Susitna-Watana Hydroelectric Project Document
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SUSITNA-WATANA HYDRO

Hydropower Prospects for Southcentral Alaska

TDX Power
Nicholas Goodman
Eric Yould
for
Renewable Energy Project Alaska
October 30, 2007

Hydropower

- Statewide
- Southcentral
- Susitna project
- Chakachamna

Characteristics of Hydropower

- Renewable energy
- High front end cost
- Low annual costs
- Long lead time for permitting and construction
- Long operational life (200 years or more)
- Can be very environmentally benign
- Can impart major environmental impact

Inventory of Alaska Hydropower Potential

- U.S. Bureau of Reclamation
- U.S. Army Corps of Engineers
- 256 sites with continuous power greater than 2500 KW
- 192 billion KWH energy potential
- 40% of the United States' untapped hydropower

Potential Major Alaska Hydropower Projects

Project Name	River System	Installed Capacity (Megawatts)	Energy (Million KWH/yr)
Holy Cross	Yukon	2,800	12,300
Ruby	Yukon	1,460	6,400
Rampart	Yukon	6,000	34,200
Porcupine	Porcupine	530	2,320
Woodchopper	Yukon	2,160	14,200
Yukon-Aaiya	Yukon	3,200	21,000
Susitna	Susitna	1,500	6,500
Chakachamna	Chakachatna	320	1,600
Wood Canyon	Copper	3,600	21,900
Stikine	Stikine	2,260	9,900

Note: Chugach Electric Energy Sales approximately 2,500 million KWH

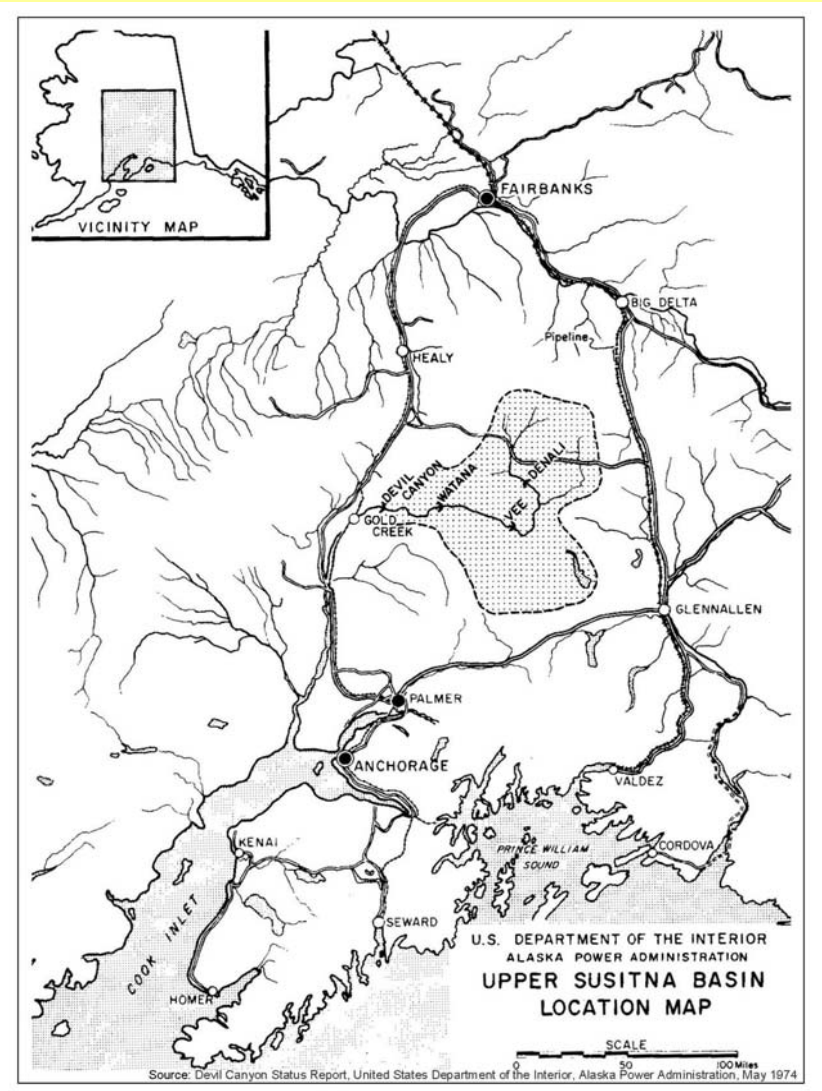
Existing Hydropower Statewide

- 40 projects
- Most located in Southeast

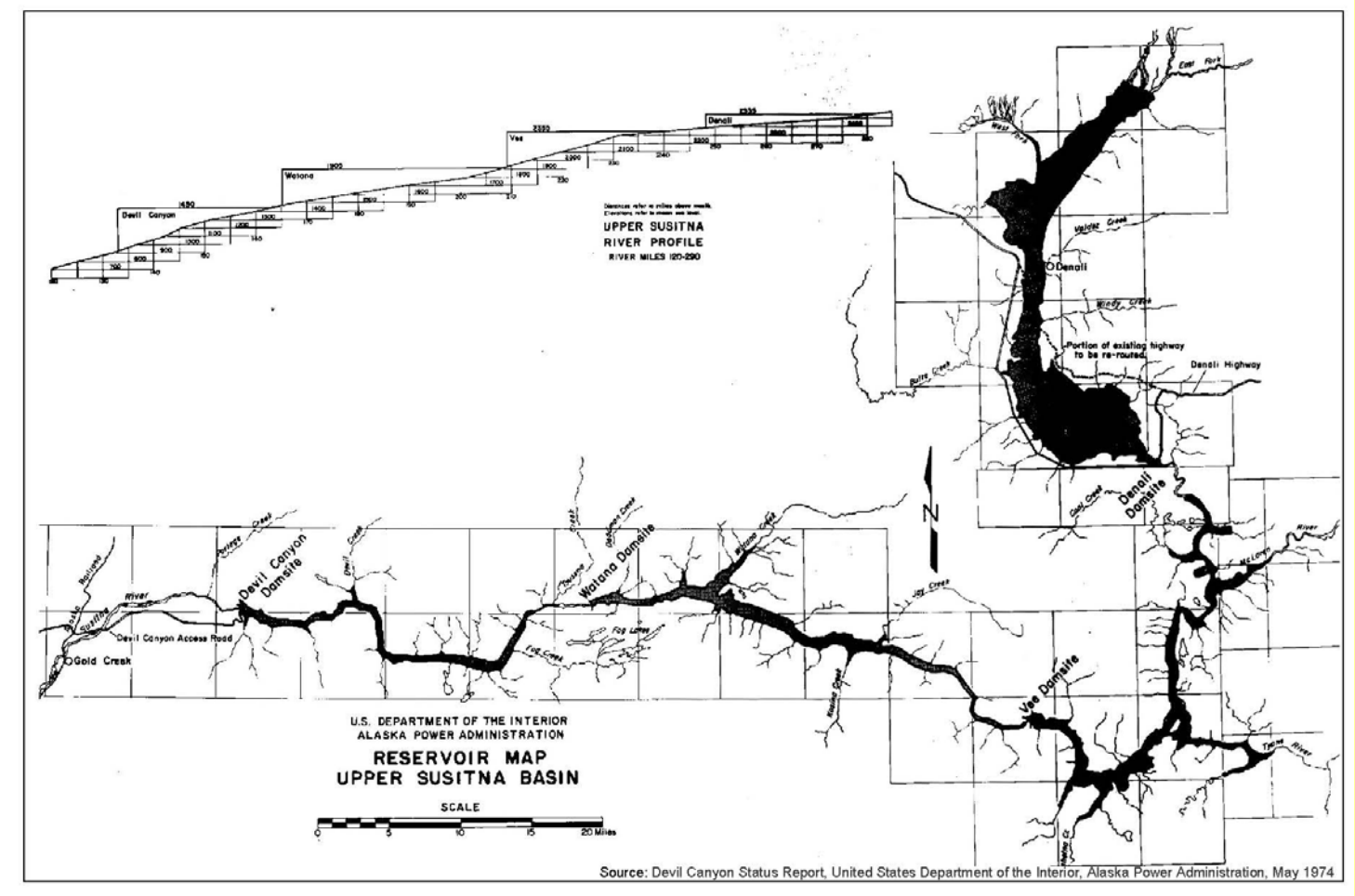
Existing Hydropower Southcentral

- Eklutna 37.5 MW
- Bradley Lake 90 MW
- Cooper Lake 5 MW

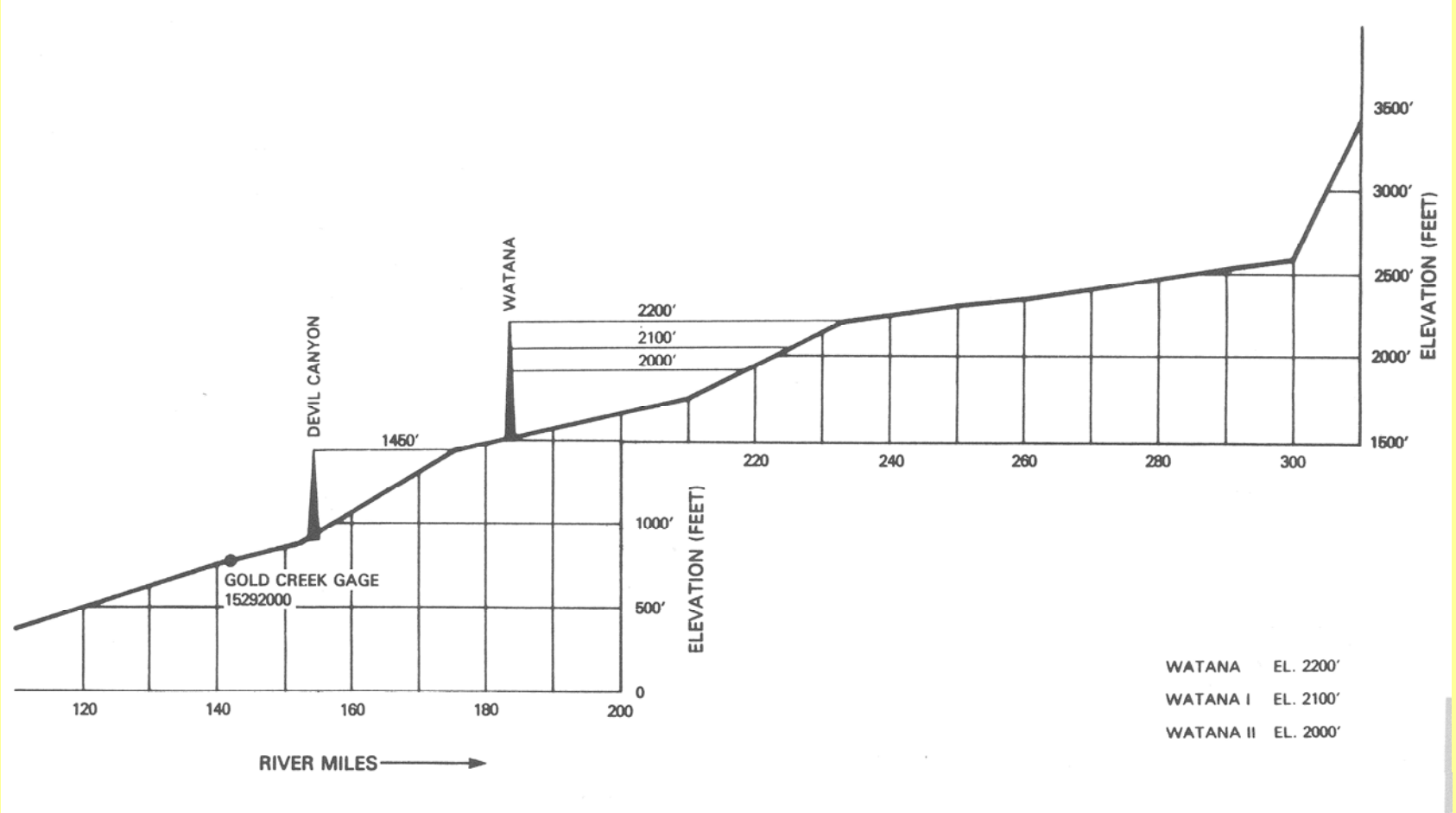
Susitna Project Location



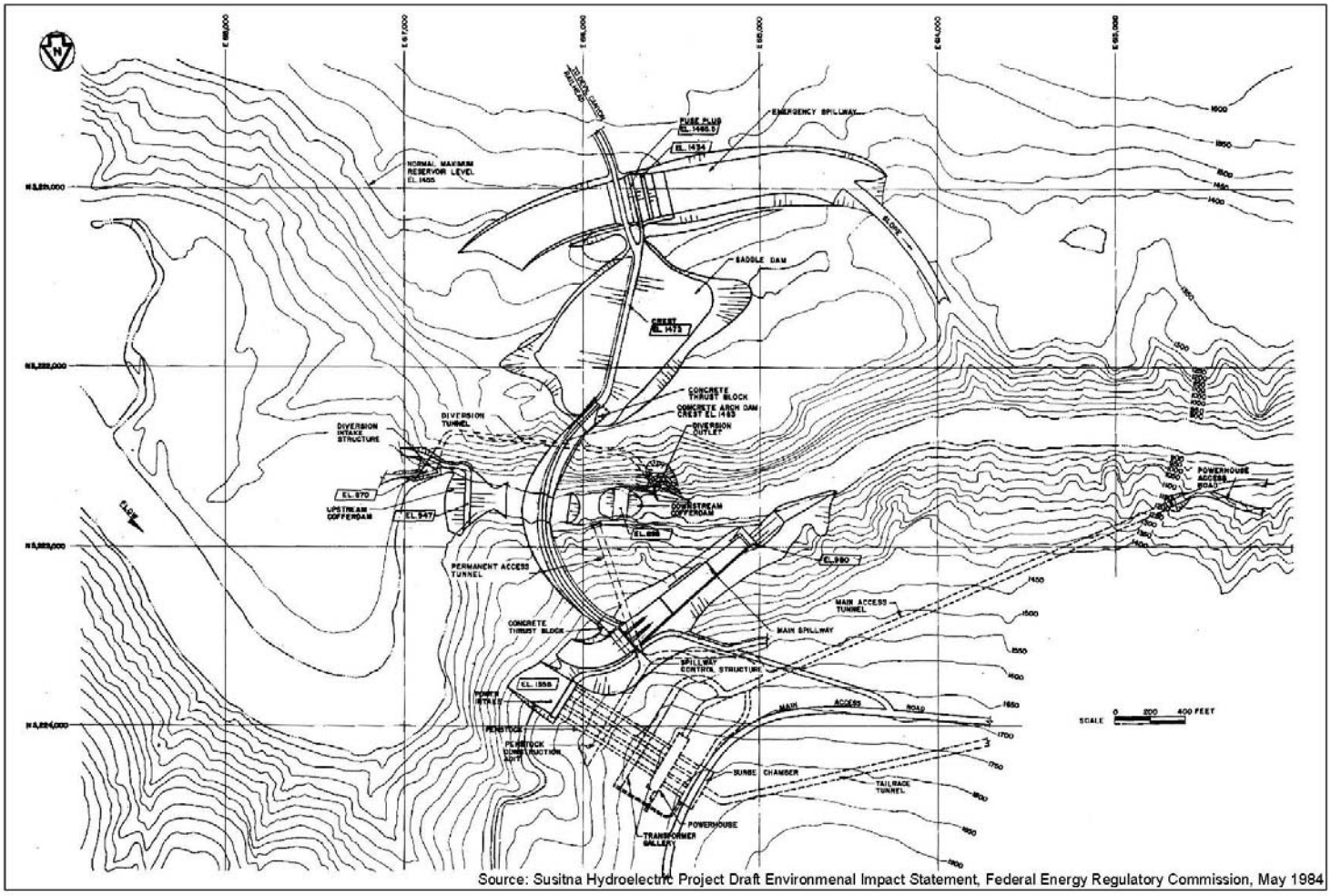
Susitna Four Dam Scheme



Profile of Watana-Devil Canyon Development

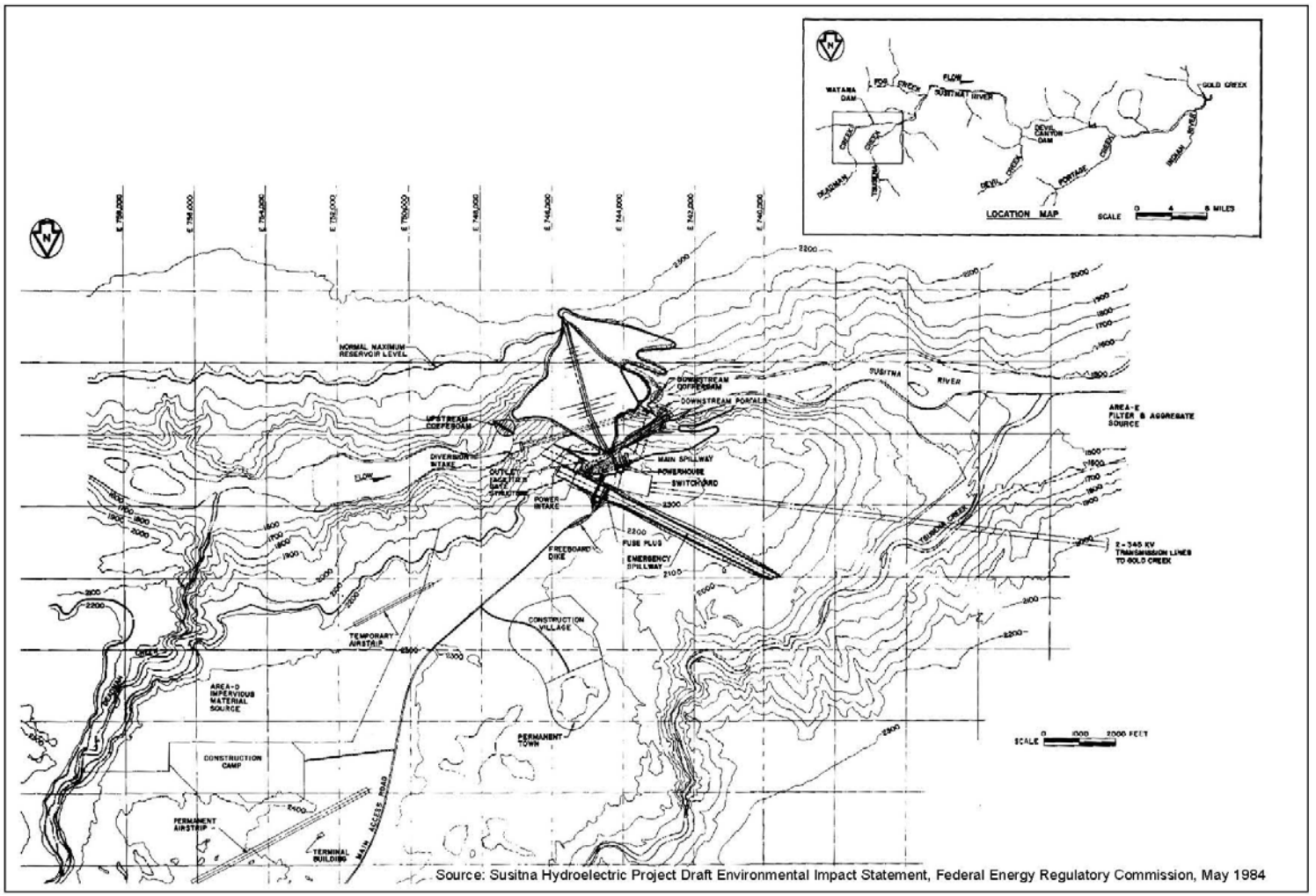


Devil Canyon Site Layout



Source: Susitna Hydroelectric Project Draft Environmenal Impact Statement, Federal Energy Regulatory Commission, May 1984

Watana Facilities Plan



Source: Susitna Hydroelectric Project Draft Environmental Impact Statement, Federal Energy Regulatory Commission, May 1984

Results of Screening Process

Site†1	Elimination Iteration†2 1	2	3	4	Site†1	Elimination Iteration†2 1	2	3	4	Site†1	Elimination Iteration†2 1	2	3	4	Site†1	Elimination Iteration†2 1	2	3	4
Allison Creek					Fox	*				Lowe				*	Talachulitna River	*			
Beluga Lower			*		Gakona		*			Lower Chulitna				*	Talkeetna R. - Sheep	*			
Beluga Upper				*	Gerstle			*		Lucy	*				Talkeetna - 2				
Big Delta	*				Granite Gorge			*		McClure Bay			*		Tanana River				*
Bradley Lake				*	Grant Lake			*		McKinley River		*			Tanzlina				*
Bremmer R. -Salmon	*				Greenstone			*		McLaren River	*				Tebay Lake		*		
Bremmer R. -S.F.	*				Gulkana River			*		Million Dollar		*			Teklanika		*		
Browne					Hanagita		*			Moose Horn	*				Tiekel River	*			
Bruskasna					Healy		*			Nellie Juan River	*				Tokichitna				*
Cache					Hicks					Nellie Juan R. -Upper				*	Totatlanika	*			
Canyon Creek	*				Jack River	*				Ohio			*		Tustumena				*
Caribou Creek	*				Johnson				*	Power Creek		*			Vachon Island		*		
Carlo		*			Junction Island		*			Power Creek - 1	*				Whiskers				*
Cathedral Bluffs				*	Kanhshna River			*		Ramport		*			Wood Canyon		*		
Chakachamna					Kasilof River		*			Sanford		*			Yanert - 2		*		
Chulitna E.F.	*				Keetna					Sheep Creek			*		Yentna			*	
Chulitna Hurrican			*		Kenai Lake				*	Sheep Creek - 1	*								
Chulitna W.F.	*				Kenai Lower			*		Silver Lake				*					
Cleave		*			Killey River	*				Skwentna				*					
Coal			*		King Mtn	*				Snow			*						
Coffee				*	Klutina				*	Solomon Gulch			*						
Crescent Lake			*		Kotsina	*				Stelters Ranch	*								
Crescent Lake - 2		*			Lake Creek Lower		*			Strandline Lake									
Deadman Creek	*				Lake Creek Upper				*	Summit Lake	*								
Eagle River	*				Lane				*	Talachulitna			*						

†1 Final site selection underlined.

†2 An asterisk (*) denotes site eliminated from further consideration.

Source: Exhibit E, Table E.10.1.

Alternatives Outside the Susitna Basin

Alternative Investigated	Estimated Total Cost of Project ($ million 1982)	Total Installed Capacity of Alternative (MW)	Average Annual Energy of Alternative (GWh)
Johnson	319	210	920
Chakachamna	905	333	1,300
Snow	305	100	375
Keetna	519	100	420
Browne	681	100	418

Hydro Alternatives

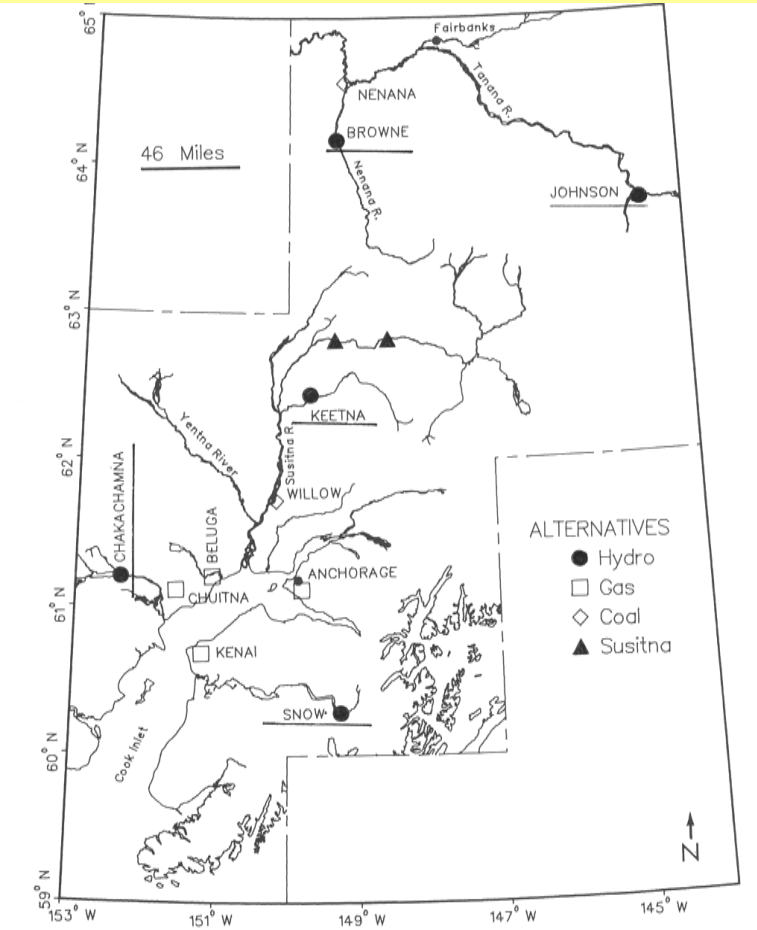


Figure 2-18. Location of Thermal and Hydroelectric Alternatives.

Chakachamna Hydropower Investigations

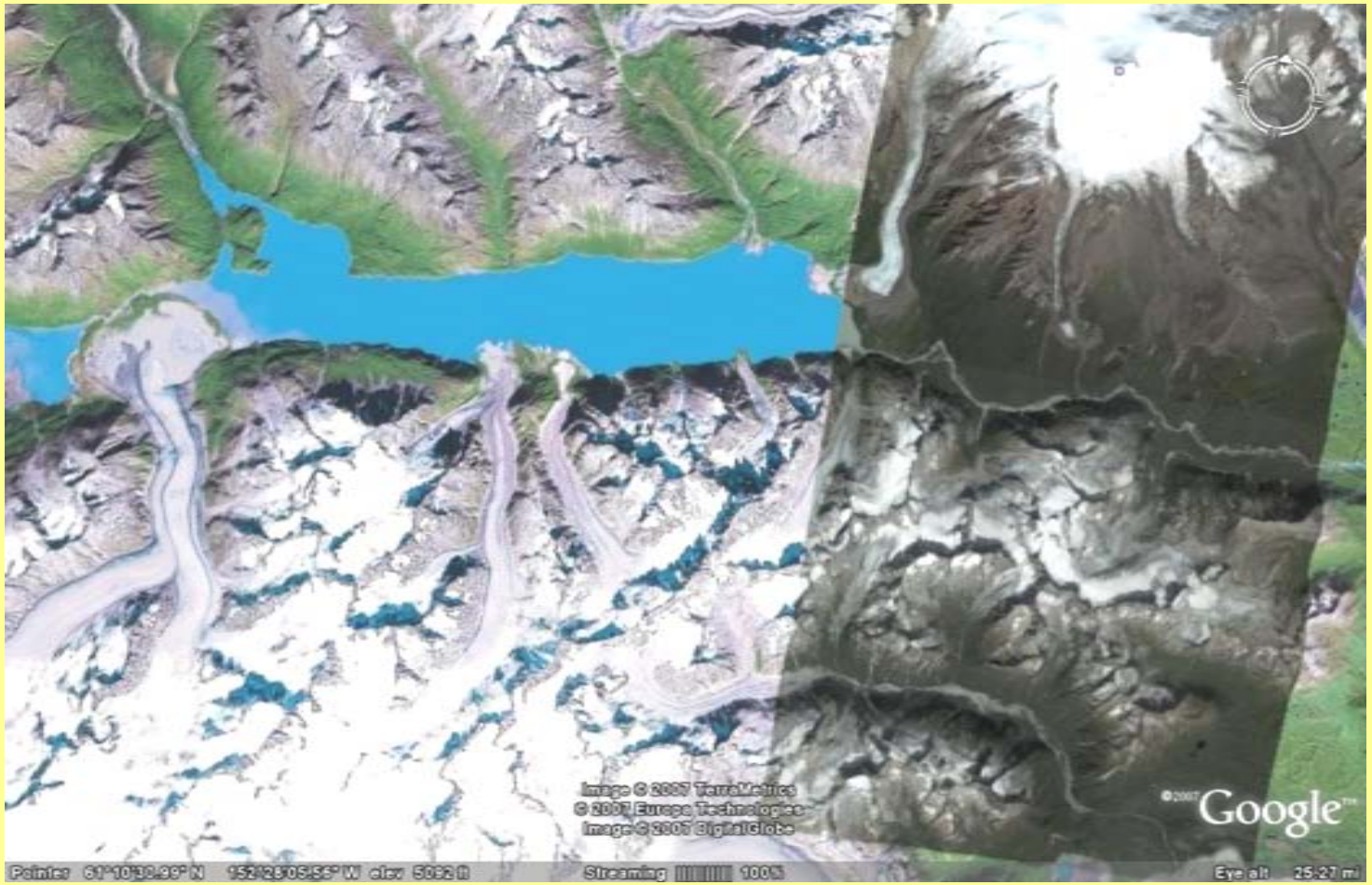
Department of Interior	Late 1940s	Reconnaissance
U.S. Army Corps of Engineers	1970s	Reconnaissance
Alaska Power Authority	Early 1980s	Pre-feasibility
TDX Power	2006	FERC permit

Chakachamna Hydro Power

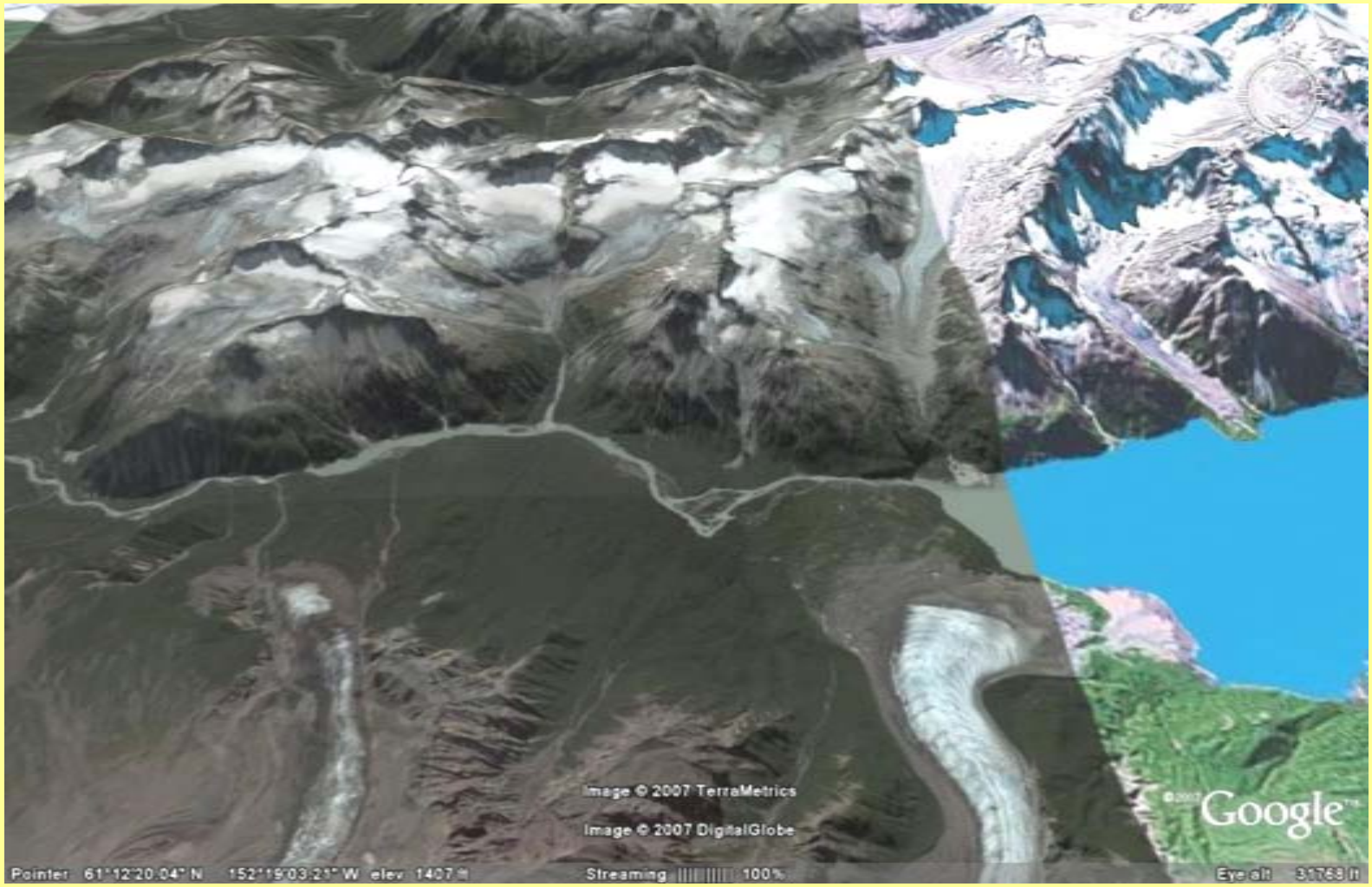
- Studied by Alaska Power Authority in early 1980's
- Divert stream flow from Chakachatna River to a powerhouse on the McArthur River by way of a 10 mile 25 foot diameter power tunnel
- Minimal dam on Chakachamna Lake
- Installed capacity of 330 MW, generating 1.6 billion KWH annually
- Total cost of project in 1980 dollars = $1.0 billion
- Project is 40 miles from Chugach Electric power facilities at Beluga

Chakachamna Project Location

Chakachamna Aerial View

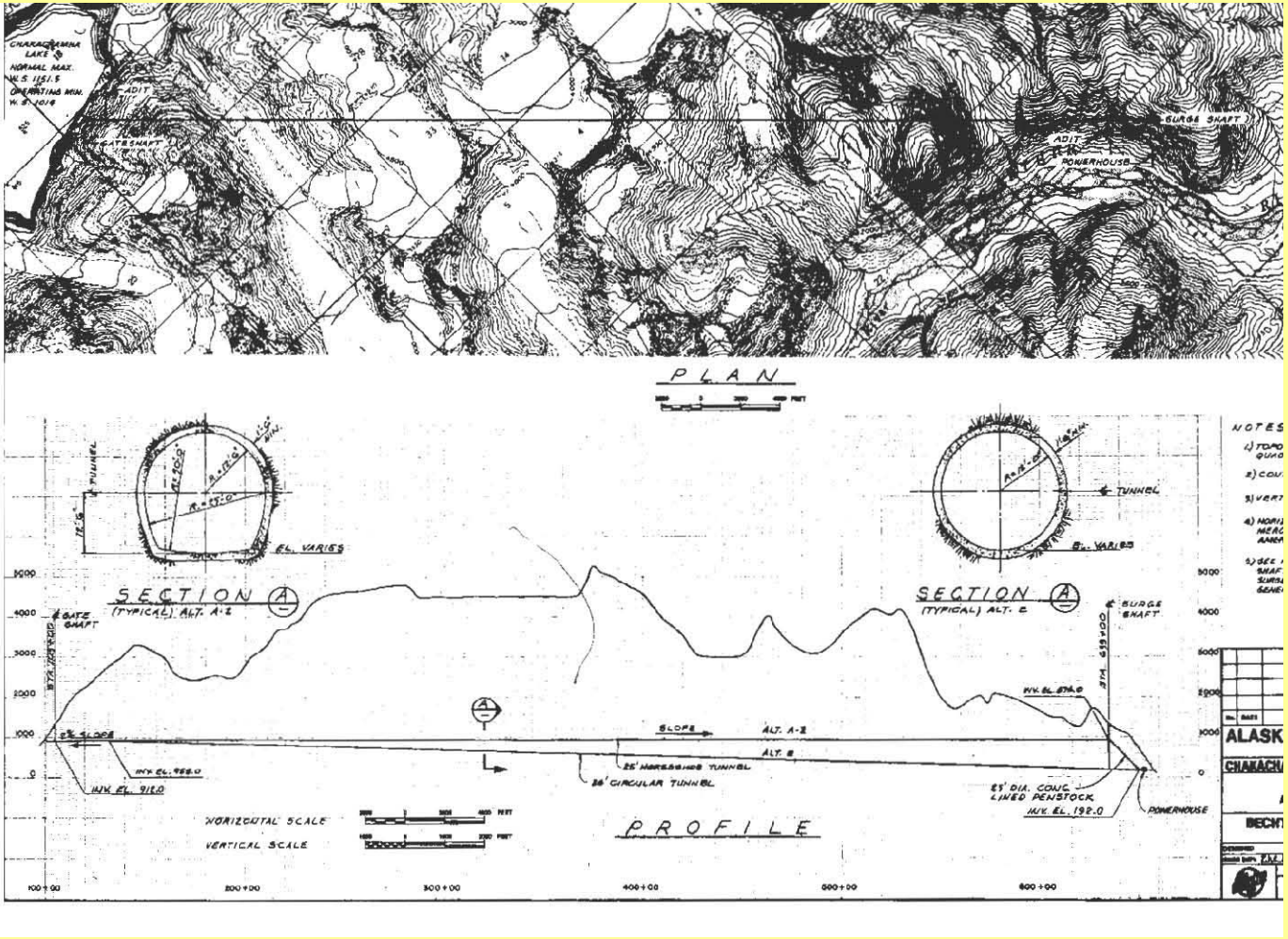


Chakachamna Dam Site

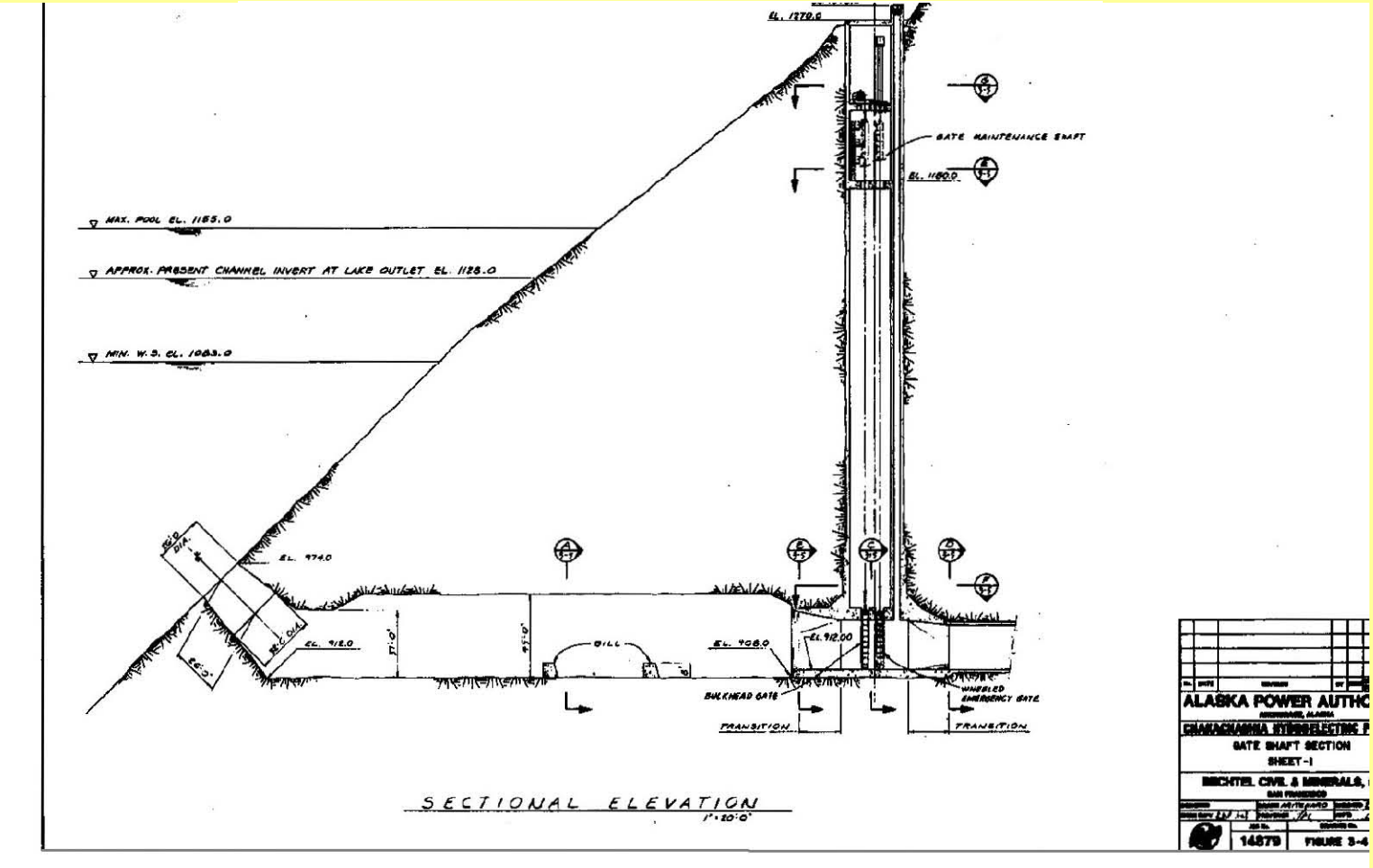


Power Plant Site

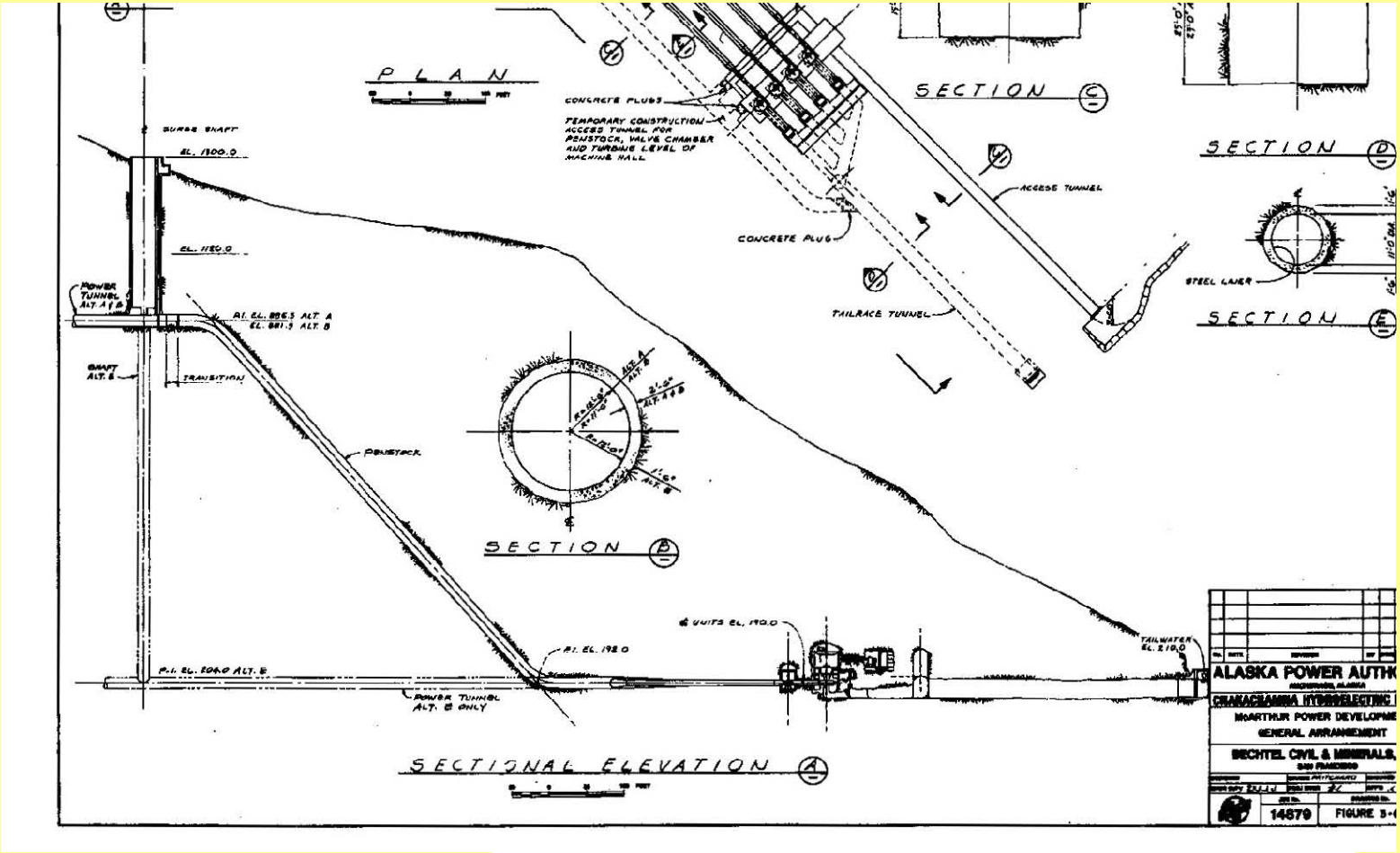
Chakachamna Selected Plan



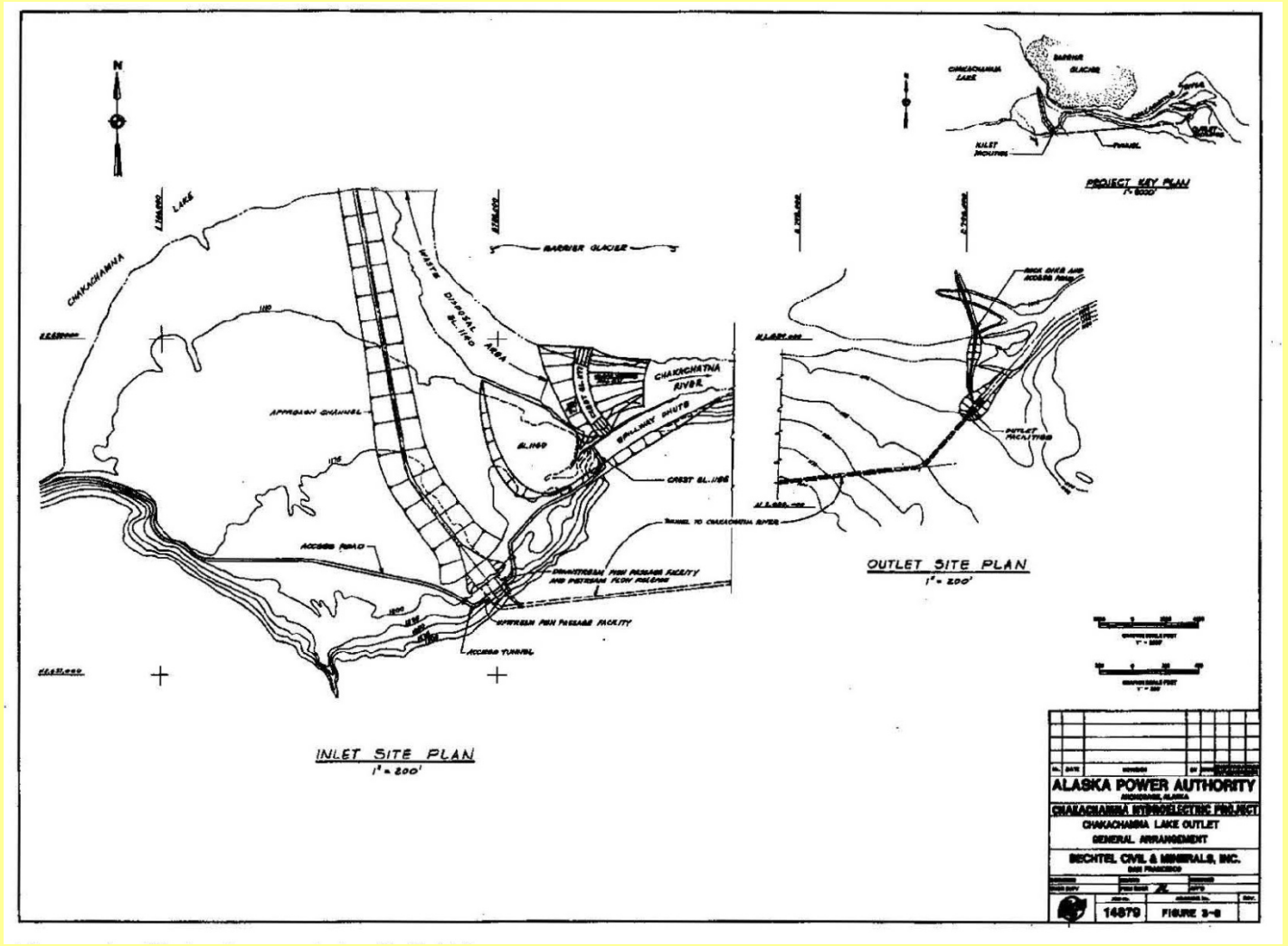
Chakachamna Lake Tap Gate Shaft Inflow to Power Tunnel



McArthur River Underground Powerhouse (Chakachamna)



Chakachamna Lake Outlet Plan



CHAKACHAMNA FISHERIES

- 5 species of salmon use the basin
- Sockeye the main salmon species
- Dolly Varden ubiquitous in the streams
- Lake trout observed in lake
- Not a large anadromous fishery but worthy of protecting
- Fish ladders at lake outlet required
- Possible temperature enhancement to river

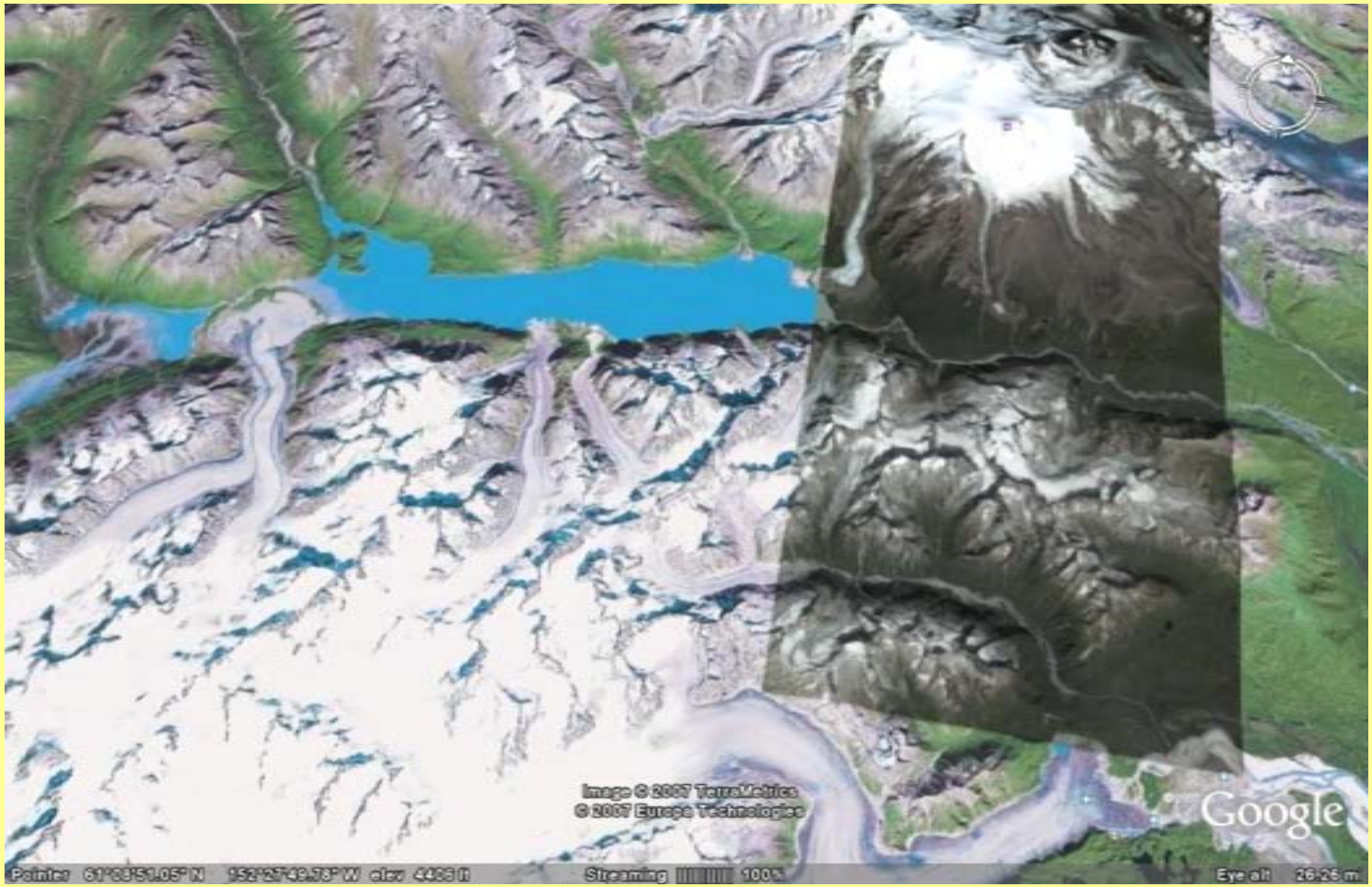
CHAKACHAMNA WILDLIFE

- 56 species of birds
- 16 species of mammals
- Moose, wolves, lynx, bear, wolverine, other fur bearers
- None on the endangered species list
- Less impact than other hydro projects of similar size

Geotechnical Considerations

- Seismic – Castle Mountain Fault
- Volcanic – Mount Spurr (1992 & 1953 eruptions)
- Glacial – Barrier, Blockade, McArthur, Shamrock

Geotechnical Overview



Next Steps

Preliminary permit investigations	36 months
FERC licensing	18-36 months
Project construction	76 months
Power on line	2015