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INSTREAM ICE SIMULATION STUDY /

**SUSITNA  
HYDROELECTRIC PROJECT**  
FEDERAL ENERGY REGULATORY COMMISSION  
PROJECT No. 7114

**INSTREAM ICE SIMULATION STUDY**

**FINAL REPORT**

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

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## SUSITNA HYDROELECTRIC PROJECT

## INSTREAM ICE SIMULATION STUDY

Report by  
Harza-Ebasco Susitna Joint Venture

Prepared for  
Alaska Power Authority

Final Report  
October 1984

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V	1976-77	Very Warm	Watana Operating	1996	Inflow-Matching
W	1982-83	Warm	Watana Operating	1996	Inflow-Matching
X	1971-72	Cold	Watana Operating	1996	4°C
Y	1971-72	Cold	Watana and D.C. Operating	2002	Inflow-Matching
Z	1982-83	Warm	Watana and D.C. Operating	2002	Inflow-Matching
A1	1981-82	Average	Watana Filling (2nd Winter)	--	--

# REPORT

## 1.0 INTRODUCTION

### 1.1 OBJECTIVE AND SCOPE

This report presents the results to date of the instream ice simulation studies for the Susitna Hydroelectric Project. The objective of these studies is to determine the effect of the proposed Watana and Devil Canyon Dams on river ice processes and the corresponding water surface elevations during the winter season in the Susitna River downstream of the dams. These studies are limited to the Middle Reach of the Susitna River (i.e., upstream of the confluence with the Chulitna River - See Figure 1), wherein the greatest impact of the project is expected.

The information presented in this report will be used in future environmental studies, particularly in assessment of possible project impacts on salmon incubation and spawning. Of special interest in this regard are a number of slough and side channel areas, adjacent to the mainstem of the Susitna River, which are known to be the habitat for salmon spawning. Results of the river ice studies are therefore focused on several of the more important slough and side channel locations along the Middle Susitna River. Results include continuous descriptions of ice thickness, water surface elevation and water temperature at these locations.

This report provides a comparison of simulated pre-project (i.e., "natural") river ice conditions with that expected during operation of the proposed project (i.e., "with-project"). In order to provide a broad range of comparisons, various combinations of winter weather patterns, project energy demands, instream flow requirements and reservoir release temperature policies were considered. The river ice simulations cover the six month period from November 1 through April 30, during which the freeze-up and melt-out of the Middle Susitna River is generally expected to occur with-project.

The river ice simulation studies represent one component of a coordinated environmental study effort. Corresponding simulations of the reservoir operation, reservoir temperature distribution and stream temperature provided boundary conditions on which the river ice studies were based. The results of these related studies were summarized in separate reports provided to the Federal Energy Regulatory Commission in the Alaska Power Authority's comments on the Draft Environmental Impact Statement.

## 1.2 BACKGROUND INFORMATION

The proposed Susitna Hydroelectric Project is to be located in south-central Alaska approximately 140 miles north-northeast of Anchorage and 110 miles south-southwest of Fairbanks. The proposed project, consisting of Watana and Devil Canyon dams, would generate electrical power for the Railbelt region of Alaska. The Watana and Devil Canyon dam sites are 184 and 152 river miles, respectively, upstream from the mouth of the Susitna River at Cook Inlet. Construction of the Watana dam, an 885 ft high earthfill structure, is planned to be completed in 1994 with power generation beginning in 1996. The 645 ft high Devil Canyon concrete arch dam is planned to be completed in 2002.

Observations of natural ice processes on the Middle Susitna River have been documented for the past four winters; 1980-81, 1981-82, 1982-83 and 1983-84 (R&M Consultants 1981, 1982a, 1983, 1984). An additional study of natural hydraulic and ice conditions has also been presented (R&M Consultants 1982b). The reader may find it useful to review these materials in order to become familiar with Susitna river ice processes and general ice terminology used in this report.

The present river ice simulation studies are based upon application of the computer model "ICECAL." ICECAL computes hydraulic and ice conditions within the river on a daily basis and its capabilities are briefly outlined in Section 2.1. A detailed documentation of ICECAL and its calibration to the Middle Susitna River has been presented previously (Harza-Ebasco, 1984).

Each ICECAL simulation of with-project conditions is based upon corresponding simulations of the flow rates and water temperatures released from the Watana or Devil Canyon reservoir and the subsequent cooling (or warming) of this water as it travels in the river downstream of the reservoir. Flow rates and water temperatures released from the proposed reservoirs are simulated with the Dynamic Reservoir Simulation Model, i.e. "DYRESM" (Alaska Power Authority 1984). Results of the DYRESM simulations are input to a stream temperature simulation model, "SNTMP" (Arctic Environmental Information and Data Center 1984, Alaska Power Authority 1984), which computes longitudinal stream temperature profiles in the Susitna River on a weekly basis. Results of the DYRESM and SNTMP simulations are then input to the ICECAL model for simulation of the instream hydraulic and ice conditions.



## 2.0 METHODOLOGY

### 2.1 MODEL

The computer model, ICECAL, was used to generate the river ice simulations presented in this report. The model provides a daily summary of hydraulic, temperature and ice conditions throughout the study reach. A brief outline of ICECAL operations is presented in this section. A detailed documentation of ICECAL and its calibration to the Middle Susitna River for the winters of 1982-83 and 1983-84 has been presented previously in a calibration report (Harza-Ebasco 1984).

Two improvements have been incorporated into ICECAL since the preparation of the calibration report. Computation of solid ice growth (See Item 6 below) has been refined to include the effects of snow cover which tends to insulate the ice cover from the ambient air temperature. Also, computation of lateral ice growth (See Item 4 below) has been improved to more accurately reflect observations on the Susitna River. The effects of these ICECAL improvements were checked by repeating the calibration simulations for the 1982-83 and 1983-84 winters. It was found that the improved ICECAL version gave equivalent or better calibration results compared to the previous version, in terms of agreement with the observed ice conditions. The improved ICECAL calibration runs for the 1982-83 and 1983-84 winters are presented in this report as Exhibits D and E respectively. All river ice simulations presented in this study are based on the improved version of ICECAL.

The particular hydraulic and ice operations performed by the ICECAL model include the following:

1. Hydraulic profiles are computed daily for the study reach. Computations are based upon the Bernoulli and Manning equations and include the effects of existing ice in the river.

2. Water temperature profiles required for with-project simulations are provided by the SNTMP stream temperature studies (AEIDC 1984). The SNTMP stream temperatures are based upon open water conditions and are therefore not applicable to that portion of the river which is ice covered. For ice covered reaches, therefore, stream temperatures are computed by ICECAL based on a heat transfer coefficient approach (Harza-Ebasco 1984).
3. Generation of small ice crystals, know as frazil ice (Ashton 1978), is computed for reaches of turbulent, open water in which the water temperature has dropped to 0°C. Frazil ice flow rates are tabulated as the ice is carried downstream with the flow.
4. Lateral or border ice growth proceeding from the river banks (See Figure 2) is computed based on Susitna River observations. This lateral ice growth tends to reduce the open water surface area available for frazil ice generation.
5. Frazil ice particles tend to coalesce into floating pans or larger rafts of slush ice which may accumulate downstream at the front of a developing ice cover (See Figure 2). Hydraulic conditions at the ice cover are analyzed to determine if the incoming ice pans will accumulate at the upstream edge of the cover, thereby advancing the "ice front". Alternately, the incoming ice may be swept beneath the ice front and deposited downstream on the underside of the ice cover, thereby thickening the ice cover.
6. Slush and solid ice component thicknesses of the river ice cover are computed. Initial ice cover accumulations consist of slush ice as discussed in (5) above. The initial slush ice cover then gradually freezes into solid ice, beginning at the upper surface (exposed to the cold air) and proceeding down. ICECAL computes this daily growth of solid ice within the initial accumulations of slush ice. If the solid ice grows thru the slush, the model computes the additional thickness below the slush.

7. Melting of the ice cover and retreat of its ice front are computed when warm water (i.e., above 0°C) reaches the ice cover. In this manner, a spring "melt-out" is simulated. Mechanical "break-up" of the ice cover is not considered, being beyond the state-of-the-art in river ice modeling. Although severe springtime break-up activity and resulting ice jams have been observed for certain years under natural conditions, it is expected that a gradual spring melt-out, as considered in the model, will be more characteristic of the with-project condition. Severe springtime break-up activity is largely associated with rapid natural flow increases which lift and fracture the ice cover (R&M 1982a). The proposed project reservoirs will regulate such seasonal flow events, yielding a more stable flow regime for the Middle Susitna River and thereby allowing an existing ice cover to melt in place.

Required input data for the ICECAL model includes the following:

1. River cross-sectional geometry and bed roughness for study reach
2. Weather conditions (daily air temperature and wind velocity) within the study reach
3. Water inflow hydrograph at upstream boundary of study reach
4. Daily frazil ice discharges at upstream boundary of study reach
5. Water temperature profiles in the study reach upstream of the ice front.

Further discussion of the input data used for natural and with-project simulations is presented in Sections 2.3 and 2.4, respectively.

## 2.2 RANGE OF SIMULATED CONDITIONS

The particular river ice simulations included in this report are tabulated in Table I. As shown, the simulations include four winters of historical weather and flow data; 1971-72, 1976-77, 1981-82 and 1982-83. Air temperatures for these four winters are plotted in Figure 3. Figure 4 shows the corresponding natural river flows during the winter season. The four particular winters were selected to include possible extremes in expected with-project river ice conditions. Based on Talkeetna air temperatures averaged over the 5 month period from November through March, as shown in Figure 5, the winters of 1971-72 and 1976-77 respectively represent the coldest and warmest winters recorded during the past 40 years. The winter of 1981-82 is considered average in air temperature and the winter of 1982-83 is considered warmer than average.

Talkeetna air temperatures averaged over the 3 month period from December through February (See Figure 6) show similar historical trends as the 5 month period from November through March.

The range of simulated conditions also includes various stages during development of the project; natural conditions, filling of Watana Reservoir (first and second winters), Watana operating alone (1996 and 2001 energy demands), and Watana and Devil Canyon operating together (2002 and 2020 energy demands). The year 1996 represents the expected first year of Watana power generation. Start-up of the Devil Canyon power generation is planned for the year 2002.

Reservoir releases for the with-project simulations satisfy the Case C operating guide (Alaska Power Authority, 1983). Flow rates for the with-project simulations are adjusted on a weekly basis and are shown in Figure 7.

Temperature of the reservoir releases is controlled by operation of a multi-level intake structure. The policy of operation used in the simulations is based on an attempted match of the release temperature with that of the

natural flow entering the reservoir. In effect, this "inflow matching" policy results in release of the coldest available water during the winter months. As a sensitivity investigation, one river ice simulation considers the effect of an assumed release of warm, 4°C water throughout the period of simulation. Release of 4°C water is a hypothetical situation only, since the warmest water available to the proposed intake structure (using the lowest level intake ports) will be somewhat colder than 4°C during the winter months.

The range of simulated conditions in this study is intended to provide a broad base for comparisons between the natural and with-project river ice environments. Of necessity, all combinations of meteorology, hydrology, energy demands and reservoir operations could not be considered herein. However, the range of simulations included is believed adequate to allow significant conclusions regarding river ice behavior.

### 2.3 SIMULATIONS OF NATURAL ICE CONDITIONS

As shown in Table I, this report includes natural ice simulations for the winters of 1971-72, 1976-77, 1981-82 and 1982-83. These simulations were based on the following conditions and assumptions:

#### 1. Study Reach

The study reach extends from River Mile 98.6 (Chulitna confluence) to River Mile 139.4 (slightly upstream of Gold Creek). Progression of a defineable ice front has been observed in this reach under natural conditions. Upstream of Gold Creek, however, localized unstable ice bridging processes have been observed to close the river prior to arrival of the ice front. Since the ICECAL model does not attempt to simulate such processes, and since observations of frazil ice quantities are available only at Gold Creek, the model does not extend upstream of this vicinity for the simulations of natural ice conditions. The central questions regarding project-induced changes in natural ice conditions

pertain principally to civil structures or environmental concerns within the 40 mile river segment included in the ICECAL natural simulations. Project effects on natural ice processes upstream of RM 139 can be forecast on the basis of the stream temperature modeling and the experience gained from winter ice observations and modeling the lower 40 miles of the Middle Susitna River with ICECAL.

2. Period of Simulation

Simulations cover the 6 month period from November 1 through April 30. Ice front progression up the Middle Susitna River has not occurred prior to November 1 during the four years of ice observations. Simulation of spring break-up or melt-out is not attempted for natural conditions.

3. Starting Date for Ice Front Progression into the Middle Susitna River

When available, actual observations are used for the starting date of the ice front progression at the Susitna-Chulitna confluence. Observed starting dates have ranged from November 5 through December 8 and are shown in Table II. For years when observations are not available, an assumed date is selected within the observed range based on the severity of the particular winter.

4. Water Flow Rates

Historical flow data at Gold Creek (River Mile 137) were used as recorded by the USGS and/or R&M Consultants, Inc. (See Figure 4). Daily flow rates were interpolated for periods when data are not available. Flow rate adjustment factors were applied along the study reach to account for tributary inflows (R&M 1982b).

5. Weather Data

Daily air temperatures and wind speeds recorded at Talkeetna and Watana weather stations were interpolated linearly along the river length. Talkeetna data are available for all years simulated. Watana data, when not available, were estimated from a correlation with available Talkeetna data.

6. Frazil Ice Discharge at Gold Creek

This quantity was computed from actual ice observations at Gold Creek (River Mile 137), when available. These ice discharges were found to be well correlated with Talkeetna air temperature data. This correlation provided an estimate of frazil ice discharge at Gold Creek for years in which observations were not available.

7. Stream Temperatures

Stream temperatures were assumed to be 0°C throughout the natural simulations.

2.4 SIMULATIONS OF WITH-PROJECT ICE CONDITIONS

The various with-project ice simulations were based on the following conditions and assumptions:

1. Study Reach

The study reach extends from the Susitna-Chulitna confluence (River Mile 98.6) to the Watana (River Mile 184.4) or Devil Canyon (River Mile 152) damsite.

2. Period of Simulation

Simulations cover the 6 month period from November 1 through April 30. The freeze-up and melt-out of the Middle Susitna River are generally expected to occur during this period.

3. Starting Date for Ice Front Progression into the Middle Susitna River

Progression of the ice front upstream of the Susitna-Chulitna confluence begins when the Lower Susitna River (downstream of the Chulitna confluence) has frozen over. The Lower Susitna freeze-up is characterized by an initial ice bridge formation near River Mile 9 and the subsequent advance of an ice cover up to the Chulitna confluence.

The Lower Susitna ice cover during with-project conditions is supplied by frazil ice generated in the Yentna, Talkeetna, Chulitna, Lower Susitna (upstream of the ice cover) and Middle Susitna Rivers. The ICECAL model considers the total volume of ice required to fill the Lower Susitna River from the Yentna confluence (River Mile 30) to the Chulitna confluence (River Mile 98.6) and computes the time needed to generate the necessary frazil ice. Frazil ice generation in the Middle Susitna River is computed directly by the model. The frazil ice contributions of the Talkeetna, Chulitna and Lower Susitna Rivers are computed by correlation with cumulative freezing degree days at the Talkeetna weather station.

Lower Susitna River ice observations suggest that the ice front typically reaches the Yentna confluence (River Mile 30) in late October or early November under natural conditions (See Table II). It is expected that this event will not be significantly delayed under with-project conditions. Although the frazil ice contribution from the Middle Susitna River is greatly reduced under with-project conditions, the Yentna River, which produces more than 50%



of the total ice downstream of River Mile 30 (R&M, 1984), remains unchanged. Also unchanged are the frazil ice contributions of the Chulitna and Talkeetna Rivers which represent about 20% of the natural Susitna frazil ice discharge at Talkeetna (R&M 1983).

Based on the above, November 1 was selected as a representative date on which the Lower Susitna ice front reaches the Yentna confluence during with-project conditions. The ICECAL model and related computations of tributary frazil ice production therefore begin on November 1 for the with-project river ice simulations. Daily tabulations of cumulative ice production are performed until the ice storage capacity of the Lower Susitna is reached. At this point, the model begins progression of the ice cover at the Chulitna confluence (River Mile 98.6).

#### 4. Water Flow Rates

Water flow rates at the upstream boundary of the ICECAL simulation are determined by releases from the Watana or Devil Canyon reservoirs. This information is read directly from the output of the corresponding DYRESM simulation and is summarized in Figure 7. The flow rates are provided on a weekly basis and are adjusted along the study reach to account for tributary inflows (R&M 1982b). Fluctuations of flow within a particular day or week are not considered.

#### 5. Weather Data

Daily air temperature and wind speed data are interpolated along the river length between Talkeetna, Devil Canyon and Watana weather stations. Watana and Devil Canyon data, when unavailable, are estimated from a correlation with Talkeetna data.

## 6. Frazil Ice Discharge at Upstream Boundary of Model

Water released from the Watana and Devil Canyon reservoirs remains above 0°C throughout the year. Therefore, no frazil ice exists at the upstream boundary of the with-project simulations.

## 7. Stream Temperatures

Reservoir release temperatures are computed in daily time steps by the DYRESM simulations. Corresponding SNTMP simulations provide stream temperature profiles on a weekly basis throughout the study reach. This information is read directly into the ICECAL model. The SNTMP stream temperature profiles are based upon open water conditions and are therefore not applicable to that portion of the river which is ice covered. The SNTMP results are therefore superseded by ICECAL temperature computations for that portion of the river where an ice cover exists.

## 2.5 SLOUGH AND SIDE CHANNEL AREAS

Various slough and side channel areas adjacent to the mainstem Susitna River are of special importance as salmon spawning habitat. A typical slough, illustrated in Figure 8, is an overflow channel separated from the mainstem by a well-vegetated bar or island (Alaska Power Authority 1983). Sloughs are generally fed by a small stream and/or upwelling of groundwater. Side channels are similar to sloughs, but are not fed by such a stream or groundwater upwelling. An alluvial berm generally extends across the upstream end of the slough or side channel, shielding it from the river. High natural river flows or ice activity will periodically overtop this upstream berm and flood the slough or side channel with water or ice. The water level at a given mainstem river mile which results in overtopping of a nearby slough or side channel berm is referred to in this study as the "threshold elevation." Since slough and side channel systems may include a network of multiple channels, overtopping of a particular berm may be controlled by the water level in the mainstem at a different river mile

location. For this reason, the "threshold elevation" in the mainstem is not necessarily equal to the corresponding berm crest elevation.

The important sloughs and side channels have been identified and are tabulated in Table III. For the purpose of the river ice simulations, it is assumed that particular sloughs have been isolated from the river channel. That is, the model assumes that the cross-sectional area of these particular sloughs (See Table III) is not available to pass flow or store ice. This assumption has no influence on the model results for those simulations in which the river stages remain below the natural threshold elevations. For those simulations which show slough overtoppings, the slough isolation assumption yields river stages which may be slightly higher than those expected had these slough areas been included in the cross sections. The slough isolation assumption therefore yields conservative results, reflecting levels to which slough berms would have to be constructed if that slough were to be protected from overtopping.

## 2.6 INTERPRETATIONS OF COMPUTER SIMULATIONS

River ice mechanics and modeling is a relatively primitive field of study. Ice processes are complicated, unsteady and non-uniform, and many aspects are not yet fully understood. Although the ICECAL model is considered state-of-the-art, certain simplifications and limitations are necessarily involved. Three dimensional concepts are presented in a one-dimensional format, and the model therefore computes an average or characteristic velocity and ice thickness to represent a particular cross-section. The actual spatial distribution of velocity and ice thickness may be highly non-uniform and is beyond the scope of the model. Figure 9 contrasts actual and computed ice distribution at a hypothetical cross-section.

For these reasons, selected ICECAL computer simulations have been interpreted by R&M Consultants, Inc., based on their experience with Suaitna River ice over the past four years. These interpretations are identified in Table I and are presented in Exhibits U-A1. The resulting interpretive sketches combine the quantitative ICECAL results with observed river ice

distribution trends to yield the best estimate of the actual river appearance at selected cross-sections.

### 3.0 RESULTS

#### 3.1 GENERAL

Results of the river ice simulations are presented in Exhibits A through T. Each exhibit includes the following information:

1. Profile of the maximum river stages which occurred during the simulation period and the corresponding ice cover thickness which existed on the date of maximum stage. (Since river stage is influenced by both flow rate and ice thickness, the ice thicknesses shown do not necessarily represent the maximum thickness.)
2. Location of the ice front and 0°C water isotherm throughout the simulation.
3. Time history plots of water surface elevation, ice thickness and water temperature at selected slough and side channel areas.

Table IV is a summary of the maximum water surface elevations which occurred at selected slough and side channel areas for all the river ice simulations. Table V summarizes the number of occurrences where with-project simulations resulted in higher maximum stages than the corresponding natural conditions for the same weather period. Table VI shows those slough and side channel areas where the known threshold elevation was simulated to be overtopped with-project but not under natural conditions, and vice versa. Table VII summarizes the starting date, maximum extent and melt-out date of the ice front for each simulation. Tables VIII and IX present the maximum total and solid ice thicknesses, respectively, which occurred during the simulations.

Interpretive sketches for selected ICECAL simulations are presented in Exhibits U-A1. Each sketch shows natural river conditions observed in 1983-84, a selected ICECAL simulation result and an interpreted version of the

ICECAL result for a particular river cross section. This interpreted version is based on detailed observation of Susitna River ice processes and represents the best estimate of the actual appearance of the particular river cross section at the time of its maximum winter stage. Relative to the ICECAL results, the interpretive sketches show that the thickest deposits of slush ice will generally accumulate in the low velocity zones near the river banks. Correspondingly thinner ice and occasional open water is shown in the high velocity zones of the channel.

### 3.2 SIMULATIONS OF NATURAL CONDITIONS

Of the four years simulated, the cold winter of 1971-72 (Exhibit A) typically results in the greatest ice thicknesses and highest river stages within the study reach. For this winter, maximum total ice thicknesses (solid + slush component) within the study reach range from 5 ft. to 11 ft., including up to 5 ft. of solid ice. The winter of 1981-82 (Exhibit C), an average winter in terms of air temperatures, shows maximum total ice thicknesses of 4 ft. to 10 ft., of which 3 ft. to 4 ft. is typically solid ice. Maximum river stages for 1981-82 are often 1 ft. to 3 ft. lower than those for 1971-72.

The winter of 1982-83, a relatively warm winter, was used for model calibration purposes (Harza-Ebasco 1984). Actual ice observations are shown along with simulated results in Exhibit D. Maximum total ice thicknesses for 1982-83 range from 3 ft. to 8 ft., of which 3 ft. is typically solid ice. Maximum river stages are generally 0 ft. to 4 ft. lower than those of 1971-72.

The very warm winter of 1976-77 results in the smallest ice thicknesses and lowest river stages of the four winters simulated. Maximum total ice thicknesses range from 1 ft. to 7 ft., of which 1 ft. to 2 ft. is solid ice. Maximum river stages for 1976-77 are generally 2 ft. to 6 ft. lower than those of 1971-72.

For the winters of 1971-72, 1981-82 and 1982-83, ice front progression at the Chulitna confluence (River Mile 98.6) begins in early or mid-November and reaches Gold Creek in late December or early January. The winter of 1976-77 however, shows the ice front beginning in early December and reaching Gold Creek in early March. All four simulations are characterized by a rapid initial ice front progression rate in the lower portion of the study reach with a gradual slowing as it approaches Gold Creek.

### 3.3 WATANA OPERATING WITH 1996 ENERGY DEMAND

Simulation results are presented in Exhibits F-J. As shown, the start of the ice front progression at the Chulitna confluence ranges from late November (1971-72 winter) to late December (1981-82 winter). This represents a delay of 2 to 5 weeks relative to natural conditions for the corresponding winters. The maximum upstream extent of the ice front is between River Miles 137 and 140 for the winters of 1971-72, 1976-77 and 1981-82, and at River Mile 127 for the winter of 1982-83. Completion of the spring melt-out in the Middle Susitna (i.e., down to River Mile 98.6) ranges from mid March (1982-83 winter) to mid May (1971-72 winter). The spring melt-out occurs 5 to 7 weeks earlier than natural river break-up based on observation of 1981-82 and 1982-83.

The most severe ice conditions for Watana operation and 1996 energy demand occur for the winter of 1971-72 (Exhibit F). For this simulation, maximum total ice thicknesses range from 2 ft. to 11 ft., including up to 5 ft. of solid ice. These ice thicknesses are generally similar to those of natural conditions in the reach downstream of Gold Creek (River Mile 137). Maximum river stages, however, are 3 ft. to 7 ft. higher than natural conditions due to the significantly higher winter flow rates with the project.

The mildest simulated river ice conditions for the 1996 energy demand occur for the winter of 1982-83 (Exhibit I). Maximum total ice thicknesses for this simulation range from 2 ft. to 8 ft., including up to 2 ft. of solid ice. These thicknesses are generally similar to natural 1982-83 conditions, but maximum with-project river stages are 2 ft. to 5 ft. higher than natural

conditions due to the higher with-project winter flows. Maximum river stages for the 1982-83 with-project simulation are 0 ft. to 7 ft. lower than those of the 1971-72 severe conditions.

The effect of a hypothetical warm ( $4^{\circ}\text{C}$ ) water release from the Watana reservoir throughout the 1971-72 winter was considered as shown in Exhibit J. With these "warm" reservoir releases, the ice cover progression at the Chulitna confluence begins 3 weeks later and melt-out occurs approximately 7 weeks earlier than with the "inflow matching" temperature release policy of Exhibit F (See Section 2.2). Maximum ice thicknesses with the warm releases range from 2 ft. to 7 ft., and maximum river stages are typically 1 ft. to 7 ft. lower than those with the "inflow-matching" releases. Maximum extent of the ice cover with the warm releases is River Mile 127, versus River Mile 140 under inflow matching release temperatures. It therefore appears that control of the reservoir release temperatures may have a significant impact on river ice development.

#### 3.4 WATANA OPERATING WITH 2001 ENERGY DEMAND

Simulations of Watana operating with the 2001 energy demand were made for the winters of 1971-72 and 1982-83 (See Exhibits K and L). Results show that the ice front starting date, melt-out date and maximum upstream extent are similar to those of the 1996 energy demand for the corresponding winters. However, some redistribution of the frazil ice depositions along the river length is apparent. Such differences in ice distribution can be caused by different patterns of reservoir release temperatures occurring at different times within a given winter season. In particular, for the 1971-72 winter, the 2001 energy demand shows colder December reservoir releases than the 1996 demand, thereby causing a faster ice front progression. The subsequent heavy frazil production in January is accumulated at a further upstream location for the 2001 demand. As a result, maximum river stages in the vicinity of river miles 137-142 for the 1971-72 winter with 2001 energy demand are 2 ft. to 10 ft. higher than those with the 1996 demand.



Maximum total ice thicknesses for the 1971-72 winter with 2001 energy demand range from 4 ft. to 14 ft. of which 4 ft. to 5 ft. is solid ice. Maximum river stages are 2 ft. to 6 ft. higher than for natural 1971-72 conditions.

Maximum total ice thicknesses for the 1982-83 winter with 2001 energy demand range from 2 ft. to 7 ft. including up to 2 ft. of solid ice. Maximum river stages are 1 ft. to 6 ft. higher than natural conditions in the reach downstream of River Mile 124 where the with-project ice cover exists. Upstream of the with-project ice cover, however, maximum river stages are 1 ft. to 4 ft. lower than natural conditions. Although the with-project flow rates are higher, the displacement and frictional resistance of the natural ice cover in this reach result in higher river stages for natural conditions than with-project.

### 3.5 WATANA AND DEVIL CANYON OPERATING WITH 2002 ENERGY DEMAND

Simulation results for Watana and Devil Canyon operating with 2002 energy demand are presented in Exhibits M-P. Results show that the beginning of the ice front progression at the Chulitna confluence ranges from early December to mid-January, approximately 0-2 weeks later than the corresponding Watana-only simulations, and 4-6 weeks later than natural conditions for the same winters. Maximum upstream extent of the ice front ranges from River Mile 123 to 137, and is 3-13 miles downstream of that with Watana only and 1996 energy demand. Simulated melt-out with both dams operating and 2002 energy demand ranges from mid-March to mid-May, being 0-3 weeks earlier than Watana-only simulations for the corresponding winters, and 7-8 weeks earlier than the natural break-up observed for the 1981-82 and 1982-83 winters.

For both dams operating with 2002 energy demand, the most severe ice conditions occur with the 1971-72 winter (Exhibit M). Maximum ice thicknesses for this case range from 3 ft. to 7 ft., of which 3 ft. to 5 ft. is solid ice. Maximum river stages are 1 ft. to 5 ft. lower than the corresponding Watana-only simulation with 1996 energy demand. Maximum river stages downstream of River Mile 130 are 0 ft. to 4 ft. higher than natural

conditions. Upstream of this location, however, the ice cover is much thinner with-project and maximum river stages are 0 ft. to 3 ft. lower than natural conditions.

The winters of 1976-77, 1981-82 and 1982-83 (Exhibits N, O and P) all show relatively mild ice conditions for both dams operating with the 2002 energy demand. Maximum ice thicknesses for these cases range from 1 ft. to 6 ft., including 1 ft. to 2 ft. of solid ice. Maximum river stages are 0 ft. to 7 ft. lower than the corresponding Watana-only simulations with 1996 energy demand. Maximum river stages, where an ice cover exists, are 1 ft. to 4 ft. higher than corresponding natural conditions. Upstream of the with-project ice cover, maximum river stages are 0 ft. to 5 ft. lower than natural conditions. Again, the higher natural stages in this reach are due to the displacement and frictional resistance of the natural ice cover.

### 3.6 WATANA AND DEVIL CANYON OPERATING WITH 2020 ENERGY DEMAND

Simulations of Watana and Devil Canyon operating with the 2020 energy demand were performed for the winters of 1971-72 and 1982-83 (Exhibits Q and R). Results show that the ice front starting date and maximum upstream extent are generally similar to those of the 2002 energy demand for the corresponding winters. The spring melt-out with the 2020 energy demand, however, occurs 1 to 3 weeks earlier than with the 2002 energy demand. This is apparently caused by somewhat warmer reservoir release temperatures resulting from the 2020 reservoir simulation.

Simulation of the 1971-72 winter with 2020 energy demand shows maximum ice thicknesses which range from 2 ft. to 7 ft. including 1 ft. to 4 ft. of solid ice. Maximum river stages in the ice-covered reach (downstream of River Mile 130) are 1 ft. to 7 ft. higher than corresponding natural conditions. Upstream of the with-project ice cover, maximum river stages are 1 ft. to 5 ft. lower than those of natural conditions, due to the displacement and frictional resistance of the natural ice cover.

Simulation of the 1982-83 winter with 2020 energy demand shows maximum ice thicknesses ranging from 1 ft. to 3 ft., including up to 1 ft. of solid ice. Maximum river stages in the ice-covered reach are 0 ft. to 4 ft. higher than natural conditions. Upstream of the with-project ice cover, maximum stages are 0 ft. to 4 ft. lower than corresponding ice-covered natural conditions.

### 3.7 WATANA FILLING

River ice simulations for the first and second years of filling the Watana reservoir are shown in Exhibits S and T. The first winter of filling, which involves relatively warm reservoir releases from the low level outlet works, was simulated with the relatively warm 1982-83 weather conditions. The second winter of filling includes release of colder water from the reservoir surface and was simulated with the colder 1981-82 weather conditions. The two simulations were selected to provide a typical range of ice conditions during the filling of the Watana reservoir.

Results for Watana filling show that the ice front progression at the Chulitna confluence begins in mid-December, 5-7 weeks later than corresponding natural conditions. The simulated melt-out for the first winter of filling occurs in early May, similar to the timing of break-up under natural conditions. The second winter of filling shows an estimated melt-out in late May (extrapolated from April conditions), 2 to 3 weeks later than the natural break-up. However, since increasing Watana flow releases during the month of May are not included in the simulation period, a mild spring break-up for the second year of Watana filling may actually occur with similar timing as the natural conditions.

The Watana filling simulations show the ice front progressing up to River Mile 156-162. This ice progression is significantly further upstream than any of the other with-project simulations and is due to the lower river flows and velocities which exist under filling conditions. However, simulation of an ice front progression upstream of River Mile 140 is considered an approximation only, since intermittent bridging of lateral ice has been

observed to be the dominant process in this reach for natural conditions. Such intermittent ice bridging is not modeled by ICECAL.

Simulation of the first year of filling with the 1982-83 winter shows maximum ice thicknesses of 1 ft. to 6 ft., including up to 2 ft. of solid ice. Maximum river stages are 0 ft. to 5 ft. lower than natural conditions for 1982-83.

Simulation of the second year of filling with the 1981-82 winter shows maximum ice thicknesses of 1 ft. to 8 ft., including up to 3 ft. of solid ice. Maximum river stages are generally 0 ft. to 3 ft. lower than natural conditions for 1981-82.

#### 4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are based upon the river ice simulation results to date and are subject to the various assumptions and conditions described in this report. In particular, the with-project ice results are based on a reservoir release temperature policy which attempts to match the natural stream temperatures incoming to the reservoir (i.e., coldest available water is released from the reservoir during winter season). Conclusions apply only to the Middle Susitna River (i.e., upstream of the confluence with the Chulitna River) wherein the most significant project impacts are expected.

##### 1. Ice Front Progression and Melt-Out

Relative to natural conditions, initial progression of the Middle Susitna ice front at the Chulitna confluence (River Mile 98.6) is expected to be delayed by 2 to 5 weeks with Watana operating alone, and 4 to 6 weeks with Watana and Devil Canyon operating together. Completion of a gradual spring melt-out in the Middle Susitna River with Watana operating alone is expected 5 to 7 weeks earlier than the natural, mechanical break-up. With both dams operating, completion of the spring melt-out is expected 7 to 8 weeks earlier than the natural break-up.

Maximum upstream extent of the river ice cover during the selected warm, average and cold winters is expected to range from River Mile 124 to 142 with Watana operating alone. With the addition of the Devil Canyon dam, this maximum upstream extent will be somewhat reduced, with an expected range of River Mile 123 to 137.

##### 2. Ice Thicknesses

In those reaches where an ice cover exists, the maximum total and solid ice thicknesses with Watana operating alone are expected to be generally similar to those of natural conditions. With both

dams operating, the maximum total and solid ice thicknesses are expected to be typically 1 ft. to 2 ft. less than those of natural conditions.

### 3. River Stages and Slough Overtopping

In those reaches where an ice cover exists, the maximum river stages with Watana operating alone are expected to be generally higher than those of the natural conditions, typically by 2 ft. to 7 ft. Corresponding maximum river stages in ice covered reaches with both dams operating are expected to be typically 1 ft. to 6 ft. higher than those of natural conditions.

Upstream of the with-project ice front, however, the maximum river stages with Watana operating alone are expected to be typically 1 ft. to 3 ft. lower than the corresponding natural conditions. With both dams operating, these maximum river stages are expected to be typically 1 ft. to 5 ft. lower than natural conditions.

As a result of the above, overtopping of the natural threshold elevations in various slough and side channel areas in the lower reaches of the Middle Susitna (downstream of River Mile 127) is expected to be more frequent with the project than under natural conditions (See Table VI). However, various slough and side channel areas in the upper reaches of the Middle Susitna (upstream of River Mile 127) are expected to be overtopped less frequently with the project than under natural conditions.

### 4. Further Considerations

It is expected that the policy which governs reservoir release temperatures may have a major impact on the river ice development (See Exhibit F vs. Exhibit J). Additional simulations including possible alternate temperature release policies may therefore be useful for future aquatic assessments.

## 5.0 REFERENCES

- Alaska Power Authority, 1983, "Susitna Hydroelectric Project," Application for FERC License, Volume 5A, Exhibit E, Chapter 2.
- Alaska Power Authority, 1984, "Susitna Hydroelectric Project - Alaska Power Authority Comments on the Federal Energy Regulatory Commission Draft Environmental Impact Statement of May 1984," Appendices IV and V.
- Arctic Environmental Information and Data Center, 1984, "Assessment of the Effects of the Proposed Susitna Hydroelectric Project on Instream Temperature and Fishery Resources in the Watana to Talkeetna Reach," Draft Report for Harza-Ebasco for Alaska Power Authority.
- Ashton, George D., 1978, "River Ice," Annual Review of Fluid Mechanics.
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# TABLES

TABLE I

**SUSITNA HYDROELECTRIC PROJECT  
SCOPE OF RIVER ICE SIMULATIONS**

Project Status	Natural Conditions	Watana Only Operating		Watana and Devil Canyon Operating		Watana Filling	
Operating Guide	----	Case C		Case C		----	
Energy Demand	----	1996	2001	2002	2020	----	
Release Temperature	----	N W	N	N	N	----	
						1st Winter	2nd Winter
<b>Historical Period:</b>							
1971-72 (Cold winter)	X	⊗ ⊗	X	⊗	X		
1976-77 (Very Warm winter)	X	⊗		X			
1981-82 (Average winter)	X	X		X			⊗
1982-83 (Warm winter)	X	⊗	X	⊗	X	X	

Notes: 1. N represents natural "inflow matching" policy for reservoir release temperatures.

2. W represents assumed warm, 4°C temperature release.

Legend: X ICECAL simulation

⊗ ICECAL simulation and interpretive sketch

TABLE II  
SUSITNA HYDROELECTRIC PROJECT  
OBSERVED ICE FRONT PROGRESSION  
ON THE SUSITNA RIVER

<u>Observed Location of Ice Front</u>	<u>River Mile</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
River Mile 9	9	Unknown	Early Nov.	Oct. 22	Oct. 26
Chulitna Confluence	98.6	Nov. 29	Nov. 18	Nov. 5	Dec. 8
Near Gold Creek	136	Dec. 12	Dec. 31	Dec. 27	Jan. 5

TABLE III  
SUSITNA HYDROELECTRIC PROJECT  
SLOUGH AND SIDE CHANNEL AREAS  
IN MIDDLE SUSITNA RIVER

<u>Area</u>	<u>River Mile Location</u>	<u>Threshold Elevation (feet)</u>
*Whiskers Slough	101.5 <sup>H</sup>	367
Side Channel at Head of Gash Creek	112.0	Unknown
*Slough 6A	112.3 <sup>M</sup>	U
*Slough 8	114.1 <sup>H</sup>	476
Side Channel MSII	115.5	482
Side Channel MSII	115.9 <sup>H</sup>	487
Curry Slough	120.0 <sup>H</sup>	Unknown
*Moose Slough	123.5 <sup>H</sup>	Unknown
*Slough 8A - West Channel	126.1 <sup>H</sup>	573
*Slough 8A - East Channel	127.1 <sup>H</sup>	582
*Slough 9	129.3 <sup>H</sup>	604
Side Channel Upstream of Slough 9	130.6	Unknown
Side Channel Upstream of 4th July Creek	131.8	Unknown
Slough 9A	133.7 <sup>H</sup>	651
Side Channel Upstream of Slough 10	134.3	657
Side Channel Downstream of Slough 11	135.3	Unknown
*Slough 11	136.5 <sup>H</sup>	687
*Slough 17	139.3 <sup>H</sup>	Unknown
Slough 20	140.5 <sup>H</sup>	730
*Slough 21 - Entrance A6	141.8 <sup>H</sup>	747
*Slough 21	142.2 <sup>H</sup>	755
Slough 22	144.8 <sup>H</sup>	788

Legend:

- \* - For purposes of simulation, these sloughs are assumed to be isolated from the cross-section.
- H - Indicated location represents the head of the slough or channel
- M - Indicated location represents the mouth of the slough or channel
- U - "Upland" slough with no upstream head or berm.

**SUSITNA HYDROELECTRIC PROJECT  
MAXIMUM SIMULATED WINTER RIVER STAGES**

**TABLE IV**

Slough or Side Channel	River Mile	Threshold Elevation	NATURAL CONDITIONS				WATANA ONLY					WATANA AND DEVIL CANYON					WATANA FILLING				
			1971-72	1976-77	1981-82	1982-83	1996 DEMAND				2001 DEMAND		2002 DEMAND				2020 DEMAND		YR.1	YR. 2	
							1971-72	1976-77	1981-82	1982-83	1971-72 <sup>W</sup>	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72			1982-83
Whiskers	101.5	367	369	366	368	367	372	370	371	370	371	372	370	371	368	369	369	372	370	367	367
Gash Creek	112.0	Unknown	456	455	455	456	459	457	460	459	460	459	461	458	455	458	457	459	457	455	455
8A	112.3	(Upland)	459	467	457	459	462	460	462	462	463	461	463	460	458	458	460	461	459	467	467
8	114.1	476	474	472	472	474	478	475	477	476	477	476	478	475	474	475	475	478	475	473	473
MS II	115.6	482	484	480	484	484	490	487	488	488	488	489	489	487	485	485	487	490	489	481	483
MS II	115.9	487	485	482	486	486	492	489	491	491	490	491	492	489	488	488	490	492	490	485	488
Curry	120.0	Unknown	522	520	523	520	526	525	527	525	523	525	521	522	521	520	520	525	523	520	521
Moose	123.6	Unknown	552	548	549	548	556	554	555	550	552	555	550	553	550	548	545	555	550	548	548
8A West	126.1	573	572	569	571	570	578	575	574	572	572	575	568	574	571	568	568	575	572	568	570
8A East	127.1	582	584	581	583	582	587	585	585	582	582	586	581	584	582	580	581	585	582	580	582
9	129.3	604	605	603	606	605	609	607	607	603	603	610	603	606	602	601	602	608	603	602	603
9 u/s	130.6	Unknown	622	616	620	621	624	622	620	617	617	625	617	620	616	616	616	621	617	616	618
4th July	131.8	Unknown	632	626	629	630	635	633	631	628	628	636	628	633	627	627	627	631	628	626	628
9A	133.7	651	655	649	651	651	657	655	653	650	650	659	650	652	650	650	650	651	650	650	650
10 u/s	134.3	657	662	654	657	658	663	661	659	656	656	665	656	659	655	655	655	657	656	658	655
11 d/s	135.3	Unknown	673	667	670	672	675	672	670	668	668	676	668	670	667	667	667	668	668	670	668
11	136.5	687	684	681	683	684	688	686	687	683	683	690	683	685	682	682	682	684	684	682	682
17	139.3	Unknown	-	-	-	-	717	715	715	715	715	727	715	714	714	714	714	715	715	712	713
20	140.5	730	-	-	-	-	732	730	729	729	729	741	729	728	728	728	728	729	729	727	729
21 (A6)	141.8	747	-	-	-	-	746	746	746	746	745	751	746	746	746	745	746	747	747	746	746
21	142.2	755	-	-	-	-	753	753	753	753	753	755	753	752	752	752	752	753	754	751	750
22	144.8	788	-	-	-	-	787	787	787	786	787	787	786	785	785	785	785	787	787	782	782

**NOTES:**

1. ☐ Indicates locations where maximum river stage equals or exceeds a known slough threshold elevation. See Exhibits A-T for duration of overtoppings.
2. "Case C" operating guide is assumed for with-project simulations.
3. 1971-72<sup>W</sup> simulation assumes warm, 4° C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
4. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.

Upstream Boundary of Natural Simulations

Upstream Extent of Ice Cover Progression

5. All river stages in feet.
6. Winter air temperatures:  
1971-72 cold  
1976-77 very warm  
1981-82 average  
1982-83 warm

TABLE V

**SUSITNA HYDROELECTRIC PROJECT  
OCCURRENCES WHERE WITH-PROJECT MAXIMUM RIVER STAGES  
ARE HIGHER THAN NATURAL CONDITIONS**

<u>Slough or Side Channel</u>	<u>River Mile</u>	<u>Watana Only Operating</u>	<u>Watana and Devil Canyon Operating</u>	<u>Watana Filling</u>
Whiskers	101.5	6/6	6/6	0/2
Gash Creek	112.0	6/6	5/6	0/2
6A	112.3	6/6	5/6	0/2
8	114.1	6/6	6/6	1/2
MSII	115.5	6/6	6/6	0/2
MSII	115.9	6/6	6/6	0/2
Curry	120.0	6/6	3/6	0/2
Moose	123.5	6/6	4/6	0/2
8A West	126.1	5/6	4/6	0/2
8A East	127.1	4/6	2/6	0/2
9	129.3	4/6	2/6	0/2
9 u/s	130.6	3/6	0/6	0/2
4th July	131.8	3/6	2/6	0/2
9A	133.7	3/6	1/6	0/2
10 u/s	134.3	4/6	1/6	0/2
11 d/s	135.3	3/6	0/6	0/2
11	136.5	4/6	2/6	0/2

## Notes:

1. For example, 4/6 means that 4 of the 6 with-project simulations resulted in a higher maximum river stage than the natural conditions for corresponding winters.
2. "Case C" operating guide and "inflow-matching" reservoir release temperatures are assumed for with-project simulations.

**SUSITNA HYDROELECTRIC PROJECT  
EXPECTED PROJECT EFFECTS ON WINTER SLOUGH OVERTOPPING**

**TABLE VI**

Slough or Side Channel	River Mile	WATANA ONLY						WATANA AND DEVIL CANYON						WATANA FILLING		
		1996 DEMAND					2001 DEMAND		2002 DEMAND				2020 DEMAND		YR.1	YR.2
		1971-72	1976-77	1981-82	1982-83	1971-72 <sup>W</sup>	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82
Whiskers	101.5		X						X					O	O	
8	114.1	X		X	X	X	X	X				X				
MS II	115.5		X						X					O		
MS II	115.9	X	X	X	X	X	X	X	X	X	X	X	X			
8A West	126.1	X	X	X			X		X			X				
8A East	127.1		X					O	X	O	O			O		
9	129.3		X		O	O		O		O	O		O	O	O	
9A	133.7		X		O	O		O		O	O		O	O	O	
10 u/s	134.3		X		O	O		O		O	O		O		O	
11	136.5	X		X			X									

**LEGEND:**

- X Slough is overtopped with project, but not under simulated natural conditions for the corresponding winter.
- O Slough is overtopped with simulated natural conditions, but not overtopped with project.

**NOTES:**

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72<sup>W</sup> simulation assumes warm, 4° C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Winter air Temperatures:  
 1971-72 cold  
 1976-77 very warm  
 1981-82 average  
 1982-83 warm

TABLE VII

**SUSITNA HYDROELECTRIC PROJECT  
SIMULATED ICE FRONT PROGRESSION**

	<u>Starting Date at Chulitna Confluence</u>	<u>Melt-Out Date</u>	<u>Maximum Upstream Extent (River Mile)</u>
<b>Natural Conditions</b>			
1971-72	Nov. 5	--	137 <sup>N</sup>
1976-77	Dec. 8	--	137 <sup>N</sup>
1981-82	Nov. 18	May 10-15 <sup>B</sup>	137 <sup>N</sup>
1982-83	Nov. 5	May 10 <sup>B</sup>	137 <sup>N</sup>
<b>Watana Only - 1996 Demand</b>			
1971-72	Nov. 28	May 15 <sup>E</sup>	140
1976-77	Dec. 25	May 3 <sup>E</sup>	137
1981-82	Dec. 28	April 3	137
1982-83	Dec. 12	Mar. 20	127
1971-72 <sup>W</sup>	Dec. 17	Mar. 27	127
<b>Watana Only - 2001 Demand</b>			
1971-72	Nov. 28	May 15 <sup>E</sup>	142
1982-83	Dec. 19	March 16	124
<b>Both Dams - 2002 Demand</b>			
1971-72	Dec. 2	May 3 <sup>E</sup>	137
1976-77	Jan. 10	April 20	126
1981-82	Dec. 30	Mar. 12	124
1982-83	Dec. 22	Mar. 20	123
<b>Both Dams - 2020 Demand</b>			
1971-72	Dec. 3	April 15	133
1982-83	Dec. 14	Mar. 12	127
<b>Watana Filling</b>			
1982-83 (YR.1)	Dec. 23	May 2 <sup>E</sup>	156 <sup>I</sup>
1981-82 (YR.2)	Dec. 23	May 30 <sup>E</sup>	162 <sup>I</sup>

**Legend:** B - Observed natural break-up.  
 E - Melt-out date is extrapolated from results when occurring beyond April 30.  
 N - Ice cover for natural conditions extends upstream of Gold Creek (River Mile 137) by means of lateral ice bridging.  
 I - Computed ice front progression upstream of Gold Creek (River Mile 137) is approximation only. Observations indicate closure of river by lateral ice in this reach for natural conditions.

**Notes:** 1. "Case C" operating guide is assumed for with-project simulations.  
 2. 1971-72<sup>W</sup> simulation assumes 4°C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.  
 3. Weather conditions:  
     1971-72: Cold winter                      1981-82: Average winter  
     1976-77: Very warm winter              1982-83: Warm winter



**SUSITNA HYDROELECTRIC PROJECT  
TOTAL ICE THICKNESS  
MAXIMUM SIMULATED VALUES**

**TABLE VIII**

		NATURAL CONDITIONS				WATANA ONLY					WATANA AND DEVIL CANYON				WATANA FILLING							
						1996 DEMAND					2001 DEMAND		2002 DEMAND		2020 DEMAND		YR. 1	YR. 2				
Slough or Side Channel	River Mile	1971-72	1976-77	1981-82	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72 <sup>W</sup>	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82		
Whiskers	101.5	5	2	4	3	5	2	3	2	3	5	2	5	1	2	2	4	1	2	3		
Gash Creek	112.0	5	4	4	4	5	3	5	5	6	5	7	5	2	2	3	4	1	3	4		
6A	112.3	6	5	4	5	5	3	5	4	6	5	7	5	2	3	4	4	1	5	5		
8	114.1	5	2	4	4	5	2	4	3	4	5	5	4	2	3	3	4	1	3	3		
MSII	115.5	5	2	5	5	6	2	5	5	4	5	6	4	3	3	4	4	2	3	5		
MSII	115.9	5	3	7	6	7	3	7	6	6	5	8	4	6	4	6	5	3	5	8		
Curry	120.0	6	5	7	4	7	5	8	5	3	5	1	4	3	1	1	4	2	4	6		
Moose	123.5	10	4	7	5	9	6	8	2	4	6	2	7	4	1		7	2	5	6		
8A West	126.1	5	2	3	3	5	3	3	1	1	5		3	1			3	1	1	2		
8A East	127.1	5	2	3	3	4	3	2	0	0	4		3				3	0	1	2		
9	129.3	6	4	7	6	5	3	3			6		3				3		2	4		
9 u/s	130.6	8	3	6	7	5	4	2			6		3				2		3	6		
4th July	131.8	7	1	3	5	5	3	2			7		3				2		1	3		
9A	133.7	7	1	3	3	6	4	2			8		3						3	2		
10 u/s	134.3	11	1	3	4	7	5	2			9		4						6	2		
11 d/s	135.3	6	1	3	5	6	4	2			8		3						3	3		
11	136.5	5	1	3	4	3	2	2			5		1						3	4		
17	139.3	Upstream Boundary of Natural Simulations				2					13								1	4		
20	140.5					2					12										1	4
21 (A6)	141.8					Upstream Extent of Ice Cover Progression					3									1	2	
21	142.2										1								1	1		
22	144.8																		1	1		

**NOTES:**

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72<sup>W</sup> simulation assumes warm, 4°C reservoir releases.  
All other with-project simulations assume an "inflow-matching" temperature policy.
3. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.
4. All ice thickness in feet.
5. Winter air temperatures:  
1971-72 cold  
1976-77 very warm  
1981-82 average  
1982-83 warm

**SUSITNA HYDROELECTRIC PROJECT  
SOLID ICE THICKNESS  
MAXIMUM SIMULATED VALUES**

**TABLE IX**

		NATURAL CONDITIONS				WATANA ONLY					WATANA AND DEVIL CANYON				WATANA FILLING					
						1986 DEMAND				2001 DEMAND		2002 DEMAND		2020 DEMAND		YR. 1	YR. 2			
Slough or Side Channel	River Mile	1971-72	1976-77	1981-82	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72 <sup>W</sup>	1971-72	1982-83	1971-72	1976-77	1981-82	1982-83	1971-72	1982-83	1982-83	1981-82
Whiskers	101.5	5	2	4	3	5	2	3	2	3	5	2	5	1	2	2	4	1	2	3
Gash Creek	112.0	5	2	4	3	5	2	3	2	2	5	1	5	1	2	1	4	1	2	3
6A	112.3	5	2	4	3	5	2	3	2	2	5	1	5	1	2	1	4	1	2	3
8	114.1	5	2	4	3	5	2	3	2	2	5	1	5	1	2	1	4	1	2	3
MSII	115.5	5	2	4	3	5	2	3	2	1	5	1	4	1	1	1	4	1	2	3
MSII	115.9	5	2	4	3	5	2	3	1	1	5	0	4	1	1	1	4	1	2	3
Curry	120.0	5	2	4	3	5	2	2	0	1	5	0	4	1	1	0	3	0	2	3
Moose	123.5	5	2	4	3	4	1	2	0	0	4	0	4	0	0		2	0	2	2
8A West	126.1	5	2	3	3	4	1	1	0	0	4		3	0			1	0	1	2
8A East	127.1	5	2	3	3	3	1	1	0	0	4		3				1	0	1	2
9	129.3	5	2	3	3	3	1	1			4		3				1		1	2
9 u/s	130.6	5	2	3	3	3	1	1			4		2				0		1	2
4th July	131.8	5	1	3	3	2	1	1			4		2				0		1	2
9A	133.7	5	1	3	2	2	1	0			4		1						1	2
10 u/s	134.3	5	1	3	2	2	0	0			3		1						1	2
11 d/s	135.3	4	1	3	2	2	0	0			3		0						1	2
11	136.5	4	1	3	2	1	0	0			3		0						1	2
17	139.3	Upstream Boundary of Natural Simulations				0					2								0	2
20	140.5					0					2					0	2			
21 (A6)	141.8					Upstream Extent of Ice Cover Progression							1				0	2		
21	142.2												0		0	1				
22	144.8																	0	1	

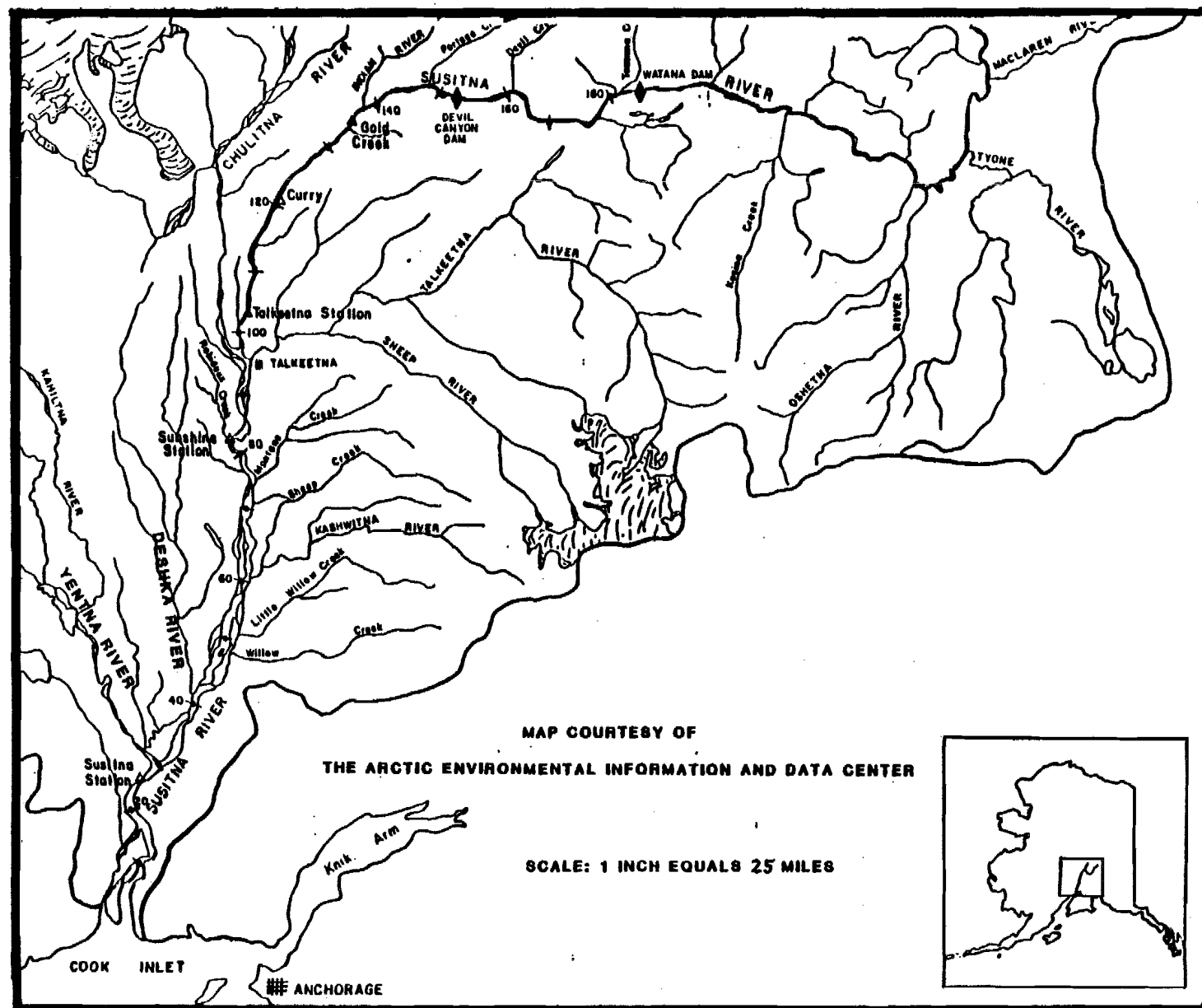
**NOTES:**

1. "Case C" operating guide is assumed for with-project simulations.
2. 1971-72<sup>W</sup> simulation assumes warm, 4°C reservoir releases. All other with-project simulations assume an "inflow-matching" temperature policy.
3. Upstream extent of simulated ice cover progression for Watana filling occurs upstream of River Mile 144.8.

4. All ice thickness in feet.
5. Winter air temperatures:  
1971-72 cold  
1976-77 very warm  
1981-82 average  
1982-83 warm

# FIGURES

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U.S. DEPT. OF INTERIOR



**FIGURE 1 - SUSITNA RIVER**

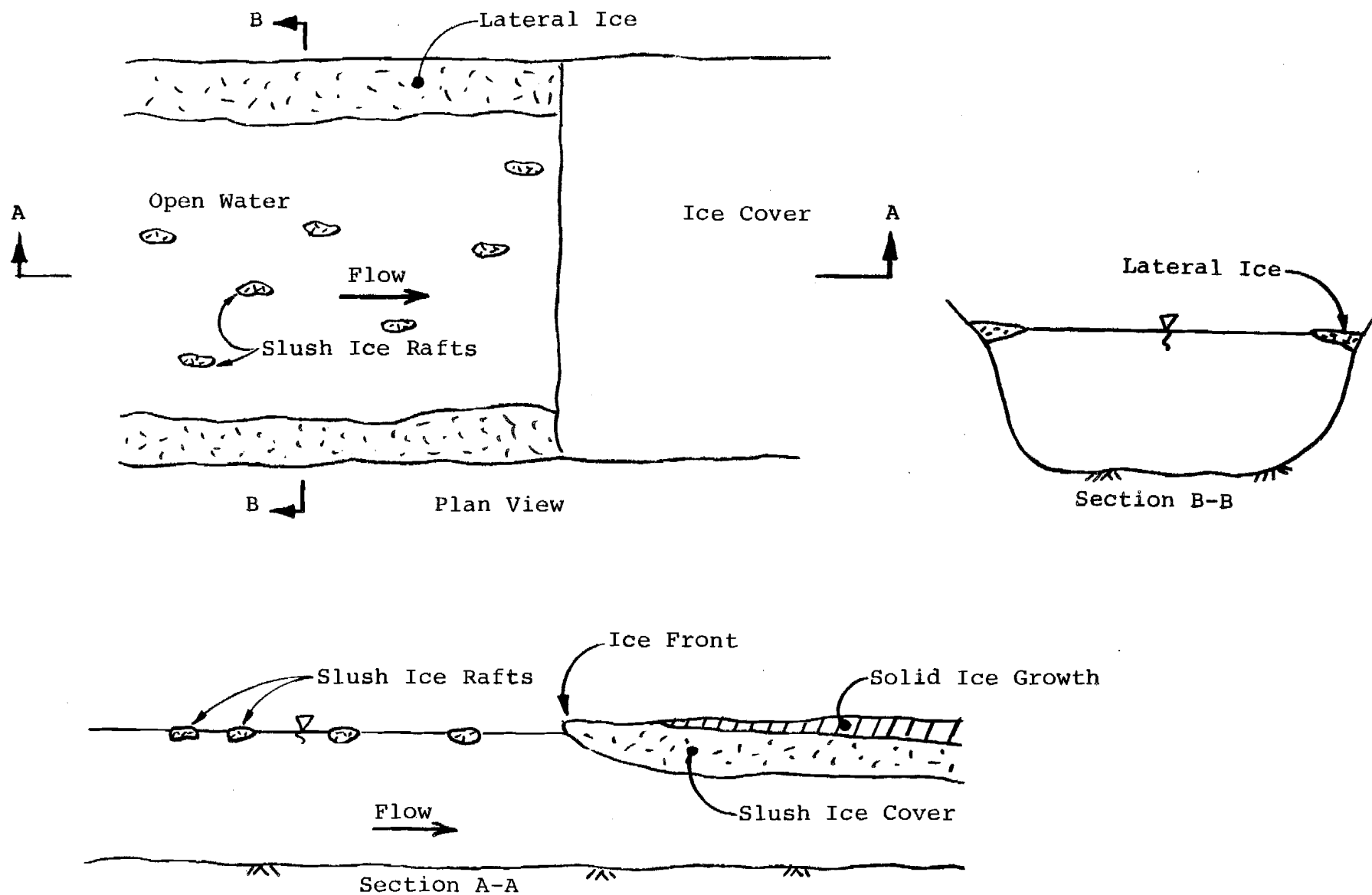


FIGURE 2 - SIMULATED RIVER ICE DEVELOPMENT

**HARZA-EBASCO**

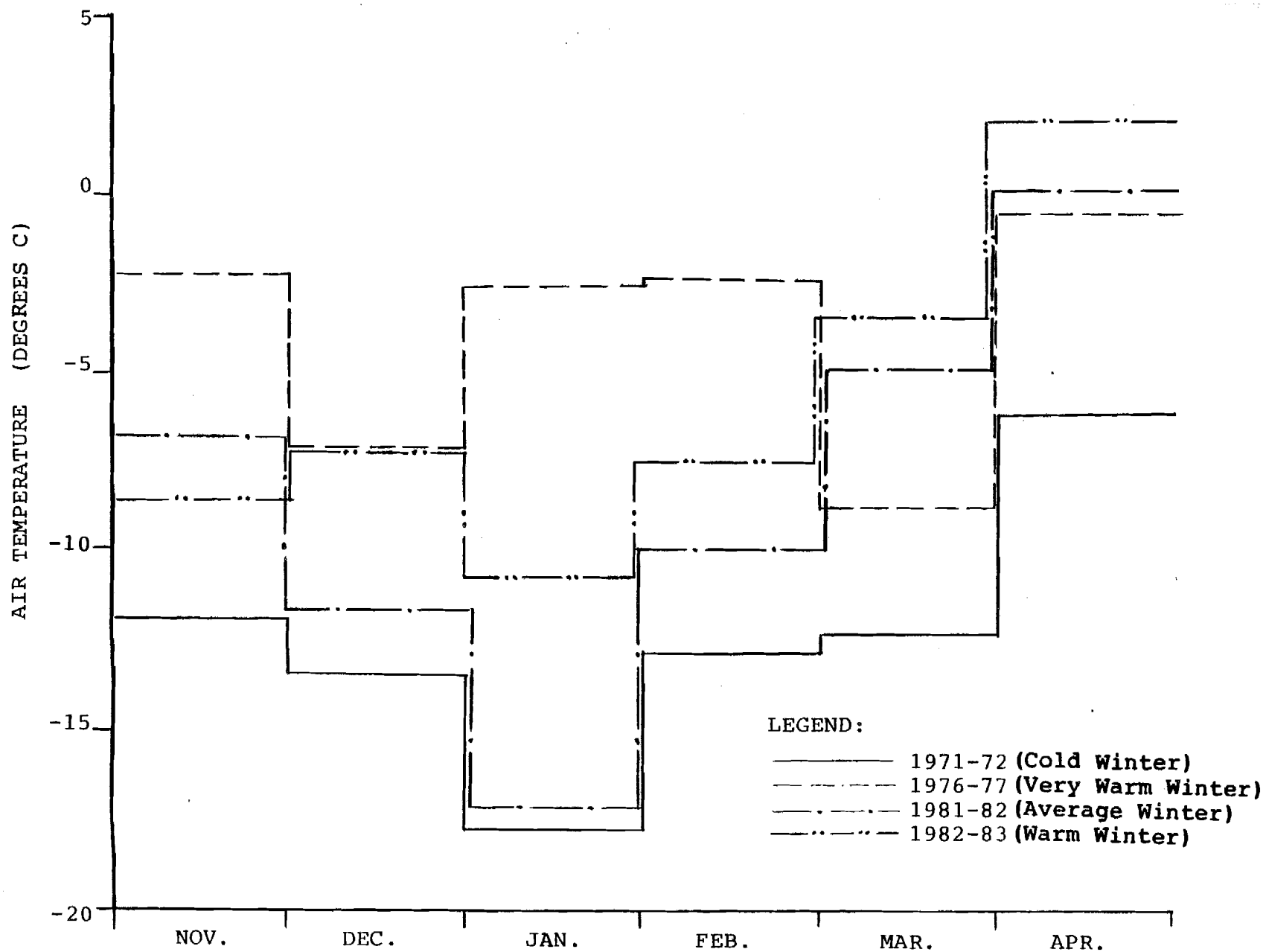


FIGURE 3 - AVERAGE MONTHLY AIR TEMPERATURES AT TALKEETNA

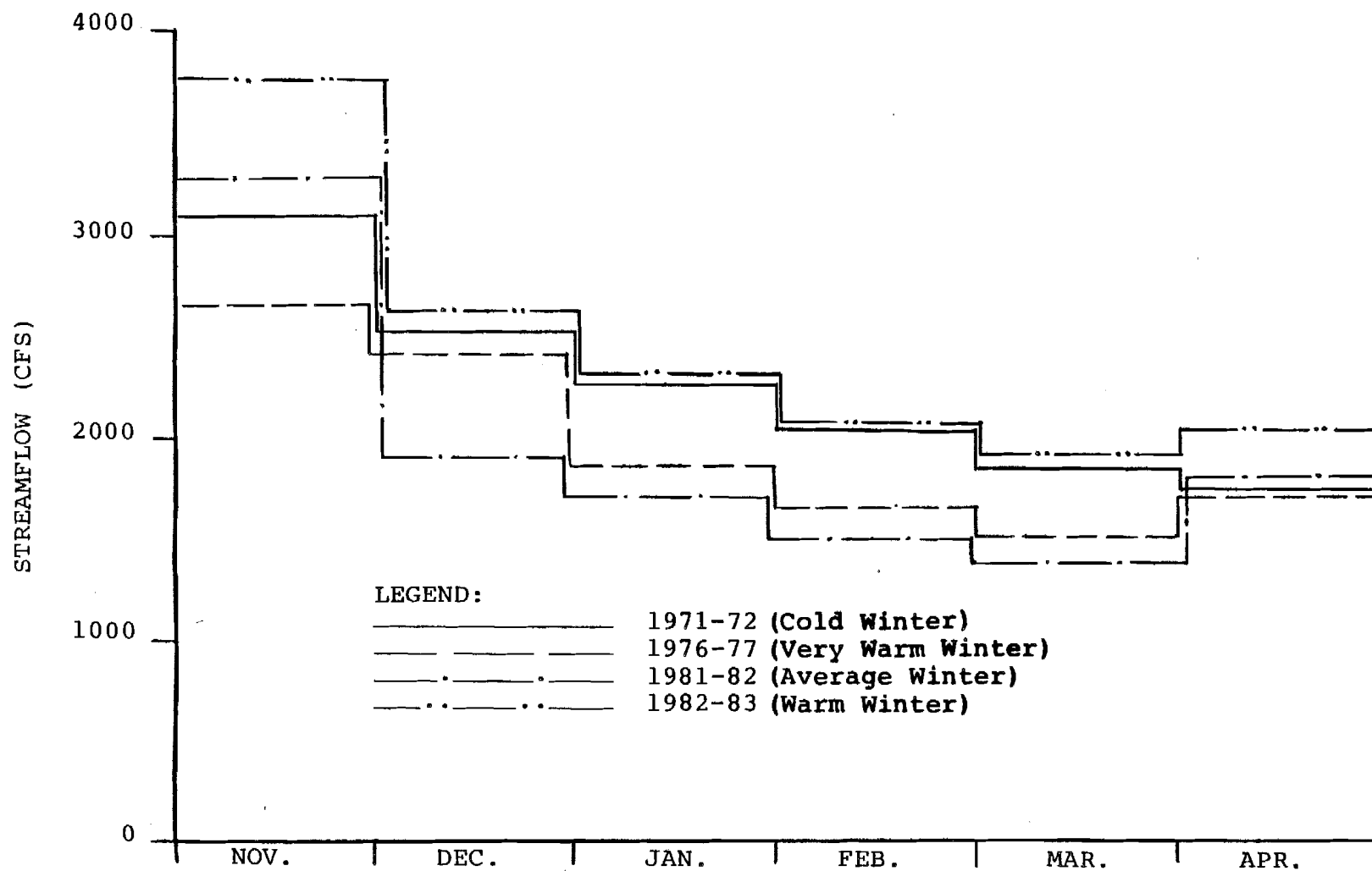


FIGURE 4 - SUSITNA RIVER NATURAL STREAMFLOWS AT GOLD CREEK — AVERAGE MONTHLY VALUES

**SUSITNA PROJECT  
TALKEETNA AIR TEMPERATURES  
NOVEMBER - MARCH  
1944 - 1983**

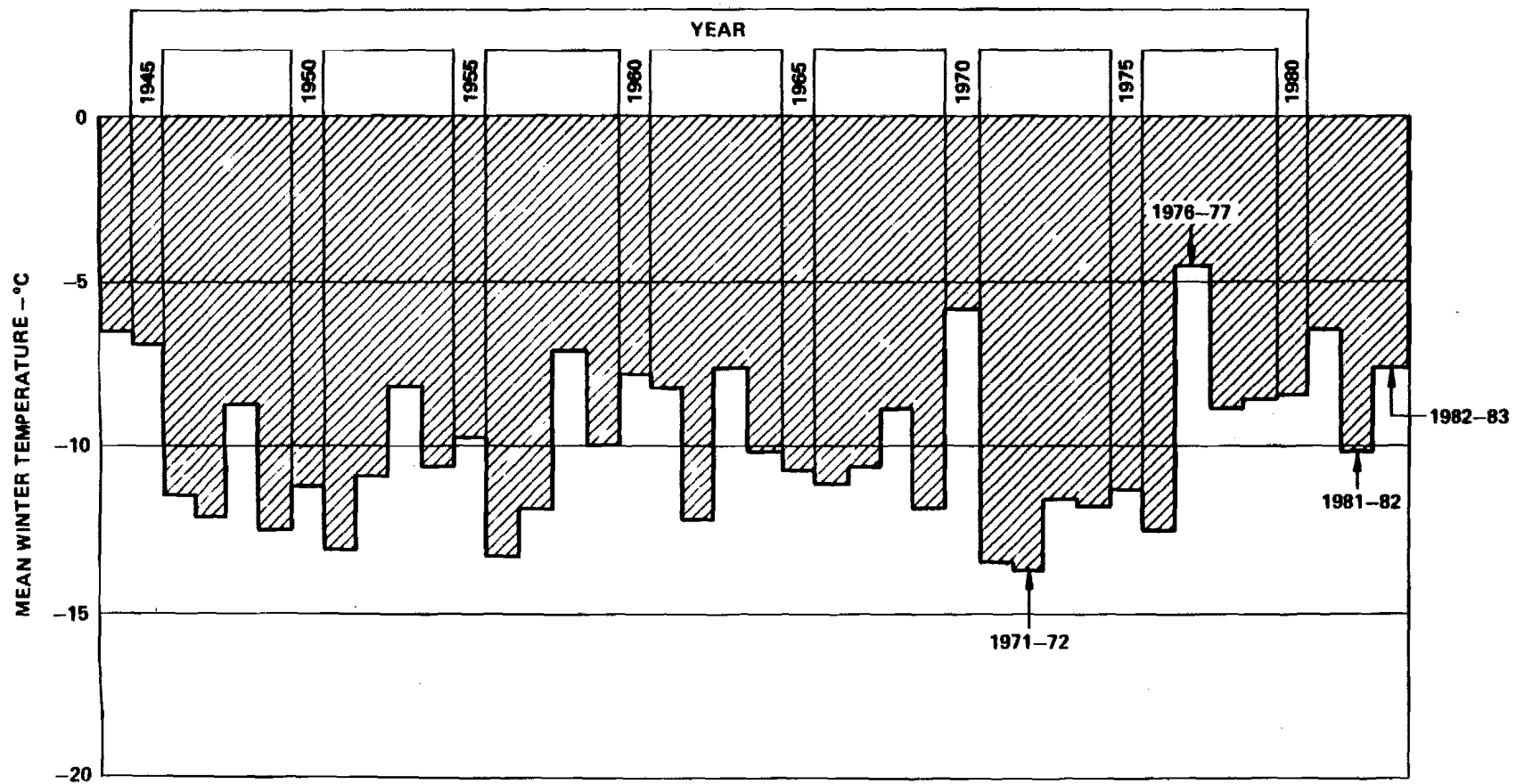


FIGURE 5



**SUSITNA PROJECT  
TALKEETNA AIR TEMPERATURES  
DECEMBER - FEBRUARY  
1944 - 1983**

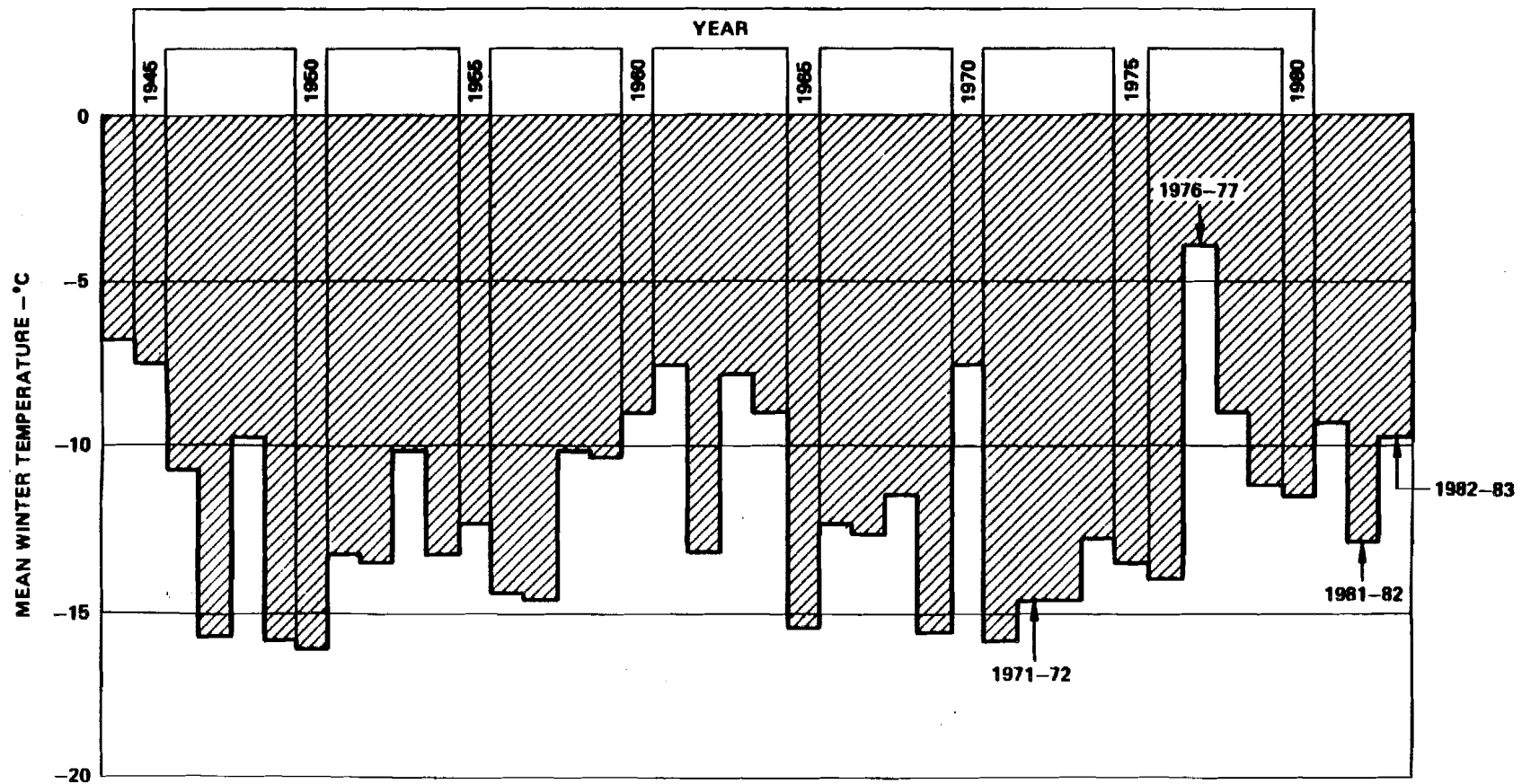


FIGURE 6

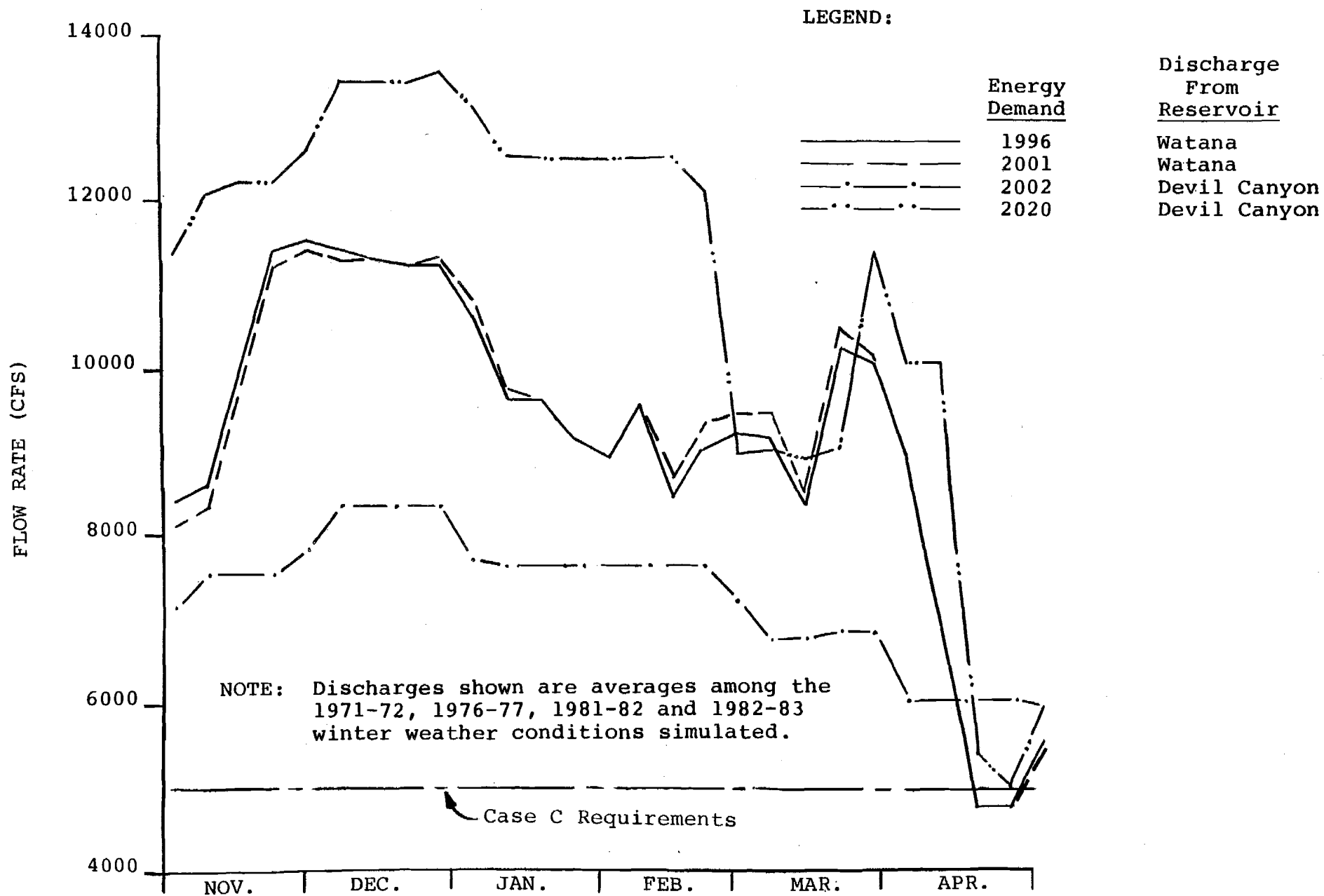
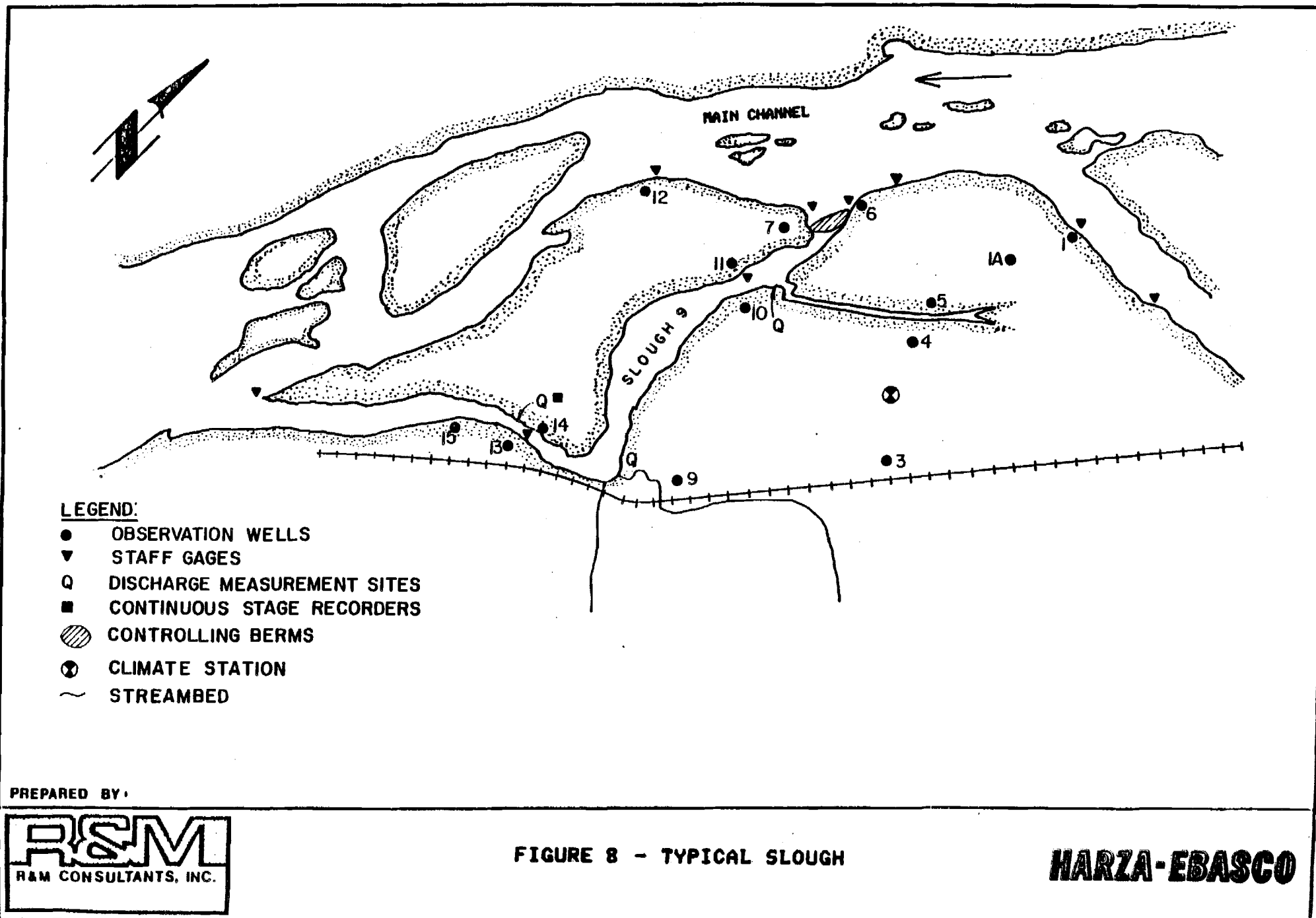
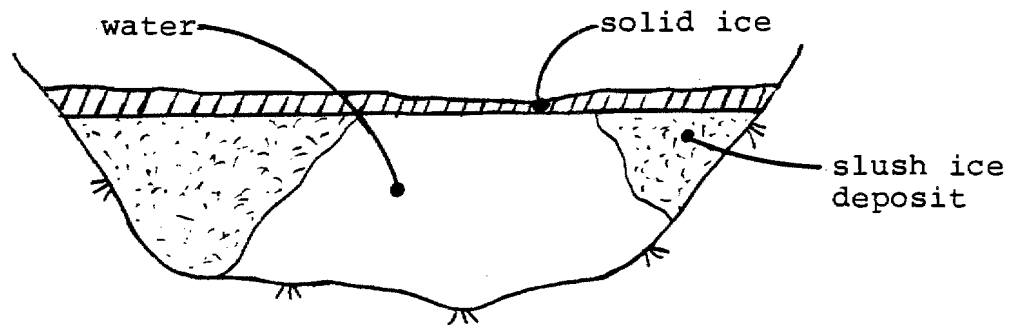
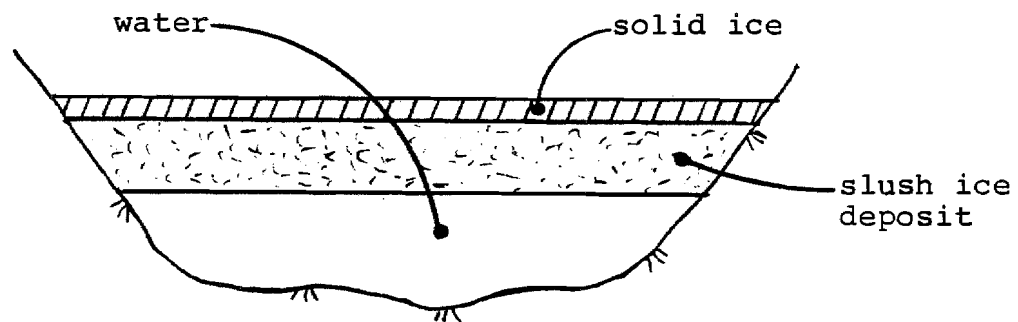


FIGURE 7 - DISCHARGE FROM PROJECT RESERVOIRS





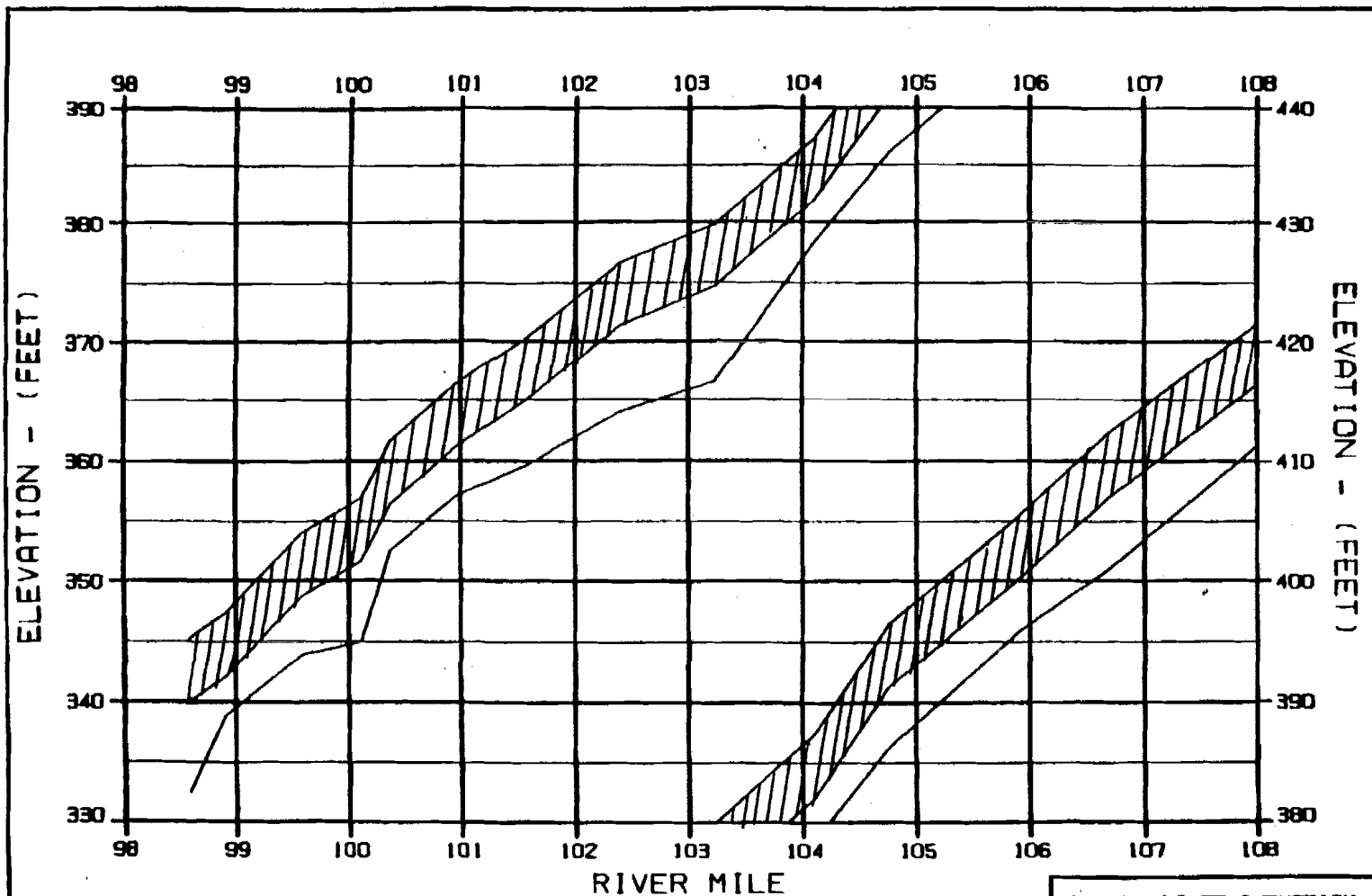
a. Actual River Cross-Section



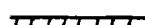



b. Simulated River Cross-Section

FIGURE 9 - ICE DISTRIBUTION - ACTUAL VS. SIMULATED

# EXHIBIT A



LEGEND:

-  TOP OF SOLID ICE
-  SLUSH/SOLID ICE INTERFACE
-  BOTTOM OF SLUSH ICE
-  RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

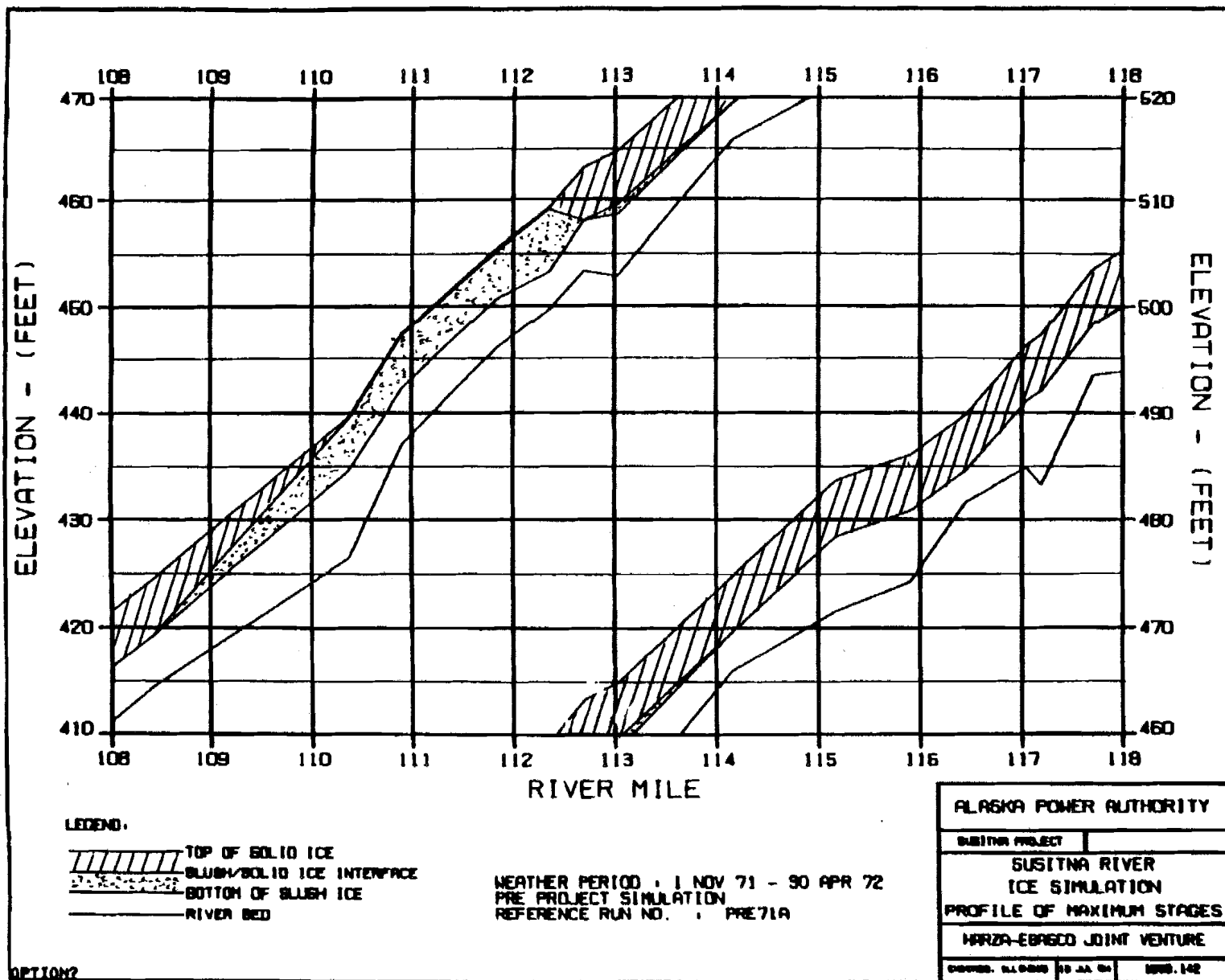
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

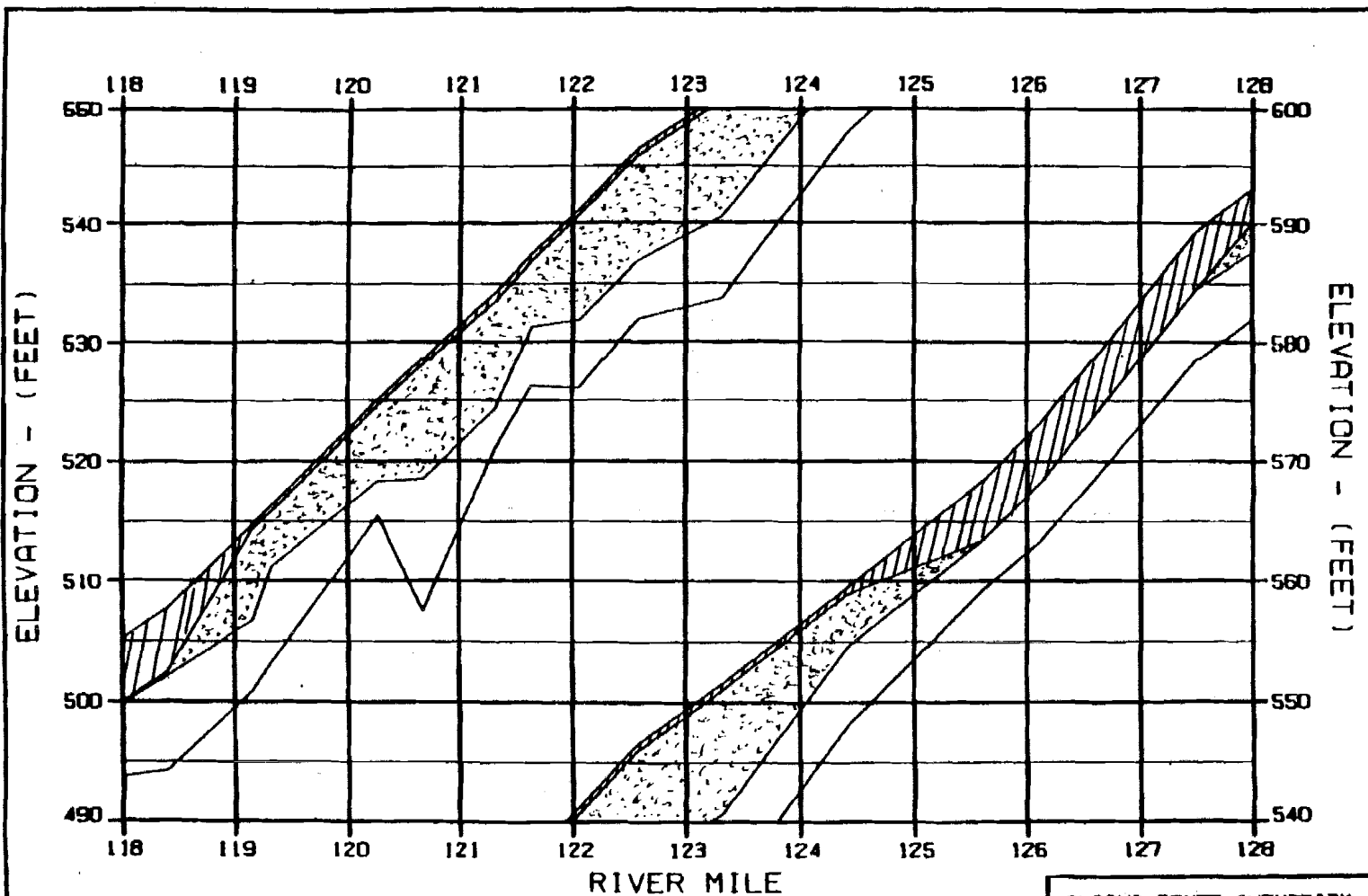
HARZA-EBASCO JOINT VENTURE

DESIGNED BY: [blank] 10 JUL 74 1000.142

OPTION?

c





LEGEND:

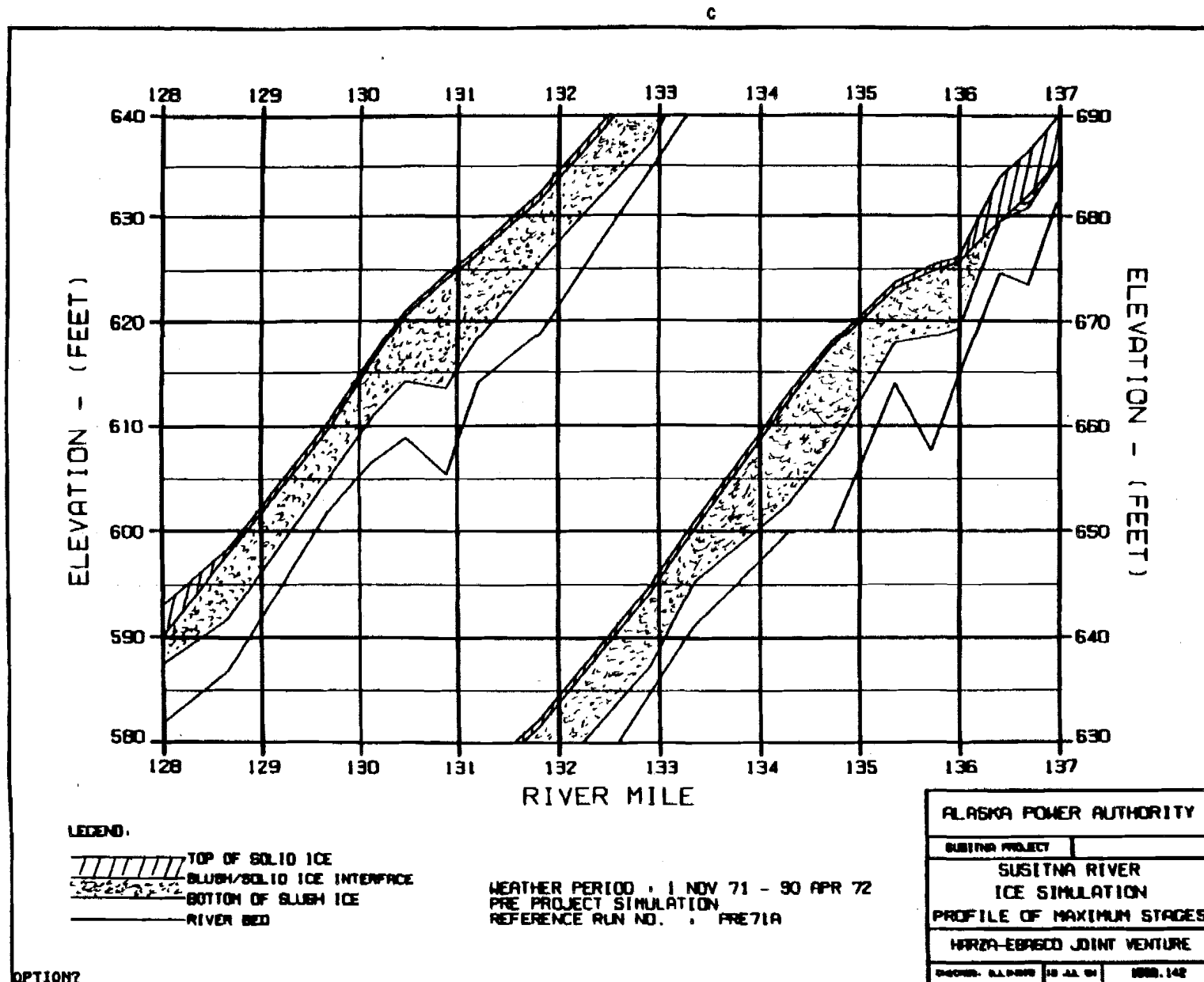
- TOP OF SOLID ICE
- SLUSH/SOLID ICE INTERFACE
- BOTTOM OF SLUSH ICE
- RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

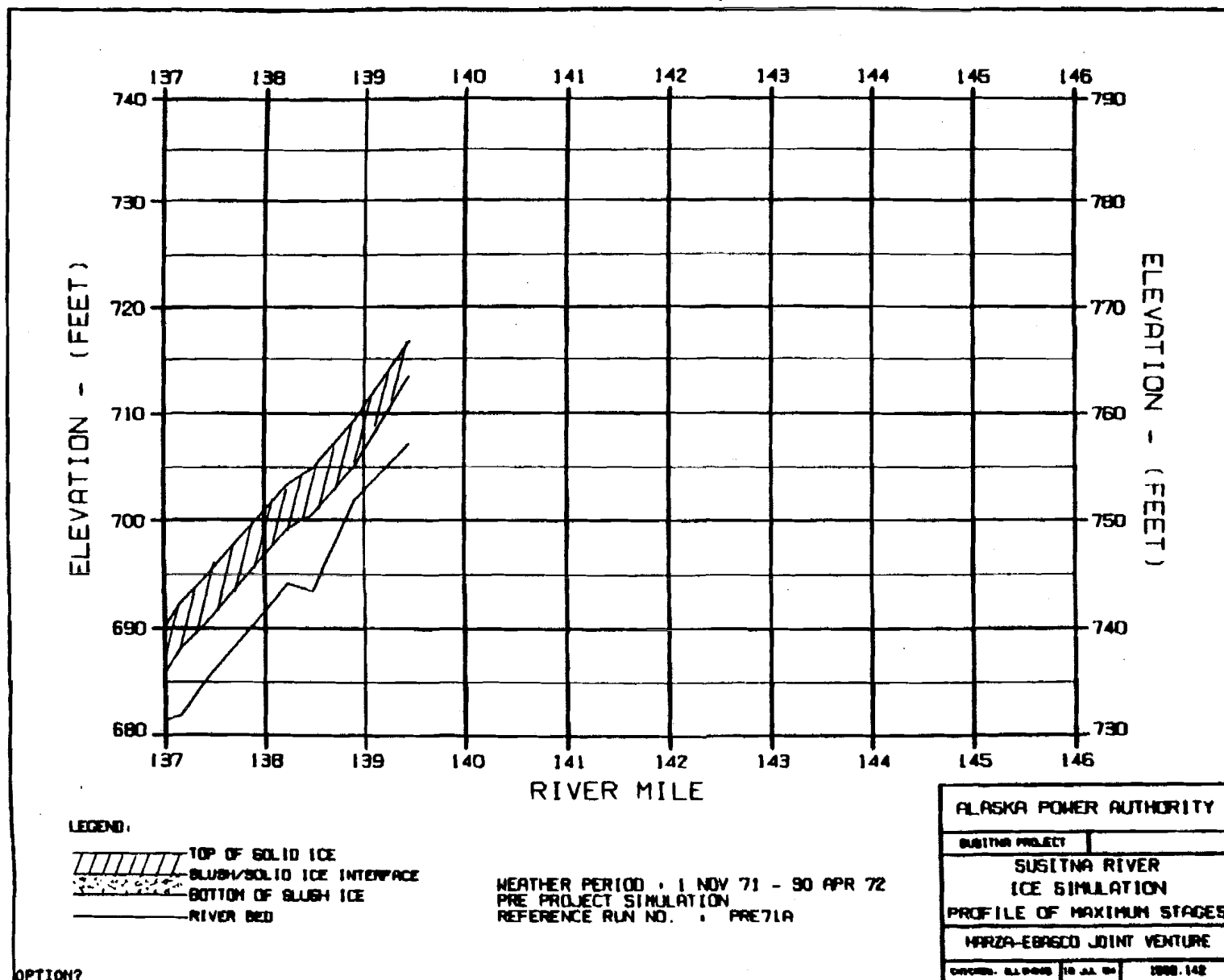
ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
PROFILE OF MAXIMUM STAGES		
HARZA-EBASCO JOINT VENTURE		
CHIEF: B. L. BROWN	DATE: 10 JUL 72	1000.142

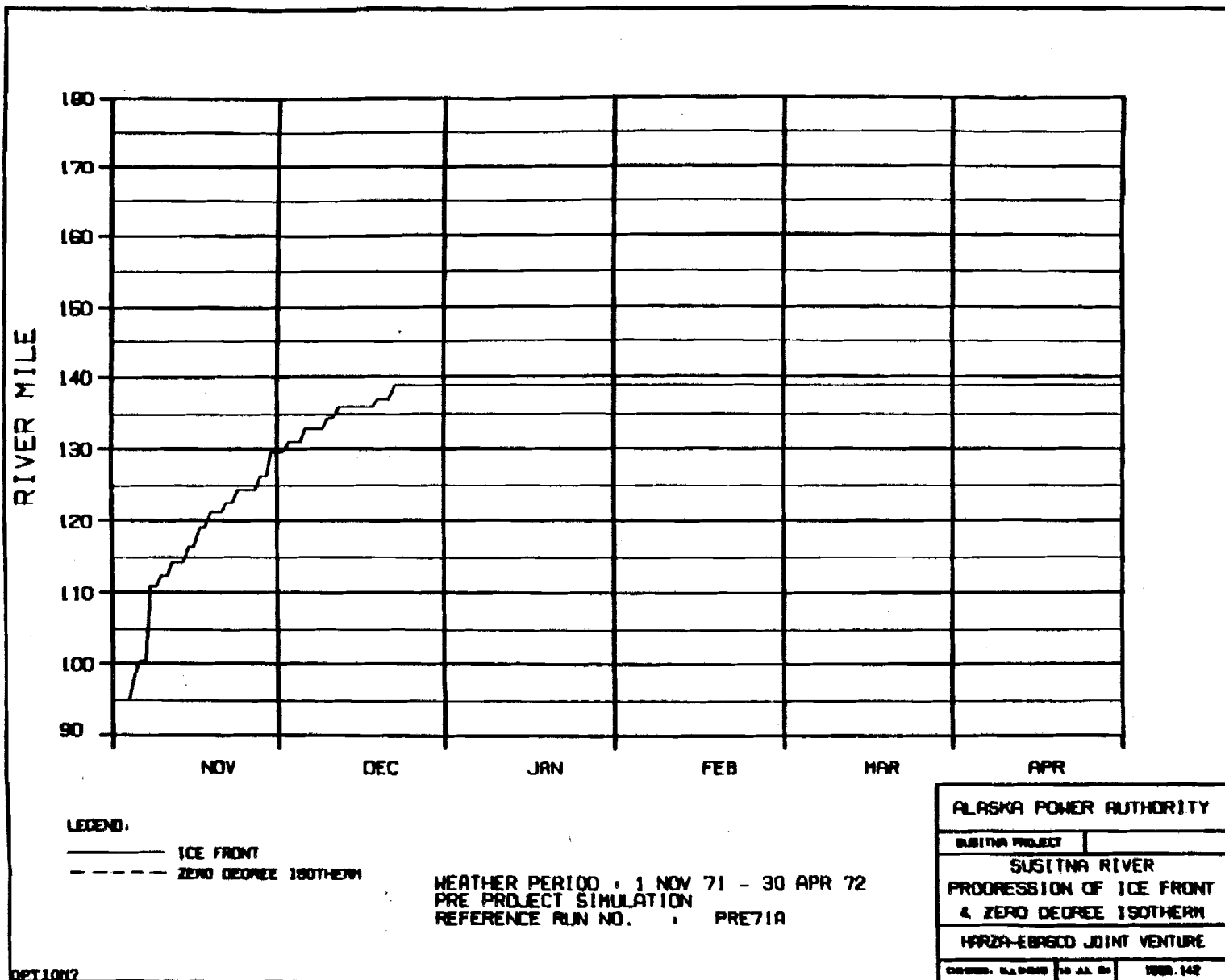
OPTION?

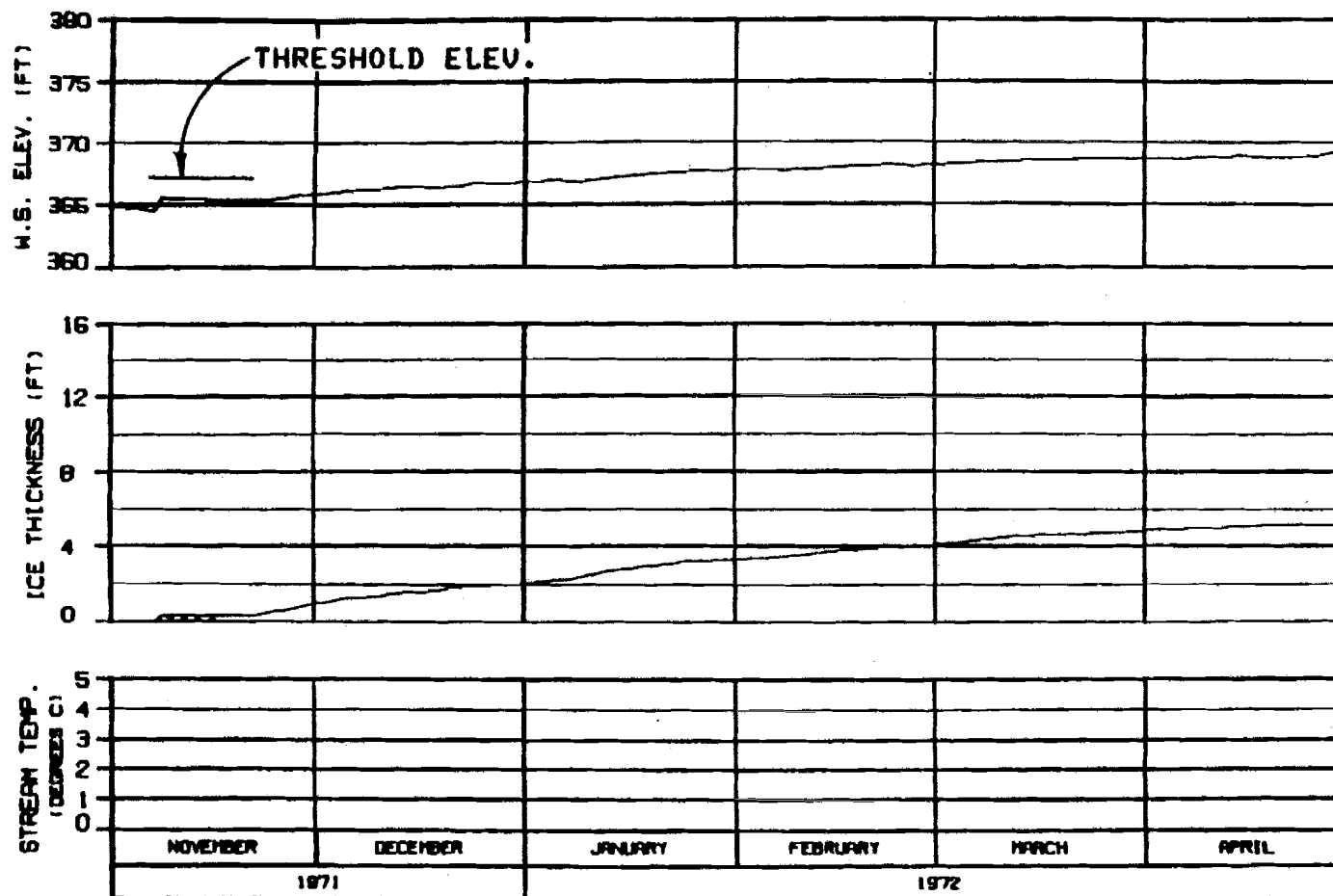




c







HEAD OF WHISKERS SLOUGH  
RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

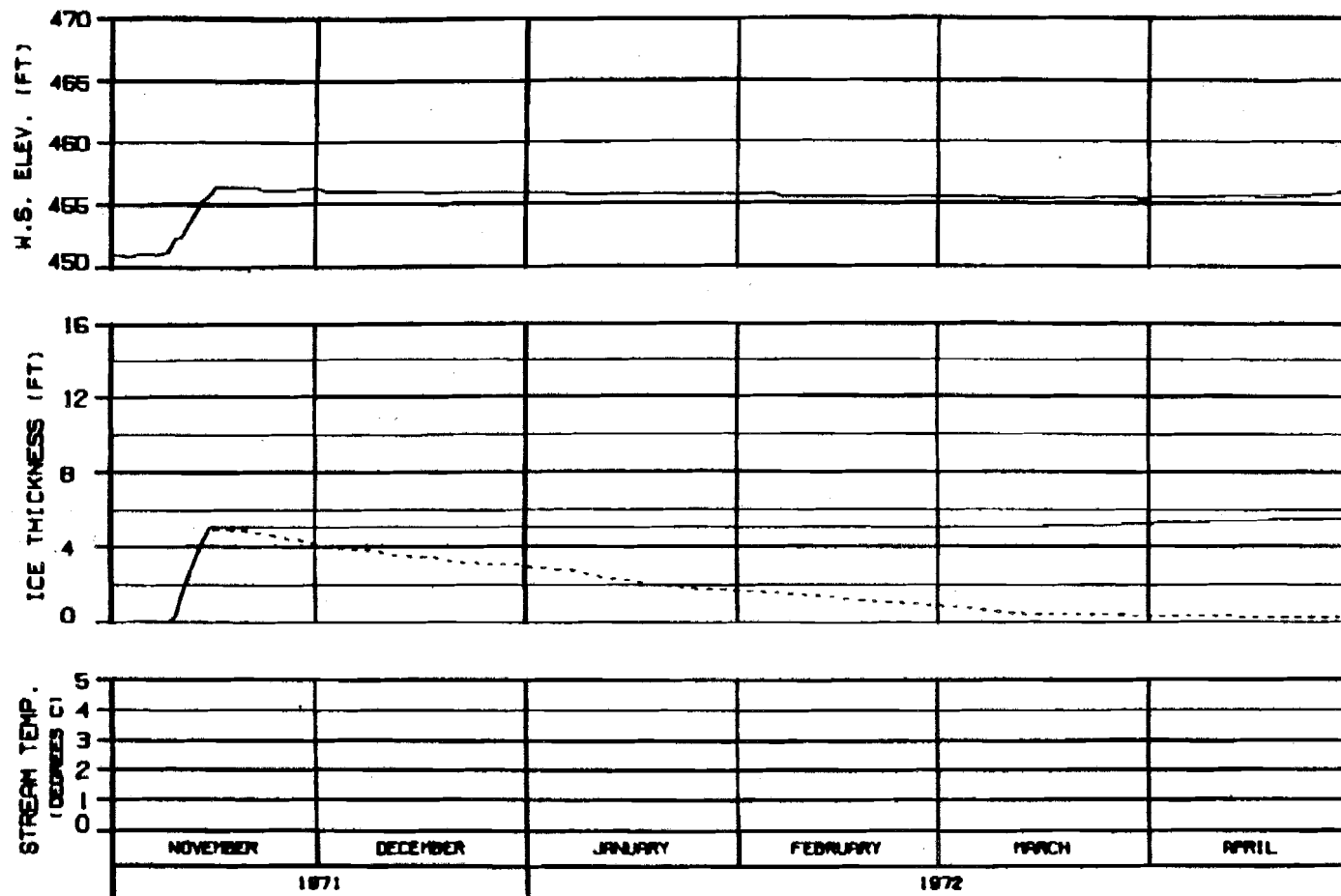
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EGRECO JOINT VENTURE

DRAWN: R.L. DAVIS 30 JAN 72 1000.142



SIDE CHANNEL AT HEAD OF GASH CREEK  
RIVER MILE : 112.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

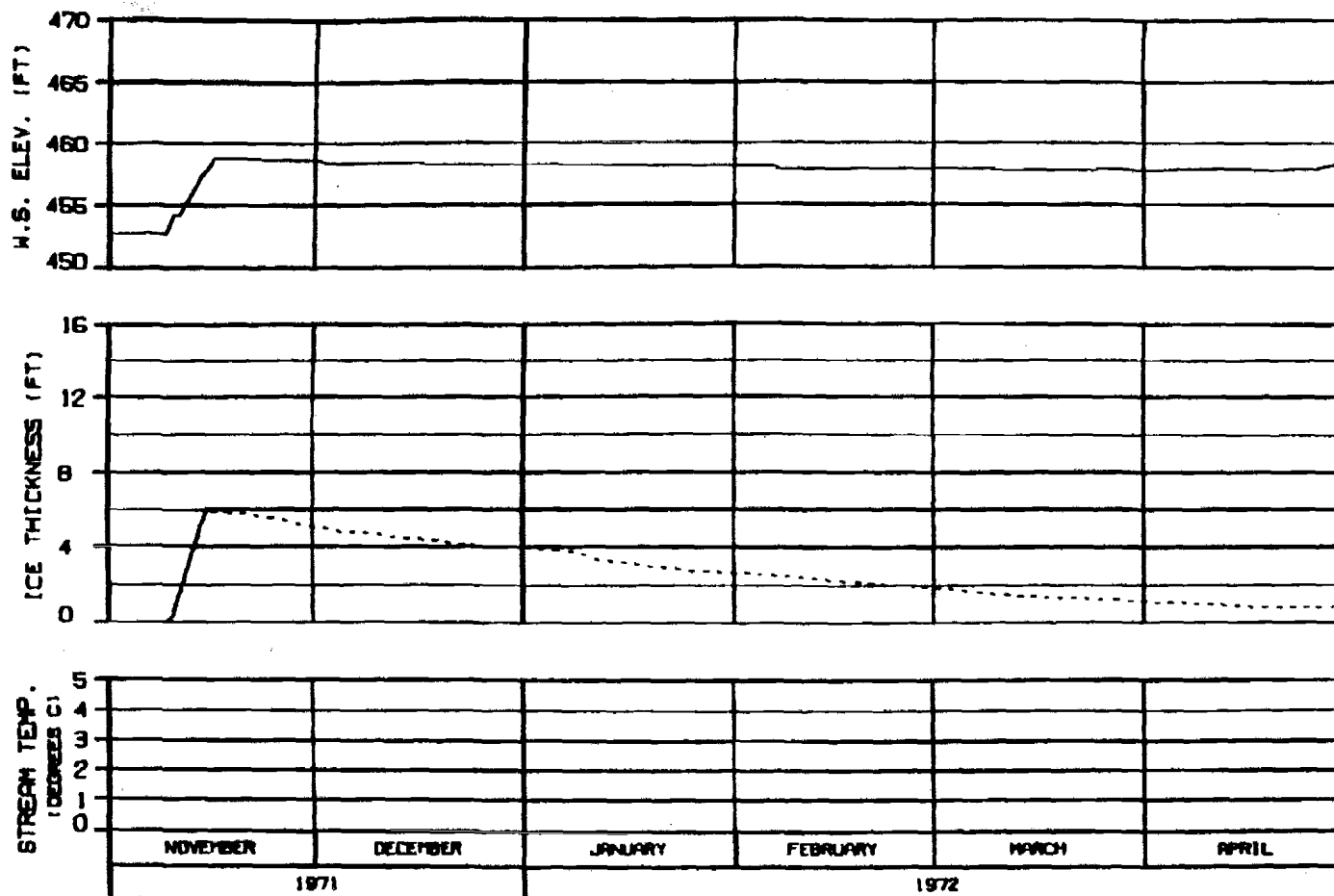
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: S.A. 1000 30 JUL 81 1000.142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

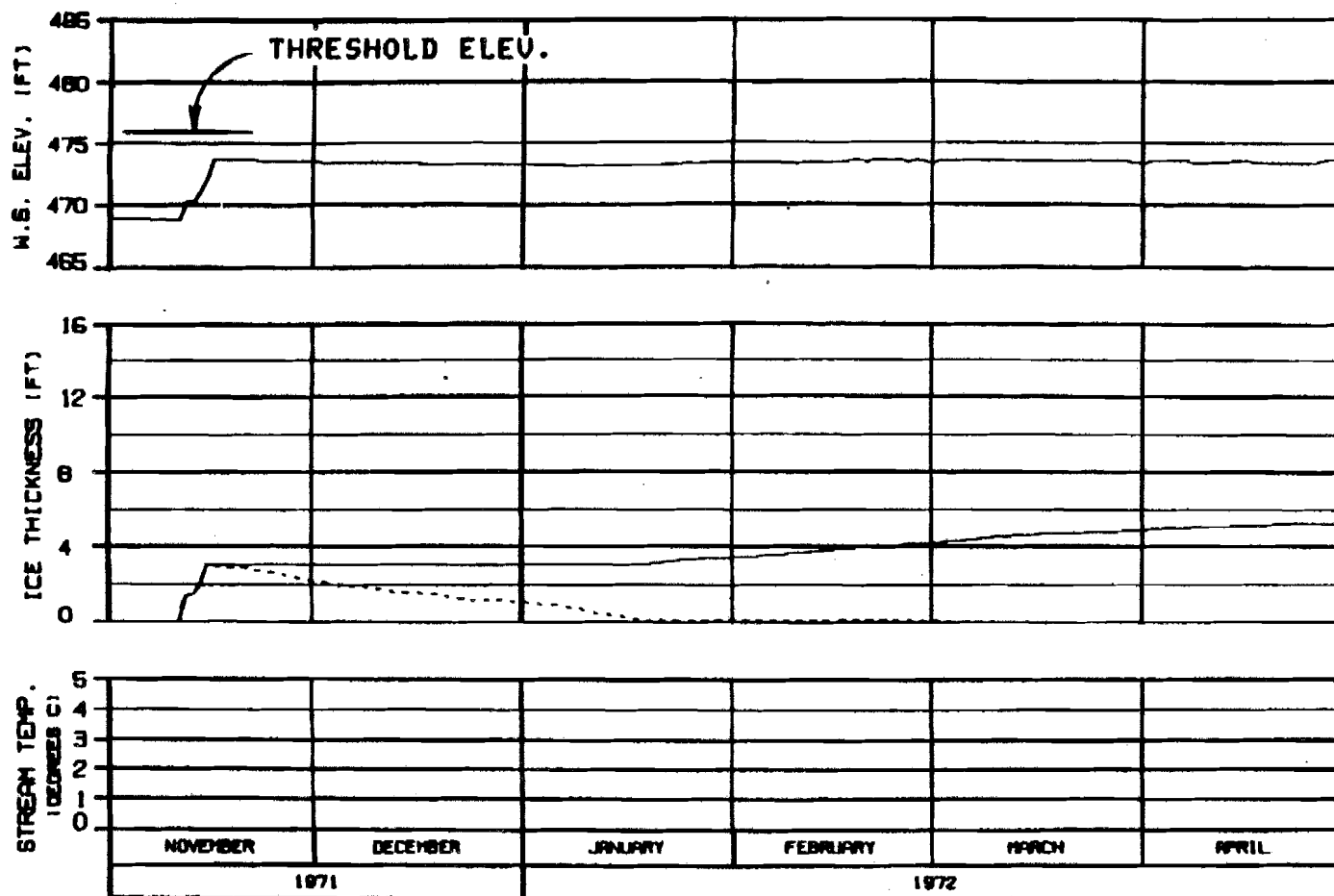
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBERD JOINT VENTURE

CHECKED: SLD/STG NO. 44 04 1000.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

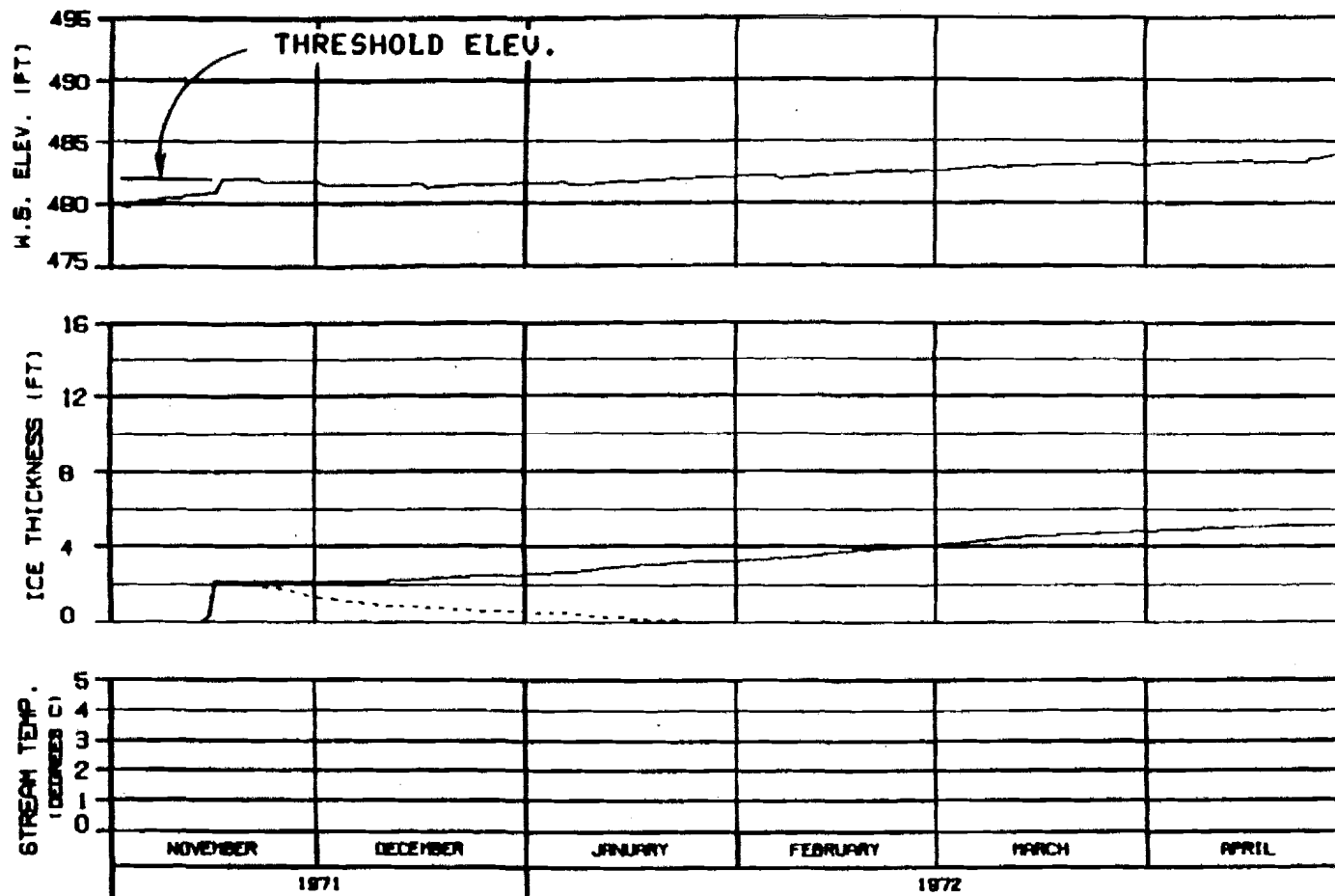
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBERG JOINT VENTURE

ORDER: 114100 10 JUL 71 1000.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

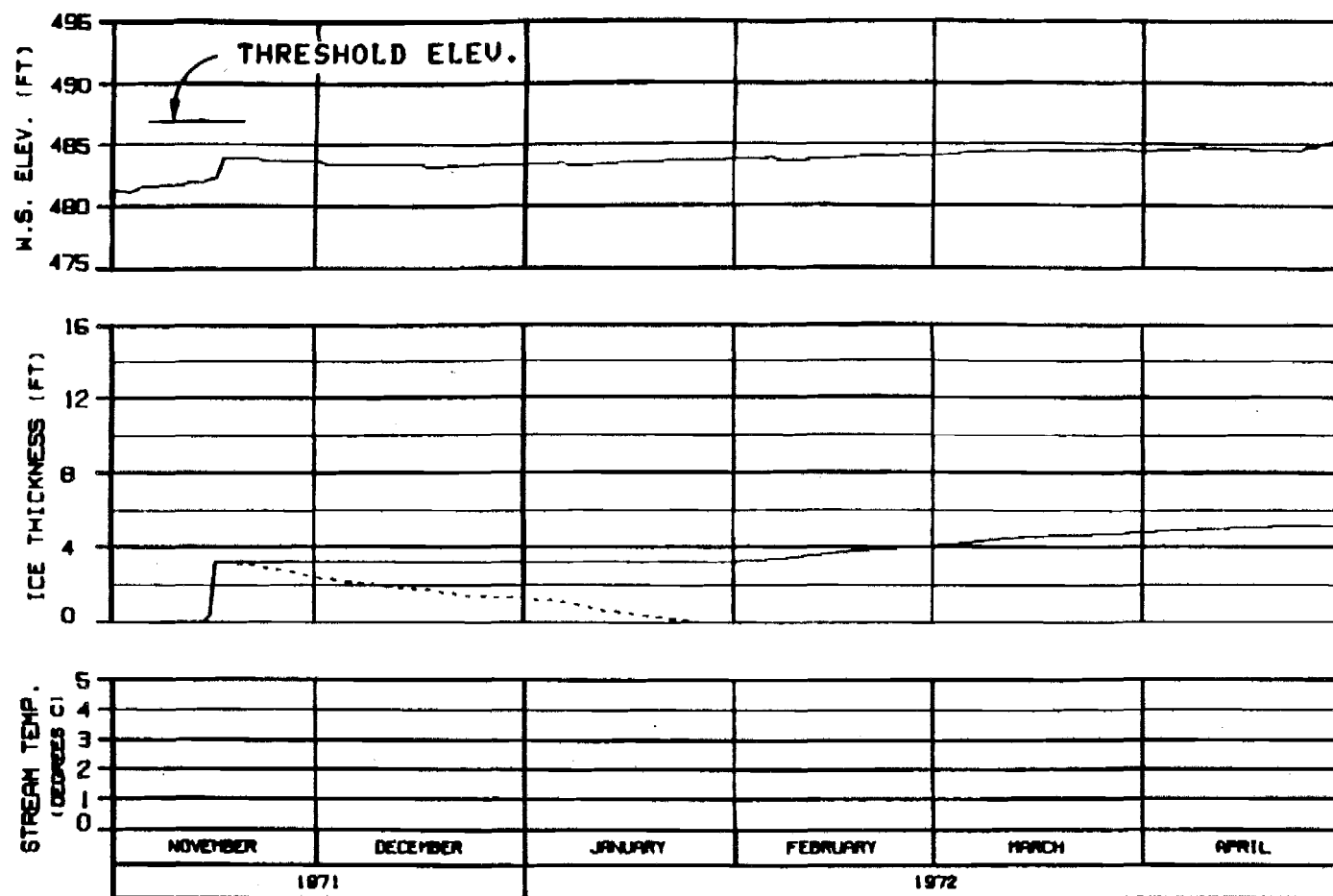
SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBASCO JOINT VENTURE

CHART NO. 11-10000 10 JUL 72 2000-142





HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - BLUISH COMPONENT

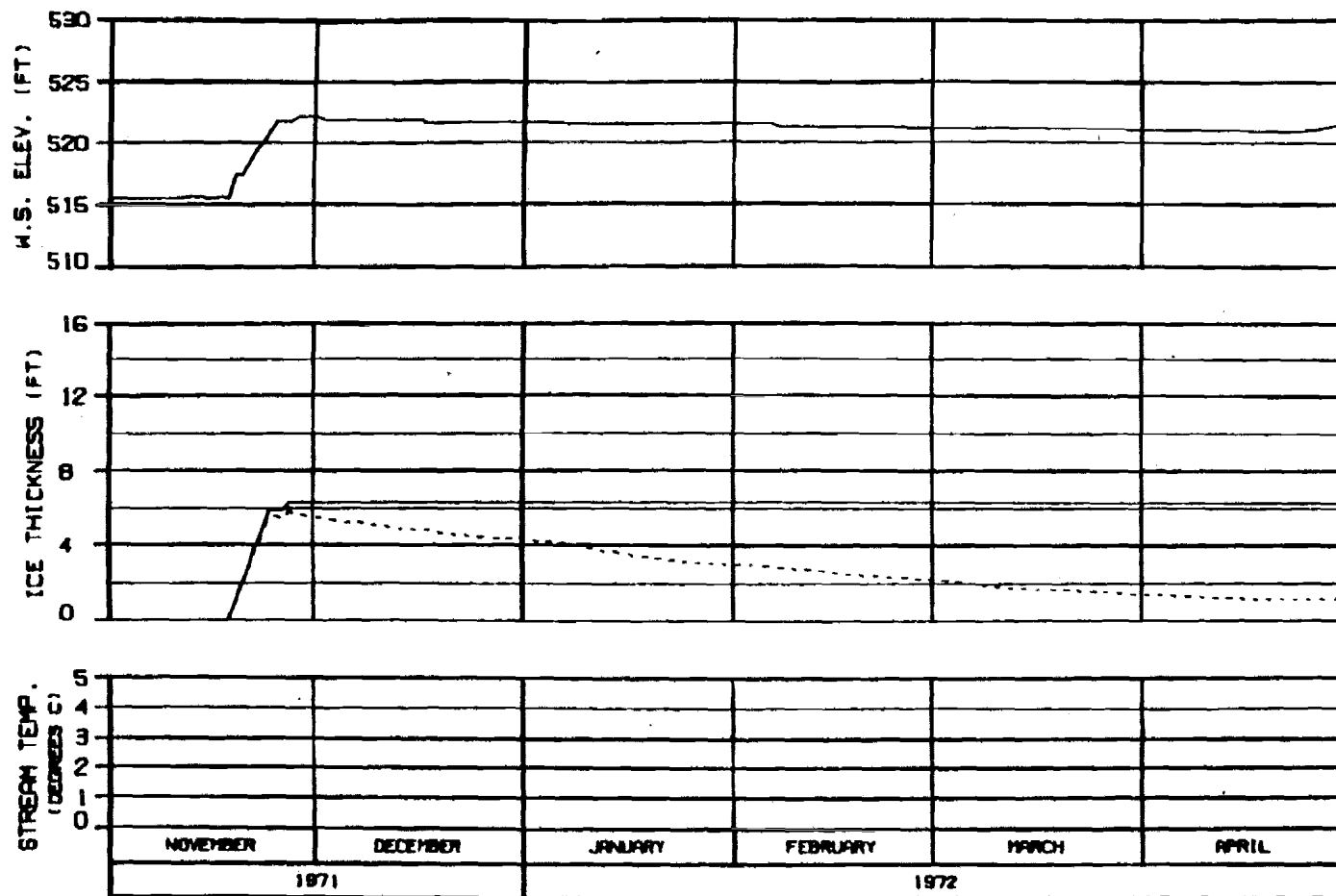
ALASKA POWER AUTHORITY

SUBMITTAL PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

ENCLOSURE - 11/1/71 TO 11/1/71 11/1/71



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

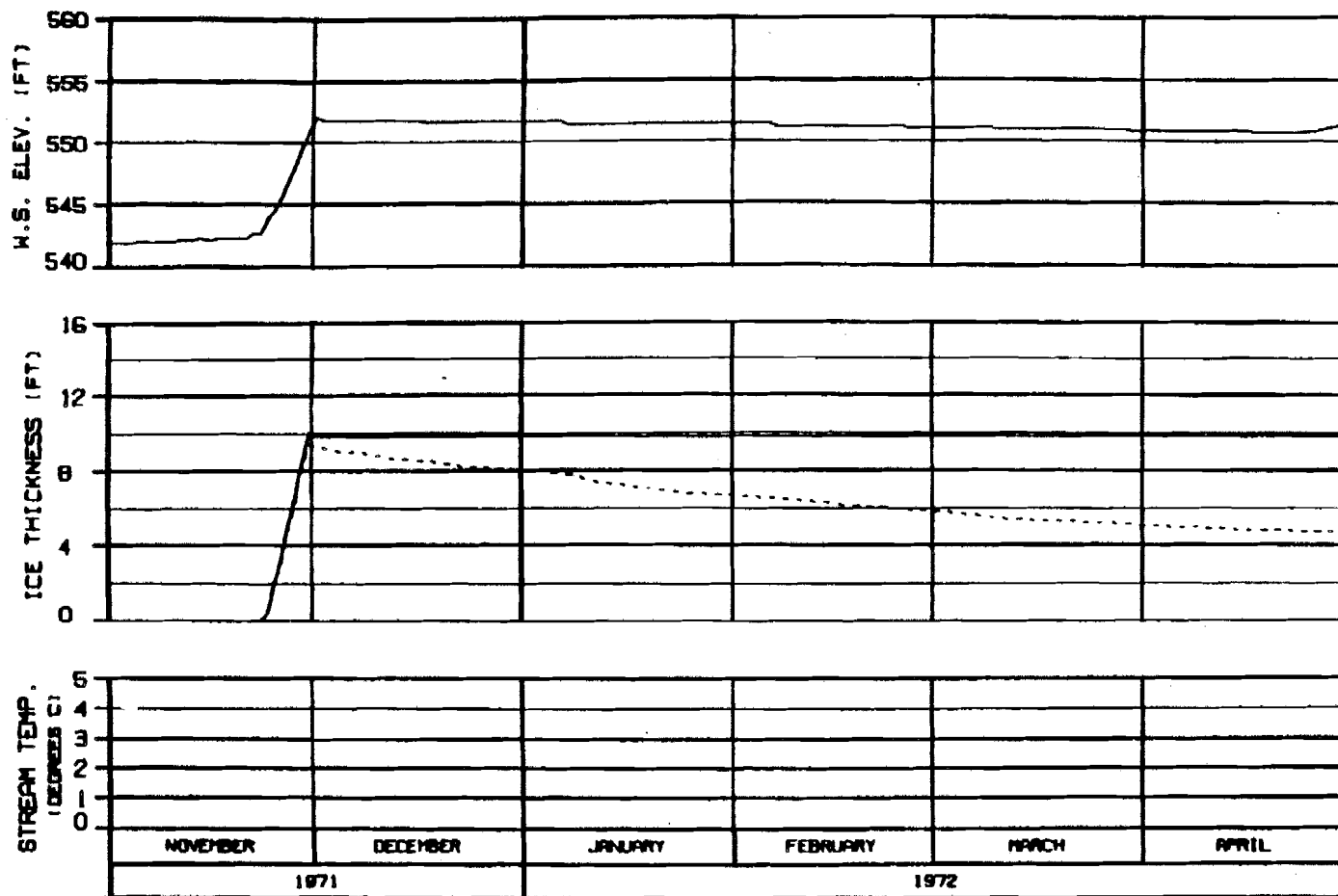
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARDA-EBASCO JOINT VENTURE

OWNER: ALASKA POWER AUTHORITY  
 DRAWING NO: 142

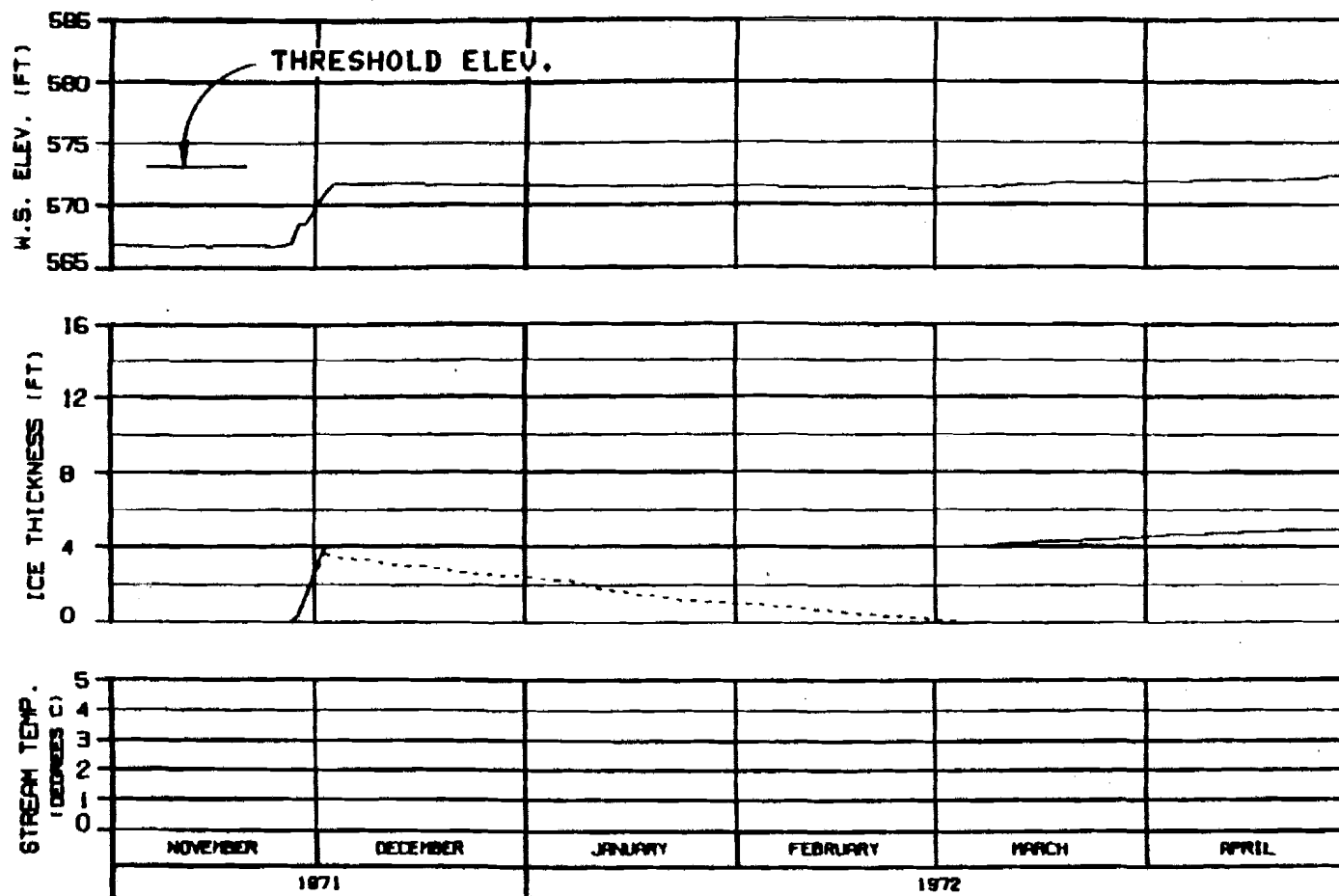


HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EBASCO JOINT VENTURE	
DESIGNED BY: AL-1000	30 JUL 71
1000.142	



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 71 - 30 APR 72

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND.

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

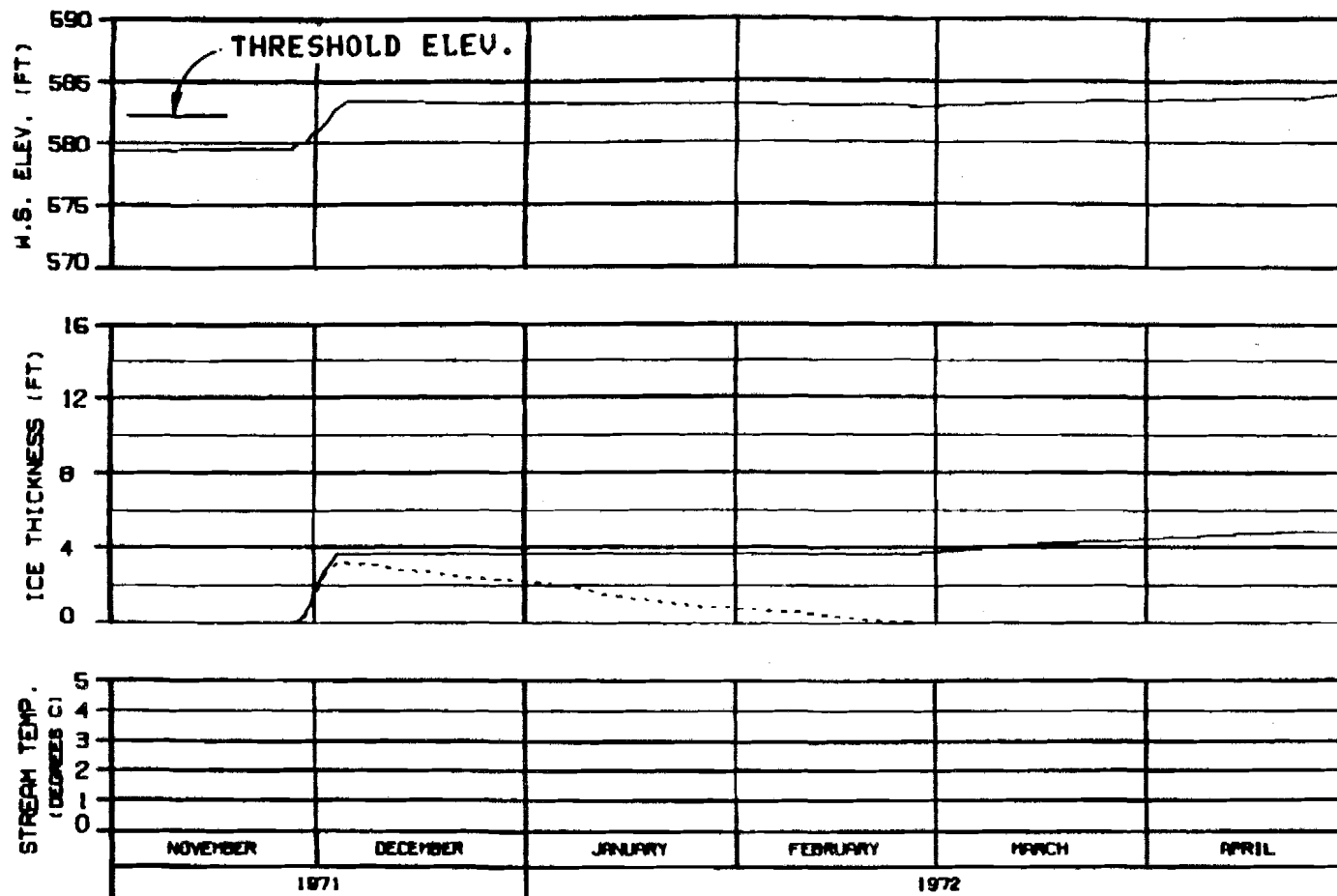
SUSITNA RIVER

ICE SIMULATION

TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHART NO. 142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

WEATHER PERIOD : 1 NOV 71 - 30 APR 72

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER

ICE SIMULATION

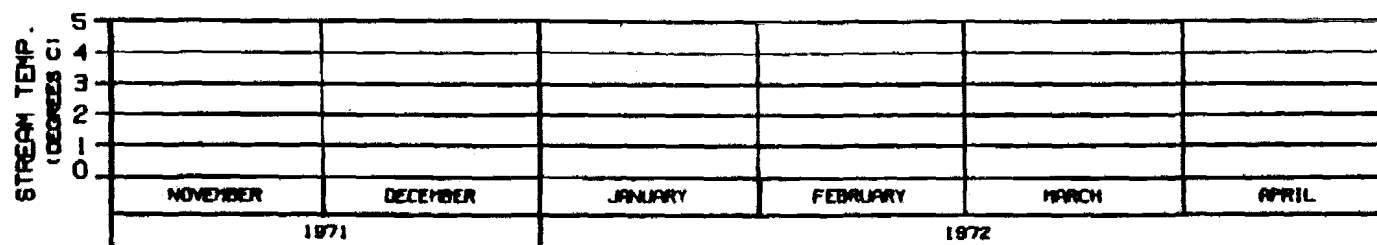
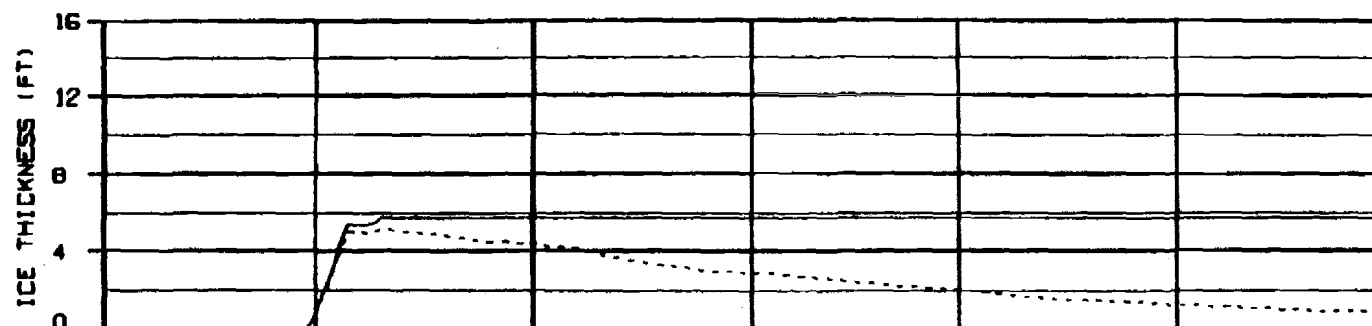
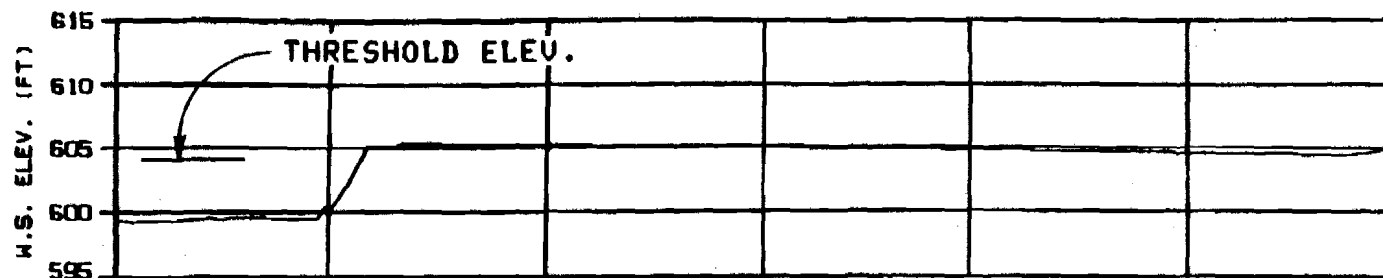
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: ALP/MS

30 JUL 71

1000.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

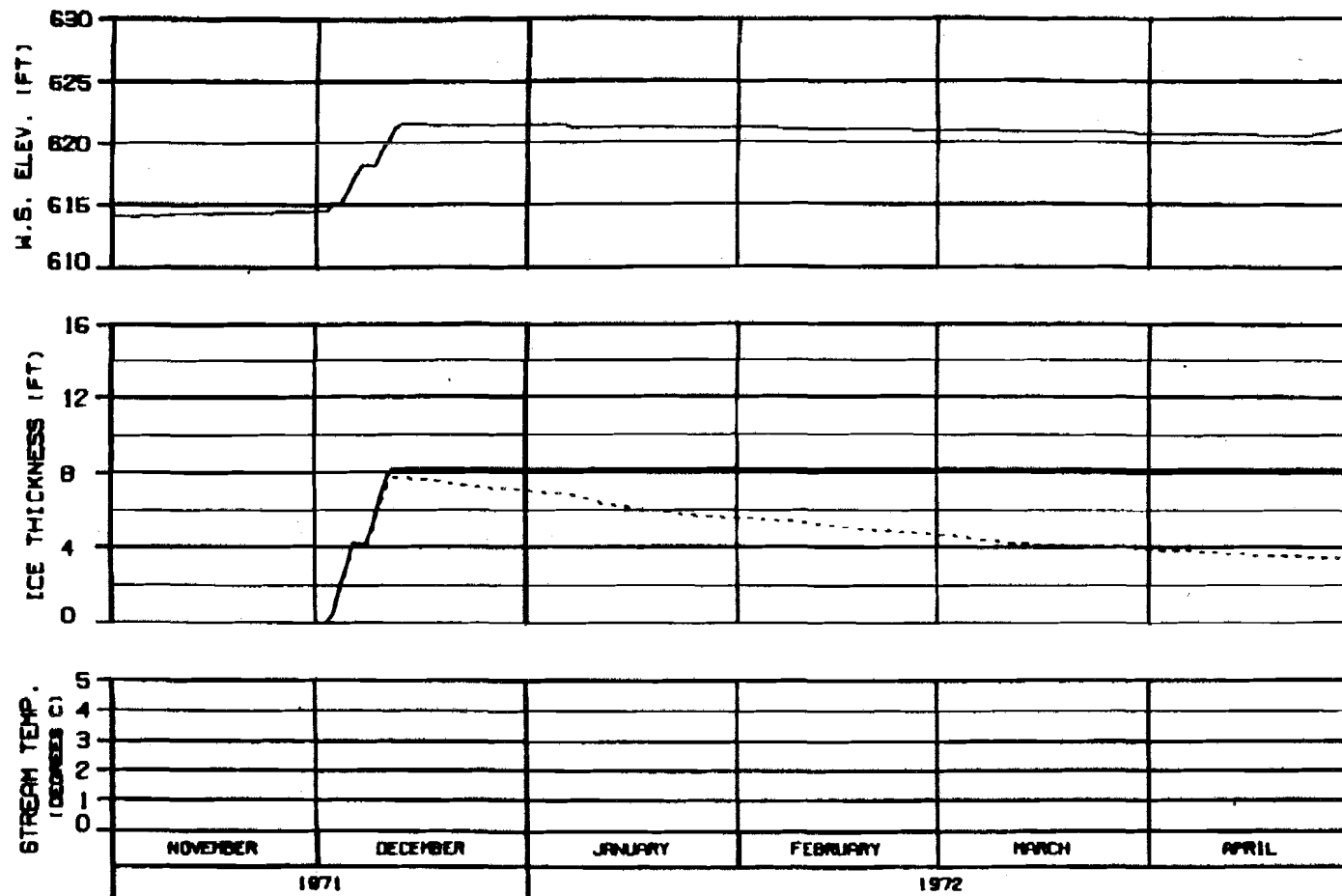
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

OWNER: ALP-EPJ 10 AS 01 1000.142

OPTION?

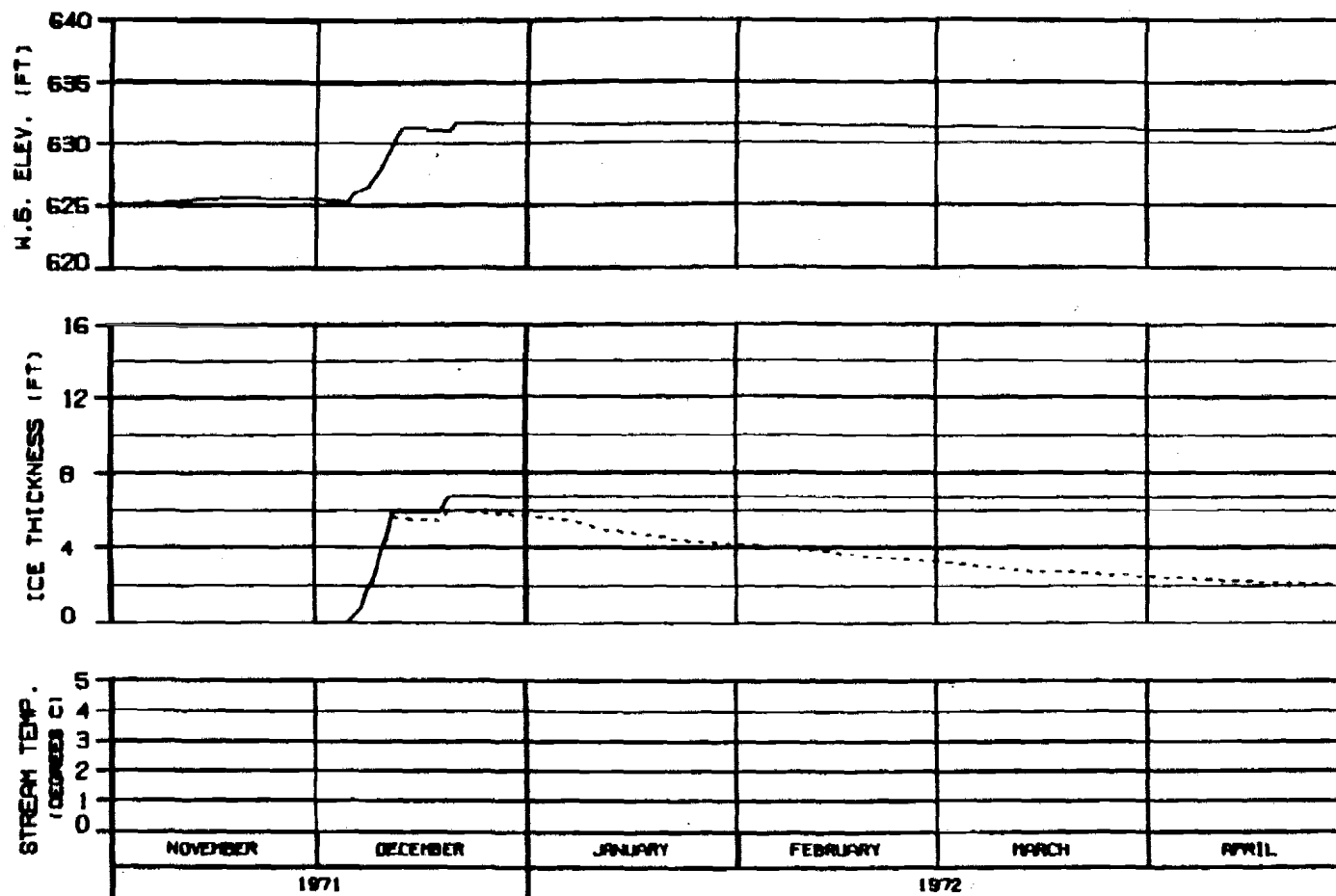
OPTION?



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 9  
 RIVER MILE : 130.60  
 WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EBRACO JOINT VENTURE	
DESIGNED BY: B. J. BENT	30 JUL 74
10000.142	



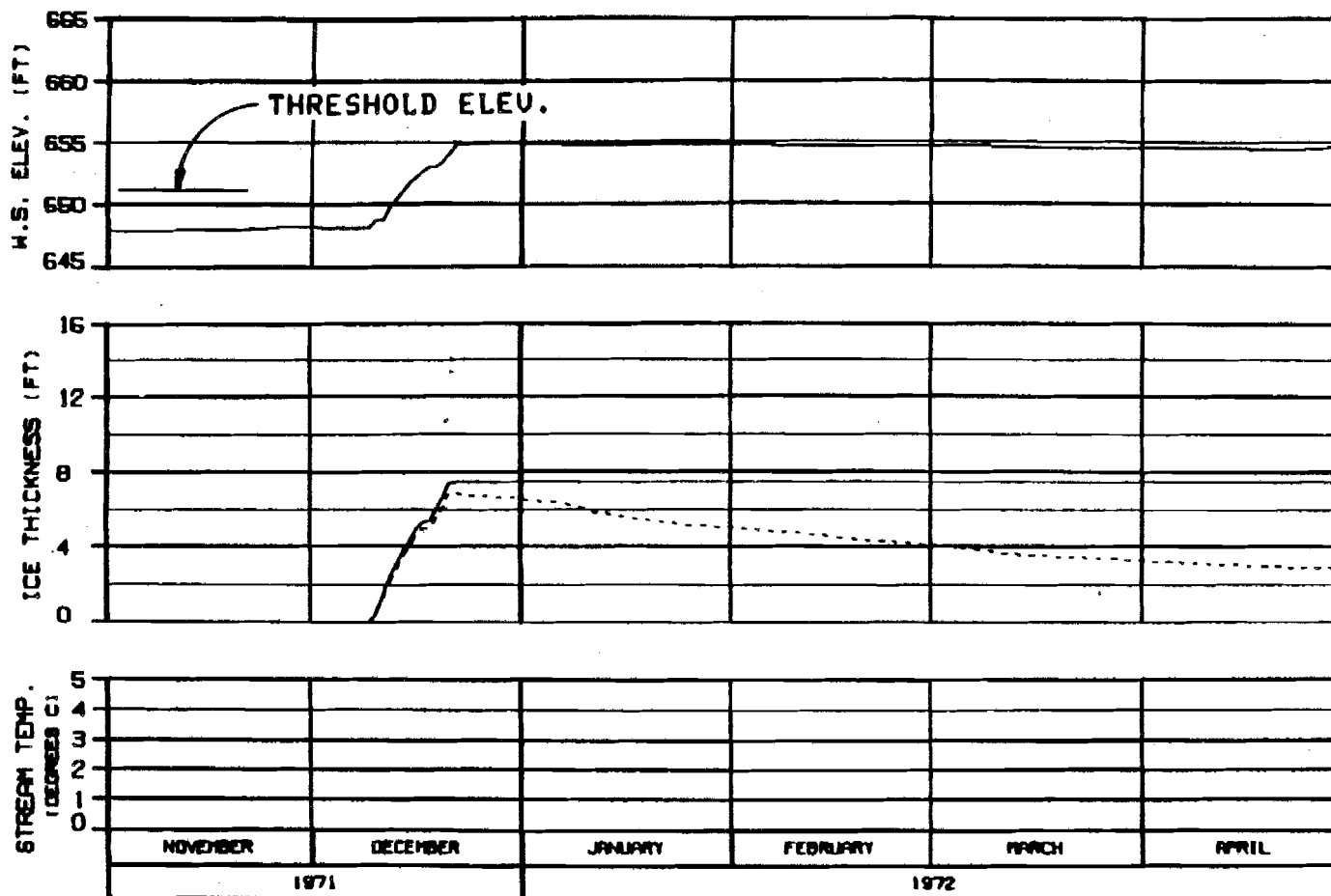
ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... BLUSH COMPONENT

SIDE CHANNEL U/S OF 4TH JULY CREEK  
 RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY	
EXISTING PROJECT	
SUSITNA RIVER	
ICE SIMULATION	
TIME HISTORY	
WARZA-EBASCO JOINT VENTURE	
CHART NO. 11-1000	30 JUL 72
SHEET 142	





HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

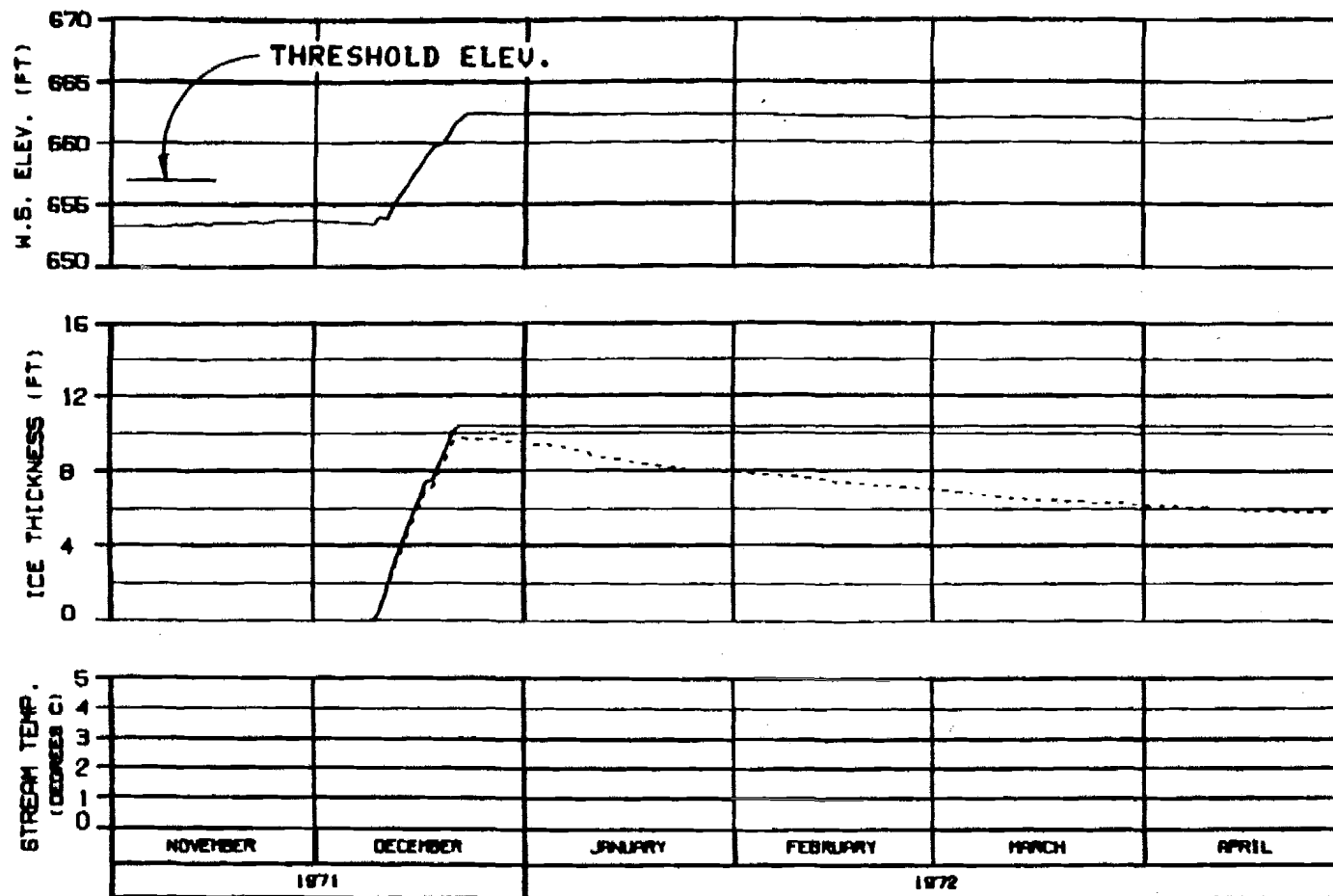
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZDA-EBASCO JOINT VENTURE

DESIGN: 81-0000 10 JAN 81 1000.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 71 - 30 APR 72

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - BLUSH COMPONENT

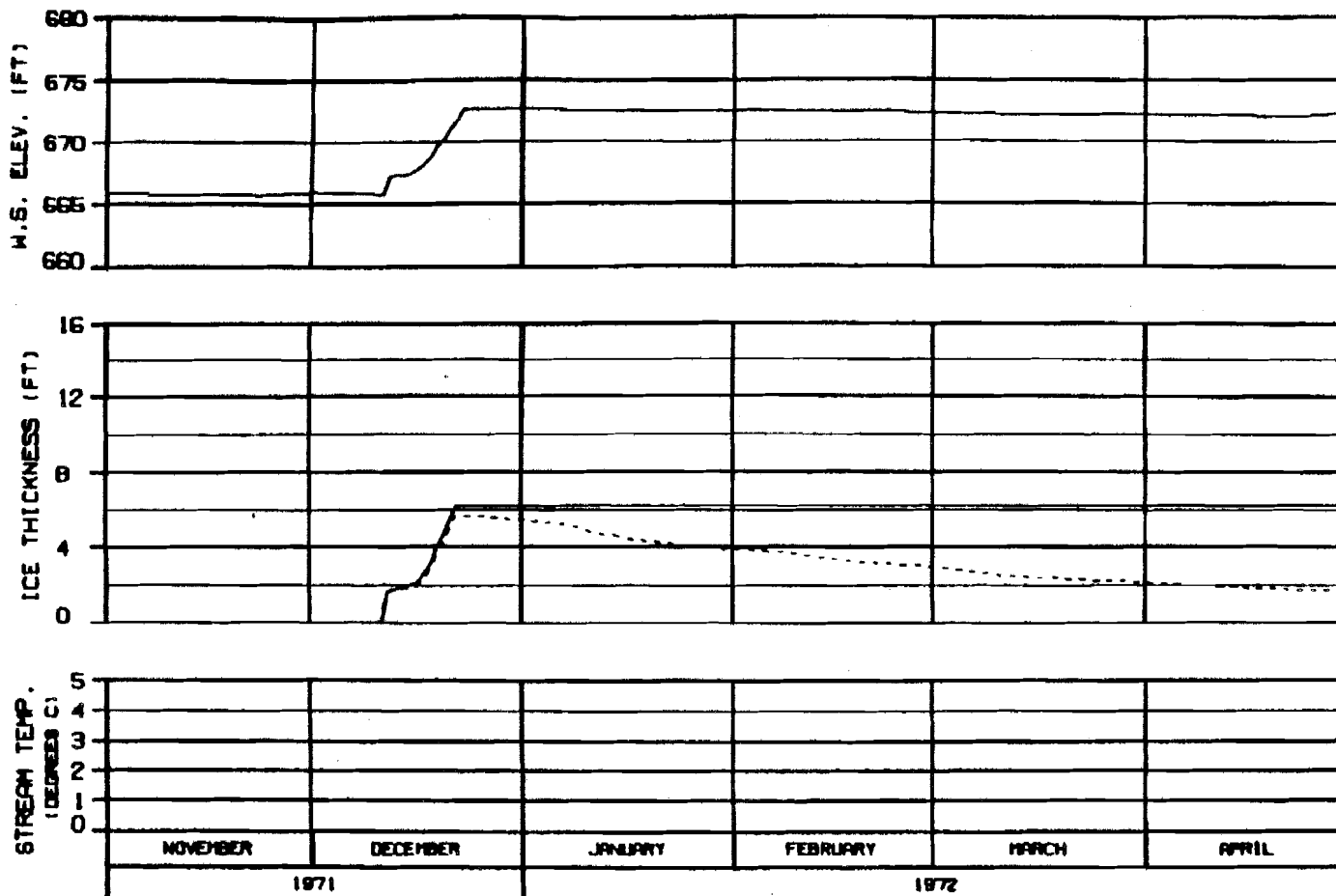
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: H. J. H. 1000.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

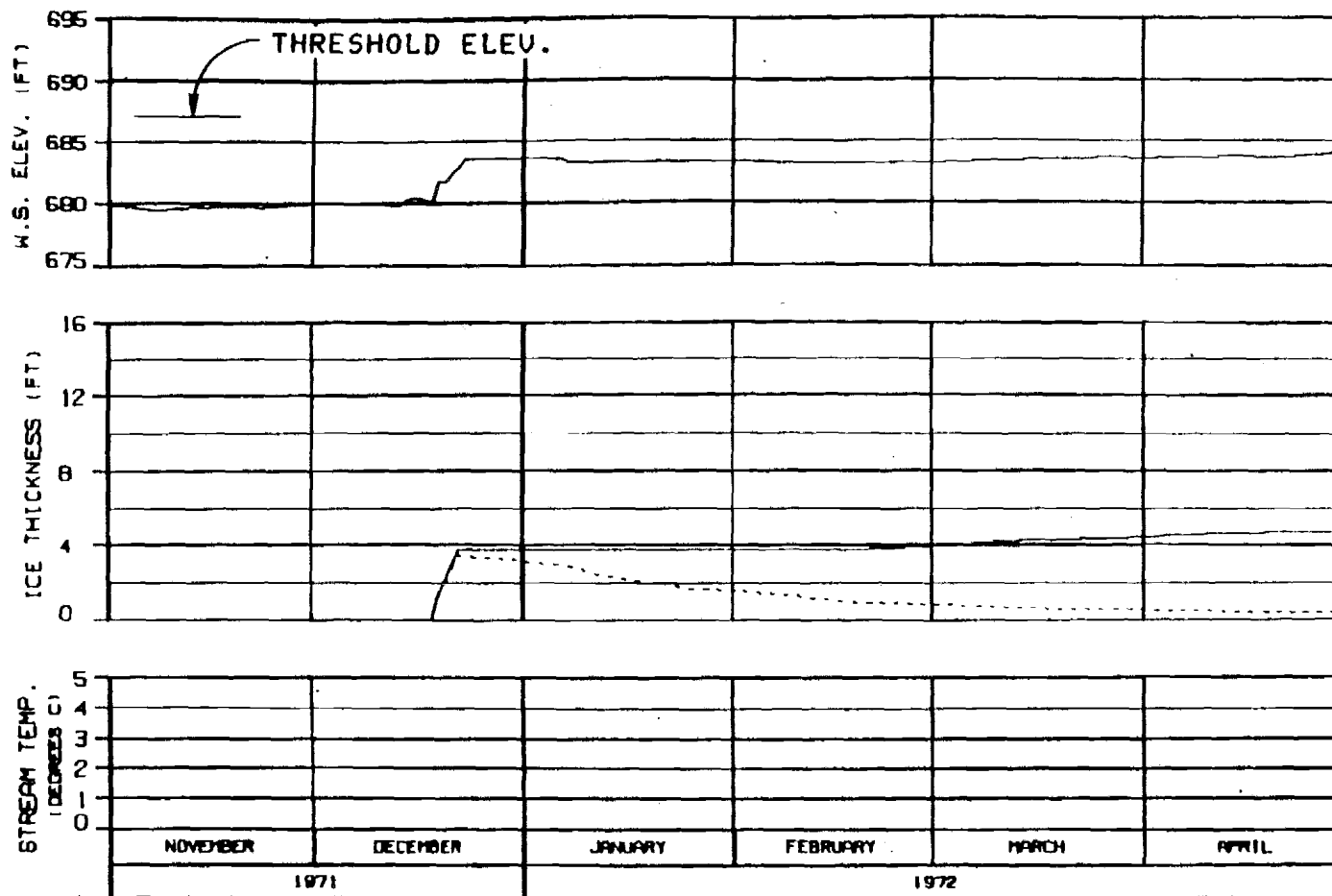
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBASCO JOINT VENTURE

CHIEF: G. L. BROWN 10 22 82 1000.142



HEAD OF SLOUGH 11

RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - BULK COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE71A

ALASKA POWER AUTHORITY

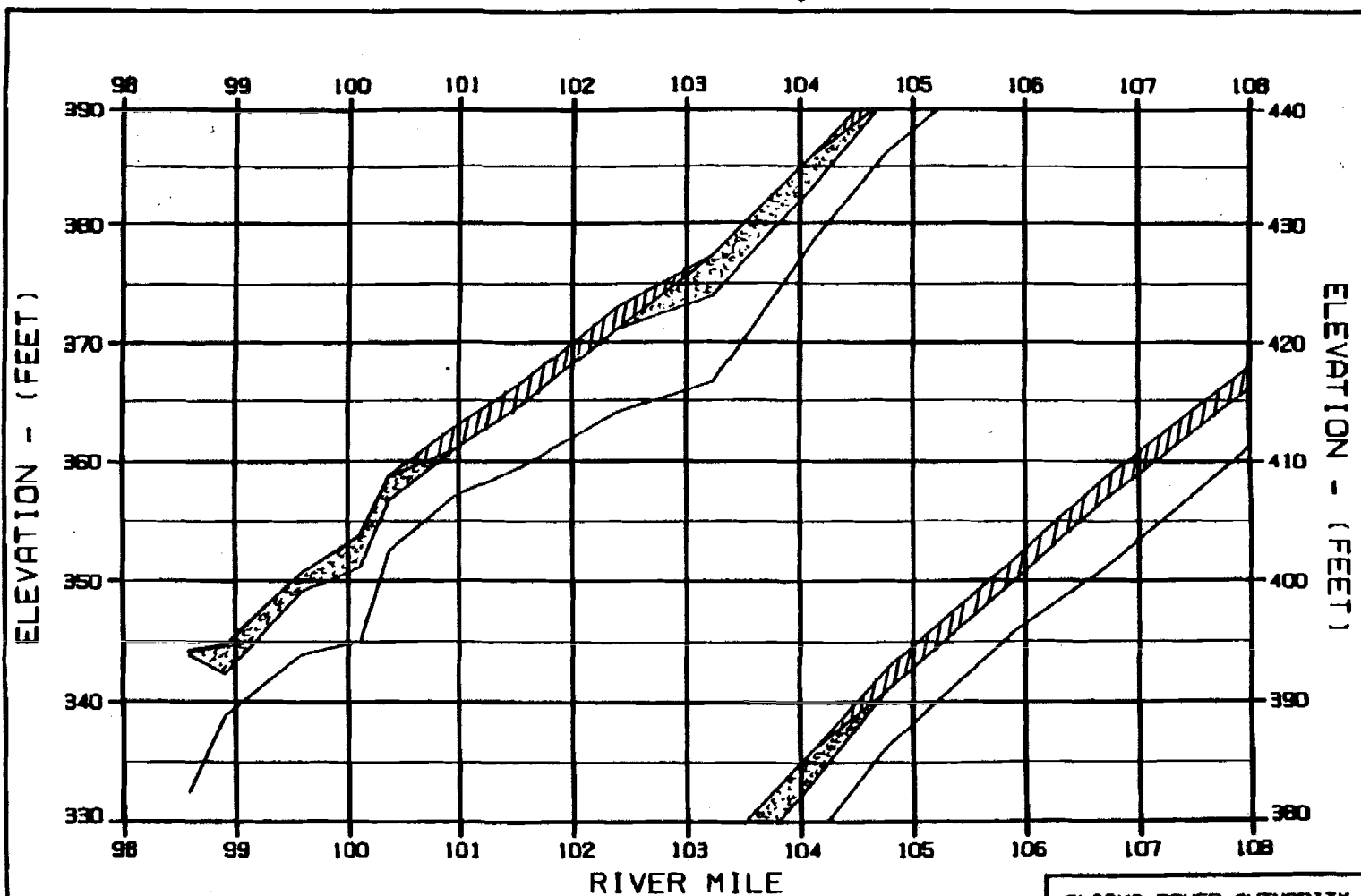
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY


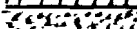


HARZA-EBERD JOINT VENTURE

DESIGN: RALPH W. 10 AA 04 PAGES: 142

# EXHIBIT B



**LEGEND:**

-  TOP OF SOLID ICE
-  SLUSH/SOLID ICE INTERFACE
-  BOTTOM OF SLUSH ICE
-  RIVER BED

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE 76A

ALASKA POWER AUTHORITY

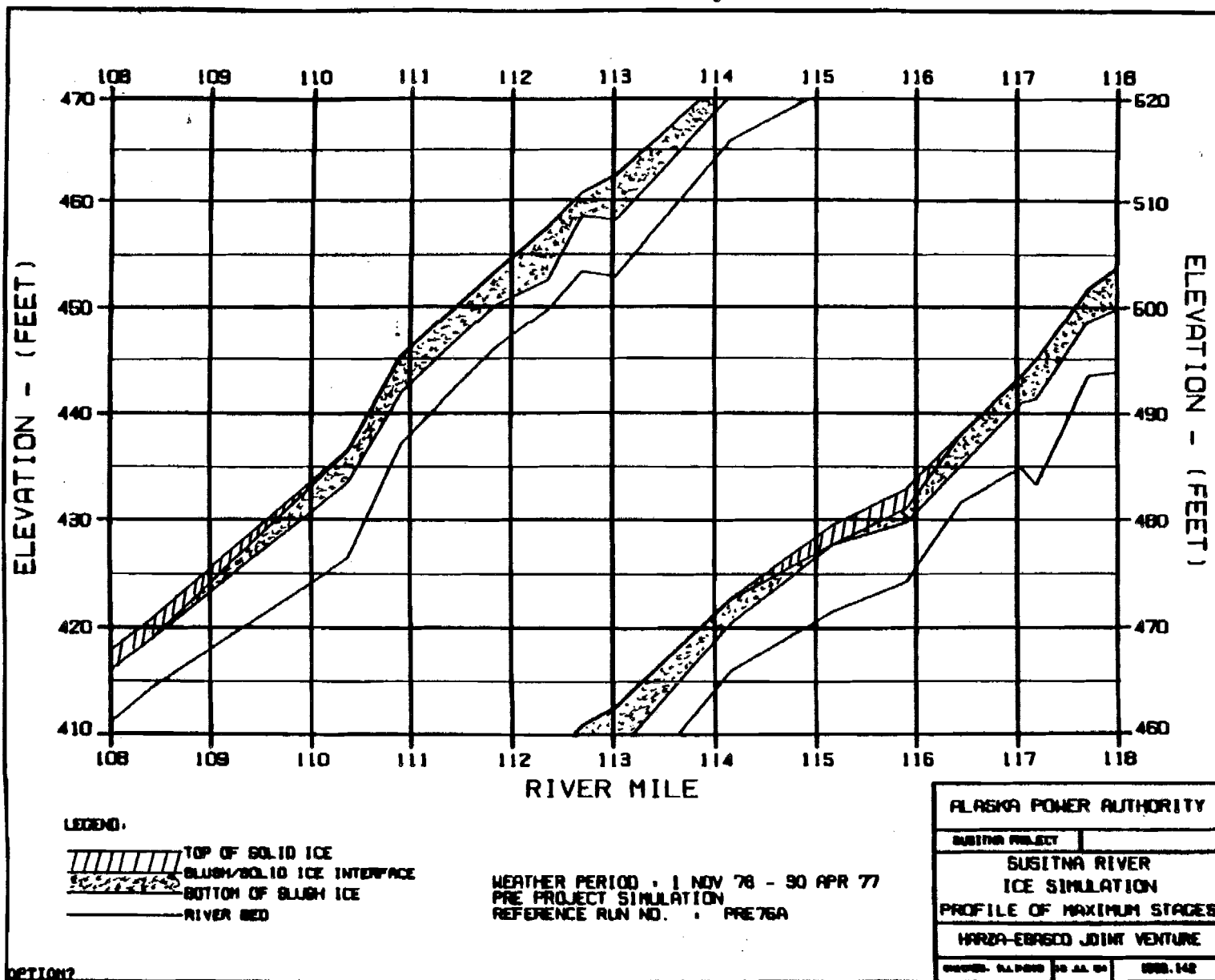
SUSITNA PROJECT

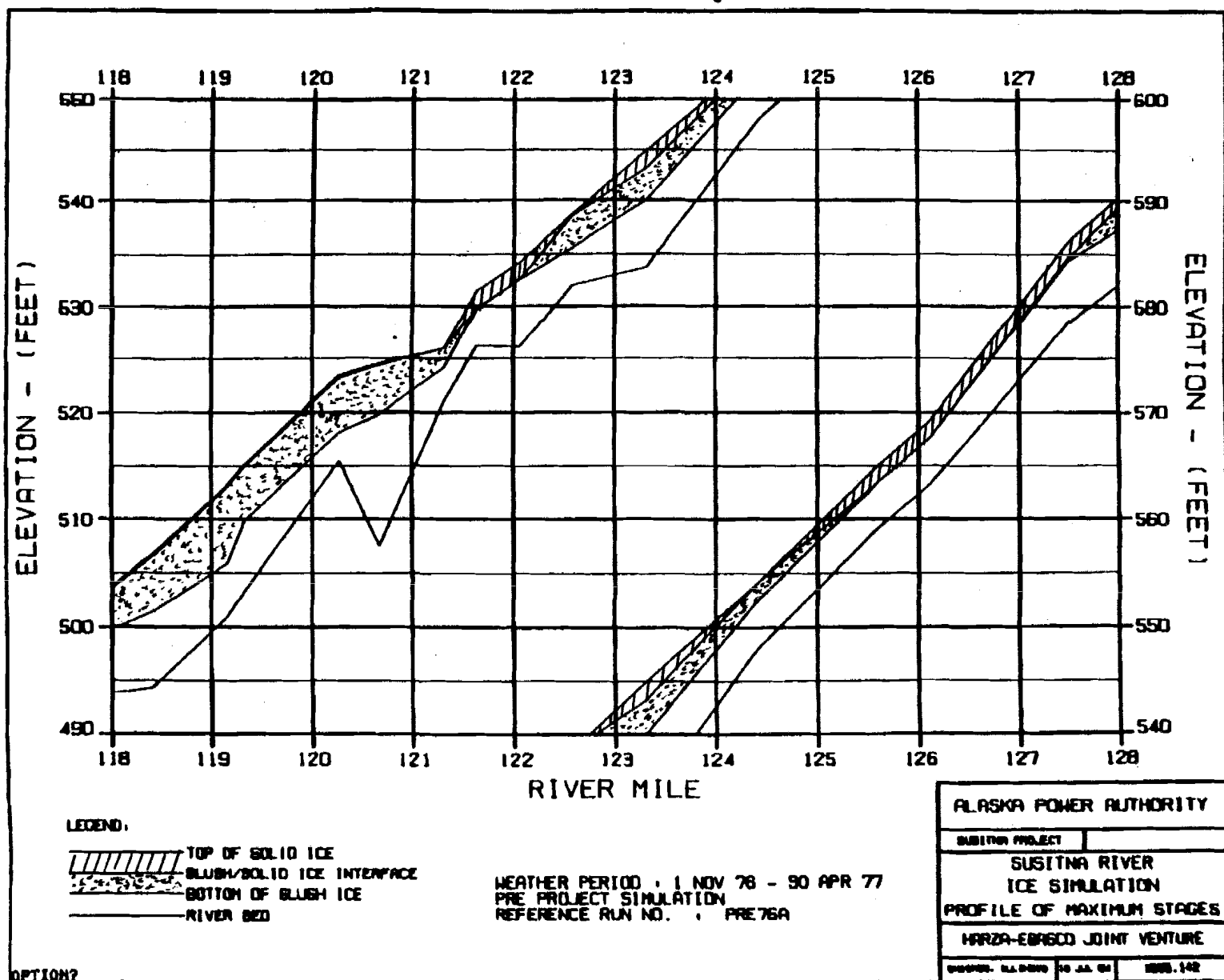
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HARZA-EGROD JOINT VENTURE

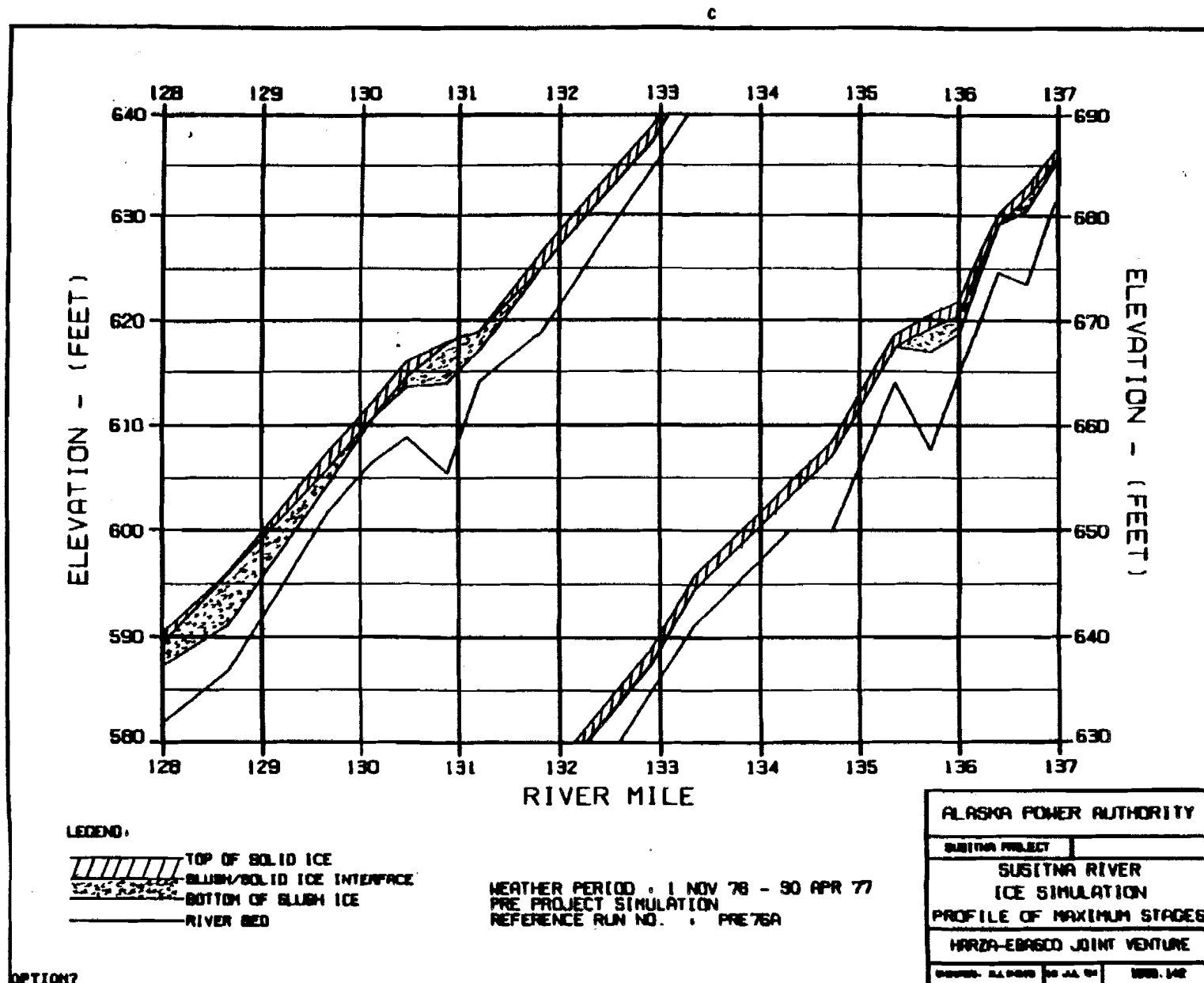
FIGURE 11-1000 TO 11-1010 11-1012

OPTION?

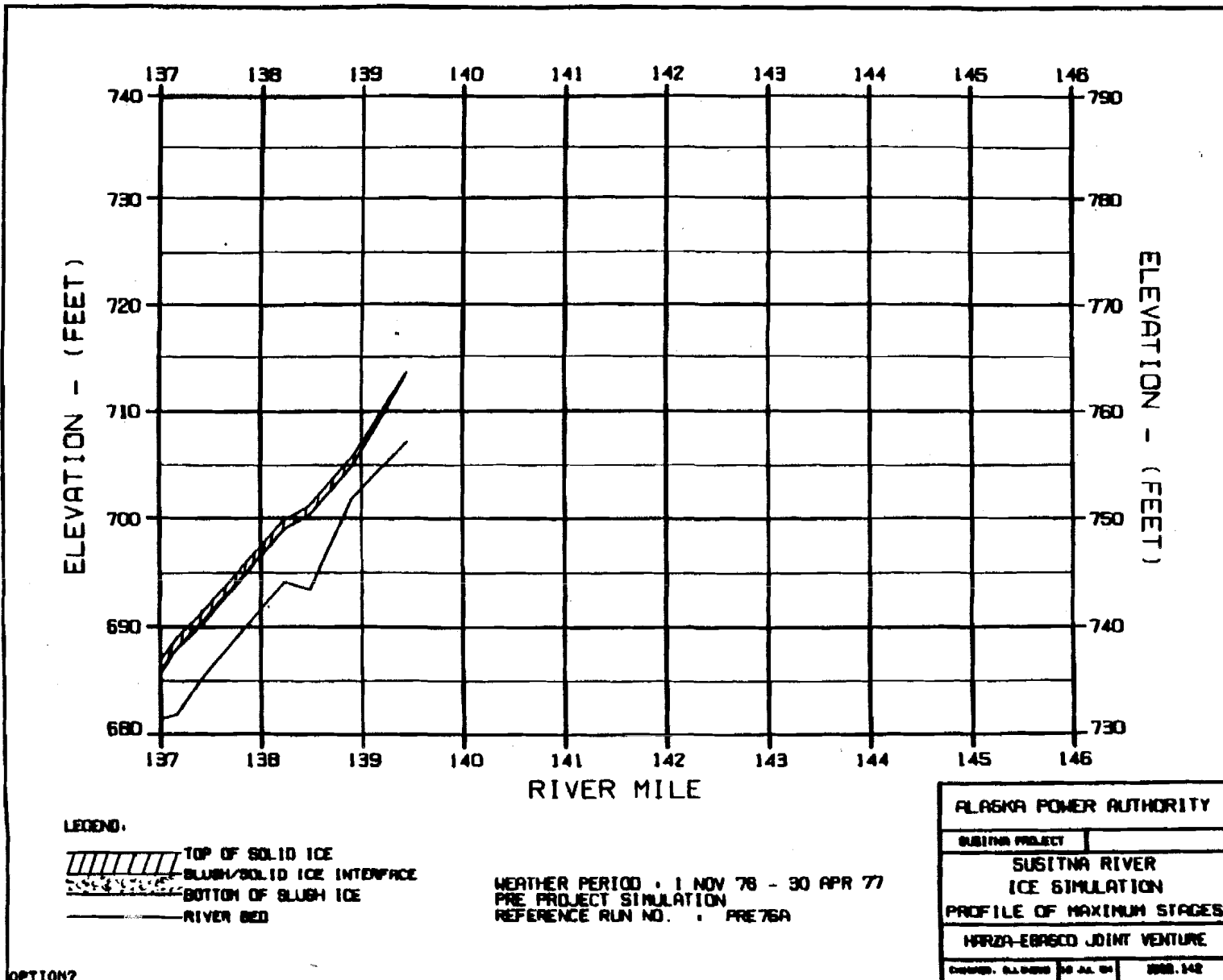


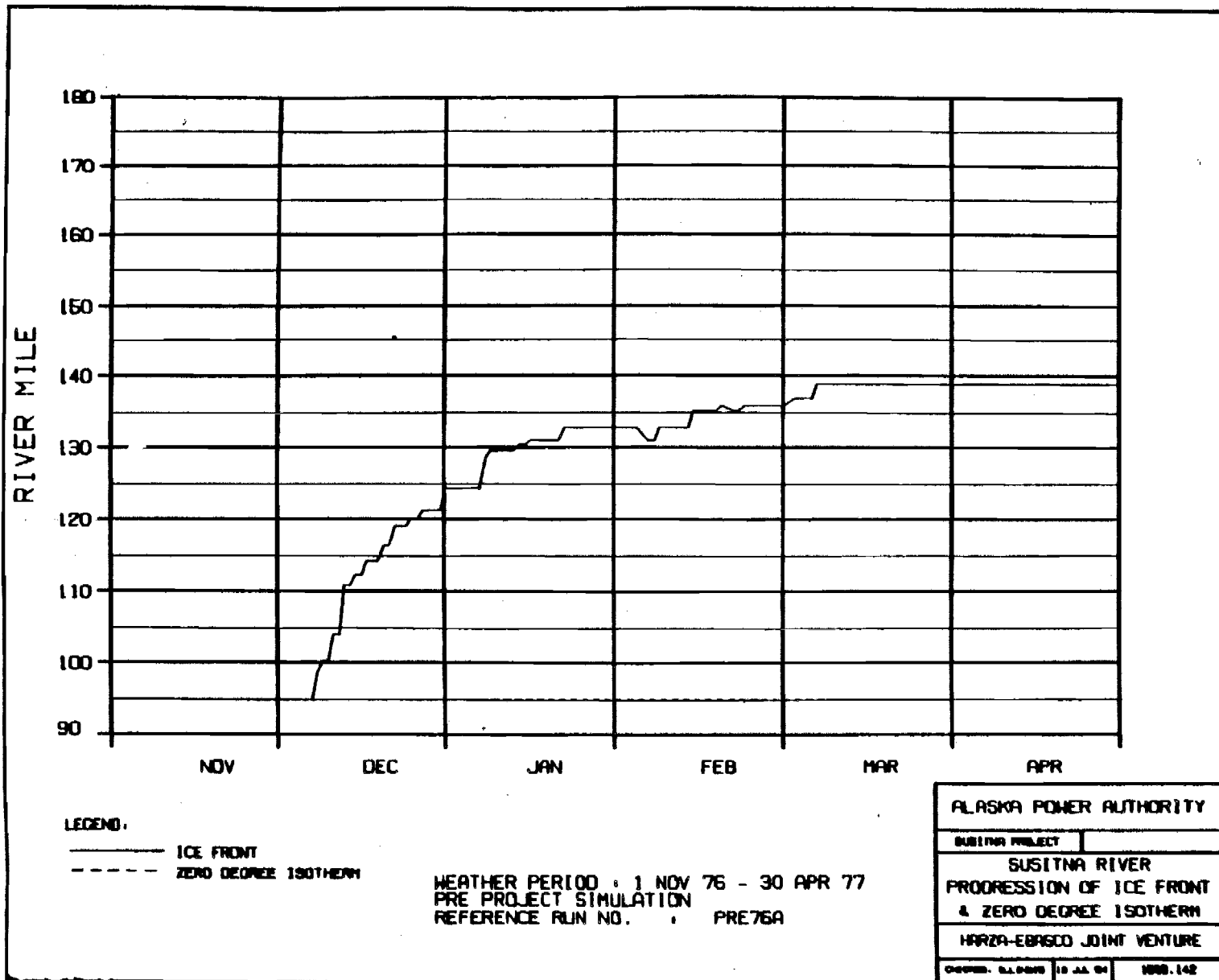


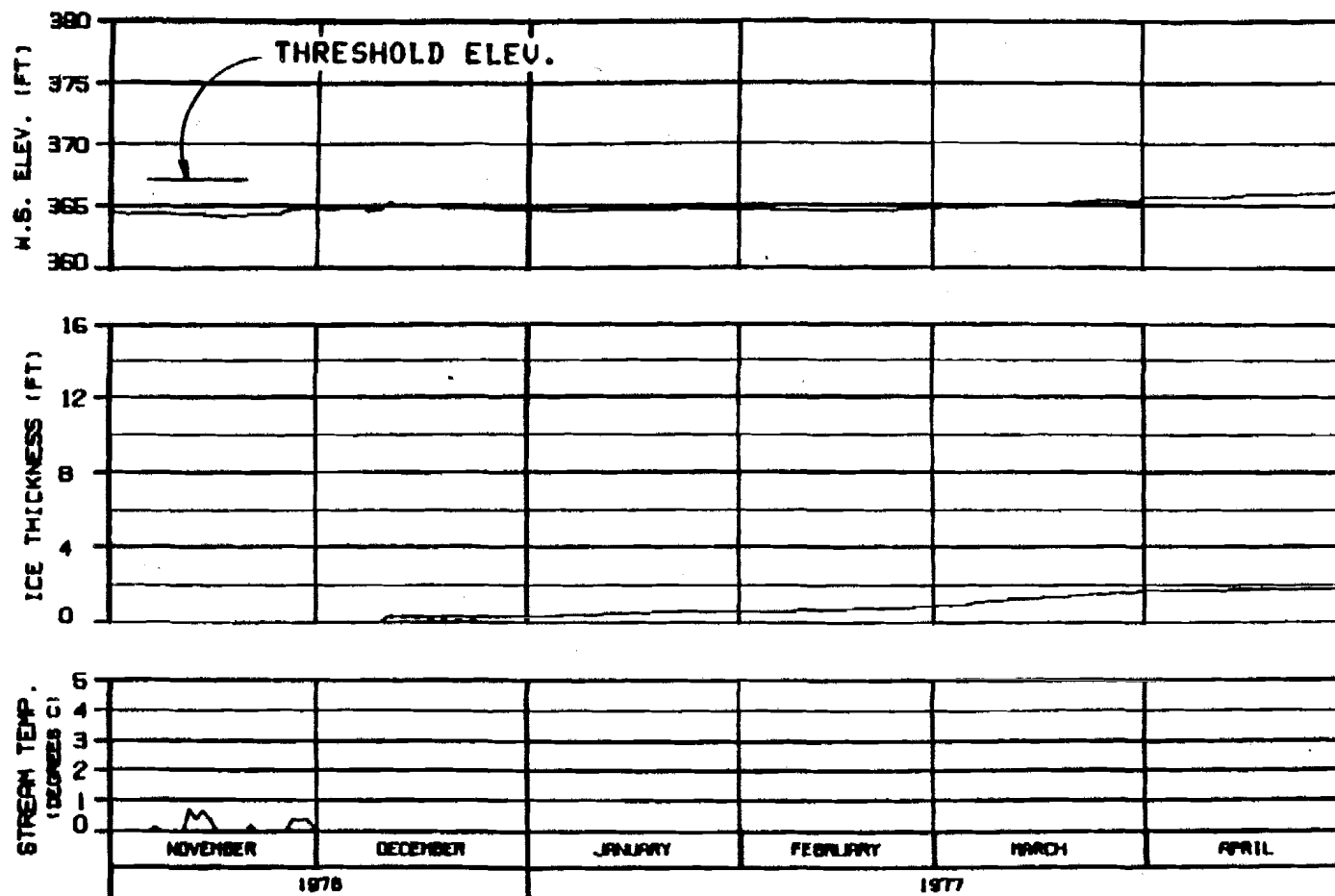




C







**ICE THICKNESS LEGEND:**

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

**HEAD OF WHISKERS SLOUGH**

**RIVER MILE : 101.50**

**WEATHER PERIOD : 1 NOV 76 - 30 APR 77**

**PRE PROJECT SIMULATION**

**REFERENCE RUN NO. : PRE76A**

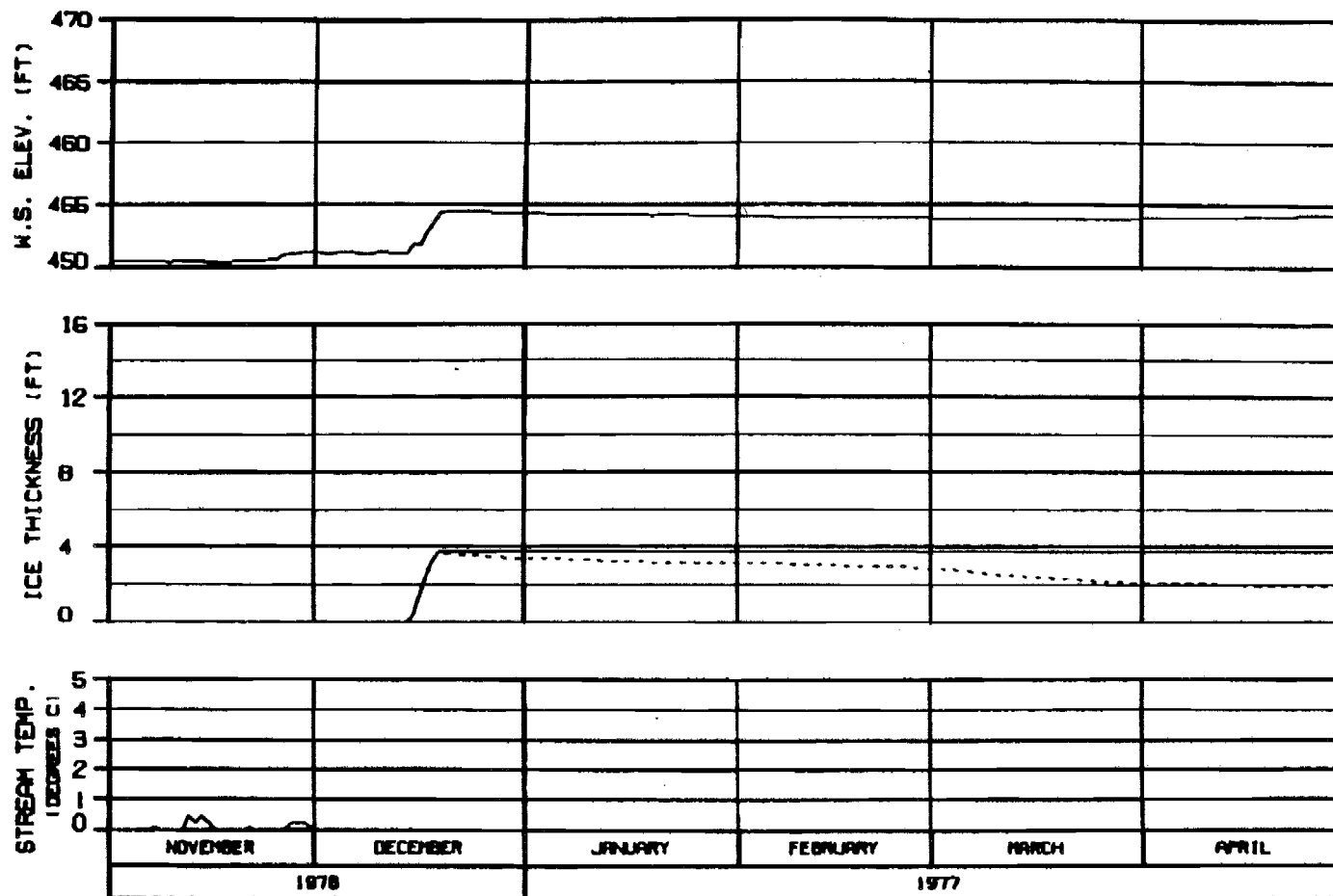
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBRISCO JOINT VENTURE**

DESIGN - ALD-000 NO. 44. 04 000.142



SIDE CHANNEL AT HEAD OF GASH CREEK  
RIVER MILE : 112.00

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

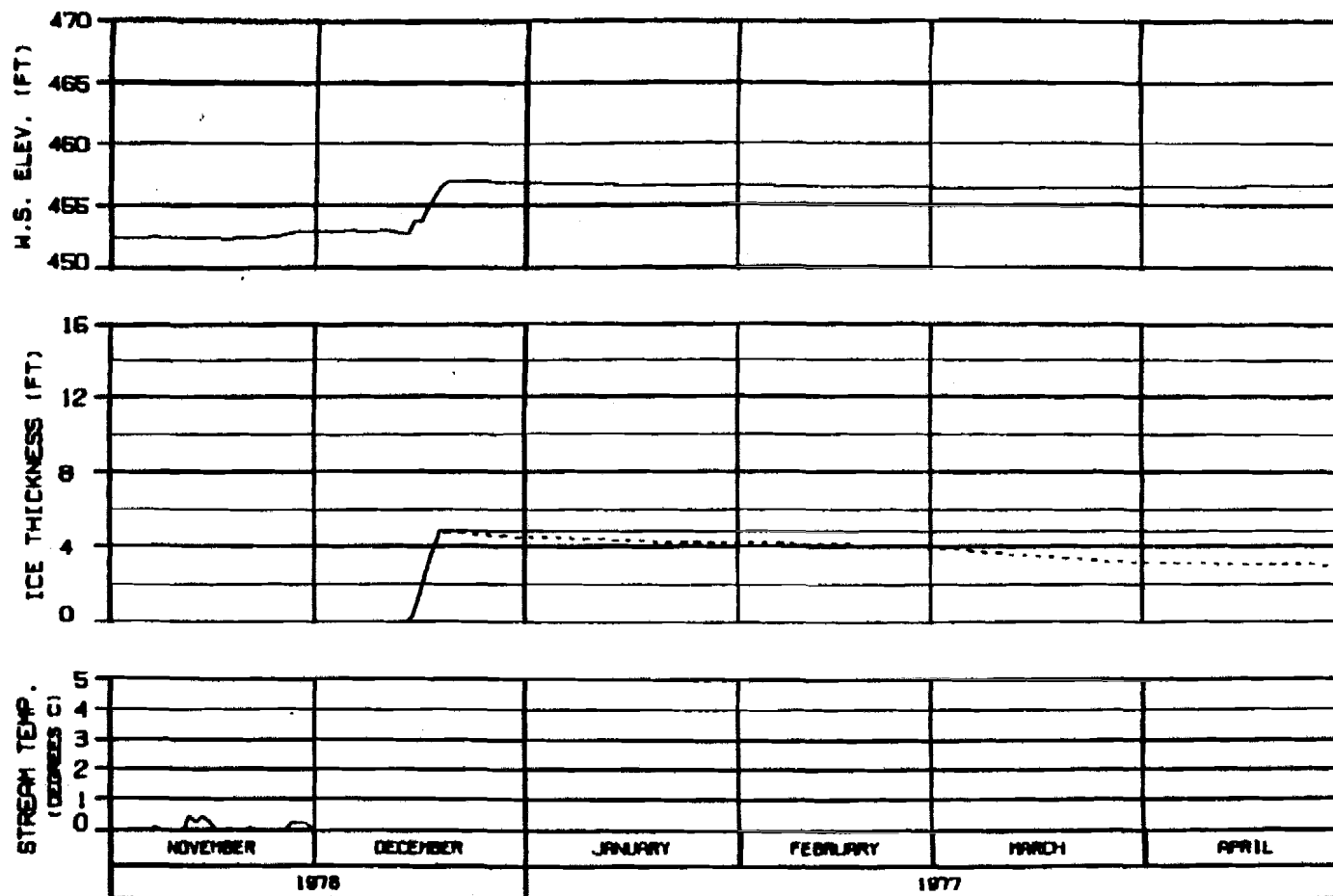
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: 11/1/76 10 JAN 77 1000.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

MOUTH OF SLOUGH 6A  
 RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

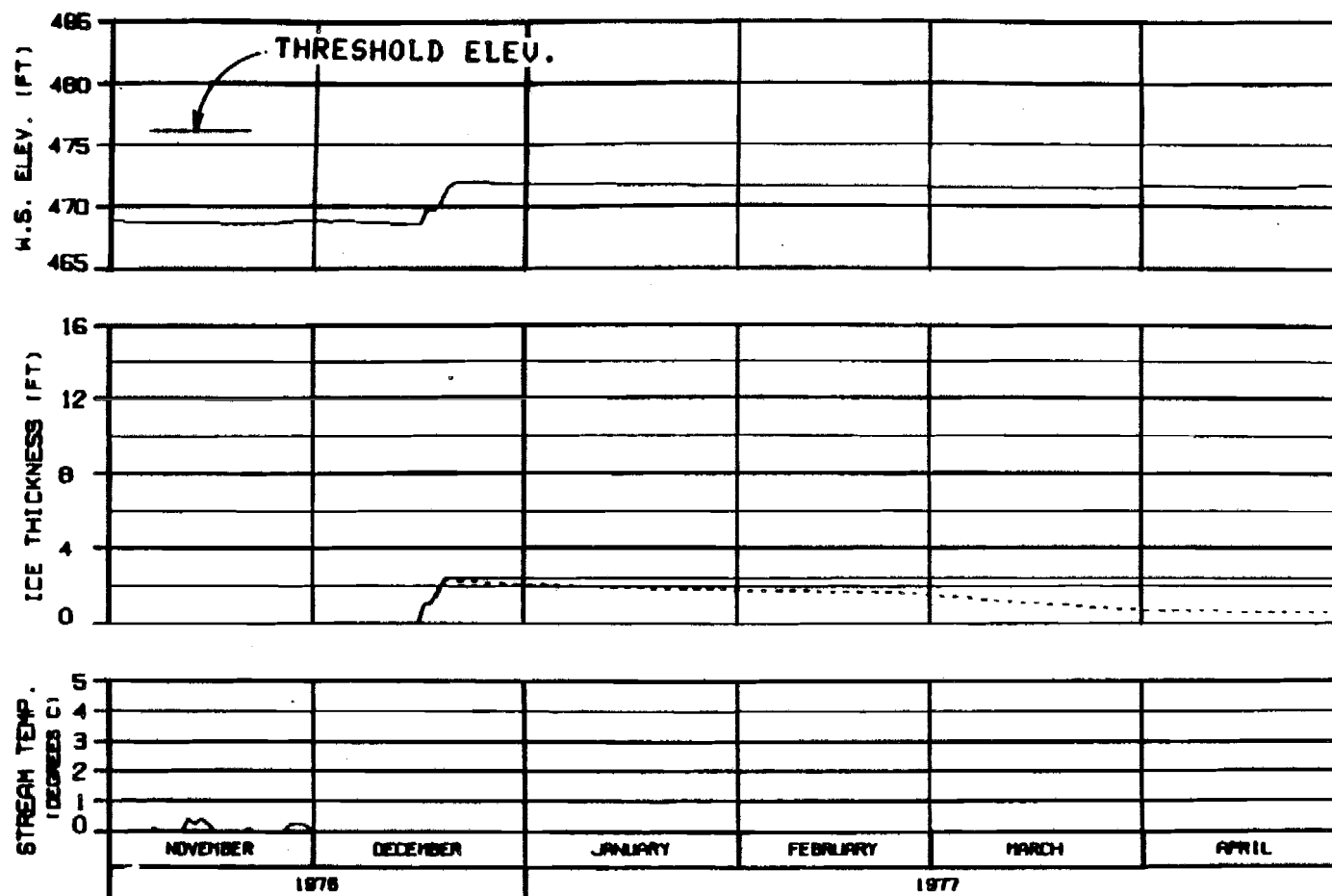
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. BROWN 28 JUL 77 1000-142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

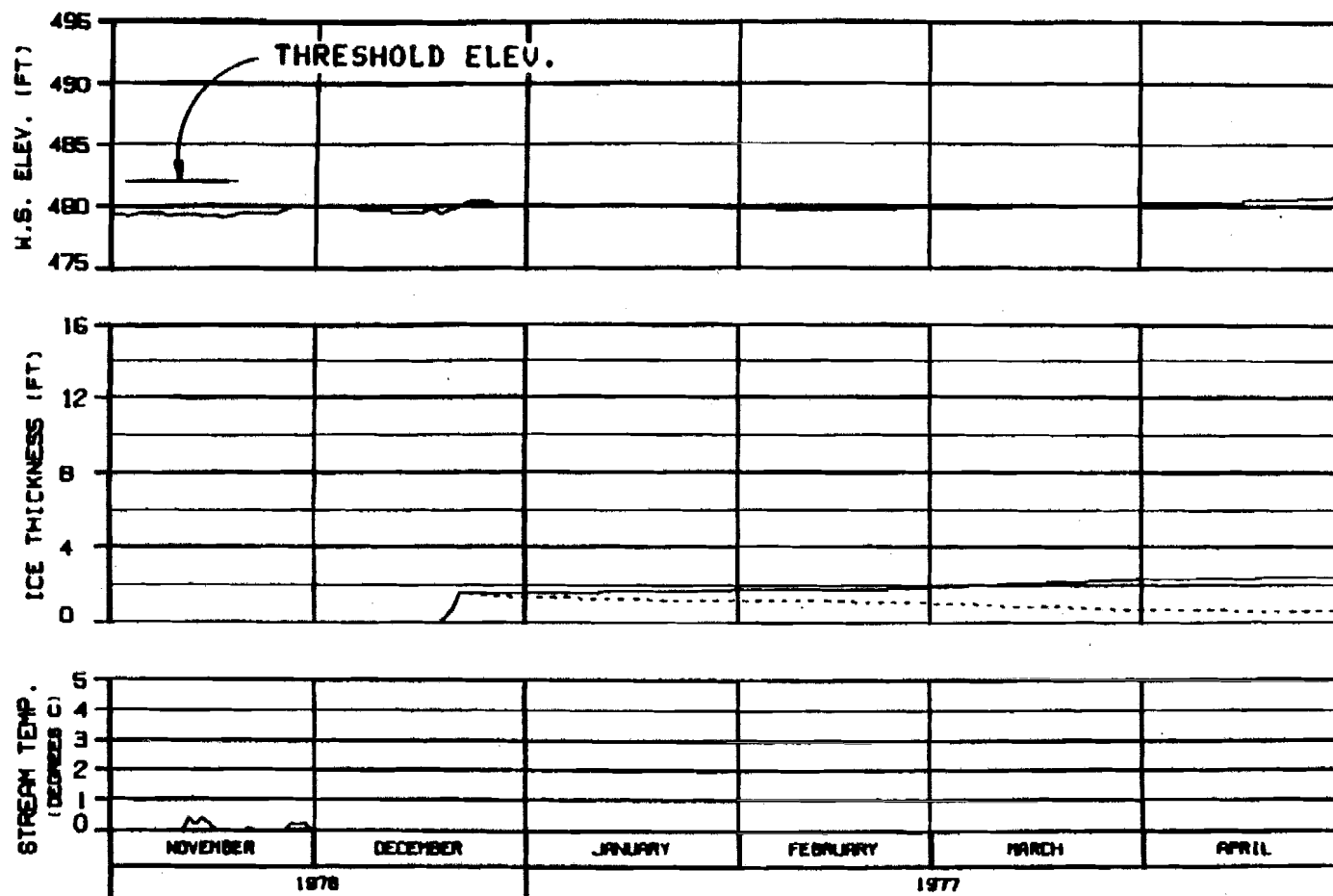
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBERD JOINT VENTURE

DESIGN: S. L. GIBBS 10 JUL 76 1000.142



ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

SIDE CHANNEL MSII

RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

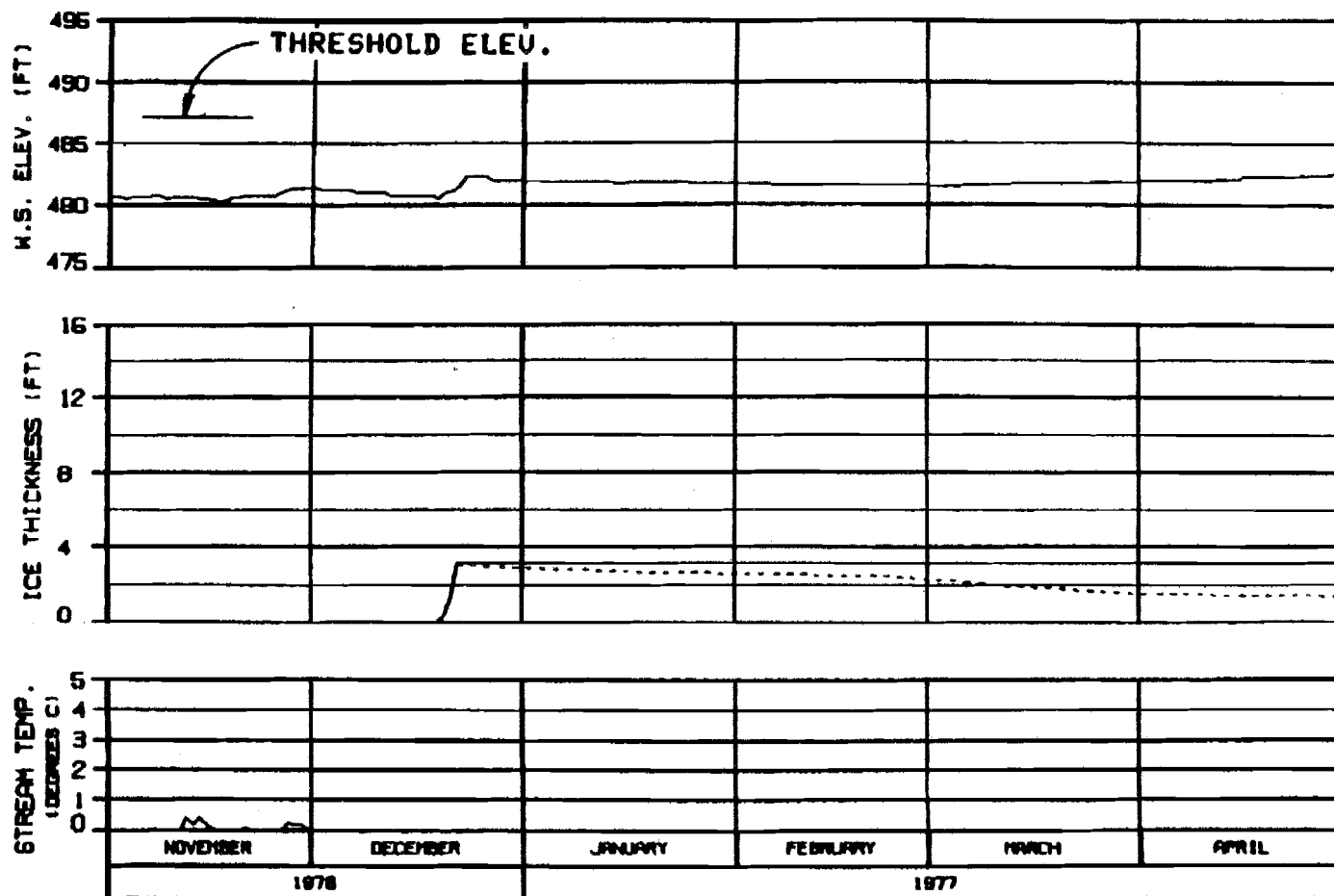
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DRAWN: SLD/MS NO. AA 01 1000.142





HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

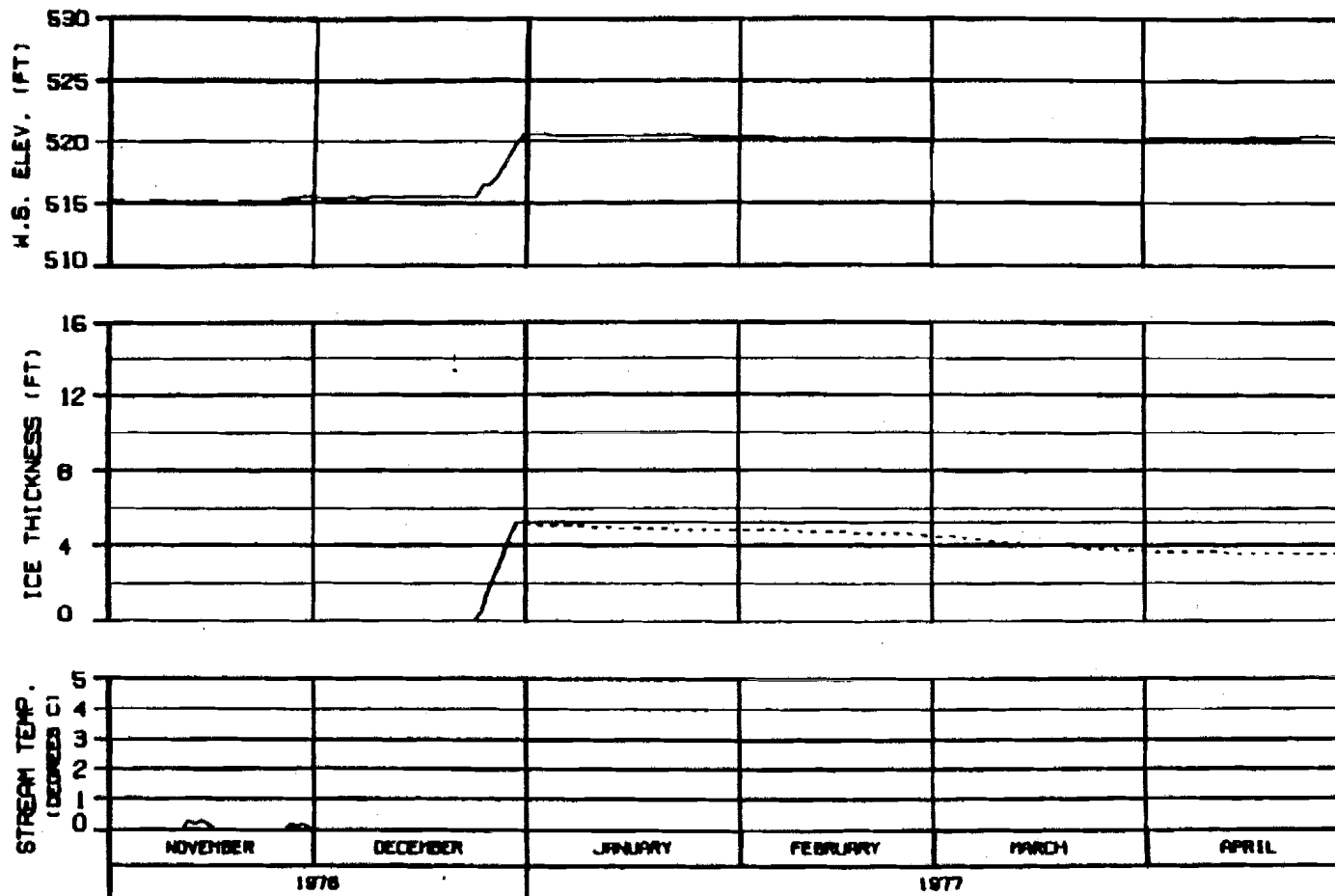
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: B. BROWN 30 JAN 77 SHEET 142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

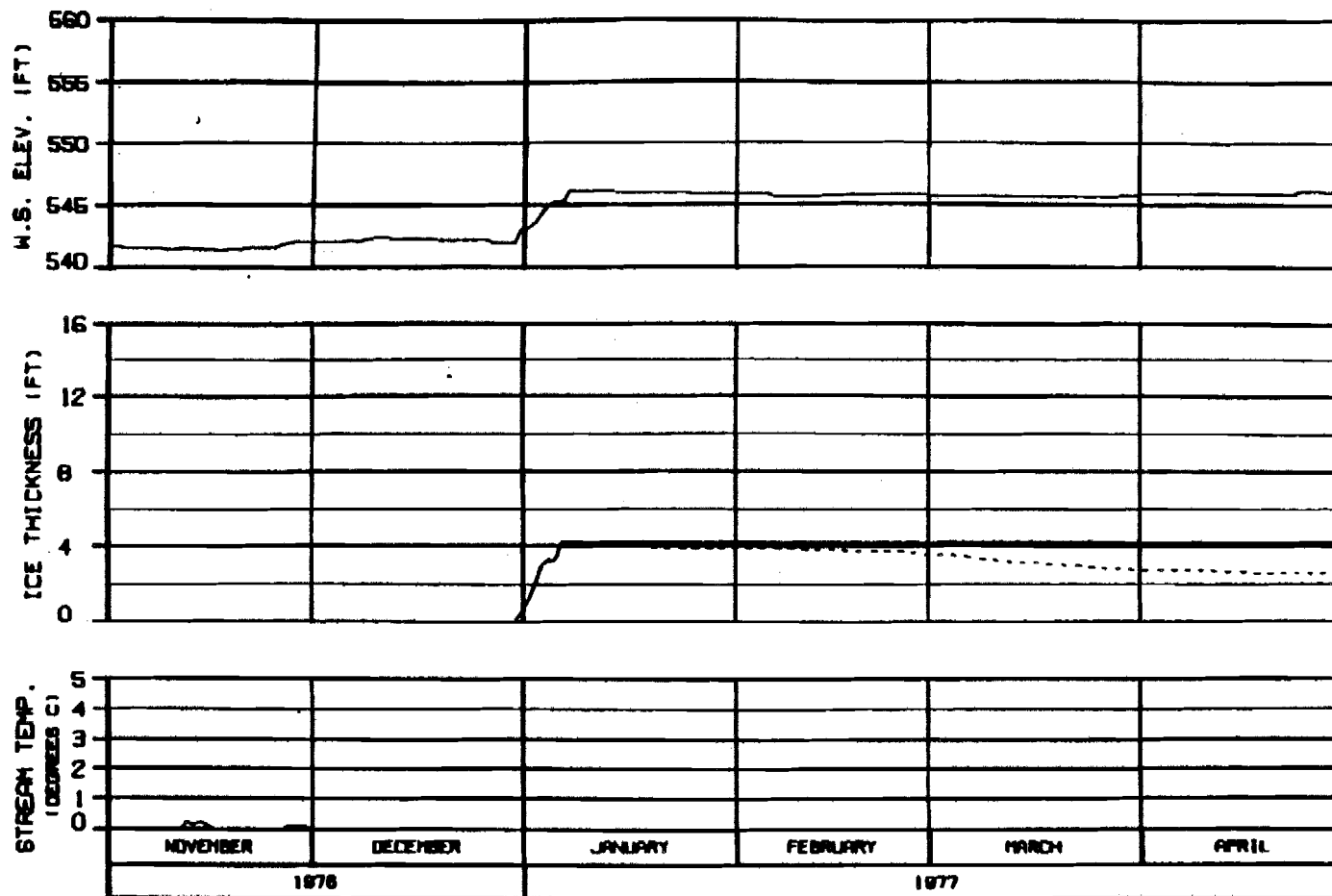
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTER - 11-10-76 10 AA 01 1000.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

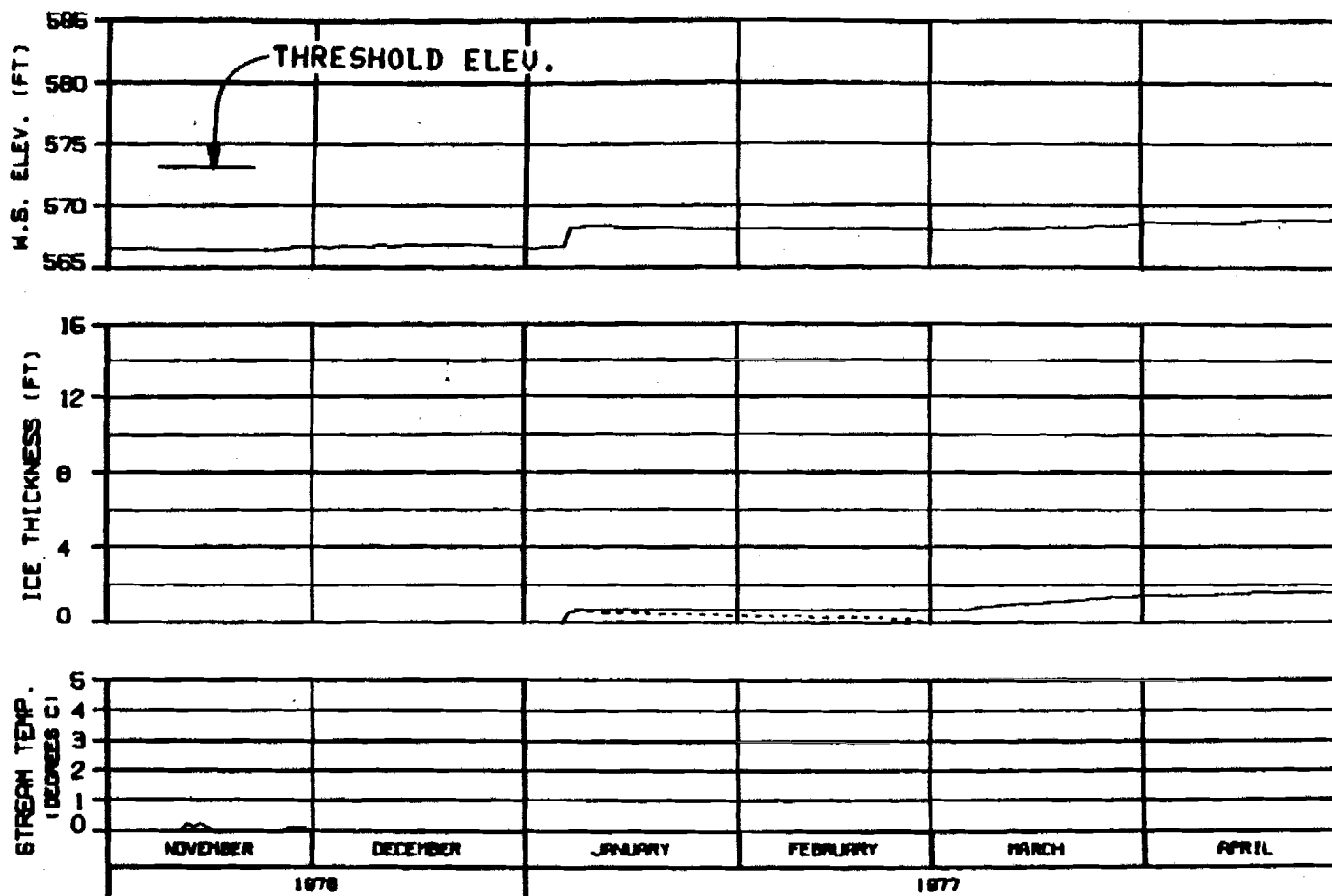
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: [ ] 20 JUL 81 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 76 - 30 APR 77

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

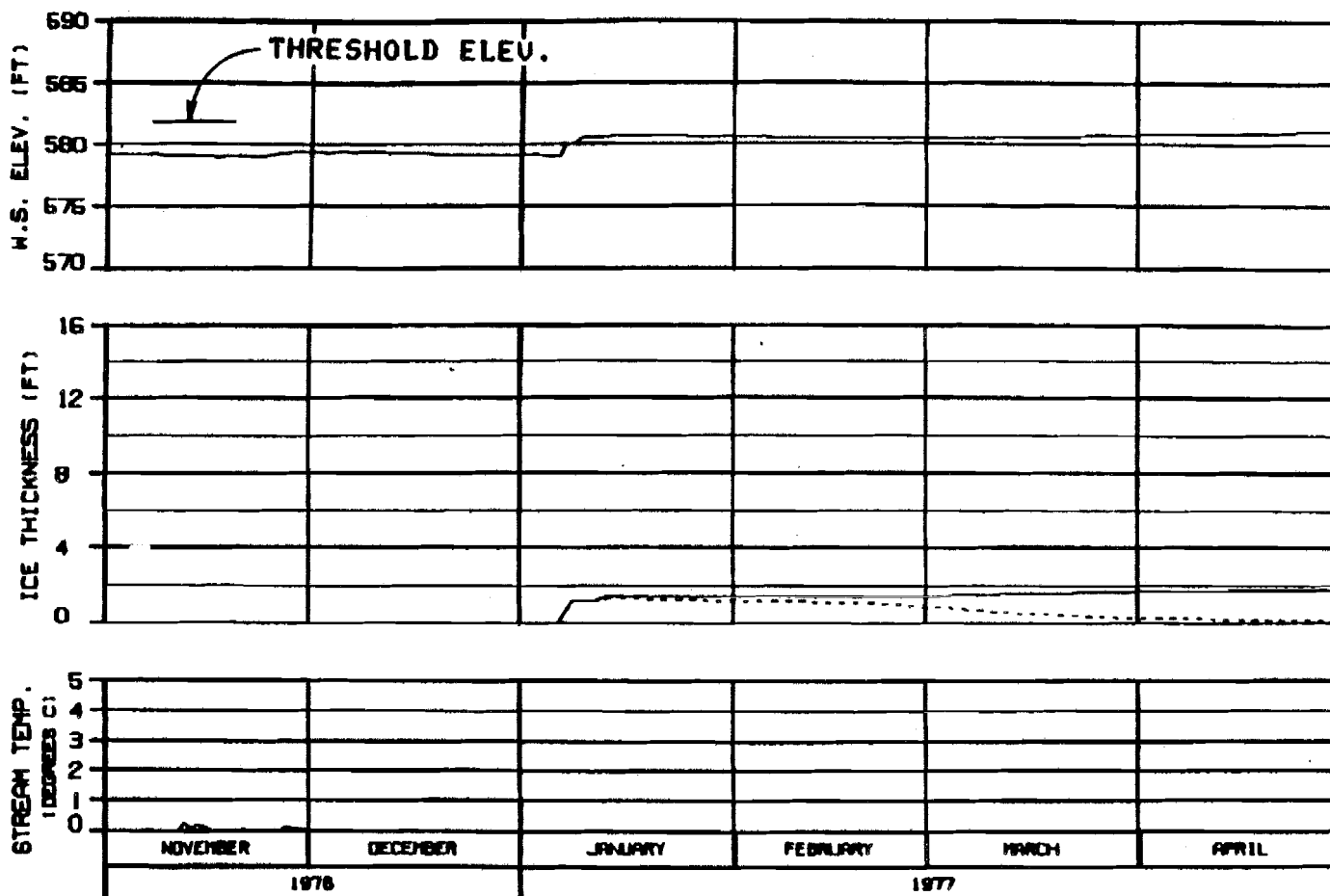
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHECKED: SLD/MSD 20 JUL 81 5000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

———— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

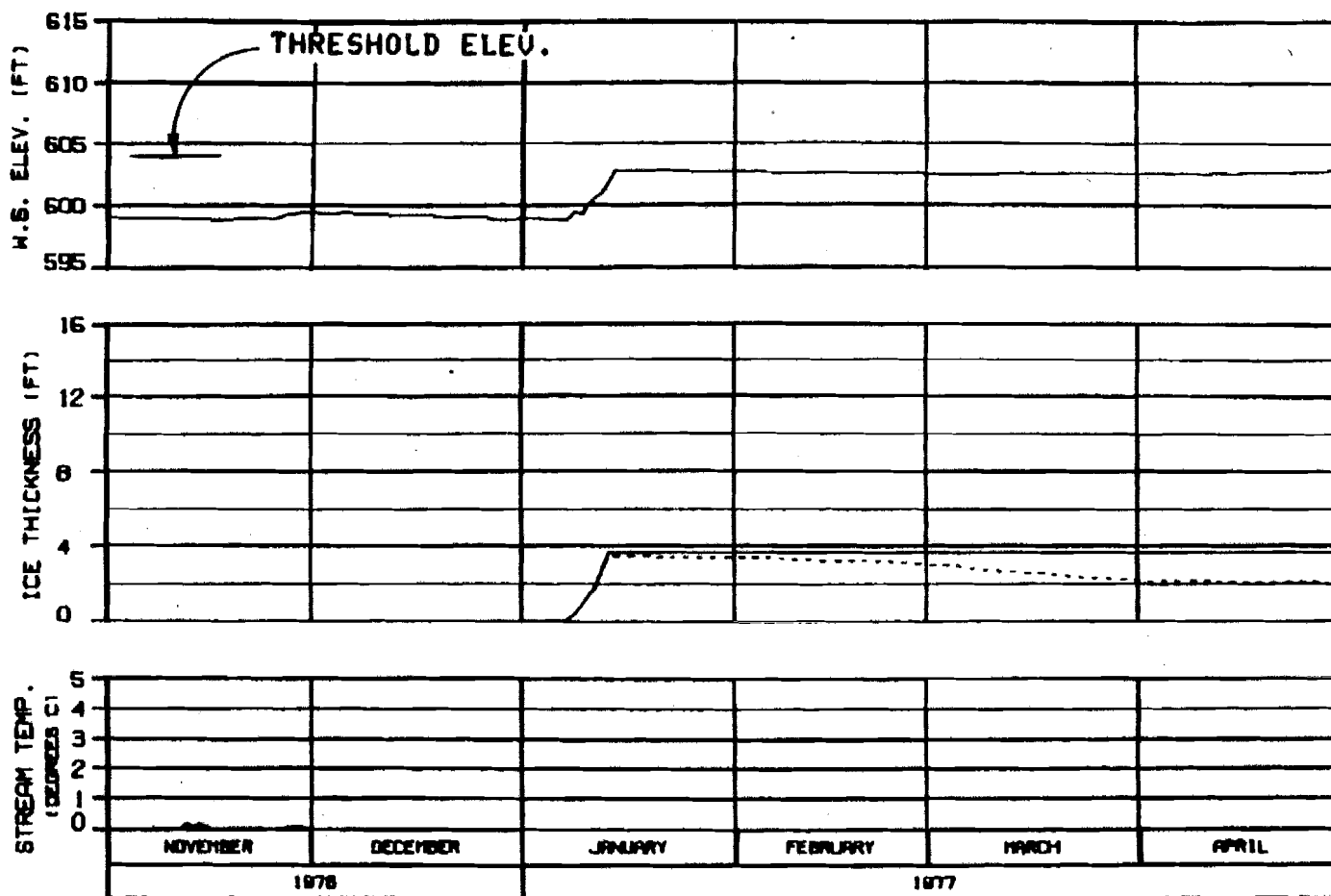
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRSCO JOINT VENTURE

DESIGNED BY: J. A. BROWN 10 JAN 77 SHEET 142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

OPTION?

ALASKA POWER AUTHORITY

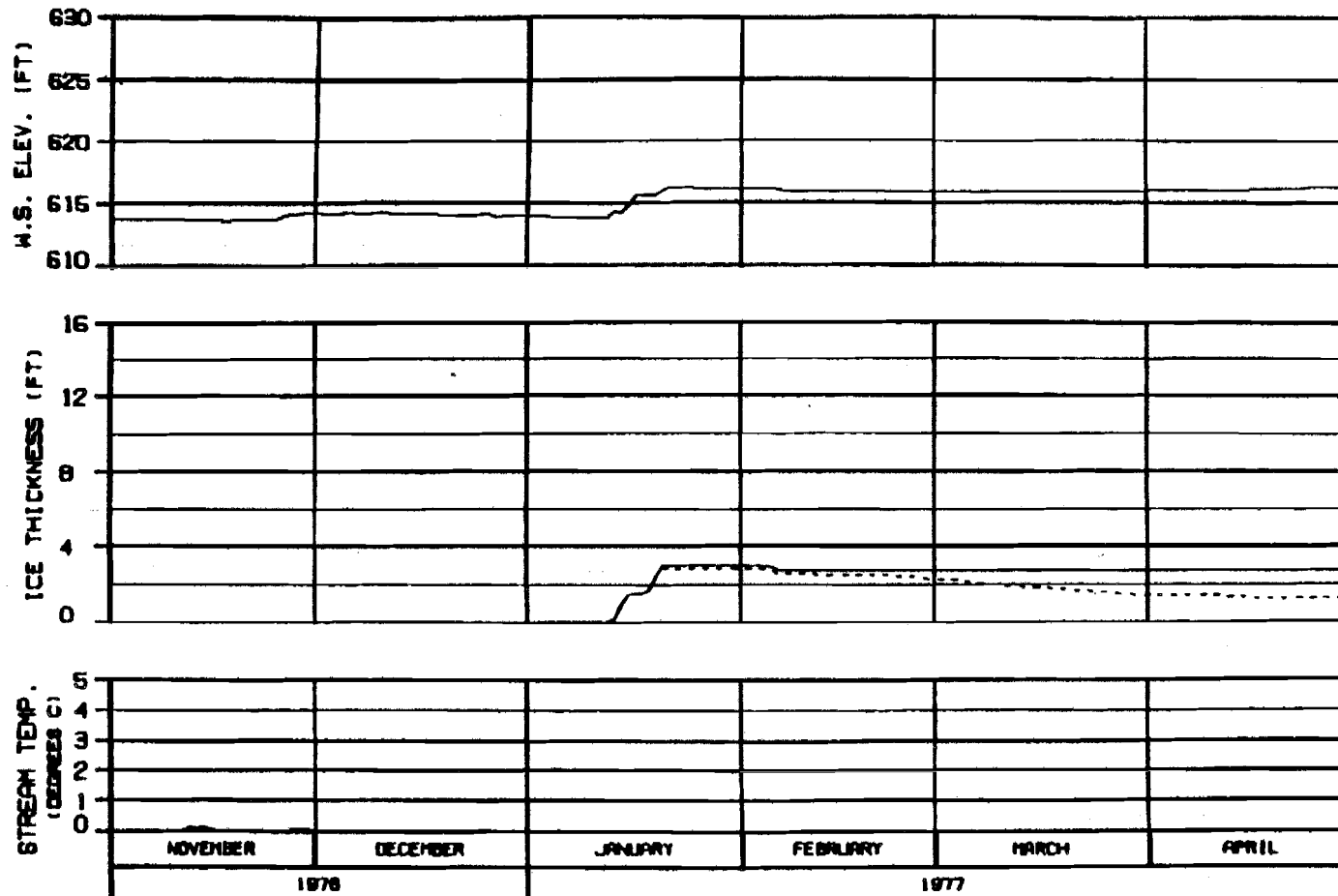
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGNED BY: B. B. BROWN 10 JAN 77 1000.142

OPTION 7



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

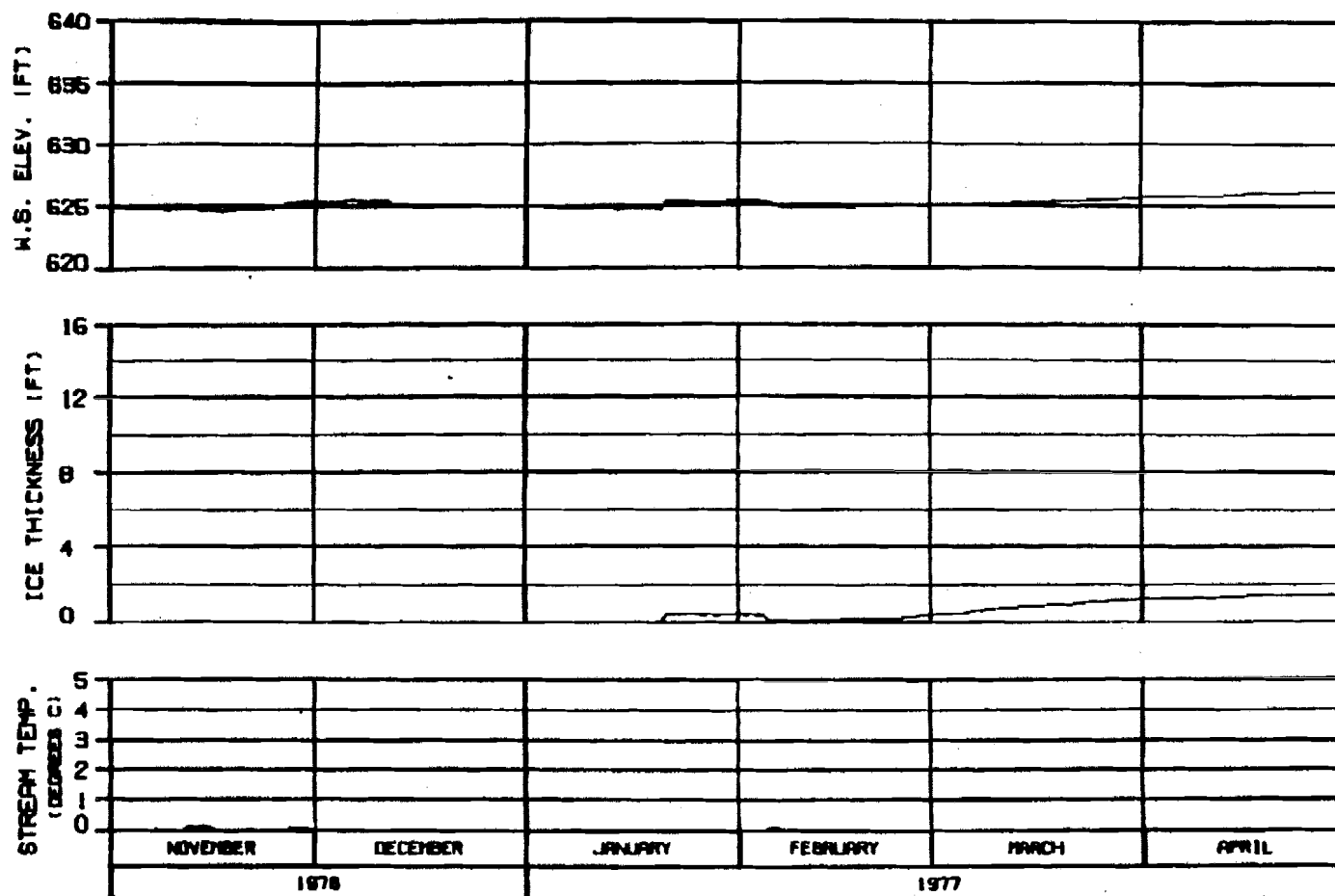
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRACO JOINT VENTURE

DESIGN: 84-0000 10 JUL 81 1000.142



SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY

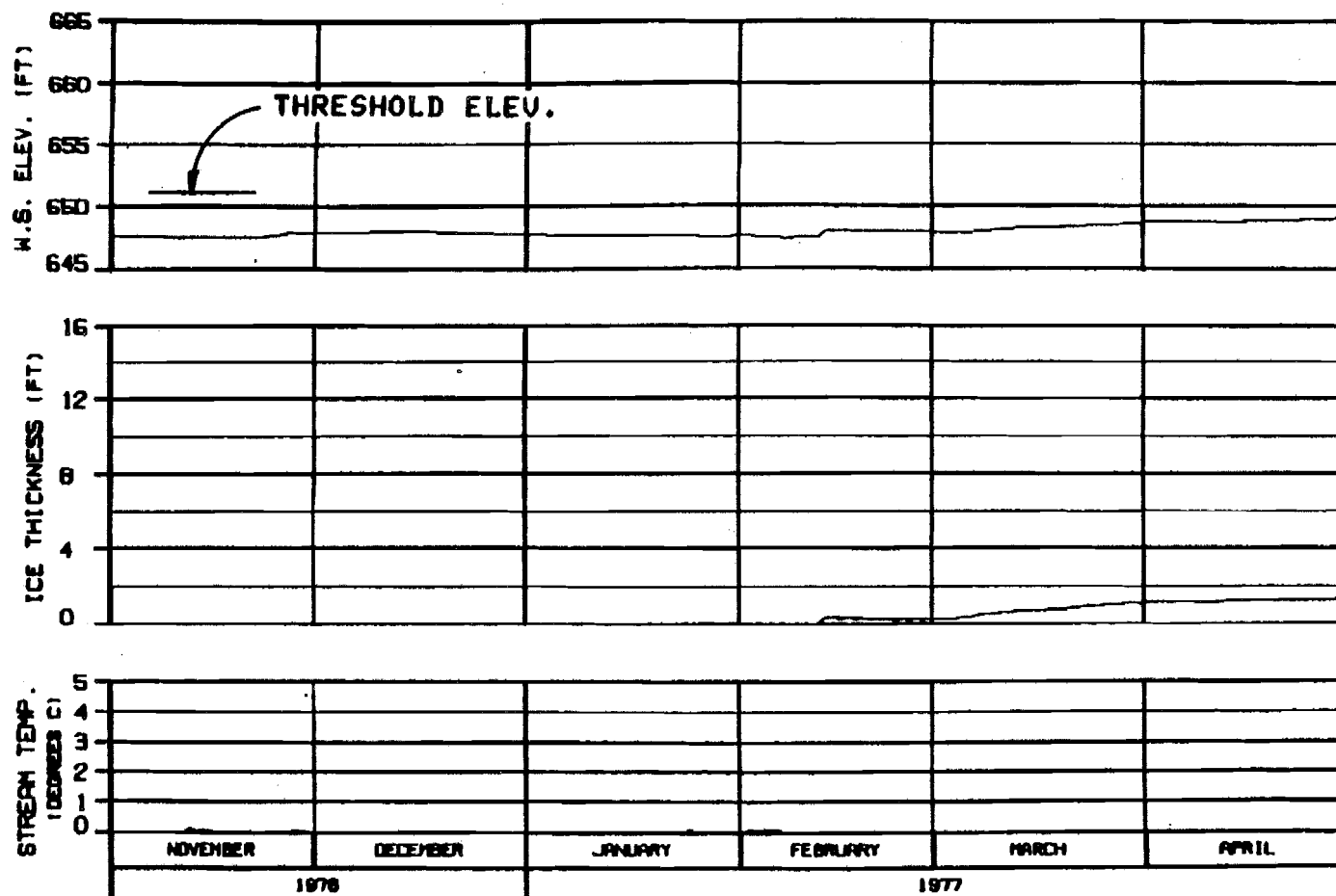
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-ESPICOD JOINT VENTURE

OWNER: ALASKA POWER AUTHORITY 10 JAN 77 1000-142





HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

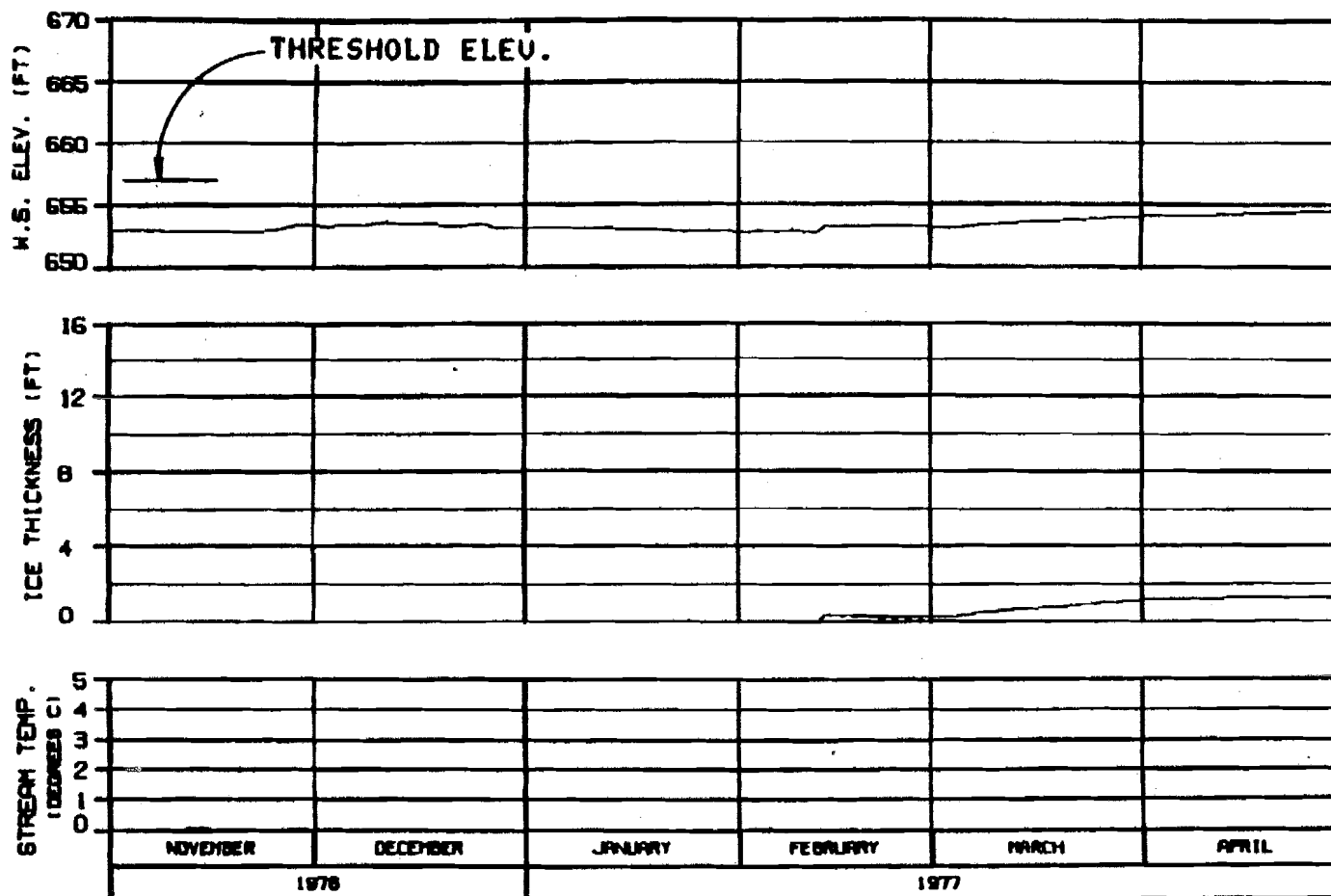
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBR600 JOINT VENTURE

DESIGNED BY: EBR600 NO. 1000 1000.142



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

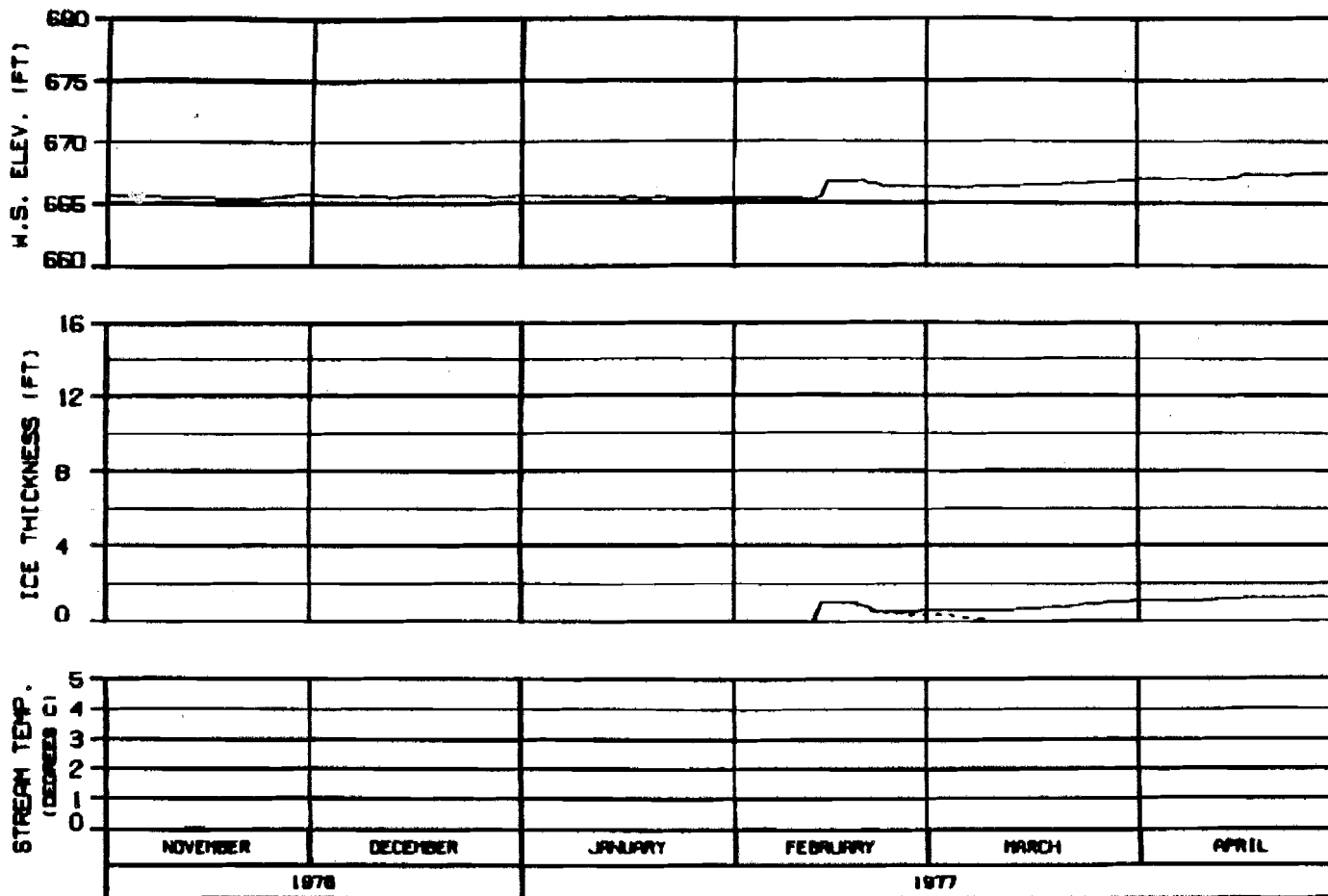
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED: 8/14/77 BY: J.L. 04 1000.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 76 - 30 APR 77

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE76A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

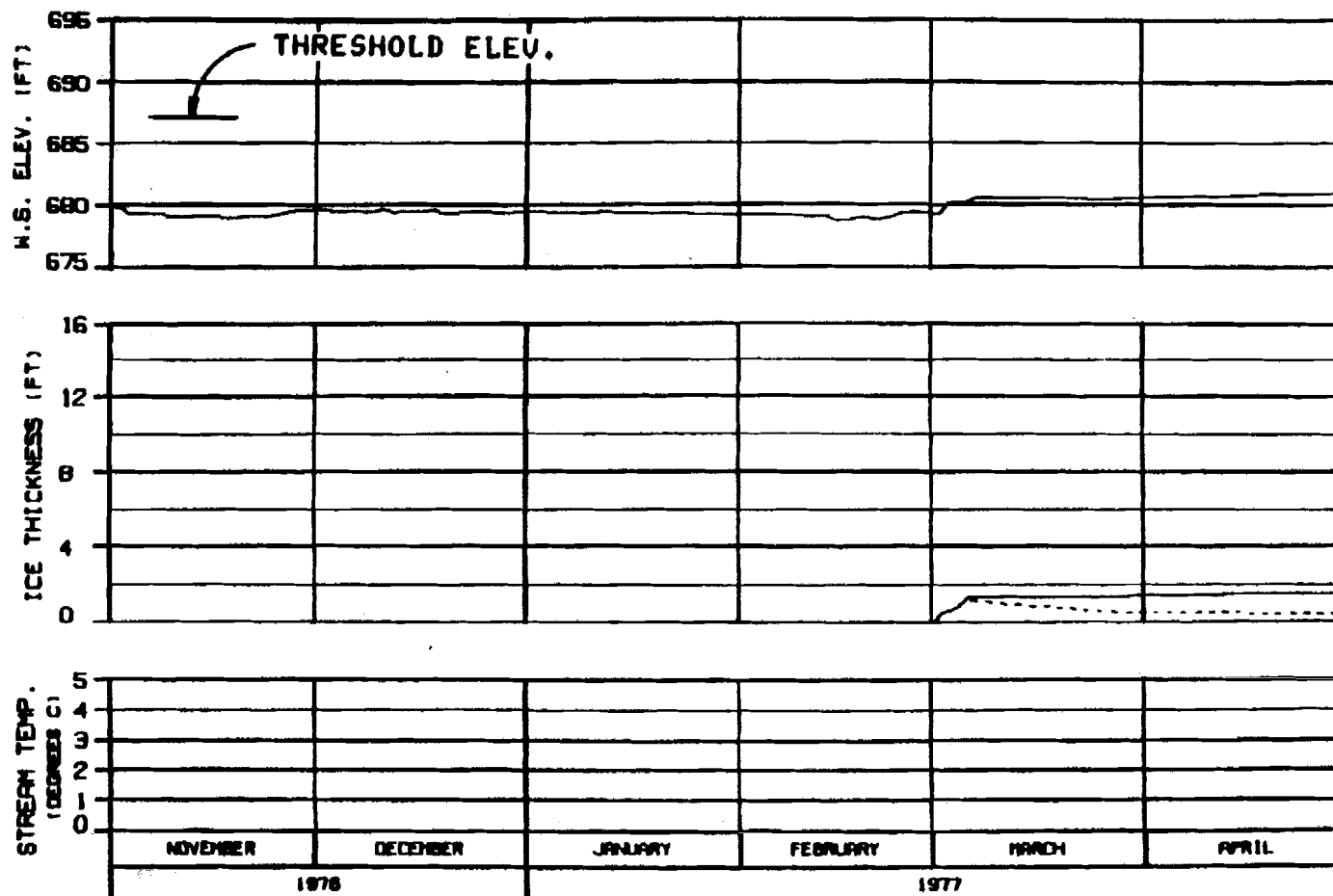
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAVERA-EBERSON JOINT VENTURE

DESIGNER - EBERSON 30 JAN 77 1000.142



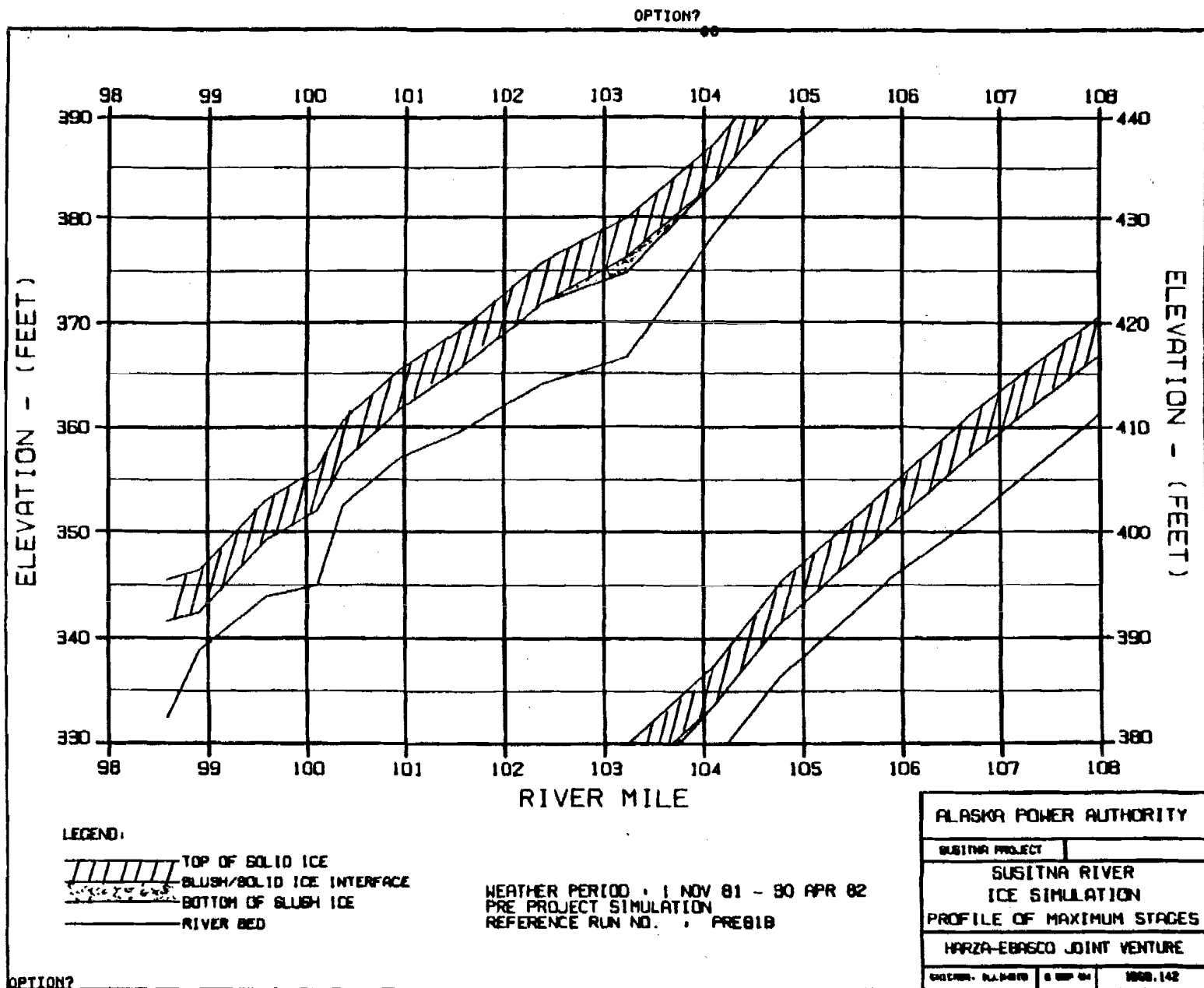
HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

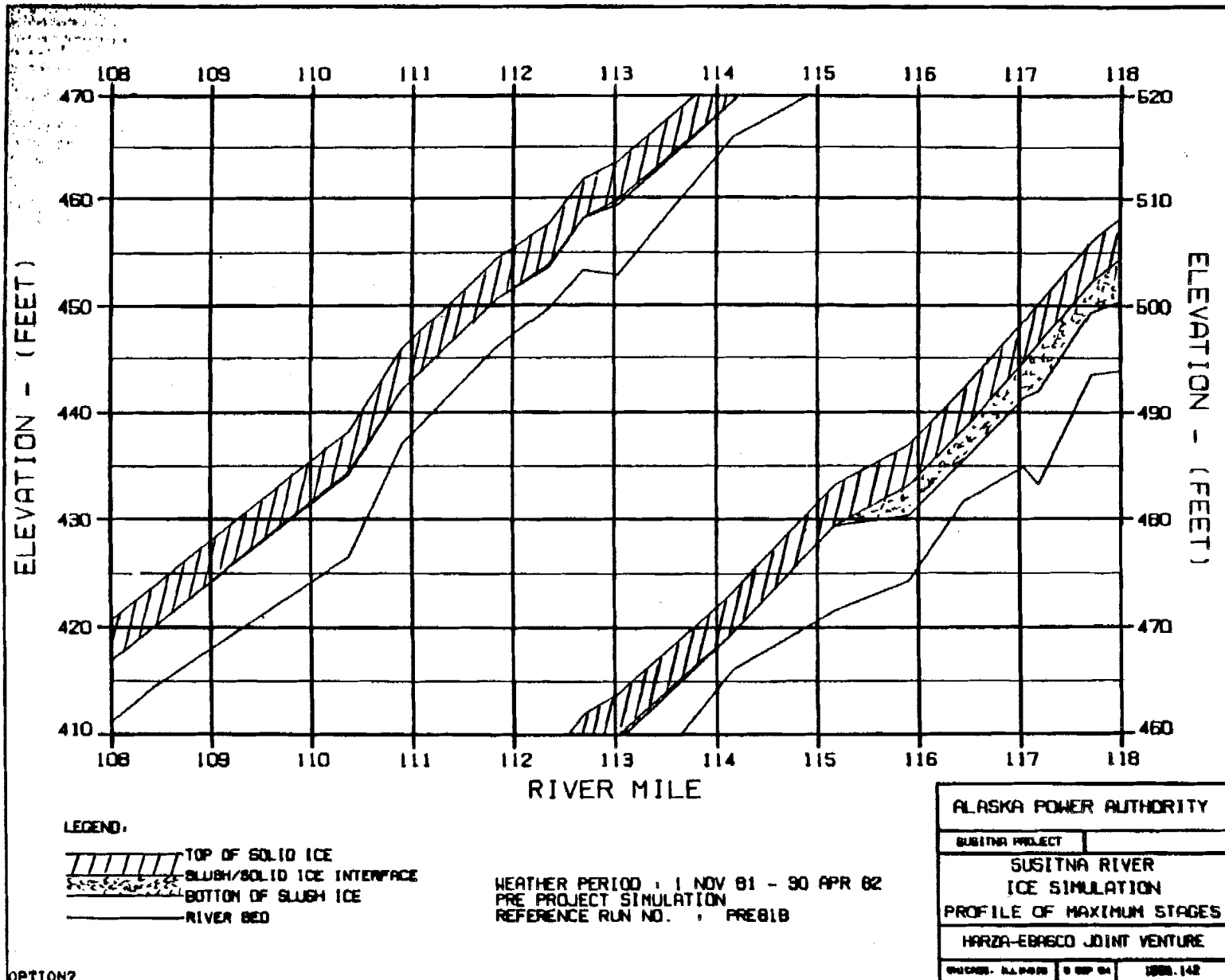
WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE76A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
MARZA-EBERG JOINT VENTURE	
DESIGN. NUMBER	NO. 142

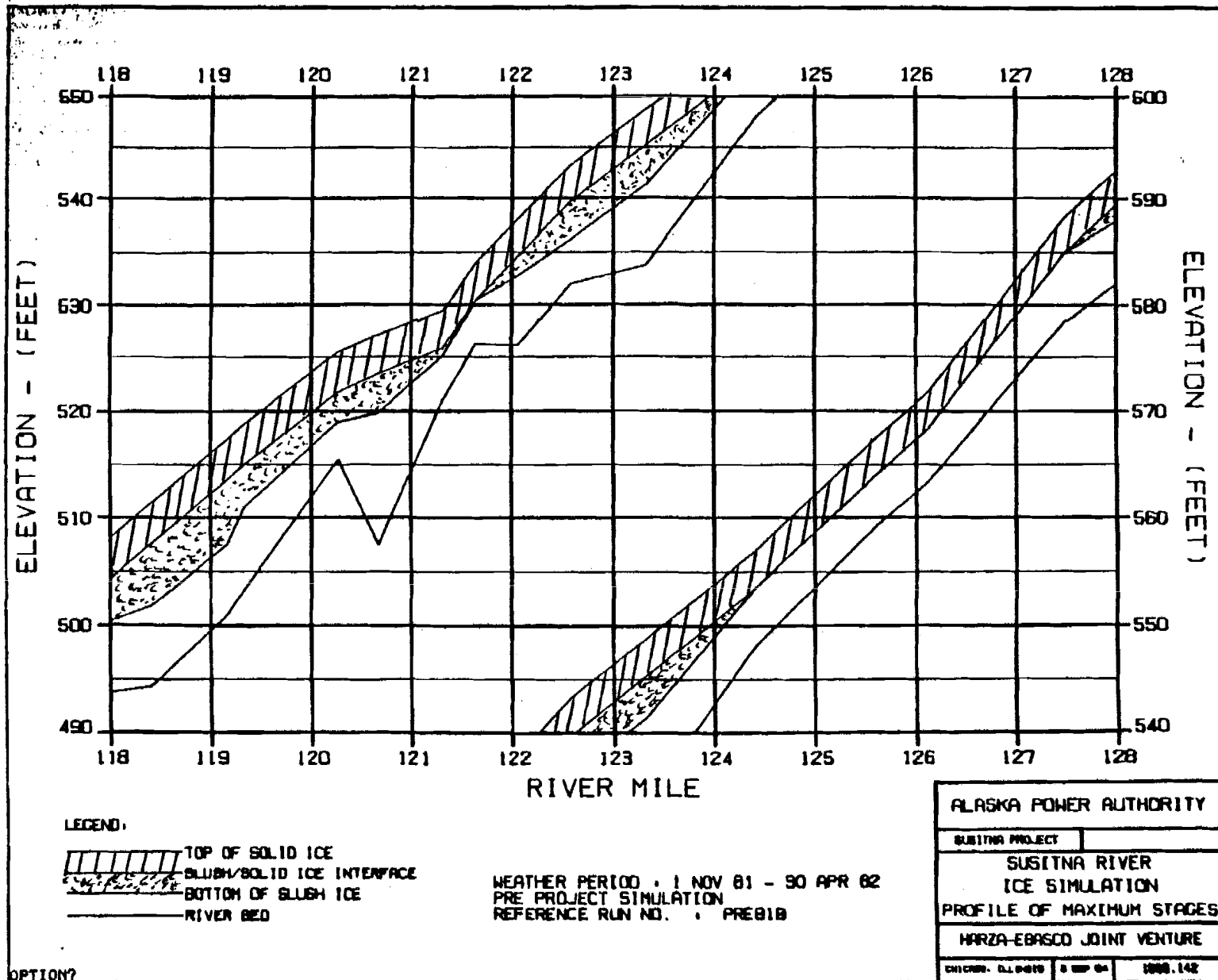
# EXHIBIT C



CC



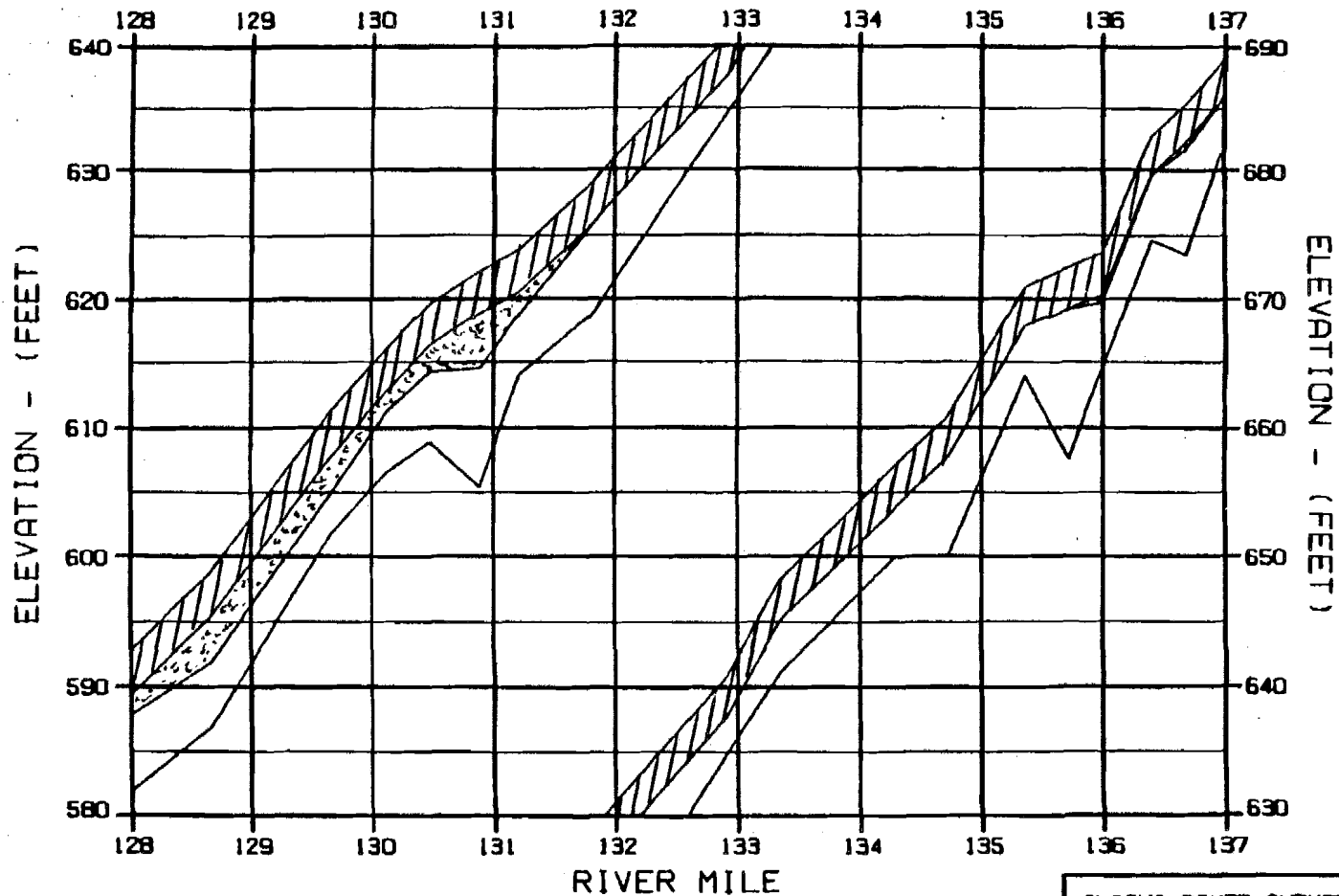
CC







OPTION?



CC



LEGEND:

-  TOP OF SOLID ICE
-  SLUSH/SOLID ICE INTERFACE
-  BOTTOM OF SLUSH ICE
-  RIVER BED

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE81B

ALASKA POWER AUTHORITY

SUSITNA PROJECT

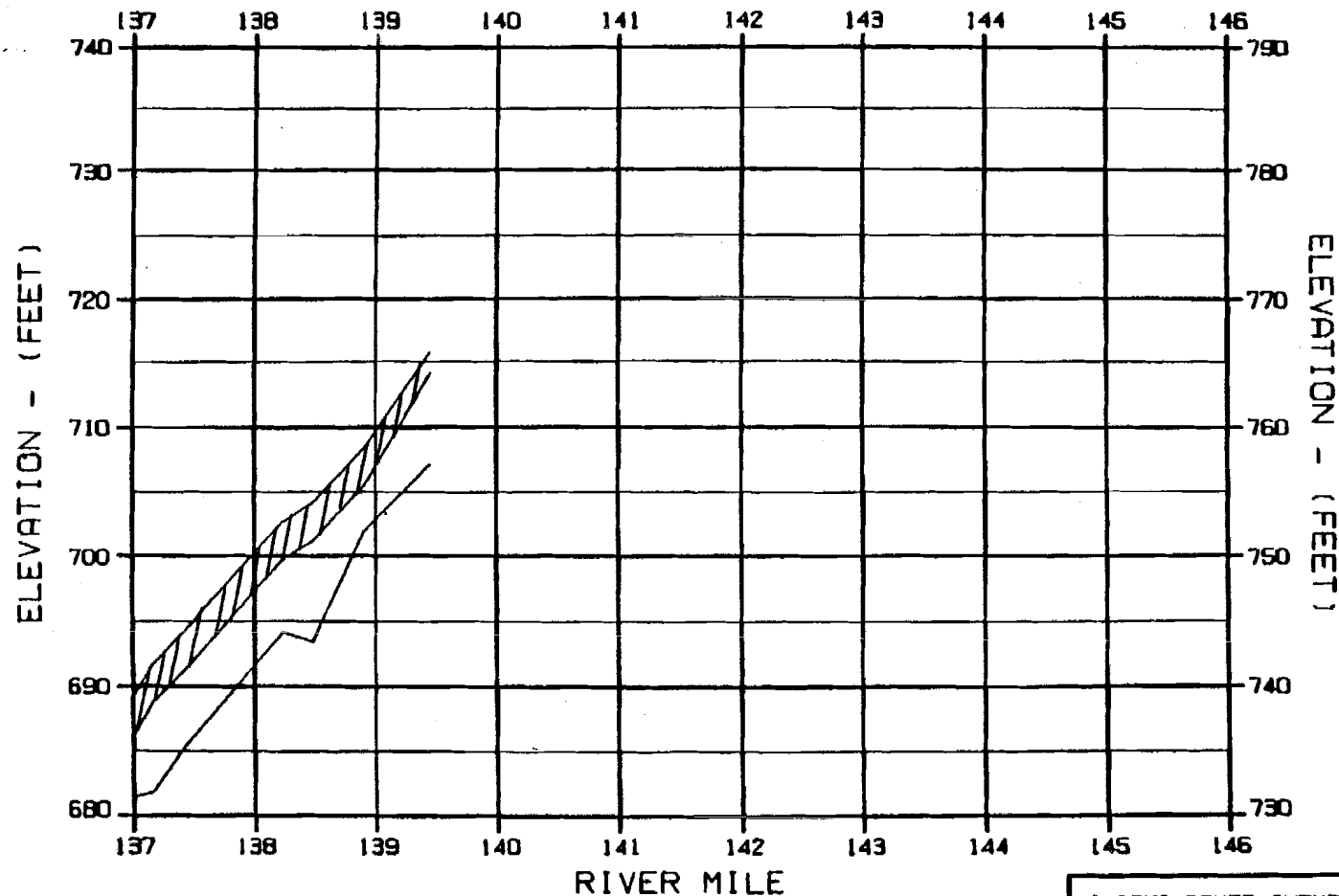
SUSITNA RIVER  
ICE SIMULATION  
PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

DESIGNED - E.L. BROWN 2 SEP 81 1000.142

OPTION2

CC



LEGEND:

- TOP OF SOLID ICE
- SLUSH/SOLID ICE INTERFACE
- BOTTOM OF SLUSH ICE
- RIVER BED

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

ALASKA POWER AUTHORITY

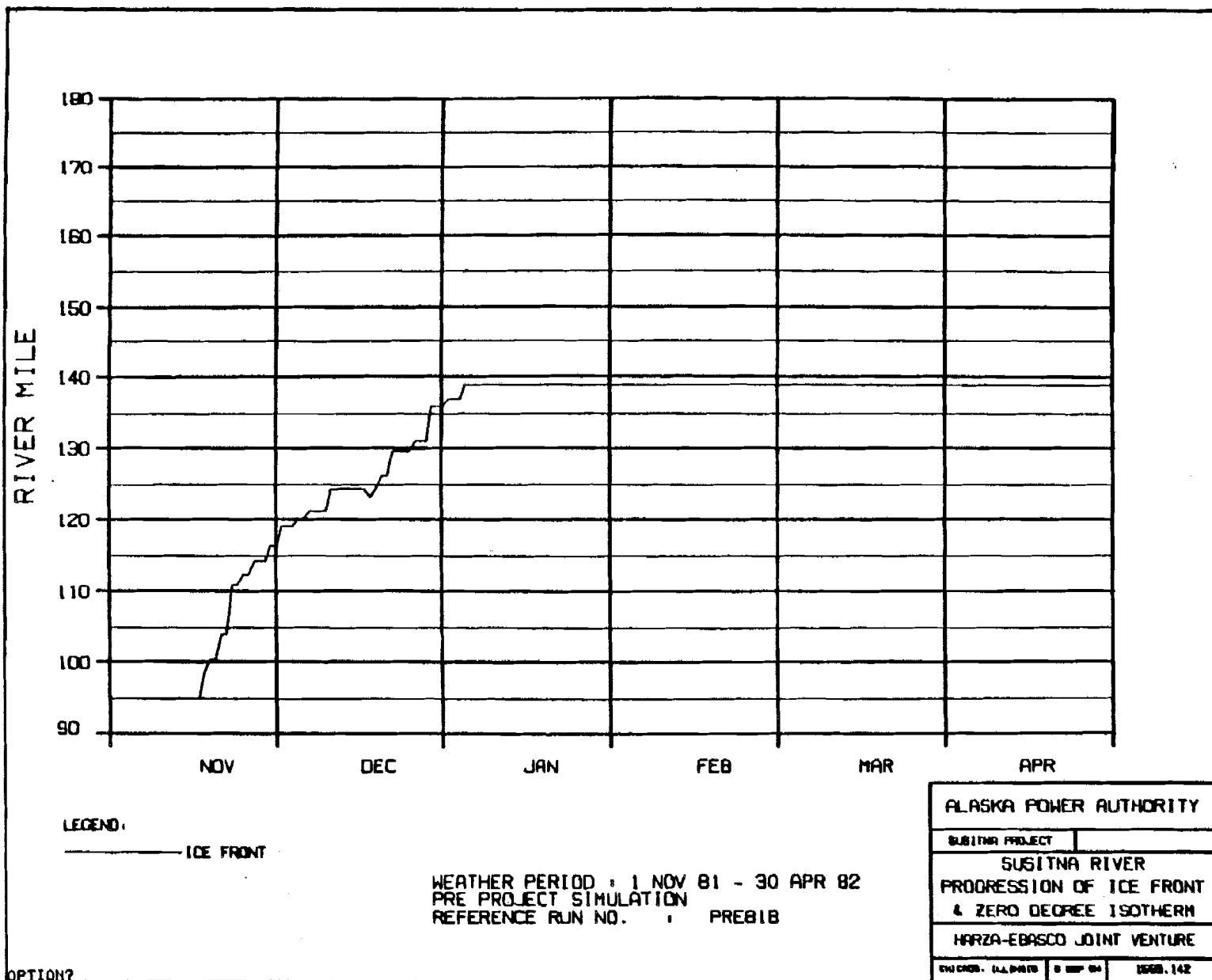
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

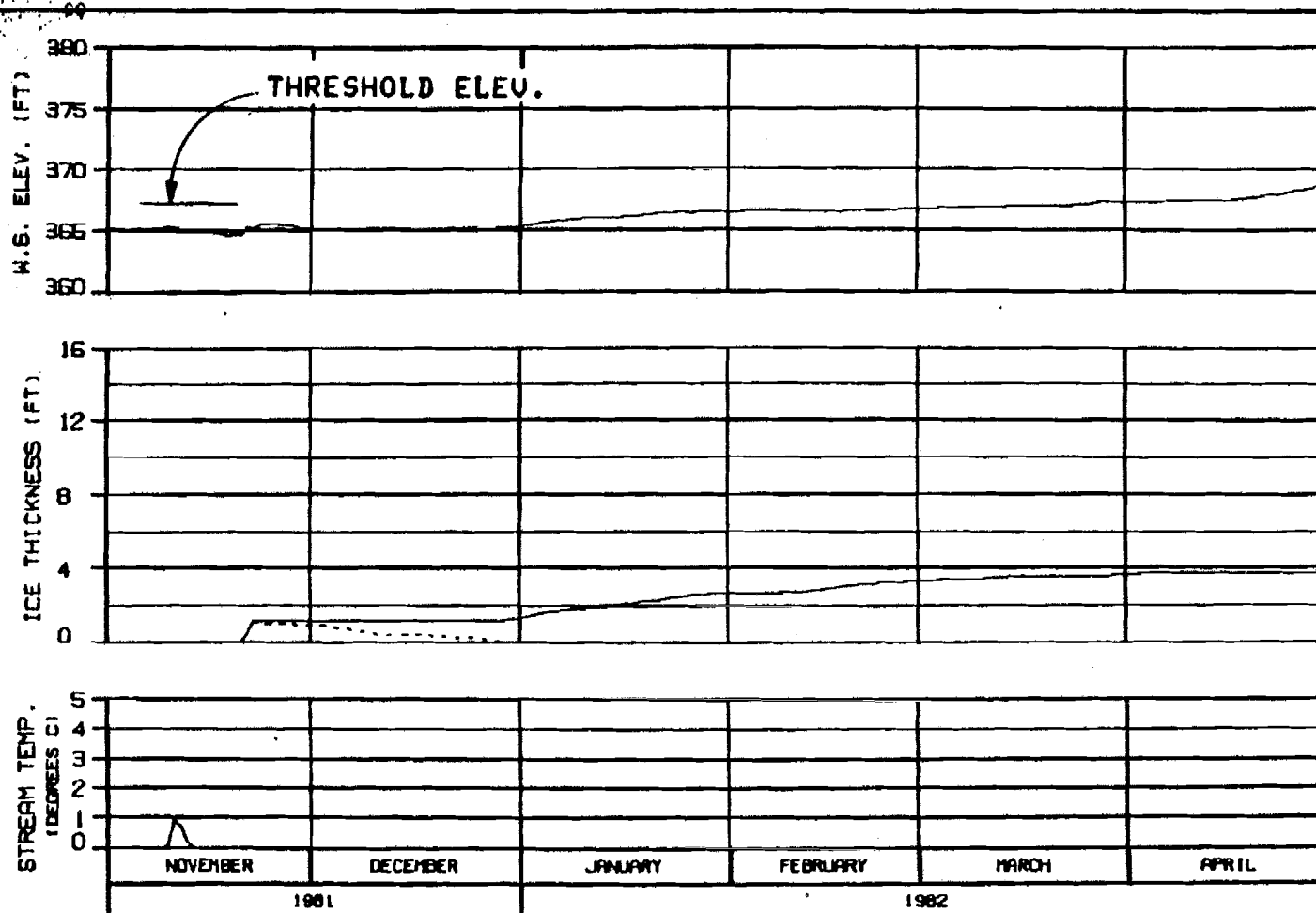
HARZA-EBAGCO JOINT VENTURE

CHECKED: SLD-800 8 SEP 84 1000.142

OPTION?



OPTION?



# HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

## ICE THICKNESS LEGEND:

———— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

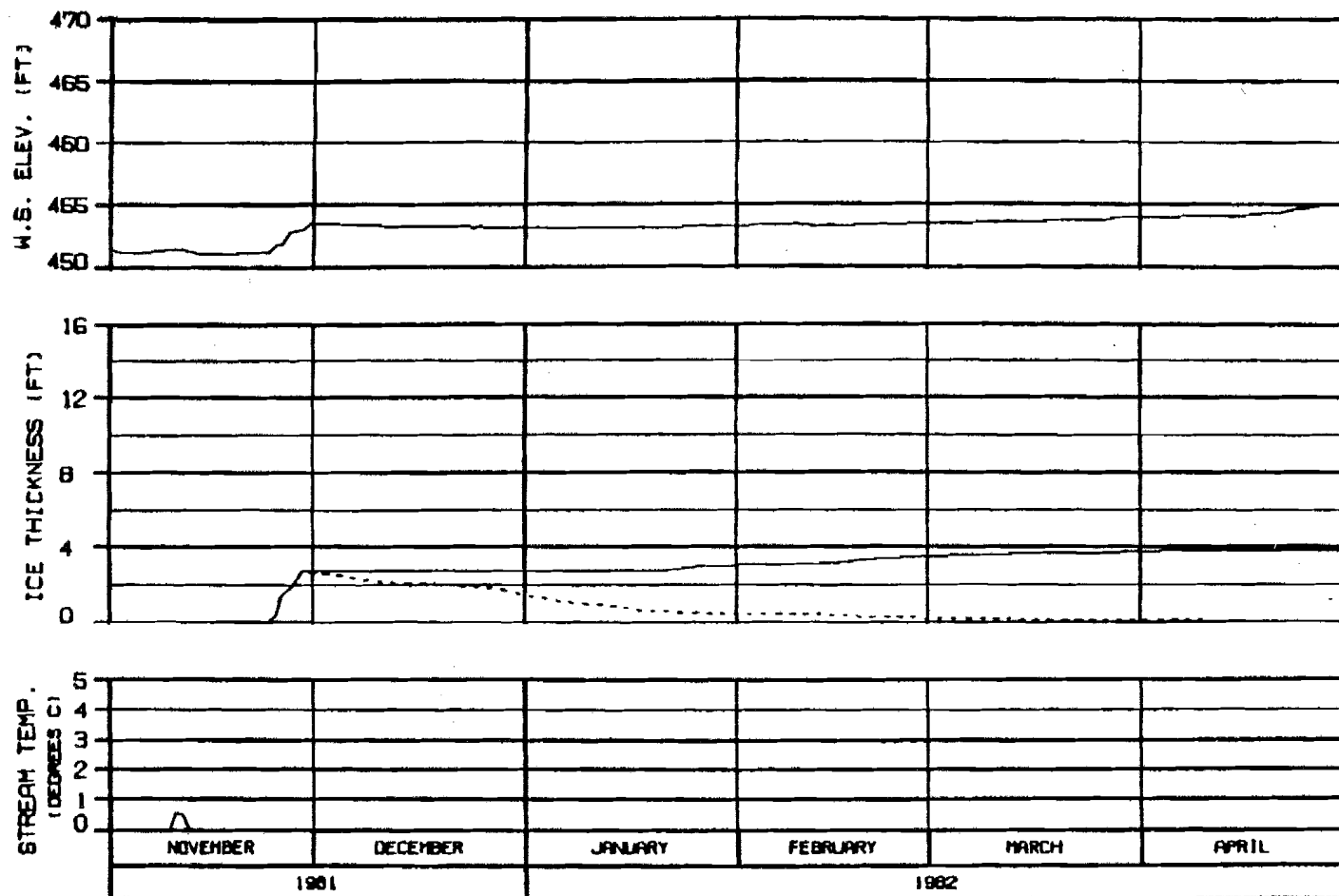
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

PROJECT - 811-0010 8 SEP 81 1000.142



**ICE THICKNESS LEGEND:**

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

**SIDE CHANNEL AT HEAD OF GASH CREEK**

**RIVER MILE : 112.00**

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

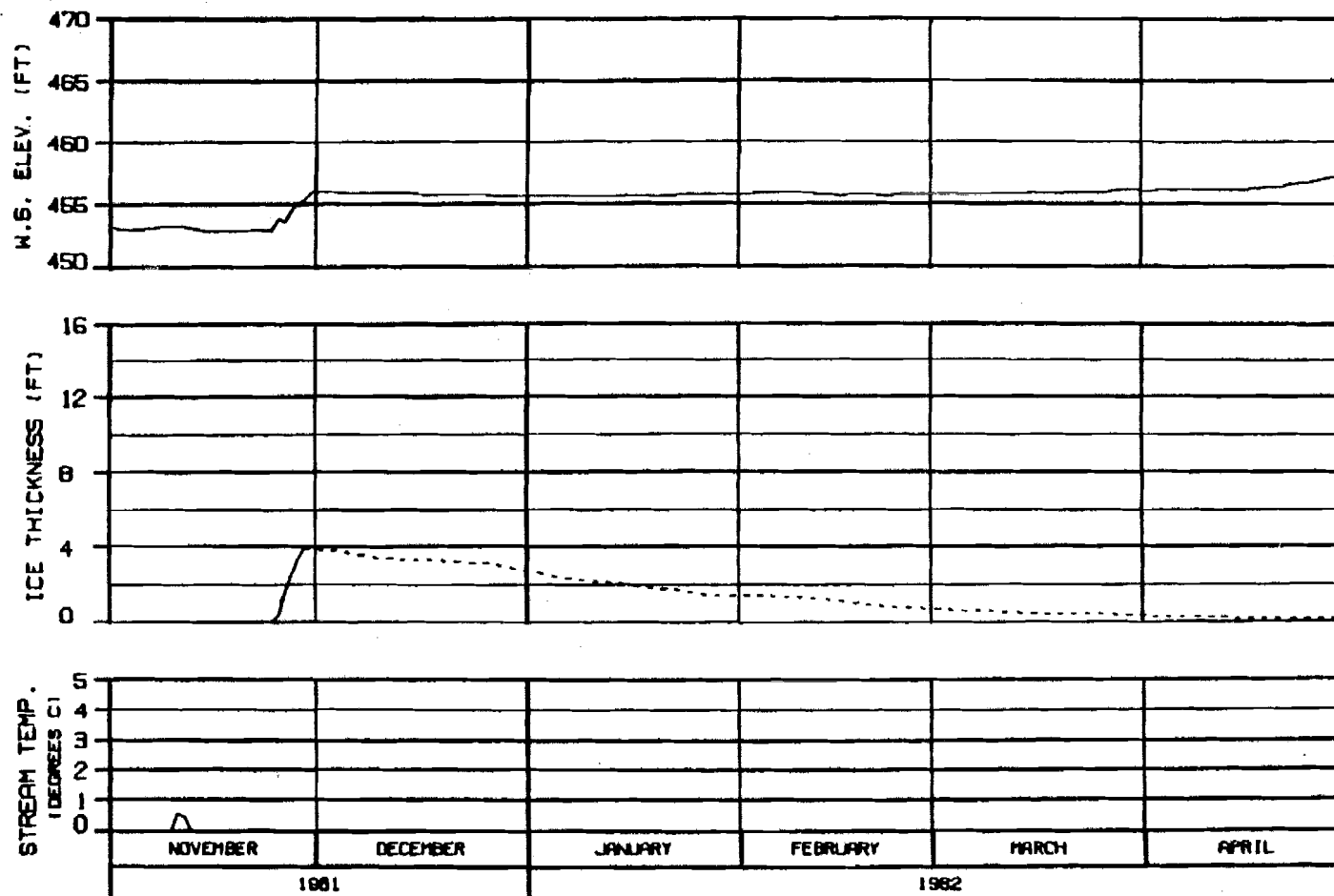
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

CHARTER - ALL DATA 5 SEP 82 1000.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

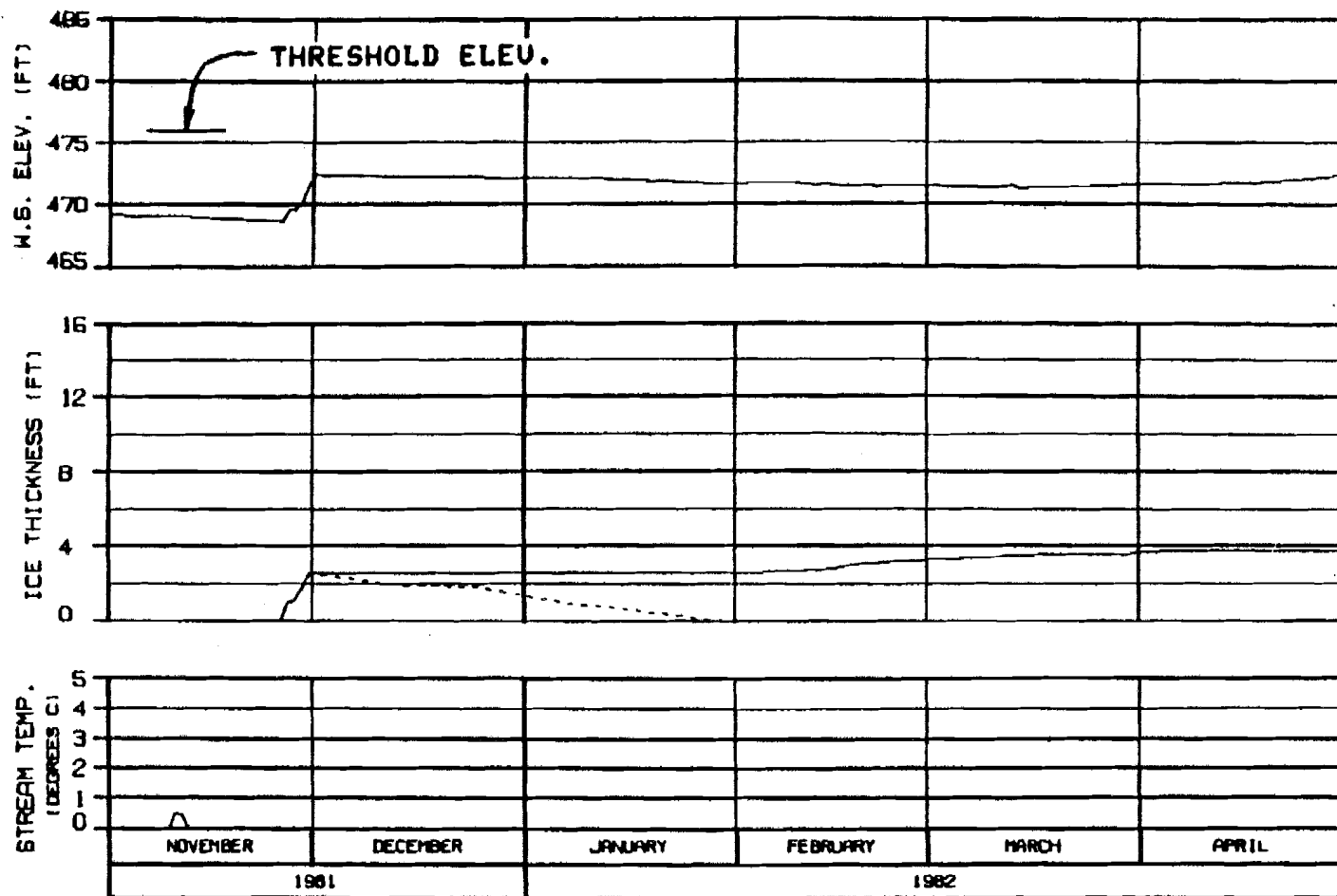
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN - 81-0-000 5 SEP 81 1000.142



HEAD OF SLOUGH 8

RIVER MILE : 114.10

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

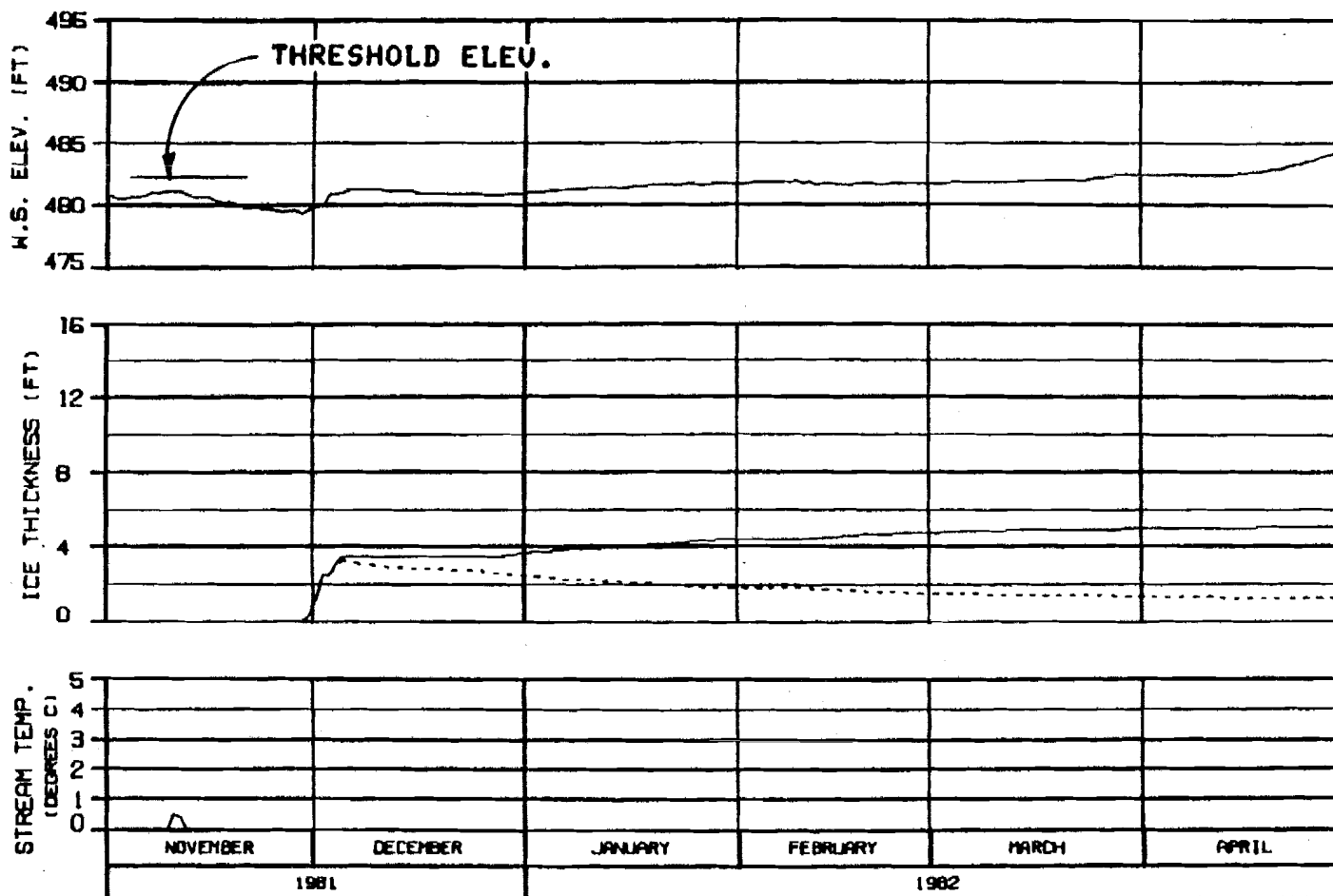
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EGASCO JOINT VENTURE

CHIEF, ALASKA

5 SEP 82

1000.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL MSII  
 RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

ALASKA POWER AUTHORITY

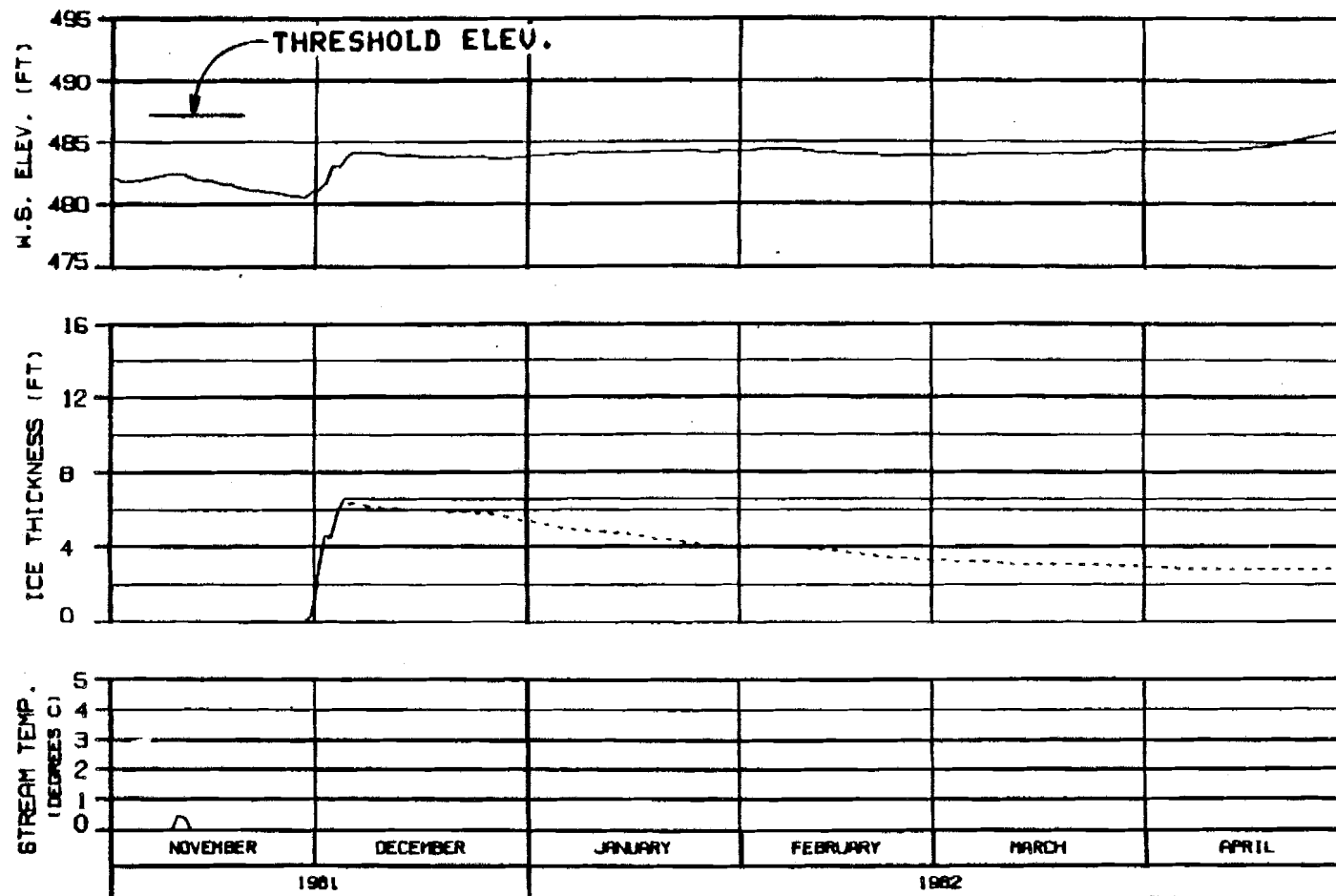
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHGNO. 0110010 0 SEP 84 1000.142





HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

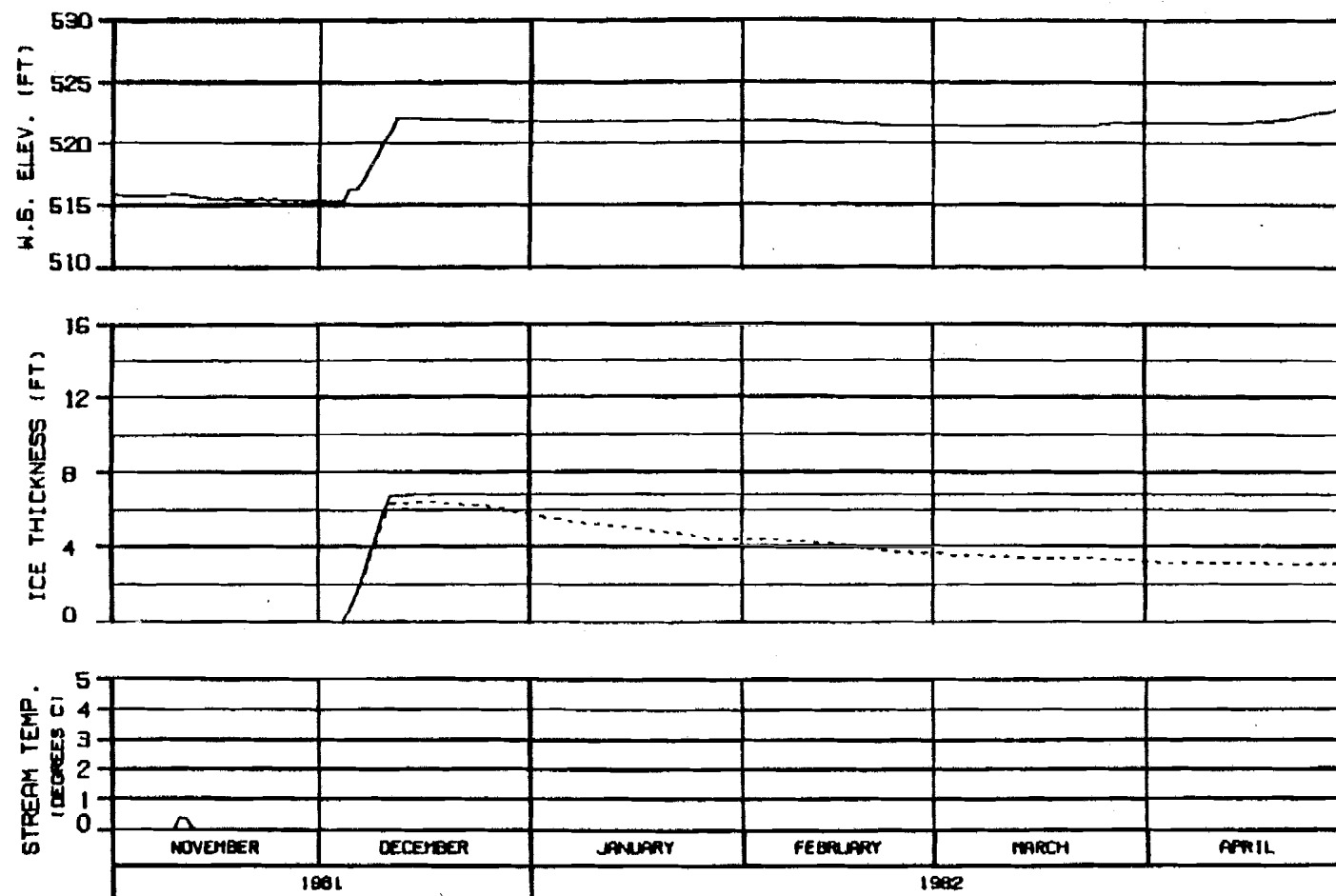
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBAGCO JOINT VENTURE

DRAWN: S. L. 10119 5 SEP 82 1000-142



**ICE THICKNESS LEGEND:**

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

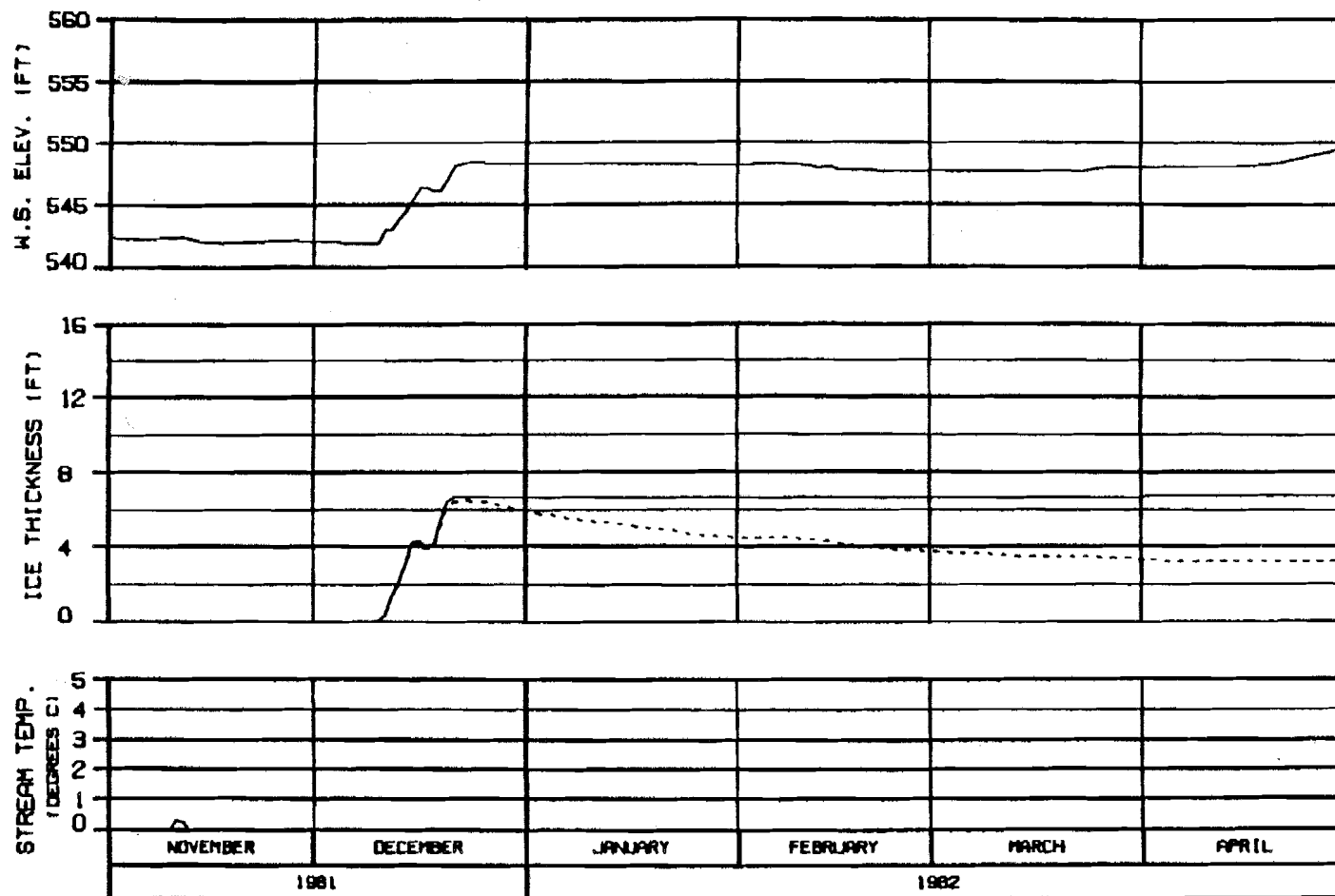
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ENCLOSURE - DATA SHEET 5 SEP 82 1000.142



**HEAD OF MOOSE SLOUGH**  
**RIVER MILE : 123.50**

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLOUGH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

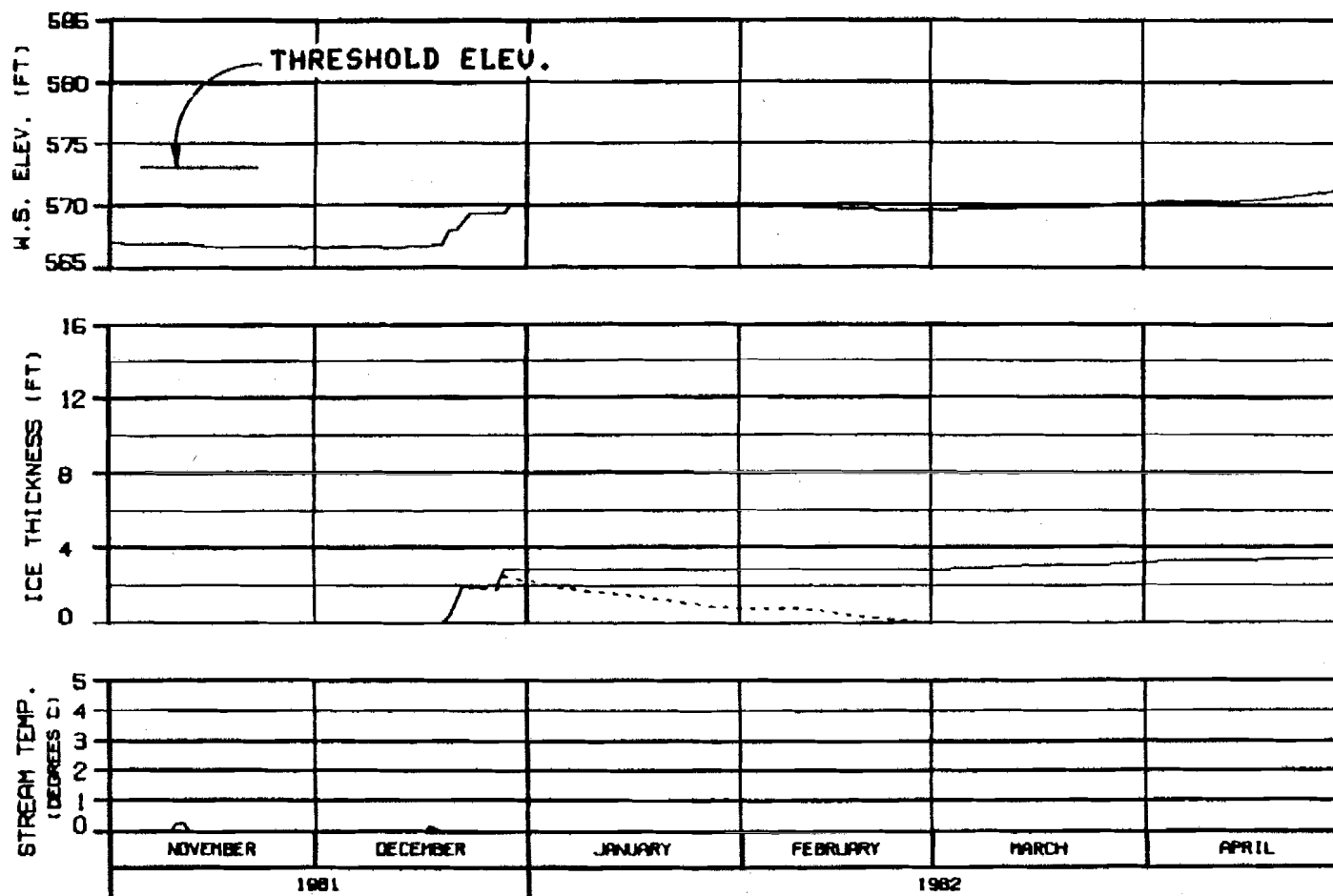
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHIEF: J.L. BROWN

8 SEP 82

USBR 142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

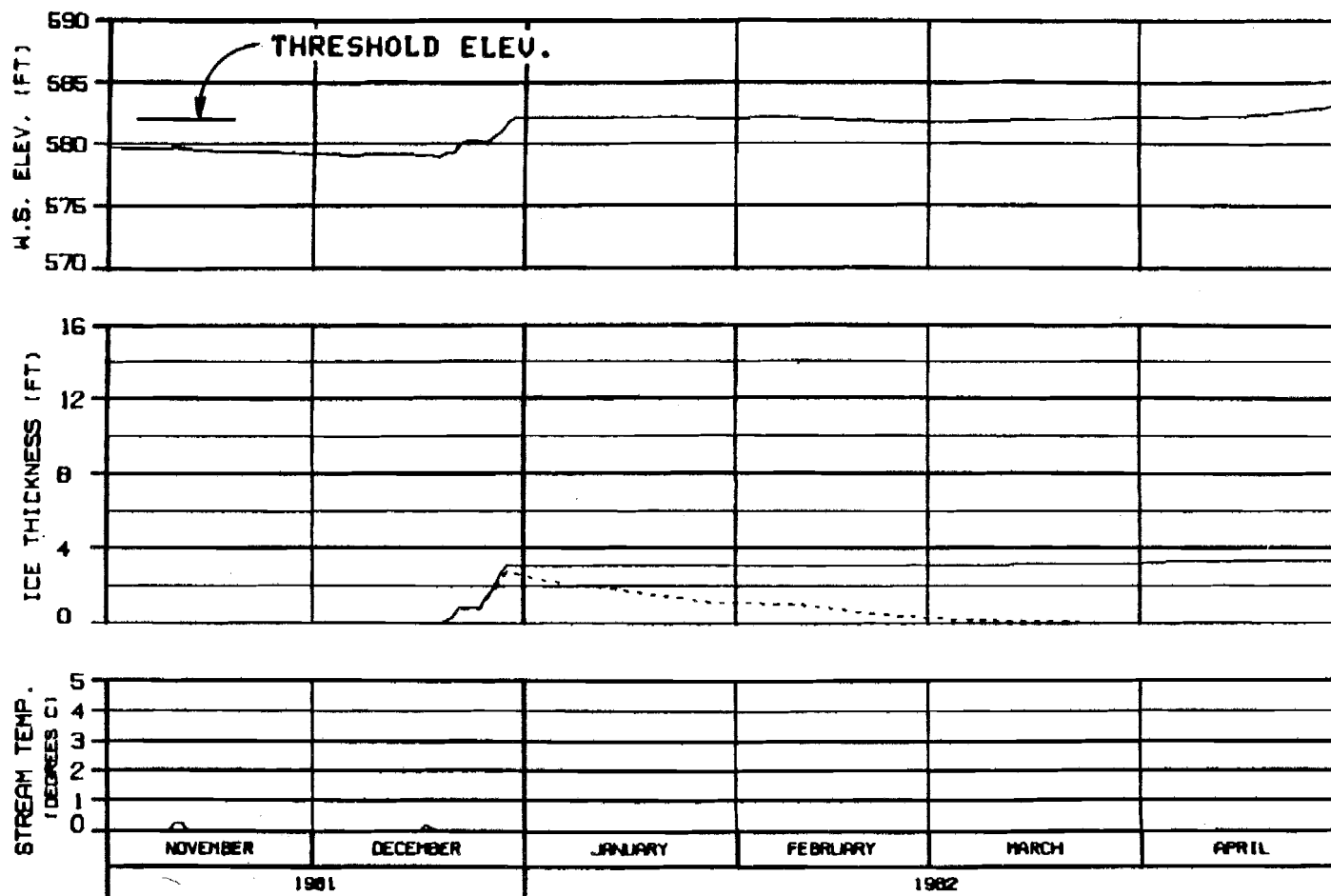
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS 60606-1442



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

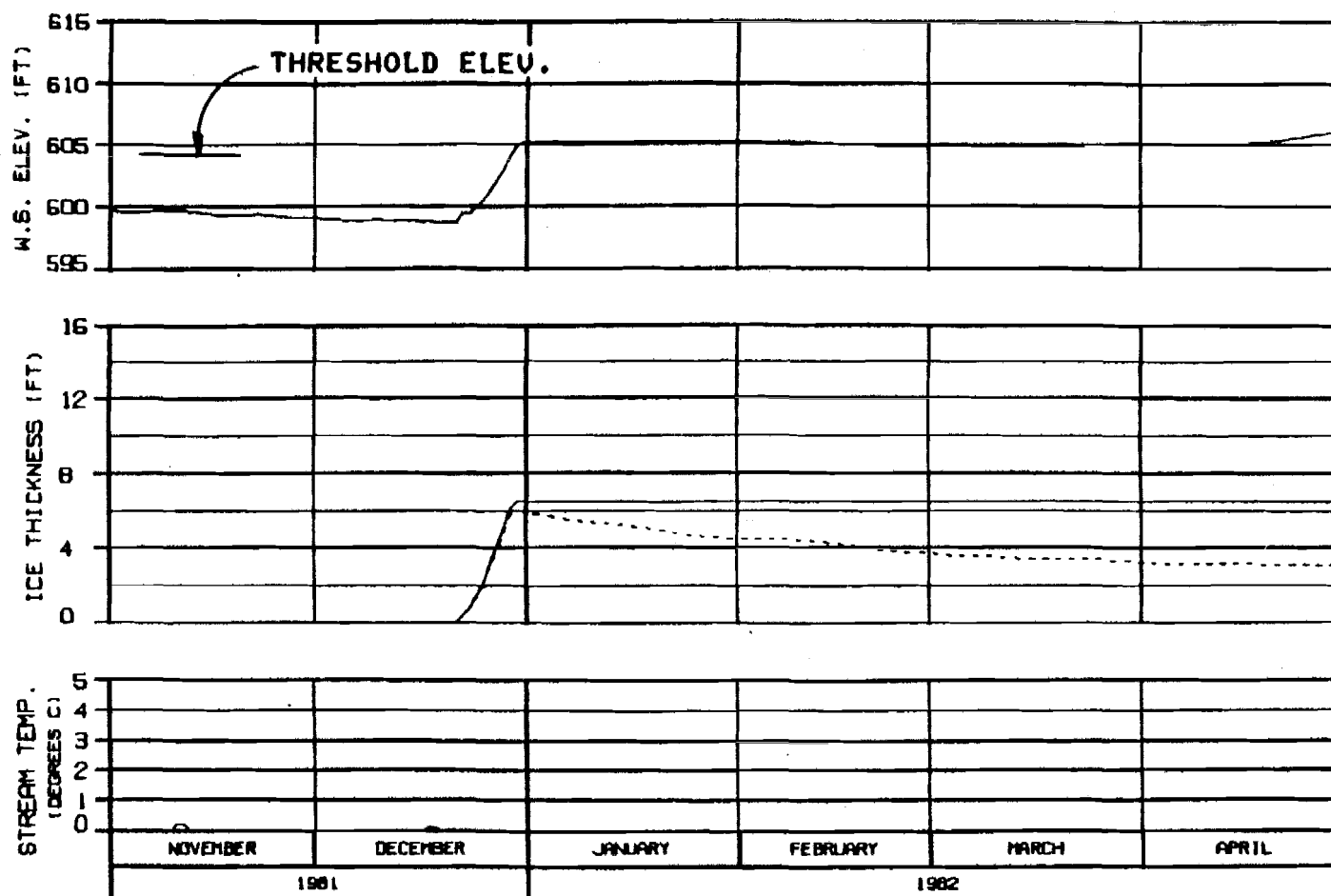
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: ALP/MS 8 SEP 84 1000.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE818

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

OPTION?

ALASKA POWER AUTHORITY

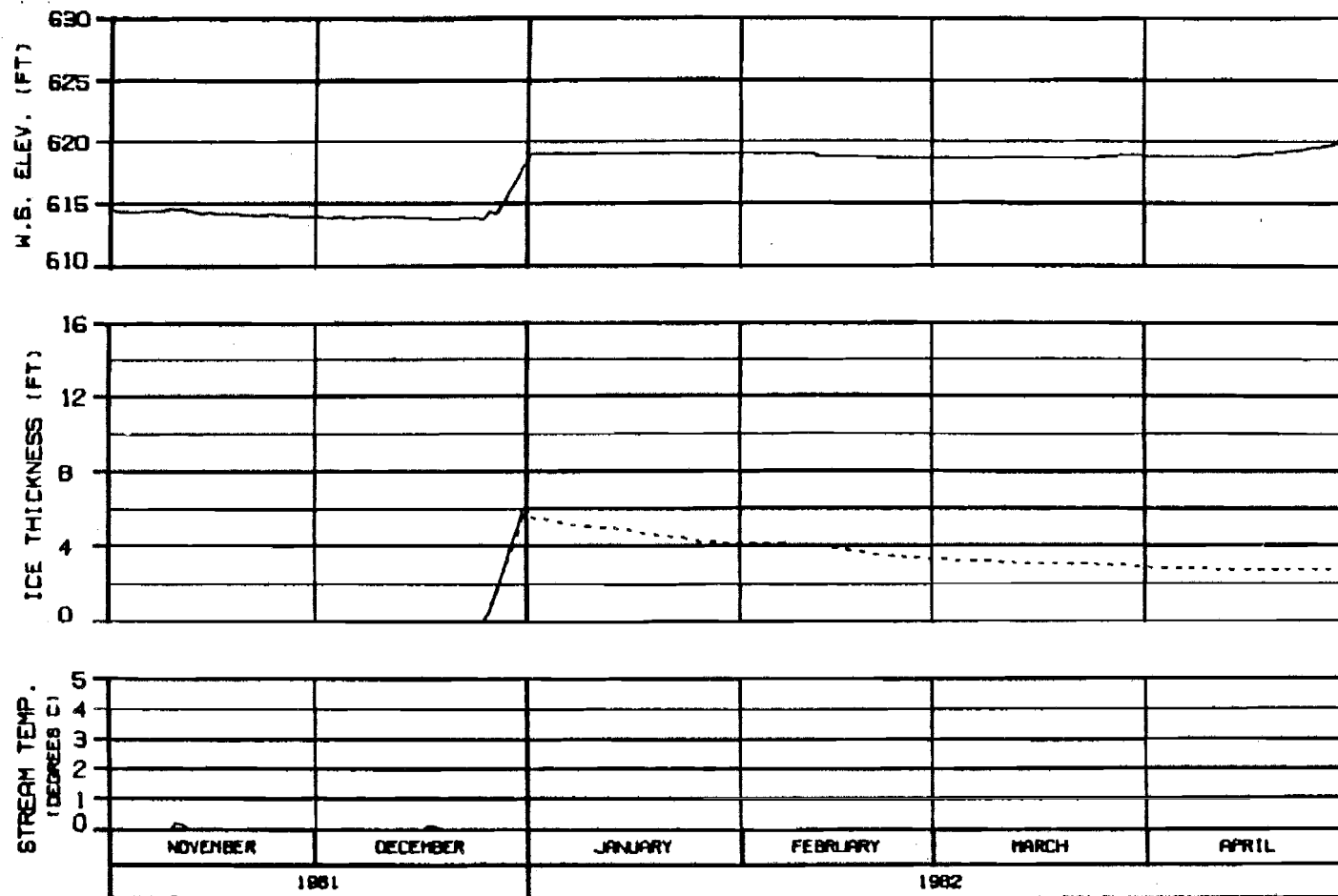
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARGE: 0110010 0 SEP 84 1000.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. 1 PRE81B

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

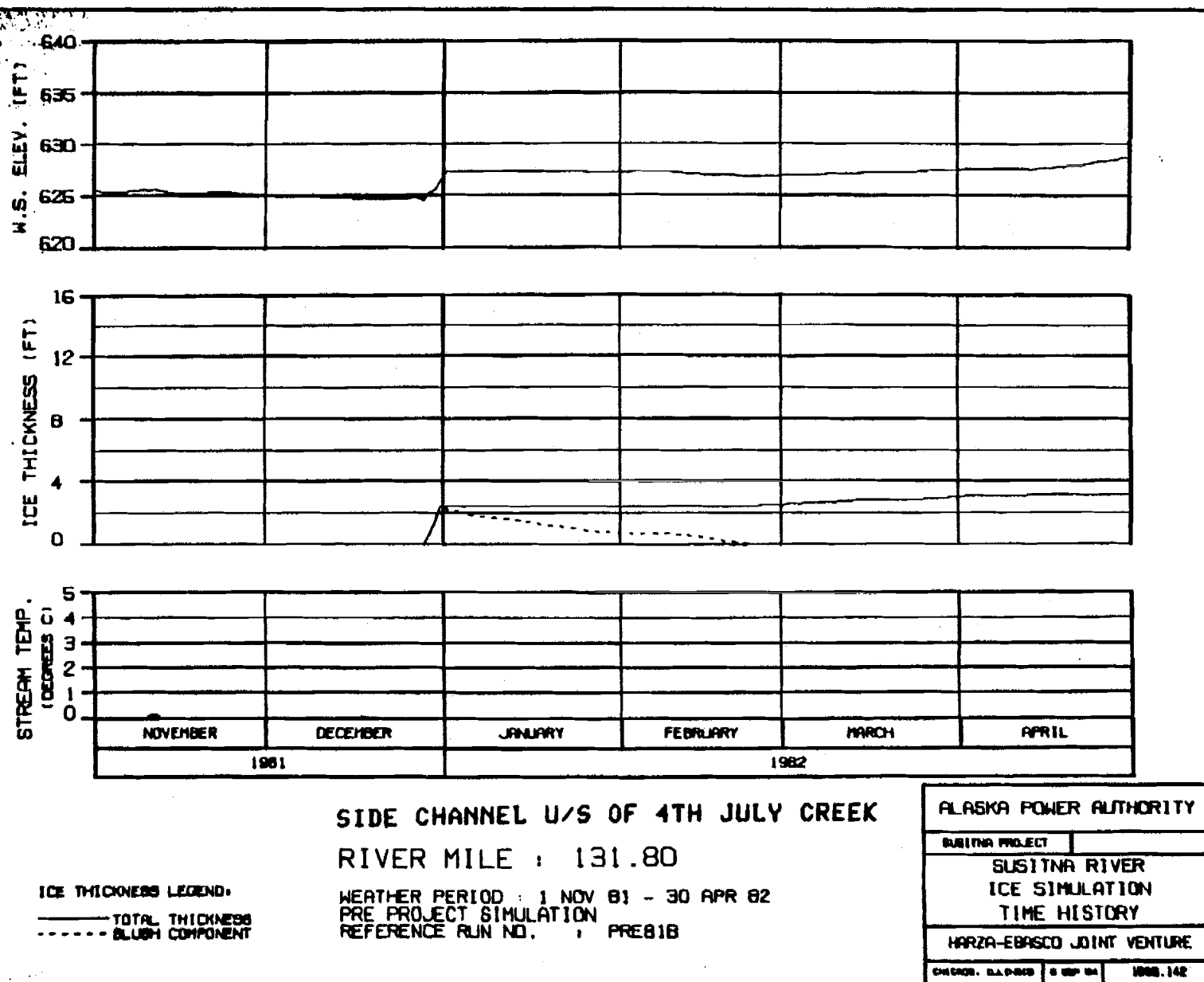
ALASKA POWER AUTHORITY

SUSITNA PROJECT

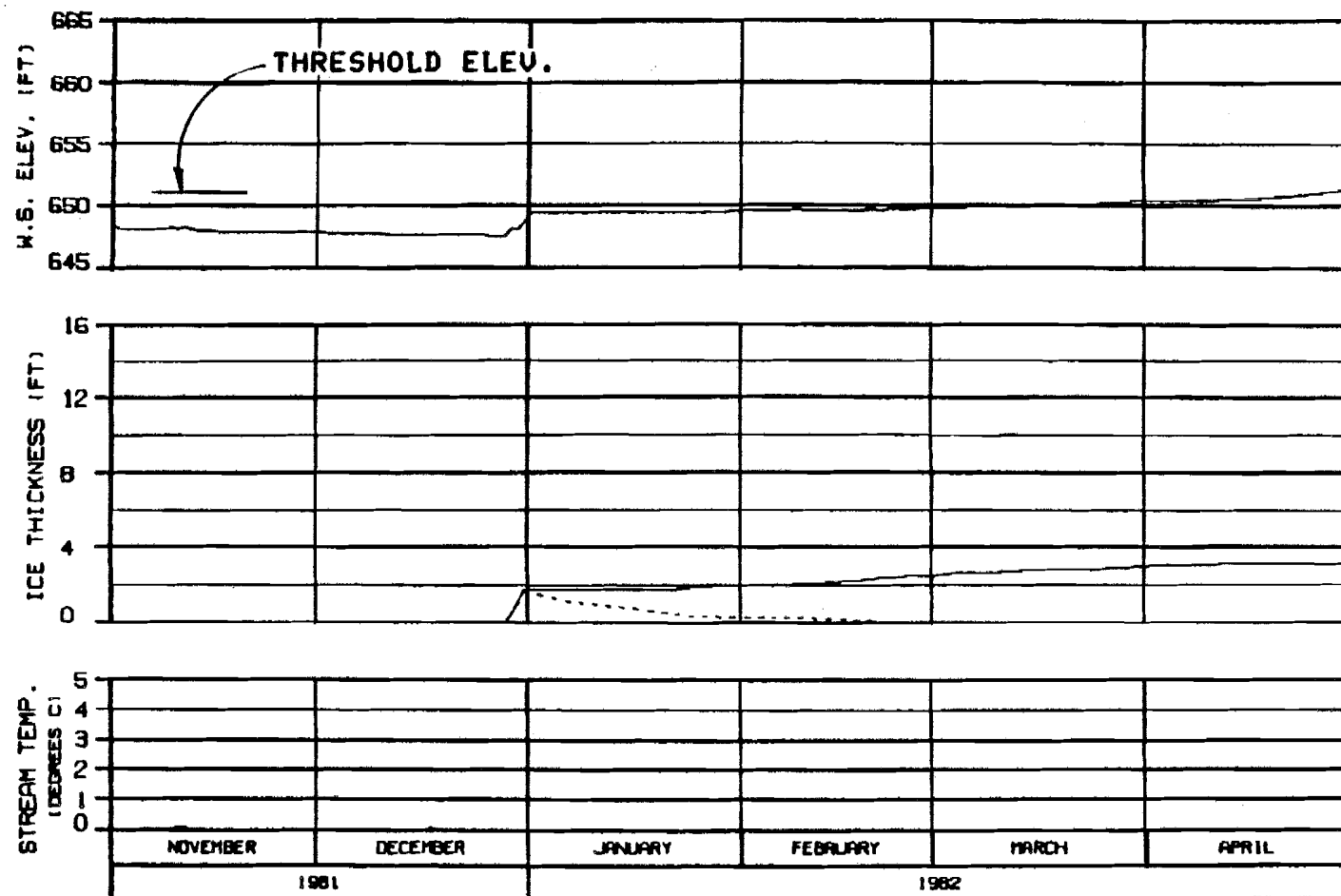
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DWG NO. 111-0-010 1 OF 10 1000-142







ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

HEAD OF SLOUGH 9A  
 RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE81B

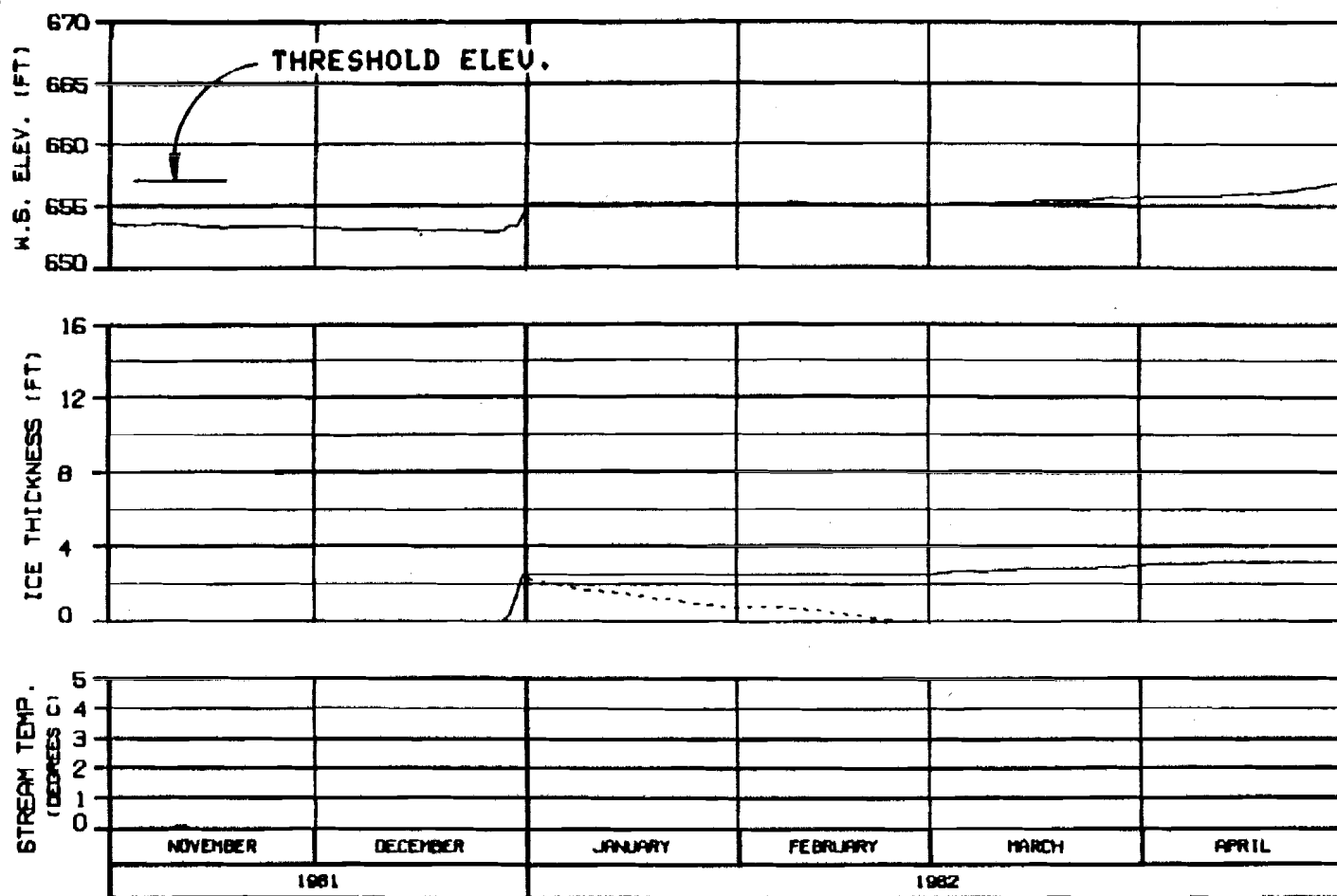
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

CRS CHRS. 511 P-81B 5 SEP 84 1588.142



**SIDE CHANNEL U/S OF SLOUGH 10**  
**RIVER MILE : 134.30**

**WEATHER PERIOD : 1 NOV 81 - 30 APR 82**  
**PRE PROJECT SIMULATION**  
**REFERENCE RUN NO. : PRE818**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLOUGH COMPONENT

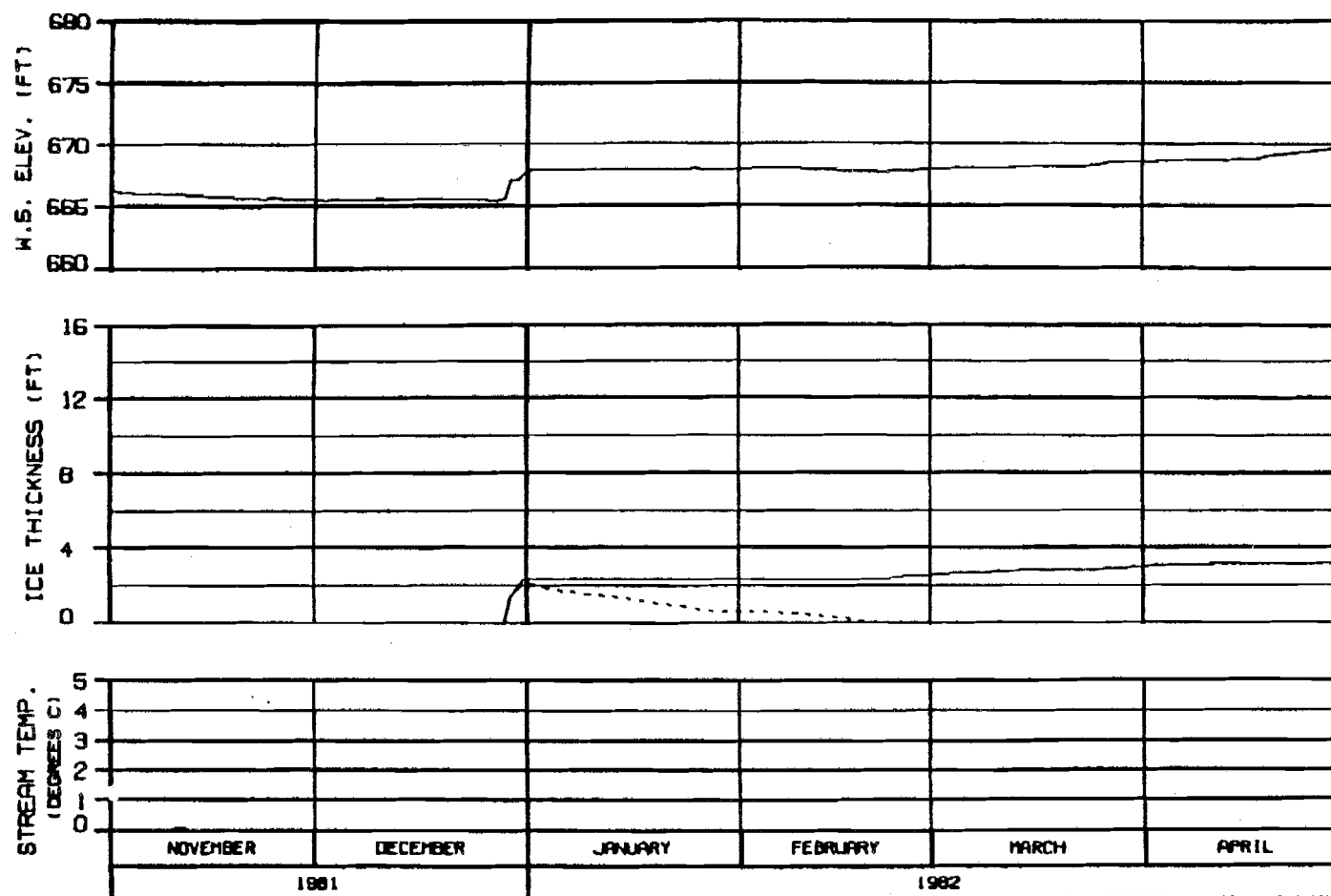
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HARZA-EBRACO JOINT VENTURE**

**ENCLOS. 5110-010 3 SEP 84 1000,142**



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 81 - 30 APR 82

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE818

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

ALASKA POWER AUTHORITY

SUSITNA PROJECT

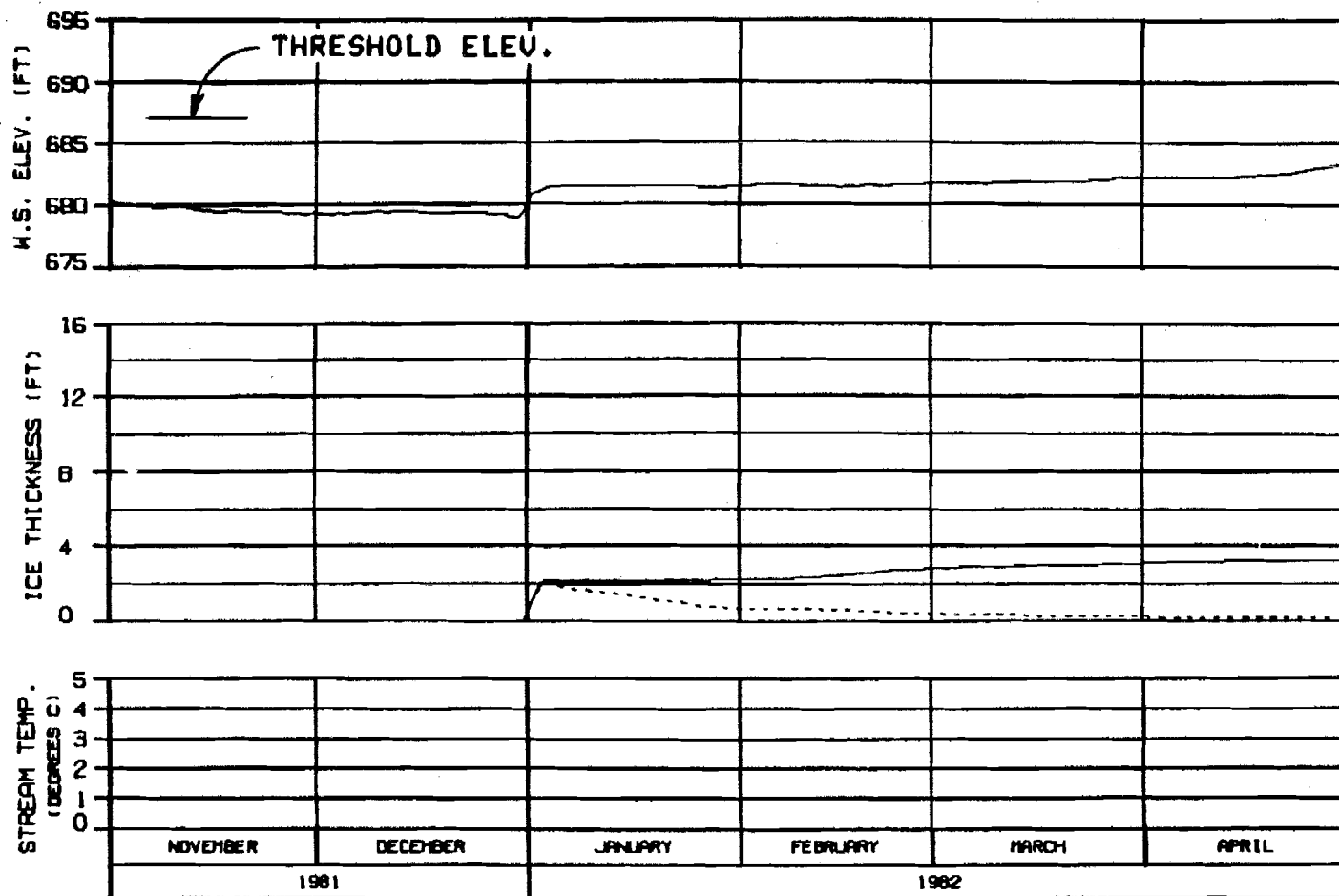
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DWG NO. AL-8400

8 SEP 82

VS88.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE81B

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

ALASKA POWER AUTHORITY

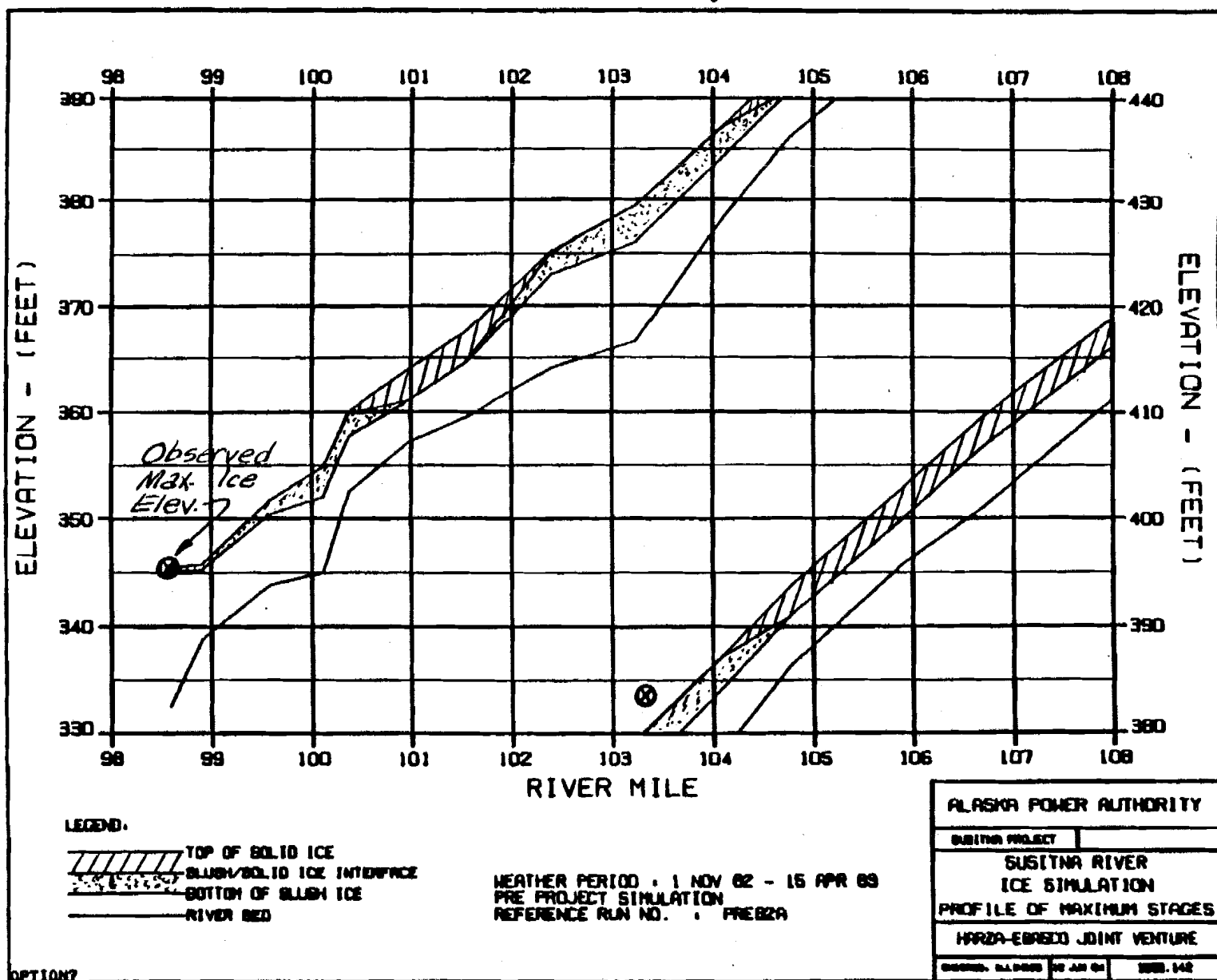
SUSITNA PROJECT

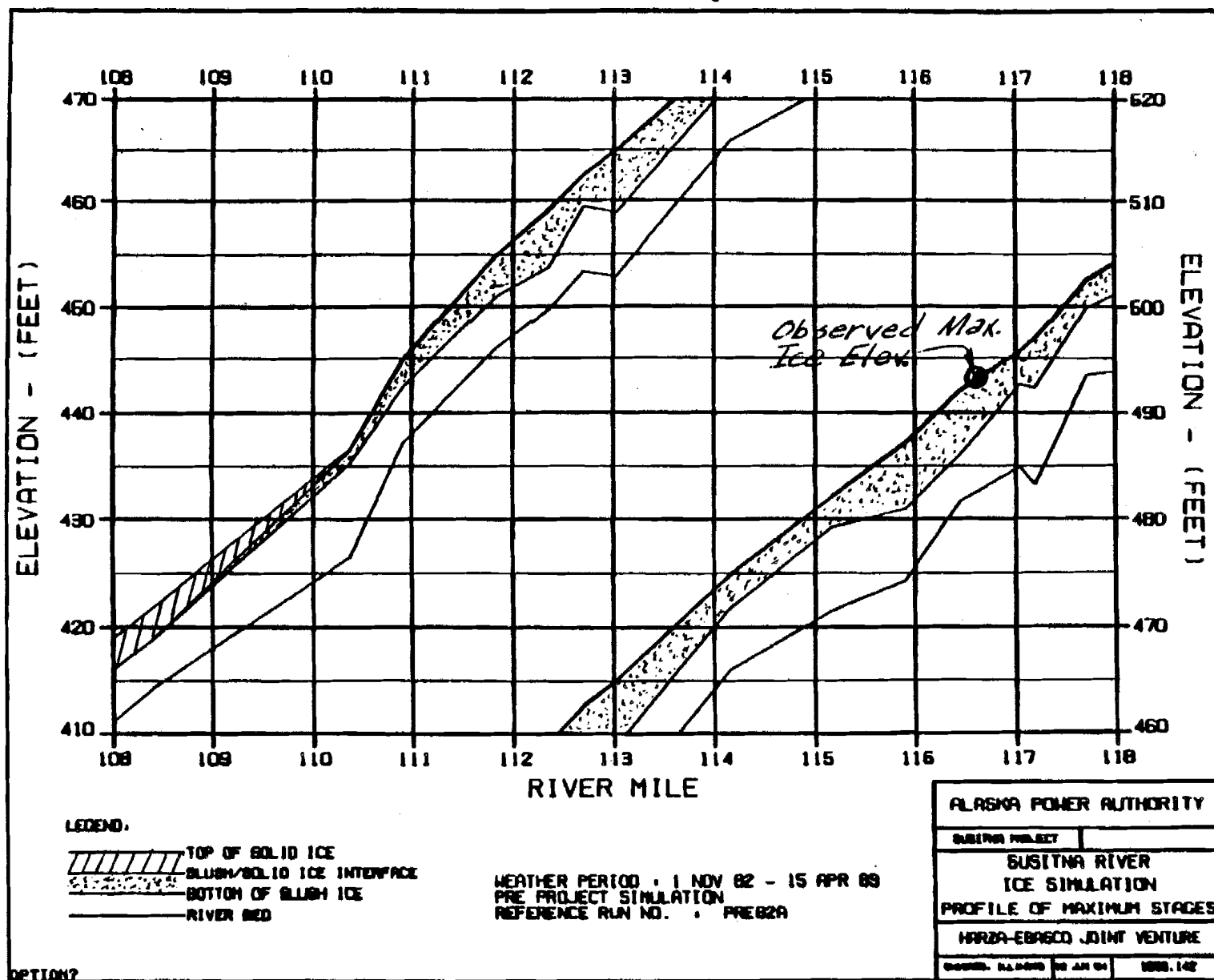
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

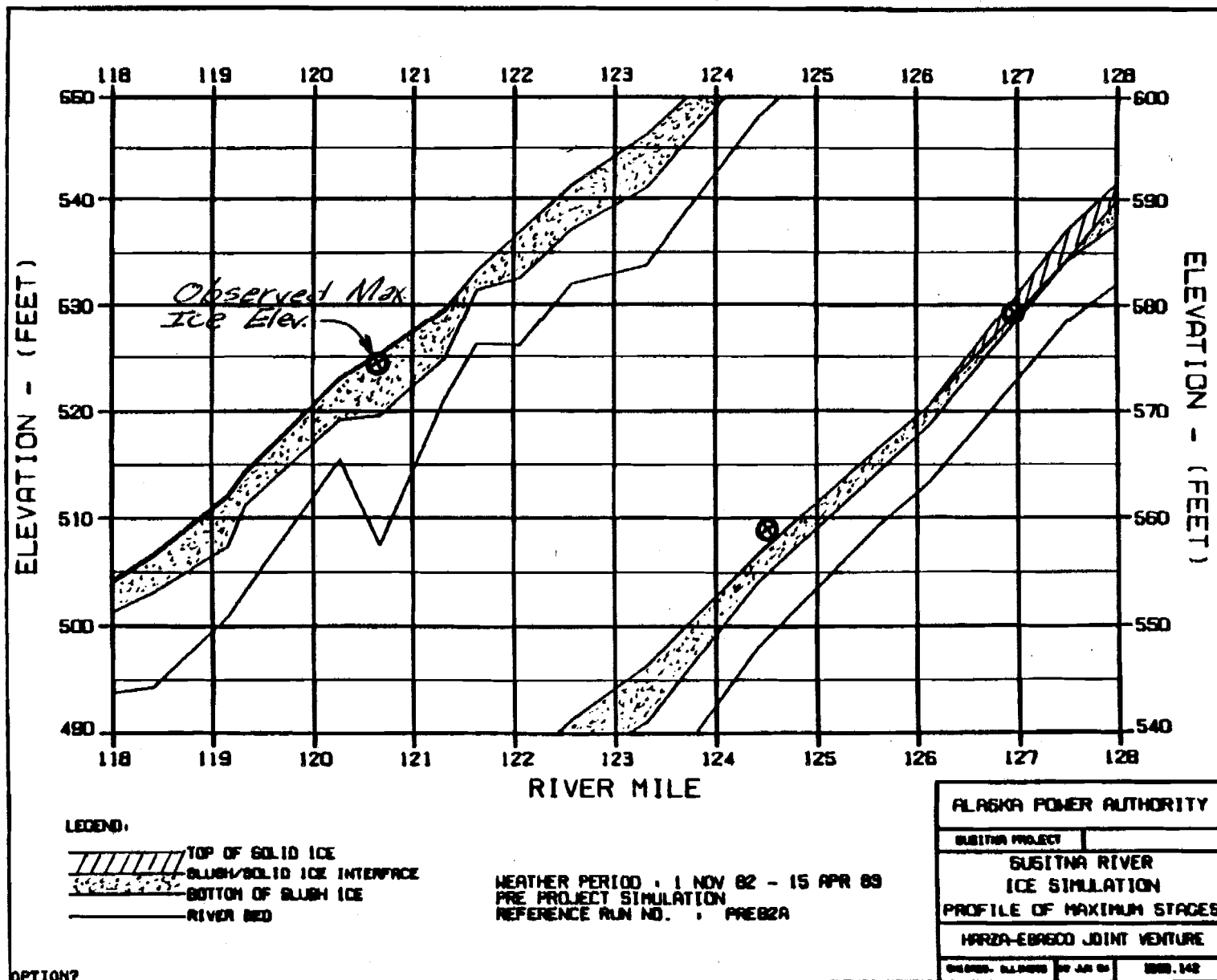
HARZA-EBASCO JOINT VENTURE

CHECKED: J.L.P. 05 SEP 84 1000.142

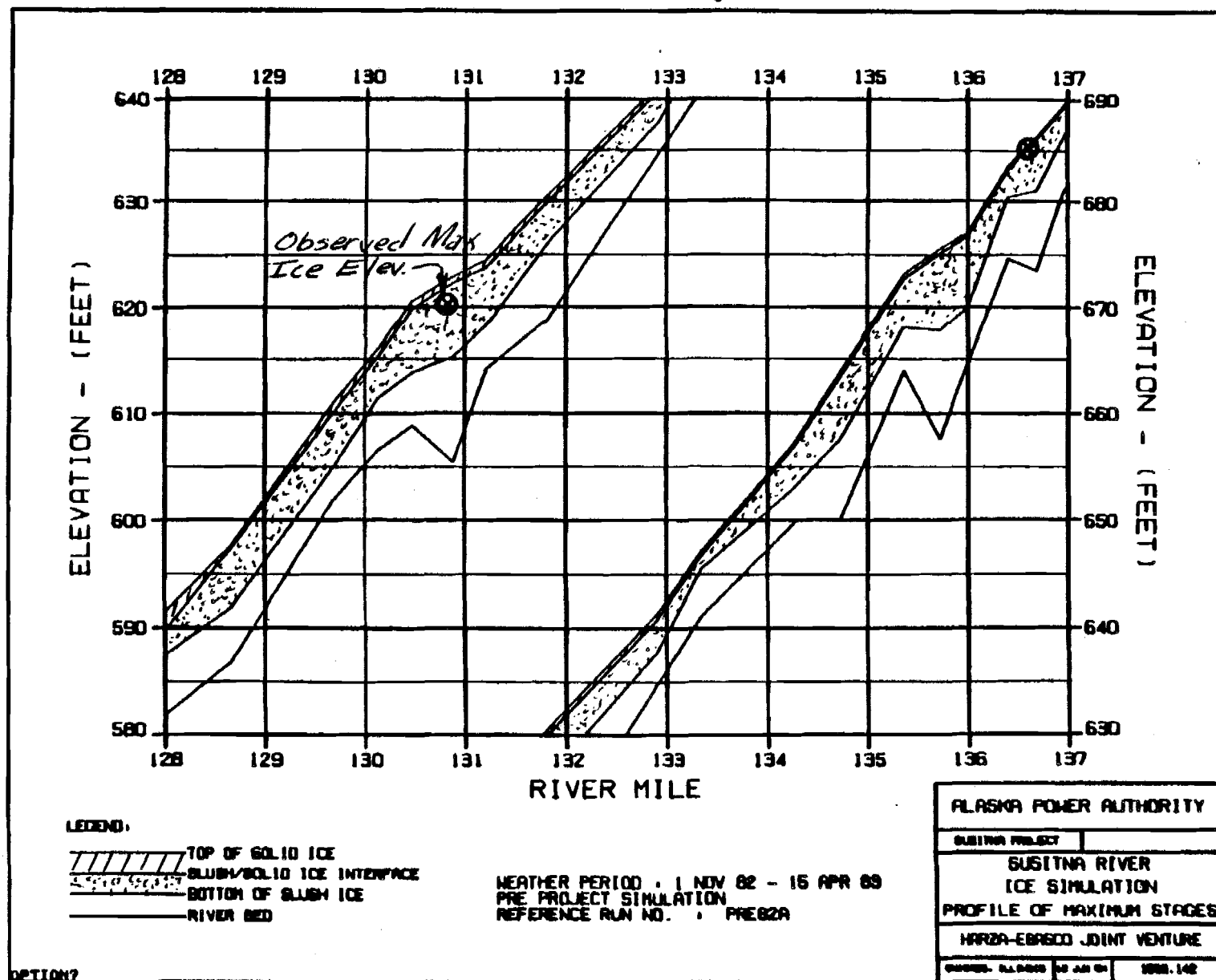
# EXHIBIT D

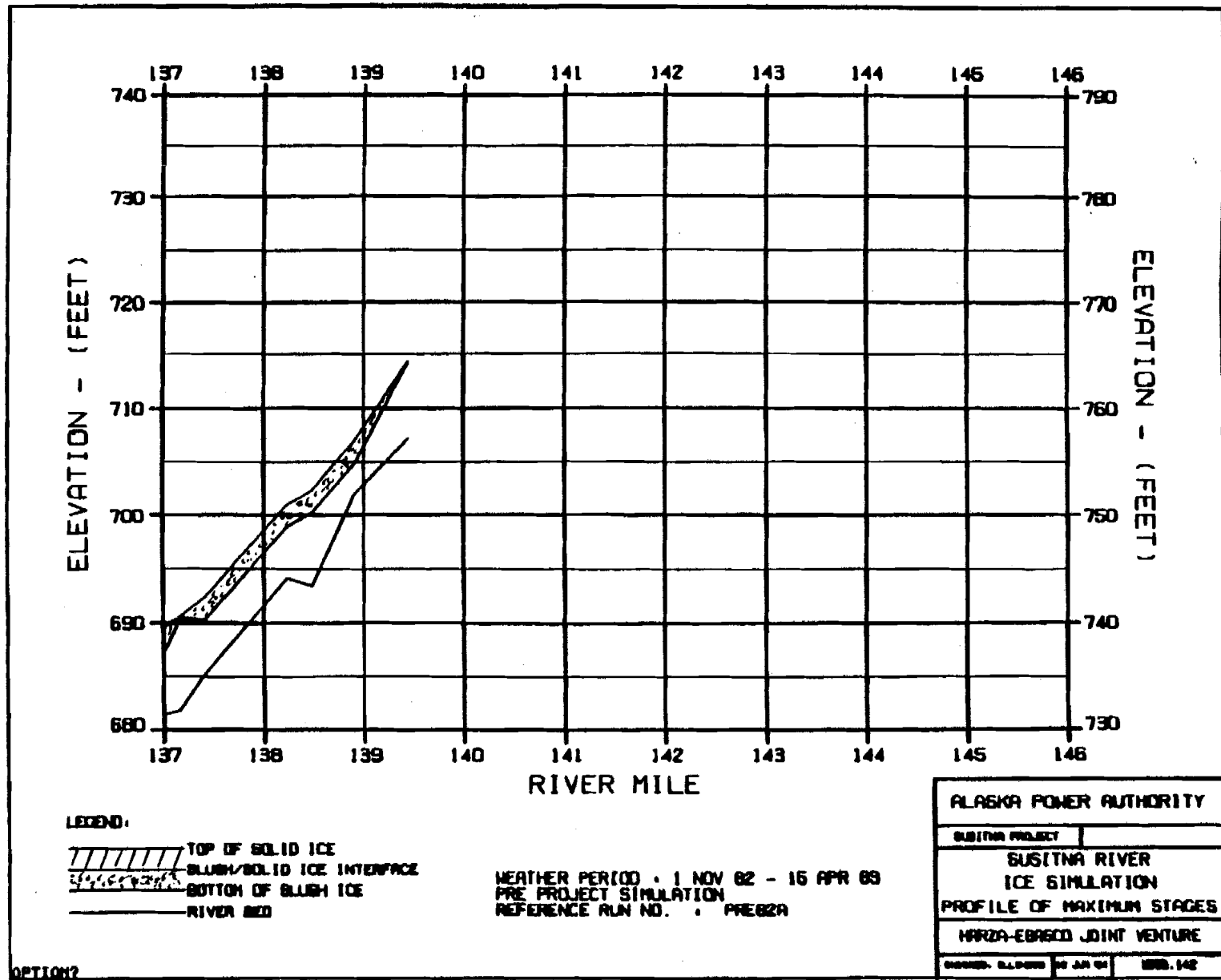


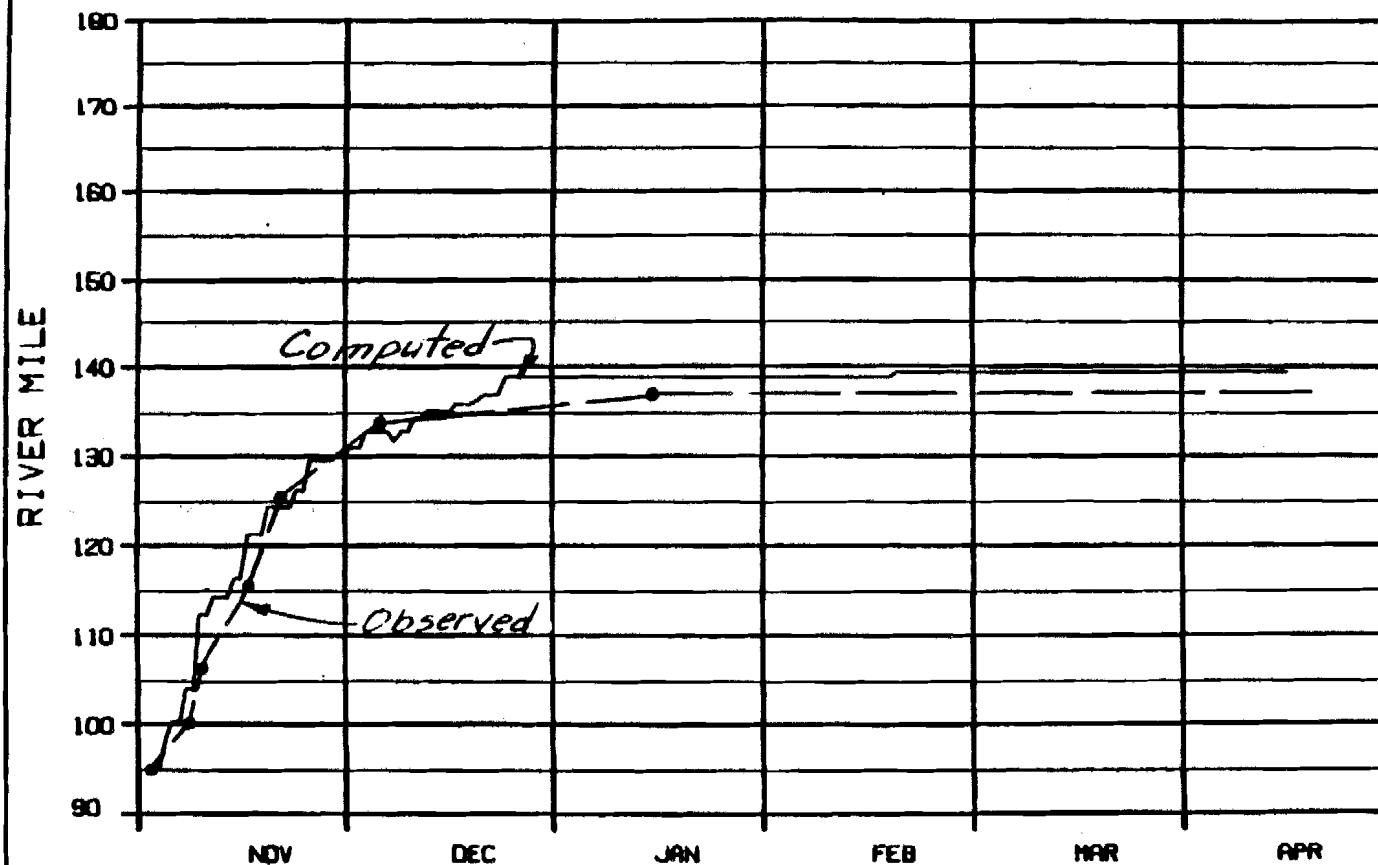












## LEGEND.

— ICE FRONT  
 - - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. . . PRE82A

## ALASKA POWER AUTHORITY

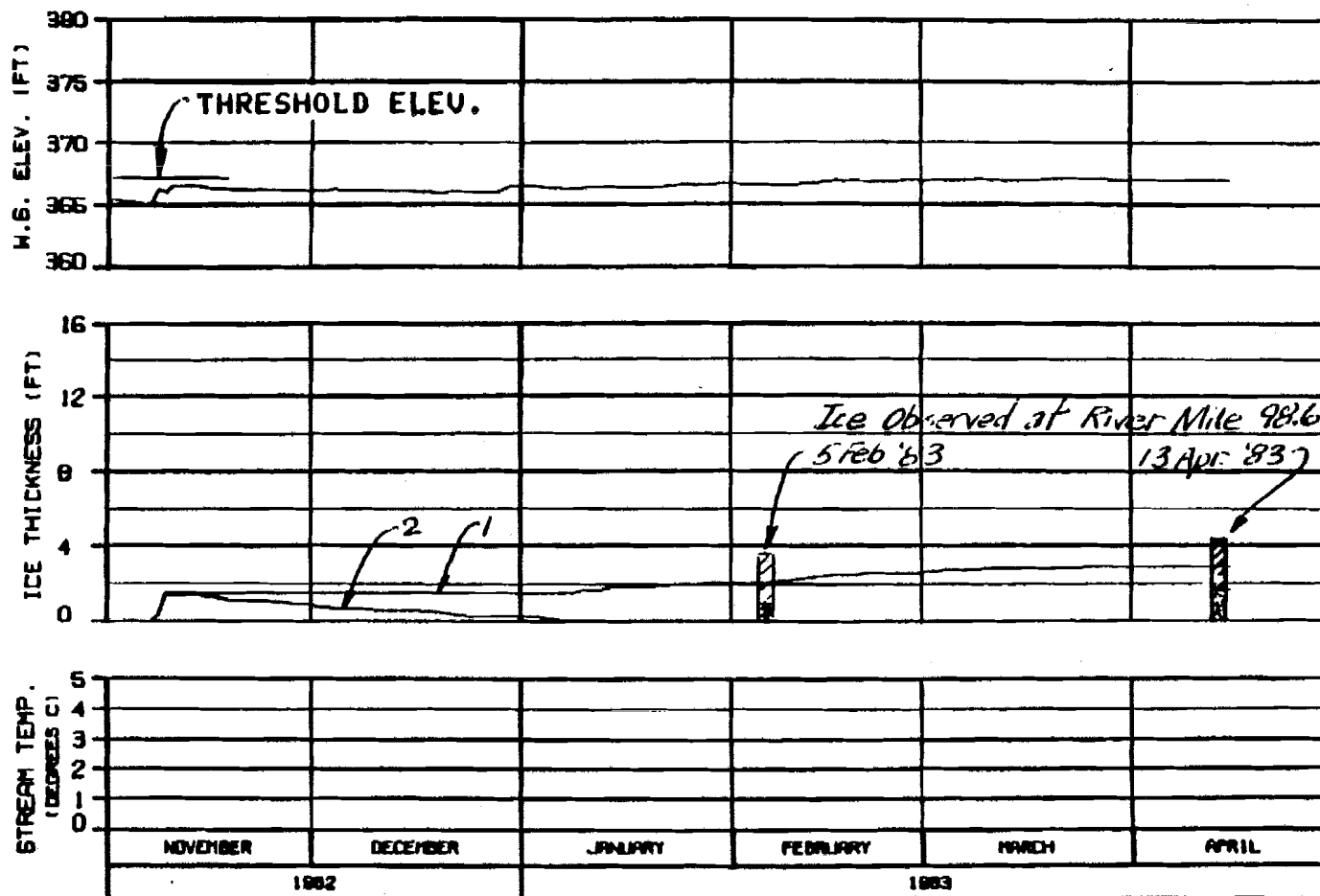
SUSITNA PROJECT

SUSITNA RIVER  
 PROGRESSION OF ICE FRONT  
 & ZERO DEGREE ISOTHERM

WARZA-EBASCO JOINT VENTURE

DESIGN: ALP/82 10 JAN 83 1000.148

OPTION?



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

HEAD OF WHISKERS SLOUGH  
RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

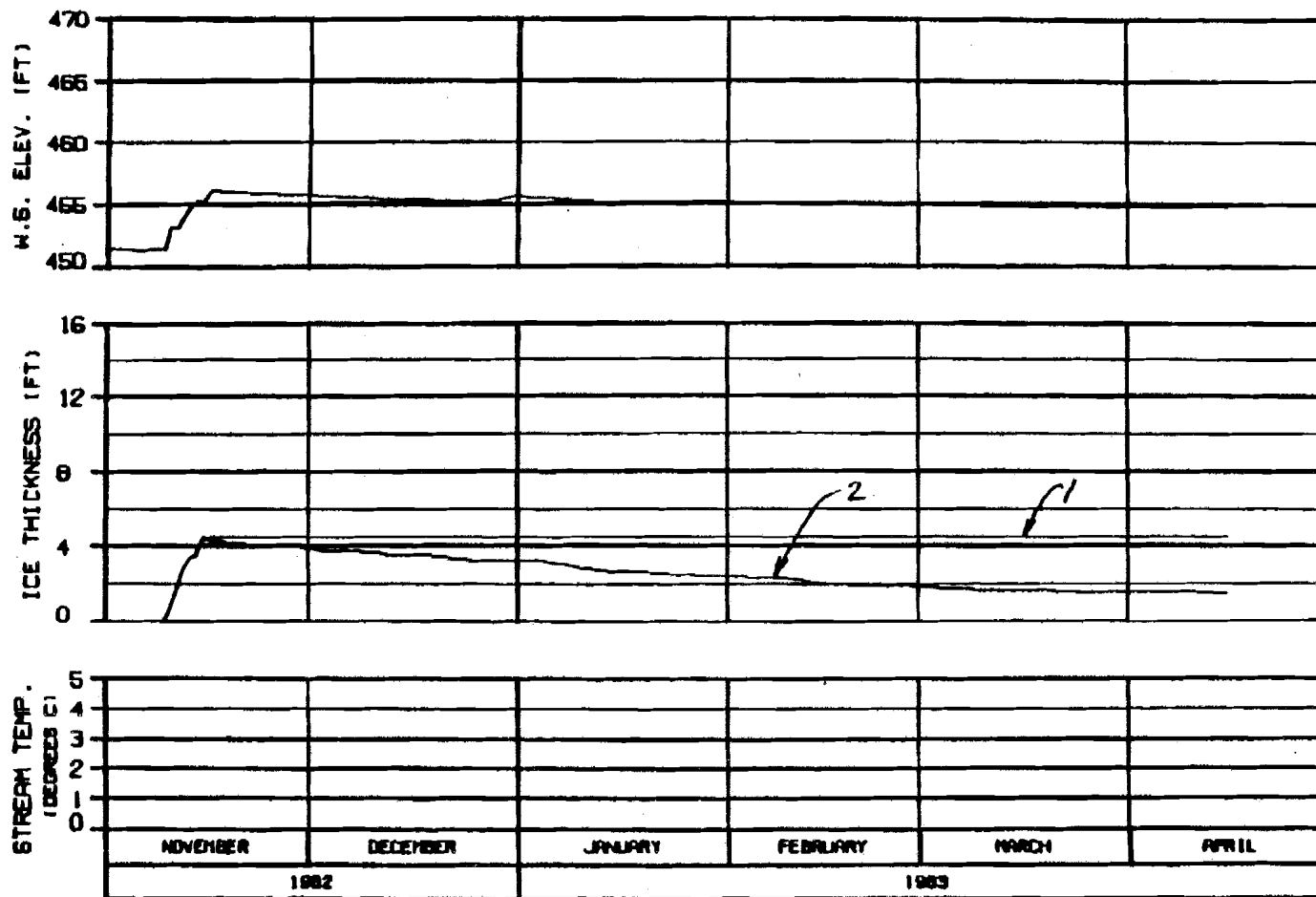
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: [ ] 24 JAN 84 2000.142

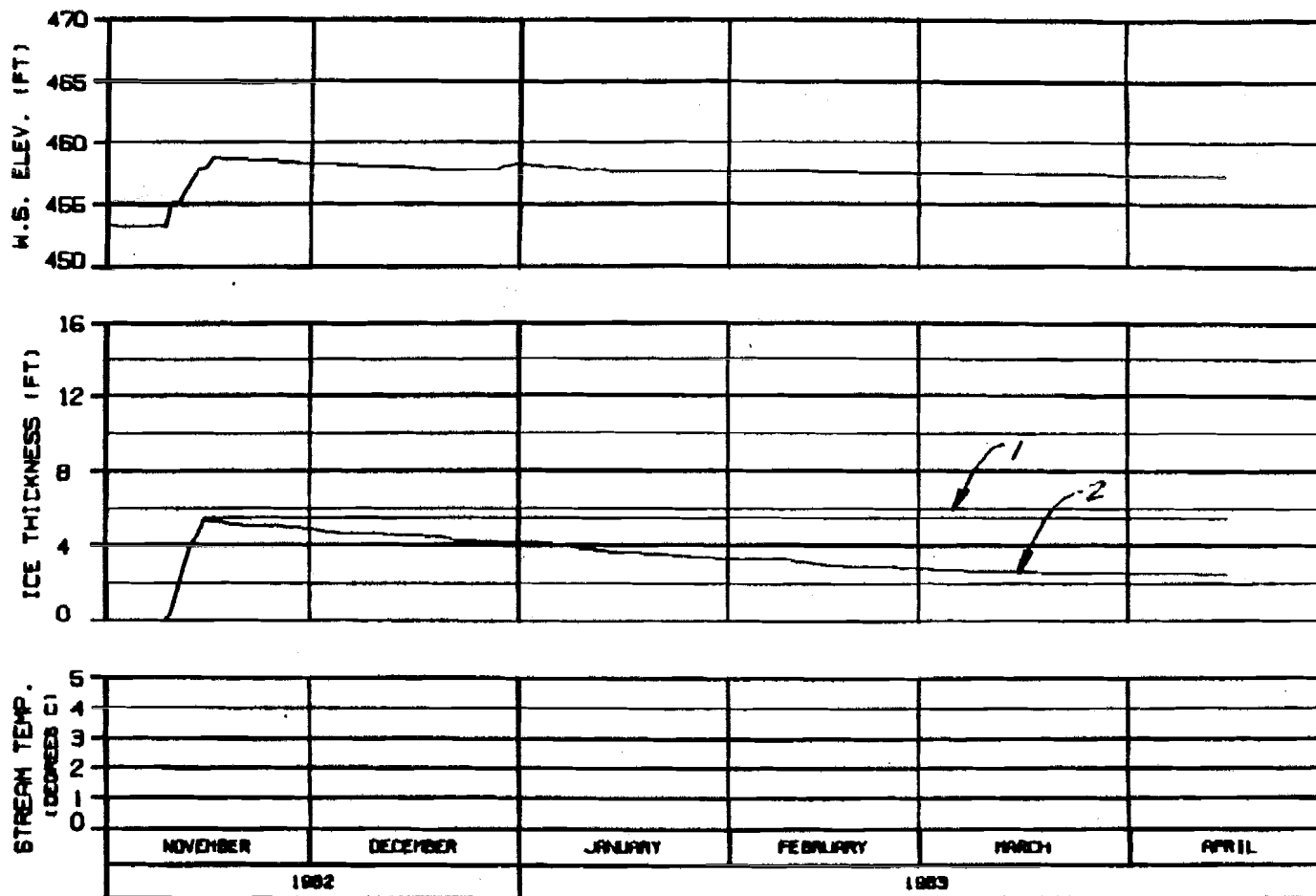


# **SIDE CHANNEL AT HEAD OF GASH CREEK** **RIVER MILE : 112.00**

ICE THICKNESS LEGEND:  
 1. TOTAL THICKNESS  
 2. BLUFF COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PREB2A

ALASKA POWER AUTHORITY		
SUSTINA PROJECT		
SUSTINA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGNED BY: ELLIOTT	DATE: 14 JAN 84	REVISION: 142



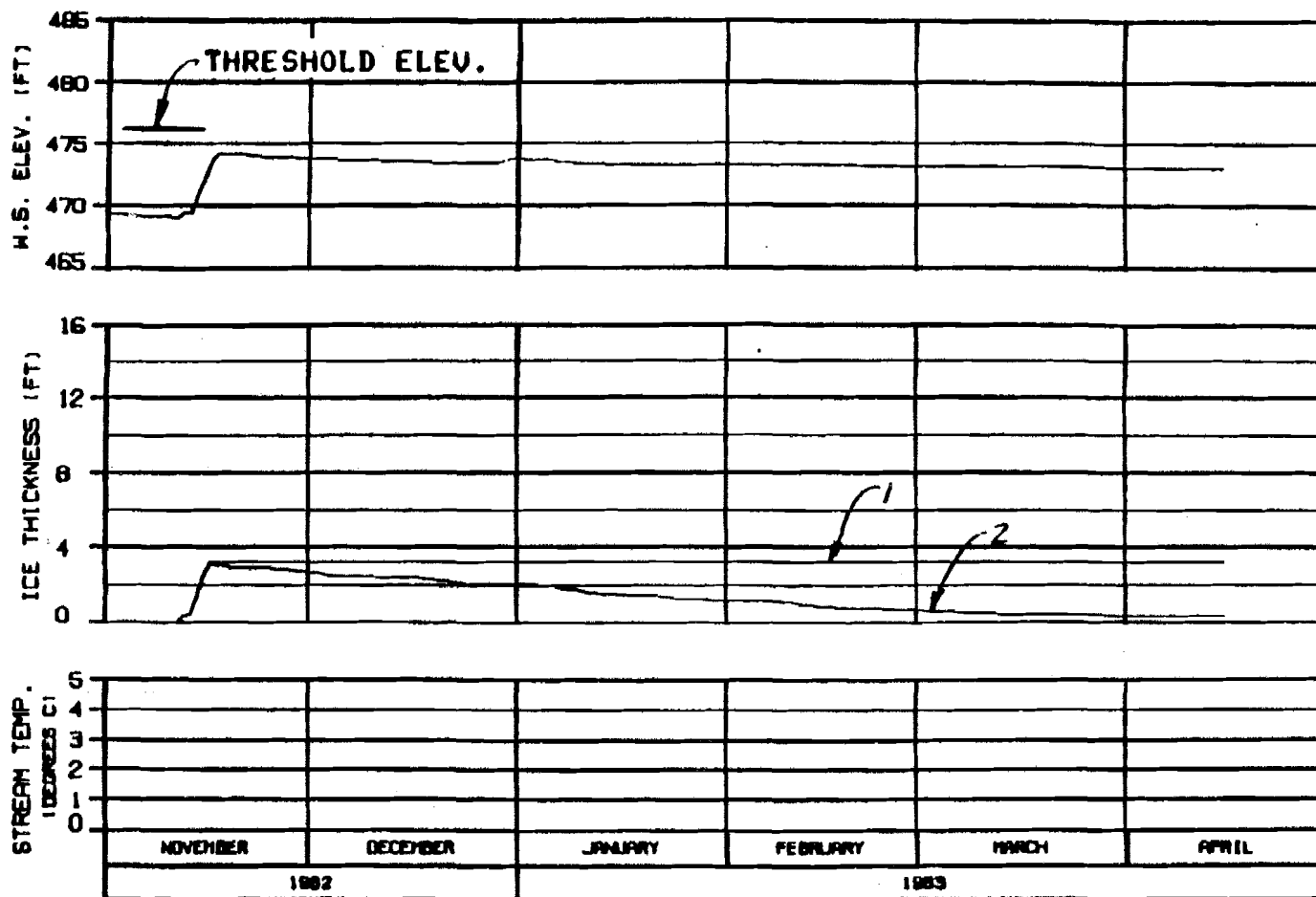
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-ERASSCO JOINT VENTURE		
DESIGNED: G. L. BROWN	11 JAN 83	988.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

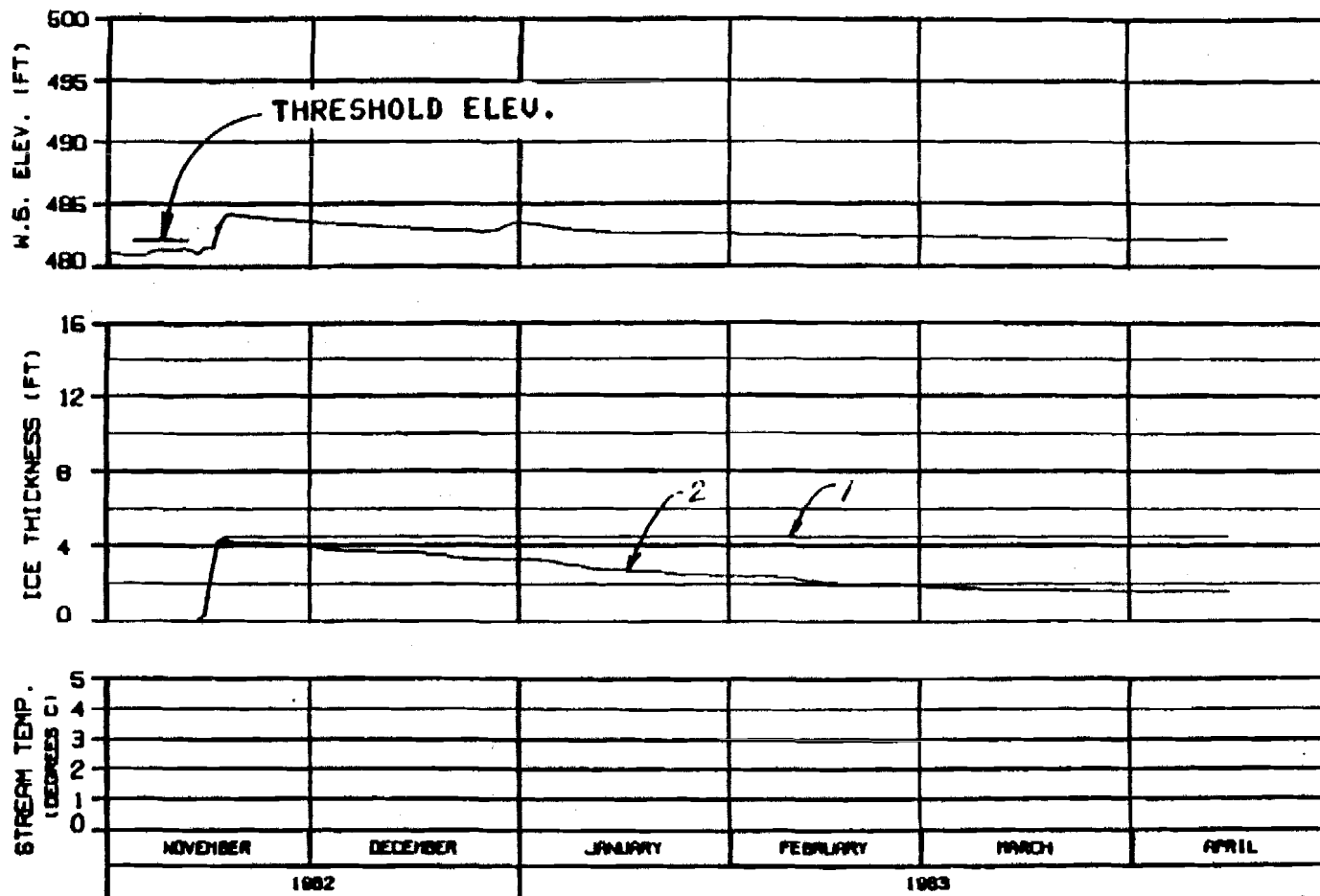
ALASKA POWER AUTHORITY

EXISTING PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: 14 JAN 83 1983.142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**SIDE CHANNEL MSII  
RIVER MILE : 115.50**

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

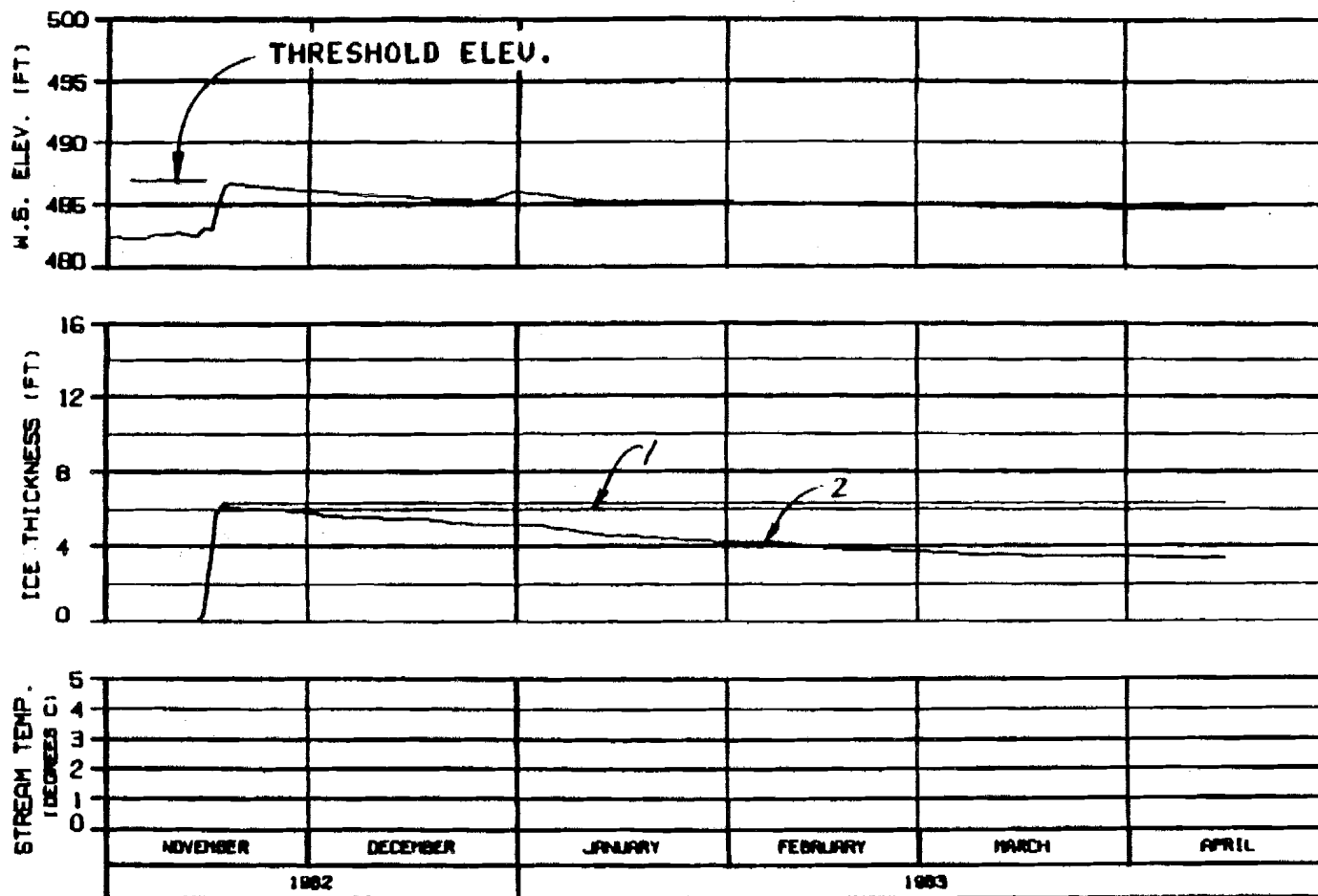
**SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY**

**WARZA-EBRSCO JOINT VENTURE**

DESIGNED BY: [ ] DRAWN BY: [ ] CHECKED BY: [ ]

1982.142





HEAD OF SIDE CHANNEL NSII  
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

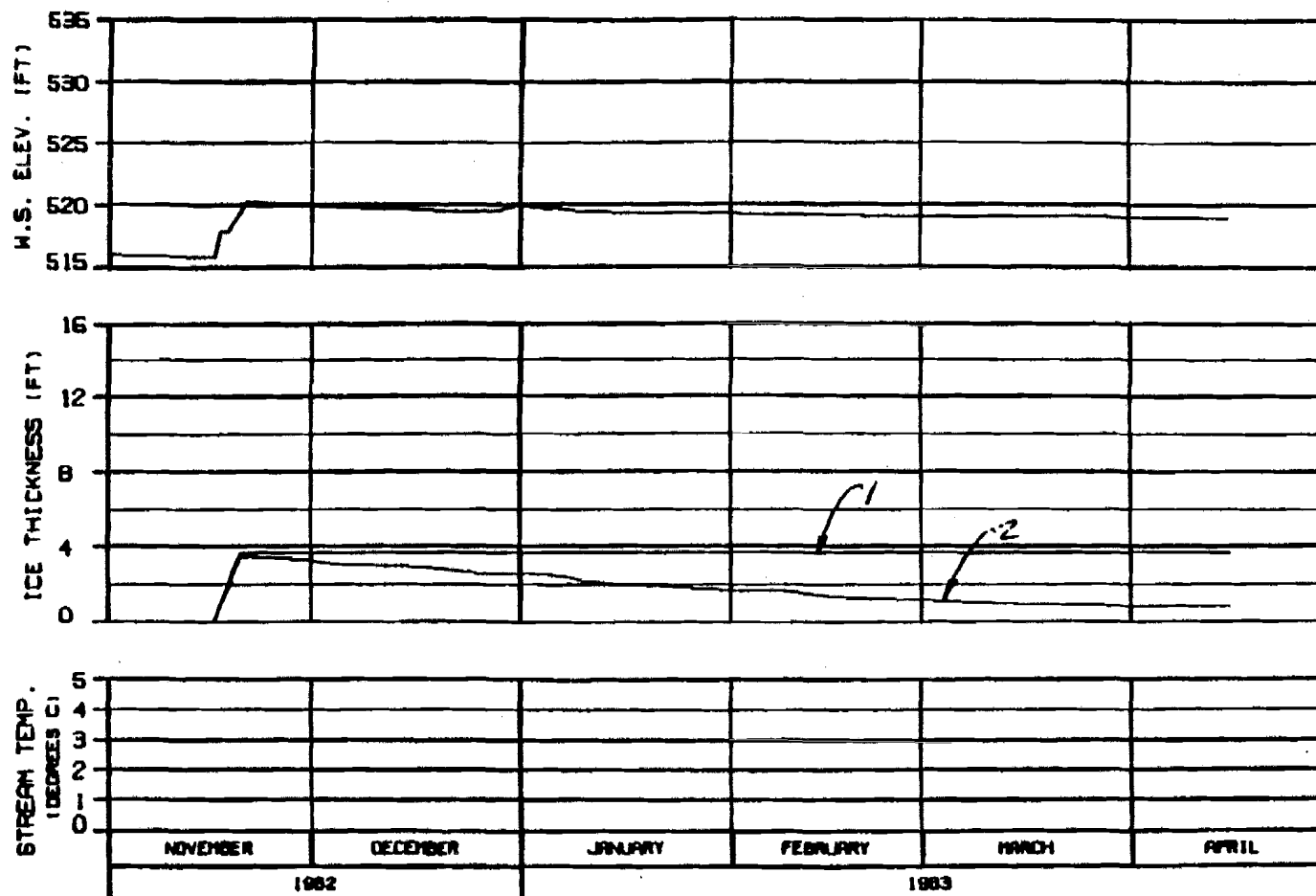
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

UNCLASS. ELEV. 82 JAN 84 1982.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE82A

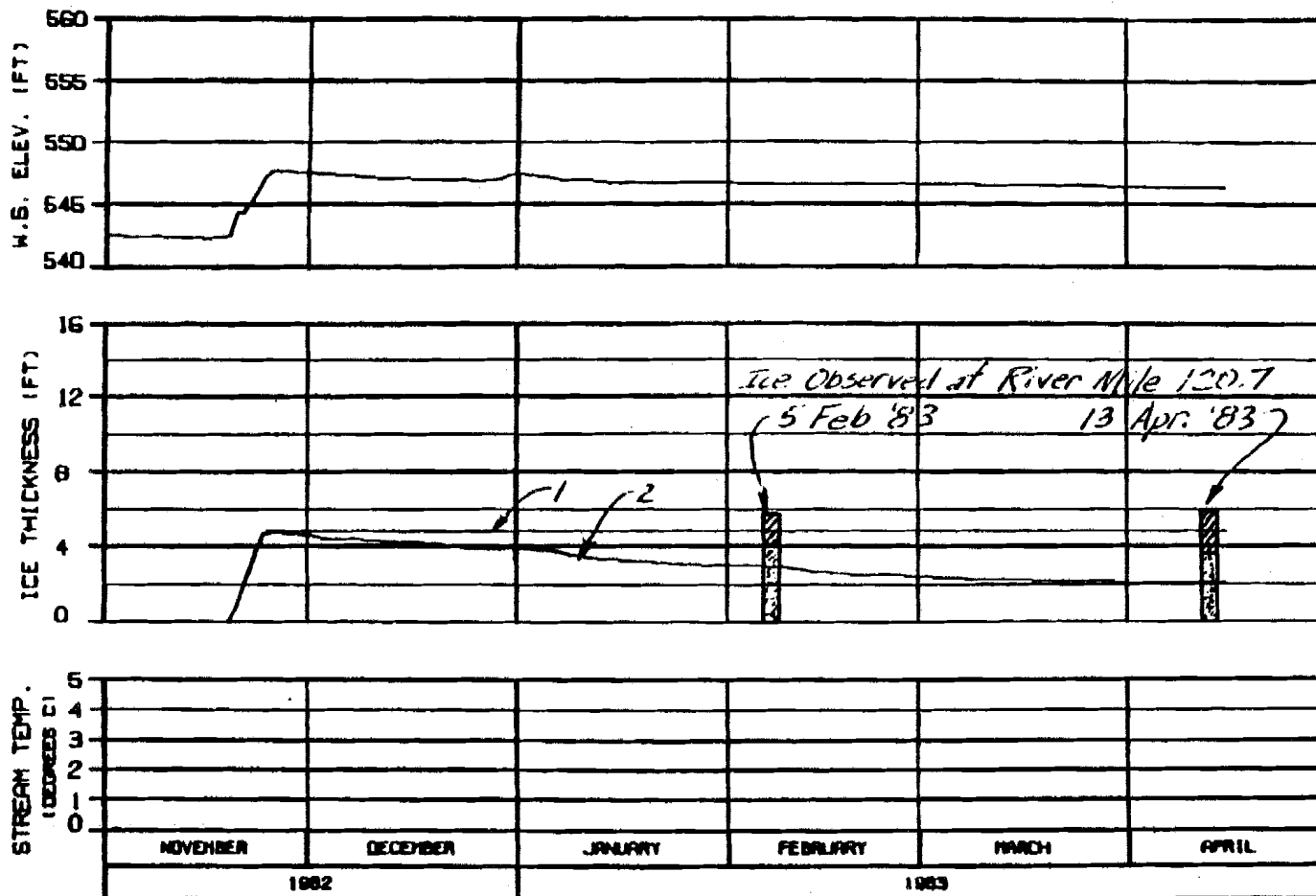
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: ALBERT DA JN 84 1000.142



**HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50**

**ICE THICKNESS LEGEND:**  
1. TOTAL THICKNESS  
2. SLUSH COMPONENT

**WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A**

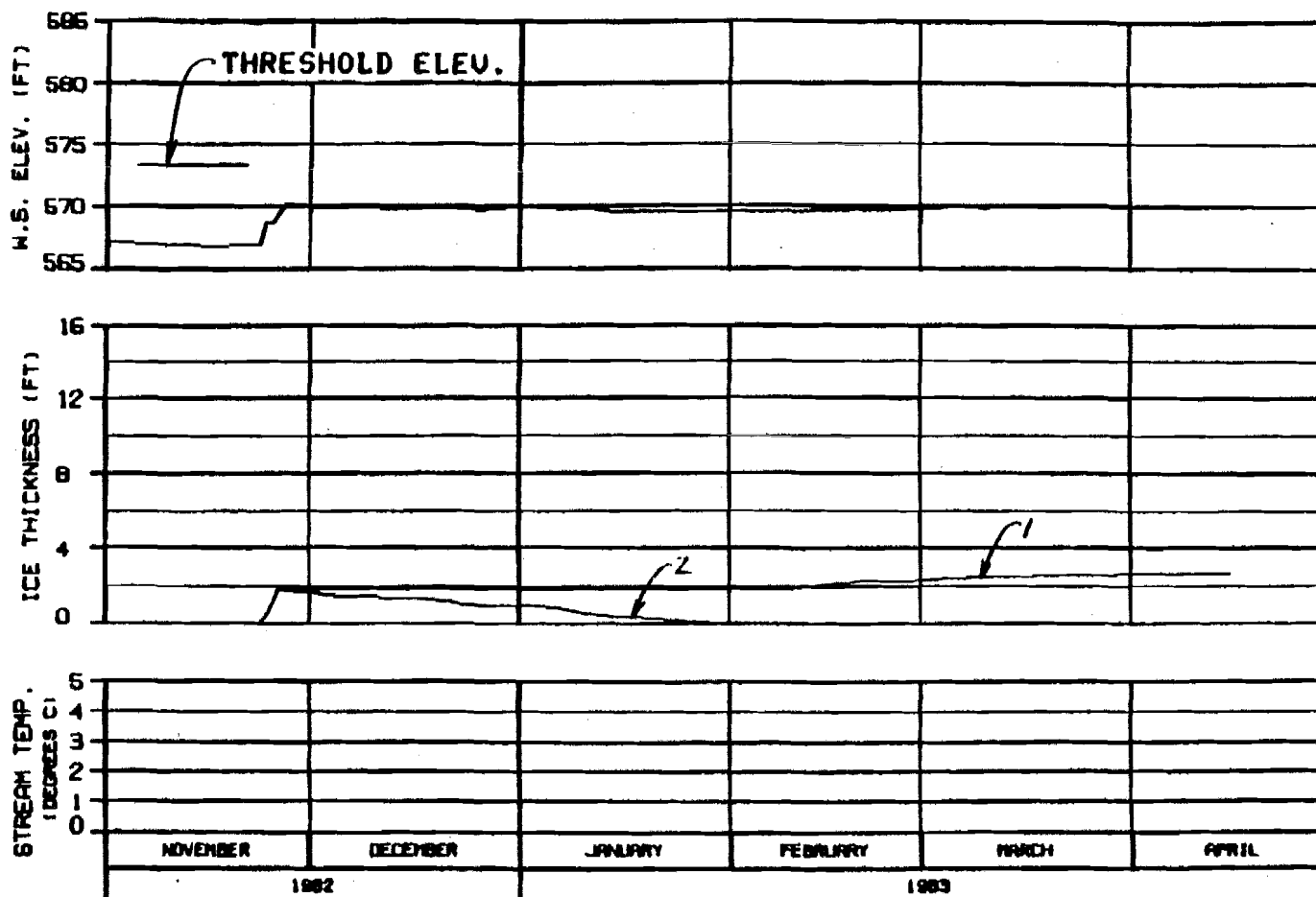
**ALASKA POWER AUTHORITY**

**SUBMITTAL PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**WARZA-EBRACO JOINT VENTURE**

**ORDER: 82-0000 24 APR 83 888.142**



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

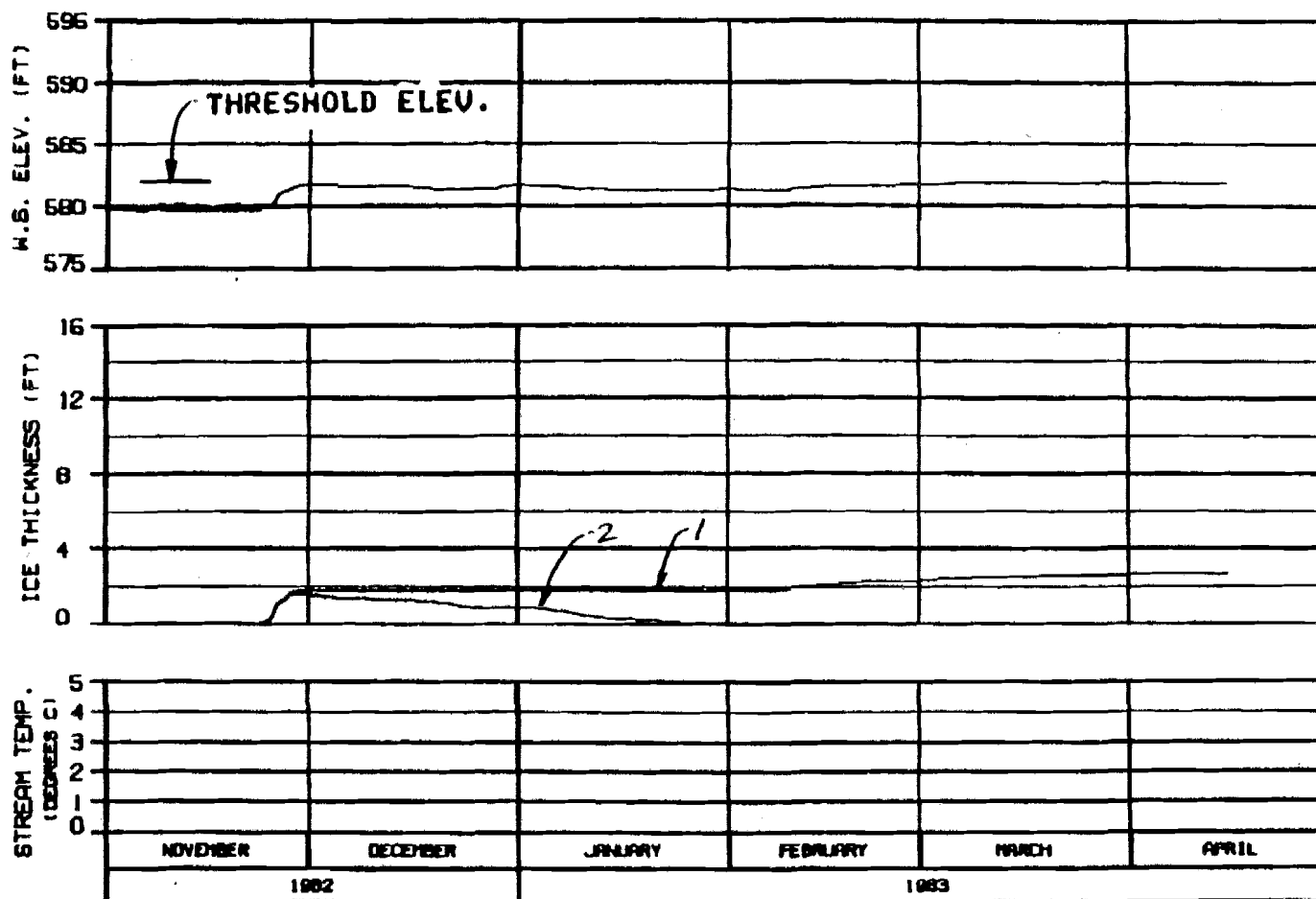
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRSCO JOINT VENTURE

PROJECT: SL-1000 11 JAN 83 1000.142



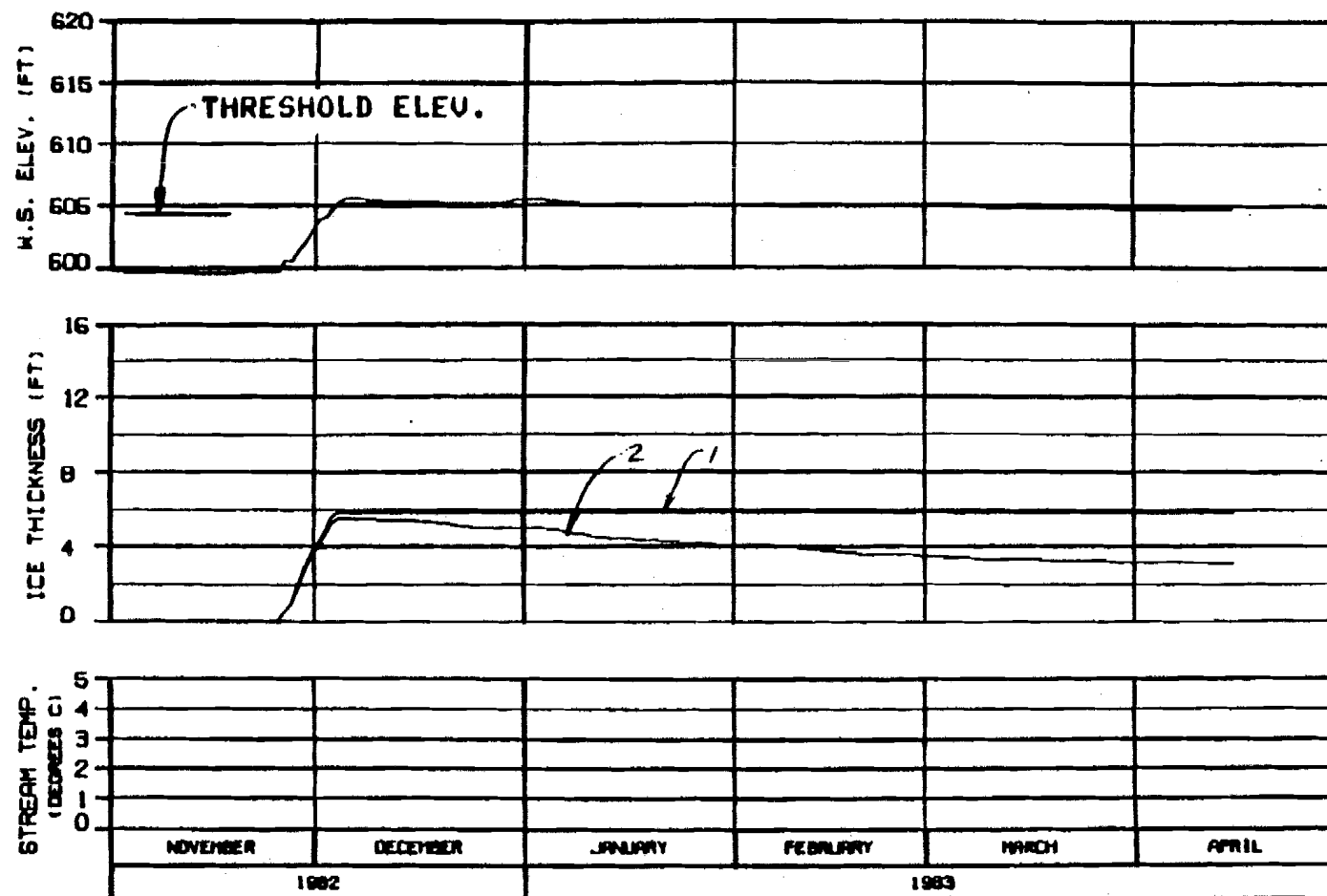
HEAD OF SLOUGH 8A (EAST)  
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
WARDA-EBASCO JOINT VENTURE		
CHIEF, BLDG	11 JAN 83	1000.142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 16 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

ALASKA POWER AUTHORITY

SUBMITTER PROJECT

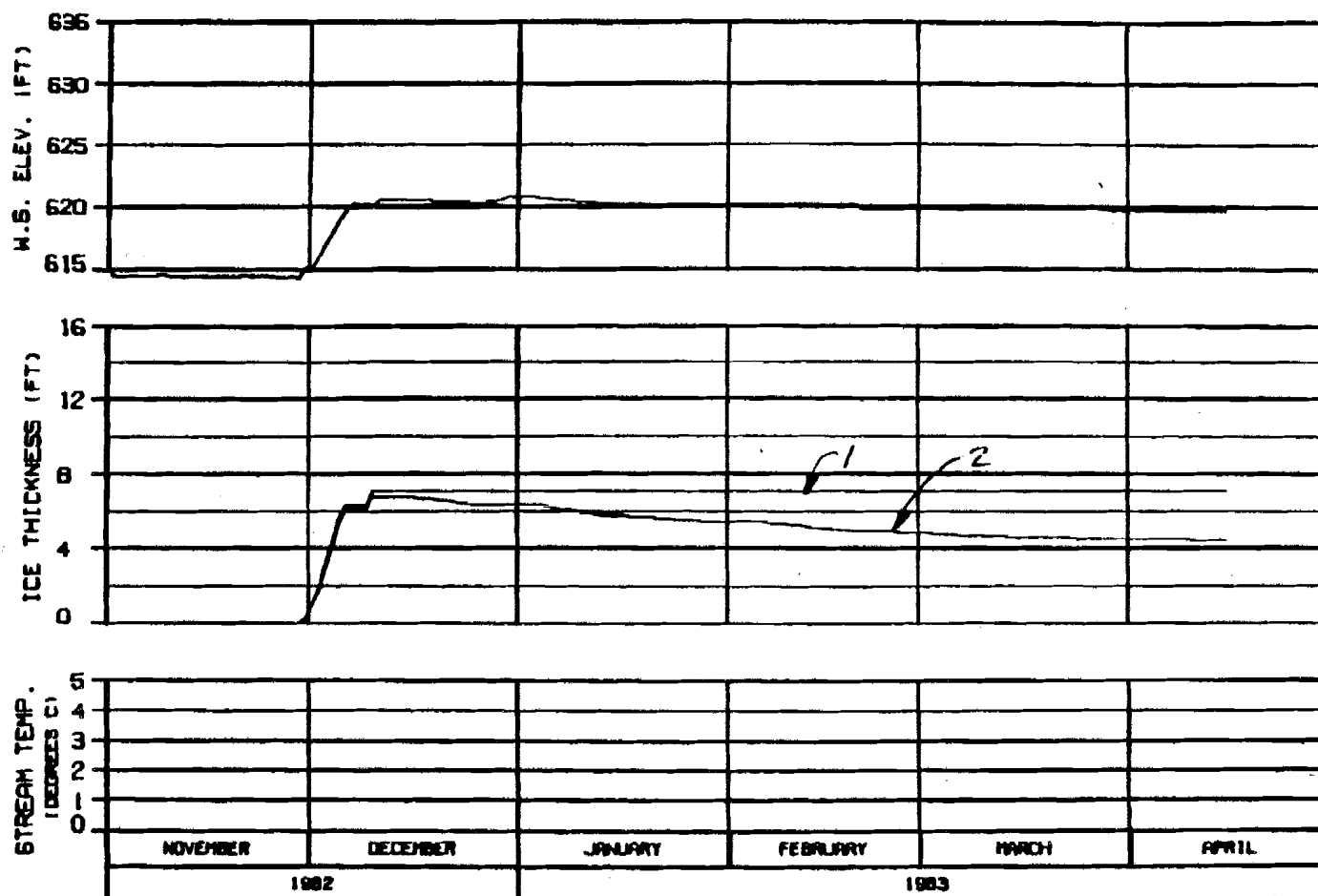
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

CHARTER, ALASKA 24 JAN 83 1000.142

OPTION?

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE82A

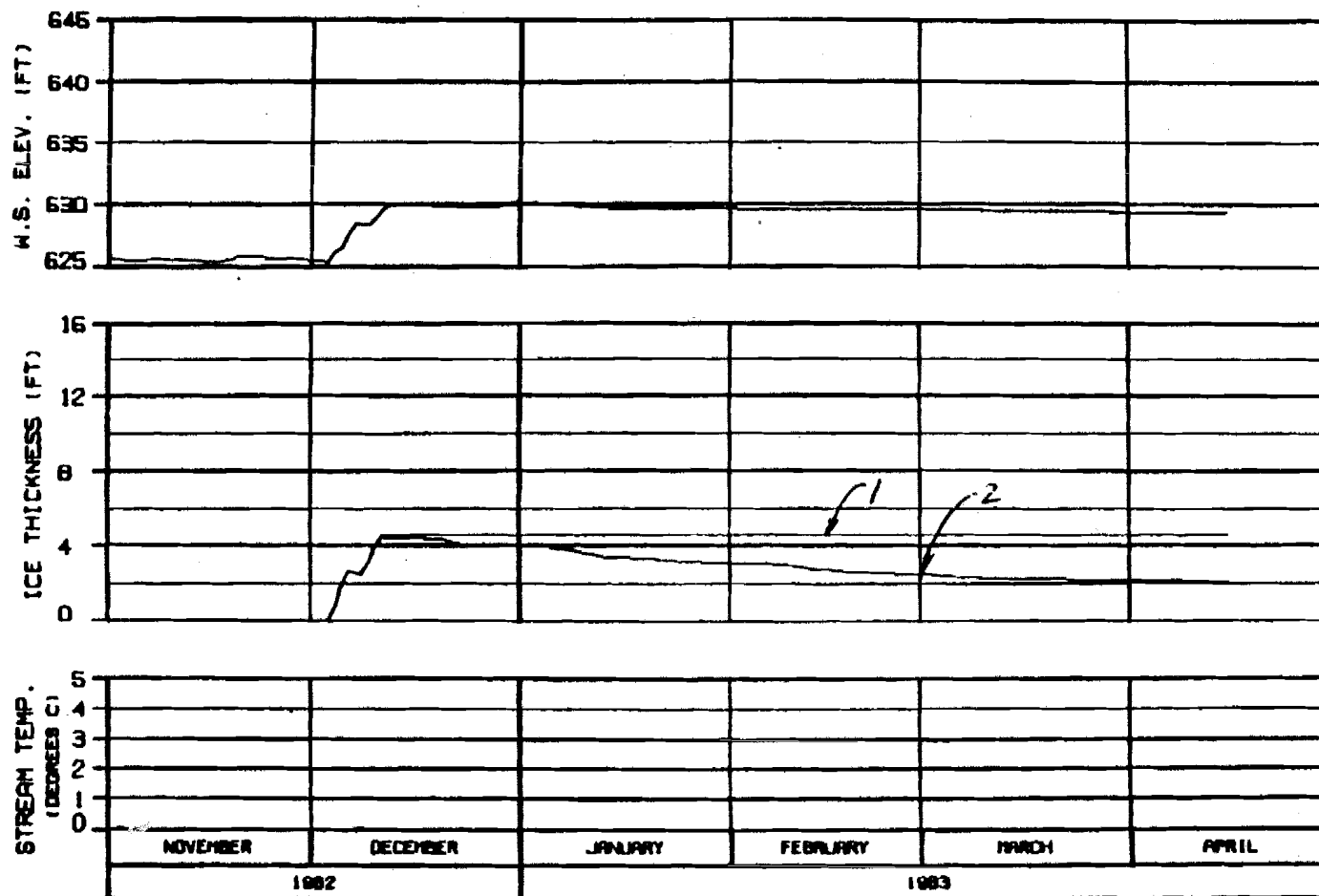
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED - ALASKA 14 JAN 83 1983-142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

**ALASKA POWER AUTHORITY**

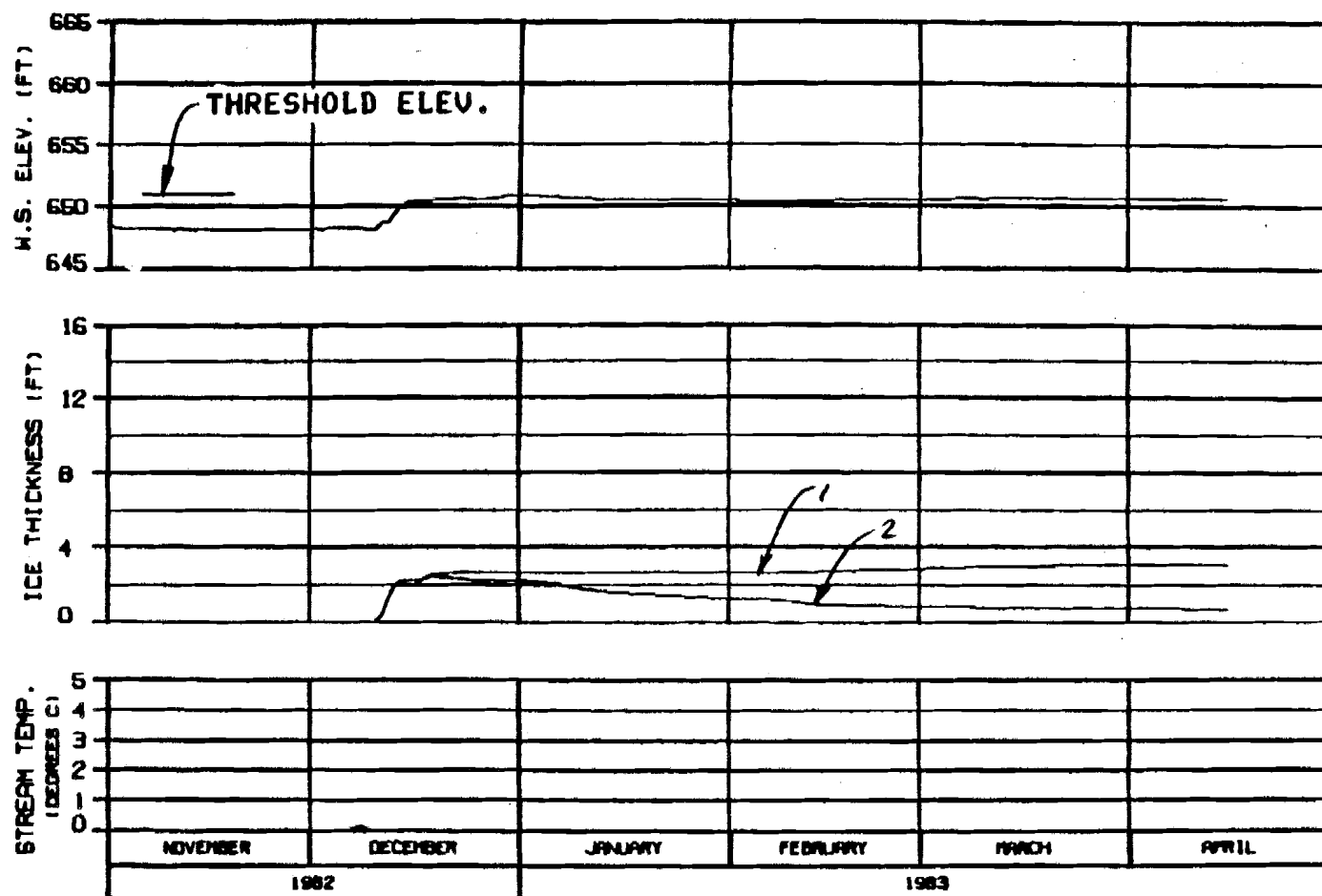
**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBRACO JOINT VENTURE**

DESIGNED BY: [ ] 14 JAN 84 1000.142





**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. BLUISH COMPONENT

**HEAD OF SLOUGH 9A**  
**RIVER MILE : 133.70**

**WEATHER PERIOD : 1 NOV 82 - 15 APR 83**  
**PRE PROJECT SIMULATION**  
**REFERENCE RUN NO. : PRE82A**

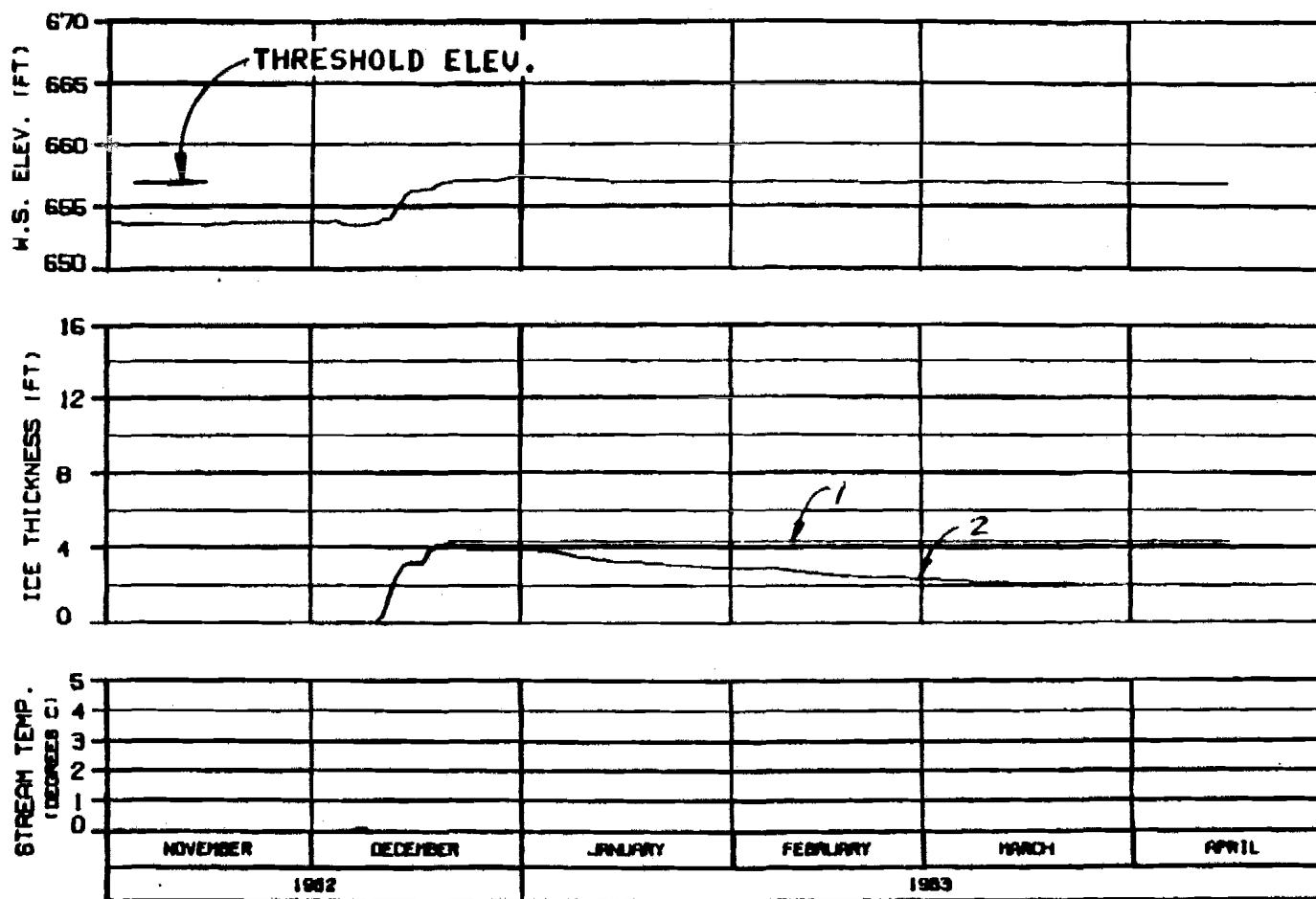
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HARZA-EBAGOD JOINT VENTURE**

**ORDER: 82-000 14 JAN 84 1000.142**



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

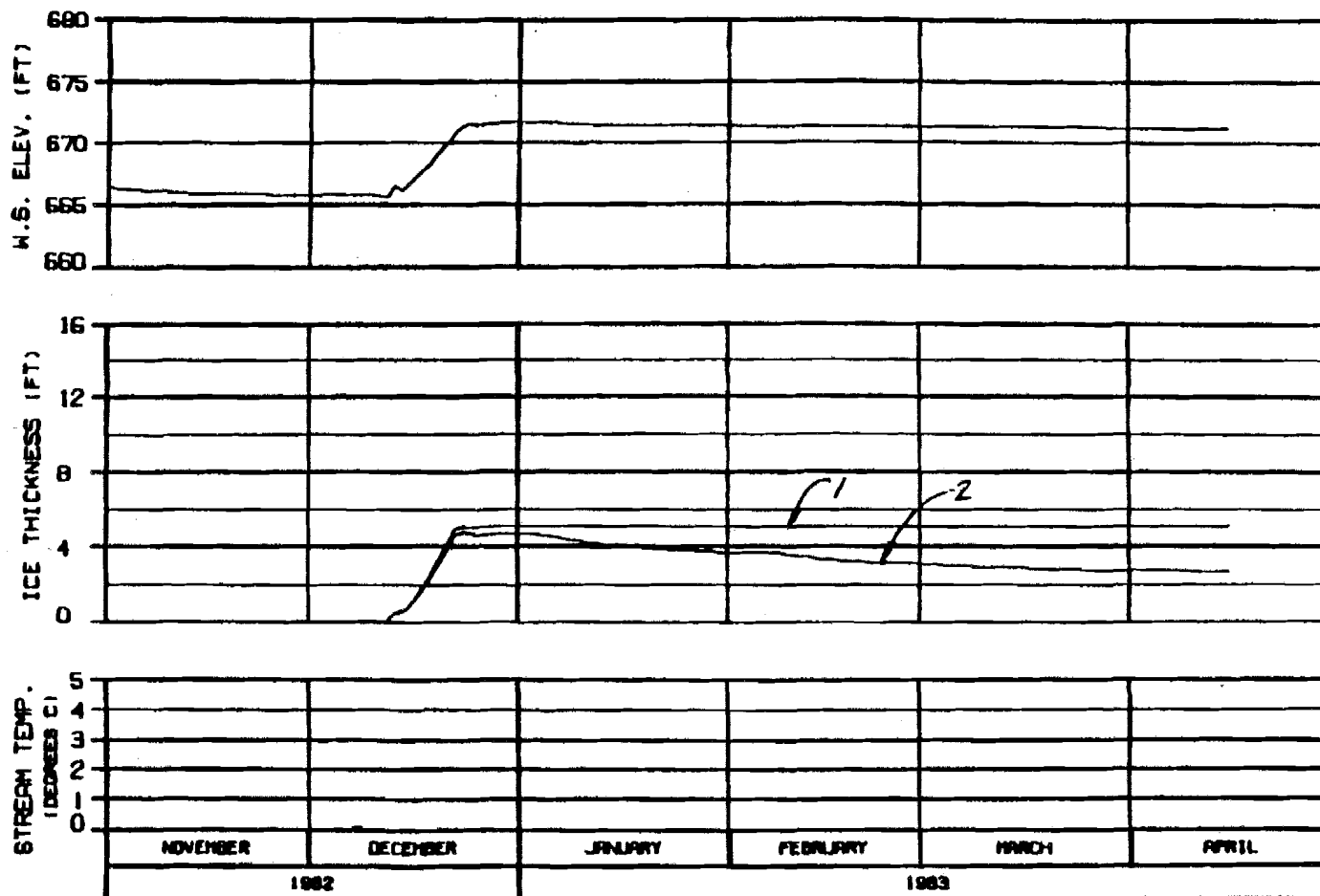
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

DESIGNED BY: J. L. PETERSON 24 JAN 83 0000.142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY

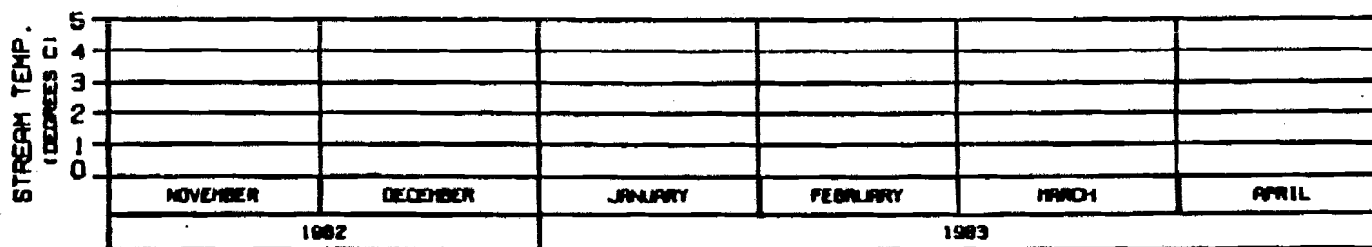
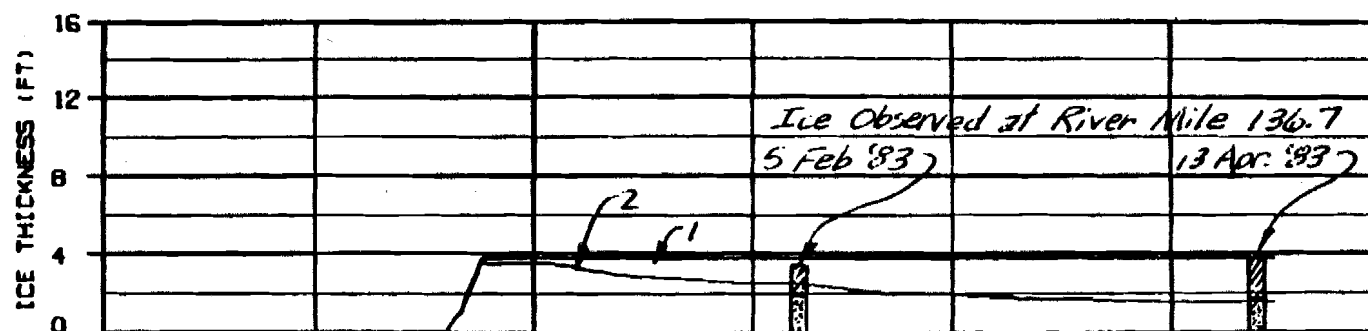
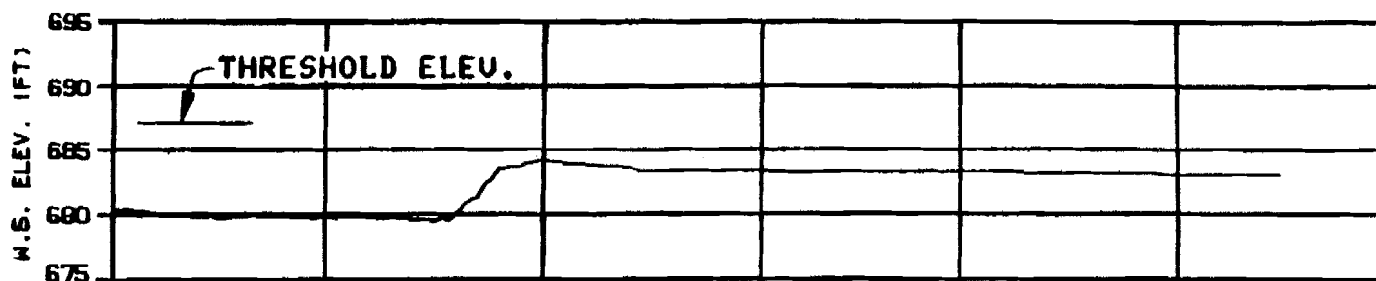
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DATE: 11/15/82 BY: JAC

1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

WEATHER PERIOD : 1 NOV 82 - 15 APR 83  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE82A

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

ALASKA POWER AUTHORITY

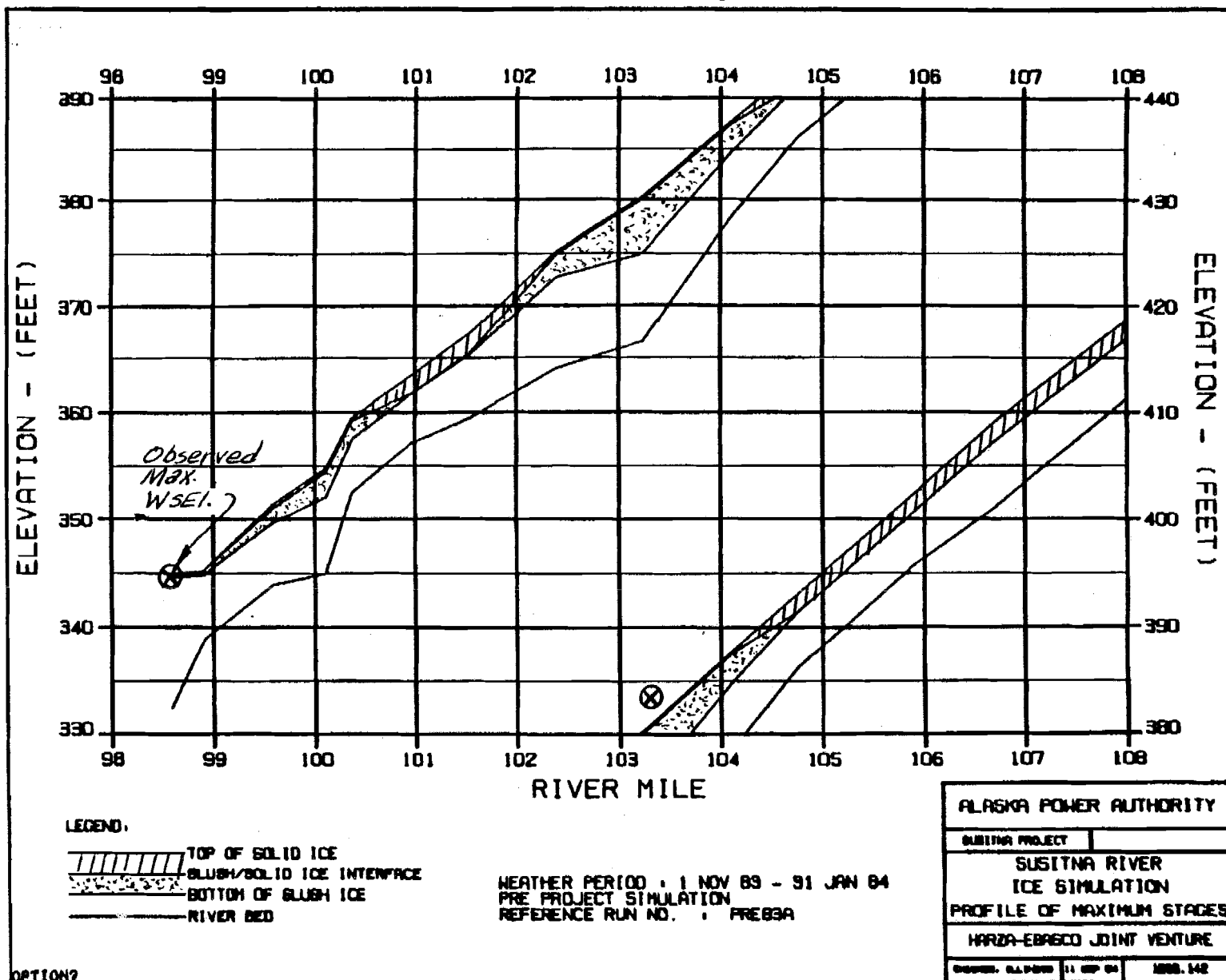
SUSITNA PROJECT

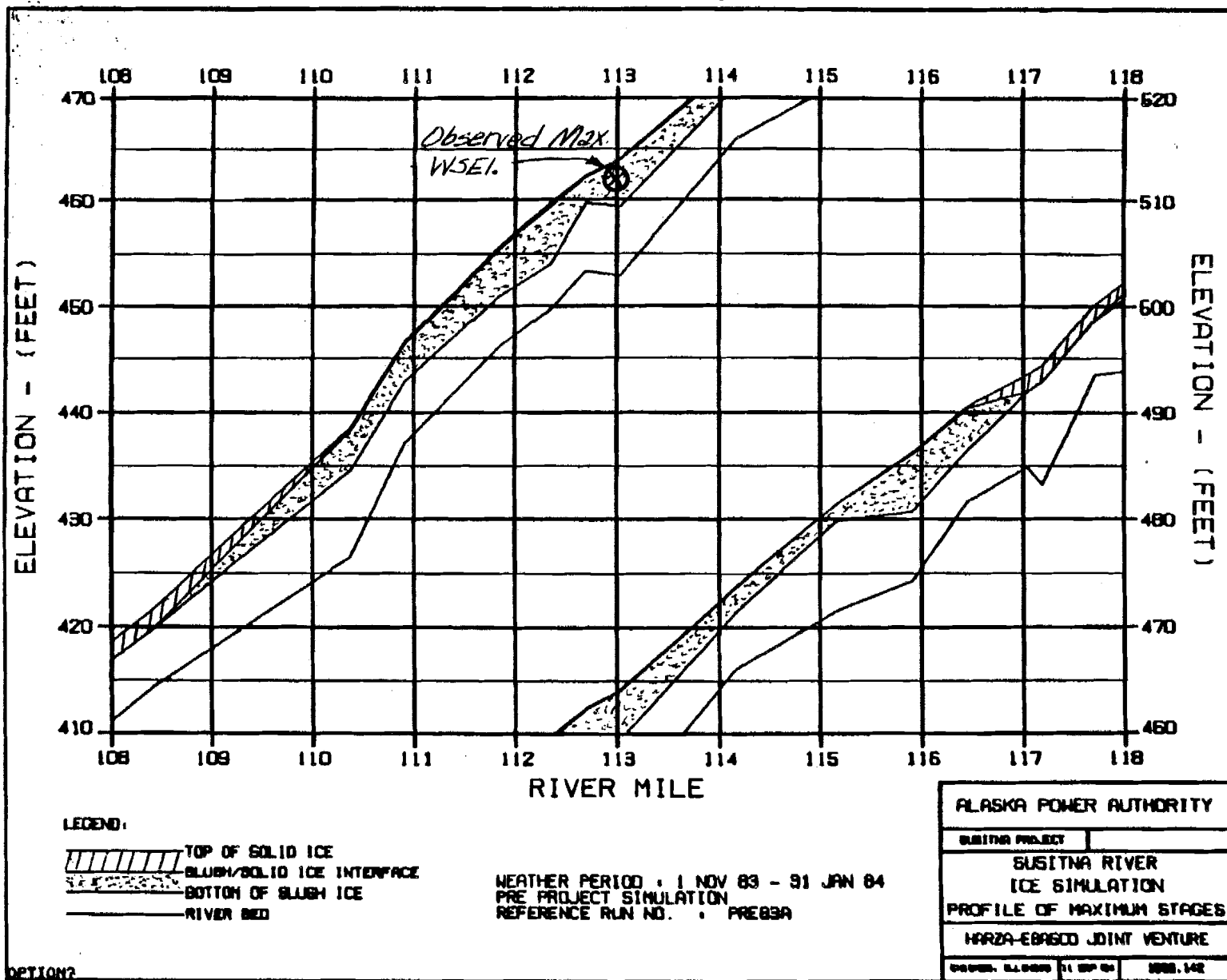
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

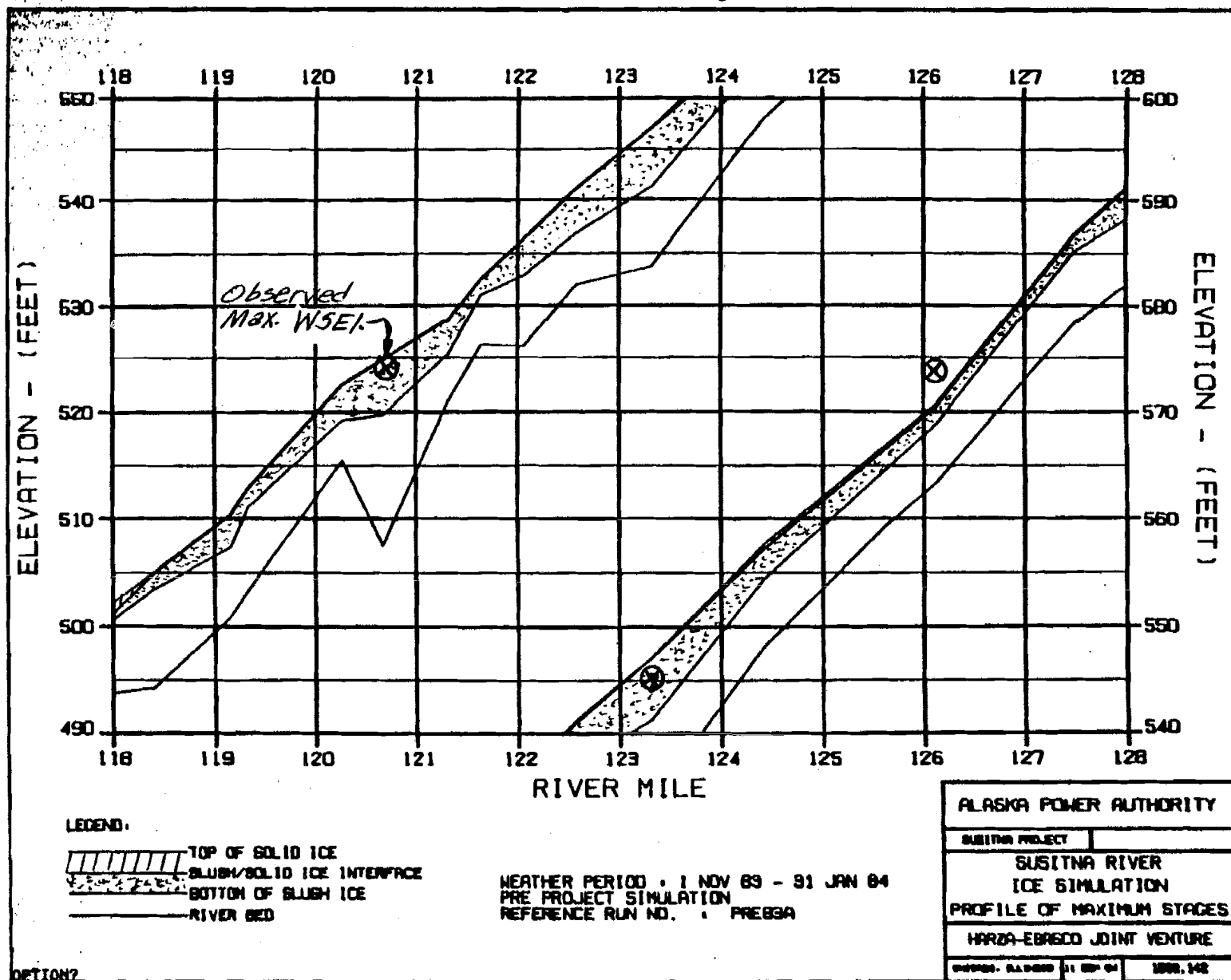
HARZA-EBASCO JOINT VENTURE

DESIGNED BY: 04 APR 83 0000.142

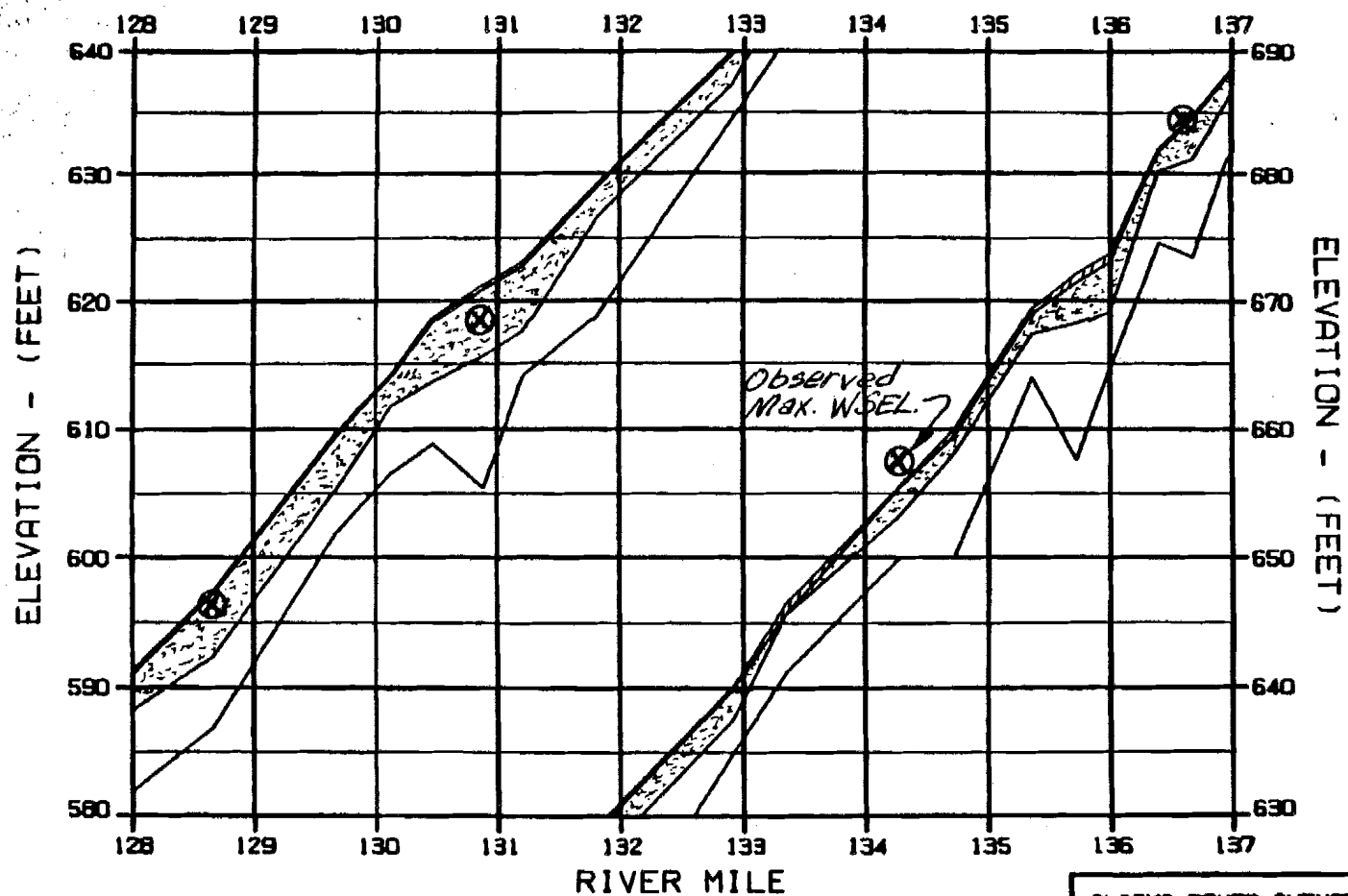
# EXHIBIT E











LEGEND:

- TOP OF SOLID ICE
- SLUSH/SOLID ICE INTERFACE
- BOTTOM OF SLUSH ICE
- RIVER BED

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ALASKA POWER AUTHORITY

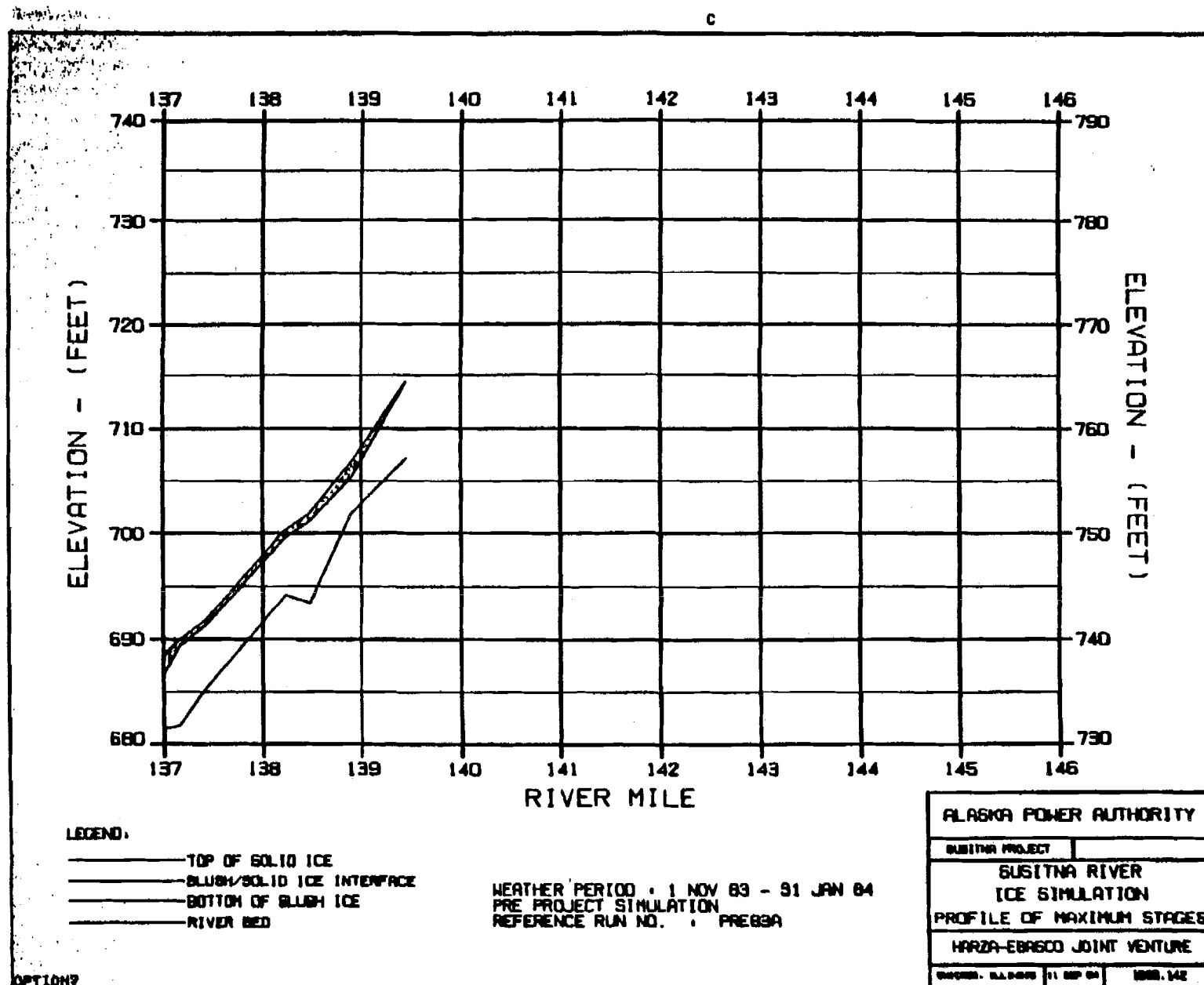
SUSITNA PROJECT

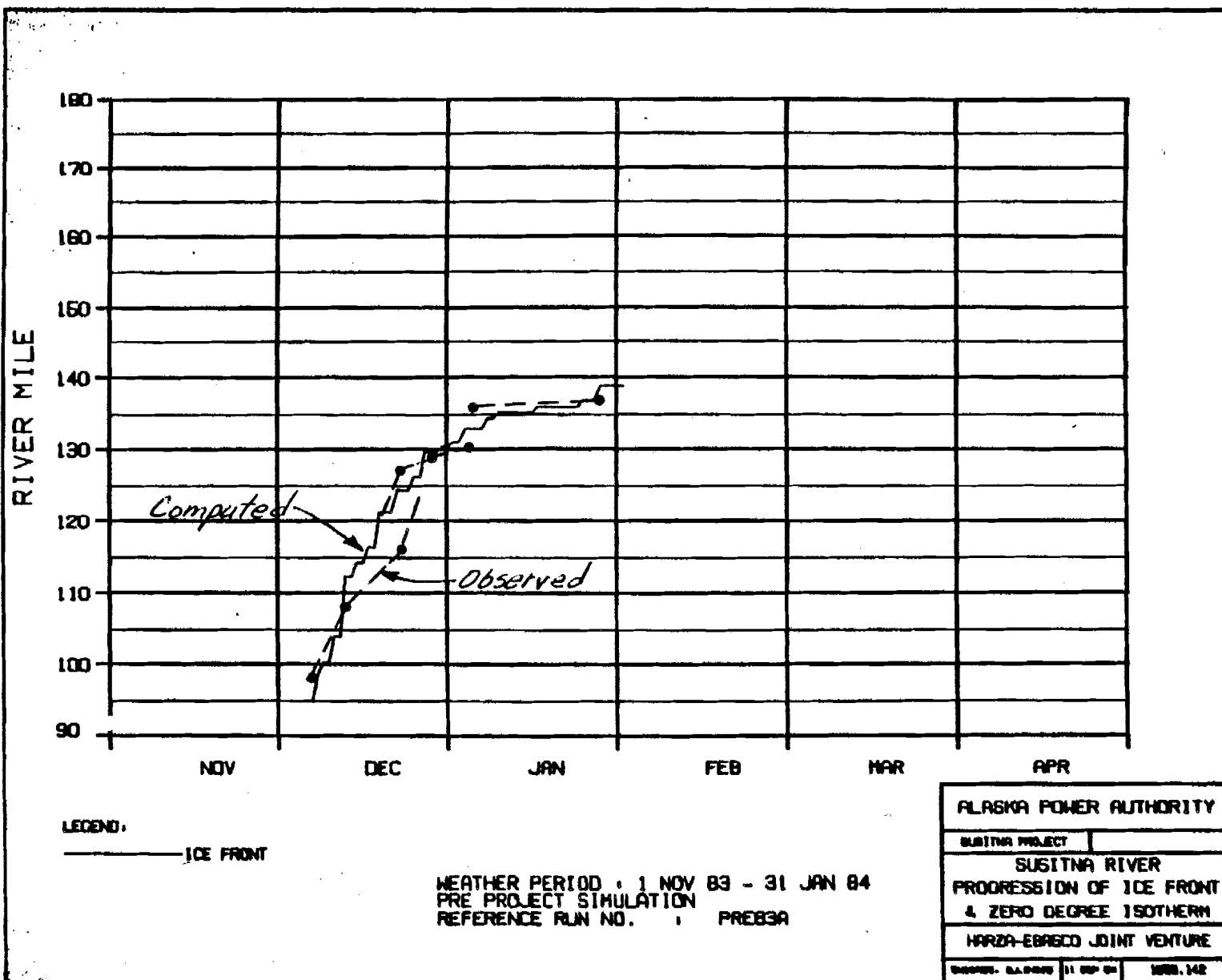
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

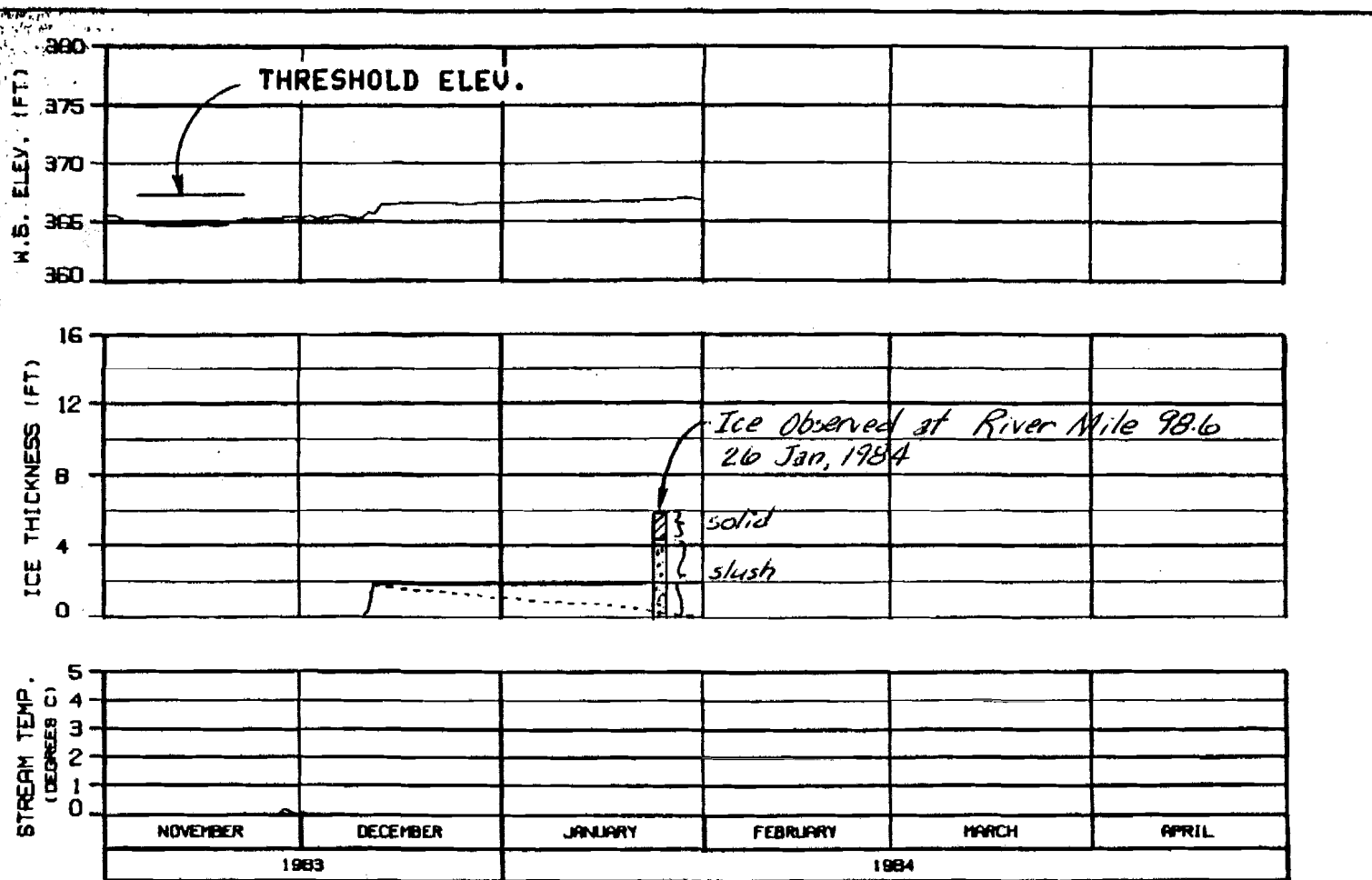
HARZA-EBASCO JOINT VENTURE

CHARTER: 8-1-83 31 SEP 84 3000.142

OPTION?







# HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84

PRE PROJECT SIMULATION

REFERENCE RUN NO. : PRE83A

## ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
- - - - SLUSH COMPONENT

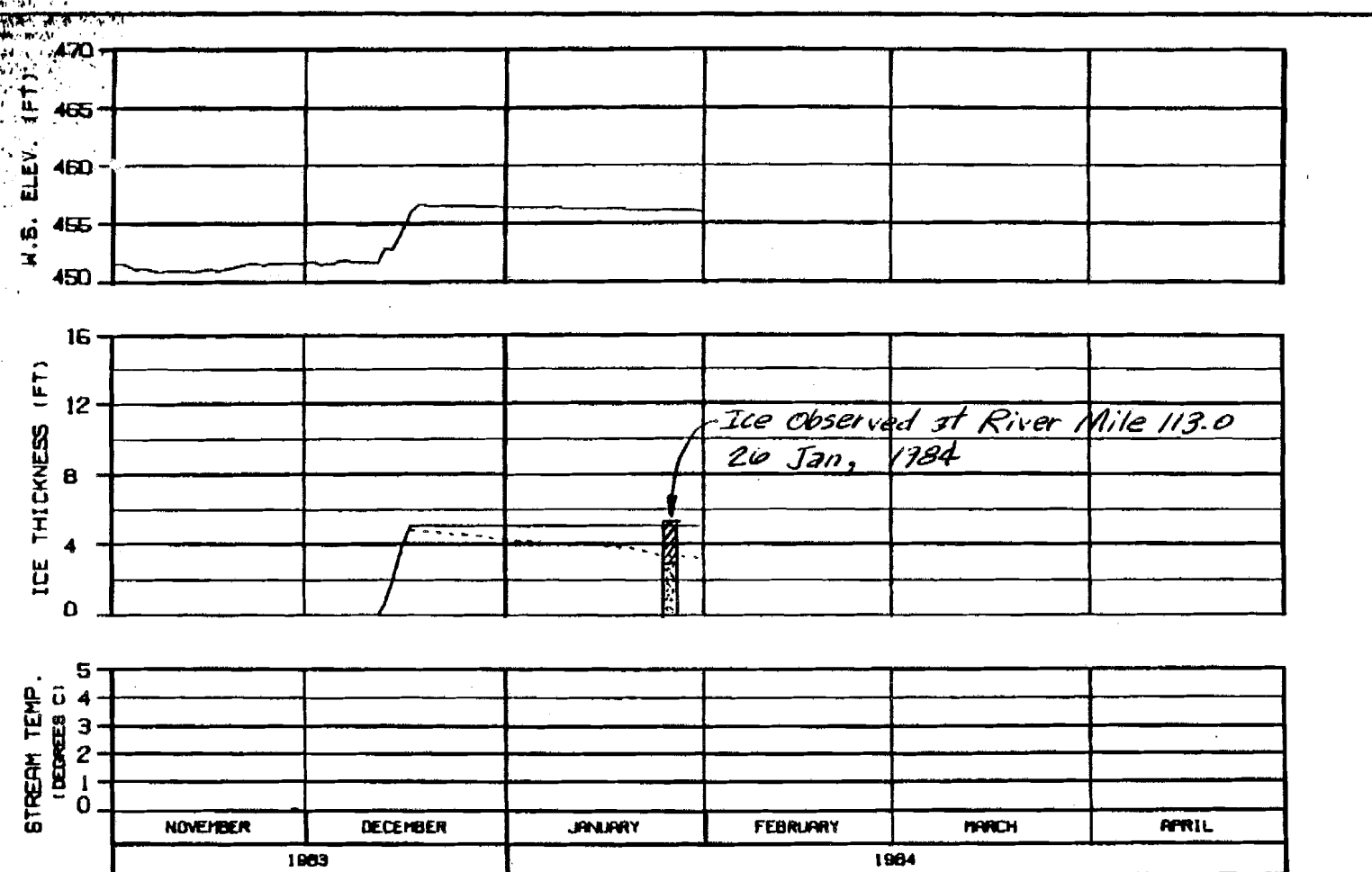
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: DLD/MS 11 SEP 84 1000.142

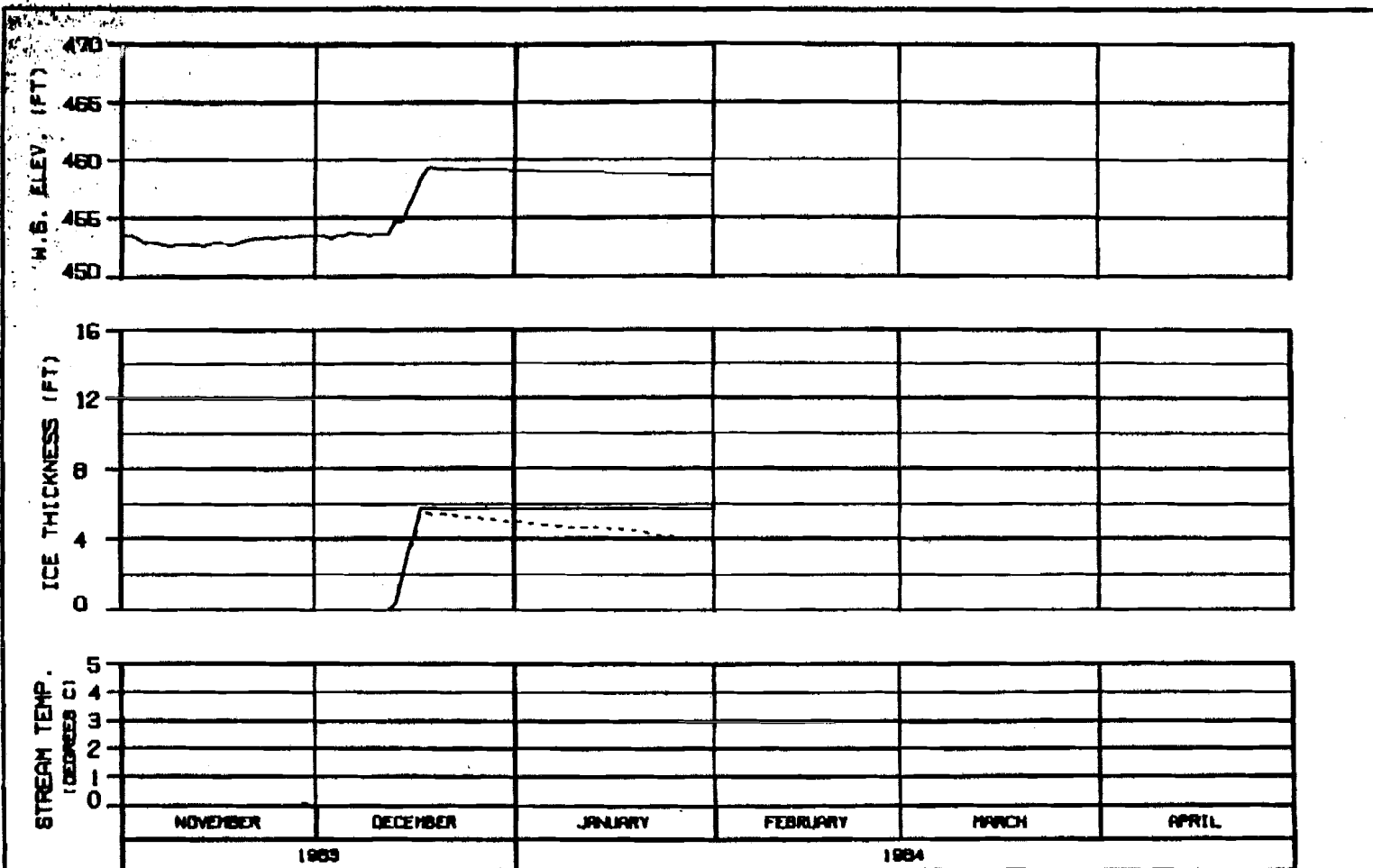


**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHICAGO - ALL RIGHTS	21 SEP 84
8888.142	



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE83A

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

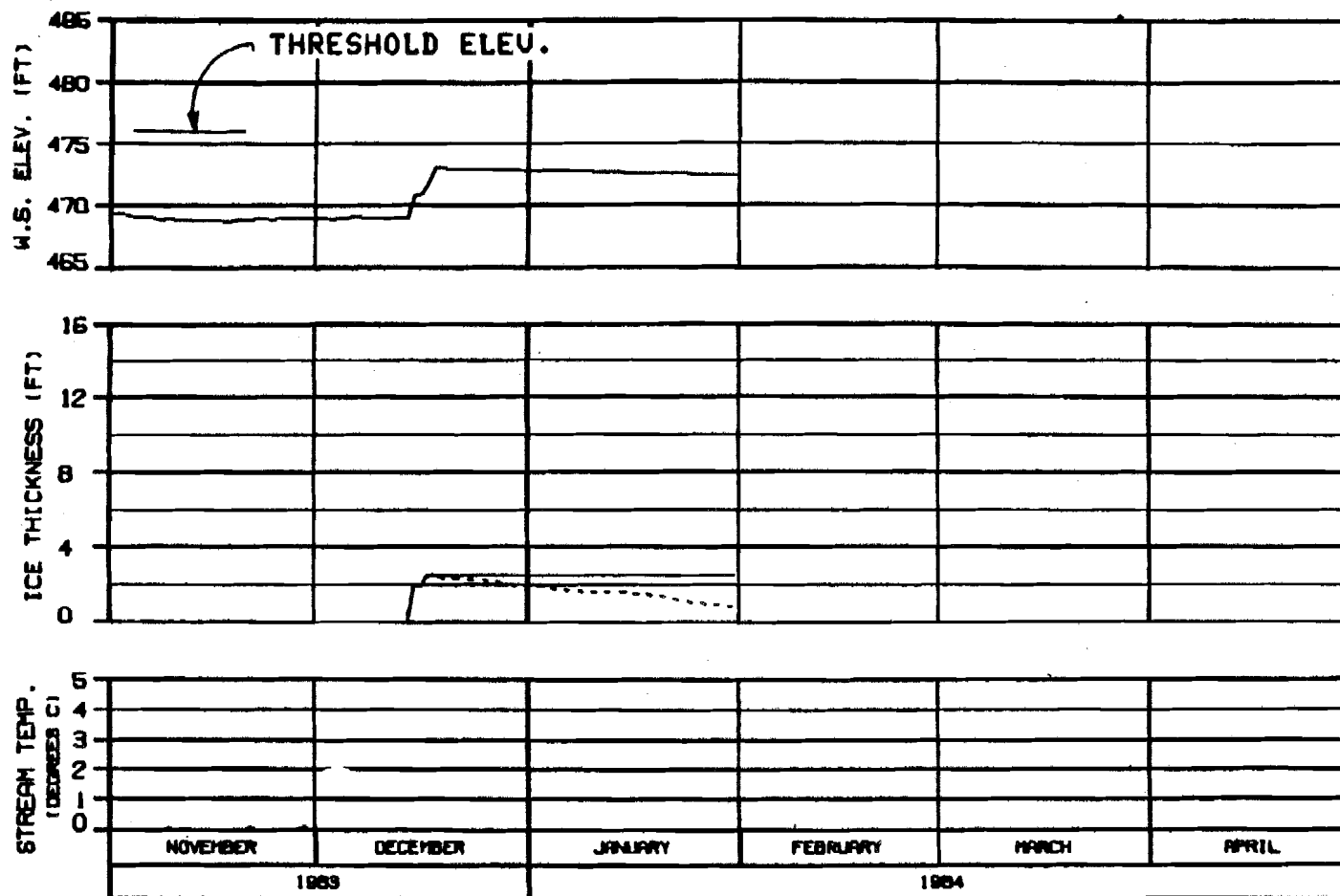
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DESIGN: ALP-8301 11 SEP 84 1000.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE83A

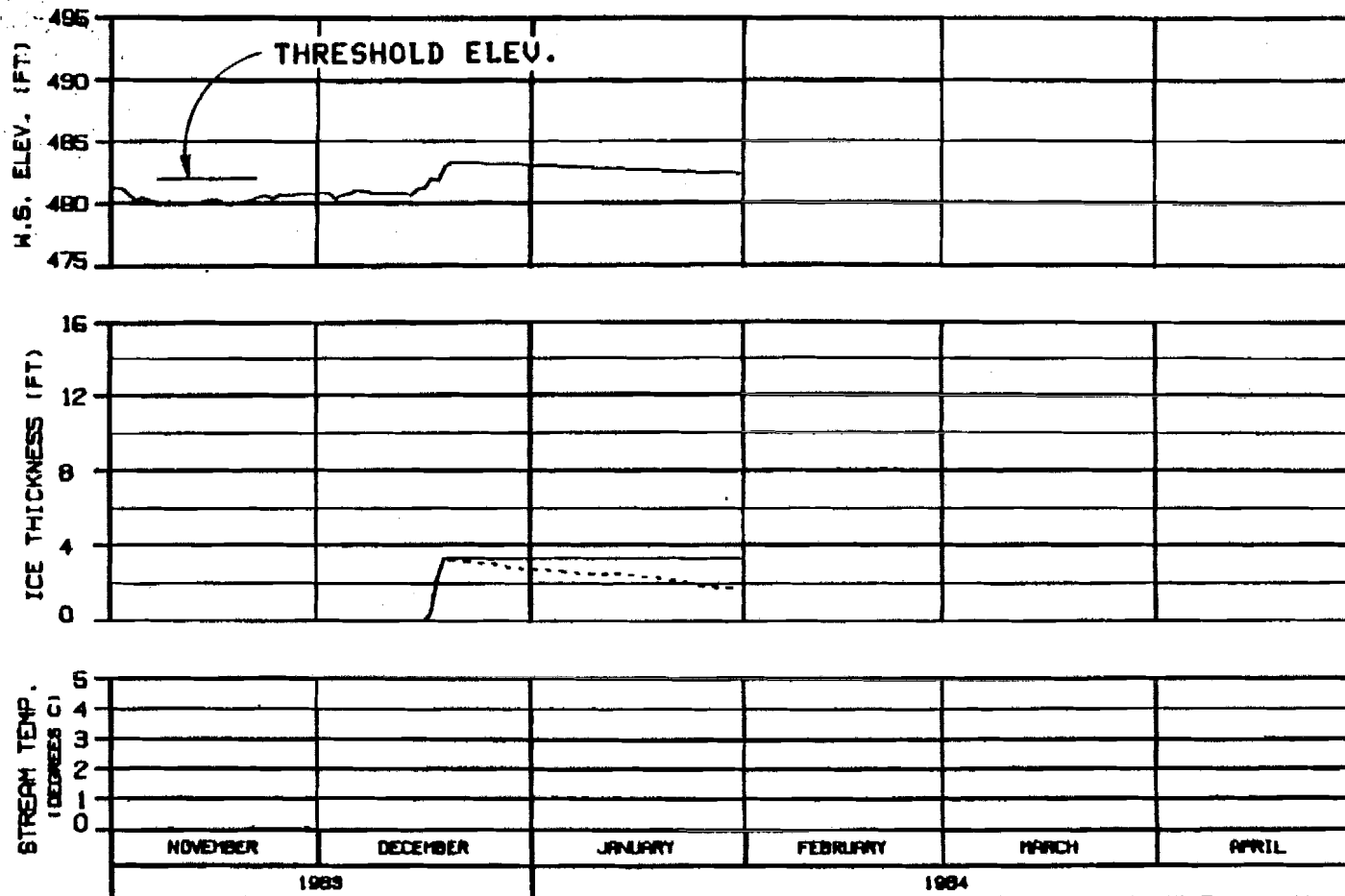
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S. L. 0000 31 SEP 84 1000.142



**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

**WEATHER PERIOD : 1 NOV 83 - 31 JAN 84**  
**PRE PROJECT SIMULATION**  
**REFERENCE RUN NO. : PRE83A**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - BLUISH COMPONENT

**ALASKA POWER AUTHORITY**

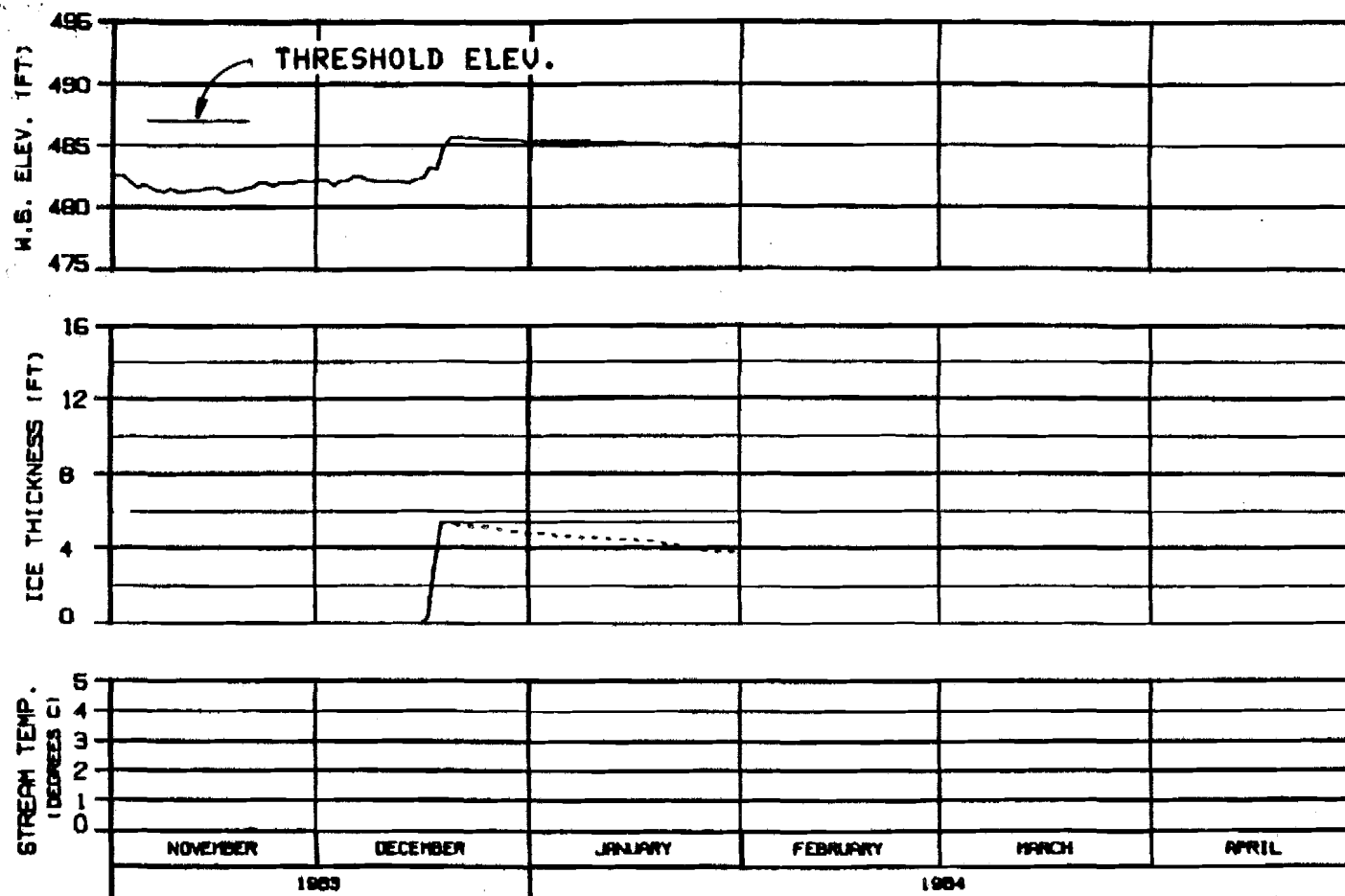
**SUSITNA PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HAZARDA-EBASCO JOINT VENTURE**

**CHECKED: S.A. 0000 31 SEP 84 0000.142**





**ICE THICKNESS LEGEND:**

—— TOTAL THICKNESS  
 - - - - BLUISH COMPONENT

**HEAD OF SIDE CHANNEL MSII**

**RIVER MILE : 115.90**

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

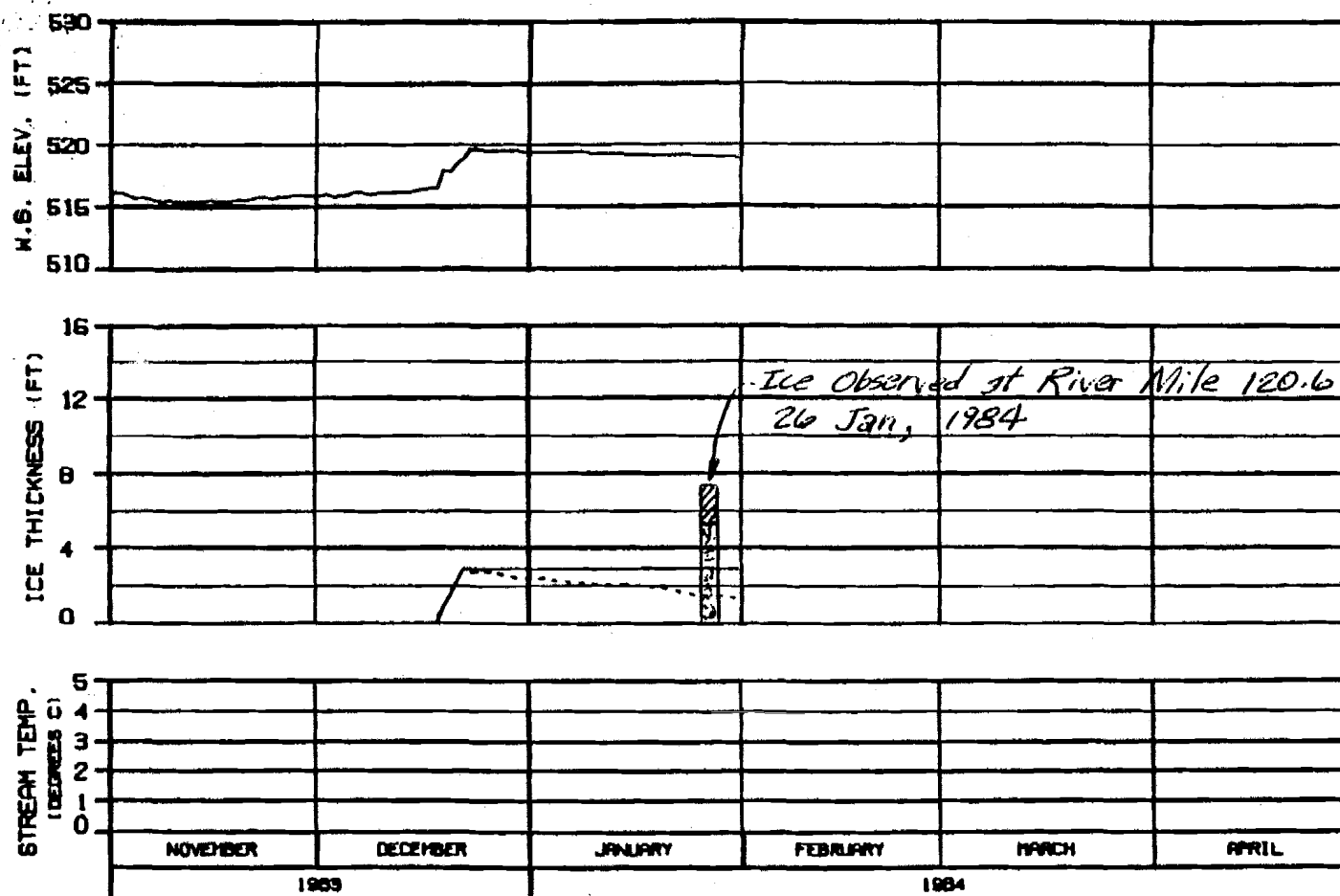
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: J. J. PETERSON 11 SEP 84 SHEET 142

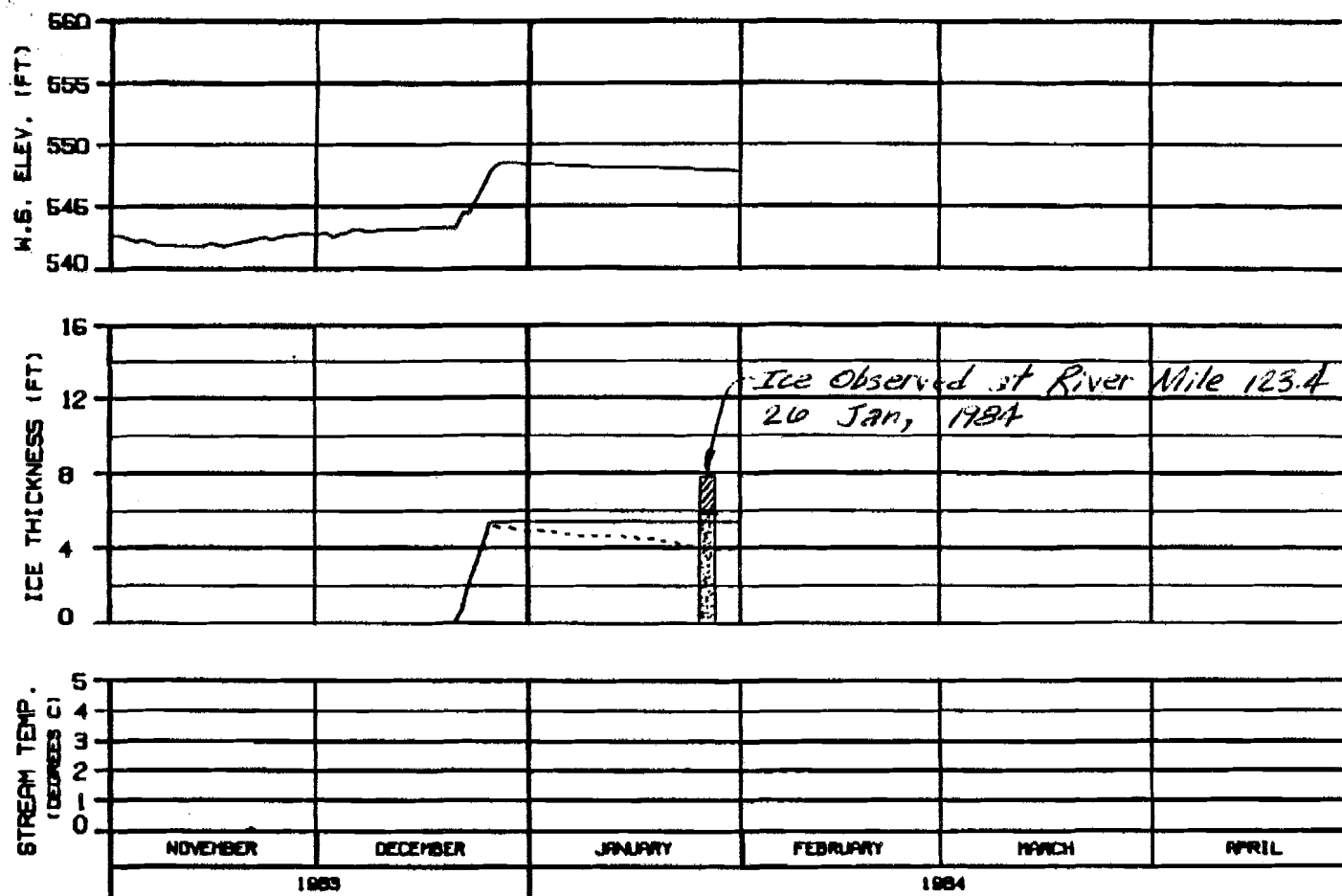


ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EBR600 JOINT VENTURE	
DESIGNED: ALP/DES	31 SEP 84
REVISED: 142	



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

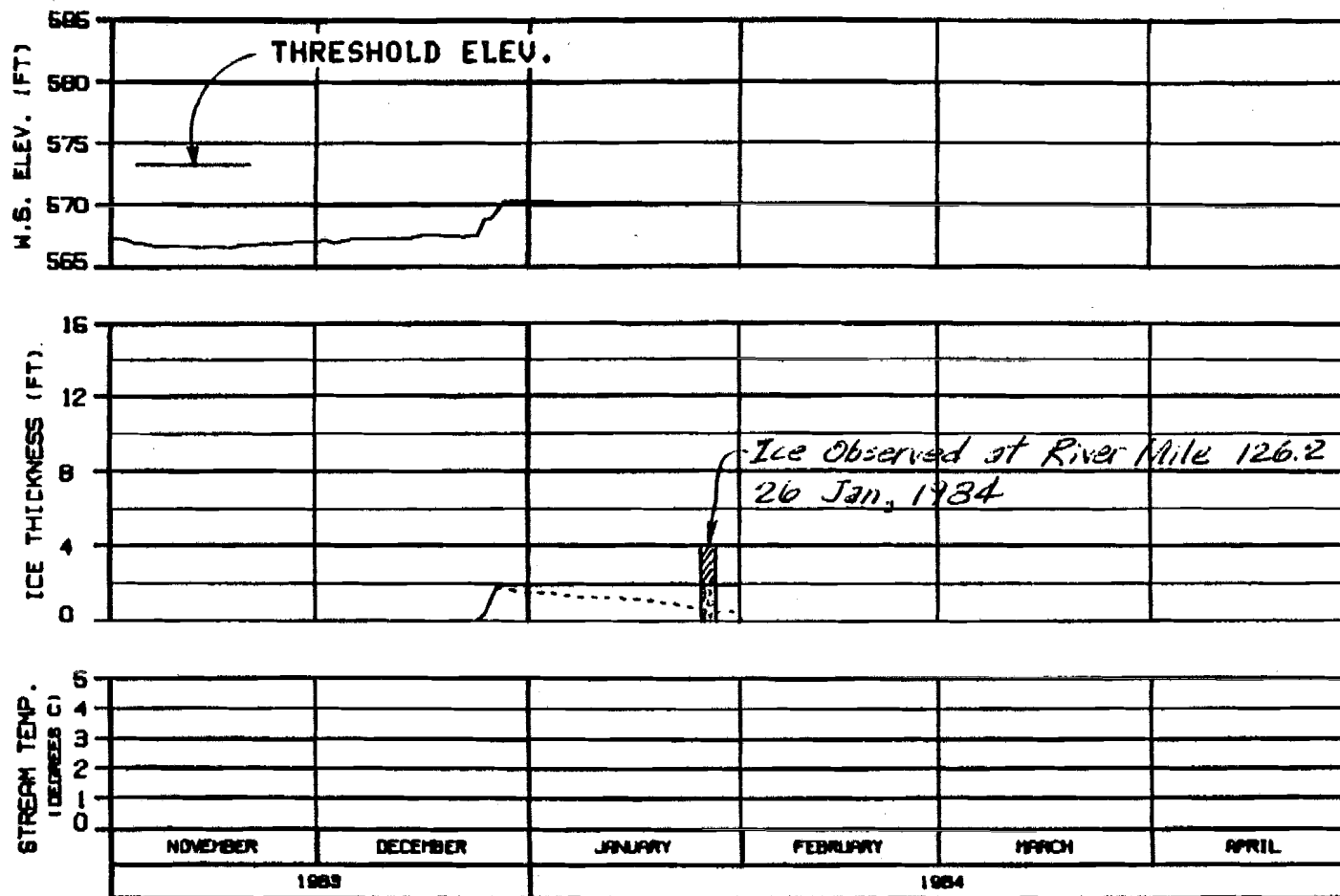
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACD JOINT VENTURE

FIGURE - 8A-0000 11 SEP 84 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE83A

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

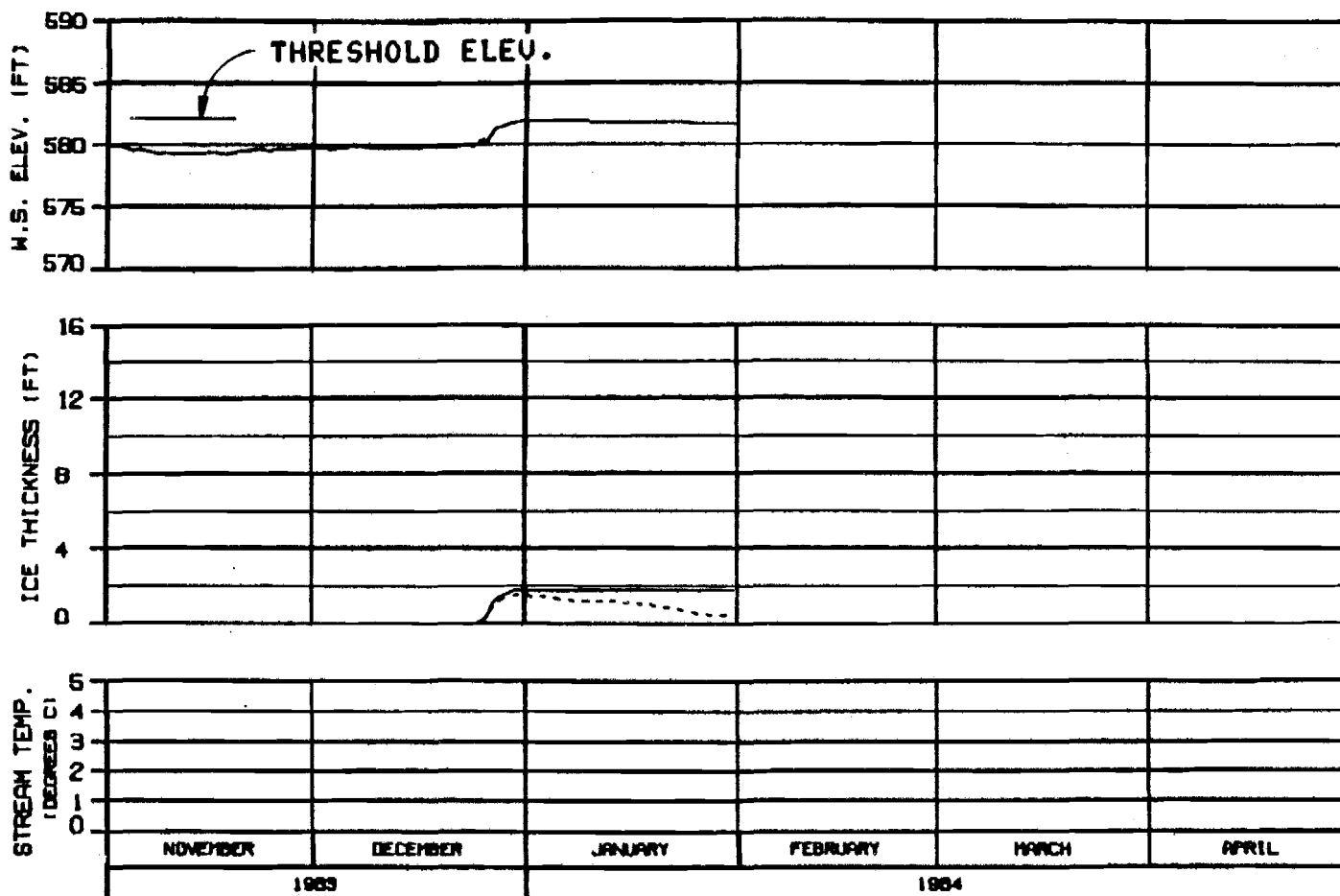
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHART: SLDGWS 11 SEP 84 1983.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

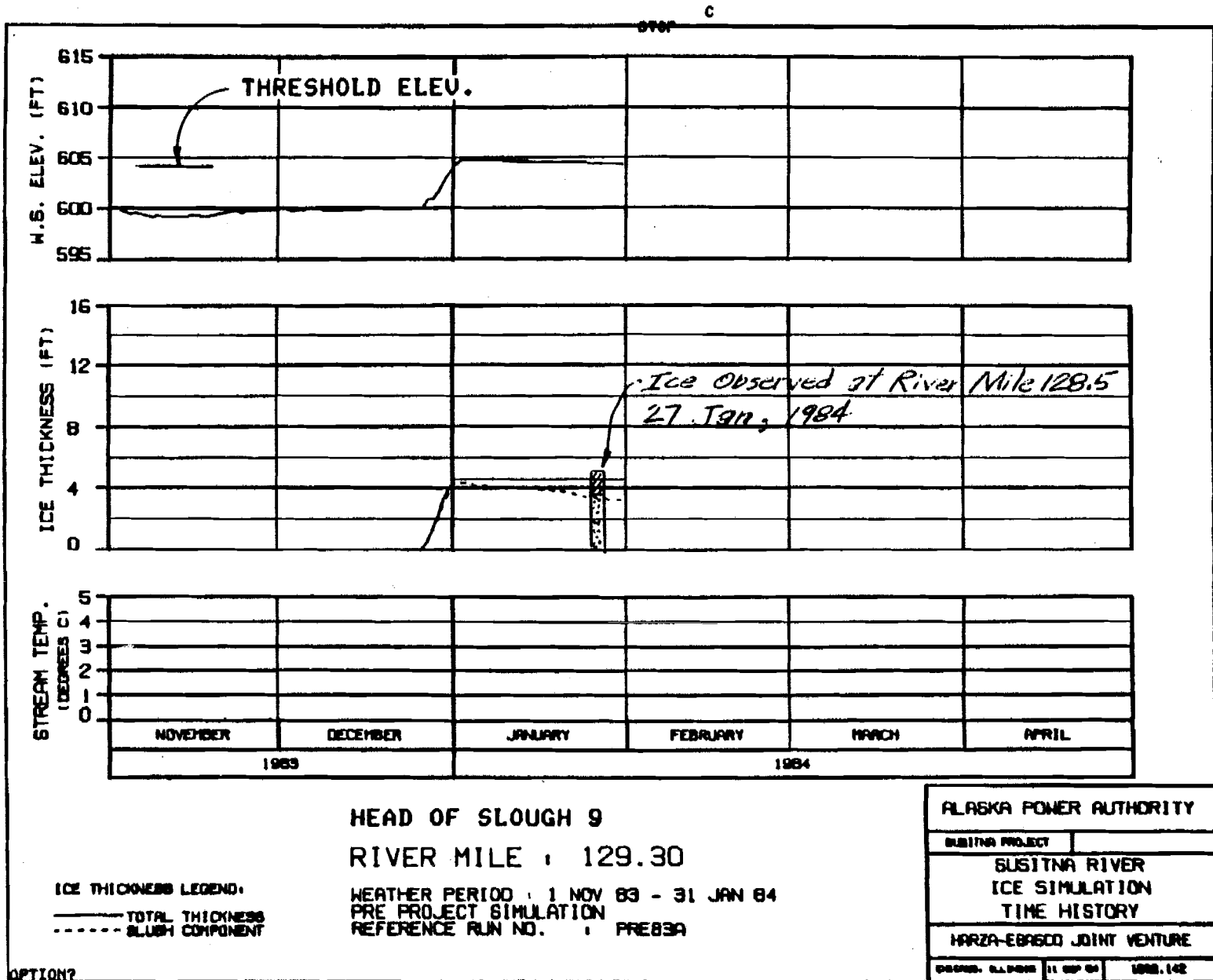
ALASKA POWER AUTHORITY

SUSITNA PROJECT

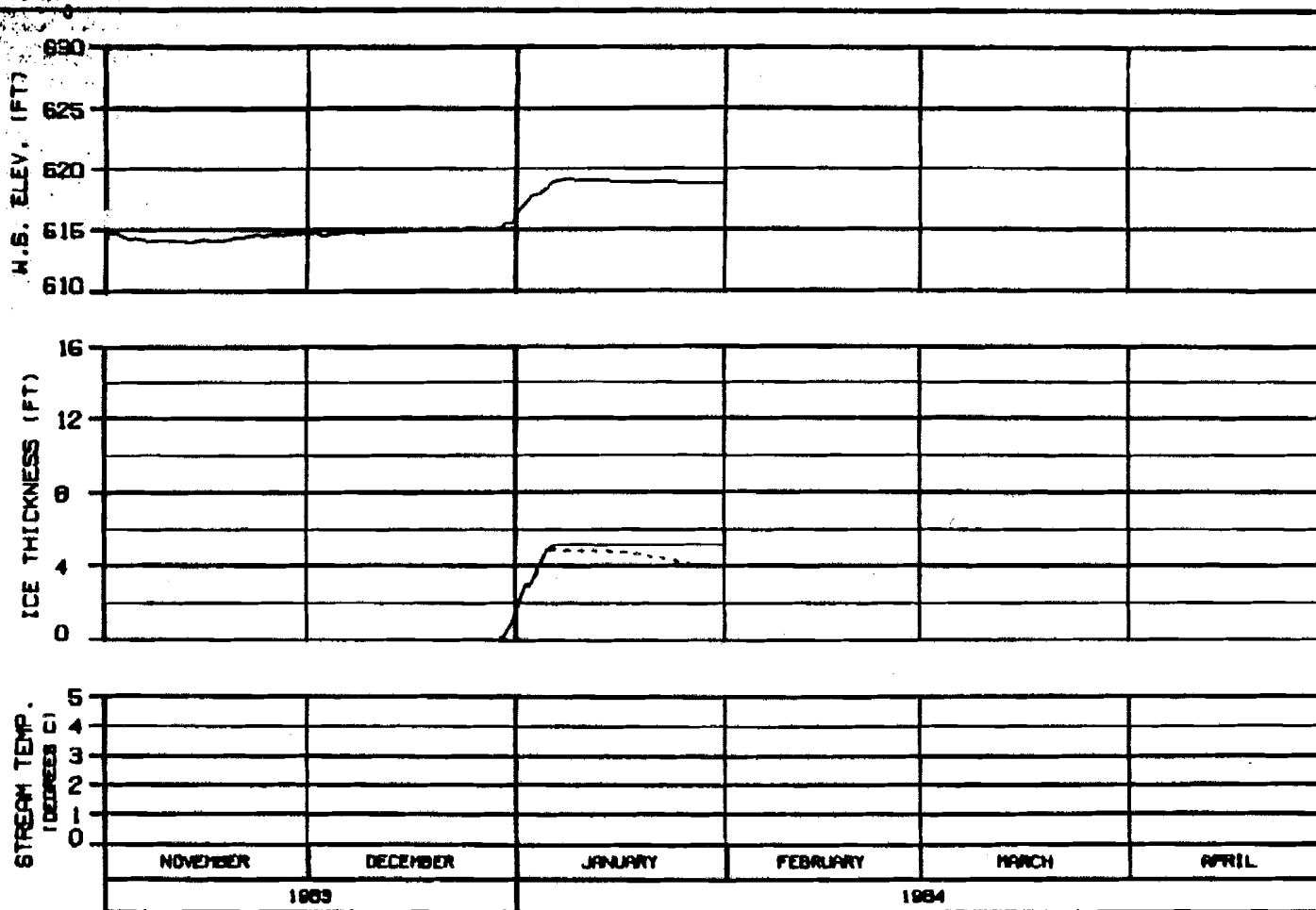
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRISCO JOINT VENTURE

DESIGNED BY: R. L. P. 83-08 31 SEP 84 1000.142



OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE83A

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- BLUSH COMPONENT

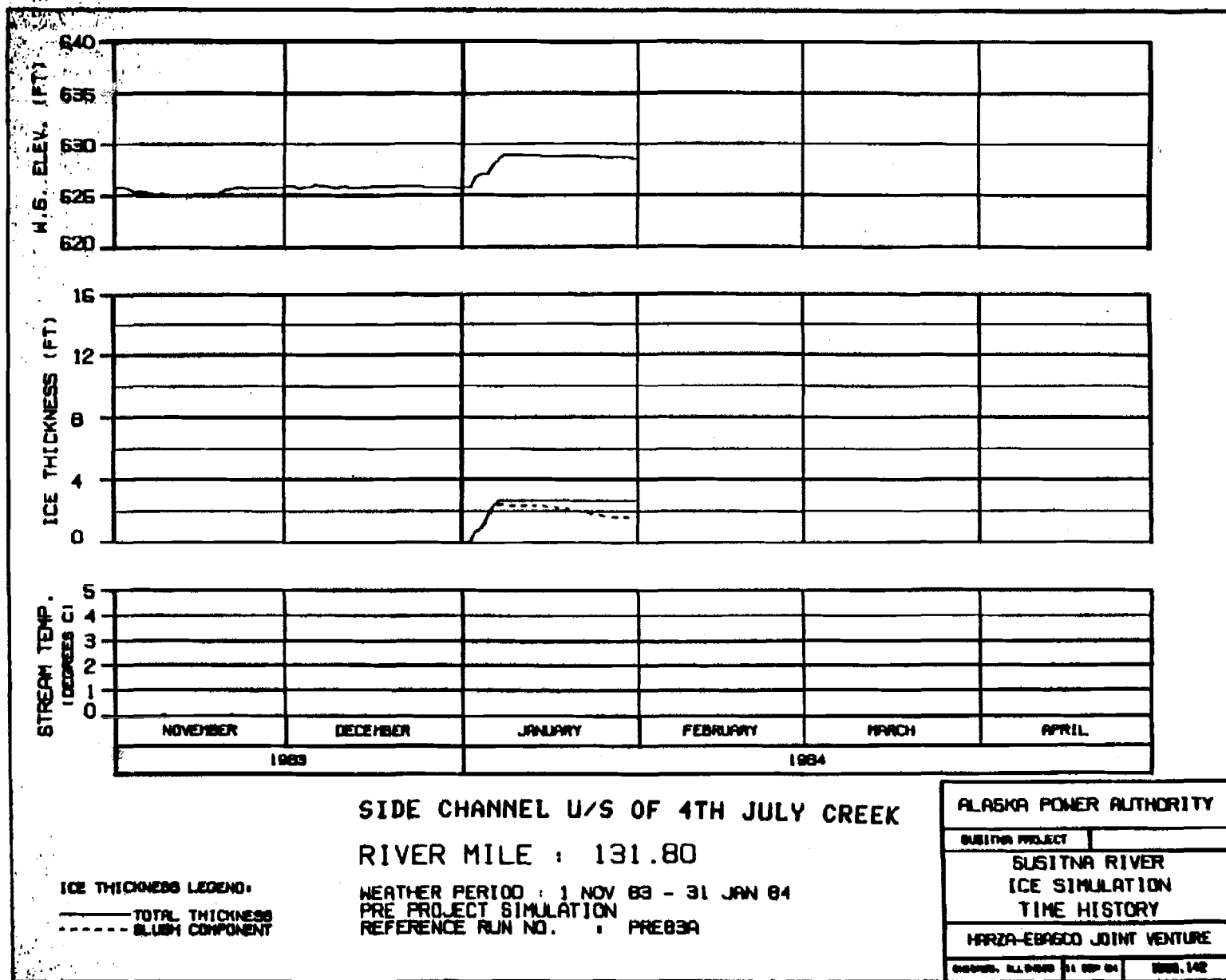
ALASKA POWER AUTHORITY

SUSITNA PROJECT

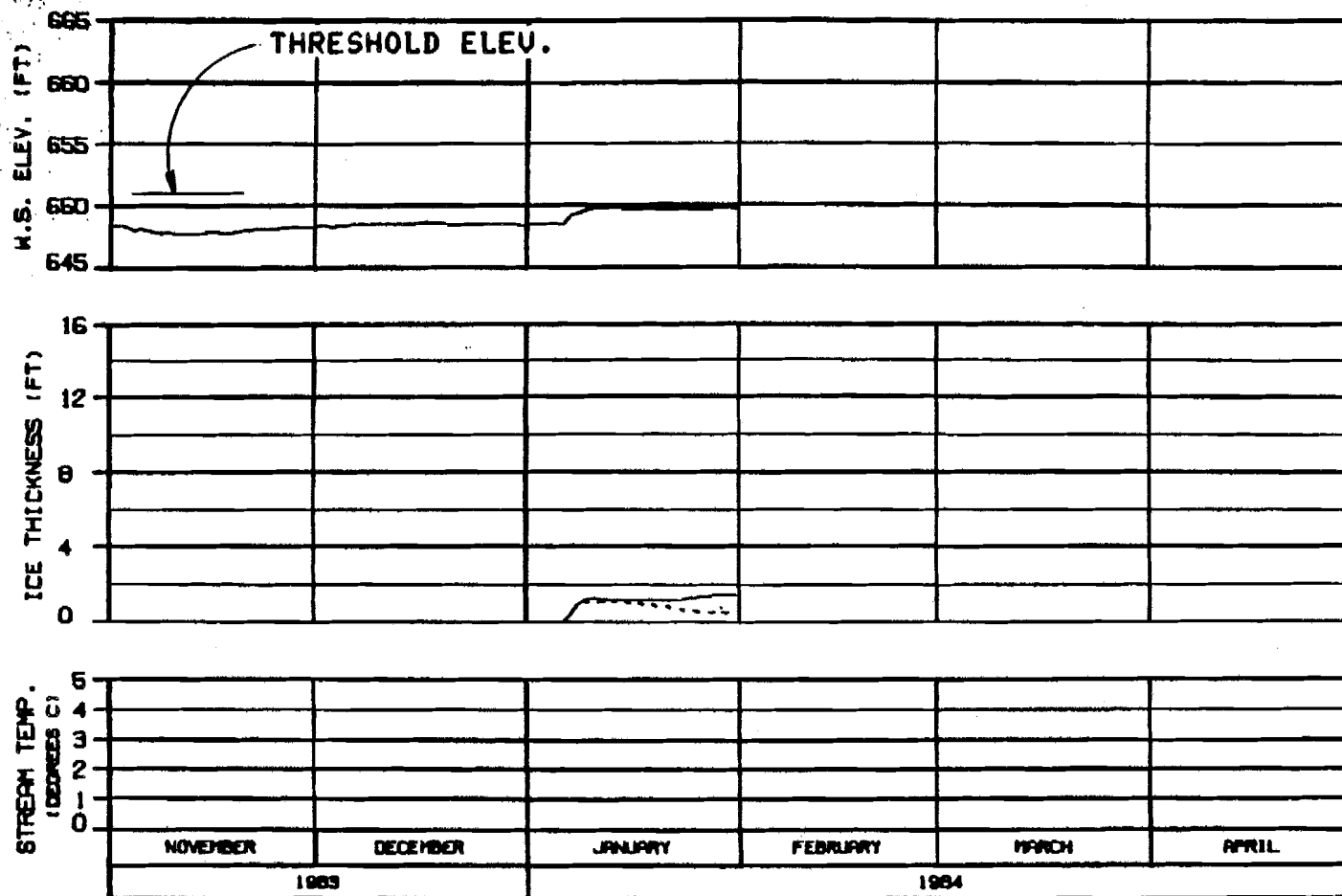
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHART NO. AL-888 11 SEP 84 1000.142







HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
PRE PROJECT SIMULATION  
REFERENCE RUN NO. : PRE83A

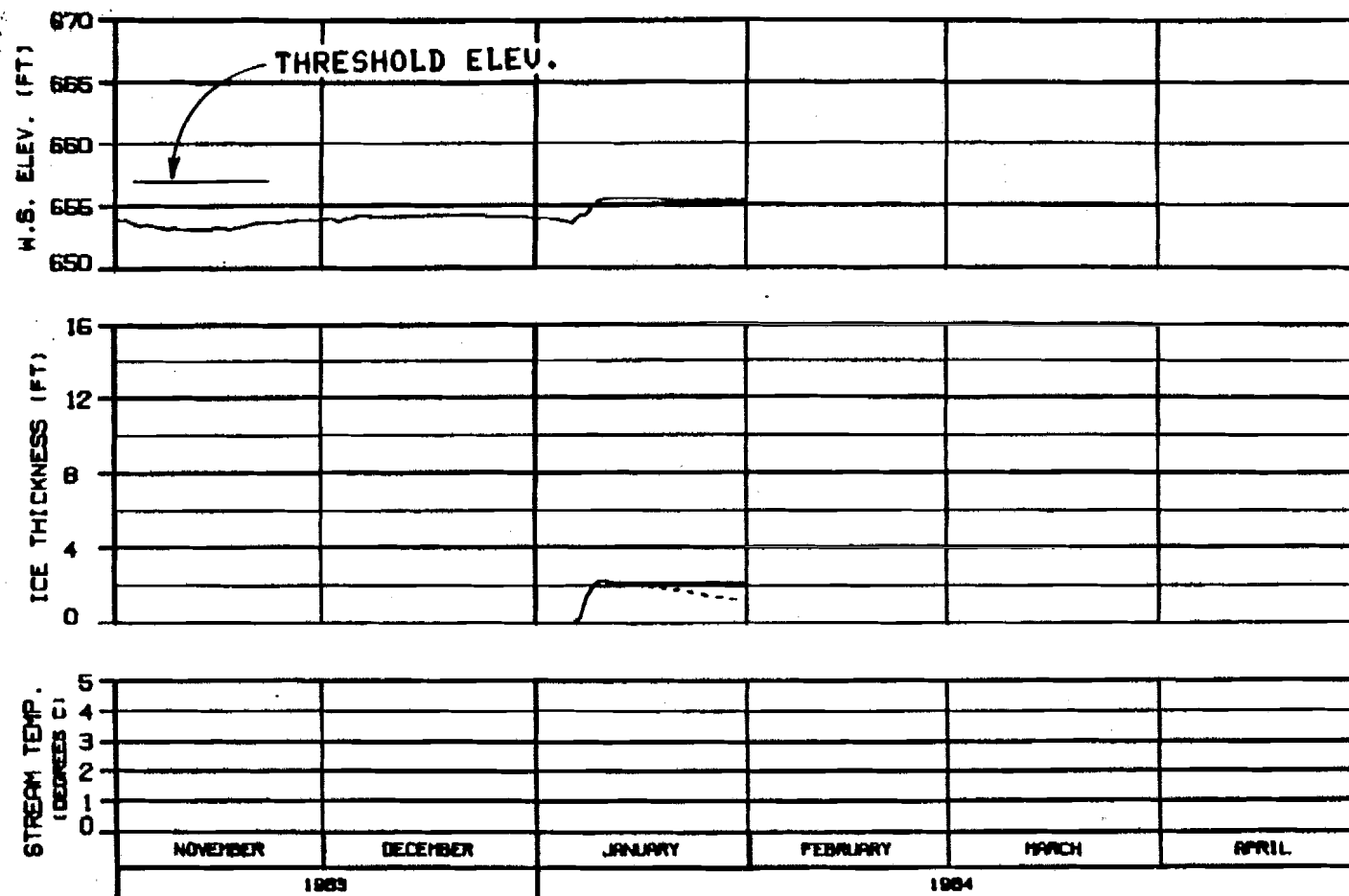
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBAGOOD JOINT VENTURE

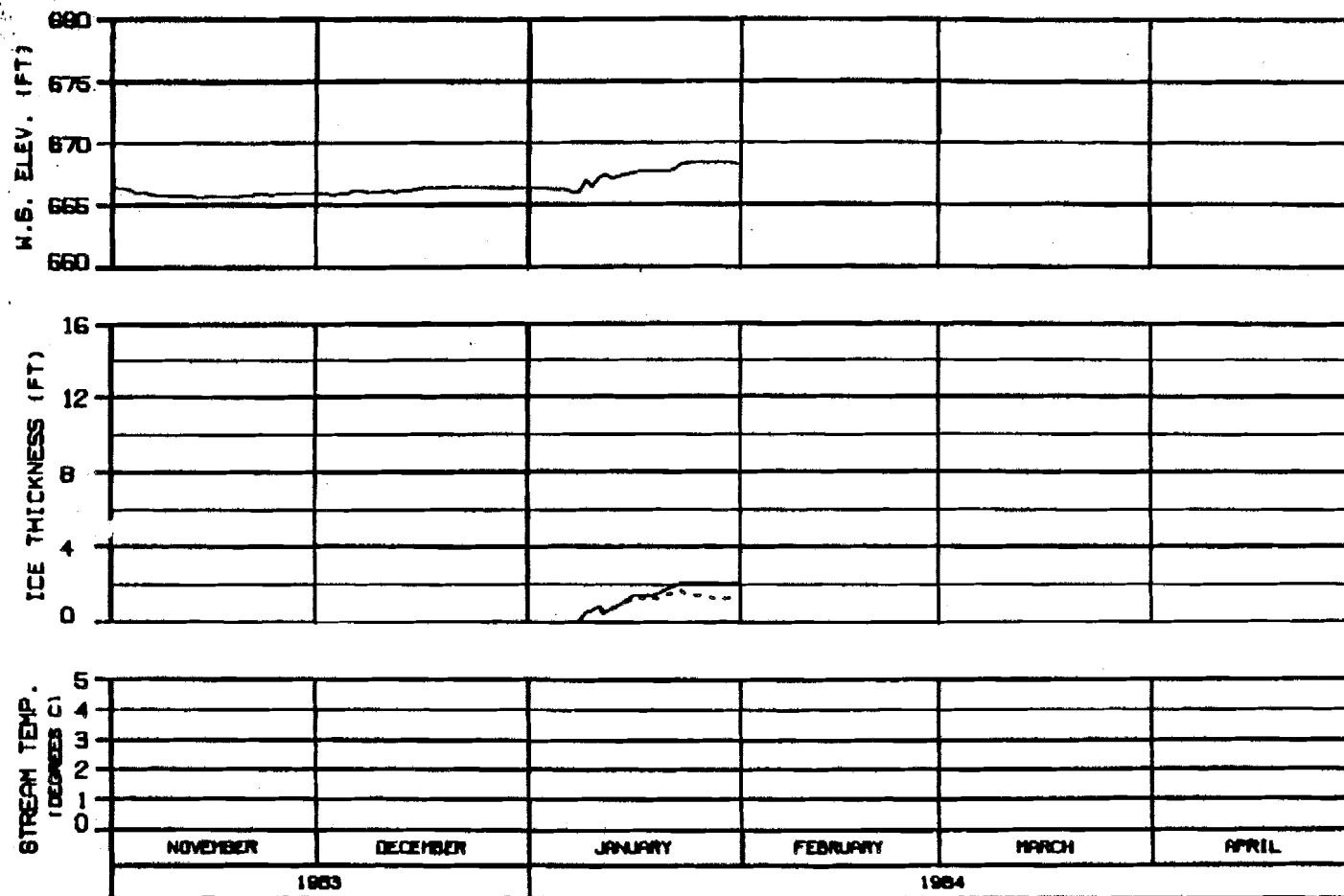
DESIGNED - ALL 8-83 11 SEP 84 888.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 10  
 RIVER MILE : 134.30  
 WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
WARDA-EBASCO JOINT VENTURE		
DESIGN: ALP/MS	11 SEP 84	2000.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL D/S OF SLOUGH 11  
 RIVER MILE : 135.30  
 WEATHER PERIOD : 1 NOV 83 - 31 JAN 84  
 PRE PROJECT SIMULATION  
 REFERENCE RUN NO. : PRE83A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

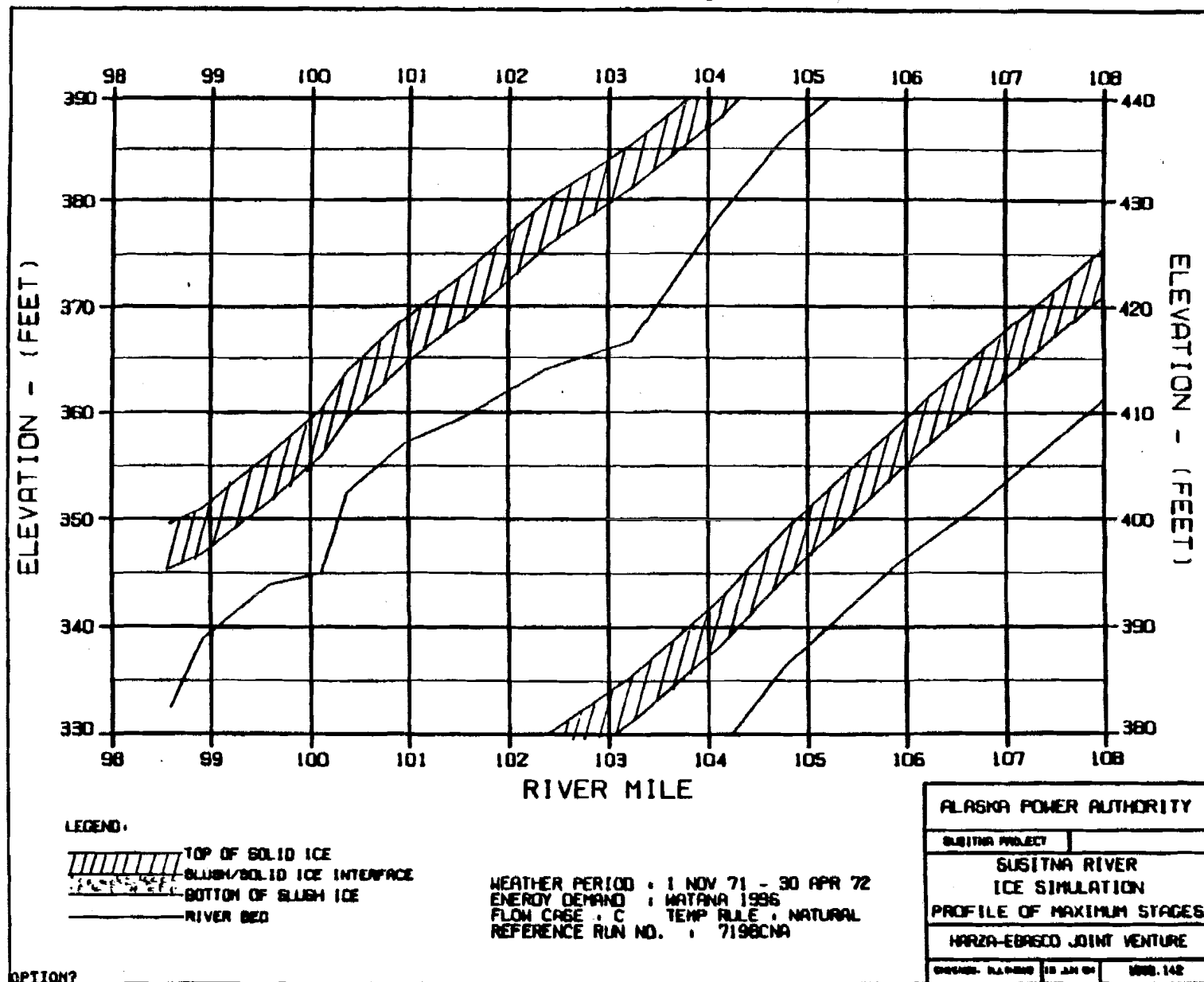
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

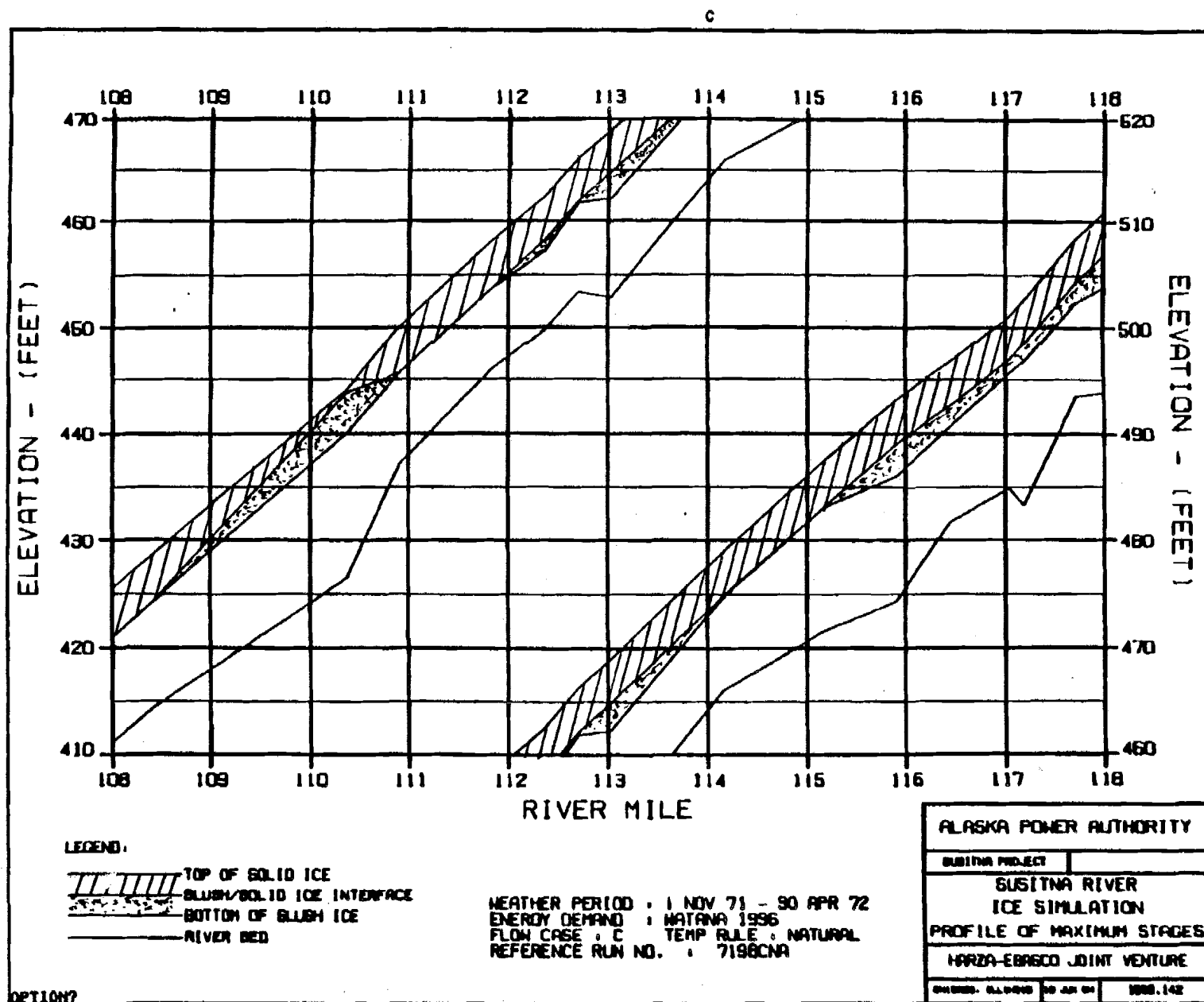
HARZA-EBASCO JOINT VENTURE

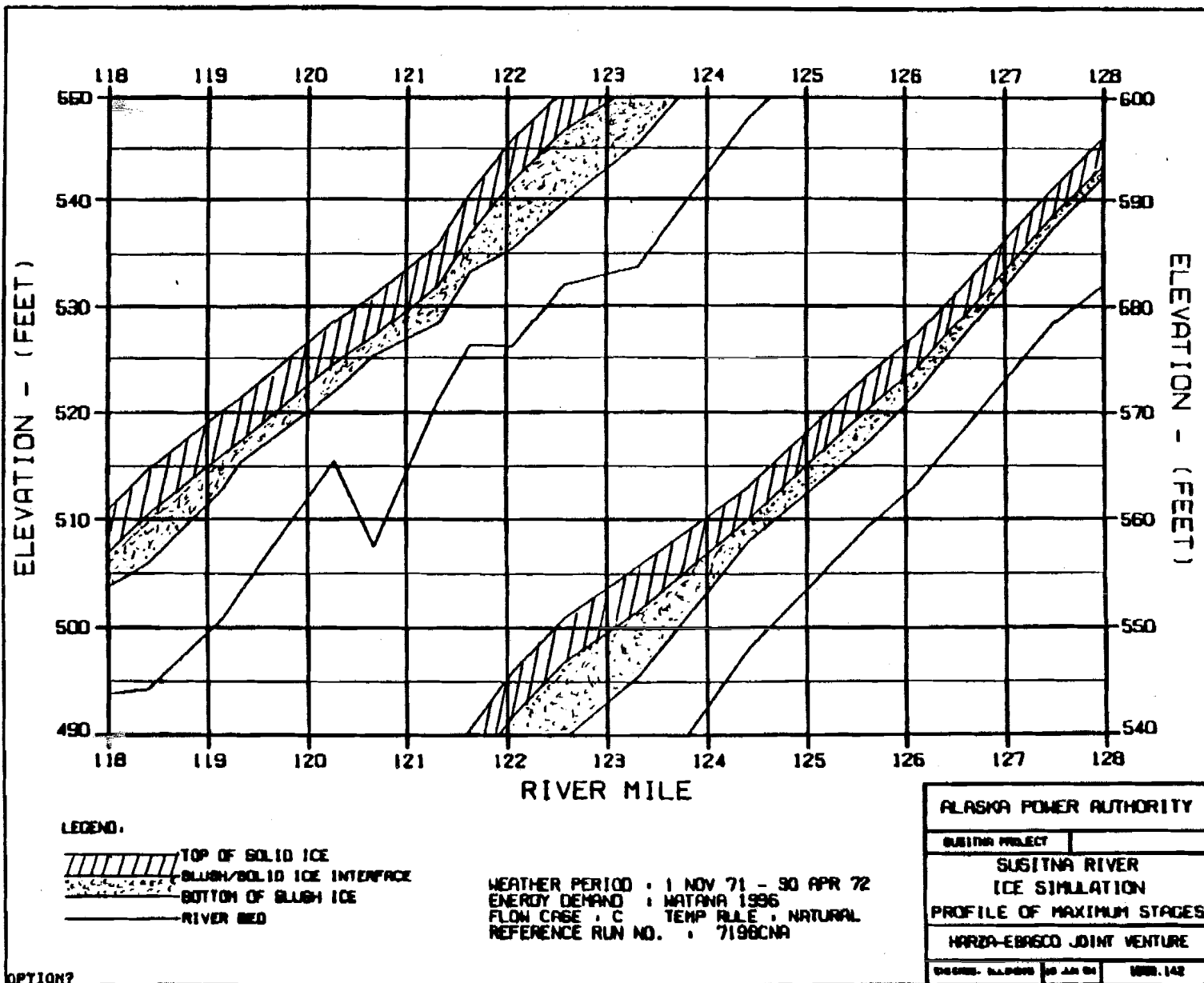
DESIGN: E.L. HARRIS 11 SEP 84 1000-142



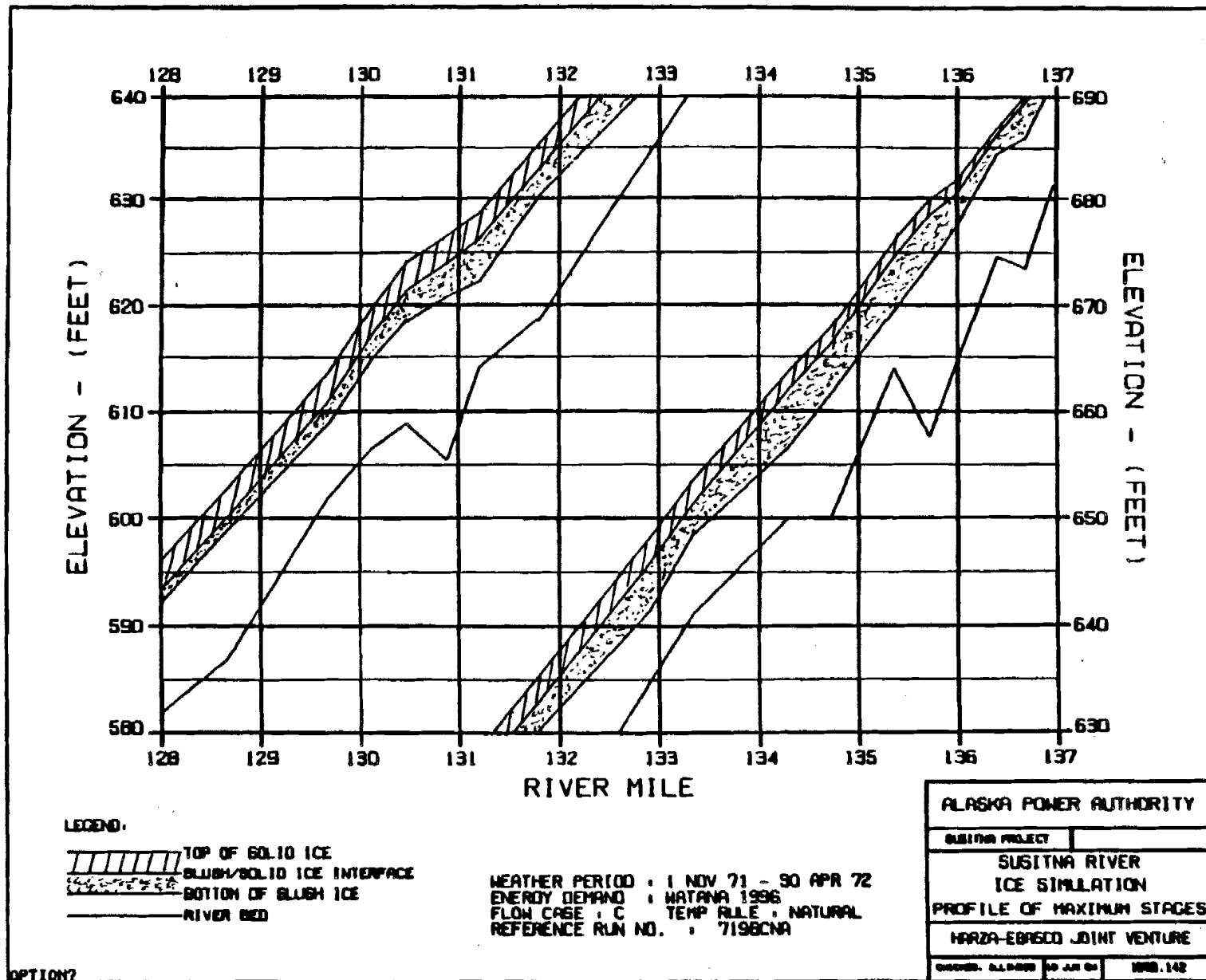
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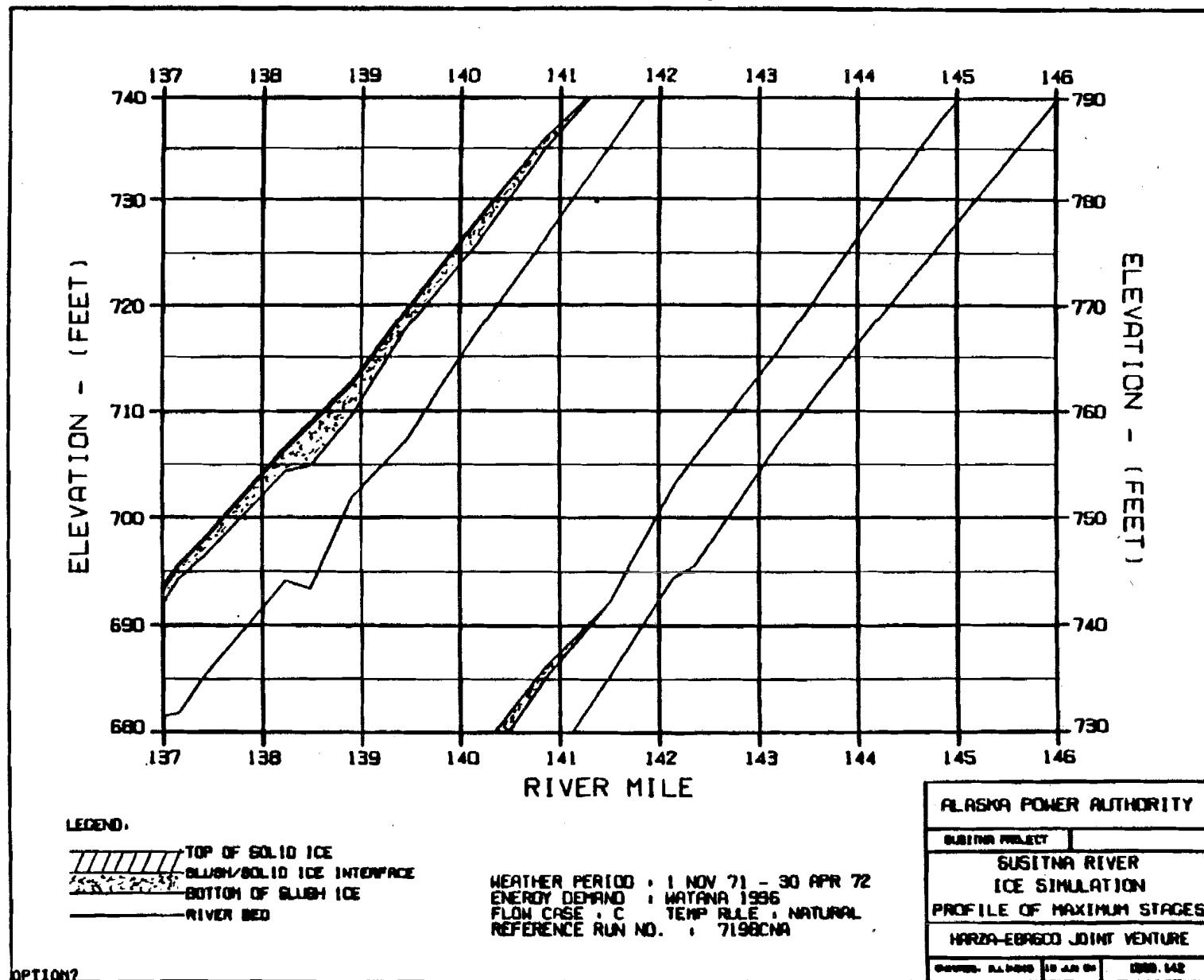


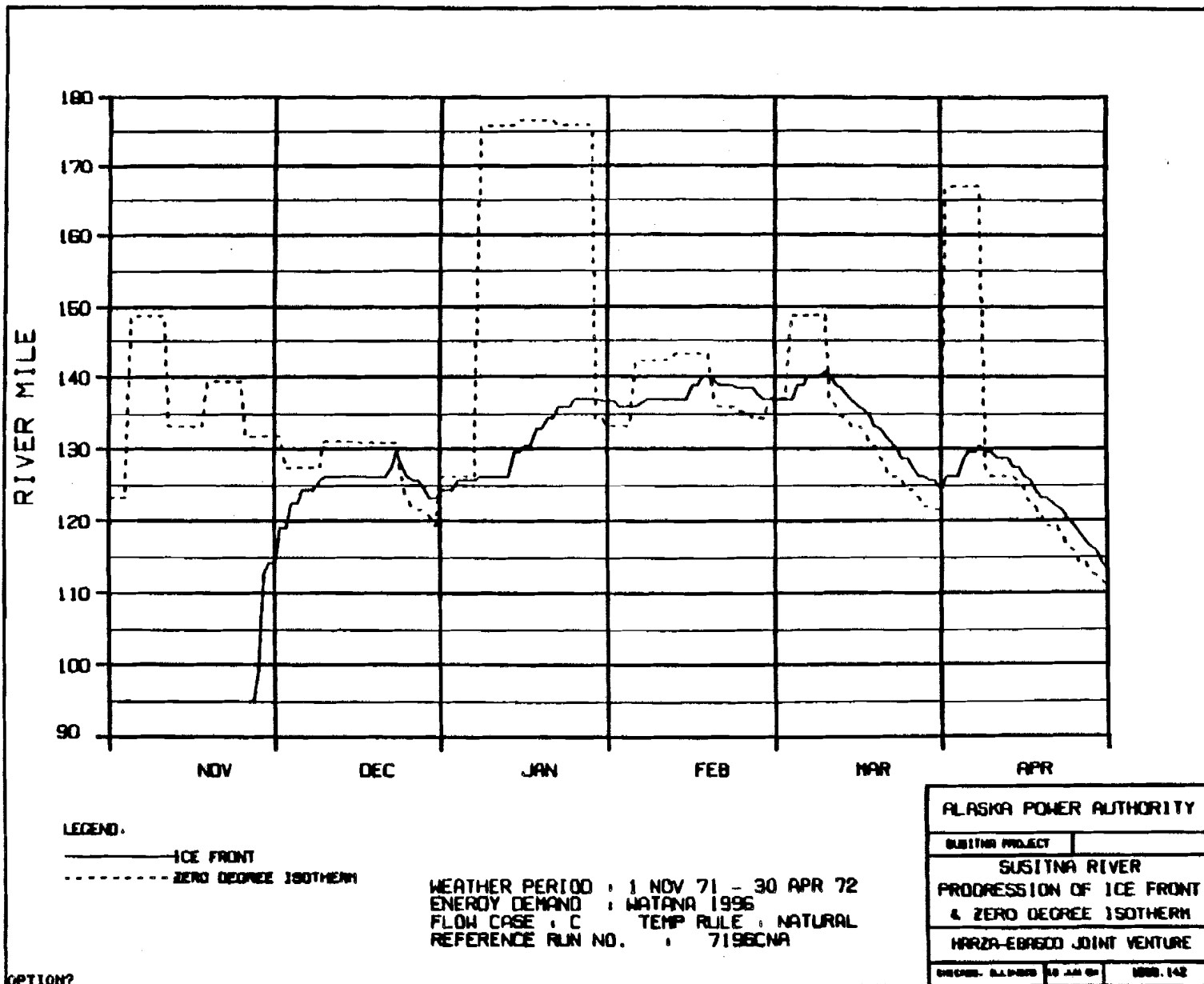


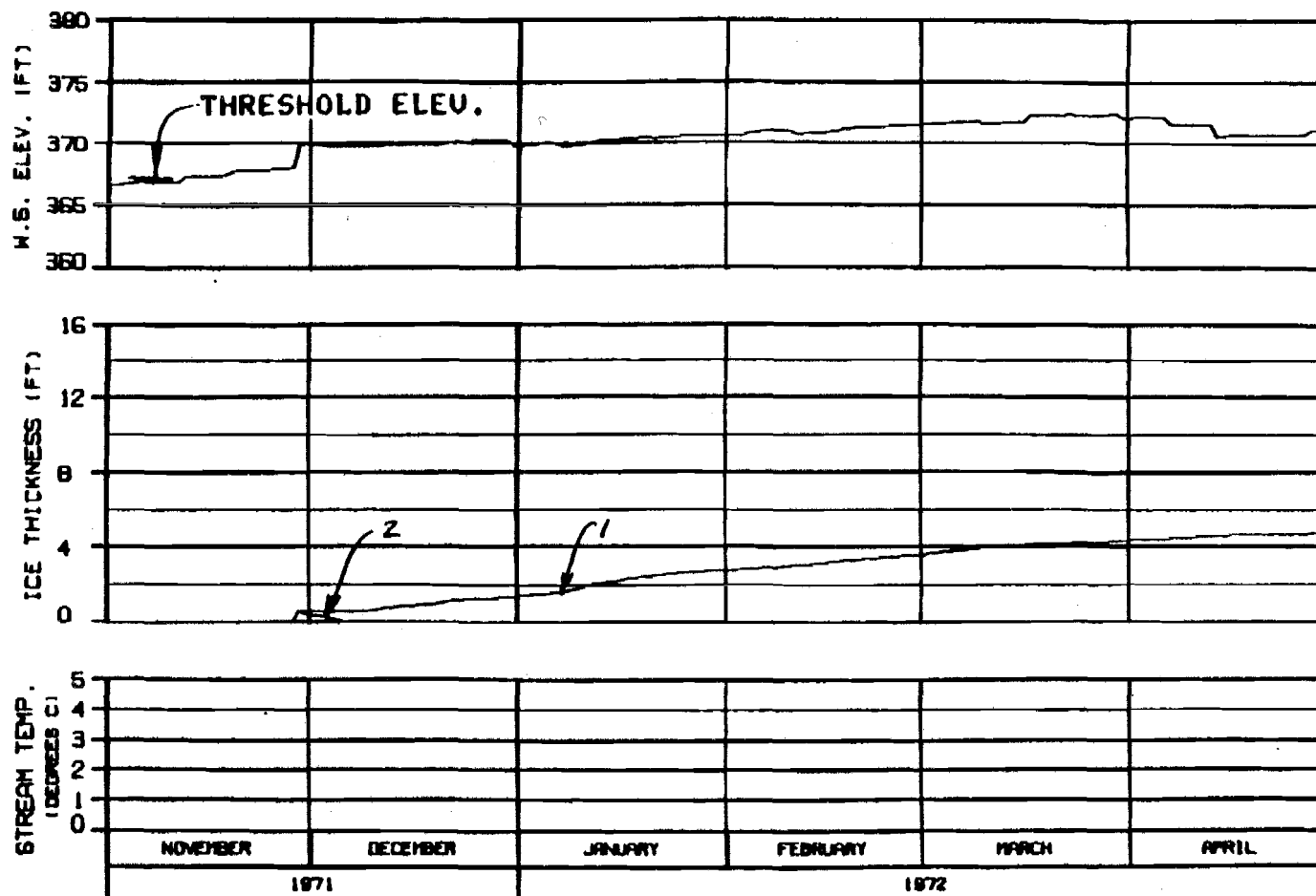












# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

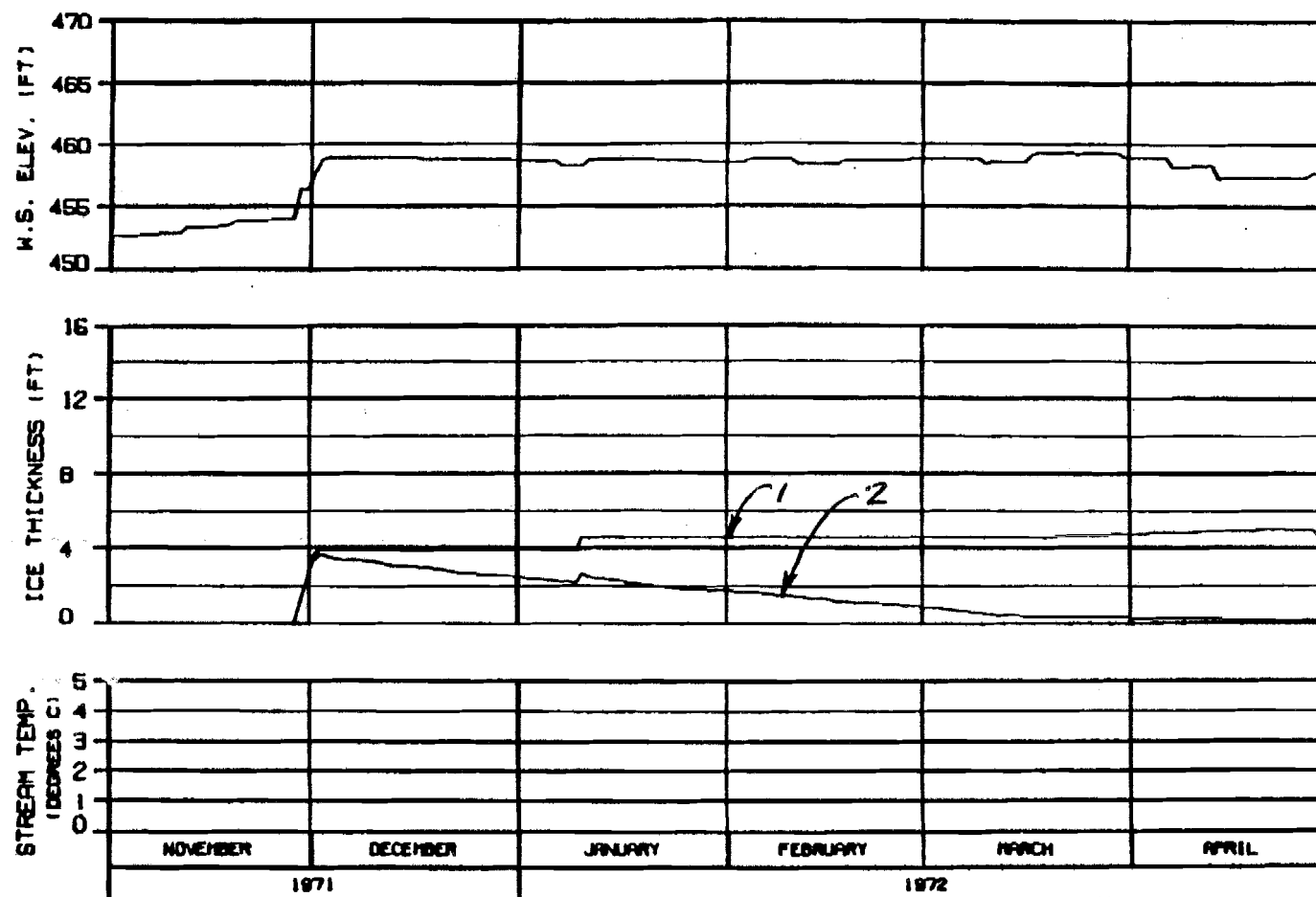
## ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

ISSUED: AL-0070 10 JAN 74 1000.142



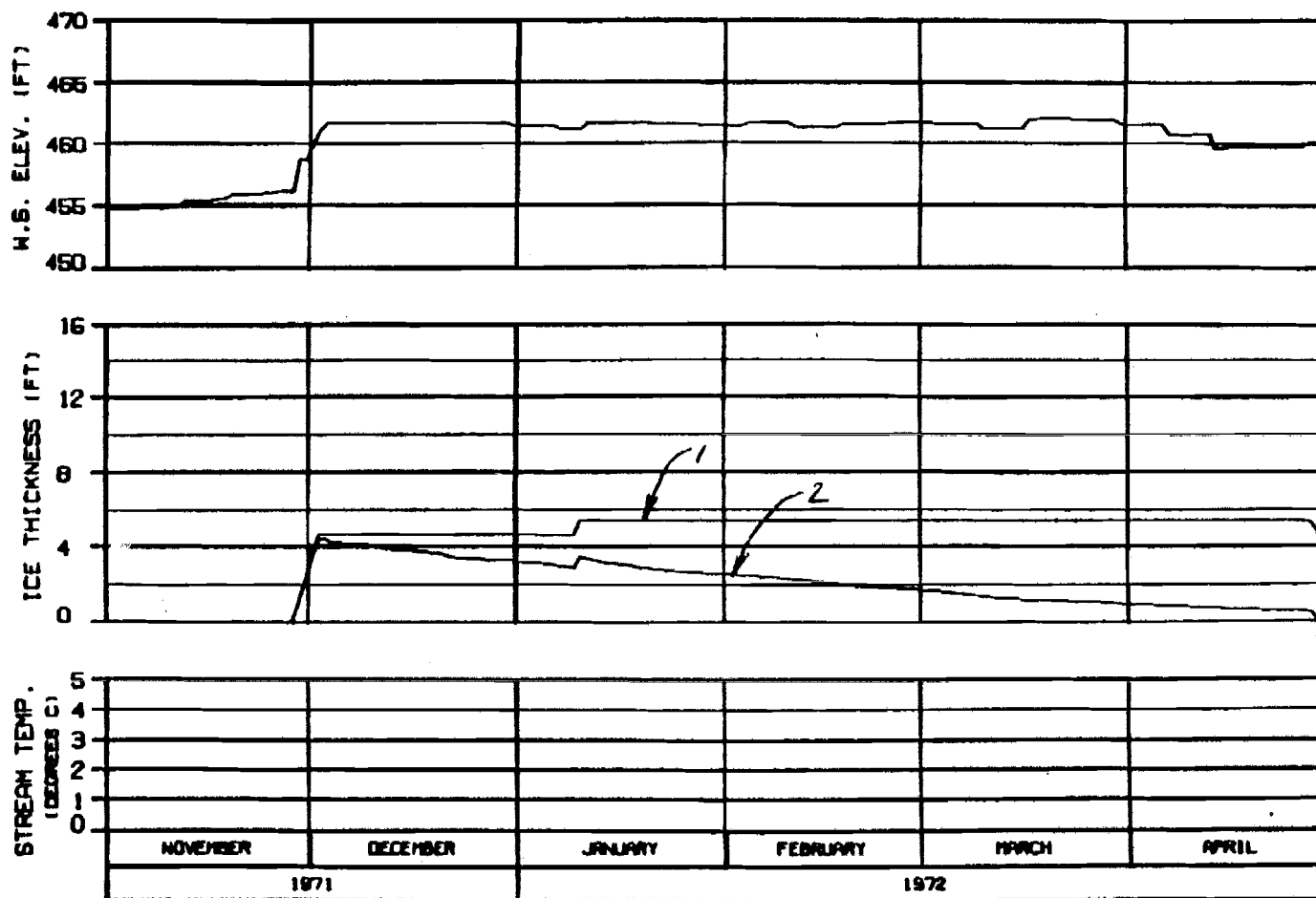
# **SIDE CHANNEL AT HEAD OF GASH CREEK** **RIVER MILE : 112.00**

## **ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. BLISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7196CNA

<b>ALASKA POWER AUTHORITY</b>		
<b>SUSTINA PROJECT</b>		
<b>SUSTINA RIVER</b>		
<b>ICE SIMULATION</b>		
<b>TIME HISTORY</b>		
<b>HARZA-EBRARD JOINT VENTURE</b>		
DESIGNED BY: BLM	NO. 111 01	REV. 142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : MATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

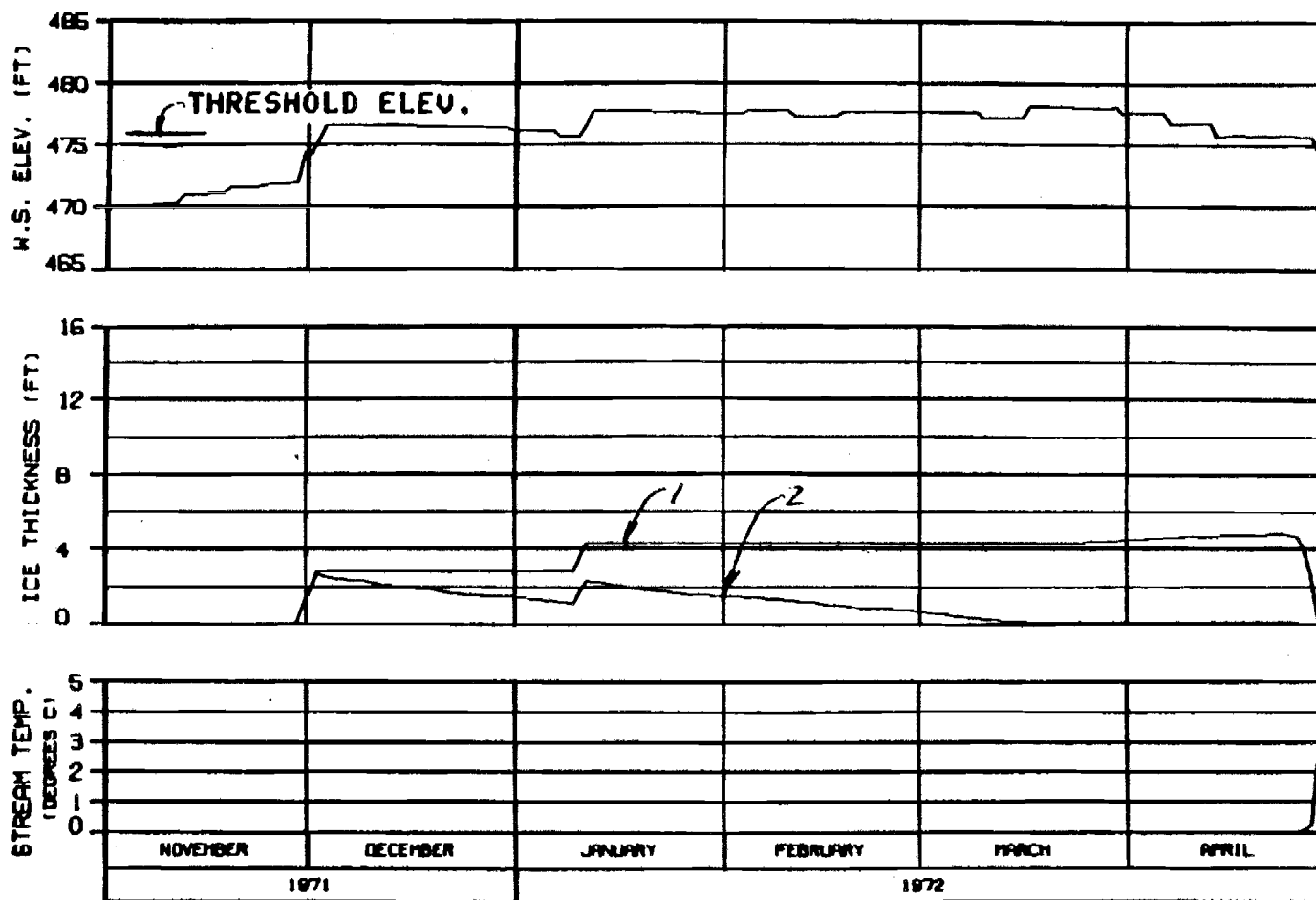
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZARDOUS JOINT VENTURE

DESIGNED - S.A. P. 10 JAN 72 100.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

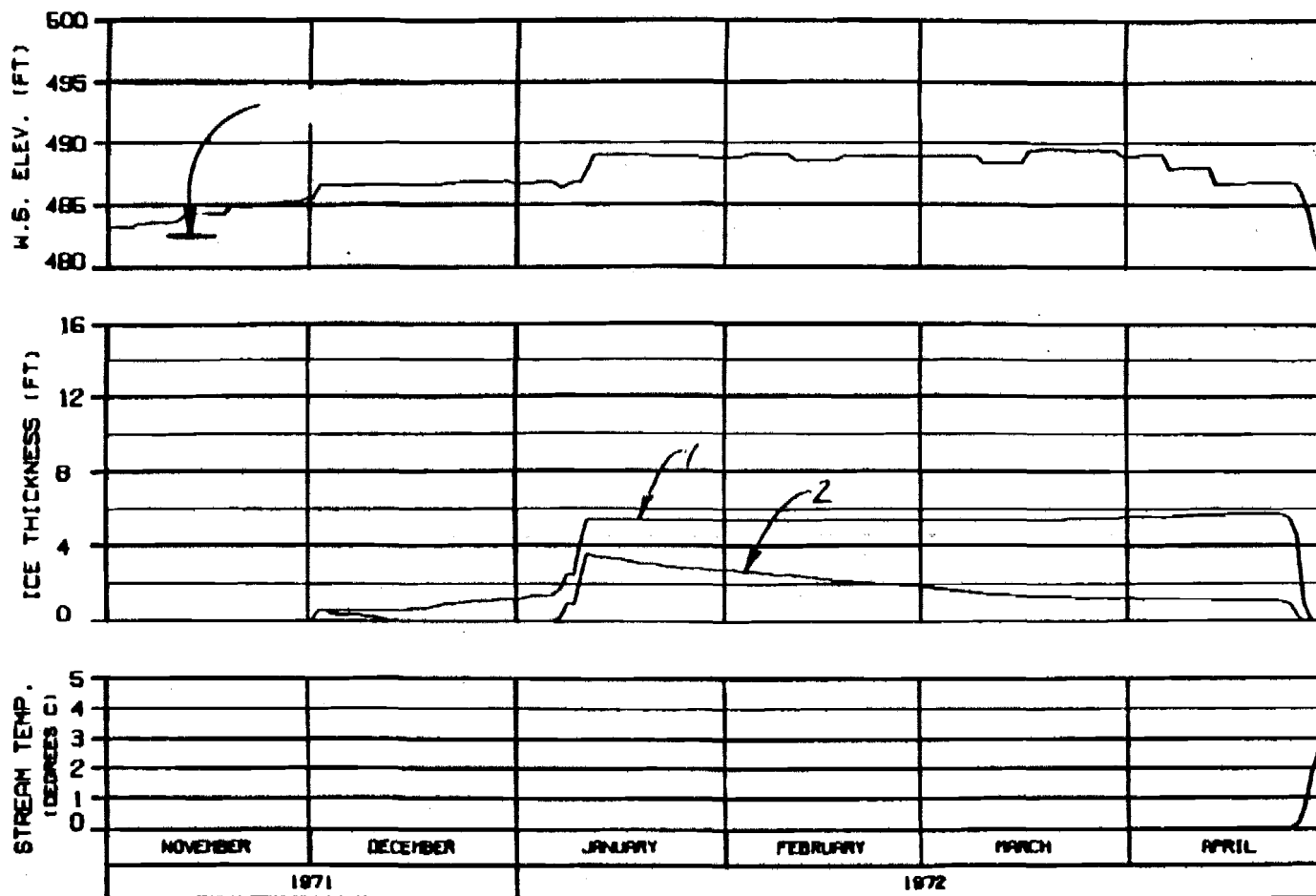
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBAGOO JOINT VENTURE

CHARGE - ALBANY 30 JAN 84 1996.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL MSII  
RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

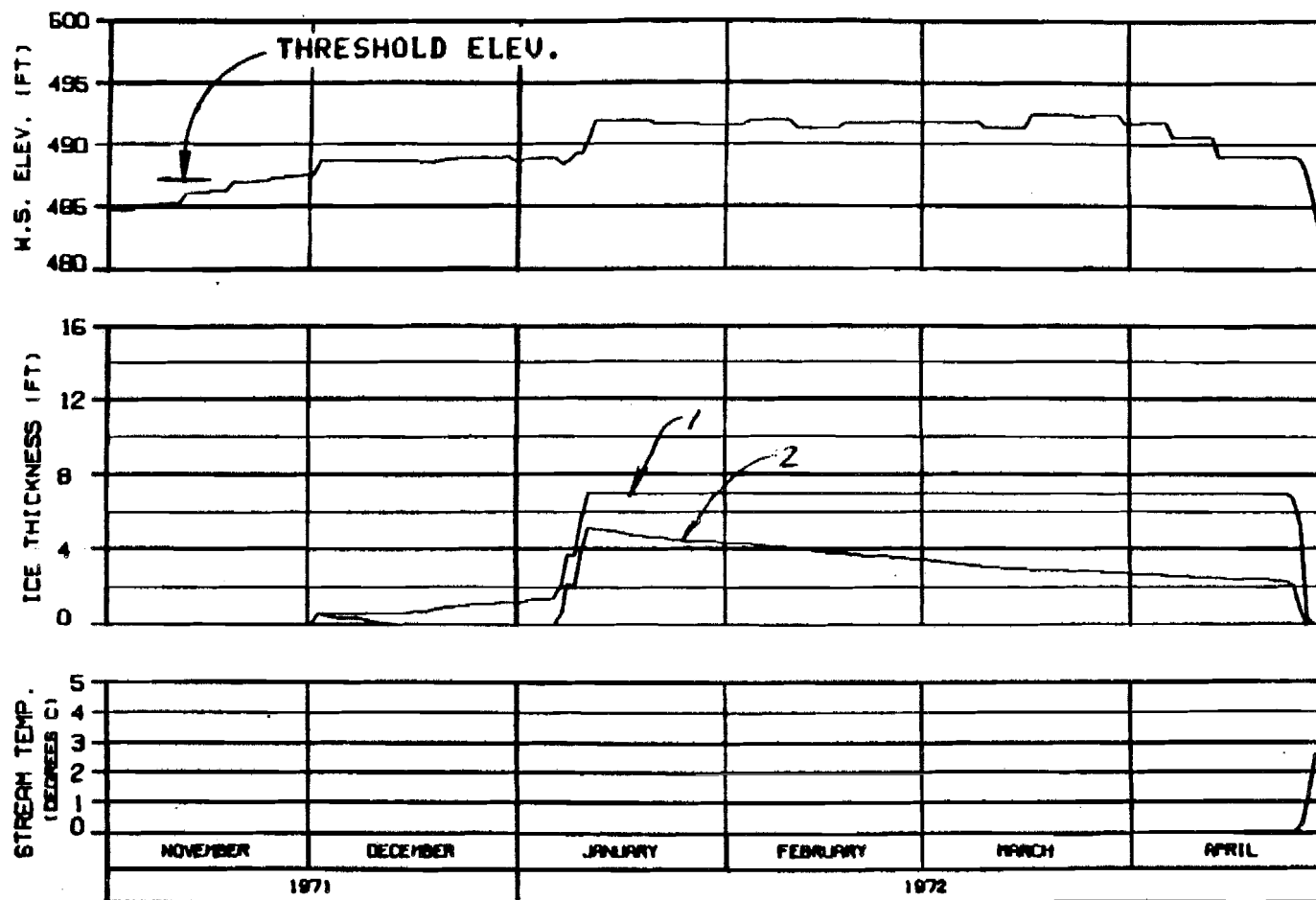
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBBECO JOINT VENTURE

DESIGNED BY: J. B. BROWN 10 JAN 74 1000.142





# HEAD OF SIDE CHANNEL NSII RIVER MILE : 115.90

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7196CNA

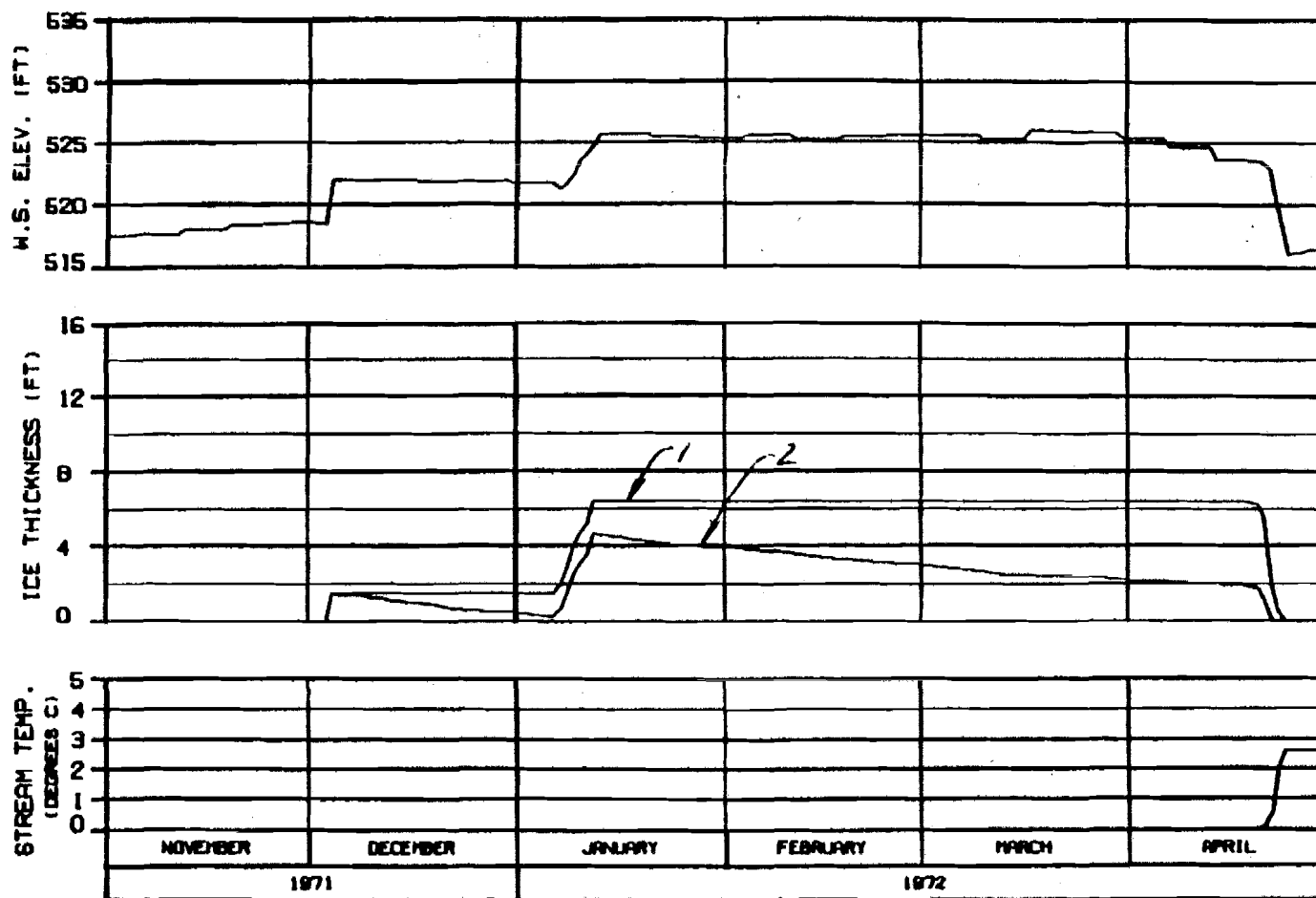
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: BLD/000 10 JAN 80 1000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71960NA

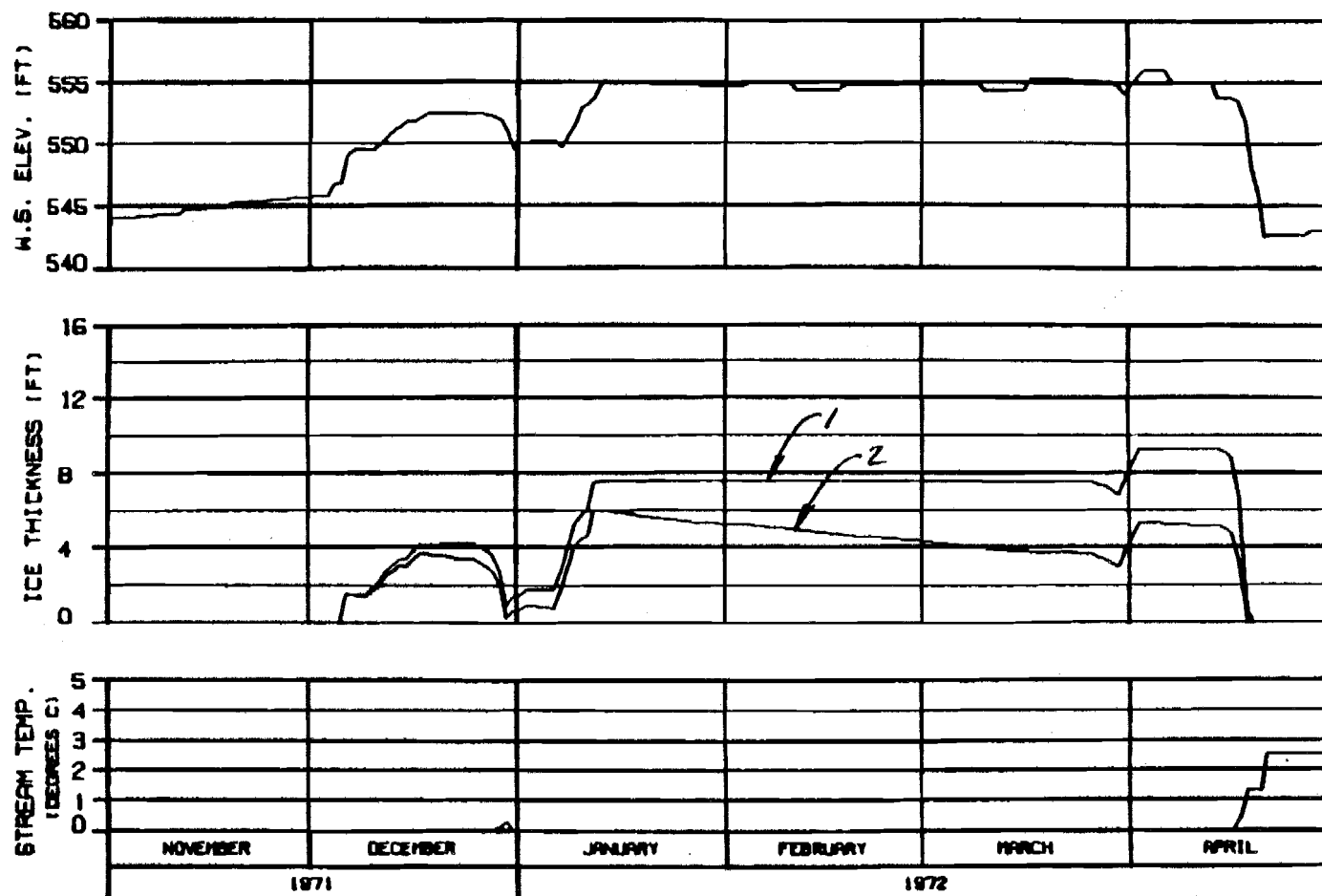
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EDBECO JOINT VENTURE

DESIGNED BY: J. J. JONES 20 JAN 82 SHEET 142



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

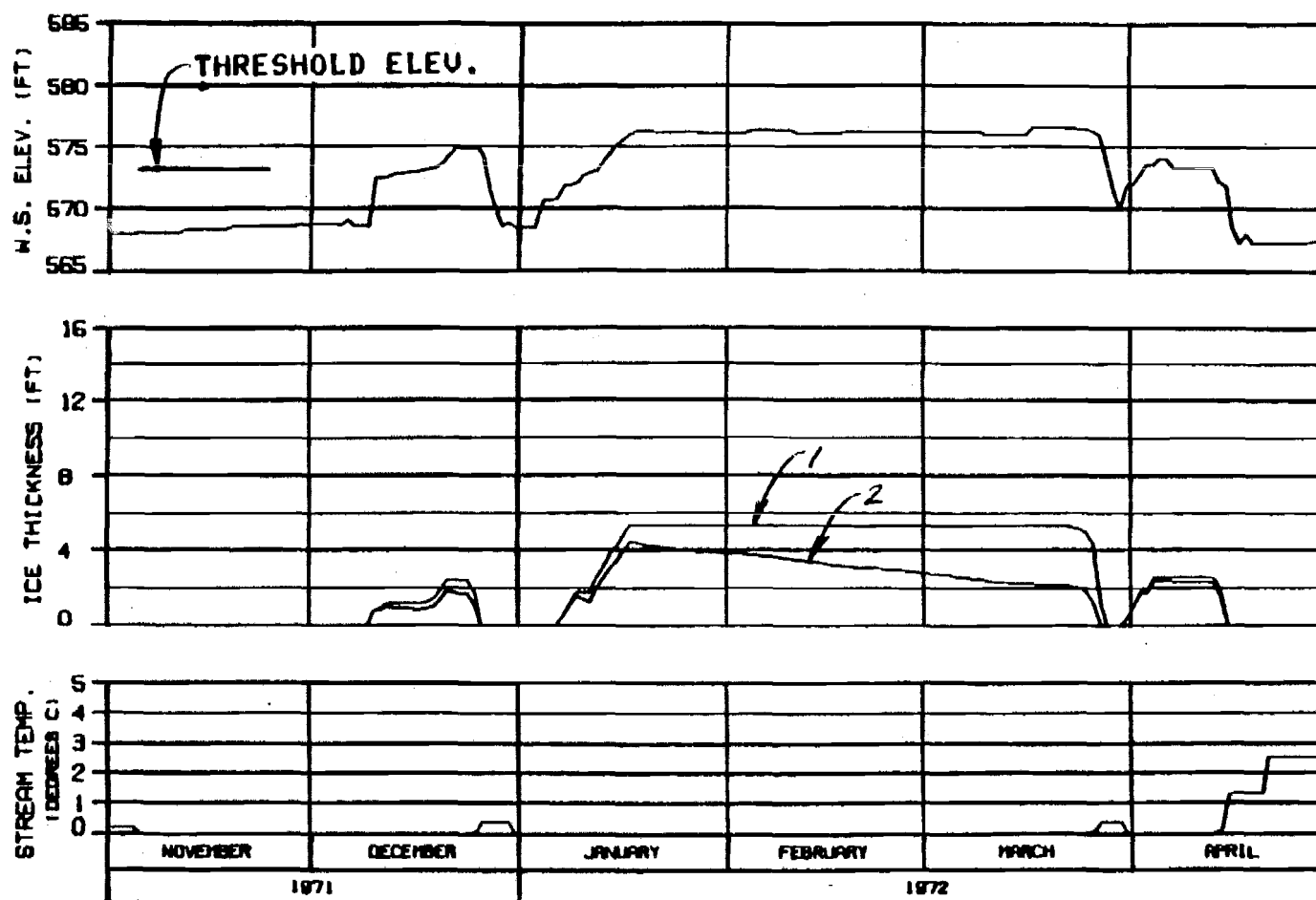
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNER: ALP/MS 30 JAN 84 1000.142



# HEAD OF SLOUGH 8A (WEST) RIVER MILE : 126.10

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : MATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SLUTTNA PROJECT

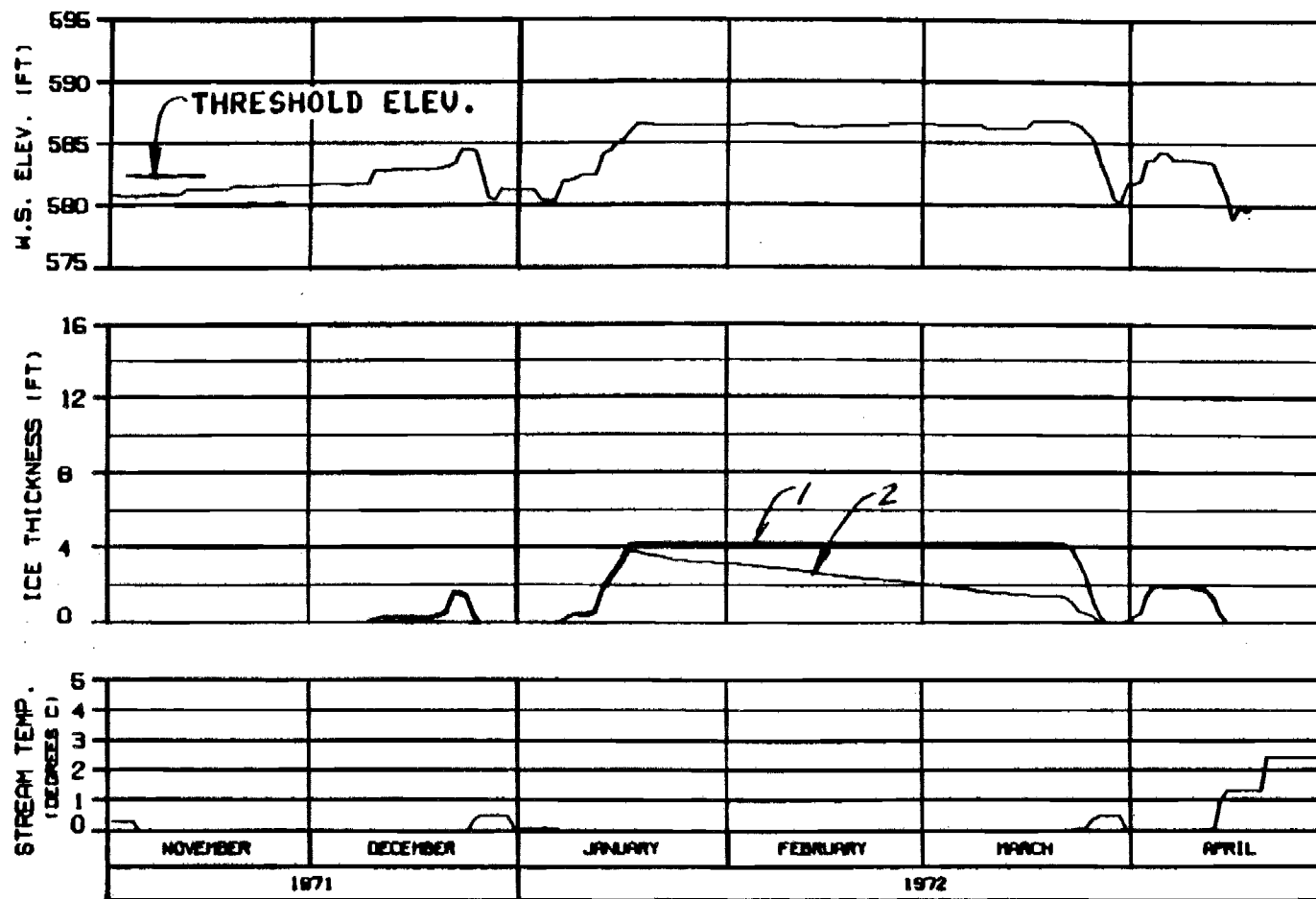
SLUTTNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ORDER: 11-0010

20 JAN 82

1000.142



HEAD OF SLOUGH 8A (EAST)  
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : MATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

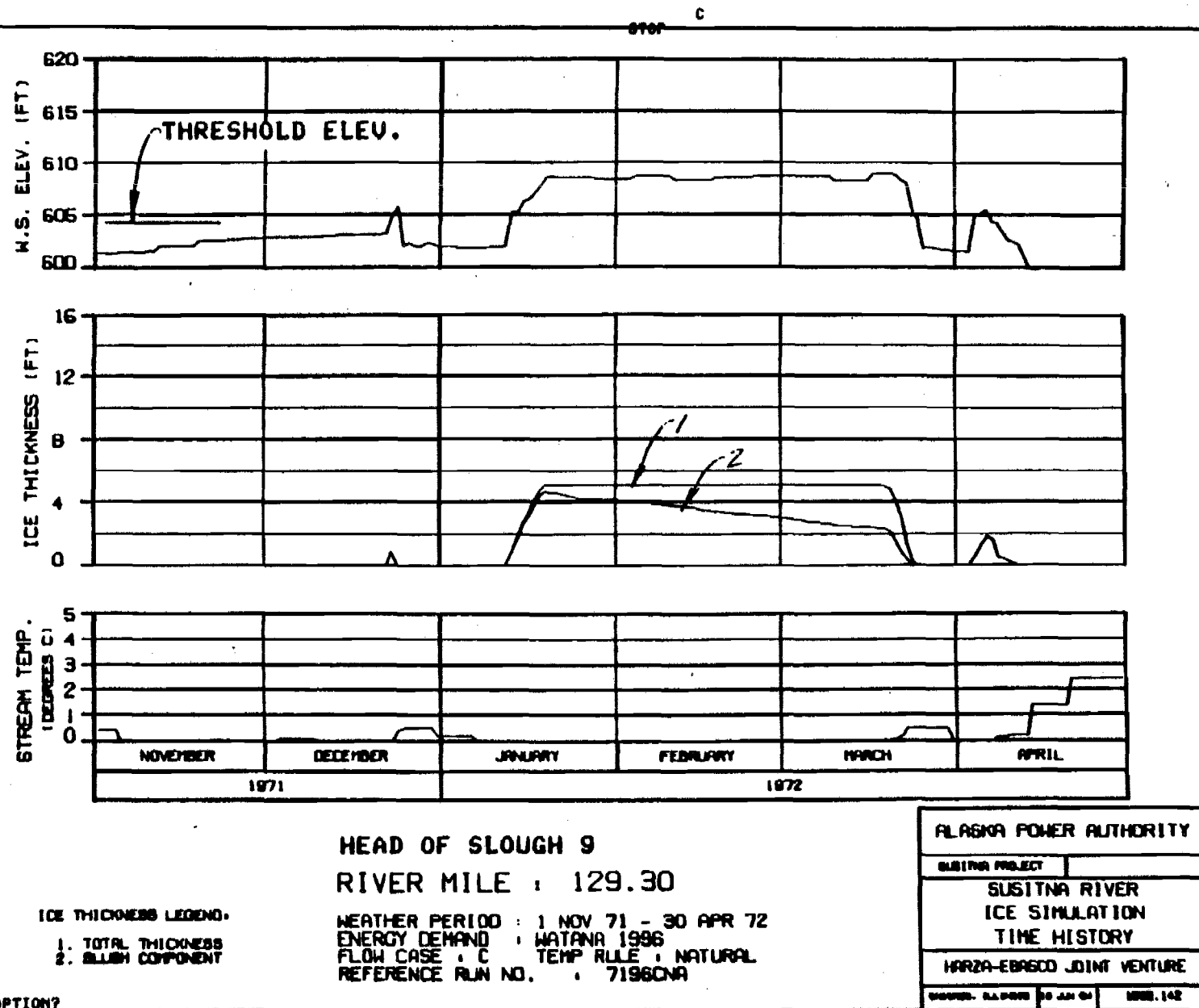
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACD JOINT VENTURE

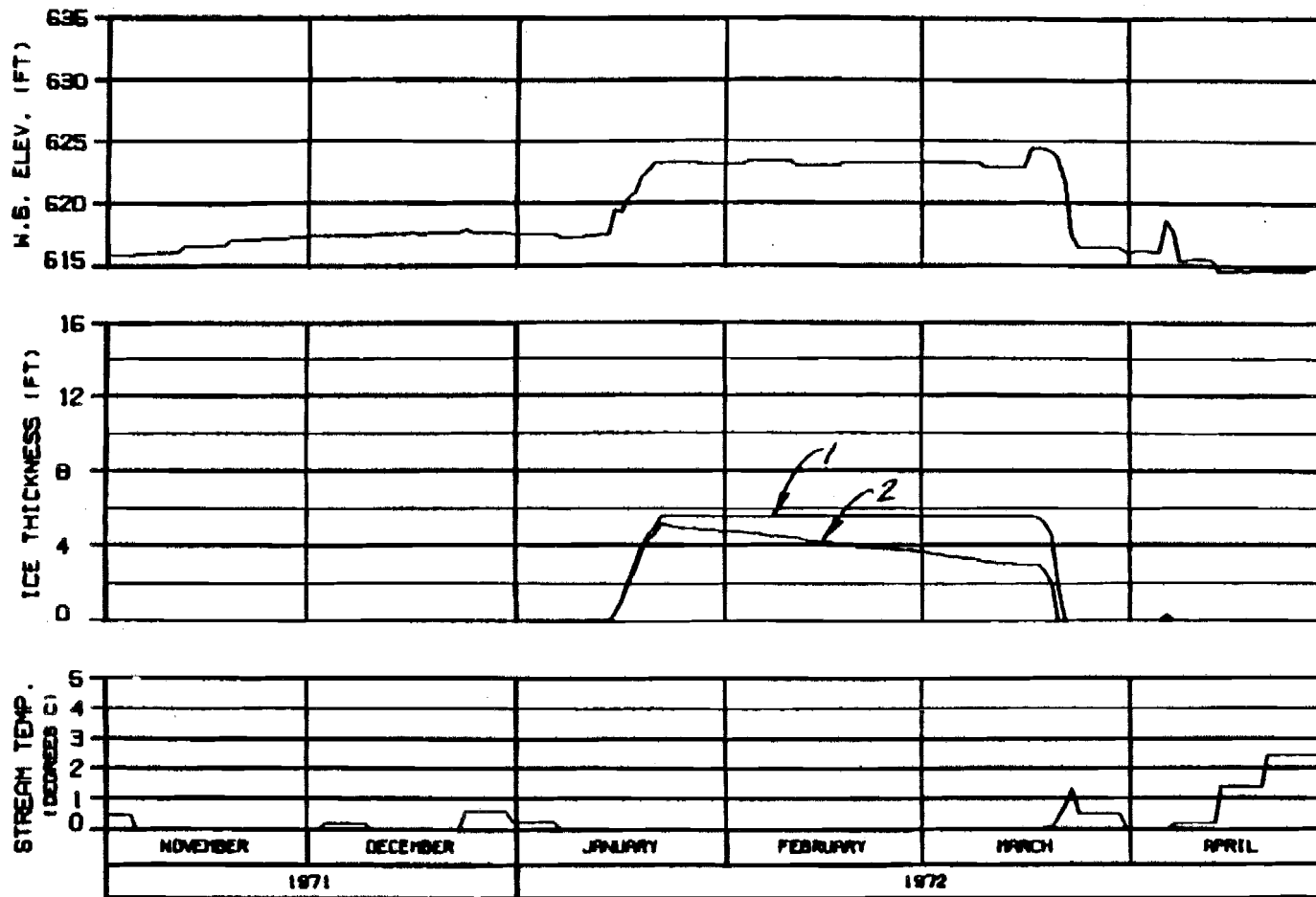
CHIEF: SLOUGH

NO JAN 81

1998.142



OPTION?



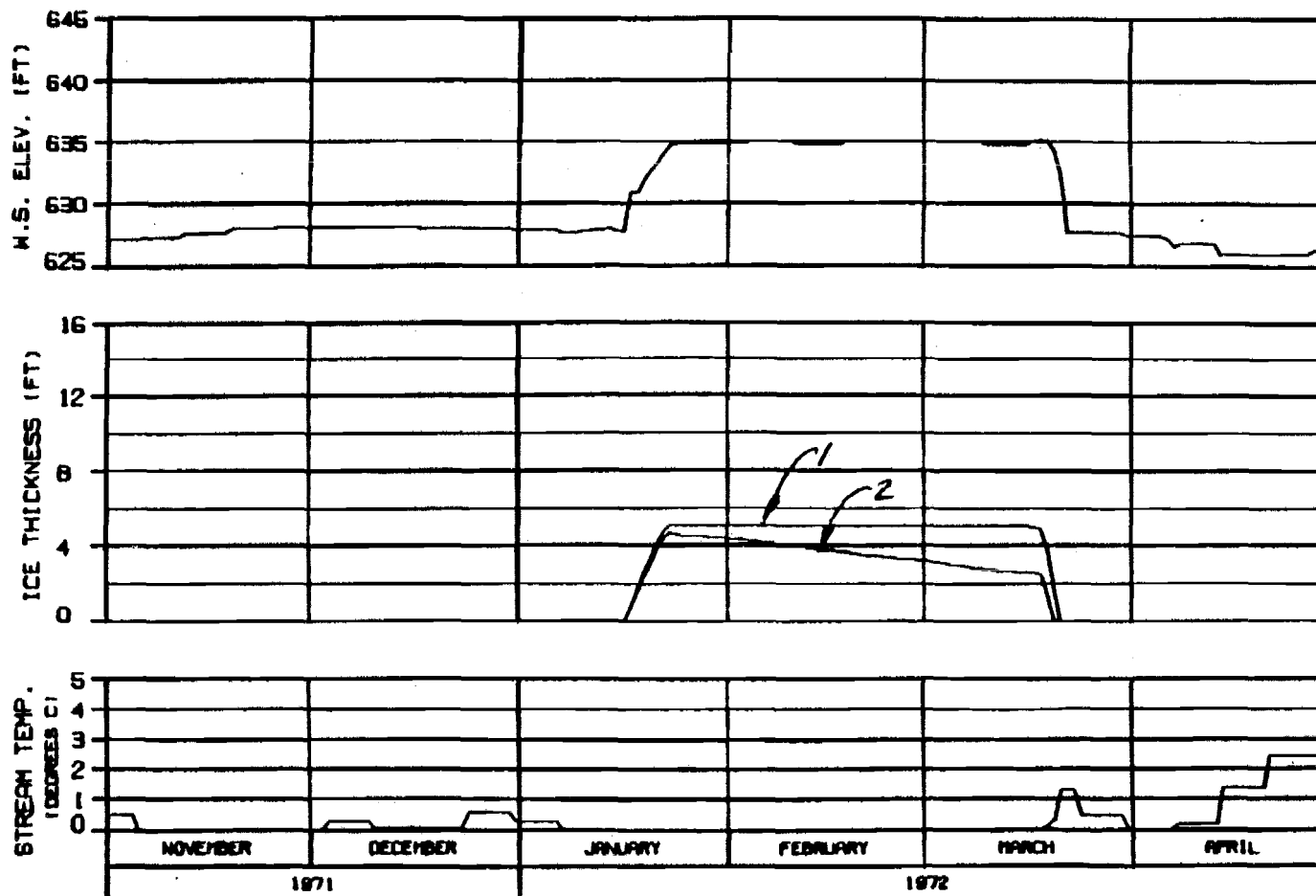
SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EGASCO JOINT VENTURE	
DESIGNED - EL PASO	10 JAN 84
9800.142	



**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7196CNA

**ALASKA POWER AUTHORITY**

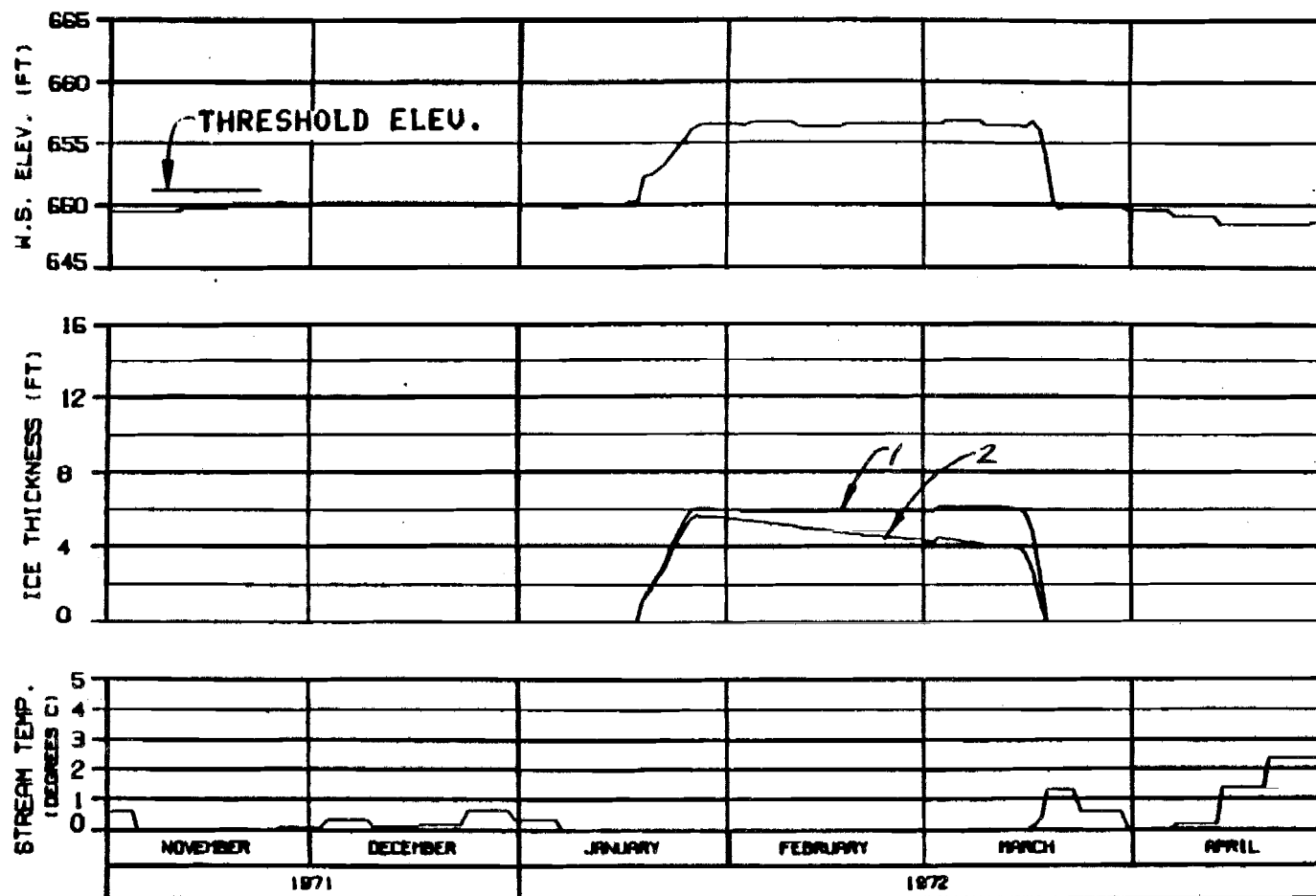
**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**WARZA-EBASCO JOINT VENTURE**

DESIGNED BY: J. L. BROWN 25 JAN 72 1000.142





HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

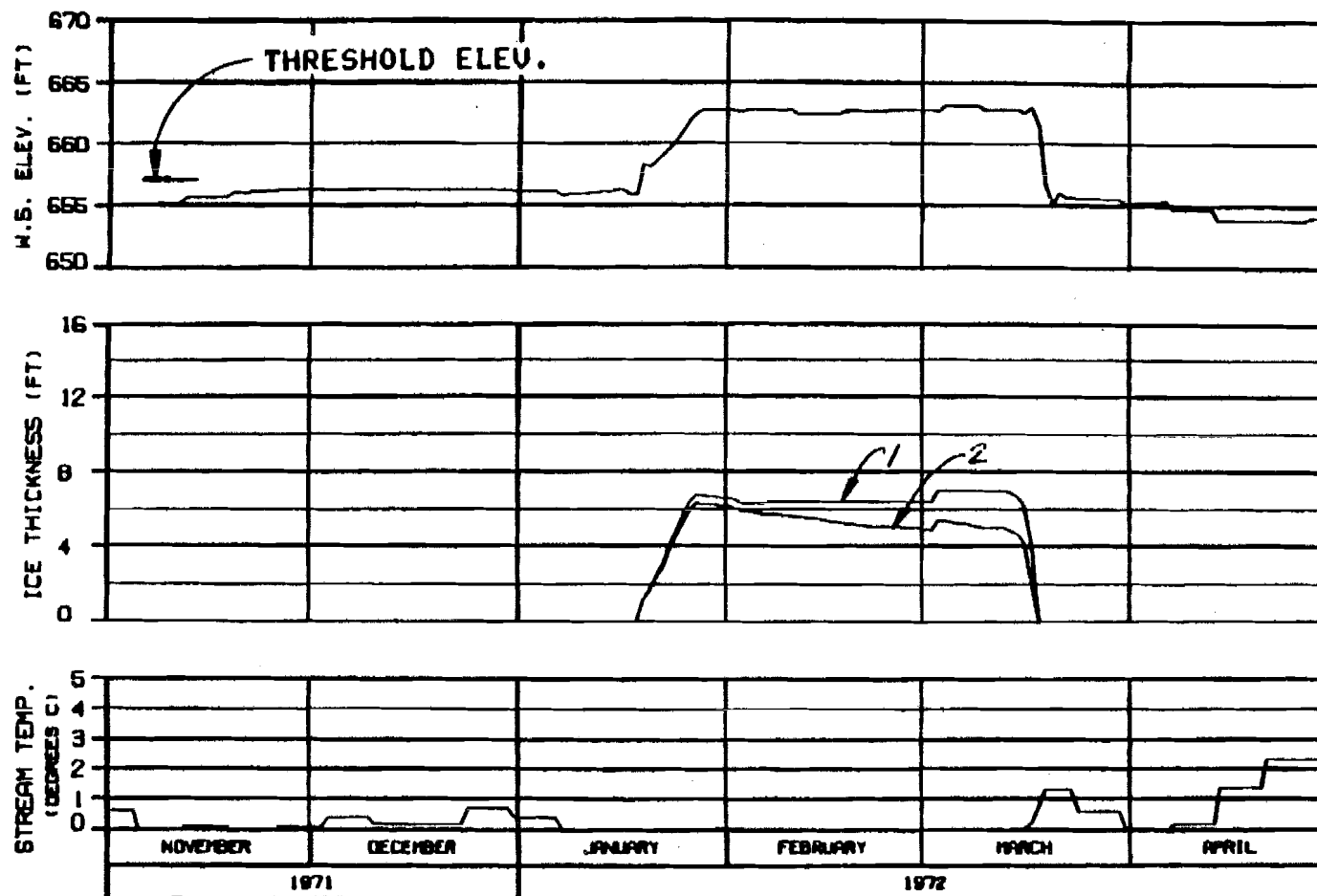
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

DESIGN: BLD-000

NO. 40 00

ISS. 142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

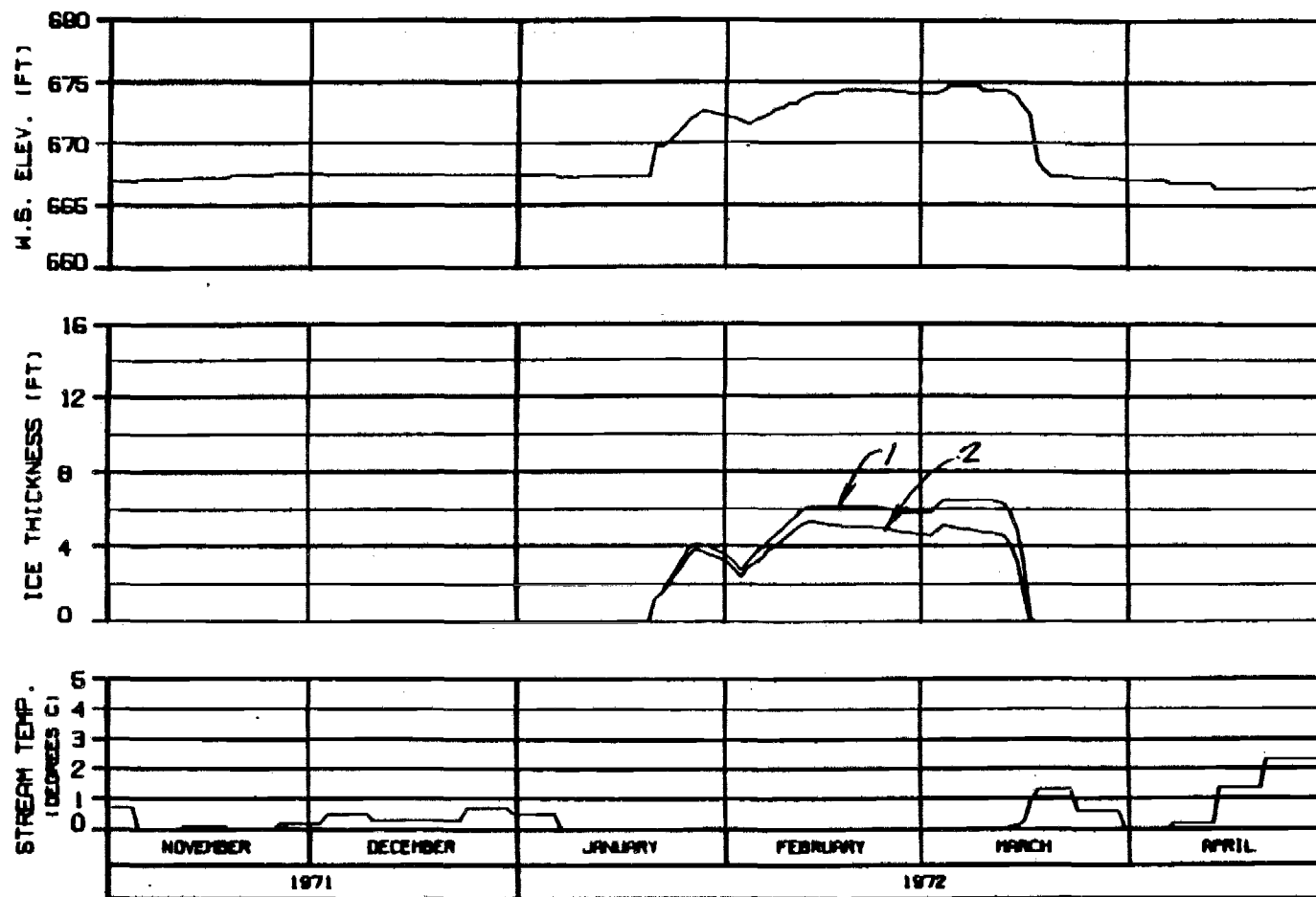
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: J. P. 1000 20 JAN 84 1000.142



**SIDE CHANNEL D/S OF SLOUGH 11**  
**RIVER MILE : 135.30**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. LUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71960NA

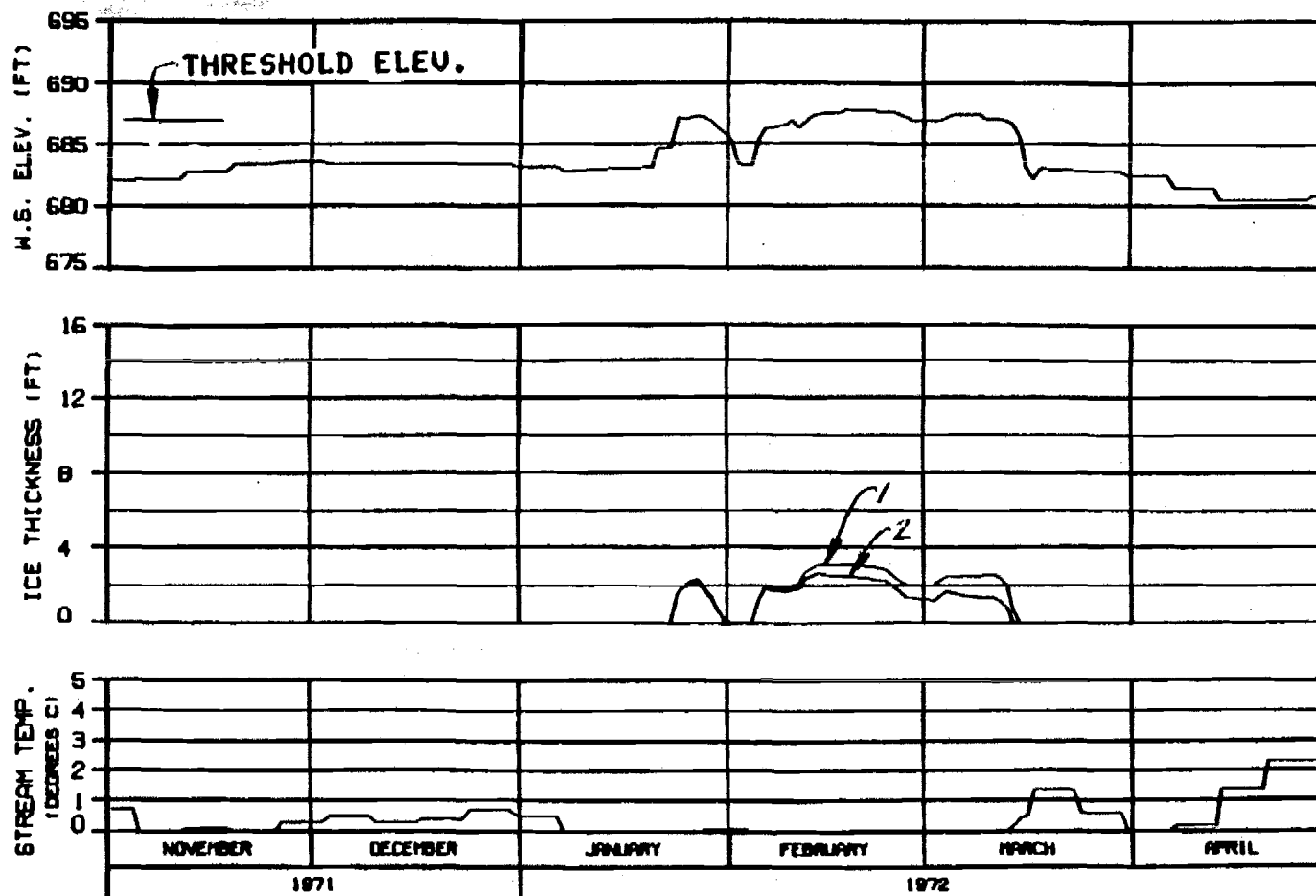
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

ORDER- 848890 30 JAN 80 1988.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71960NA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

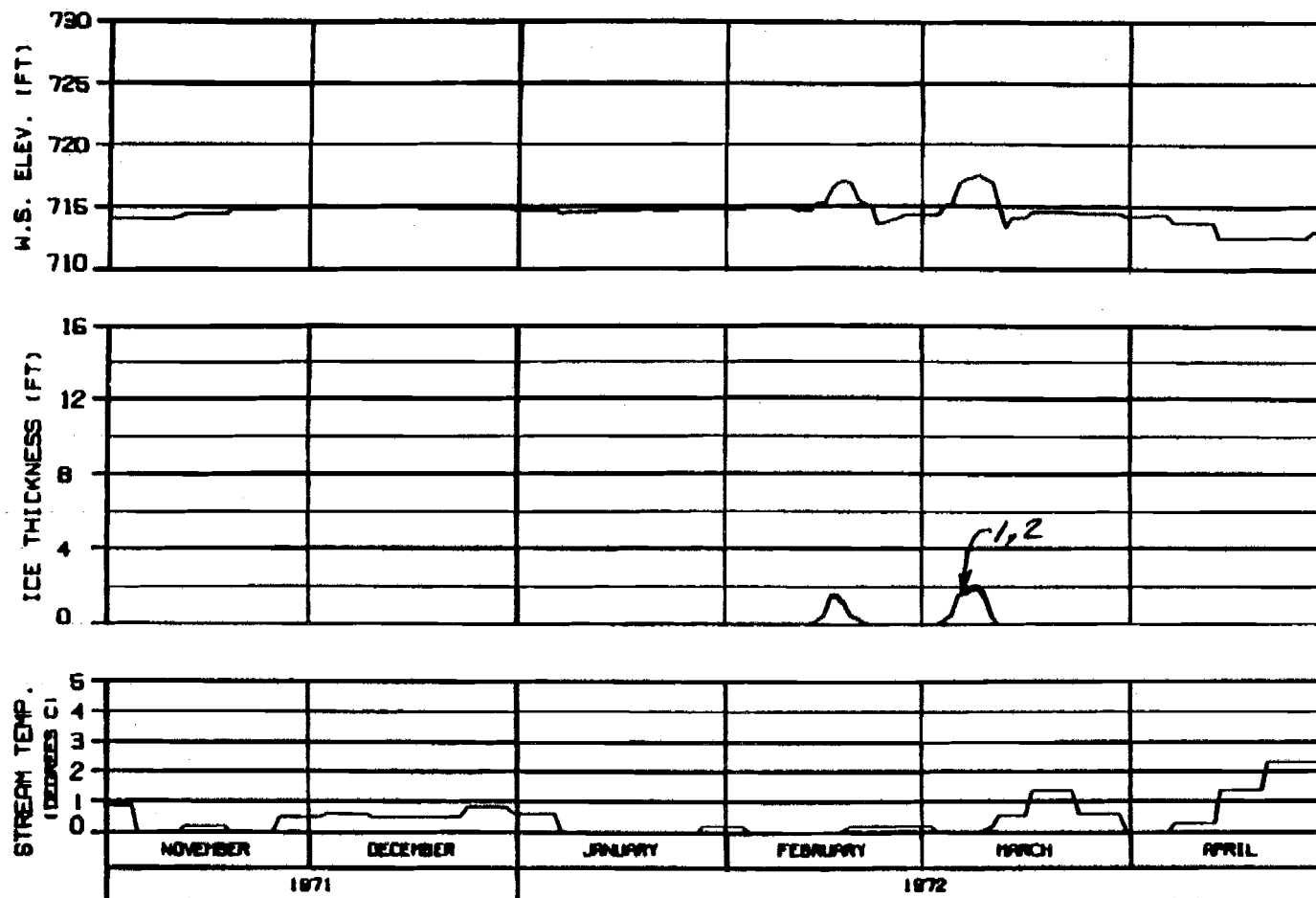
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. BROWN

25 JAN 82

1996.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71960NA

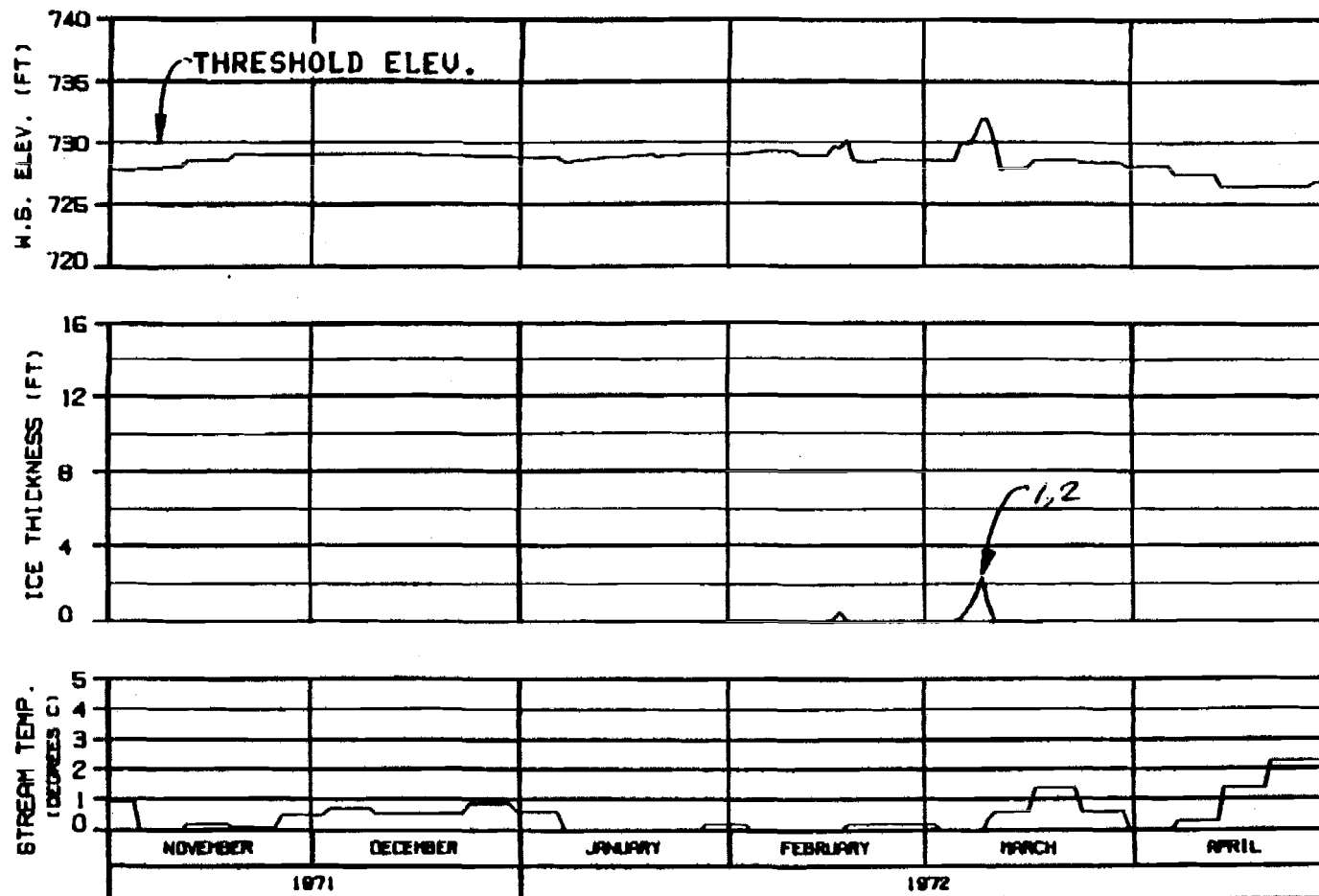
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHIEF: GLENN 30 JAN 81 1996.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7196CNA

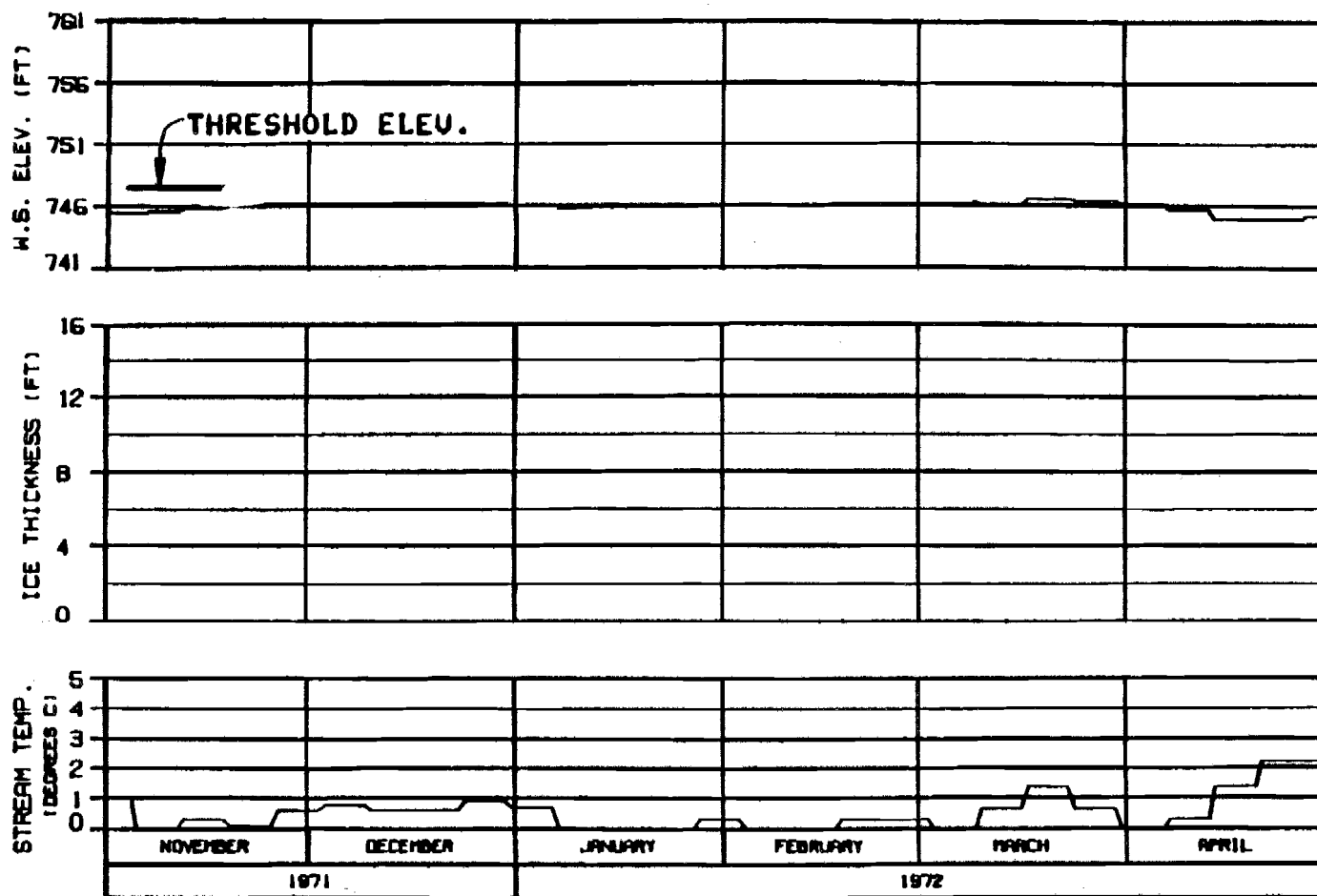
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRSCO JOINT VENTURE

CHECKED: J. J. BROWN 20 JAN 84 1000.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : HATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

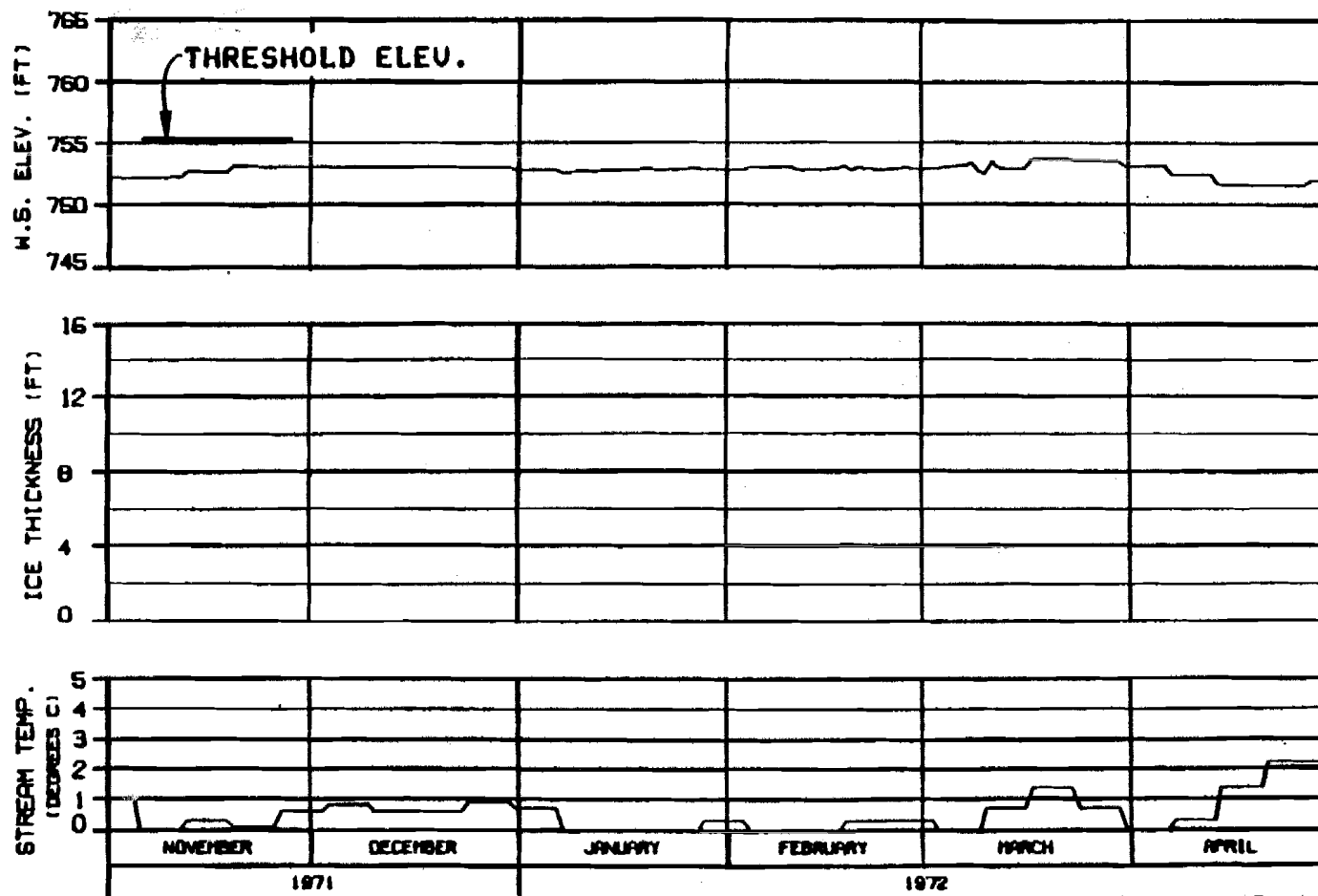
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGN: 11-1000

NO. 1000

1000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71960NA

ALASKA POWER AUTHORITY

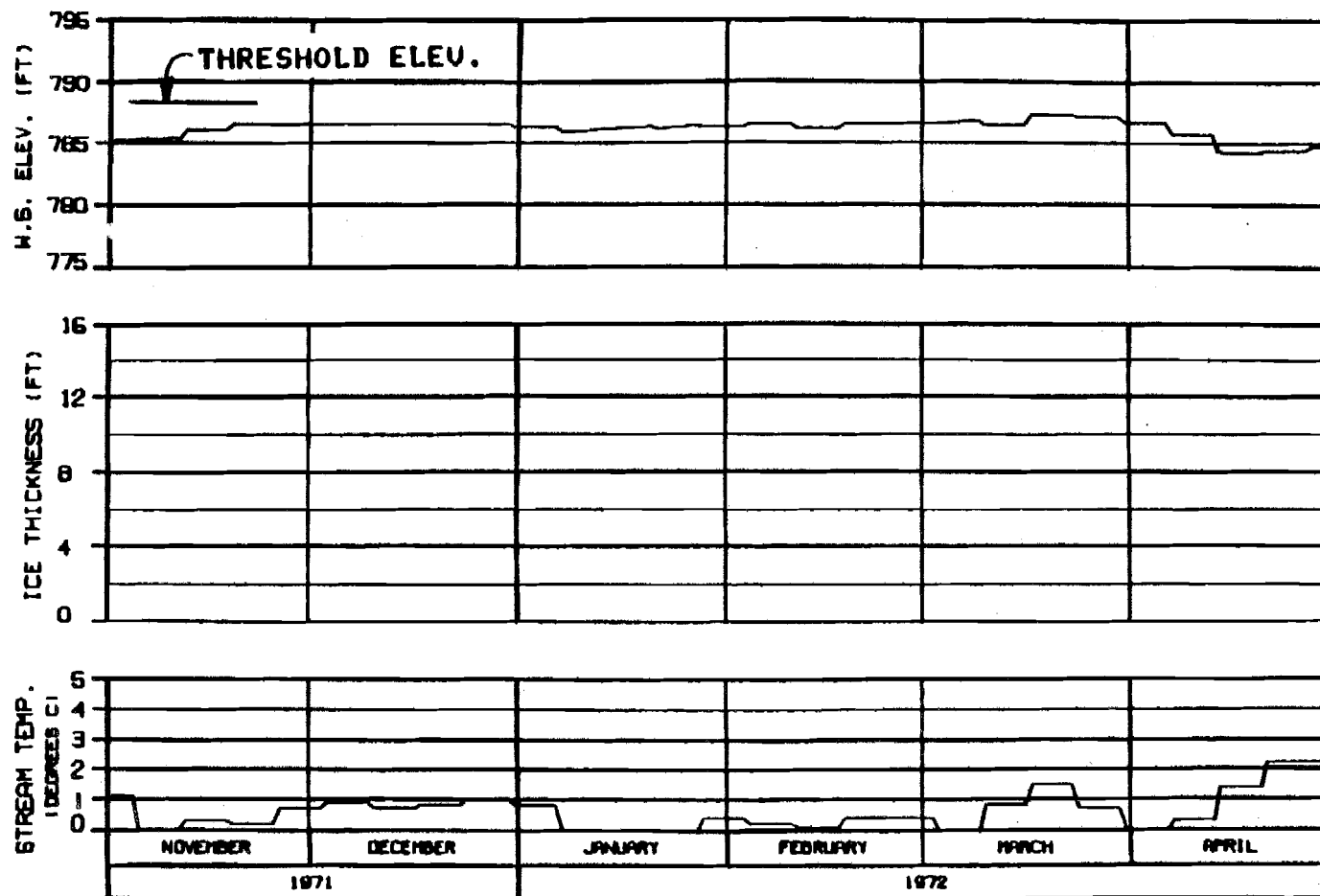
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

ORDER: 81-0000 10 APR 81 1000.142





HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7198CNA

OPTION?

ALASKA POWER AUTHORITY

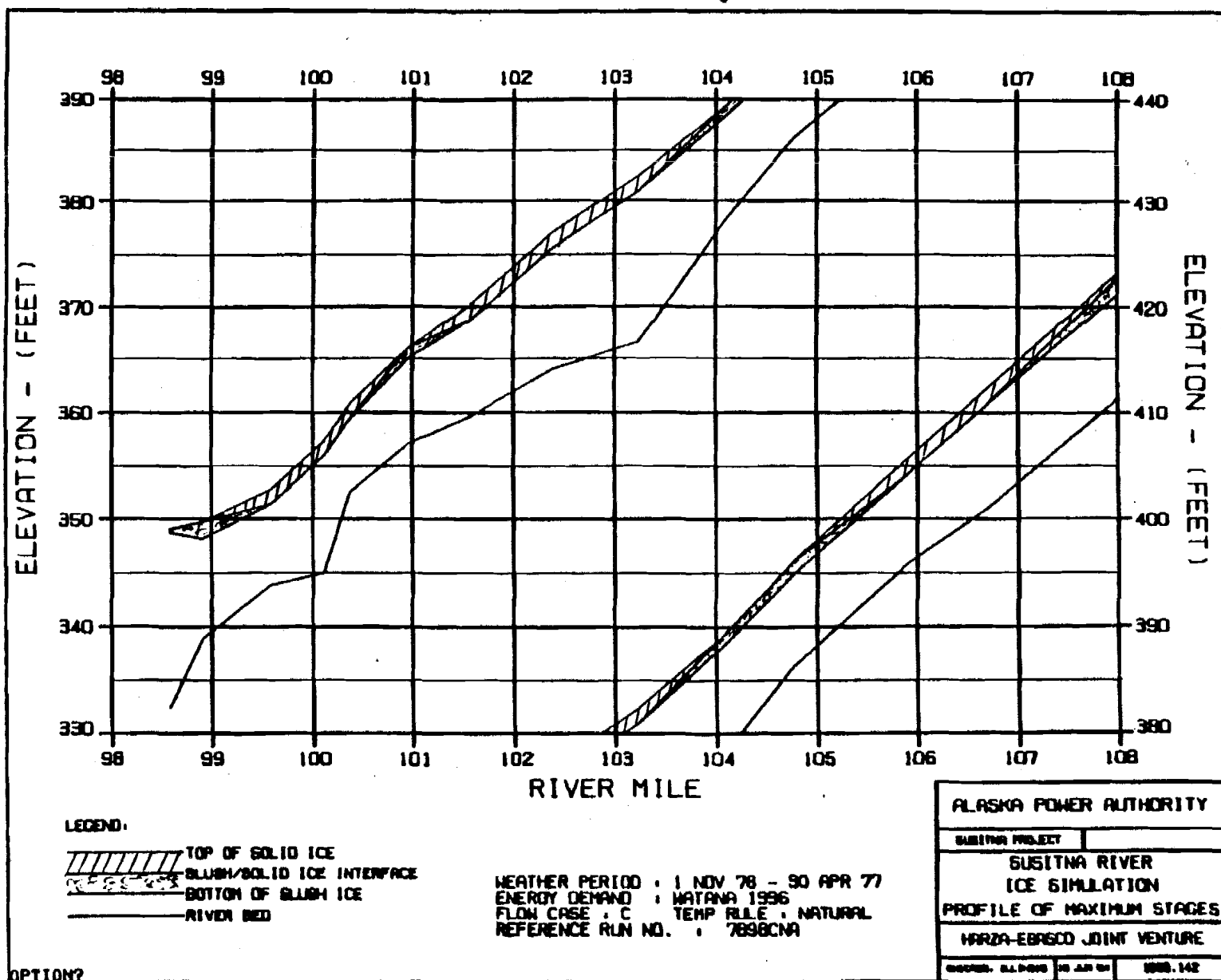
SUSITNA PROJECT

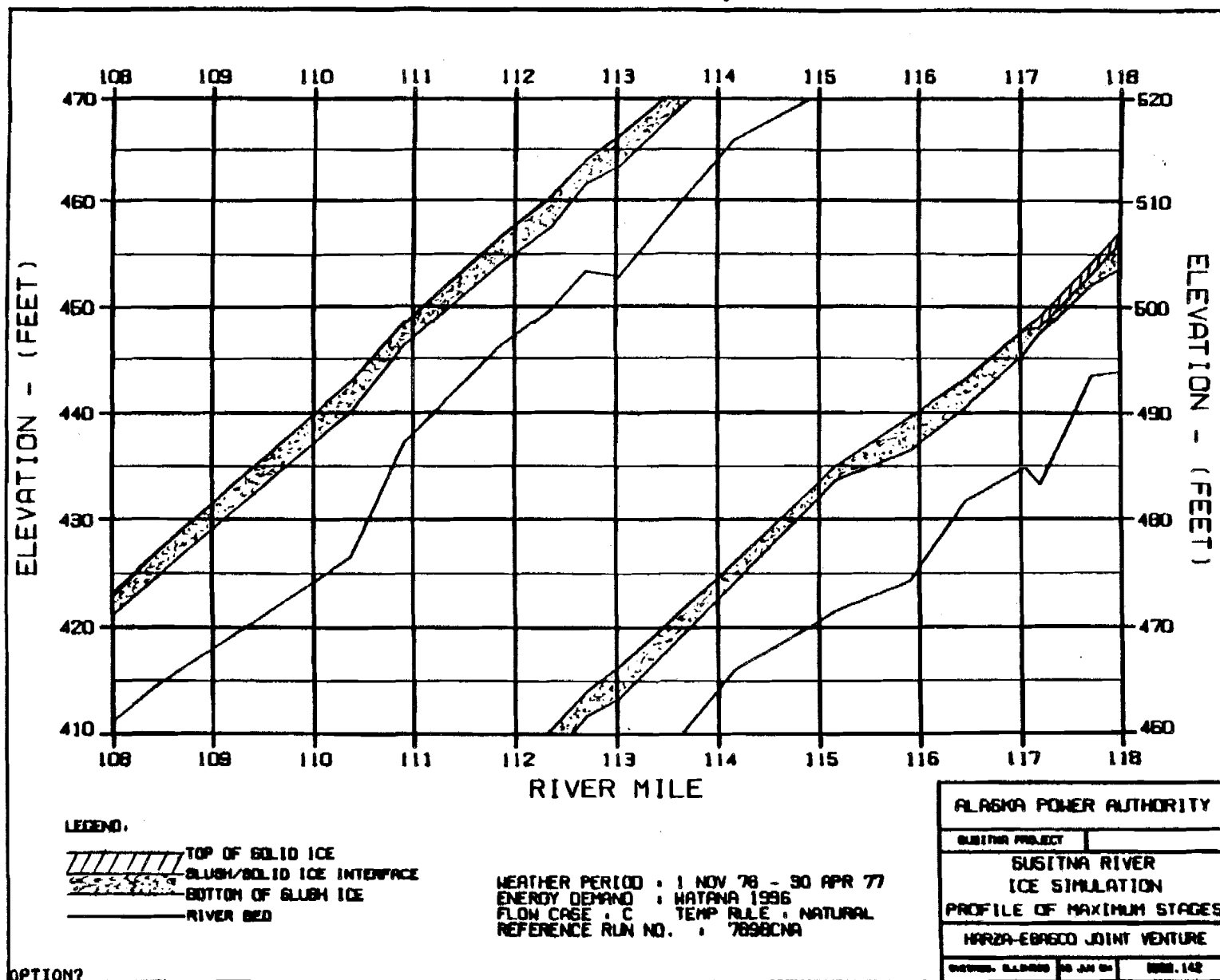
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

MIRZA-EBRSCO JOINT VENTURE

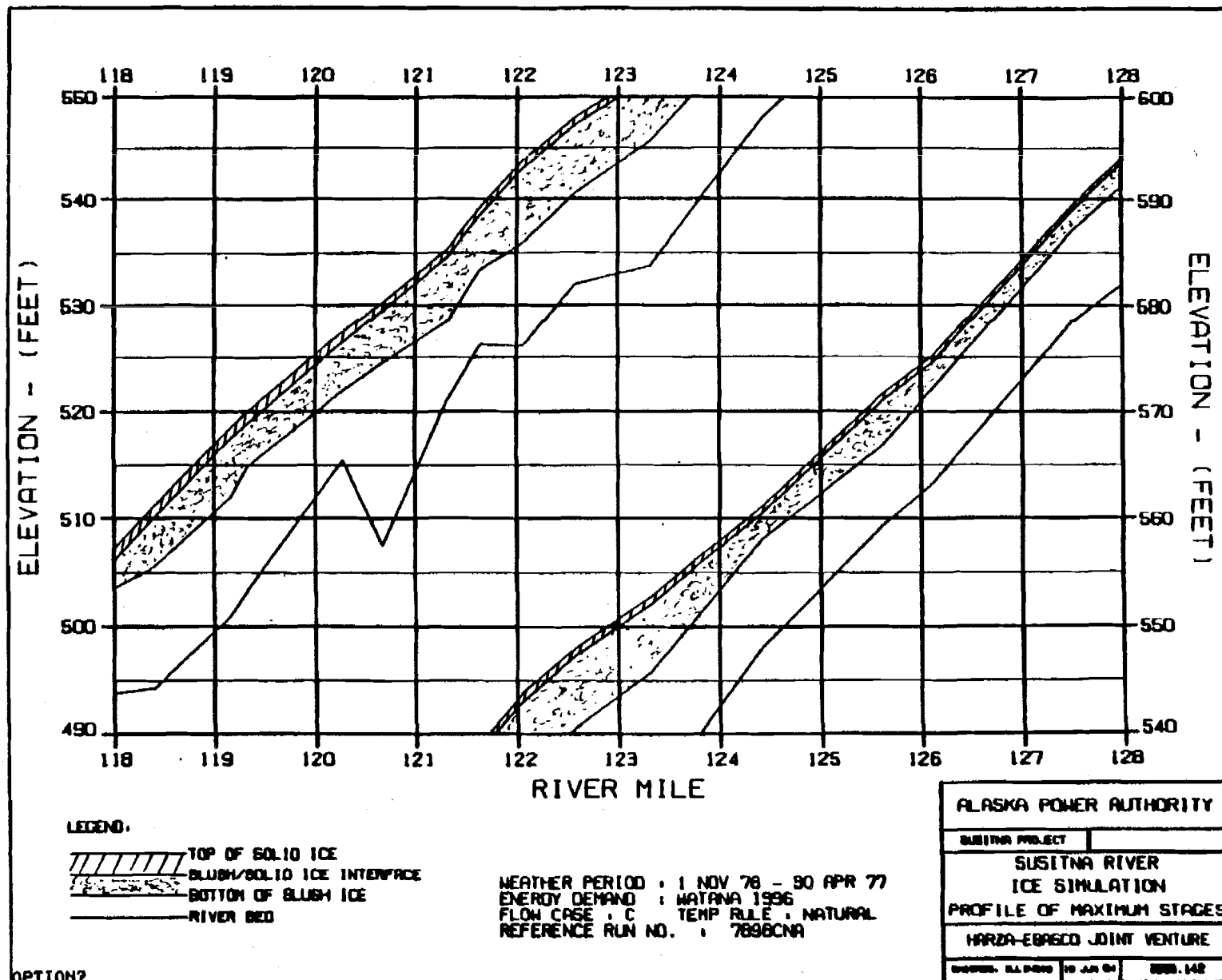
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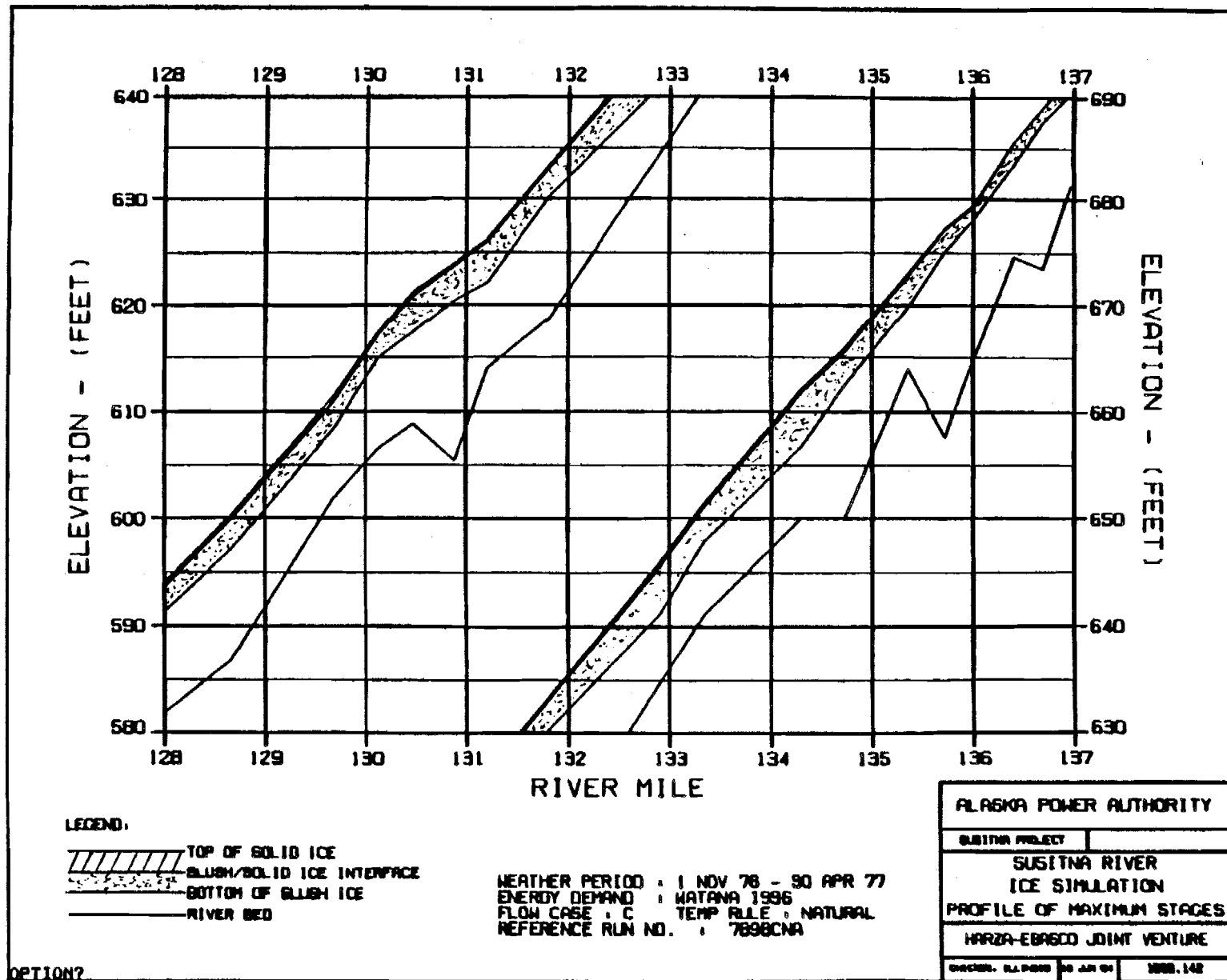
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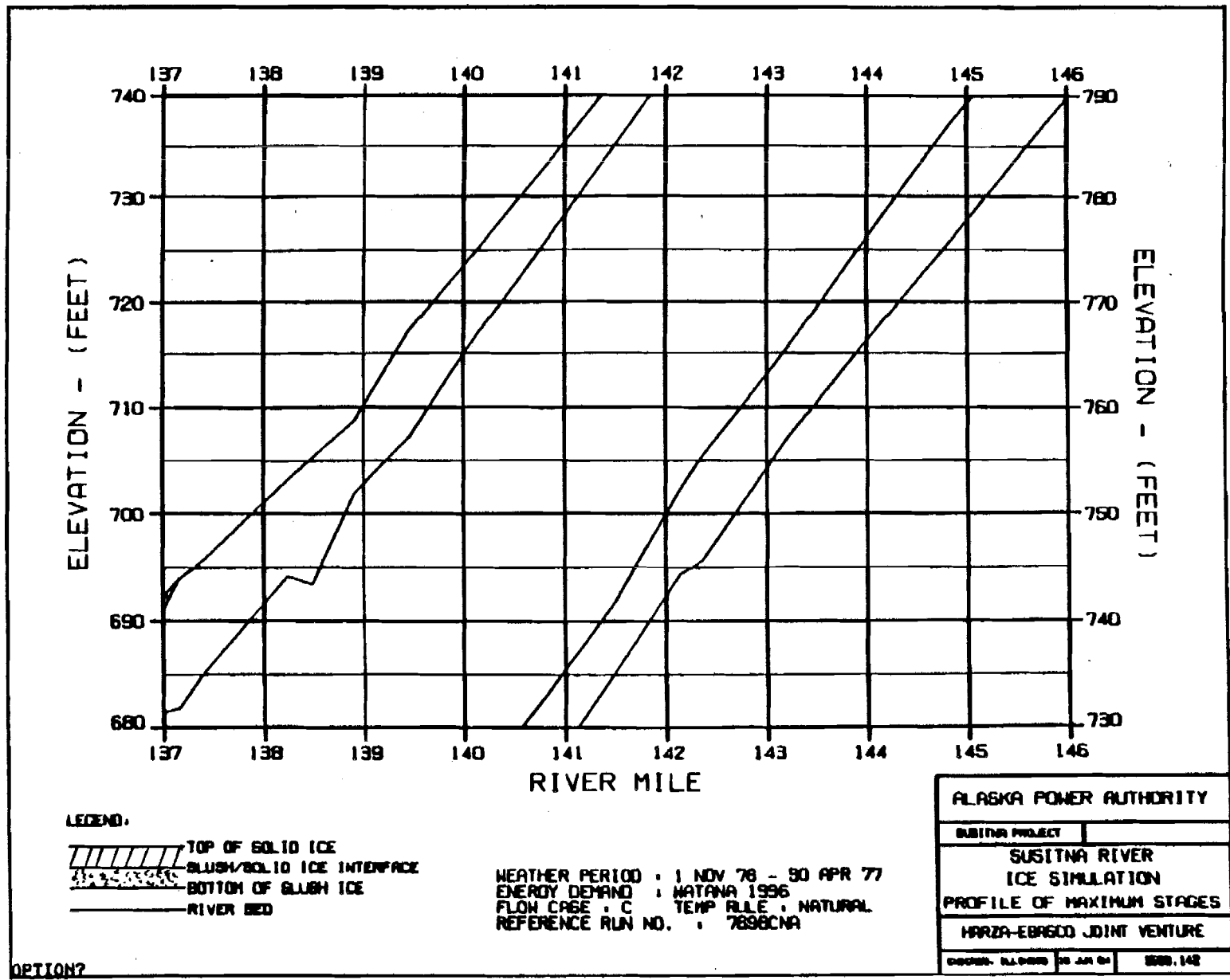


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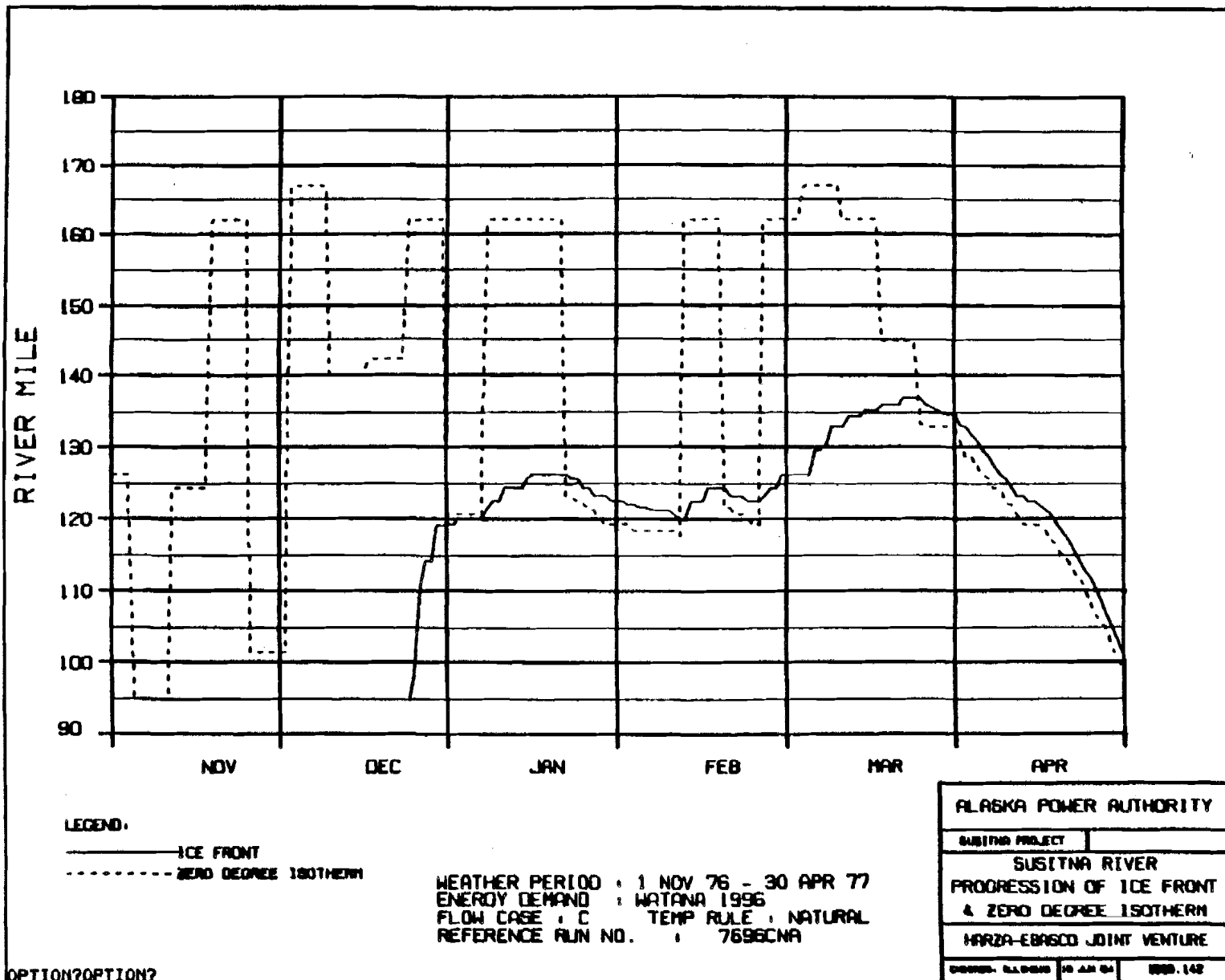




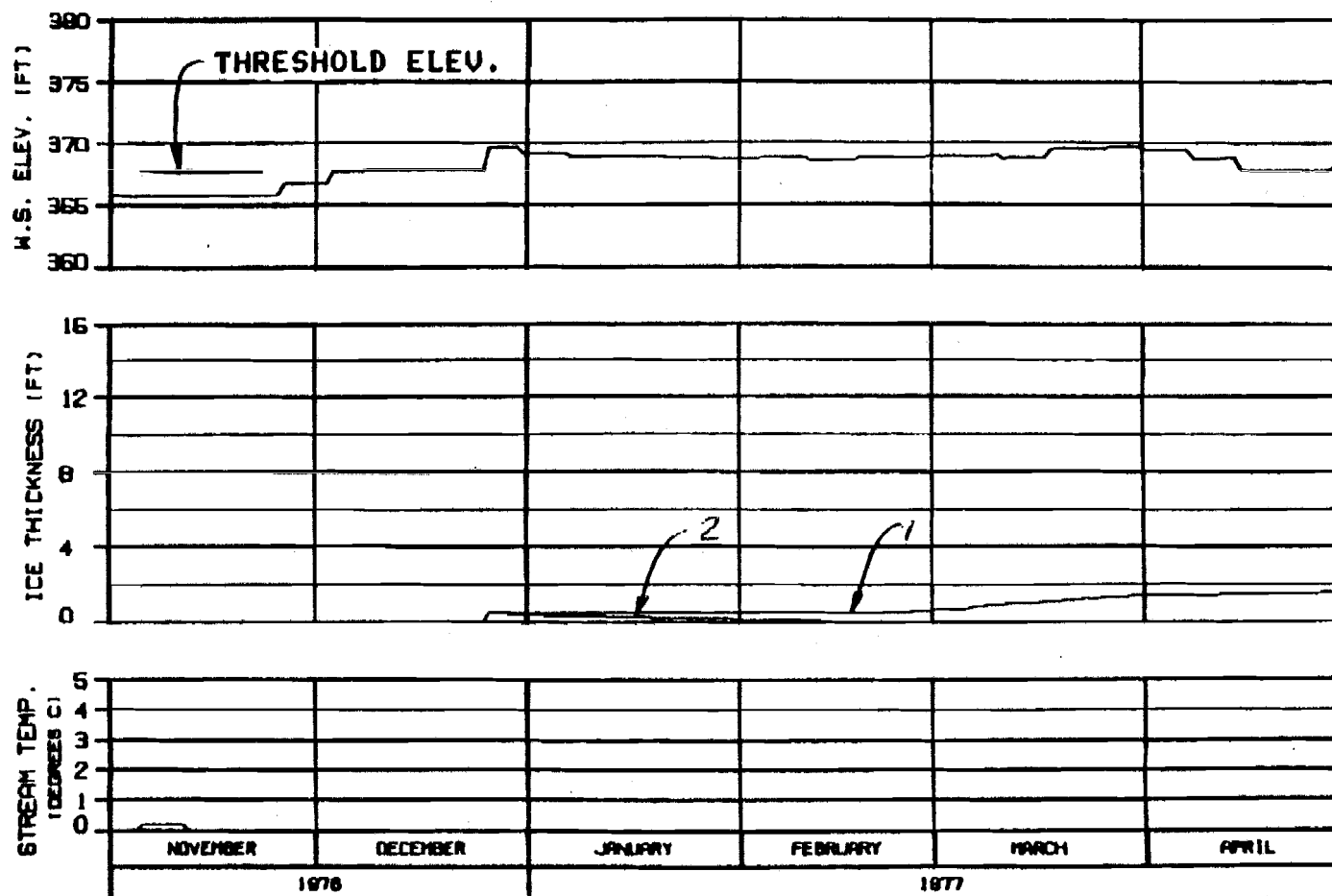
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C







# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

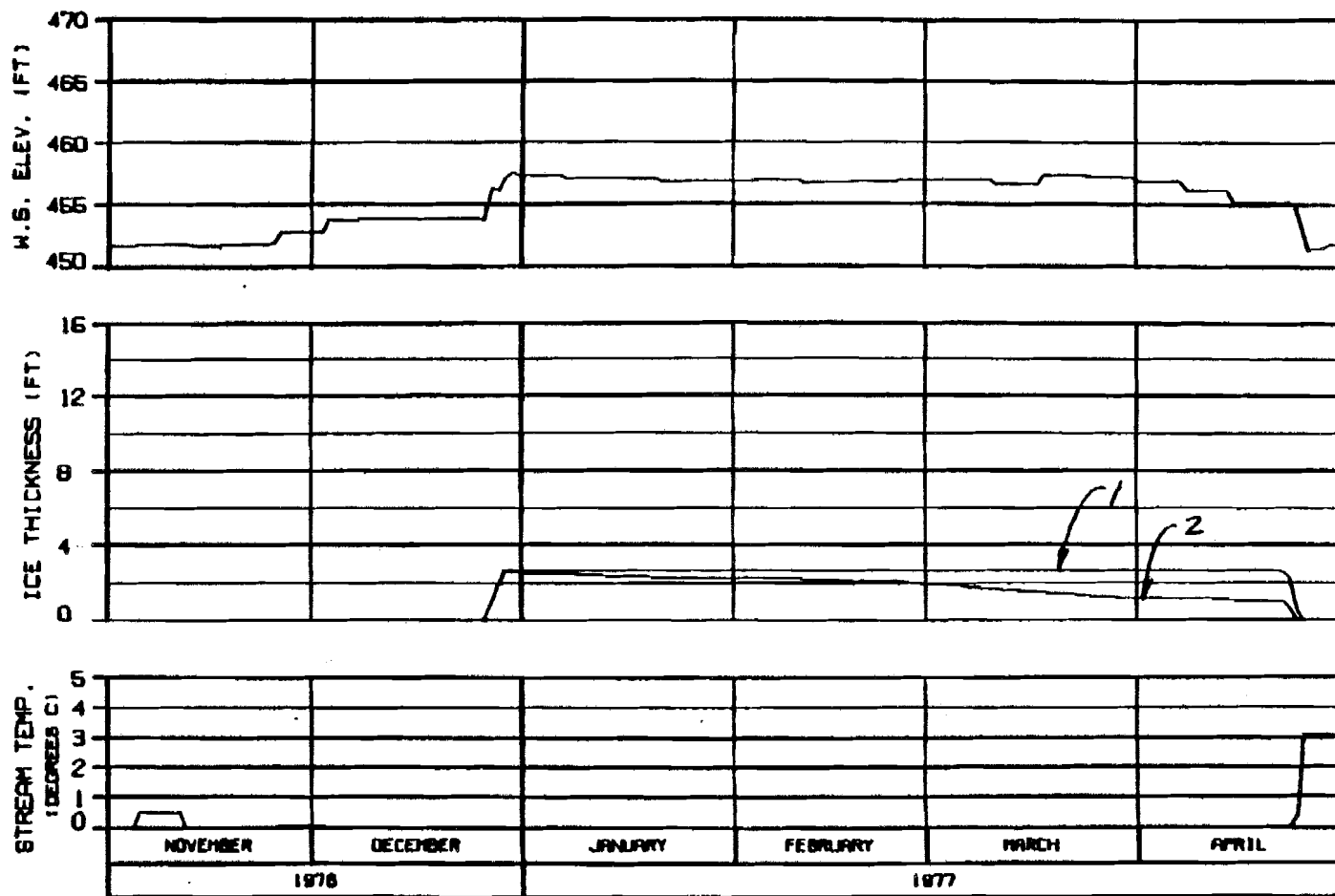
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN. ALP-000 10 JAN 81 1000.142



**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : MATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

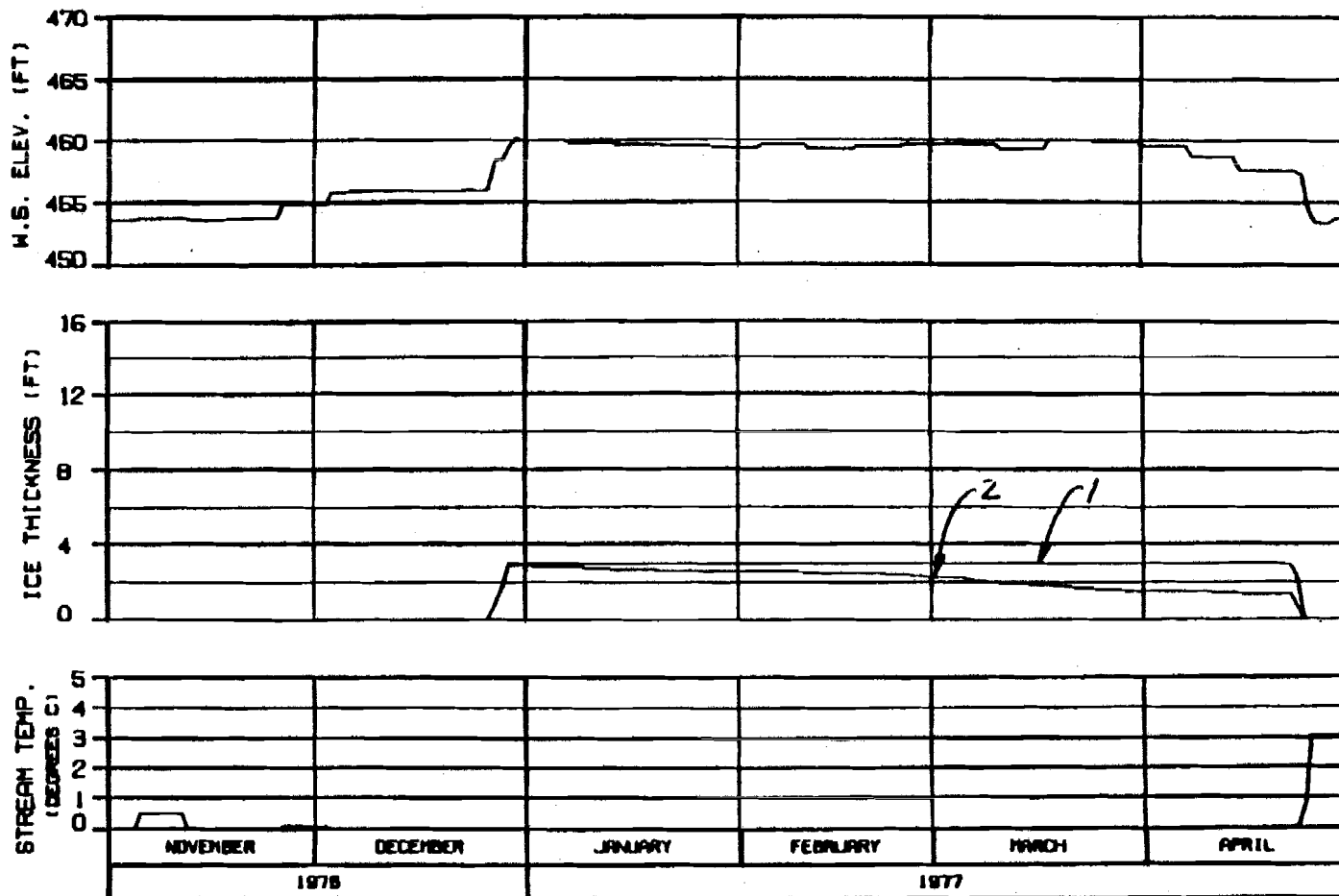
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EBRARD JOINT VENTURE

DESIGN: BLDG 25 JAN 81

1000.142



**MOUTH OF SLOUGH 6A**  
**RIVER MILE : 112.34**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

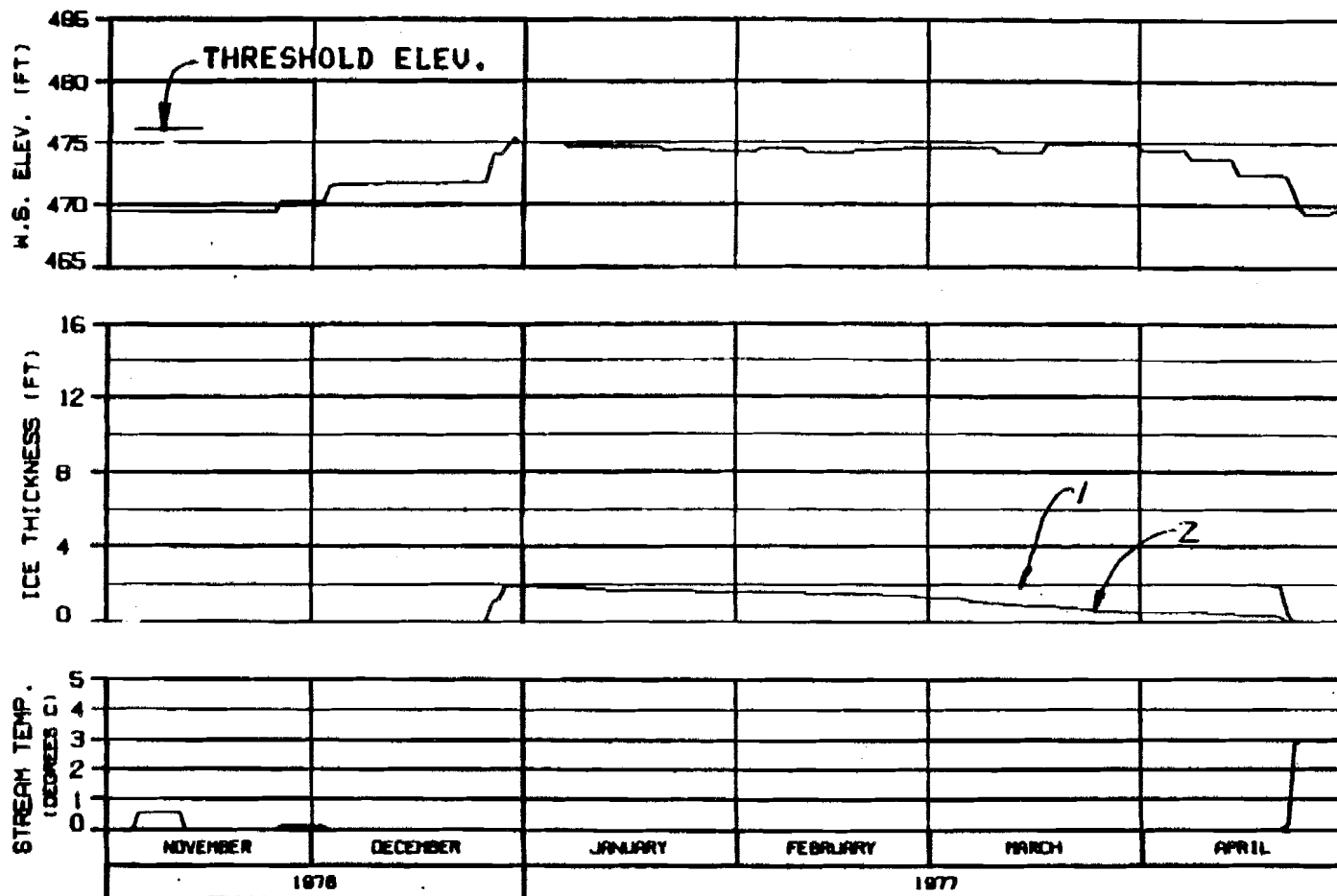
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**WARZA-EGASCO JOINT VENTURE**

DESIGNED BY: JLD/MSD 30 JAN 81 1000.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

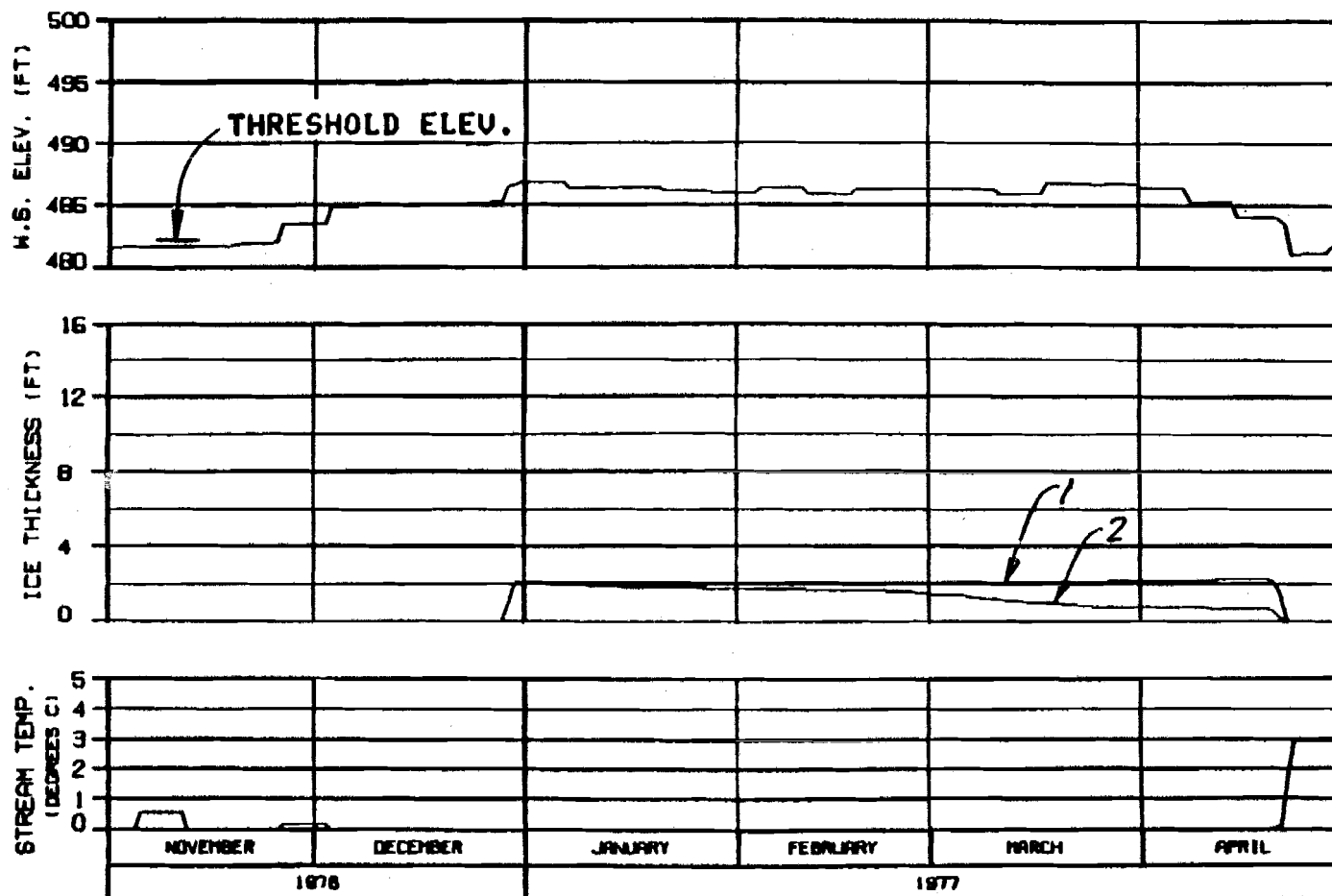
SUSTNA PROJECT

SUSTNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZDA-EBR600 JOINT VENTURE

DATE: 11/28/76 BY: JH

PAGE: 142



**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

ICE THICKNESS LEGEND:  
 1. TOTAL THICKNESS  
 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

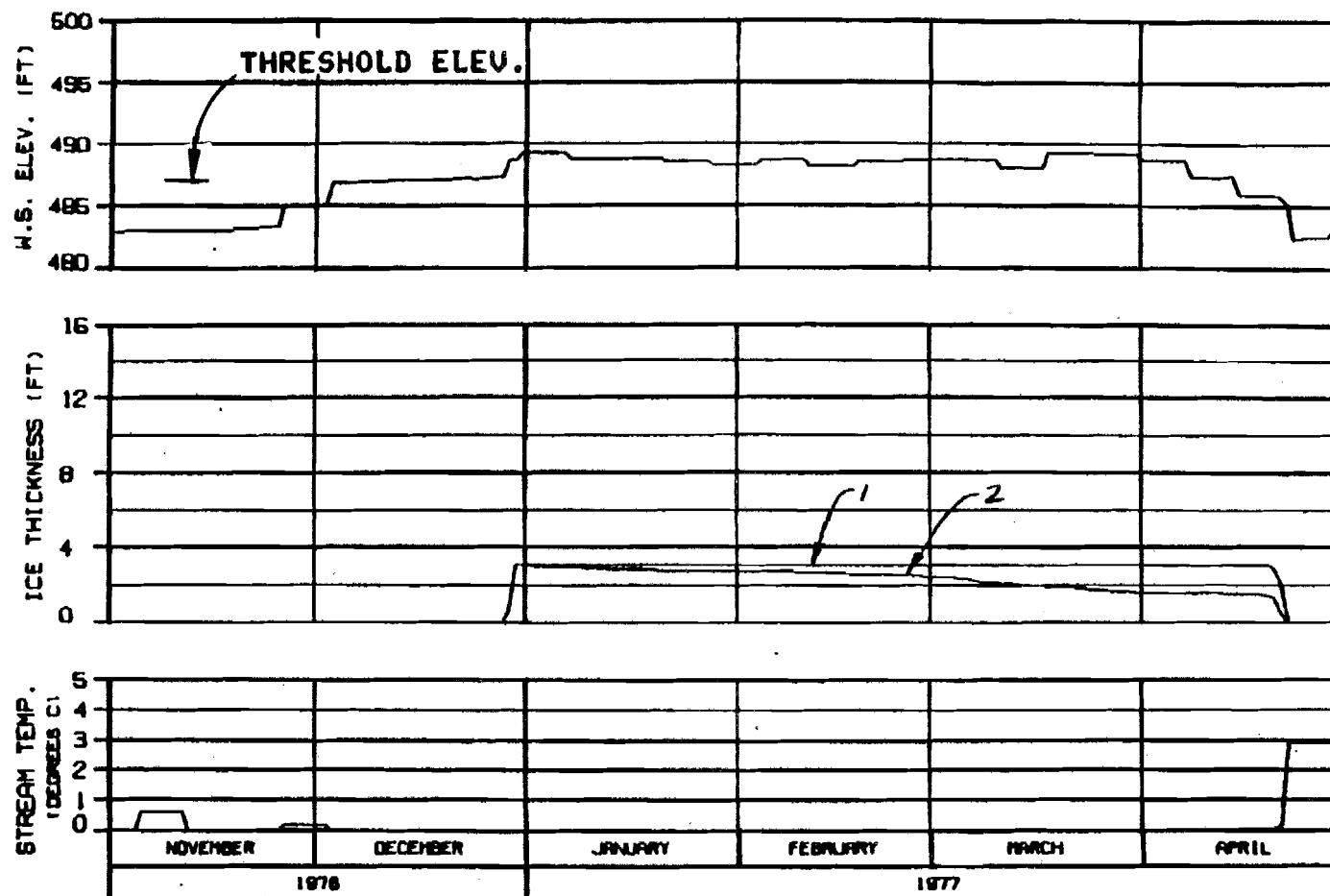
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBAGCO JOINT VENTURE

DESIGNED BY: J. J. HARRIS 30 JAN 80 1980. 142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90**

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : NATANA 1996  
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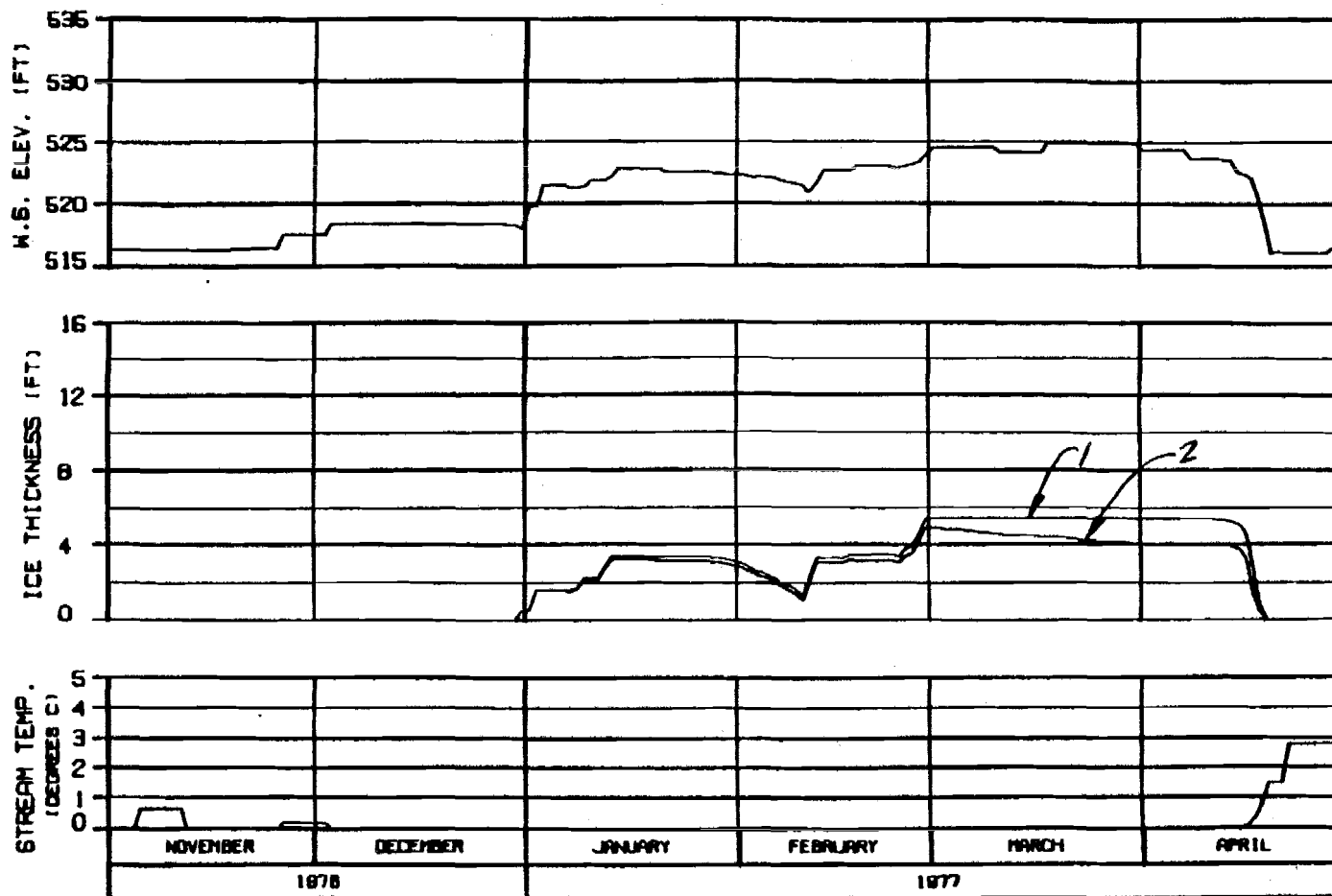
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBRACD JOINT VENTURE**

DESIGN. DATED 10 JAN 84 1000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
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 REFERENCE RUN NO. : 7696CNA

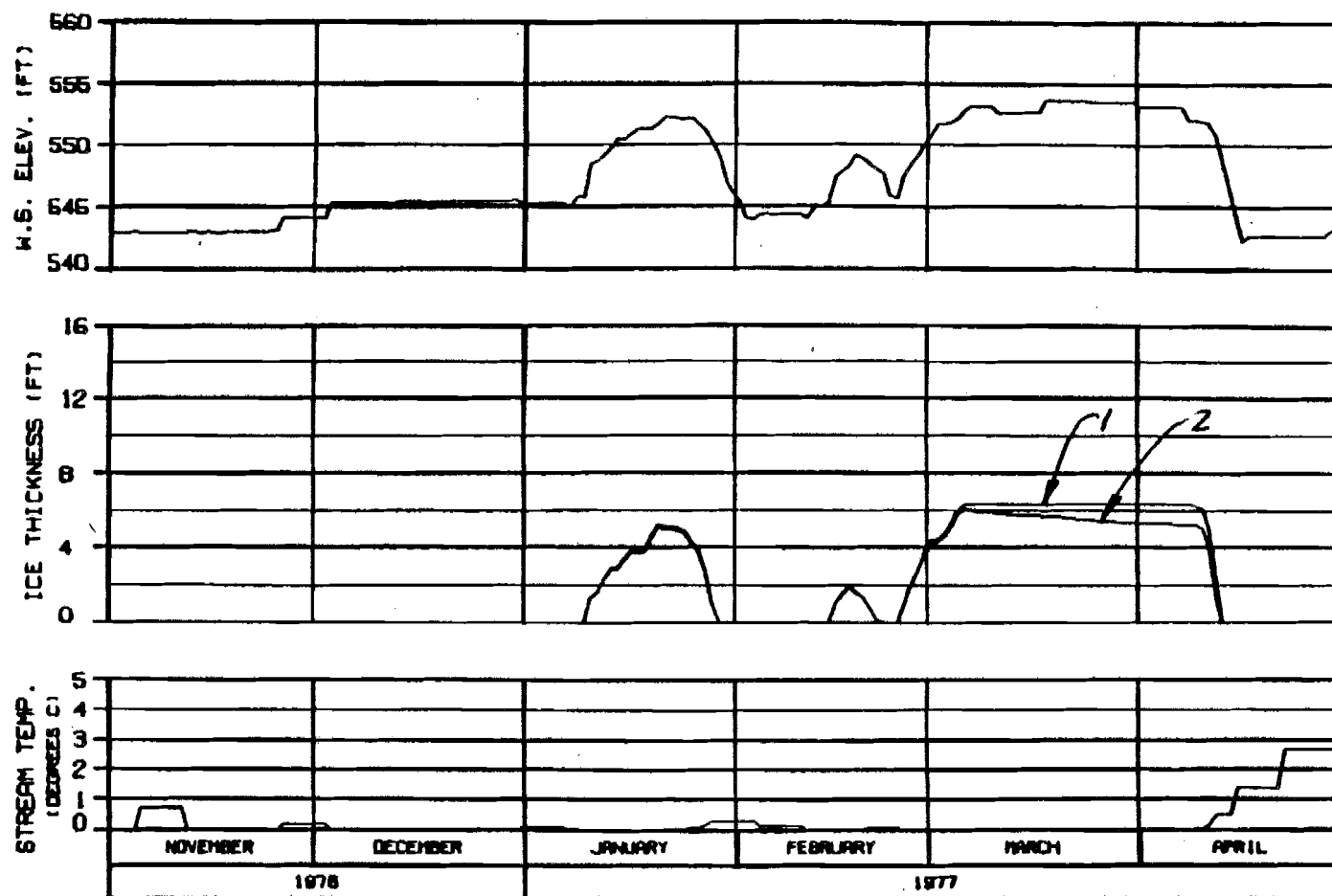
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. H. HARRIS 10 JAN 77 1000-142



HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : MATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

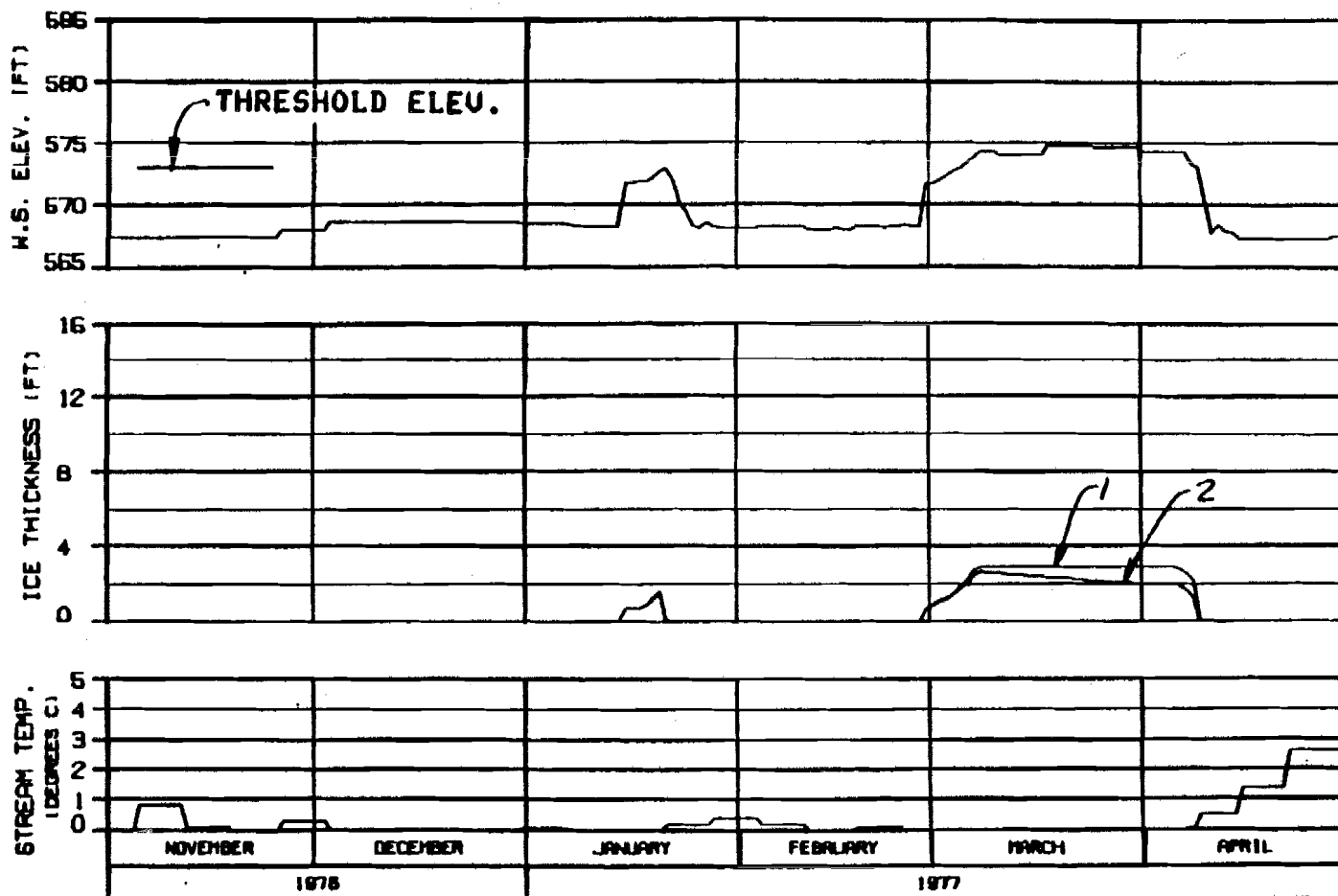
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRSCO JOINT VENTURE

DESIGNED: ALP/PSB 16 JAN 84 DRAWN: IAS





HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

SLUSH PROJECT

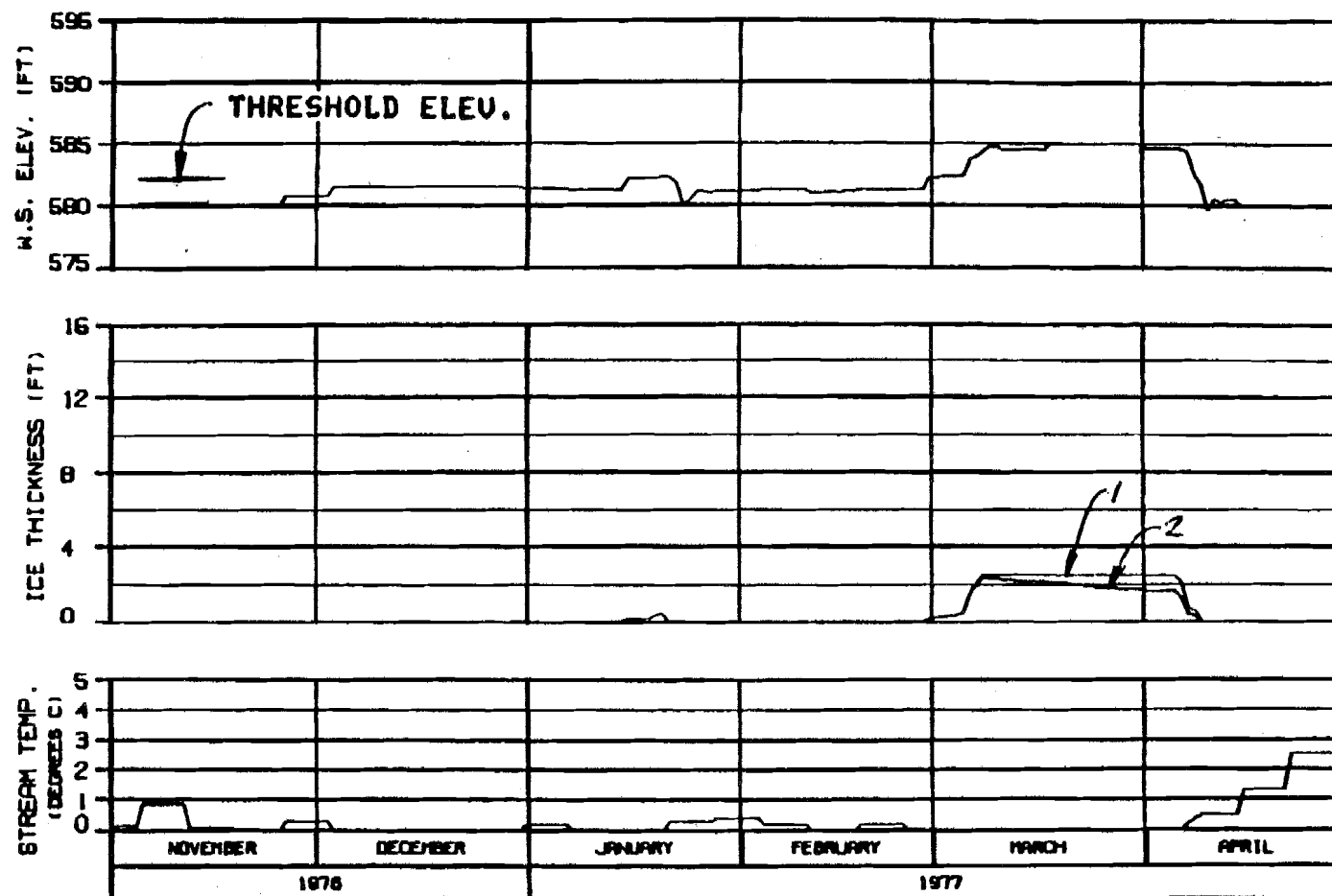
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRSCO JOINT VENTURE

DESIGN: SL-0000

25 JAN 81

ENG. 142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

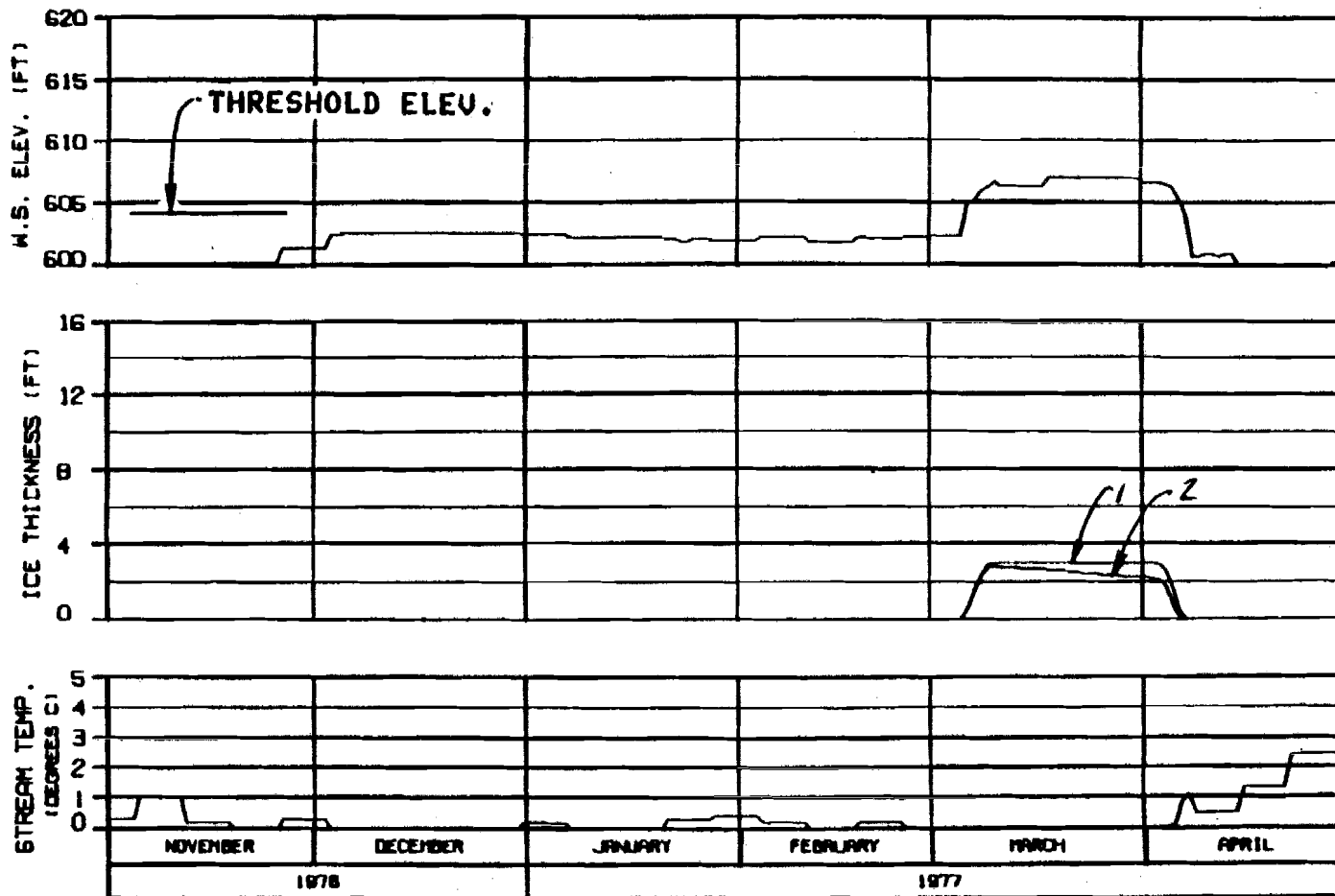
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

CHART: ALP-88 10 JAN 81 1000.142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

OPTION?

ALASKA POWER AUTHORITY

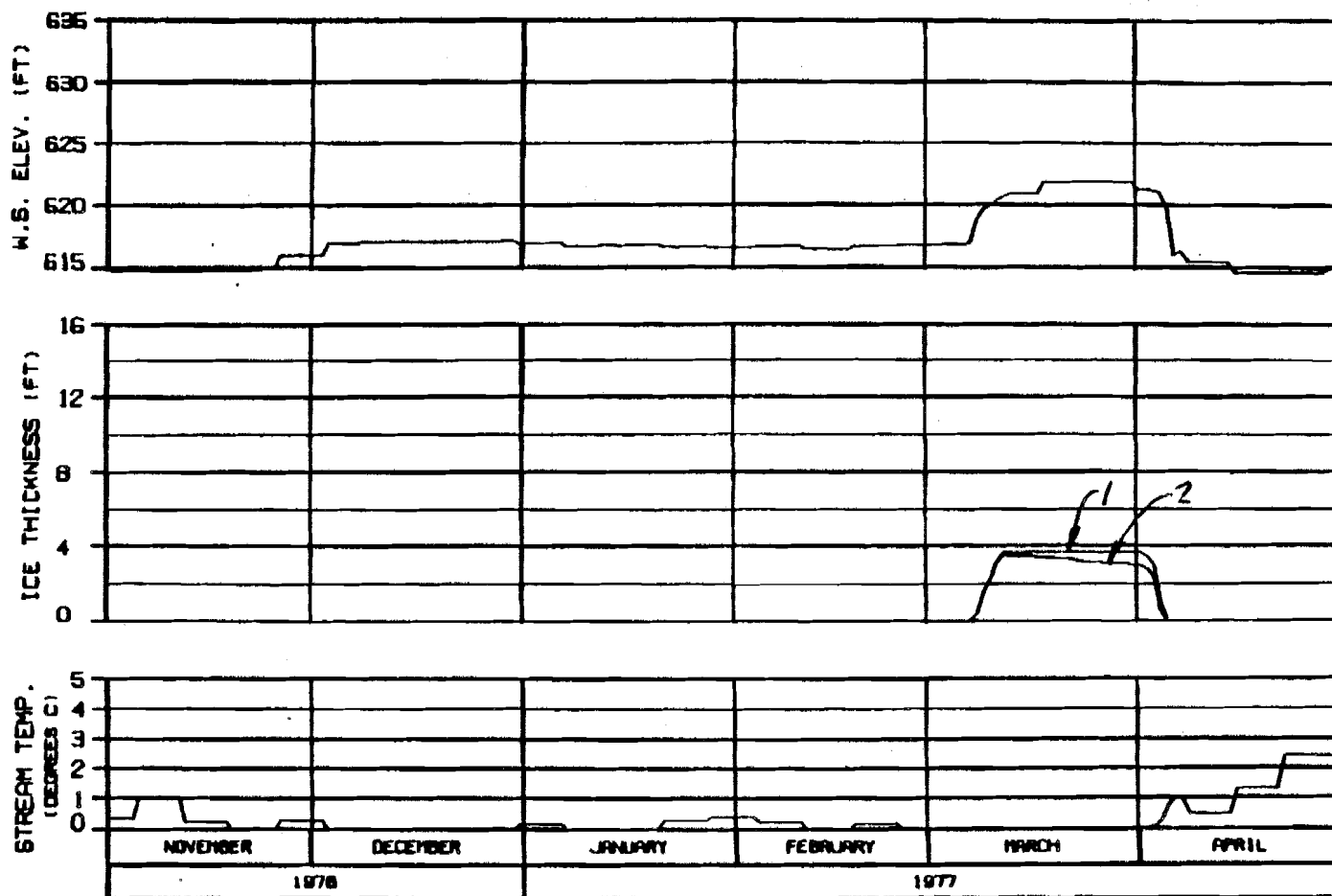
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

WORKSHEET: 10 JAN 81 1996.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

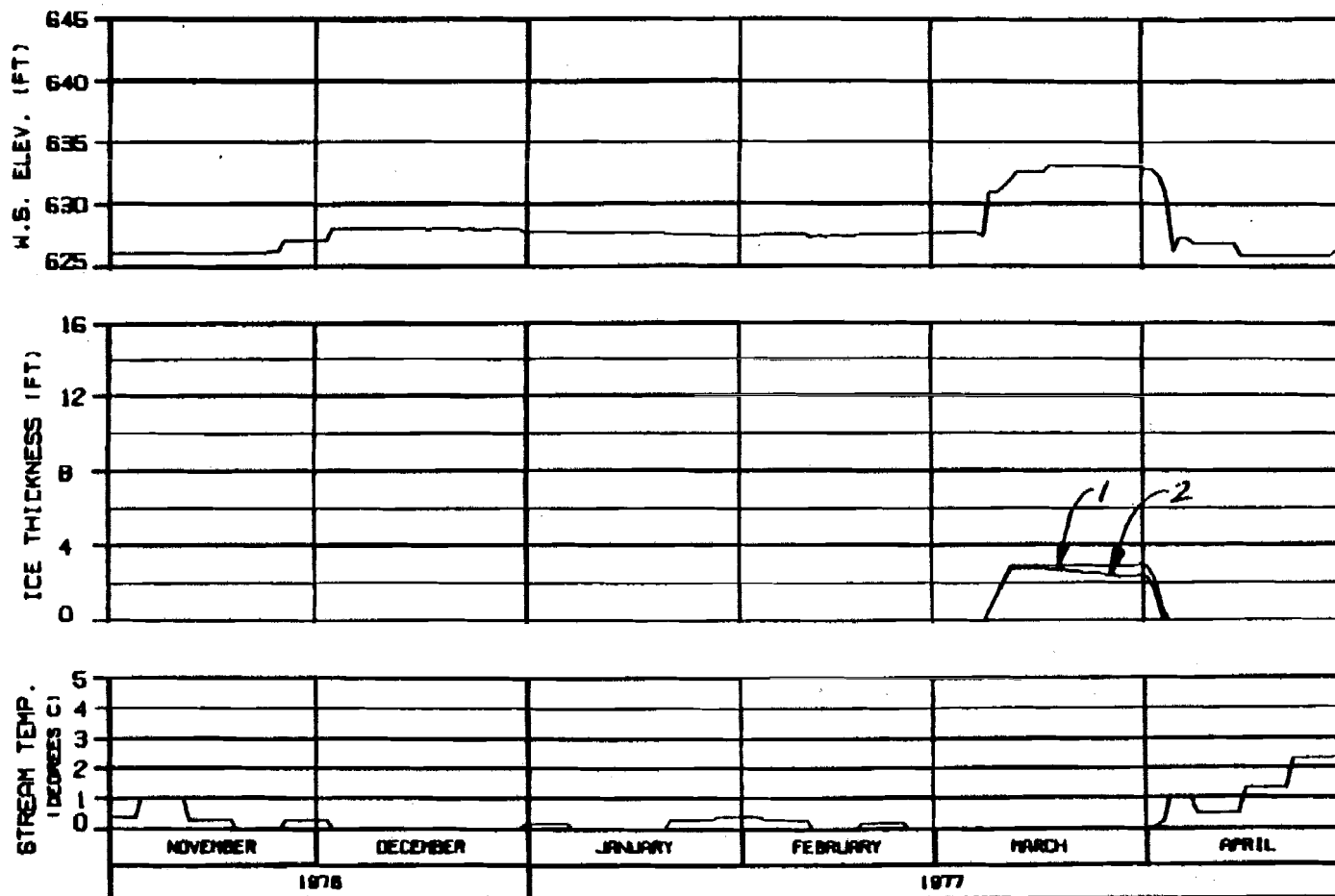
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRSCO JOINT VENTURE

DESIGNER: EBRSCO 10 APR 81 1000.142



**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : MATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

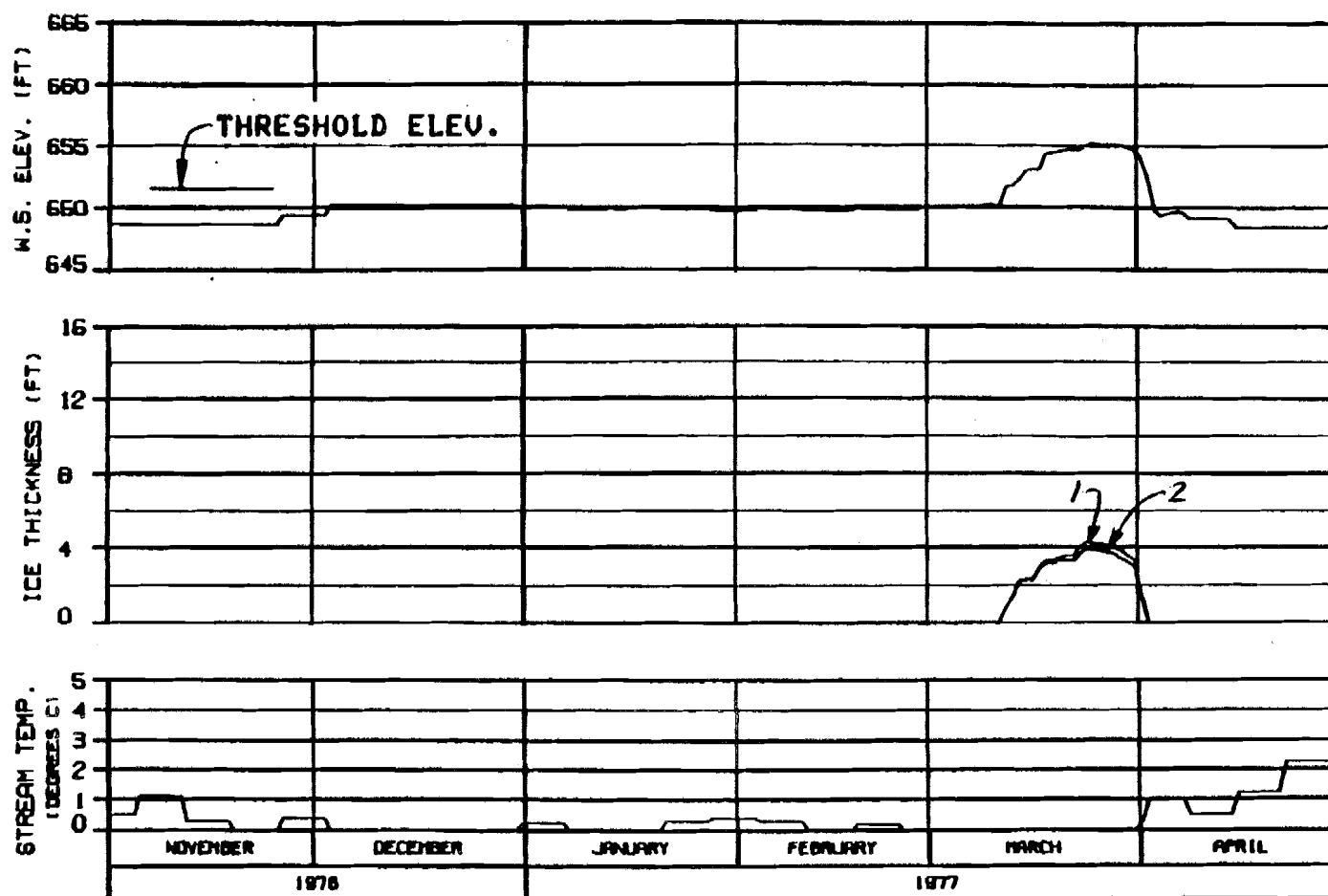
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: R. B. BROWN 10 JAN 81 1000.142



HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

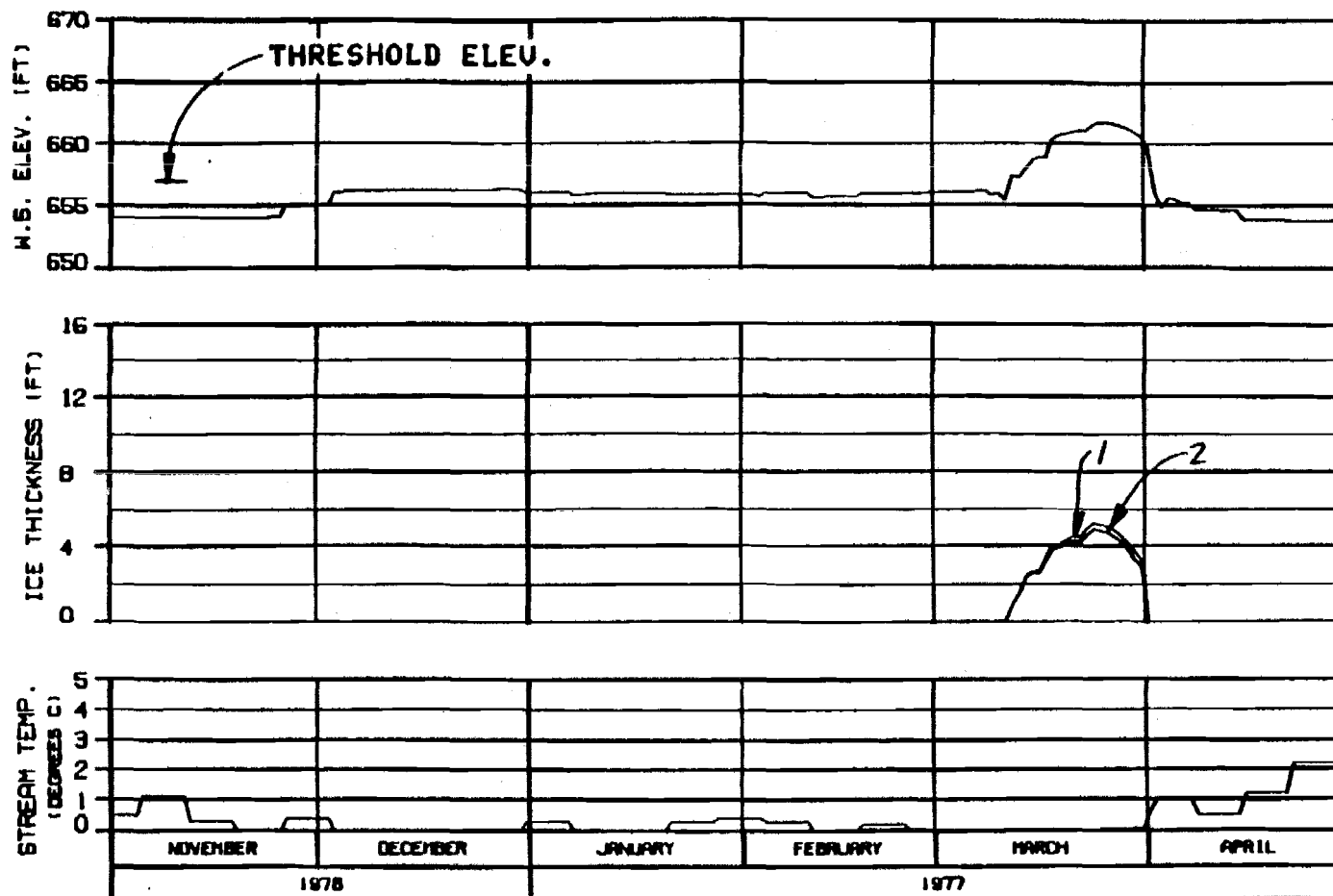
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: B. L. BROWN 30 JAN 78 1000.142



ICE THICKNESS LEGEND.

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
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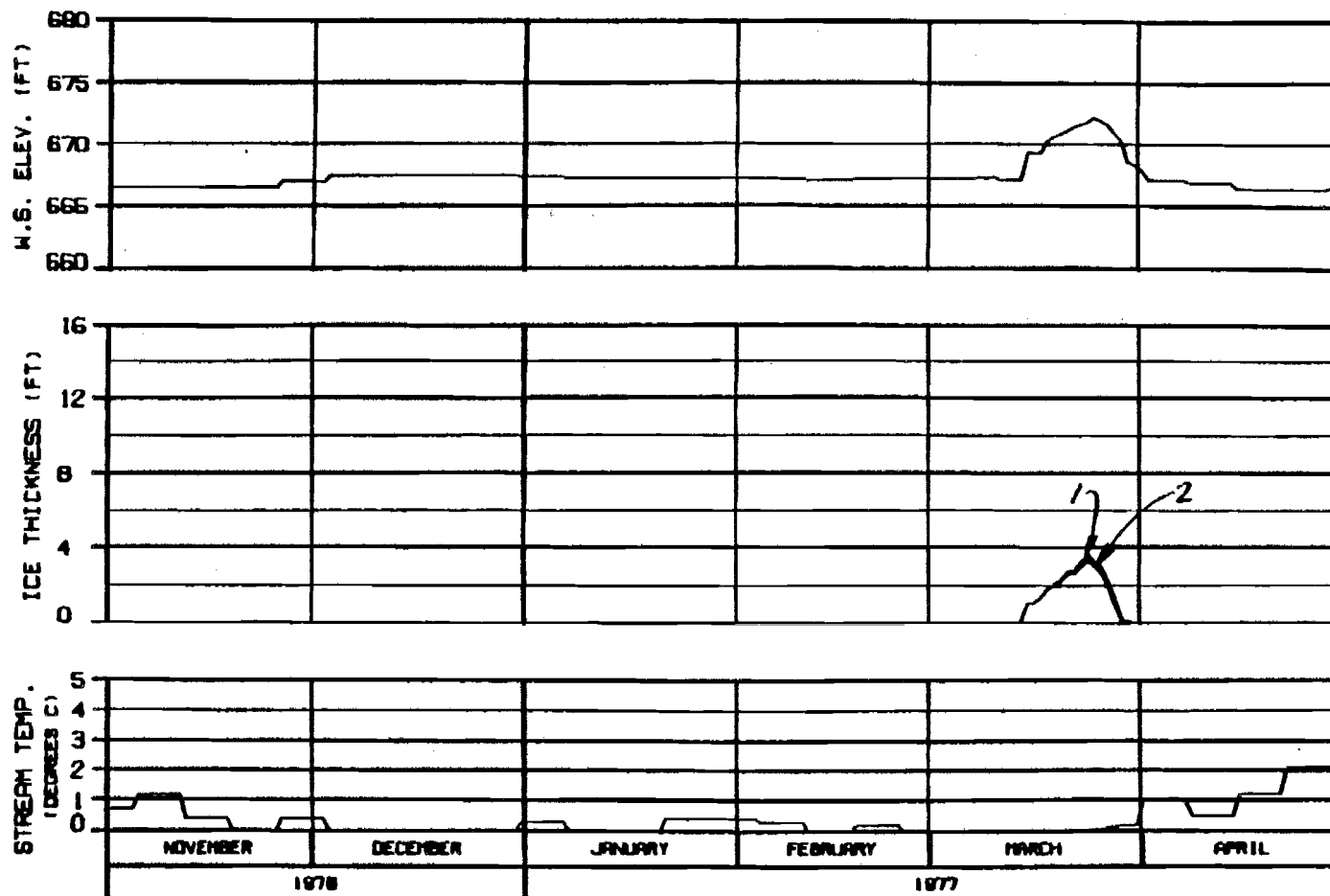
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DRAWN: J. L. BROWN 10 JAN 80 1000.142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

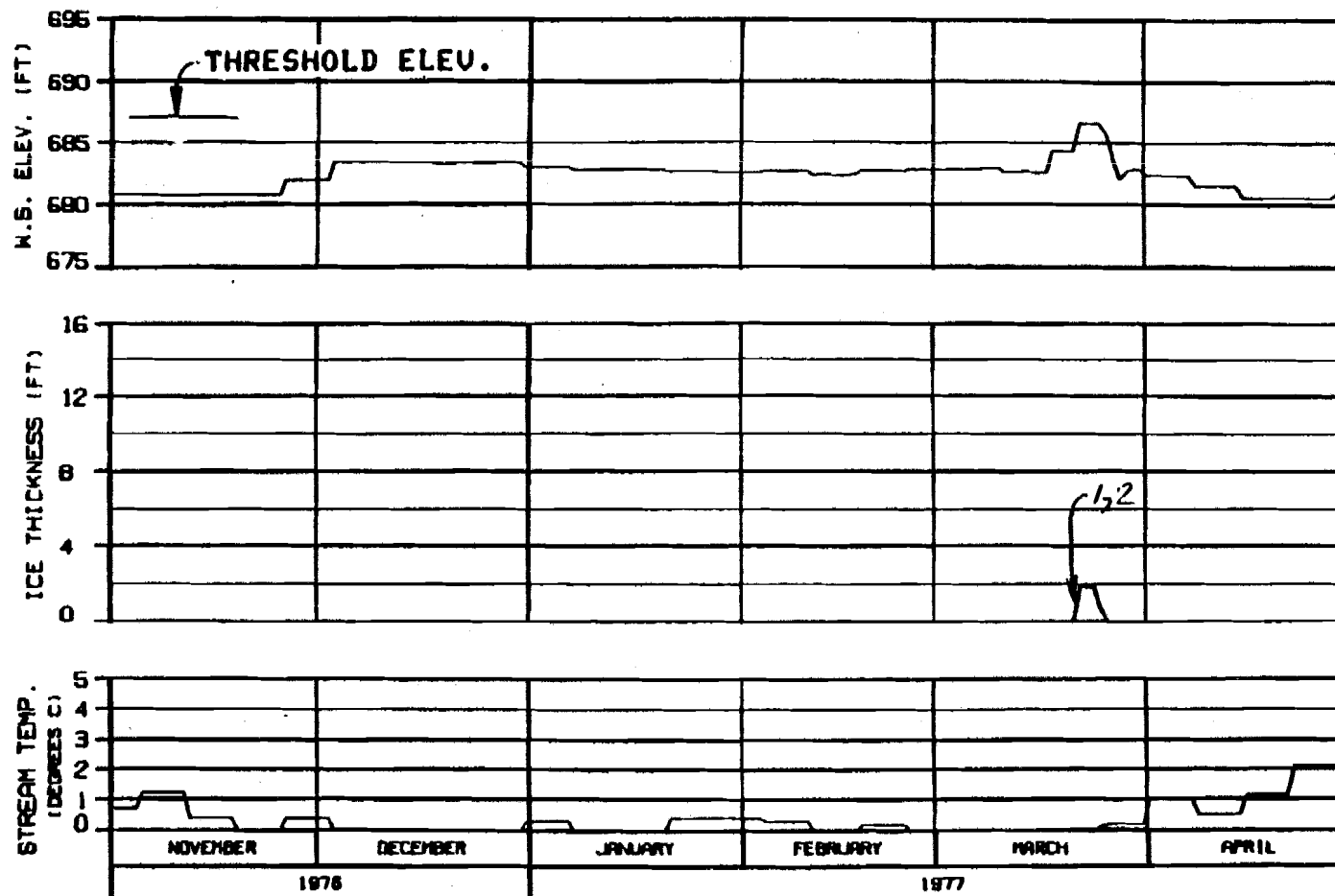
SUBMITTAL PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. DAVIS 20 JAN 77 1000.142





HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

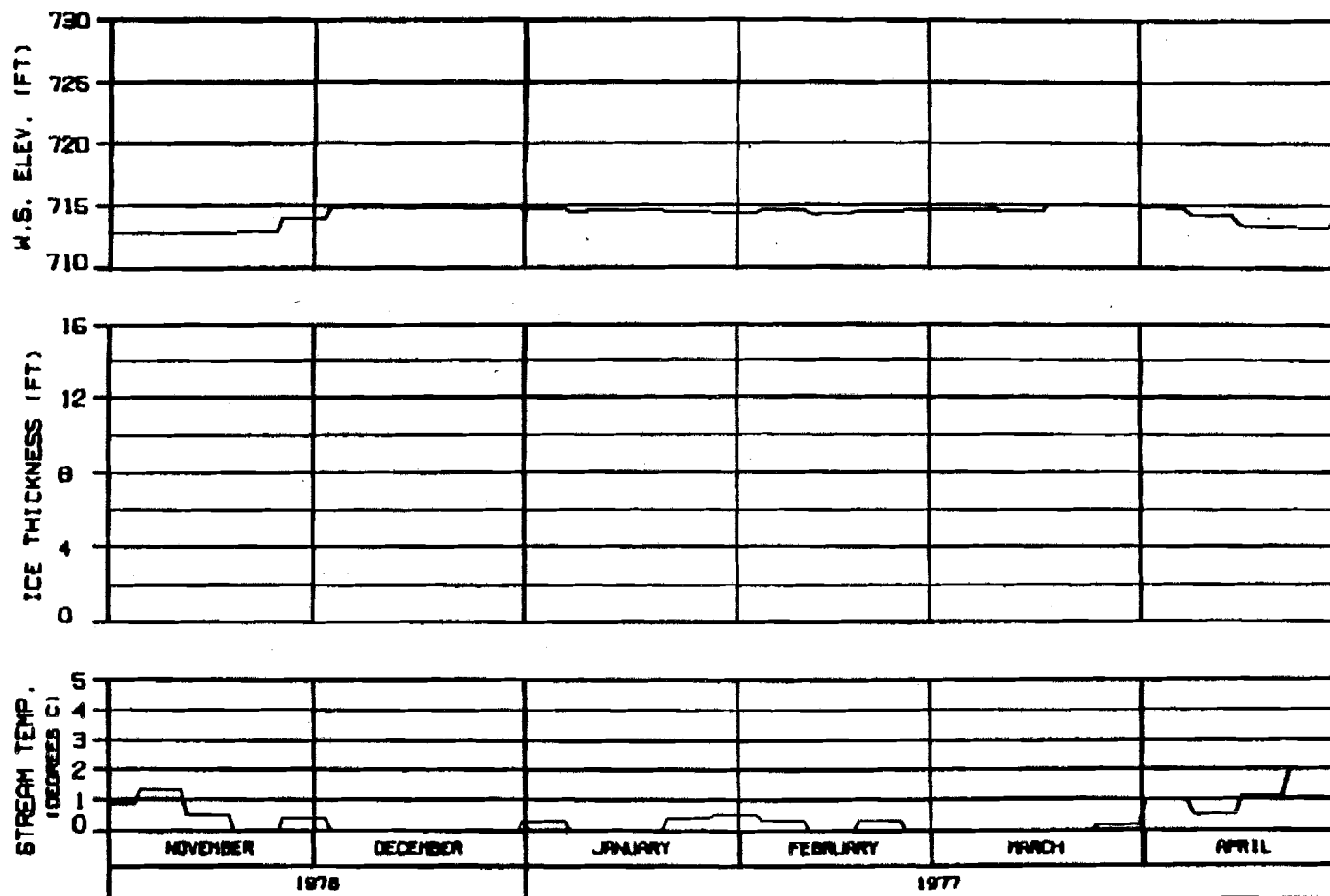
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN - ELEVATION

30 JAN 81

1000.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7695CNA

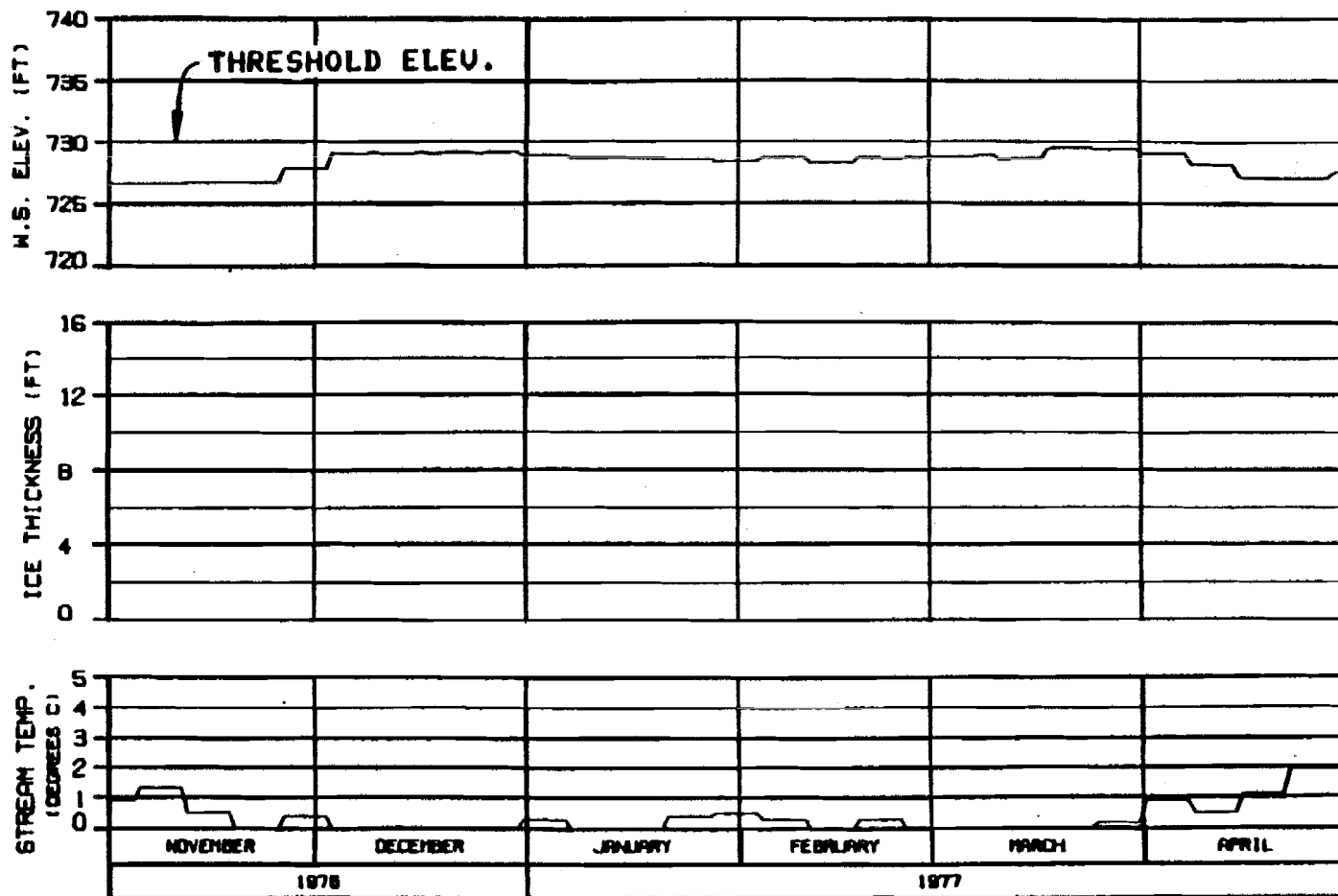
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

DESIGNED BY: J. J. JONES 10 JAN 81 1000.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

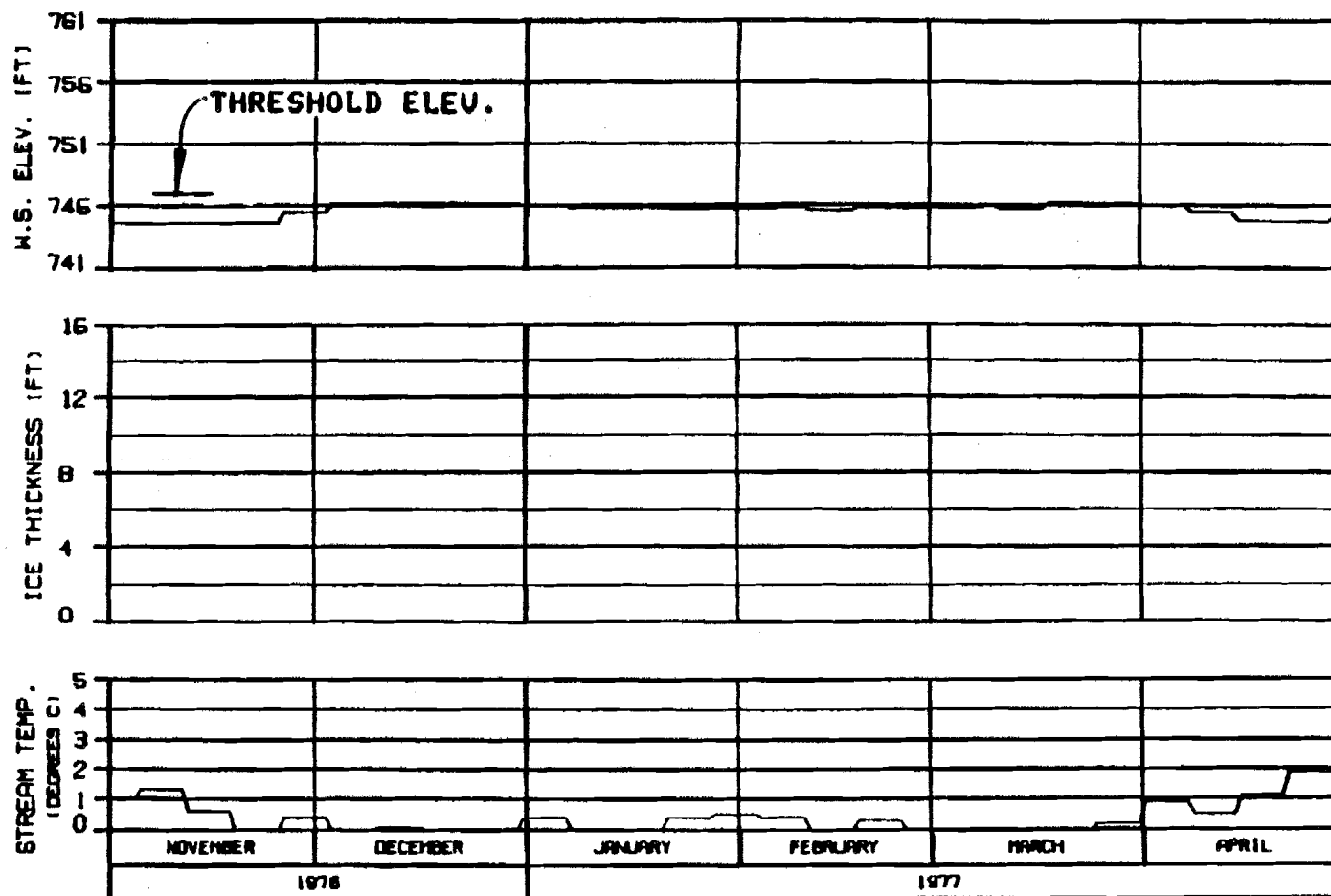
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

DESIGNED BY: EBRACO 20 JAN 81 1996.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

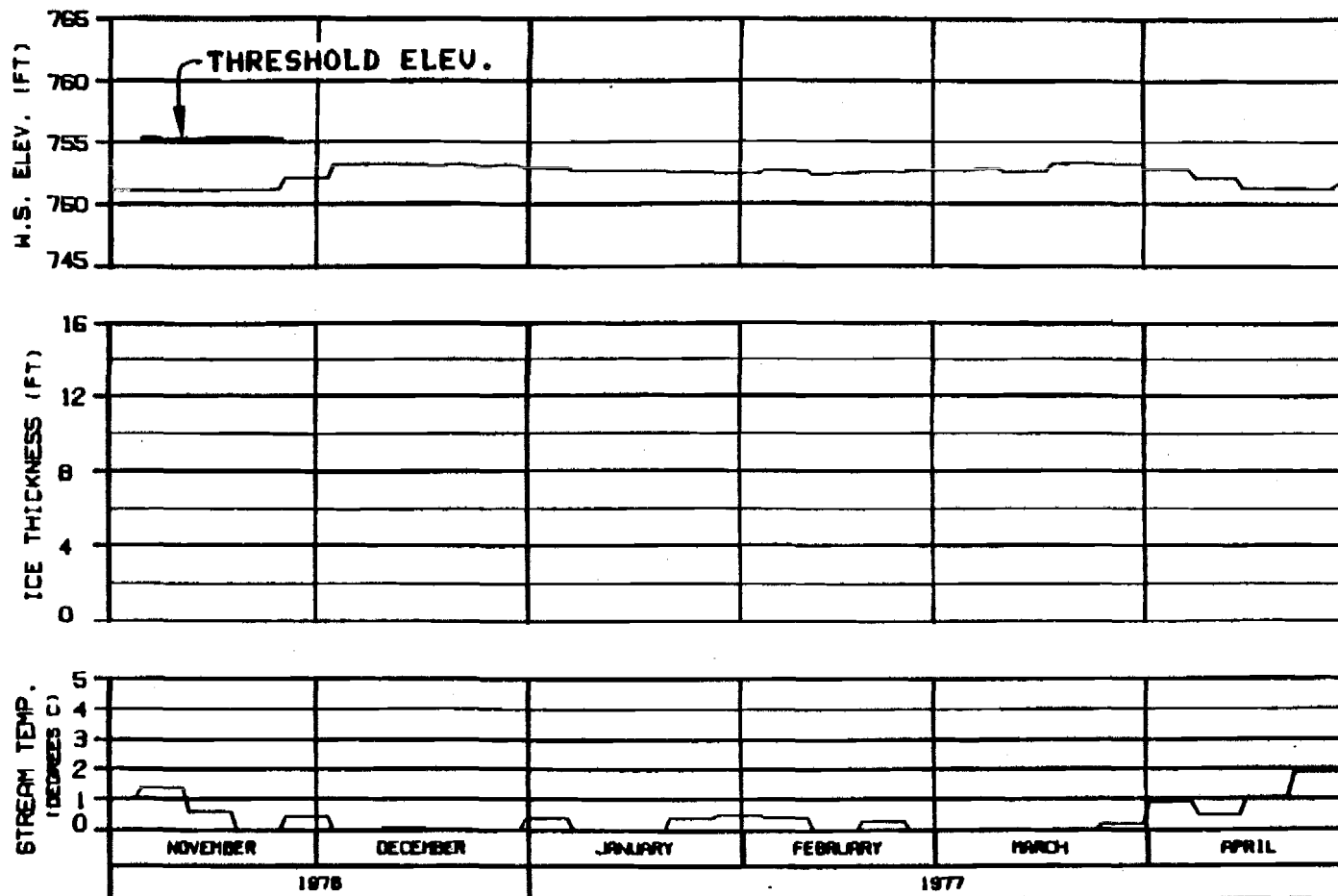
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBR&D JOINT VENTURE

UPPER ALASKA 30 JAN 84 0000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7696CNA

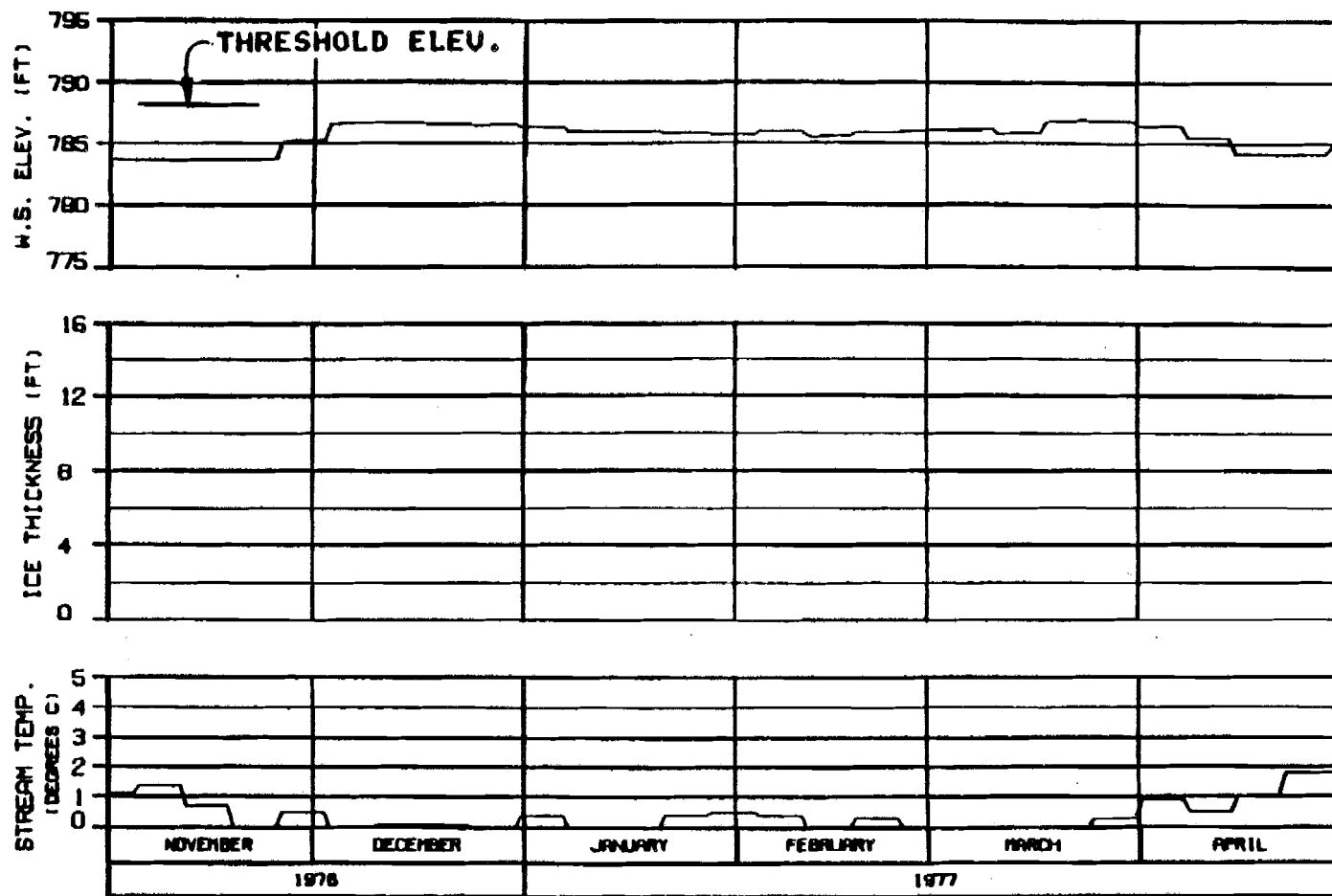
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

DESIGNED BY: HAZRA-EBASCO 10 JAN 81 VER. 142



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7696CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

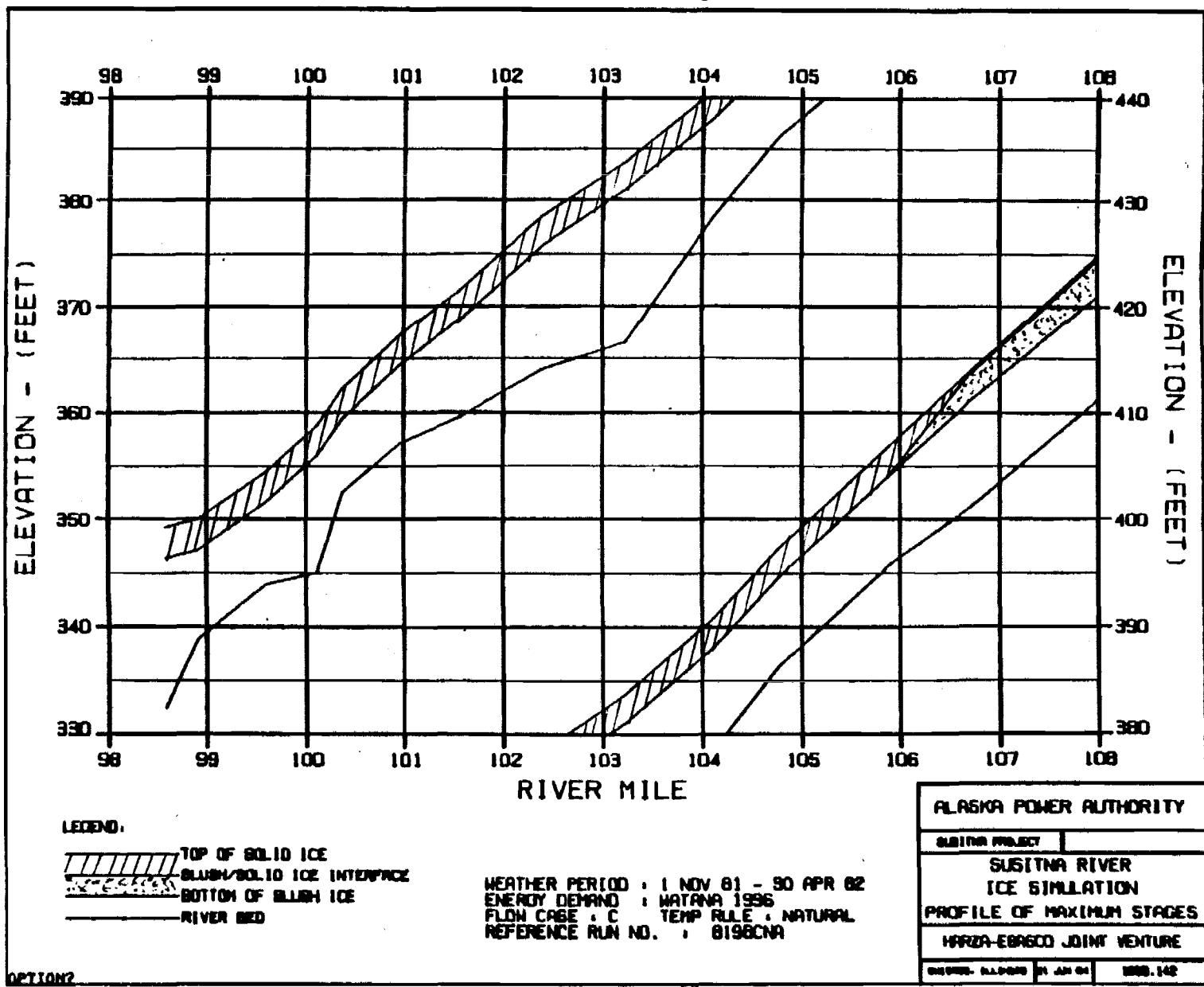
HARZA-EBRACO JOINT VENTURE

DESIGNED BY: J. R. BROWN 20 JAN 81 1000.142

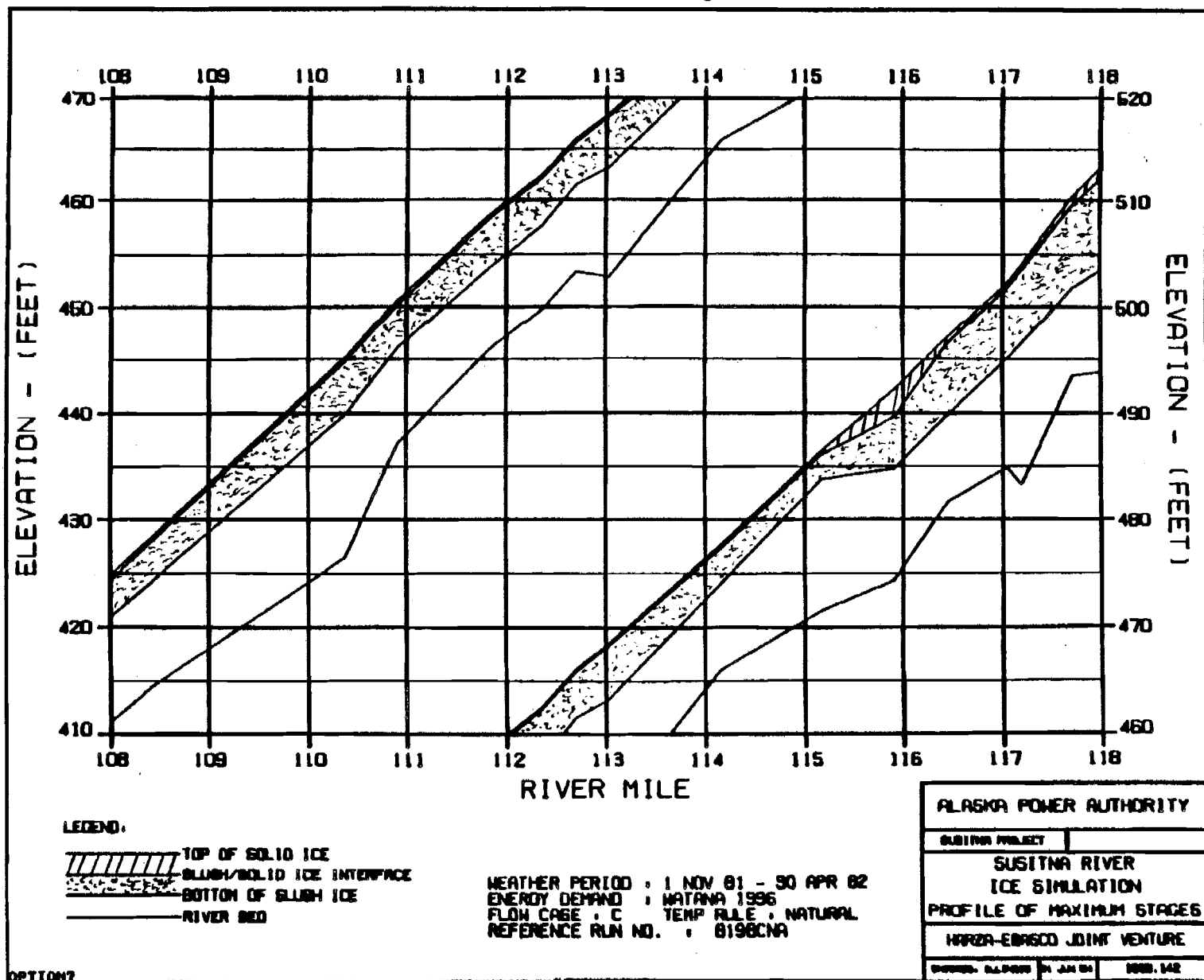
OPTION?

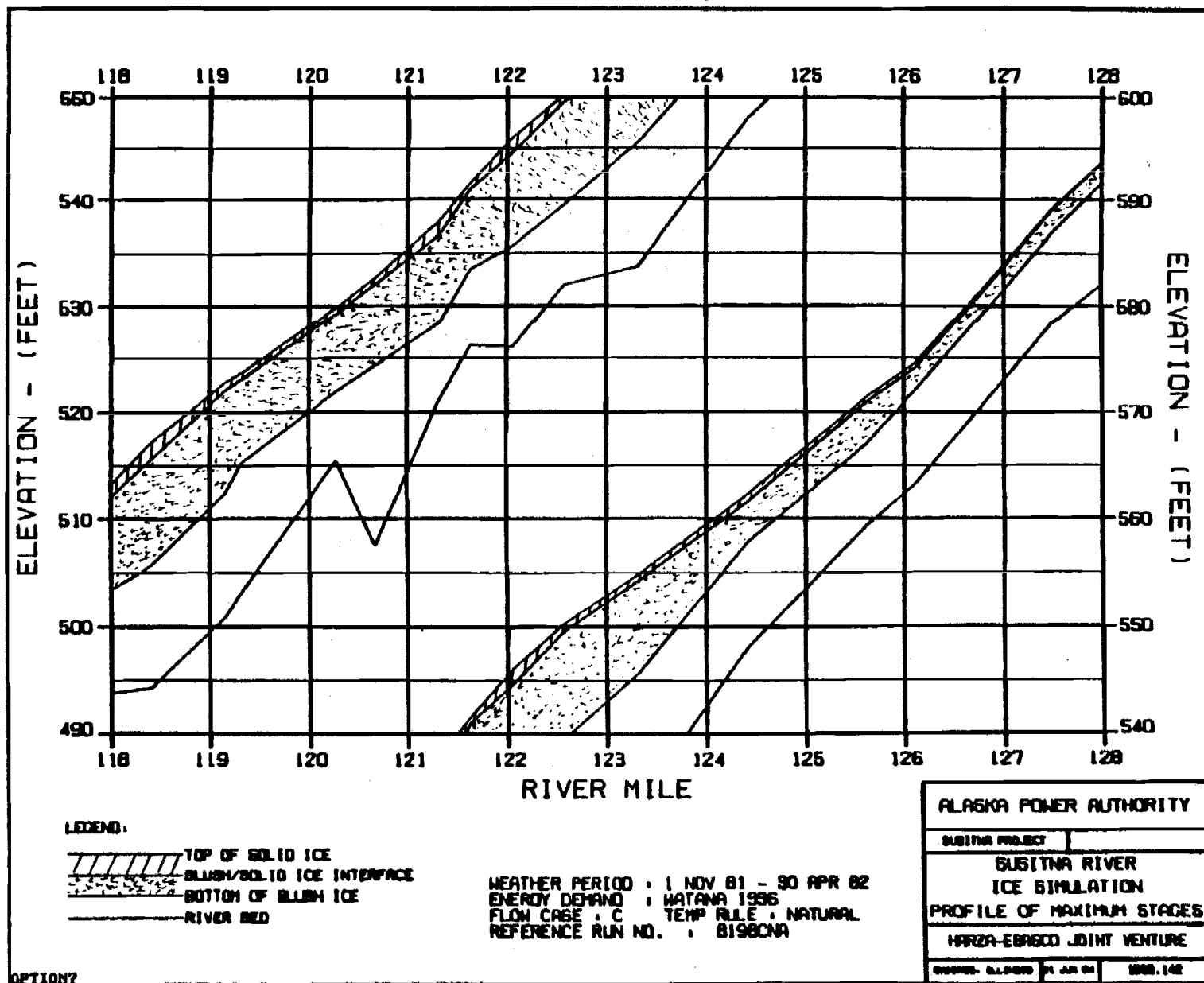
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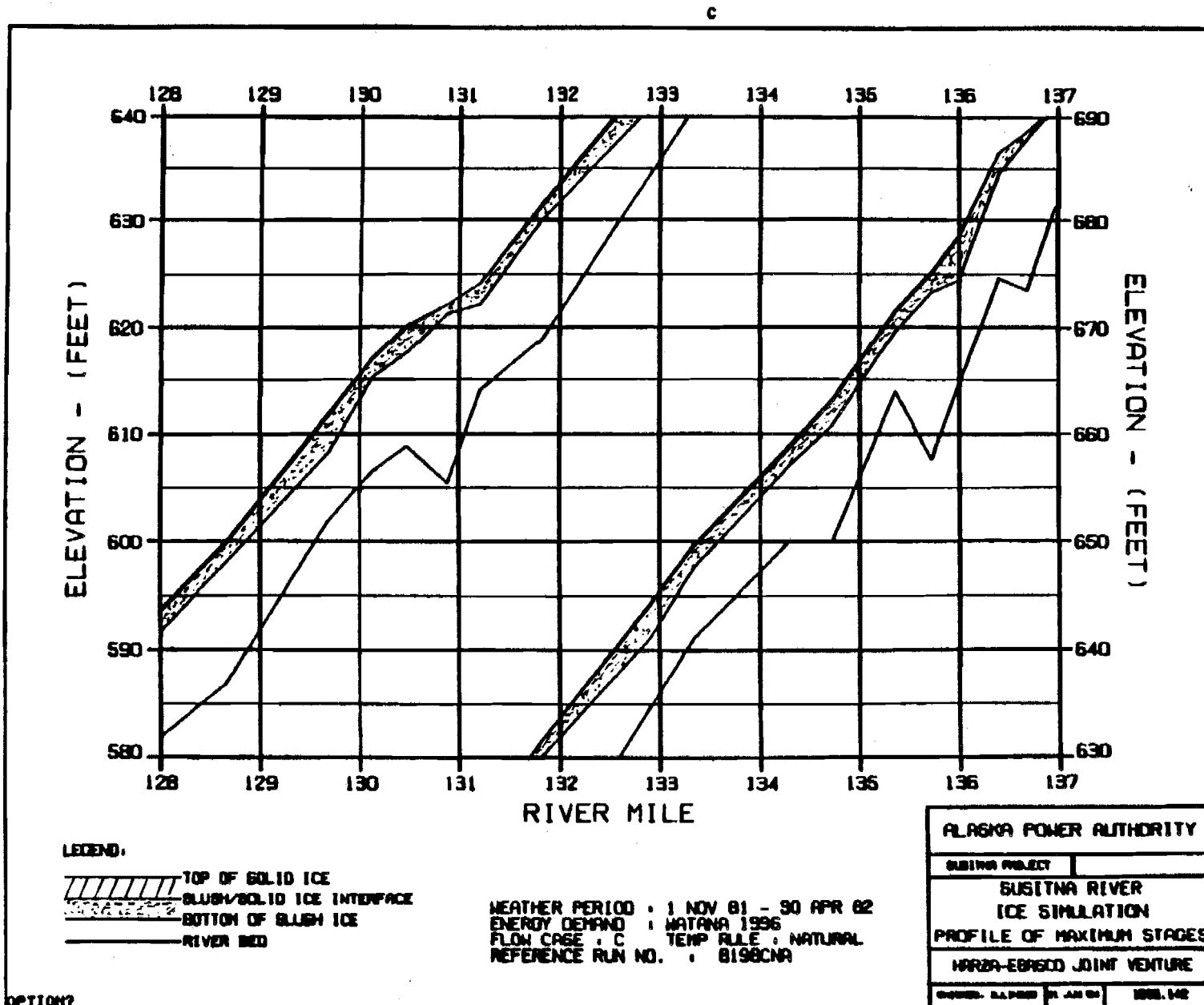
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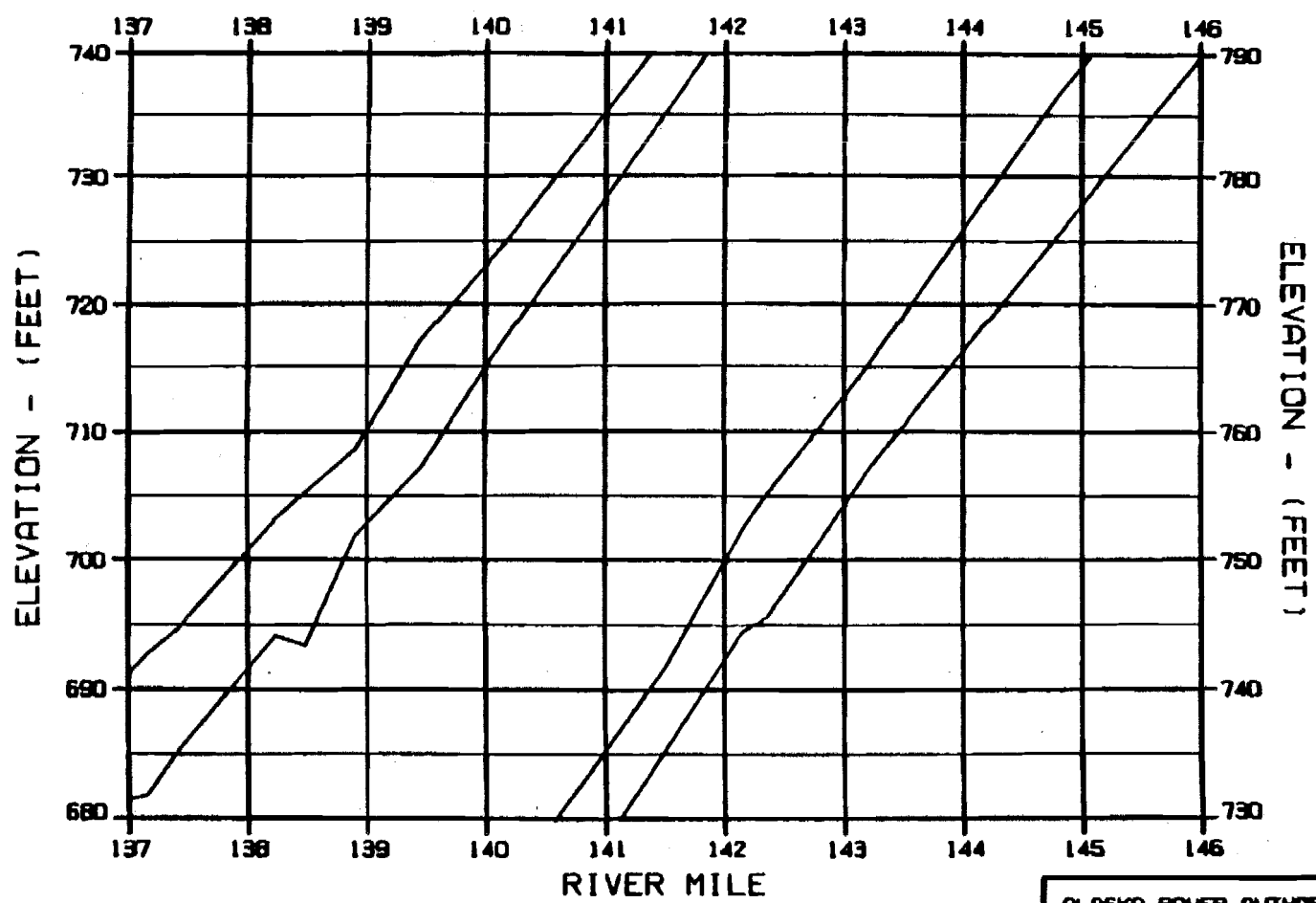








c



LEGEND:

TOP OF SOLID ICE

SLUSH/SOLID ICE INTERFACE

BOTTOM OF SLUSH ICE

RIVER BED

WEATHER PERIOD : 1 NOV 81 - 30 APR 82

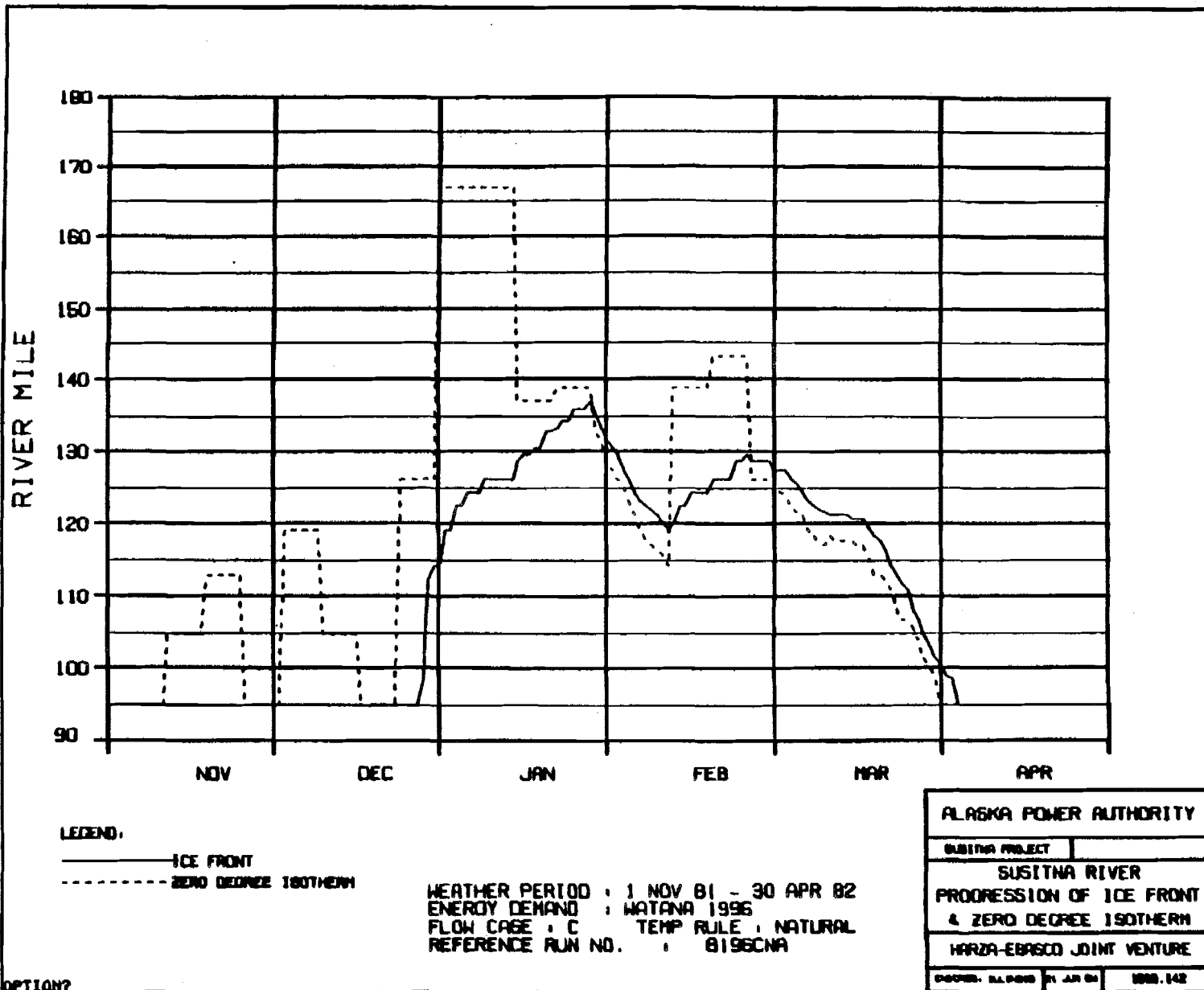
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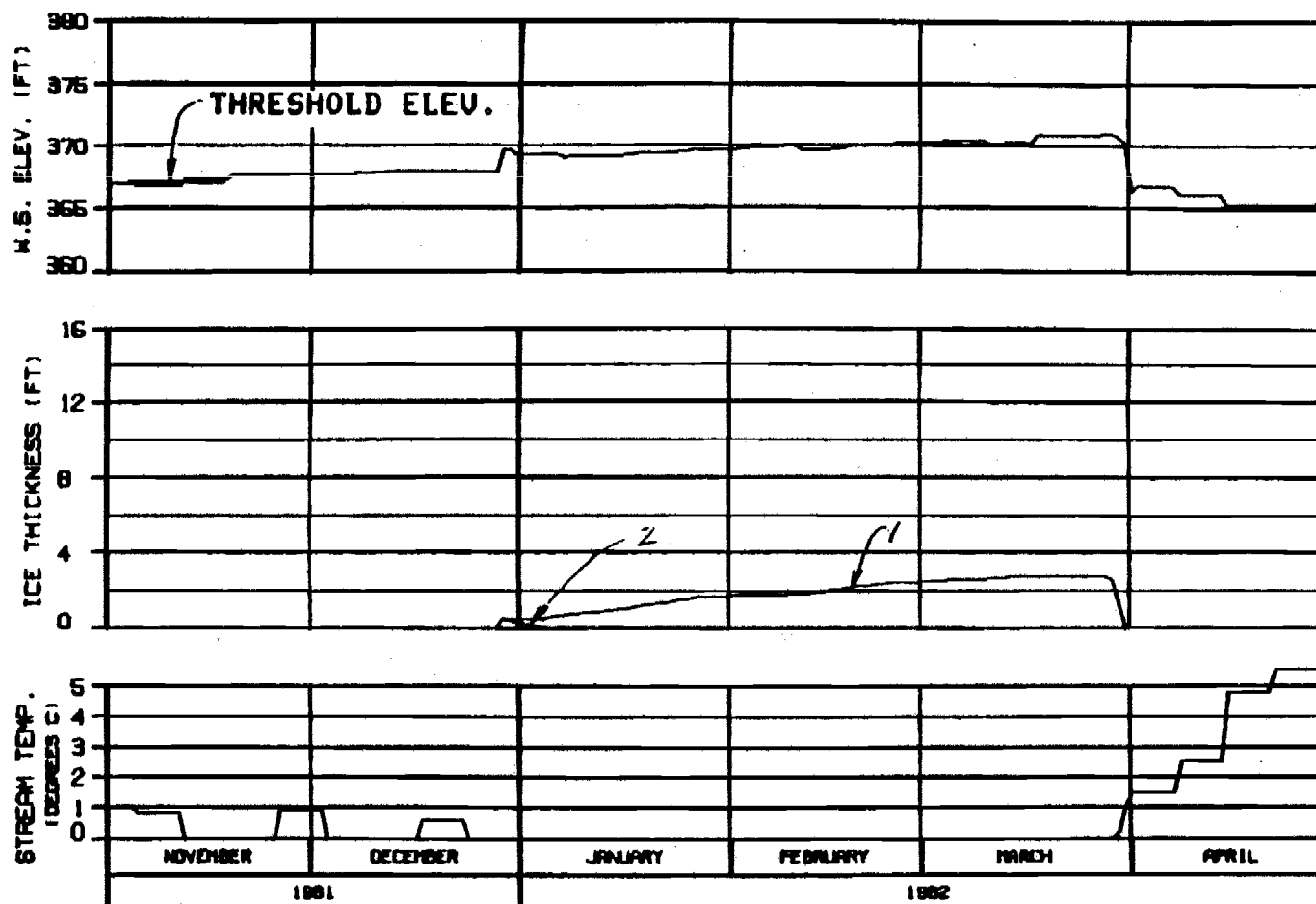
FLOW CASE : C TEMP RULE : NATURAL

REFERENCE RUN NO. : 8198CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
PROFILE OF MAXIMUM STAGES		
WARZA-EBRISCO JOINT VENTURE		
DESIGNED BY	DATE	REVISION
W. J. JONES	11 JAN 84	0000.142

OPTION?





# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B196CNA

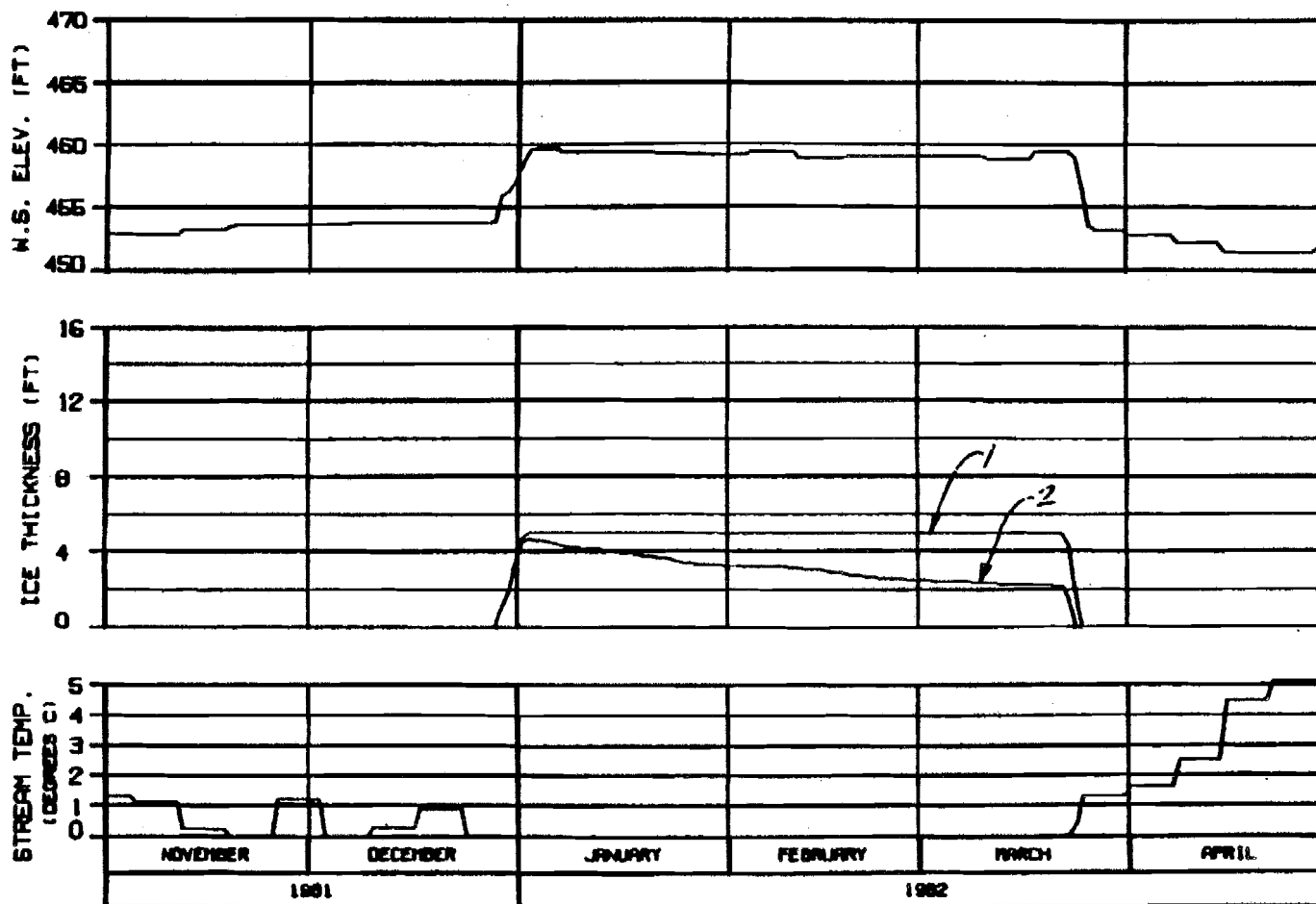
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGNED: AL 0000 21 JAN 82 1000.042



**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

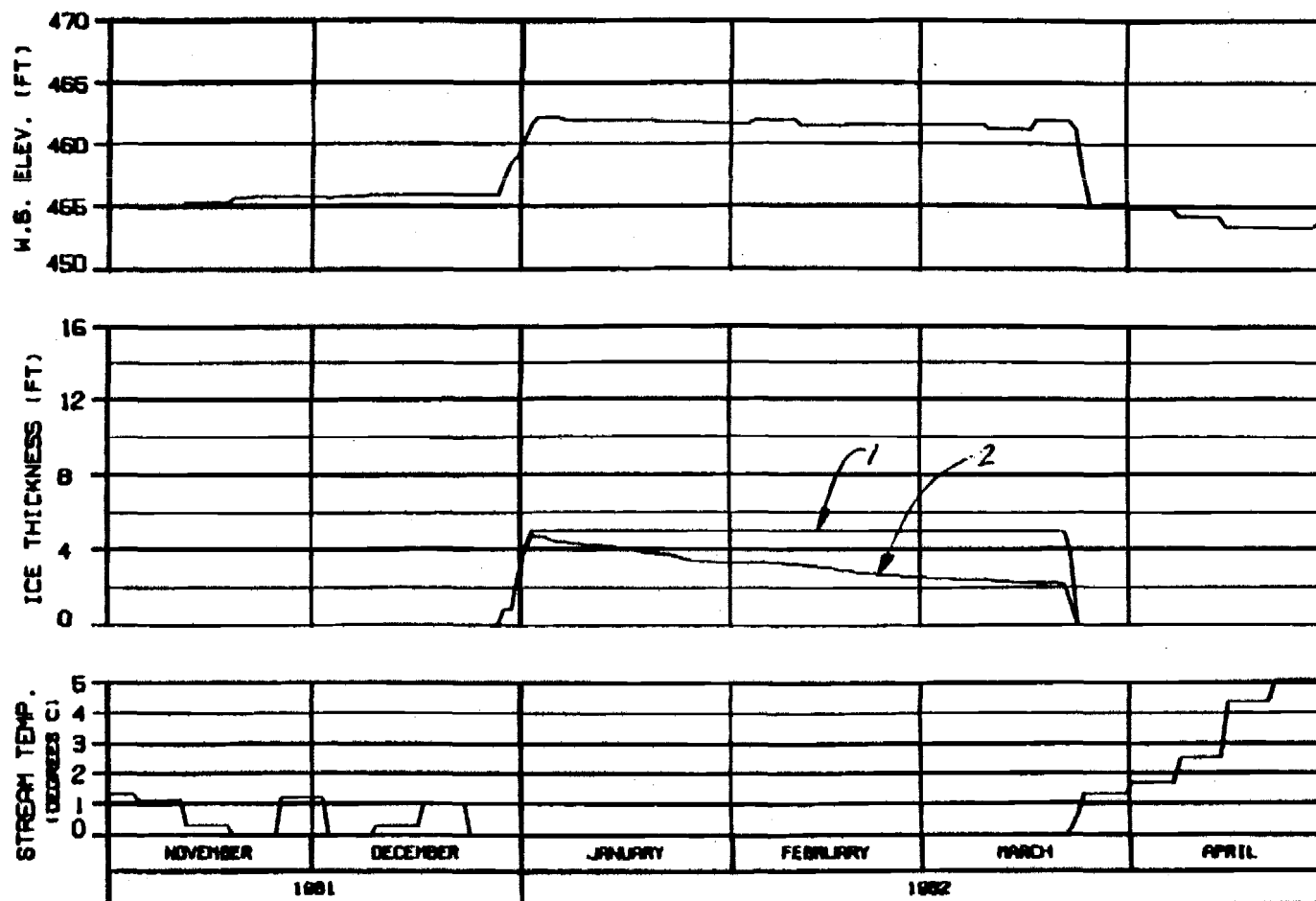
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBASCO JOINT VENTURE**

DESIGN: 8196CNA 11 JAN 82 1982.142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

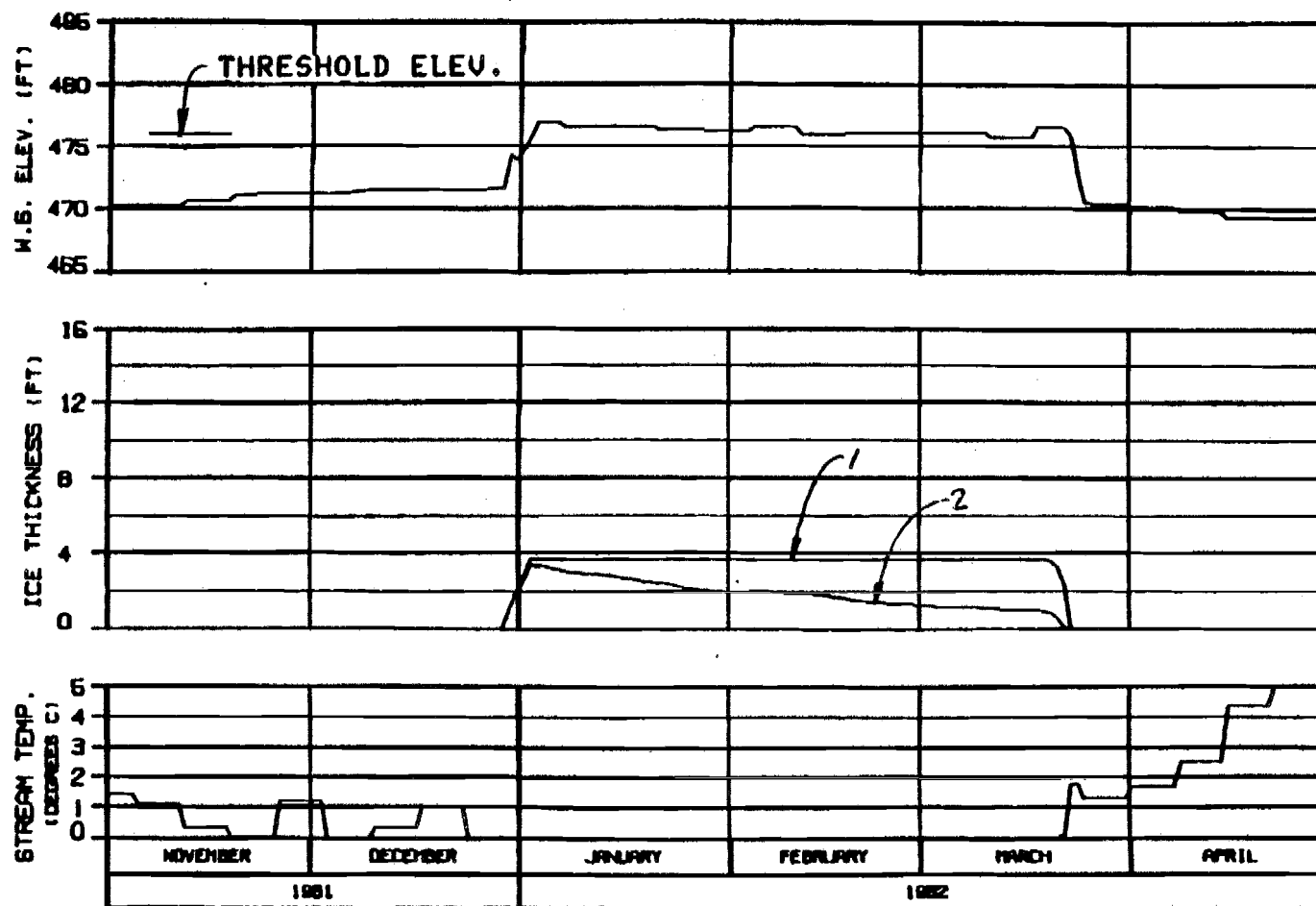
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. J. J. IN JAN 82 1982. 142





HEAD OF SLOUGH 8

RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

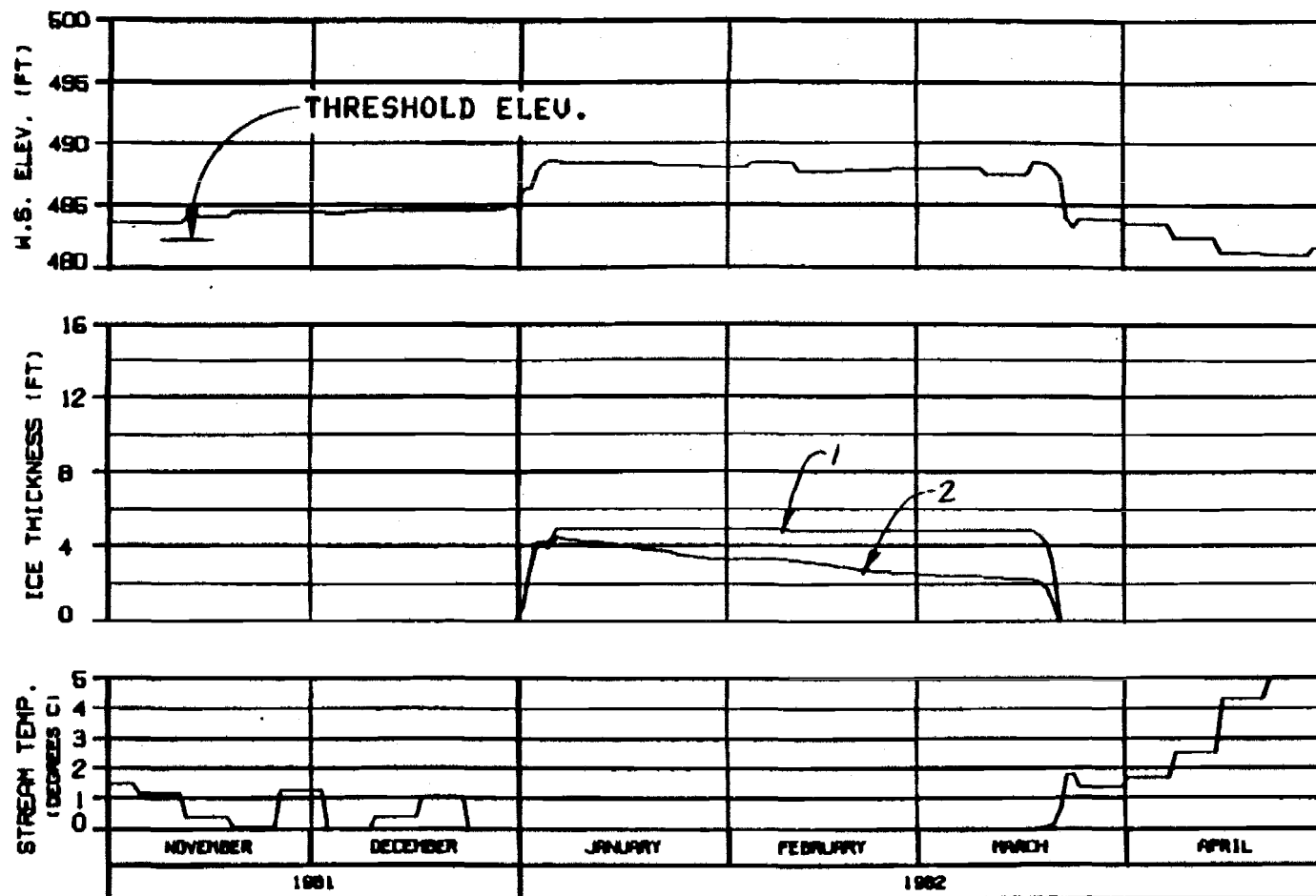
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-ERAGOD JOINT VENTURE

DESIGN: 04/82 BY: JAR/BA 0000-142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BULKY COMPONENT

SIDE CHANNEL MSII  
RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B196CNA

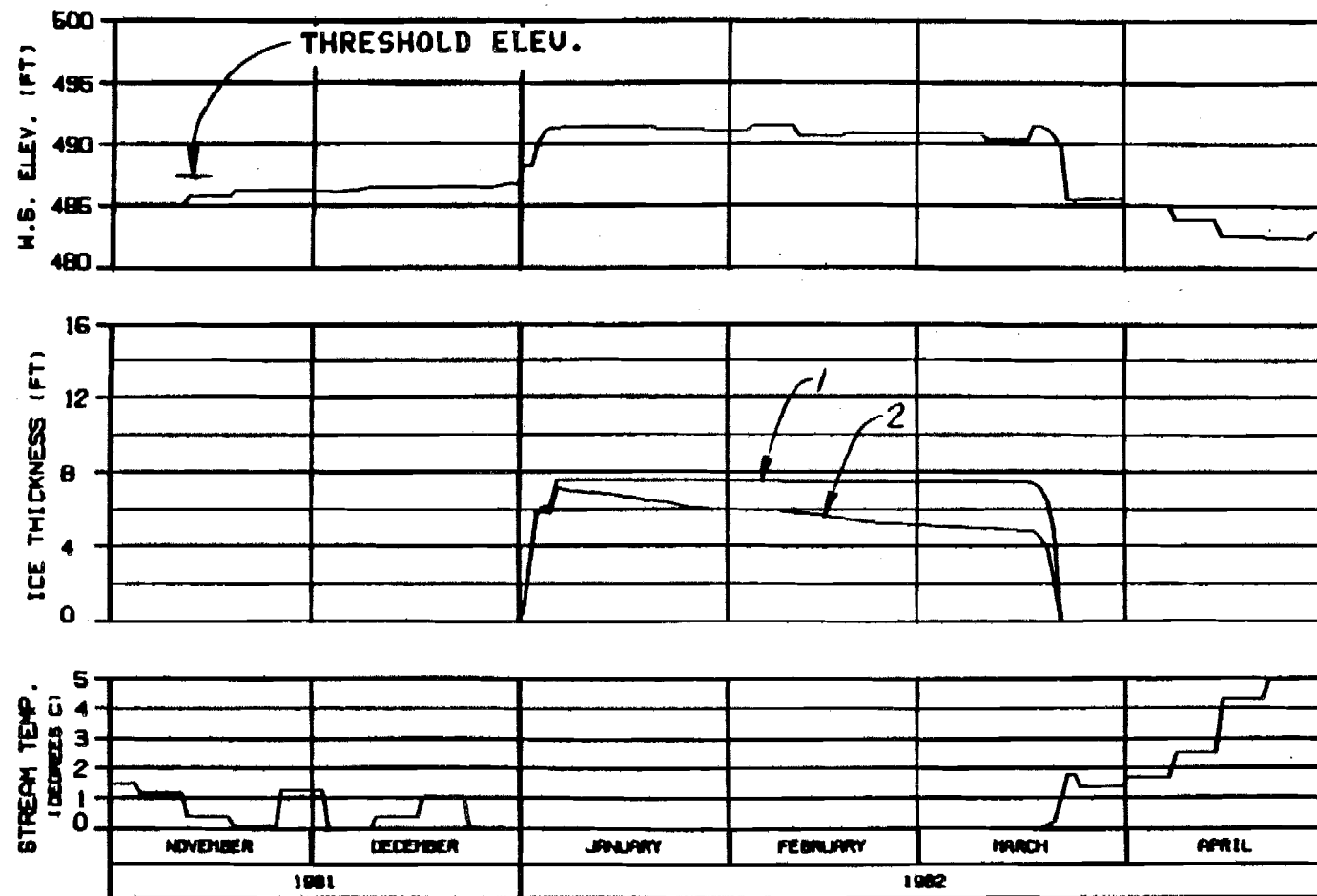
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DESIGN: ALBION 21 JAN 82 1000.142



**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

**HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90**

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

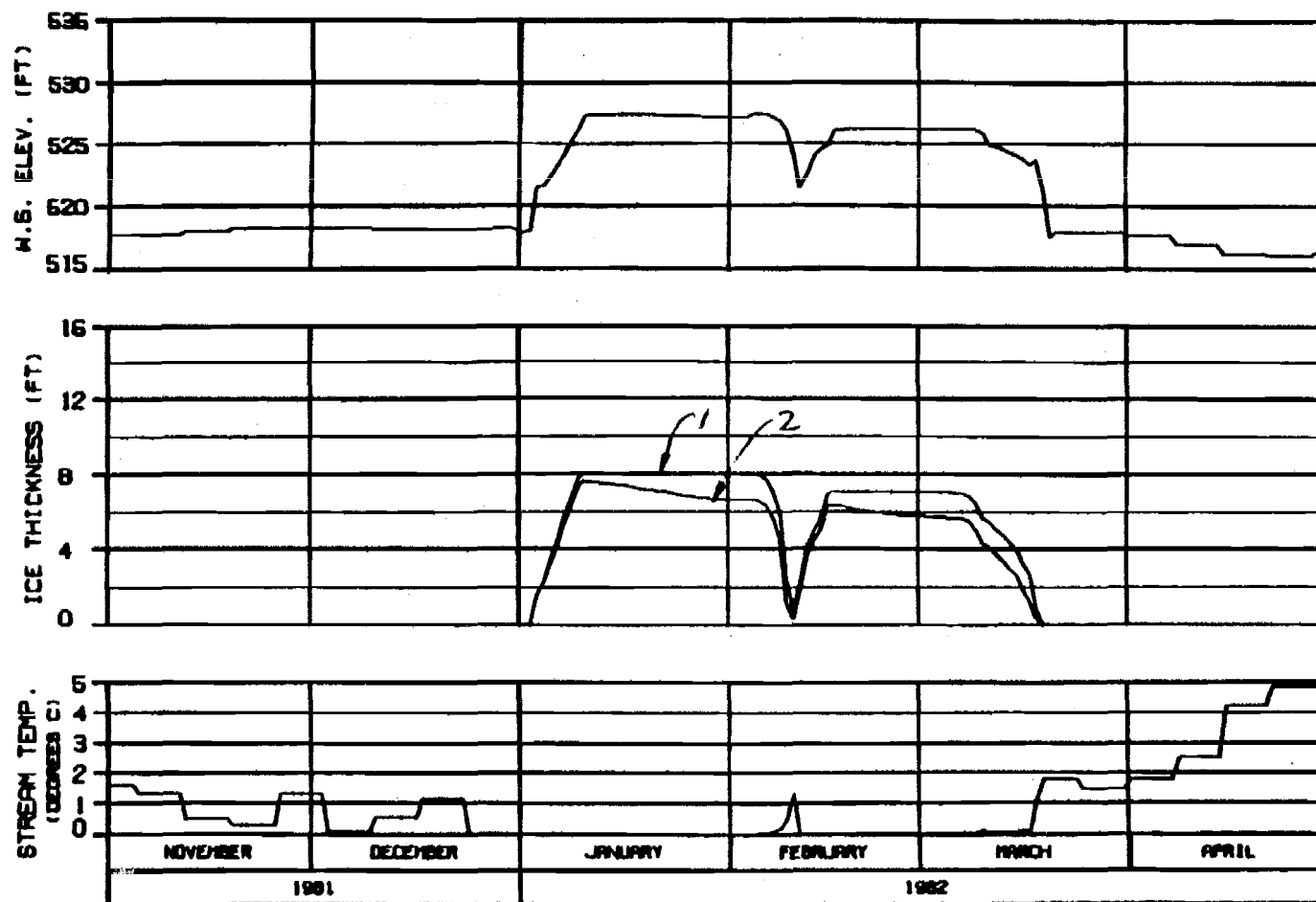
**ALASKA POWER AUTHORITY**

SUSITNA PROJECT

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

WARZA-EBRISCO JOINT VENTURE

DESIGN- 8196CNA IN JAN 82 1982.142



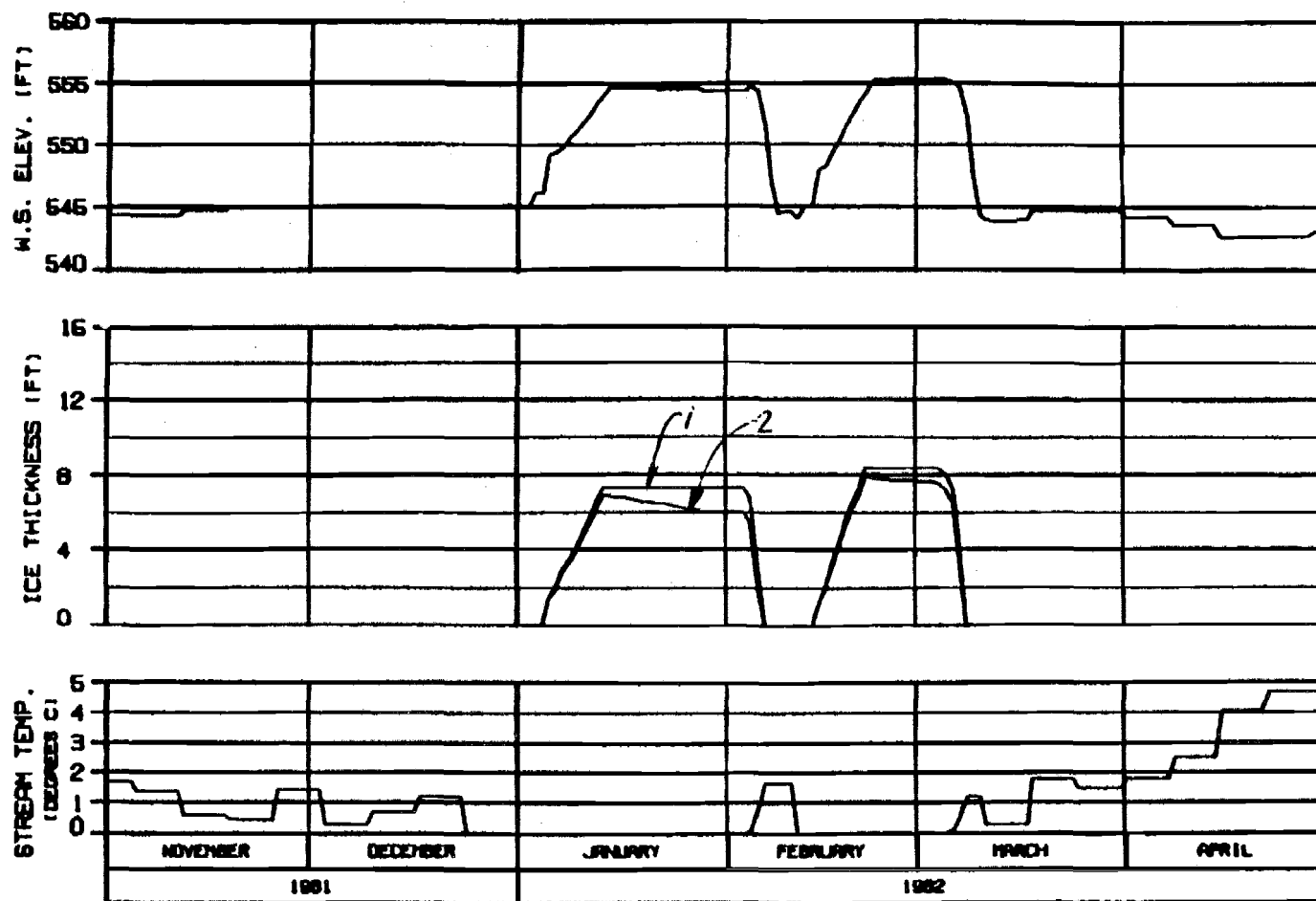
ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EBERD JOINT VENTURE	
DESIGNED: BLAGROD 21 JAN 82	ISSUED: 142



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

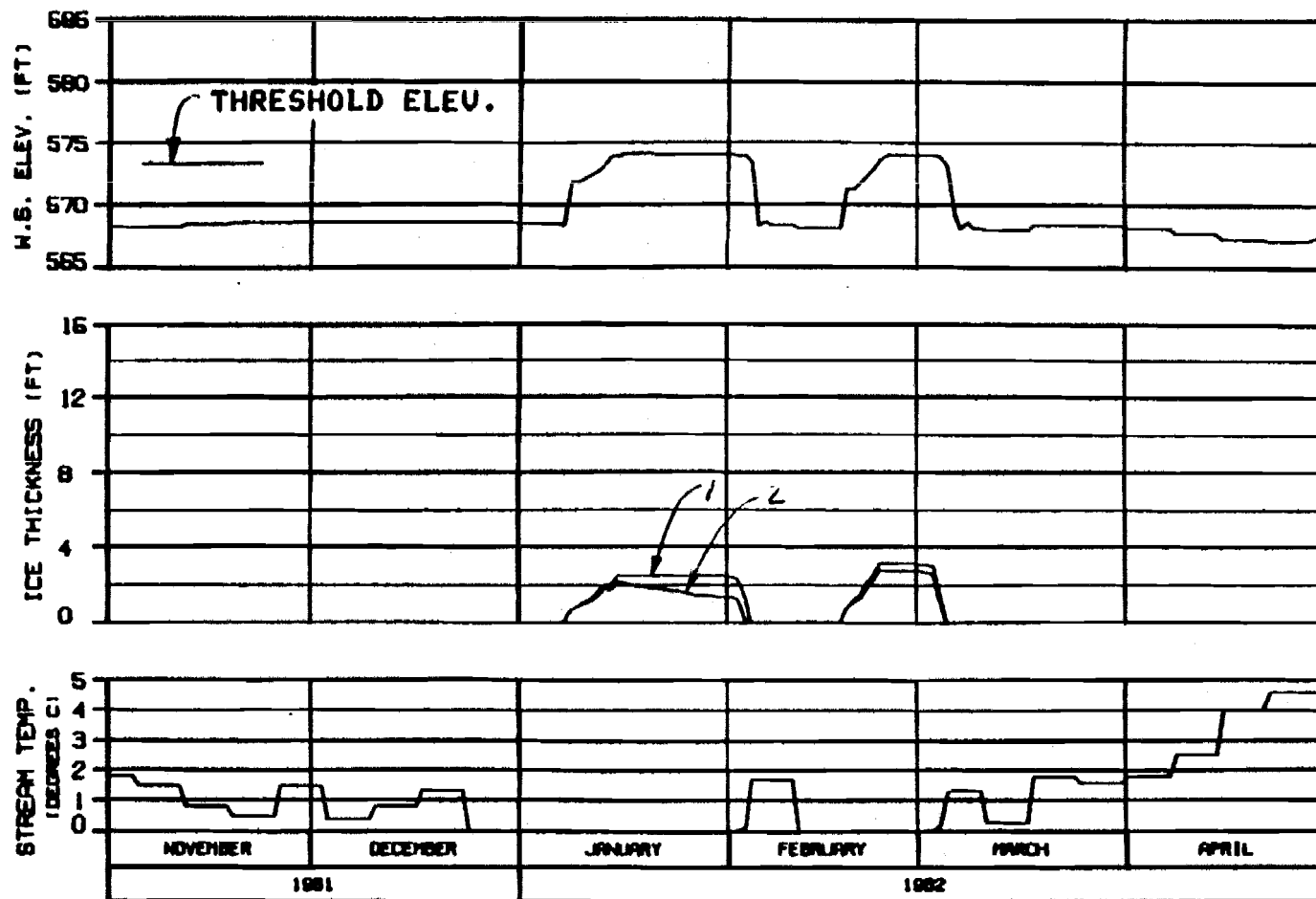
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBERD JOINT VENTURE

DESIGN: 810000 21 JUL 82 888.142



HEAD OF SLOUGH 8A (WEST)  
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

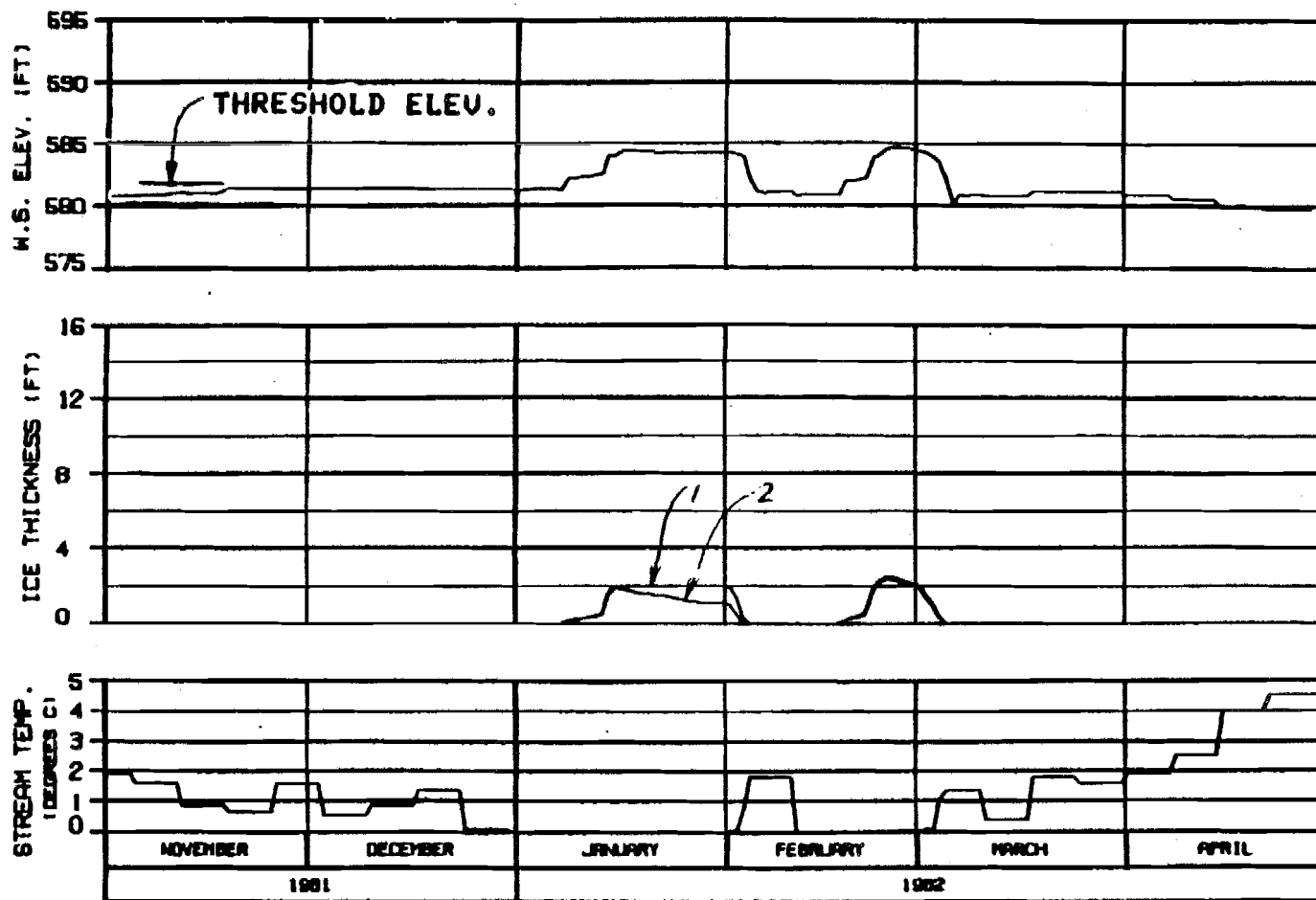
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HERZA-EBRACD JOINT VENTURE

DESIGN: GLENN J. J. 01 0000.142



# HEAD OF SLOUGH 8A (EAST) RIVER MILE : 127.10

## ICE THICKNESS LEGEND:

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

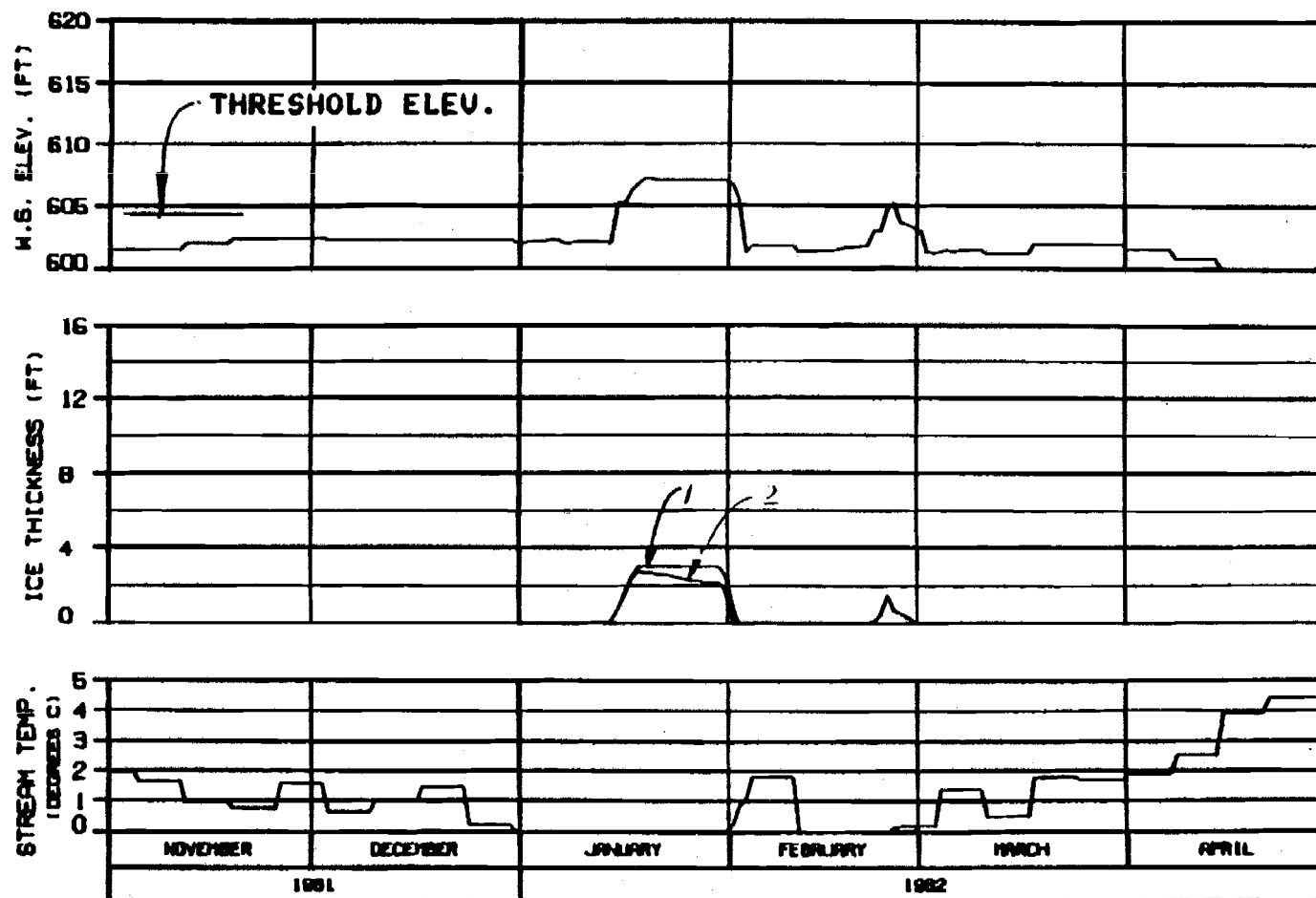
ALASKA POWER AUTHORITY

SLUSH PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HRZA-EBRSCO JOINT VENTURE

CHARTS: SLUSH 8A JAN 84 1000.148



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

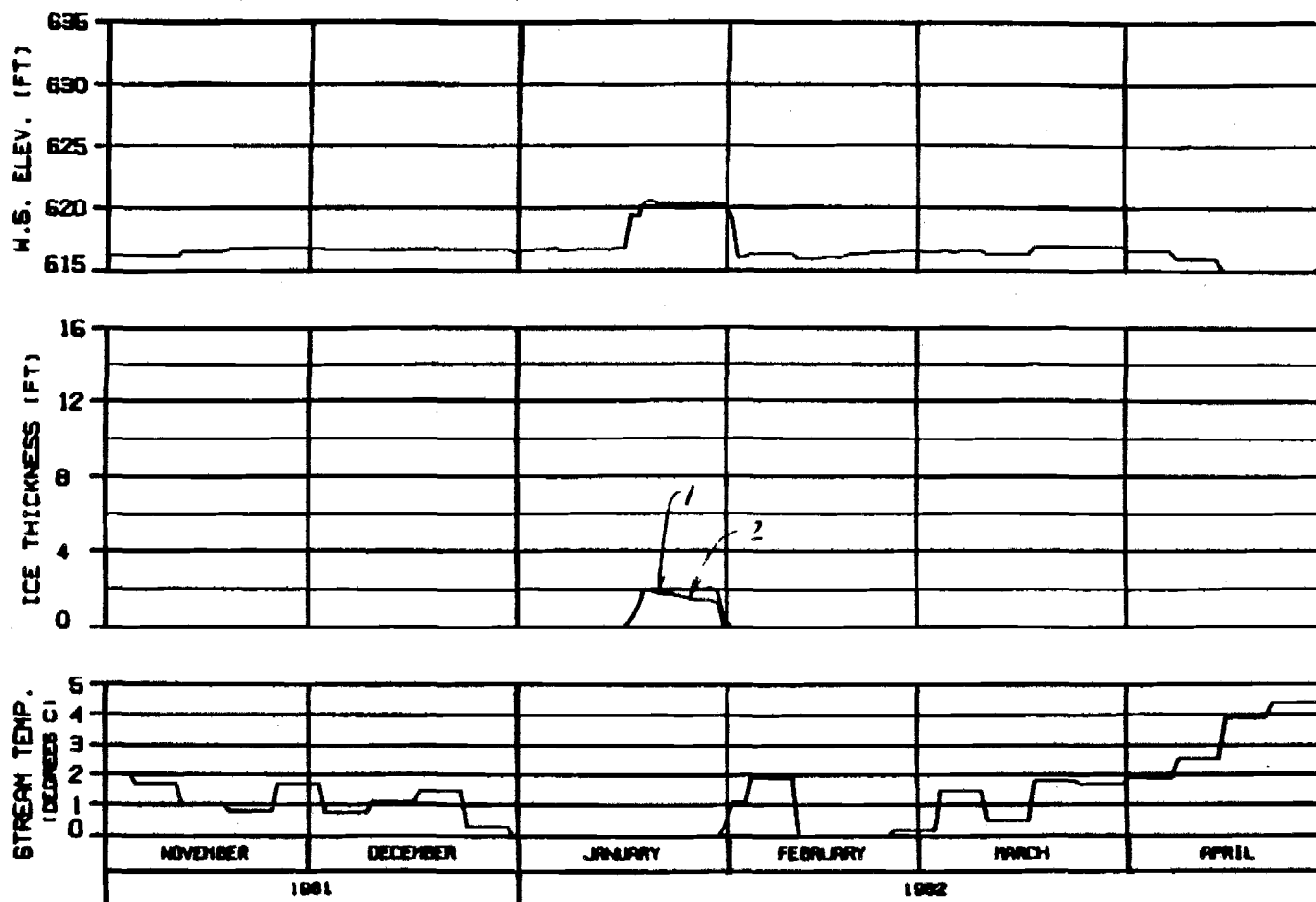
WARZA-EBASCO JOINT VENTURE

WORKSHEET: 01 JAN 84 000.148

OPTION?



OPTION?



# SIDE CHANNEL U/S OF SLOUGH 9 RIVER MILE : 130.60

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

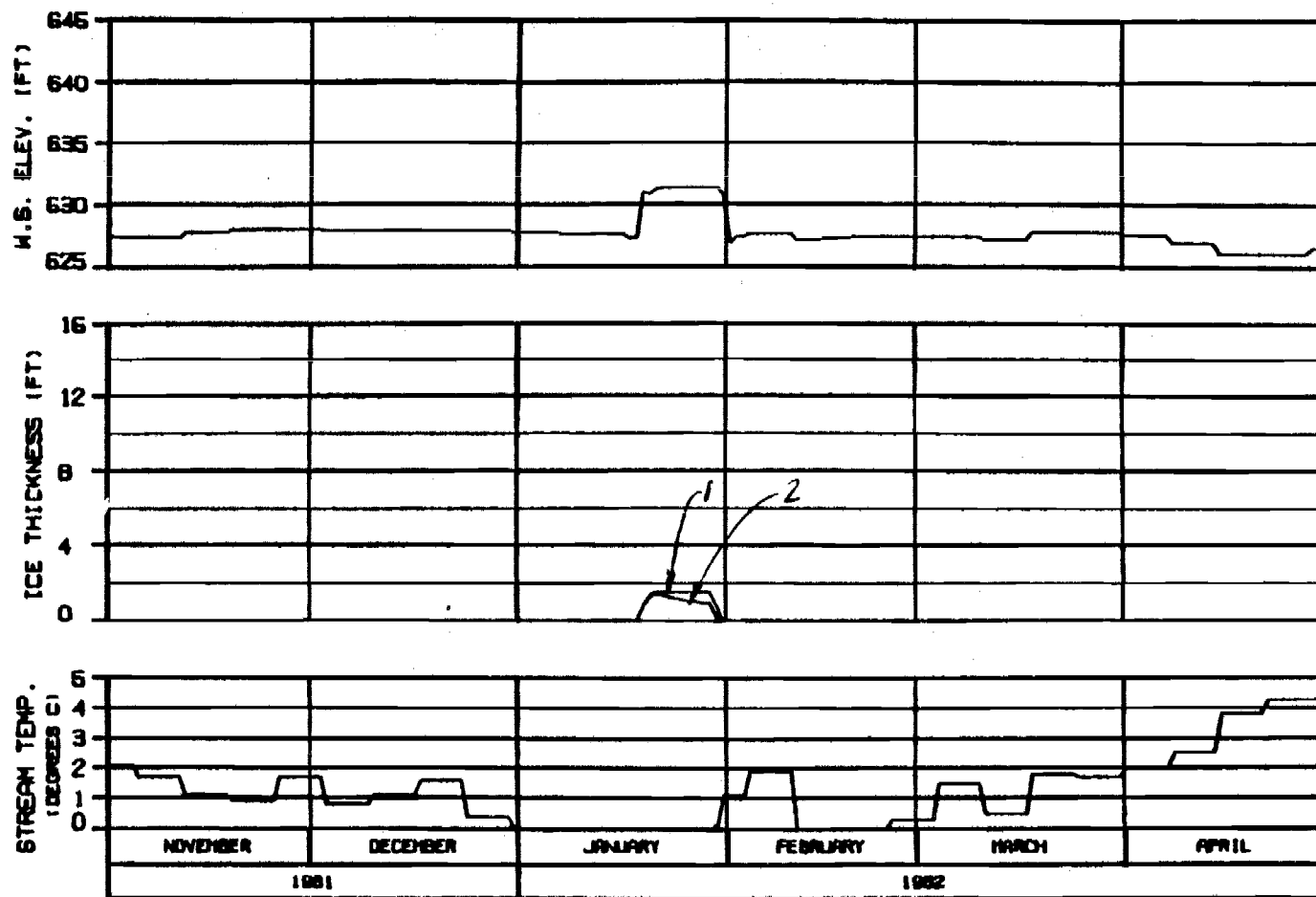
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTS: SLUSHED IN JAN 82 1996.142



**SIDE CHANNEL U/S OF 4TH JULY CREEK**  
**RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

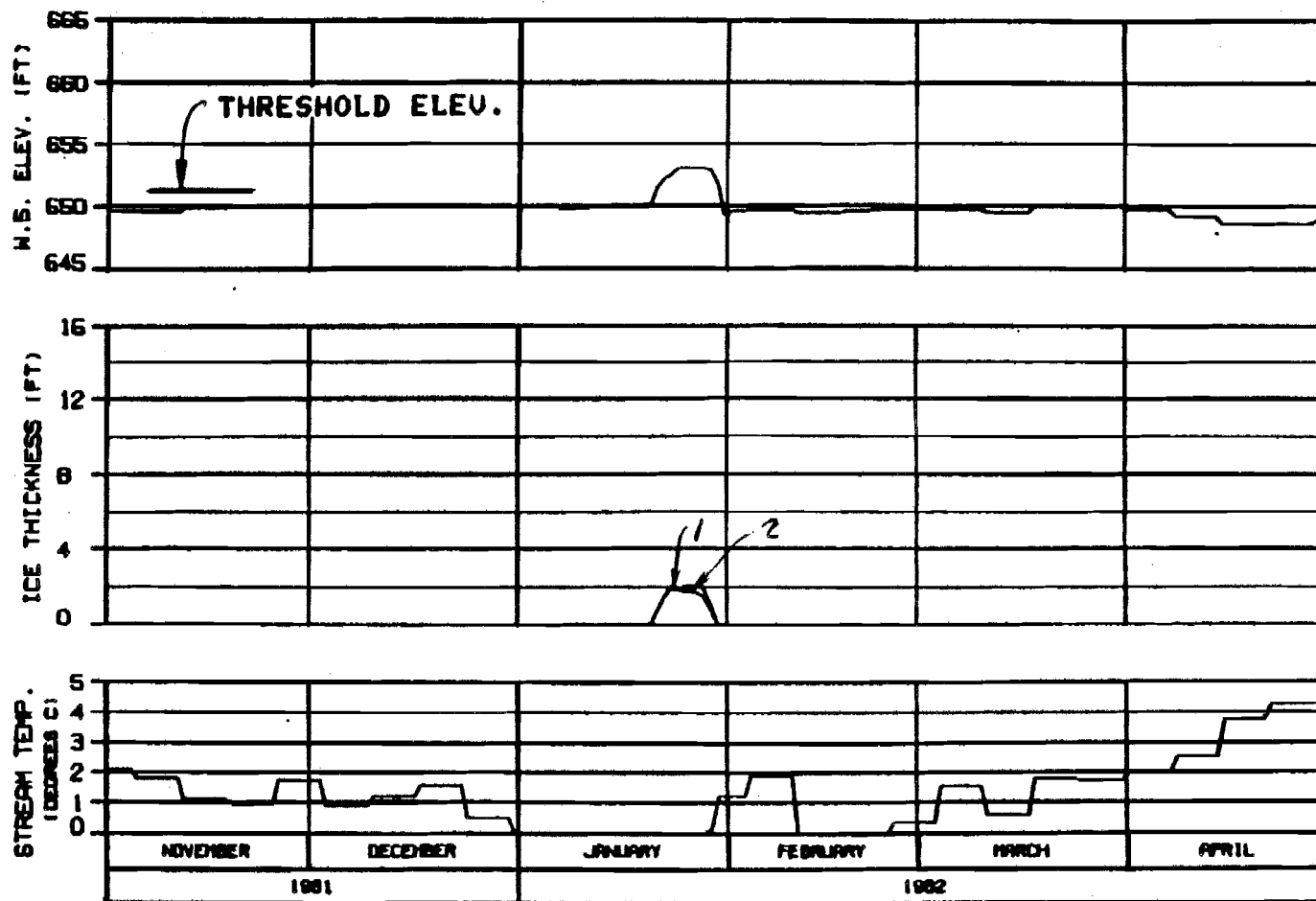
**ALASKA POWER AUTHORITY**

**EXISTING PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBRACO JOINT VENTURE**

DESIGNED BY JAS 81 1000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BULKY COMPONENT

HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
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REFERENCE RUN NO. : 8196CNA

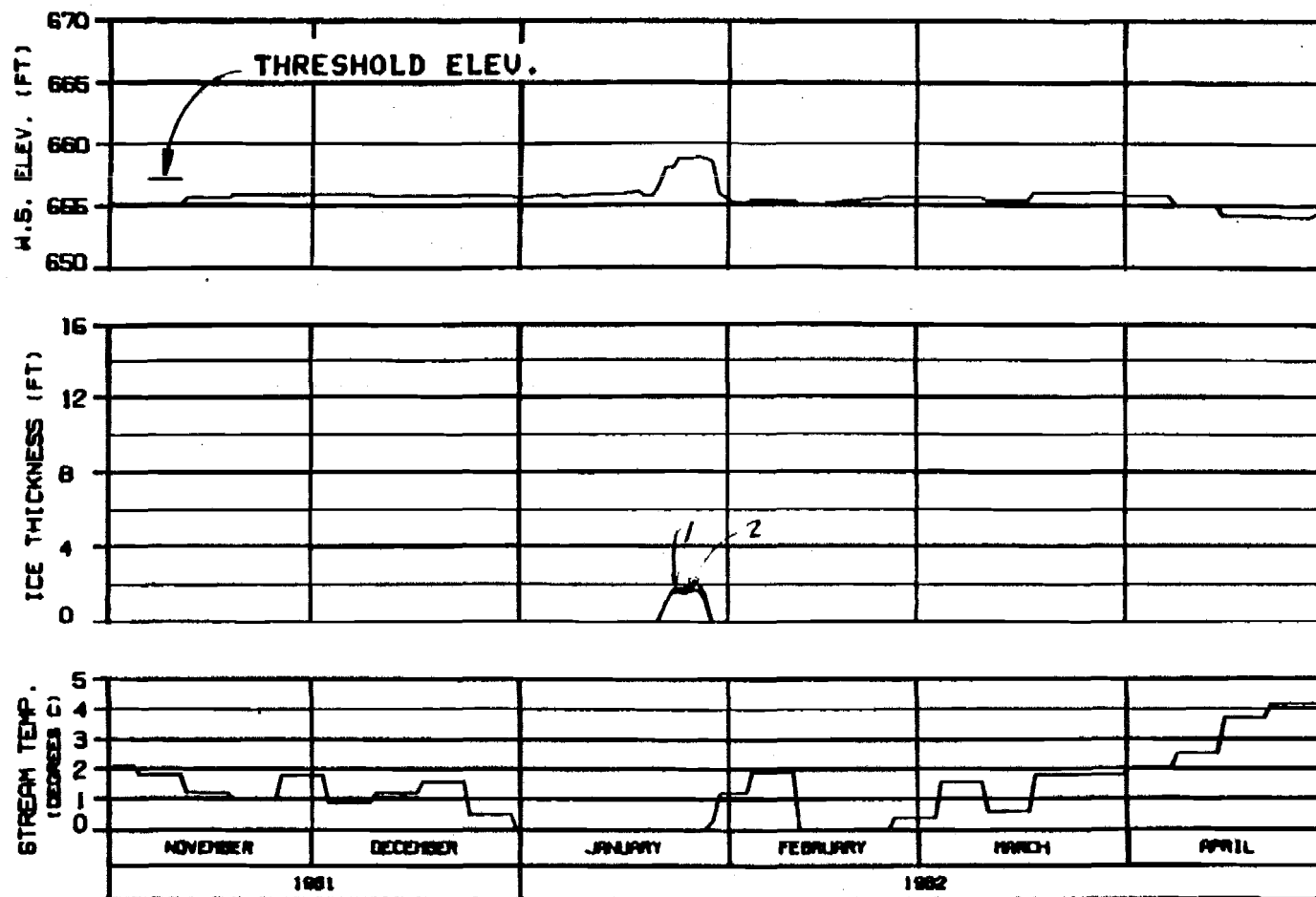
ALASKA POWER AUTHORITY

SUBITNA PROJECT

SUBITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARDA-EBR600 JOINT VENTURE

WORKSHEET: 8196CNA 21 JAN 82 1982.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

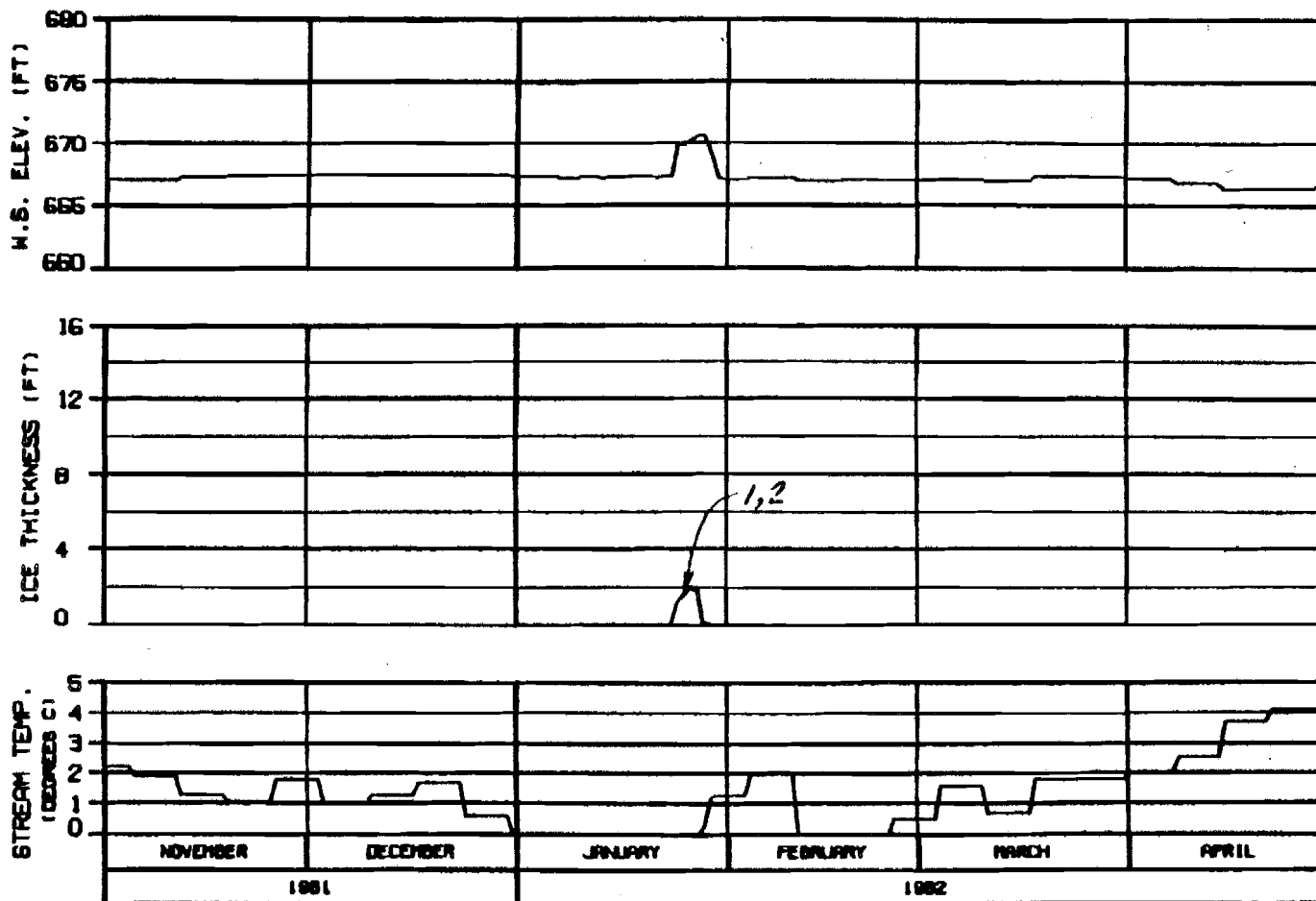
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARDA-EBASCO JOINT VENTURE

ORDER: AL 1000 21 JAN 82 0000.142



**SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
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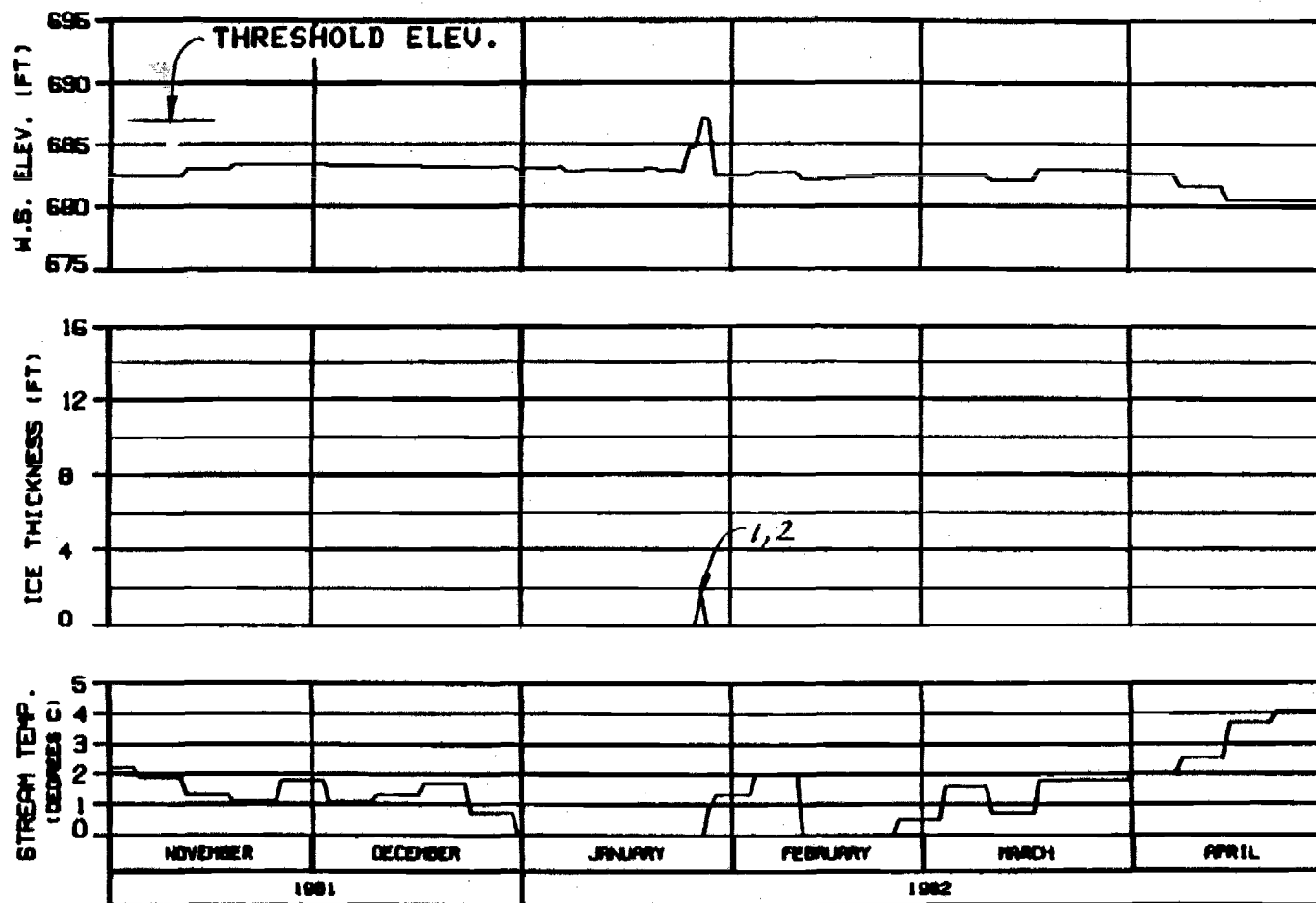
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HAZRA-ES&CO JOINT VENTURE**

DESIGN REPORT IN JAN 84 1985.148



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

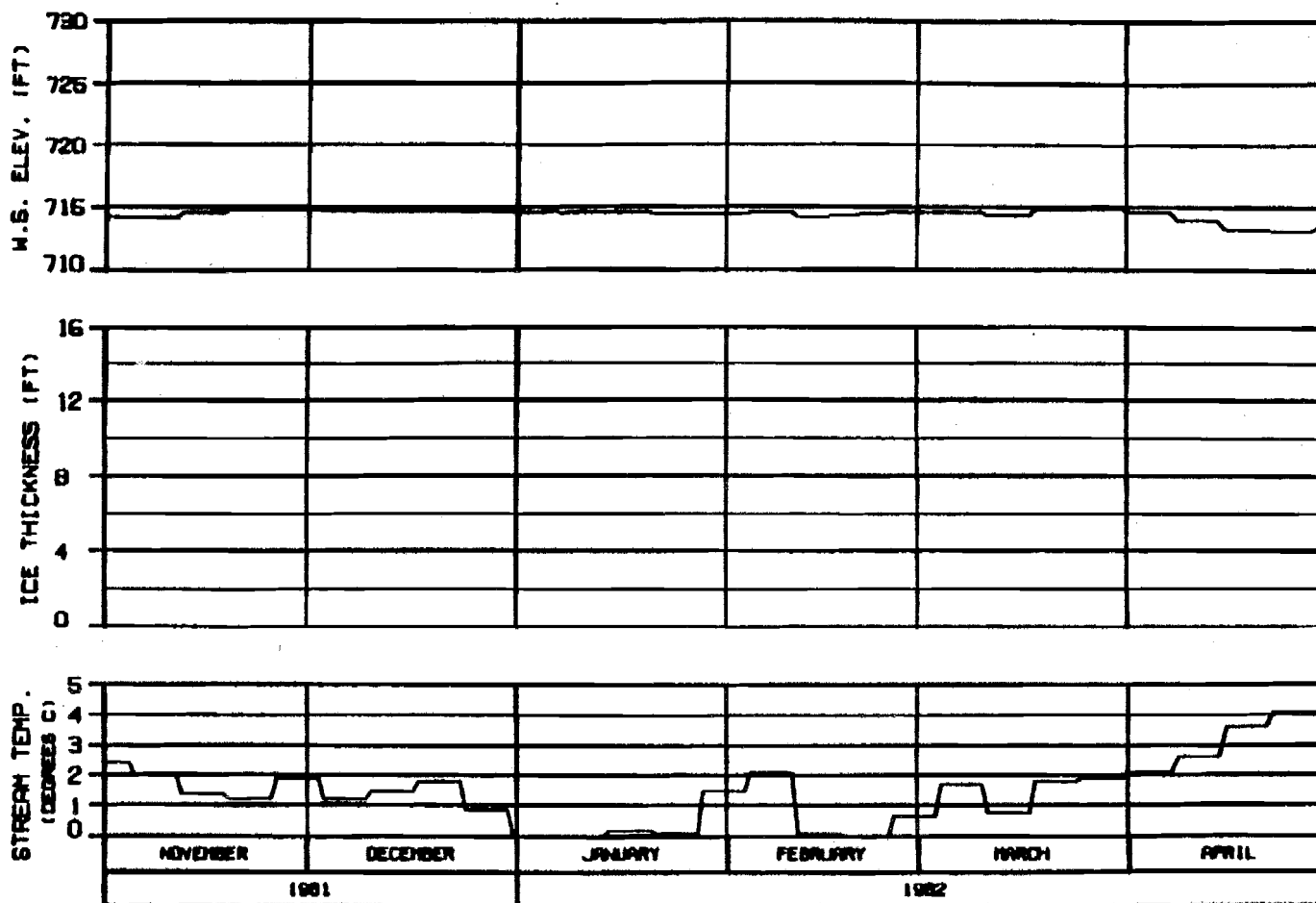
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

CHIEF, ALASKA POWER AUTHORITY

1982.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

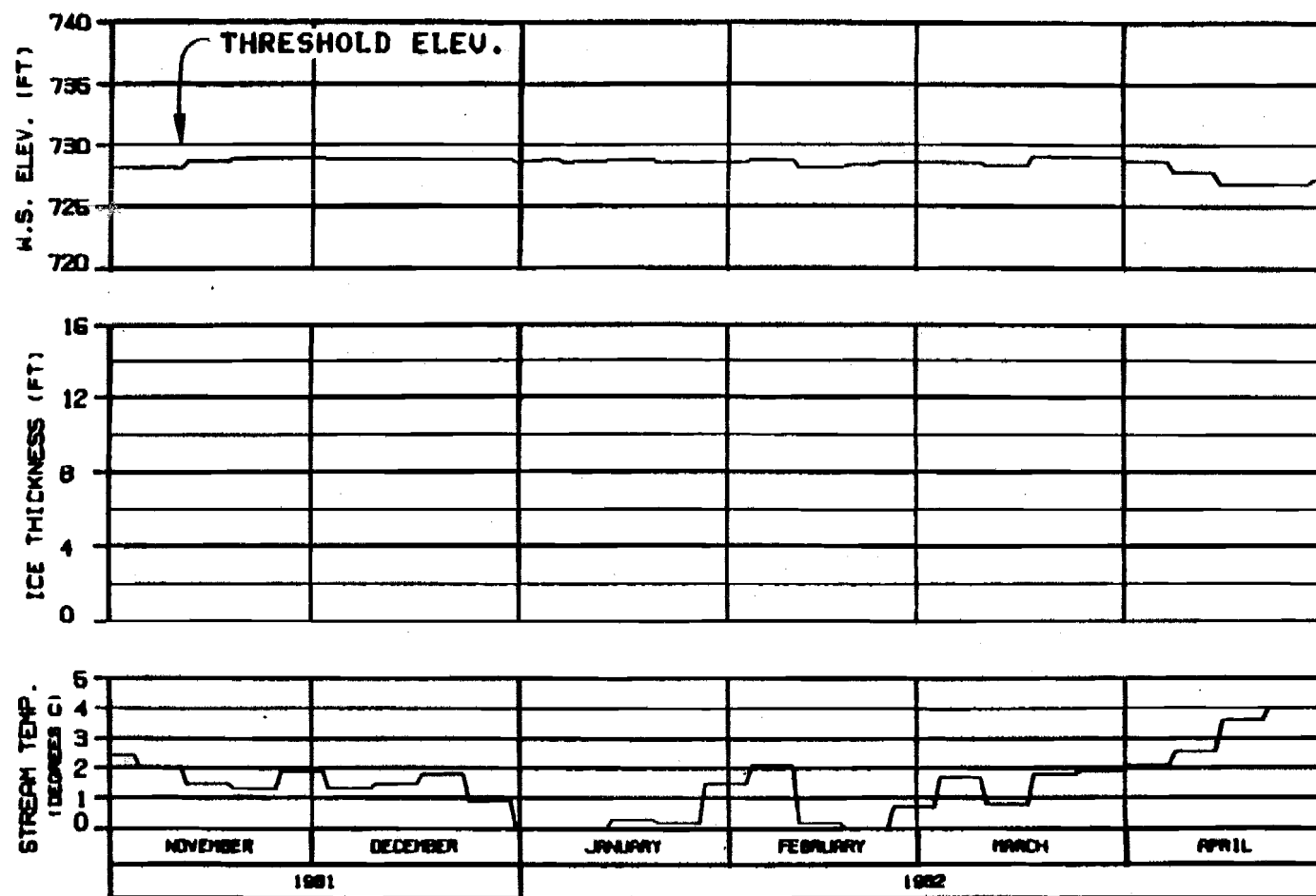
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRARD JOINT VENTURE

DESIGNED BY: [ ] IN: [ ] DATE: 04/82



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

PROJECT NAME

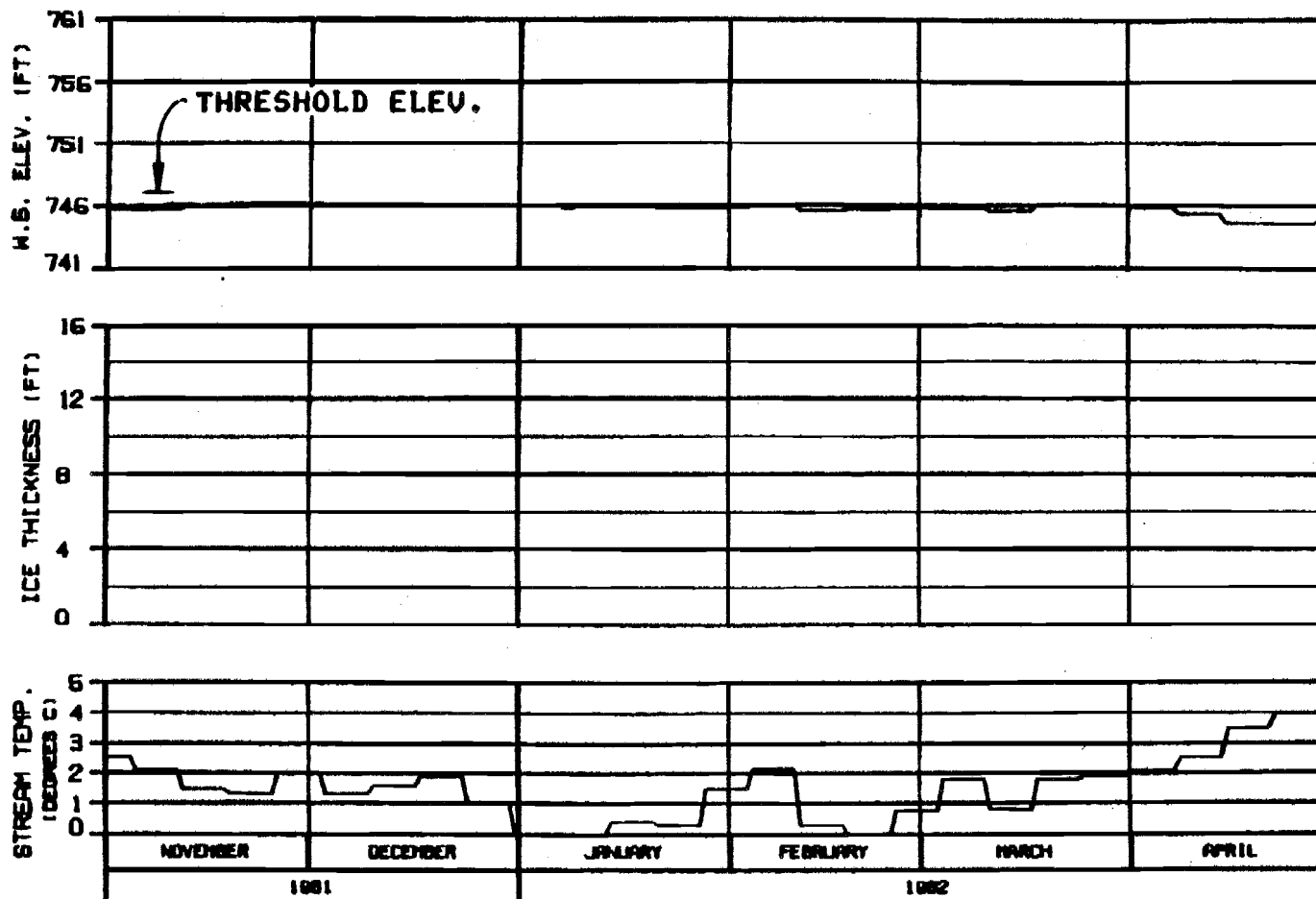
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DATE: 11/19/81 BY: JAS/BA

NO. 142





SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8196CNA

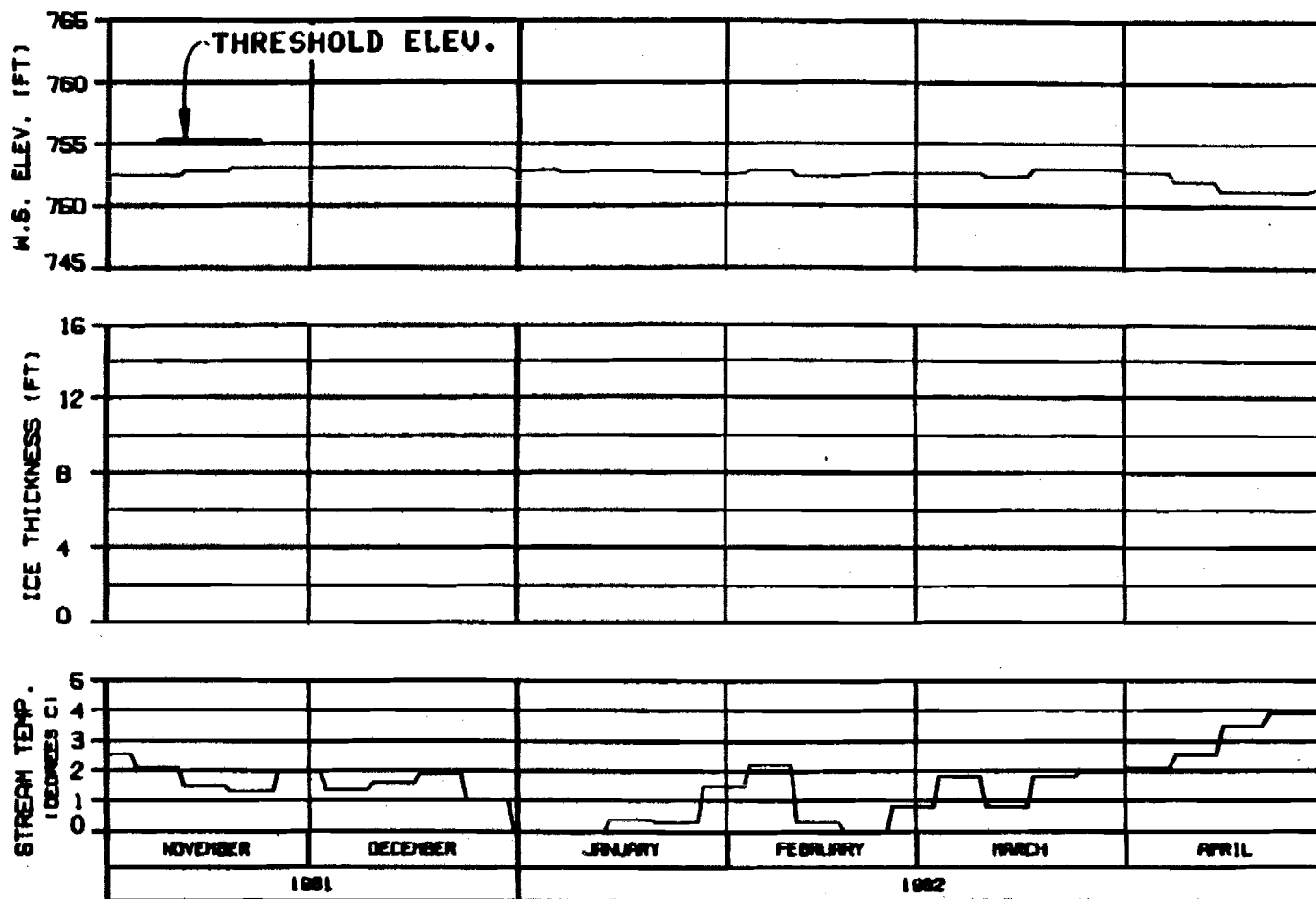
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EDGECO JOINT VENTURE

ISSUED: 04/08/82 BY: JH/82 000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 81960NA

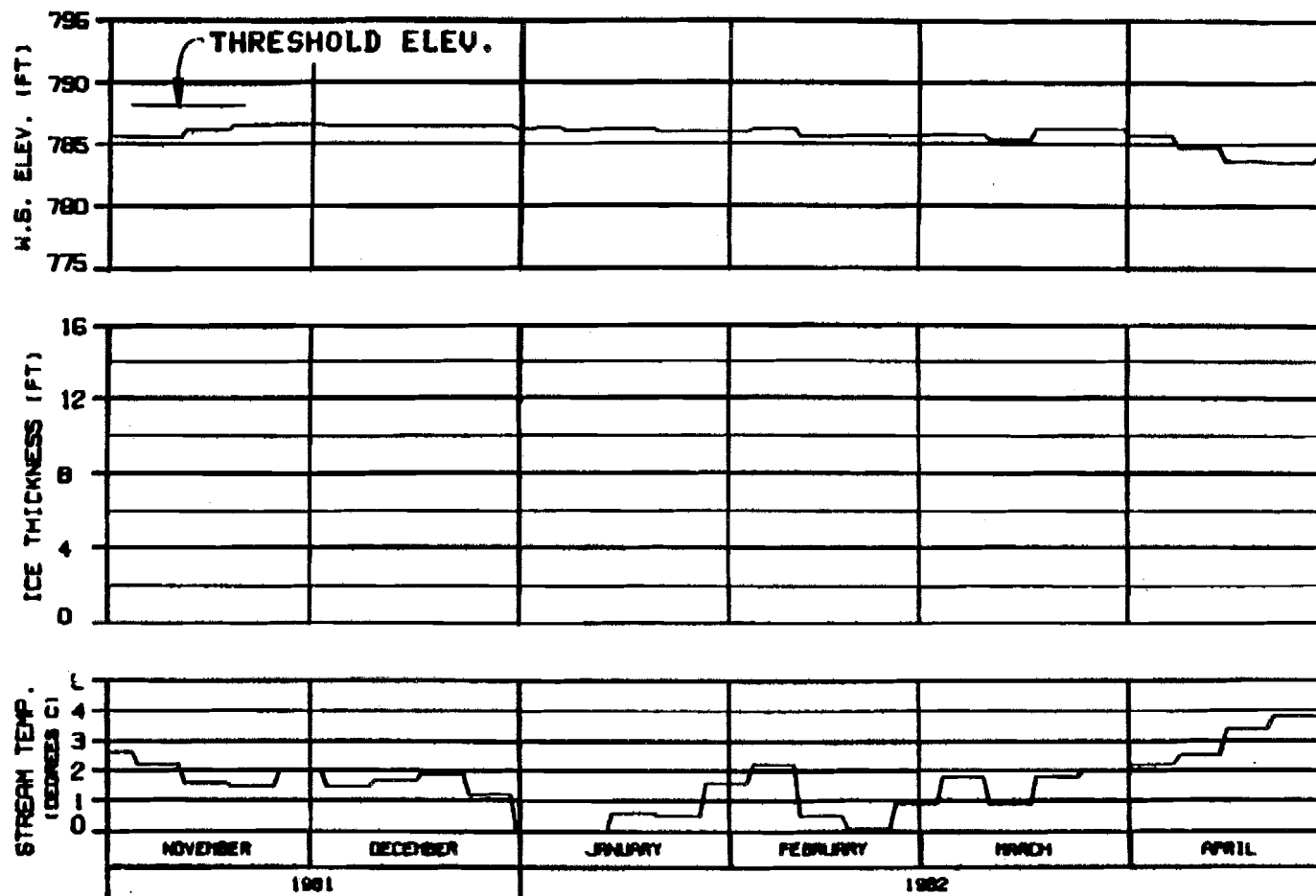
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARDA-EDBSCO JOINT VENTURE

ISSUED: 8-1-82 BY: JAC/CH 8208.142



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8196CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

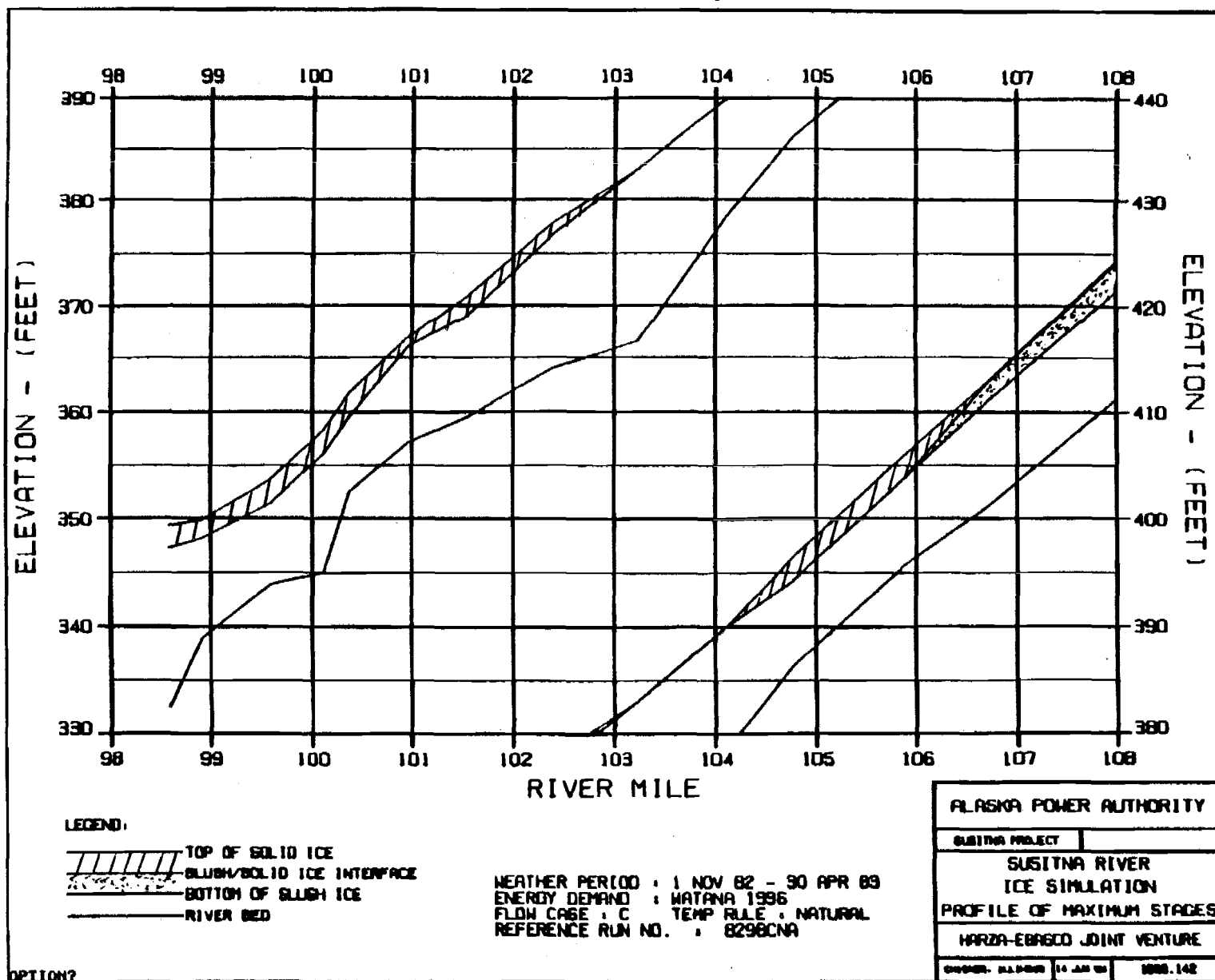
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

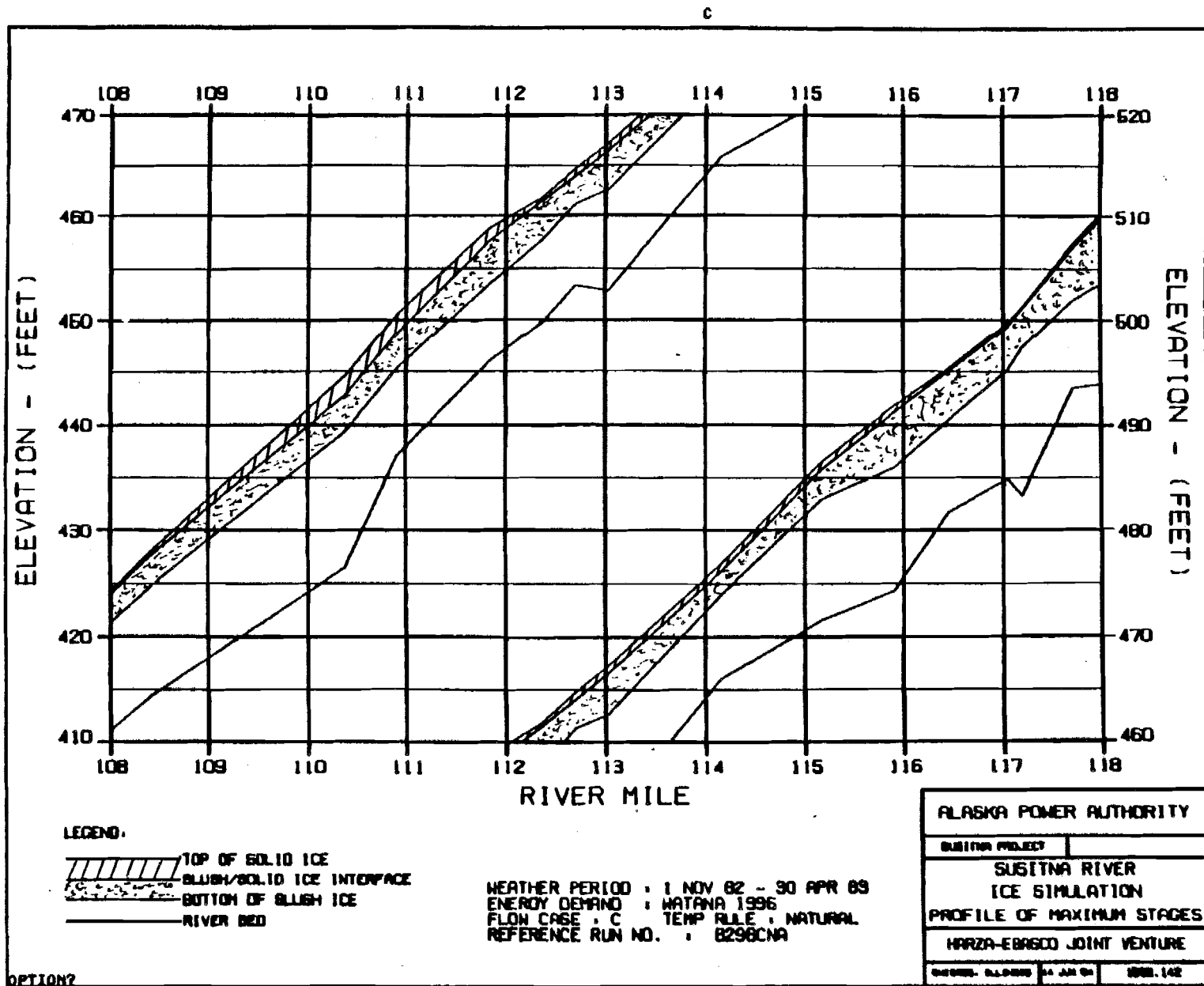
HARZA-EBRARD JOINT VENTURE

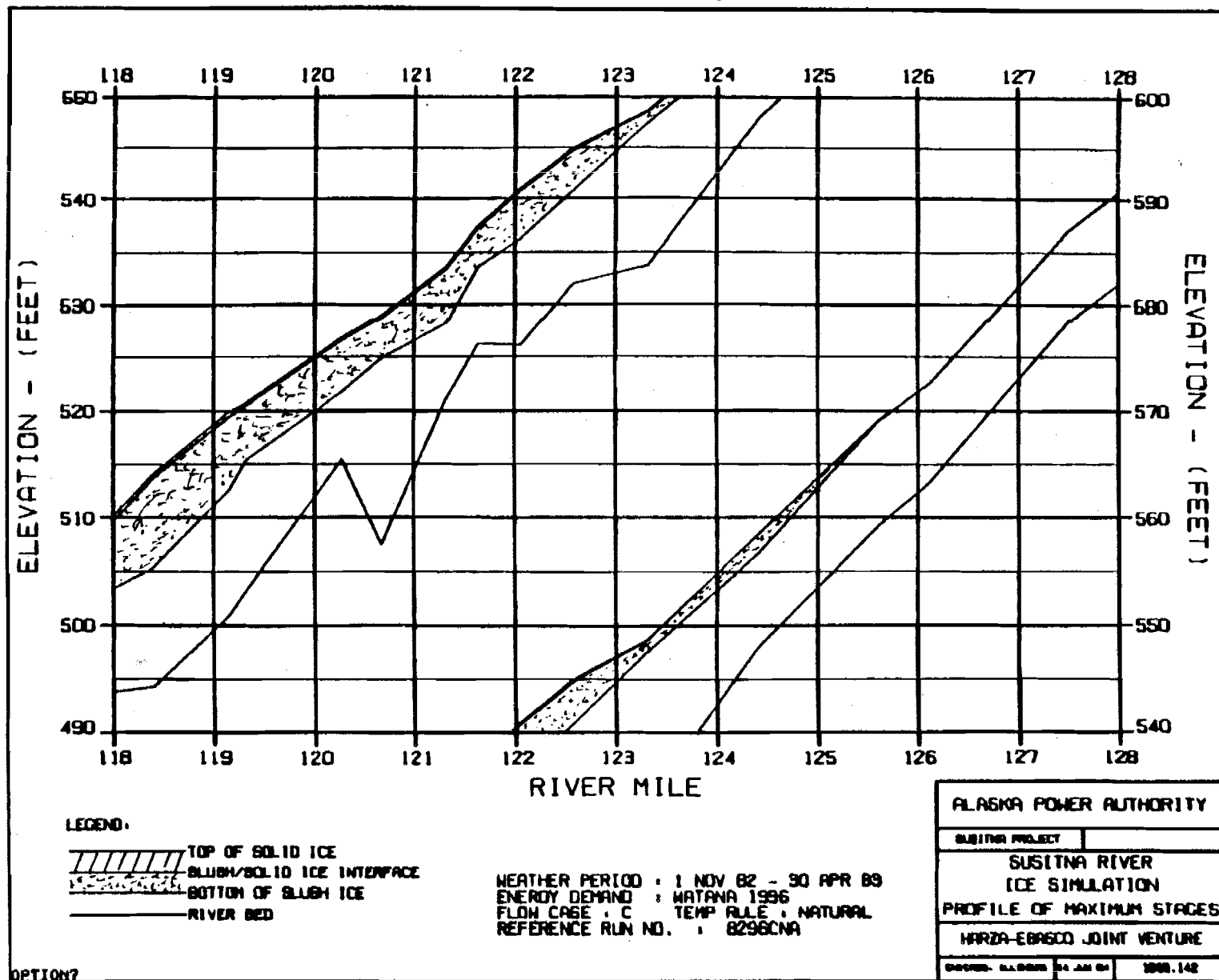
ISSUED: ALPHEUS IN JAN 82 1000.142

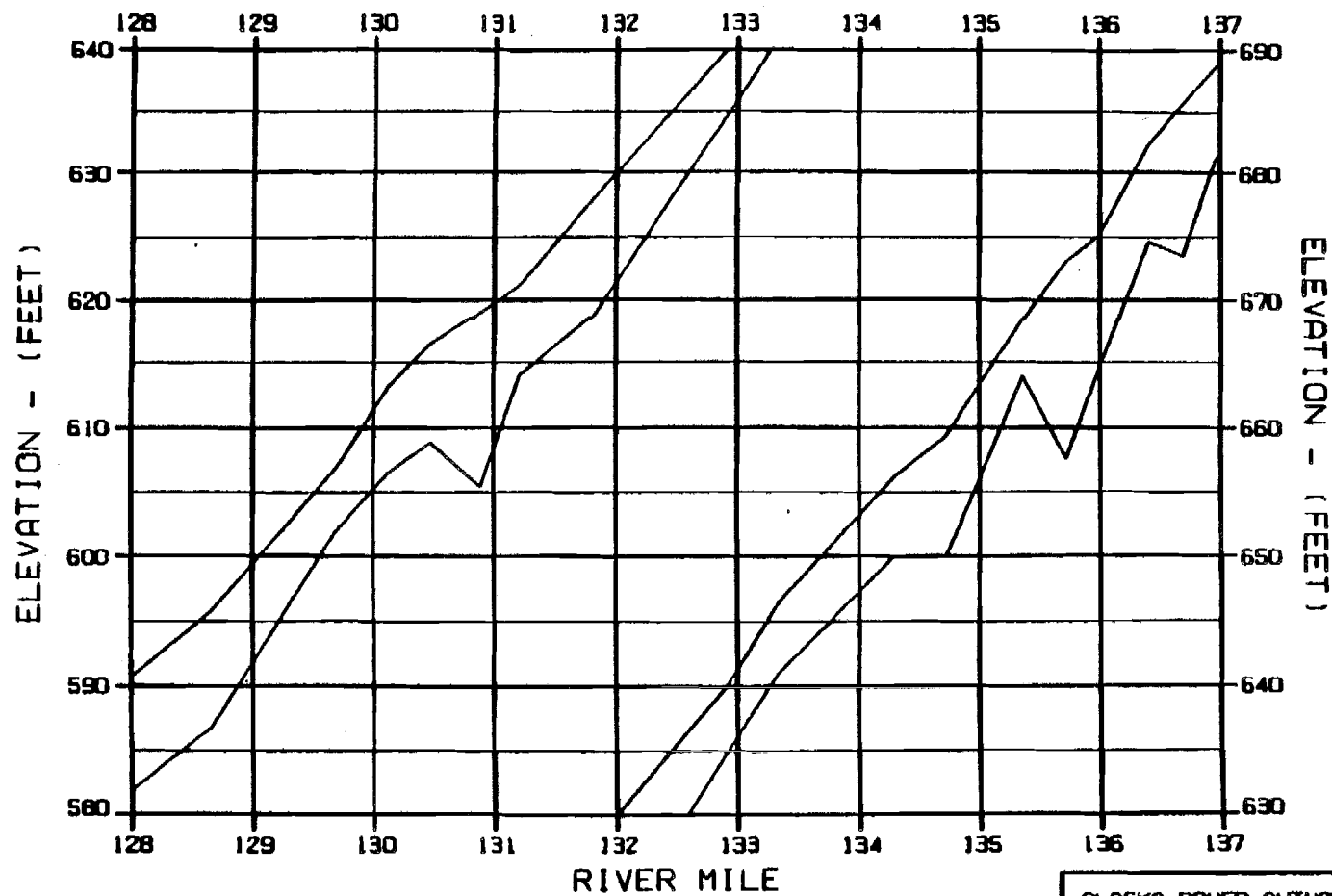
OPTION?

# EXHIBIT I

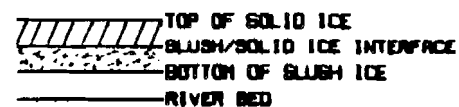








LEGEND:



WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8298CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER

ICE SIMULATION

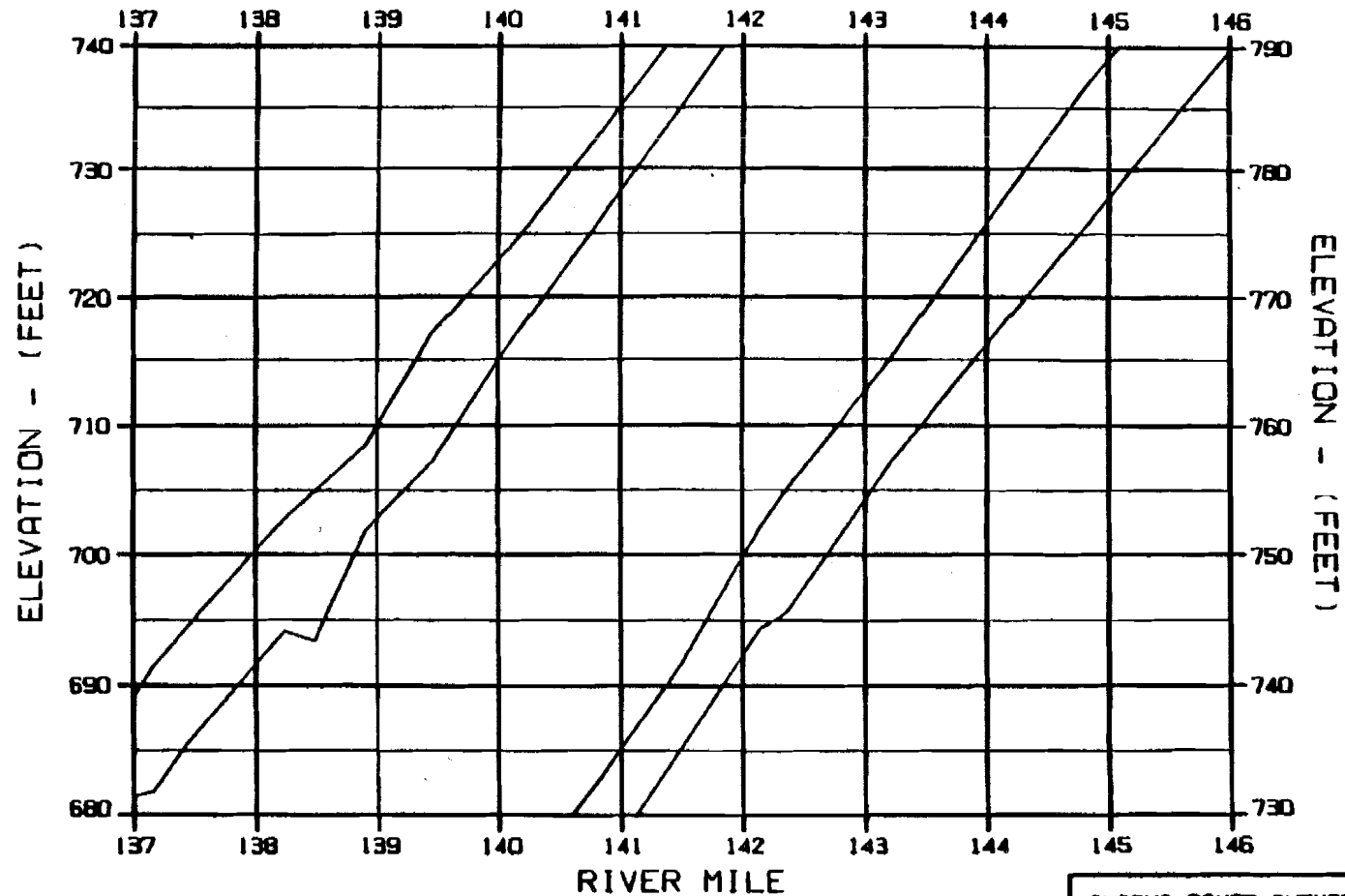
PROFILE OF MAXIMUM STAGES

WARZA-EBRACO JOINT VENTURE





CHARTED: ALASKA 82 JAN 83 1998.142

OPTION 7





## LEGEND:

 TOP OF SOLID ICE  
 SLUSH/SOLID ICE INTERFACE  
 BOTTOM OF SLUSH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8298CNA

ALASKA POWER AUTHORITY

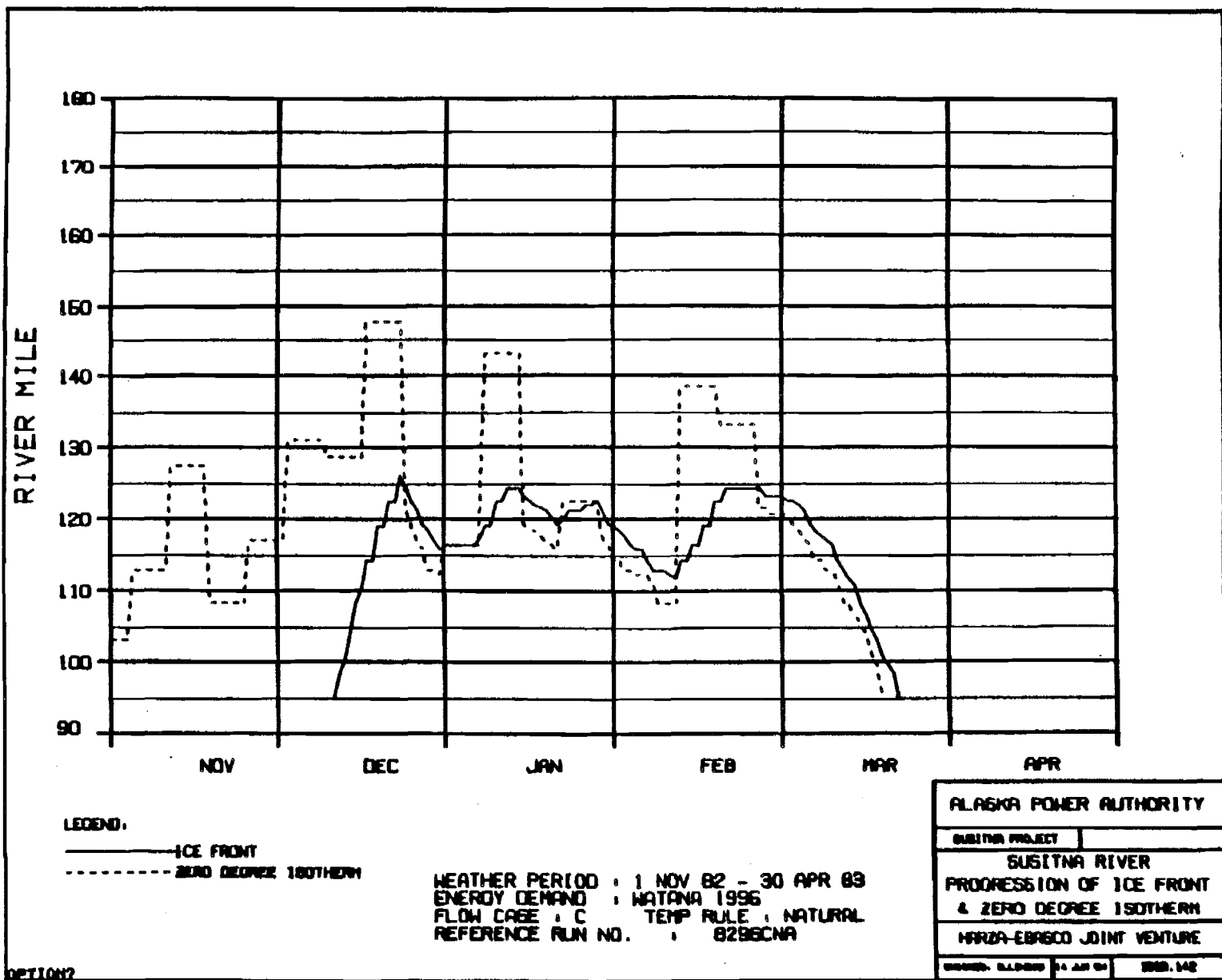
SUSITNA PROJECT

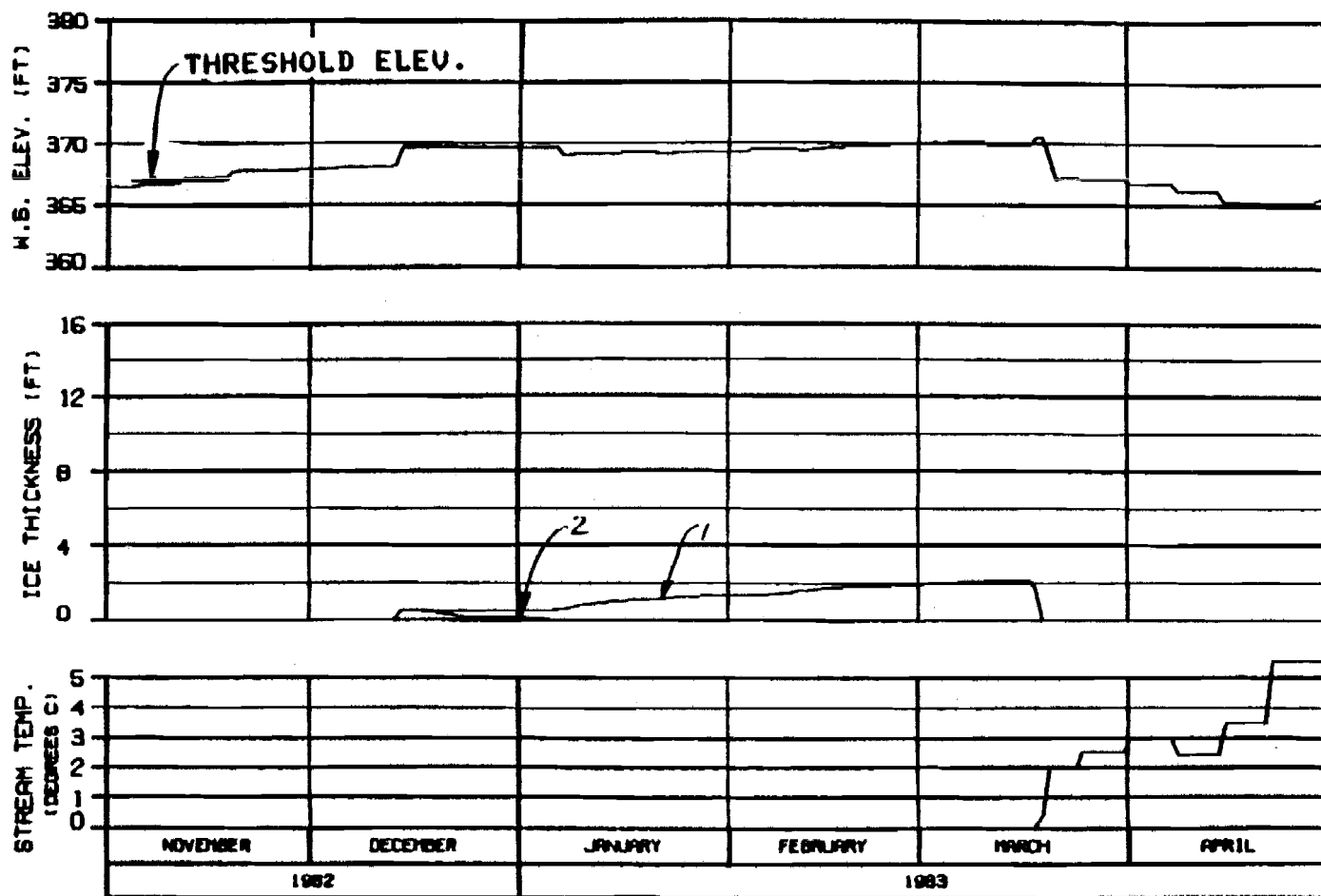
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HARZA-EBRACO JOINT VENTURE

DESIGN - 82-0425 5A JAN 83 1000.142

OPTION?





# HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

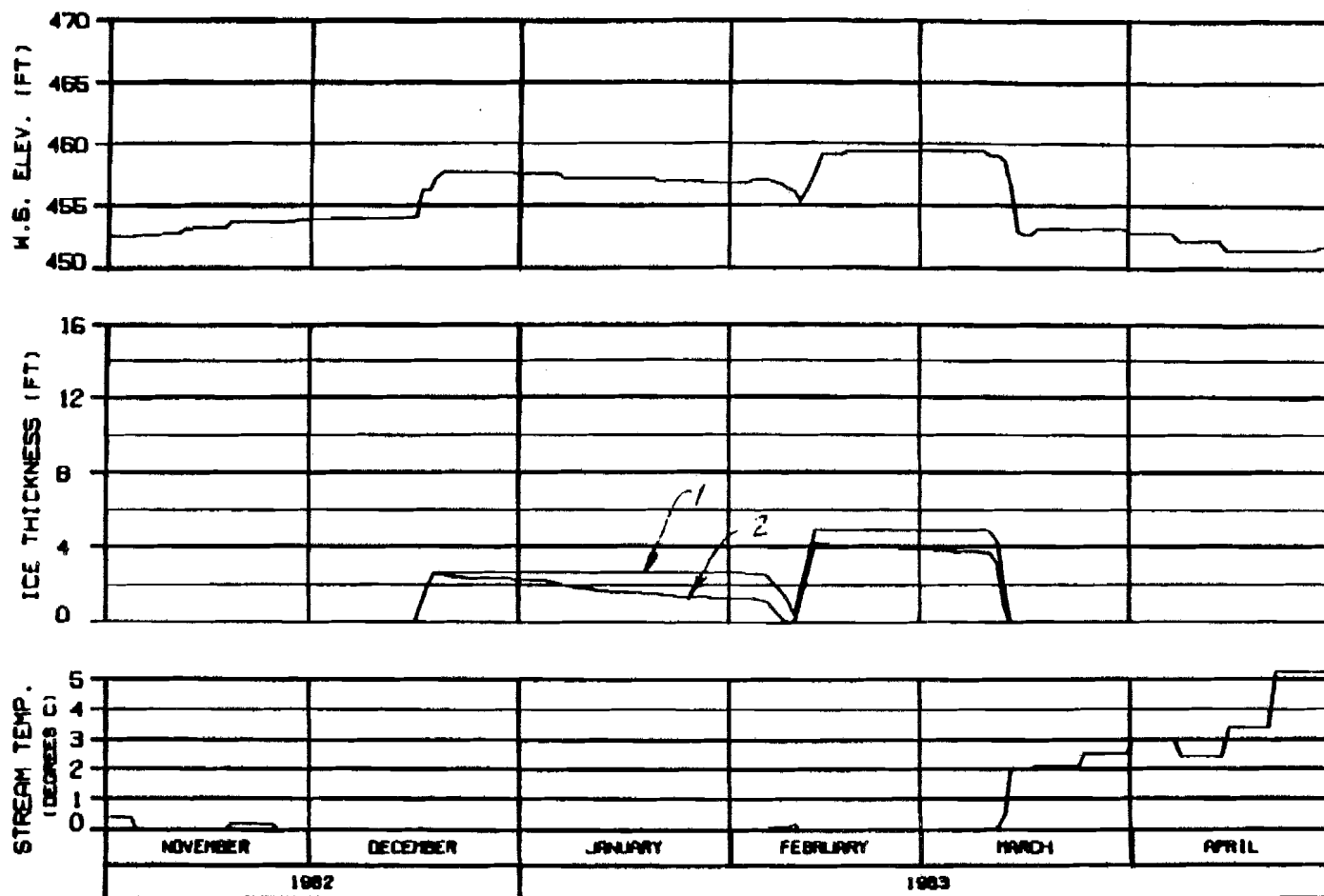
## ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGN: BLDG 10 JAN 84 1000.142



# **SIDE CHANNEL AT HEAD OF GASH CREEK** **RIVER MILE : 112.00**

## **ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

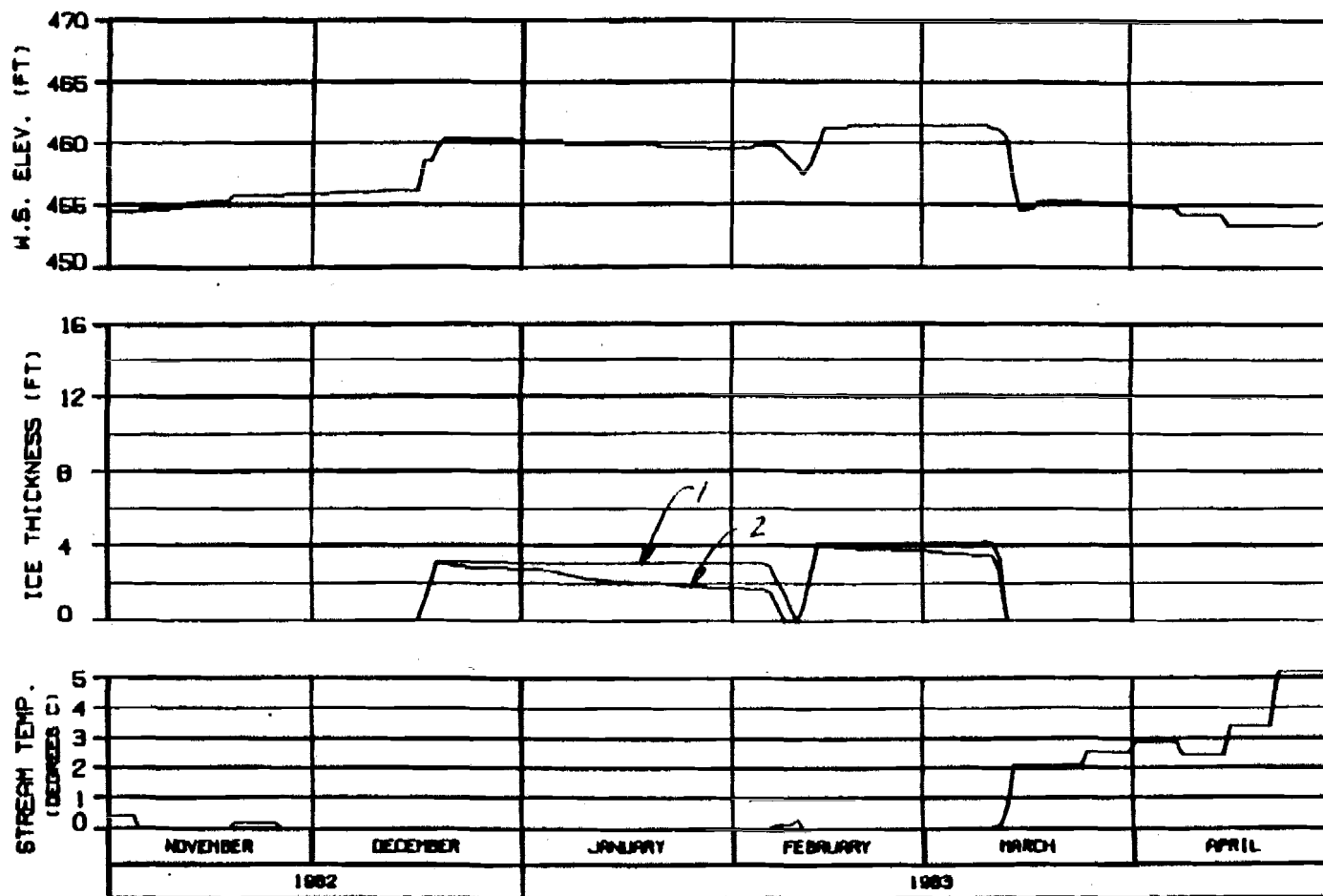
## **ALASKA POWER AUTHORITY**

SUSITNA PROJECT

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**WARZA-EBASCO JOINT VENTURE**

ISSUED: 11/19/82 08 JAN 83 1000.142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

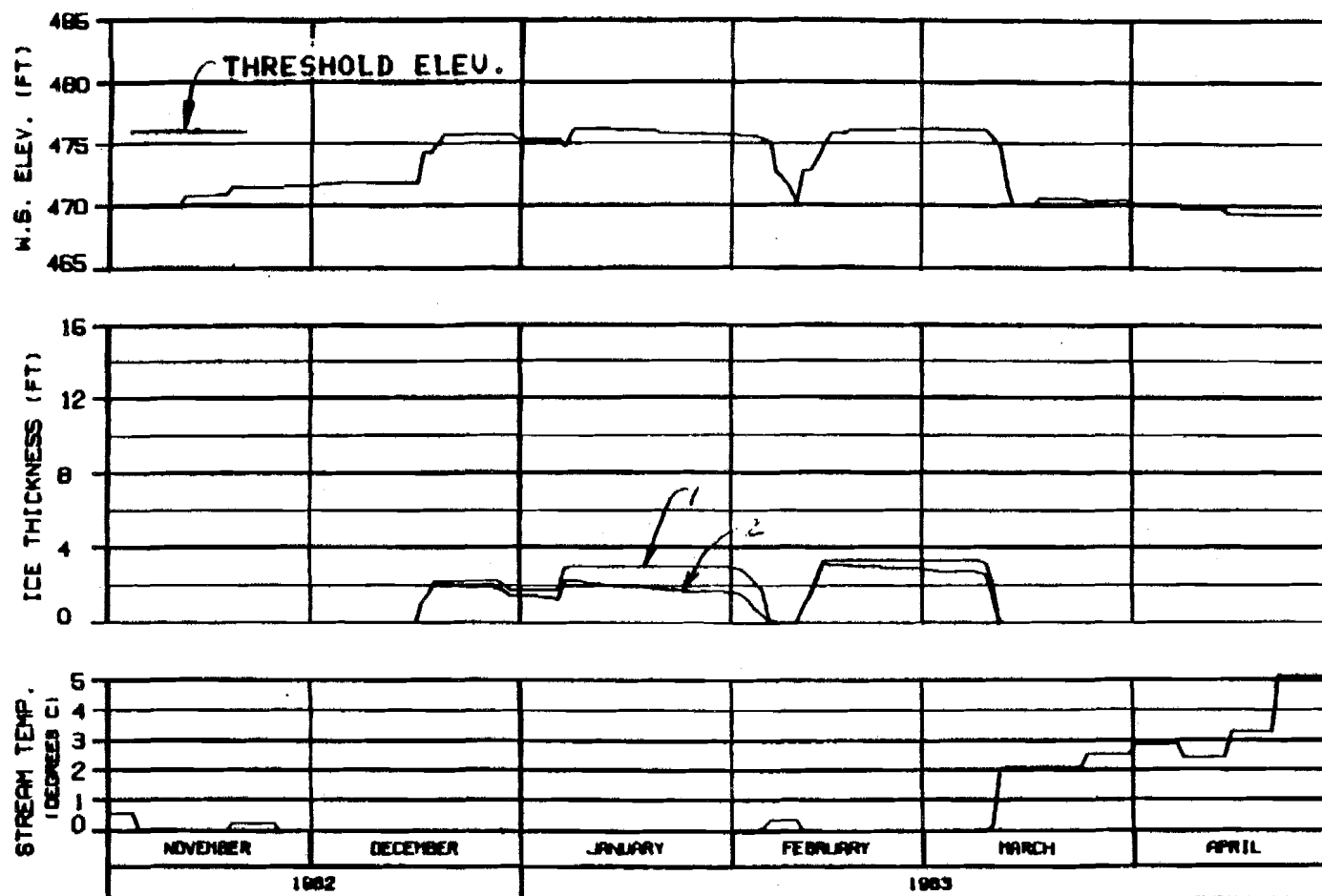
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGN: 82-0000 20 JAN 83 1000.142



# HEAD OF SLOUGH 8 RIVER MILE : 114.10

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

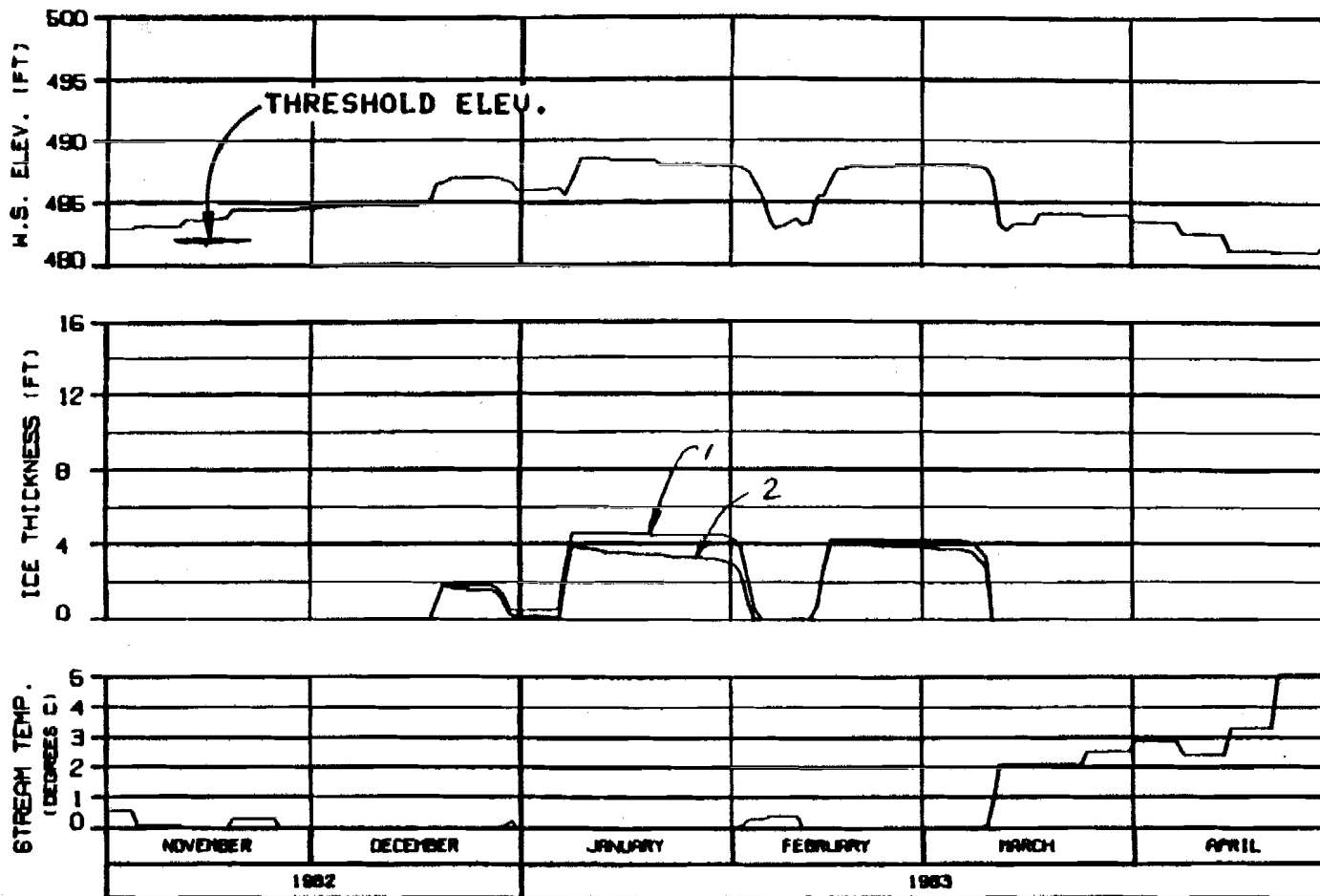
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HRZA-EBASCO JOINT VENTURE

ISSUED: 04/08/83 BY: JAM/DA 1000.142



**SIDE CHANNEL MSII  
RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : HATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

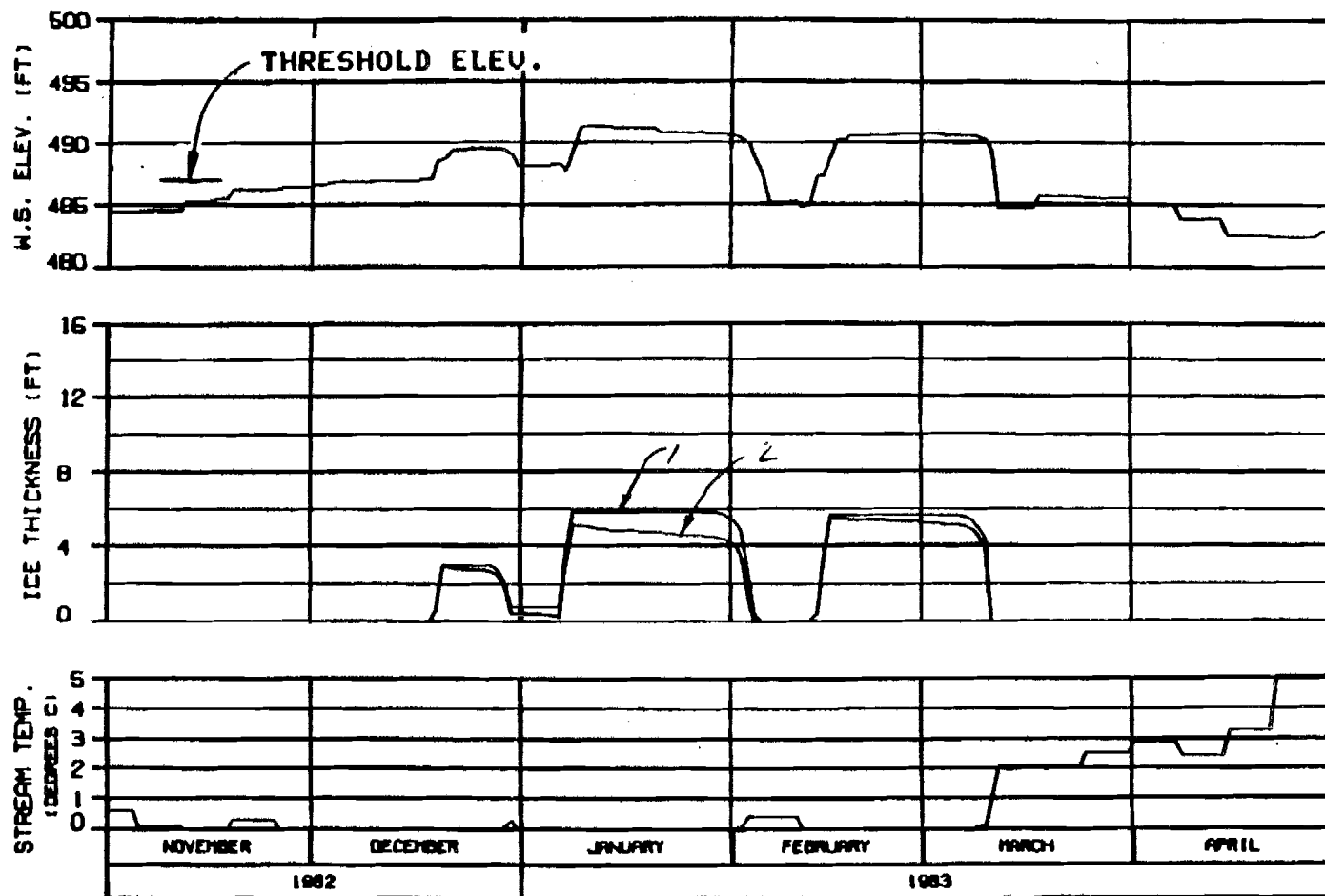
**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGN - ALASKA

30 JAN 84

0000.142



HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

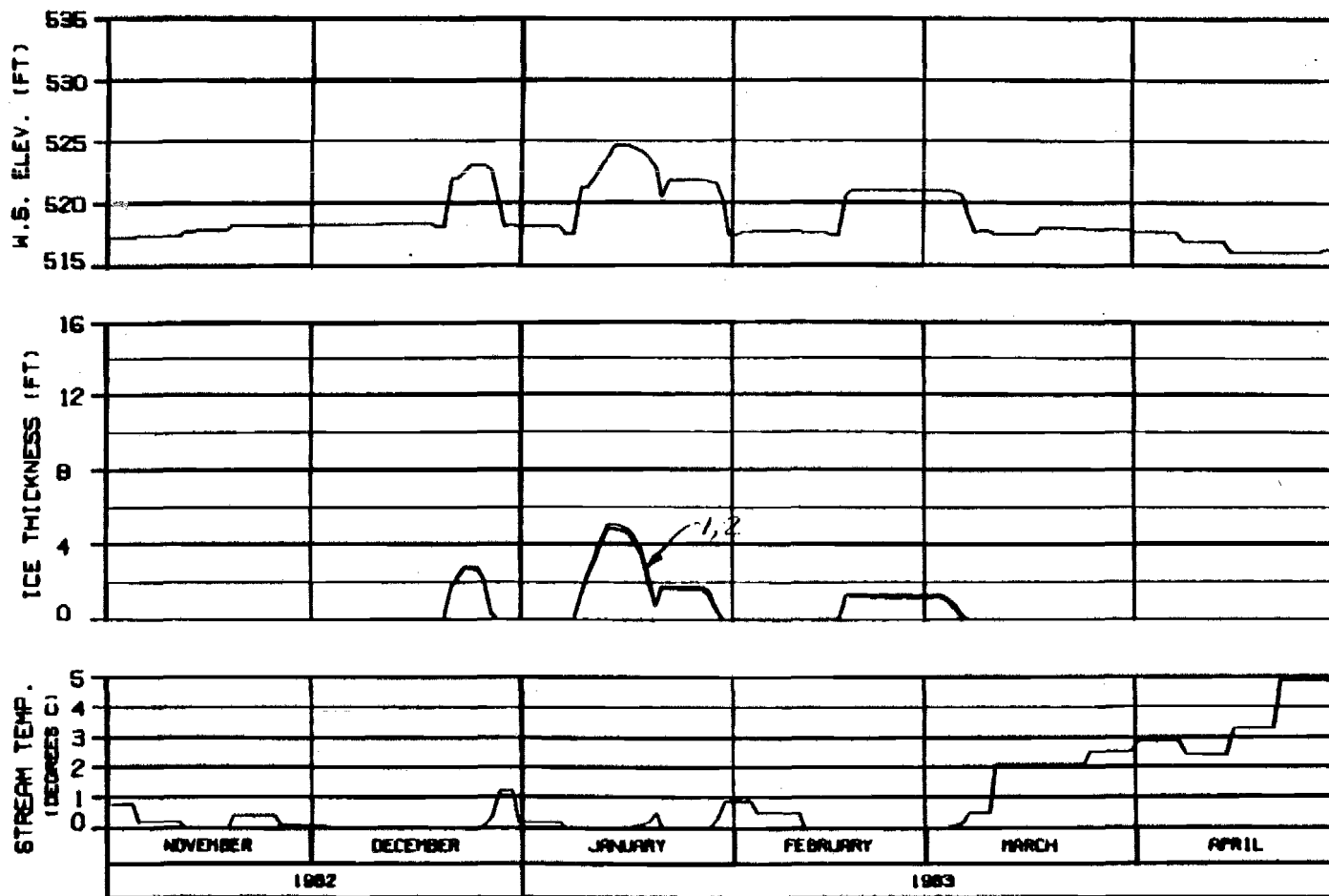
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTS ALONG TO JAN 84

1982.142





ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

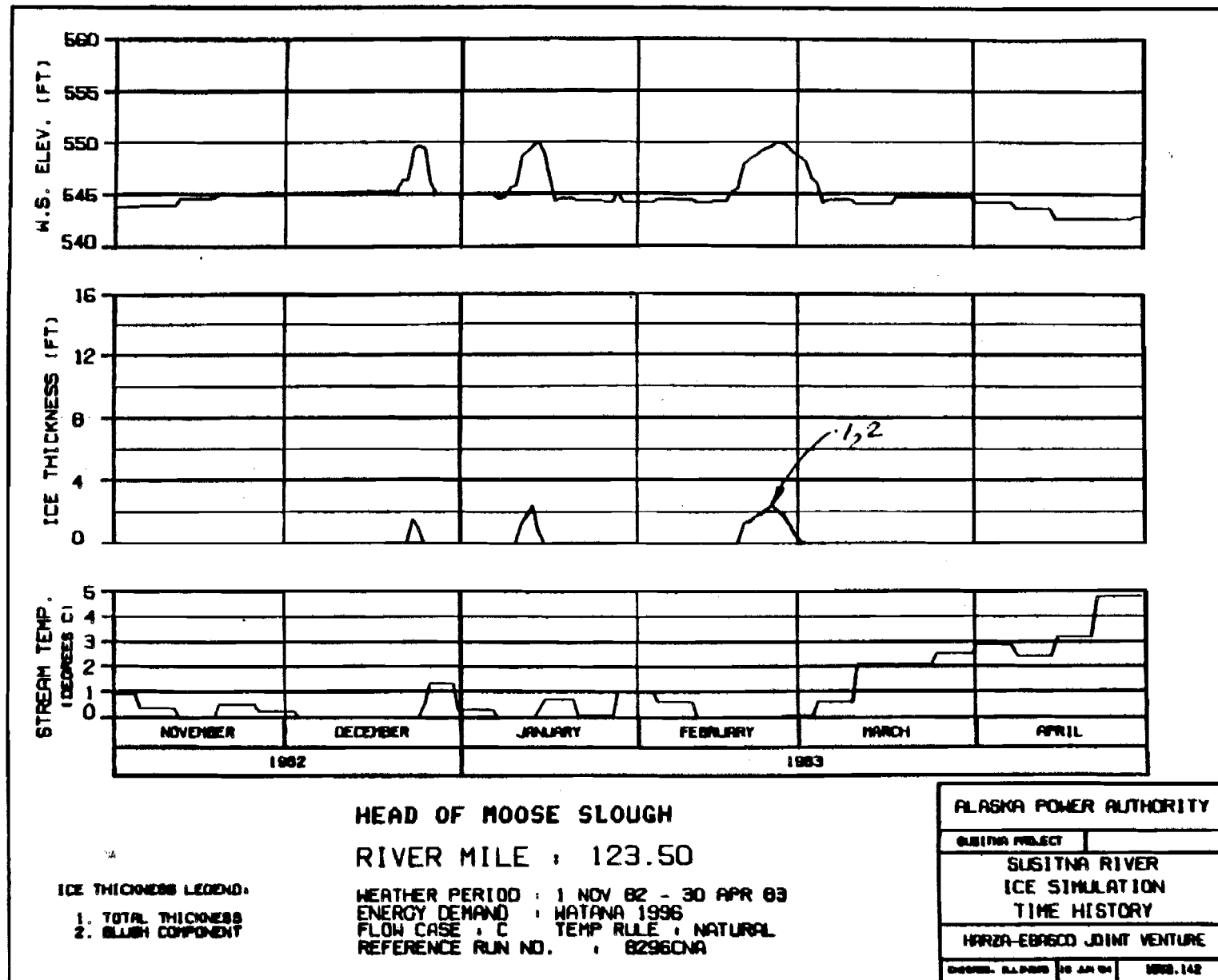
ALASKA POWER AUTHORITY

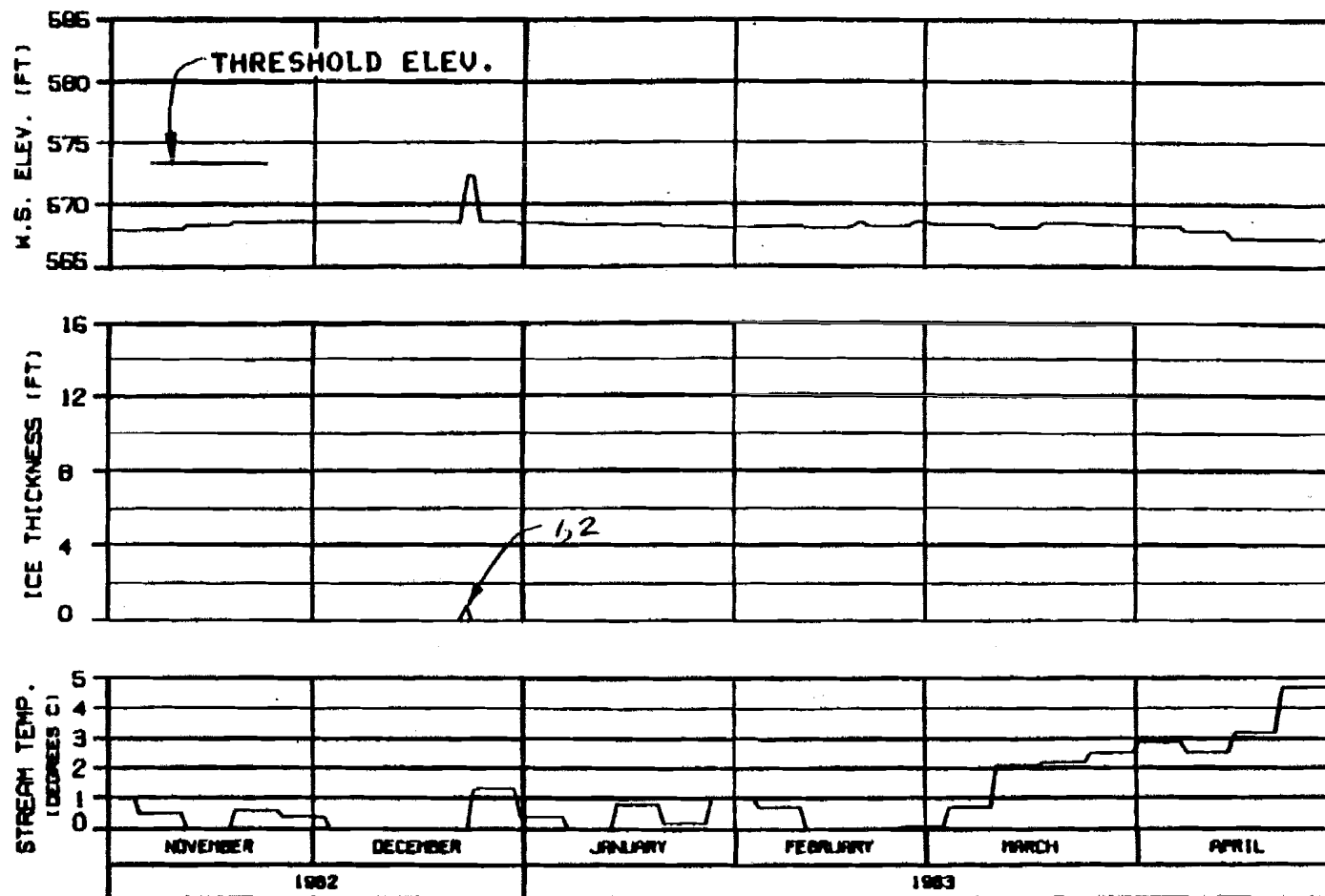
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

CHIEF, ALASKA POWER AUTHORITY 1000.142





HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C      TEMP RULE : NATURAL  
 REFERENCE RUN NO. : B296CNA

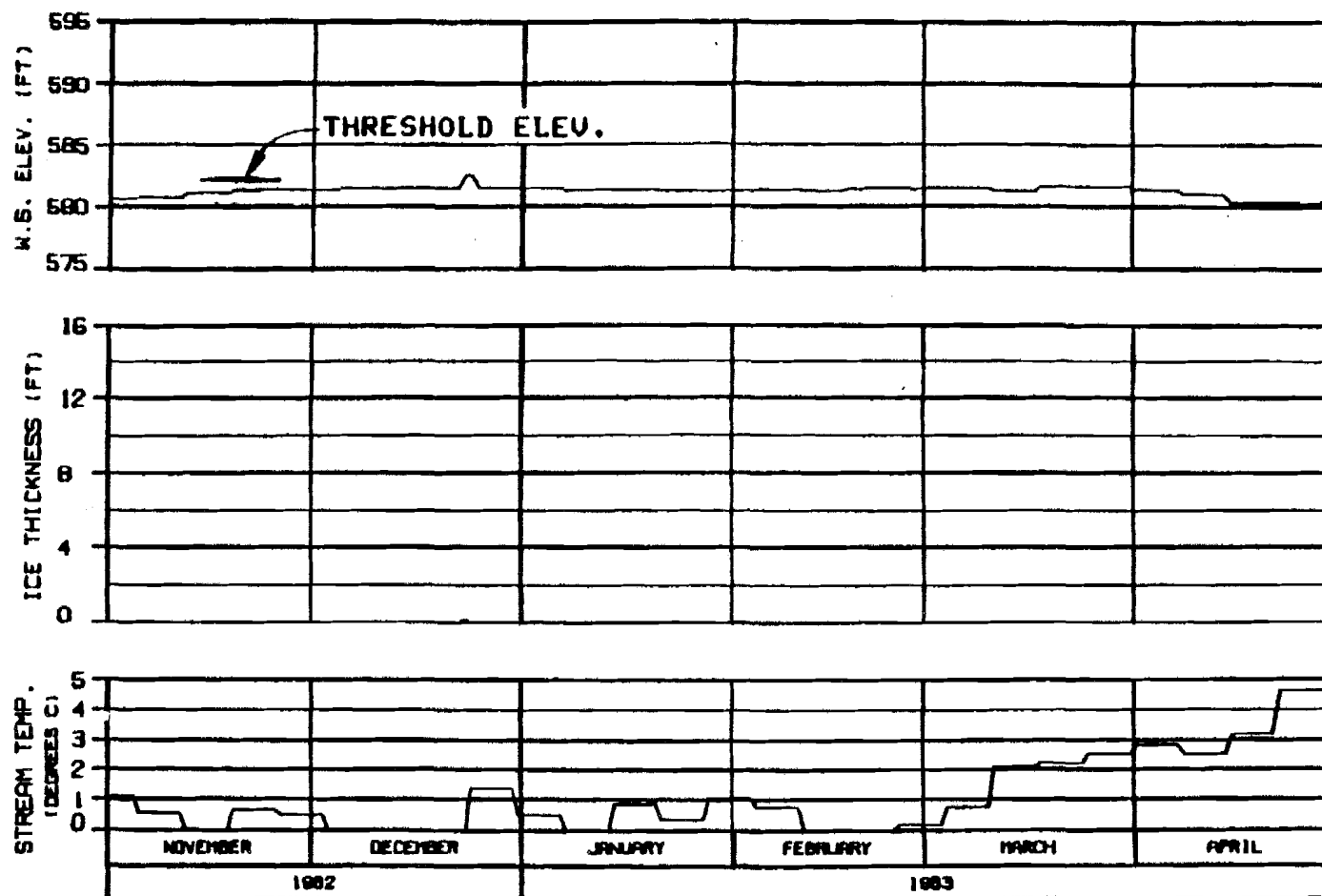
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGN: B. L. P. 82      30 JAN 83      0000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

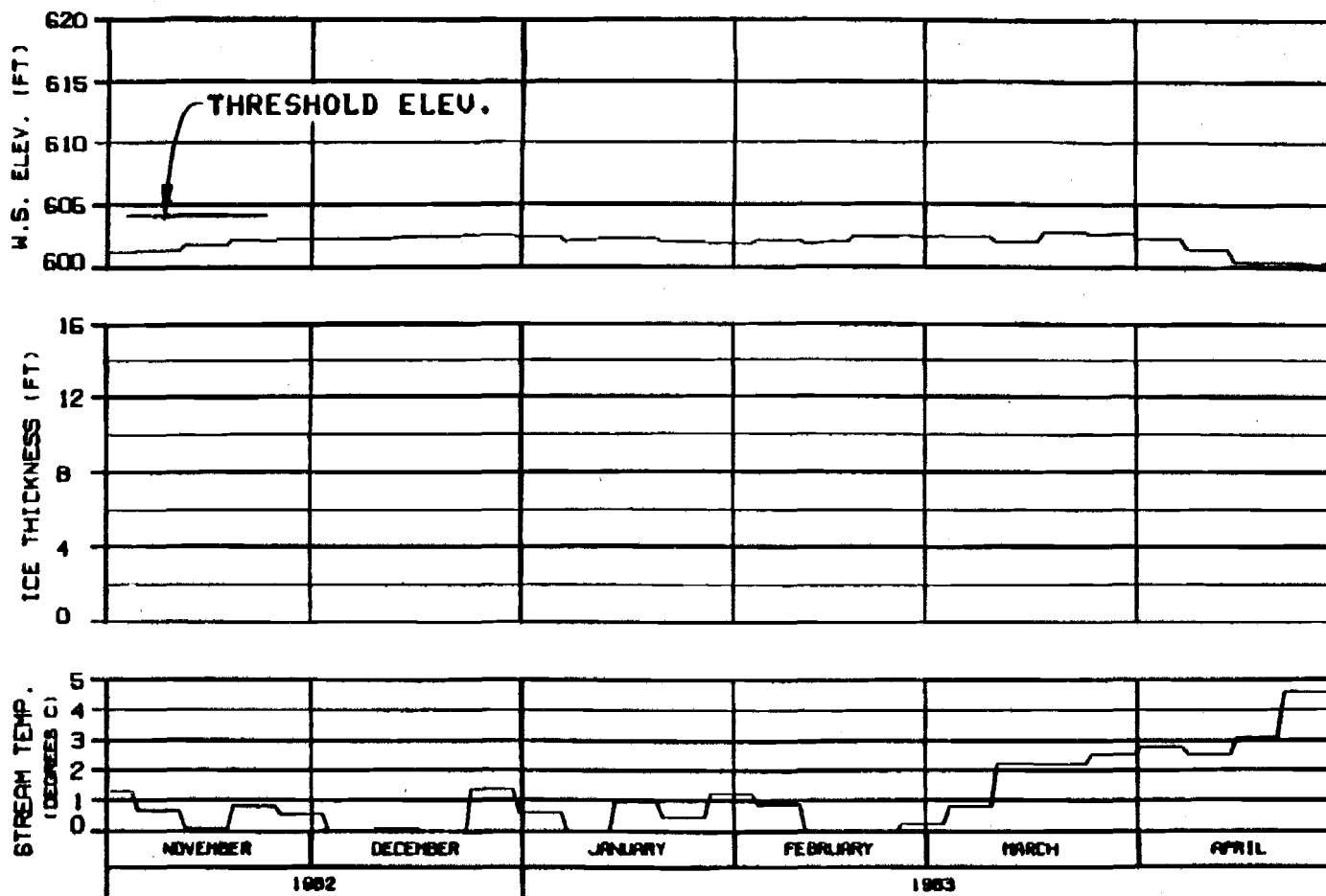
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTED: 04/04/83 10 JAN 84 1983.142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

OPTION?

ALASKA POWER AUTHORITY

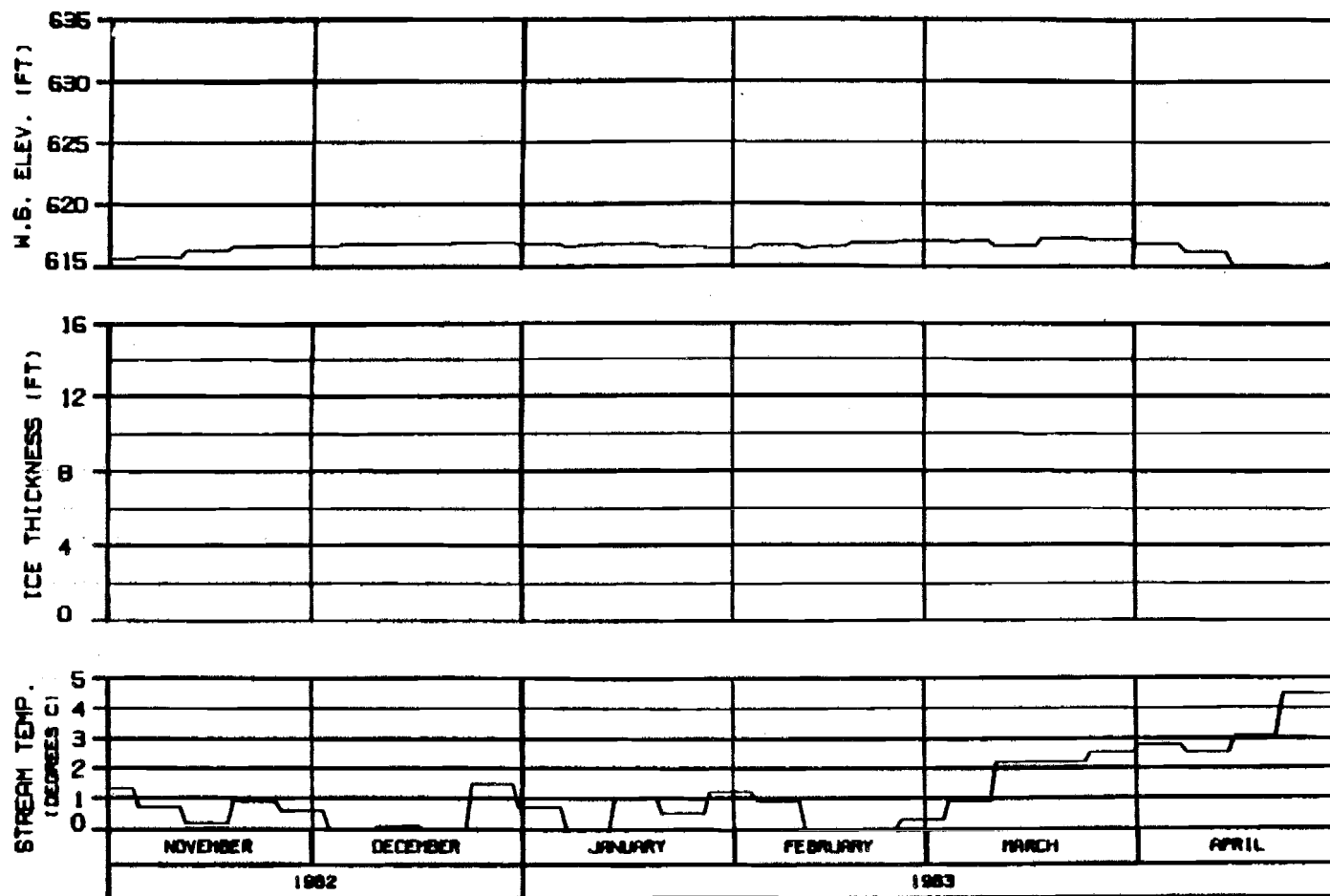
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGN - ALASKA 30 JAN 83 1983.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : HATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

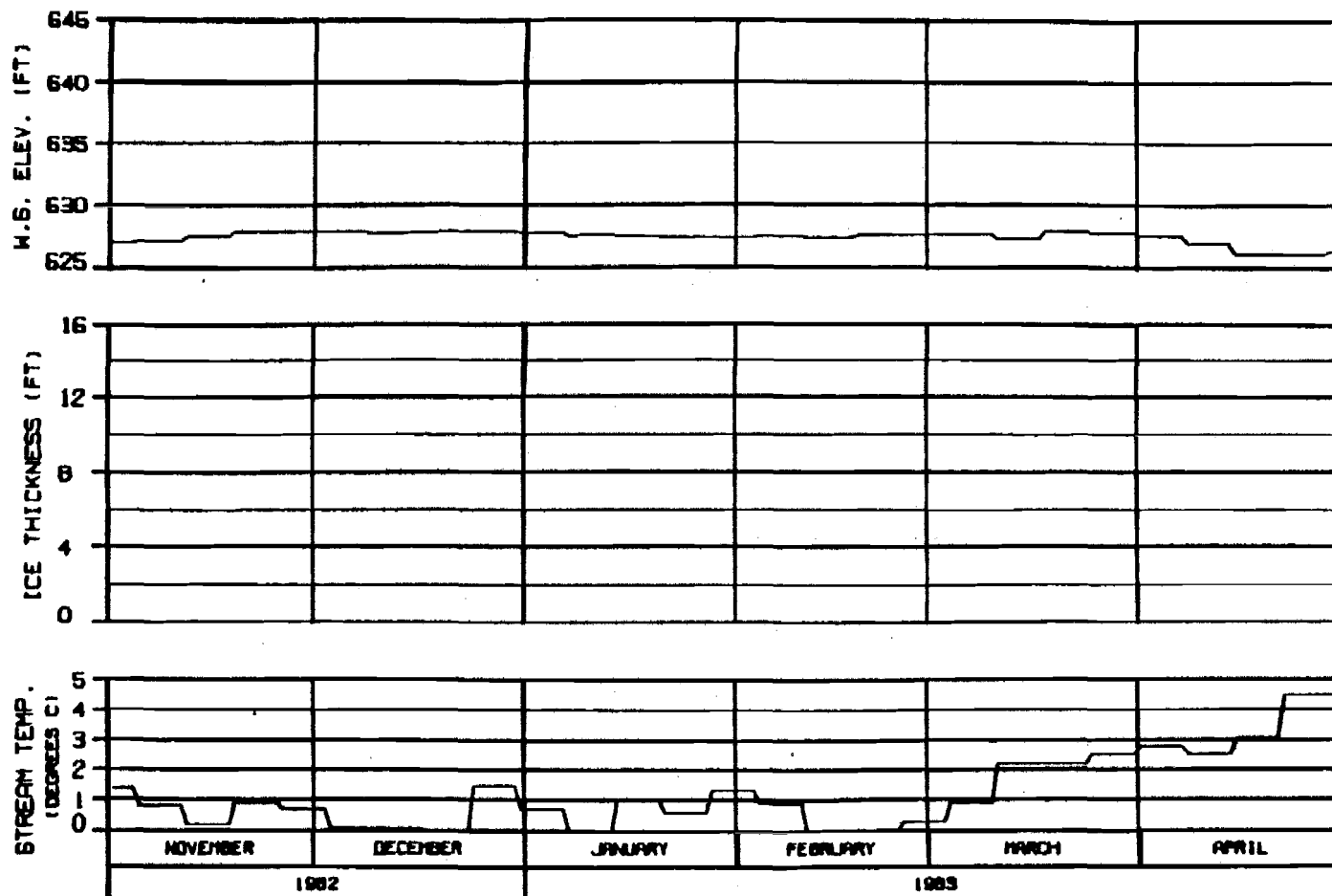
ALASKA POWER AUTHORITY

OUTING PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DRAWN: ALBERT 10 JAN 84 SHEET 142



**SIDE CHANNEL U/S OF 4TH JULY CREEK**  
**RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**  
 1. TOTAL THICKNESS  
 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

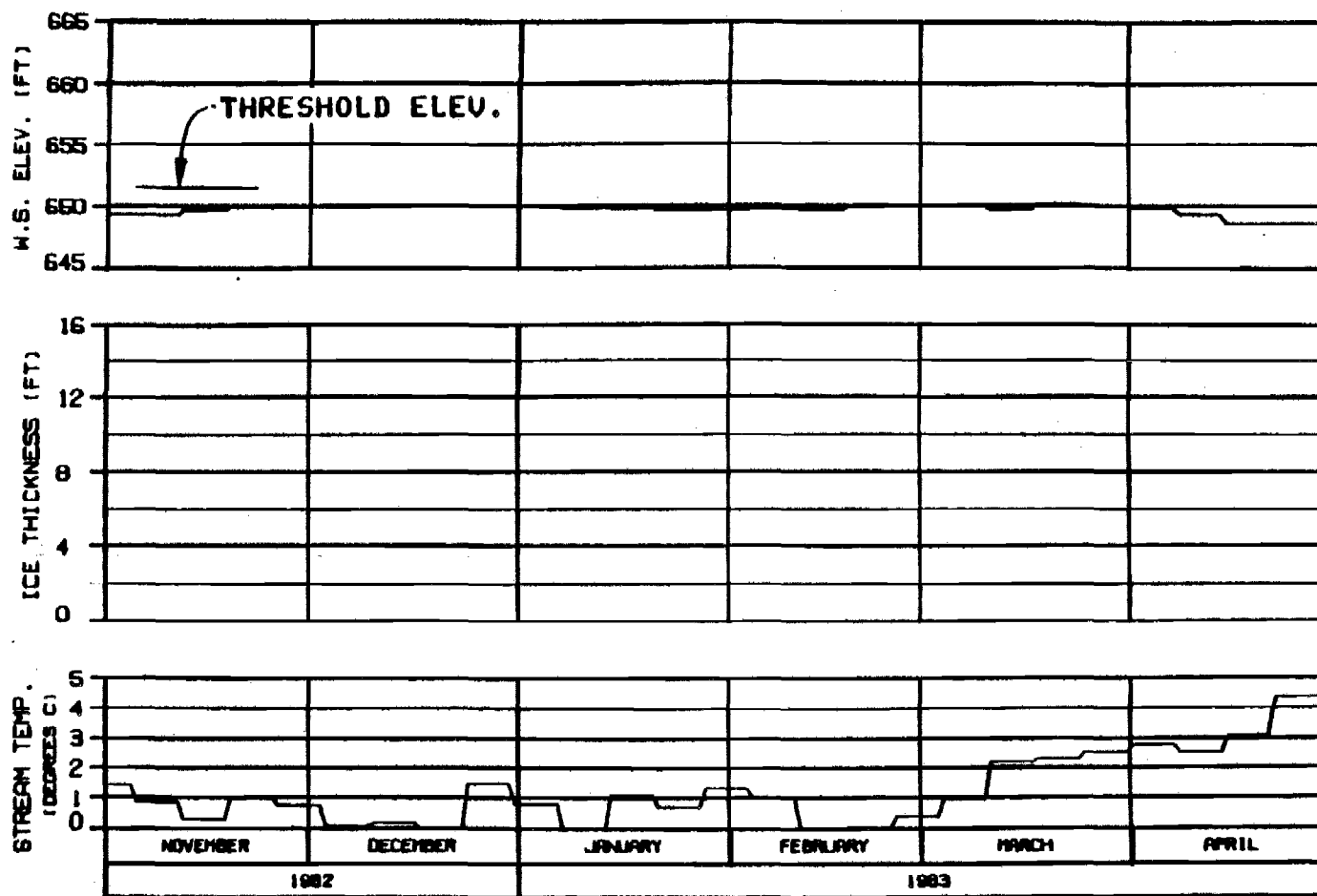
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**WARZA-EBR600 JOINT VENTURE**

DESIGNED: 01.0000 20 JAN 83 0000.142



**HEAD OF SLOUGH 9A**  
**RIVER MILE : 133.70**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

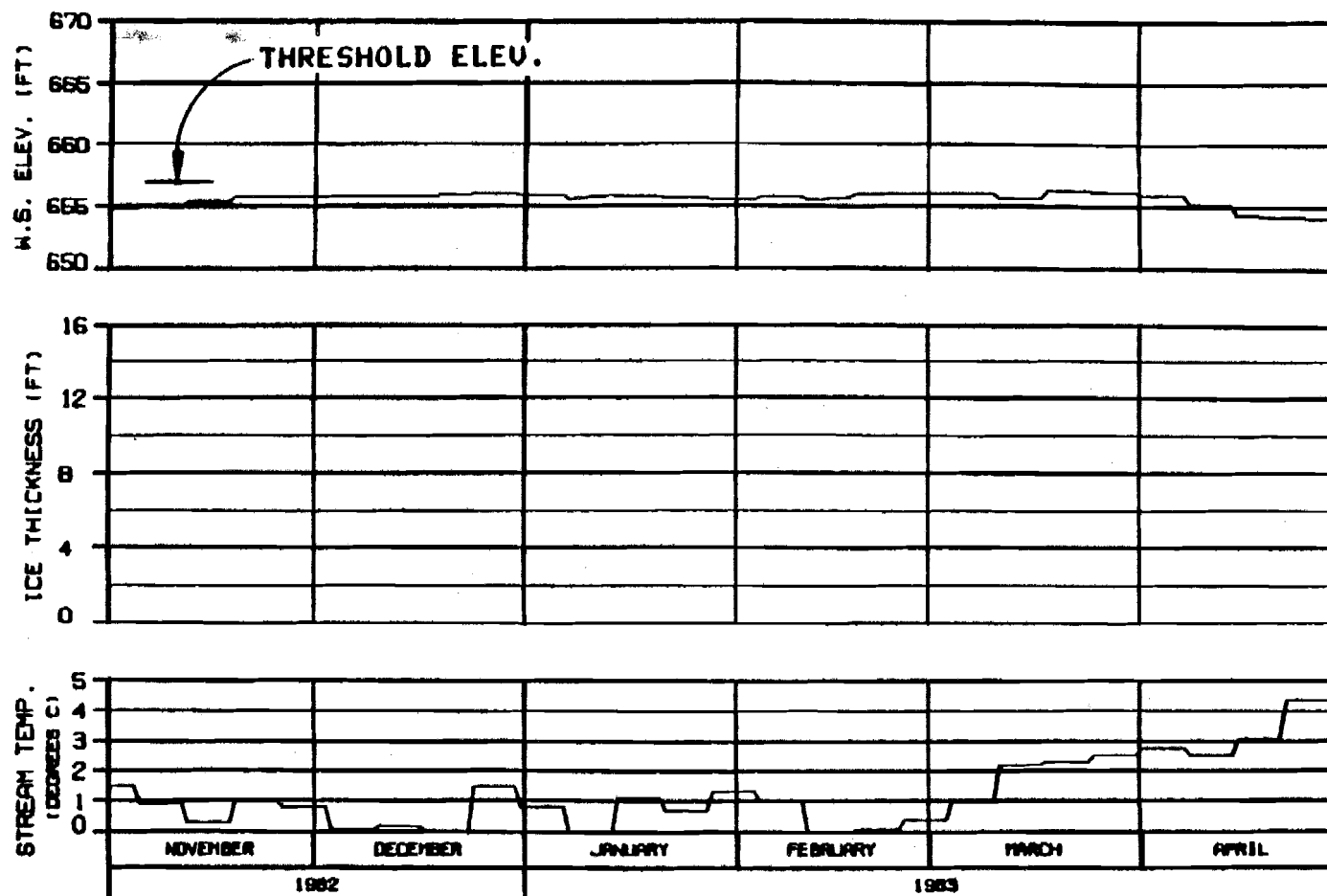
**HAZA-EBASCO JOINT VENTURE**

ORDER: 84-0000

00 JAN 84

000,142





**SIDE CHANNEL U/S OF SLOUGH 10**  
**RIVER MILE : 134.30**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

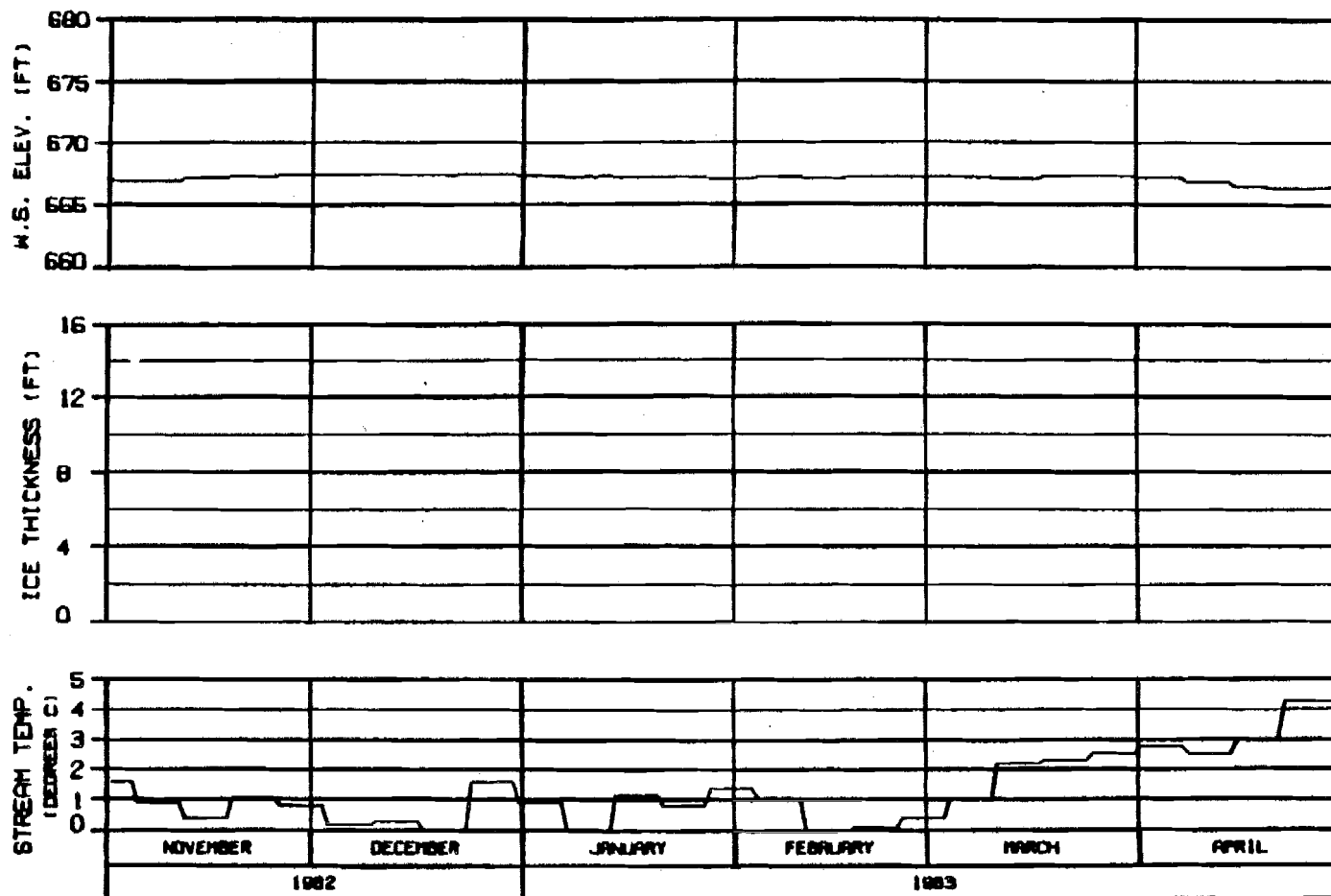
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: 10 JAN 84 1000.142



**SIDE CHANNEL D/S OF SLOUGH 11**  
**RIVER MILE : 135.30**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

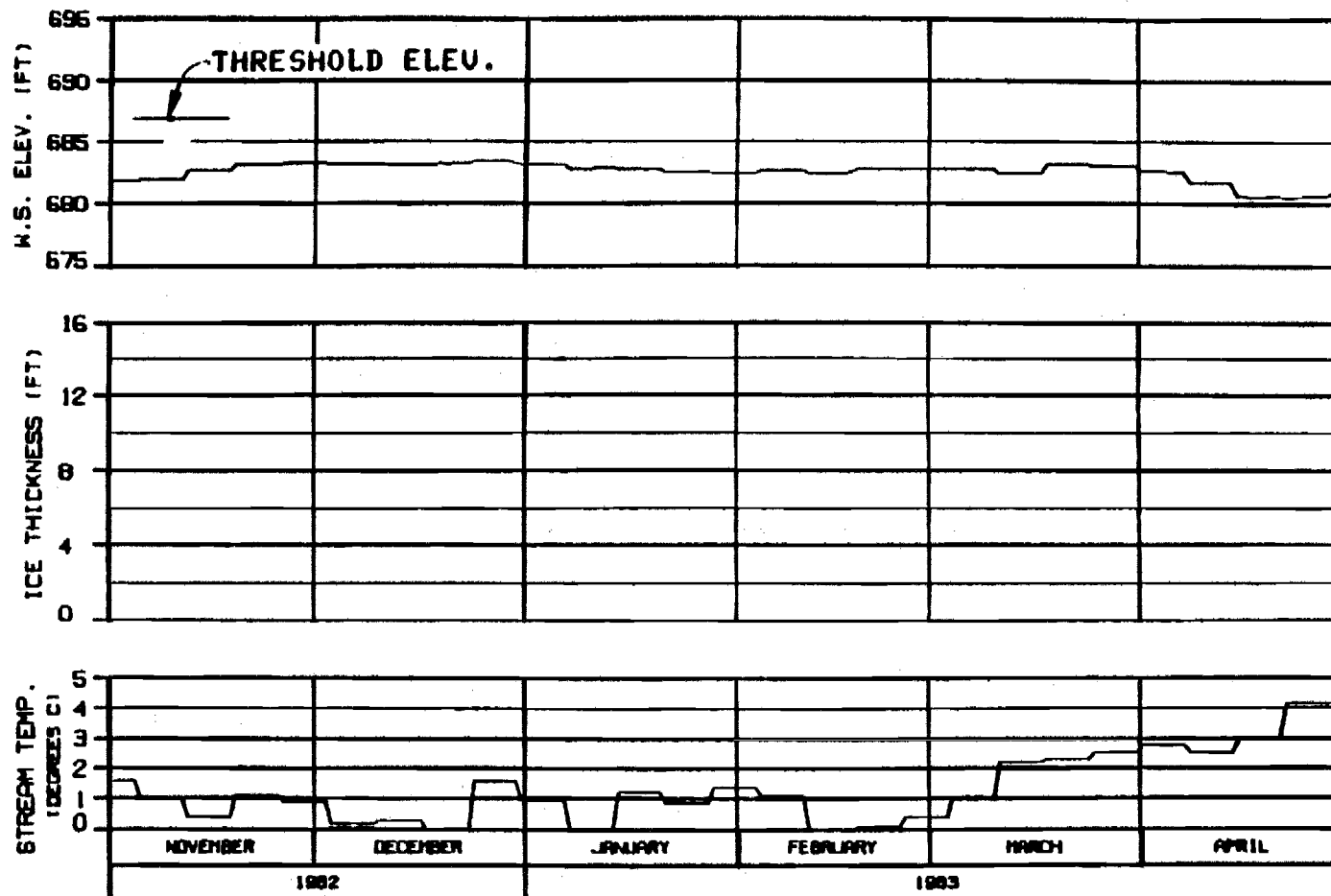
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBASCO JOINT VENTURE**

DESIGNED BY: HAZRA-EBASCO 10 JAN 83 1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

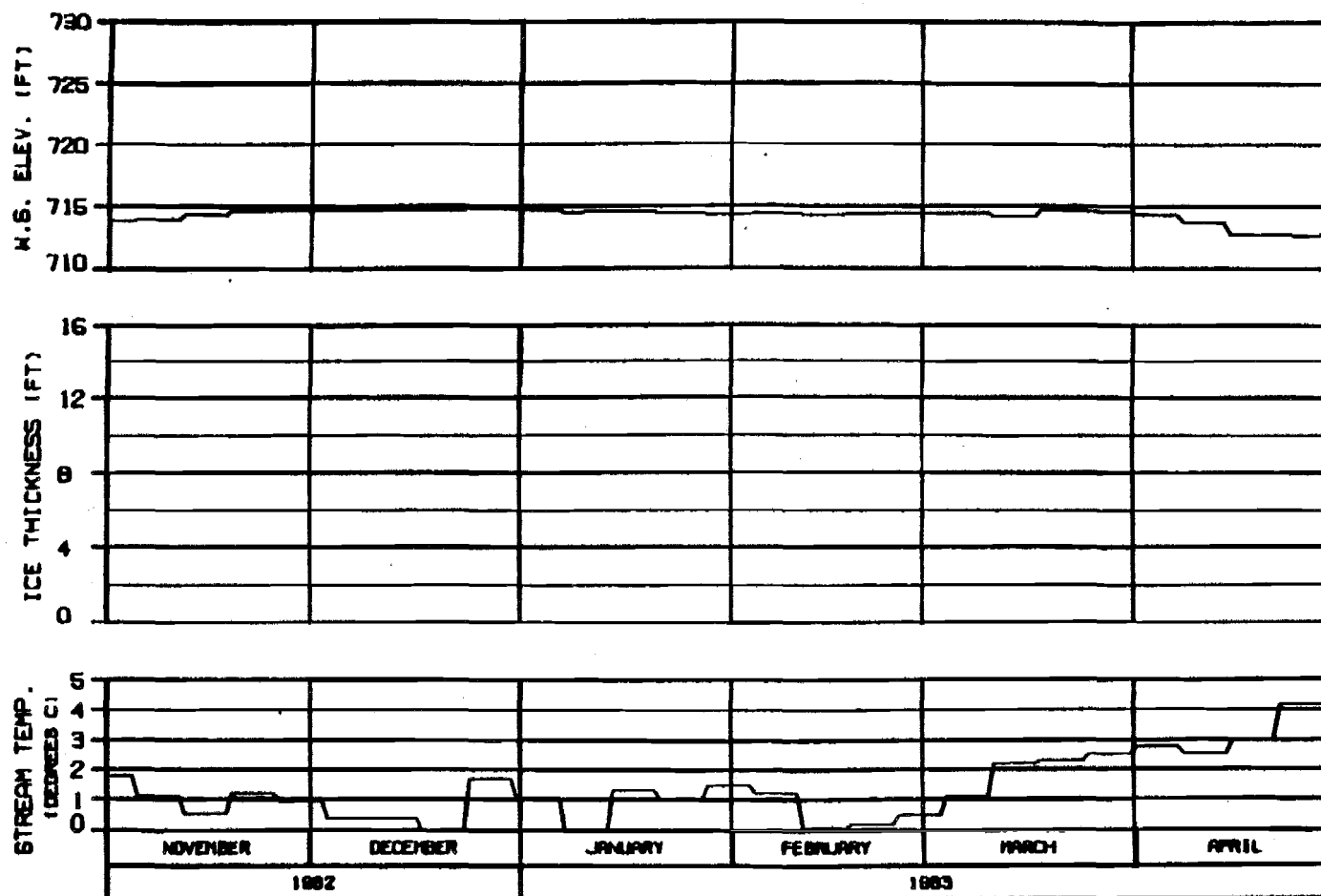
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ISSUED: 04/28/83 BY: JAC/SH 0000.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B296CNA

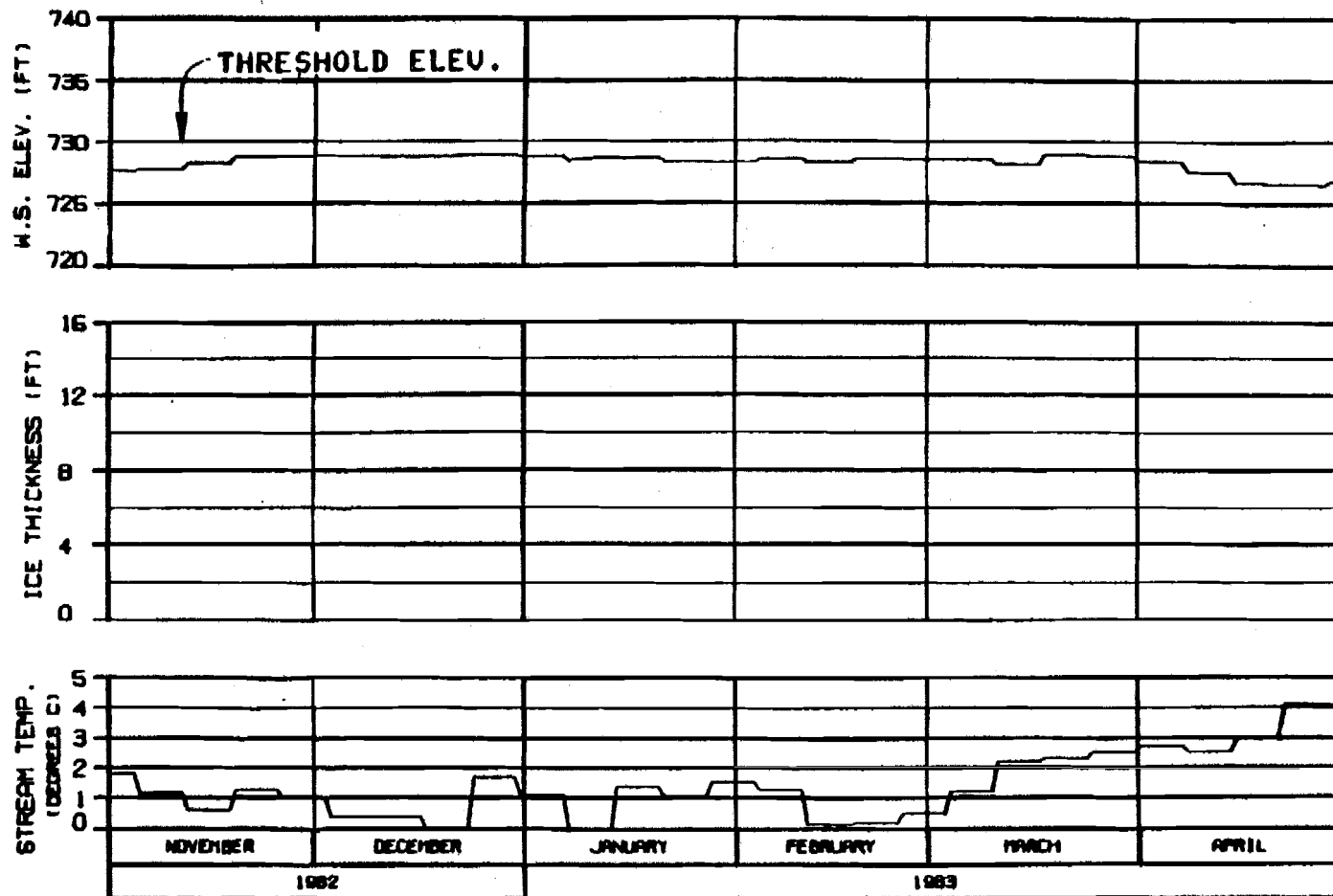
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZDA-EBASCO JOINT VENTURE

DESIGNED: B.L. DAVIS 20 JAN 84 1983.142



HEAD OF SLOUGH 20

RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

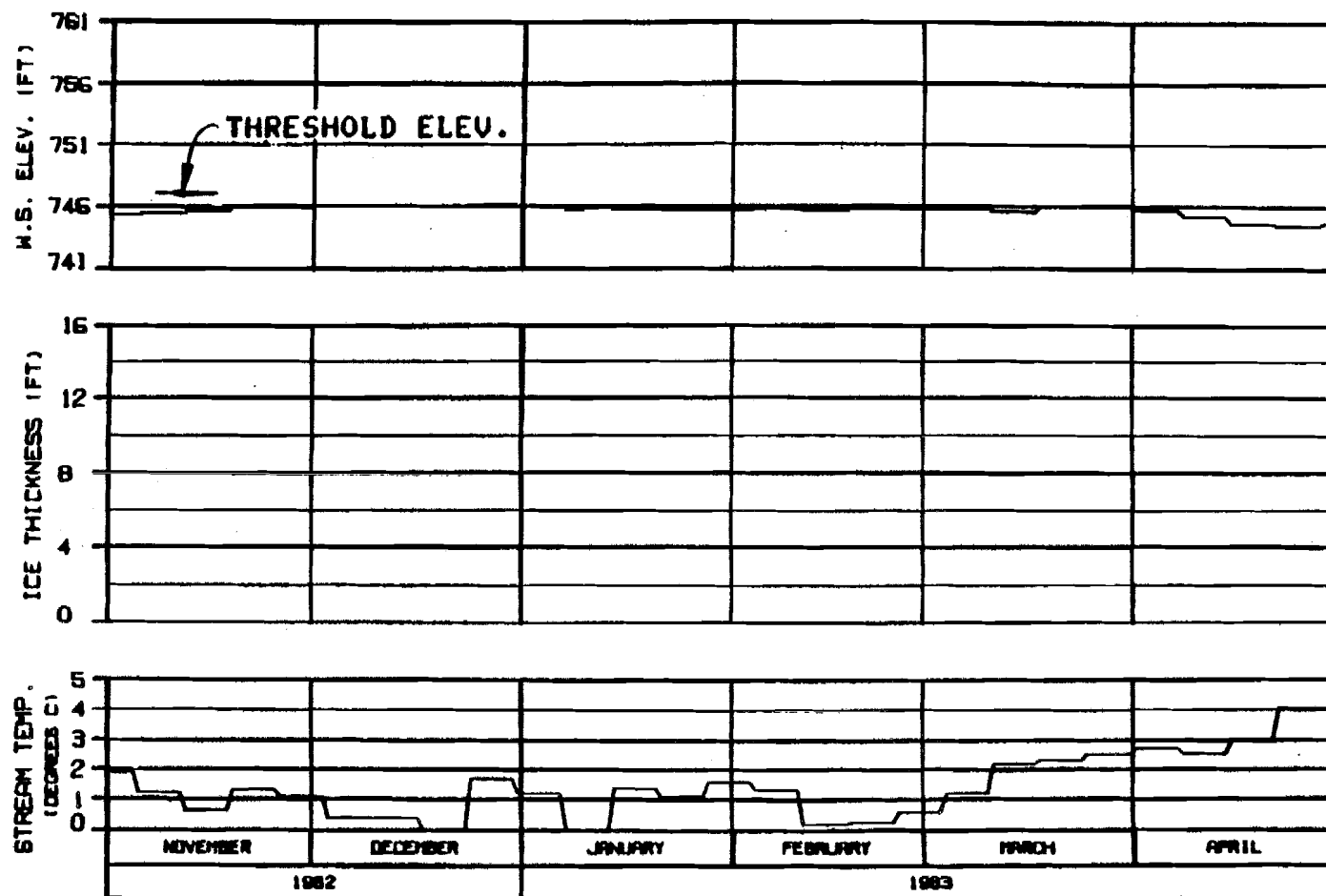
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBR&C JOINT VENTURE

DESIGNED BY: J. L. DAVIS NO. 44 82 1000.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8296CNA

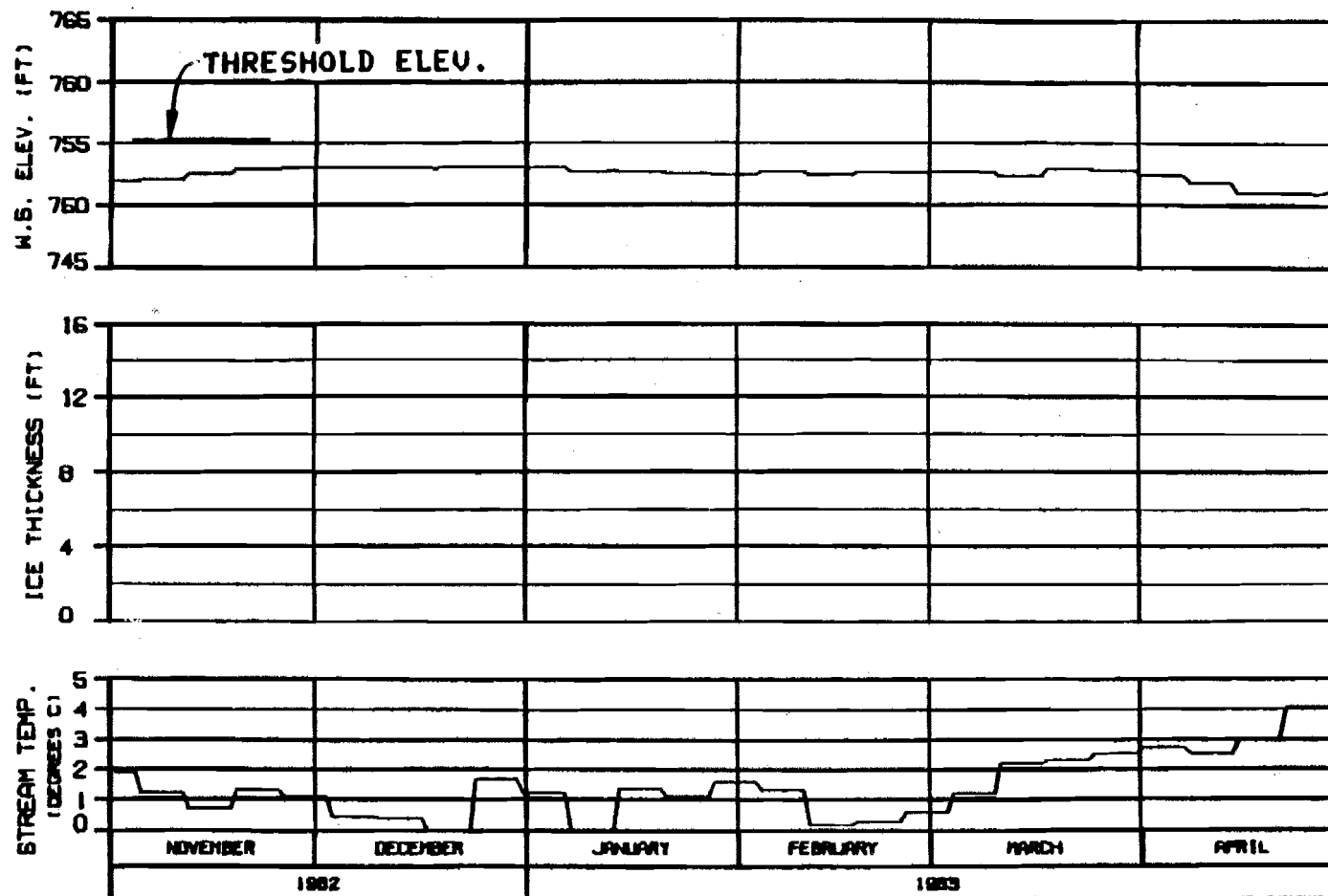
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGN: 820000 20 JAN 84 1000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

ALASKA POWER AUTHORITY

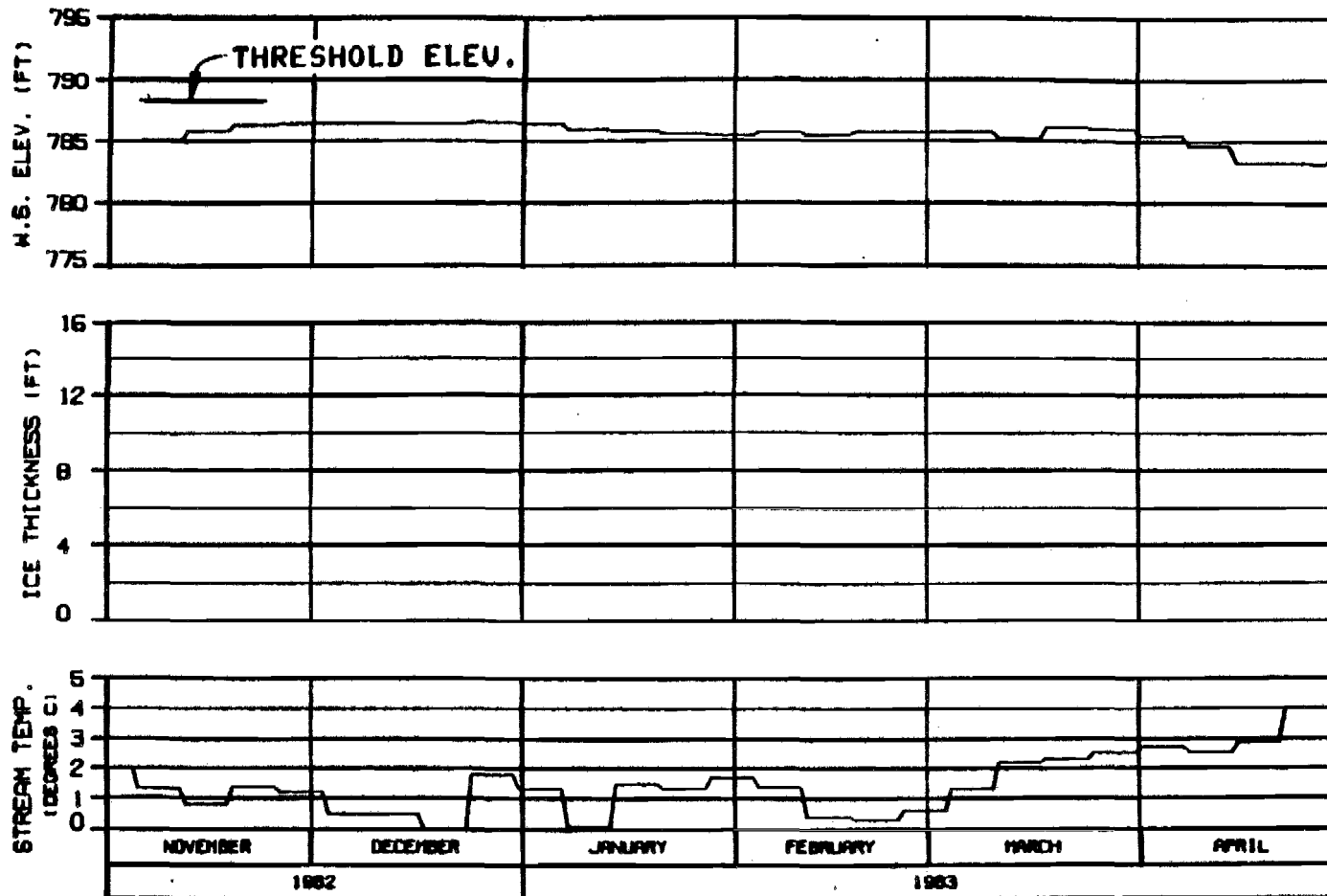
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DRAWN: BLANKS 20 JAN 83 1983.142

C



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8296CNA

OPTION?

ALASKA POWER AUTHORITY

SUBITNA PROJECT

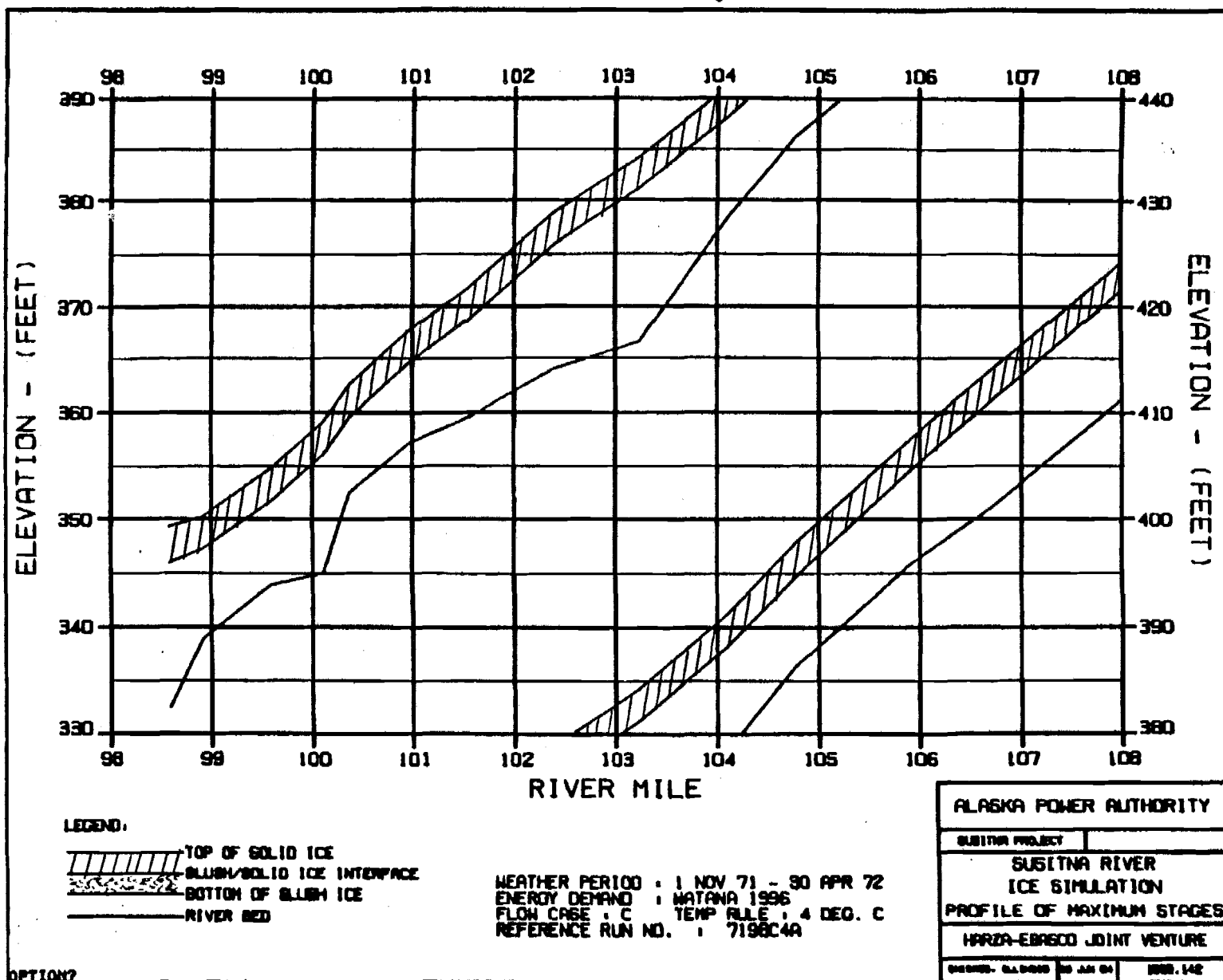
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ICE SIMULATION  
TIME HISTORY

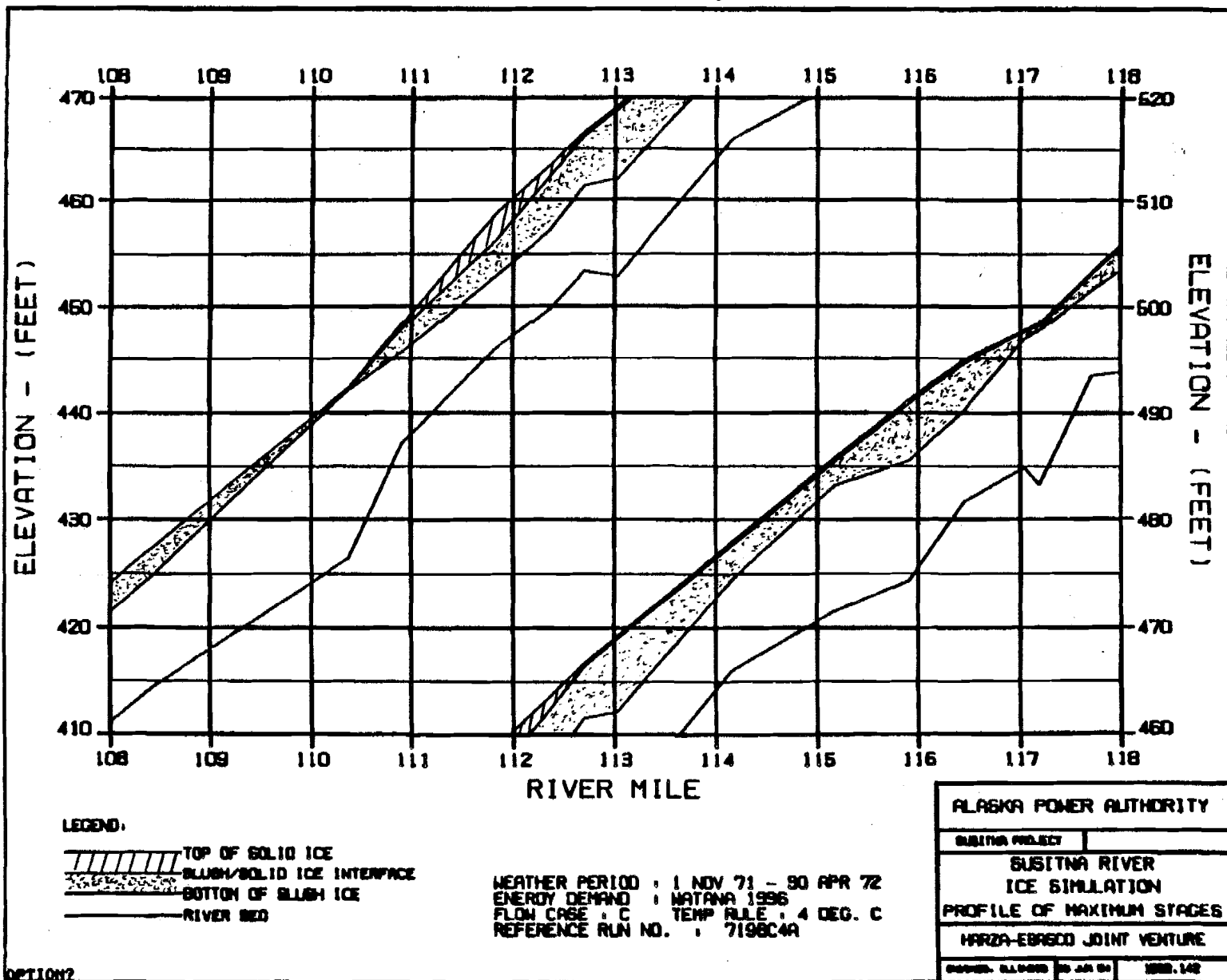
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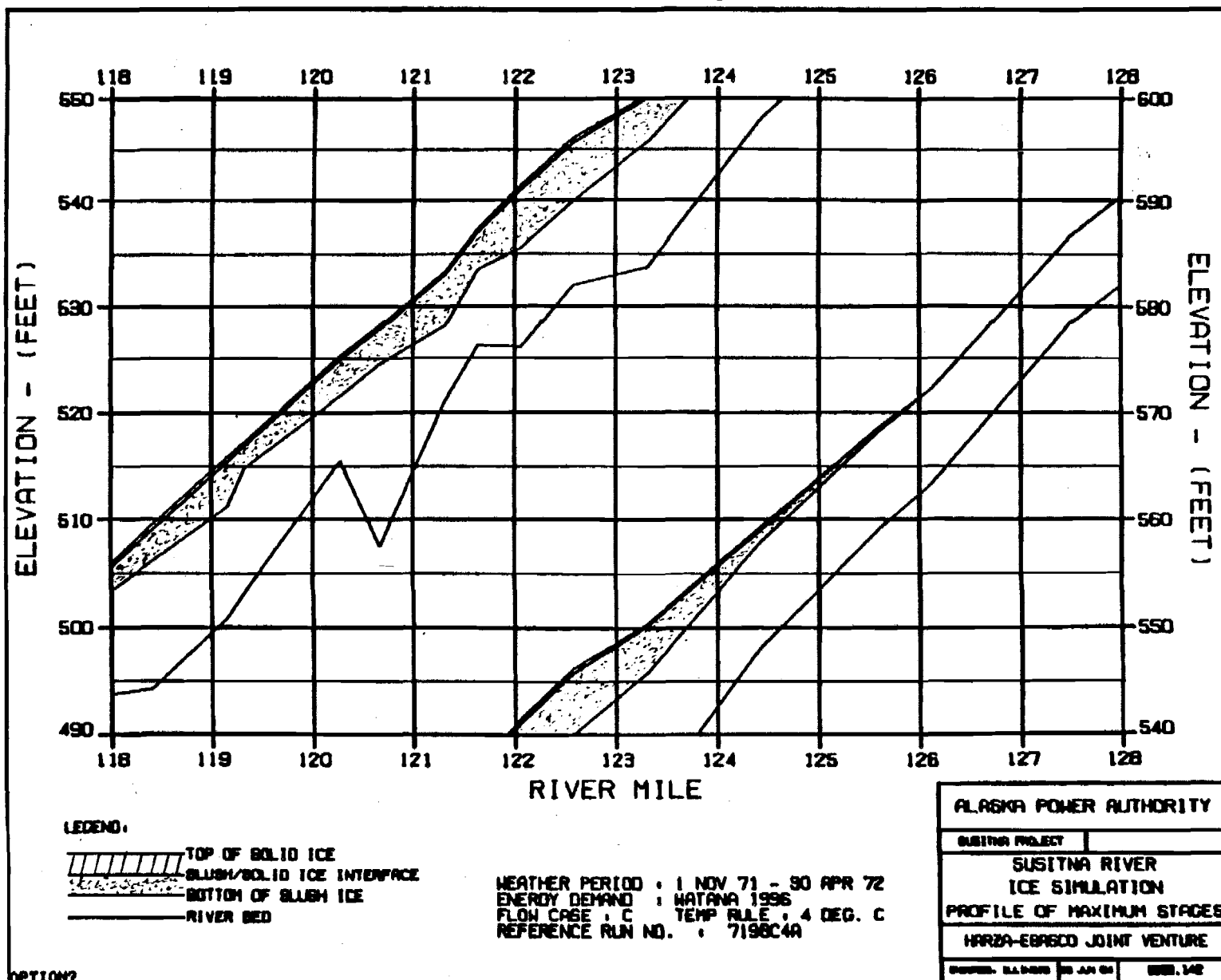
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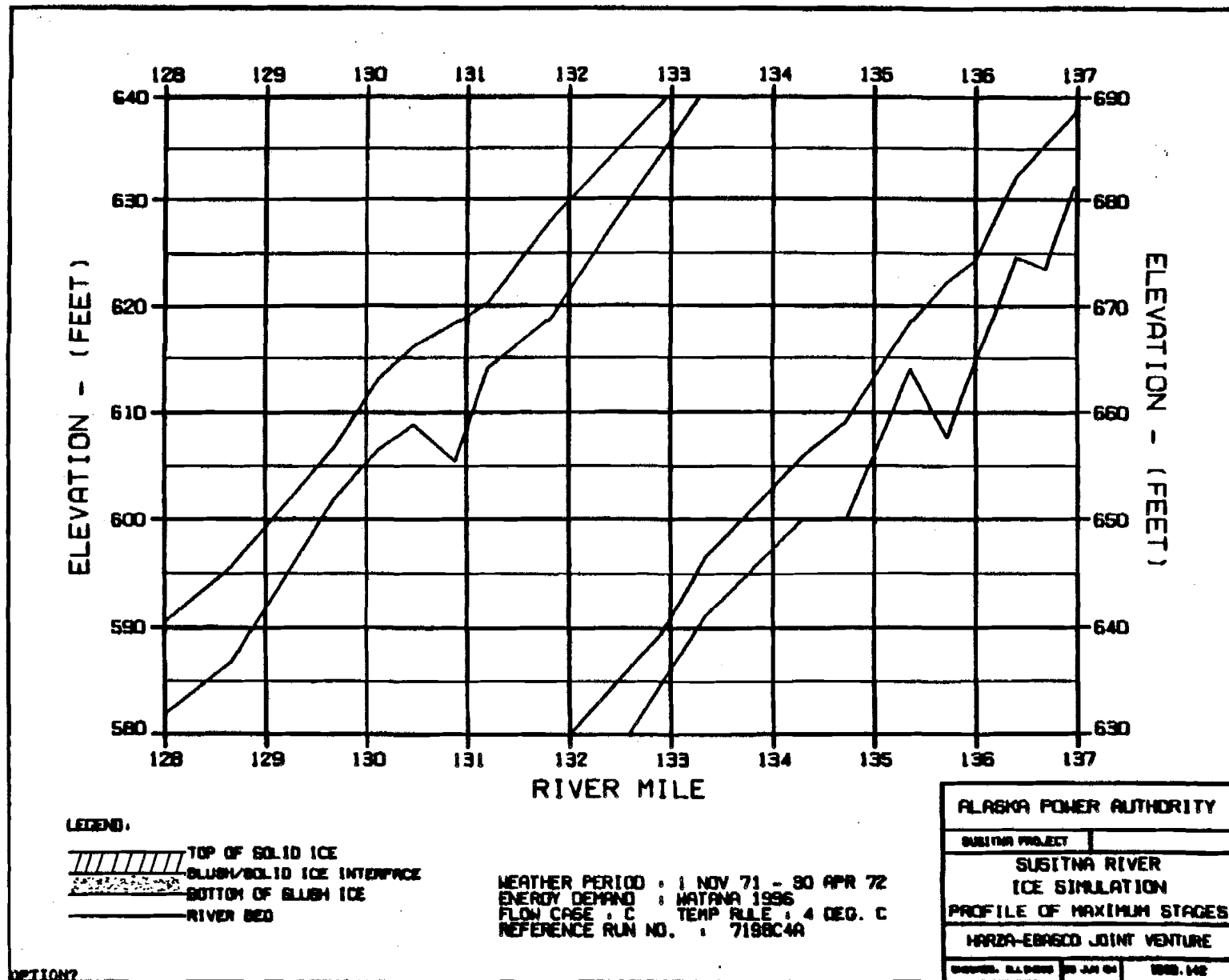


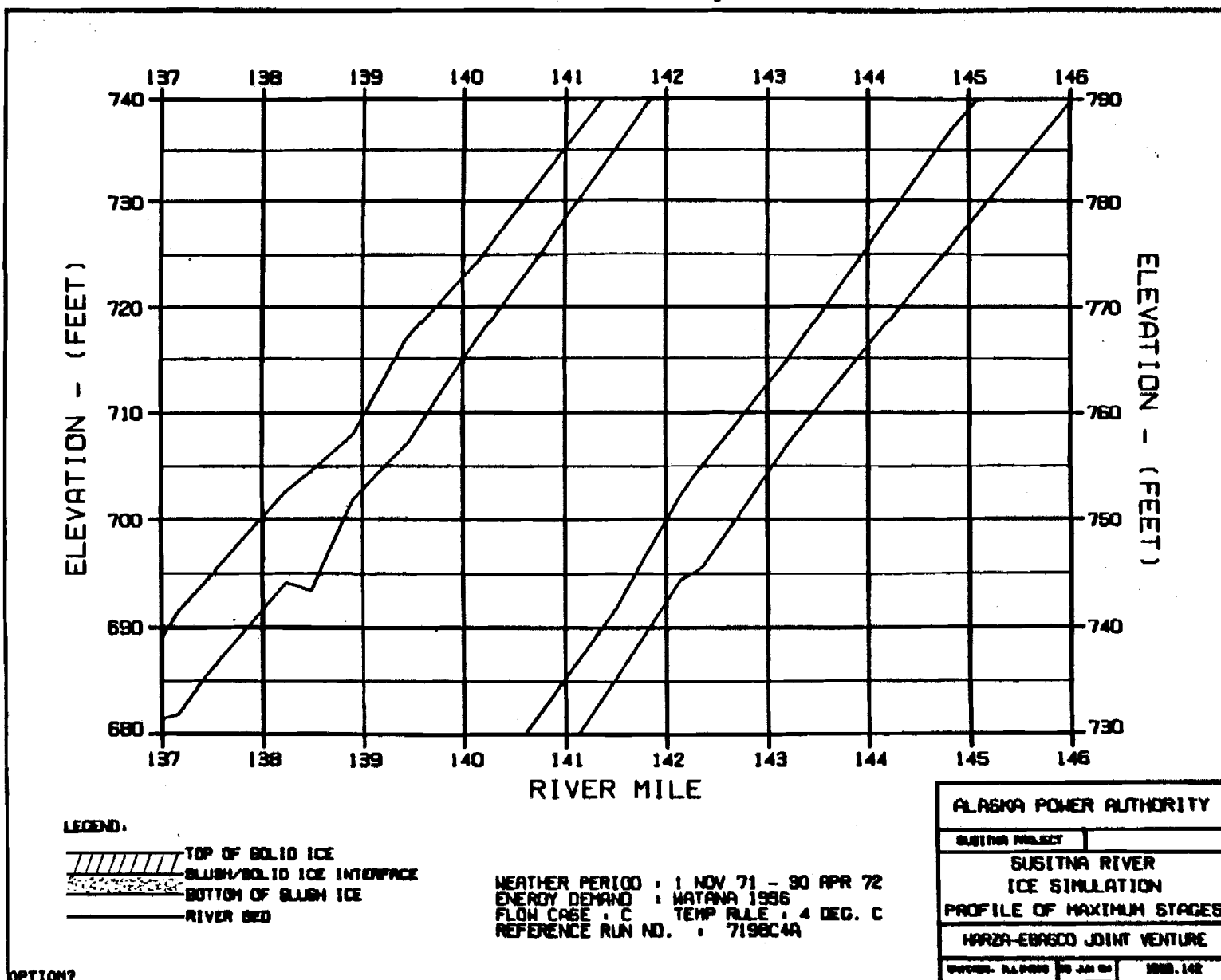
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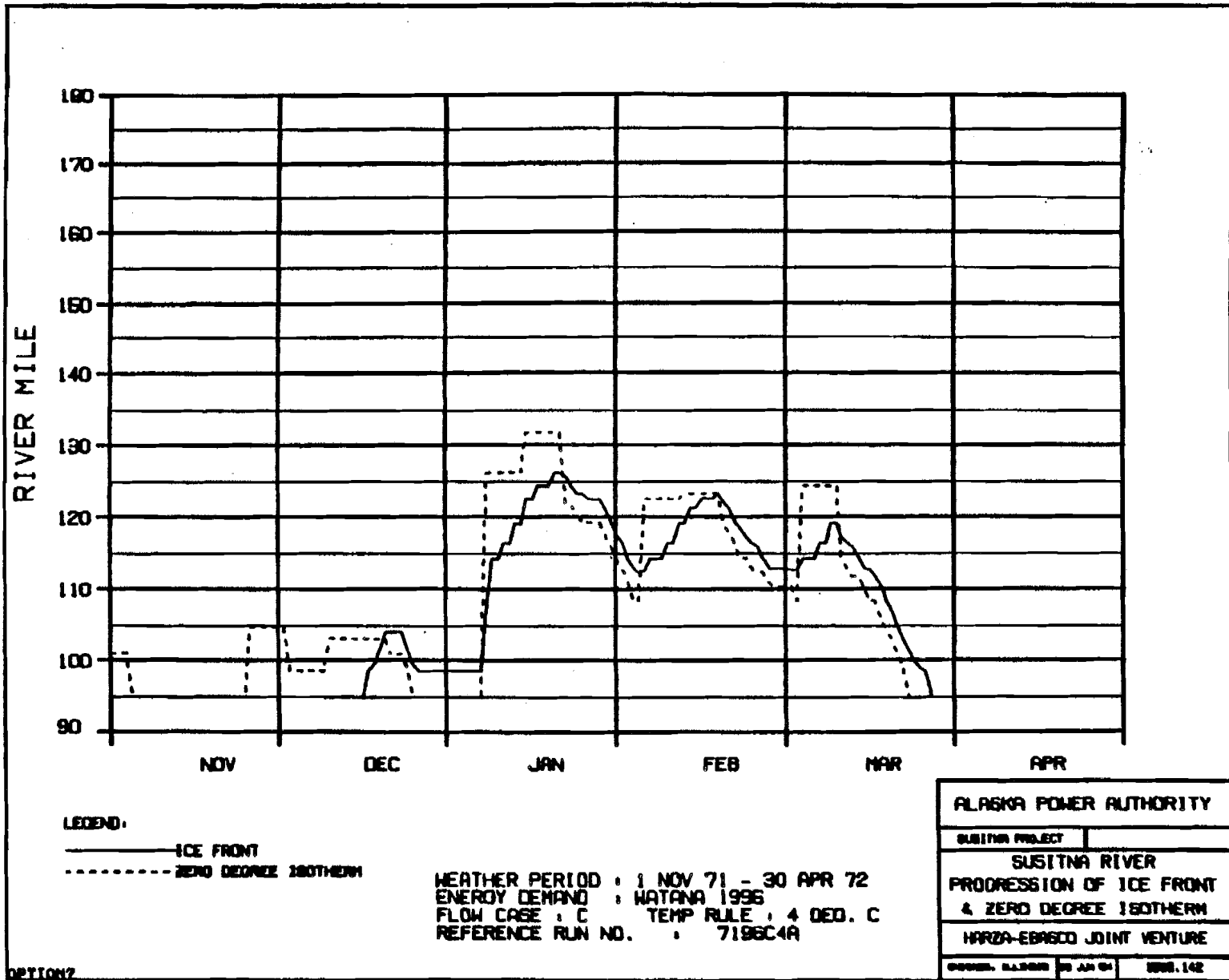


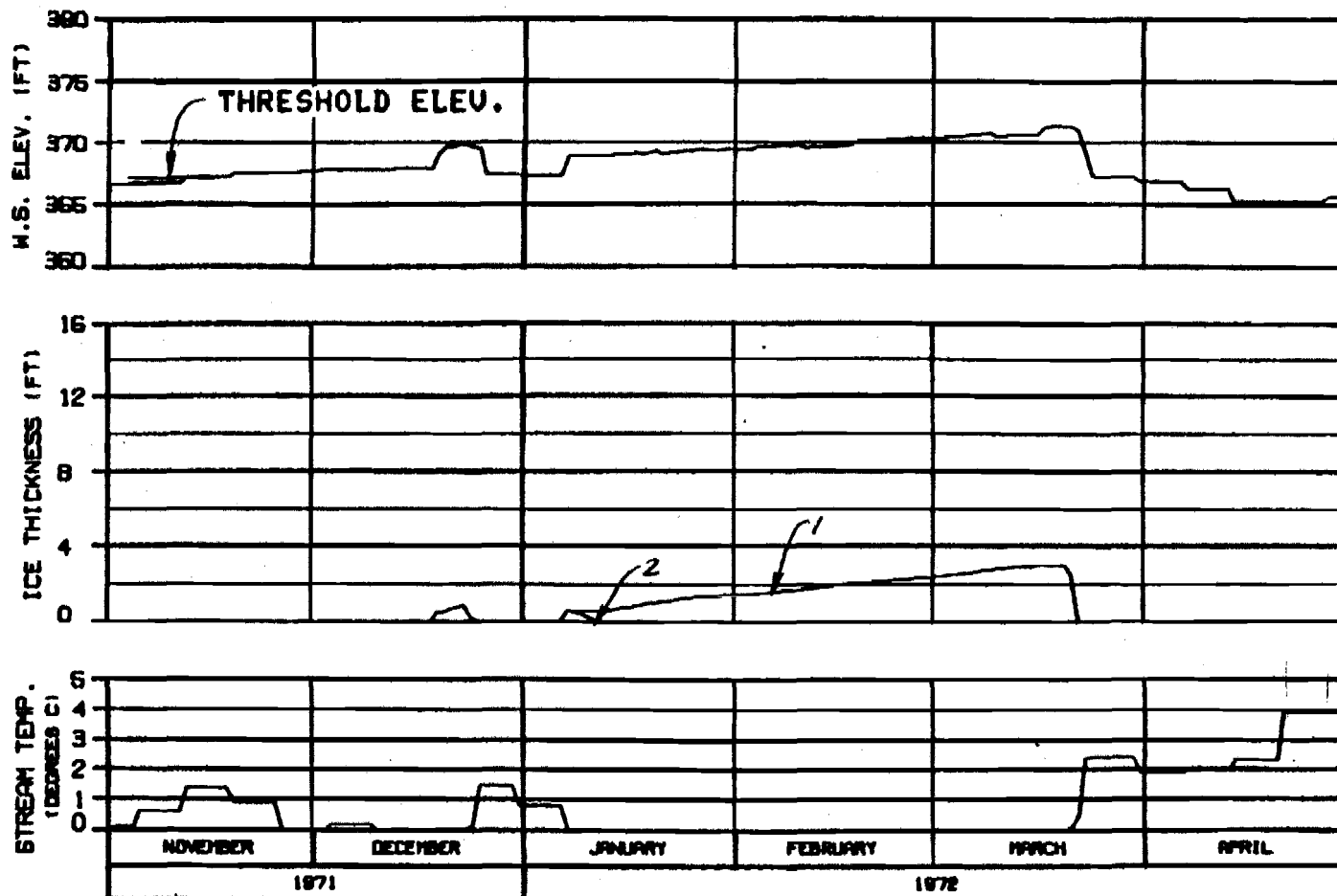












# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1986  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

ALASKA POWER AUTHORITY

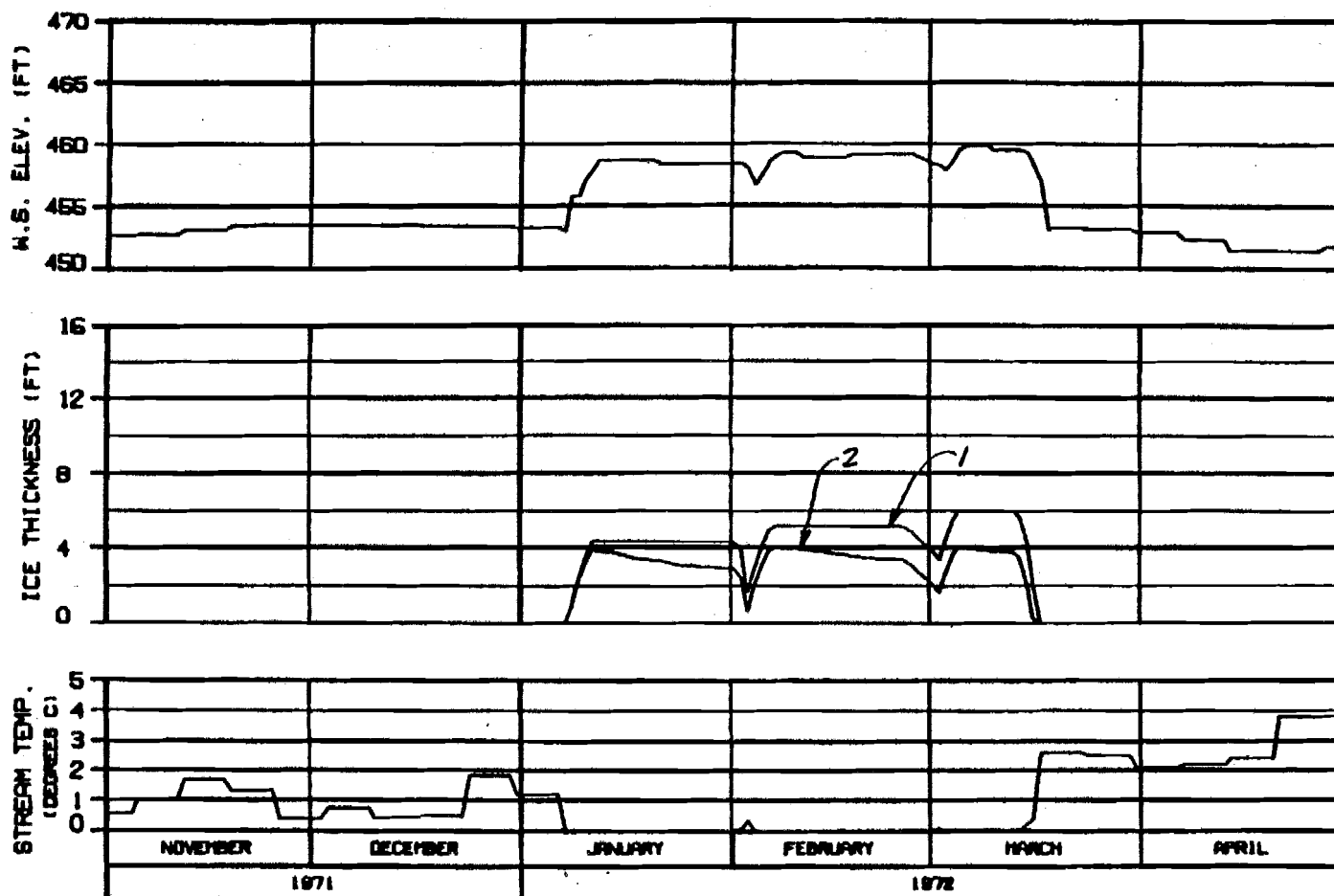
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DESIGNED BY: J. L. BROWN 30 JAN 72 1000.142





# **SIDE CHANNEL AT HEAD OF GASH CREEK**

**RIVER MILE : 112.00**

## **ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

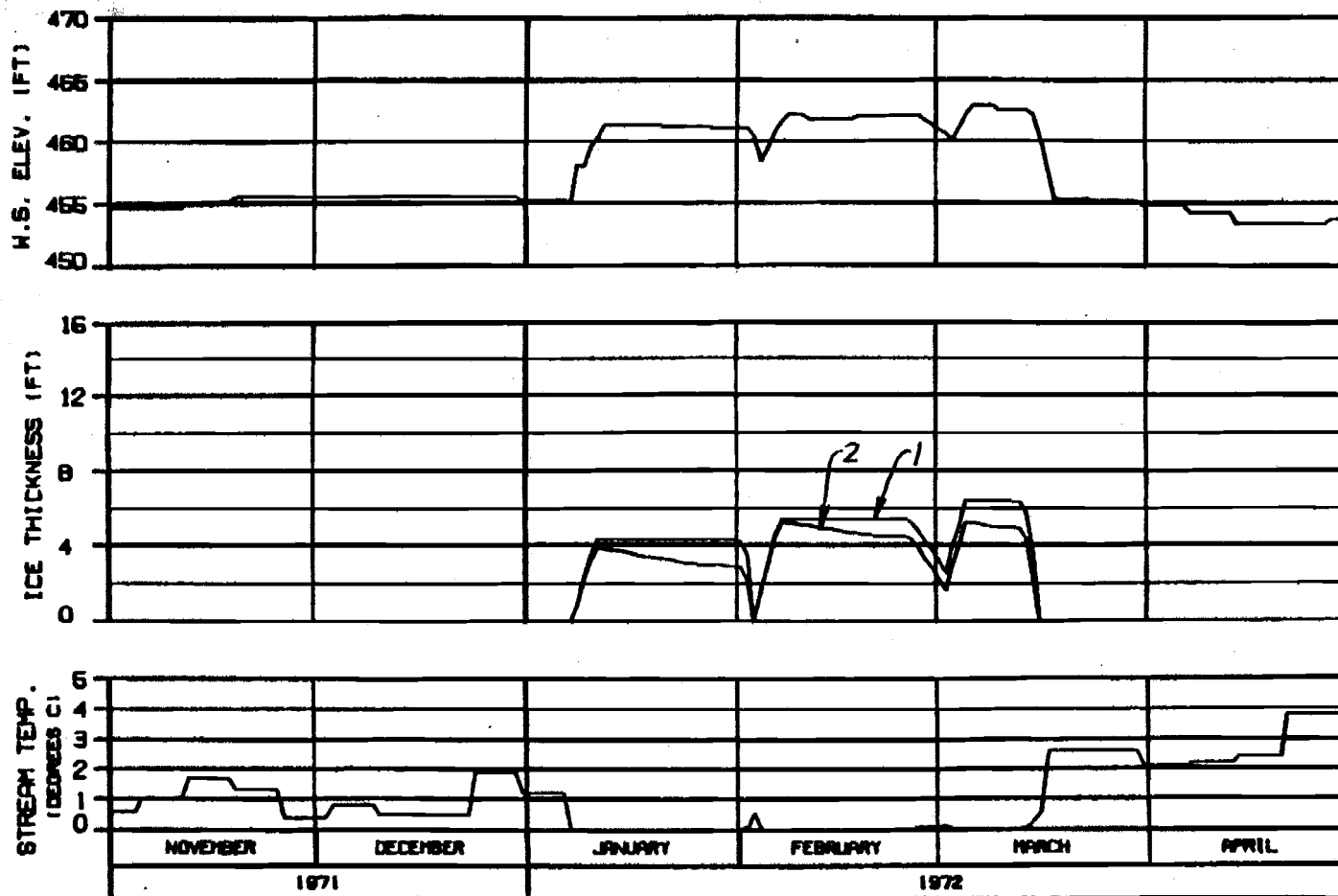
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBASCO JOINT VENTURE**

DESIGNED - ALASKA POWER AUTHORITY 1972.142



**MOUTH OF SLOUGH 6A**  
**RIVER MILE : 112.34**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : HATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4R

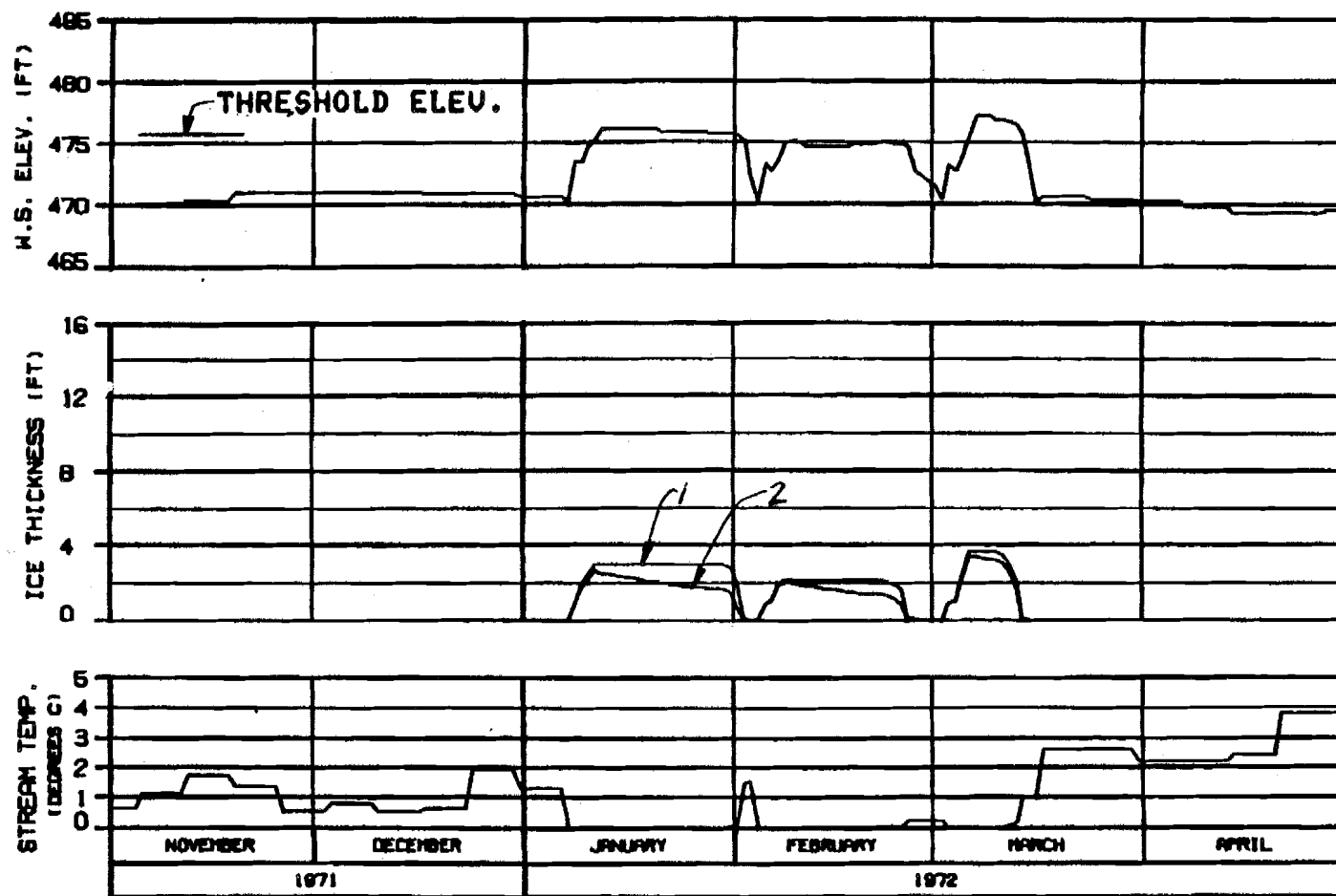
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**WARDA-EBASCO JOINT VENTURE**

DESIGNED BY: ALP/EPD 25 JAN 81 1000.142



**HEAD OF SLOUGH 8  
RIVER MILE : 114.10**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

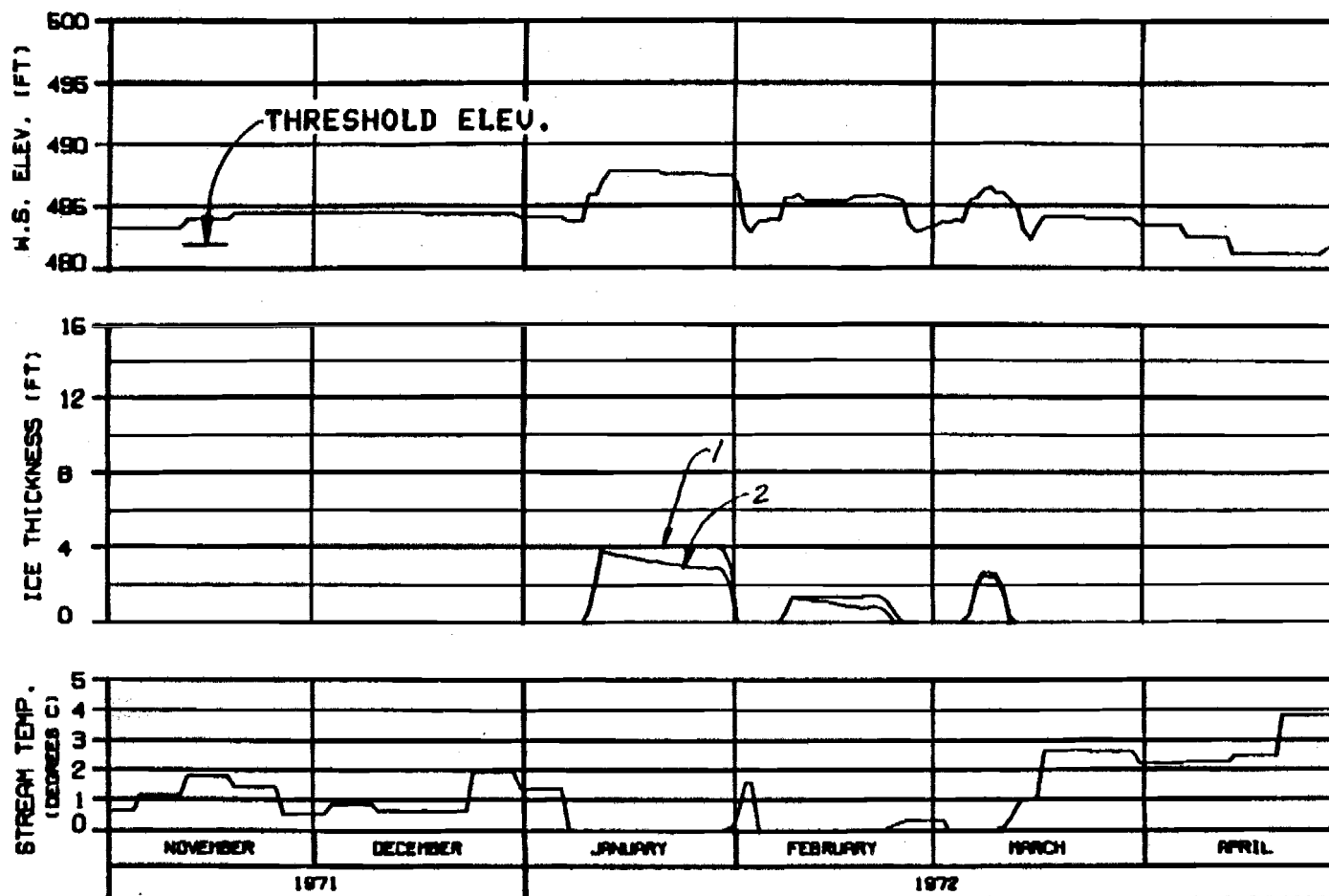
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**WARZA-EBASCO JOINT VENTURE**

DESIGNED BY: J. J. J. DATE: 1972.142



**SIDE CHANNEL MSII  
RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

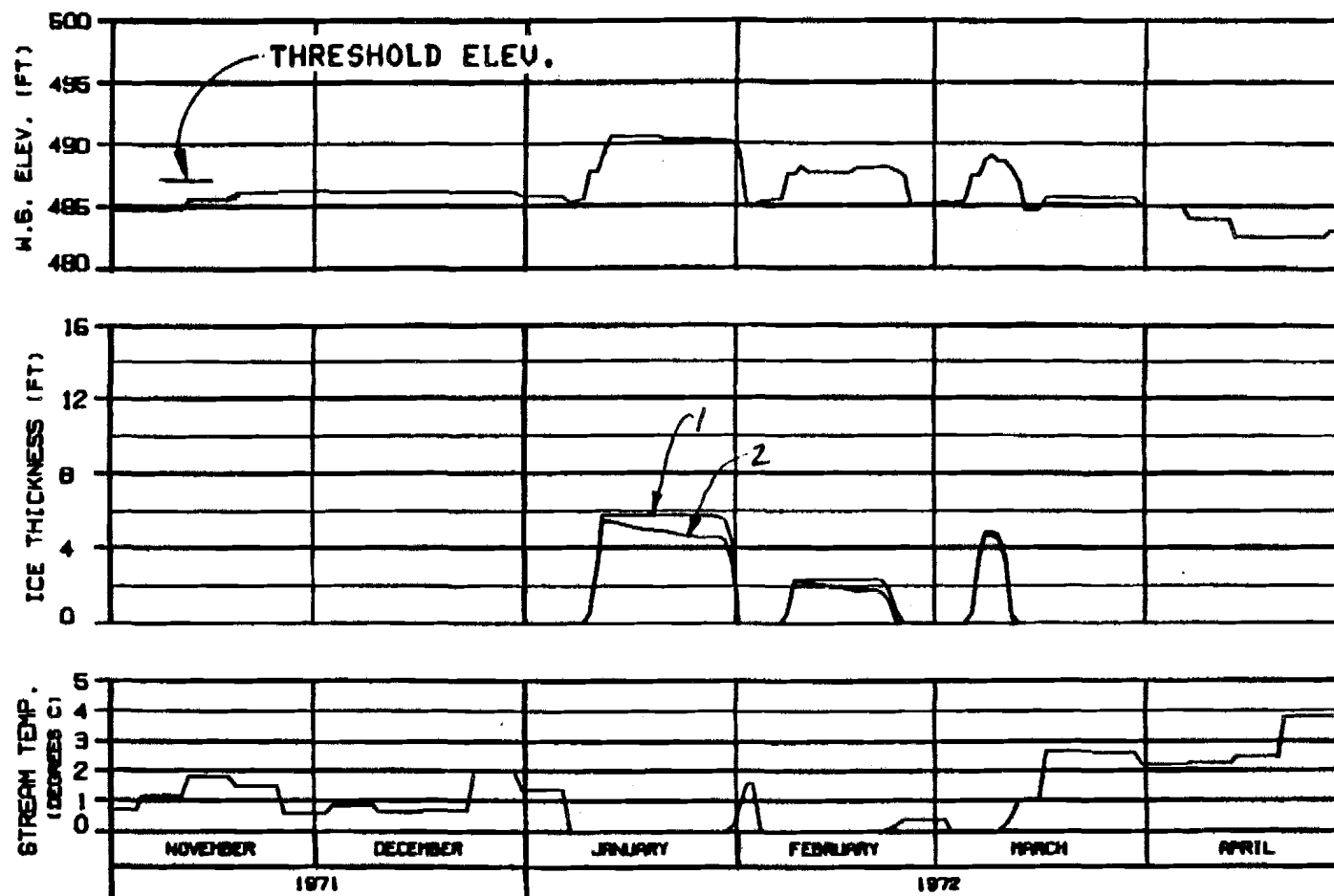
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HAZDA-EBASCO JOINT VENTURE**

DESIGNED: E.A.D-500 20 JAN 84 1000.142



# HEAD OF SIDE CHANNEL MSII RIVER MILE : 115.90

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

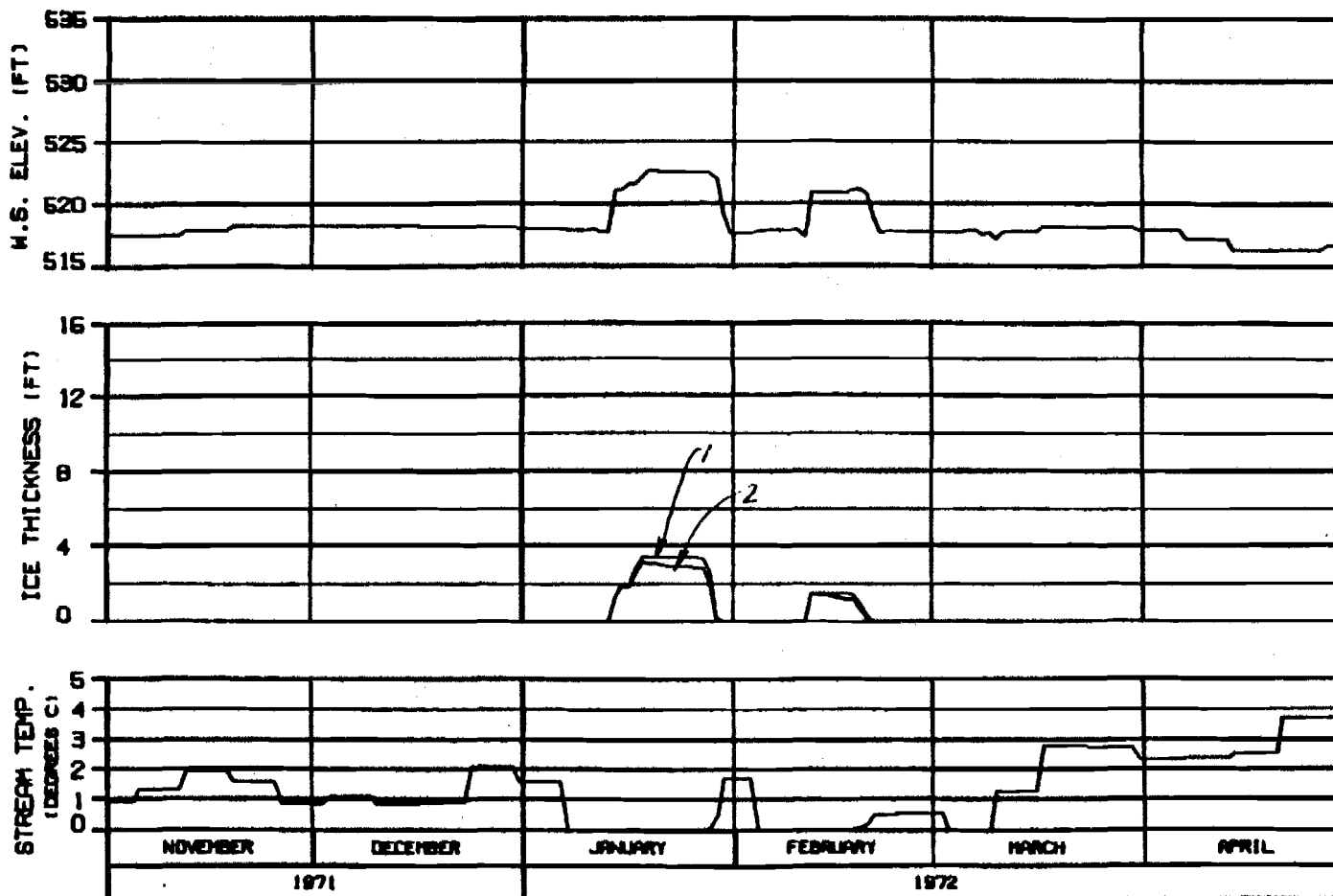
## ALASKA POWER AUTHORITY

SUBMITTA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZA-EBRSCD JOINT VENTURE

ISSUED: 01-0000 00 JAN 82 0000.142



ICE THICKNESS LEGEND:  
 1. TOTAL THICKNESS  
 2. BLUISH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

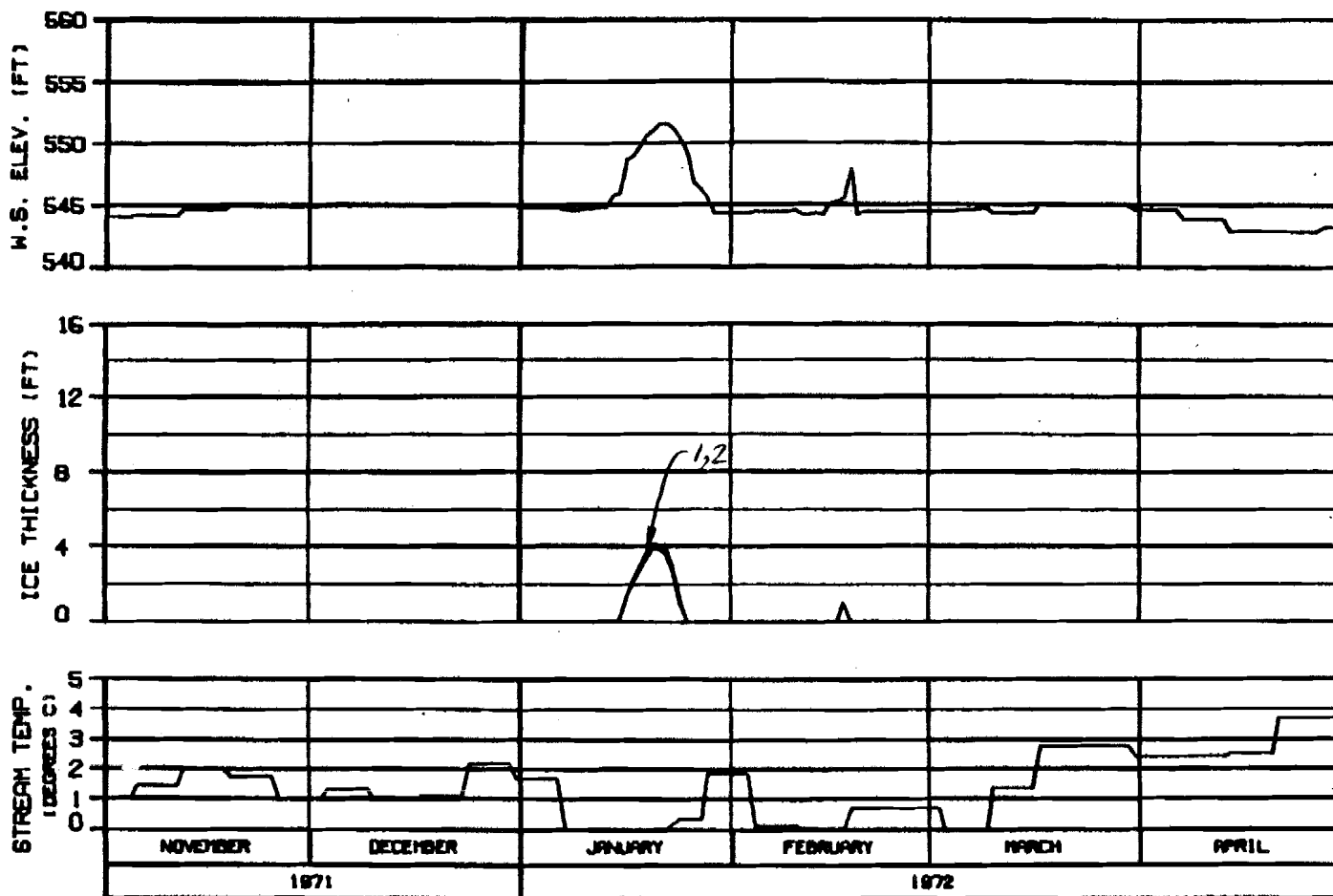
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EDBECO JOINT VENTURE

DESIGNED BY: [blank] 30 JAN 82 1000-142



HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

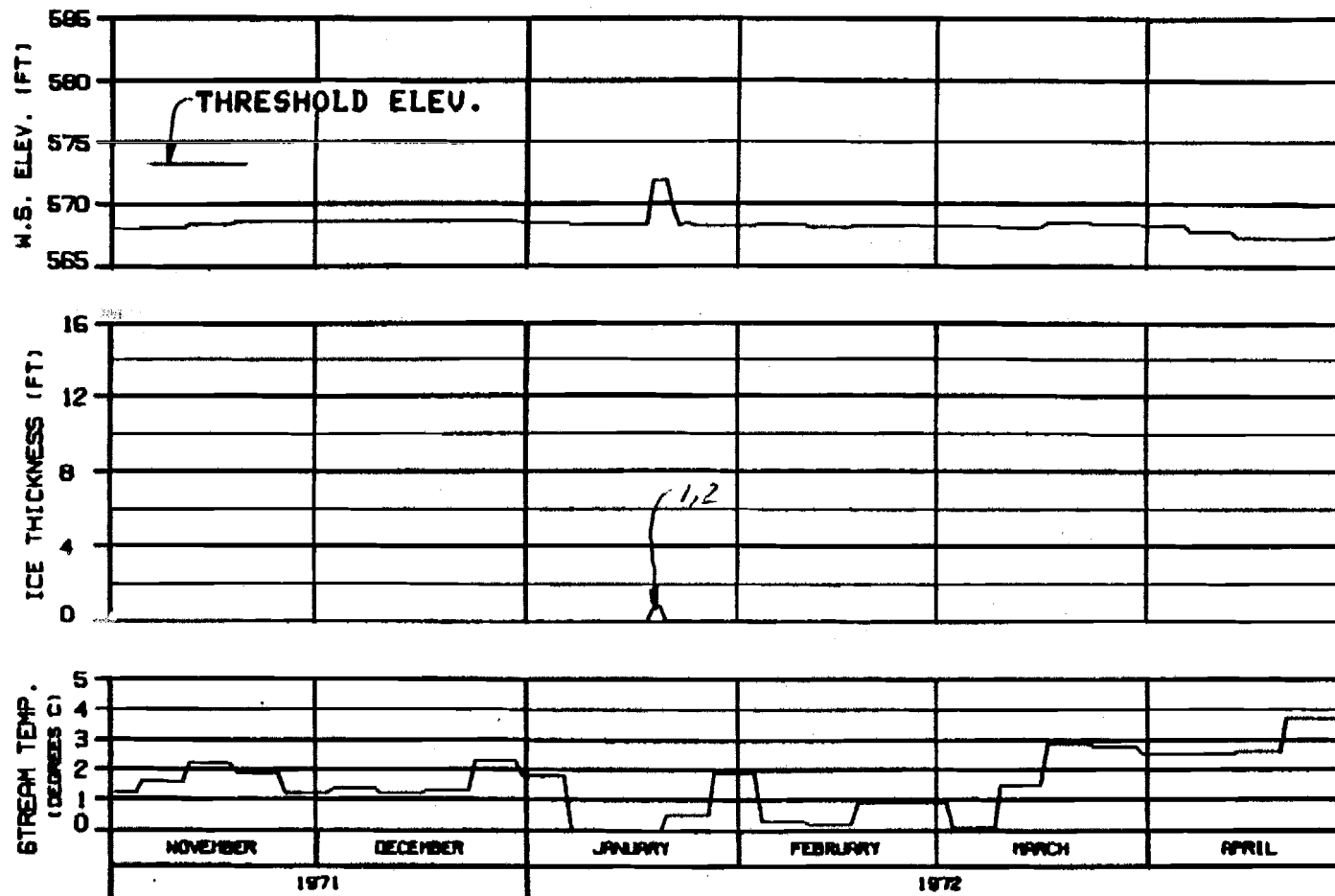
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBR600 JOINT VENTURE

CHART: ALD006 15 JAN 81 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : MATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

ALASKA POWER AUTHORITY

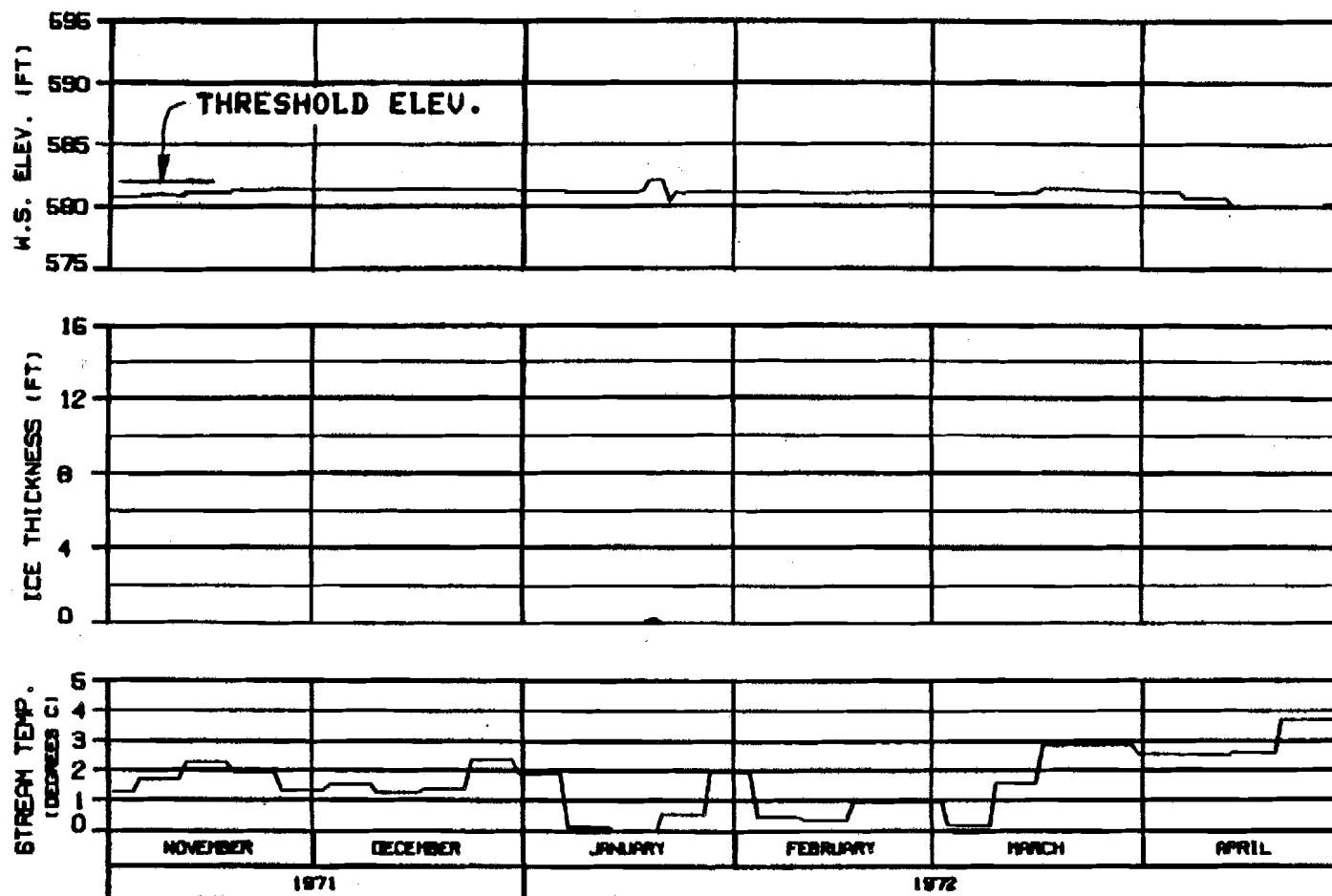
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

CHART: 81-0010 10 JAN 72 1000.142





HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

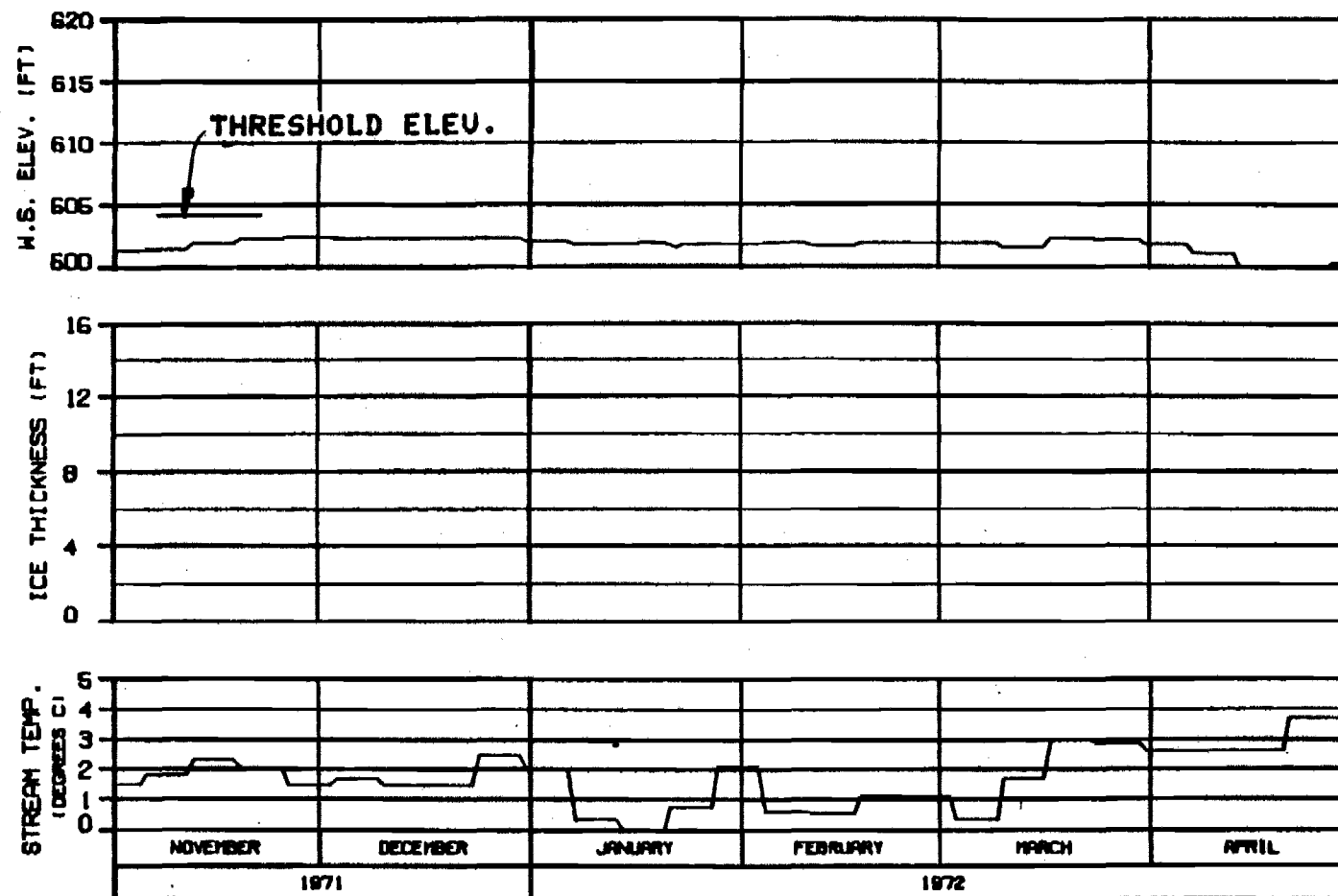
ALASKA POWER AUTHORITY

SUBMITTER PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: 81-1000 25 JAN 81 888.142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:  
1. TOTAL THICKNESS  
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

OPTION?

ALASKA POWER AUTHORITY

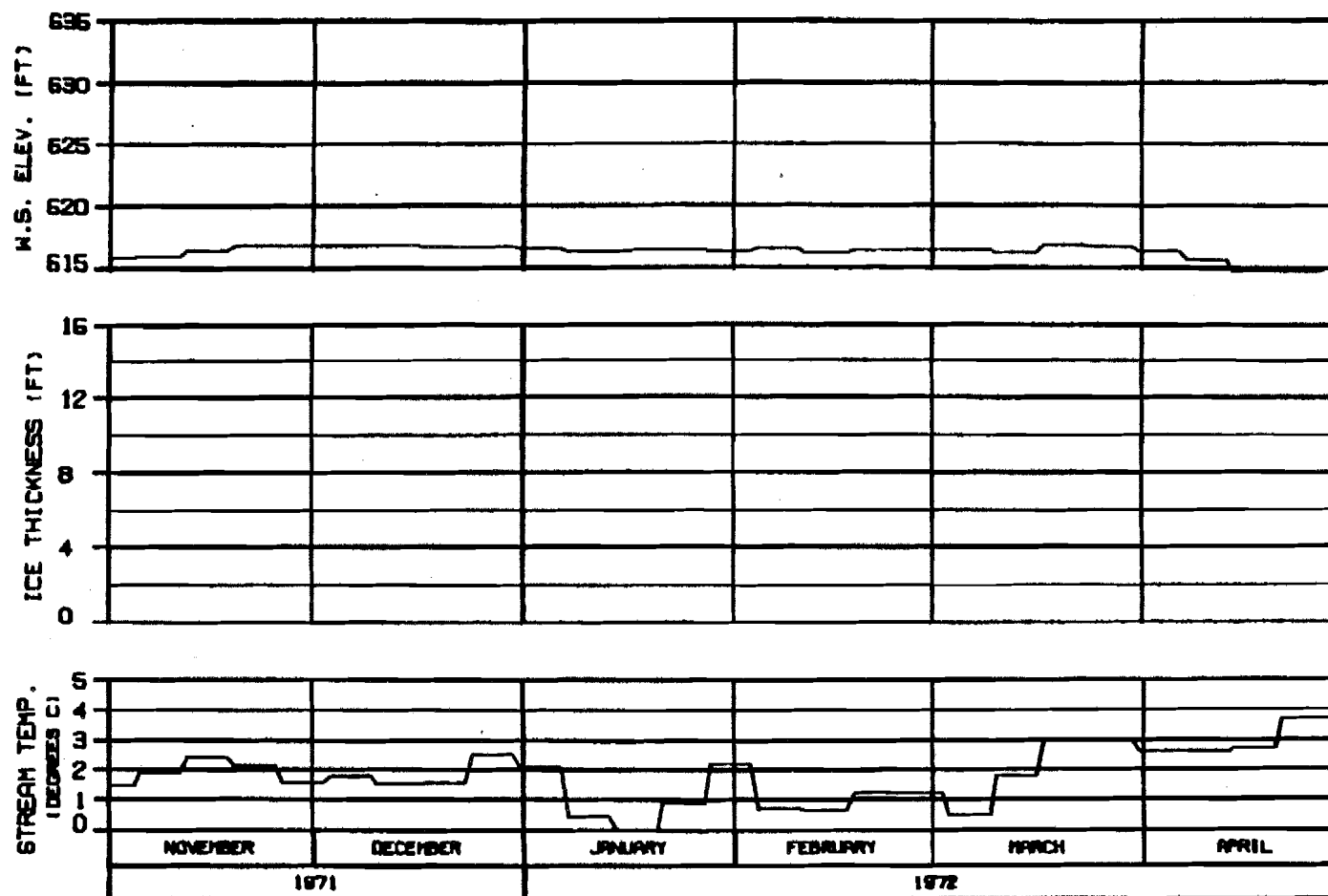
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRARD JOINT VENTURE

FIGURE 9.1-1000 25 JAN 84 1000.142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

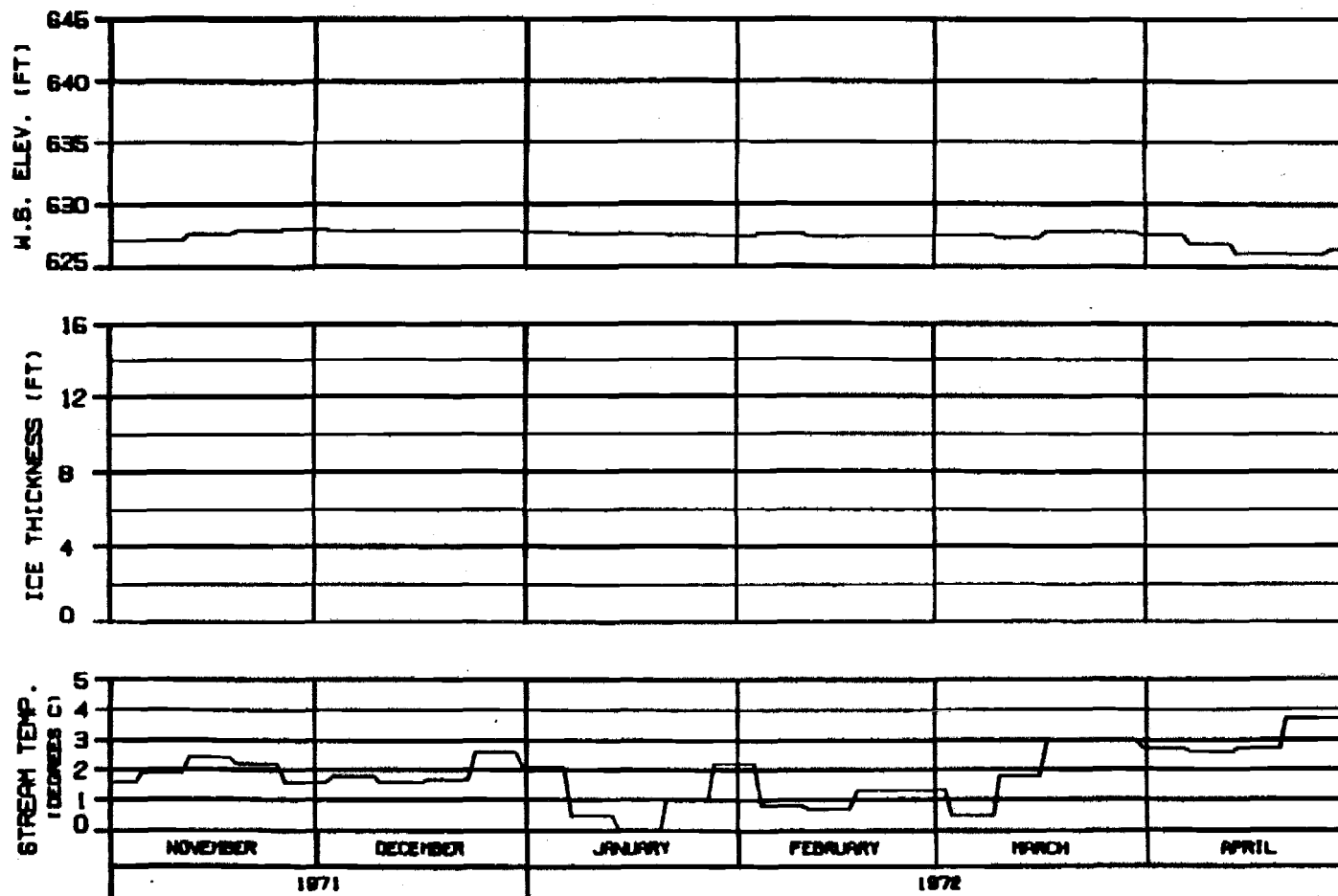
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DATE: 11/28/82 BY: JAC/SH 1000.142



SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

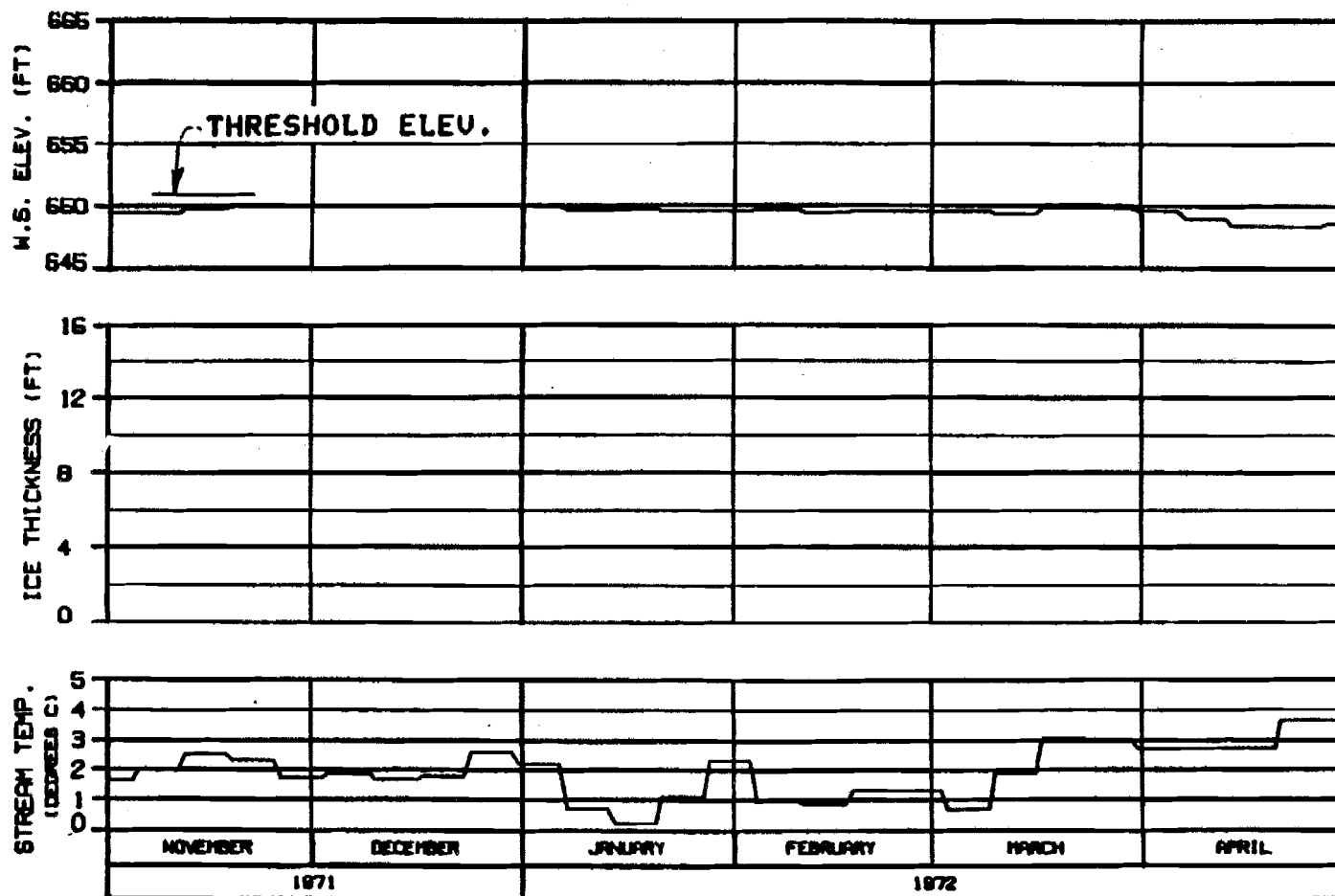
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRSCO JOINT VENTURE

COVERED: 01/01/72 TO 04/30/72



**HEAD OF SLOUGH 9A**  
**RIVER MILE : 133.70**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

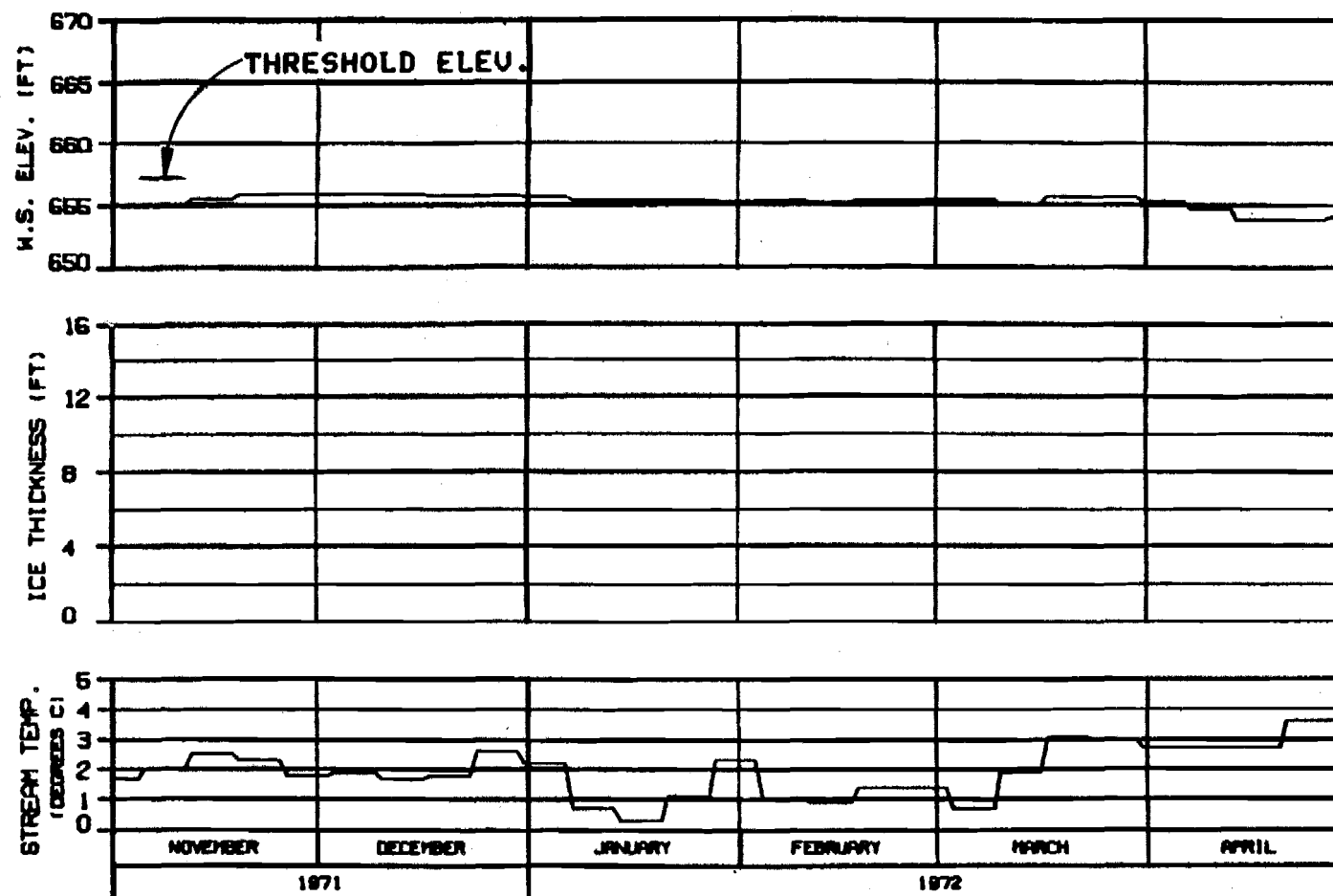
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBASCO JOINT VENTURE**

DESIGNED BY: HAZRA-EBASCO DRAWN BY: JAH/SH DATE: 1992.142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**SIDE CHANNEL U/S OF SLOUGH 10**  
**RIVER MILE : 134.30**

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

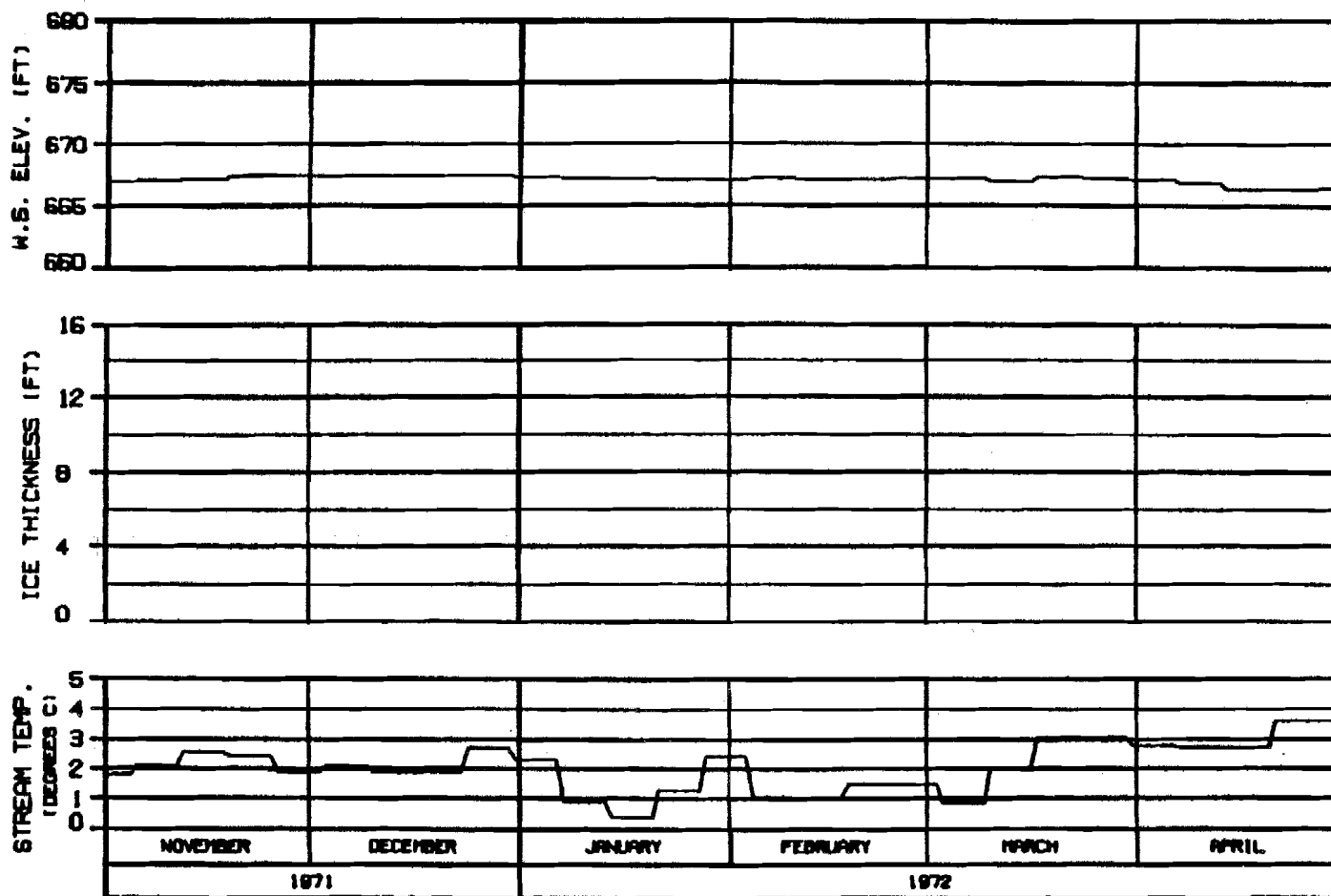
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBR&CO JOINT VENTURE**

DESIGN - RALPH W. BROWN JR. JAN 81 1000.142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**SIDE CHANNEL D/S OF SLOUGH 11**

**RIVER MILE : 135.30**

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
 FLOW CASE : C TEMP RULE : 4 DEG. C  
 REFERENCE RUN NO. : 7196C4A

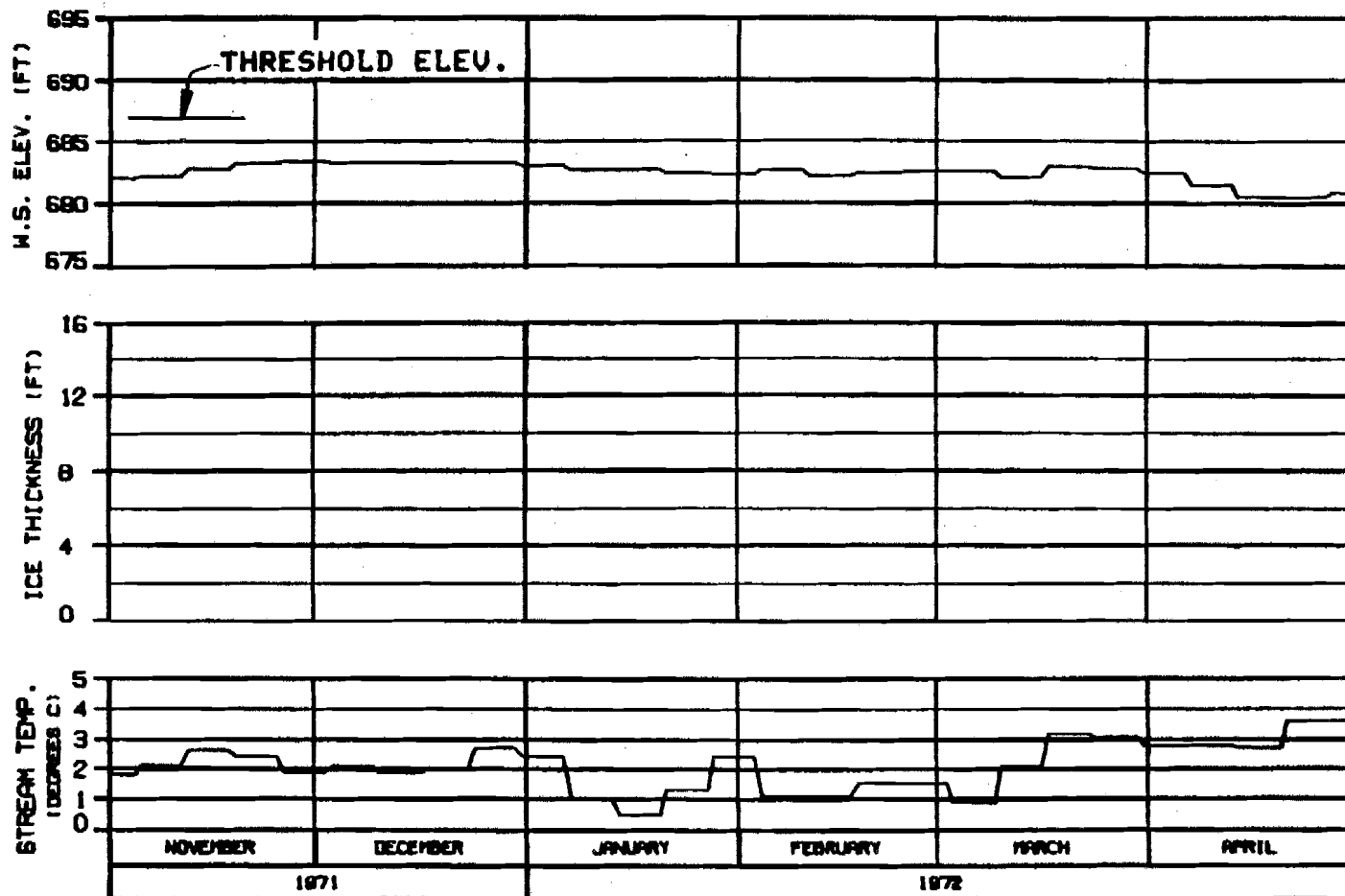
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: J. J. J. DATE: 10 JAN 74 1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

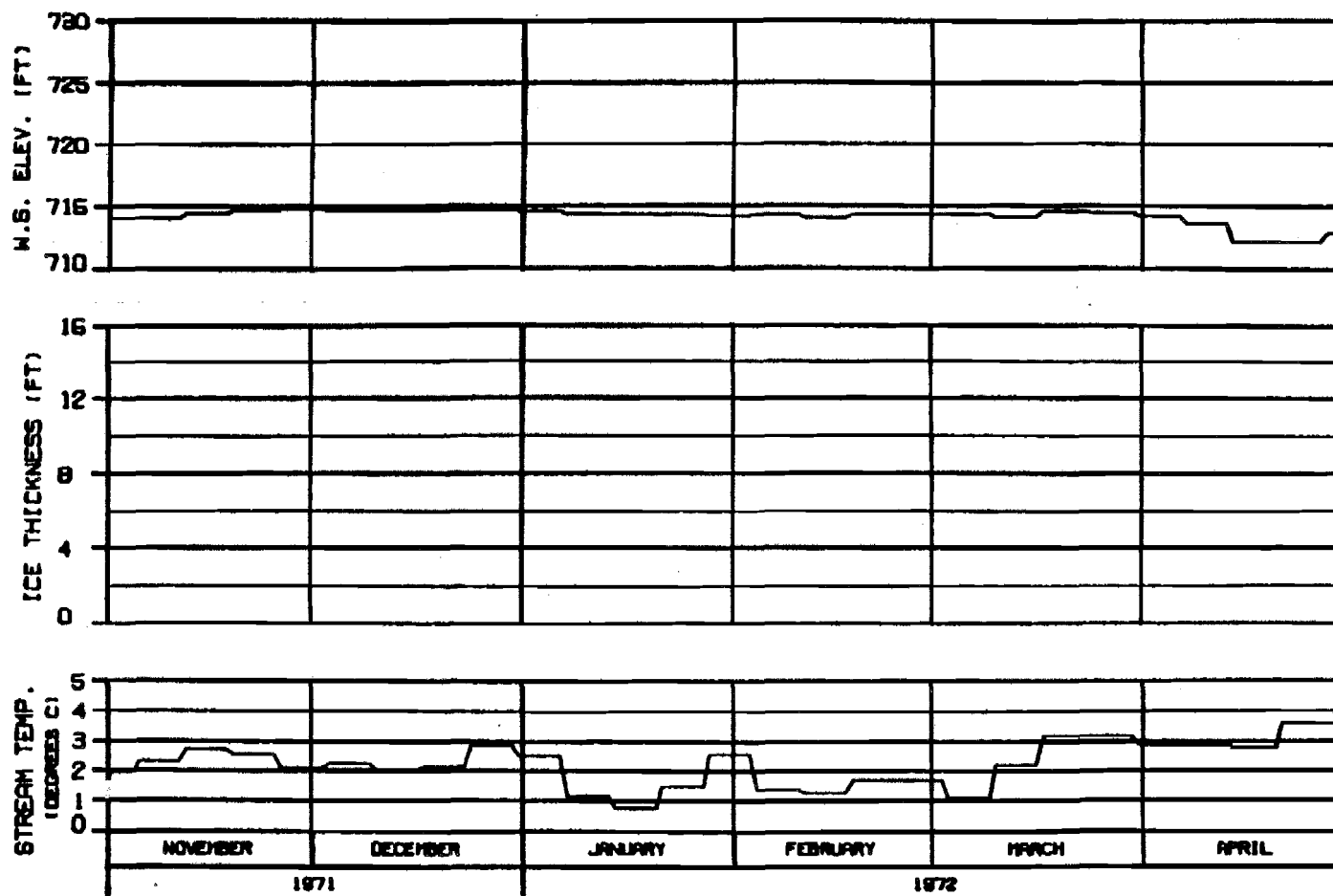
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: BARNER 25 JAN 81

ISS: 142





HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

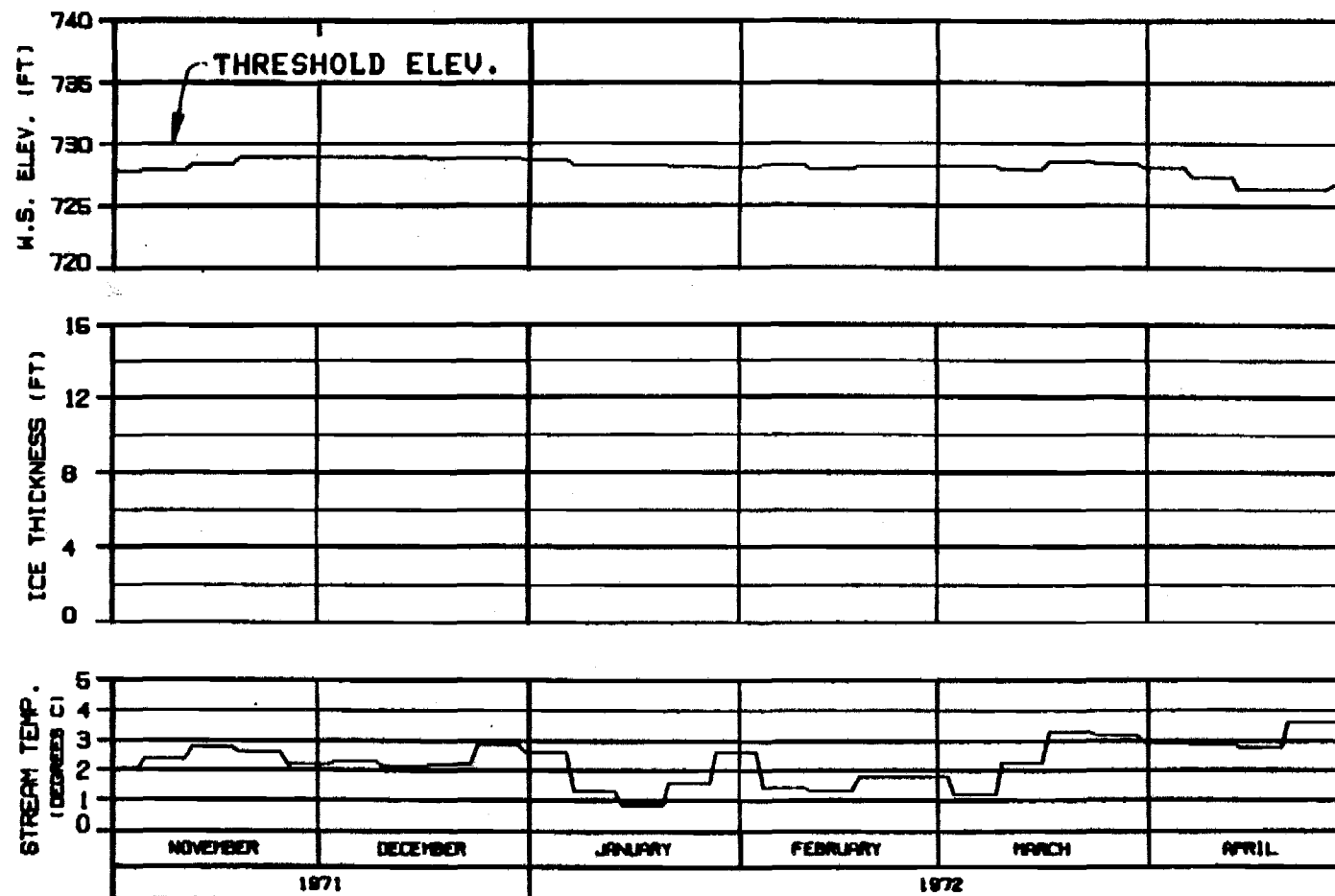
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DESIGN: EBRSCO 30 APR 72 1000.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
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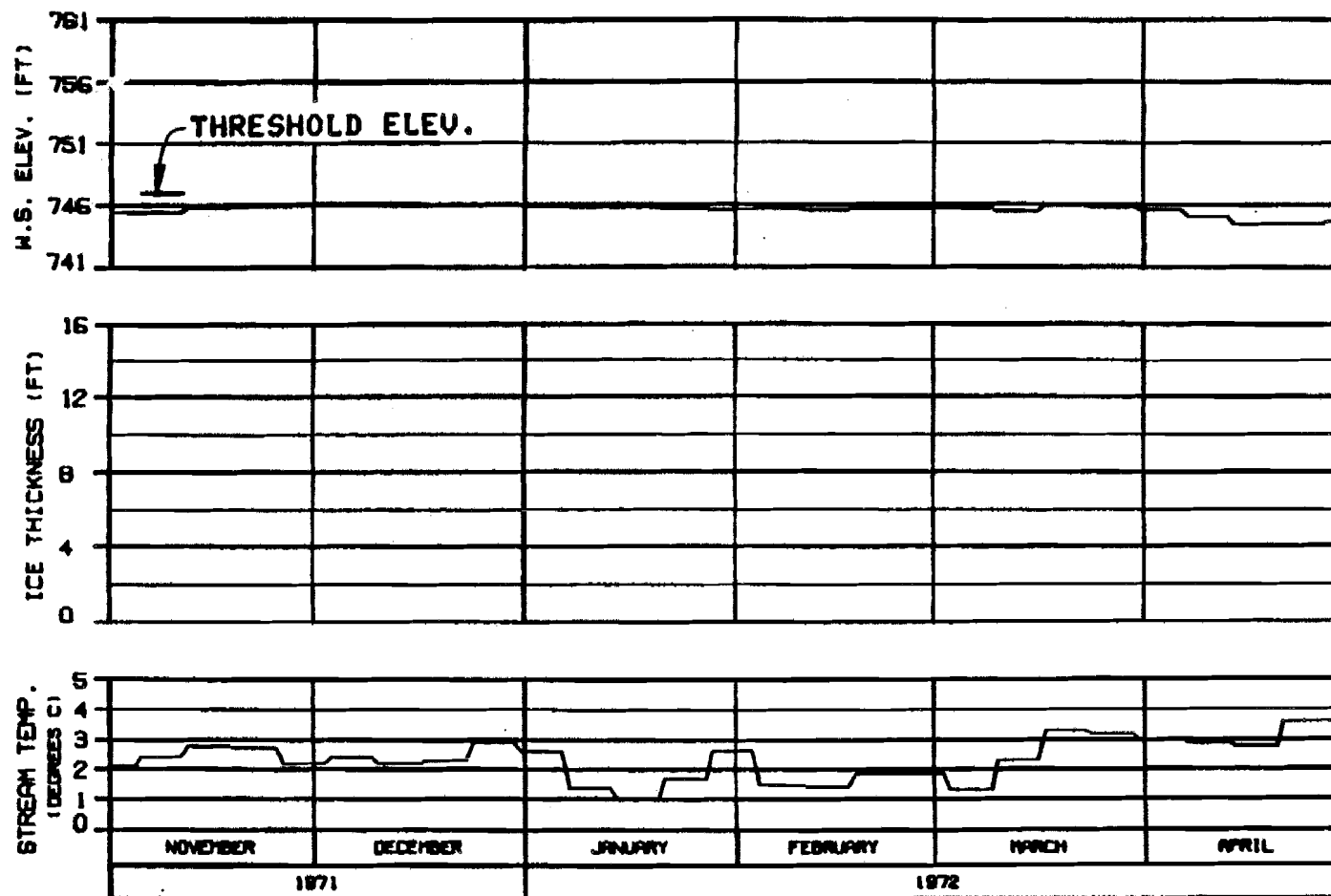
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

DOCID: 84288 IN JAN 81 1988.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 1996  
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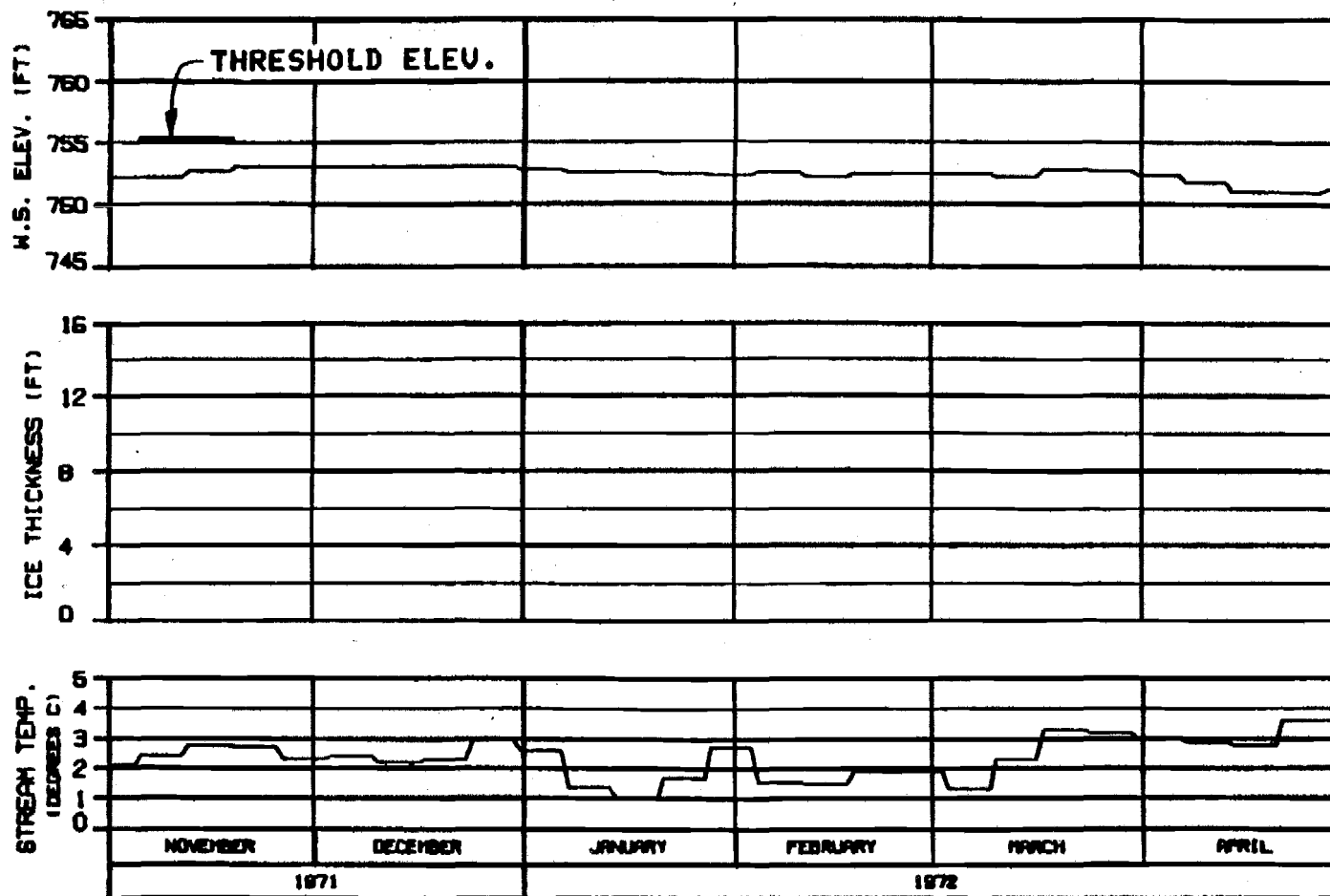
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBR600 JOINT VENTURE

DRAWN: ALP/MS 25 JAN 81 1000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : HATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

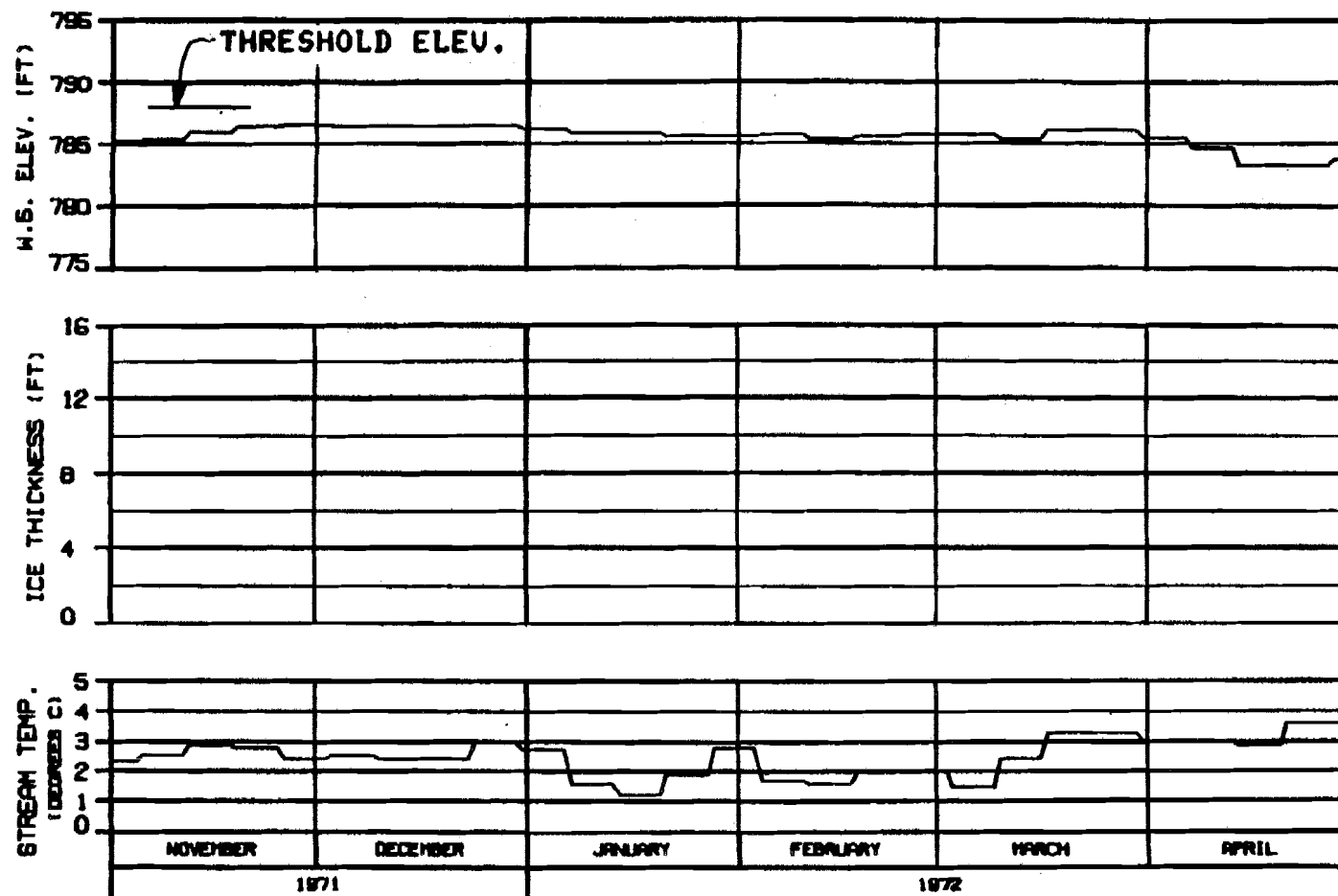
ALASKA POWER AUTHORITY

SUBMITTA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ISSUED: ALASKA POWER AUTHORITY JAN 81 1988.142



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 1996  
FLOW CASE : C TEMP RULE : 4 DEG. C  
REFERENCE RUN NO. : 7196C4A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

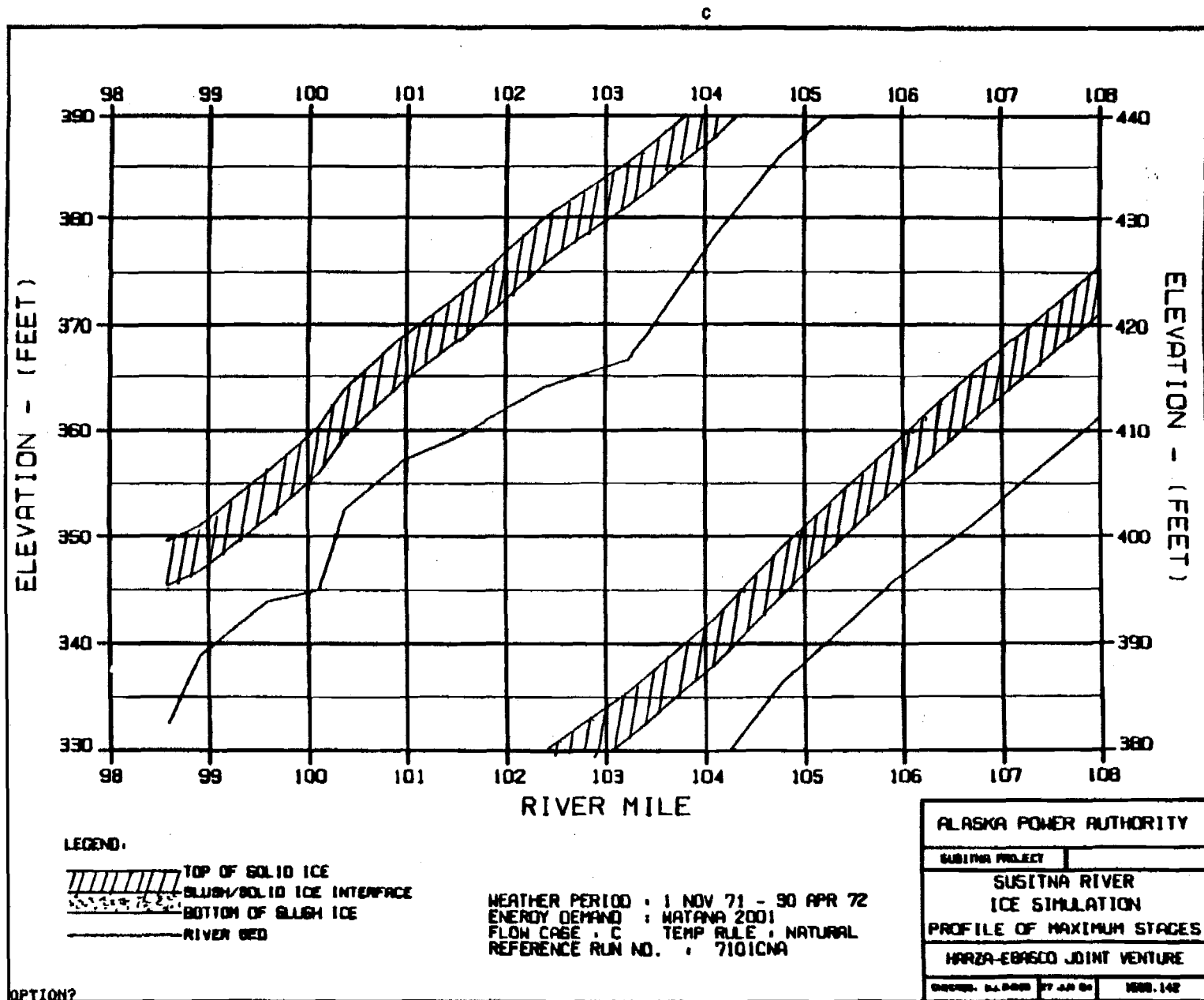
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

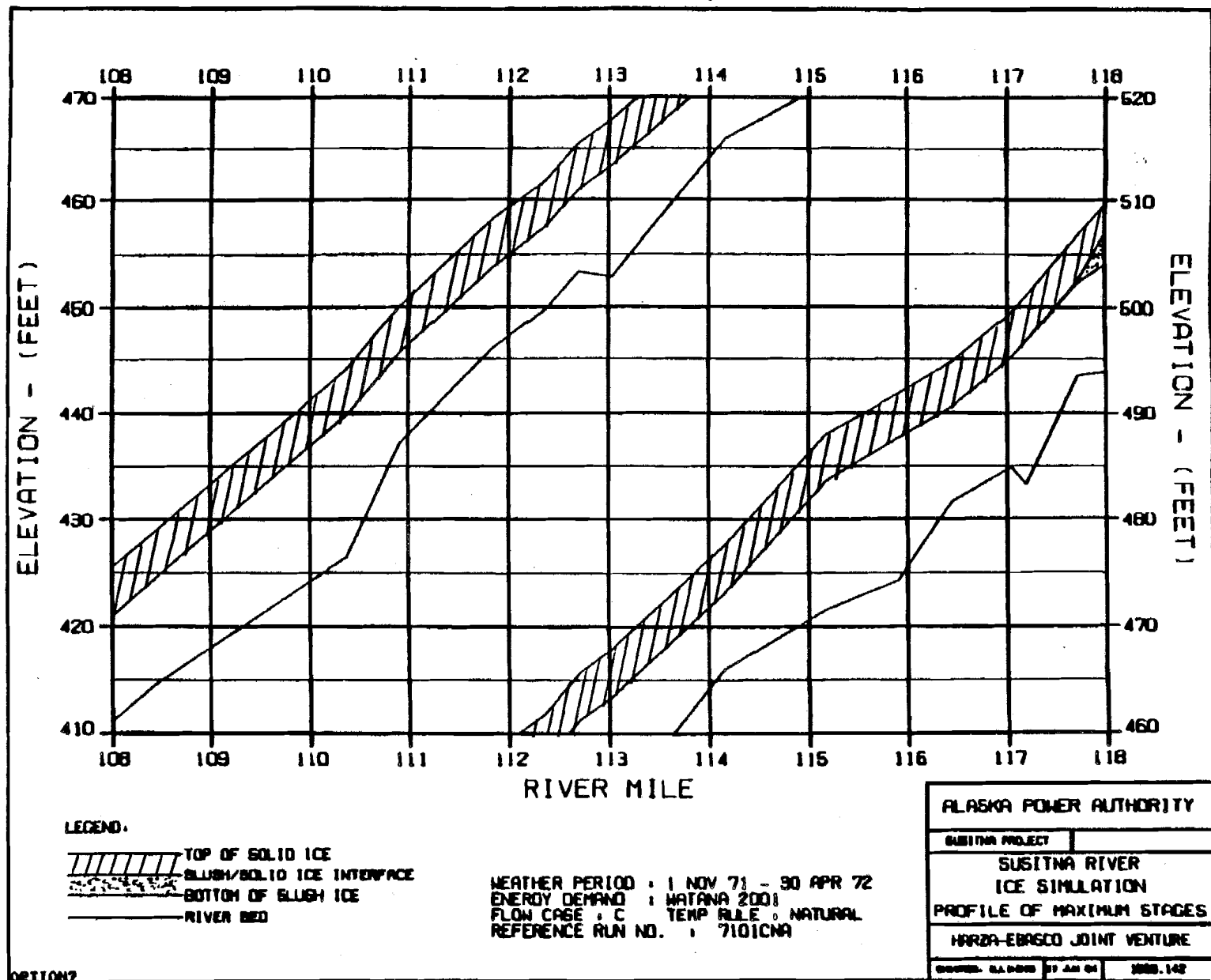
HARZA-EBRACO JOINT VENTURE

DESIGNED BY: [ ] TO: [ ] 1998.142

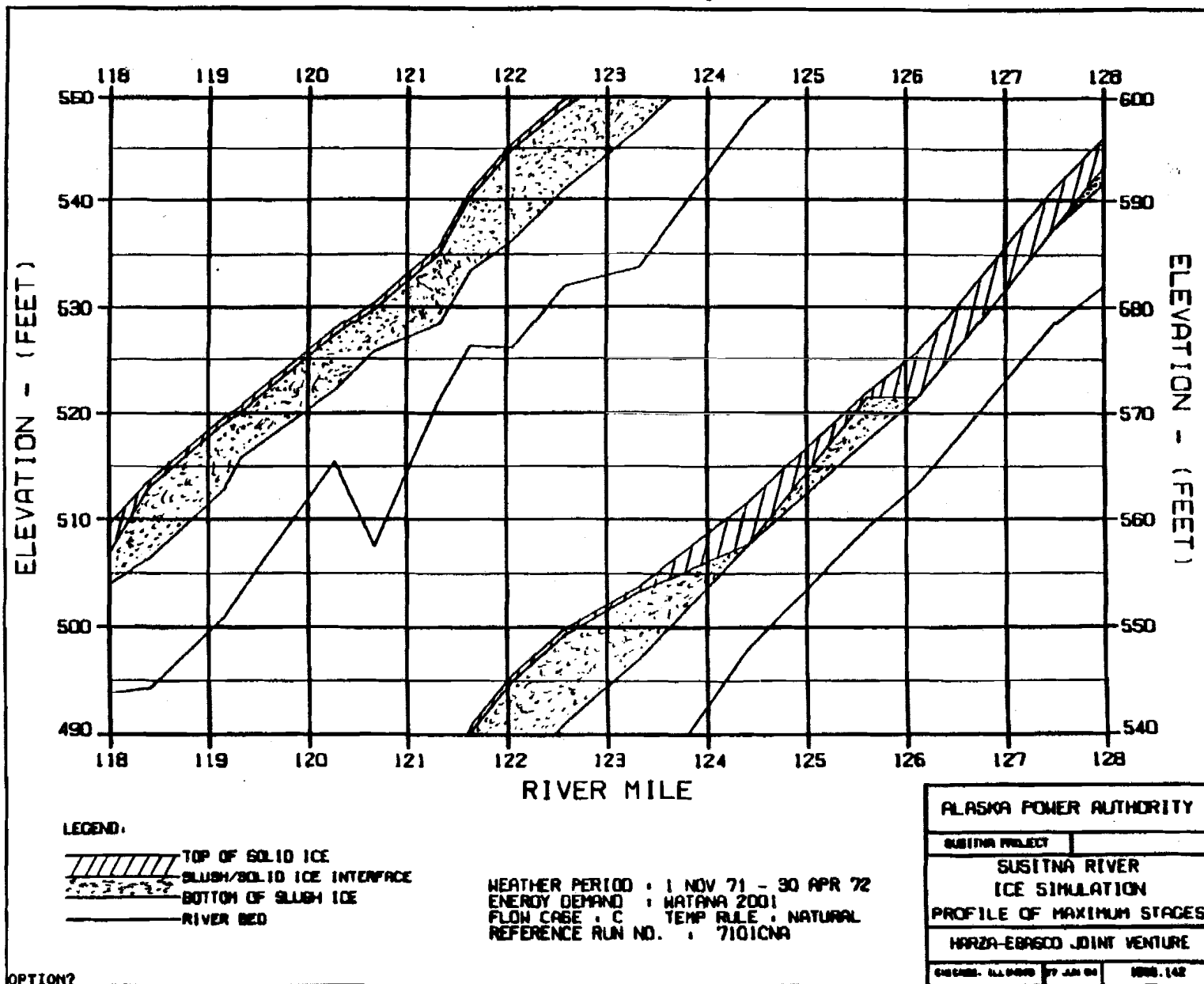
OPTION?

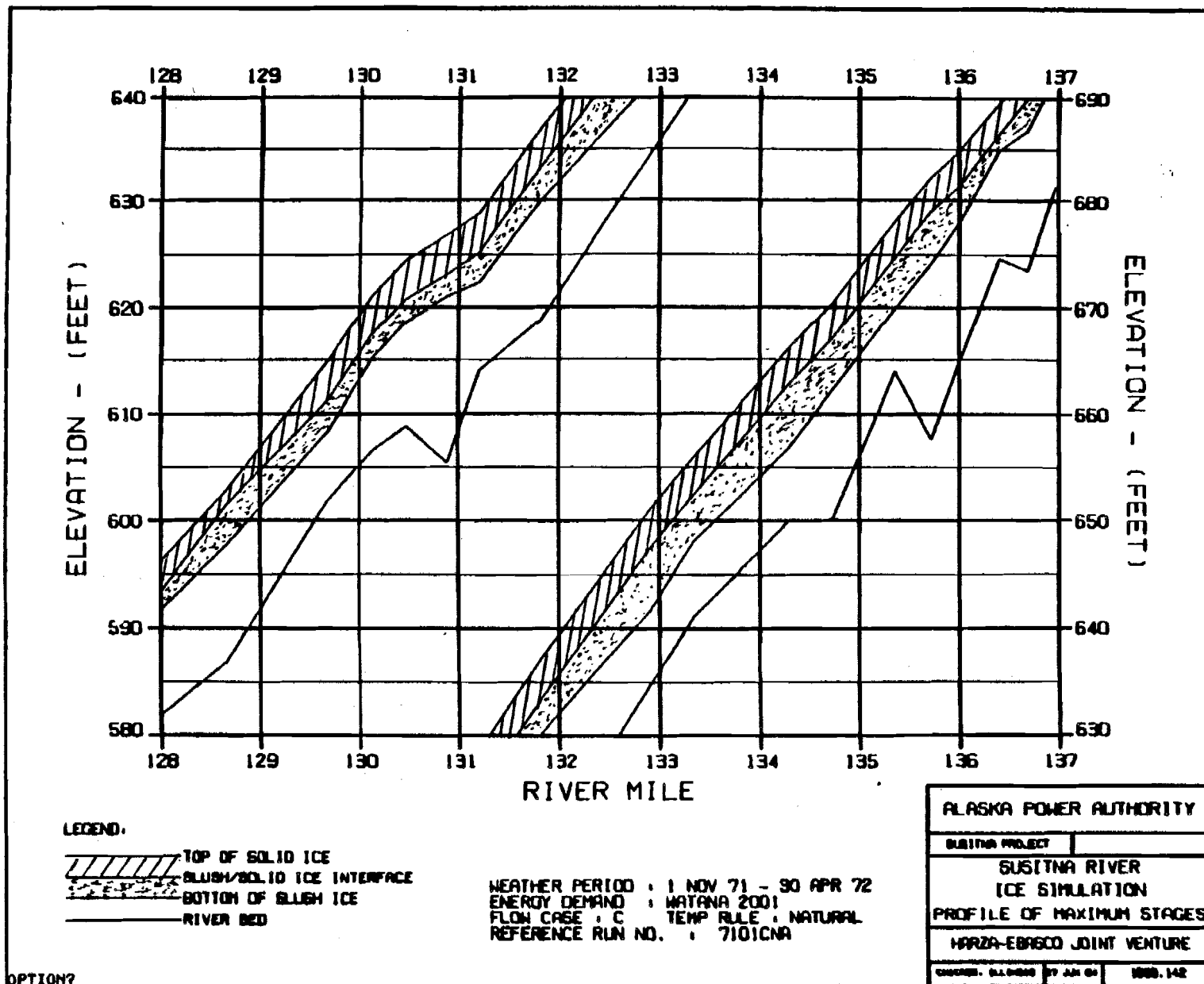
# EXHIBIT K

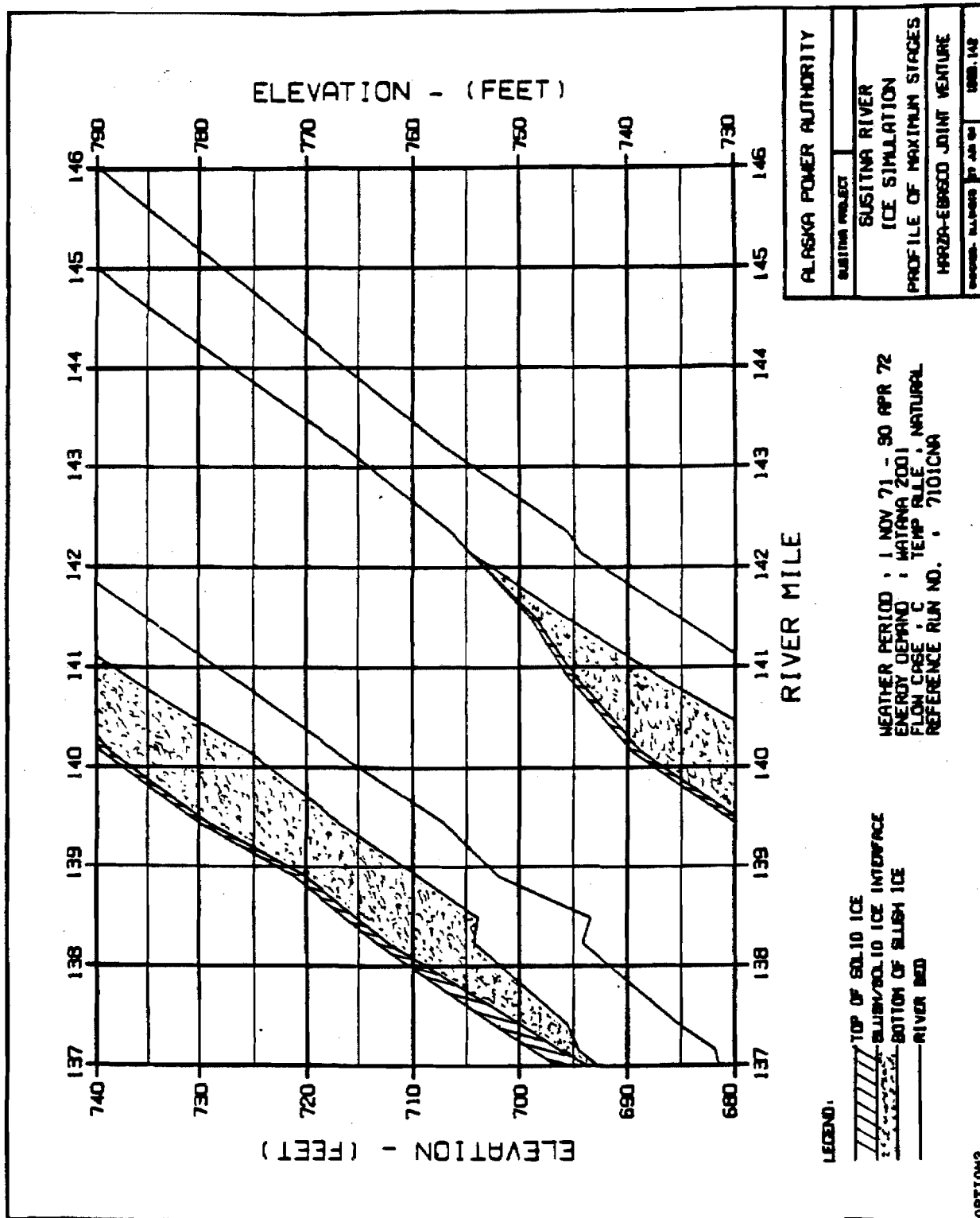


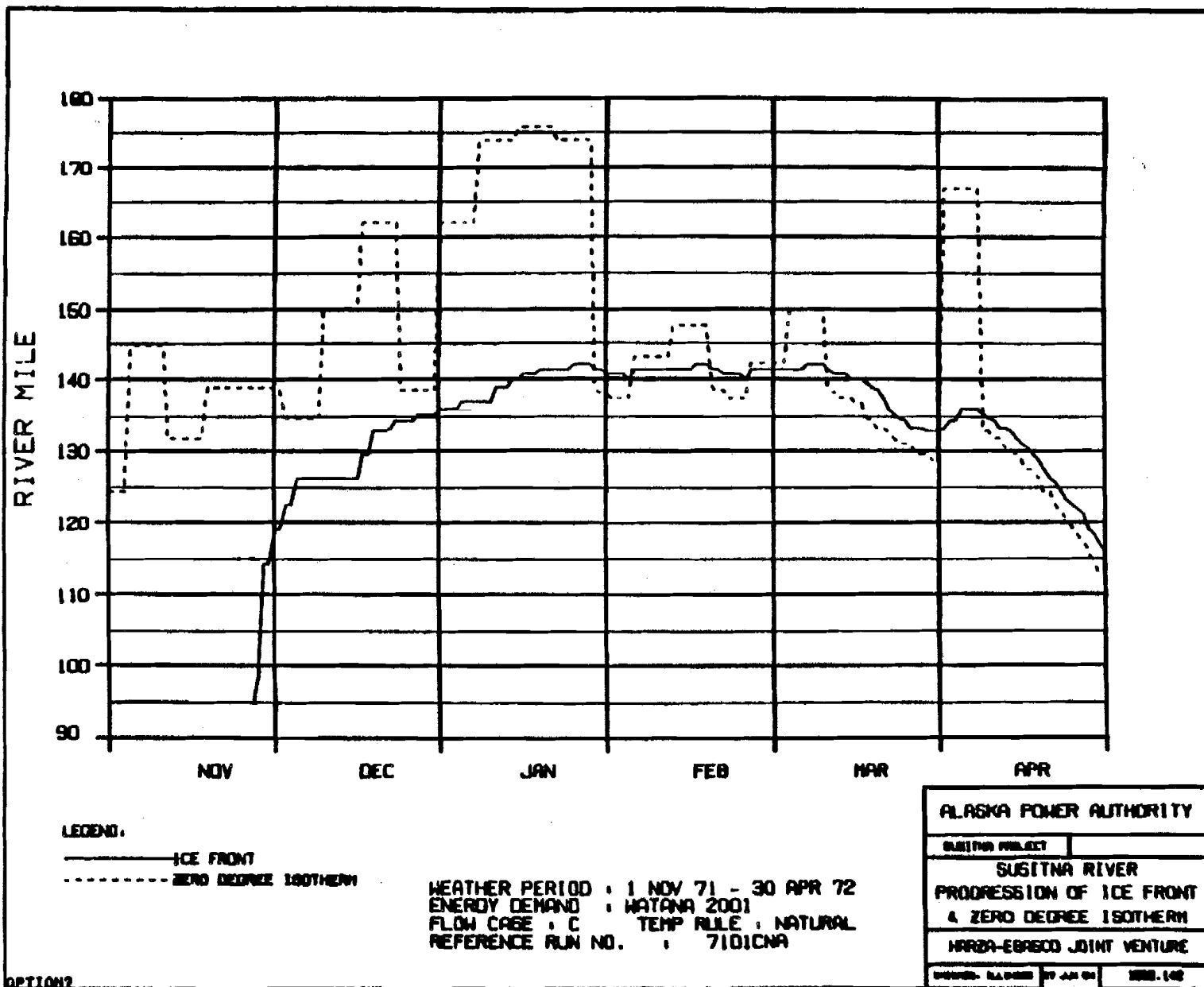


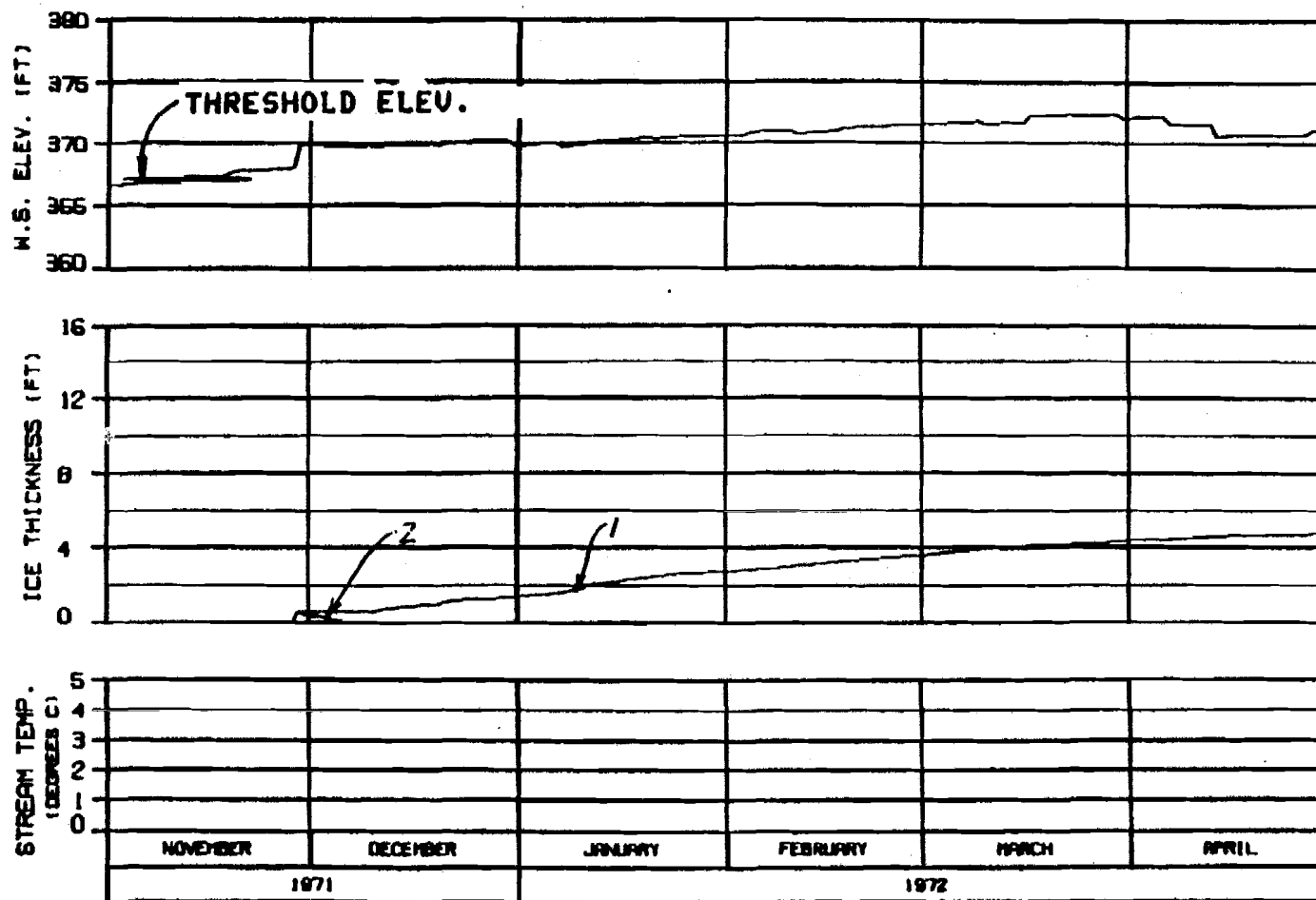












# HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71010NA

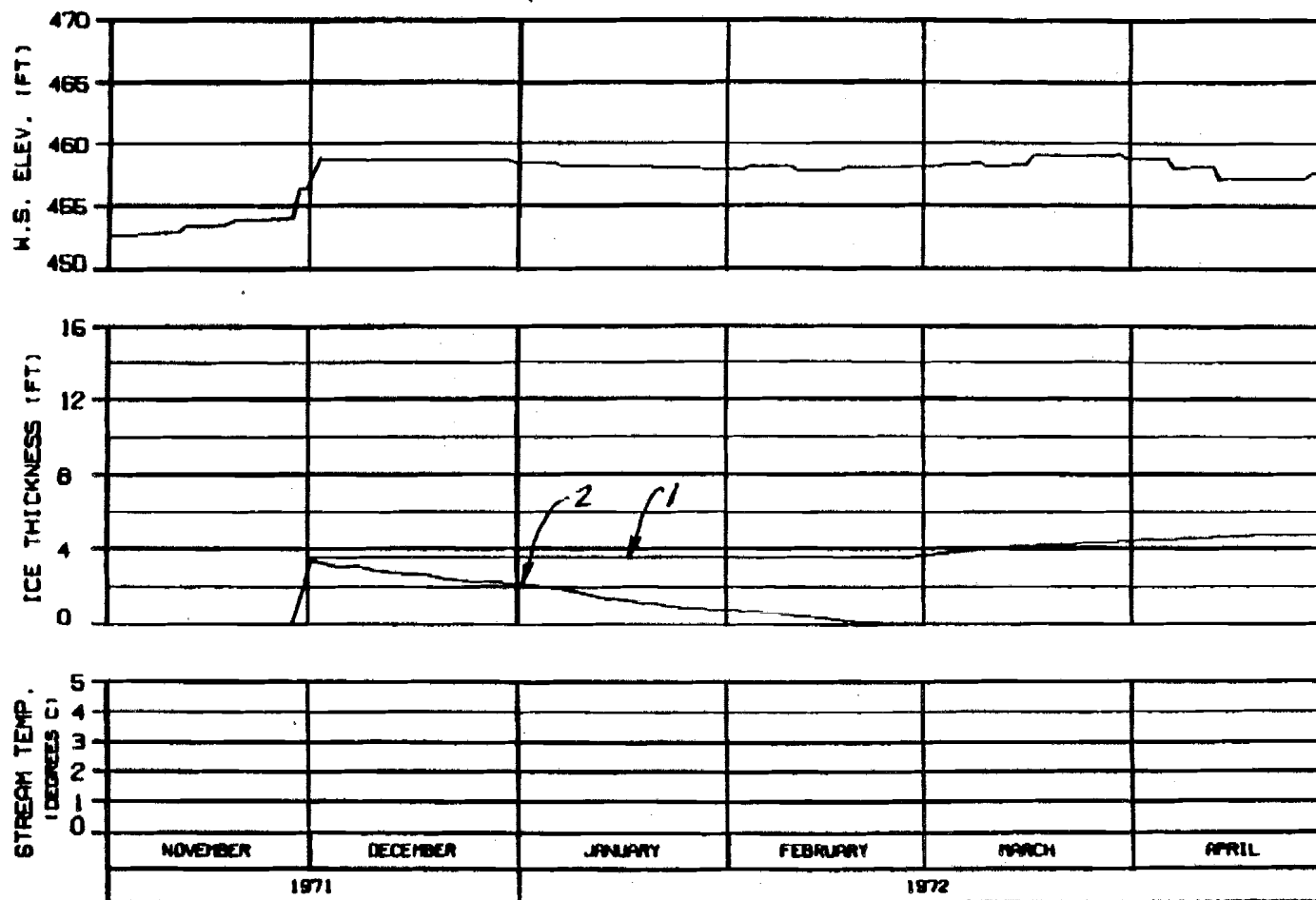
## ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRISCO JOINT VENTURE

DRAWN: AL 1000 BY JAN 84 1000.142



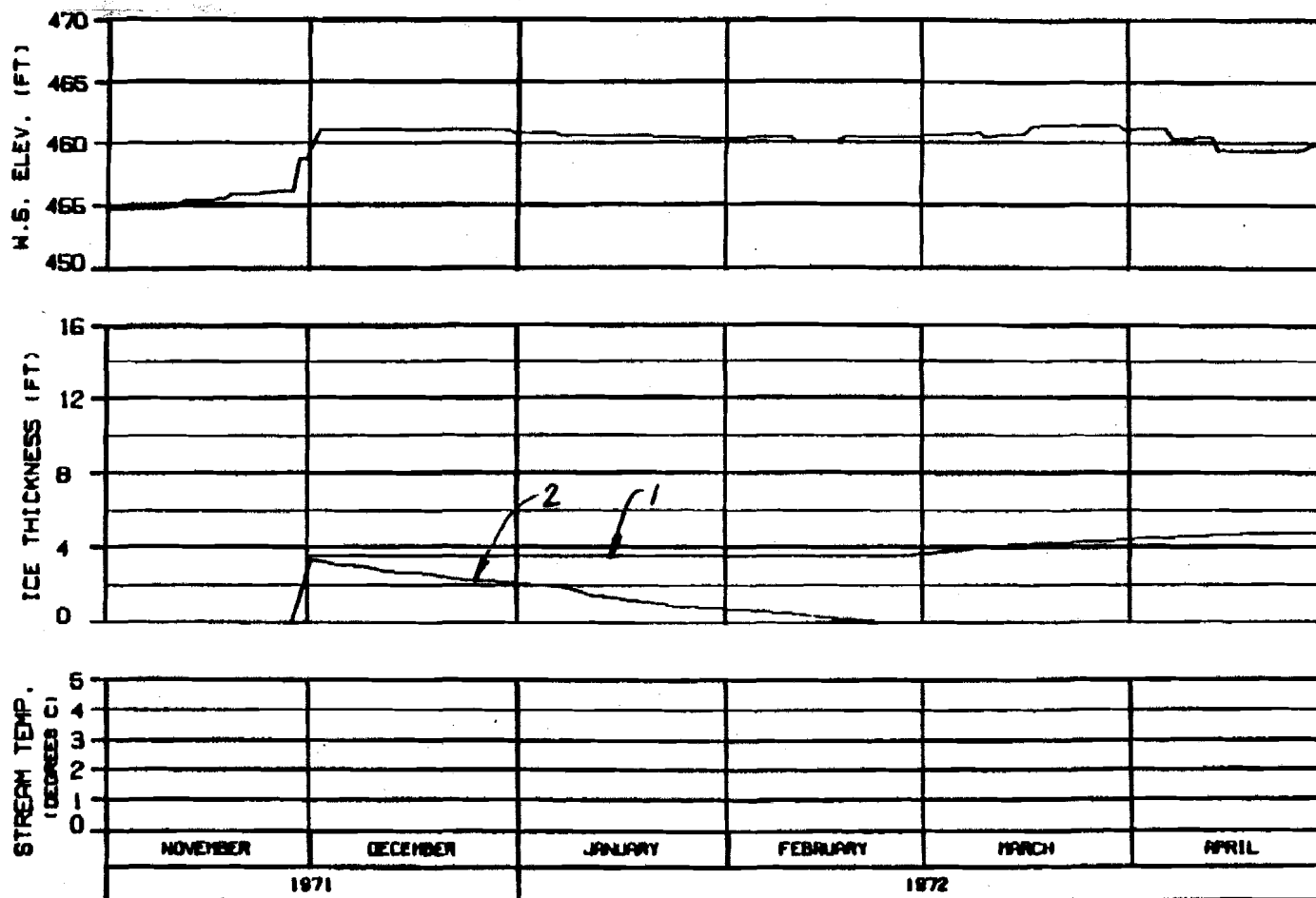
# **SIDE CHANNEL AT HEAD OF GASH CREEK** **RIVER MILE : 112.00**

## **ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. BLUE COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY		
DISTRICT PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGNED: BLANK	BY JAN 80	1000.142



**MOUTH OF SLOUGH 6A**  
**RIVER MILE : 112.34**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71010NA

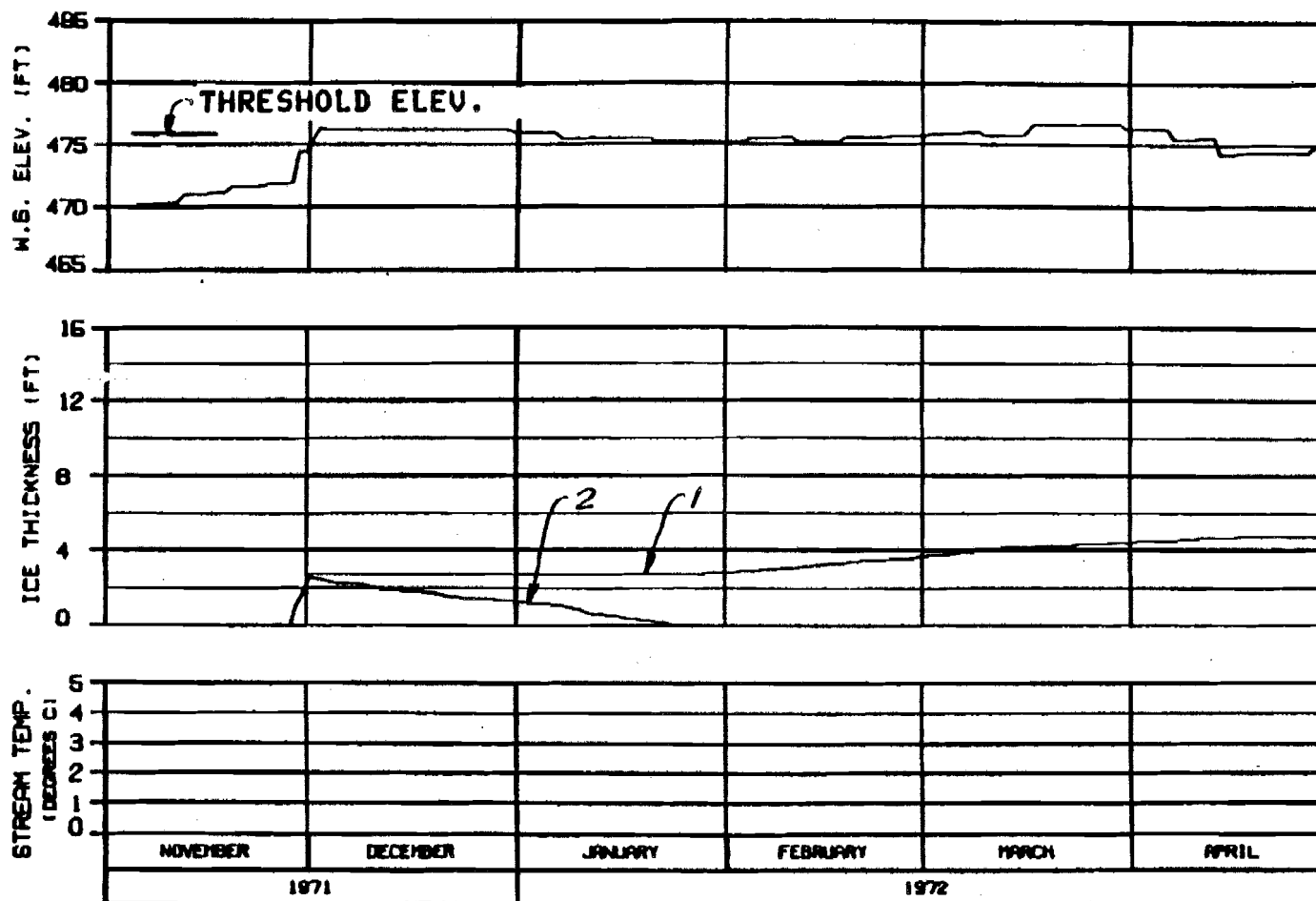
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**WARZA-EBERD JOINT VENTURE**

CHARTED: ALASKA BY JAN 64 1988.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

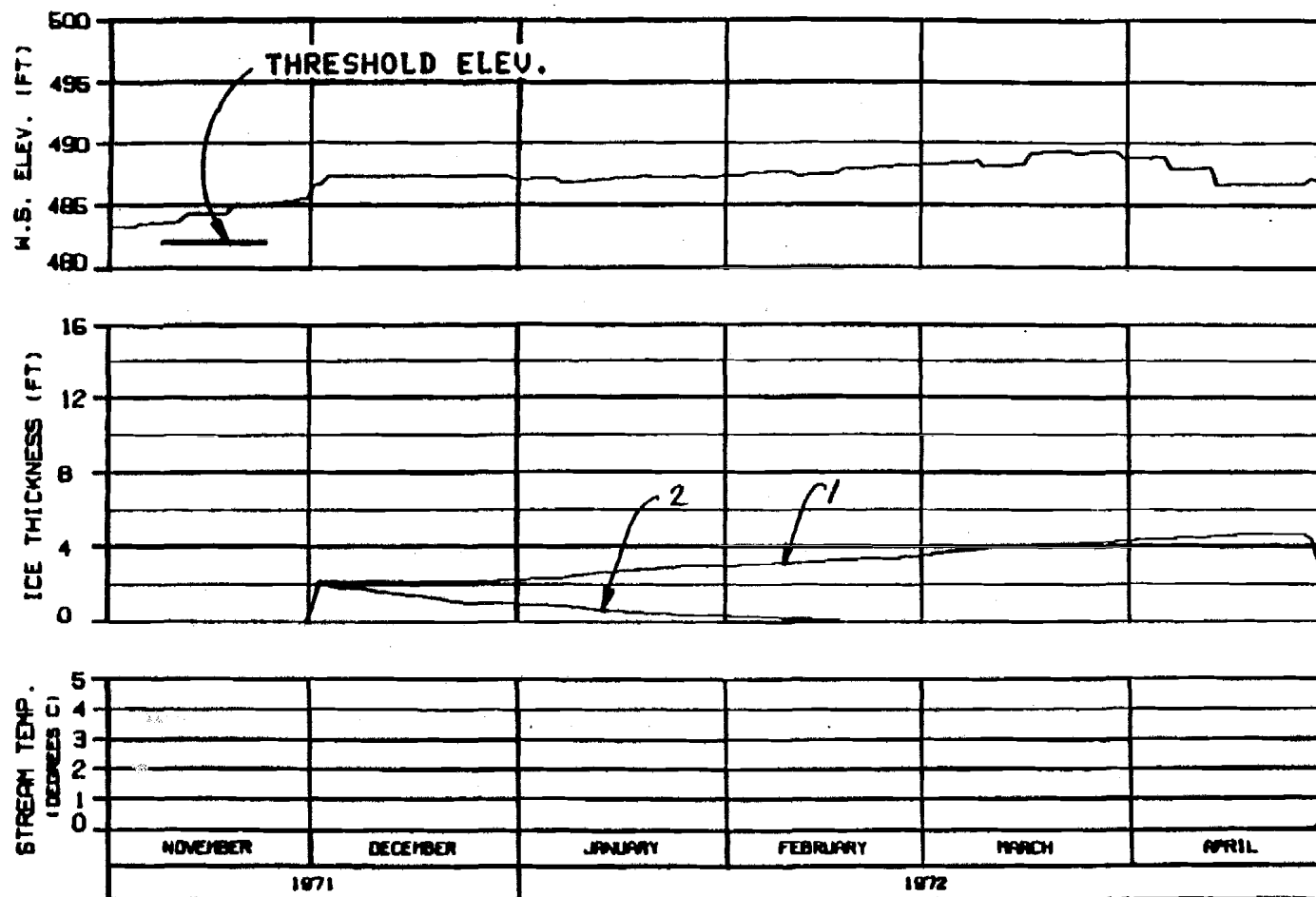
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBR600 JOINT VENTURE

DESIGN. DATED 27 JAN 72 1000.142





**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

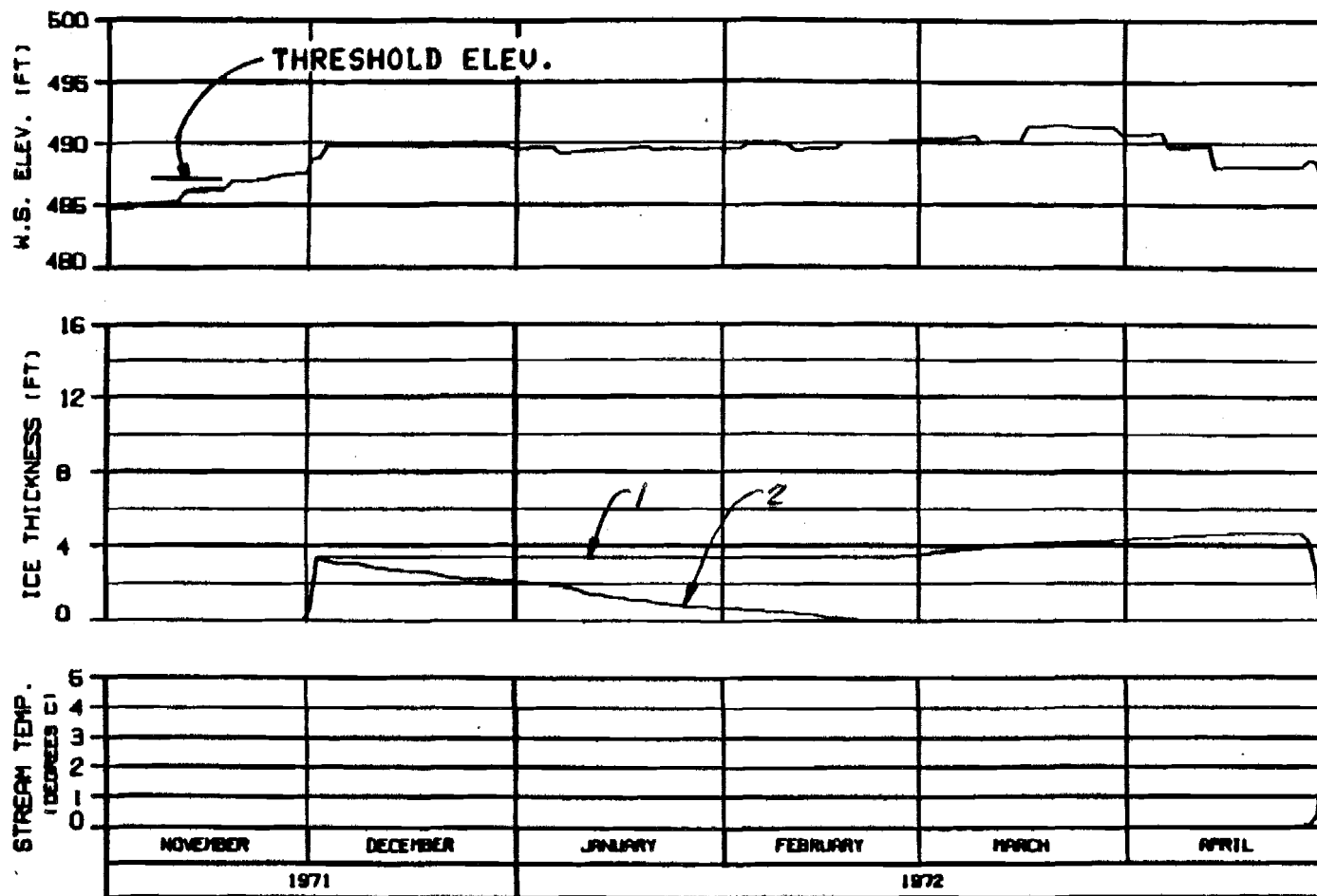
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**WARZA-EBASCO JOINT VENTURE**

000000 01 0000 01 JAN 82 0000.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
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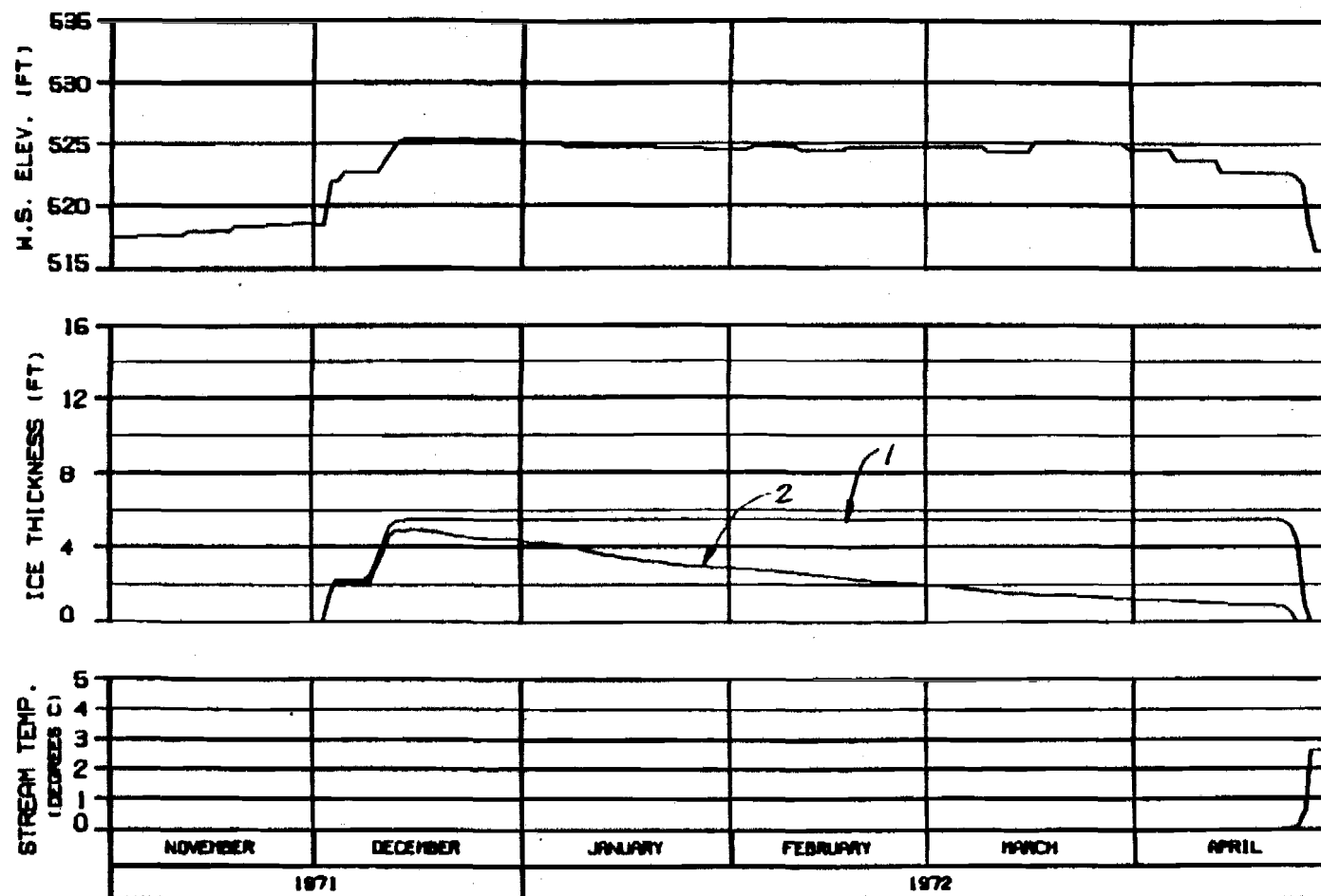
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: ELLIOTT BY JAN 82 1982.148



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**RIVER MILE : 120.00**

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

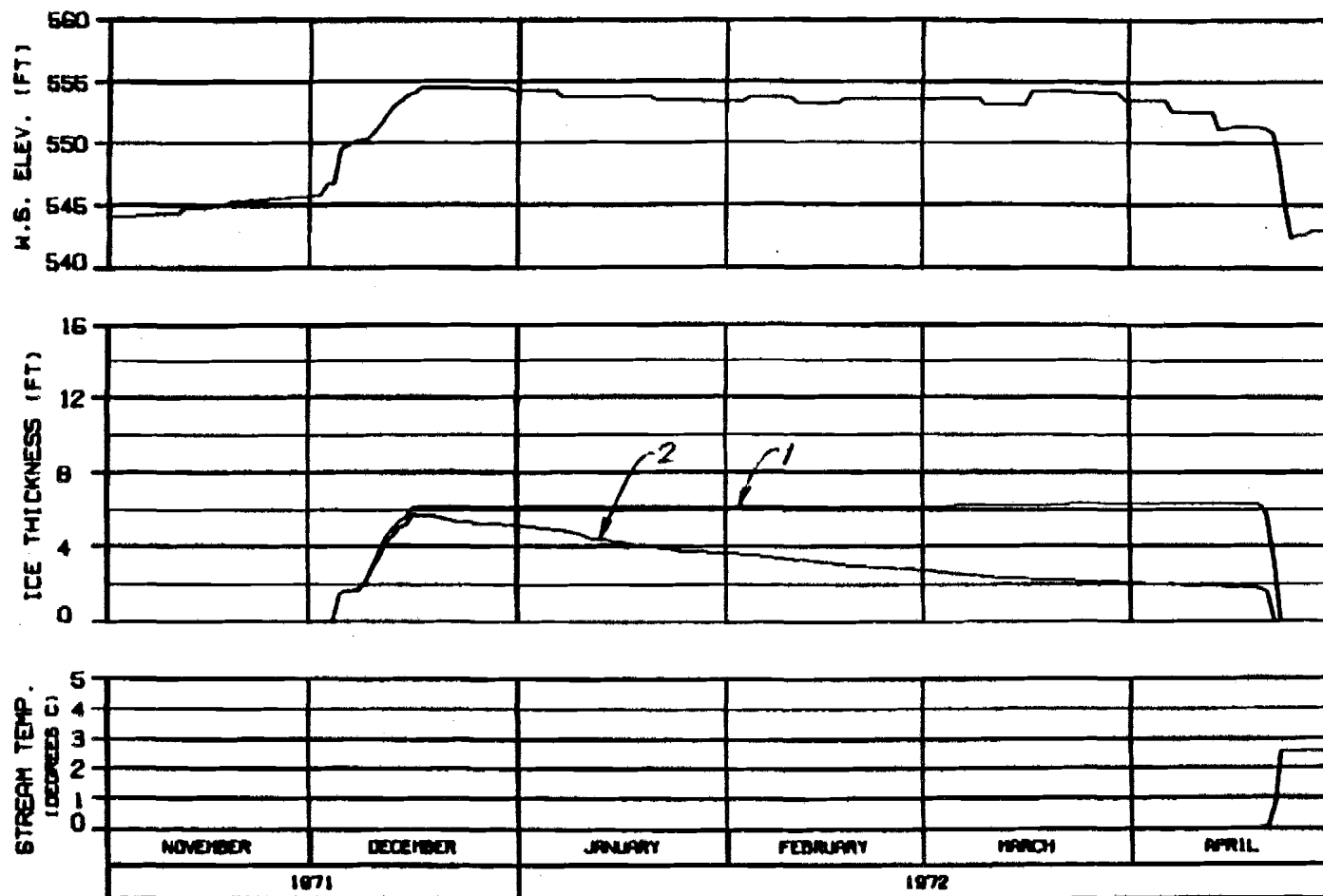
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBRACD JOINT VENTURE**

**DESIGN: 11-0000 BY JAM 01 1000.142**



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : HATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

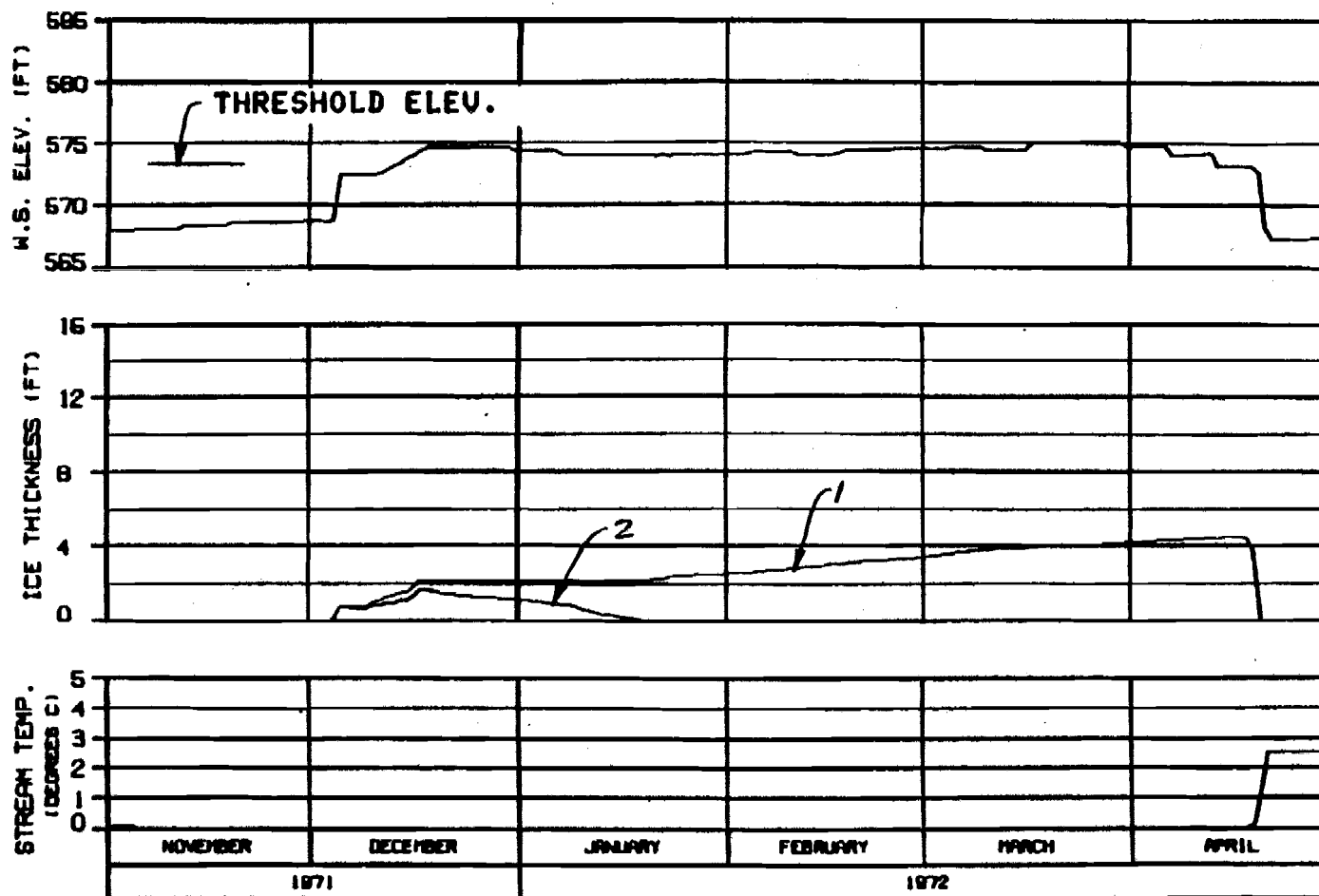
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRACCO JOINT VENTURE

DESIGN: SLD/MS 77 JAN 78 1000.142



HEAD OF SLOUGH 8A (WEST)  
RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

SUBJECT PROJECT

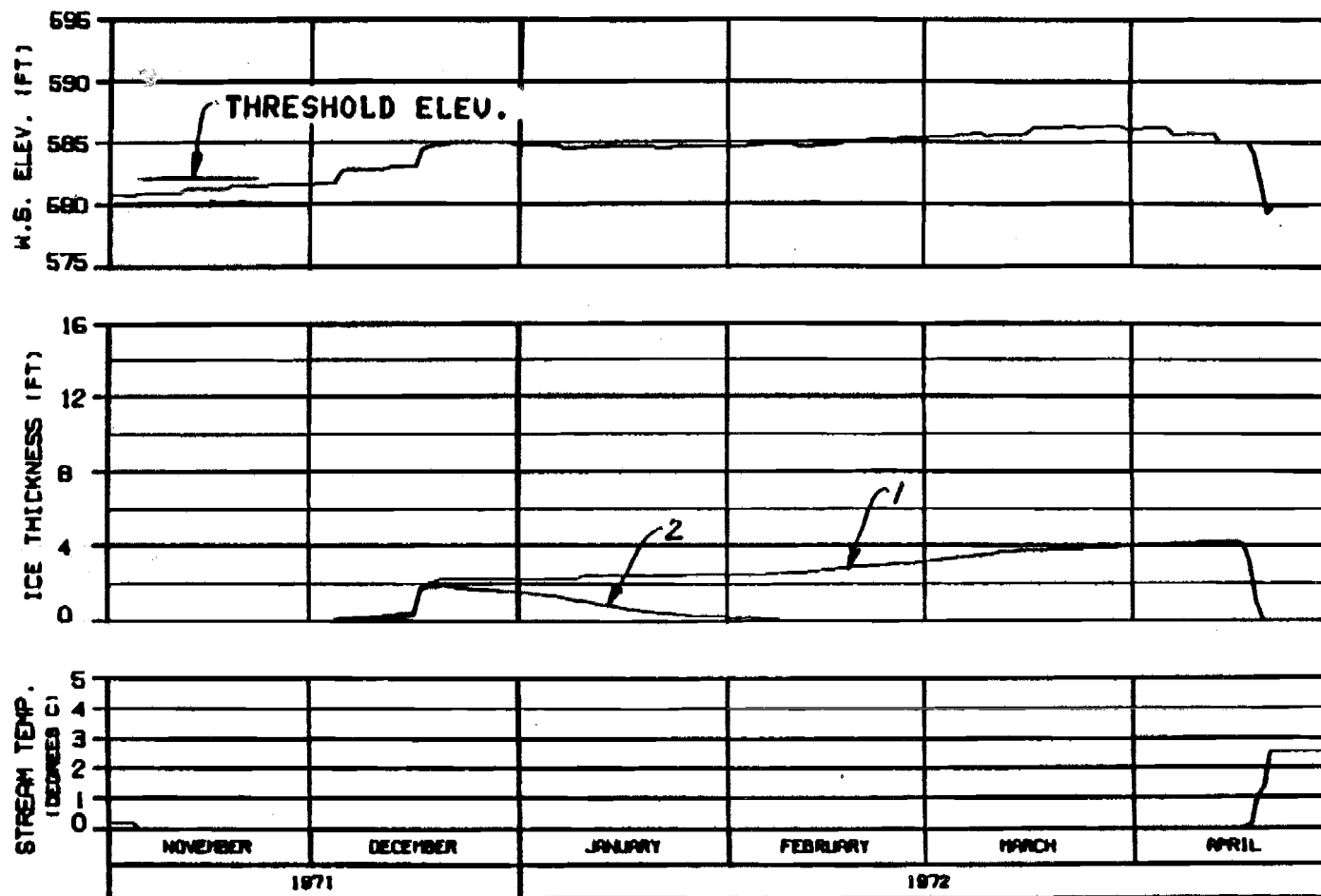
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

DESIGNED BY: B. B. B. B.

BY: J. A. B.

DATE: 1972



HEAD OF SLOUGH 8A (EAST)  
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71010NA

ALASKA POWER AUTHORITY

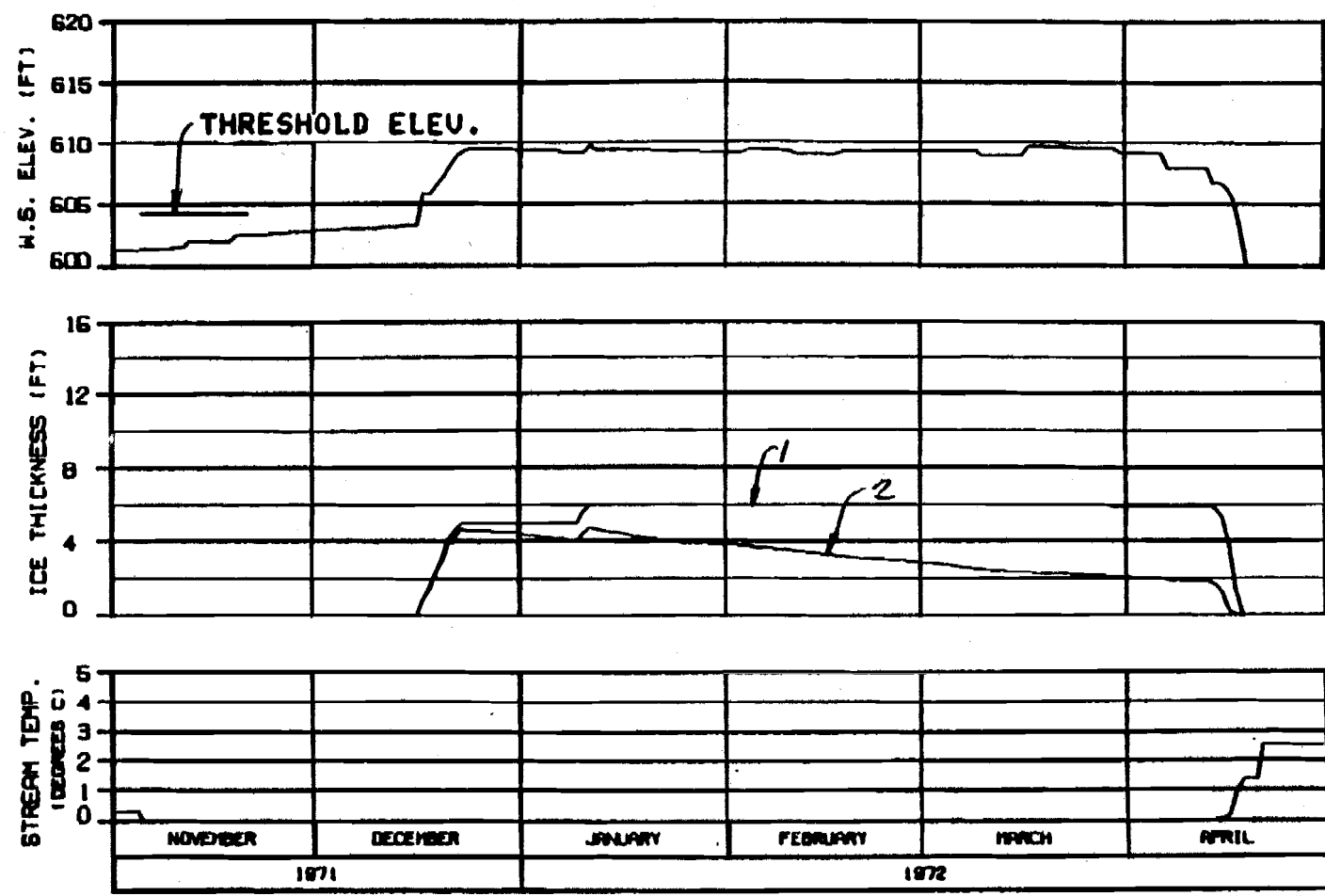
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DESIGN. BY: 77 JAN 74 1000.042

c



**HEAD OF SLOUGH 9**  
**RIVER MILE : 129.30**

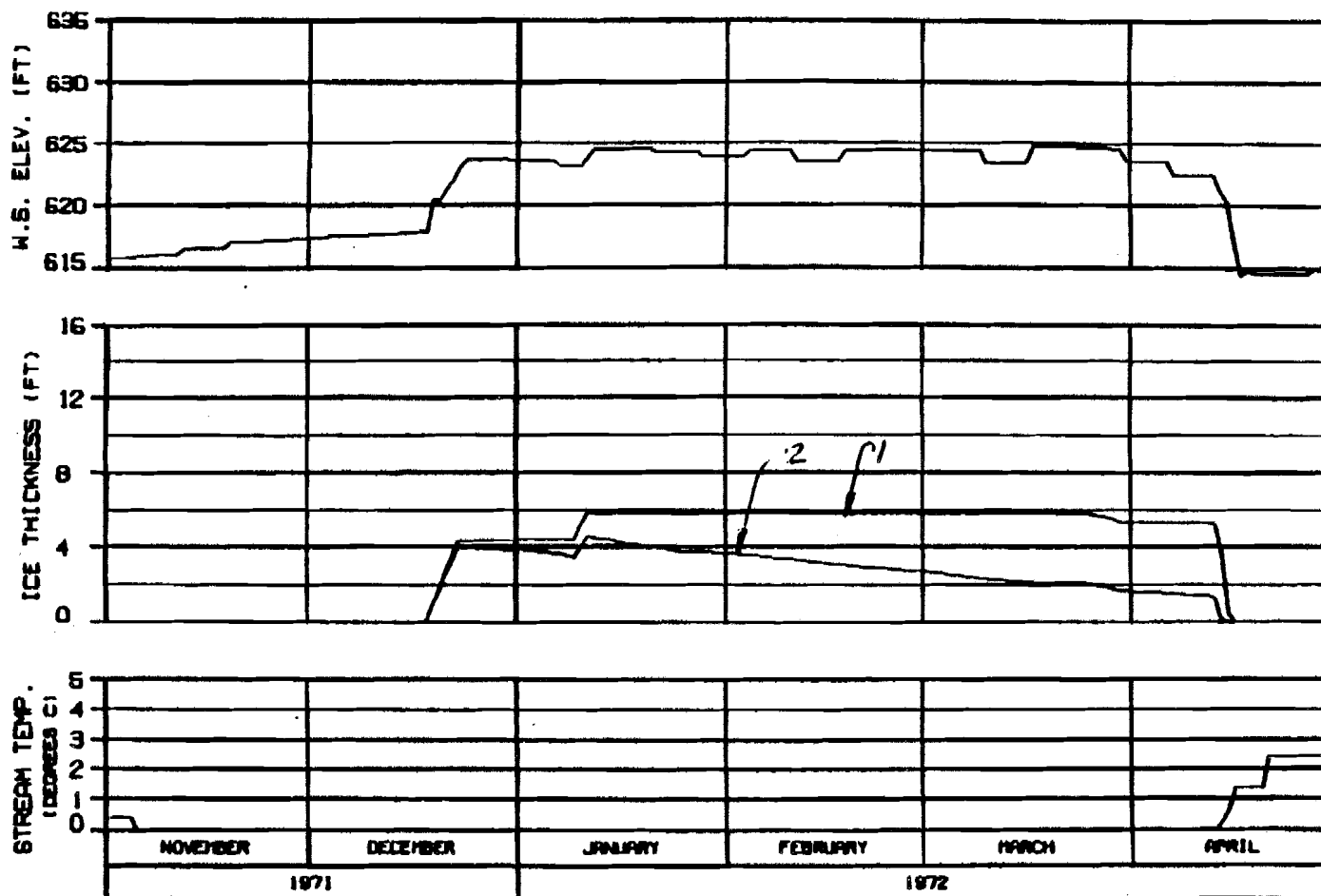
**ICE THICKNESS LEGEND:**  
 1. TOTAL THICKNESS  
 2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

OPTION?

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	
SUSITNA RIVER	
ICE SIMULATION	
TIME HISTORY	
WARZA-EBRACO JOINT VENTURE	
DESIGNED BY	1000-142

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

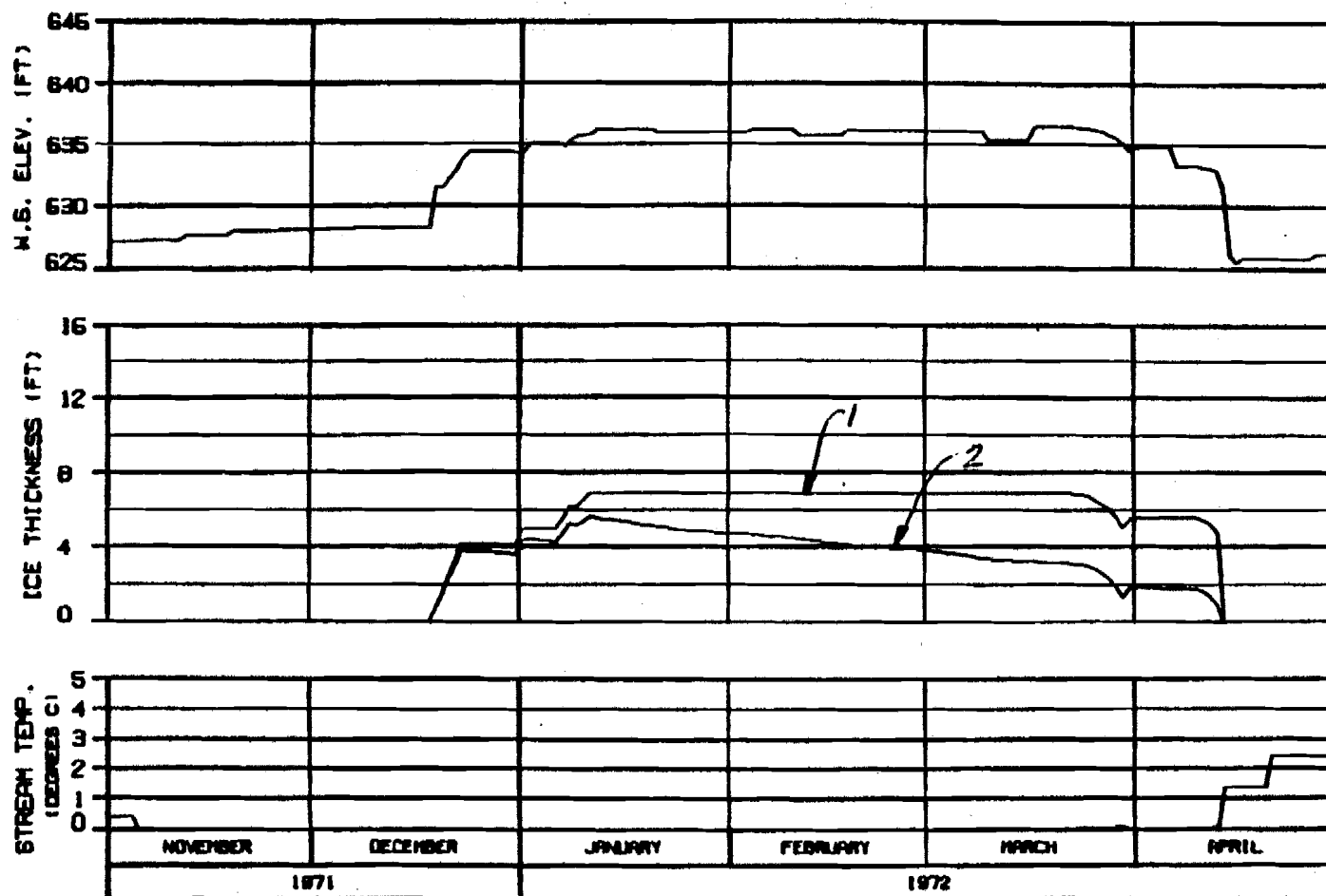
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARDA-EBRACO JOINT VENTURE

DESIGNED BY: J. D. BROWN 27 JAN 72 DRAWN BY: J. D. BROWN





**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

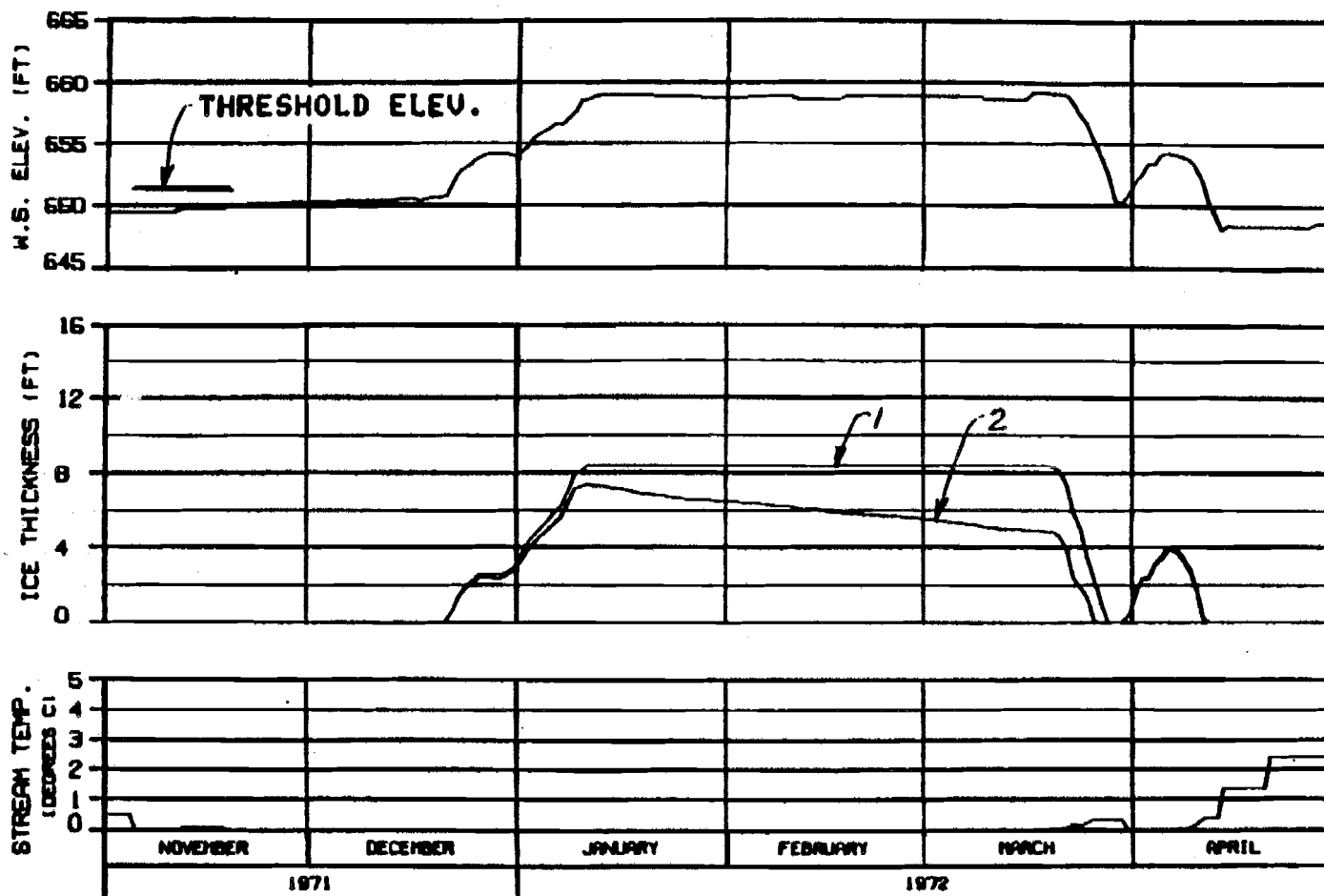
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: J. D. HARRIS 10 JAN 74 1000.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

- 1. TOTAL THICKNESS
- 2. ABLATION COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71010NA

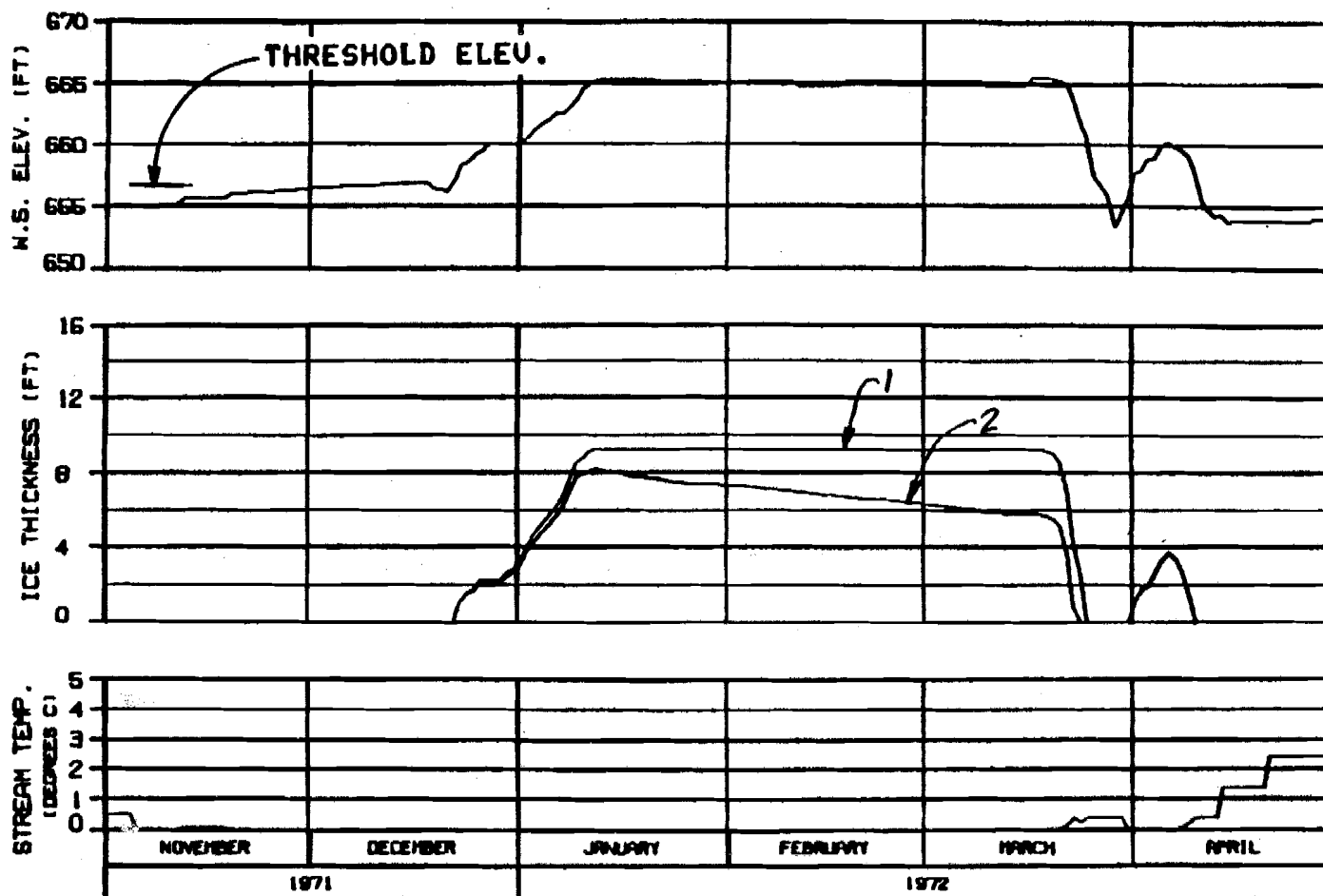
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: 11-1000 07 JAN 81 1000.142



SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

SUBMITTER PROJECT

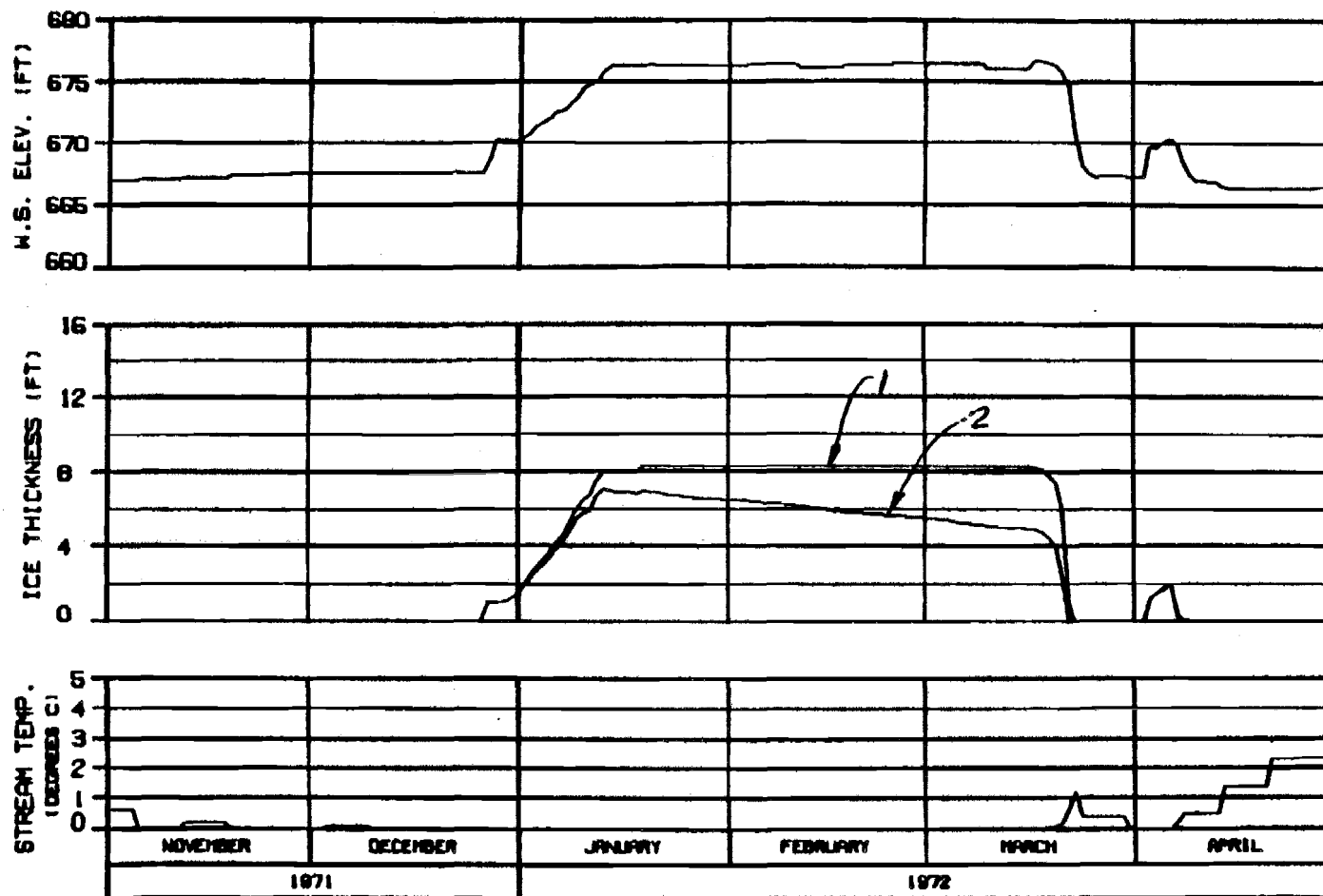
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNER: EBRACO

BY JAN 81

1000.142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

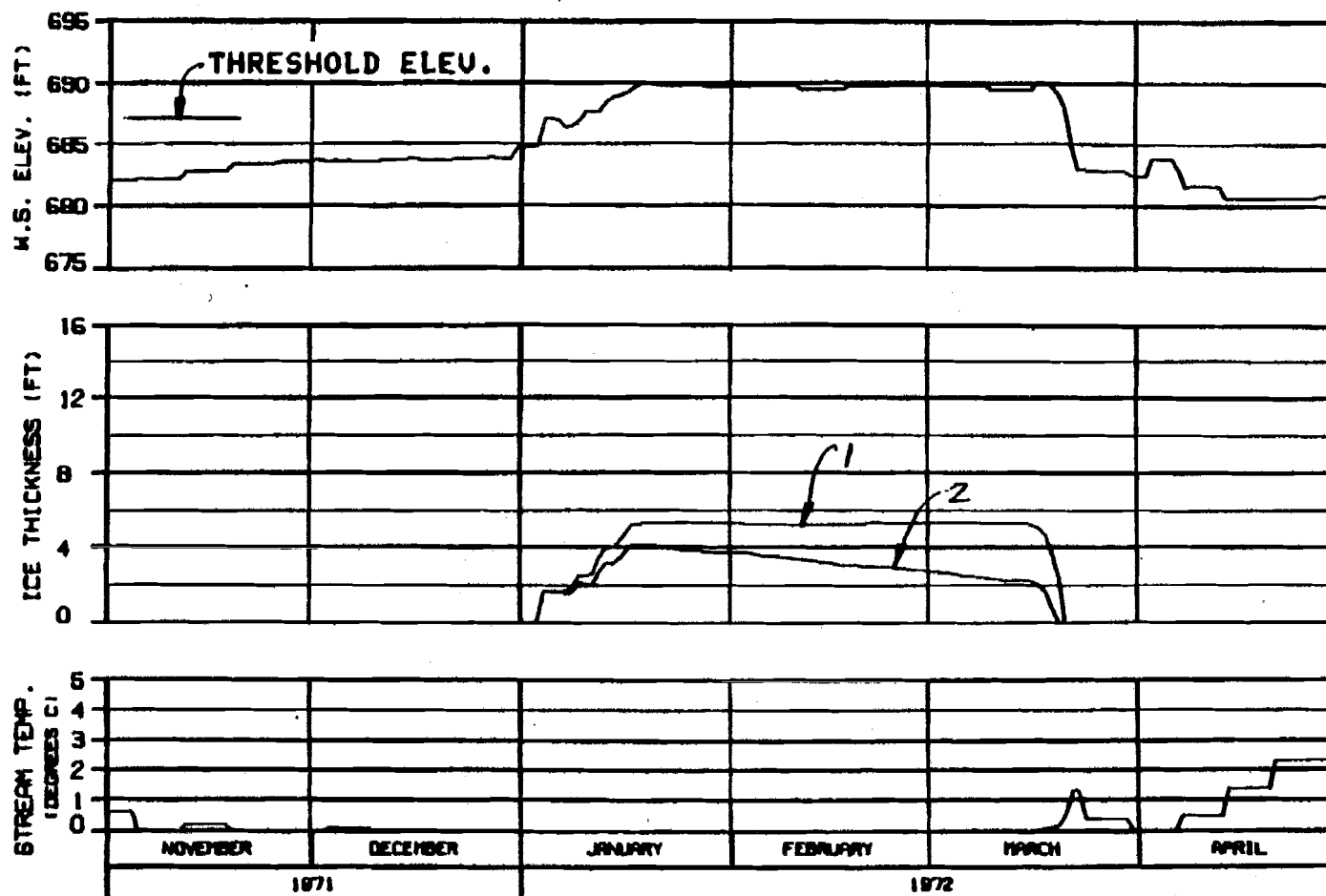
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRISCO JOINT VENTURE

DESIGN: 11-10-71 BY J.A.G. 1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

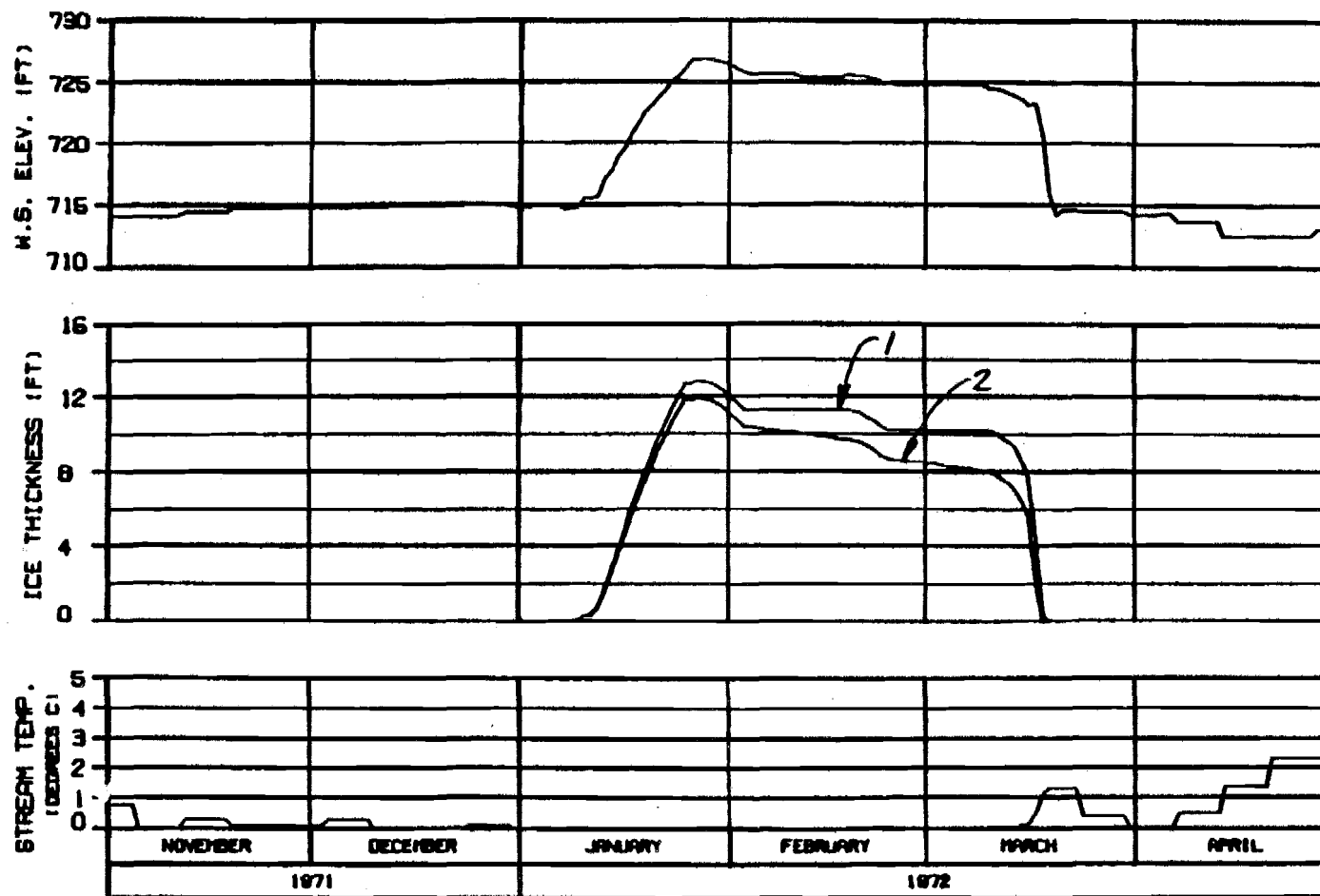
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

GRAPHED, PLOTTED BY JJA ON 1000.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

- 1. TOTAL THICKNESS
- 2. BULGE COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

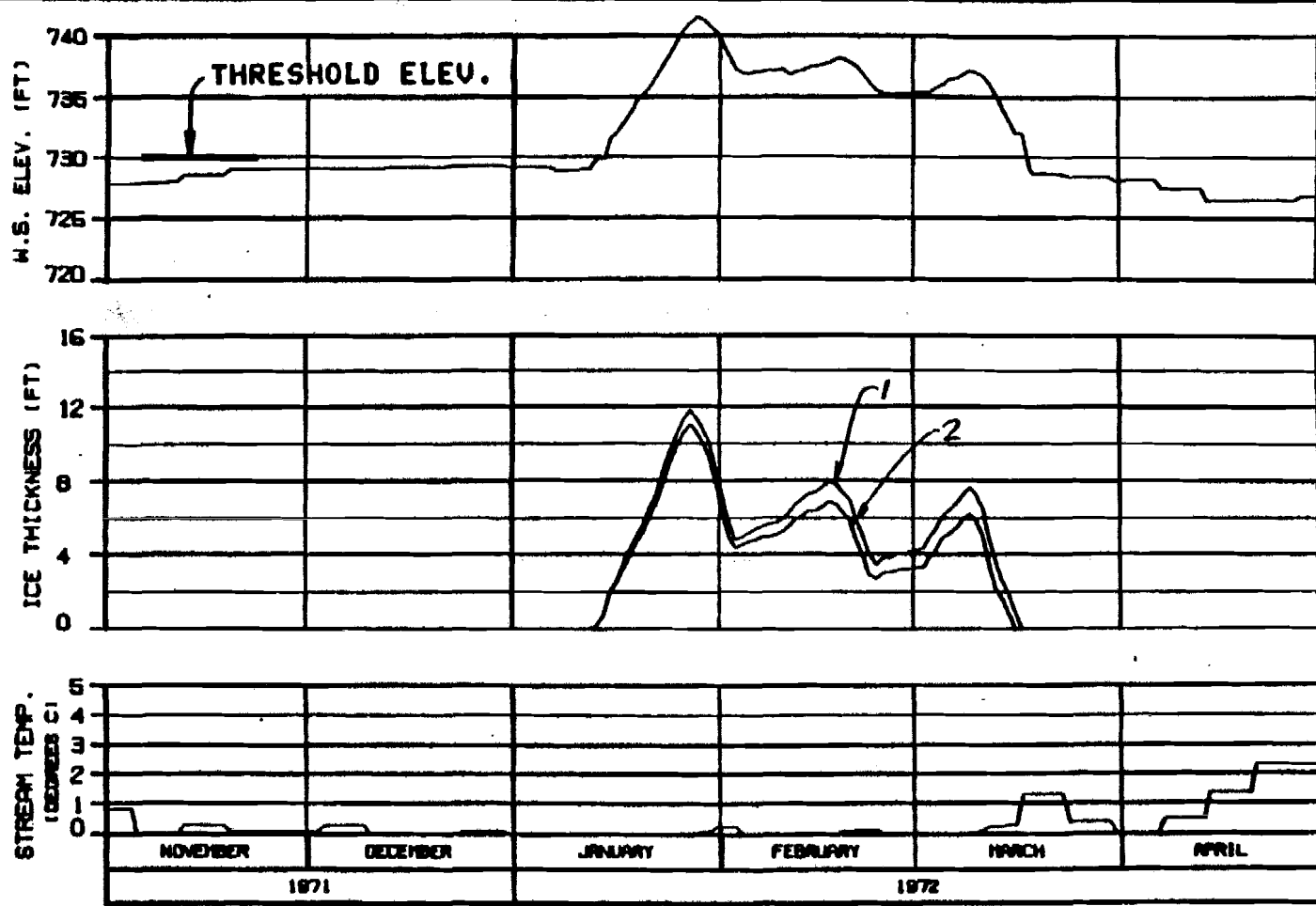
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZA-EDBROO JOINT VENTURE

REVISED: 01-00-00 BY JAH/BA 1000.142

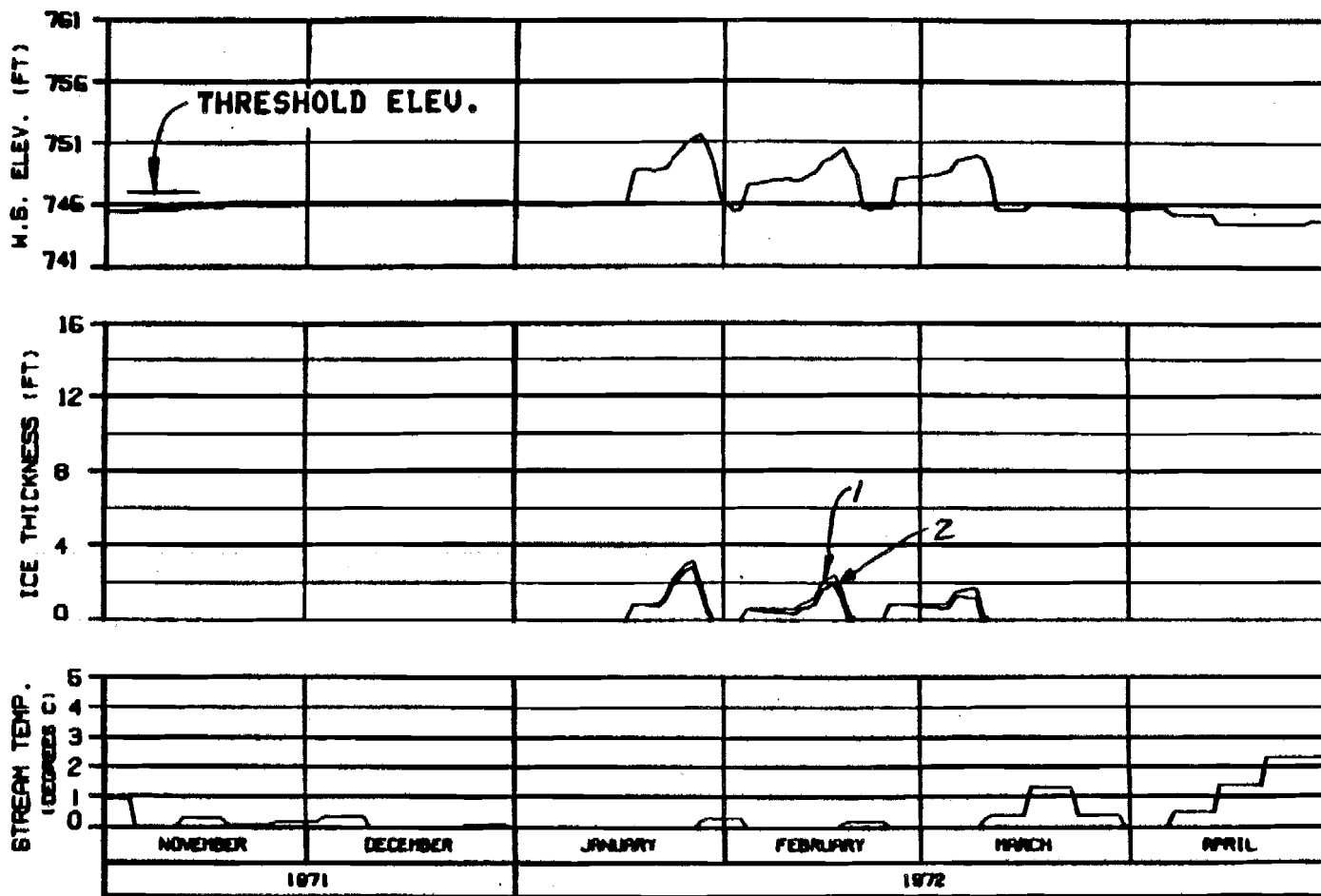


HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
1. TOTAL THICKNESS  
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
MARZA-EBASCO JOINT VENTURE	
DESIGN: 04-000	77 APR 81 1000.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7101CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

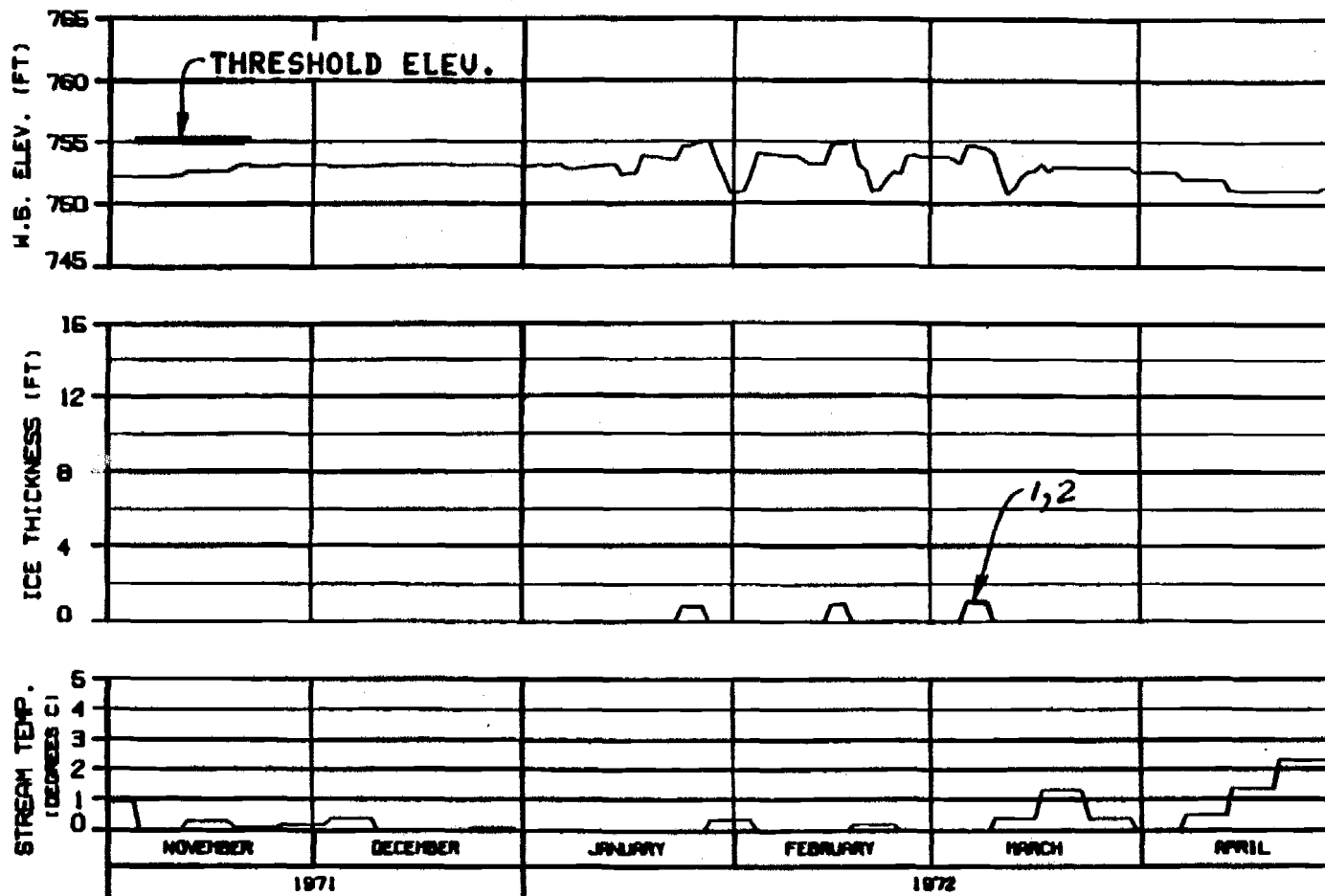
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

DESIGNED BY: J. J. J. 77 JAN 81

REVISION 142





HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7101CNA

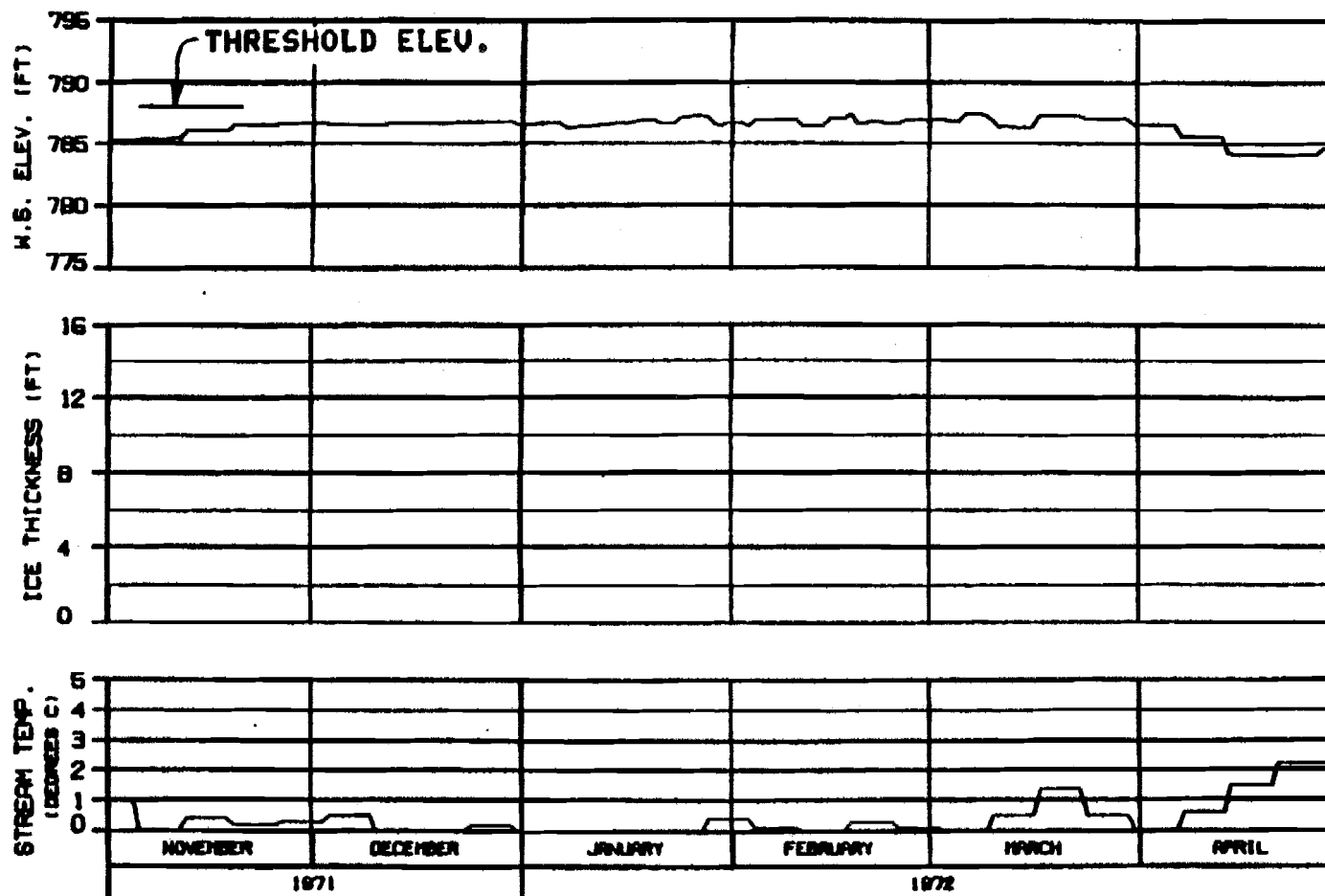
ALASKA POWER AUTHORITY

QUISTON PROJECT

SUGITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EG&G JOINT VENTURE

DESIGNED: SLD-800 BY JAG ON 1000.142



**HEAD OF SLOUGH 22**  
**RIVER MILE : 144.80**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**WEATHER PERIOD : 1 NOV 71 - 30 APR 72**  
**ENERGY DEMAND : NATANA 2001**  
**FLOW CASE : C TEMP RULE : NATURAL**  
**REFERENCE RUN NO. : 7101CNA**

**OPTION?**

**ALASKA POWER AUTHORITY**

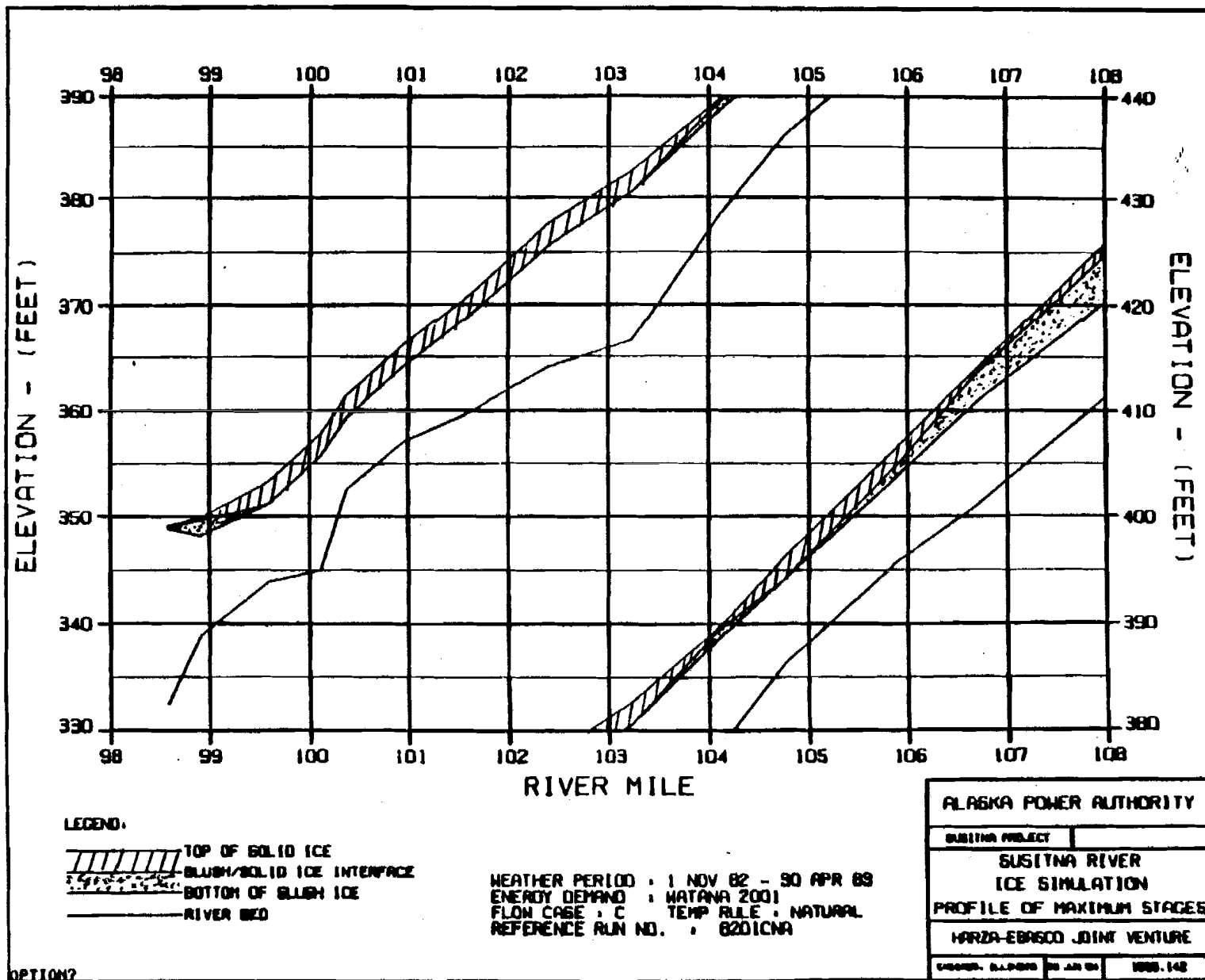
**SUBMITTER PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

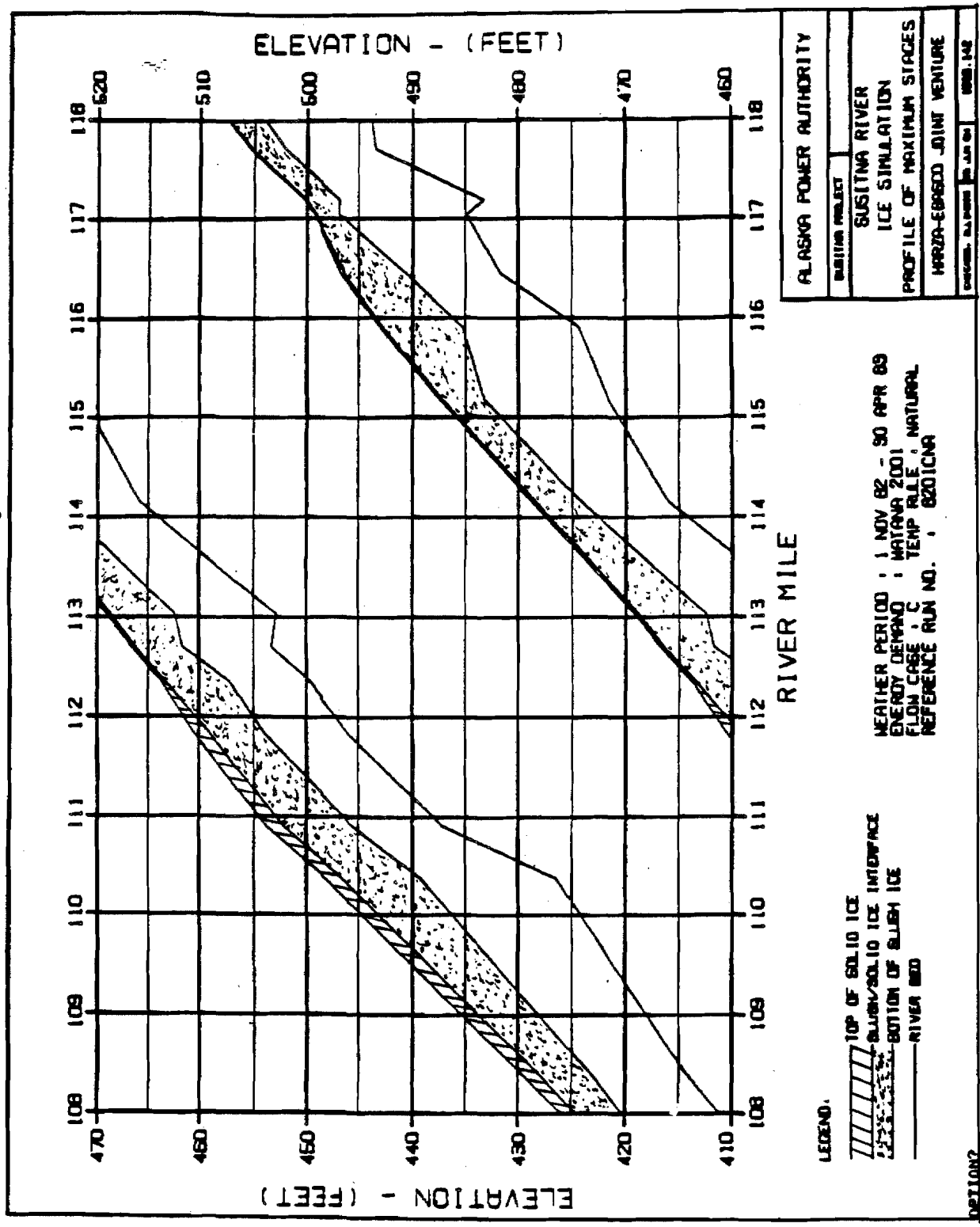
**HAZRA-EBASCO JOINT VENTURE**

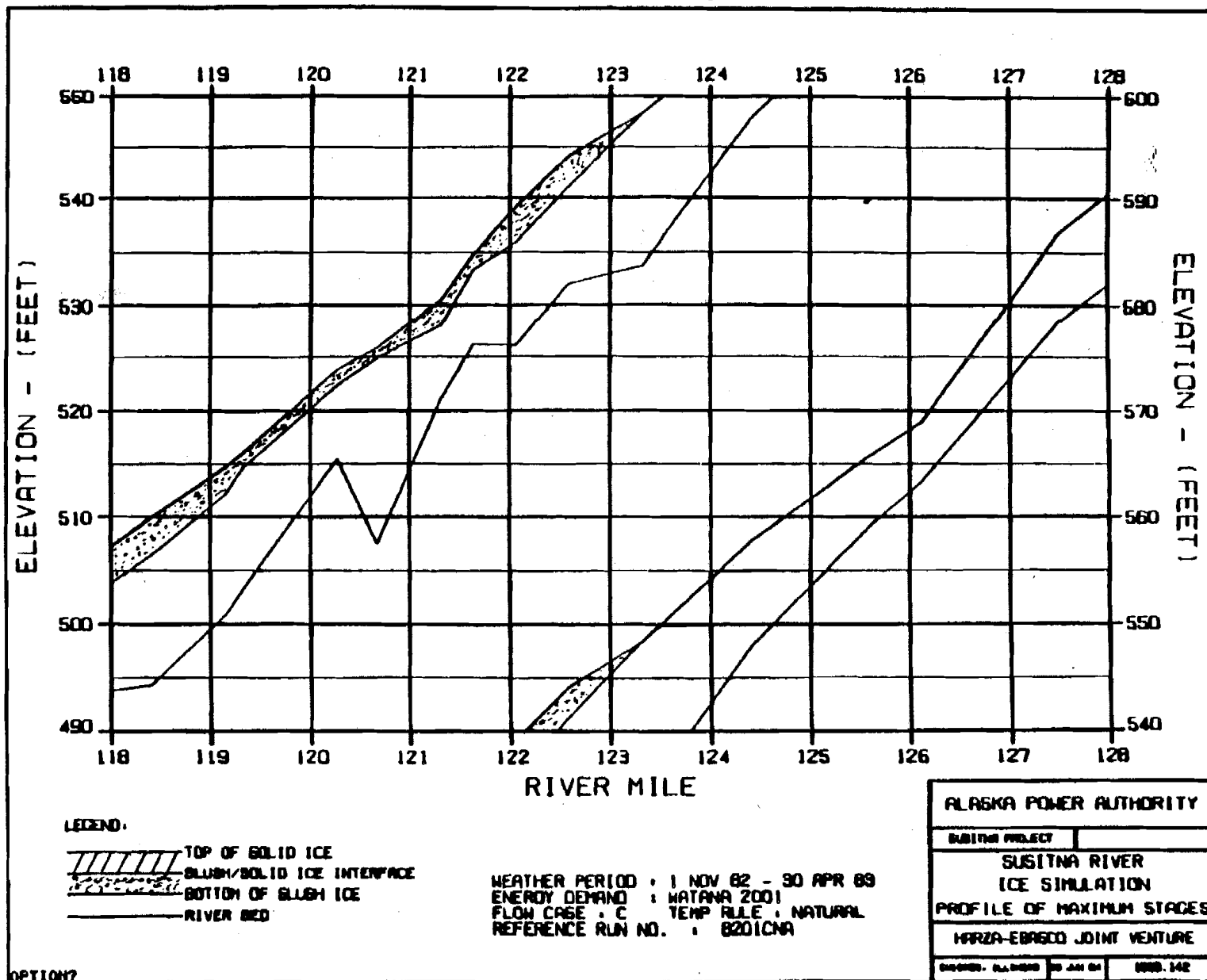
**DESIGNED BY JAC 84** **NOV. 1982**

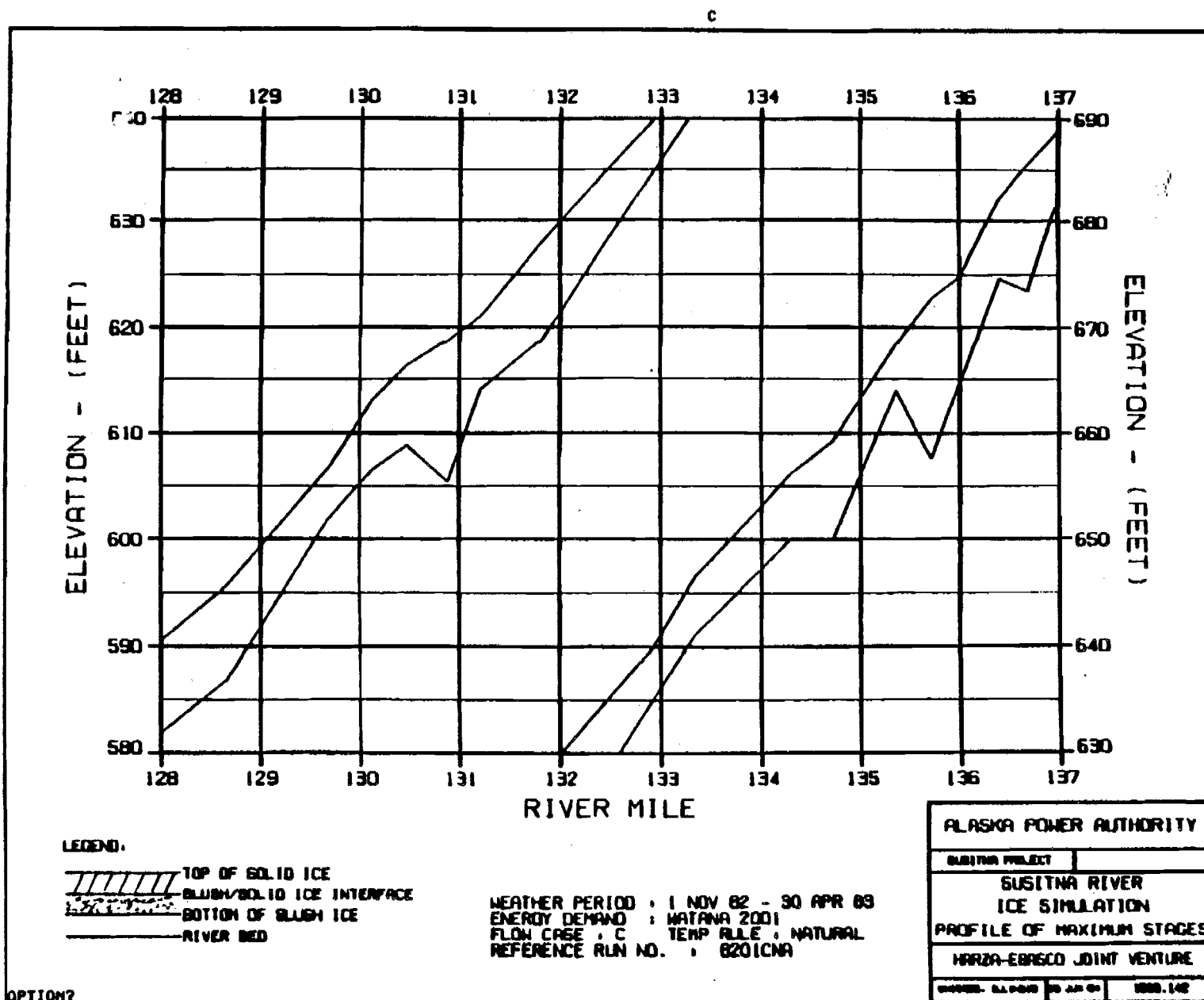
# EXHIBIT L

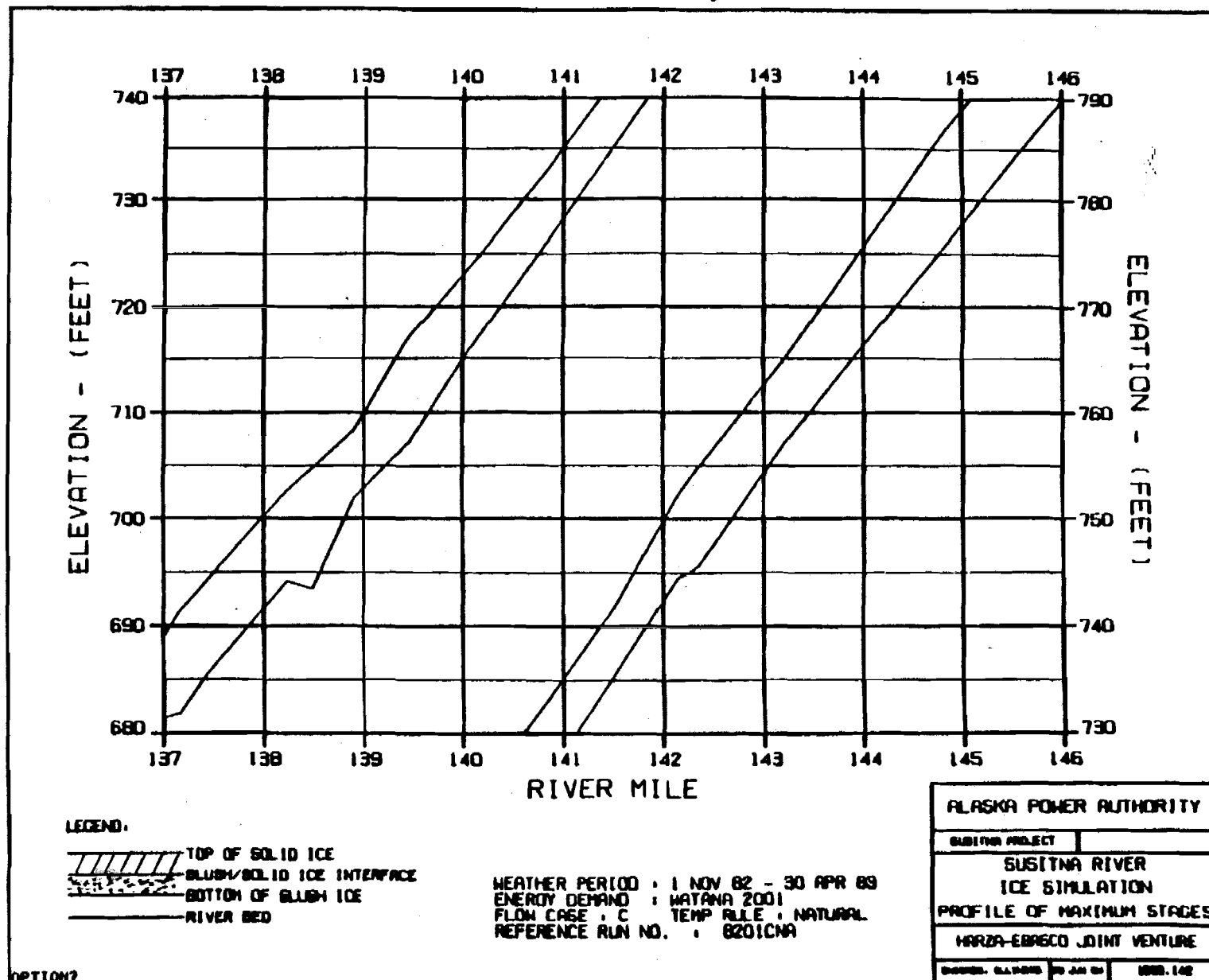


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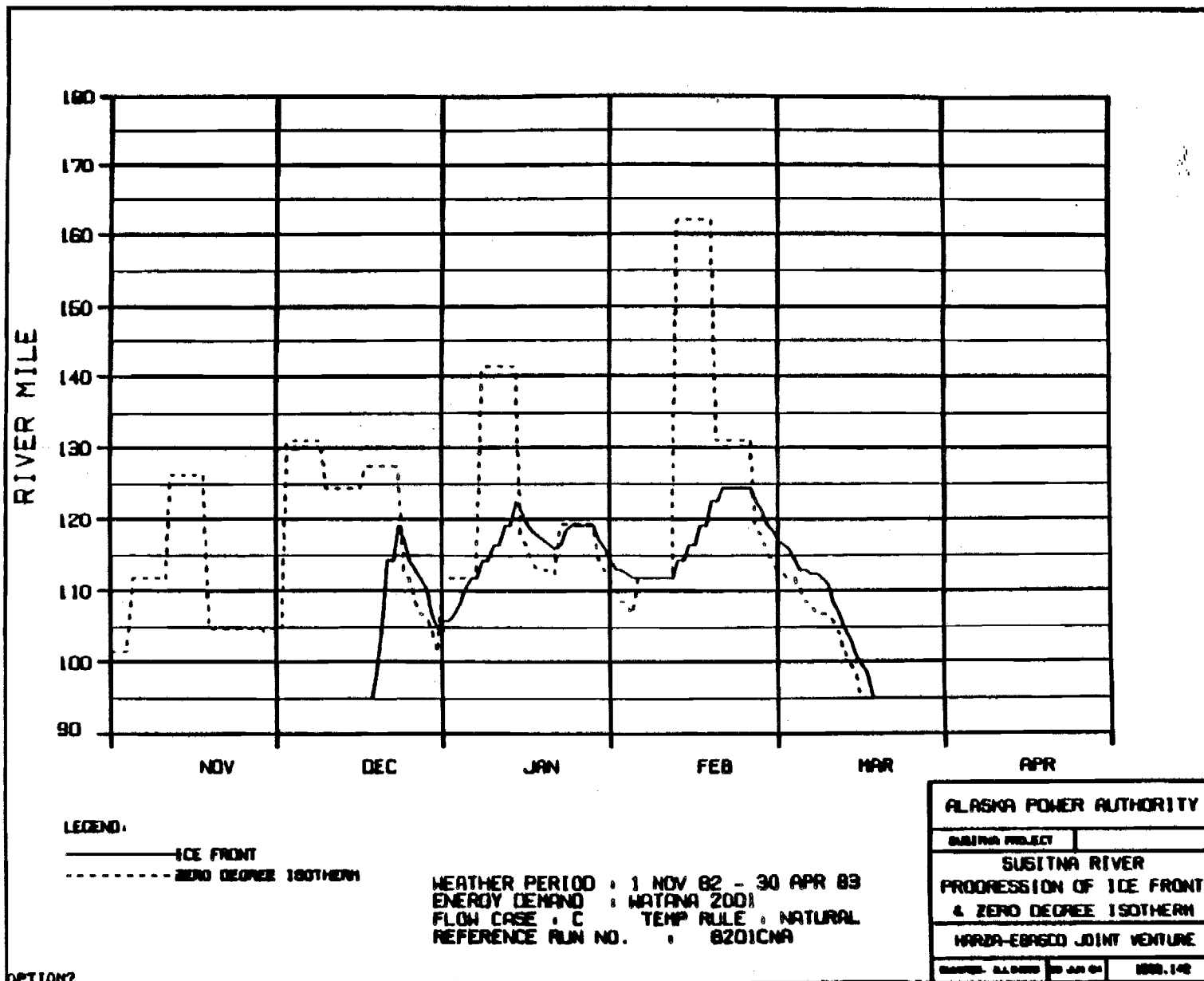


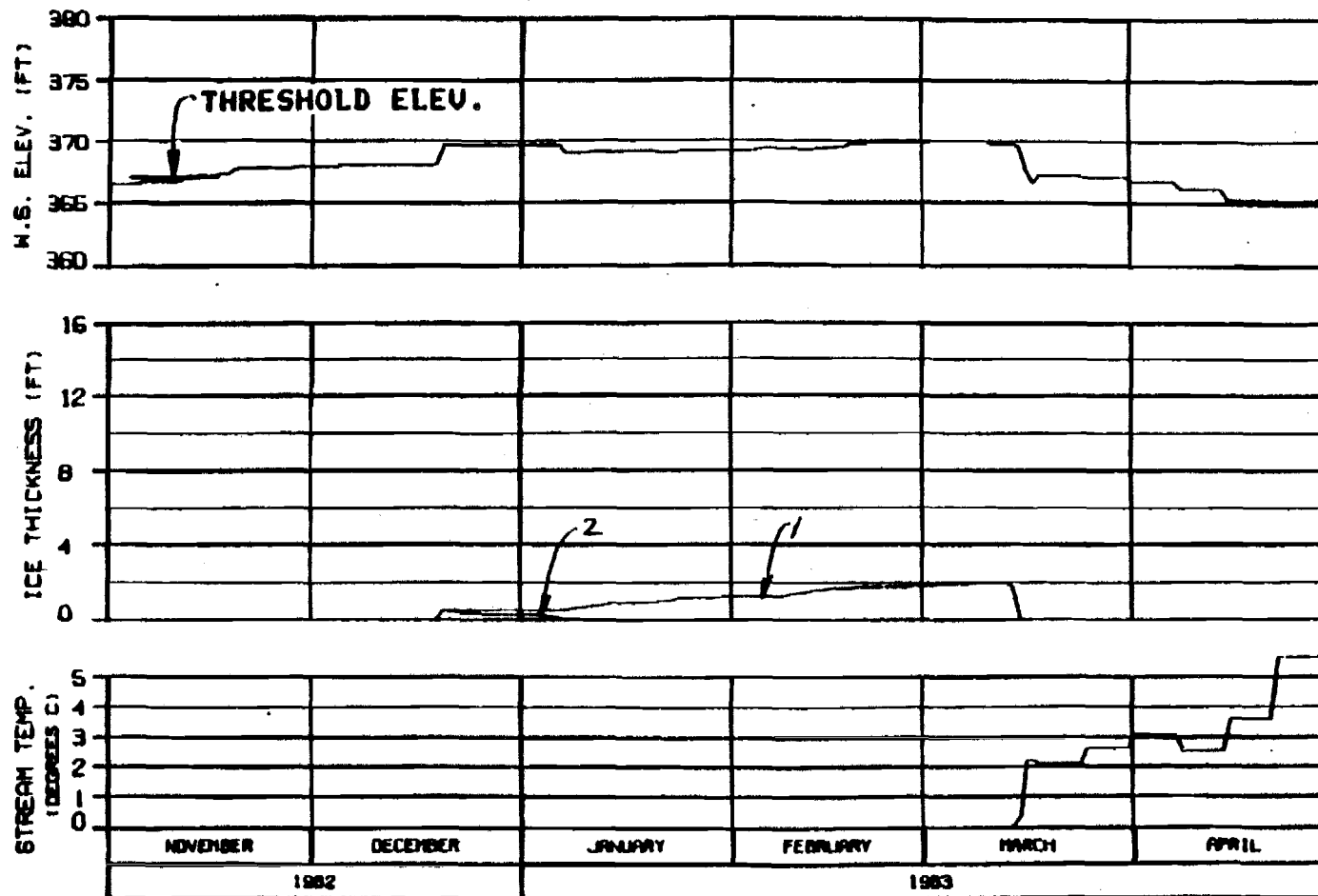












# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B2010NA

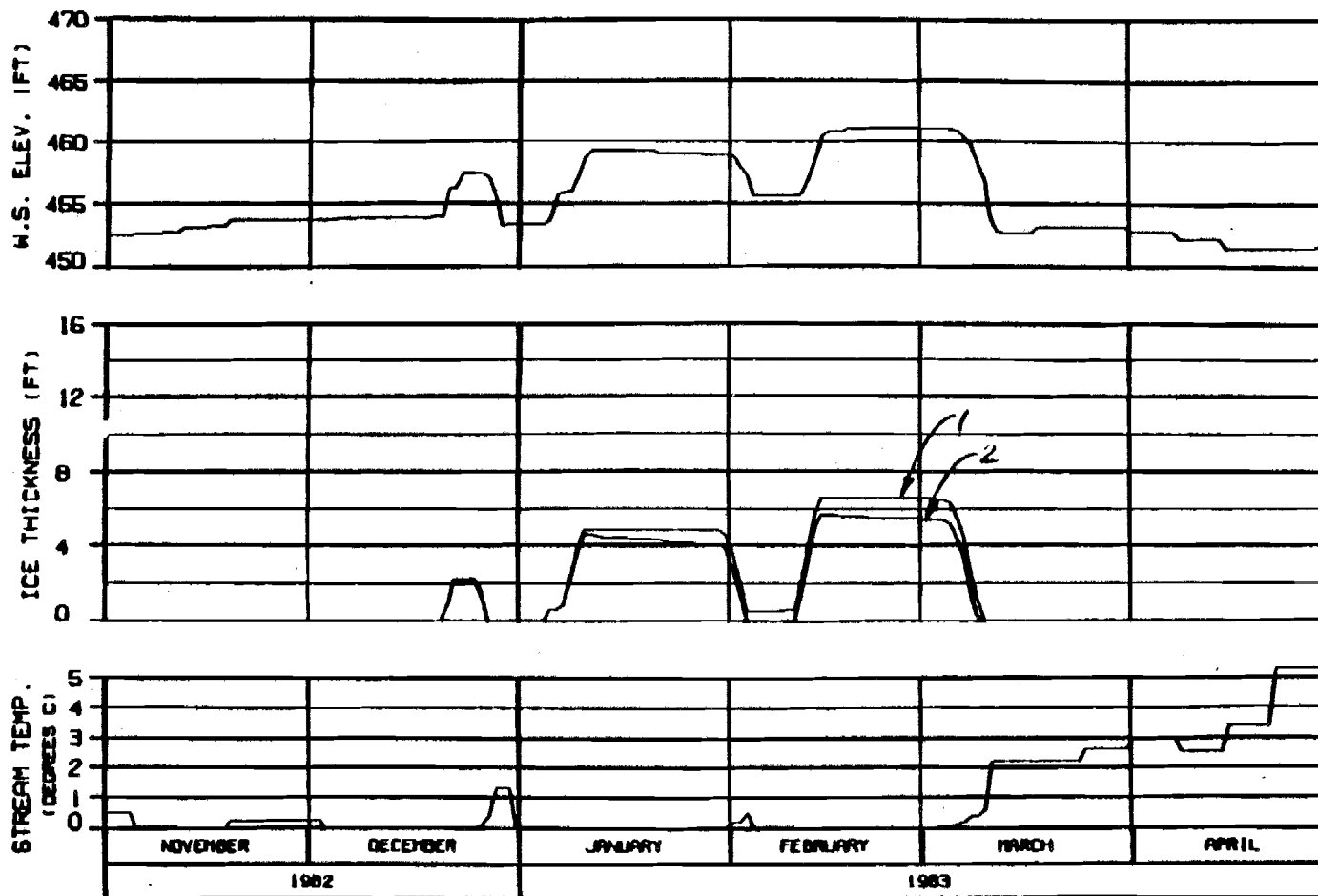
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HEARZA-EBRACCO JOINT VENTURE

DESIGNED BY: B2000 TO: JAN 83 1000.142



**SIDE CHANNEL AT HEAD OF GASH CREEK  
RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : B2010NA

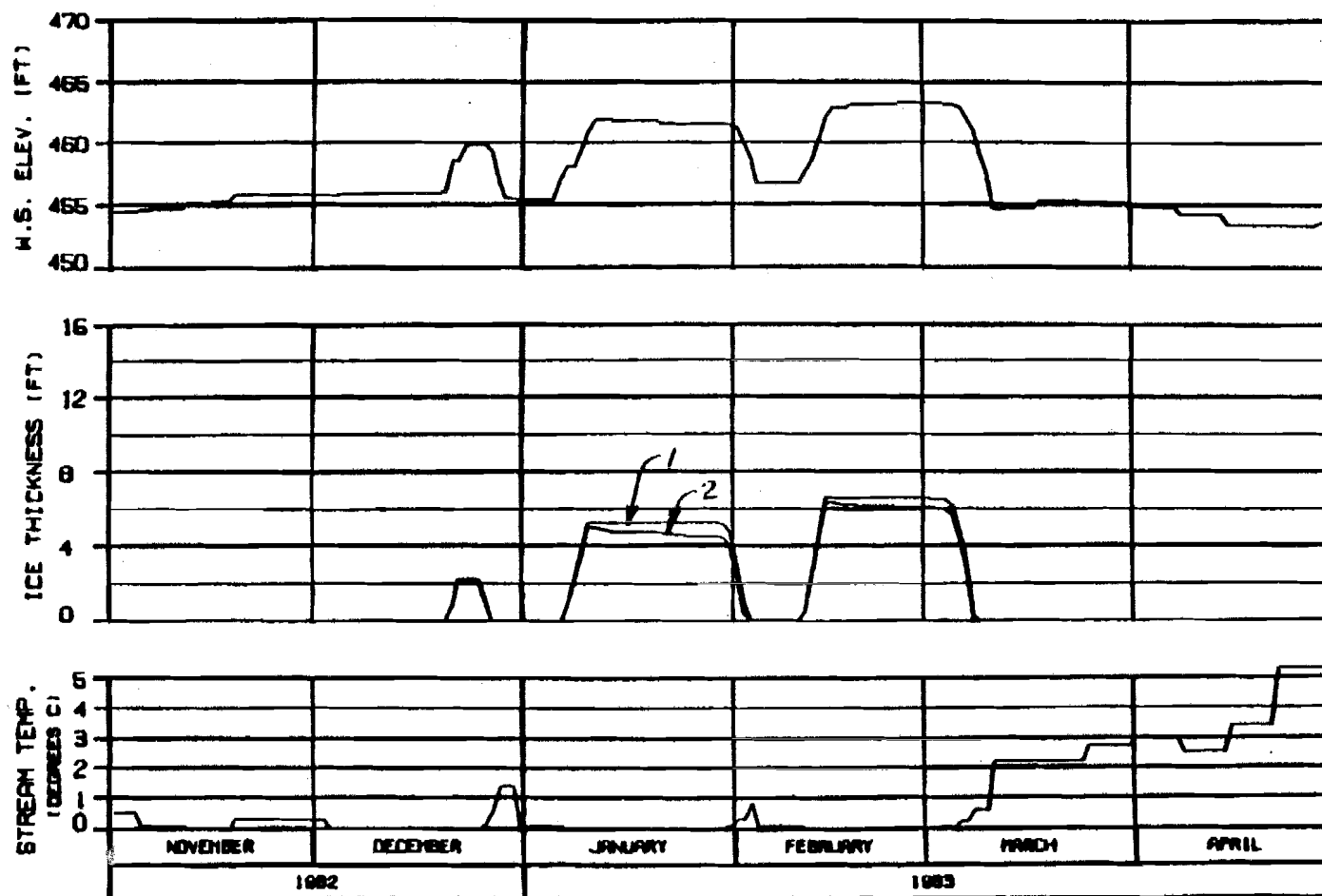
**ALASKA POWER AUTHORITY**

SUBMITTER PROJECT

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBR600 JOINT VENTURE**

CHECKED: ALP/MS 28 JAN 83 1983.142



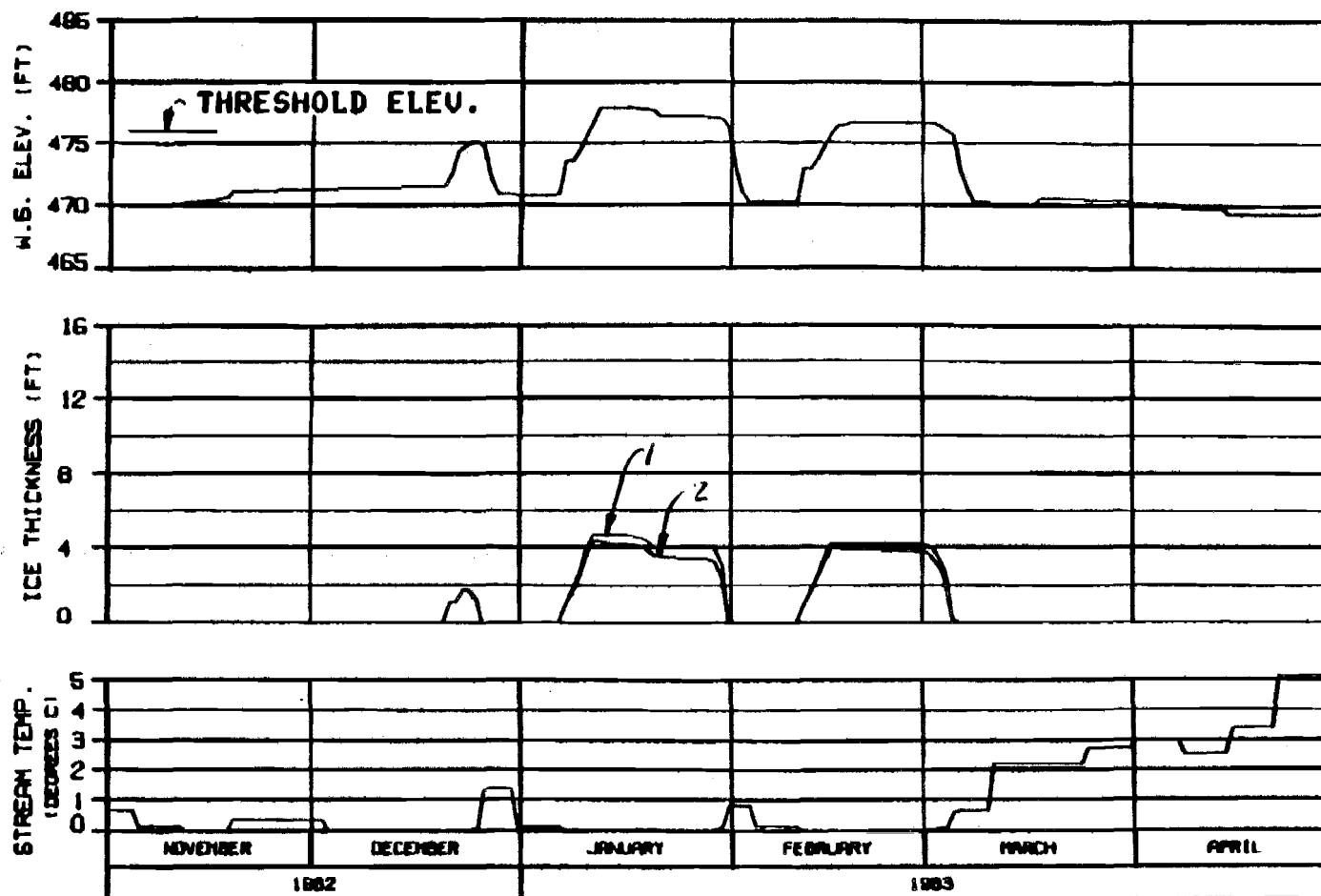
MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EBRIGOD JOINT VENTURE	
DRAWN: S. L. PERRY	IN JAN 84
1983.142	



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B201CVA

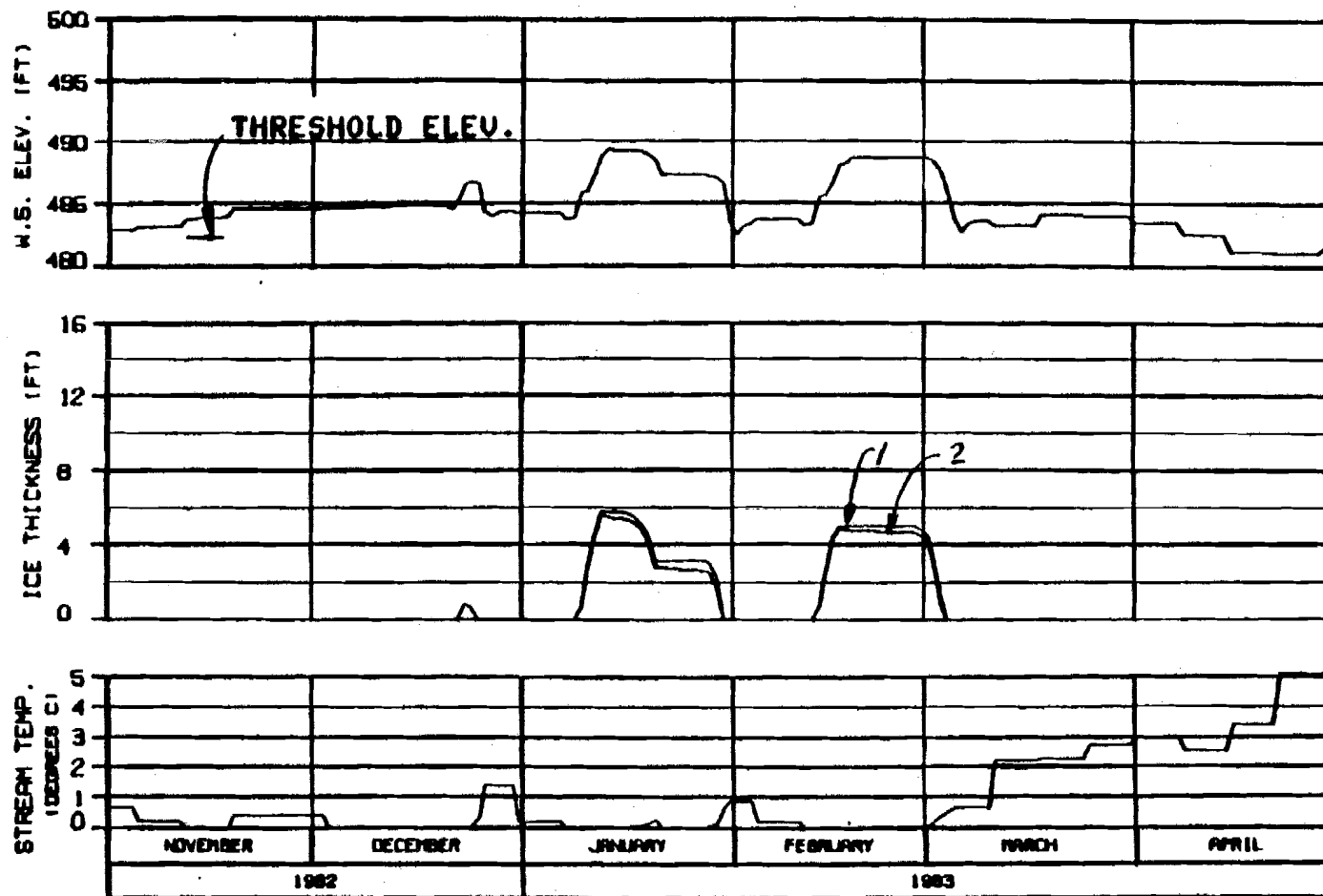
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

SHEET: 04-0000 30 JAN 84 1983.142



**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. BLISH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8201CNA

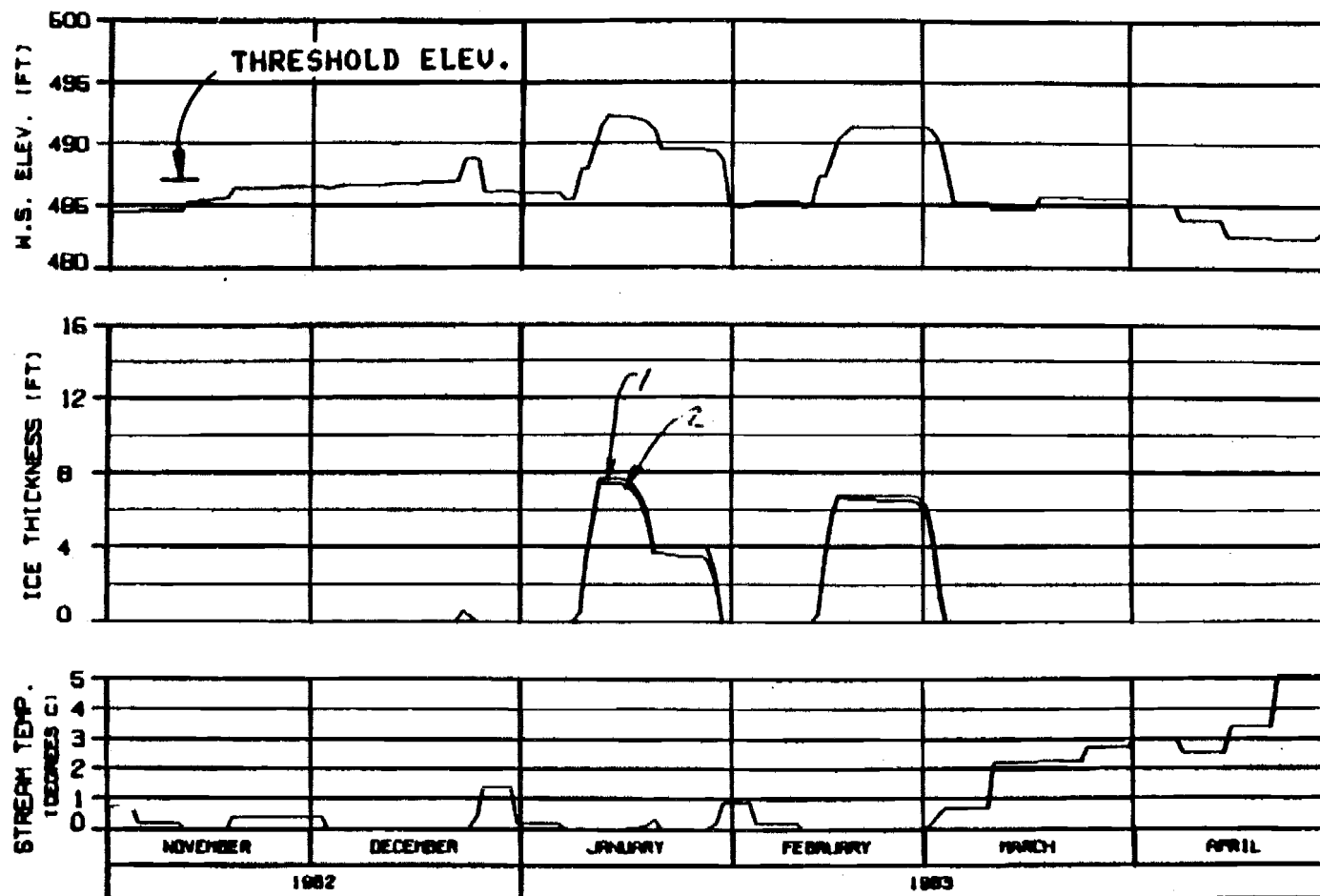
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HAZDA-EBASCO JOINT VENTURE**

CHARTS: 8A-P-000 30 JAN 83 1983.148



HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 82010NA

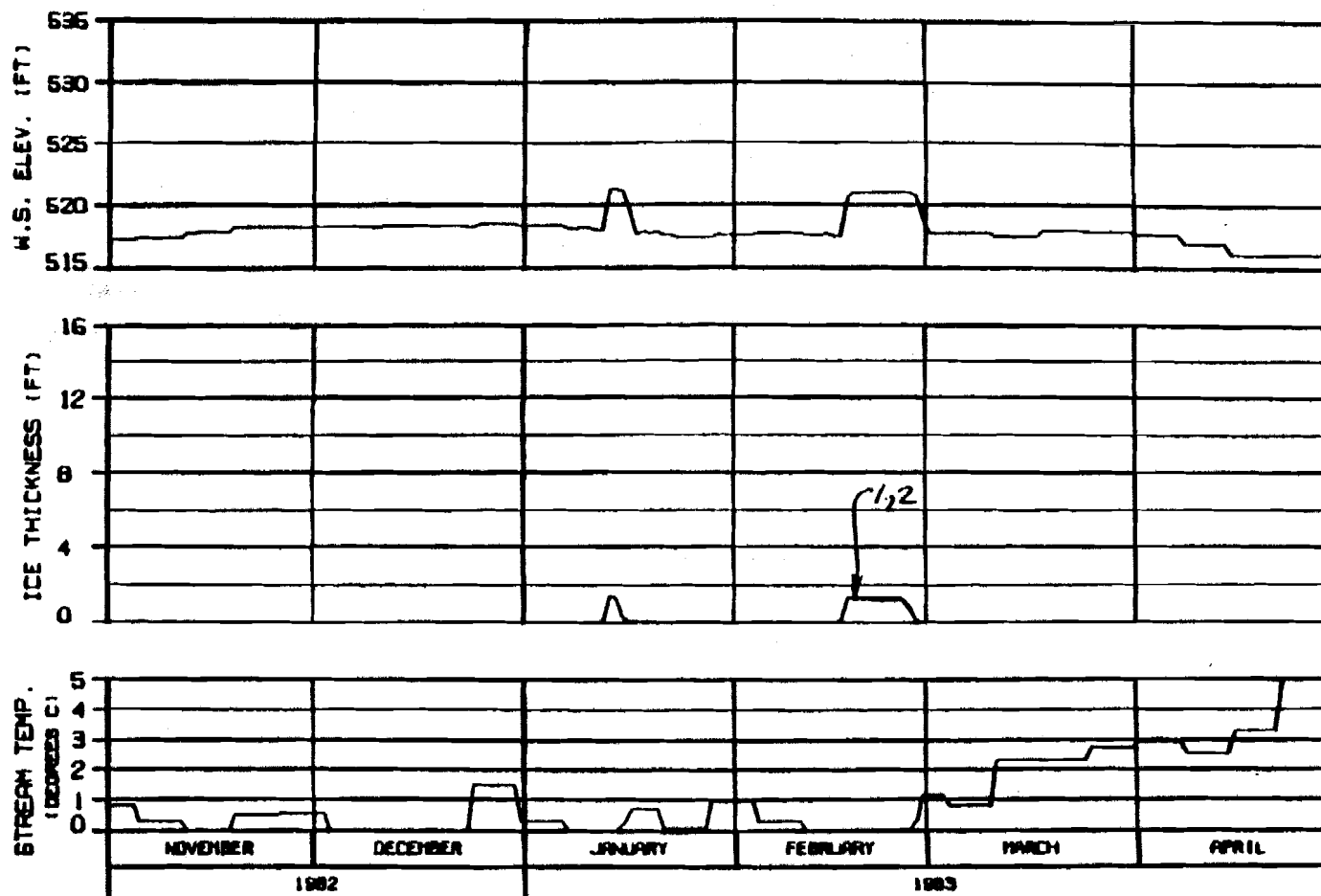
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRSCO JOINT VENTURE

DESIGNED BY: HAZRA-EBRSCO DRAWN BY: JAM/SH DATE: MAR. 1983



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

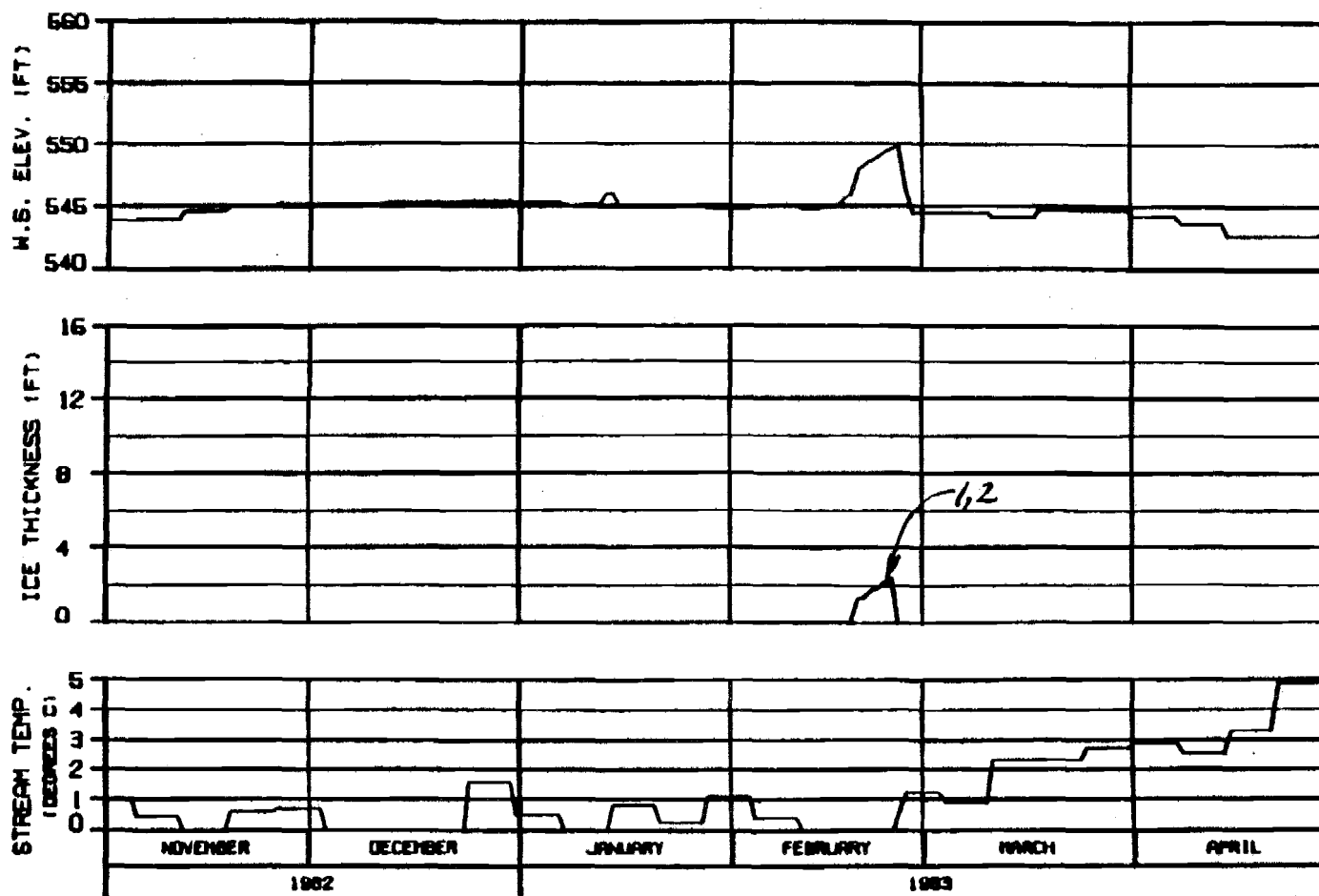
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EBRARD JOINT VENTURE

DESIGN - ALASKA 30 JAN 84 1983.142





# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

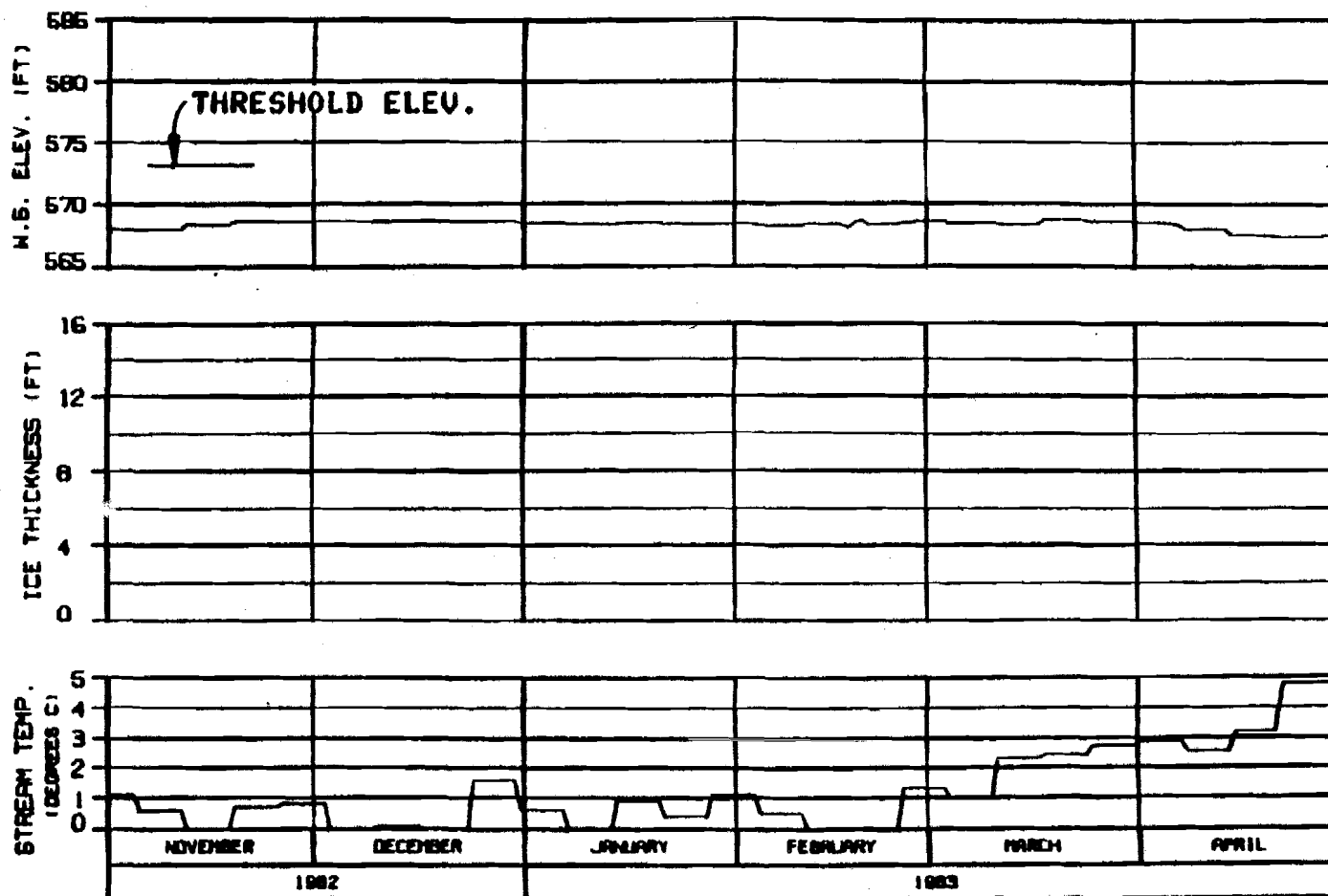
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRACCO JOINT VENTURE

DESIGNED BY: J. L. BROWN 30 JAN 83 1000-142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8201CNA

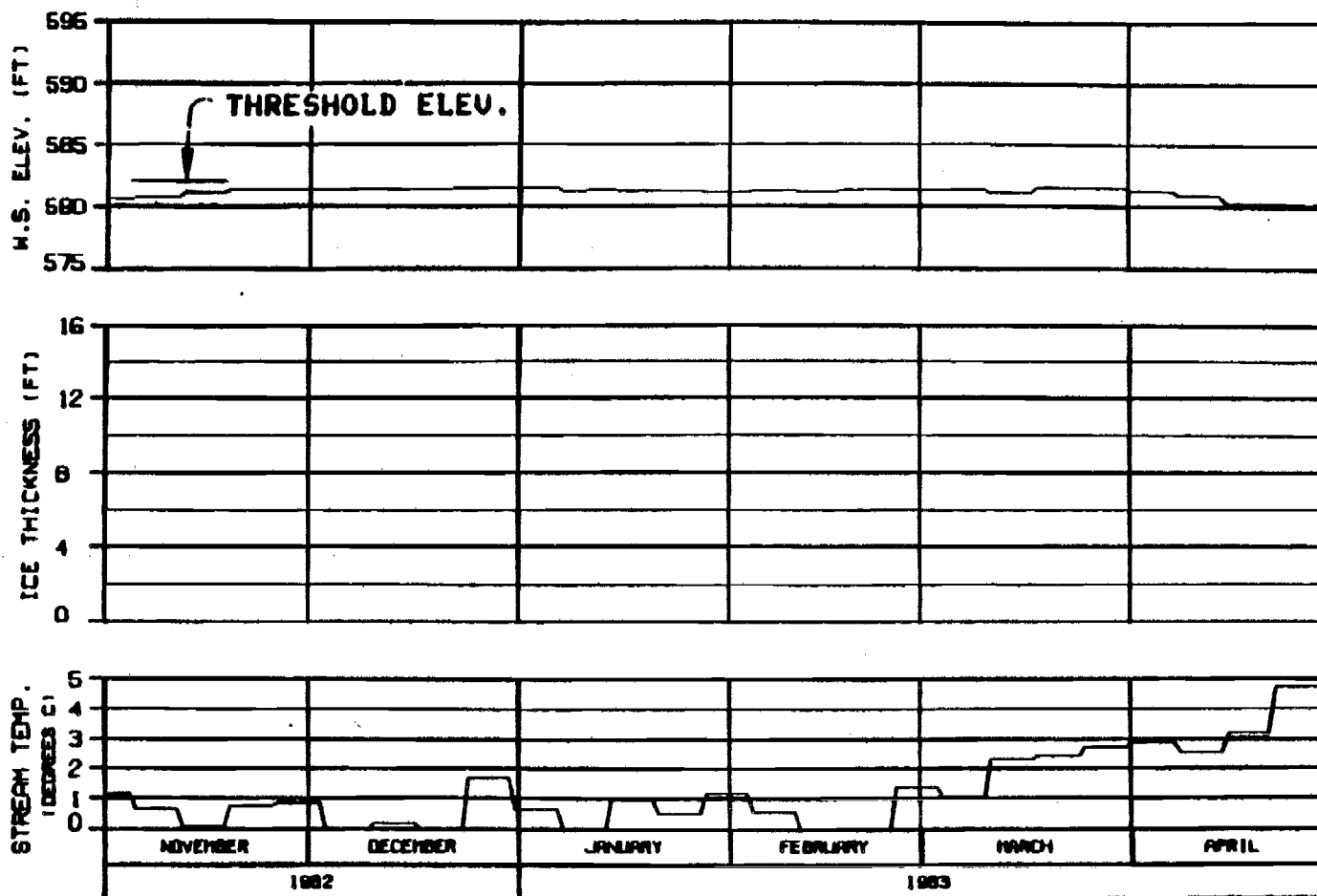
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EBRISCO JOINT VENTURE

DESIGNED - 04/08/83 BY JAM/CH 10000-142



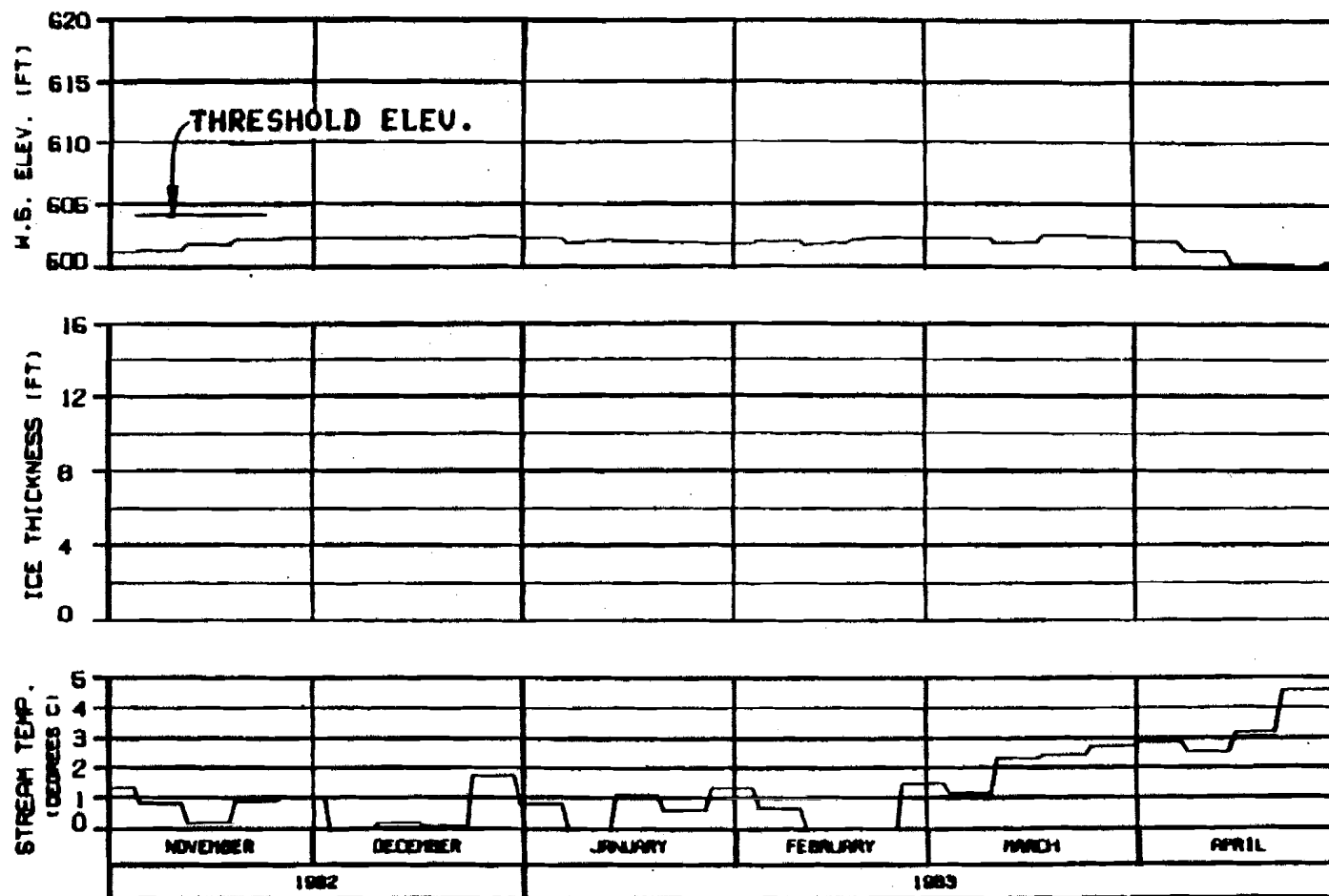
HEAD OF SLOUGH 8A (EAST)  
RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : MATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGN: ALP/HR	BY: JAH/SH	1988.142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : MATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B201CNA

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

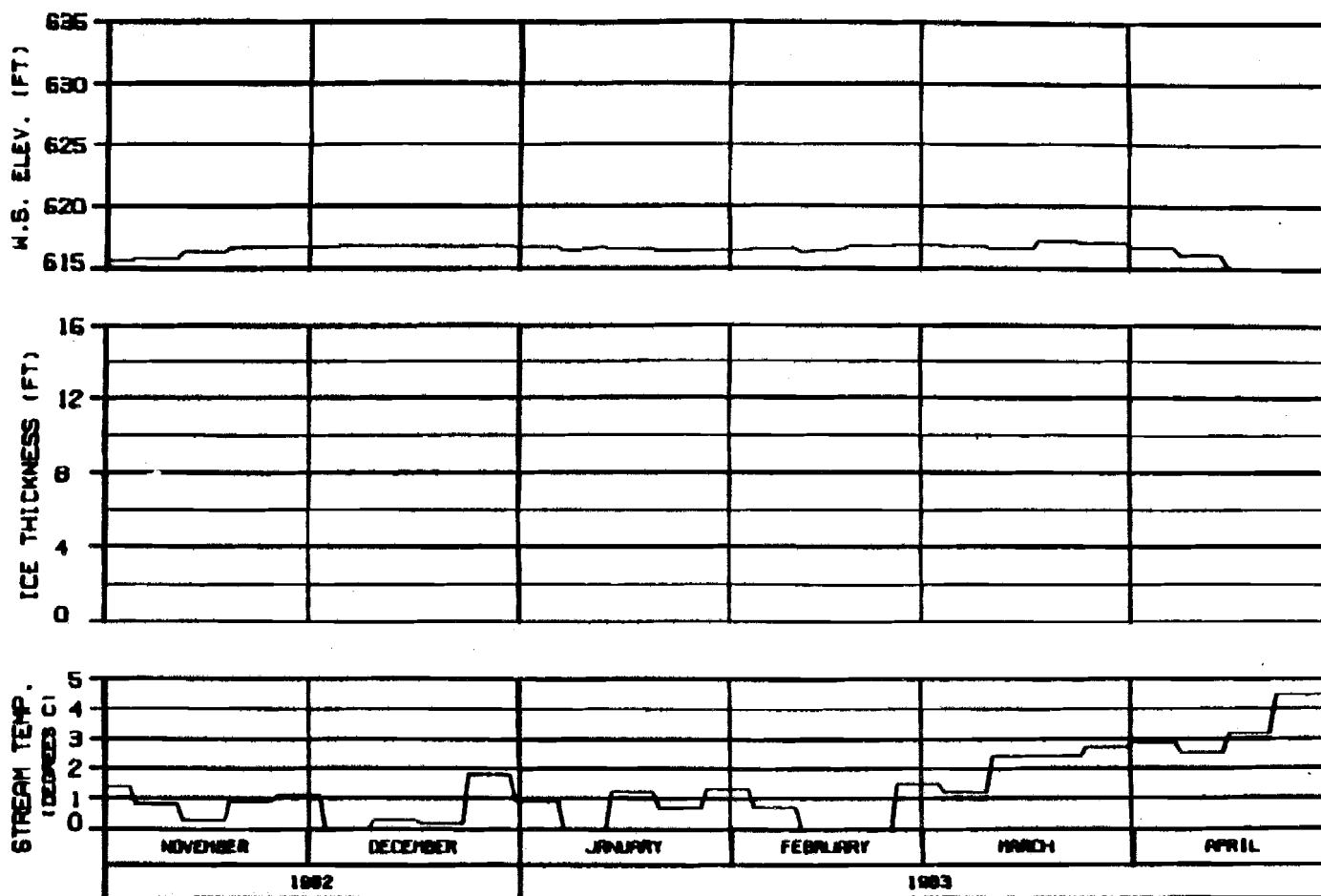
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

ISSUED: 04/08/83 BY: JAL/DA 1000.148

OPTION?

OPTION?



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

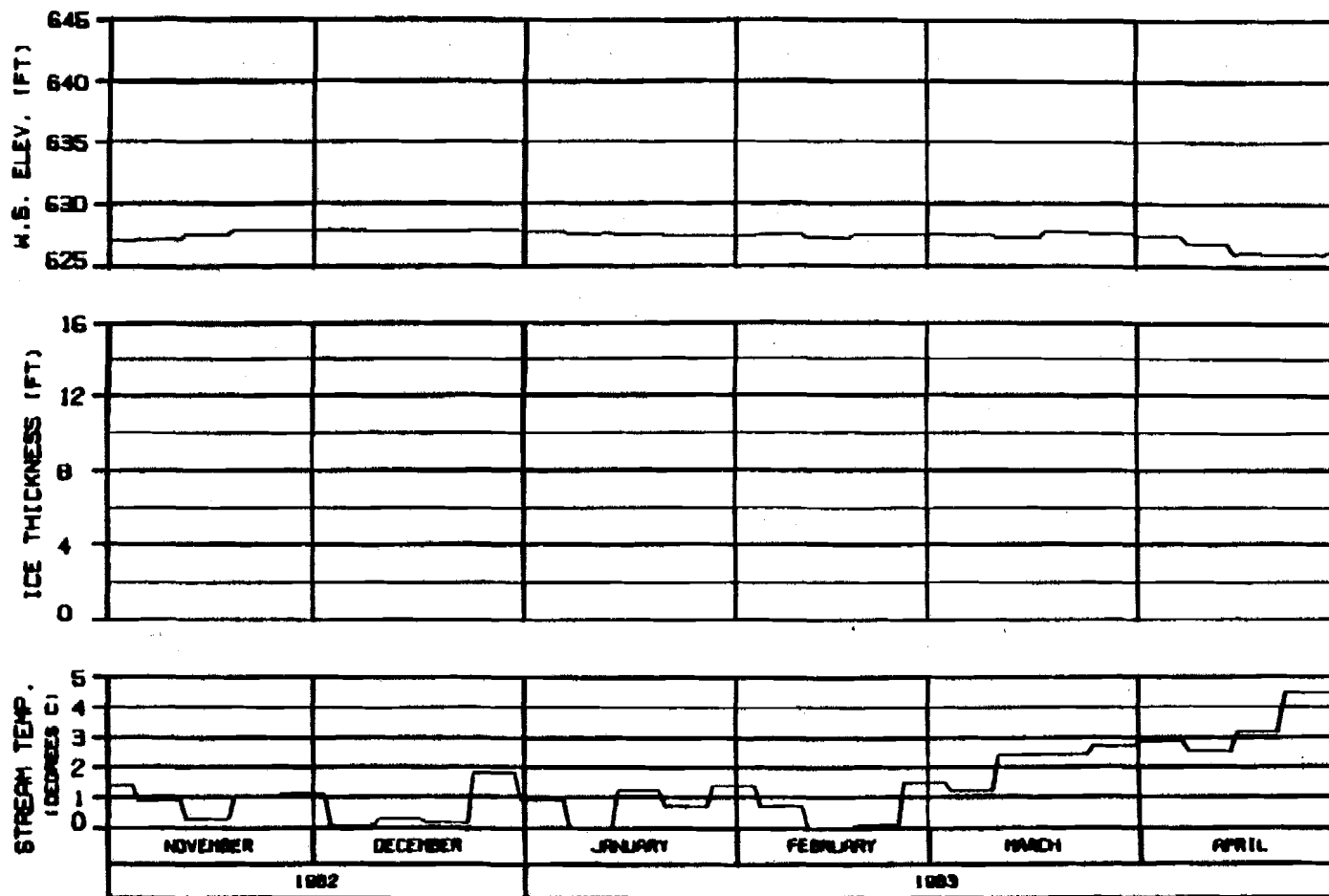
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DESIGNED BY: J. A. SMITH 1983.142



SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

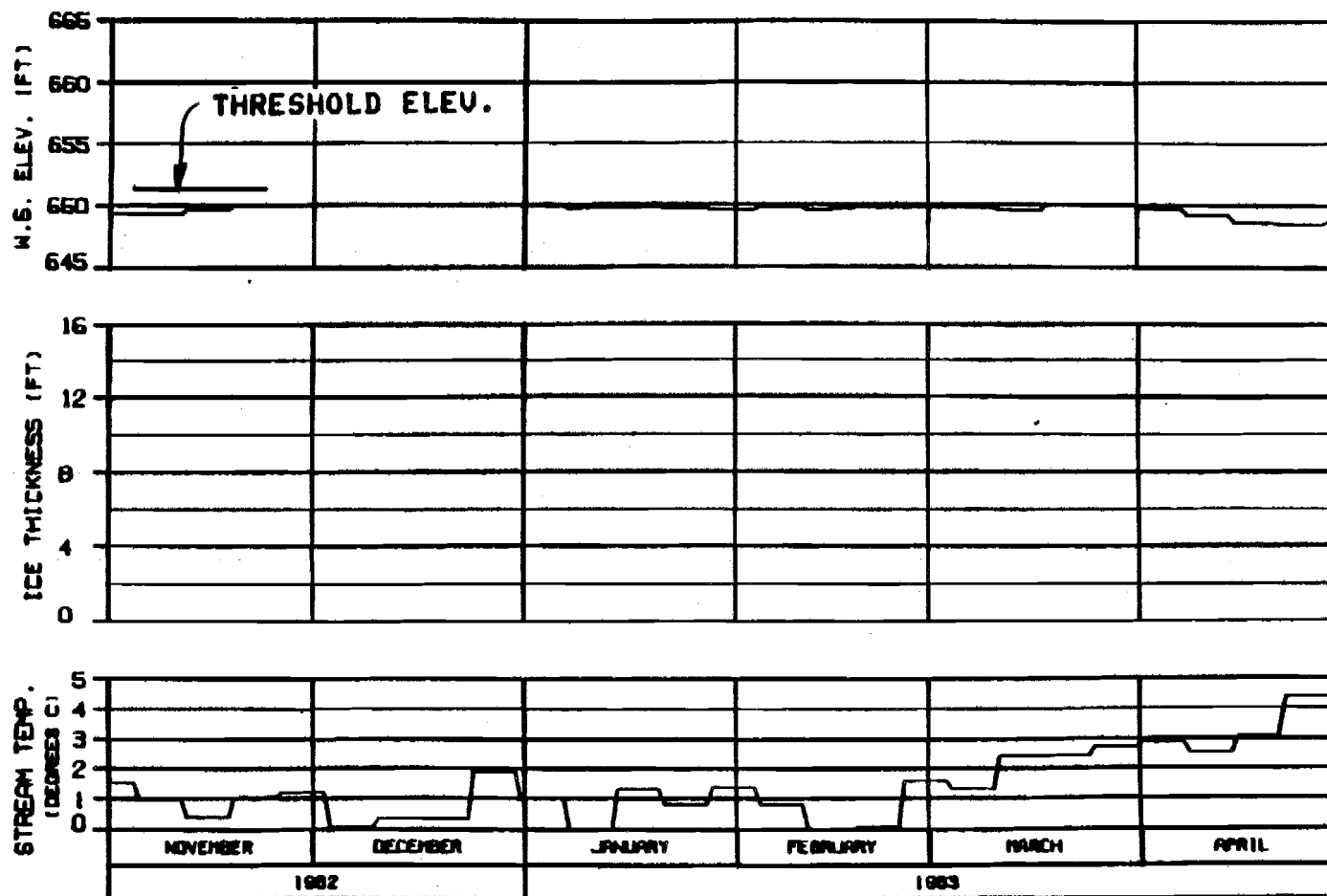
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

DESIGNED - 8/1/82 BY JAM/SM 1000.142



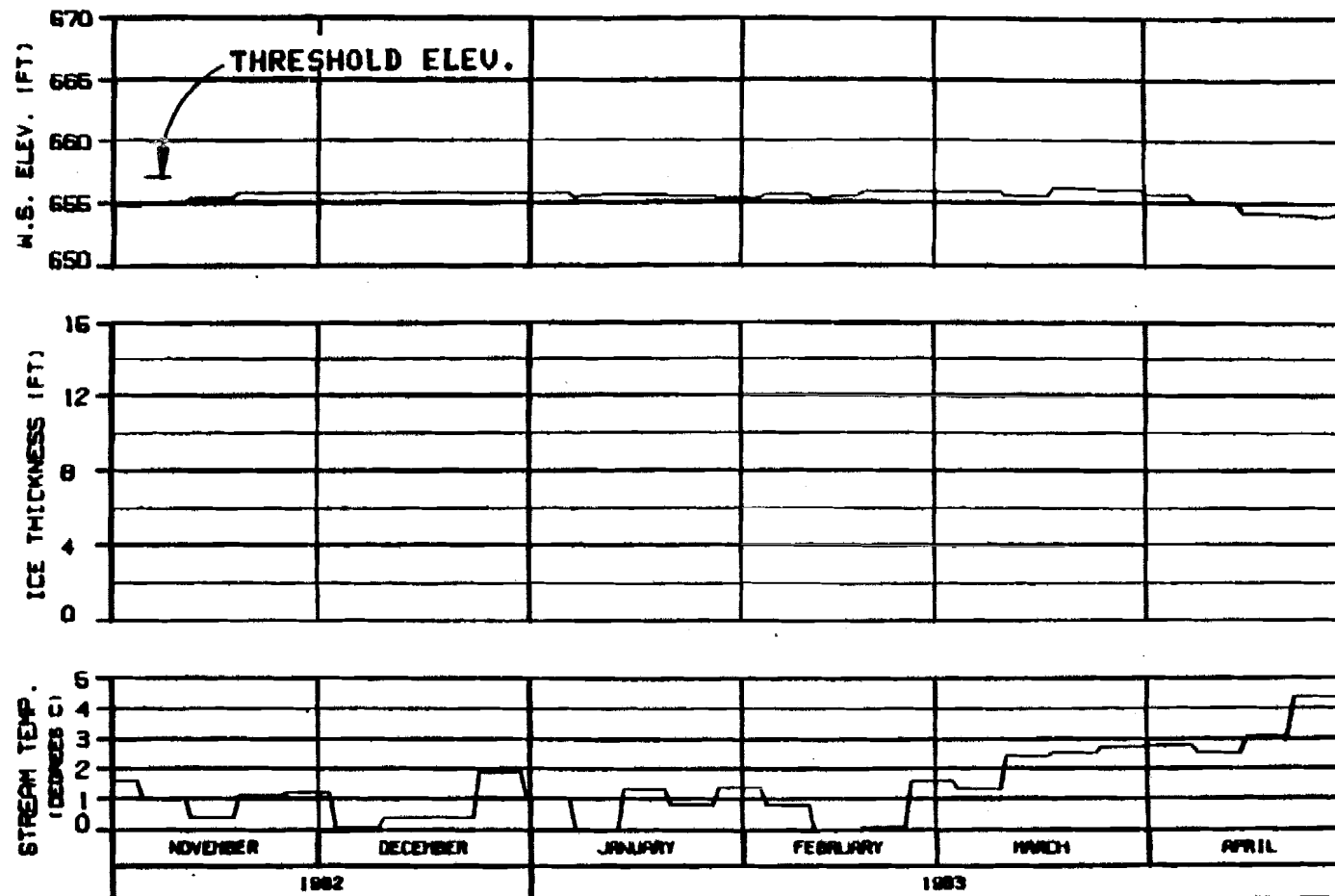
# HEAD OF SLOUGH 9A RIVER MILE : 133.70

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 82010NA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBR&CO JOINT VENTURE	
DESIGN: ELLIOTT	NO. 201 04
REV. 142	



**SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30**

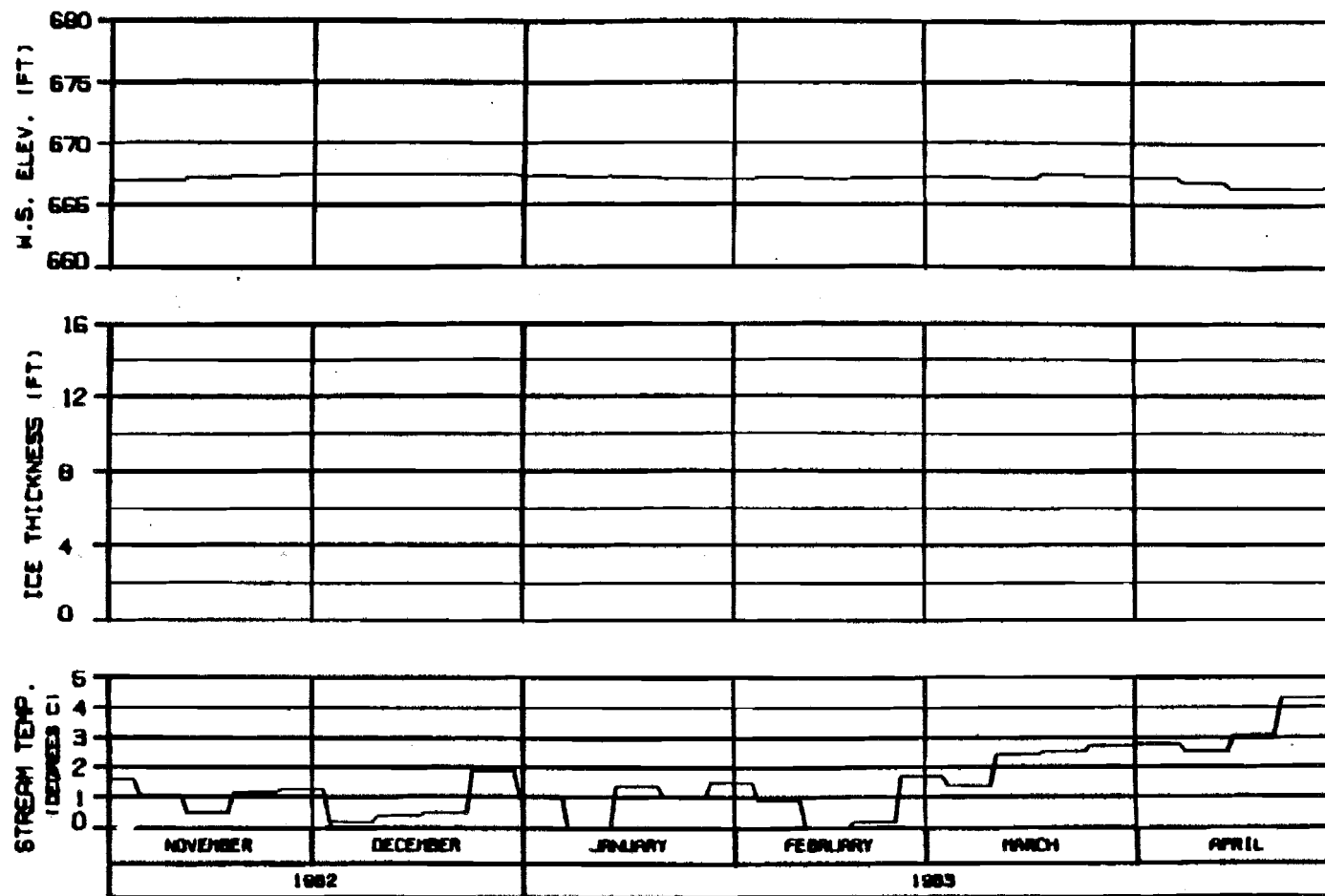
**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 82D1CNA

ALASKA POWER AUTHORITY		
SUSTINA PROJECT		
SUSTINA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGNED: B.L. GIBSON	20 JAN 83	8205.142





ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B2010NA

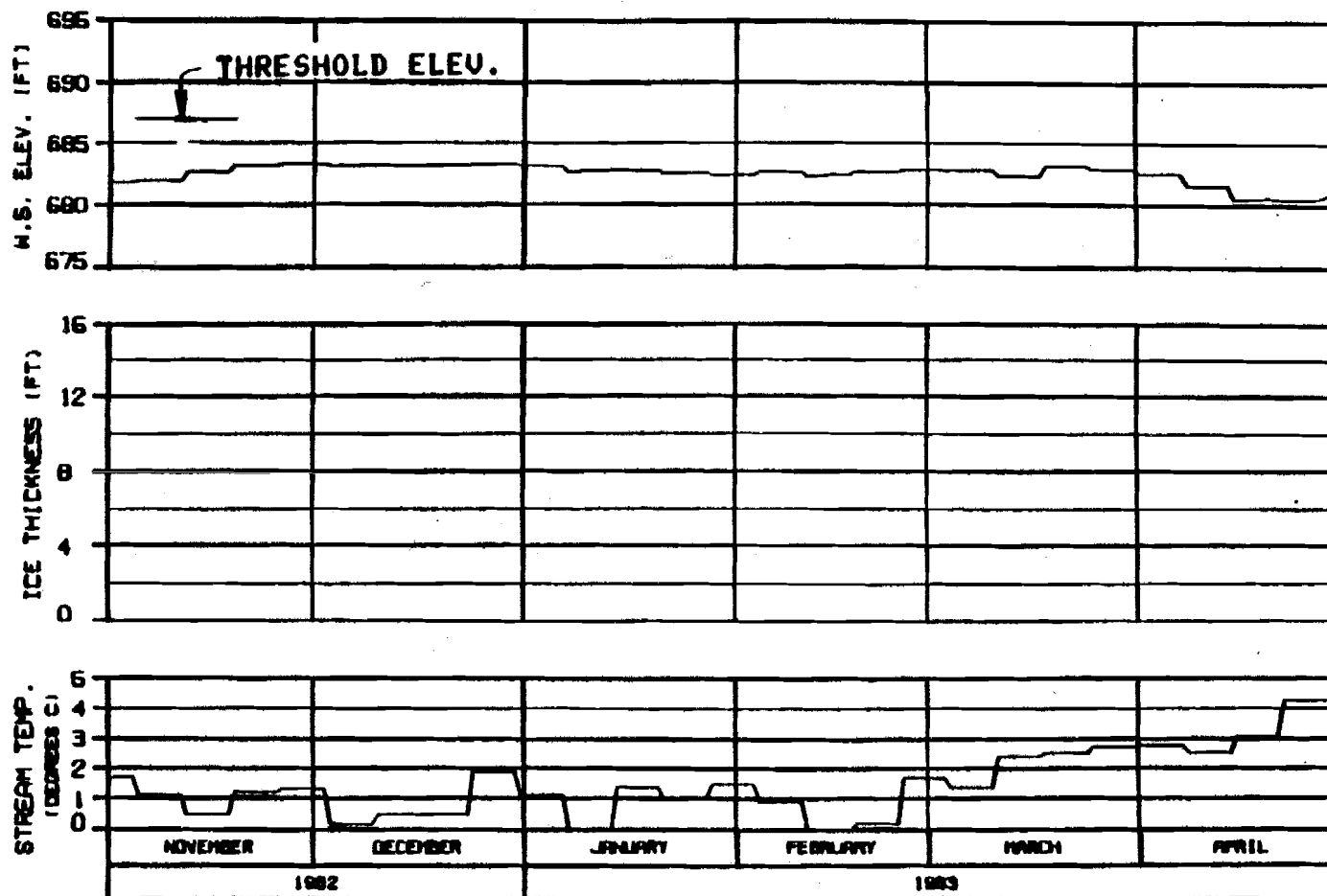
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: B. L. 1000 20 JAN 84 1000.100



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 82010NA

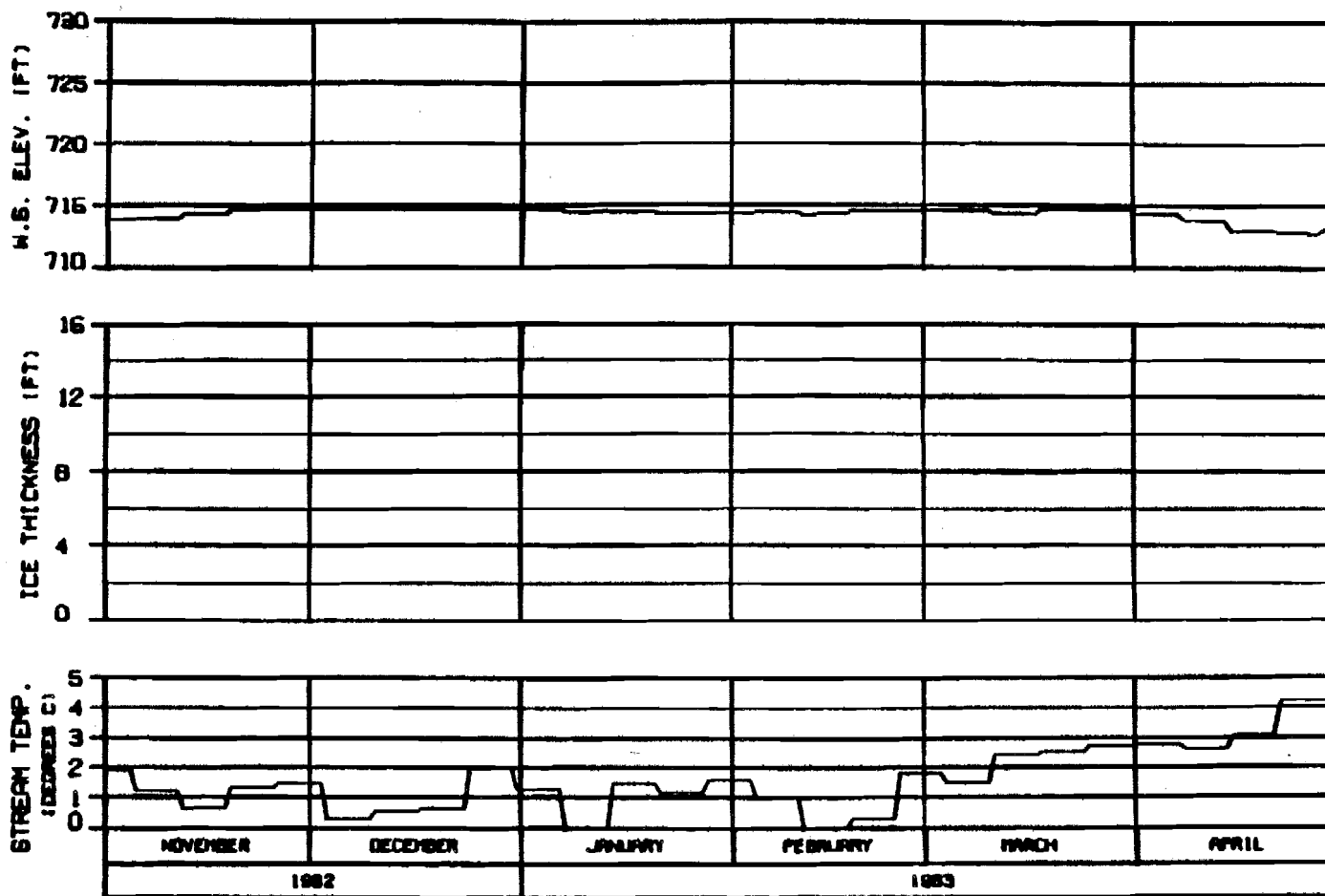
ALASKA POWER AUTHORITY

SUSTAIN PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: [blank] DRAWN BY: [blank] DATE: 1983.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

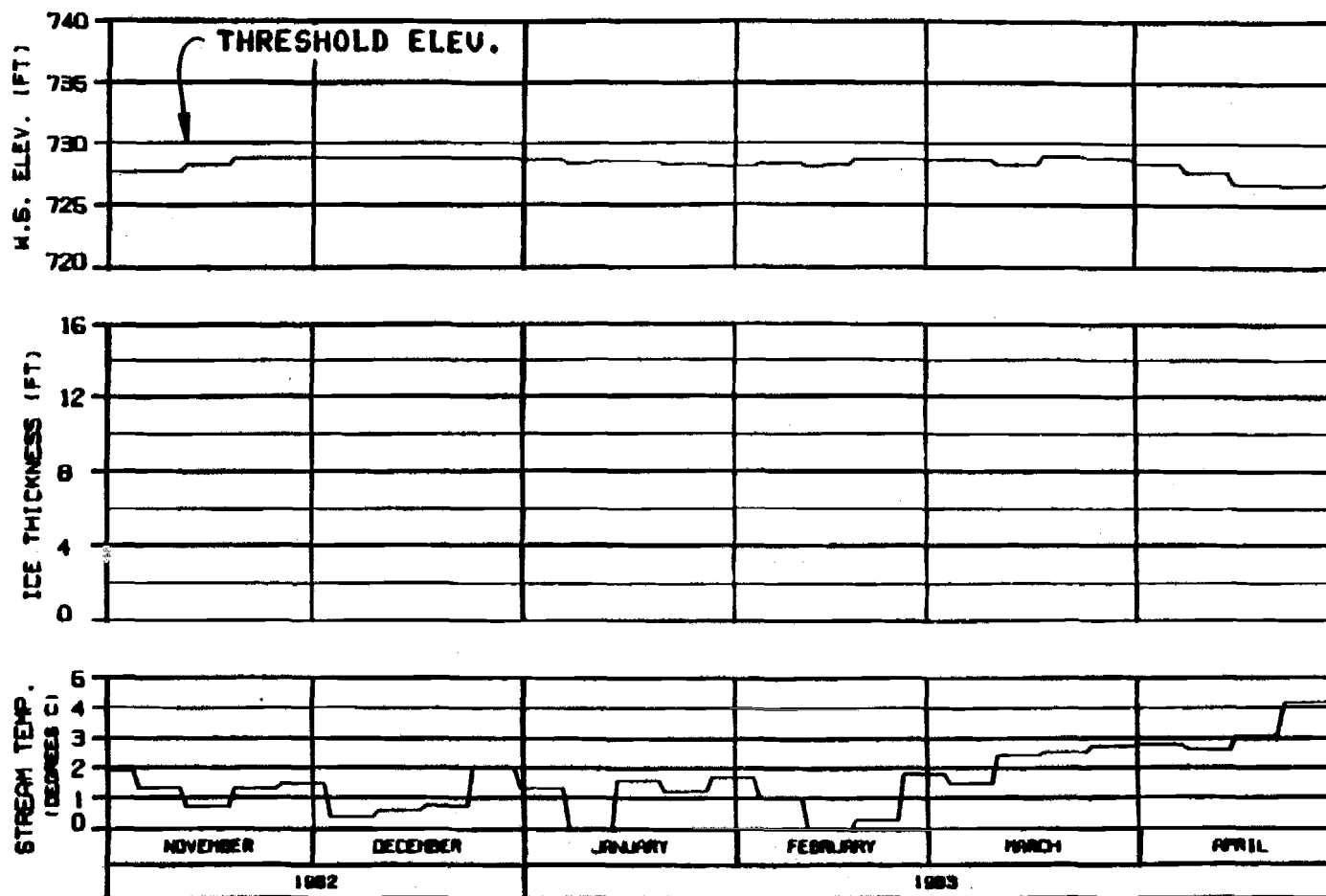
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EDSICO JOINT VENTURE

DATE: 04/08/83 BY: JH/BA

ISS: 142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLDN CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

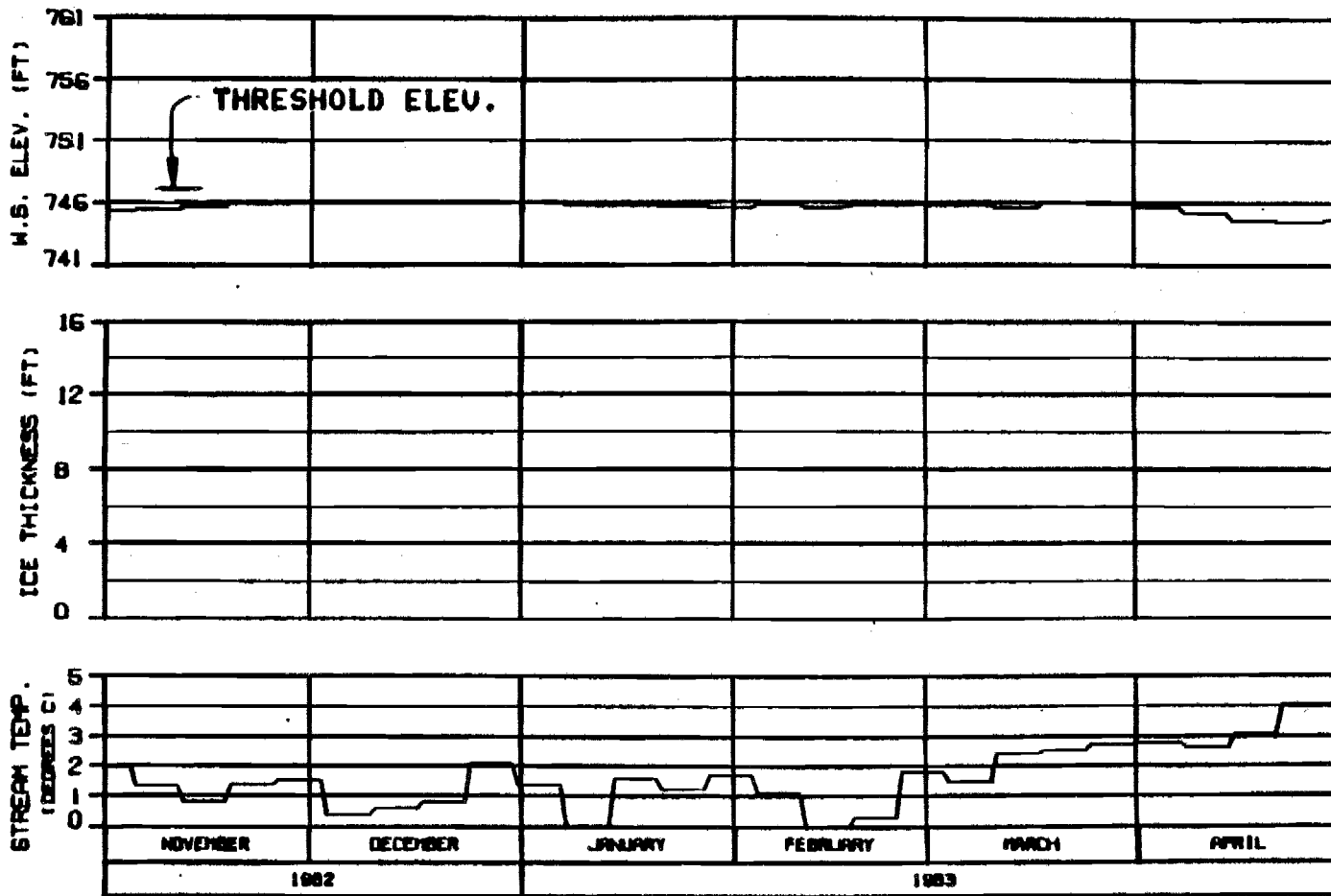
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGN: 81-0000 30 APR 83 1983.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 2001  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8201CNA

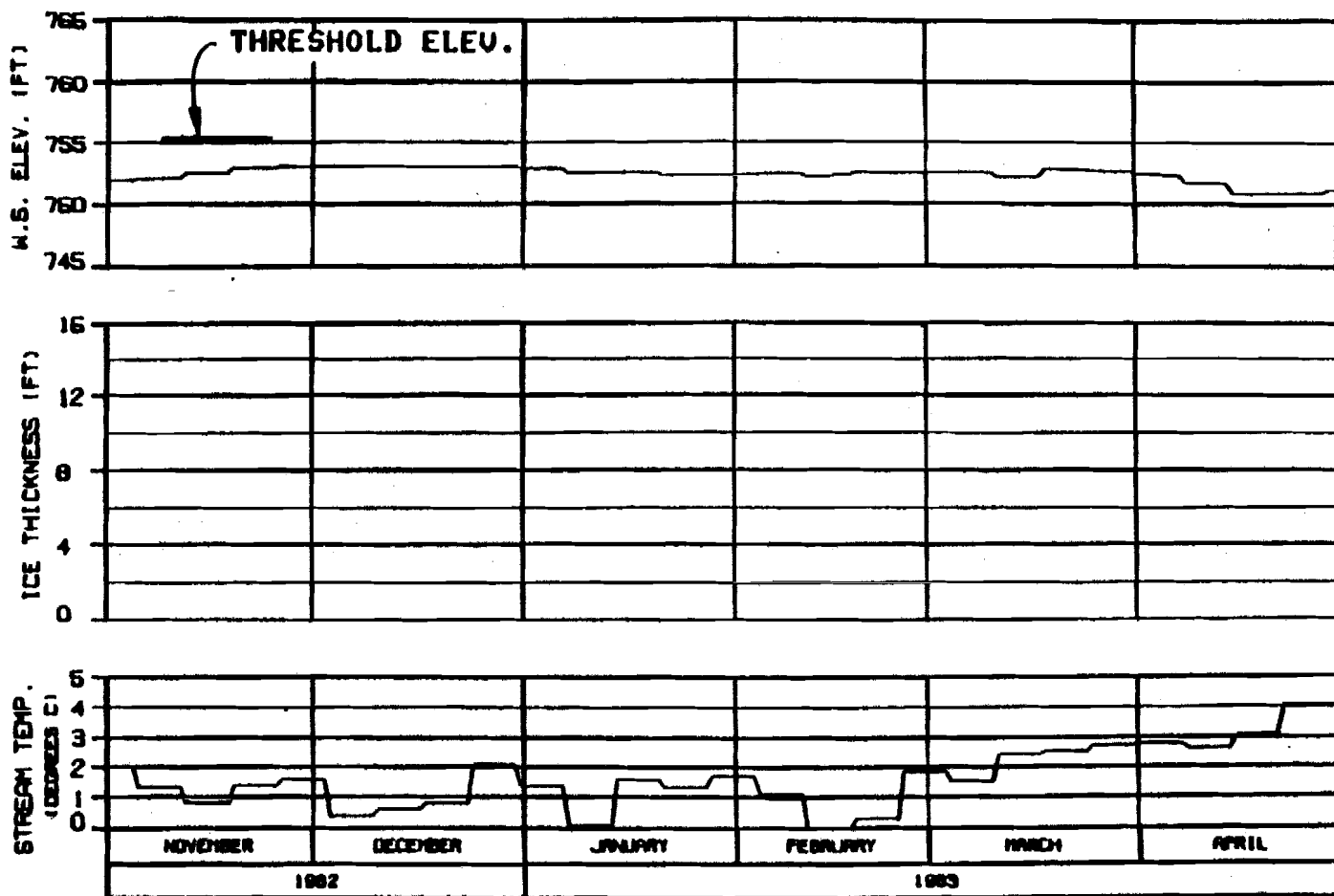
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRDC JOINT VENTURE

DESIGNED BY: J. H. HARRIS 20 APR 83 1000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : MATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

ALASKA POWER AUTHORITY

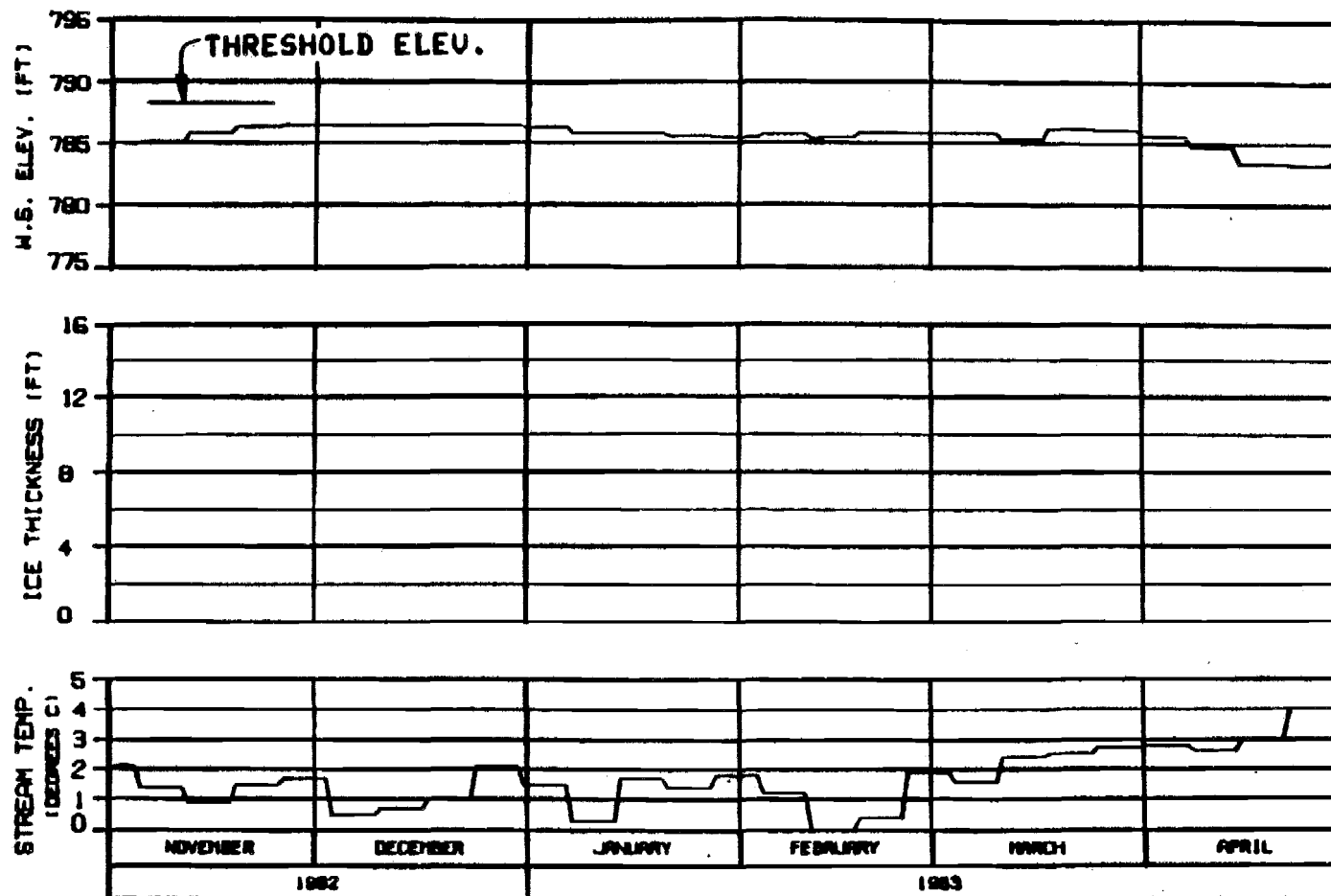
SUSTAIN PROJECT

SUSTAINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

OWNER: ALASKA POWER AUTHORITY 142.20

C



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 2001  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8201CNA

OPTION?

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EDBECO JOINT VENTURE

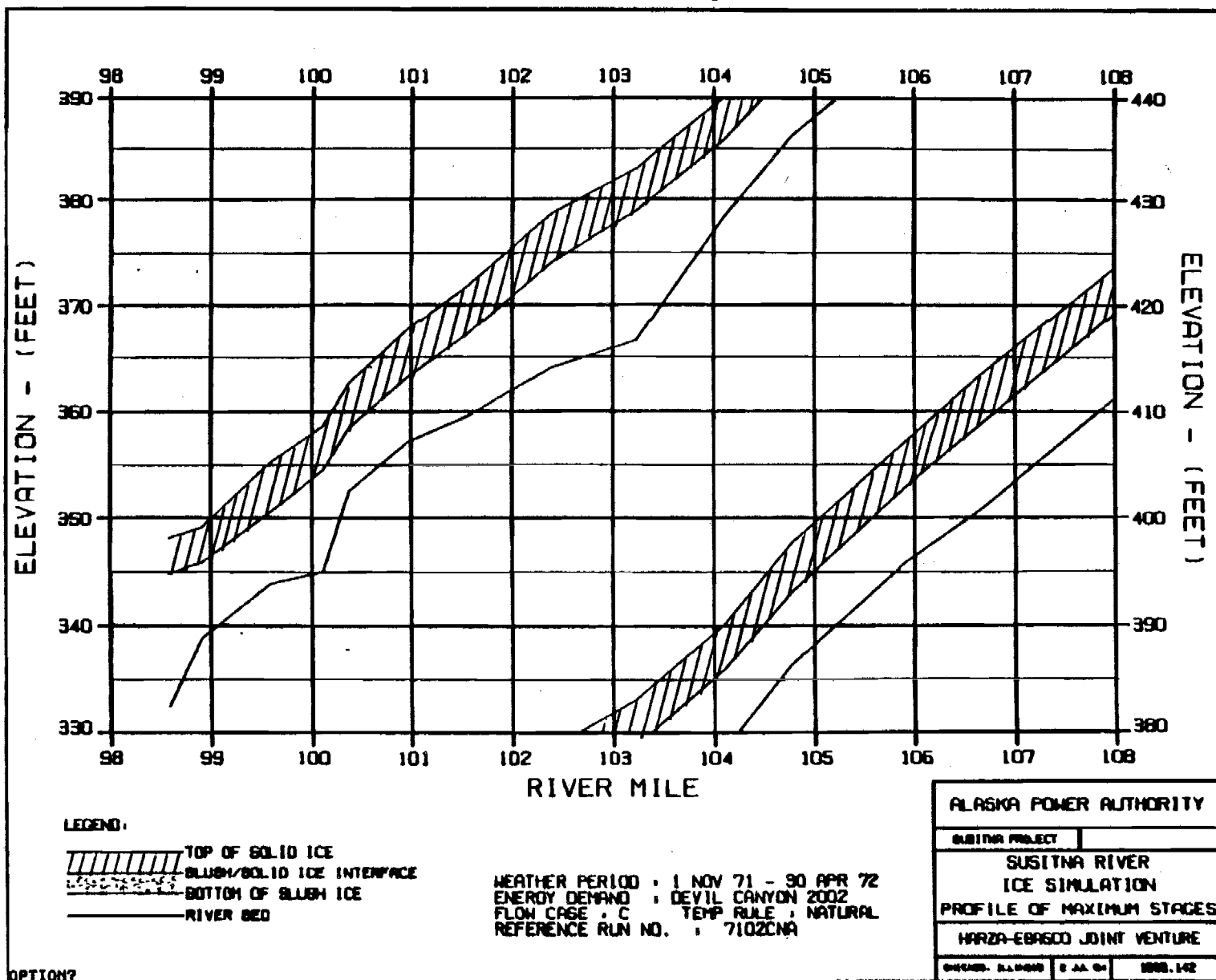
DESIGN: E. L. BROWN

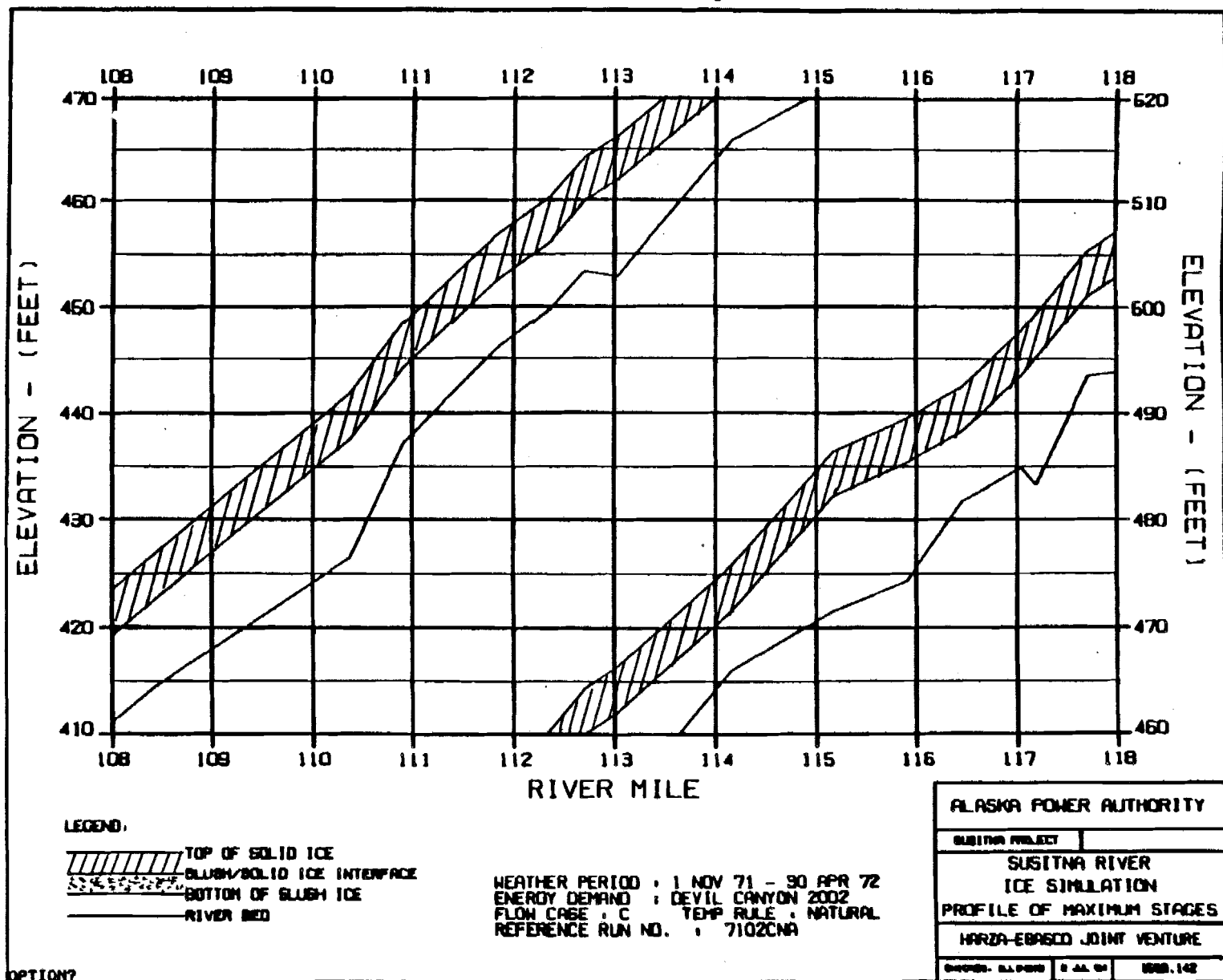
30 APR 83

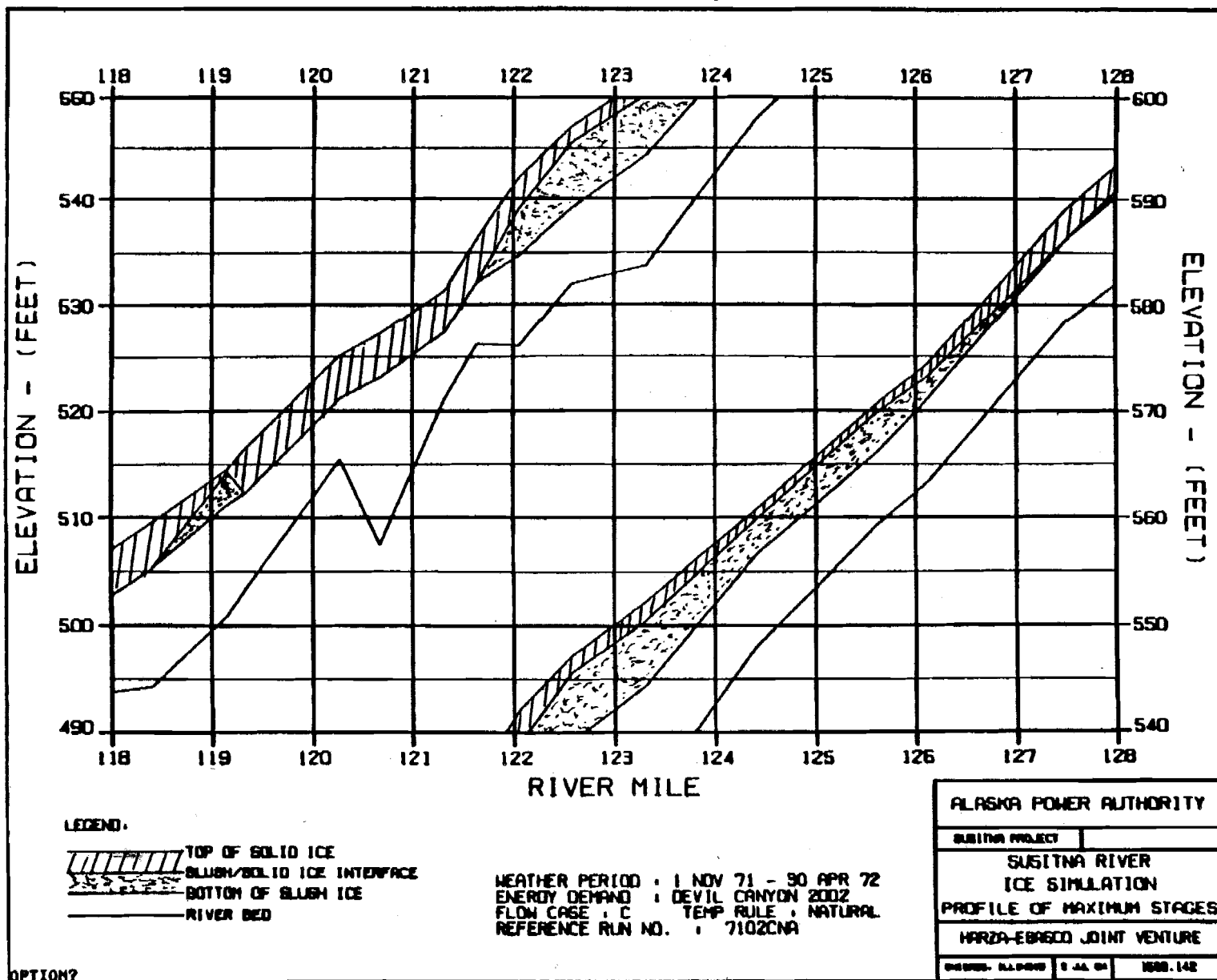
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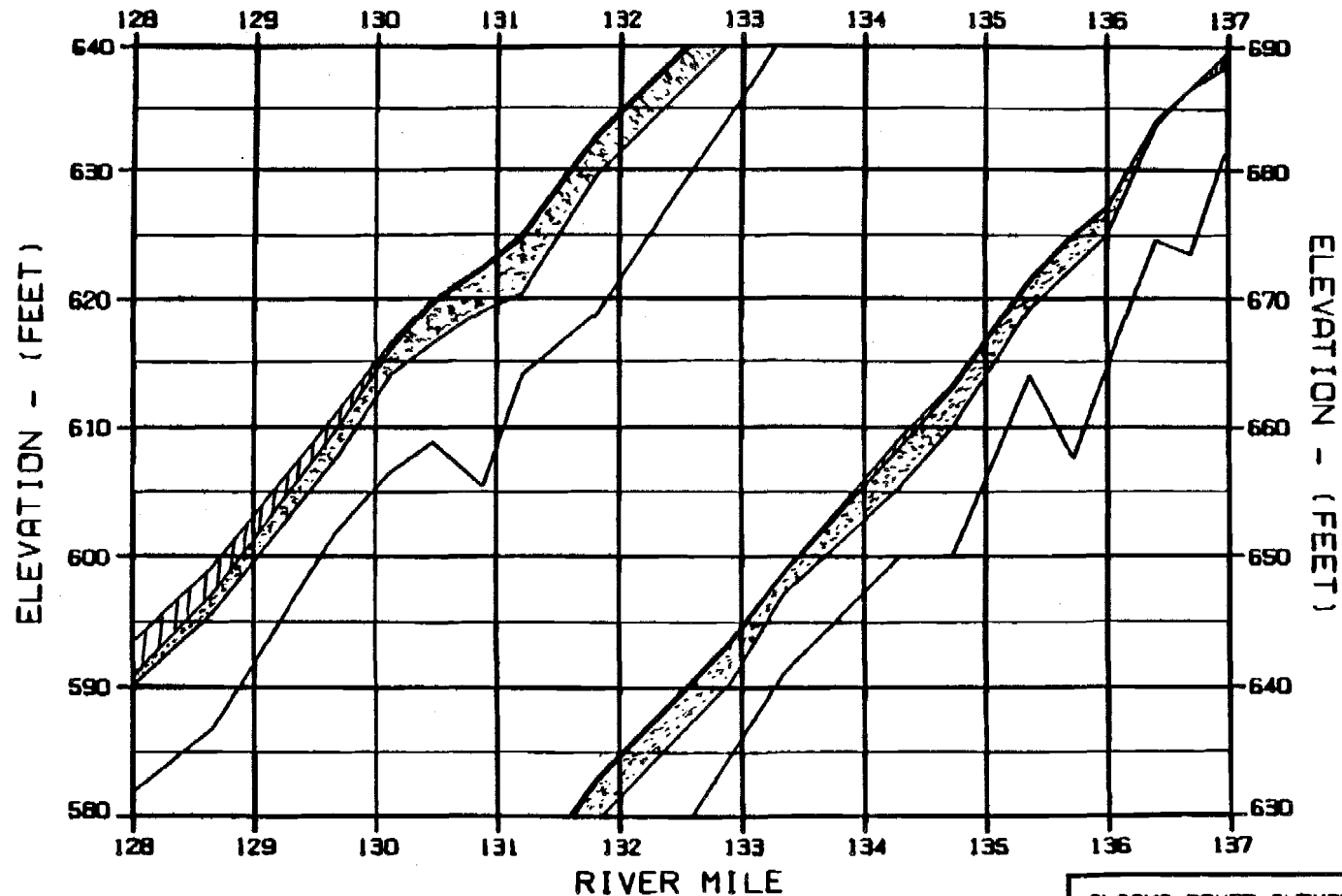
# EXHIBIT M











LEGEND.

TOP OF SOLID ICE  
 SLUSH/SOLID ICE INTERFACE  
 BOTTOM OF SLUSH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

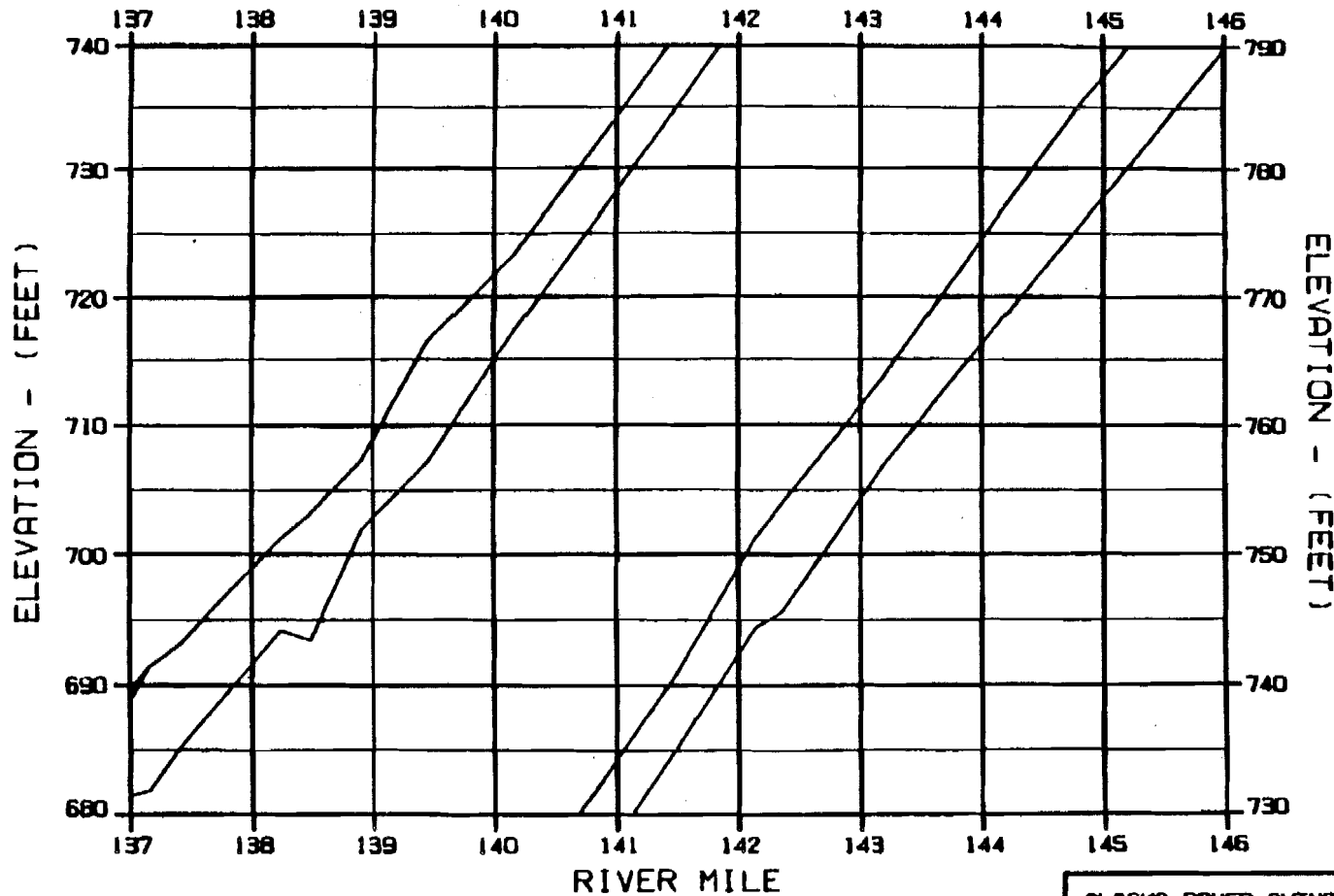
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HARZA-EGASCO JOINT VENTURE

DRAWN: S.A. 1000 8 JUL 74 1000.142

OPTION?

C



LEGEND:

TOP OF SOLID ICE  
 BLUISH/SOLID ICE INTERFACE  
 BOTTOM OF BLUISH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

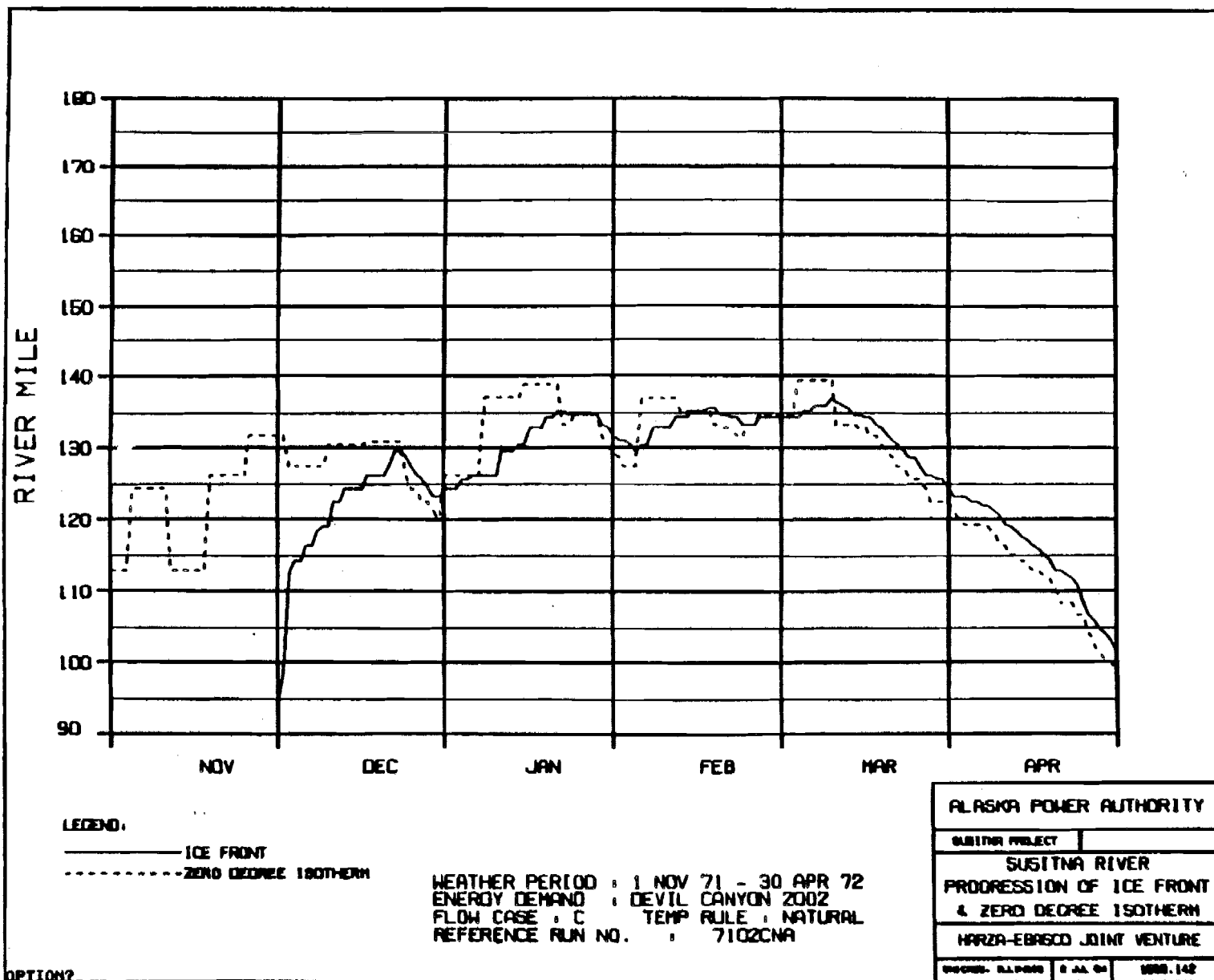
SUSITNA PROJECT

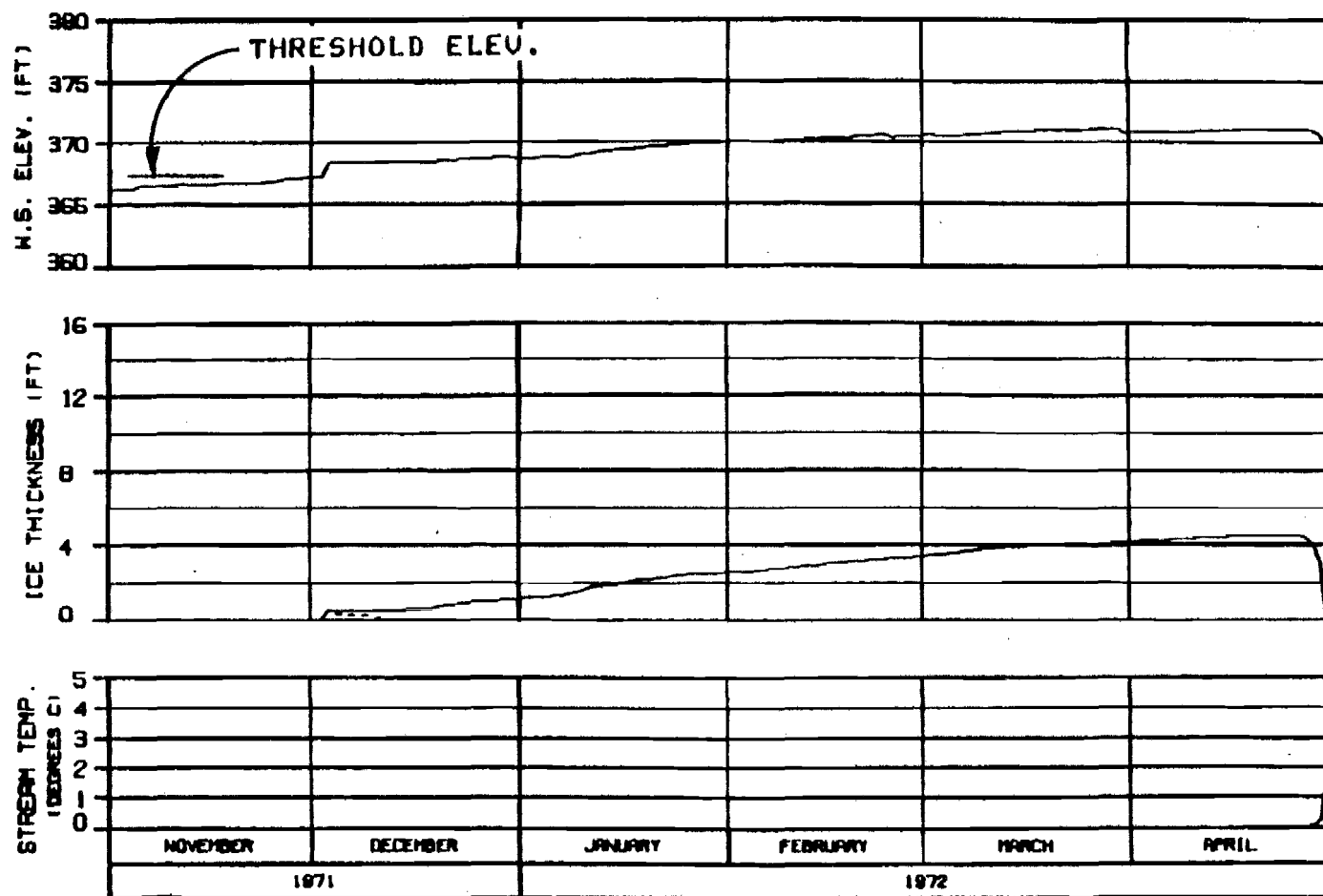
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHIEF: ALP-000 2-11-01 1000.142

OPTION?





# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

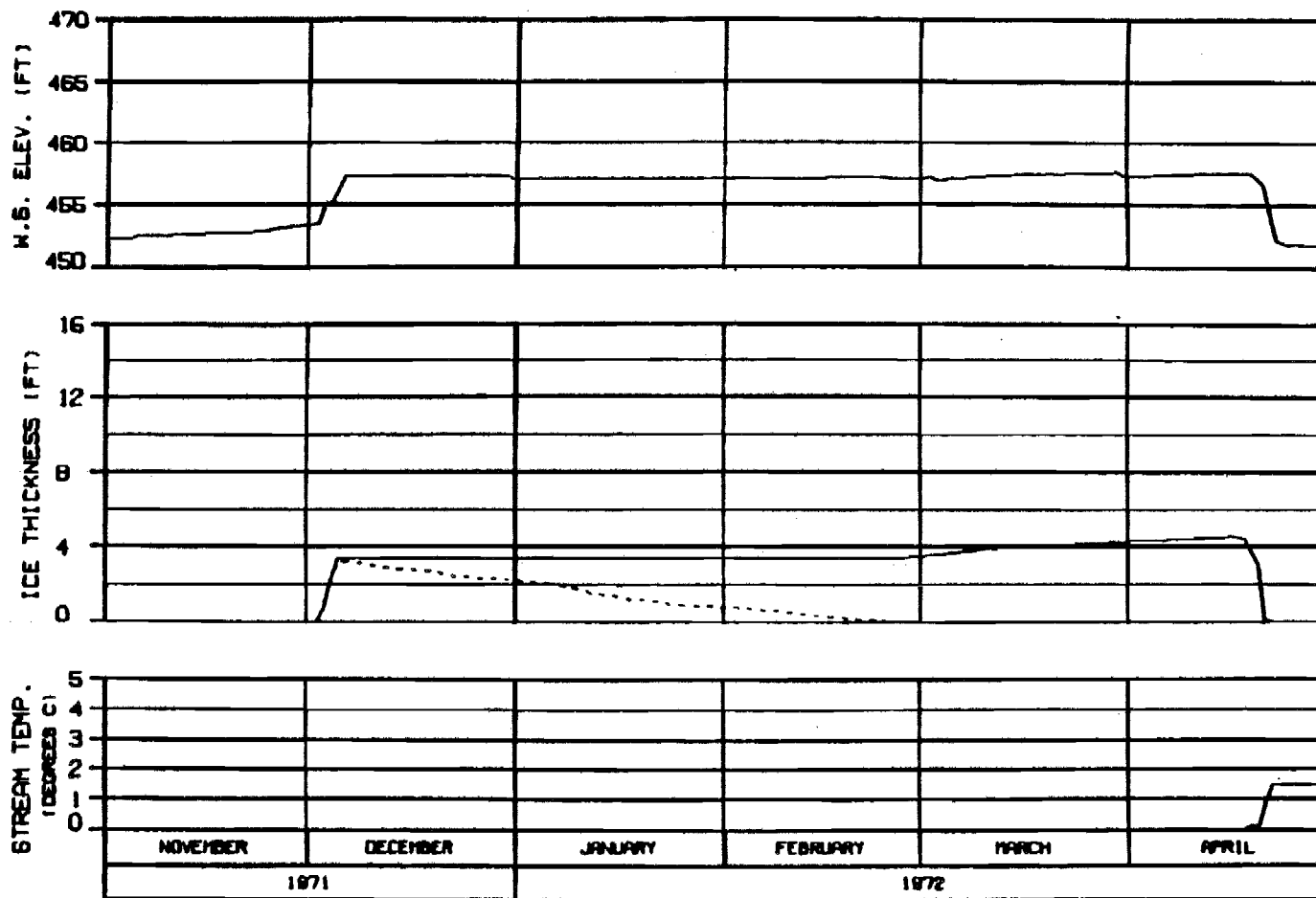
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DRAWN: SLP/DBB 9 JAN 82 1000.142



**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

———— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

**ALASKA POWER AUTHORITY**

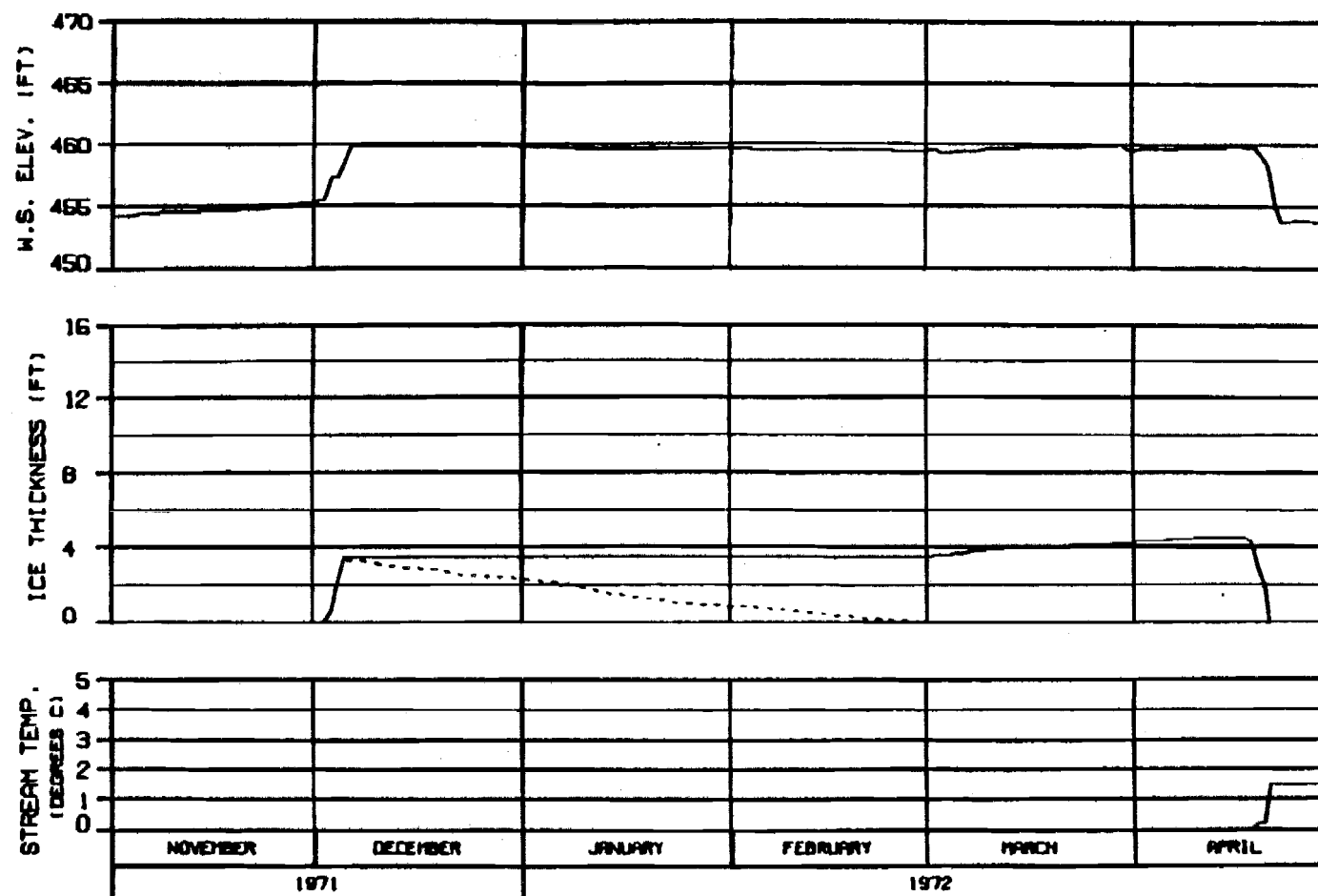
SUSTINA PROJECT

**SUSTINA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

HARZA-EBASCO JOINT VENTURE

DESIGN: ALP/AM 0 ALL BY 1000.142





MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

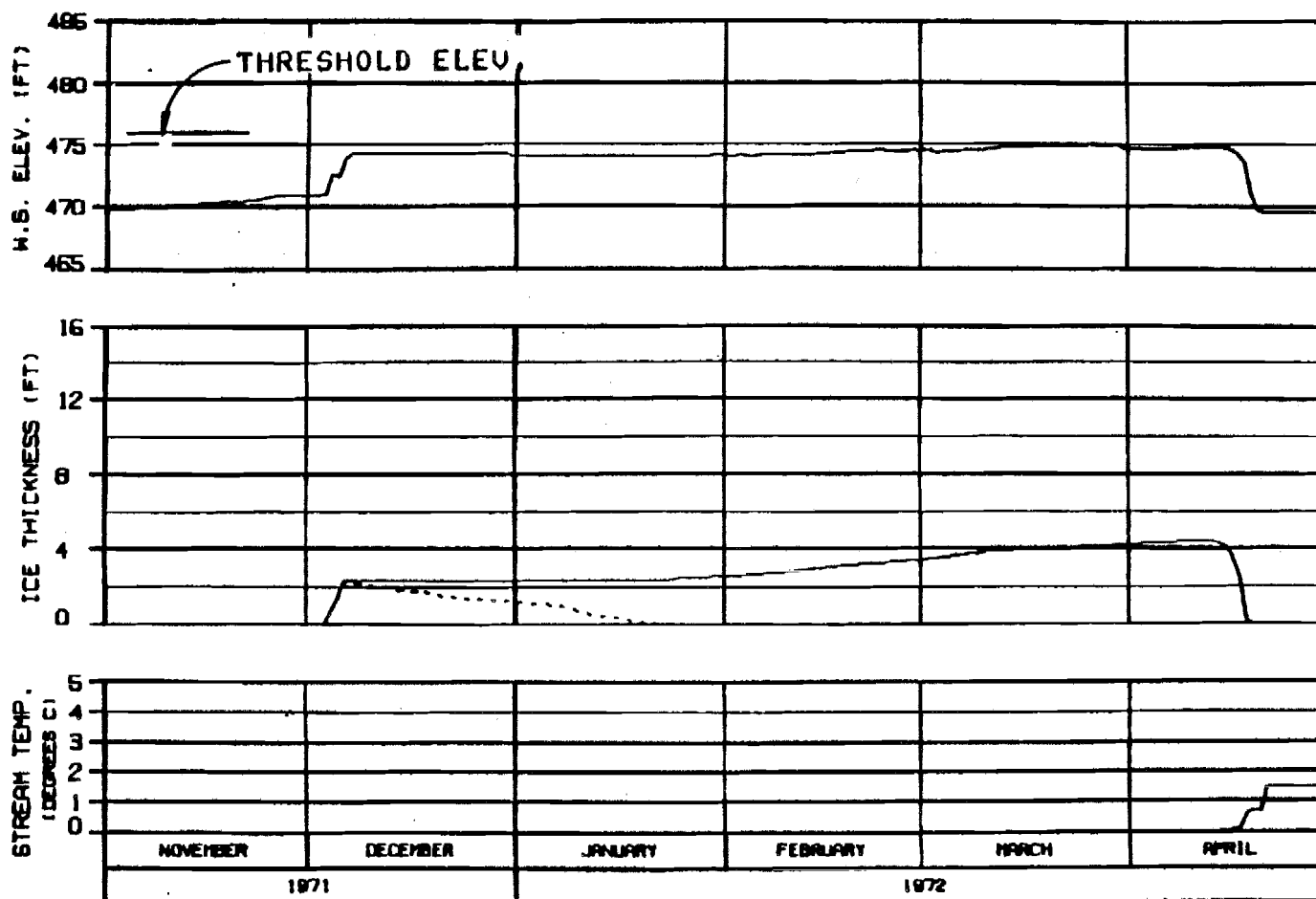
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZA-EBASCO JOINT VENTURE

DESIGNED BY: J. A. BROWN

DATE: 10/1/72

ISSUE: 142

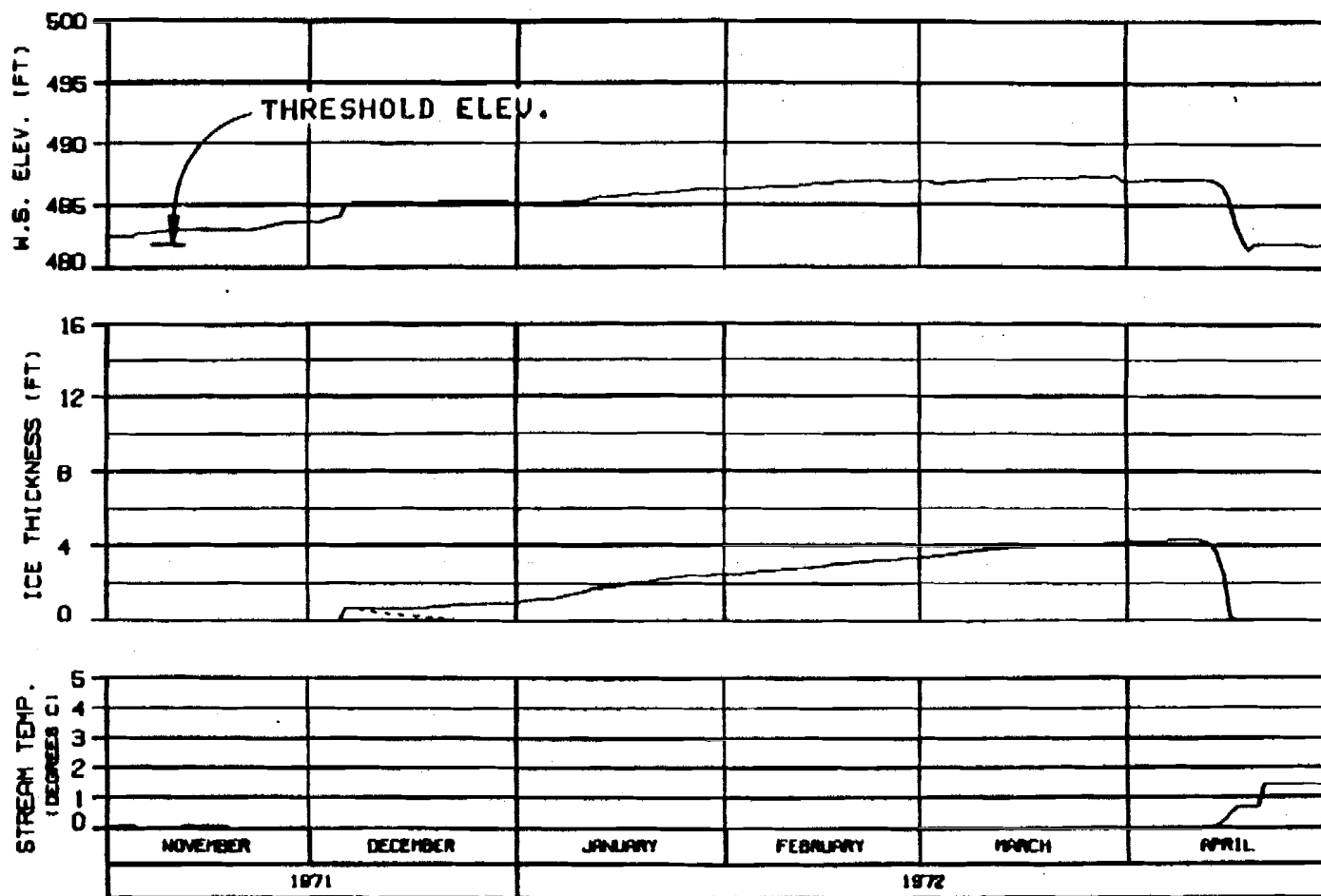


HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY	
GUSITNA PROJECT	
GUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBERD JOINT VENTURE	
DESIGNED - ELLIOTT	NOV. 1972



SIDE CHANNEL MSII  
RIVER MILE : 115.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

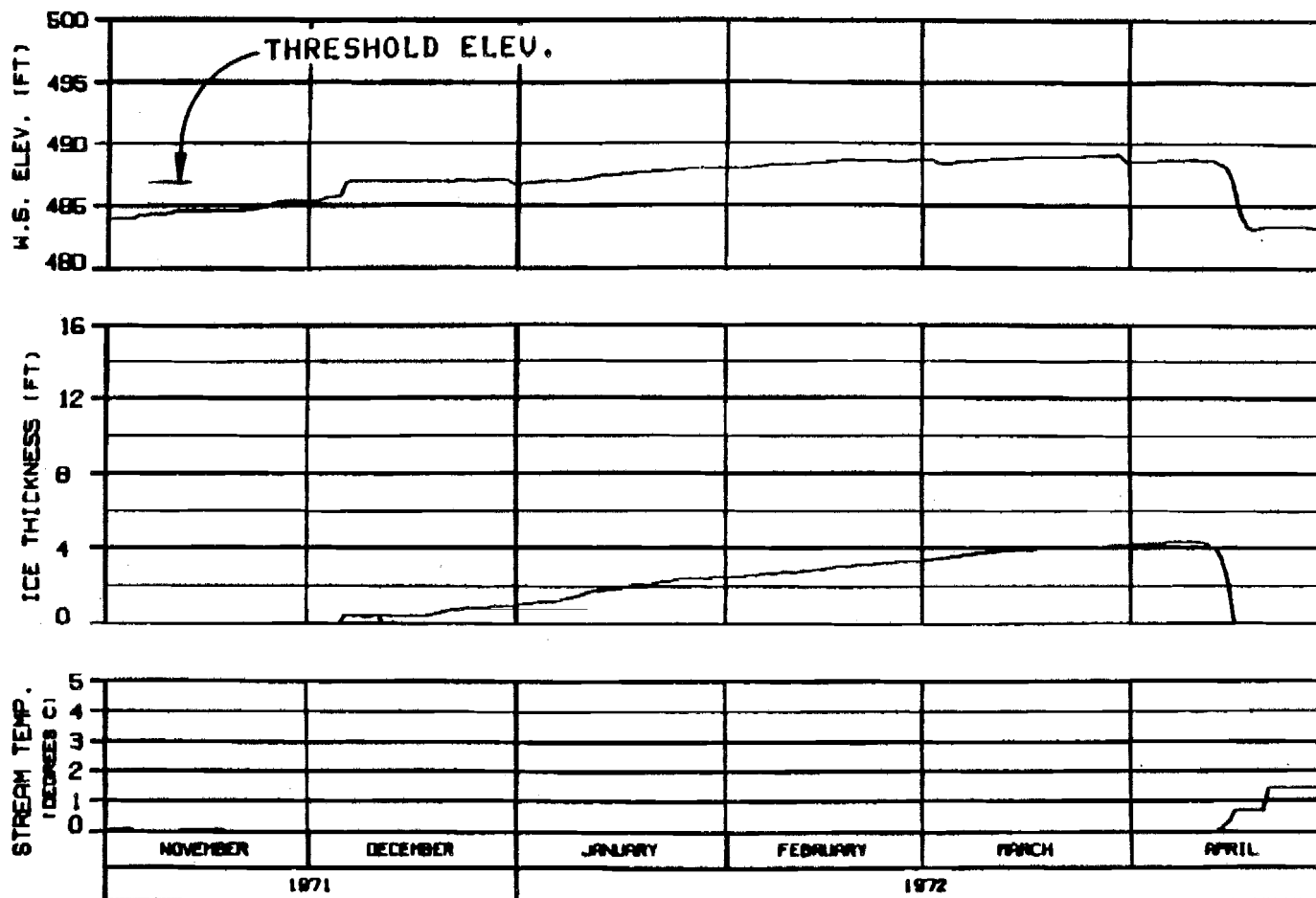
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBERD JOINT VENTURE

CHG-88-01-000 0 JUL 88 1000.142



# HEAD OF SIDE CHANNEL MSII RIVER MILE : 115.90

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71020NA

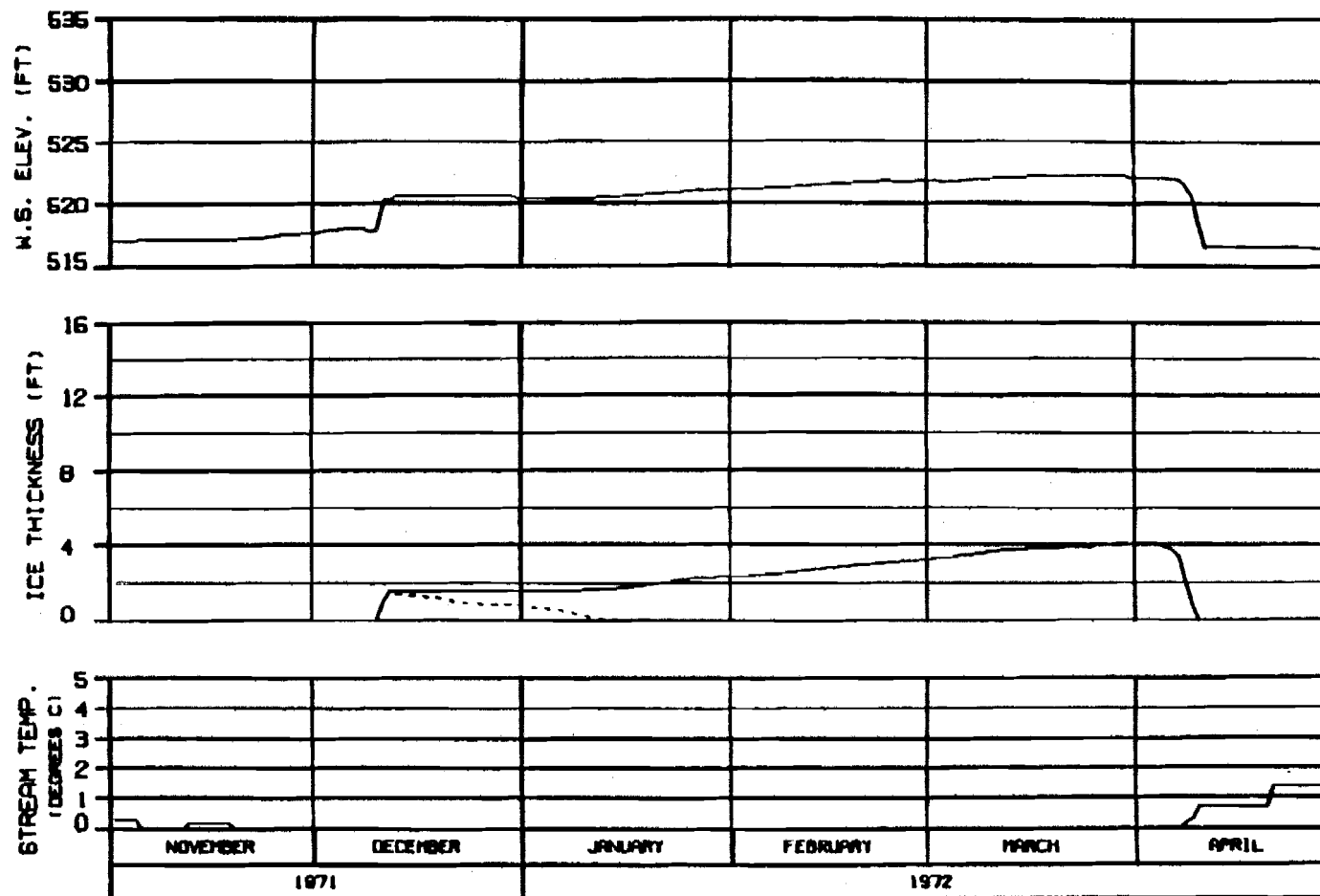
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTS - 8A-8470 8 JA 01 888.142



ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

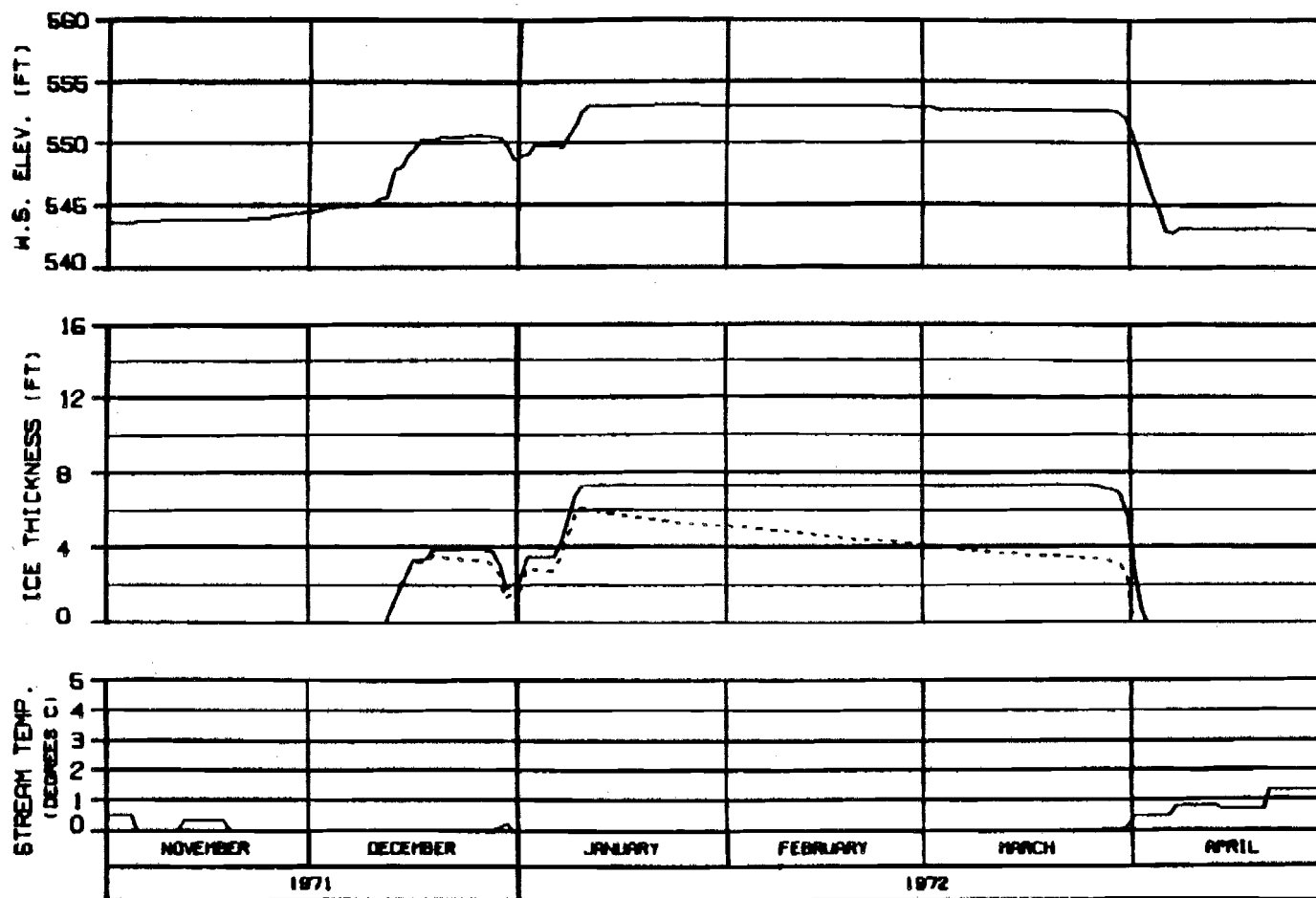
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: B.A. 0000 8 JUL 84 1000.142



HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

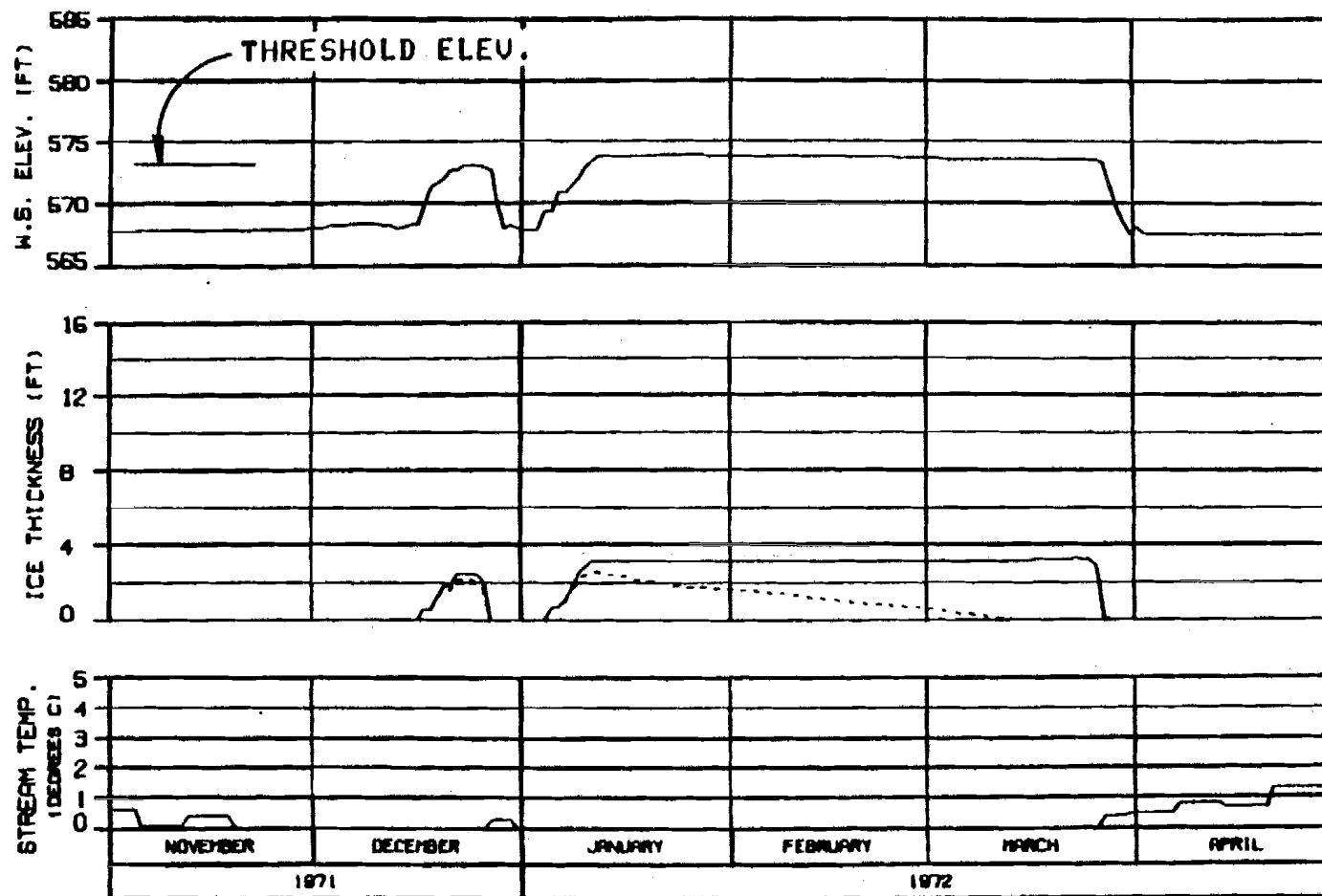
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

DESIGNER: SLADENB 8 JUL 81 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

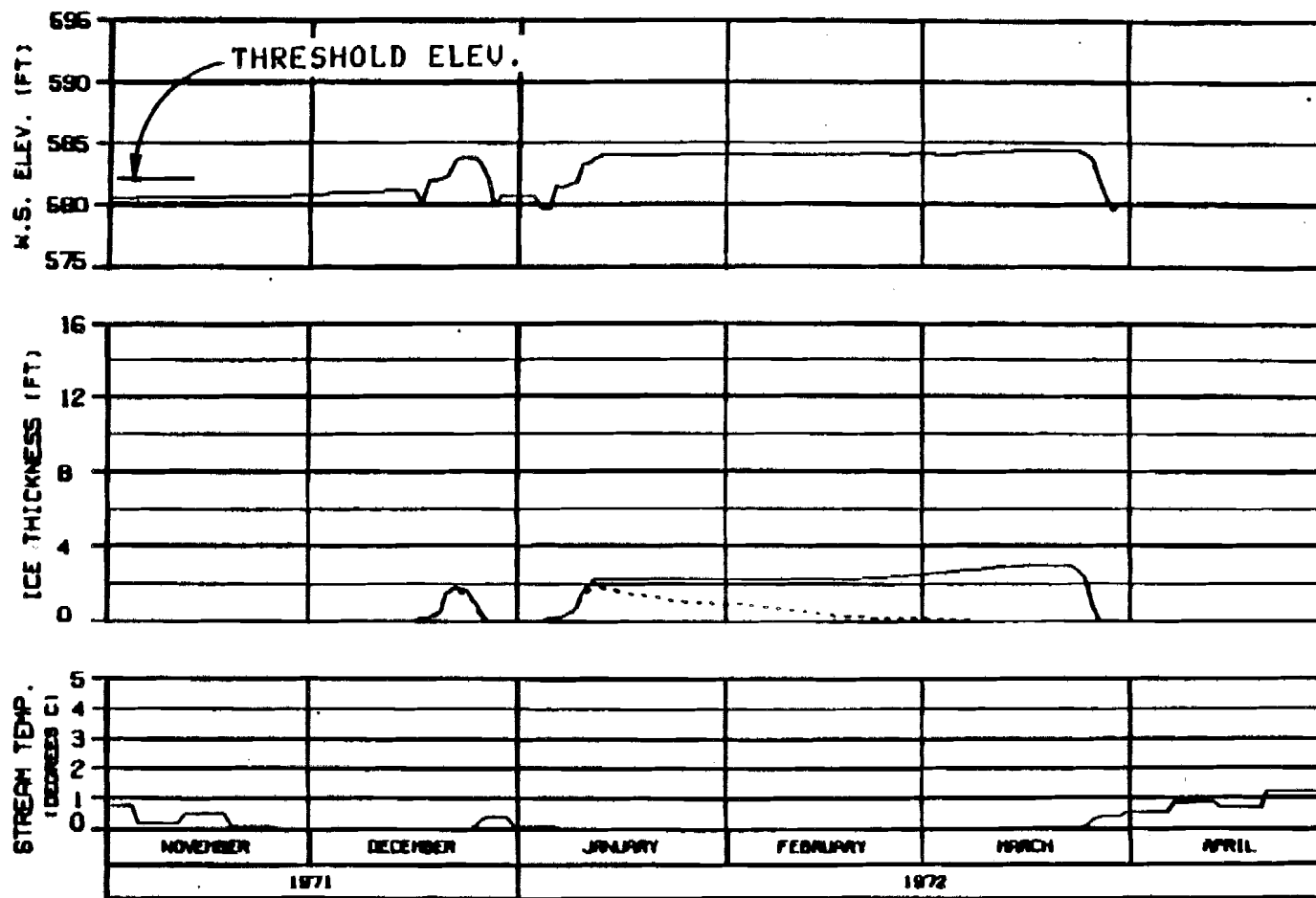
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHANGES: ALL DATA 5 JAN 84 0000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

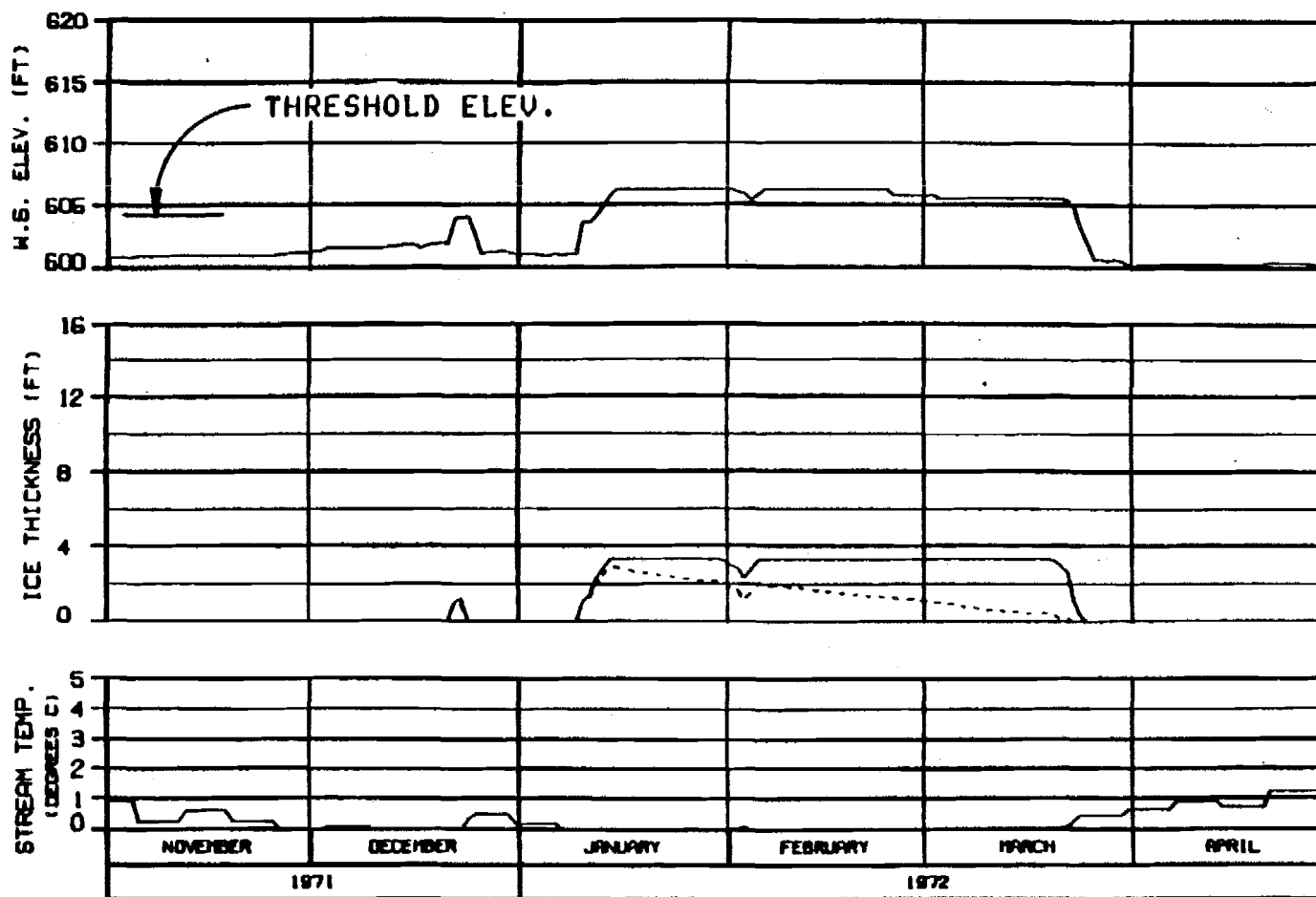
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

DESIGNED BY: R. L. PETERSON & ASSOCIATES, INC. DRAWN BY: J. L. PETERSON





HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

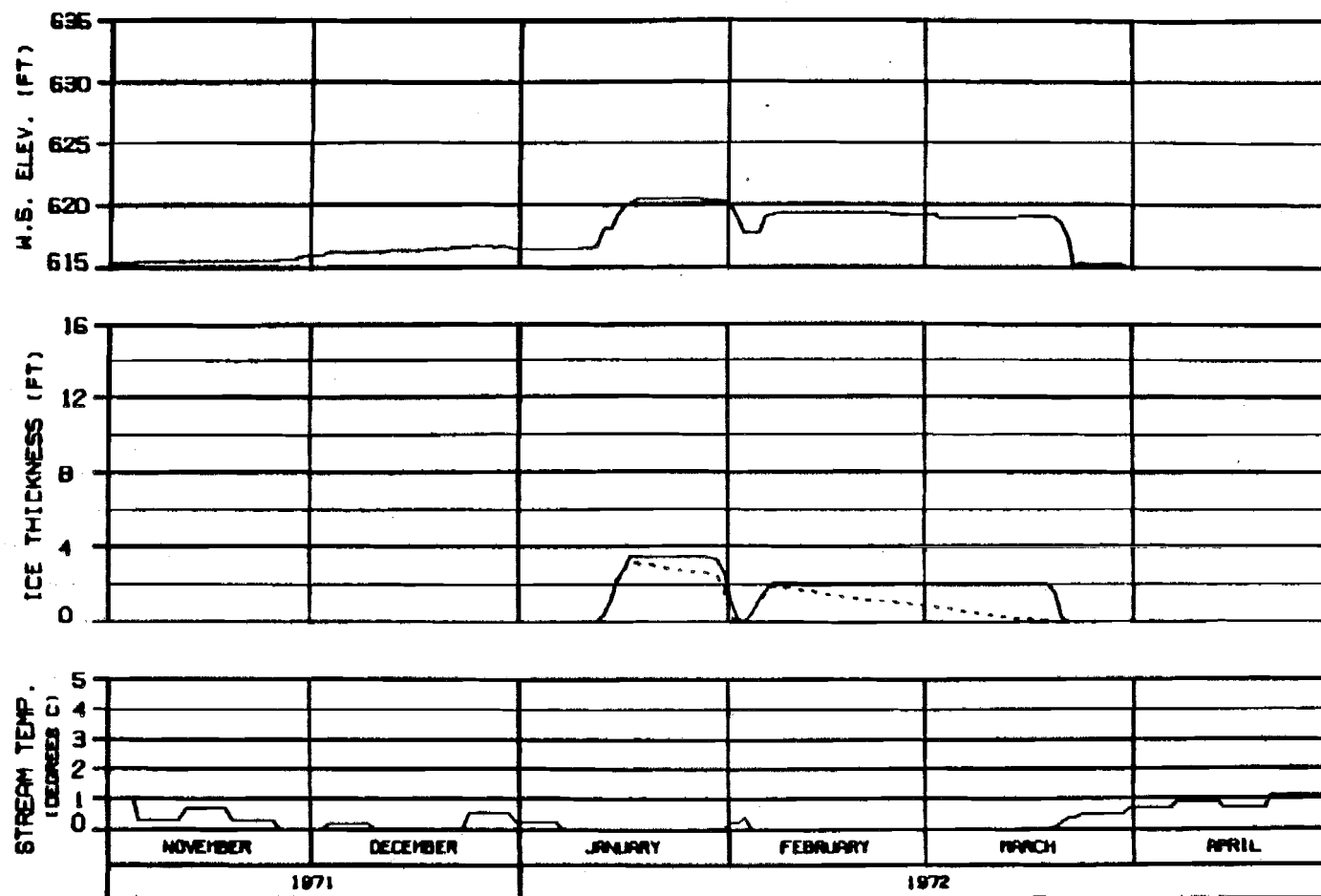
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBR600 JOINT VENTURE

DESIGNED: SLP/PSR 0 AA 04 1000.142

OPTION?

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

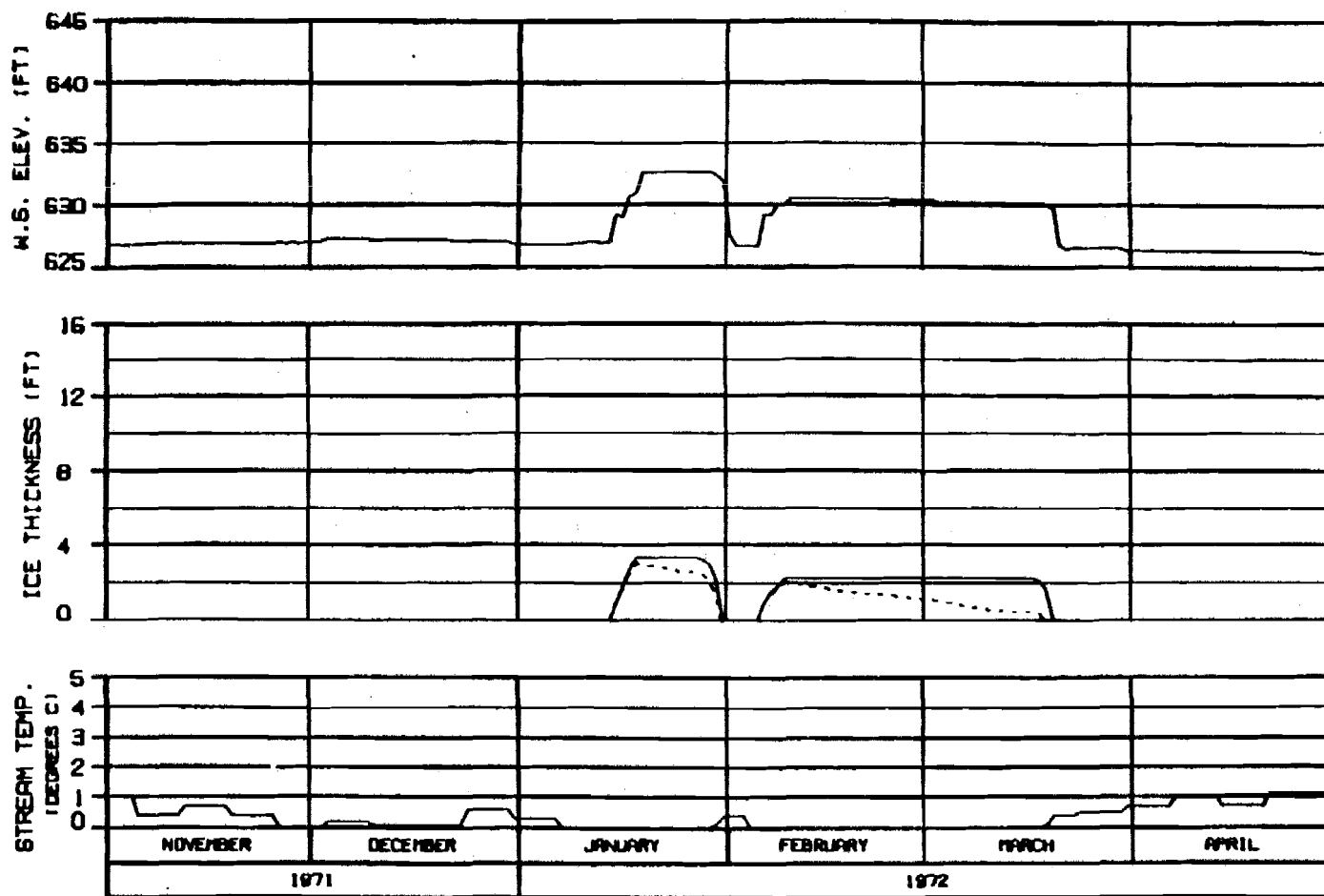
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HRZA-EBASCO JOINT VENTURE

DESIGNED BY: J. J. J. 8 JUL 84 1000-142



ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF 4TH JULY CREEK  
 RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

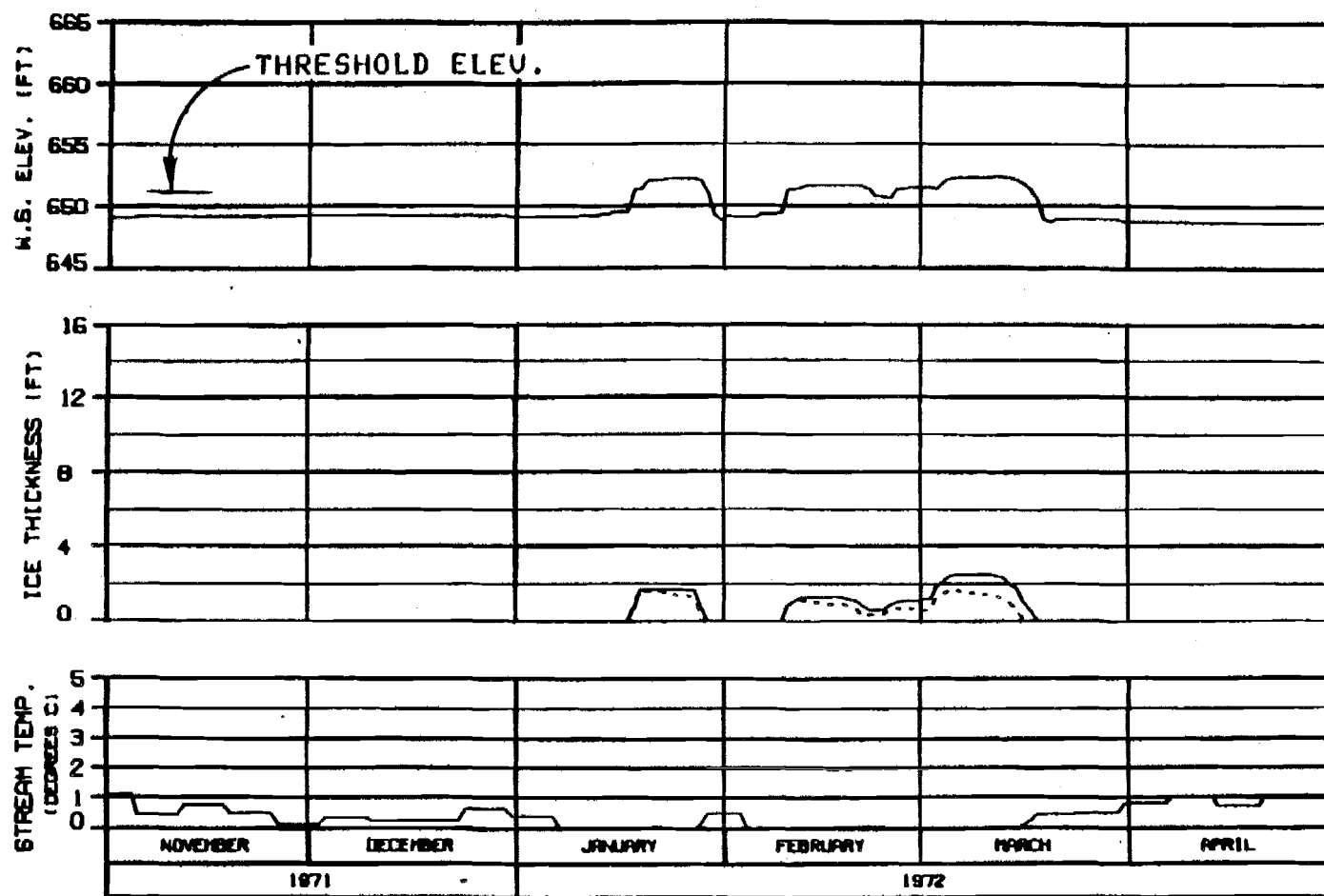
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHGDR. ALP-000 9 JAN 72 0000.142

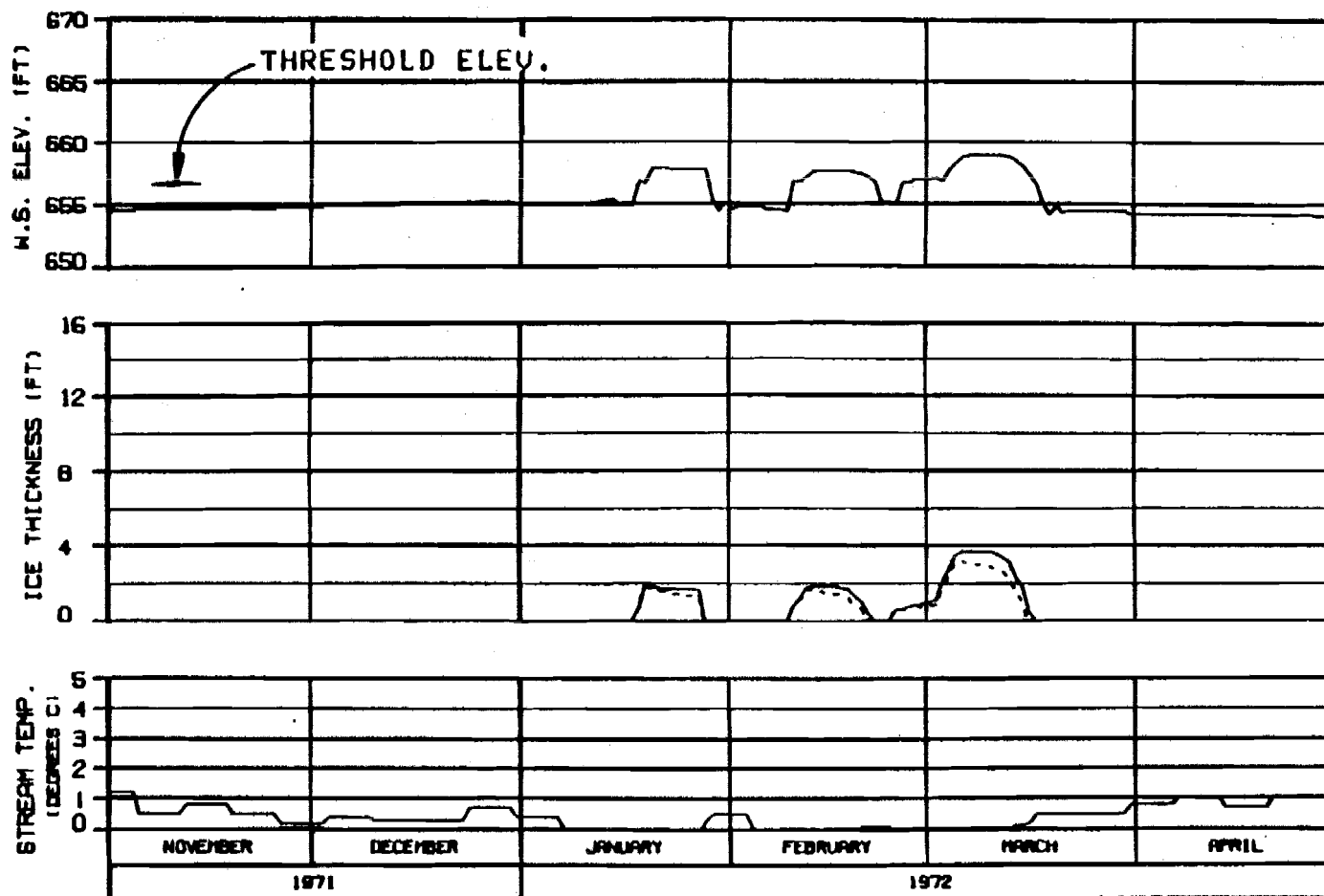


HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 71020NA

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
CHART NO. 11-0000	DATE 04-04-78
ISSN 142	



SIDE CHANNEL U/S OF SLOUGH 10

RIVER MILE : 134.30

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7102CNA

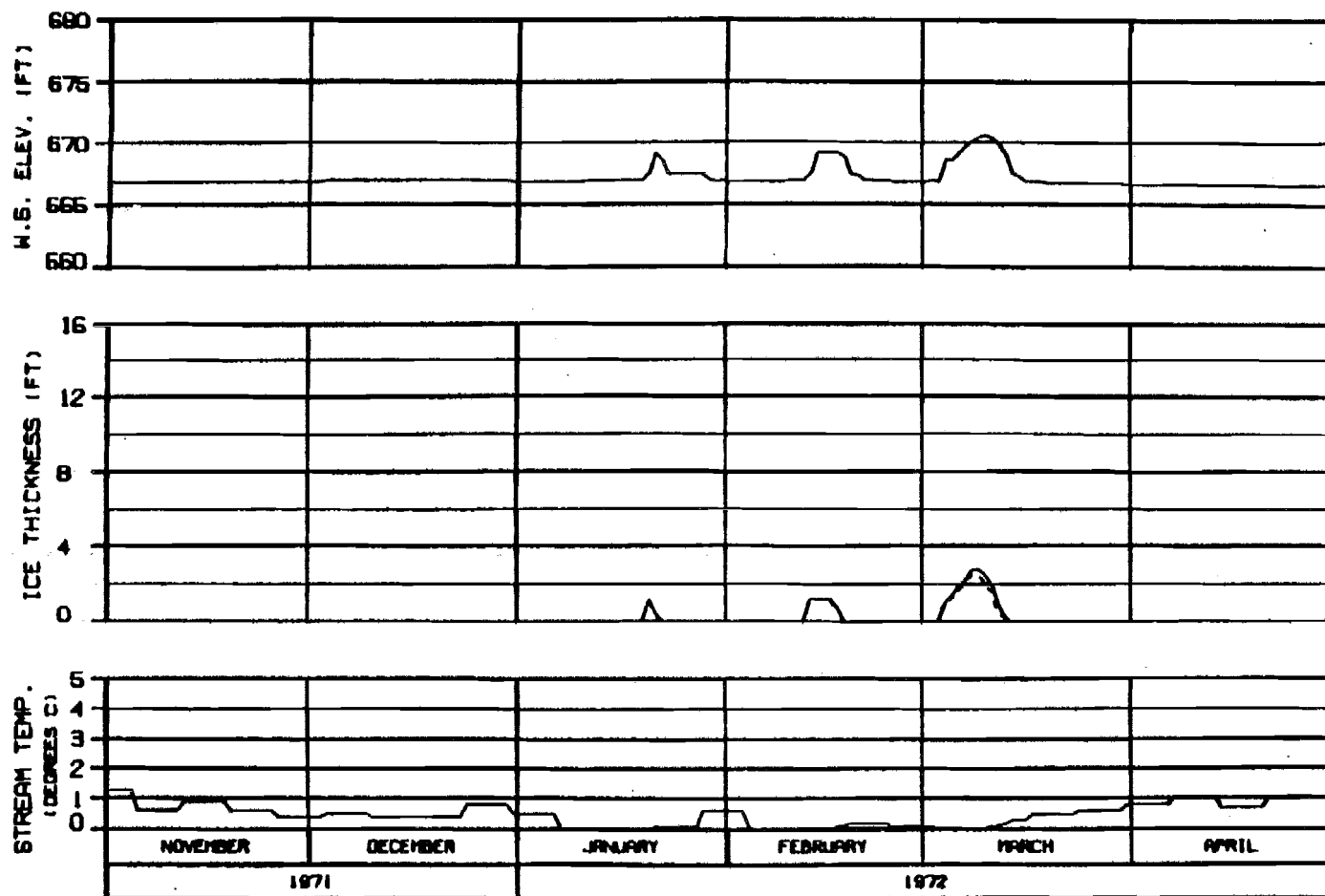
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DESIGNED BY: D. J. BROWN 5 JUL 72 1000-142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

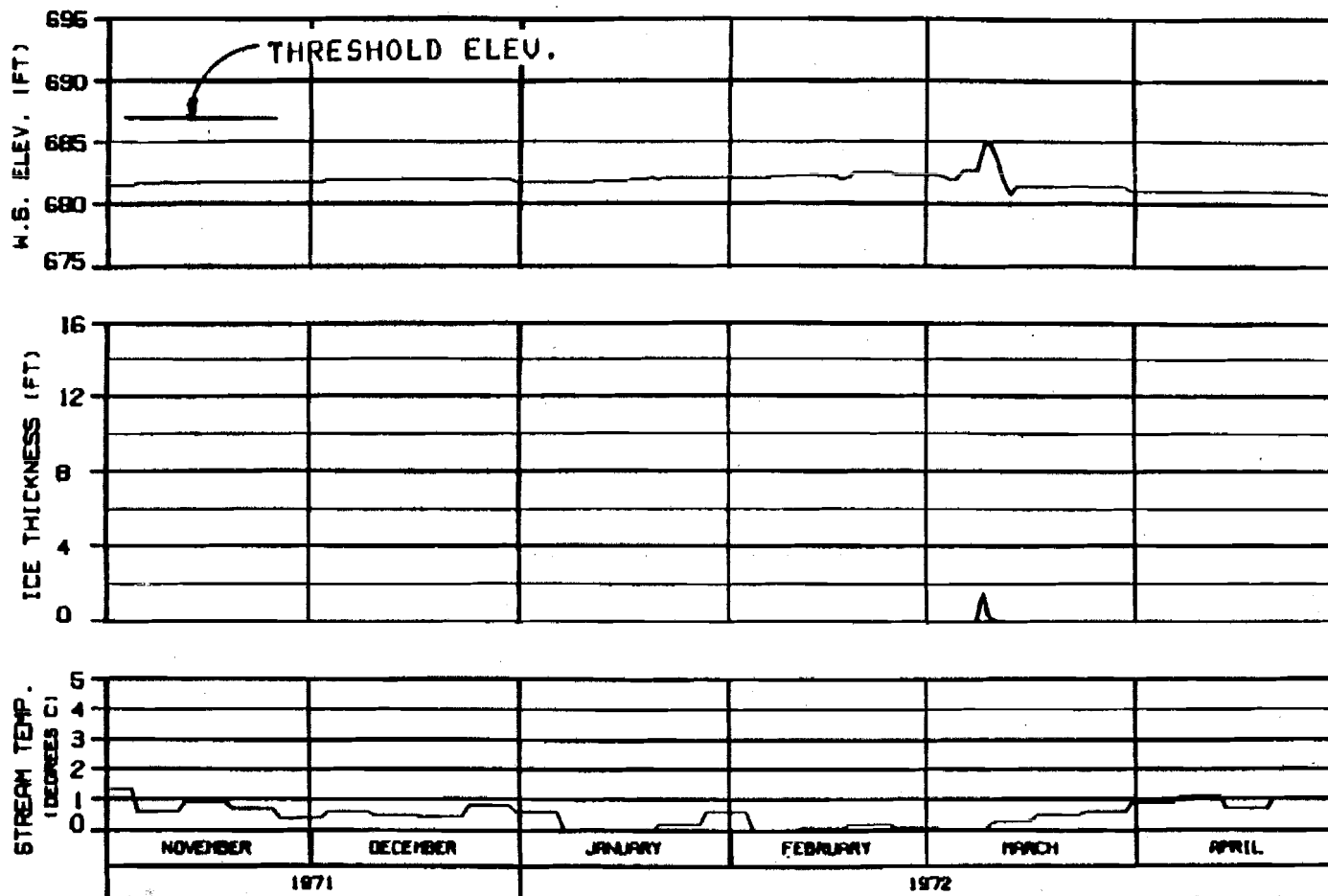
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DESIGNED - S.A. BROWN 3-22-81 1000-142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

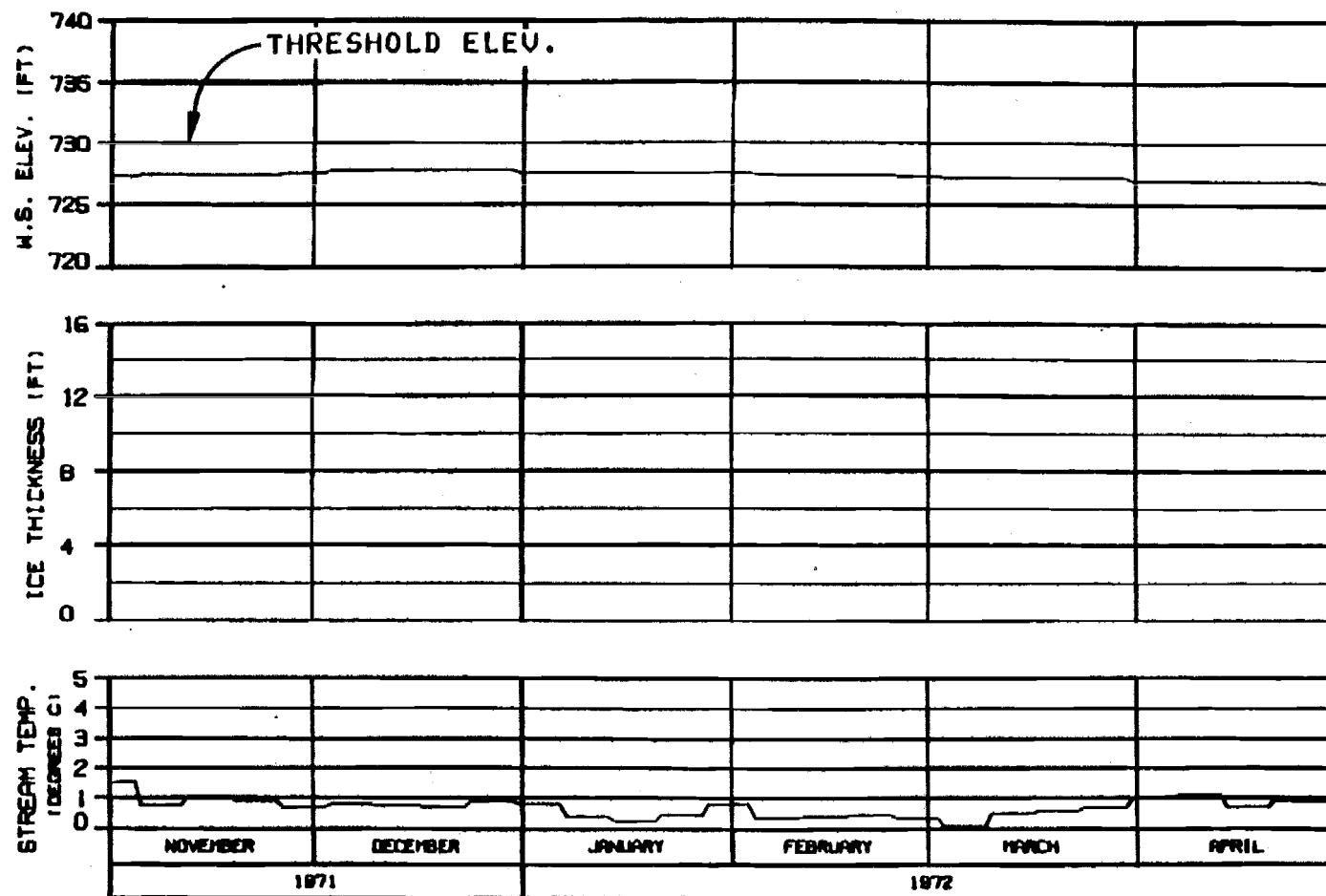
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EG&G JOINT VENTURE

WORKSHEET: 01-0000 0 1A 04 000.142







HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

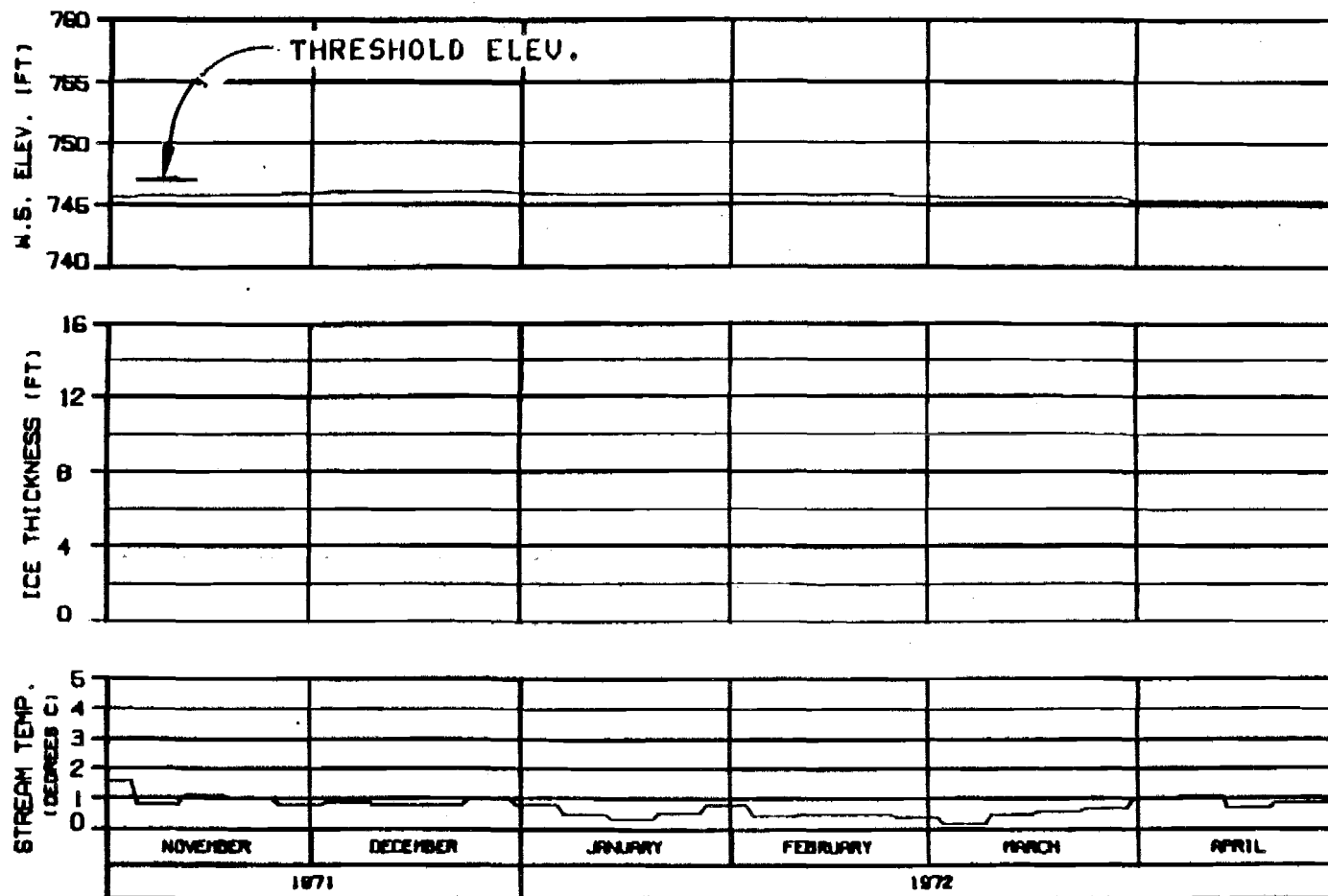
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DESIGNED BY: B. J. B. 1000.142



SLOUGH 21 (ENTRANCE A6)  
RIVER MILE : 141.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

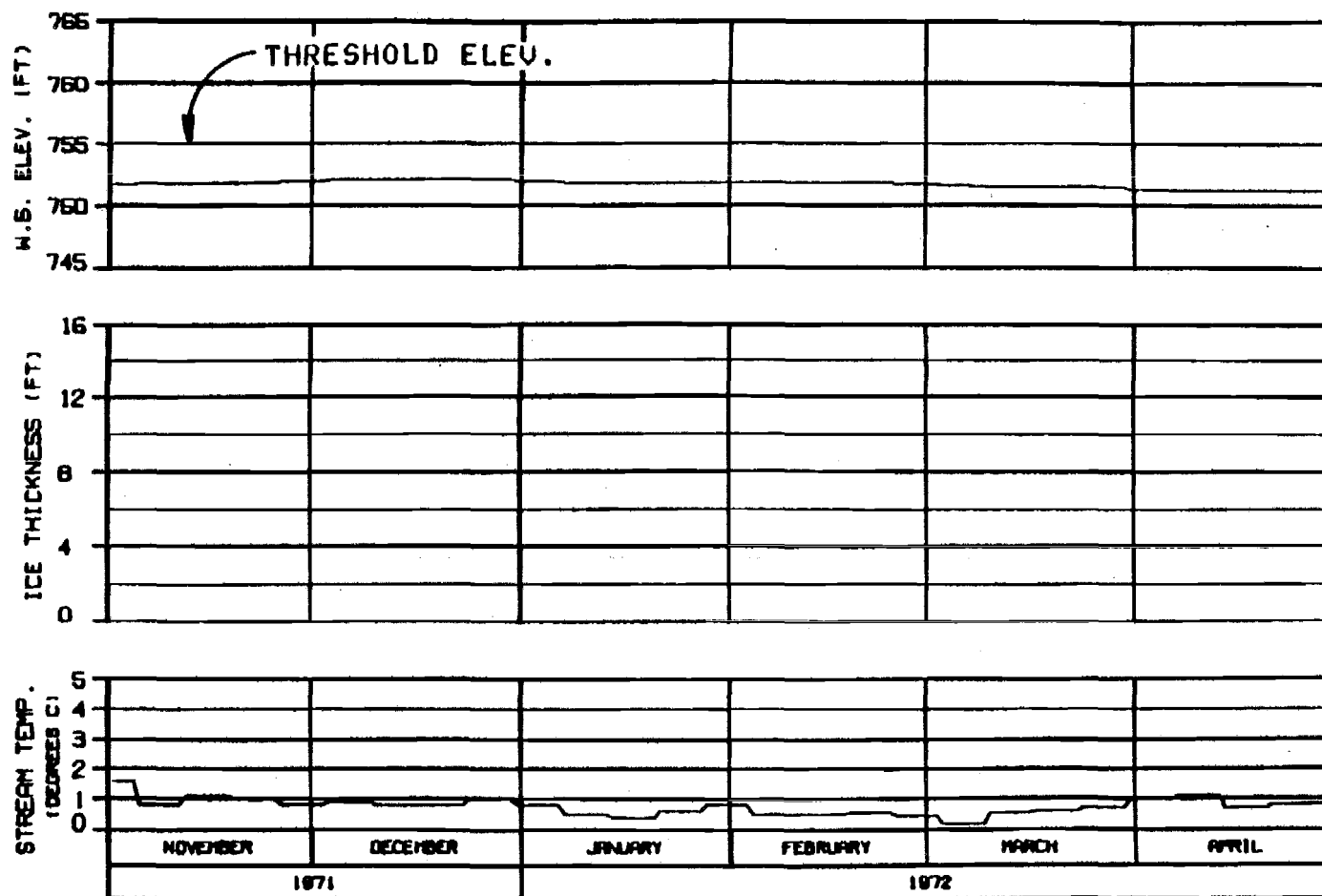
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBR600 JOINT VENTURE

PROJECT: S.A. 0000 0.00 01 1980.142

OPTION?



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

ALASKA POWER AUTHORITY

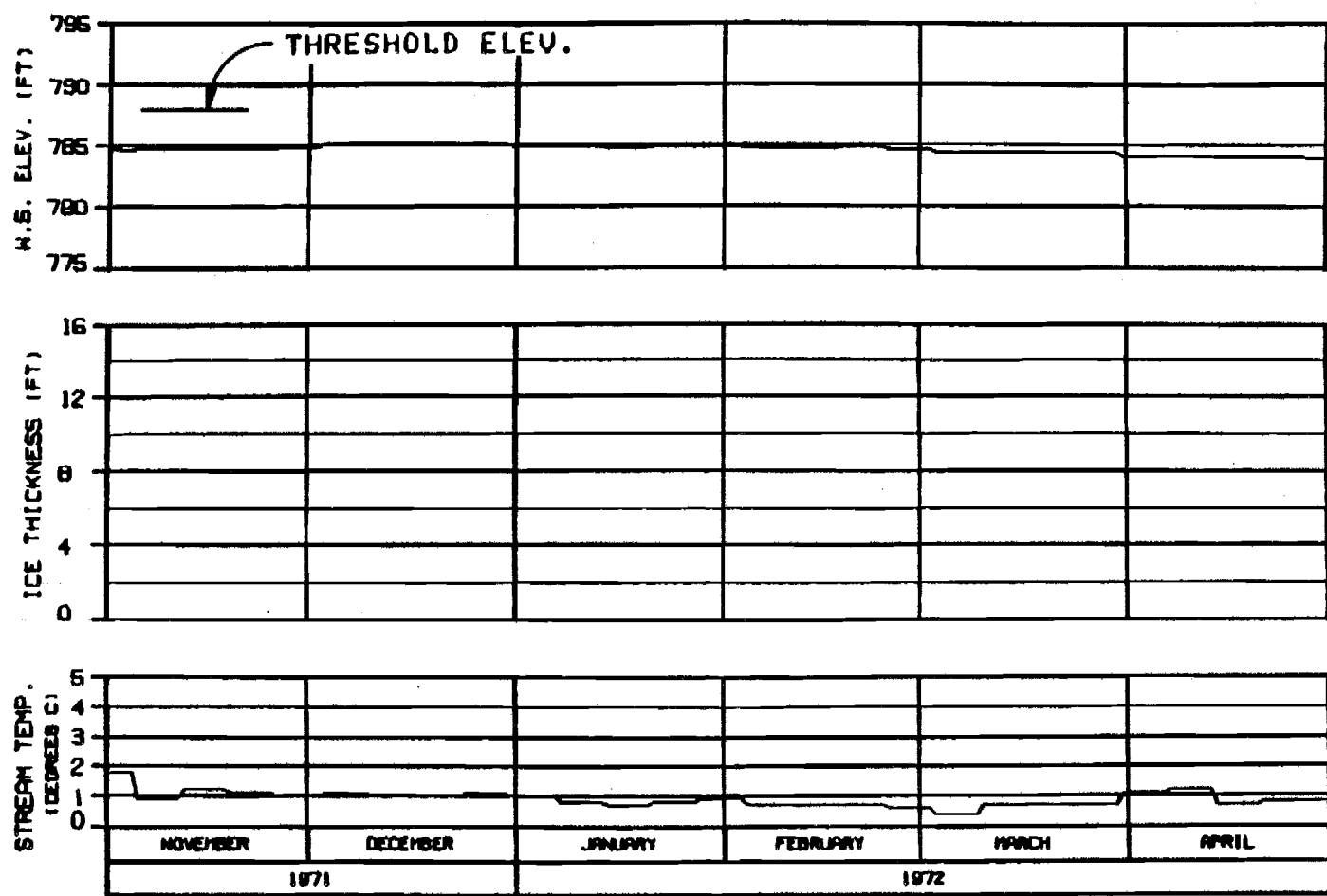
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DESIGNED BY: J. J. J. 8 JUL 72 1000.142

C



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

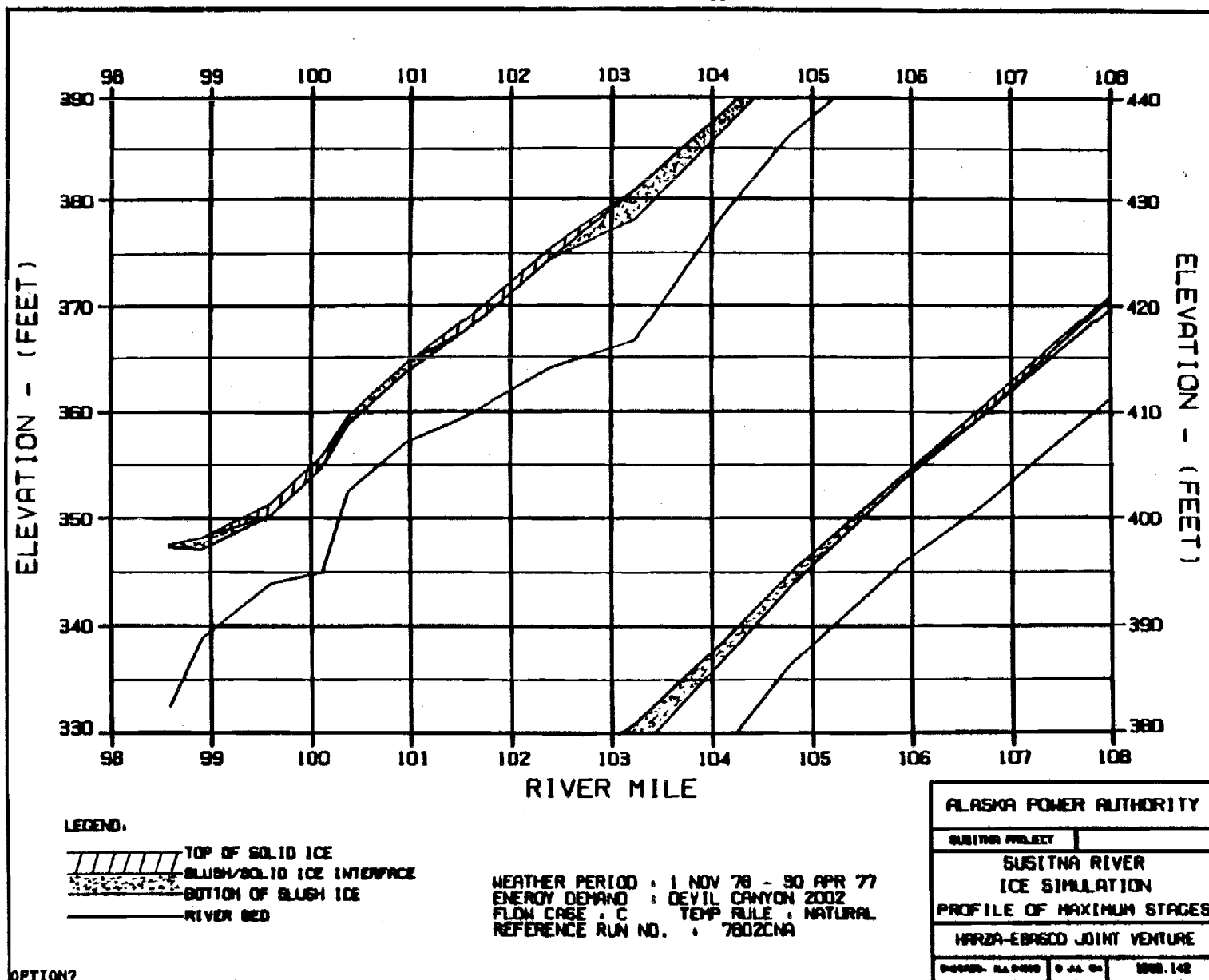
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ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7102CNA

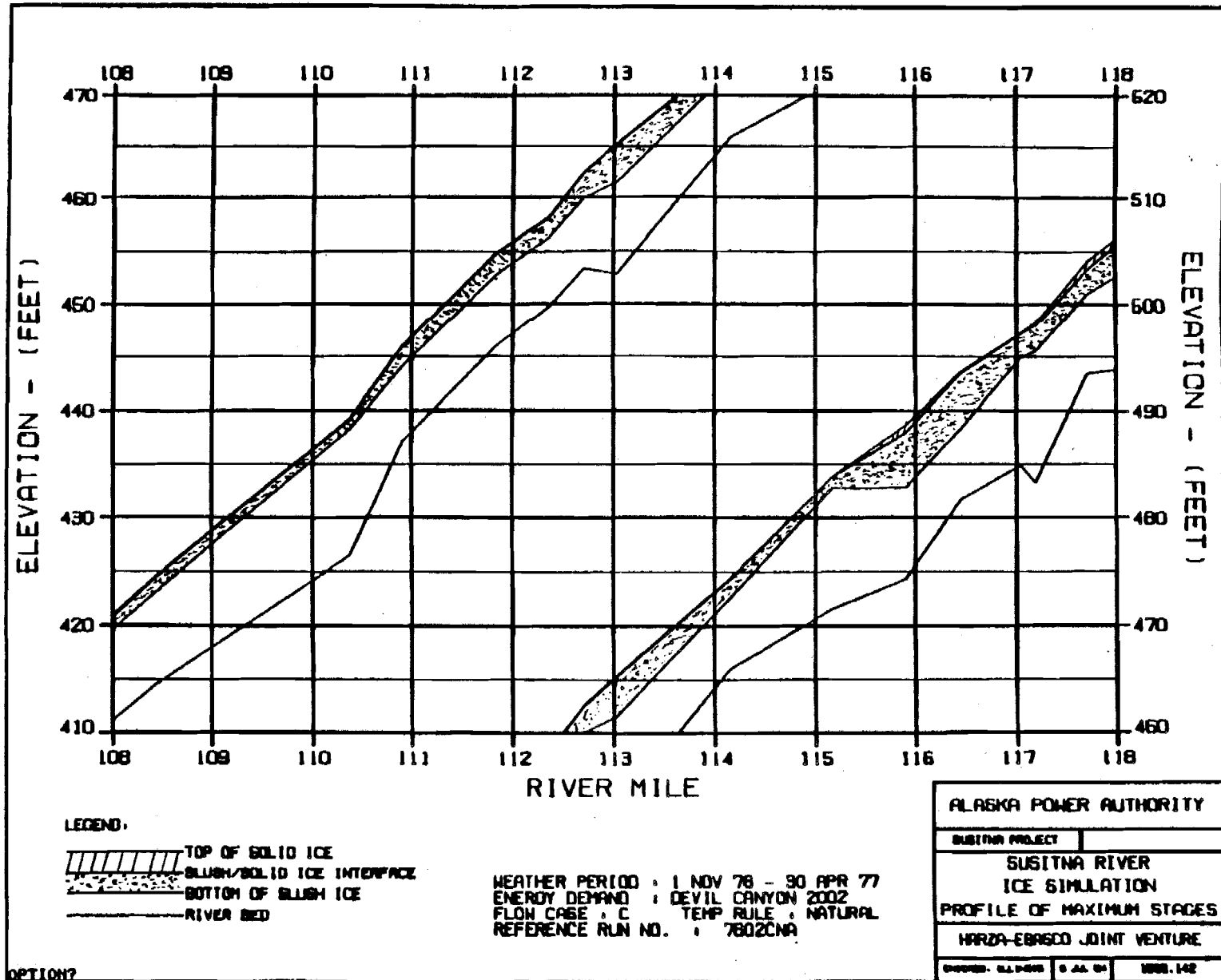
ALASKA POWER AUTHORITY		
SUBMITTER PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGNED BY: D. J. GIBSON	DRAWN BY: D. J. GIBSON	NO. 142

OPTION?

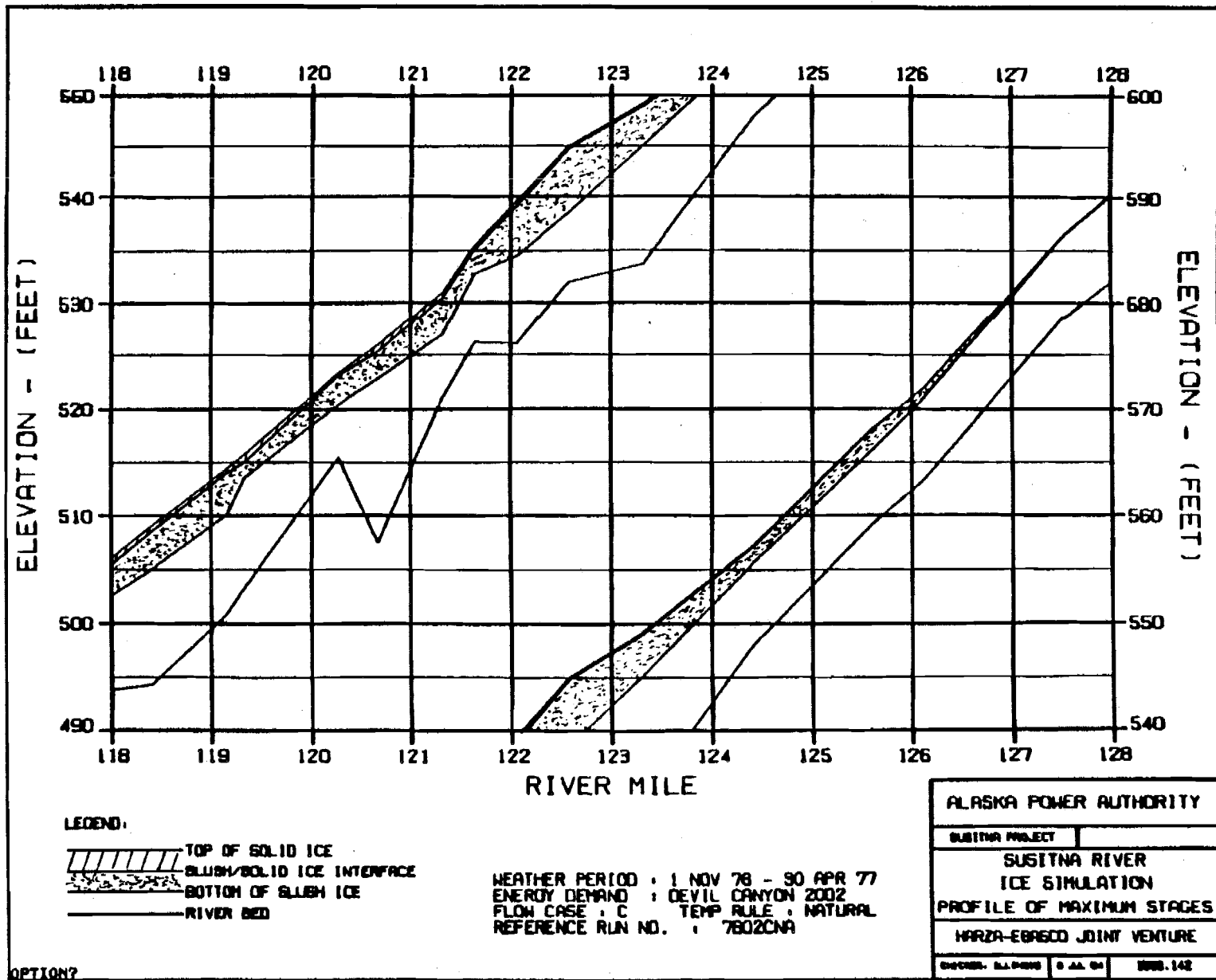
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CC



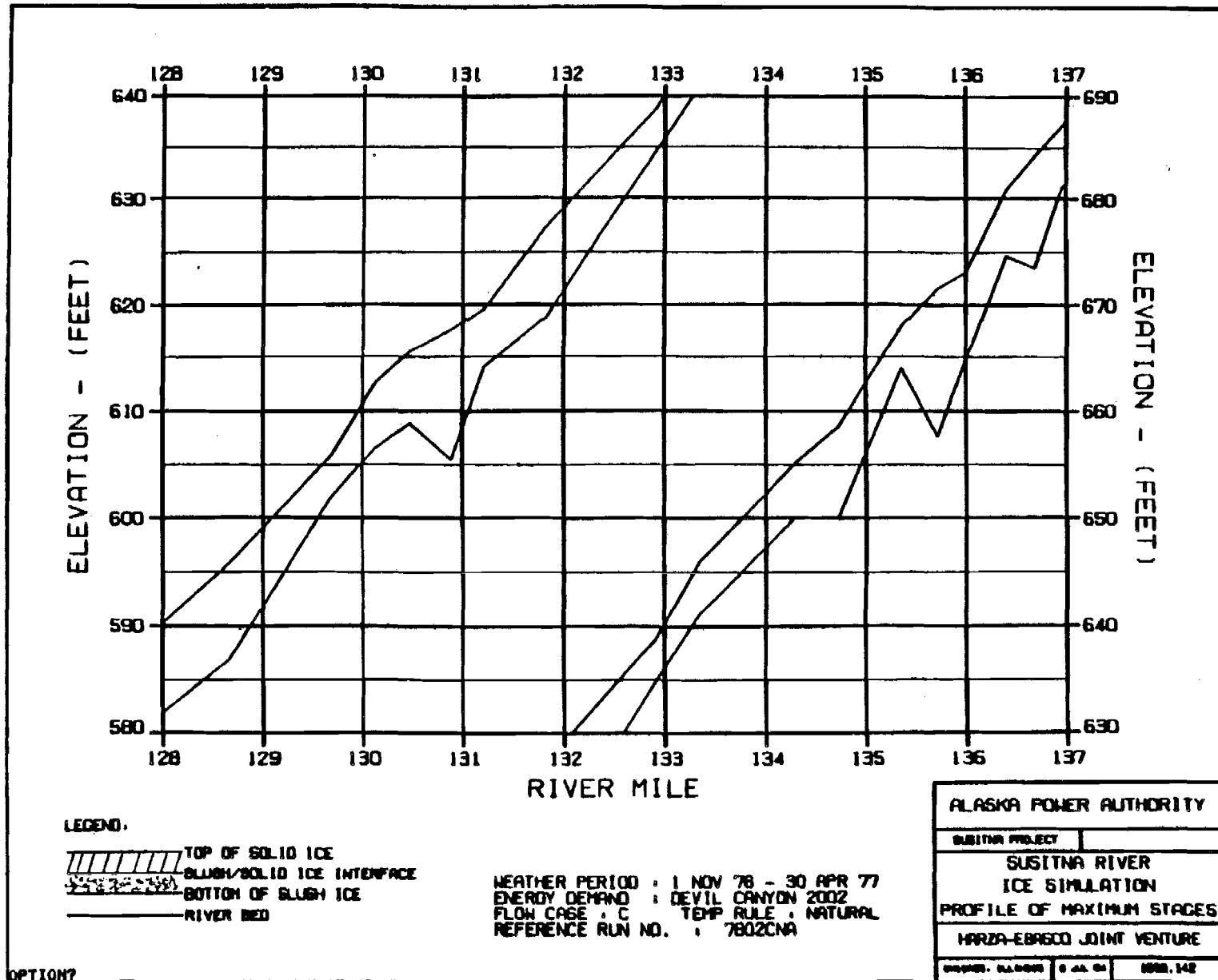


CC





CC





LEGEND:

TOP OF SOLID ICE  
 SLUSH/SOLID ICE INTERFACE  
 BOTTOM OF SLUSH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7802CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

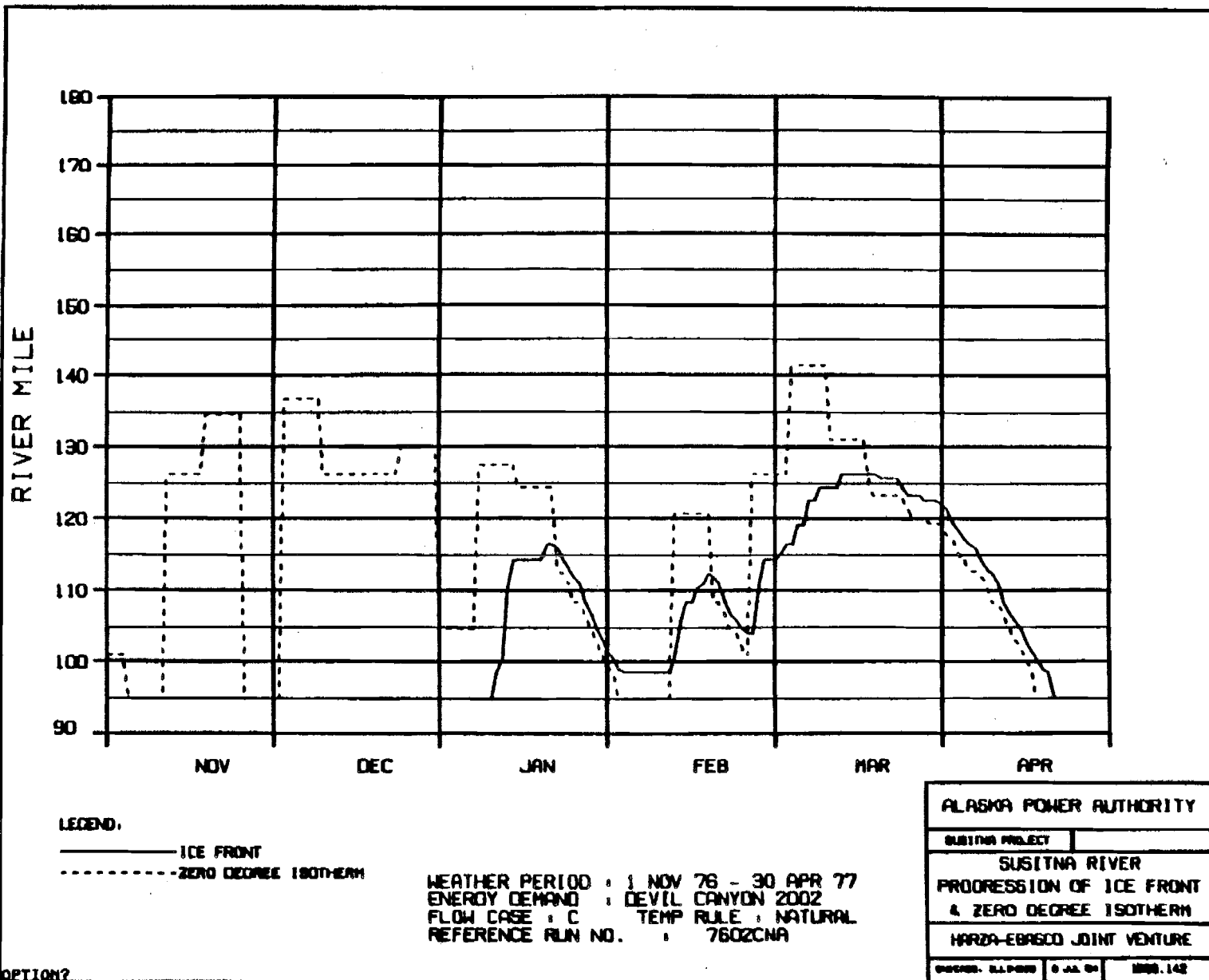
HARZA-EBASCO JOINT VENTURE

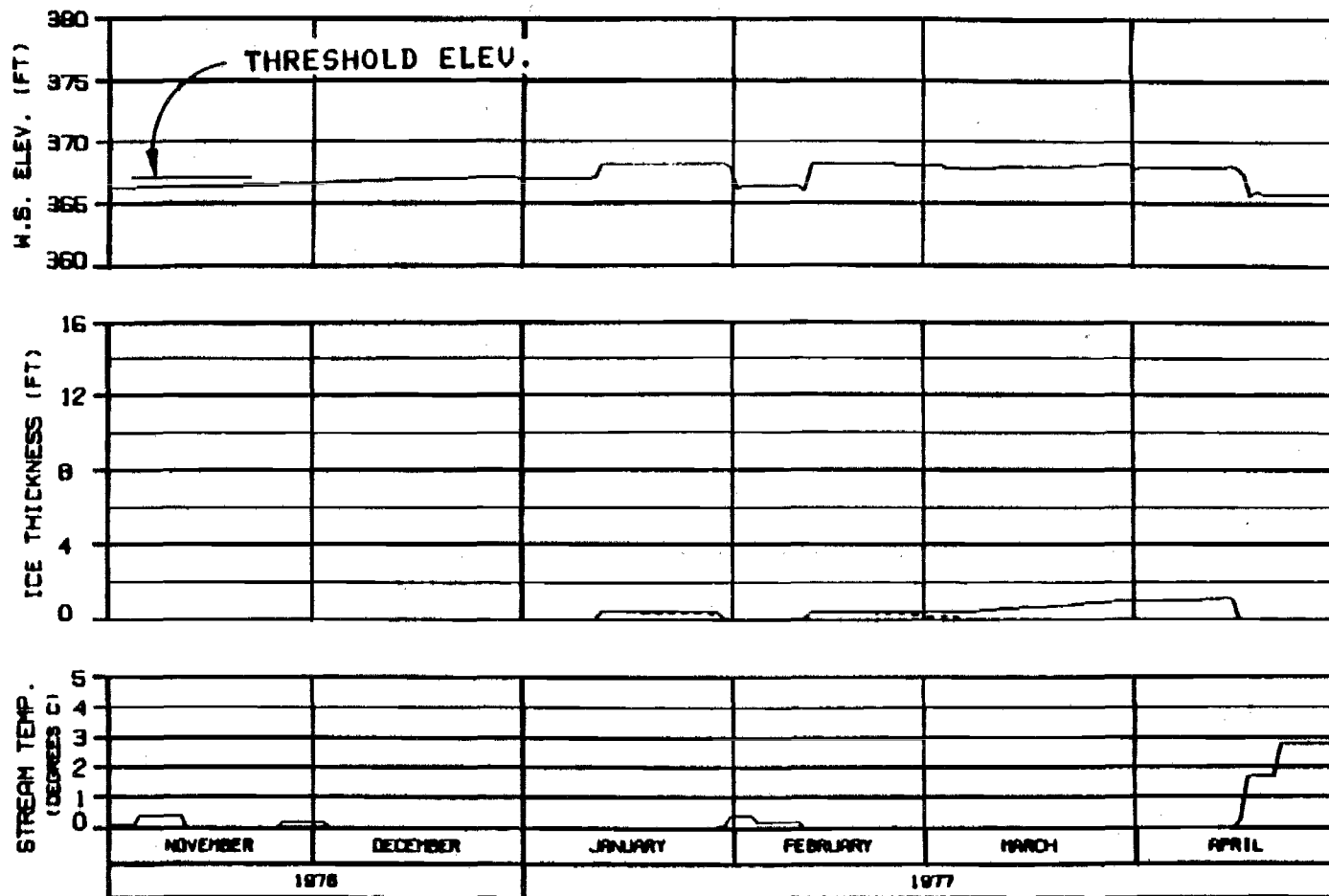
DESIGNED BY: J. B. BROWN

CHECKED BY: J. A. BROWN

DATE: 1/82

OPTION 2





# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7802CNA

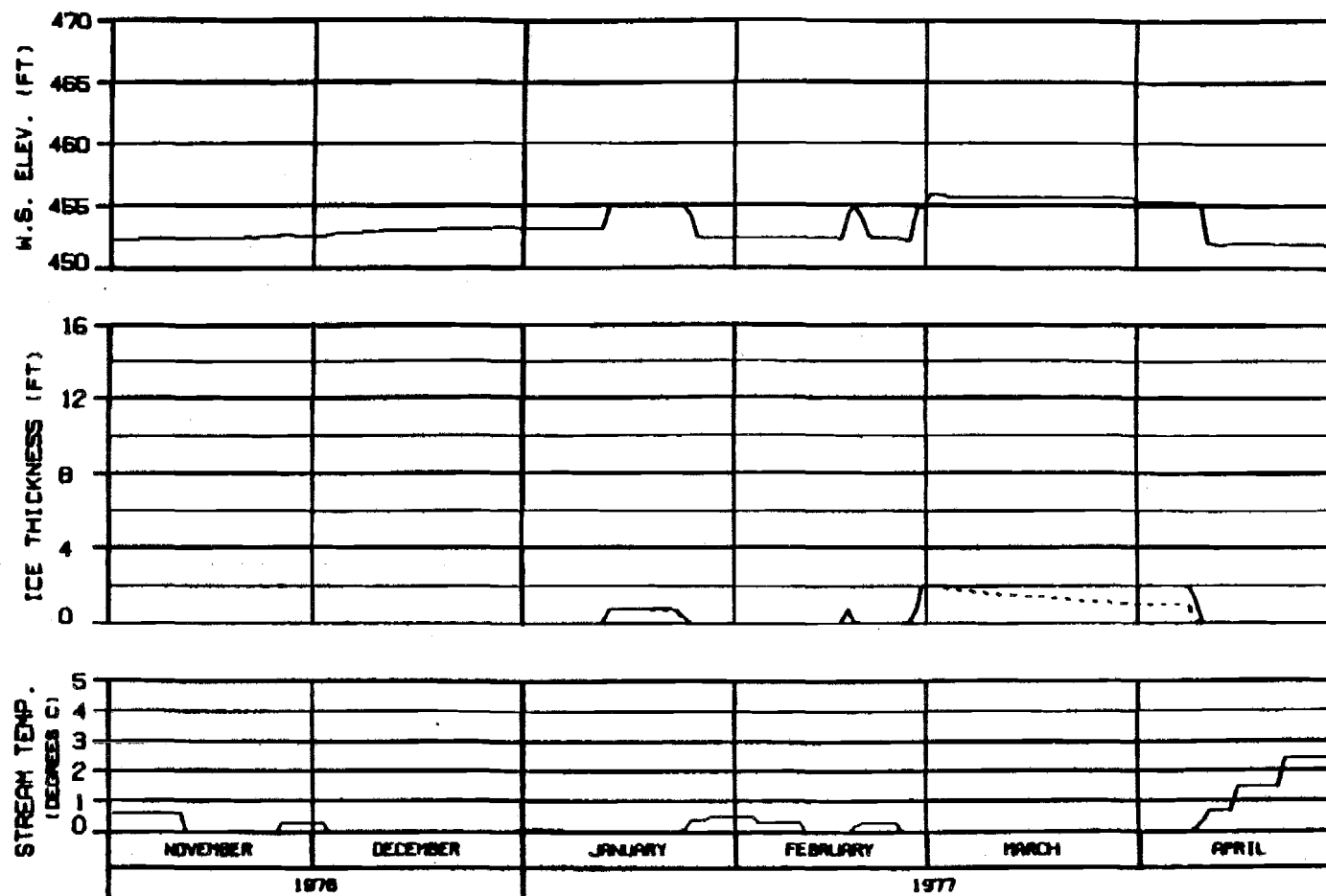
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBR600 JOINT VENTURE

CHARTS: SL-1000 5-11-77 1000.142



# SIDE CHANNEL AT HEAD OF GASH CREEK RIVER MILE : 112.00

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

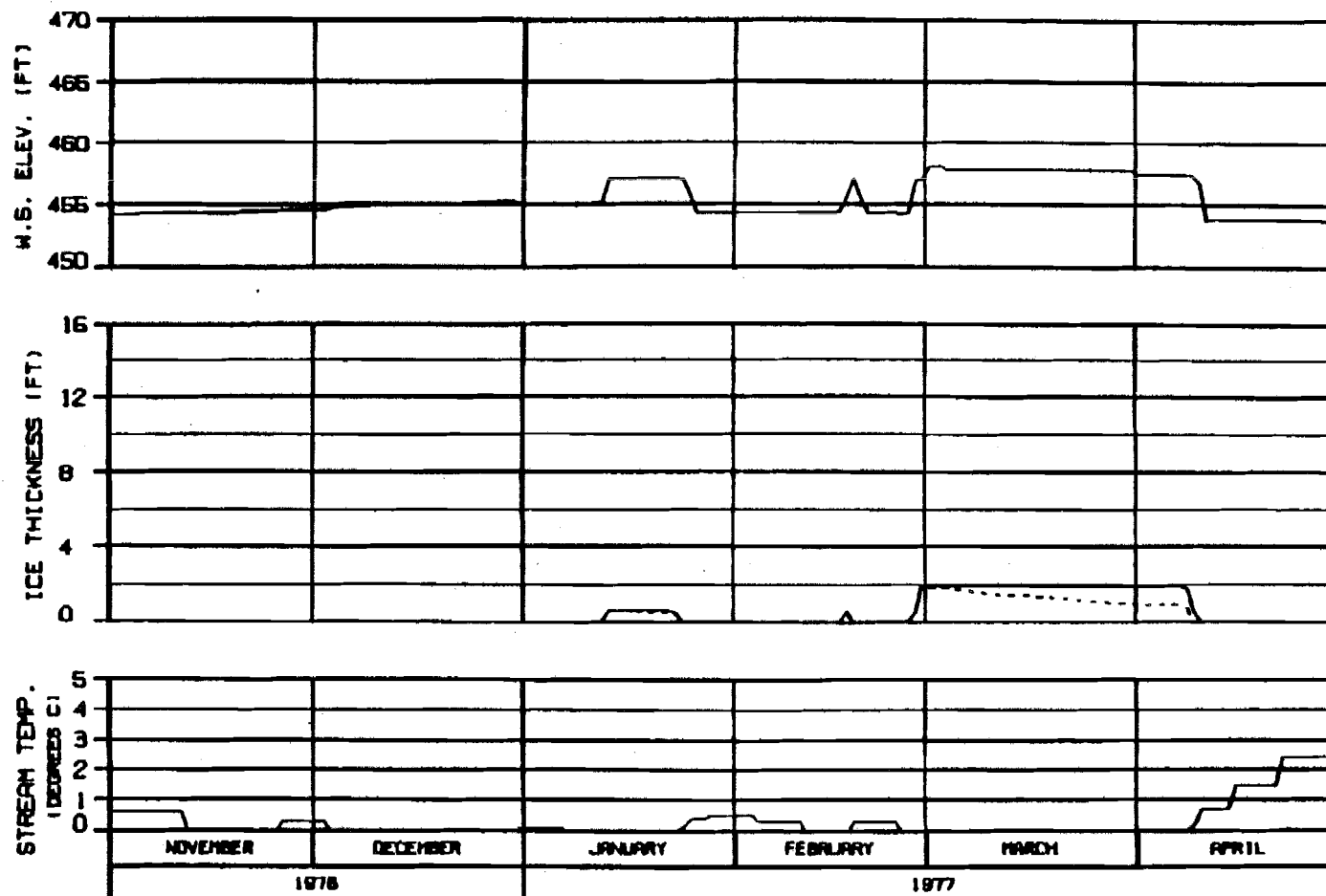
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARDA-EBRARD JOINT VENTURE

DESIGN: EBRARD 8 JAN 81 1000.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

MOUTH OF SLOUGH 6A  
 RIVER MILE : 112.34

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

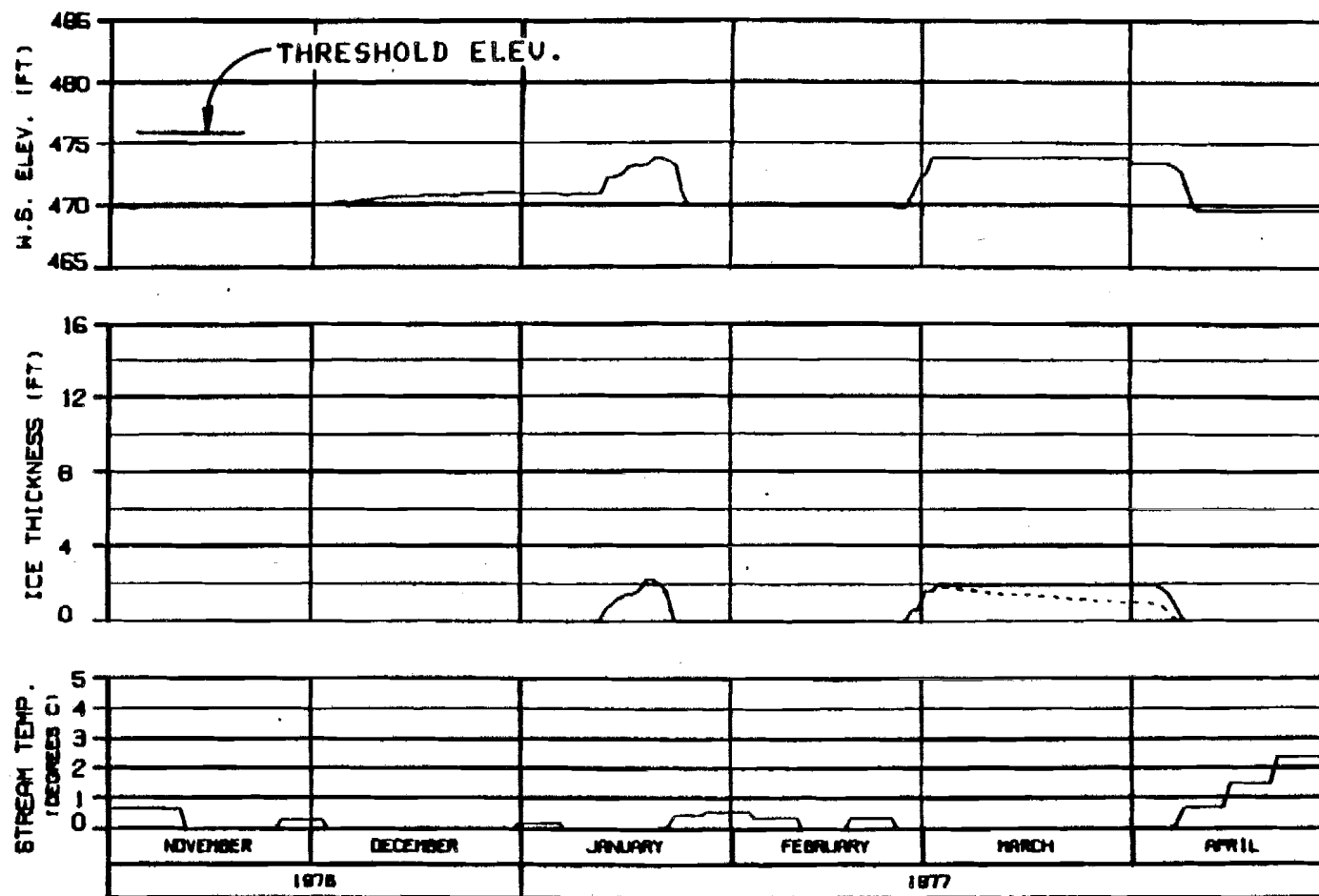
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. A. B. 1000.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

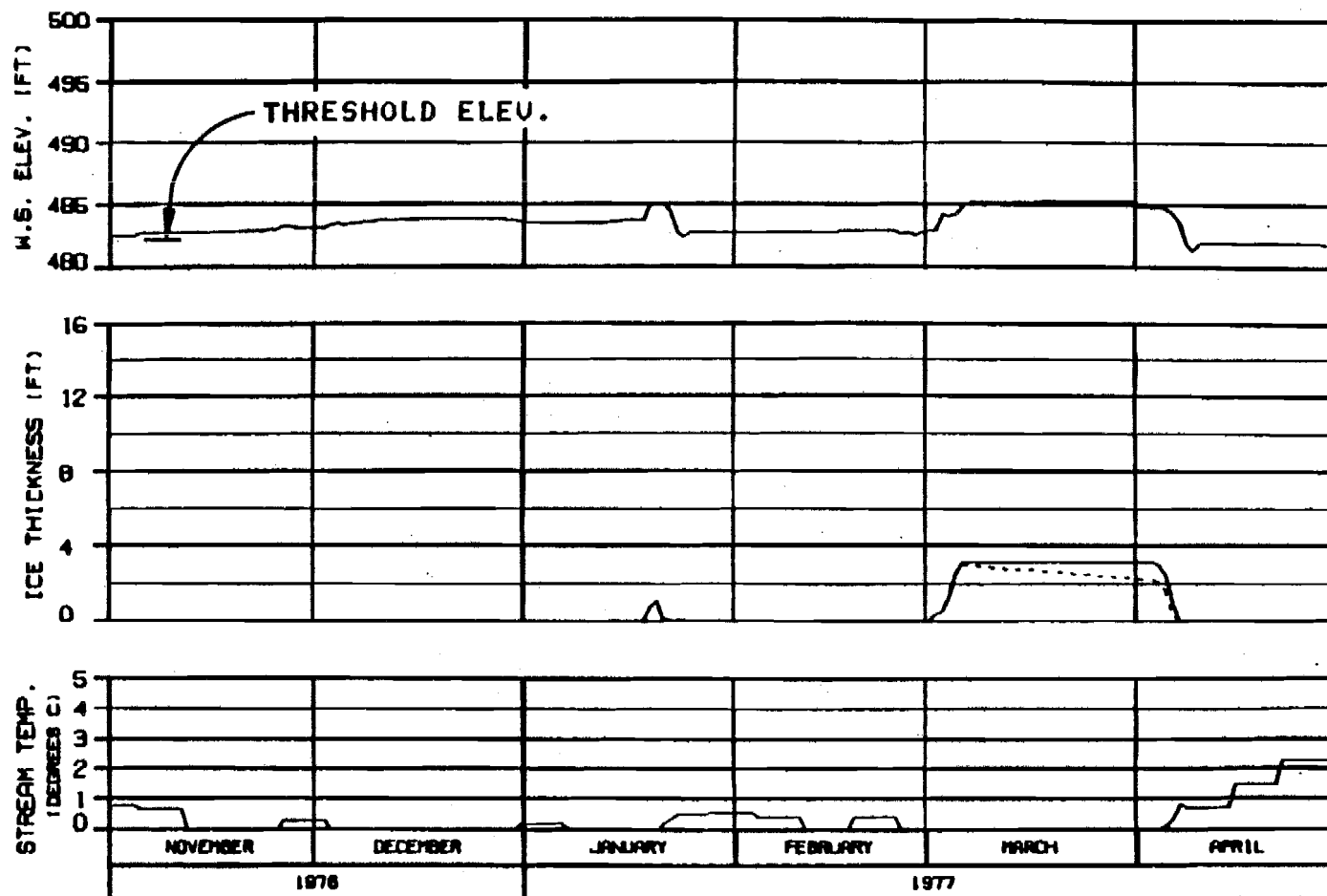
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ORDER: 04-0000 0 00 00 000.142



SIDE CHANNEL MSII

RIVER MILE : 115.50

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

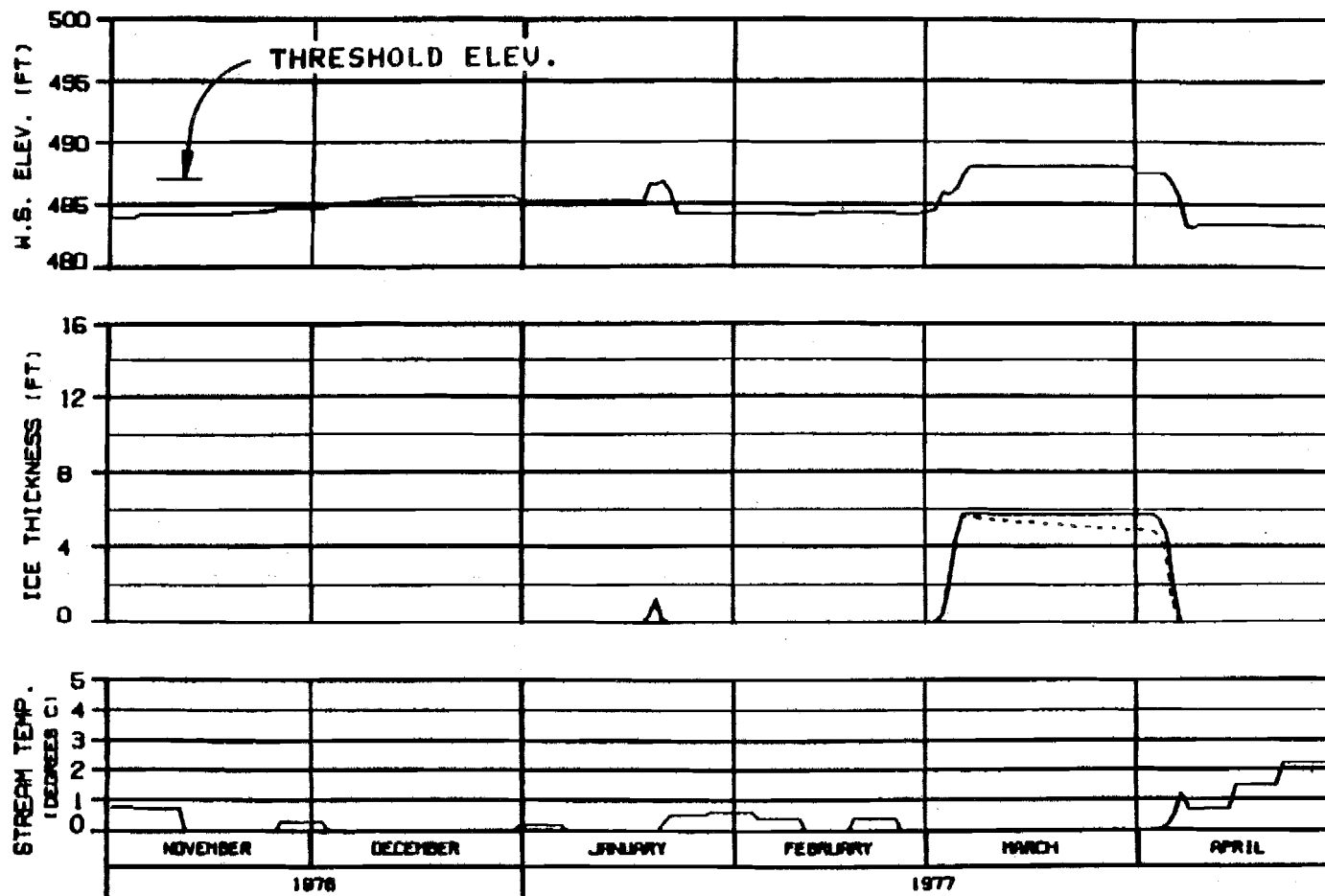
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARDA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. P. 0000 0 JUL 76 0000.142





**HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90**

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

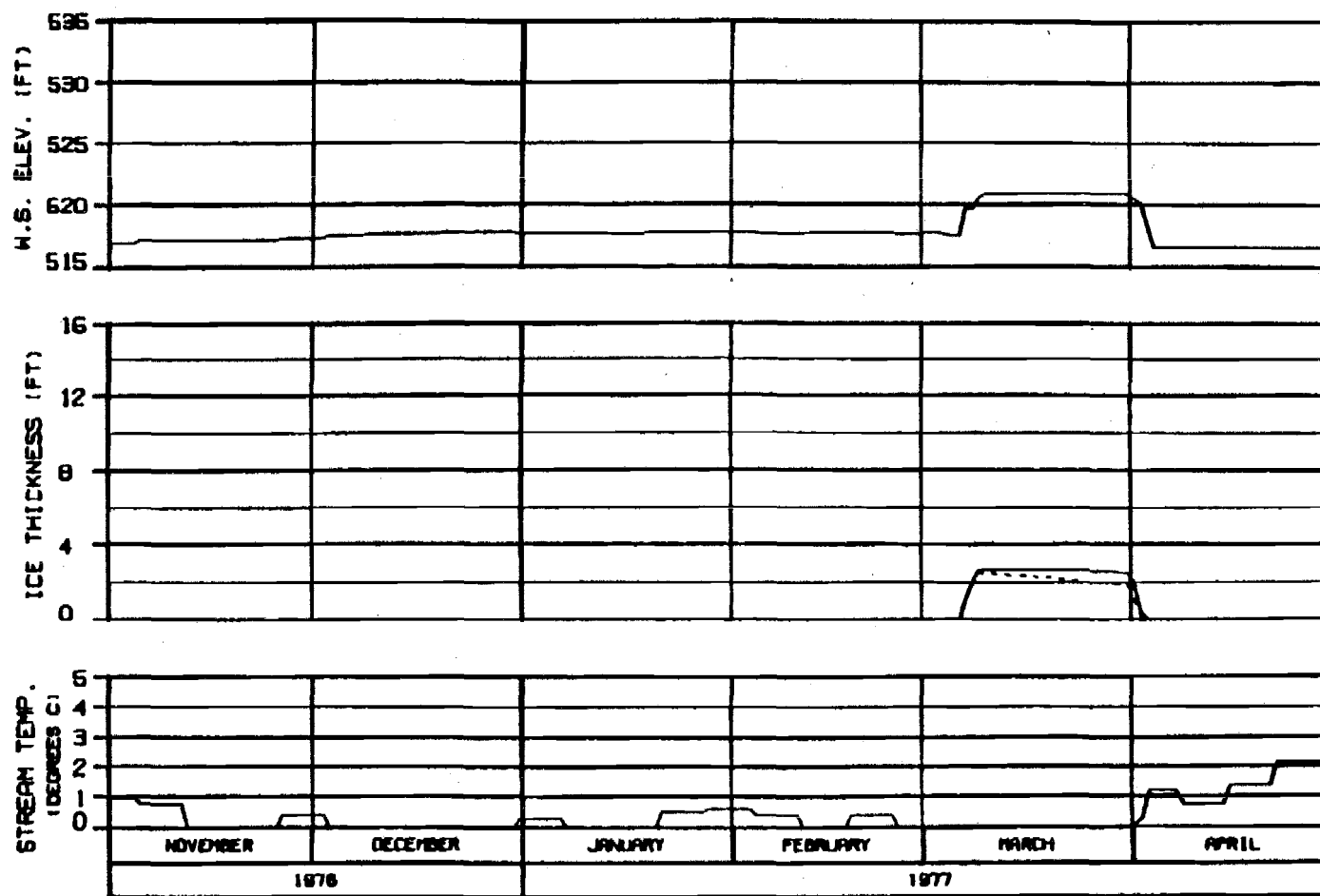
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

CHARTED: 04/08/00 0 00 00 1000.142



ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

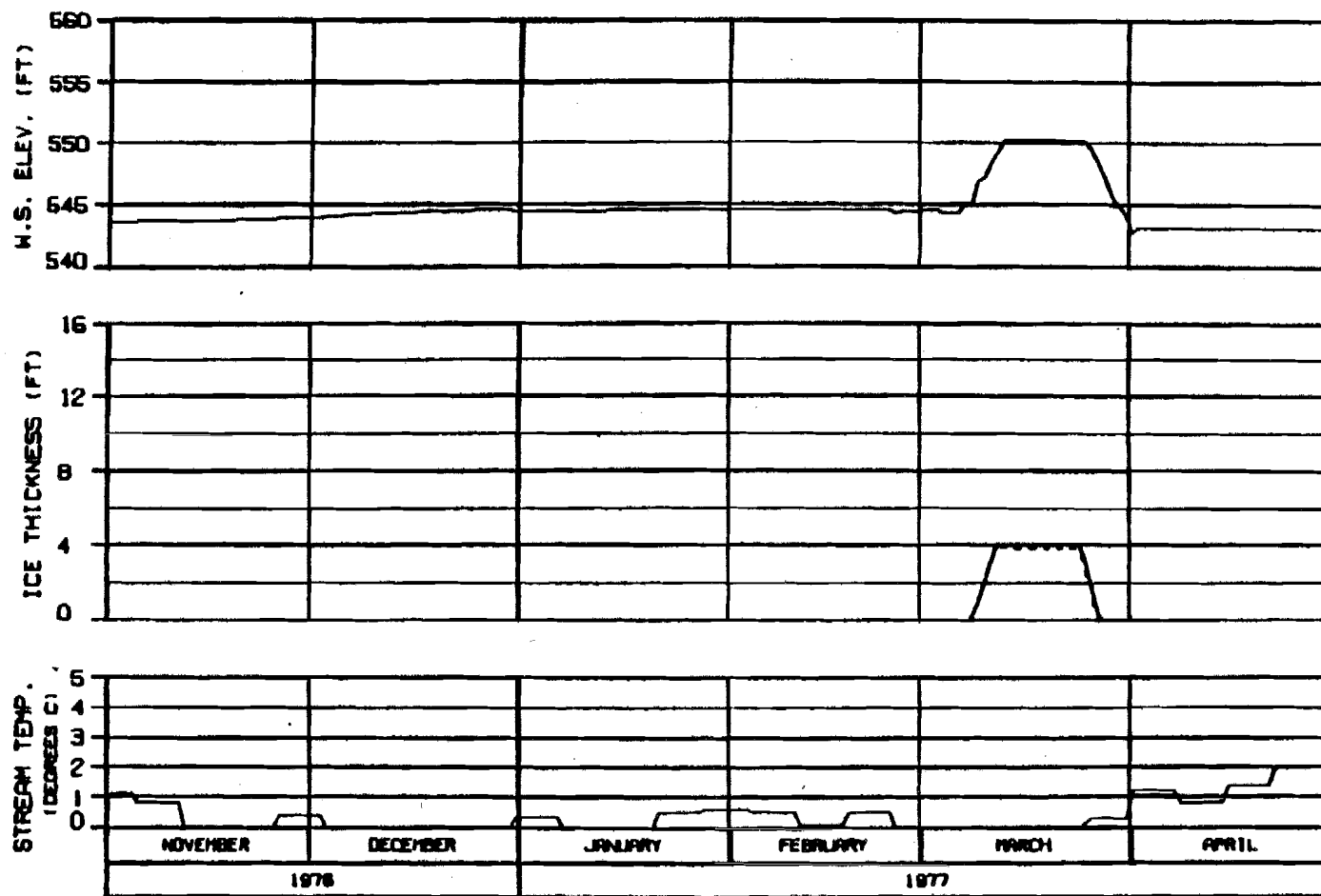
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DRAWN: ALP-000 0.00 01 1000.142

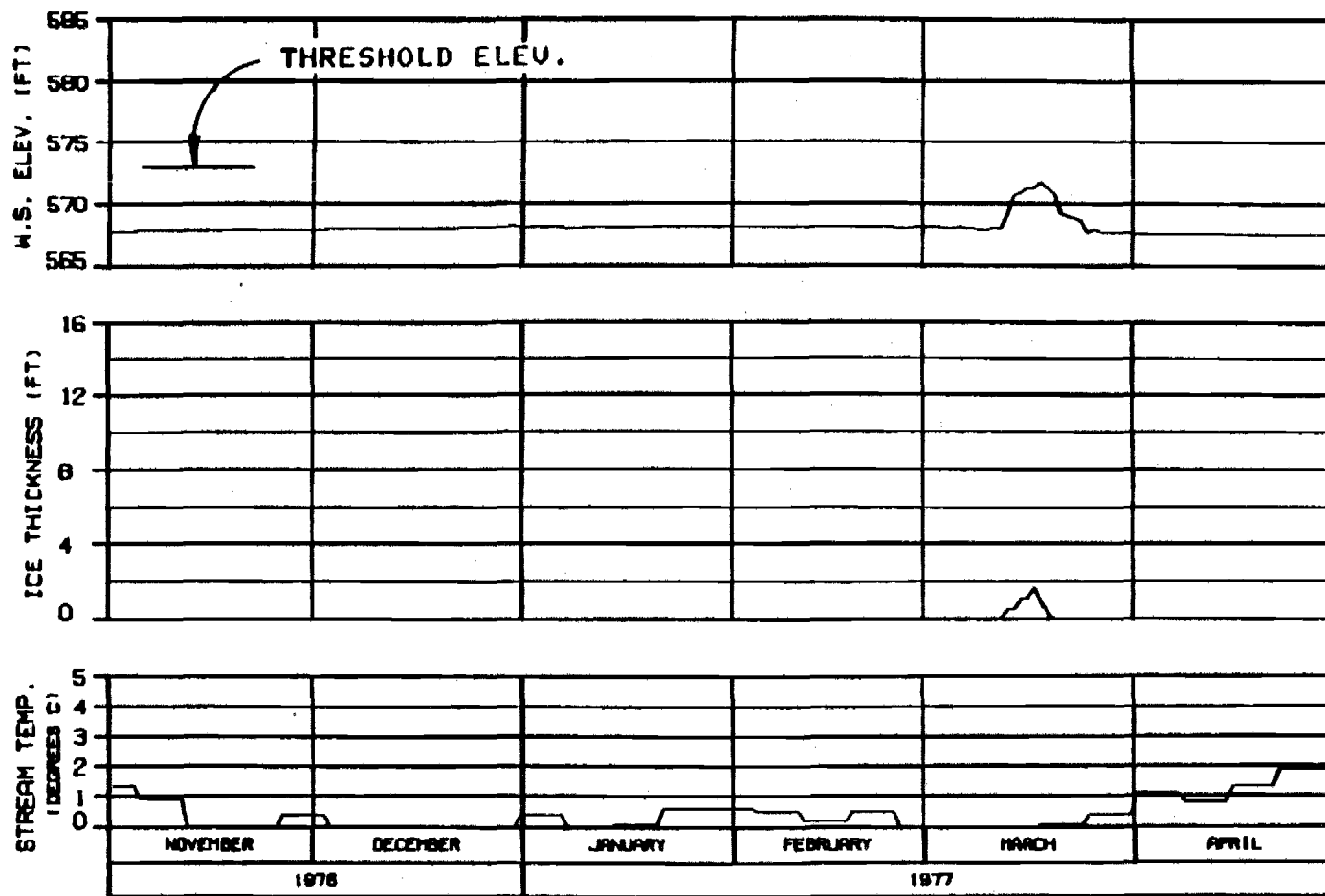


HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
MARZA-EBASCO JOINT VENTURE	
DESIGNED: ALASKA	DATE: 8 MAR 84
1000.142	



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

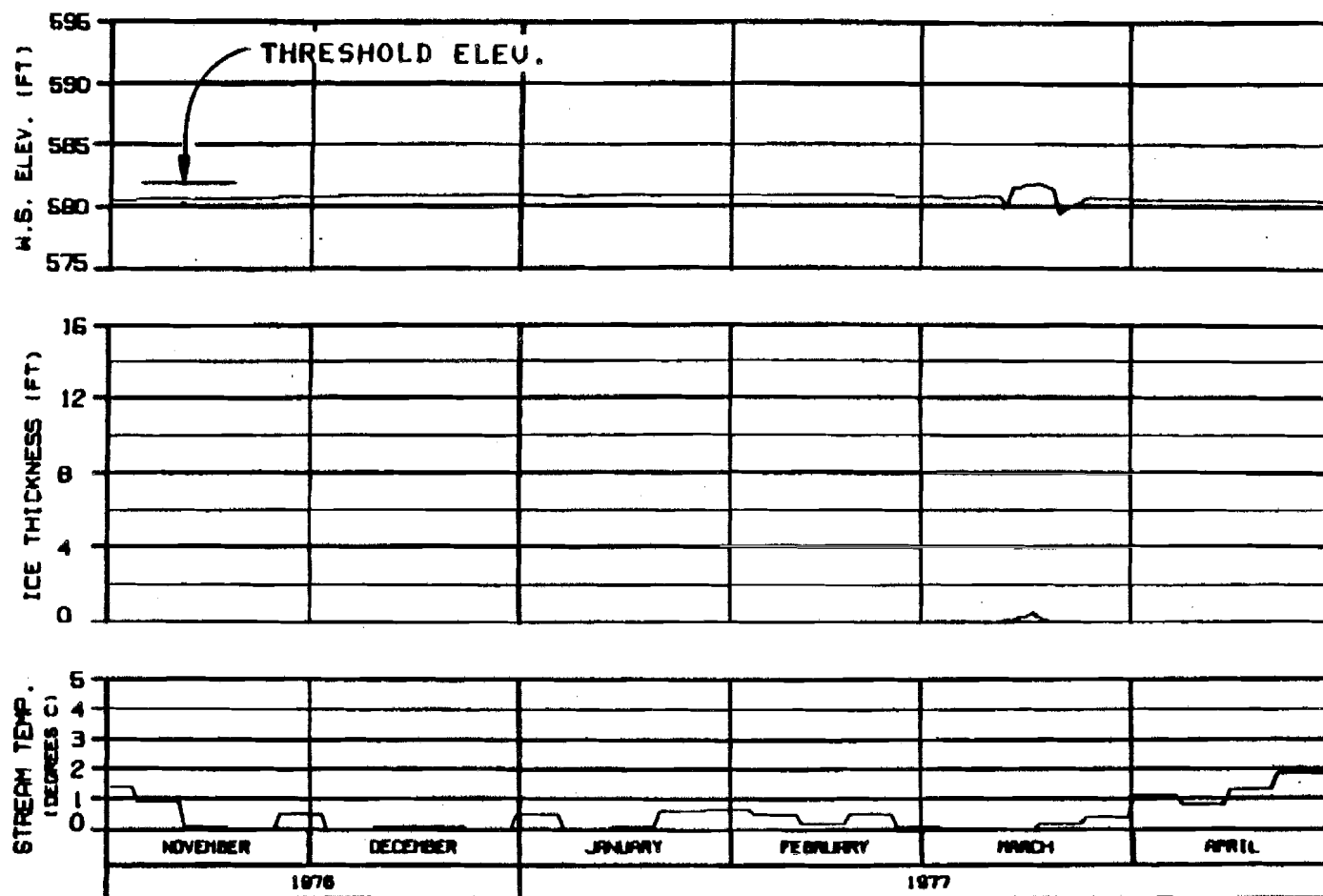
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHIEF: ALPOM 8 JUL 84 1000.142



HEAD OF SLOUGH 8A (EAST)  
RIVER MILE : 127.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

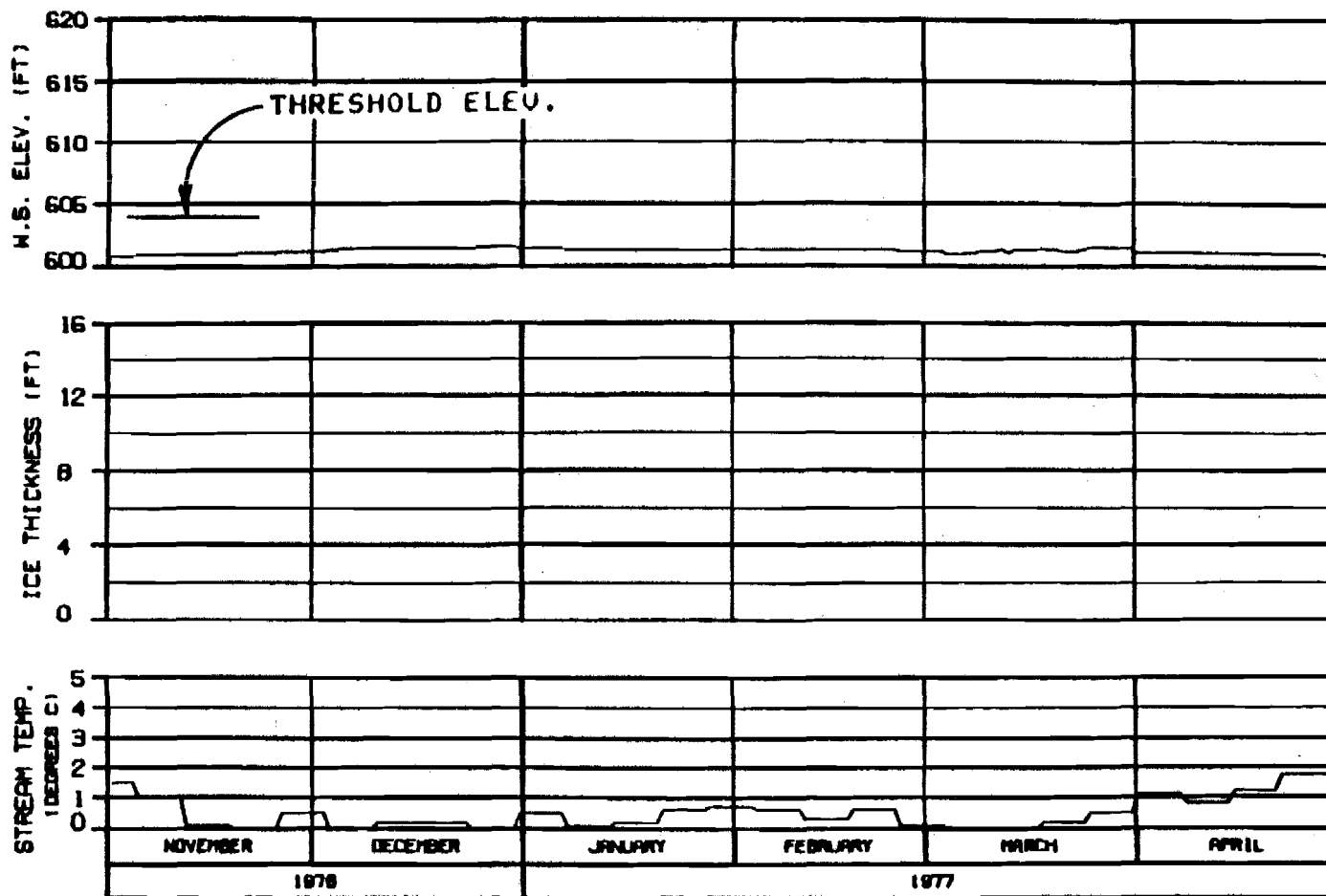
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBRSCO JOINT VENTURE

DESIGNED BY: HAZRA 6 JUL 81 1000-142



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

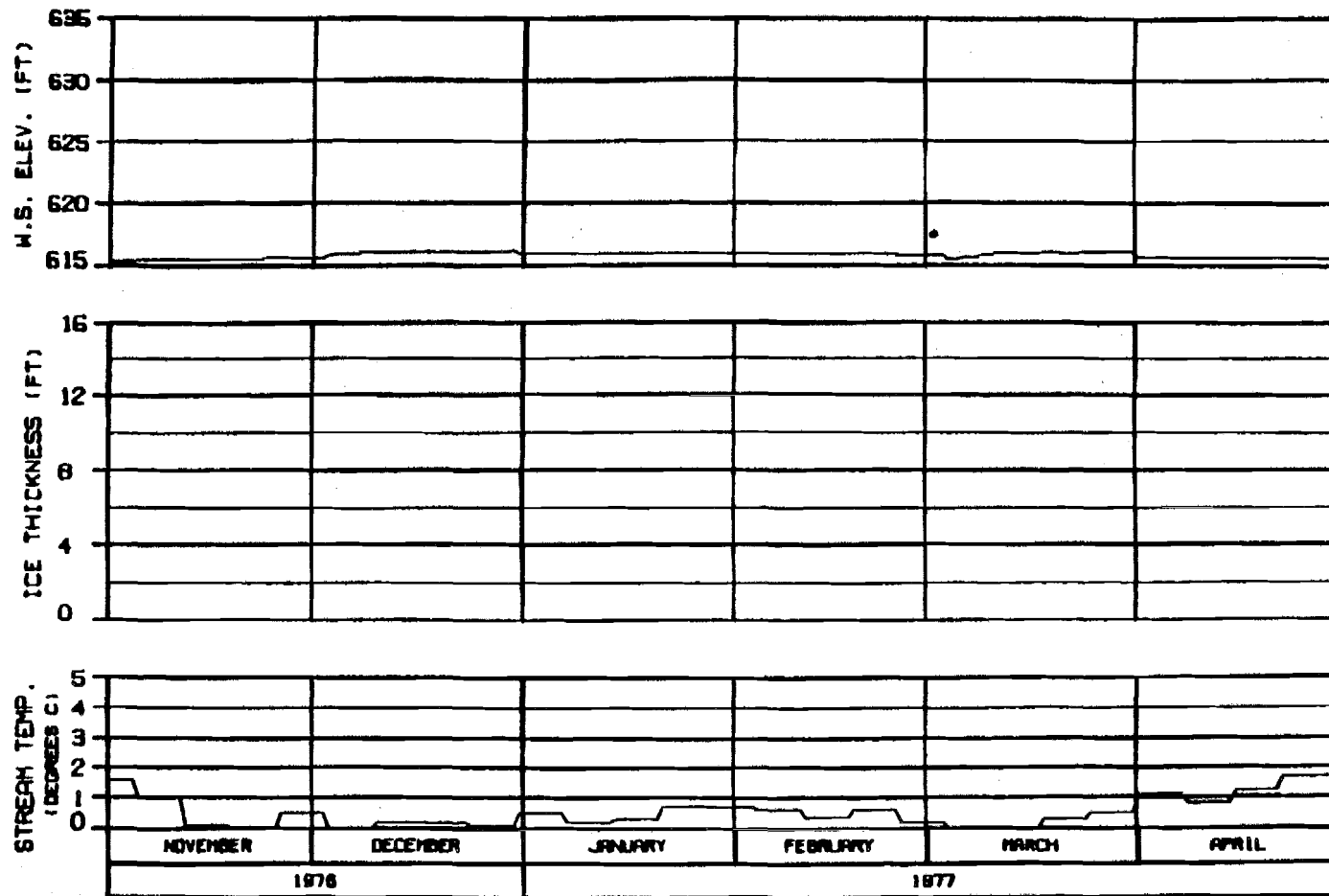
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGNED BY: D. L. DODGE DRAWN BY: S. J. G. 1000-142

OPTION 7

OPTION 7



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

———— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

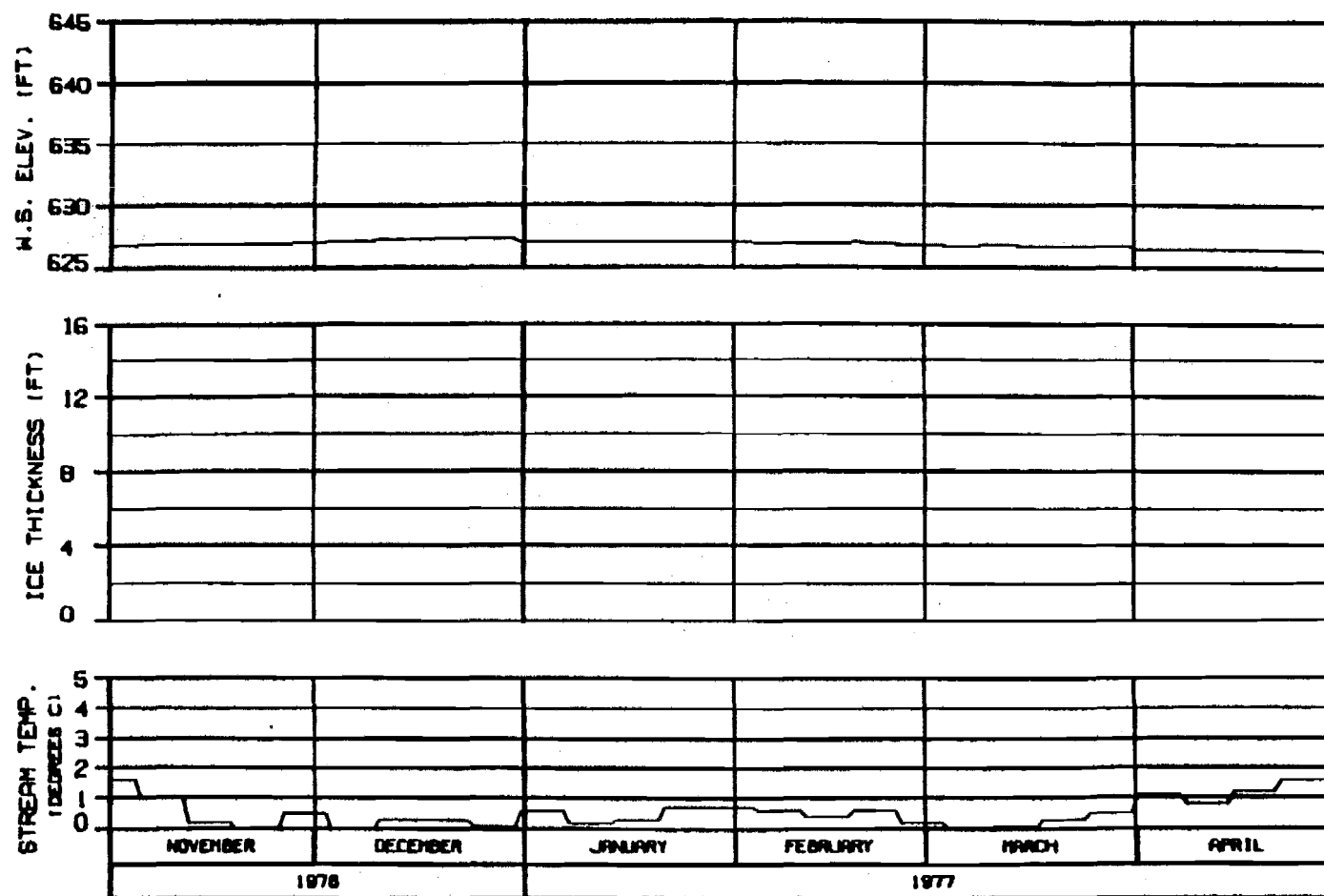
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGN: BLDG 6 JUL 87 1000.142



SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

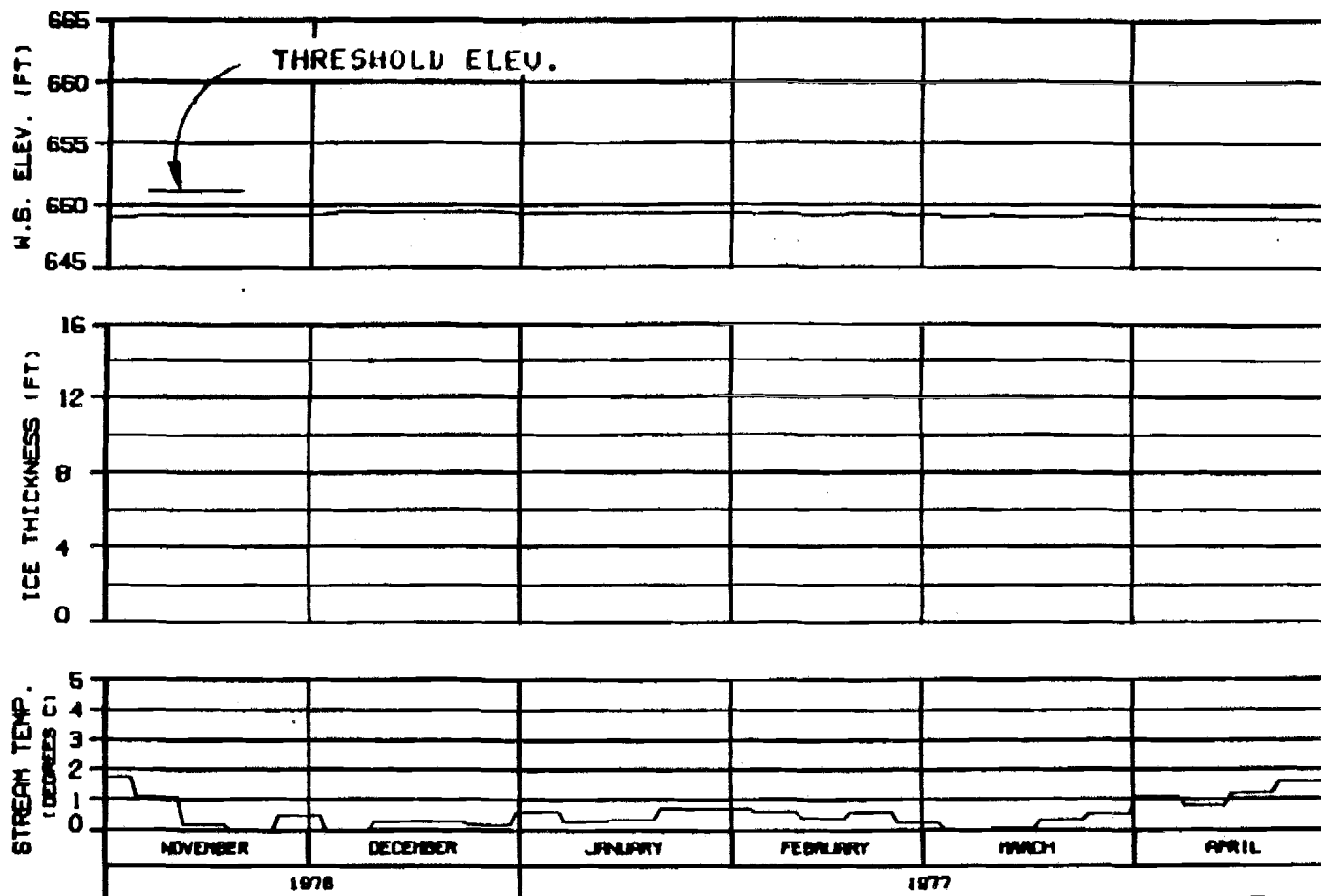
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBAGCO JOINT VENTURE

CHARTER: 8-10-76 8 JUL 77 WBS: 142





HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

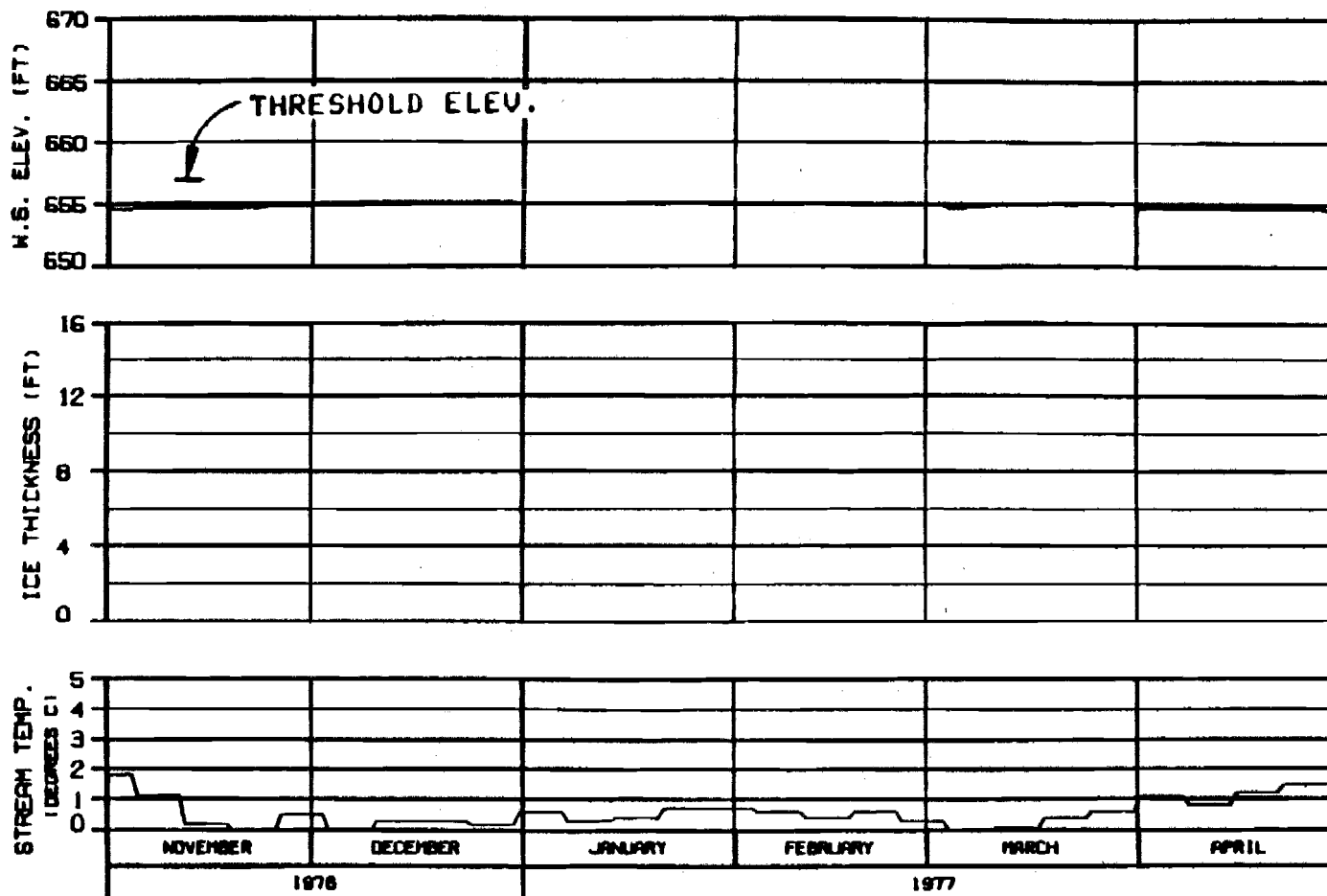
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARDA-EBR600 JOINT VENTURE

DRAWN: S. L. PETER

8 JUL 77

1000.142



SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

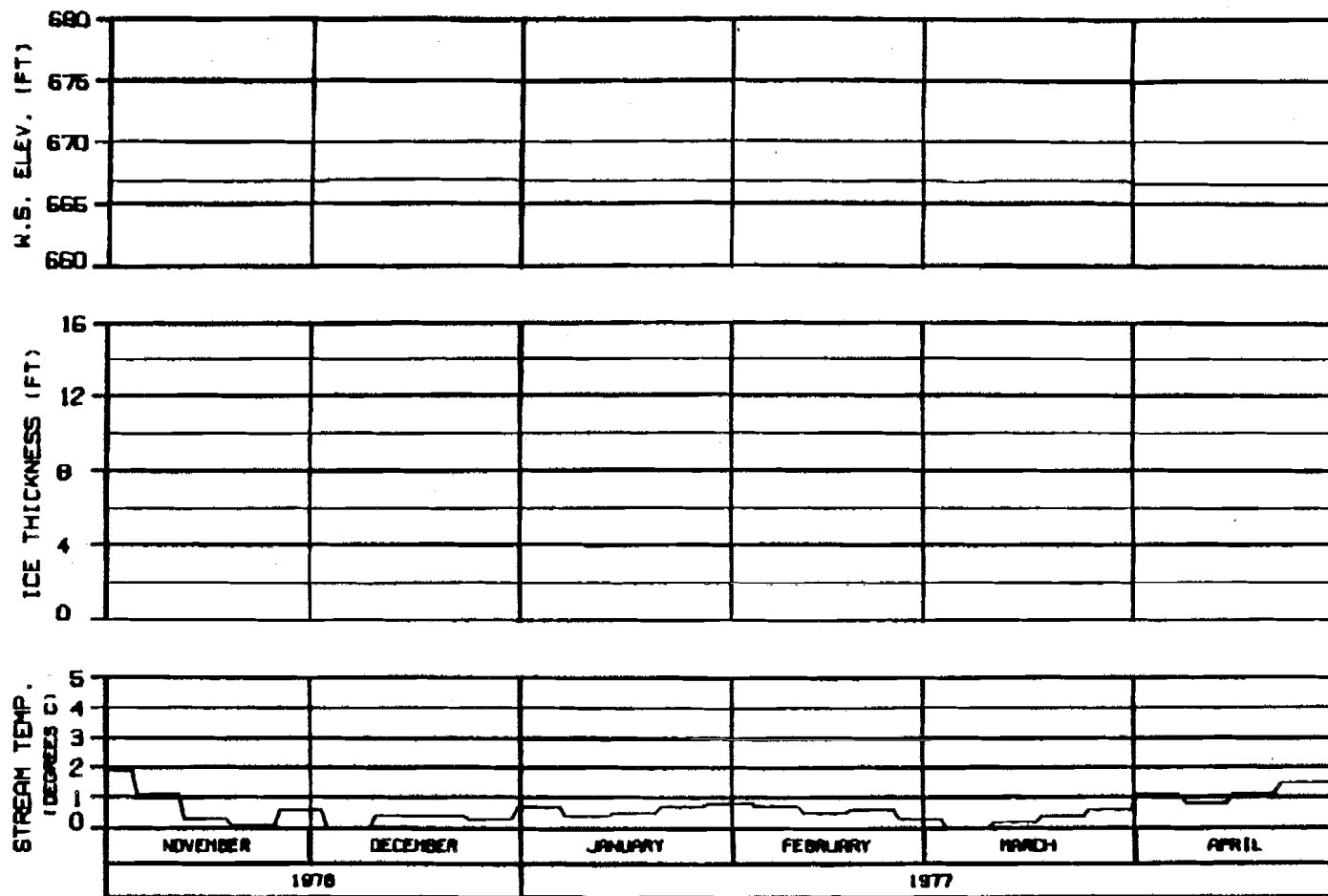
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBR600 JOINT VENTURE

DESIGN: S. L. BROWN

5 JUL 84

1000.142

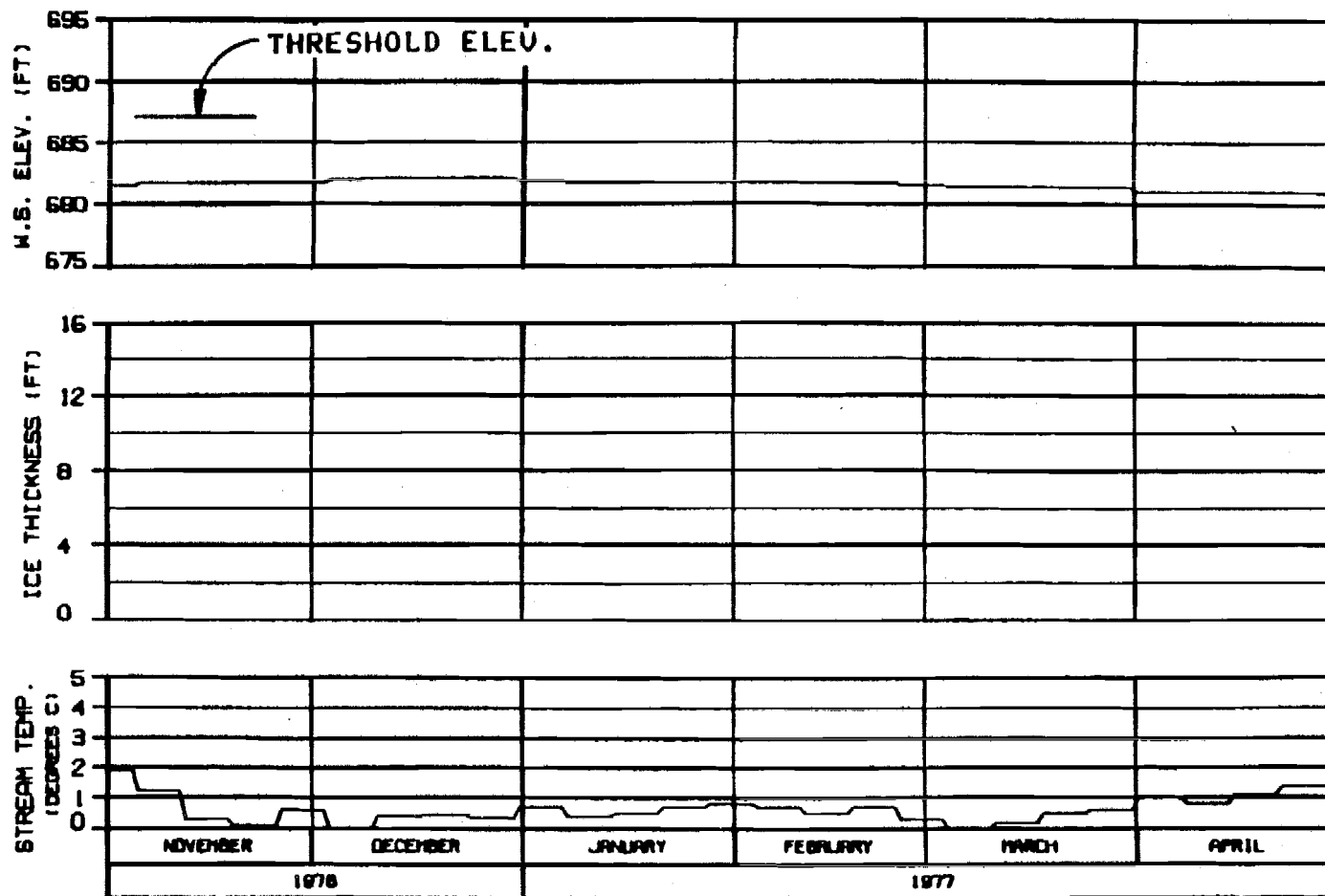


ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL D/S OF SLOUGH 11  
 RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY		
SUBITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
WARZA-EBASCO JOINT VENTURE		
DESIGNED BY	D. M. M.	1986.102

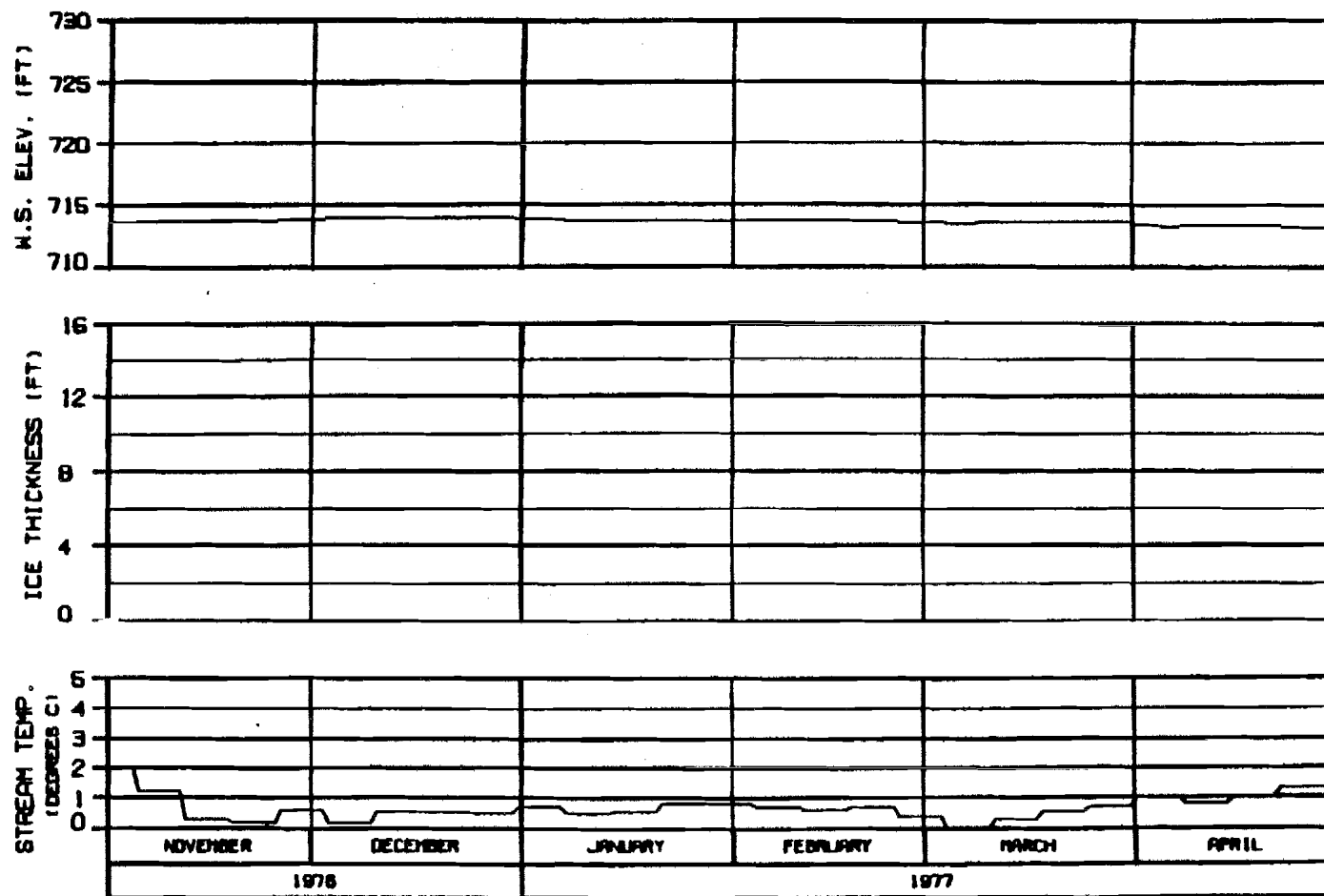


HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7502CNA

ALASKA POWER AUTHORITY		
SUBMITTA PROJECT		
SLUITSNA RIVER		
ICE SIMULATION		
TIME HISTORY		
HARZA-EBRACO JOINT VENTURE		
DESIGNED: R. L. DAVIS	DRAWN: R. L. DAVIS	1000.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

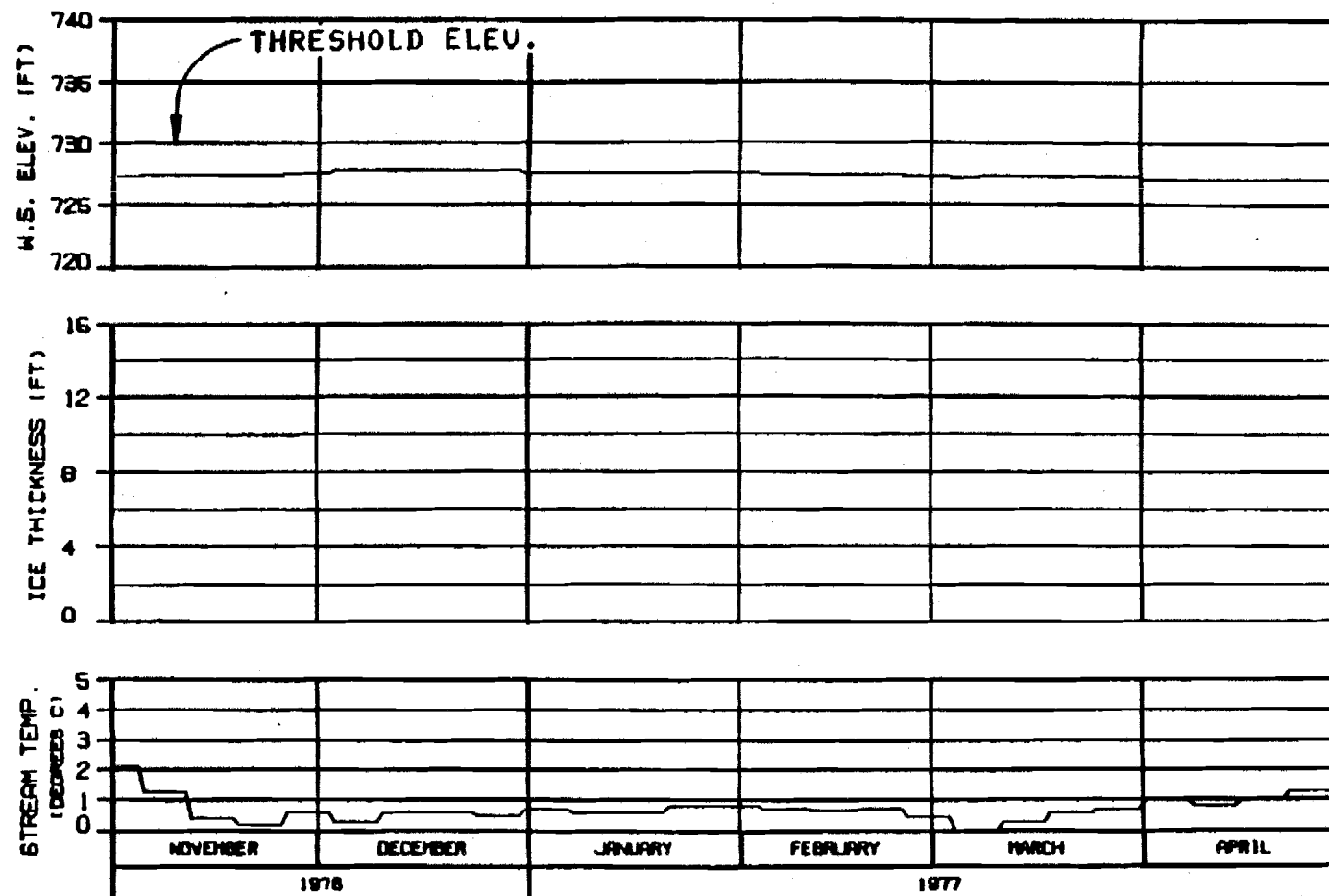
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN - 04-0000 5 44 04 1000.142

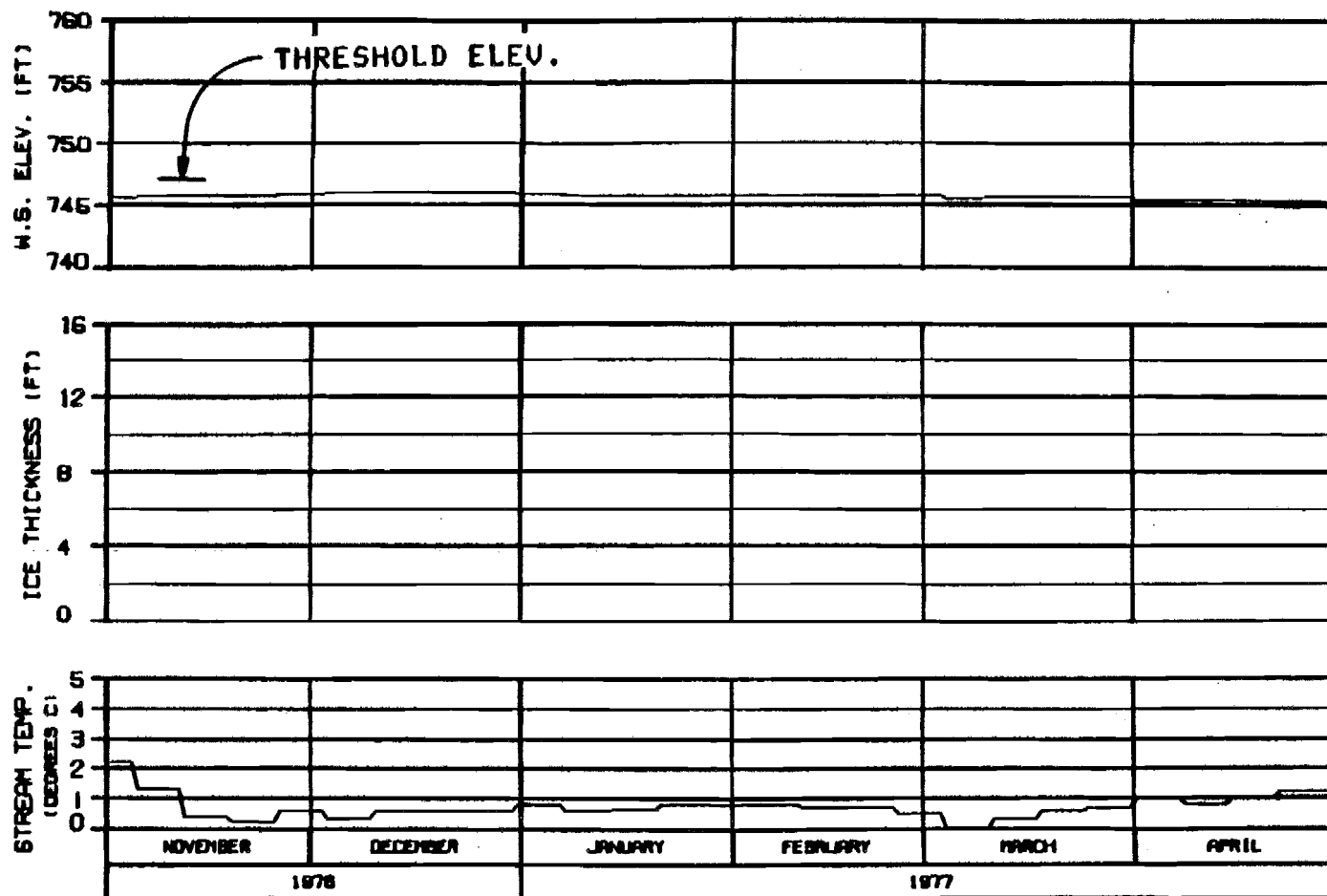


HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 76020NA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
MARZA-EBASCO JOINT VENTURE	
DESIGNED - AL-0000	8 JAN 80
1988.142	



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
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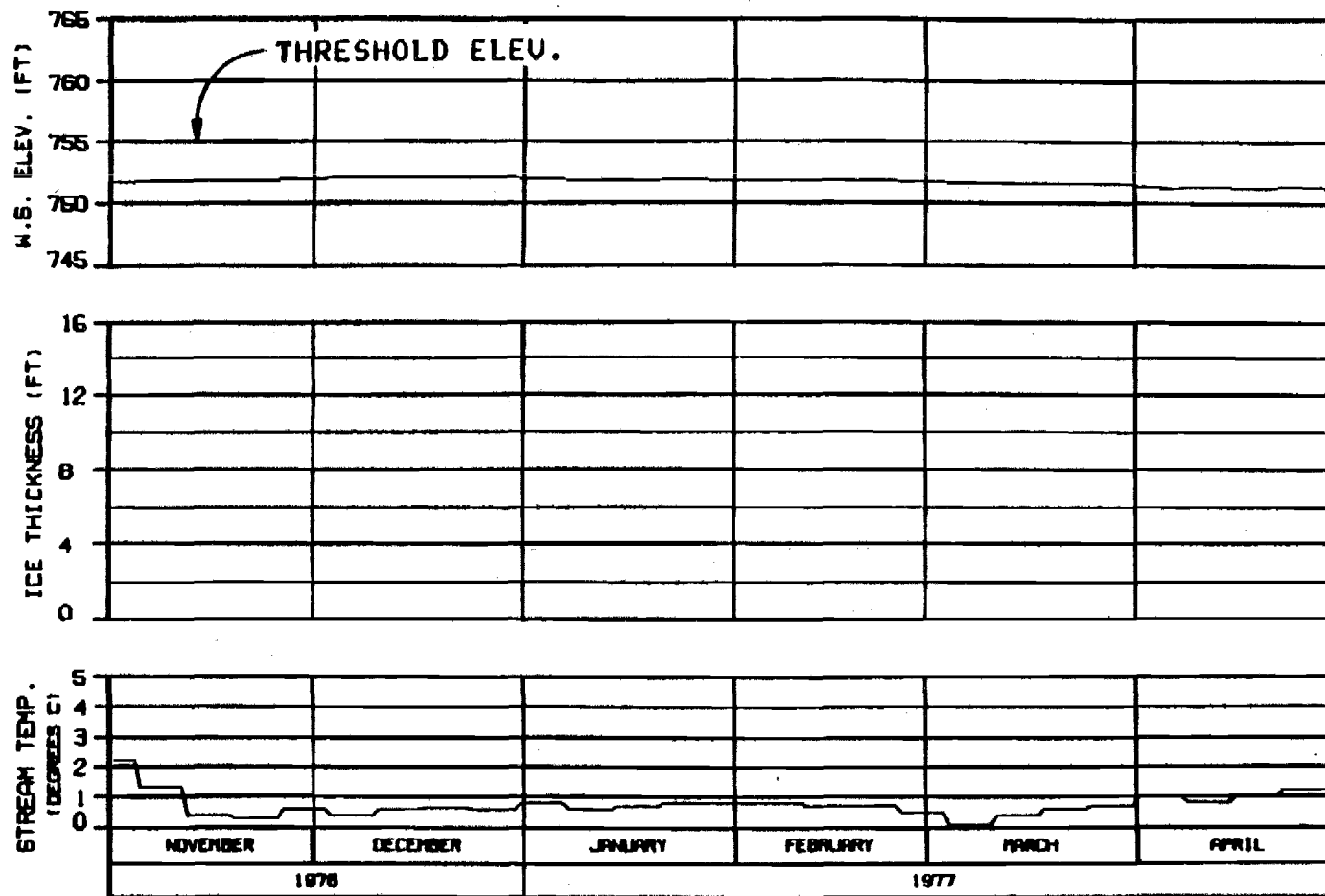
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DRAWN: D.L.B. 8 JUL 80 EBR. 142



HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

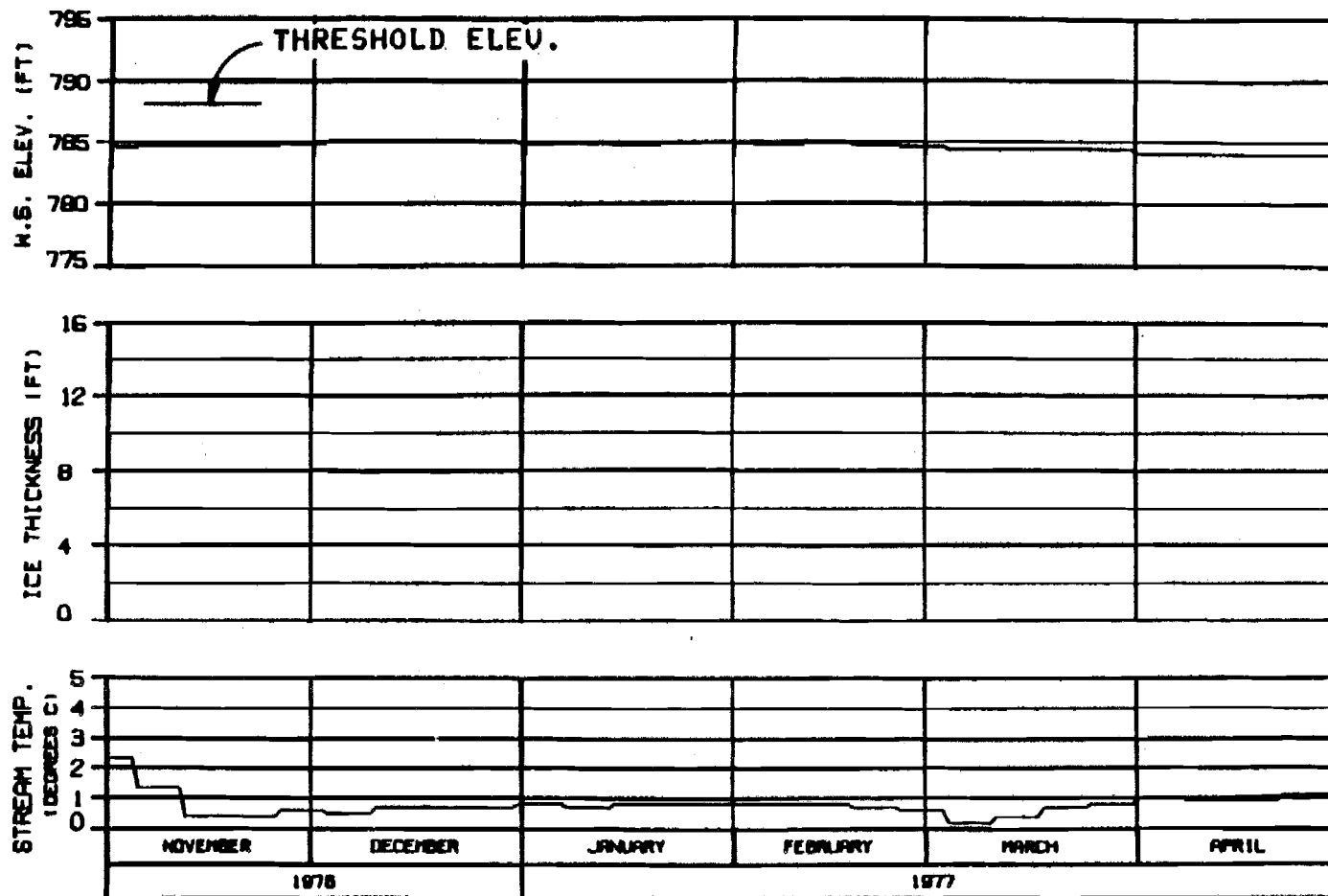
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRARD JOINT VENTURE

DESIGNER: SLD/BRN S.A. 94 1000.142



CC



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 76 - 30 APR 77  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7602CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED - RALPH BROWN

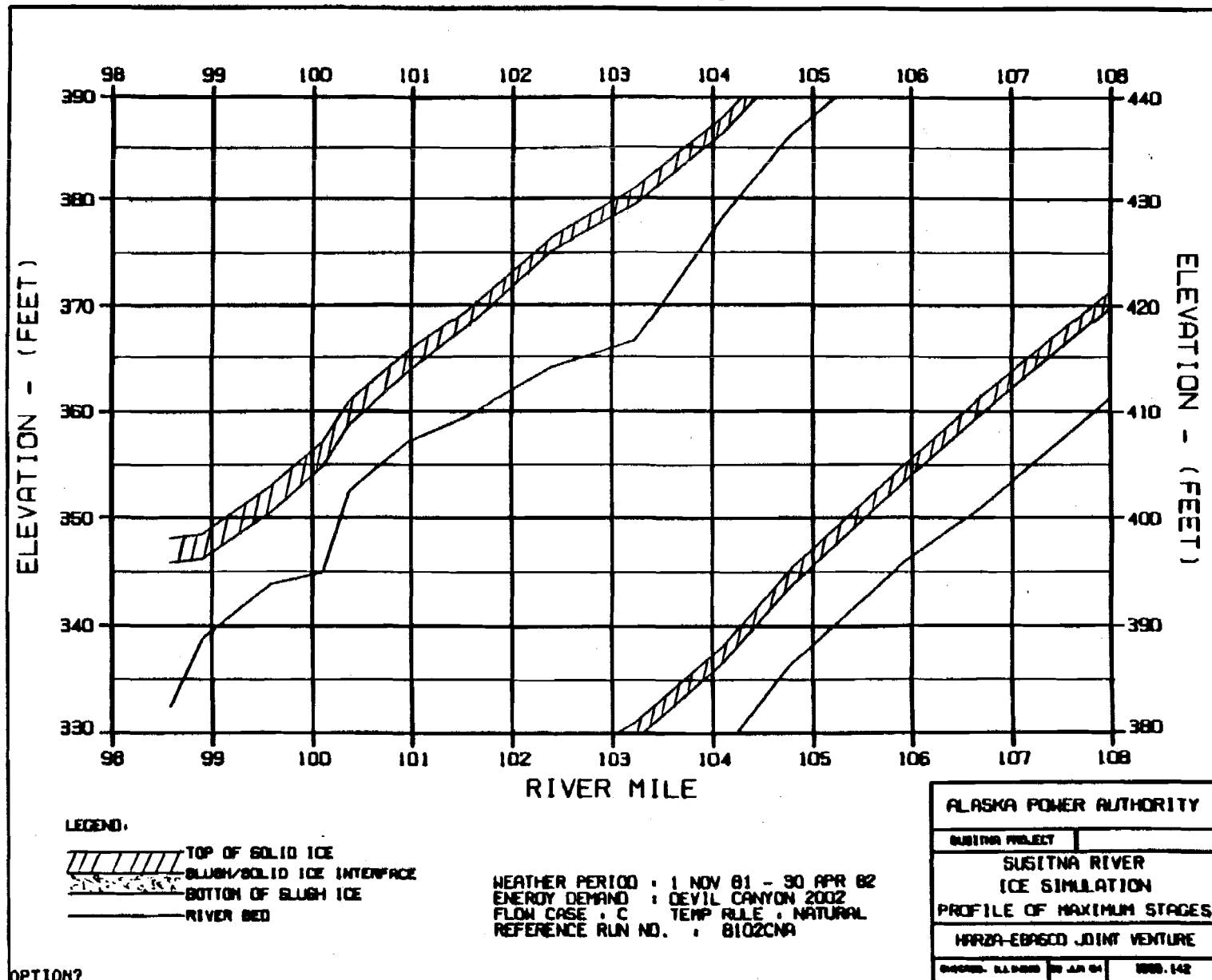
8 JAN 77

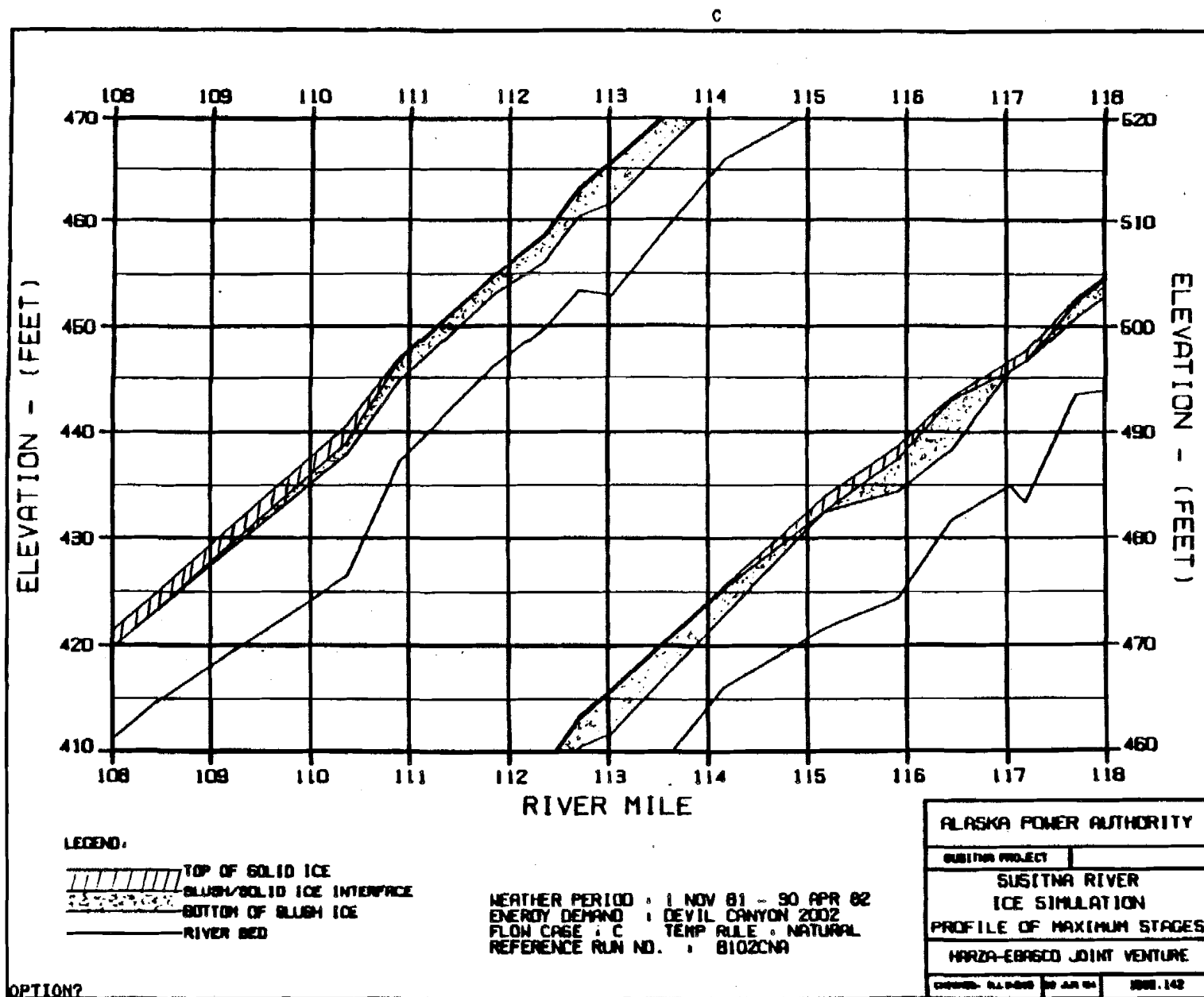
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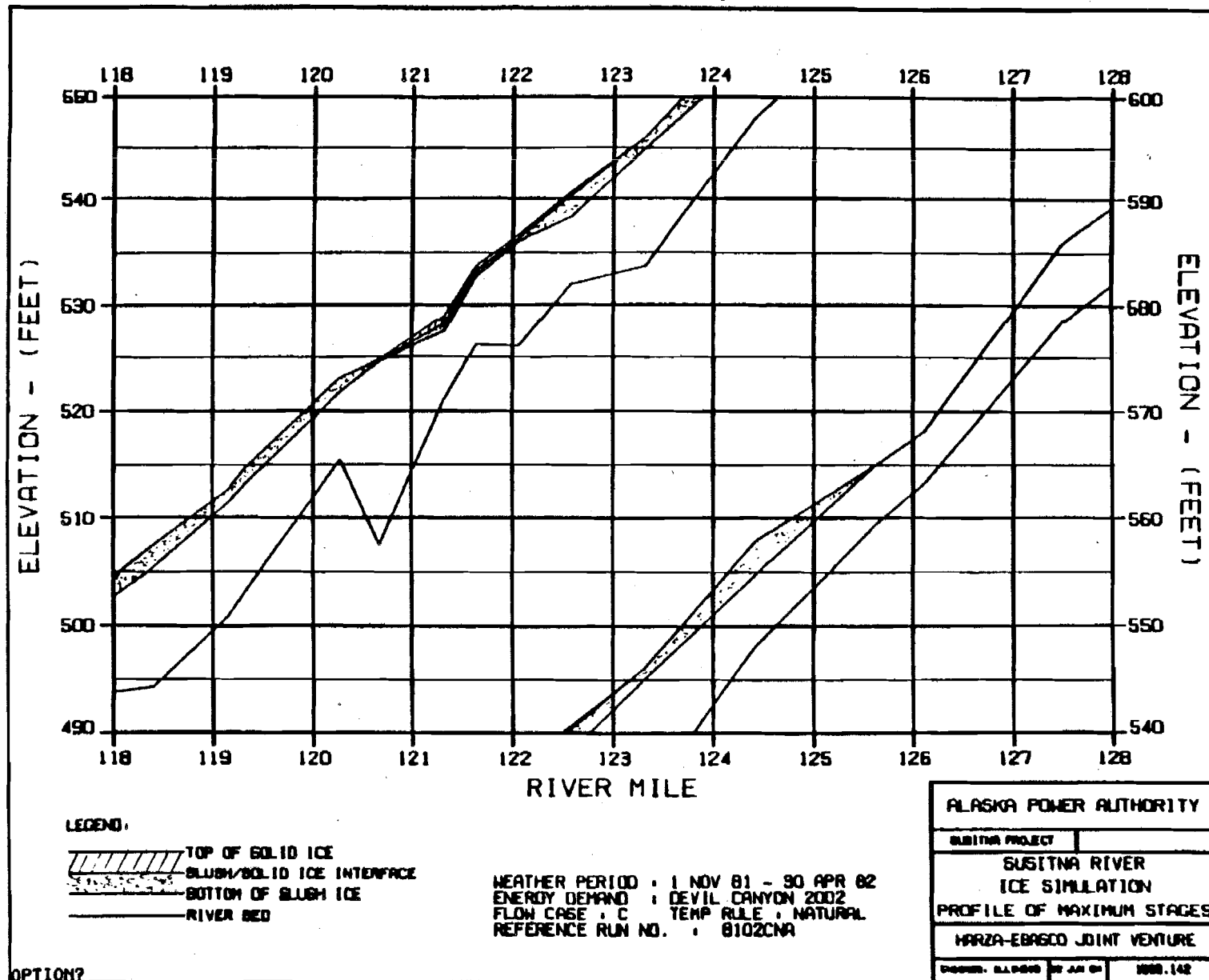
OPTION?

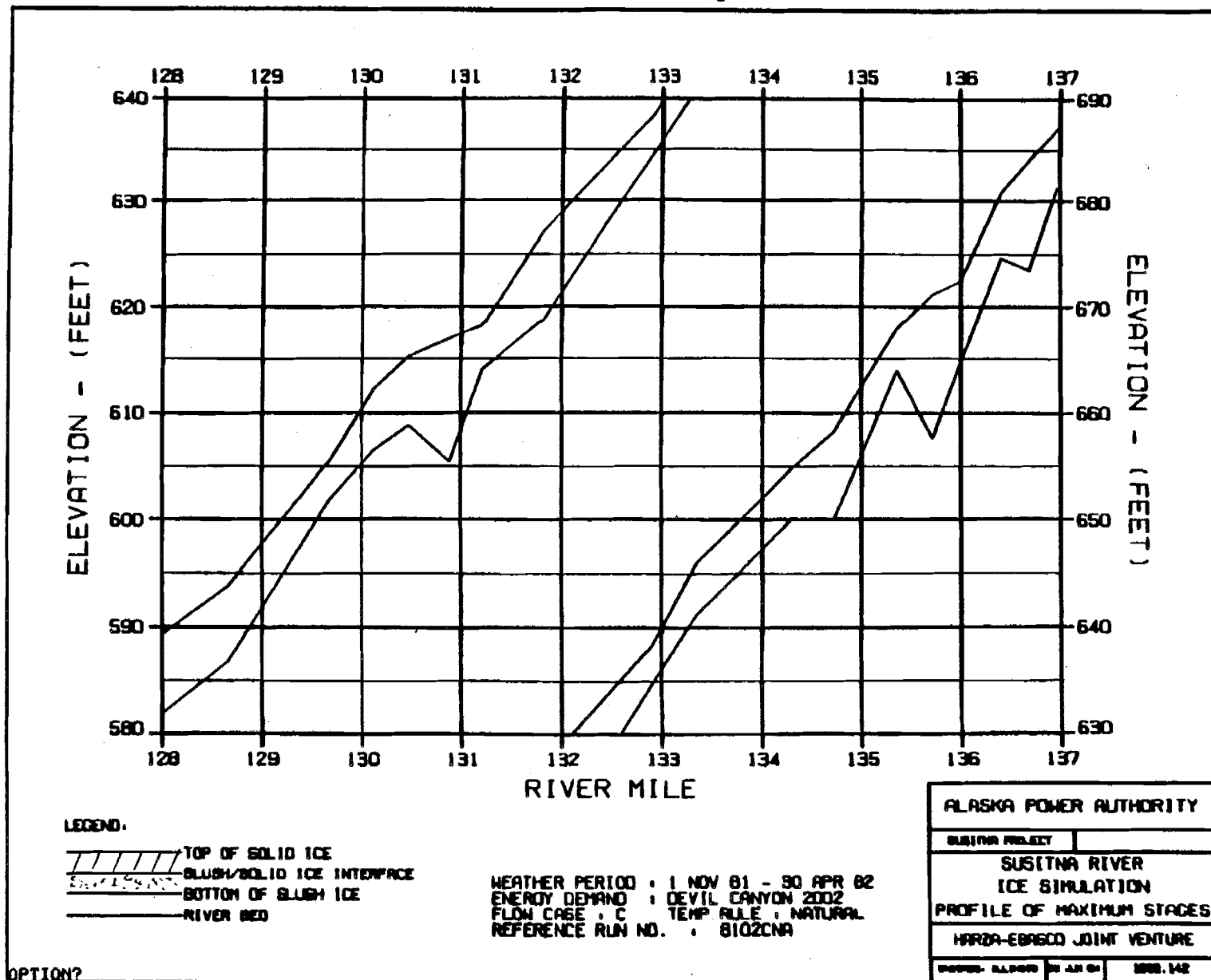
# EXHIBIT O

C

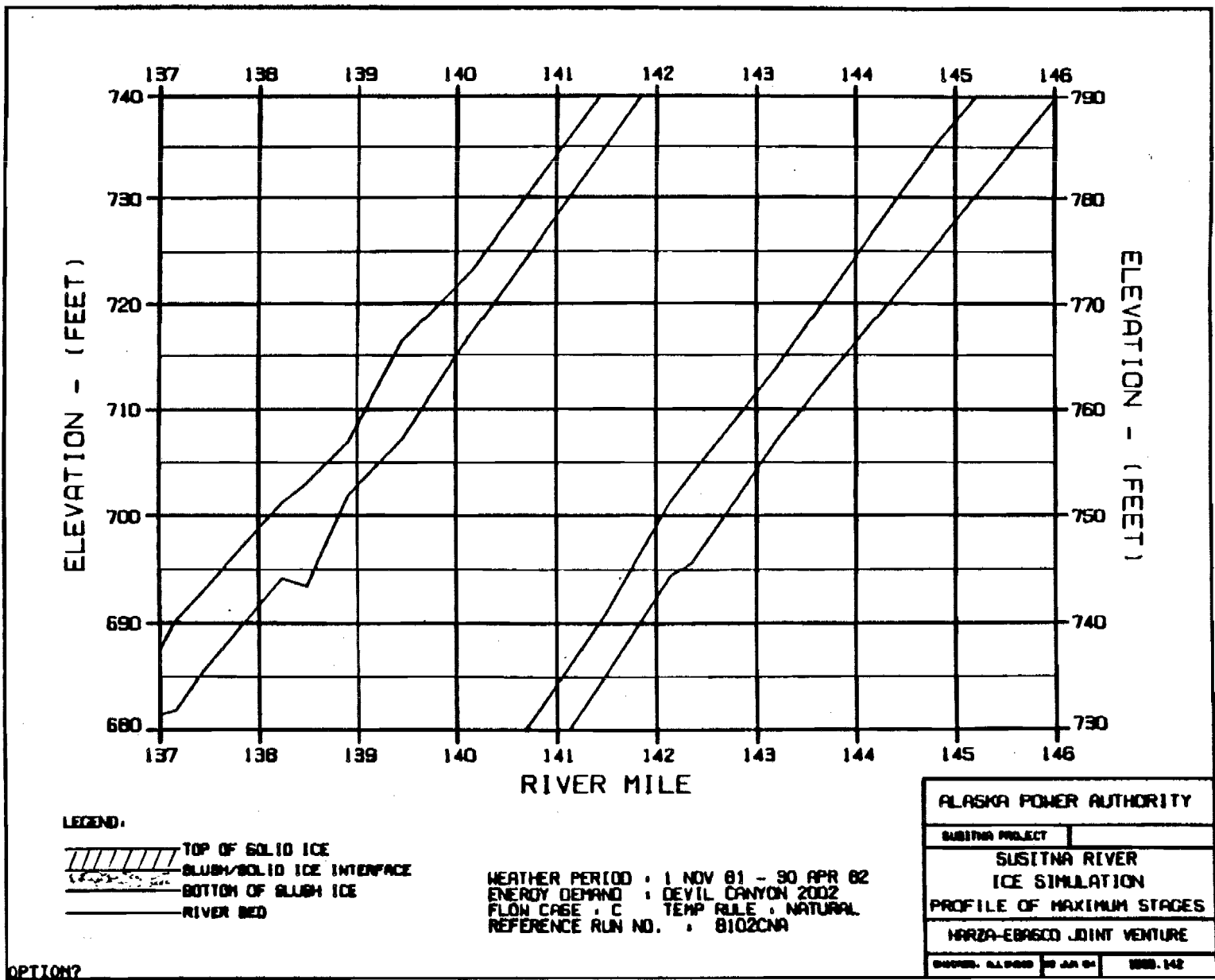


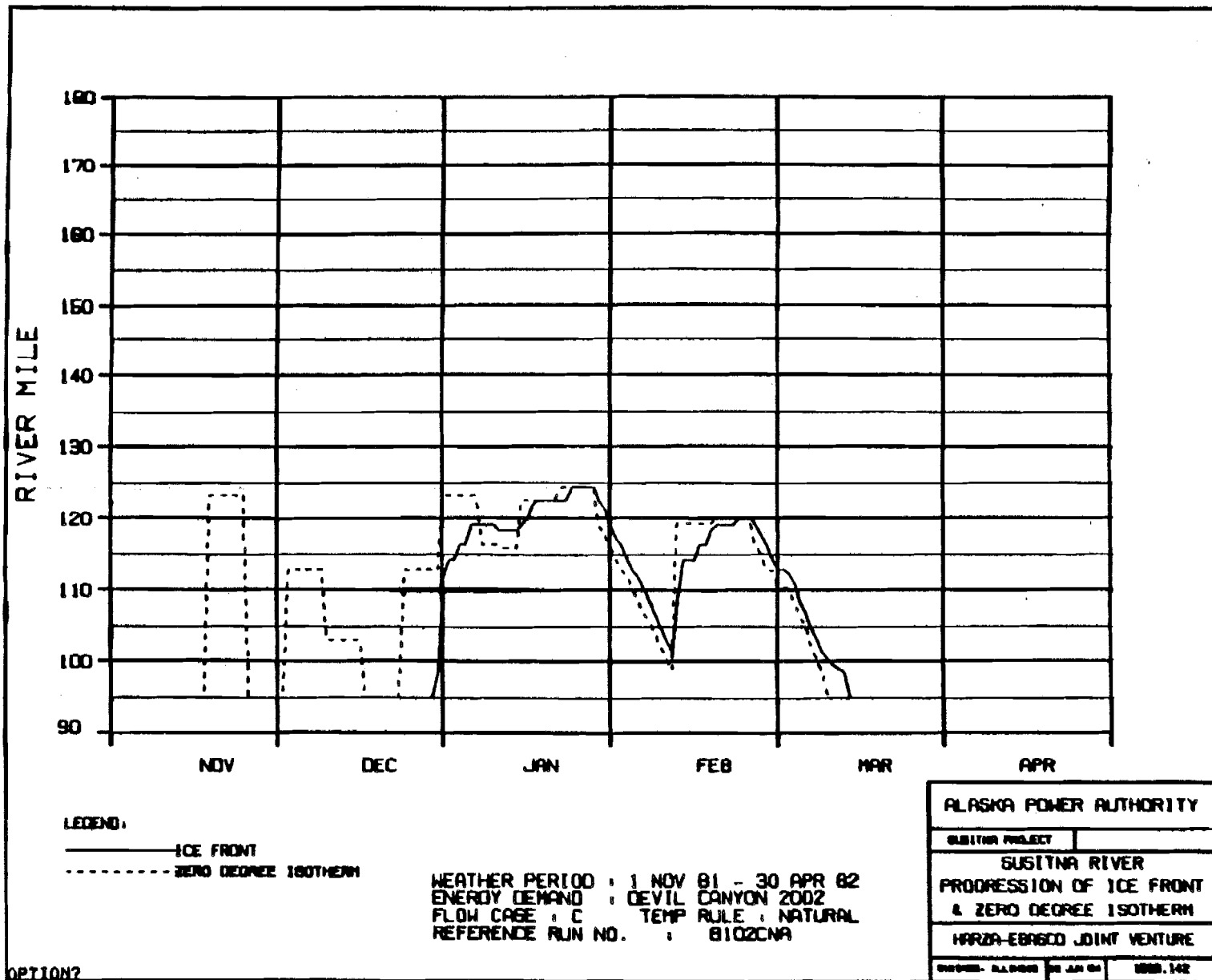




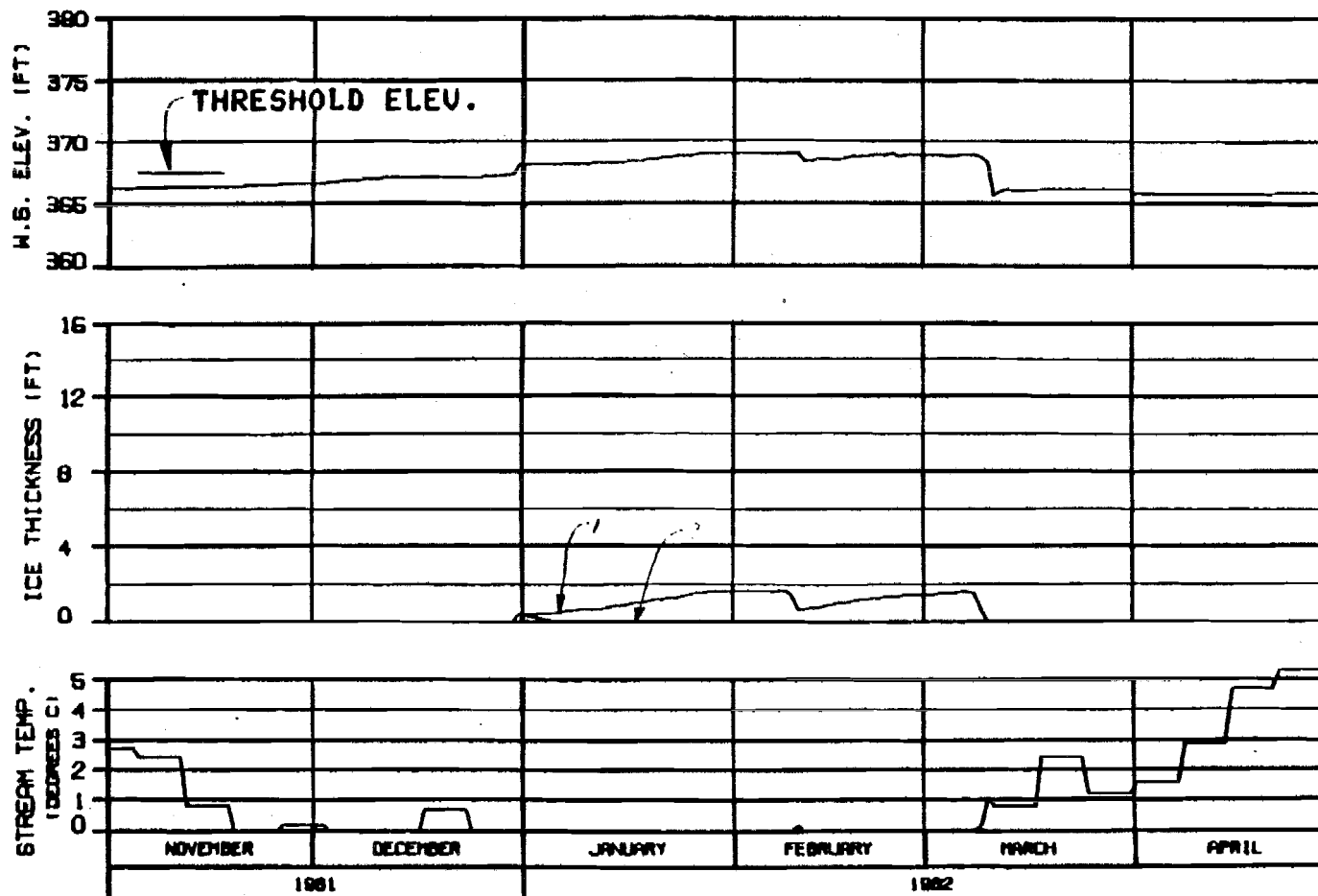


C









ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

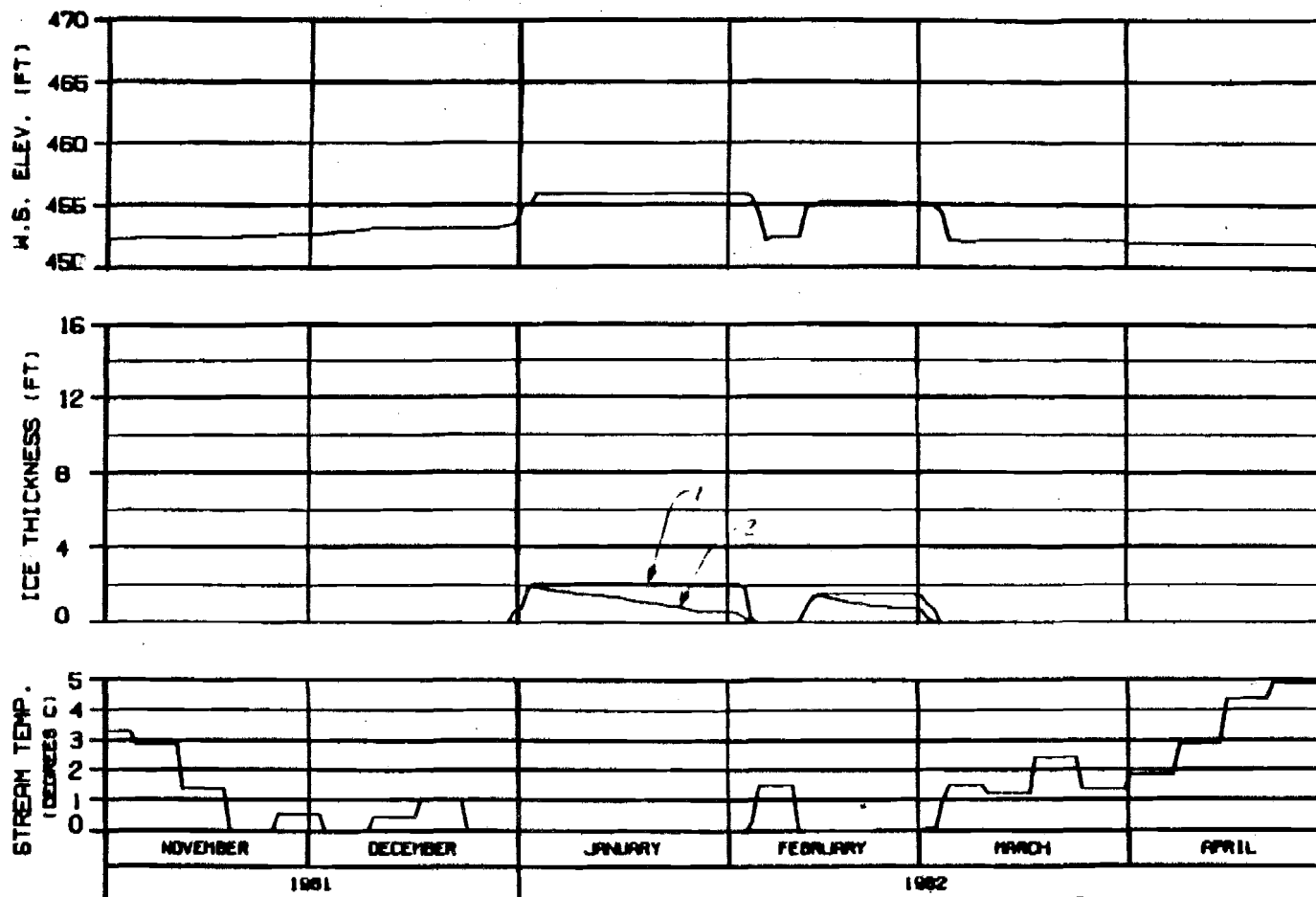
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBR&CO JOINT VENTURE

CHECKED: 11/1/82 BY JAN 84 1000.142



**SIDE CHANNEL AT HEAD OF GASH CREEK  
RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

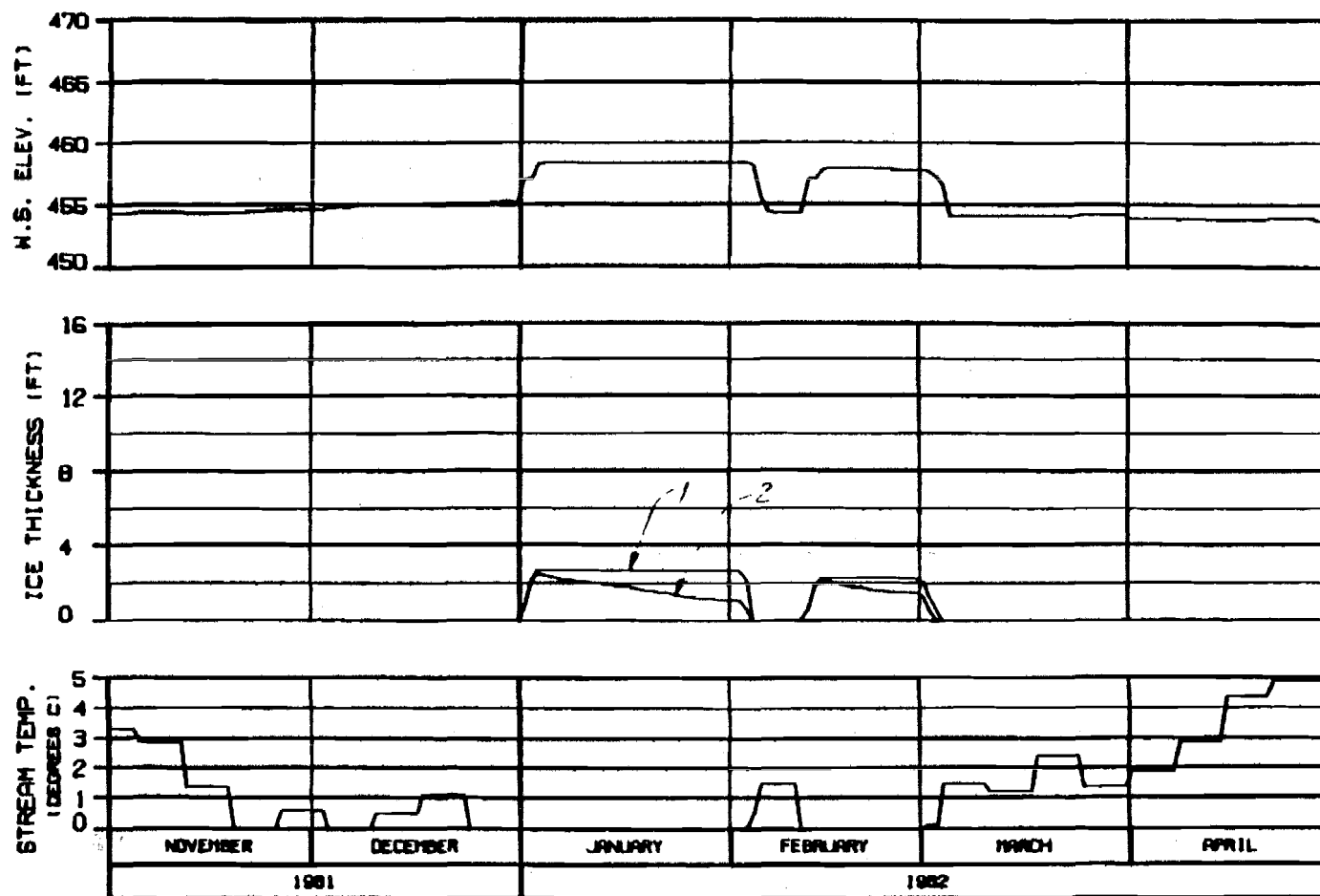
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HAZDA-EBASCO JOINT VENTURE**

DESIGNED BY: ALP/MSB 28 JAN 84 1000.142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

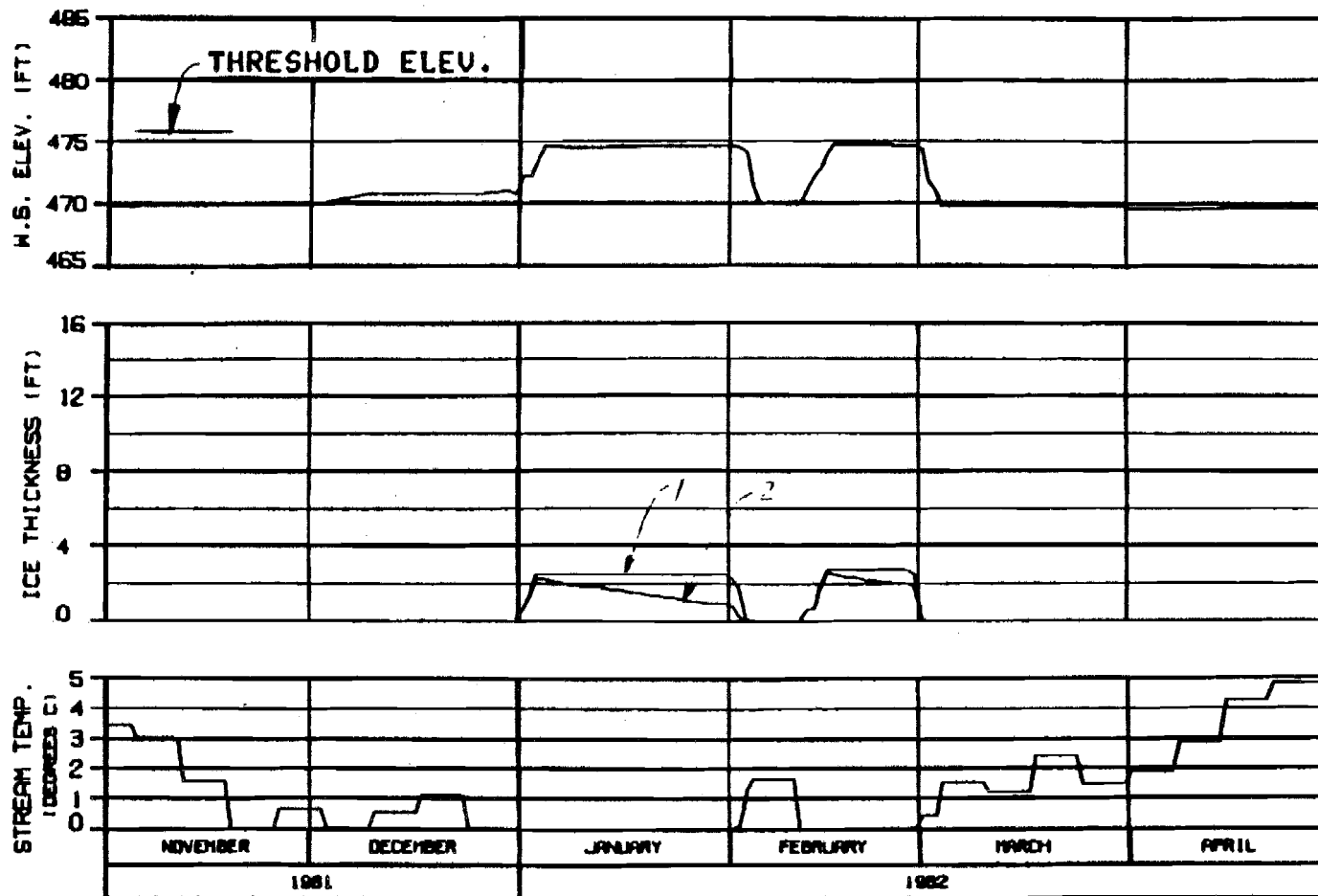
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBR6CO JOINT VENTURE

DESIGNED BY JAH/SH 1000.142



# HEAD OF SLOUGH B RIVER MILE : 114.10

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
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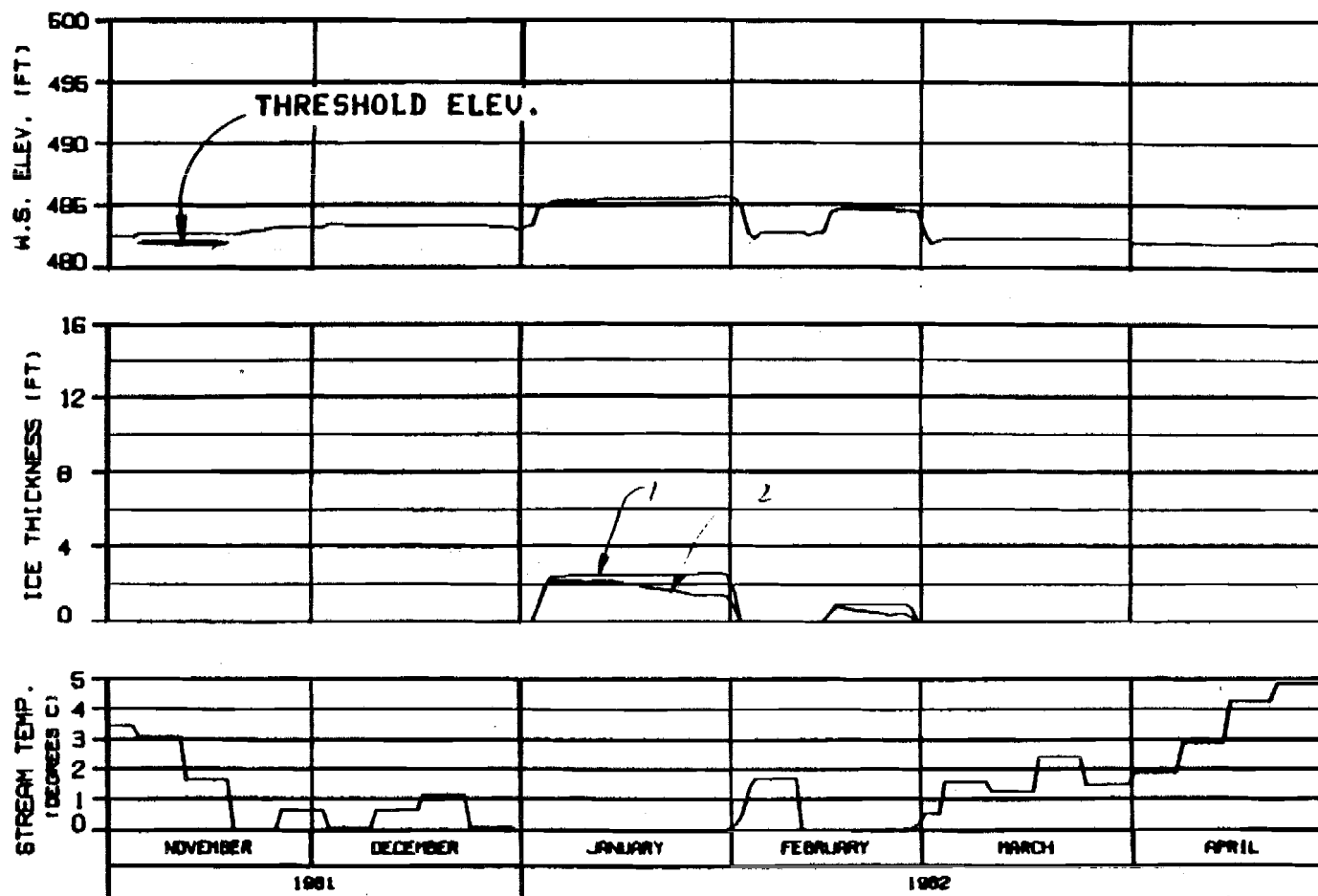
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGN: 81-0000 20 JAN 81 1000.142



**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 81020NA

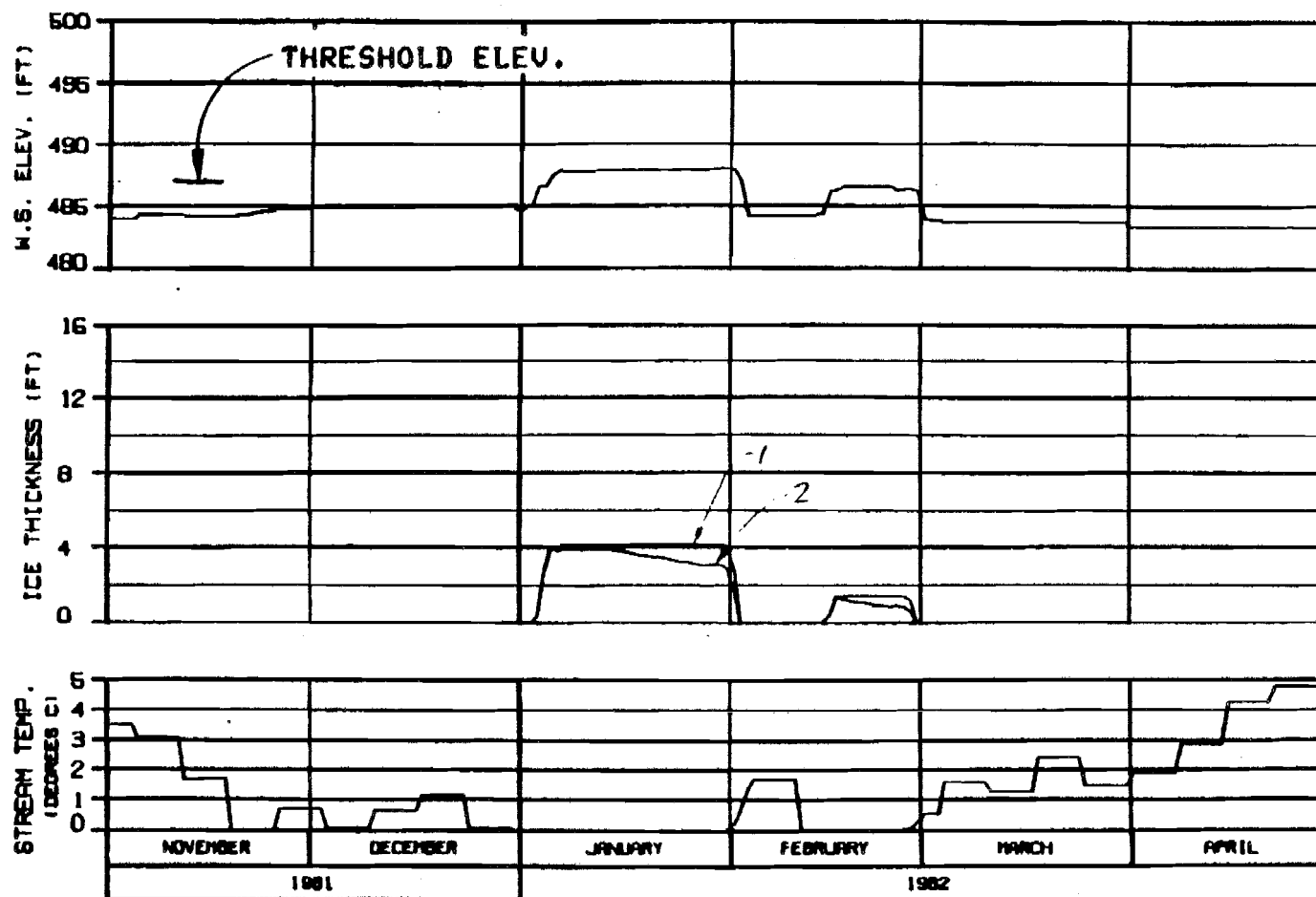
**ALASKA POWER AUTHORITY**

SUSITNA PROJECT

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGN. ALBANY 25 JAN 82 1000.142



HEAD OF SIDE CHANNEL MSII  
RIVER MILE : 115.90

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C      TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

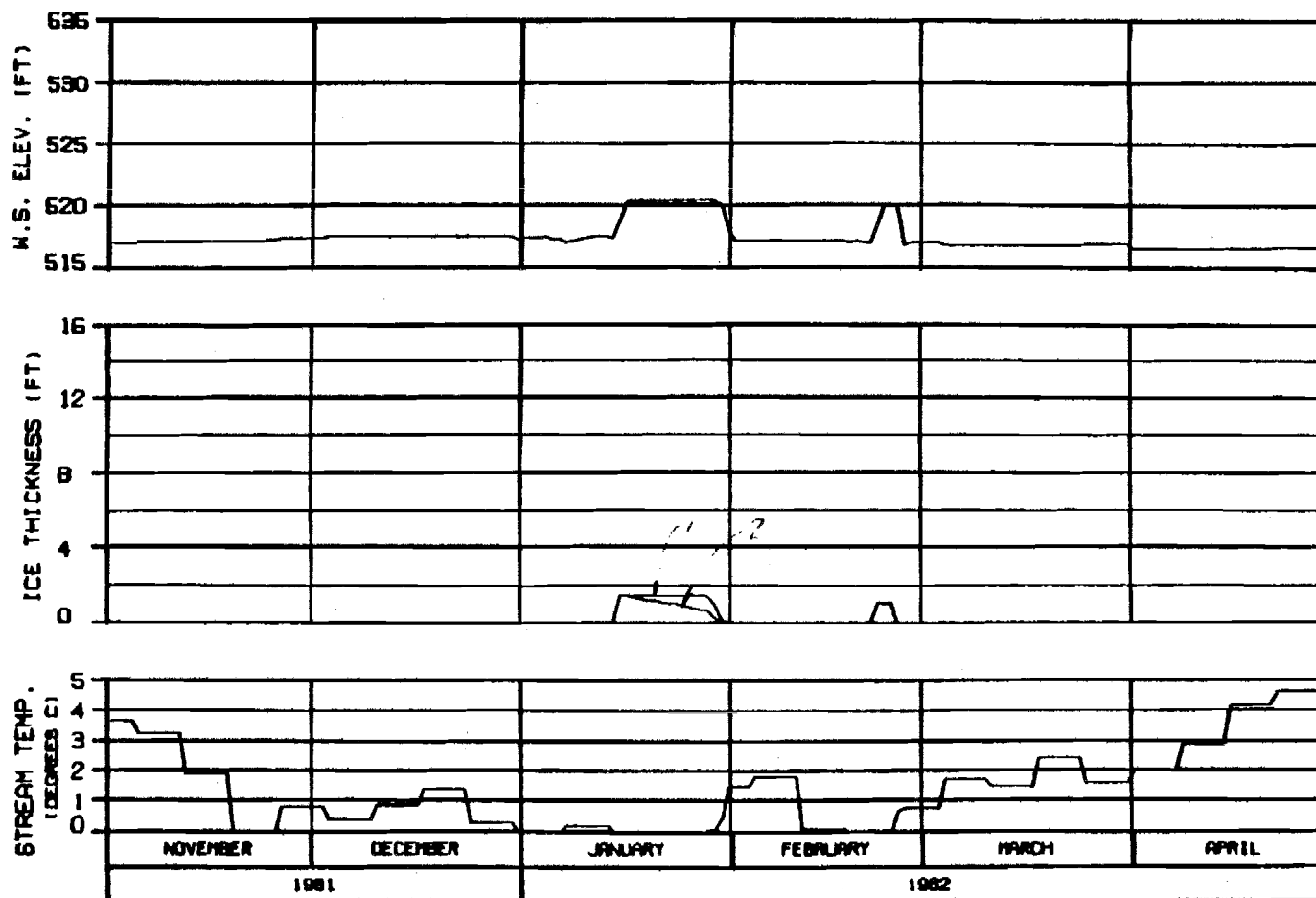
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

CHARTER: 81-0000 00 JAN 81 0000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY

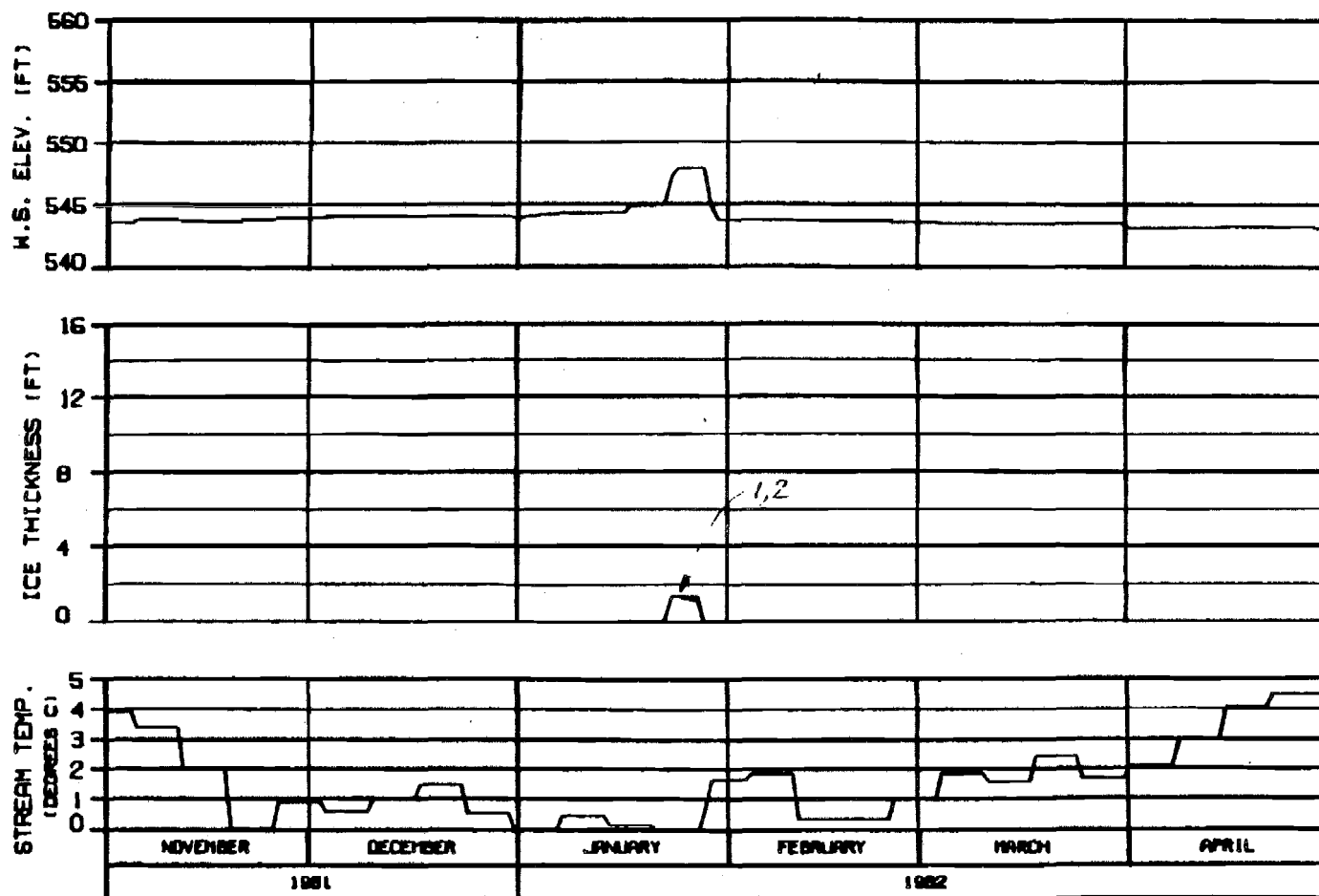
SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBERSCO JOINT VENTURE

DATE: 11/10/81 BY: JLM

REV: 142



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

ALASKA POWER AUTHORITY

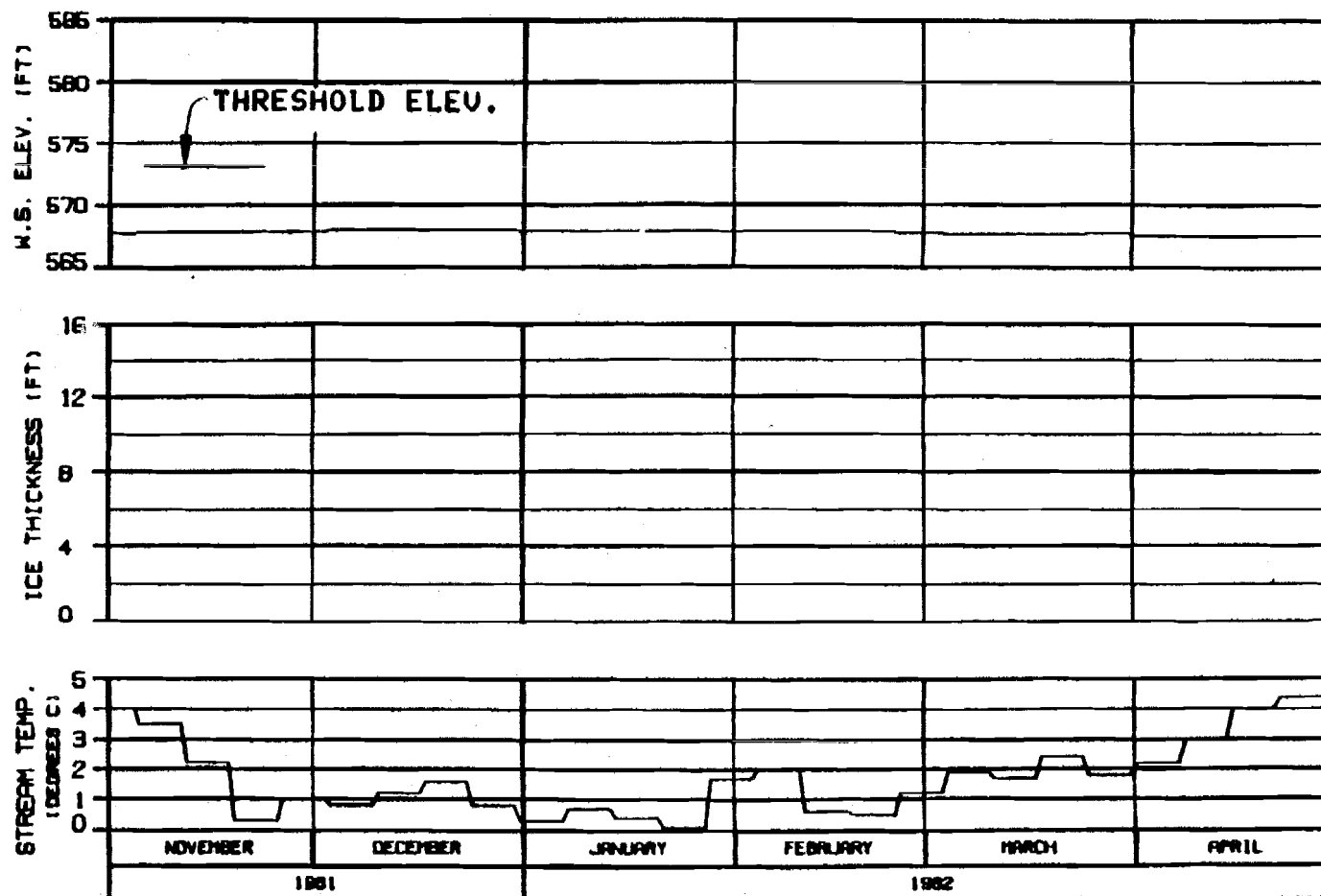
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. BROWN 30 JAN 82 10000.142





**HEAD OF SLOUGH 8A (WEST)**  
**RIVER MILE : 126.10**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

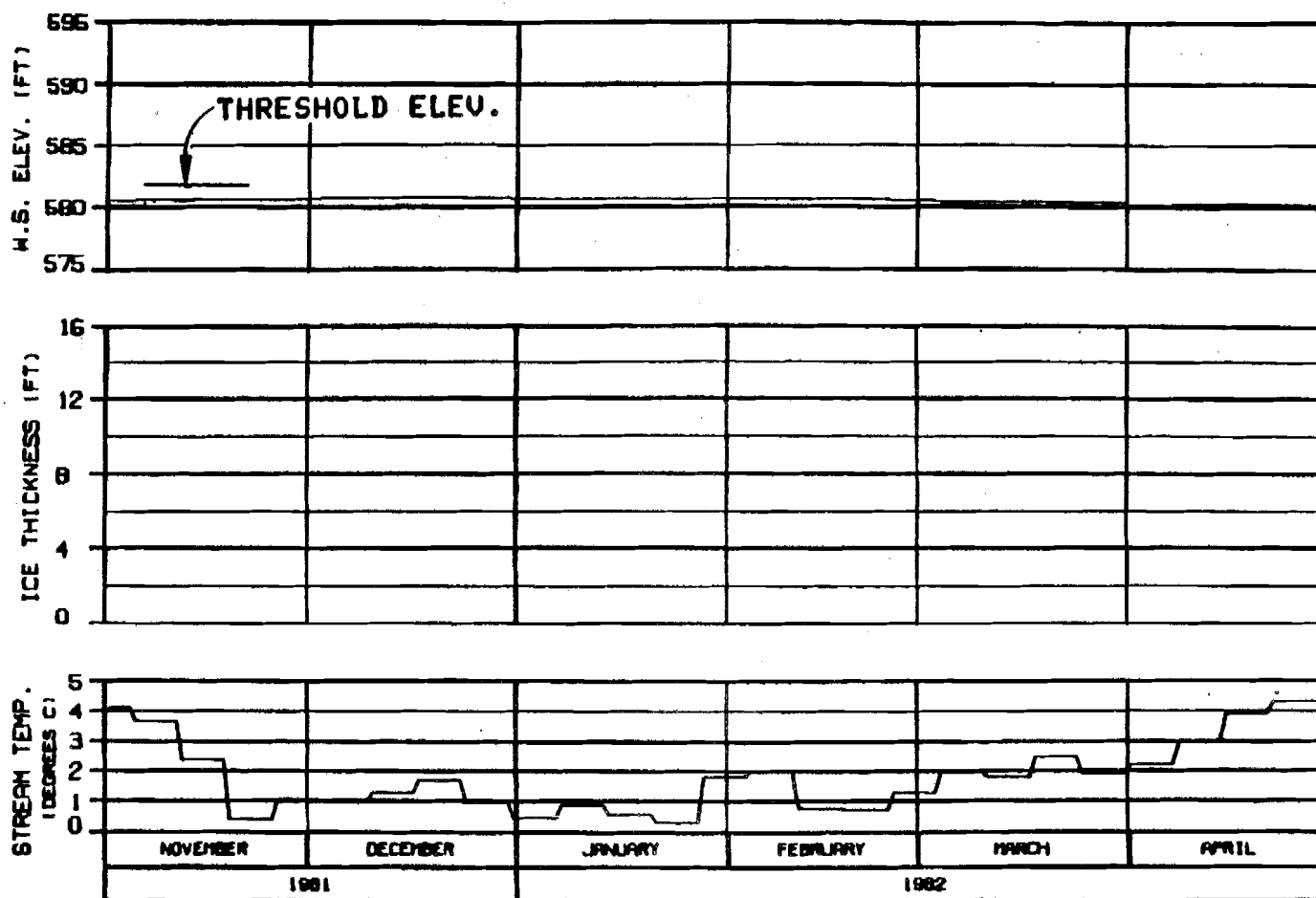
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBRACCO JOINT VENTURE**

DESIGN: R. L. BROWN JR. JAN 81 1000.142



# HEAD OF SLOUGH 8A (EAST) RIVER MILE : 127.10

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 81020NA

ALASKA POWER AUTHORITY

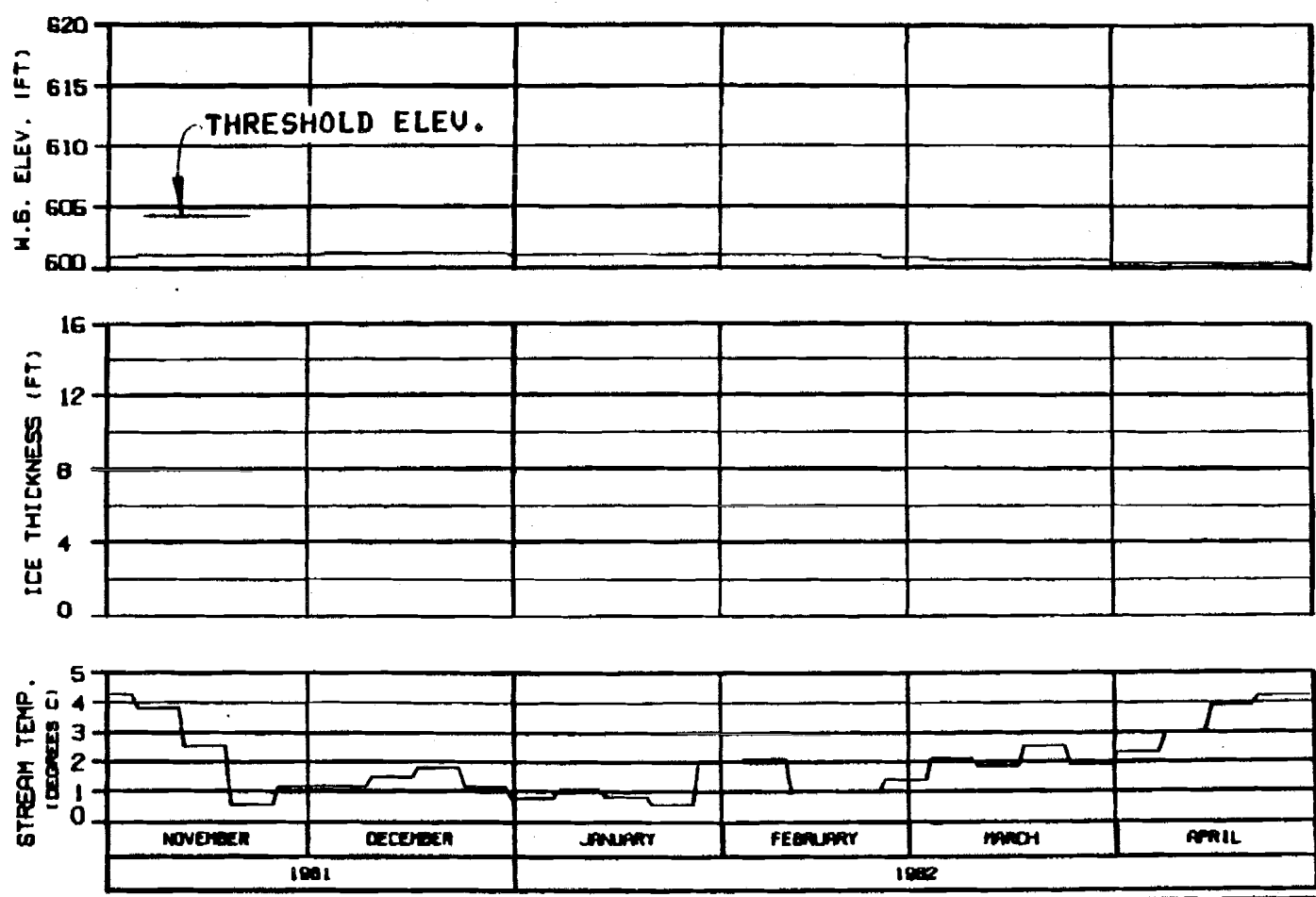
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ISSUED: ALP-88 20 JAN 84 1988.142

STOP C



HEAD OF SLOUGH 9  
RIVER MILE : 129.30

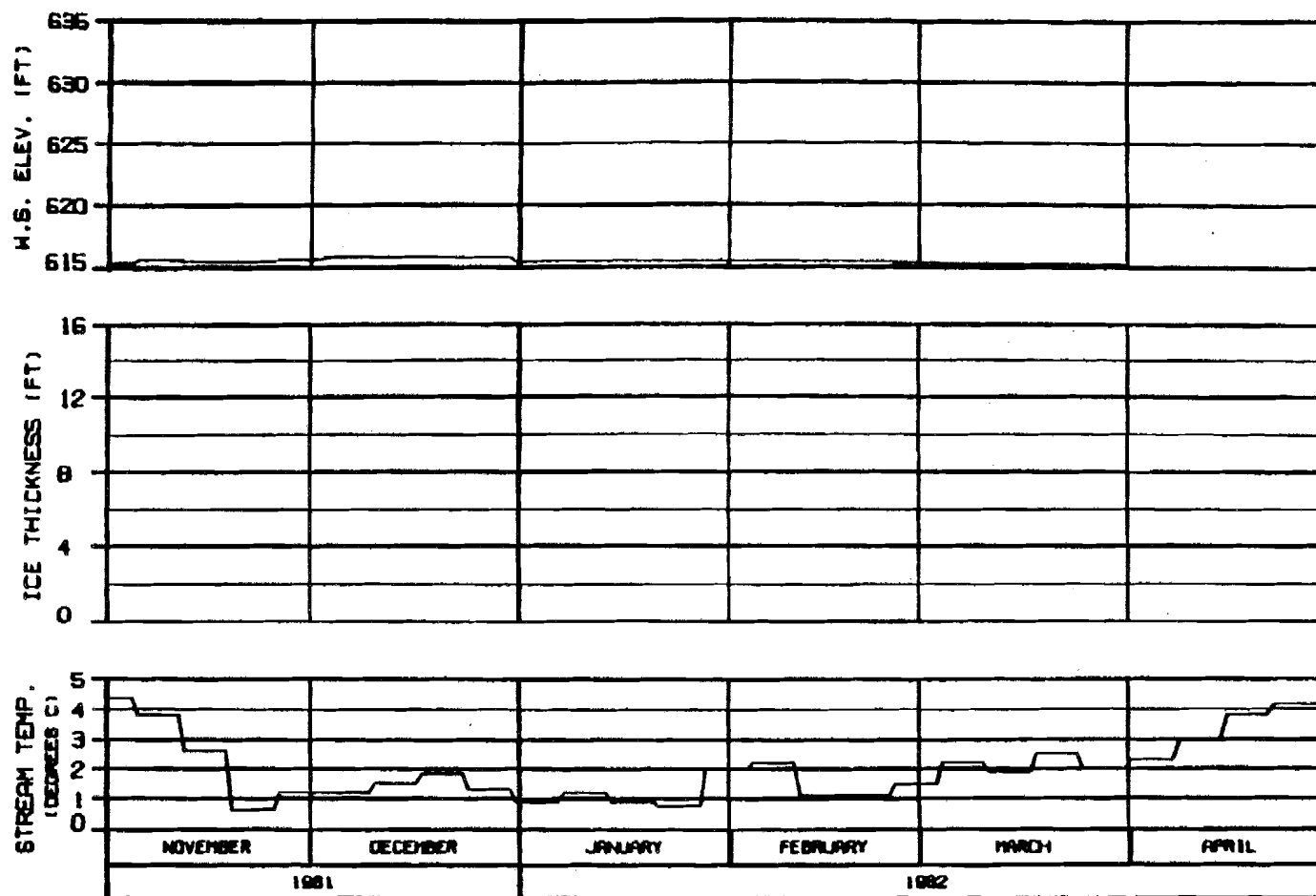
ICE THICKNESS LEGEND:  
1. TOTAL THICKNESS  
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 81020NA

OPTION?

ALASKA POWER AUTHORITY	
SUBMITTER PROJECT	
SUSTITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBRISCO JOINT VENTURE	
CHARTED: 04-10-82	REV. JAN 84
1000.142	

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

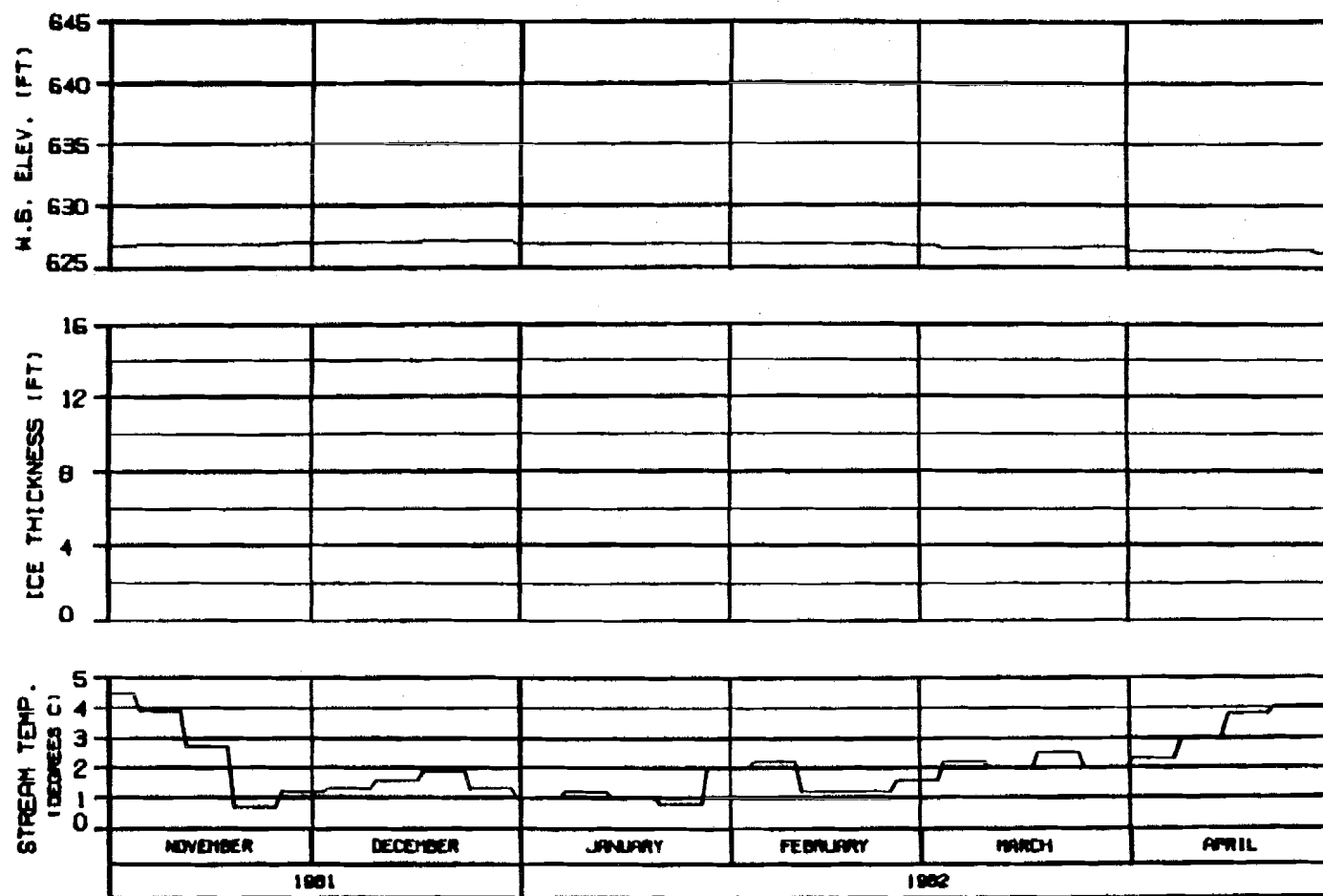
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

PROJECT: SLD 8801 28 JAN 82 0005.142



**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : B102CNA

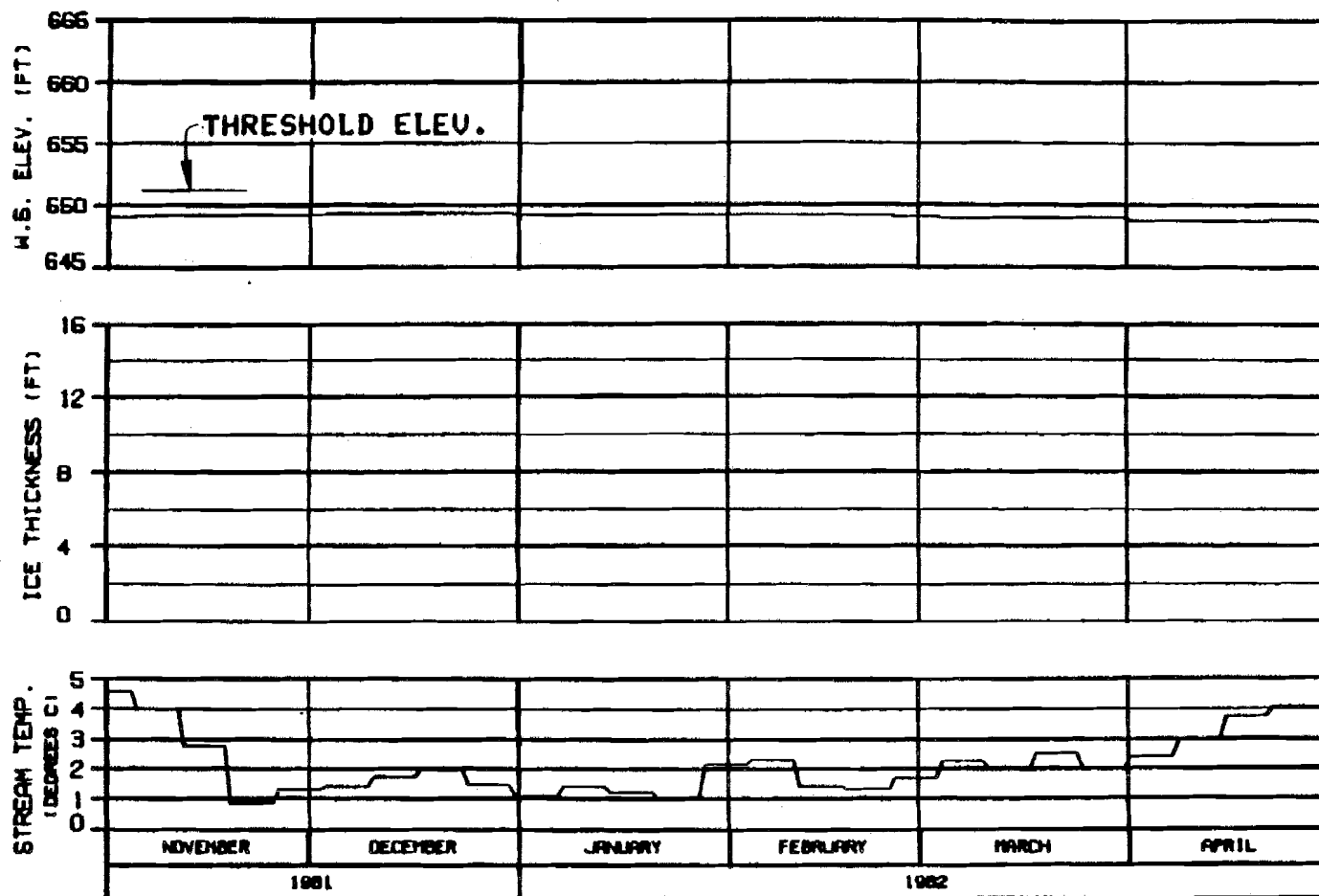
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

**DRAWN: ALP/MS IN JAN 84 1000.142**



HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 81020NA

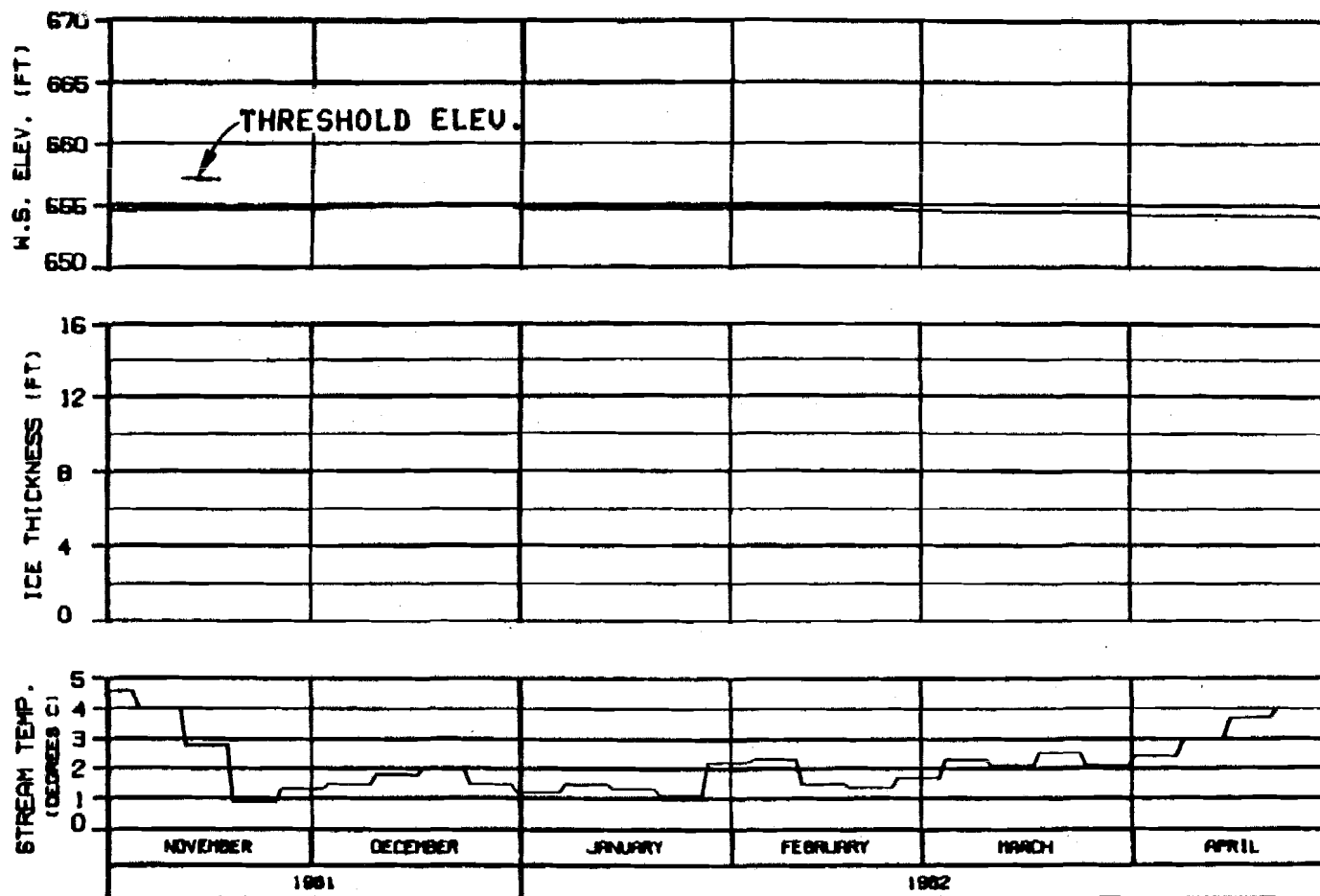
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: GLENN 28 JAN 82 1000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

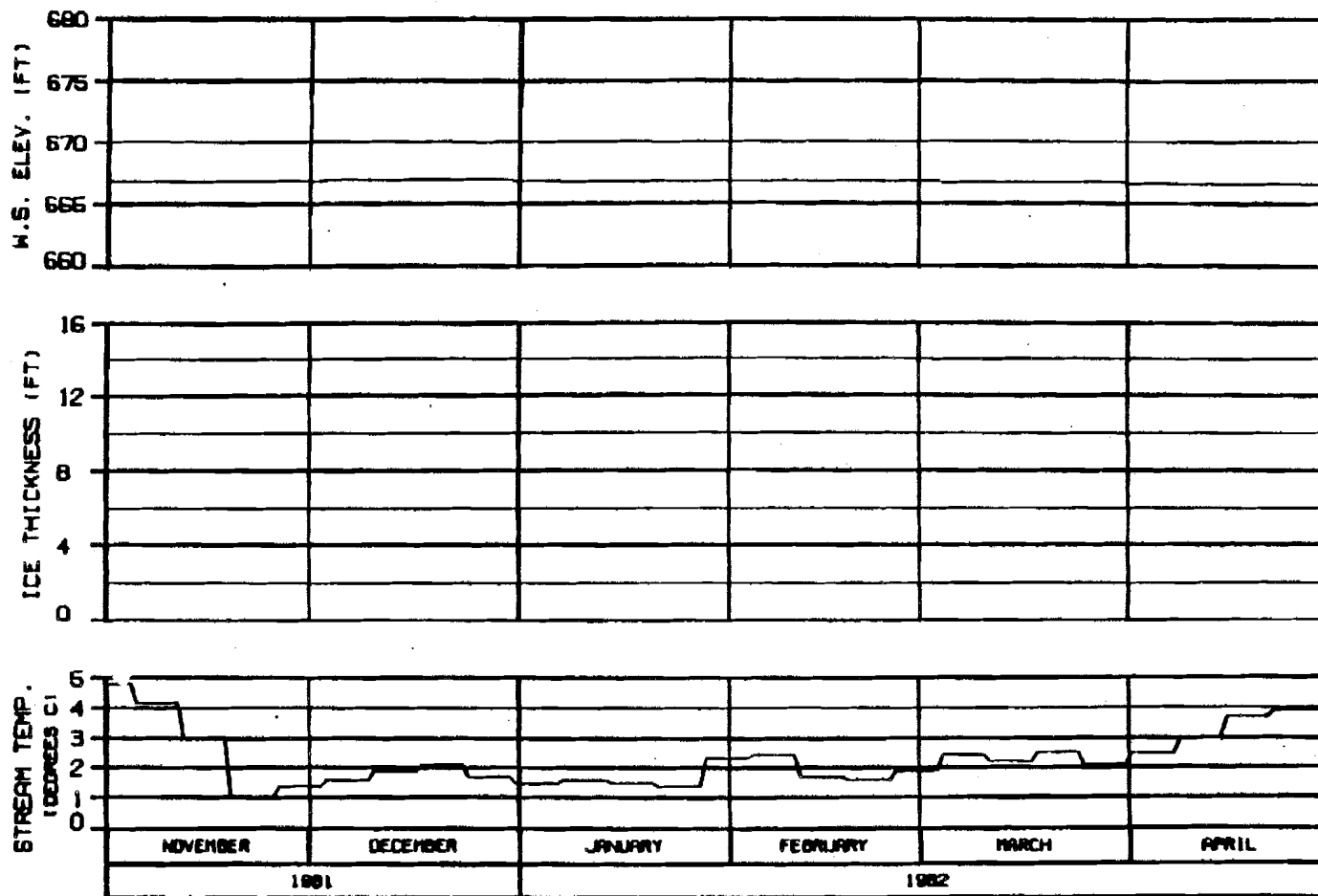
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACD JOINT VENTURE

DESIGN: ALP-8808 28 JAN 82 1000.142



**SIDE CHANNEL D/S OF SLOUGH 11**  
**RIVER MILE : 135.30**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

**ALASKA POWER AUTHORITY**

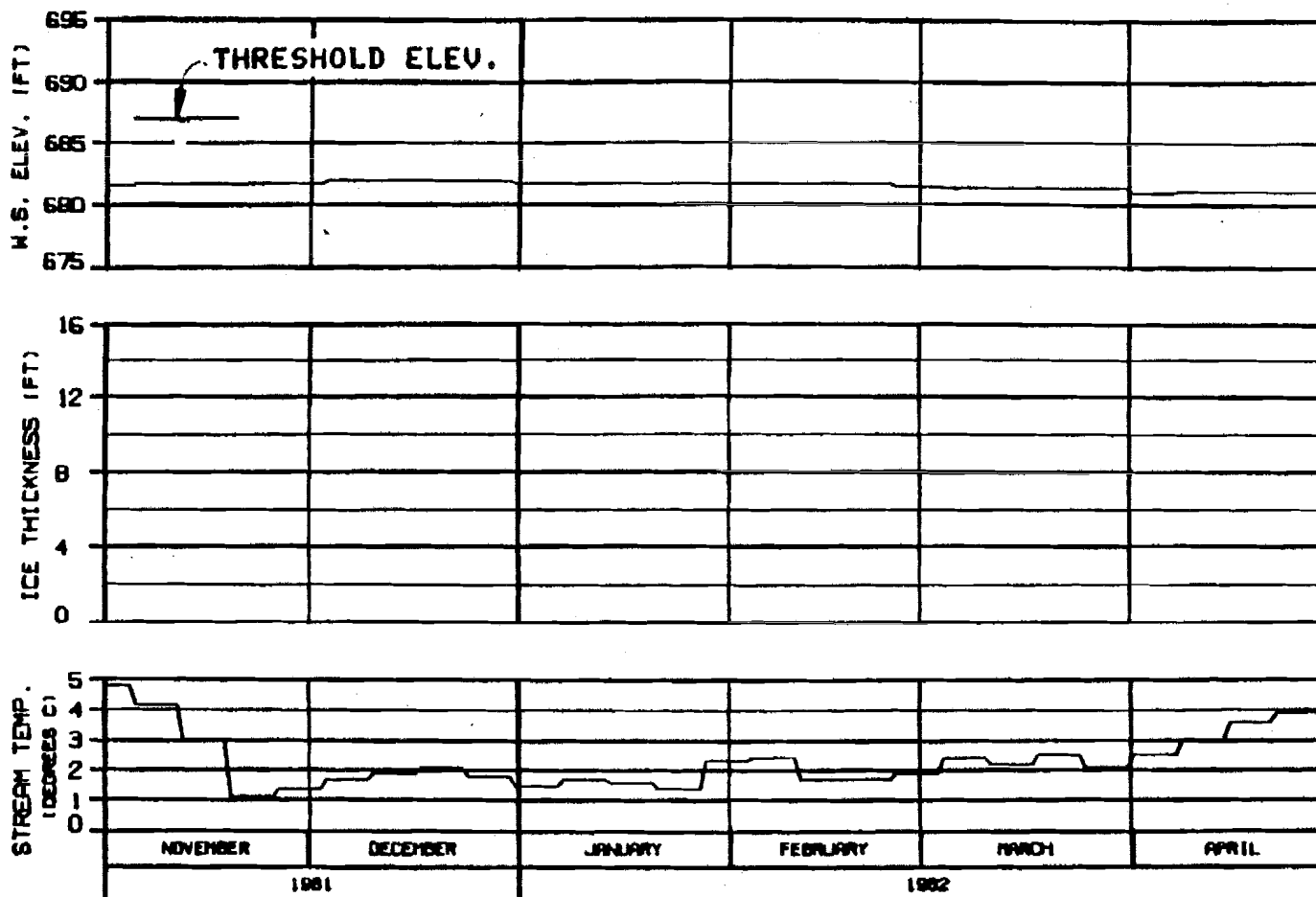
**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBRACO JOINT VENTURE**

DESIGN: S. L. HARRIS JR. JAN 84 1000.142





HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
1. TOTAL THICKNESS  
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

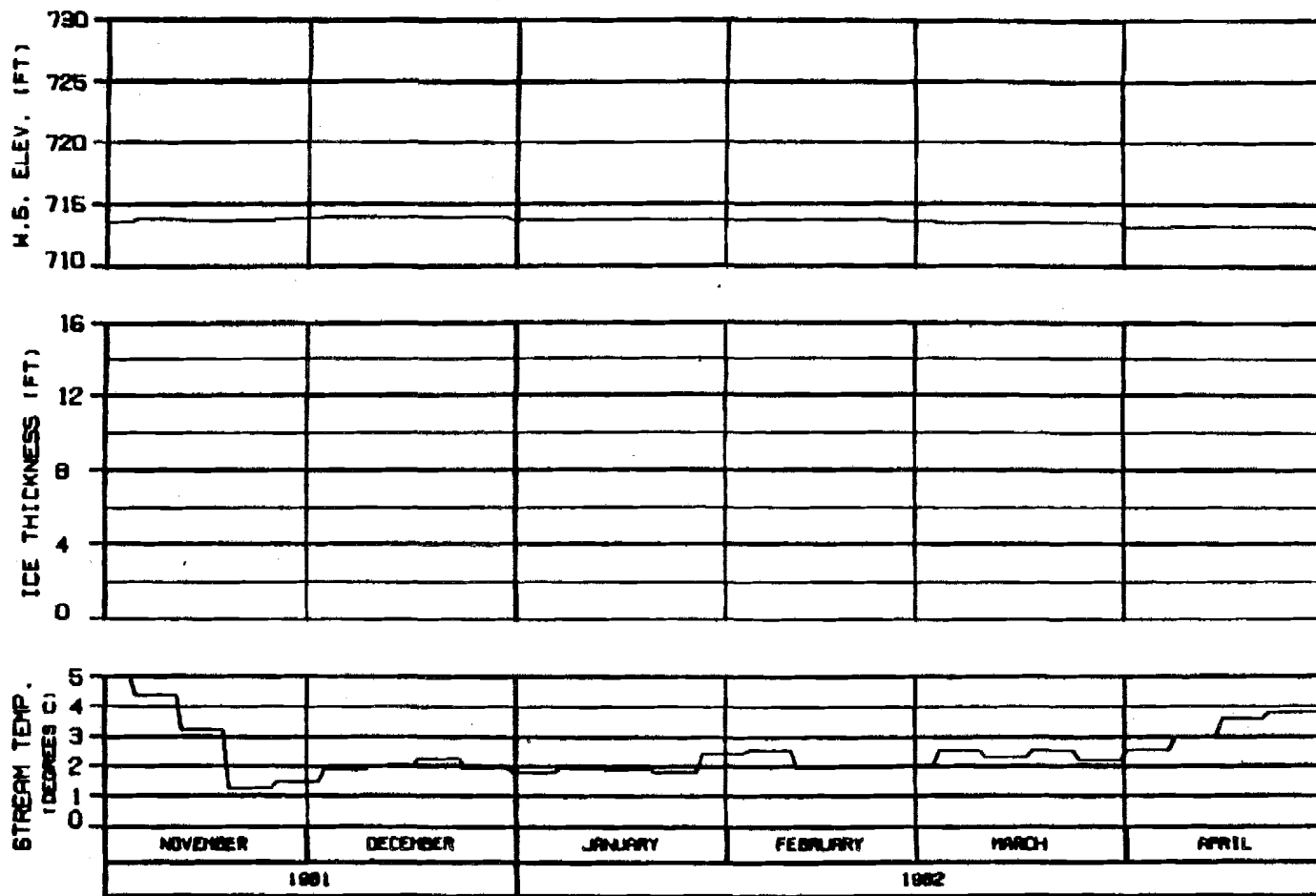
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: EBRACO 20 JAN 84 1000.142



HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

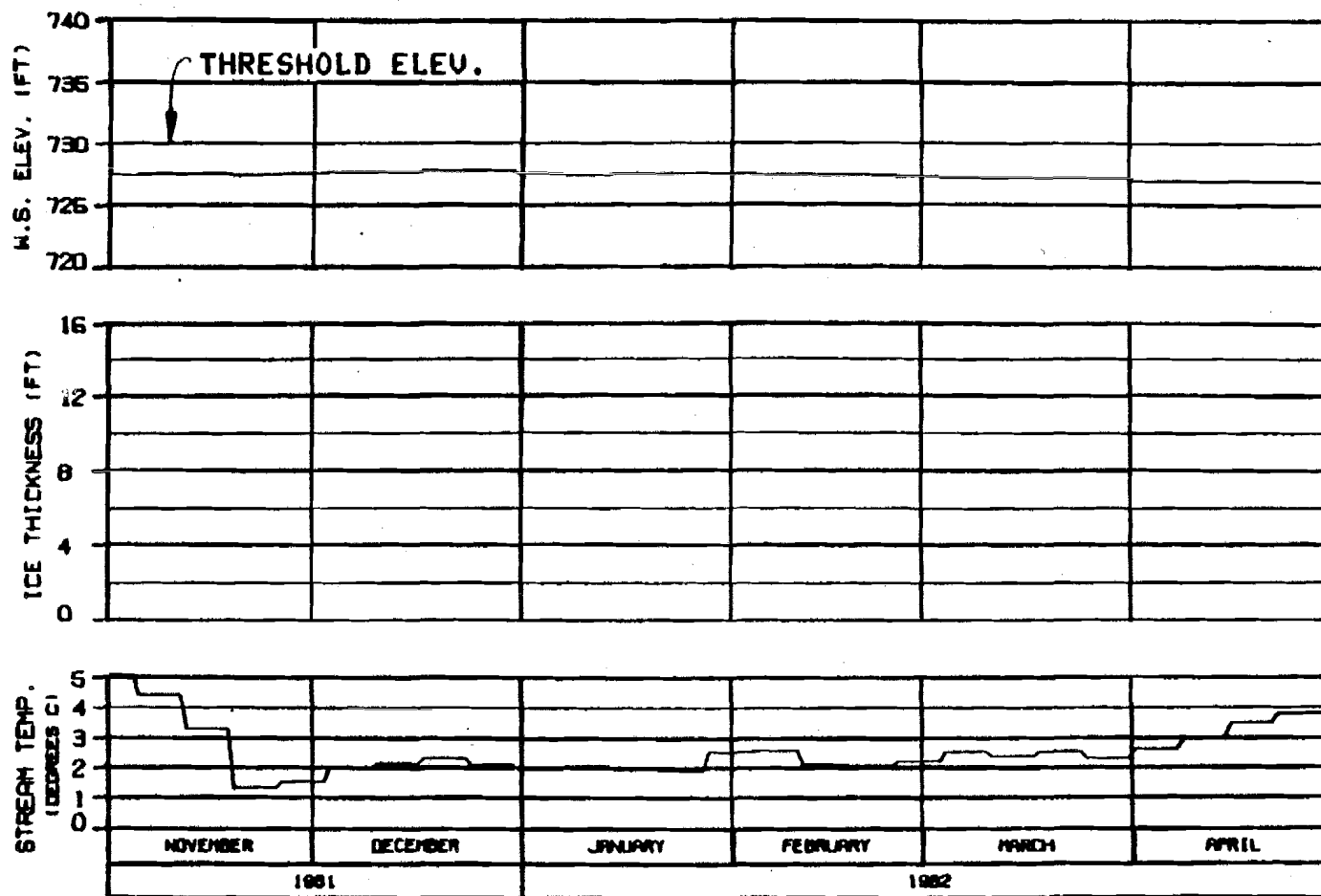
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBERCO JOINT VENTURE

DESIGN: B.L. BROWN 30 JAN 84 1000.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 81020NA

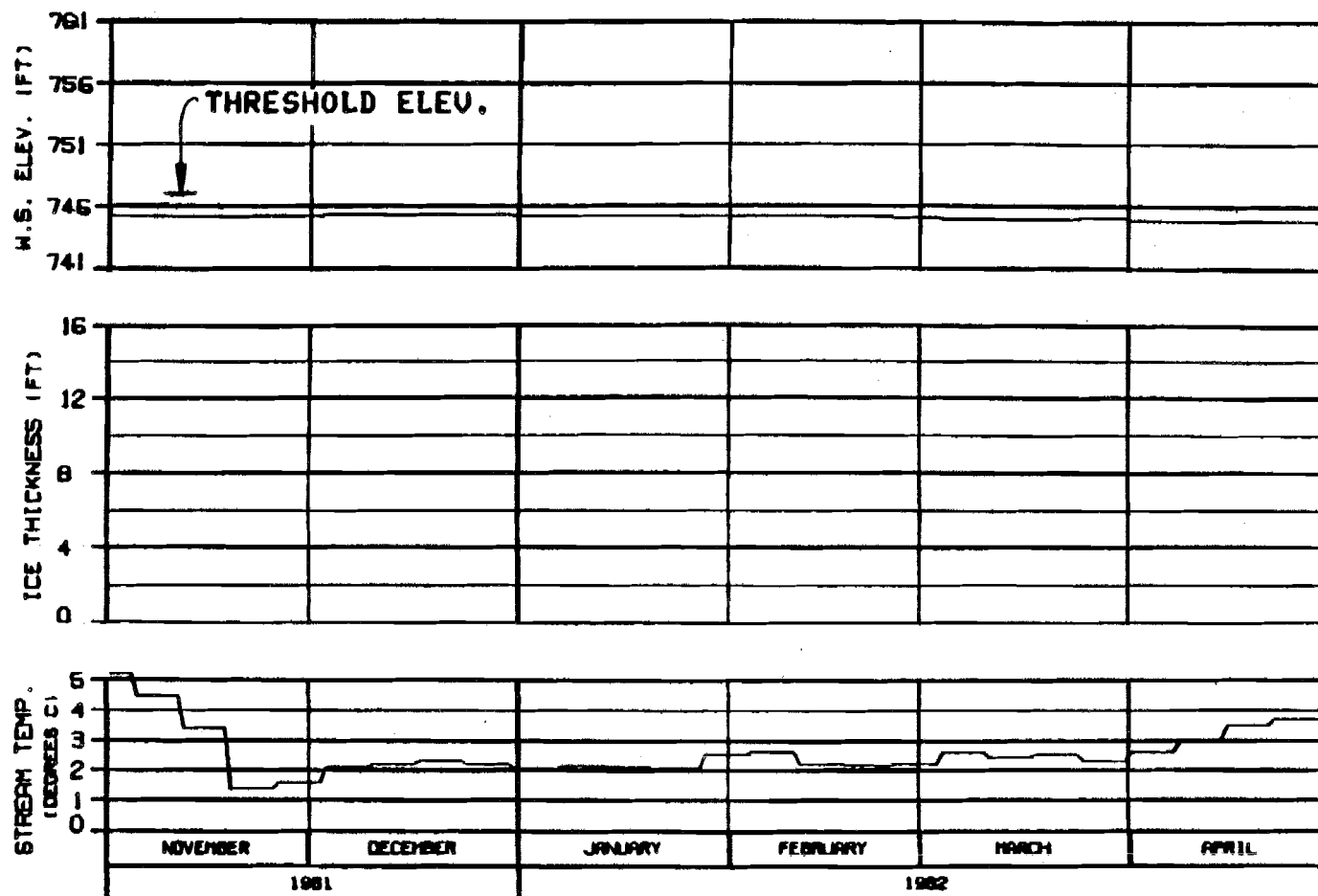
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGN: SL-2005 25 JAN 82 1982.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8102CNA

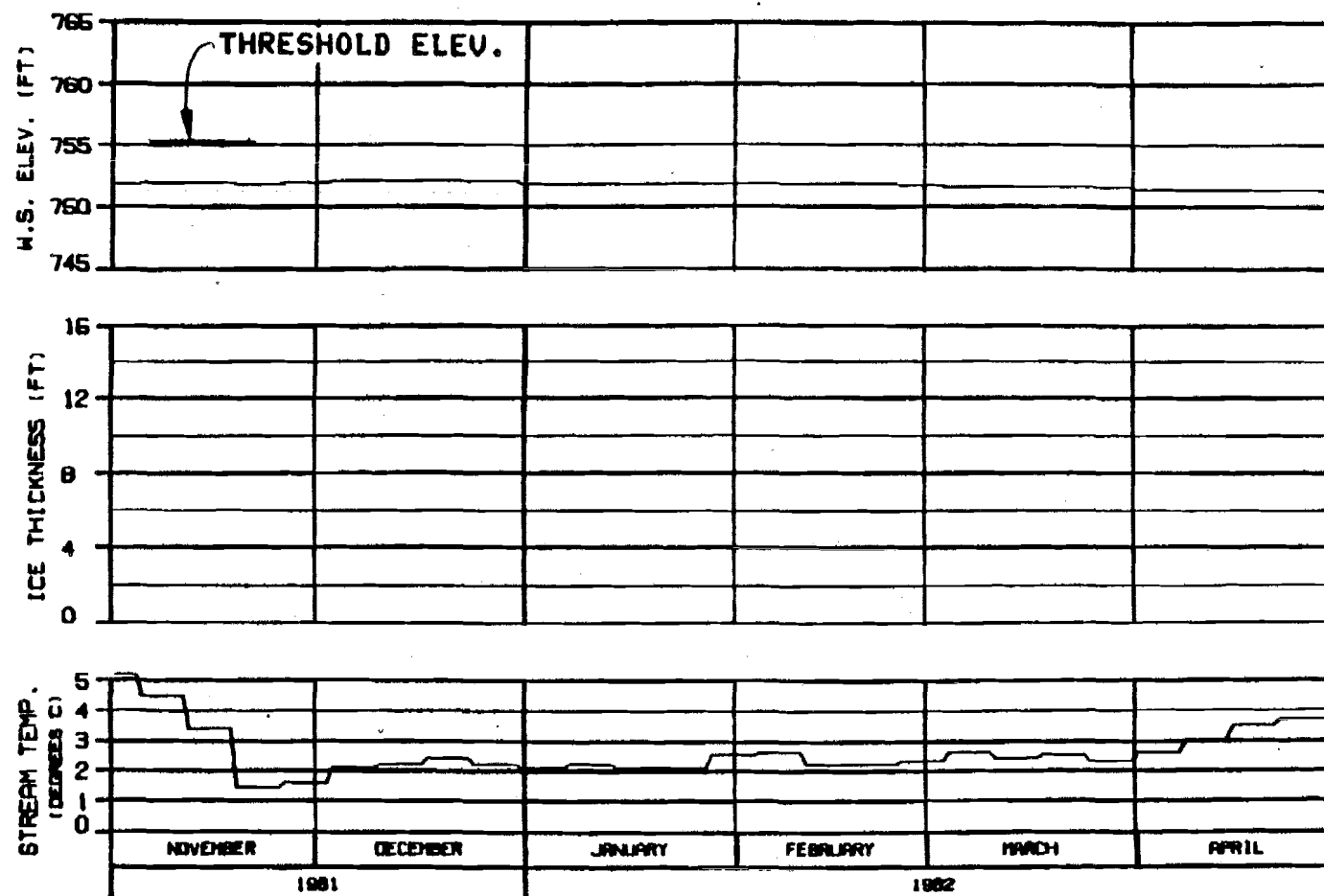
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGN: ALASKA POWER AUTHORITY 30 JAN 82 1982.142



# HEAD OF SLOUGH 21 RIVER MILE : 142.20

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8102CNA

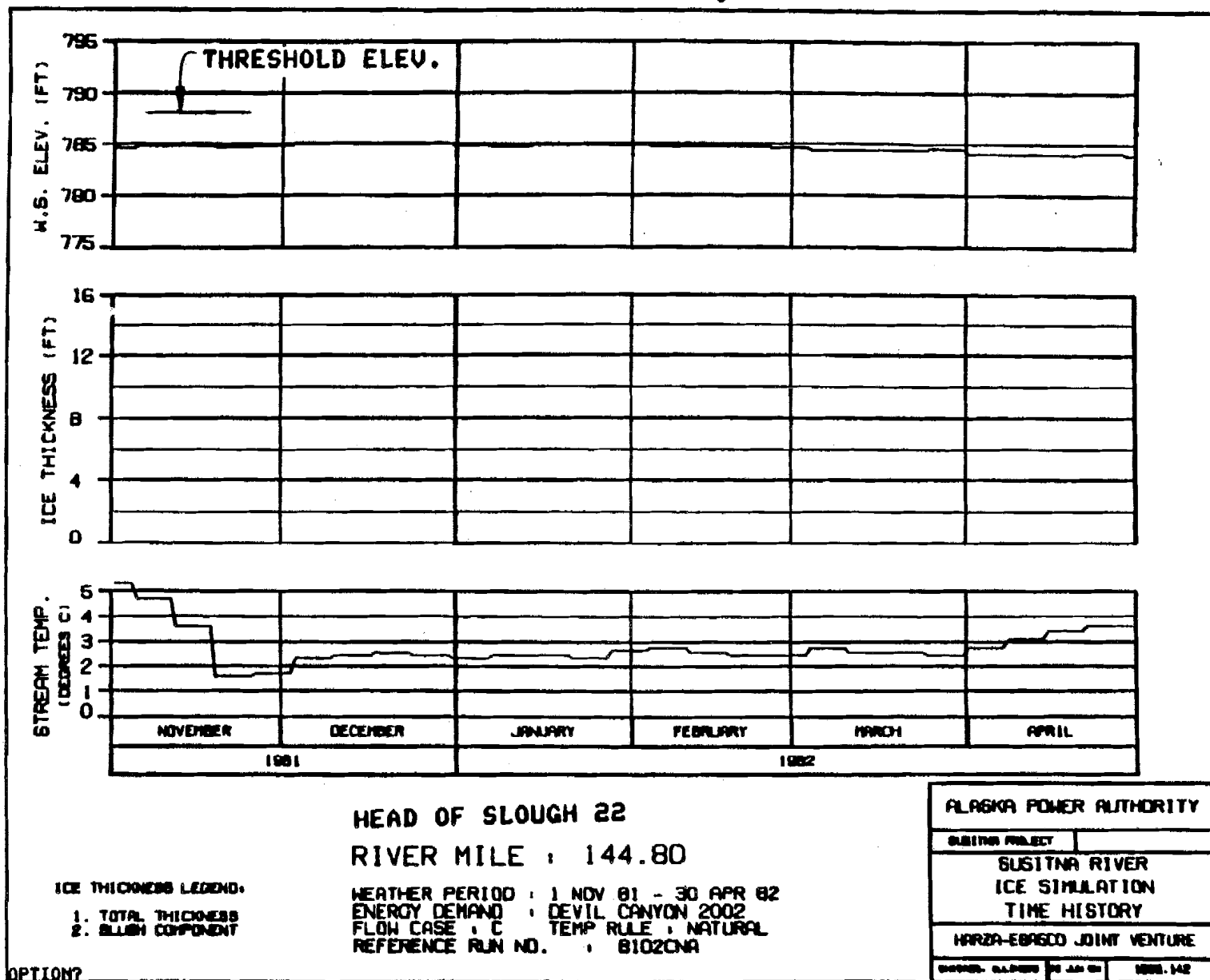
ALASKA POWER AUTHORITY

SUSITNA PROJECT

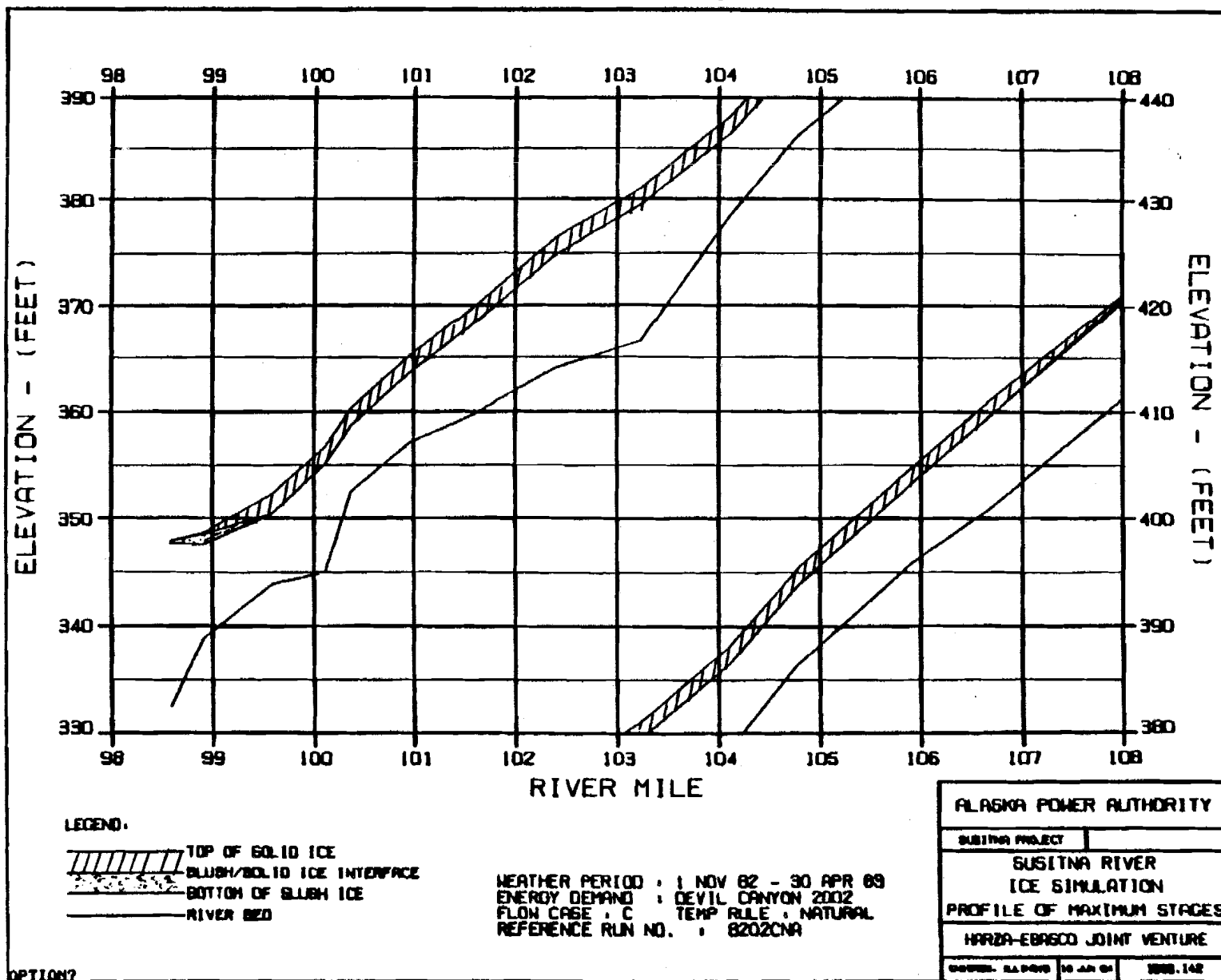
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBASCO JOINT VENTURE

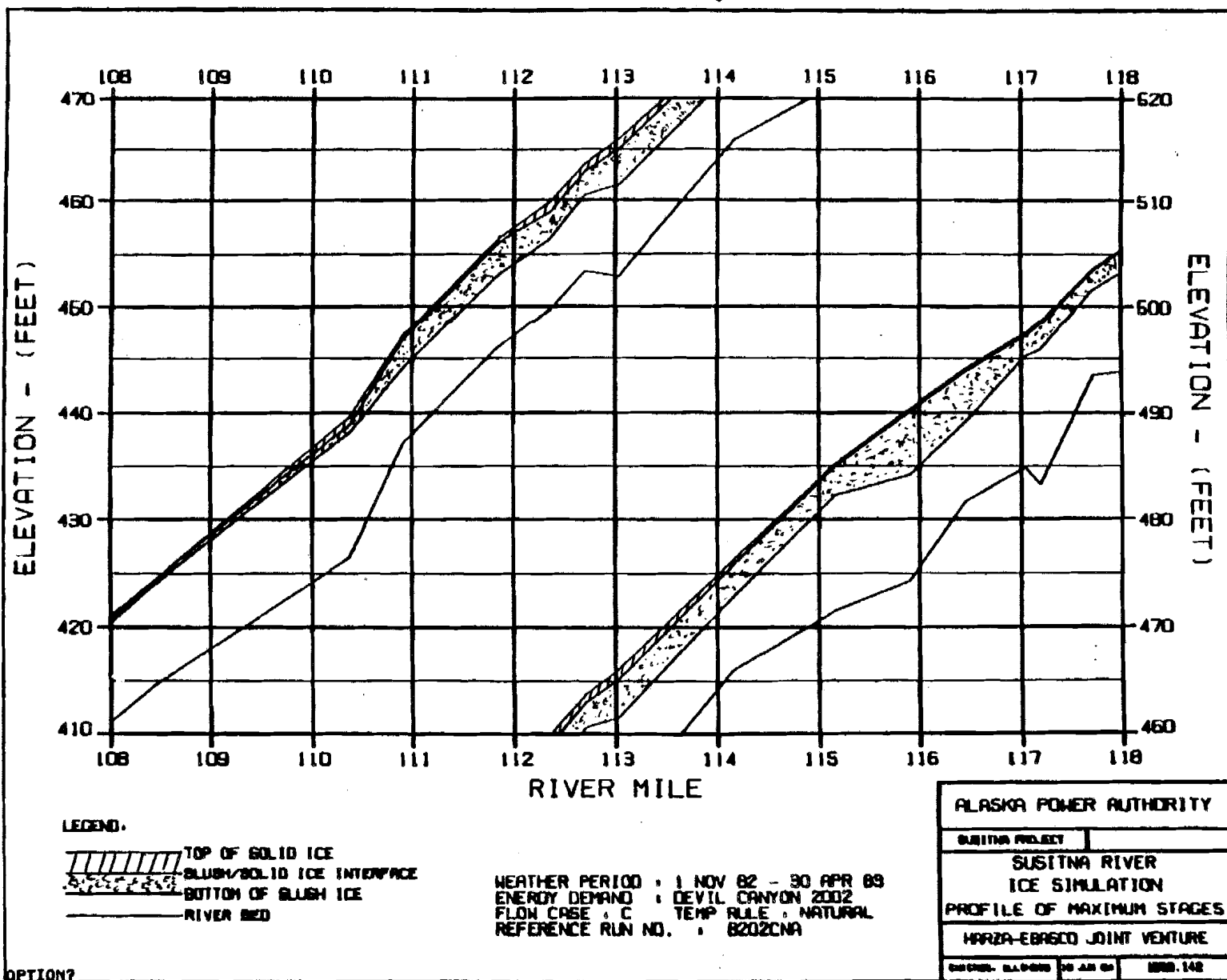
CHARTS: 81-02CNA 30 APR 82 1982-142

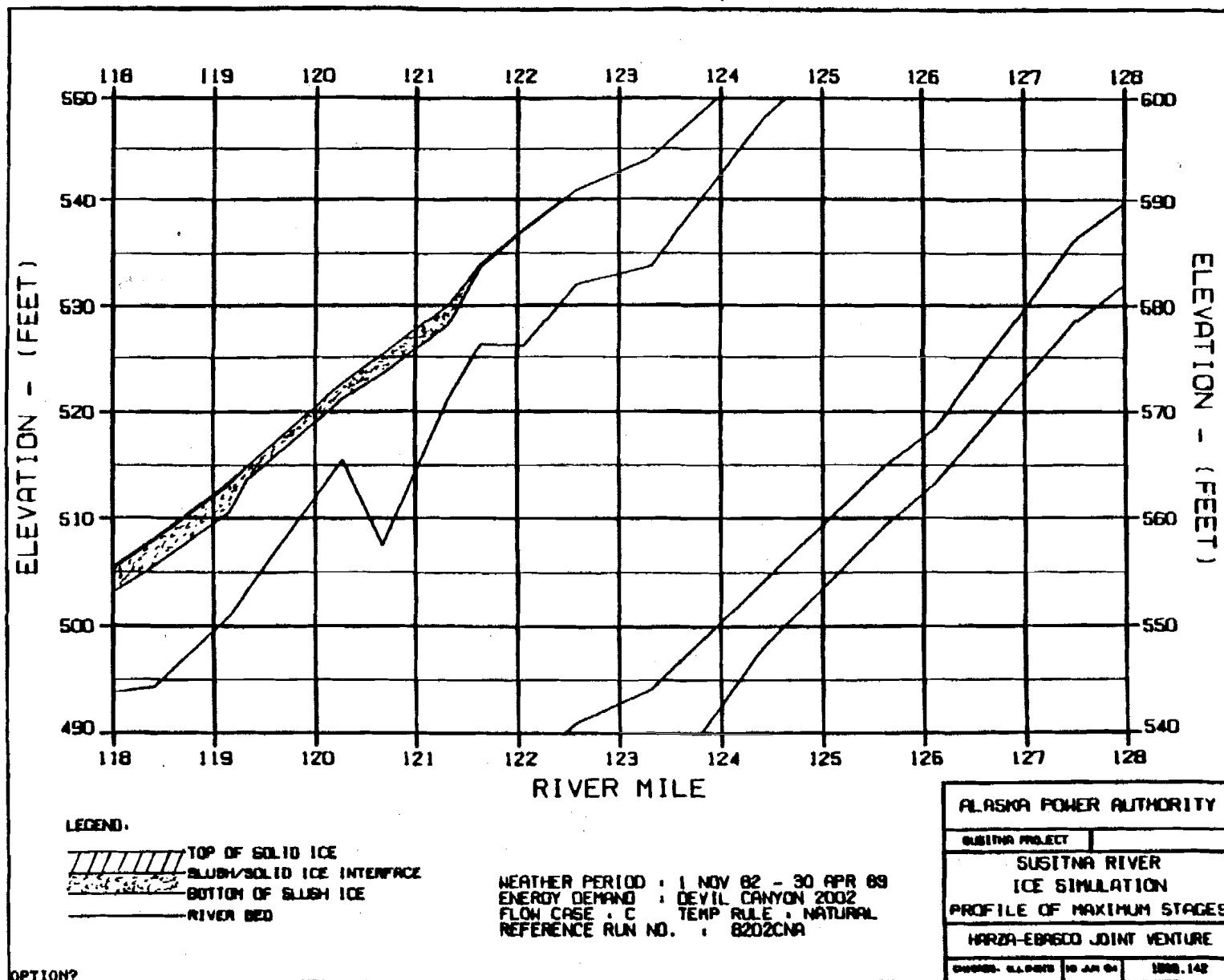


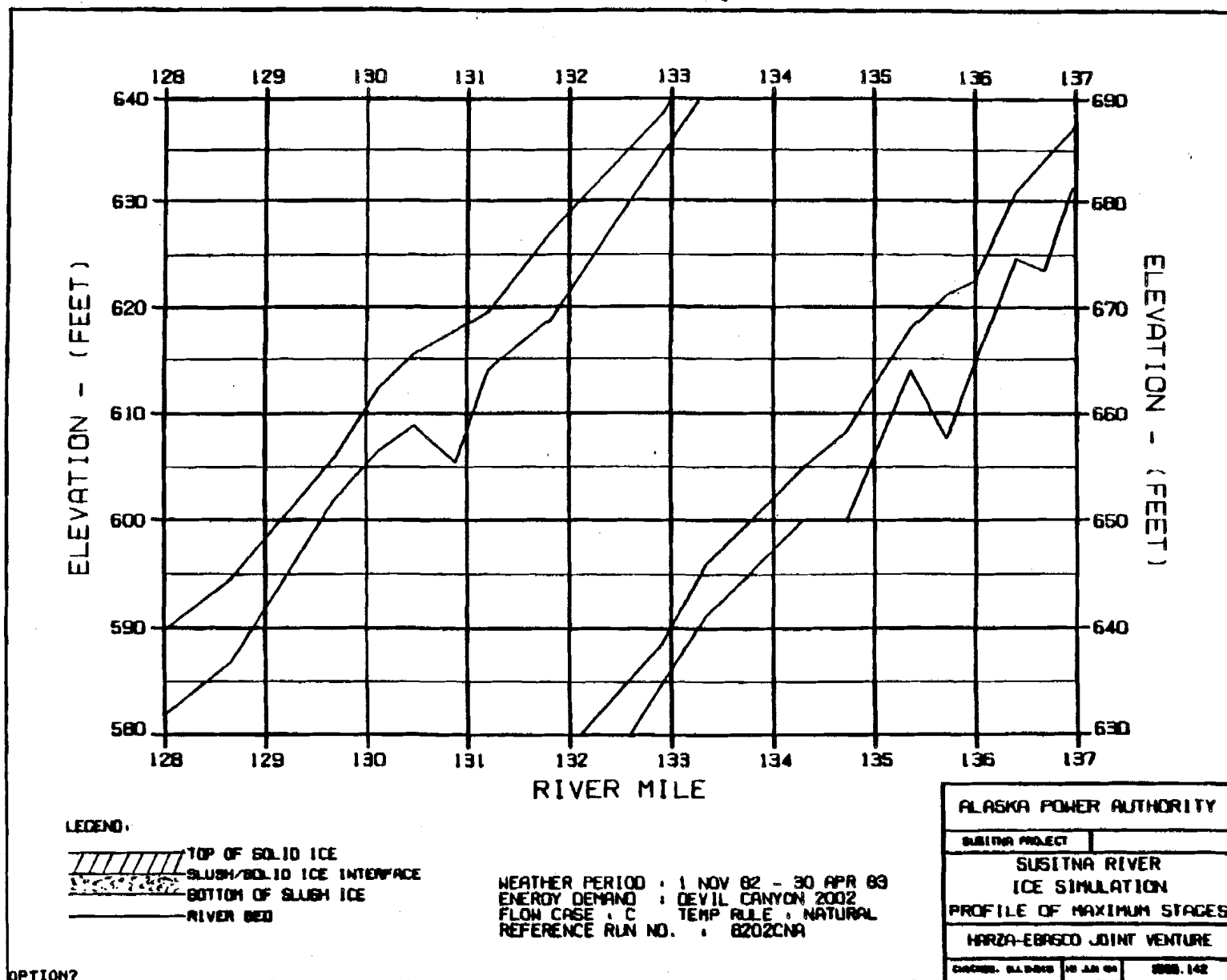
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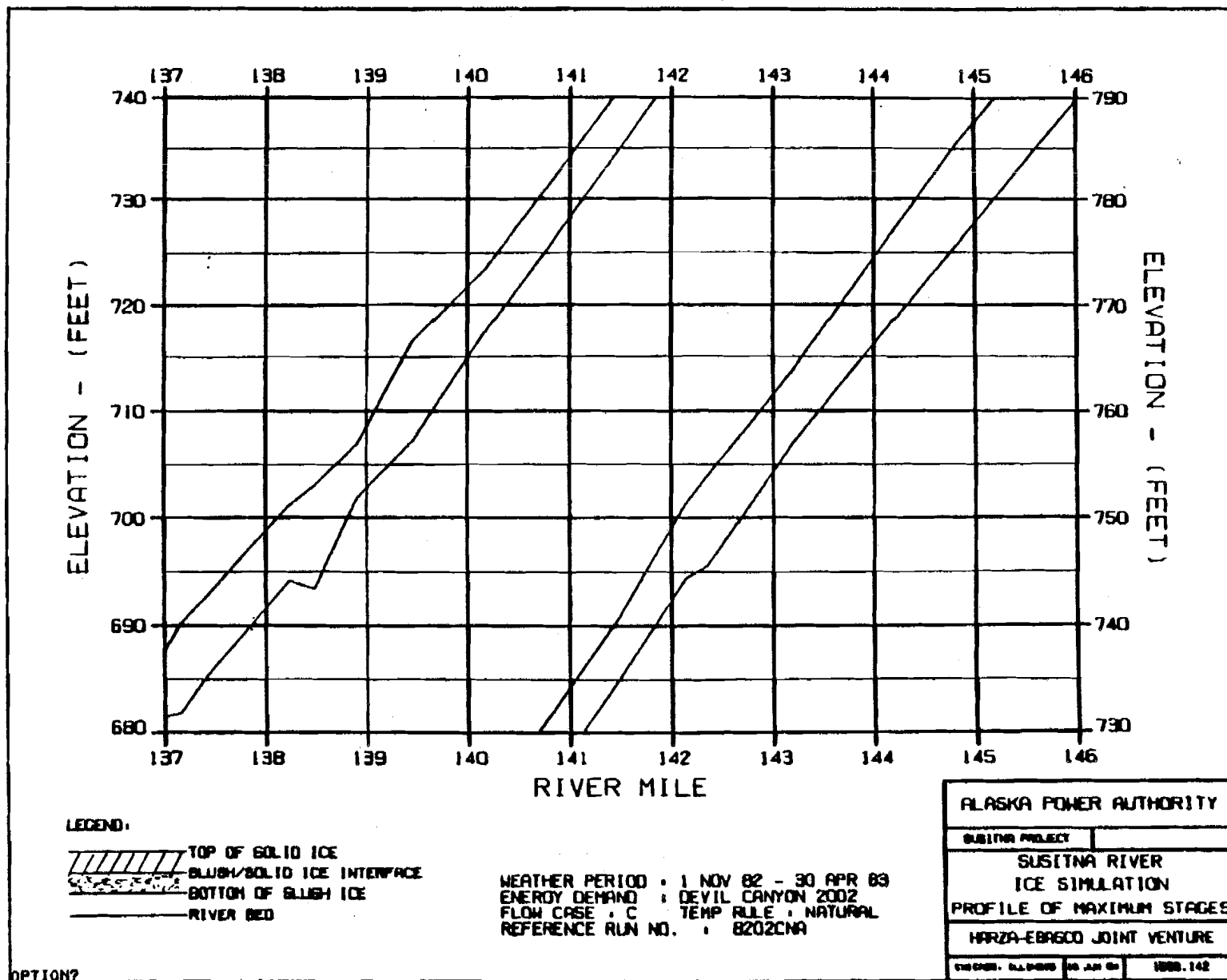


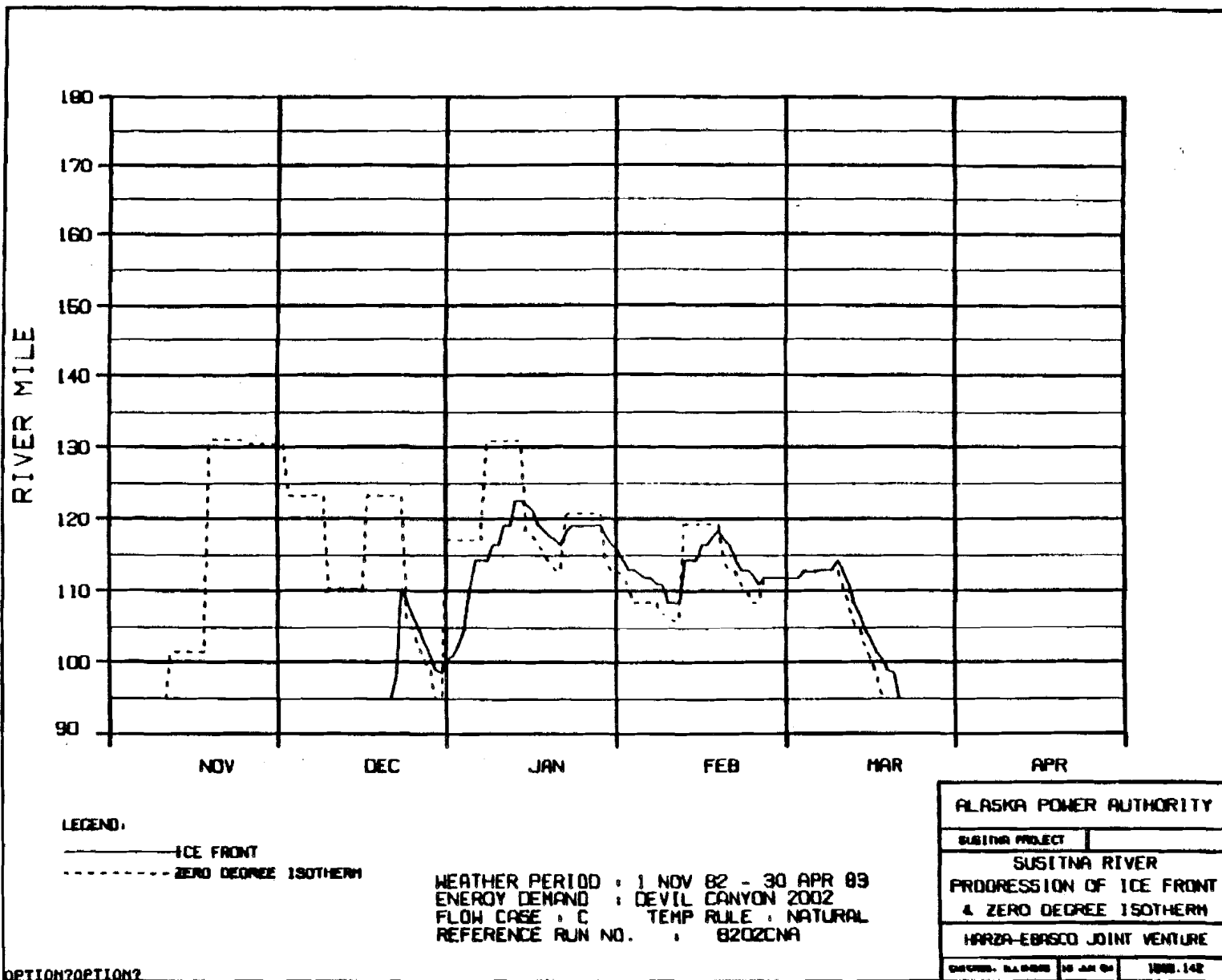


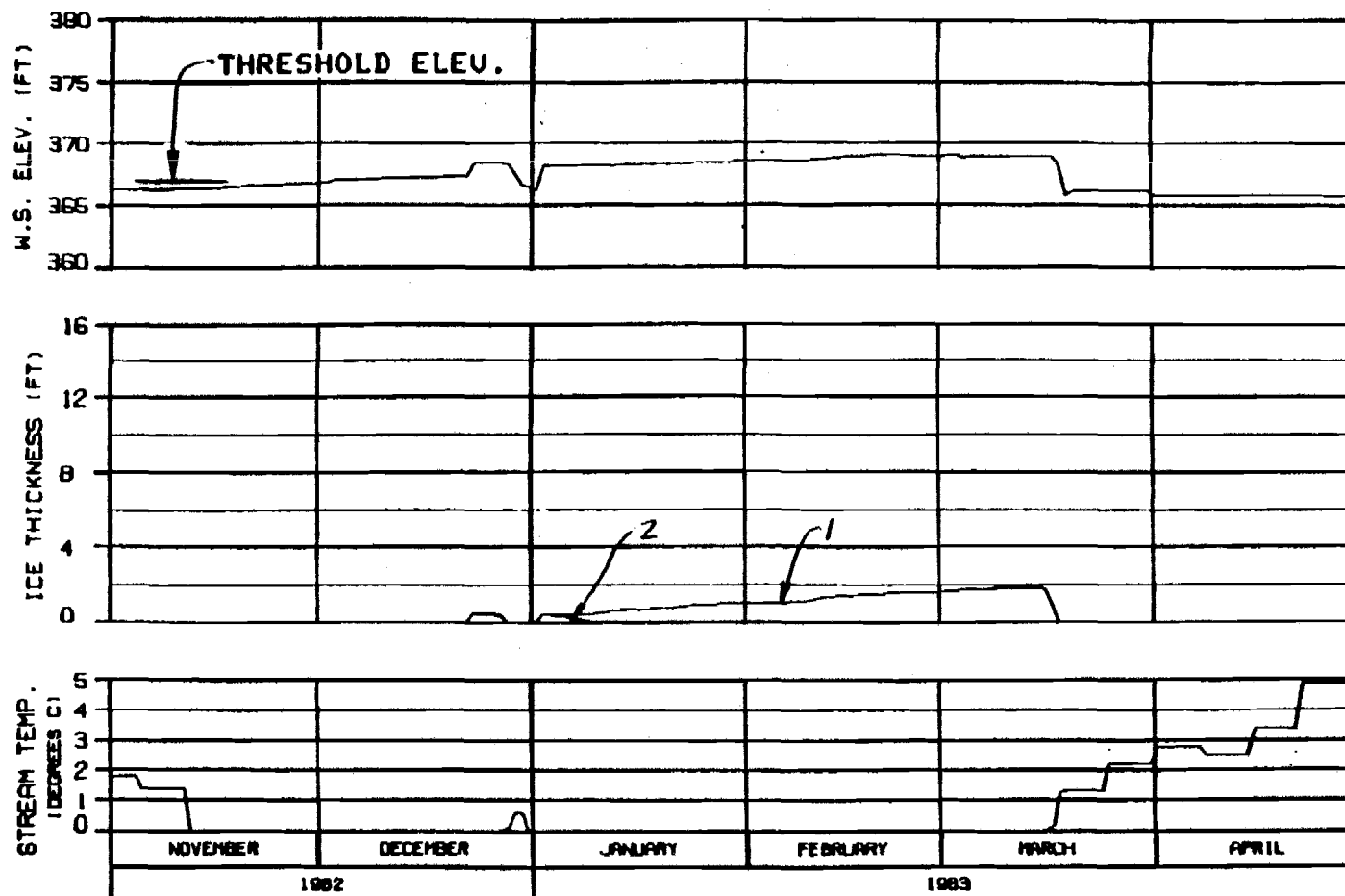












# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : B202CNA

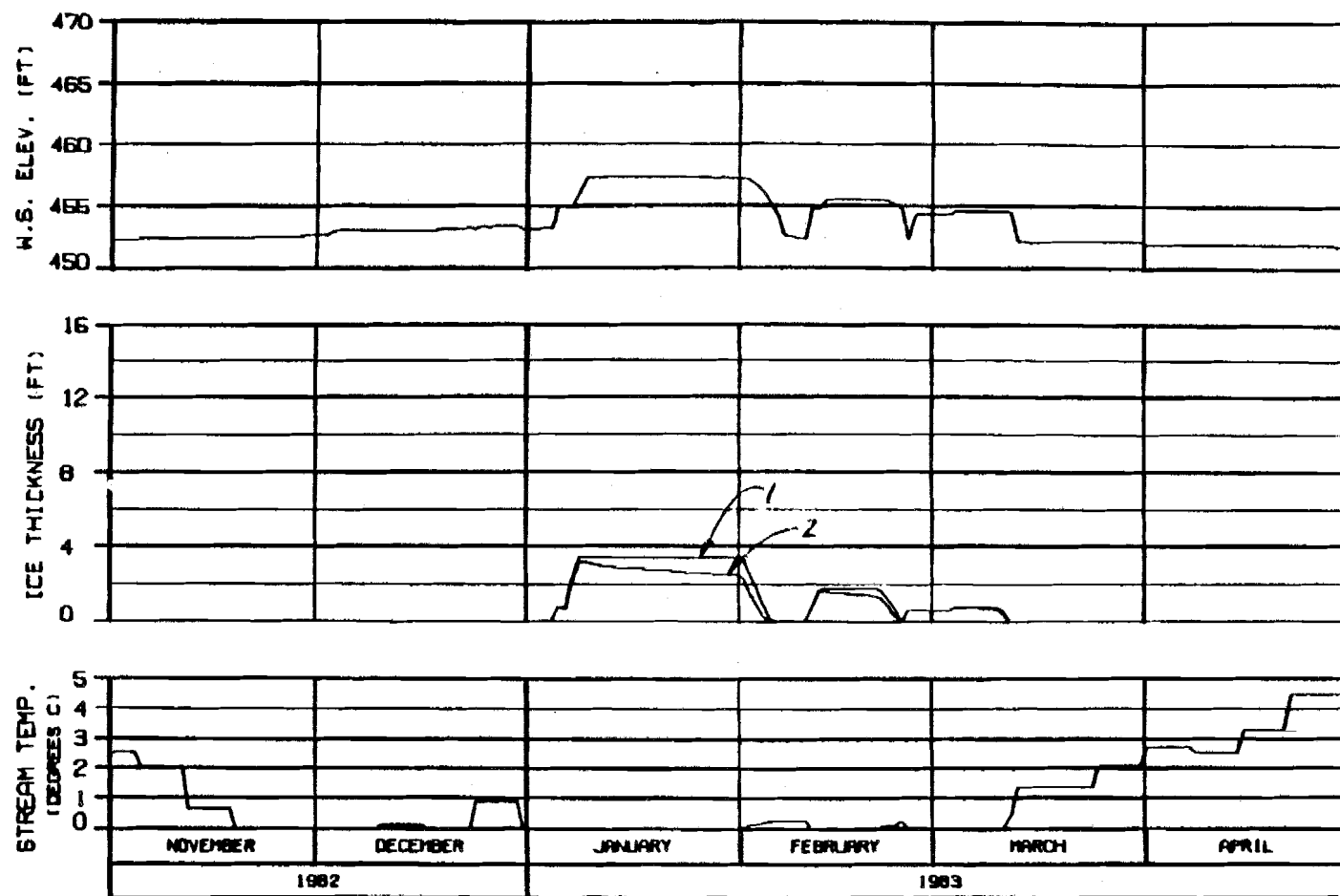
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCD JOINT VENTURE

SHEET: 142 OF 142



**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

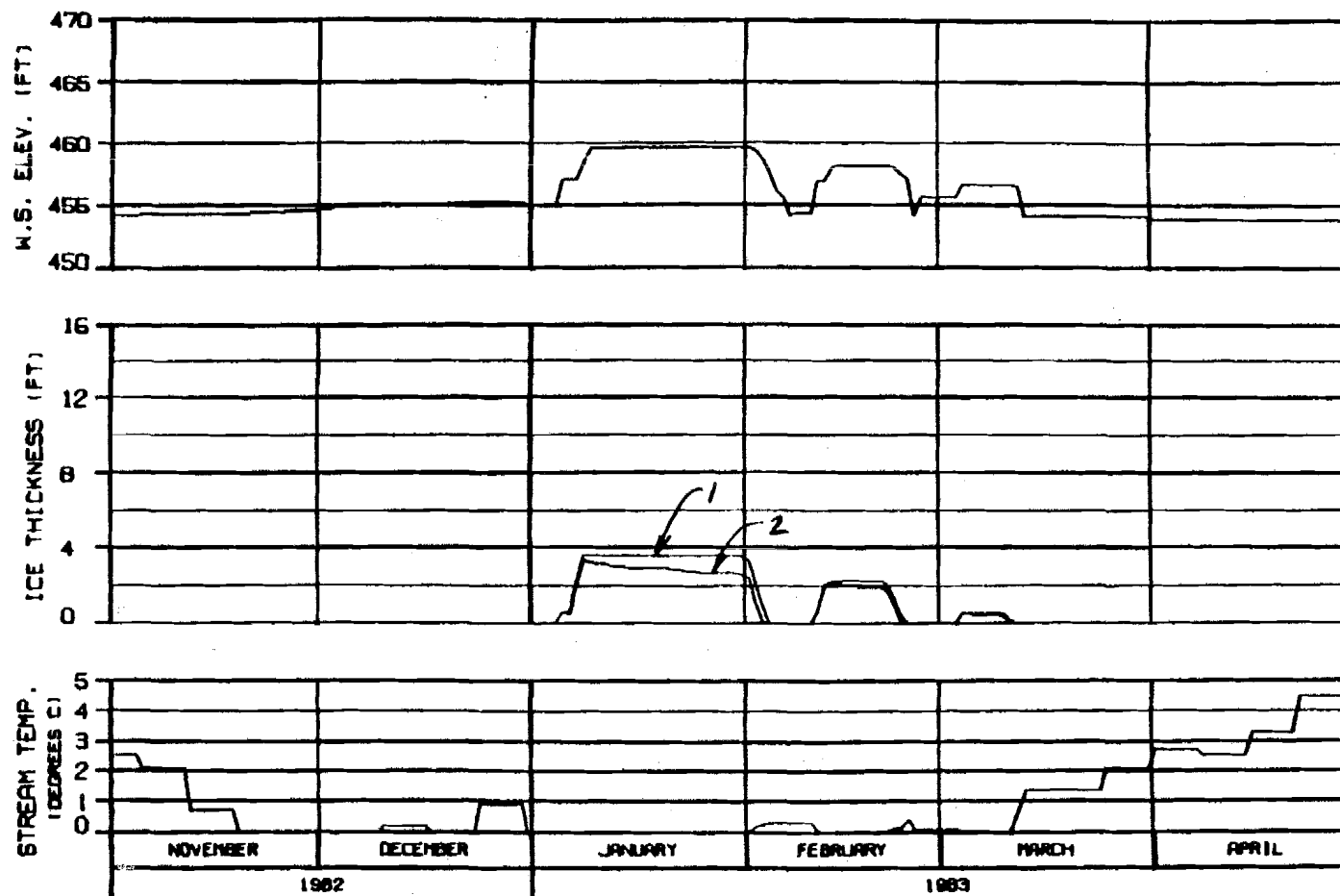
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

CHARTS - ALP 800 30 JAN 83 1000.142



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY

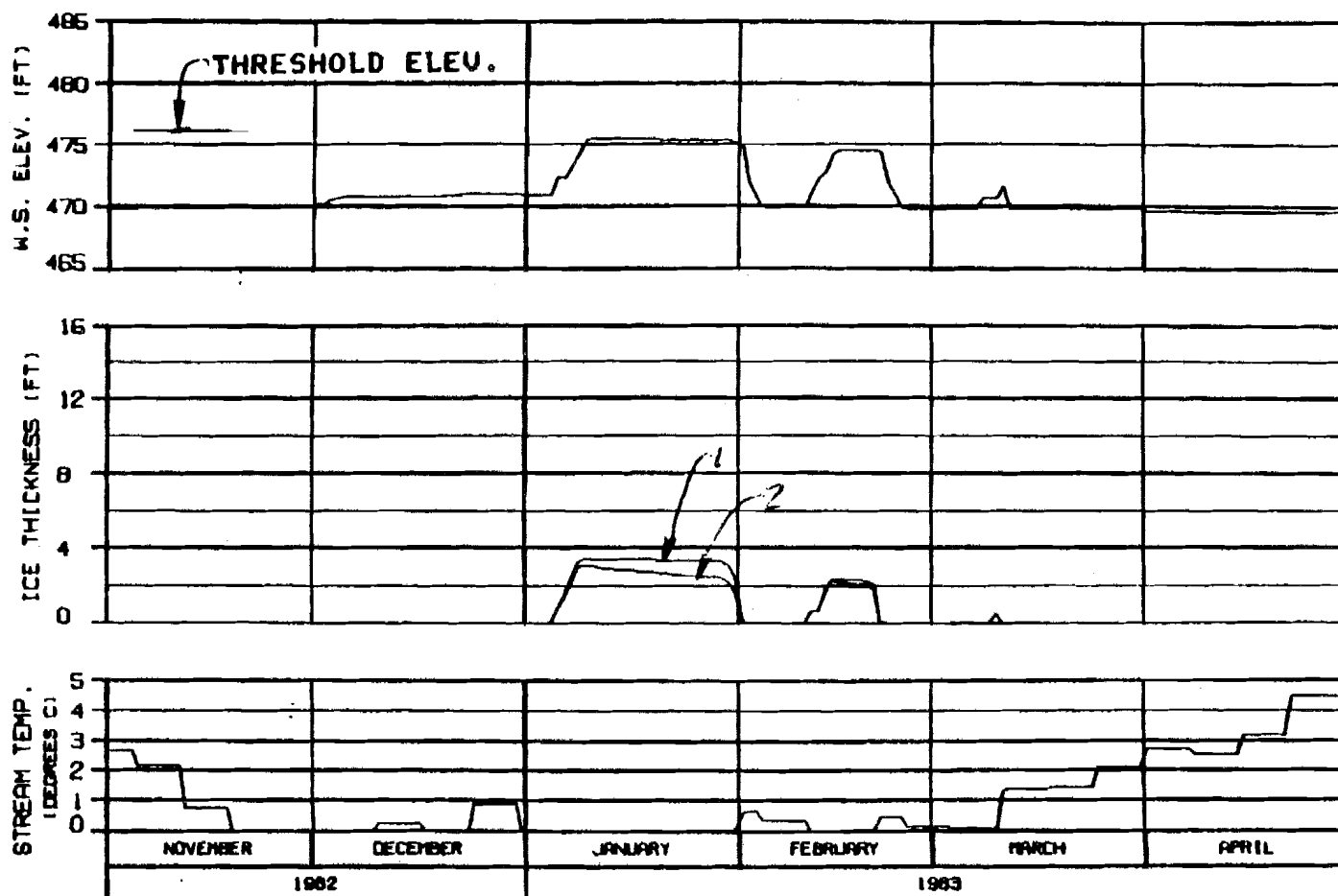
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

CHARTS: SL-1000 10 JAN 84 0000-142





HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 82020NA

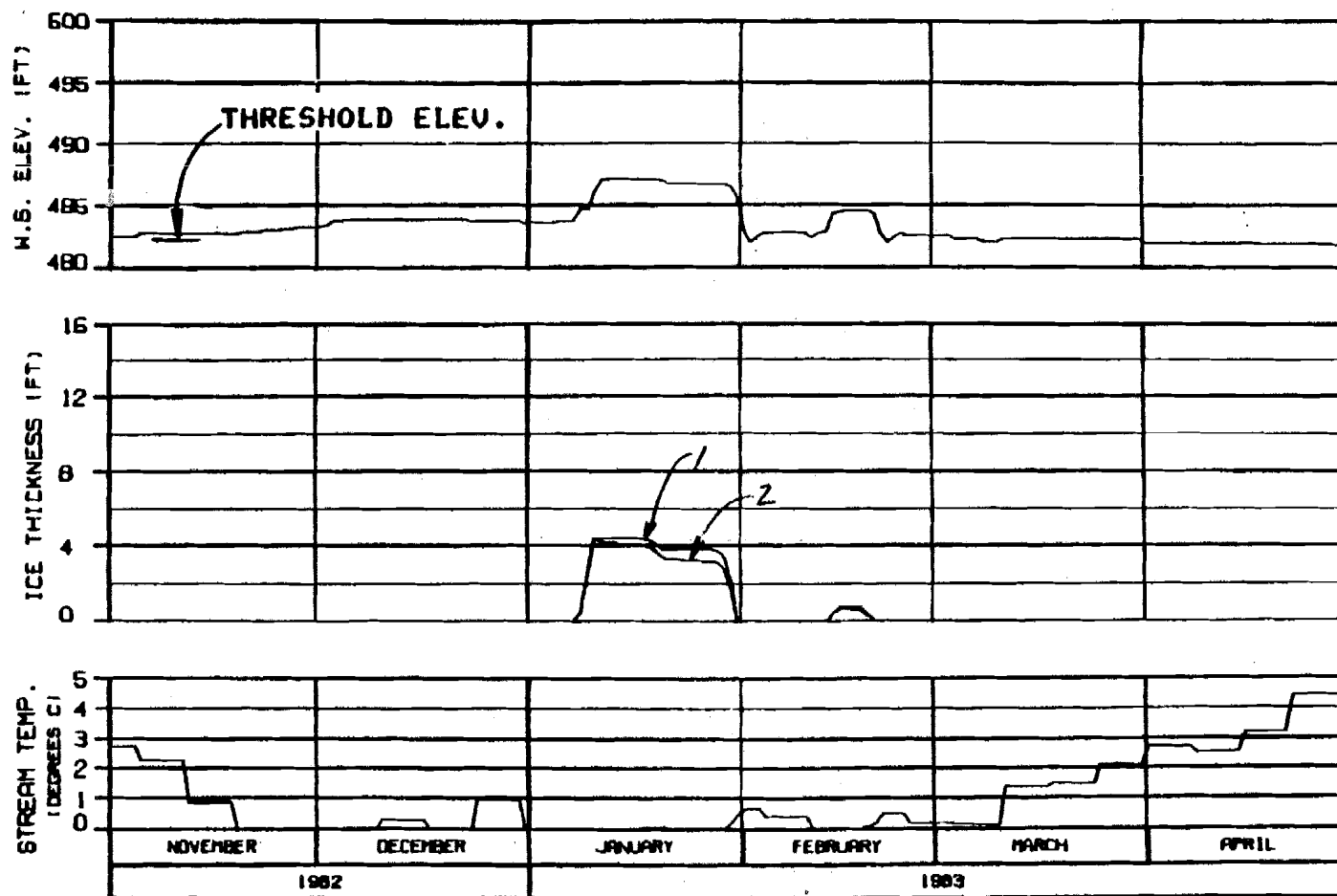
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DISTRICT: SLEP-875 00 JAN 84 1000.142

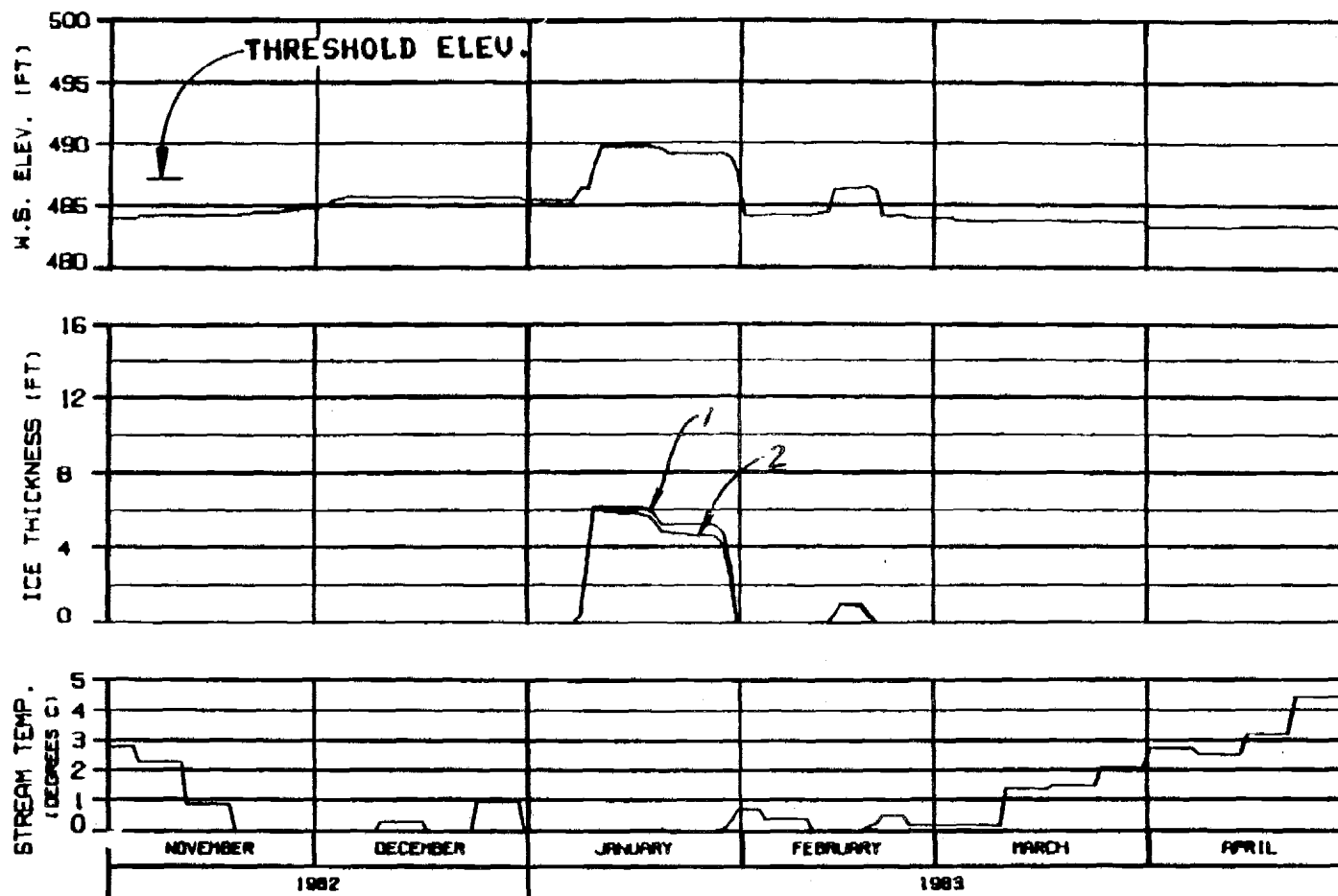


**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

ICE THICKNESS LEGEND:  
 1. TOTAL THICKNESS  
 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
WARZA-EBASCO JOINT VENTURE		
CHG. NO. 82-0005	15 JAN 83	1000.142



**HEAD OF SIDE CHANNEL MSII**  
**RIVER MILE : 115.90**

**ICE THICKNESS LEGEND:**

- 1. TOTAL THICKNESS
- 2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

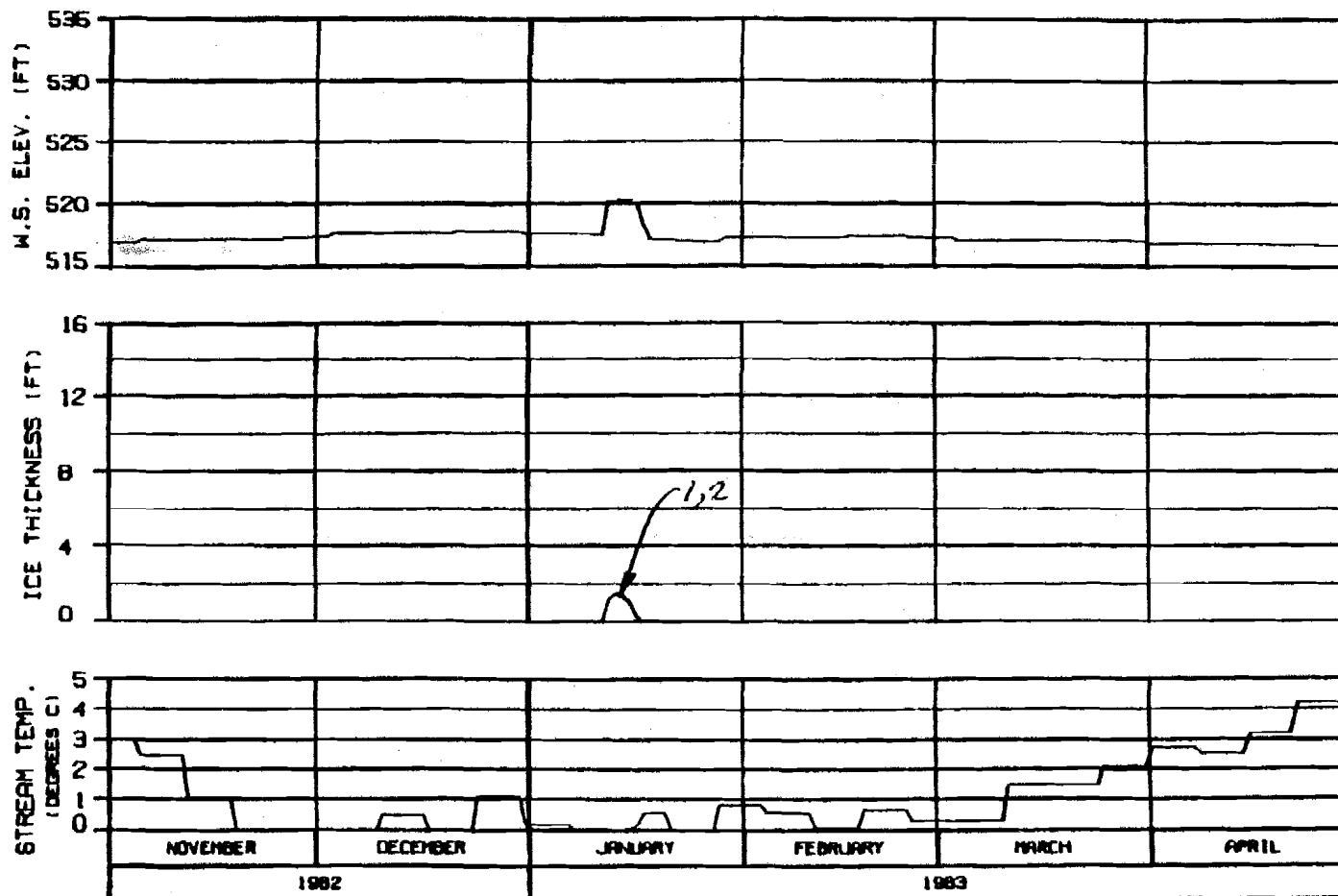
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HAZRA-EBAGCO JOINT VENTURE**

DESIGN: ELA 0001 10 JAN 84 1000.142



ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

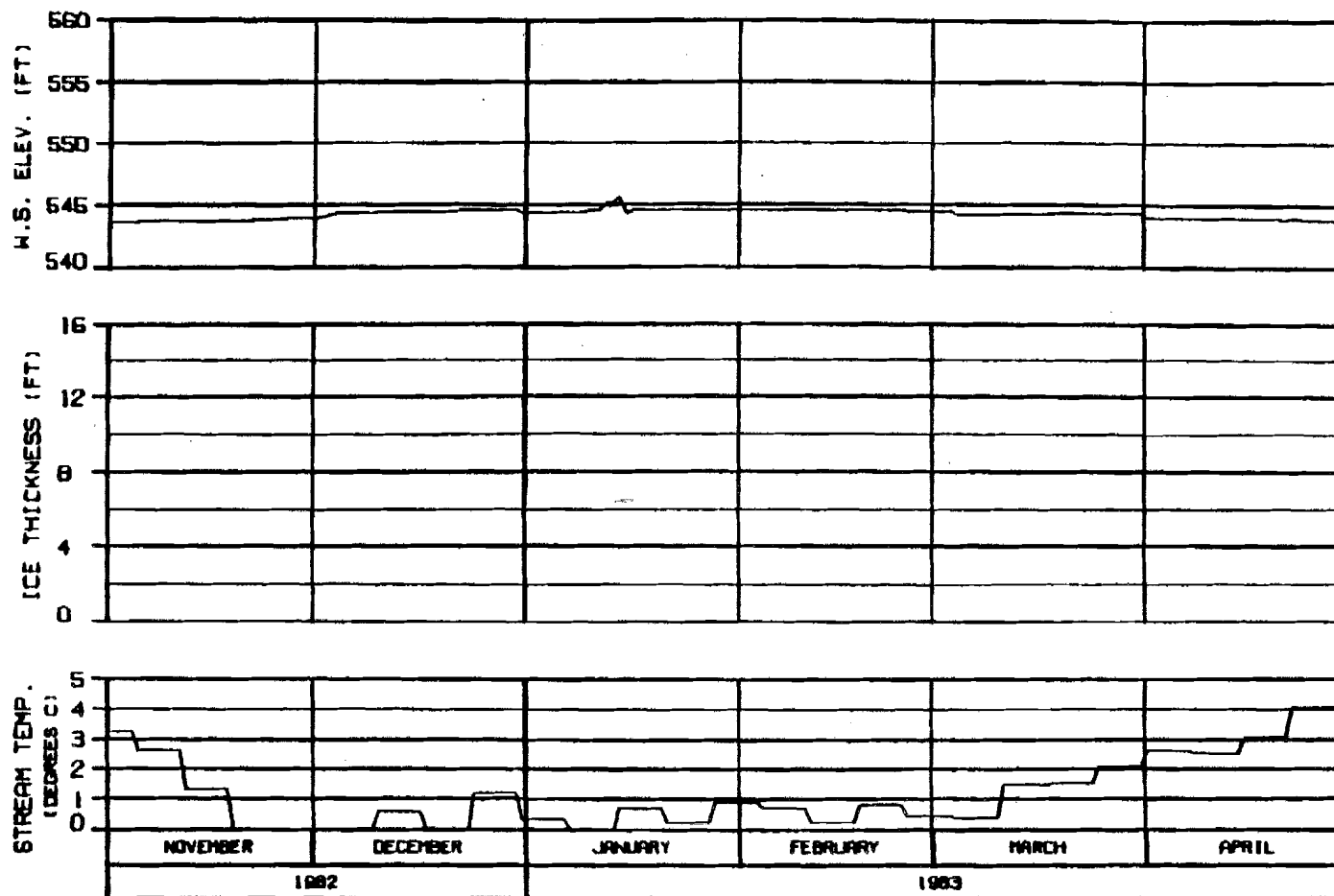
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DRAWN: SLD/000 NO JAN 83 1000.142



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B2D2CNA

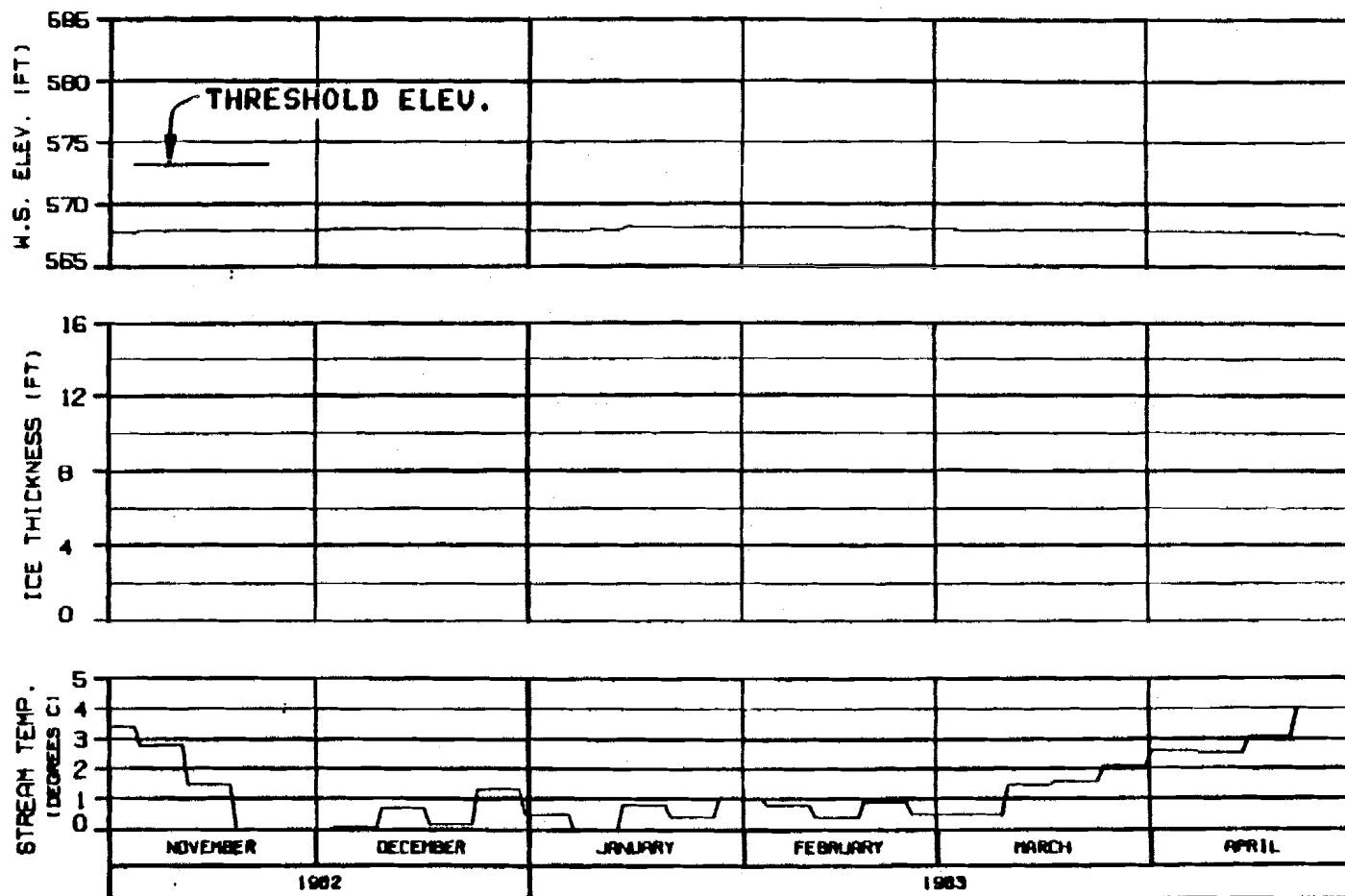
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ORDER: 44-0000 10 JAN 83 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

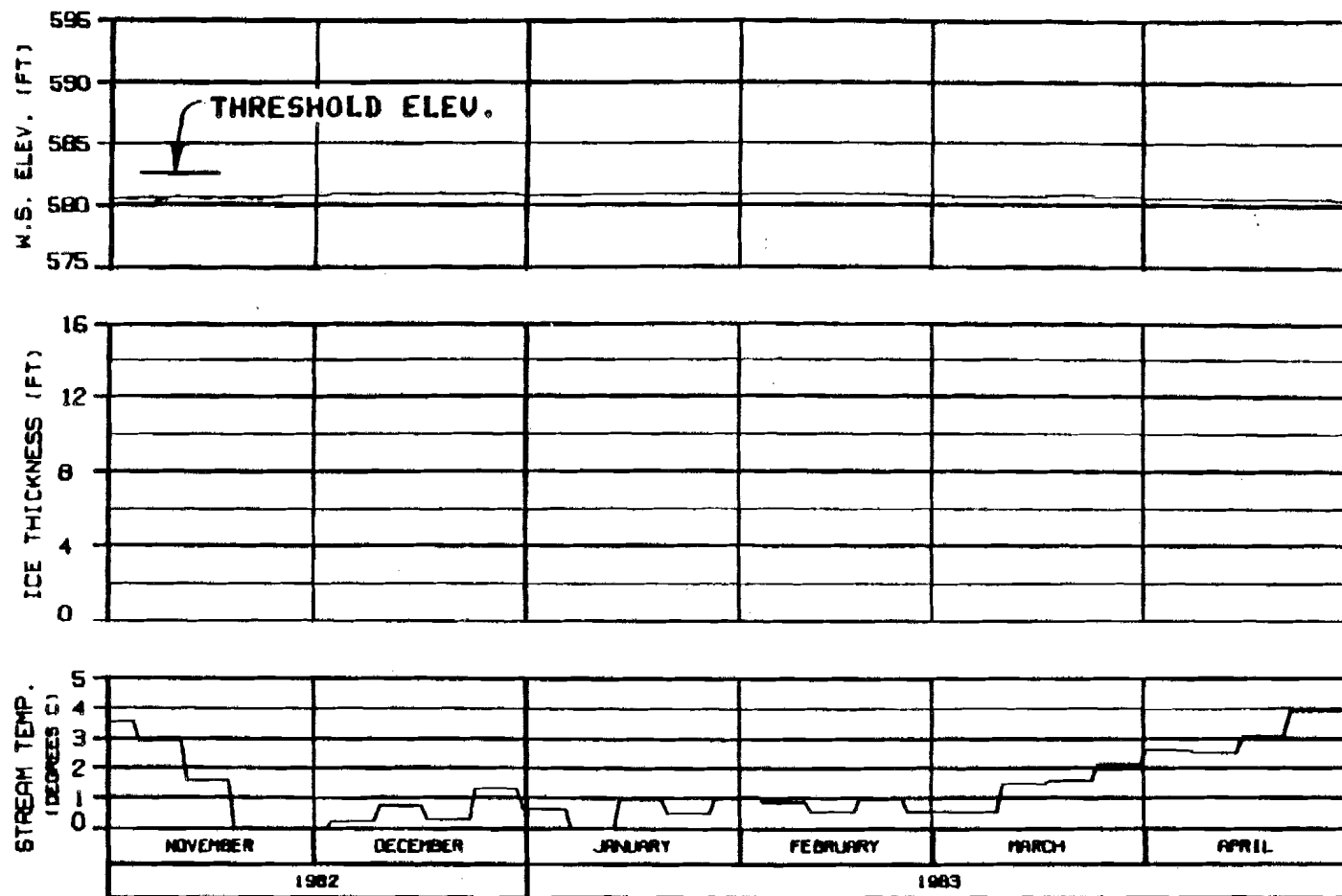
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHARTED- 84-0000 30 JAN 84 1000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

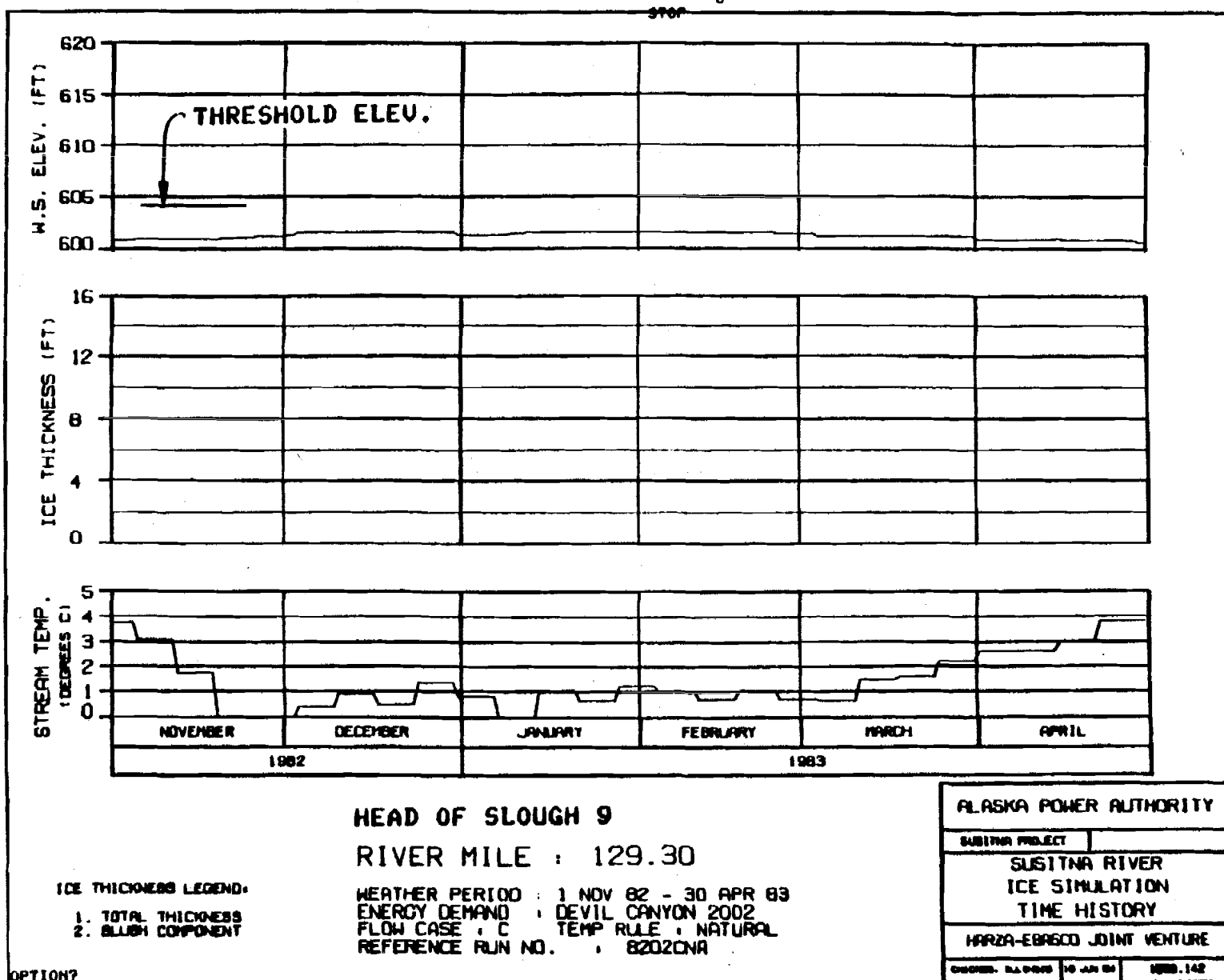
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

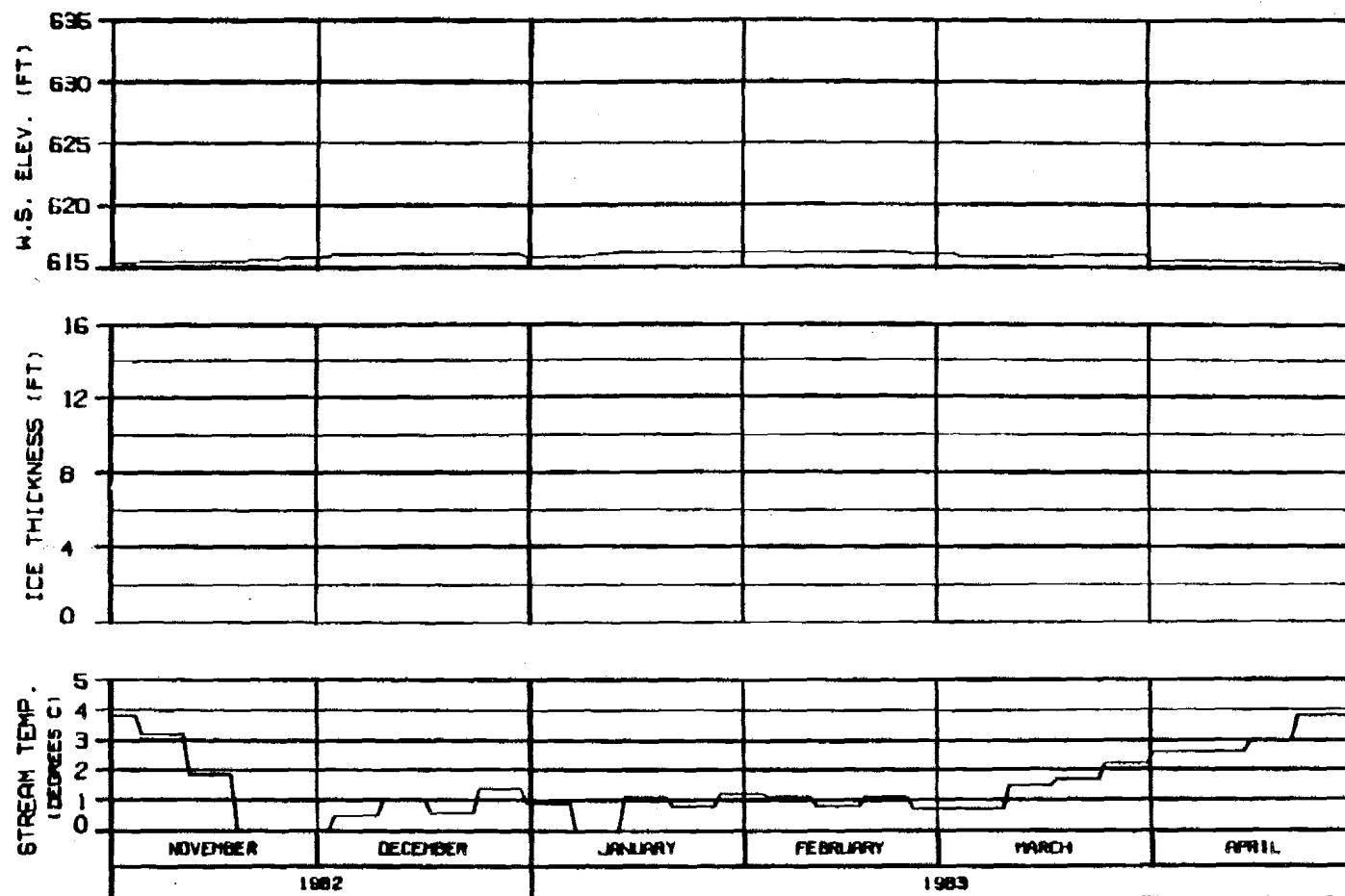
HARZA-EBASCO JOINT VENTURE

CHIEF: B. L. BROWN 10 JAN 84 1000.142





OPTION?



**SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUGH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 82020NA

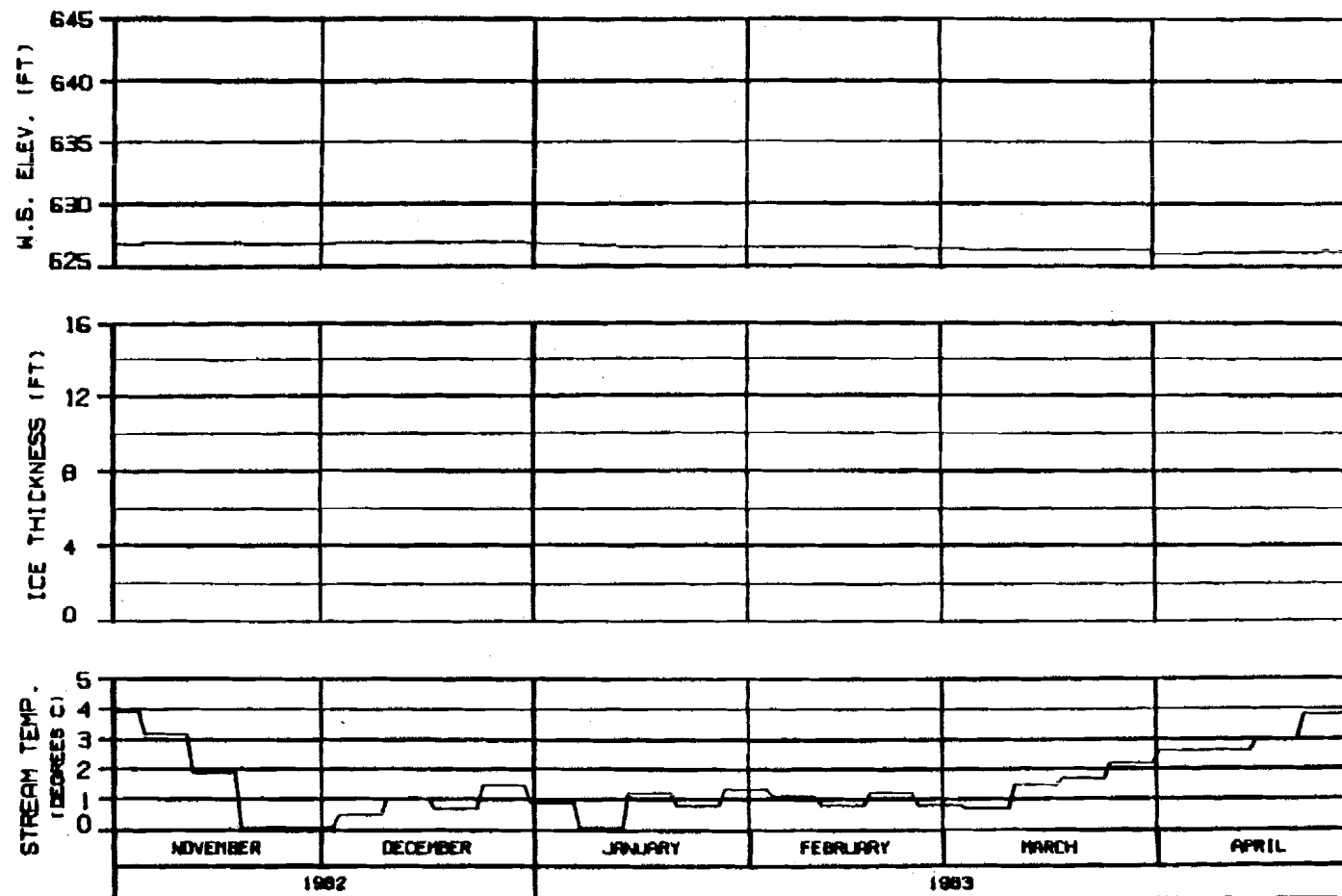
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBERCO JOINT VENTURE**

CHIEF: R. L. PERRY 30 APR 83 1000.142



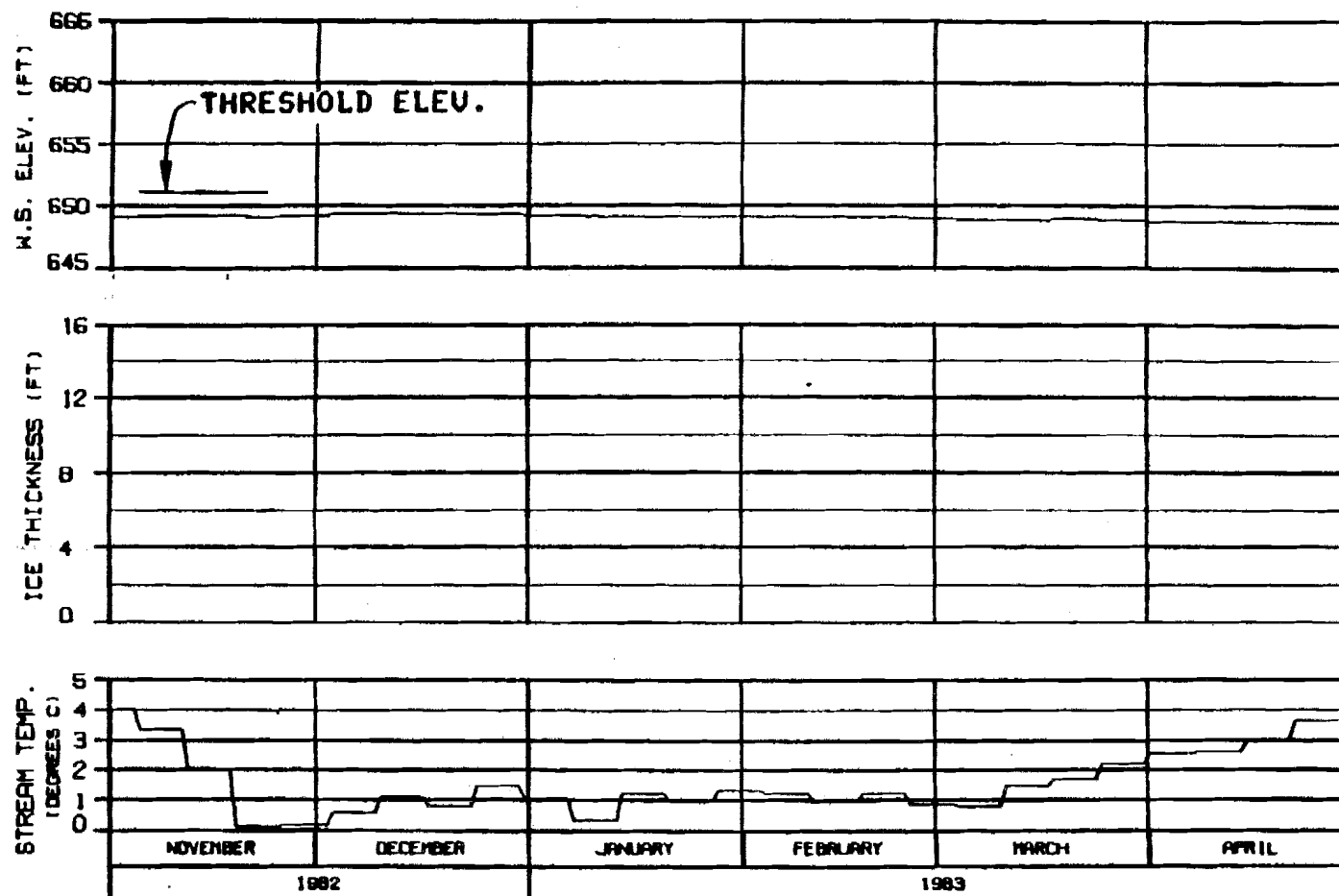
**SIDE CHANNEL U/S OF 4TH JULY CREEK**  
**RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
WARZA-EBASCO JOINT VENTURE		
DESIGN: 82-0000	15 JAN 83	1000.142



# HEAD OF SLOUGH 9A RIVER MILE : 133.70

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : B202CNA

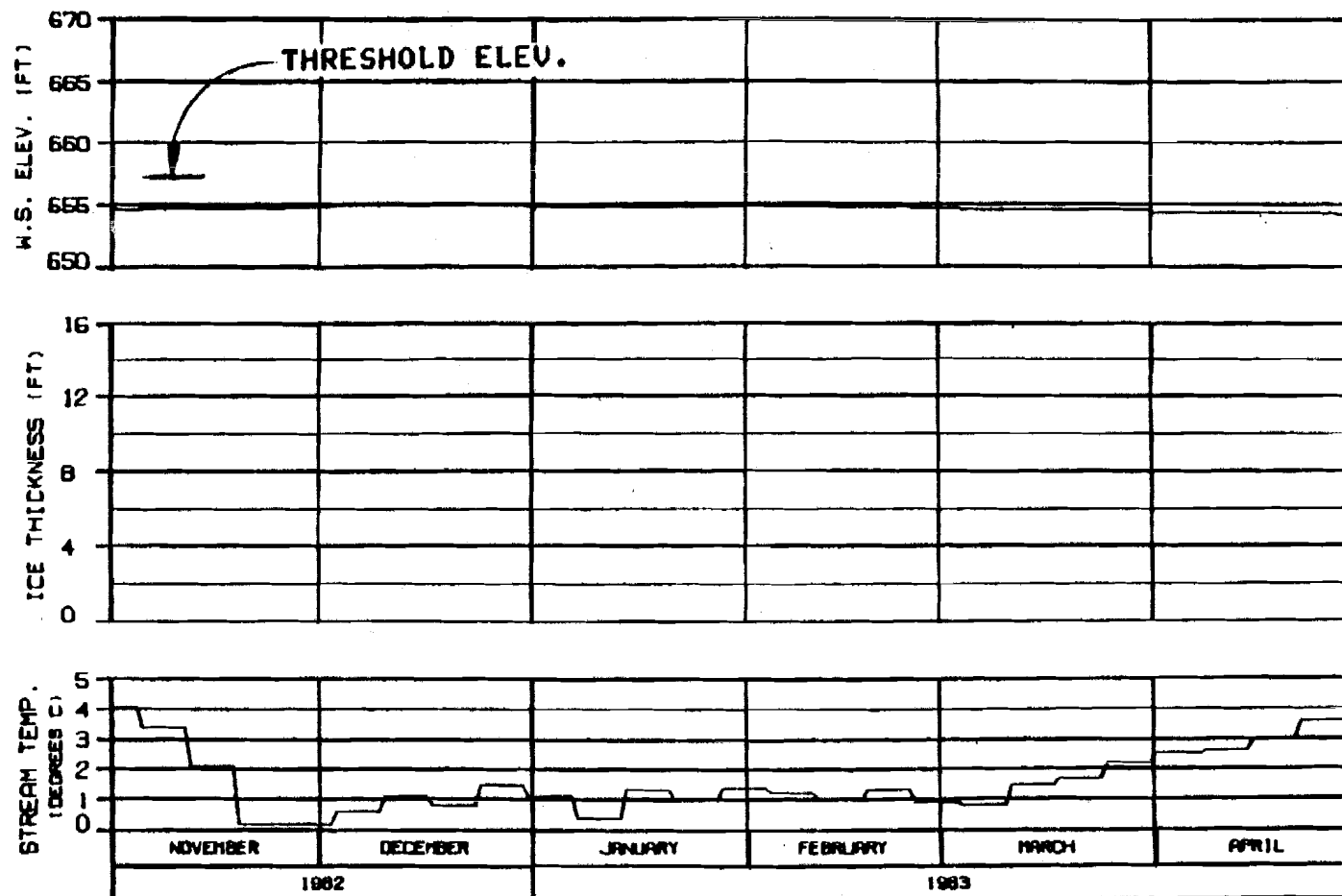
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DESIGN. BY: B. B. B. 10 JAN 84 1502.142



SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8202CNA

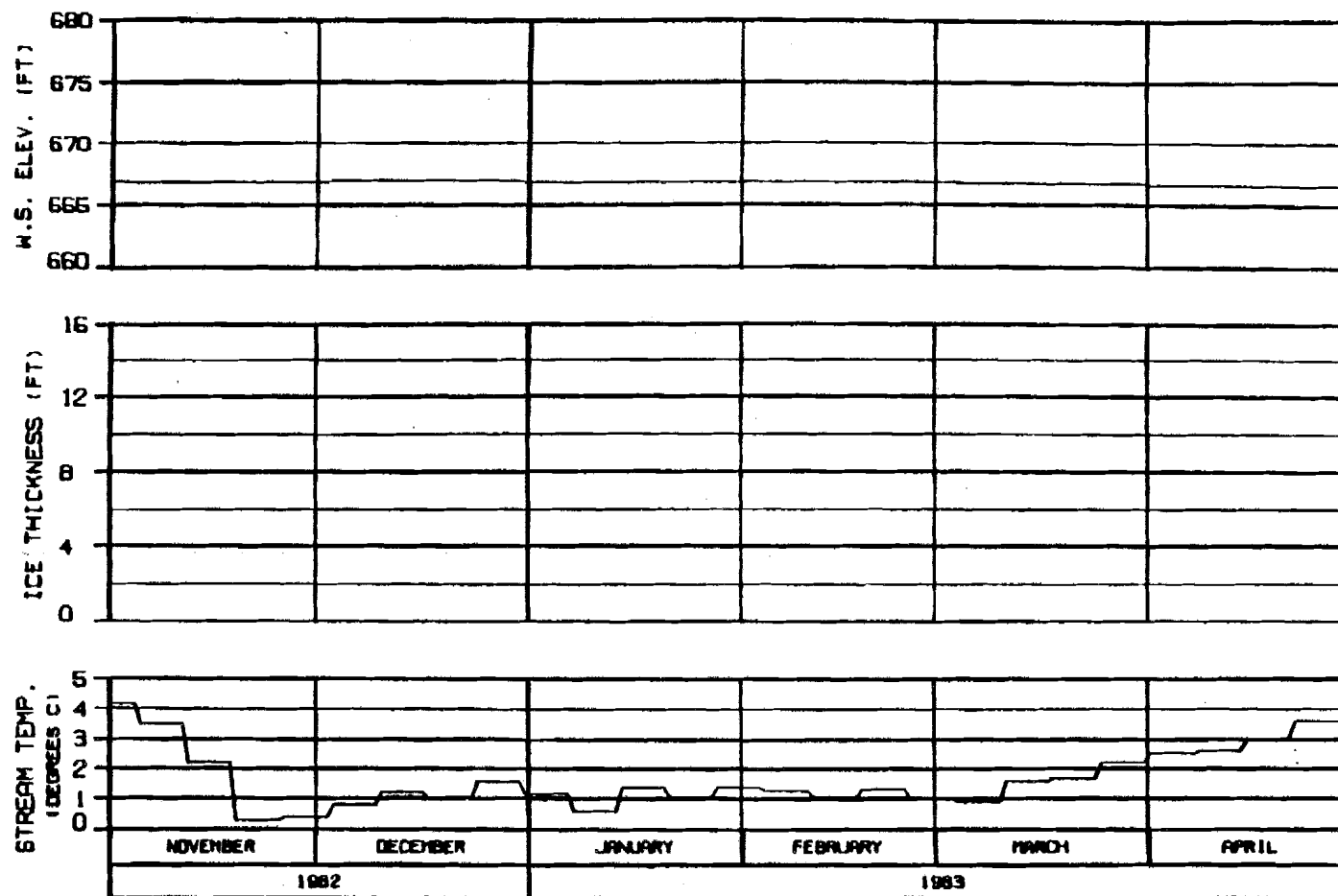
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

CHANGES: 11/1/82 10 JAN 83 1000.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 8202CNA

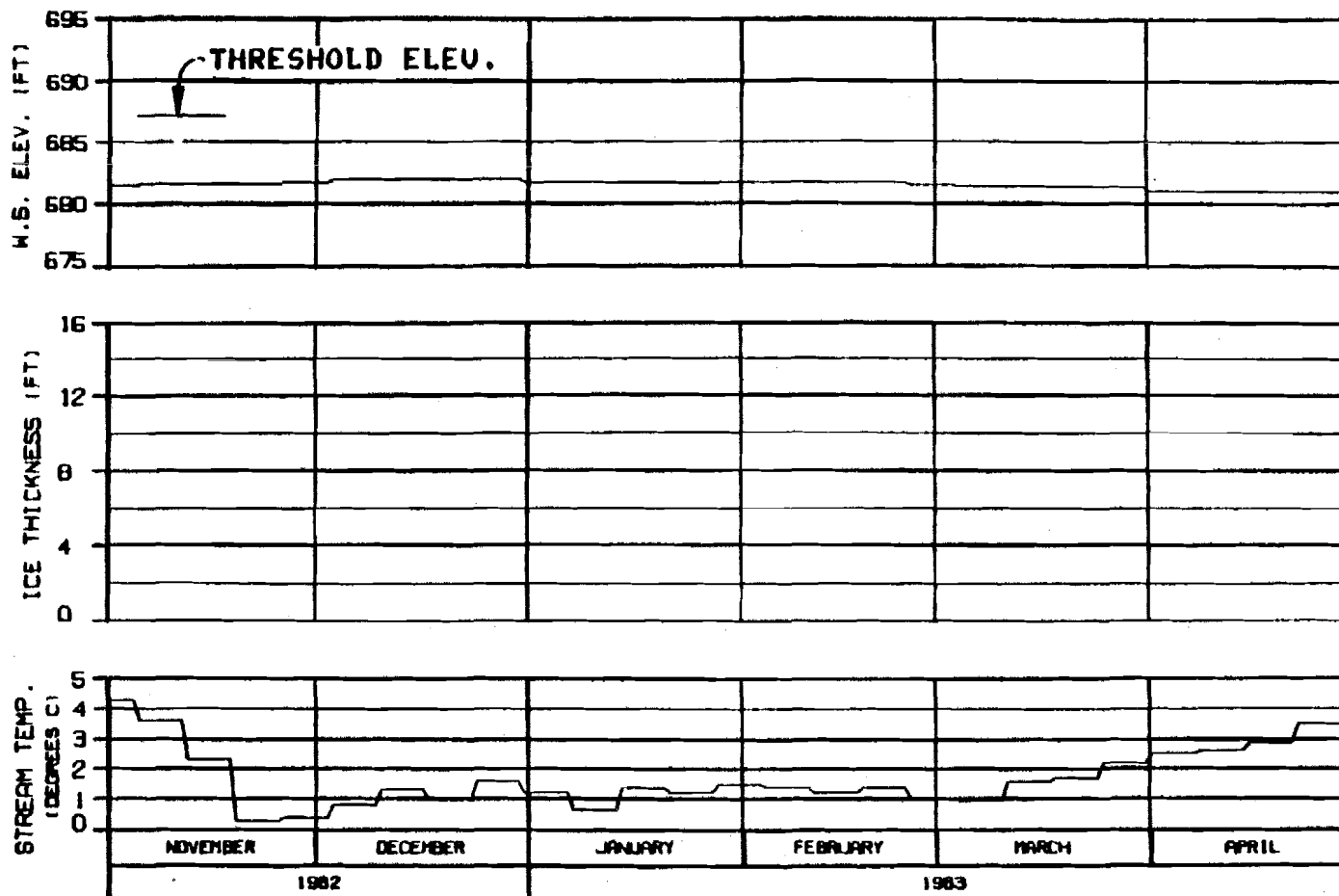
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED - ALASKA 10 JAN 83 1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : B202CNA

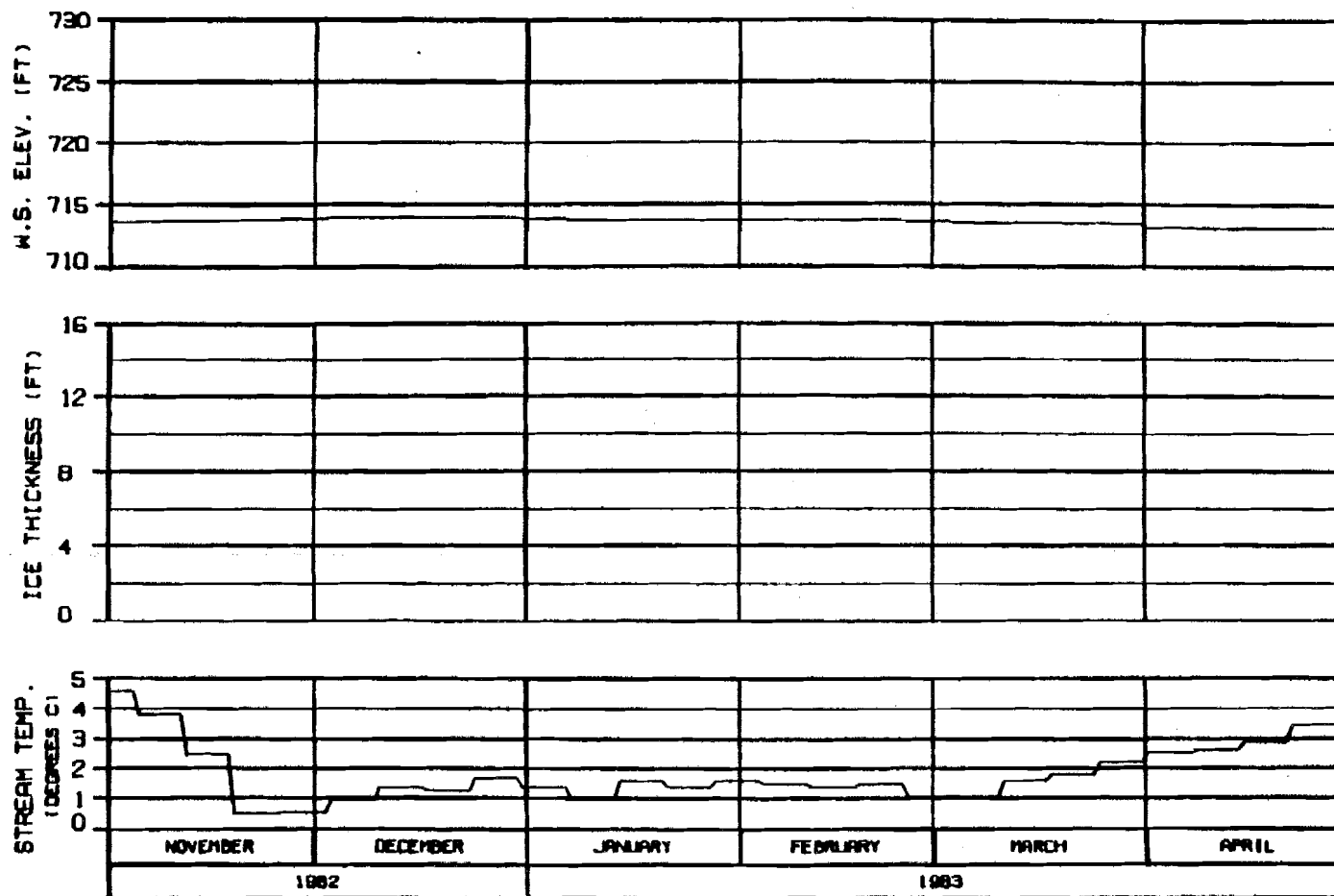
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHIEF: B. L. P. 83 JAN 83 1063.142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 82020NA

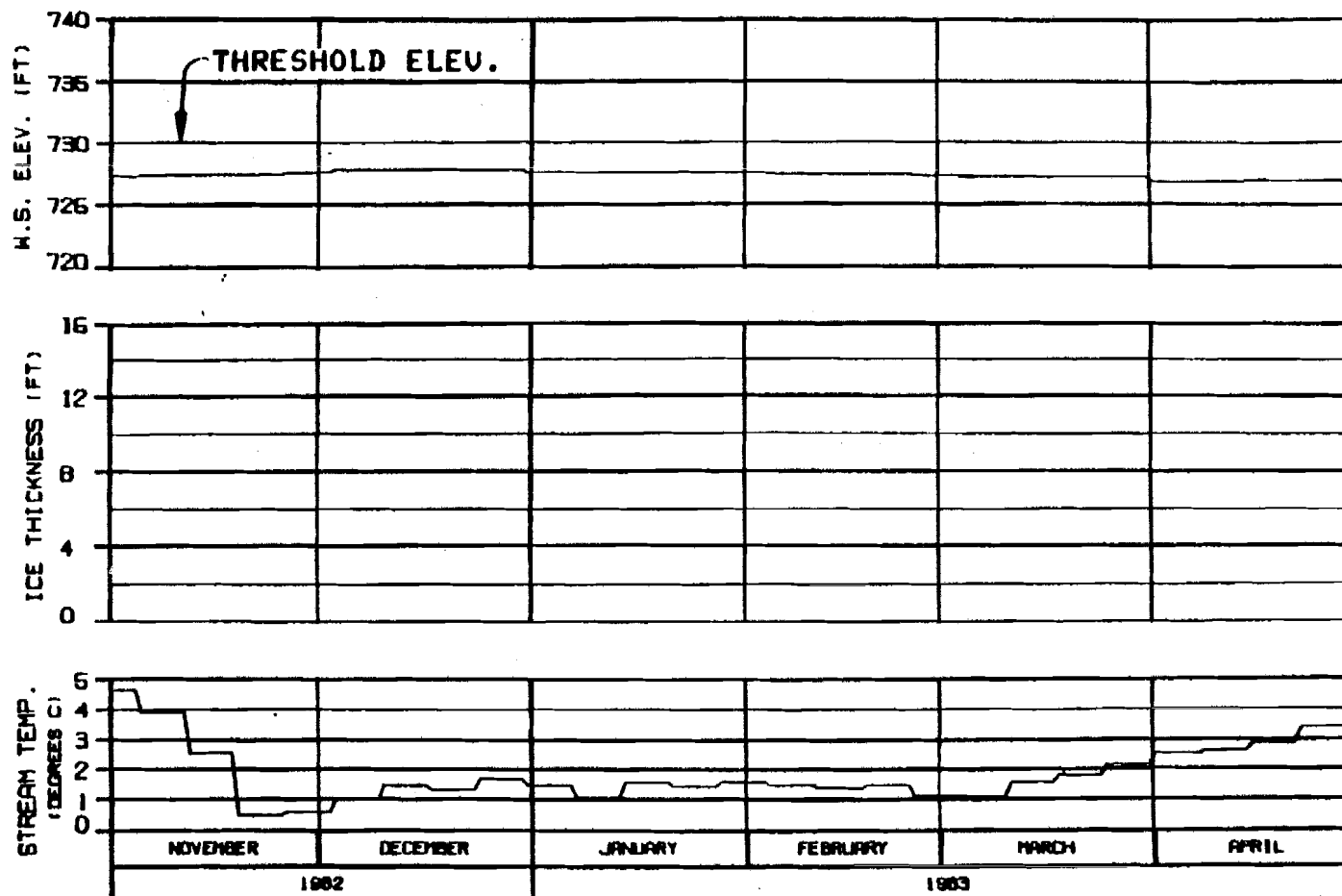
ALASKA POWER AUTHORITY

SUSTNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DRAWN: BLD/MS 10 JAN 84 1000.142



# HEAD OF SLOUGH 20 RIVER MILE : 140.50

## ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8202CNA

ALASKA POWER AUTHORITY

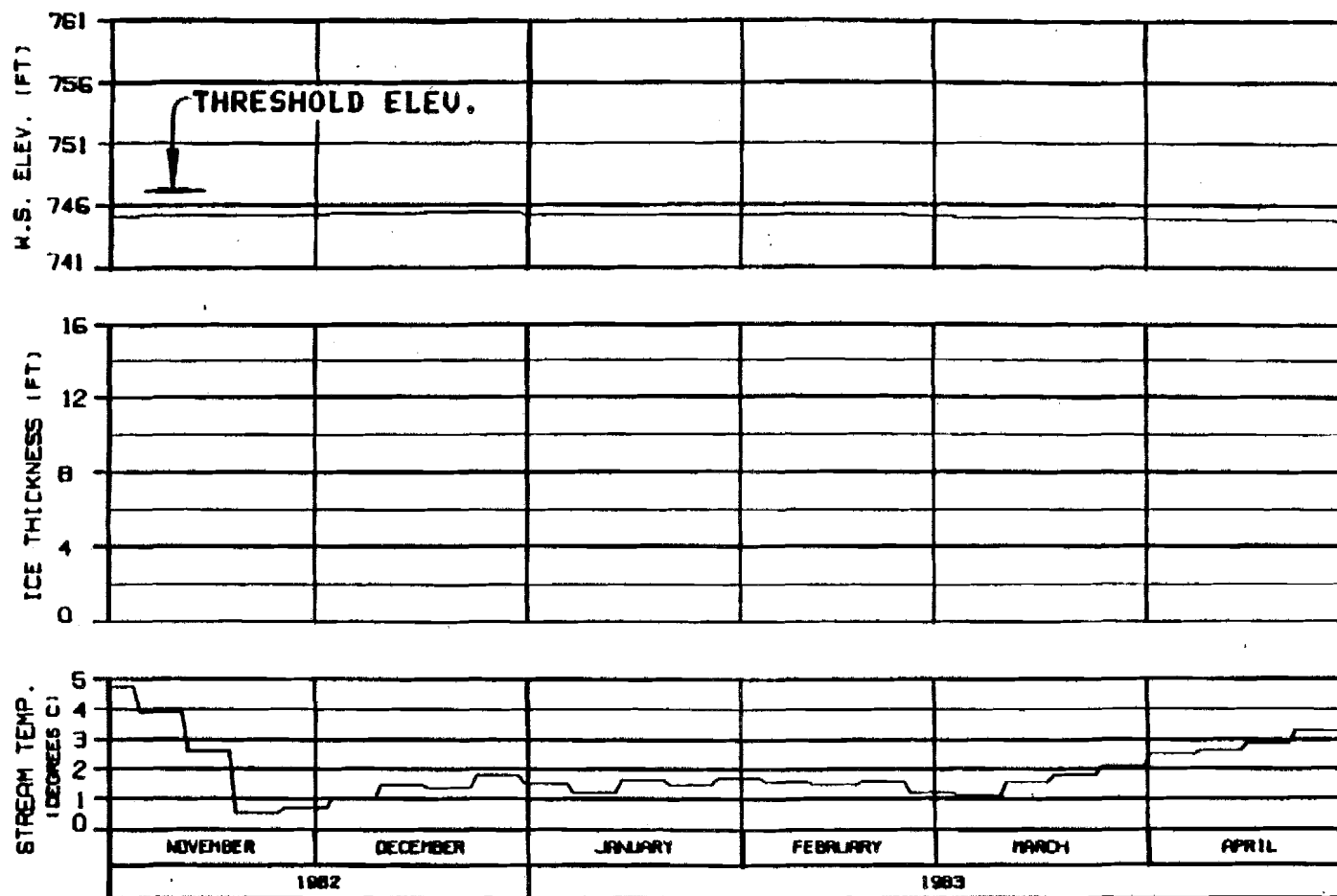
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: SLP/83 10 JAN 84 1000, 142





SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2002  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 82020NA

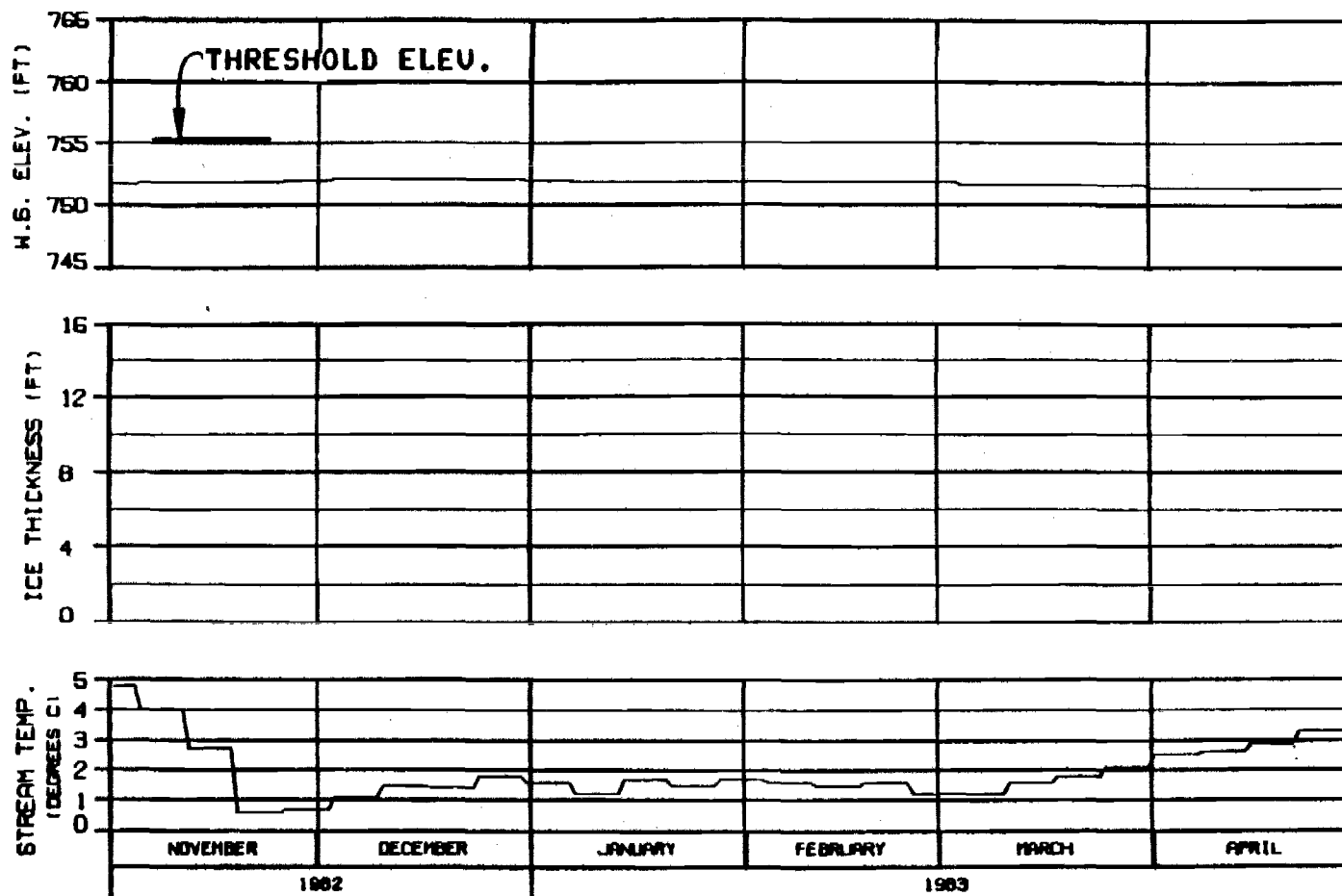
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DIGEST: ALP-88 16 JAN 84 1000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8202CNA

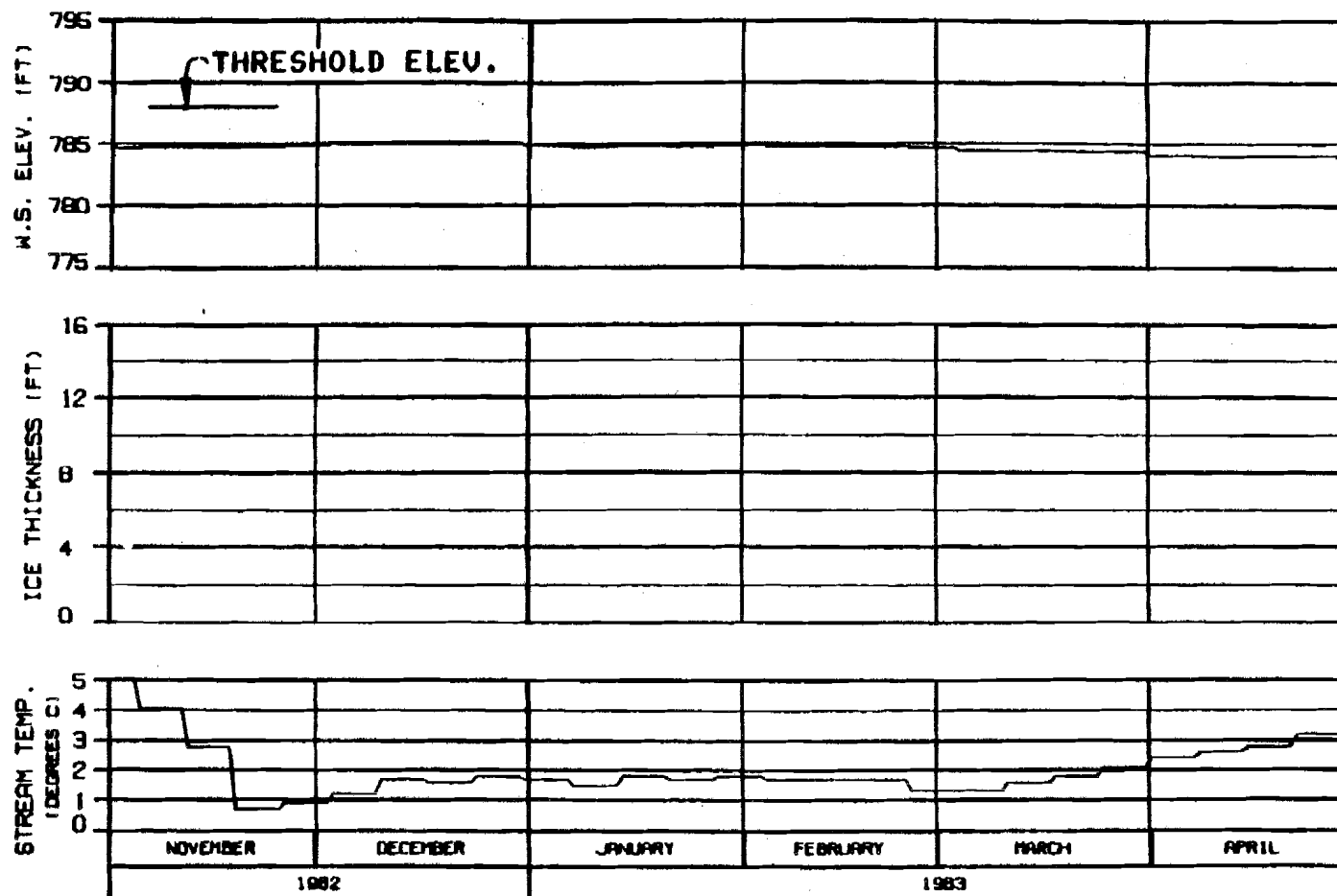
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: ALB-8202 10 JAN 84 1982.142



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:

1. TOTAL THICKNESS
2. SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2002  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 8202CNA

OPTION?

ALASKA POWER AUTHORITY

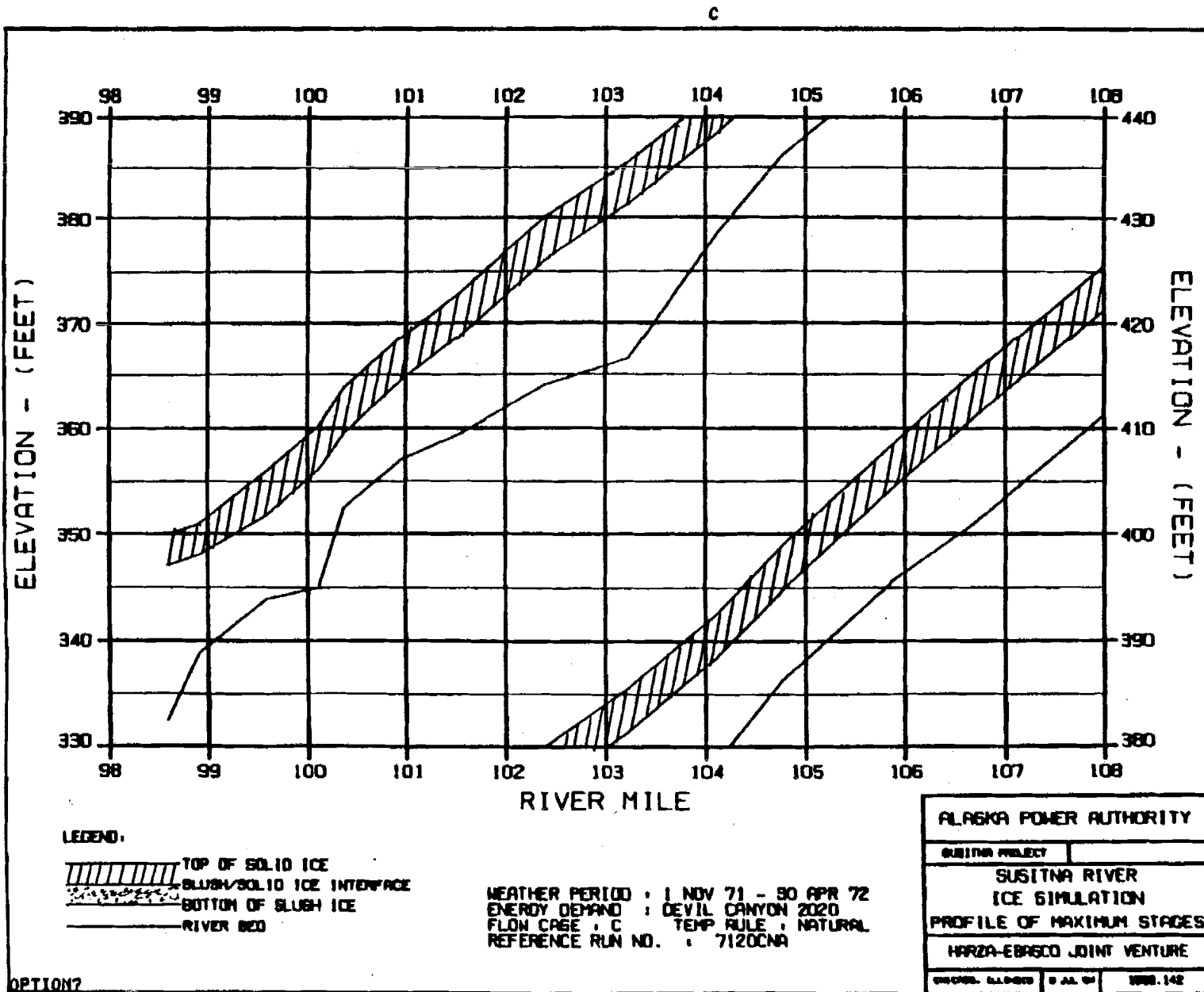
SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

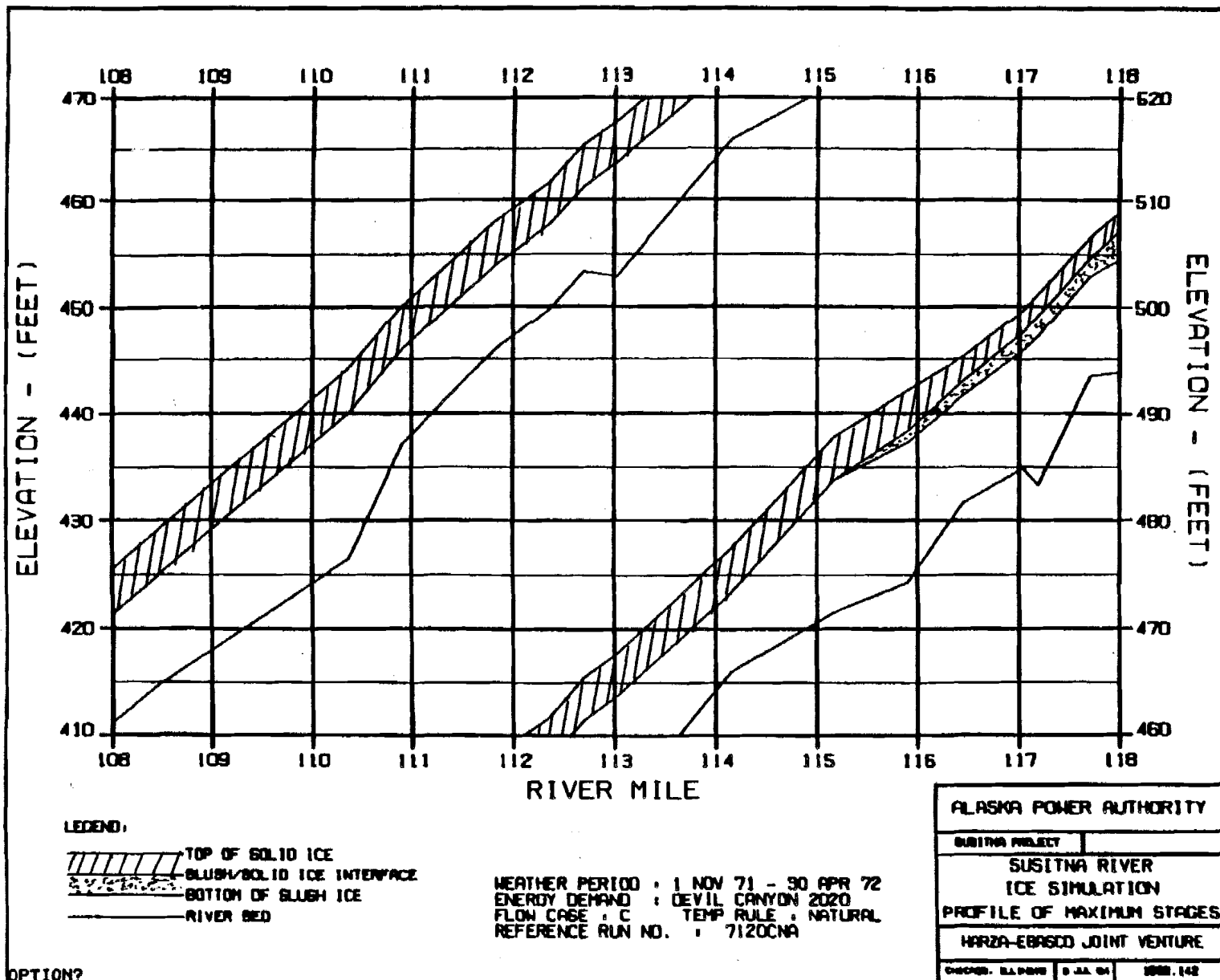
HARZA-EBASCO JOINT VENTURE

DRAWN: ALP/MS 10 JAN 83 1000-142

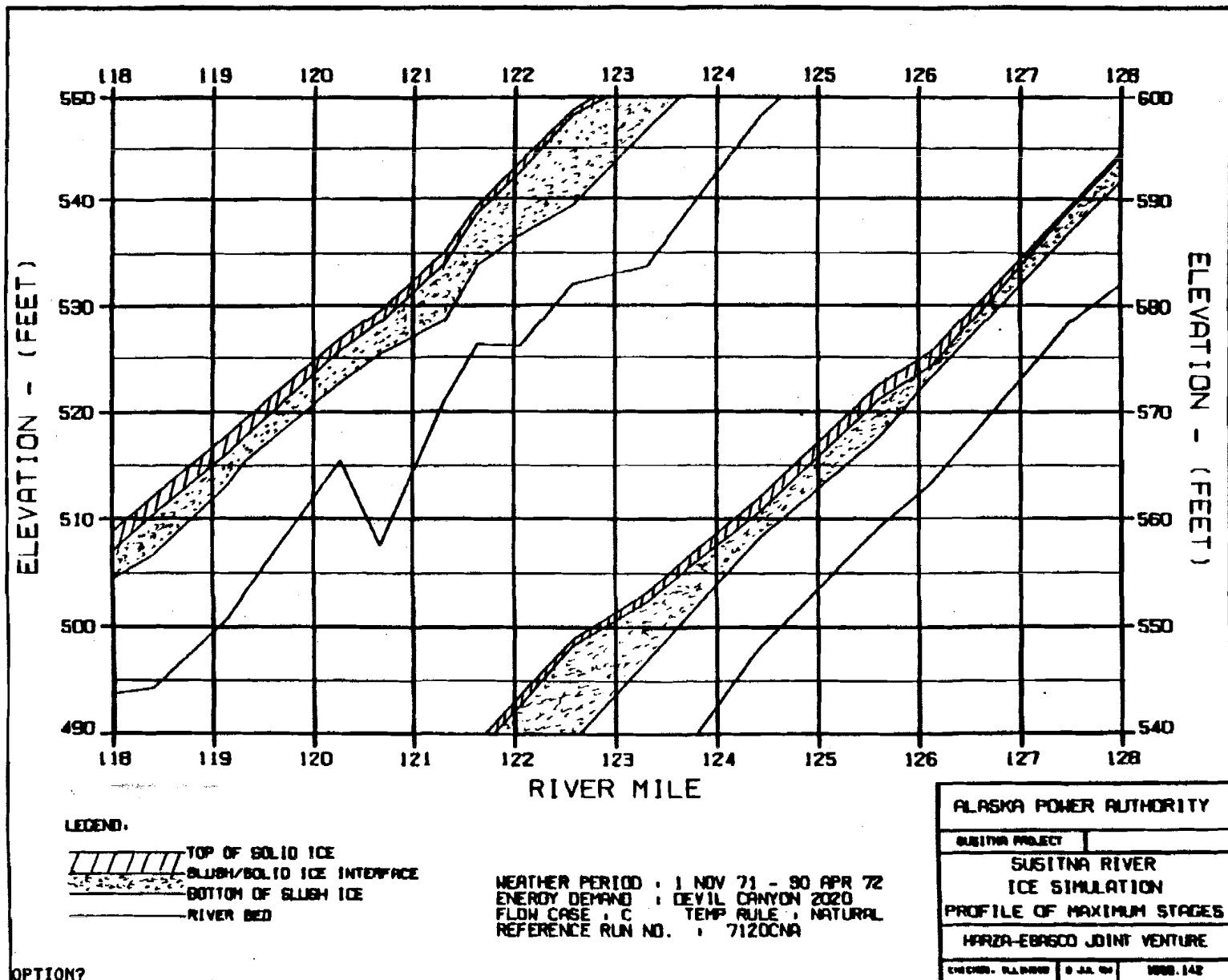
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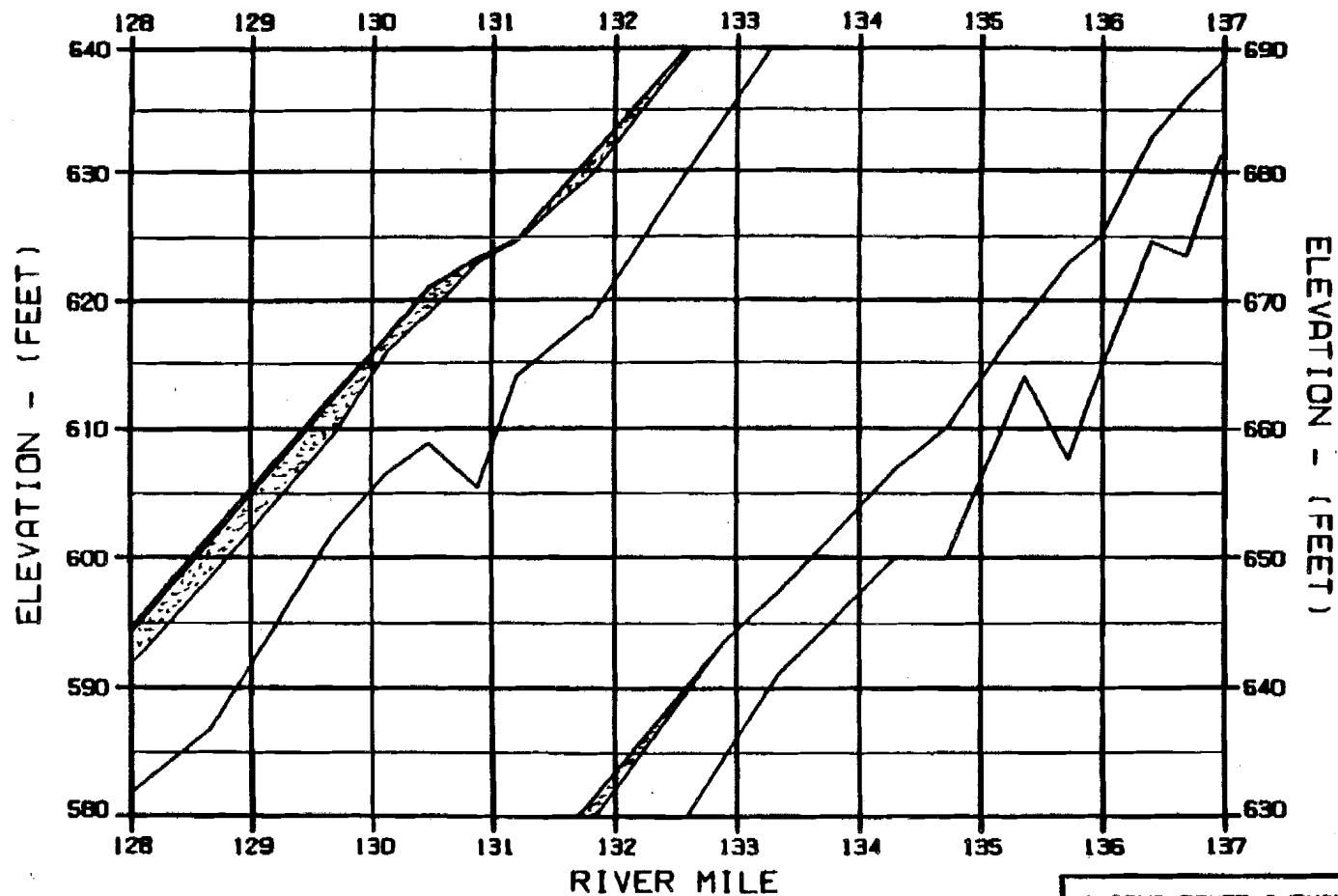


C



C





**LEGEND:**

TOP OF SOLID ICE  
 SLUSH/SOLID ICE INTERFACE  
 BOTTOM OF SLUSH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER**  
**ICE SIMULATION**  
**PROFILE OF MAXIMUM STAGES**

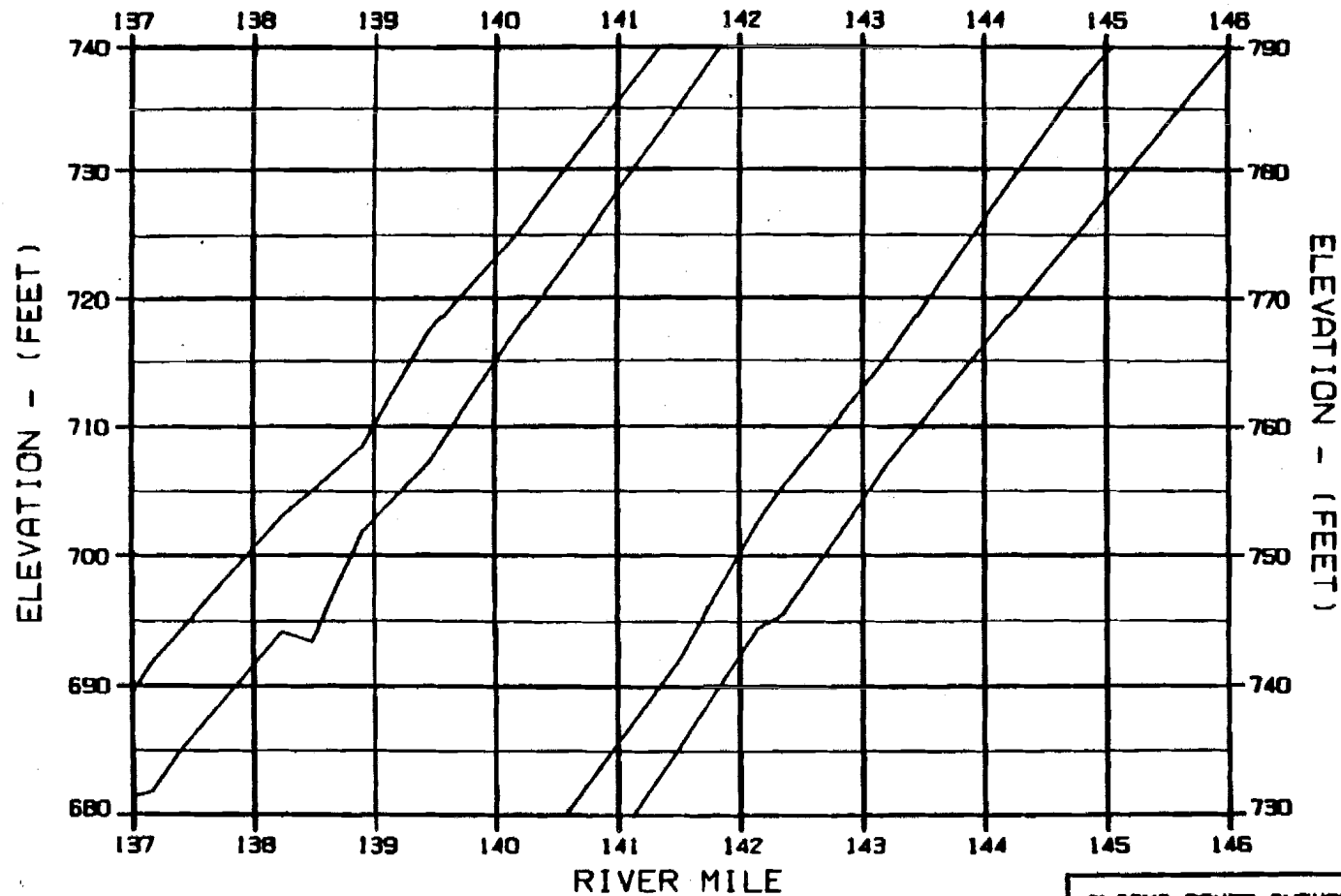
**HARZA-EBASCO JOINT VENTURE**

DESIGN: 01/0000 3 JUL 72 1000.142

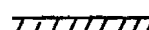
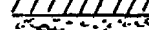
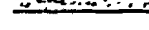

OPTION2



C



## LEGEND:

 TOP OF SOLID ICE  
 BLUSH/SOLID ICE INTERFACE  
 BOTTOM OF BLUSH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 712DCNA

ALASKA POWER AUTHORITY

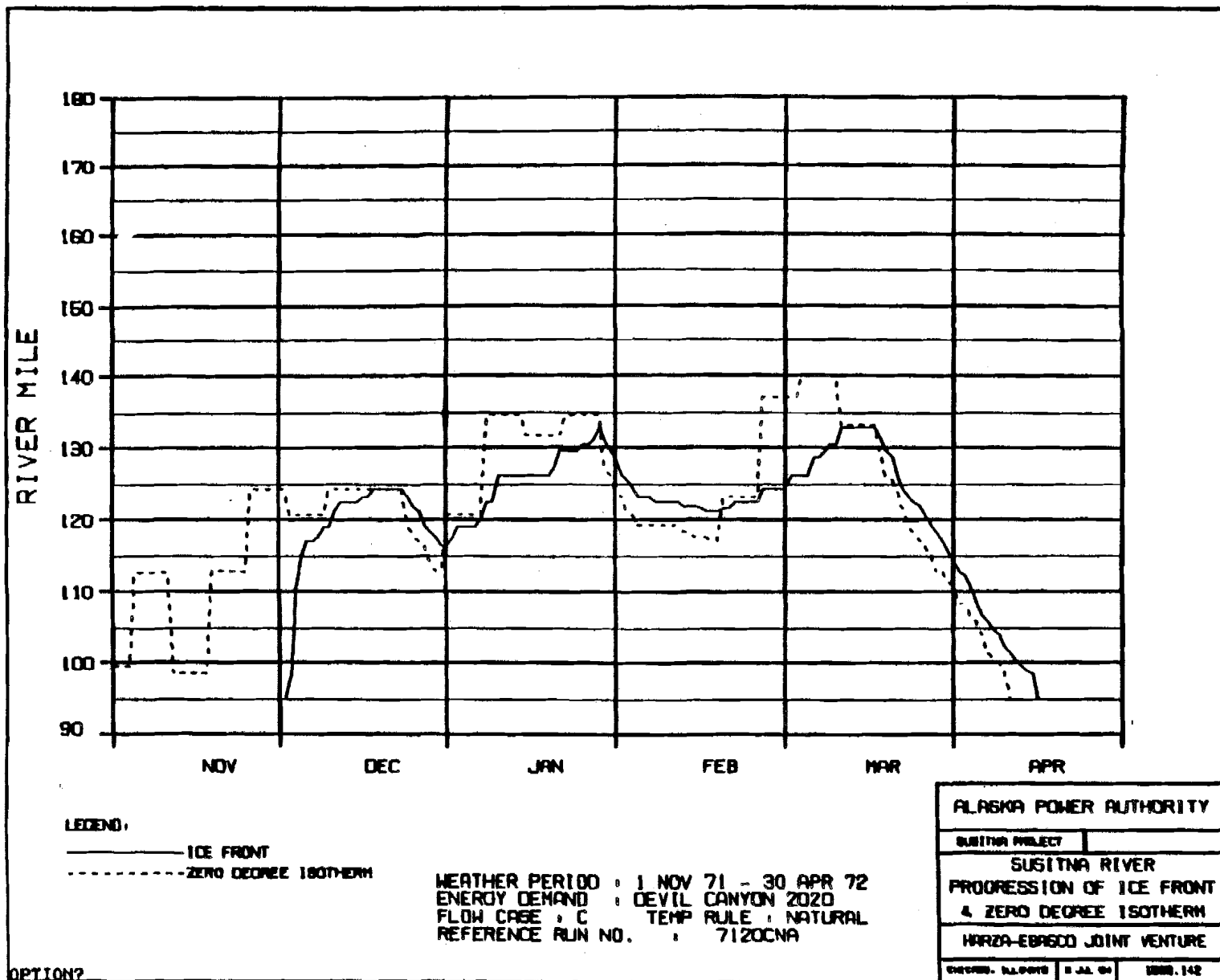
SUSITNA PROJECT

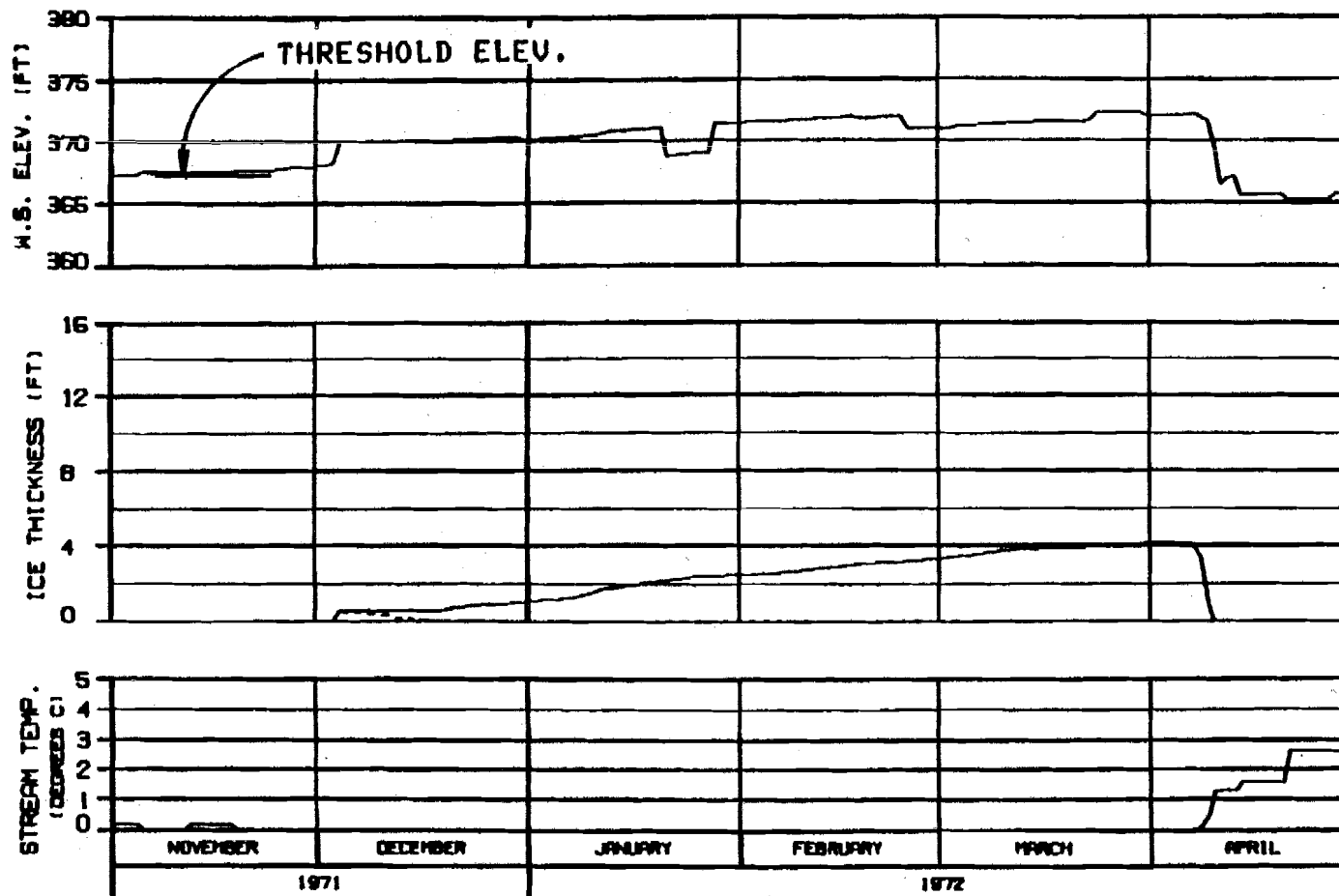
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HARZA-EBASCO JOINT VENTURE

CHARGE: ALP-001 0 JUL 81 1980.142

OPTION?





# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

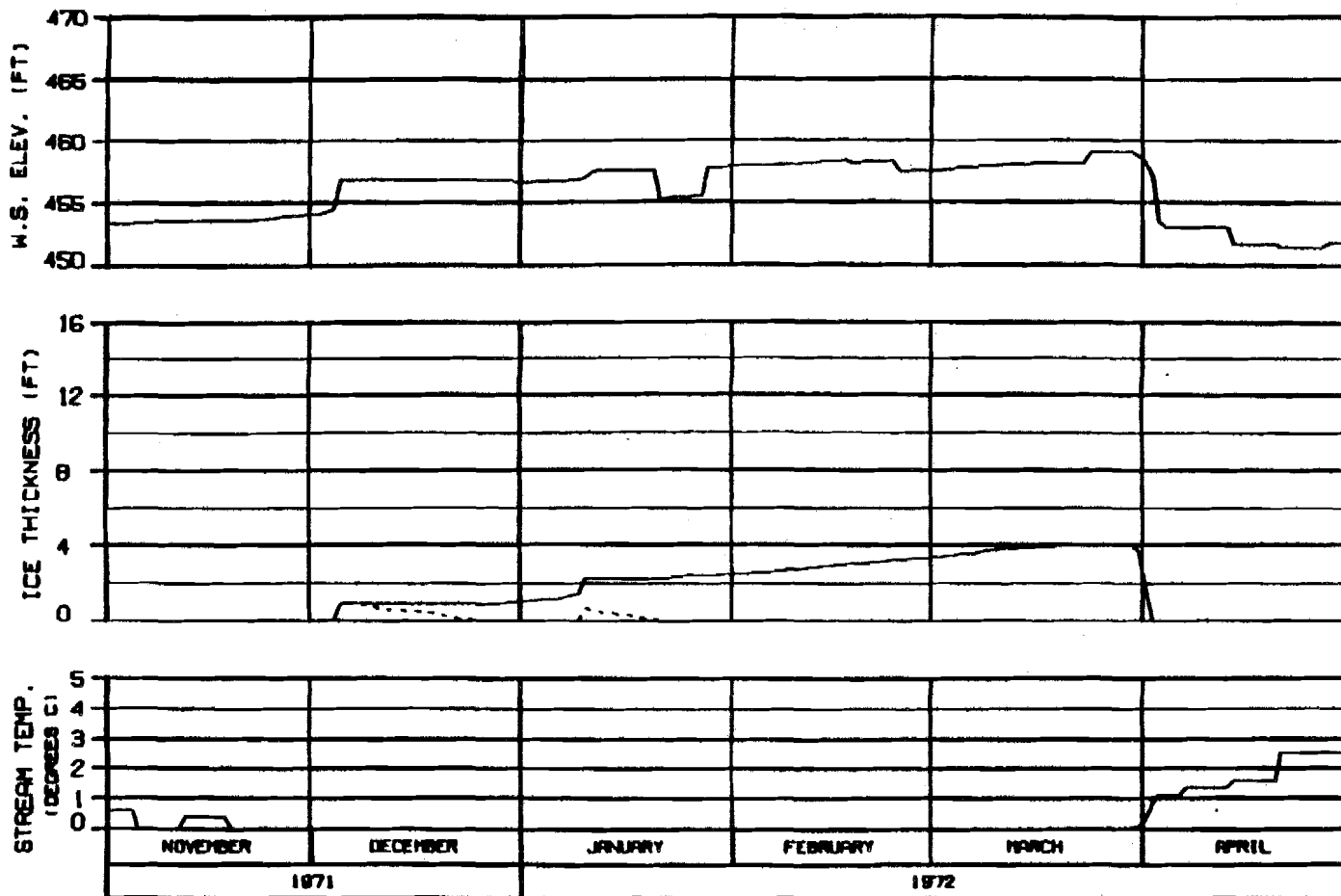
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

CHARTER- AL 04010 8 JUL 72 1000.102



**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

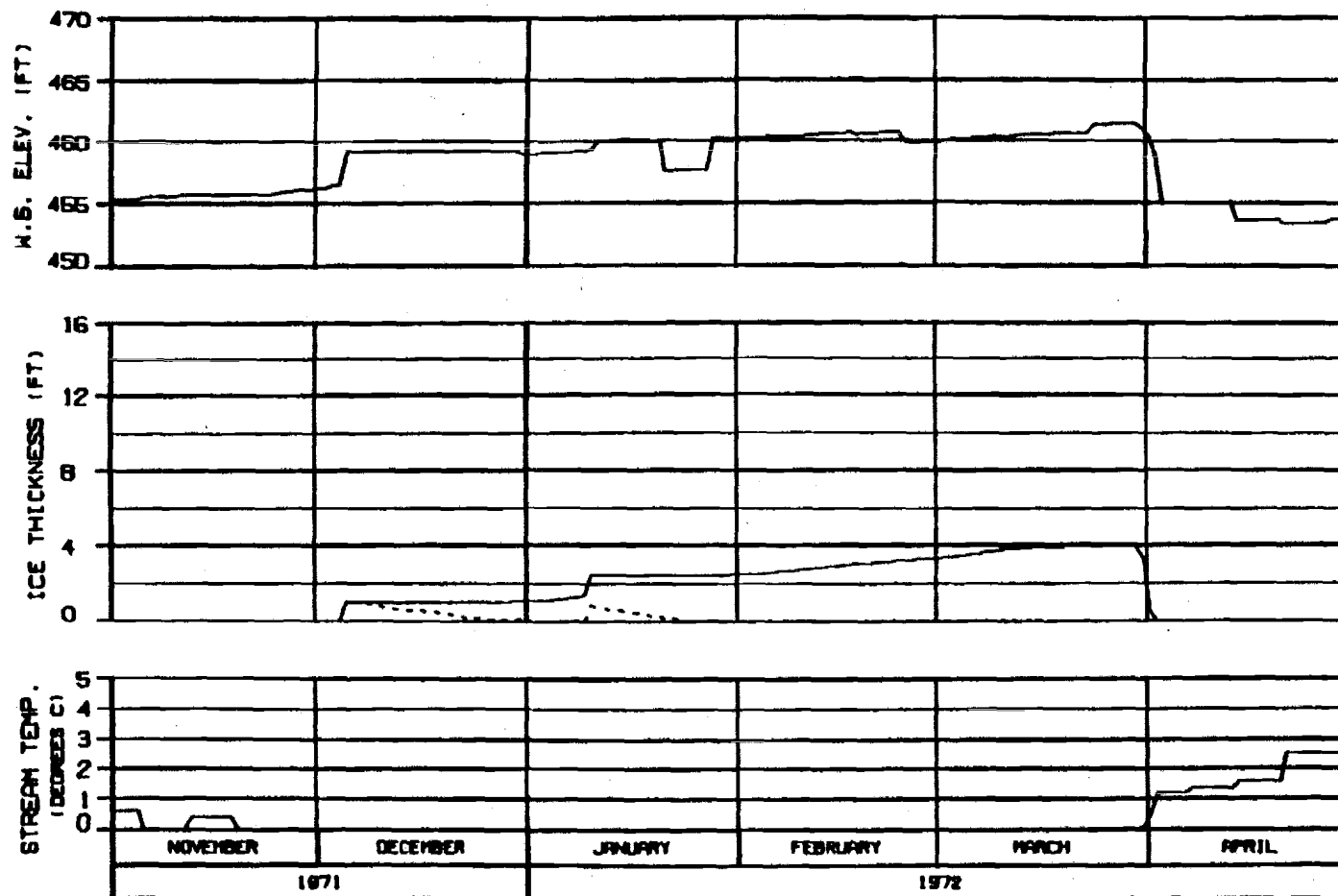
**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

CHUCK, B. & S. 8 JAN 80 1000.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

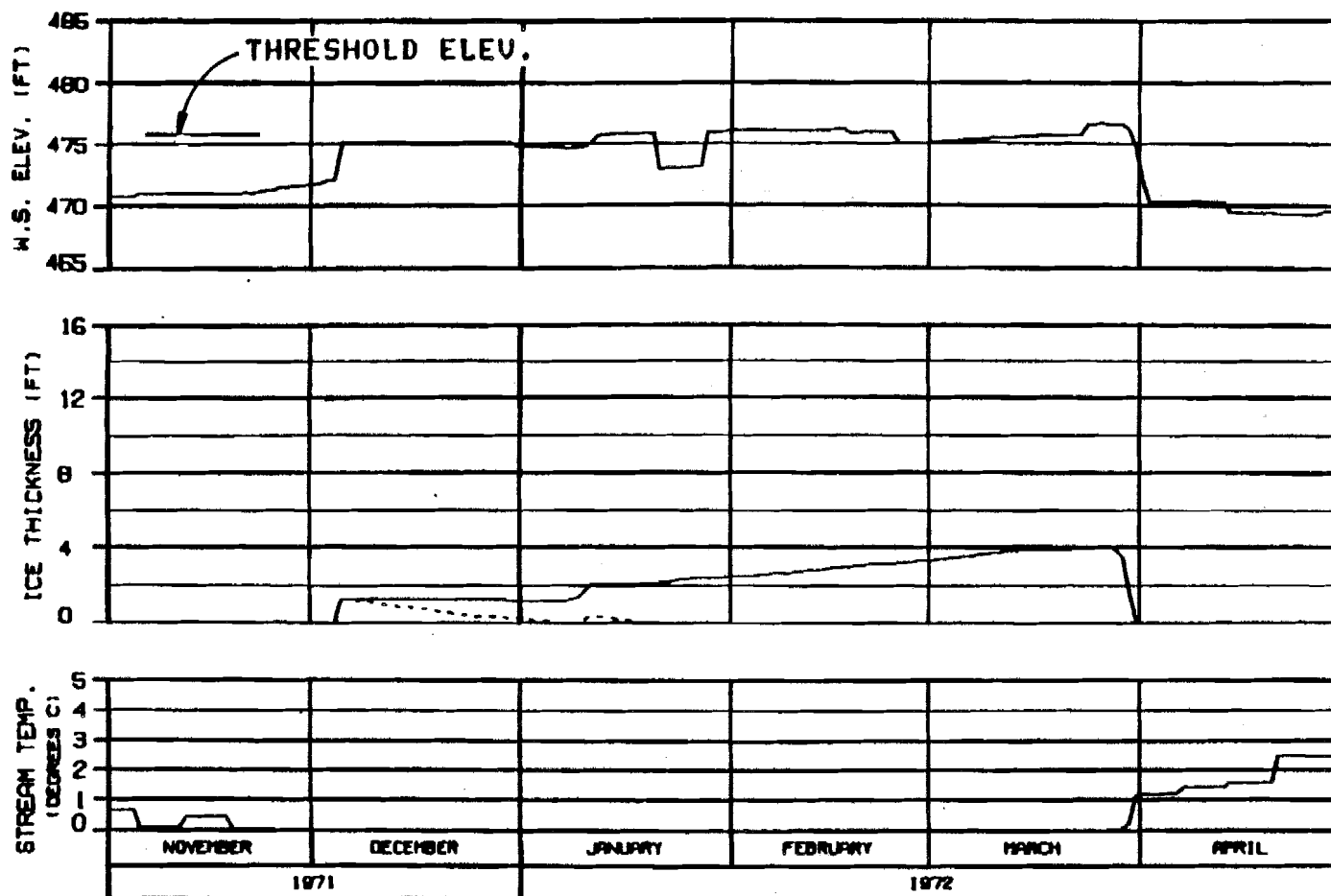
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: SLD/BBB 8 JUL 81 1000.142



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

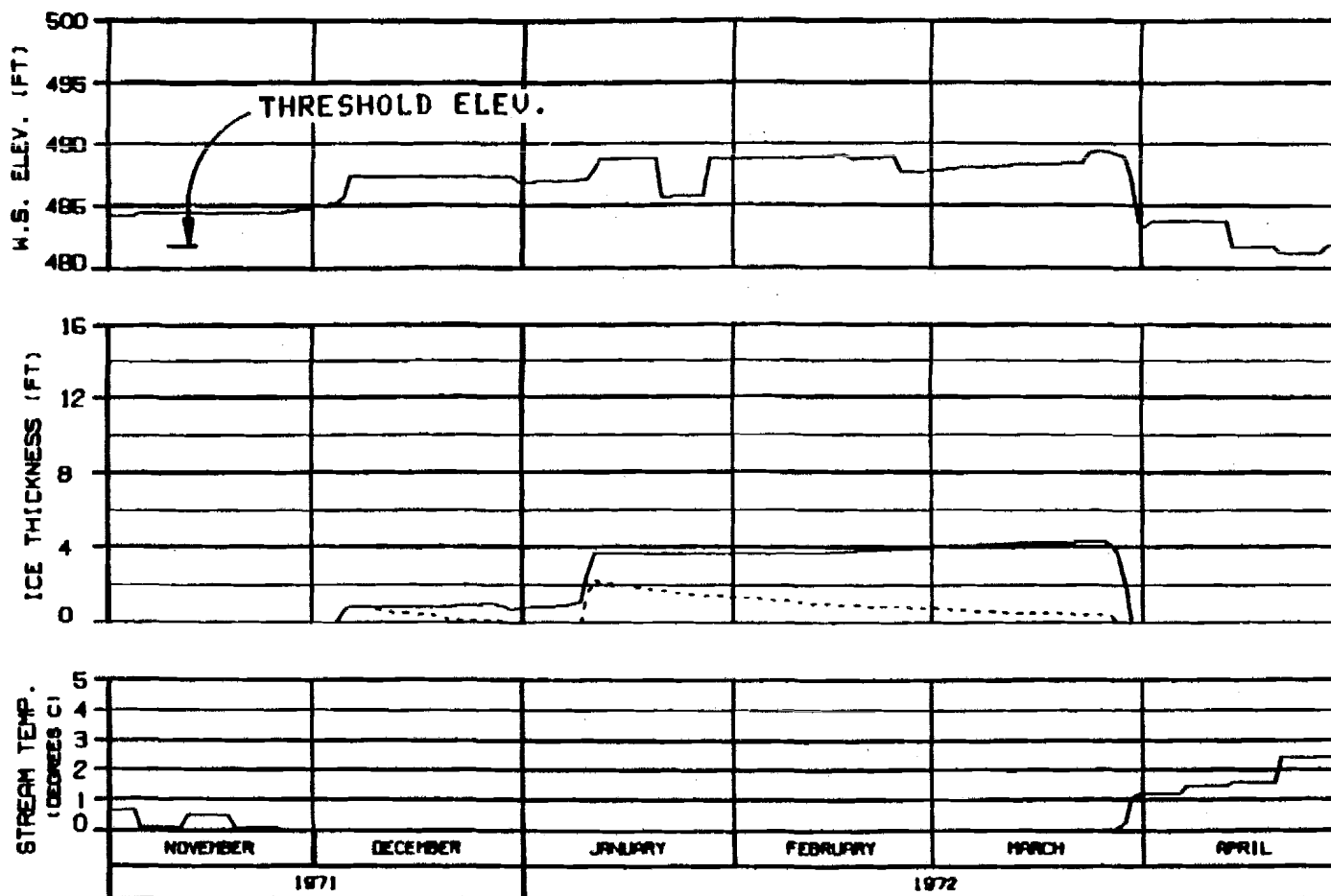
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

DRAWN: S. L. BROS. 8 JAN 72 1000.142



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL MSII  
 RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

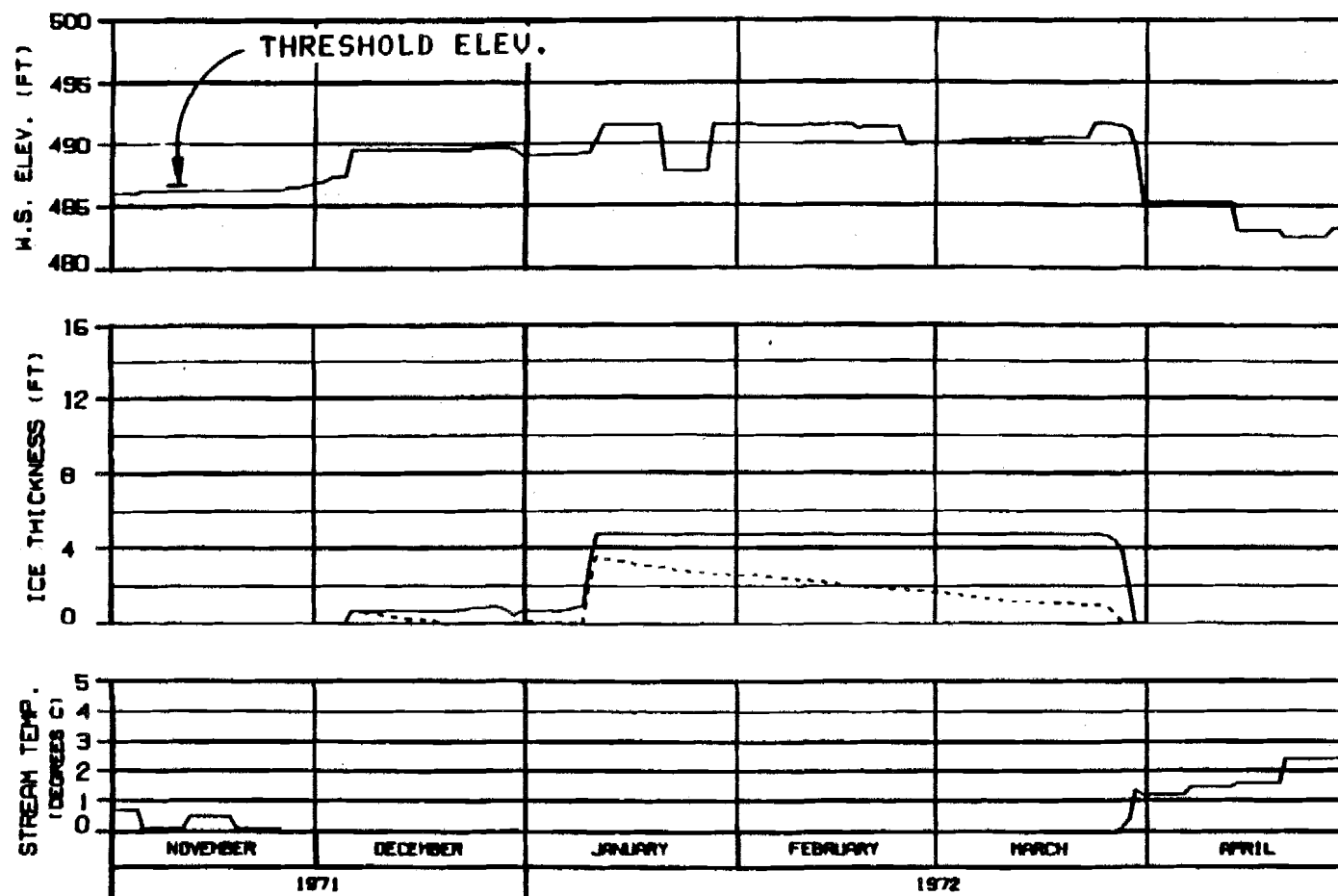
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHUCK. HARRIS 5 JUL 81 1000.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ---- BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
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ALASKA POWER AUTHORITY

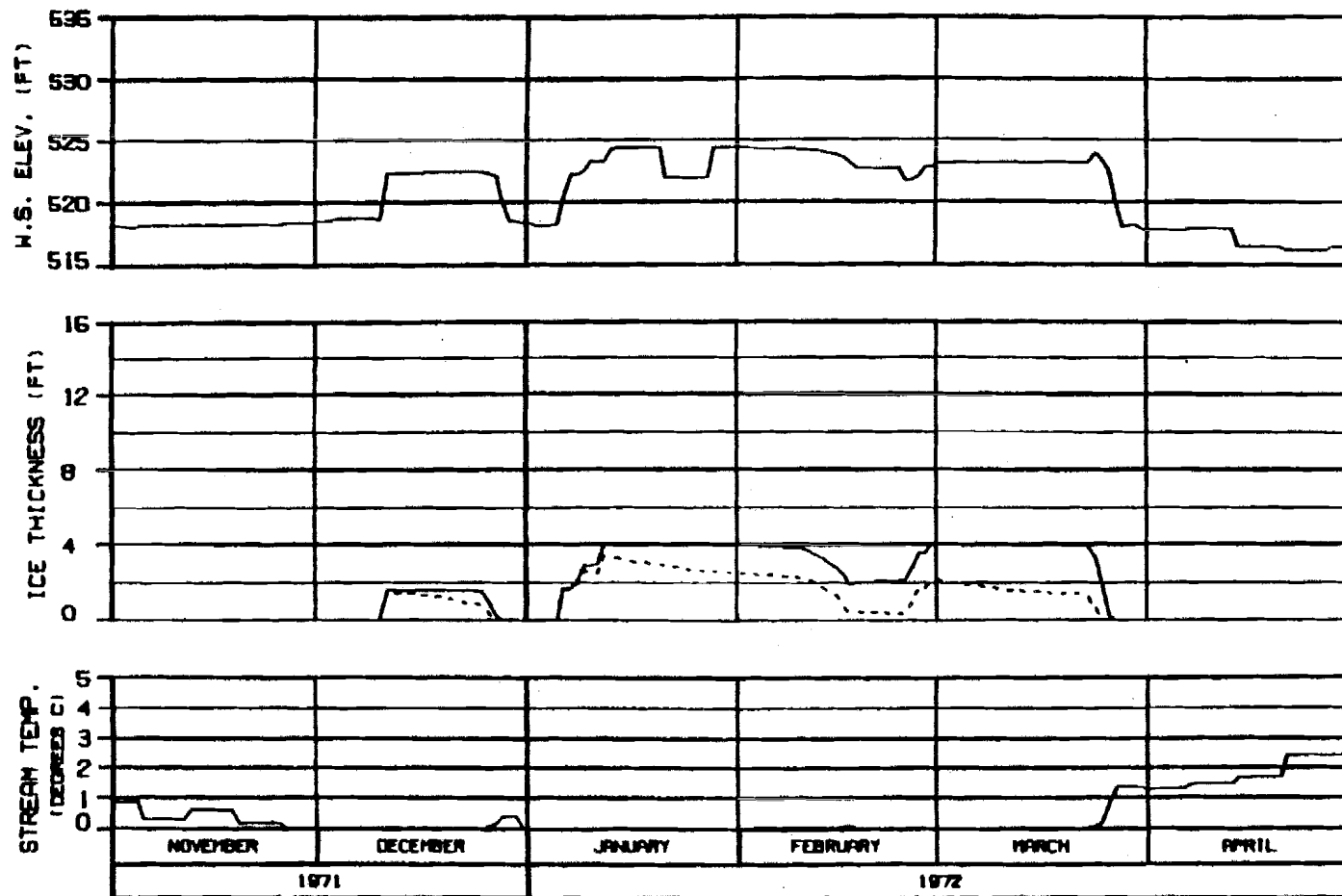
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

OWNER: ALASKA POWER AUTHORITY  
 DRAWN: S. J. G. 1000-142





ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 71200NA

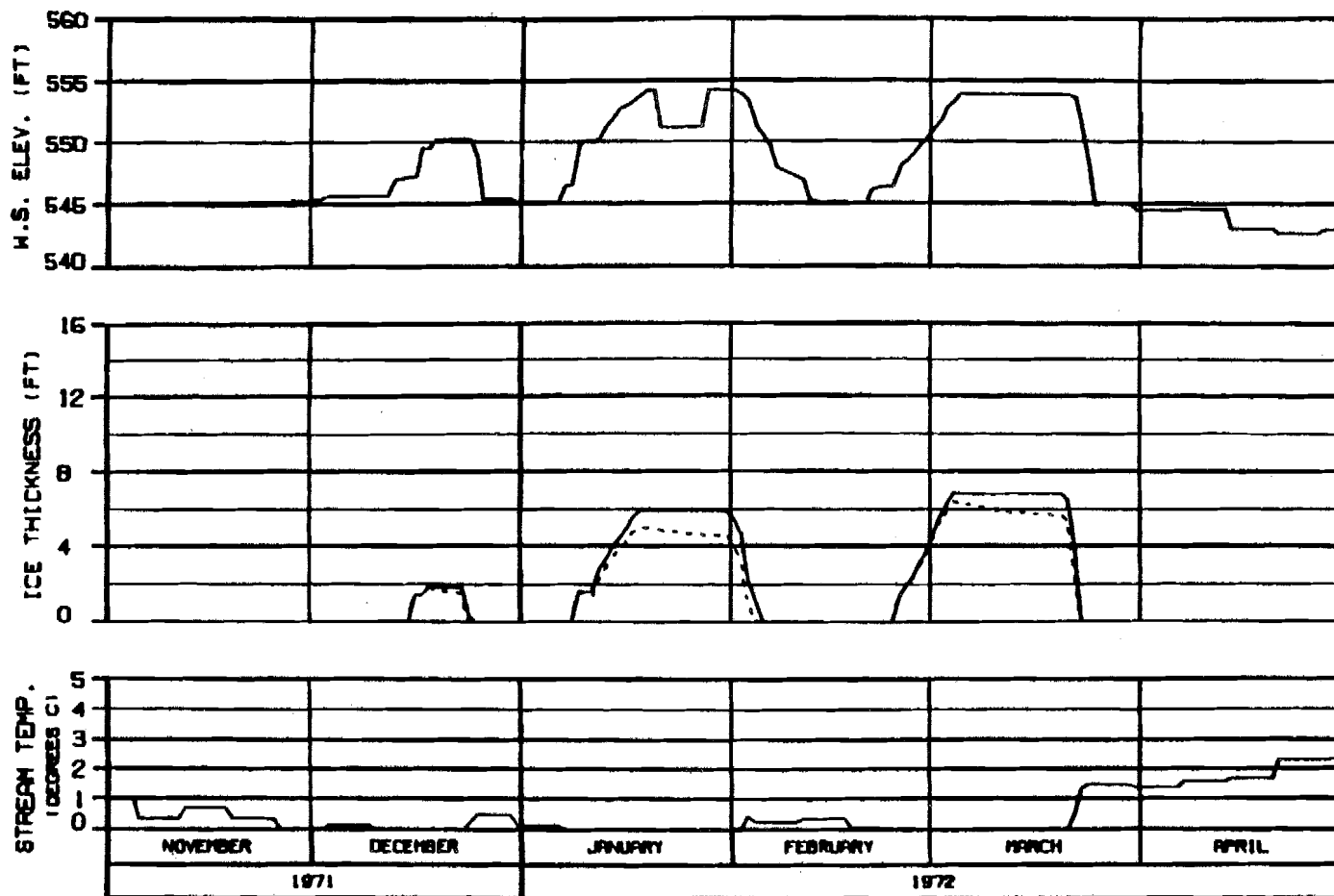
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ENGINEER: ALP/MS 9 JAN 81 1000.142



HEAD OF MOOSE SLOUGH

RIVER MILE : 123.50

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

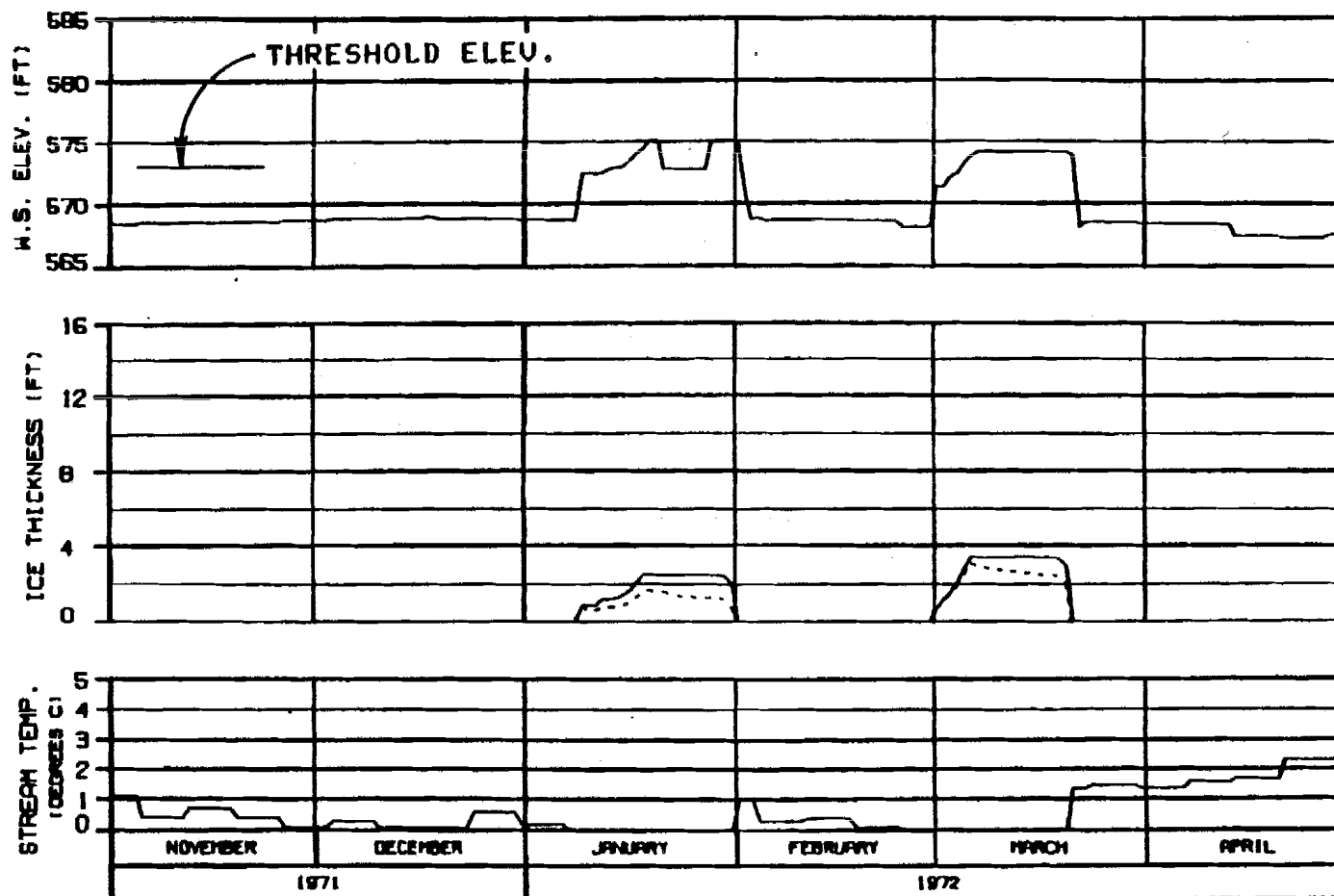
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EBRACCO JOINT VENTURE

DESIGN: SLUSH

9 JUL 72

1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

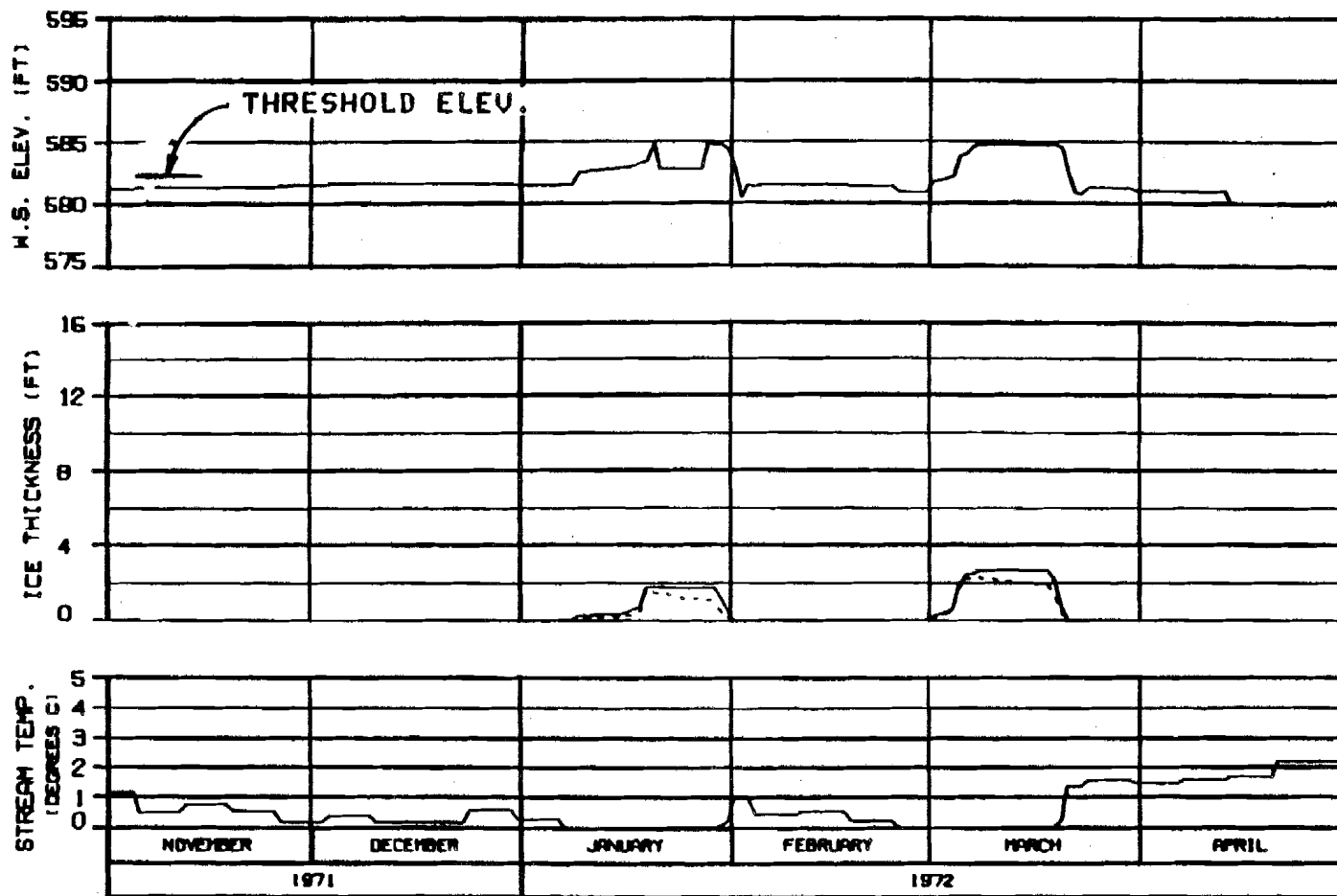
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ORDER. 84-010 8 JUL 84 1000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

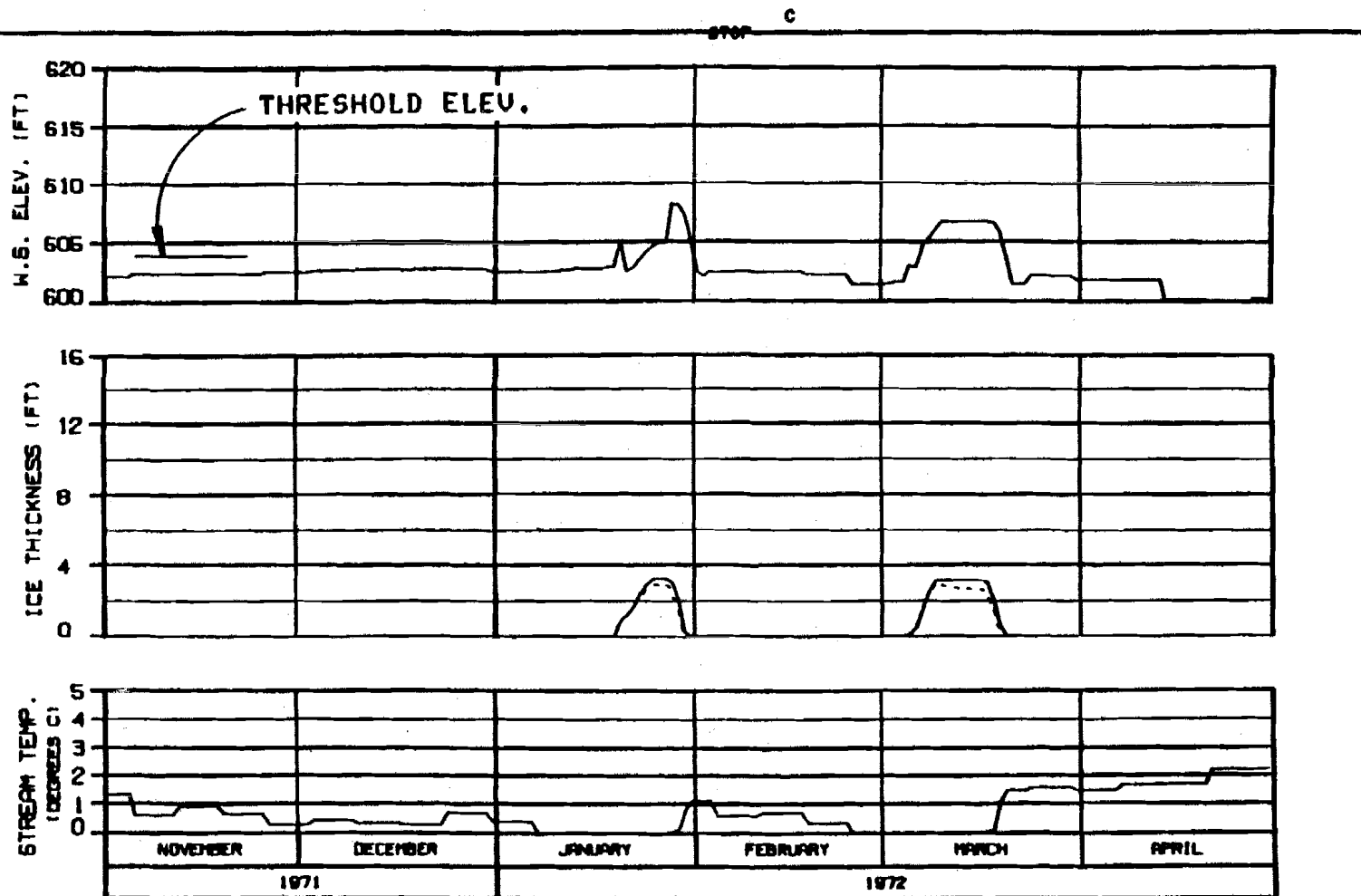
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: S. L. BROWN 8 JAN 72 1000.142



HEAD OF SLOUGH 9

RIVER MILE : 129.30

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

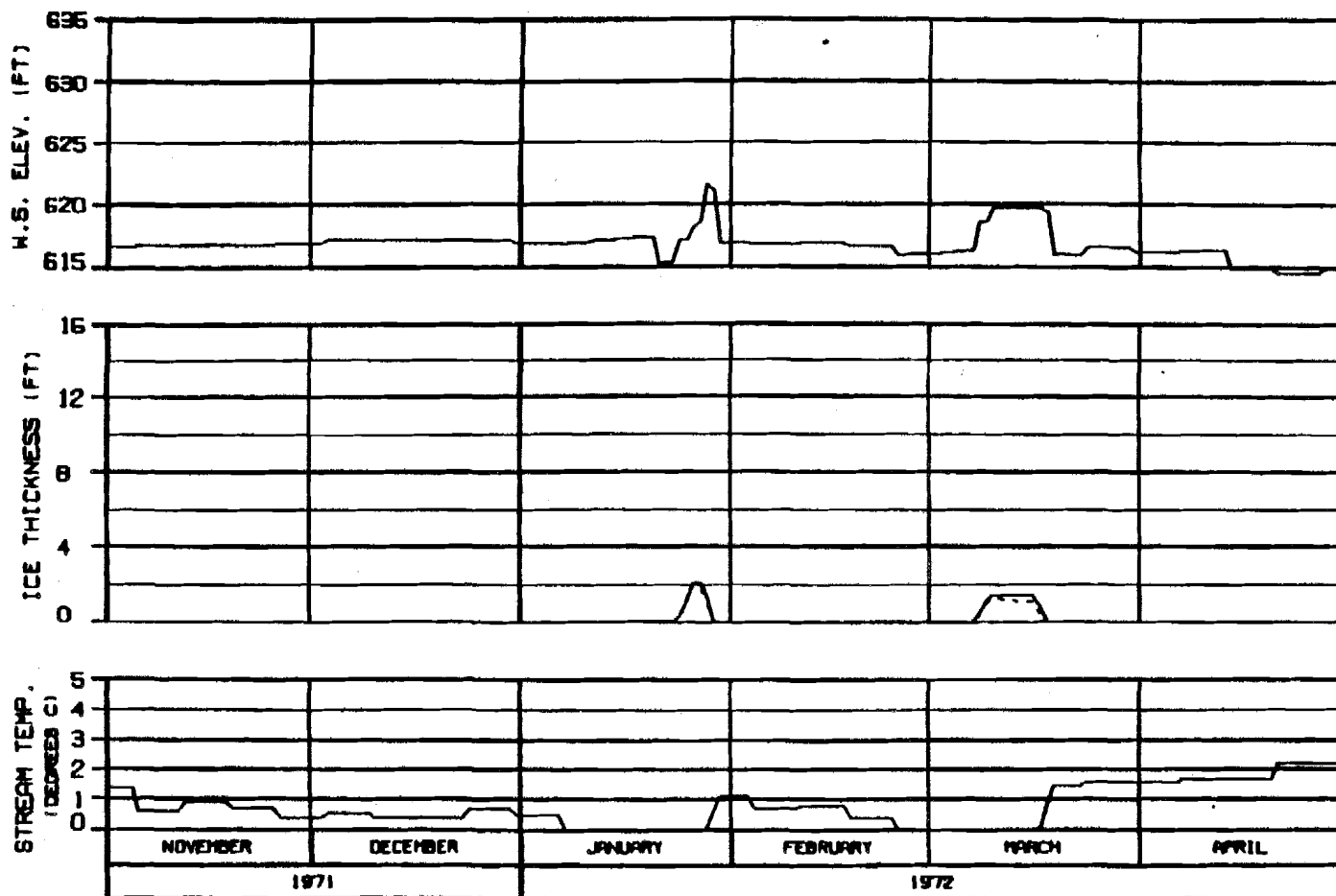
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: ALP-005 5 JUL 71 000.142

OPTION?

OPTION 7

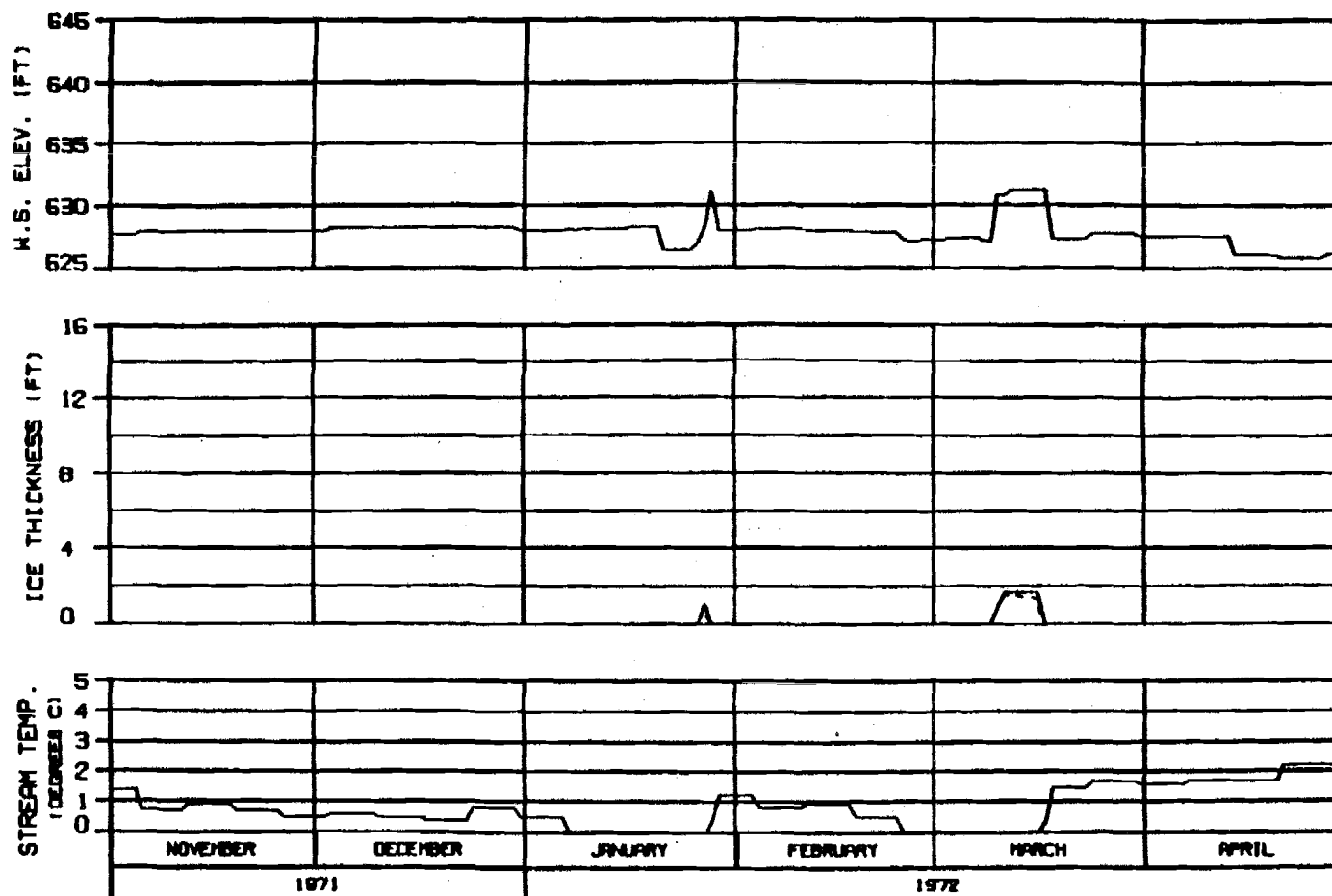


ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 9  
 RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DESIGNER: H.A. POWERS	DATE: 8 JAN 72
SHEET: 142	



**SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

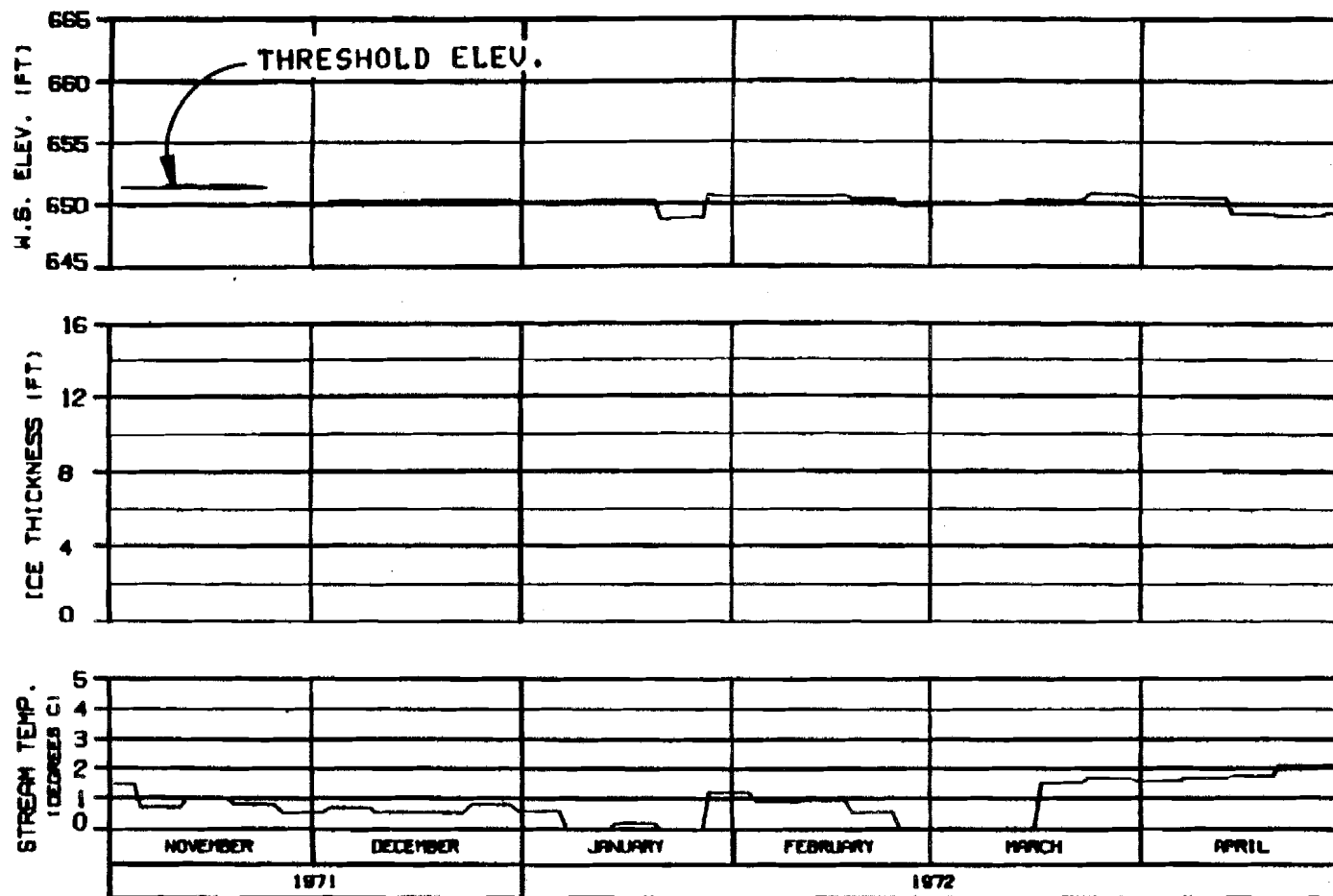
**ALASKA POWER AUTHORITY**

SUSITNA PROJECT

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

**HARZA-EBASCO JOINT VENTURE**

DESIGNED BY: G. L. BROWN    DRAWN BY: D. A. SMITH    SHEET NO.: 1000.142



HEAD OF SLOUGH 9A

RIVER MILE : 133.70

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

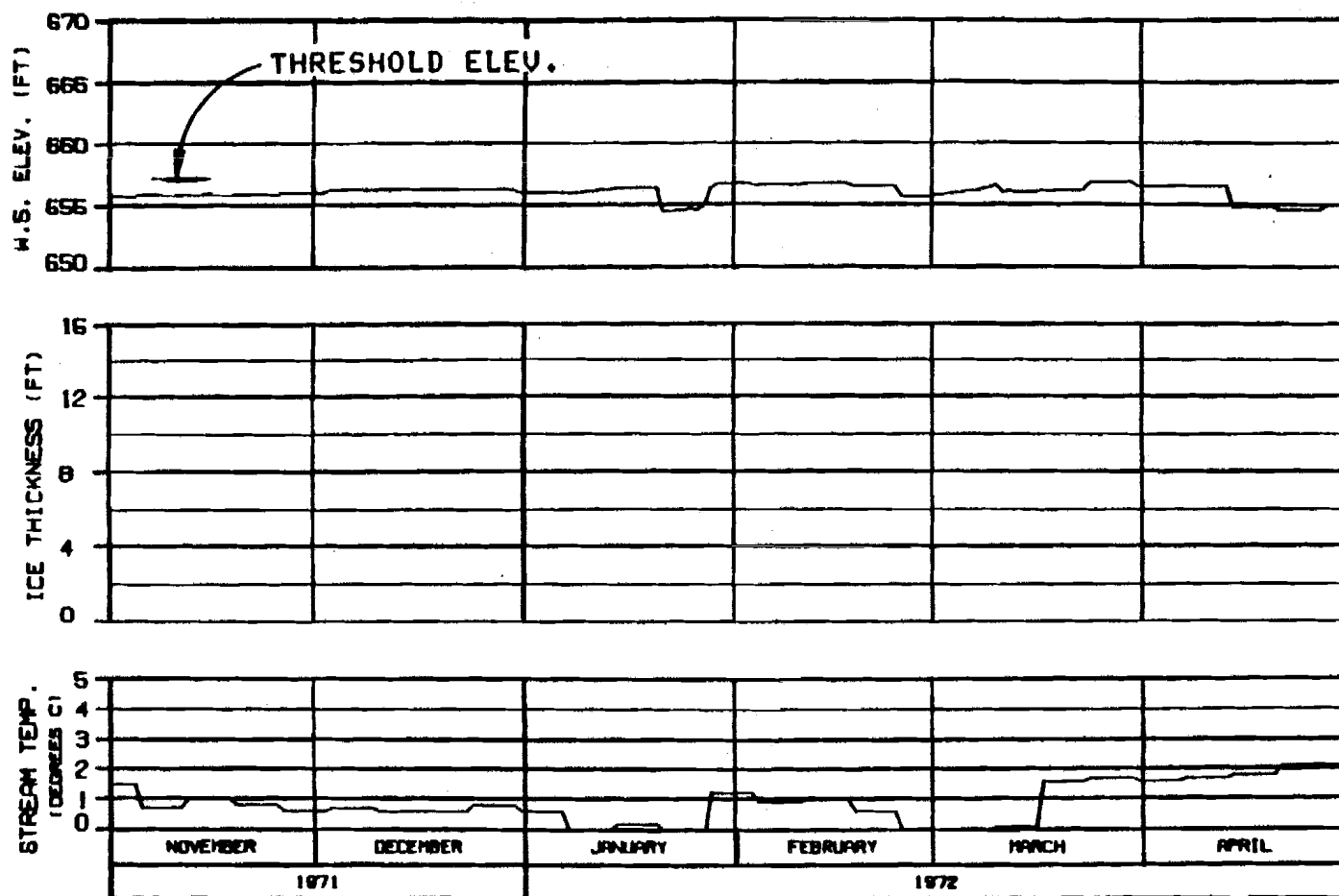
SUSTITNA PROJECT

SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBRSCO JOINT VENTURE

DIVISION - SLUSHING 9 JUL 80 1980.142





SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

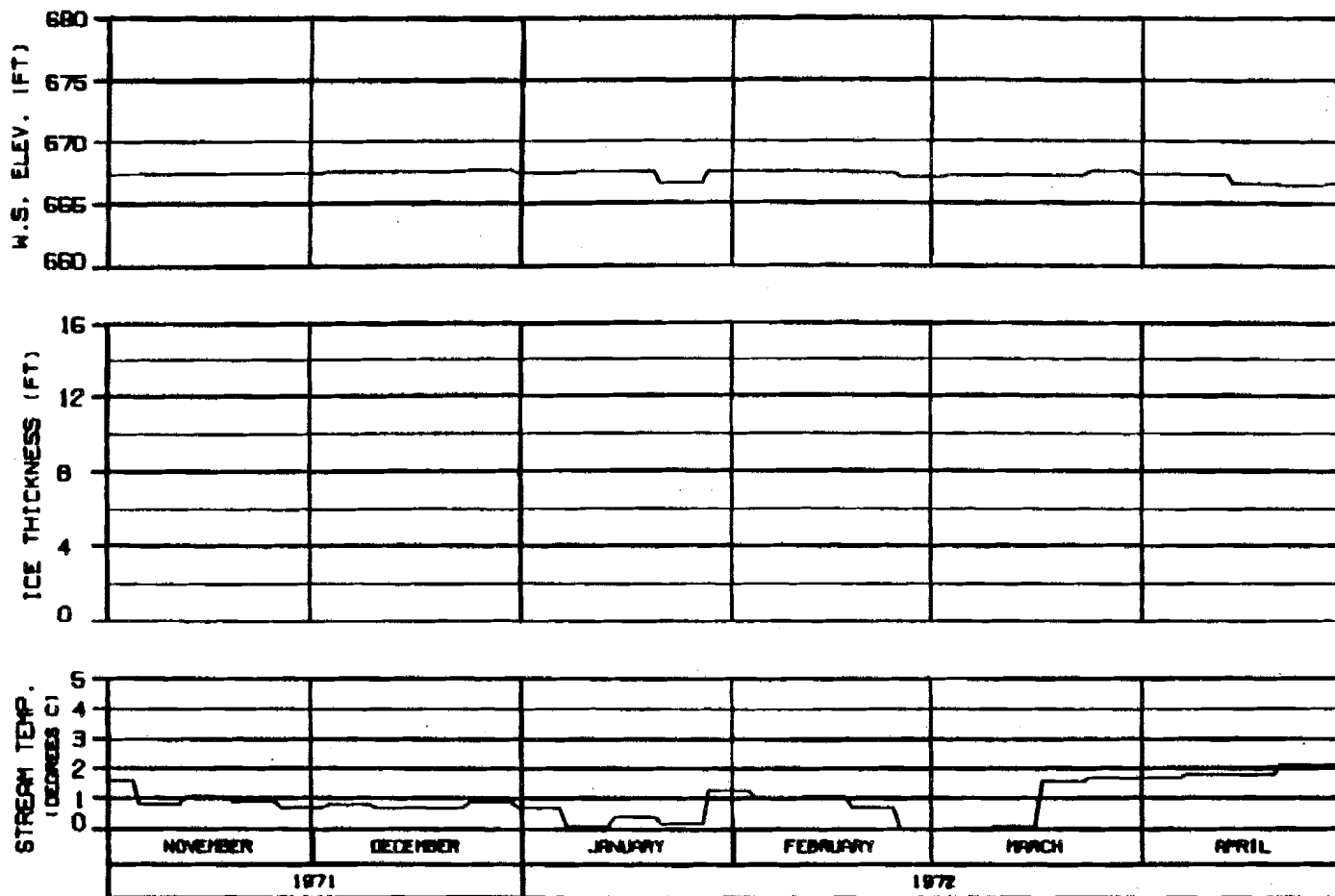
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN - ALASKA POWER AUTHORITY 0.00 0000.142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

ICE THICKNESS LEGEND:

———— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

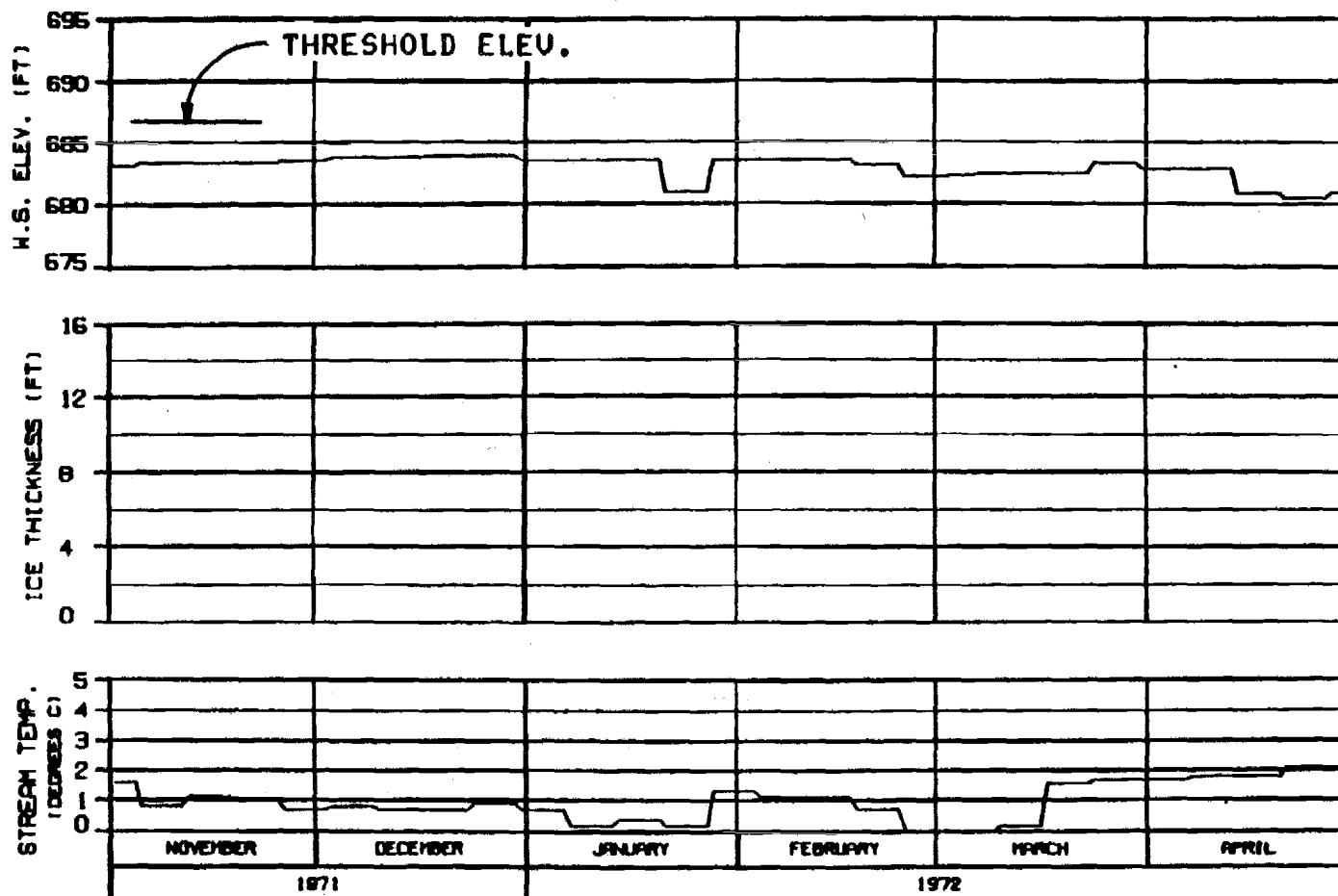
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRARD JOINT VENTURE

CHIEF: S. L. PETERSON S. J. J. 1980.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

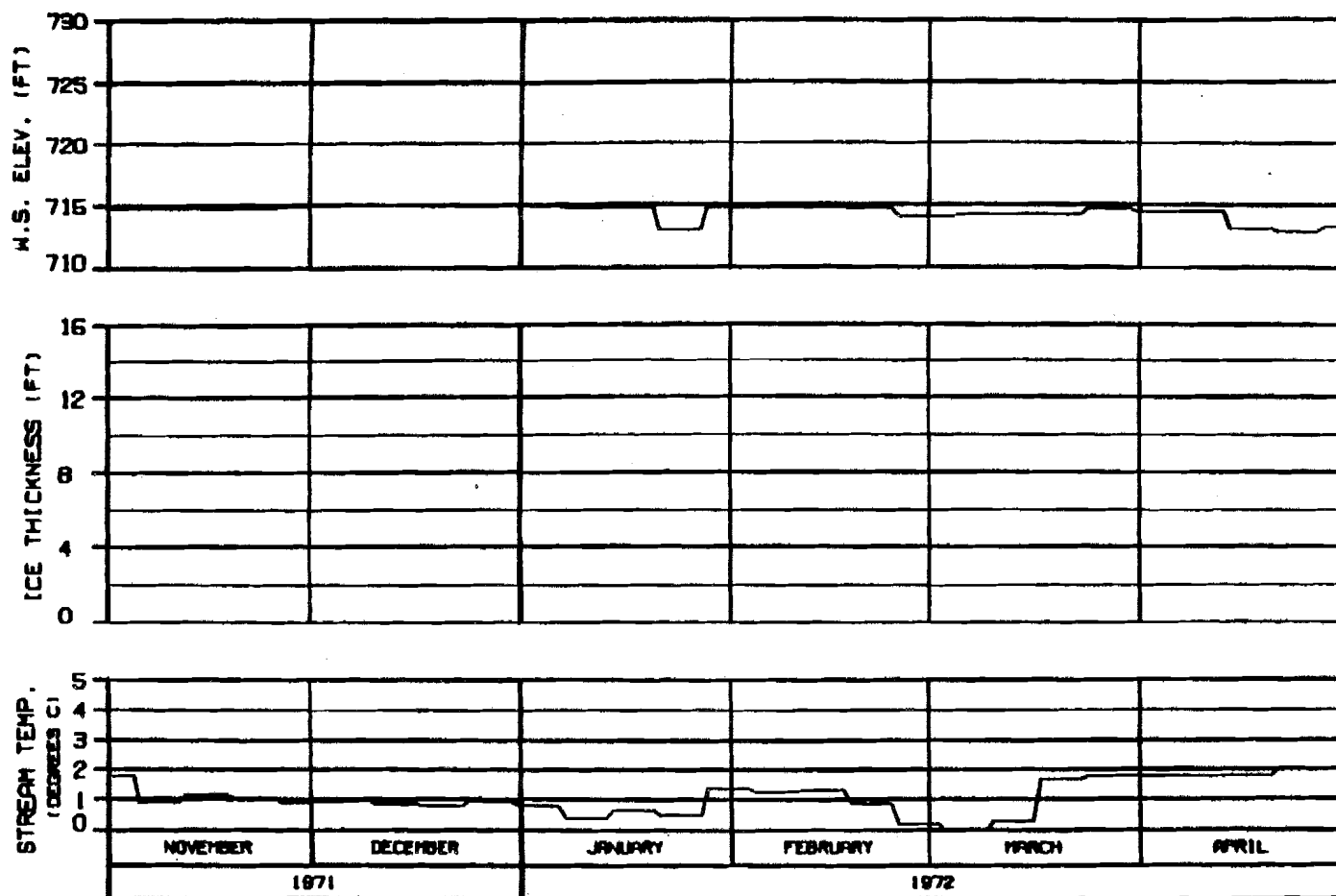
SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACCO JOINT VENTURE

CHUCKER, B.L. 0008

9 JUL 74

NOV. 142

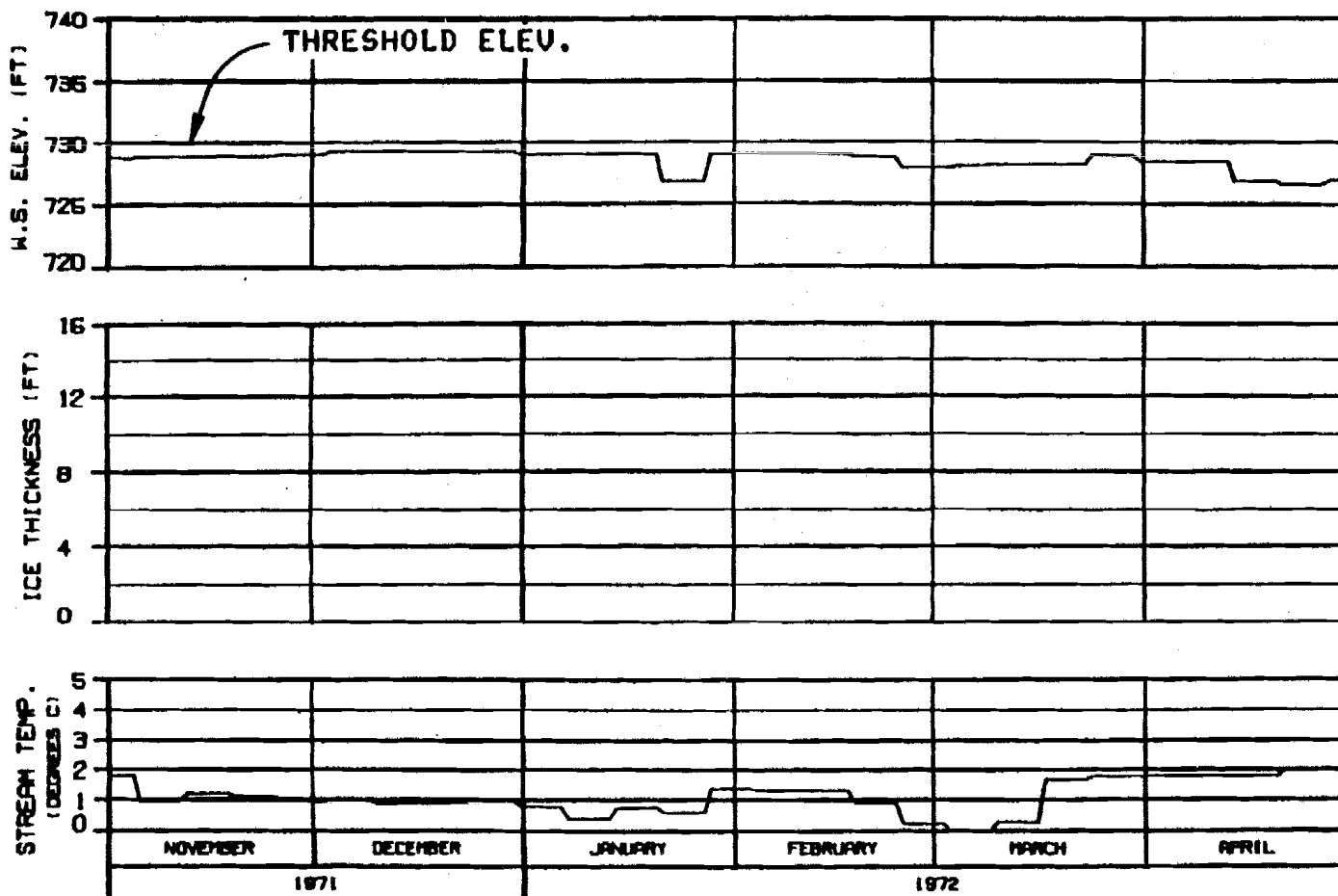


# HEAD OF SLOUGH 17 RIVER MILE : 139.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY		
SUSTINA PROJECT		
SUSTINA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGNED BY: B.L. BROWN	DRAWN BY: B.L. BROWN	1000.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

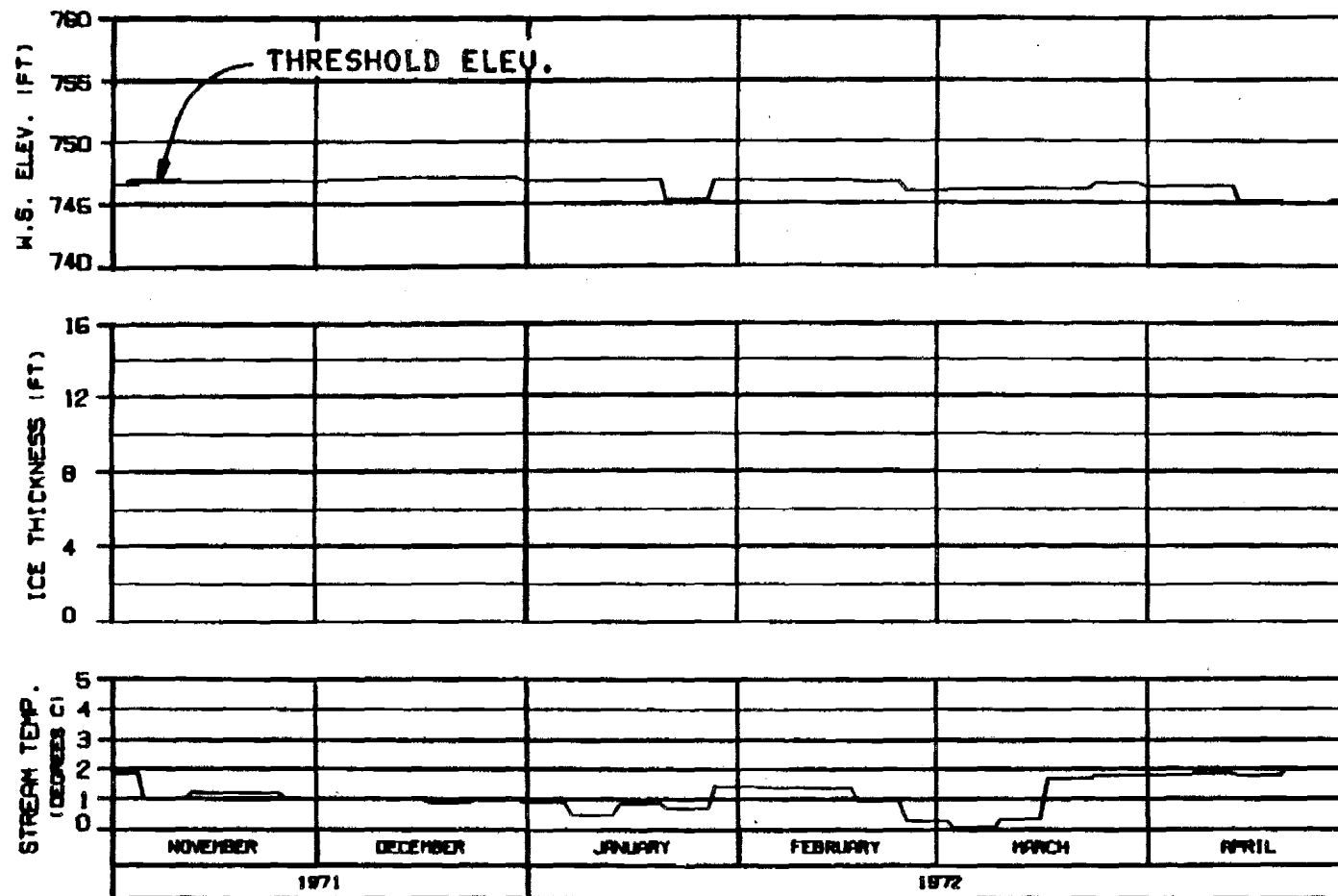
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACCO JOINT VENTURE

DRAWN BY: BGP 0 00 00 0000.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP RULE : NATURAL  
 REFERENCE RUN NO. : 7120CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

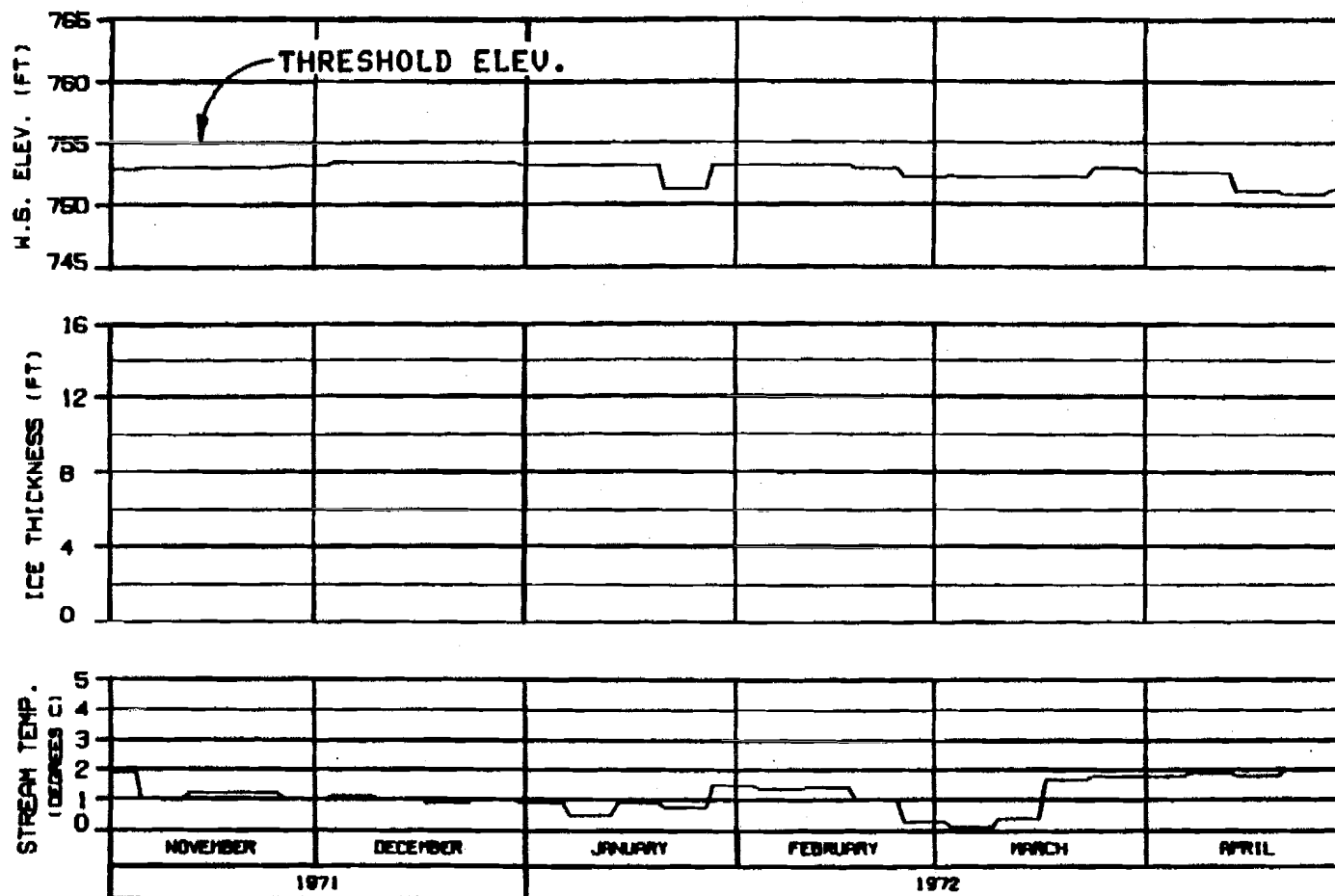
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZRA-EBR600 JOINT VENTURE

DESIGN: SL2000

8 JUL 84

ISSN: 142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

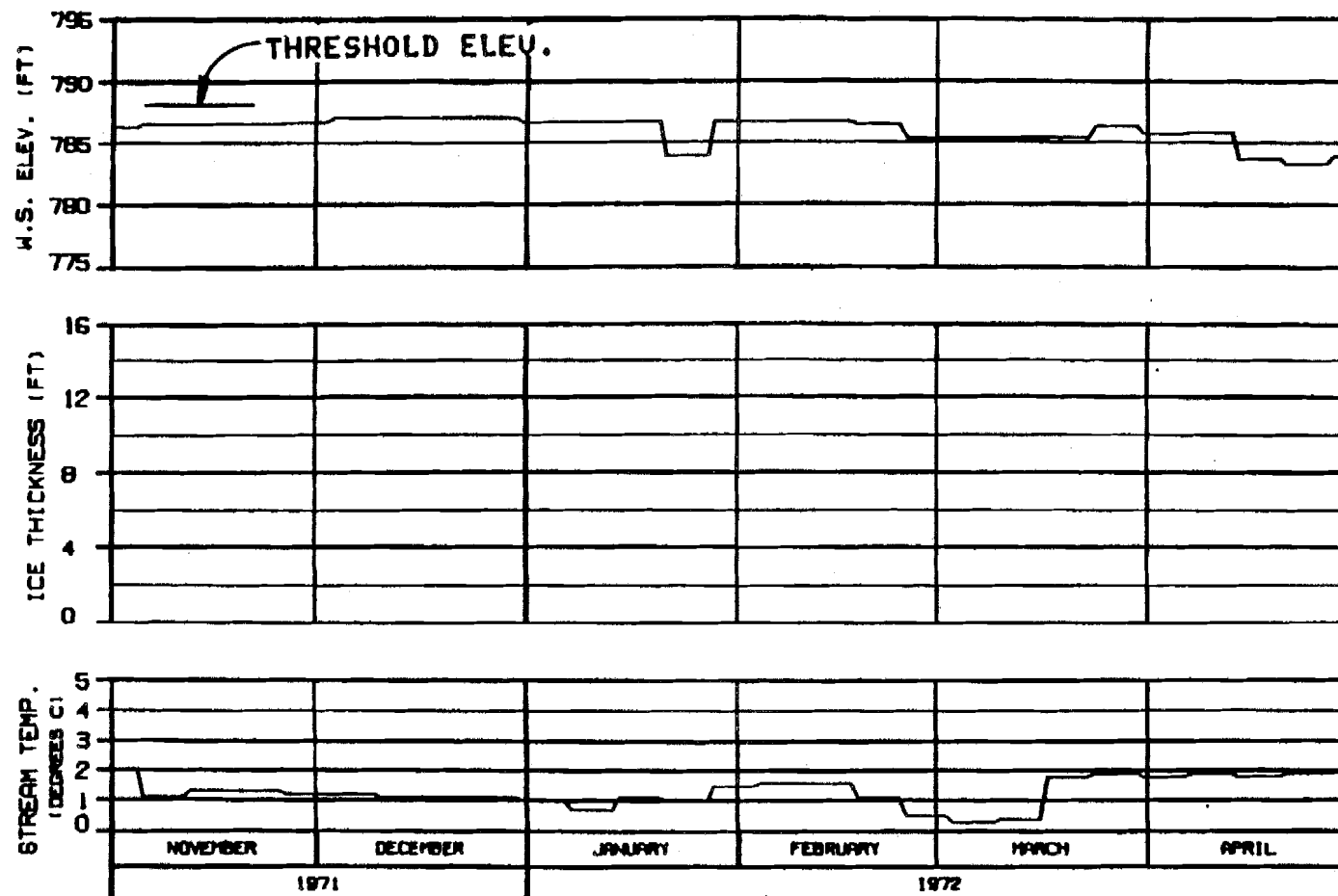
ALASKA POWER AUTHORITY

SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

CHICAGO, ILLINOIS 9 JAN 81 1980.142



**HEAD OF SLOUGH 22**  
**RIVER MILE : 144.80**

**ICE THICKNESS LEGEND:**  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 71 - 30 APR 72  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP RULE : NATURAL  
REFERENCE RUN NO. : 7120CNA

**ALASKA POWER AUTHORITY**

**SUSITNA PROJECT**

**SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY**

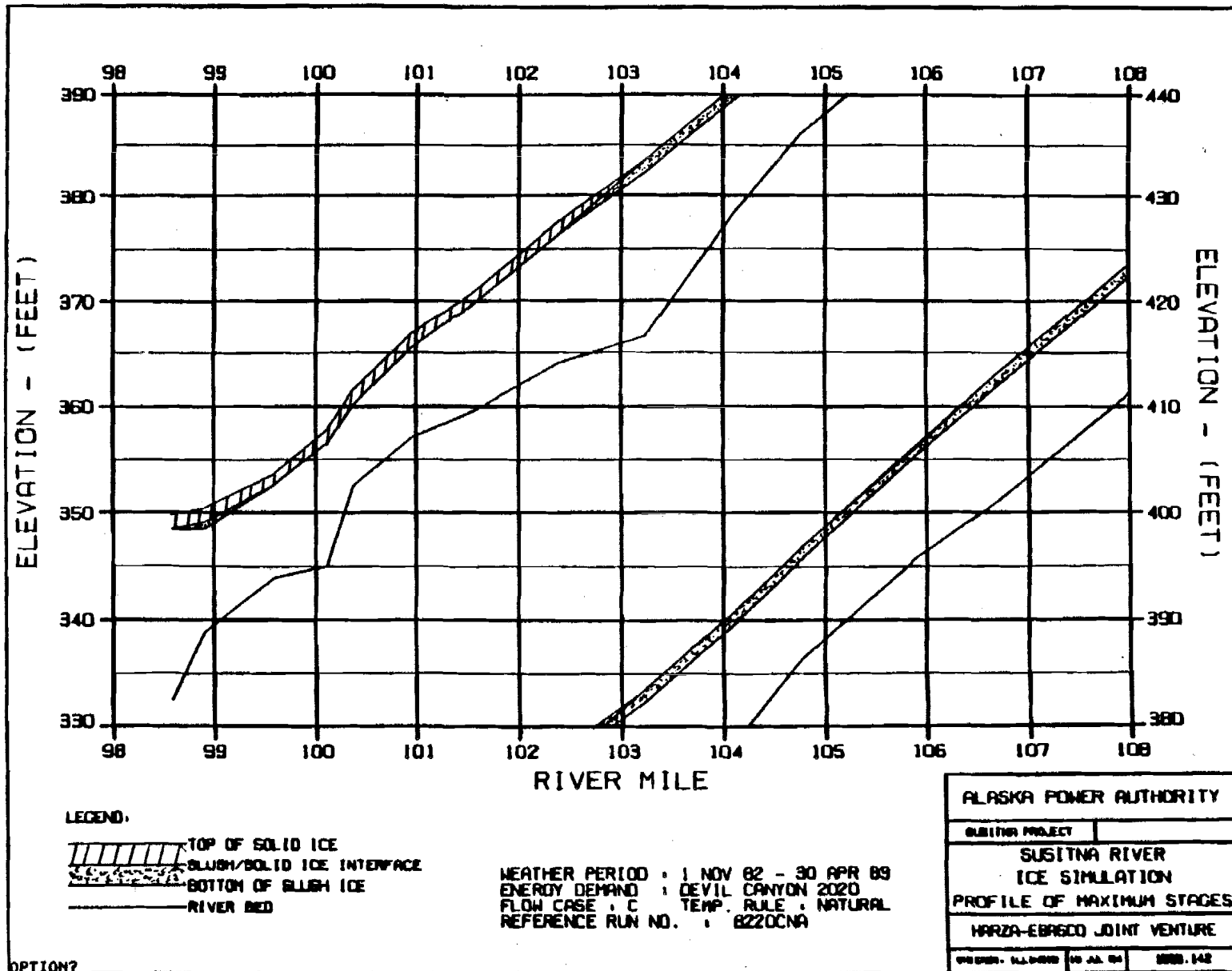
**HARZA-EBRACD JOINT VENTURE**

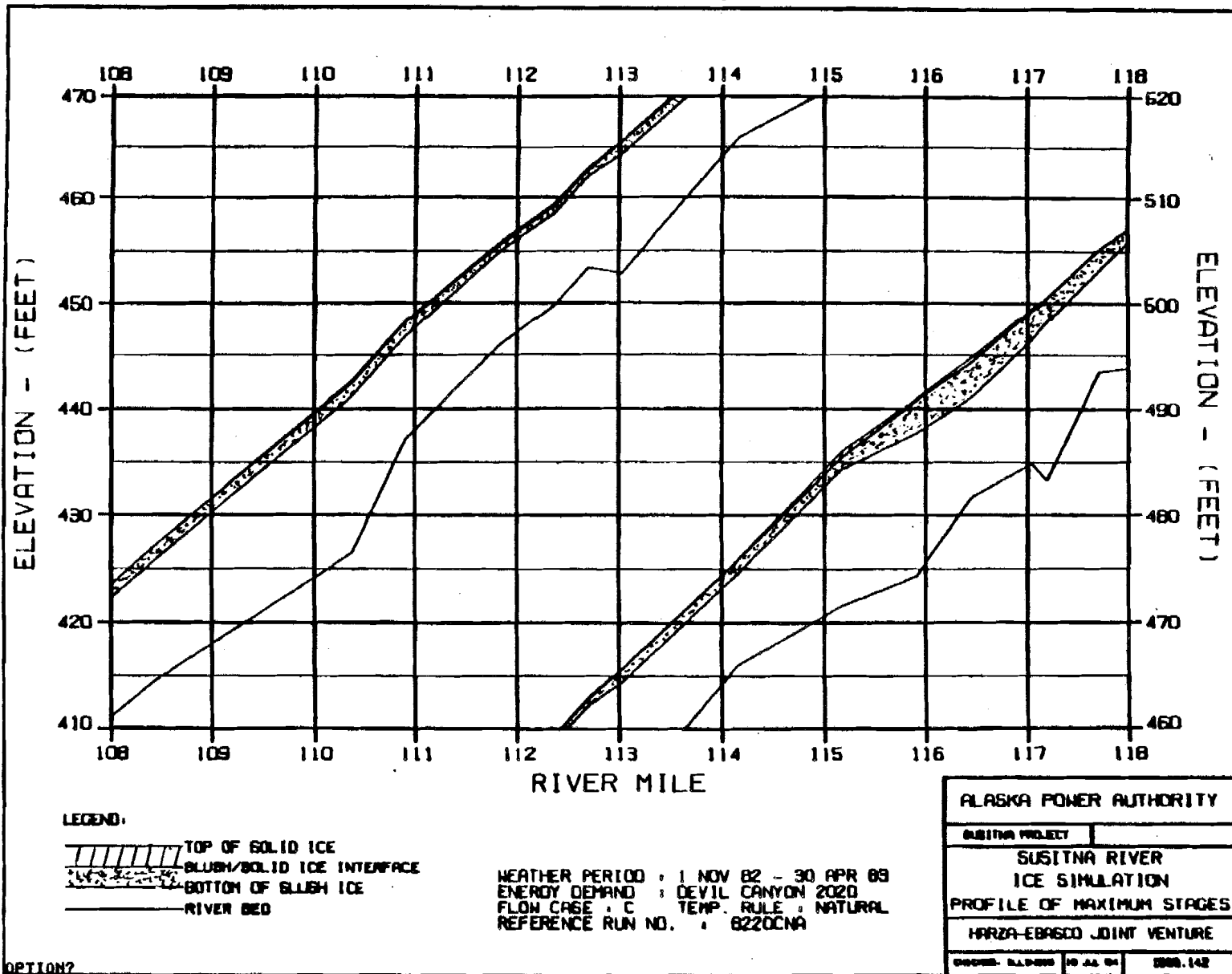
CHARTS - ALP-0015 6 JUL 80 1000.142

OPTION?

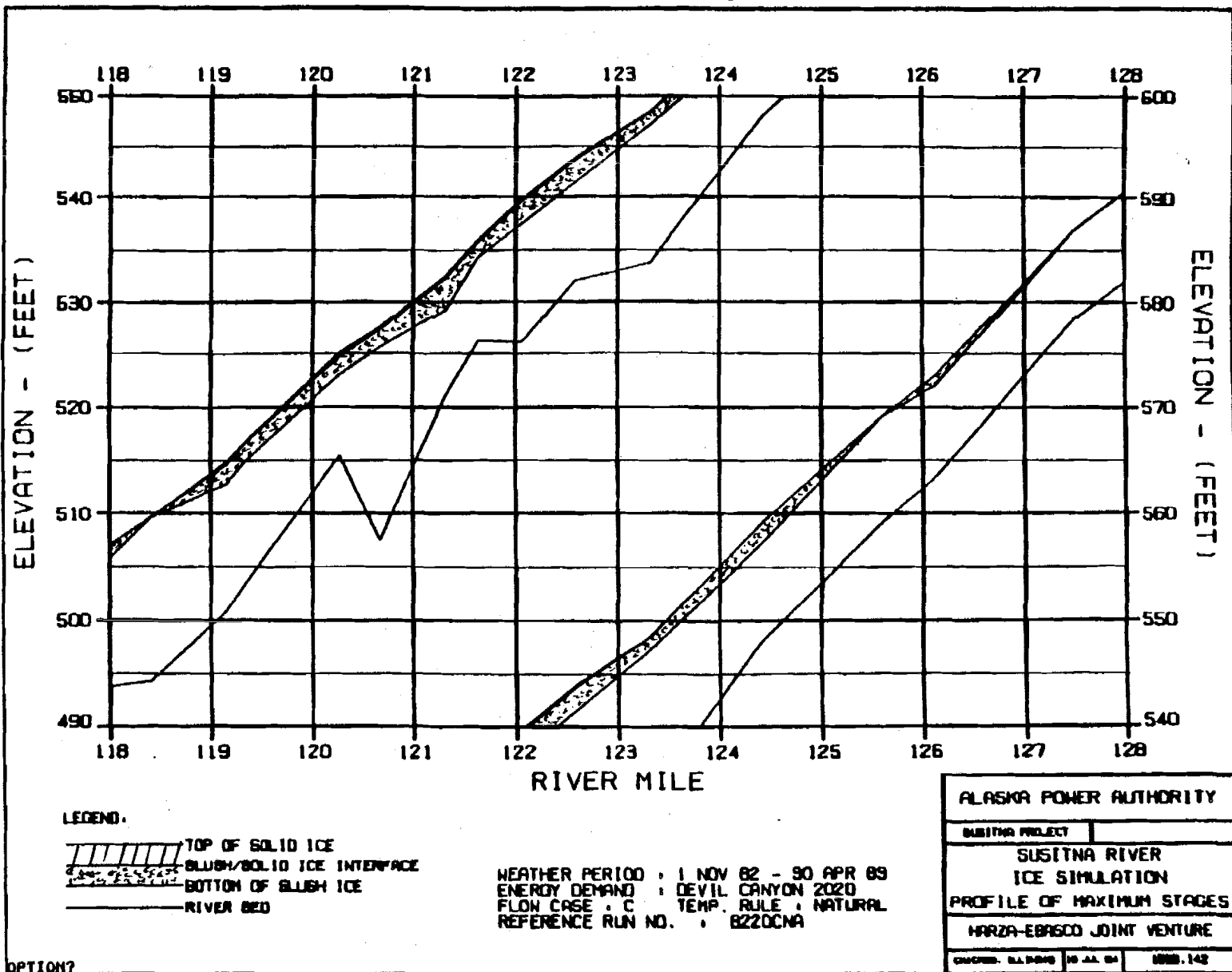


# EXHIBIT R

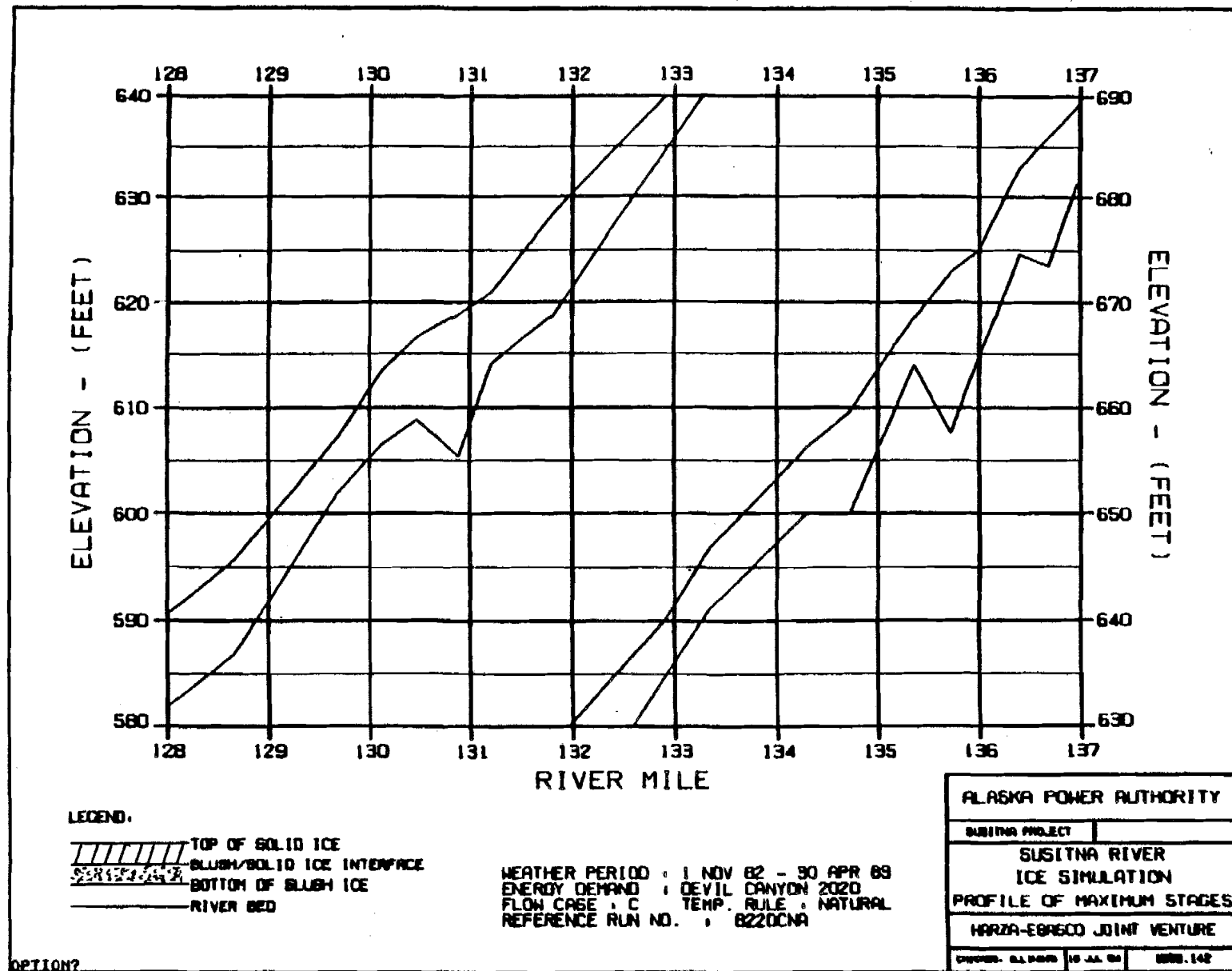




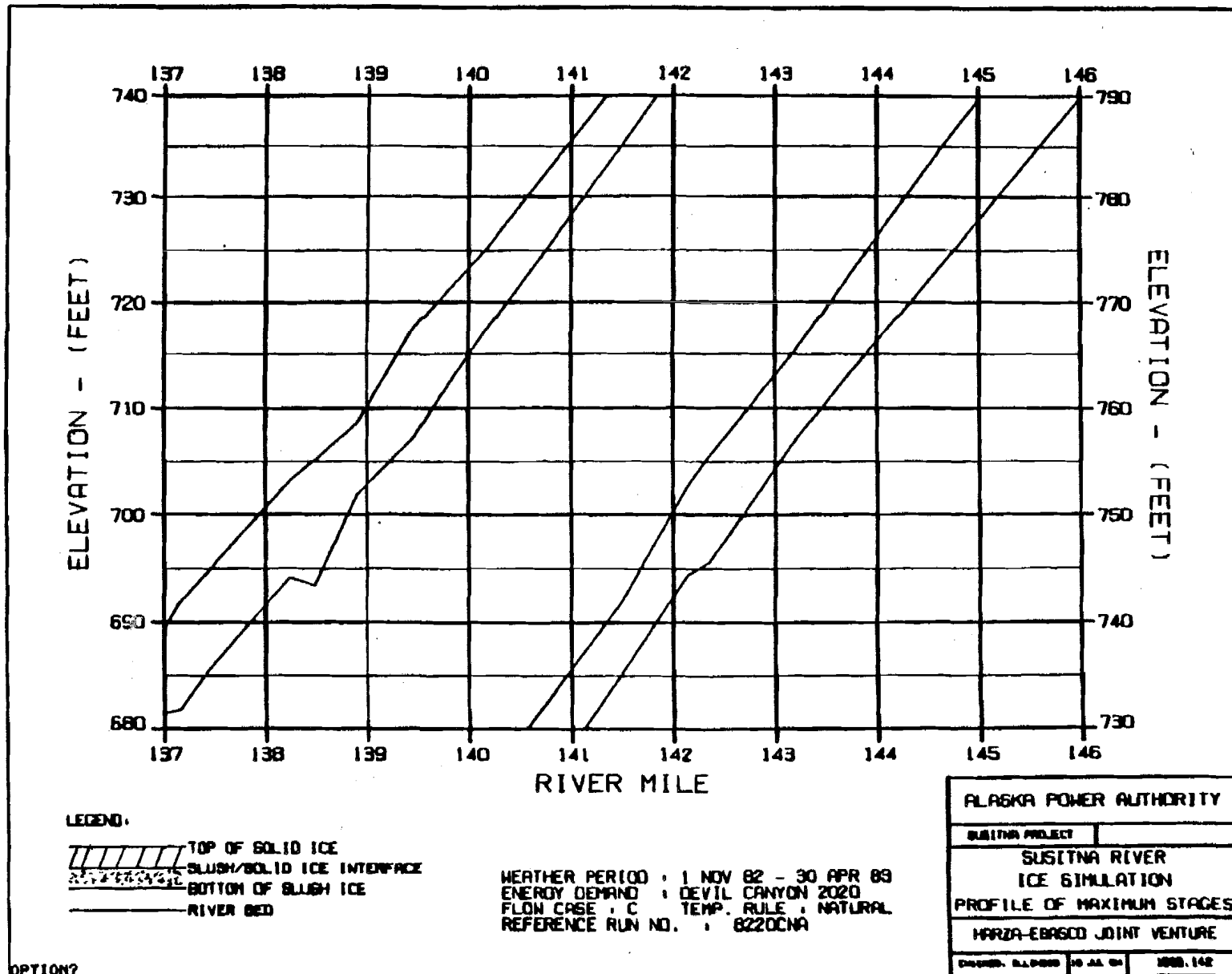
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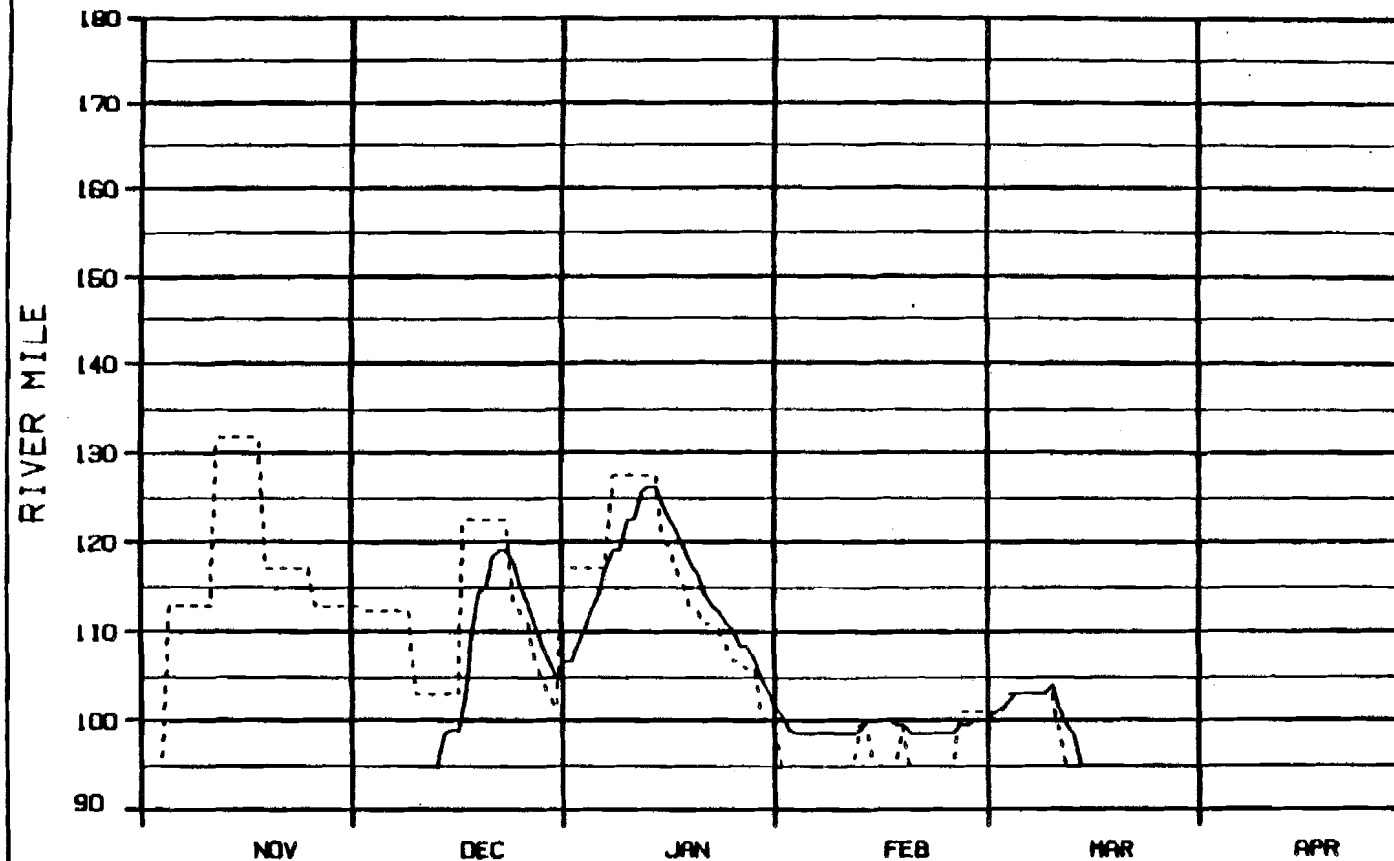


OPTION?



CC





## LEGEND:

— ICE FRONT

- - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 8220CNA

## ALASKA POWER AUTHORITY

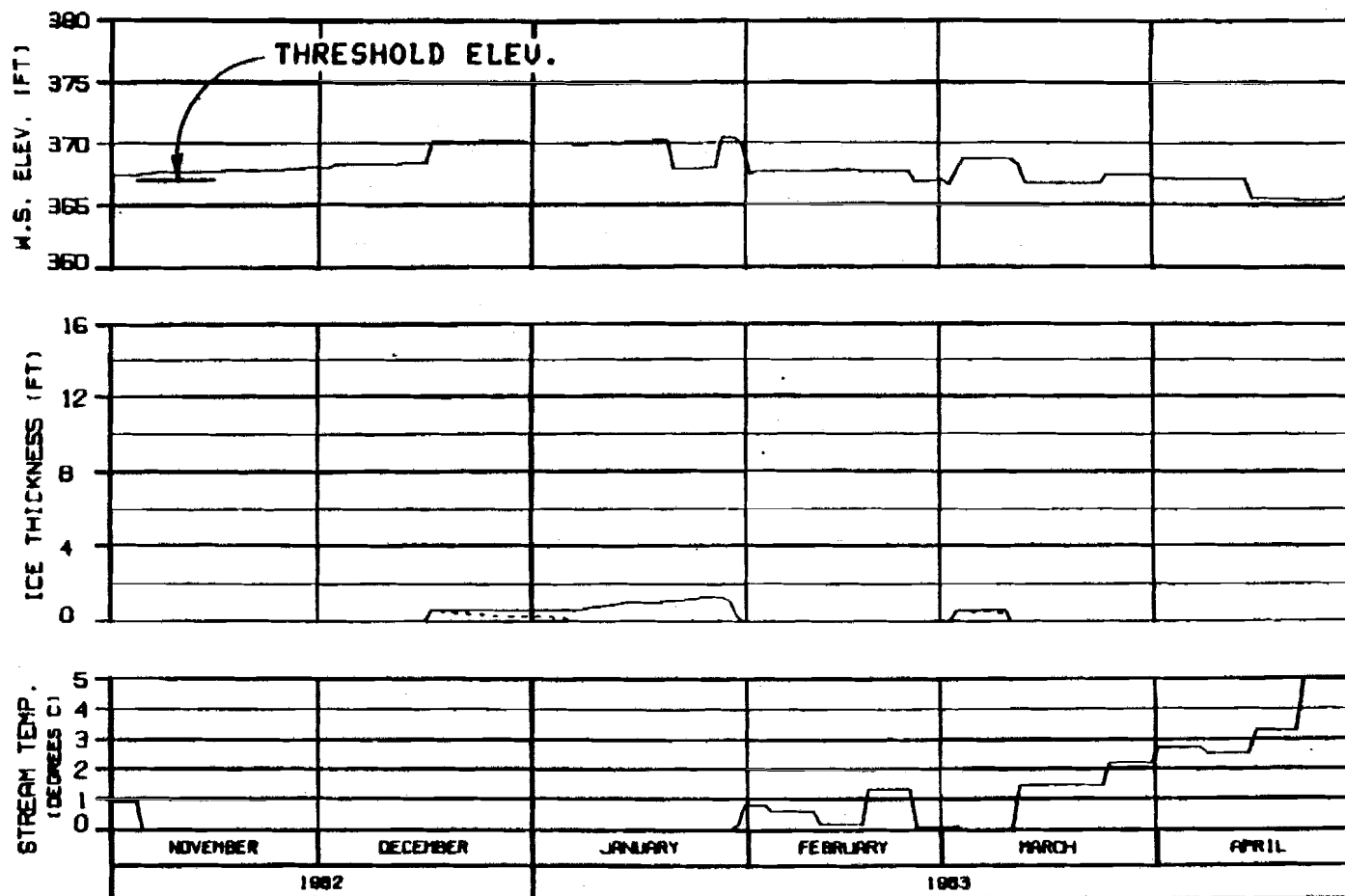
SUSITNA PROJECT

SUSITNA RIVER  
 PROGRESSION OF ICE FRONT  
 & ZERO DEGREE ISOTHERM

HARZA-EBRACO JOINT VENTURE

DESIGNED BY: J. L. BROWN 10 JUL 83 1000-142

OPTION?



# HEAD OF WHISKERS SLOUGH

RIVER MILE : 101.50

## ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 82200NA

ALASKA POWER AUTHORITY

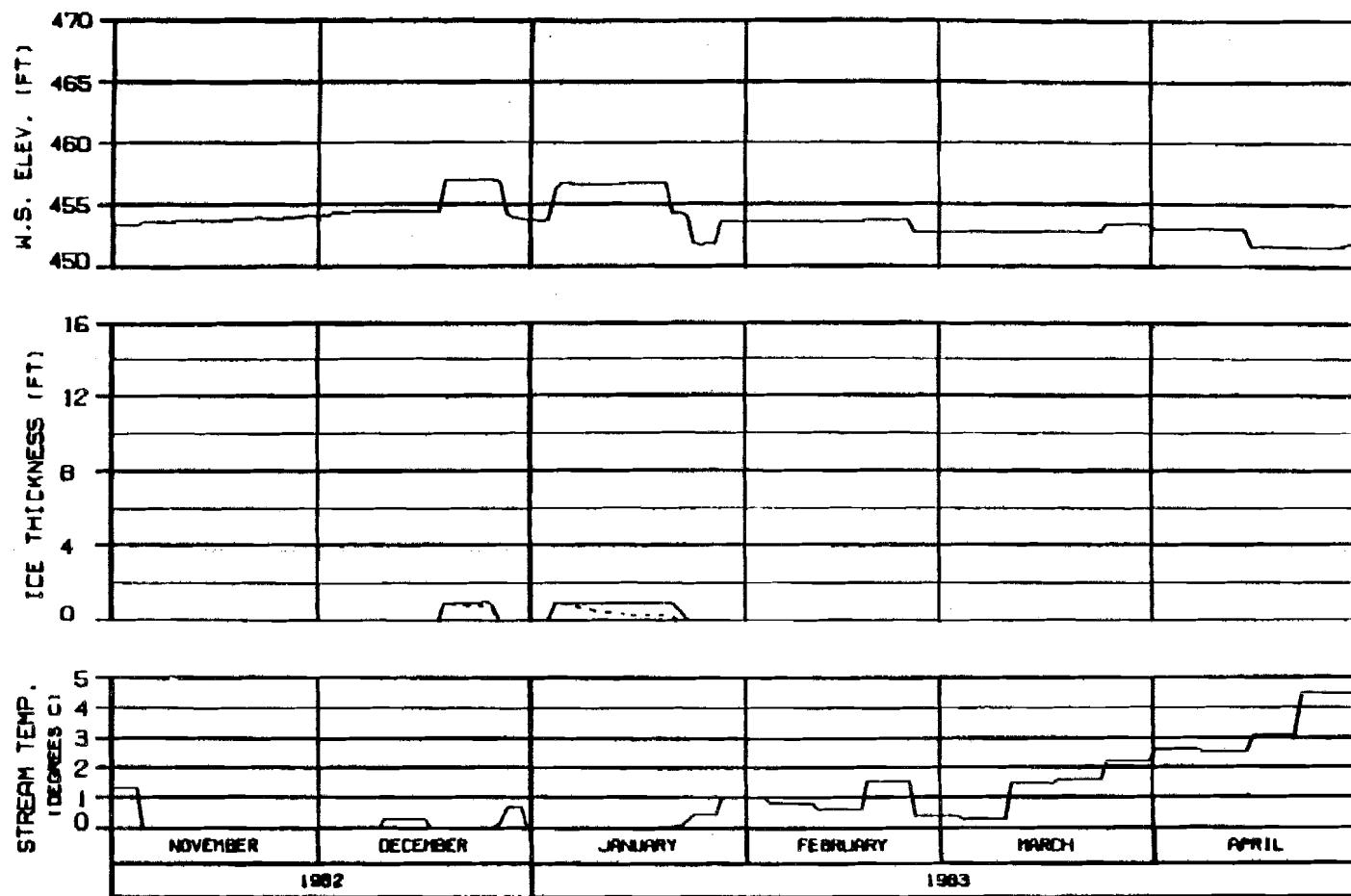
SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: A. B. B. 10 JUL 84 1000.142





# SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

## ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 8220CNA

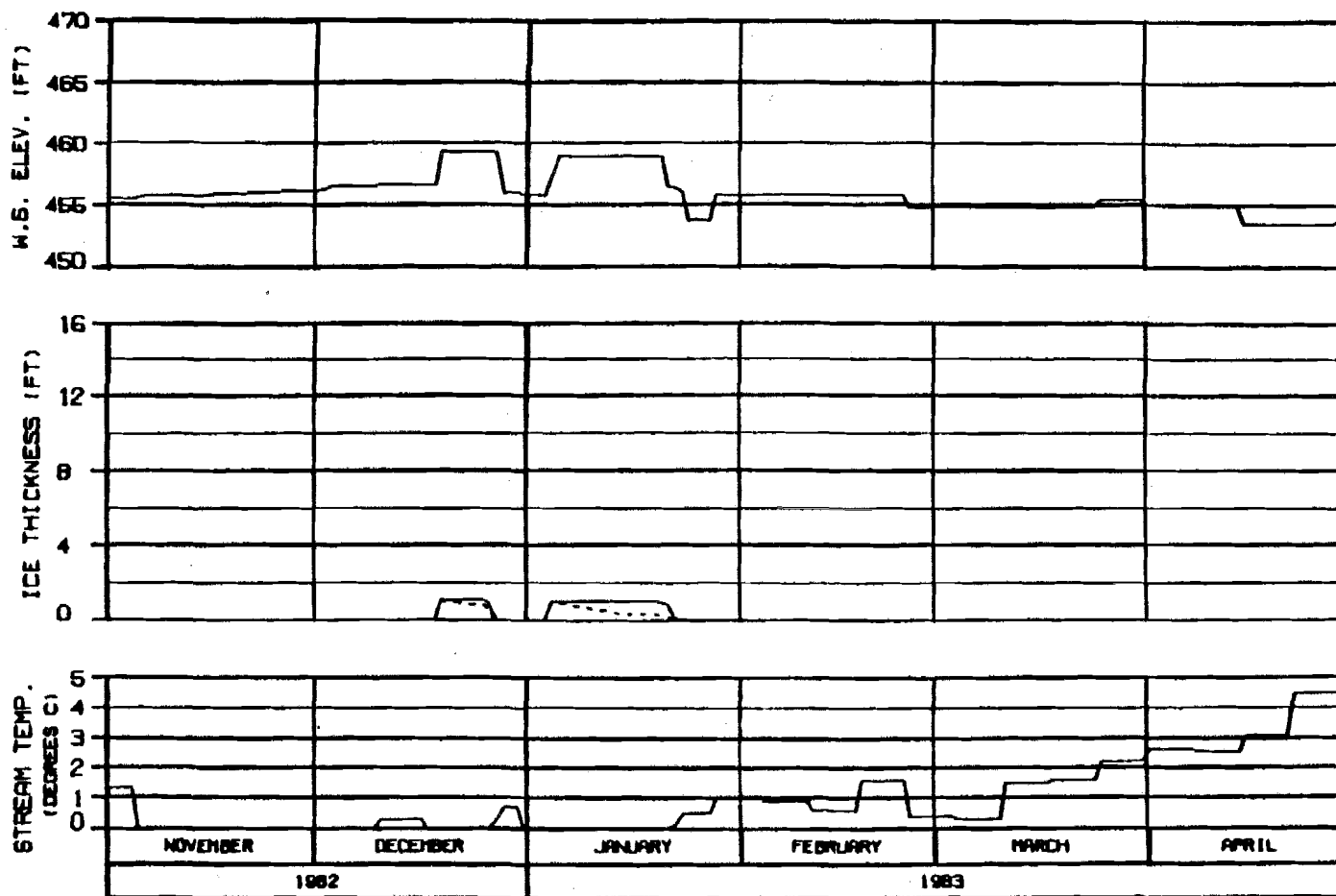
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHECKED: B.L. 8/83 18 JAN 84 1000.142



MOUTH OF SLOUGH 6A

RIVER MILE : 112.34

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : B220CNA

ALASKA POWER AUTHORITY

SUSTITNA PROJECT

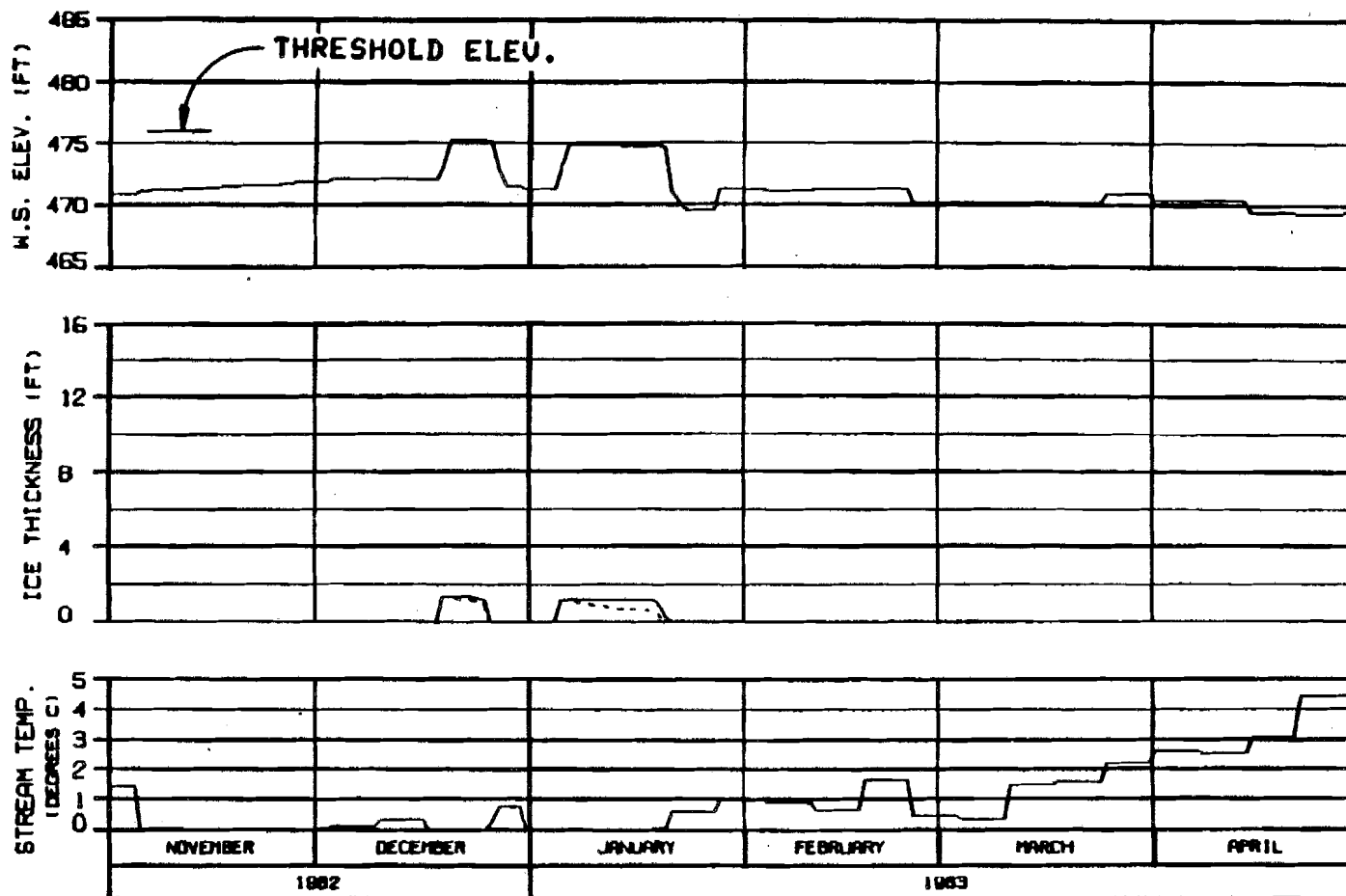
SUSTITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DRAWN: S. L. BROWN

10 JUL 83

ISSN. 142

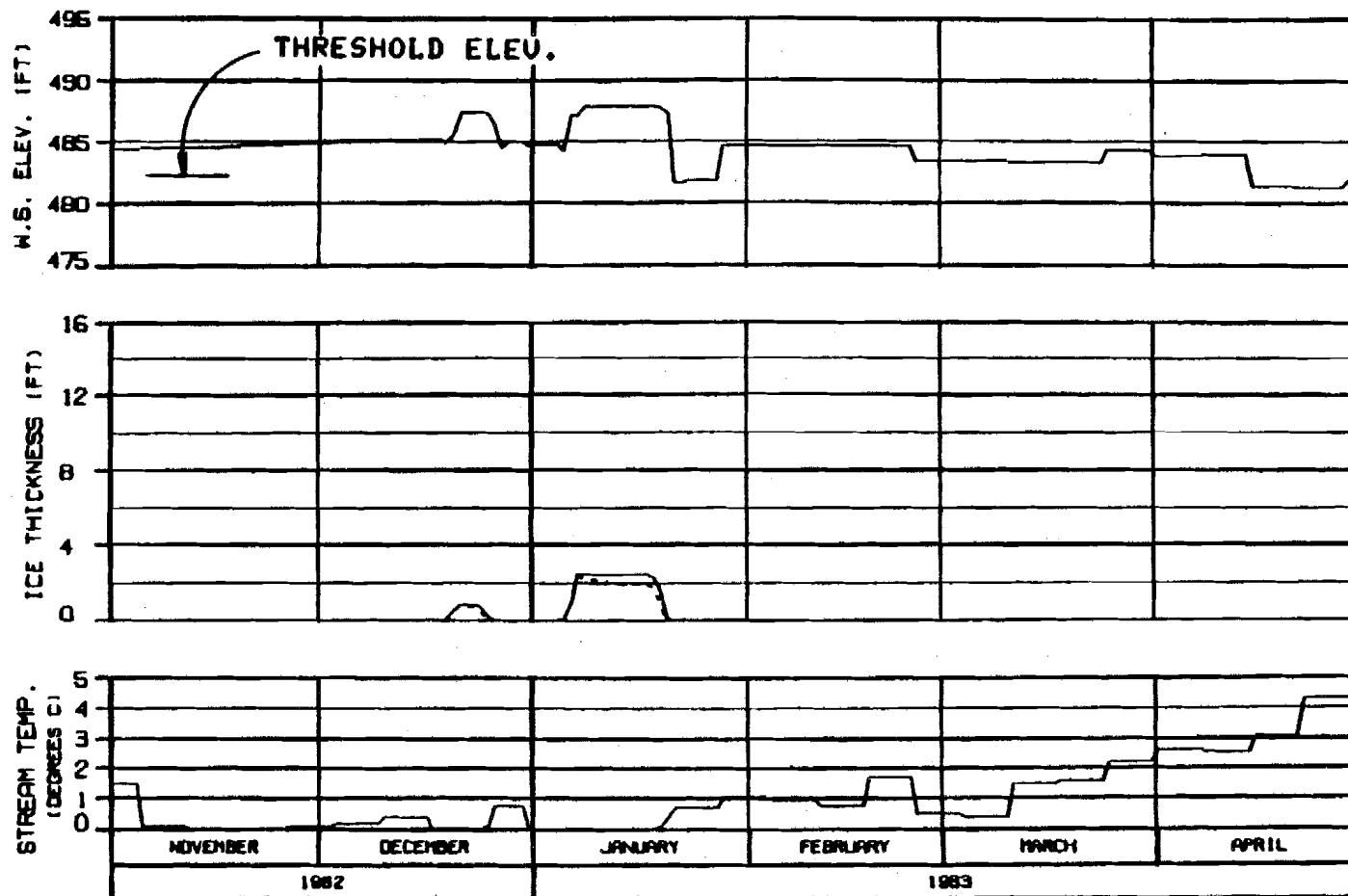


HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHIEF: S. J. P. 888	10 JUL 83	1000-142



SIDE CHANNEL MSII  
RIVER MILE : 115.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

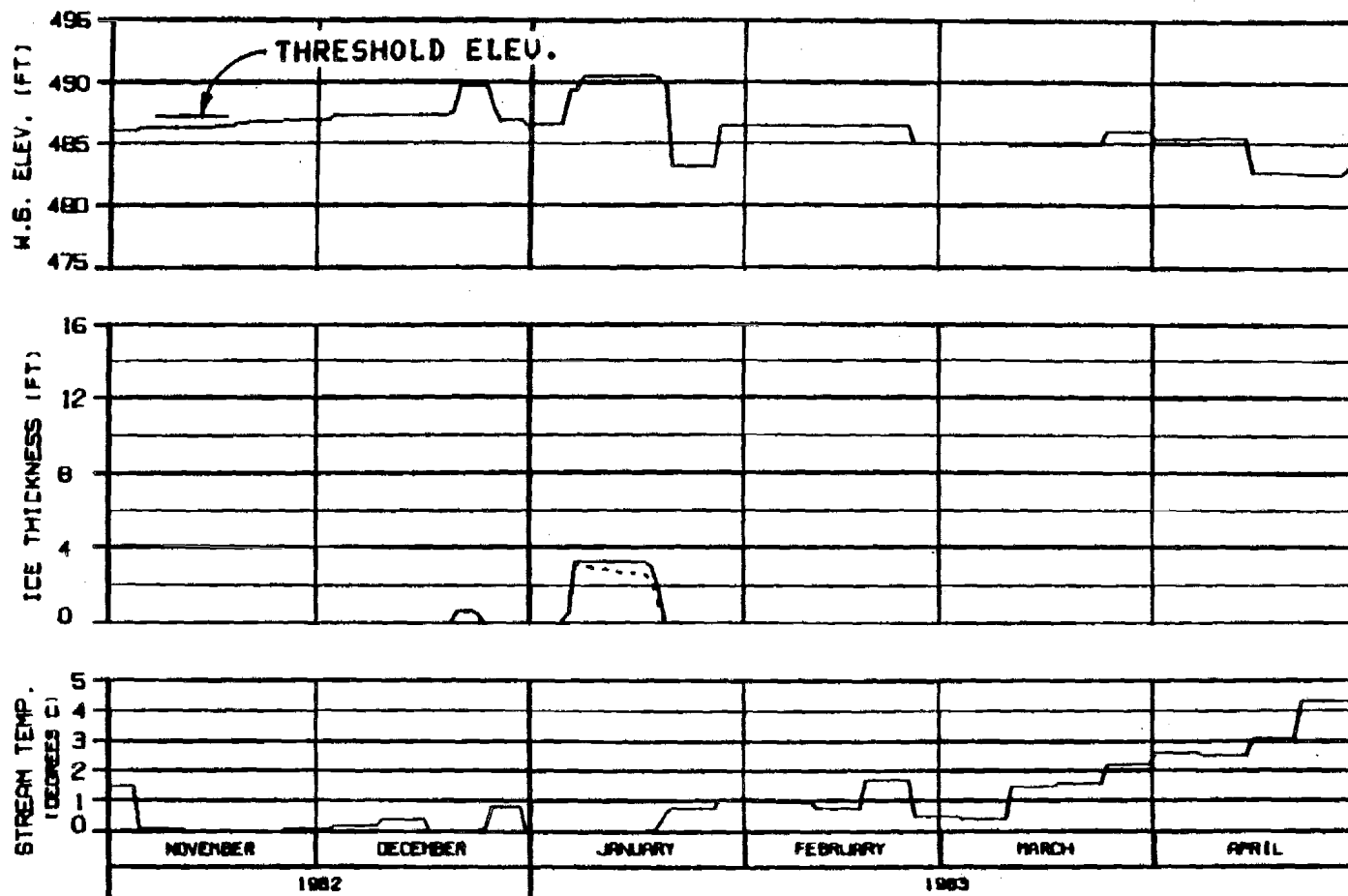
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: 810000 10 JAN 84 1000.142



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 82200NA

ALASKA POWER AUTHORITY

SUSTAIN PROJECT

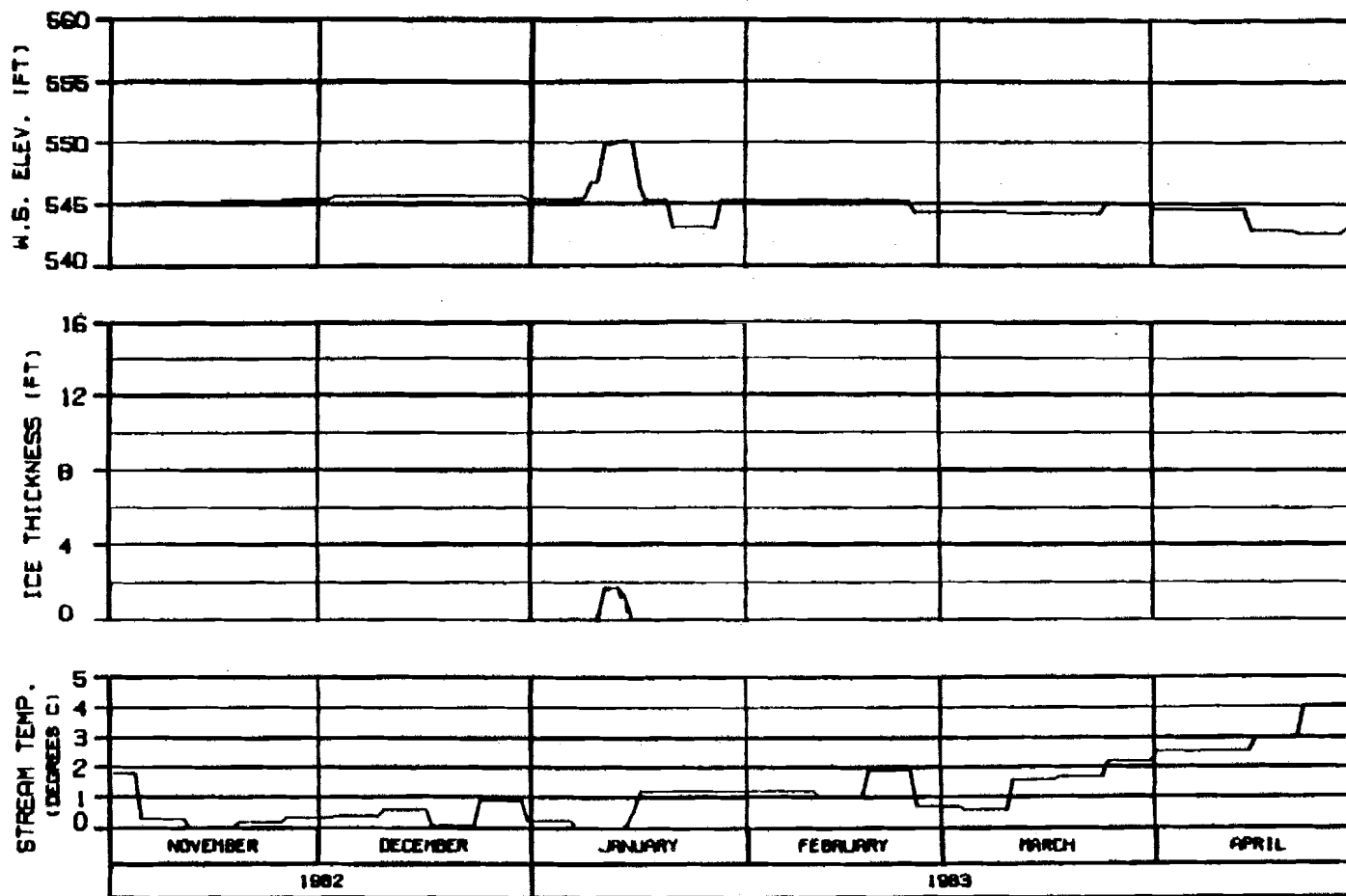
SUSITNA RIVER

ICE SIMULATION

TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHIEF: ELDER 30 JUL 84 1983.142



HEAD OF MOOSE SLOUGH  
RIVER MILE : 123.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

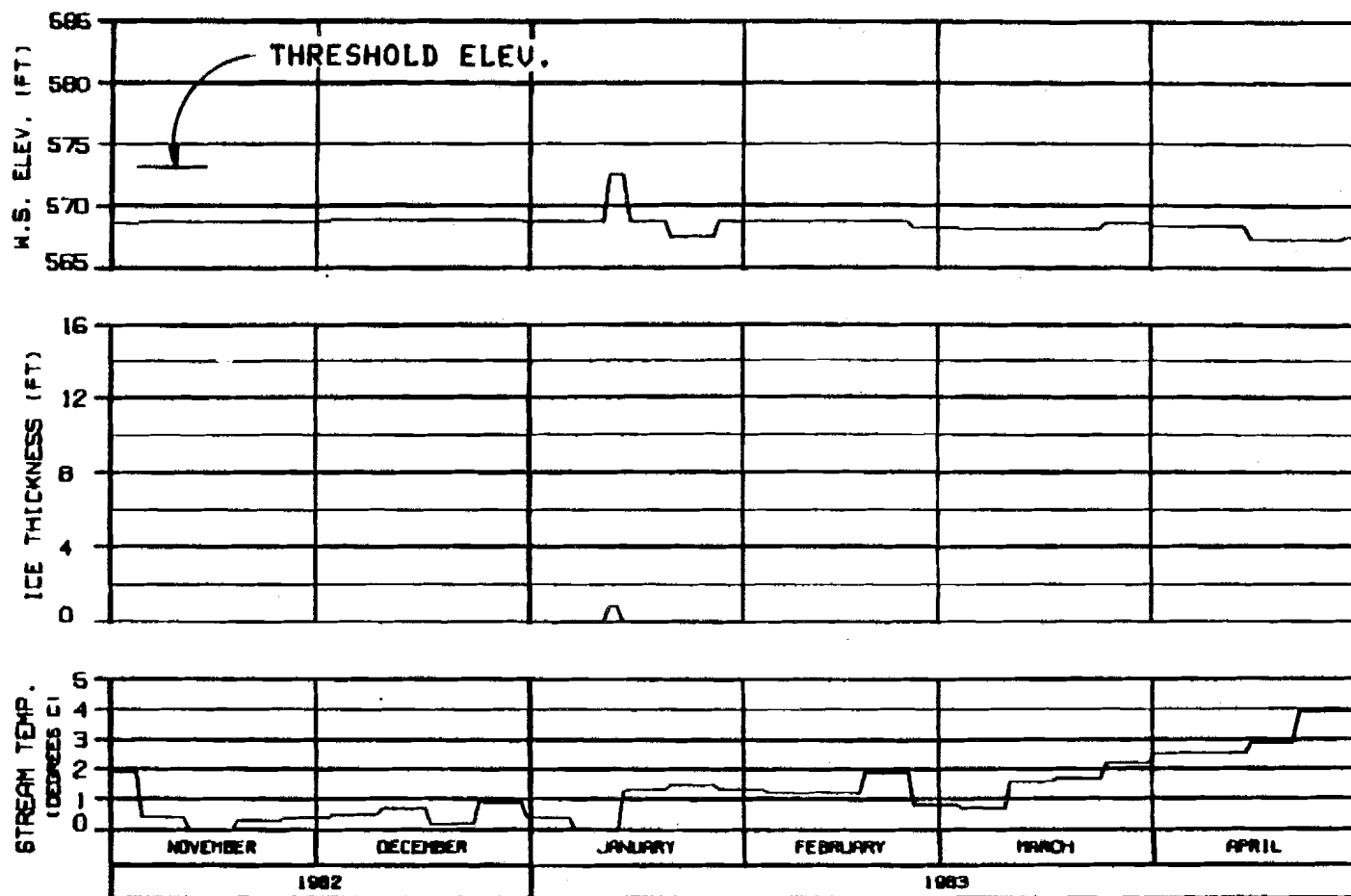
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

DRAWN: R.L.D. NO. 142 1983.142



HEAD OF SLOUGH 8A (WEST)  
RIVER MILE : 126.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

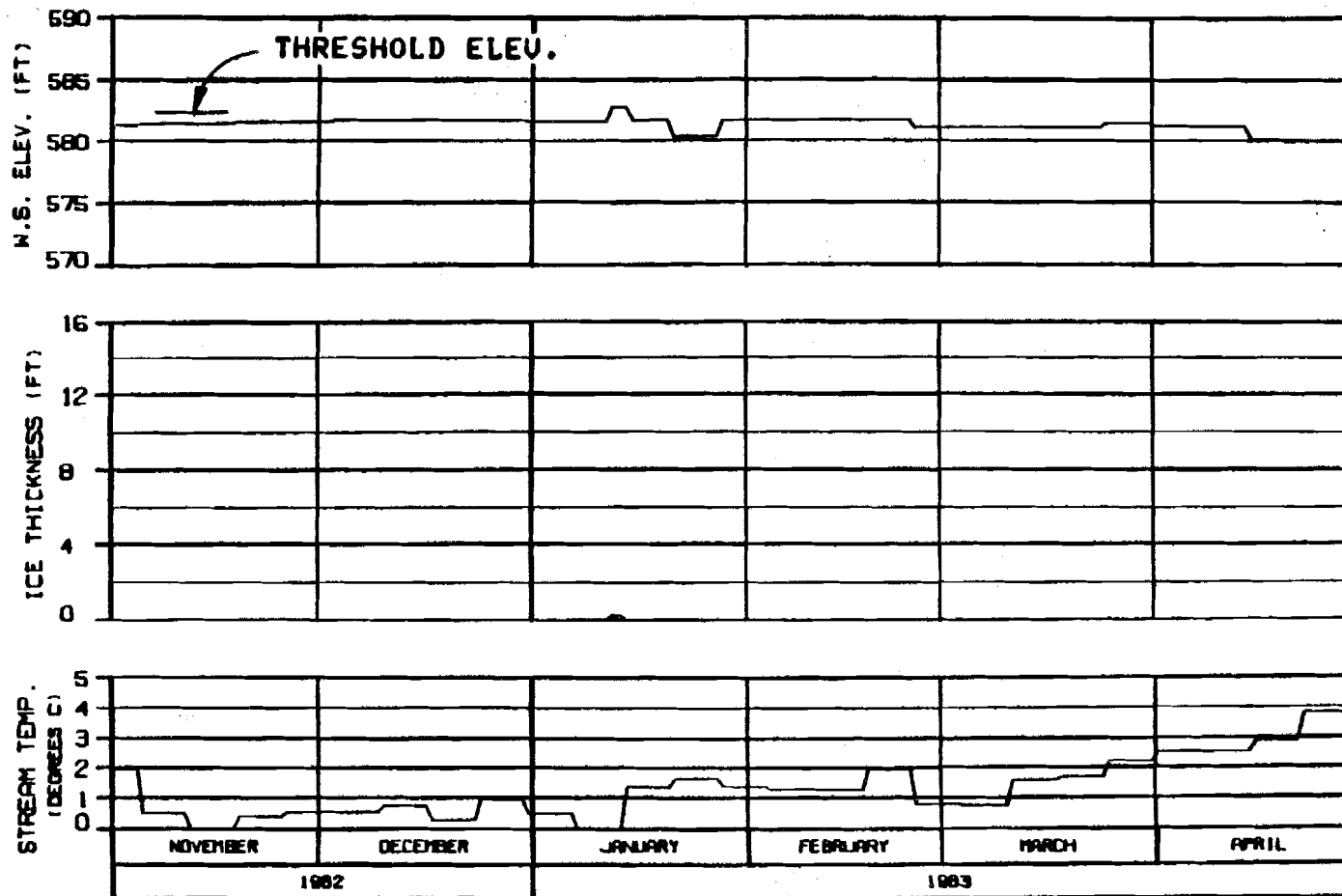
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HR2A-EBR6CO JOINT VENTURE

CHARTS, ALP-8202 10 AL 01 1000.142



HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER

ICE SIMULATION

TIME HISTORY

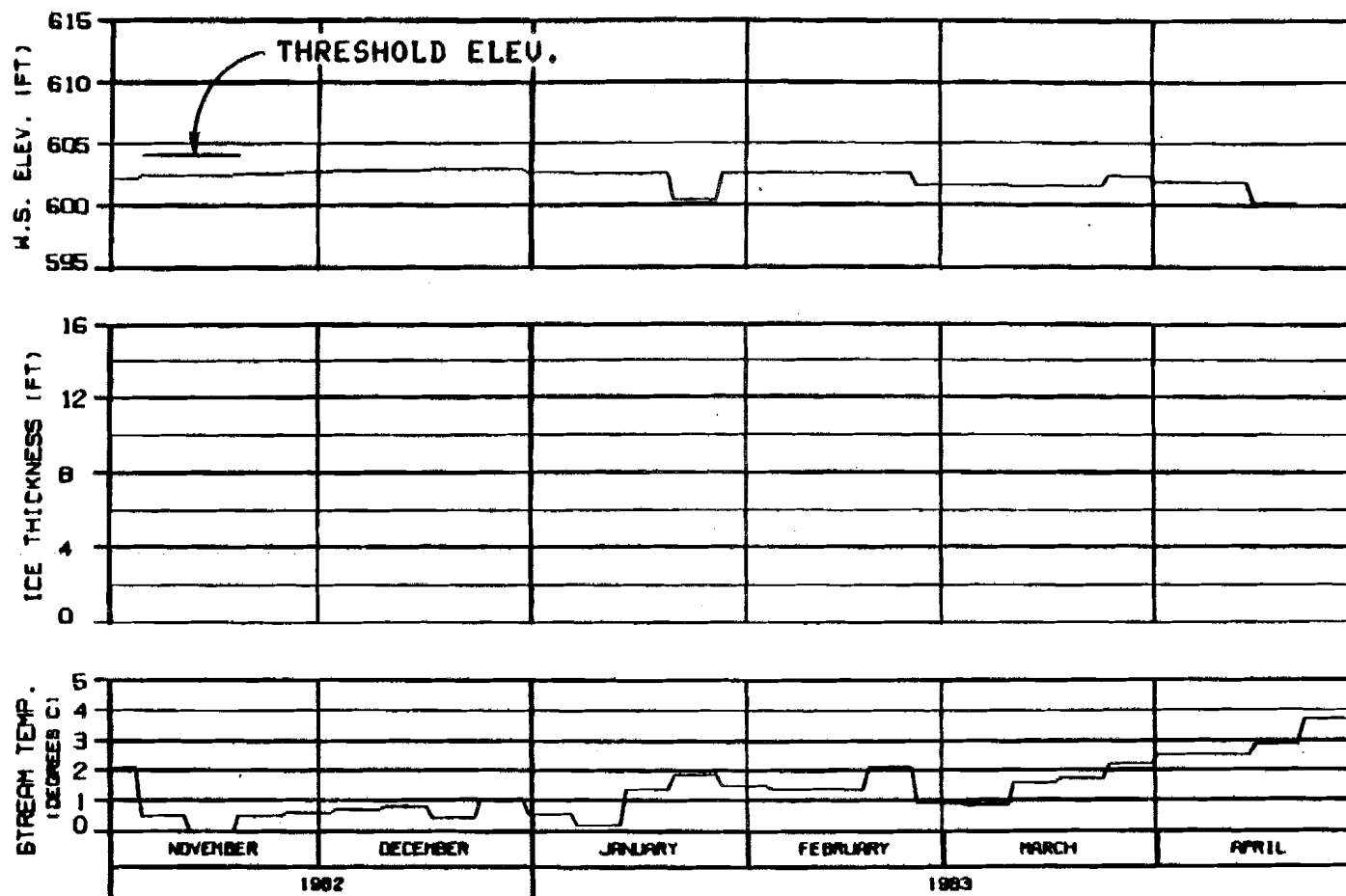
WARZA-EBASCO JOINT VENTURE

CHECKED: B.A. PONS

10 JAN 83

888.142





HEAD OF SLOUGH 9  
RIVER MILE : 129.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUGH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY

SUSTITNA PROJECT

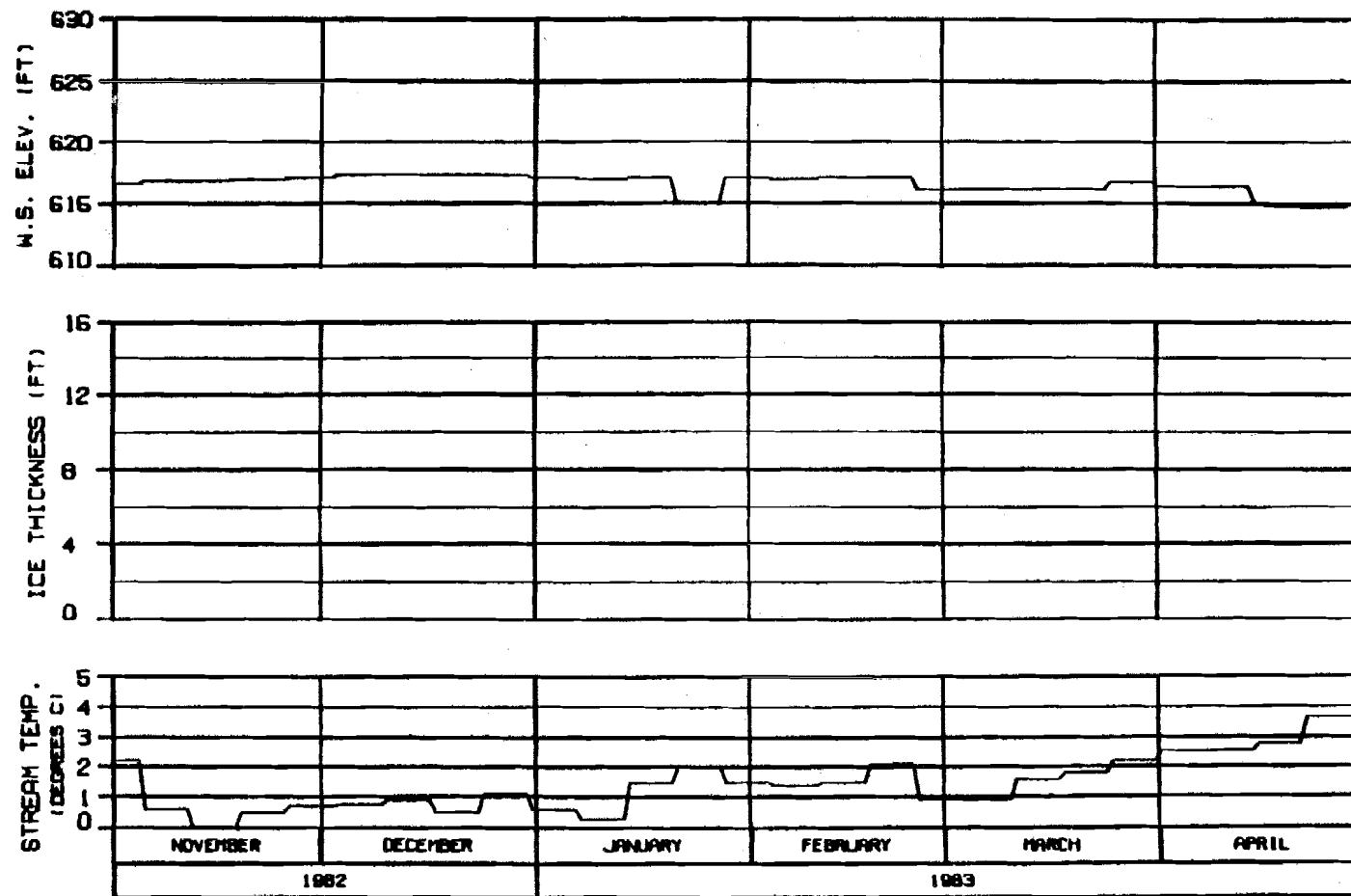
SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACO JOINT VENTURE

CHUCKER, AL 8-888 10-22-84 1000.142

OPTION?

OPTION?



SIDE CHANNEL U/S OF SLOUGH 9  
RIVER MILE : 130.60

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

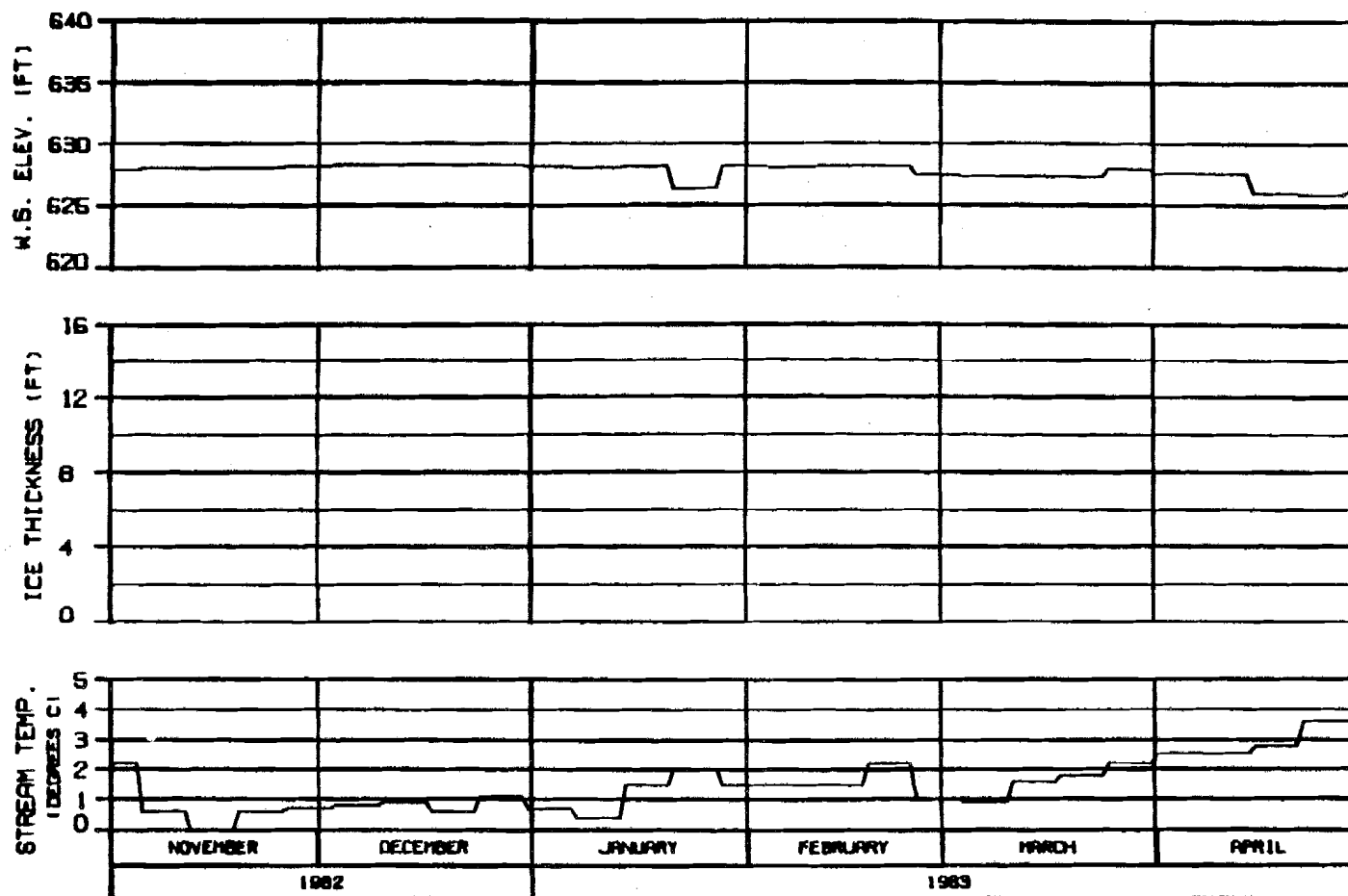
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN - B.L. 04/83 10 JAN 84 1000.142



SIDE CHANNEL U/S OF 4TH JULY CREEK

RIVER MILE : 131.80

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ..... BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
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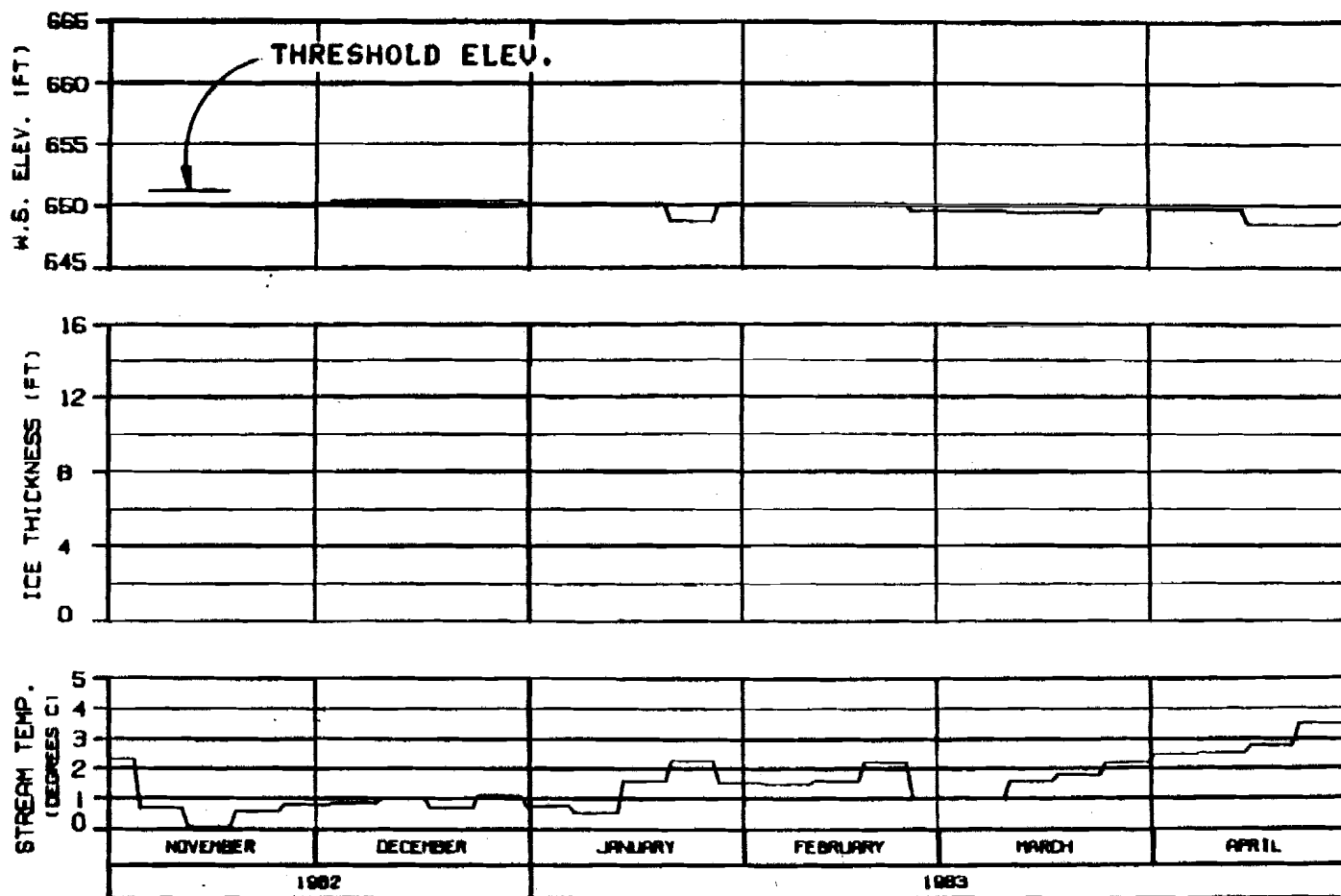
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTS: ALL 1982 10 JUL 84 888-142



HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

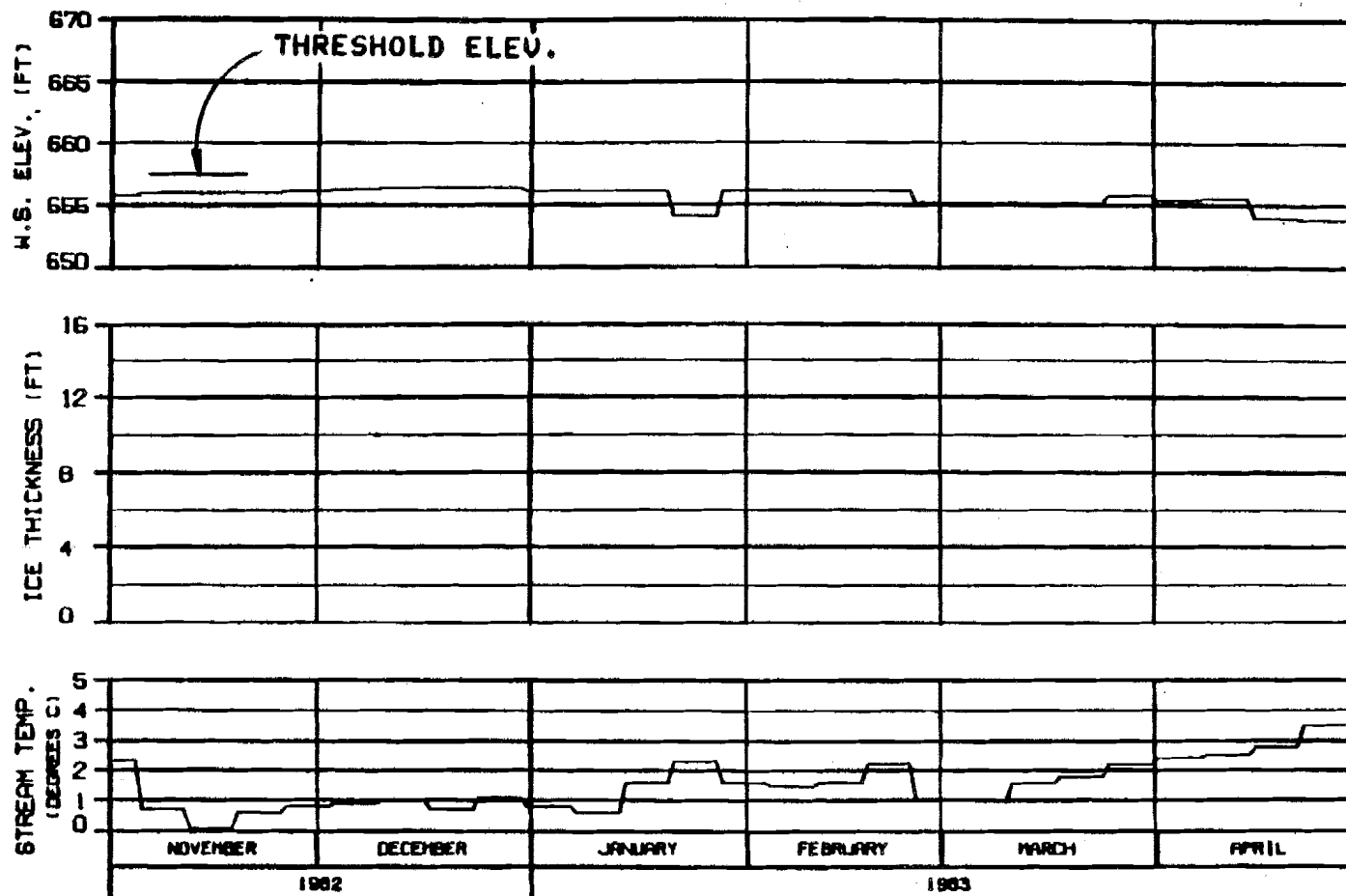
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: A. L. HARRIS 10 JUL 84 1000.142



SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

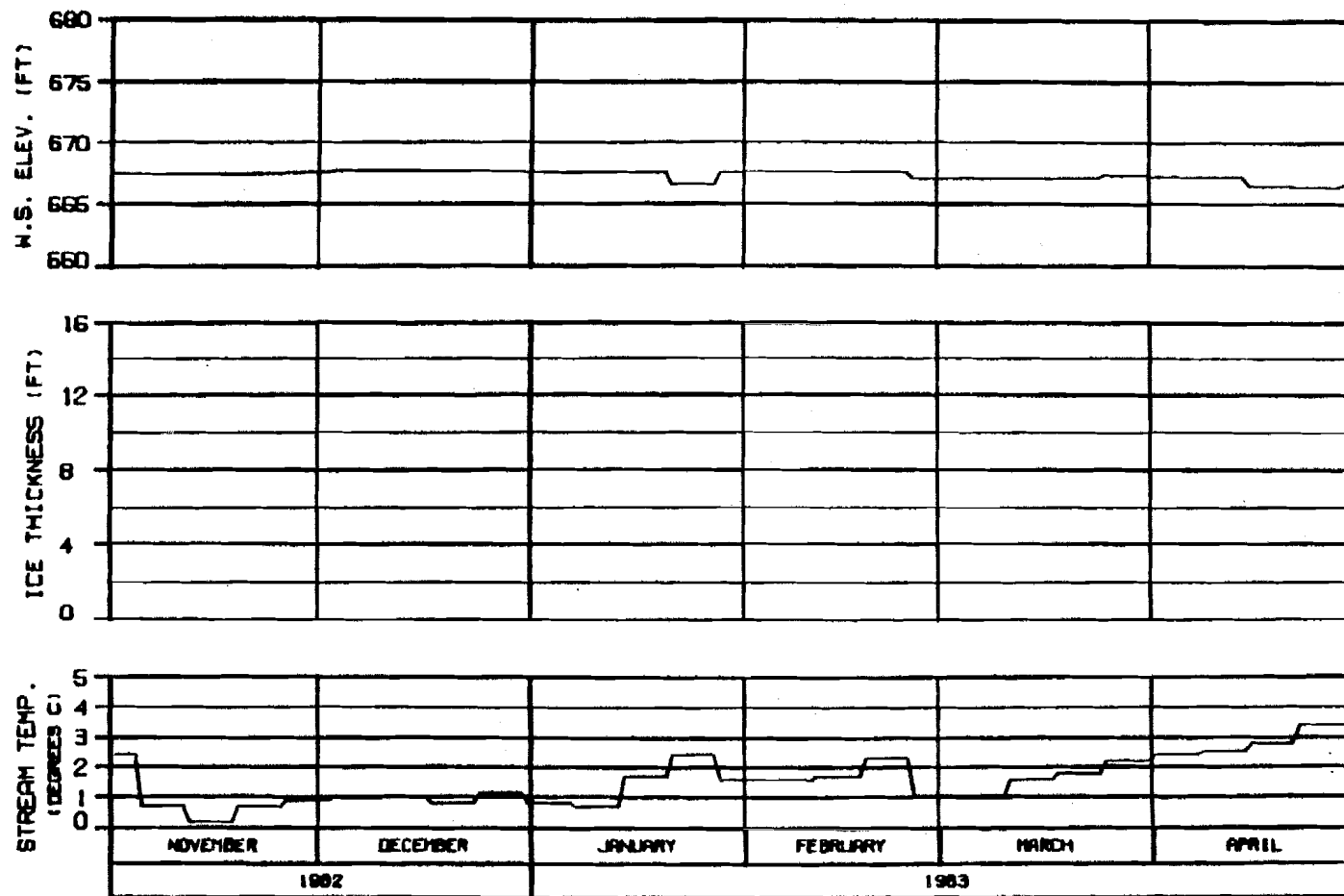
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

MARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. A. G. 10 JAN 83 1000.142



SIDE CHANNEL D/S OF SLOUGH 11

RIVER MILE : 135.30

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 8220CNA

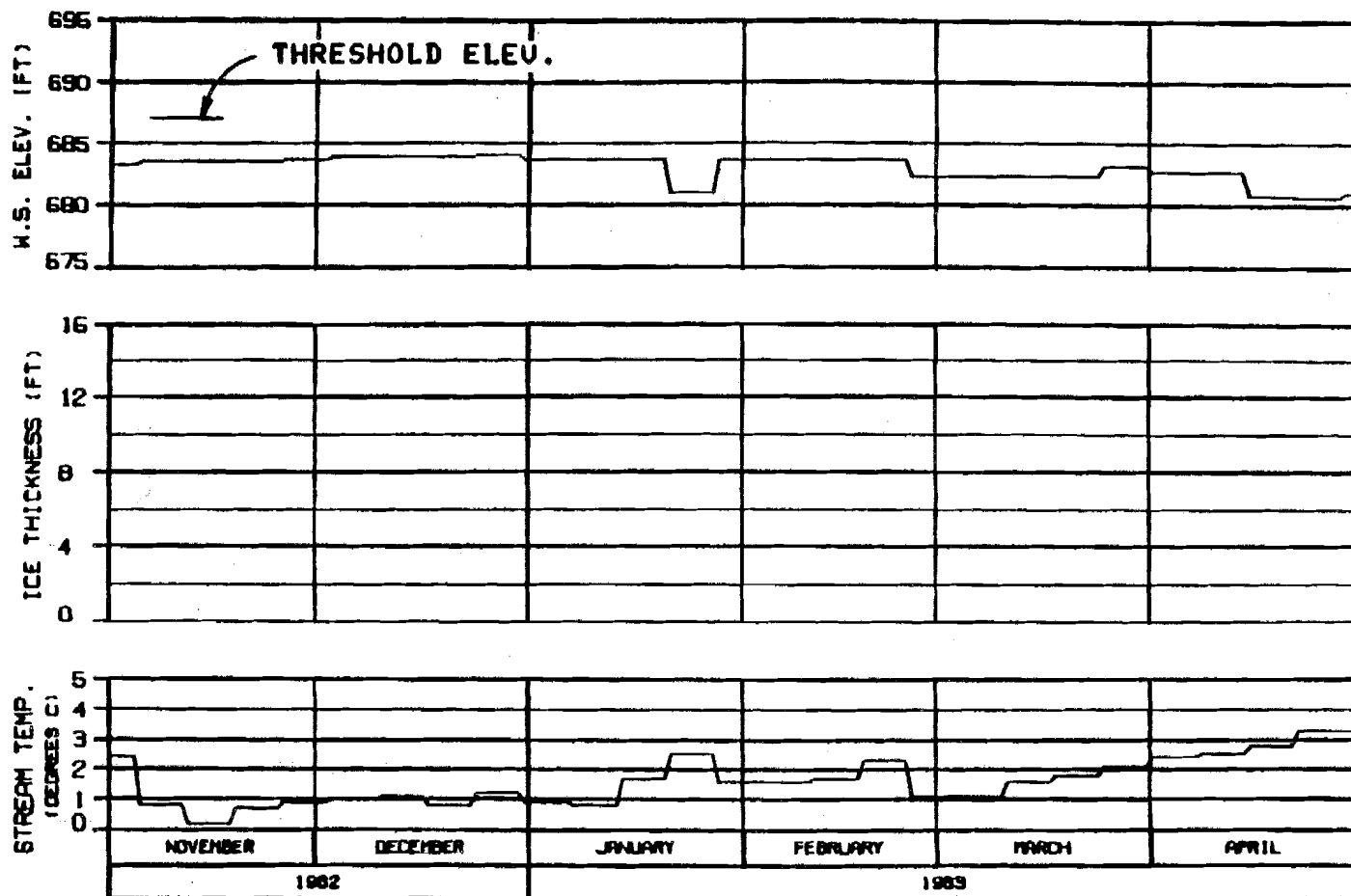
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRACO JOINT VENTURE

DESIGNER: SL-0000 10 JAN 83 10000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

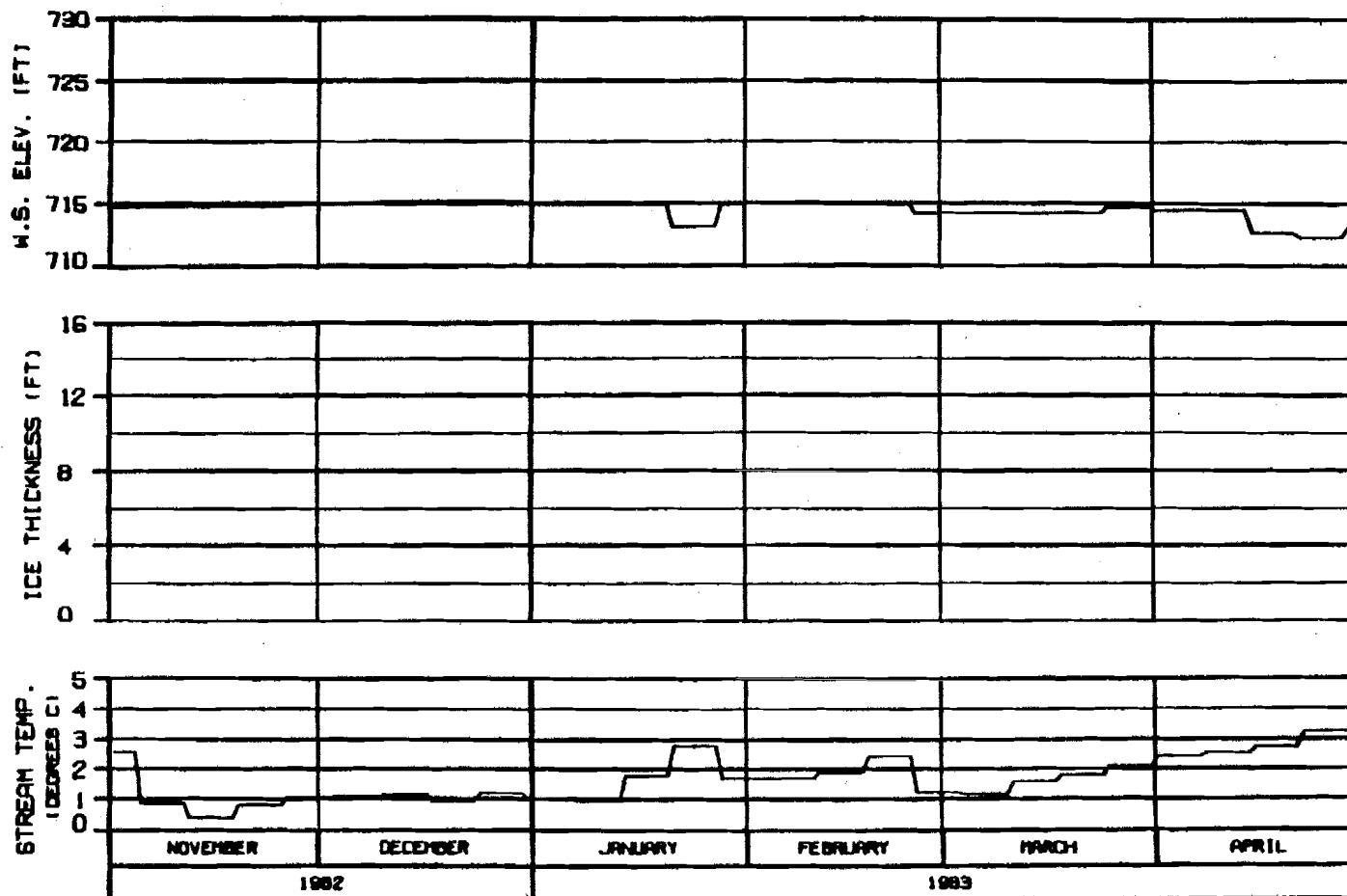
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

ORDER - 84-0000 10 JAN 84 0000.142



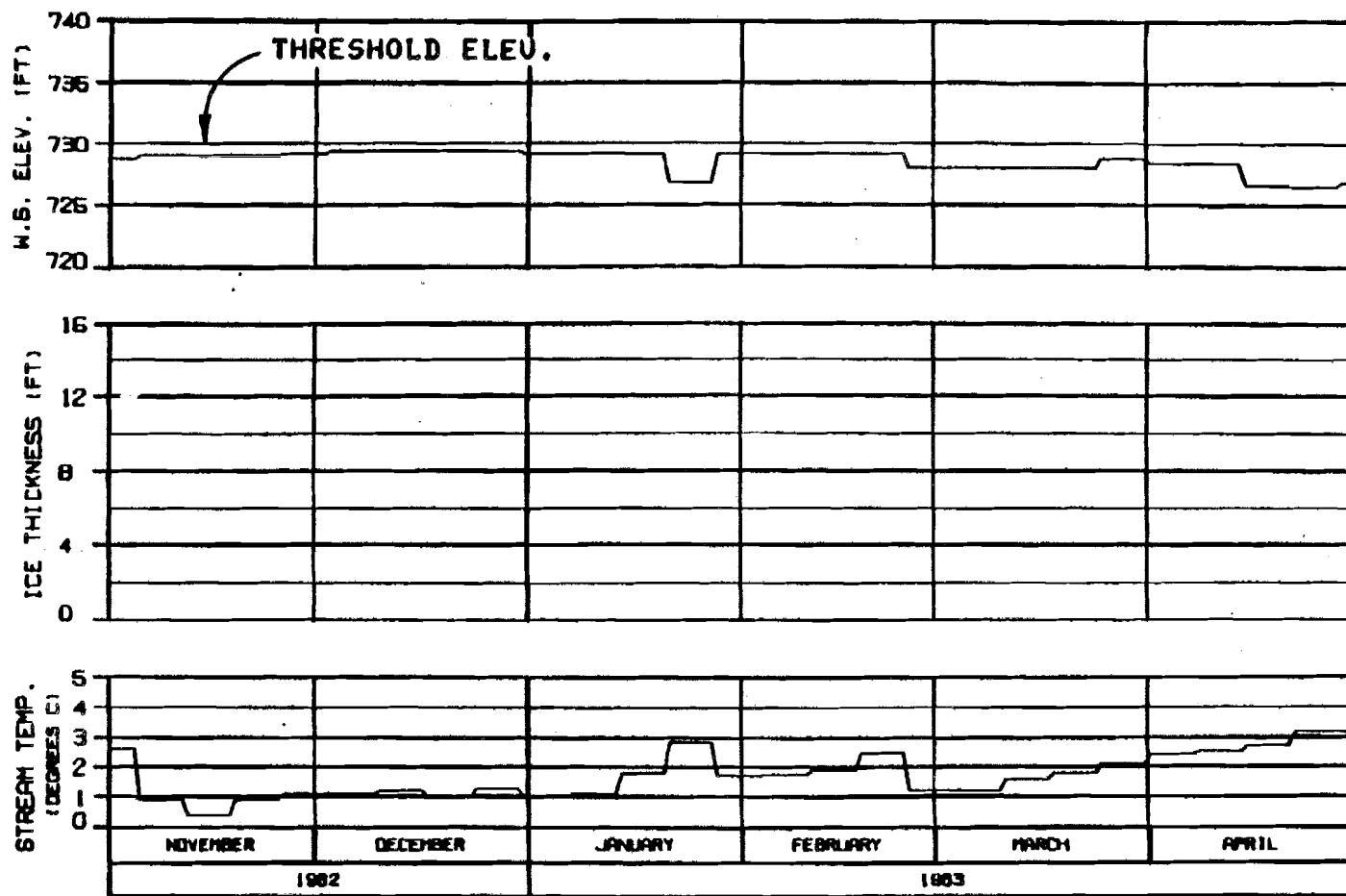
HEAD OF SLOUGH 17  
RIVER MILE : 139.30

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY		
SUBITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
CHUCKER, AL 1982	10 JUL 83	VERB. 142





HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

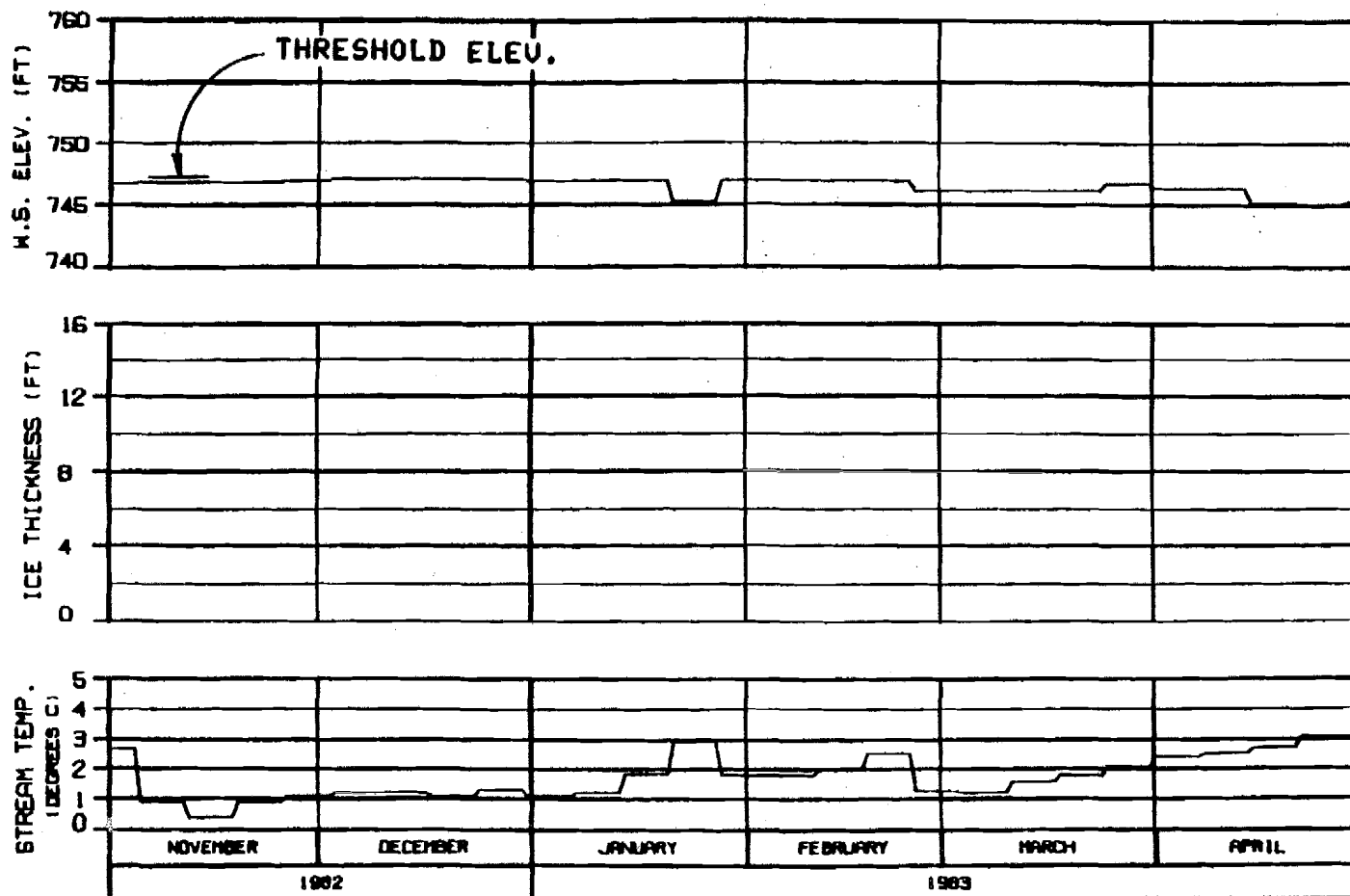
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

CHIEF: D.L. HARRIS 10 JUL 84 1000.142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DEVIL CANYON 2020  
 FLOW CASE : C      TEMP. RULE : NATURAL  
 REFERENCE RUN NO. : 8220CNA

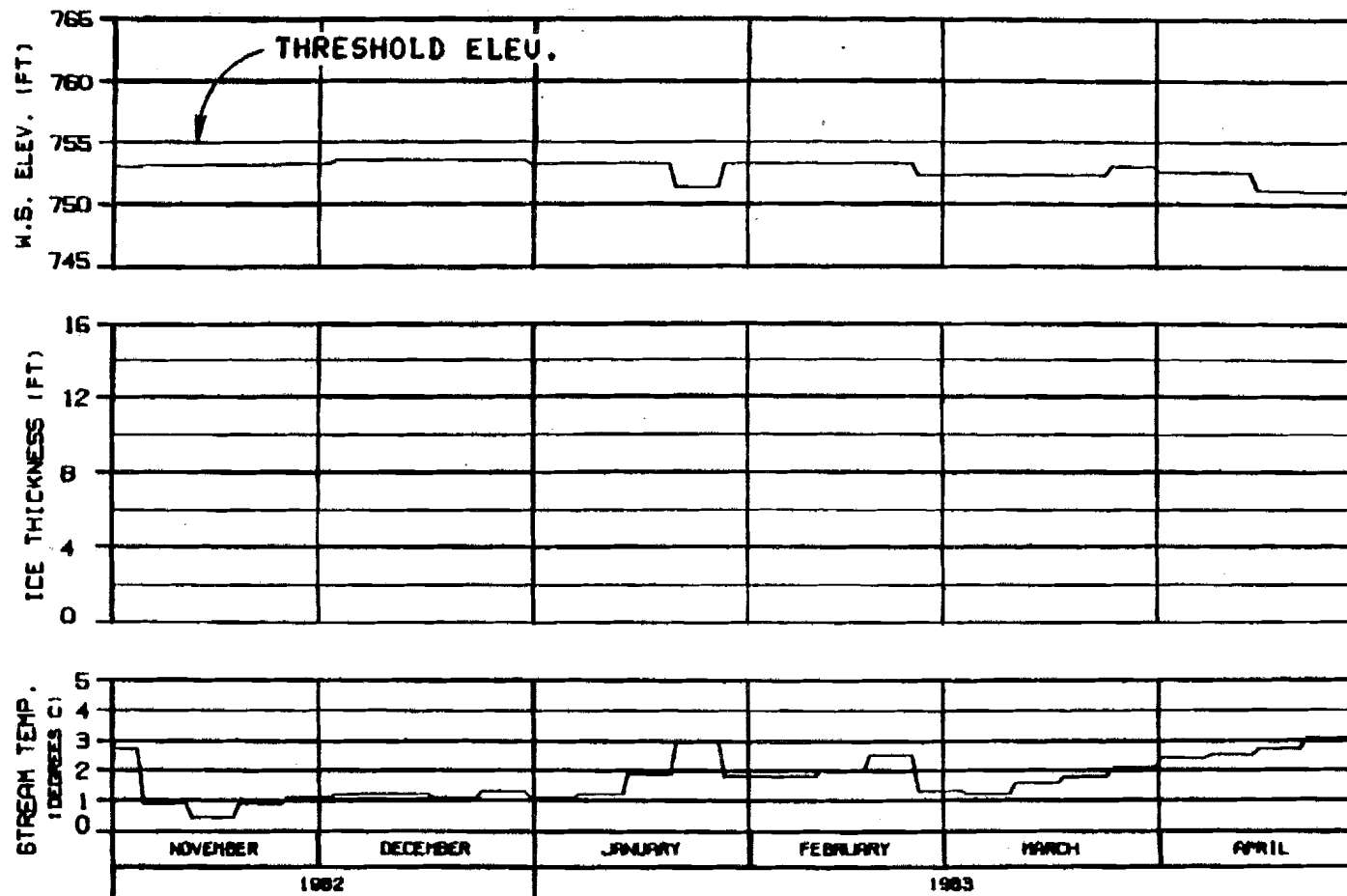
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EGASCO JOINT VENTURE

CHARGE : 82-8075      10 JUL 84      10000.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : B220CNA

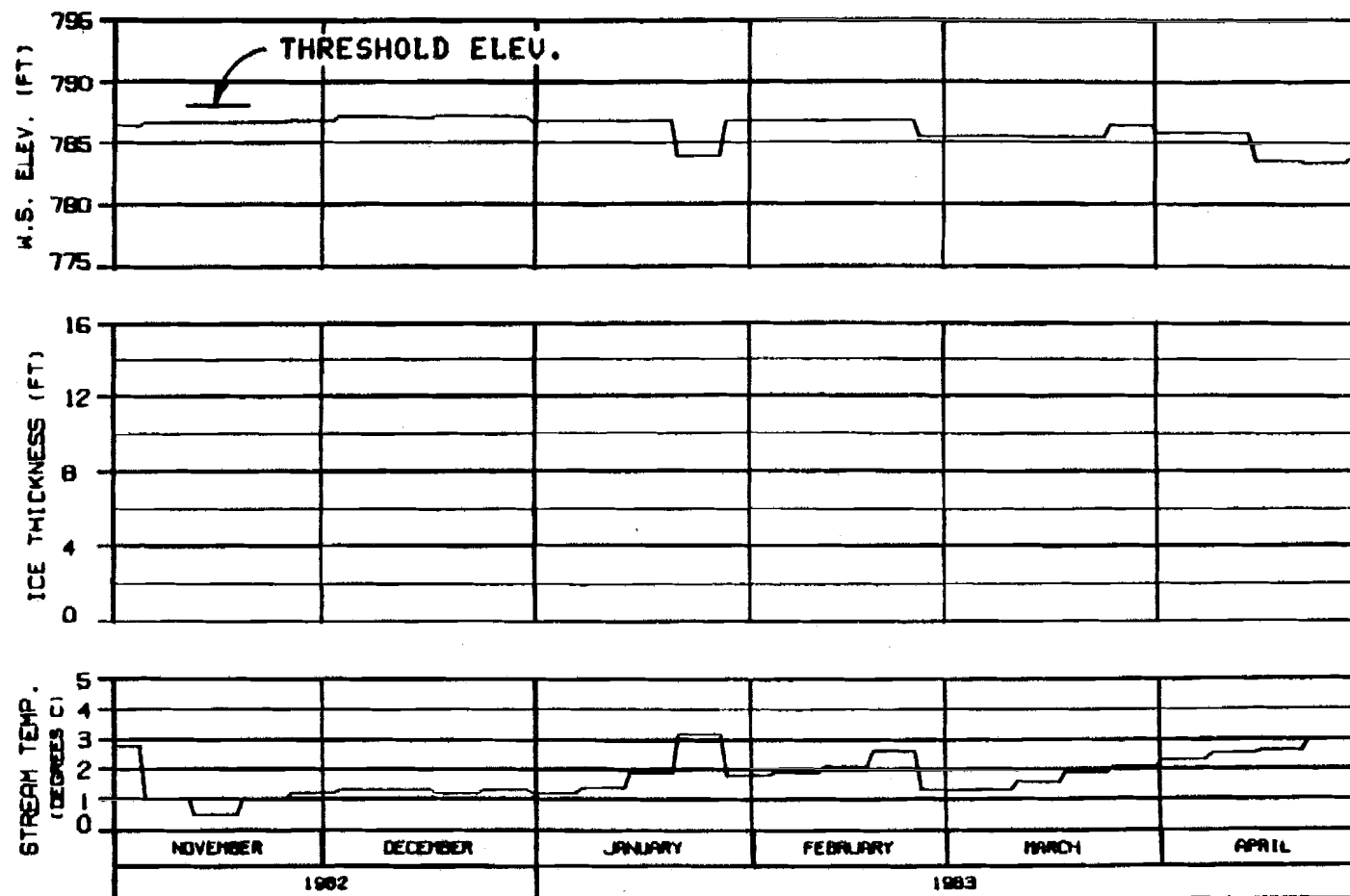
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

000000 - 000000 15 JAN 83 0000:142



HEAD OF SLOUGH 22  
RIVER MILE : 144.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUGH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : DEVIL CANYON 2020  
FLOW CASE : C TEMP. RULE : NATURAL  
REFERENCE RUN NO. : 8220CNA

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

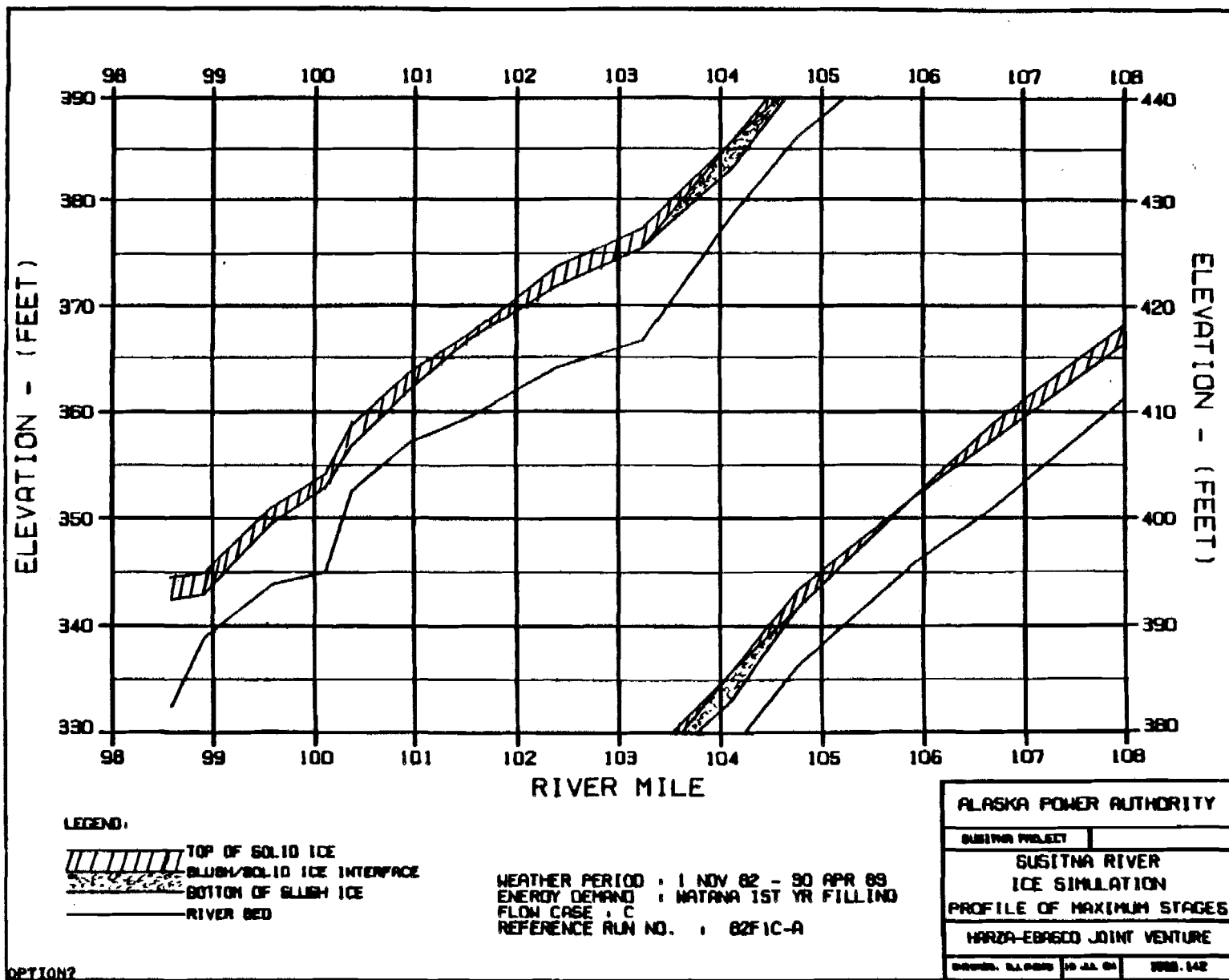
WARZA-EBRACO JOINT VENTURE

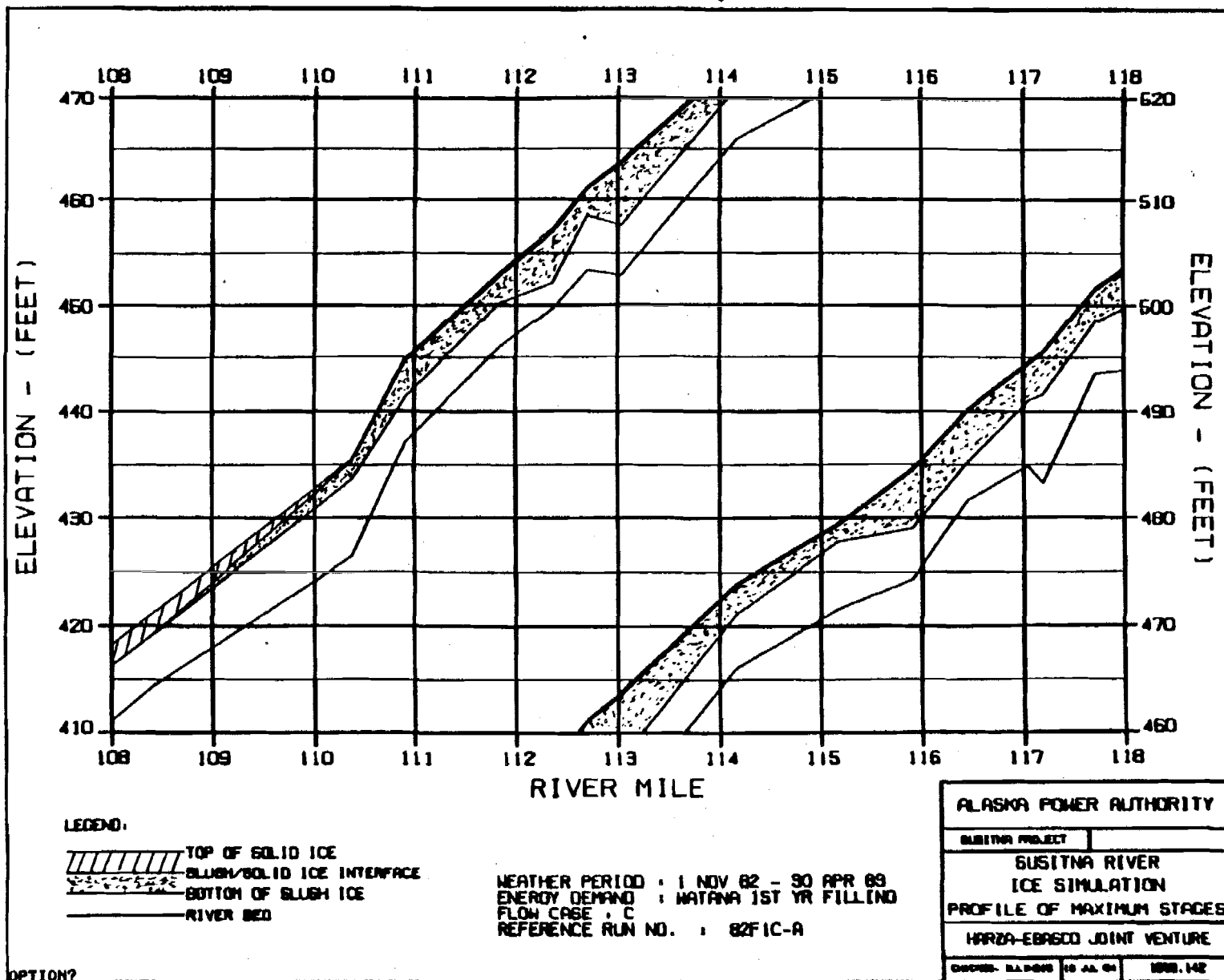
CHECKED: 11/1/83 BY: J. L. 1000.142

OPTION?

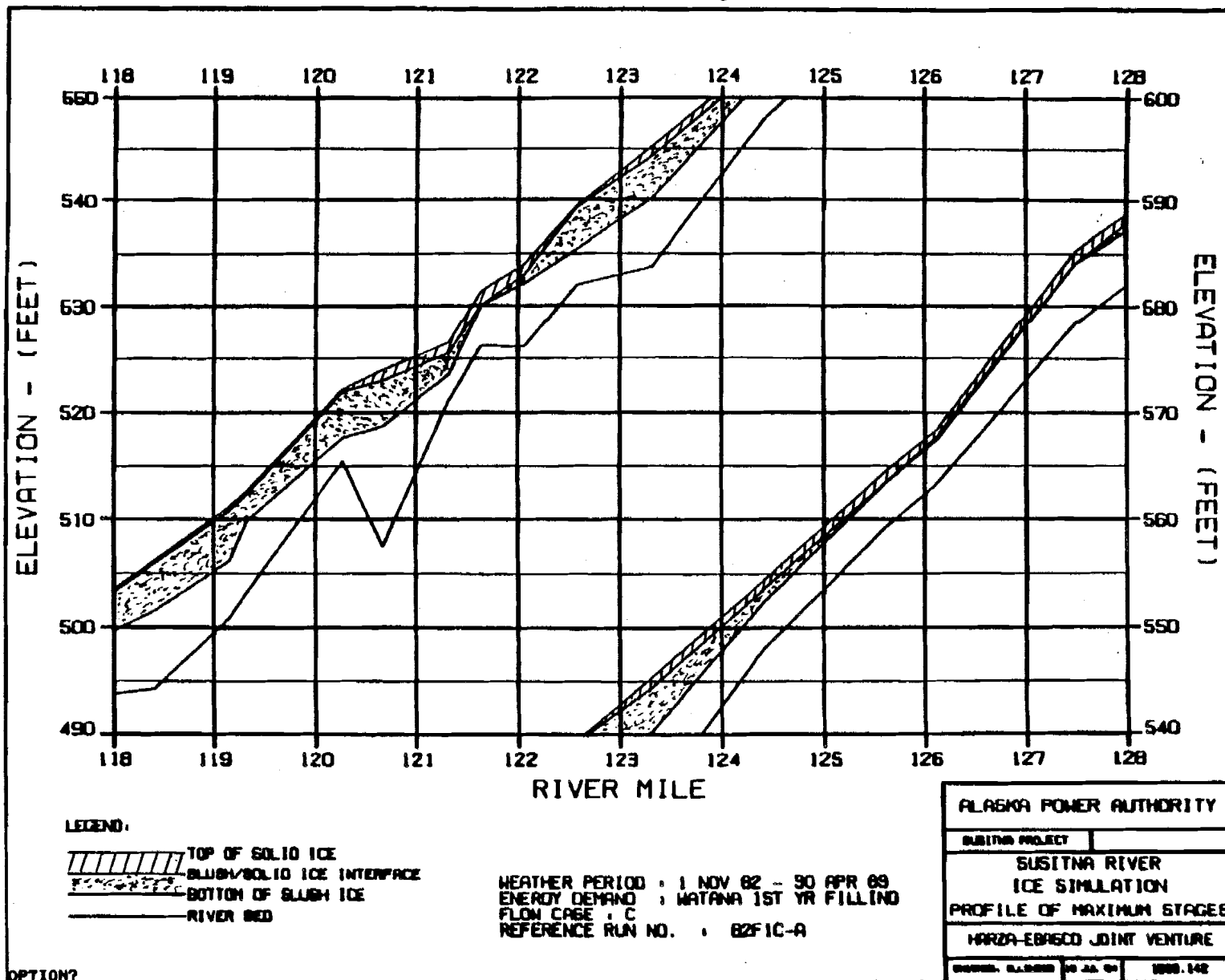
# EXHIBIT S

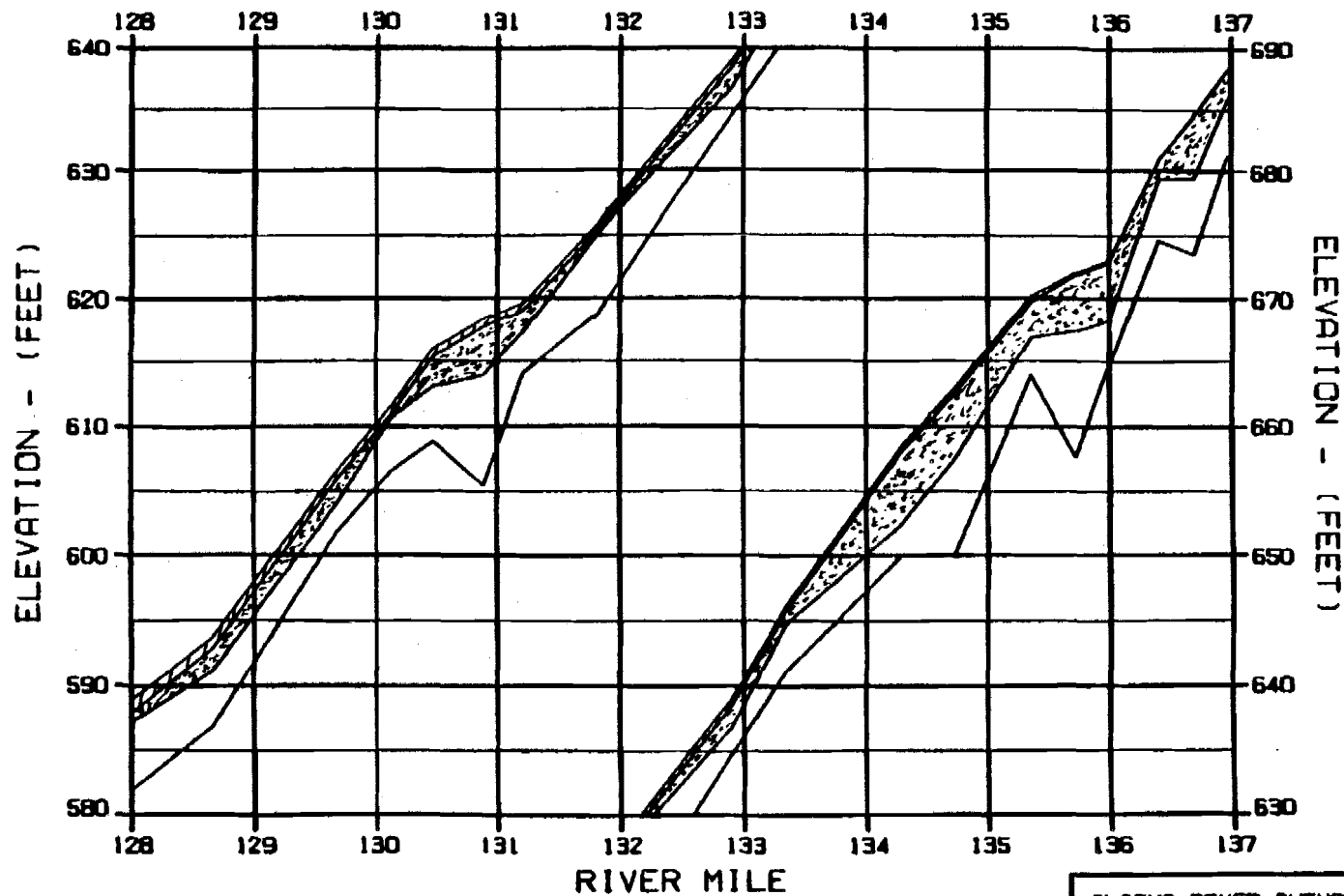
The following study, entitled "Watana-First Year Filling" corresponds to the winter of 1991-92, as depicted in Exhibit E.2.138 of the License Application. The weather used corresponds to the winter of 1982-83, which is a mild winter. Releases from Watana under these conditions would be made thru the low-level outlet.











**LEGEND:**

TOP OF SOLID ICE  
 BLUISH/SOLID ICE INTERFACE  
 BOTTOM OF BLUISH ICE  
 RIVER BED

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82FIC-A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER

ICE SIMULATION

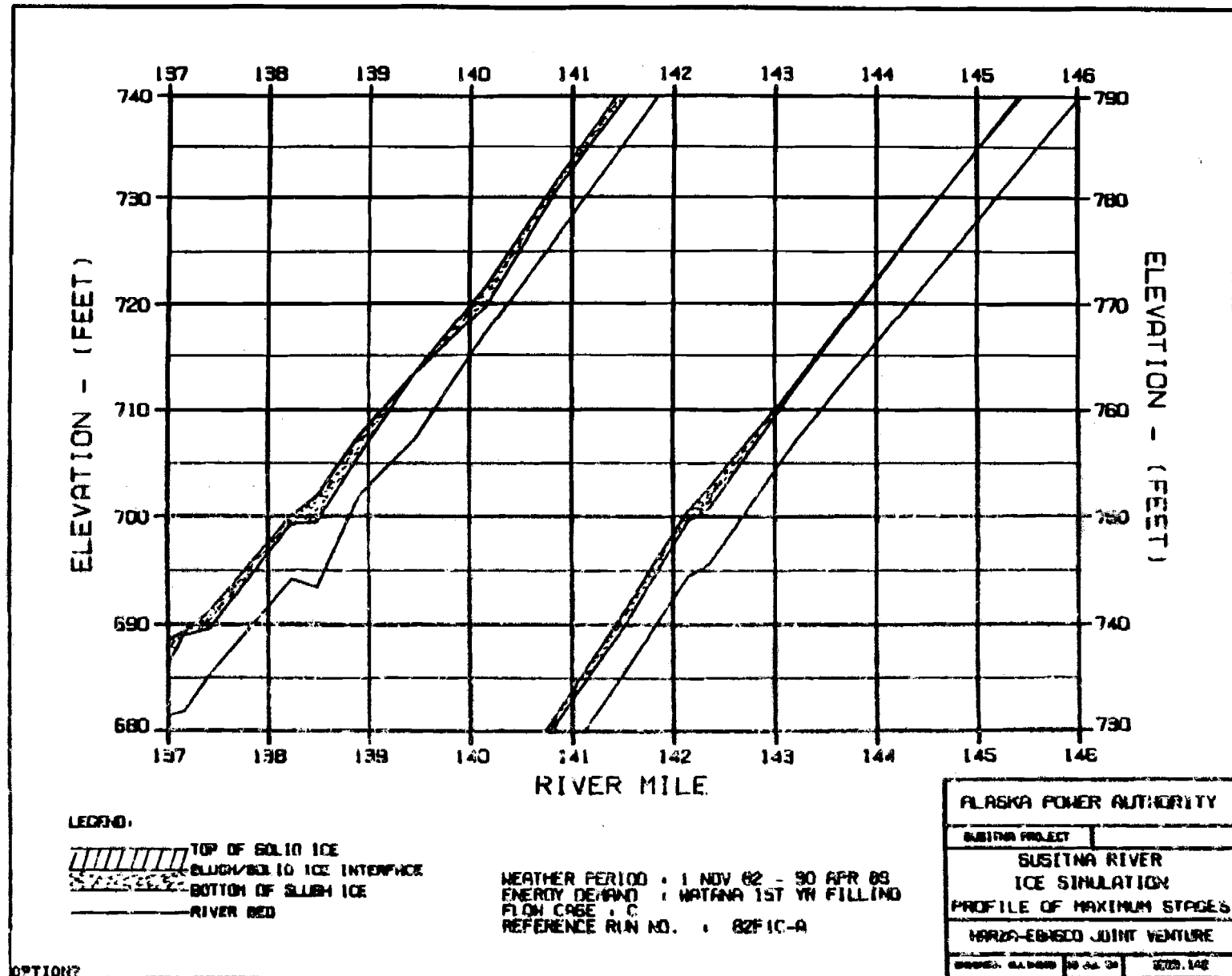
PROFILE OF MAXIMUM STAGES

HARZA-EBERD JOINT VENTURE

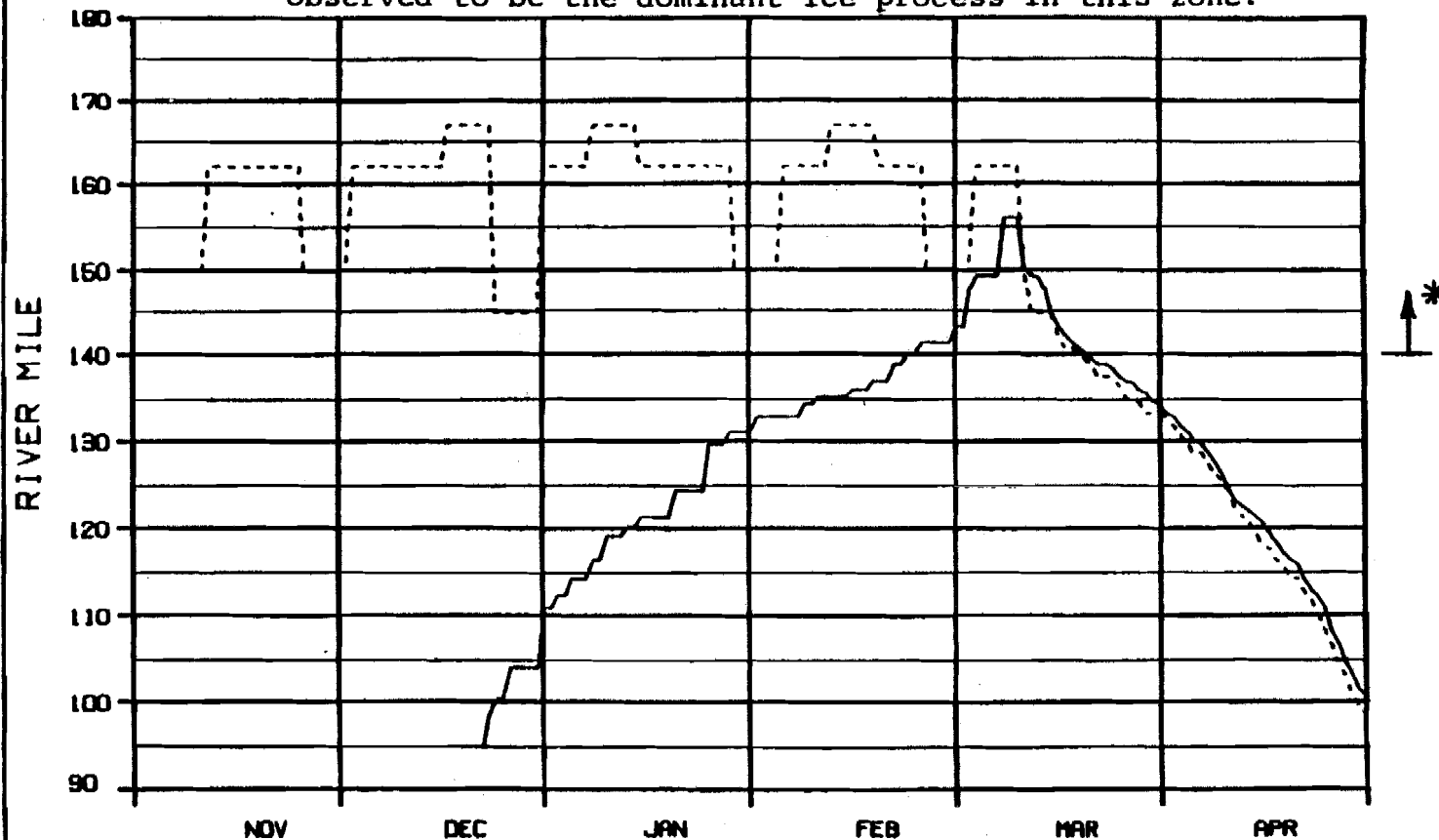
SUSITNA RIVER  
 10 JAN 83  
 1000.142

OPTION?

C



\* Note: Simulation of progression u/s of River Mile 140  $\pm$  is considered approximate since intermittent bridging of border ice has been observed to be the dominant ice process in this zone.



LEGEND:

———— ICE FRONT  
 - - - - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B2F1C-A

OPTION?

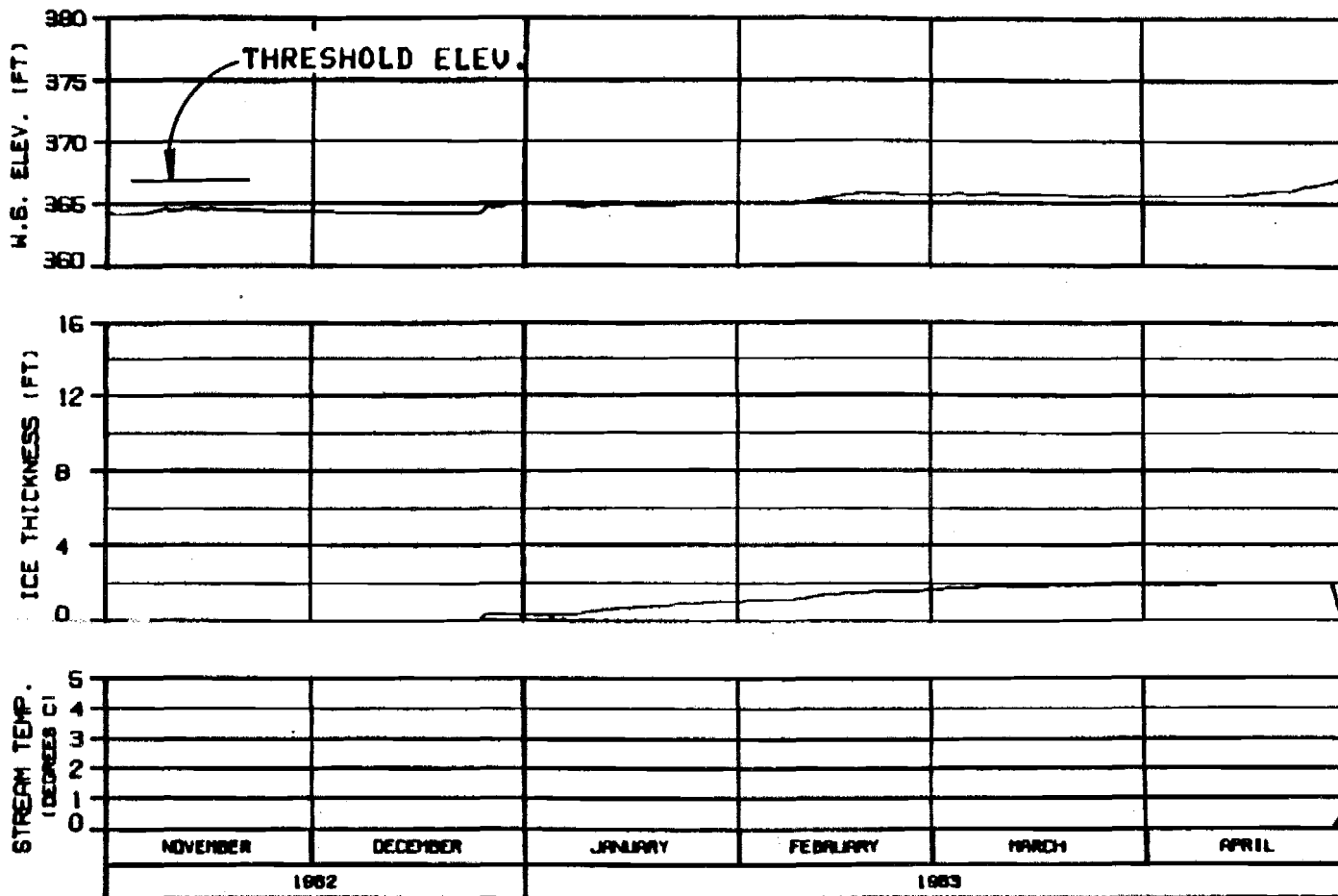
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 PROGRESSION OF ICE FRONT  
 & ZERO DEGREE ISOTHERM

HAZDA-EBASCO JOINT VENTURE

DESIGNED BY: HAZDA 10 JAN 83 1000.142

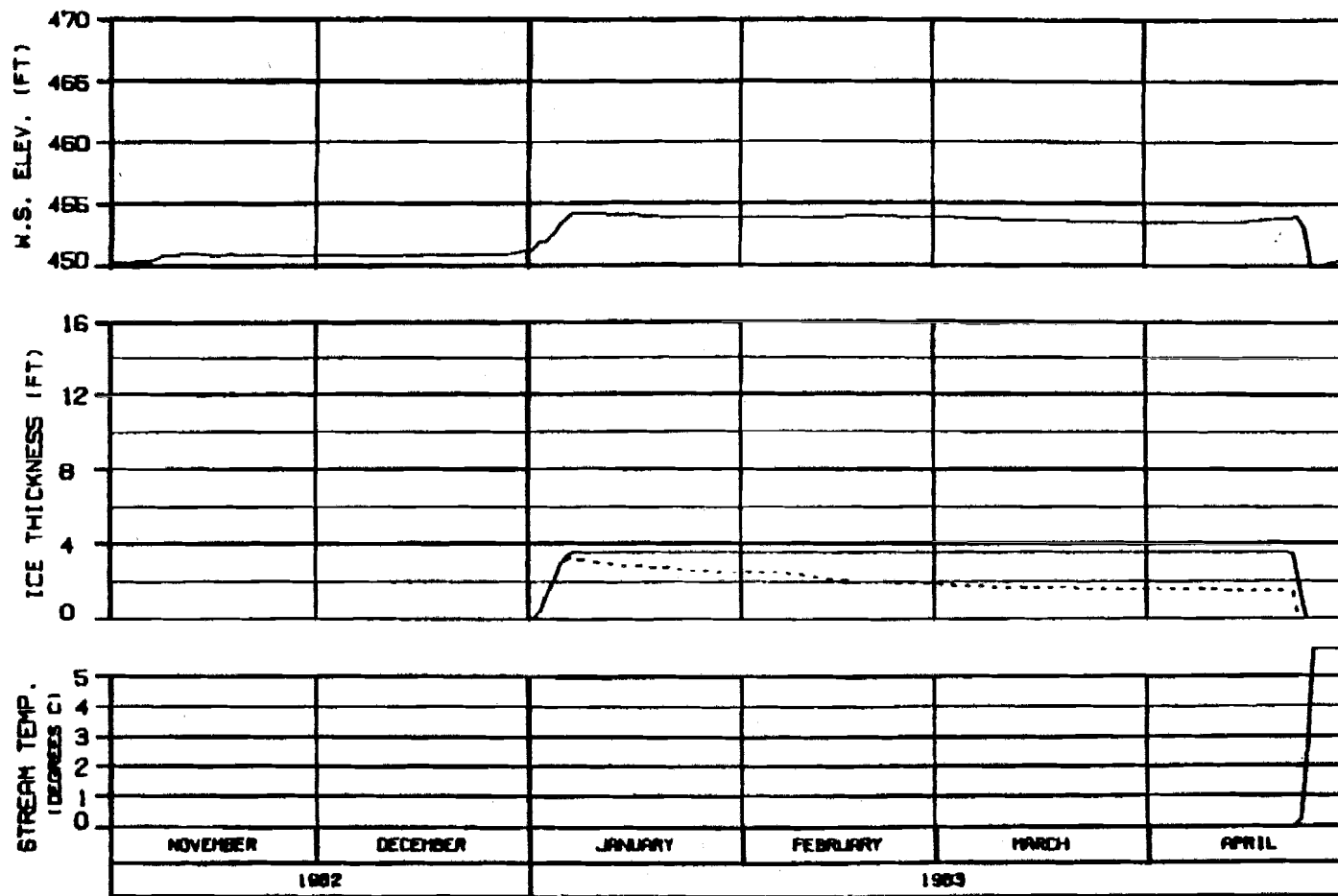


# HEAD OF WHISKERS SLOUGH RIVER MILE : 101.50

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B2F1C-A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
MARZA-EBASCO JOINT VENTURE		
DESIGNED BY	10 AA 01	1000-142



SIDE CHANNEL AT HEAD OF GASH CREEK

RIVER MILE : 112.00

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - BLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : MATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82FIC-A

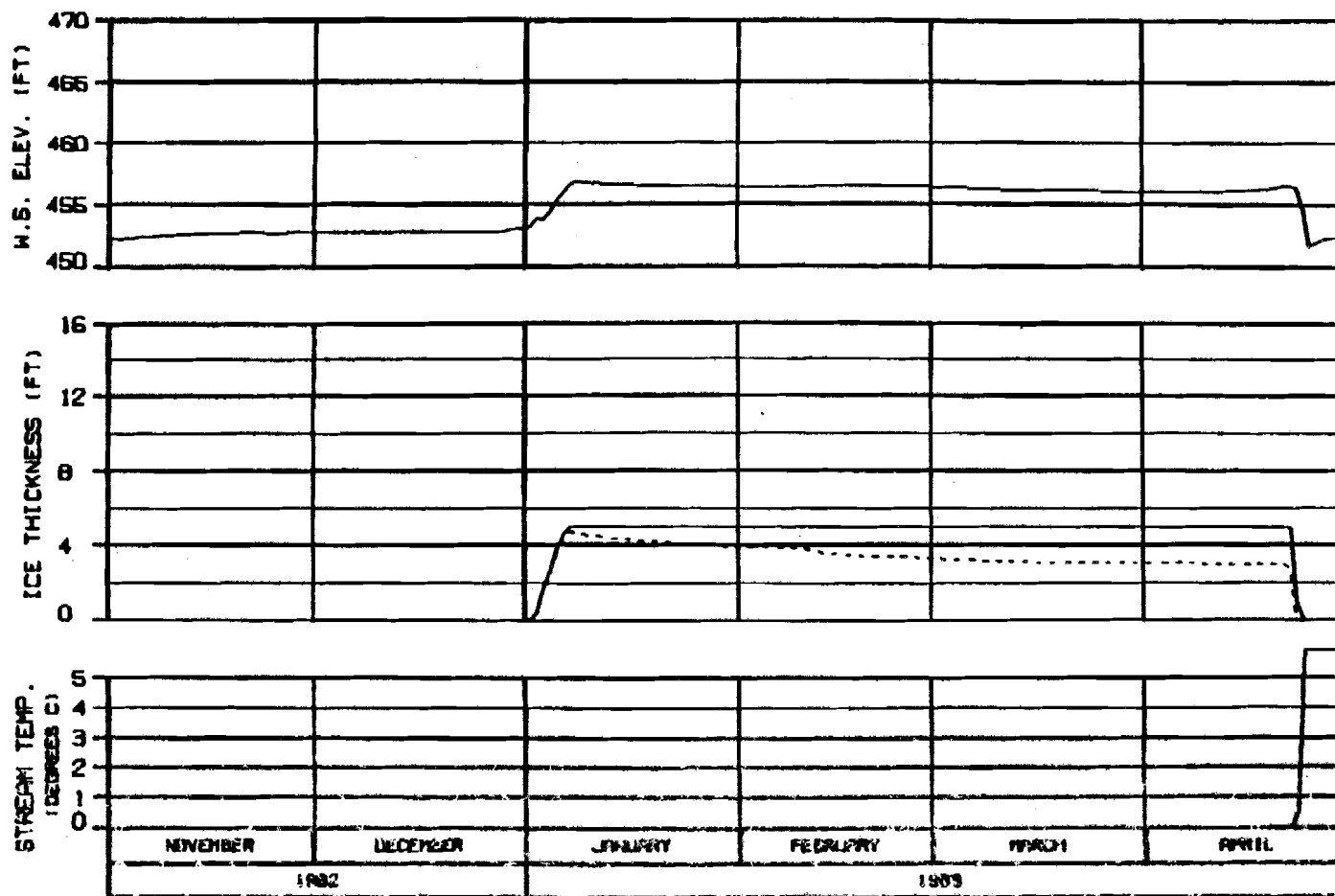
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRISCO JOINT VENTURE

DESIGNER: ALM-8207 10-01-84 0000-142



MOUTH OF SLOUCH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : MATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIL-A

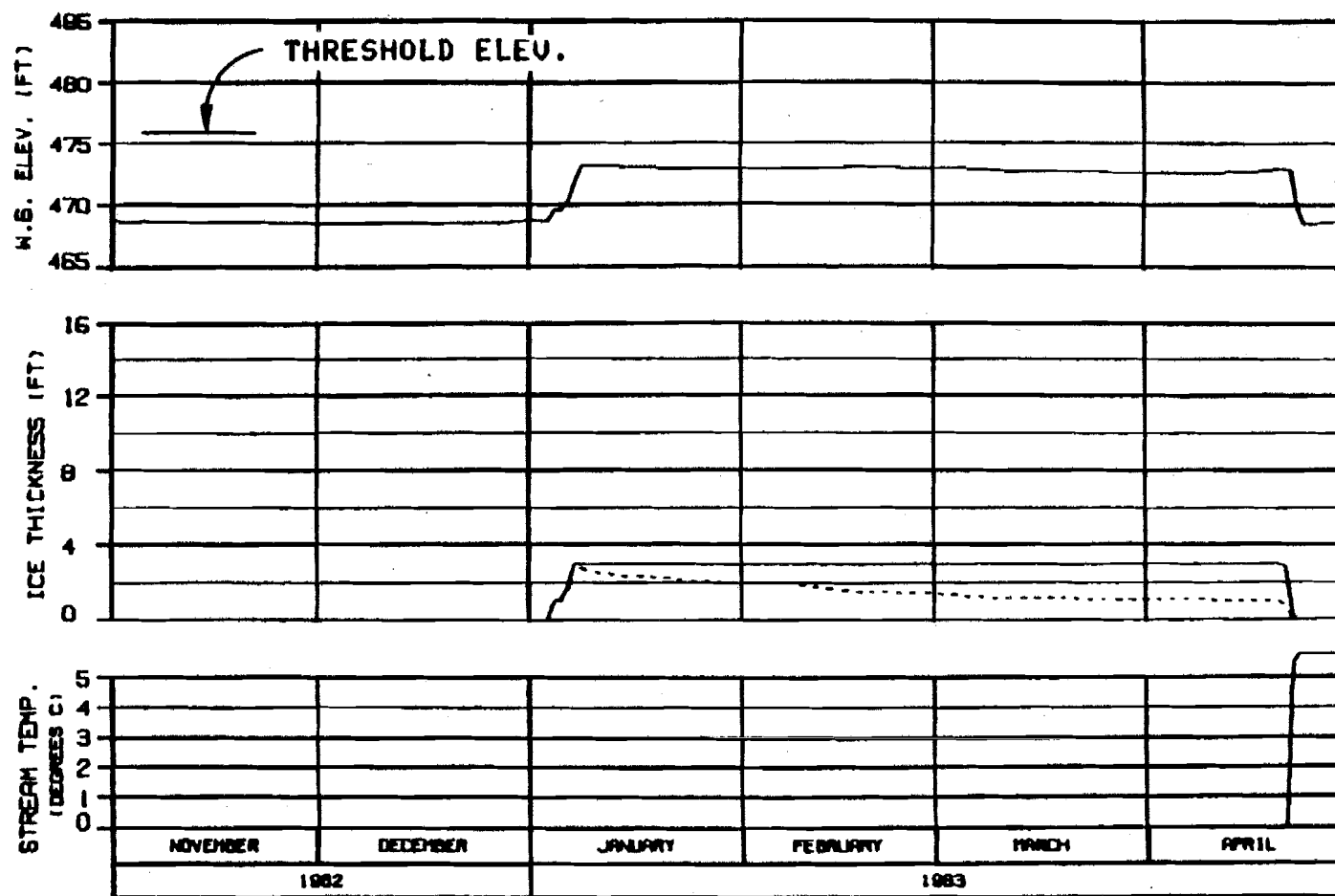
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

MARTA-EBERD JOINT VENTURE

UNITED STATES OF AMERICA



HEAD OF SLOUGH 8  
RIVER MILE : 114.10

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIC-A

ALASKA POWER AUTHORITY

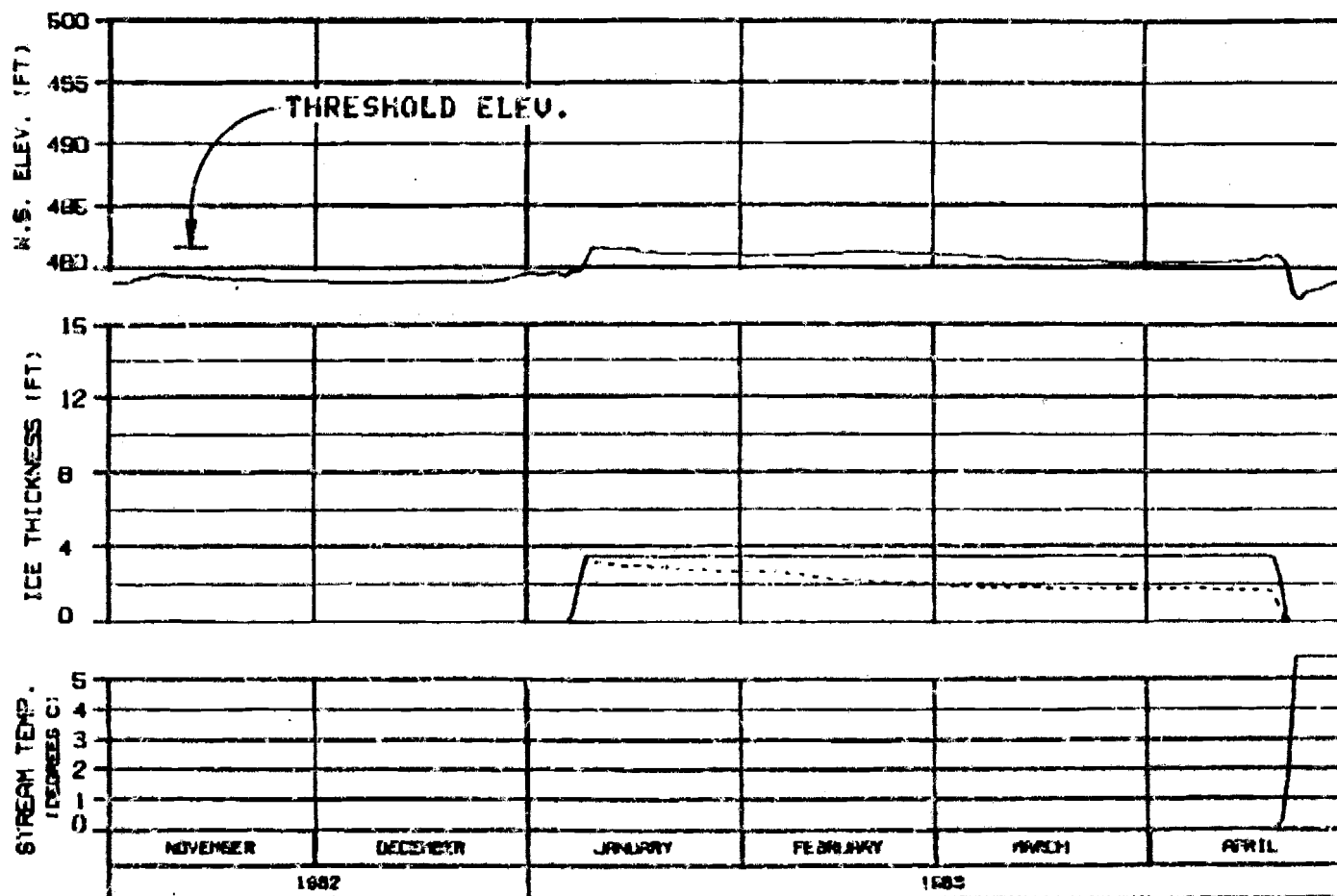
SUSTITNA PROJECT

SUSTITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACD JOINT VENTURE

DESIGNED BY: B. L. PETERSON TO: J. A. G. 1000.142





SIDE CHANNEL NSII

RIVER MILE : 115.50

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : DATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82FIC-A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

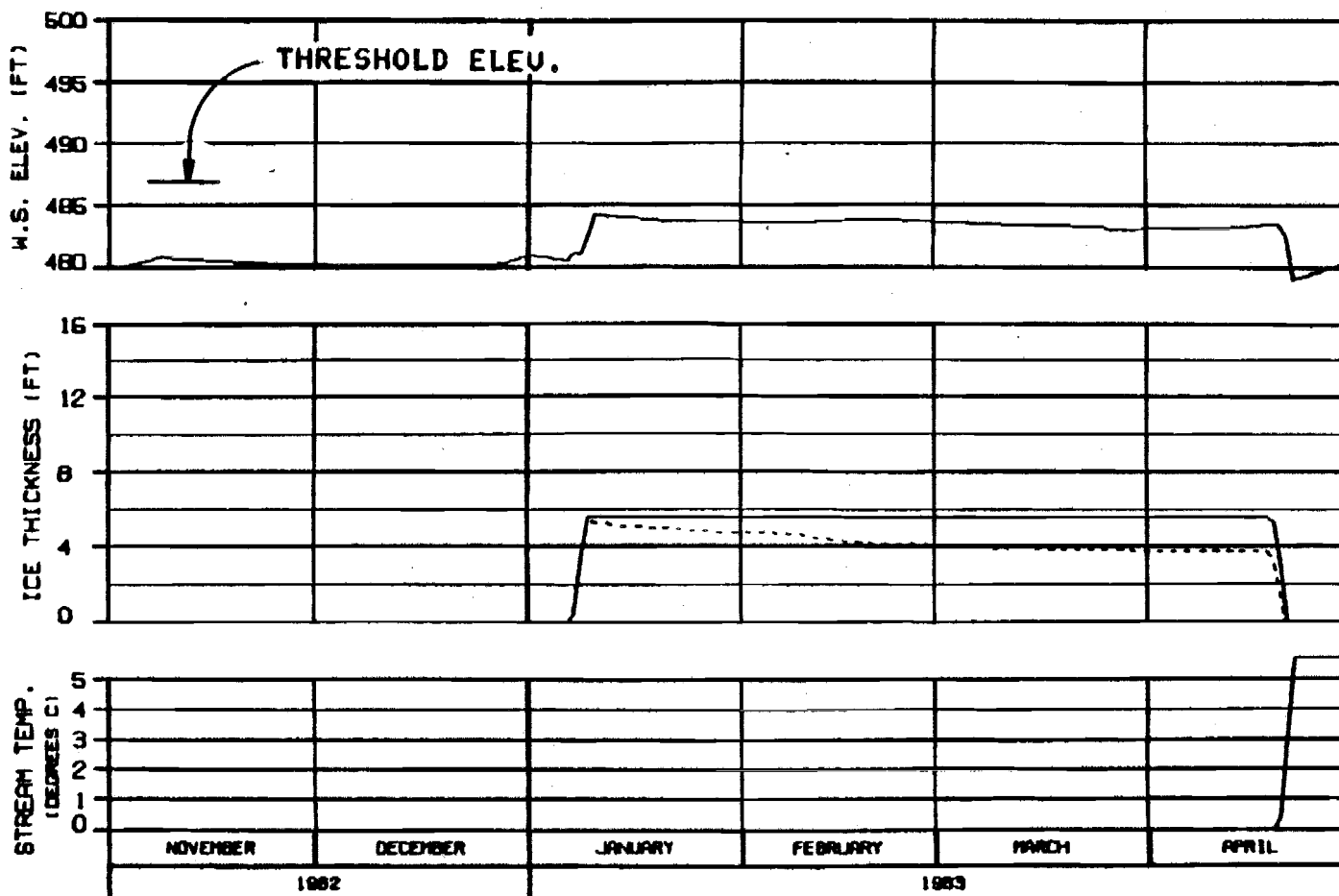
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EDBECO JOINT VENTURE

DESIGNED BY: B. L. G. 10 JAN 83 DRAWN BY: M. H. 102



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIC-A

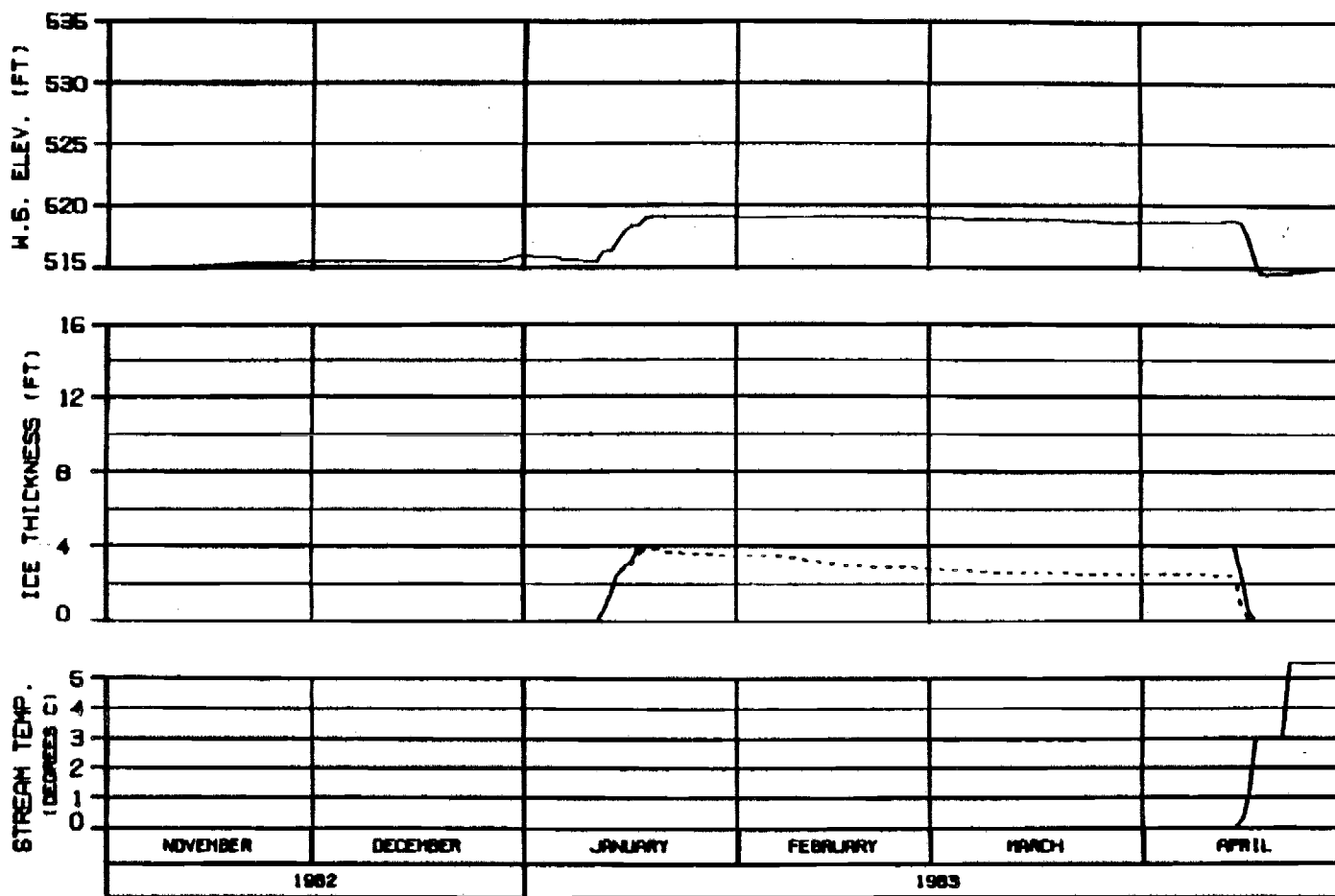
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DRAWN: BL/MSB 10 JAN 83 1983.148



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... BLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82FIC-A

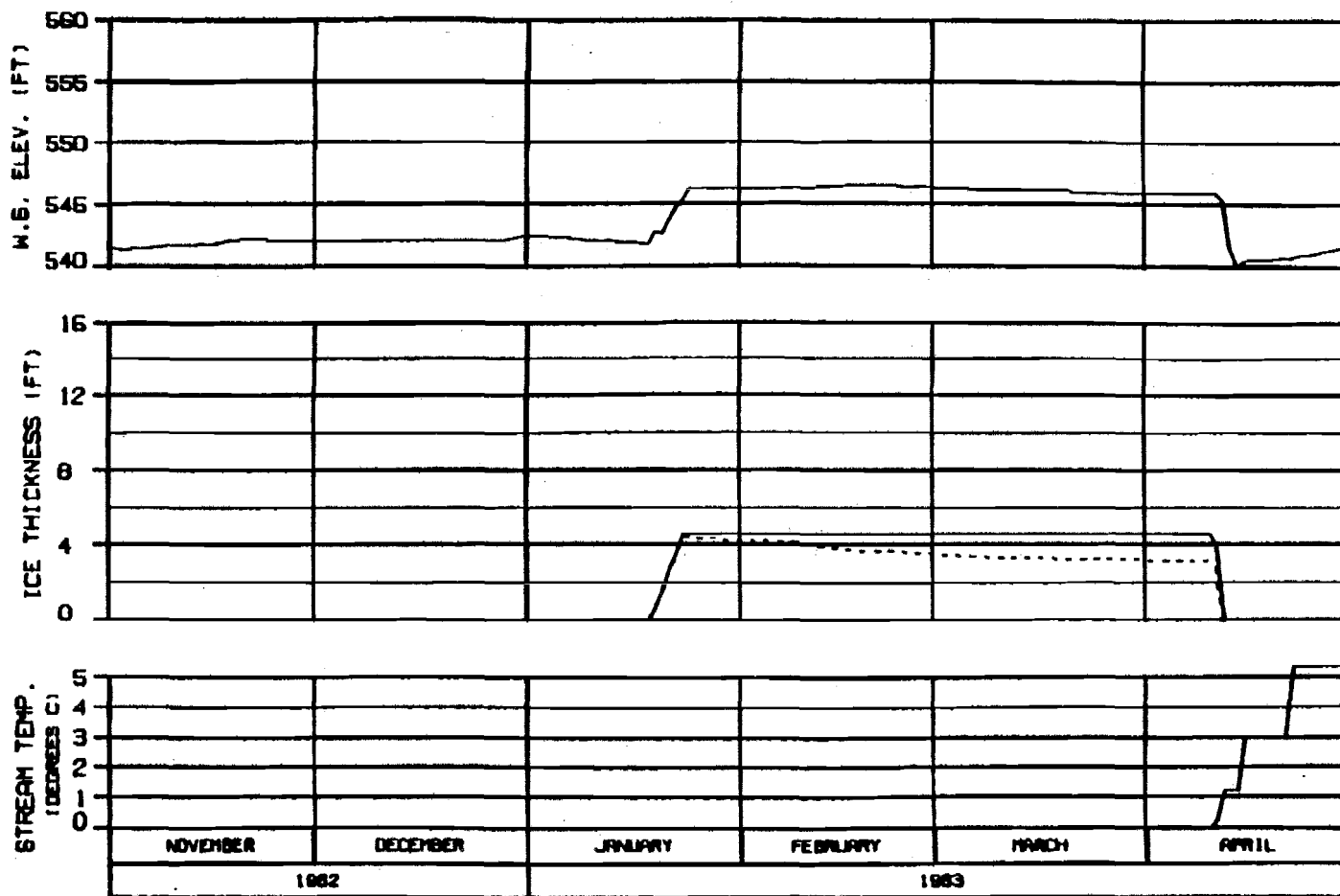
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. BROWN 10 JUL 83 1000.142



# HEAD OF MOOSE SLOUGH RIVER MILE : 123.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82F1C-A

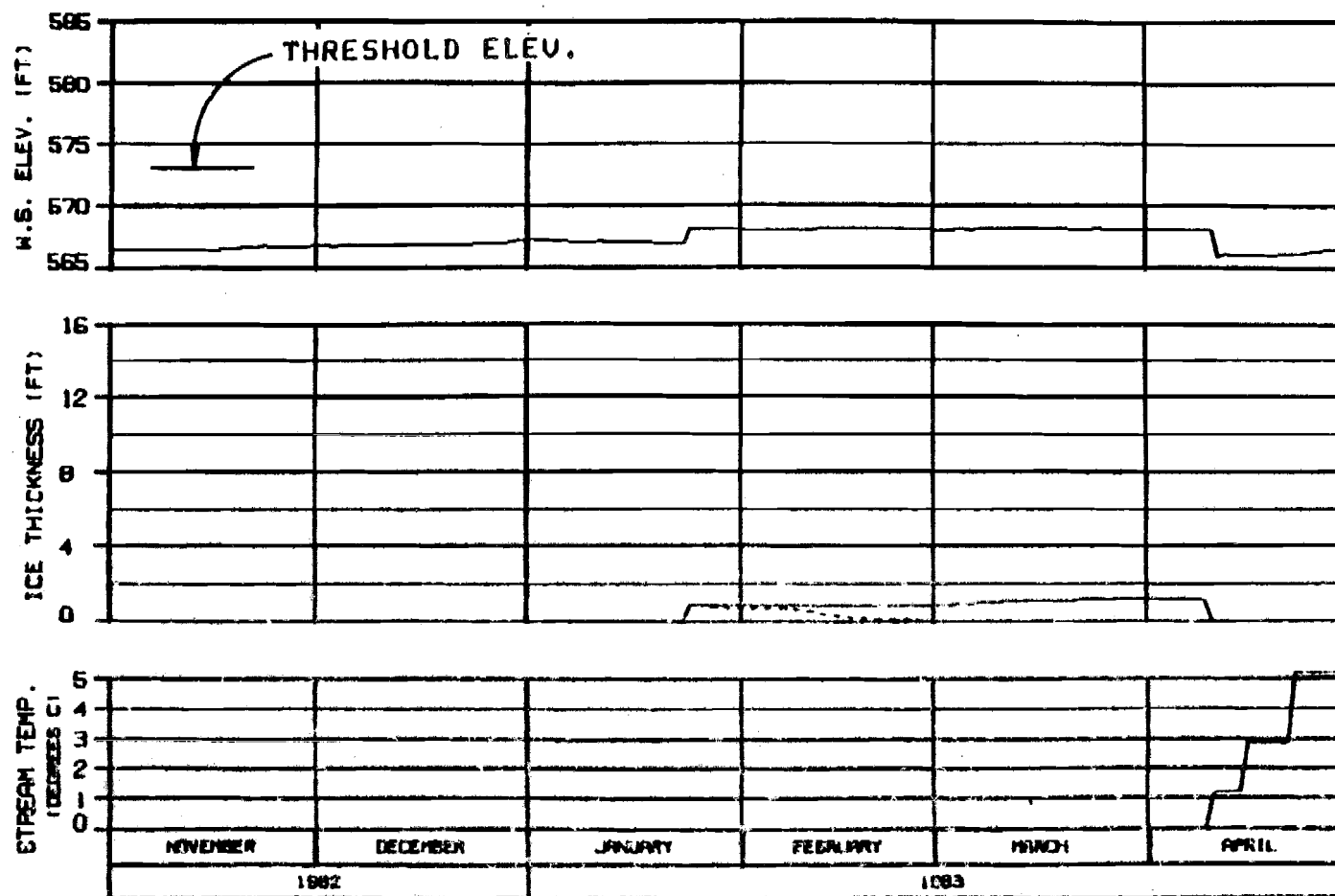
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: AL 1000 20 JAN 84 1000.142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82FIC-A

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - BLEND COMPONENT

ALASKA POWER AUTHORITY

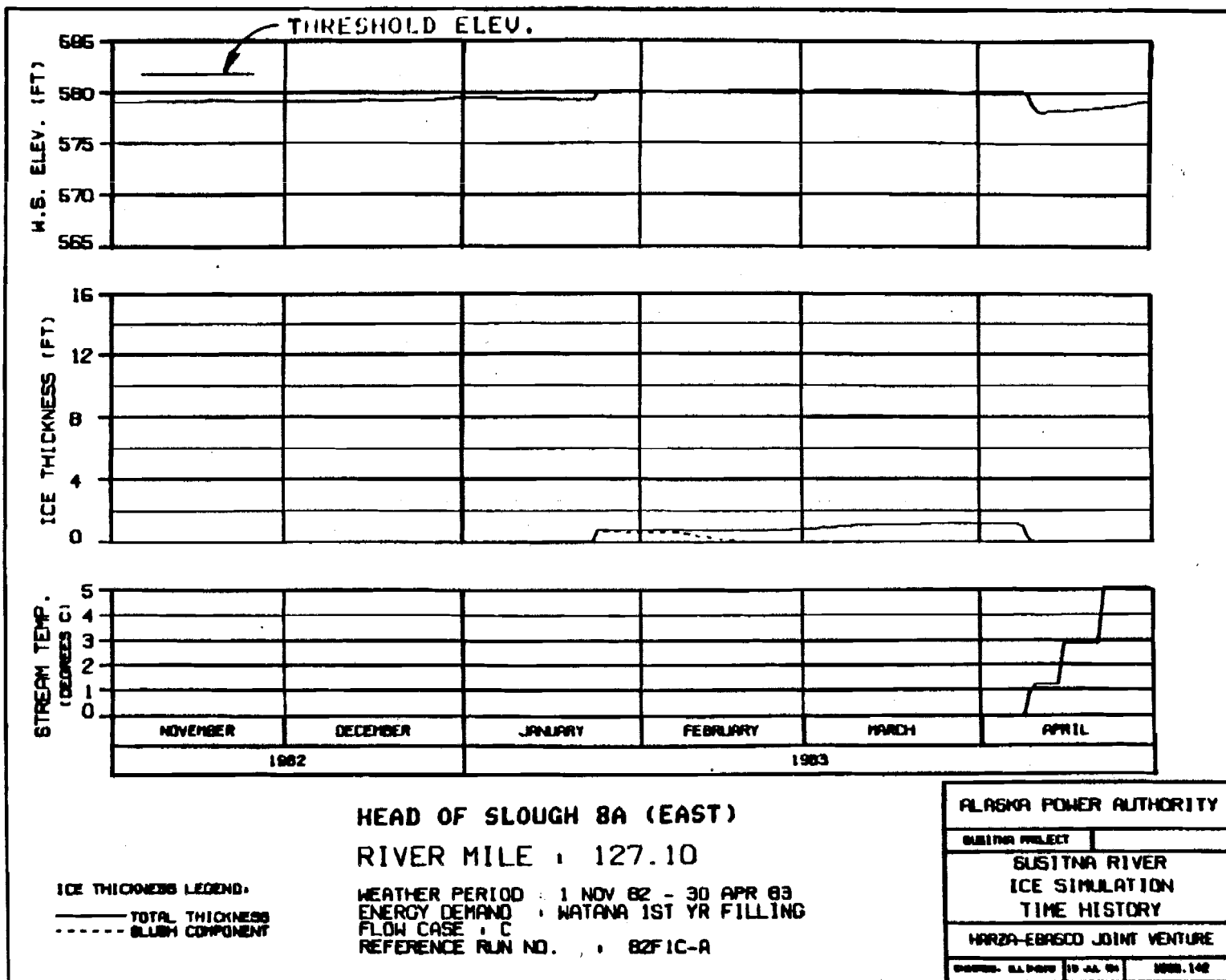
SUSTAIN PROJECT

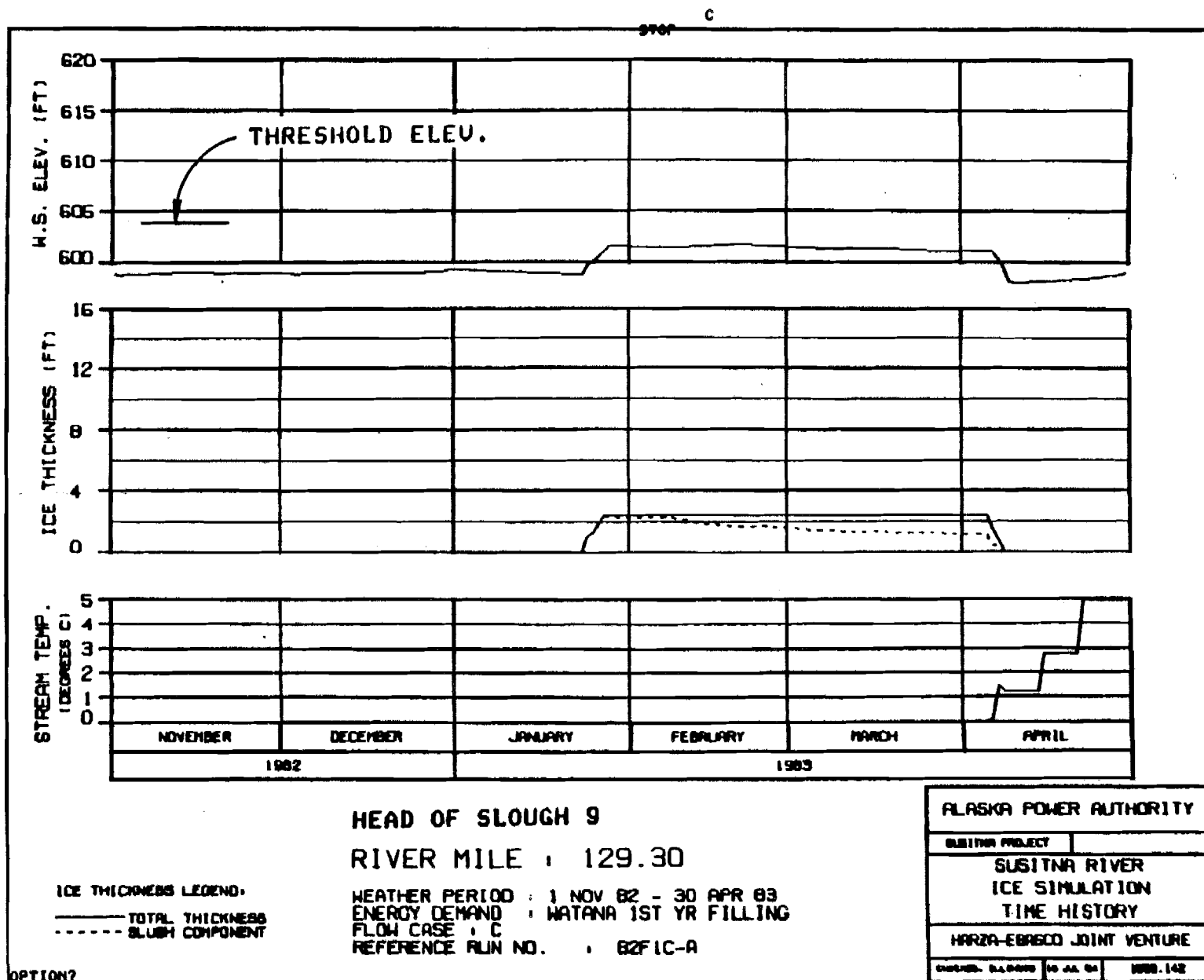
SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HAZARDOUS JOINT VENTURE

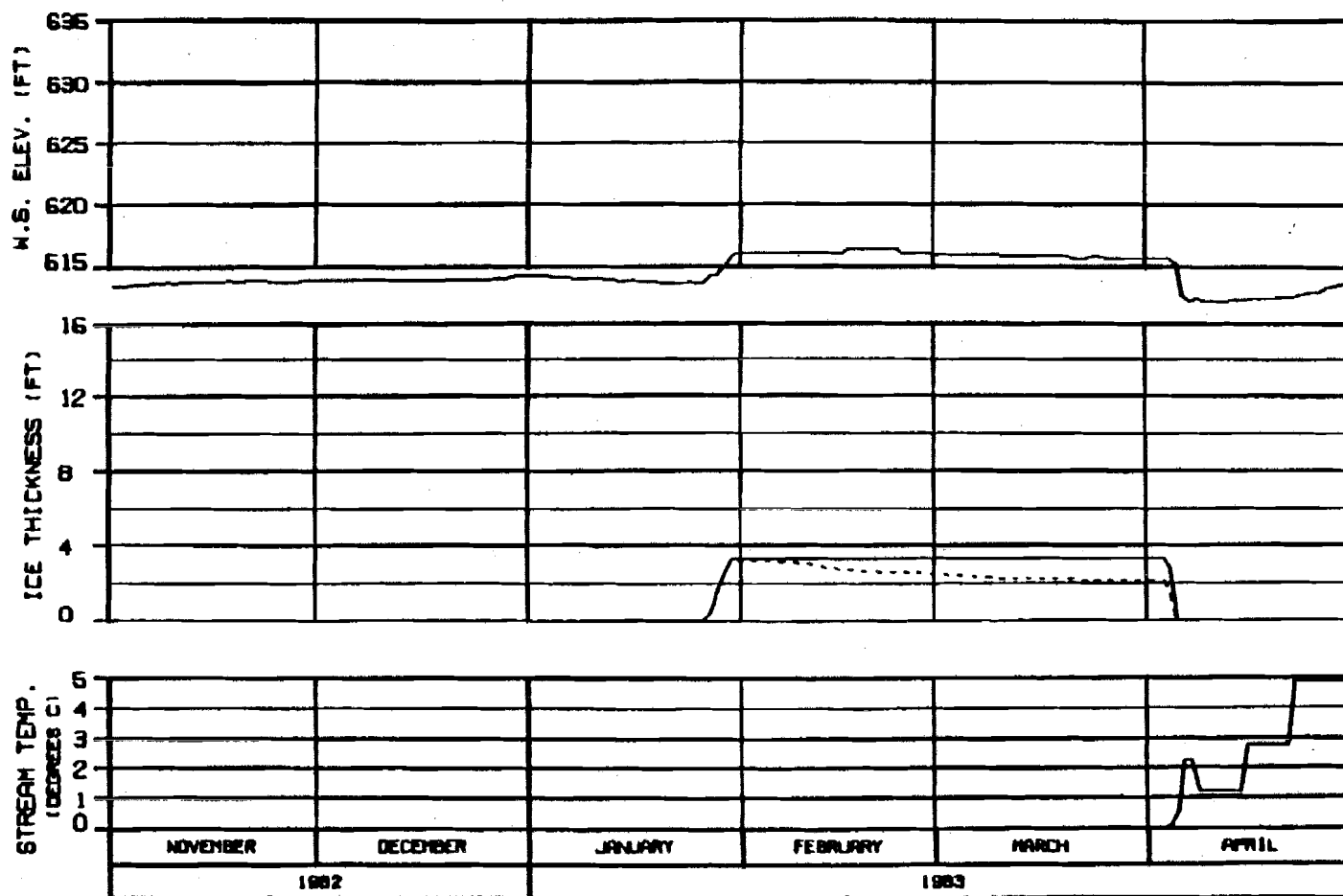
DATE: 11/1/83 BY: JAA/BAH

REV. 142





OPTION?



SIDE CHANNEL U/S OF SLOUGH 9

RIVER MILE : 130.60

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : MATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82F1C-A

ALASKA POWER AUTHORITY

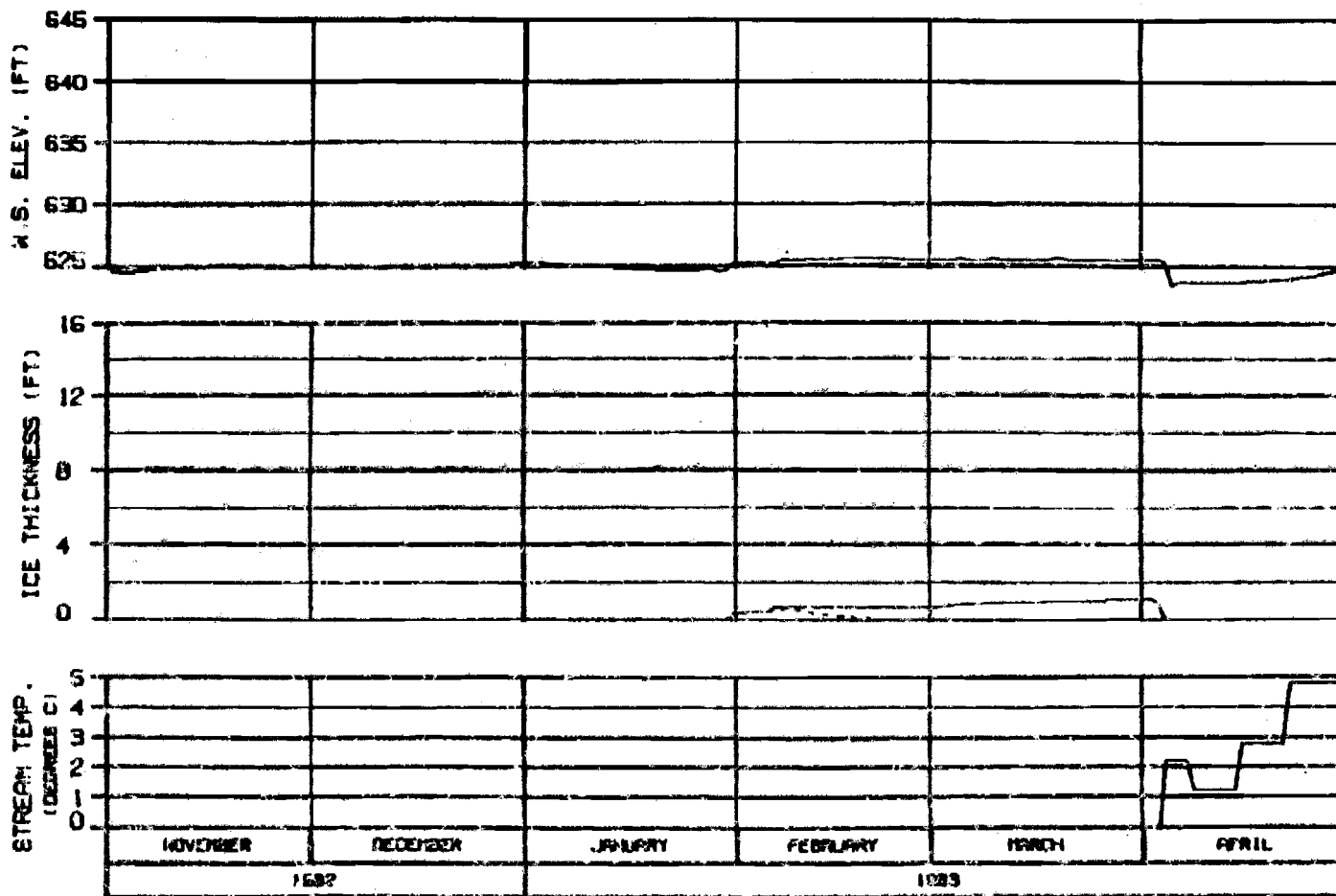
SUSTNA PROJECT

SUSTNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBR600 JOINT VENTURE

DESIGN: AL-8200 10 JUL 83 1000.142





SIDE CHANNEL U/S OF 4TH JULY CREEK  
RIVER MILE : 131.80

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : MATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : B2F1C-A

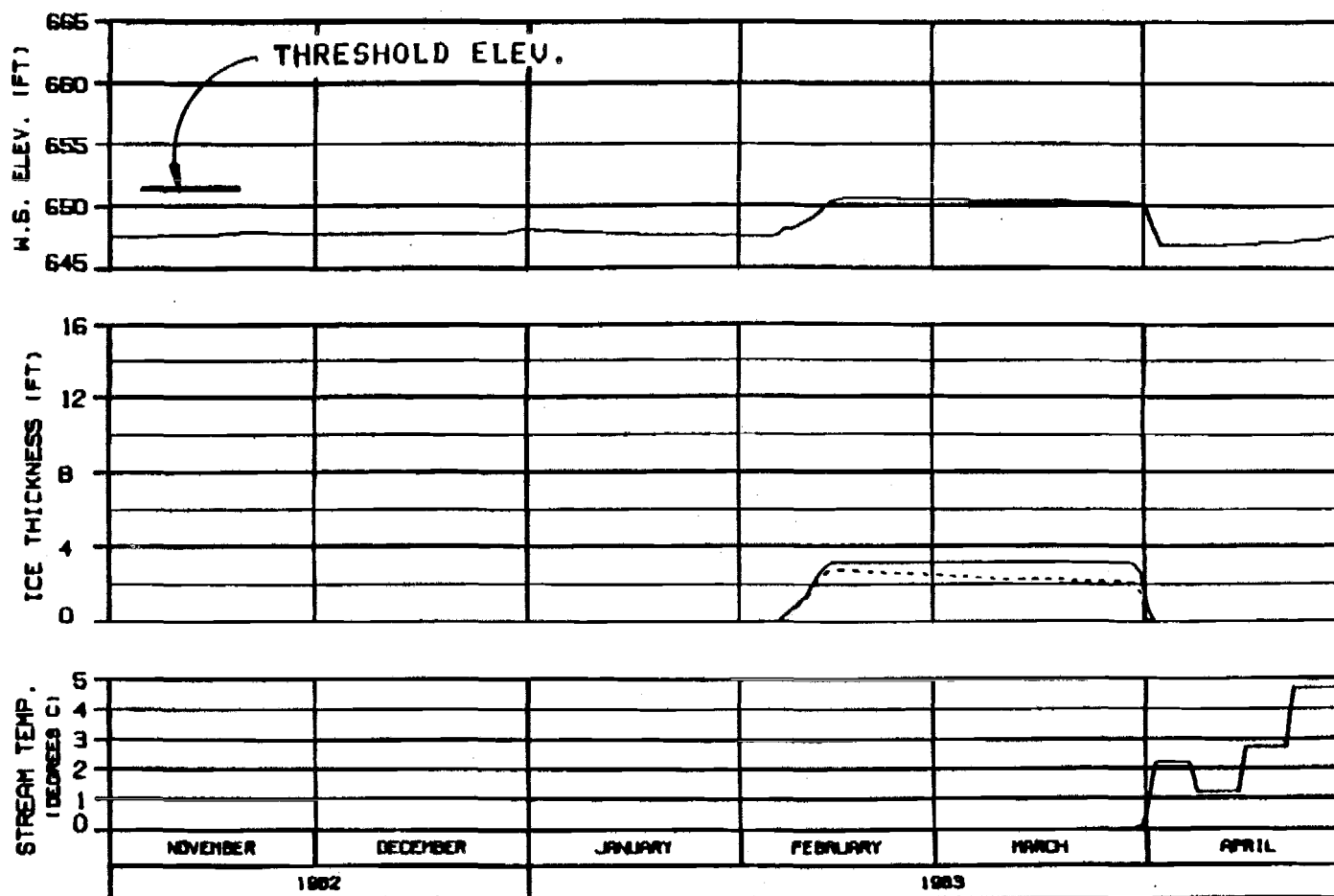
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

MAZDA-EBRACO JOINT VENTURE

DESIGNED: 11/19/82 BY: J.E. 1000.142



HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : B2F1C-A

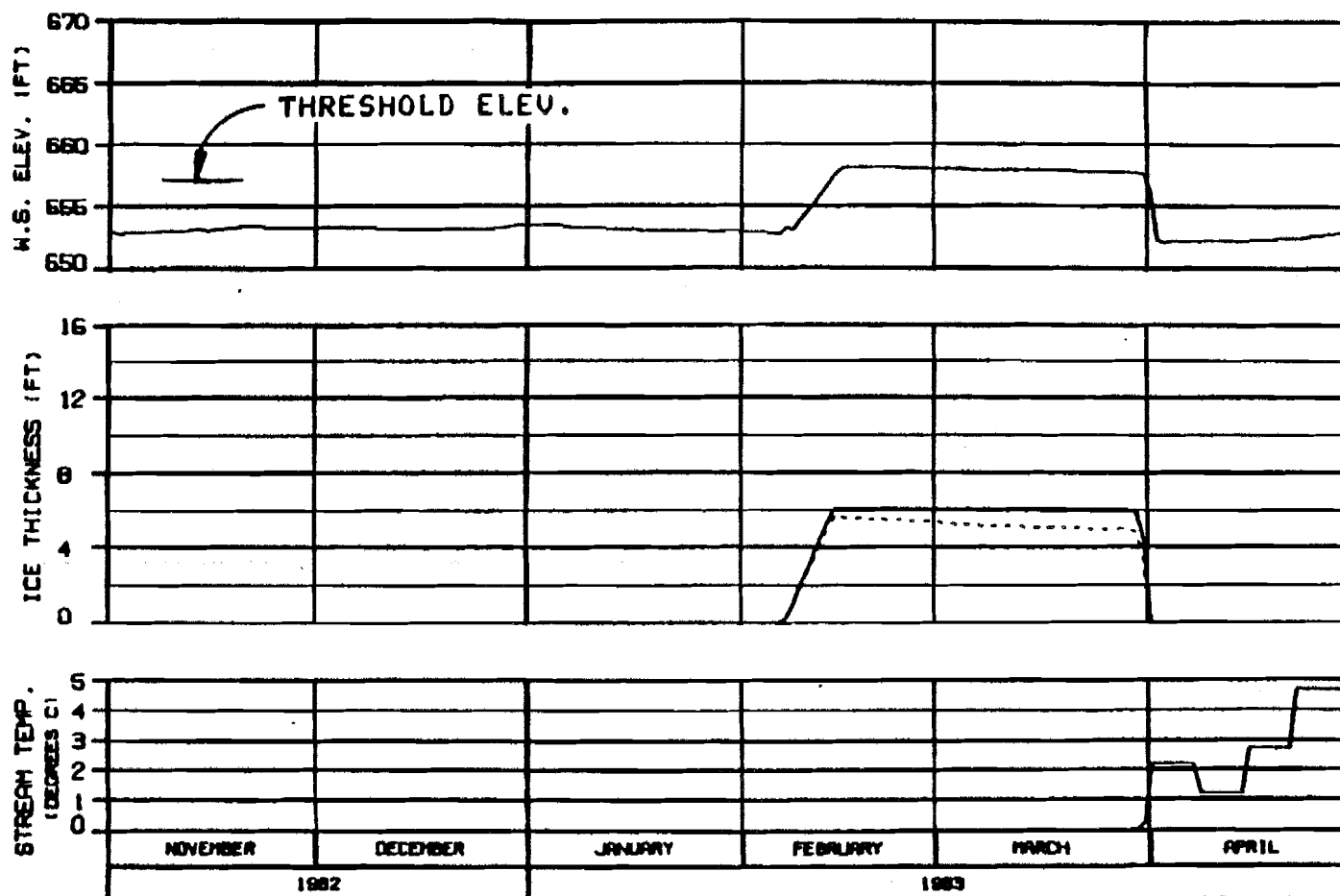
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBASCO JOINT VENTURE

ORDER: 81-0000 10 11 81 1000.142

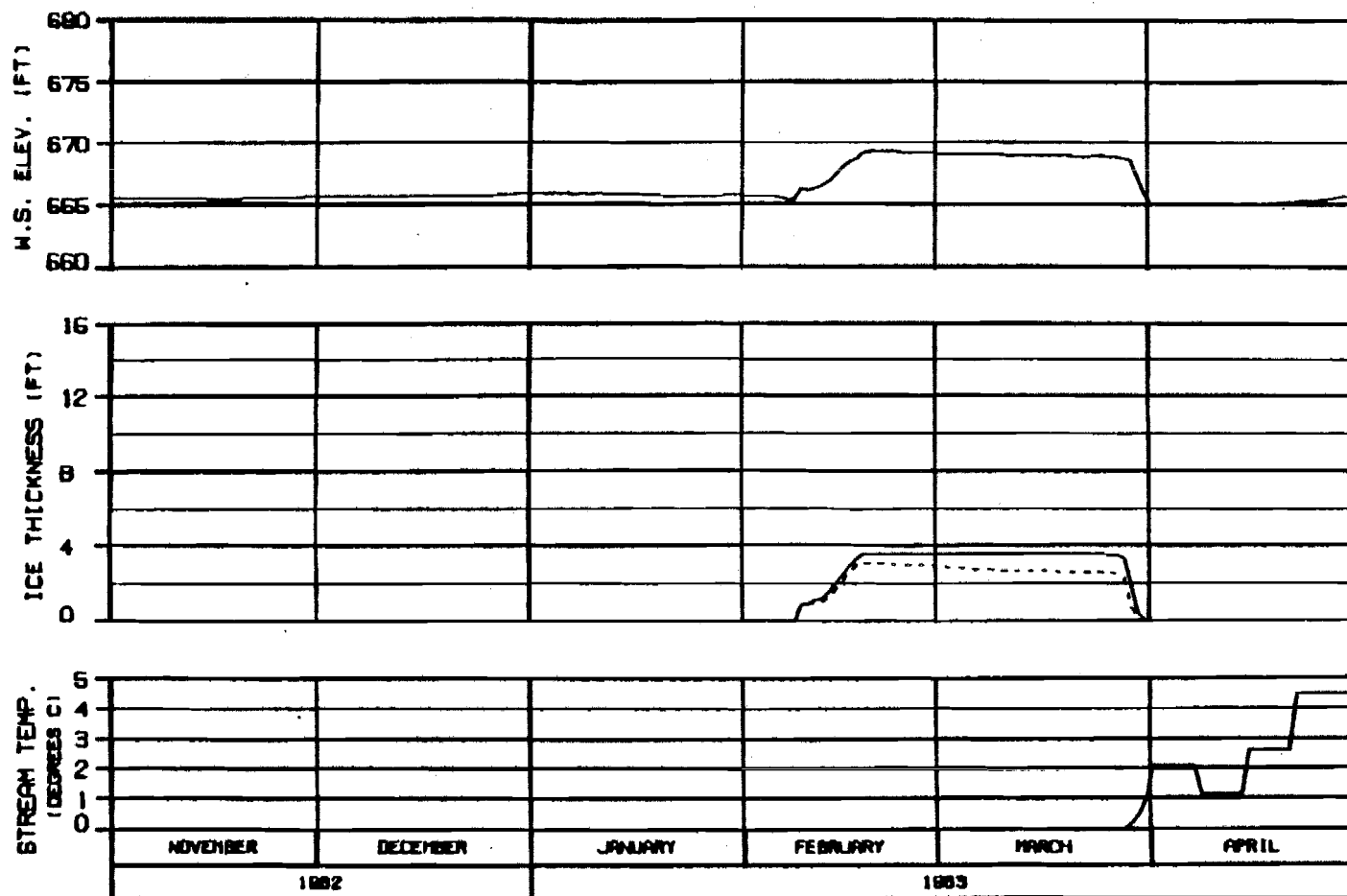


**SIDE CHANNEL U/S OF SLOUGH 10  
RIVER MILE : 134.30**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : HATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 02FIC-A

ALASKA POWER AUTHORITY		
SUBMITTER PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
HARZA-EBERLE JOINT VENTURE		
DESIGNED: 04-1983	BY: JLS	REV: 142



SIDE CHANNEL D/S OF SLOUGH 11  
RIVER MILE : 135.30

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIC-A

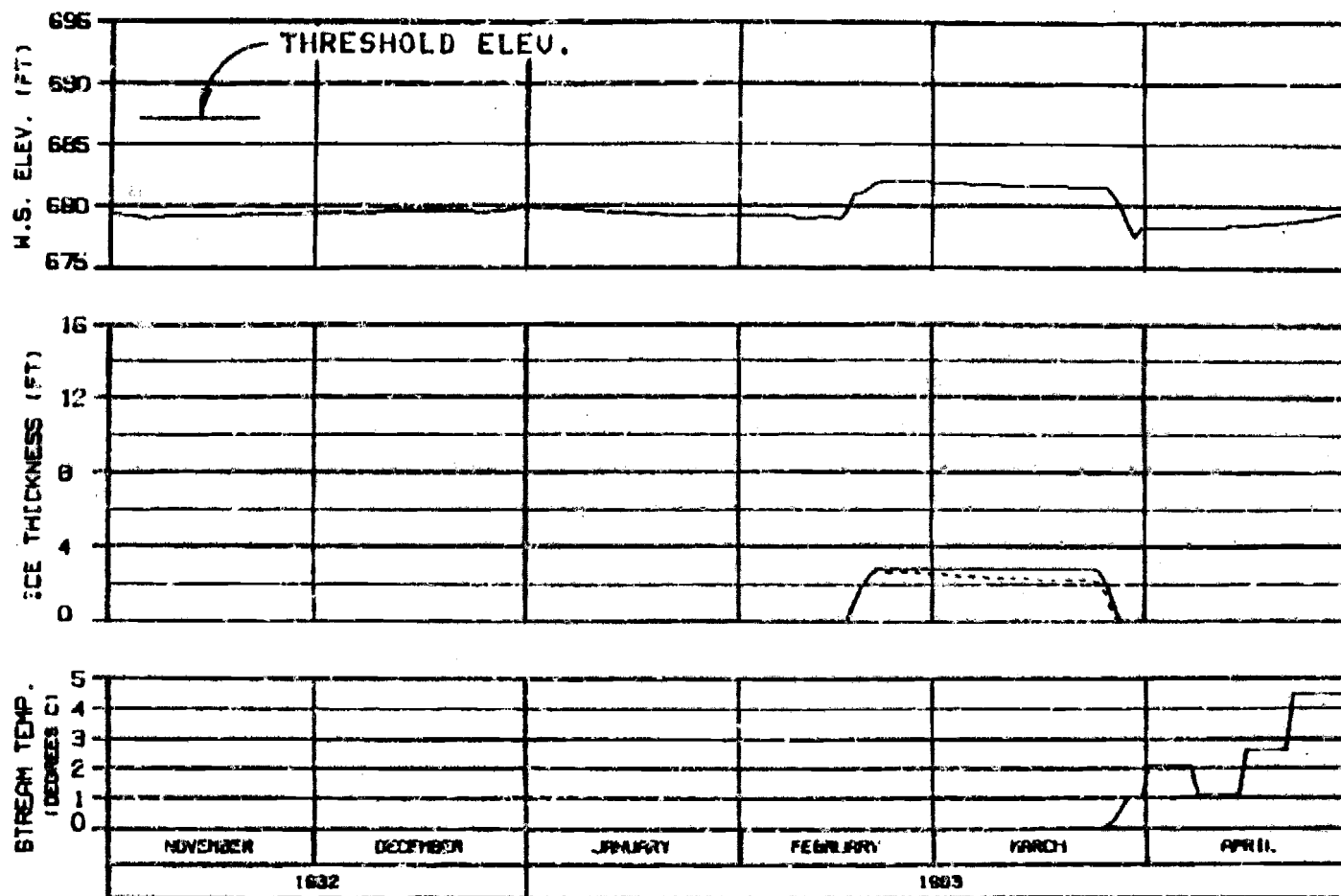
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRACO JOINT VENTURE

DESIGN: B.L.DENIS 10 JAN 84 1000.142



HEAD OF SLOUGH 11  
RIVER MILE : 136.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 0271C-A

ALASKA POWER AUTHORITY

SUSTINA PROJECT

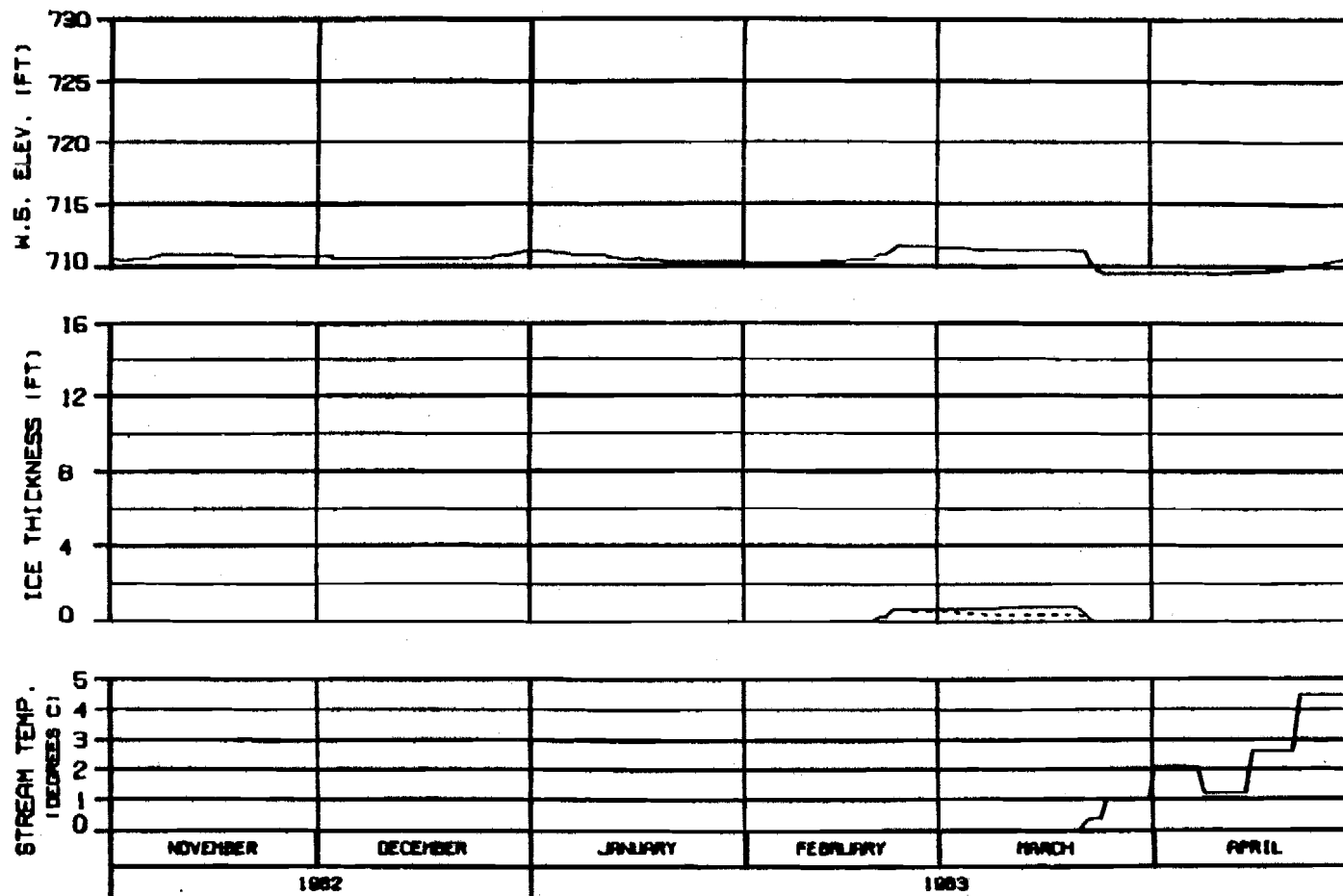
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EGAGOO JOINT VENTURE

DYKES, ALPHEA

10 JUL 83

ISSN 142



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 82F1C-A

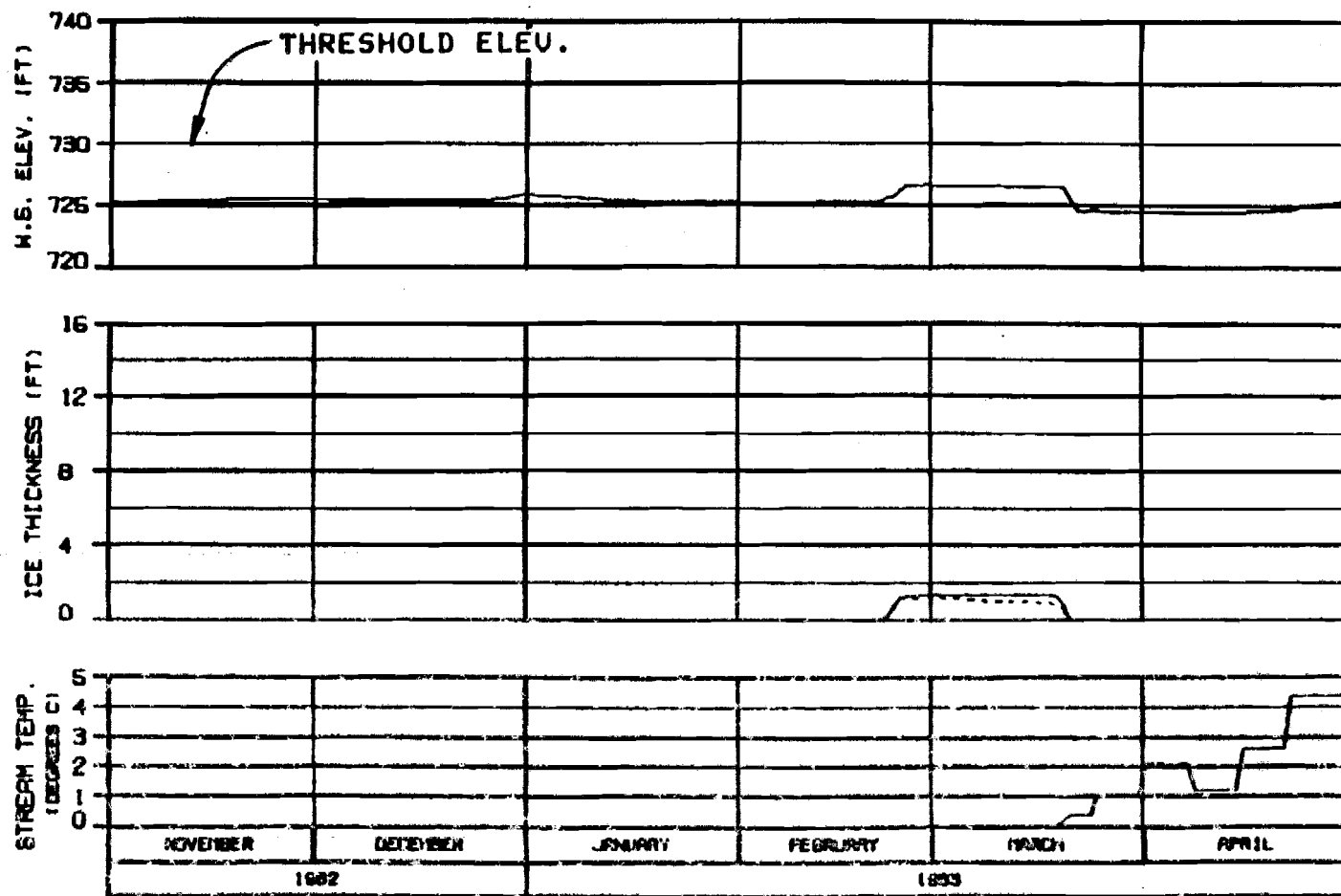
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBRSCO JOINT VENTURE

ORDER: 81-0000 30 JUL 81 1982.142

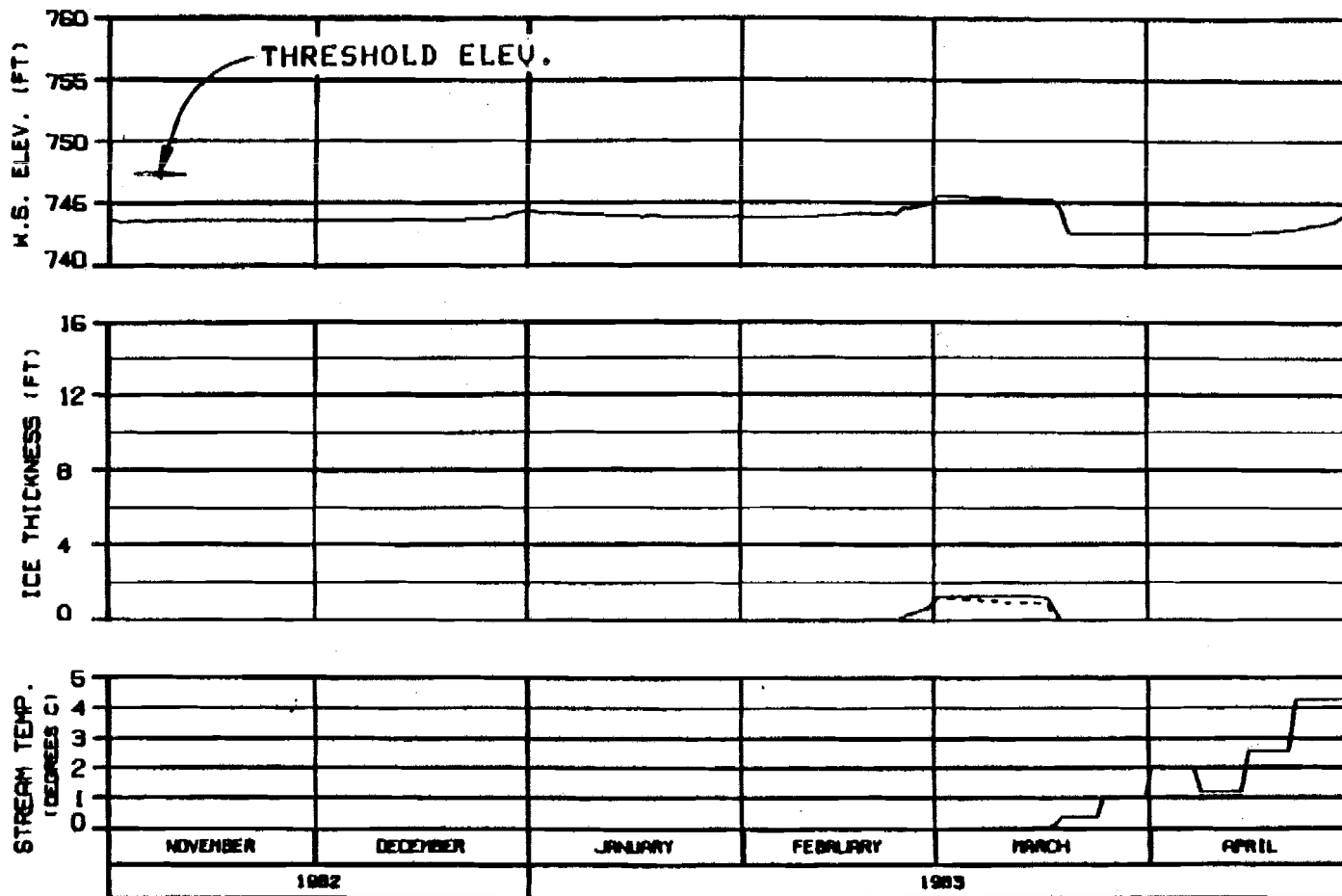


HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : WATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIC-A

ALASKA POWER AUTHORITY	
MISTINA PROJECT	
SUSTINA RIVER	
ICE SIMULATION	
TIME HISTORY	
HARZA-EBERD JOINT VENTURE	
CHARTS - ELEVATION	10 44 84
1983.142	



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : WATANA 1ST YR FILLING  
 FLOW CASE : C  
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ALASKA POWER AUTHORITY

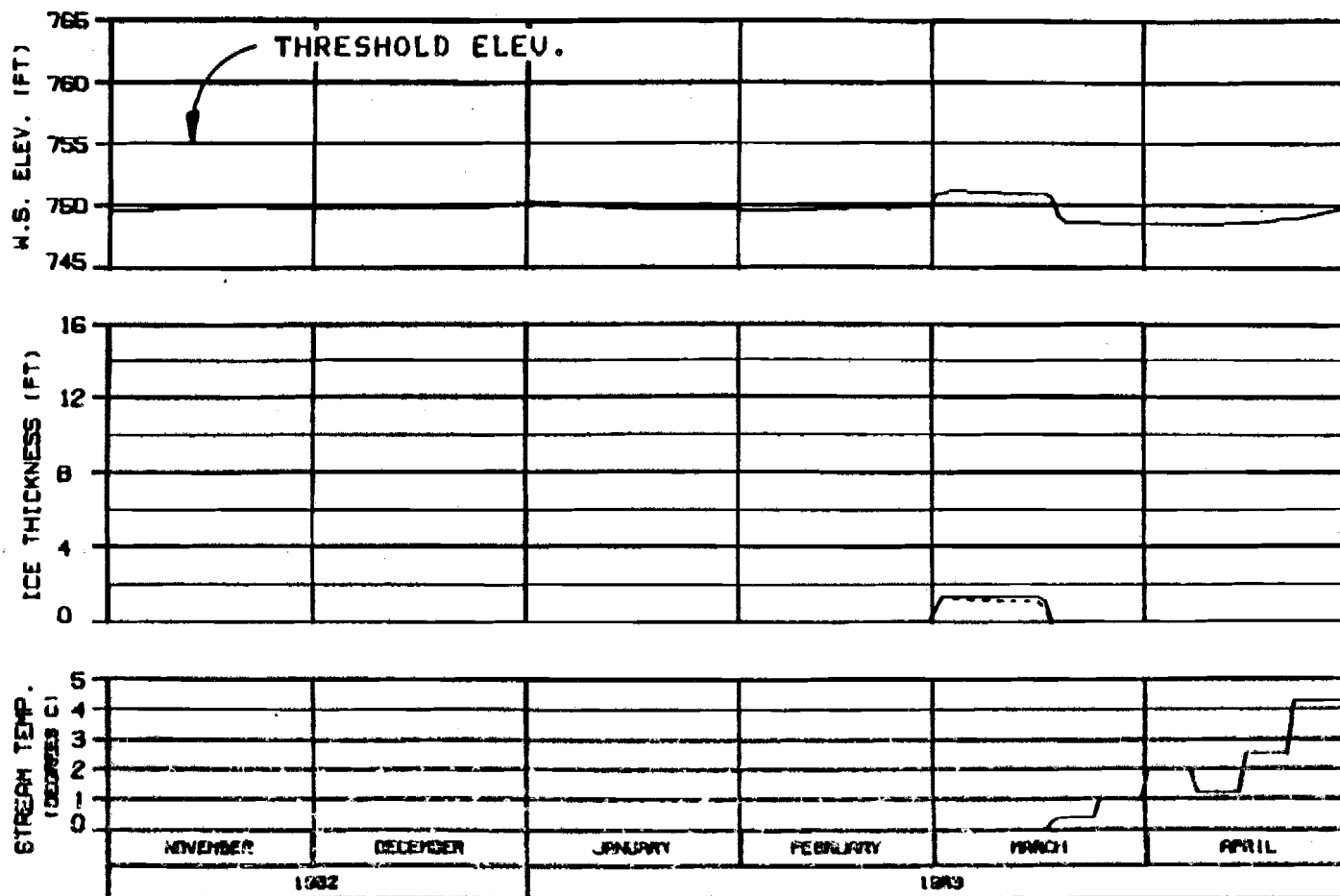
SUBMITTER PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBAGCO JOINT VENTURE

ORDER: 84-000 NO. 00 00 000.142





HEAD OF SLOUGH 21

RIVER MILE : 142.20

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
ENERGY DEMAND : NATANA 1ST YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 82FIC-A

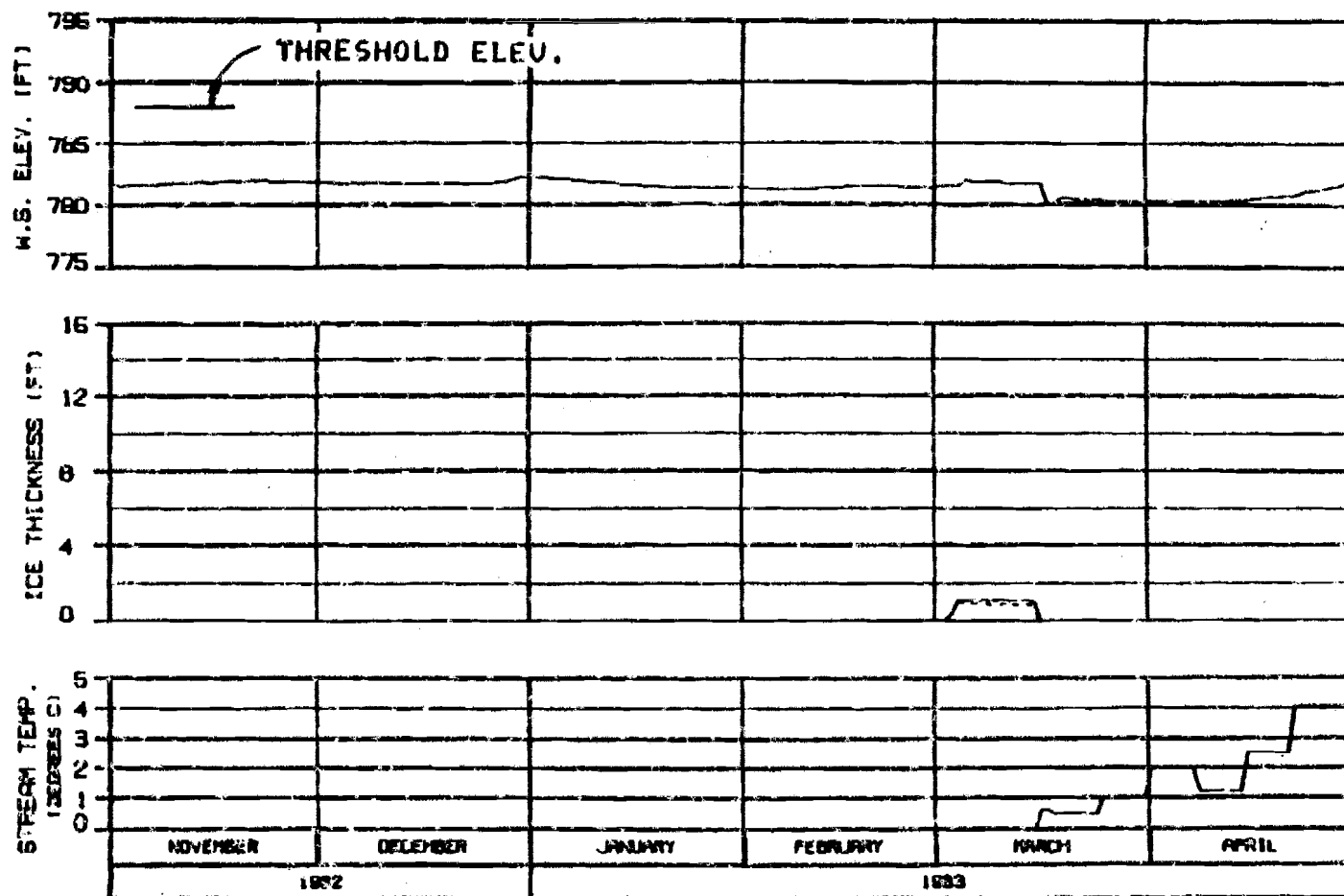
ALASKA POWER AUTHORITY

SUBMITTER PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBRACD JOINT VENTURE

CHARTED, 11/1/82 BY J.A. 83 MCH. 142



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:

----- TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 82 - 30 APR 83  
 ENERGY DEMAND : NATANA 1ST YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 32FIC-A

ALASKA POWER AUTHORITY

GLACIER PROJECT

SUSITNA RIVER

ICE SIMULATION

TIME HISTORY

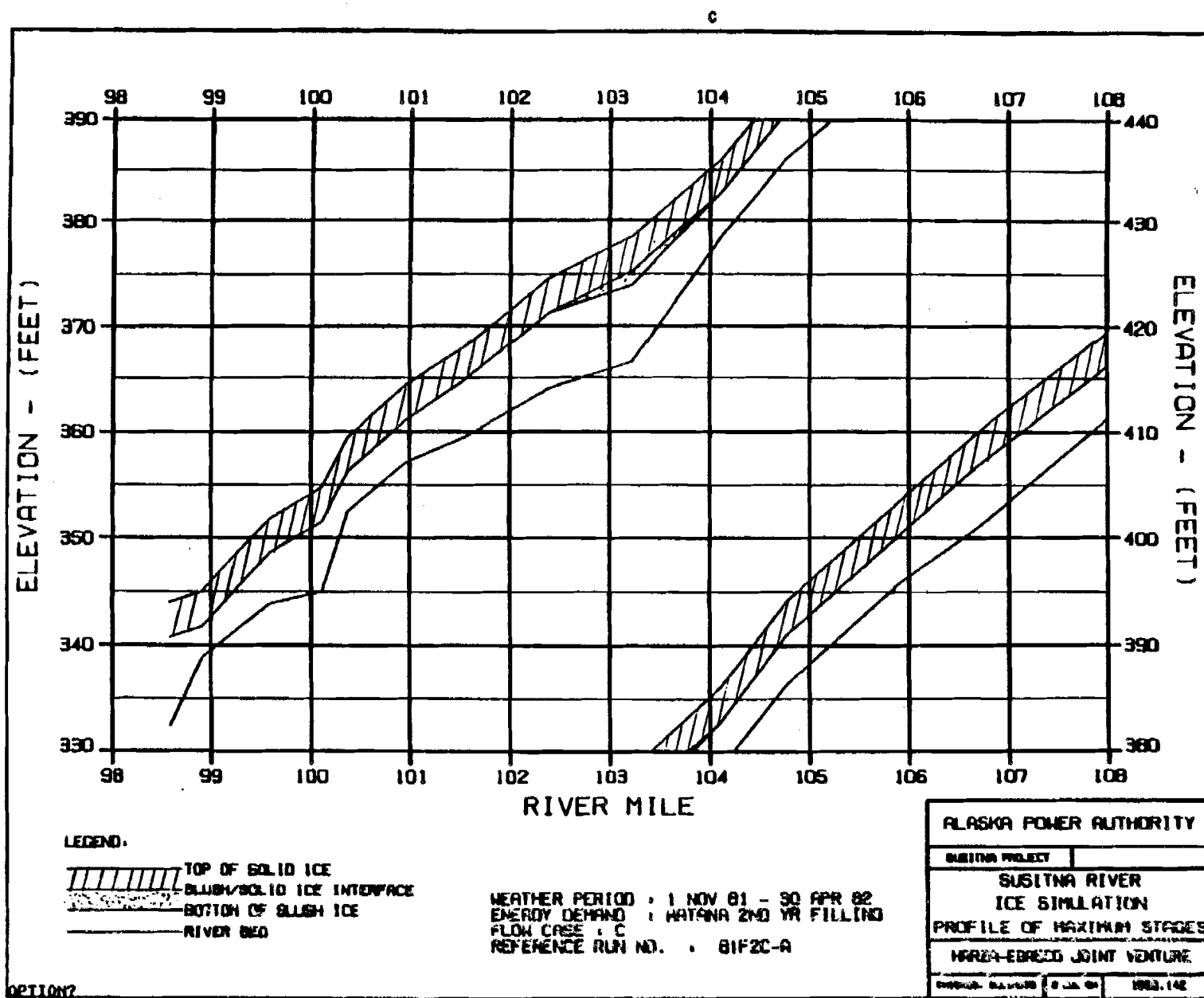
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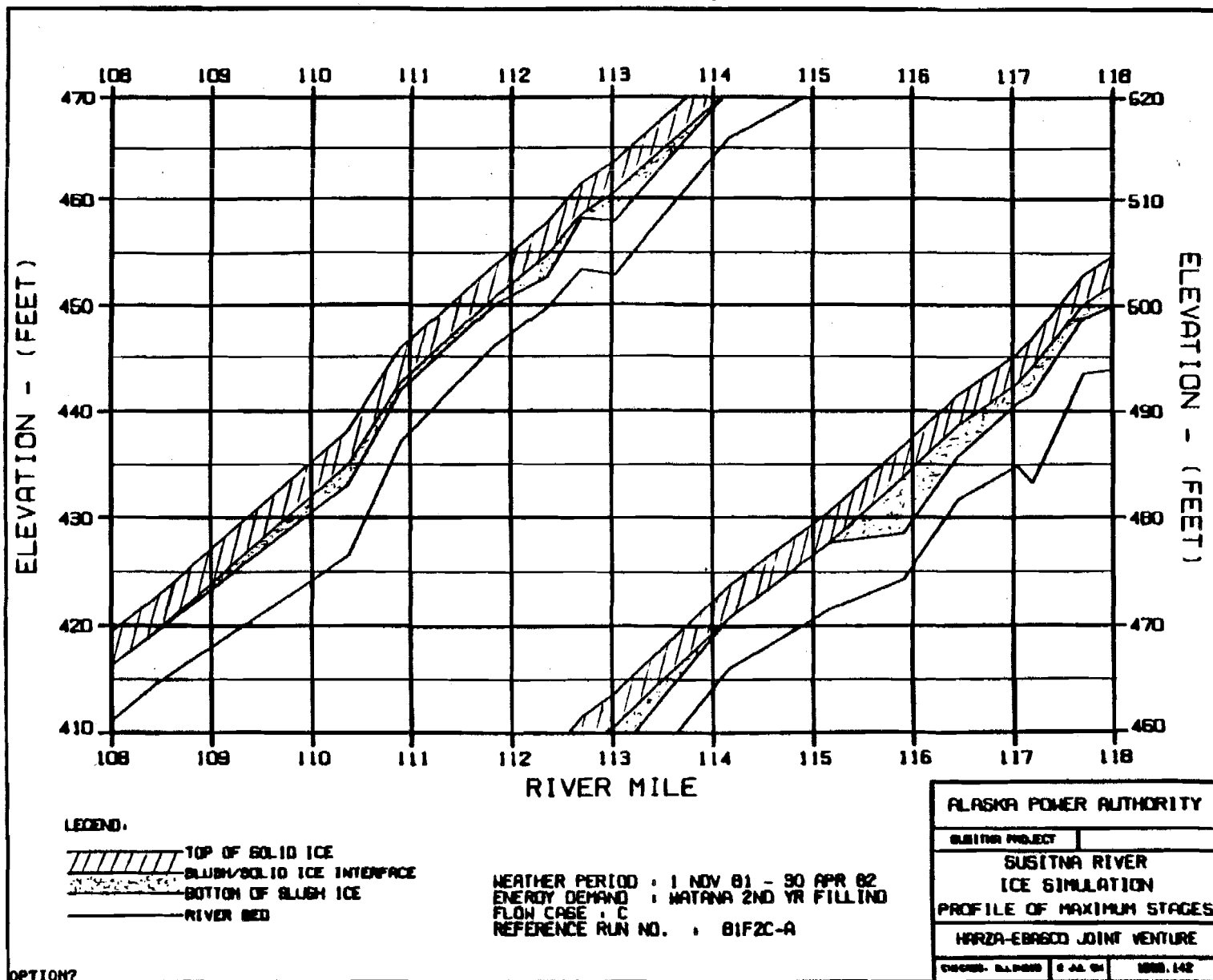
CHARTED: 11/8/82 BY: J.A. G. 1388.142

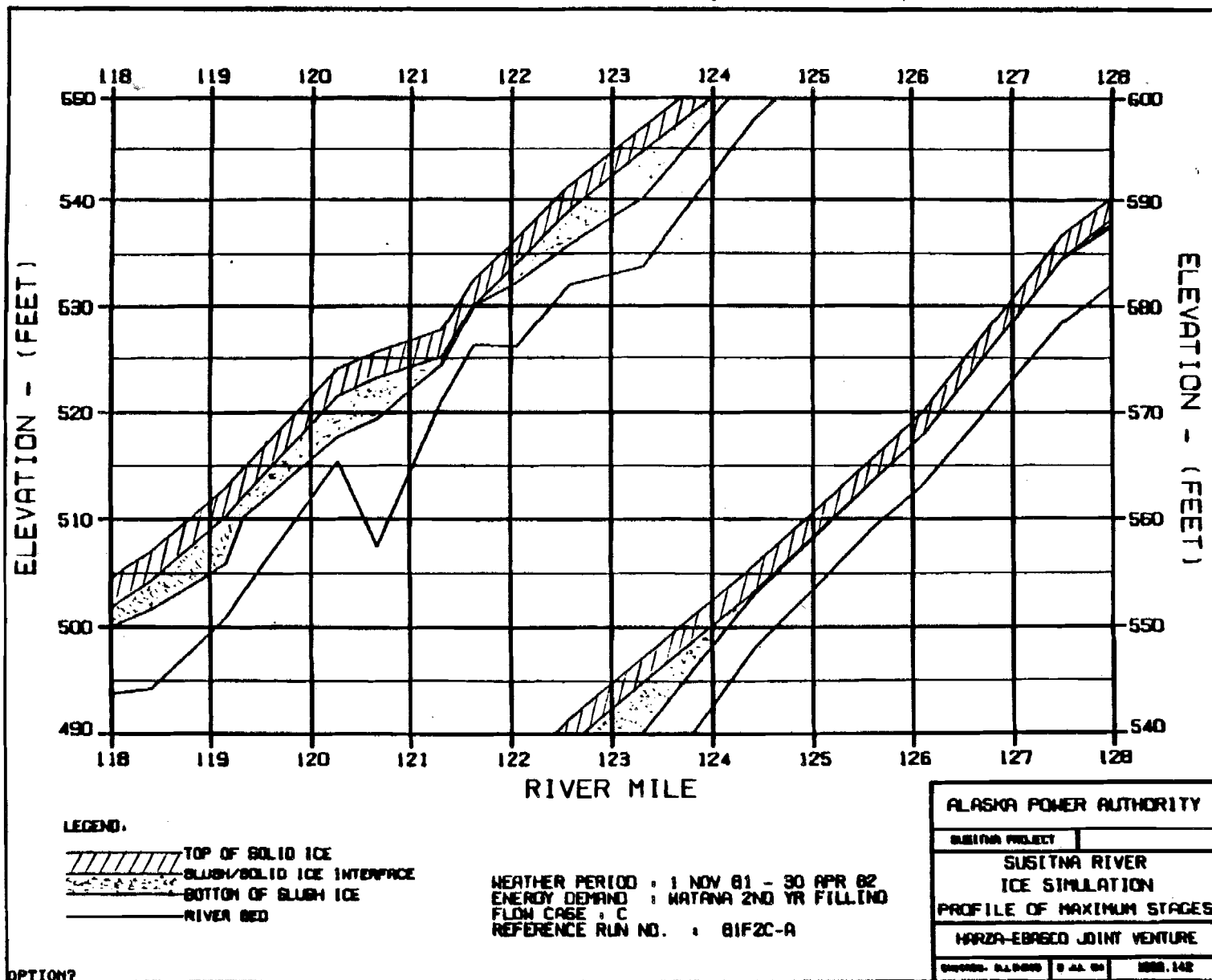
OPTION2

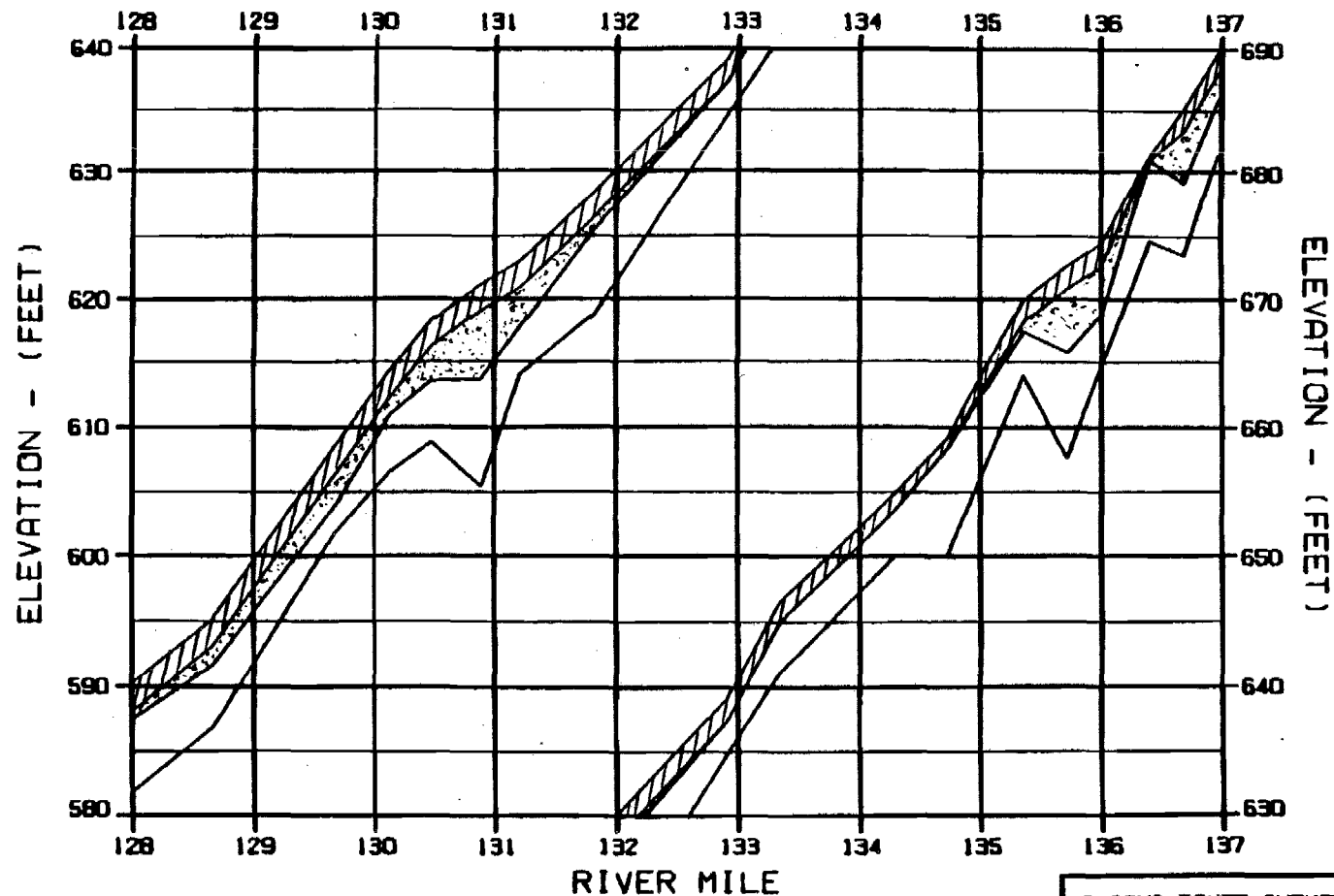
# EXHIBIT T

The following study, entitled "Watana-Second Year Filling" corresponds to the winter of 1992-93, as depicted in Exhibit E.2.138 of the License Application. The weather used corresponds to the winter of 1981-82, which is a cold winter. Releases from Watana under these conditions would be made thru the mid-level outlet.









LEGEND:

- TOP OF SOLID ICE
- SLUSH/SOLID ICE INTERFACE
- BOTTOM OF SLUSH ICE
- RIVER BED

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : MATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

SUSITNA PROJECT

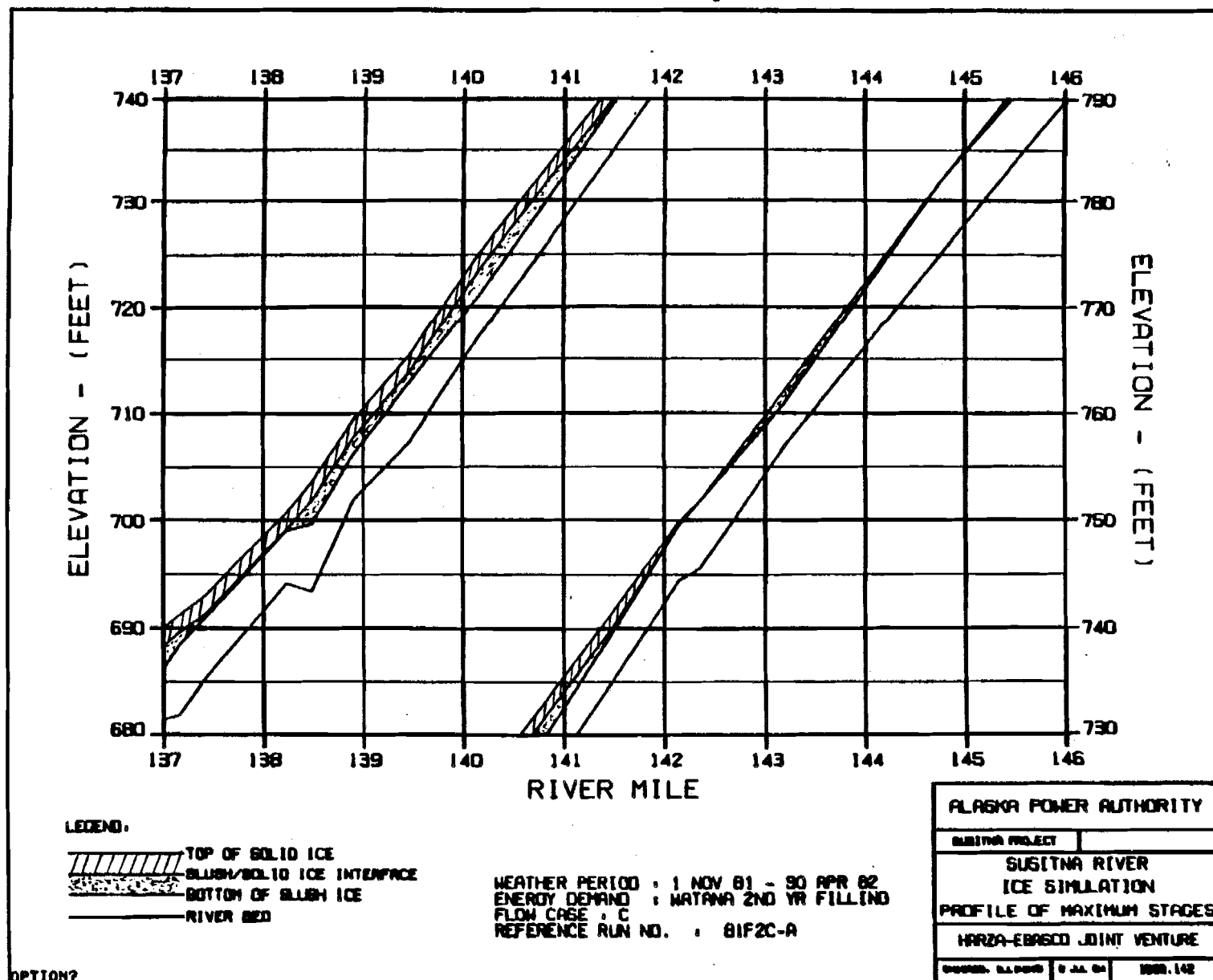
SUSITNA RIVER  
 ICE SIMULATION  
 PROFILE OF MAXIMUM STAGES

HAZDA-EBRACO JOINT VENTURE

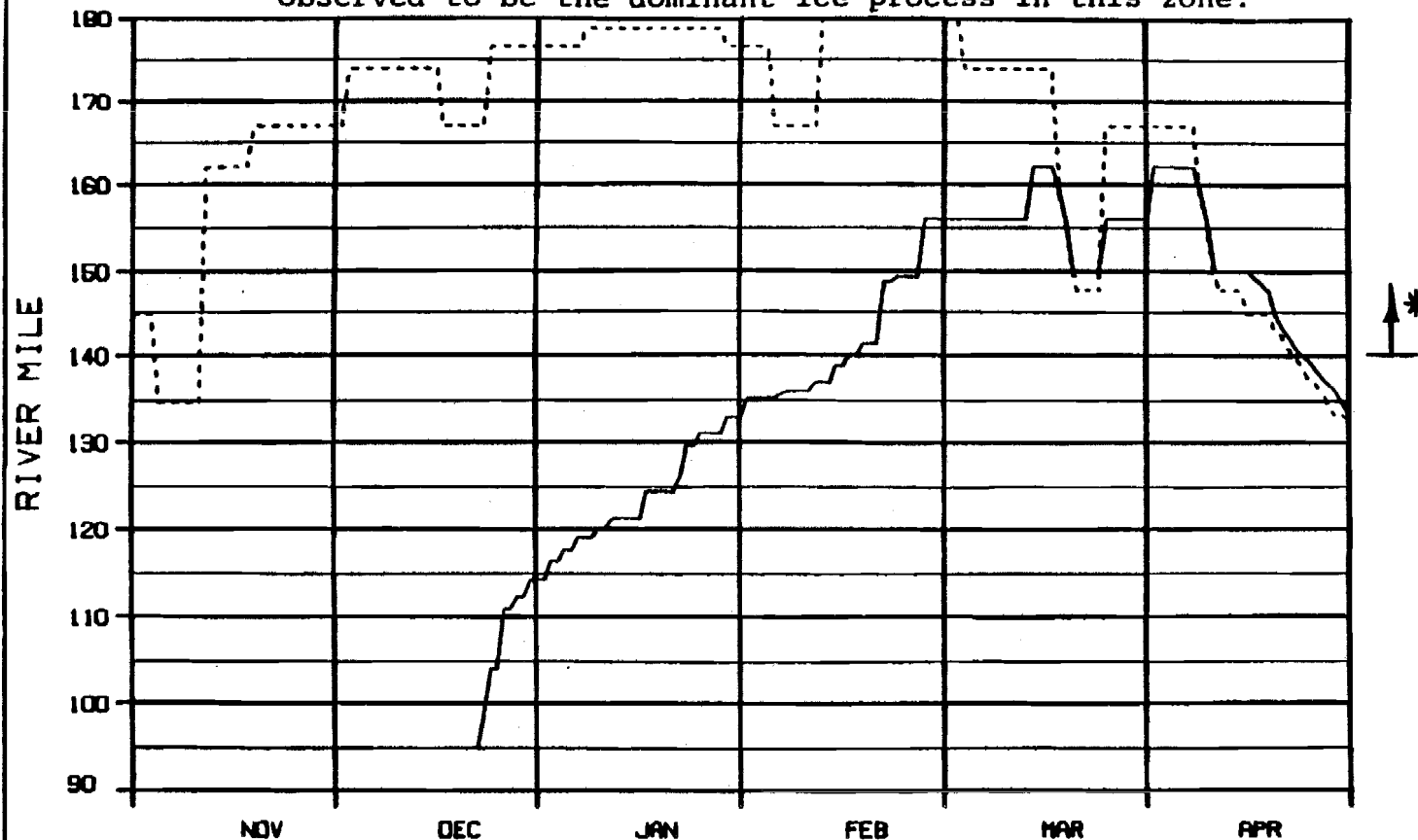
DESIGNED BY: [ ] DRAWN BY: [ ] DATE: 1982.142

OPTION?





\* Note: Simulation of progression u/s of River Mile 140  $\pm$  is considered approximate since intermittent bridging of border ice has been observed to be the dominant ice process in this zone.



LEGEND:

———— ICE FRONT  
 - - - - - ZERO DEGREE ISOTHERM

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

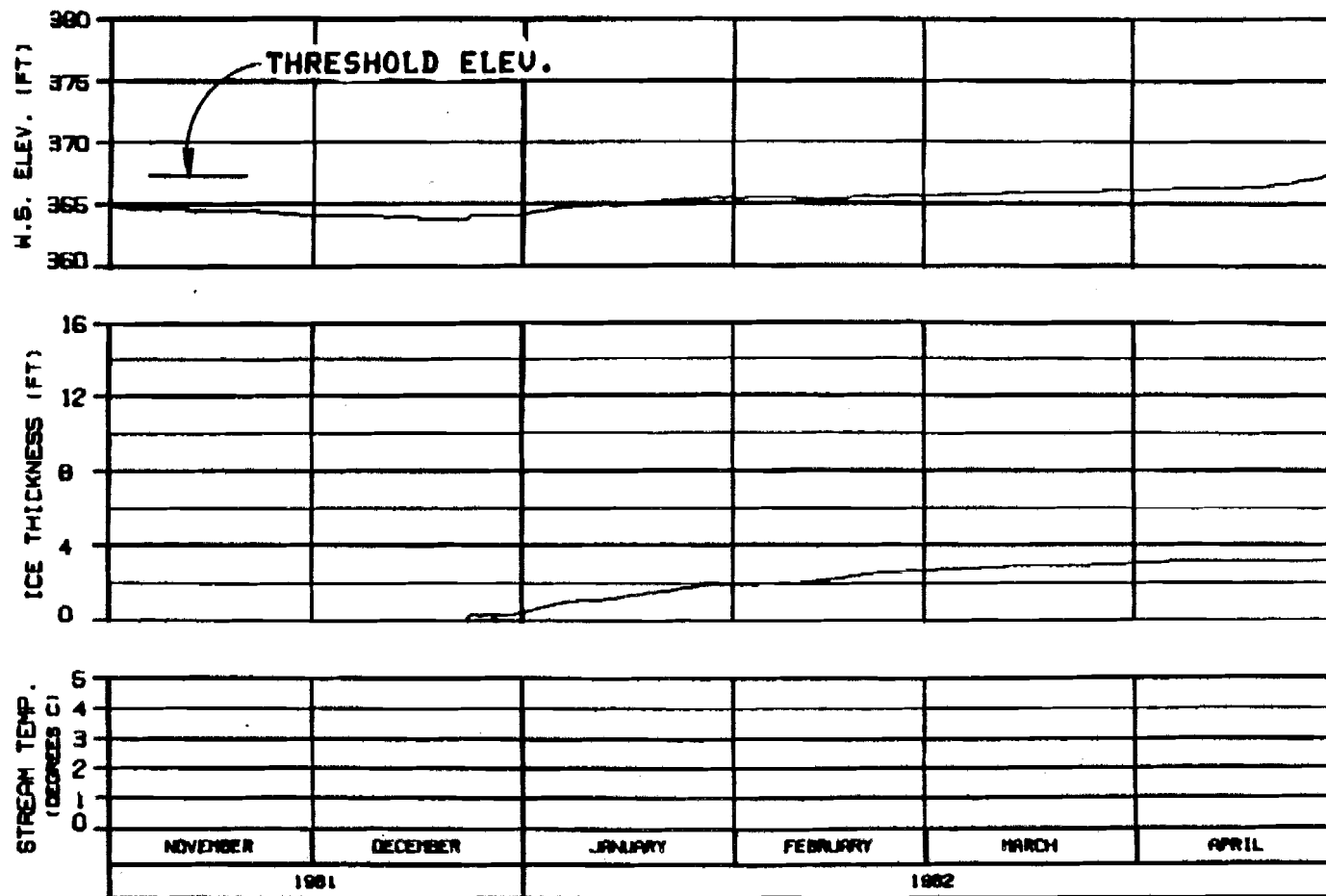
SUSITNA PROJECT

SUSITNA RIVER  
 PROGRESSION OF ICE FRONT  
 & ZERO DEGREE ISOTHERM

WARZA-EBASCO JOINT VENTURE

DESIGNED: S. L. HARRIS 8 JAN 82 1000-142

OPTION 2



**HEAD OF WHISKERS SLOUGH**  
**RIVER MILE : 101.50**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

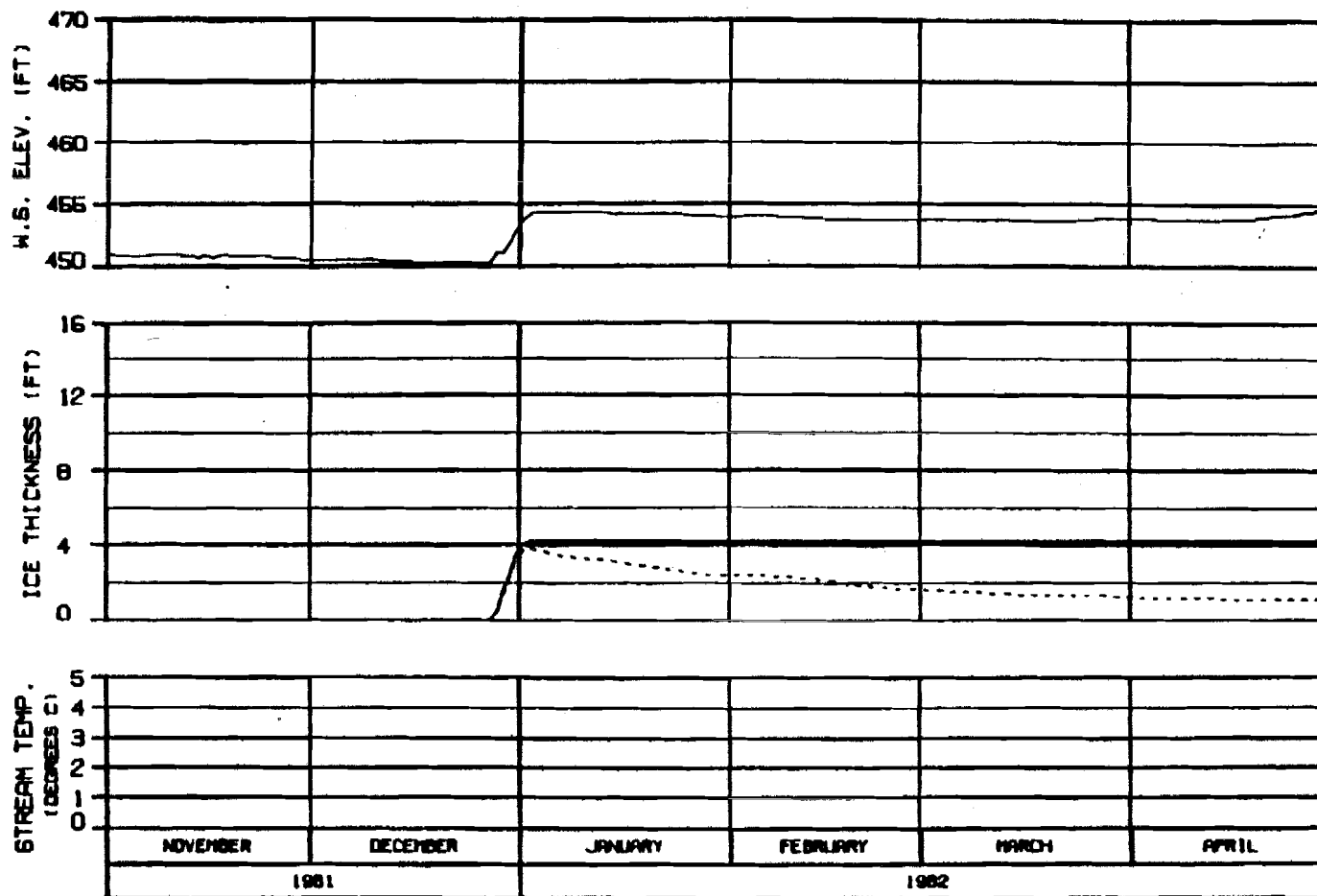
**ALASKA POWER AUTHORITY**

**SUSTINA PROJECT**

**SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EBRACCO JOINT VENTURE**

**DITCHED, ALASKA 2 JUL 81 1000.142**

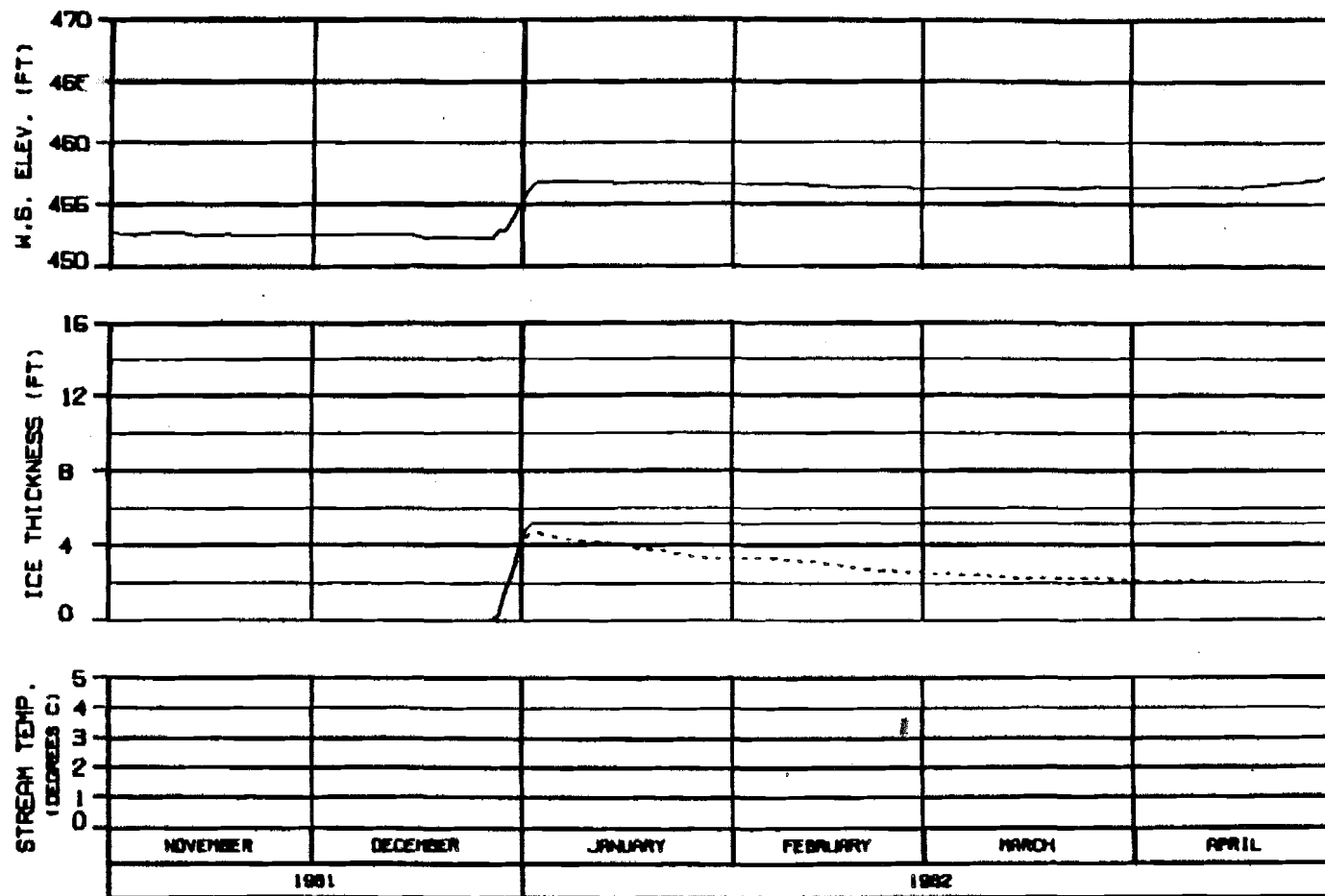


**SIDE CHANNEL AT HEAD OF GASH CREEK**  
**RIVER MILE : 112.00**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBASCO JOINT VENTURE	
DESIGNED: E.A. HARRIS	FILE NO: 888.148



MOUTH OF SLOUGH 6A  
RIVER MILE : 112.34

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 2ND YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 81F2C-A

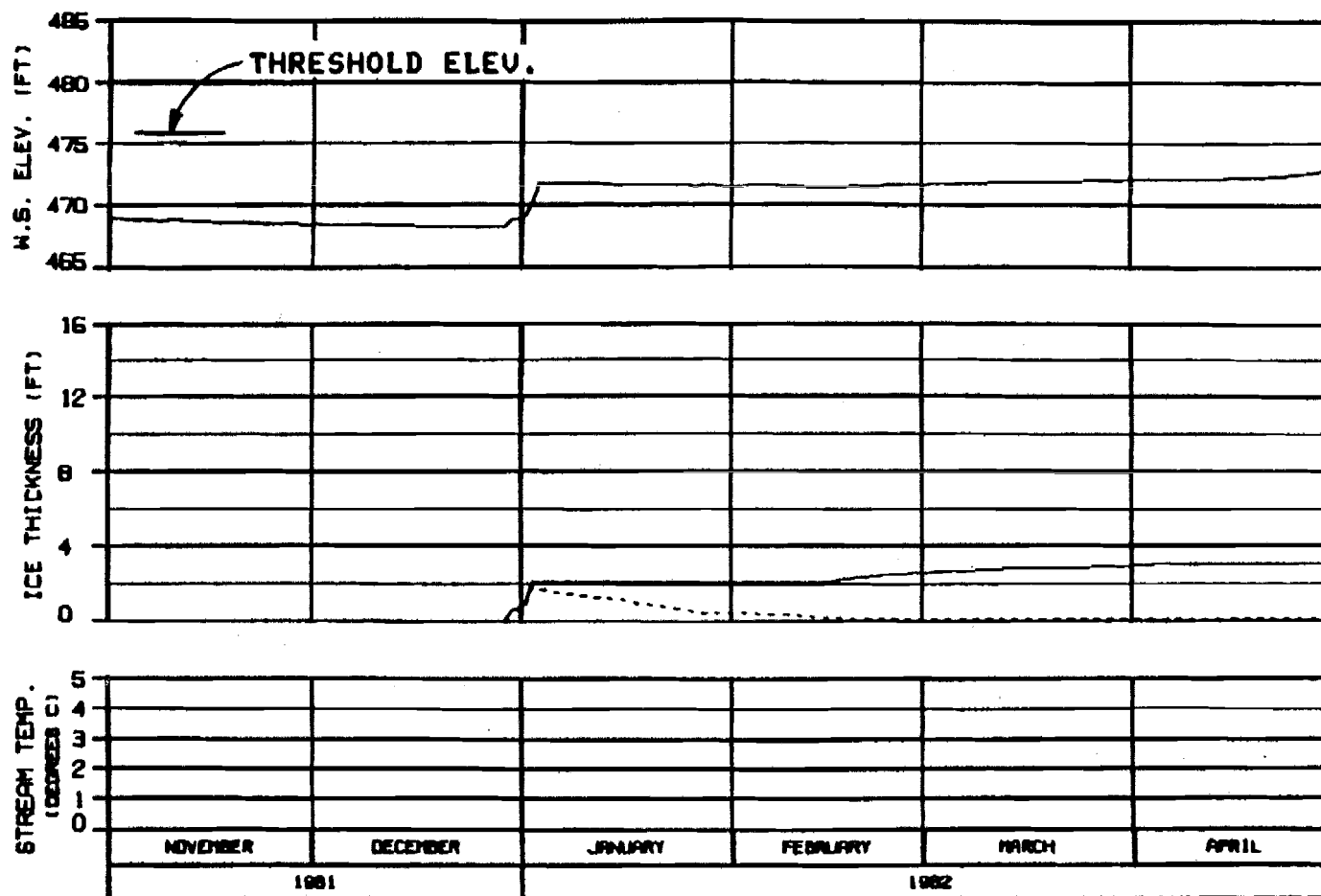
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HAZRA-EBERD JOINT VENTURE

DESIGN: 8-10-81 8-11-81 8-12-81

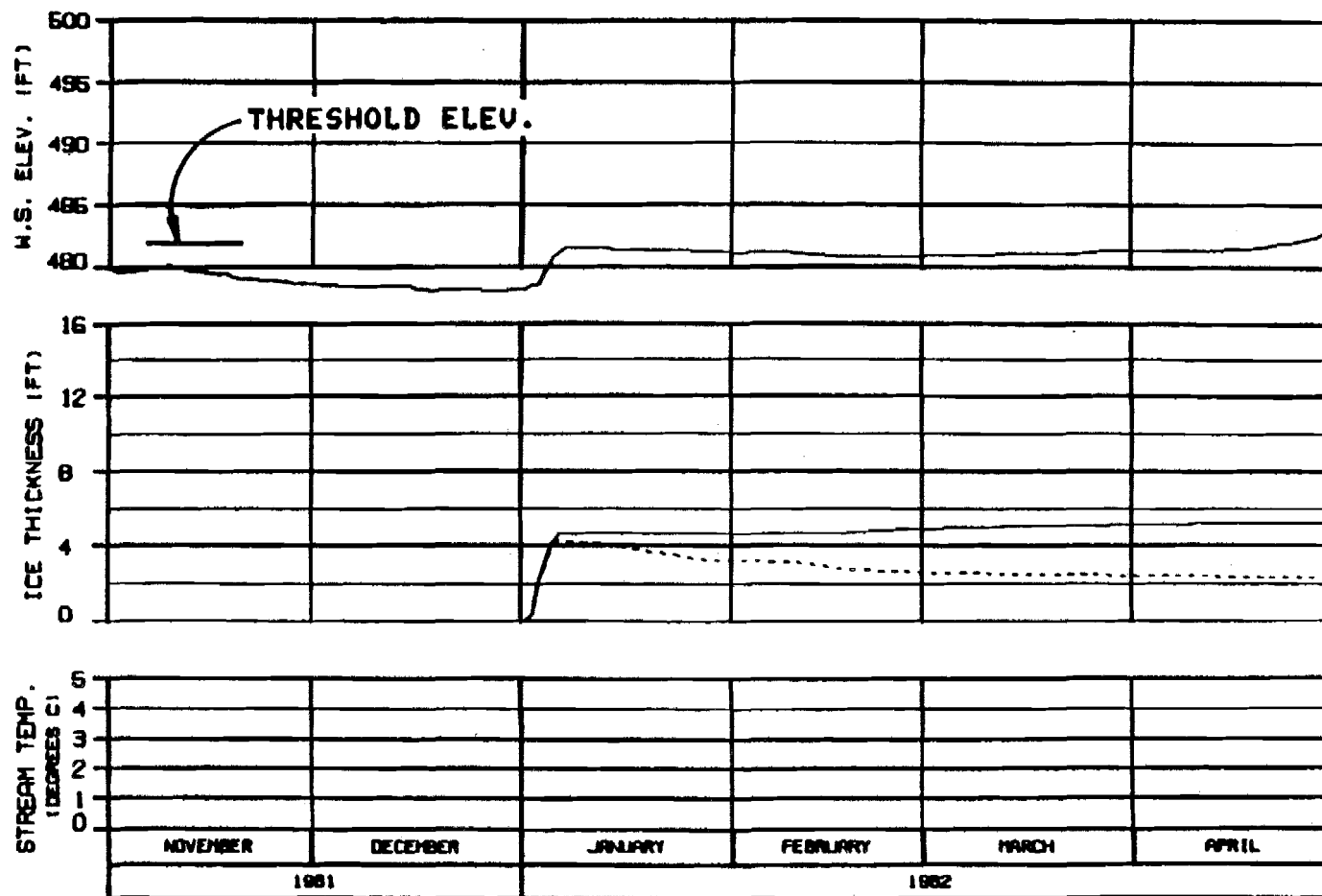


**HEAD OF SLOUGH 8**  
**RIVER MILE : 114.10**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
HARZA-EBASCO JOINT VENTURE		
DESIGN. BY	DATE	REVISION
ALP/MS	8 JUL 84	1000.148



**SIDE CHANNEL MSII**  
**RIVER MILE : 115.50**

**ICE THICKNESS LEGEND:**  
 ——— TOTAL THICKNESS  
 - - - - - MELT COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

**ALASKA POWER AUTHORITY**

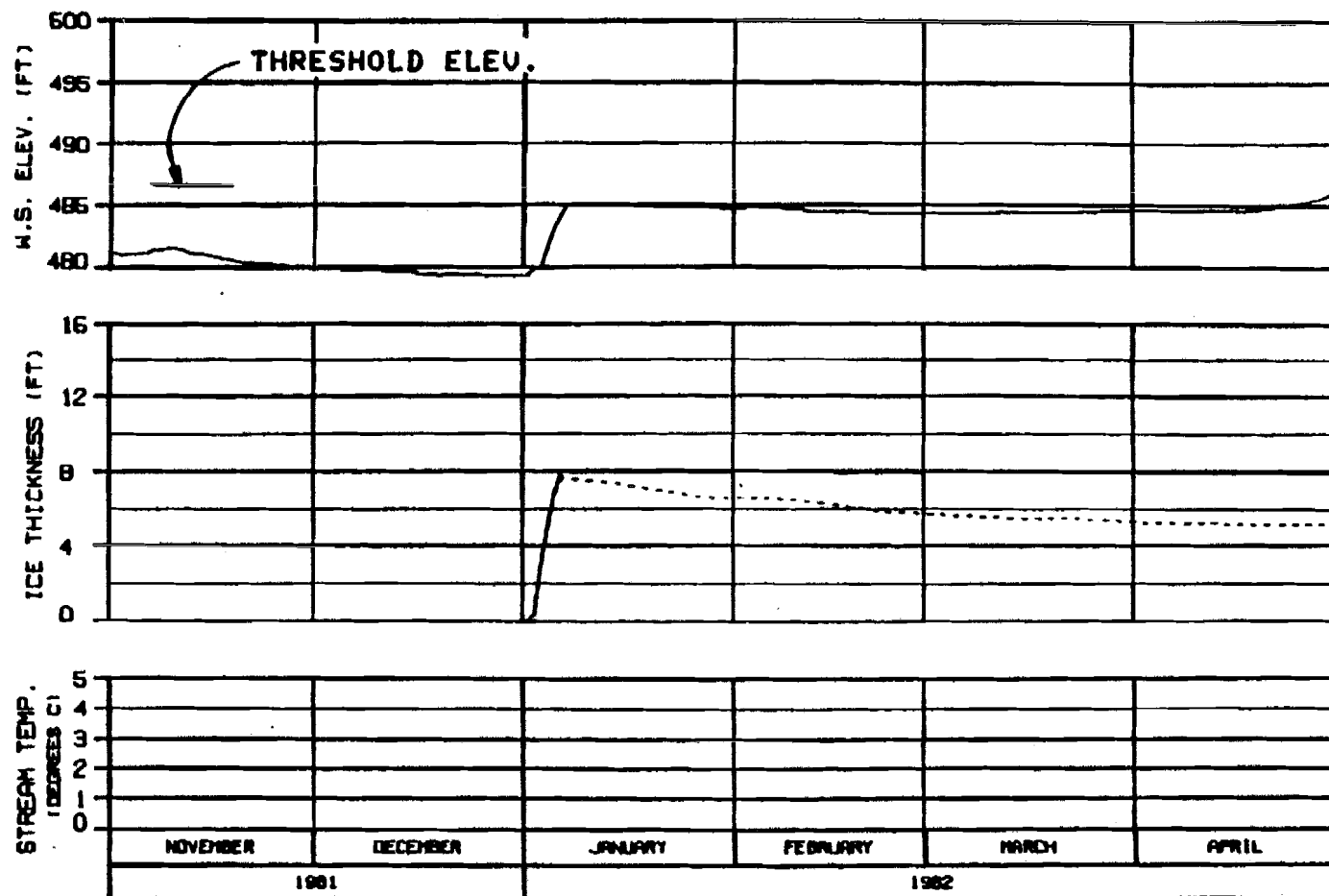
**QUESTION PROJECT**

**SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY**

**HARZA-EDBECO JOINT VENTURE**

DESIGNED BY: [ ] DRAWN BY: [ ] CHECKED BY: [ ]

**PAGE 142**



HEAD OF SIDE CHANNEL MSII

RIVER MILE : 115.90

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - BLUISH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY

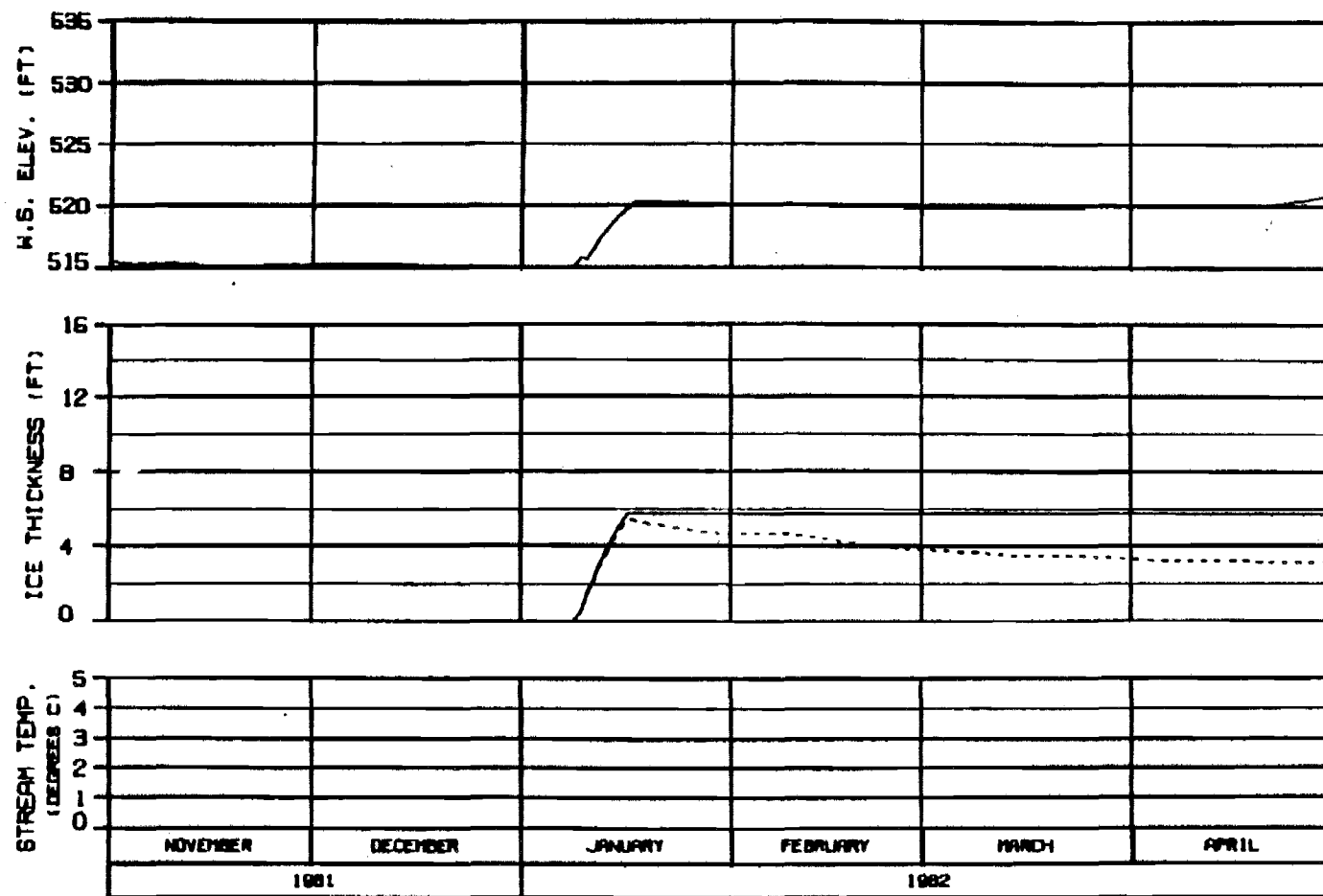
SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: HARPIS 8 JAN 82 1000.142





ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

RIVER MILE : 120.00

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

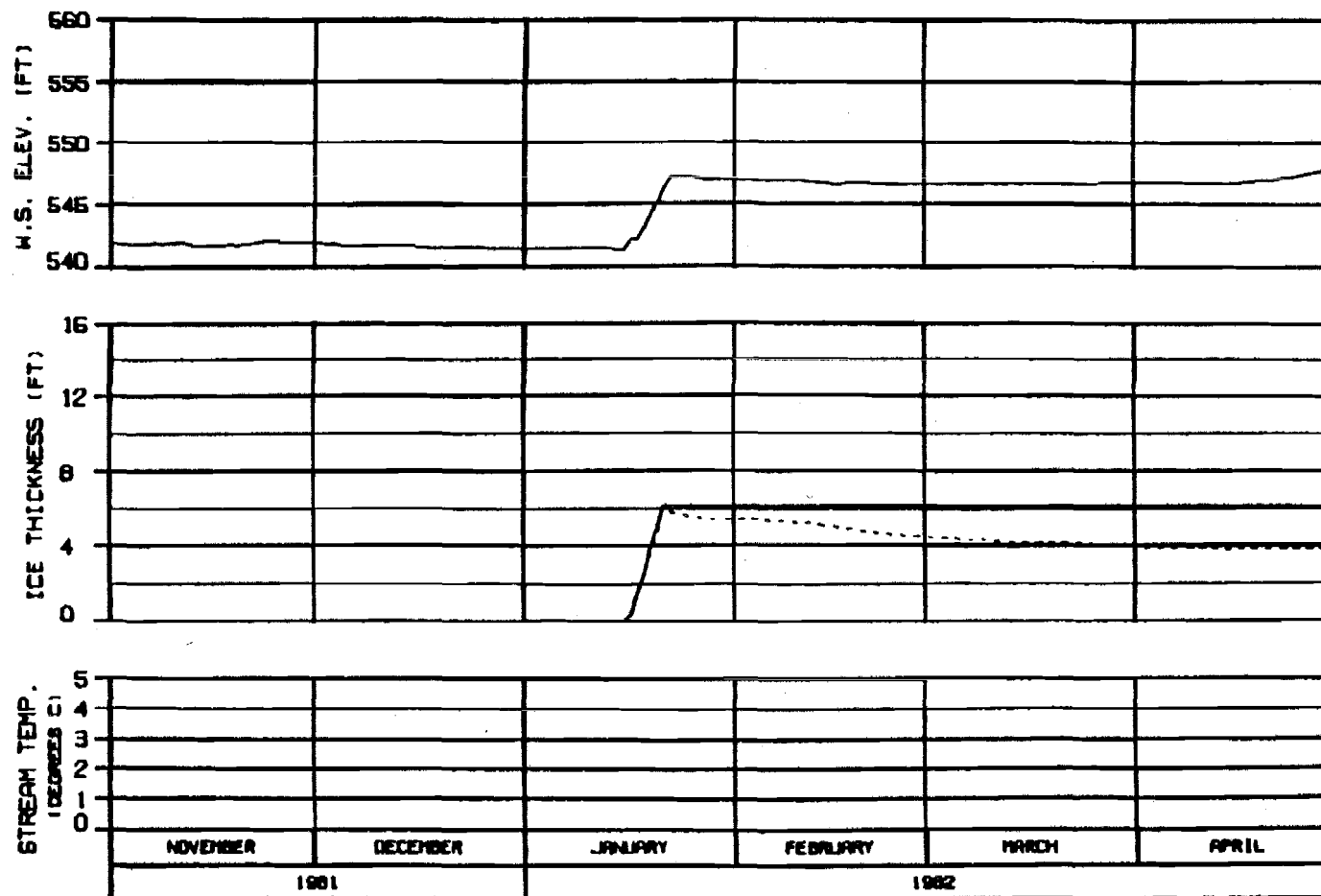
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBERD JOINT VENTURE

DRAWN: S.A. PETER 8 JAN 84 1000.142



ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

HEAD OF MOOSE SLOUGH  
 RIVER MILE : 123.50

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

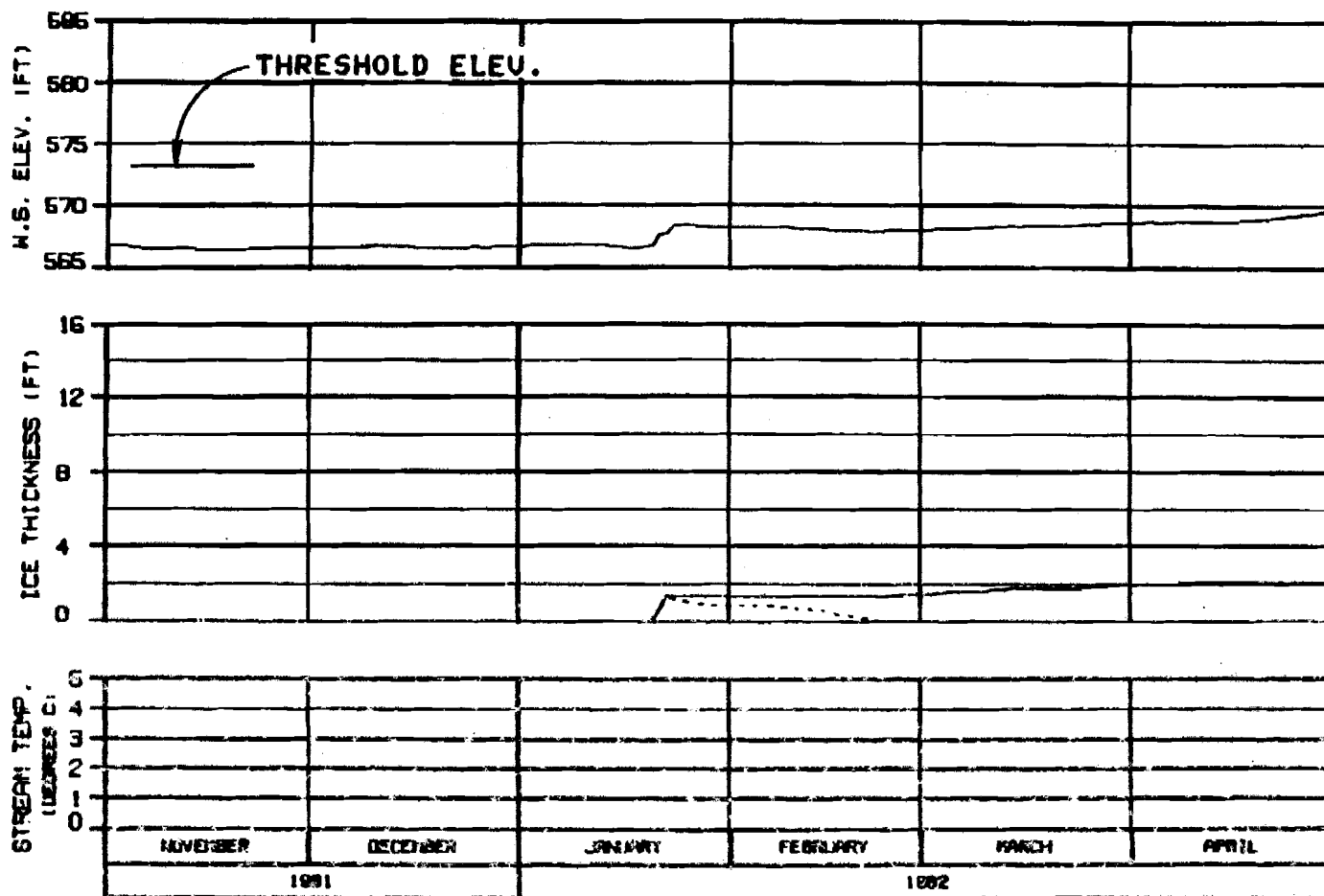
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. PETERSON 3-22-81 10000-142



HEAD OF SLOUGH 8A (WEST)

RIVER MILE : 126.10

ICE THICKNESS LEGEND:

——— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

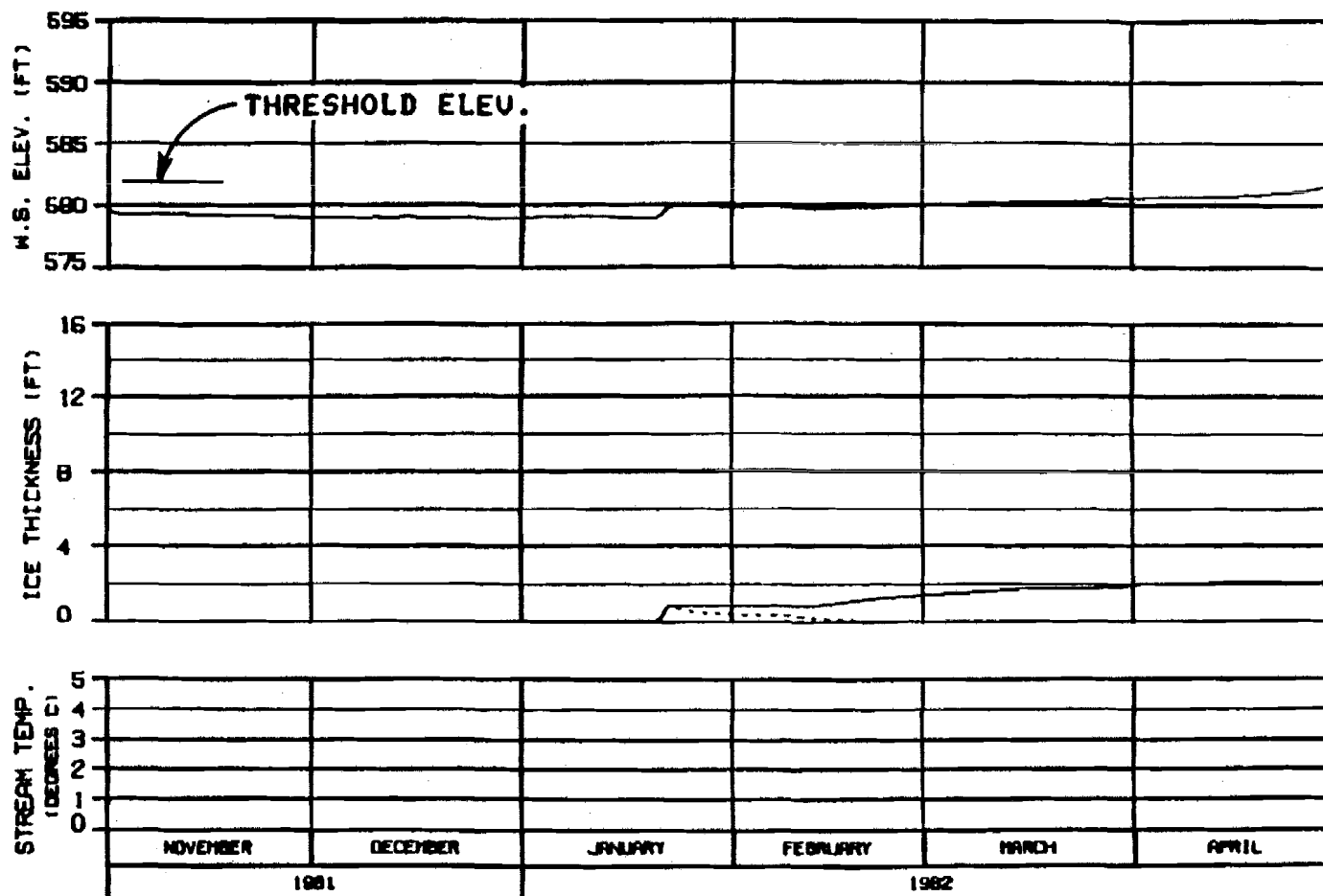
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBERD JOINT VENTURE

DESIGNED BY: B. J. J. 8/1/81 100% ICE



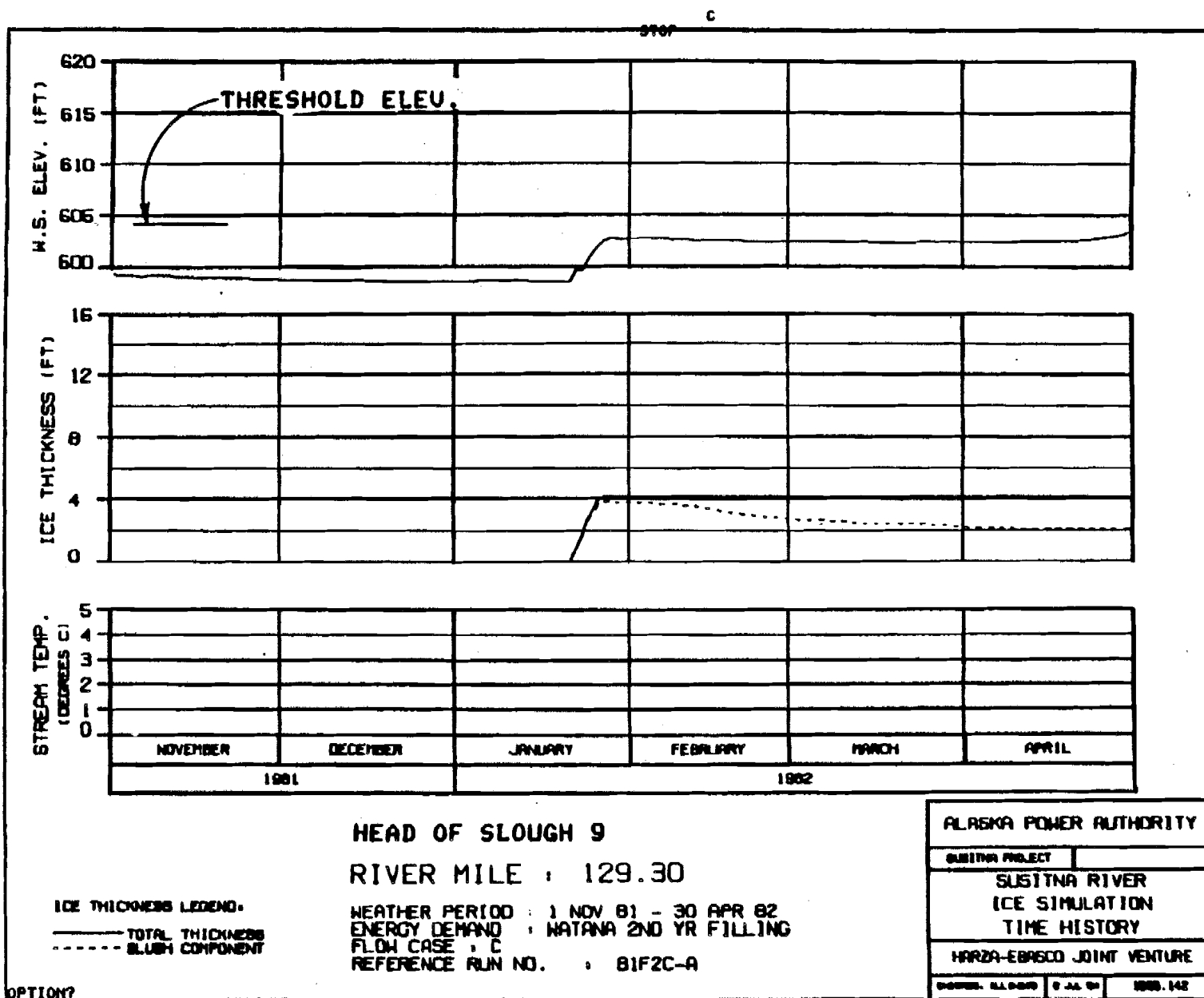
HEAD OF SLOUGH 8A (EAST)

RIVER MILE : 127.10

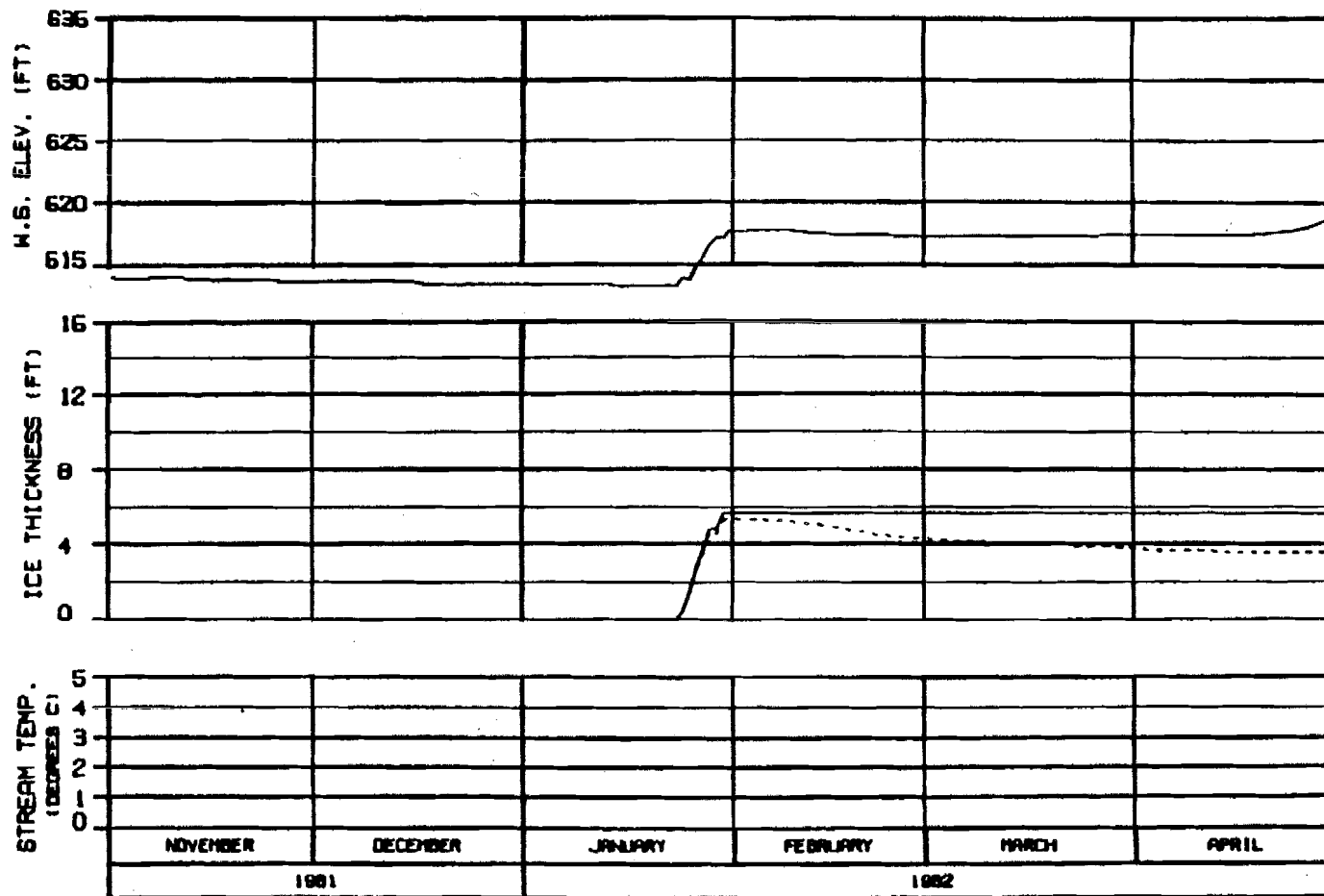
ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 ..... SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY	
SUSTINA PROJECT	
SUSTINA RIVER ICE SIMULATION TIME HISTORY	
WARZA-EGASCO JOINT VENTURE	
DESIGNED: E.A. DUNN	8 JUL 82
1982.142	



OPTION?



ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF SLOUGH 9  
 RIVER MILE : 130.60

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

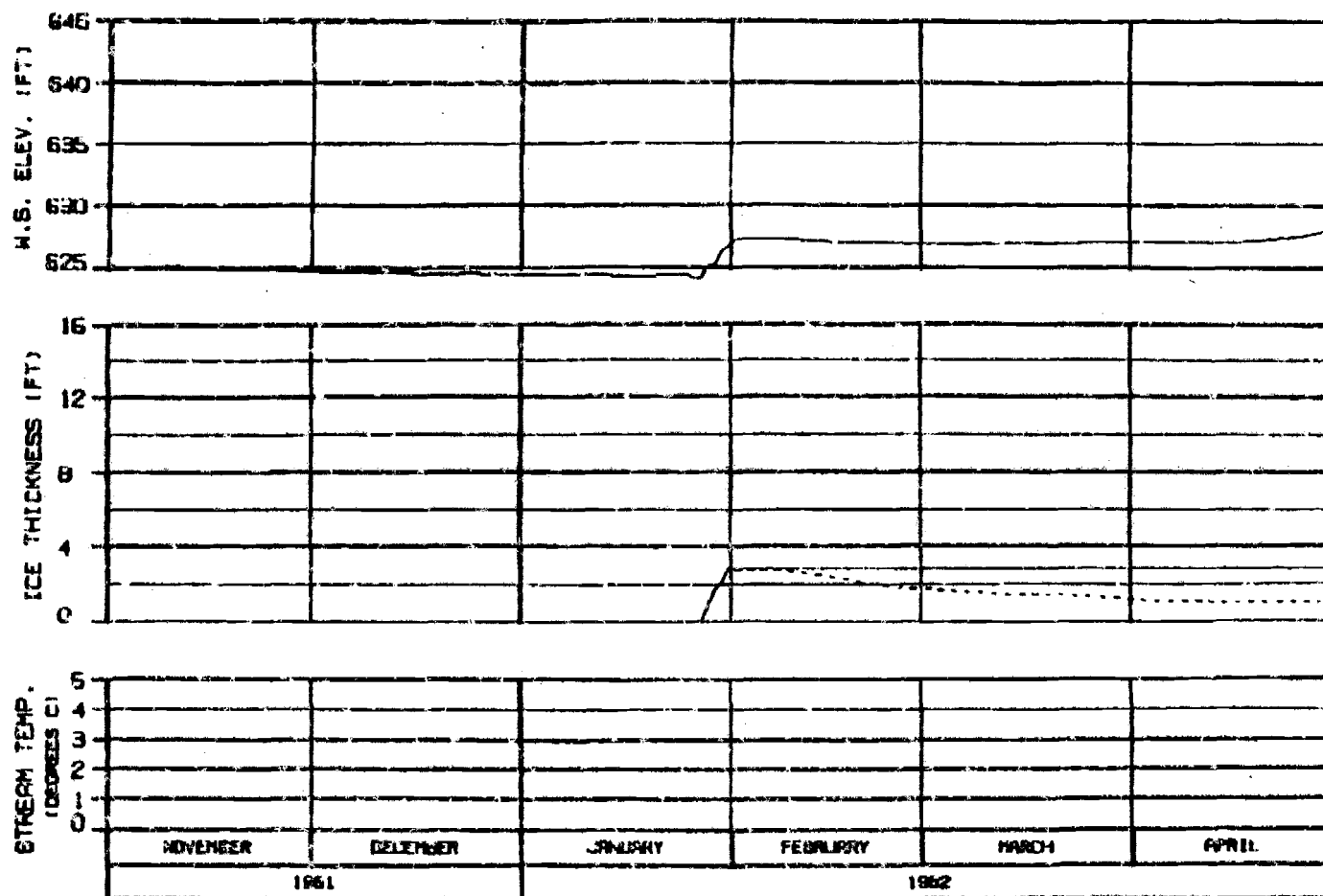
ALASKA POWER AUTHORITY

SUSITNA PROJECT

SUSITNA RIVER  
 ICE SIMULATION  
 TIME HISTORY

HARZA-EBASCO JOINT VENTURE

DESIGN: ALBION 8 JAN 84 1988.142

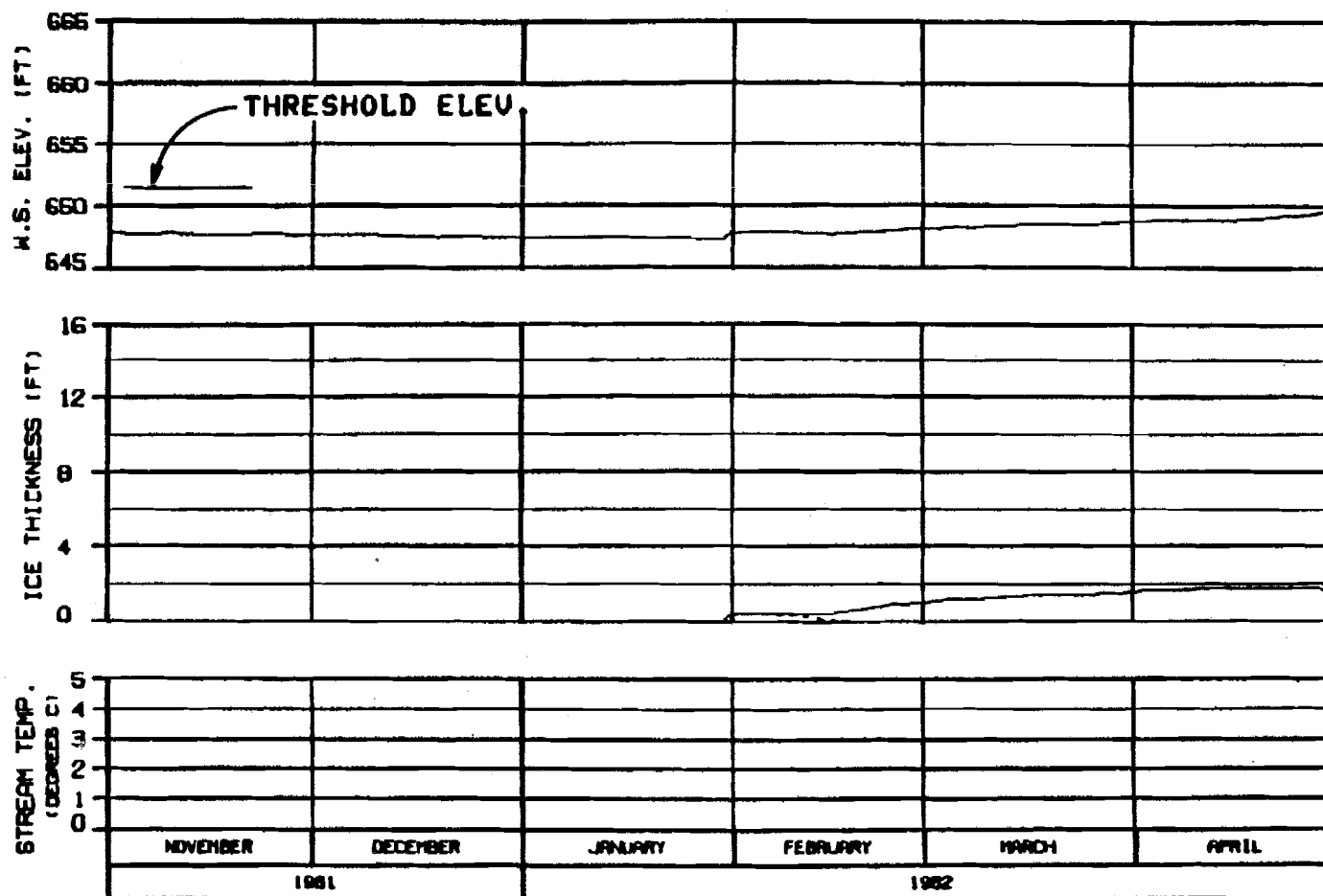


ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

SIDE CHANNEL U/S OF 4TH JULY CREEK  
 RIVER MILE : 131.80

WEATHER PERIOD : 1 NOV 61 - 30 APR 62  
 ENERGY DEMAND : HATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER		
ICE SIMULATION		
TIME HISTORY		
HPR2A-EBASCO JOINT VENTURE		
DESIGNED: E.L. BROWN	BY: J.L. SMITH	DATE: 1/62



HEAD OF SLOUGH 9A  
RIVER MILE : 133.70

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : WATANA 2ND YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY

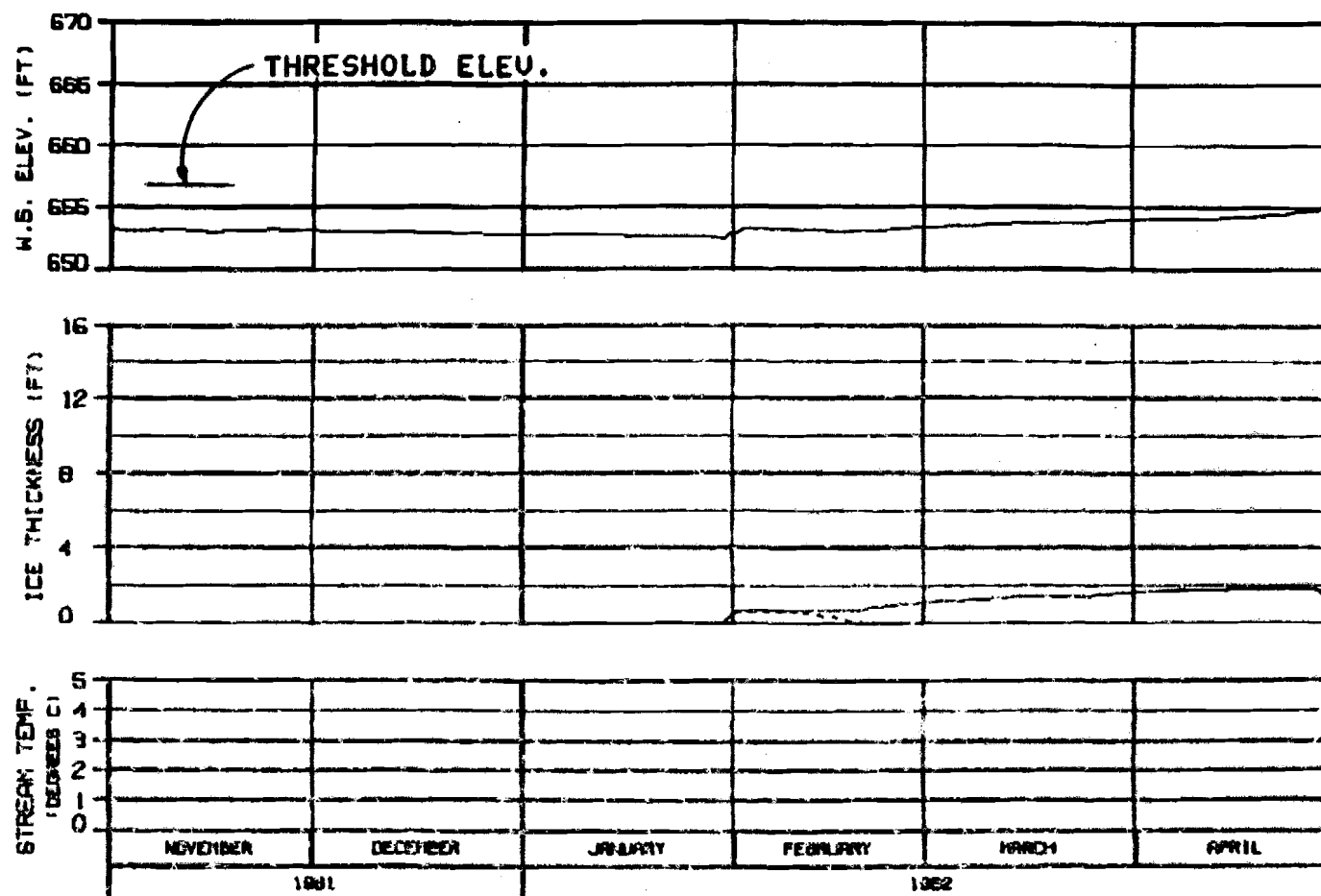
SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

WARZA-EBRARD JOINT VENTURE

DESIGN: B.L. 81-010 11 JUL 81 1000.142





SIDE CHANNEL U/S OF SLOUGH 19  
RIVER MILE : 134.30

ICE THICKNESS LEGEND:

----- TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : MATANA 2ND YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : RIF2C-A

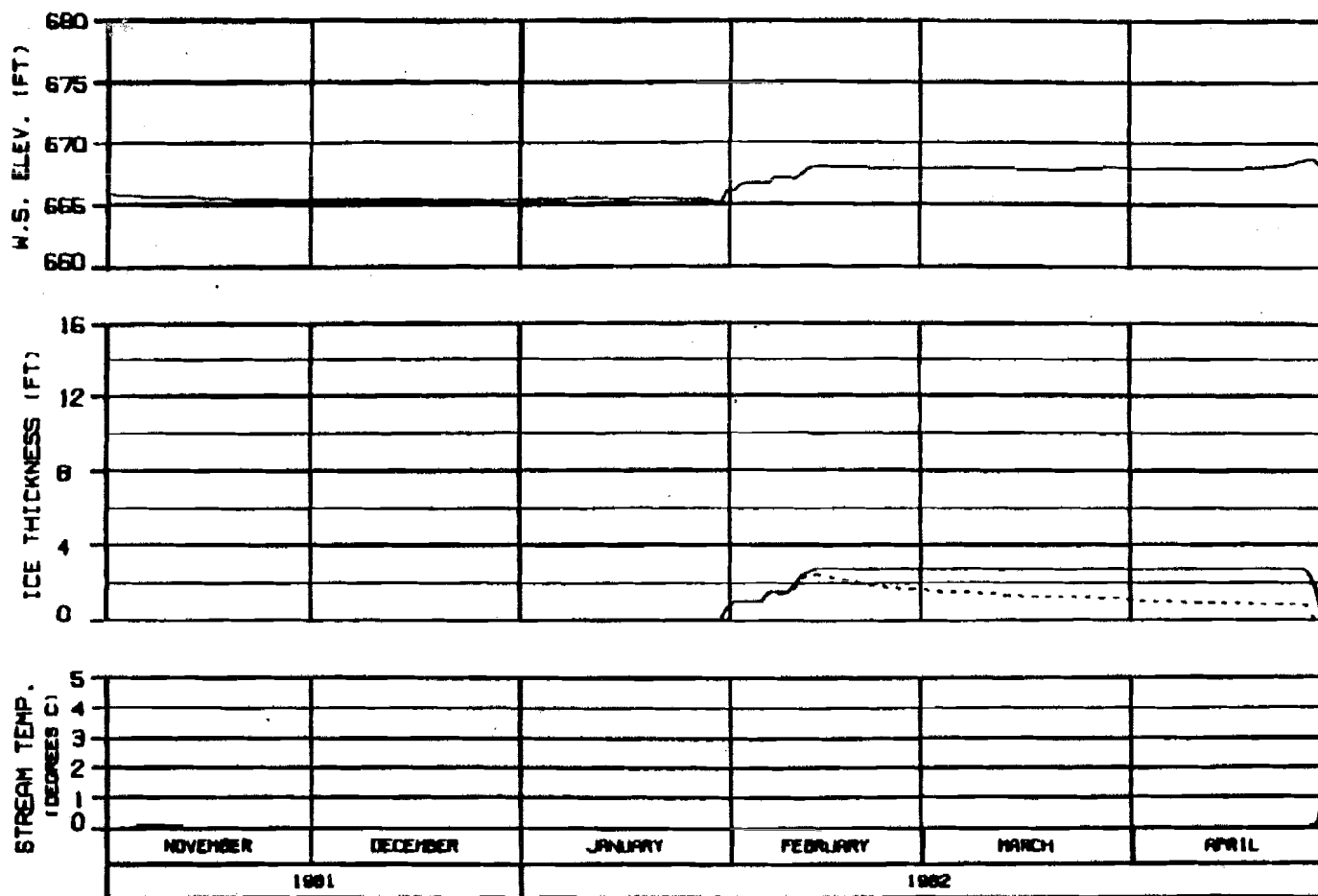
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

MANA-EGRET JOINT VENTURE

DESIGN: 01-0070 2-22-84 1000.102



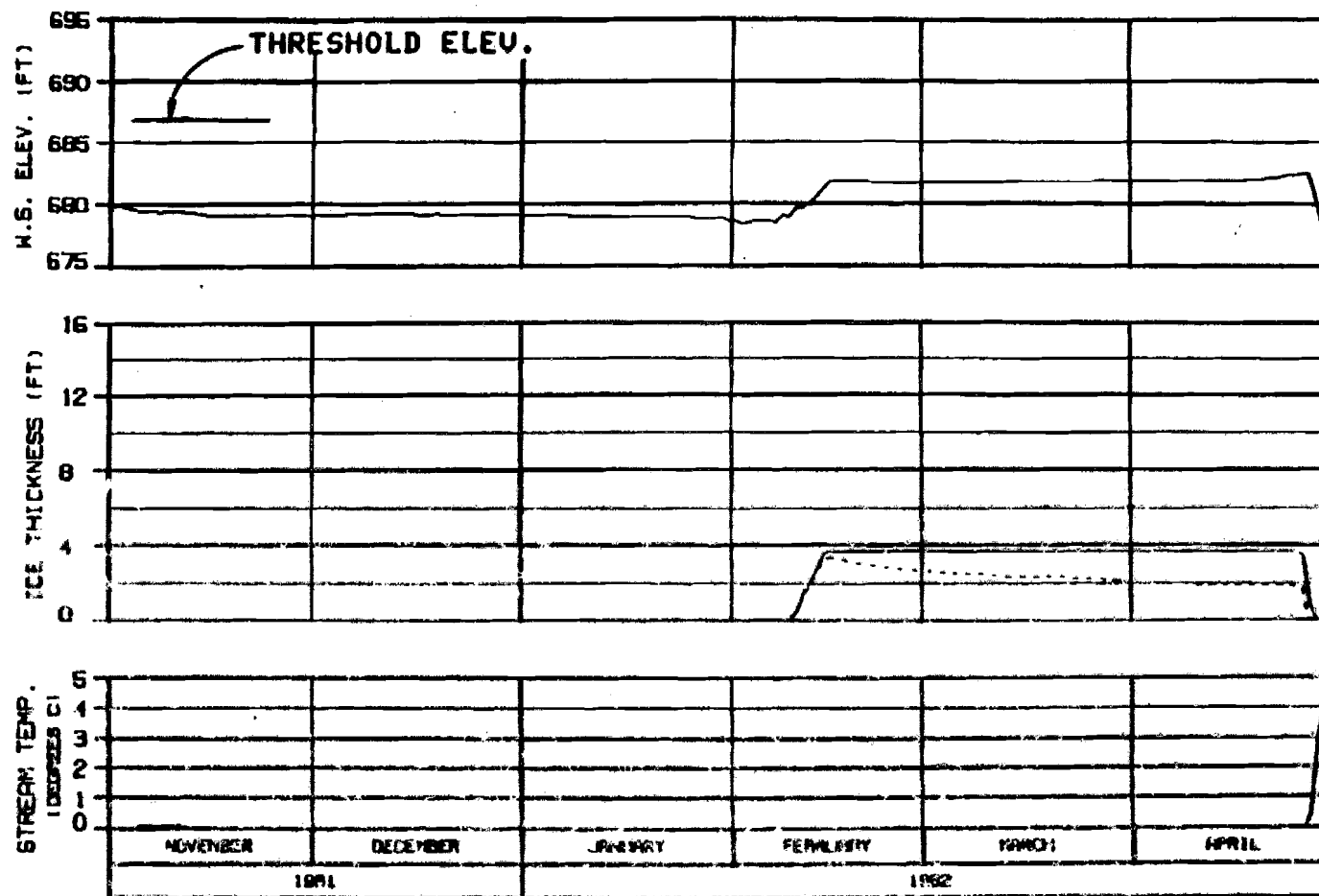
ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 ----- SLUSH COMPONENT

SIDE CHANNEL D/S OF SLOUGH 11  
 RIVER MILE : 135.30

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY	
SUSITNA PROJECT	
SUSITNA RIVER ICE SIMULATION TIME HISTORY	
HARZA-EBRARD JOINT VENTURE	
DESIGNED BY: B. J. BROWN	DATE: 7 JUL 81
DRAWN BY: 1000.142	

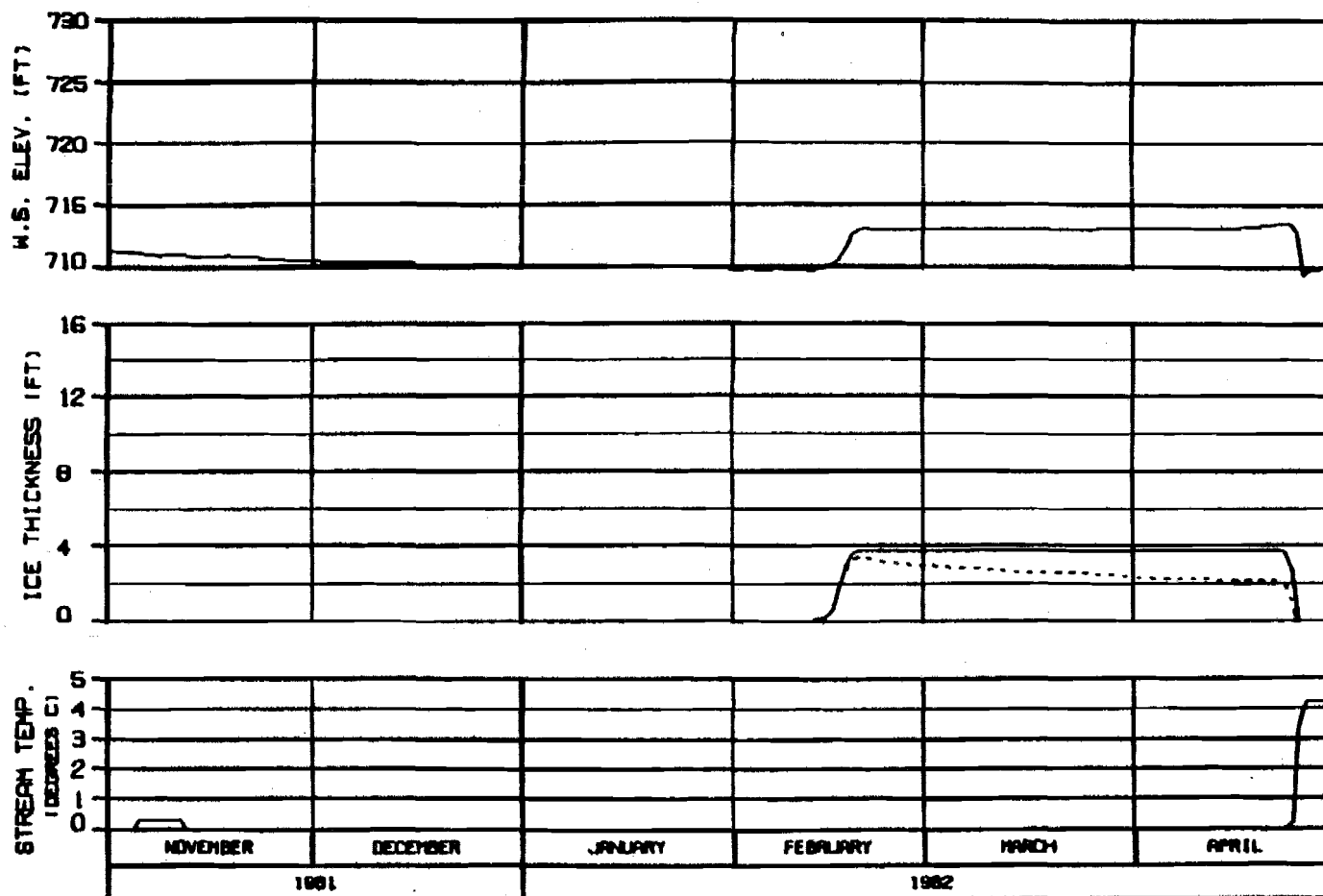


ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - BLUE-I COMPONENT

HEAD OF SLOUGH 11  
 RIVER MILE : 136.50

WEATHER PERIOD : 1 NOV 61 - 30 APR 62  
 ENERGY DEMAND : MATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

ALASKA POWER AUTHORITY		
DISTING PROJECT		
SUSTINA RIVER		
ICE SIMULATION		
TIME HISTORY		
HARZA-EBRACO JOINT VENTURE		
DESIGN: 8-1-61	SCALE: 1:1	1000:1



HEAD OF SLOUGH 17

RIVER MILE : 139.30

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

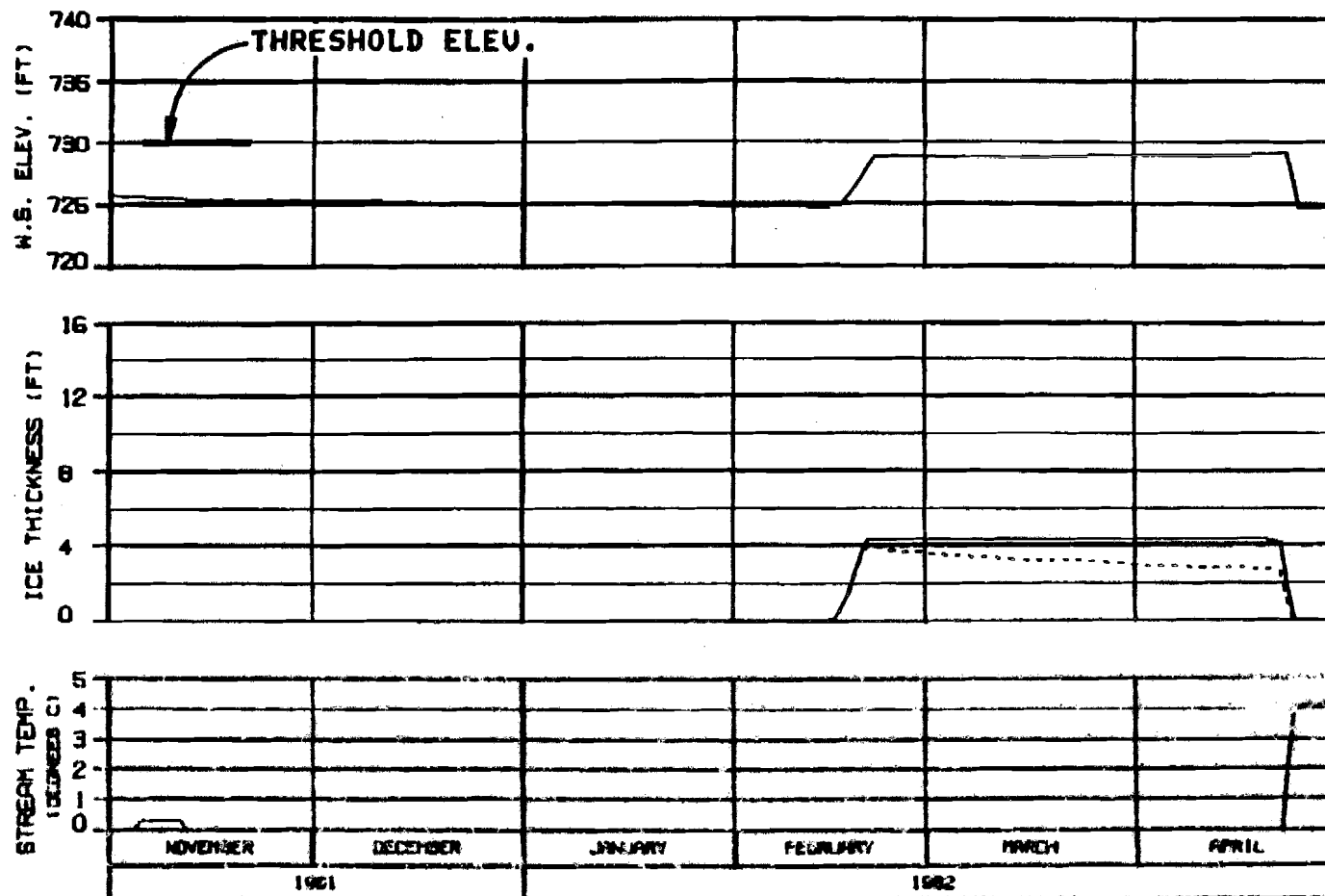
ALASKA POWER AUTHORITY

SUSTINA PROJECT

SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBASCO JOINT VENTURE

DESIGNED: B.A. 00000 2 11 81 1000.142



HEAD OF SLOUGH 20  
RIVER MILE : 140.50

ICE THICKNESS LEGEND:  
——— TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 61 - 30 APR 62  
ENERGY DEMAND : WAYANA 2ND YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

SUSTINA PROJECT

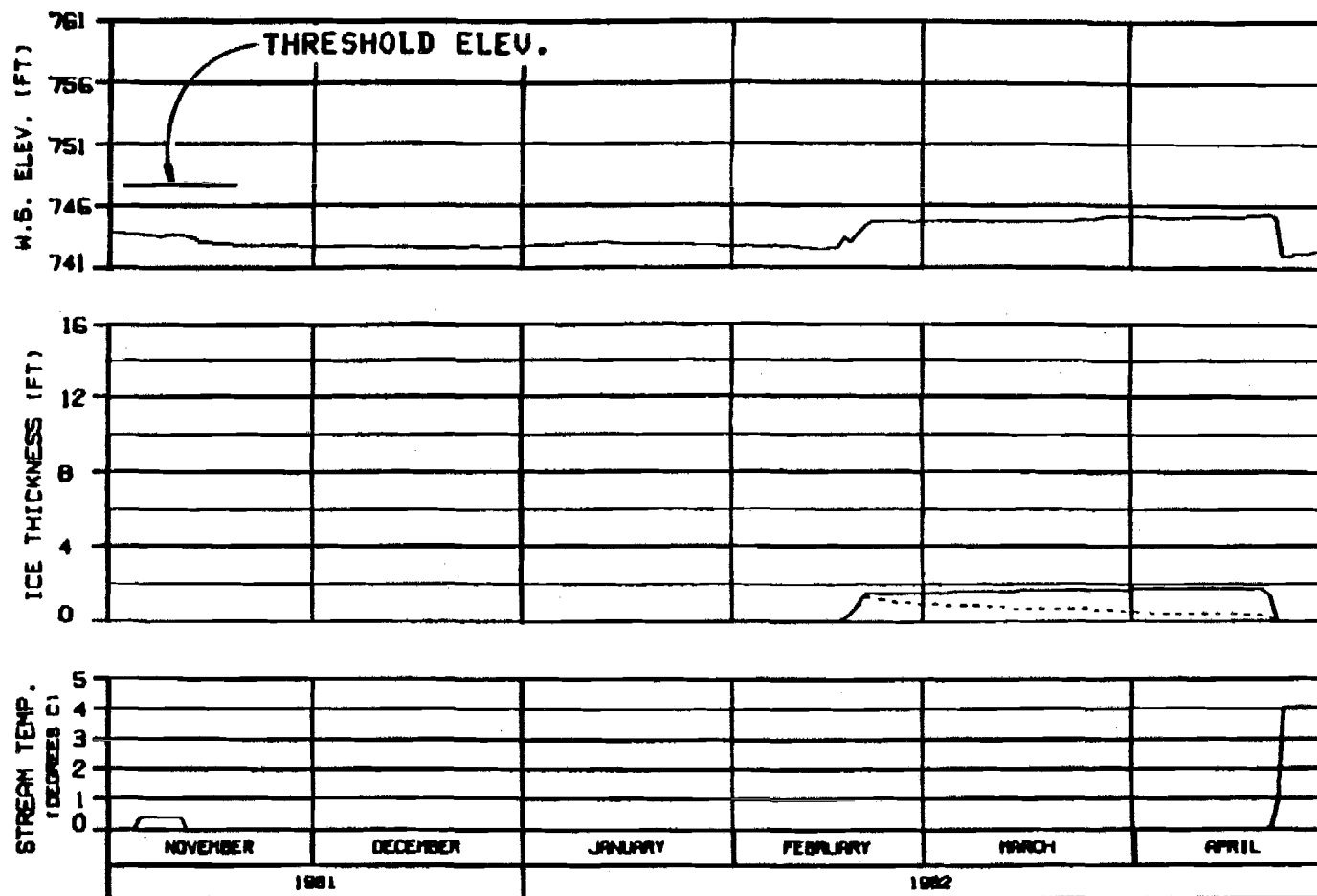
SUSTINA RIVER  
ICE SIMULATION  
TIME HISTORY

PARZA-EBERG JOINT VENTURE

PREPARED BY: S. J. J. J.

DATE: 11/22/61

REV. 142



SLOUGH 21 (ENTRANCE A6)

RIVER MILE : 141.80

ICE THICKNESS LEGEND:

—— TOTAL THICKNESS  
 - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : WATANA 2ND YR. FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : 81F2C-A

ALASKA POWER AUTHORITY

SUSTINA PROJECT

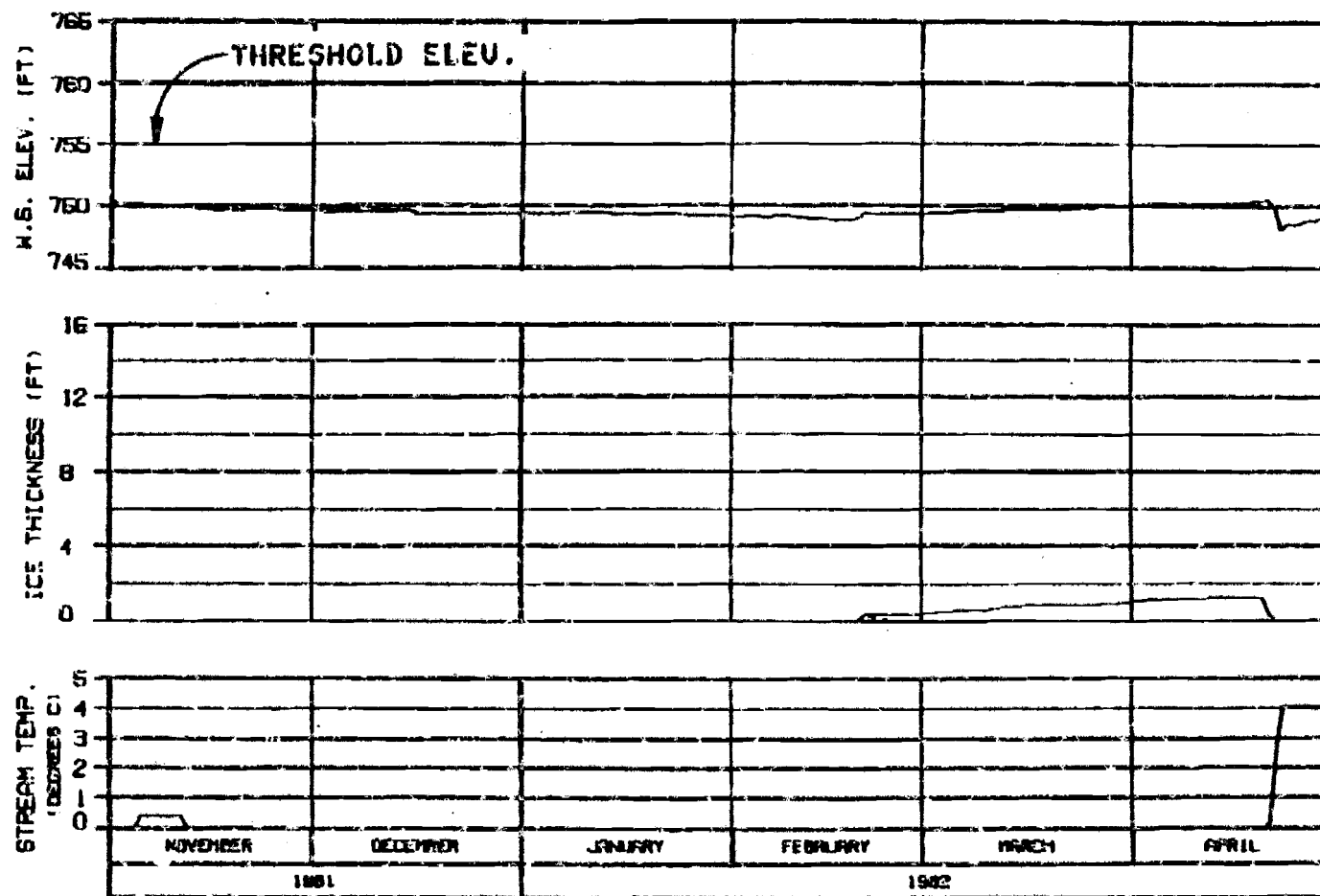
SUSTINA RIVER  
 ICE SIMULATION  
 TIME HISTORY

WARZA-EBR600 JOINT VENTURE

DESIGN: B.L. BROWN

WAL 81

8888.142



HEAD OF SLOUGH 21  
RIVER MILE : 142.20

ICE THICKNESS LEGEND:  
----- TOTAL THICKNESS  
----- SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
ENERGY DEMAND : HATANA 2ND YR FILLING  
FLOW CASE : C  
REFERENCE RUN NO. : 81F2C-A

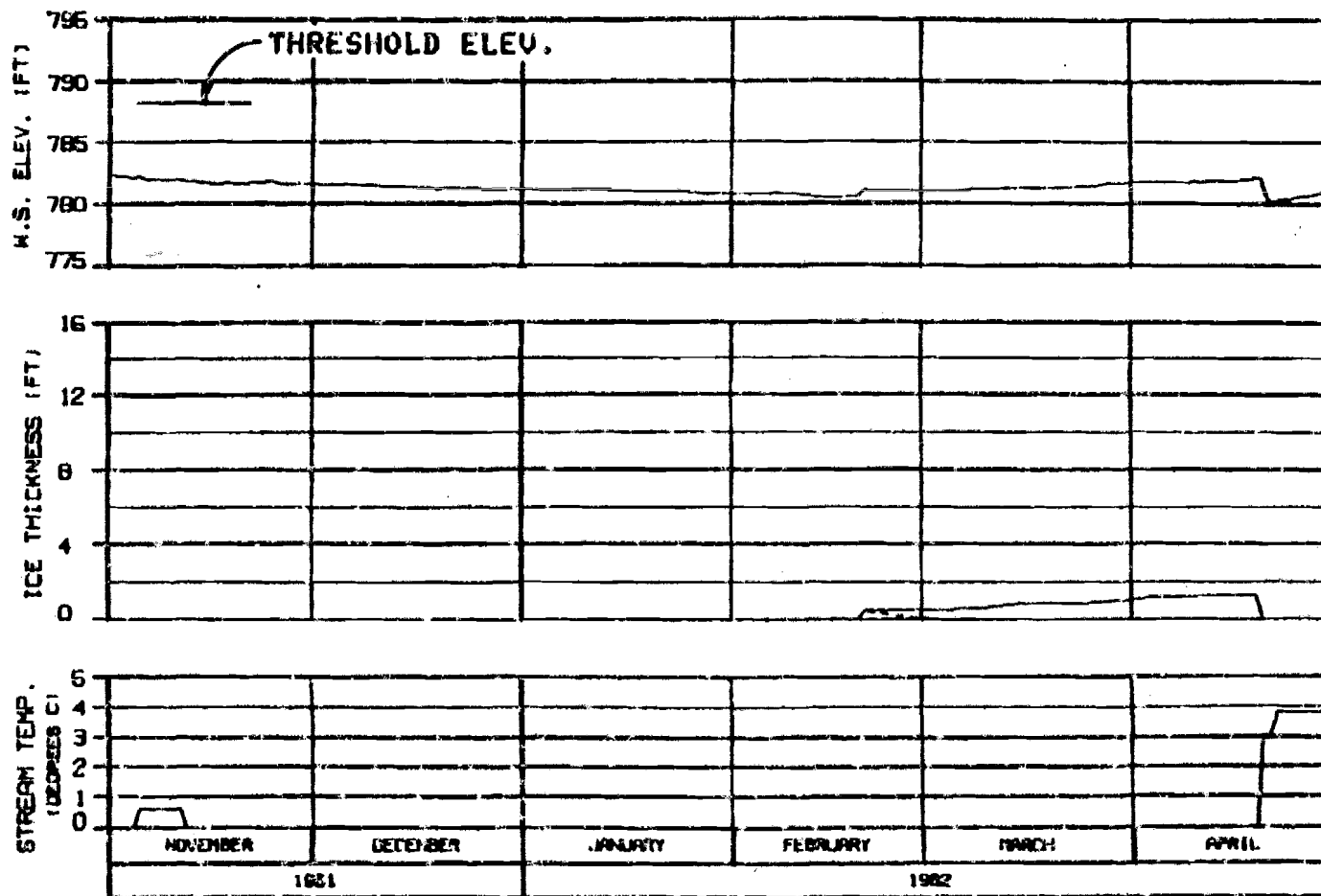
ALASKA POWER AUTHORITY

SYSTEM PROJECT

SUSITNA RIVER  
ICE SIMULATION  
TIME HISTORY

HARZA-EBASCO JOINT VENTURE

CHARTER: 81-0100 8 JUL 81 1000.142



HEAD OF SLOUGH 22

RIVER MILE : 144.80

ICE THICKNESS LEGEND:  
 ——— TOTAL THICKNESS  
 - - - - - SLUSH COMPONENT

WEATHER PERIOD : 1 NOV 81 - 30 APR 82  
 ENERGY DEMAND : NATANA 2ND YR FILLING  
 FLOW CASE : C  
 REFERENCE RUN NO. : B1F2C-A

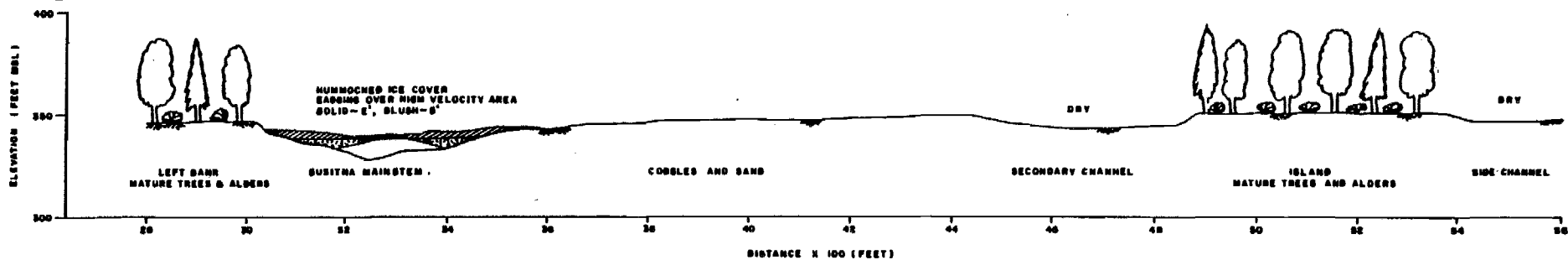
ALASKA POWER AUTHORITY		
SUSITNA PROJECT		
SUSITNA RIVER ICE SIMULATION TIME HISTORY		
HARZA-EBRACO JOINT VENTURE		
DESIGNED - B.J. BROWN	DRAWN - B.J. BROWN	SCALE 1:42

OPTION 7



# EXHIBIT U

### 1. Natural Ice Conditions (1983)



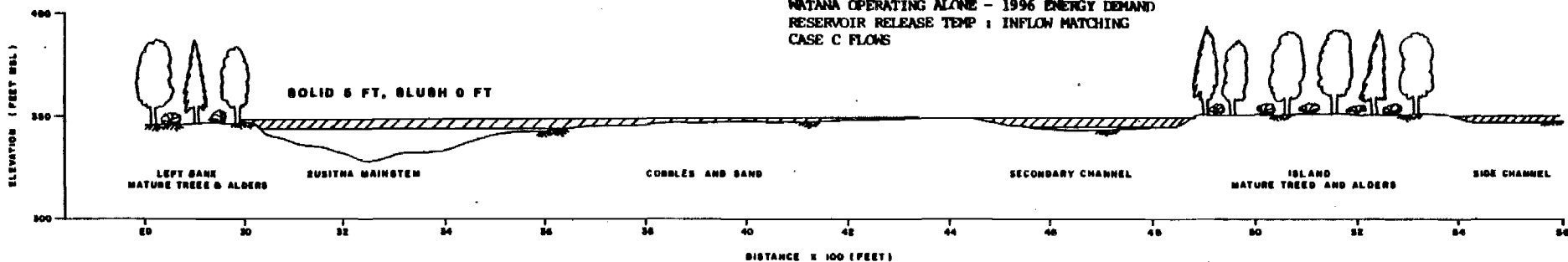
### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA

WINTER 1971-72

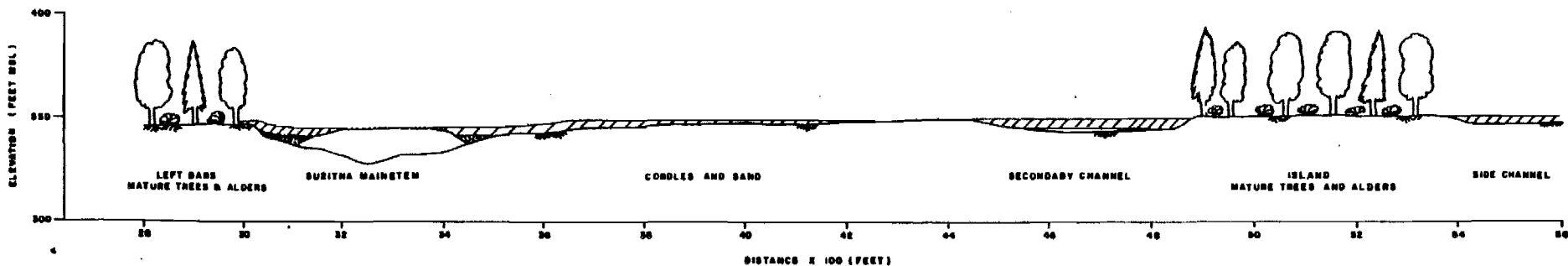
WATANA OPERATING ALONE - 1996 ENERGY DEMAND

RESERVOIR RELEASE TEMP : INFLOW MATCHING

CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

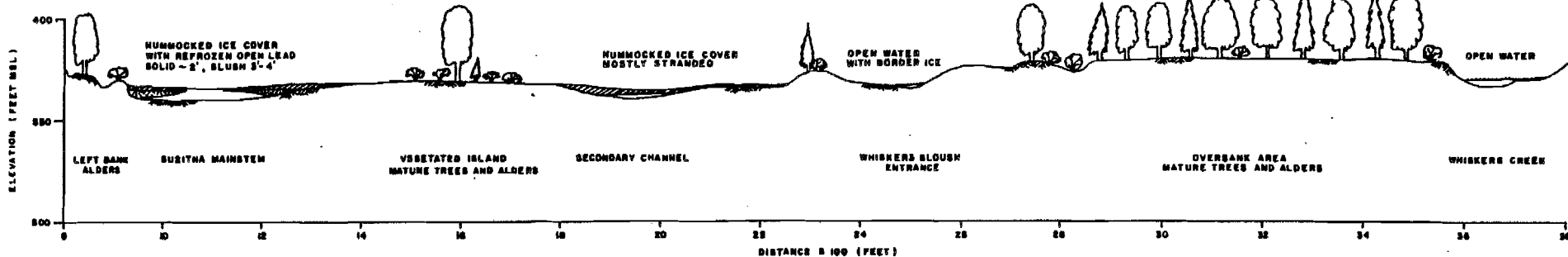
**LRX-3**

1982 CROSS SECTION SURVEY  
RIVER MILE 98.6  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

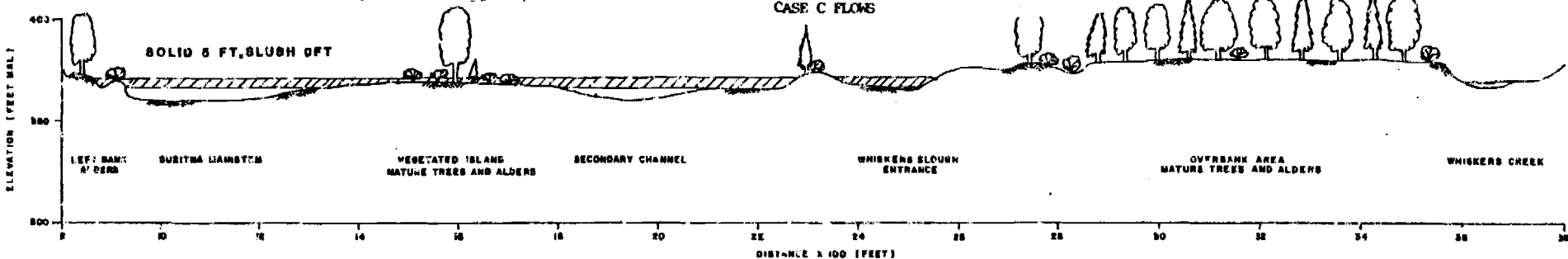
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

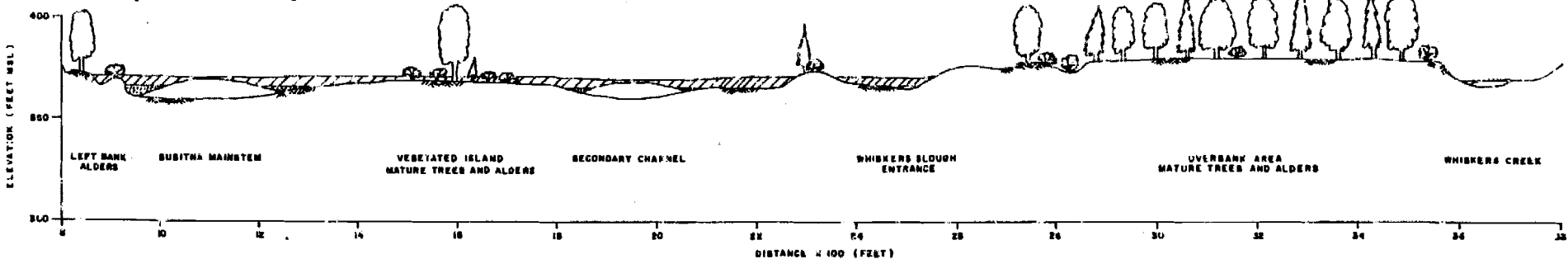


WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN #7186CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

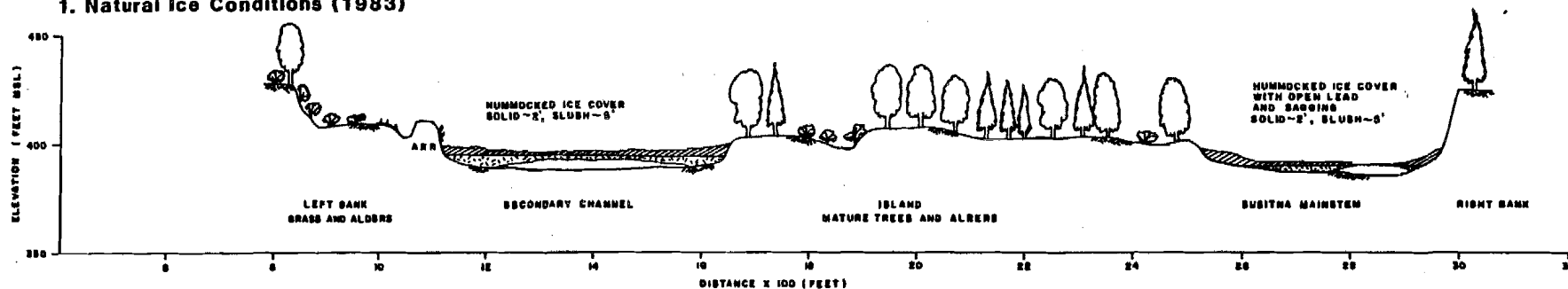
**LRX-7**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 101.5**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

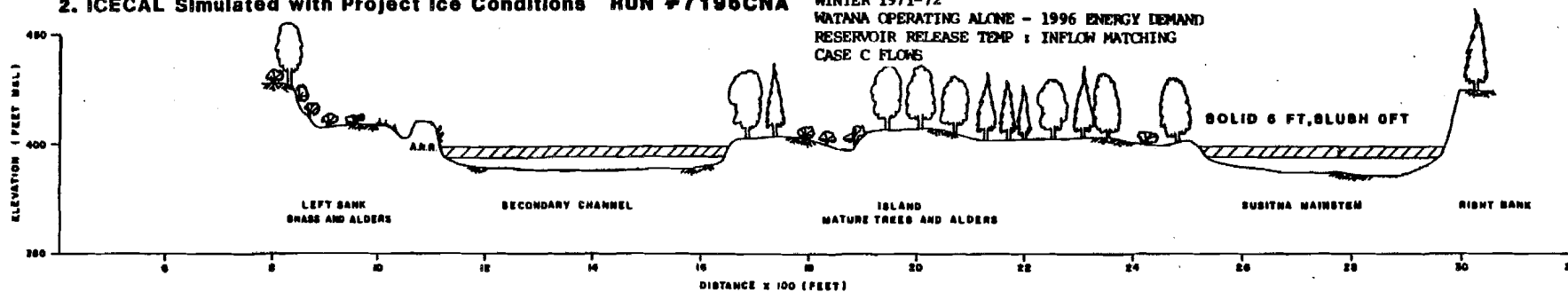
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

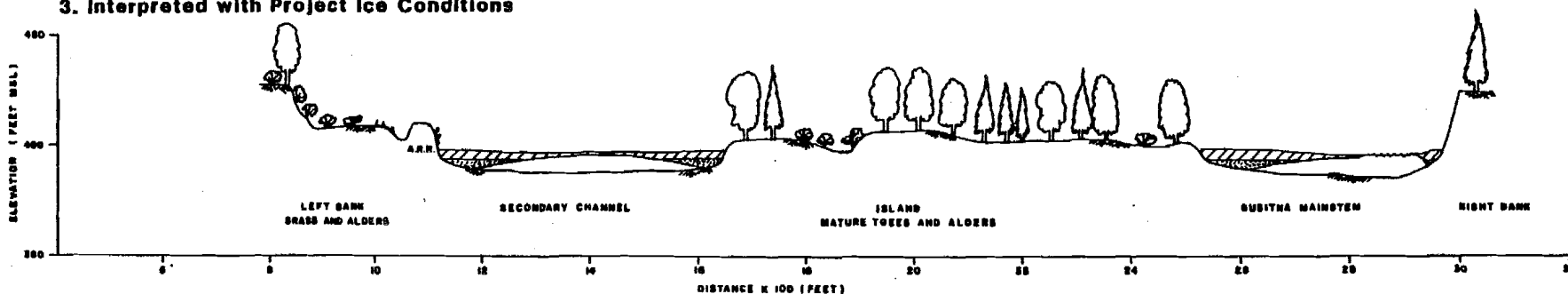


### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

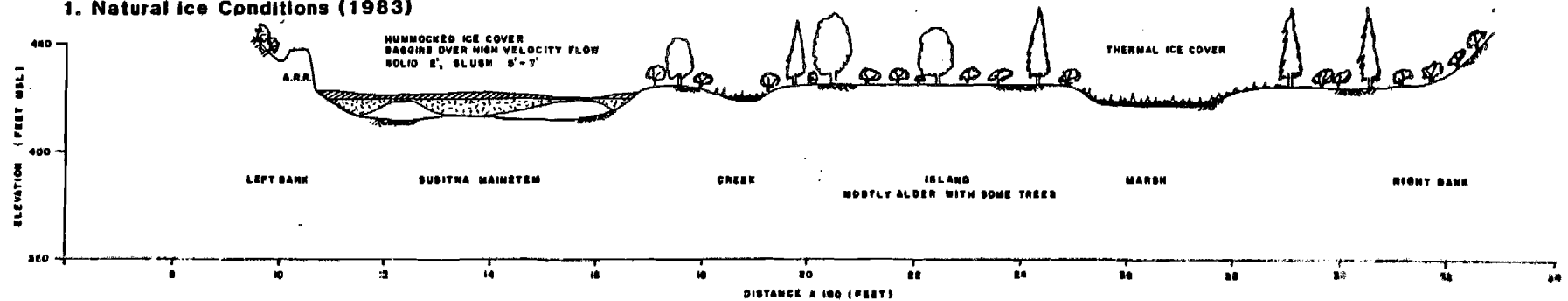
**LRX-10**

**1980 CROSS SECTION SURVEY  
RIVER MILE 104.8  
VERTICAL EXAGGERATION 4:1**

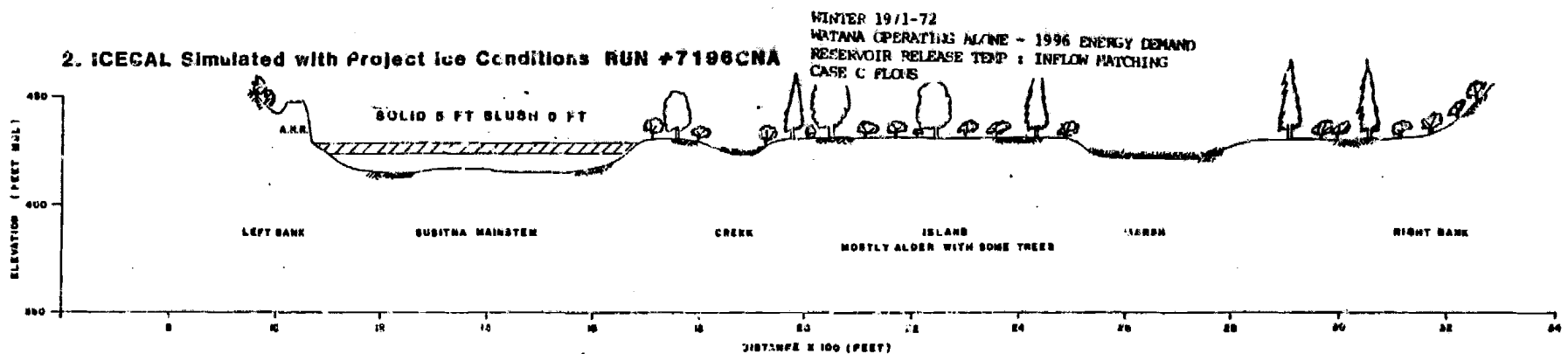
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

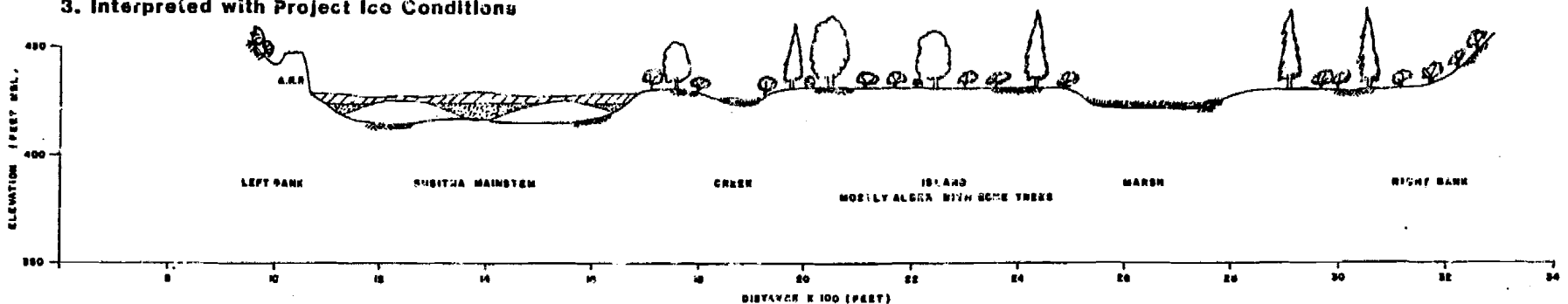
### 1. Natural Ice Conditions (1983)



### 2. ICEGAL Simulated with Project Ice Conditions RUN #7198CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS ELEVATORS

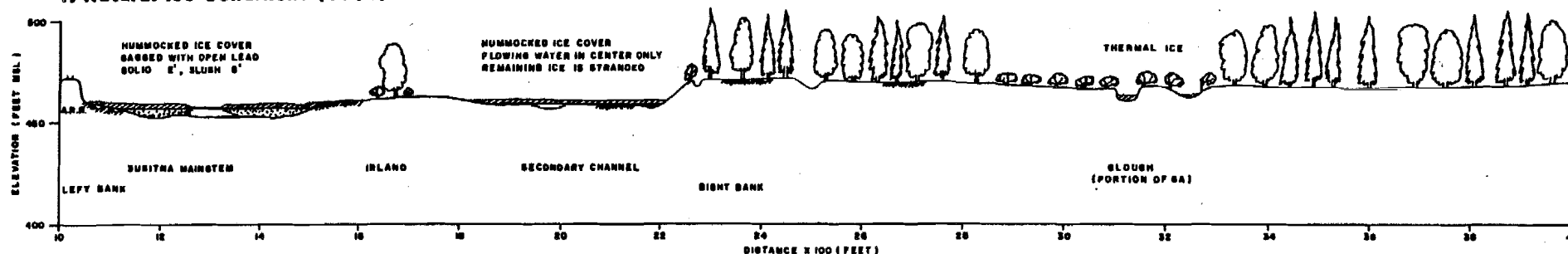
**LRX-12**

**1931 CROSS SECTION SURVEY  
RIVER MILE 108.4  
VERTICAL EXAGGERATION 4:1**

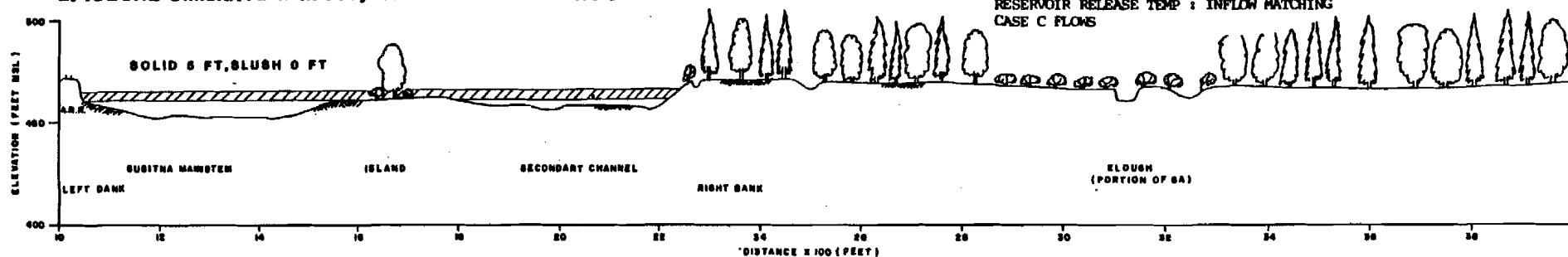
PREPARED FOR:

**MANZA-EBASCO**  
SUSITNA JOINT VENTURE

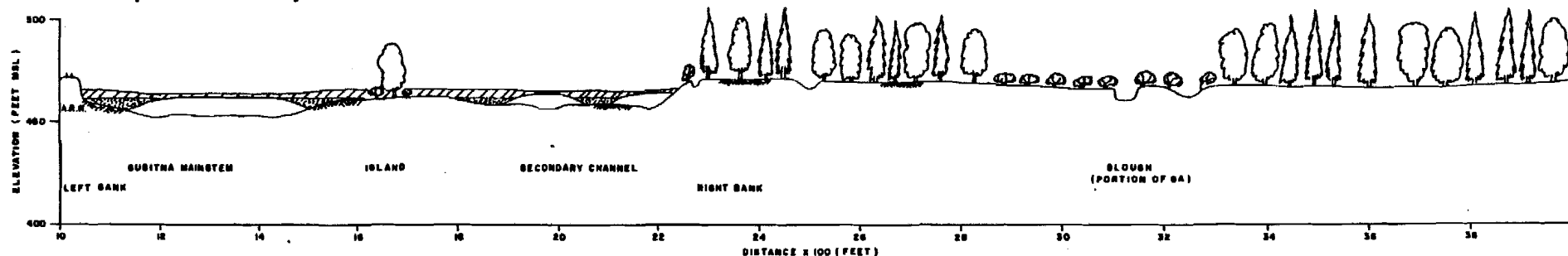
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

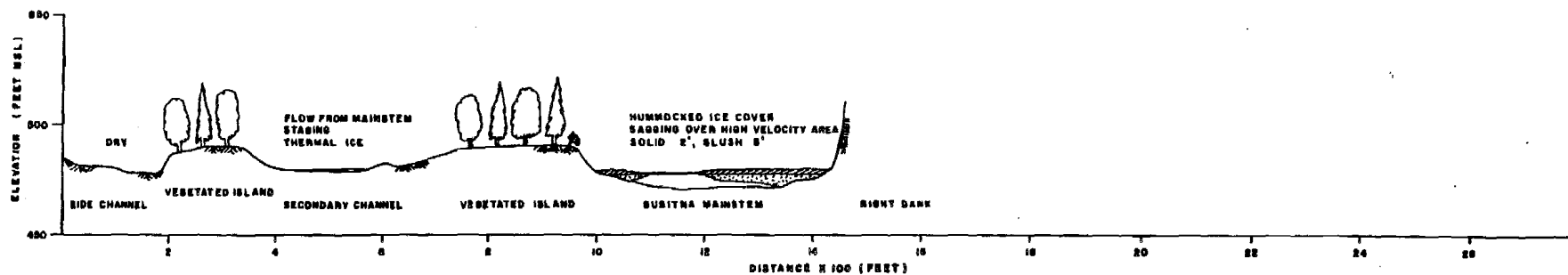
**LRX-17**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 112.7**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

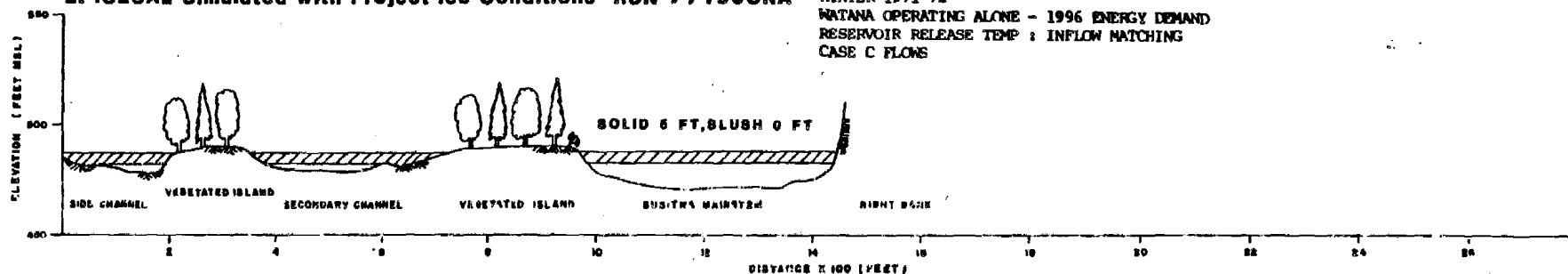
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

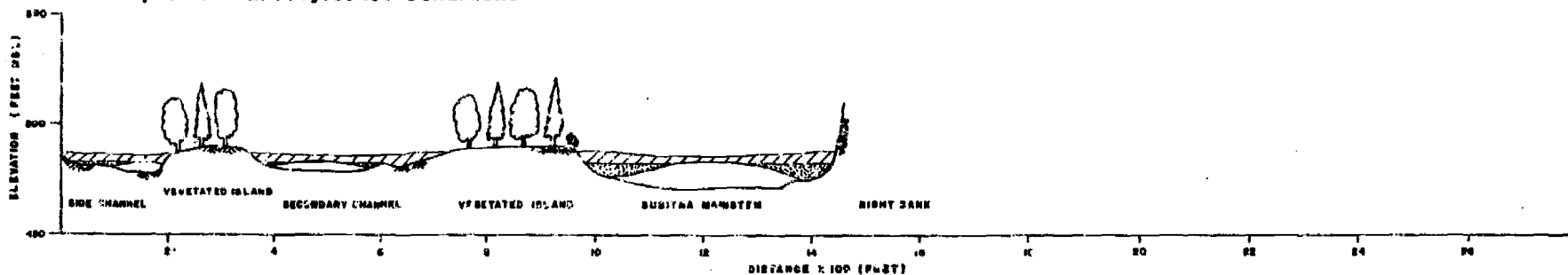


### 2. ICECAL Simulated with Project Ice Conditions RUN #7198CNA

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PERM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

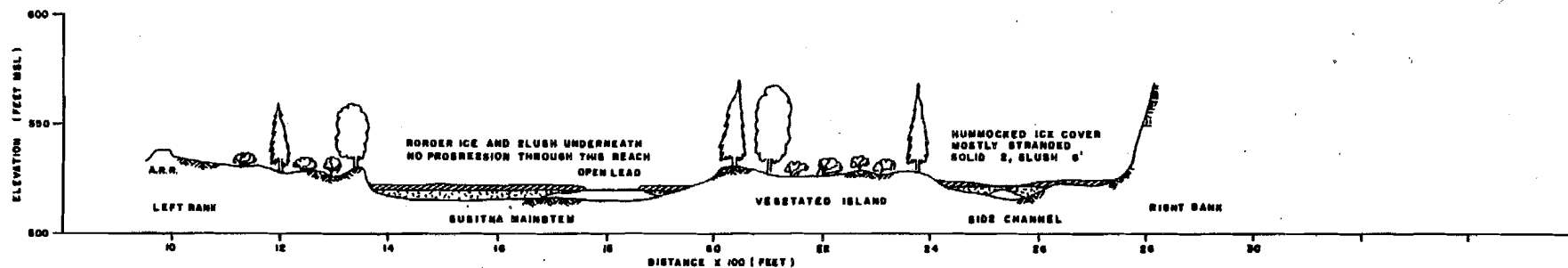
**LRX-18.2**

**1982 CROSS SECTION SURVEY**  
**RIVER MILE 118.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

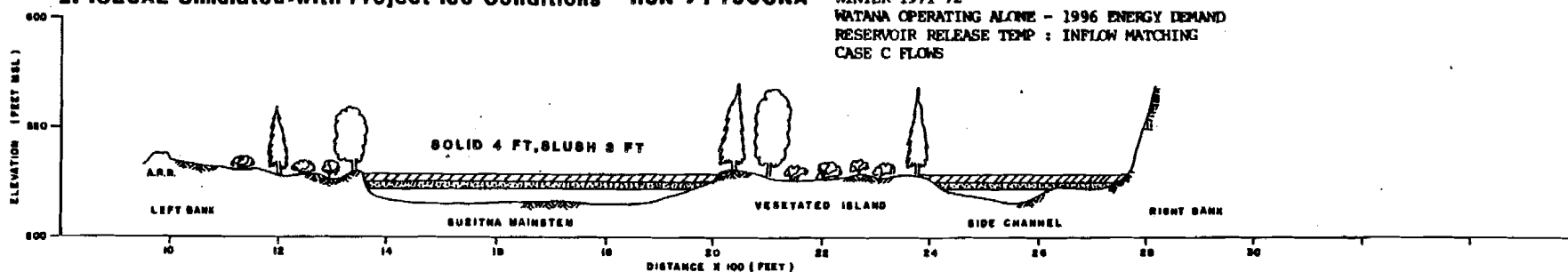
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

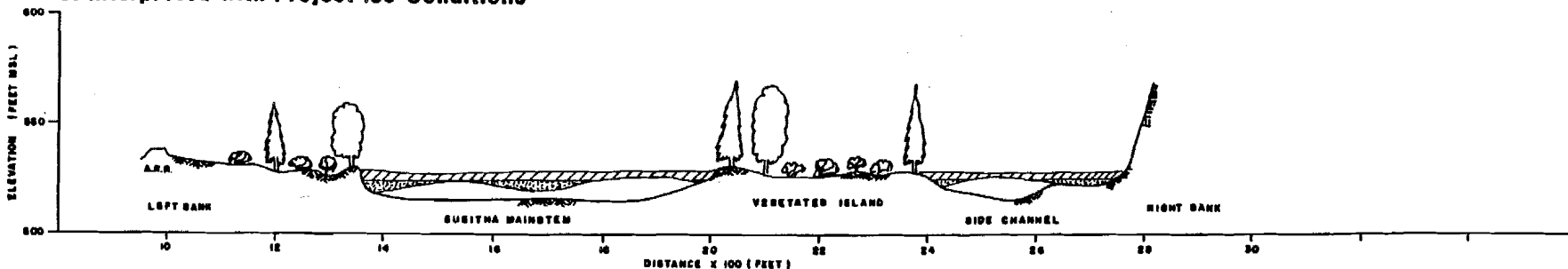


### 2. ICECAL Simulated-with Project Ice Conditions RUN #7196CNA

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ESM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-23**

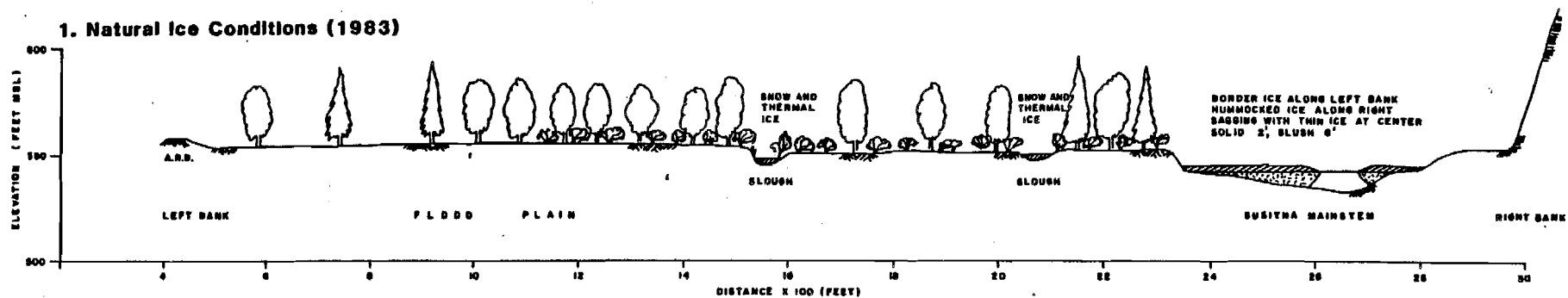
**1980 CROSS SECTION SURVEY**  
**RIVER MILE 120.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

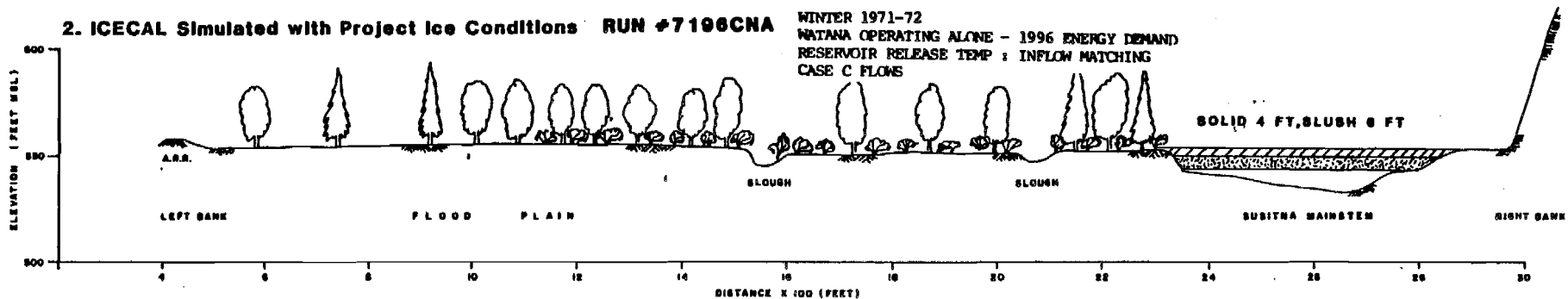
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



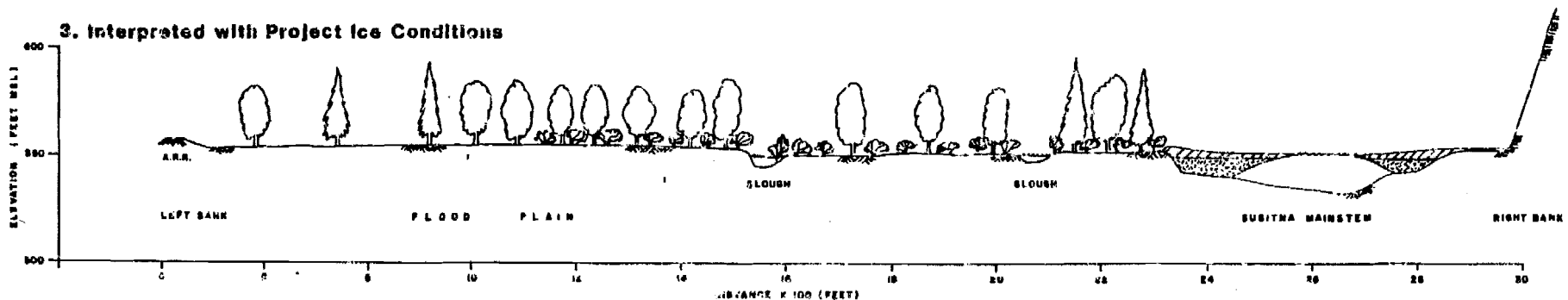
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNING SURVEYORS

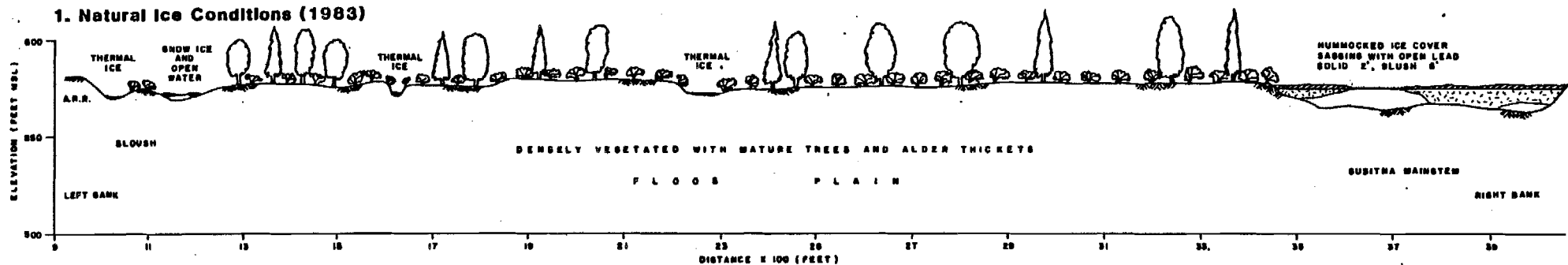
**LRX -27**

1980 CROSS SECTION SURVEY  
RIVER MILE 123.3  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

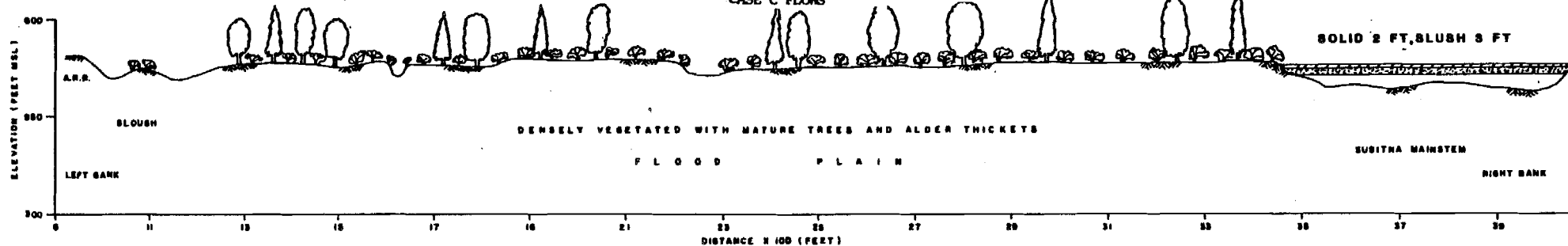
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

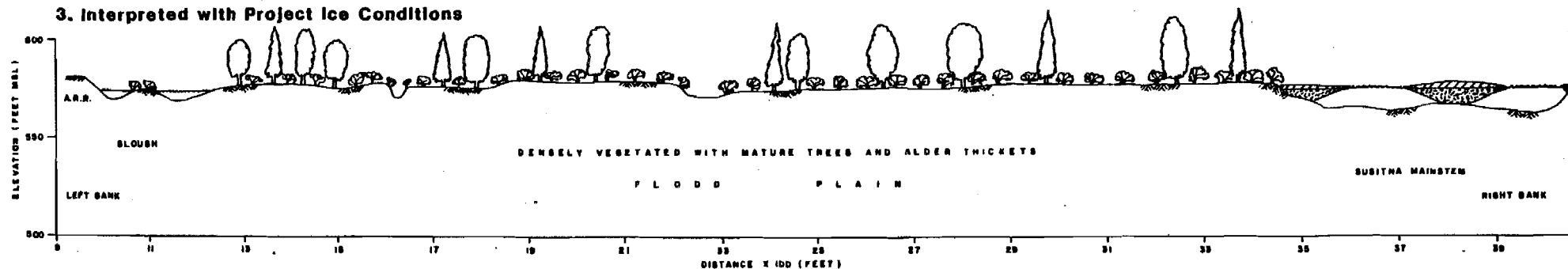


WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

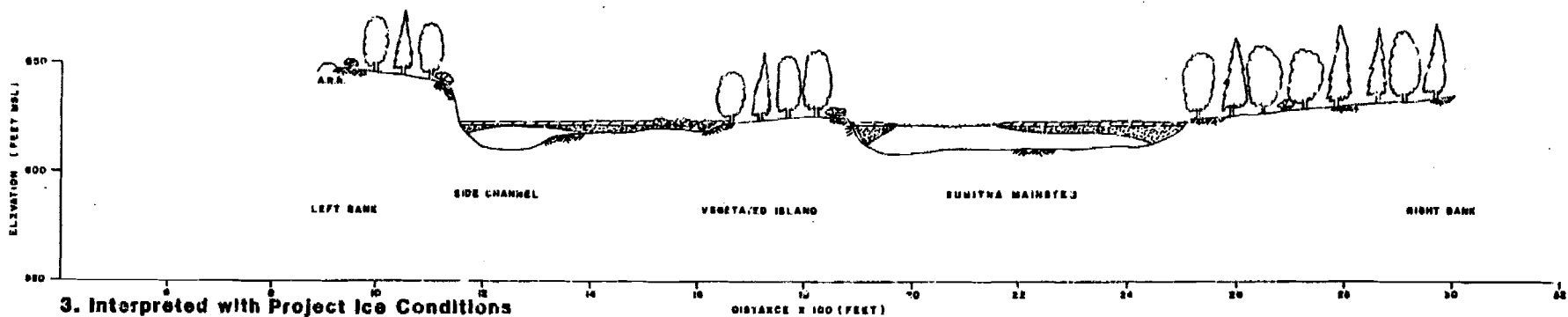
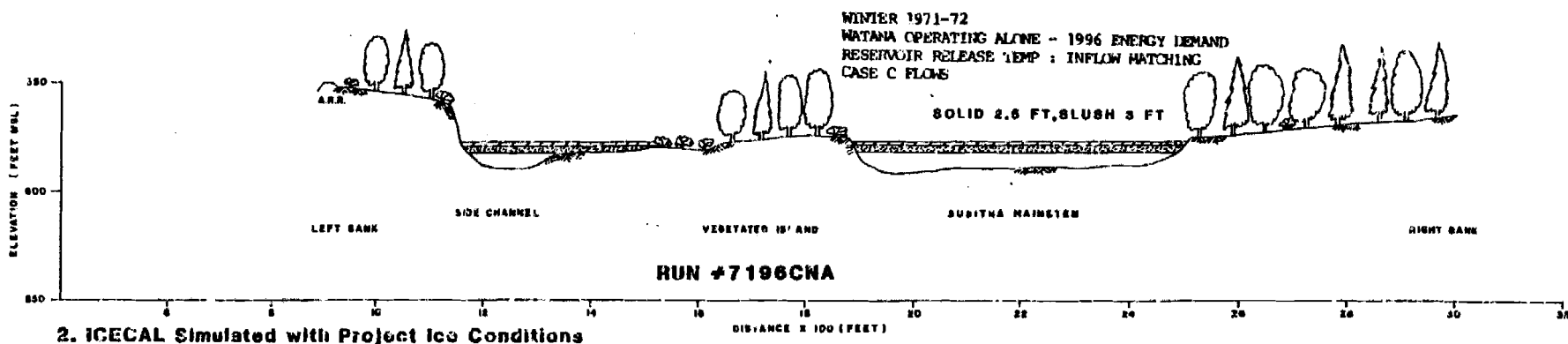
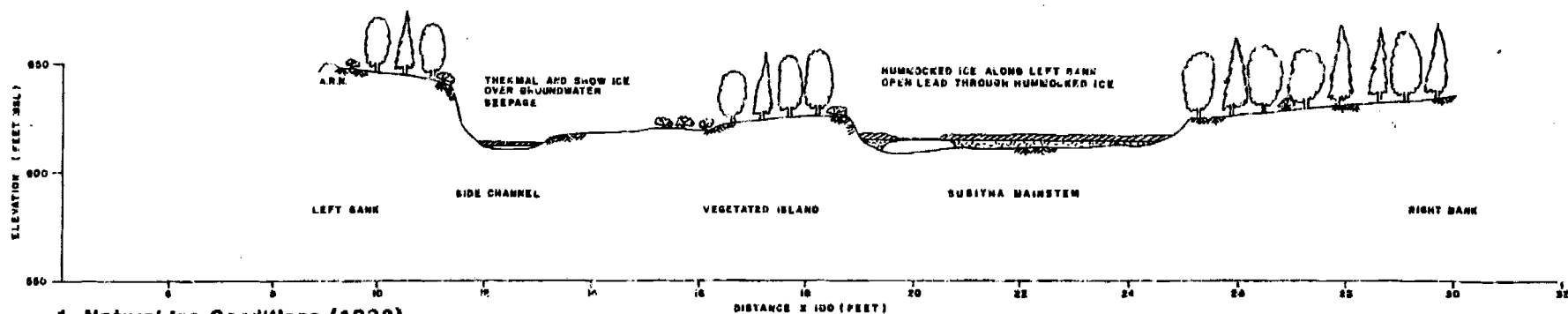
**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-29**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 126.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



PREPARED BY:

**PSM**  
PSM CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

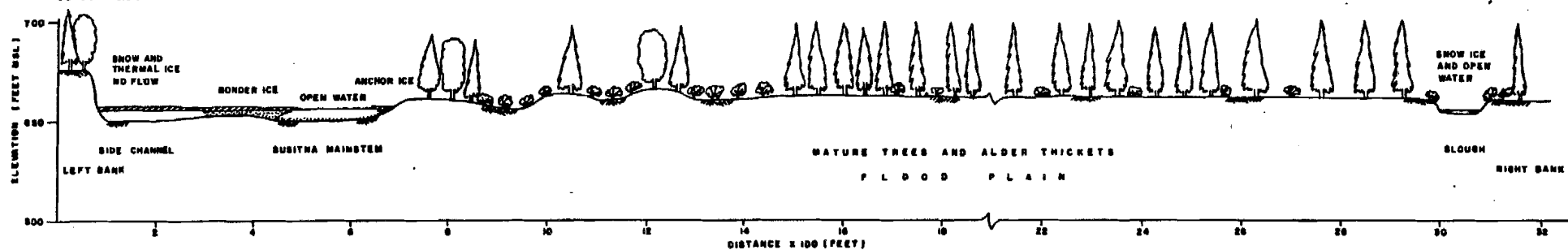
**LRX-34**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 130.8**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

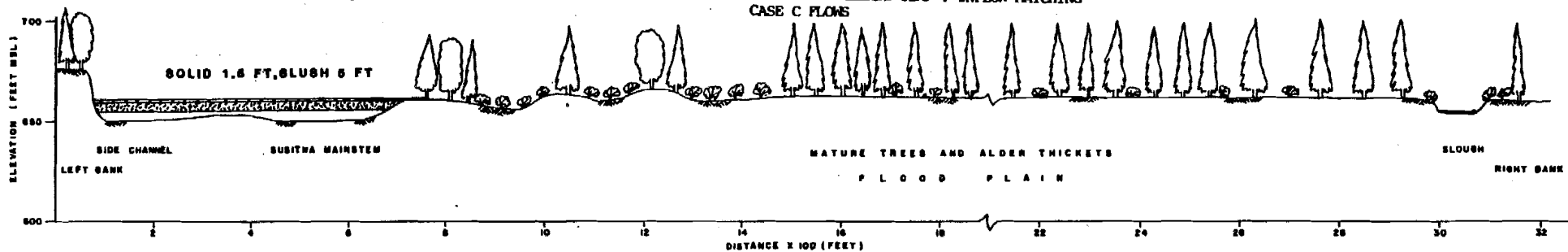
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

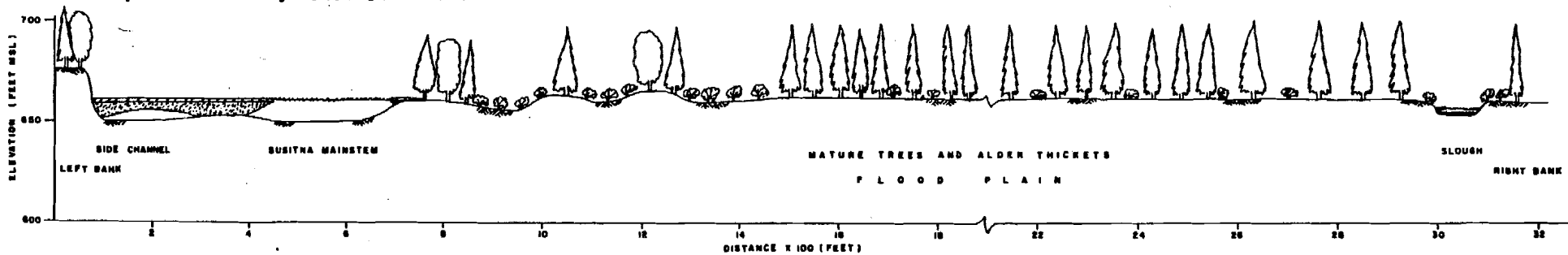


### 2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA

WINTER 1971-72  
 WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
 ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

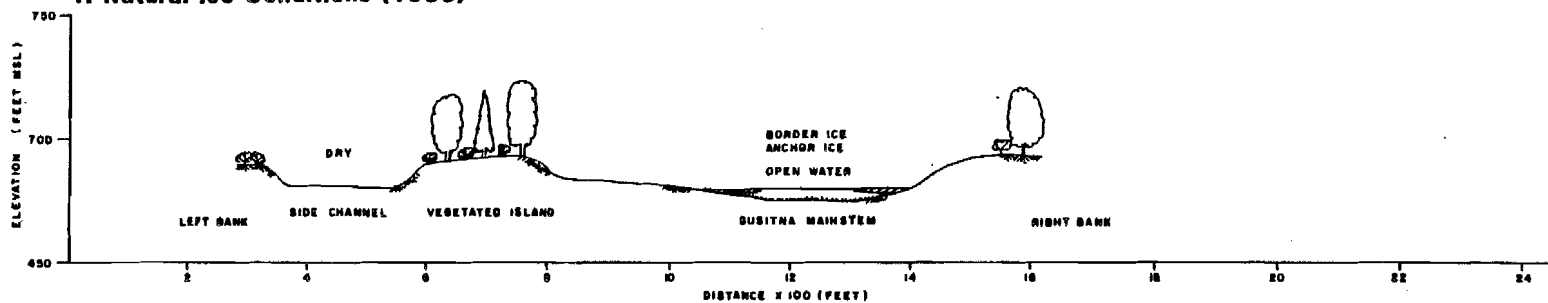
**LRX-40**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 134.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

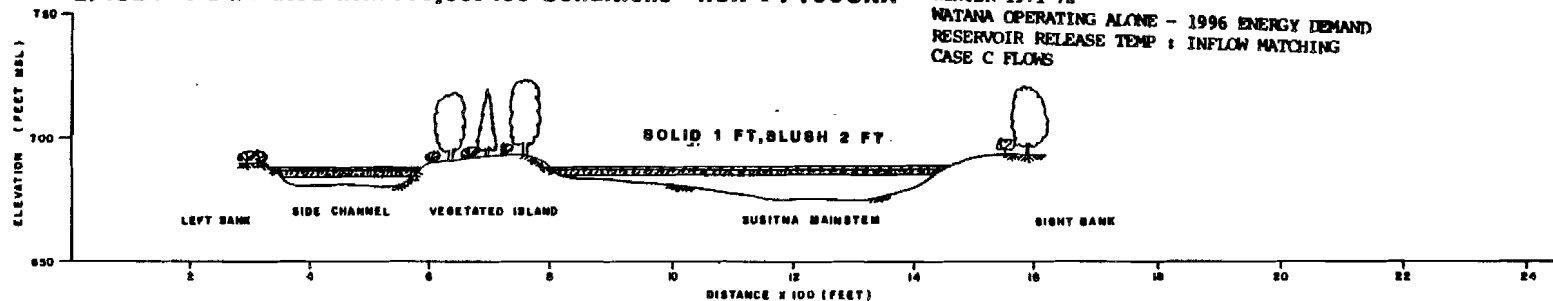
**HARZA-EBASCO**  
 SUSITNA JOINT VENTURE

1. Natural Ice Conditions (1983)

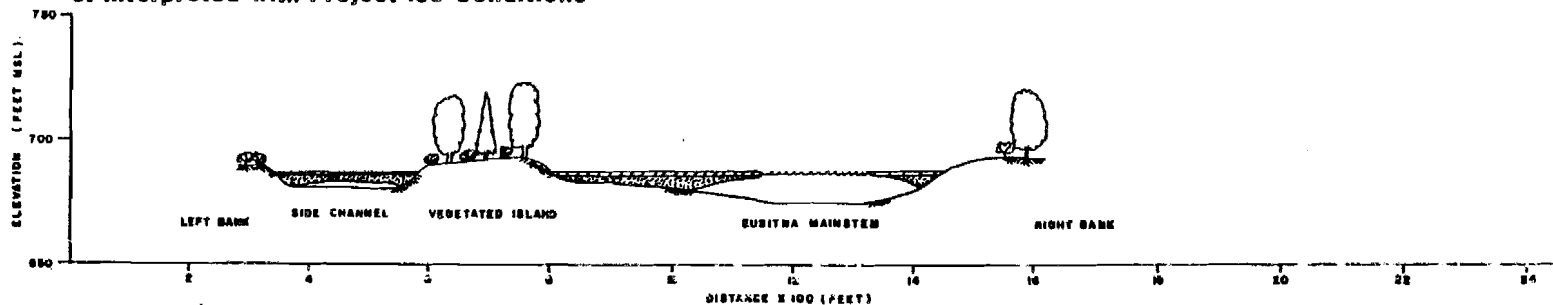


2. ICECAL Simulated with Project Ice Conditions RUN #7196CNA

WINTER 1971-72  
NATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



3. Interpreted with Project Ice Conditions



PREPARED BY:

**RCM**  
REM CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-44**

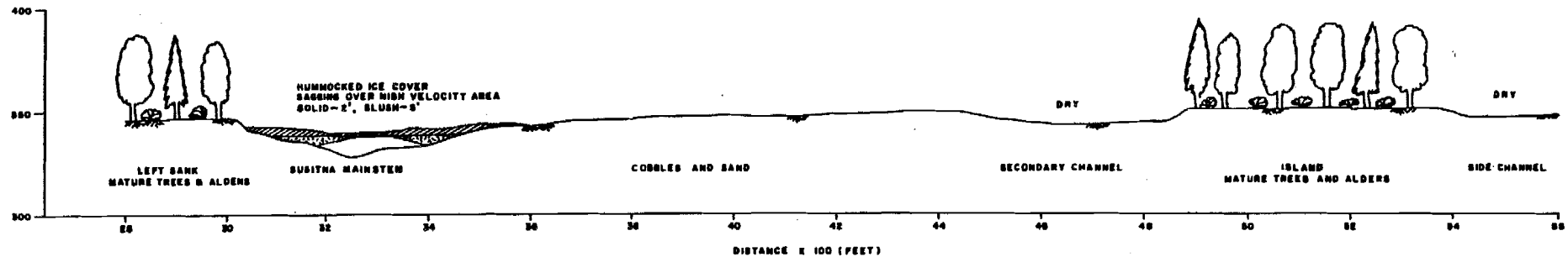
1980 CROSS SECTION SURVEY  
RIVER MILE 135.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

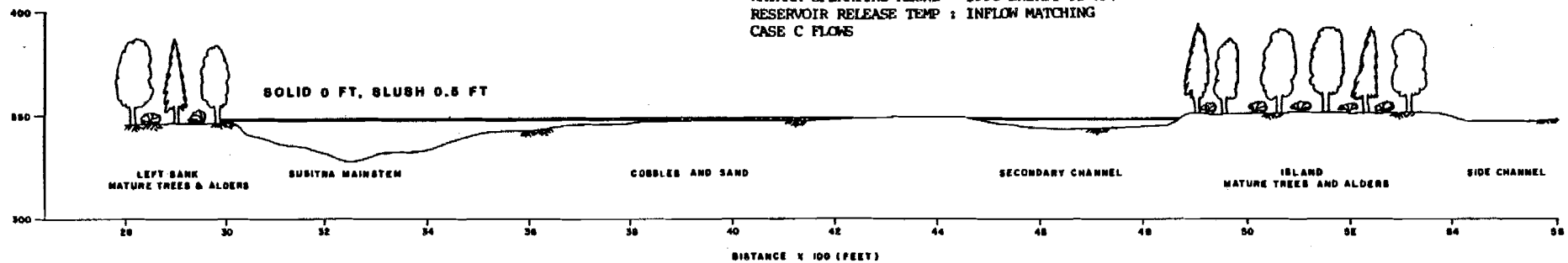
# EXHIBIT V

### 1. Natural Ice Conditions (1983)

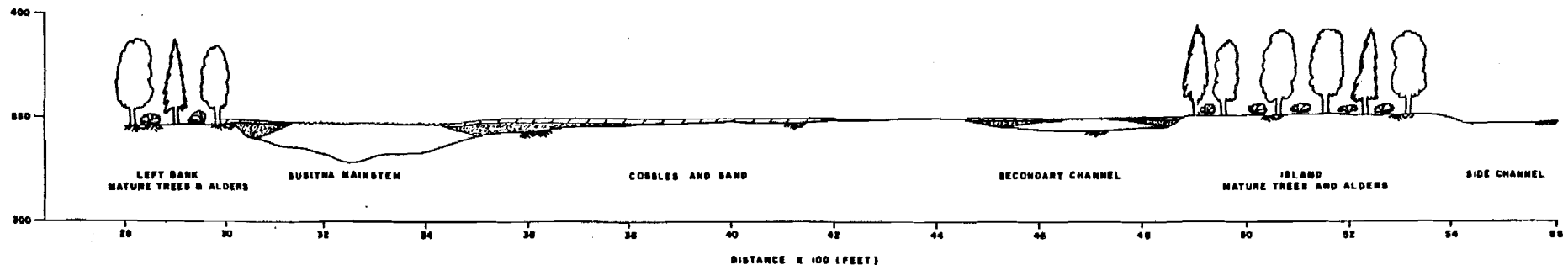


### 2. ICECAL Simulated with Project Ice Conditions RUN#7698CNA

WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

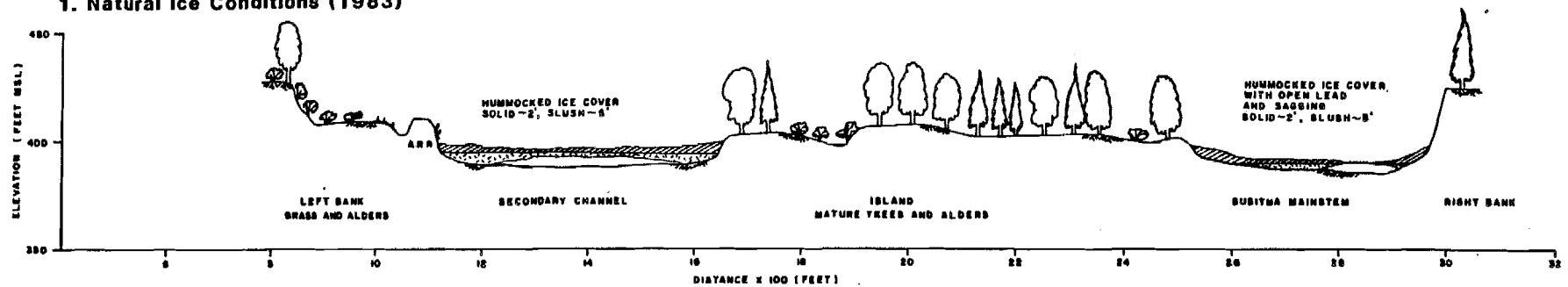
**LRX-3**

**1982 CROSS SECTION SURVEY  
RIVER MILE 98.6  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

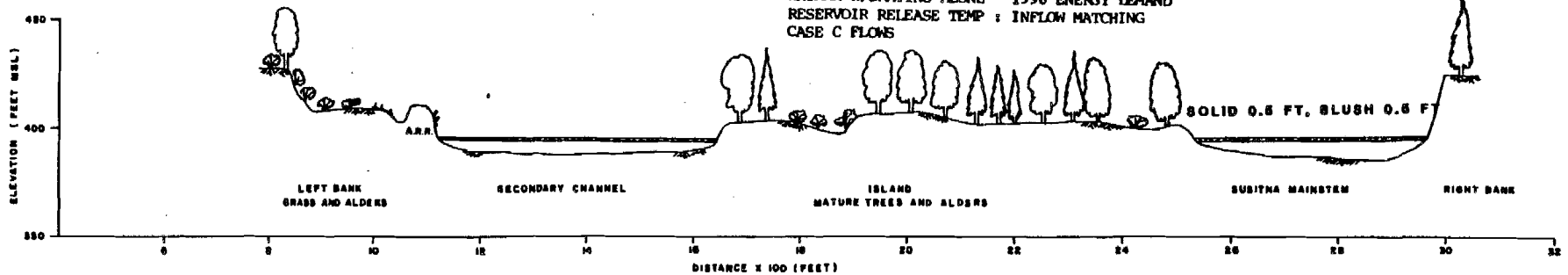
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

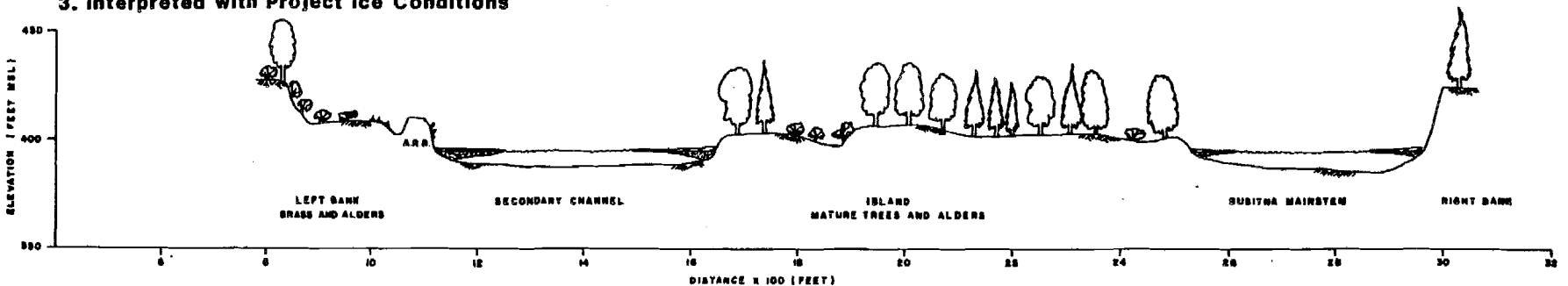


### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA

WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-10**

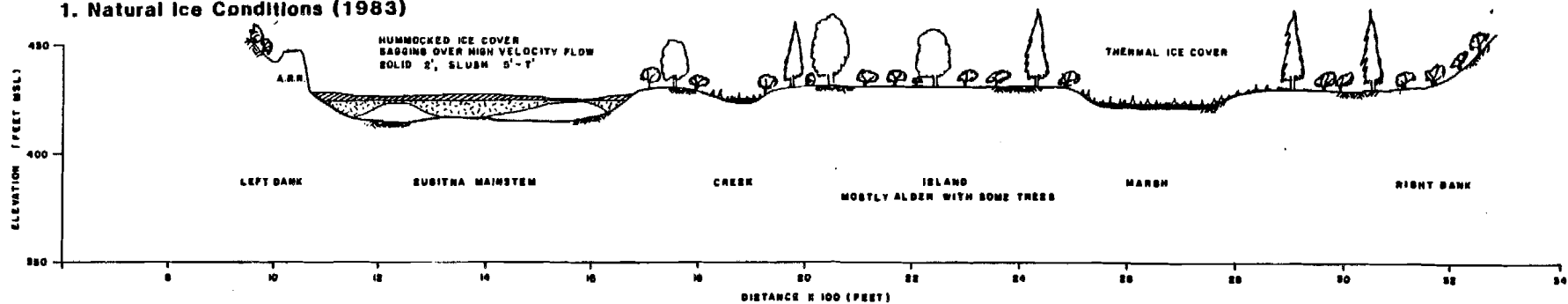
**1980 CROSS SECTION SURVEY**  
RIVER MILE 104.8  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

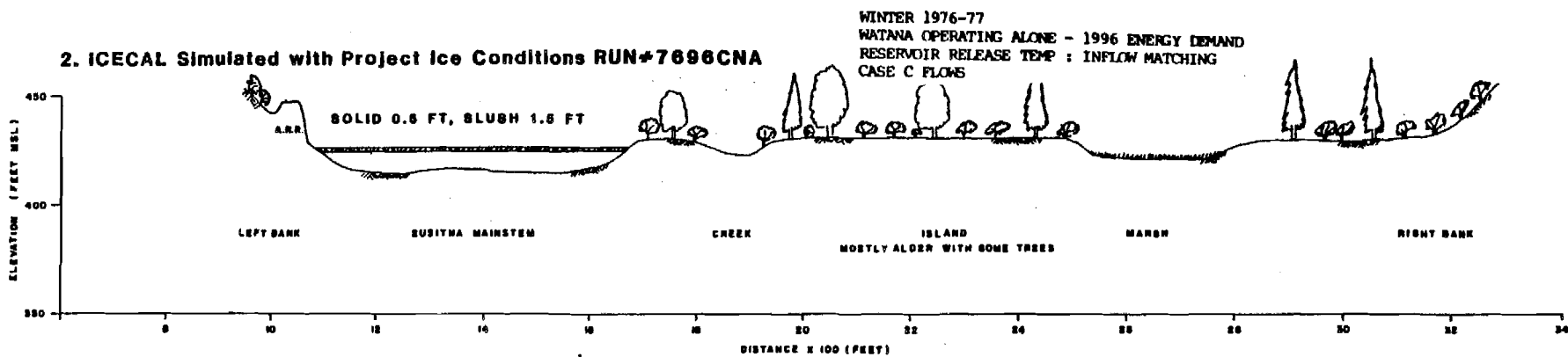
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



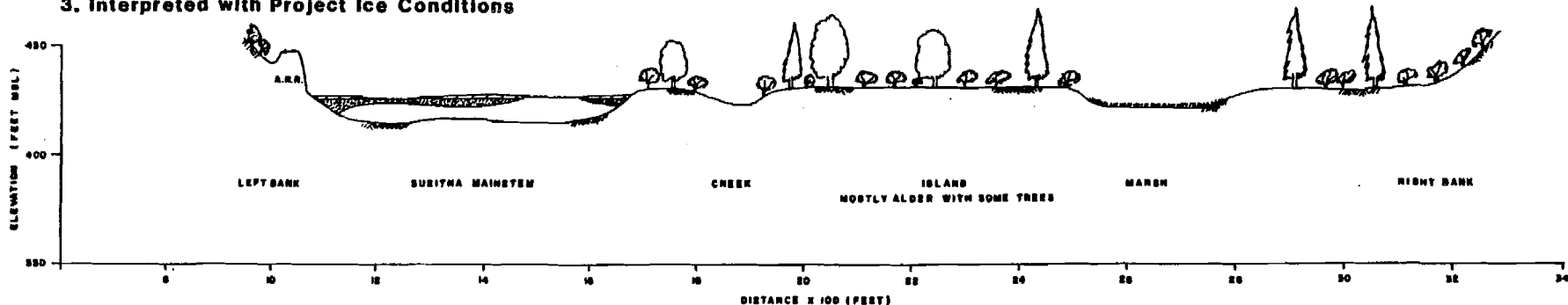
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

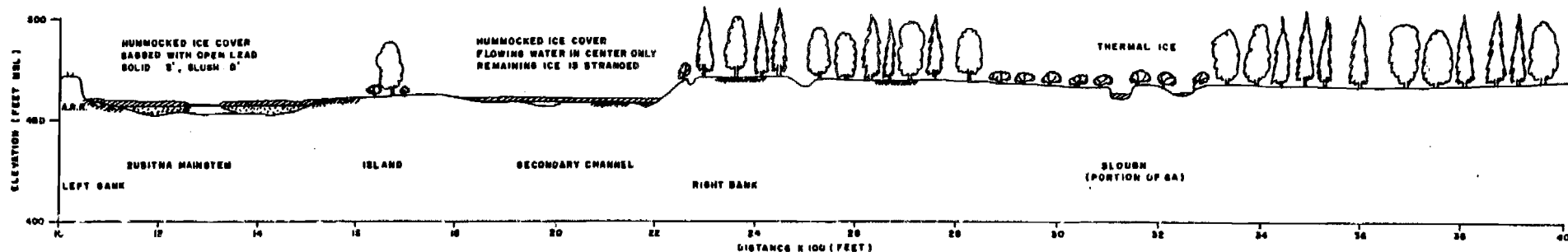
**LRX-12**

**1981 CROSS SECTION SURVEY  
RIVER MILE 108.4  
VERTICAL EXAGGERATION 4:1**

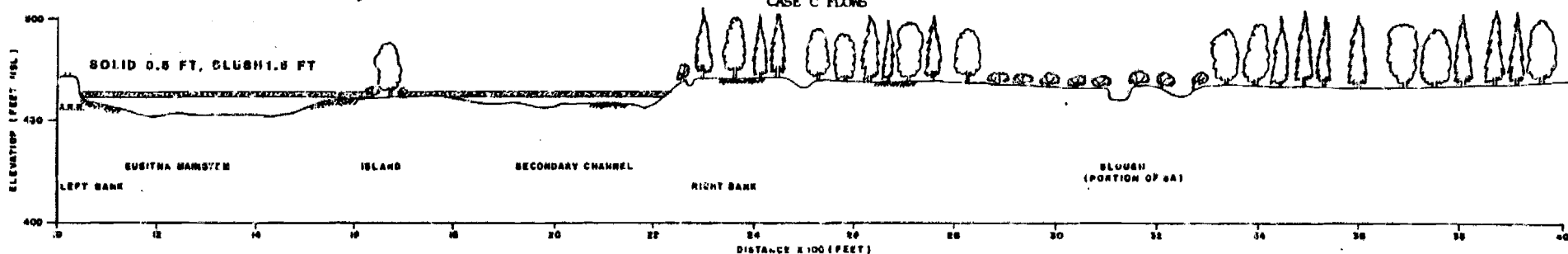
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

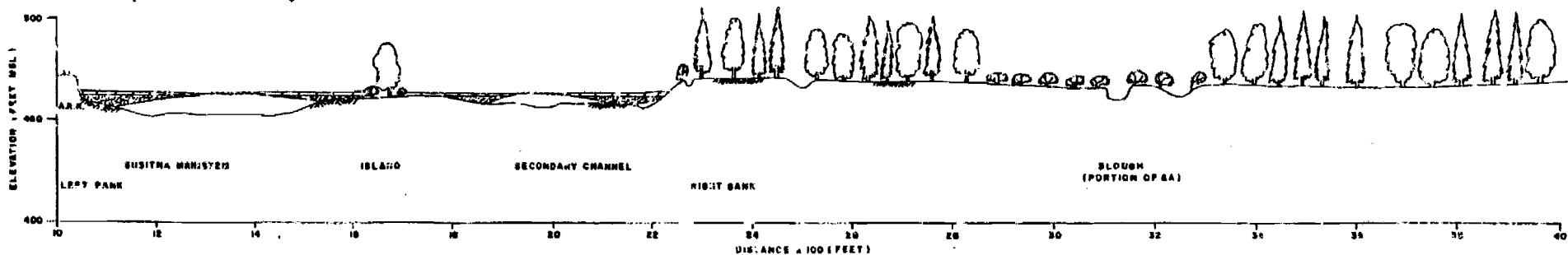


### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA



WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS

### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNING SURVEYORS

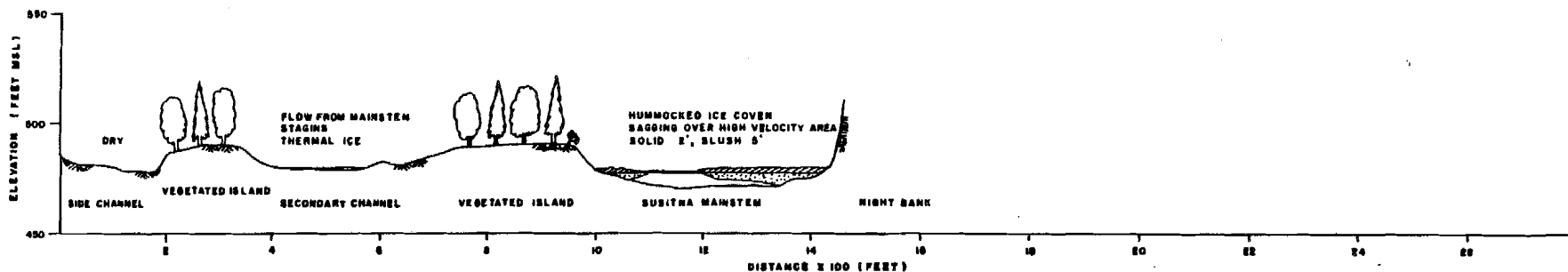
**LHX-17**

**1980 CROSS SECTION SURVEY  
RIVER MILE 112.7  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

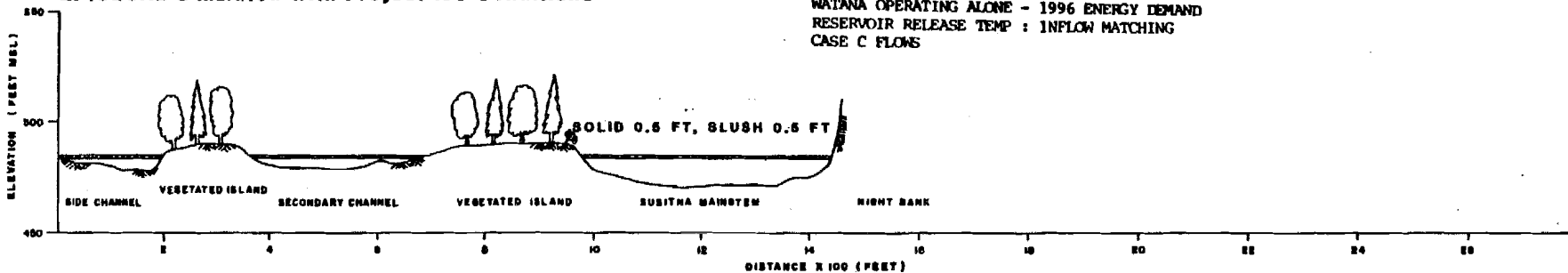
**WATANA-EPASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

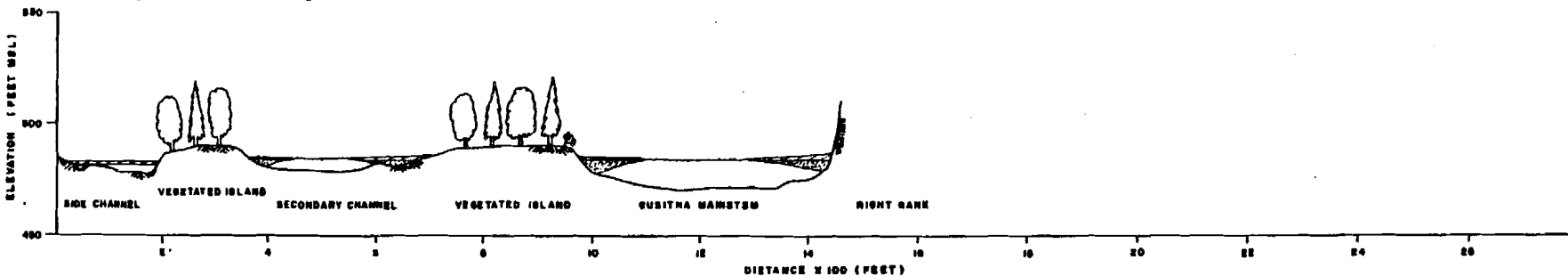


### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA

WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

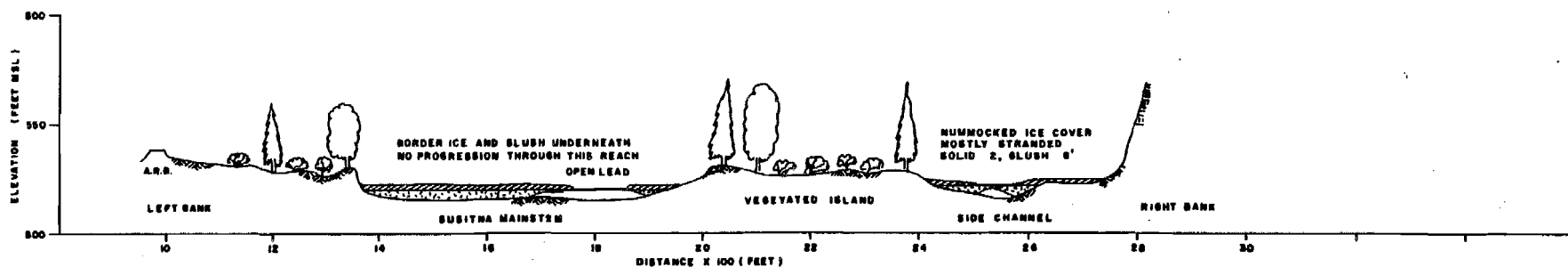
**LRX-18.2**

**1982 CROSS SECTION SURVEY**  
**RIVER MILE 115.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

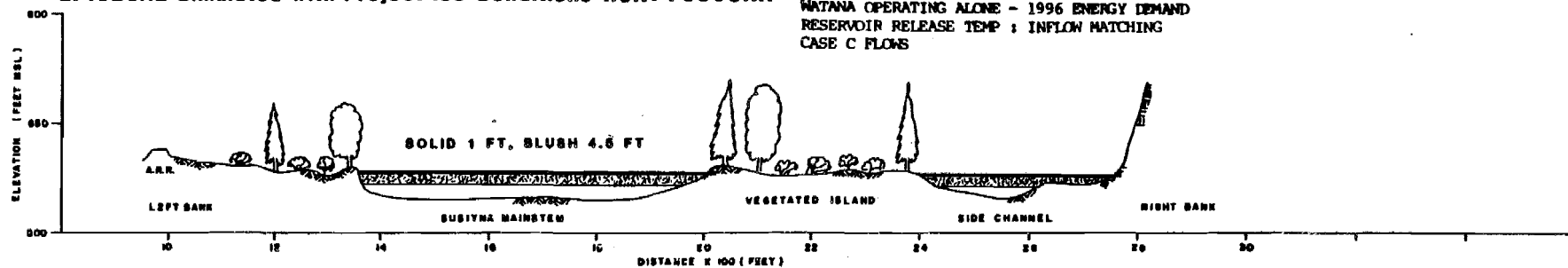
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

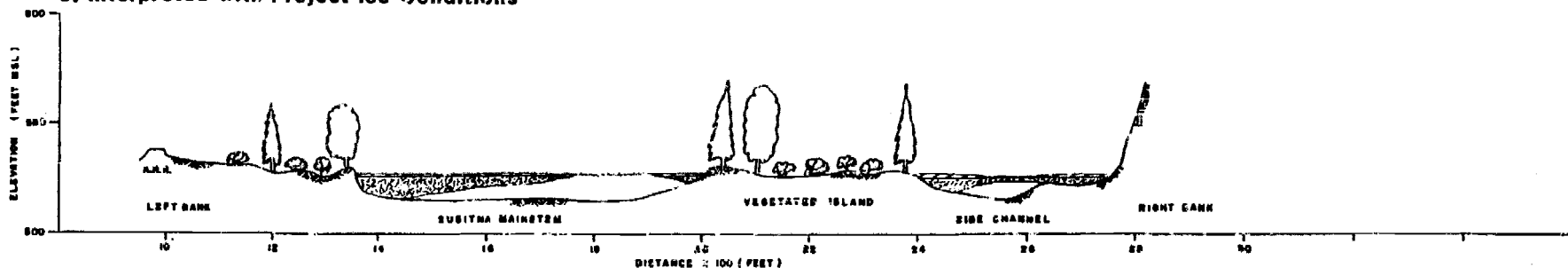


### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA

WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

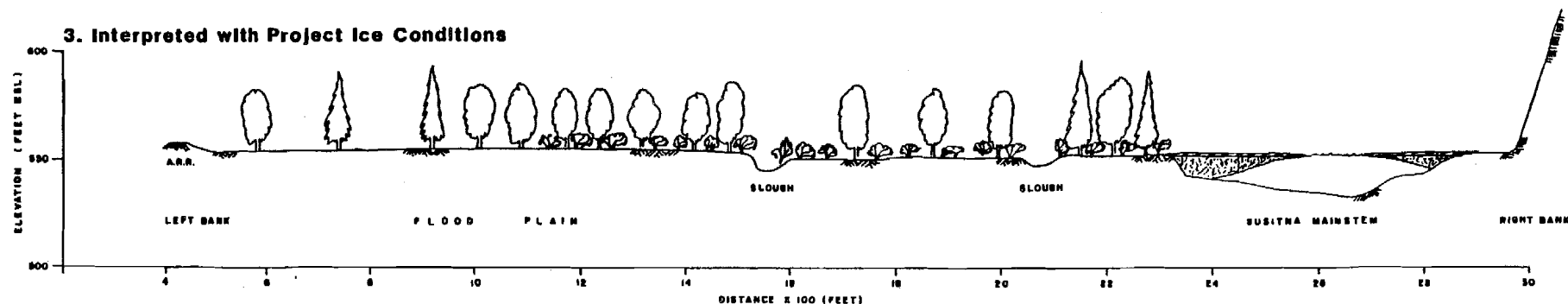
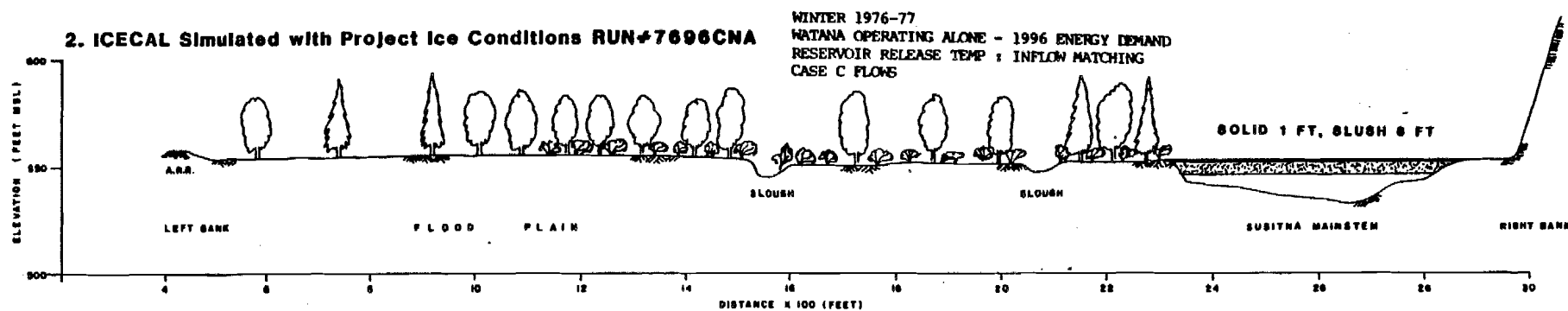
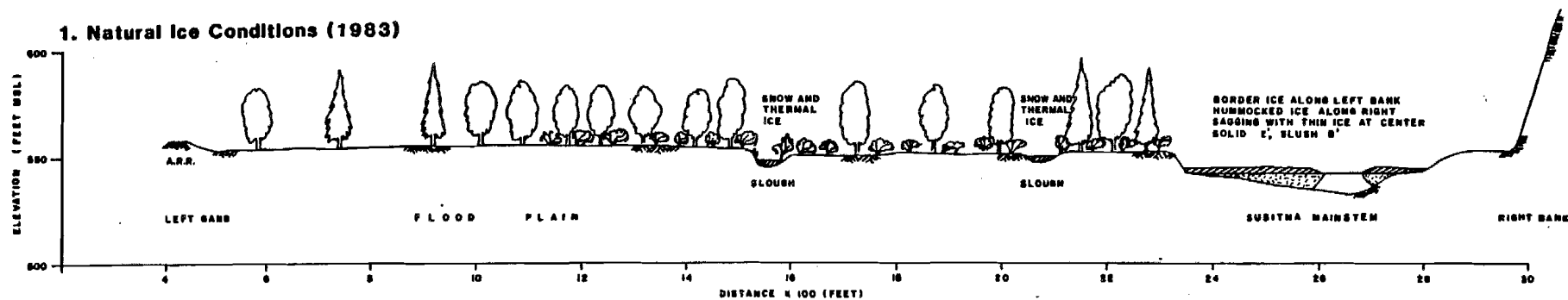
**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-23**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 120.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-ELASCO**  
SUSITNA JOINT VENTURE



PREPARED BY:

**FSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

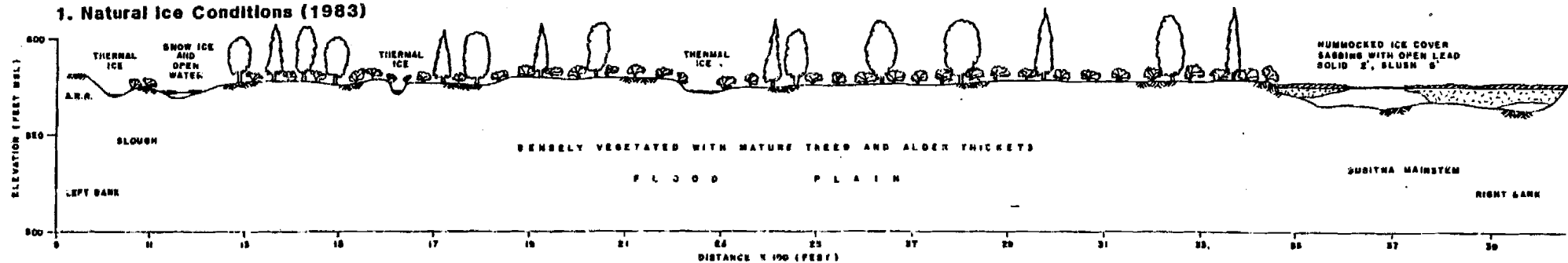
**LRX -27**

**1980 CROSS SECTION SURVEY  
RIVER MILE 123.3  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

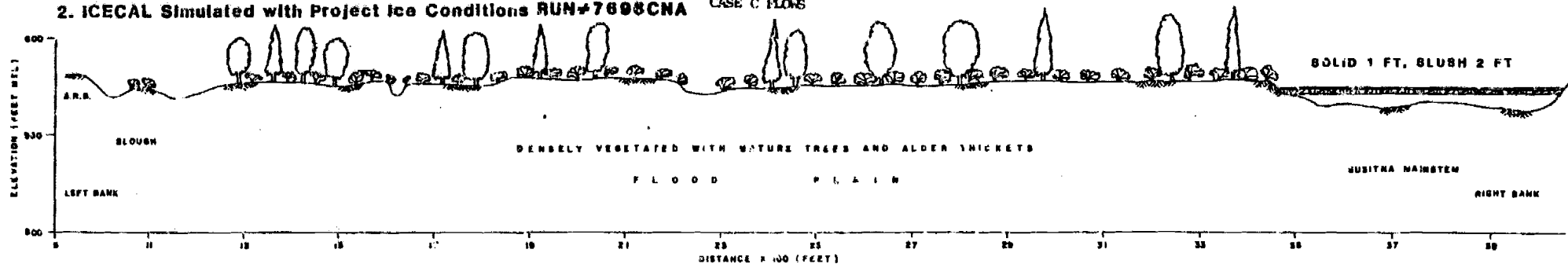
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

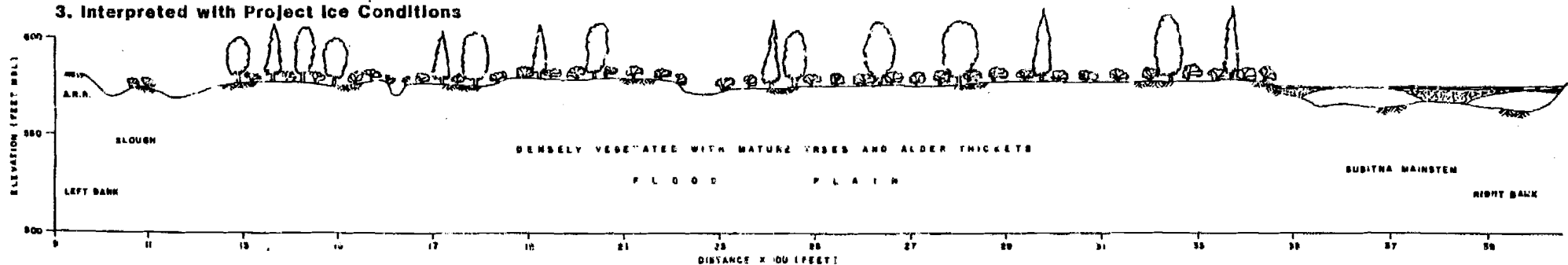


WINTER 1976-77  
 HATANA OPERATING ALONE - 1990 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C HONS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7698CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

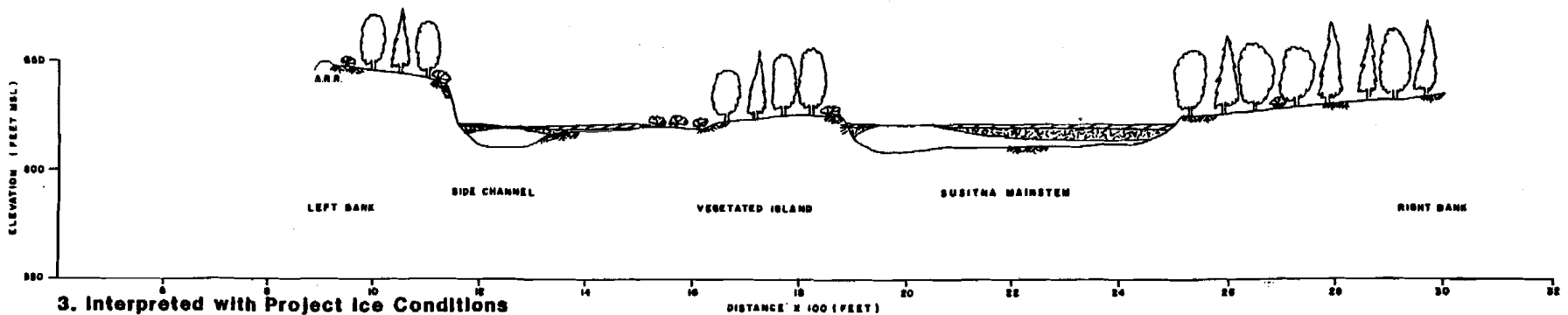
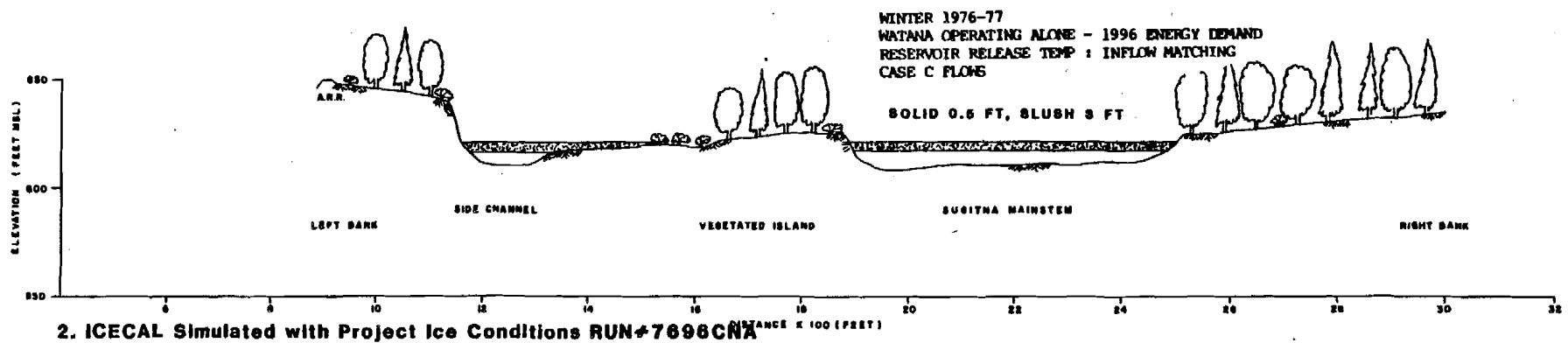
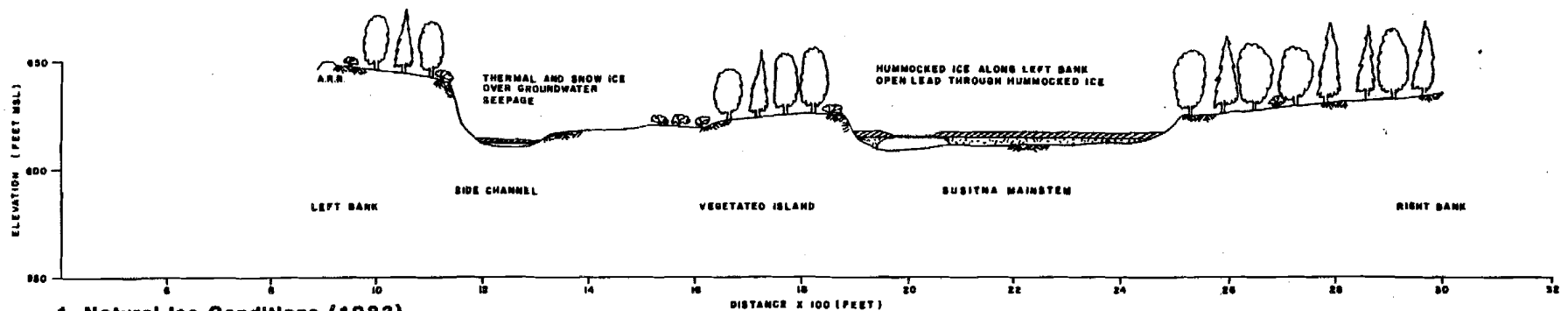
**R&M**  
**R&M CONSULTANTS, INC.**  
 ENGINEERS GEOLGISTS PLANNERS SURVEYORS

**LRX-29**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 126.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
 SUSITNA JOINT VENTURE



PREPARED BY:

**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

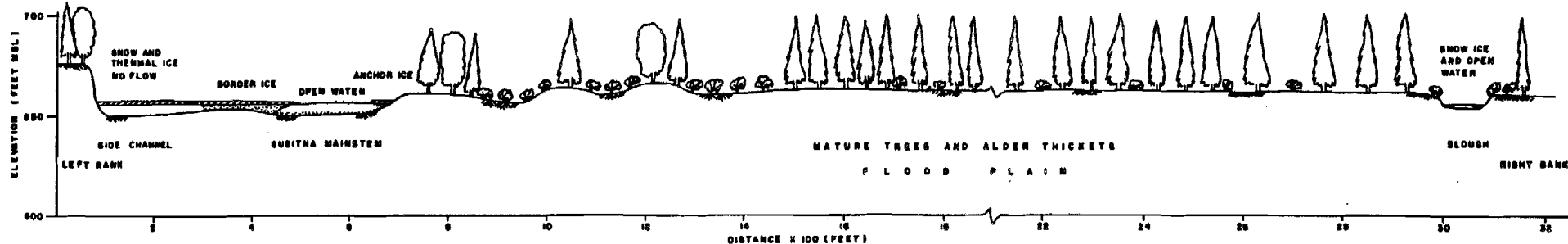
**LRX-34**

**1980 CROSS SECTION SURVEY  
RIVER MILE 130.5  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

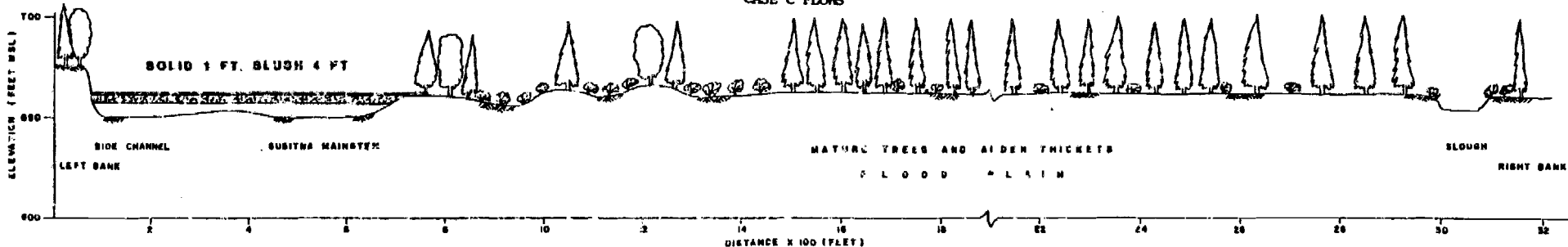
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

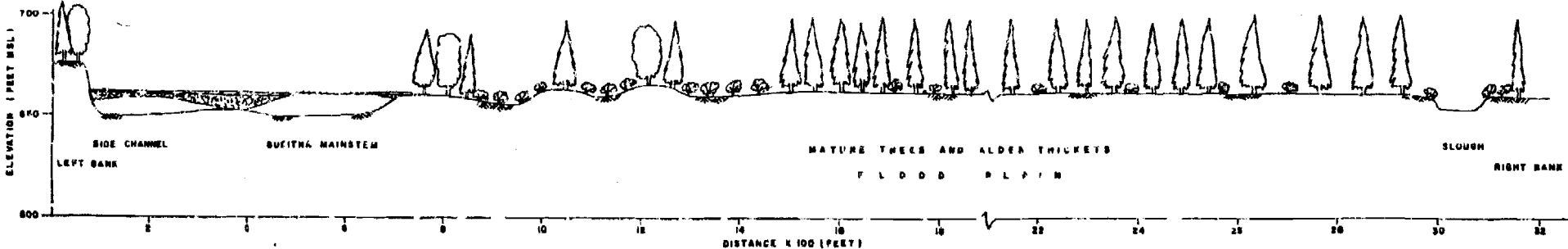


WINTER 1976-77  
 WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RCM**  
 RCM CONSULTANTS, INC.  
 ENGINEERS GEOLGISTS PLANNERS SURVEYORS

LRX-40

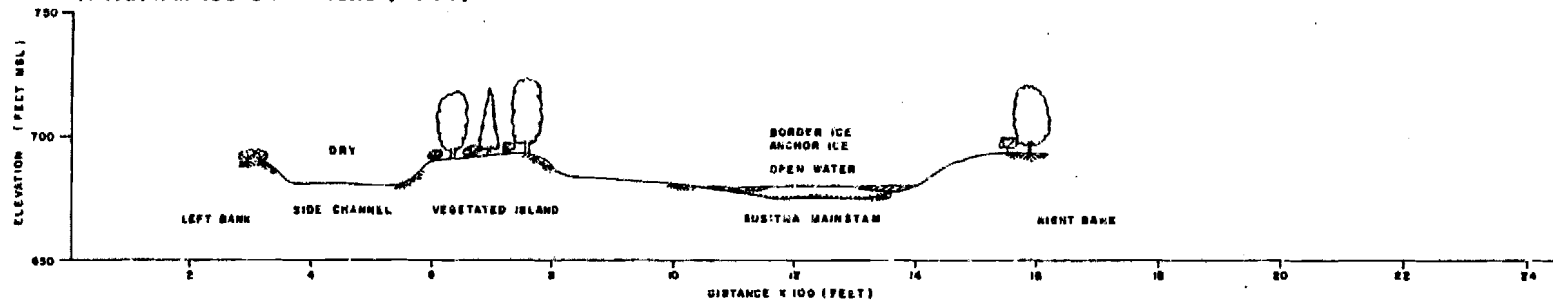
1980 CROSS SECTION SURVEY  
 RIVER MILE 134.2  
 VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
 SUSITNA JOINT VENTURE

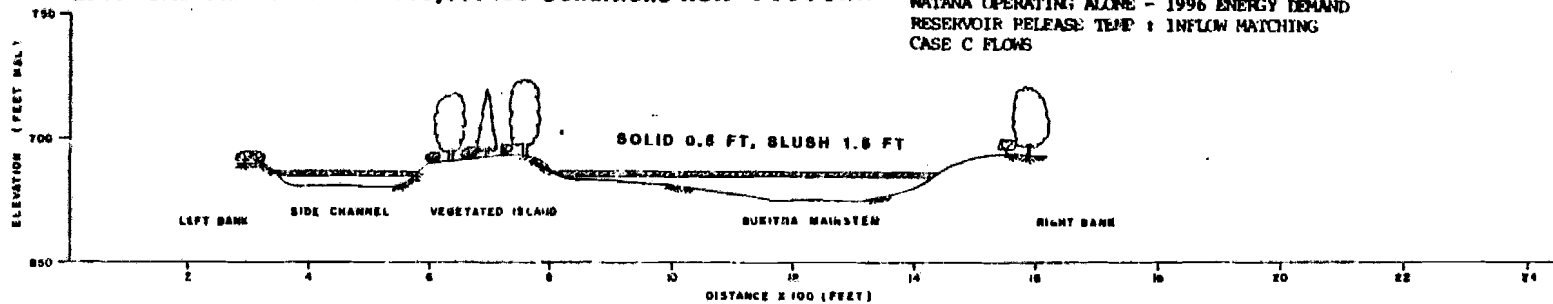


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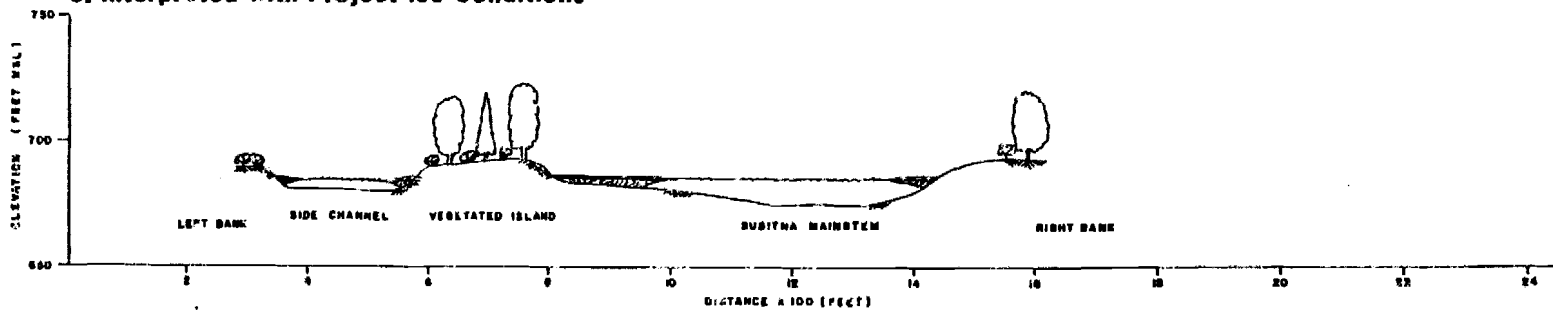


2. ICECAL Simulated with Project Ice Conditions RUN#7696CNA

WINTER 1976-77  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



3. Interpreted with Project Ice Conditions



PREPARED BY:

**REM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

LRX-44

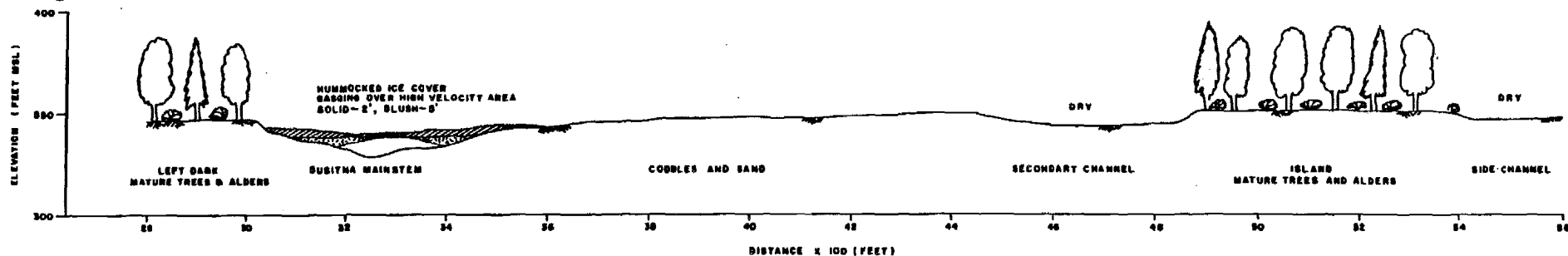
1980 CROSS SECTION SURVEY  
RIVER MILE 130.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

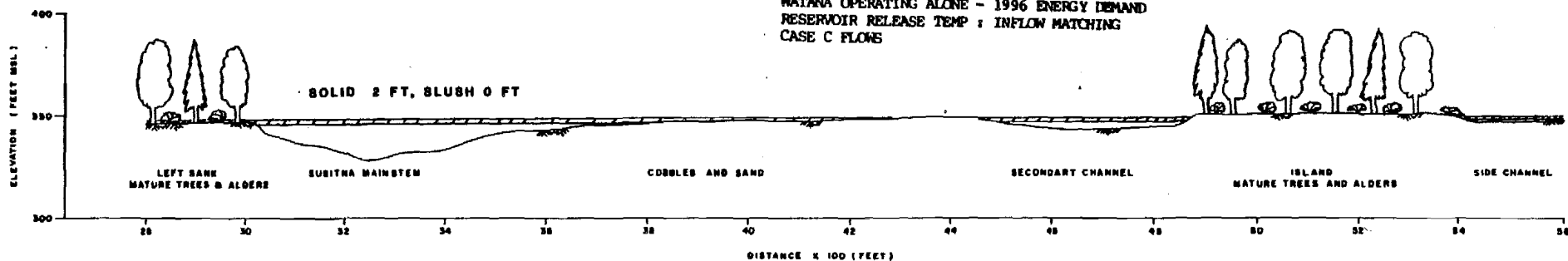
# EXHIBIT W

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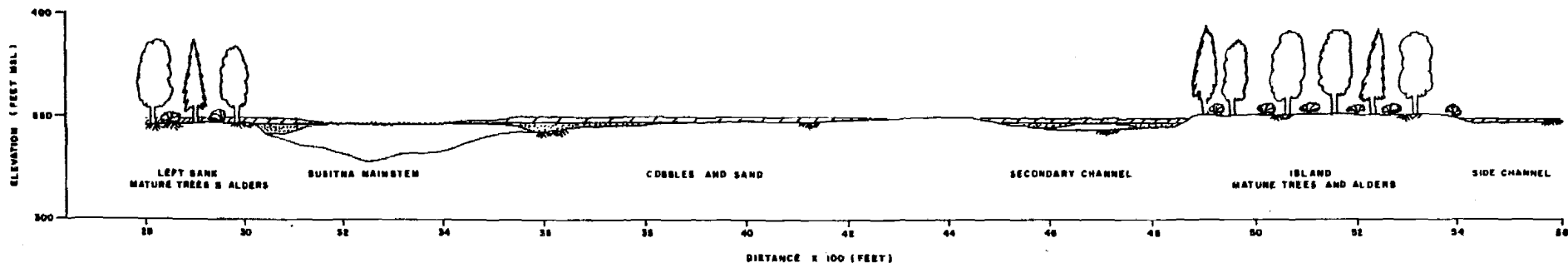


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

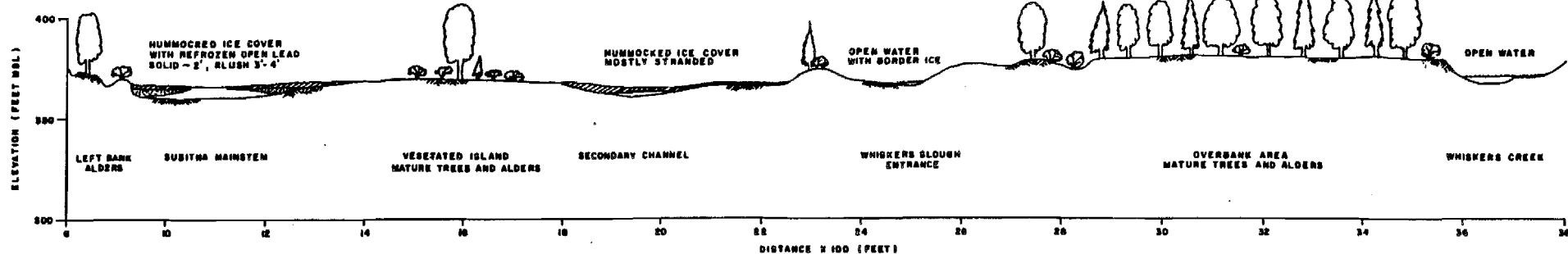
**LRX-3**

**1982 CROSS SECTION SURVEY**  
**RIVER MILE 98.6**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

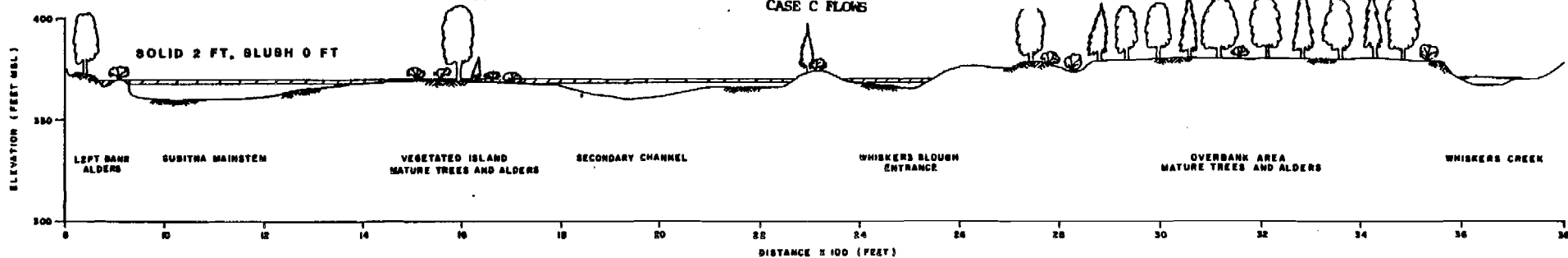
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

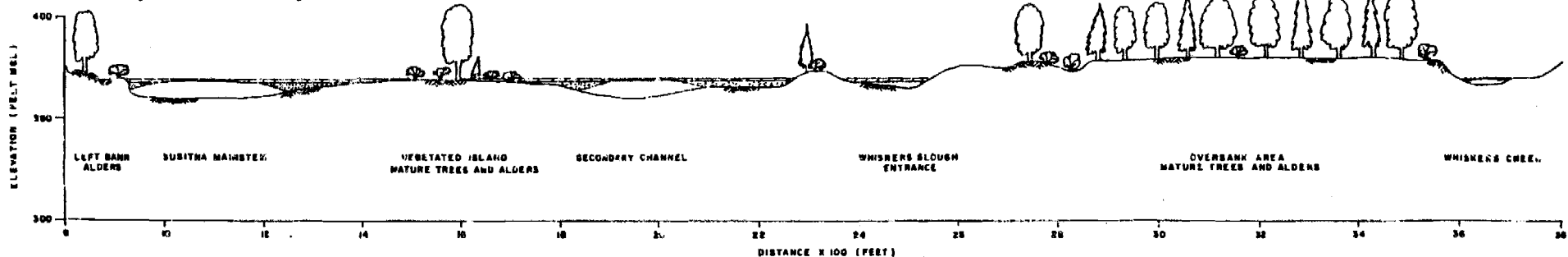


WINTER 1982-83  
 NATANA OPERATING ALONE - 1996 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
 ENGINEERS ARCHITECTS PLANNERS SURVEYORS

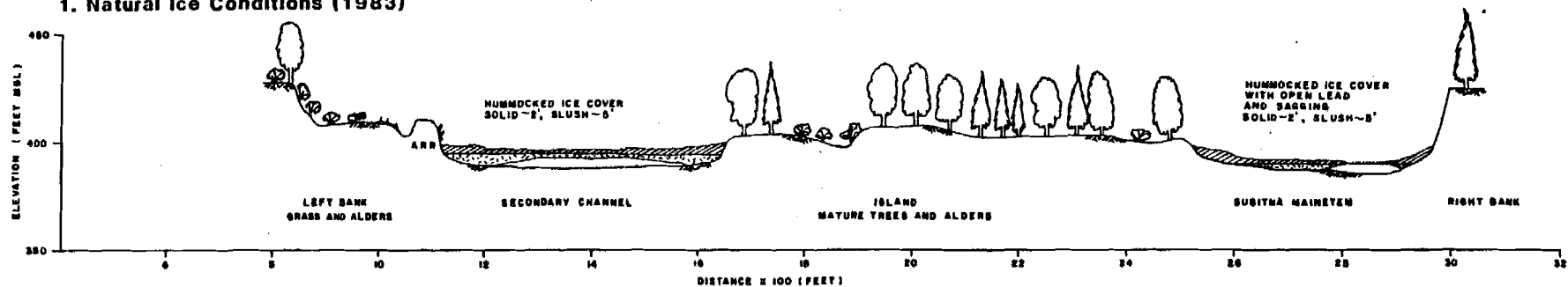
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**1980 CROSS SECTION SURVEY  
 RIVER MILE 101.5  
 VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

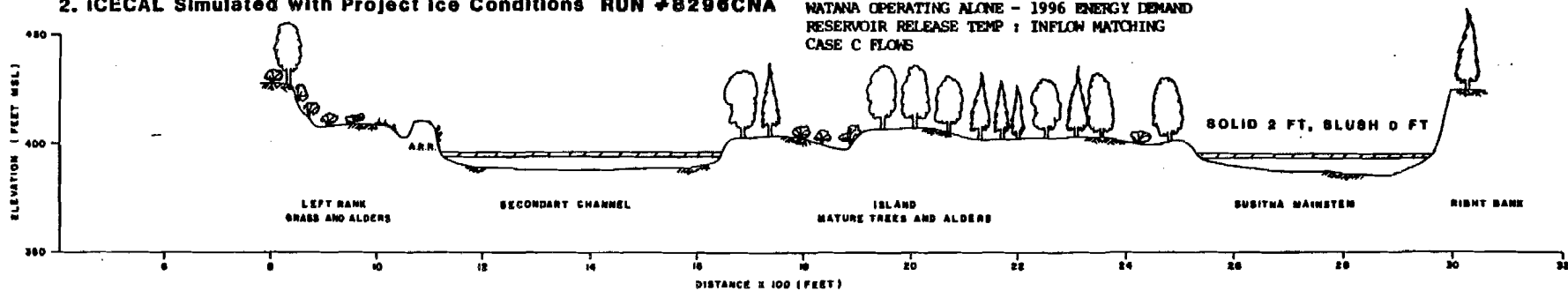
**MARZA-EBASCO**  
 SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

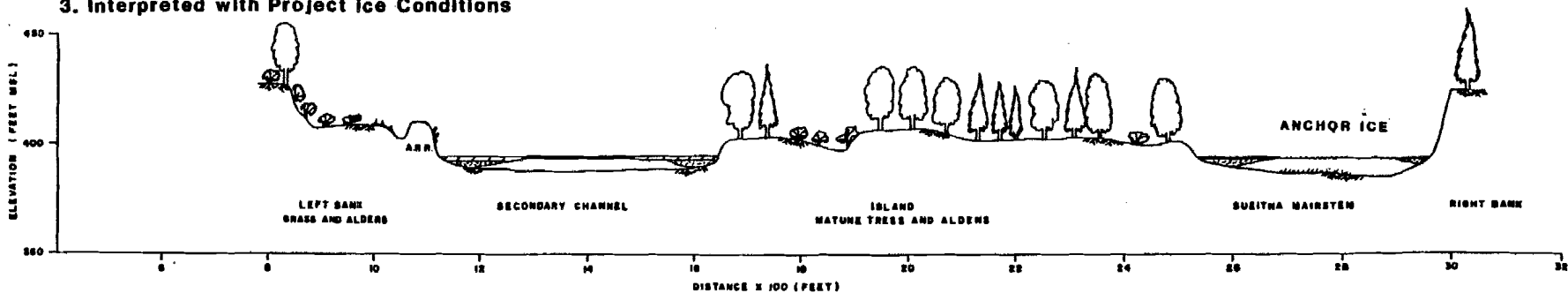


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

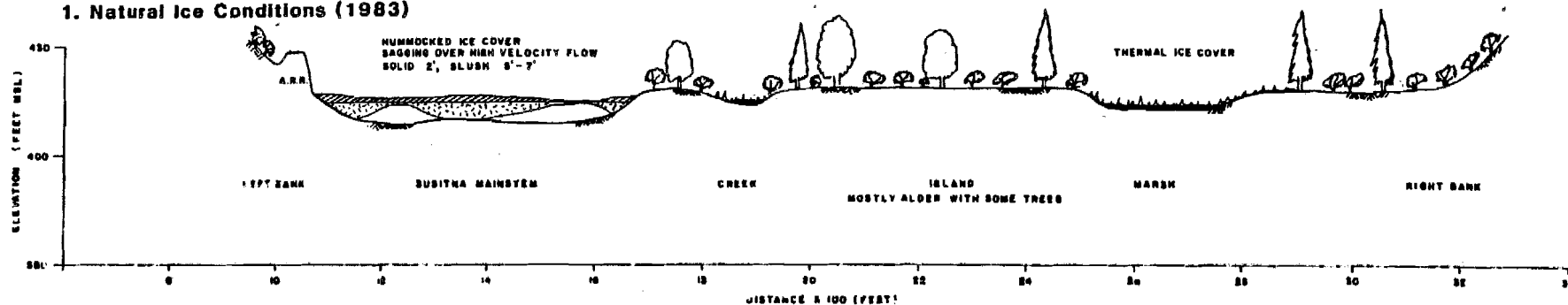
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**1980 CROSS SECTION SURVEY**  
**RIVER MILE 104.8**  
**VERTICAL EXAGGERATION 4:1**

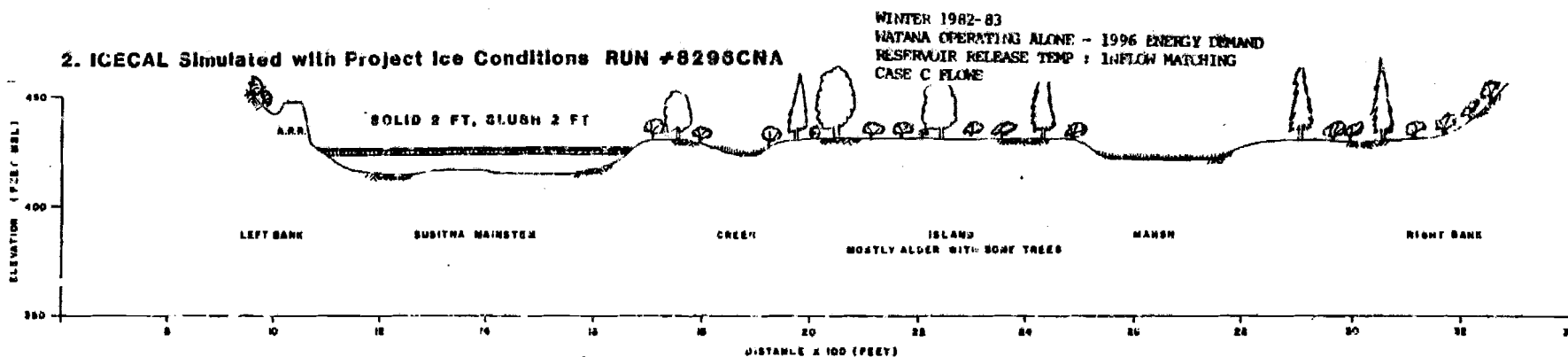
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

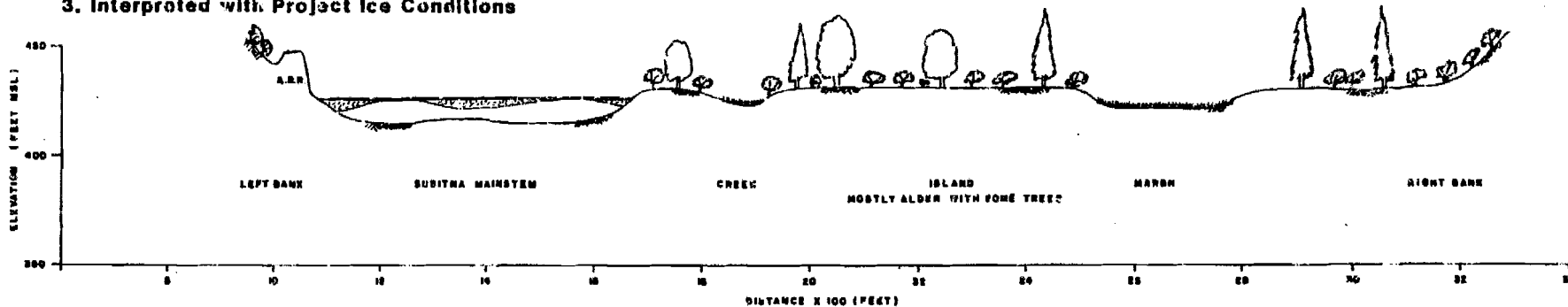
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN #8295CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PCM**  
PCM CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

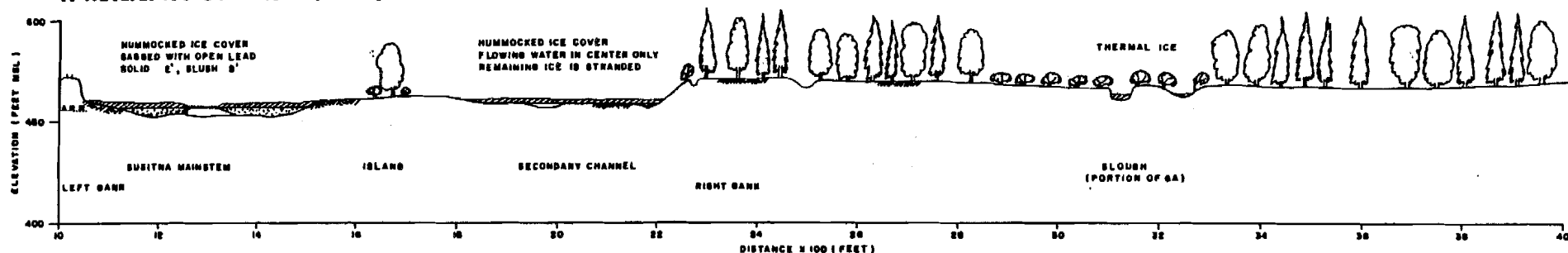
LRX-12

1981 CROSS SECTION SURVEY  
RIVER MILE 108.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

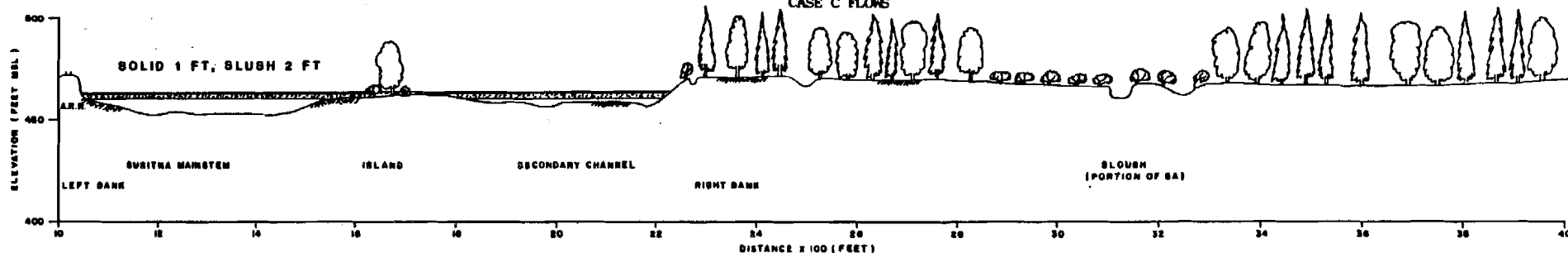
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

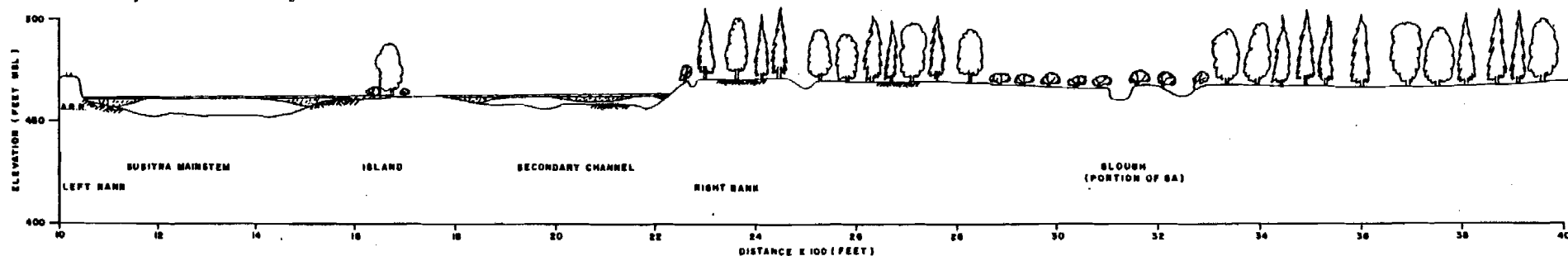


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

LRX-17

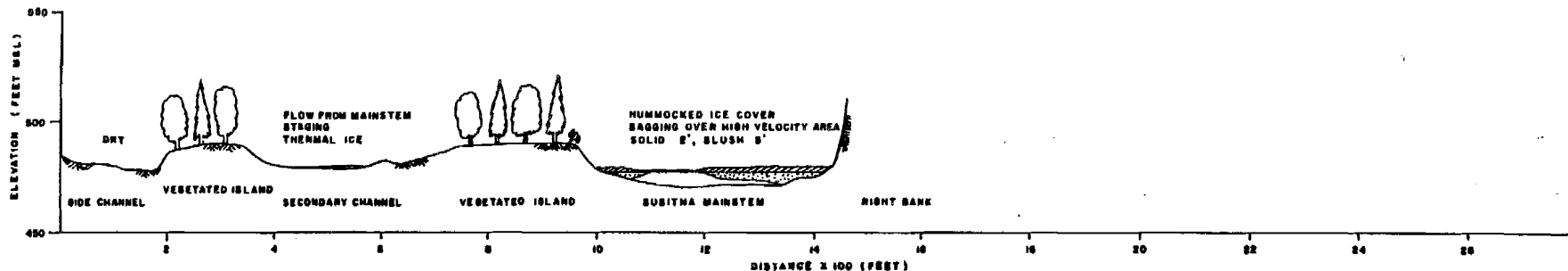
1980 CROSS SECTION SURVEY  
RIVER MILE 112.7  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

HARZA-EBASCO  
SUSITNA JOINT VENTURE

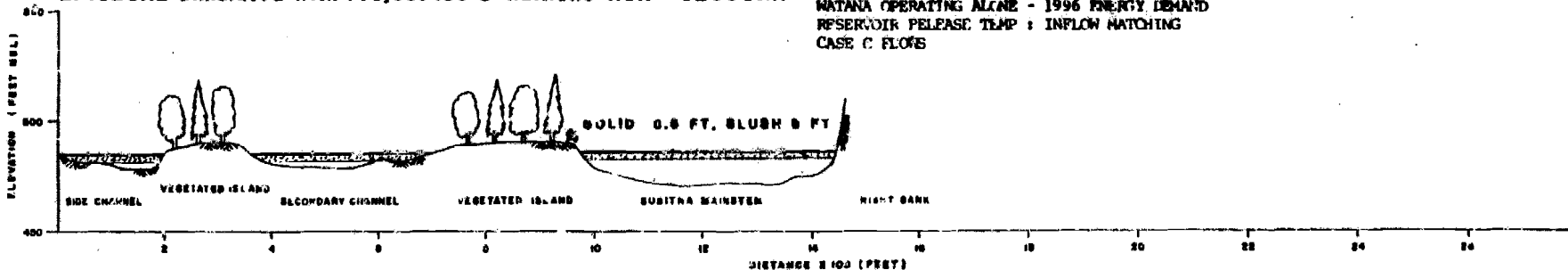
R&M  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

### 1. Natural Ice Conditions (1983)

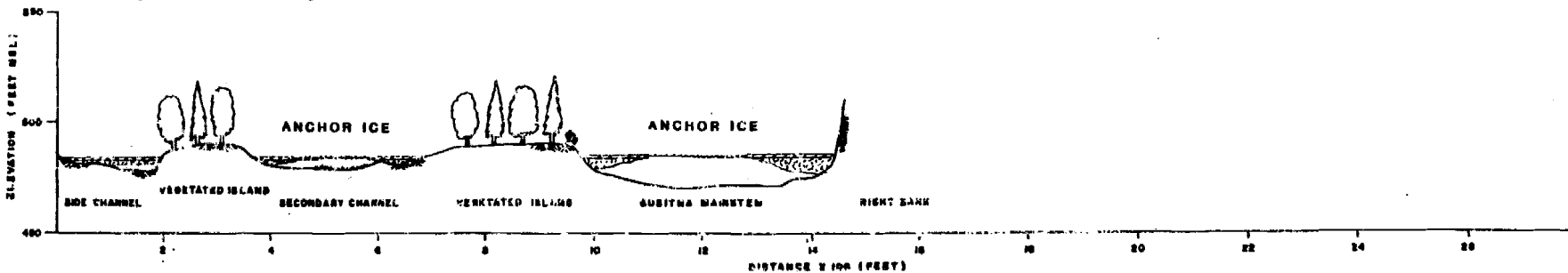


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
BUSINESS DEVELOPMENT PLANNING CONSULTANTS

**LRX-18.2**

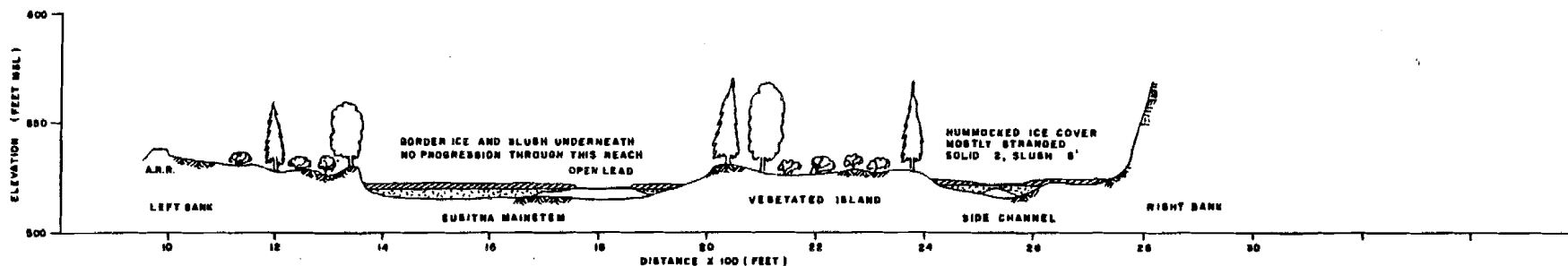
1982 CROSS SECTION SURVEY  
RIVER MILE 113.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

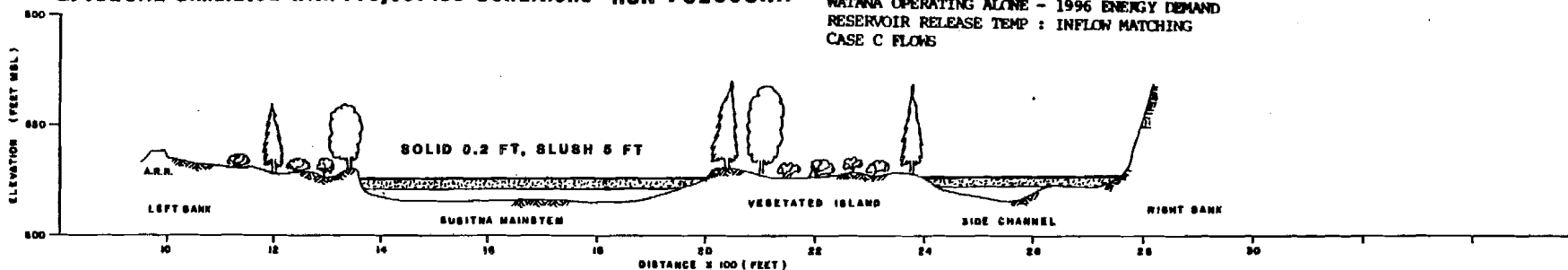


### 1. Natural Ice Conditions (1983)

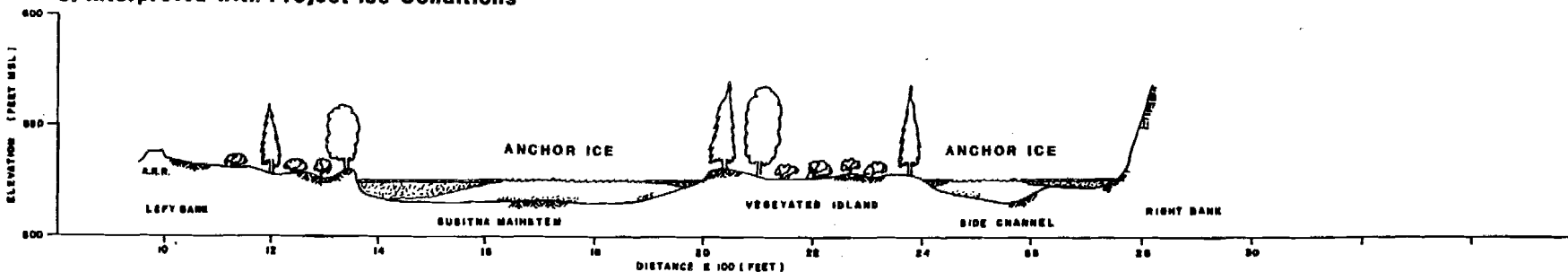


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

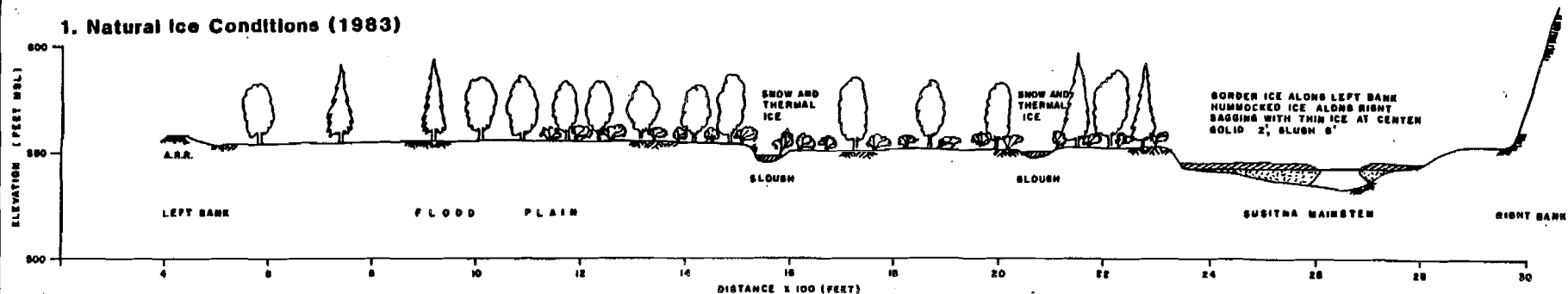
**LRX-23**

**1980 CROSS SECTION SURVEY  
RIVER MILE 120.2  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

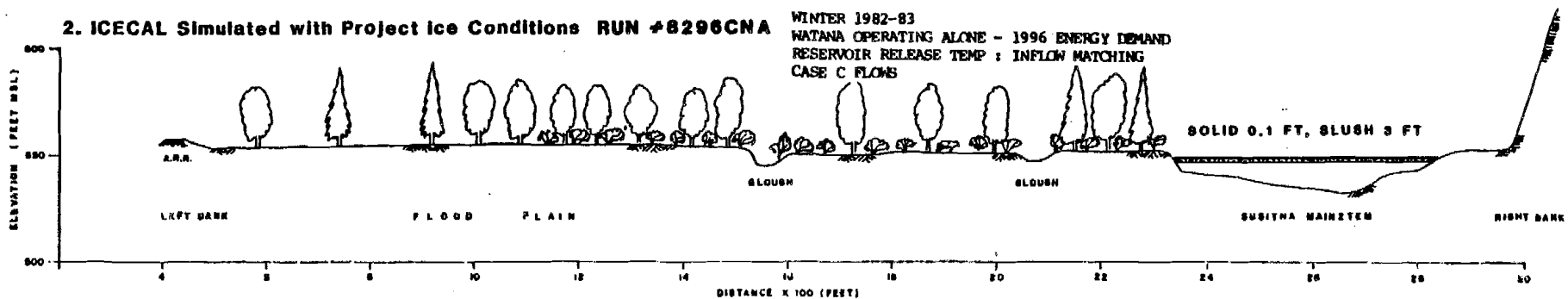
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

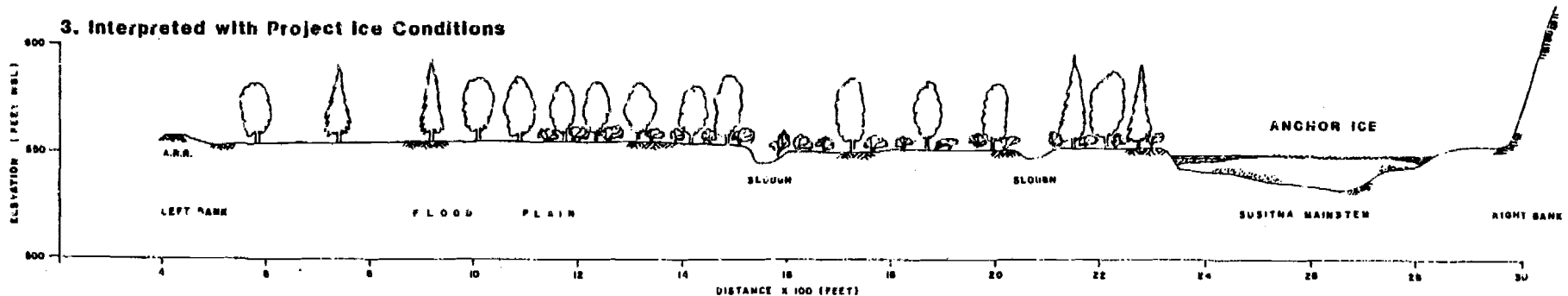


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

ERM  
ERM CONSULTANTS, INC.  
ENGINEERS GEOLGISTS PLANNERS ENVIRONMENTALISTS

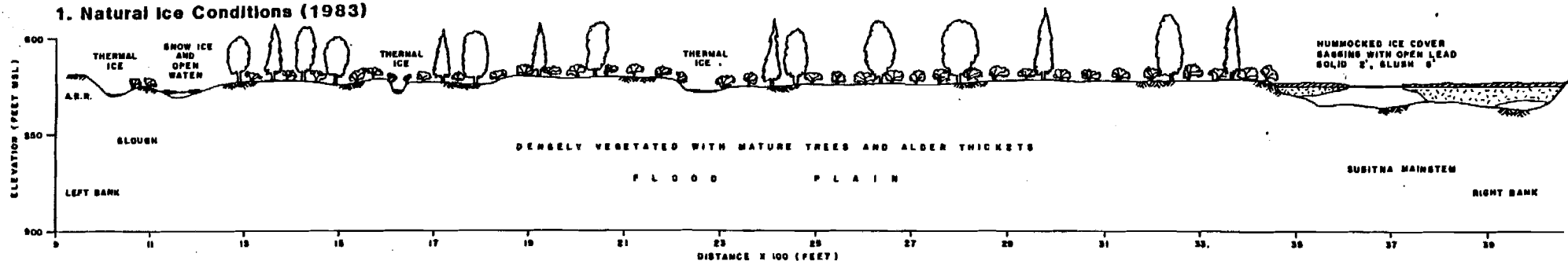
LRX -27

1980 CROSS SECTION SURVEY  
RIVER MILE 123.3  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

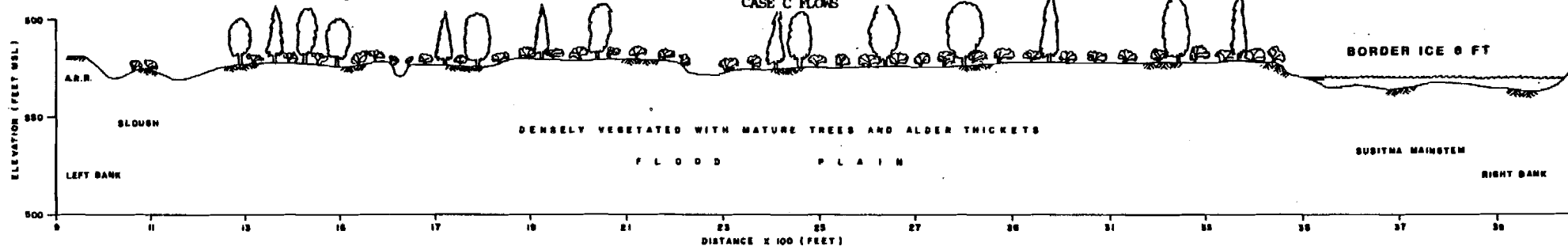
HARZA-EBASCO  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

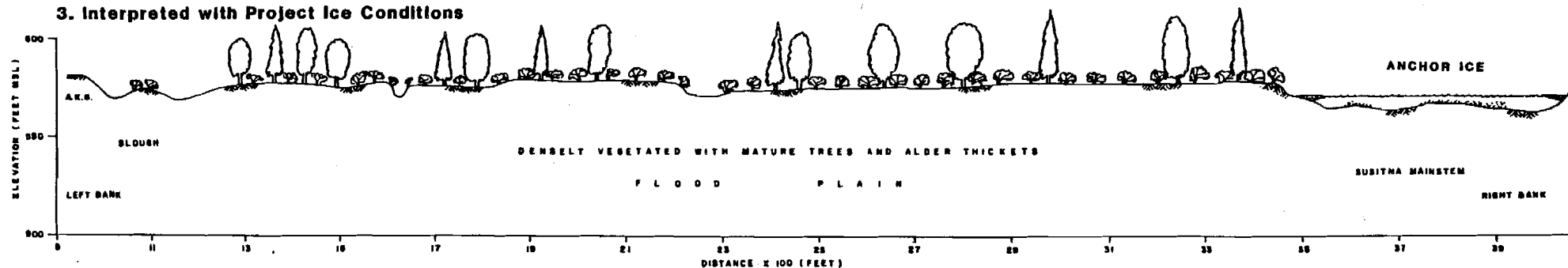


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

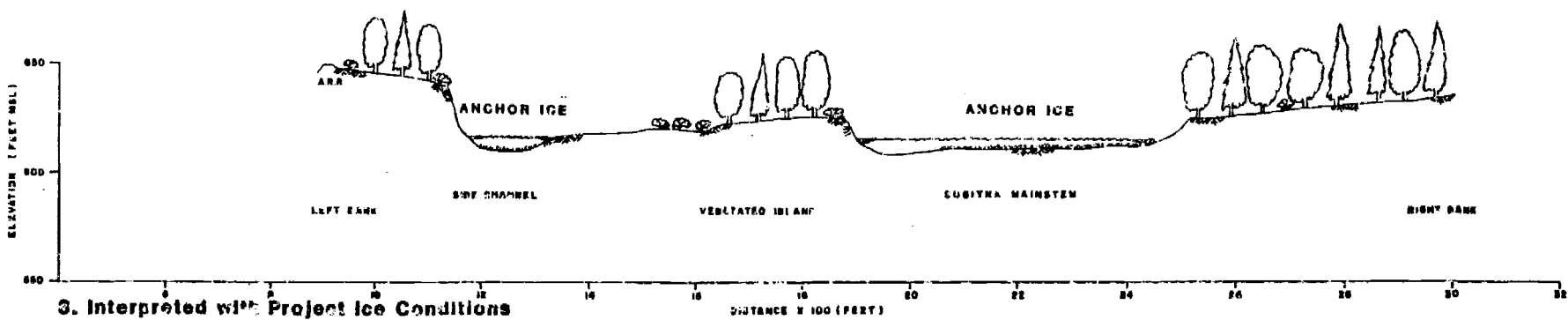
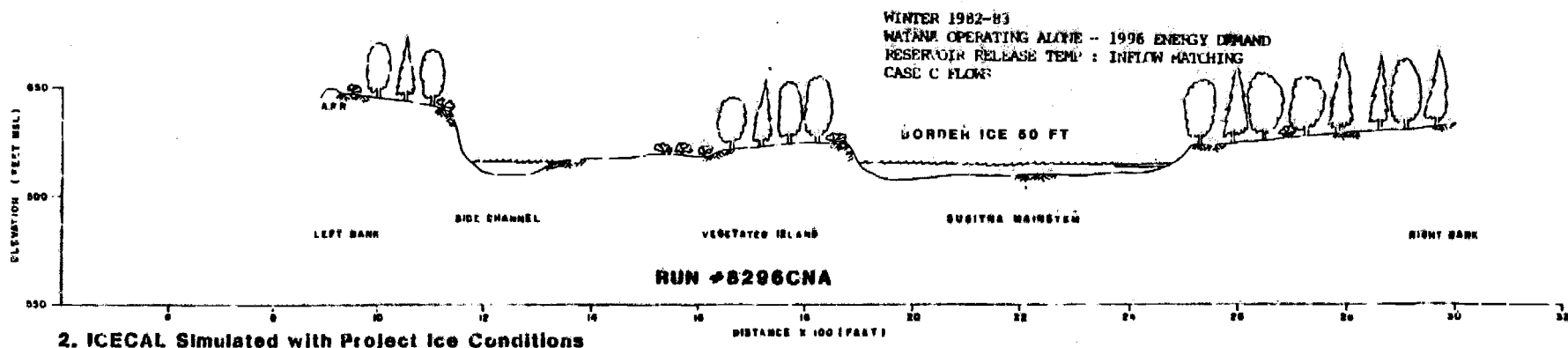
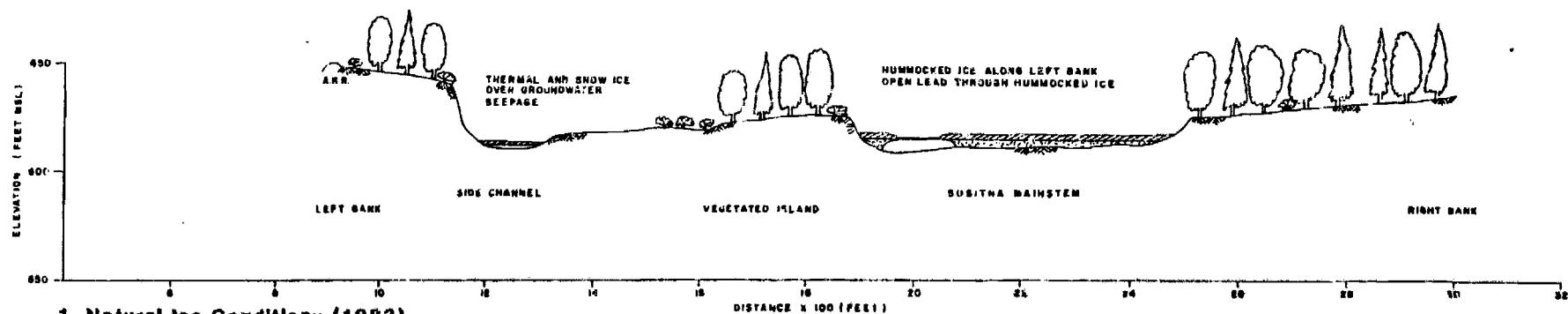
LRX-29

1980 CROSS SECTION SURVEY  
RIVER MILE 126.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS



PREPARED BY:

**PCM**  
PCM CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

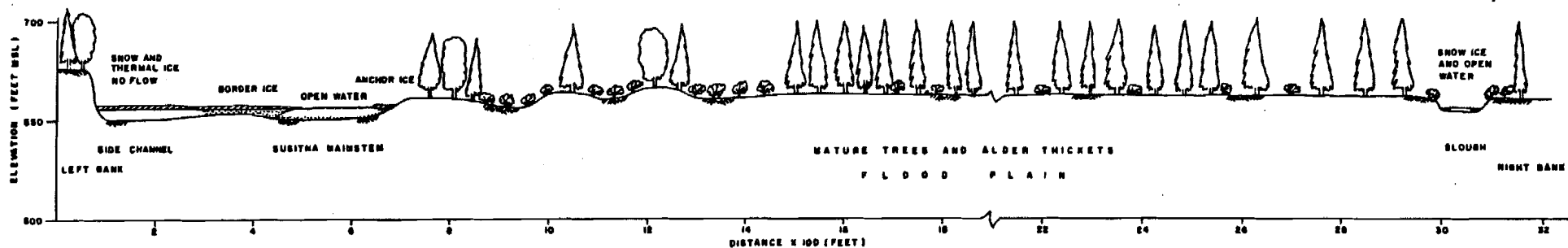
**LRX-34**

1980 CROSS SECTION SURVEY  
RIVER MILE 130.5  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

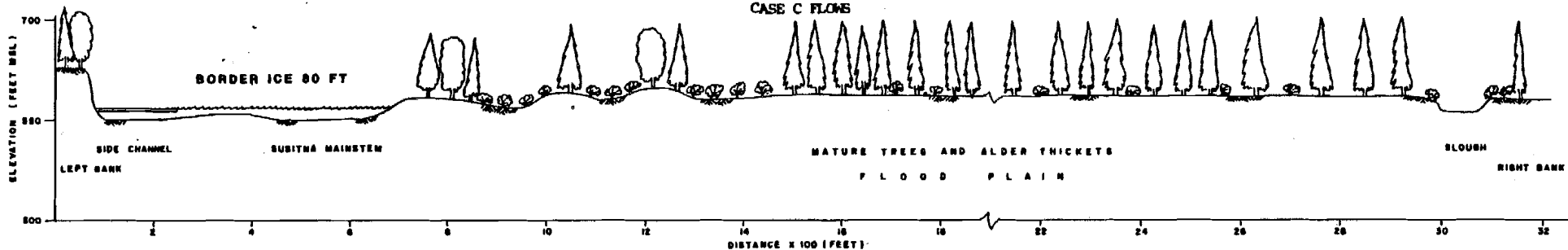
**MARZA-EDASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

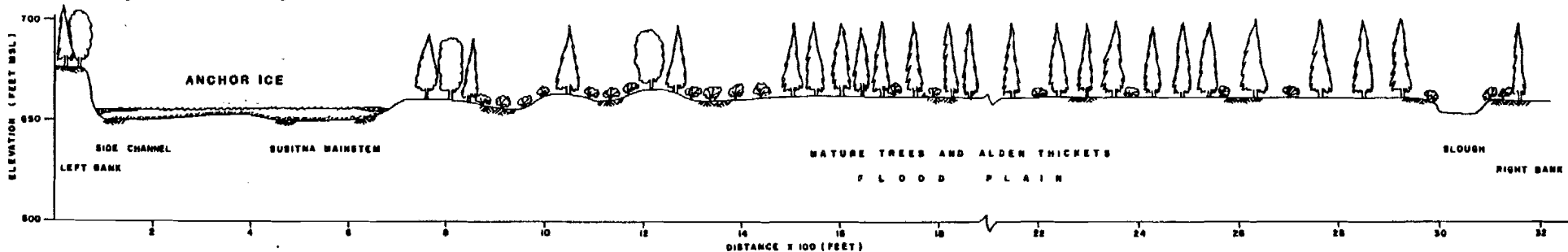


### 2. ICECAL Simulated with Project Ice Conditions RUN #8296CNA

WINTER 1982-83  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

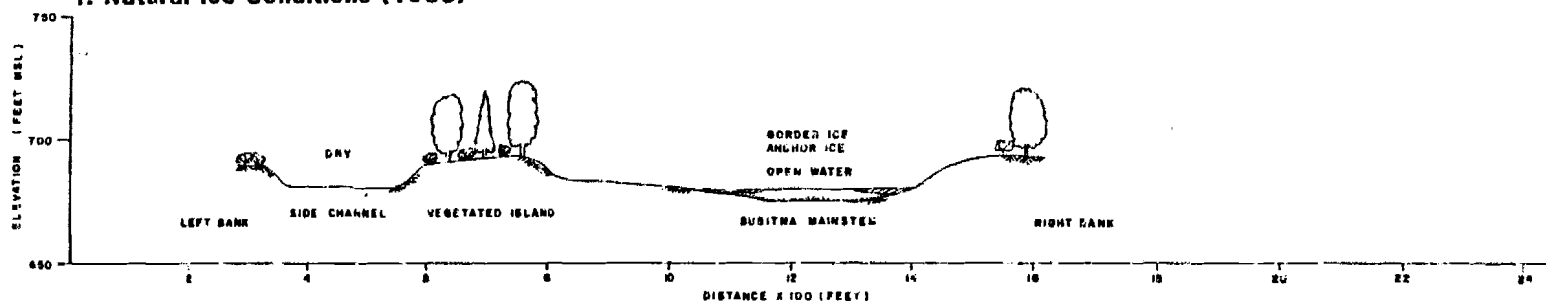
**LRX-40**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 134.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

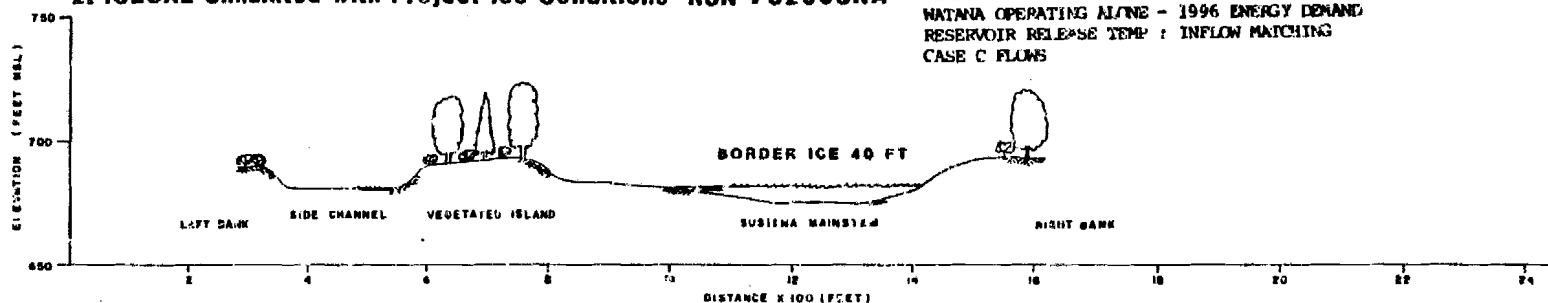
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

1. Natural Ice Conditions (1983)

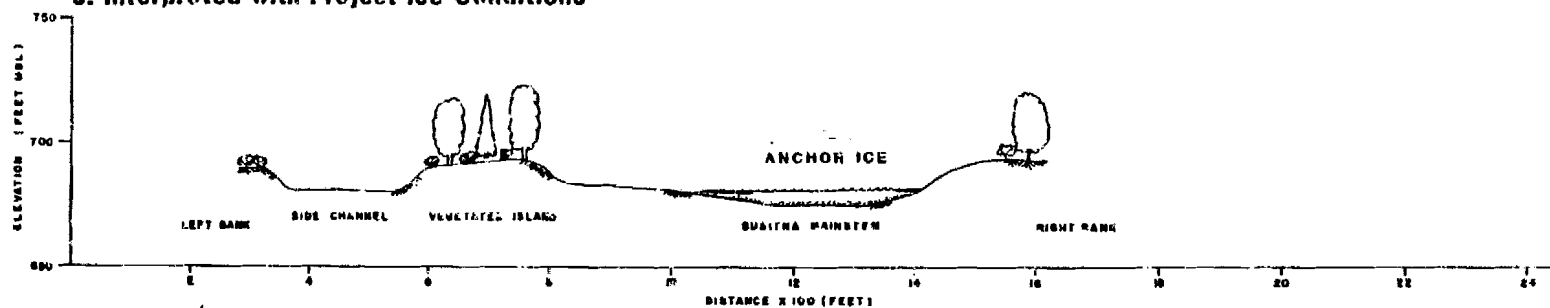


2. ICECAL Simulated with Project Ice Conditions RUN #8298CNA

WINTER 1982-83  
WATNA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-44**

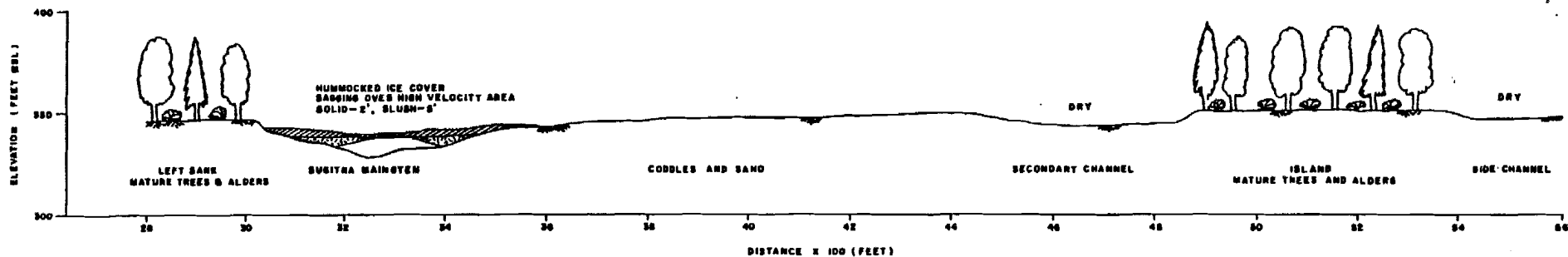
**1980 CROSS SECTION SURVEY**  
**RIVER MILE 136.4**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

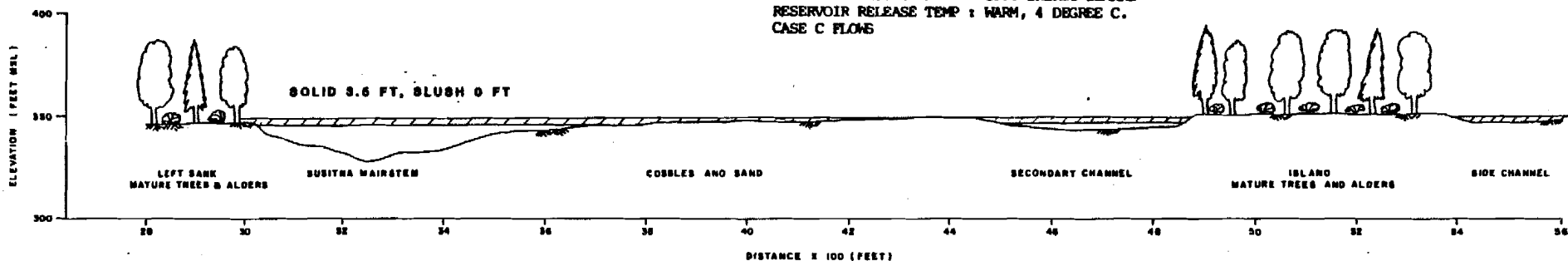
# EXHIBIT X

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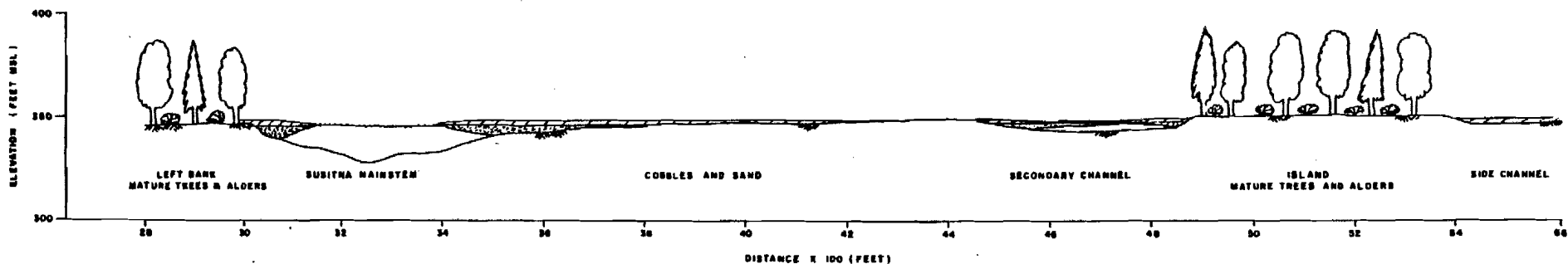


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-3**

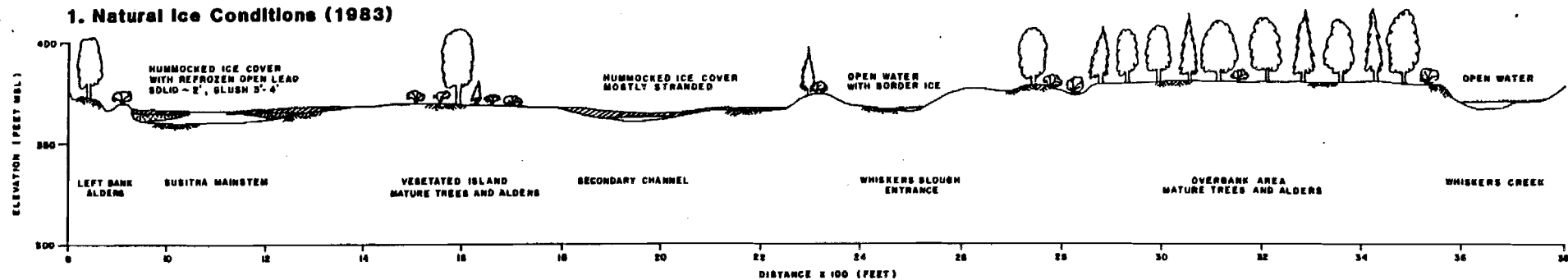
**1982 CROSS SECTION SURVEY**  
**RIVER MILE 98.6**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

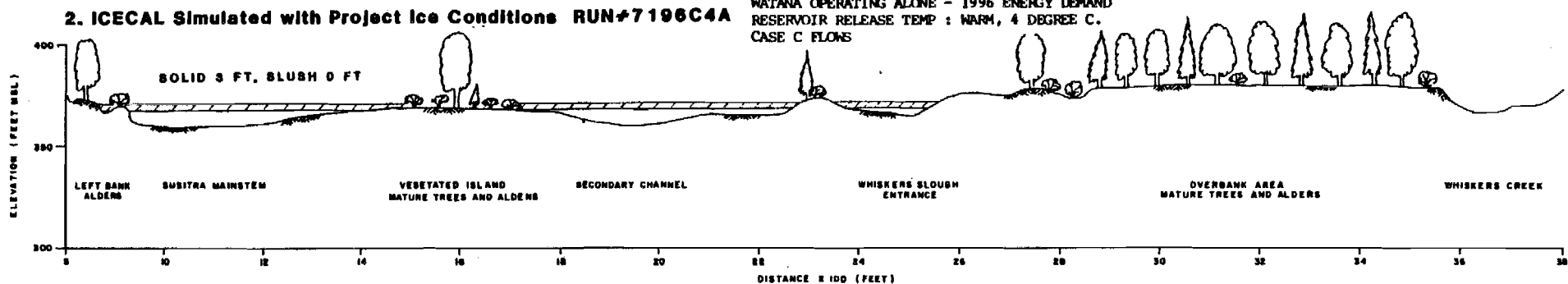


### 1. Natural Ice Conditions (1983)

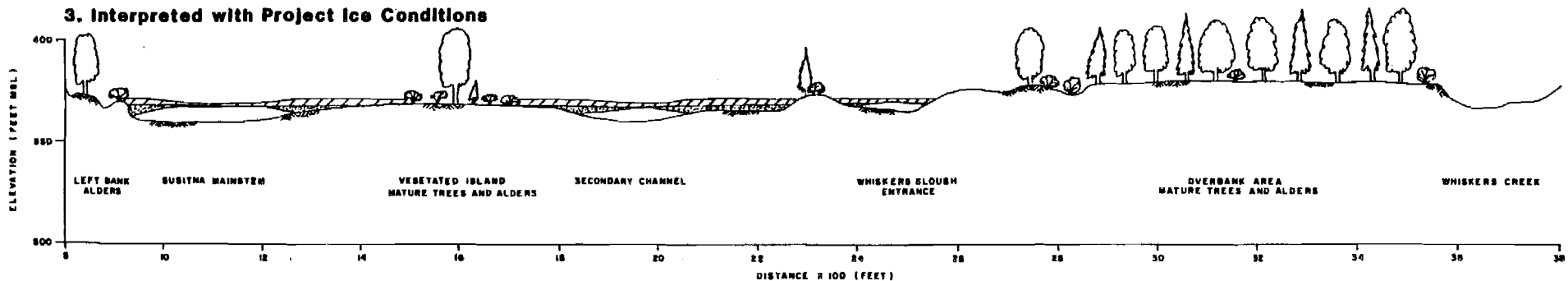


WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : WARM, 4 DEGREE C.  
CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

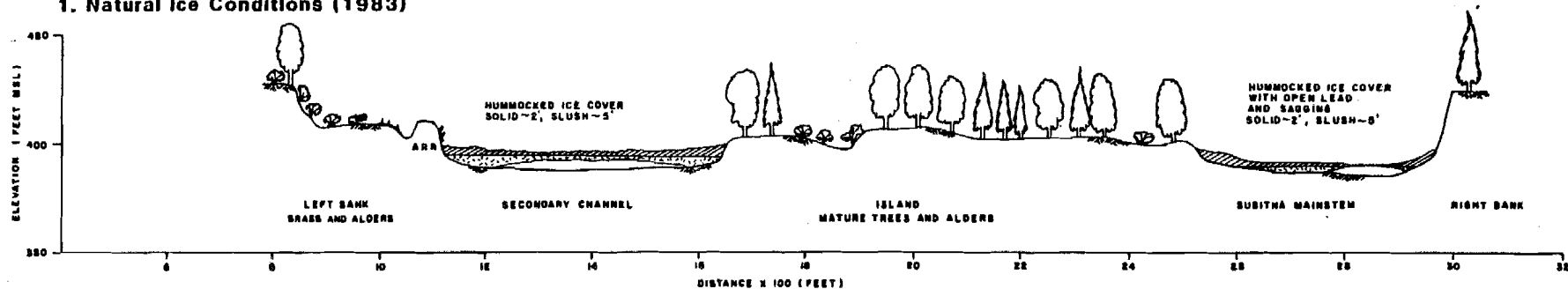
**LRX-7**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 101.5**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

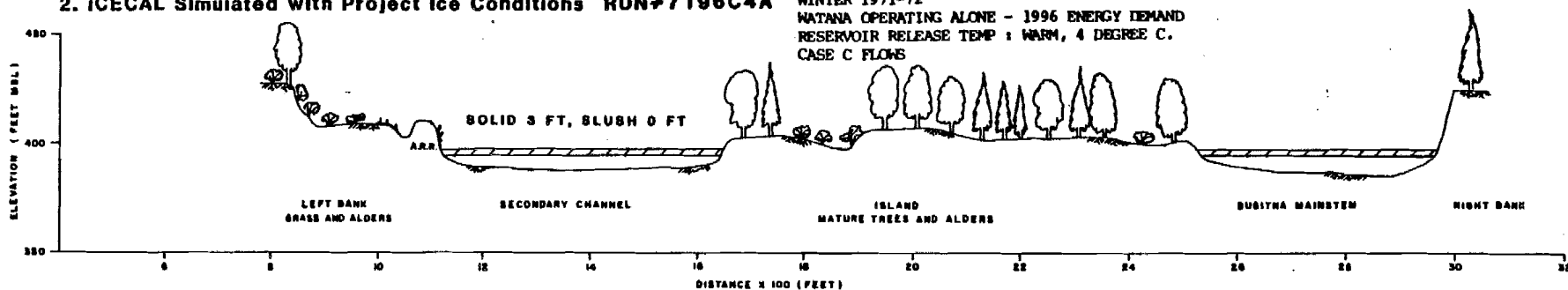
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

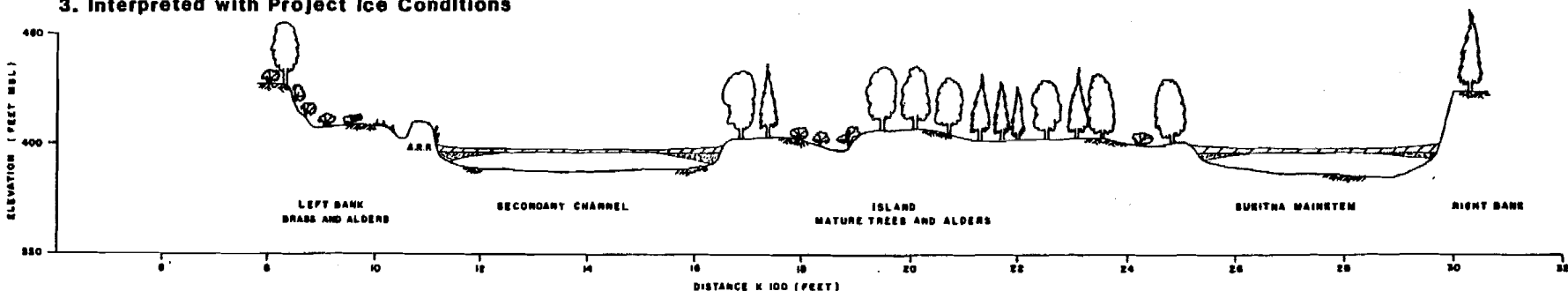


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP: WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

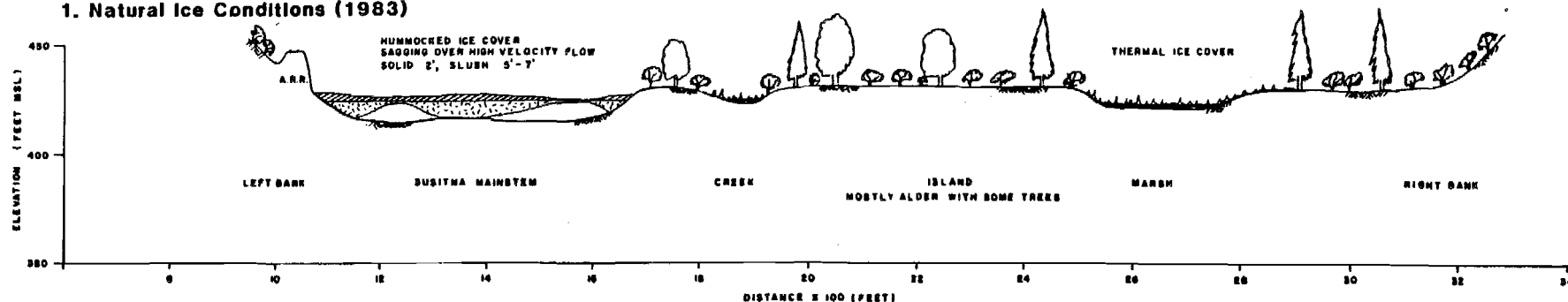
**LRX-10**

**1980 CROSS SECTION SURVEY  
RIVER MILE 104.8  
VERTICAL EXAGGERATION 4:1**

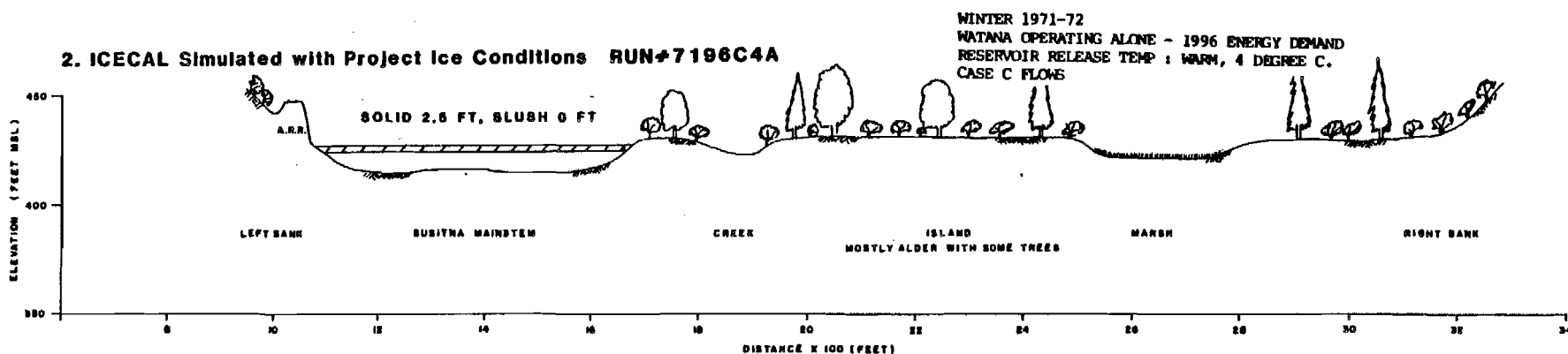
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

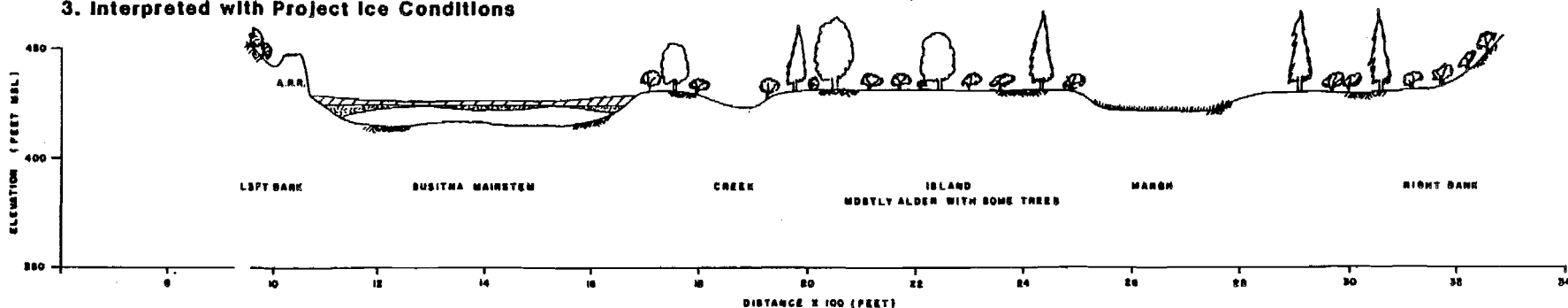
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

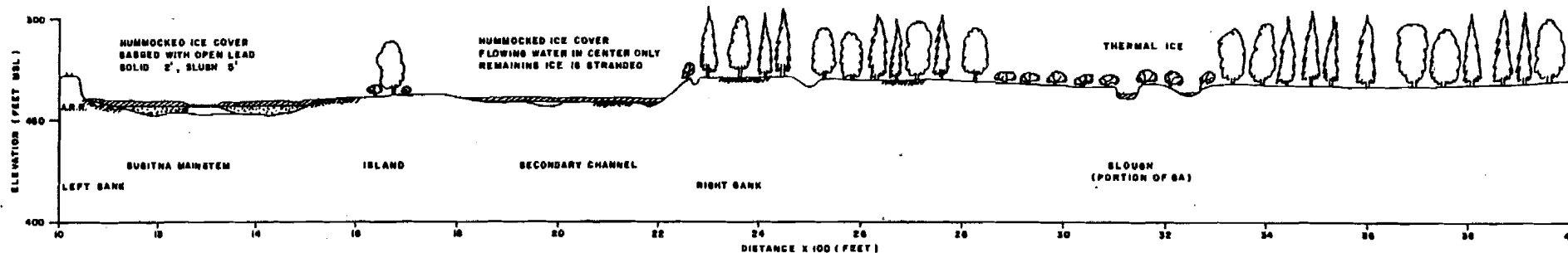
LRX-12

1981 CROSS SECTION SURVEY  
RIVER MILE 108.4  
VERTICAL EXAGGERATION 4:1

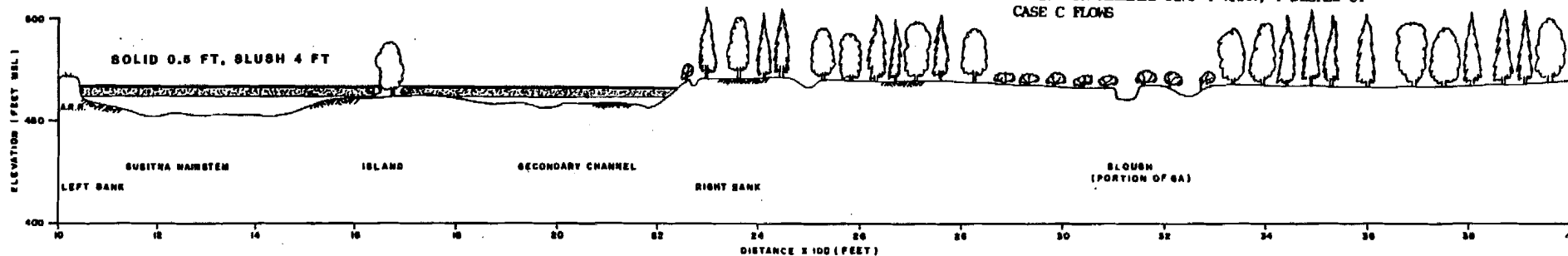
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

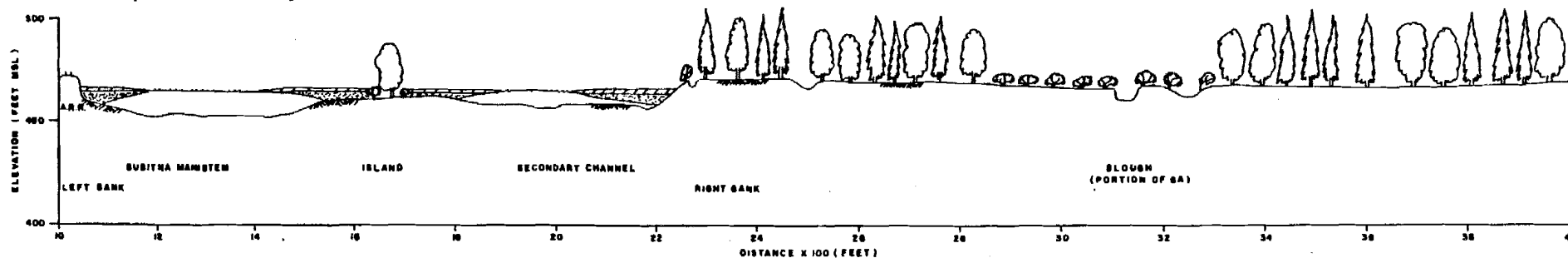
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLGISTS PLANNERS SURVEYORS

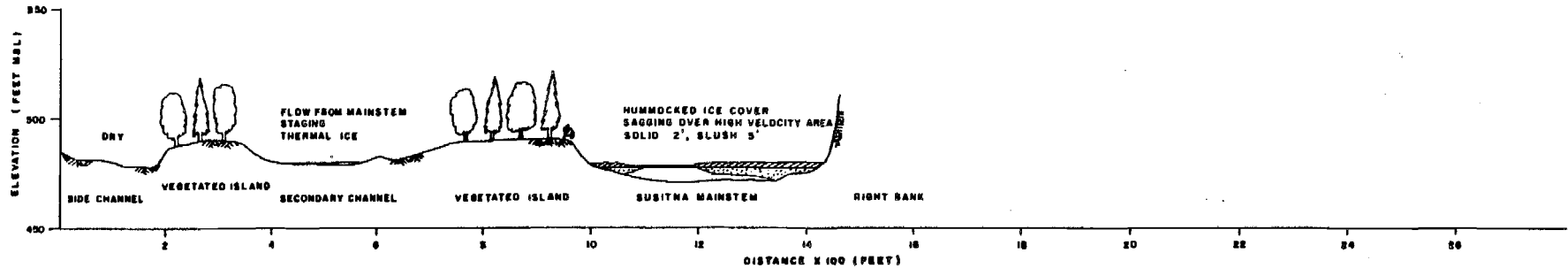
**LRX-17**

**1980 CROSS SECTION SURVEY  
RIVER MILE 112.7  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

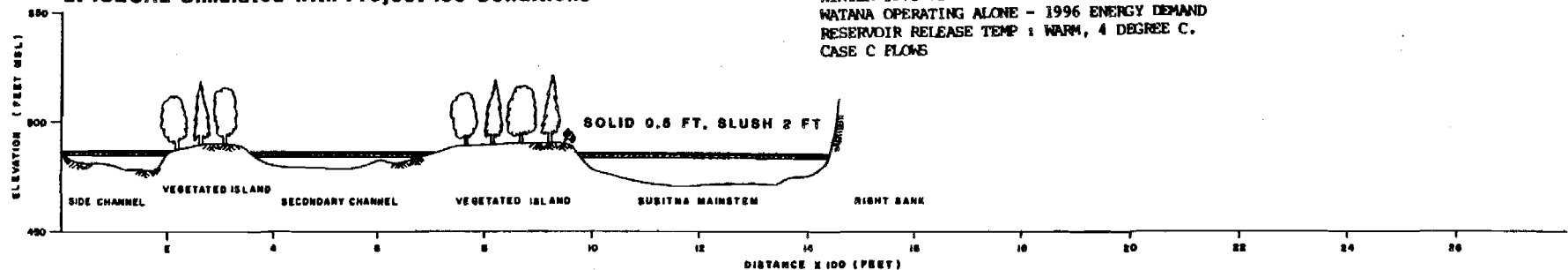
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

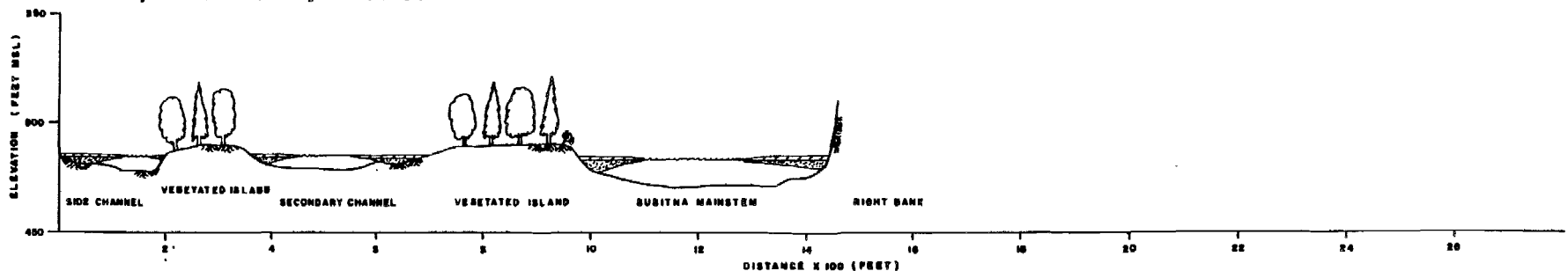


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP: WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

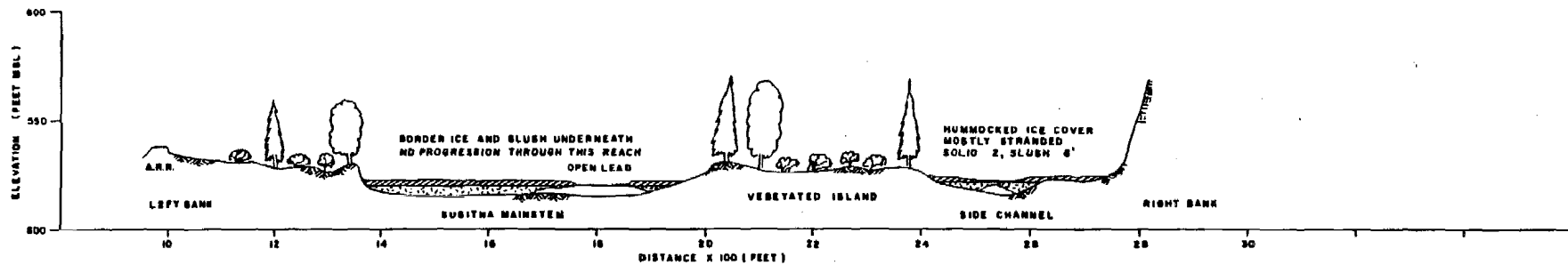
**LRX-18.2**

**1982 CROSS SECTION SURVEY**  
**RIVER MILE 115.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

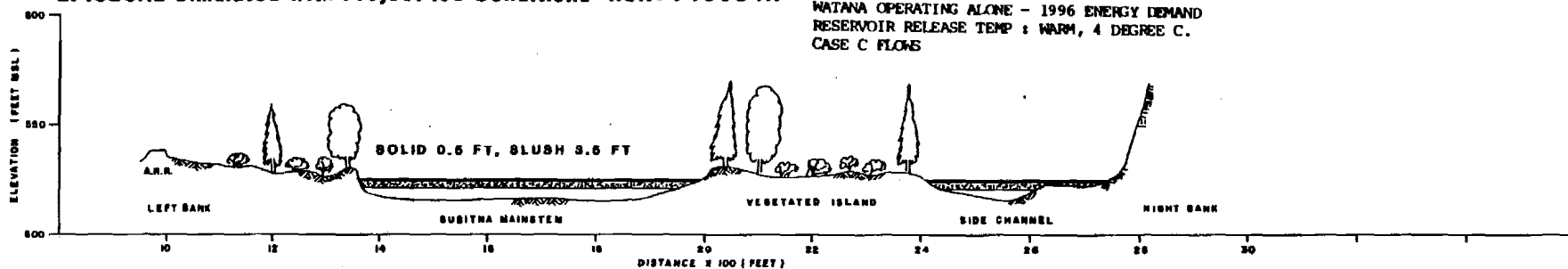
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

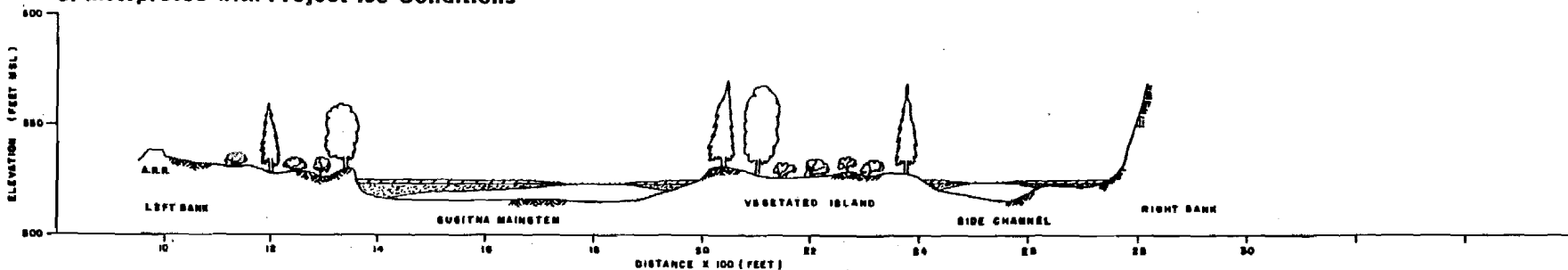


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

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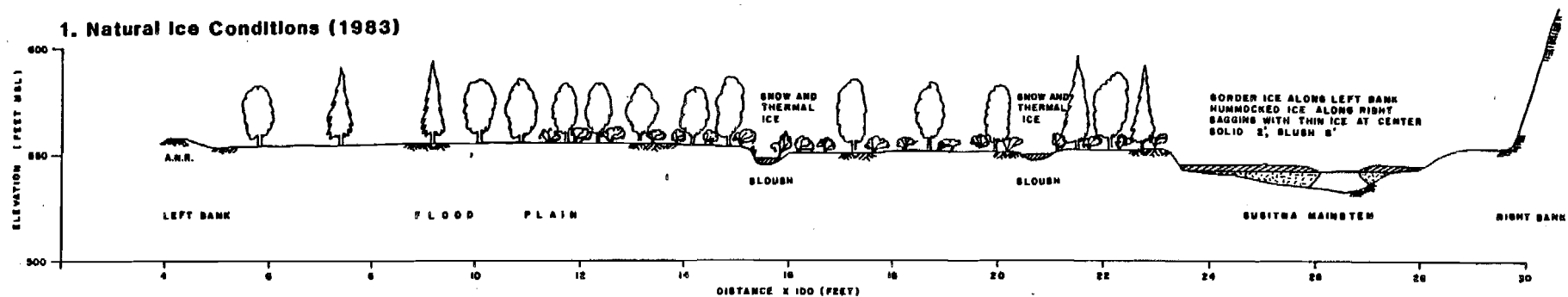
**LRX-23**

1980 CROSS SECTION SURVEY  
RIVER MILE 120.2  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

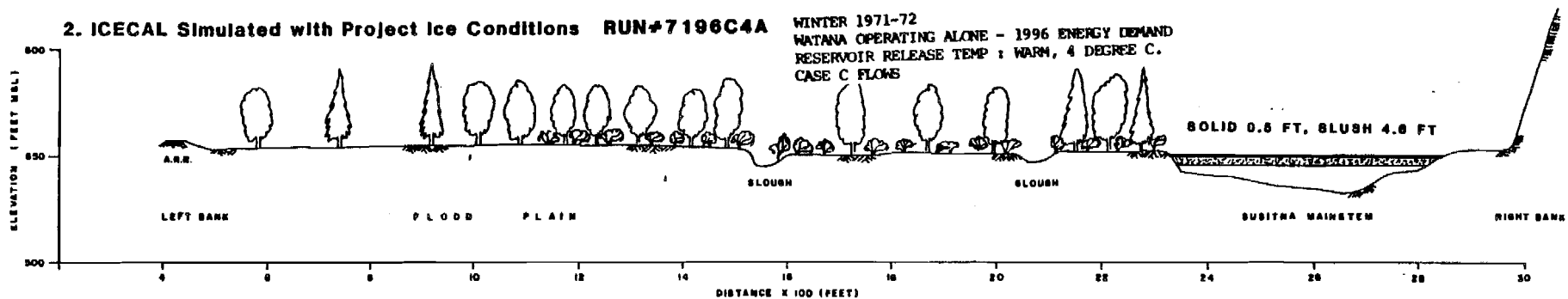
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

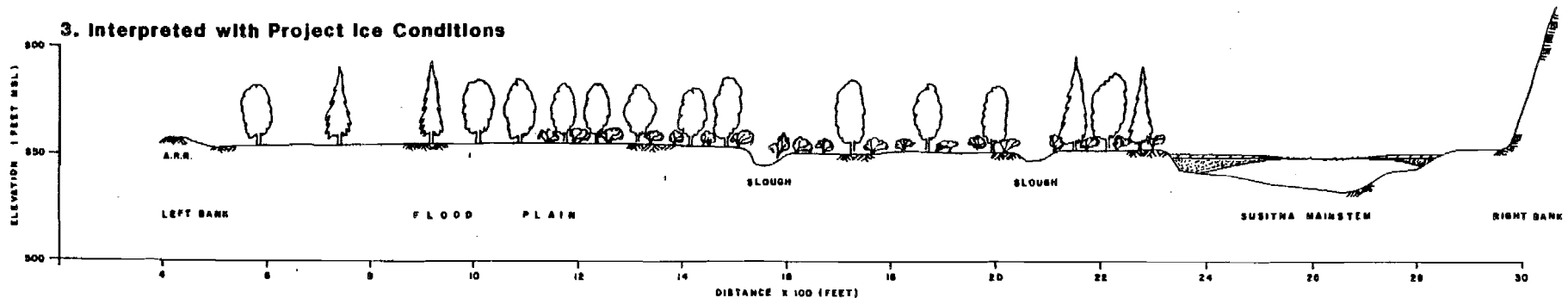


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP: WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



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ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

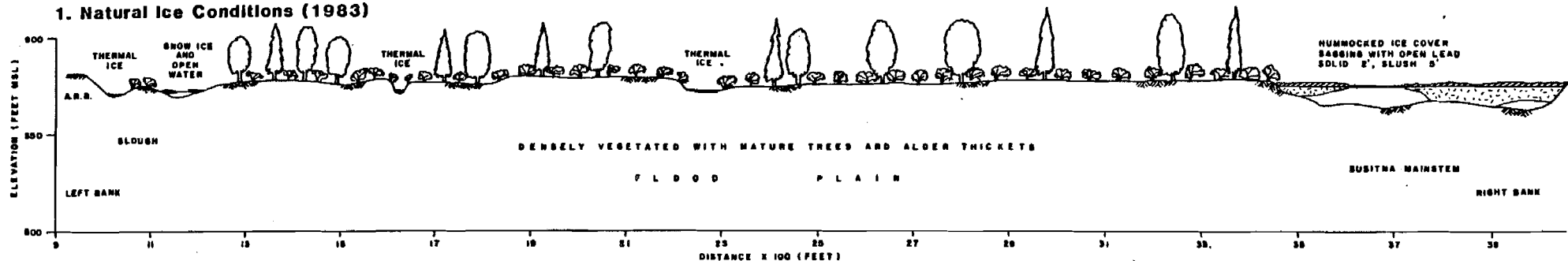
**LRX -27**

**1980 CROSS SECTION SURVEY**  
RIVER MILE 123.3  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

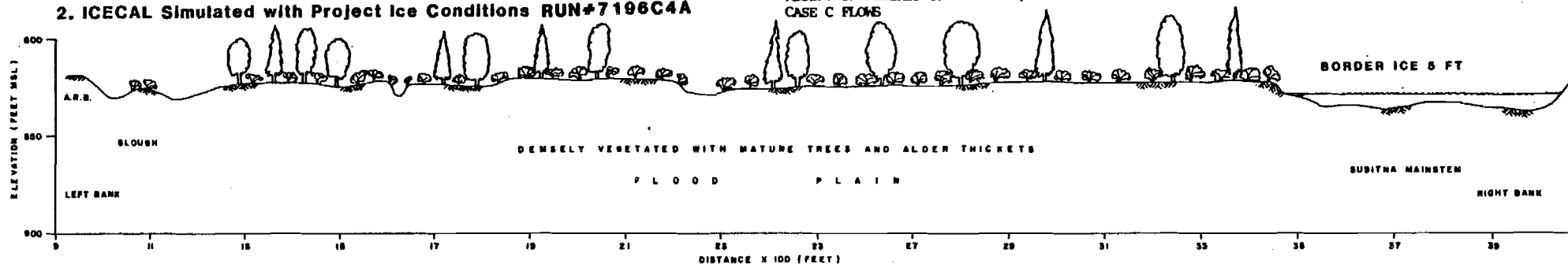
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

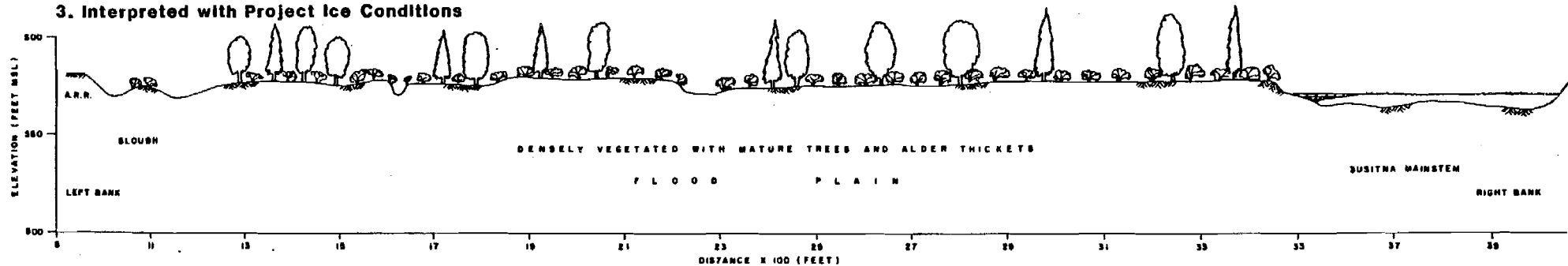


WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : WARM, 4 DEGREE C.  
CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

LRX-29

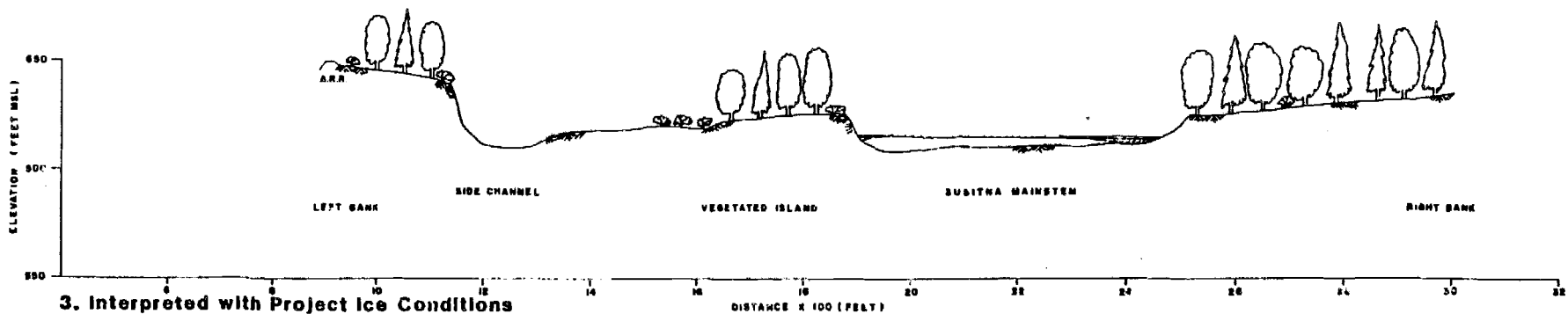
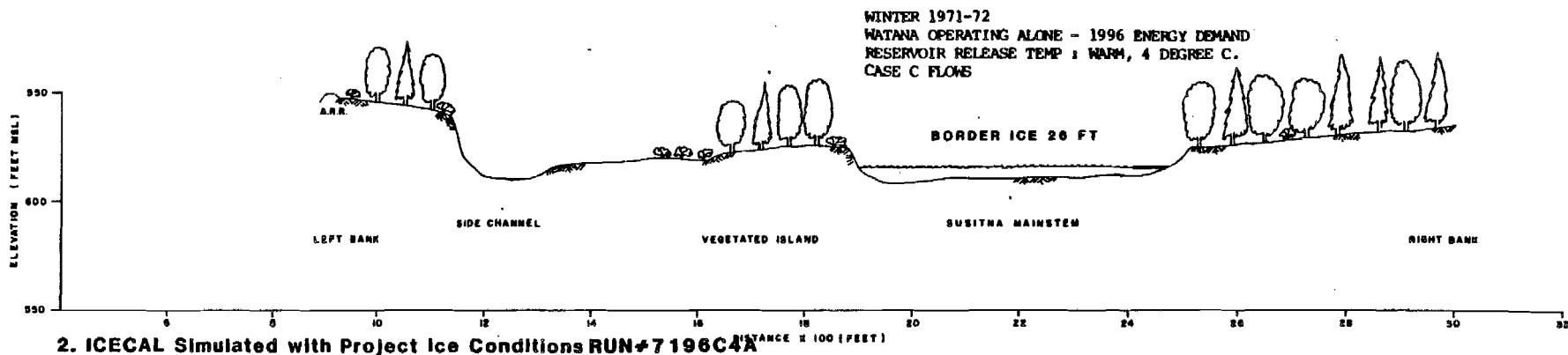
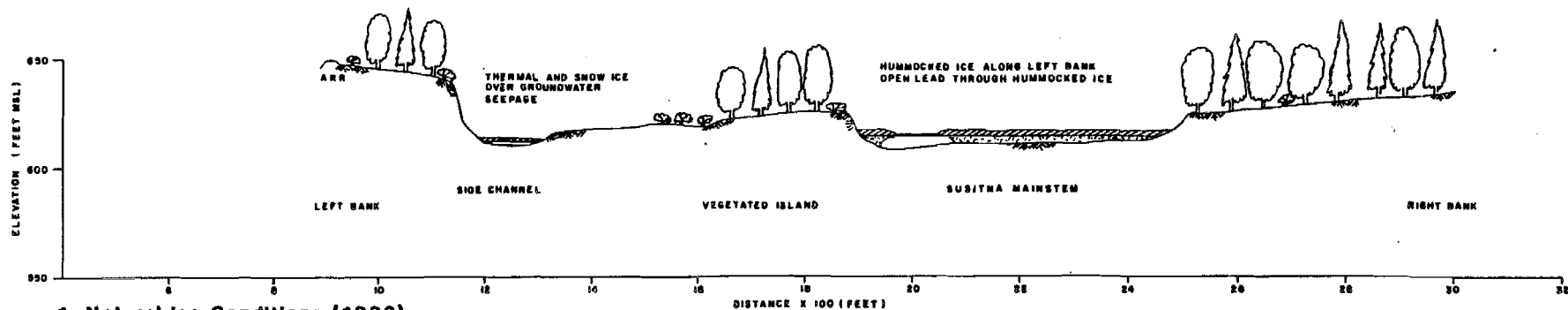
1980 CROSS SECTION SURVEY  
RIVER MILE 126.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

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PREPARED BY:

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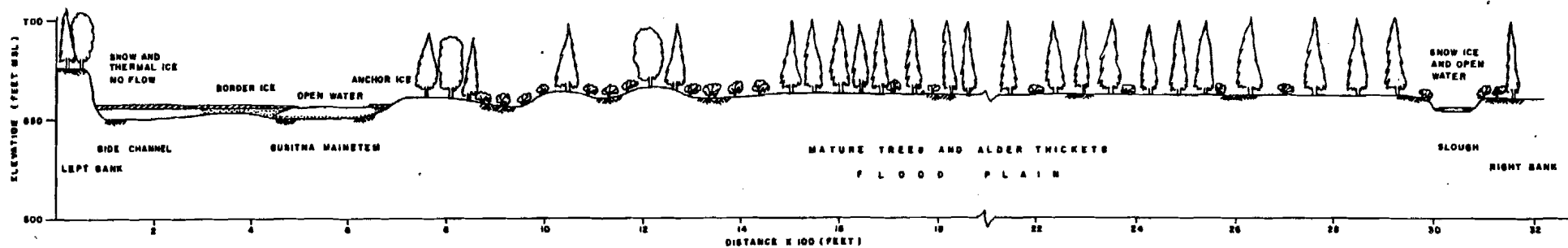
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**1980 CROSS SECTION SURVEY**  
**RIVER MILE 130.3**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

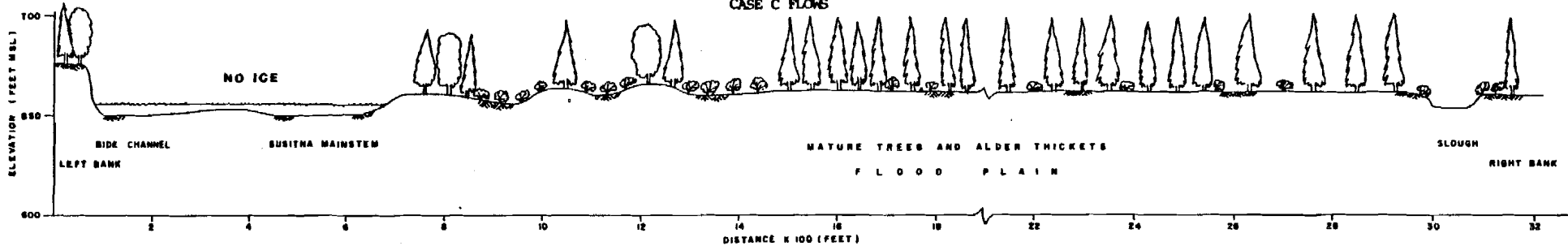
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

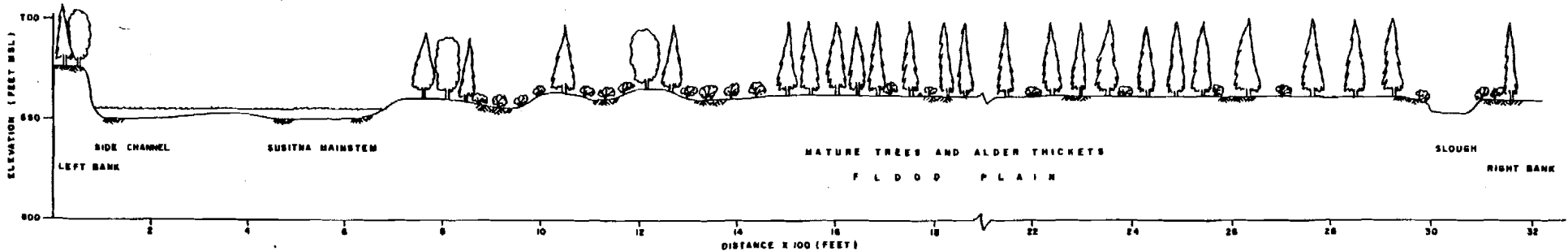


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP: WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

LRX-40

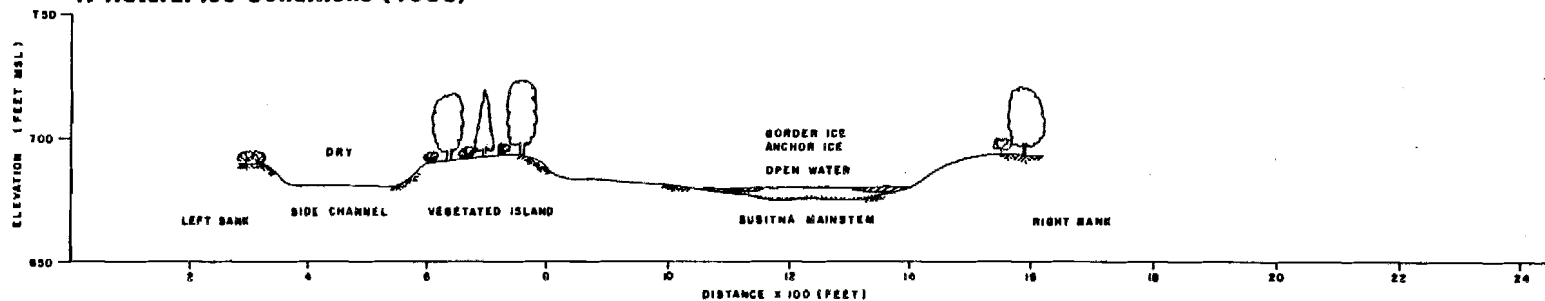
1980 CROSS SECTION SURVEY  
RIVER MILE 134.2  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

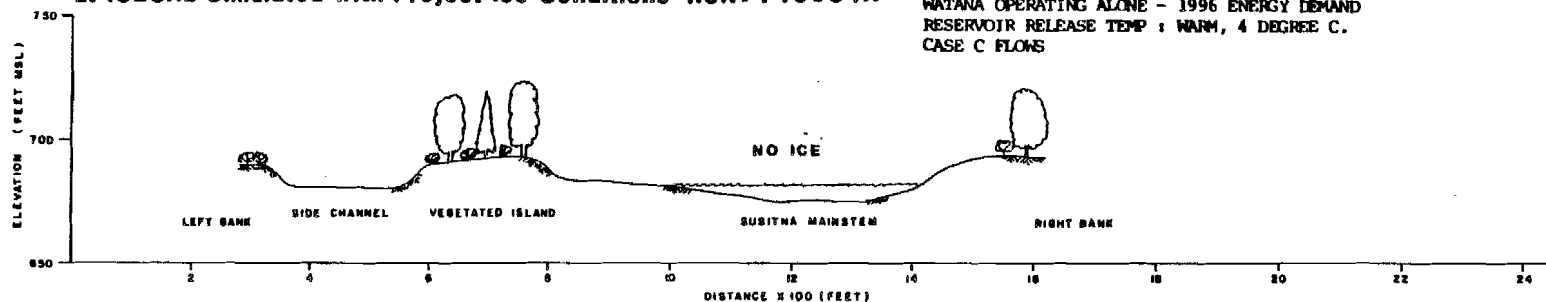
**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

### 1. Natural Ice Conditions (1983)

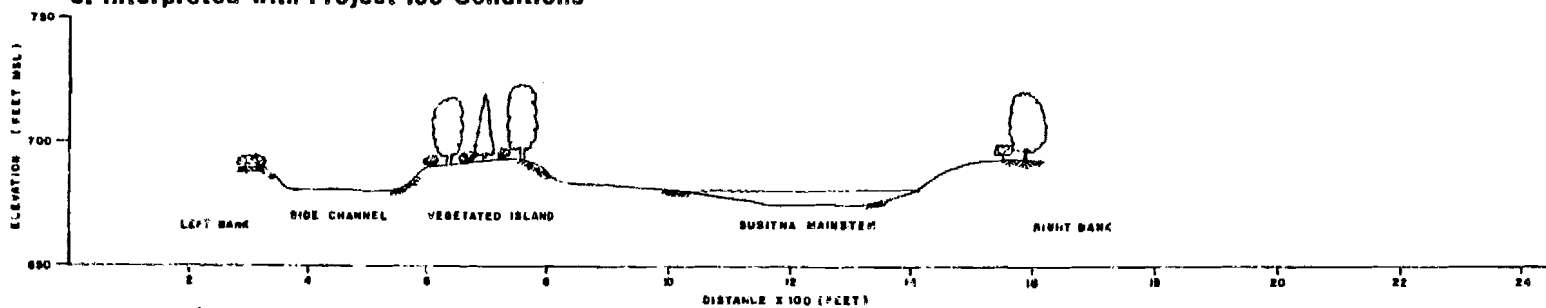


### 2. ICECAL Simulated with Project Ice Conditions RUN#7196C4A

WINTER 1971-72  
WATANA OPERATING ALONE - 1996 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : WARM, 4 DEGREE C.  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



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**LRX-44**

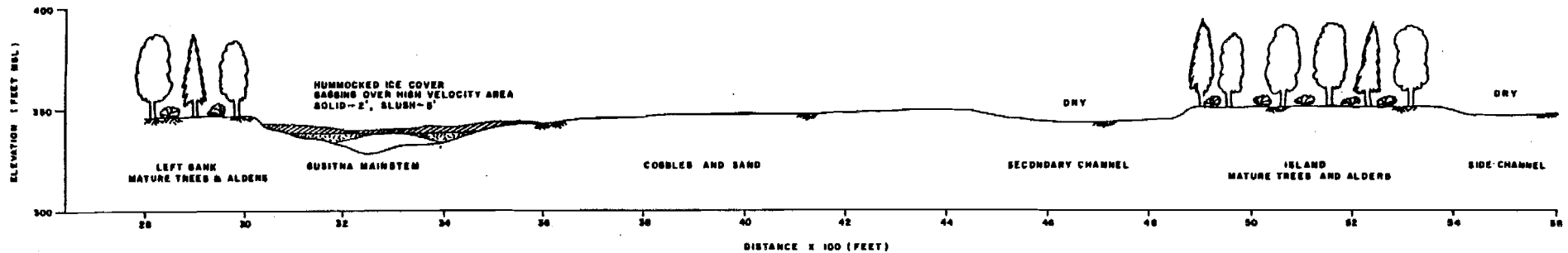
1980 CROSS SECTION SURVEY  
RIVER MILE 136.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

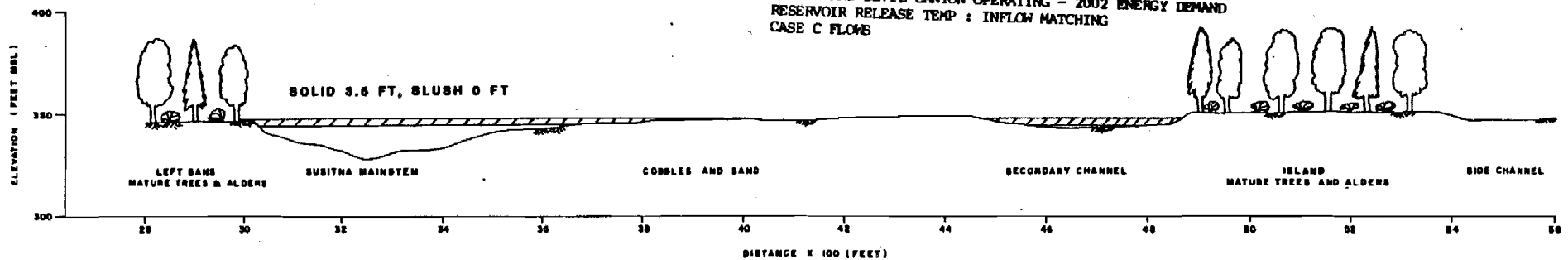
# EXHIBIT Y

### 1. Natural Ice Conditions (1983)

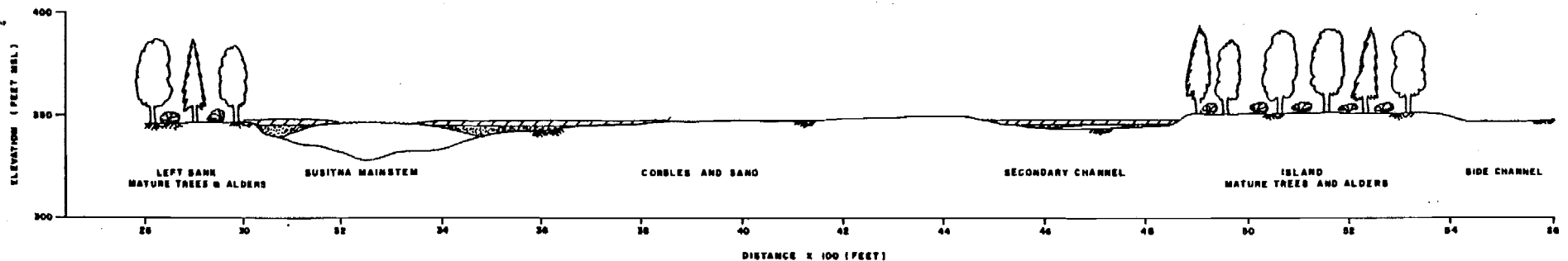


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

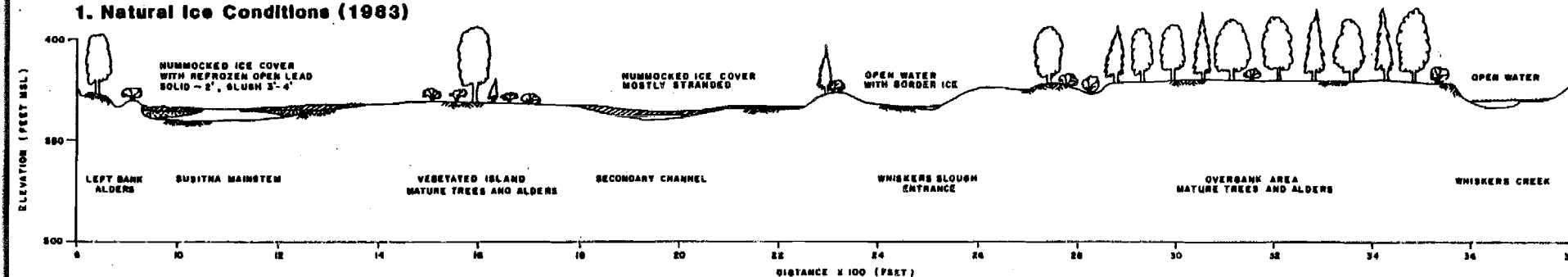
**LRX-3**

1982 CROSS SECTION SURVEY  
RIVER MILE 98.6  
VERTICAL EXAGGERATION 4:1

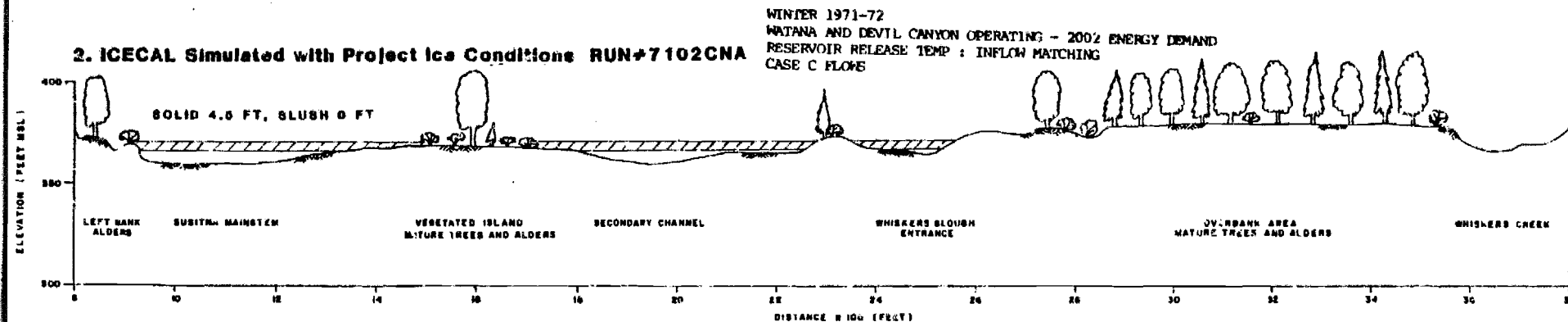
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

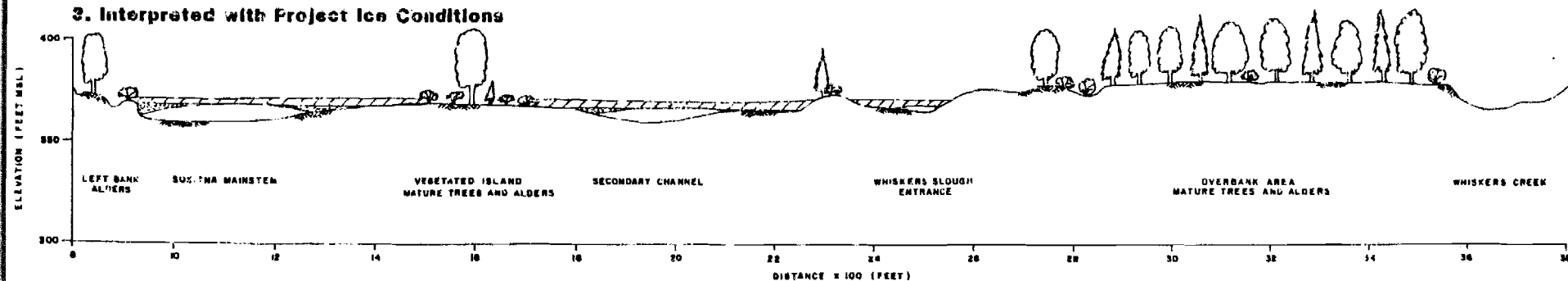
# 1. Natural Ice Conditions (1983)



# 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA



# 3. Interpreted with Project Ice Conditions



PREPARED BY:

**REM CONSULTANTS, INC.**  
ENGINEERS, ARCHITECTS, PLANNERS, SURVEYORS

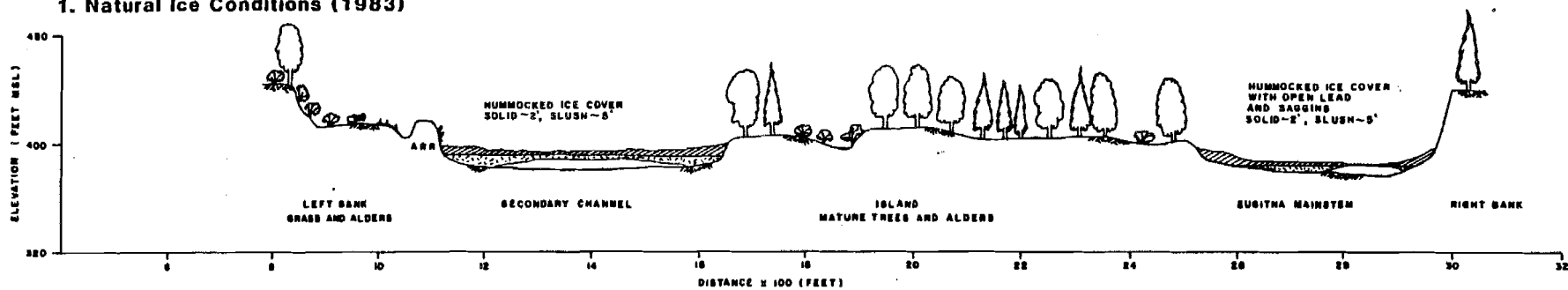
**LRX-7**

**1980 CROSS SECTION SURVEY**  
RIVER MILE 101.5  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

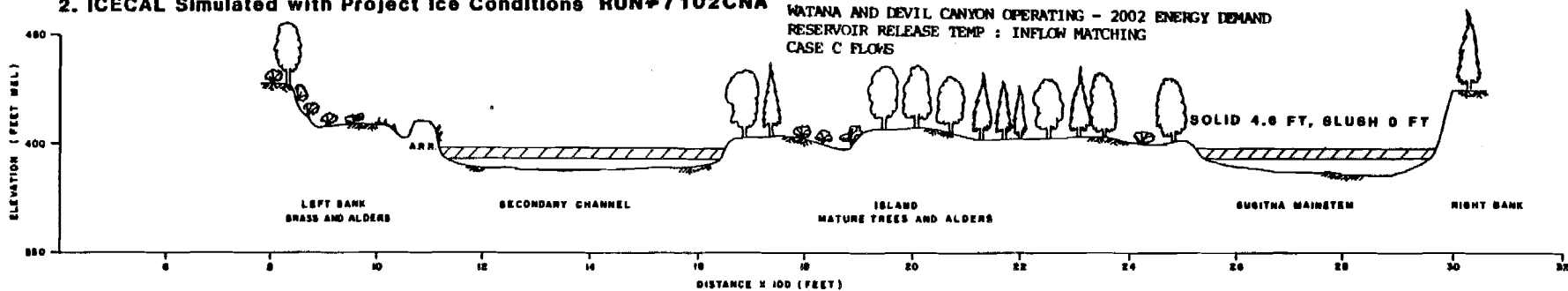
**HARZA-EBASCO**  
SIBITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

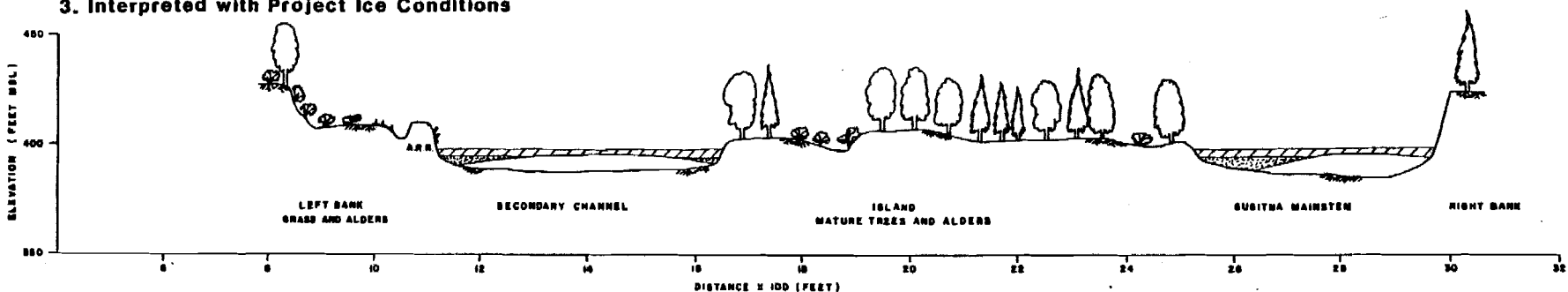


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
MATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

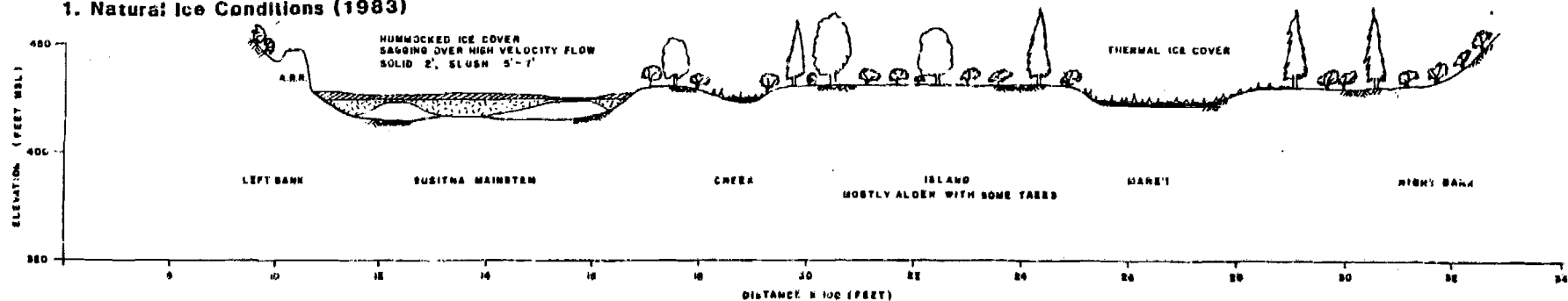
**LRX-10**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 104.8**  
**VERTICAL EXAGGERATION 4:1**

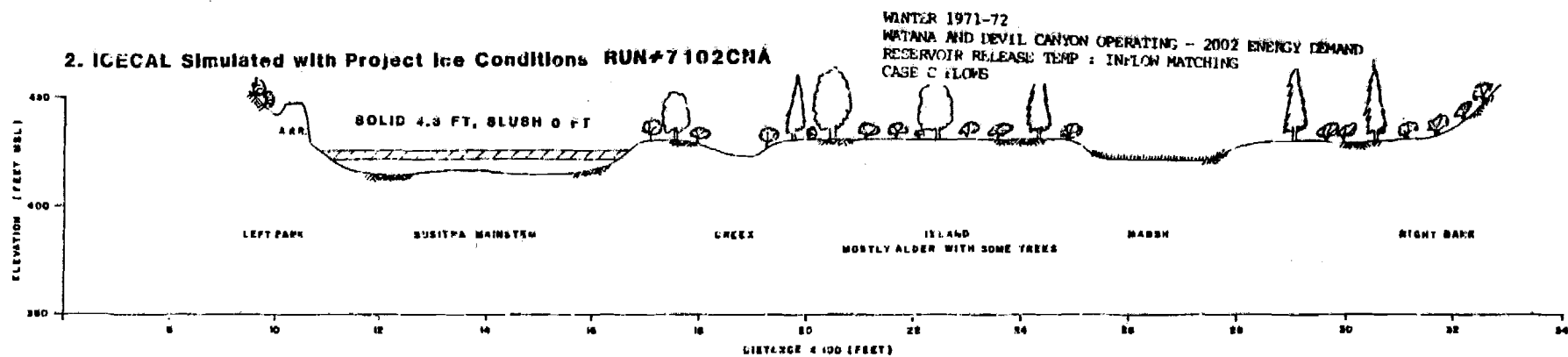
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

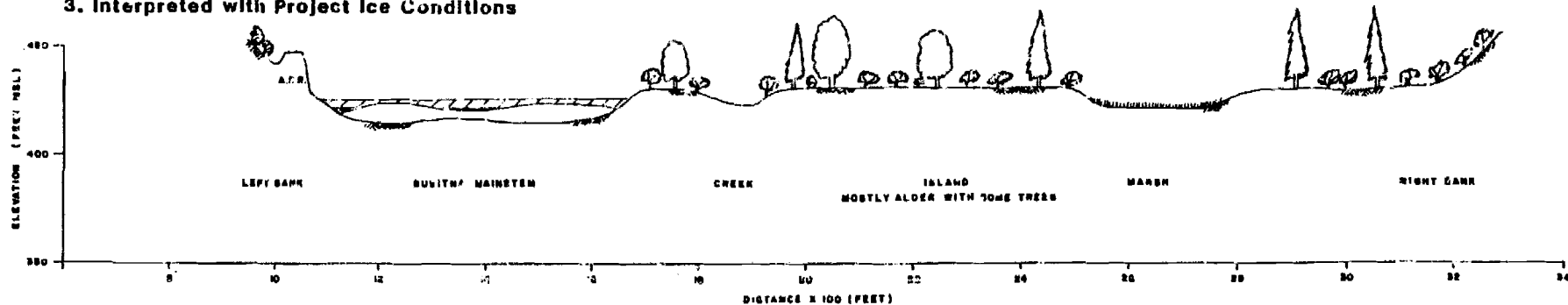
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**REM**  
REM CONSULTANTS, INC.  
ENGINEERING GEOLOGISTS PLANNING SURVEYORS

**LRX-12**

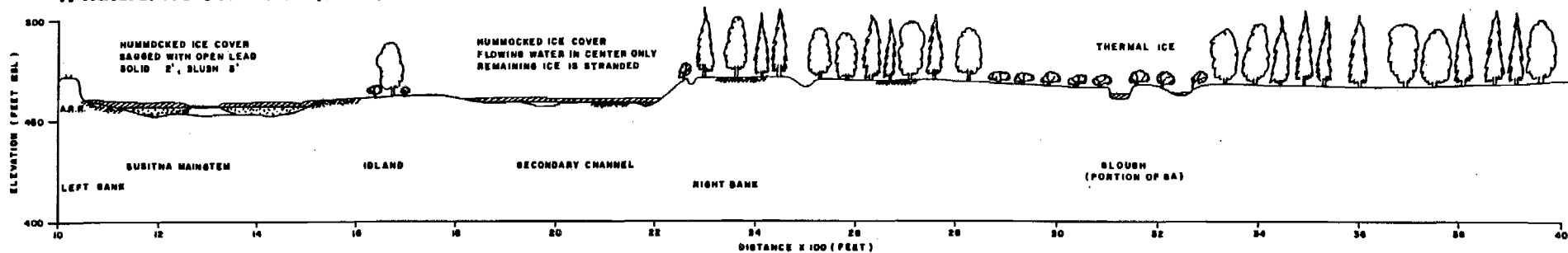
1981 CROSS SECTION SURVEY  
RIVER MILE 100.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

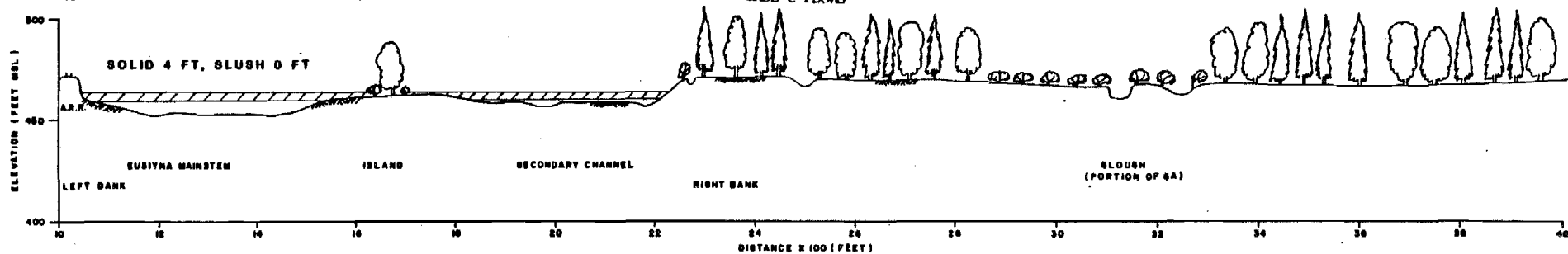


### 1. Natural Ice Conditions (1983)

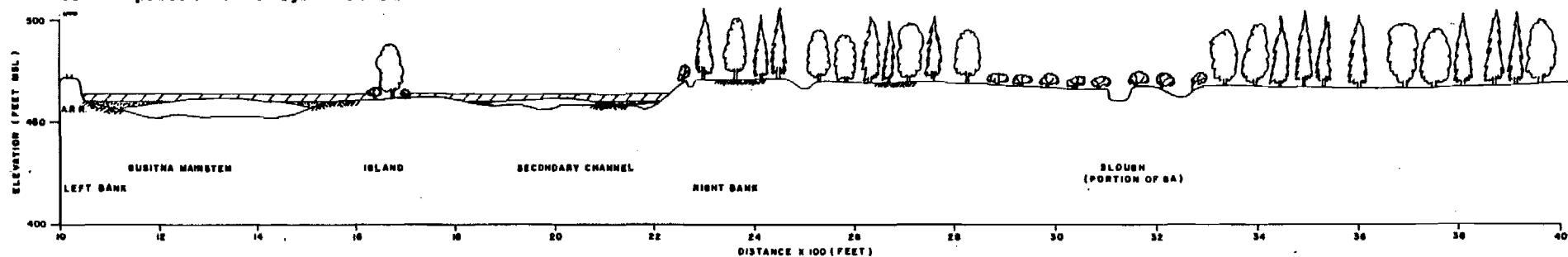


WINTER 1971-72  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

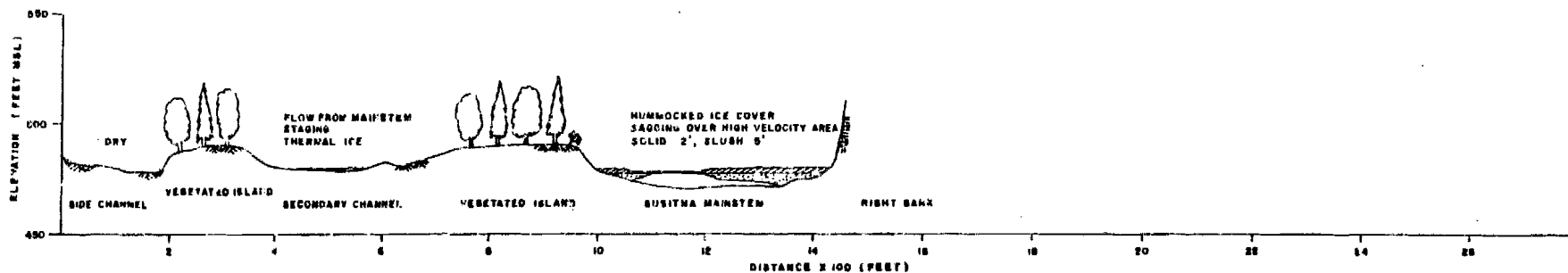
**LRX-17**

**1980 CROSS SECTION SURVEY  
RIVER MILE 112.7  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

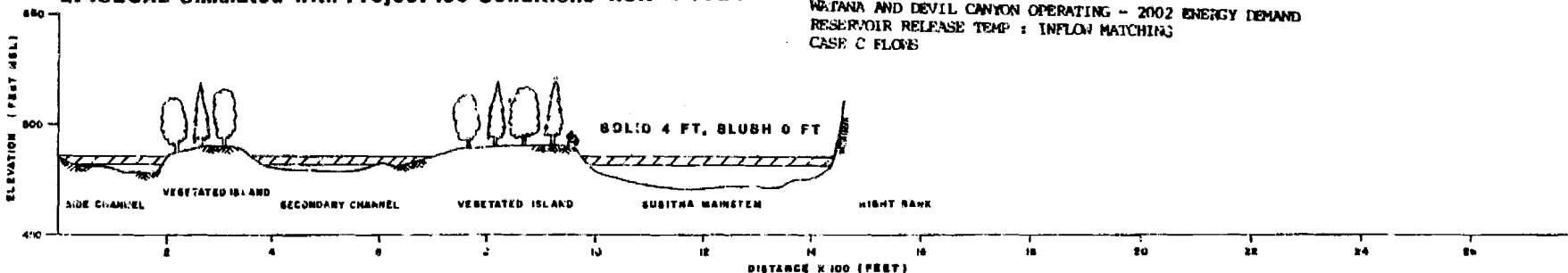
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

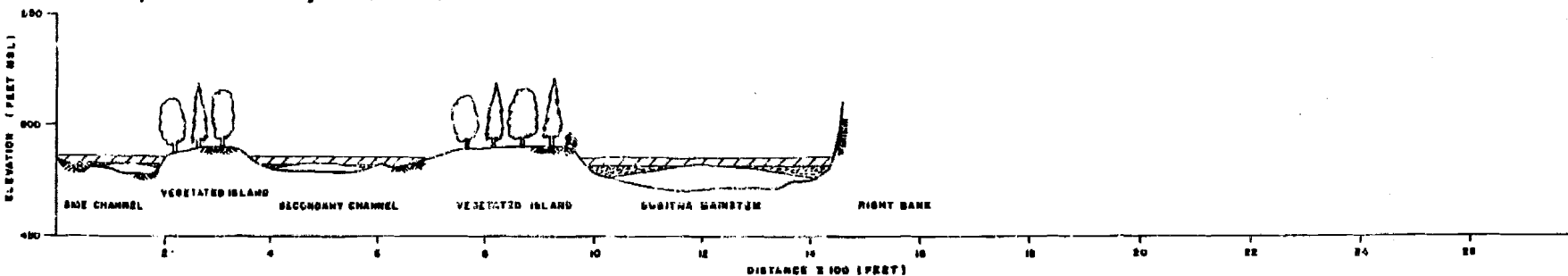


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

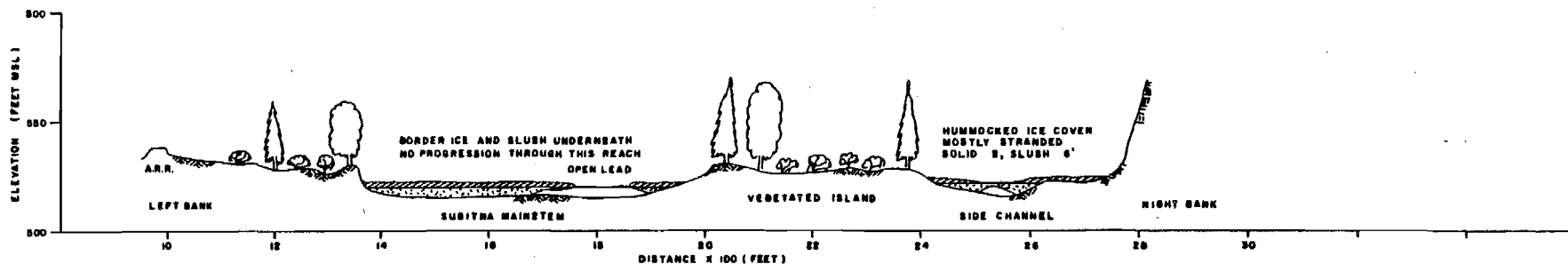
**LRX-18.2**

1982 CROSS SECTION SURVEY  
RIVER MILE 115.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

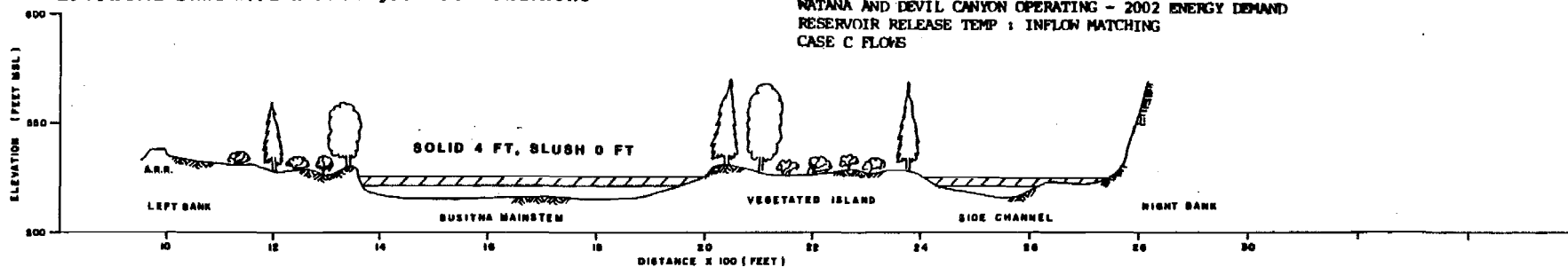
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

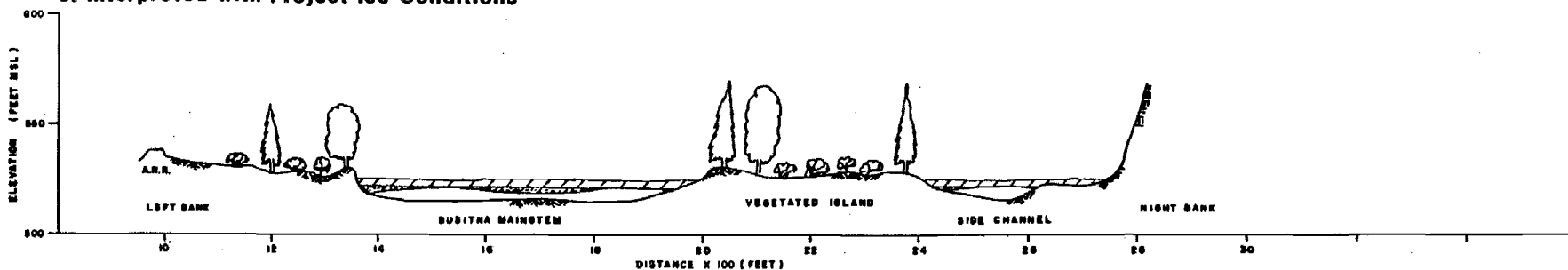


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
NATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

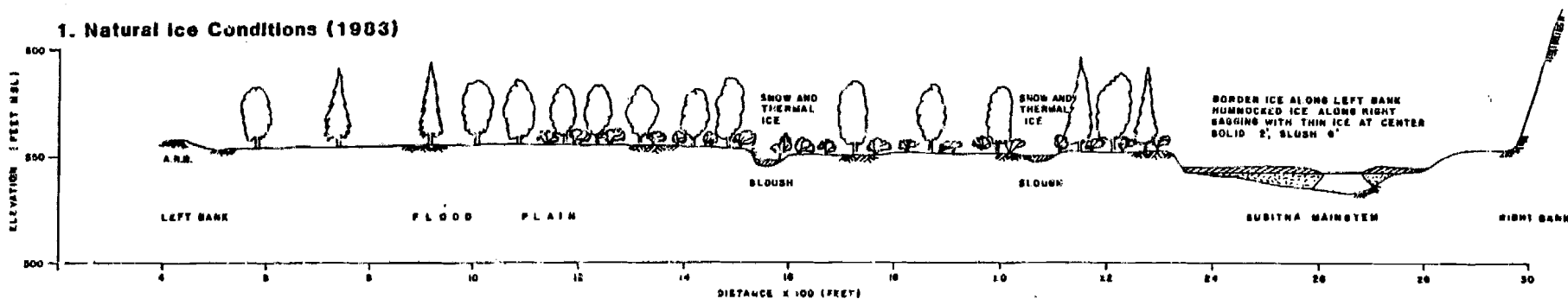
**LRX-23**

**1980 CROSS SECTION SURVEY  
RIVER MILE 120.2  
VERTICAL EXAGGERATION 4:1**

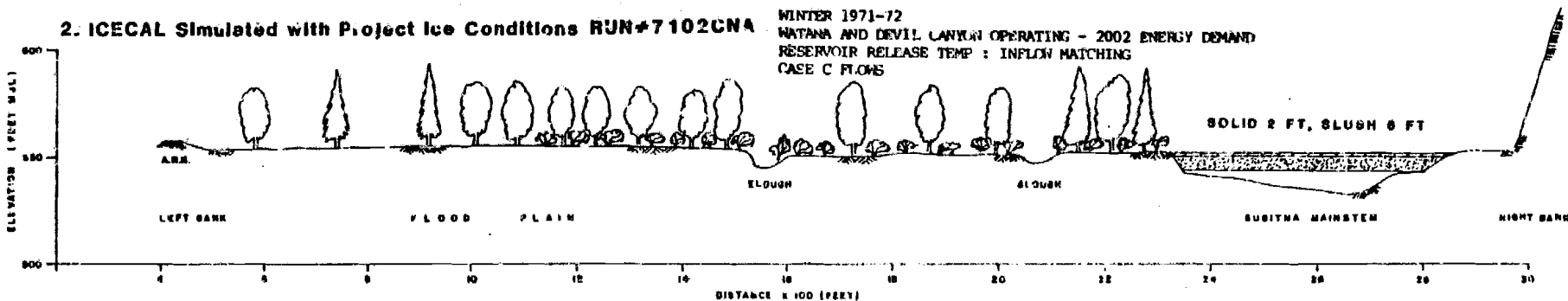
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

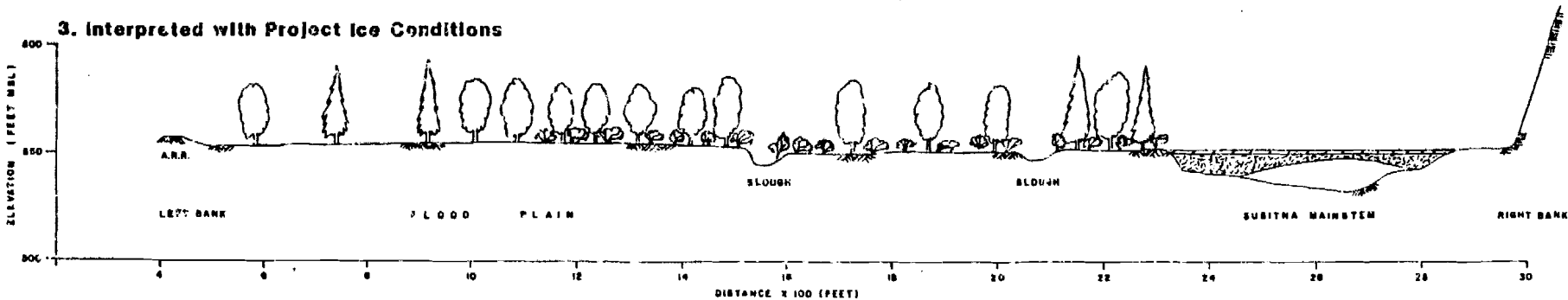
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RCM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

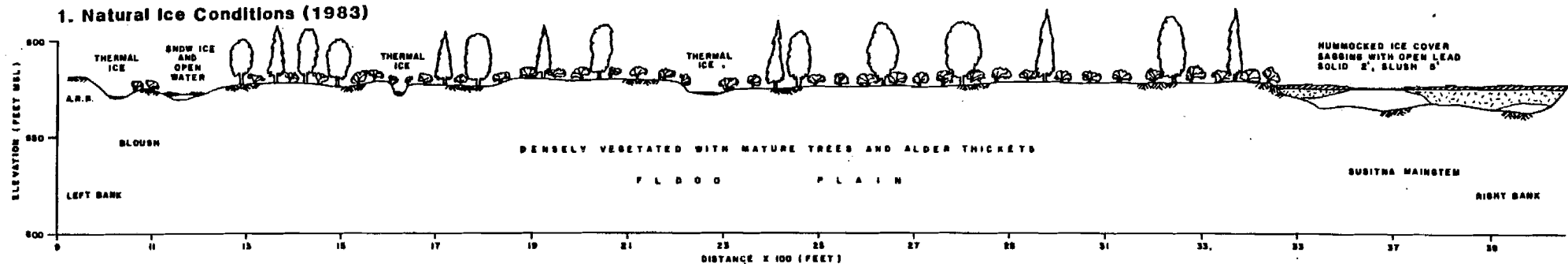
**LRX -27**

1980 CROSS SECTION SURVEY  
RIVER MILE 123.3  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

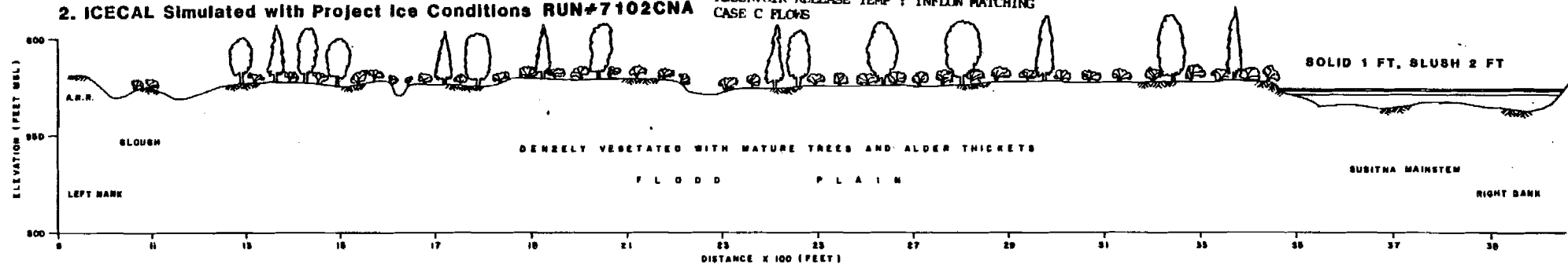
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

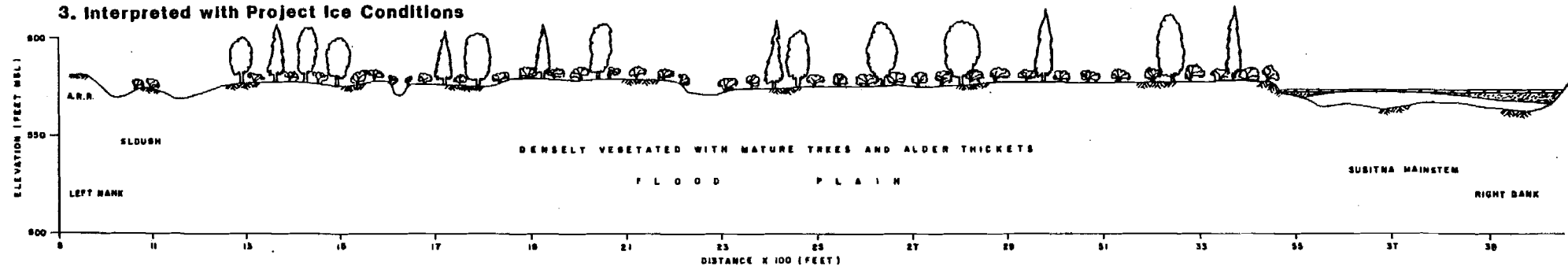


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

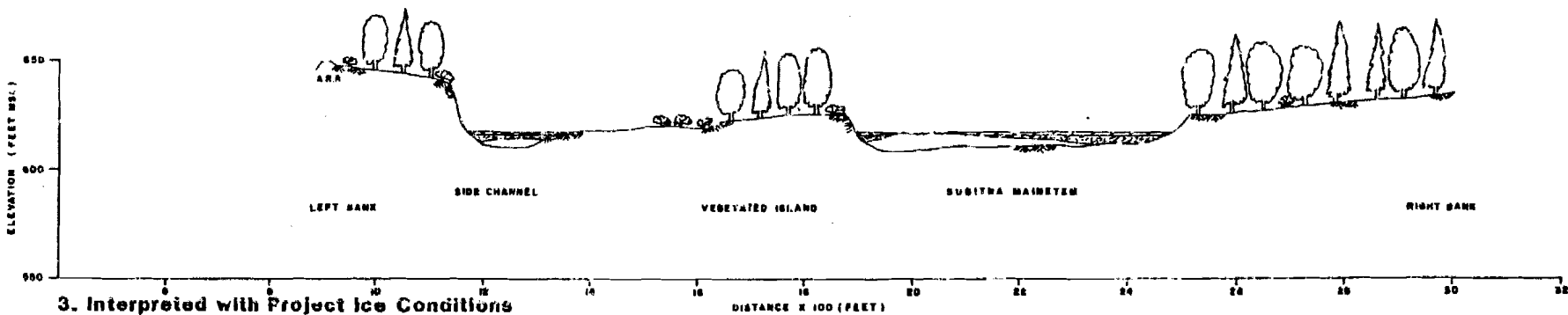
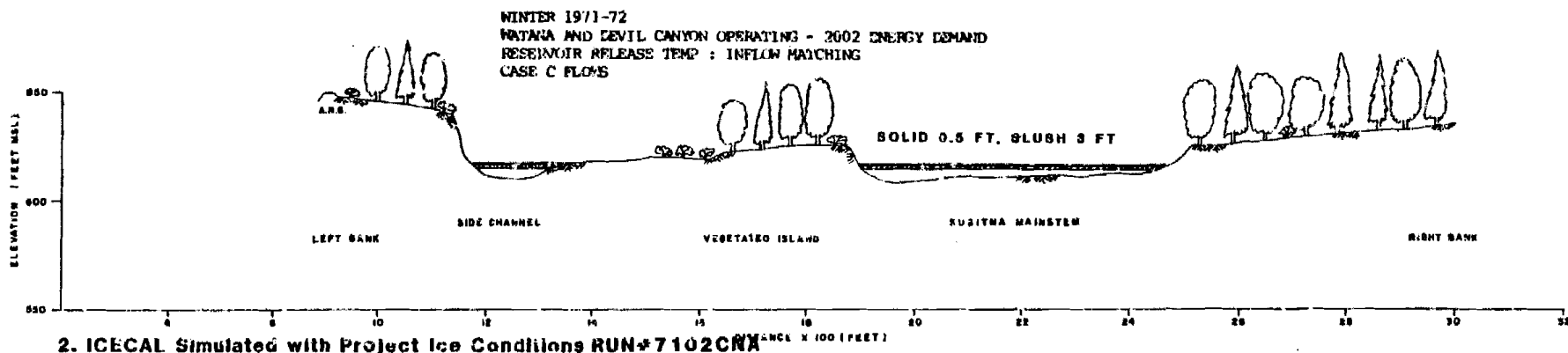
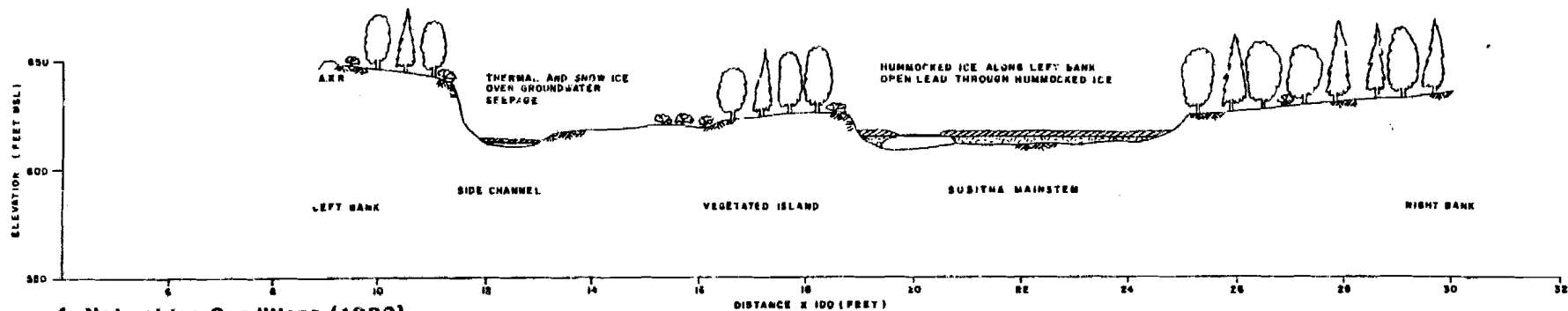
LRX-29

1980 CROSS SECTION SURVEY  
RIVER MILE 126.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

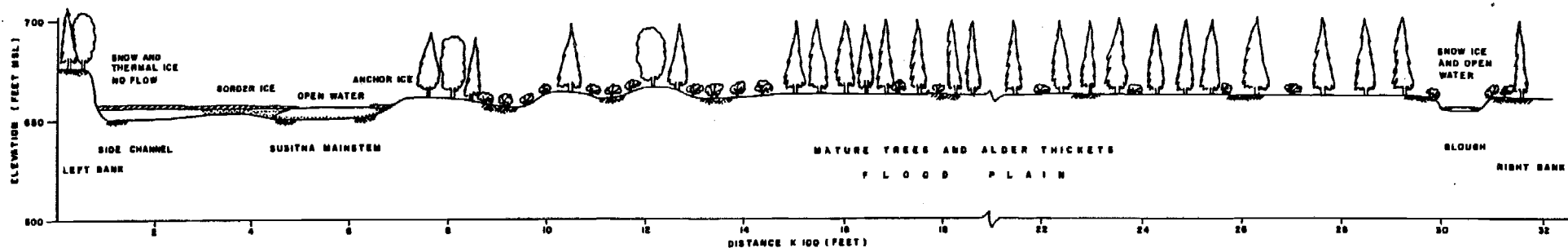
**LRX-34**

1980 CROSS SECTION SURVEY  
RIVER MILE 130.5  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

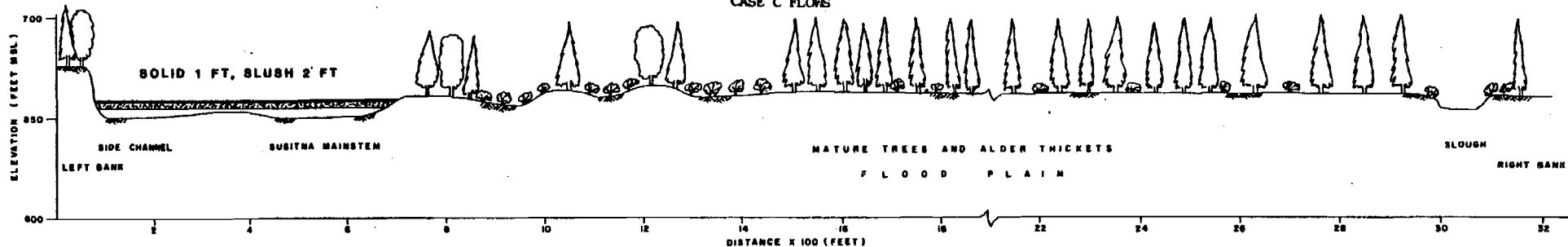
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

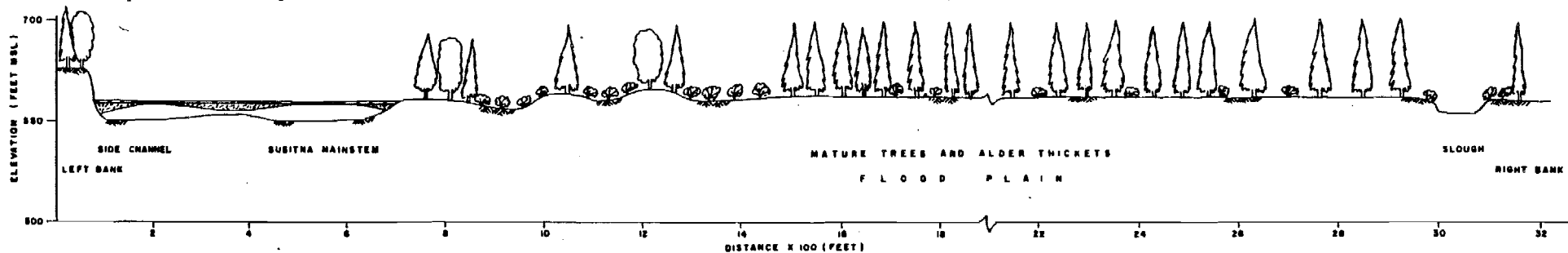


WINTER 1971-72  
 WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

LRX-40

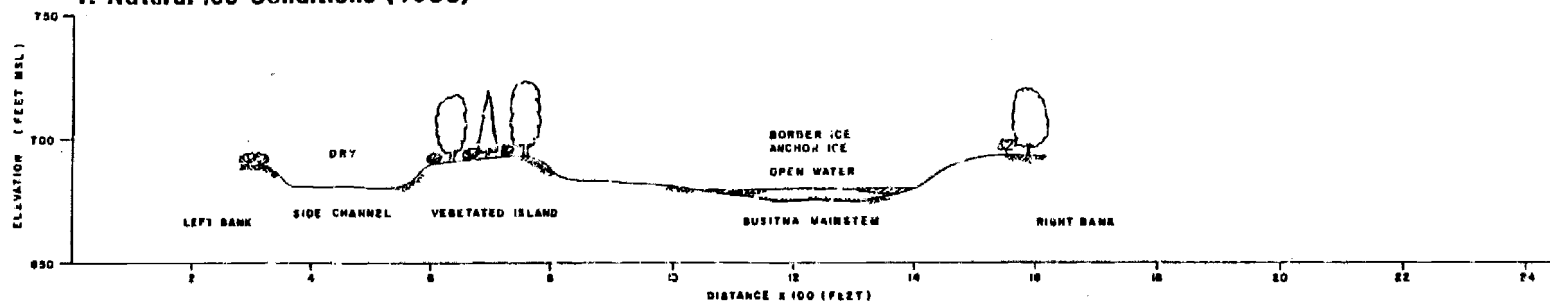
1980 CROSS SECTION SURVEY  
 RIVER MILE 134.2  
 VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
 SUSITNA JOINT VENTURE

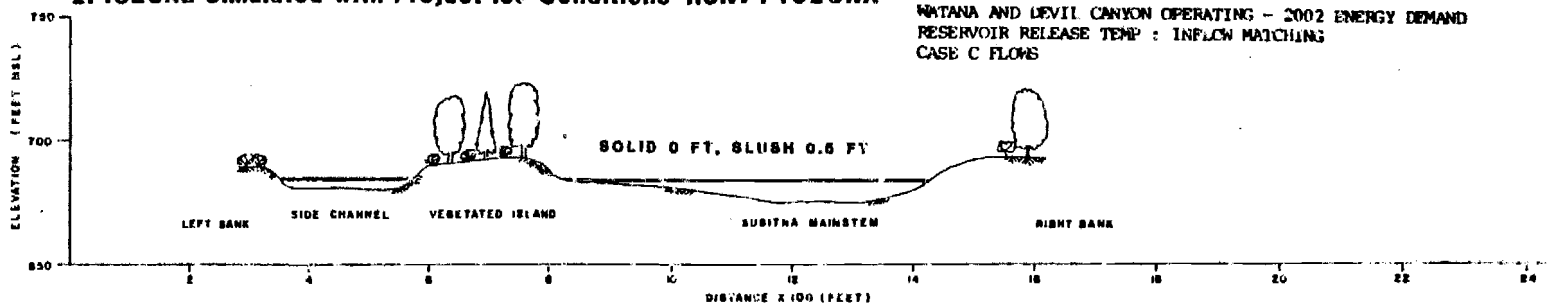
**R&M**  
 R&M CONSULTANTS, INC.  
 ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

### 1. Natural Ice Conditions (1983)

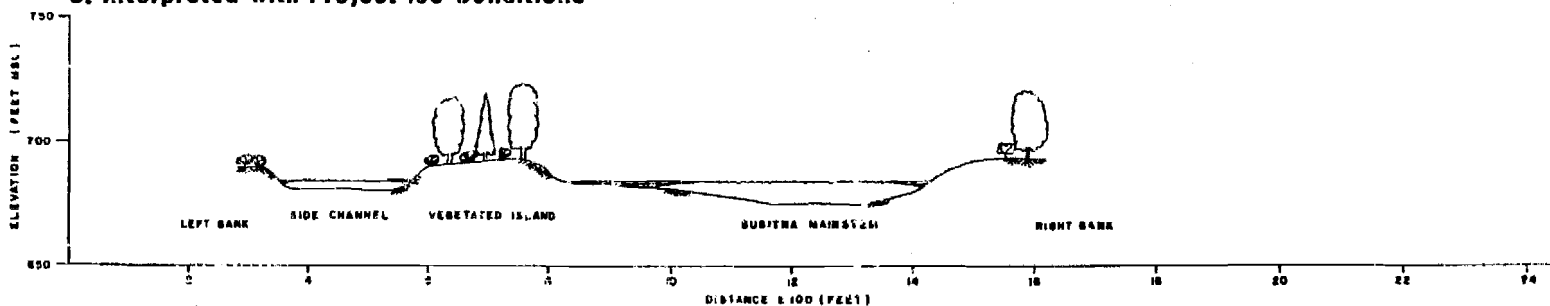


### 2. ICECAL Simulated with Project Ice Conditions RUN#7102CNA

WINTER 1971-72  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**REM**  
REM CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-44**

1980 CROSS SECTION SURVEY  
RIVER MILE 136.4  
VERTICAL EXAGGERATION 4:1

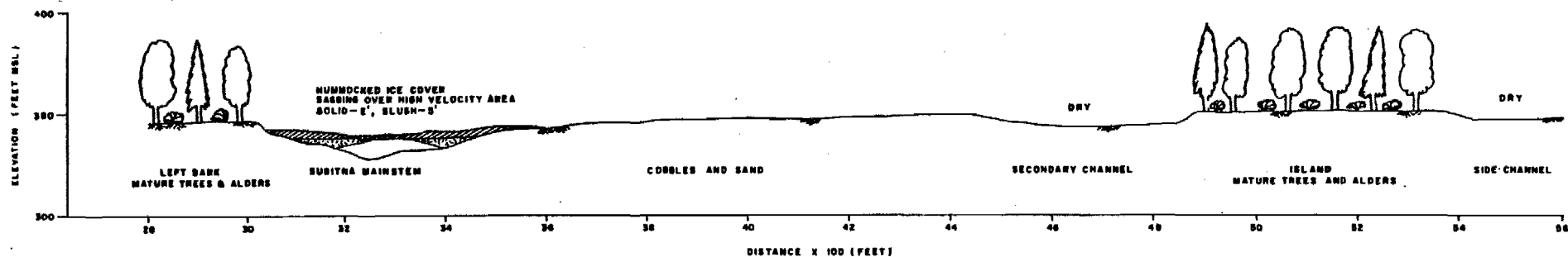
PREPARED FOR:

**WARZA-EBASCO**  
SUSITNA JOINT VENTURE



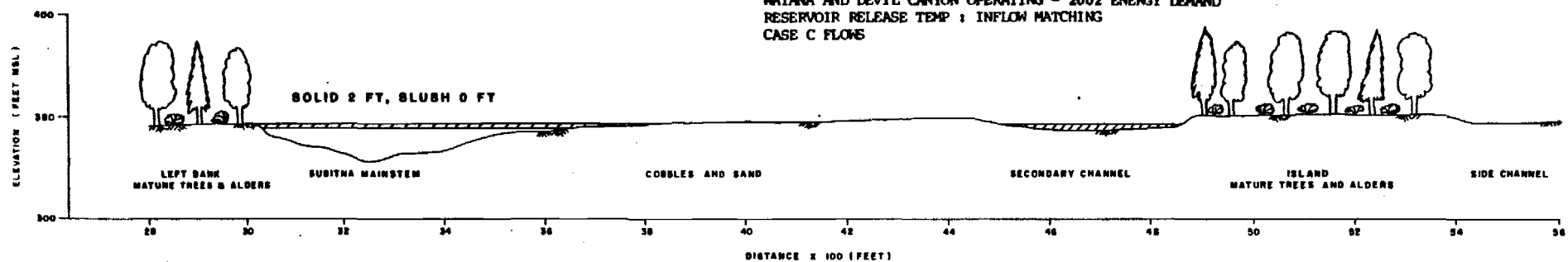
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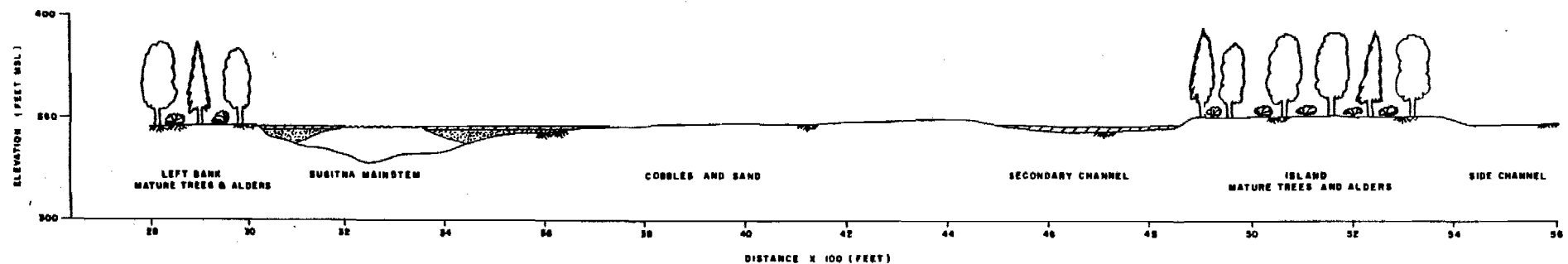


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

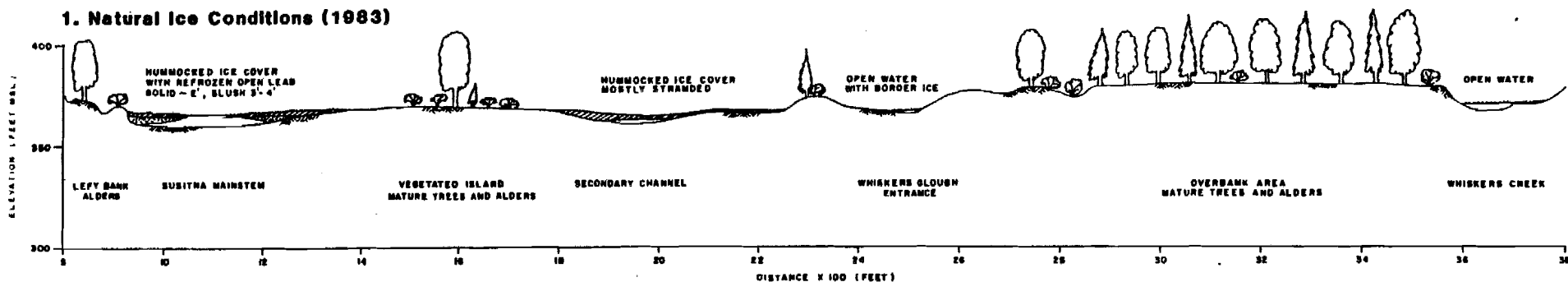
**LRX-3**

1982 CROSS SECTION SURVEY  
RIVER MILE 98.6  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

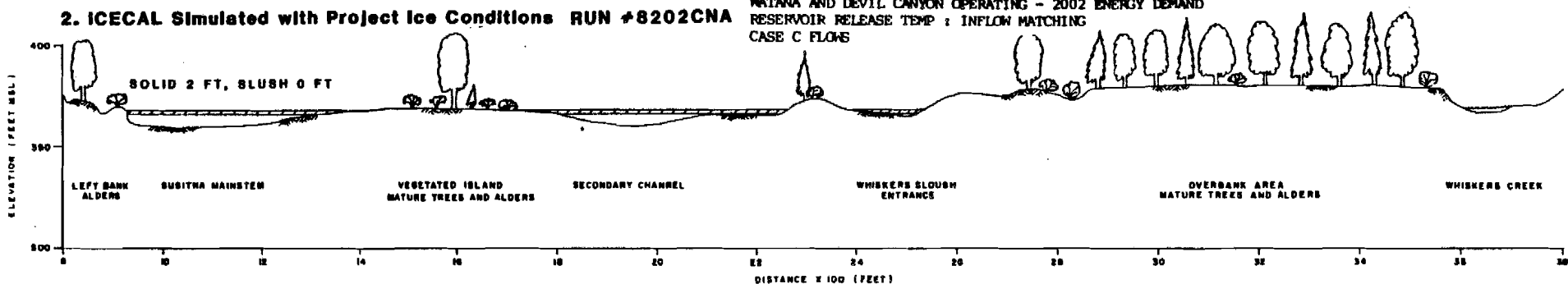
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

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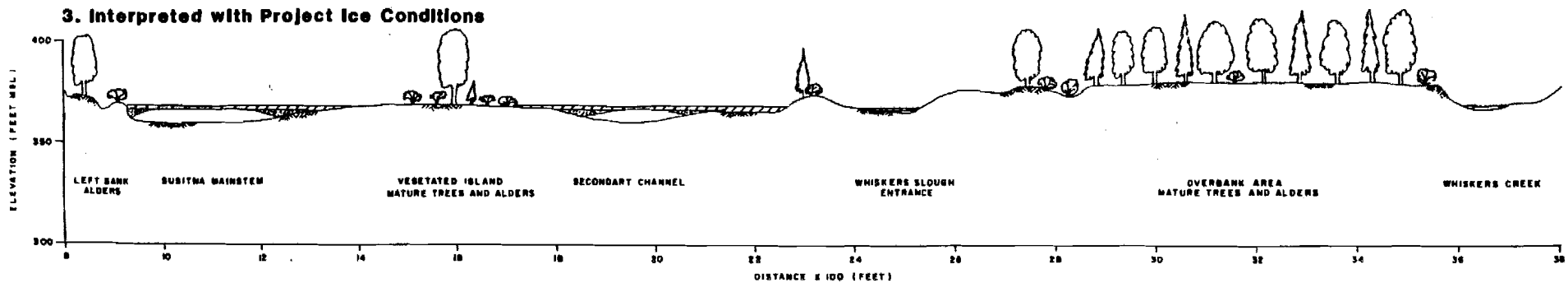


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

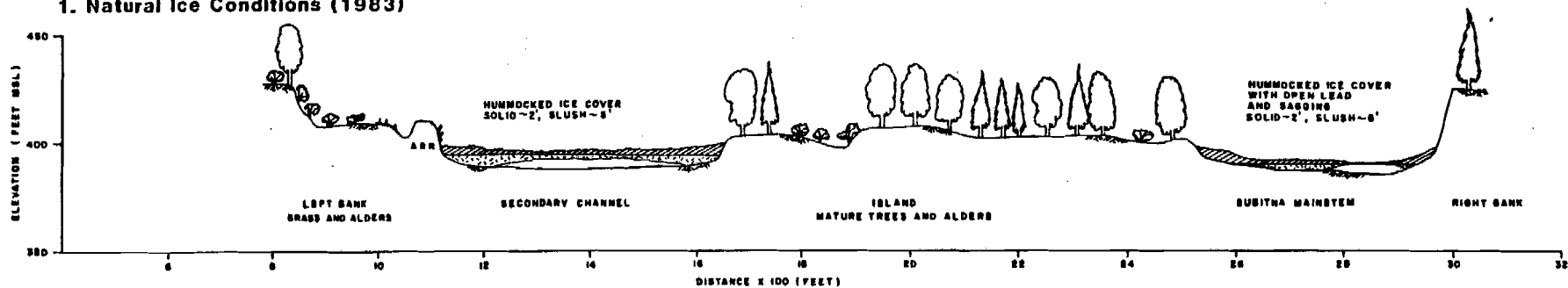
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**1980 CROSS SECTION SURVEY**  
**RIVER MILE 101.5**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

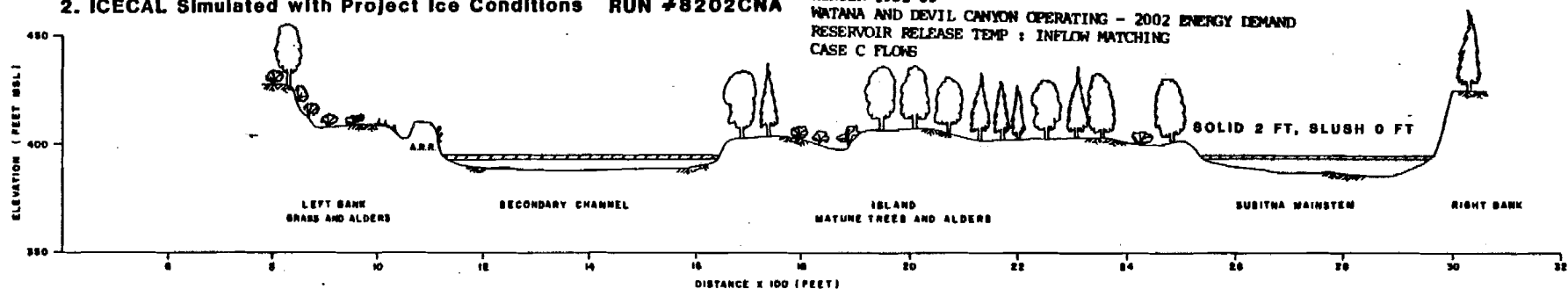
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

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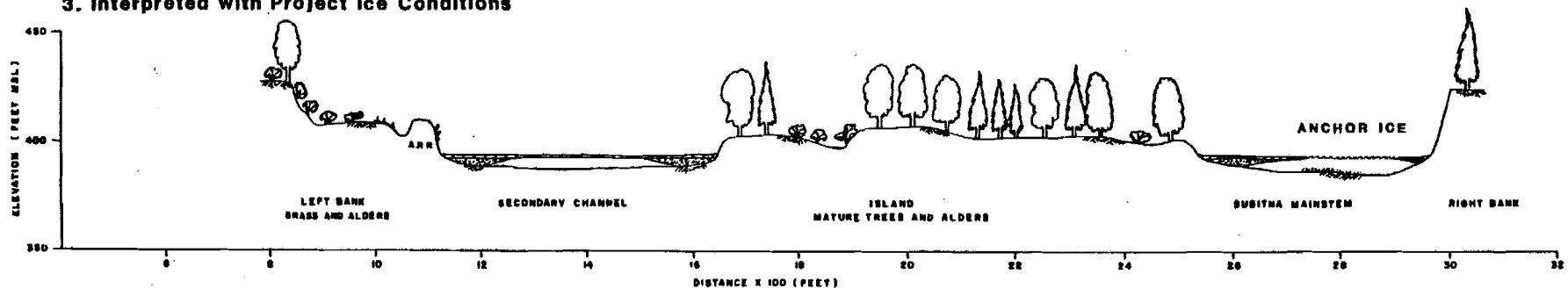


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

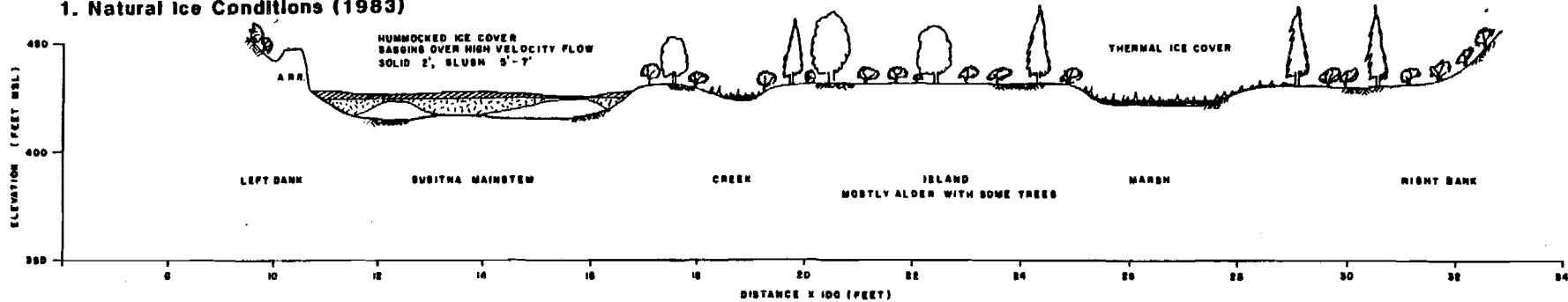
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1980 CROSS SECTION SURVEY  
RIVER MILE 104.8  
VERTICAL EXAGGERATION 4:1

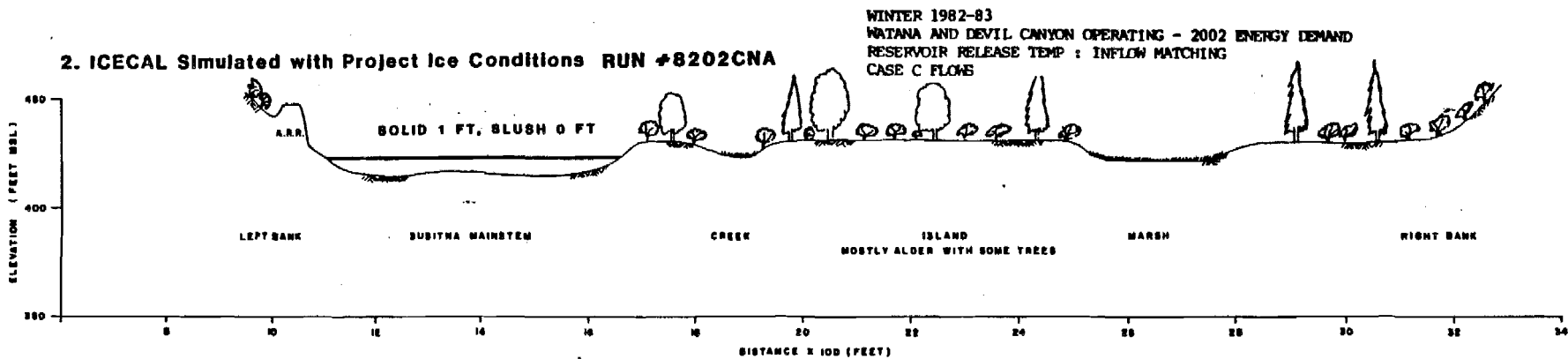
PREPARED FOR:

**HARZA-EBASCO**  
SUBITNA JOINT VENTURE

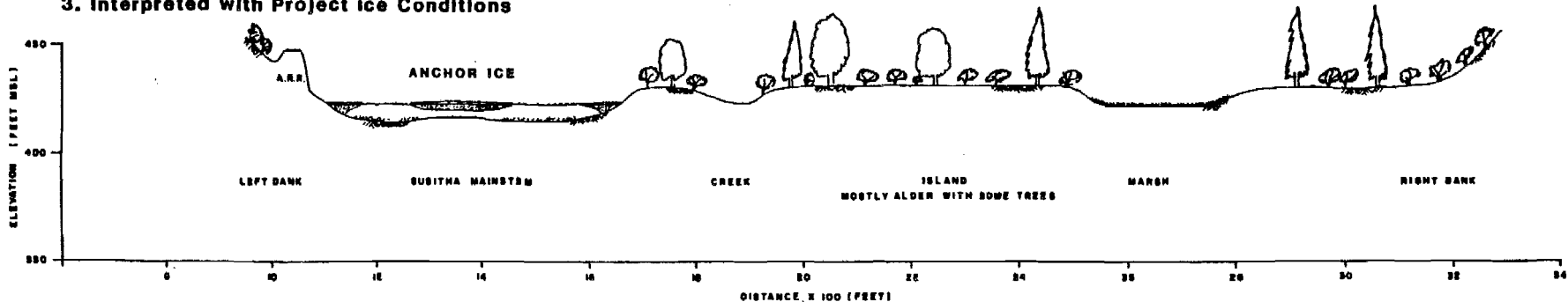
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA



### 3. Interpreted with Project ice Conditions



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

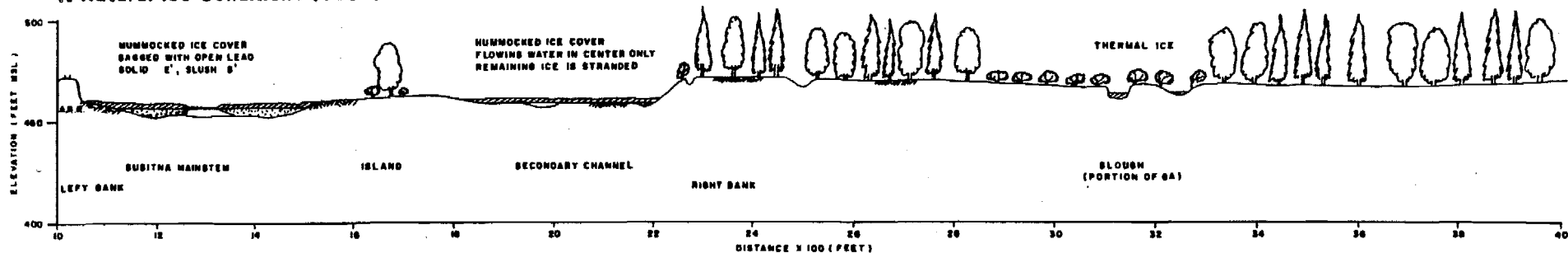
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**1981 CROSS SECTION SURVEY  
RIVER MILE 108.4  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

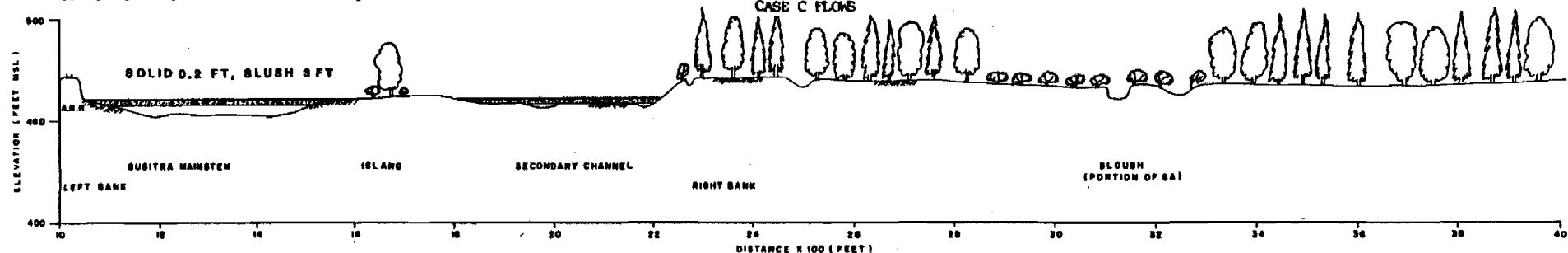
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

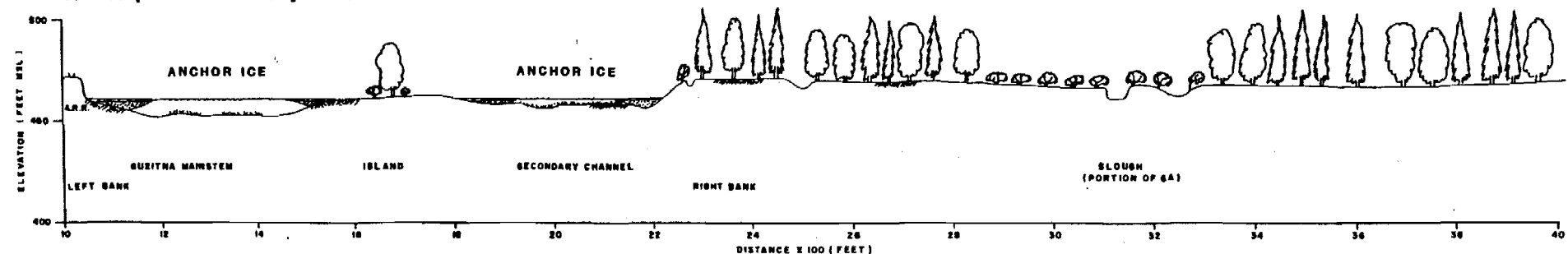


WINTER 1982-83  
 NATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
 RESERVOIR RELEASE TEMP : INFLOW MATCHING  
 CASE C FLOWS

### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

LRX-17

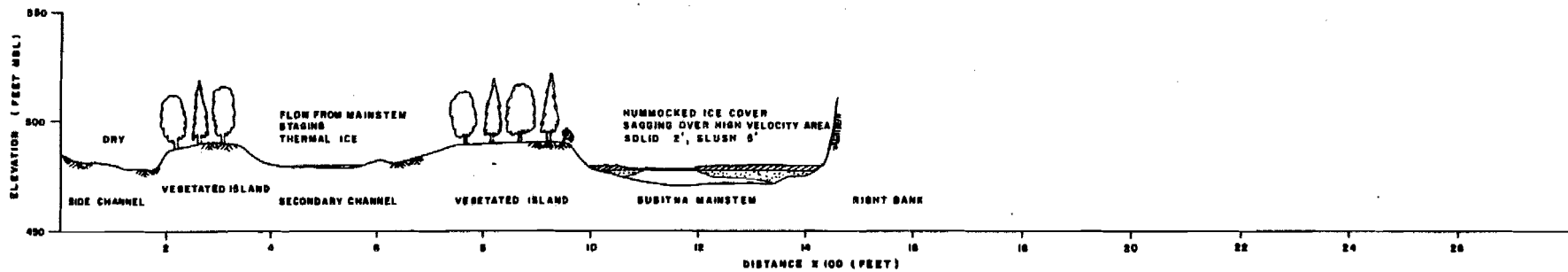
1980 CROSS SECTION SURVEY  
 RIVER MILE 112.7  
 VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
 SUSITNA JOINT VENTURE

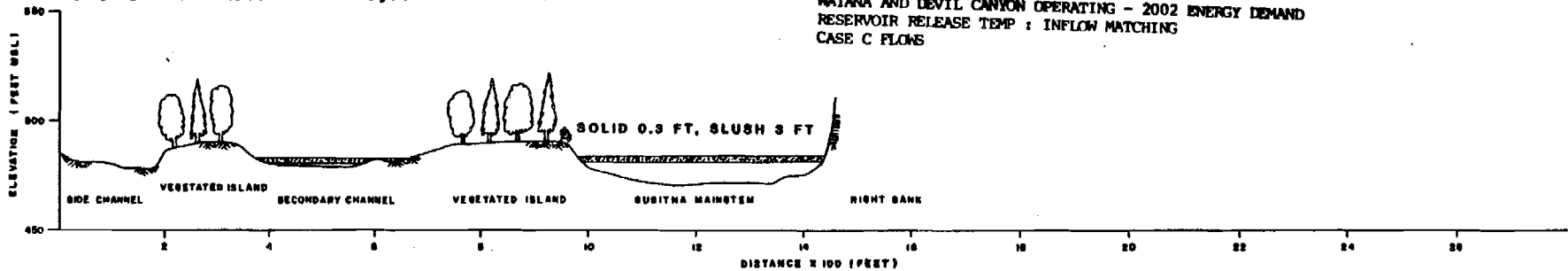
**R&M CONSULTANTS, INC.**  
 ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

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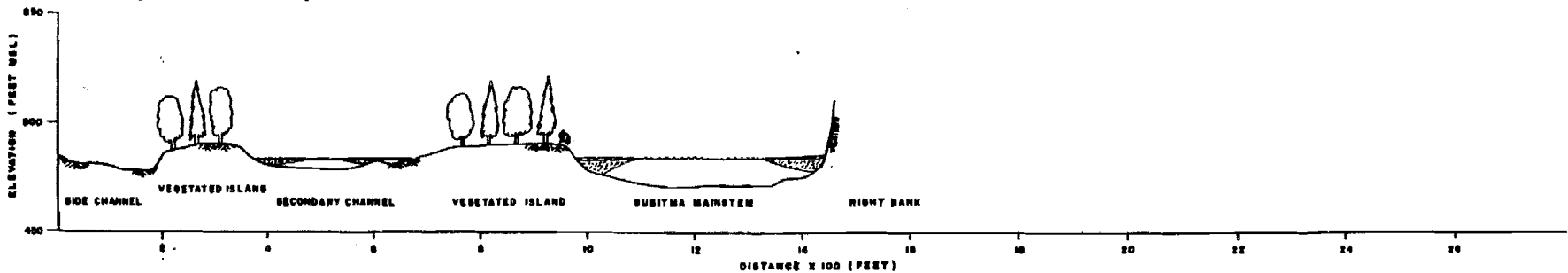


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

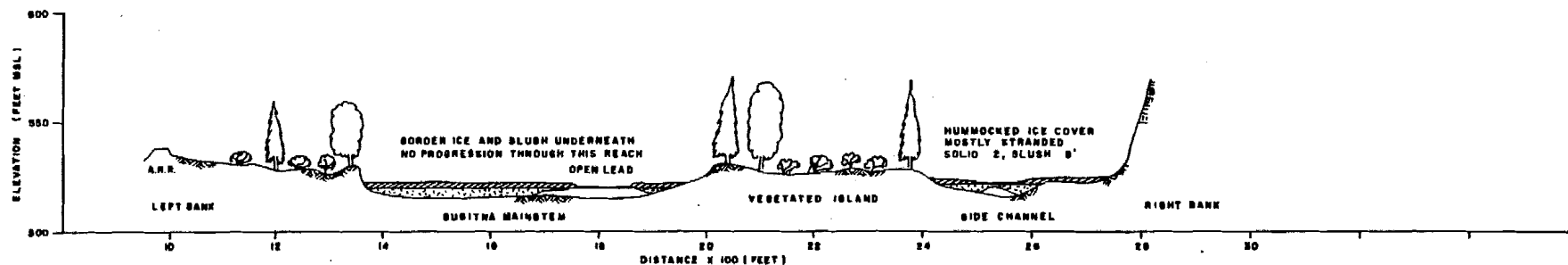
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**1982 CROSS SECTION SURVEY  
RIVER MILE 115.1  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

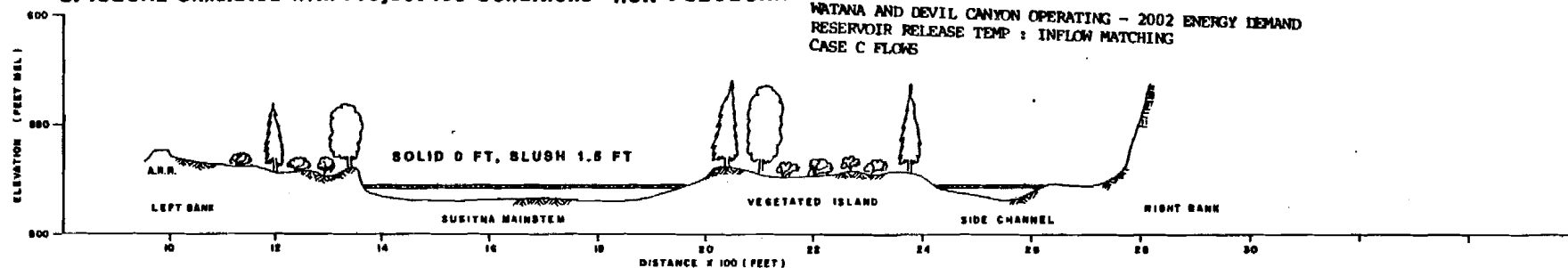
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

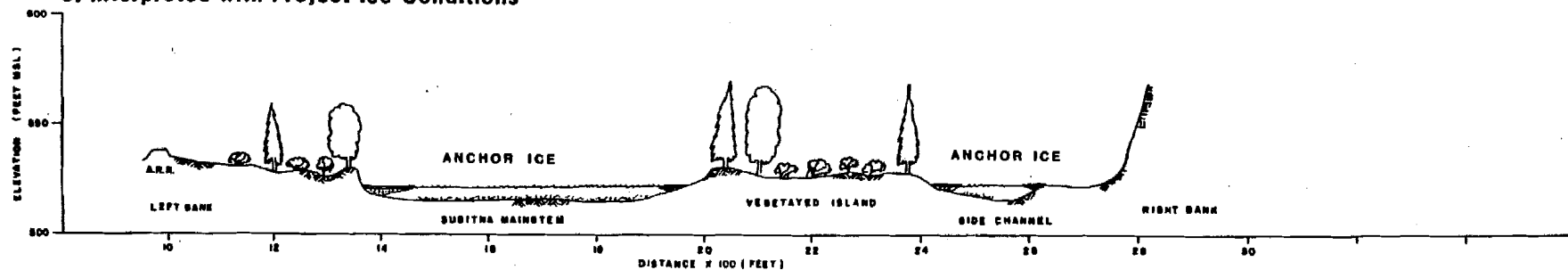


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RSM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-23**

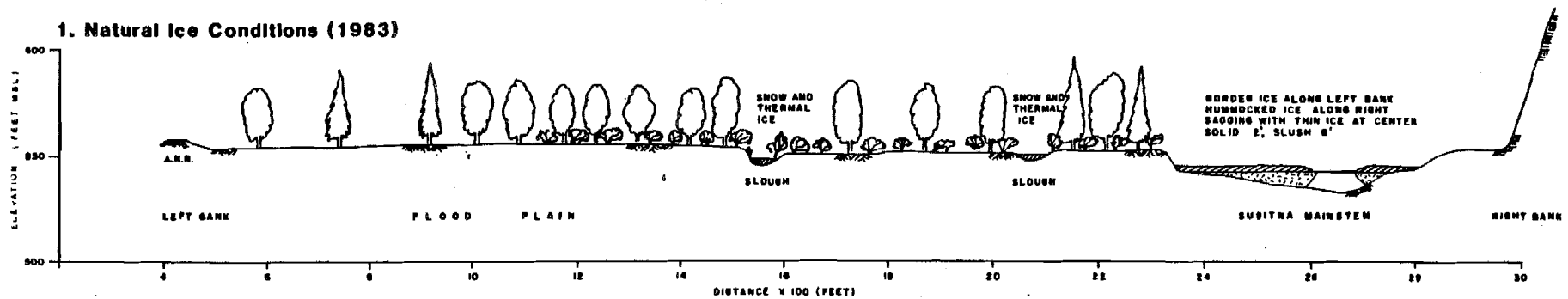
**1980 CROSS SECTION SURVEY**  
**RIVER MILE 120.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

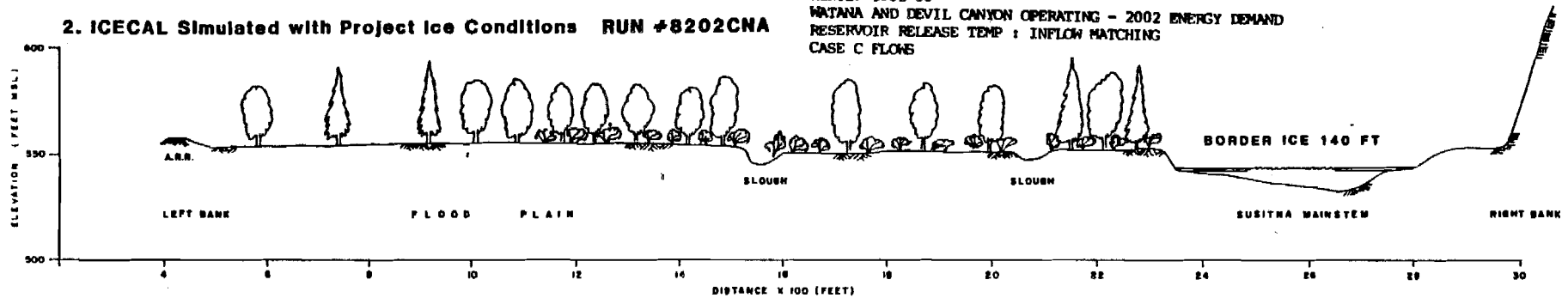


### 1. Natural Ice Conditions (1983)

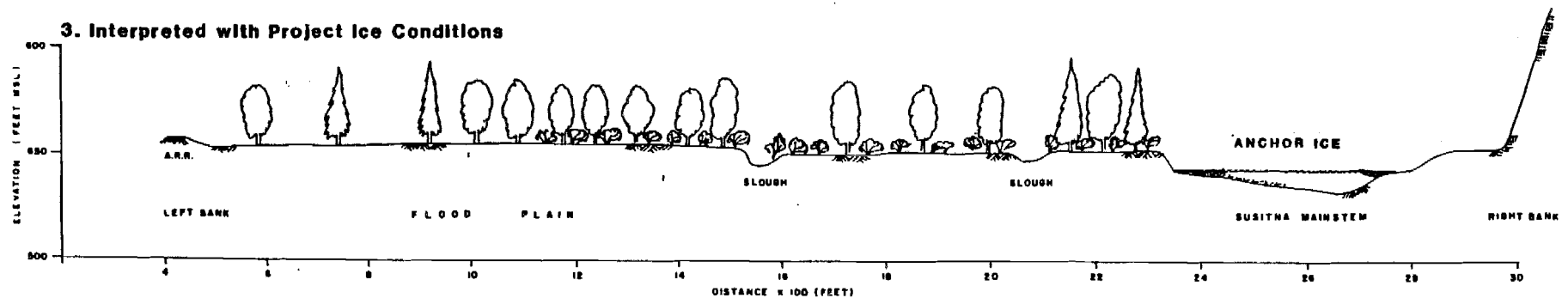


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ERM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

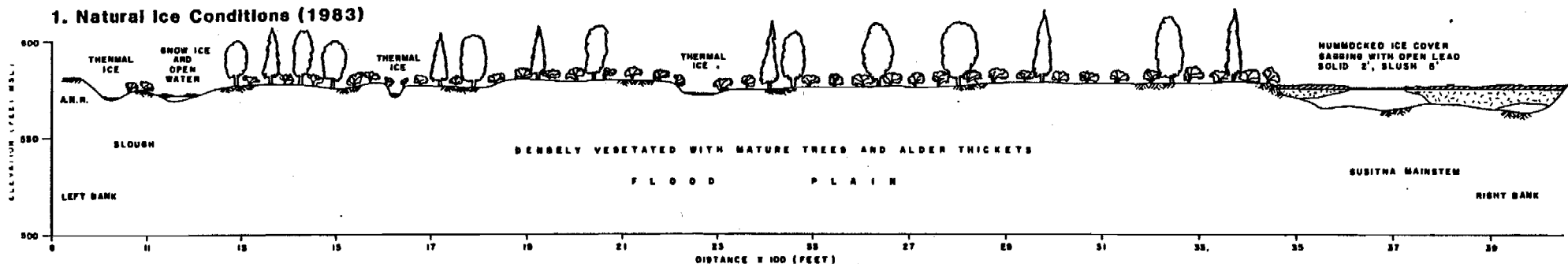
**LRX -27**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 123.3**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

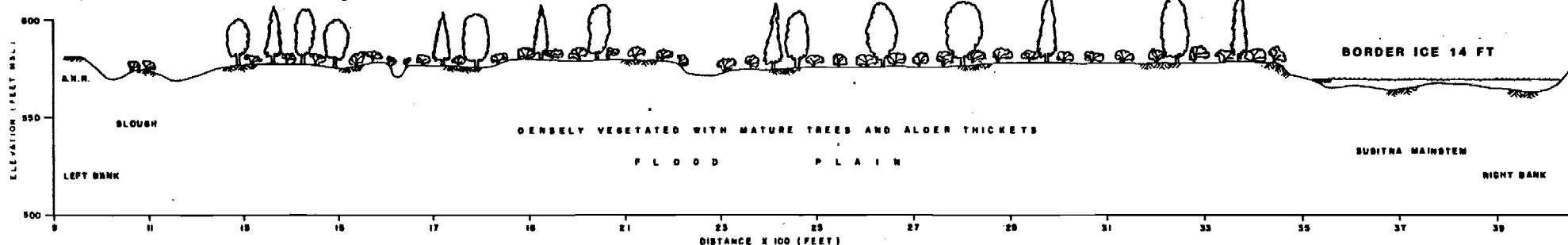
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

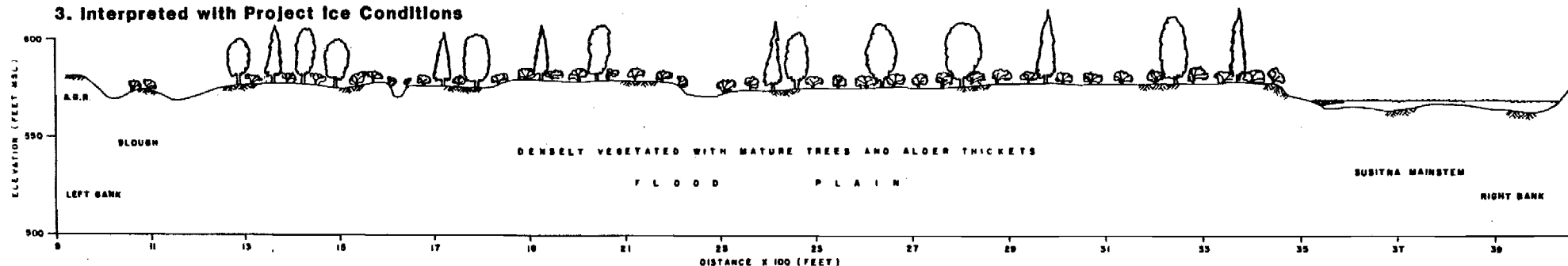


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

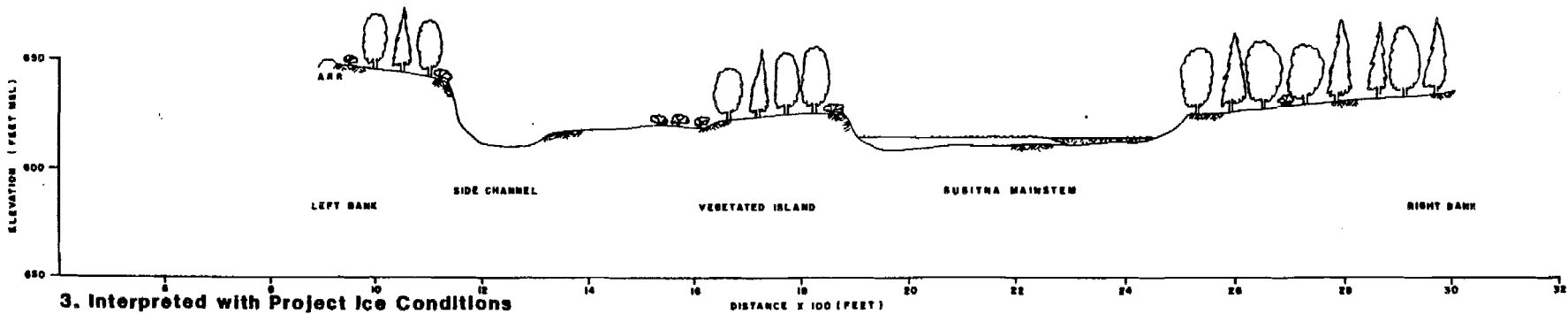
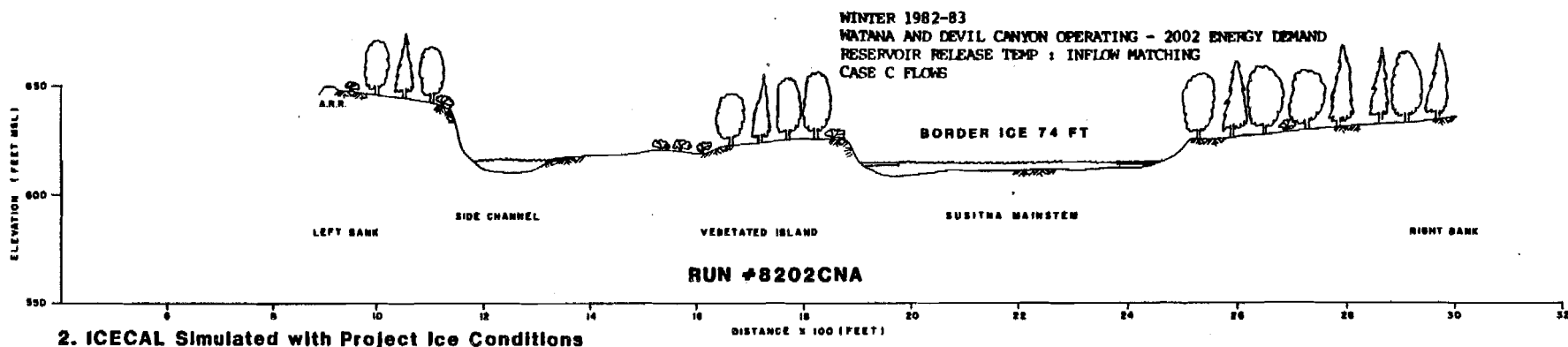
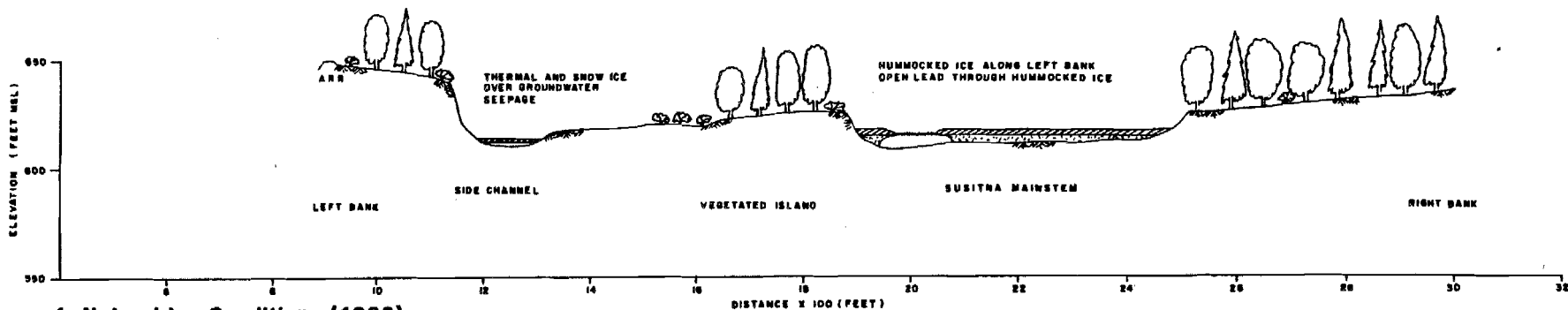
**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-29**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 126.1**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

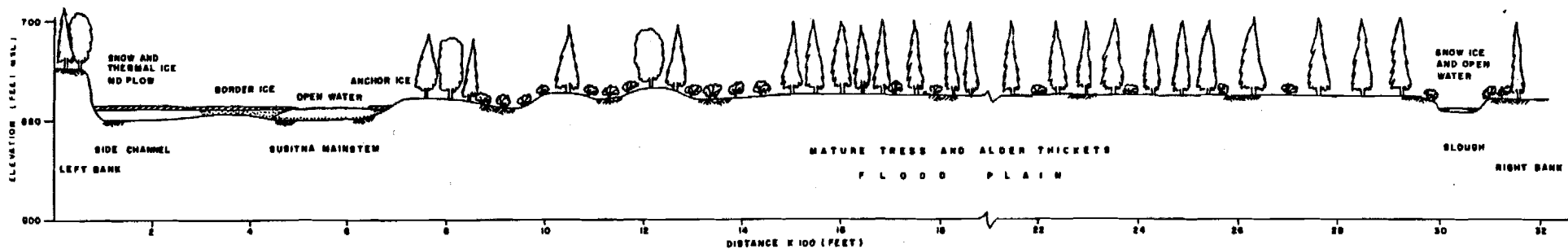
**LRX-34**

**1980 CROSS SECTION SURVEY  
RIVER MILE 130.5  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

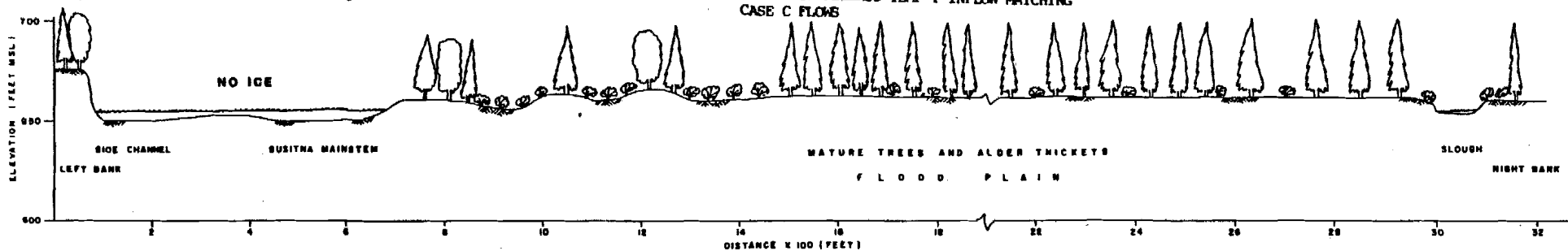
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

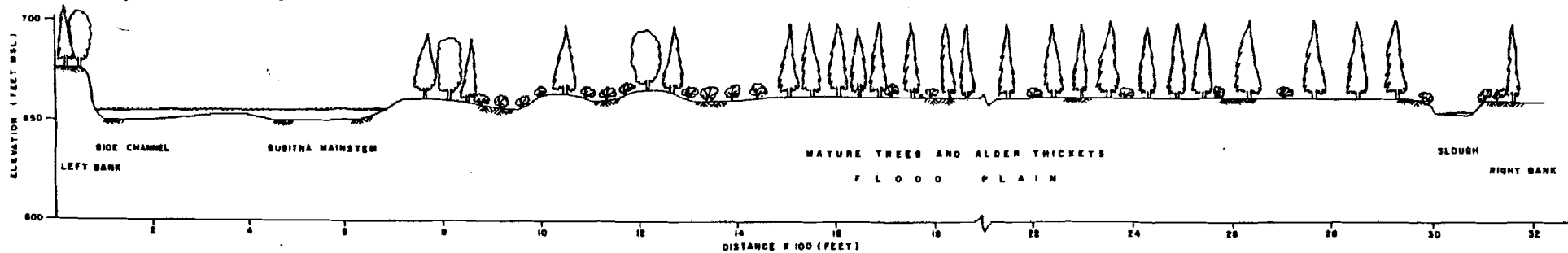


### 2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

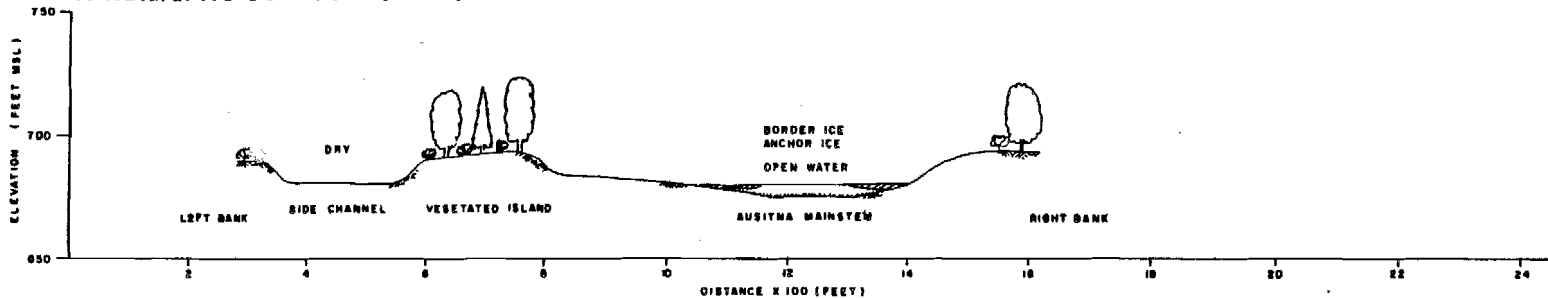
**LRX-40**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 134.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

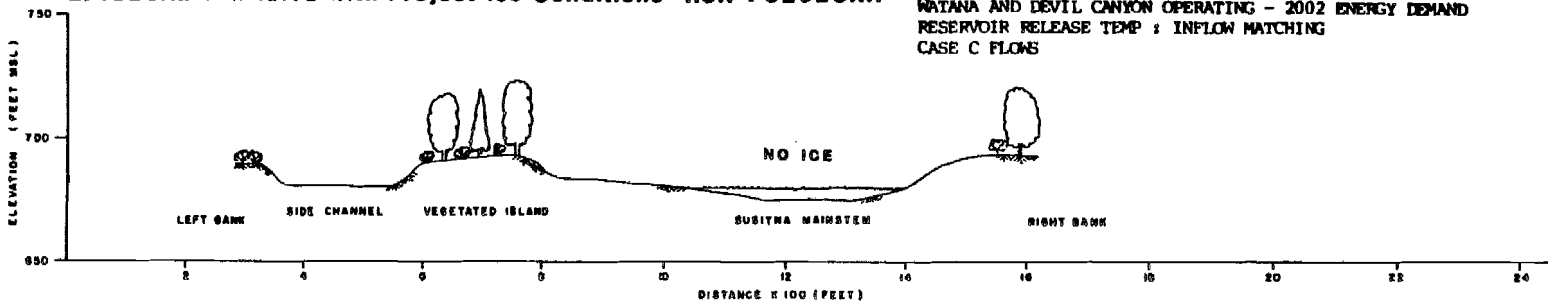
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

1. Natural Ice Conditions (1983)

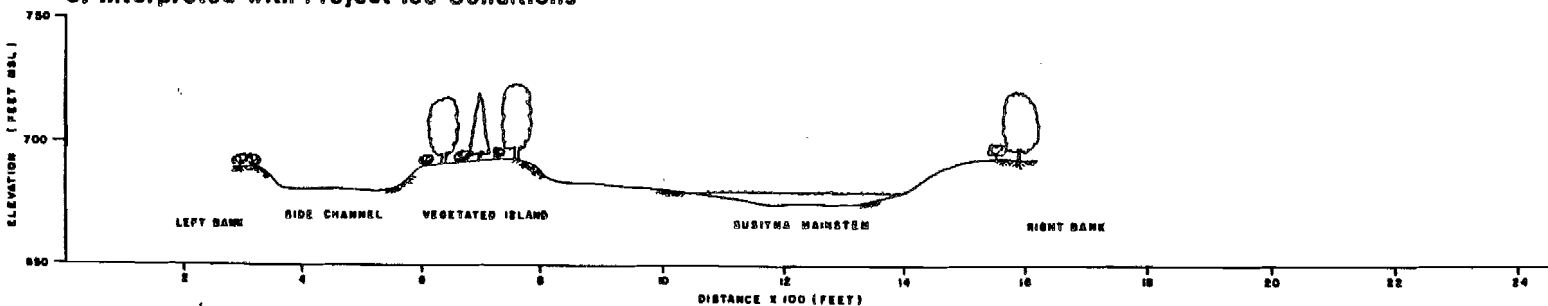


2. ICECAL Simulated with Project Ice Conditions RUN #8202CNA

WINTER 1982-83  
WATANA AND DEVIL CANYON OPERATING - 2002 ENERGY DEMAND  
RESERVOIR RELEASE TEMP : INFLOW MATCHING  
CASE C FLOWS



3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-44**

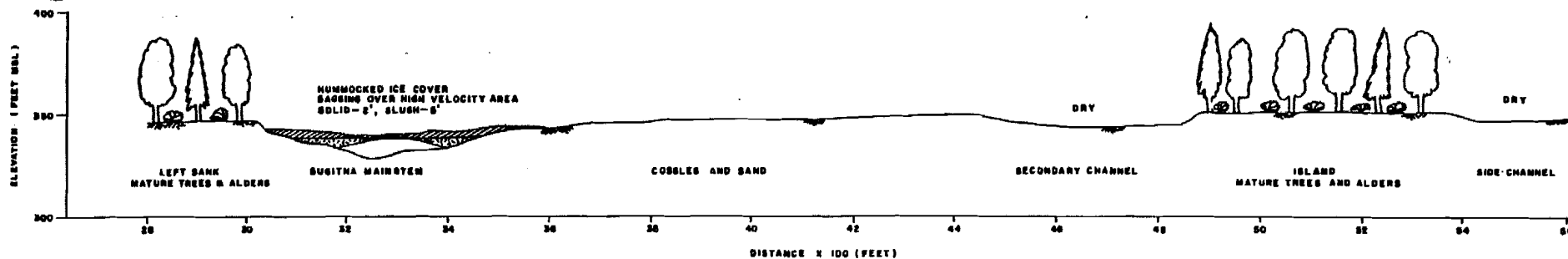
**1980 CROSS SECTION SURVEY**  
**RIVER MILE 136.4**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

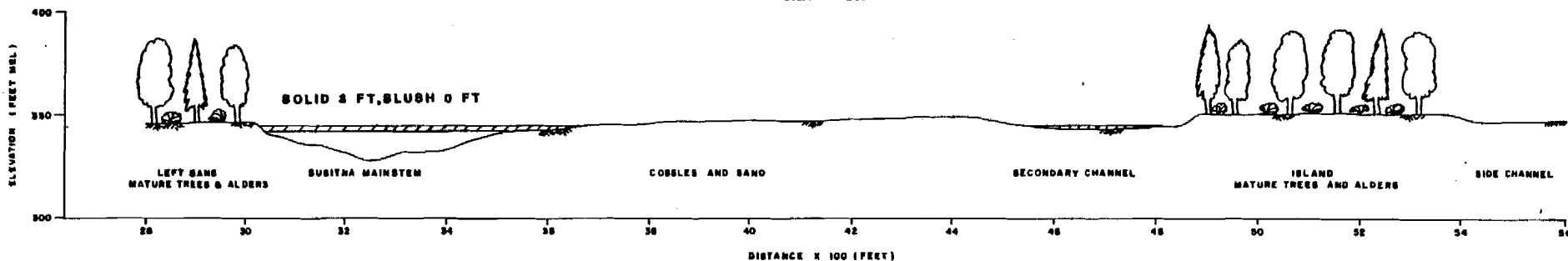
# EXHIBIT A1

### 1. Natural Ice Conditions (1983)

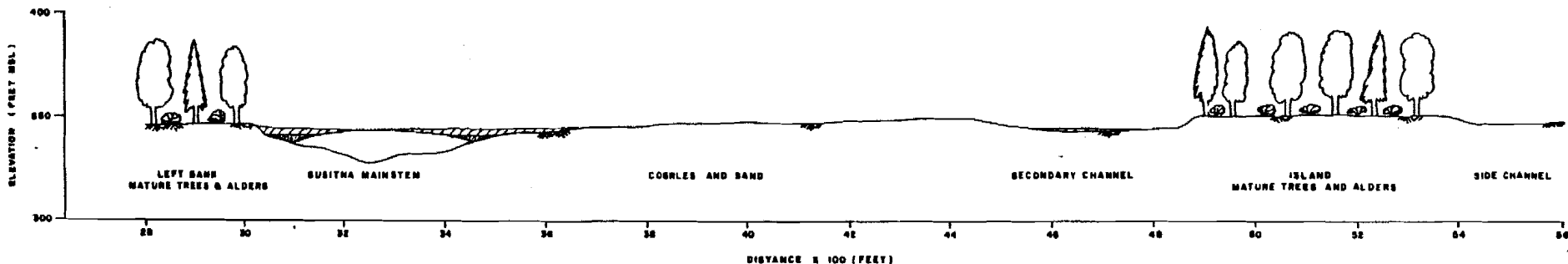


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ESM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

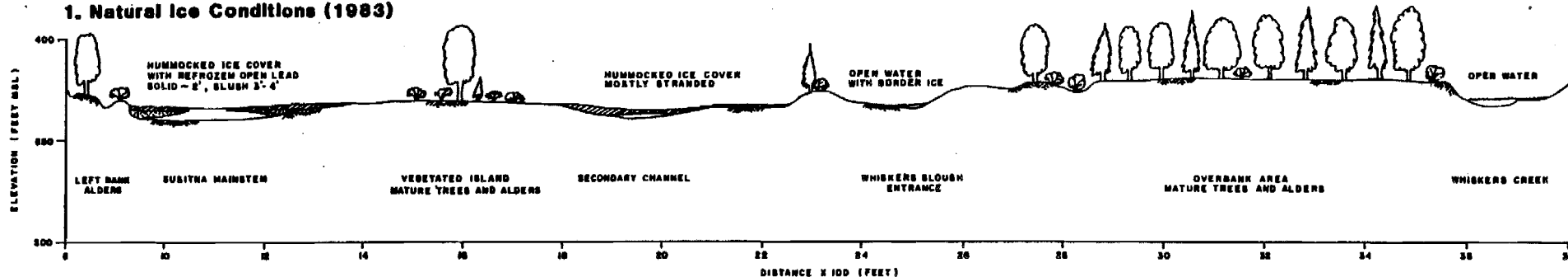
**LRX-3**

**1982 CROSS SECTION SURVEY**  
**RIVER MILE 98.6**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

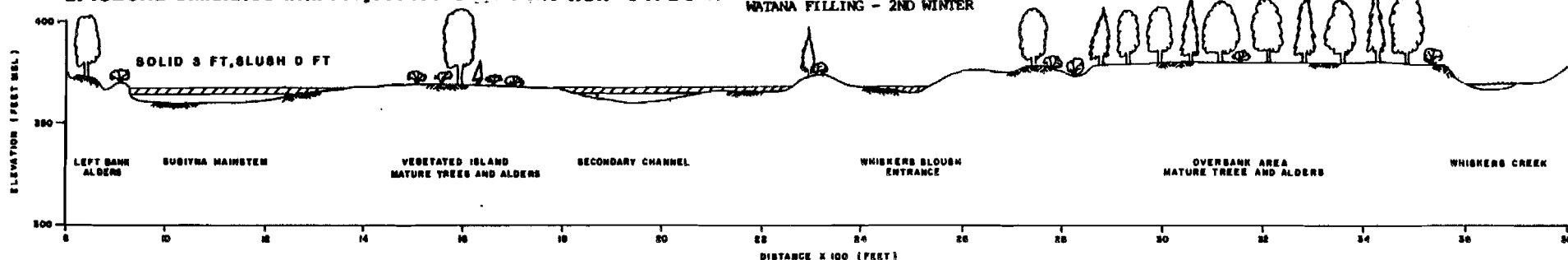
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

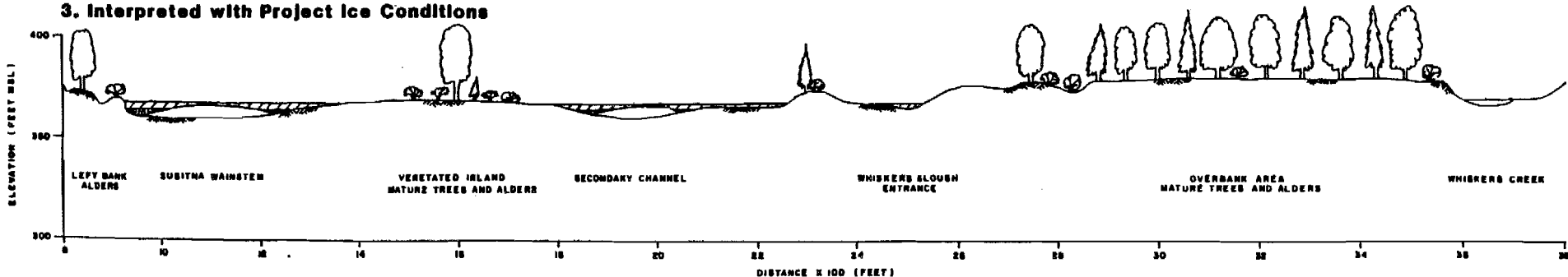


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-7**

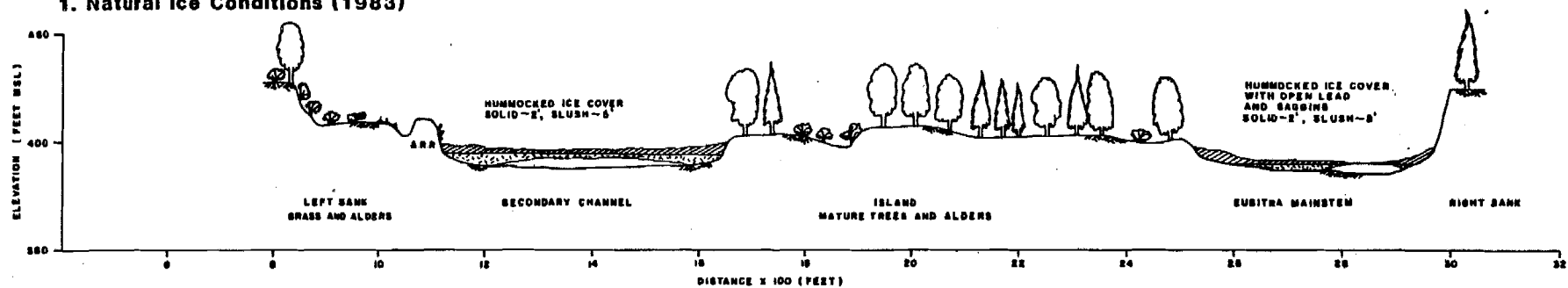
**1980 CROSS SECTION SURVEY**  
**RIVER MILE 101.5**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

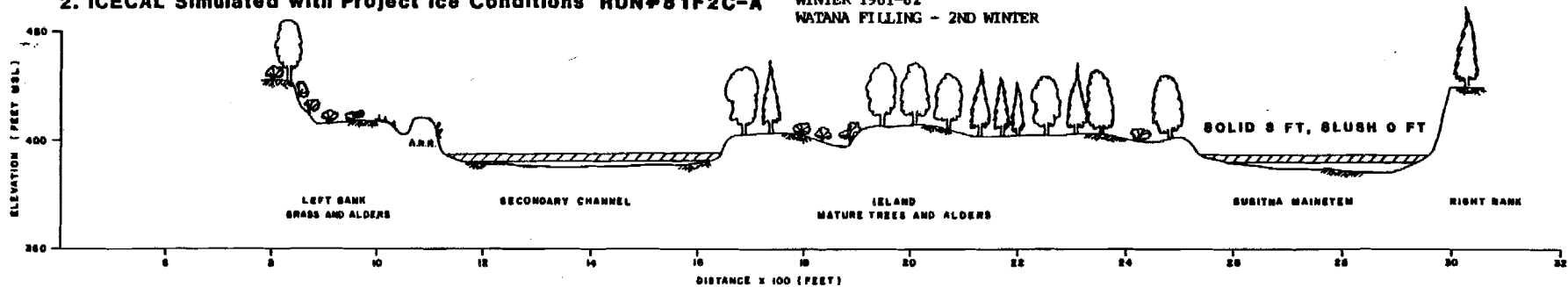
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



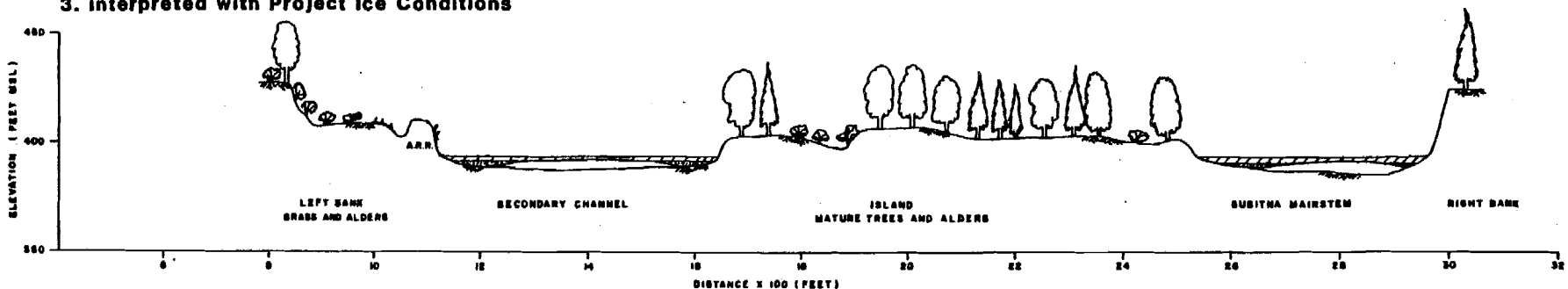
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A WINTER 1981-82 WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**R&M**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

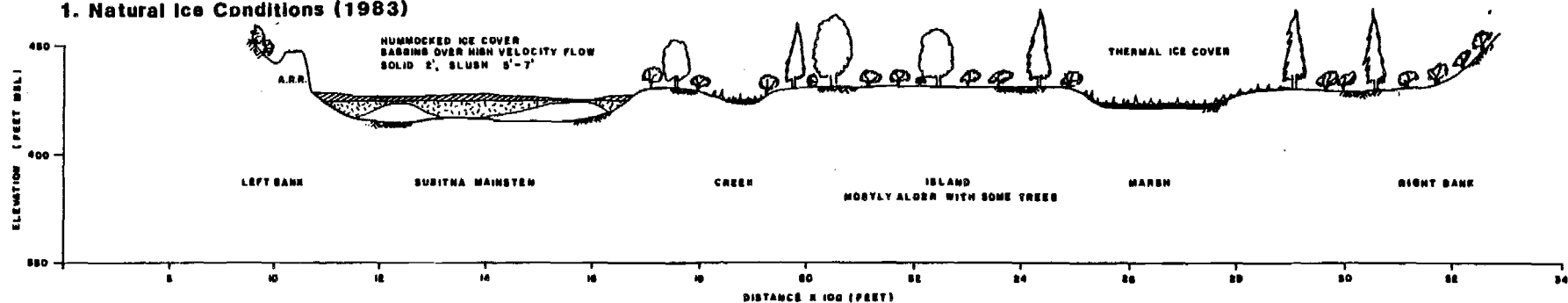
**LRX-10**

**1980 CROSS SECTION SURVEY  
RIVER MILE 104.8  
VERTICAL EXAGGERATION 4:1**

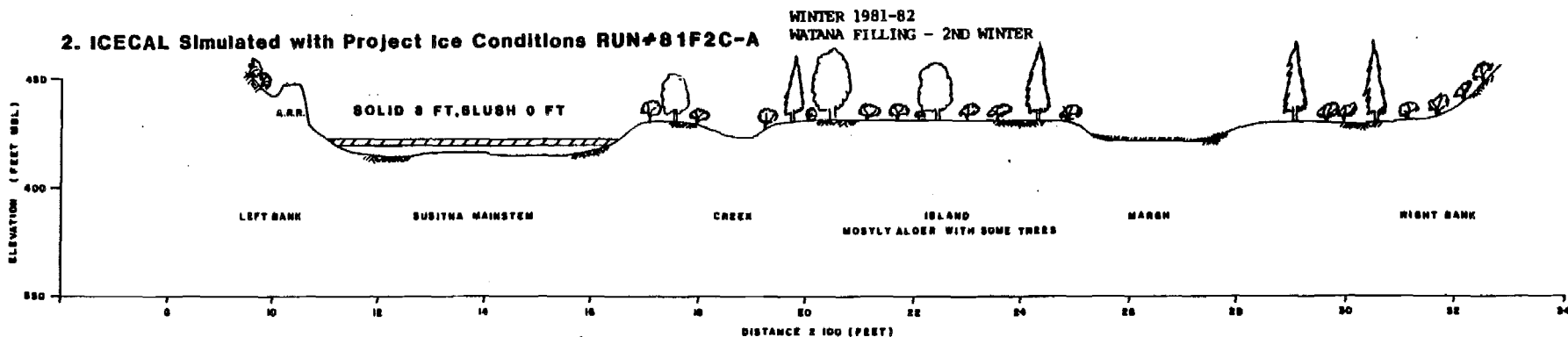
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

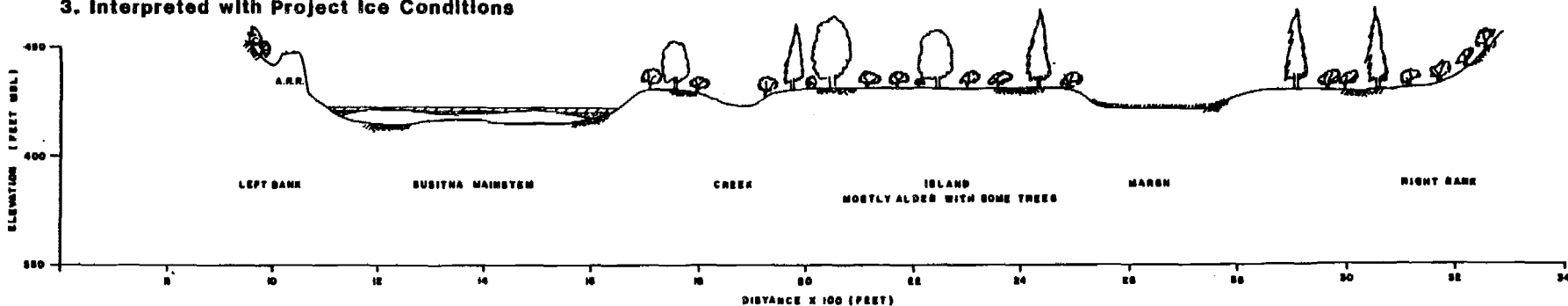
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**PSM**  
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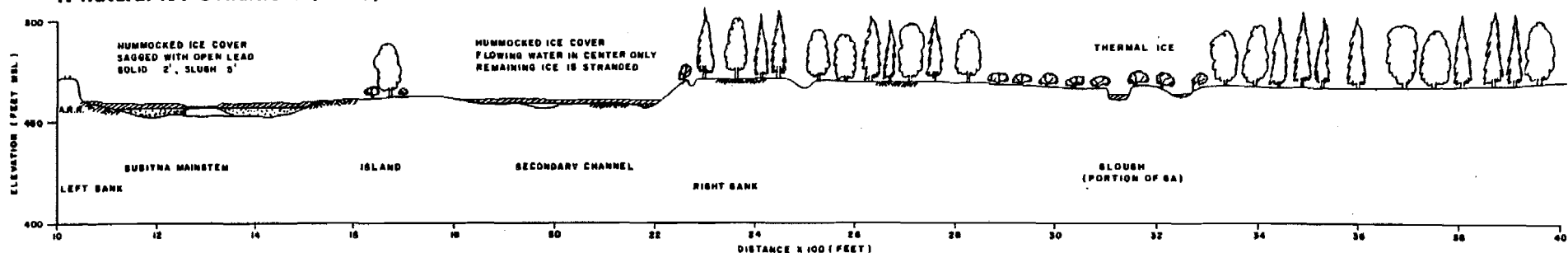
**LRX-12**

**1981 CROSS SECTION SURVEY**  
**RIVER MILE 108.4**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

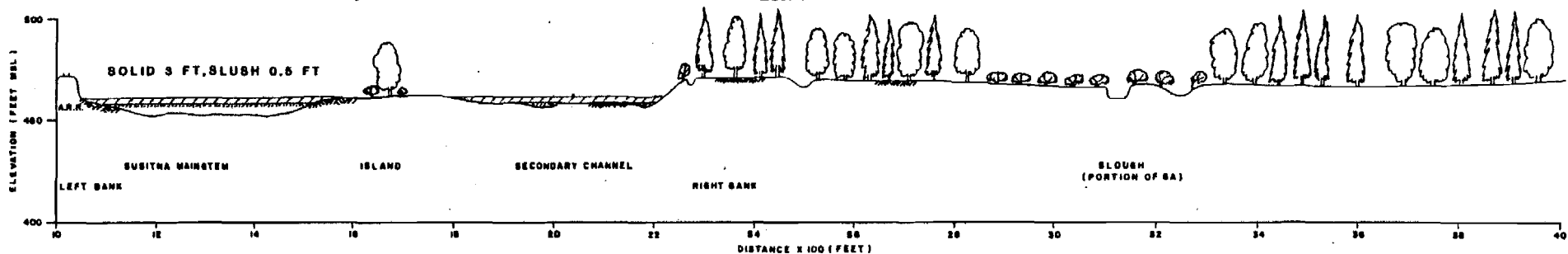
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

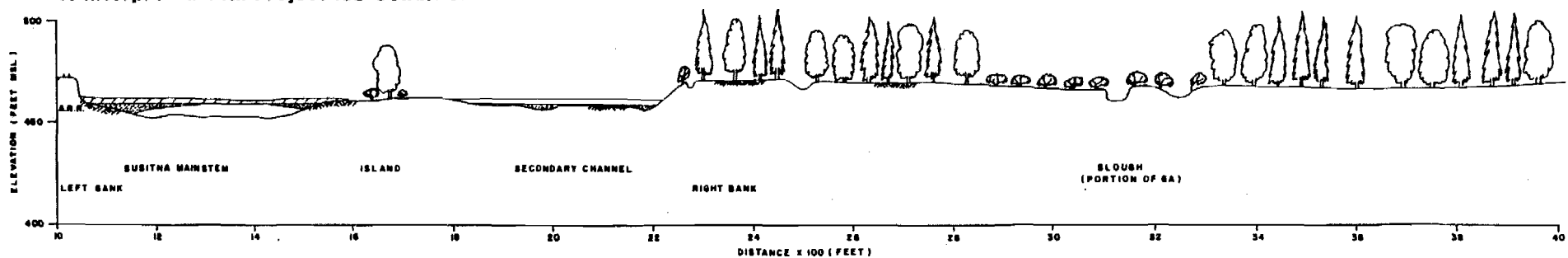


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WADANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

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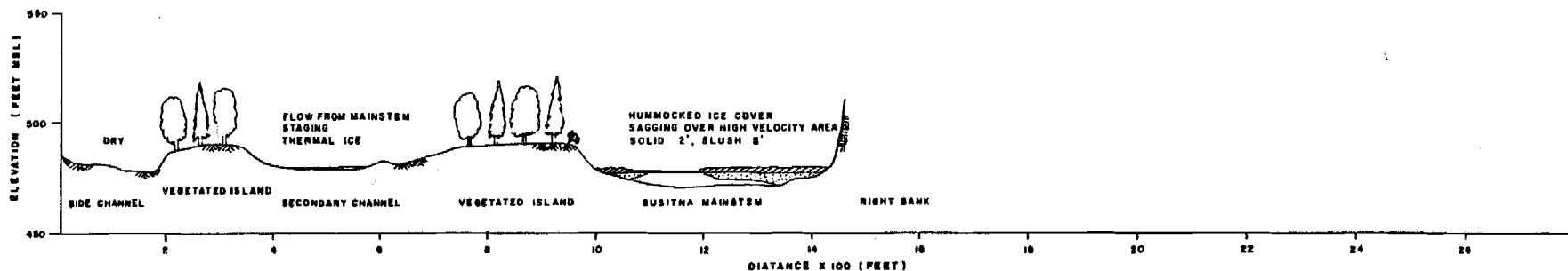
**LRX-17**

**1980 CROSS SECTION SURVEY  
RIVER MILE 112.7  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

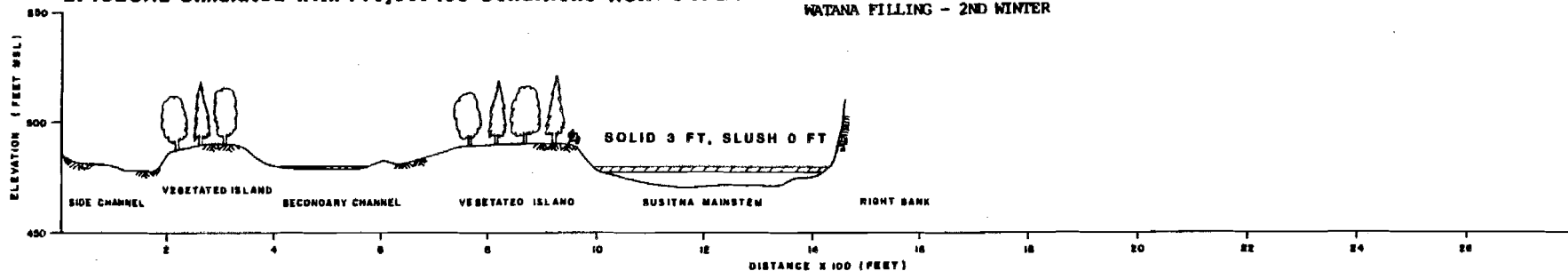
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

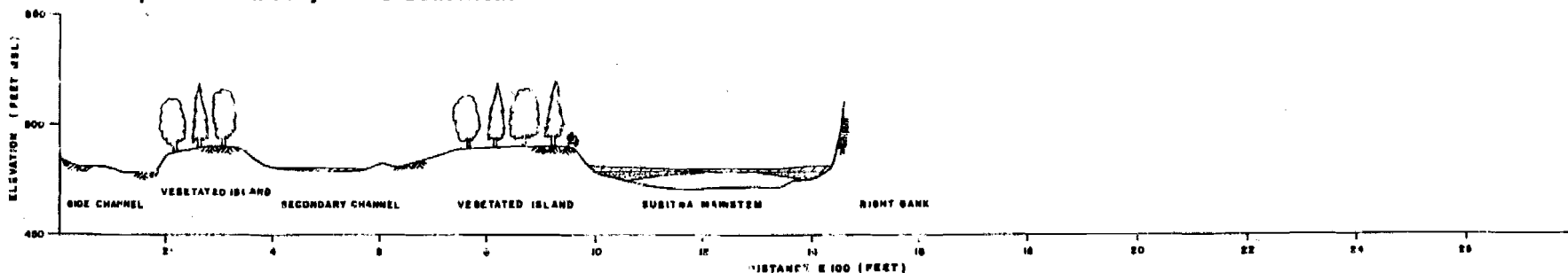


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ERM**  
ERM CONSULTANTS, INC.  
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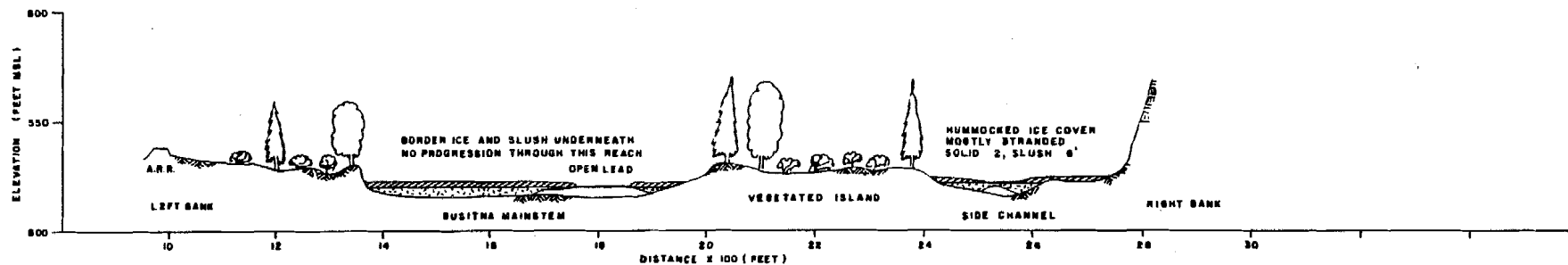
LRX-13.2

1982 CROSS SECTION SURVEY  
RIVER MILE 115.1  
VERTICAL EXAGGERATION 4:1

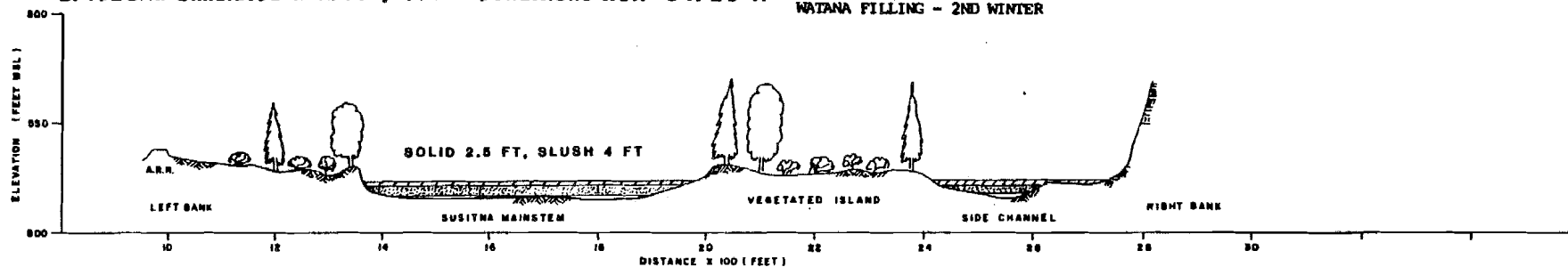
PREPARED FOR:

**MARZA-ENACCO**  
SUSITNA JOINT VENTURE

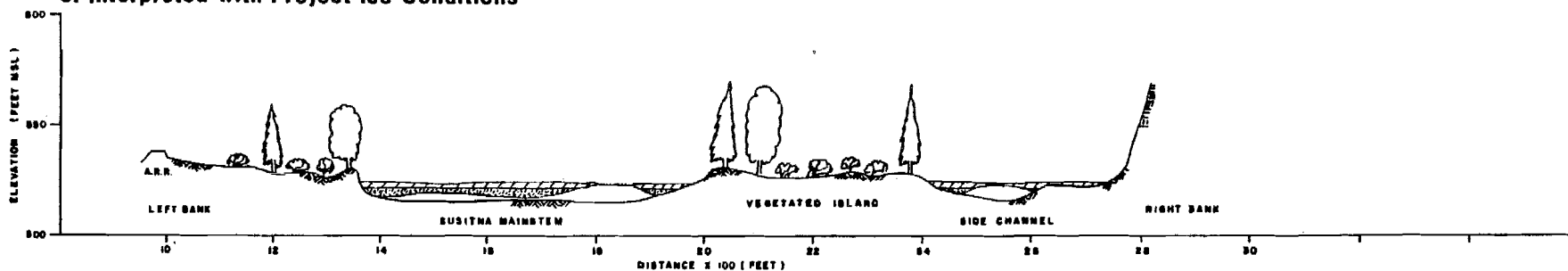
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A WINTER 1981-82 WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ESM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

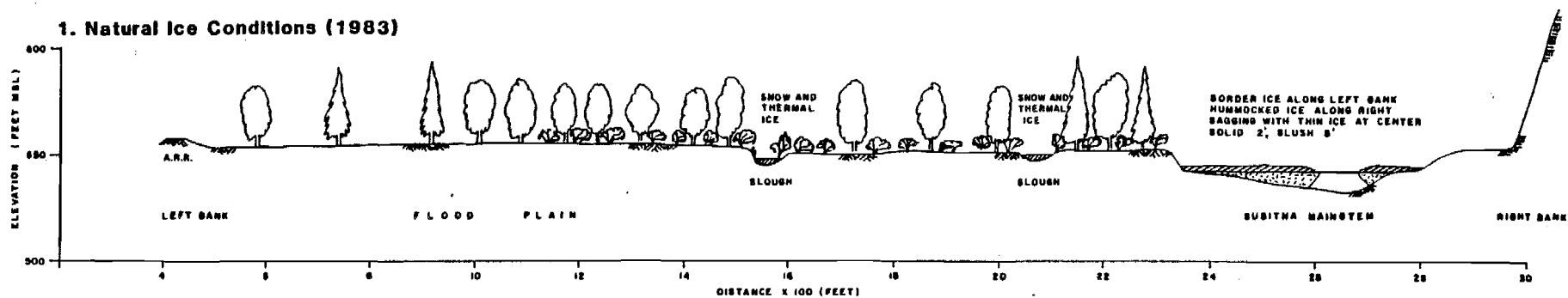
**LRX-23**

**1980 CROSS SECTION SURVEY  
RIVER MILE 120.2  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

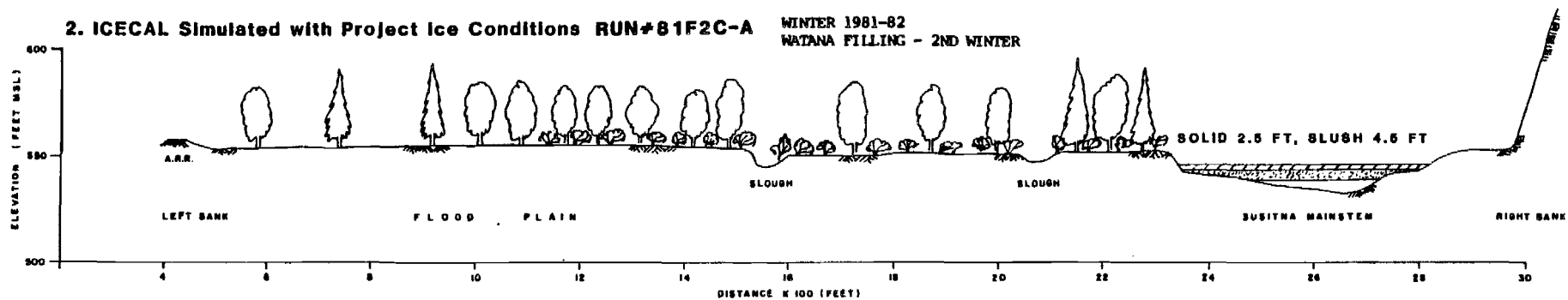
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

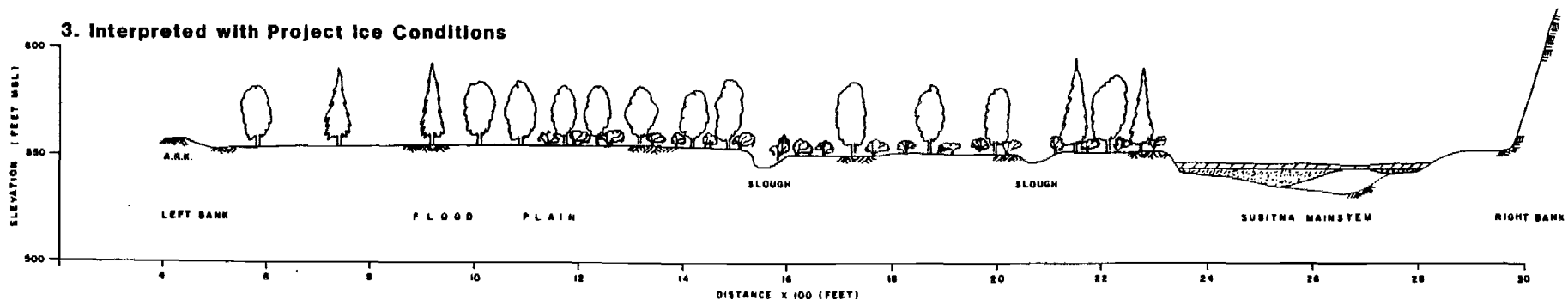


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**ESM**  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

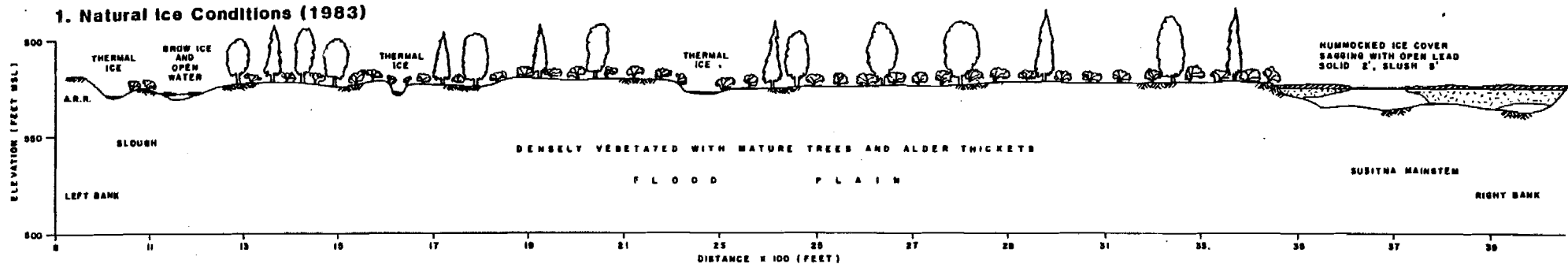
**LRX -27**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 123.3**  
**VERTICAL EXAGGERATION 4:1**

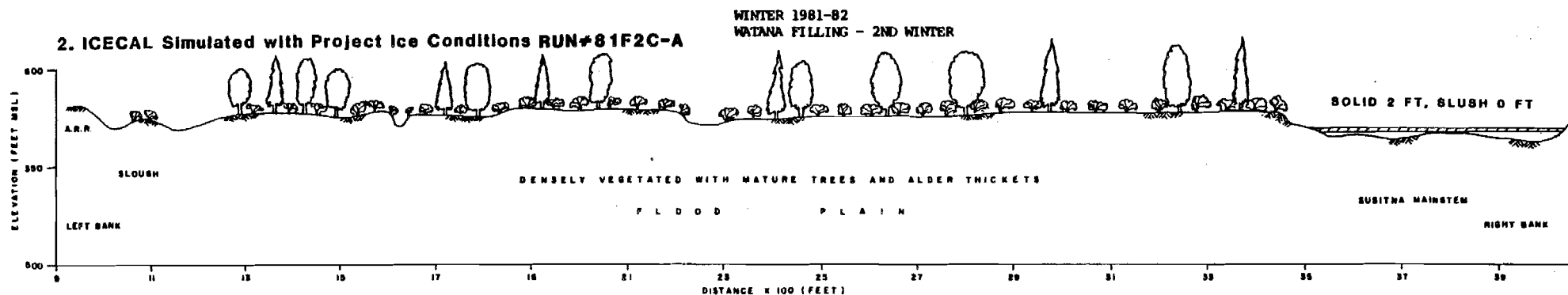
PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

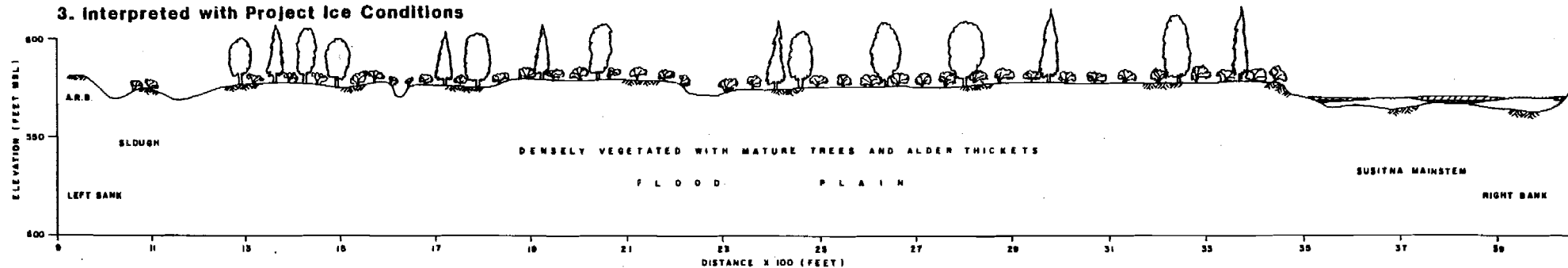
### 1. Natural Ice Conditions (1983)



### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

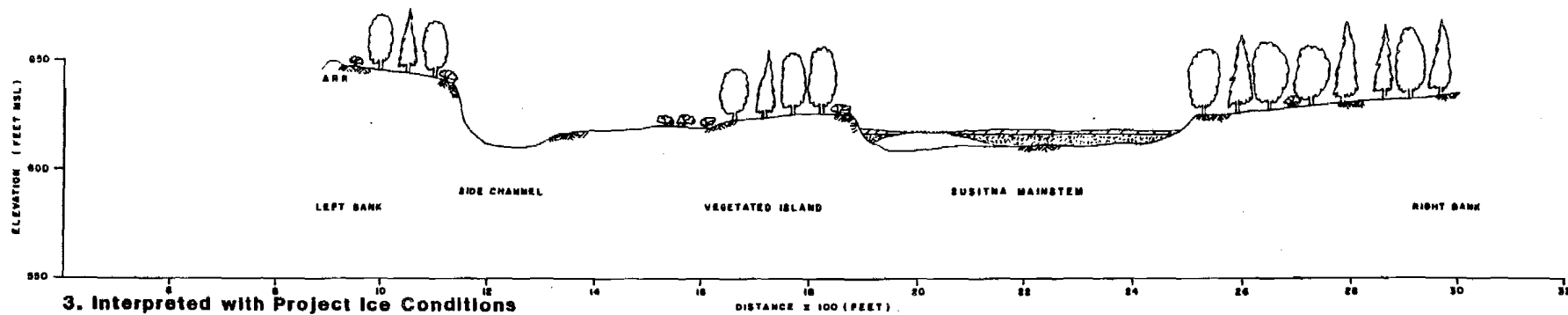
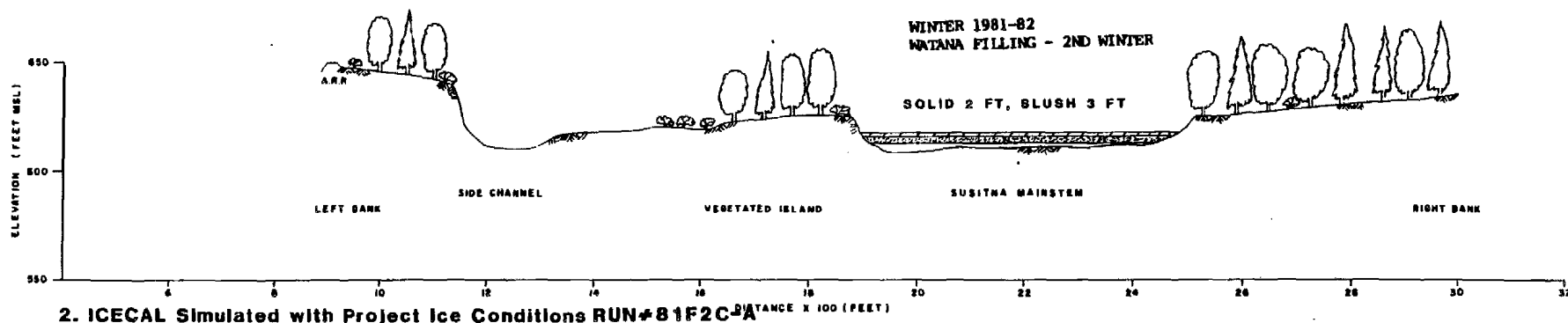
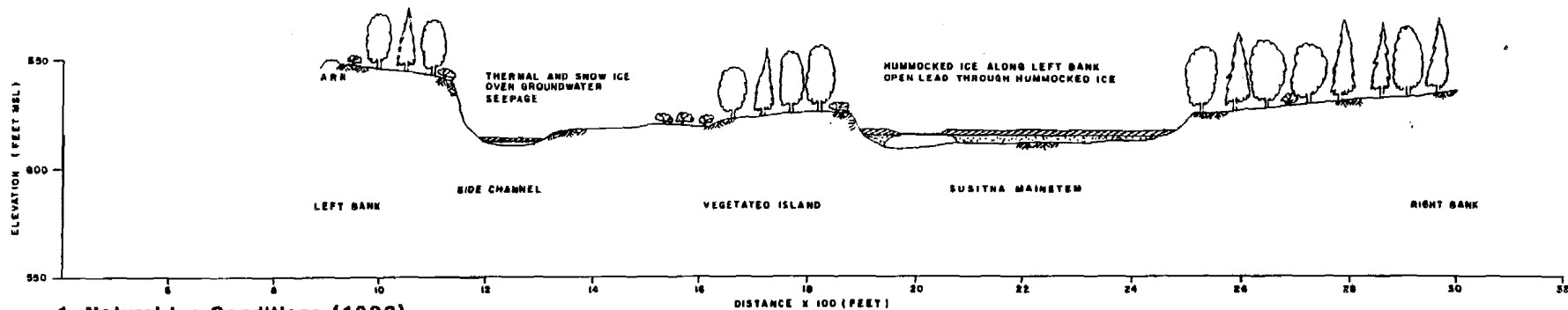
**PSM**  
R&M CONSULTANTS, INC.  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-29**

1980 CROSS SECTION SURVEY  
RIVER MILE 126.1  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE



PREPARED BY:

**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

**LRX-34**

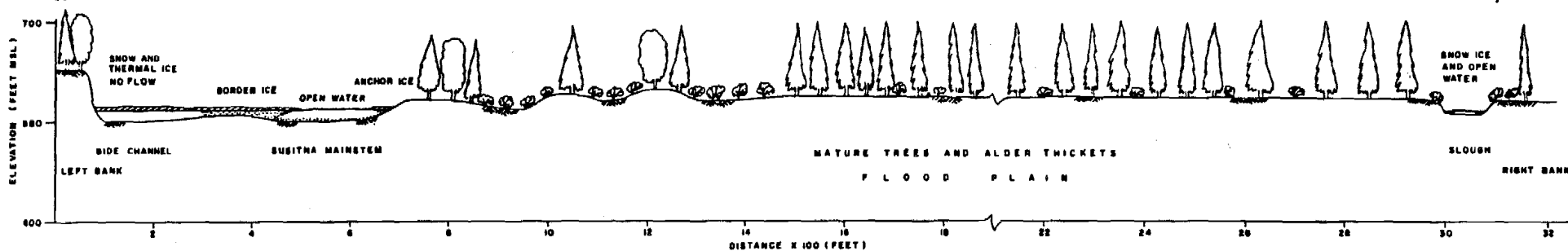
**1980 CROSS SECTION SURVEY  
RIVER MILE 130.5  
VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

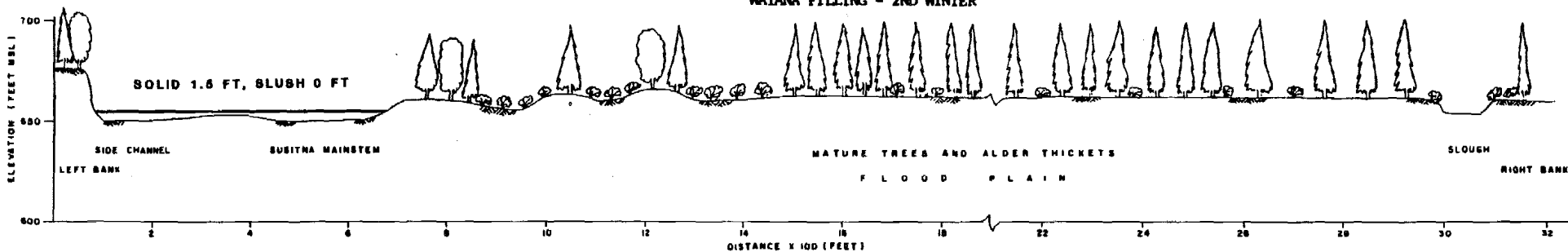


### 1. Natural Ice Conditions (1983)

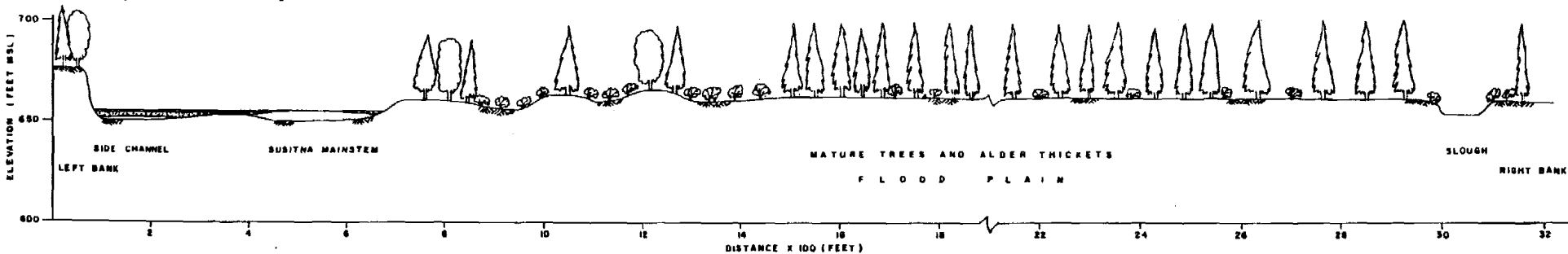


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

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**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

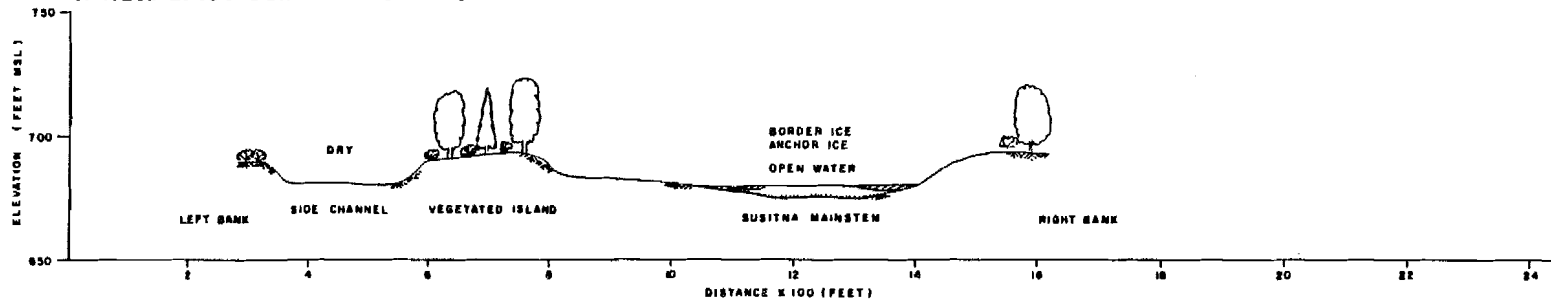
**LRX-40**

**1980 CROSS SECTION SURVEY**  
**RIVER MILE 134.2**  
**VERTICAL EXAGGERATION 4:1**

PREPARED FOR:

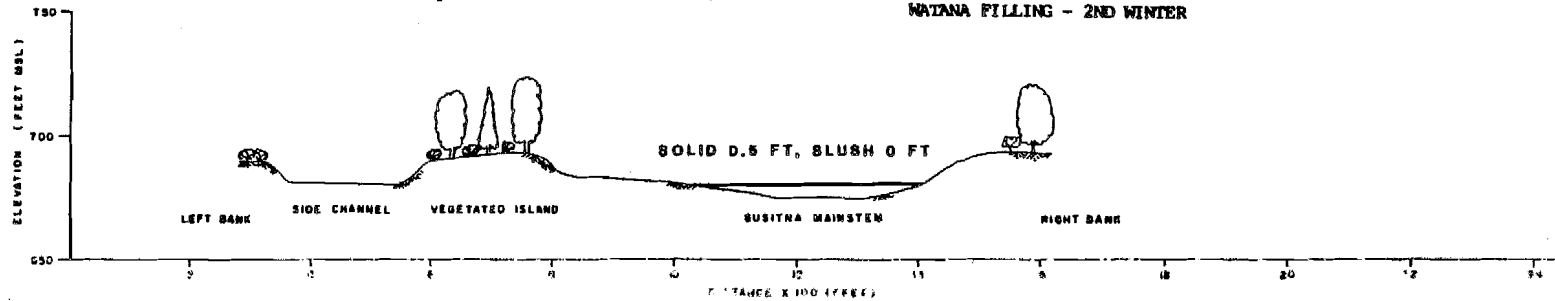
**HARZA-EBASCO**  
SUSITNA JOINT VENTURE

### 1. Natural Ice Conditions (1983)

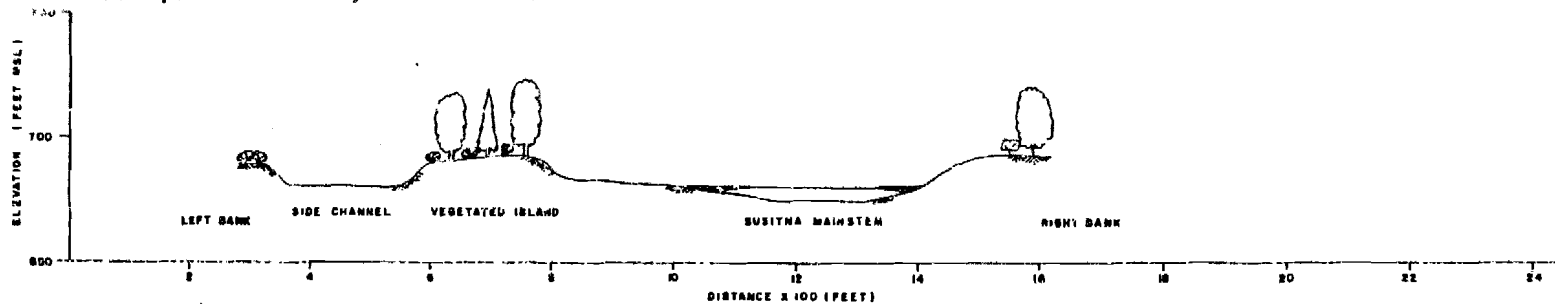


### 2. ICECAL Simulated with Project Ice Conditions RUN#81F2C-A

WINTER 1981-82  
WATANA FILLING - 2ND WINTER



### 3. Interpreted with Project Ice Conditions



PREPARED BY:

**RCM**  
RCM CONSULTANTS, INC.  
ENGINEERS ARCHITECTS PLANNERS SURVEYORS

**LRX-44**

1980 CROSS SECTION SURVEY  
RIVER MILE 136.4  
VERTICAL EXAGGERATION 4:1

PREPARED FOR:

**HARZA-EBASCO**  
SUSITNA JOINT VENTURE