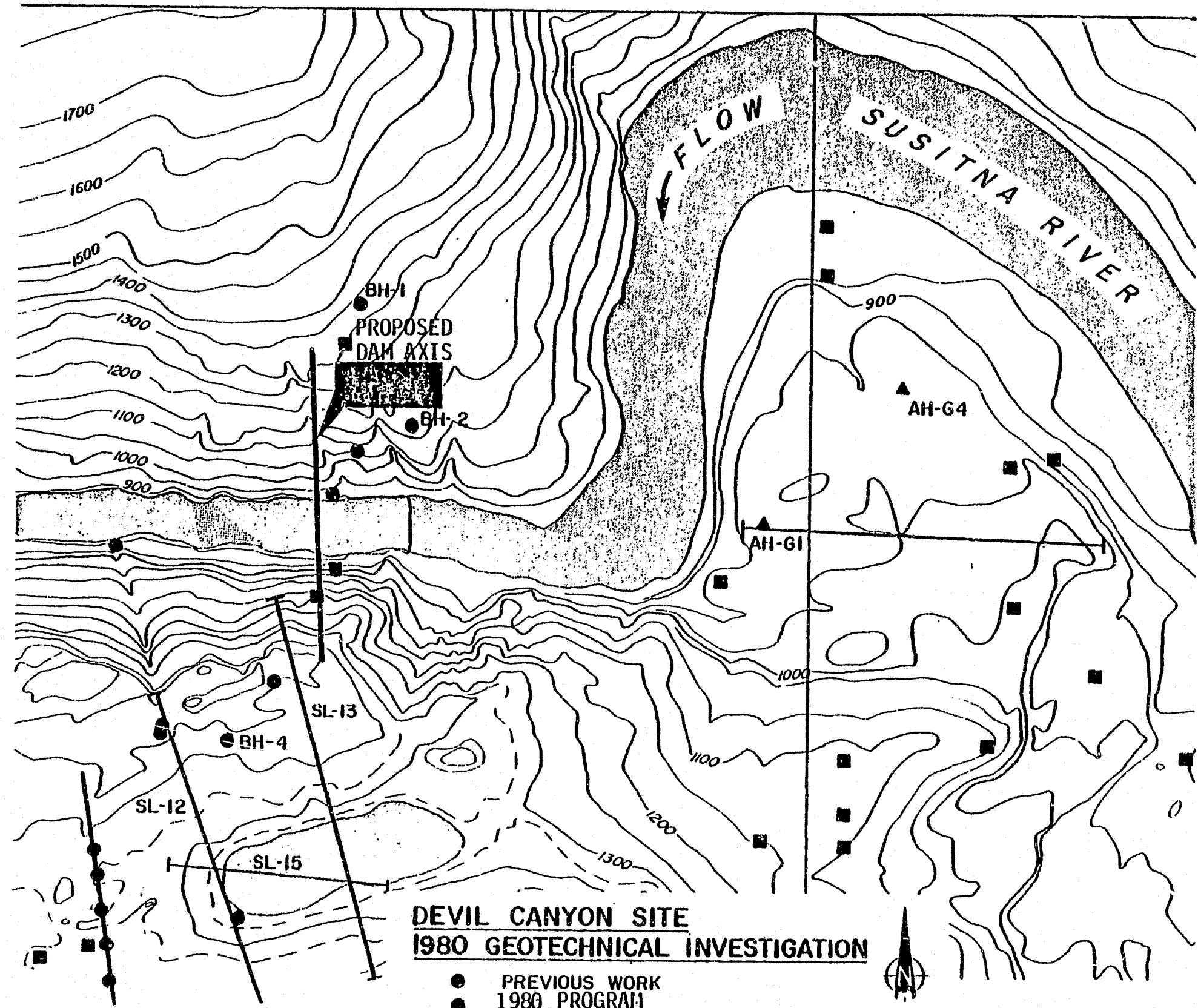
(USACE, 1978)

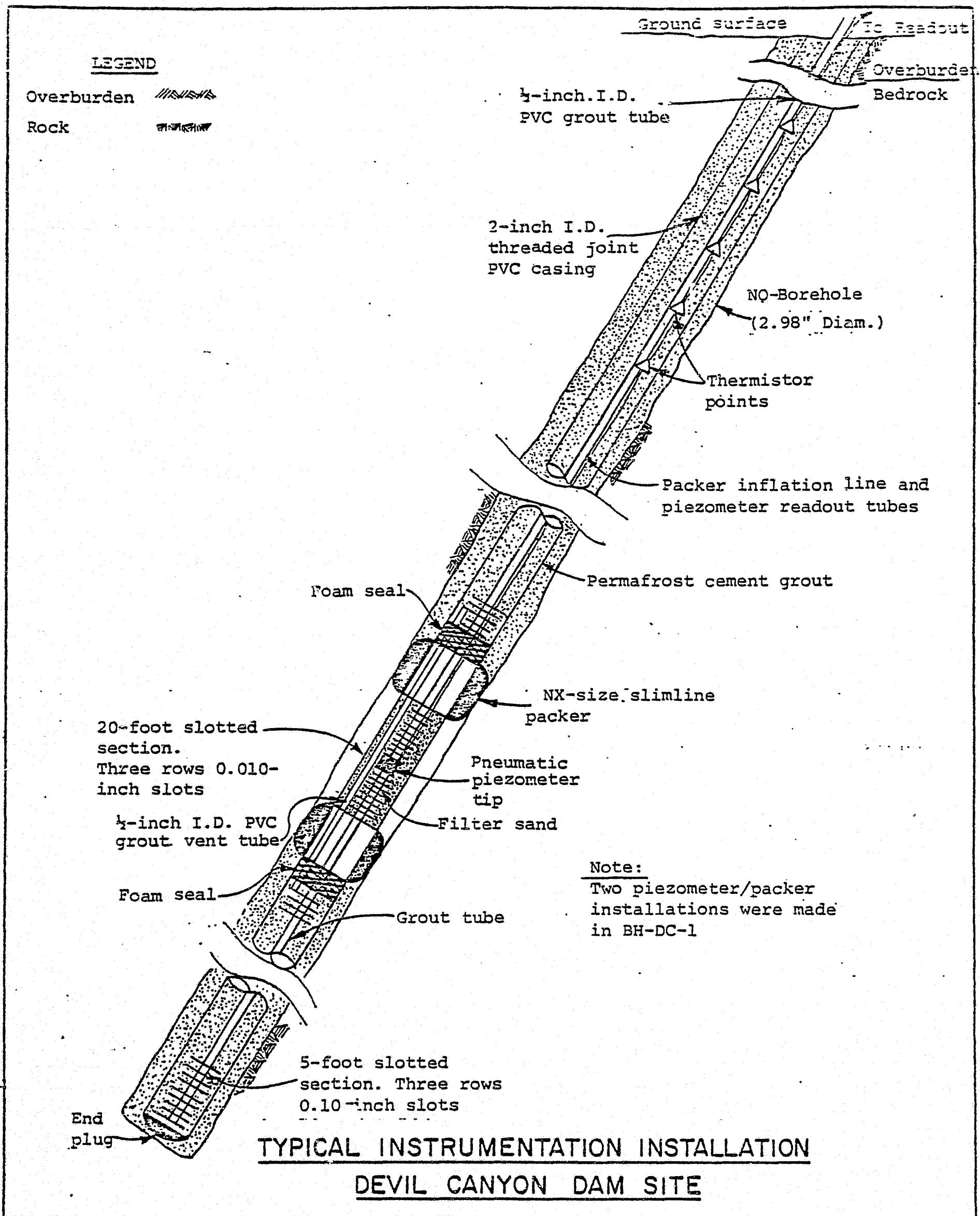
## TASK 5 - SUMMARY OF PREVIOUS WORK

ACRES

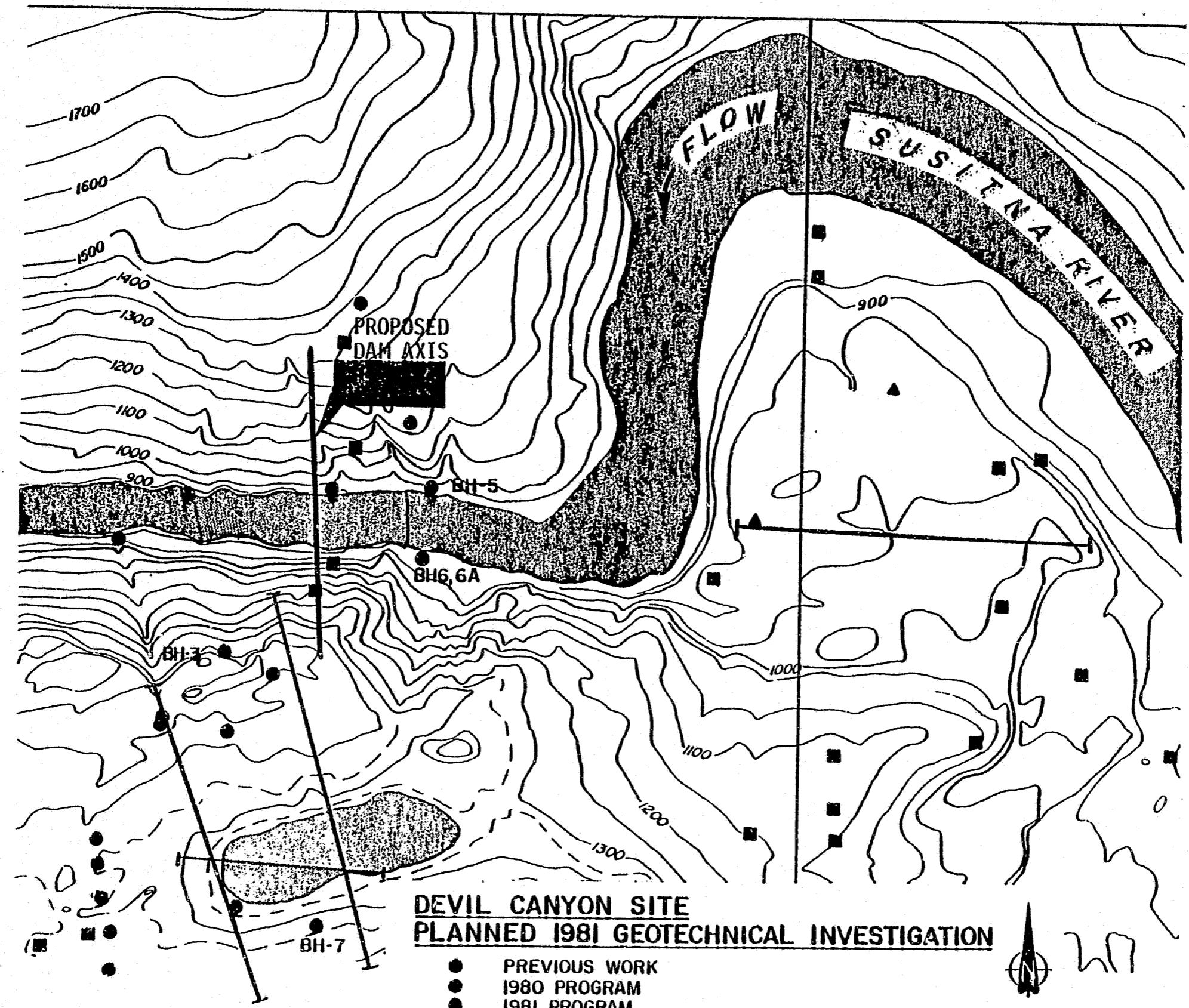


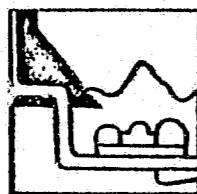
ACERIS





ACRES





# WILHELM

# **■ ALTERNATIVE SITES**

# **■ WATANA PROJECT**

# **■ DEVIL CANYON PROJECT**

# **■ STAGED DEVELOPMENT**

# **■ FEASIBILITY REPORT**

ACRES

ACRES

**TASK 6 - DESIGN DEVELOPMENT**

TASK 6

OBJECTIVES

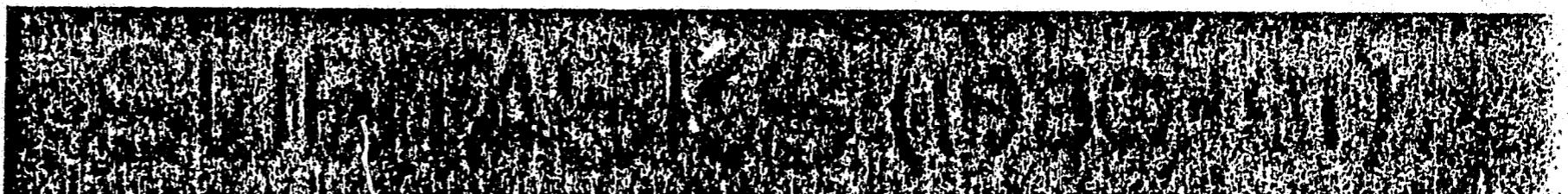
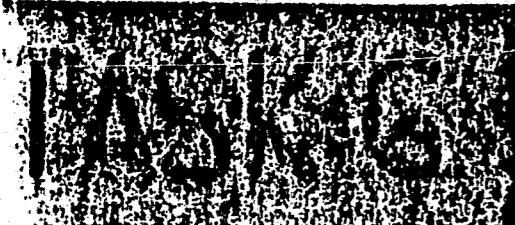


- BASIN DEVELOPMENT ALTS.
- GENERATION PLANNING
- DEVELOPMENT SELECTION
- PRELIMINARY DESIGN/COSTS
- FEASIBILITY REPORT

6.32 - 6.36

ADD. DEV. STUDIES

**THERMAL RESOURCES****HYDRO RESOURCES****CONSERVATION****GENERATION PLAN**



- 6.01** REVIEW PREVIOUS STUDIES
- 6.02** TUNNEL ALTERNATIVES
- 6.03** ALT. SUSITNA DEVELOPMENTS
- 6.04** DEVIL CANYON ARCH
- 6.05** DEVILS MOUTH SEL. REPORT
- 6.06** STAGE I DEVELOPMENT

TASK 6

SUBTASKS (1981-82)

ACRES

6.07 THRU 6.30

# PRELIMINARY DESIGNS, WATANA & DEVIL CANYON DEVELOPMENTS

6.31

# FEASIBILITY REPORT

**WALK**

# ACRES

19. *Leucania* *luteola* (Hufnagel) *luteola* Hufnagel, 1808.

632

# THERMAL RESOURCES

633

# HYDRO RESOURCES

G34

# ENVIRONMENTAL ASSESSMENTS

635

# L.M. & CONSERVATION

G.36

# GENERATION PLANNING

6.37

# UPDATE PLAN

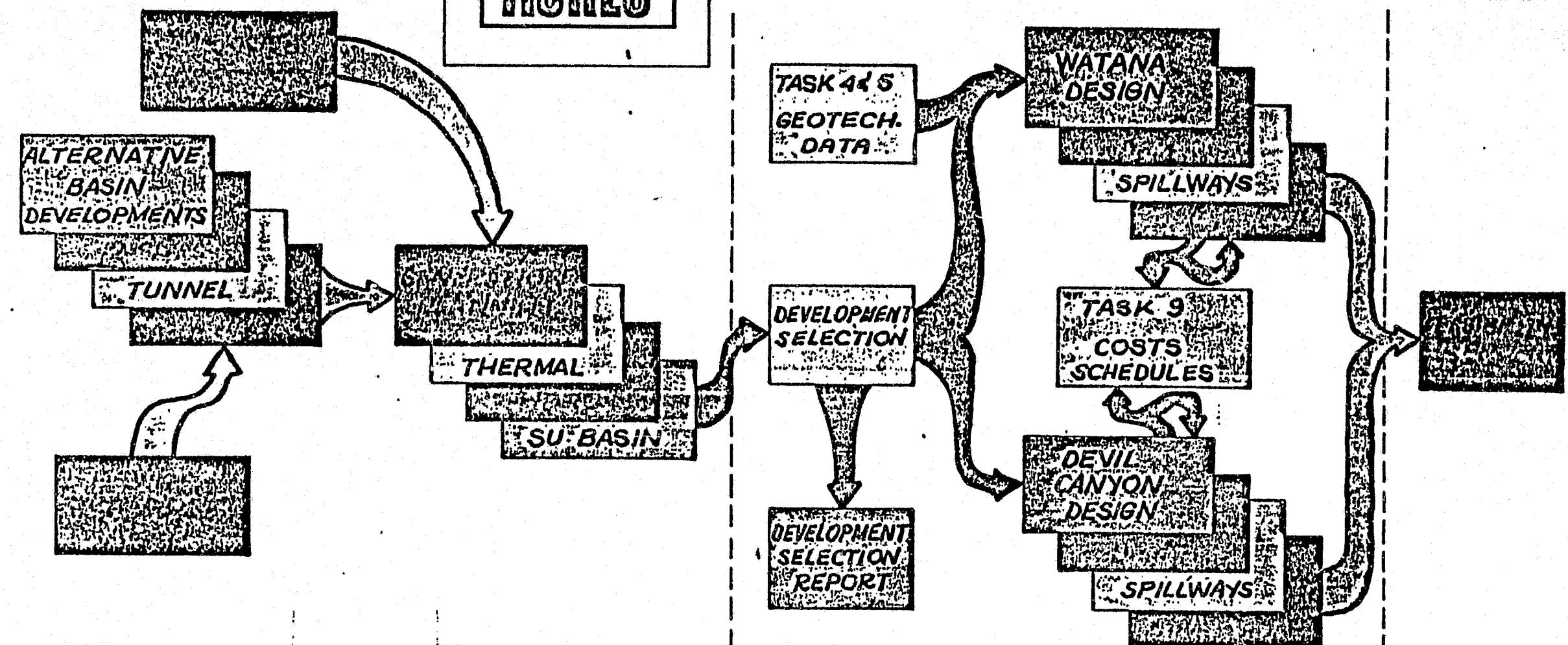
6.23

# LIAISON W/ALTERNATIVES

# TASK 6

## HOPES

# METHODOLOGY

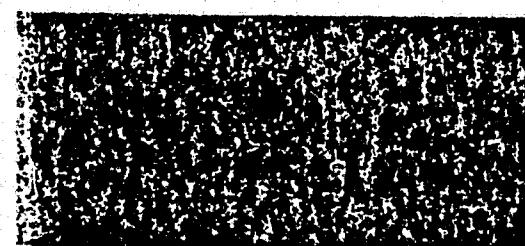


JUNE  
1980

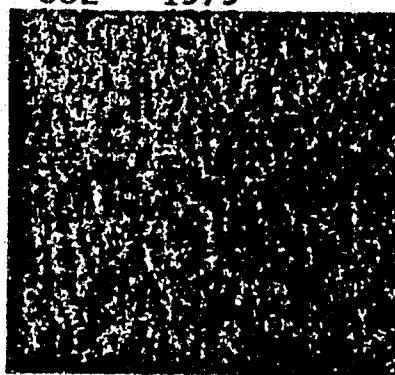
MARCH  
1981

APRIL  
1982

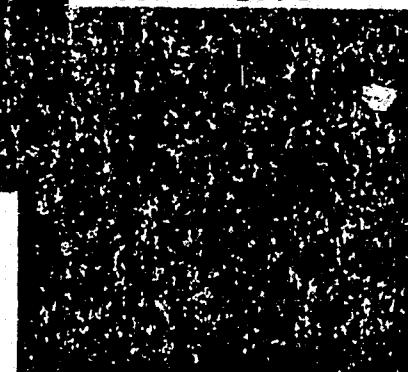
00137



COE 1979



COE 1975



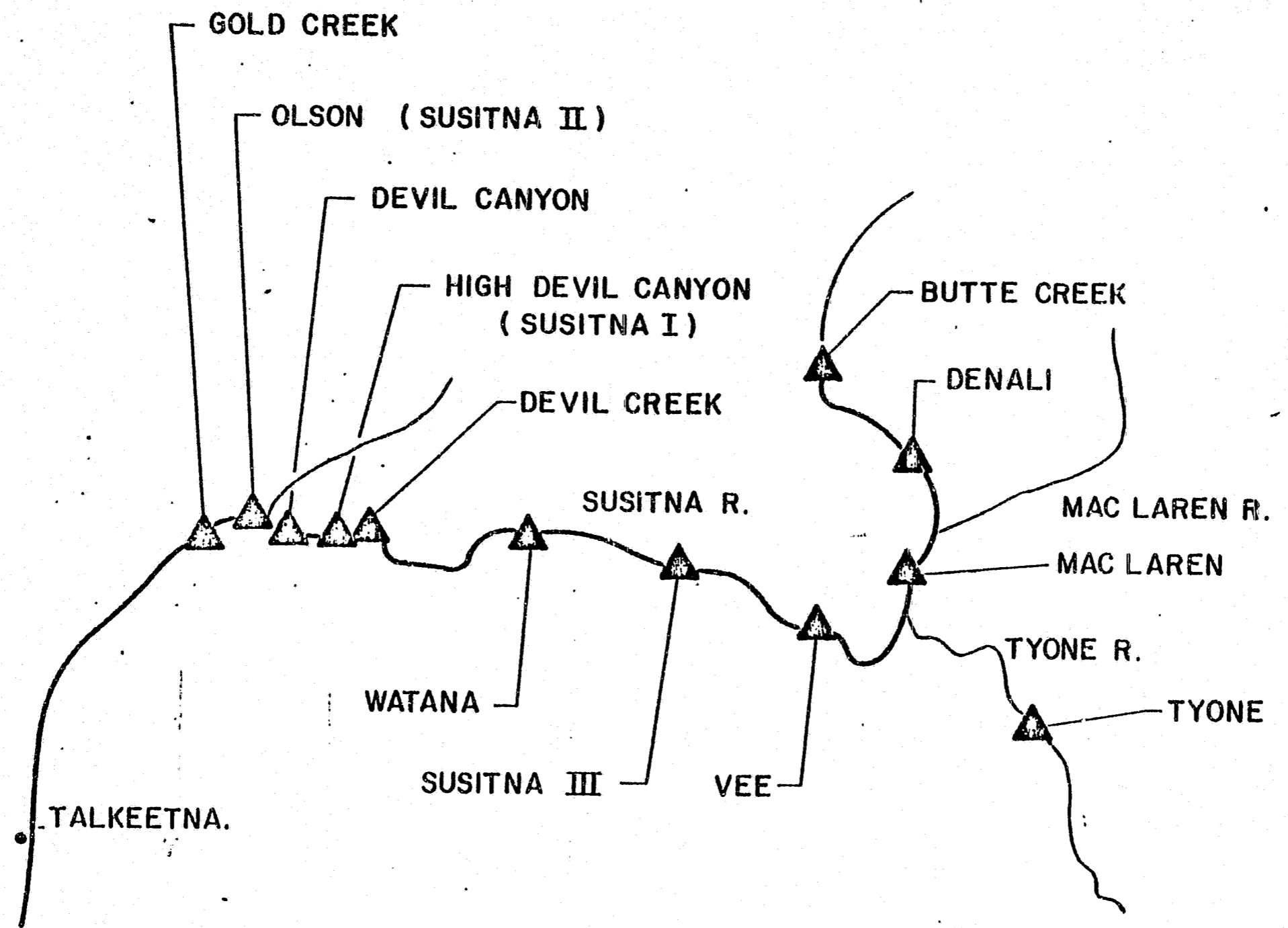
AP  
ADMIN.  
1974

WPRS  
(USBR)  
1960

WPRS  
(USBR)  
1953

## PREVIOUS STUDIES

ACRES



DAMSITES ON THE SUSITNA

ACRES

GOLD CREEK

OLSON (SUSITNA II)

DEVIL CANYON

HIGH DEVIL CANYON  
(SUSITNA I)DEVIL  
CREEK

WATANA

SUSITNA III

TALKEETNA

PRELIMINARY SCREEN

DENALI

MAC LAREN R.

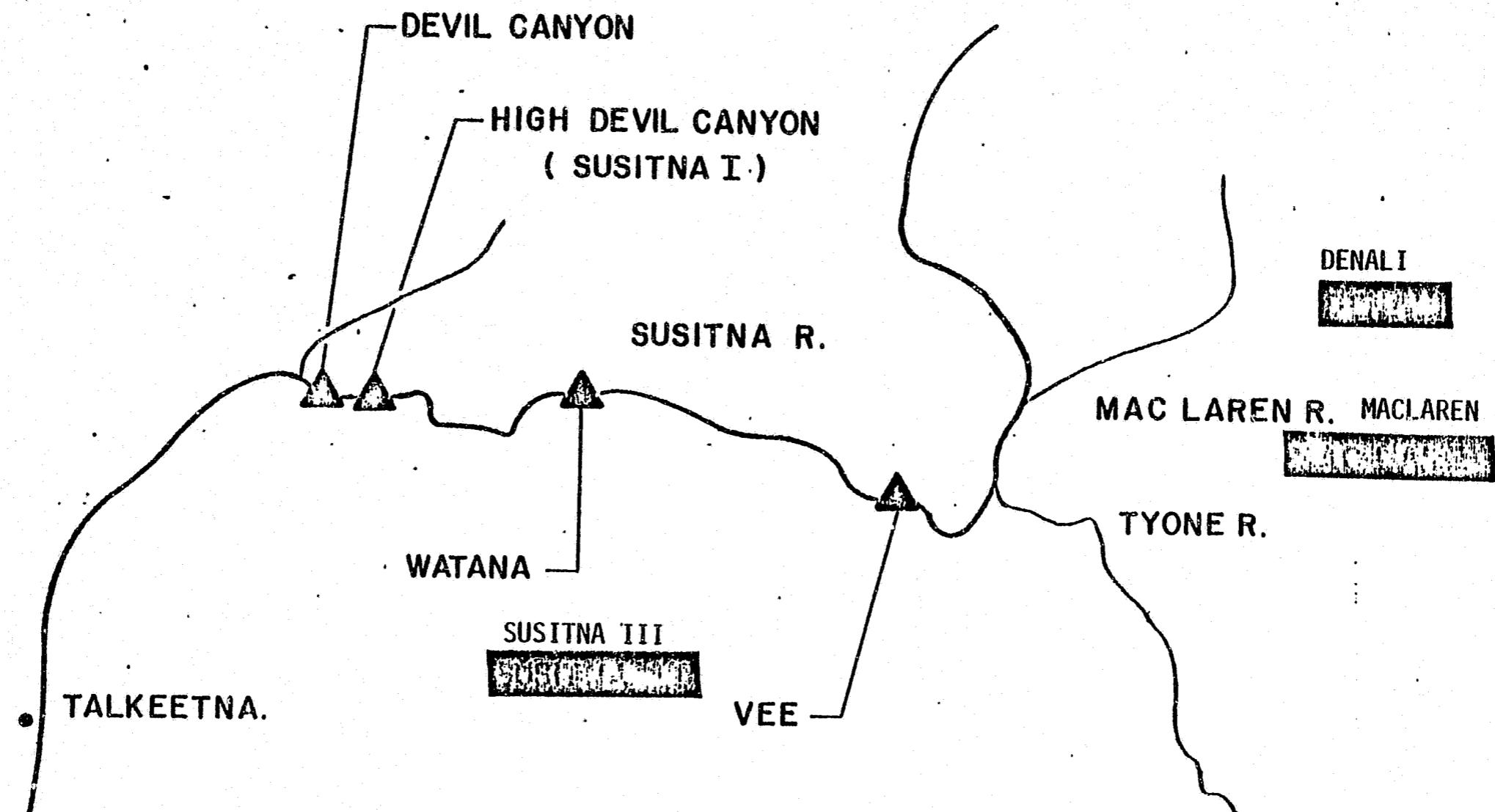
MAC LAREN

TYONE R.

TYONE

• DAMSITES ON THE SUSITNA

ACRES



DETAILED SCREEN

ACRES

DAMSITES ON THE SUSITNA

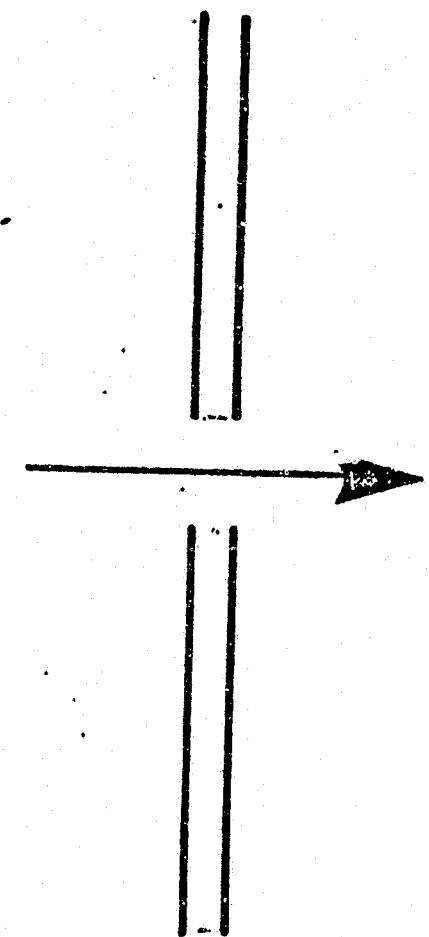
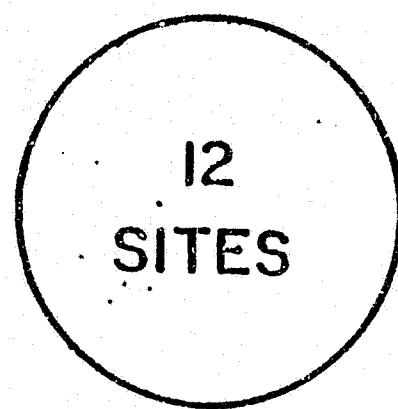
# SELECTION CRITERIA

ENERGY CONTRIBUTION  
DEPENDABILITY  
ECONOMICS  
RESOURCES CONSERVATION  
SEISMIC CONSEQUENCES  
GEOTECHNICAL UNKNOWNS  
ENVIRONMENTAL IMPACTS

- SCENIC VALUE
- AIR AND WATER QUALITY
- FISHERIES
- WILD LIFE
- WETLANDS
- CULTURAL RESOURCES
- SOCIO-ECONOMIC
- ACCESS
- TRANSMISSION

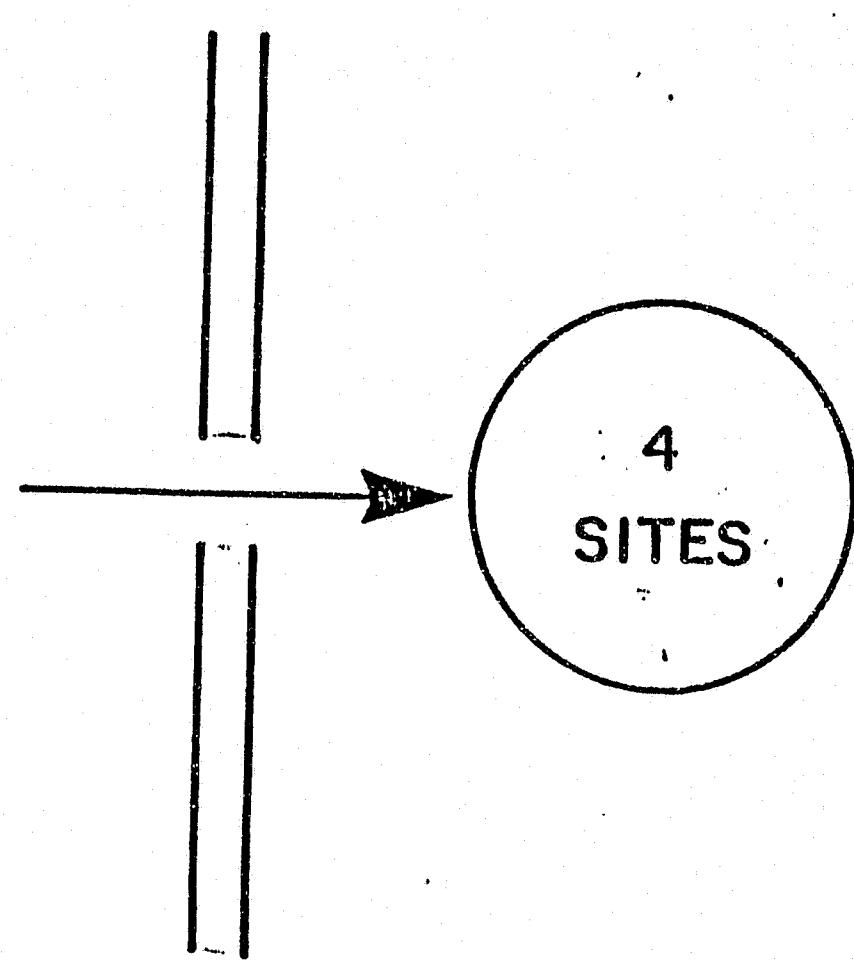
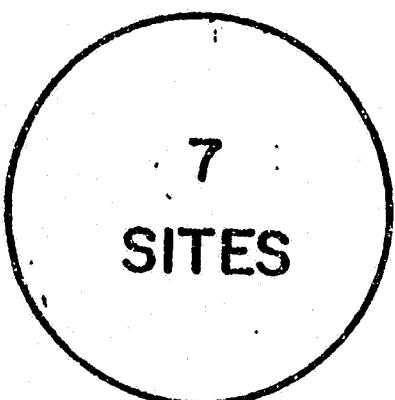


**PRELIMINARY  
SCREEN  
(SINGLE SITES)**



ENERGY / CAPACITY  
ENVIRONMENTAL  
COST  
DUPLICATION

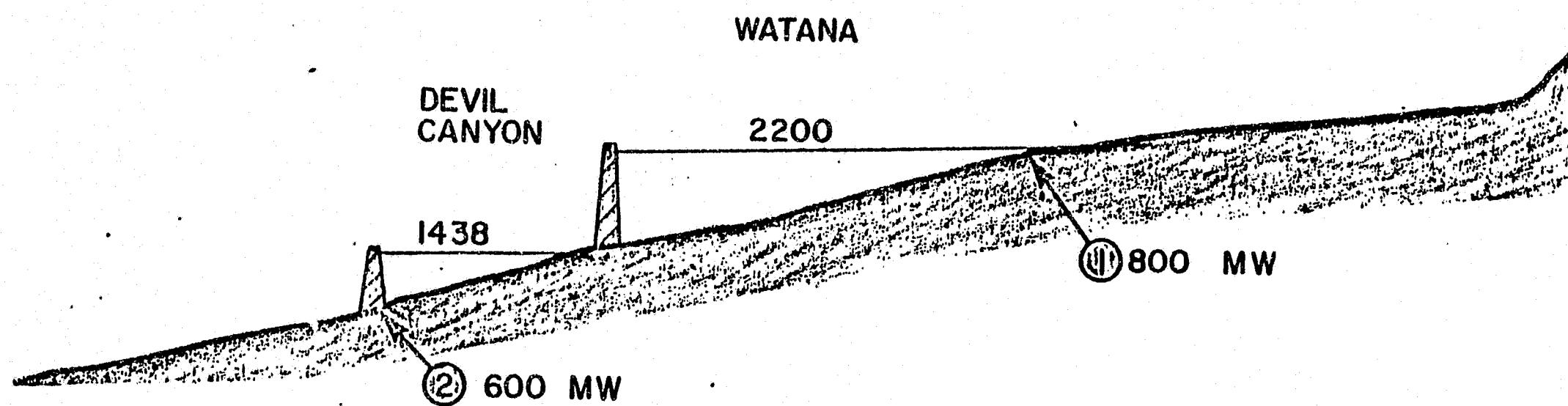
**DETAILED  
SCREEN  
(PLANS)**



ENERGY / CAPACITY  
COST  
ENVIRONMENTAL

**SITE SELECTION**

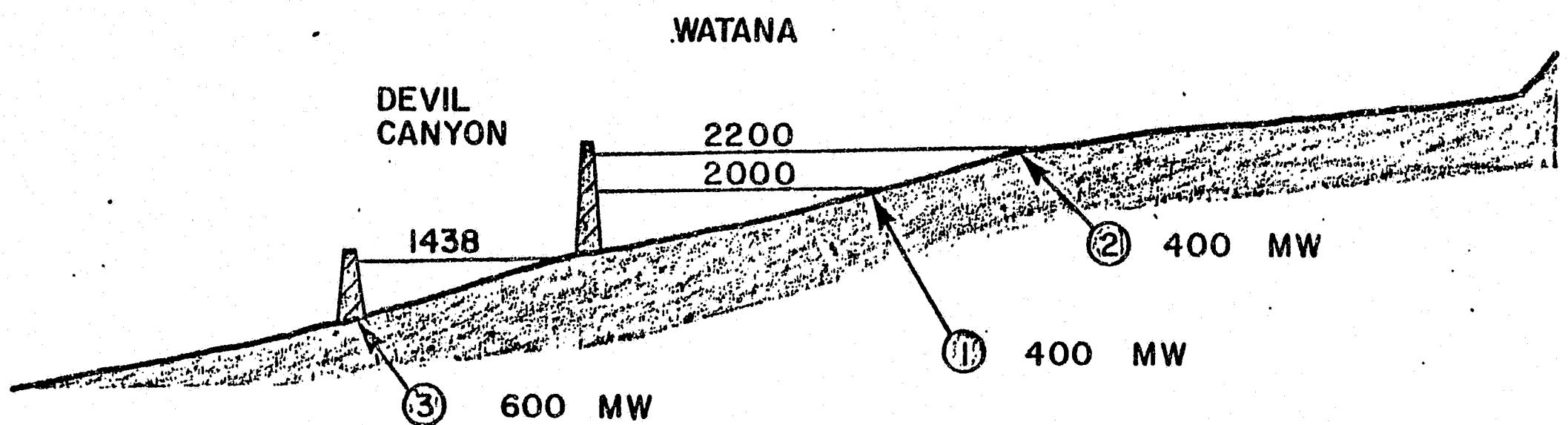
ACRES



## PLAN I

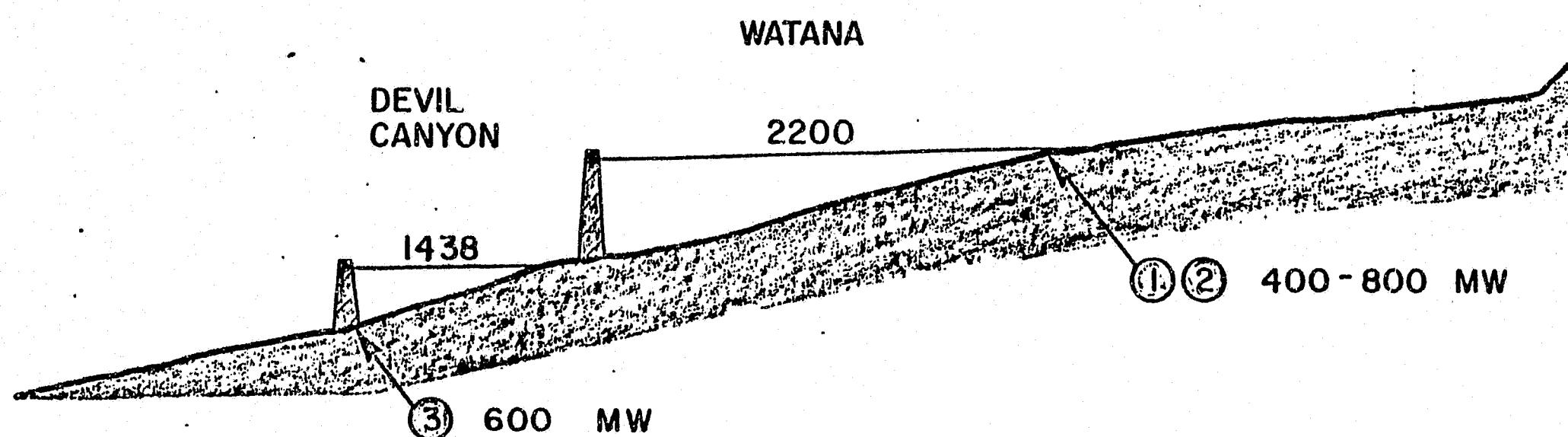
CAPITAL COST	\$ 2.8	BILLION
ANNUAL ENERGY	6.1	BILLION KWH
TOTAL POWER	1400	MW

ACRES



PLAN 2	CAPITAL COST	\$ 3.0 BILLION
	ANNUAL ENERGY	6.1 BILLION KWH
	TOTAL POWER	1400 MW

ACRES

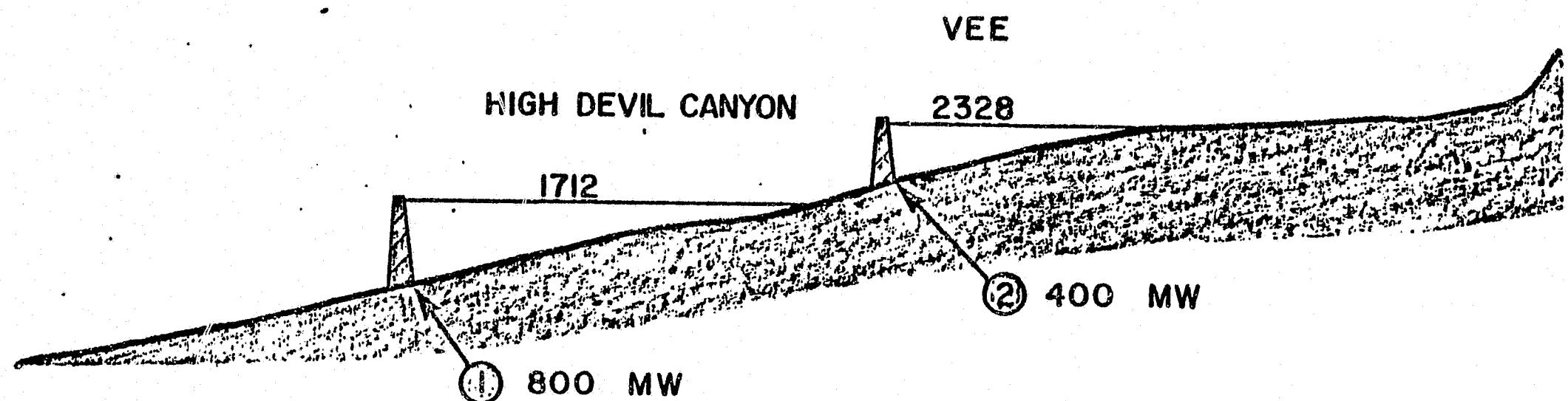


PLAN 3 CAPITAL COST \$ 2.8 BILLION

ANNUAL ENERGY 6.1 BILLION KWH

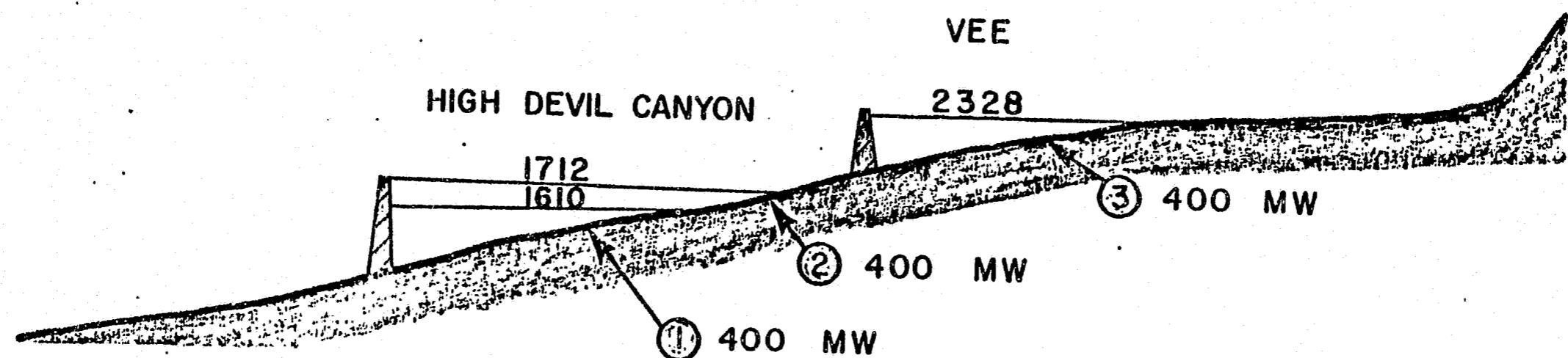
TOTAL POWER 1400 MW

ACRES



PLAN 4      CAPITAL COST      \$ 2.6 BILLION  
                ANNUAL ENERGY      4.9 BILLION KWH  
                TOTAL POWER      1200 MW

ACRES



PLAN 5

CAPITAL COST

\$ 2.7 BILLION

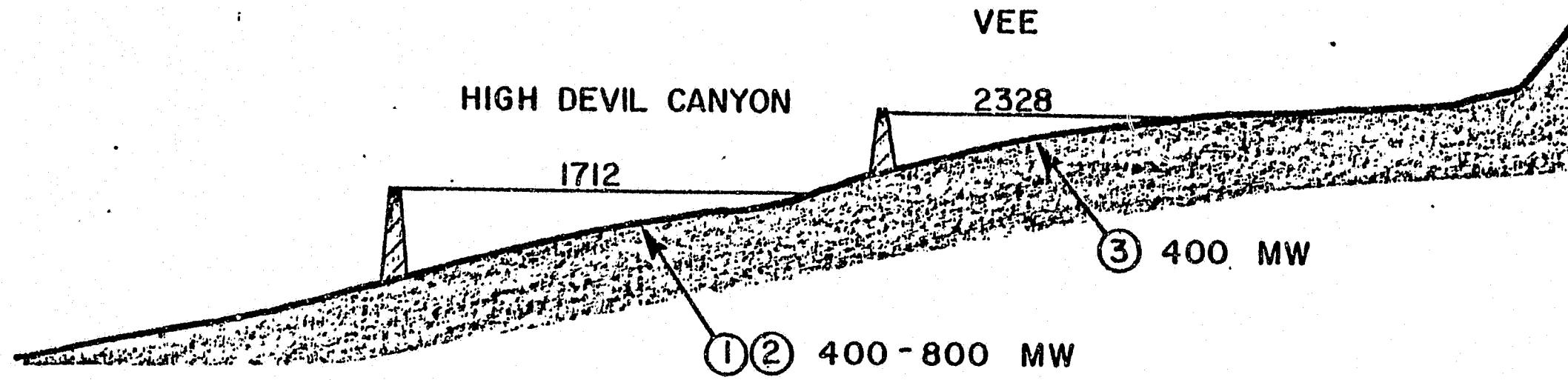
ANNUAL ENERGY

4.9 BILLION KWH

TOTAL POWER

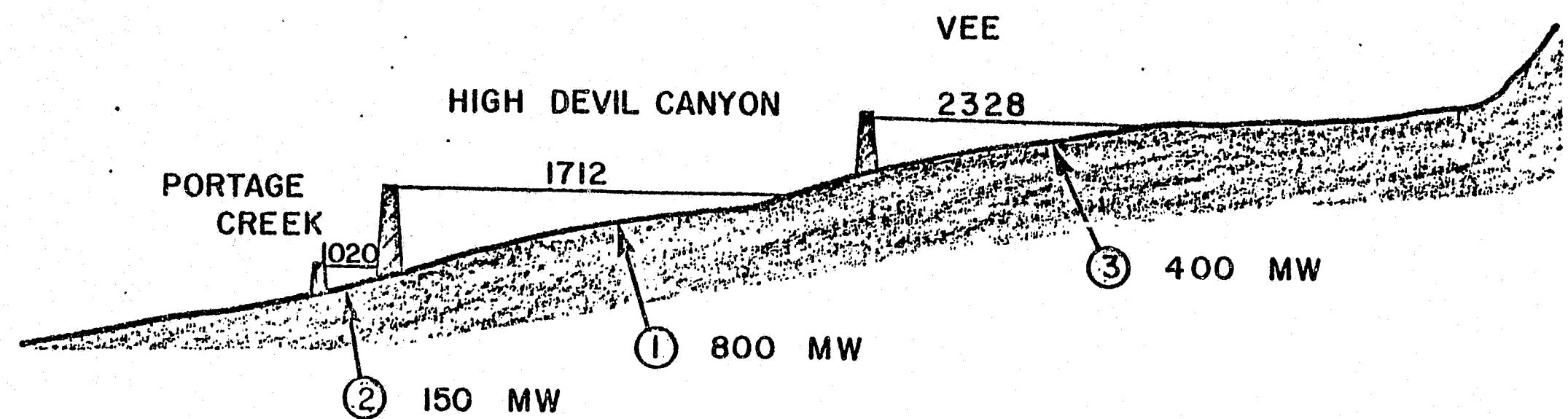
1200 MW

ACRES



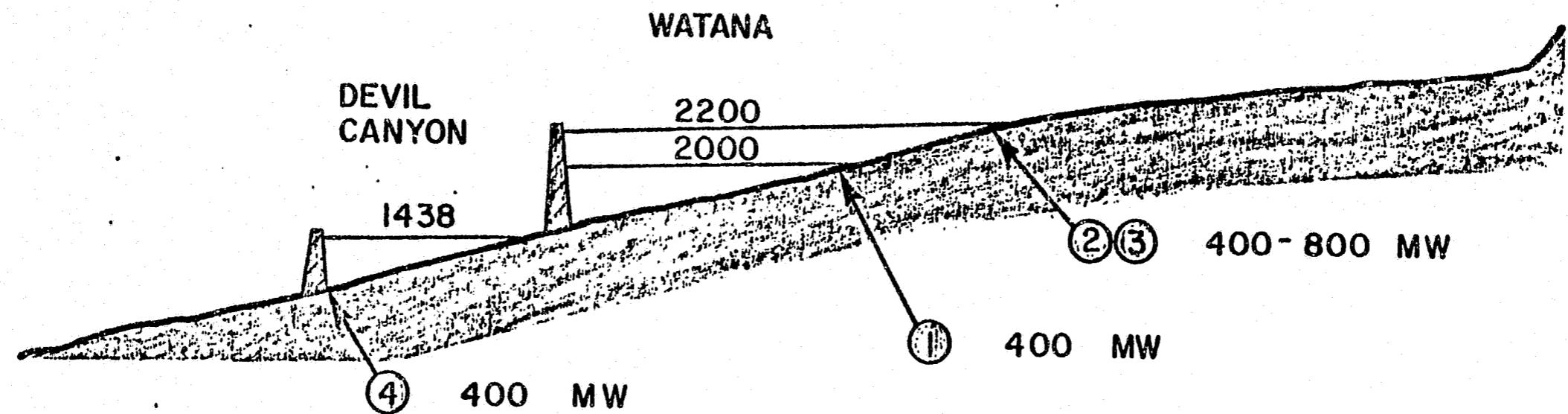
PLAN .6 CAPITAL COST \$2.45-2.6 BILLION  
ANNUAL ENERGY 4.6-4.9 BILLION KWH  
TOTAL POWER 800-1200 MW

00137



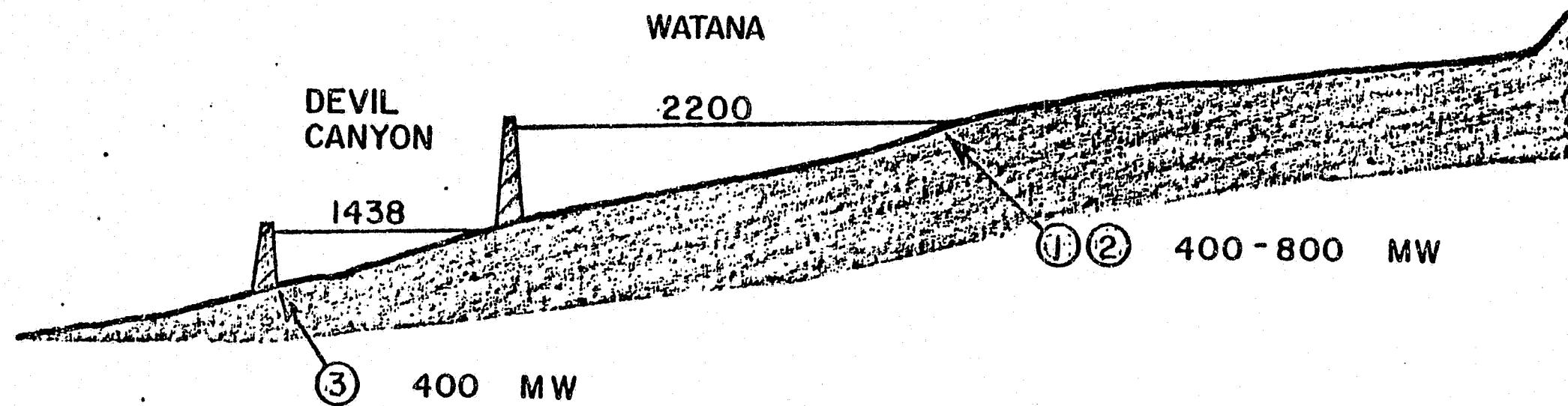
PLAN 7	CAPITAL COST	\$ 3.2 BILLION
	ANNUAL ENERGY	5.5 BILLION KWH
	TOTAL POWER	1350 MW

ACRES



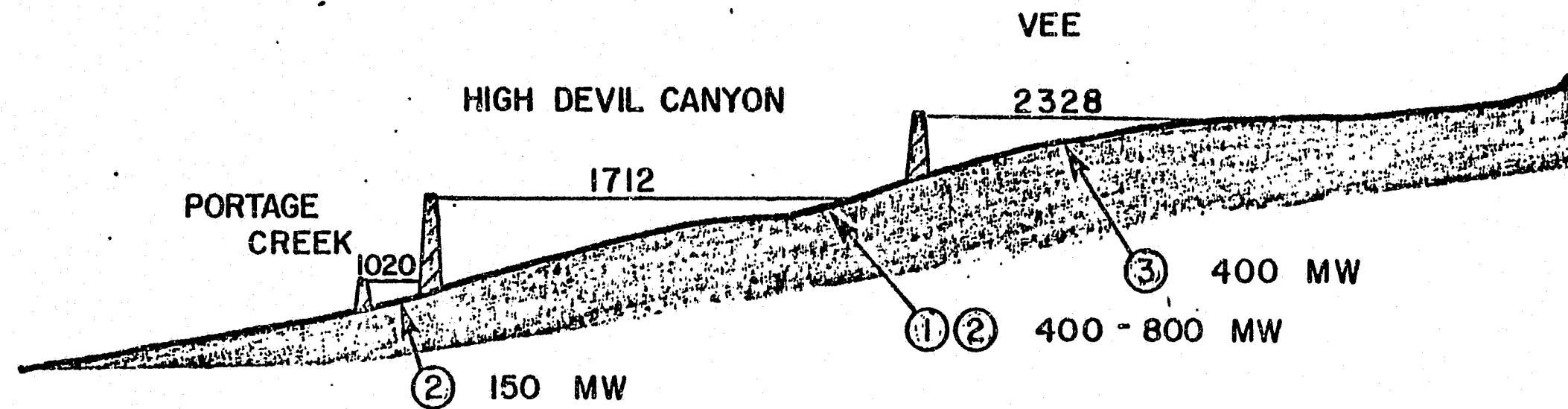
PLAN 2A CAPITAL COST \$2.83-2.96 BILLION  
ANNUAL ENERGY 6.2 BILLION KWH  
TOTAL POWER 800-1200 MW  
REREGULATION \$0.1 BILLION

ACRES



PLAN 3A CAPITAL COST \$ 2.64-2.79 BILLION  
REREGULATION \$ 0.1 BILLION  
ANNUAL ENERGY 6.2 BILLION KWH  
TOTAL POWER 800-1200 MW

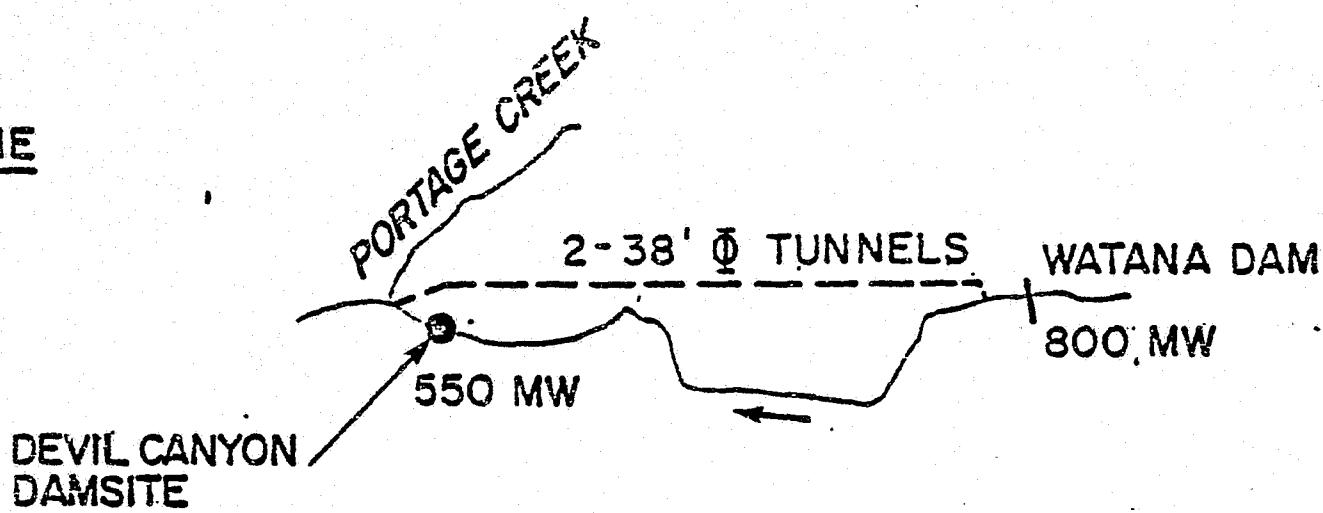
ACRES



PLAN 6A	CAPITAL COST	\$ 3.24 BILLION
	ANNUAL ENERGY	5.5 BILLION KWH
	TOTAL POWER	1350 MW

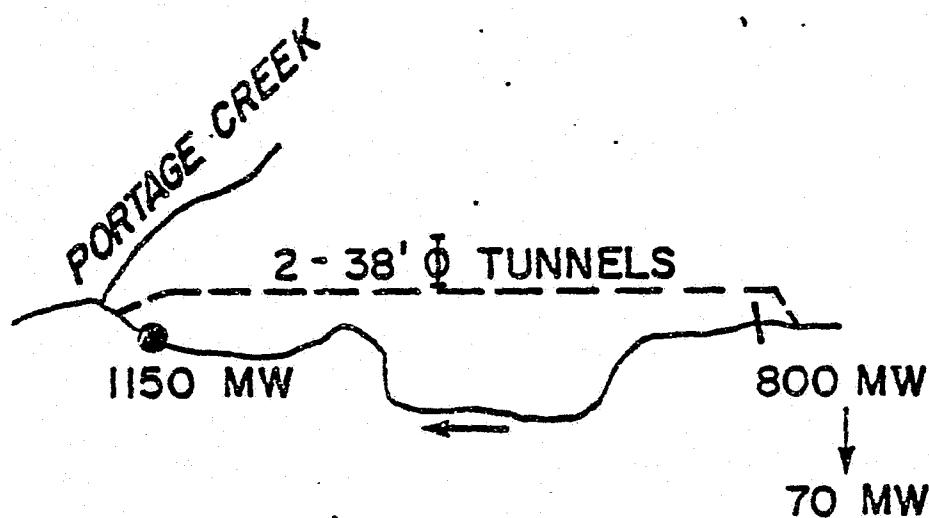
SCHEME

MODE OF TUNNEL  
OPERATION



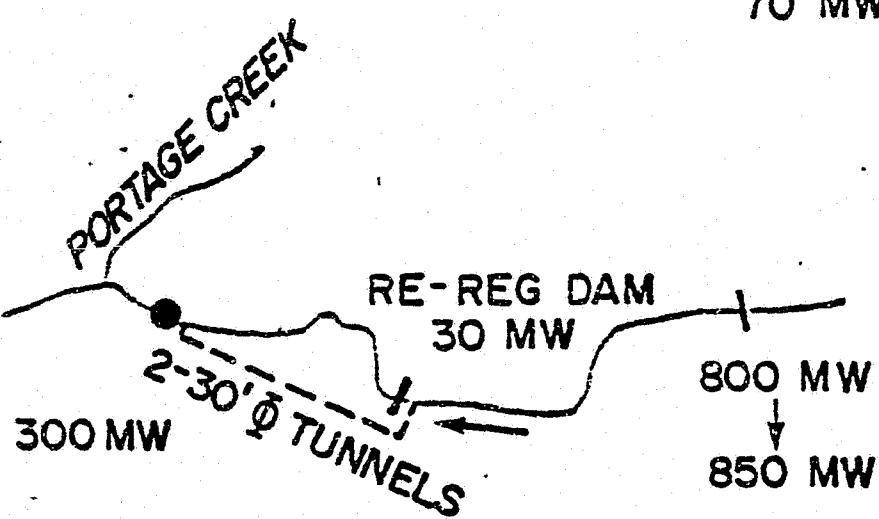
PEAKING

DEVIL CANYON  
DAMSITE



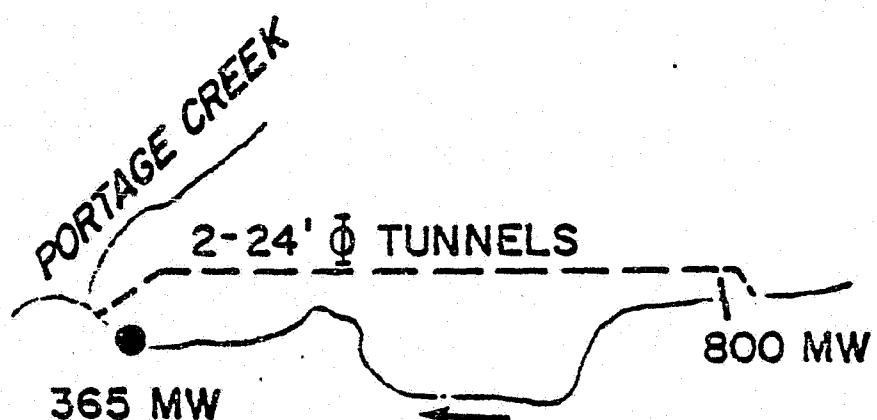
PEAKING

2



BASE LOAD

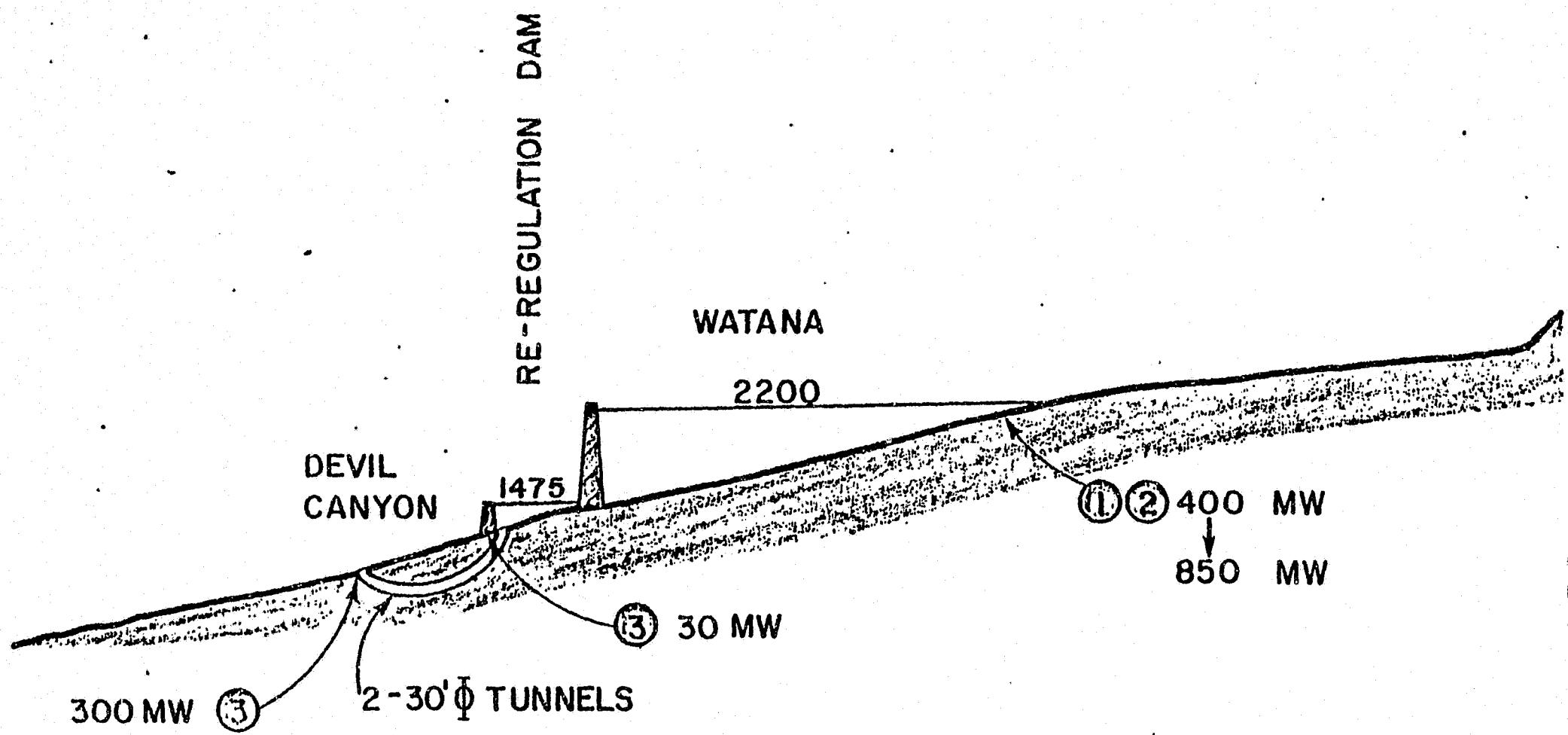
3



BASE LOAD

4

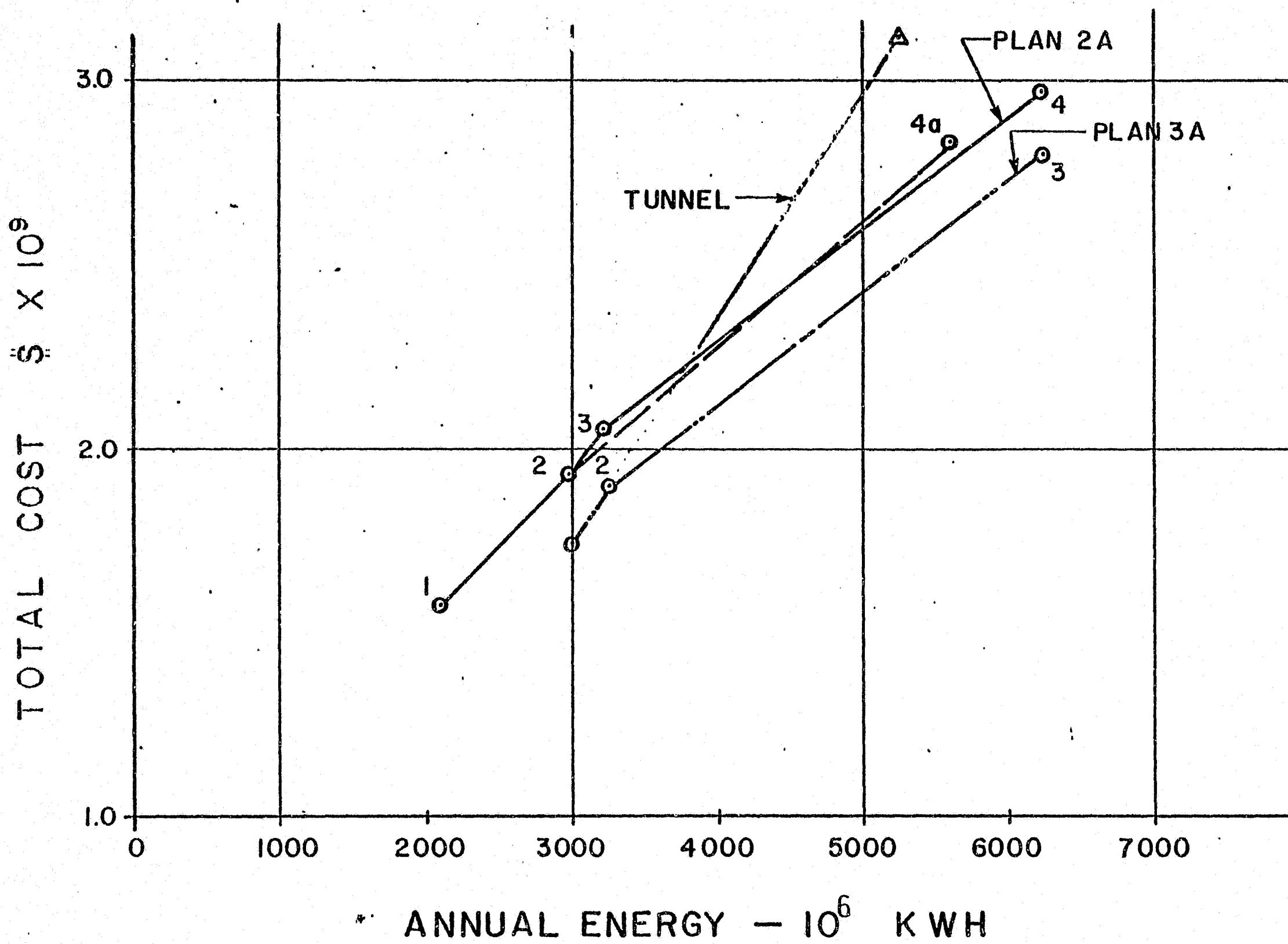
TUNNEL SCHEMES



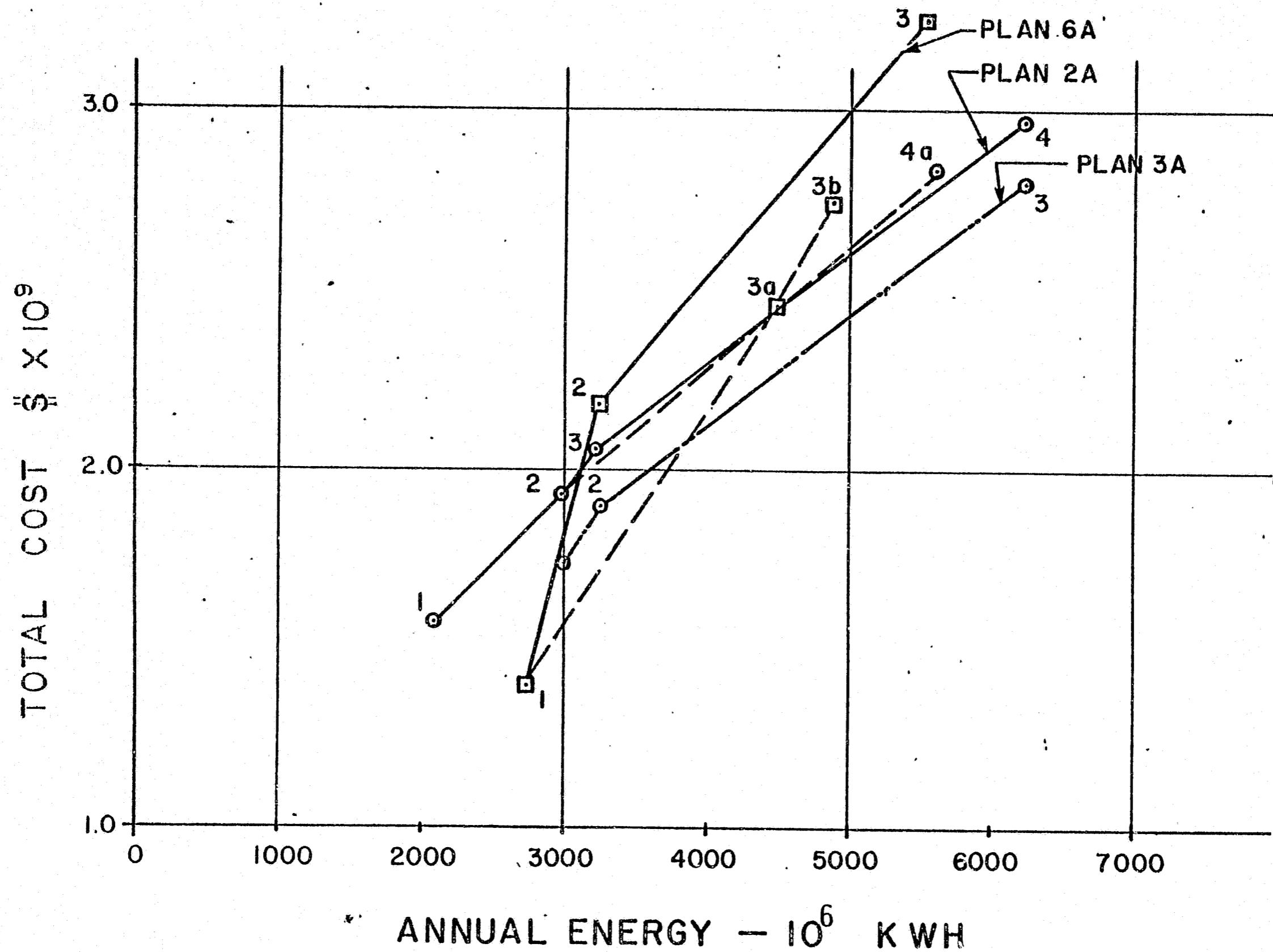
**SELECTED  
TUNNEL SCHEME**

CAPITAL COST	\$ 3.1	BILLION
ANNUAL ENERGY	5.3	BILLION KWH
TOTAL POWER	1180	MW

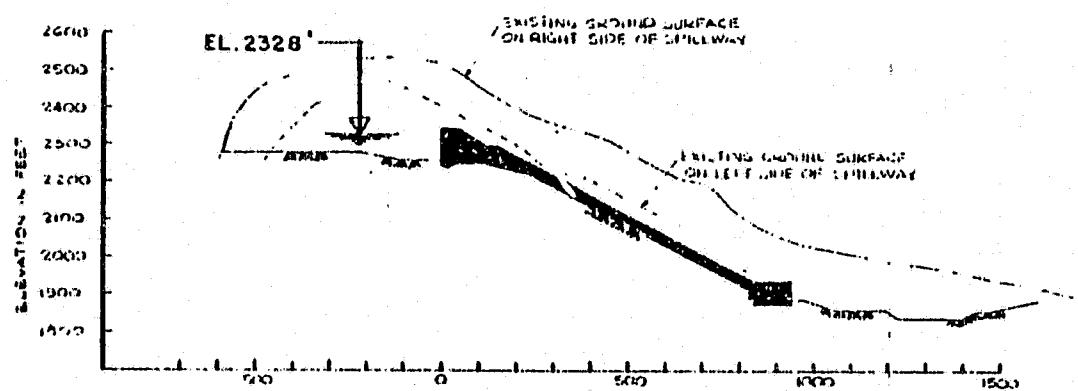
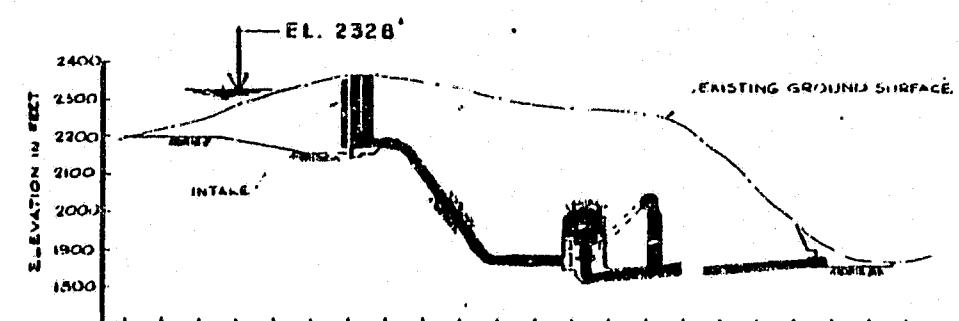
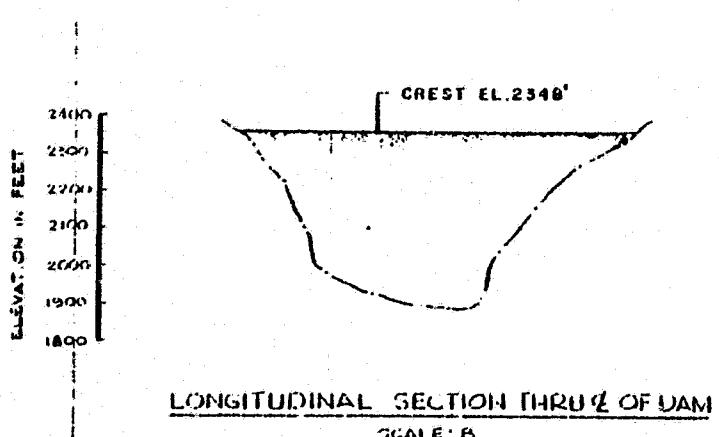
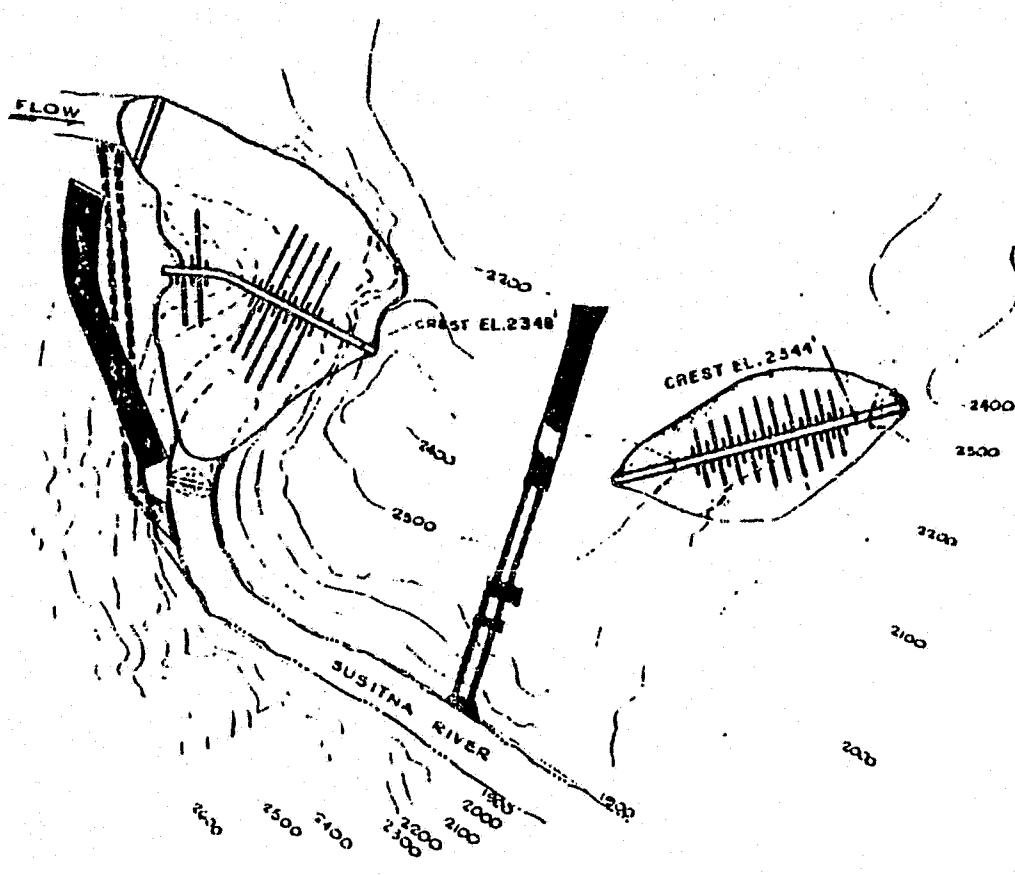
ACRES



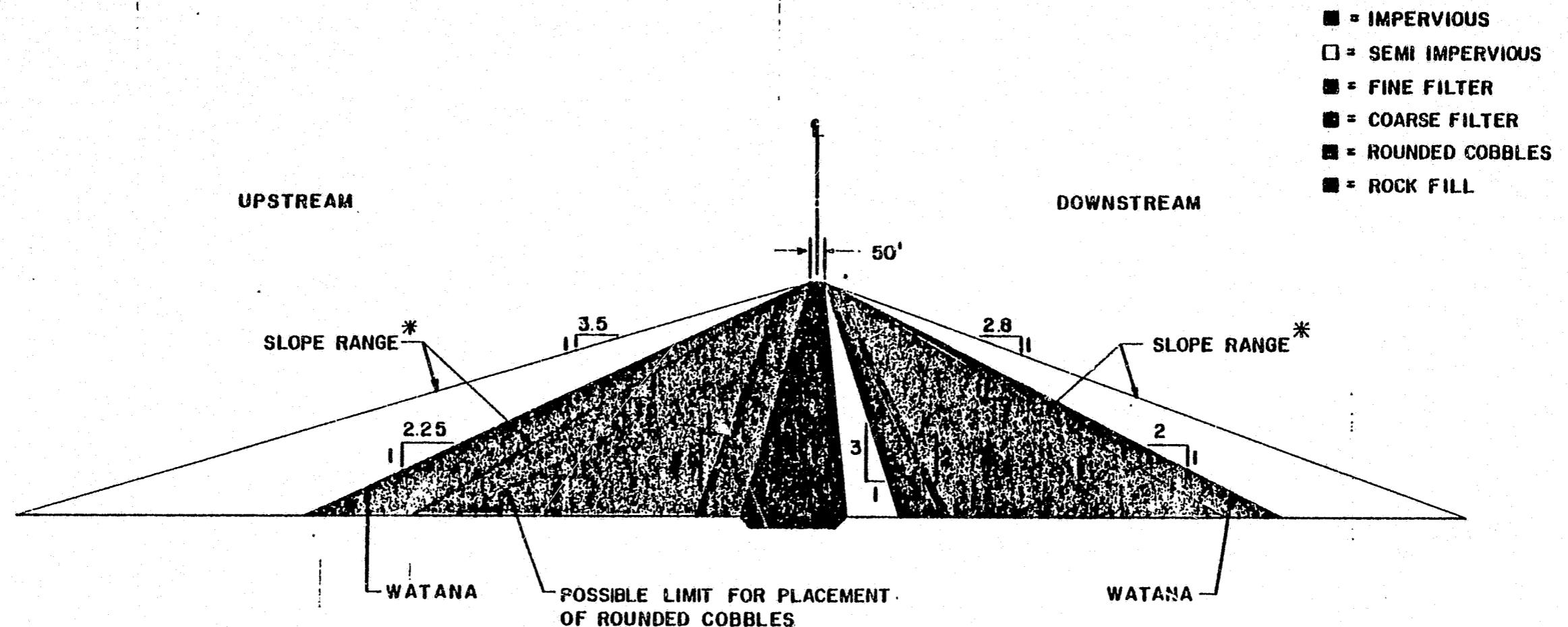
ACRES



ACRES



V.F.F.



\* BASED ON A STUDY OF 28 MAJOR DAMS - FROM  
 SEISMICALLY ACTIVE AREAS - WORLD WIDE  
 HEIGHT RANGE: 197 TO 800 FEET.

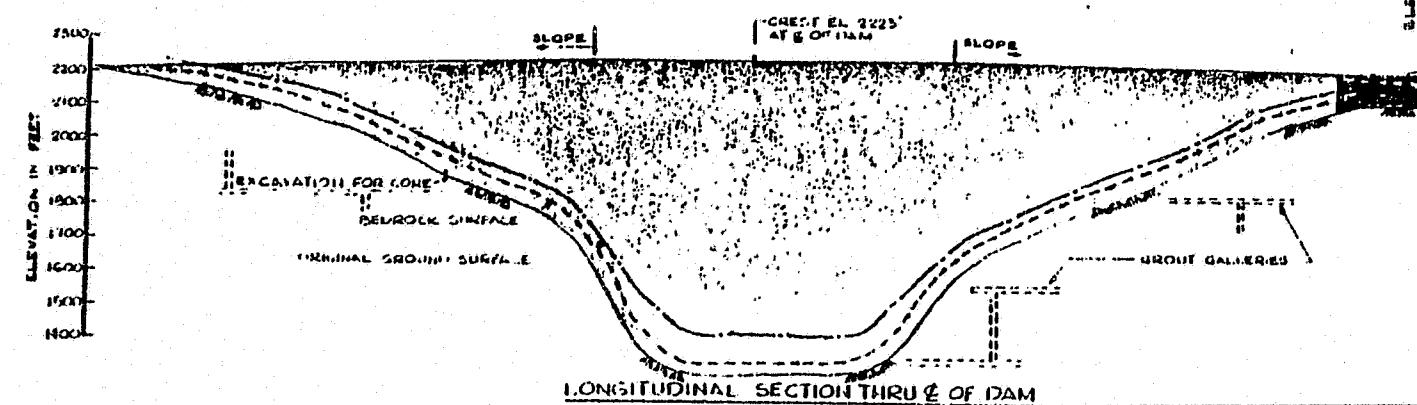
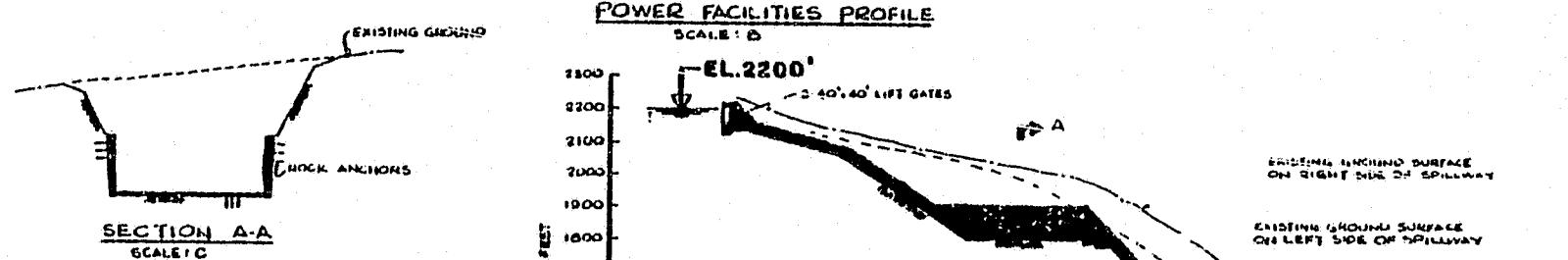
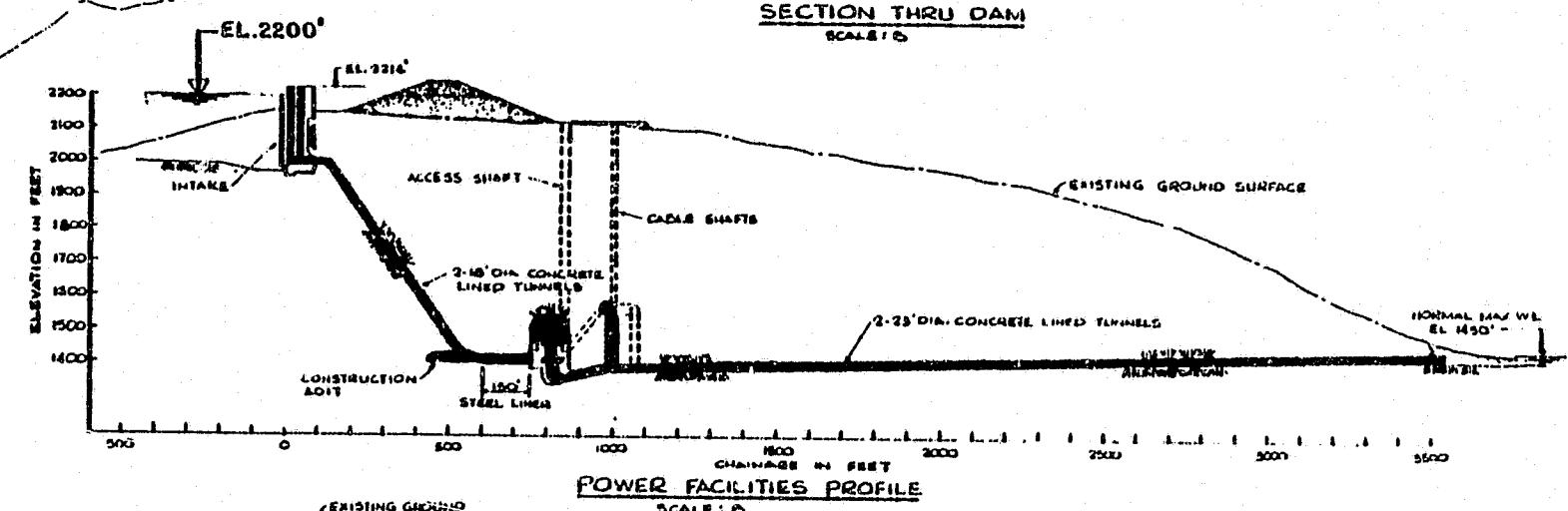
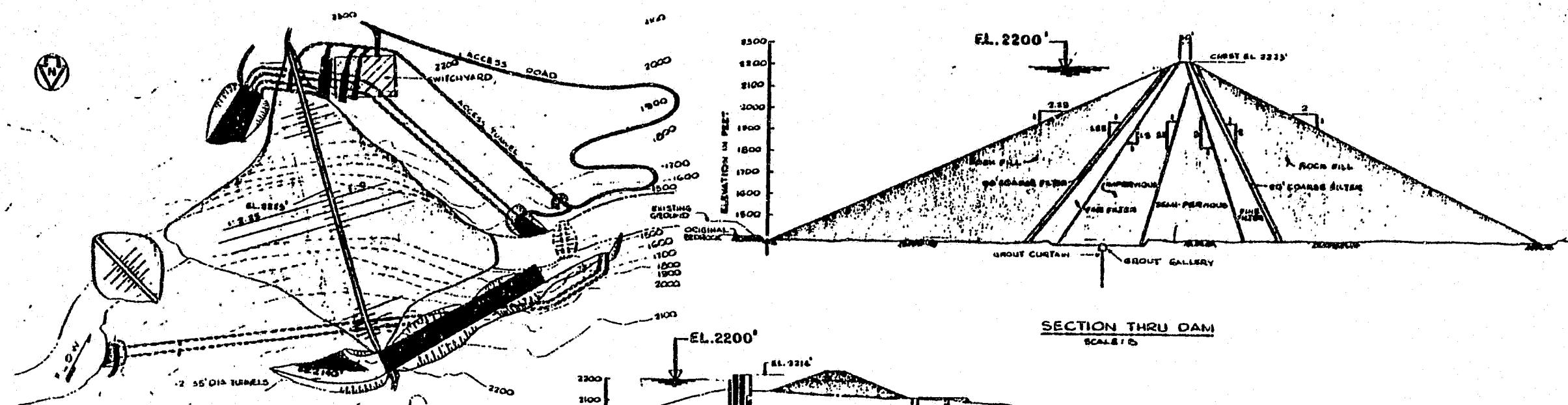
### WATANA DAM

### CONCEPTUAL DESIGN

0 400 800  
 1"=400'

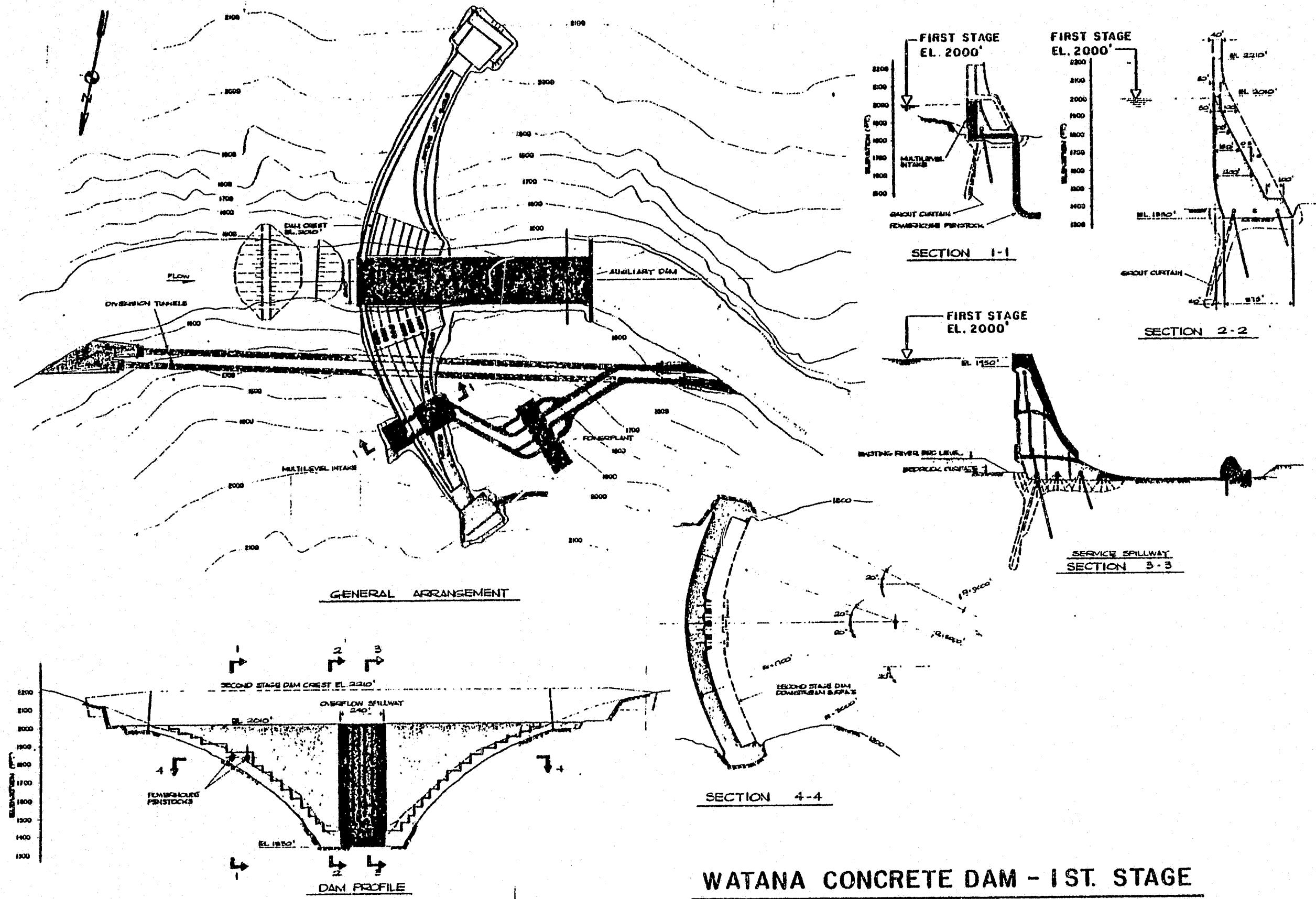
JANUARY, 1981

ACRES

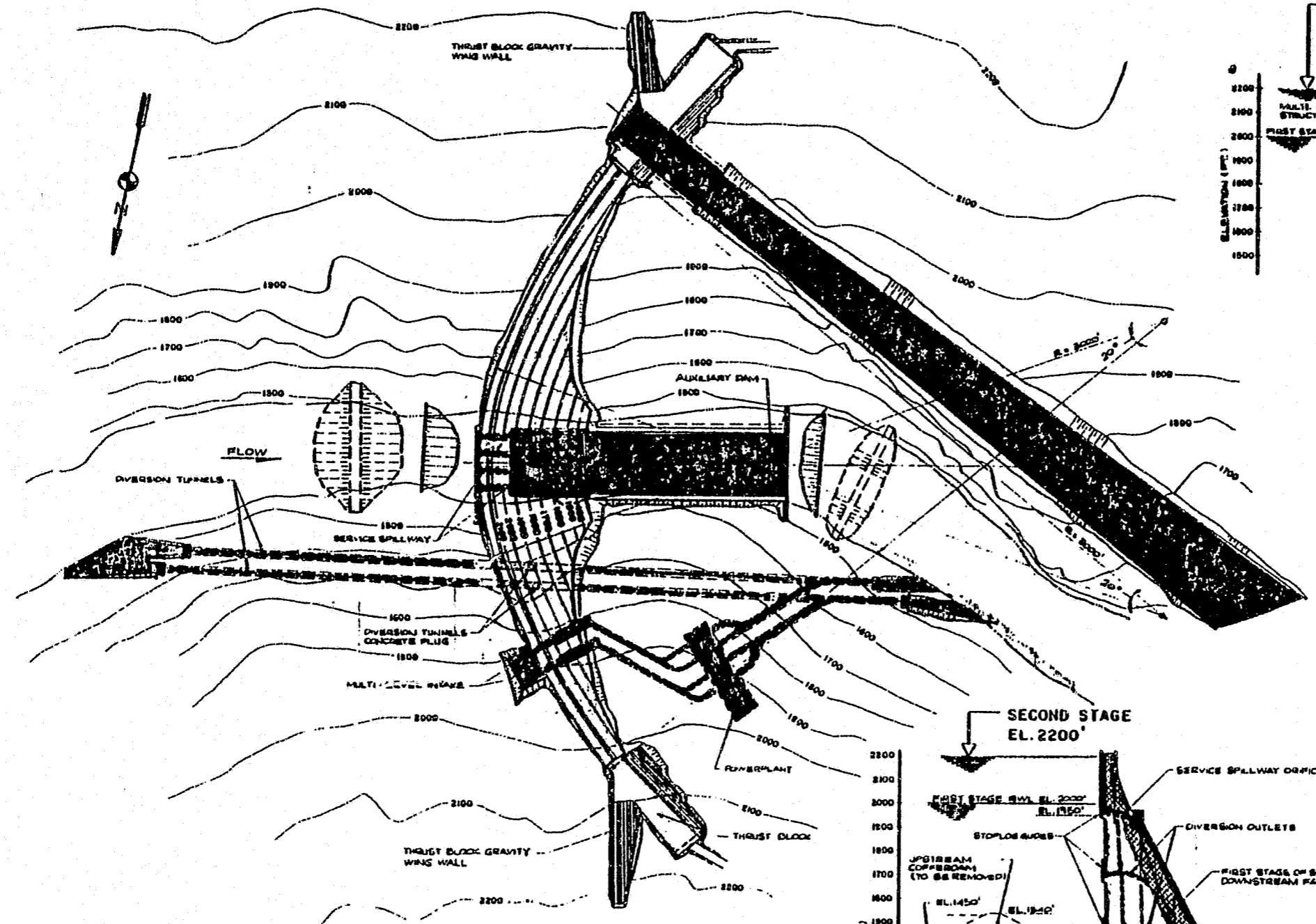


WATANA FILL DAM

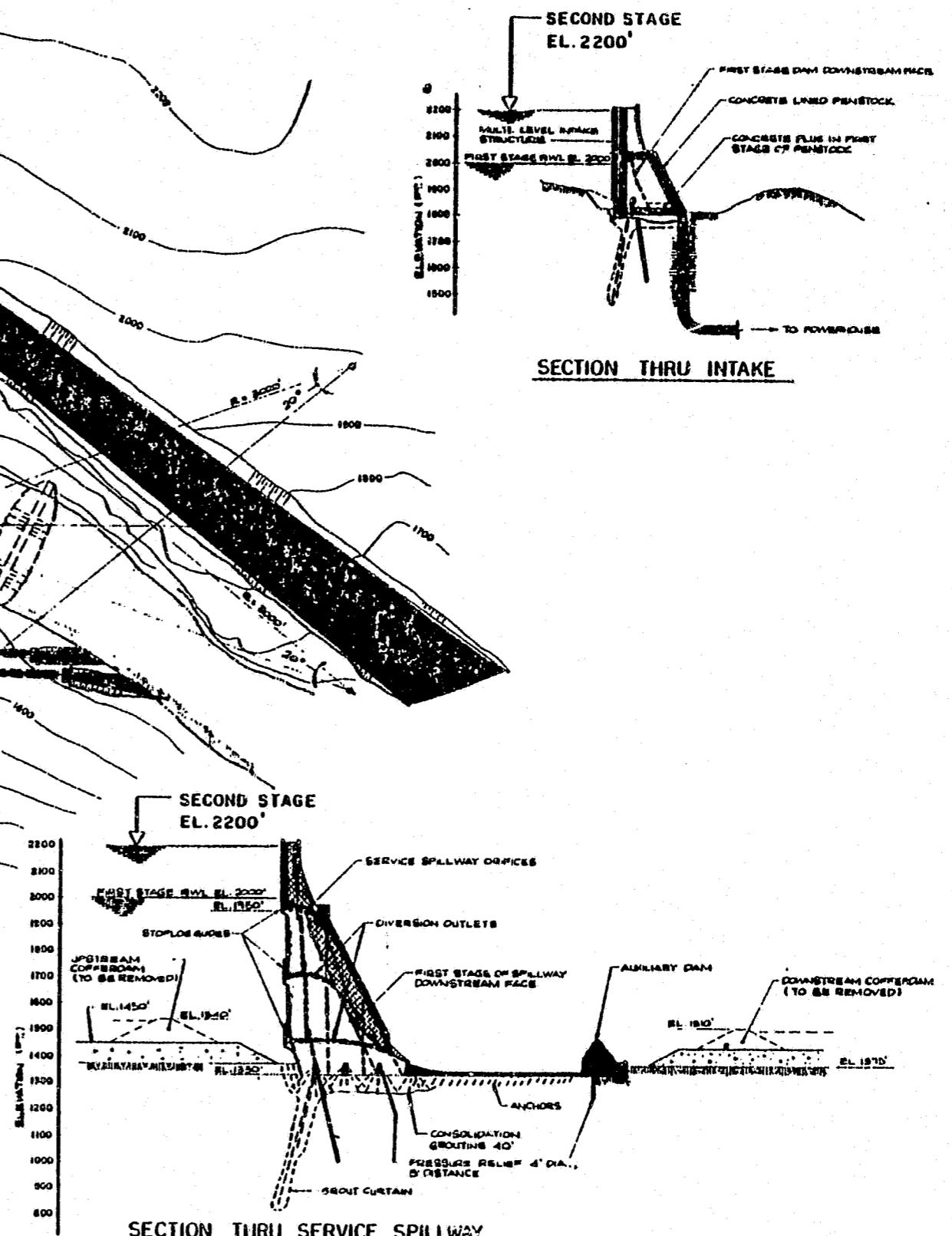
ACRES



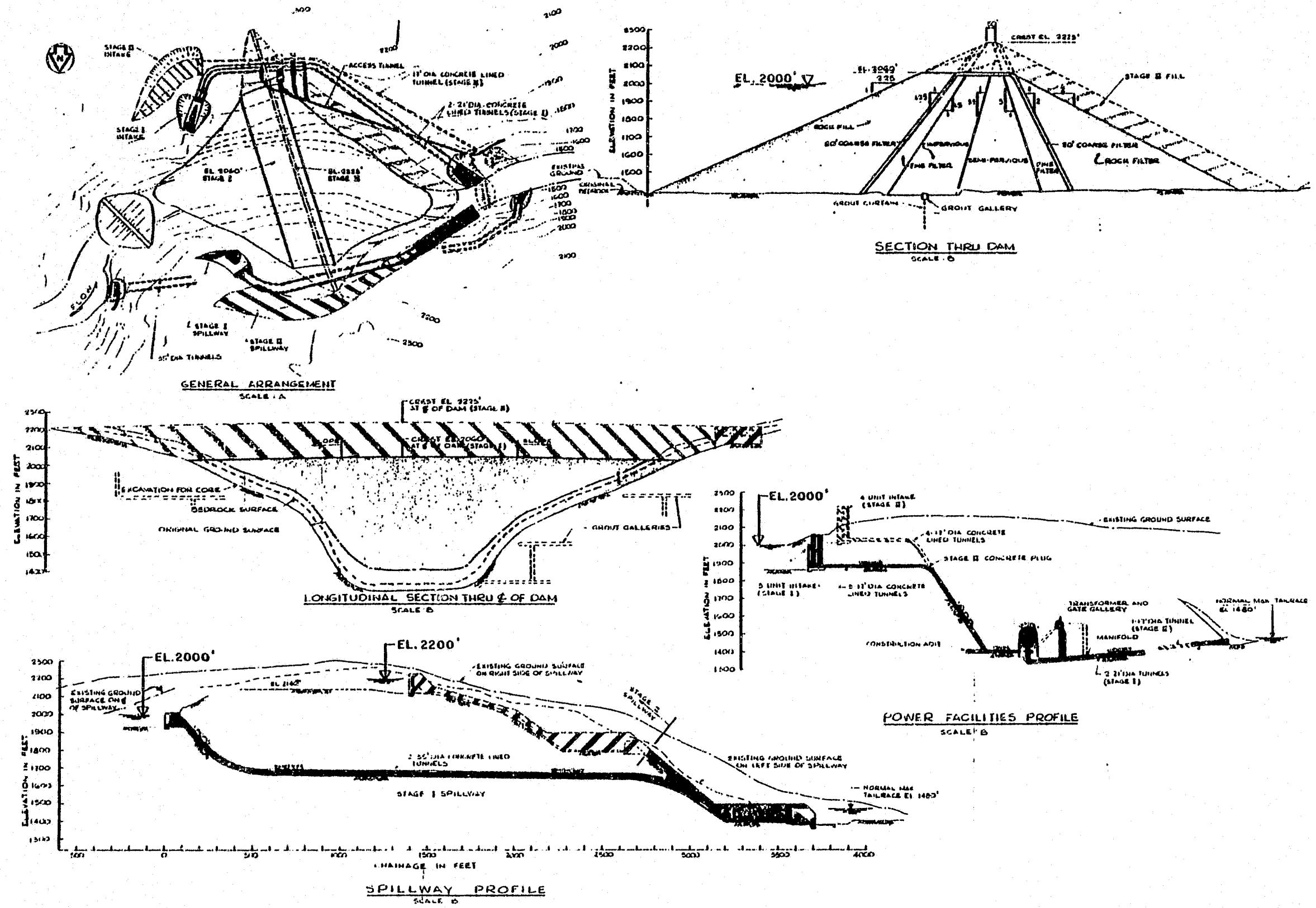
WATANA CONCRETE DAM - 1ST. STAGE



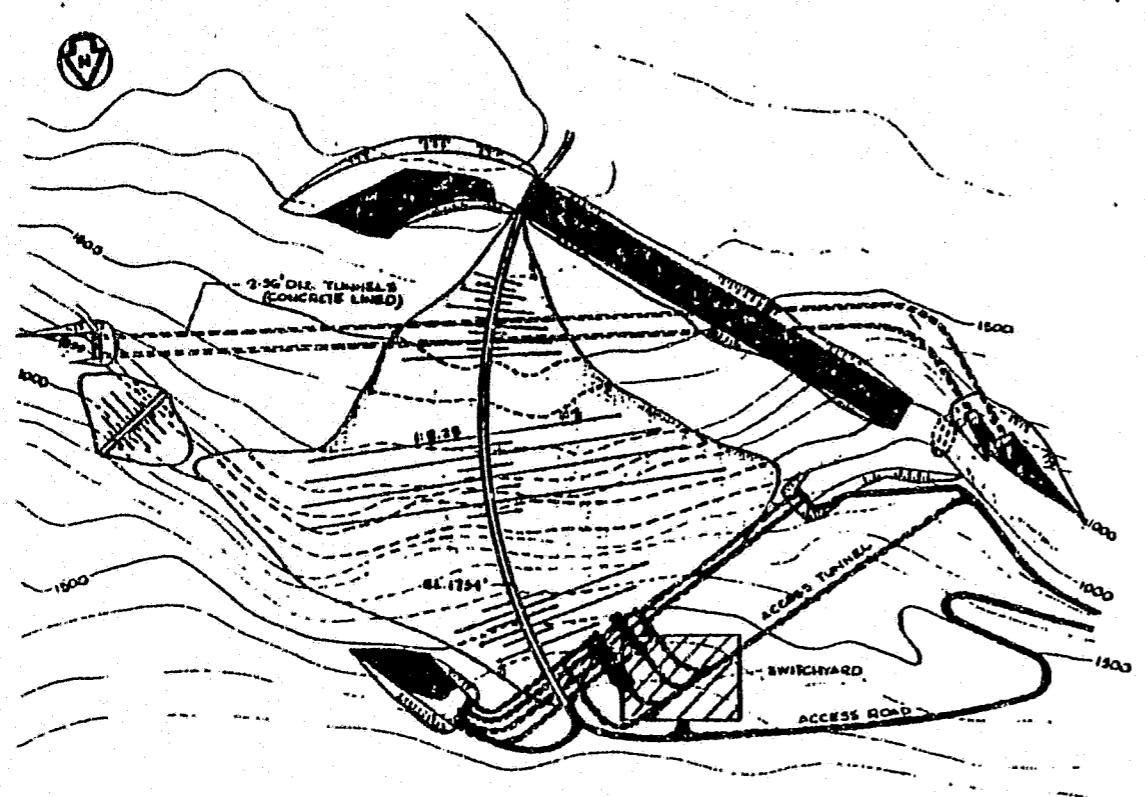
**WATANA CONCRETE DAM - 2 ND. STAGE**



**ACRES**

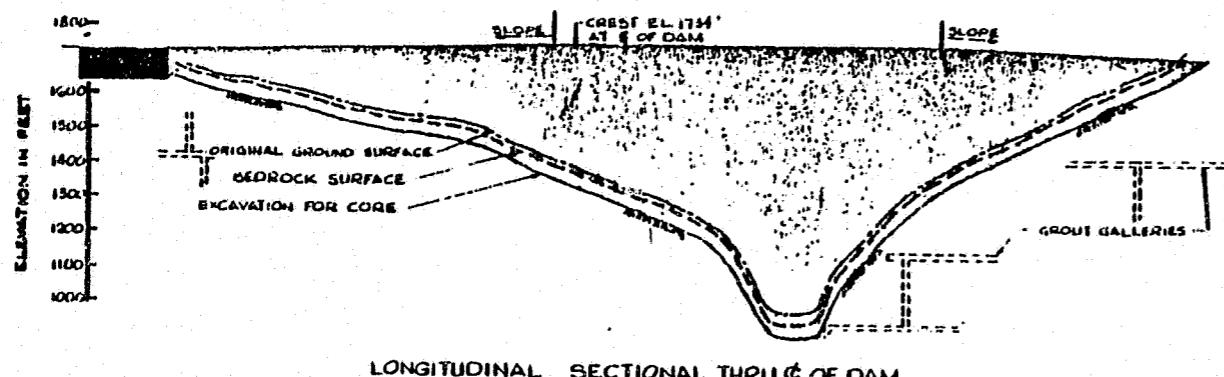


# WATANA STAGED DEVELOPMENT



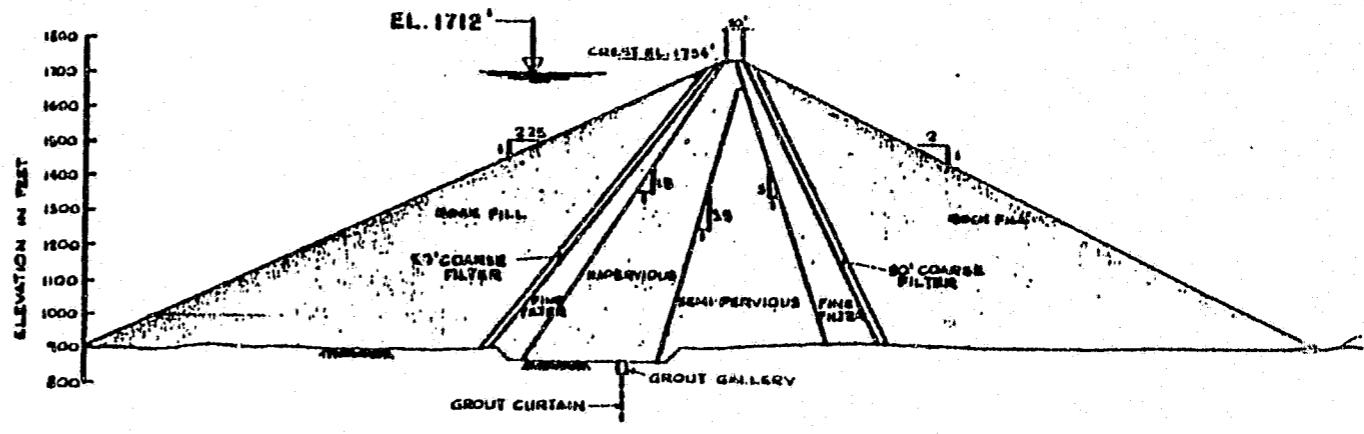
GENERAL ARRANGEMENT

SCALE 1:4



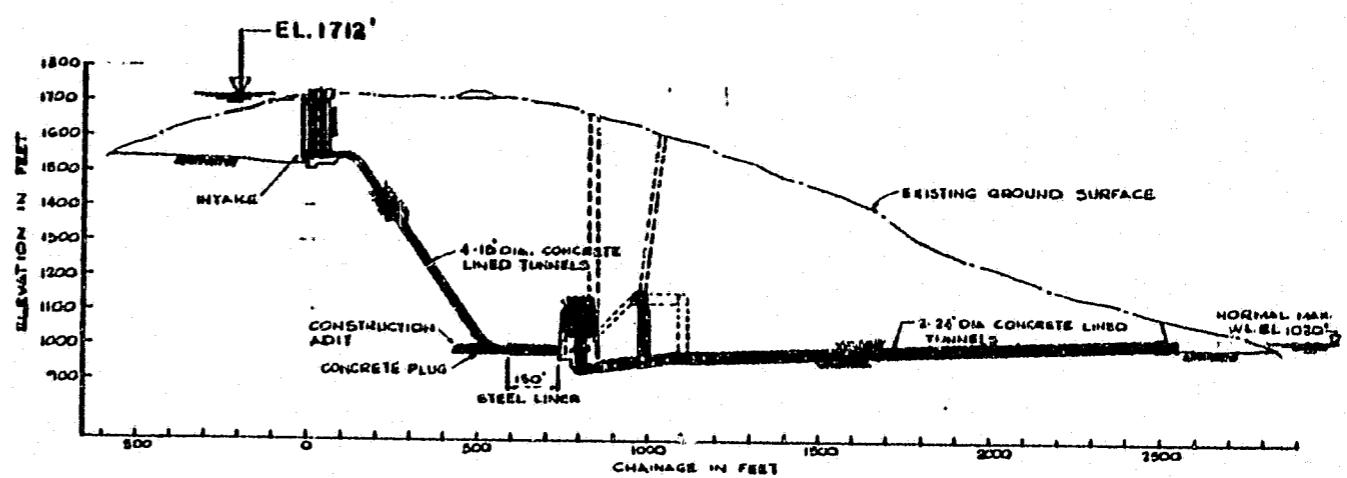
LONGITUDINAL SECTIONAL THRU Ⓛ OF DAM

SCALE 1:8



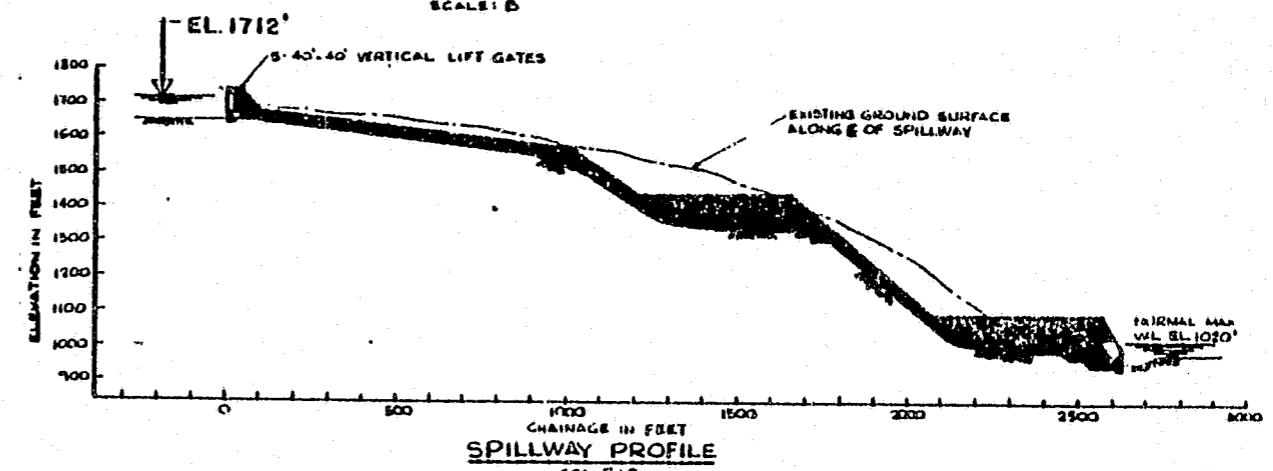
SECTION THRU DAM

SCALE 1:8



POWER FACILITIES PROFILE

SCALE 1:8

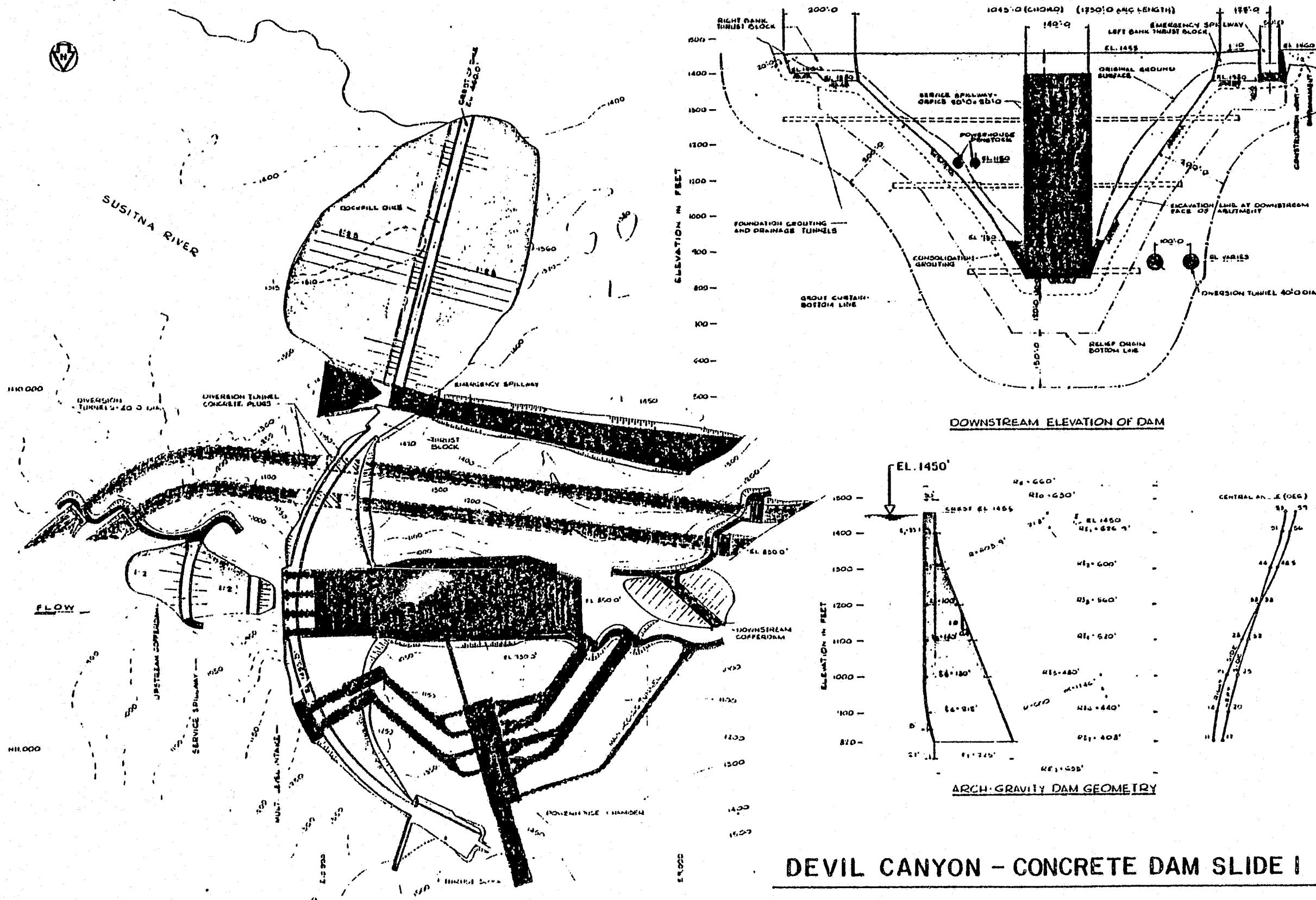


SPILLWAY PROFILE

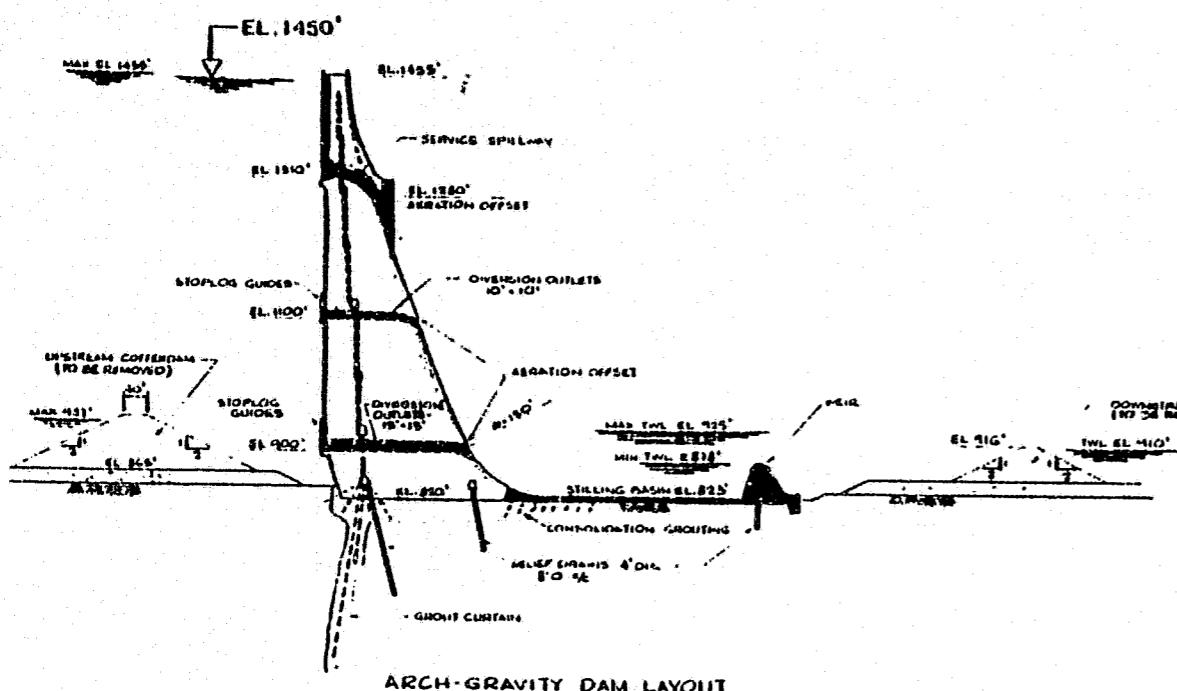
SCALE 1:8

**HIGH DEVIL CANYON**

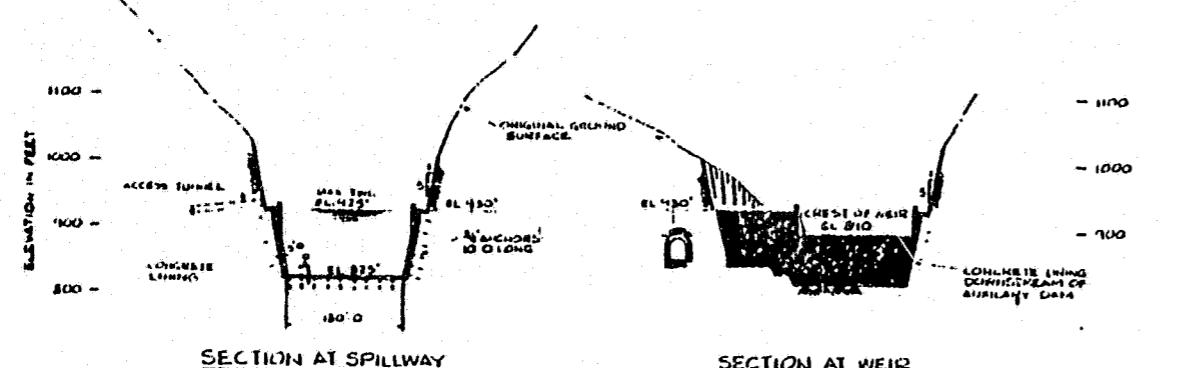
ACRES



**ACRES**

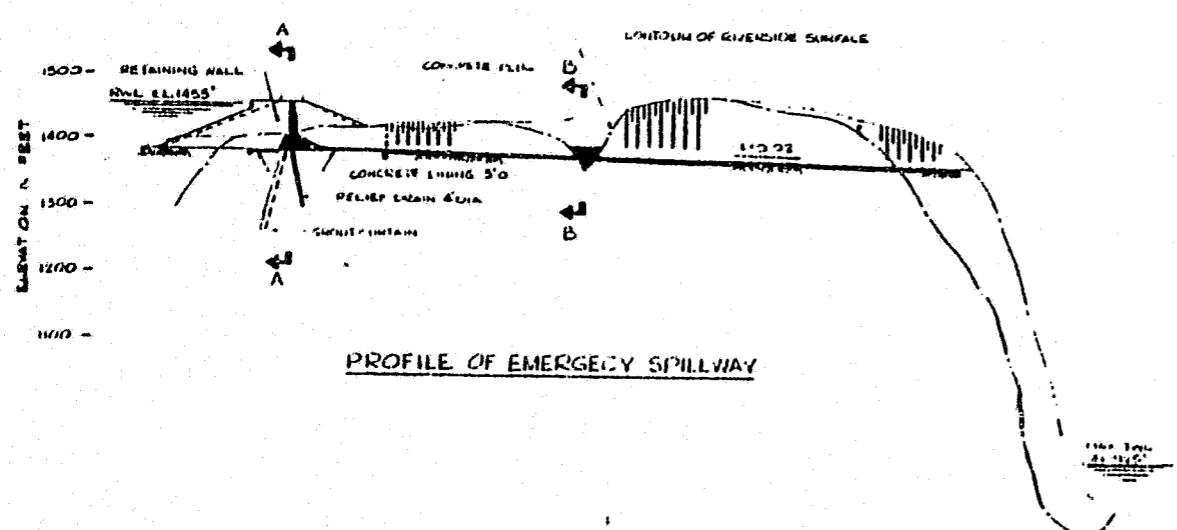


## ARCH-GRAVITY DAM LAYOUT

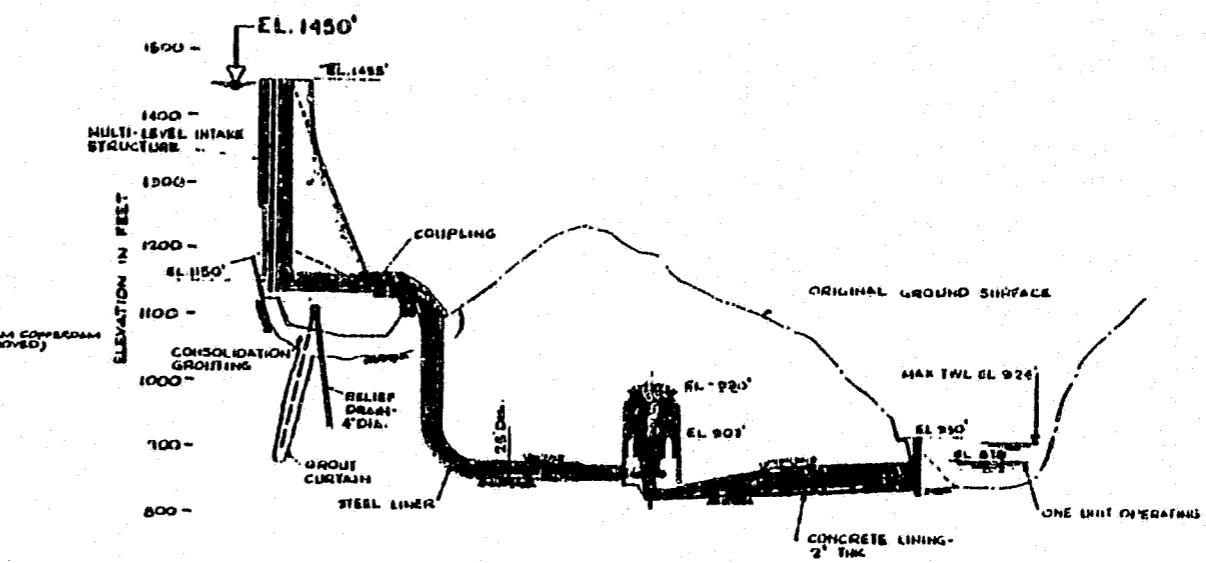


SECTION AT SPILLWA

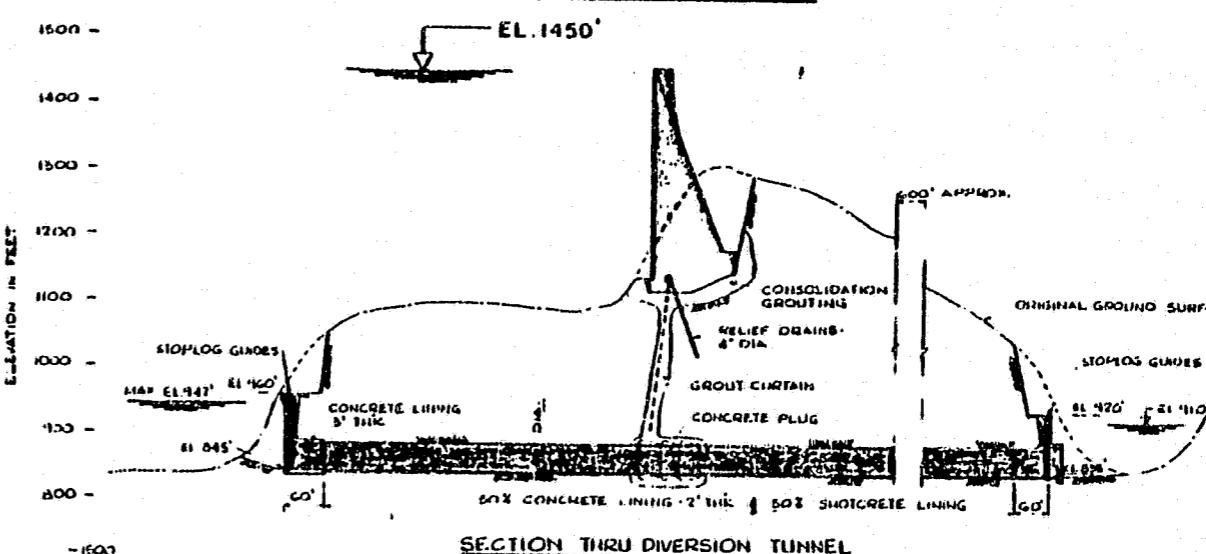
SECTION AT WEIR



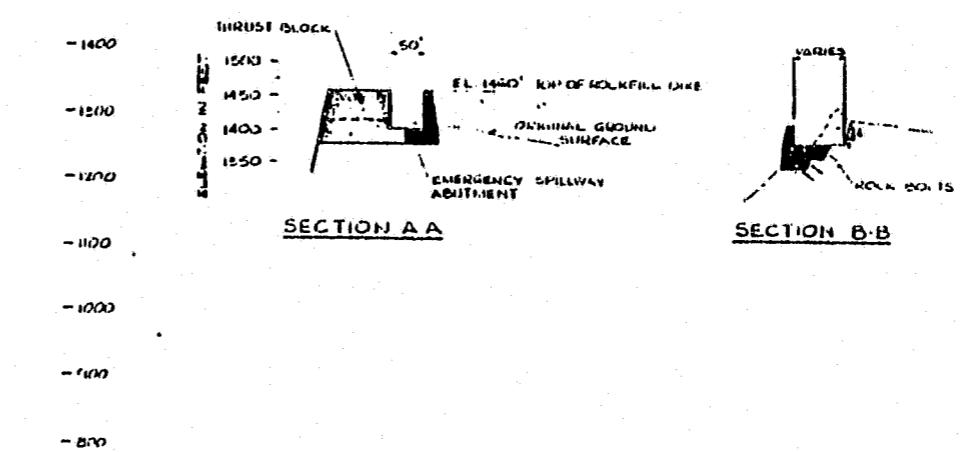
PROFILE OF EMERGENCY SPILLWATER



## POWER FACILITIES PROFILE



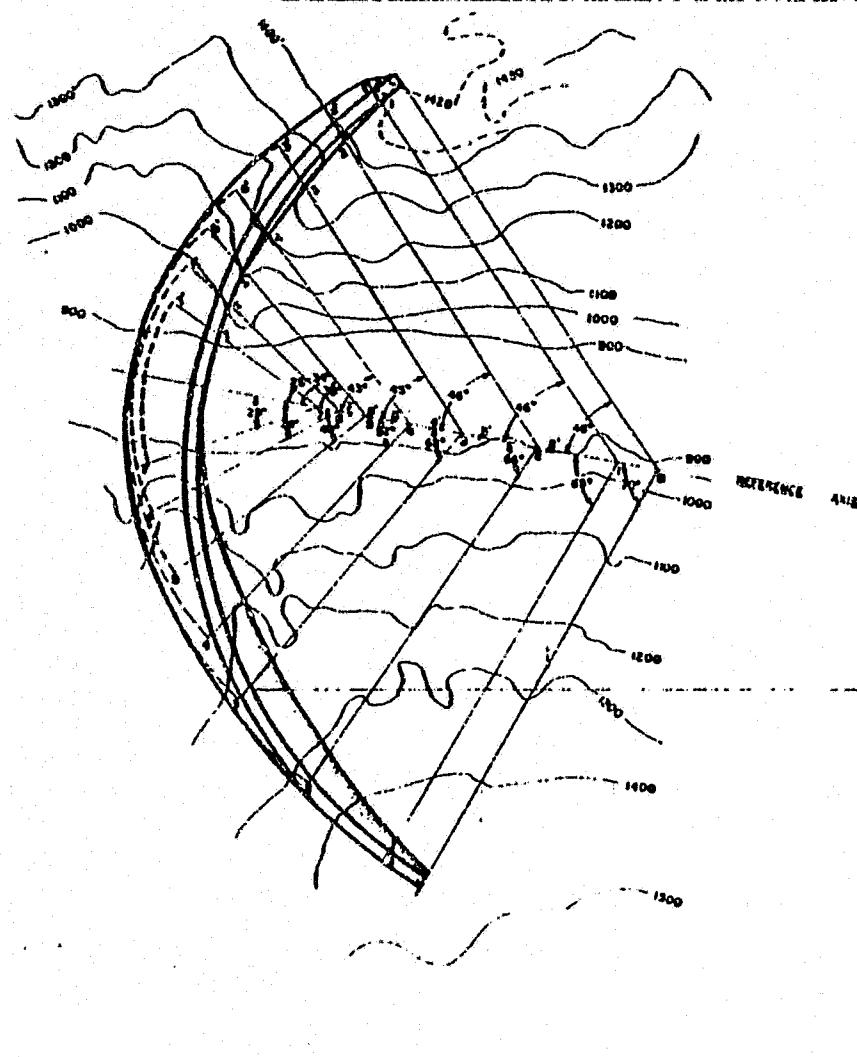
**SECTION THRU DIVERSION TUNNEL**



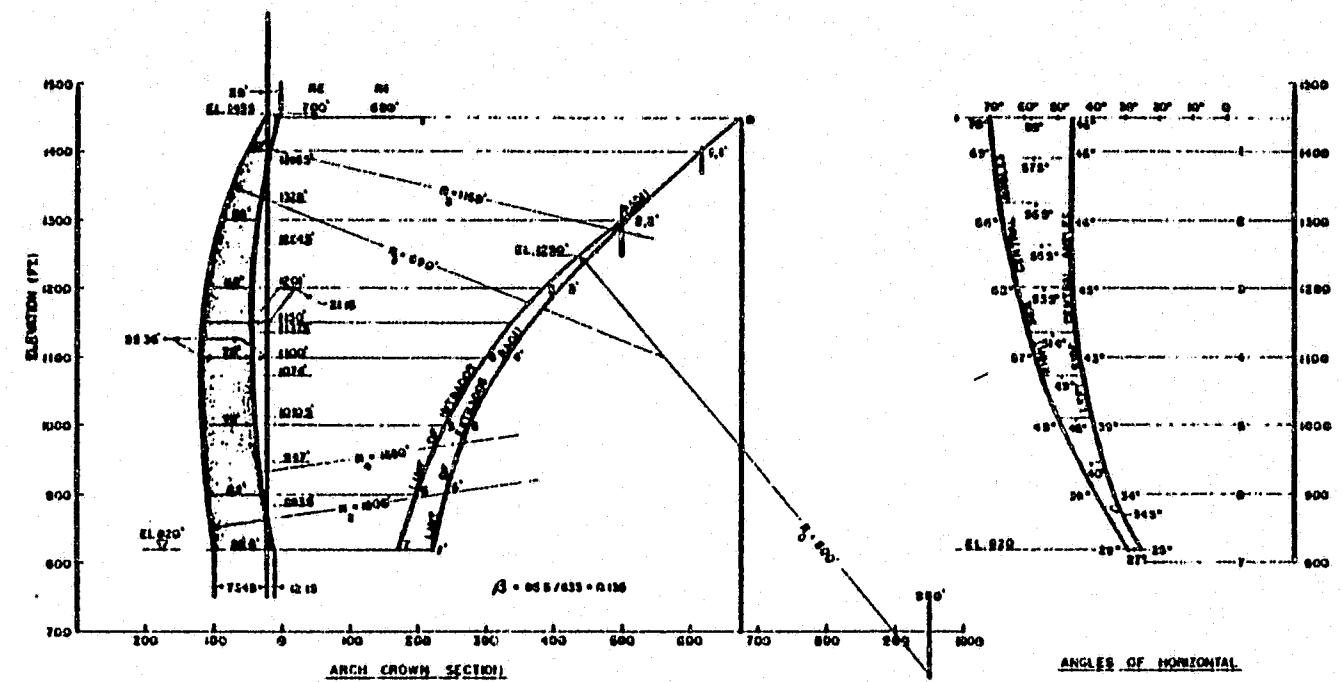
SECTION AA

SECTION 8.4

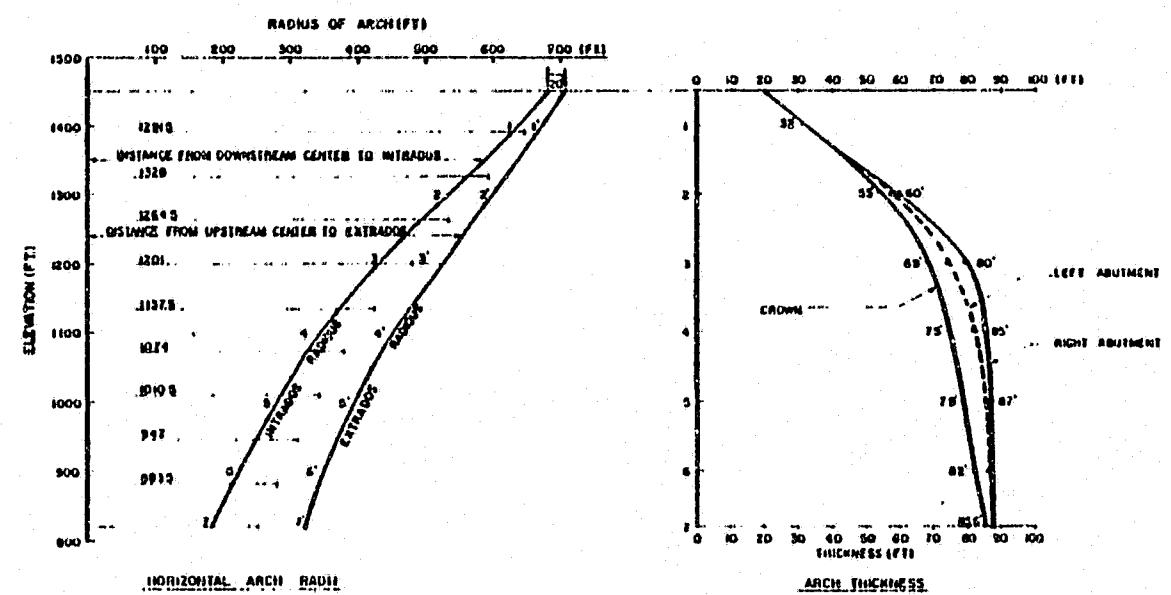
**ACRES**



PLAN OF ARCH



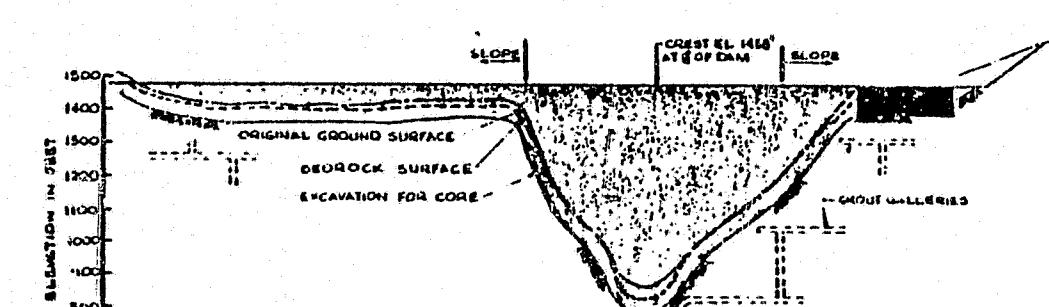
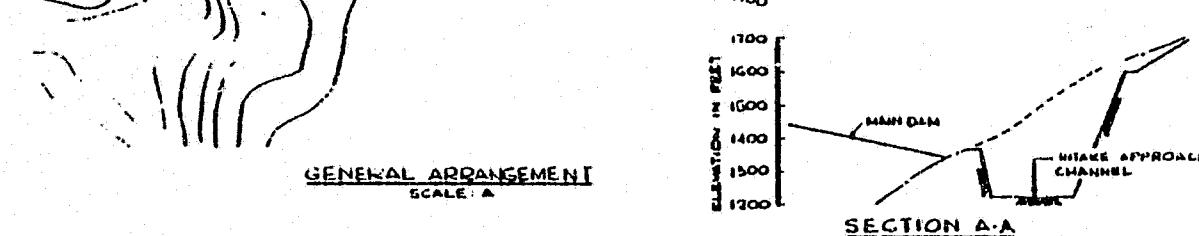
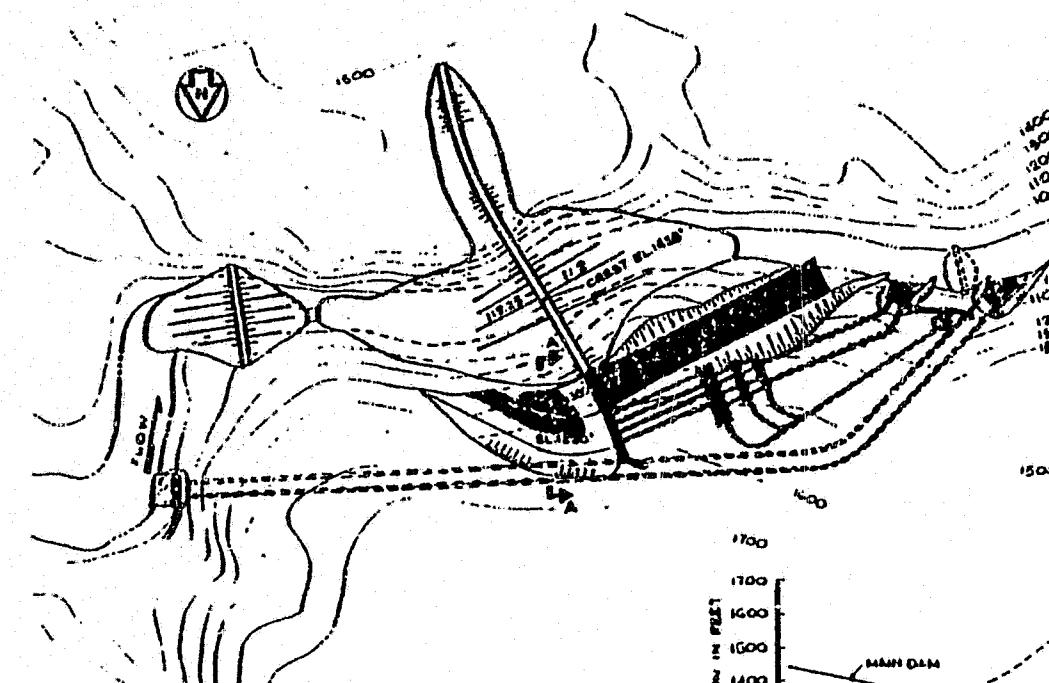
## ANGLES OF HORIZONTAL ARCH TO REFERENCE AXIS



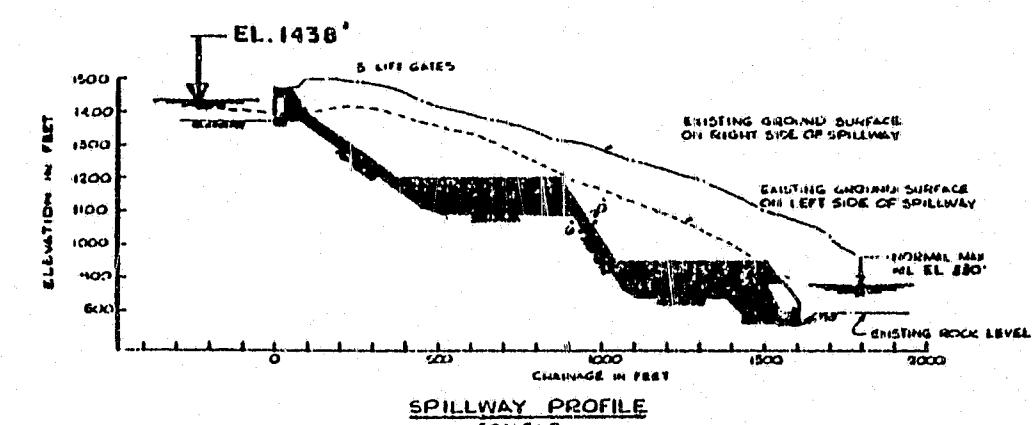
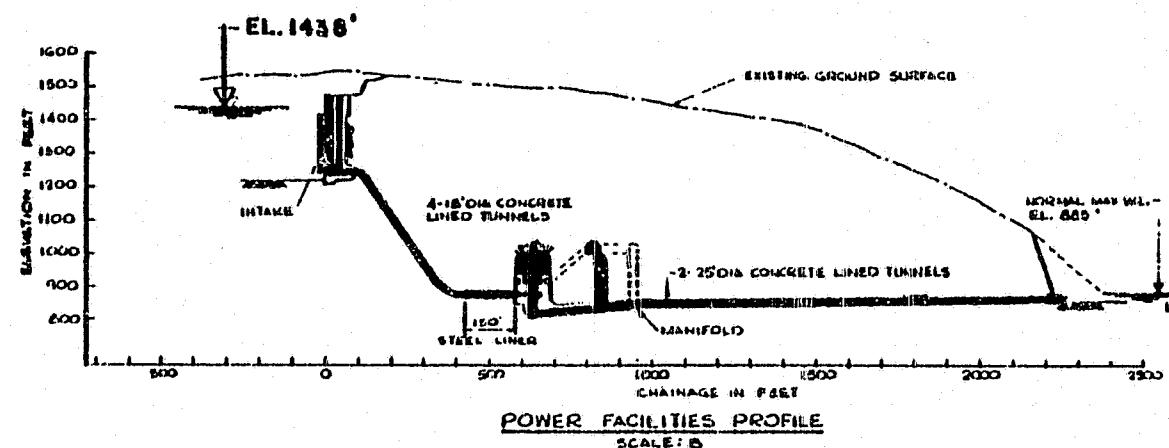
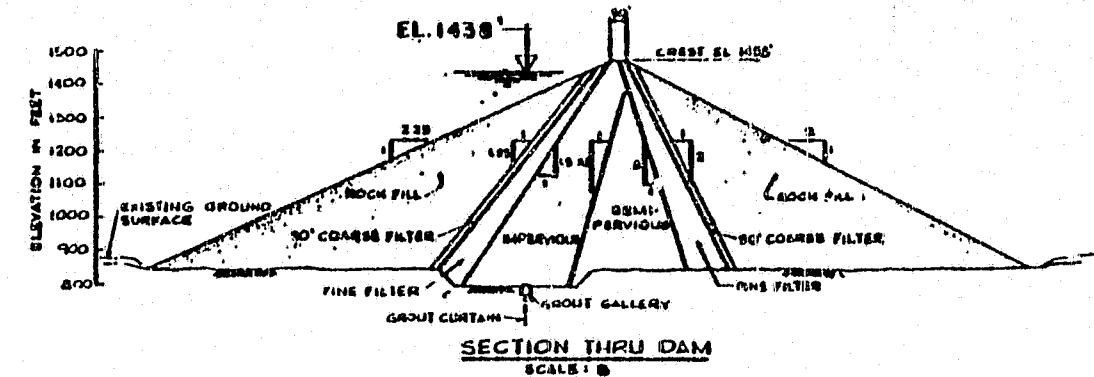
HORIZONTAL ARCH RADIUS

**DEVIL CANYON - THIN ARCH DAM  
(SIMILAR TO USBR)**

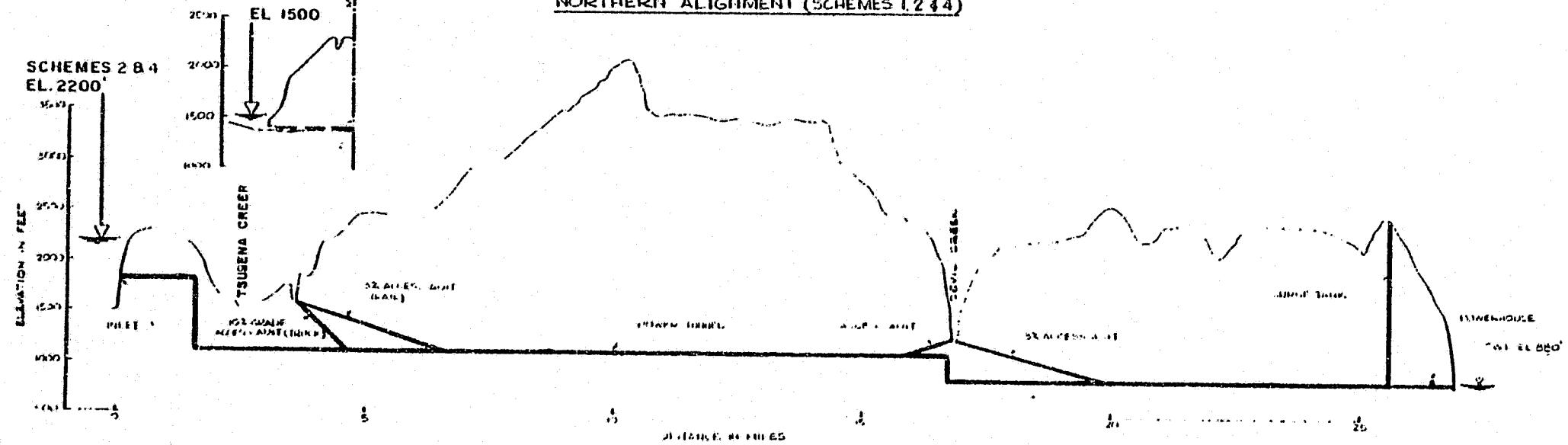
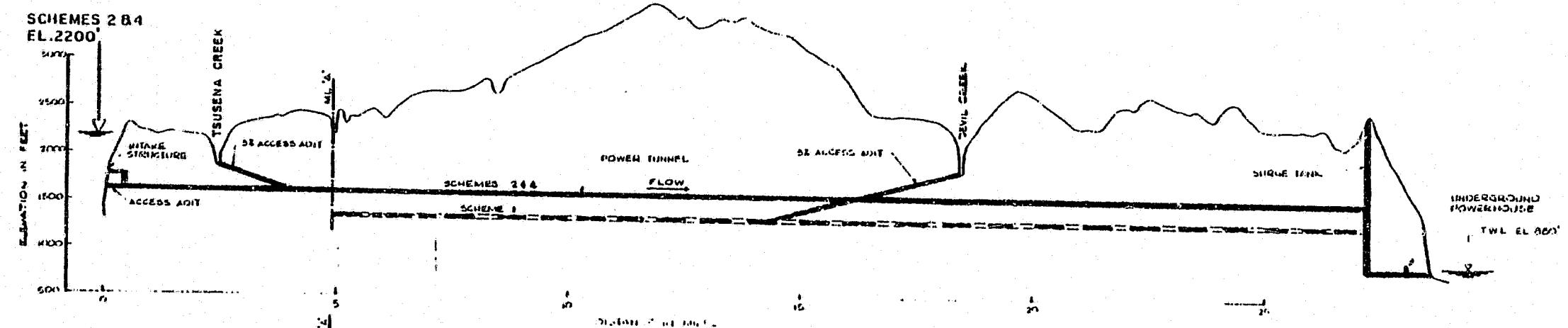
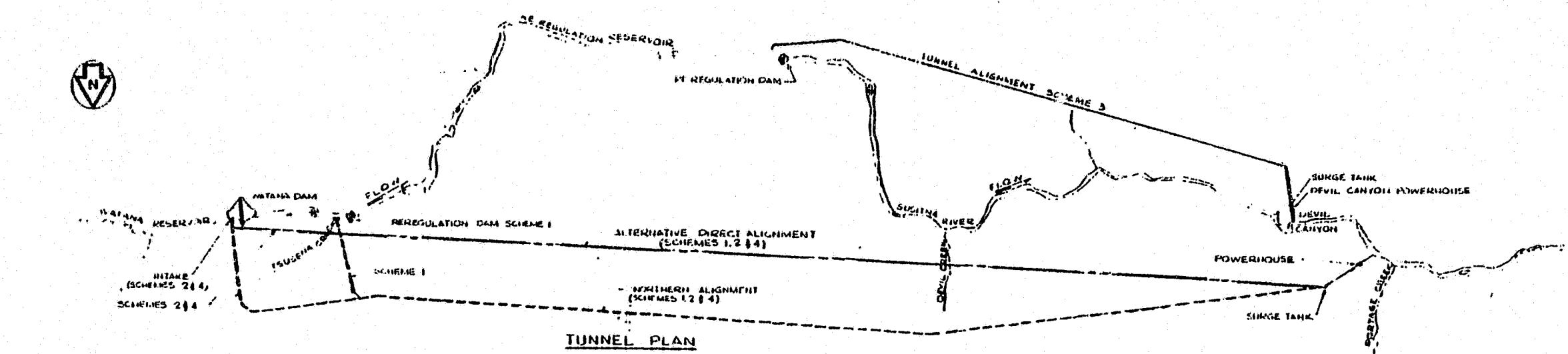
ACRES



DEVIL CANYON FILL DAM

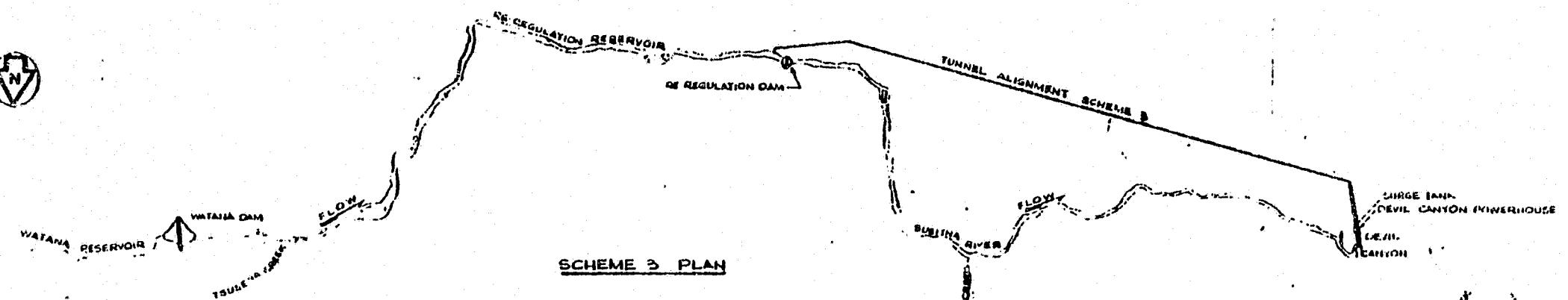


ACHES

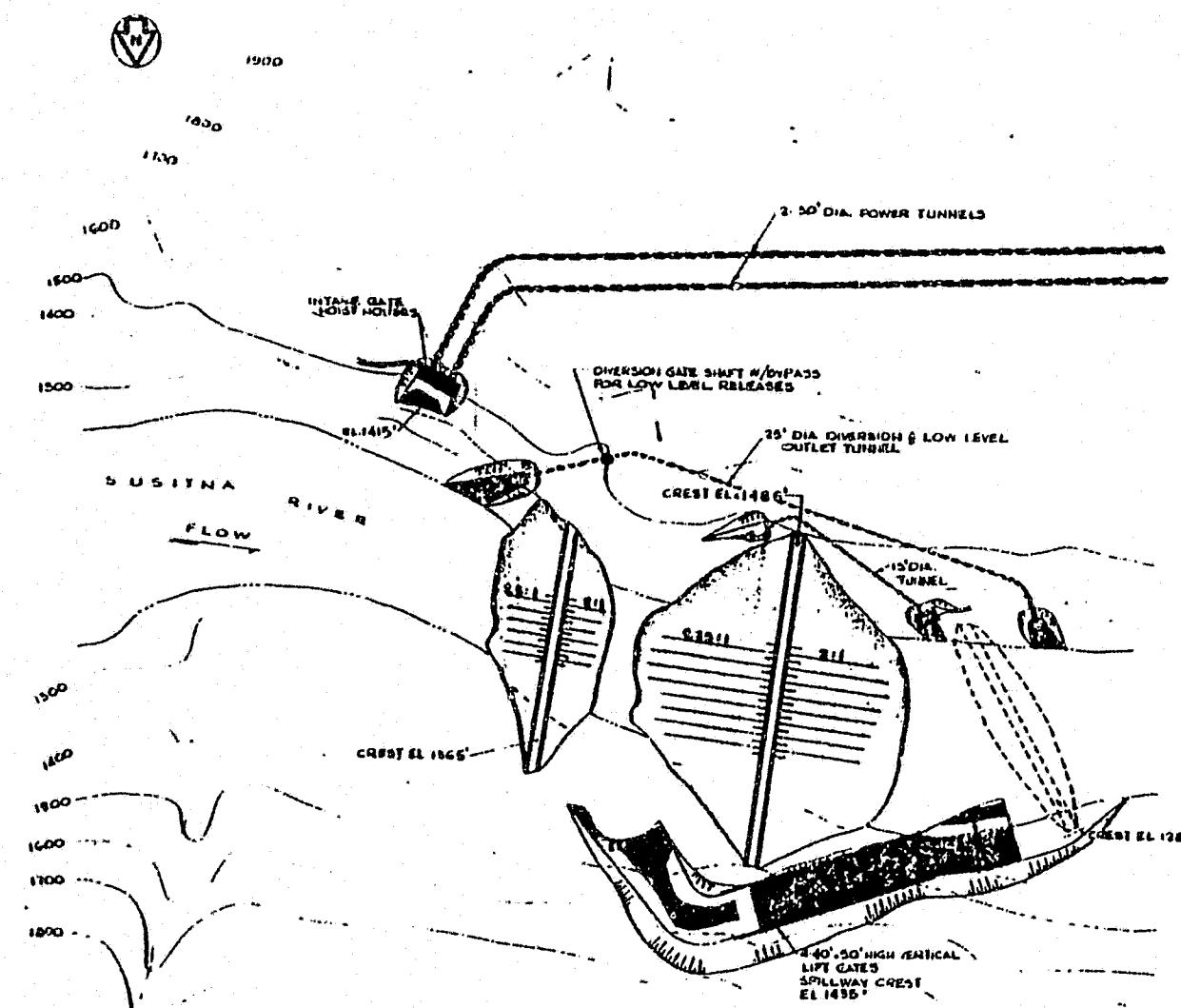


## ALTERNATIVE TUNNEL SCHEMES

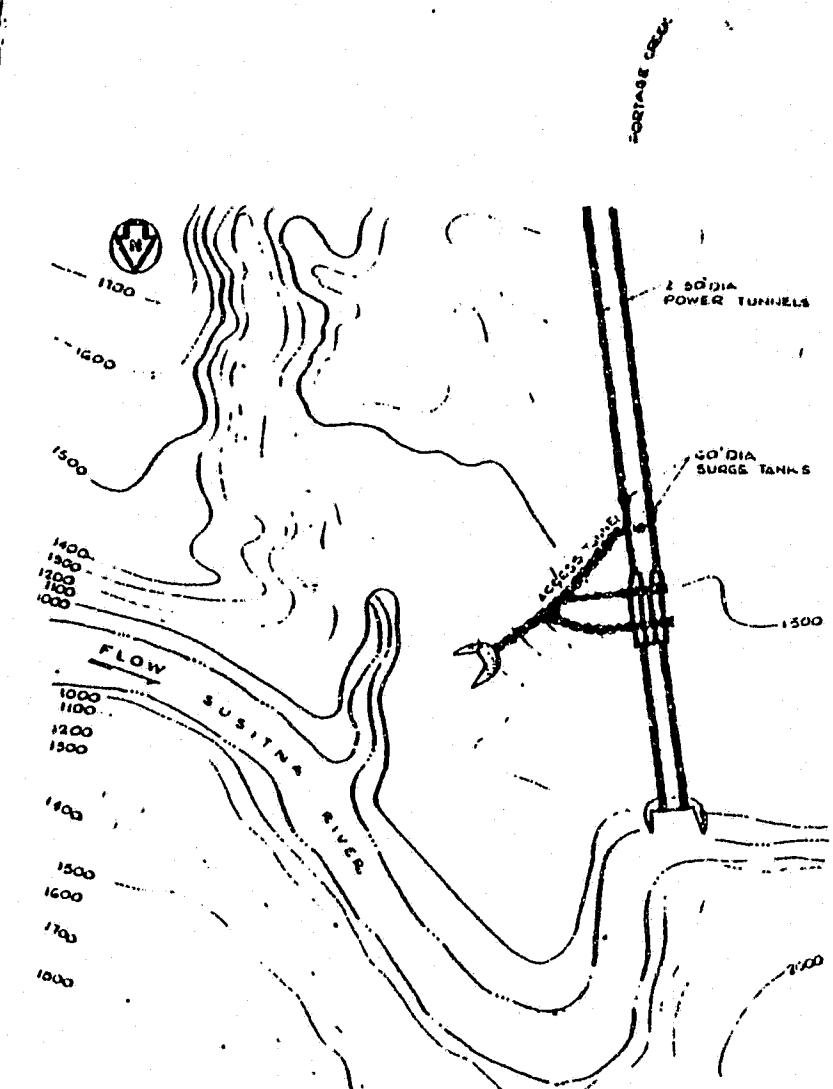
LAUREL



**SCHEME 3 PLAN**



GENERAL ARRANGEMENT  
RE-REGULATION DAM



GENERAL ARRANGEMENT  
DEVIL CANYON POWERHOUSE

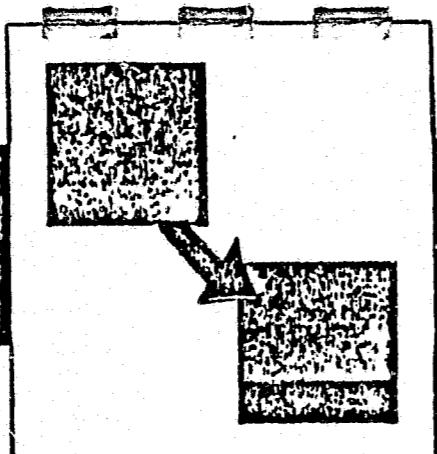
## TUNNEL SCHEME 3



ACRES

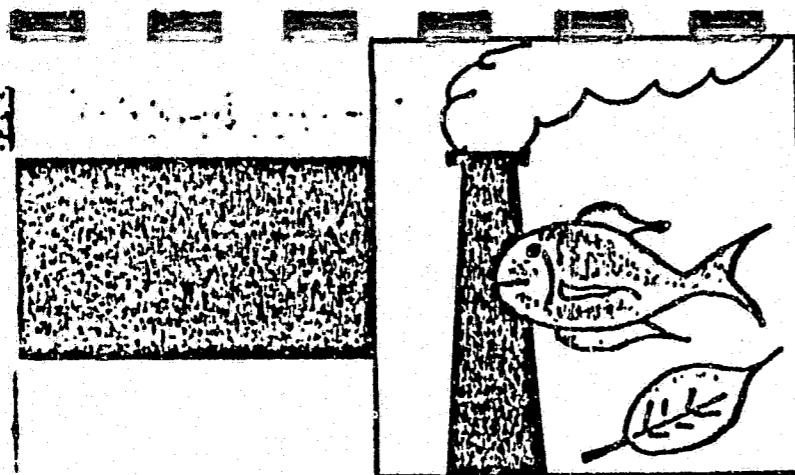
# POWER ALTERNATIVES

PRESENTED BY: C. DEBELIUS



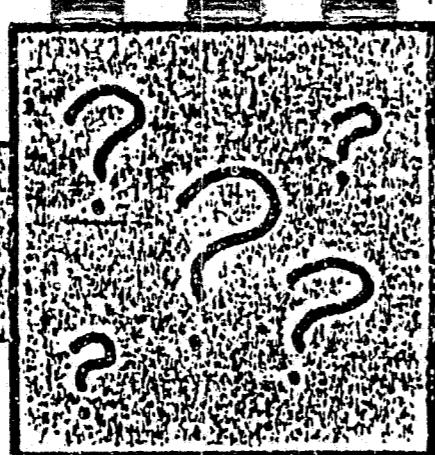
## NEW SUBTASKS - TASK 6

- 6.32 THERMAL RESOURCES
- 6.33 OTHER HYDRO
- 6.34 ENVIRONMENTAL
- 6.35 LOAD MANAGEMENT AND CONSERVATION
- 6.36 GENERATION PLANNING



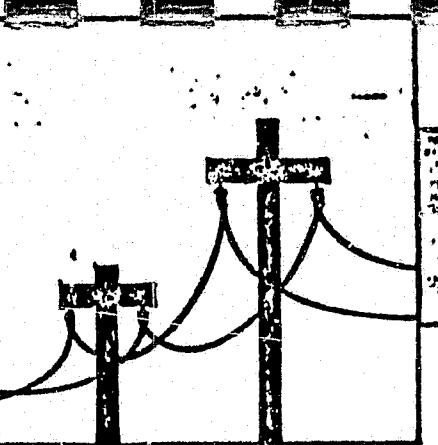
## ENVIRONMENTAL - S.T. 6.34

- DEVELOP PARAMETERS
- DEVELOP SCREENING CRITERIA
- SCREEN CLEARLY UNACCEPTABLE
- ENTER GENERATION PLANNING
- EVALUATE SCENARIO IMPACTS
- COMPARE DEVELOPMENT PLANS



CHOICES

THERMAL ONLY?  
SUSITNA + THERMAL?  
WHICH SUSITNA?



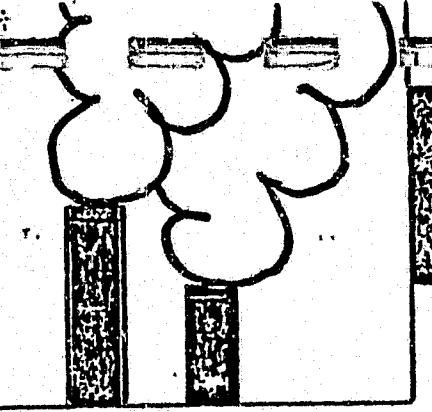
# PRESENT SYSTEM

COMBINED CYCLE 141
HYDRO 45
GAS FIRED GT 471
OIL FIRED GT 168
COAL FIRED STEAM 34
SMALL DIESELS 65

944  
MW

ANCHORAGE MUNICIPAL 215
CHUGACH ELECTRIC 411
GOLDEN VALLEY 211
FAIRBANKS MUNICIPAL 671

OTHERS 40 MW



## THERMAL POSSIBILITIES

- COAL FIRED STEAM - 100, 250, 500 MW
- GAS FIRED COMBINED CYCLE - 250 MW
- GAS TURBINE - 75 MW
- DIESEL - 10 MW
- FUEL USE ACT CONSTRAINTS

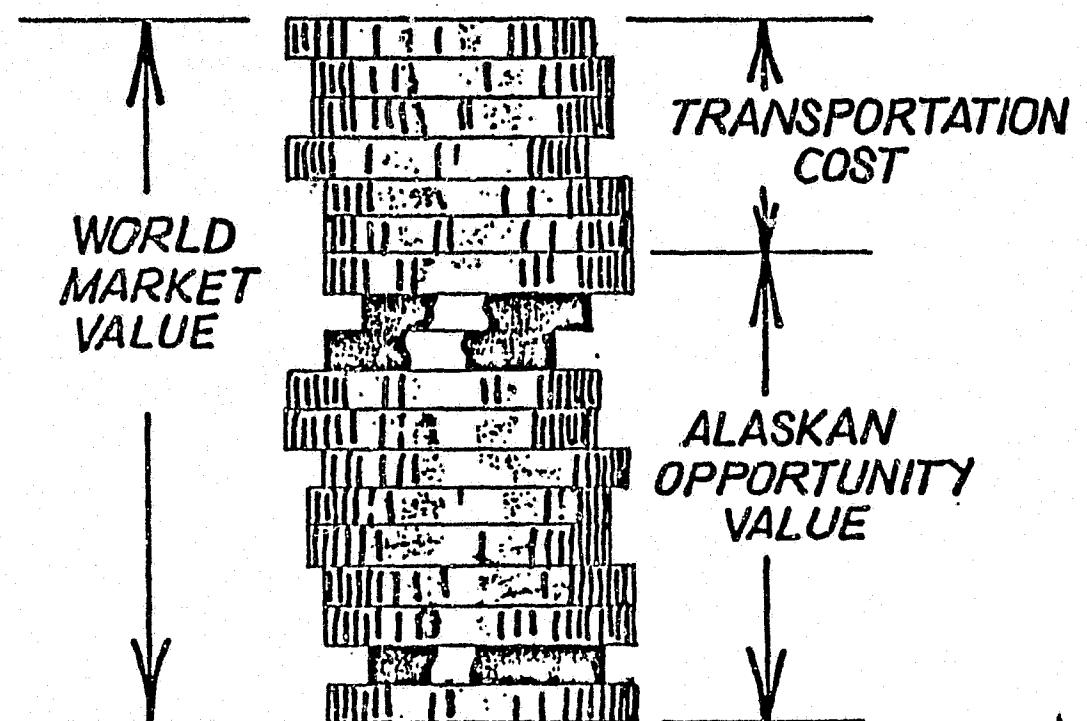


## FUEL USE ACT

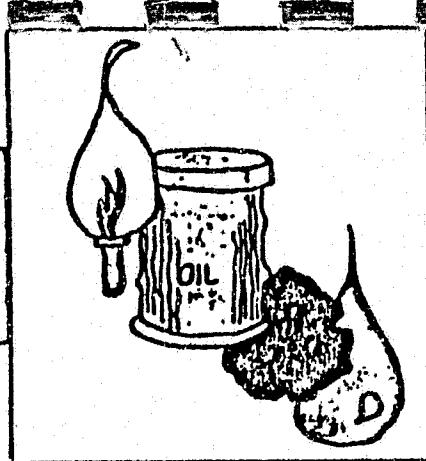
- EXISTING ALASKA UNITS EXEMPT
- 1500 HOUR LIMIT ON NEW
- FURTHER EXEMPTION ONLY IF NO VIABLE ALTERNATIVE EXISTS



# FUEL COSTS



	RANGE OF OPPORTUNITY \$	SELECTED VALUE
COAL	.83 - 1.33	1.15
GAS	1.50 - 2.92	2.00
OIL	3.45 - 4.01	4.00



# SELECTED PARAMETERS

CONTINGENCY ALLOWANCE

HYDRO

20%

THERMAL

16%

REAL INTEREST RATE

1.5%

3%

5%

FUEL ESCALATION

COAL

2.93%

DISTILLATE

3.58%

NATURAL GAS

3.98%

ECONOMIC LIFE (YEARS)

OIL FIRED GT

20

GAS FIRED GT

30

LARGE STEAM TURBINE

30

SMALL STEAM TURBINE

35

50

HYDROPOWER



## SELECTED PARAMETERS

CONTINGENCY ALLOWANCE

HYDRO

20%

THERMAL

16%

REAL INTEREST RATE

1.5%

3%

5%

FUEL ESCALATION

COAL

2.93%

DISTILLATE

3.58%

NATURAL GAS

3.98%

OIL FIRED GT

20

ECONOMIC LIFE (YEARS)

GAS FIRED GT

30

LARGE STEAM TURBINE

30

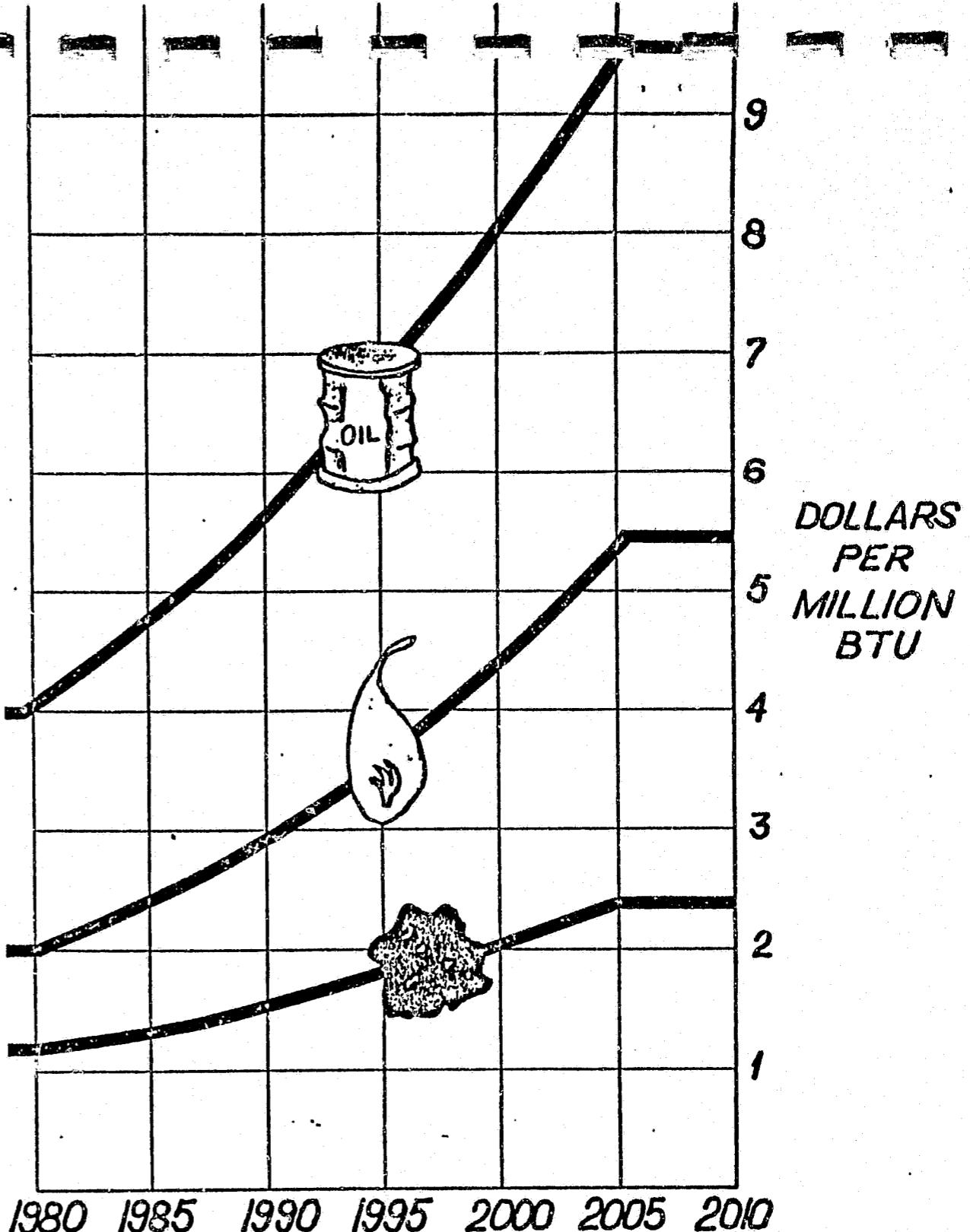
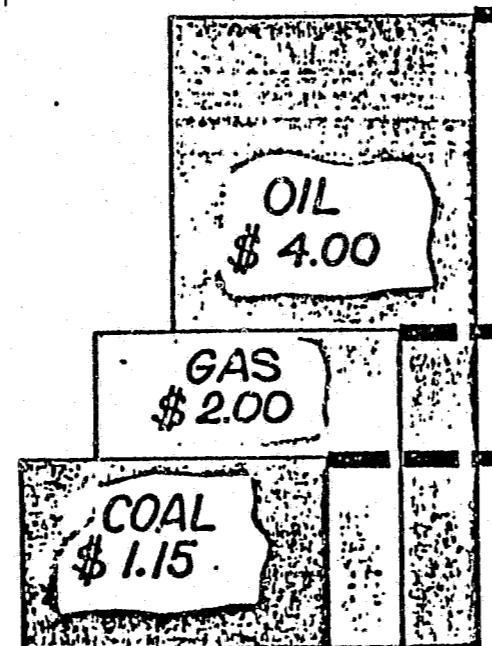
SMALL STEAM TURBINE

35

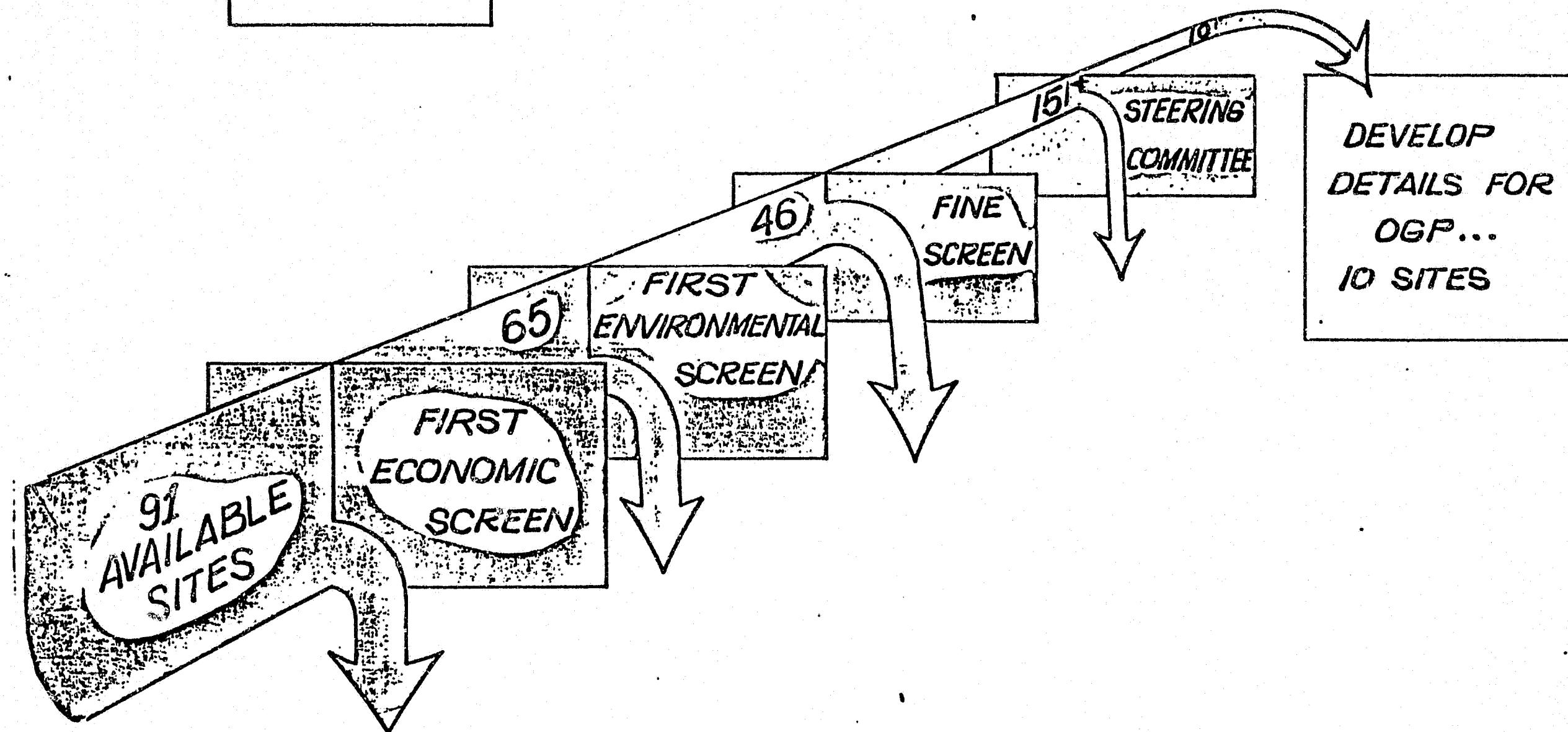
HYDROPOWER

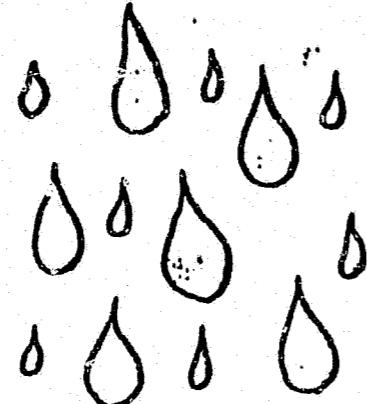
50

# FUEL COST PROJECTIONS



# NON-SUSTAINABLE HYDRO

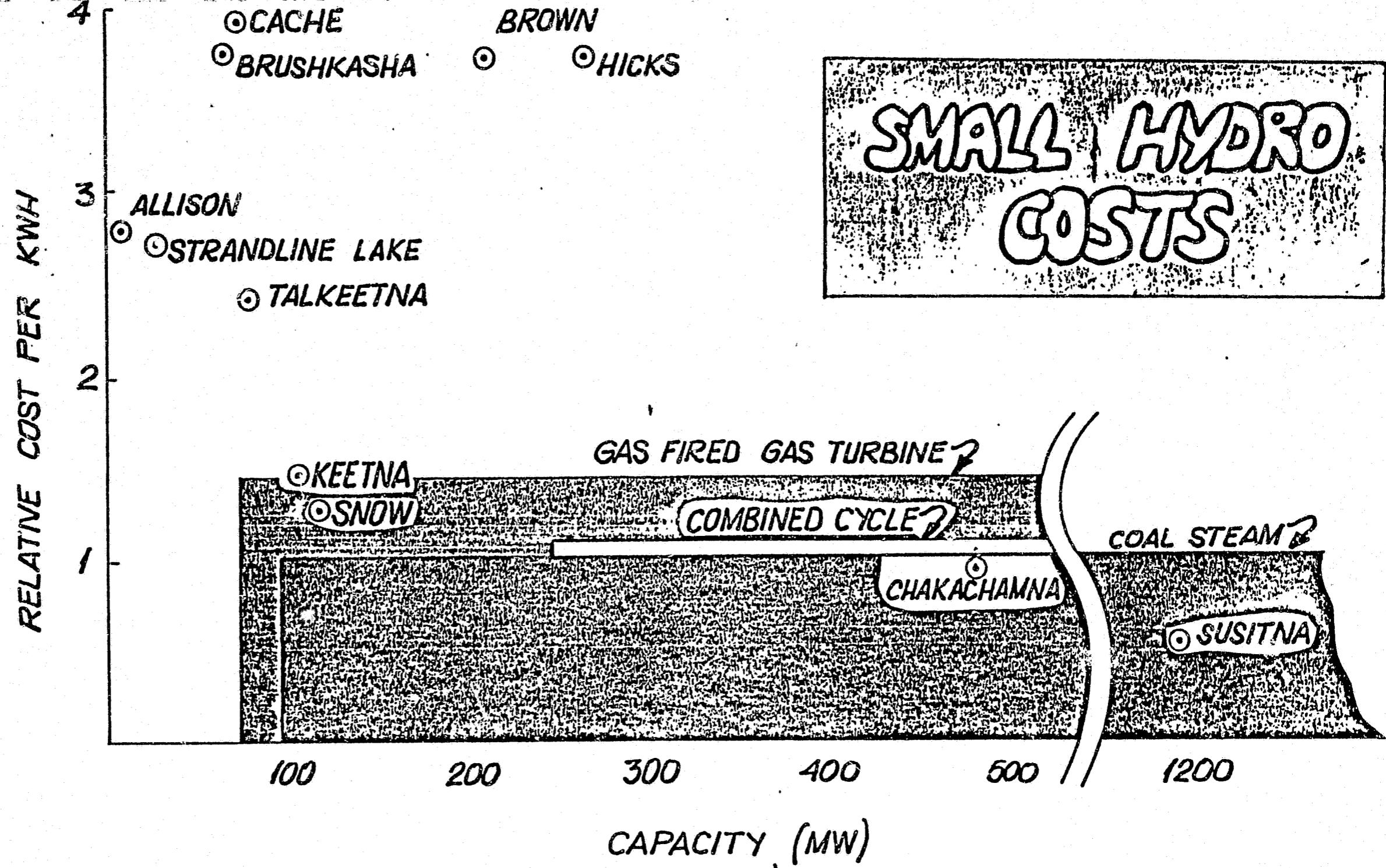


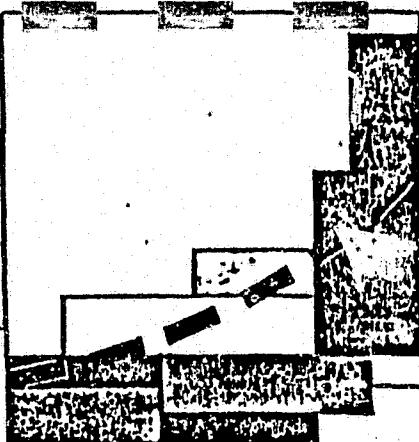


## POSSIBLE HYDRO LIST

	MW	ENV.	ECON.
SNOW	63		
BRUSKASNA	46		
KEETNA	93		
CACHE	63		
BROWNE	165		
TALKEETNA 2	73		
HICKS	122		
CHAKACHAMNA	350		
ALLISON	7.5		
STRANDLINE LAKE	42		
BRADLEY LAKE *	100		

\* AUTHORIZED PROJECT

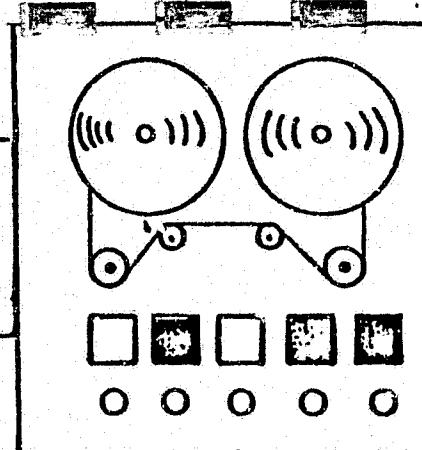




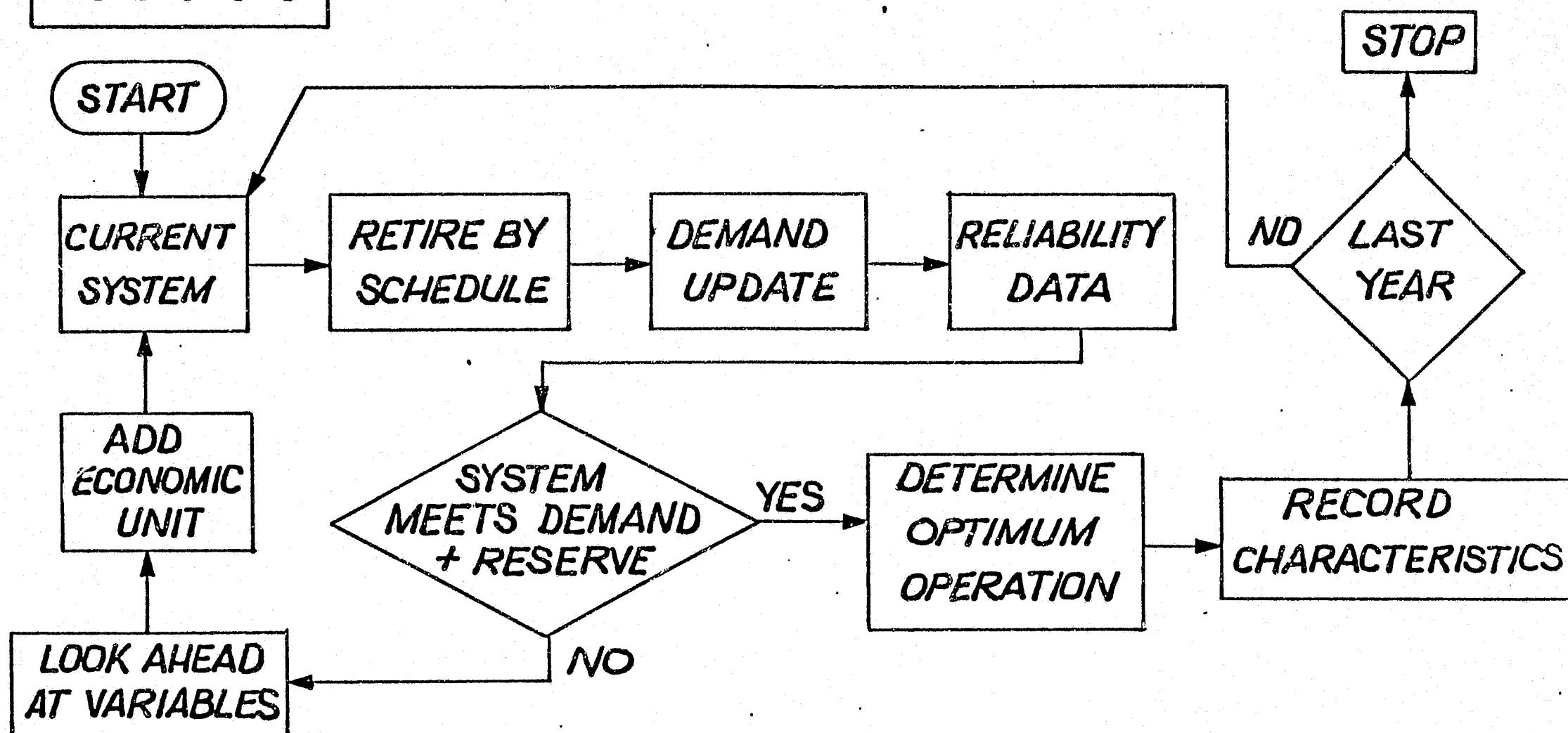
# ABOUT GENERATION PLANNING

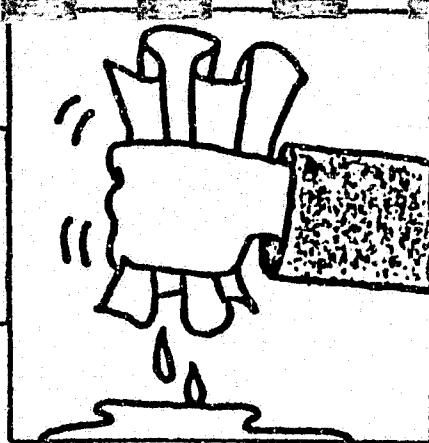
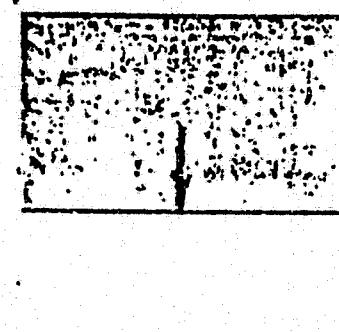
1. A SYSTEM EXISTS.
2. IT WILL EVOLVE,  
WITH OR WITHOUT  
SUSITNA.
3. SUSITNA CANNOT  
BE CONSIDERED  
IN ISOLATION.

OBJECTIVE :  
FIND MOST  
SUITABLE  
SUSITNA  
PROJECT



# OPTIMUM GENERATION - OGP



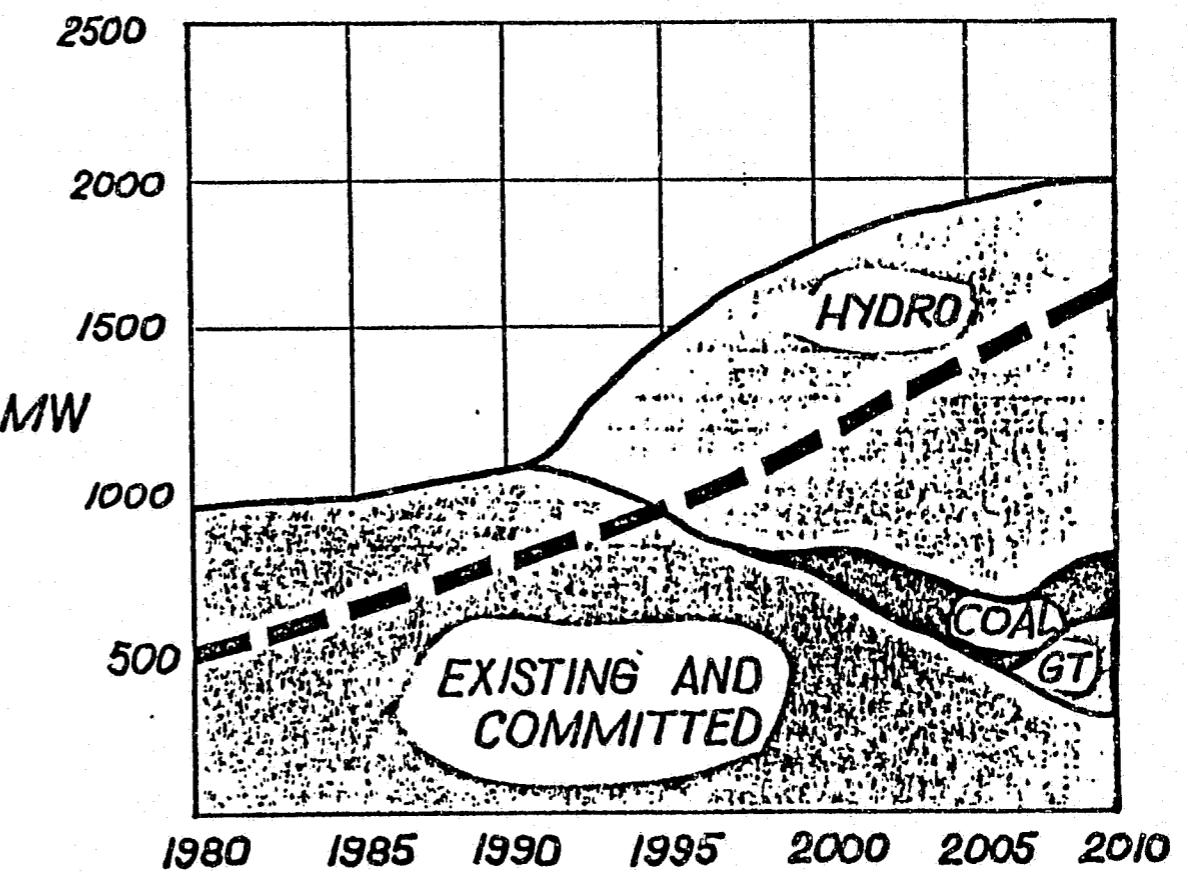
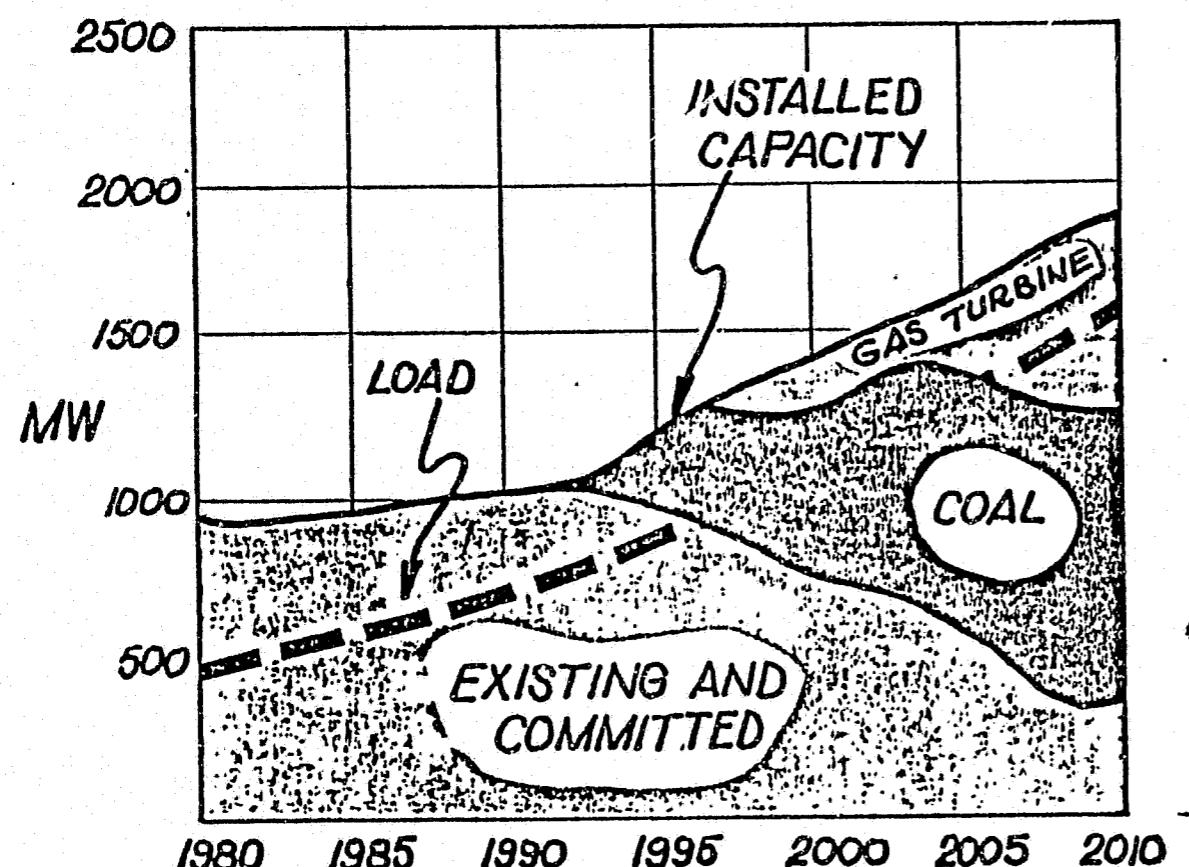


# SUMMARY

- POS EVOLUTION
- ENERGY FORECASTS
- LOAD FORECASTS
- GENERATION PLANNING

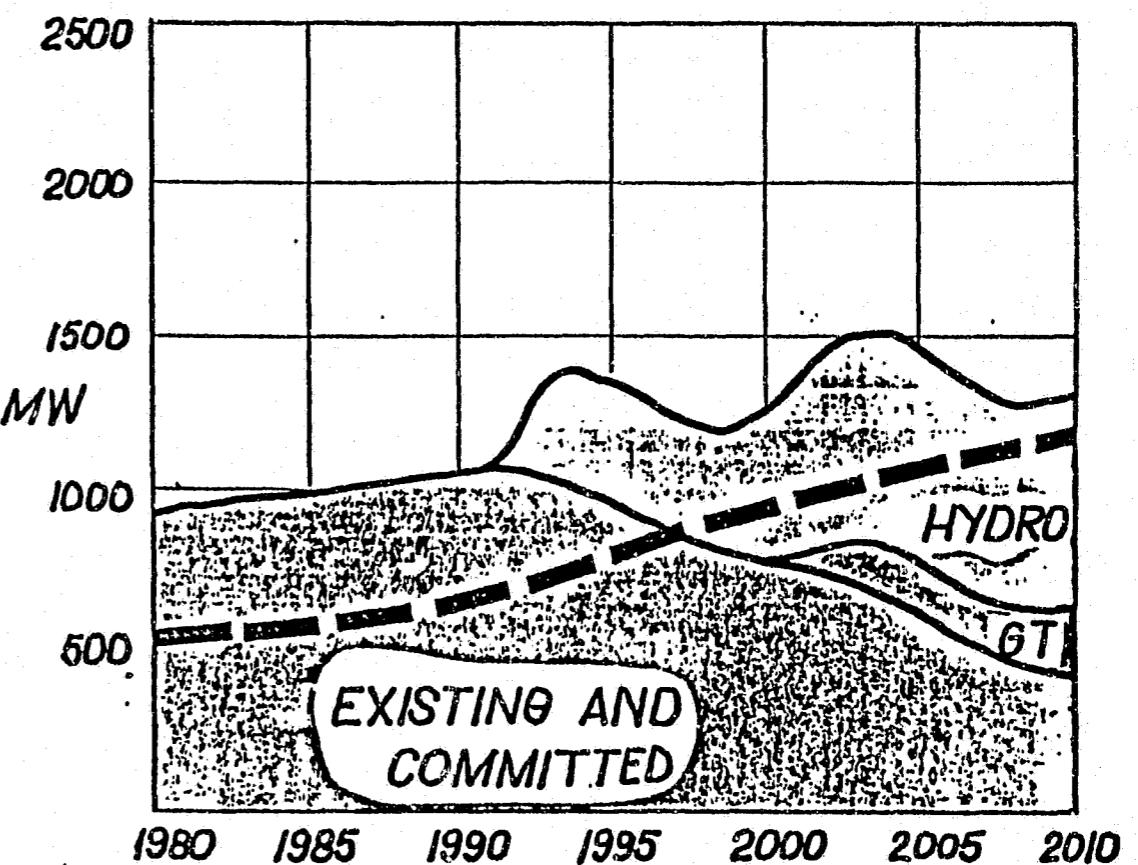
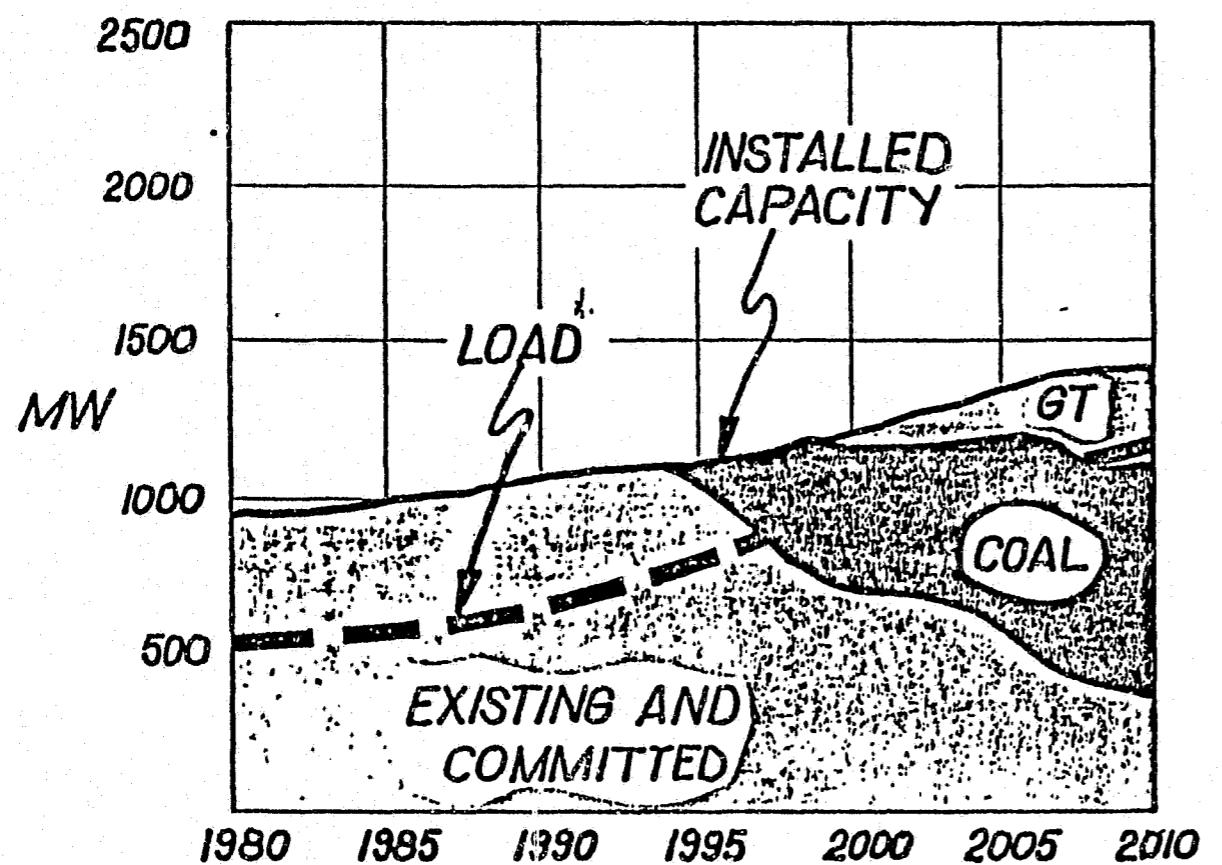
MID-  
RANGE

# SYSTEM COMPARISON



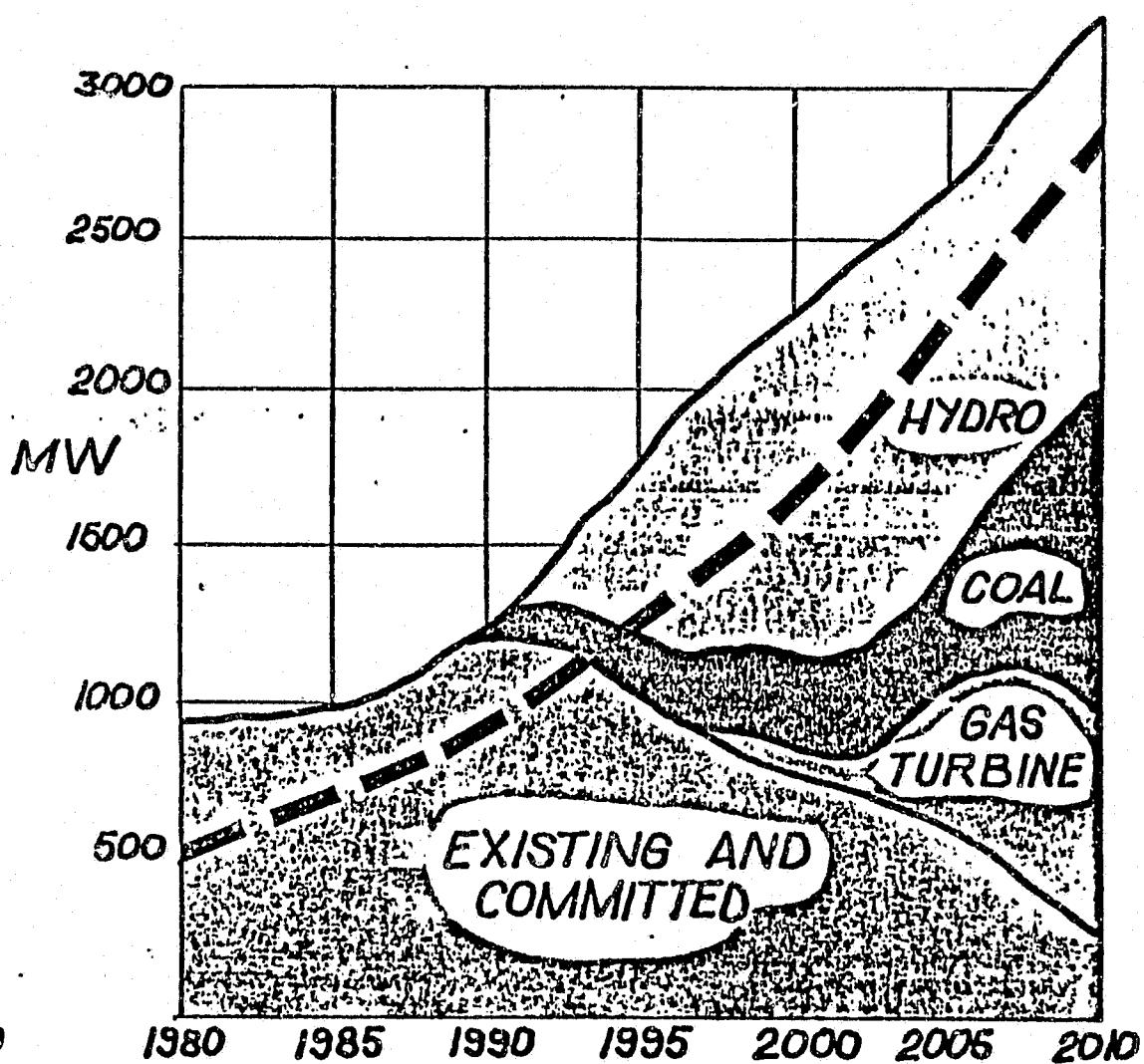
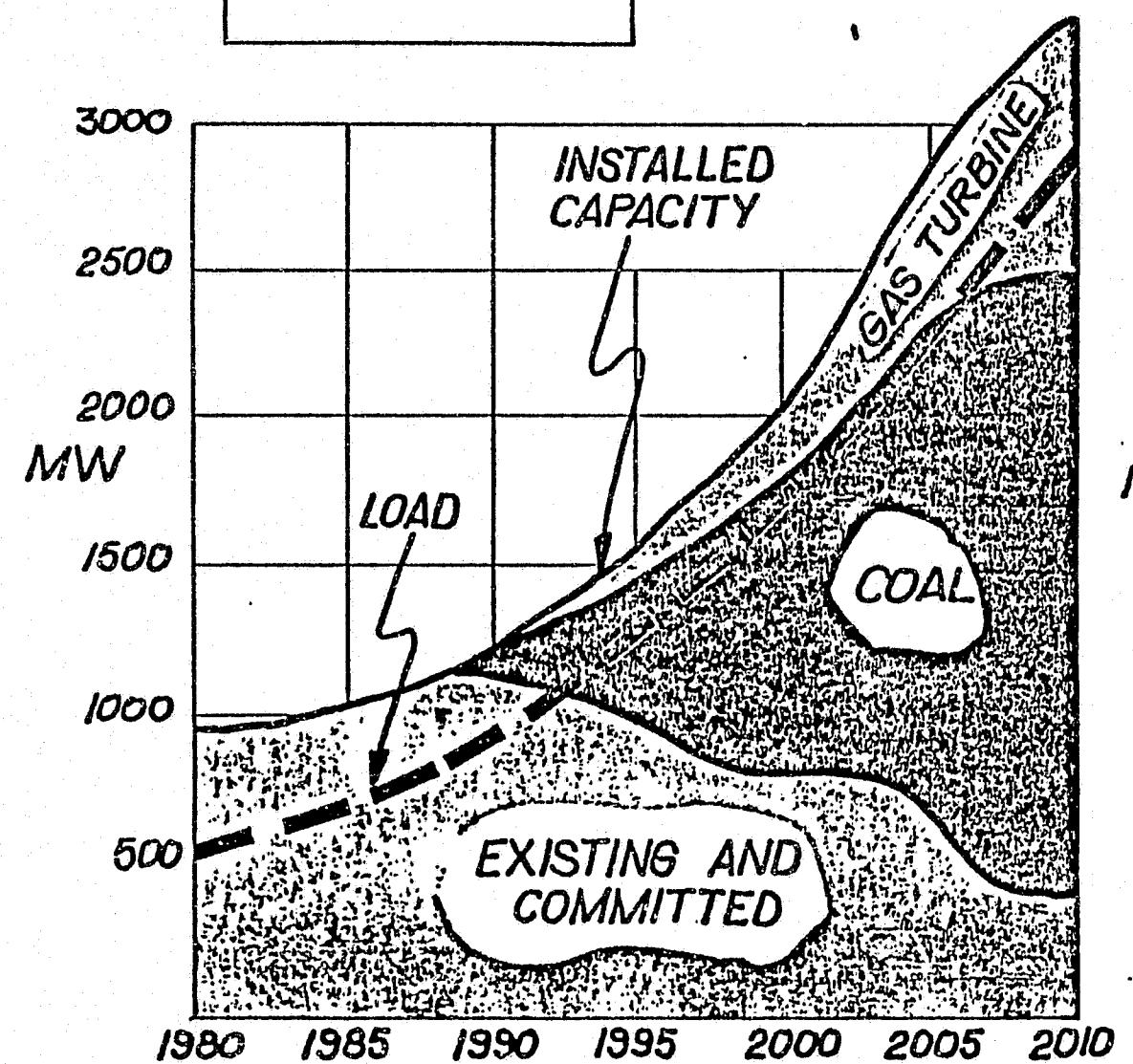
LOW  
RANGE

# SYSTEM COMPARISON



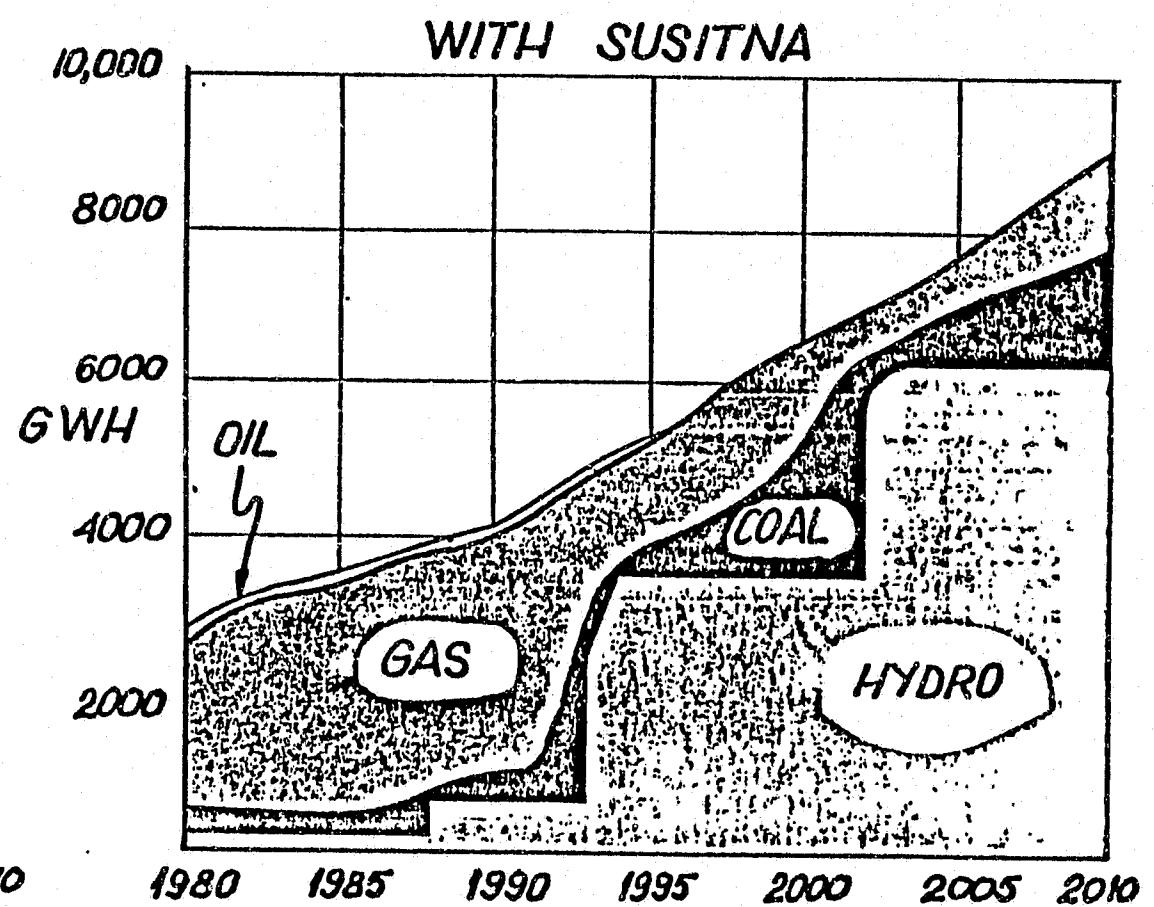
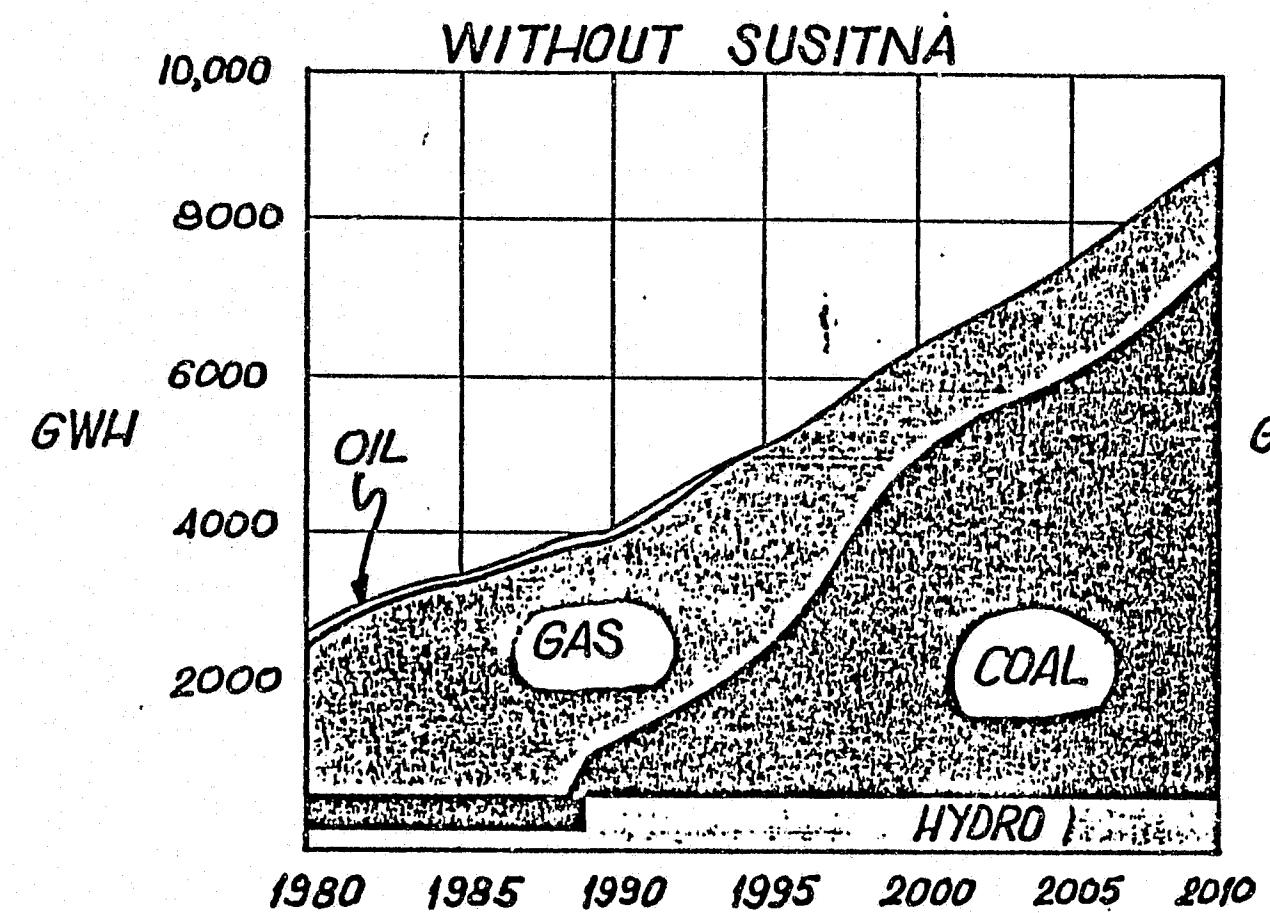
HIGH  
RANGE

# SYSTEM COMPARISON



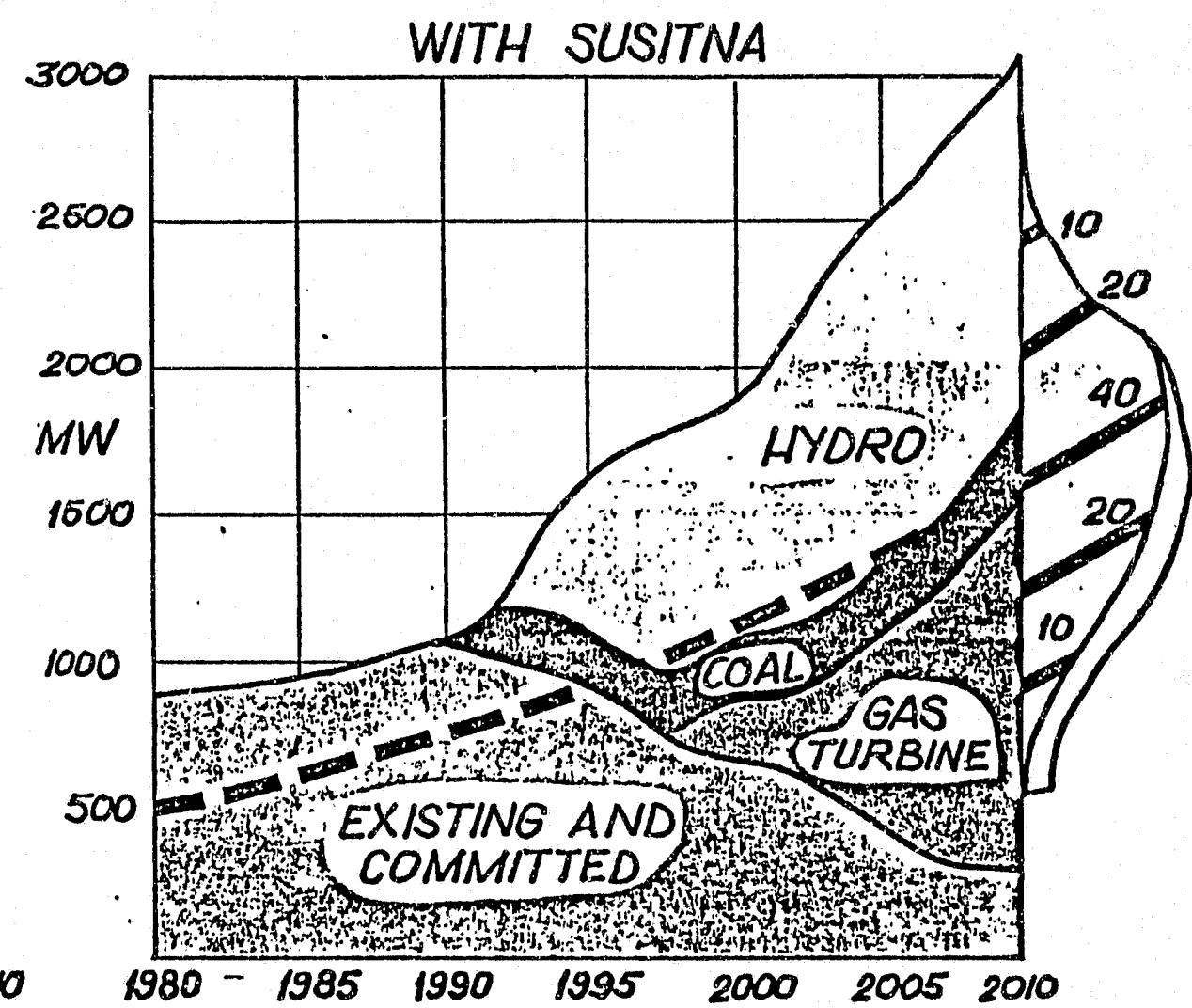
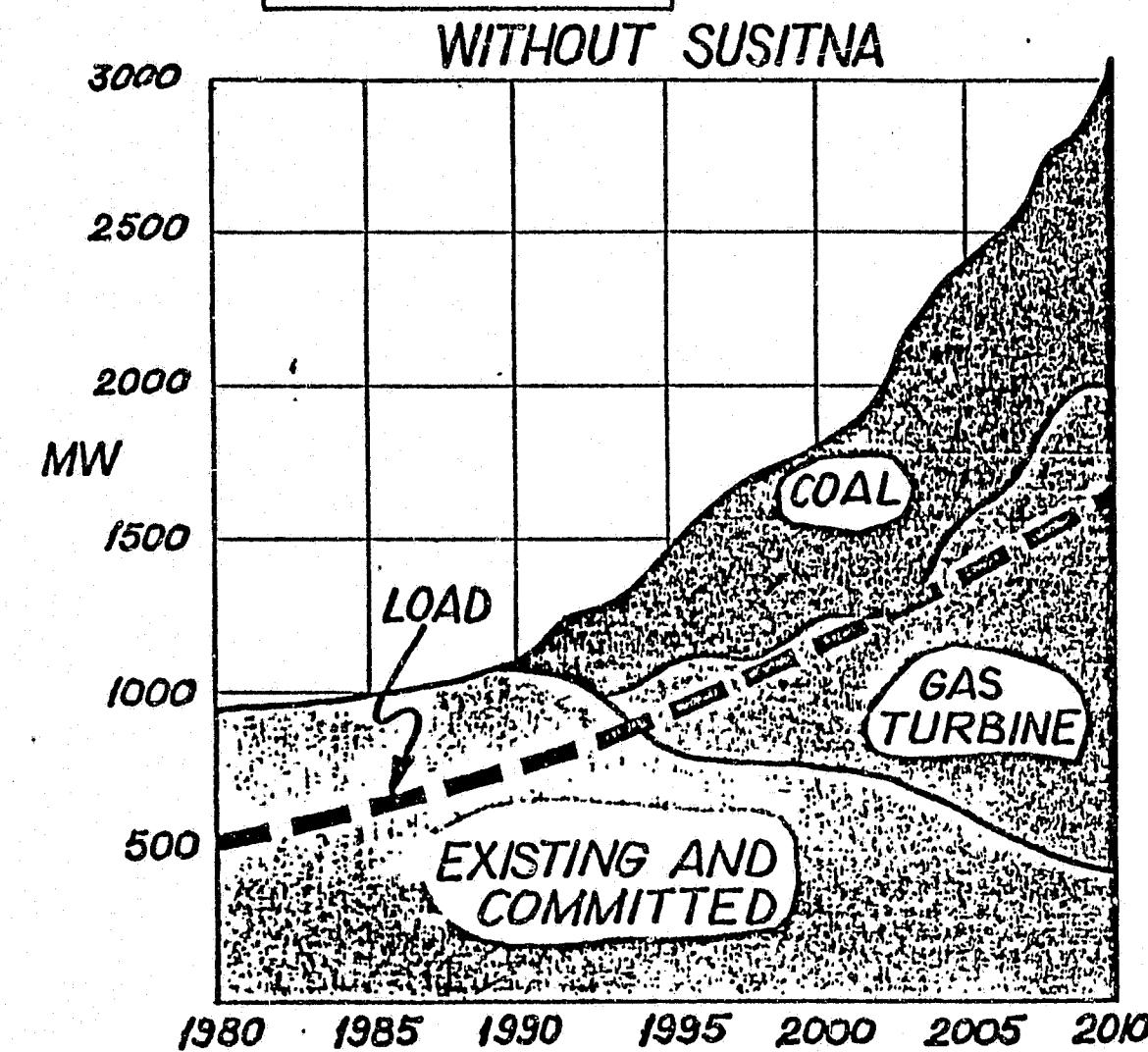
MID  
RANGE

# SYSTEM ENERGY COMPARISON



MID-  
RANGE

# PROBABILISTIC LOAD EFFECT



?

LW = LOW WATANA  
W = WATANA  
HDC = HIGH DEVIL CANYON  
DC = DEVIL CANYON  
T = TUNNEL  
V = VEE

# SUSITNA SYSTEMS

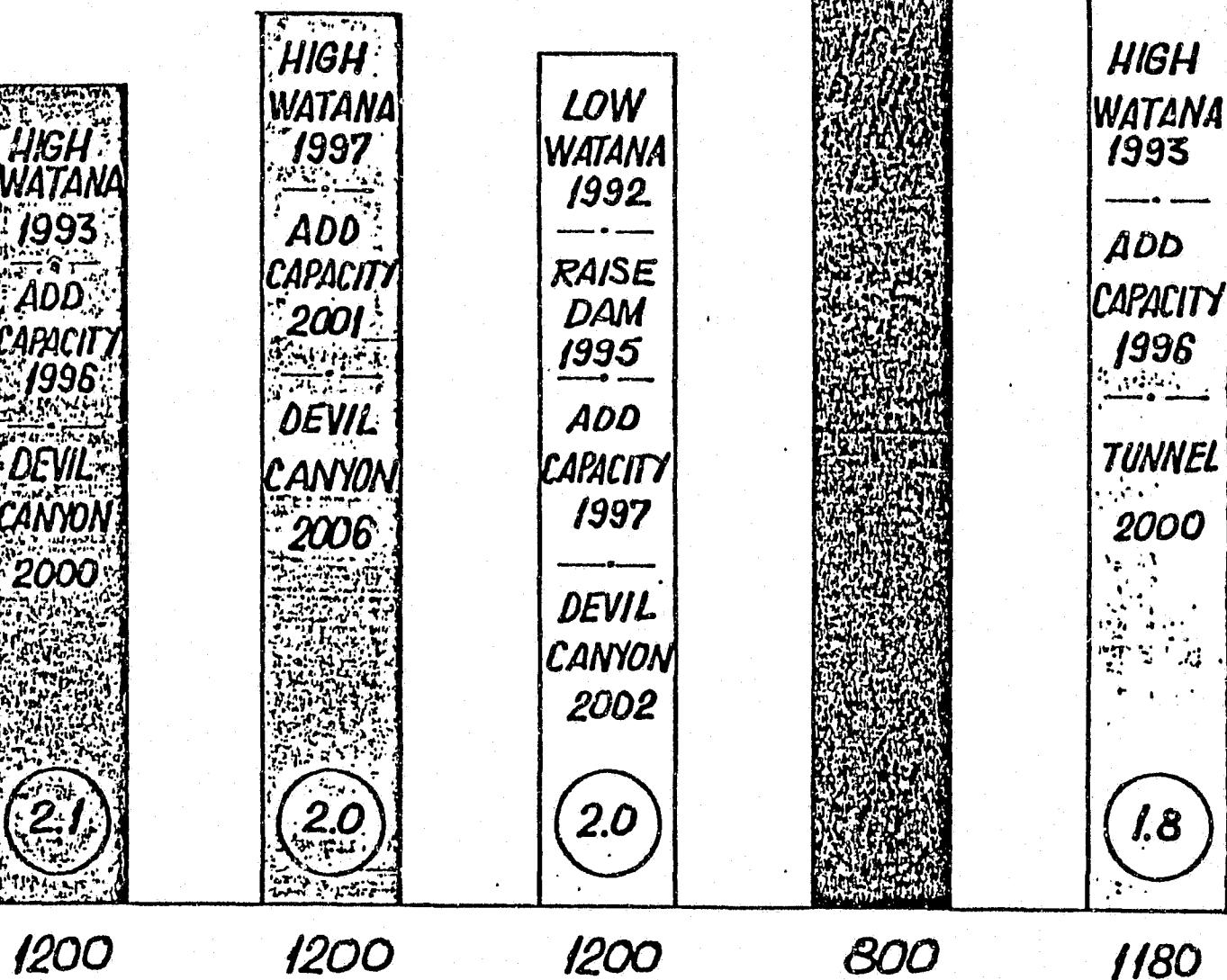
<u>PARAMETER</u>	<u>THERMAL</u>	<u>SUSITNA 3AEE</u>	<u>SUSITNA 3AL</u>	<u>SUSITNA 2A</u>	<u>SUSITNA 6A</u>	<u>SUSITNA 7</u>
THERMAL ADDITIONS (MW)	1550	525	550	500	910	700
SUSITNA ADDITIONS YR / PLANT / MW	—	93/W/400 96/W/400 00/DC/400	97/W/400 01/W/400 06/DC/400	93/LW/400 96/+ DAM 97/W/400 02/DC/400	94/HDC/400 00/VEE/400	93/W/400 96/W/400 00/T/380
CUMULATIVE PRESENT WORTH 1980 \$ (MILLIONS)						
1980 - 1990	874	874	874	874	874	874
1990 - 2010	<u>3319</u>	<u>2360</u>	<u>2800</u>	<u>2518</u>	<u>2625</u>	<u>2585</u>
30 YEAR TOTAL	4193	3234	3674	3392	3499	3459

# ALTERNATIVE SYSTEM COSTS

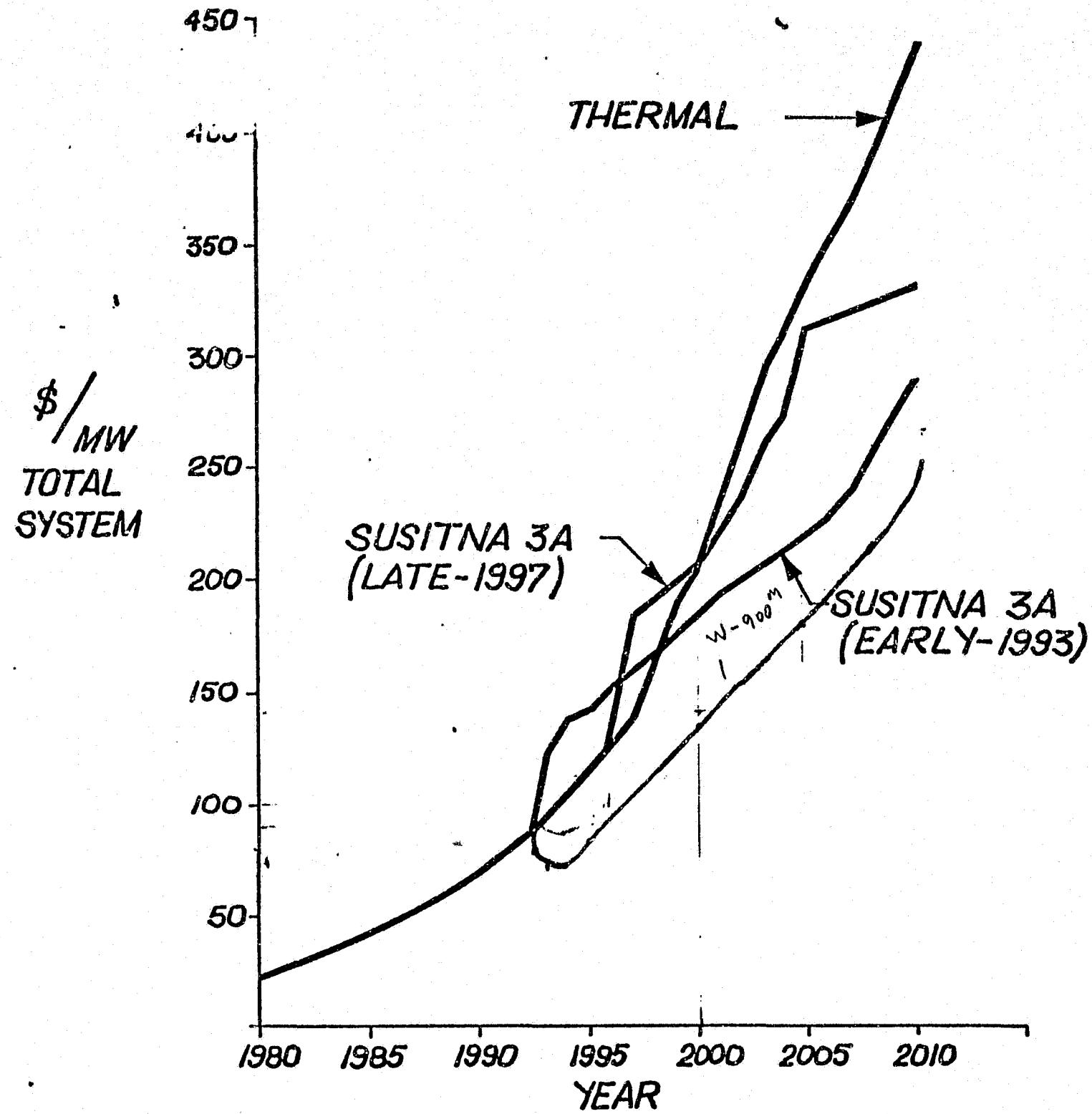
TOTAL  
SYSTEM  
1980  
PRESENT  
WORTH  
(\$ $\times 1,000,000$ )

B/C  
RATIO

SUSITNA CAPACITY(MW) 0.



# PRELIMINARY FINANCIAL RUNS- MID RANGE



# SELECTION CRITERIA

ENERGY CONTRIBUTION  
DEPENDABILITY  
ECONOMICS  
RESOURCES CONSERVATION  
SEISMIC CONSEQUENCES  
GEOTECHNICAL UNKNOWN  
ENVIRONMENTAL IMPACTS

- SCENIC VALUE
- AIR AND WATER QUALITY
- FISHERIES
- WILD LIFE
- WETLANDS
- CULTURAL RESOURCES
- SOCIO-ECONOMIC
- ACCESS
- TRANSMISSION



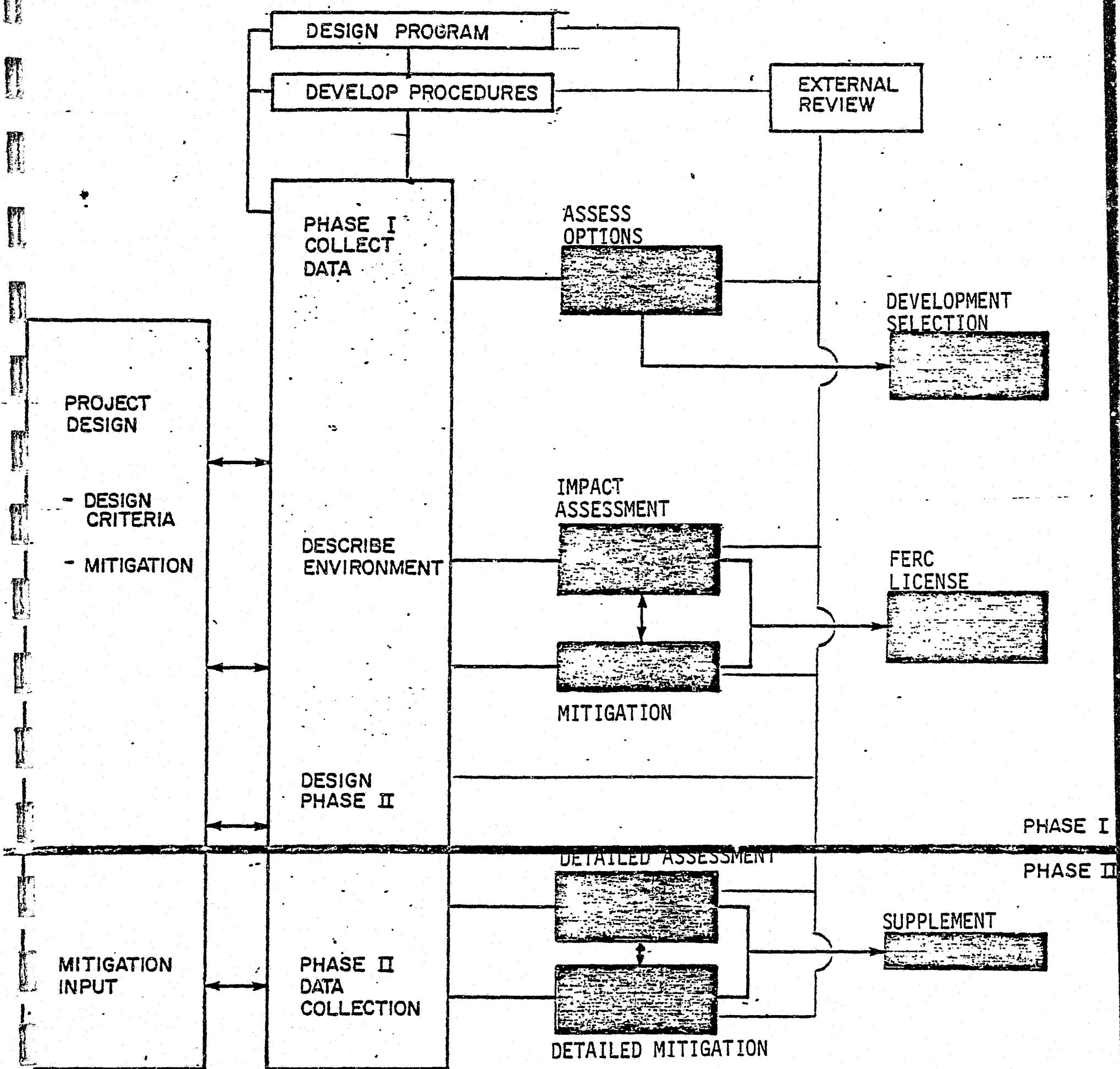
# ENVIRONMENTAL ASSESSMENT

- FIELD ACTIVITIES
- ALTERNATIVES
- WATER QUALITY
- SOCIO ECONOMICS
- CULTURAL       LAND USE
- RECREATION
- FISH & WILDLIFE
- VEGETATION       LICENSING

ACRES

ACRES

TASK 7 - ENVIRONMENTAL



ENVIRONMENTAL STUDY LOGIC

ACRES

FISHERIES

WILDLIFE

PLANT ECOLOGY

LAND USE

SOCIOECONOMIC

ARCHEOLOGICAL

RECREATION

INPUT TO:

DEVELOPMENT SELECTION

DESIGN

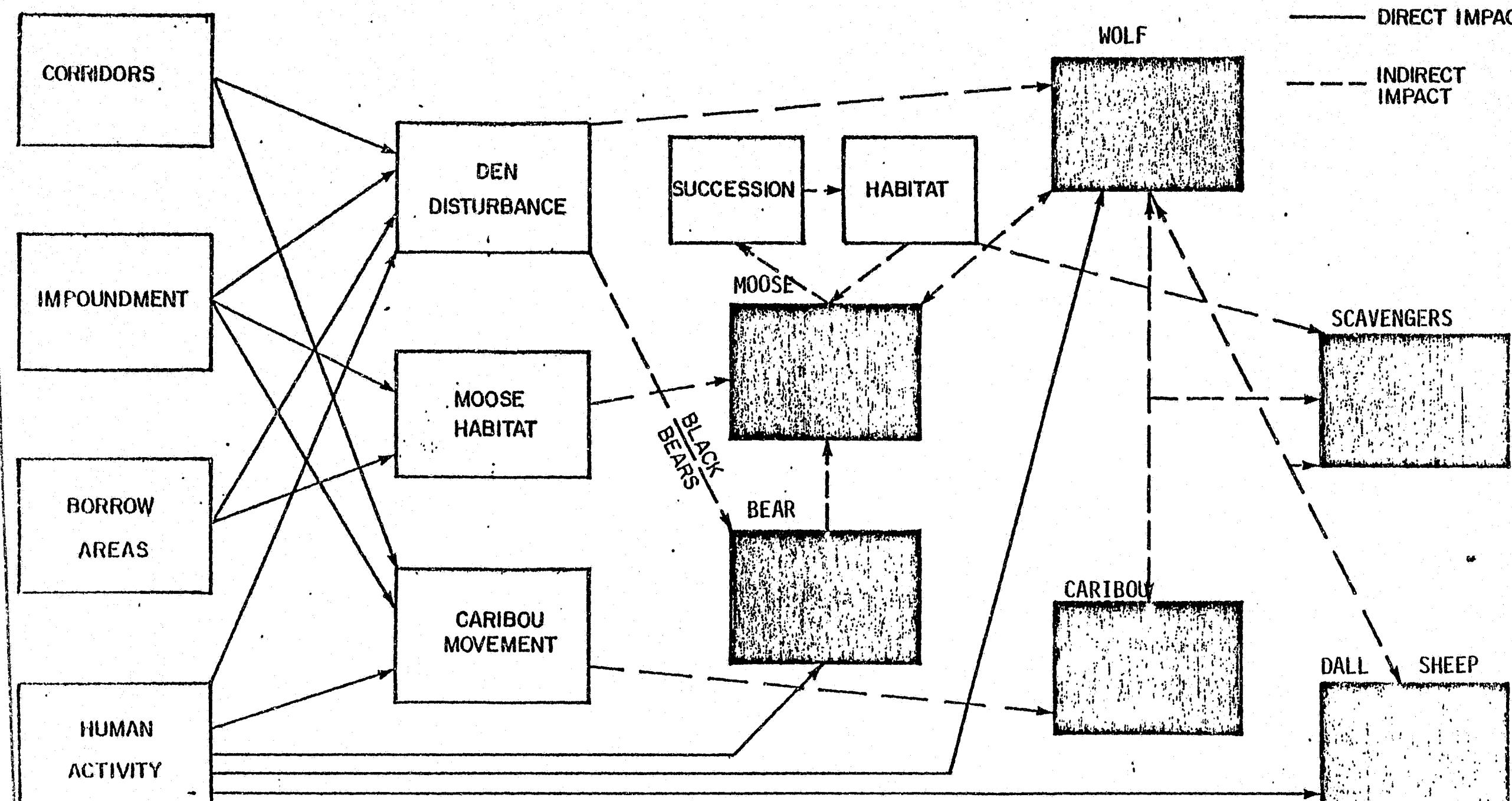
CORRIDOR SELECTION

ENVIRONMENTAL STUDY COMPONENTS

ACRES

DIRECT IMPACT

INDIRECT  
IMPACT

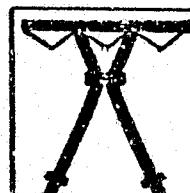
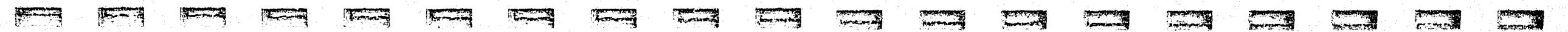


POTENTIAL AVENUES OF BIG GAME IMPACT

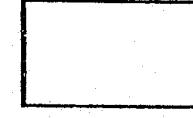
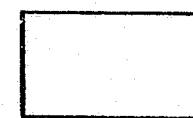
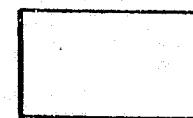
**ADRES**

AVOID	-	NO ACTION
MINIMIZE	-	LIMIT ACTION
RECTIFY	-	REHABILITATE
REDUCE	-	MAINTENANCE
COMPENSATE	-	REPLACEMENT

**MITIGATION ALTERNATIVES**



MANUFACTURED BY



ACRES

TASK 3

ACRES

REGULATED PIPE

CORRIDOR  
SELECTION

SYSTEM  
STUDIES

ROUTE  
SELECTION

LINE DESIGN

SURVEYS

DESIGN CP.

COST ESTIMATE

**ROUTE SELECTION CRITERIA**

**I ENVIRONMENT:**

- 1 - SCENIC QUALITY - RECREATION
- 2 - CULTURAL RESOURCES
- 3 - WILDLIFE
- 4 - VEGETATION
- 5 - SOIL
- 6 - EXISTING DEVELOPMENT - SOCIAL

**II COSTS:**

- 1 - LENGTH
- 2 - TOPOGRAPHY
- 3 - ACCESS ROADS
- 4 - CONSTRUCTION
- 5 - OPERATION AND MAINTENANCE
- 6 - LAND OWNERSHIP

**III ENGINEERING:**

- 1 - RELIABILITY
- 2 - EASE OF REPAIR
- 3 - TYPE OF TOWERS
- 4 - FOUNDATION
- 5 - SEISMIC
- 6 - LOADING

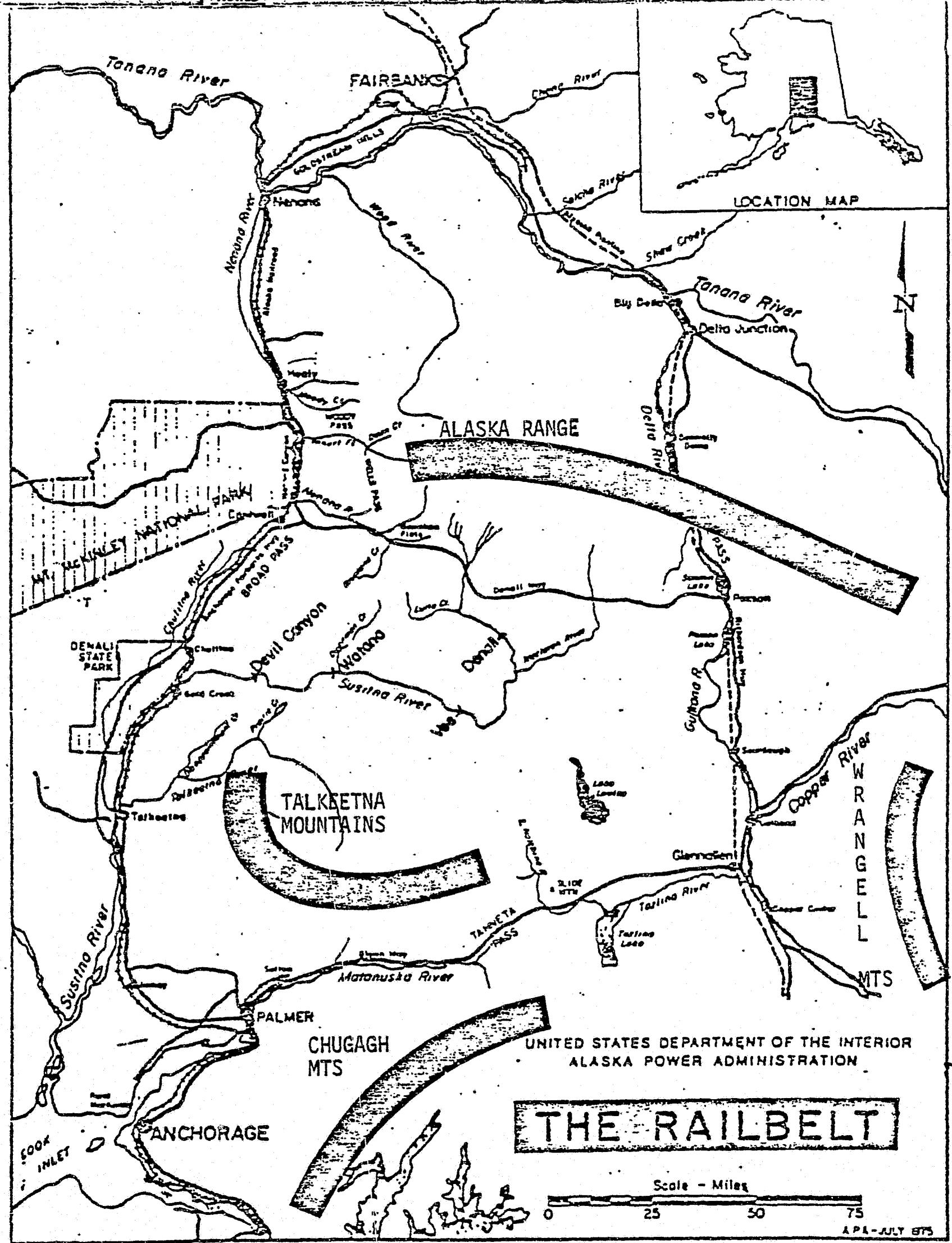


FIGURE 1

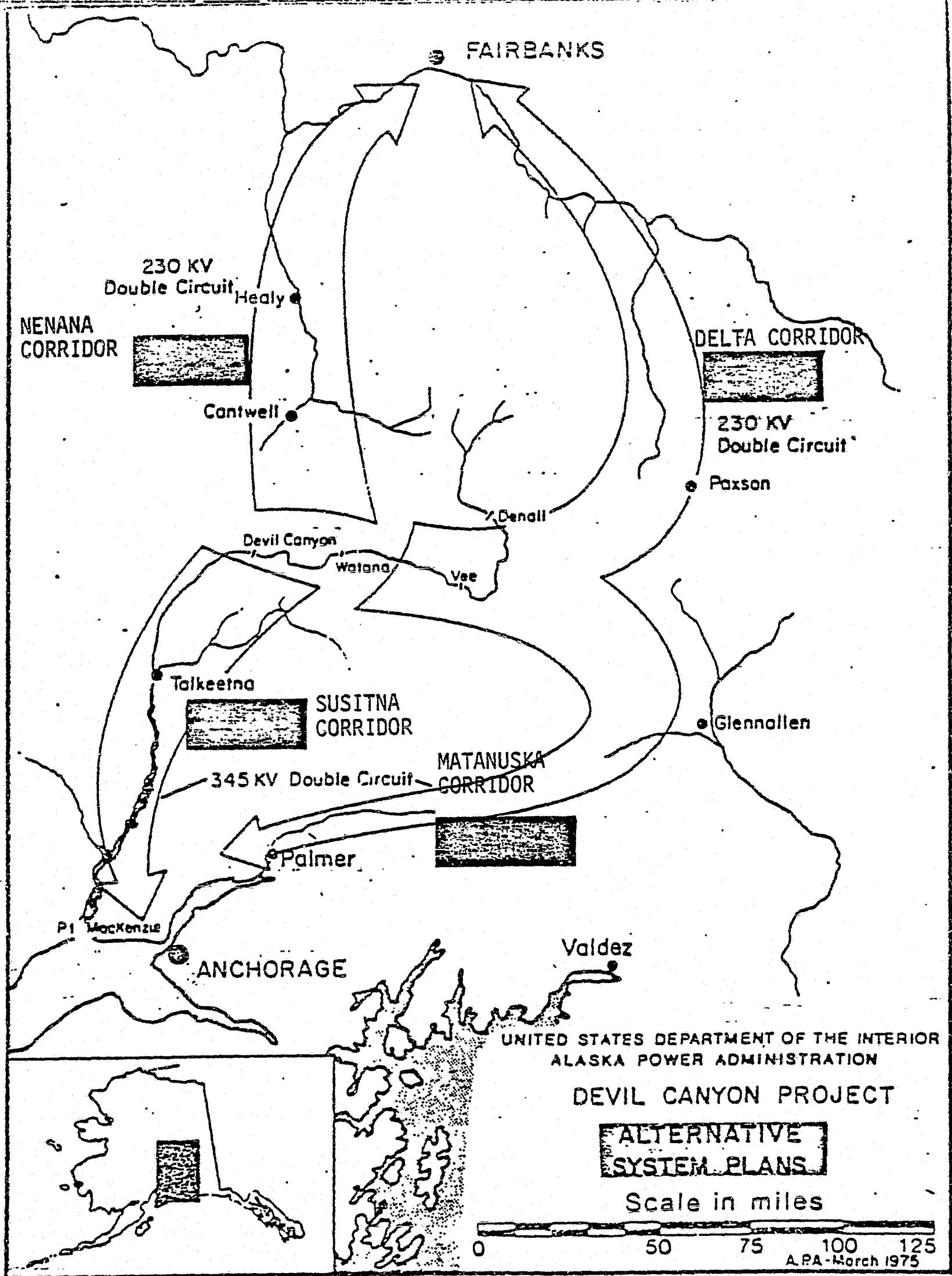


FIGURE 2

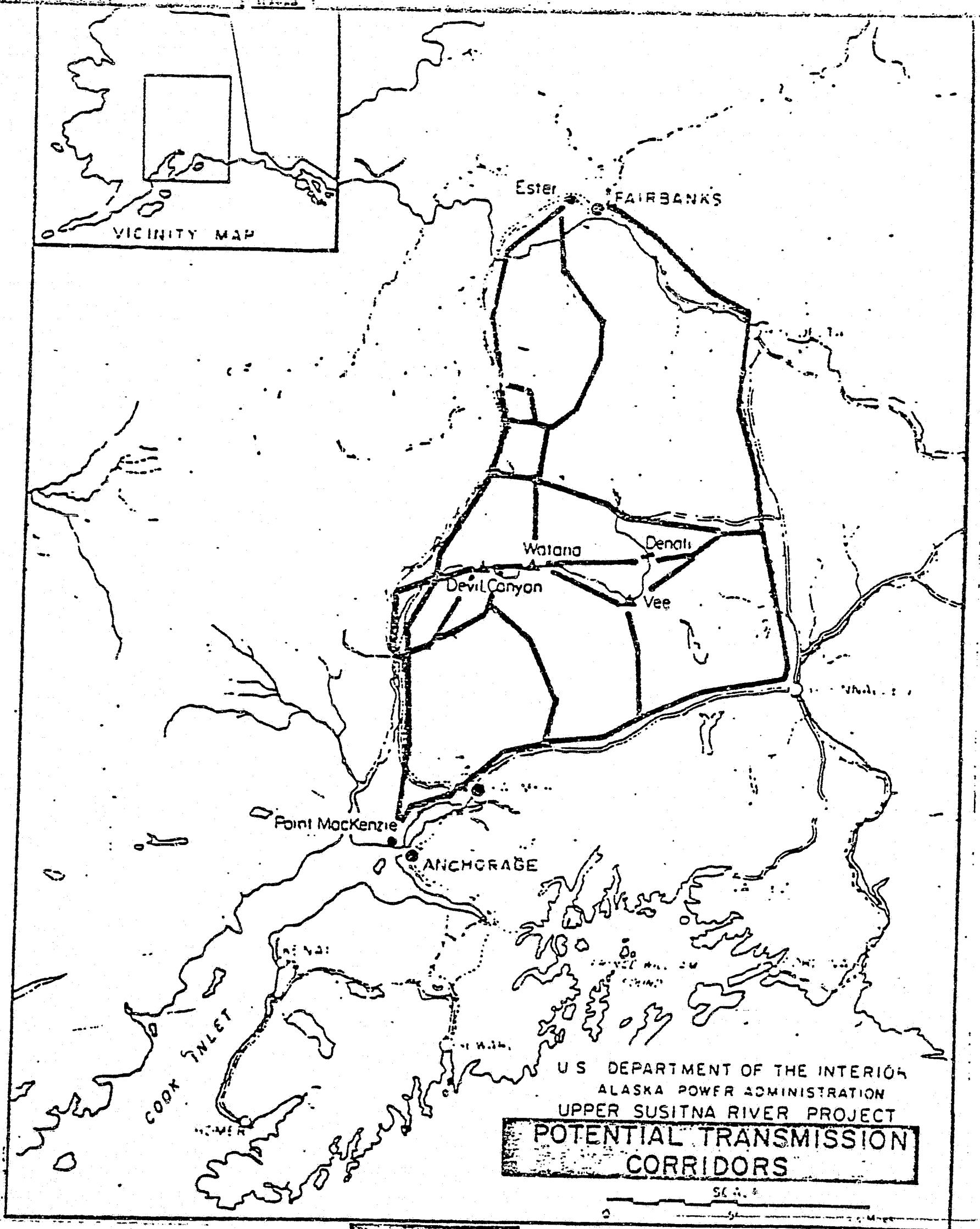


FIGURE 3

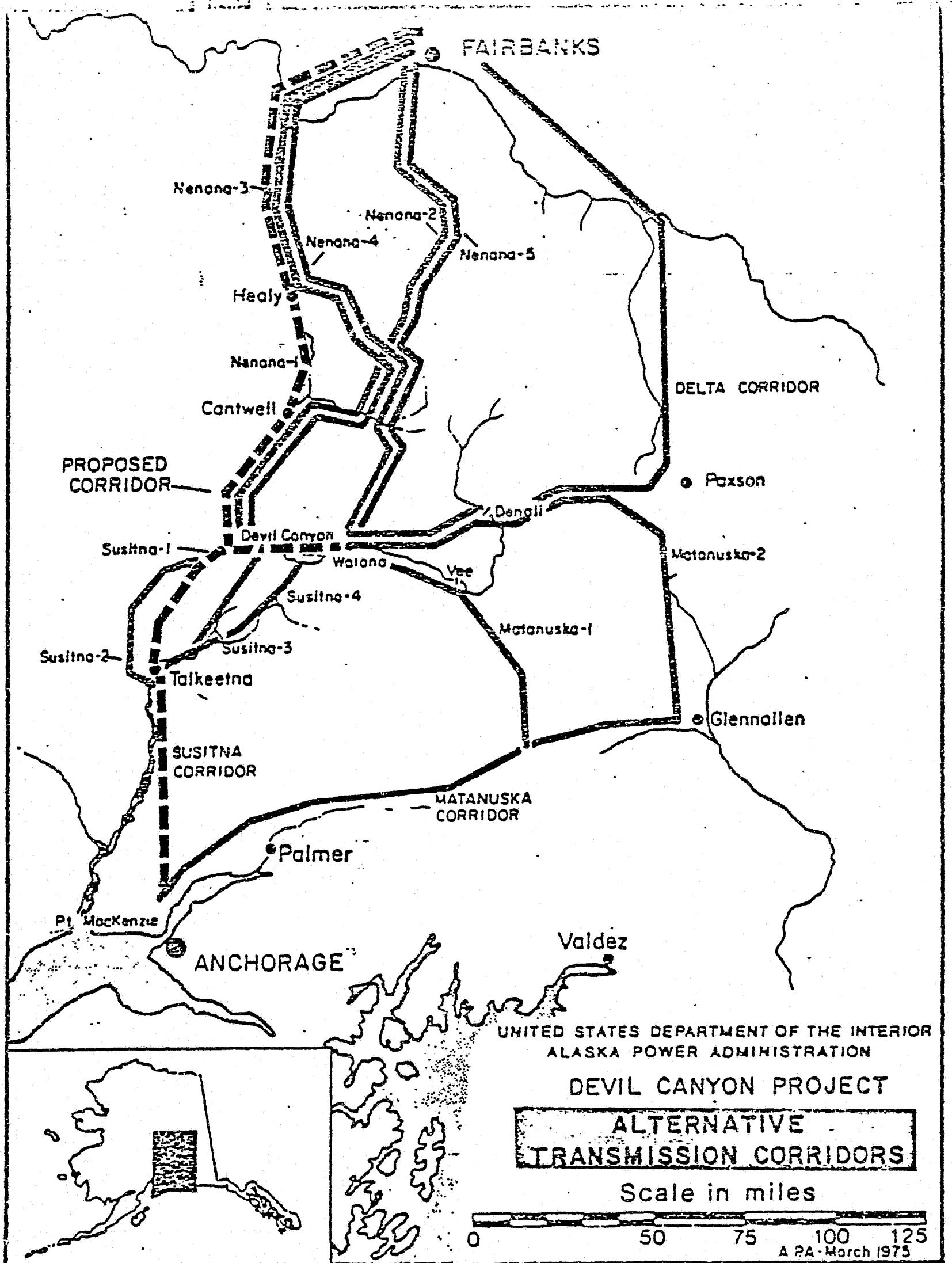


FIGURE 4

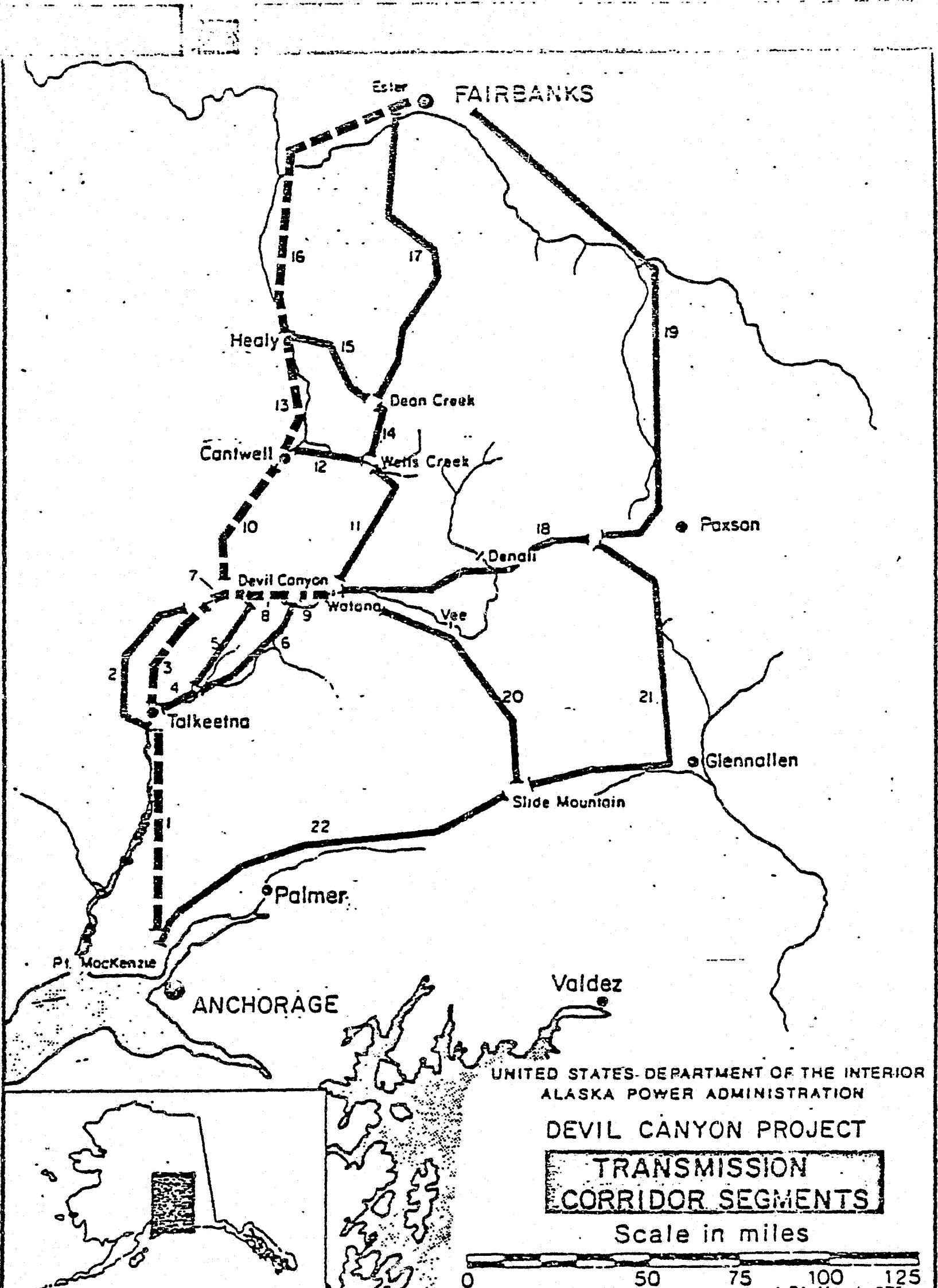


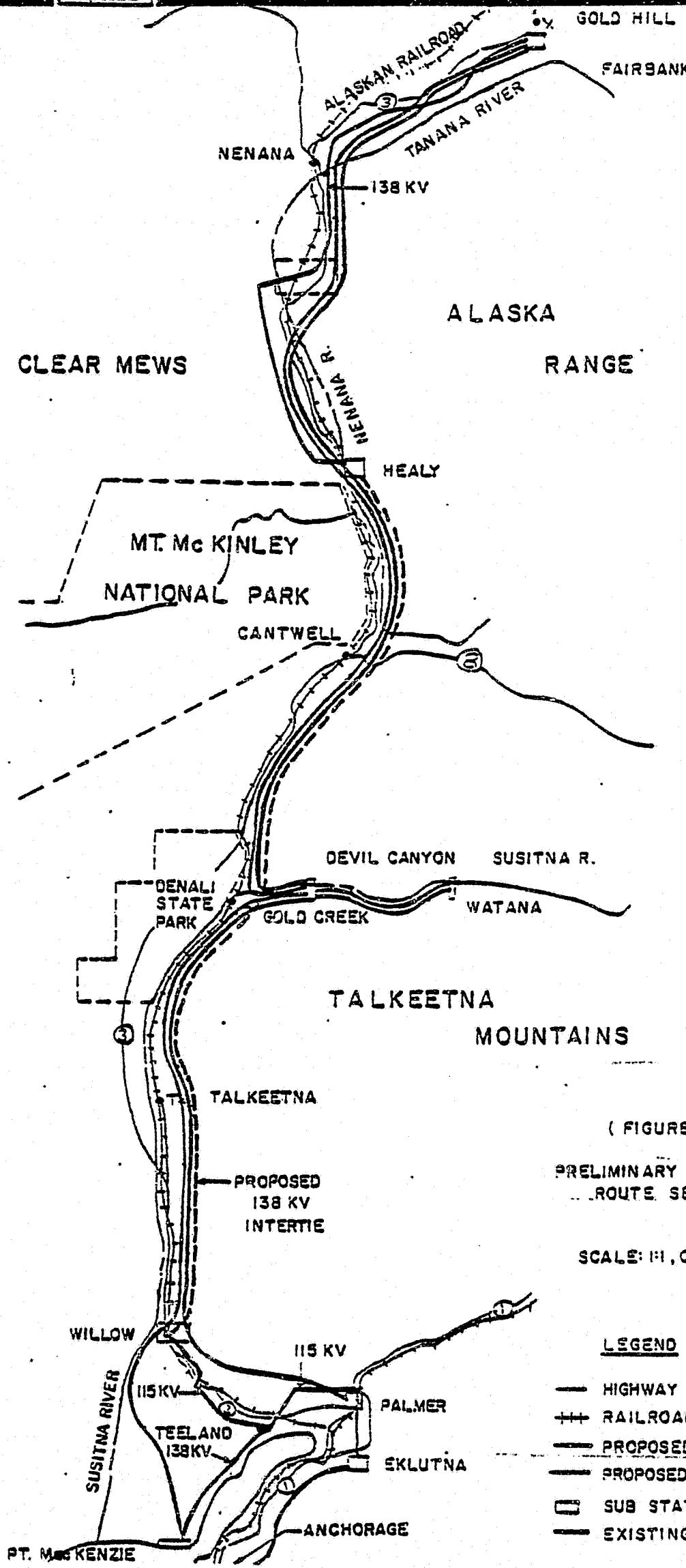
FIGURE 5

ACRES

482287

MARGIN  
COPIES:

ment  
line



(FIGURE 6)

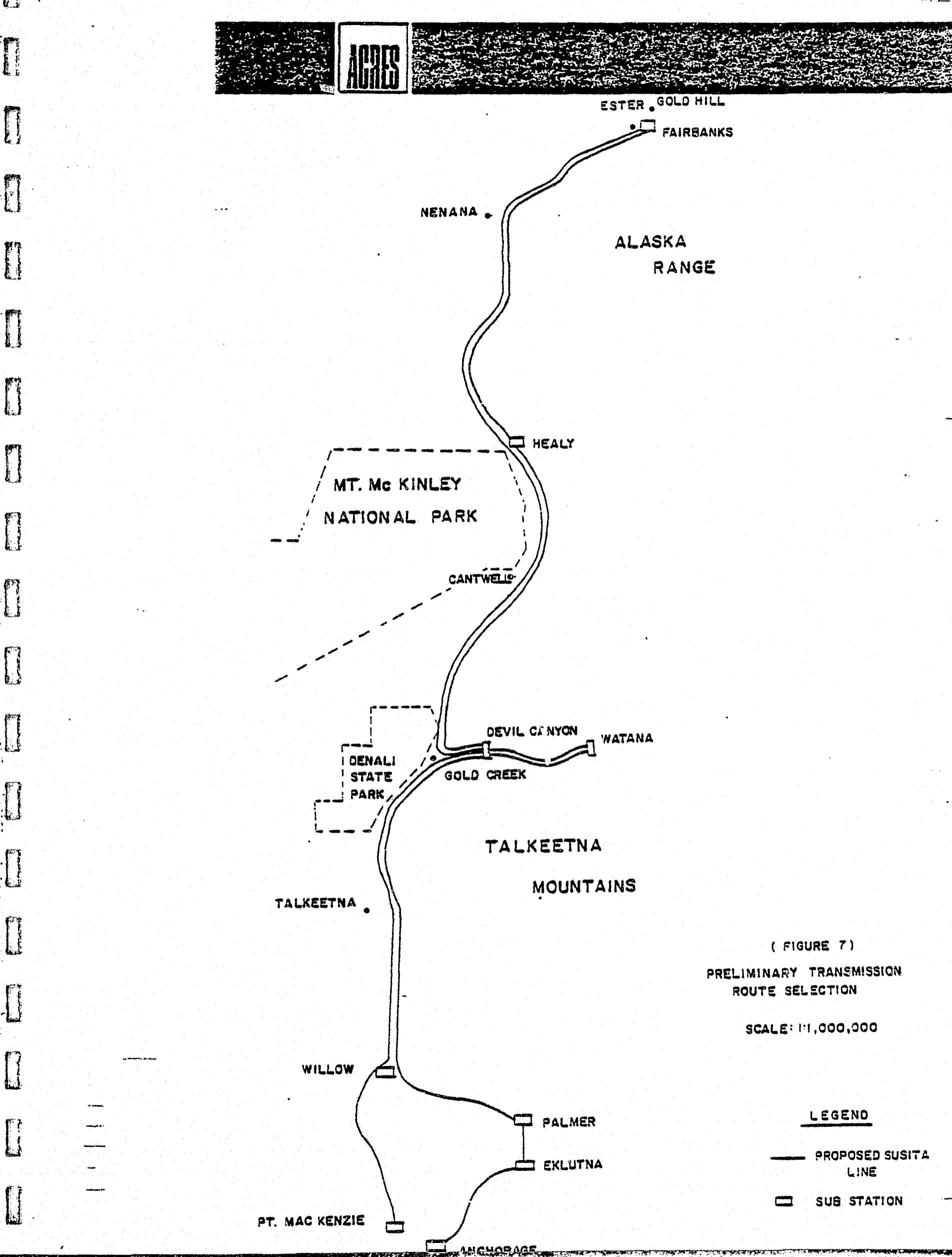
PRELIMINARY TRANSMISSION  
ROUTE SELECTION

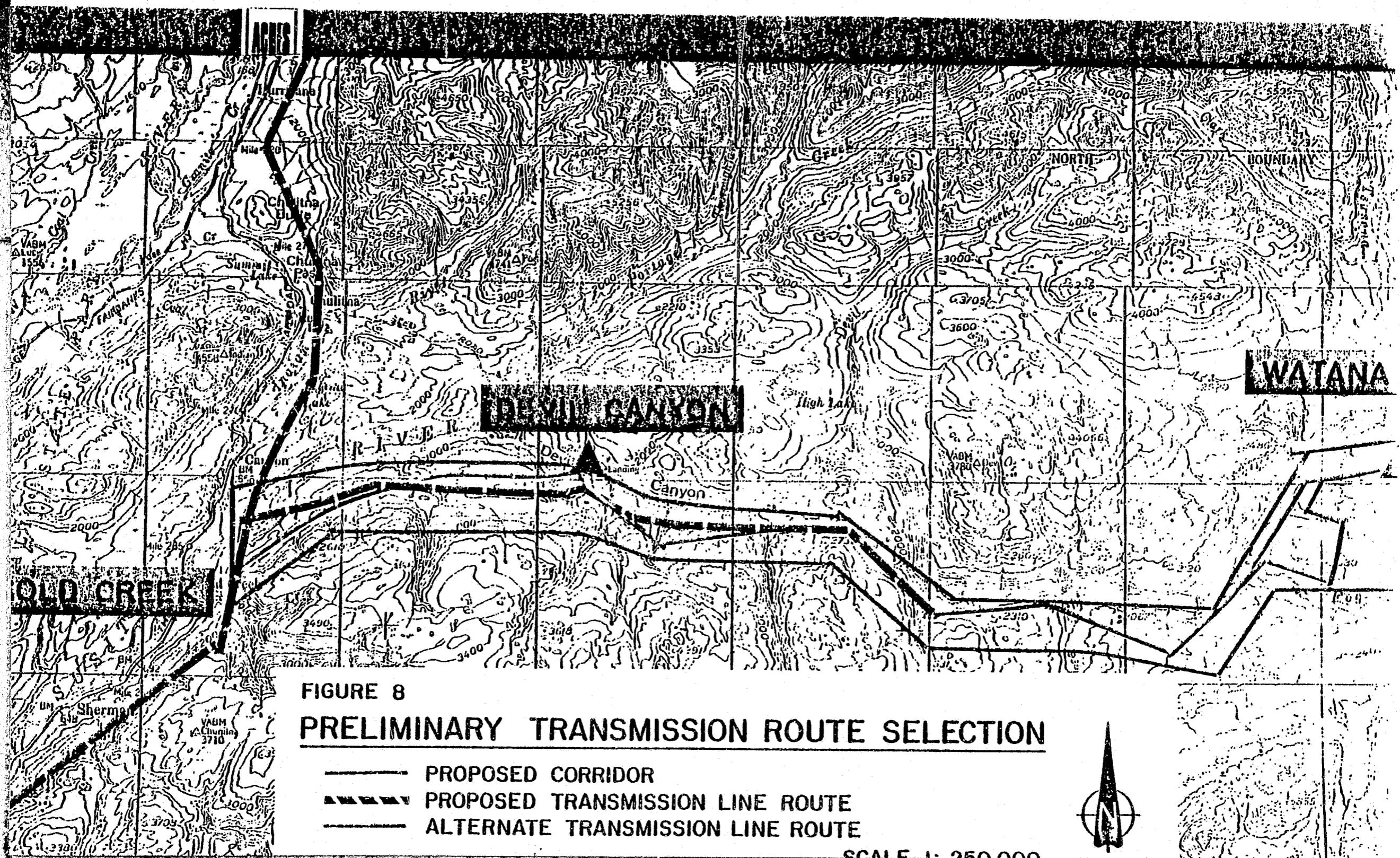
SCALE: 1:1,000,000

LEGEND

- HIGHWAY
- RAILROAD
- PROPOSED 138 KV INTERTIE
- PROPOSED SUSITNA LINE
- SUB STATION
- EXISTING LINE

ACRES





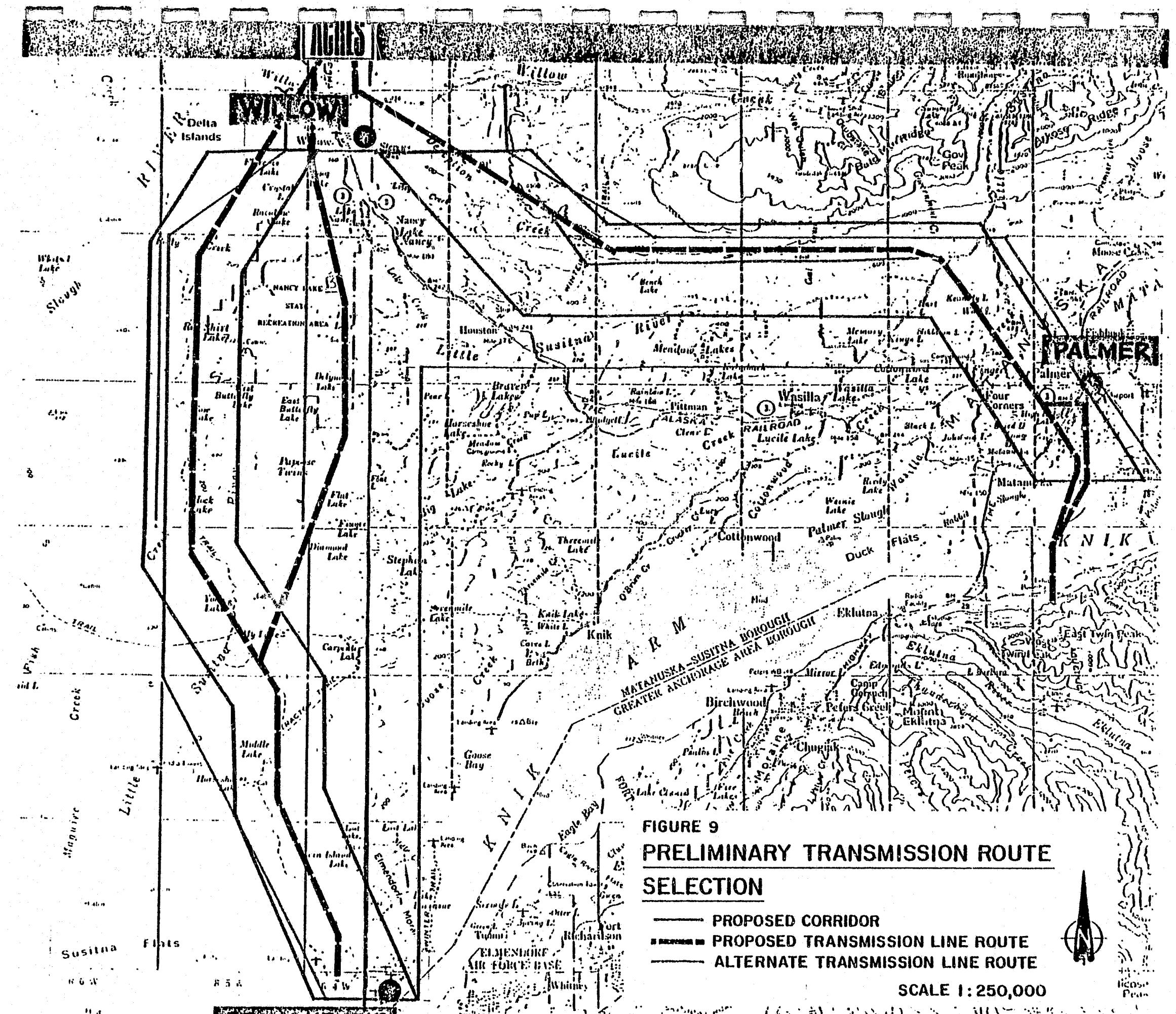
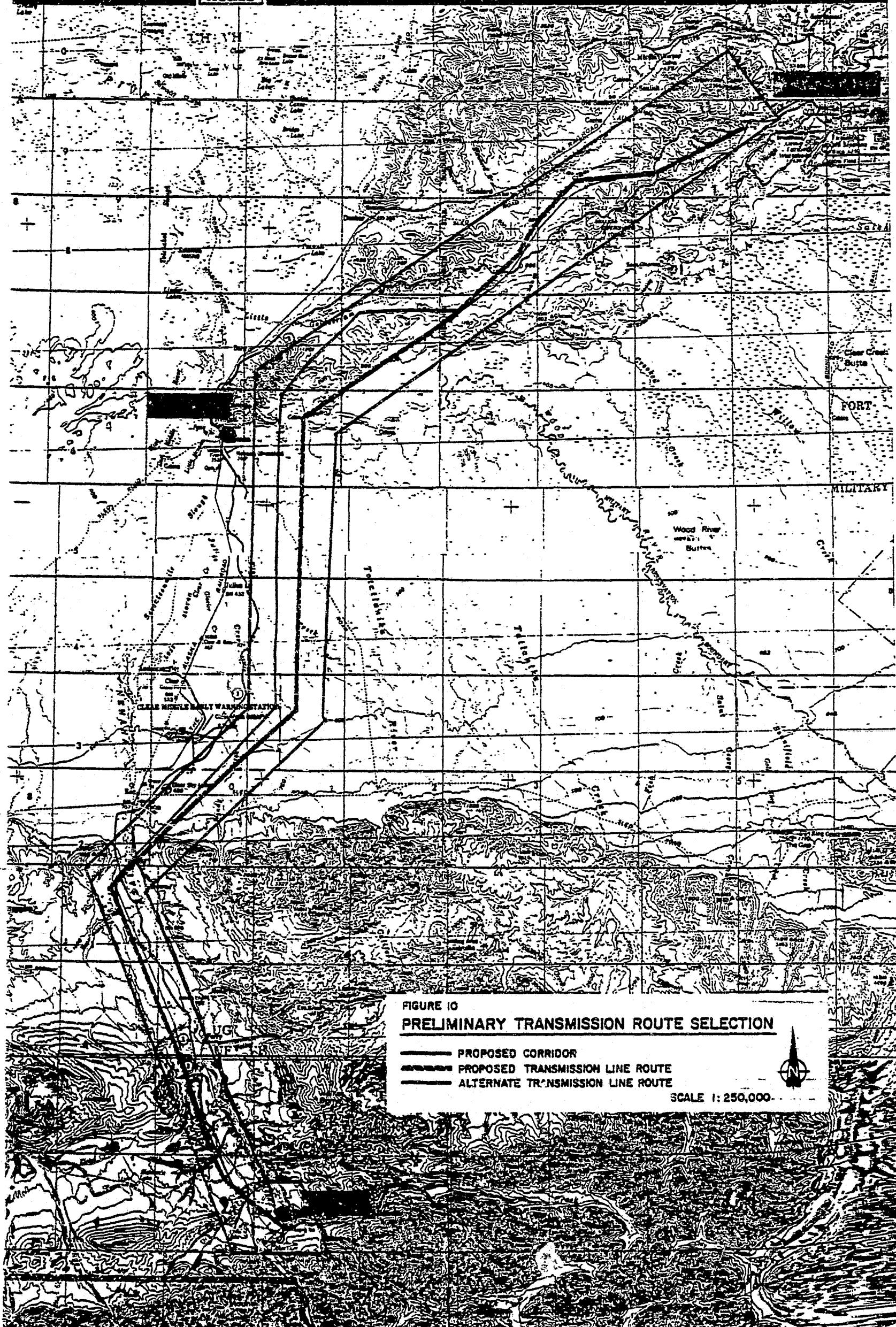


FIGURE 9  
PRELIMINARY TRANSMISSION ROUTE  
SELECTION

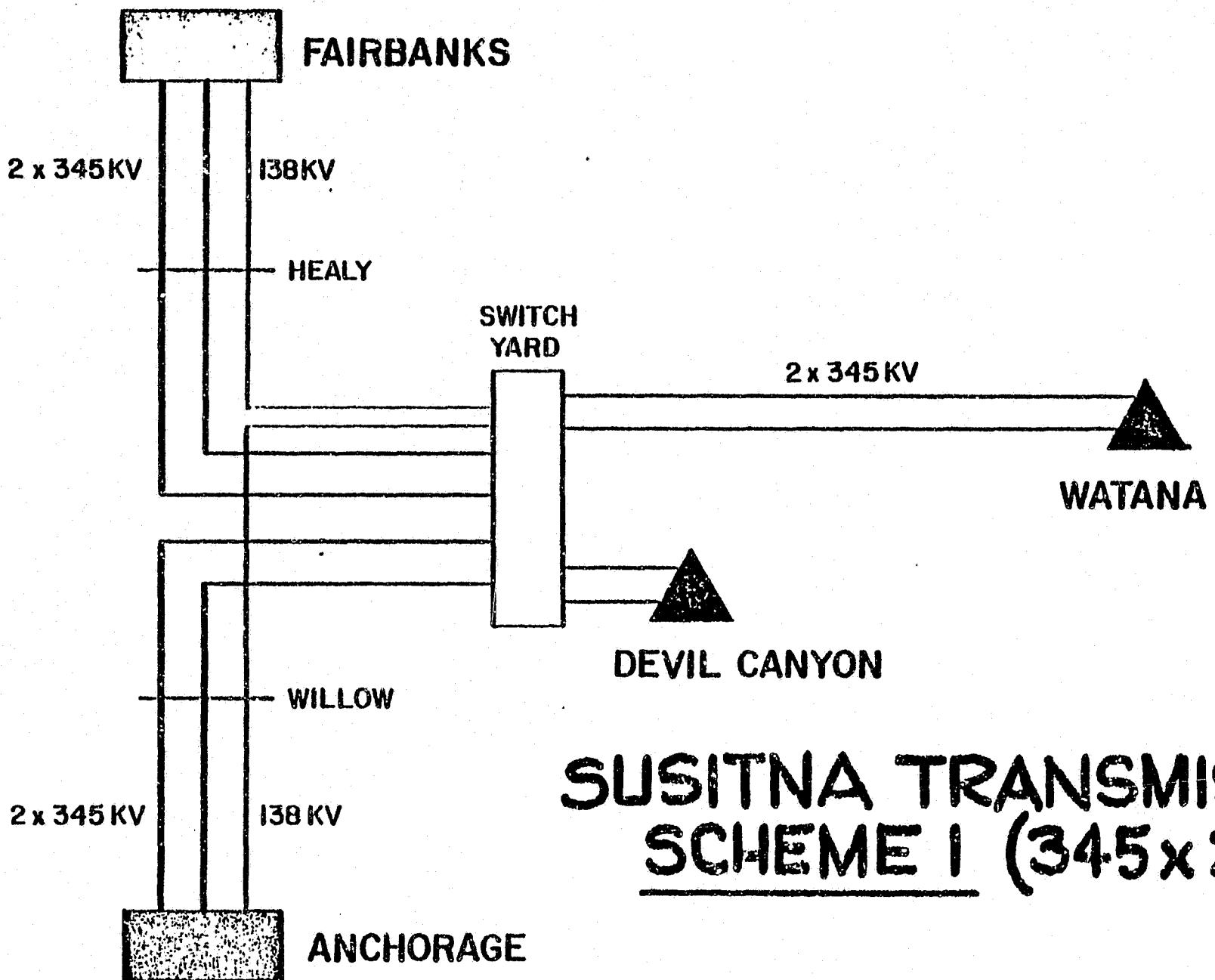
— PROPOSED CORRIDOR  
- - - PROPOSED TRANSMISSION LINE ROUTE  
— ALTERNATE TRANSMISSION LINE ROUTE

SCALE 1:250,000

ACRS

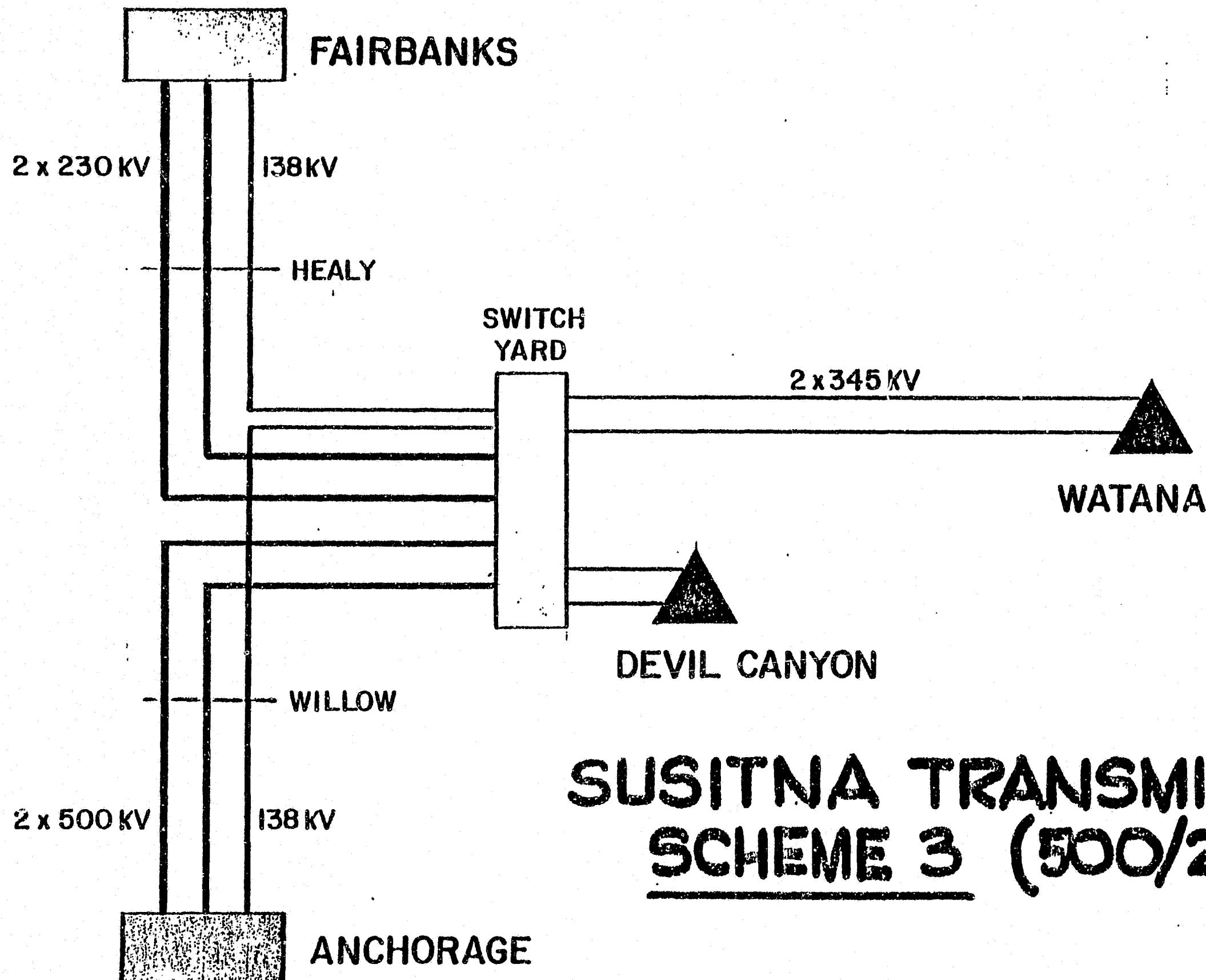


ACRES



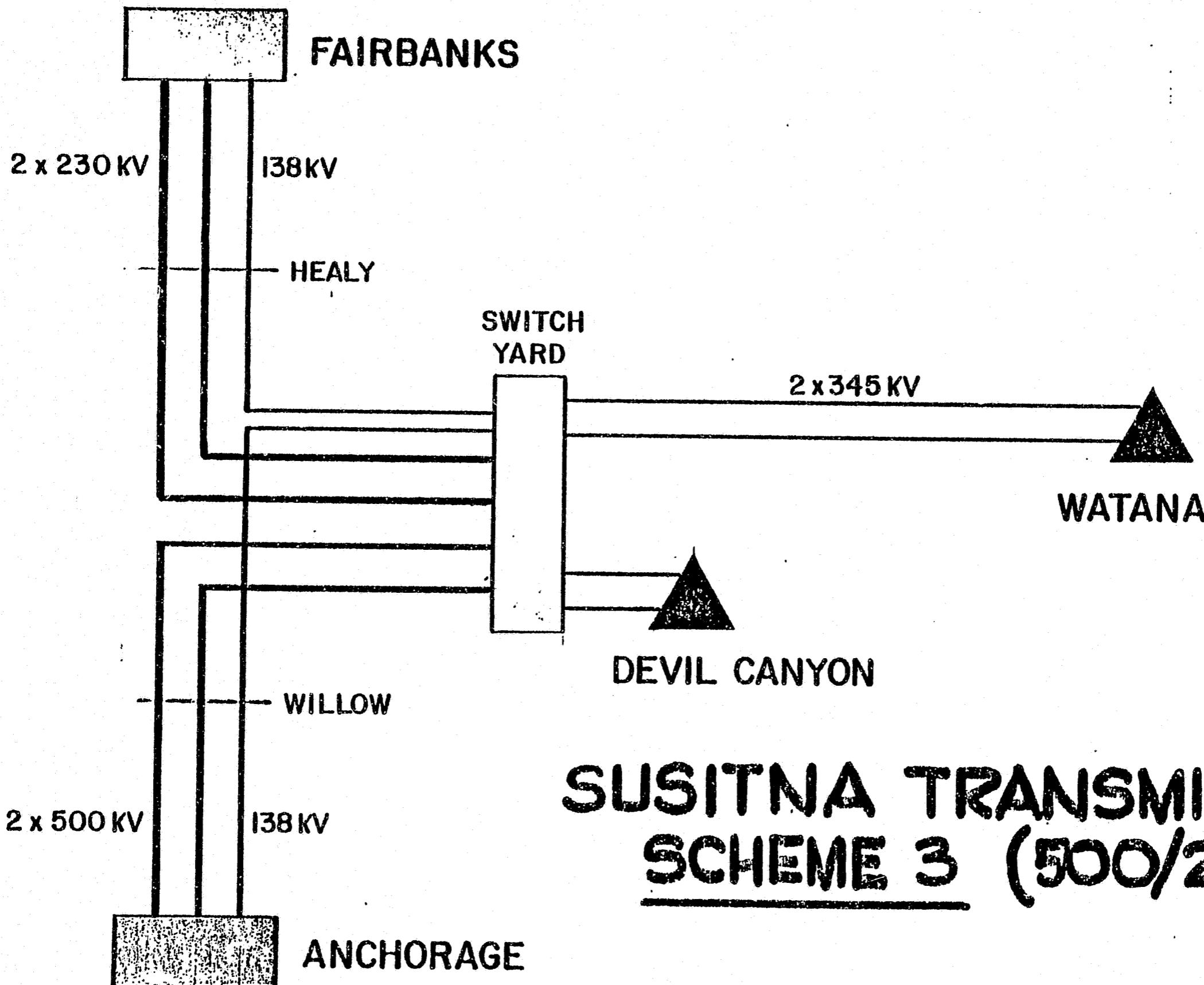
## SUSITNA TRANSMISSION SCHEME I (345x2 KV)

ACIES



**SUSITNA TRANSMISSION  
SCHEME 3 (500/230 KV)**

FACTS



## SUSITNA TRANSMISSION SCHEME 3 (500/230 KV)



# DATA ACQUISITION / COST ESTIMATES / CONSTRUCTION SCHEDULES / CONTINGENCIES

DATA ACQUISITION

COST ESTIMATES

CONSTRUCTION SCHEDULES

CONTINGENCIES

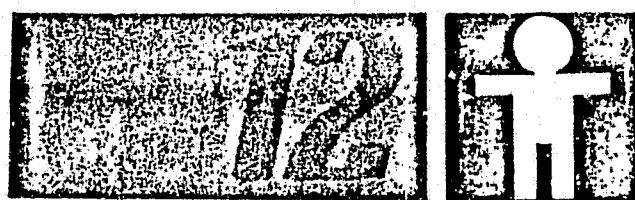


FERC

FEDERAL ENERGY REGULATORY COMMISSION

**■ NEW REGULATIONS  
■ DATA ACQUISITION  
■ EXHIBITS  
■ APPLICATION FORM  
■ REVIEW  
■ FILING**

- OVERVIEW
- RISK ANALYSES
- TAX EXEMPTION
- RISK SHARING
- POWER SALES



- INFORMATION OFFICE**
- PUBLIC MEETINGS**
- WORKSHOPS**
- PUBLICATIONS**
- ACTION LIST**

# **ALASKA POWER AUTHORITY**

## SUSITNA PUBLIC PARTICIPATION PROGRAM

### OBJECTIVES OF THE PUBLIC PARTICIPATION PROGRAM

The Power Authority Public Participation program is a COMMUNICATION PROCESS designed to strengthen the planning and decision-making on Susitna. Three main objectives are:

1. TO DISTRIBUTE IMPORTANT INFORMATION TO THE PUBLIC about the issues, problems, alternative choices, opportunities and impacts regarding the plans and decisions to be made on Susitna.
2. TO GATHER IMPORTANT INFORMATION FROM THE PUBLIC about values, attitudes and opinions regarding the plans and decisions to be made.
3. TO INSURE THAT THE INFORMATION FROM THE PUBLIC is fully considered along with technical information in the planning and decision-making process.

#### Review of the program

1. Community meetings
2. Workshops
3. Action System
4. Publications
  - a. General public
  - b. Special interest groups
5. Information office

#### Summary of major concerns expressed by public

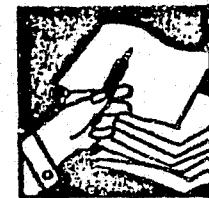
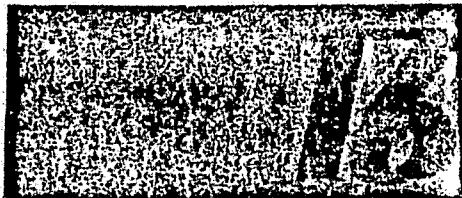
1. Adequacy and objectivity of alternatives study (alternatives other than Susitna)
2. Adequacy of environmental studies
  - a. Socio-economic questions (lifestyle, local hire, industrialization)
  - b. Impacts on commercial fishing industry
  - c. Impacts on wildlife
3. Public Participation program
4. Adequacy of energy forecasts (including concern for excess power)

Major changes that occurred in 1980

1. Commissioning a separate Alternatives Study
2. Addition of a sociocultural study
3. Additional studies of alternative Susitna Basin developments  
(more studies on tunnel alternatives, smaller hydro facilities,  
staging of development, and effects of load management and  
conservation on power needs)

Specific goals for 1981:

1. Educate the public to the major implications of a Susitna development
2. Continue to involve the public in "smaller" decisions within the  
Susitna planning effort: recreation and road access planning
3. Provide objective and factual information on major issues:  
    seismic questions  
    fish impacts



# MANAGEMENT INFORMATION

- PROCEDURES
- FINANCIAL CONTROL
- SCHEDULE CONTROL
- COST CONTROL
- MANPOWER
- DOCUMENT CONTROL

ACRES