

3439



BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT
SUSITNA HYDROELECTRIC PROJECT

VOLUME 15

D R A F T

EXHIBIT F
PROJECT DESIGN PLATES

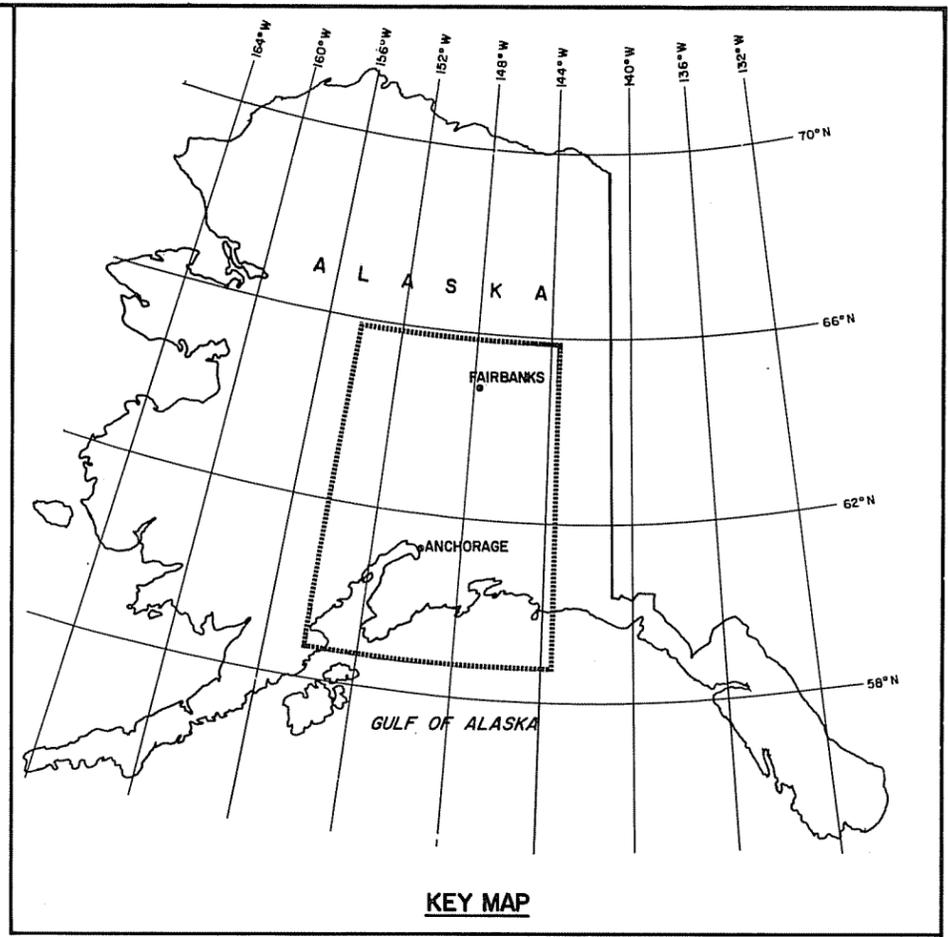
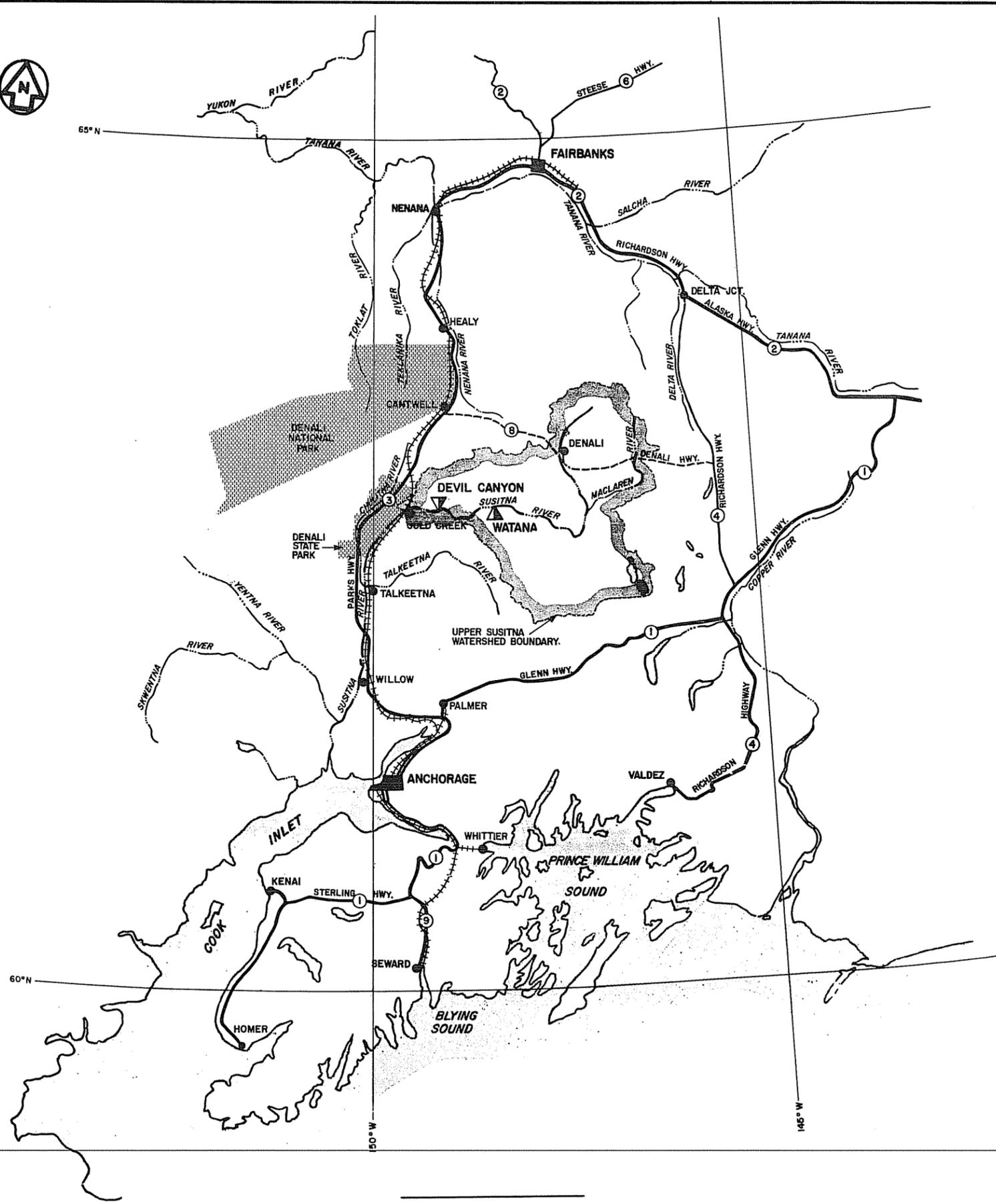
HARZA-EBASCO
SUSITNA JOINT VENTURE

OVR-HD
TK
1425
.SB
F471
no. 3439

Alaska Power Authority

Merged With
ARLIS
ANCHORAGE, ALASKA
Est. 1992
ALASKA DEPT. OF FISH & GAME
333 Raspberry Rd.
Anchorage, Alaska 99518-1599

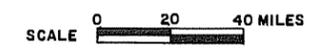
GENERAL



KEY MAP

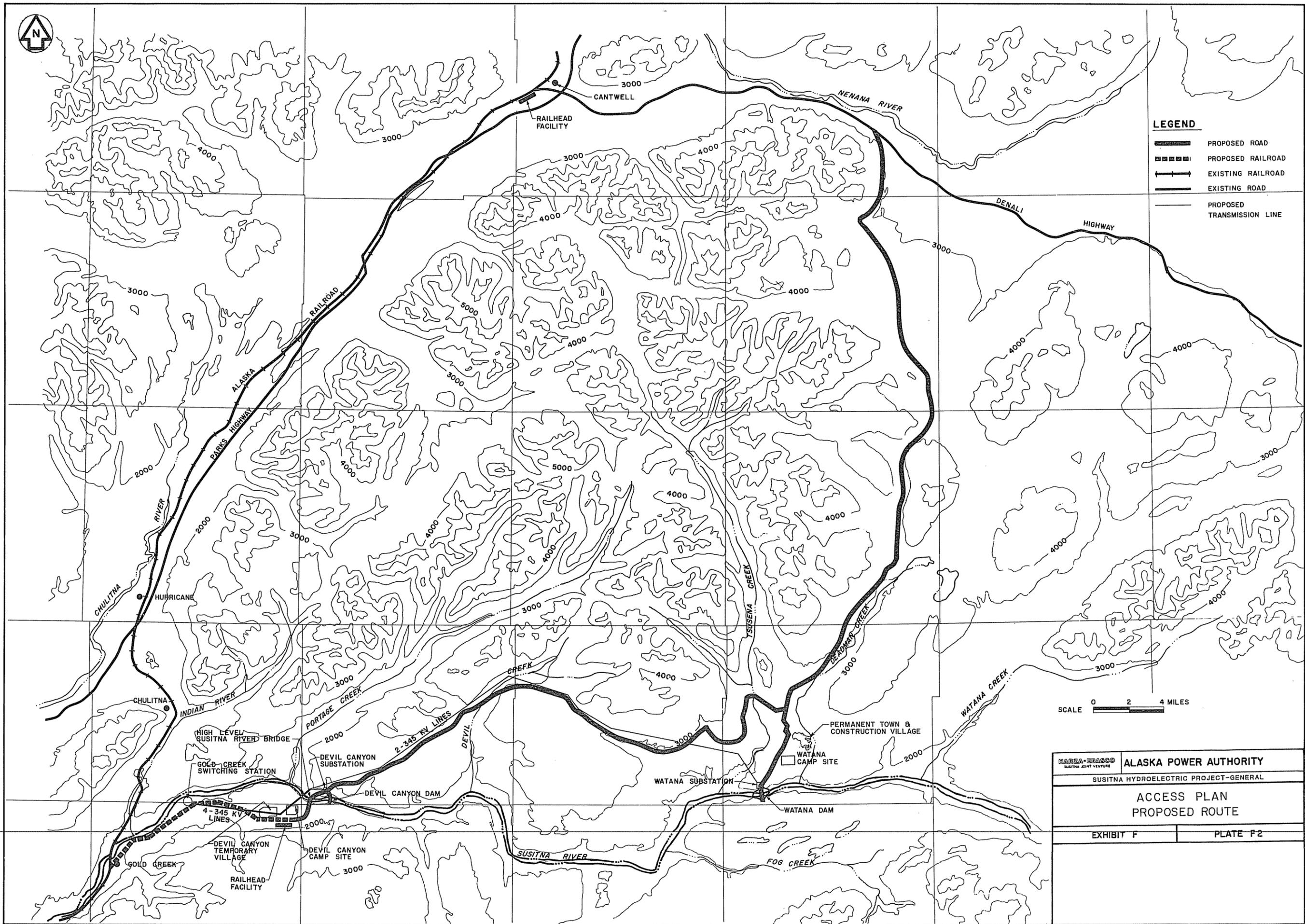
LEGEND

- PRIMARY PAVED UNDIVIDED HIGHWAY
- SECONDARY PAVED UNDIVIDED HIGHWAY
- SECONDARY GRAVEL HIGHWAY
- RAILROAD
- RIVER



MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-GENERAL			
RAILBELT AREA			
EXHIBIT F		PLATE FI	

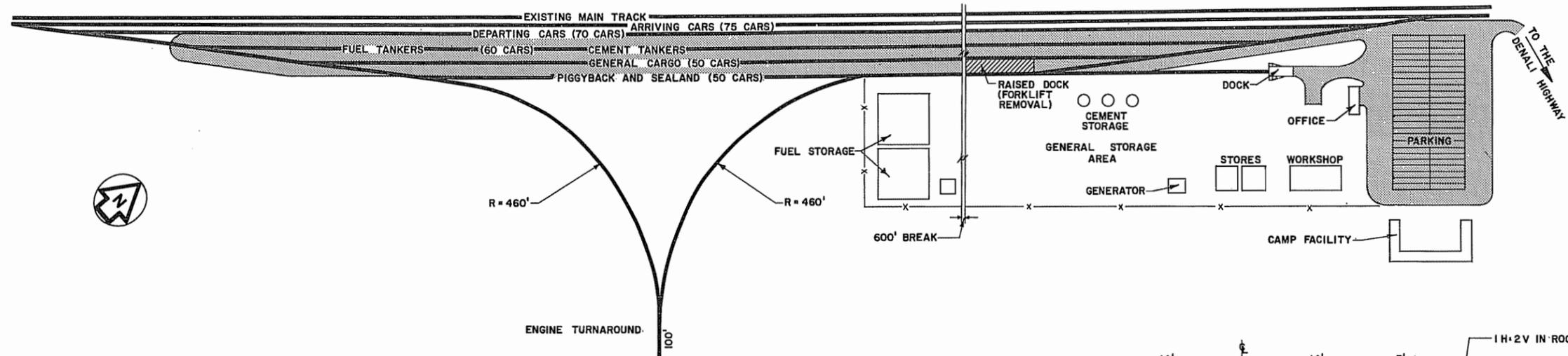
3 3755 000 44158 4



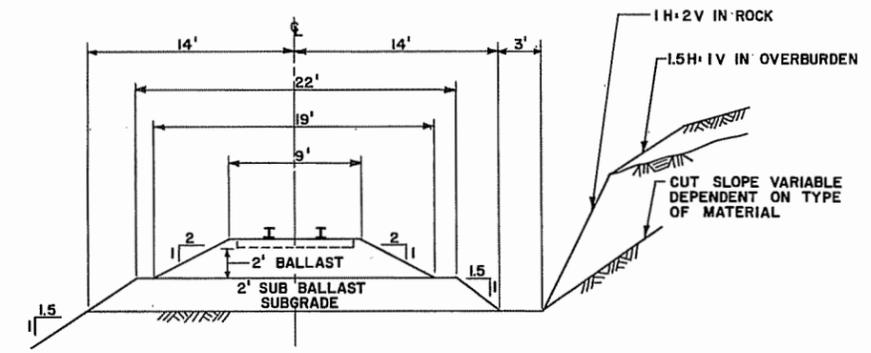
- LEGEND**
- PROPOSED ROAD
 - PROPOSED RAILROAD
 - EXISTING RAILROAD
 - EXISTING ROAD
 - PROPOSED TRANSMISSION LINE

SCALE 0 2 4 MILES

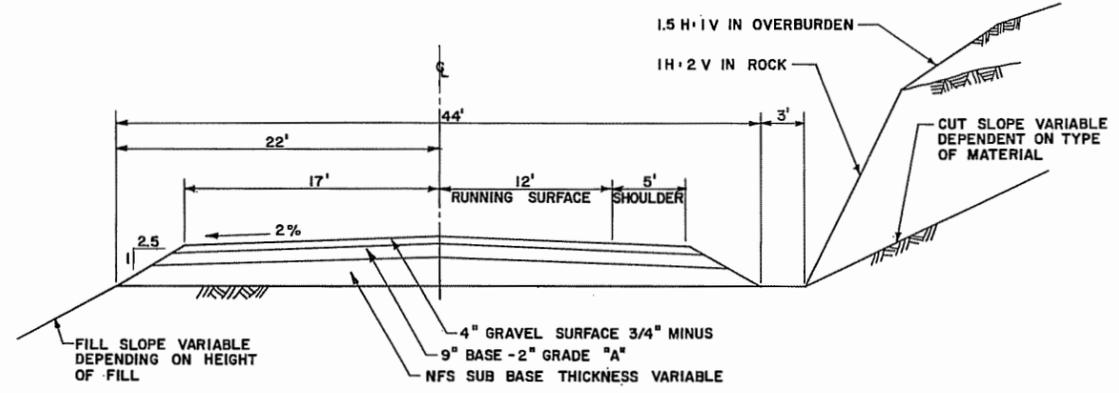
HARZA-EBASC® SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-GENERAL			
ACCESS PLAN PROPOSED ROUTE			
EXHIBIT F		PLATE F2	



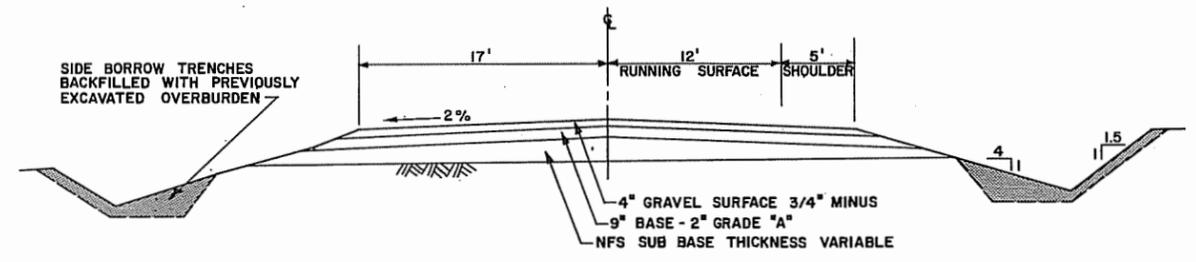
RAILHEAD FACILITY AT CANTWELL - PLAN
SCALE A



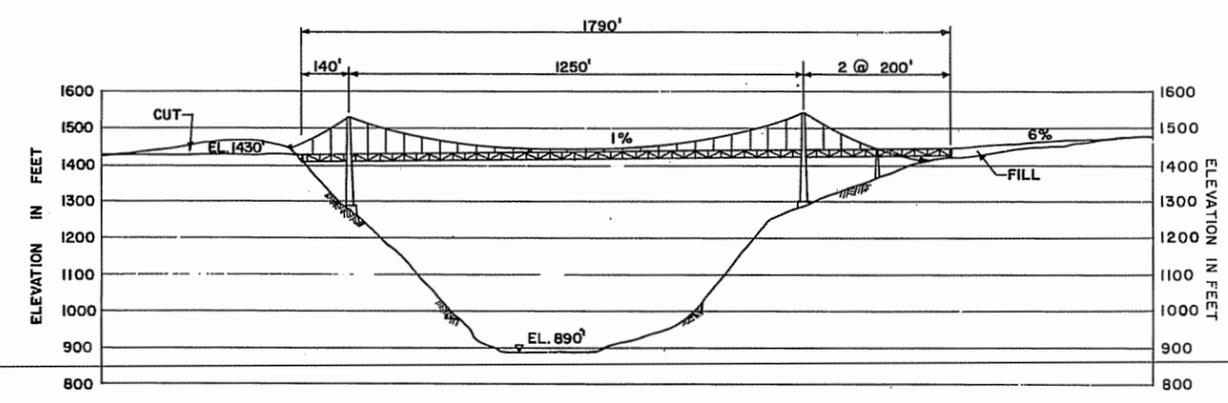
TYPICAL RAILROAD CROSS SECTION
SCALE B



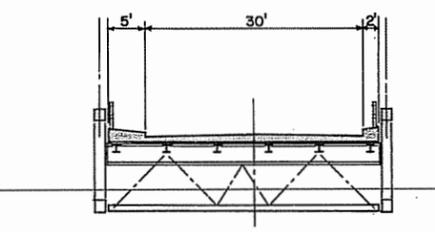
TYPICAL 'SIDEHILL CUT' SECTION
SCALE B



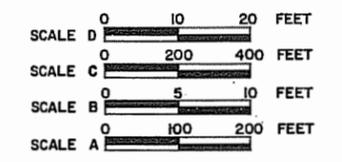
TYPICAL 'SIDE BORROW' SECTION
SCALE B



HIGH LEVEL SUSITNA RIVER BRIDGE
SCALE C

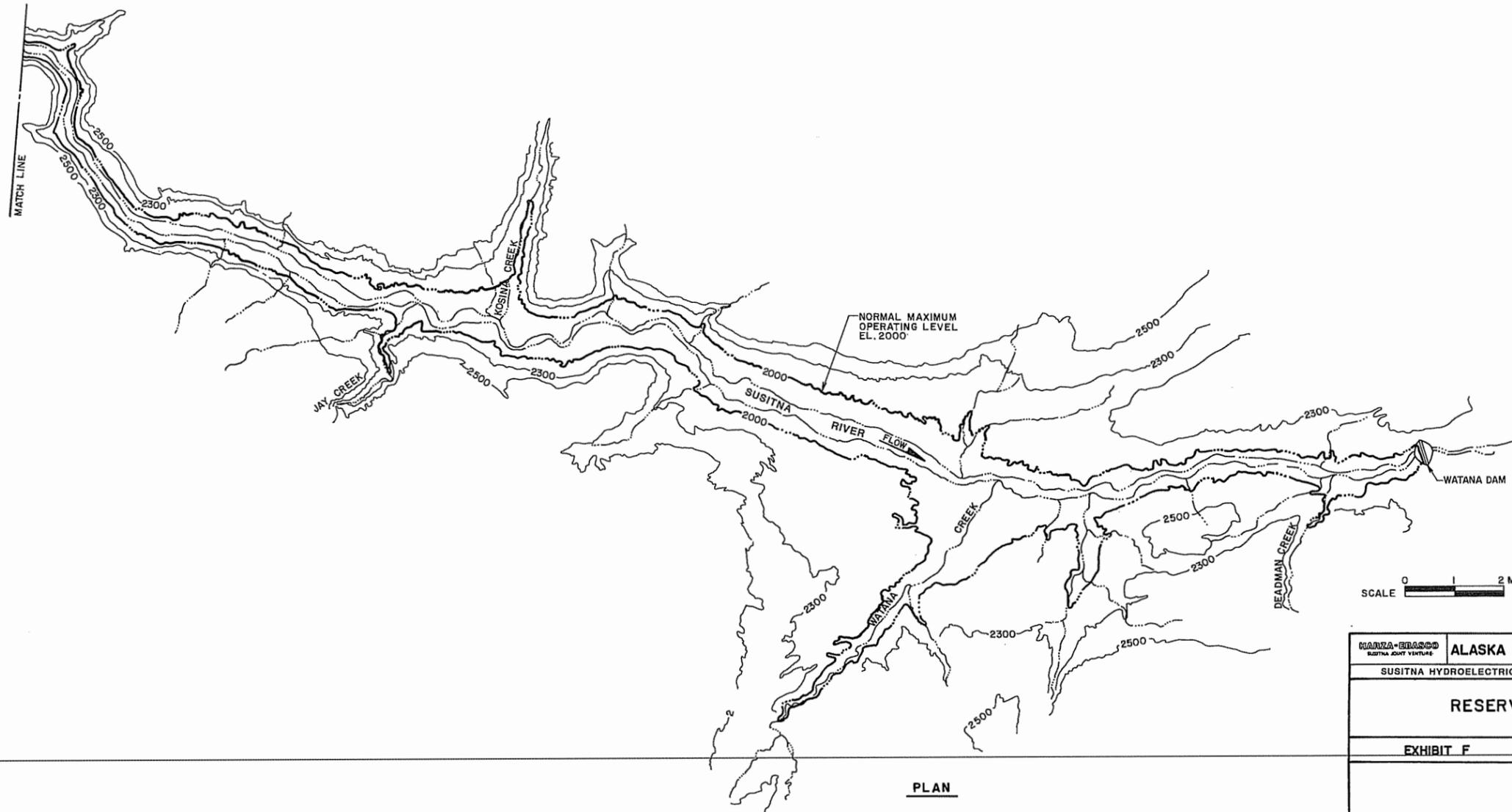
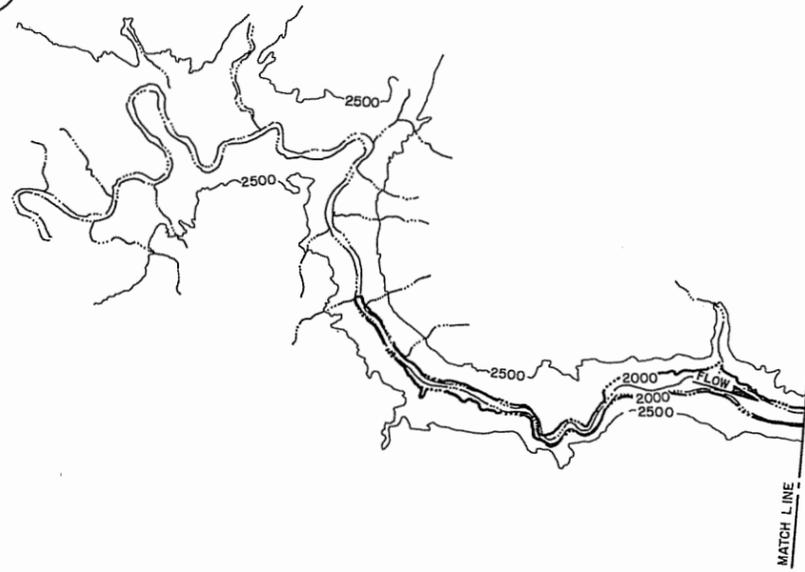


TYPICAL CROSS SECTION
HIGH LEVEL SUSITNA RIVER BRIDGE
SCALE D

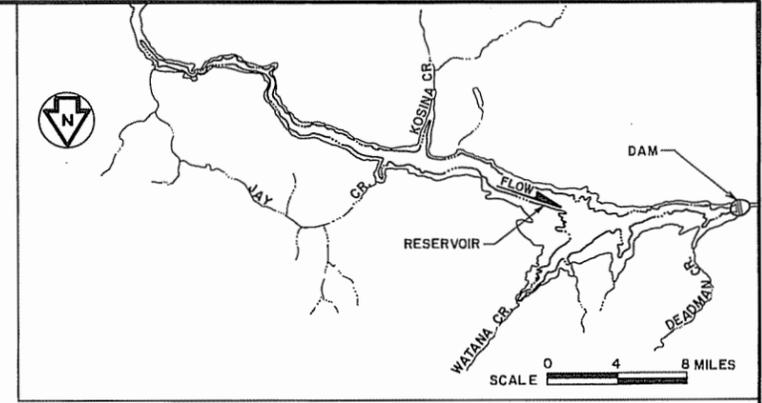


MARZA-BEASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-GENERAL	
ACCESS PLAN TYPICAL DETAILS	
EXHIBIT F	PLATE F-3

STAGE I (WATANA)



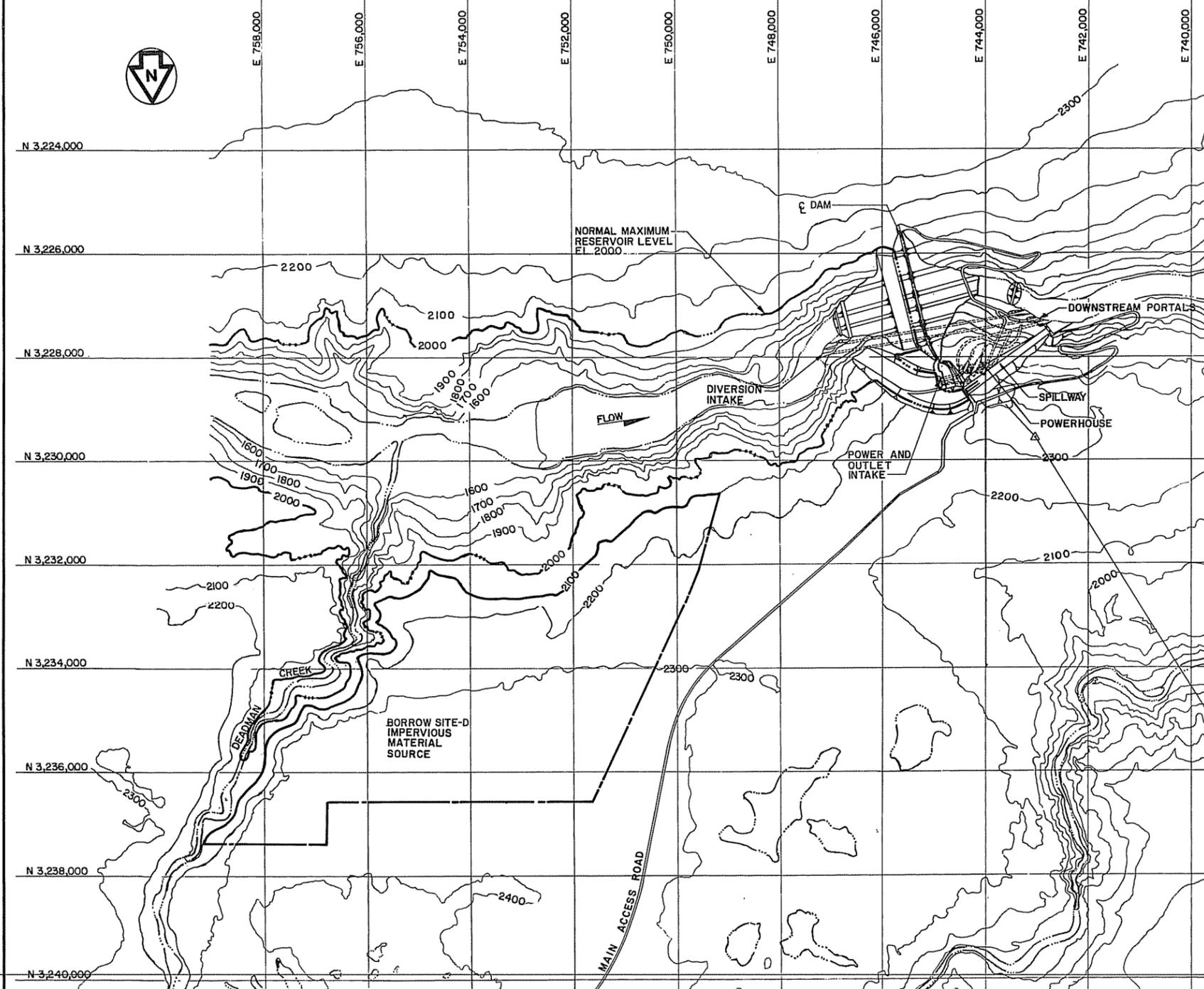
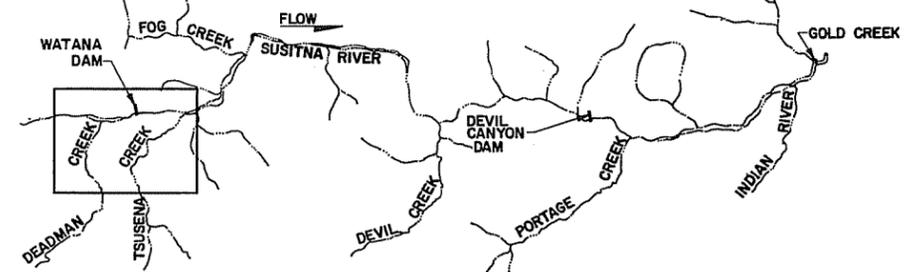
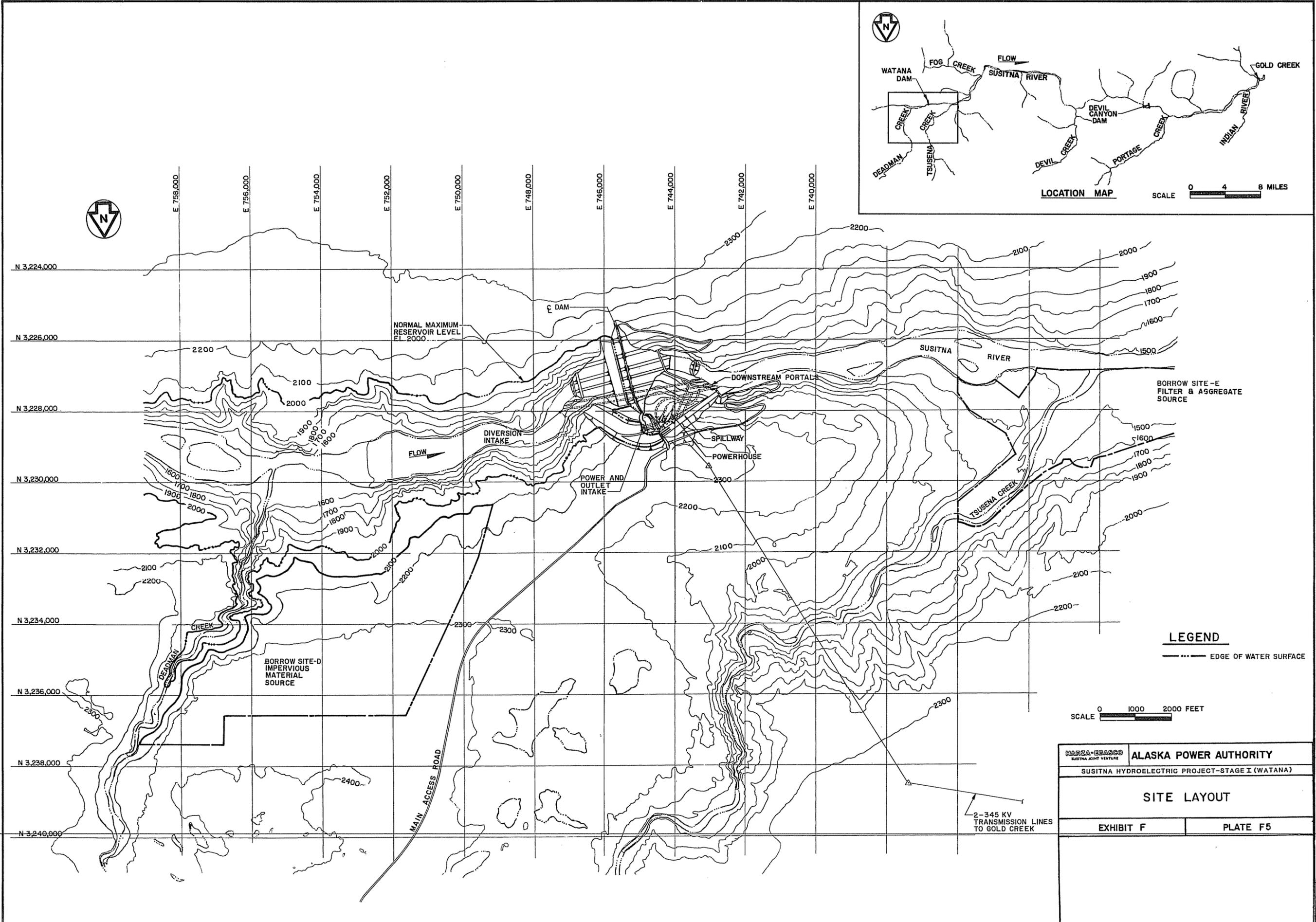
PLAN



LOCATION MAP

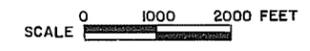


<small>MANA-ENSCO SUSITNA JOINT VENTURE</small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
RESERVOIR PLAN	
EXHIBIT F	PLATE F4

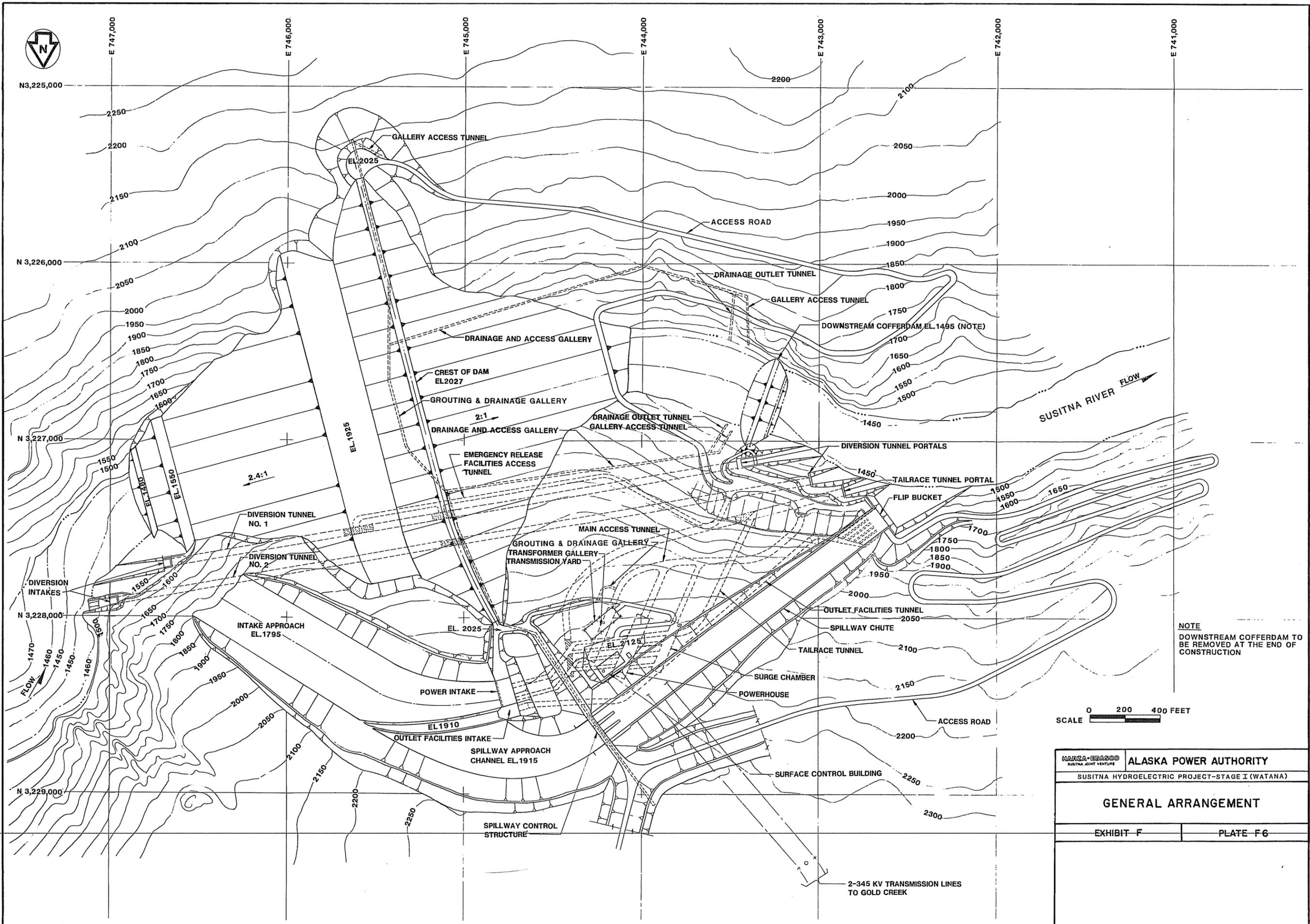


LEGEND

--- EDGE OF WATER SURFACE



<small>MARZA-EBASCO</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
SITE LAYOUT			
EXHIBIT F		PLATE F5	



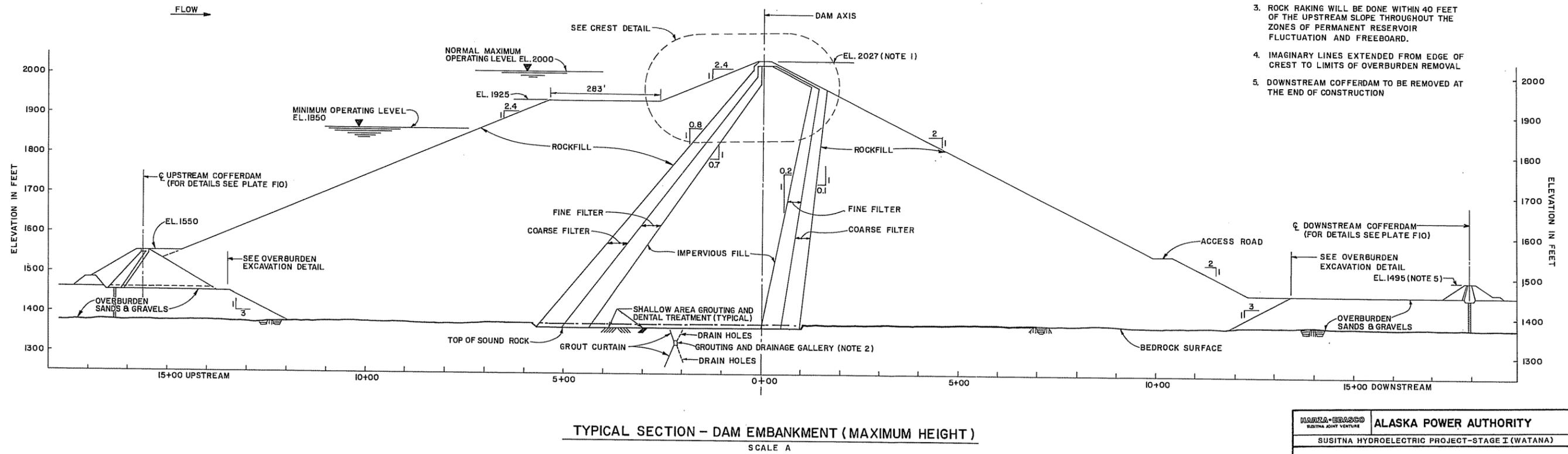
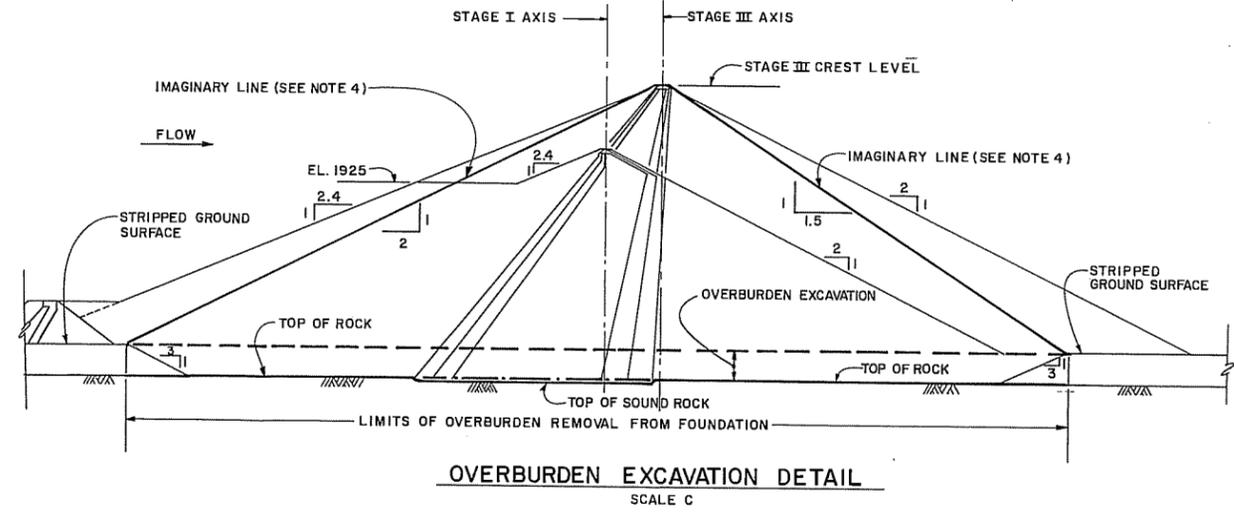
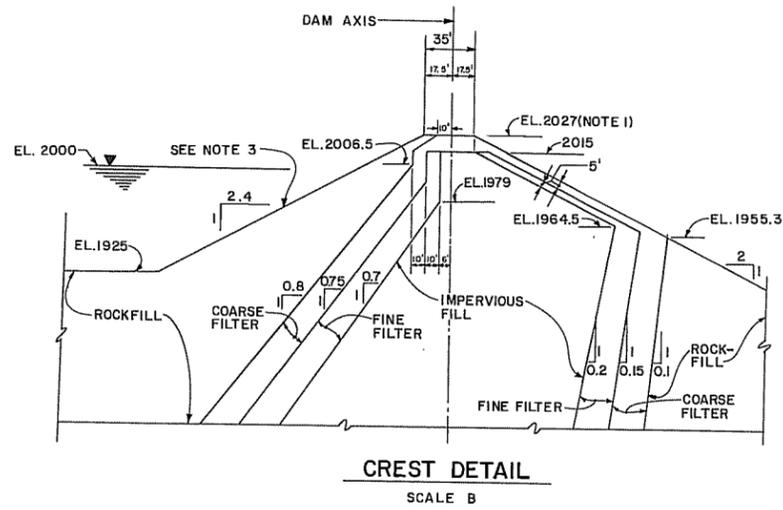
NOTE
DOWNSTREAM COFFERDAM TO
BE REMOVED AT THE END OF
CONSTRUCTION

SCALE 0 200 400 FEET

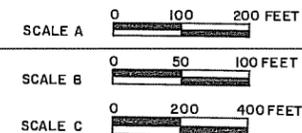
MANZA-EDASCO
SUSITNA JOINT VENTURE
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)

GENERAL ARRANGEMENT

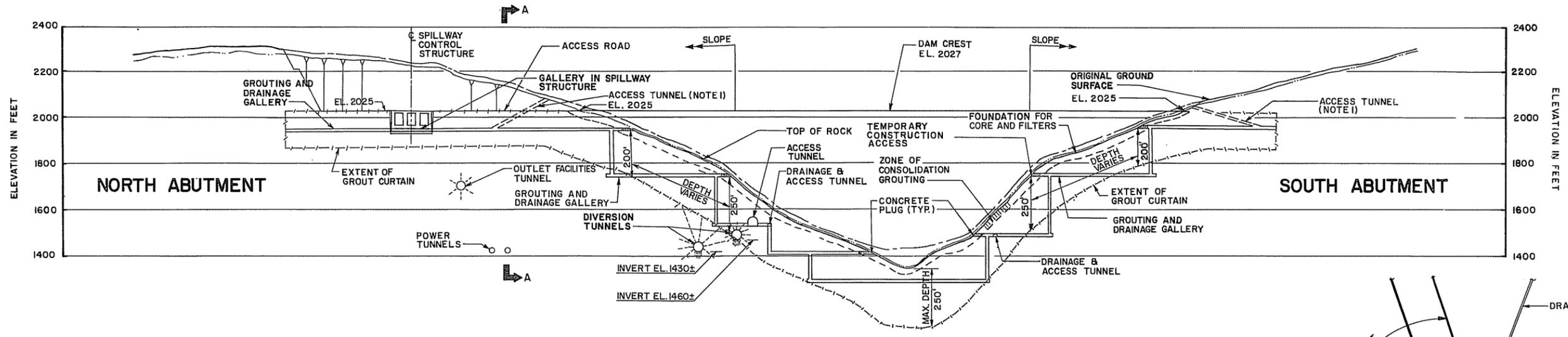
EXHIBIT F PLATE F 6



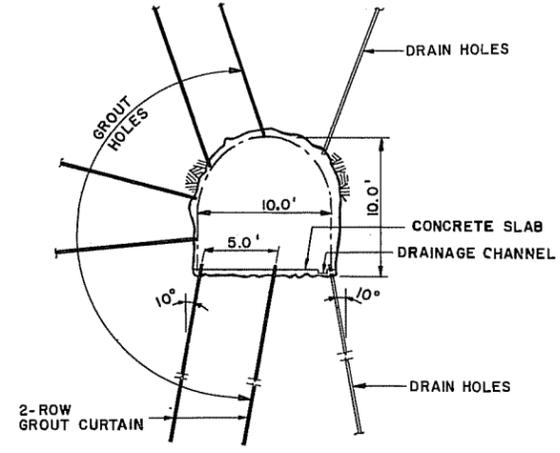
- NOTES:
1. INCLUDES 2' SETTLEMENT OVERBUILD.
 2. DRAINAGE AND GROUTING DETAILS SHOWN ON PLATE F8.
 3. ROCK RAKING WILL BE DONE WITHIN 40 FEET OF THE UPSTREAM SLOPE THROUGHOUT THE ZONES OF PERMANENT RESERVOIR FLUCTUATION AND FREEBOARD.
 4. IMAGINARY LINES EXTENDED FROM EDGE OF CREST TO LIMITS OF OVERBURDEN REMOVAL
 5. DOWNSTREAM COFFERDAM TO BE REMOVED AT THE END OF CONSTRUCTION



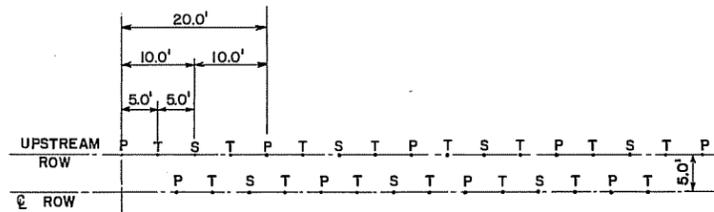
HANZA-EMSCO REGISTERED JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
DAM			
TYPICAL SECTION AND DETAILS			
EXHIBIT F		PLATE F7	



PROFILE (LOOKING UPSTREAM)
SCALE A

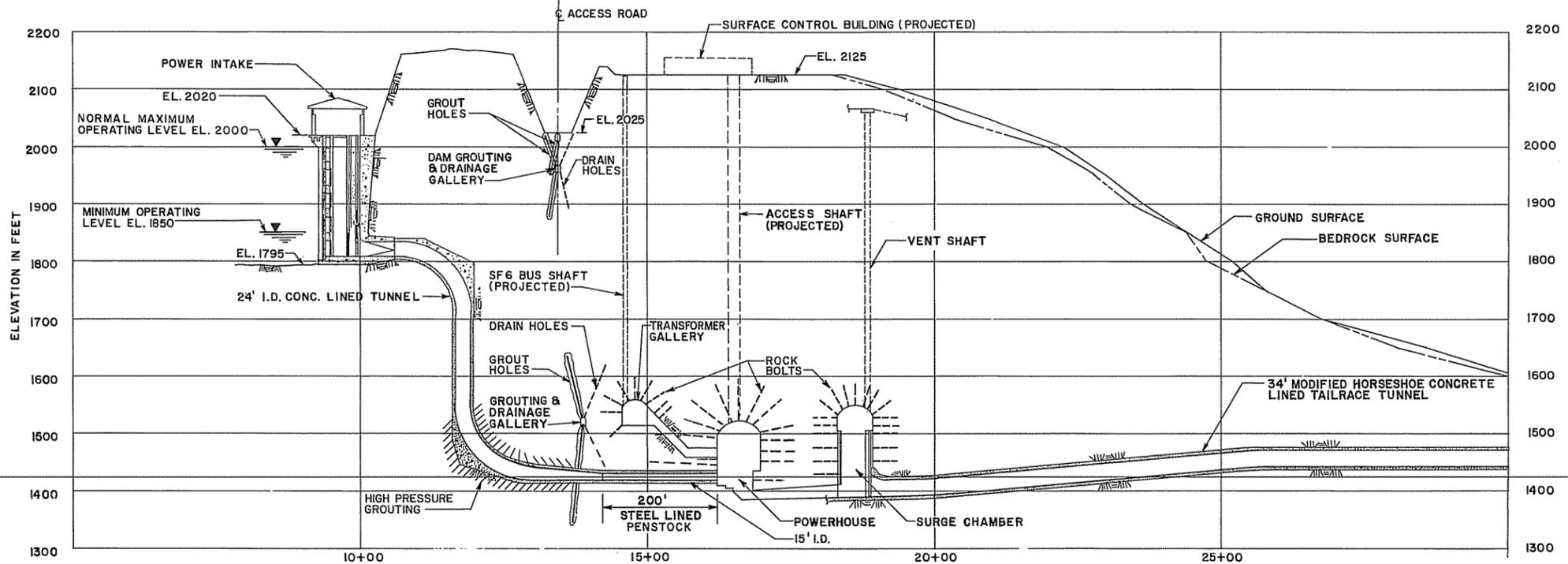


DETAIL - GROUTING & DRAINAGE GALLERY
SCALE D



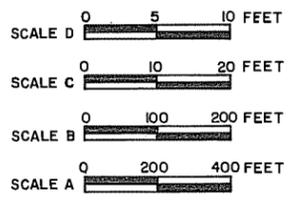
GROUT HOLE SPACING
SCALE C

LEGEND
P = PRIMARY GROUT HOLE
S = SECONDARY GROUT HOLE
T = TERTIARY GROUT HOLE

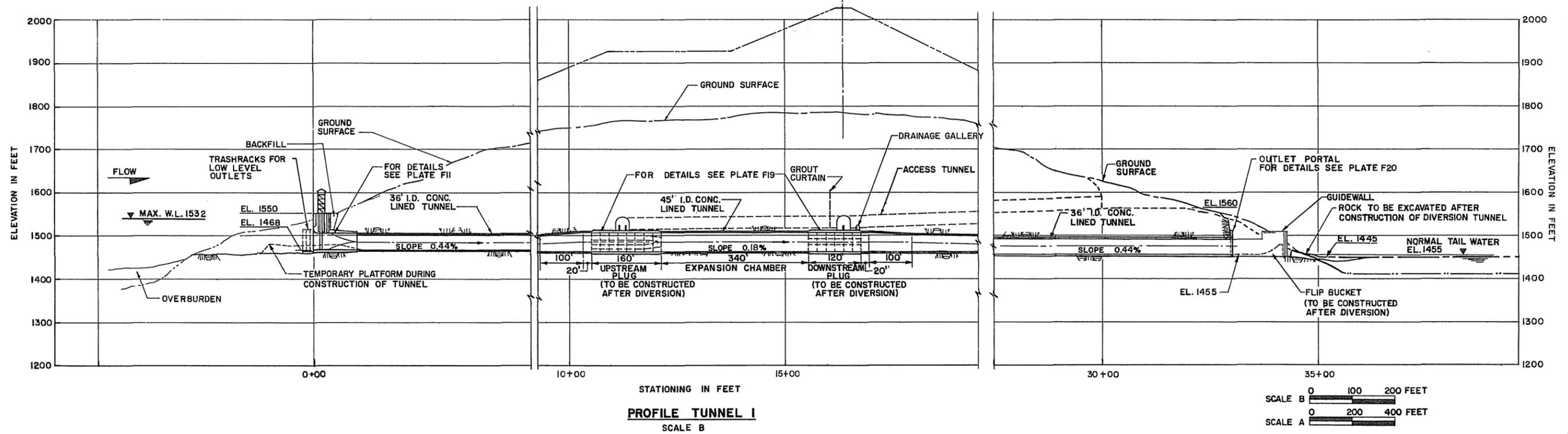
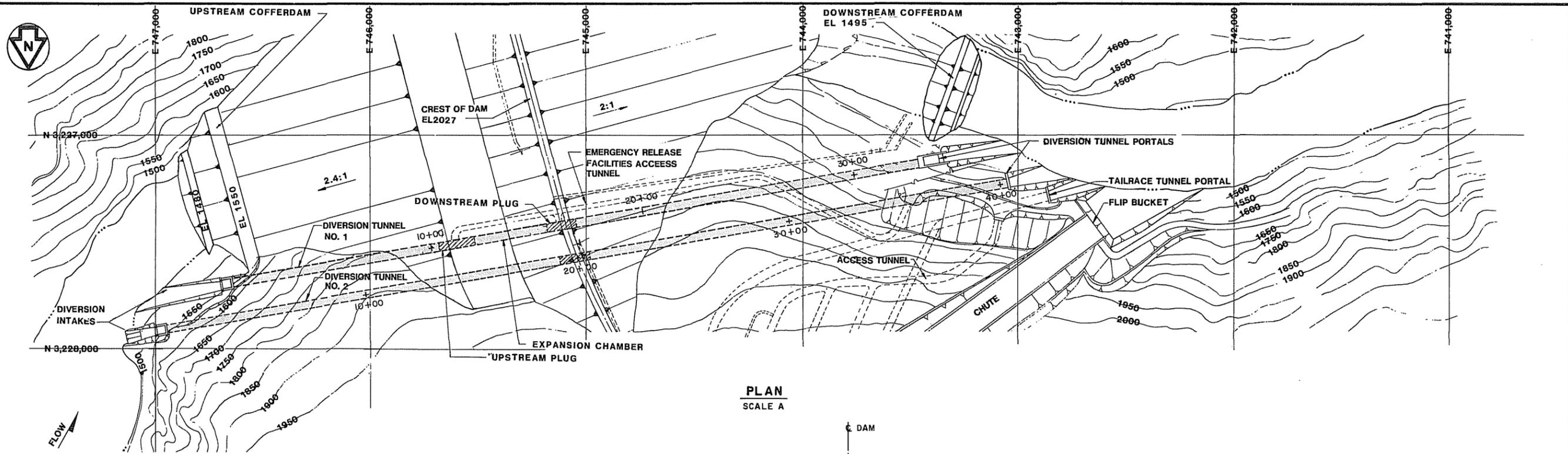


SECTION A-A
SCALE B

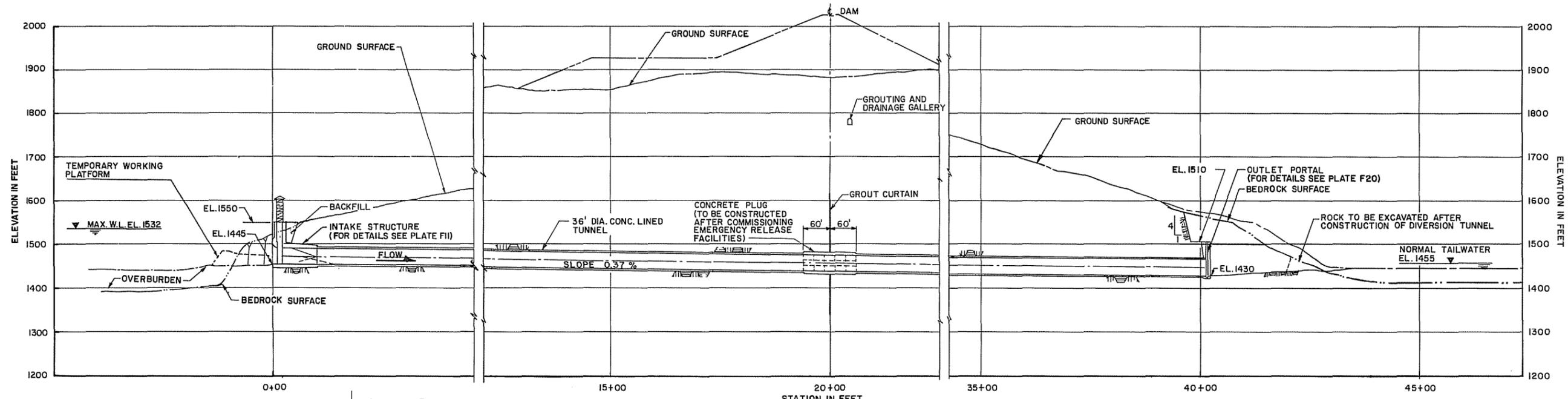
- NOTES
- ACCESS WOULD BE FROM THE DOWNSTREAM SIDE OF THE DAM.
 - WORK THIS DRAWING WITH PLATE F6.



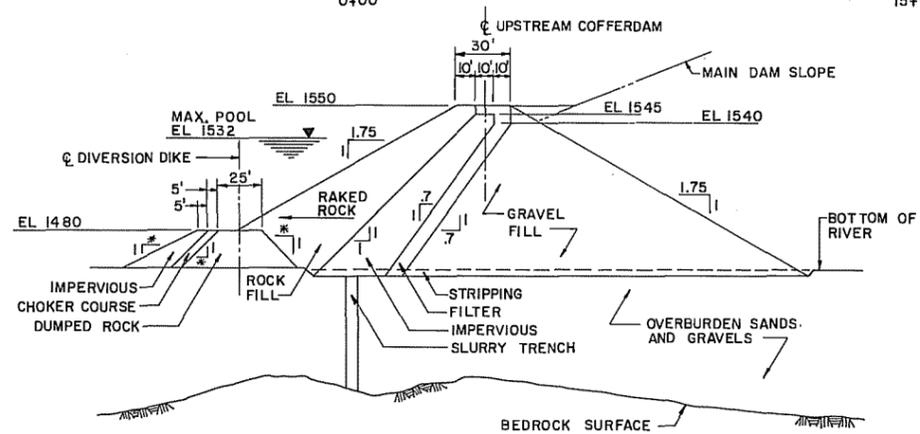
MARZA-ELASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
DAM GROUTING & DRAINAGE			
EXHIBIT F		PLATE F8	



MANZA-BLASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
DIVERSION GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F9

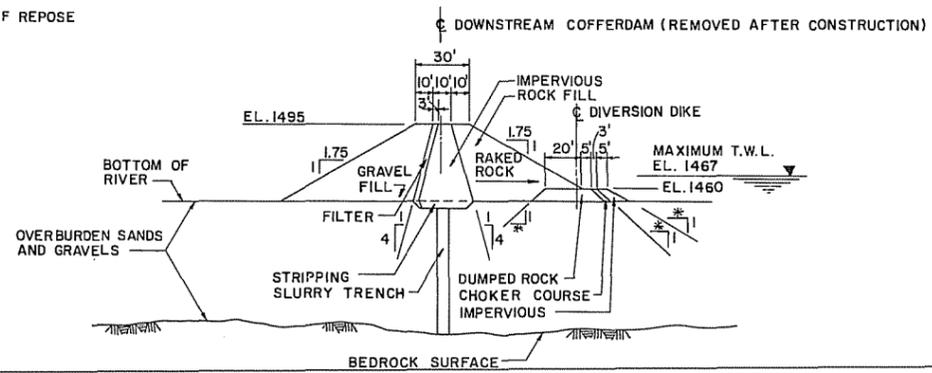


PROFILE - TUNNEL 2
SCALE A

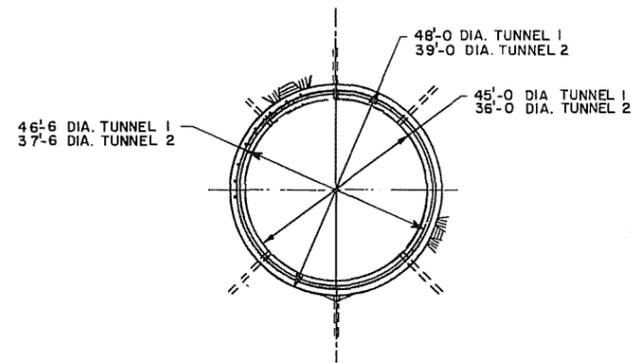


TYPICAL SECTION UPSTREAM COFFERDAM
SCALE B

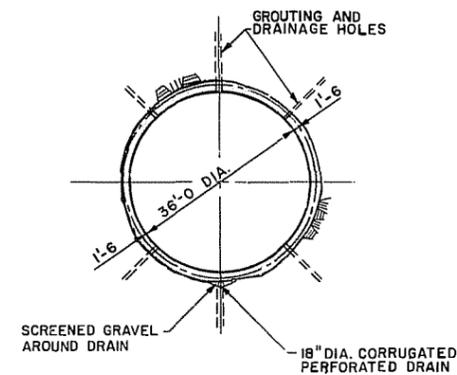
* ANGLE OF REPOSE



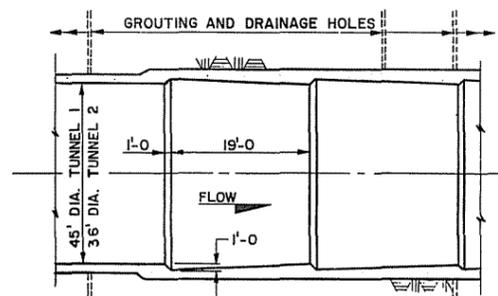
TYPICAL SECTION DOWNSTREAM COFFERDAM
SCALE B



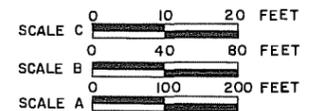
CROSS SECTION AT PLUG (TYPICAL)
N.T.S.



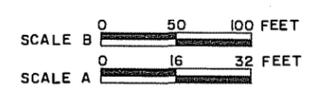
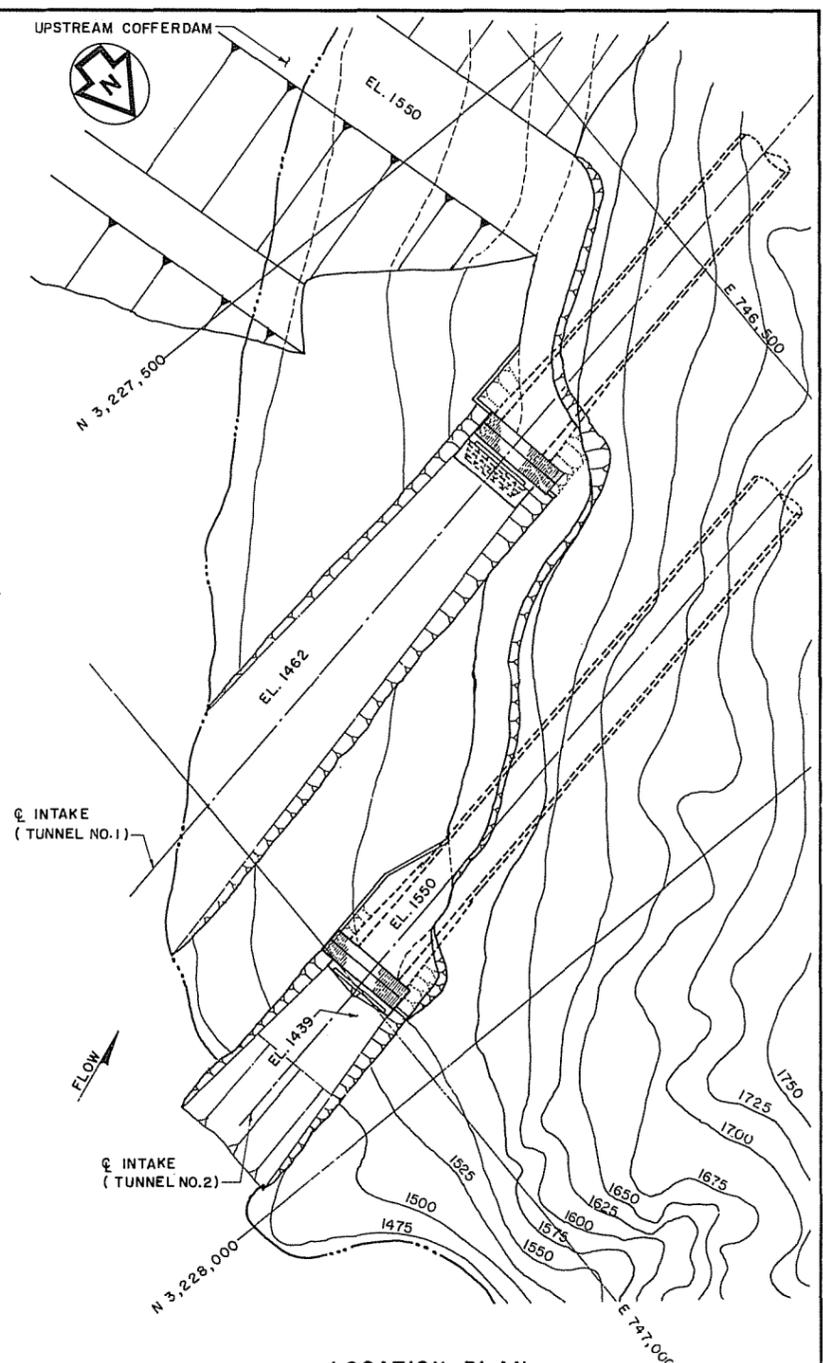
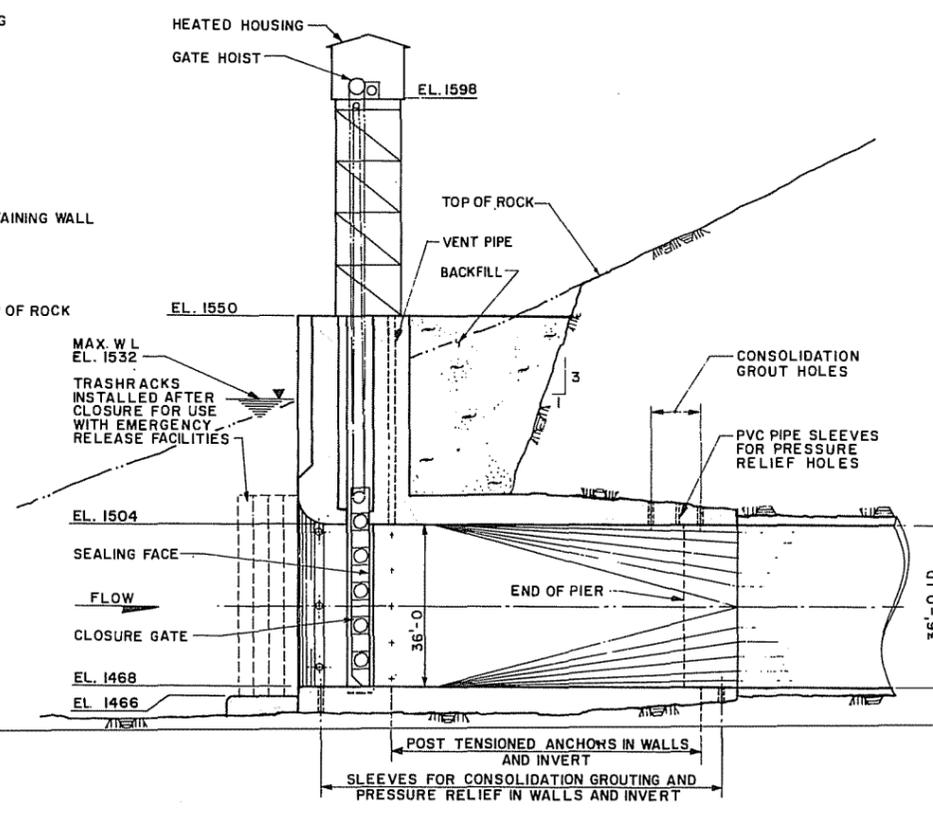
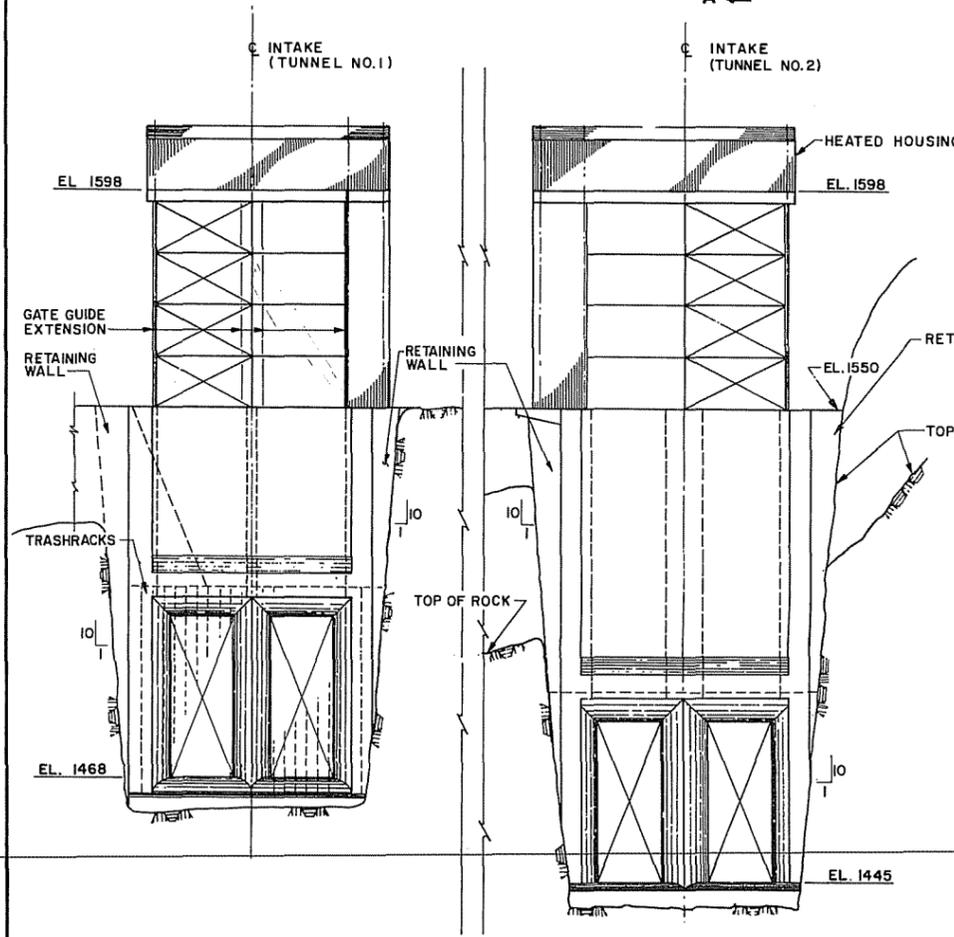
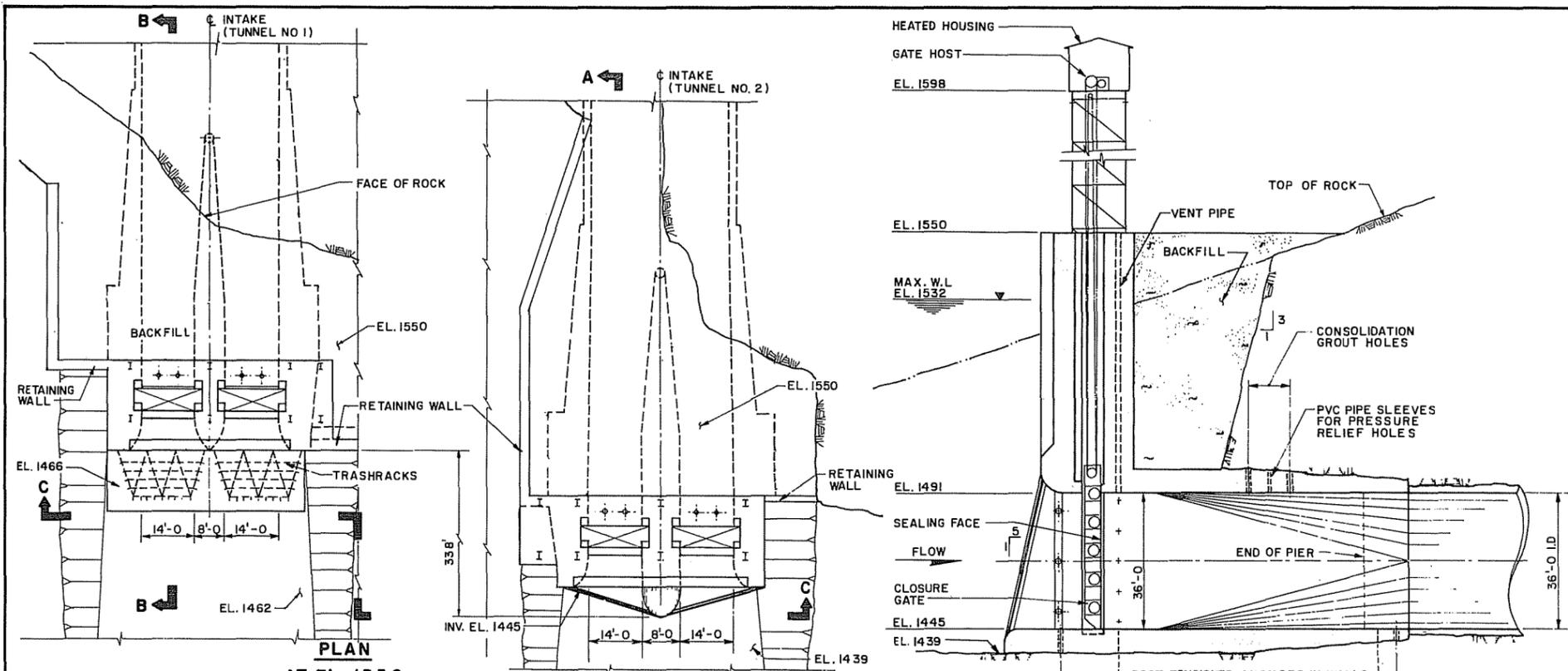
TYPICAL TUNNEL CROSS SECTION
N.T.S.



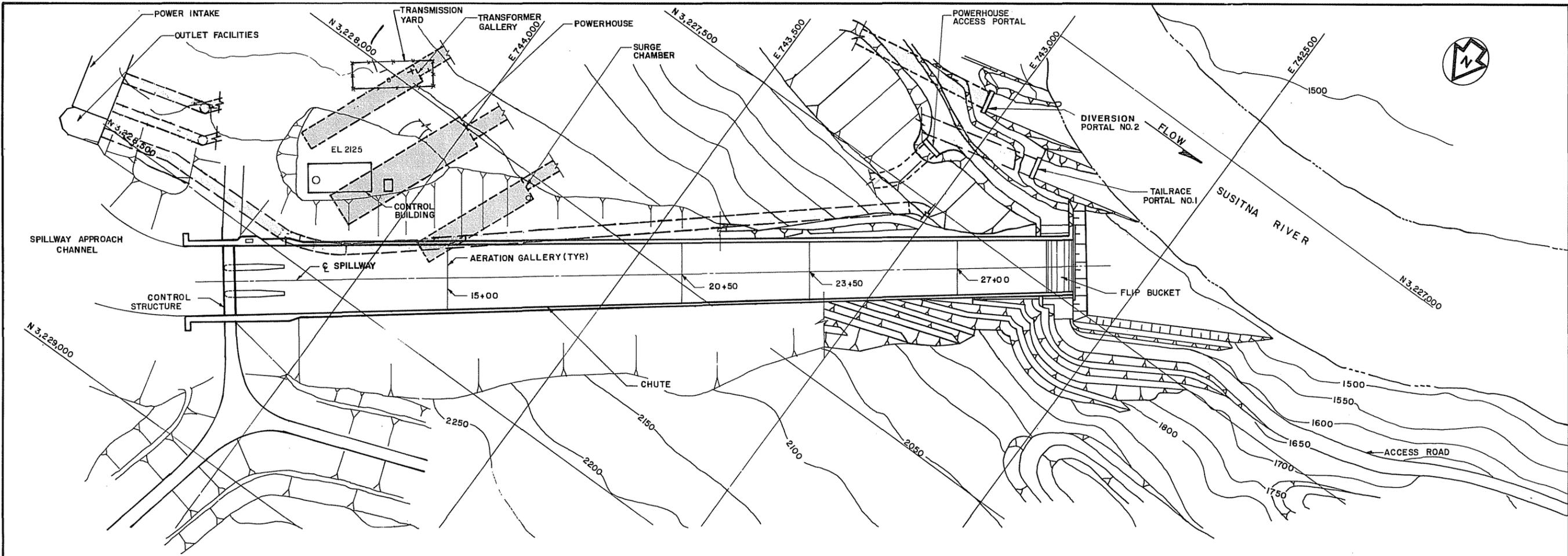
SECTION ALONG C OF TUNNEL AT PLUG LOCATION
SCALE C



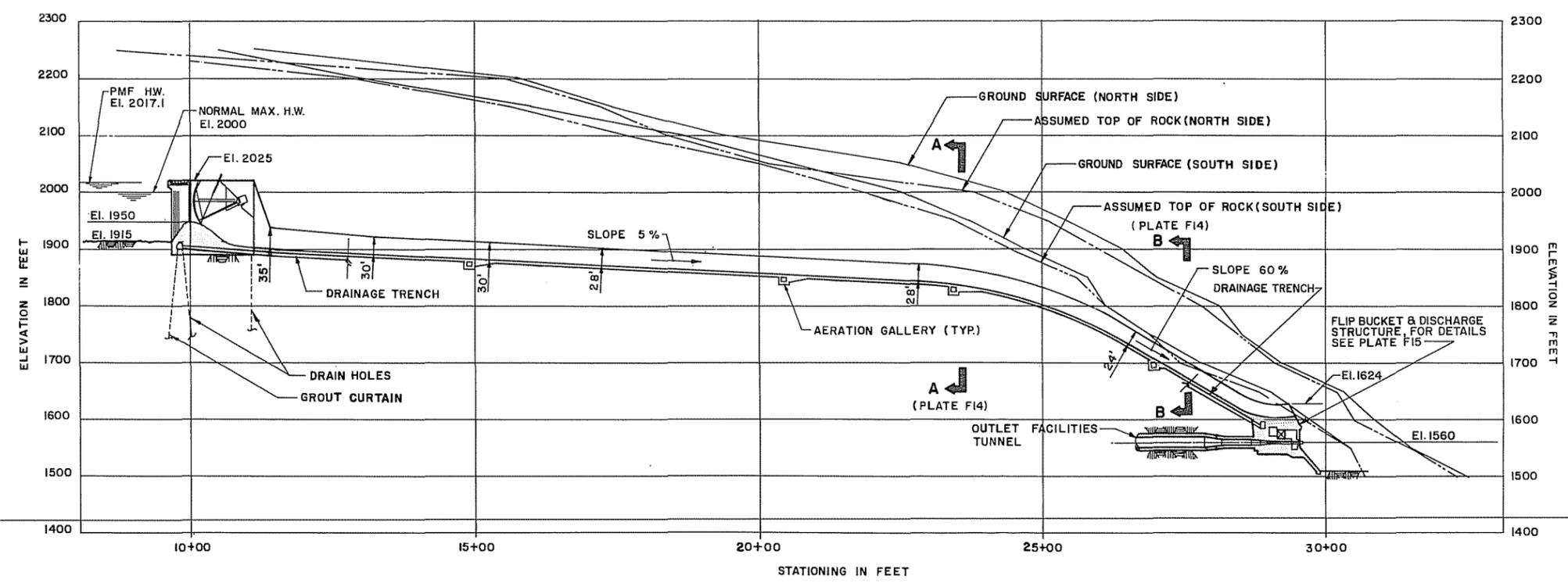
HARZA-BOASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
	SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)
COFFERDAMS AND DIVERSION TUNNEL PROFILE AND SECTIONS	
EXHIBIT F	PLATE F10



		ALASKA POWER AUTHORITY SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
DIVERSION TUNNEL INTAKE STRUCTURES			
EXHIBIT-F		PLATE-FII	



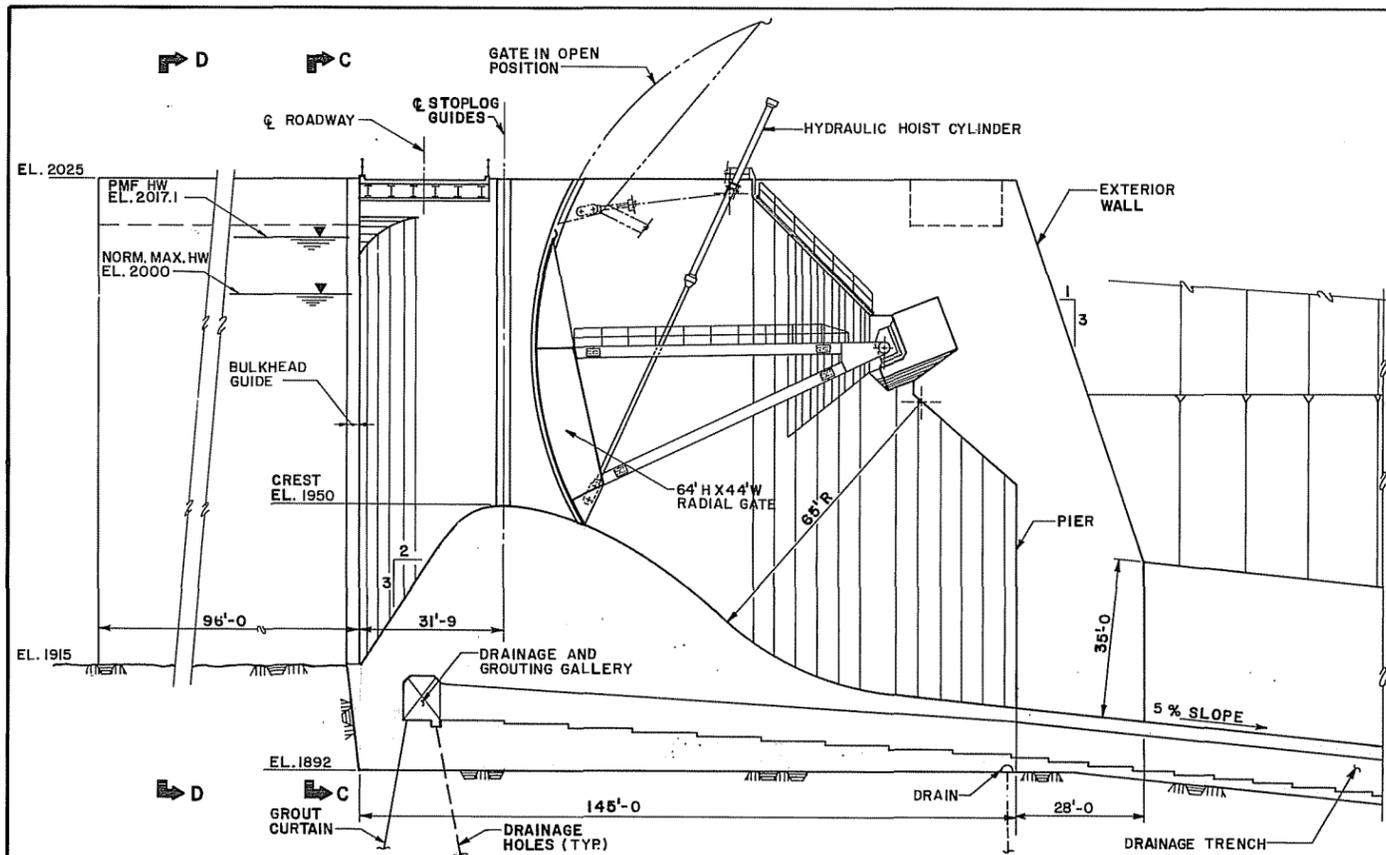
PLAN



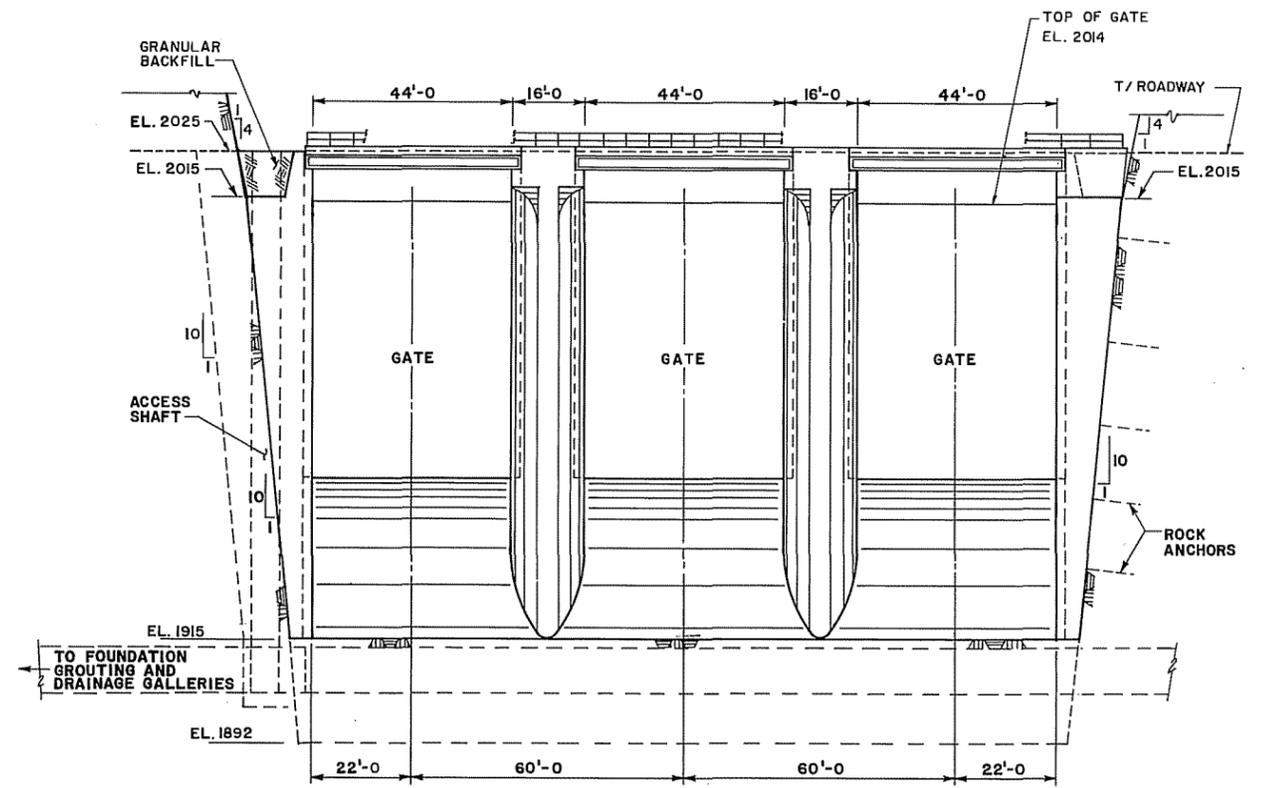
PROFILE



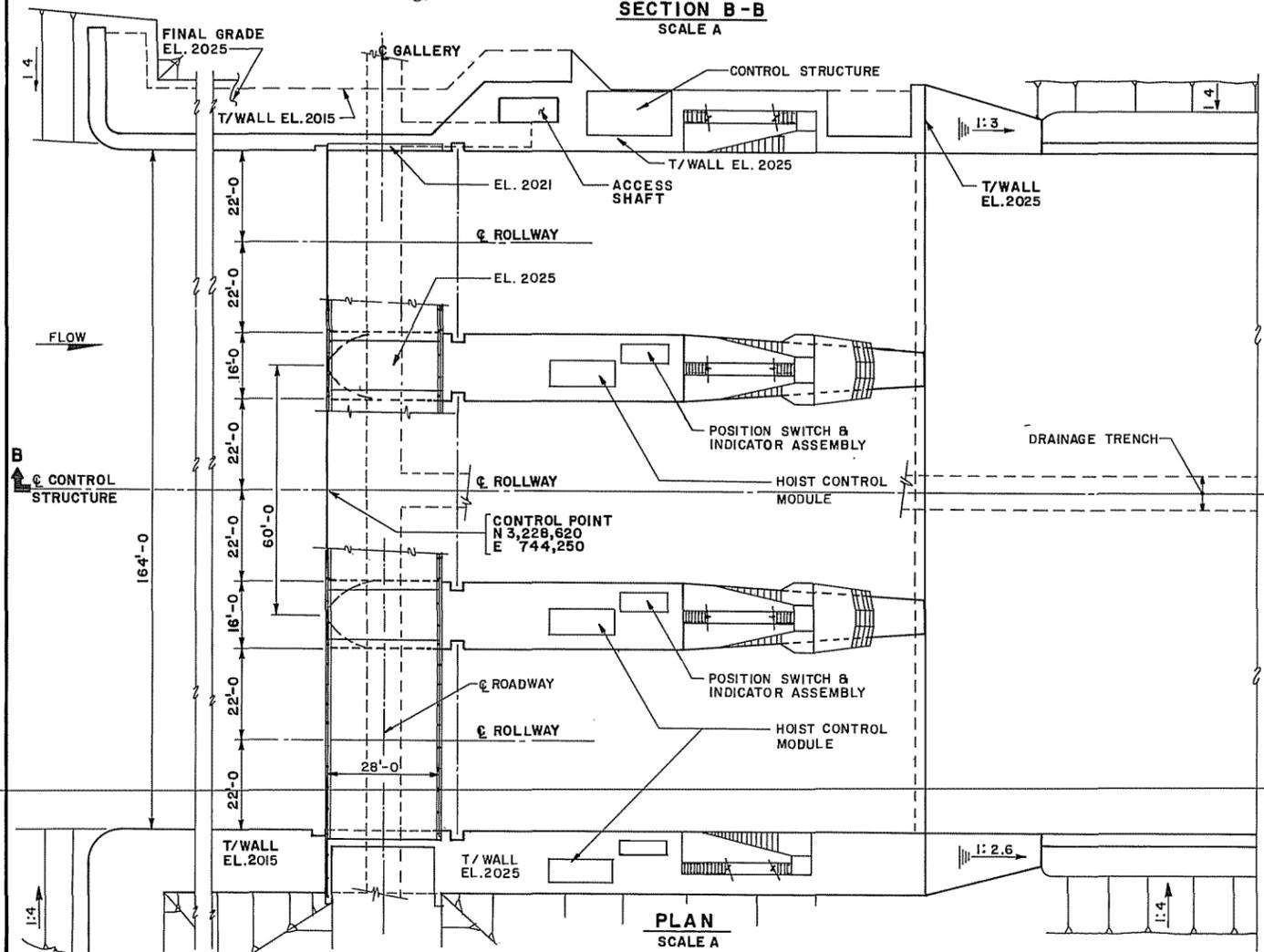
MANZA-BASCO ALASKA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
SPILLWAY GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F12



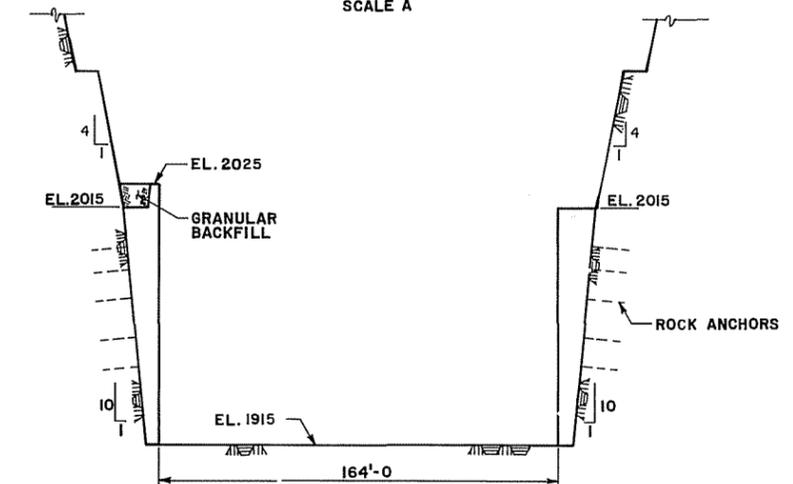
SECTION B-B
SCALE A



SECTION C-C
SCALE A



PLAN
SCALE A

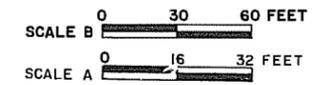


SECTION D-D
SCALE B

SPILLWAY CONTROL STRUCTURE
SUMMARY OF STABILITY ANALYSES

LOAD CONDITION	FOUNDATION STRESS U.S./D.S. (PSI)	X _{og} (FT)	FACTORS OF SAFETY			
			SLIDING	SHEAR FRICTION	FLOATATION	OVERTURNING
NORMAL INCLUDES ICE LOADS	47.6 / 53.8	1.5	N.A.	10.8	5.4	2.9
UNUSUAL 100/100 YR. EARTHQUAKE	25.8 / 75.5	11.9	N.A.	6.2	5.4	2.2
UNUSUAL DRAIN PLUGGED PMF	17.2 / 56.9	12.9	N.A.	8.2	2.4	1.6
EXTREME EARTHQUAKE	-18.4 / 119.7	32.9	N.A.	3.4	5.4	1.6

PHYSICAL PARAMETERS
φ = 41°
c = 150 PSI

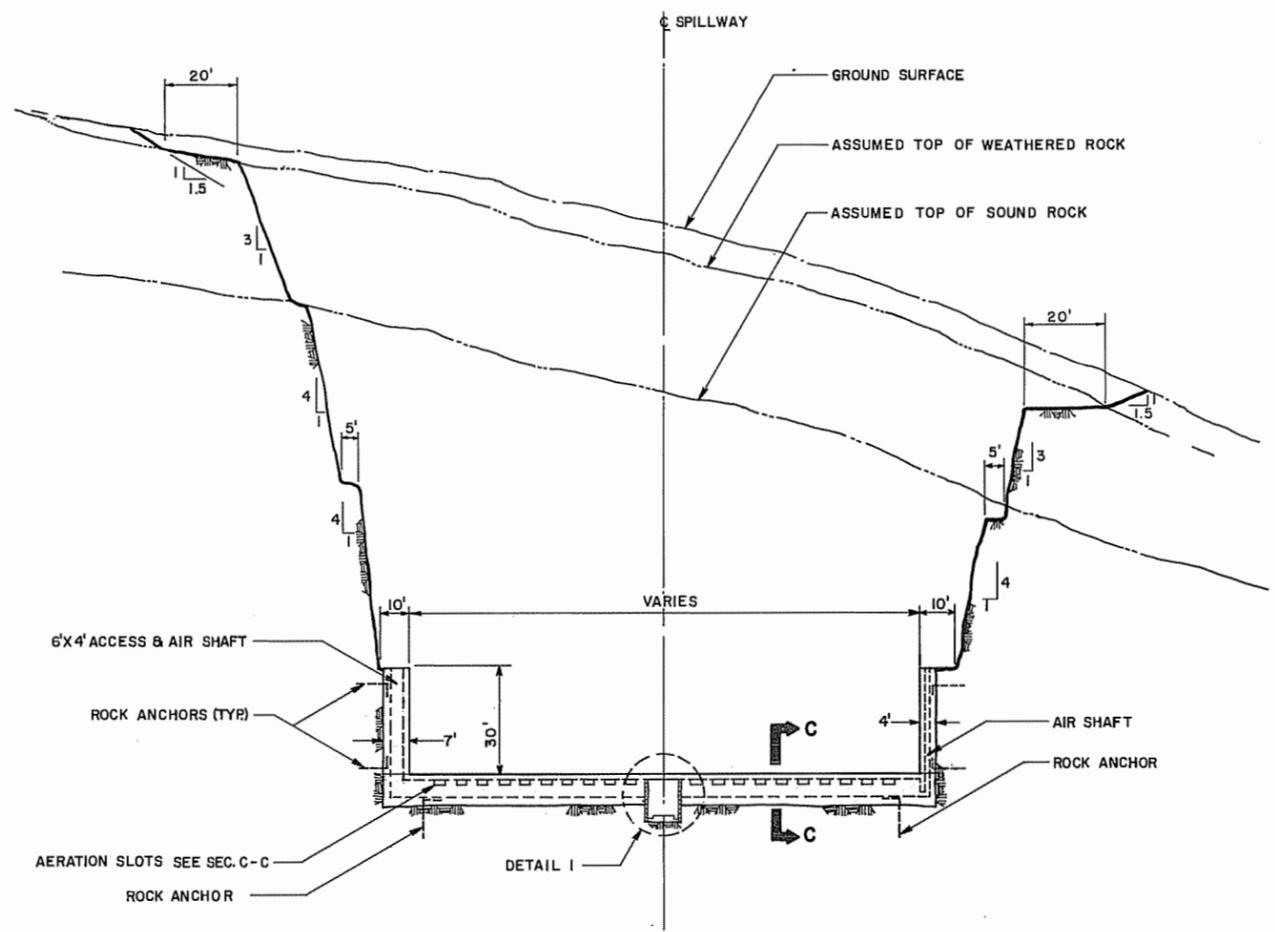


HAZZA-EDASCO
SUSITNA JOINT VENTURE

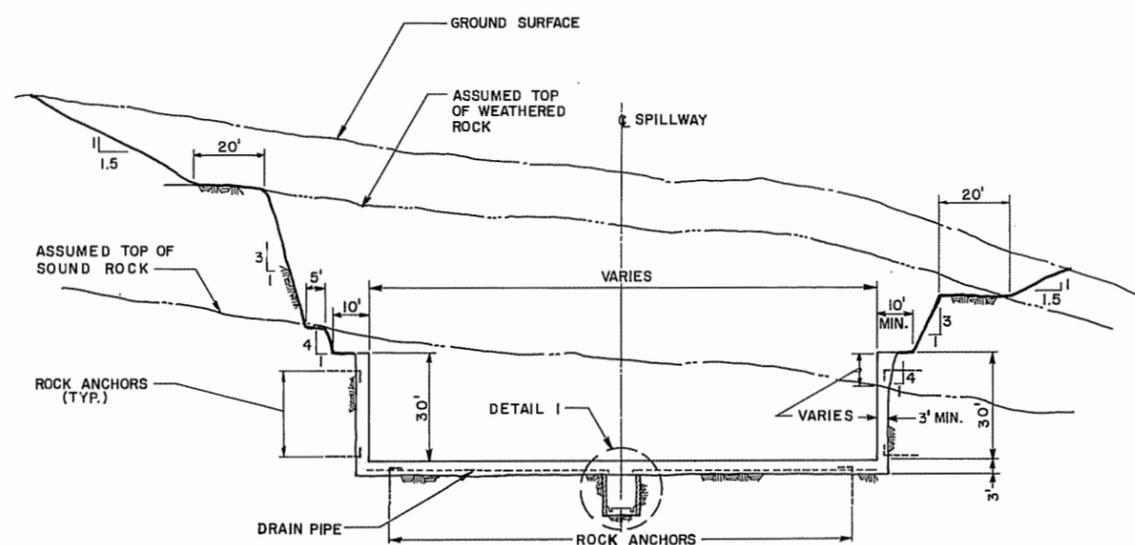
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)

SPILLWAY CONTROL STRUCTURE

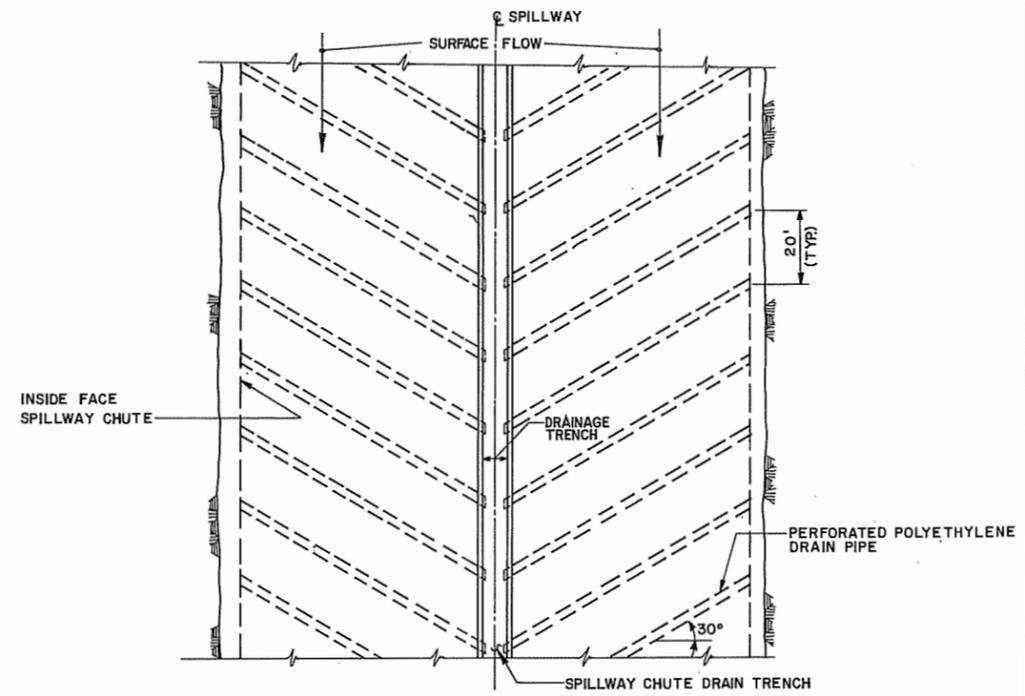
EXHIBIT F PLATE F-13



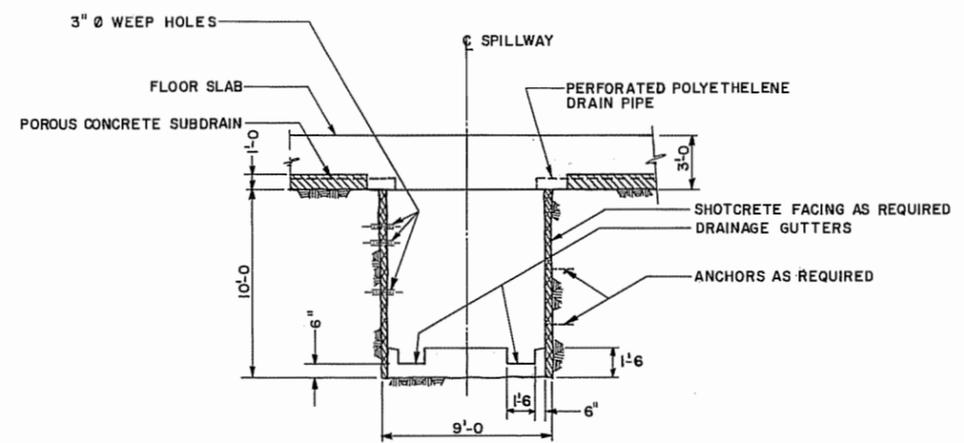
AERATION GALLERY
SECTION A-A (PLATE F12)
SCALE B'



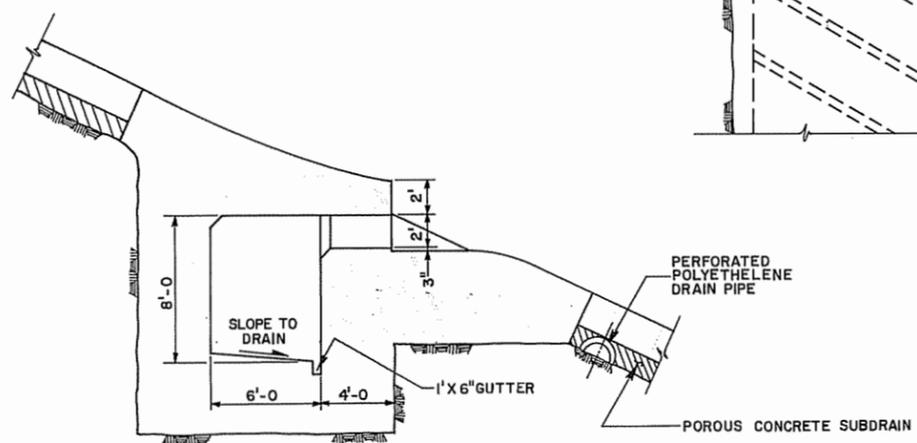
TYPICAL SPILLWAY CHUTE
SECTION B-B (PLATE F12)
SCALE B



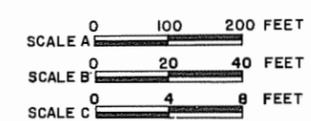
DRAIN PLAN
SCALE B



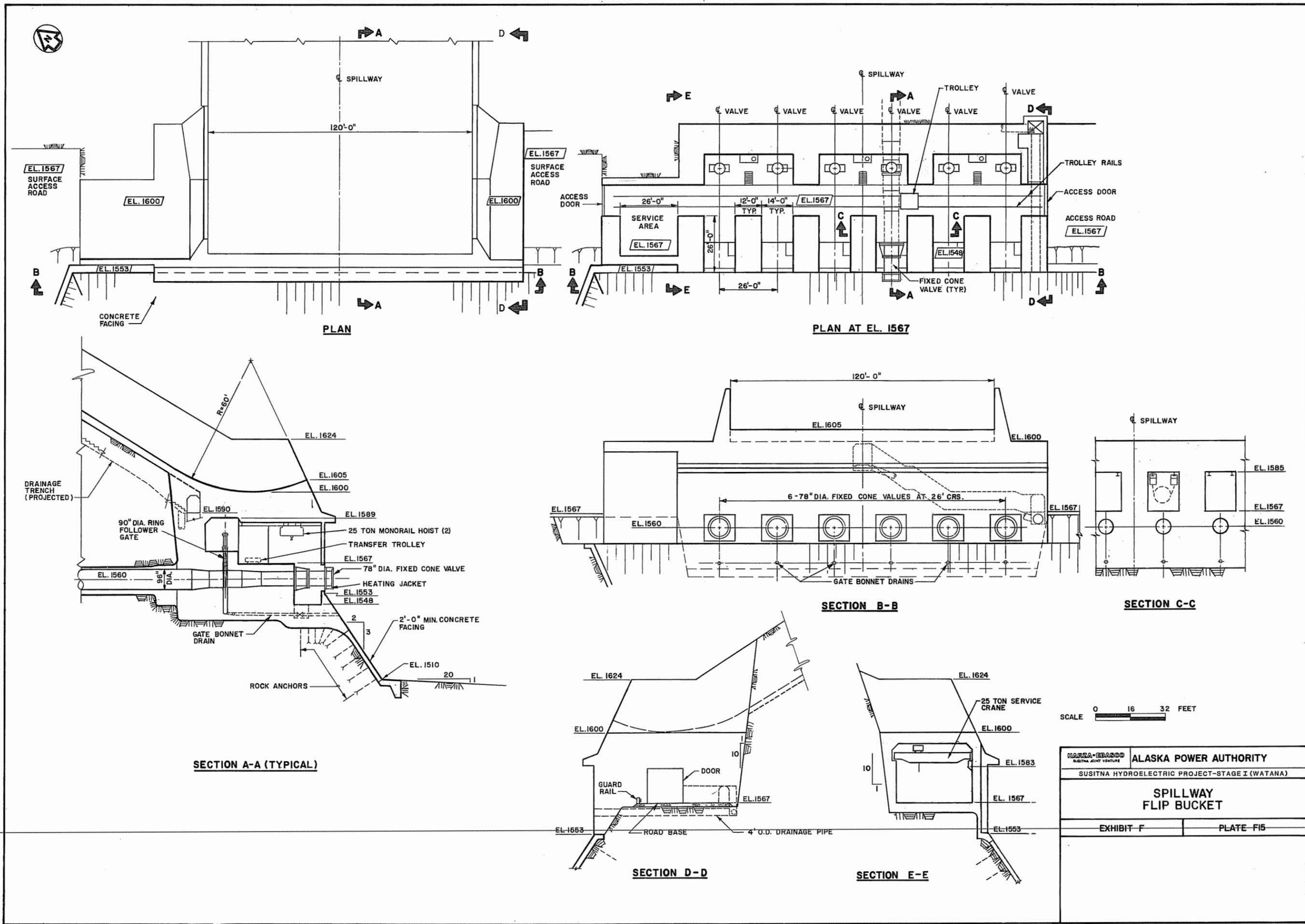
SPILLWAY CHUTE DRAINAGE TRENCH (TYPICAL)
DETAIL I
SCALE C



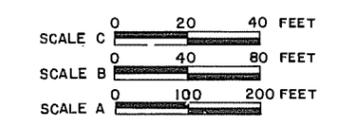
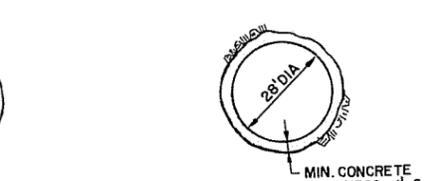
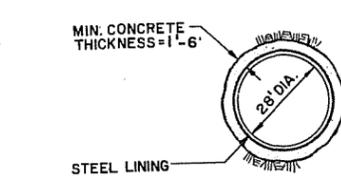
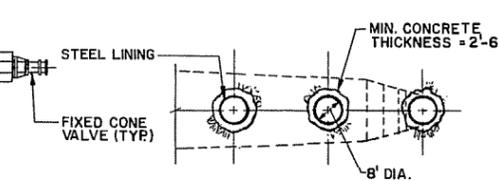
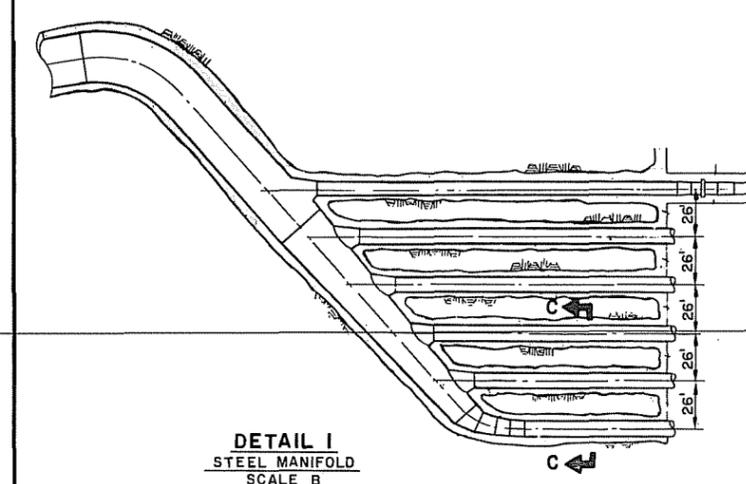
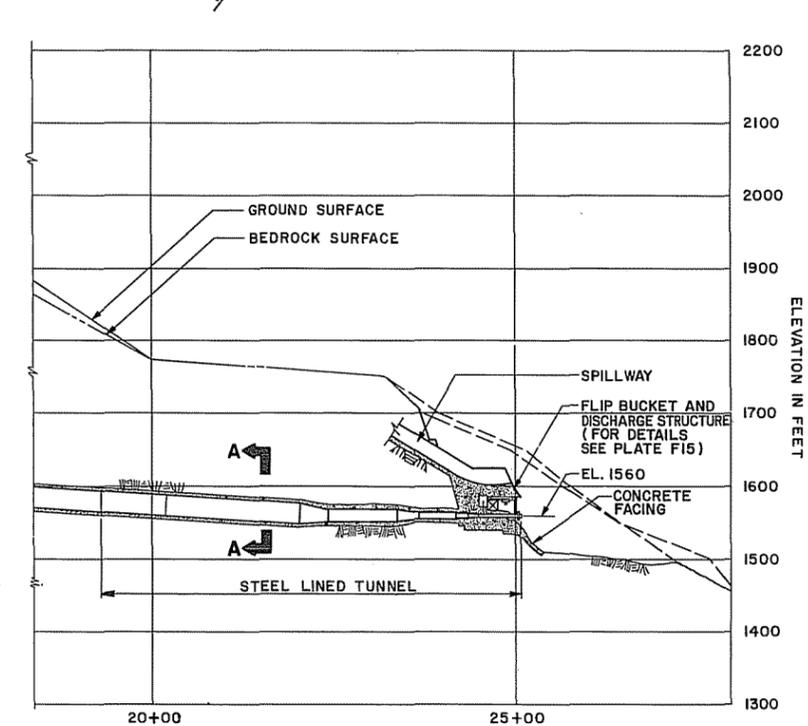
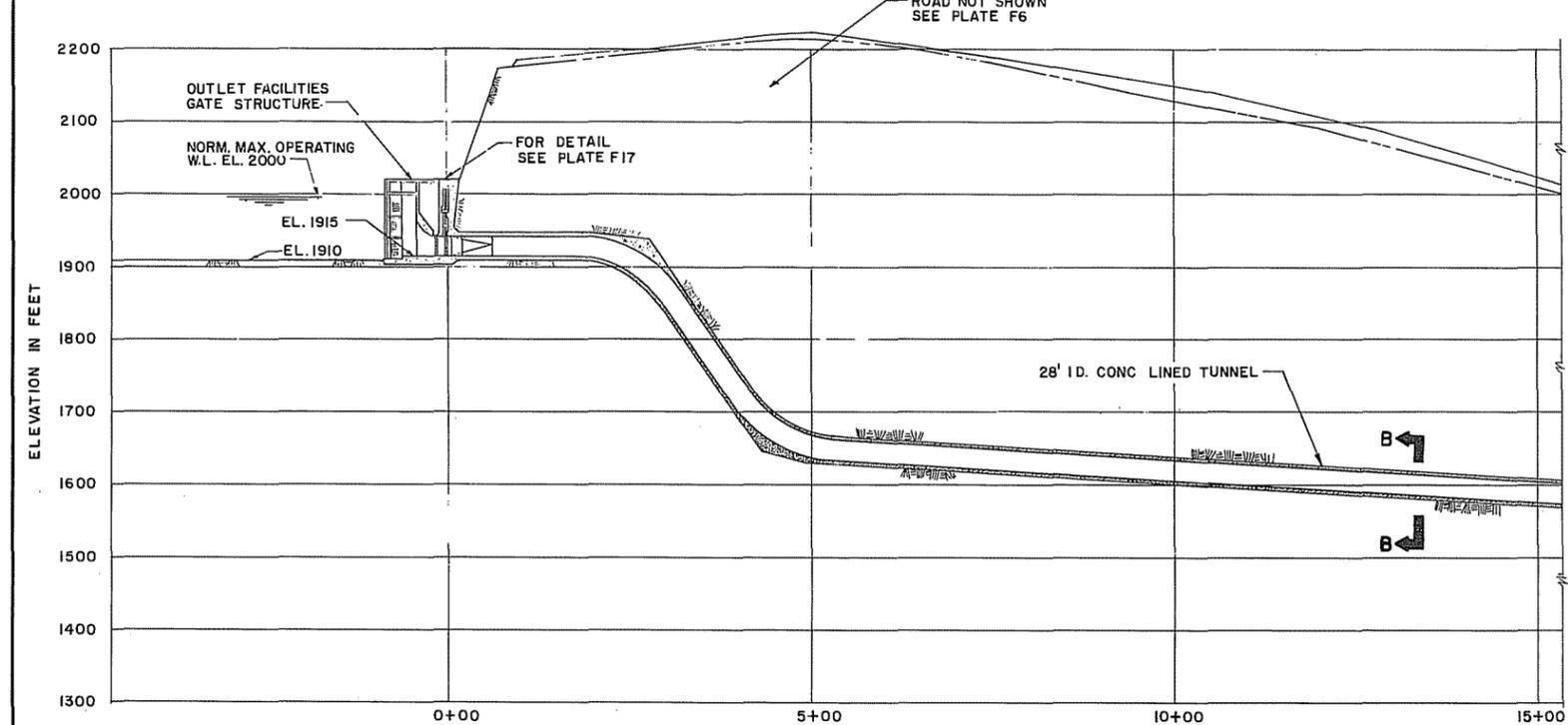
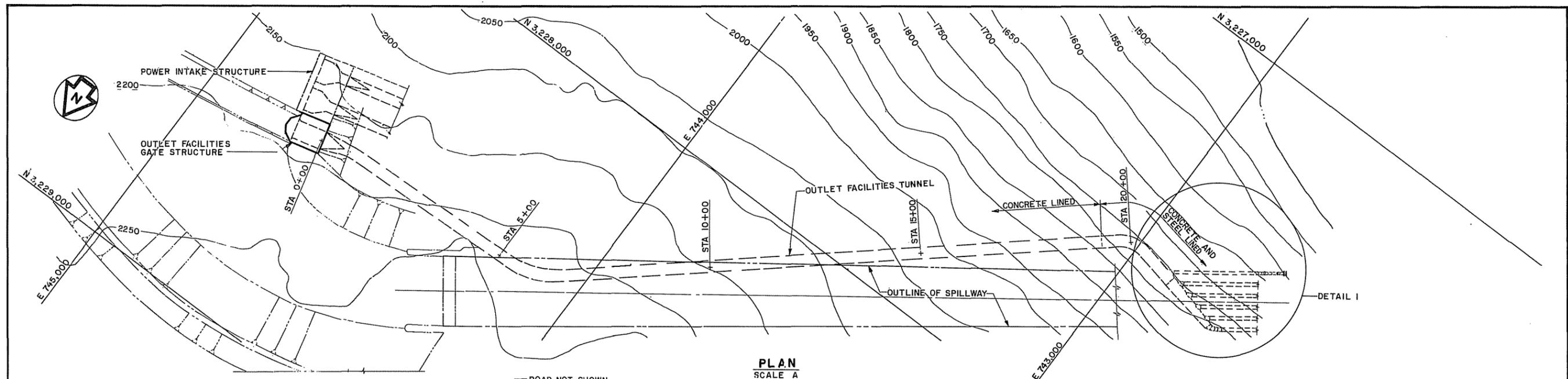
AERATION GALLERY
SECTION C-C
SCALE C



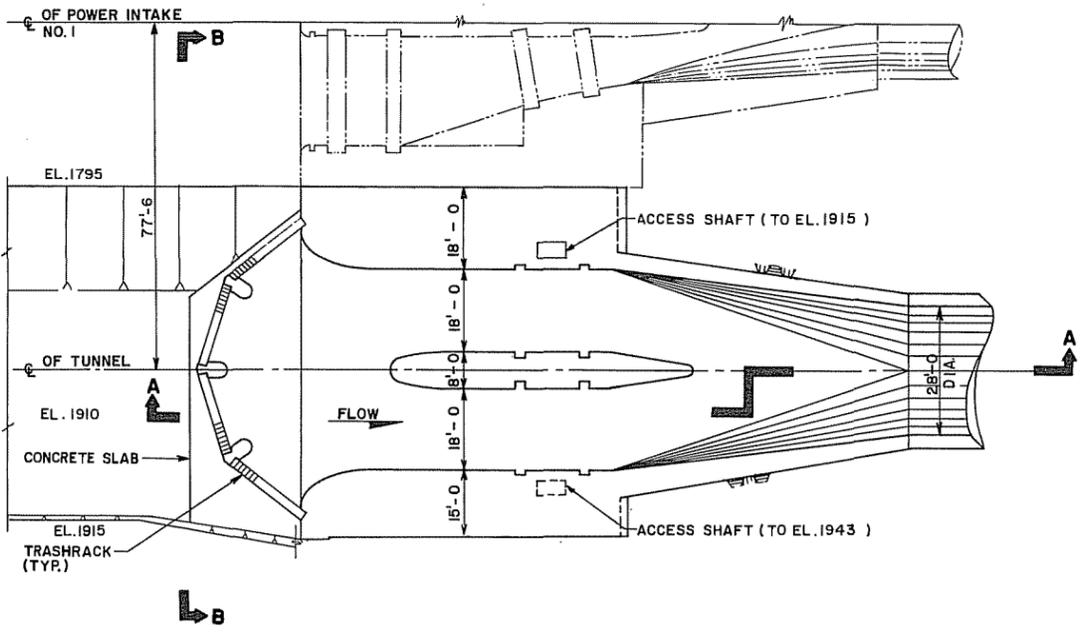
KARZA-ERASSO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
SPILLWAY PROFILE SECTIONS & DRAINAGE FEATURES	
EXHIBIT F	PLATE F 14



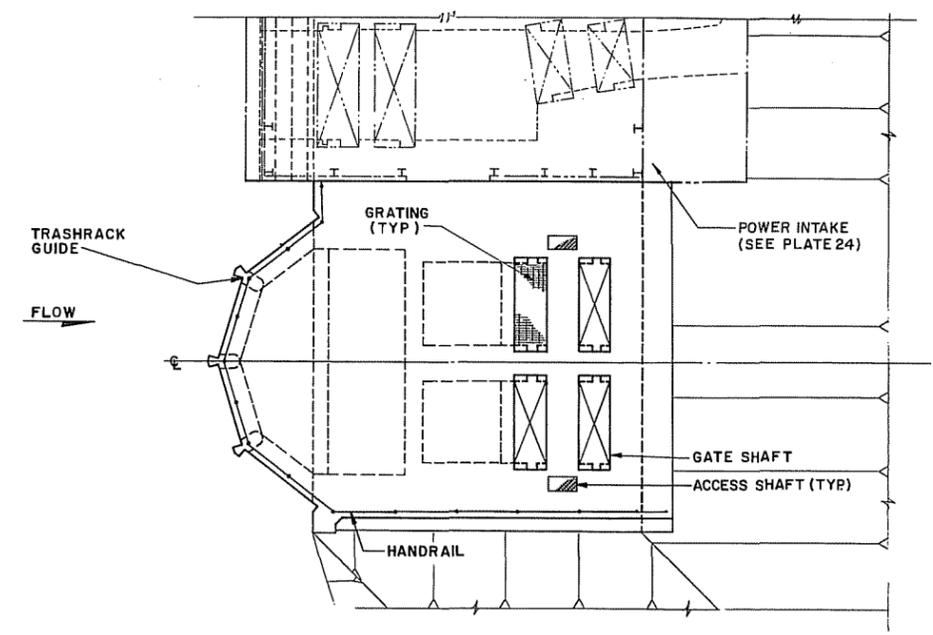
HANZA-ERASSO <small>ENGINEERING ARCHITECTURE</small>		ALASKA POWER AUTHORITY <small>SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)</small>	
SPILLWAY FLIP BUCKET			
EXHIBIT F		PLATE F15	



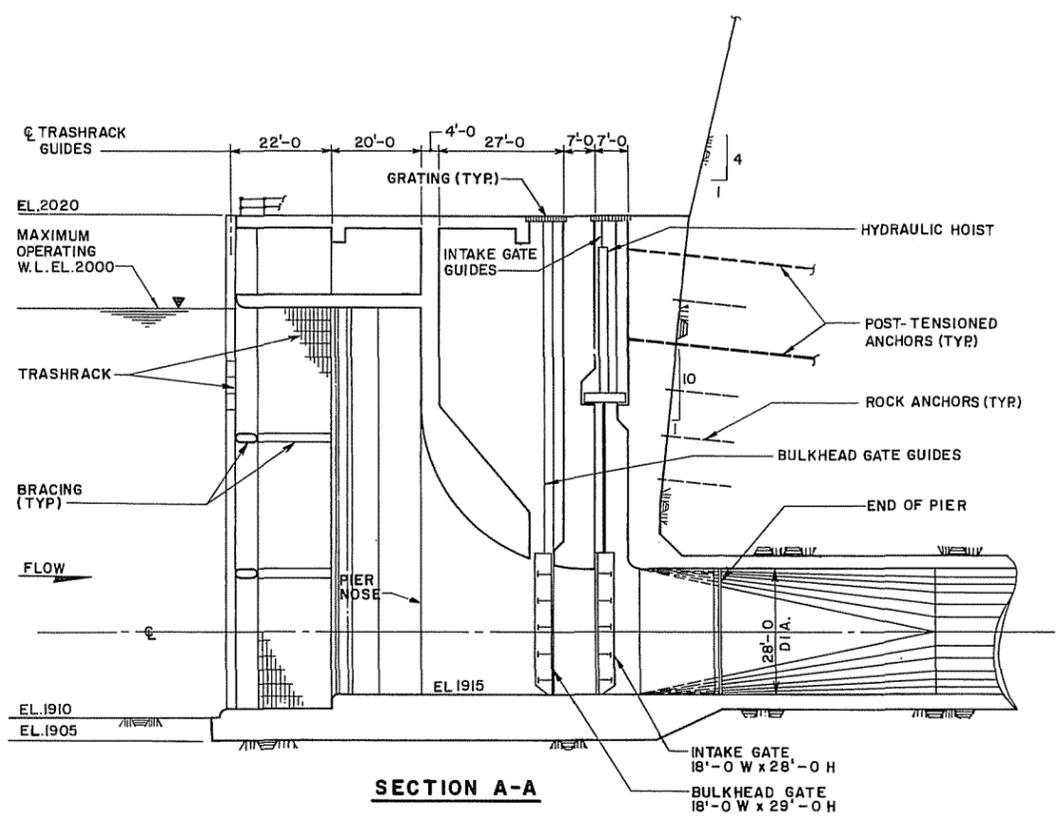
HANZA-EDASCO SUSTINA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSTINA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
OUTLET FACILITIES GENERAL ARRANGEMENT			
EXHIBIT F		PLATE F16	



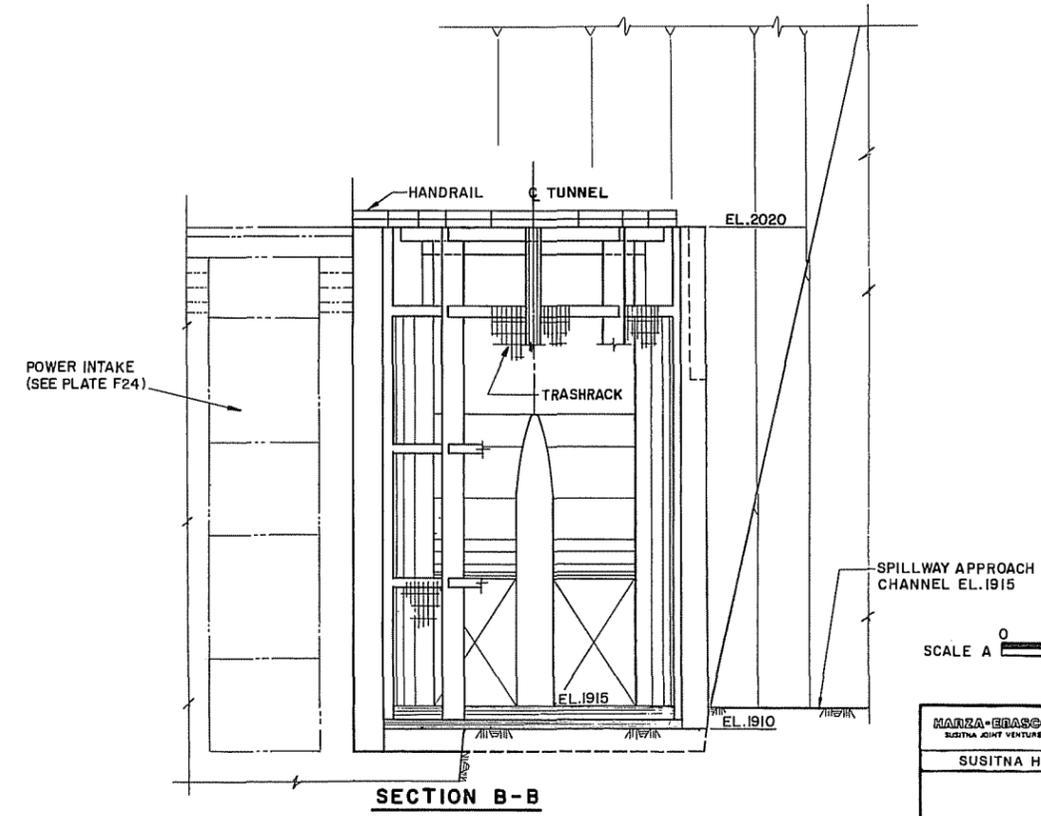
PLAN AT ϕ TUNNEL



PLAN AT EL. 2020



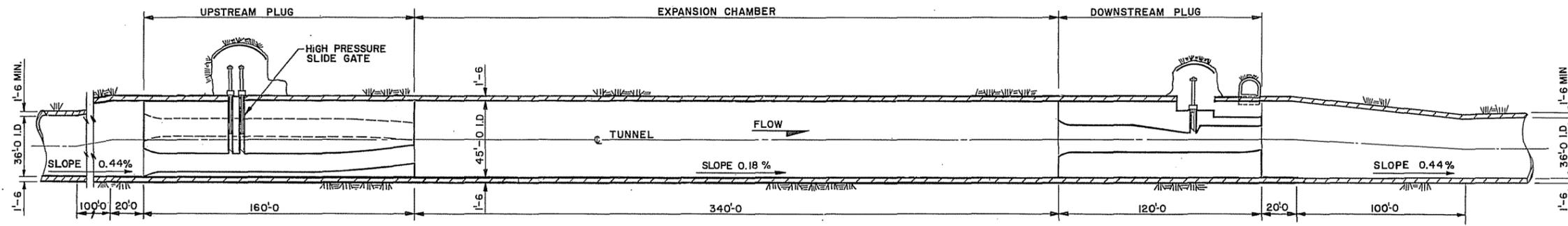
SECTION A-A



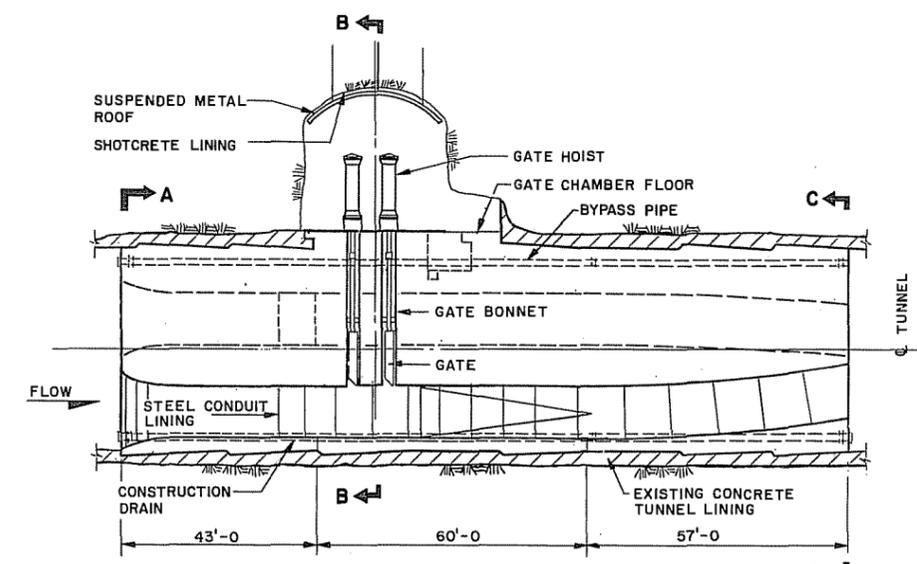
SECTION B-B

SCALE A 0 16 32 FEET

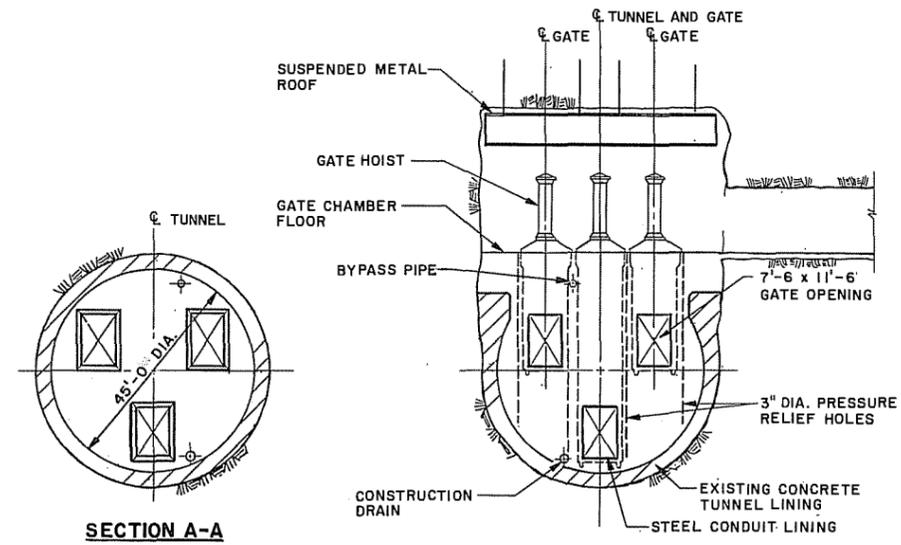
MANZA-BRASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
OUTLET FACILITIES GATE STRUCTURE	
EXHIBIT F	PLATE F-17



SECTION ALONG C-C OF TUNNEL NO. 1
SCALE A

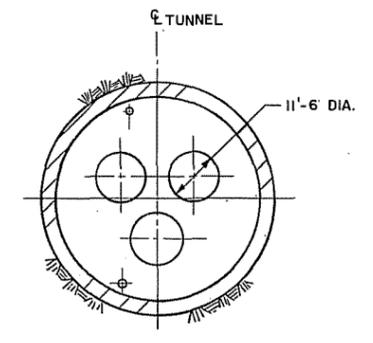


LOW LEVEL OUTLET UPSTREAM PLUG
SCALE B

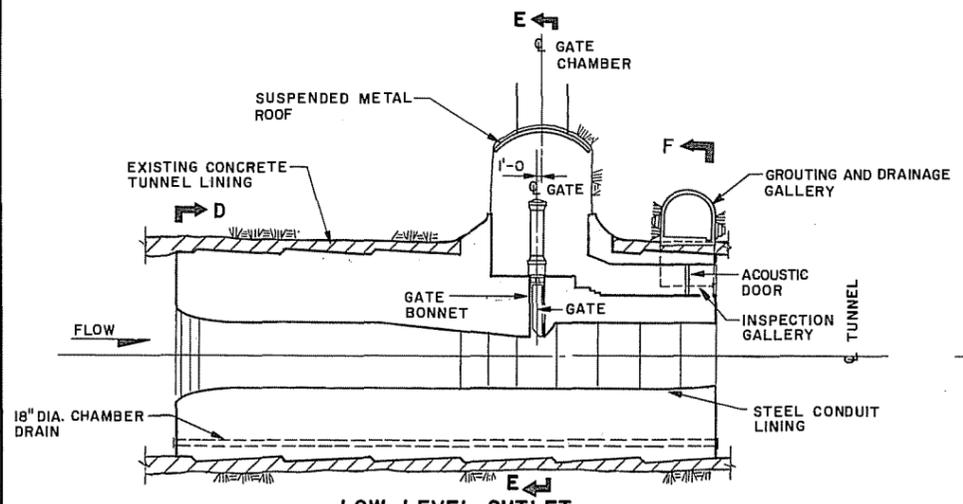


SECTION A-A
SCALE B

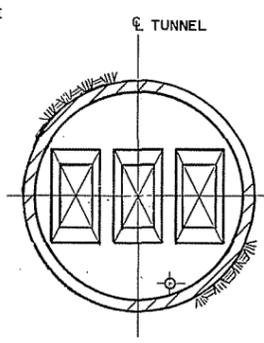
SECTION B-B
SCALE B



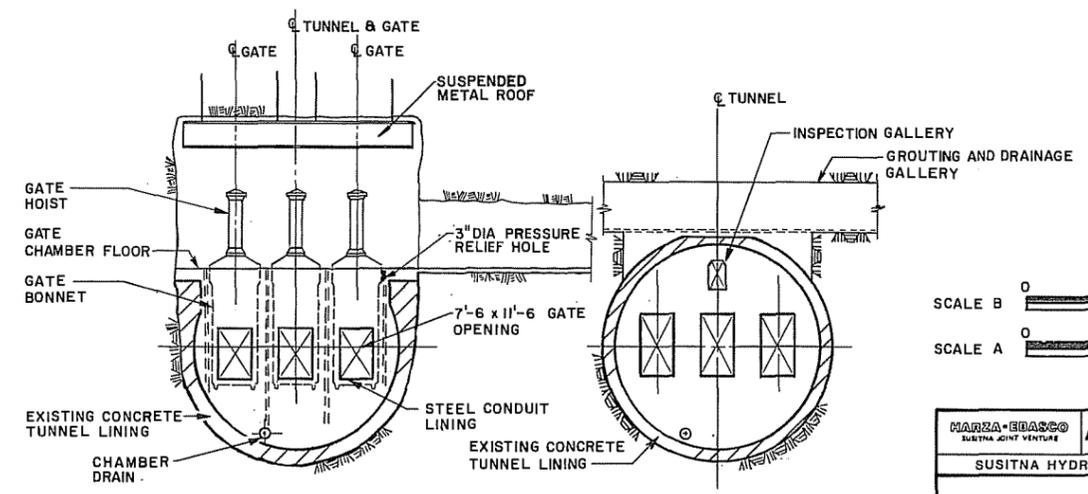
SECTION C-C
SCALE B



LOW LEVEL OUTLET DOWNSTREAM PLUG
SCALE B

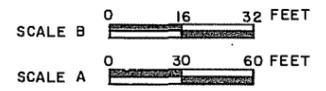


SECTION D-D
SCALE B

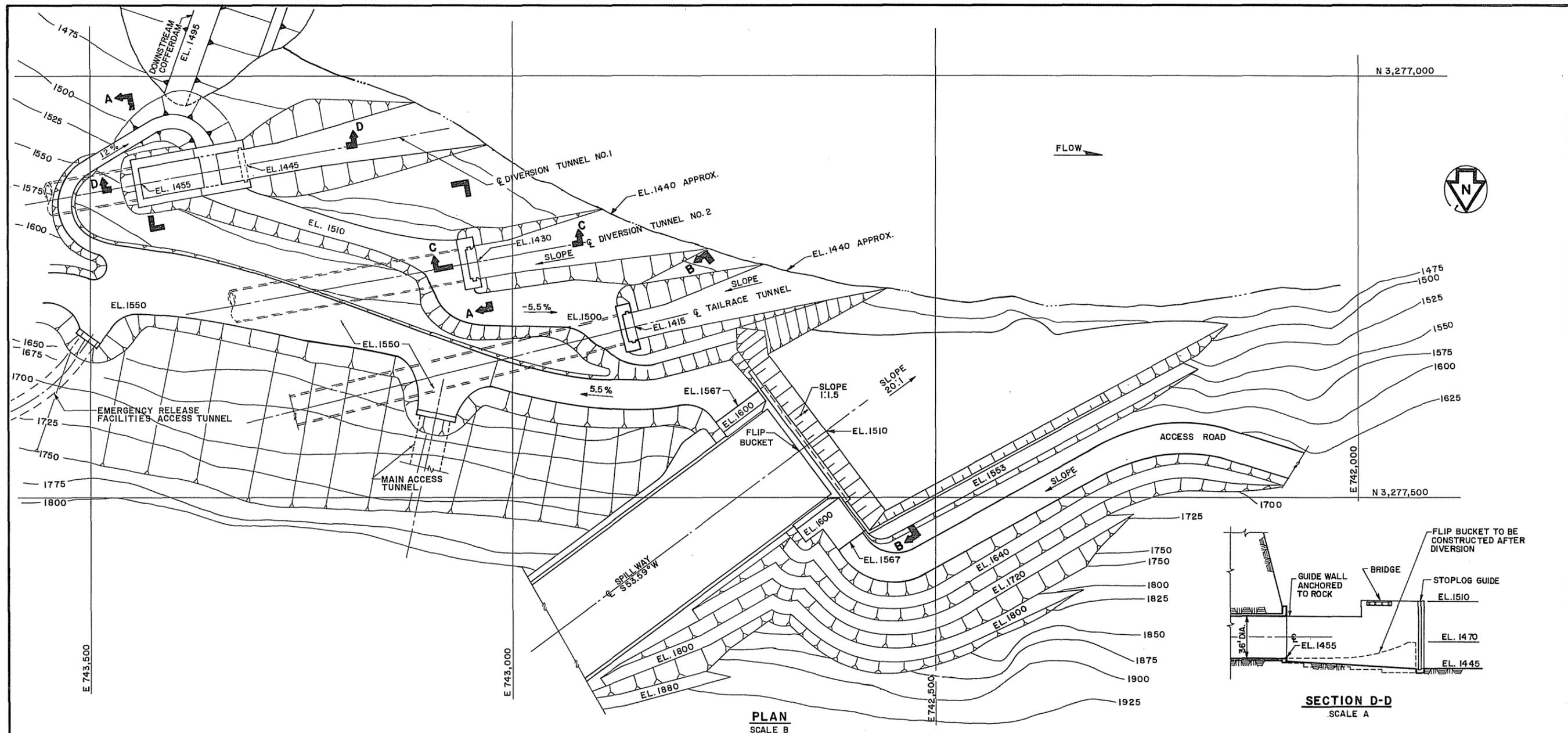


SECTION E-E
SCALE B

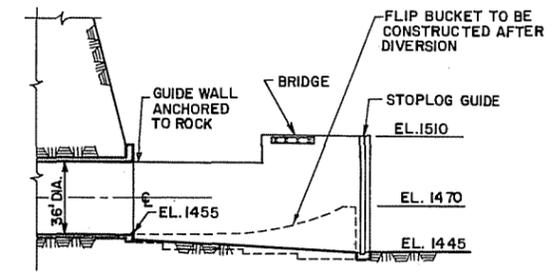
SECTION F-F
SCALE B



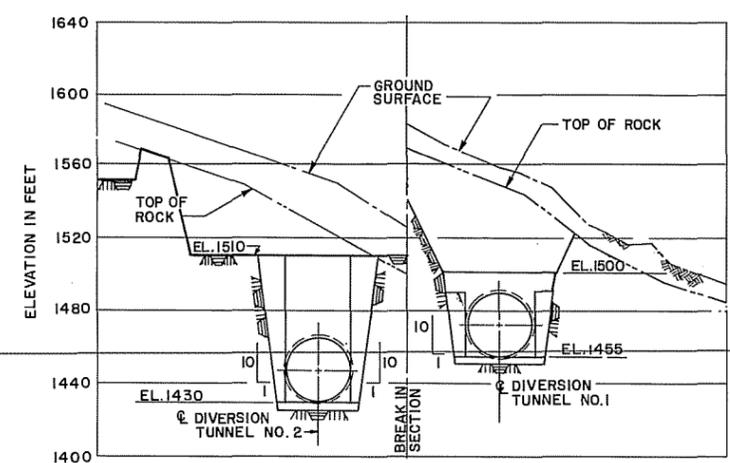
HARZA-EDASCO <small>SUBSTRA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
EMERGENCY RELEASE FACILITIES SECTIONS			
EXHIBIT F		PLATE F-19	



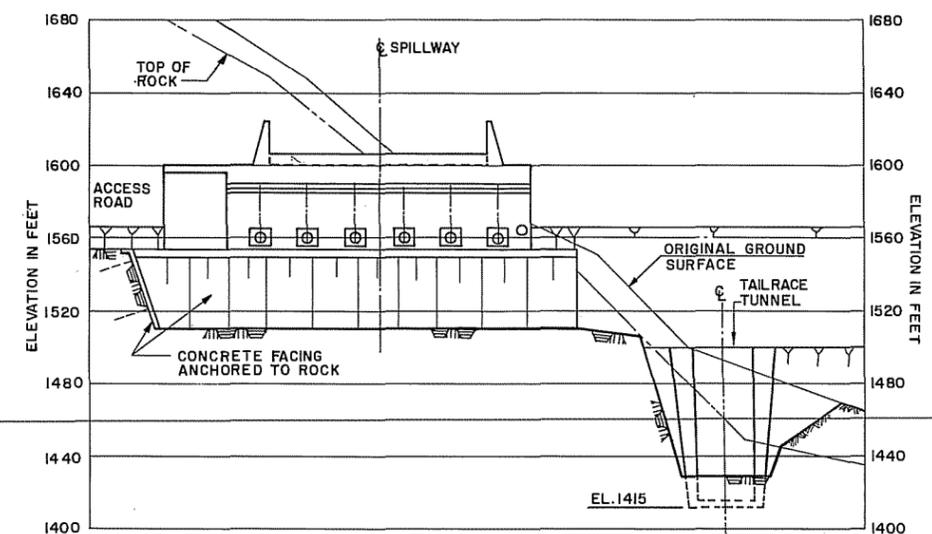
PLAN
SCALE B



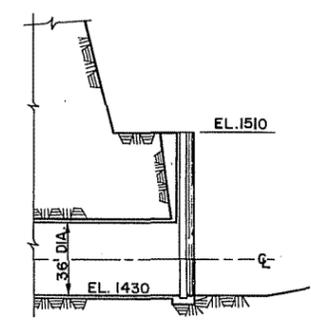
SECTION D-D
SCALE A



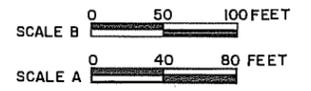
SECTION A-A
SCALE A



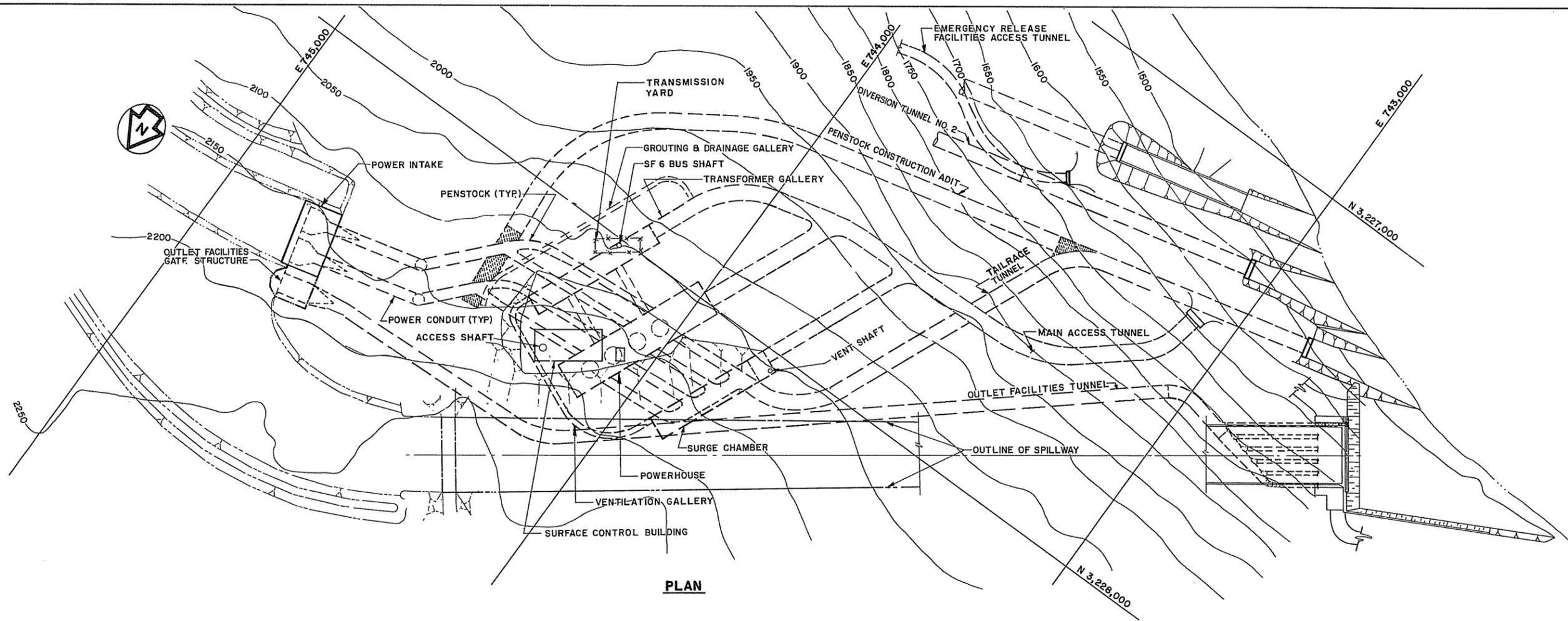
SECTION B-B
SCALE A



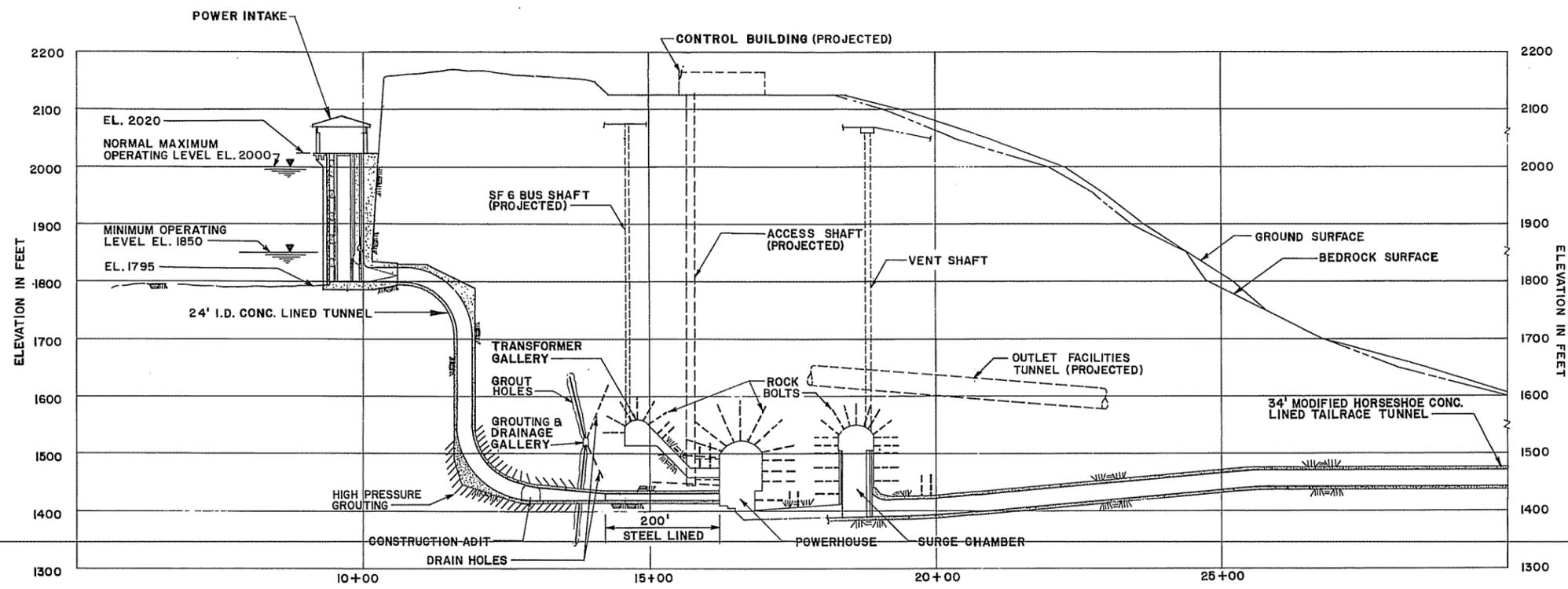
SECTION C-C
SCALE A



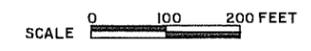
MARZA-BRASC® SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
DOWNSTREAM PORTALS PLAN & SECTIONS			
EXHIBIT F		PLATE F-20	



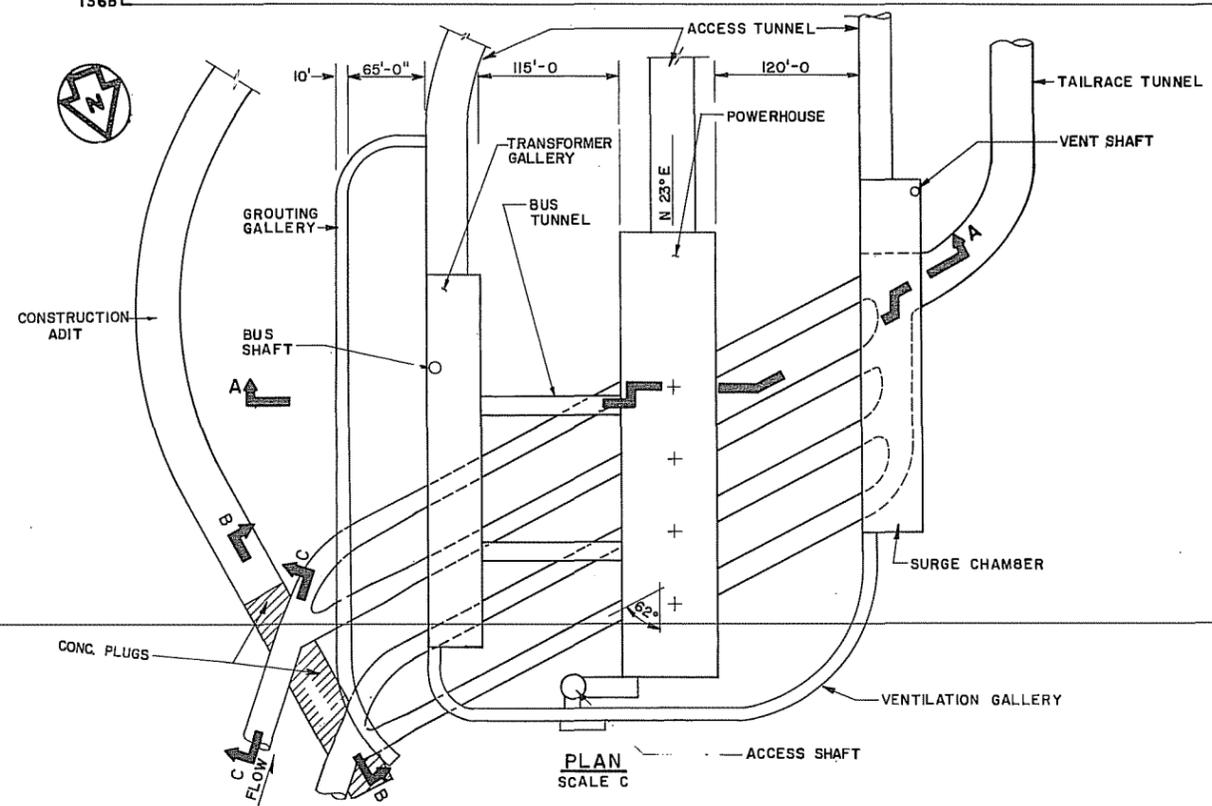
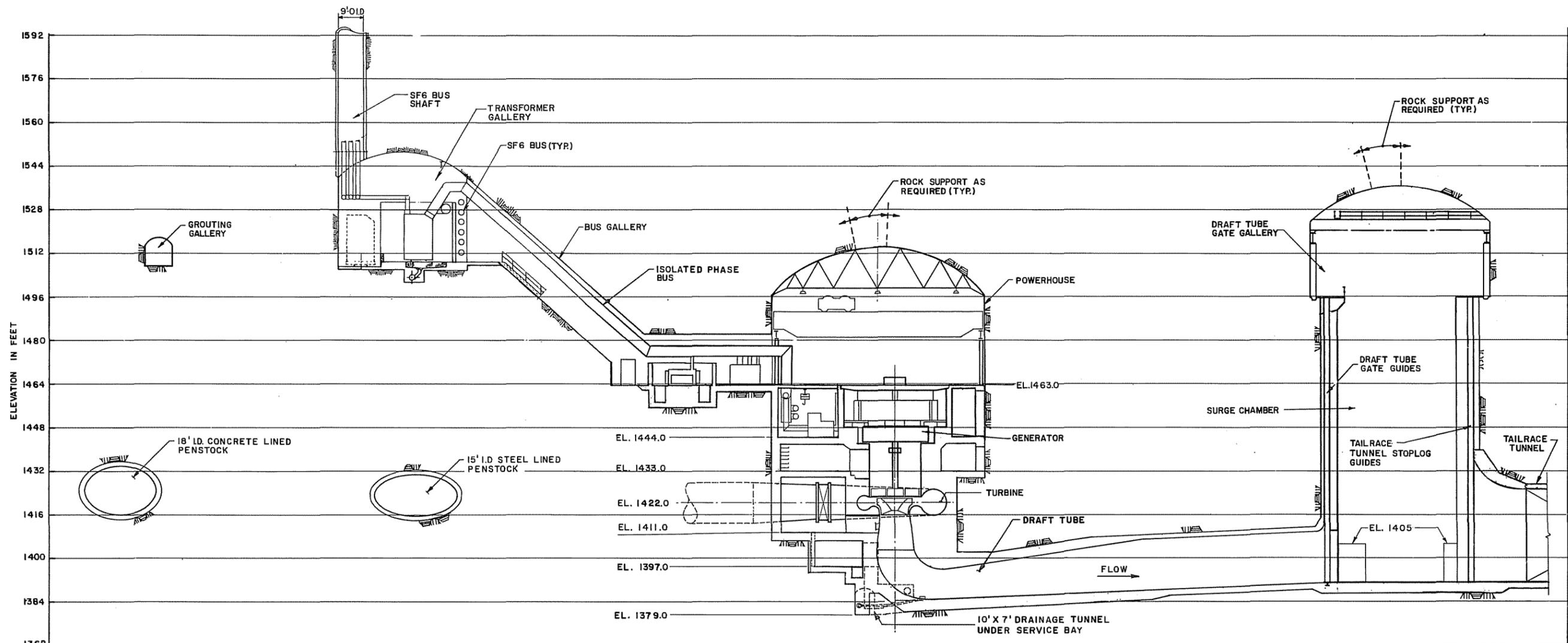
PLAN



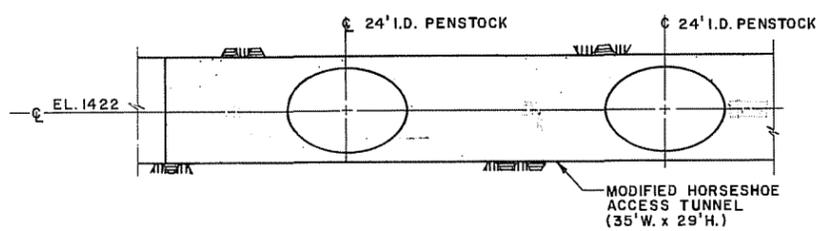
PROFILE



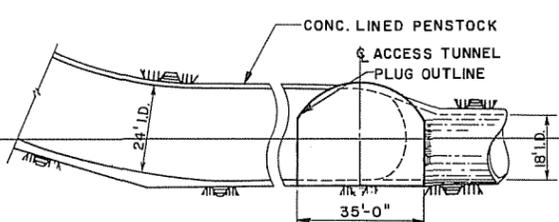
<small>HANZA-ERASSO</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
POWER FACILITIES GENERAL ARRANGEMENT			
EXHIBIT F		PLATE F-21	



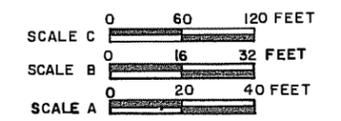
SECTION THRU CENTERLINE OF UNIT
SECTION A-A
SCALE B



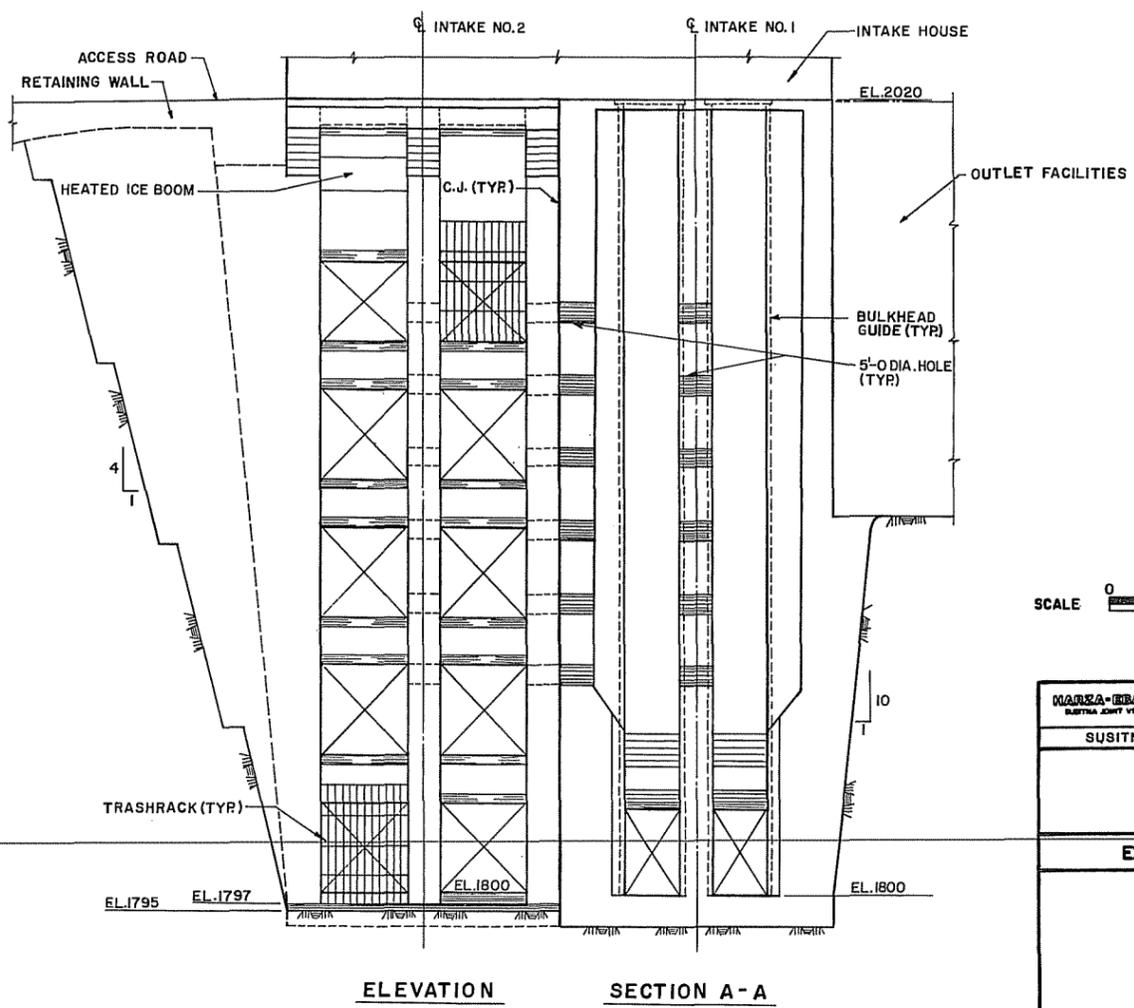
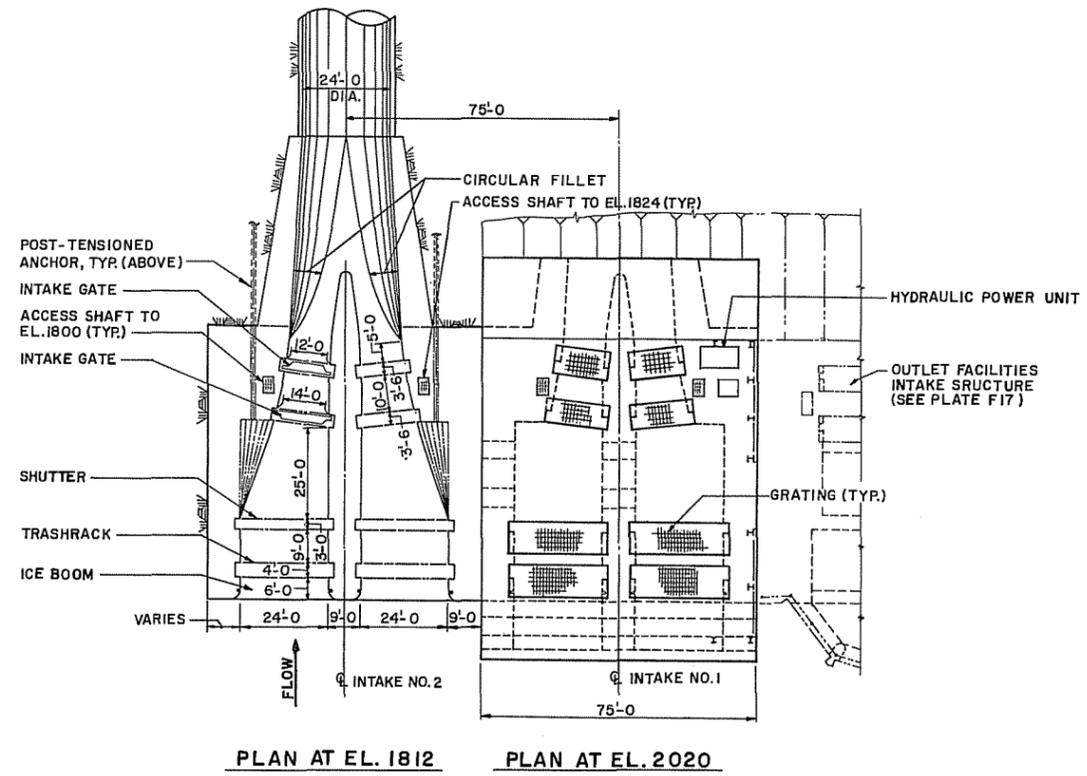
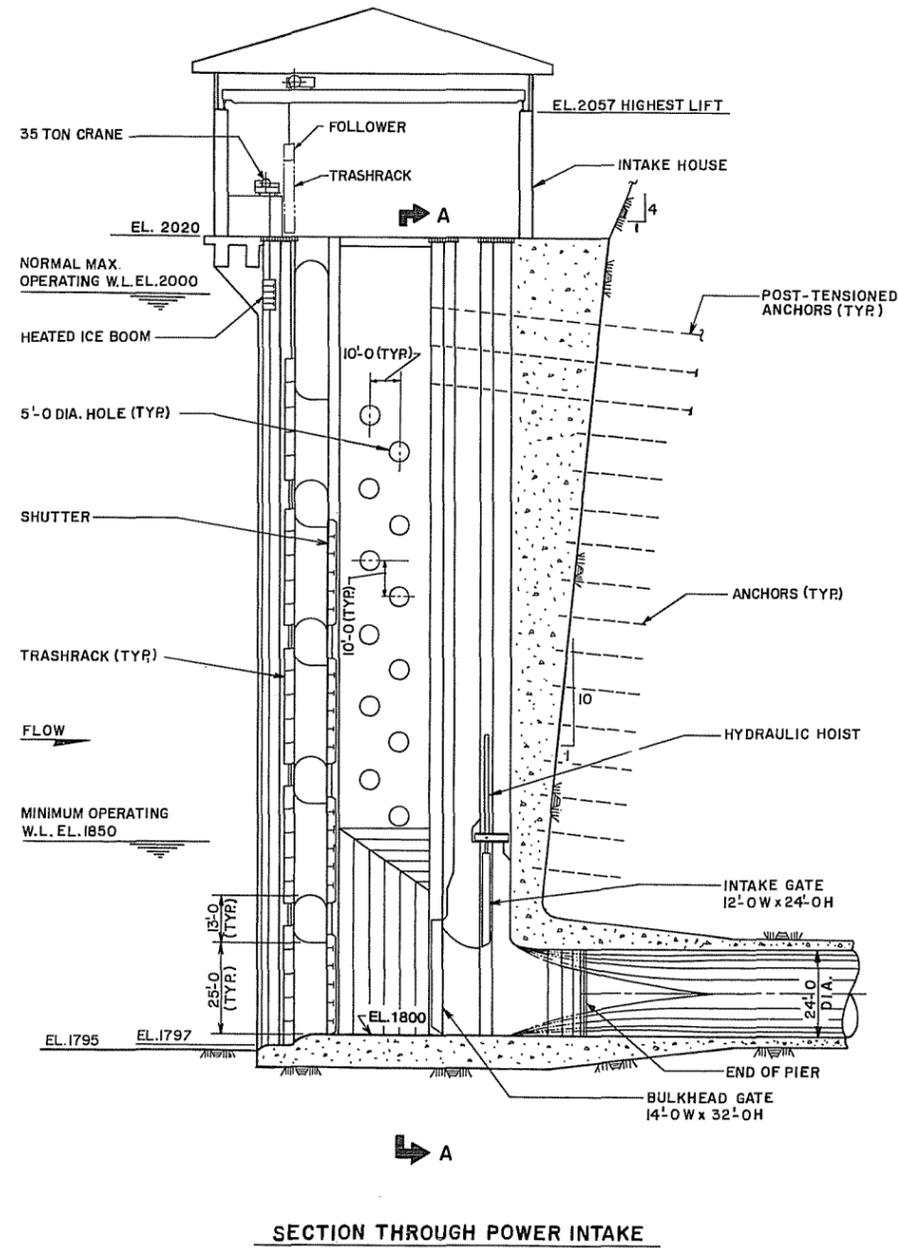
SECTION B-B
SCALE A



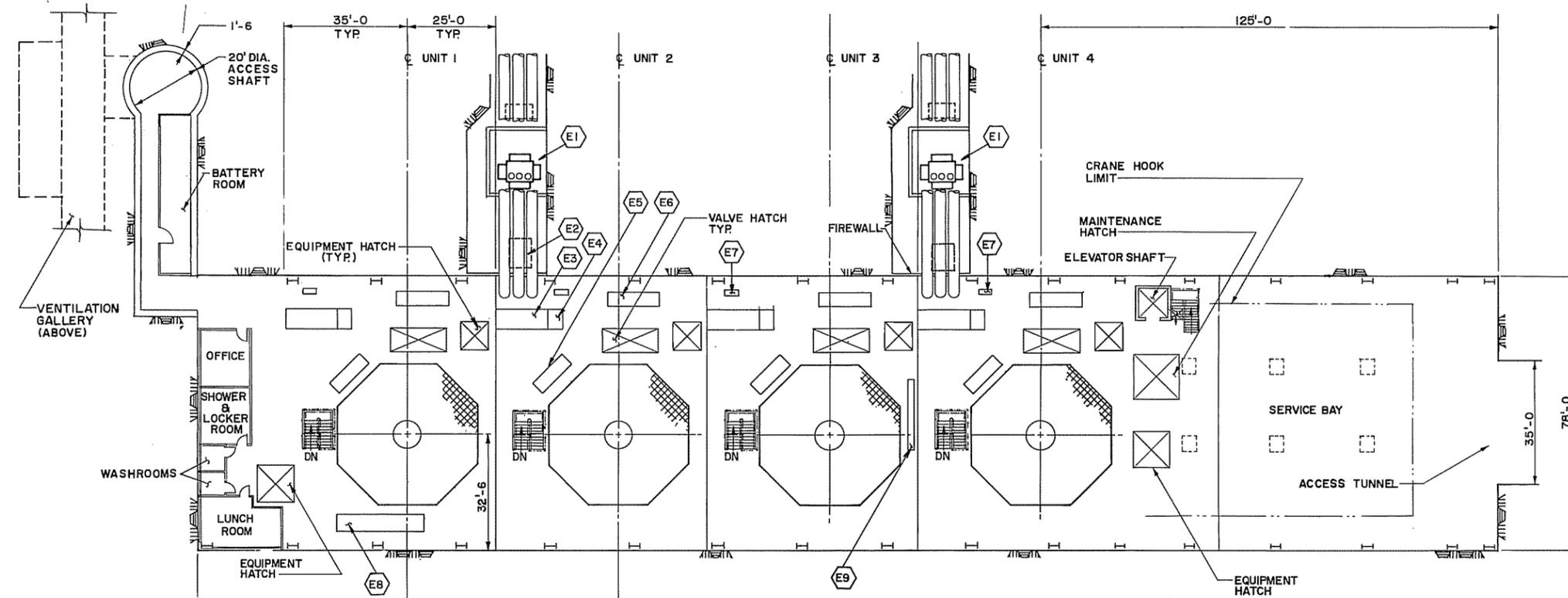
SECTION C-C
SCALE A



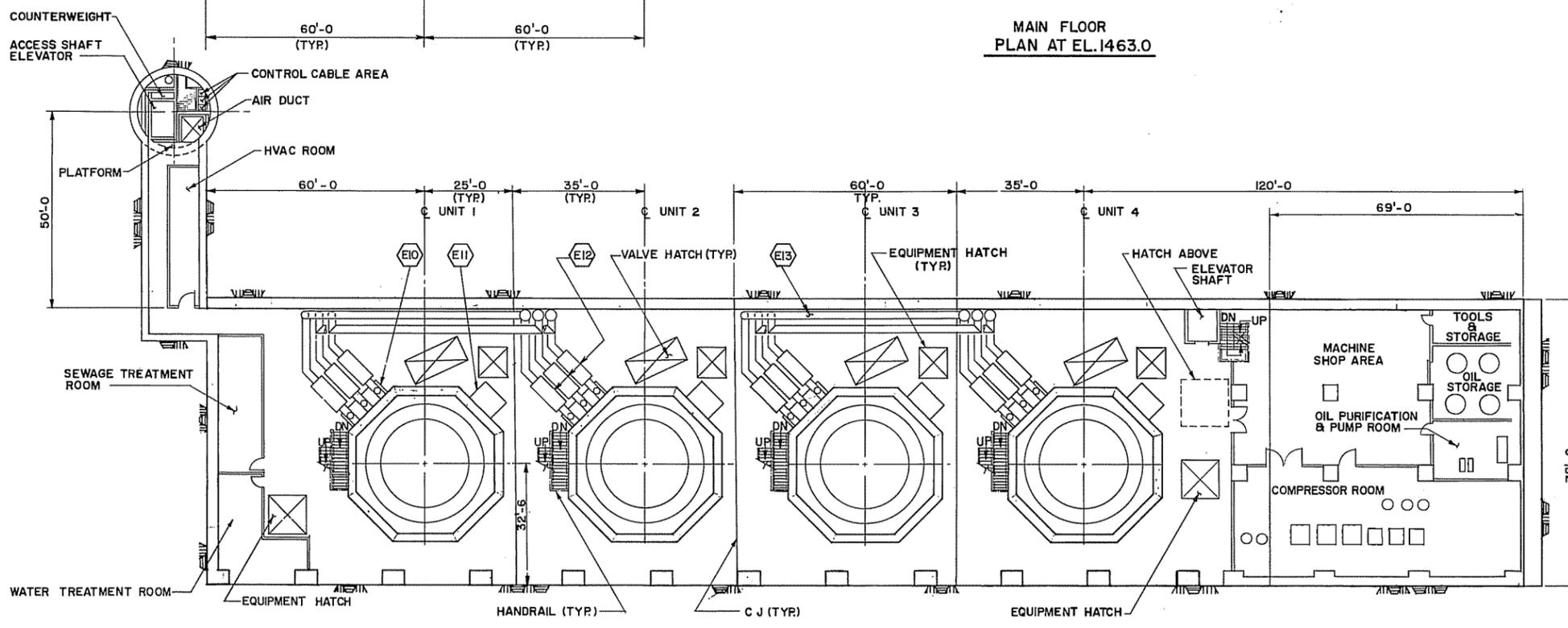
HANZA-BASCO ELECTRICAL ENGINEERS		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
POWER FACILITIES PLAN & SECTIONS			
EXHIBIT F		PLATE F 23	



		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
POWER INTAKE SECTIONS			
EXHIBIT F		PLATE F 24	



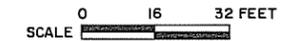
MAIN FLOOR
PLAN AT EL. 1463.0



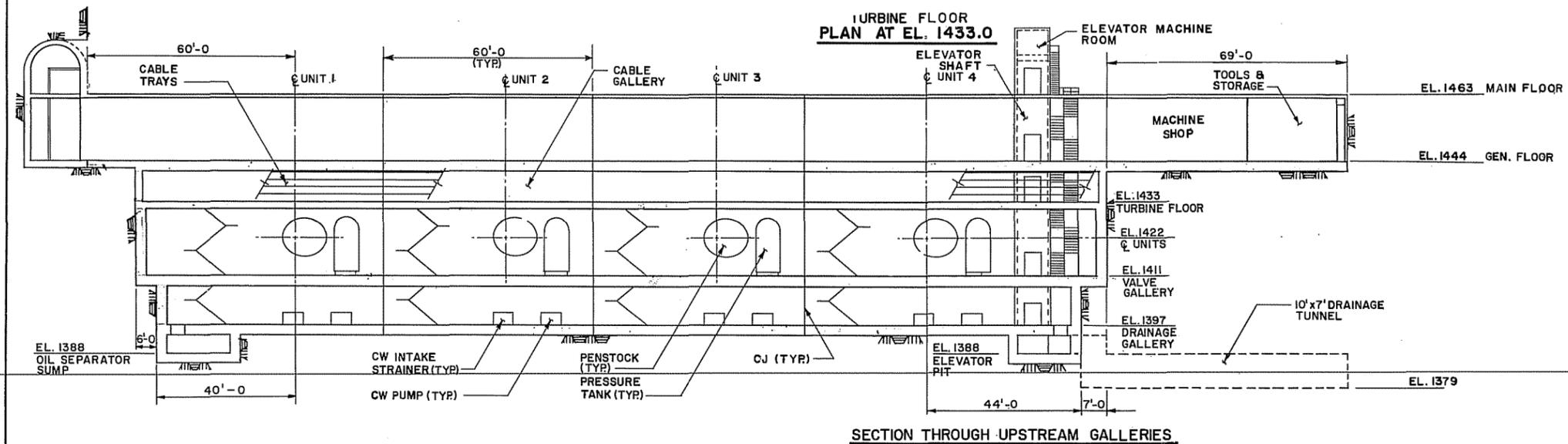
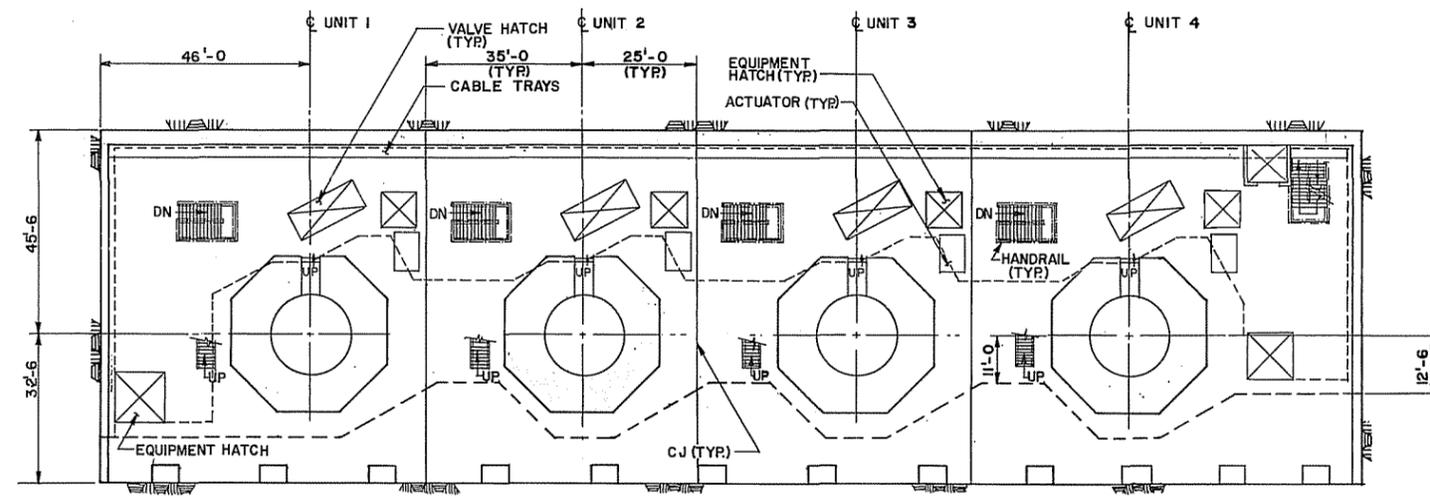
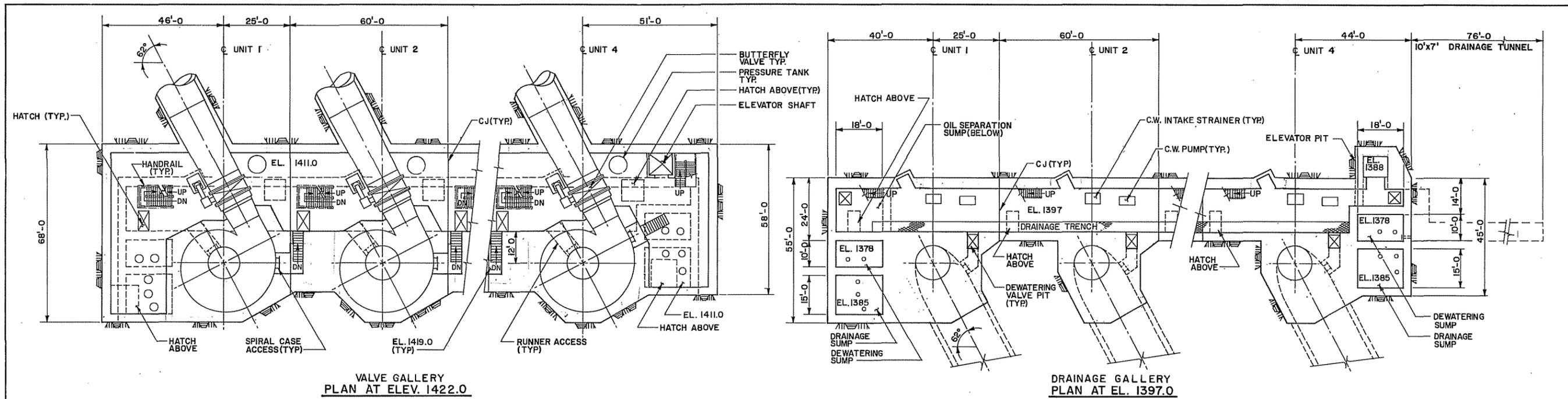
GENERATOR FLOOR
PLAN AT EL. 1444.0

LEGEND

- E1 AUXILIARY SERVICE TRANSFORMER 7.5/10MVA
- E2 AUXILIARY SERVICE TRANSFORMER 2 MVA (TYP)
- E3 UNIT CONTROL SWITCH BOARD (TYP)
- E4 GOVERNOR-ELECT CUBICLE (TYP)
- E5 EXCITATION TRANSFORMER (TYP)
- E6 EXCITATION CUBICLES (TYP)
- E7 480V PDP (TYP)
- E8 STATION SERVICE SWITCHGEAR (480V)
- E9 ESSENTIAL AC/DC SWBD
- E10 GENERATOR SURGE PROTECTION CUBICAL
- E11 GENERATOR NEUTRAL CUBICLE
- E12 GENERATOR CIRCUIT BREAKERS
- E13 15 KV ISOLATED PHASE BUS

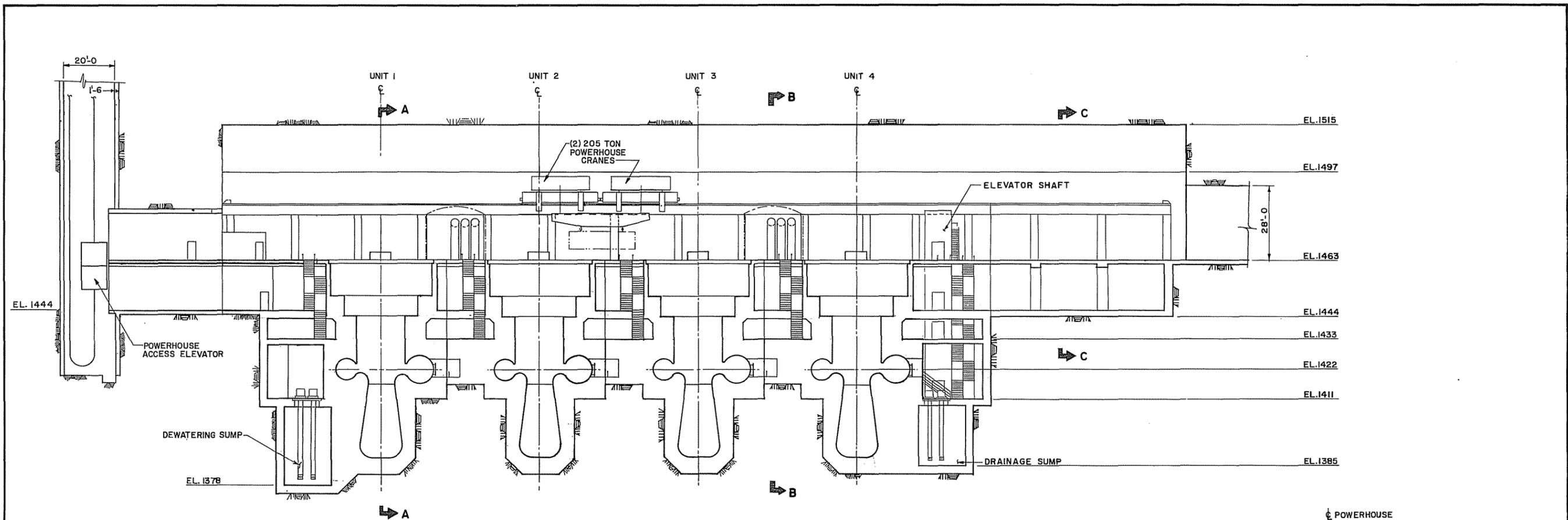


MARZA-BASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
POWERHOUSE PLANS	
EXHIBIT F	PLATE F 25

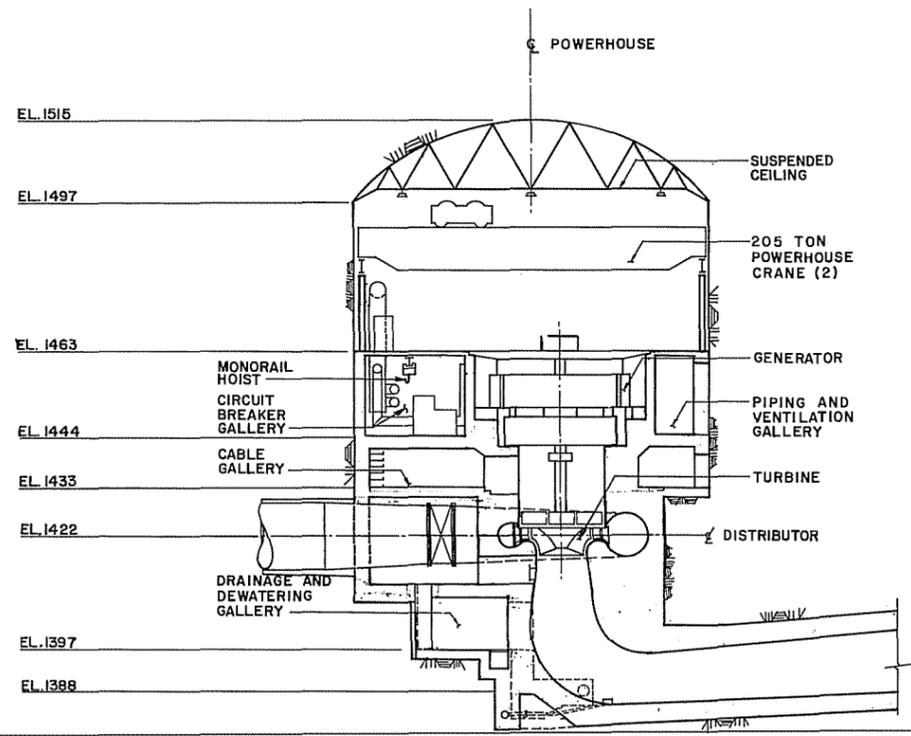


SCALE A 0 16 32 FEET

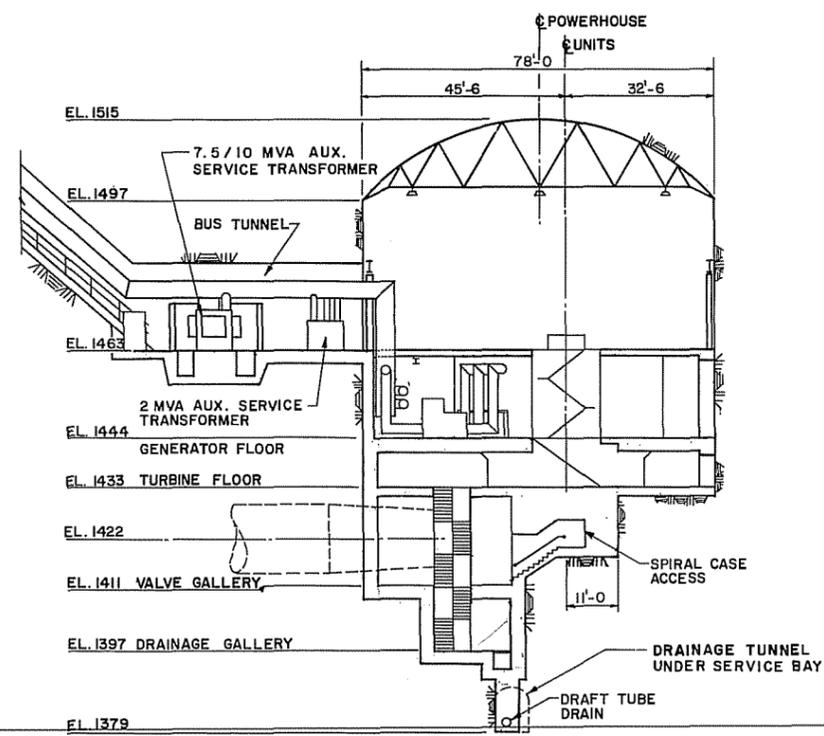
MARZA-GEASCO BESTMA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
POWERHOUSE PLANS AND SECTION			
EXHIBIT F		PLATE F 25A	



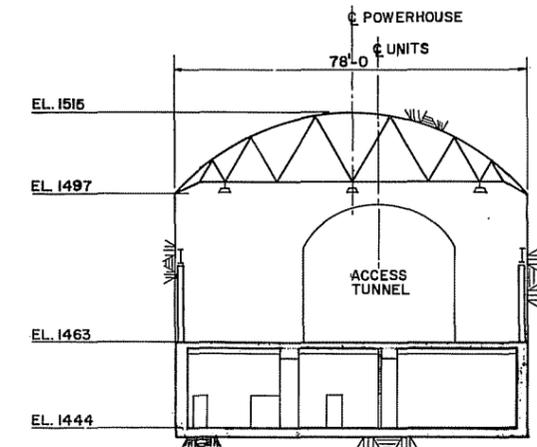
LONGITUDINAL SECTION (THRU CENTERLINE OF UNITS, UNITS NOT SHOWN)



SECTION A-A (SECTION THRU CENTERLINE OF UNIT)



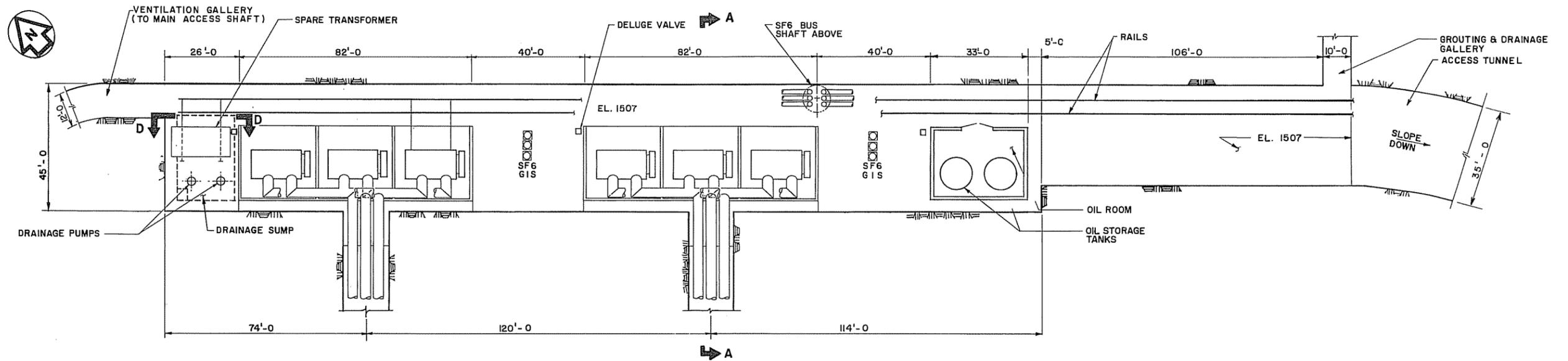
SECTION B-B (SECTION THRU BUS TUNNEL)



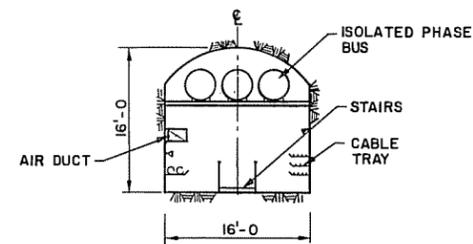
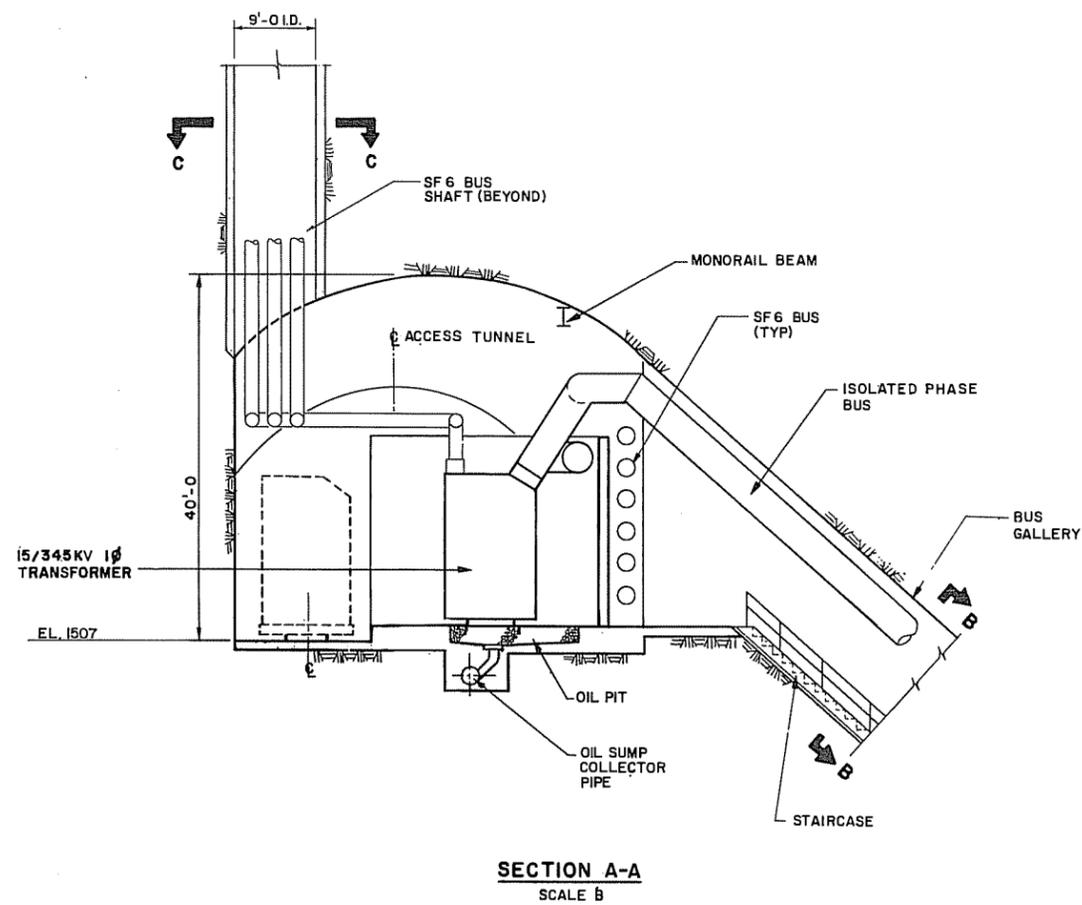
SECTION C-C
SECTION THRU SERVICE BAY

SCALE 0 16 32 FEET

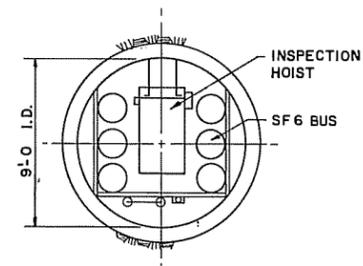
MARZA-BEASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
POWERHOUSE SECTIONS			
EXHIBIT F		PLATE F 26	



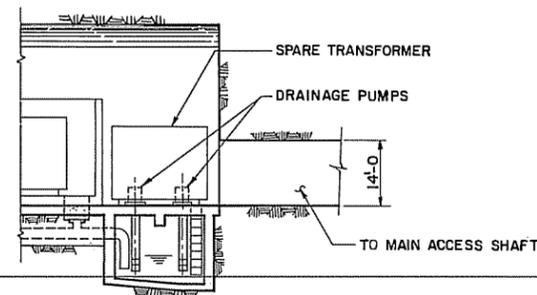
PLAN
SCALE A



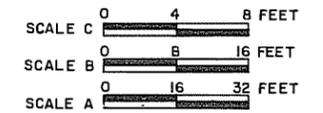
SECTION B-B
THROUGH BUS GALLERY
SCALE B



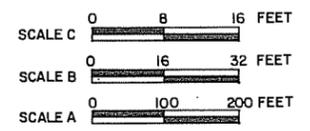
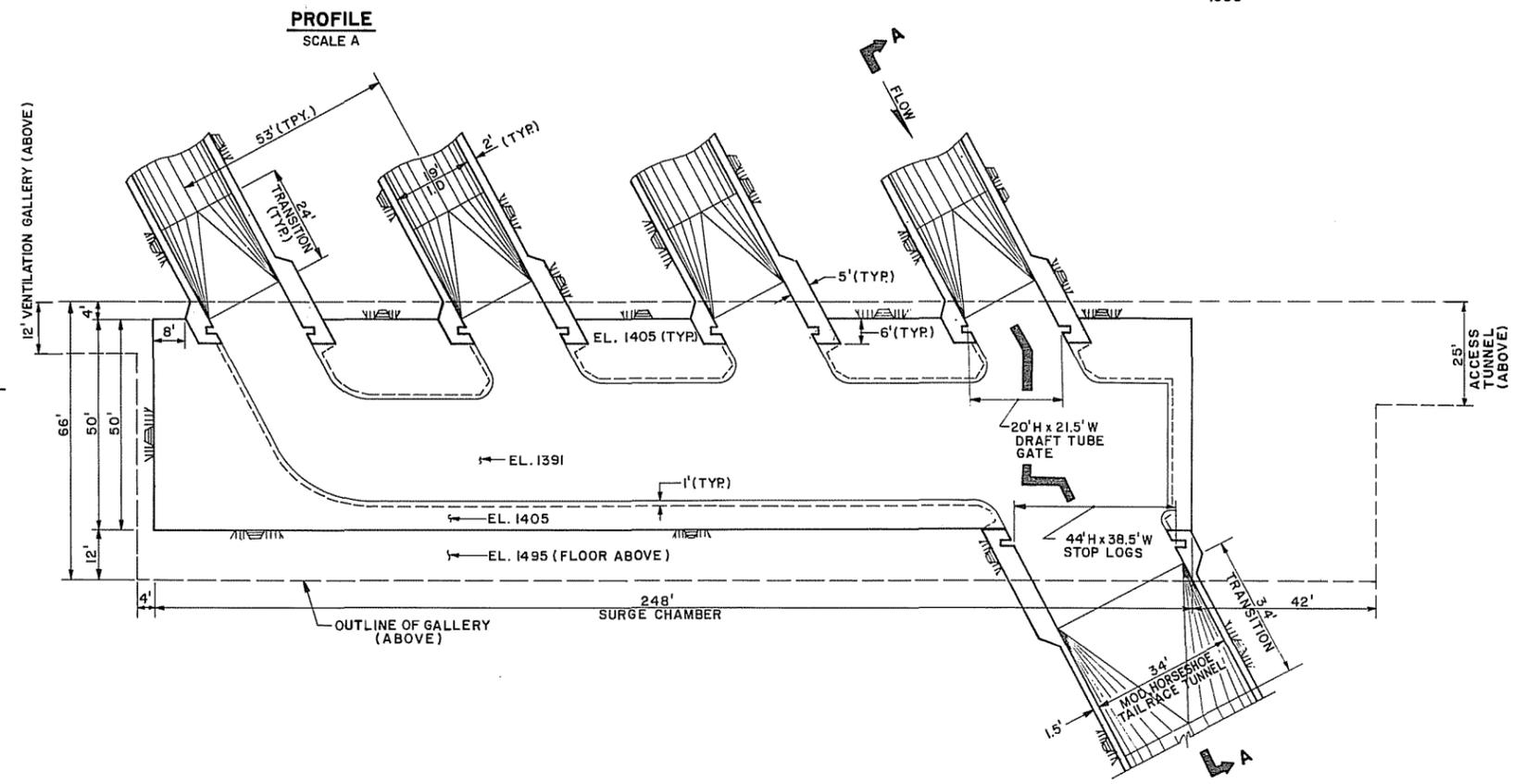
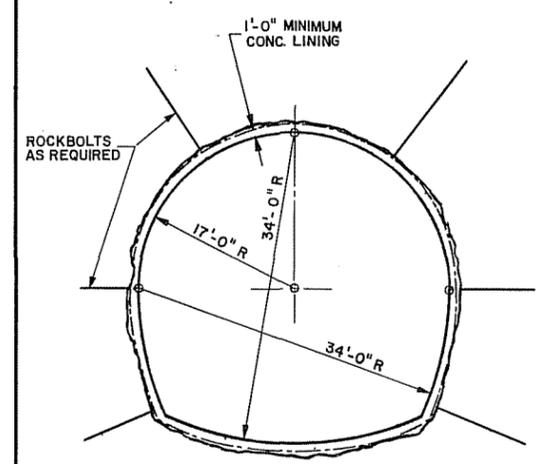
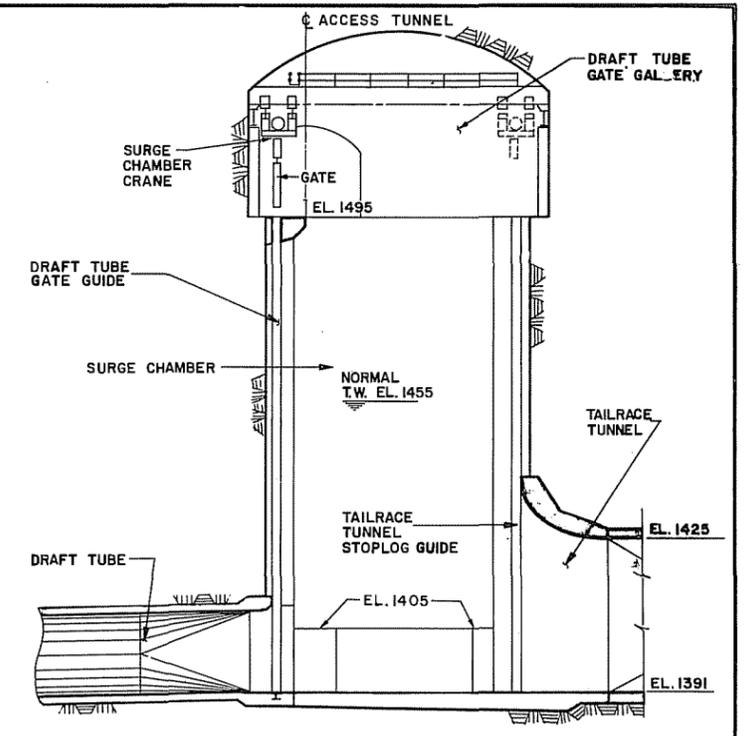
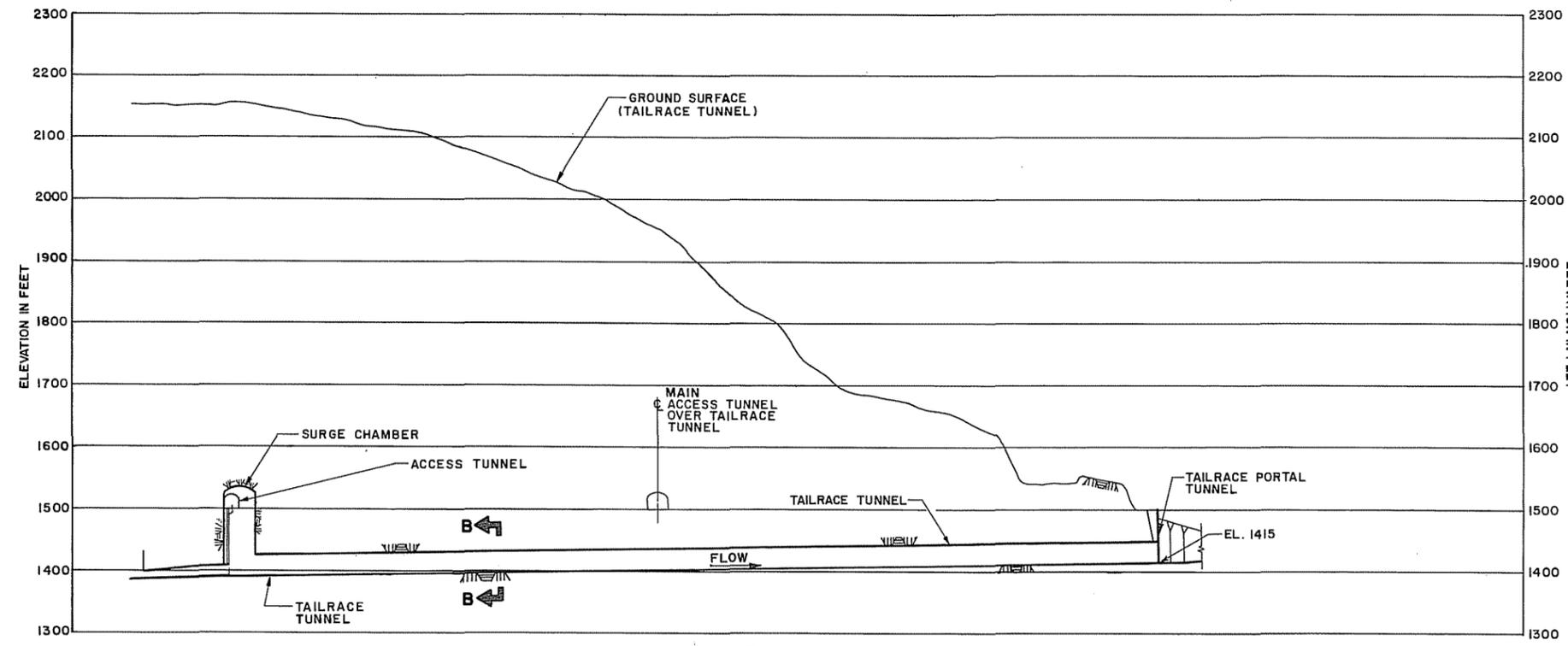
SECTION C-C
THROUGH BUS SHAFT
SCALE C



SECTION D-D
THROUGH SUMP
SCALE A



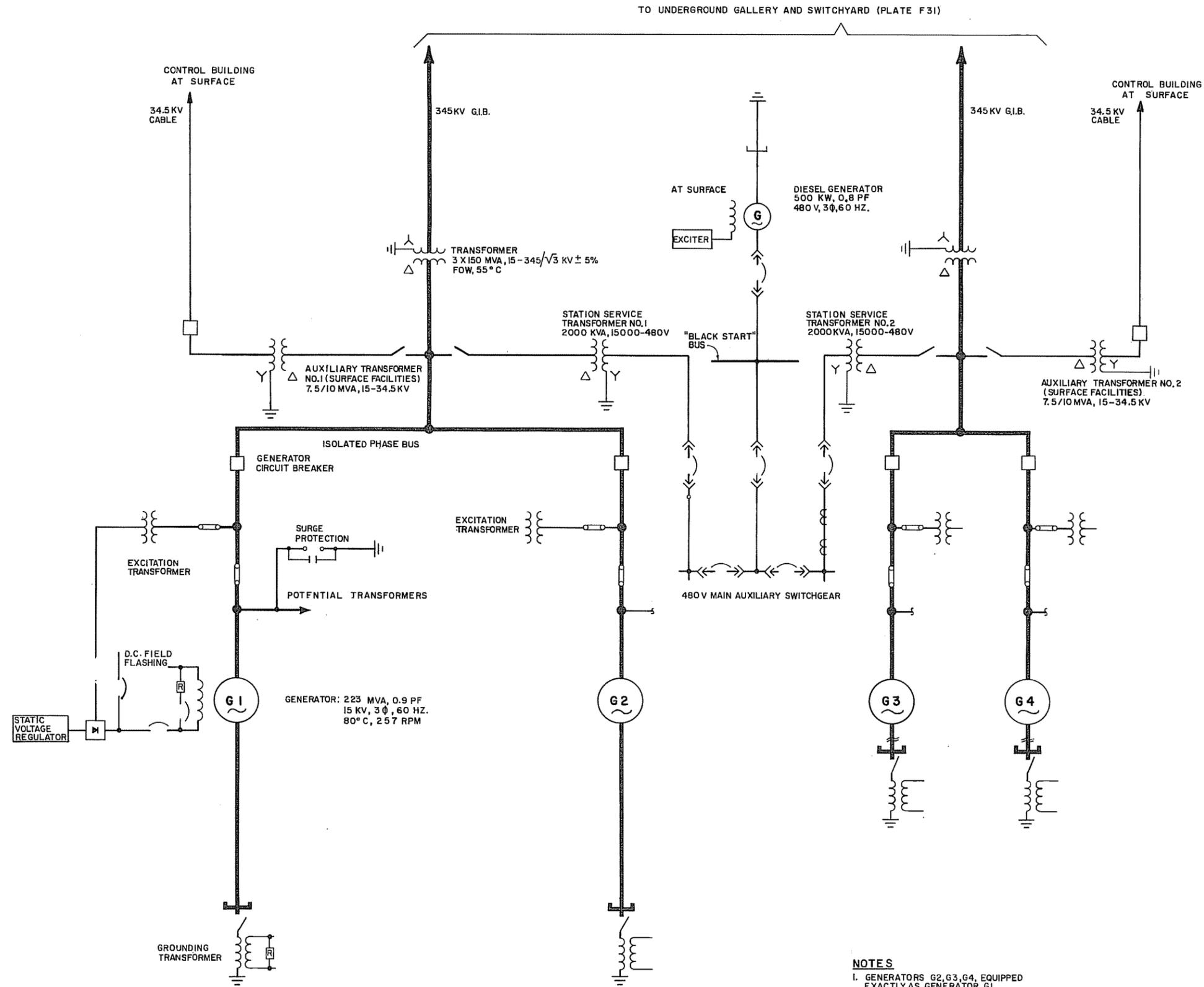
HANZA-ENSCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
TRANSFORMER GALLERY PLAN & SECTIONS			
EXHIBIT F		PLATE F-27	



SECTION B-B
CONCRETE LINED TAILRACE TUNNEL
SCALE C

SECTIONAL PLAN
SCALE B

MARZA-ERASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)			
SURGE CHAMBER AND TAILRACE SECTIONS			
EXHIBIT F		PLATE F-28	

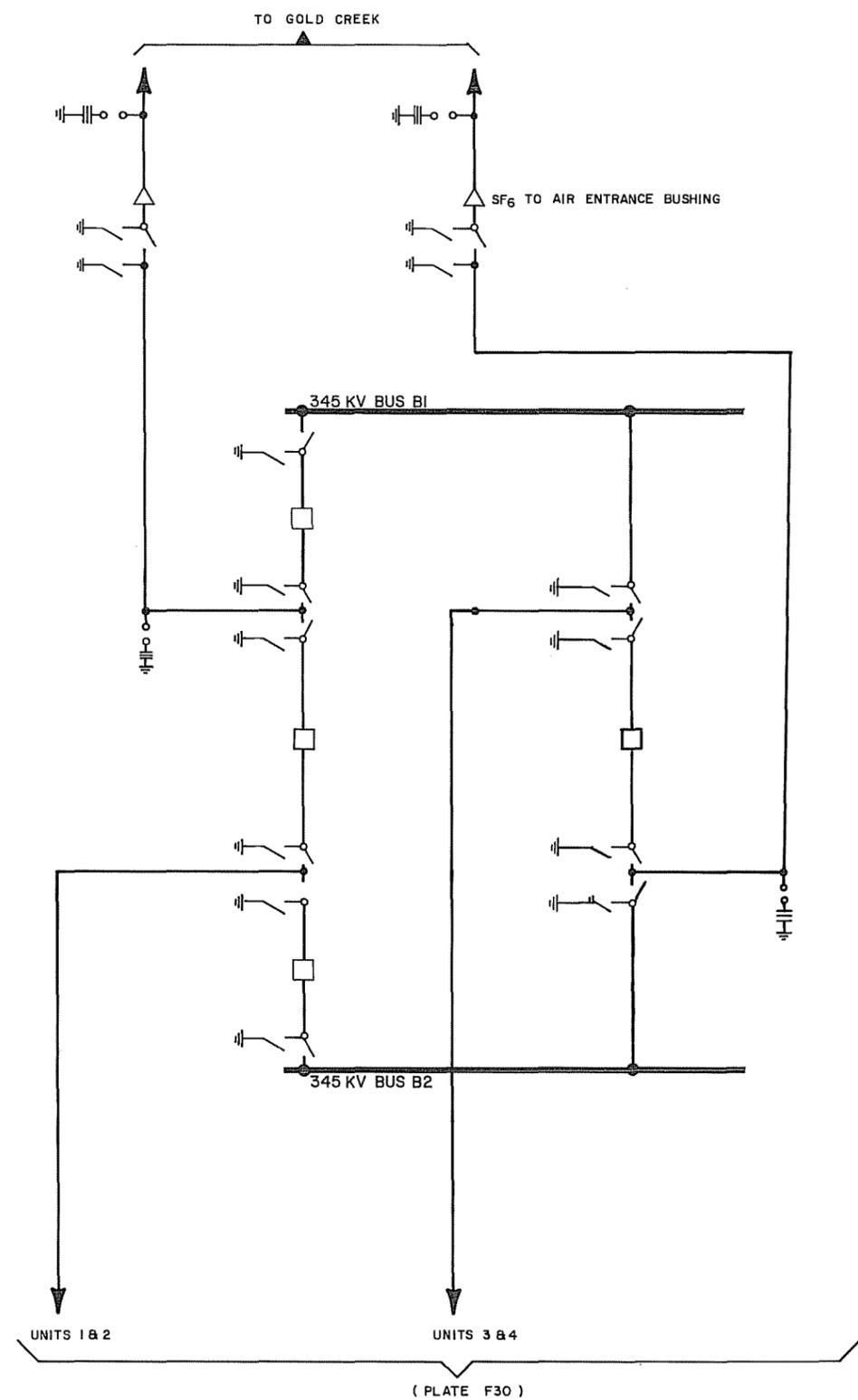


NOTES

1. GENERATORS G2, G3, G4, EQUIPPED EXACTLY AS GENERATOR G1.

2. SYMBOLS SHOWN ON F31

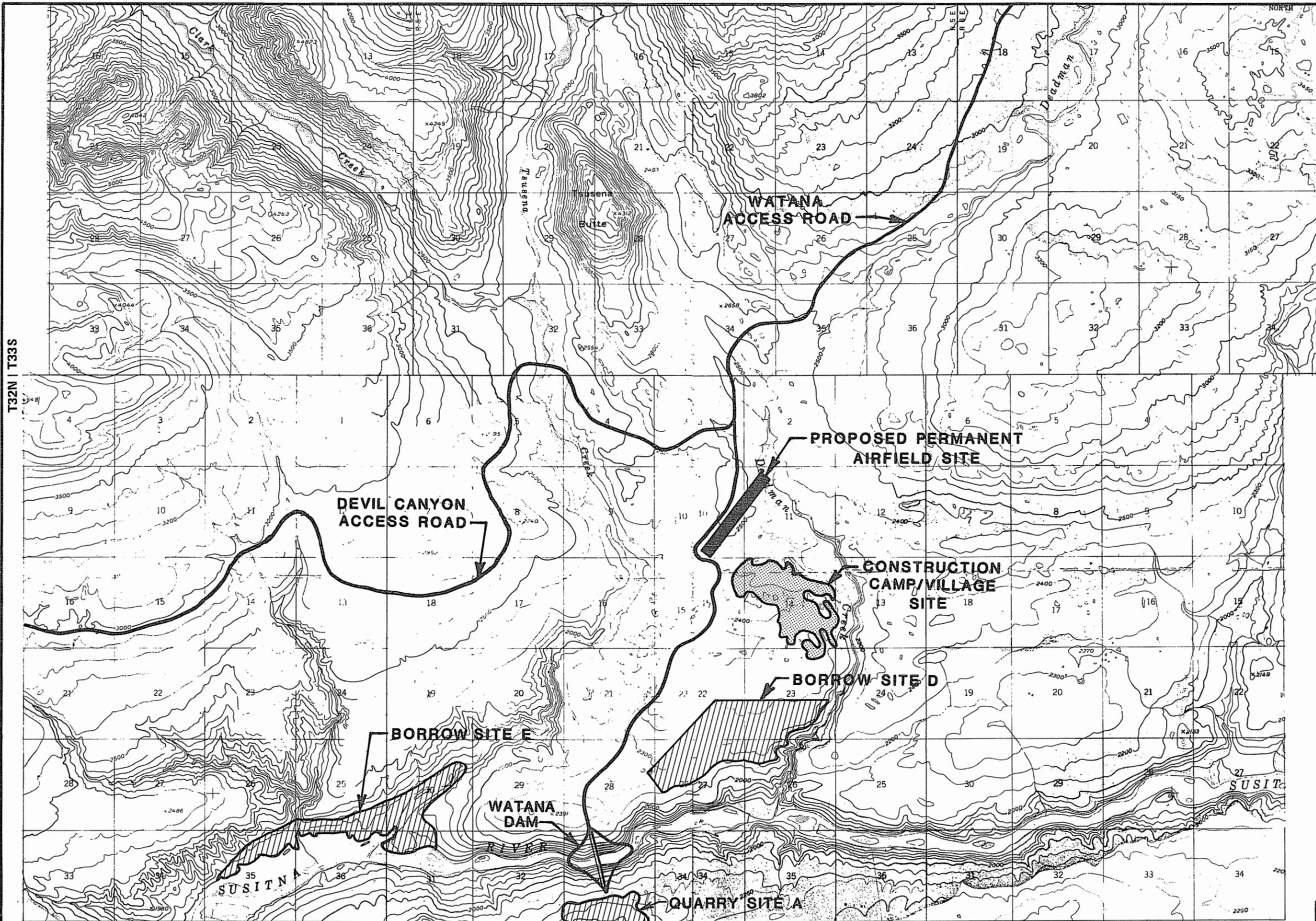
<small>HARZA-ERASSCO</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
<small>SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)</small>			
POWERHOUSE SINGLE LINE DIAGRAM			
<small>EXHIBIT F</small>		<small>PLATE F30</small>	



LEGEND

-  AC GENERATOR, 3 PHASE, 60 HZ, WYE CONNECTED
-  TRANSFORMER
-  AUTO TRANSFORMER
-  CIRCUIT BREAKER
-  DRAWOUT CIRCUIT BREAKER
-  LOW VOLTAGE AIR CIRCUIT BREAKER
-  LINK IN ISOLATED PHASE BUS
-  DISCONNECT SWITCH
-  GROUND CONNECTION
-  RESISTOR, / ADJUSTABLE
-  RESISTANCE TEMPERATURE DETECTOR
-  PROTECTIVE RELAY DEVICE
-  CURRENT TRANSFORMER
-  TRANSFORMER CONNECTION 3 PHASE, 3 WIRE, DELTA
-  TRANSFORMER CONNECTION 3 PHASE, 3 WIRE, WYE
-  REACTOR, / ADJUSTABLE
-  VOLTAGE TRANSFORMER
-  CAPACITOR
-  BUSHING CURRENT TRANSFORMER
-  LIGHTNING ARRESTOR
-  COUPLING CAPACITOR VOLTAGE TRANSFORMER
-  RECTIFIER
- G.I.S. GAS-INSULATED SWITCHGEAR
- G.I.B. GAS-INSULATED BUS

MANZA-BRASC® ALASKA POWER AUTHORITY	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
345 KV UNDERGROUND SWITCHYARD SINGLE LINE DIAGRAM	
EXHIBIT F	PLATE F 31



LEGEND

-  CAMP/VILLAGE
-  AIRFIELD
-  ACCESS ROAD
-  BORROW AREAS

T32N | T33S

R4E | R5E

R5E | R6E



Scale 1 0 1 Mile



ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)

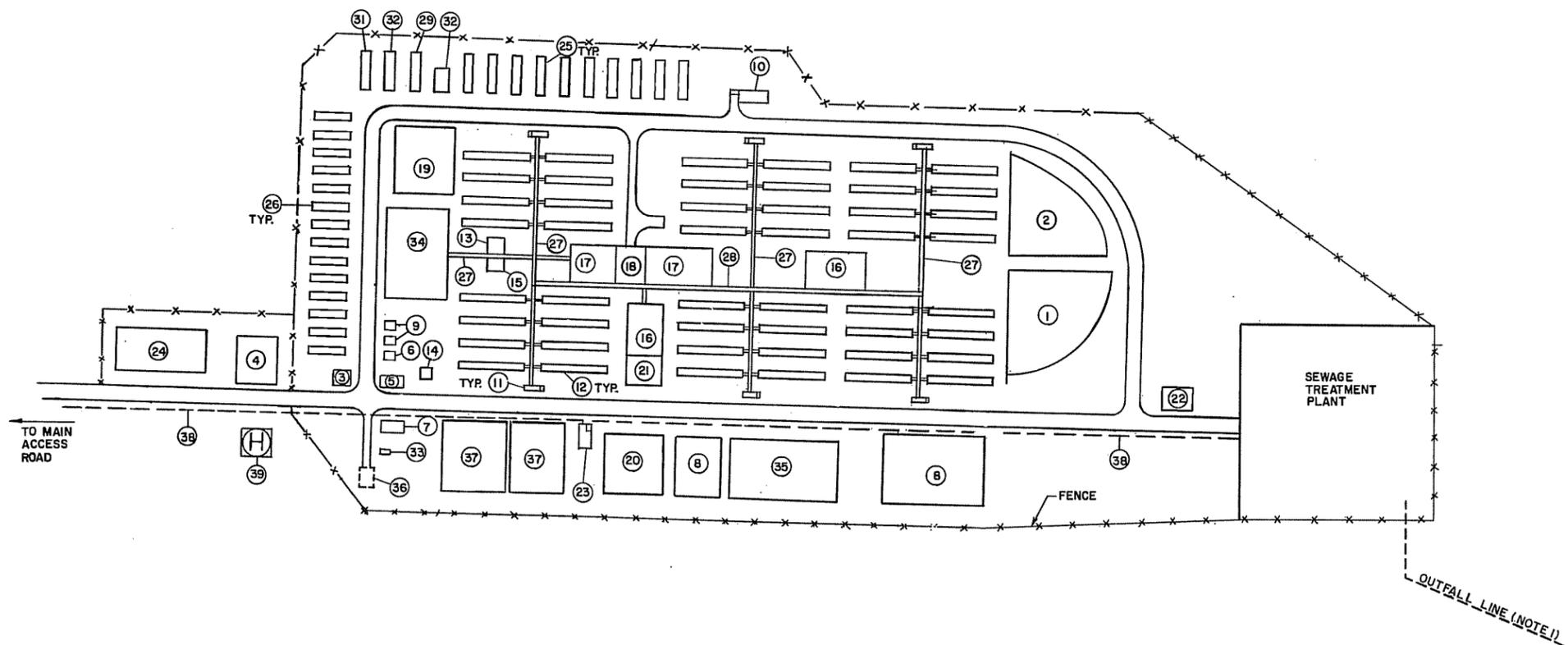
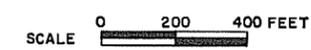
**GENERAL LAYOUT
SITE FACILITIES**

EXHIBIT F | PLATE F 34

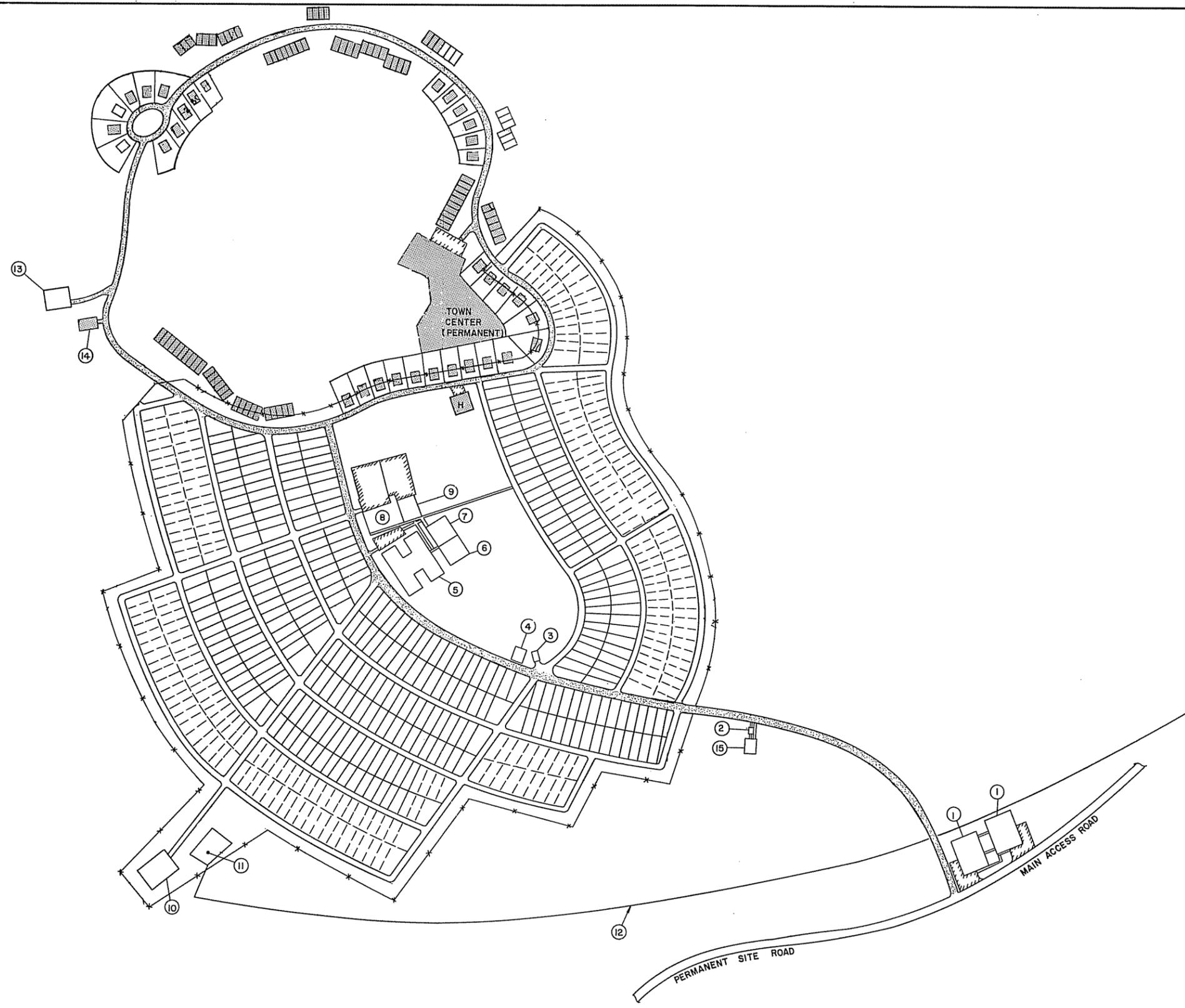
LEGEND

- ① BASEBALL
- ② SOFTBALL
- ③ SECURITY
- ④ HOSPITAL
- ⑤ FIRE & OIL SPILL
- ⑥ CAMP MANAGER'S OFFICE
- ⑦ SOILS LAB
- ⑧ PARKING AREAS
- ⑨ ADMINISTRATION OFFICES
- ⑩ STORE
- ⑪ BUS SHELTERS
- ⑫ DORMITORIES
- ⑬ LAUNDRY
- ⑭ COMMUNICATIONS CTR.
- ⑮ BANK
- ⑯ RECREATION HALL
- ⑰ KITCHEN & DINING
- ⑱ FOOD SERVICE WAREHOUSE
- ⑲ WAREHOUSE
- ⑳ GYMNASIUM
- ㉑ SWIMMING POOL
- ㉒ MAINTENANCE GARAGE
- ㉓ PUMP HOUSE (WATER)
- ㉔ HOCKEY RINK
- ㉕ BACHELOR DORMS MGMT. TYPE A
- ㉖ BACHELOR DORMS MGMT. TYPE B
- ㉗ 10' PERMAWALK
- ㉘ 16' PERMAWALK
- ㉙ MANAGER'S GUEST HOUSE
- ㉚ OWNER'S GUEST HOUSE
- ㉛ CONTRACTOR'S GUEST HOUSE
- ㉜ STAFF CLUBHOUSE
- ㉝ GENERATING STATION
- ㉞ RELOCATED CAMP HOUSING (160 SPACES)
- ㉟ FOOTBALL FIELD
- ㊱ FUEL STORAGE TANK
- ㊲ WATER RESERVOIR
- ㊳ UTILIDOR
- ㊴ HELIPAD

NOTE
 1. OUTFALL LINE LOCATION AND ORIENTATION WOULD BE SITUATED DOWNSLOPE AND DEPEND UPON TOPOGRAPHY



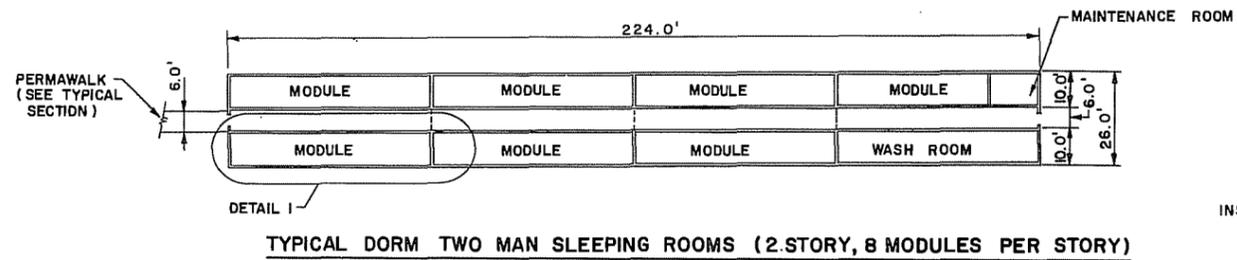
HARZA-EMARCO ELECTRA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
CONSTRUCTION CAMP GENERAL PLAN	
EXHIBIT F	PLATE F36



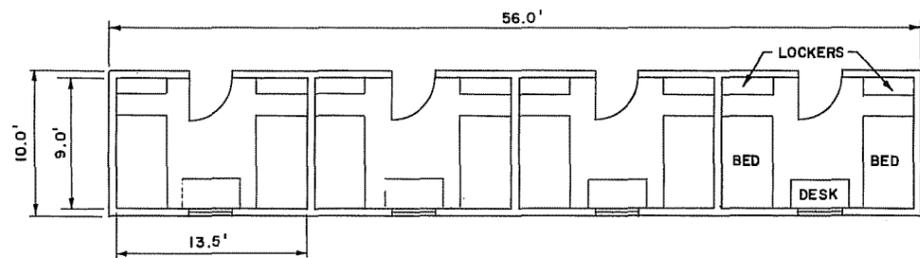
- LEGEND**
- PERMANENT NON-RESIDENTIAL BLDG.
 - PERMANENT ROAD
 - PERMANENT MULTIFAMILY DWELLINGS
72 UNITS FURNISHED BY YEAR 1992
16 UNITS " " " 2001
 - PERMANENT SINGLE FAMILY DWELLINGS
21 UNITS FURNISHED BY YEAR 1992
6 UNITS " " " 2001
 - PERMANENT HOSPITAL
 - TEMPORARY HOUSING/UTILITIES FURNISHED BY OWNER
16 EA. - 4 BEDROOMS UNITS 28' x 50'
16 EA. - 2 " " 24' x 50'
16 EA. - 3 " " " "
72 EA. - 2 " " 14' x 60'
200 EA. - 3 " " 14' x 60'
 - TEMPORARY LOTS/UTILITIES FURNISHED BY OWNER
240 EA. - LOT SPACES
 - PARKING AREAS
 - 1 MANAGERS OFFICES
 - 2 GENERATING STATION
 - 3 FIRE STATION
 - 4 GAS STATION
 - 5 SCHOOL
 - 6 SWIMMING POOL
 - 7 GYMNASIUM
 - 8 STORE
 - 9 RECREATION CENTER
 - 10 SEWAGE COLLECTION PUMP STATION
 - 11 WATER PUMP STATION
 - 12 UTILIDOR
 - 13 SEWAGE TREATMENT PLANT
 - 14 WATER TREATMENT PLANT
 - 15 FUEL STORAGE TANK (50,000 g)

SCALE 0 200 400 FEET

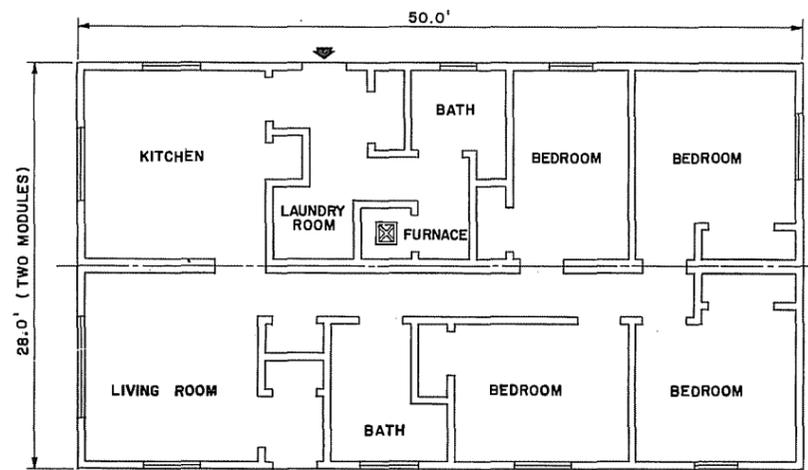
<small>HARZA-ERASSO SUSITNA JOINT VENTURE</small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
VILLAGE AND TOWN GENERAL PLAN	
EXHIBIT F	PLATE F.37



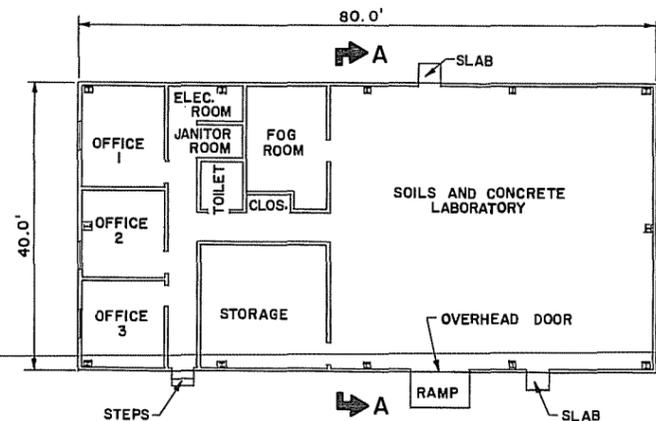
TYPICAL DORM TWO MAN SLEEPING ROOMS (2-STORY, 8 MODULES PER STORY)
 SCALE: B



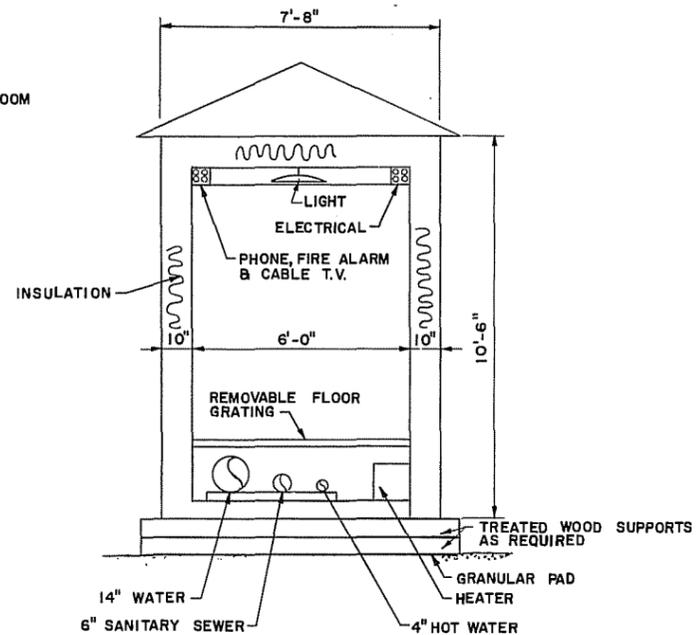
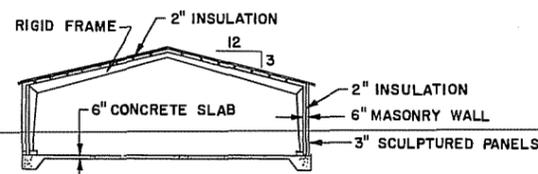
DETAIL I
 TYPICAL DORMITORY MODULE
 SCALE: C



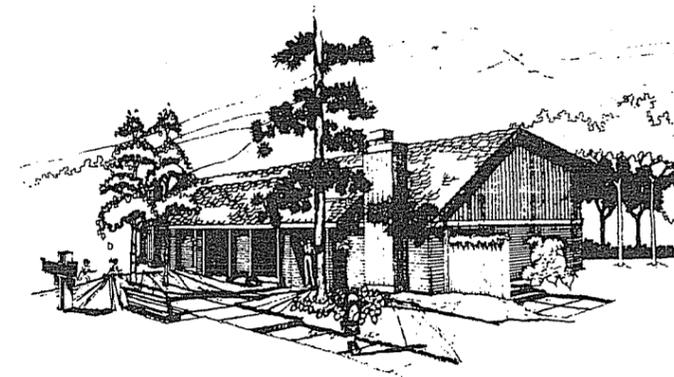
TYPICAL WOOD FRAME MODULAR HOUSE
 FOUR BEDROOM FAMILY UNIT
 SCALE: C



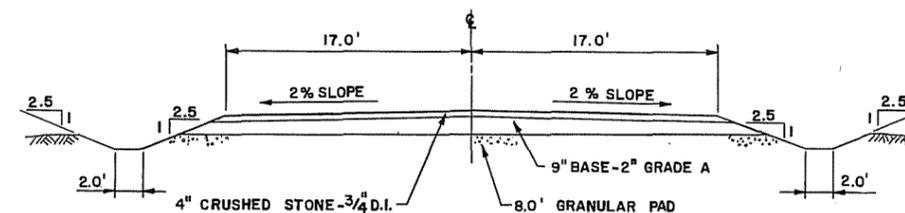
TYPICAL STEEL FRAME BUILDING
 SOILS AND CONCRETE LABORATORY
 SCALE: A



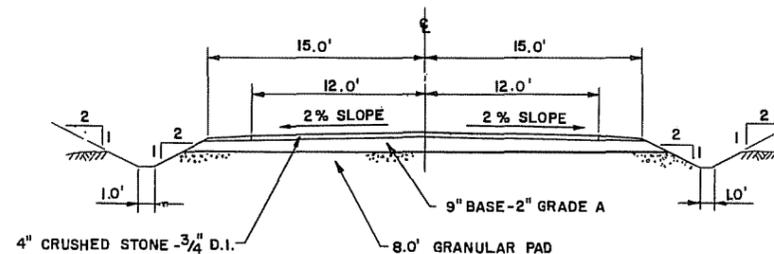
TYPICAL PERMAWALK
 WITH UTILIDOR (AT DORMS)
 SCALE: D



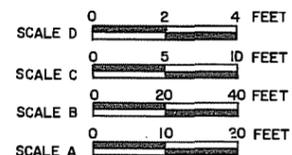
PERMANENT VILLAGE HOUSING



TYPICAL SECTION - PERMANENT SITE ROAD
 SCALE: C

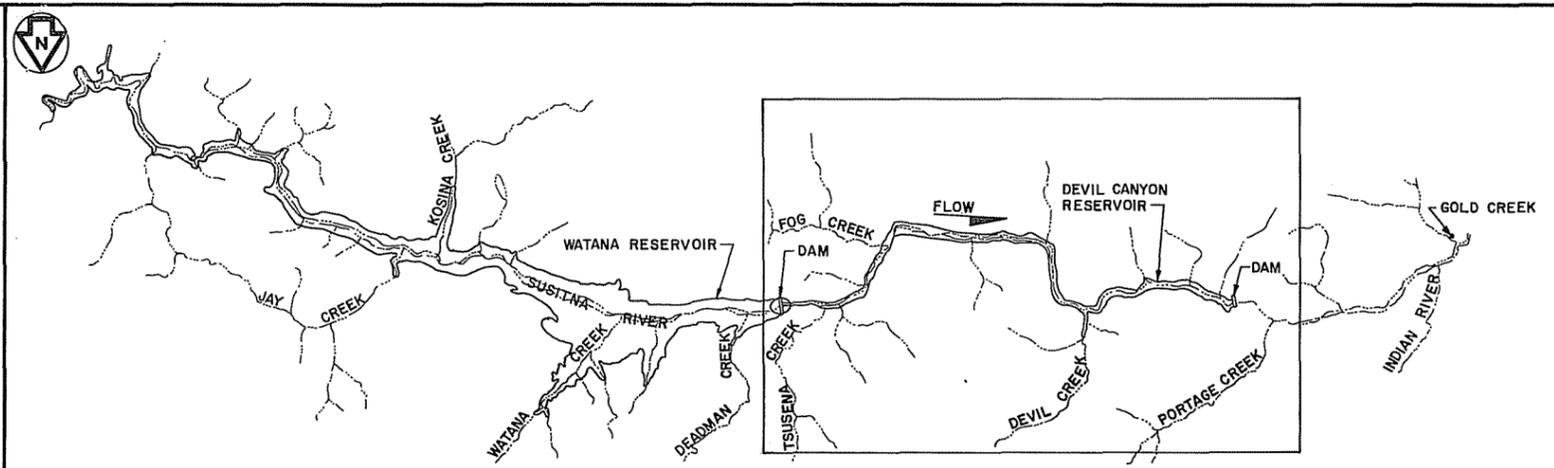


TYPICAL SECTION - SECONDARY SITE ROAD
 SCALE: C



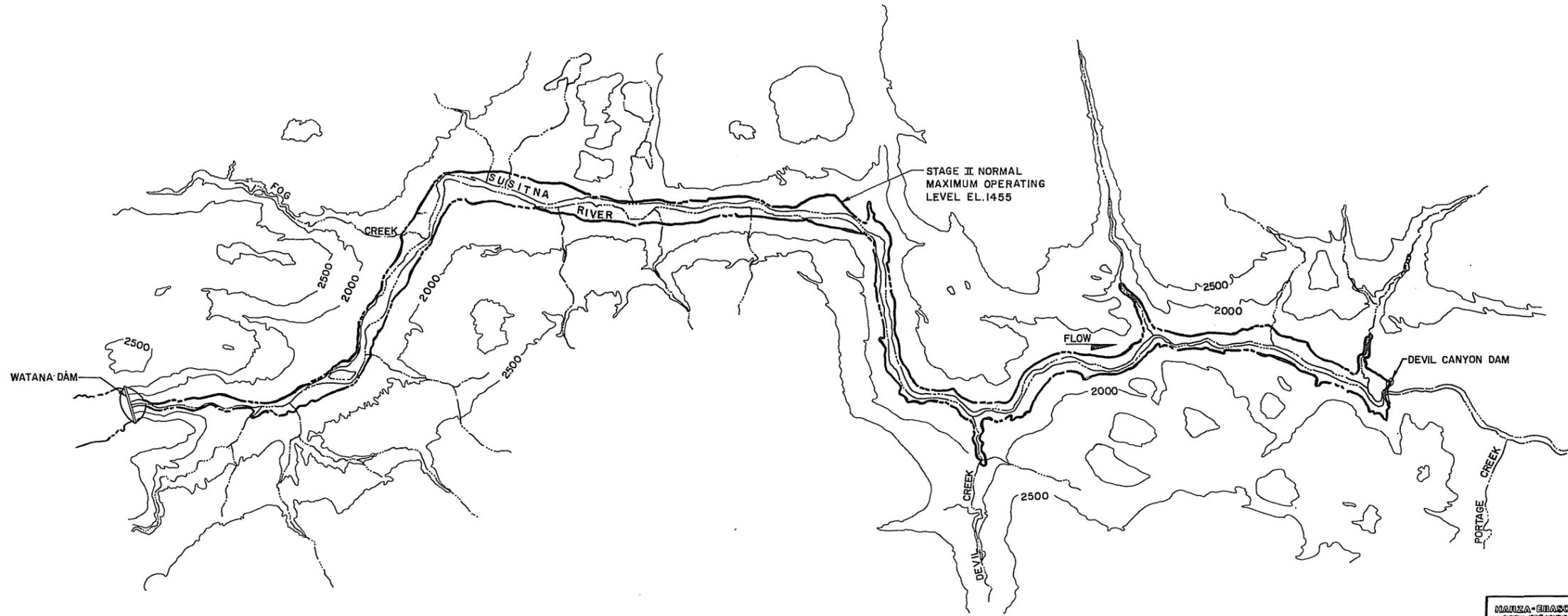
MARZA-BEASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
WATANA AND DEVIL CANYON CONSTRUCTION CAMP DETAILS	
EXHIBIT F	PLATE F38

STAGE II (DEVIL CANYON)



LOCATION MAP

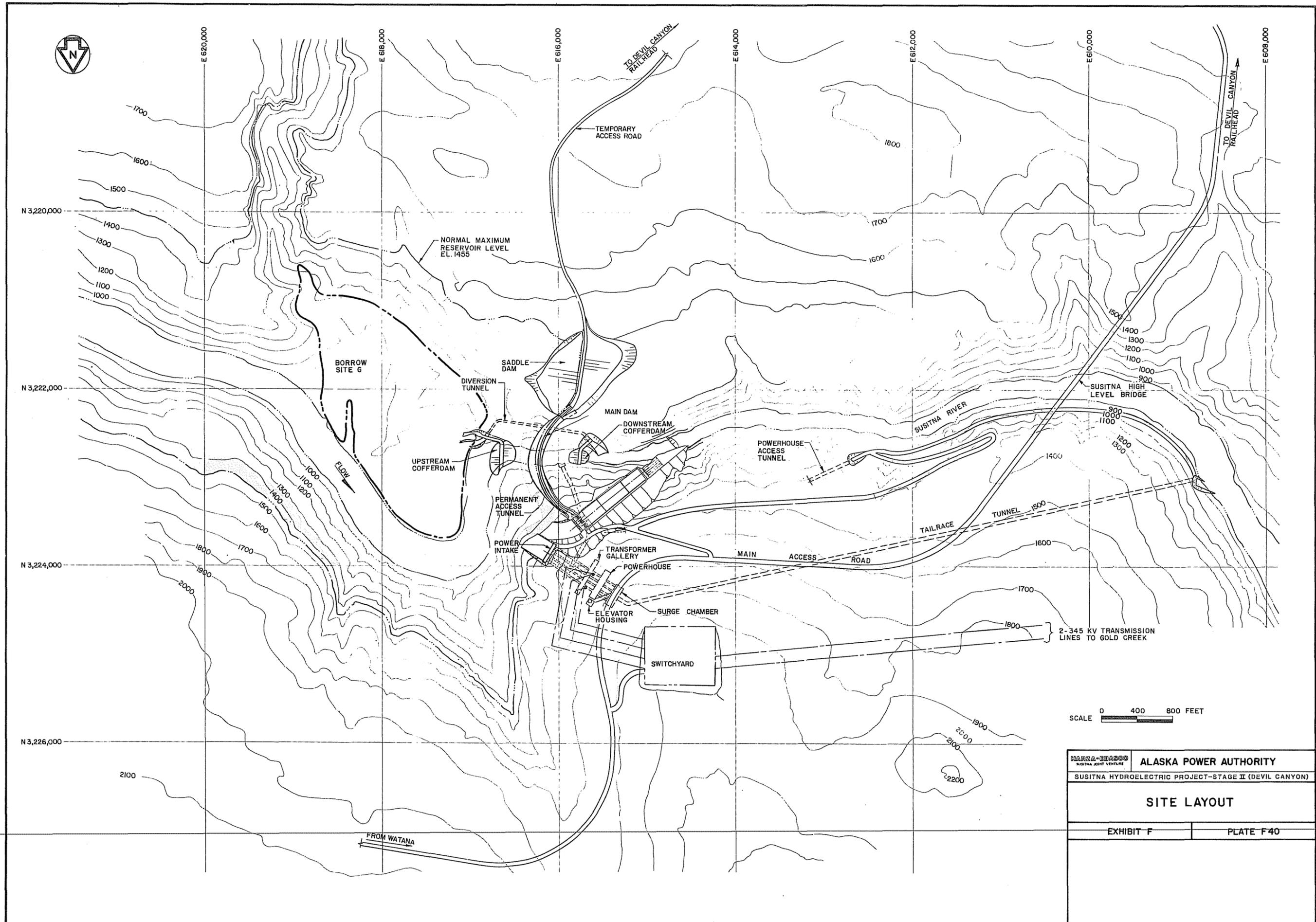
SCALE 0 4 8 MILES



PLAN

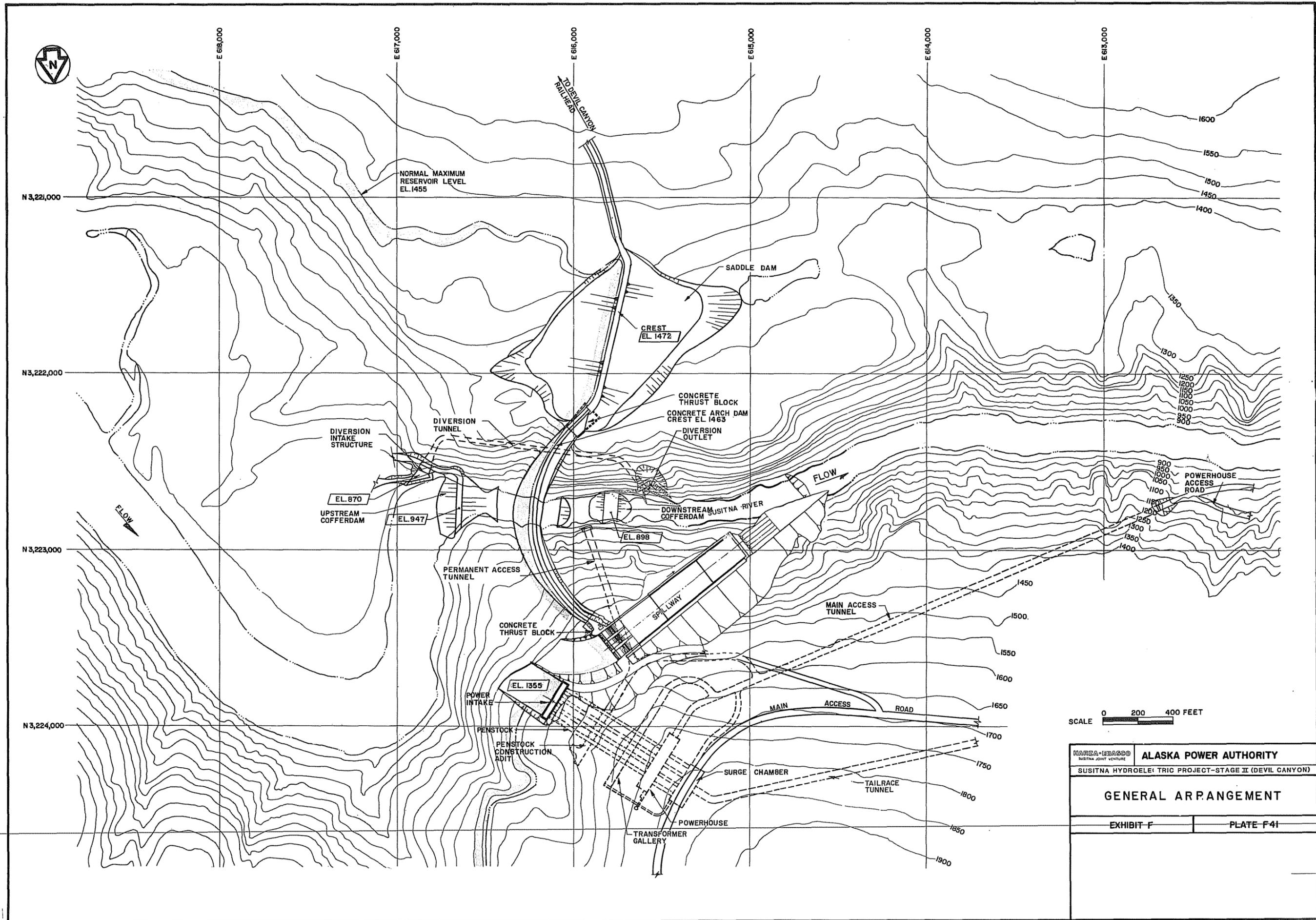
SCALE 0 1 2 MILES

<small>MANZA-ERASSO SUSITNA JOINT VENTURE</small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
RESERVOIR PLAN	
EXHIBIT F	PLATE F 39



SCALE 0 400 800 FEET

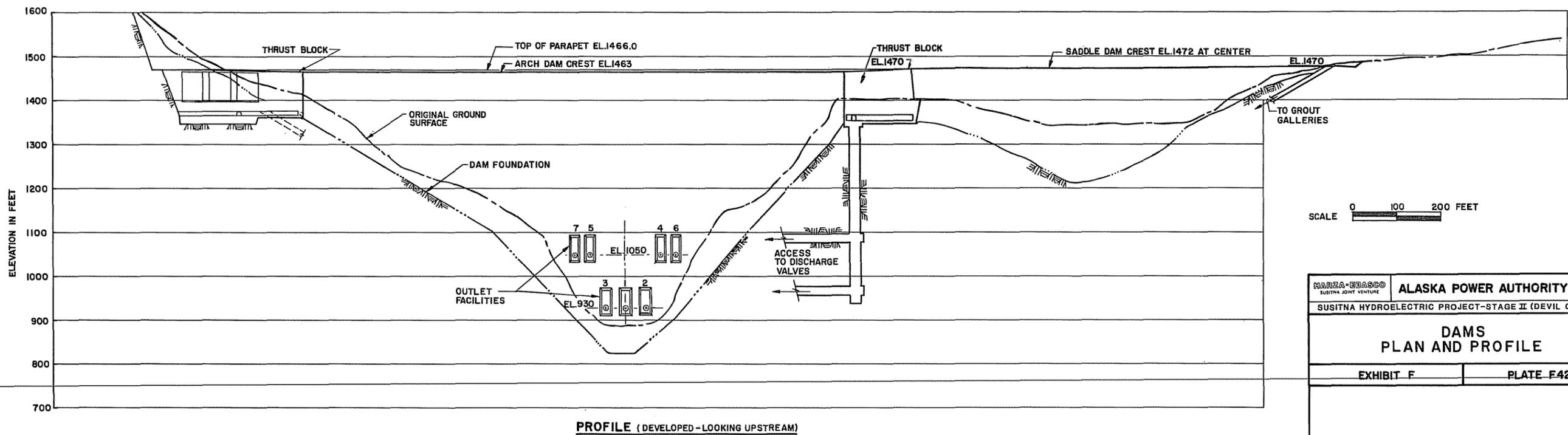
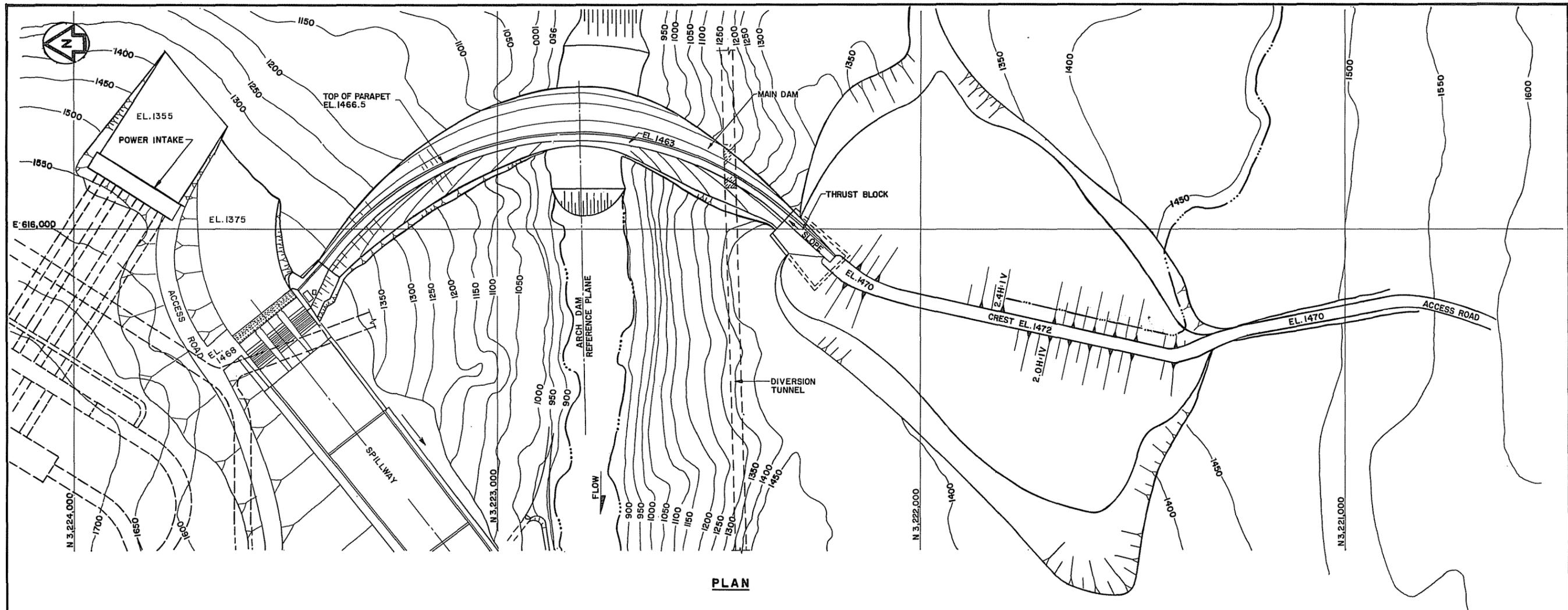
MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SITE LAYOUT			
EXHIBIT F		PLATE F40	



MARZA-BRASS®
SUSITNA JOINT VENTURE
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)

GENERAL ARRANGEMENT

EXHIBIT F PLATE F-41



HARZA-EDASCO <small>SUSTINA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
DAMS PLAN AND PROFILE			
EXHIBIT F		PLATE F42	

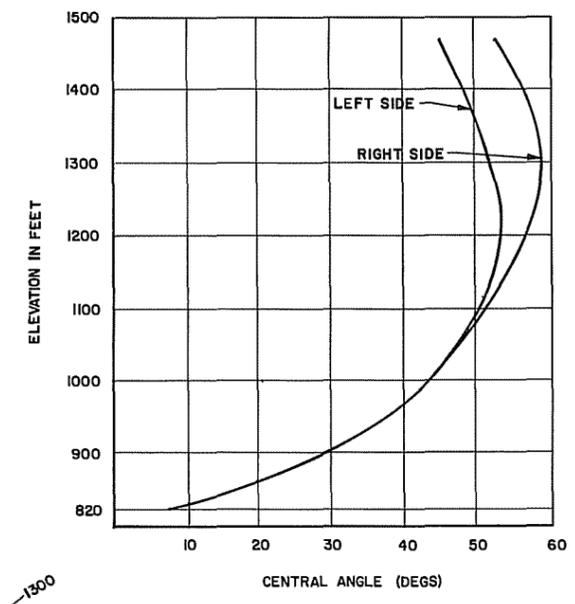
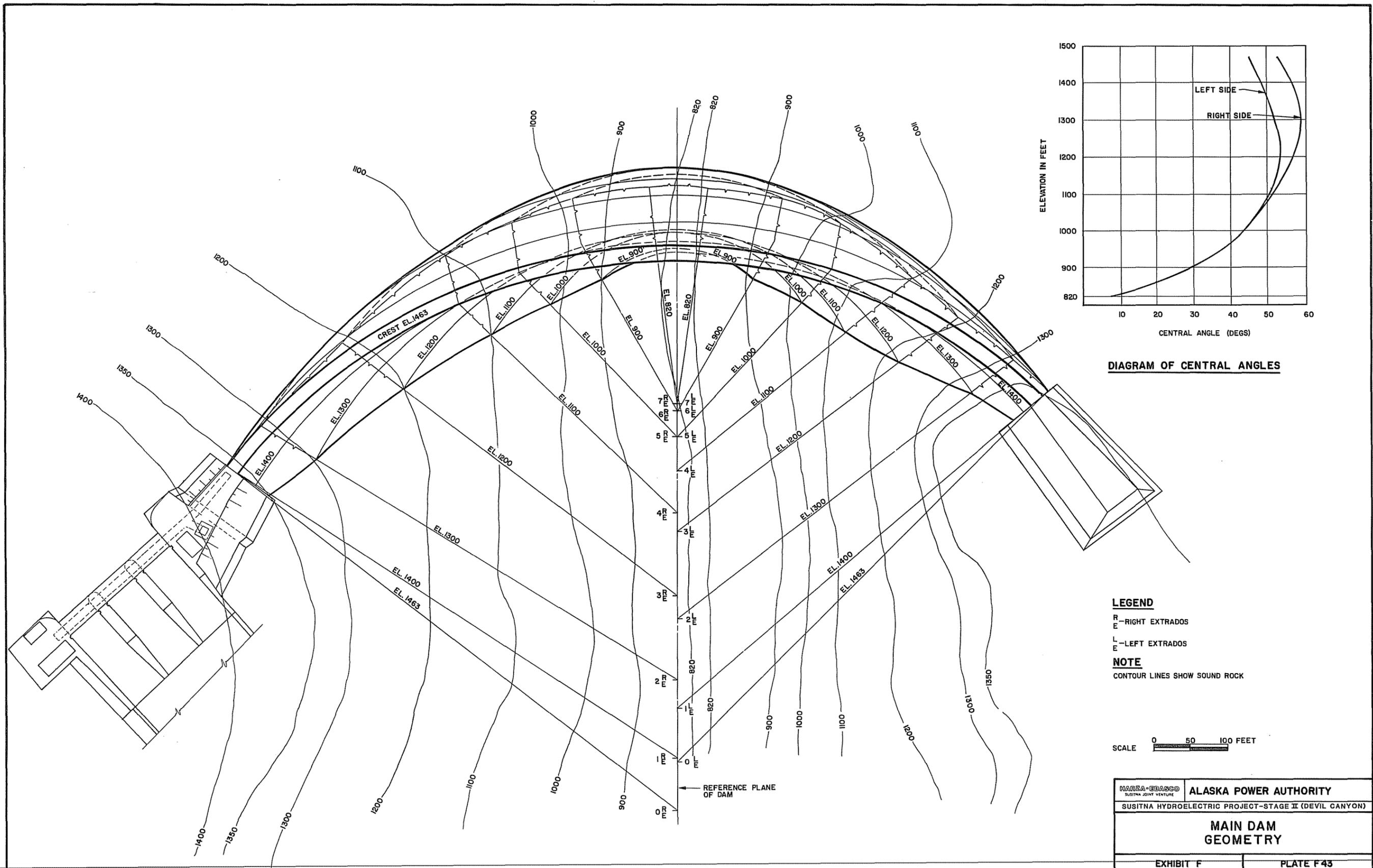


DIAGRAM OF CENTRAL ANGLES

LEGEND

- R - RIGHT EXTRADOS
- L - LEFT EXTRADOS

NOTE

CONTOUR LINES SHOW SOUND ROCK



MARZA-EBASCO ALASKA POWER AUTHORITY
SUSITNA JOINT VENTURE
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)

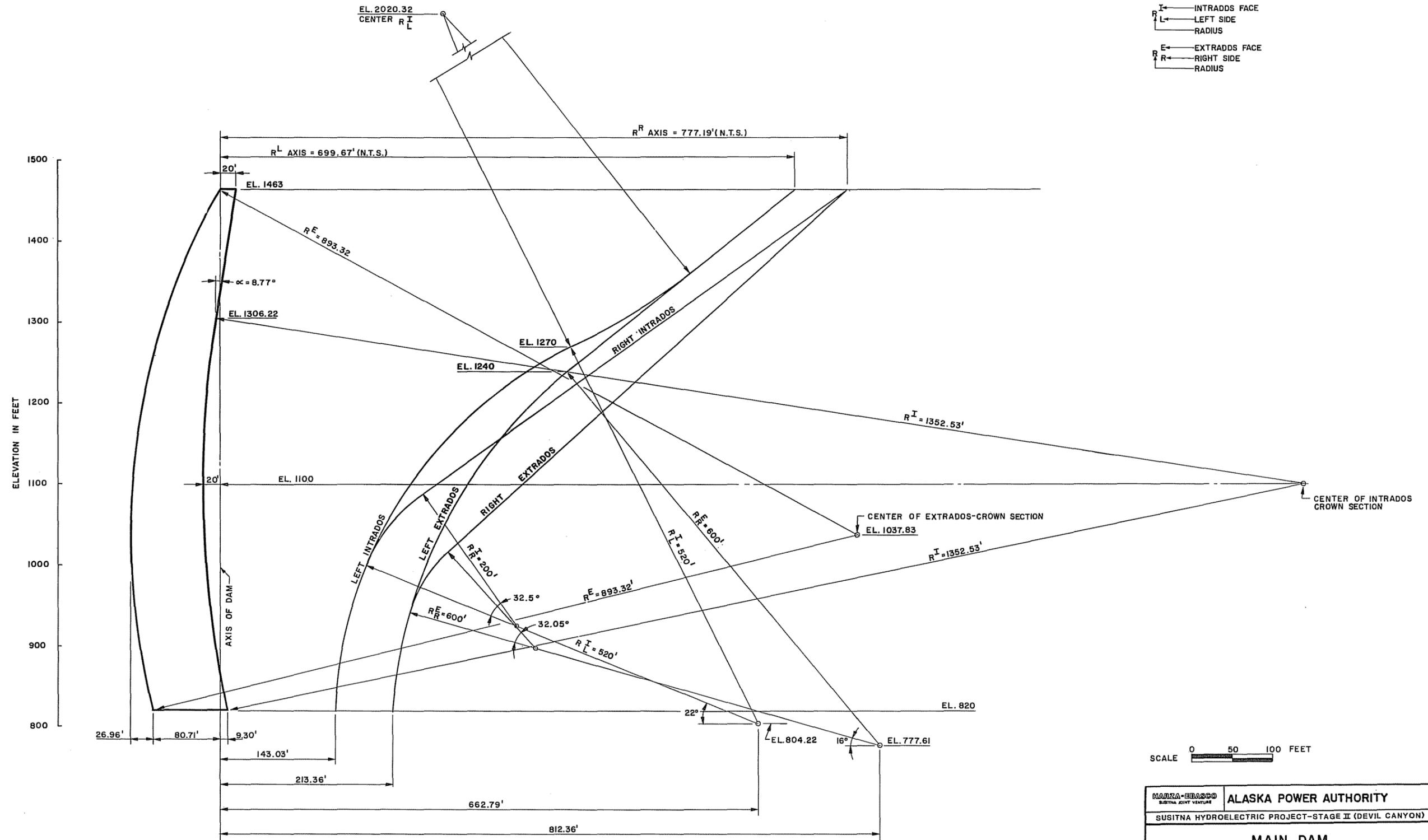
MAIN DAM GEOMETRY

EXHIBIT F

PLATE F43

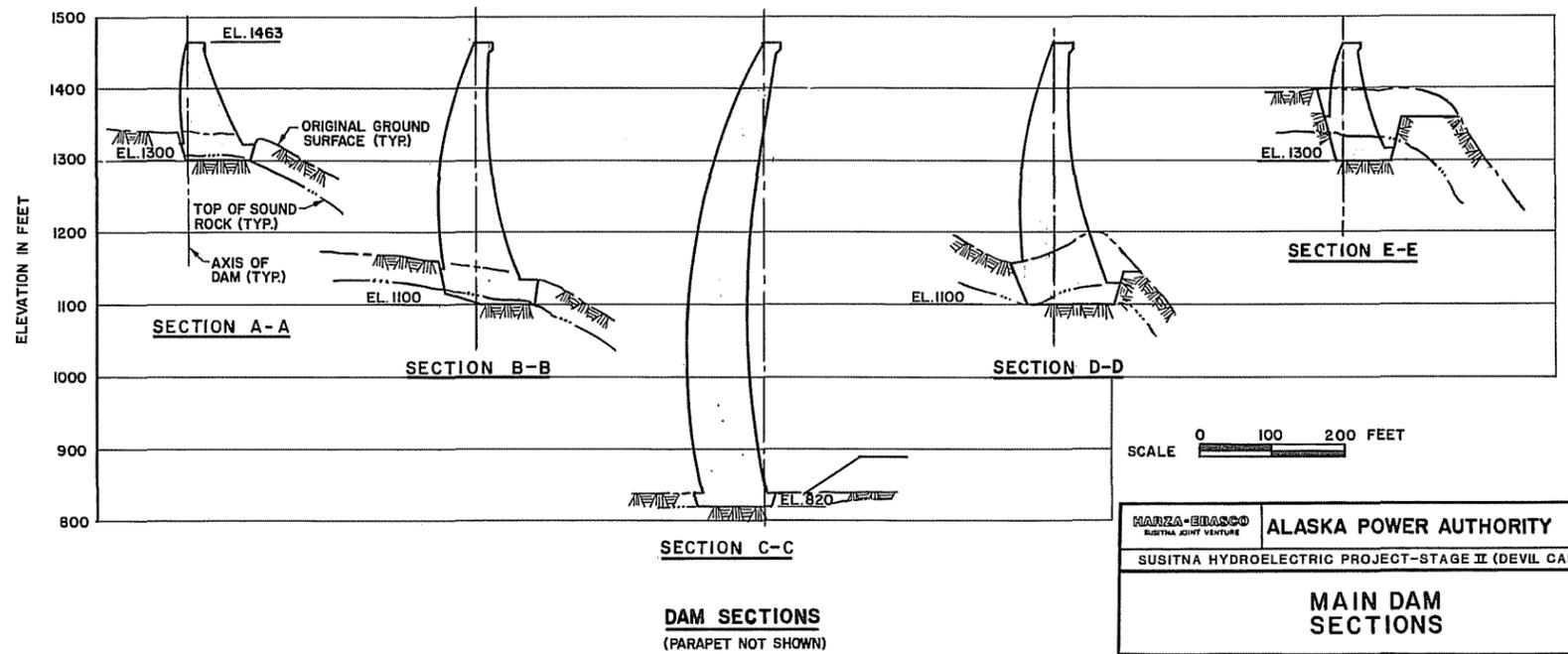
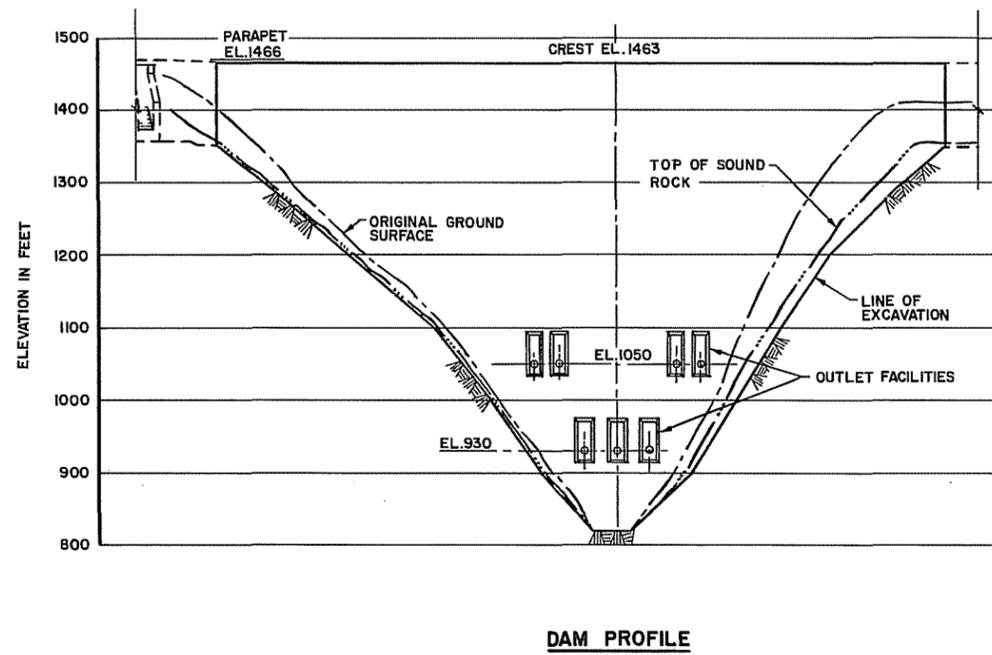
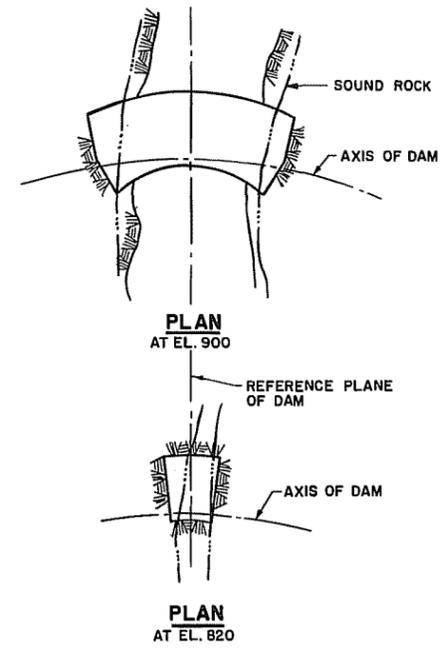
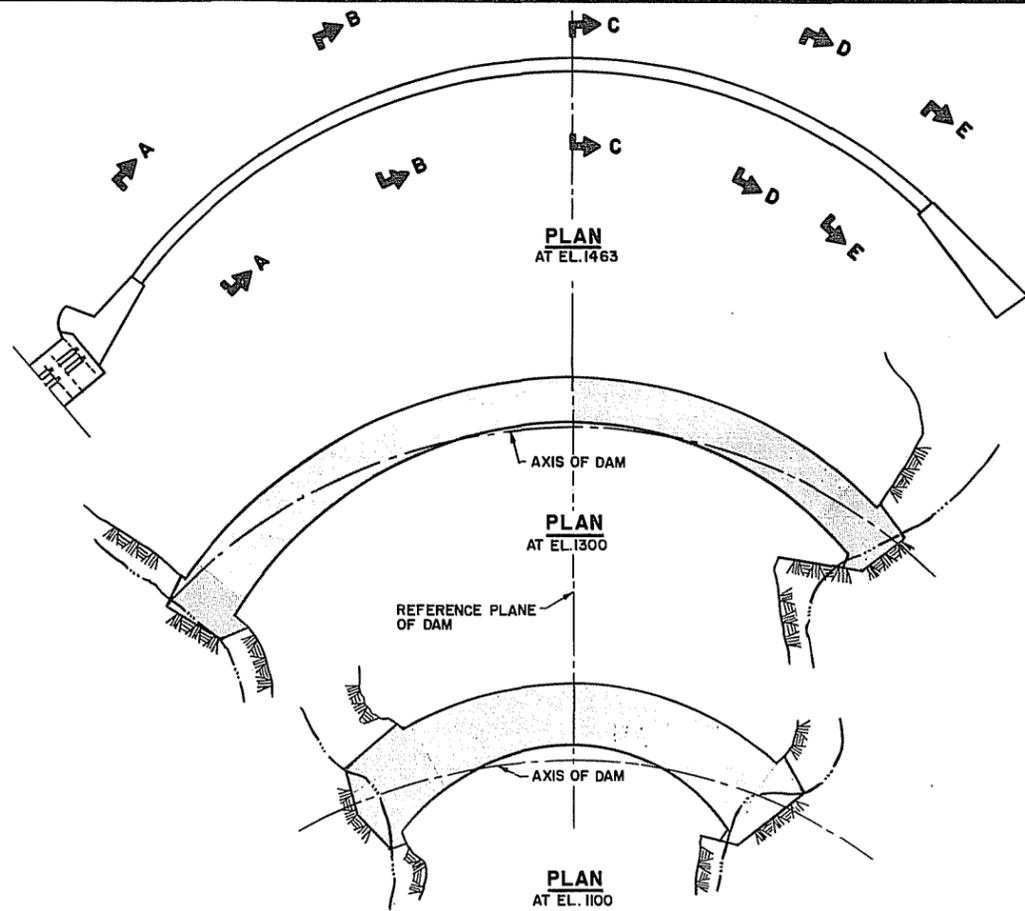
LEGEND

- I ← INTRADOS FACE
- R ← LEFT SIDE
- ← RADIUS
- E ← EXTRADOS FACE
- R ← RIGHT SIDE
- ← RADIUS

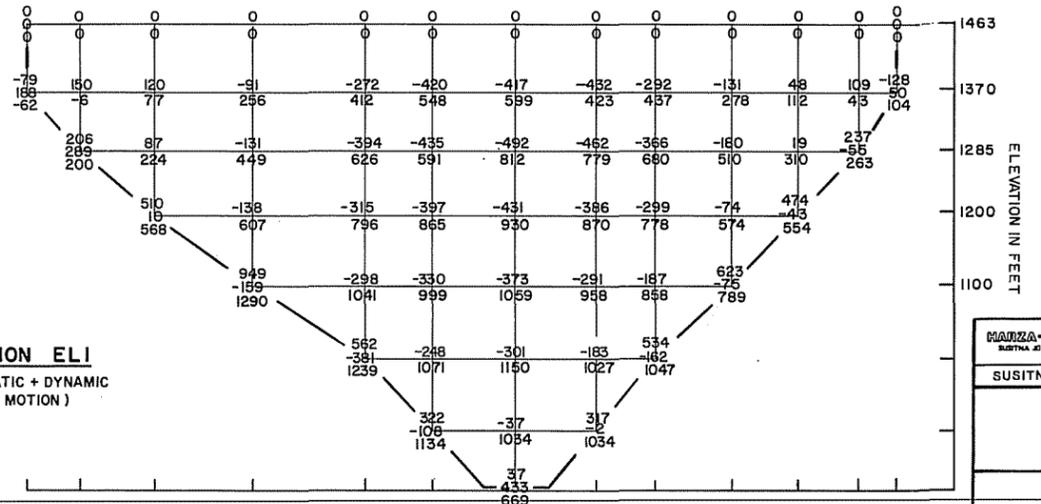
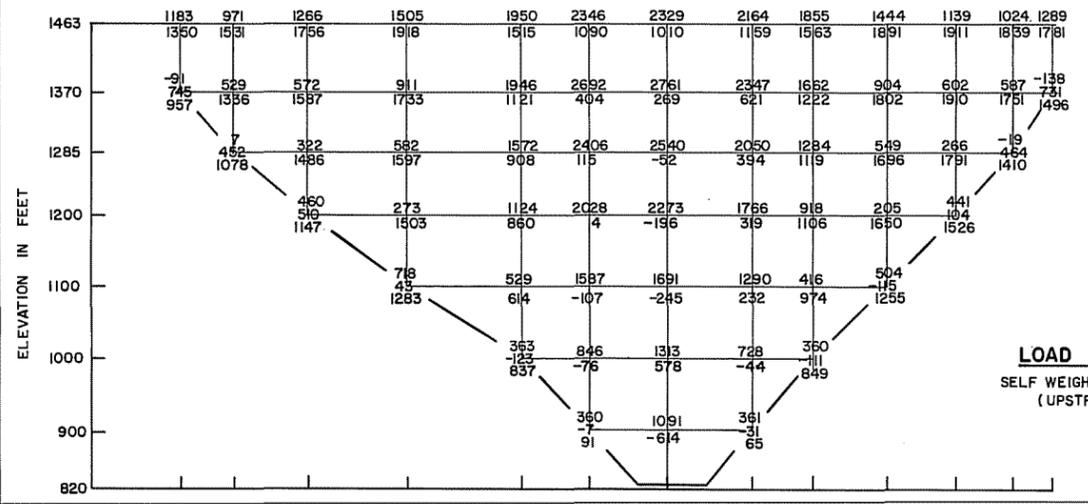
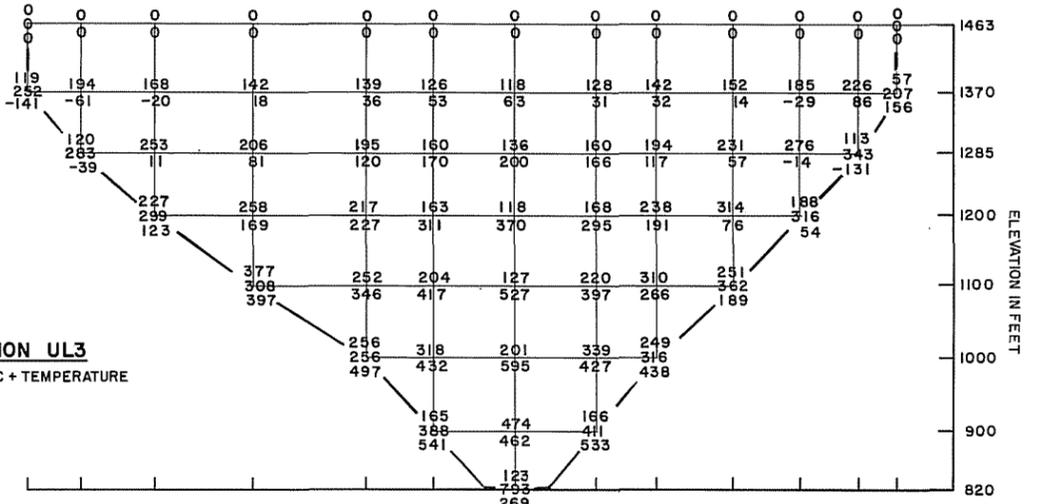
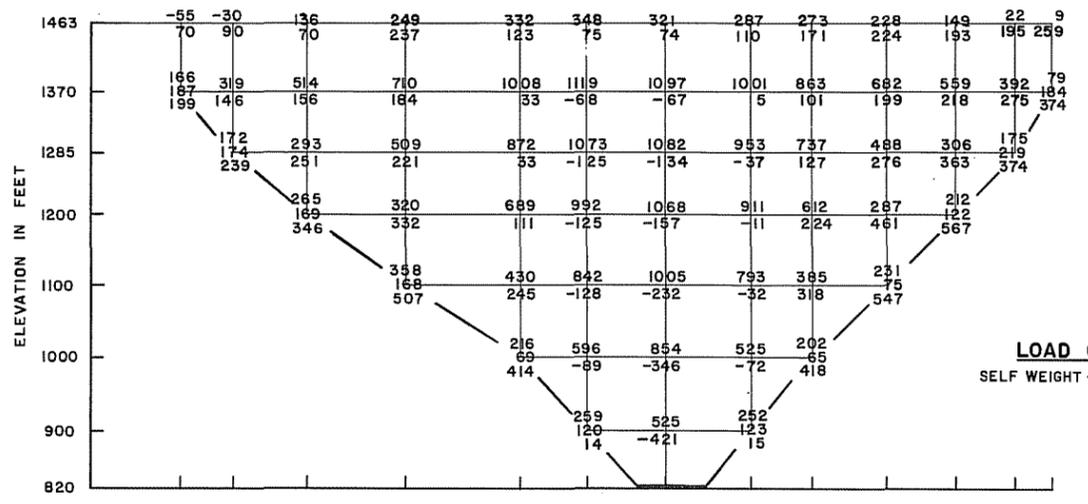
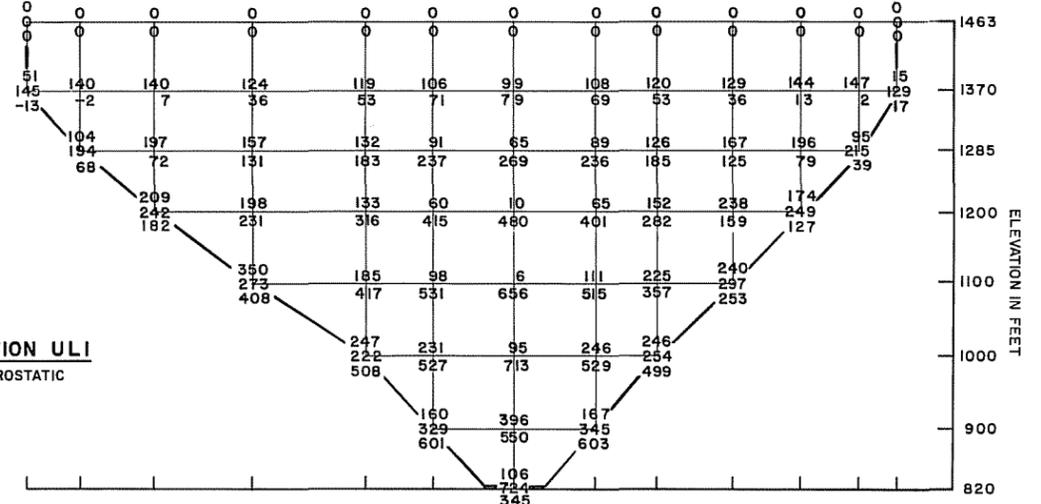
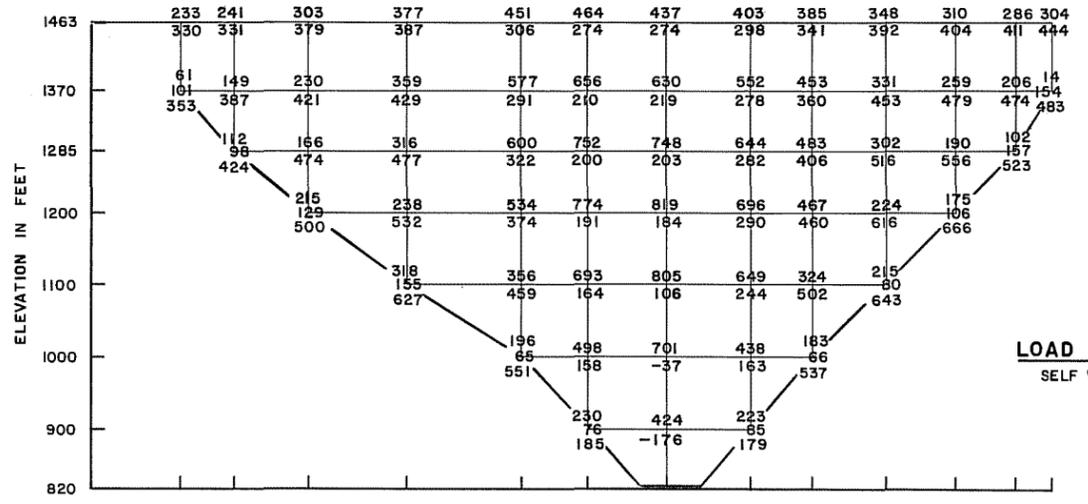


SCALE 0 50 100 FEET

MARZA-ELIASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
MAIN DAM CROWN SECTION			
EXHIBIT F		PLATE F44	



MARZA-EDASCO ELECTRA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
MAIN DAM SECTIONS	
EXHIBIT F	PLATE F45



LEGEND

- (MINUS) INDICATES TENSION
- 580 SHEAR STRESS IN P.S.I. WHERE SHOWN
- 45 STRESS AT UPSTREAM OR EXTRADOS FACE
- 658 STRESS AT DOWNSTREAM OR INTRADOS FACE

ARCH STRESSES (PARALLEL TO THE FACE OF THE DAM LOOKING UPSTREAM)

CANTILEVER STRESSES (PARALLEL TO THE FACE OF THE DAM LOOKING UPSTREAM)

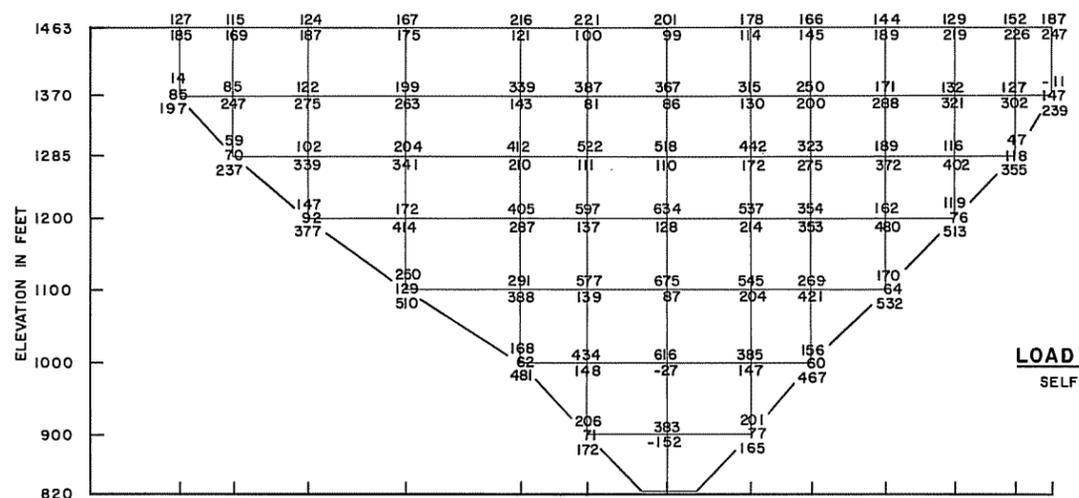
MANZA-EDASCO
SOUTH AFRICAN VENTURE

ALASKA POWER AUTHORITY

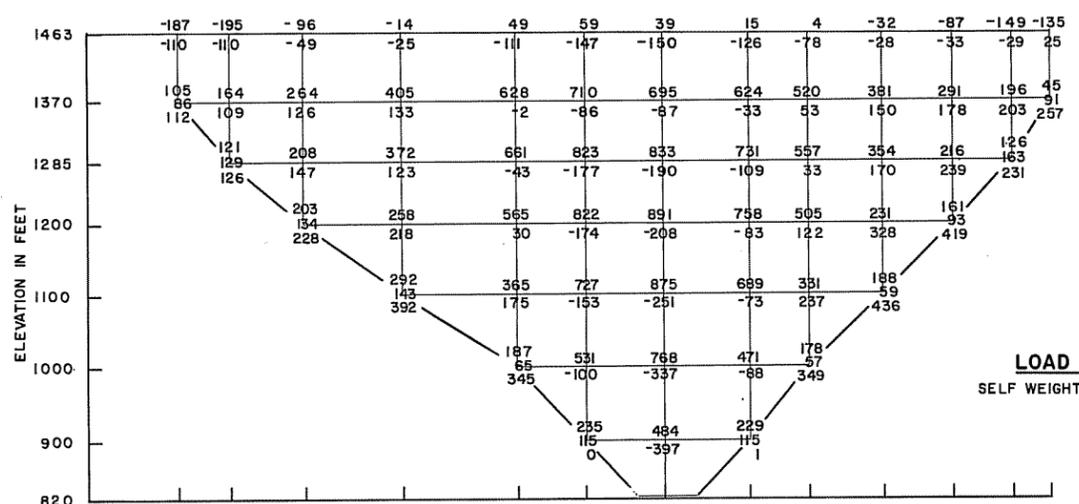
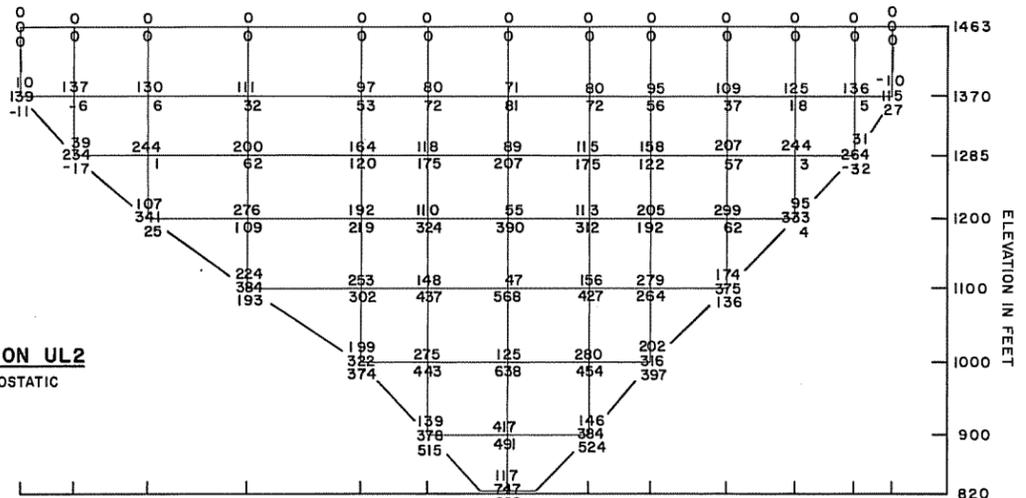
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)

**ARCH DAM STRESSES
RESERVOIR AT EL.1455**

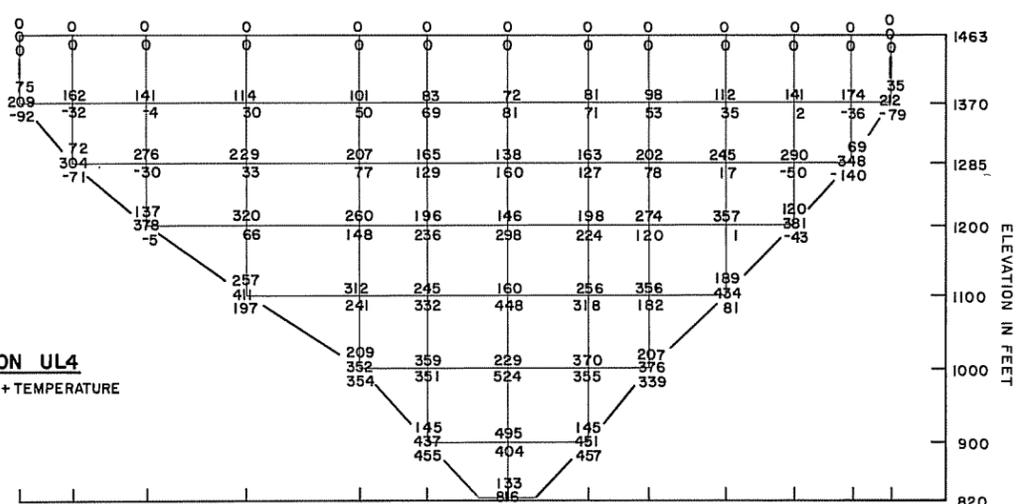
EXHIBIT F PLATE F 45A



LOAD COMBINATION UL2
SELF WEIGHT + HYDROSTATIC



LOAD COMBINATION UL4
SELF WEIGHT + HYDROSTATIC + TEMPERATURE



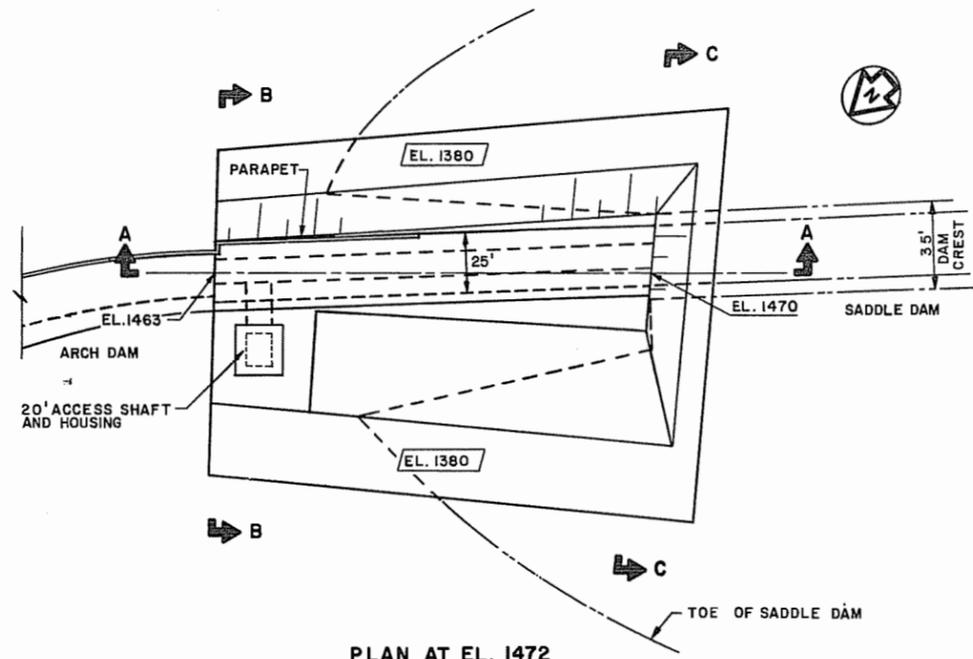
ARCH STRESSES (PARALLEL TO THE FACE OF THE DAM LOOKING UPSTREAM)

CANTILEVER STRESSES (PARALLEL TO THE FACE OF THE DAM LOOKING UPSTREAM)

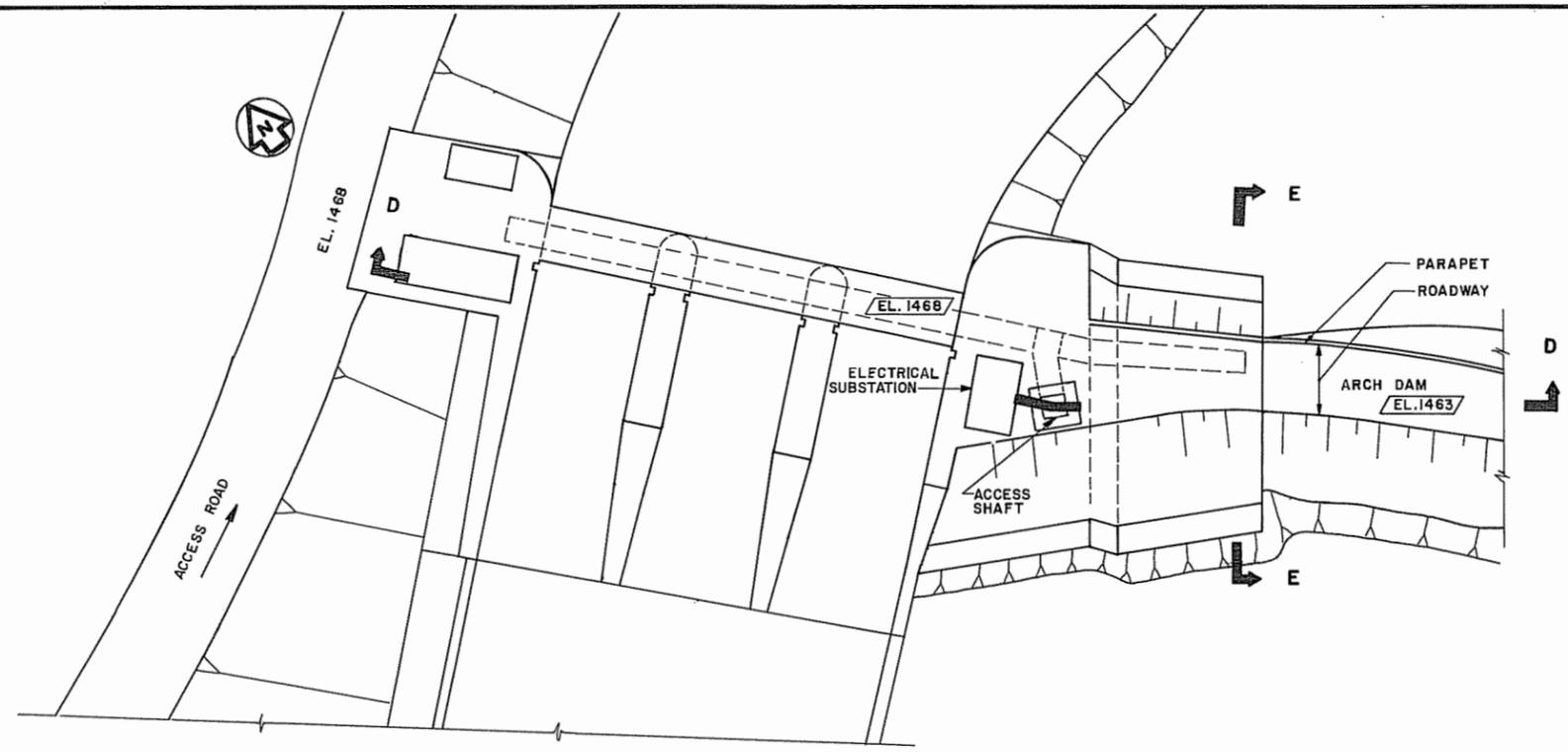
LEGEND

- (MINUS) INDICATES TENSION
- 580 SHEAR STRESS IN P.S.I. WHERE SHOWN
- 45 STRESS AT UPSTREAM OR EXTRADOS FACE
- 658 STRESS AT DOWNSTREAM OR INTRADOS FACE

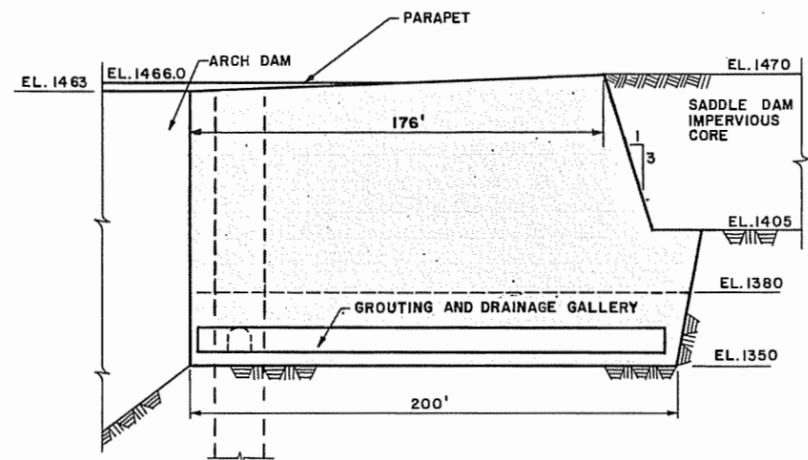
MARZA-ERASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
ARCH DAM STRESSES RESERVOIR AT EL. 1405			
EXHIBIT F		PLATE F45B	



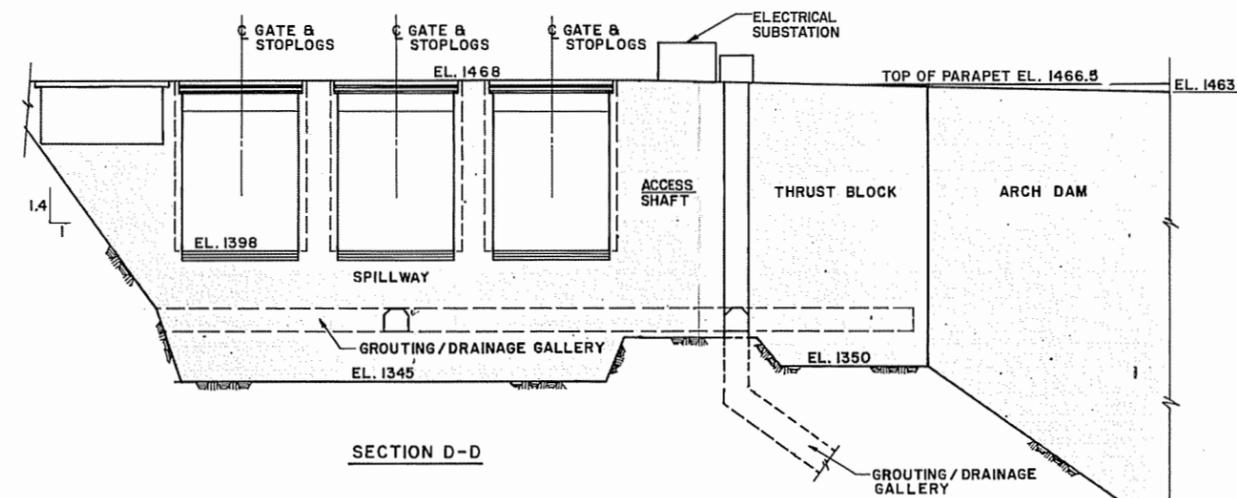
PLAN AT EL. 1472



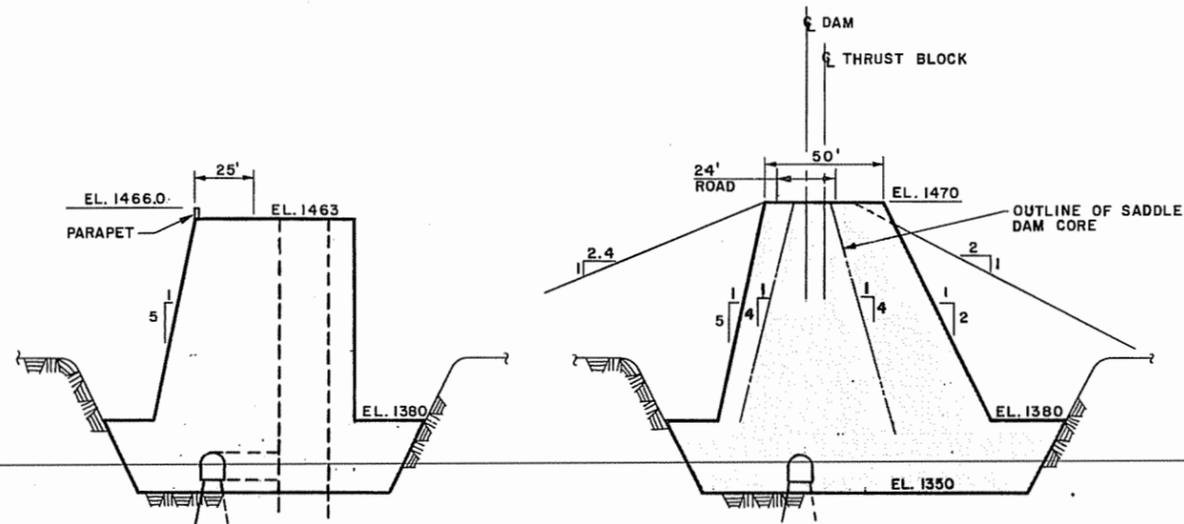
PLAN AT EL. 1468



SECTION A-A



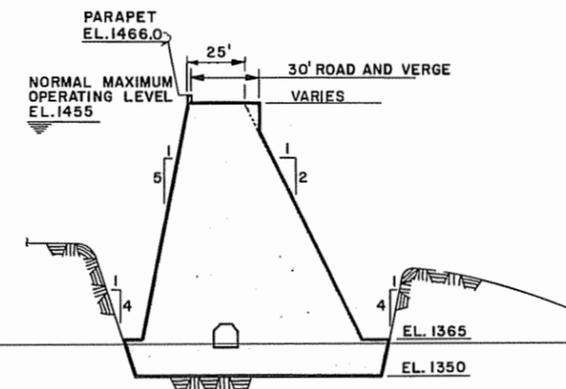
SECTION D-D



SECTION B-B

SECTION C-C

LEFT ABUTMENT THRUST BLOCK

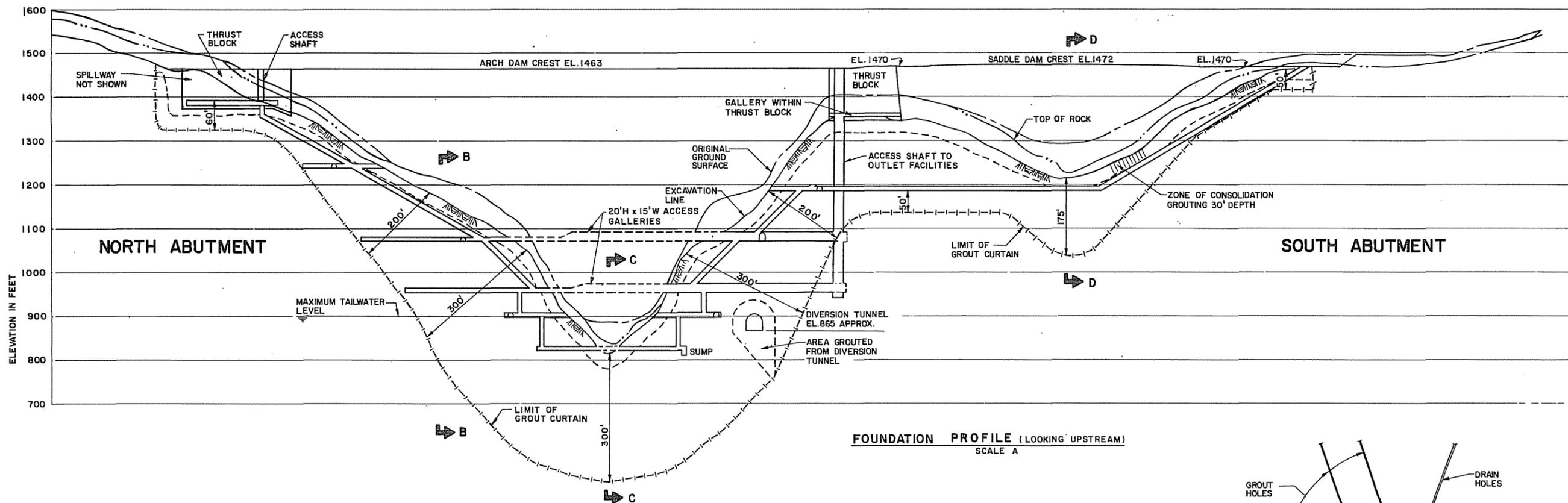


SECTION E-E

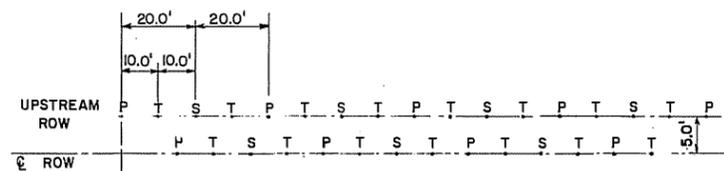
RIGHT ABUTMENT THRUST BLOCK



<small>HARZA-GEACCO SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
MAIN DAM THRUST BLOCKS			
EXHIBIT F		PLATE F46	

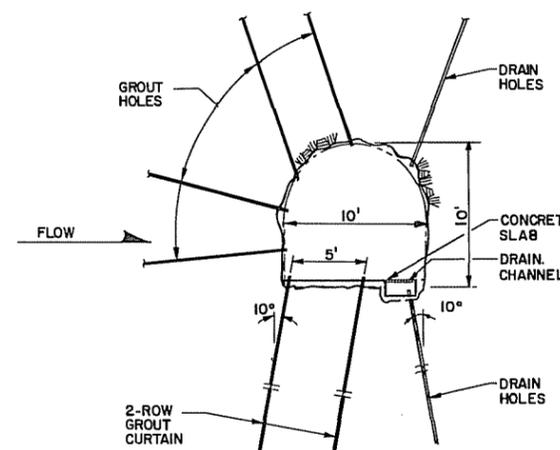


FOUNDATION PROFILE (LOOKING UPSTREAM)
SCALE A

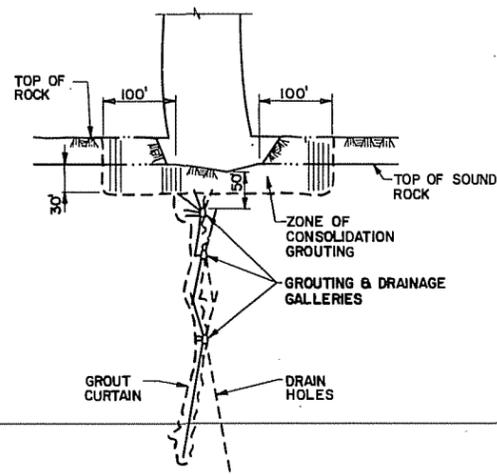


GROUT HOLE SPACING
SCALE C

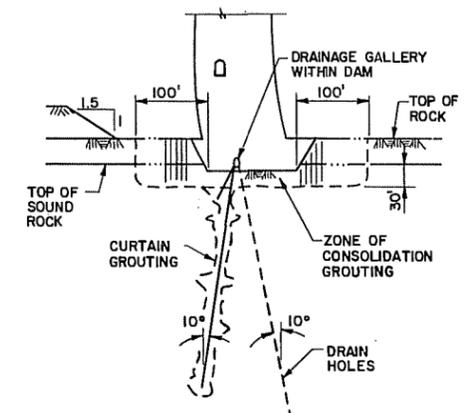
LEGEND
P = PRIMARY GROUT HOLE
S = SECONDARY GROUT HOLE
T = TERTIARY GROUT HOLE



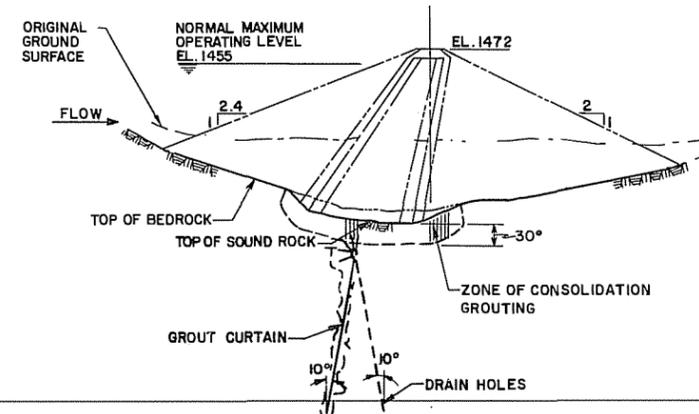
GALLERY DETAIL
SCALE B



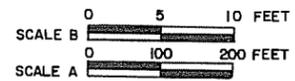
SECTION B-B
SCALE A



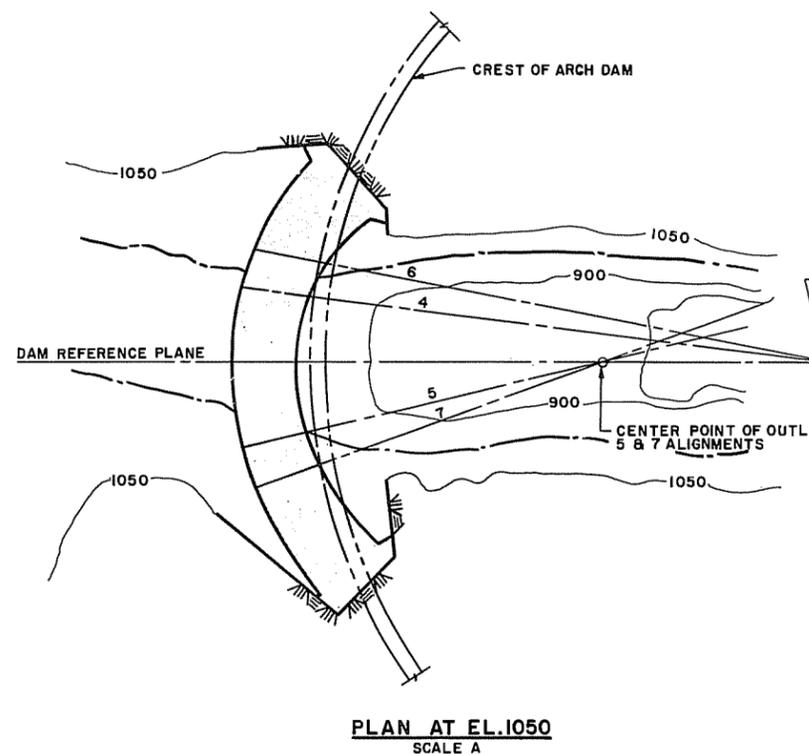
SECTION C-C
SCALE A



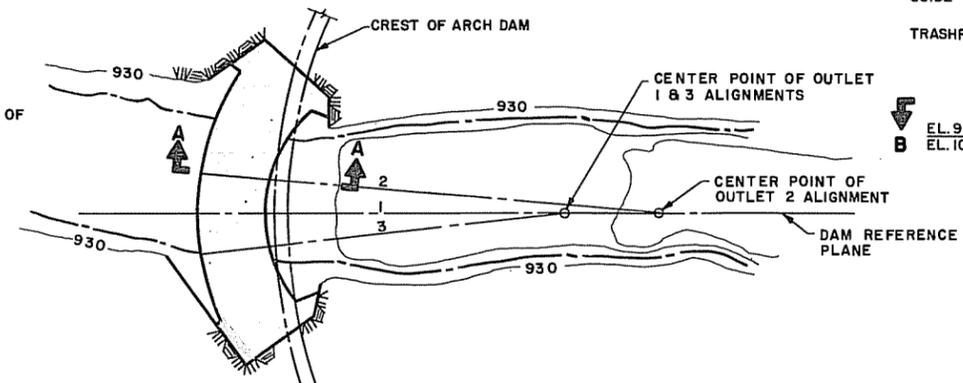
SECTION D-D
SCALE A



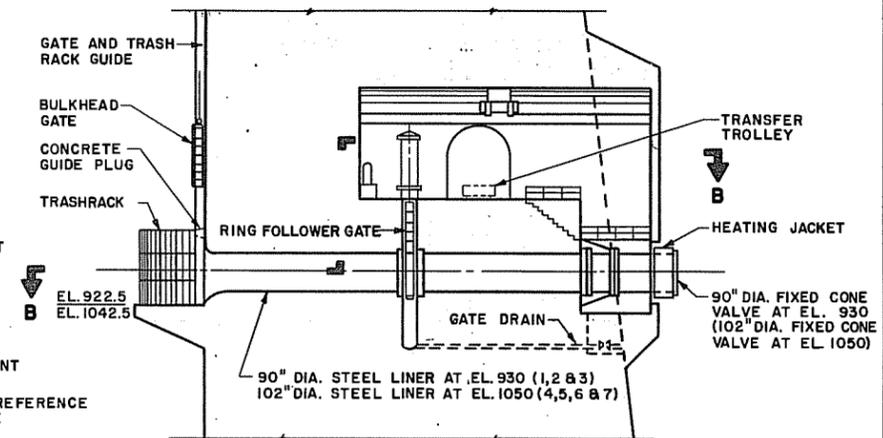
MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVL CANYON)			
MAIN DAM & SADDLE DAM GROUTING AND DRAINAGE			
EXHIBIT F		PLATE F47	



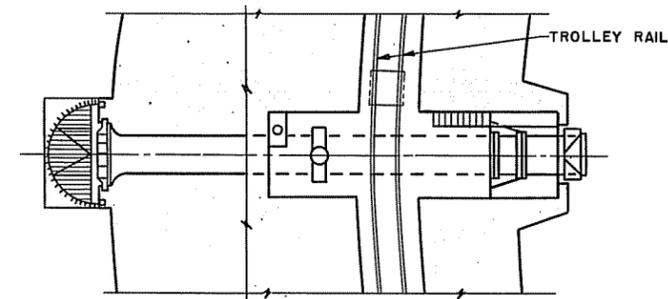
PLAN AT EL. 1050
SCALE A



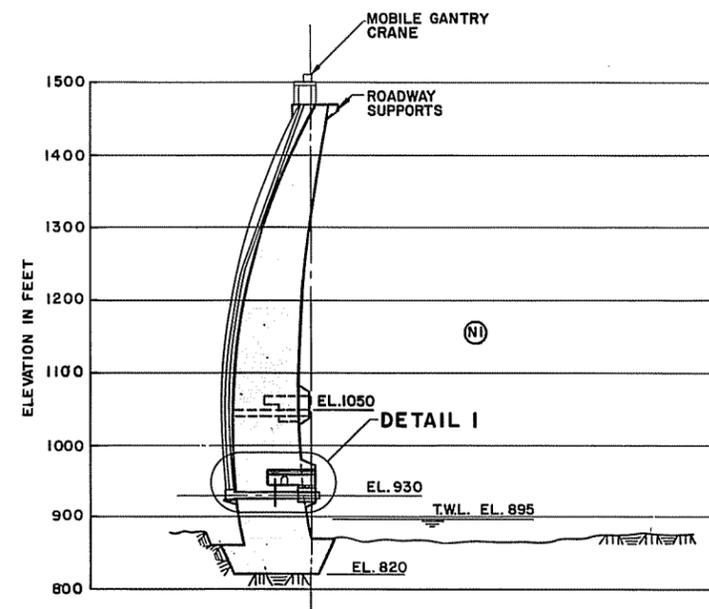
PLAN AT EL. 930
SCALE A



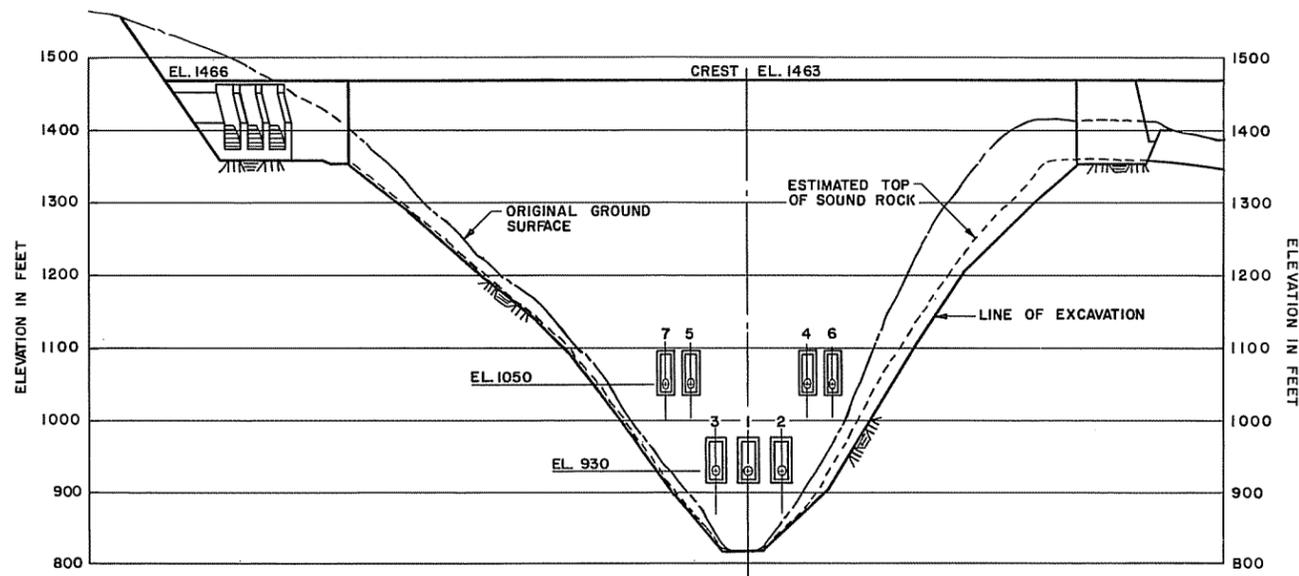
DETAIL I
SCALE B



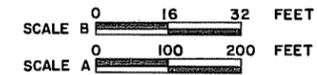
SECTION B-B
SCALE B



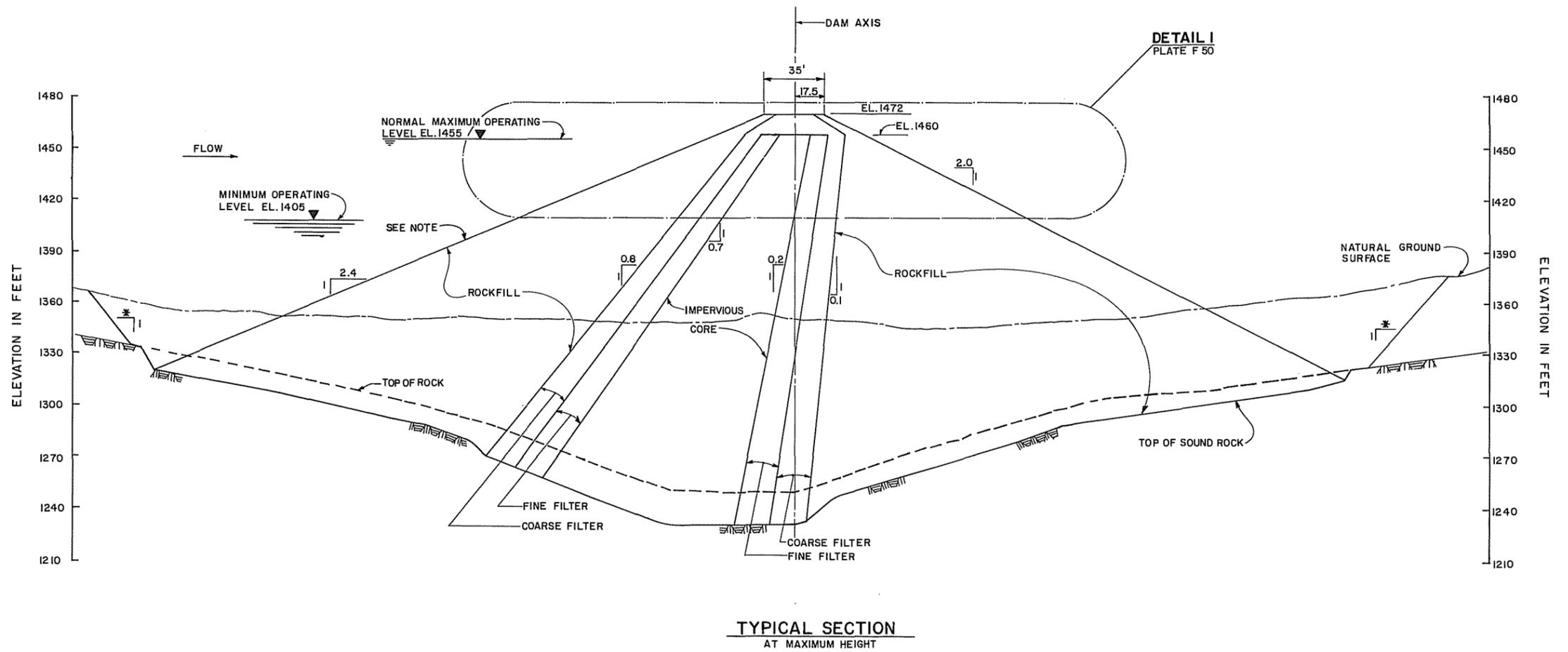
SECTION A-A (TYPICAL)
SCALE A



DAM PROFILE (PROJECTION-LOOKING UPSTREAM)
SCALE A

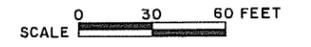


<p>MANZA-BEASCO ELECTRA JOINT VENTURE</p>	<p>ALASKA POWER AUTHORITY</p>
<p>SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)</p>	
<p>MAIN DAM OUTLET FACILITIES</p>	
<p>EXHIBIT F</p>	<p>PLATE F48</p>

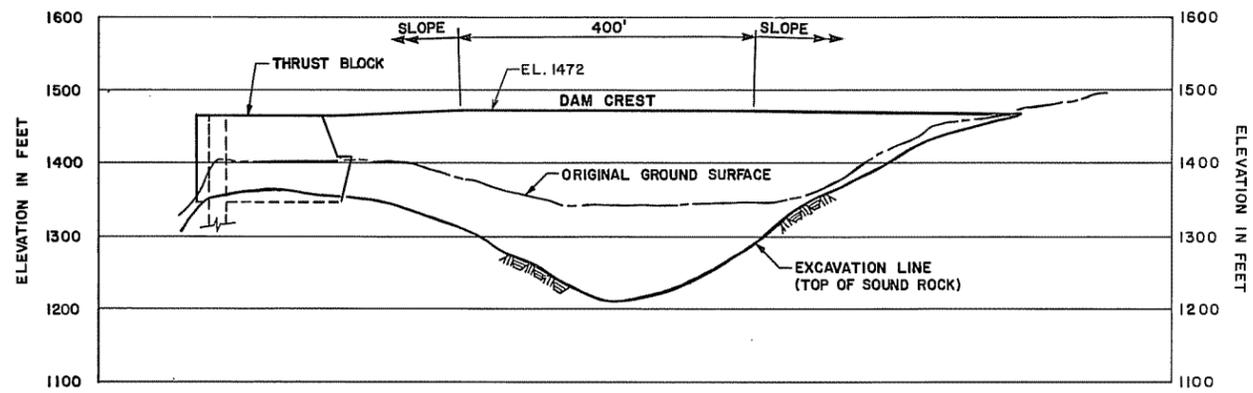


LEGEND
* STABLE

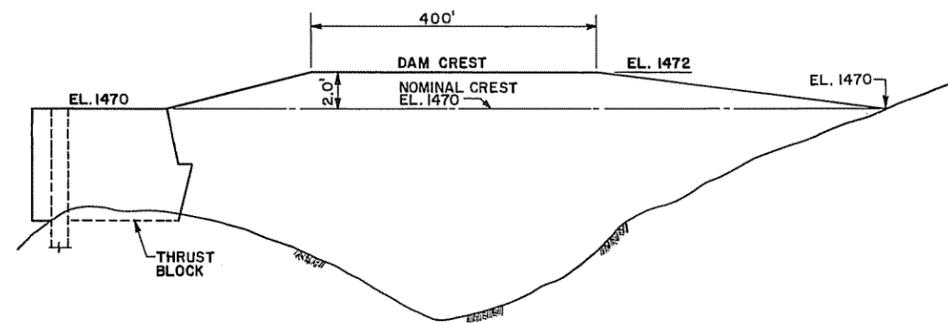
NOTE
ROCK RAKING WILL BE DONE WITHIN 40 FEET OF THE UPSTREAM SLOPE THROUGHOUT THE ZONES OF PERMANENT RESERVOIR FLUCTUATION AND FREEBOARD.



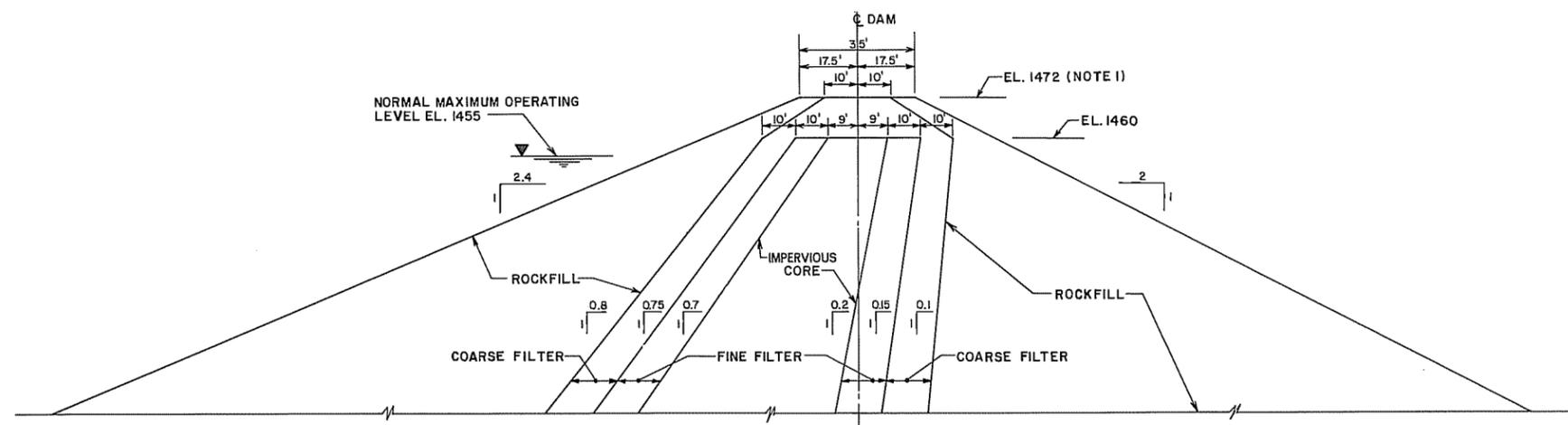
<small>HARZA-EDASCO</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SADDLE DAM SECTION			
EXHIBIT F		PLATE F49	



PROFILE (LOOKING UPSTREAM)
SCALE A

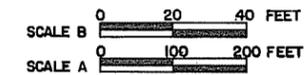


PROFILE
SHOWING CREST ELEVATIONS
N.T.S.

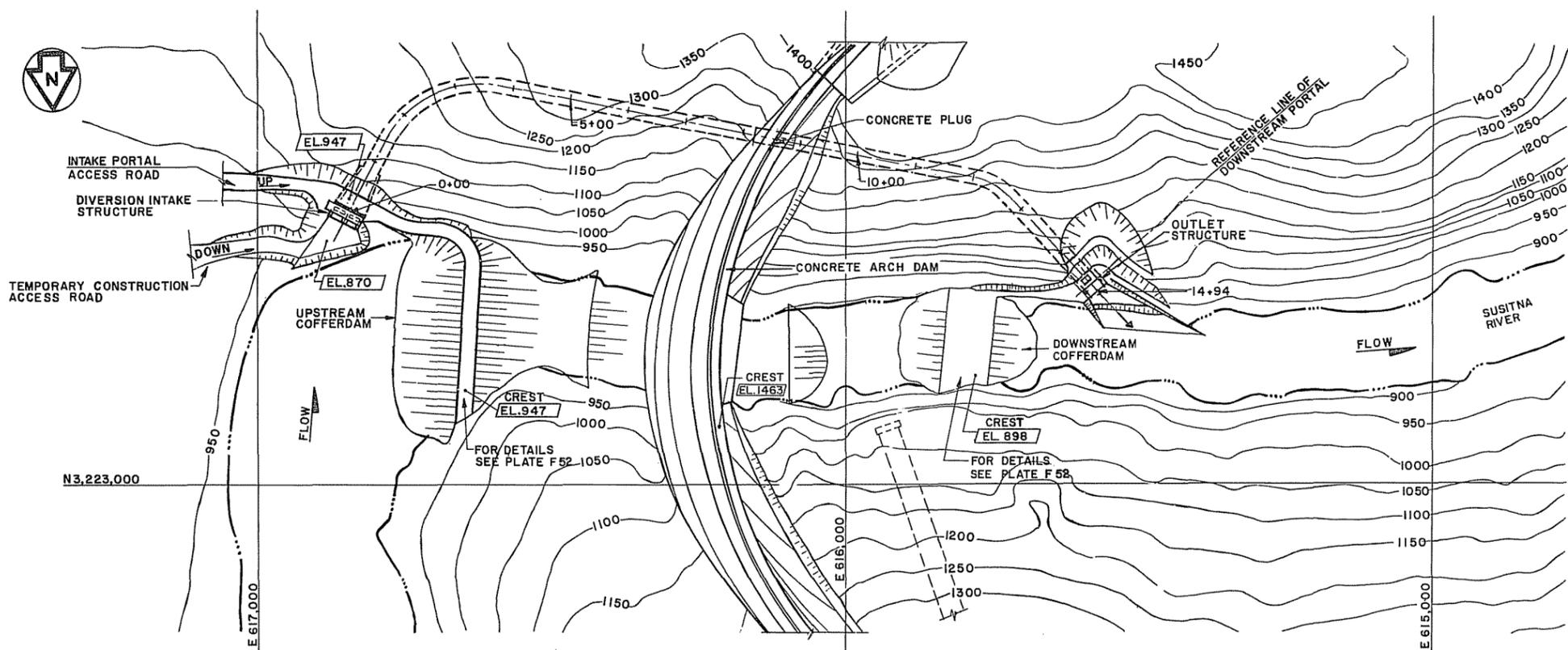


DETAIL I
SCALE B

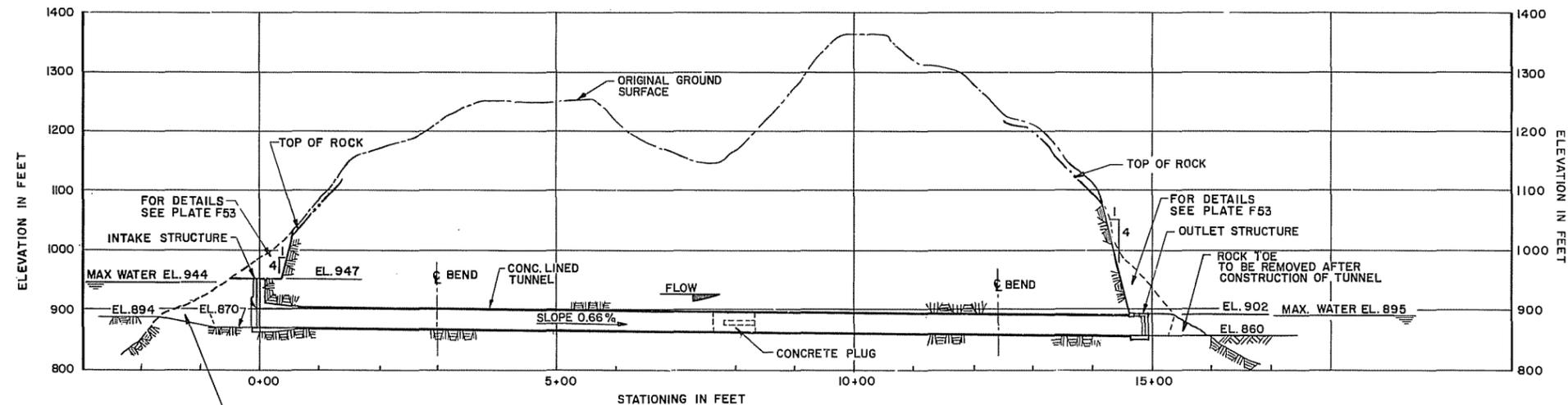
- NOTES:
1. INCLUDES 2' SETTLEMENT OVERBUILD
2. TYPICAL DAM SECTION SHOWN ON PLATE F49



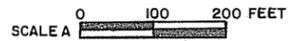
<small>MARKA-EDASCO</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SADDLE DAM PROFILE AND CREST DETAIL			
EXHIBIT F		PLATE F50	



PLAN
SCALE A



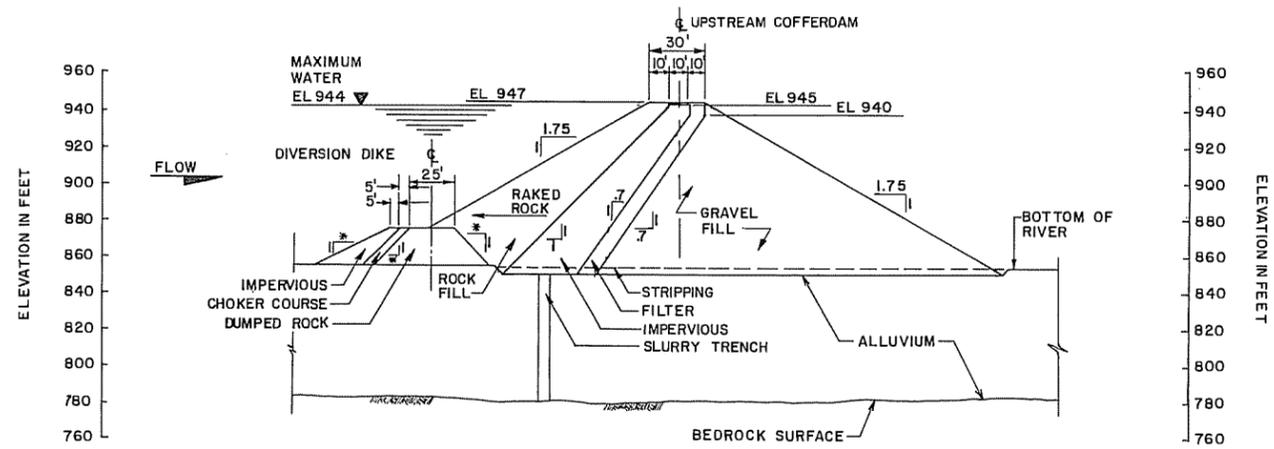
PROFILE
AT CENTERLINE TUNNEL
SCALE A



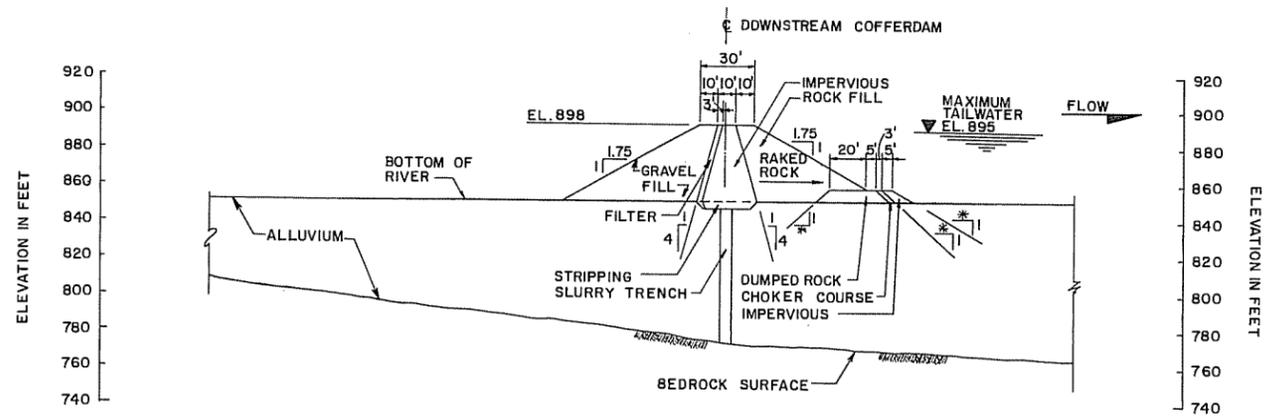
MARZA-BDASCO
SUSITNA ARCH VENTURES
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)

DIVERSION
GENERAL ARRANGEMENT

EXHIBIT F PLATE F 51

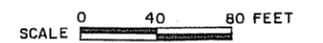


TYPICAL UPSTREAM COFFERDAM SECTION

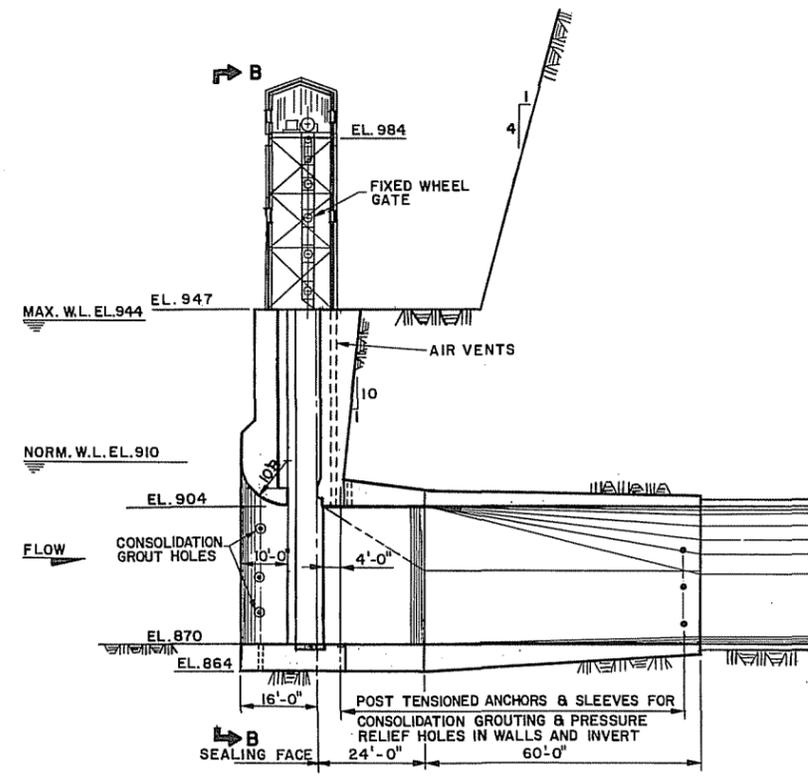


TYPICAL SECTION DOWNSTREAM COFFERDAM

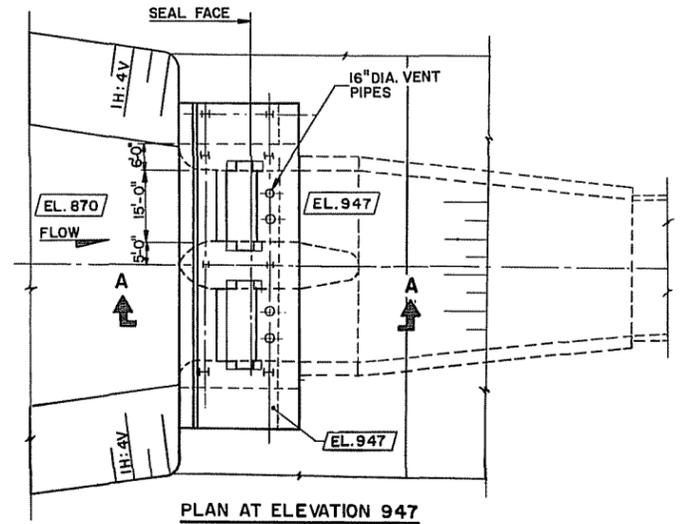
LEGEND
* ANGLE OF REPOSE



PARZA-ERASSO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
DIVERSION COFFERDAM SECTIONS	
EXHIBIT F	PLATE F52

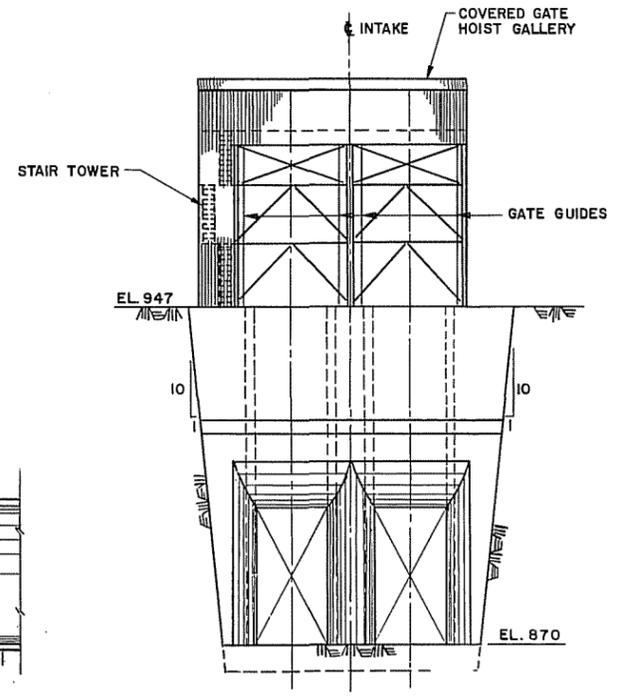


SECTION A-A
SCALE A

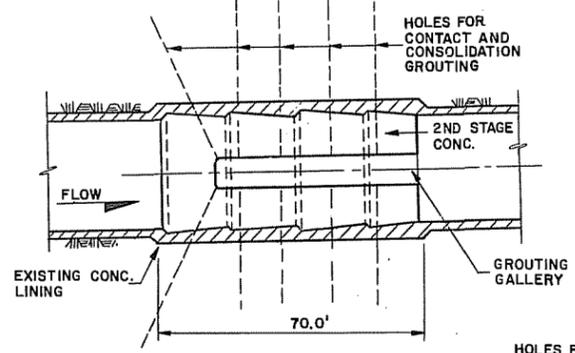


PLAN AT ELEVATION 947
SCALE A

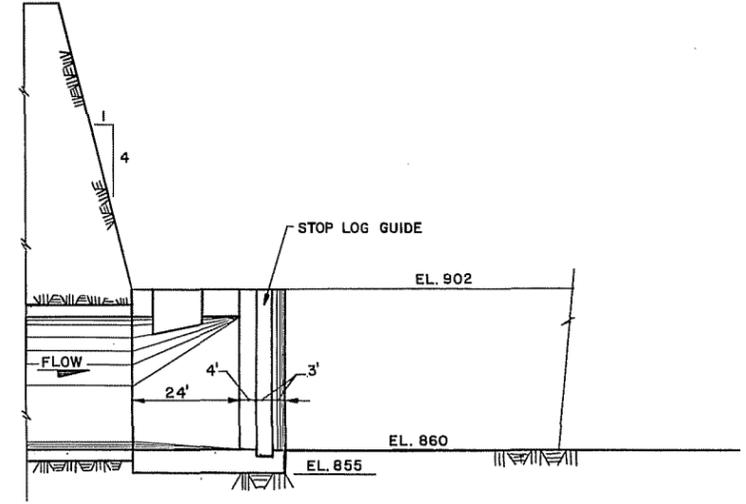
DIVERSION INTAKE STRUCTURE (PLATE F51)



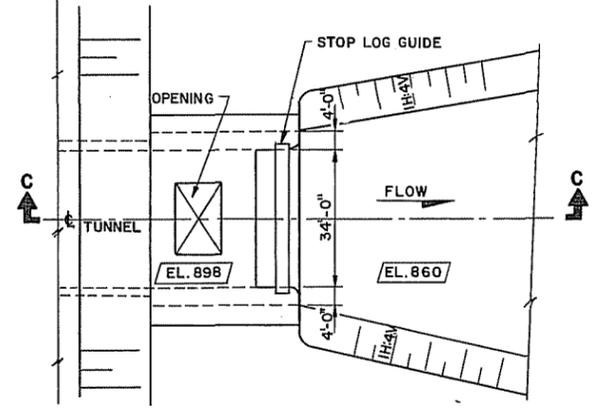
ELEVATION B-B
SCALE A



SECTION THRU PLUG
SCALE B

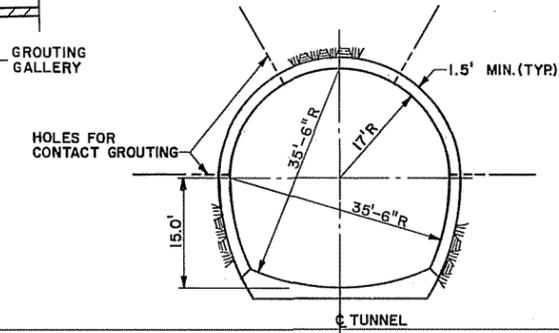


SECTION C-C
SCALE A

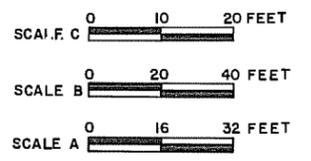


PLAN AT ELEVATION 898
SCALE A

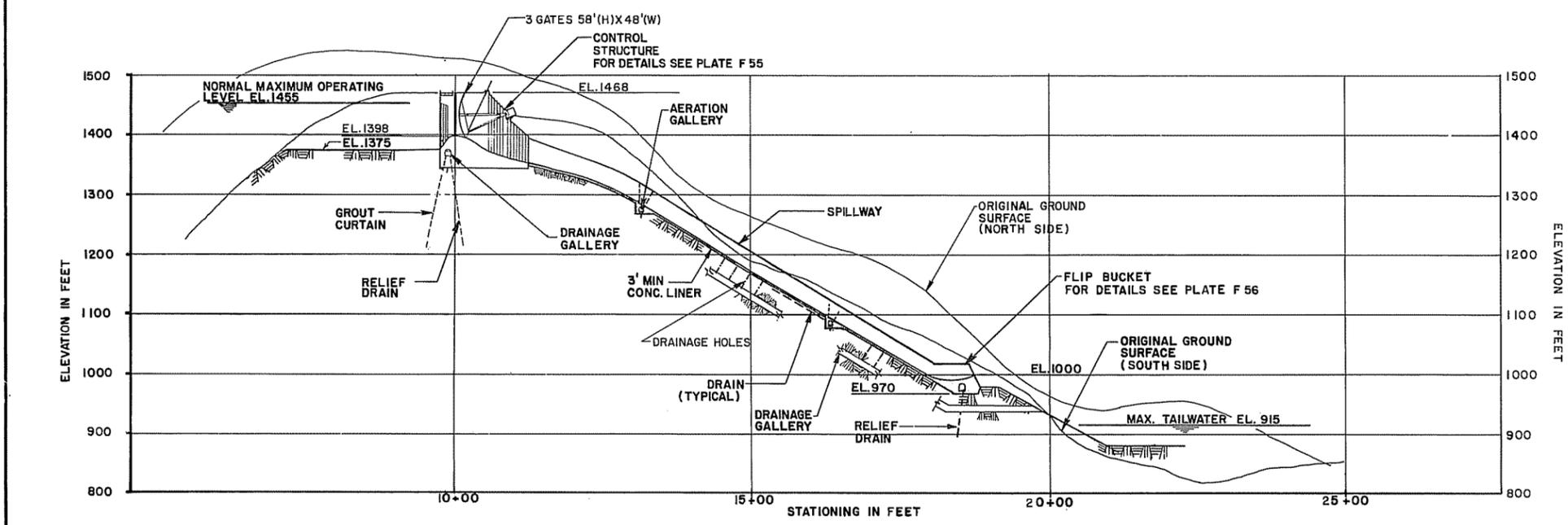
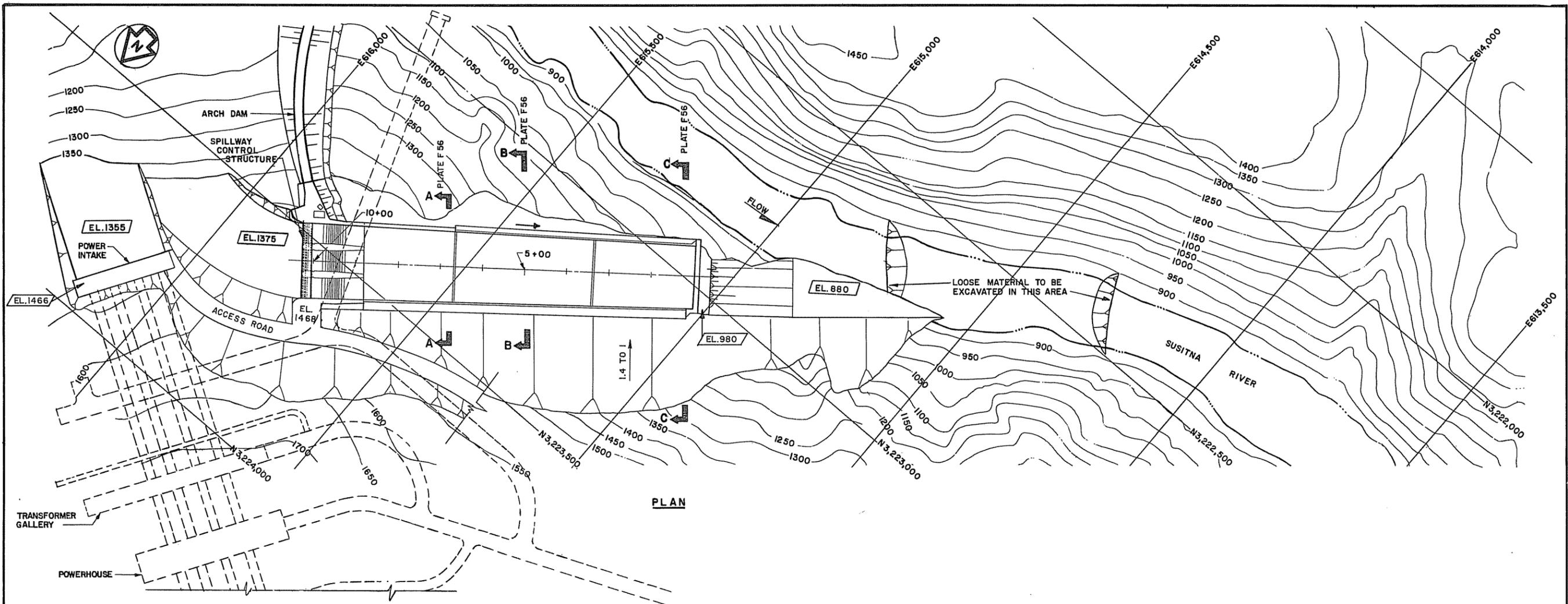
DIVERSION OUTLET STRUCTURE (PLATE F51)



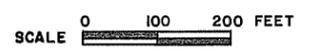
TYPICAL TUNNEL SECTIONS
SCALE C



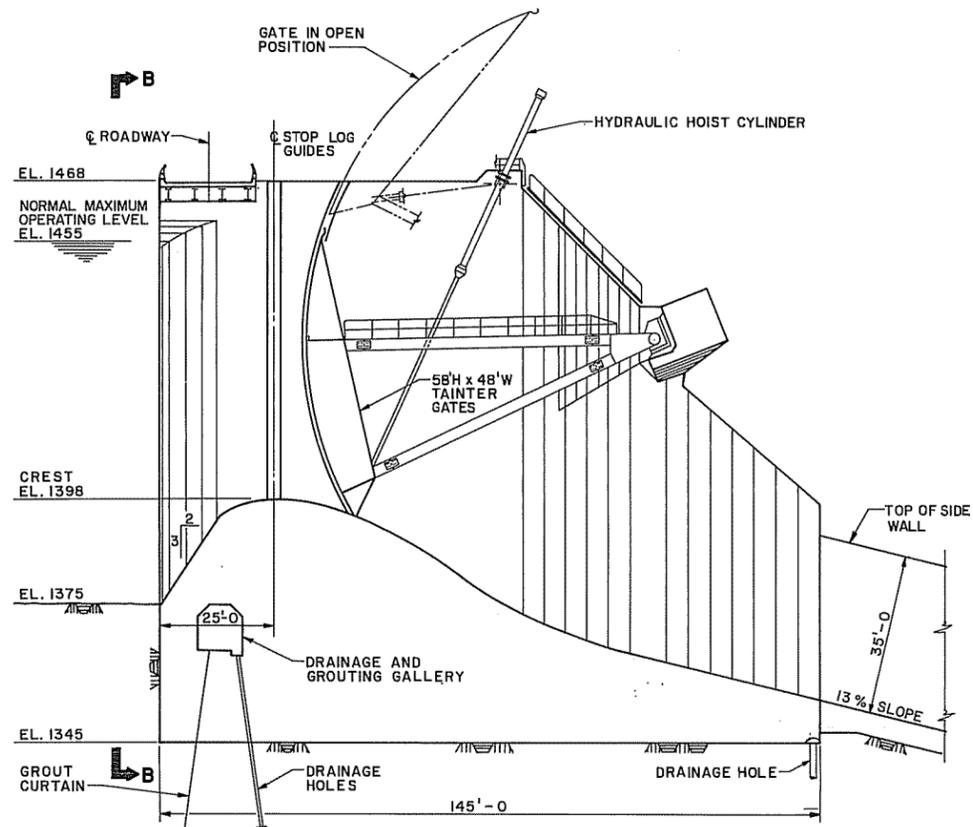
MARZA-EDASCO SUBSIDIARY JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
DIVERSION TUNNEL SECTIONS			
EXHIBIT F		PLATE F53	



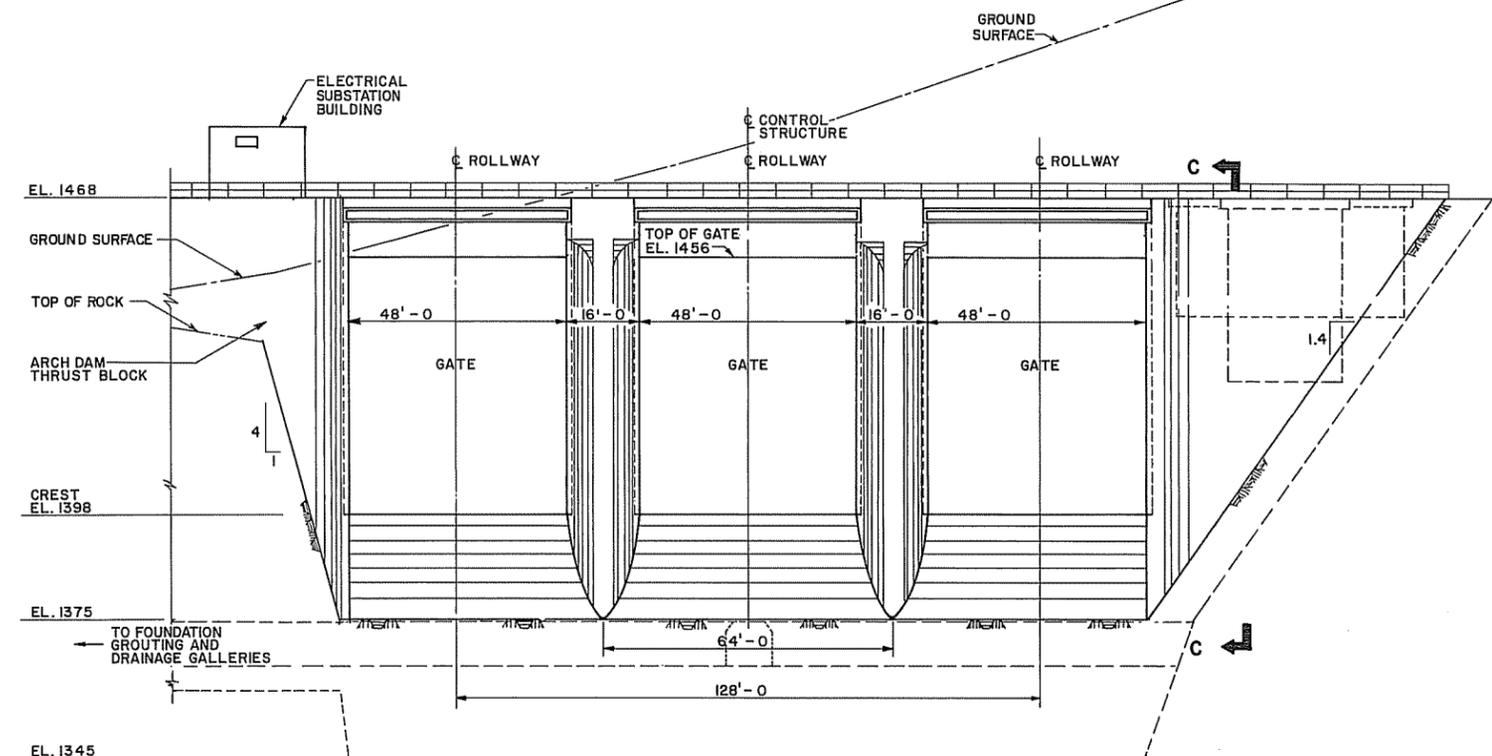
NOTE: FOR SECTIONS SEE PLATE F56



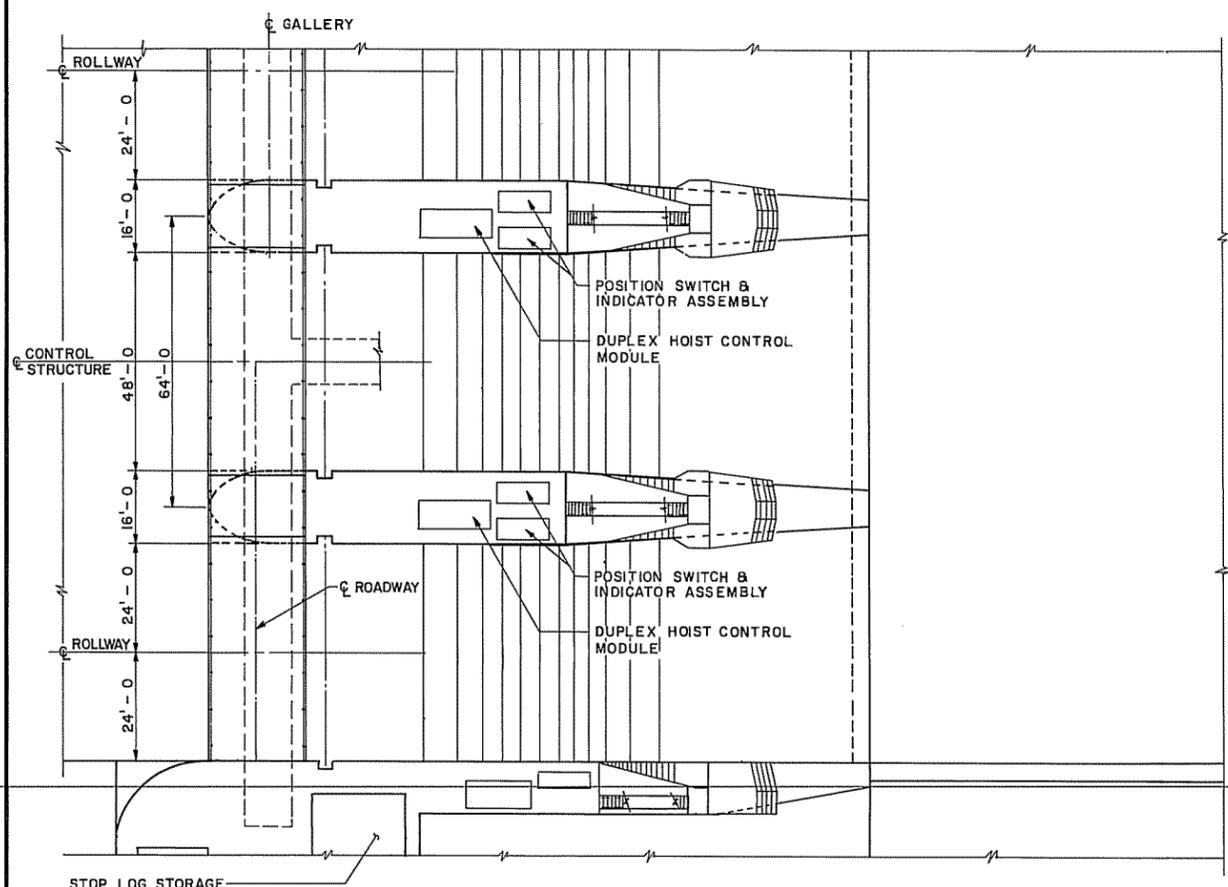
MANZA-BRASC® ALASKA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
SPILLWAY GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F 54



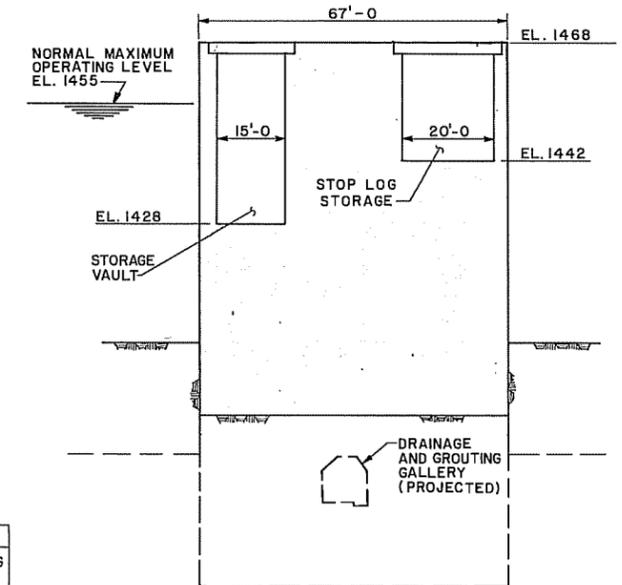
TYPICAL SECTION



ELEVATION B-B



PLAN



SECTION C-C

SPILLWAY CONTROL STRUCTURE
SUMMARY OF STABILITY ANALYSES

LOAD CONDITION	FOUNDATION STRESS U.S./D.S (PSI)	Xcg (FT)	FACTORS OF SAFETY			
			SLIDING	SHEAR FRICTION	FLOATATION	OVERTURNING
NORMAL INCLUDES ICE LOADS	41.5 / 49.6	2.1	N.A	3.3	5.2	2.7
UNUSUAL 1:100/110 YR. EARTHQUAKE (0.20g)	21.7 / 69.4	12.7	N.A	2.0	5.2	2.1
UNUSUAL DRAINS PLUGGED; PMF	21.1 / 44.2	8.6	N.A	2.9	2.4	1.7
EXTREME EARTHQUAKE (0.57g)	-19.2 / 110.3	34.3	N.A	1.2	5.2	1.5

PHYSICAL PARAMETERS
φ = 35°
c = 30 PSI

SCALE 0 16 32 FEET

MARZA-EDASCO
SUSITNA JOINT VENTURE

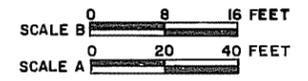
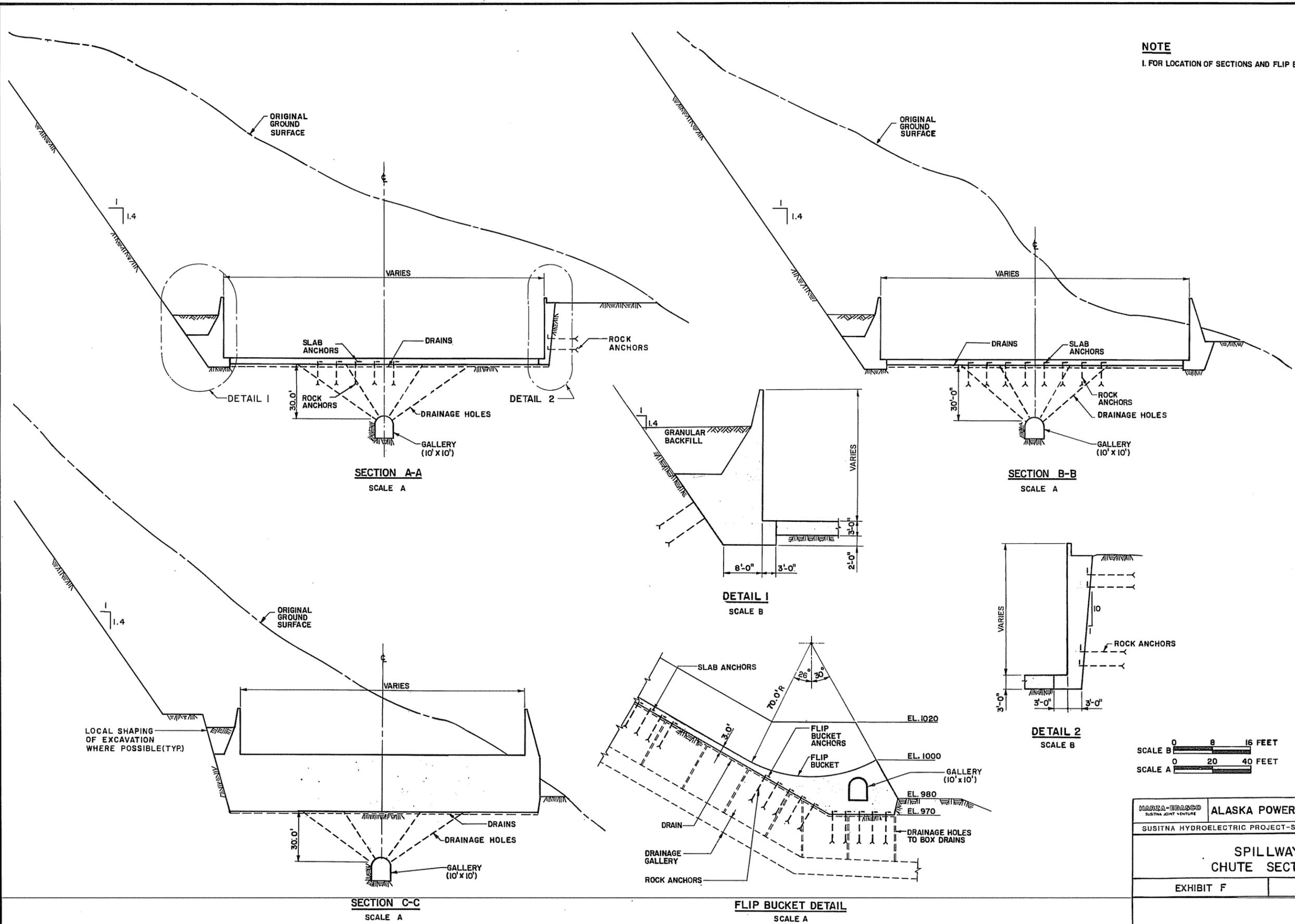
ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)

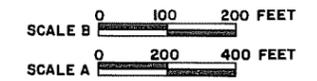
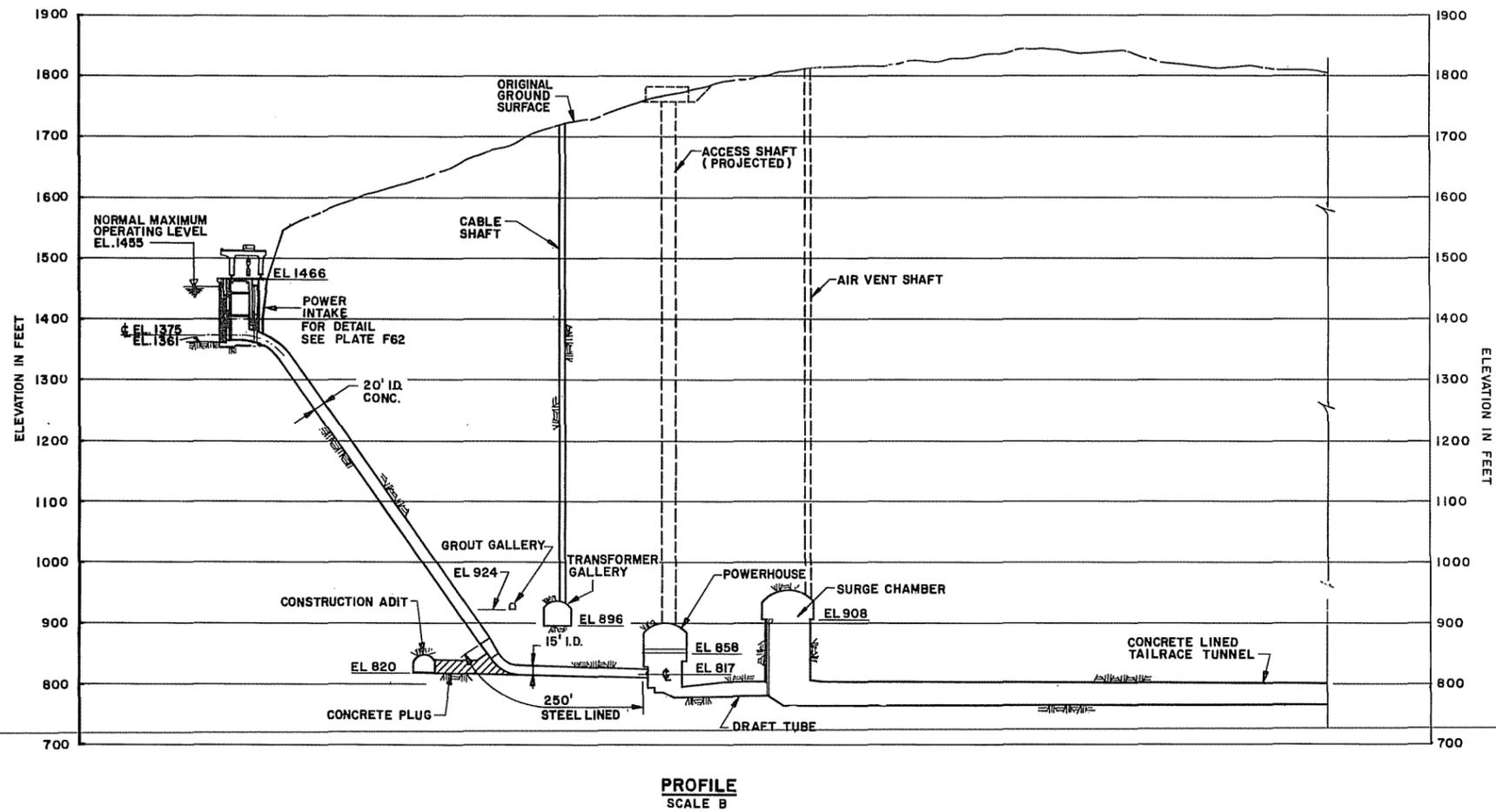
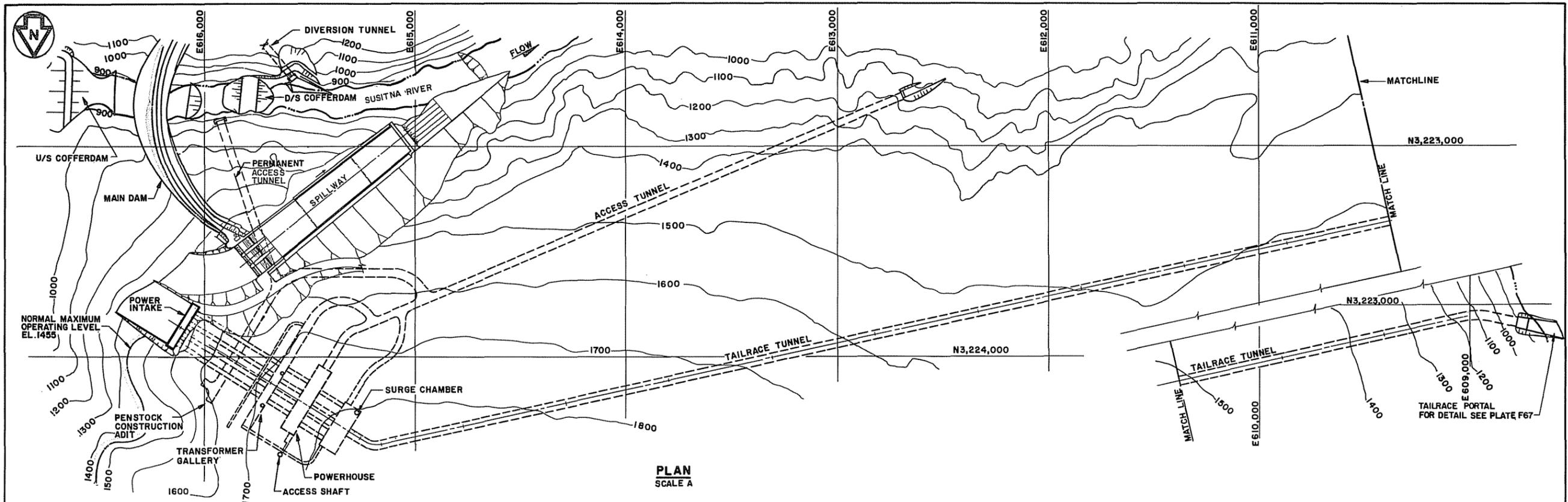
SPILLWAY CONTROL STRUCTURE

EXHIBIT F PLATE F55

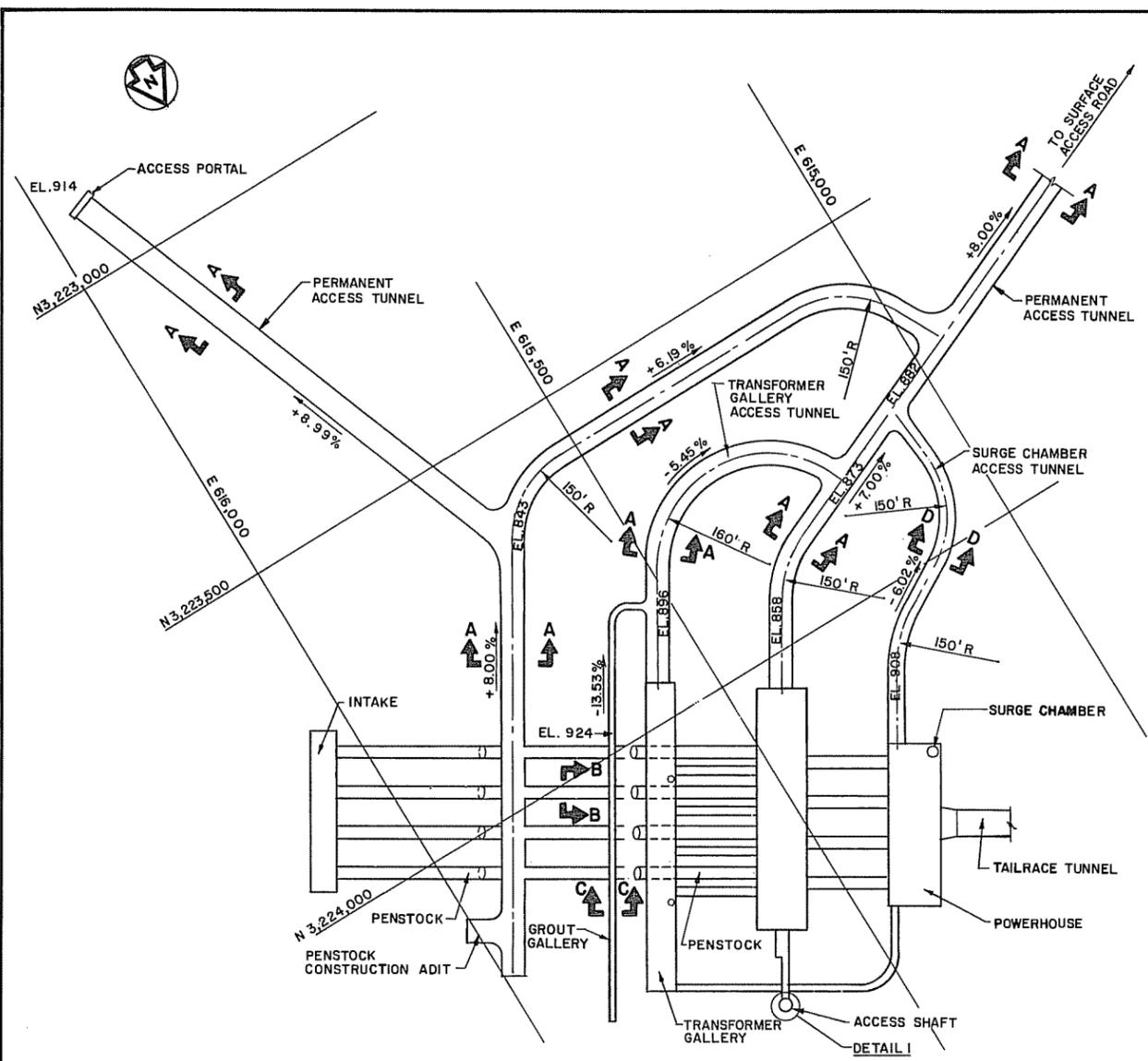
NOTE
 I. FOR LOCATION OF SECTIONS AND FLIP BUCKET, SEE PLATE F54



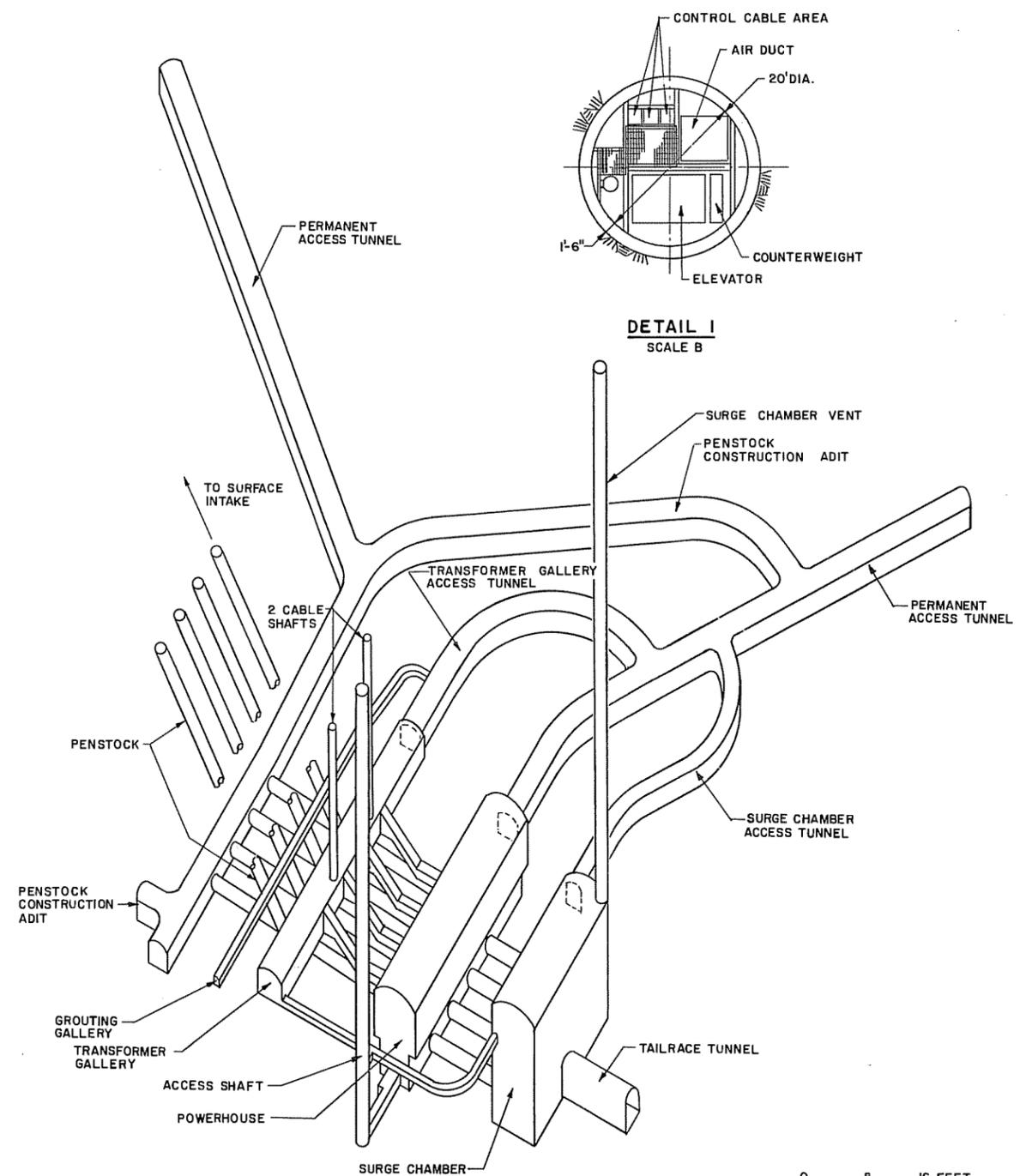
MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SPILLWAY CHUTE SECTIONS			
EXHIBIT F		PLATE F 56	



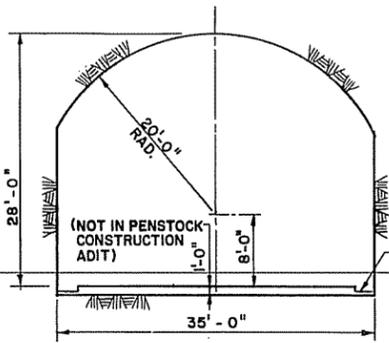
MANZA-BRASSCO SUSITNA CIVIL ENGINEERS	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
POWER FACILITIES GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F.59



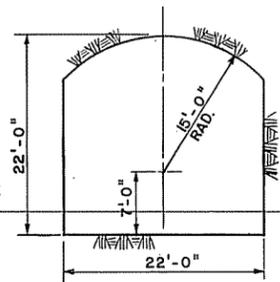
PLAN
SCALE A



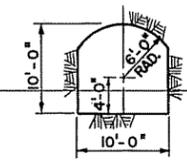
ISOMETRIC
SCALE A



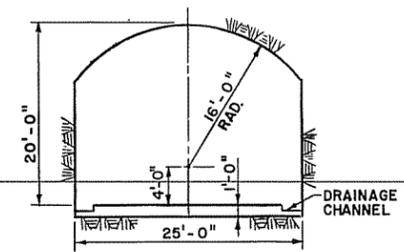
SECTION A-A
SCALE B



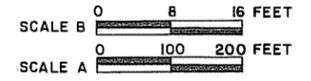
SECTION B-B
SCALE B



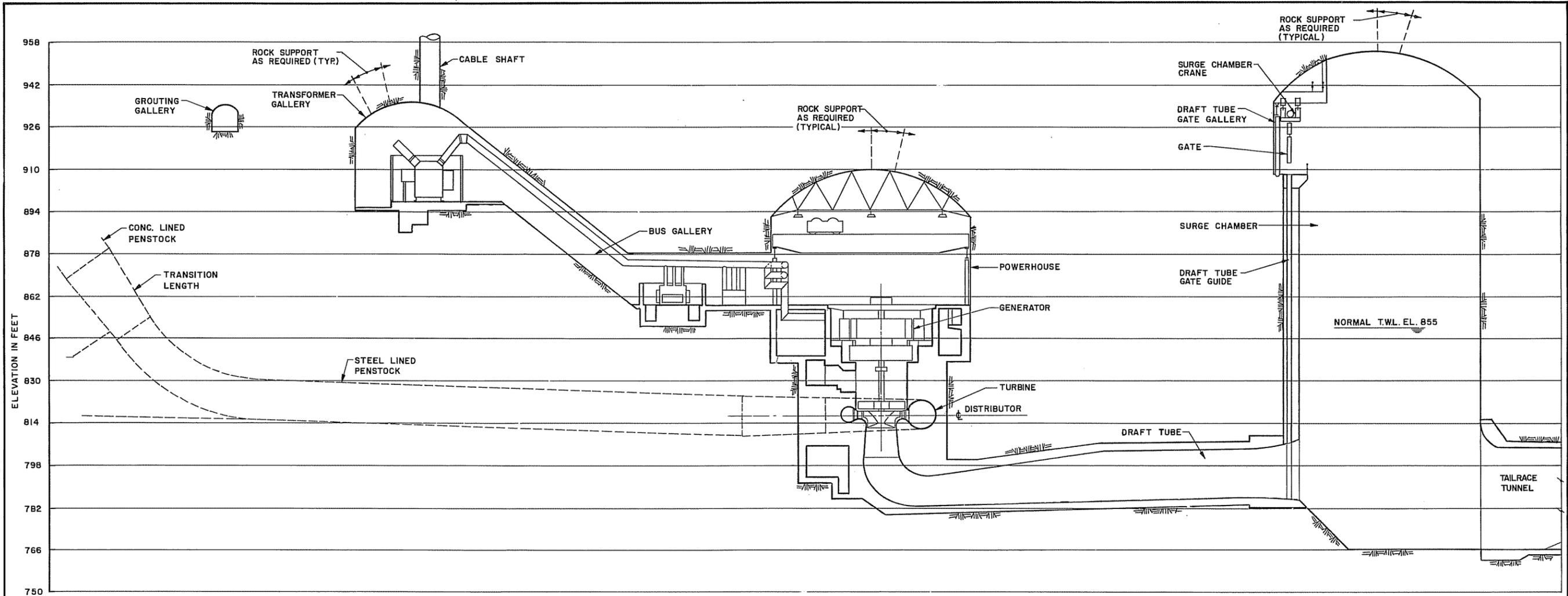
SECTION C-C
SCALE B



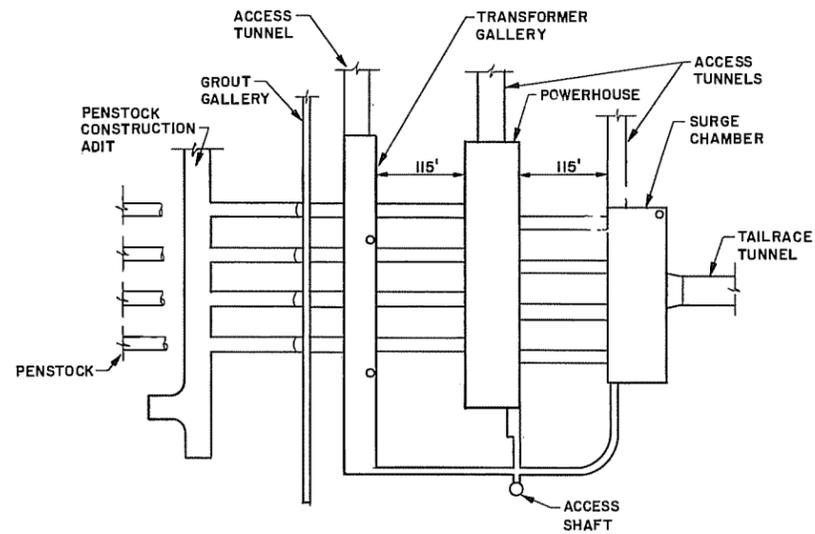
SECTION D-D
SCALE B



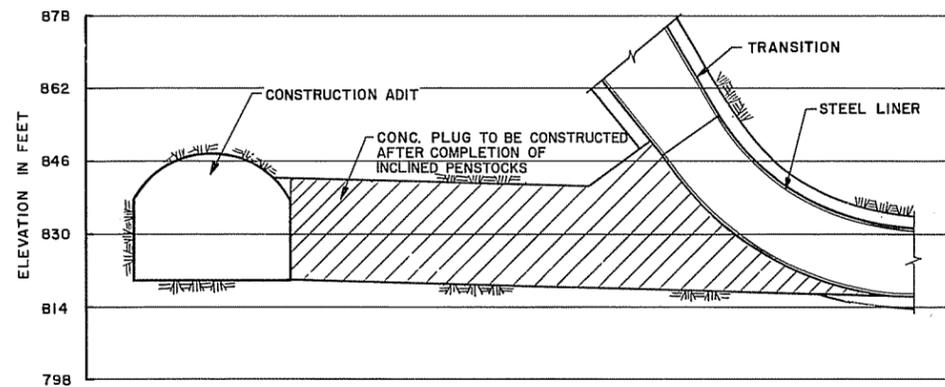
MARZA-BRASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
POWER FACILITIES ACCESS			
EXHIBIT F		PLATE F 60	



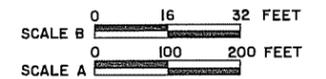
SECTION A-A
SCALE B



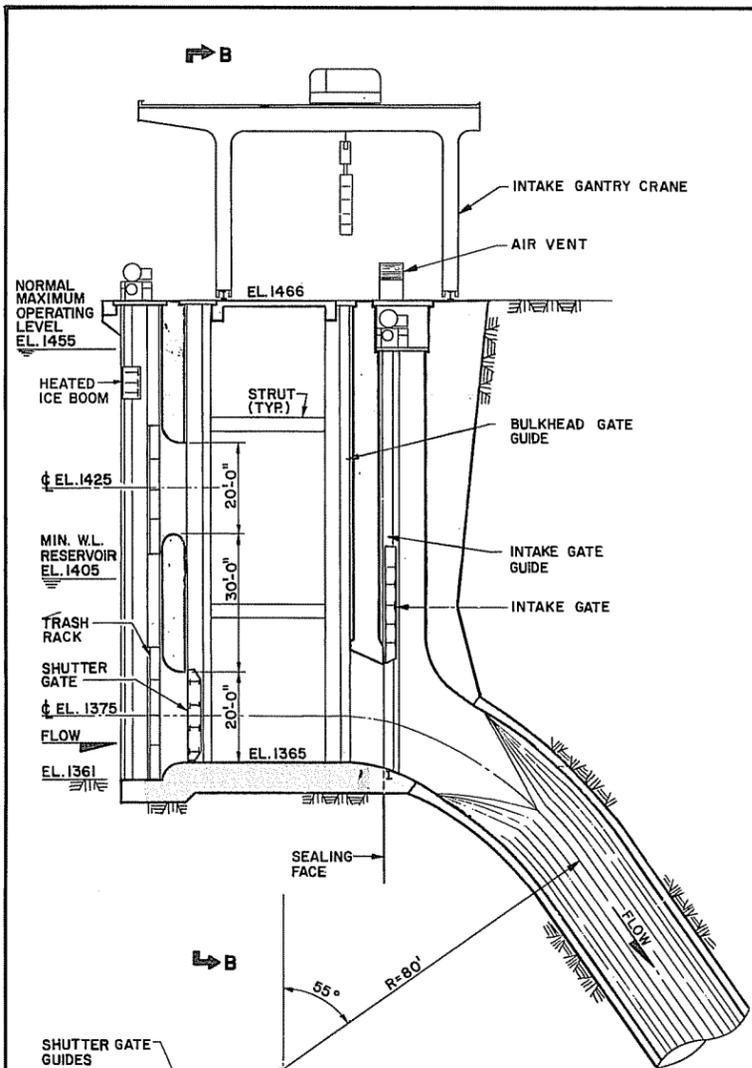
PLAN
SCALE A



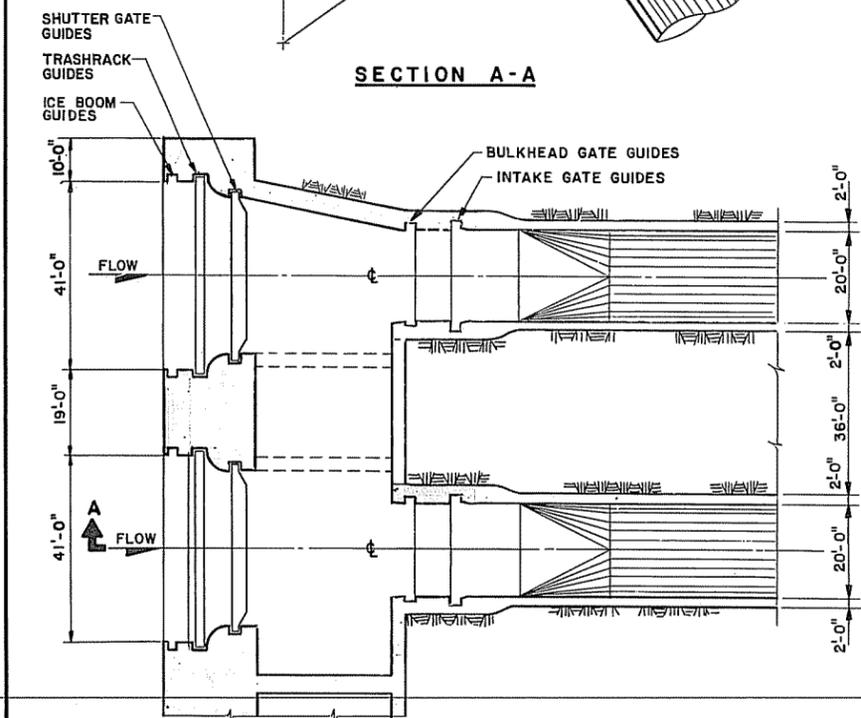
SECTION B-B
SCALE B



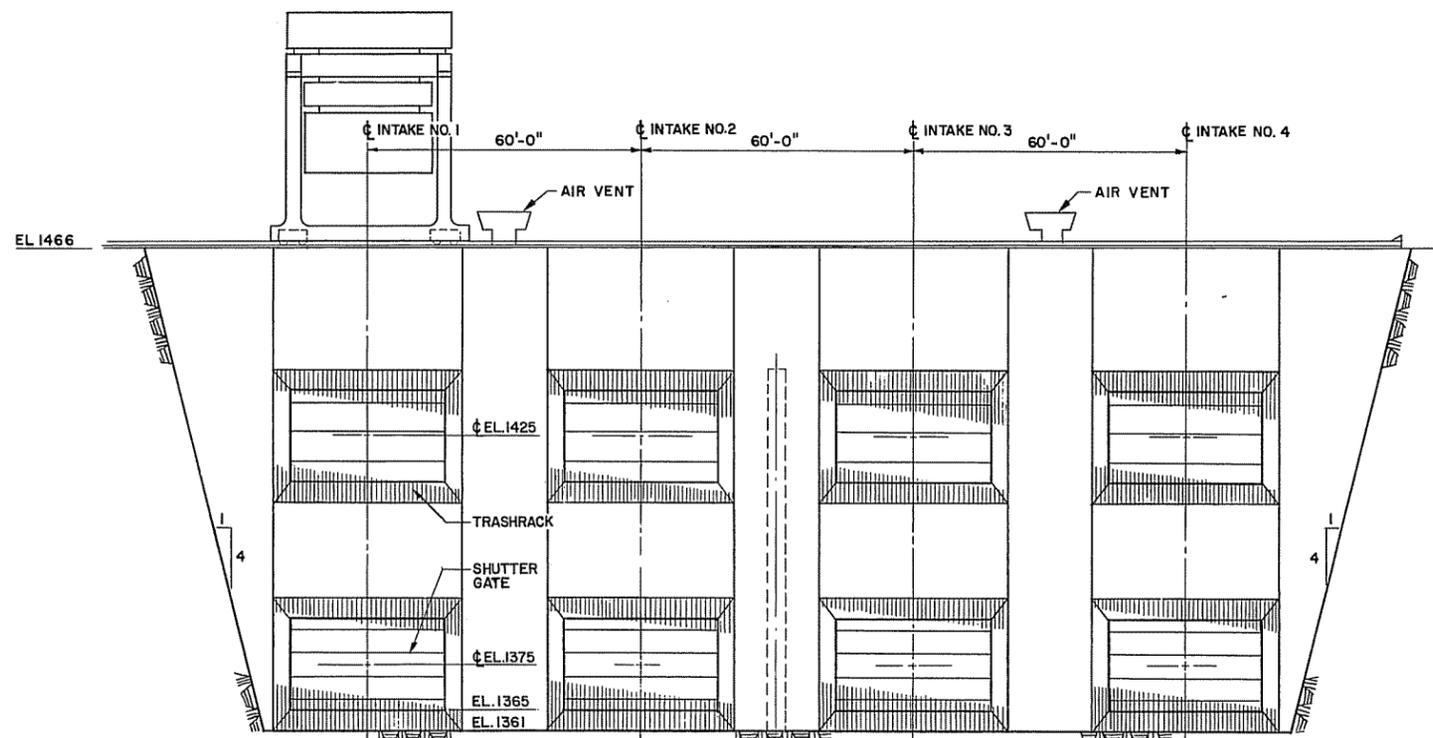
<small>MARZA-EDASC®</small> <small>SUSITNA JOINT VENTURE</small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
POWER FACILITIES PLAN & SECTIONS	
EXHIBIT F	PLATE F6I



SECTION A-A



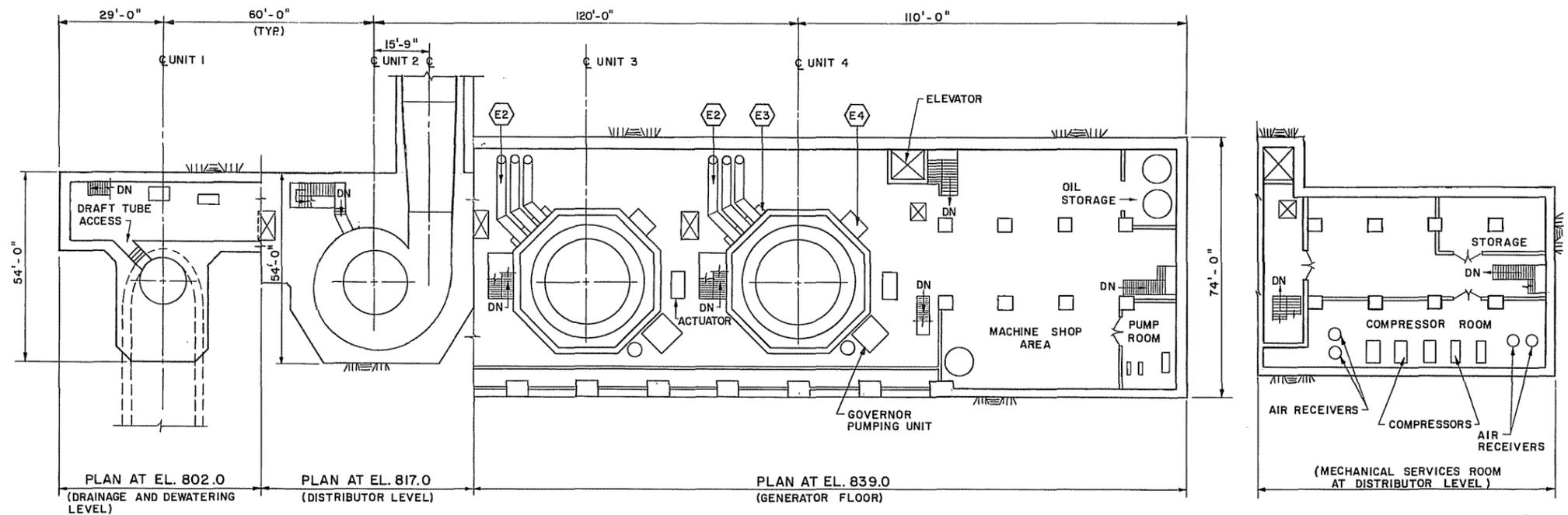
PLAN AT INTAKE CENTERLINE



ELEVATION B-B

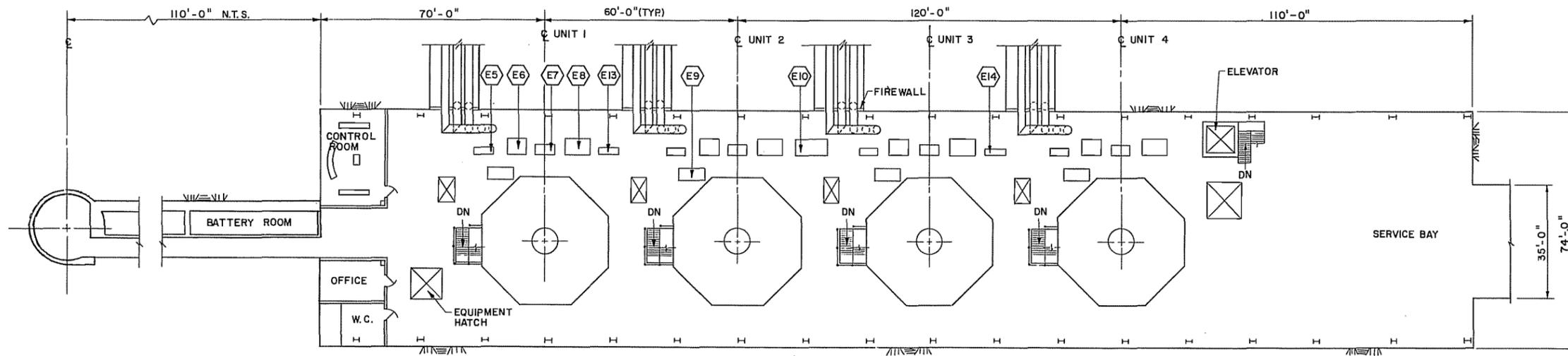
SCALE 0 16 32 FEET

MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
POWER INTAKE SECTIONS			
EXHIBIT F		PLATE F 62	



POWERHOUSE PLAN

PLAN AT EL. 817.0

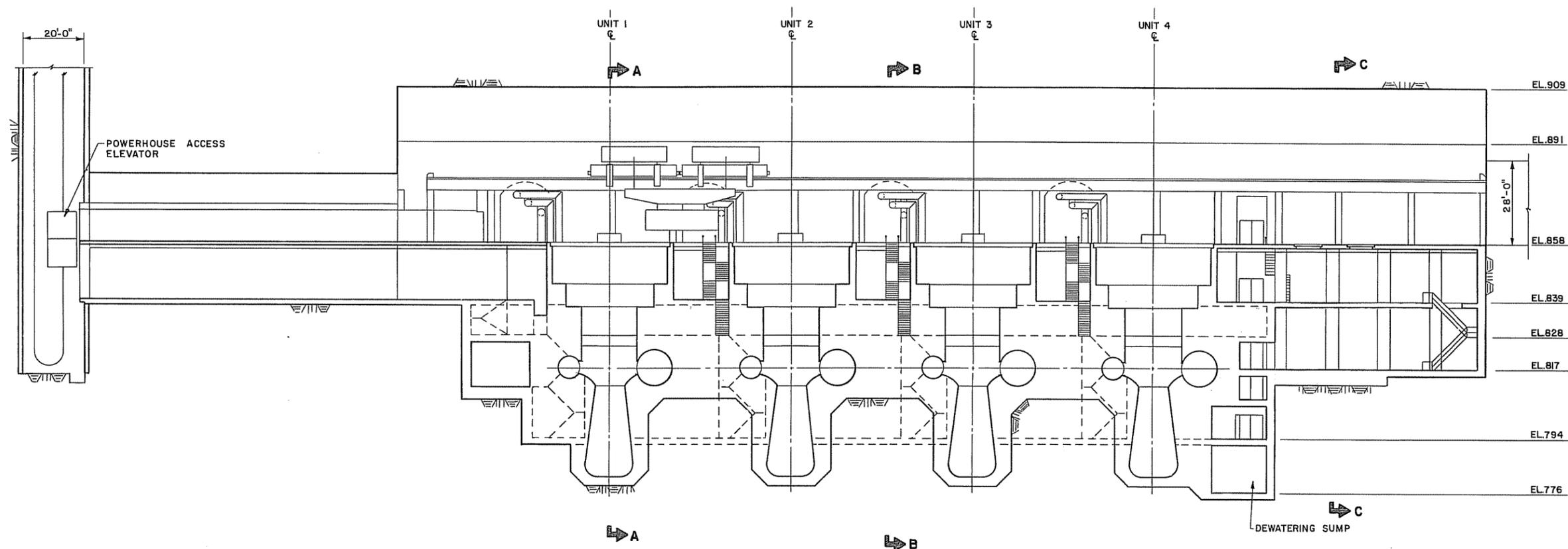


POWERHOUSE PLAN
AT EL. 858.0

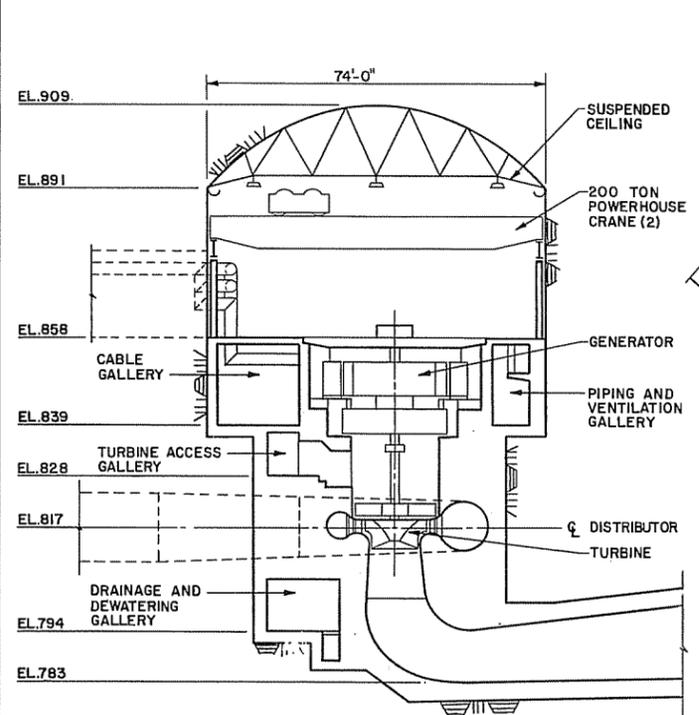
LEGEND

- E1 NOT USED
- E2 15 KV ISOLATED PHASE BUS
- E3 GENERATOR TERMINAL CUBICAL
- E4 GENERATOR NEUTRAL CUBICAL
- E5 UNIT AUXILIARY SWITCHBOARD
- E6 RELAY BOARD
- E7 TURBINE-GENERATOR CONTROL BOARD
- E8 EXCITATION BOARD
- E9 EXCITATION TRANSFORMER
- E10 MAIN AUXILIARY SWITCHGEAR
- E11 AUXILIARY SERVICE TRANSFORMER (5/7.5 MVA)- PLATE F64
- E12 AUXILIARY SERVICE TRANSFORMER (2 MVA)- PLATE F64
- E13 GENERAL AUXILIARY SWITCHBOARD
- E14 ESSENTIAL SERVICES SWITCHBOARD

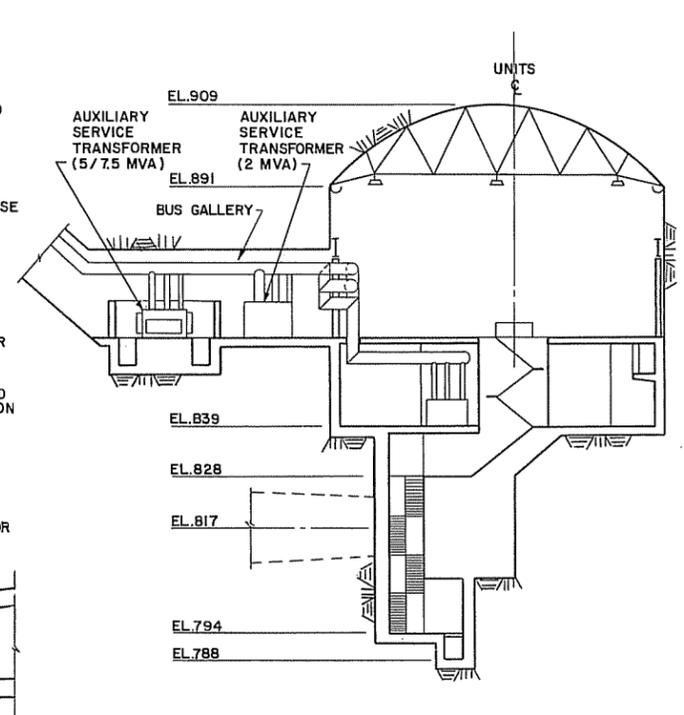
MARZA-EBASC® SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
POWERHOUSE PLANS			
EXHIBIT F		PLATE F63	



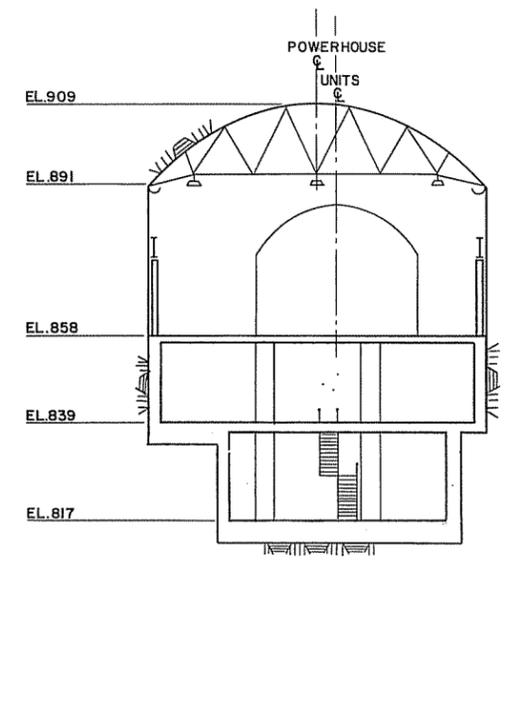
LONGITUDINAL SECTION (THRU CENTERLINE OF UNITS)



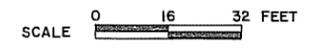
SECTION A-A (SECTION THRU CENTERLINE OF UNIT)



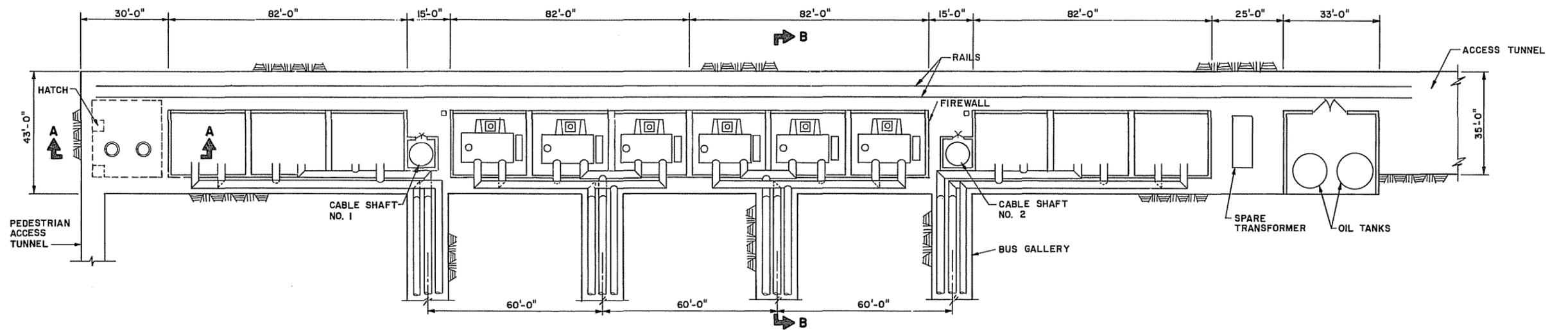
SECTION B-B (SECTION THRU BUS GALLERY)



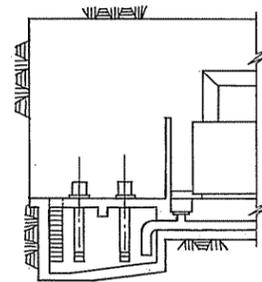
SECTION C-C (SECTION THRU SERVICE BAY)



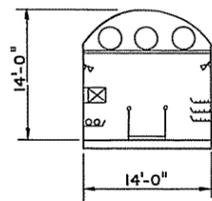
MARZA • EDASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
POWERHOUSE SECTIONS	
EXHIBIT F	PLATE F 64



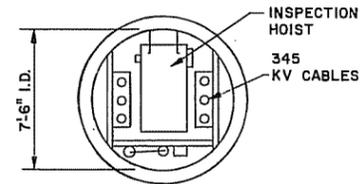
PLAN
SCALE A



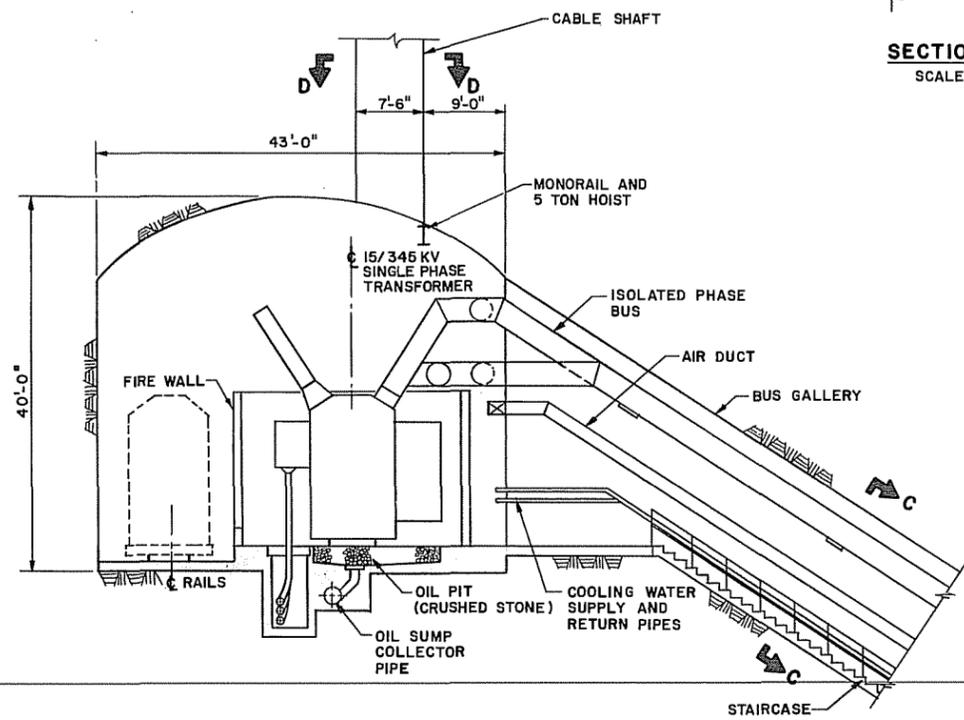
SECTION A-A
SCALE A



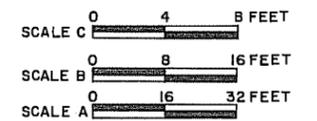
SECTION C-C
SCALE B



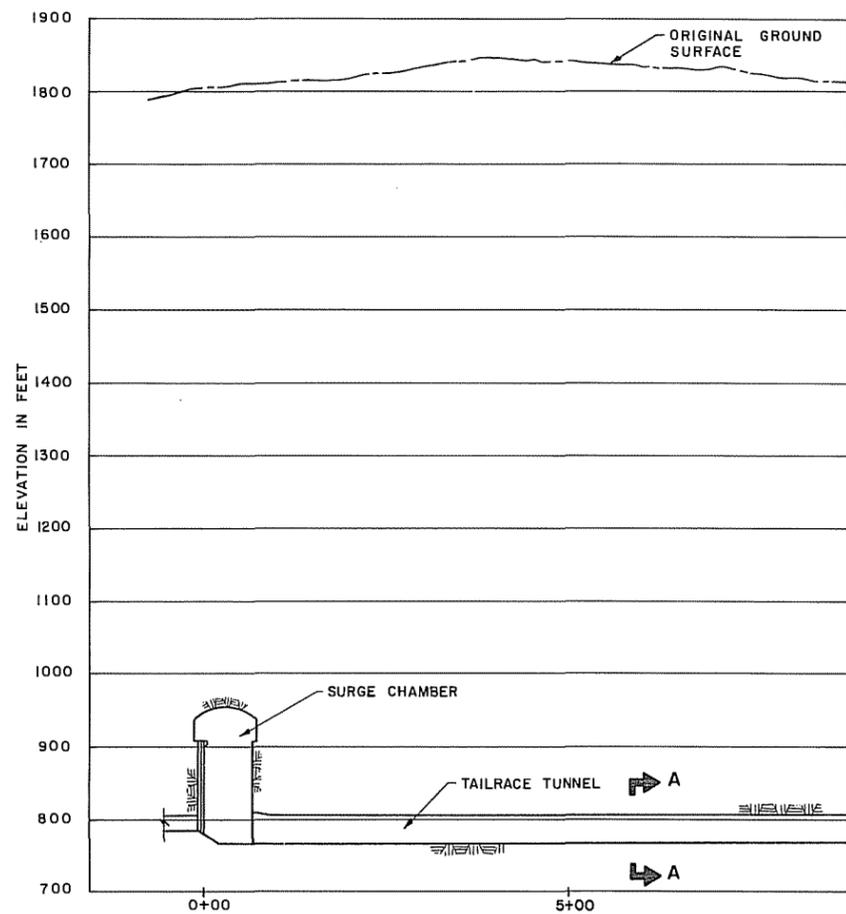
SECTION D-D
SCALE C



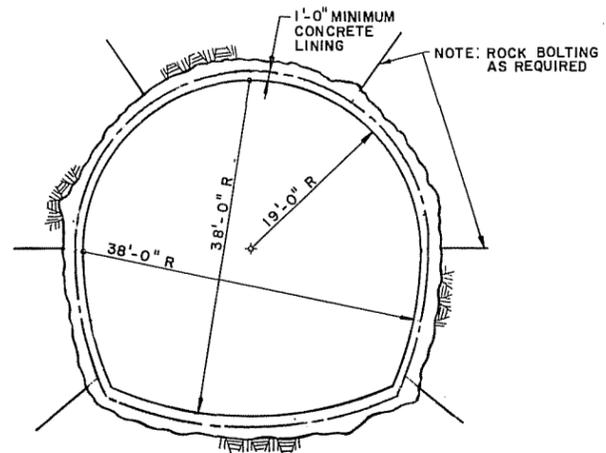
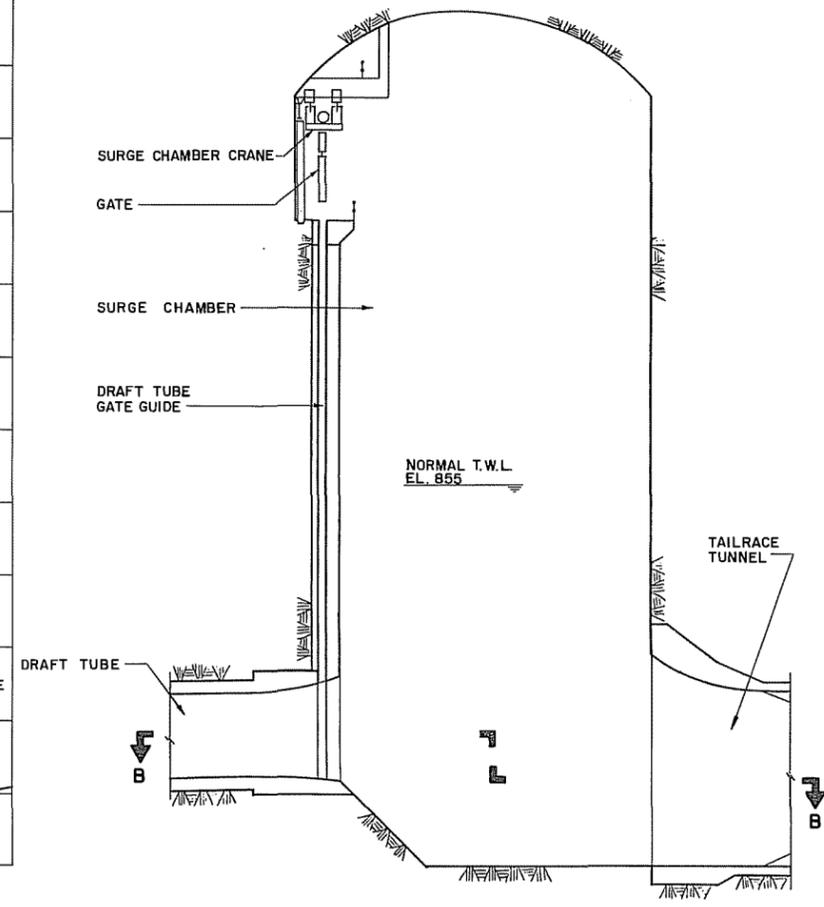
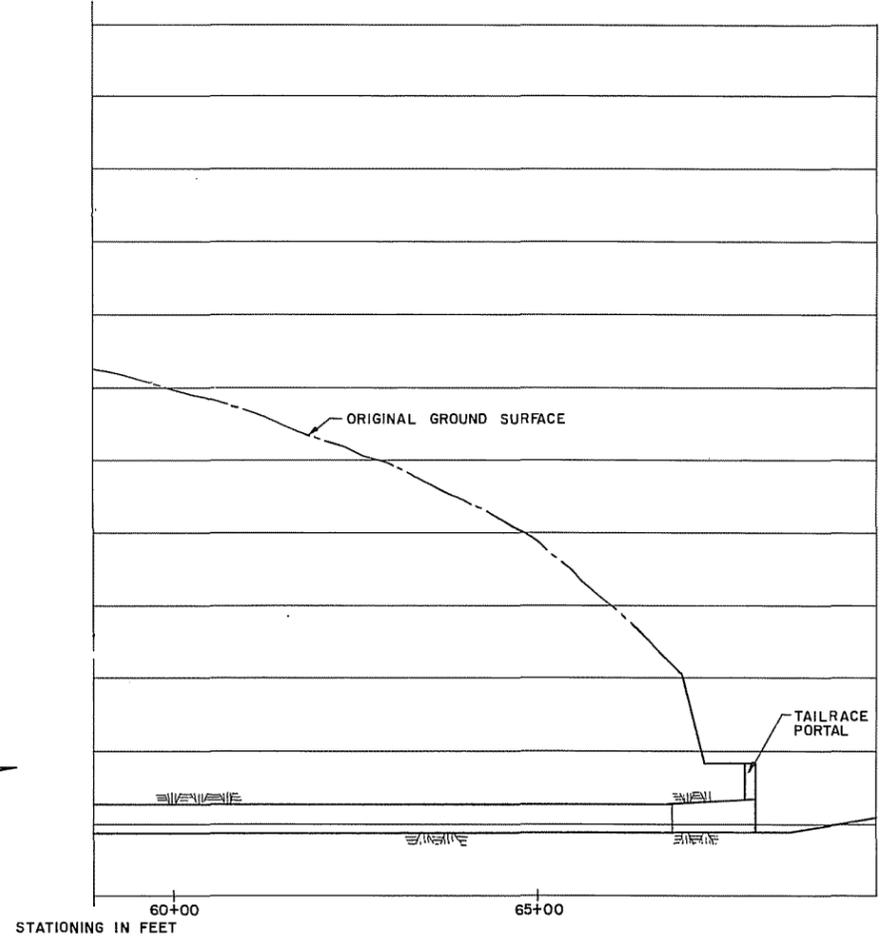
SECTION B-B
SCALE B



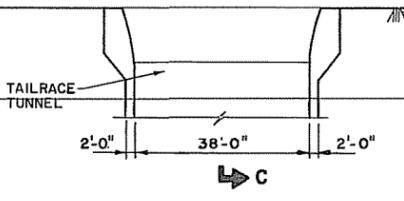
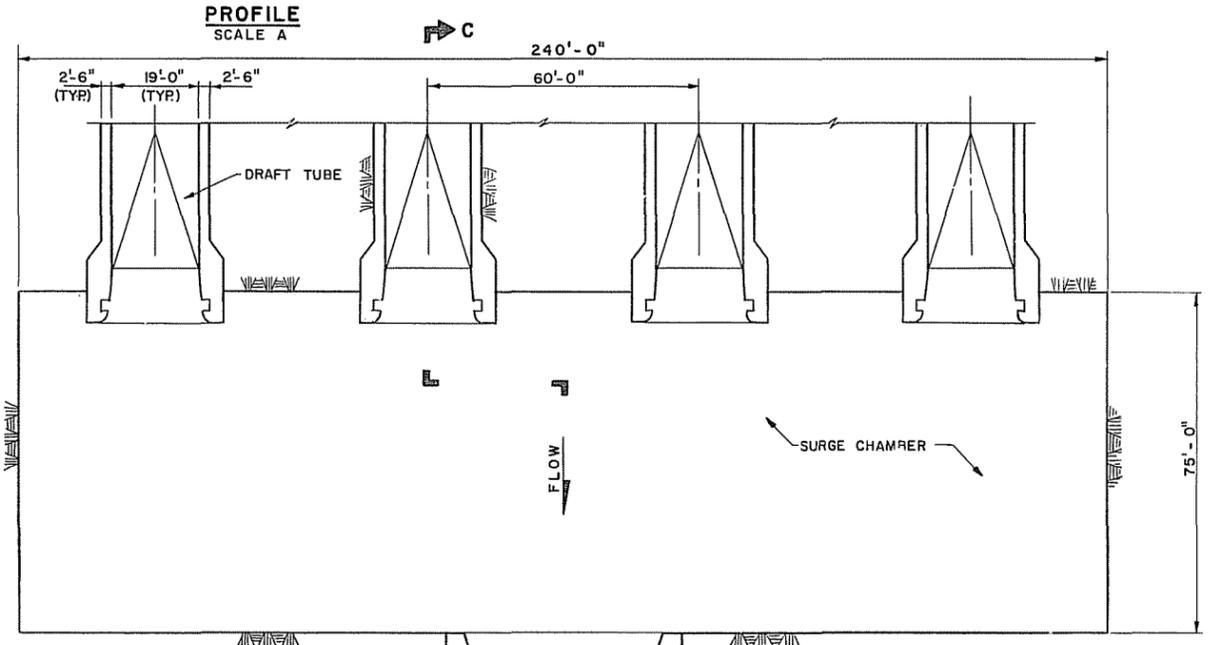
HARZA-EDASCO <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
TRANSFORMER GALLERY PLAN AND SECTIONS			
EXHIBIT F		PLATE F65	



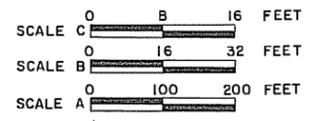
FLOW



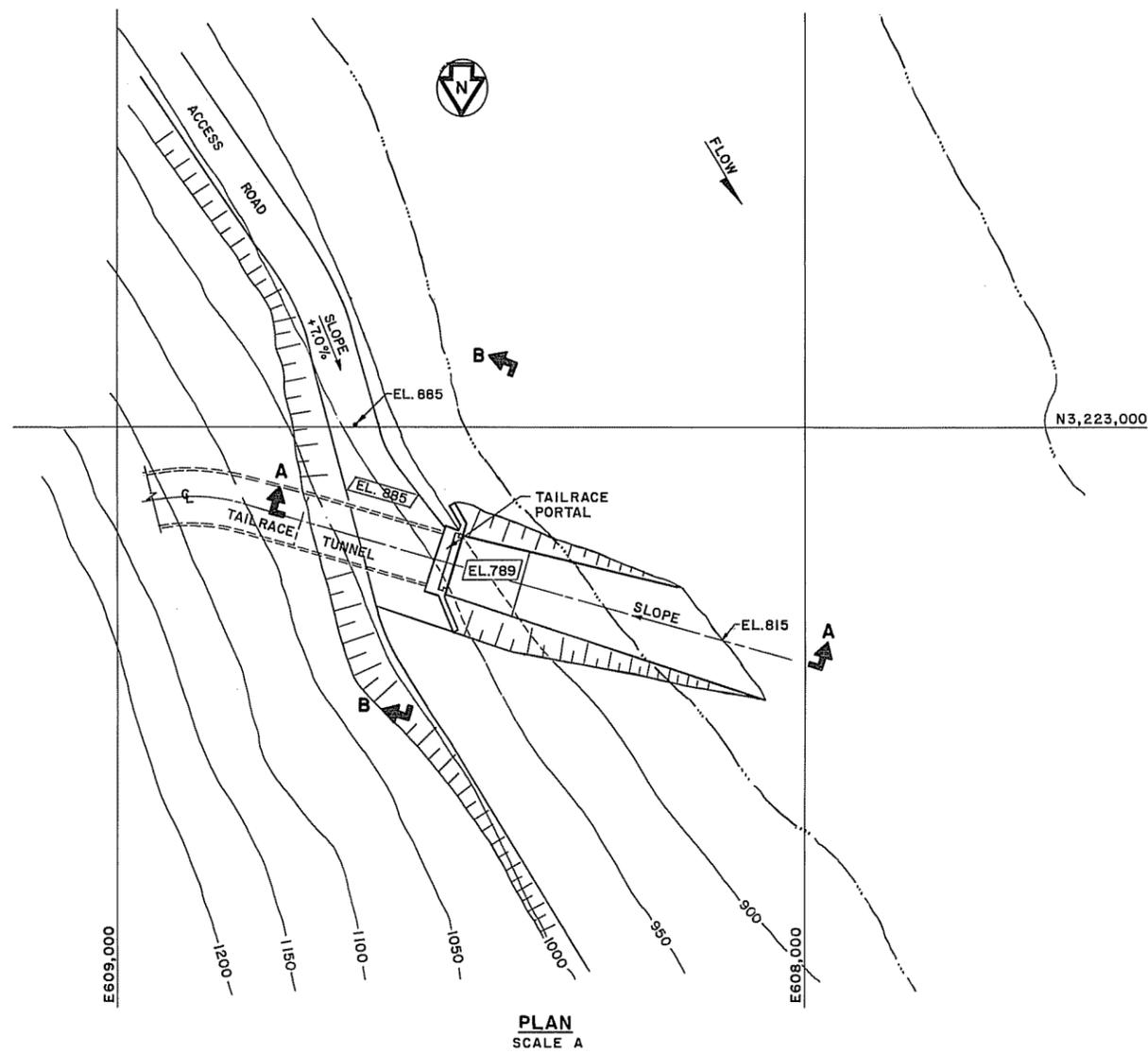
SECTION A-A
CONCRETE LINED TAILRACE TUNNEL
SCALE C



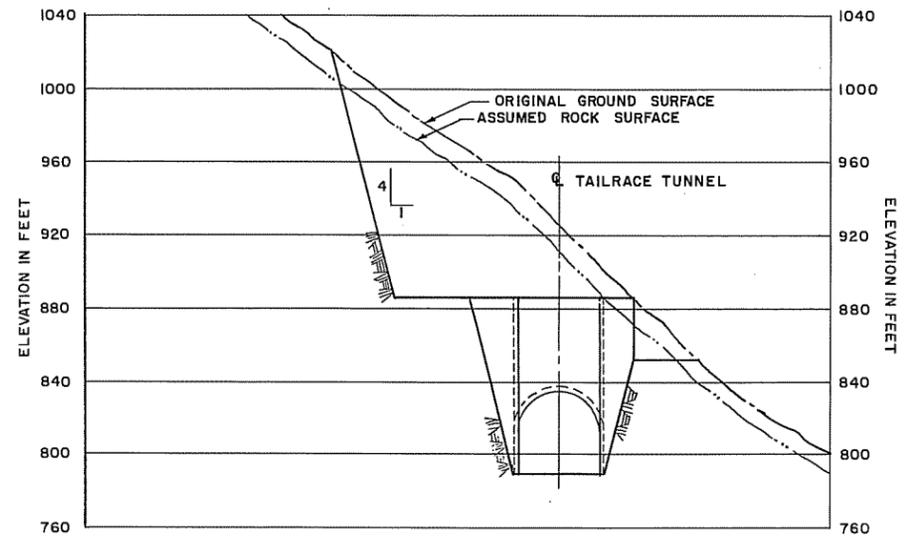
SECTION B-B
SCALE B



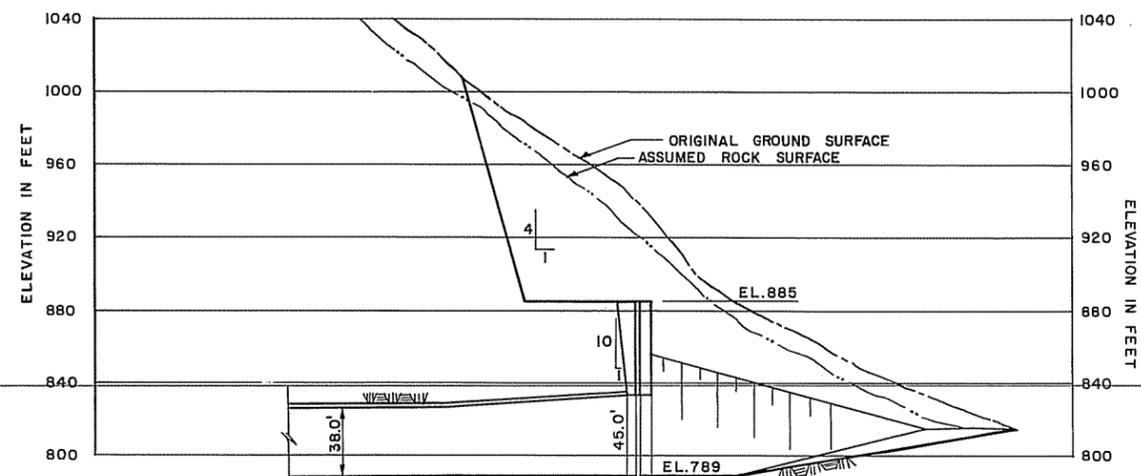
MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SURGE CHAMBER AND TAILRACE SECTIONS			
EXHIBIT F		PLATE F66	



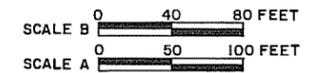
PLAN
SCALE A



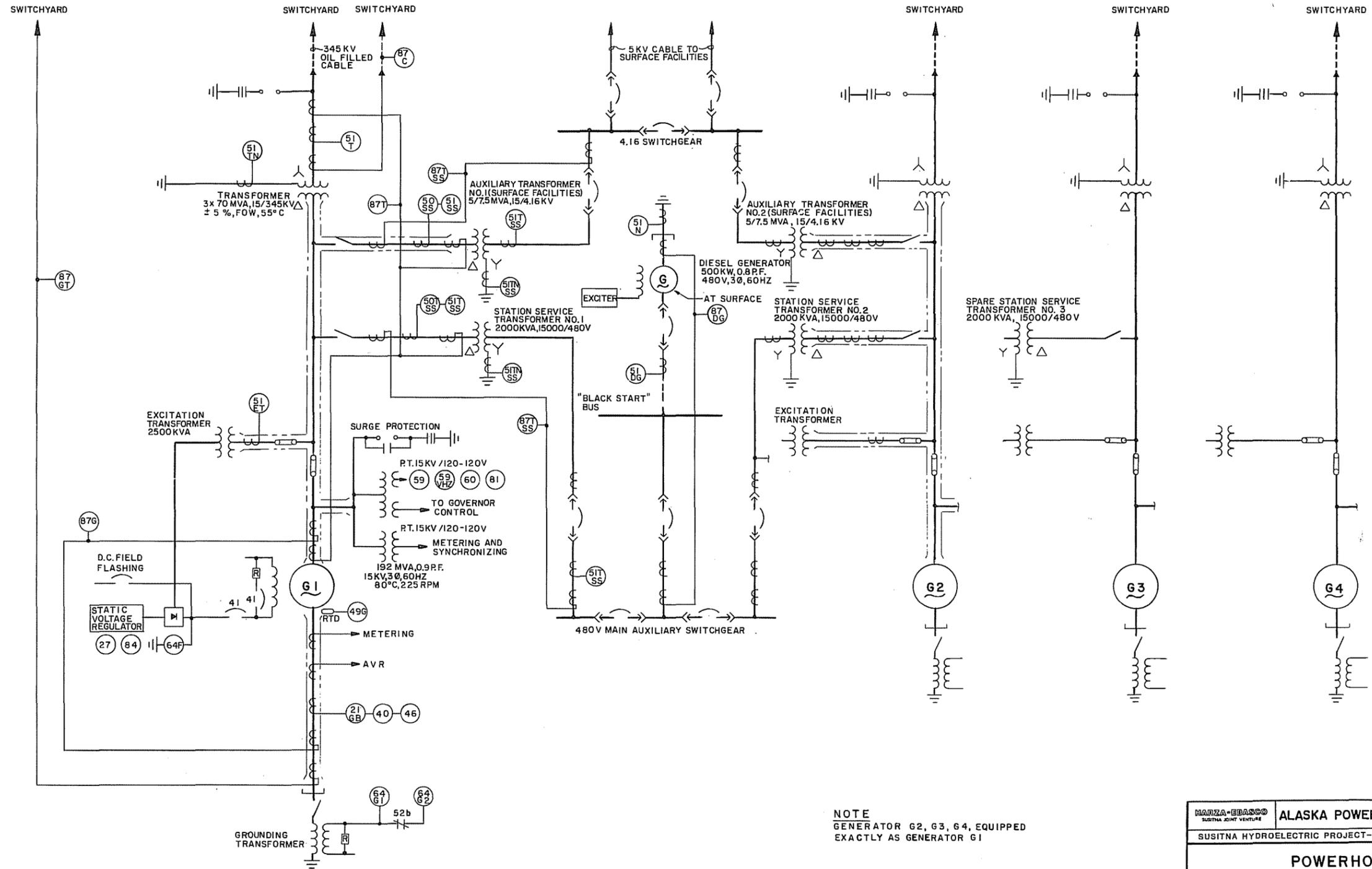
SECTION B-B
SCALE B



SECTION A-A
SCALE B

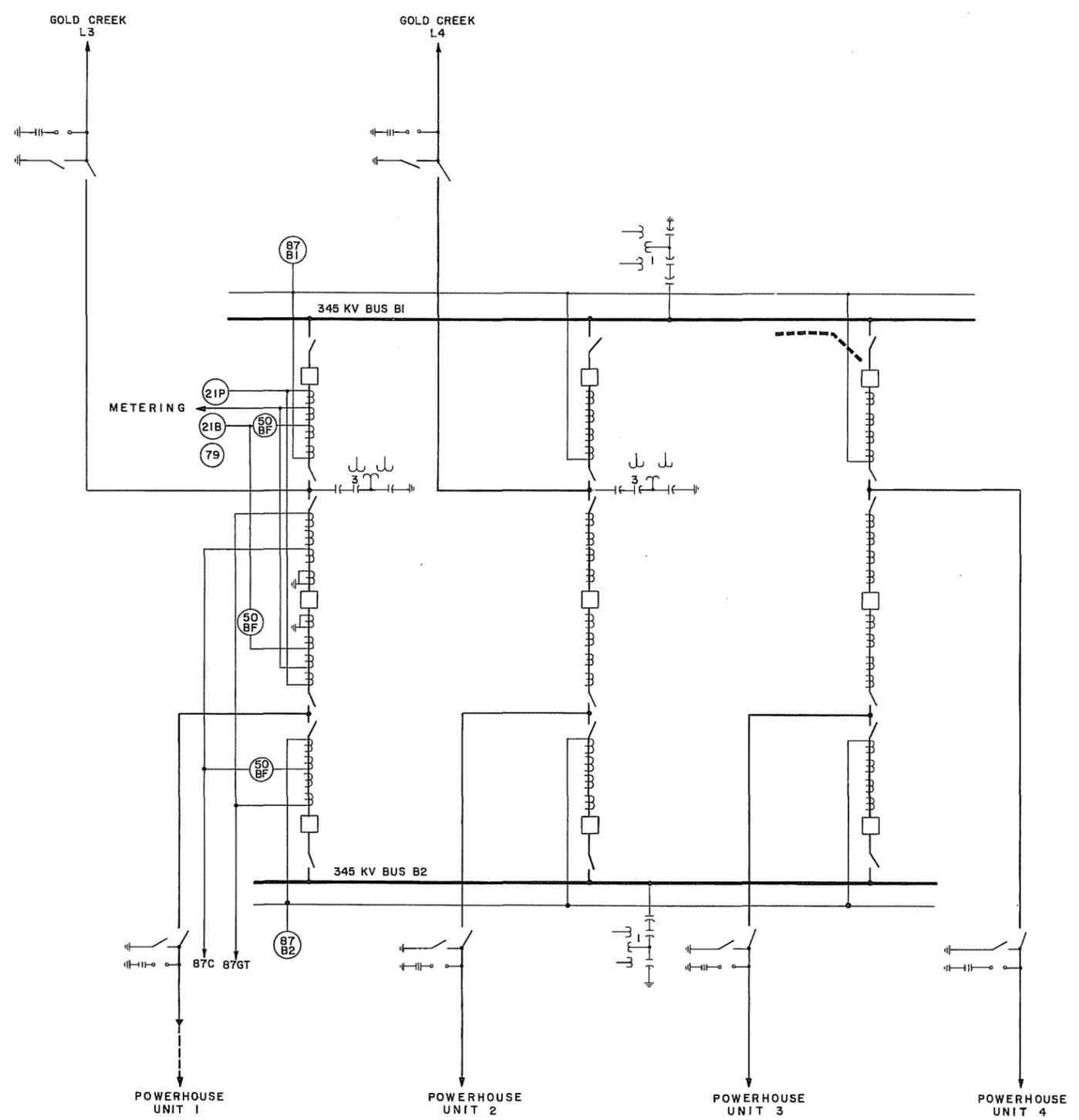


 ALASKA POWER AUTHORITY <small>SUSITNA JOINT VENTURE</small>	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
TAILRACE PORTAL PLAN AND SECTIONS	
EXHIBIT F	PLATE F67

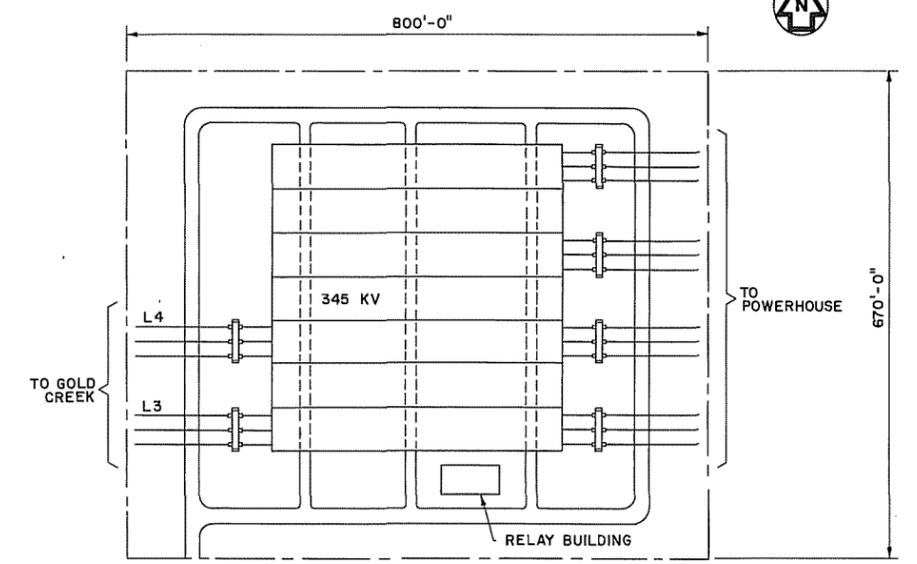


NOTE
 GENERATOR G2, G3, G4, EQUIPPED
 EXACTLY AS GENERATOR G1

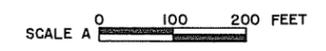
MANZA-EBASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
POWERHOUSE SINGLE LINE DIAGRAM	
EXHIBIT F	PLATE F 68



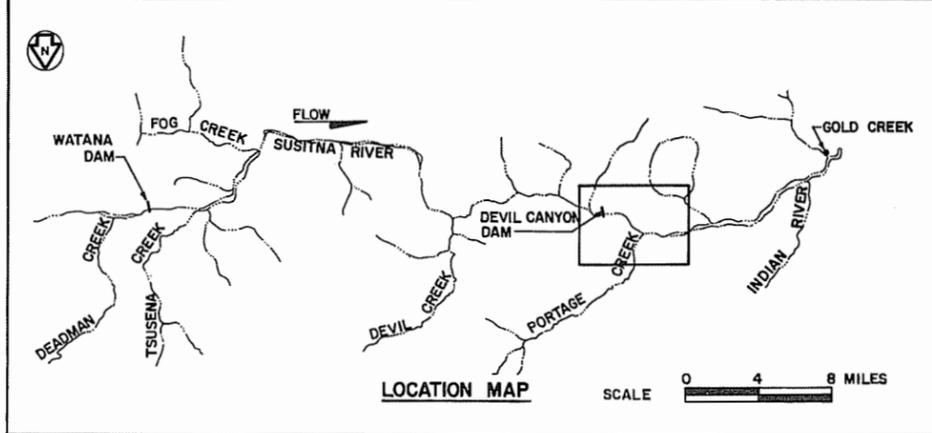
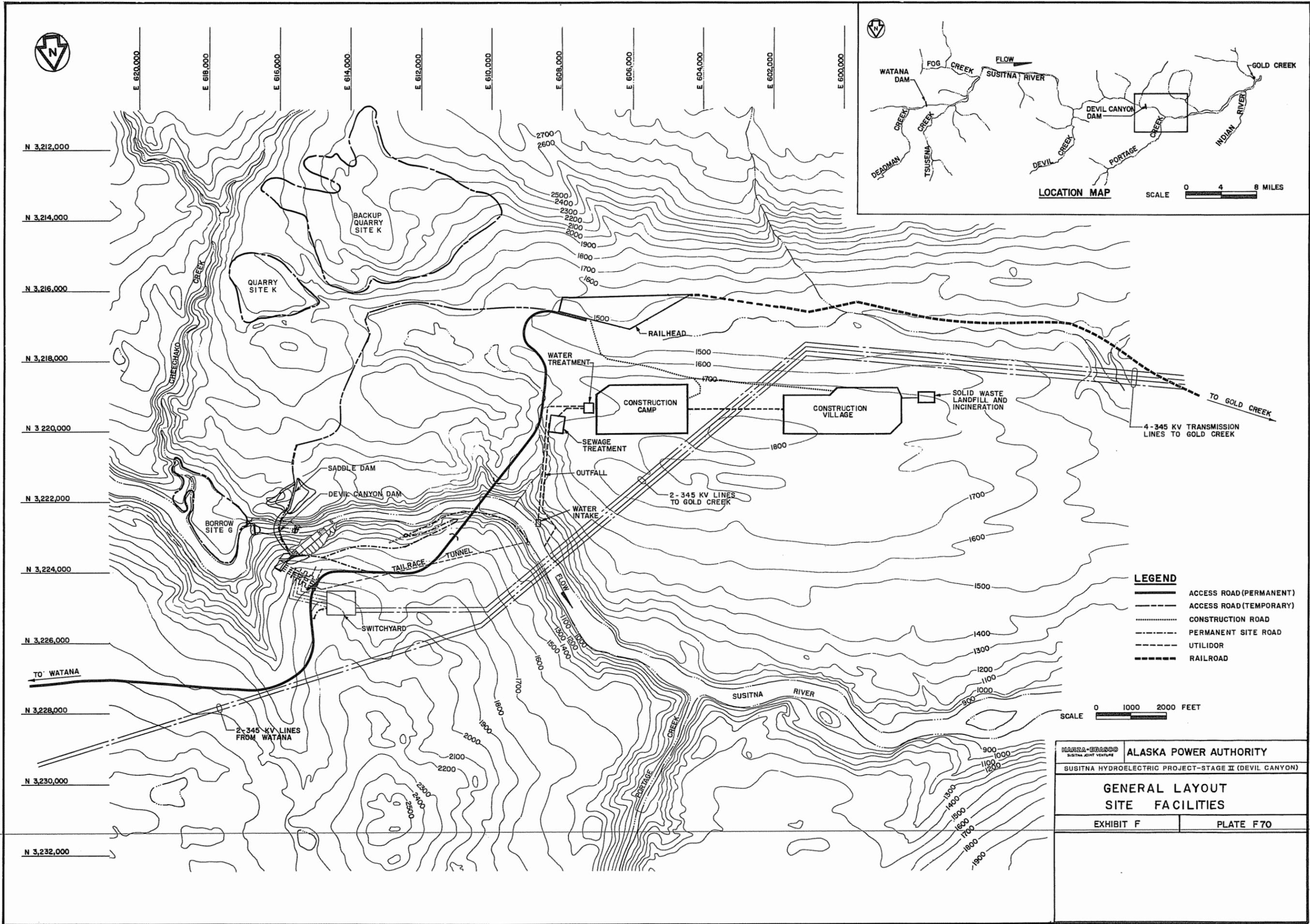
SINGLE LINE DIAGRAM



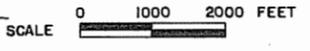
SWITCHYARD PLAN
SCALE A



MANZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
SWITCHYARD SINGLE LINE DIAGRAM AND PLAN			
EXHIBIT F		PLATE F69	



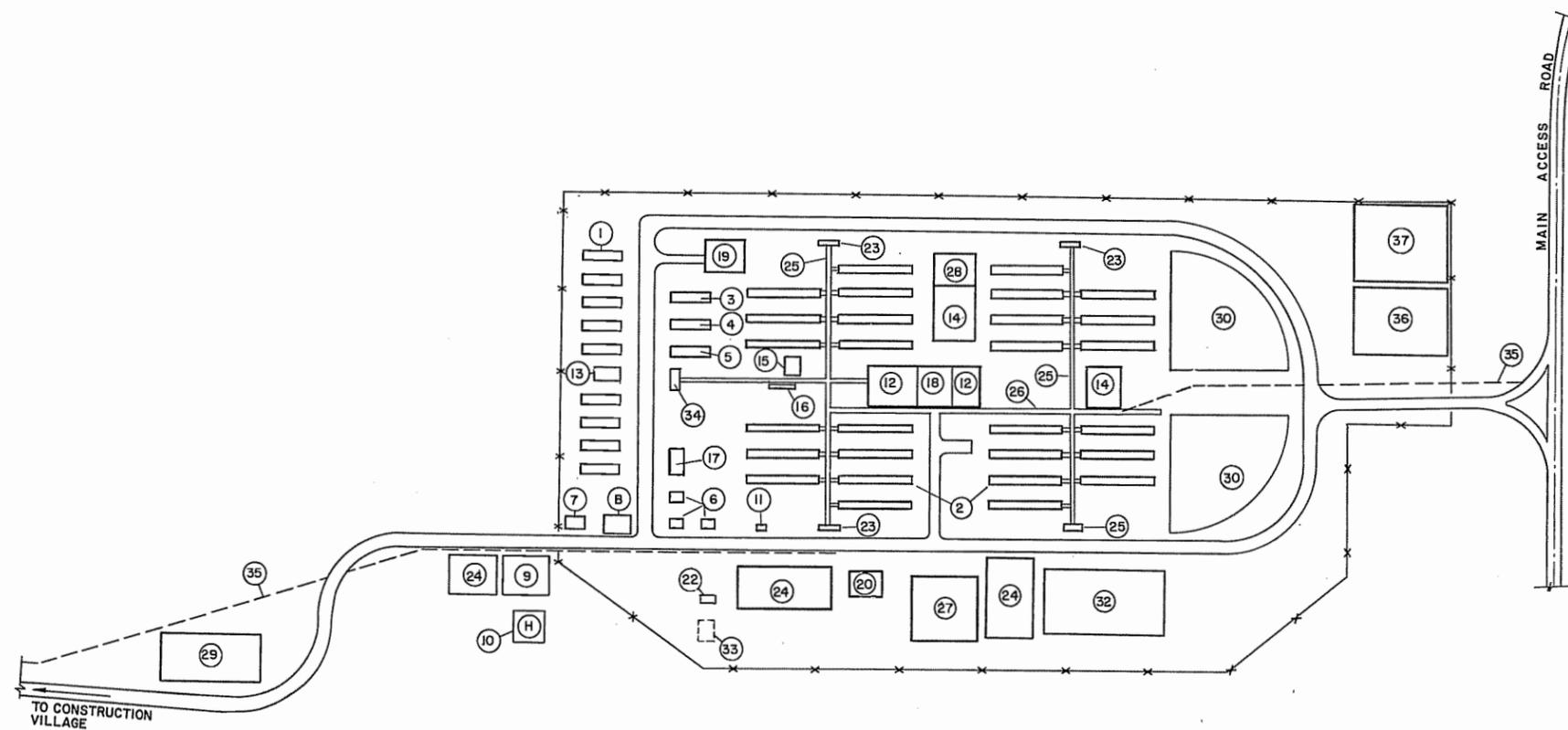
- LEGEND**
- ACCESS ROAD (PERMANENT)
 - - - ACCESS ROAD (TEMPORARY)
 - CONSTRUCTION ROAD
 - - - PERMANENT SITE ROAD
 - - - UTILIDOR
 - - - RAILROAD



MARZA-ERASSO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)			
GENERAL LAYOUT SITE FACILITIES			
EXHIBIT F		PLATE F70	

LEGEND

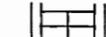
- ① STAFF AND FOREMAN HOUSING
- ② DORMITORIES
- ③ MANAGER'S GUEST HOUSE
- ④ OWNER'S GUEST HOUSE
- ⑤ CONTRACTOR'S GUEST HOUSE
- ⑥ CAMP MANAGER'S OFFICES
- ⑦ SECURITY
- ⑧ FIRE AND OIL SPILL
- ⑨ HOSPITAL
- ⑩ HELIPAD (MEDICAL EMERGENCY)
- ⑪ COMMUNICATIONS CENTER
- ⑫ KITCHEN AND DINING
- ⑬ STAFF CLUBHOUSE
- ⑭ RECREATION HALL
- ⑮ BANK
- ⑯ LAUNDRIES
- ⑰ SOILS LAB
- ⑱ FOOD SERVICE WAREHOUSE
- ⑲ WAREHOUSE
- ⑳ MAINTENANCE GARAGE
- ㉑ PUMP HOUSE
- ㉒ GENERATING STATION
- ㉓ BUS STATION
- ㉔ PARKING AND LAYDOWN AREAS
- ㉕ 10' PERMAWALK
- ㉖ 16' PERMAWALK
- ㉗ GYMNASIUM
- ㉘ SWIMMING POOL
- ㉙ HOCKEY RINK
- ㉚ BASEBALL FIELD
- ㉛ SOFTBALL FIELD
- ㉜ FOOTBALL FIELD
- ㉝ FUEL STORAGE (50,000 GAL.)
- ㉞ STORE
- ㉟ UTILIDOR
- ㊱ WATER TREATMENT PLANT
- ㊲ WATER RESERVOIR



SCALE 0 200 400 FEET

MARZA-BASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)	
CONSTRUCTION CAMP GENERAL PLAN	
EXHIBIT F	PLATE F 72

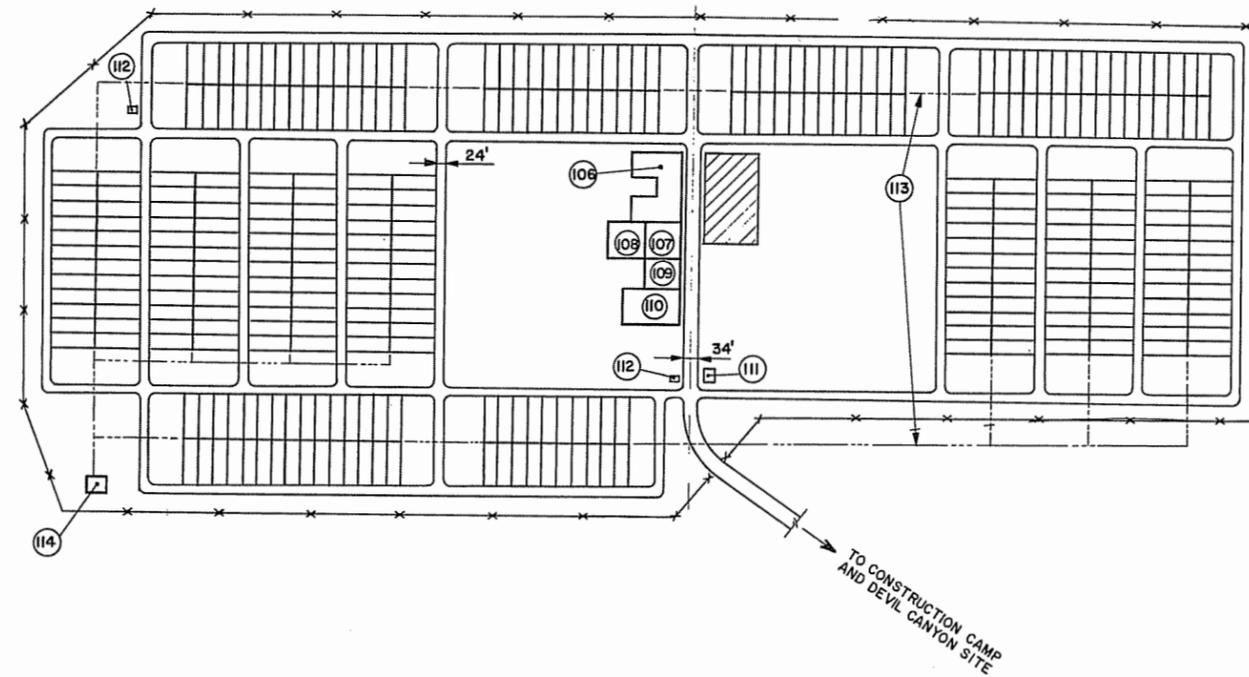
LEGEND

-  TEMPORARY HOUSING/UTILITIES FURNISHED BY OWNER.
-  PARKING AREAS

VILLAGE HOUSING - 320 UNITS

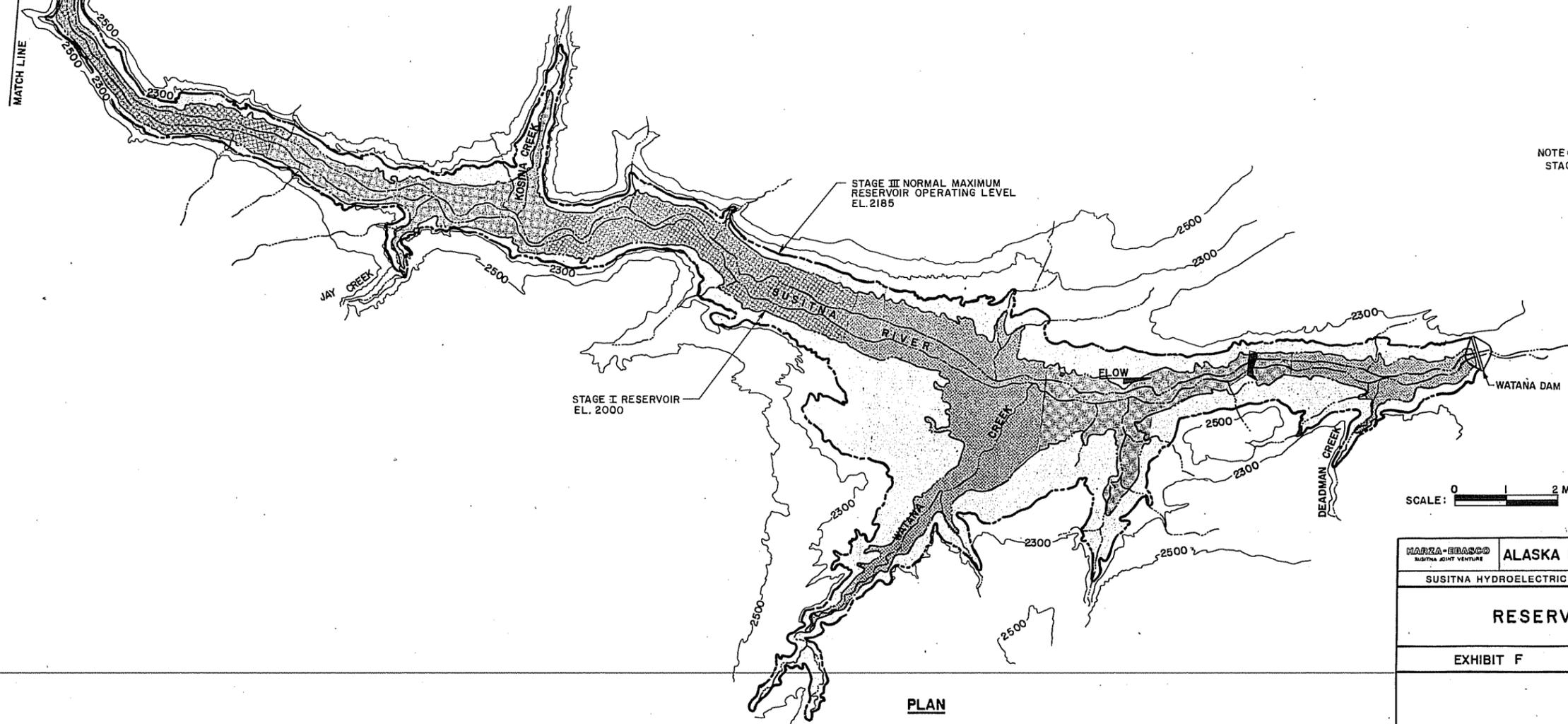
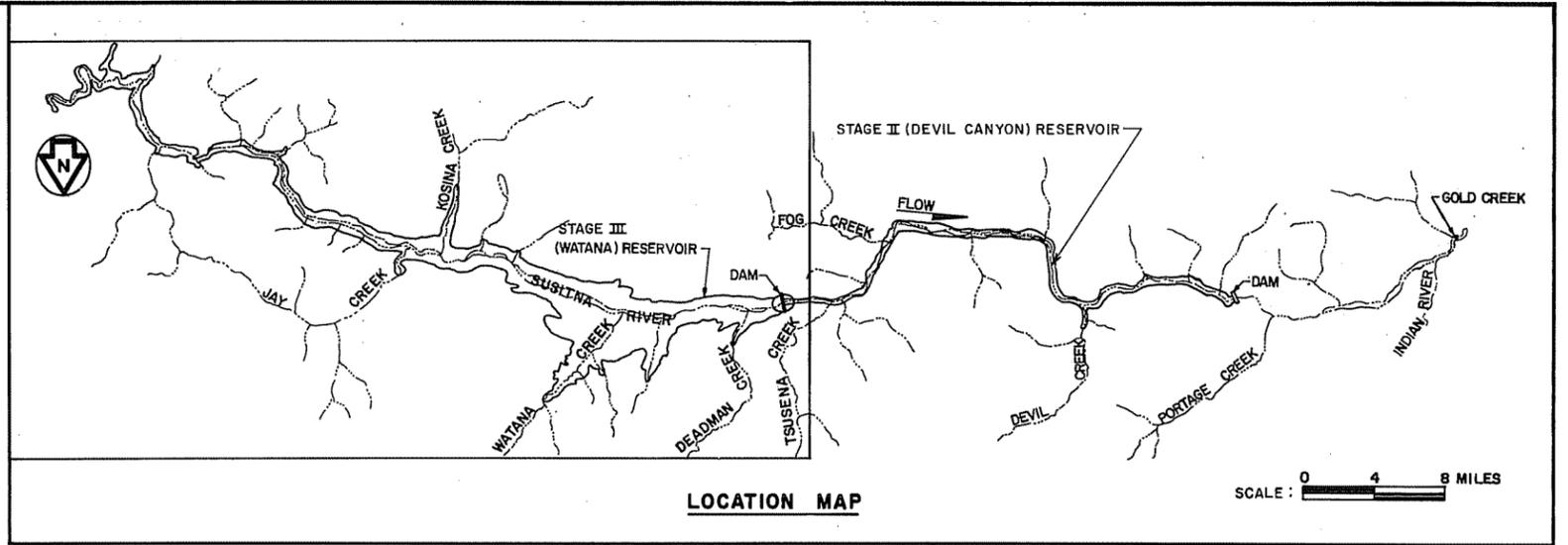
- FAMILY HOUSING - 2 B.R. - 16 UNITS (24' x 50')
- FAMILY HOUSING - 3 B.R. - 16 UNITS (24' x 50')
- FAMILY HOUSING - 4 B.R. - 16 UNITS (28' x 50')
- FAMILY HOUSING - 3 B.R. - 72 UNITS (14' x 60')
- FAMILY HOUSING - 3 B.R. - 200 UNITS (14' x 60')

- (106) SCHOOL - 30' x 35' (12 UNITS)
- (107) GYM - 100' x 100'
- (108) SWIMMING POOL - 100' x 100'
- (109) RECREATION CENTER 80' x 100'
- (110) STORE - 100' x 160'
- (111) FIRE STATION - 30' x 40'
- (112) GENERATING STATION - 20' x 30' (2 UNITS)
- (113) UTILIDOR
- (114) SEWER PUMPING STATION - 50' x 60'



SCALE 0 200 400 FEET

<small>MANA-EDASCO SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE II (DEVIL CANYON)		
CONSTRUCTION VILLAGE		
EXHIBIT F	PLATE F 73	

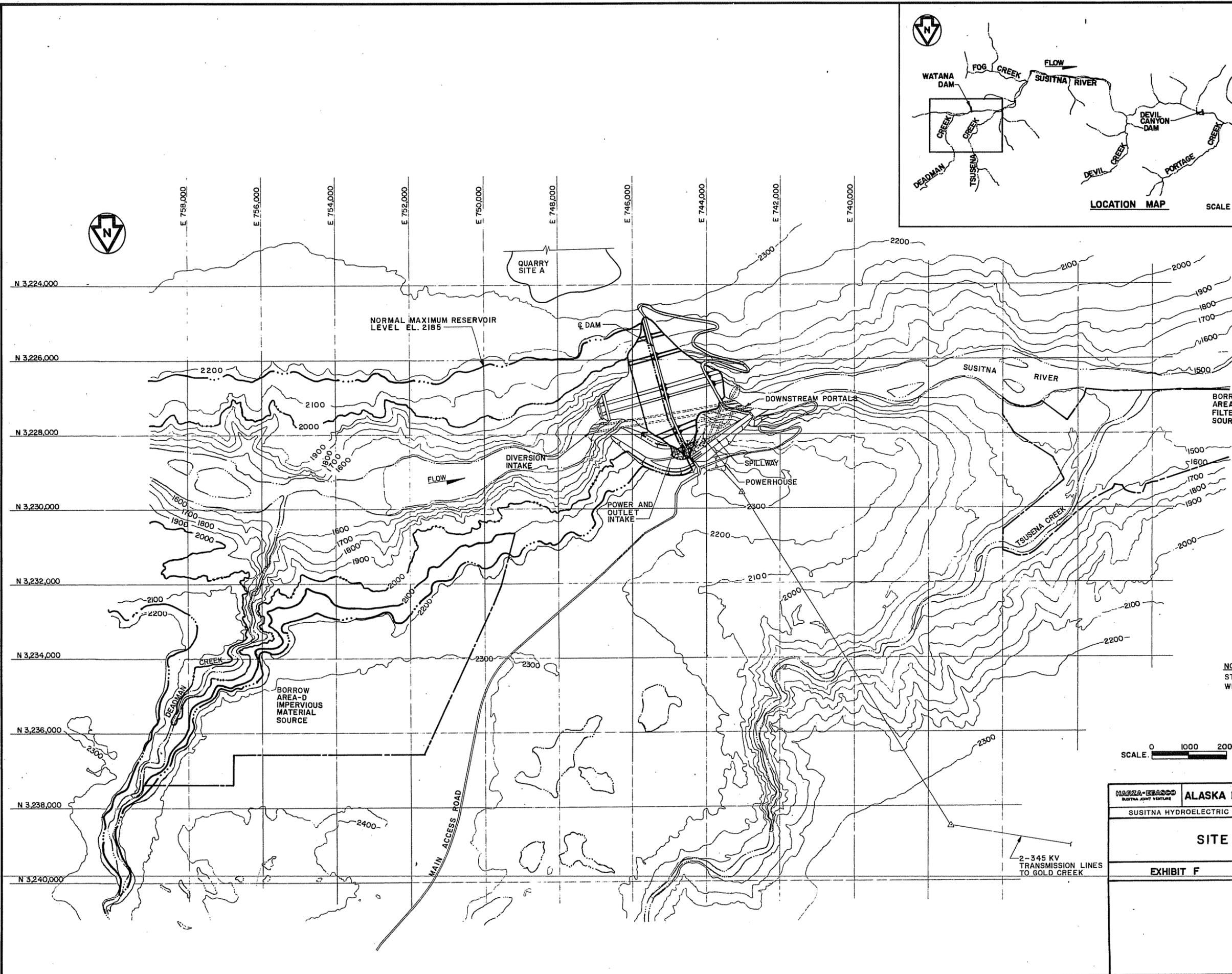
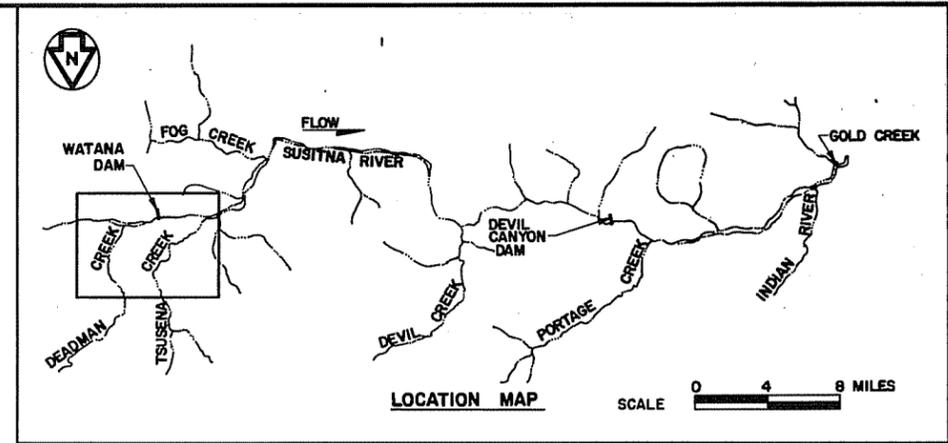


NOTE:
STAGE I RESERVOIR IS SHADED

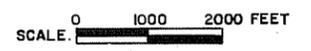
SCALE: 0 1 2 MILES

MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
RESERVOIR PLAN			
EXHIBIT F		PLATE F74	

PLAN

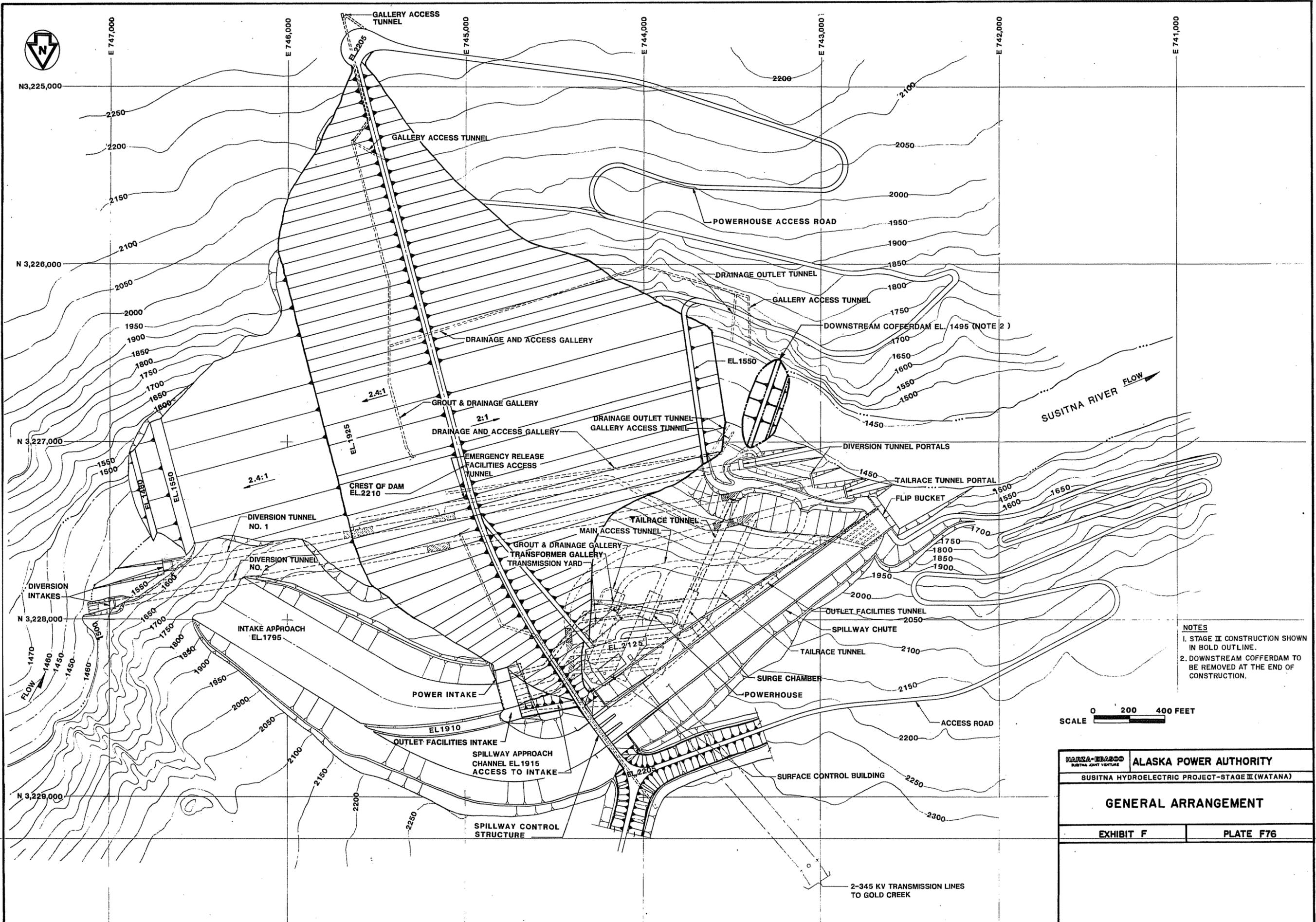


NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

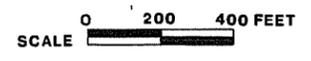


<small>HARZA-ERASCO SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
SITE LAYOUT			
EXHIBIT F		PLATE F75	

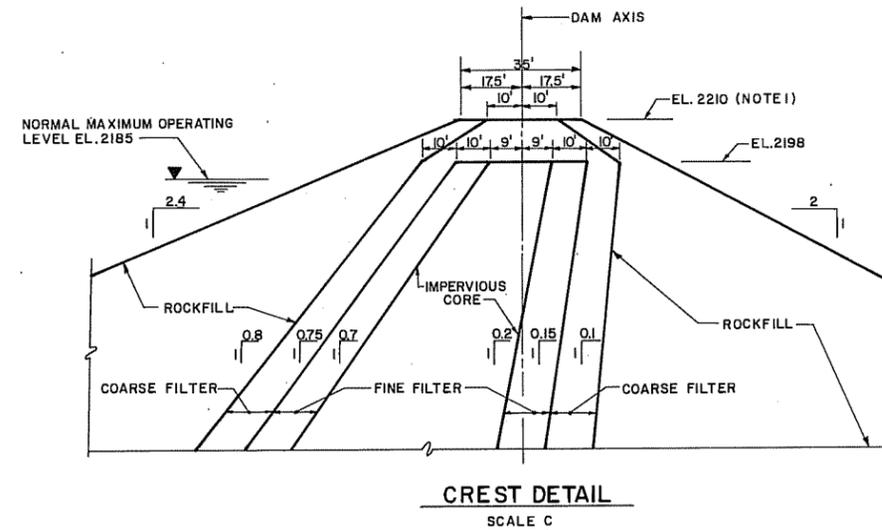
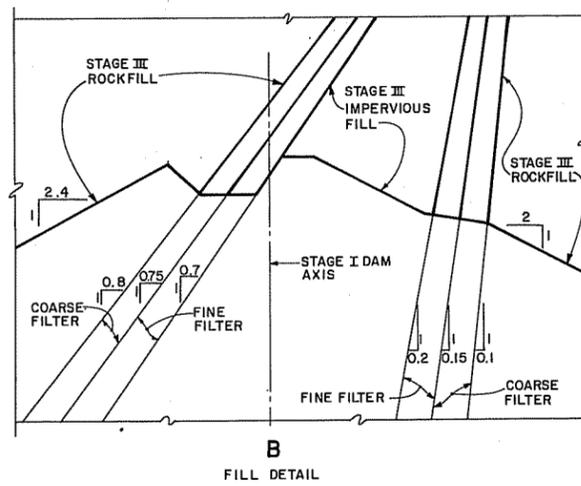
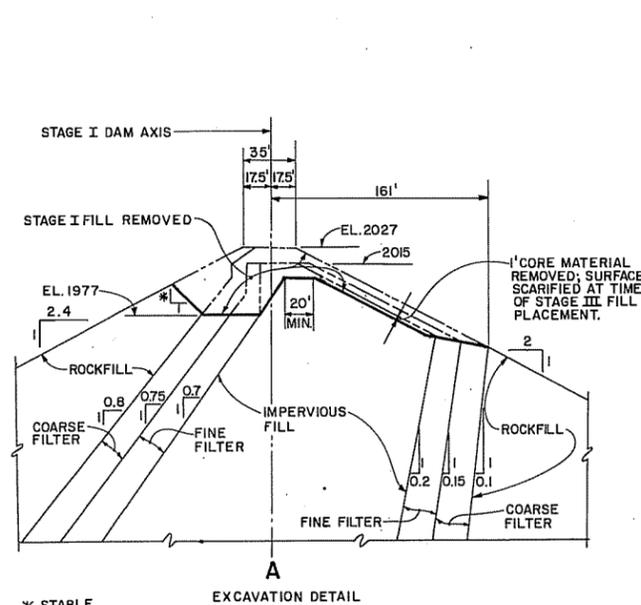
2-345 KV
TRANSMISSION LINES
TO GOLD CREEK



NOTES
 1. STAGE III CONSTRUCTION SHOWN IN BOLD OUTLINE.
 2. DOWNSTREAM COFFERDAM TO BE REMOVED AT THE END OF CONSTRUCTION.



MARZA-BACCO ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F76



* STABLE

EXCAVATION DETAIL

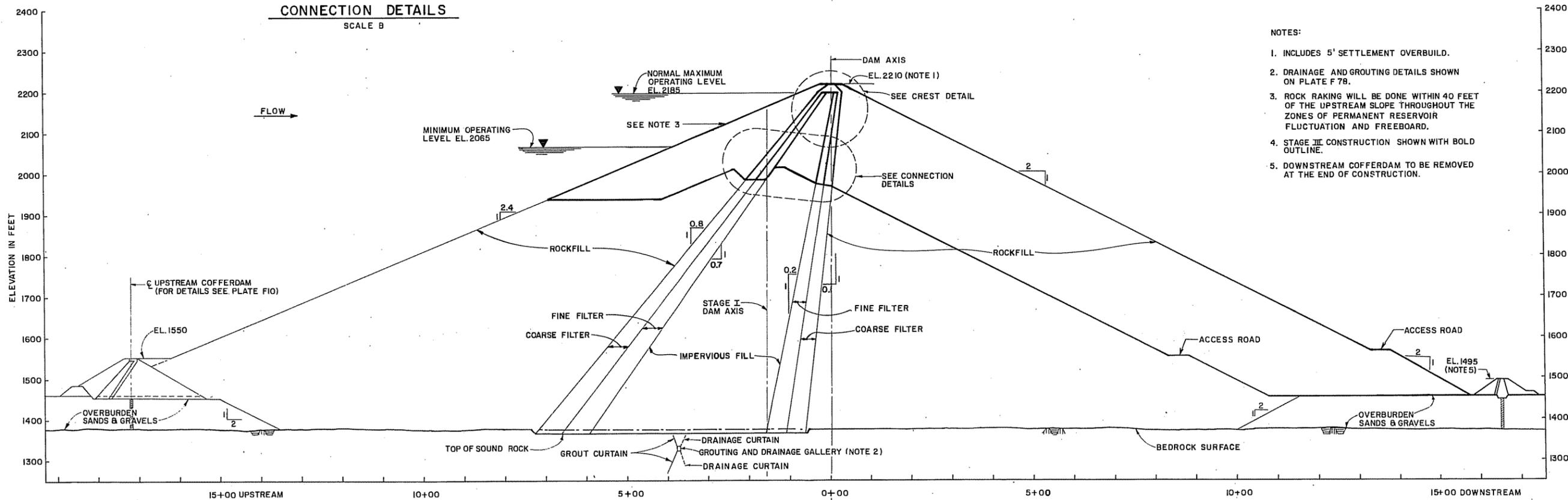
FILL DETAIL

CREST DETAIL

SCALE C

CONNECTION DETAILS

SCALE B



NOTES:

1. INCLUDES 5' SETTLEMENT OVERBUILD.
2. DRAINAGE AND GROUTING DETAILS SHOWN ON PLATE F 78.
3. ROCK RAKING WILL BE DONE WITHIN 40 FEET OF THE UPSTREAM SLOPE THROUGHOUT THE ZONES OF PERMANENT RESERVOIR FLUCTUATION AND FREEBOARD.
4. STAGE III CONSTRUCTION SHOWN WITH BOLD OUTLINE.
5. DOWNSTREAM COFFERDAM TO BE REMOVED AT THE END OF CONSTRUCTION.

TYPICAL SECTION - DAM EMBANKMENT (MAXIMUM HEIGHT)

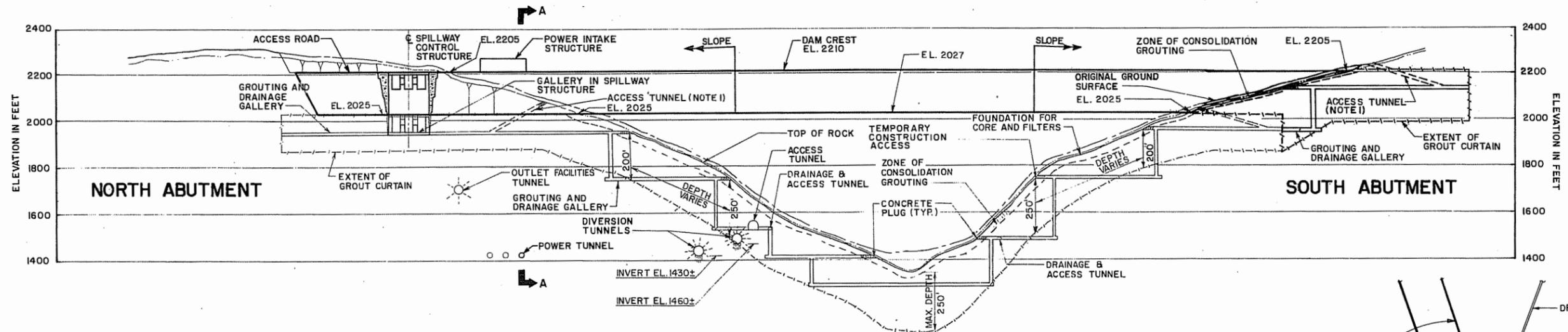
SCALE A

SCALE A 0 100 200 FEET

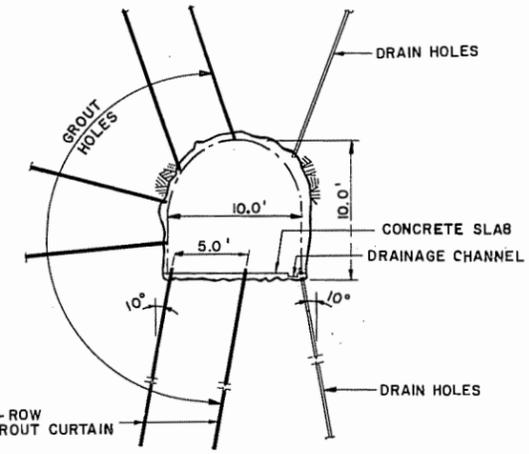
SCALE B 0 50 100 FEET

SCALE C 0 20 40 FEET

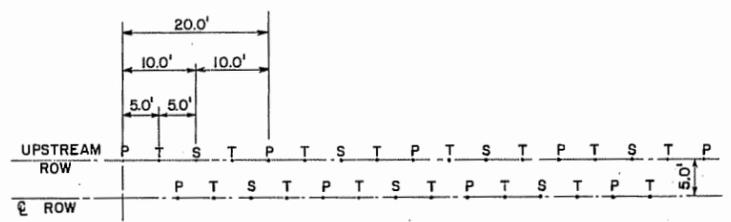
PARZA-BLASS® SUSITNA DAM PROJECT	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
DAM	
TYPICAL SECTION AND DETAILS	
EXHIBIT F	PLATE F77



PROFILE (LOOKING UPSTREAM)
SCALE A

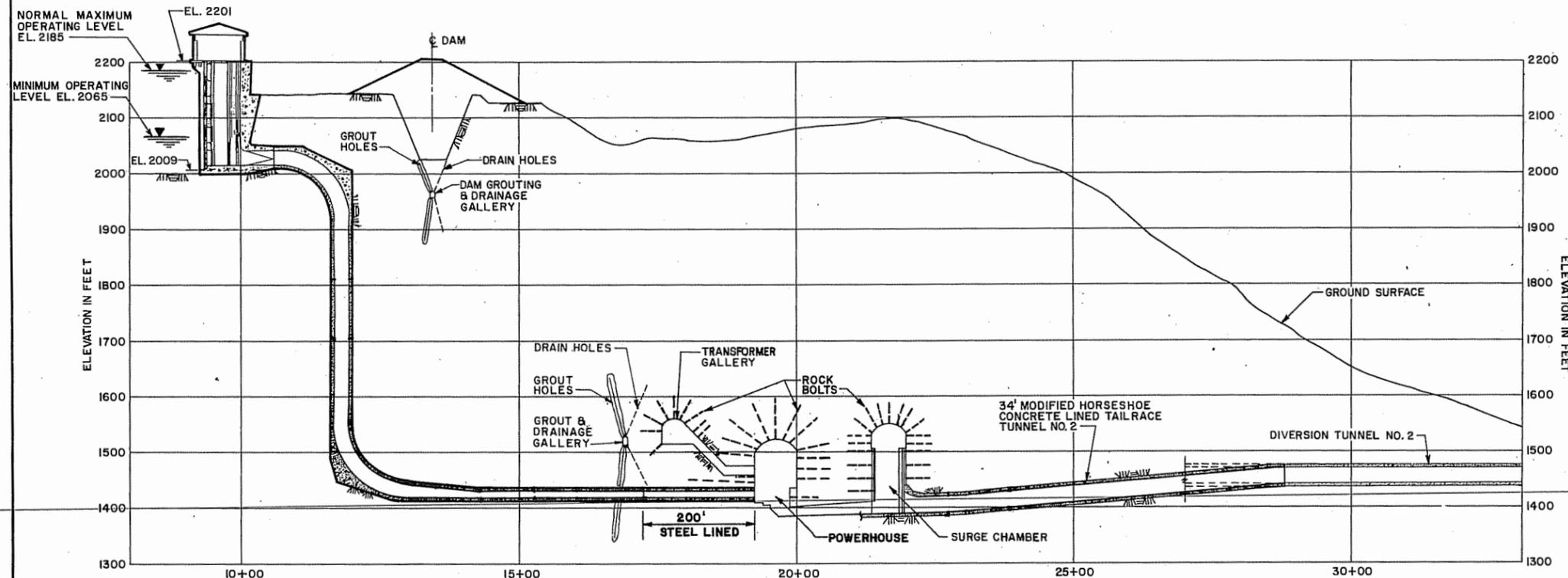


DETAIL - GROTGING & DRAINAGE GALLERY
SCALE D



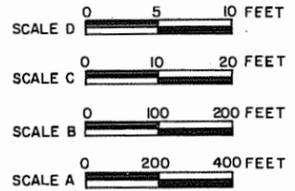
GROTGING HOLE SPACING
SCALE C

LEGEND
P = PRIMARY GROT HOLE
S = SECONDARY GROT HOLE
T = TERTIARY GROT HOLE

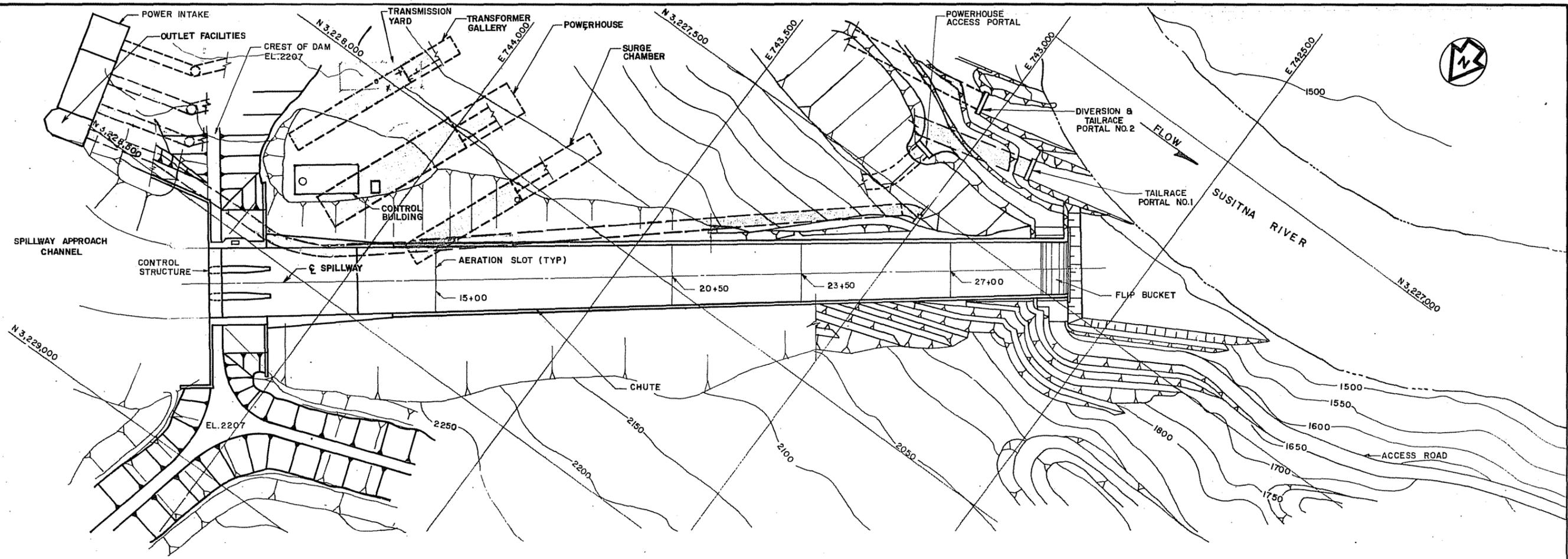


SECTION A-A
SCALE B

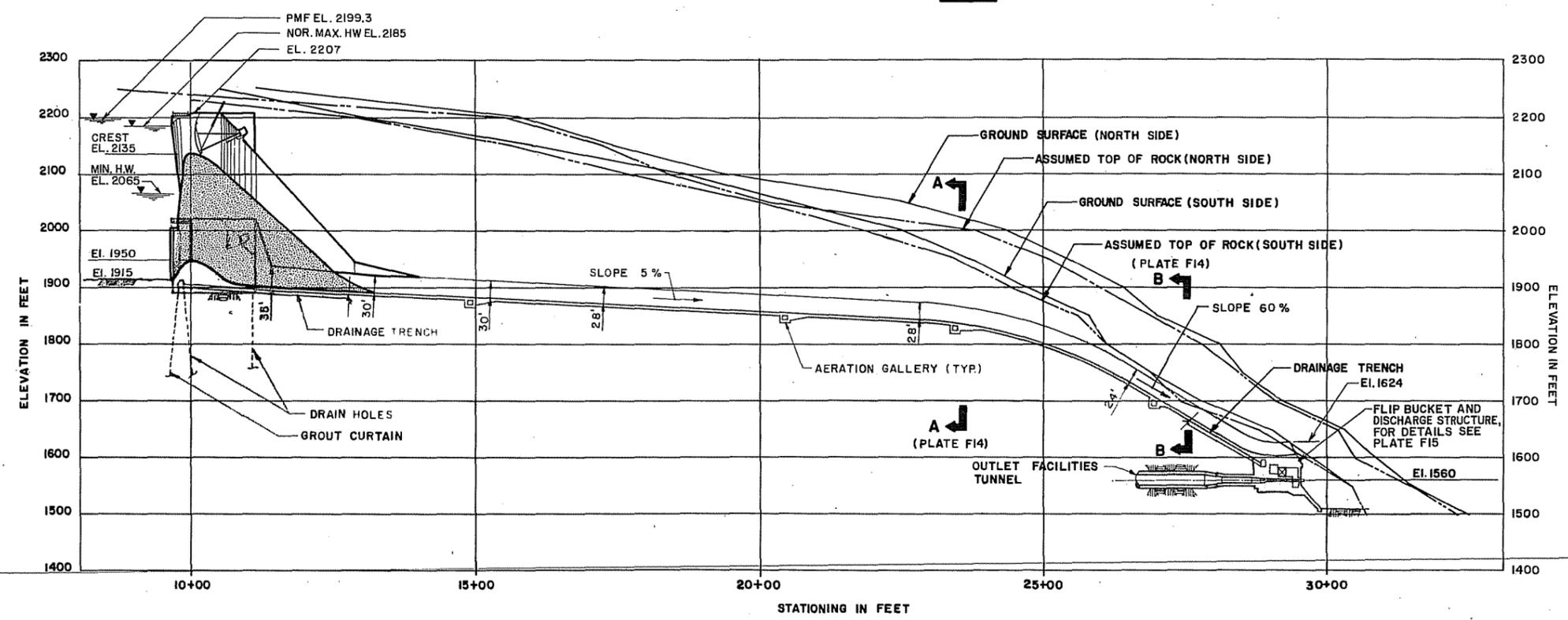
- NOTES
- ACCESS WOULD BE FROM THE DOWNSTREAM SIDE OF THE DAM.
 - WORK THIS DRAWING WITH PLATE F 76
 - STAGE III CONSTRUCTION SHOWN WITH BOLD OUTLINE



MARZA-EDASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
DAM GROTGING & DRAINAGE			
EXHIBIT F		PLATE F 78	



PLAN

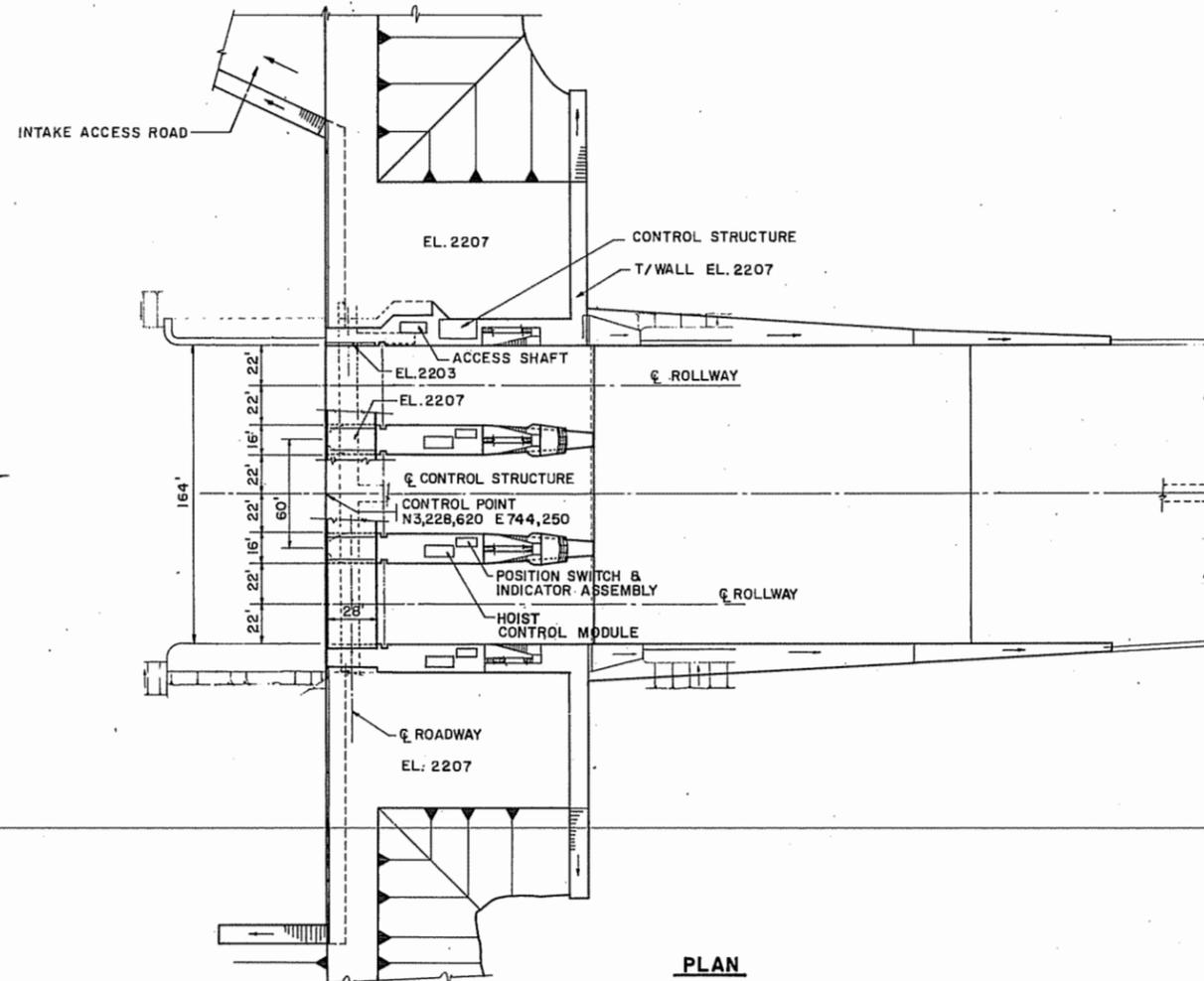
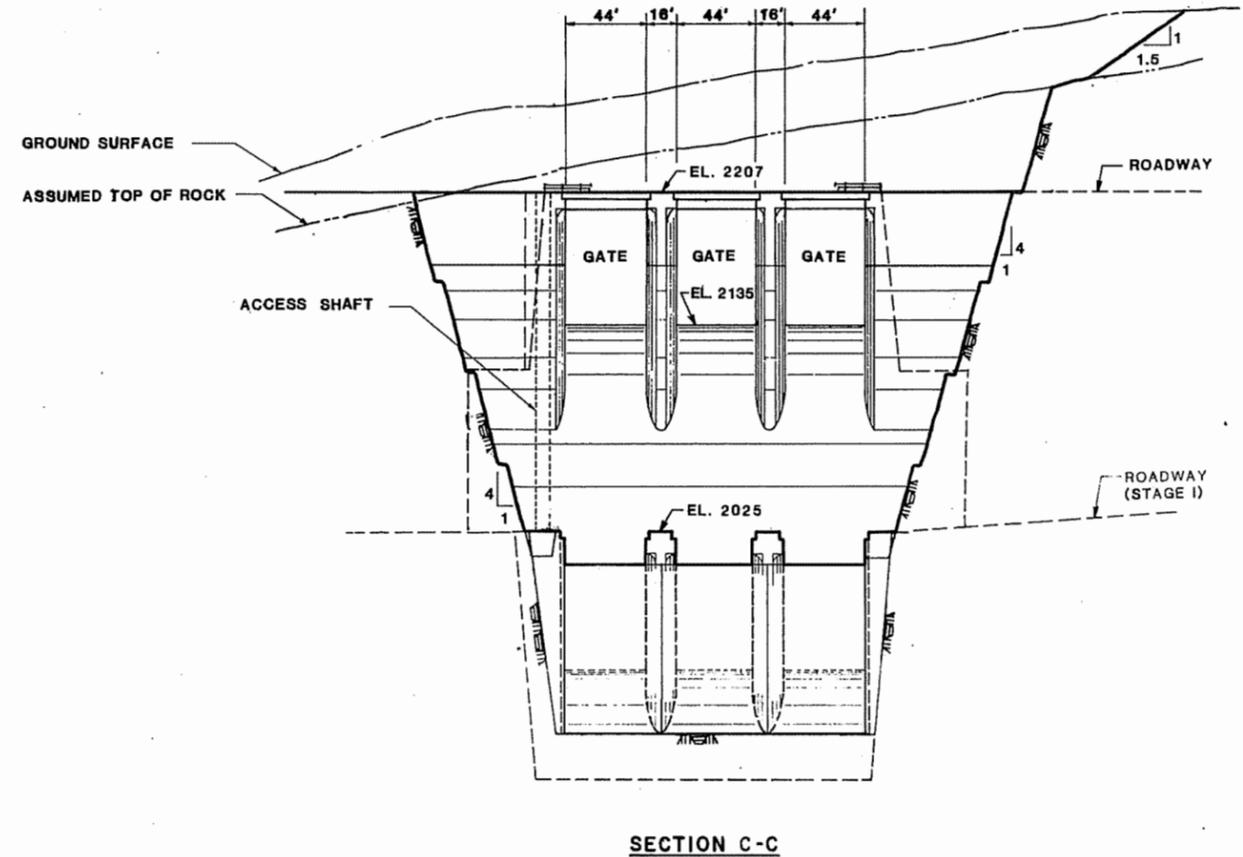
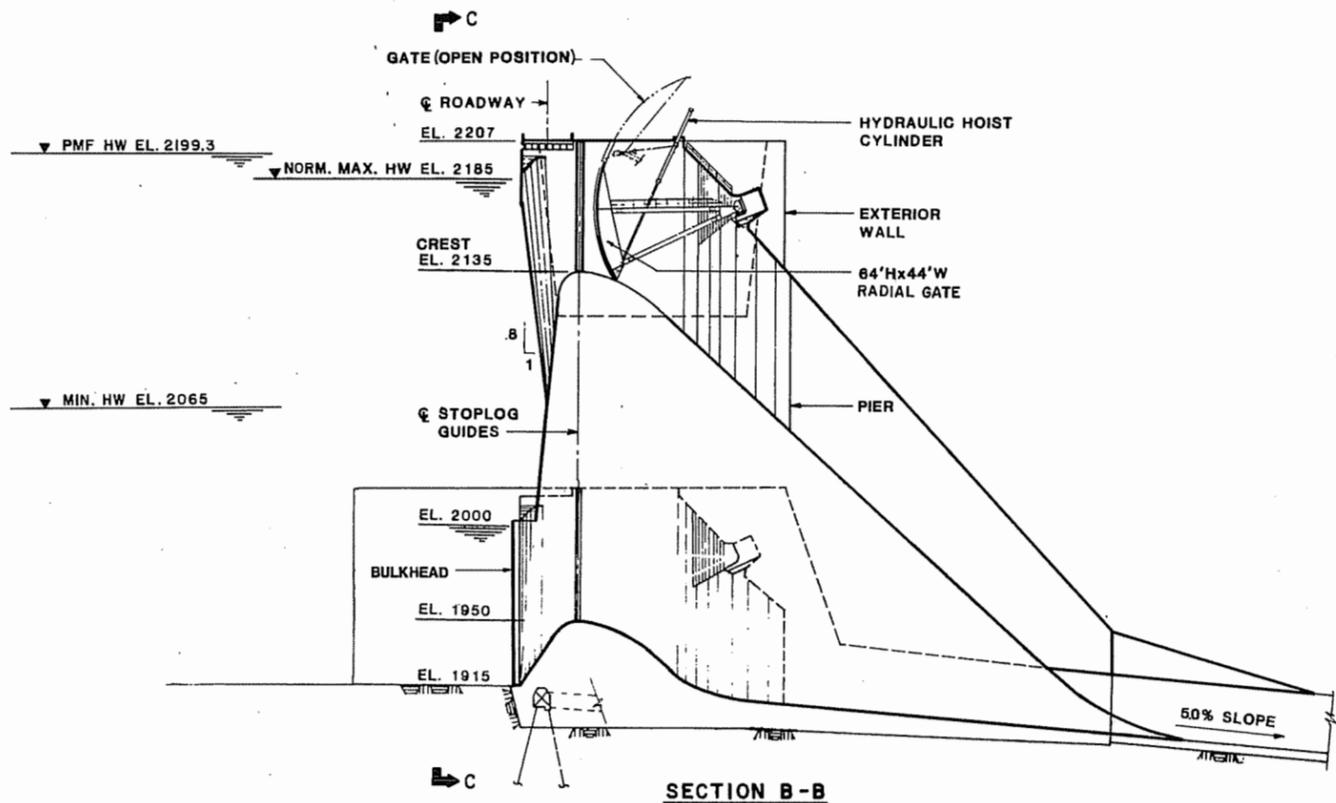


PROFILE

NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



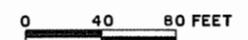
MANZA-DEASCO SUTNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUBITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
SPILLWAY GENERAL ARRANGEMENT			
EXHIBIT F		PLATE F79	



**SPILLWAY CONTROL STRUCTURE
SUMMARY OF STABILITY ANALYSES**

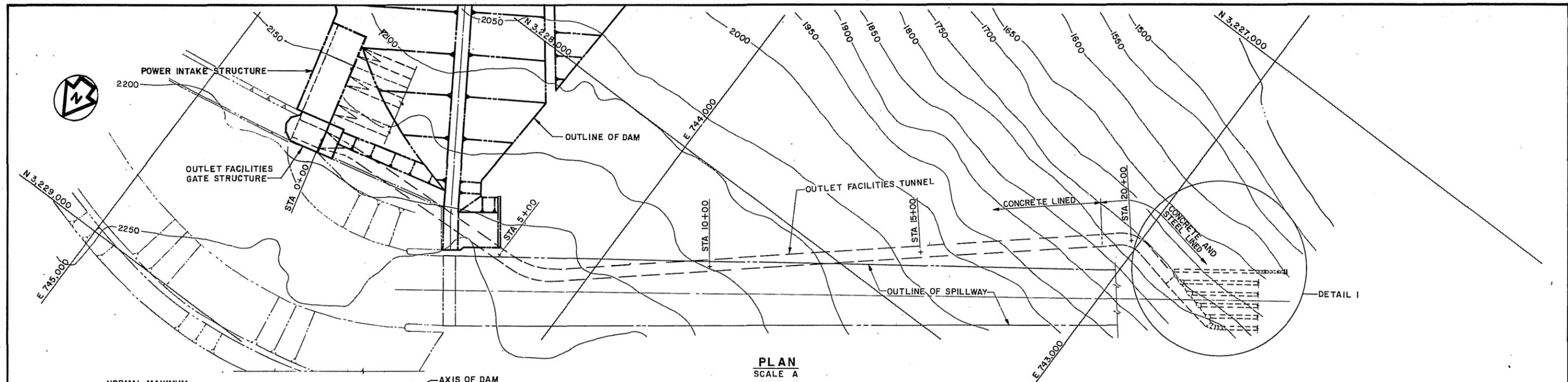
LOAD CONDITION	FOUNDATION STRESS U.S./D.S (PSI)	Xcg (FT)	FACTORS OF SAFETY			
			SLIDING	SHEAR FRICTION	FLOATATION	OVERTURNING
NORMAL INCLUDES ICE LOADS	138.9 / 113.6	5.5	N.A.	4.6	5.9	2.9
UNUSUAL 100/100 YR. EARTHQUAKE	59.0 / 193.6	29.4	N.A.	2.7	5.9	1.9
UNUSUAL DRAIN PLUGGED PMF	61.2 / 116.2	17.1	N.A.	3.8	2.4	1.7
EXTREME EARTHQUAKE	-91.1 / 343.6	95.0	N.A.	1.5	5.9	1.4

PHYSICAL PARAMETERS
φ = 41°
c = 150 PSI

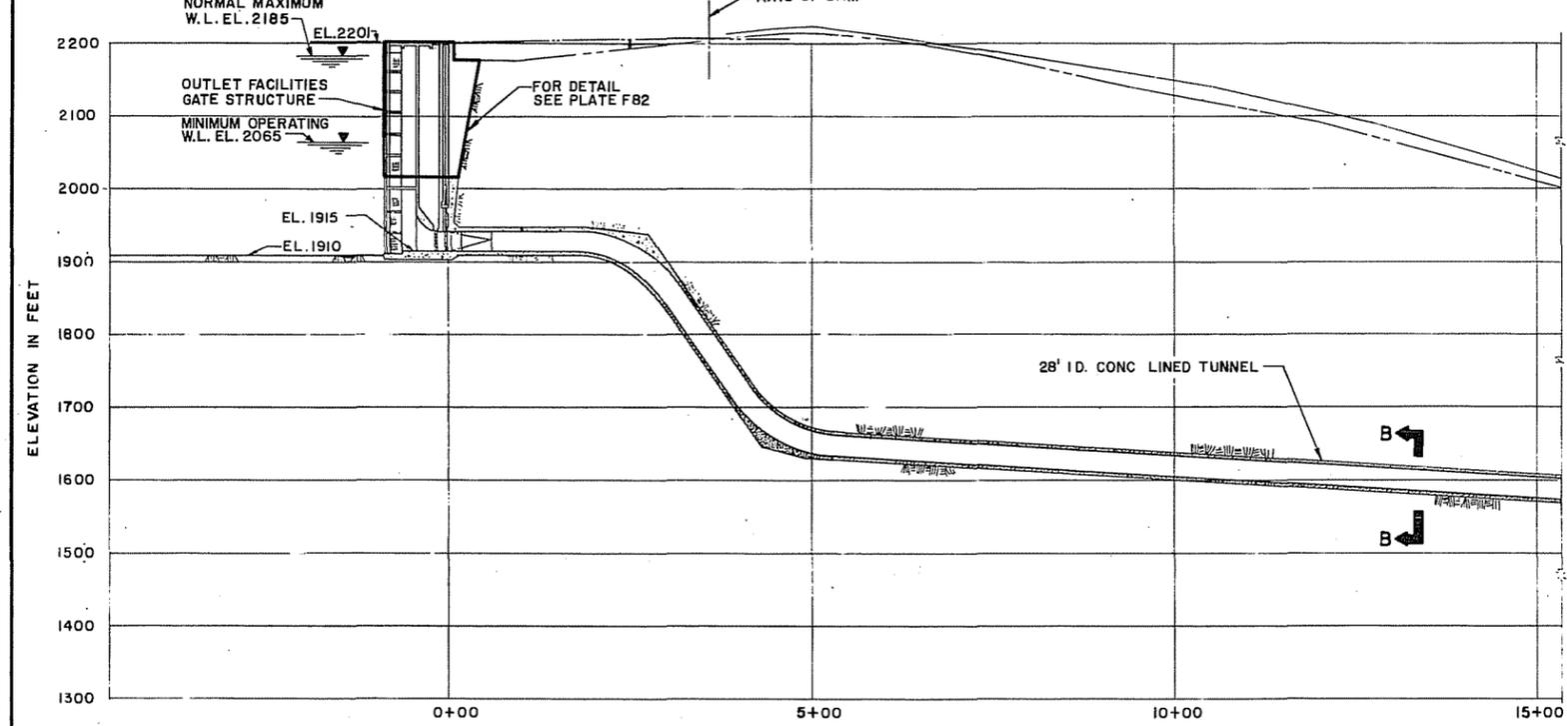


NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

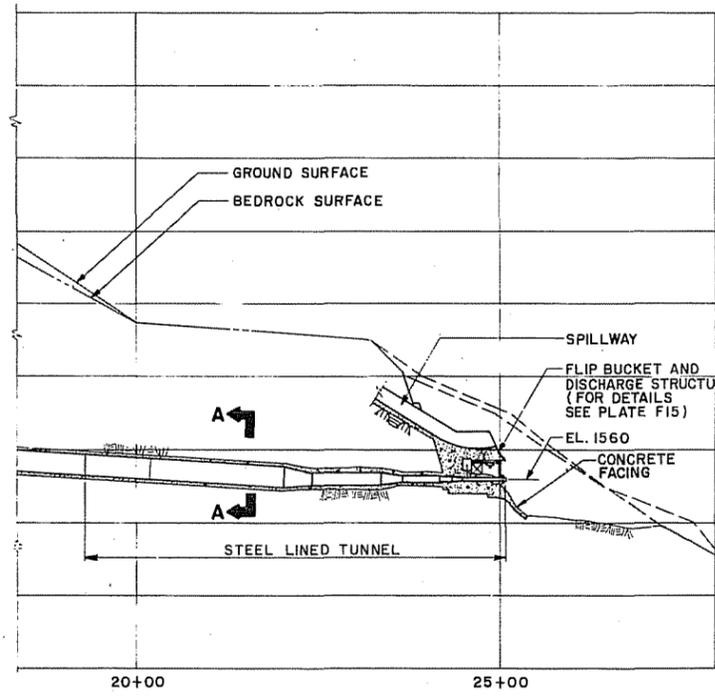
MANVA-GEASCO ELECTRA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
SPILLWAY CONTROL STRUCTURE			
EXHIBIT F		PLATE F 80	



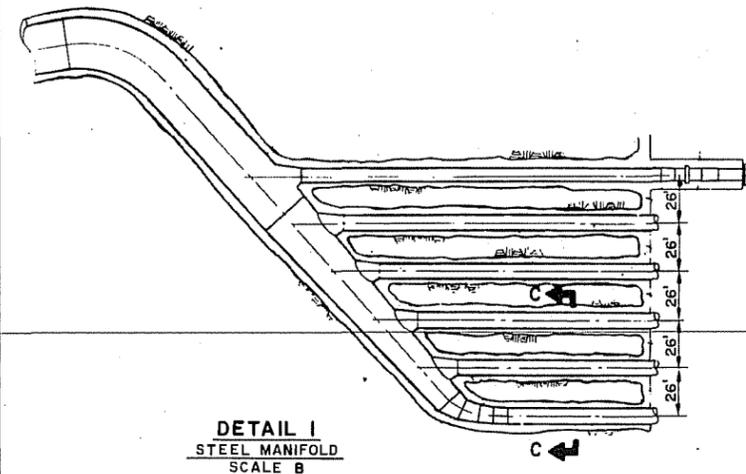
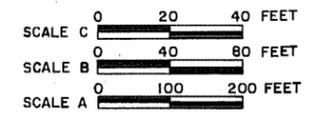
PLAN
SCALE A



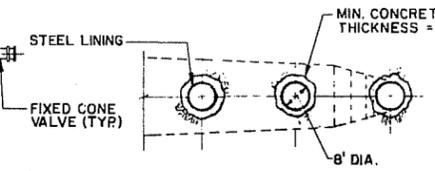
PROFILE
SCALE A



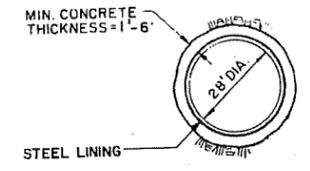
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



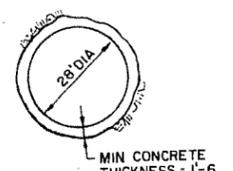
DETAIL I
STEEL MANIFOLD
SCALE B



SECTION C-C
SCALE C

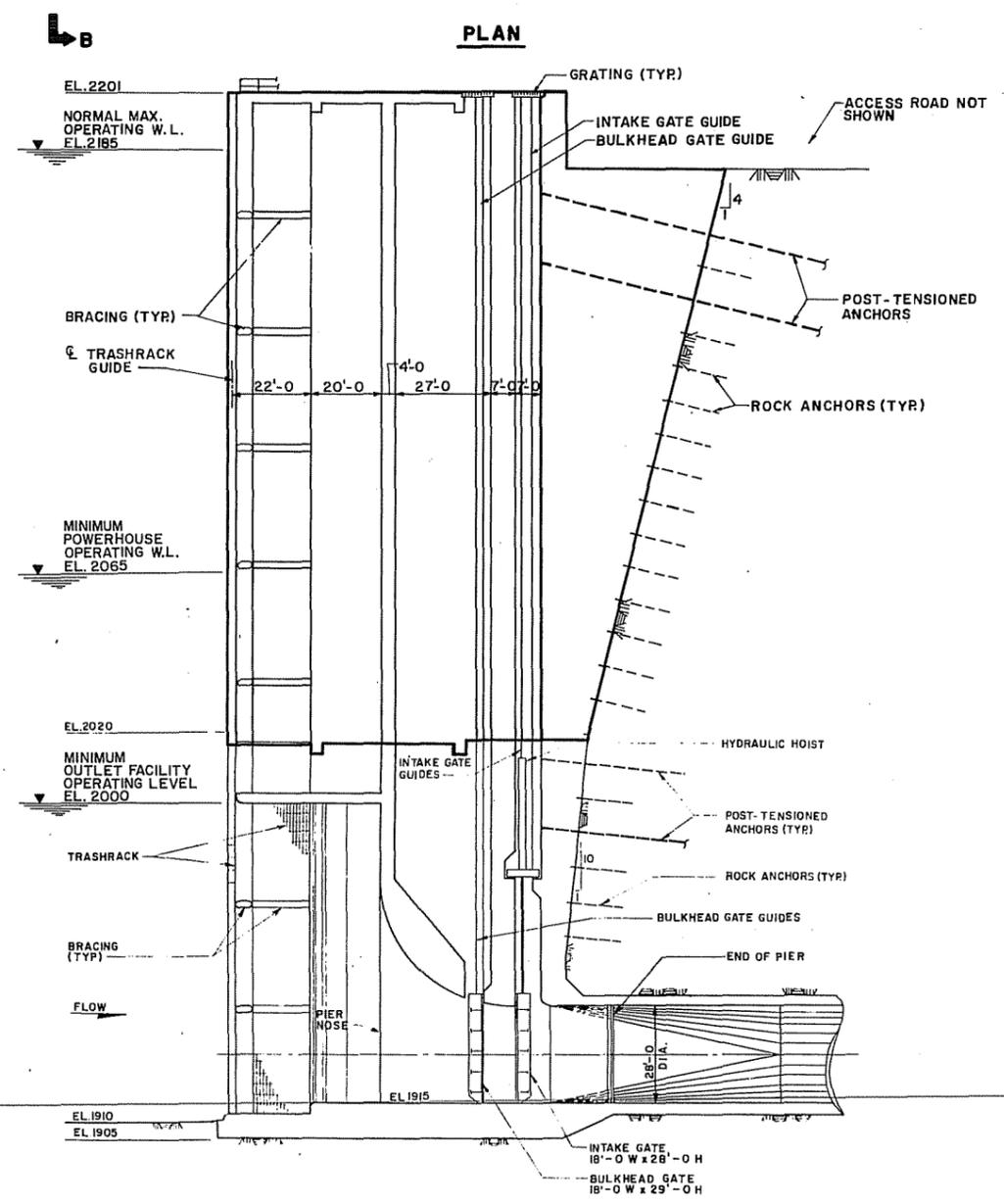
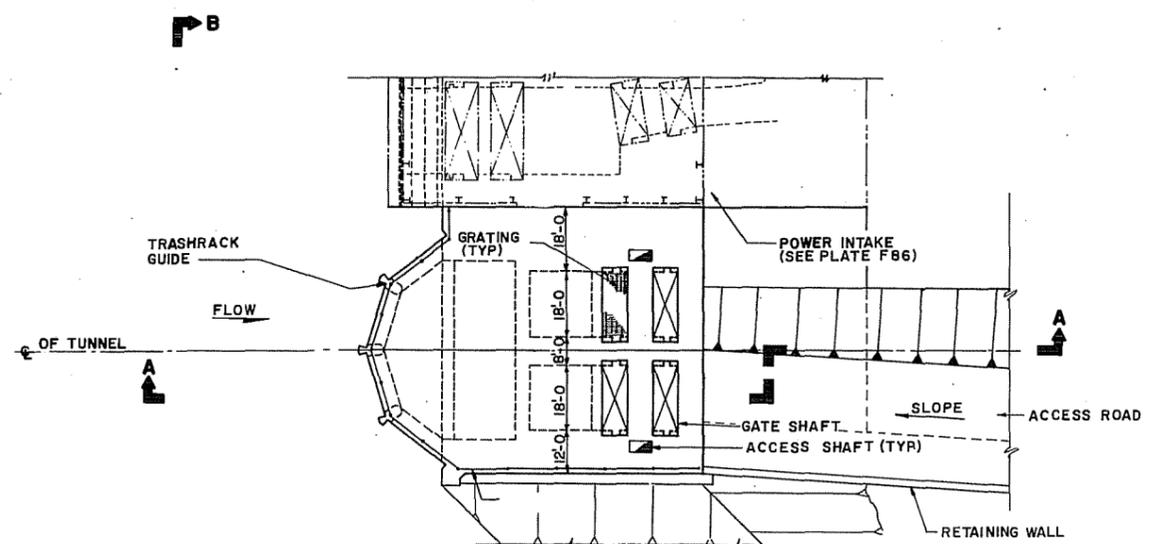


SECTION A-A
SCALE C

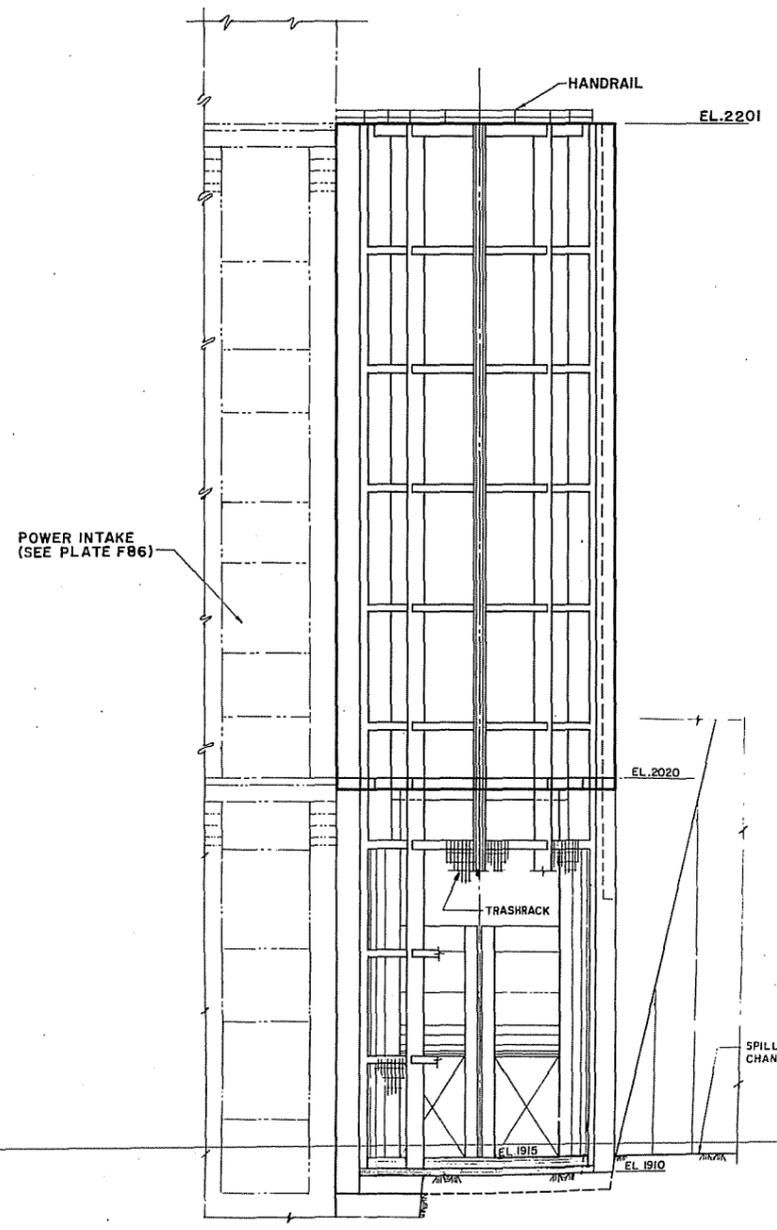


SECTION B-B
SCALE C

MARZA-TRACCO ELECTRA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
OUTLET FACILITIES		GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F81		



SECTION A-A

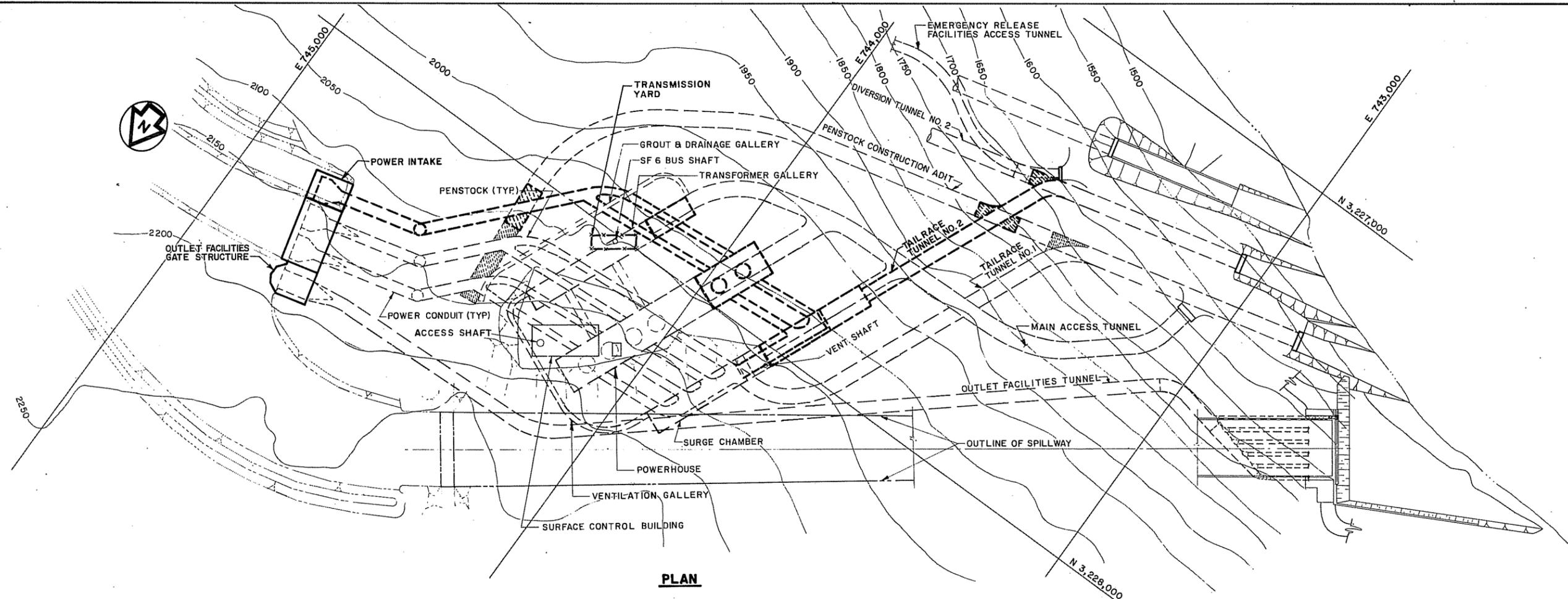


SECTION B-B

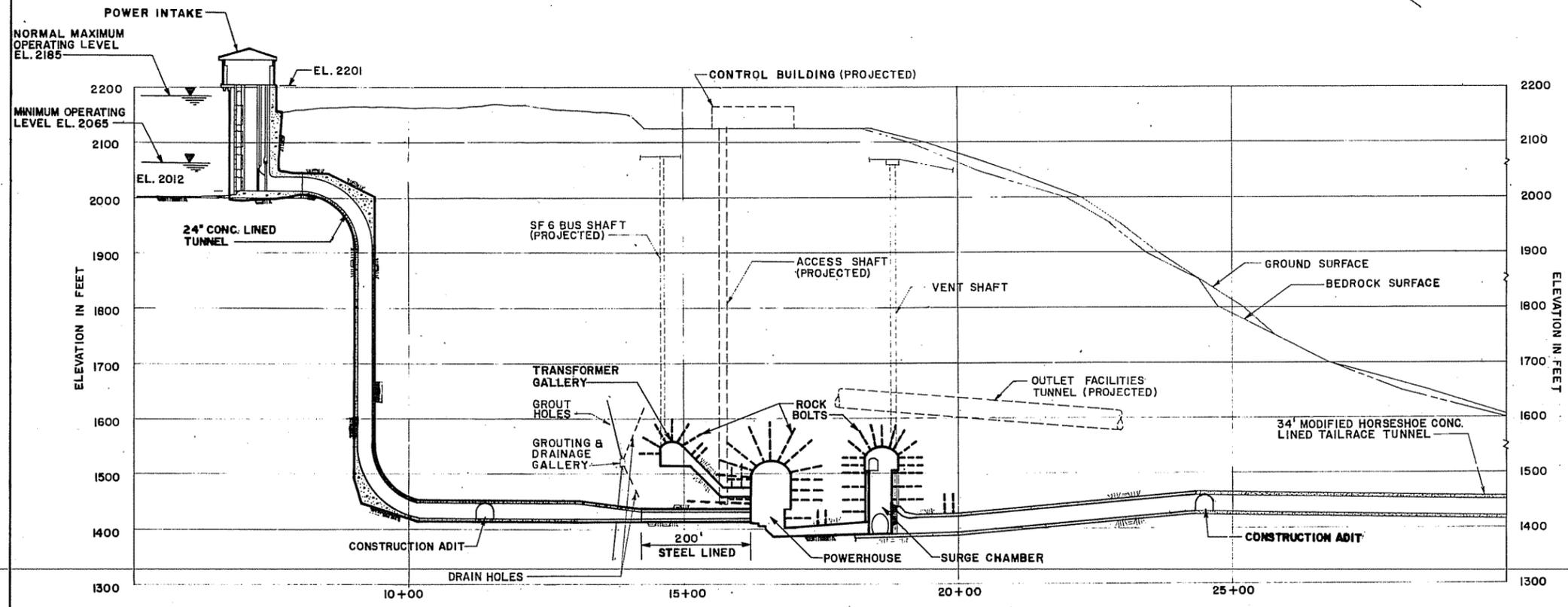
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



MANZA-ENRICO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
OUTLET FACILITIES GATE STRUCTURE			
EXHIBIT F		PLATE F-82	



PLAN

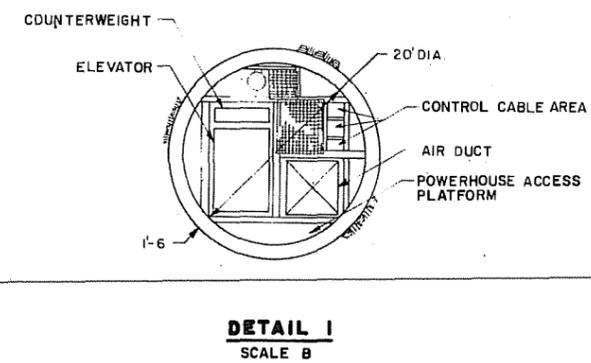
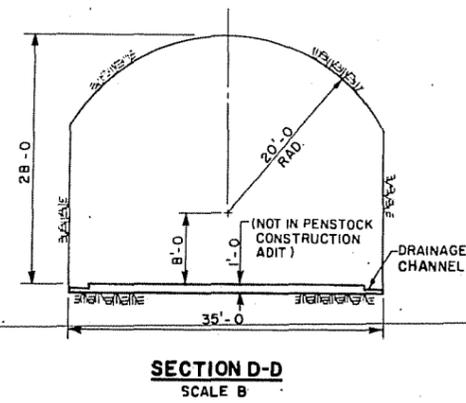
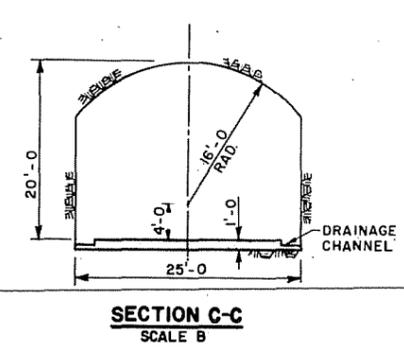
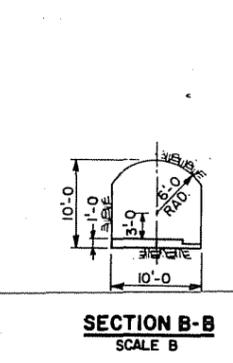
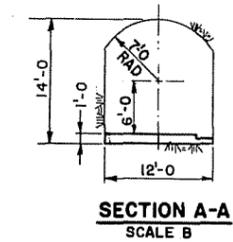
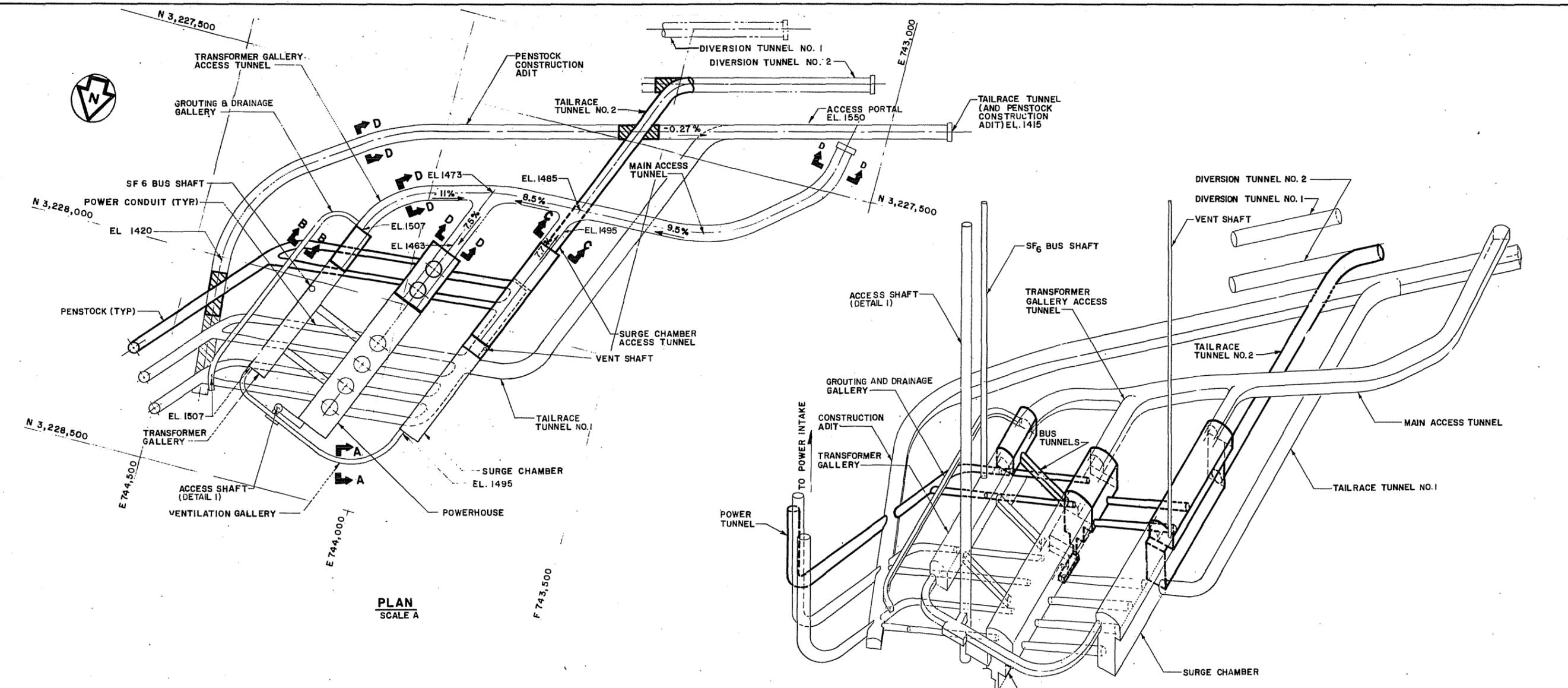


PROFILE

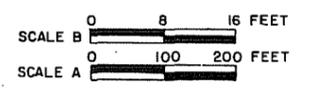
NOTE
STAGE II CONSTRUCTION SHOWN WITH BOLD LINES

SCALE 0 100 200 FEET

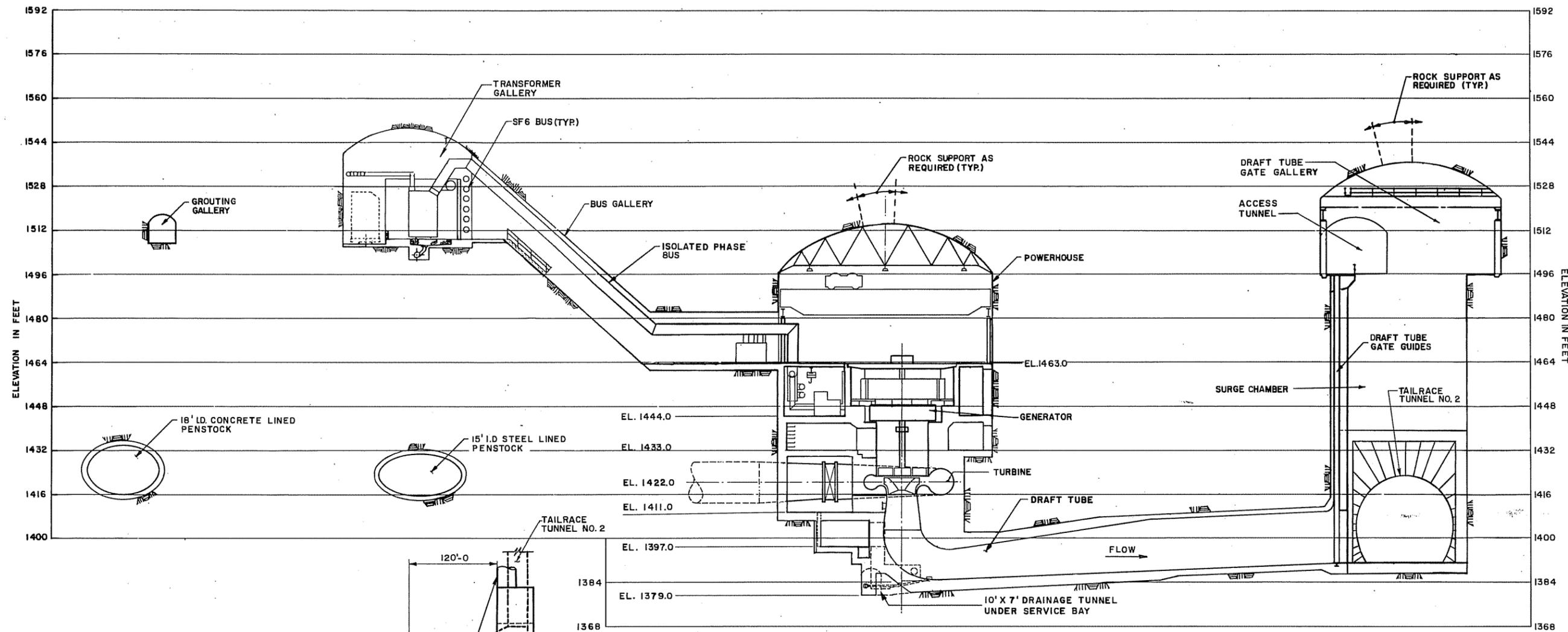
MANZA-BEASCO ELECTRICAL JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE II (WATANA)			
POWER FACILITIES GENERAL ARRANGEMENT			
EXHIBIT F		PLATE F83	



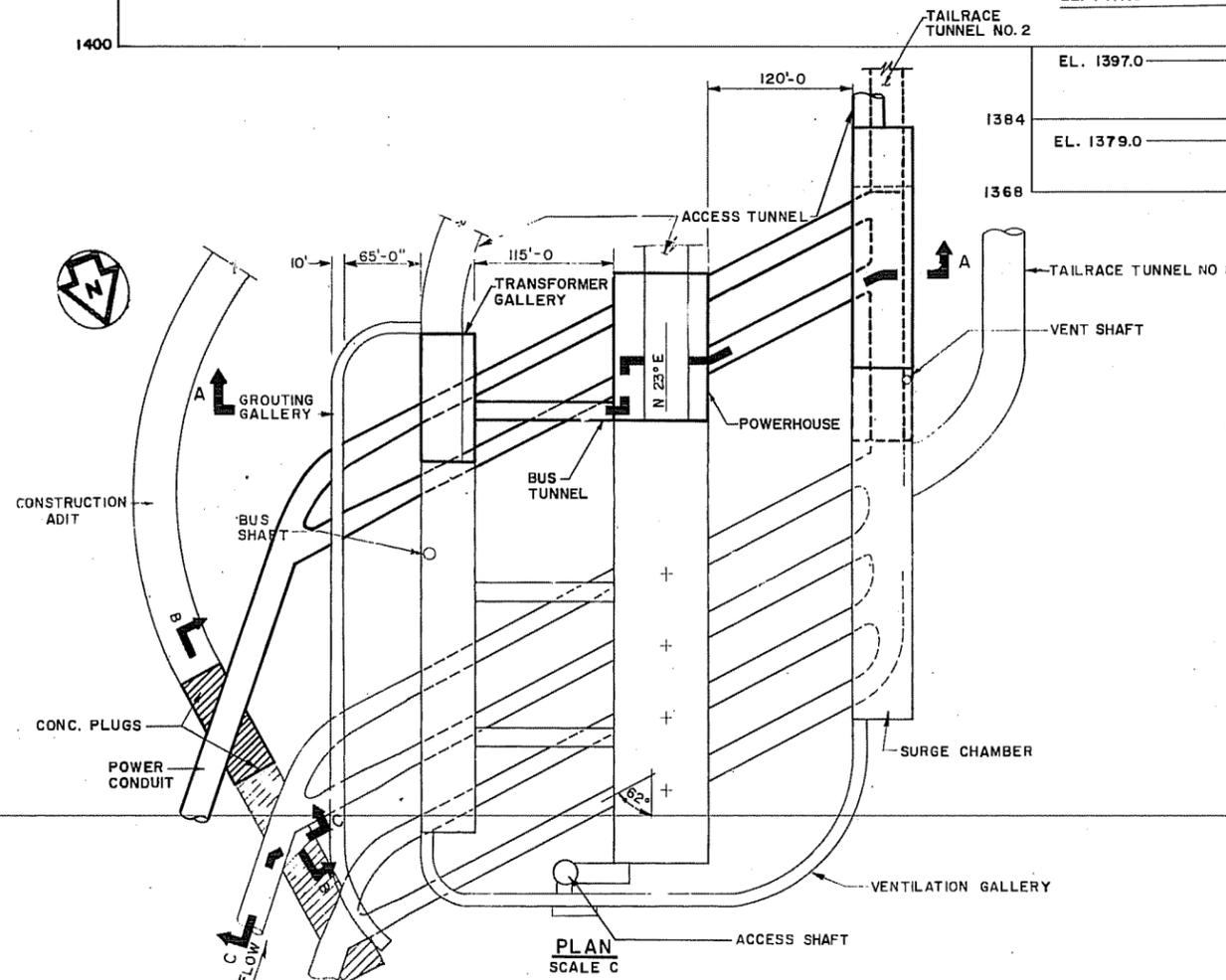
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



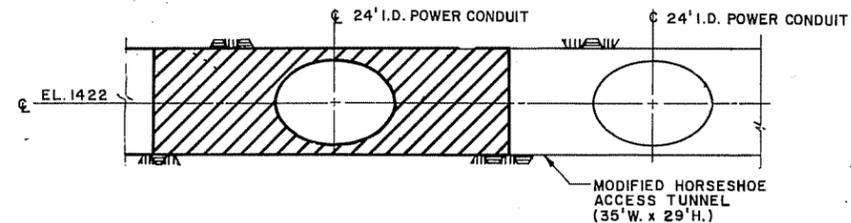
MANA-TRACO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III(WATANA)			
POWER FACILITIES ACCESS			
EXHIBIT F		PLATE F.84	



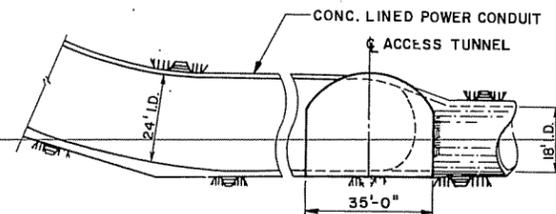
SECTION THROUGH CENTERLINE OF UNIT
SECTION A-A
SCALE B



PLAN
SCALE C

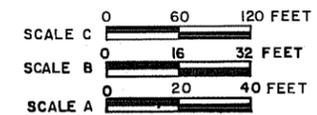


SECTION B-B
SCALE A



SECTION C-C
SCALE A

NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

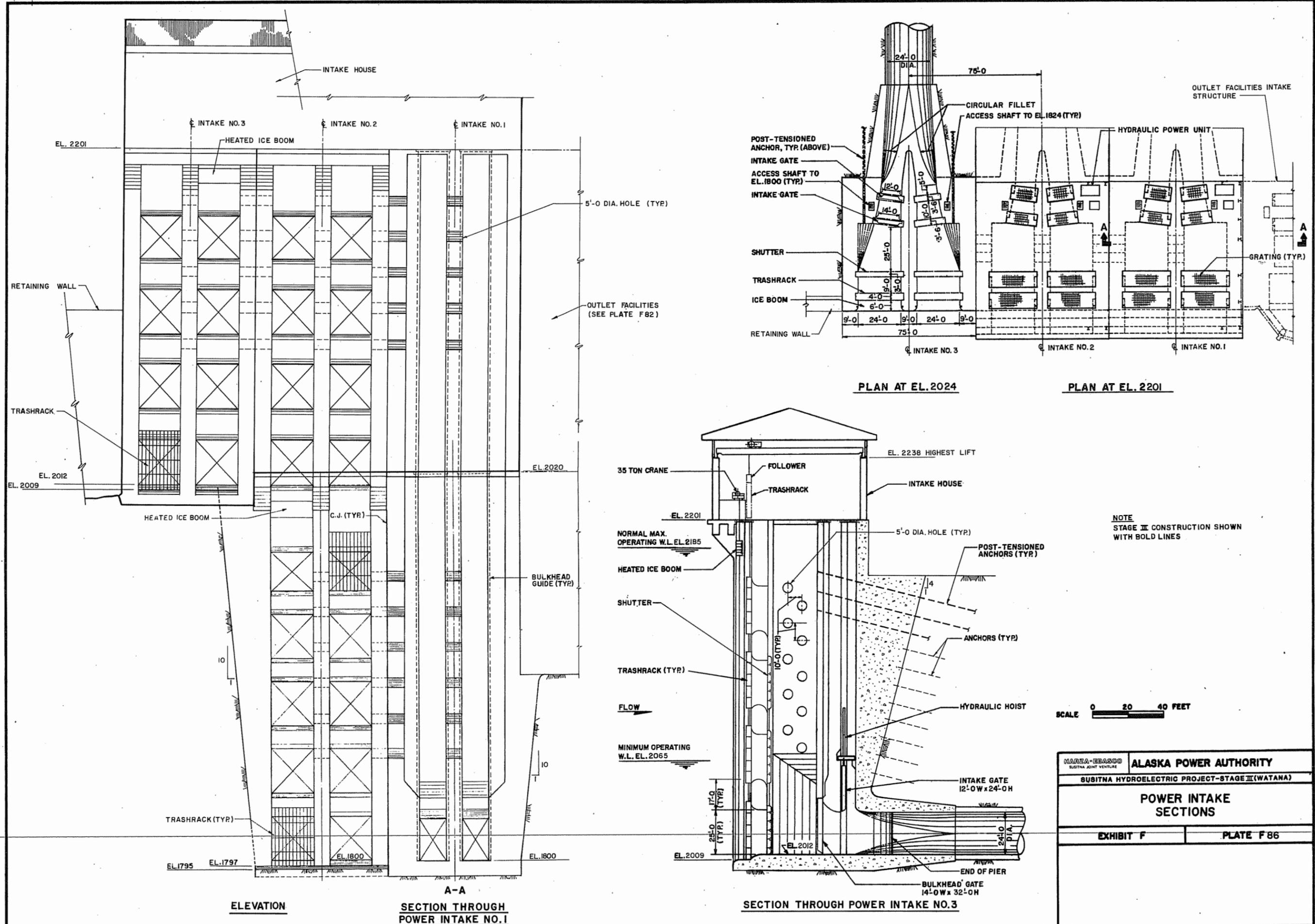


PARZA-BASCO ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)

**POWER FACILITIES
PLAN & SECTIONS**

EXHIBIT F

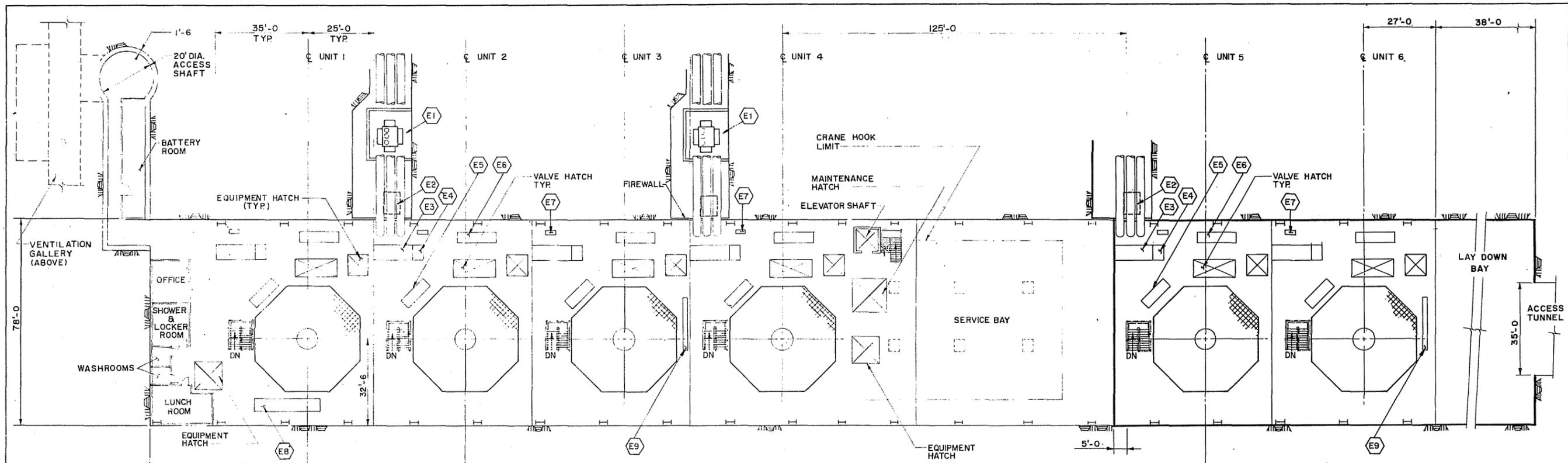
PLATE F 85



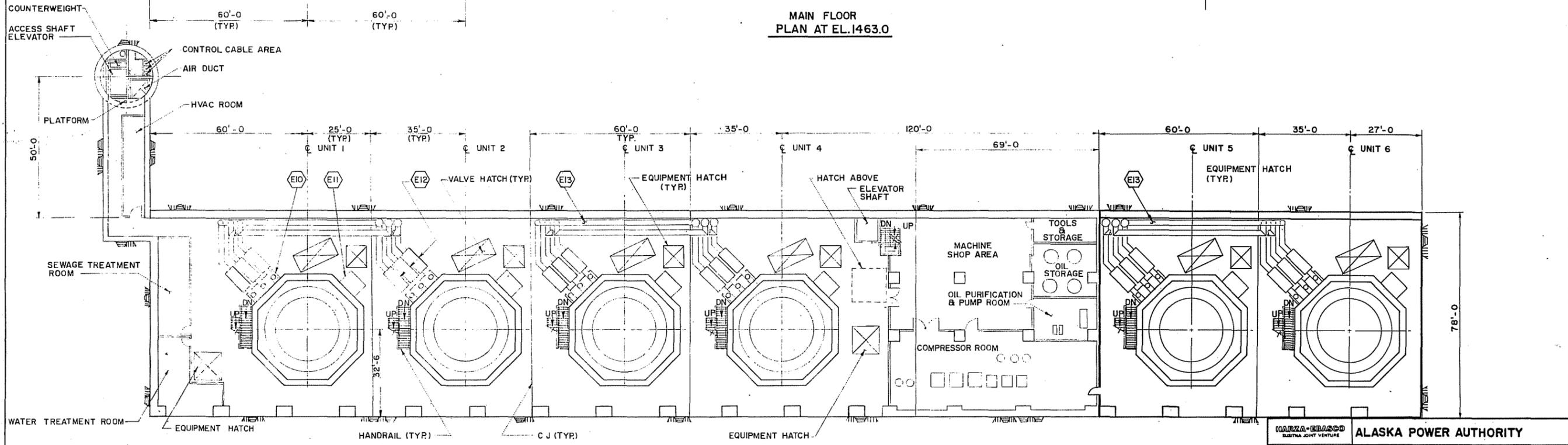
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

SCALE 0 20 40 FEET

MARZA-EDASCO SUBITNA JOINT VENTURE ALASKA POWER AUTHORITY	
SUBITNA HYDROELECTRIC PROJECT-STAGE III(WATANA)	
POWER INTAKE SECTIONS	
EXHIBIT F	PLATE F 86



MAIN FLOOR
PLAN AT EL. 1463.0



GENERATOR FLOOR
PLAN AT EL. 1444.0

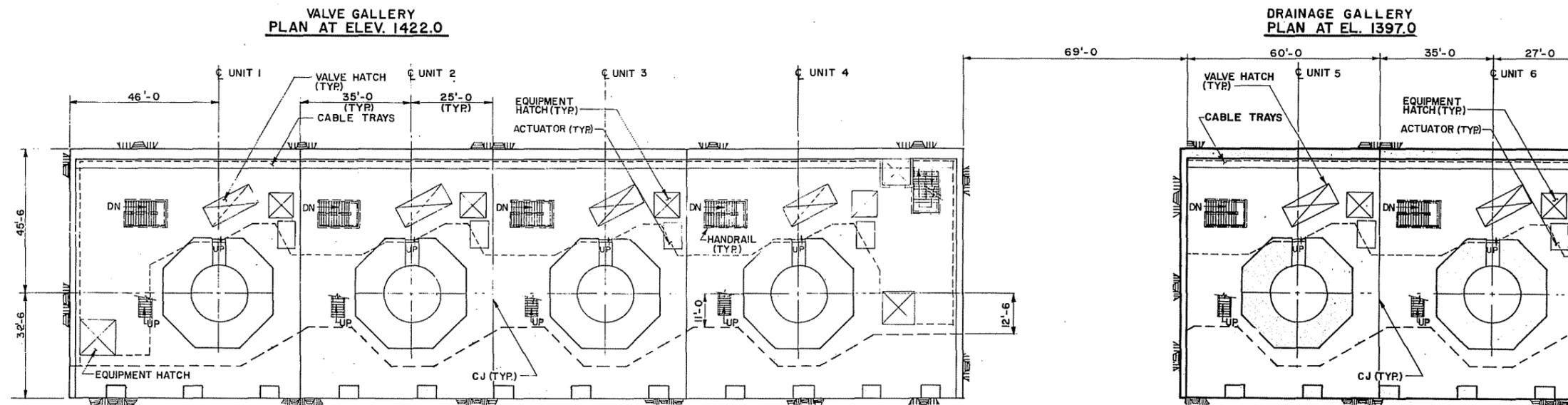
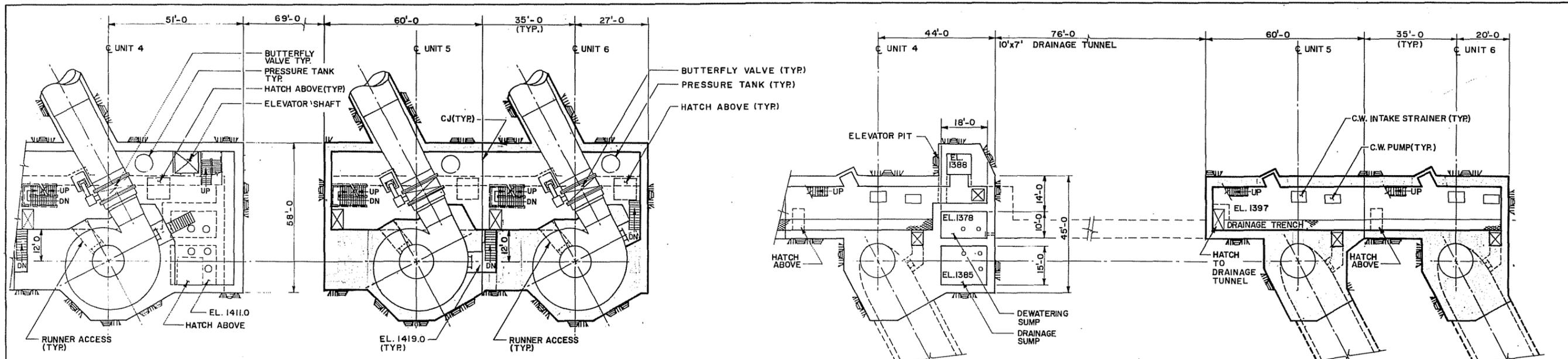
LEGEND

- E1 AUXILIARY SERVICE TRANSFORMER 7.5/10MVA
- E2 AUXILIARY SERVICE TRANSFORMER 2 MVA (TYP)
- E3 UNIT CONTROL SWITCH BOARD (TYP)
- E4 GOVERNOR ELECT CUBICLE (TYP)
- E5 EXCITATION TRANSFORMER (TYP)
- E6 EXCITATION CUBICLES (TYP)
- E7 480V PDP (TYP)
- E8 STATION SERVICE SWITCHGEAR (480V)
- E9 ESSENTIAL AC/DC SWBD
- E10 GENERATOR SURGE PROTECTION CUBICAL
- E11 GENERATOR NEUTRAL CUBICLE
- E12 GENERATOR CIRCUIT BREAKERS
- E13 15KV ISOLATED PHASE BUS

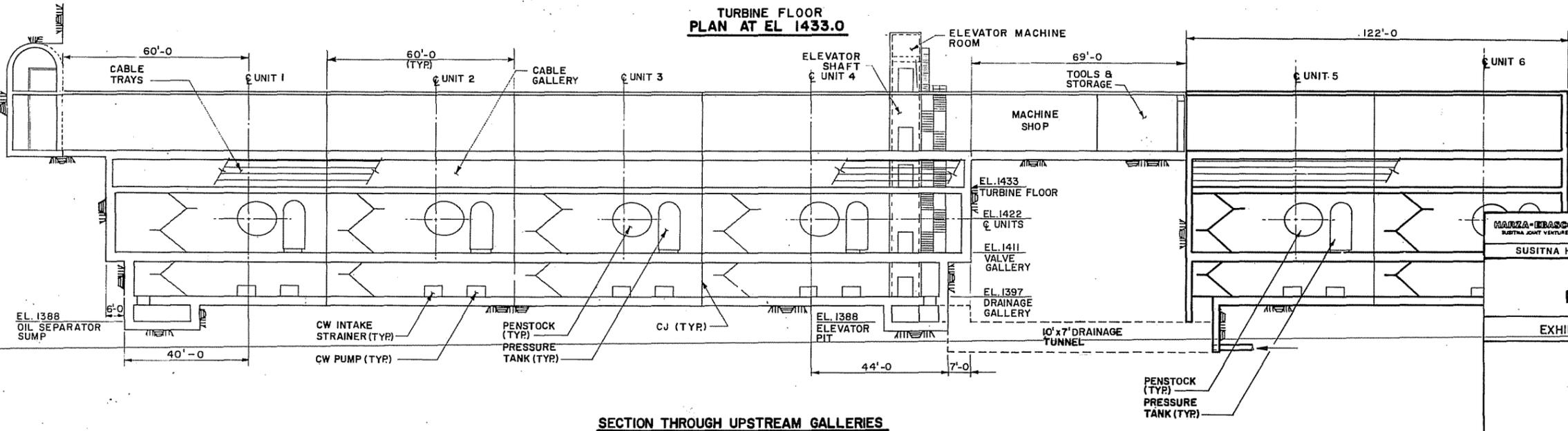
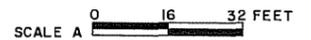
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



MANZA-BRASCO SUSTNA JOINT VENTURE	
ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
POWERHOUSE PLANS	
EXHIBIT F	PLATE F87



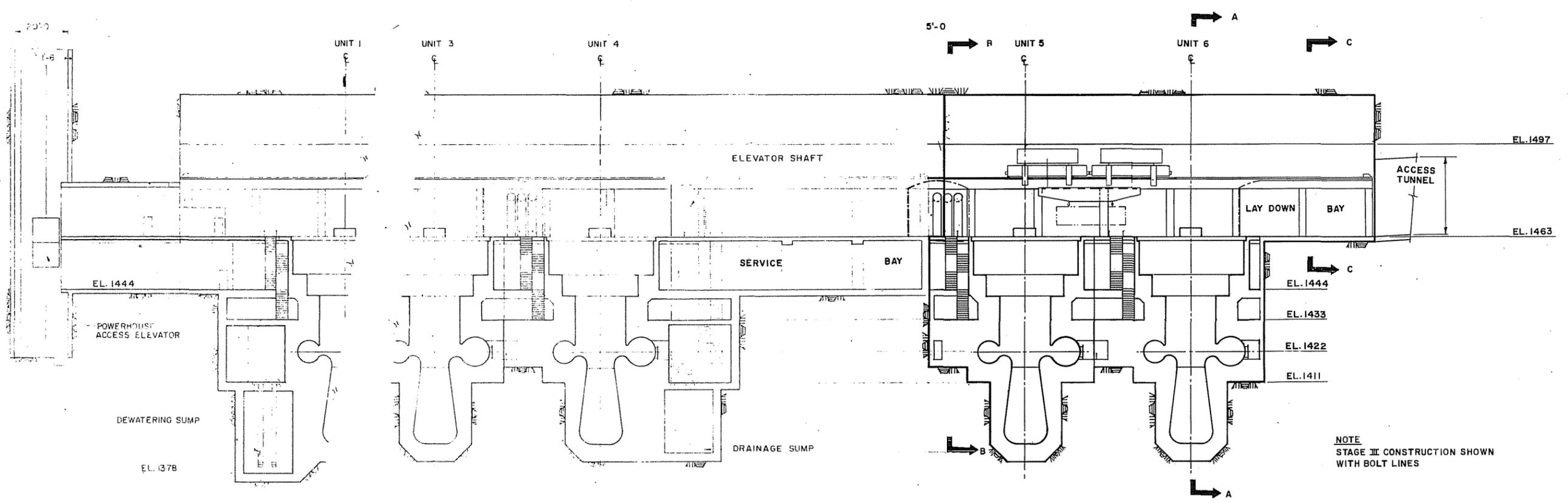
NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES



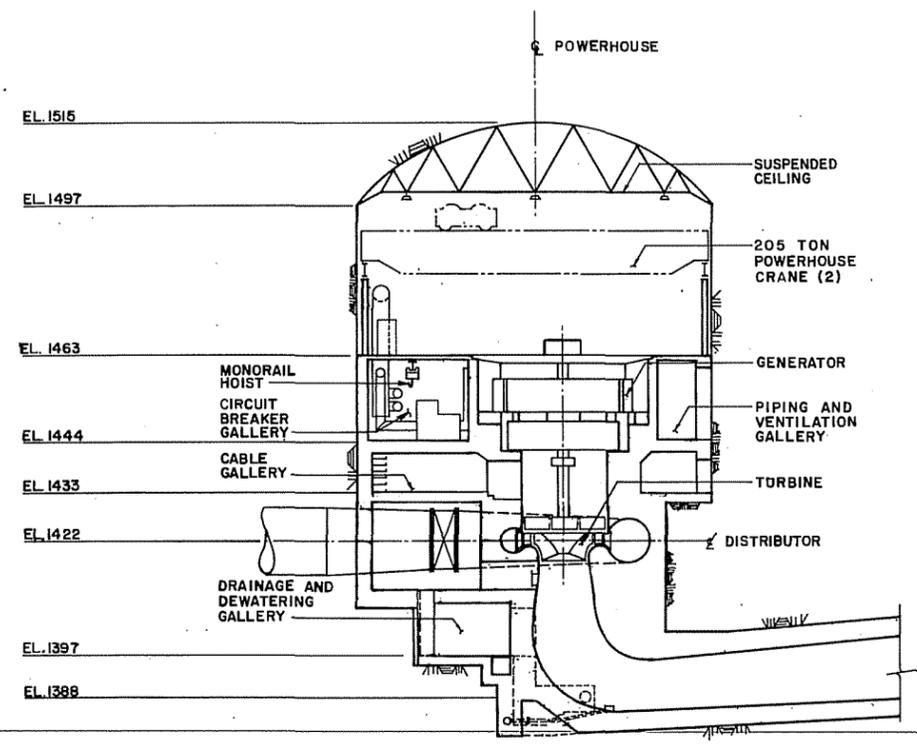
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)

POWERHOUSE PLANS AND SECTION

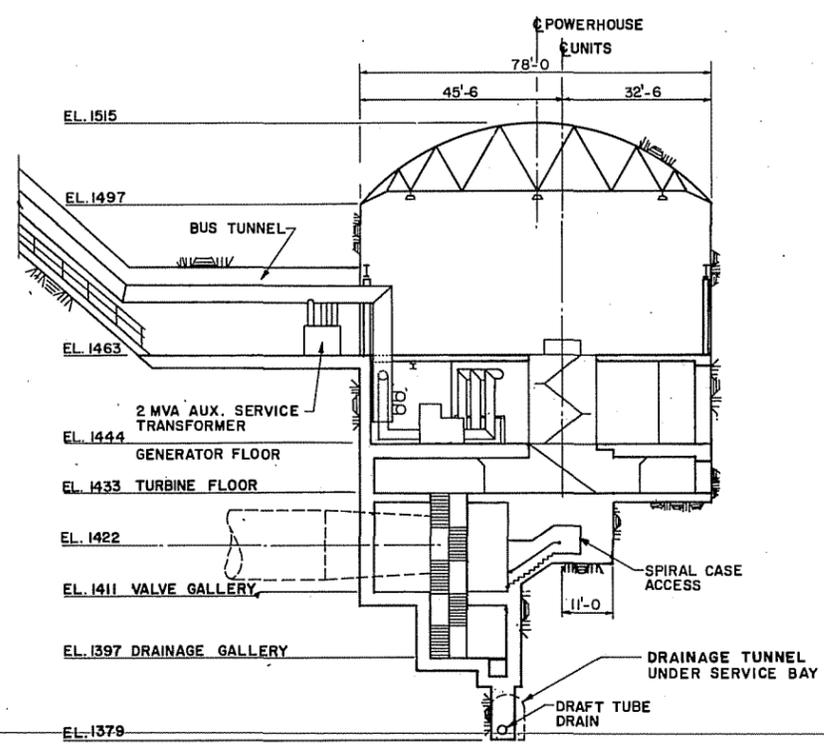
EXHIBIT F PLATE F.88



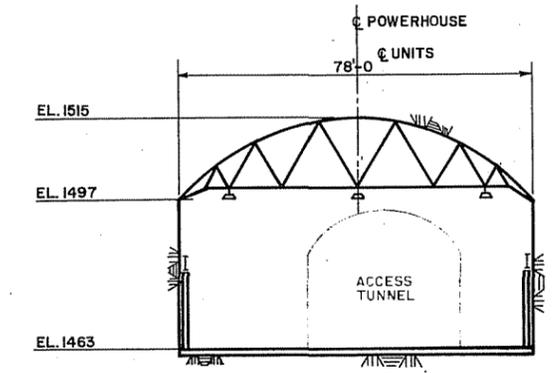
LONGITUDINAL SECTION (THRU CENTERLINE OF UNITS, UNITS NOT SHOWN)



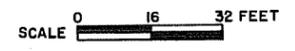
SECTION A-A (SECTION THRU CENTERLINE OF UNIT)



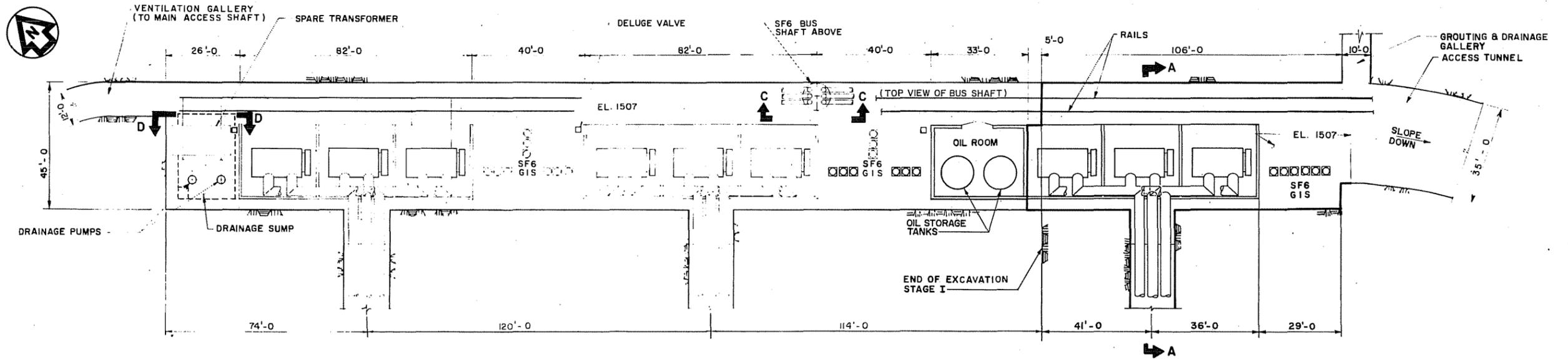
SECTION B-B (SECTION THRU BUS TUNNEL)



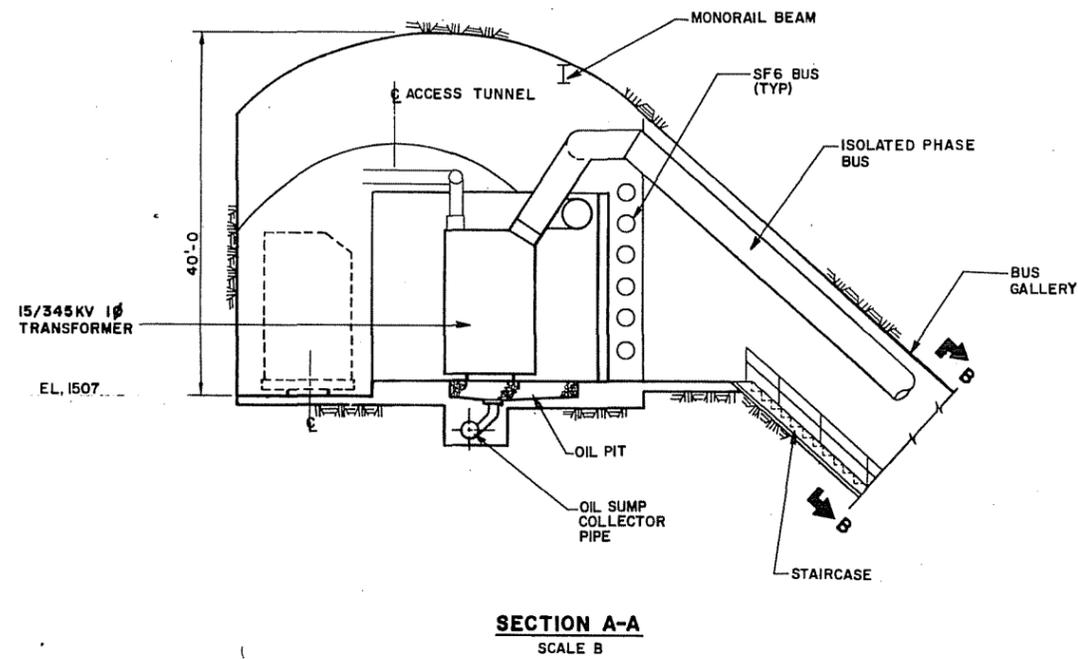
SECTION C-C
SECTION THRU LAY DOWN AREA



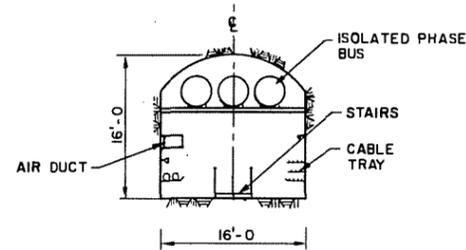
MANZA-EMASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
POWERHOUSE SECTIONS			
EXHIBIT F		PLATE F89	



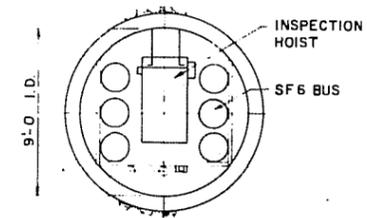
PLAN
SCALE A



SECTION A-A
SCALE B

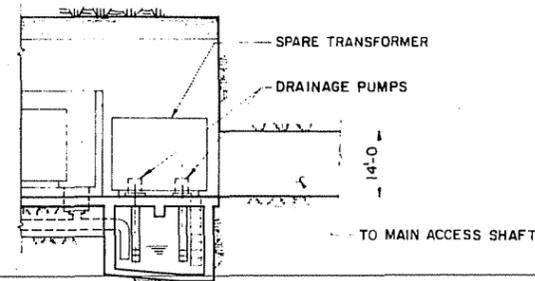
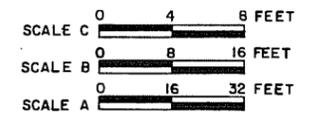


SECTION B-B
THROUGH BUS GALLERY
SCALE B



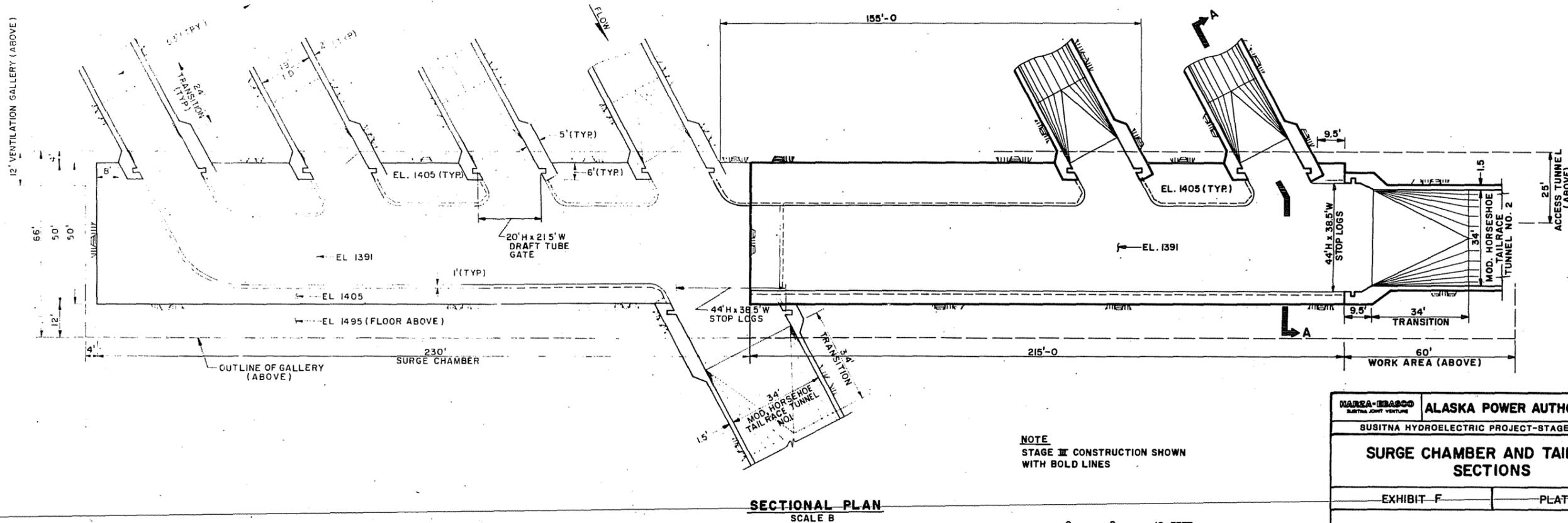
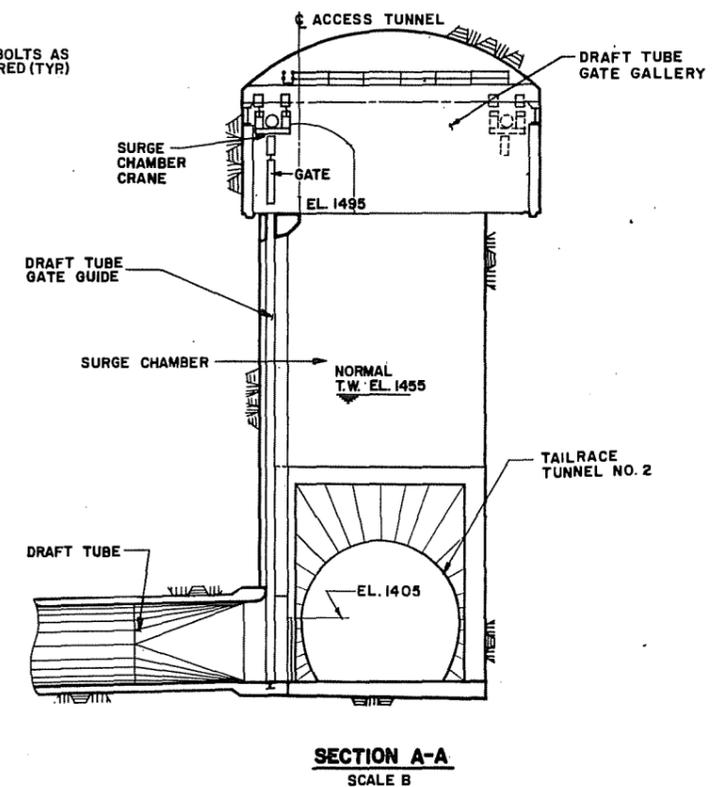
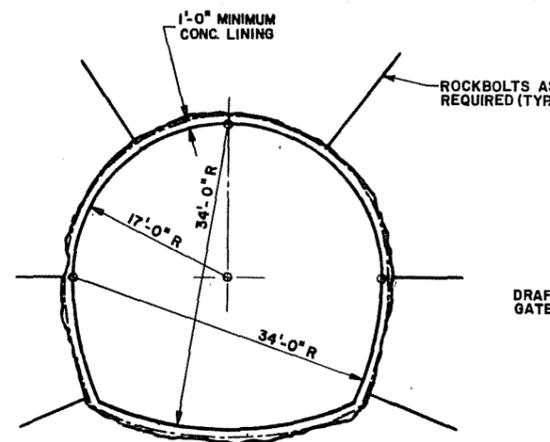
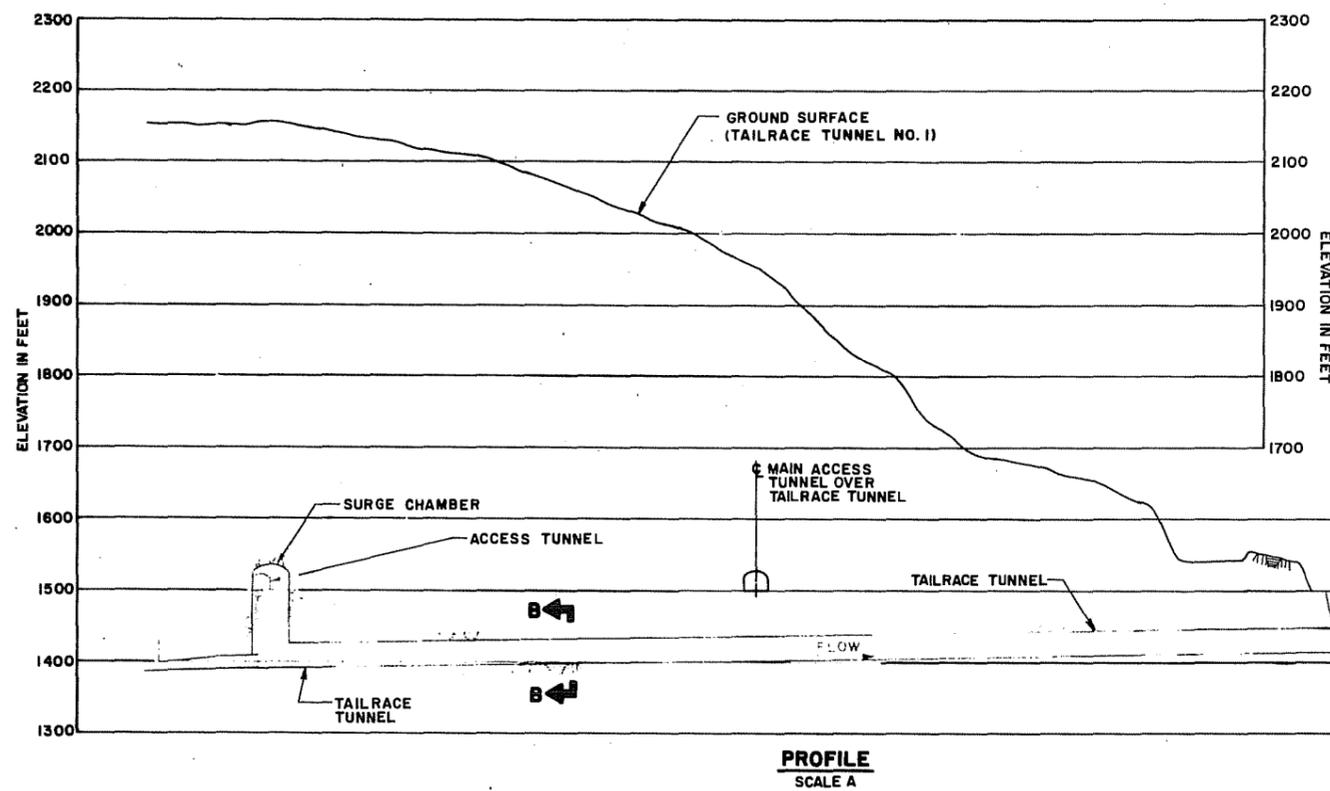
SECTION C-C
THROUGH BUS SHAFT
SCALE C

NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

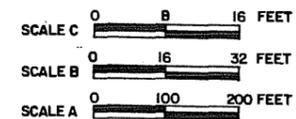


SECTION D-D
THROUGH SUMP
SCALE A

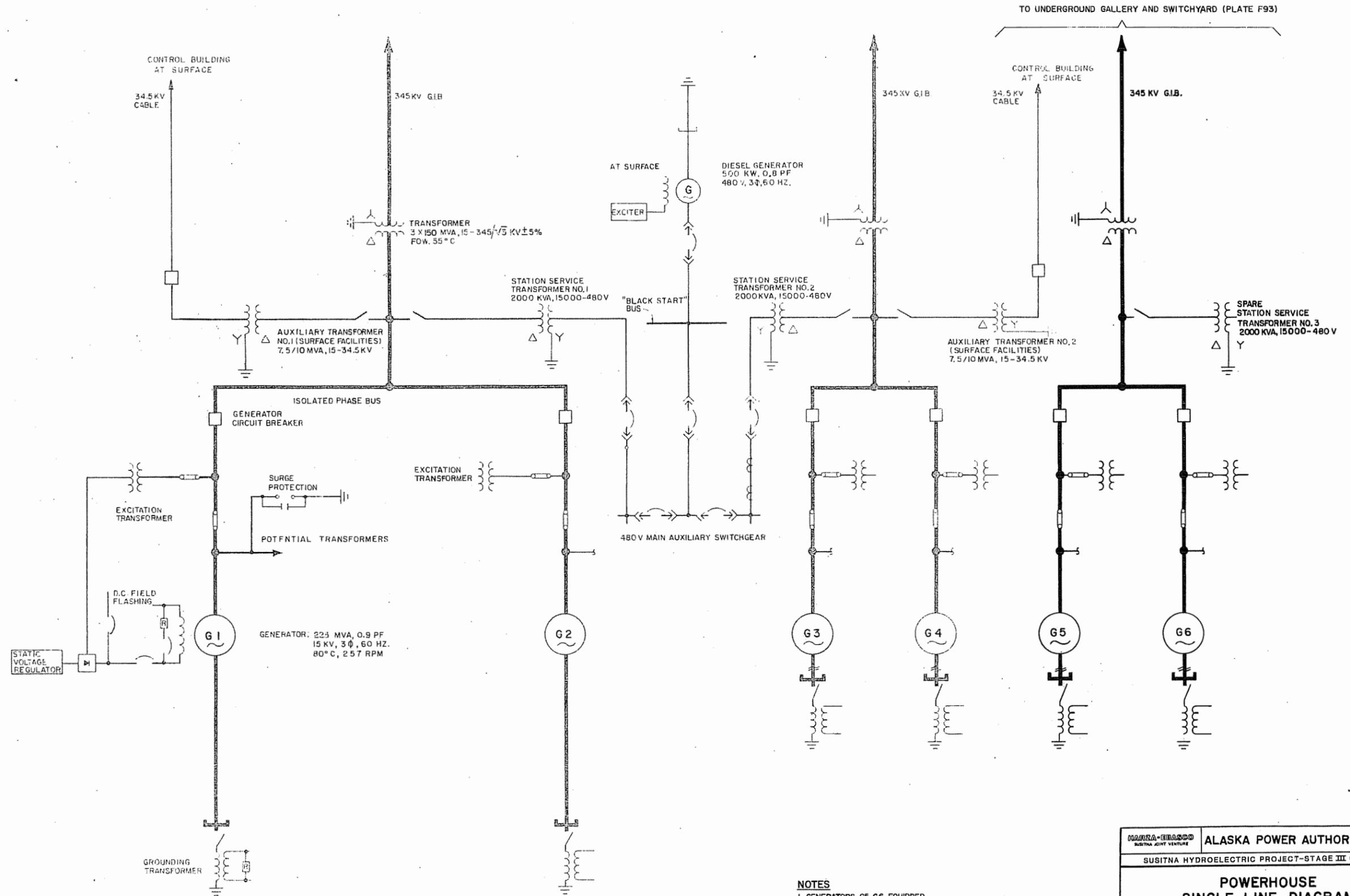
MANZA-BASCO ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
TRANSFORMER GALLERY PLAN & SECTIONS	
EXHIBIT F	PLATE F90



NOTE
STAGE III CONSTRUCTION SHOWN
WITH BOLD LINES

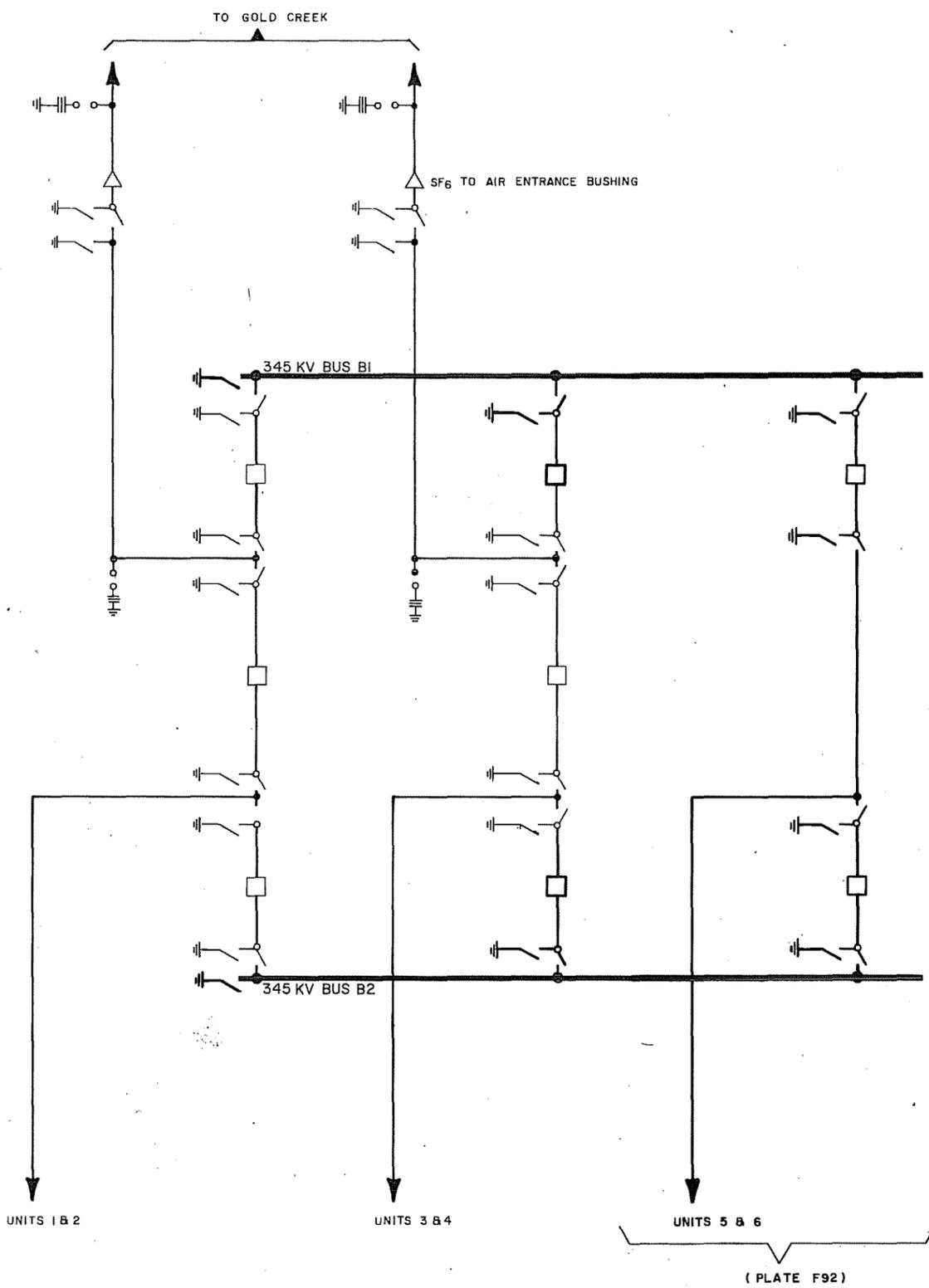


MARSA-IBASCO SUSITNA JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
SURGE CHAMBER AND TAILRACE SECTIONS			
EXHIBIT F		PLATE F91	



NOTES
 1. GENERATORS G5, G6, EQUIPPED EXACTLY AS GENERATOR G1.
 2. SYMBOLS SHOWN ON F93.

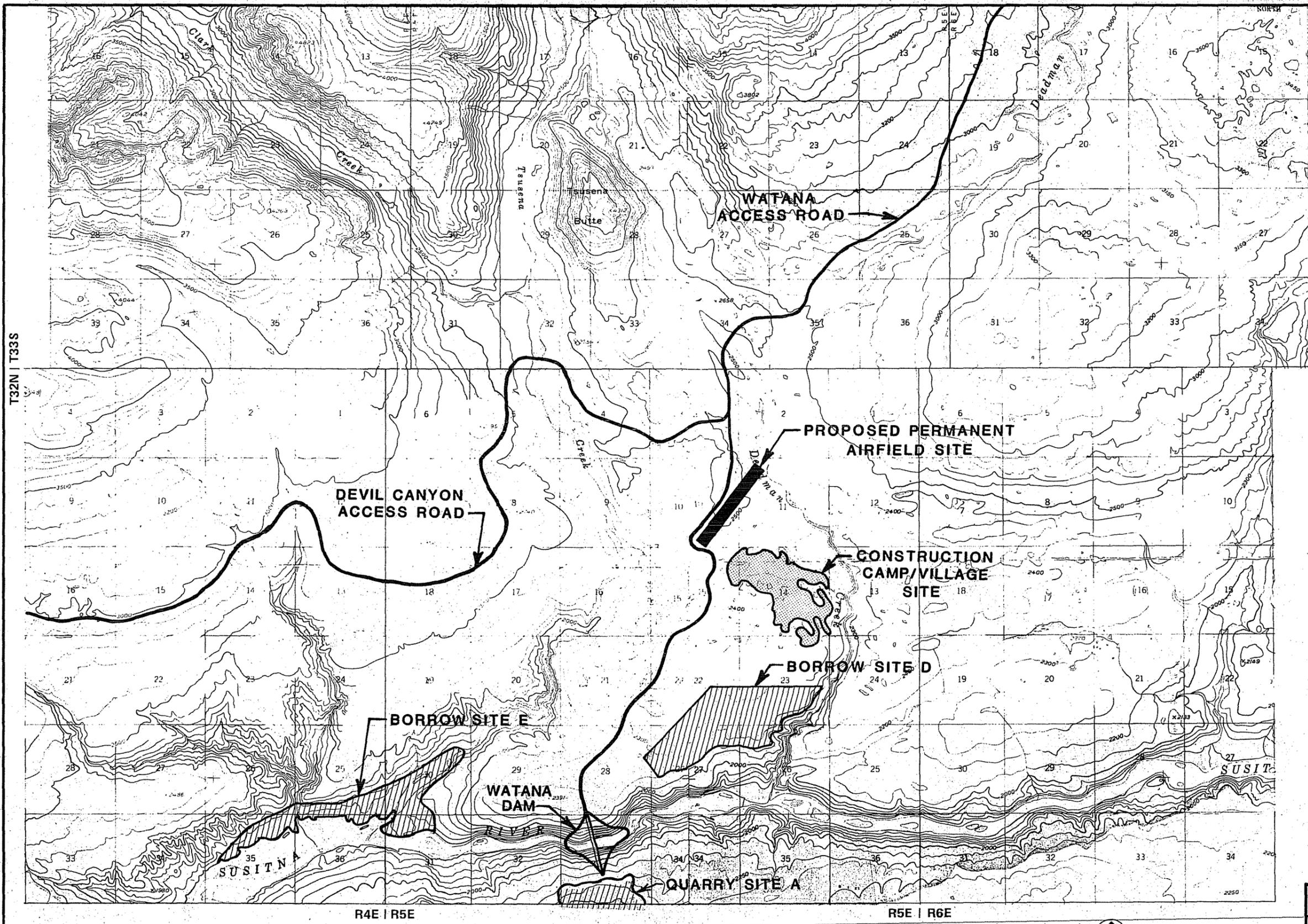
		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)			
POWERHOUSE SINGLE LINE DIAGRAM			
EXHIBIT F		PLATE F92	



LEGEND

-  A.C. GENERATOR, 3 PHASE, 60HZ, WYE CONNECTED
-  TRANSFORMER
-  AUTO TRANSFORMER
-  CIRCUIT BREAKER
-  DRAWOUT CIRCUIT BREAKER
-  LOW VOLTAGE AIR CIRCUIT BREAKER
-  LINK IN ISOLATED PHASE BUS
-  DISCONNECT SWITCH
-  GROUND CONNECTION
-  RESISTOR, ADJUSTABLE
-  RESISTANCE TEMPERATURE DETECTOR
-  STANDARD DEVICE
-  CURRENT TRANSFORMER
-  TRANSFORMER CONNECTION 3 PHASE, 3 WIRE, DELTA
-  TRANSFORMER CONNECTION 3 PHASE, 3 WIRE, WYE
-  REACTOR, ADJUSTABLE
-  VOLTAGE TRANSFORMER
-  CAPACITOR
-  BUSHING CURRENT TRANSFORMER
-  LIGHTNING ARRESTOR
-  COUPLING CAPACITOR VOLTAGE TRANSFORMER
-  RECTIFIER
- G.I.S. GAS-INSULATED SWITCHGEAR
- G.I.B. GAS-INSULATED BUS

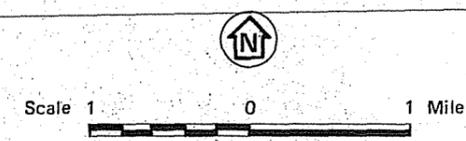
MARZA-TRACCO ALASKA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
345 kV UNDERGROUND SWITCHYARD SINGLE LINE DIAGRAM	
EXHIBIT F	PLATE F93



LEGEND

-  CAMP/VILLAGE
-  AIRFIELD
-  ACCESS ROAD
-  BORROW AREAS

<small>MARKA-ERASSO SUSITNA JOINT VENTURE</small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
GENERAL LAYOUT SITE FACILITIES	
EXHIBIT F	PLATE F94



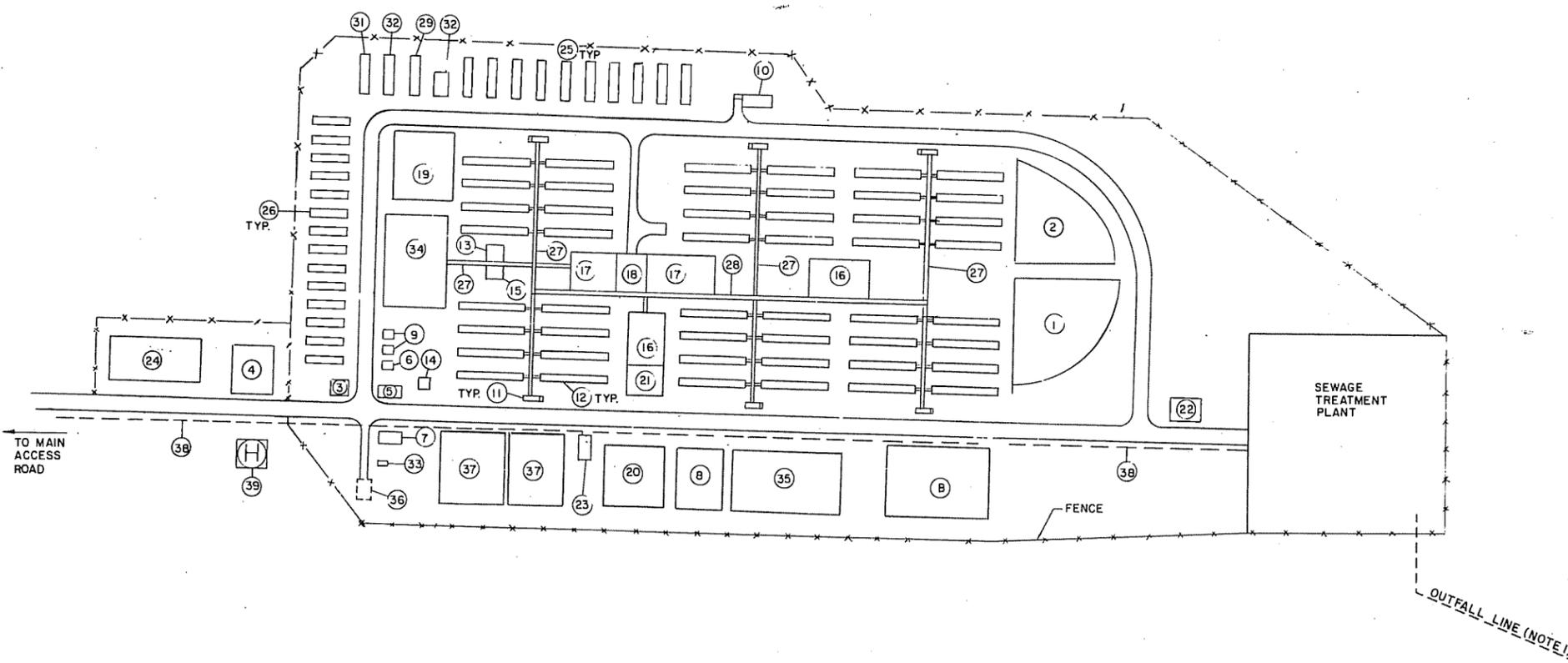
LEGEND

- ① BASEBALL
- ② SOFTBALL
- ③ SECURITY
- ④ HOSPITAL
- ⑤ FIRE & OIL SPILL
- ⑥ CAMP MANAGER'S OFFICE
- ⑦ SOILS LAB
- ⑧ PARKING AREAS
- ⑨ ADMINISTRATION OFFICES
- ⑩ STORE
- ⑪ BUS SHELTERS
- ⑫ DORMITORIES
- ⑬ LAUNDRY
- ⑭ COMMUNICATIONS CTR.
- ⑮ BANK
- ⑯ RECREATION HALL
- ⑰ KITCHEN & DINING
- ⑱ FOOD SERVICE WAREHOUSE
- ⑲ WAREHOUSE
- ⑳ GYMNASIUM
- ㉑ SWIMMING POOL
- ㉒ MAINTENANCE GARAGE
- ㉓ PUMP HOUSE (WATER)
- ㉔ HOCKEY RINK
- ㉕ BACHELOR DORMS MGMT. TYPE A
- ㉖ BACHELOR DORMS MGMT. TYPE B
- ㉗ 10' PERMAWALK
- ㉘ 16' PERMAWALK
- ㉙ MANAGER'S GUEST HOUSE
- ㉚ OWNER'S GUEST HOUSE
- ㉛ CONTRACTOR'S GUEST HOUSE
- ㉜ STAFF CLUBHOUSE
- ㉝ GENERATING STATION
- ㉞ RELOCATED CAMP HOUSING (160 SPACES)
- ㉟ FOOTBALL FIELD
- ㊱ FUEL STORAGE TANK
- ㊲ WATER RESERVOIR
- ㊳ UTILIDOR
- ㊴ HELIPAD

NOTE

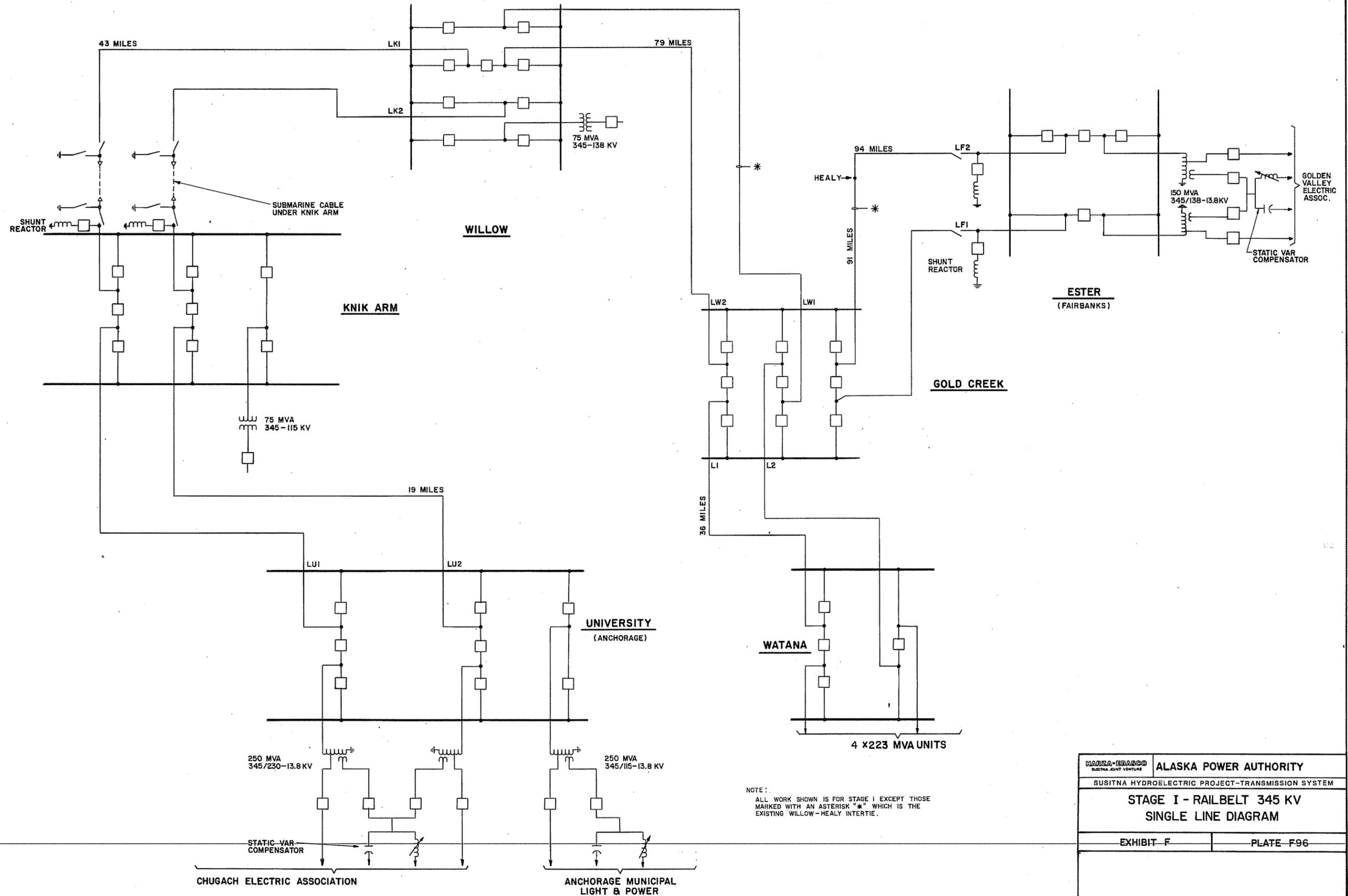
1. OUTFALL LINE LOCATION AND ORIENTATION WOULD BE SITUATED DOWNSLOPE AND DEPEND UPON TOPOGRAPHY
2. FACILITY CONSTRUCTED DURING STAGE I

SCALE 0 200 400 FEET



<small>MARRA-EBASC®</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
<small>SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)</small>			
CONSTRUCTION CAMP GENERAL PLAN			
<small>EXHIBIT F</small>		<small>PLATE F95</small>	

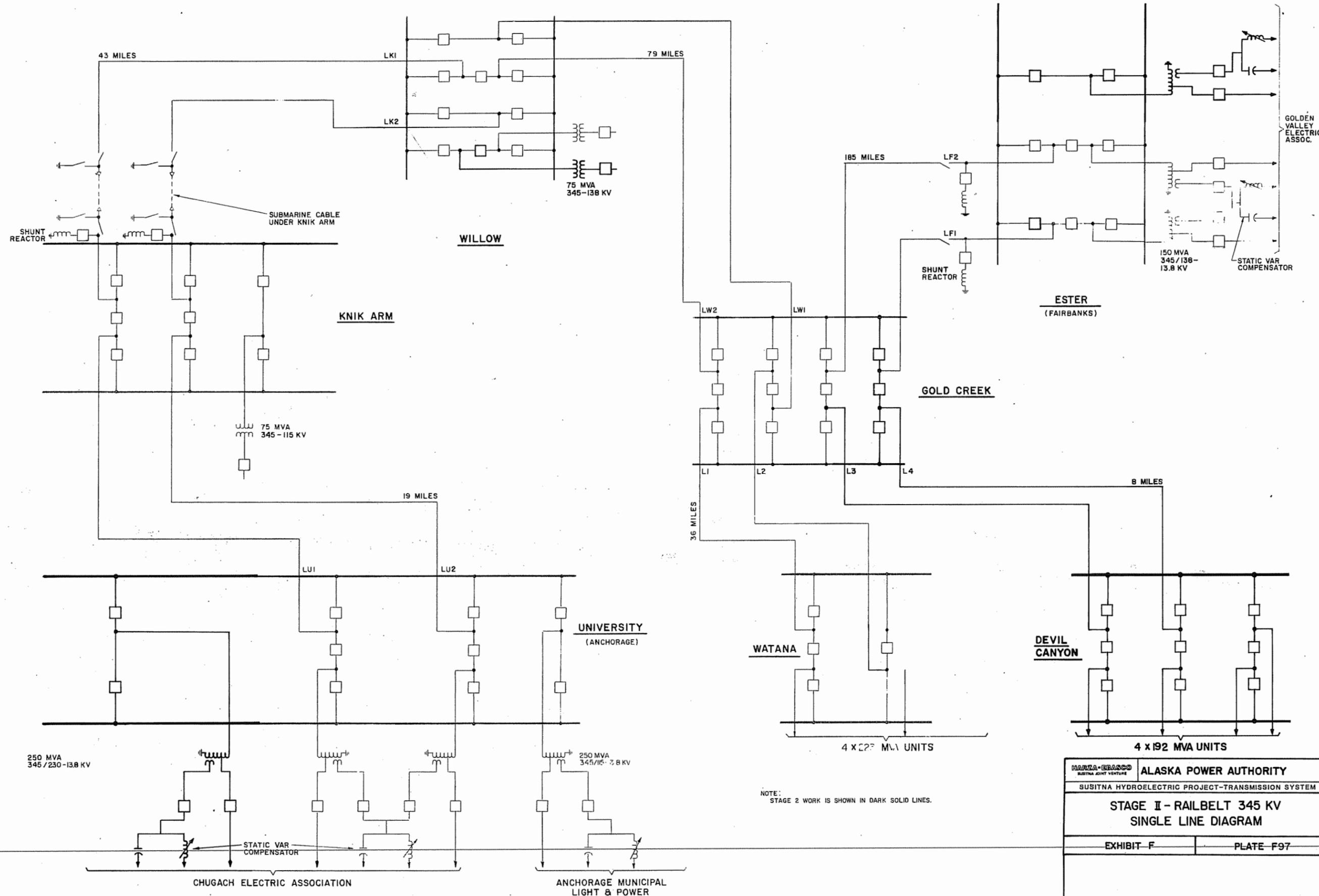
TRANSMISSION SYSTEM



NOTE:
 ALL WORK SHOWN IS FOR STAGE I EXCEPT THOSE MARKED WITH AN ASTERISK "*" WHICH IS THE EXISTING WILLOW-HEALY INTERTIE.

MANZA-EDASCO ELECTRA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
STAGE I - RAILBELT 345 KV SINGLE LINE DIAGRAM	
EXHIBIT F	PLATE F96

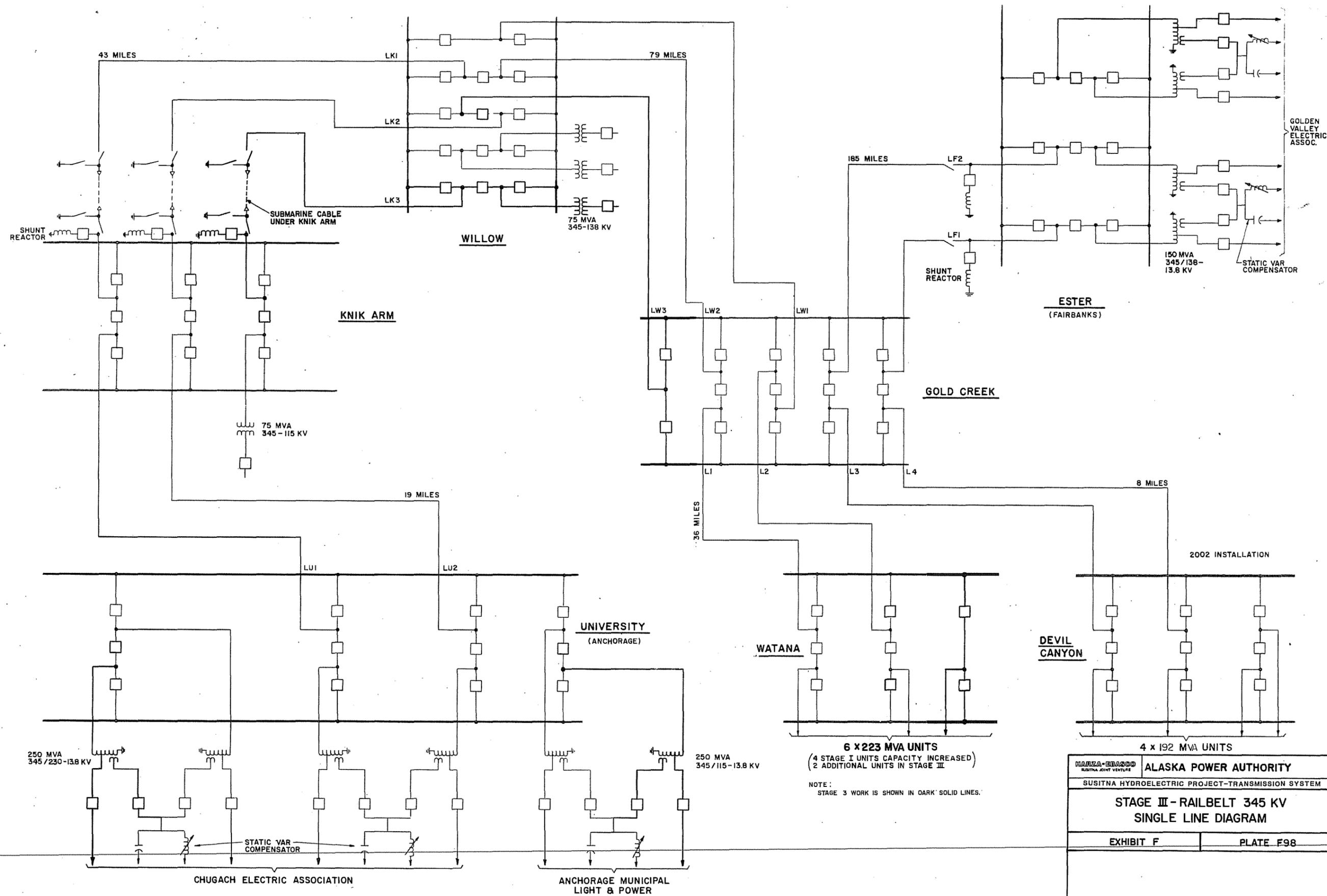
STAGE 1 (1996)



NOTE:
STAGE 2 WORK IS SHOWN IN DARK SOLID LINES.

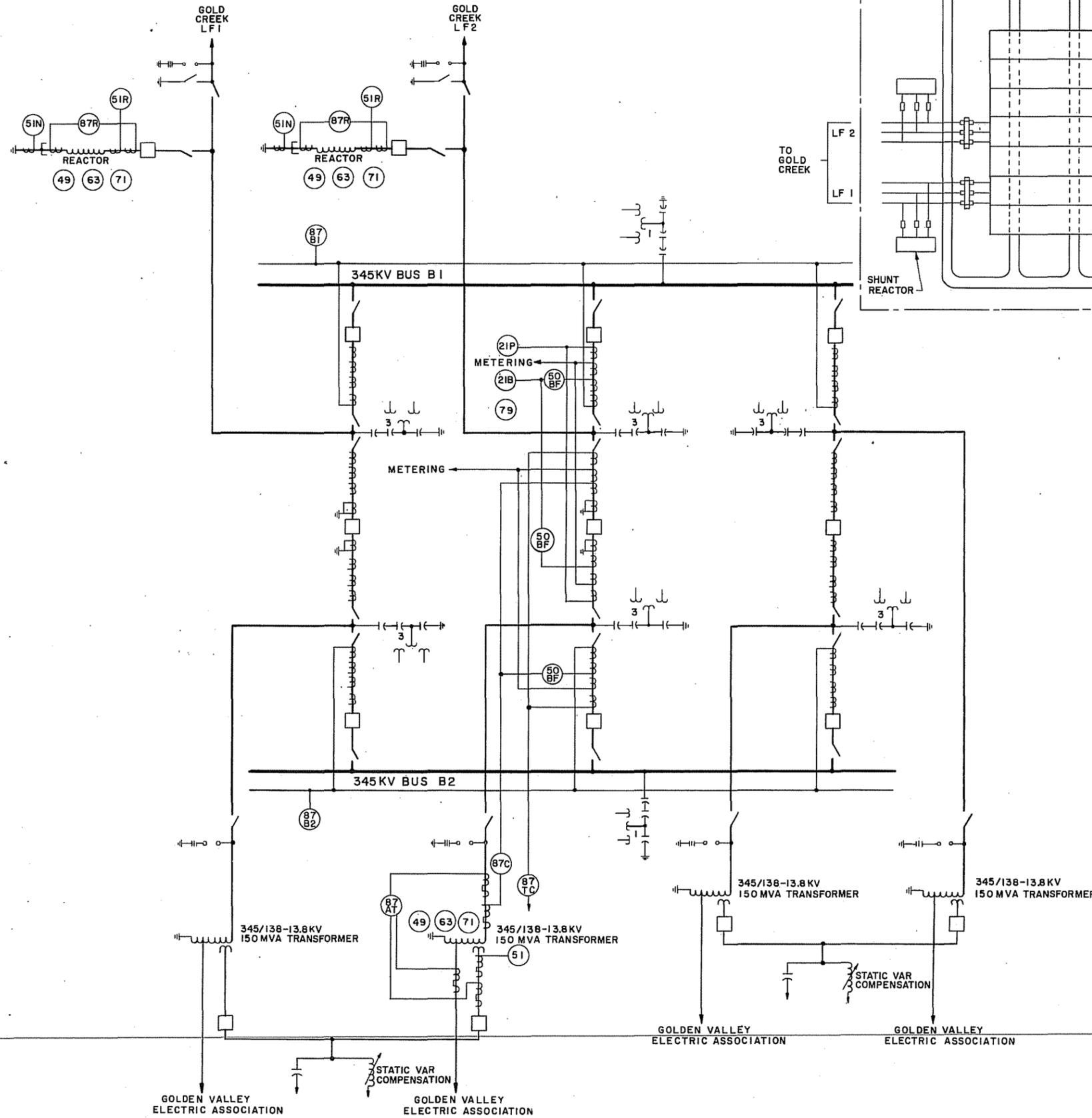
MARLB-ERASSCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
STAGE II - RAILBELT 345 KV SINGLE LINE DIAGRAM	
EXHIBIT F	PLATE F97

STAGE 2 (2002)

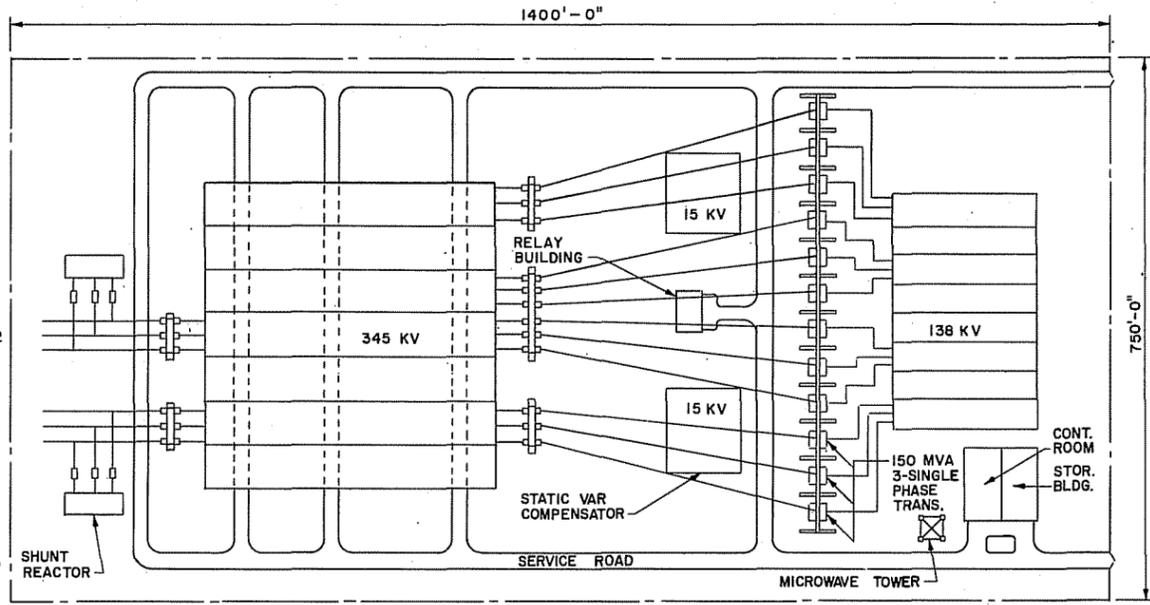


MARZA-ERASSO
 ALASKA JOINT VENTURE
 ALASKA POWER AUTHORITY
 SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM
**STAGE III - RAILBELT 345 KV
 SINGLE LINE DIAGRAM**
 EXHIBIT F PLATE F98

STAGE 3 (2010)

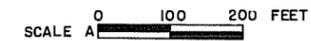


SINGLE LINE DIAGRAM

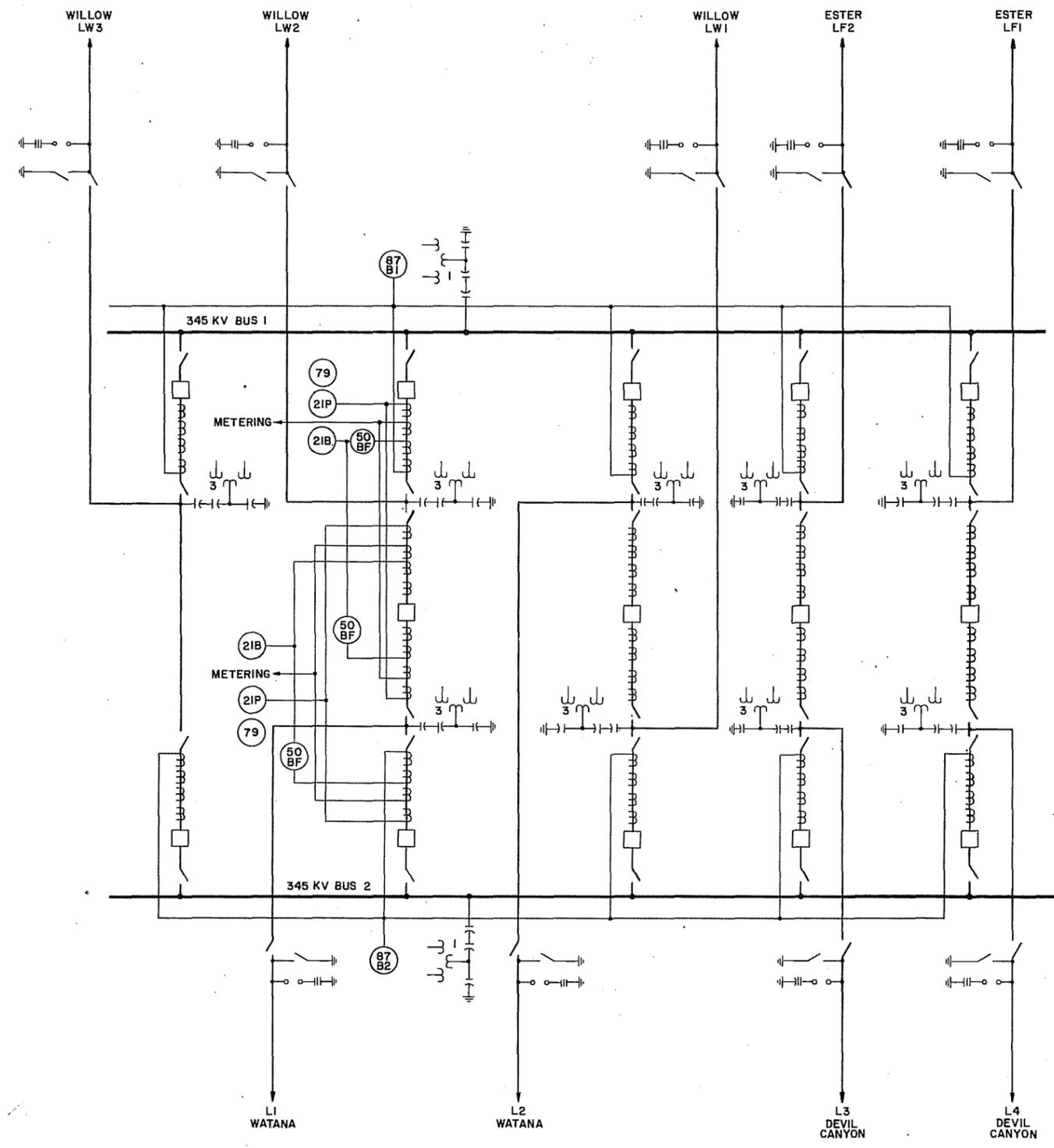


SUBSTATION PLAN
SCALE A

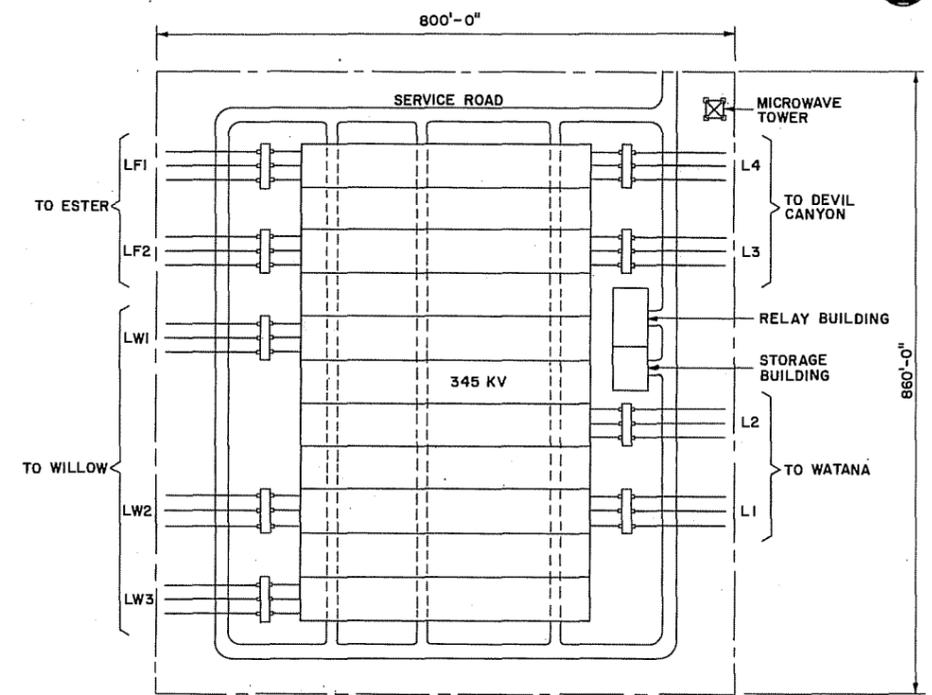
NOTE:
SHOWN IS THE ULTIMATE DEVELOPMENT OF THE SUBSTATION. FOR STAGING DEVELOPMENT, REFER TO PLATES F96, F97, AND F98, RAILBELT 345 KV SINGLE LINE DIAGRAM.



<small>MAPPA-ENASC</small> <small>SUSITNA JOINT VENTURE</small>		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM			
ESTER SUBSTATION SINGLE LINE DIAGRAM AND PLAN			
EXHIBIT F		PLATE F99	



SINGLE LINE DIAGRAM

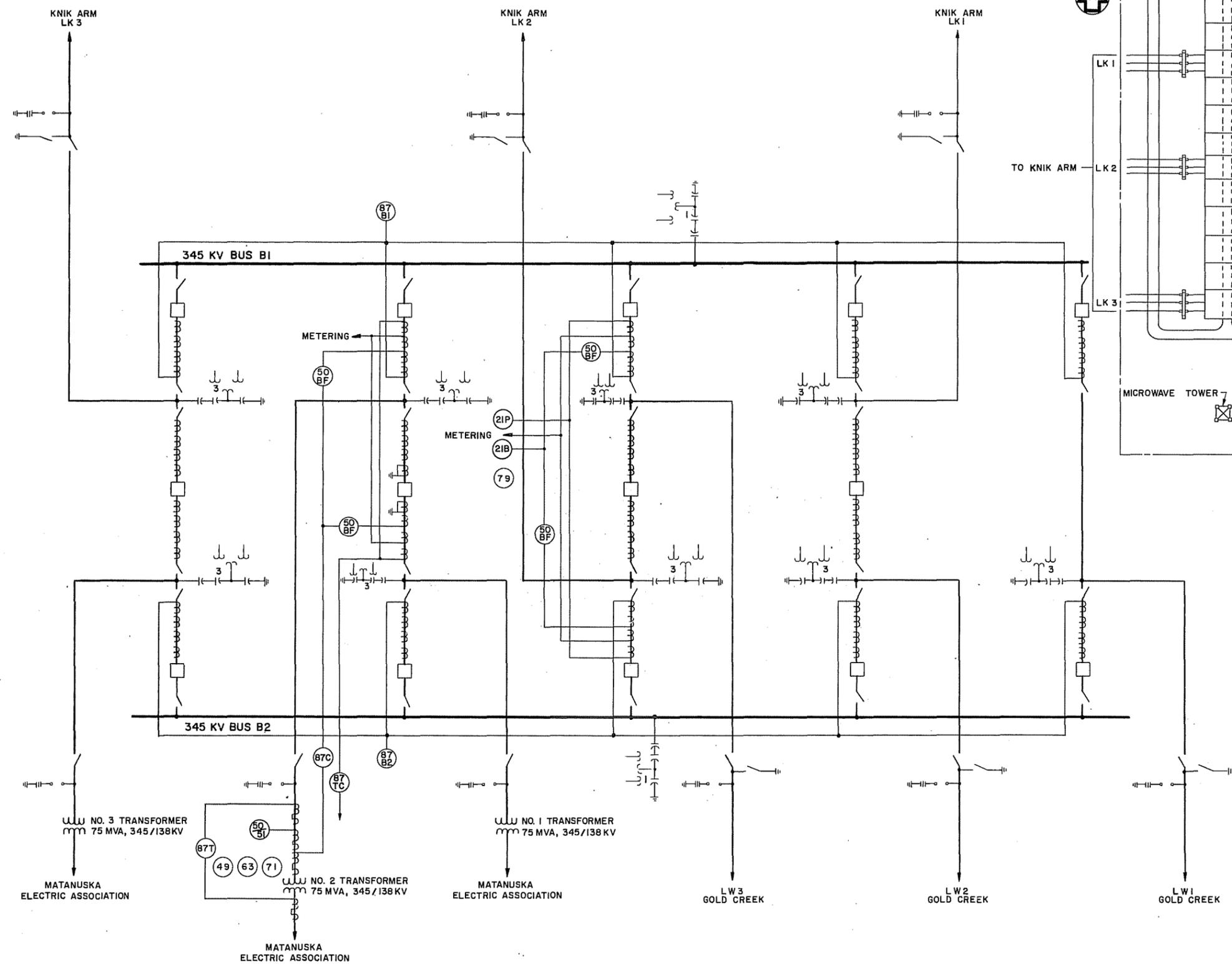


SWITCHYARD PLAN
SCALE A

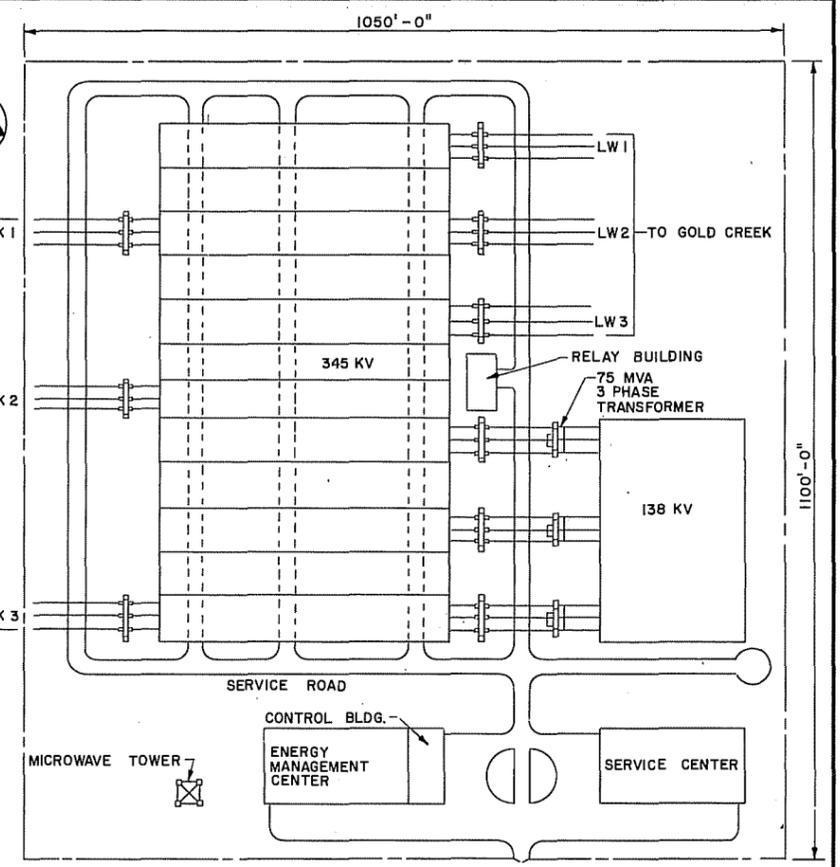
NOTE:
SHOWN IS THE ULTIMATE DEVELOPMENT OF THE SUBSTATION. FOR STAGING DEVELOPMENT, REFER TO PLATES F96, F97, AND F98, RAILBELT 345 KV SINGLE LINE DIAGRAM.



MANZA-EDASCO BUSINESS UNIT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
GOLD CREEK SWITCHYARD SINGLE LINE DIAGRAM AND PLAN	
EXHIBIT F	PLATE F-100



SINGLE LINE DIAGRAM

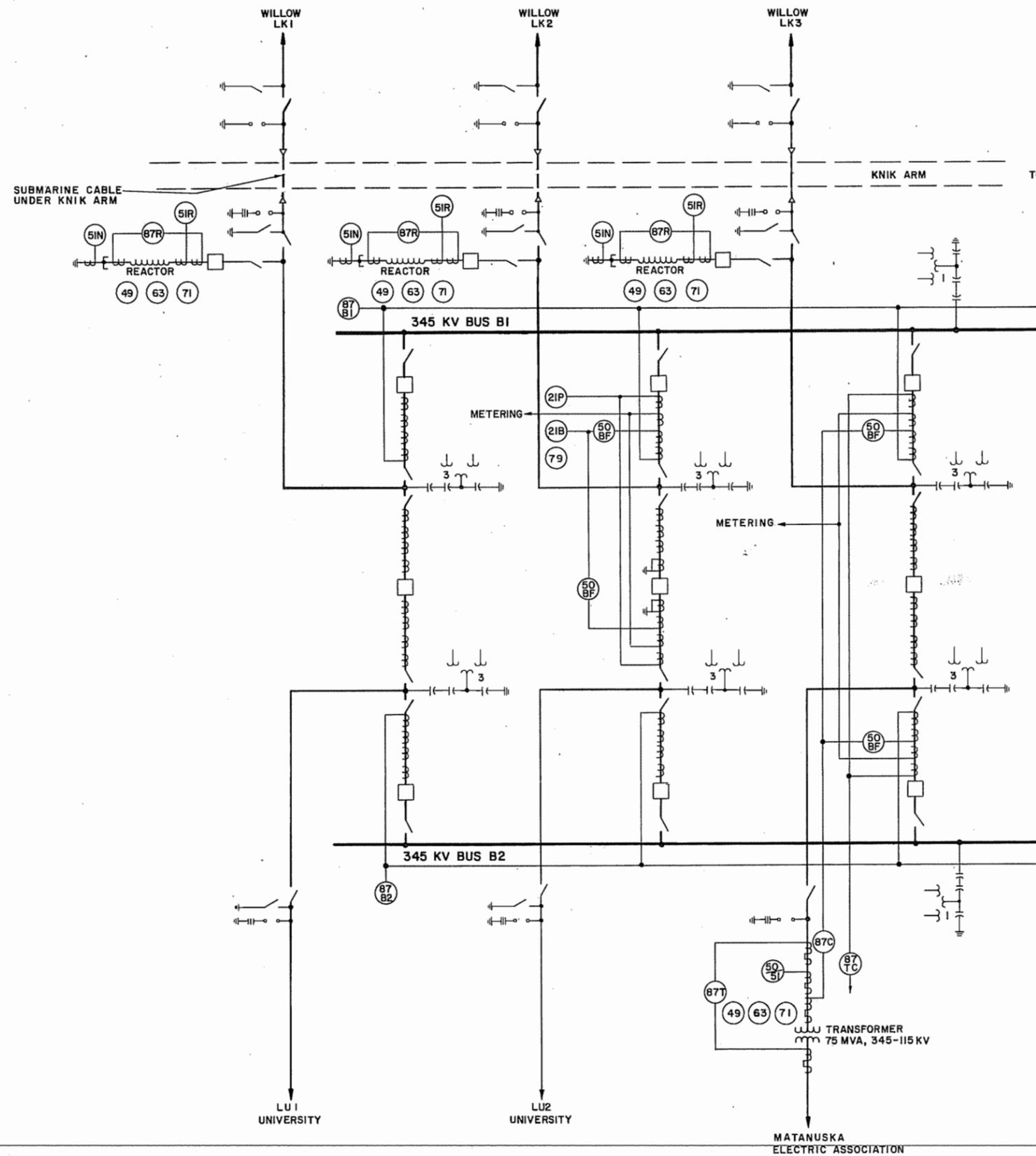


SUBSTATION PLAN
SCALE A

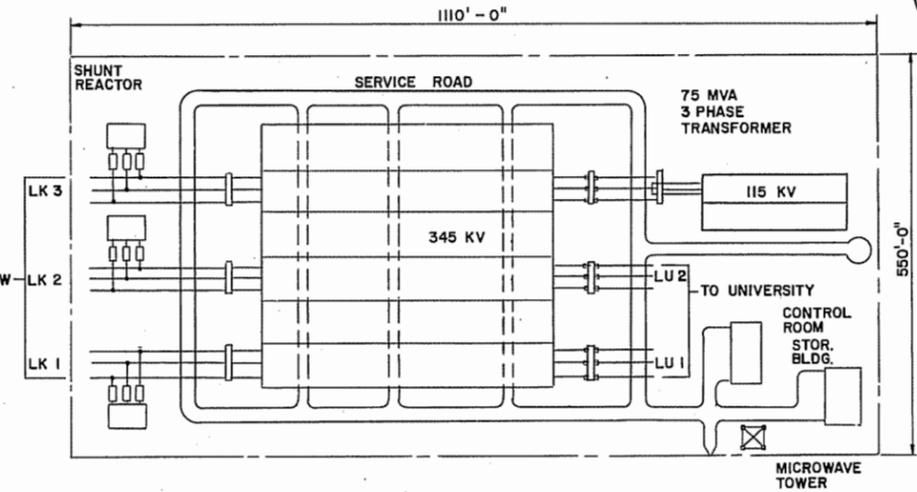
NOTE:
SHOWN IS THE ULTIMATE DEVELOPMENT OF THE SUBSTATION. FOR STAGING DEVELOPMENT, REFER TO PLATES F96, F97, AND F98, RAILBELT 345 KV SINGLE LINE DIAGRAM.

SCALE A
0 100 200 FEET

ALASKA POWER AUTHORITY <small>SUSITNA JOINT VENTURE</small>	
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
WILLOW SUBSTATION SINGLE LINE DIAGRAM AND PLAN	
EXHIBIT-F	PLATE F101



SINGLE LINE DIAGRAM

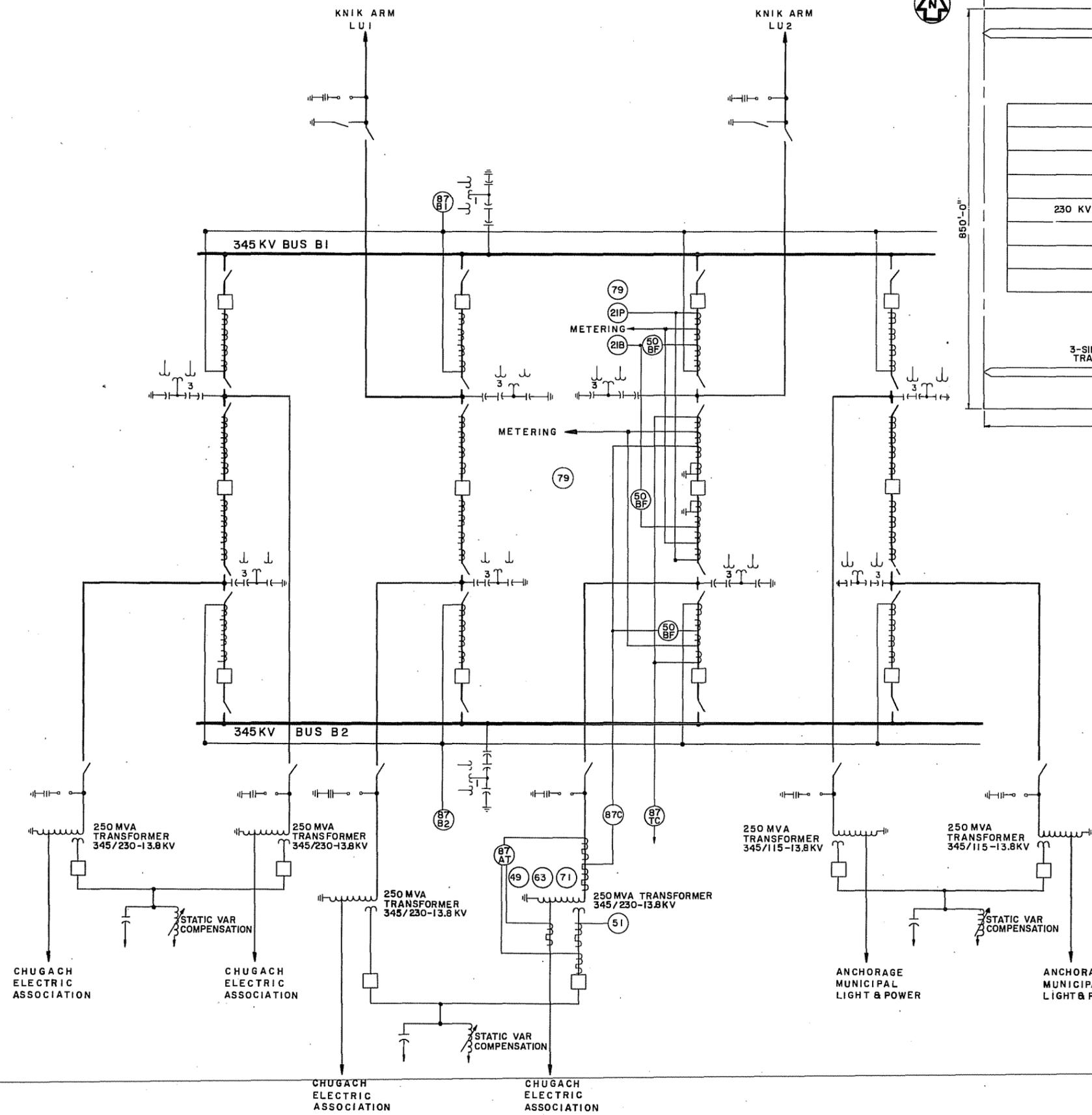


SUBSTATION PLAN
SCALE A

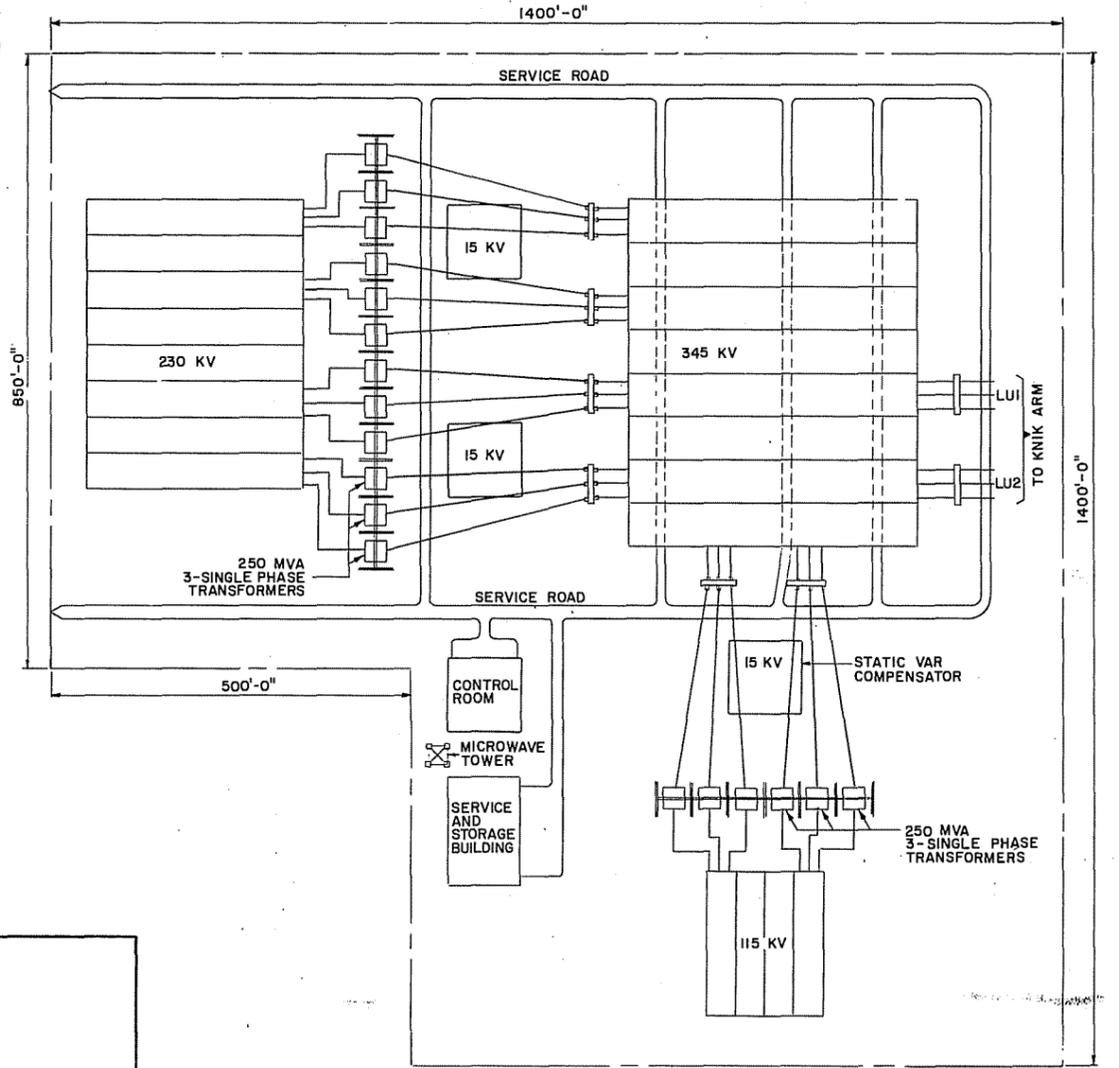
NOTE:
SHOWN IS THE ULTIMATE DEVELOPMENT OF THE SUBSTATION. FOR STAGING DEVELOPMENT, REFER TO PLATES F95, AND F98, RAILBELT 345 KV SINGLE LINE DIAGRAM.

0 100 200 FEET
SCALE A

		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM			
KNIK ARM SUBSTATION SINGLE LINE DIAGRAM, AND PLAN			
EXHIBIT F		PLATE F102	



SINGLE LINE DIAGRAM



SUBSTATION PLAN
SCALE A

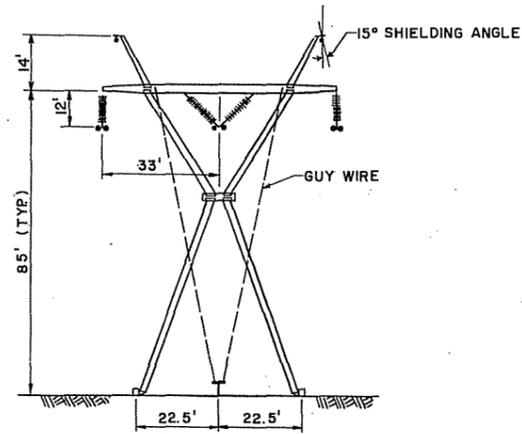
NOTE:
SHOWN IS THE ULTIMATE DEVELOPMENT OF THE SUBSTATION. FOR STAGING DEVELOPMENT, REFER TO PLATES F96, F97, AND F98, RAILBELT 345 KV SINGLE LINE DIAGRAM.

SCALE A 0 100 200 FEET

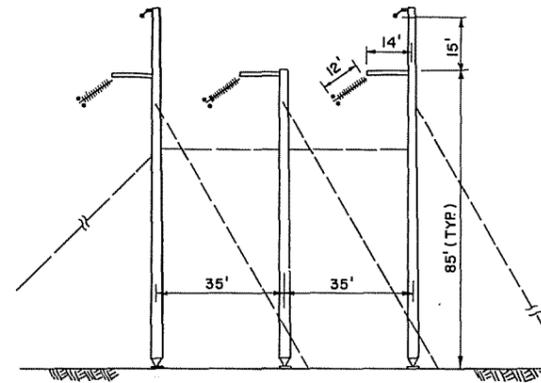
WARZA-GRASSO ELECTRICAL ENGINEERS	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
UNIVERSITY SUBSTATION SINGLE LINE DIAGRAM AND PLAN	
EXHIBIT F	PLATE F103

NOTES:

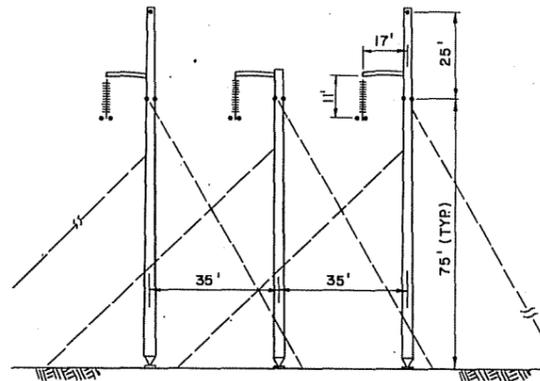
1. BASED ON PROPOSED STRUCTURES FOR INTERTIE PROJECT.
2. AVERAGE CONDUCTOR SAG - 37 FEET.
3. AVERAGE TOWER SPACING - 1400 FEET.



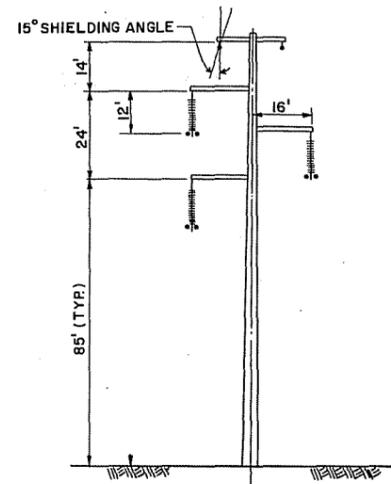
345 kV TANGENT OR LIGHT ANGLE STRUCTURE



345 kV MEDIUM ANGLE (8° - 30°) STRUCTURE



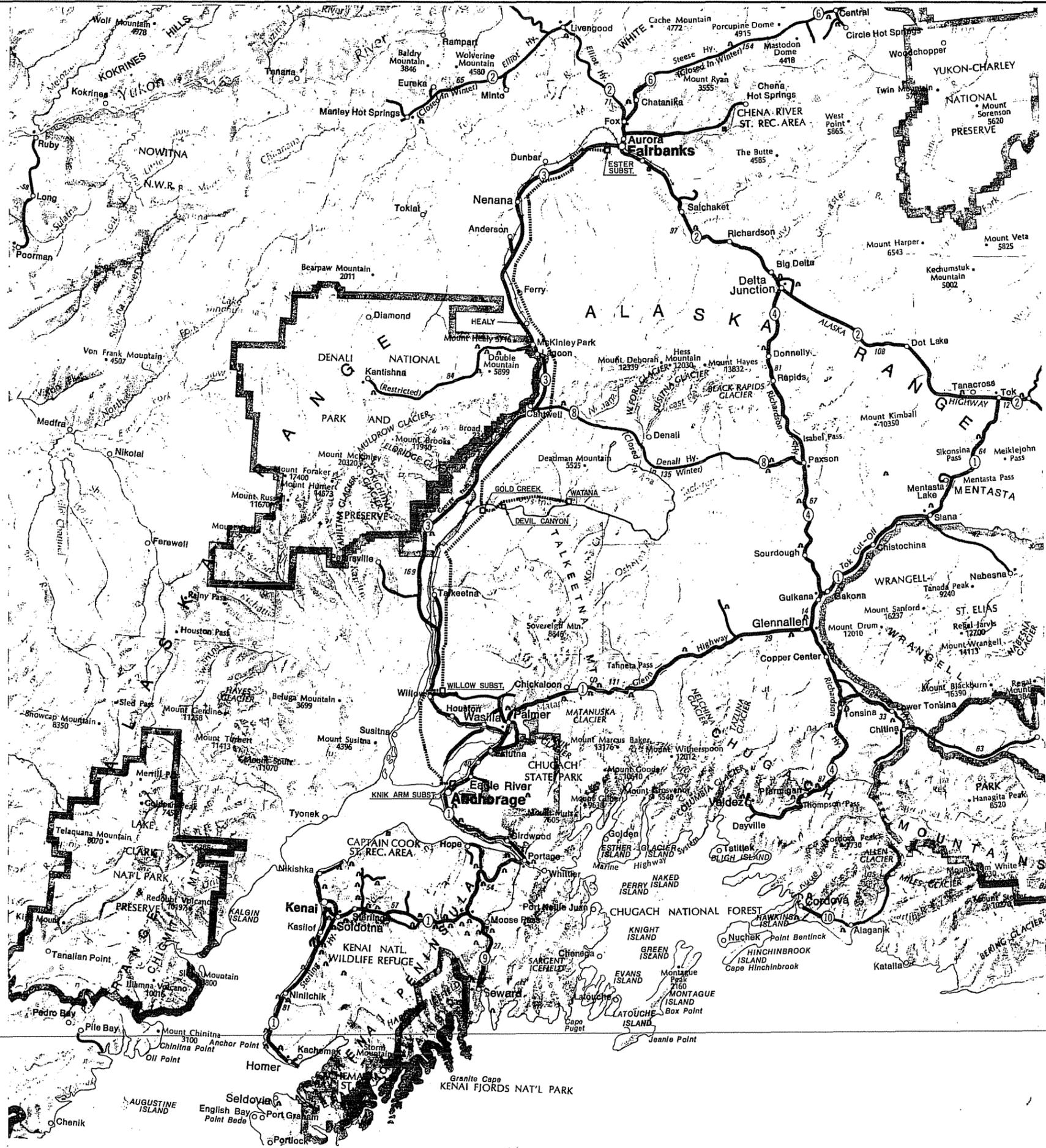
345 kV HEAVY ANGLE (8° - 50°) DEAD END STRUCTURE



345 kV SINGLE CIRCUIT TANGENT POLE

SCALE 0 20 40 FEET

<small> HARZA-BASCO SUSITNA JOINT VENTURE </small>	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM	
TYPICAL TRANSMISSION LINE STRUCTURES	
EXHIBIT F	PLATE F104



LEGEND
 ———— 345 KV TRANSMISSION CORRIDOR
 □ SUBSTATION SITE
 - - - - - R.O.W. - RIGHT-OF-WAY

NUMBER OF LINES	WIDTH OF R.O.W. (FT)	DISTANCE BETWEEN LINES (FT)	DISTANCE FROM LINE TO EDGE OF R.O.W. (FT)
1	190	—	95
2	295	105 ±	95
3	400	105 ±	95
4	505	105 ±	95

NOTE:
 I. ESTIMATED GROUND RESISTIVITY FOR DESIGN IS 50 OHMS.

MANZA-BRACCO ELECTRIC JOINT VENTURE		ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT-TRANSMISSION SYSTEM			
345 KV SYSTEM TRANSMISSION CORRIDOR			
EXHIBIT F		PLATE F105	