UAA

School of Engineering

Technical Report

ENGINEERING FEASIBILITY STUDY OF FIRE ISLAND AS A LOCATION FOR A FUTURE CORRECTIONAL FACILITY

FINAL REPORT

ENGINEERING FEASIBILITY STUDY OF FIRE ISLAND AS A LOCATION FOR A FUTURE CORRECTIONAL FACILITY

Submitted To:

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Department of Corrections

Submitted By:

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Table of Contents

Table of Contents (Continued)

List of Tables

List of Tables (Continued)

List of Figures

Engineering Feasibility Study of Fire Island
As A Location for a Future Correctional Facility

1. Executive Summary

The University of Alaska, Anchorage has undertaken a project to evaluate the feasibility of using Fire Island as a site for a correctional facility. The project was funded by by the State of Alaska through a legislative appropriation to the Department of Corrections (DOC). This document is a Final Report of the Engineering Feasibility Study of Fire Island.

Summary of Findings

Fire Island lies in Cook Inlet and within the boundaries of the Municipality of Anchorage. A 400 acre parcel of land on the north end of the island, belonging to the Cook Inlet Region, Inc., has been proposed as a site for a correctional institution with a maximum inmate population of 960. The site is large enough to accommodate such a prison.

The climatic and geophysical characteristics of the site make it suitable for construction and operation of a prison. Soil conditions at the proposed site appear to be acceptable.

Access to the island is a major concern and has a strong influence upon the costs for construction and operation of the proposed correction facility. This study leads to the conclusion that primary access to the island using air cushion vehicles and secondary access using barge service will result in the lowest capital costs for the proposed prison.

Utility services on the island raise important concerns. Available data indicate that the groundwater supply may be subject to salinity problems and may prove to be inadequate. The groundwater supply can be supplemented using treated surface waters, however, the amount of surface waters available for continuous use and the degree of treatment which may be required are unknown at this time.

The technology is available to treat wastewaters generated on the proposed site and to deal with solid waste generated on the site. Electricity will probably have to be generated on site using diesel electric generators. Some waste heat recovery can be used to reduce space heating loads. Communication services to the island can best be provided by microwave relay stations.

Fire Island lies within the Municipality of Anchorage which is considered to be a "non-attainment" area for the air pollutants carbon monoxide and total suspended particulate. This designation may have some minor impact on the process of obtaining permits to construct the facility.

The proximity of Fire Island to the Anchorage International Airport results in some noise impact on the island. A study is currently underway in which the noise levels from the airport activity are being investigated. The results of the study will be available in 1987. The noise levels may require some small added cost in construction.

The proposed site on Fire Island has not been surveyed to determine if the area is archeologically significant. A preliminary survey of the proposed area will be required before any construction can take place. If the site is found to be archeologically significant, additional studies may be required which could delay construction.

It will be necessary to conduct a wetland determination study of the proposed site prior to any construction activity. Studies of this type are done by the U.S. Army Corps of Engineers. If it is determined that the proposed construction activities would impact wetlands, then special permits must be applied for by DOC and it is likely that some modifications would have to be made in the design and construction of the prison.

As noted, the least expensive access route to Fire Island is through the use of air cushion vehicles using barge service to handle some of the supply requirements. This alternative requires the construction of a dock at the island and one on the mainland. In addition, dredging of the channel north of the island would be required. Permits for these activities are required and could result in significant time delays if it is determined that the proposed construction activities would have a significant environmental impact on the fisheries of Cook Inlet or its tributaries. The delays could be more than a year if an Environmental Impact Statement is required.

From a legal standpoint, a prison located on an island with limited access raises some points of concern. It could lead to legal challenges based on issues of cruel and unusual punishment.

Using the Spring Creek Correctional Center as a model, construction cost estimates were made for a 960 inmate facility on Fire Island. The estimates were based on two scenarios:

a) With direct road access to the site: $175,140,000
b) Without direct road access: $ 66,320,000

The construction cost estimates for the Fire Island site were compared with the estimates for sites at Palmer and at Goose Bay with the following results:

a) Construction at Palmer:	$ 50,210,000
b) Construction at Goose Bay:	$ 50,210,000

A limited study was done to compare the major differences expected in annual operation expenses of the physical plants for sites at Fire Island, Palmer, and Goose Bay. The results of the study are:

a) Fire Island	$ 3,750,000
b) Palmer	$ 650,000
c) Goose Bay	$ 670,000

A study of the relative benefits and liabilities of the correctional facility sites at Fire Island, Palmer, and Goose Bay was carried out. The results of the study are presented in brief as follows:

a) Palmer and Goose Bay are apt to be more accessible than Fire Island on a year-round basis.
b) The questional water supply at Fire Island could result in prison disruptions in the event of shortages. This is not expected to happen at Goose Bay or at Palmer.
c) The air pollution problems of Anchorage may have an impact on obtaining permits to build on Fire Island. There would be no similar problem at Palmer or at Goose Bay.
d) The Fire Island site suffers a disadvantage due to noise from the Anchorage International Airport.
e) The potential difficulties of obtaining permits to construct docks and carry out dredging operations for Fire Island would not exist for the sites at Goose Bay and Palmer.
f) The potential for legal challenges associated with island based prisons does not exist at Palmer or Goose Bay.

Based on the results noted above, it appears that the Fire Island site has more potential liabilities than the sites at Palmer and Goose Bay. No special engineering or cost benefits for Fire Island were found in the study.

The reader is cautioned that: 1) The economic studies contained herein are based on cost projections rather than on firm contractor bids; and 2) The study does not include any information concerning the cost of land acquisition for proposed alternative sites.

2. Introduction

In February, 1985 the University of Alaska, Anchorage (UAA) submitted a proposal to the State of Alaska, Department of Corrections (DOC) entitled "Fire Island Prison Feasibility Study". UAA proposed that a task force of faculty members from the School of Engineering and the School of Justice would accomplish the five specific objectives shown in Table 1.

1.	Produce forcasts of the number and custody levels of inmates which the DOC will be expected to house in each of the years from 1985 through 2000.
2.	Identify the type and regional location requirement of correctional facilities which will be needed by DOC during the next 15 years.
3.	Evaluate Fire Island's feasibility as a location for a future facility serving DOC needs identified in satisfying objectives 1) and 2).
4.	Develop cost estimates for construction and operation of the Fire Island facility.
5.	Compare alternative site options at Goose Bay and Palmer with the Fire Island site.

Table No. 1: Objectives of the UAA Study

This report summarizes the findings of objective Nos. 3, 4, and 5.

3. Location of the Fire Island Site

Fire Island lies within the boundary of the Municipality of Anchorage. It's location is shown in Figure No. 1.

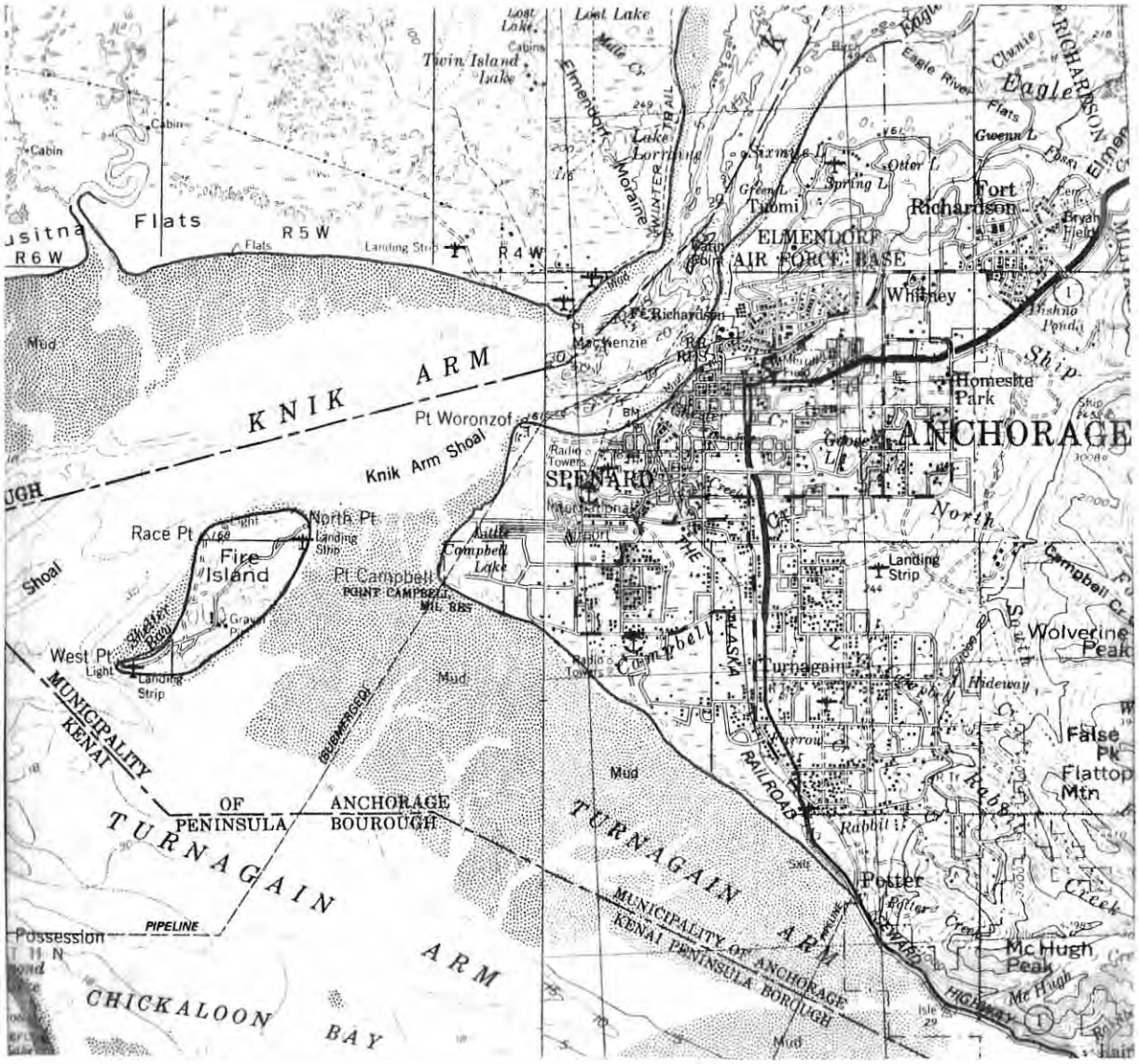


Figure No. 1: Map of the Anchorage area including Fire Island

Figure No. 2 is an enlarged map of Fire Island. Note the roadway connecting the two air strips located at the extreme ends of the island.

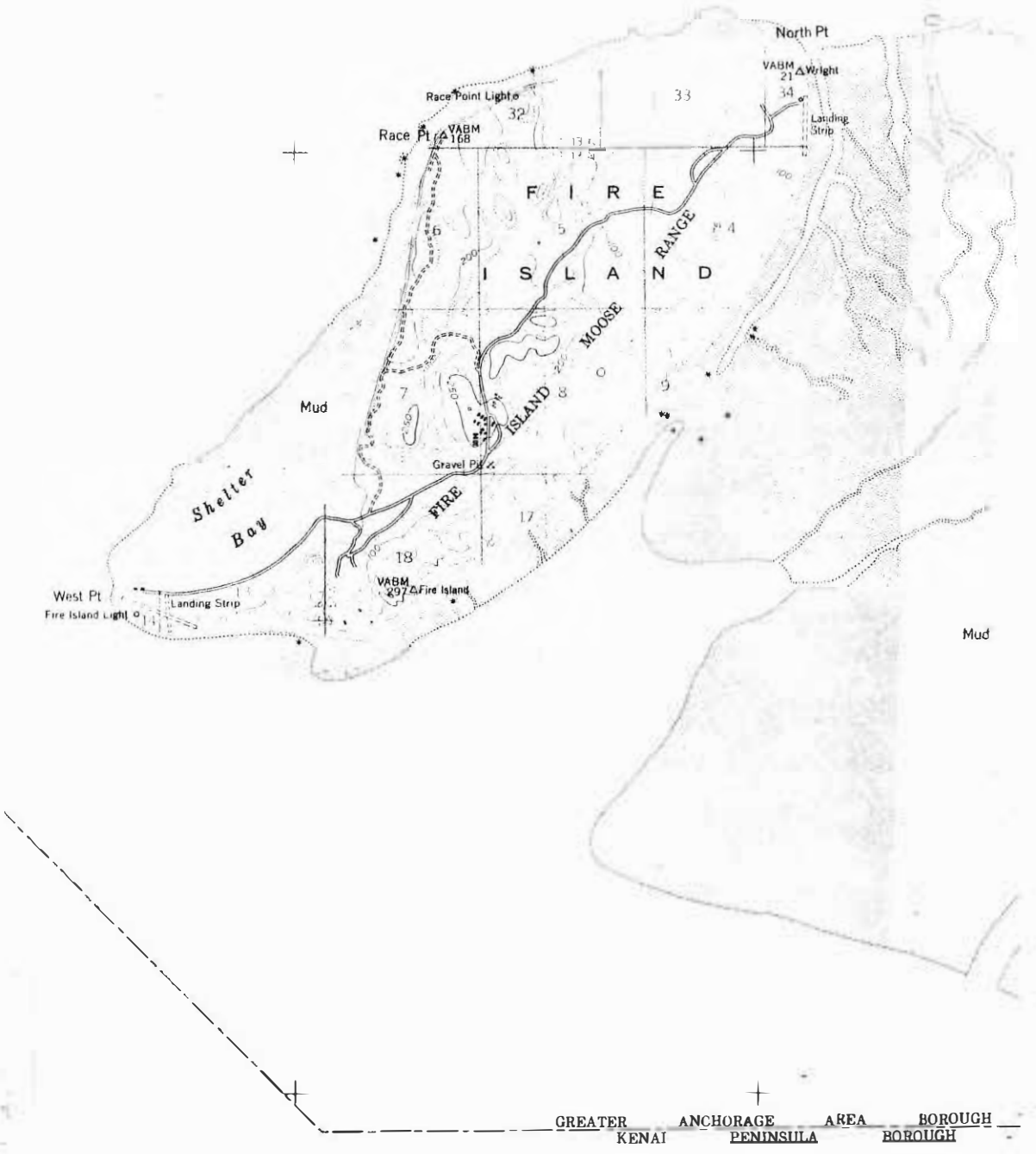


Figure No. 2: Map of Fire Island

At the northeastern end of Fire Island there is parcel of approximately 400 acres of land which is currently held by the Cook Inlet Region, Incorporated (CIRI). This parcel is shown in Figure No. 3 and lies in Township 12, Range 5W, Sec. 4 of Fire Island. This site has been proposed as the location for a prison facility.

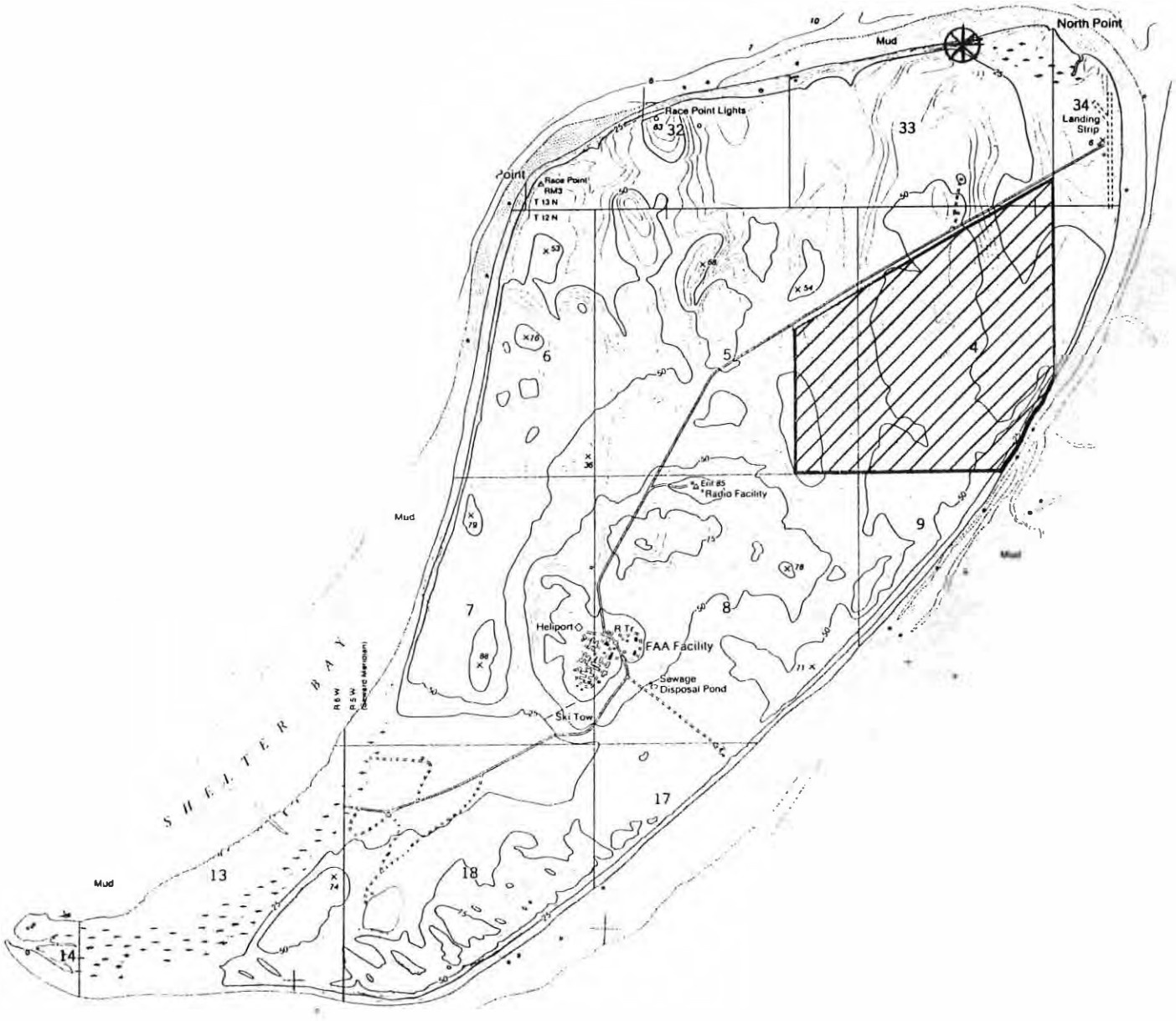


Figure No. 3: Proposed prison site on Fire Island

4. Engineering Feasibility of Fire Island as a Potential Prison Site

A. Facility Requirements and Assumptions

One of the project tasks was to identify the characteristics of the proposed prison facility and to agree upon the assumptions which would be used in determining the feasibility of the Fire Island site. The results of this effort were reported in a document entitled "Technical Memorandum: Facility Requirements and Planning Assumptions" dated July 18, 1985. The highlights of that document are summarized below:

1) The prison would be designed for a maximum inmate population of 960.
2) The total size of the prison staff would be in the range of 30% to 50% of the inmate population.
3) The design of the prison would be based on the prototype established for the Spring Creek Correctional Center (SCCC) planned for Seward, Alaska.
4) Four types of buildings would be required. These include
    - o Administrative and support buildings
    - o Inmate housing
    - o Utility buildings
    - o Auxiliary structures
5) Complete utility services would be provided including:
    - o Water supply
    - o Wastewater disposal
    - o Solid waste disposal
    - o Electrical power
    - o Energy - space heating
    - o Communication services

6) All staff will commute to Fire Island from Anchorage. No staff housing would be available on the island.

7) Emergency transportation to and from the island would be maintained.

8) Transportation would be provided for perishable and non-perishable items.

9) Three options exist for modes of access to the island.

- o Road
- o Air
- o Water

The facility requirements and assumptions noted above are general in nature. Unique facility requirements and planning assumptions were developed and discussed in the document for specific alternatives. For example, the option of using road access to the island would require a bridge (perhaps in combination with a causeway) and there are unique considerations involved with bridges.

B. Climatic Data for Fire Island

Since climate influences the design and operation of all facilities, climate data were reviewed as a part of the study. In general the overall weather of Fire Island is thought to be similar to weather at the Anchorage International Airport which is 5.6 miles to the east of the the island. It is a transitional climate between maritime and continental and is influenced by the local topography. Temperatures, precipitation and winds in the area are variable.

Temperature

Monthly average temperature readings at the Anchorage International Airport are shown below in Figure No. 4. The values shown are average values during the period 1943 - 1983.

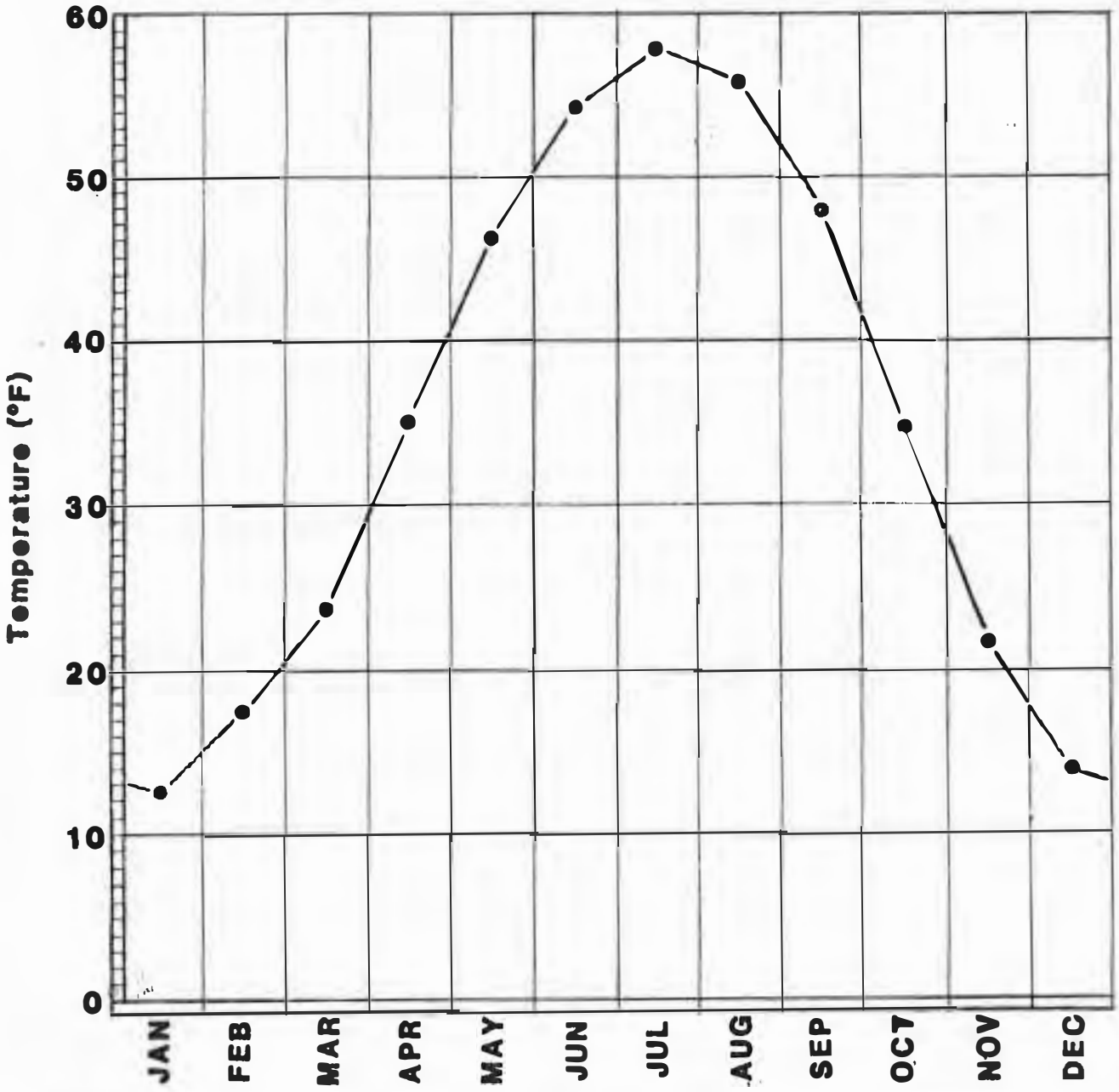


Figure No. 4: Monthly Average Temperatures at Anchorage International Airport, 1943 - 1983

Precipitation

Precipitation is very localized in the Anchorage area. It would be possible for Fire Island to receive a heavy snow or rainstorm while Anchorage receives nothing at all, or vice versa. Only very limited precipitation data are available for Fire Island. However, on an annual average, precipitation at Fire Island is thought to be roughly equivalent to that at Anchorage International Airport. Data collected at the airport are illustrated in Figure No. 5.

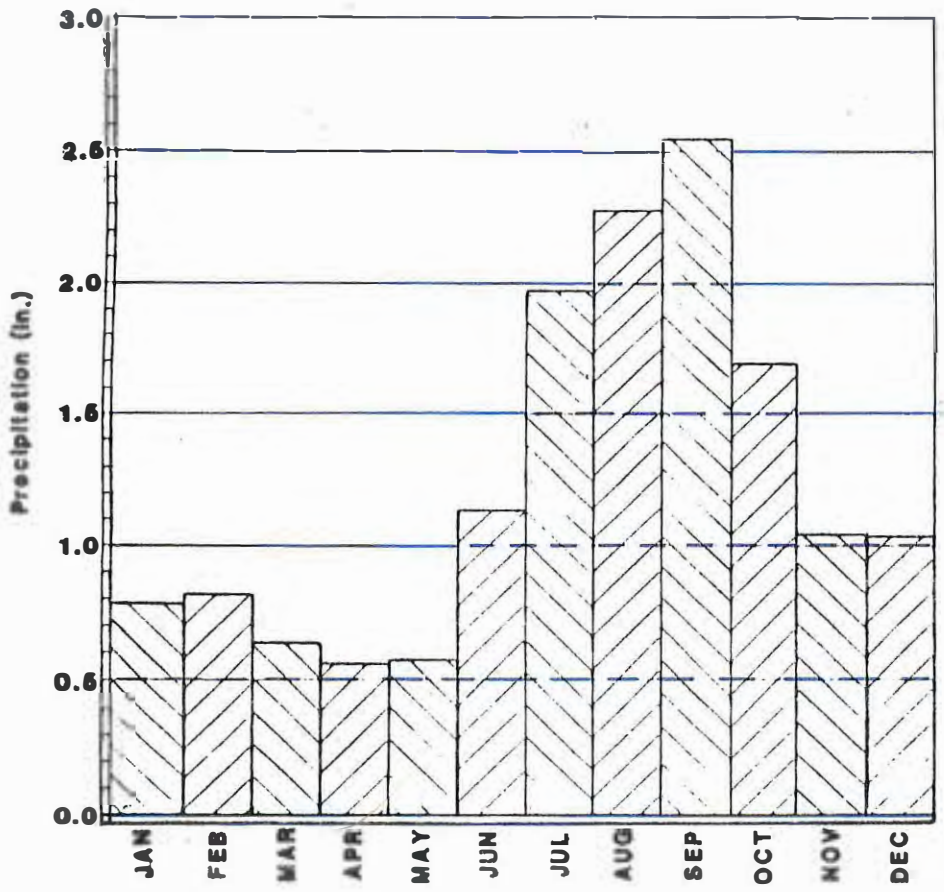


Figure No. 5: Mean Monthly Precipitation at Anchorage International Airport, 1943 - 1983

Various reports (Ref. 3) indicate that the mean annual precipitation recorded at Anchorage International Airport is 14.7 inches (water equivalent). The mean annual snowfall is 69 inches. The maximum 24 hour rainfall is 1.66 inches. The maximum 24 hour snow fall is 16.4 inches. The maximum snow depth on the ground is 47 inches, recorded in the months of December and January. No snow has been observed at the airport in the months of June, July, and August (Ref. 4).

Wind

Very little wind data from Fire Island are available. The literature survey found wind records from a 3 month period in 1948 only. Wind data is available from the Anchorage airport for an extended period of time. However, the reader should be aware that the particular micro-climate of Fire Island could yield winds which are significantly different than those recorded at Anchorage International Airport even though the two areas are separated by less than 6 miles.

Winds in the Anchorage area generally are not strong though there have been exceptions. The prevailing winds are from the south through most of the year. Figure No. 6 is a wind rose developed from data taken at the Anchorage International Airport during the period 1953 to 1977. The data show that for 30.9% of the time wind speeds are less than 4 knots. Winds up to 13 knots come from any direction.

Wind patterns on Fire Island are of concern because of their impact on the safety of aircraft landing on and departing from the island.

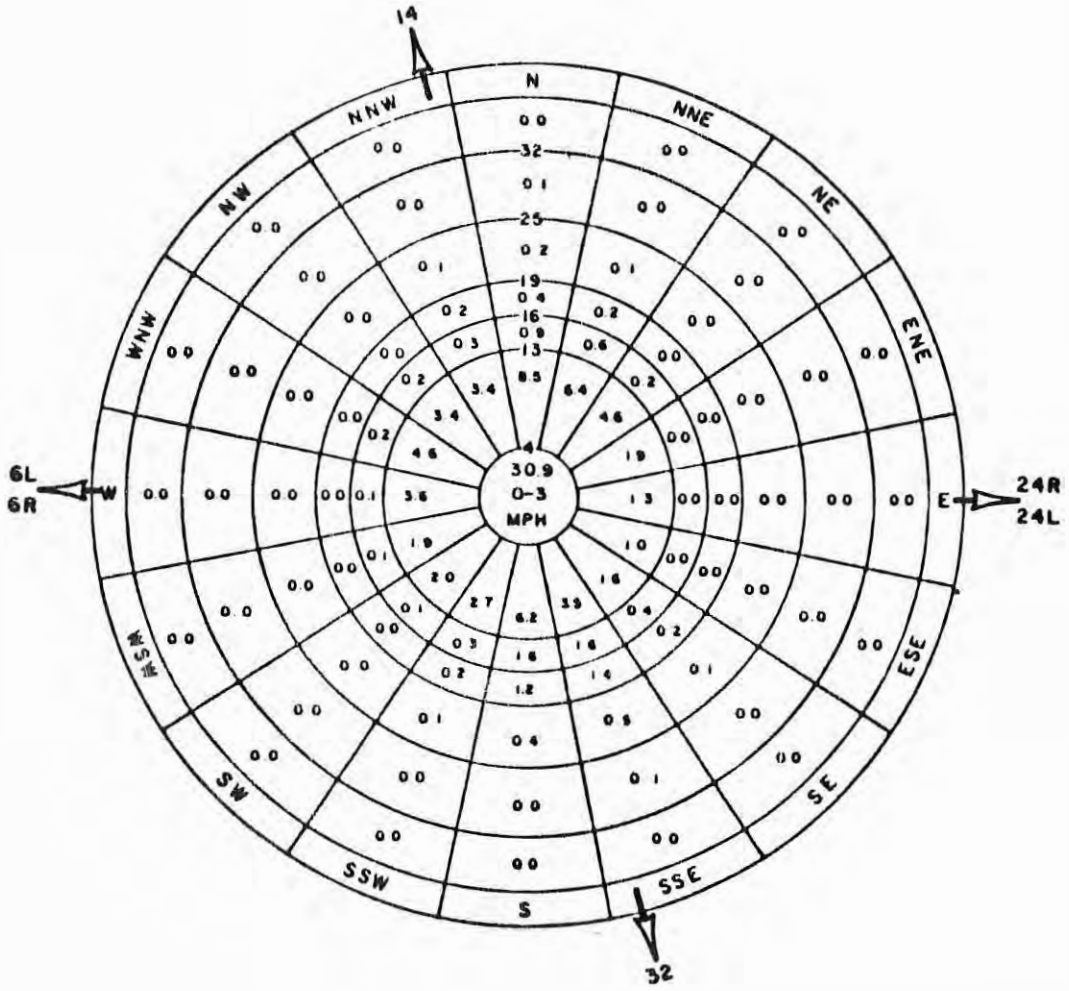


Figure No. 6: Wind Rose Data from Anchorage International Airport.

C. Geophysical Description of Fire Island

A combination of five major Pleistocene glaciations and more recent weathering actions from wind and water has

resulted in the present topography of Fire Island. Various investigators (Ref. 7 & 9) reported that the island was formed by emptying of a glaciated impounded lake which once occupied most of Cook Inlet. After drainage of the lake the remaining unconsolidated sediments of sand, gravel, silt and clay were weathered to their present configuration.

Topography

Steep bluffs ranging from 80 to 300 feet above tide level cover the entire perimeter of the island except for some low lying land areas near the northest side (North Point) and the southwest side (West Point). The low lying areas become partially submerged during high tides.

The interior topography of the island is hummocky. Knolls, ridges and depressions are inconsistently spread and elevations range from less than 50 feet to greater than 300 feet above tidewater. The interior slopes vary from less than 5% to greater than 50%, whereas the coastline is characterized by steep slopes from 75% to 100%.

There are three accessible areas to tidewater from the interior of the island. These are North Point, West Point, and a small valley (about 4000 feet in length by 2000 feet in width) located between the Federal Aviation Administration (FAA) facilities and West Point.

The topography has been mapped in 5 meter contour intervals on scale 1:25,000 U.S. Geological Survey (USGS) topographic maps (Tyonek A-1 NE, Alaska and Tyonek A-1 NW,

Alaska). These maps post-date the 1964 Good Friday earthquake. A contour map of the island is found in Figure No. 7.

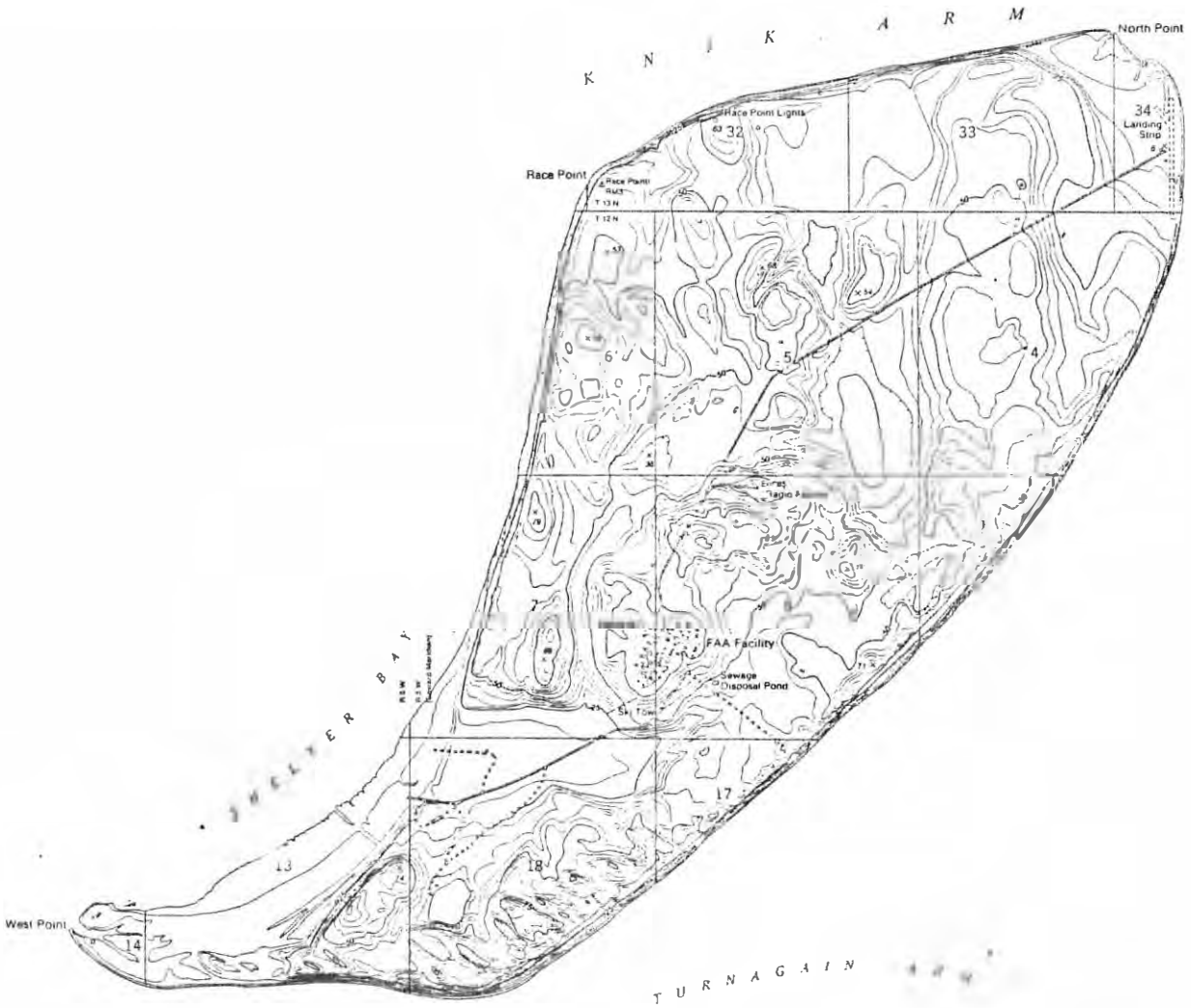


Figure No. 7: Contour Map of Fire Island

A larger scale contour map of the northeast end of Fire Island is found in Figure No. 8.

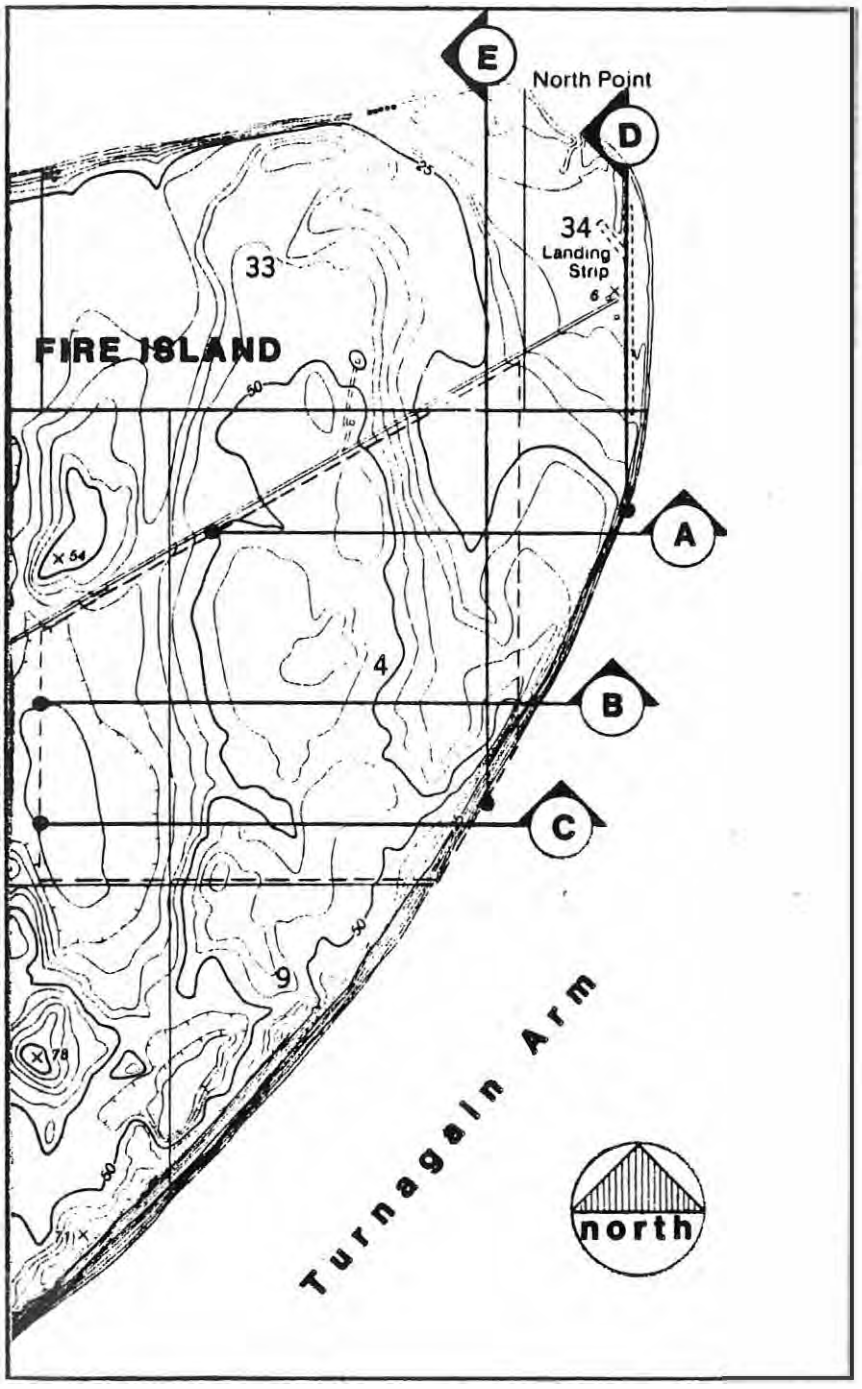


Figure No. 8: Contour Map of the Northeast End of Fire Island

Cross sectional elevations of the northest end of the island are shown in Figure Nos. 9 and 10. Refer to Figure No. 8 for location of section lines.

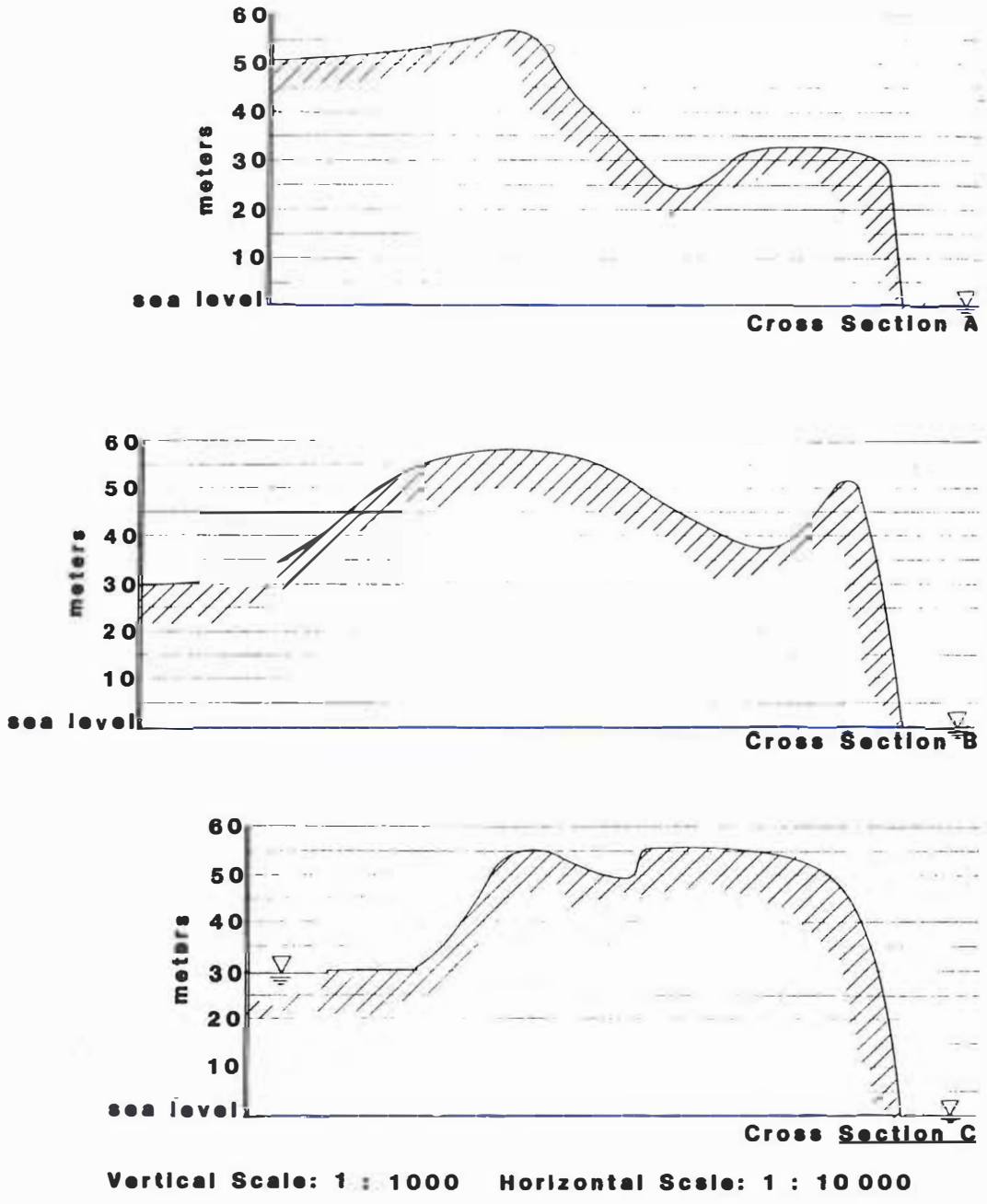


Figure No. 9: Cross Sections of Northeastern Fire Island

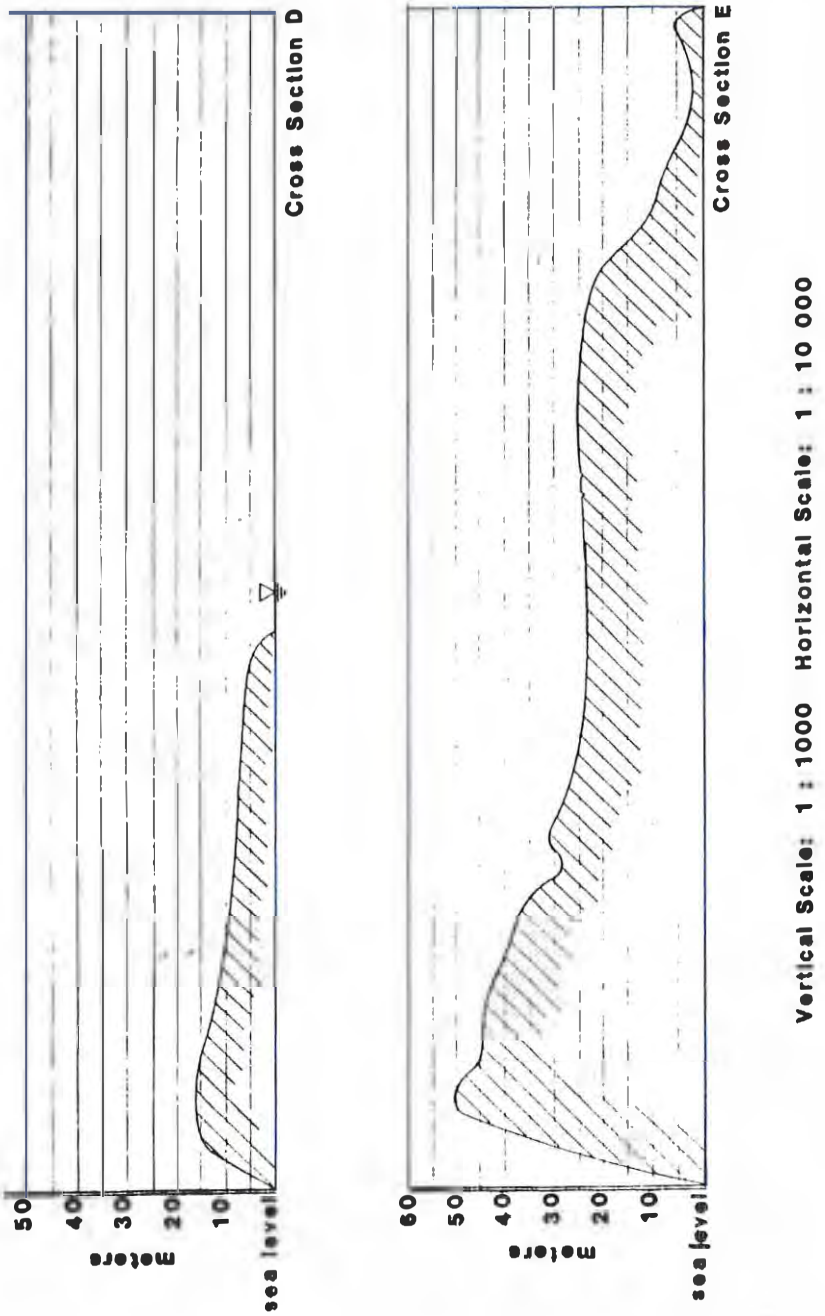


Figure No. 10: Cross Sections of Northeastern Fire Island

It appears from Figure Nos. 9 and 10 that the topography of the areas shown in Sections A and B in the northwestern directions is relatively flat. The maximum grade range is 3% to 7%.

Geology

Geologically, Fire Island may be described as unconsolidated deposits of interbedded and interfingered units of sand, gravel, clay and silt. They extend well below sea level. Underlying these deposits are poorly consolidated sediments of Tertiary age known as the Kenai formation. This rock is predominately non-marine sandstone and claystone with localized coal seams. The basement rock is the McHugh complex of late Jurassic or Cretaceous age which consists of weakly metamorphosed sediments such as grawacke, arkose-type sandstones and conglomerate.

Soils

The soil conditions vary depending on the geological background and the topography of the area. The soil conditions at the interior region of the island are known from various well logs and borings drilled at the FAA installation in the southcentral portion of the island. The data show that glacio-deltaic deposits consisting of sand and gravel, interbedded with minor amounts of silt and clay prevail in the area. Frost-susceptible silty sands and gravels were encountered from zero to 12 feet depth near the radio facility of the FAA station.

Classified borrow materials consisting of clean sands and gravels are found near the existing airstrip road which is approximately 2 1/2 miles from the FAA installation. Dune sands which may be used as construction fill materials are located close to the FAA installation. It was reported that borrow materials may be easily obtained from the exposed bank with a stripping operation. The thickness of sands and gravels is about 25 feet. They are overlain by about 2 feet of unsuitable construction material (Ref. 14).

Nine test pits were dug during previous subsoils investigations to determine the feasibility of developing a harbor facility with road access to Fire Island. The test pits located along the northern shore down to a point approximately 2500 feet southwest of Race Point confirmed the presence of glacio-deltaic sands and gravels and a deposit of alluvial sand and gravel. Silts and sands were also encountered below the land water level.

Cook Inlet Region, Inc. (CIRI) investigated the subsurface conditions at various locations of the island. The investigation consisted of various test holes and test pits and showed a wide range of soil conditions. Figure No. 11 illustrates a typical soil condition near the designated site for the proposed prison.

Seismicity

Fire Island is located in one of the most active seismic areas of the world. In 1964 a major earthquake resulted in

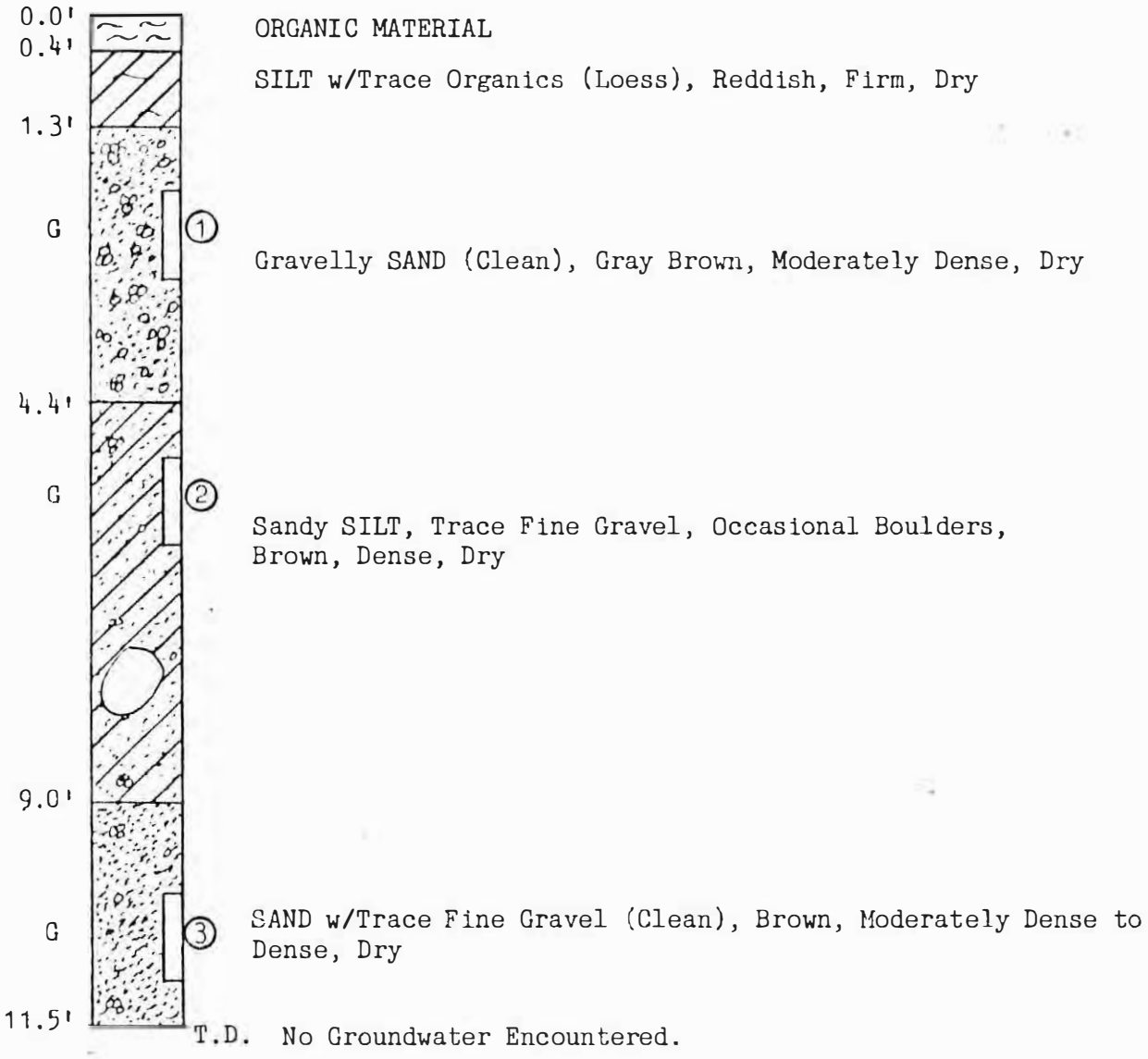
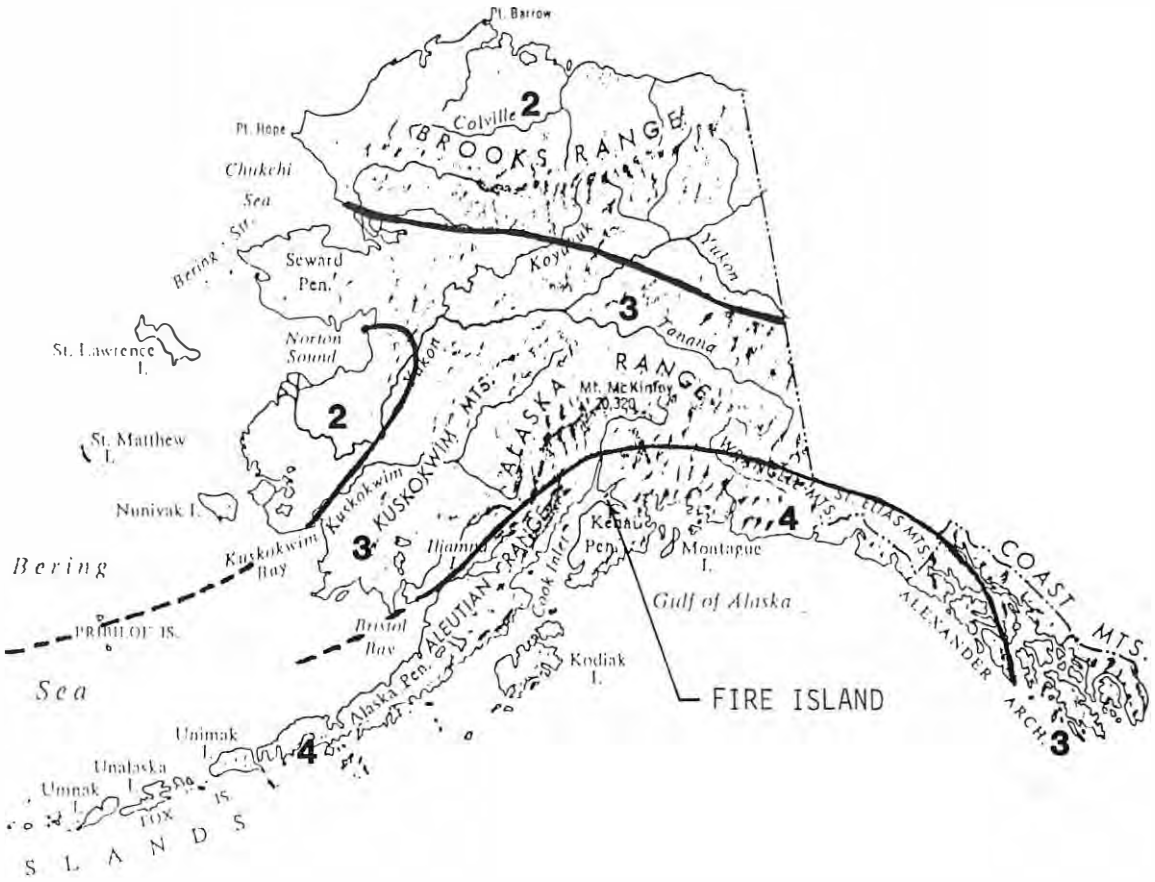


Figure No. 11: Typical Soil Condition Near the Site of the Proposed Prison Site on Fire Island

loss of life as well as great damage in Anchorage and other Alaskan communities. The seismic zones of Alaska which contribute to this activity are shown in Figure No. 12.



Zone	Possible maximum damage to structures
0	NONE
1	MINOR
2	MODERATE
3	MAJOR
4	Potential damage is greater than zone 3 due to geologic and tectonic factors

Figure No. 12: Seismic Zones of Alaska (Ref. 23, 24)

There are four effects of seismic activity which can result in damage:

- o Landsliding
- o Landspreading
- o Ground cracking
- o Liquefaction

A Geotechnical Hazard Assessment Study (Ref. 16) indicates that Fire Island may experience high intensity earthquakes. Structures located on unconsolidated sediments would experience a longer period of shaking with a correspondingly high potential for damage. However, the limited data available concerning soils on the island suggest that the island may not have unconsolidated materials. If this is the case, the potential for seismically induced ground failures is minimal at the site.

The reader should note that a complete evaluation of the potential for seismic hazards would involve a thorough (and costly) evaluation of the soils of the island.

Slide Potential

There are no snow avalanches or rock slide hazards on Fire Island. As the coastline is very steep along most of the perimeter, erosion, landslides or mass wasting are potential hazards. One investigator (Ref. 10) indicates that the potential for mass wasting is low to moderate. The coastal bluffs may be exposed to slumping, soil fall, debris siding and/or mudflow.

Coastal Erosion

Much of the perimeter of Fire Island is subject to wave action and strong tidal currents. The coastal bluffs show evidence of coastal erosion. However, for the majority of the perimeter, the erosion rates are unknown. The exception to this is the southeastern shore which receded one-quarter mile in 600 years or approximately 2 feet per year (Ref. 17). It is not anticipated that coastal erosion would be a major concern which would affect the long term use of the island.

Summary Comment

The preceeding 15 pages of this report are introductory to the topic of Section 4: Engineering Feasibility of Fire Island as a Potential Prison Site. Three subtopics have been presented.

- o Facility Requirements and Assumptions
- o Climate Data for Fire Island
- o Geo-Physical Description of Fire Island

The information within these subtopics is important as background material in evaluating the site. Detailed aspects of the site evaluation are now presented.

D. Site Evaluation

1) Suitability of Soils for Building Foundations

A review of the literature plus a limited on-site inspection of the area which is proposed as a prison site on Fire Island lead to the initial conclusion that the soils in

the area are suitable for building foundations. During a field inspection trip to the site it was observed that the site is covered with mature forest. The trees are typical of areas where the surficial soil strata are composed of well drained materials. The water table at the site is deep. Thus, surface waters should not interfere with construction or building foundations. Further, the soils are expected to be generally consolidated deposits of sands and gravel with a mixture of silt and boulders. This type of material is very suitable for building foundation support.

As noted in the discussion of Seismicity (p. 20) it appears that the proposed prison site area has a low potential for seismically induced ground failures.

Further geotechnical investigation would be necessary to confirm that the proposed site would be free of unconsolidated sediments. Additional test holes (at least 30 feet deep) at several locations in the proposed site area would supplement the existing data. This would permit a detailed analysis to determine the potential for ground failure susceptability and would also substantiate that the soils are suitable for construction without special foundation design.

2) Transportation

Transportation to and from Fire Island is a major issue affecting the feasibility of locating a prison there. Transport to the island has been studied numerous times over the past years. The studies have included causeways and bridges,

harbor construction for boat and barge service, use of air cushion vehicles and use of fixed wing and rotary wing aircraft. Transportation modes affect both the construction and the operation of facilities located on the island.

It is important to understand to magnitude of the transportation issue. Thus the number of person-trips to the island and the amount of freight transport necessary were estimated. The number of trips between Fire Island and the mainland was projected using an estimated number of staff for the correctional facility and the history of visitation at other Alaskan institutions. For planning purposes the inmate population was projected at 1000 persons with a staff of 30% to 50% of the inmate population. Trip rates were estimated by the type of trip as follows:

- o Employee trips per day: 1.1 trips/bed
- o Weekday visitors per day: 0.2 trips/bed
- o Weekend visitors: 0.5 trips/bed
- o Holiday visitors: 0.25 trips/bed

For a facility of 1000 inmates, the daily trips would be approximately 1300. Weekend trip rates would be slightly higher.

The quantity of freight which is shipped to each facility was available on an aggregate basis only. This information was not readily available separately for perishable and non-perishable goods. This is a potentially critical element for selection of a transportation alternative. Perishable goods

must be delivered on a weekly basis as a minimum to prevent spoilage. Non-perishable goods could be stored two months or longer and could be delivered in bulk shipments, possibly by barge.

The rough approximation of goods which would be received by the correctional facility is the equivalent of a 24 foot semi-trailer per week for each 100 beds. For a facility of 1000 inmates, the shipment would be the equivalent of 10 trailers per week. If estimates of quantites were available for perishable and non-perishable goods separately, a better analysis of transportation modes could be performed.

For purposes of this report, the island site has been evaluated for access by three basic modes of transportation.

1) Air access using fixed wing aircraft with periodic supply by barge.
2) Water access using a combination of air-cushion vehicles, boats and barges.
3) A road built on a bridge and causeway combination.

Air Access

The island can be accessed by air. The present airstrip on the north end of the island is the best location for a runway serving fixed wing aircraft. Other sites could support construction of a new airfield but would require large scale construction and acquisition of additional land. The costs of building a new airfield would be significantly greater than

the costs of upgrading the existing airfield. No advantage would be gained by building a new facility.

The existing runway is 2000 feet in length with a north-south orientation. It is a gravel airstrip which had lighting for night operations at one time. The runway terminates in a steep grade at the southern end.

If this mode of access were to be used, the runway would need to be upgraded for year-round operations. This would include construction of terminal facilities. The grade at the south end of the runway would have to be improved to permit operations in both directions. Navigation aids would be needed to permit operations in adverse IFR weather conditions.

It is possible to expand the airfield to nearly 3000 feet by removing the hill at the south end of the runway. Beyond this, there is not area for further expansion. This would permit use of the airport as a Basic Utility Stage II airport. As such it could accommodate 95 percent of the aircraft with a gross weight of 12,500 pounds or less. The number of passengers to be carried per flight would be limited to a maximum of 20. Many aircraft in this category are limited to less than 20 passengers. A typical shift change would require a minimum of 10 roundtrip flights. Shipment of perishable goods would require as many as 20 additional flights per week.

The number of flights required for shift changes is almost prohibitive. The flight time is approximately 15 minutes between Merrill Field and Fire Island. Ground time

would be a minimum of 10 minutes for taxiing, loading and unloading of passengers. Each round trip would therefore be a minimum of 40 minutes. To accomplish a shift change in a reasonable time period would require a separate aircraft for each round trip (or a minimum of 10 aircraft).

Weather conditions will not permit continuous operation of aircraft in the Anchorage area. Visibility and winter conditions can be expected to close the airfield on Fire Island for short periods of time. This is not considered to be a major detriment to the use of air access to the island. However, it is a factor which could influence the operation of a prison facility whose primary mode of access is aircraft.

Wind conditions on the island and in the Anchorage area are not expected to cause major problems with use of aircraft. Based on wind observations at Anchorage International Airport, the runway orientation on Fire Island provides for acceptable crosswind components 98 percent of the time.

Costs have been estimated for aircraft access to the island. Aircraft operating costs are based on hourly rental of aircraft and do not account for the fact that this operation would require a dedicated fleet of aircraft for daily shift change plus visitors. The estimated capital cost and annual operating expenses are shown in Table No. 2.

Because aircraft are not able to carry all of the freight needed for operation of a large prison facility, a dock for periodic shipments of non-perishable goods would have to be

Capital Costs	
Airfield improvements	$6,000,000
Dock & road construction	500,000
Total	$6,500,000
Annual Operating Expense	
Aircraft Operations	$1,500,000
Airfield Maintenance	60,000
Terminal and Parking	200,000
Barge Operations	50,000
Total	$1,810,000

Table No. 2: Estimated Capital Costs and Annual Operating Expenses Using Aircraft Access to Fire Island

constructed. It is suggested that a dock be located at or near North Point. (See Figure No. 13). This location requires minimal dredging to reach deep water and may be connected to the correctional facility site by a short road. The capital costs for the dock and the annual operating expense associated with barge operations are indicated above in Table No. 2.

Only very brief consideration was given to the option of using rotary wing aircraft (helicopters) for primary access to the island. The capital costs and operating expenses for helicopters are significantly higher than those for fixed wing aircraft. Further, they offer no advantage in terms of carrying capacity of either freight or passengers. However,

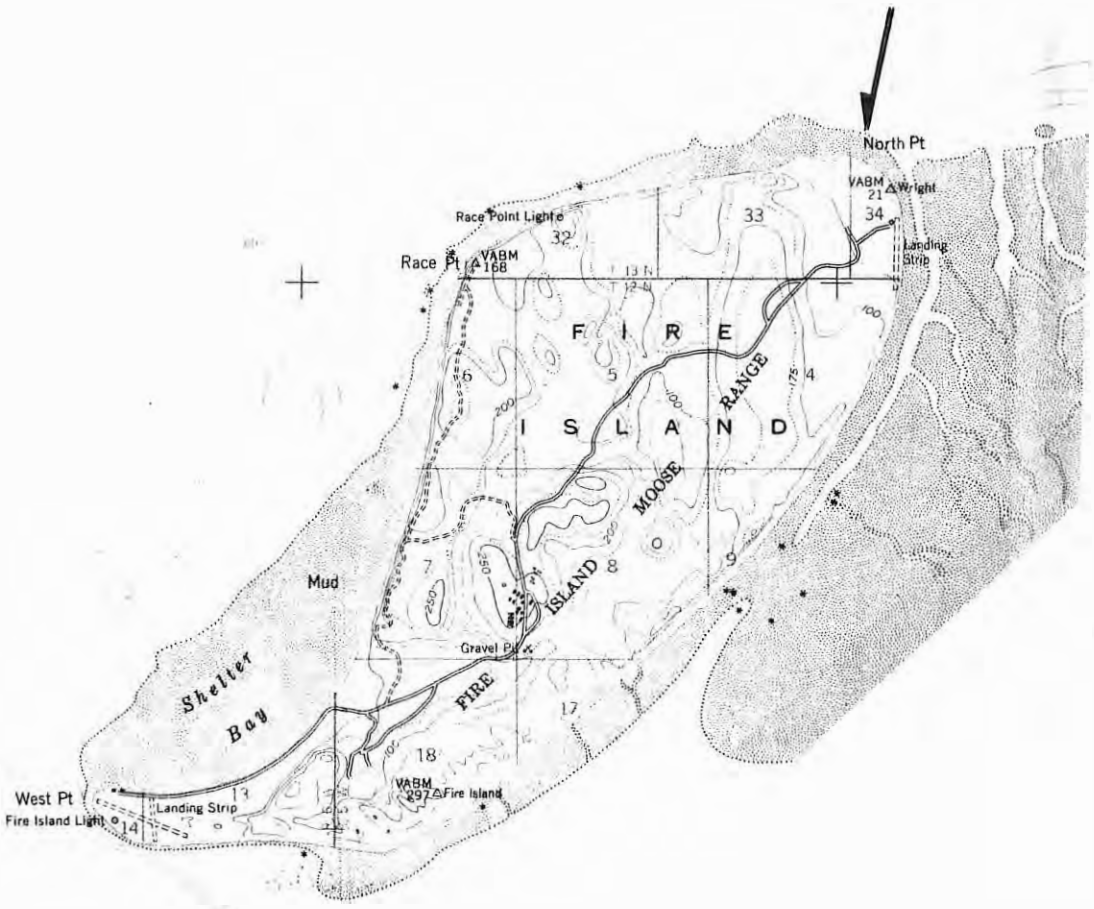


Figure No. 13: Proposed Dock Site on Fire Island

the use of rotary wing aircraft for emergency access may be advantageous as a supplement to any primary mode of transport. A landing pad could be located adjacent to the correctional facility to accommodate helicopters.

Water Access

Conventional boats are not suited to year-round operation between Fire Island and the mainland for two reasons: 1) Tidal conditions make the island inaccessible by boat during a large portion of each day; 2) Winter ice in Cook Inlet constitutes a major hazard for boat transport. The limit imposed by tidal fluctuations is seen during low tide when the water recedes as much as 1/4 mile from North Point. This limit can be overcome by a combination of dredging a navigable channel toward the island from the deep water near North Point and construction of an extended pier from the island to the channel.

In addition to the limitations noted, it is recognized that conventional boats operate at a relatively slow speed. Thus, use of conventional boats as a means of water access to the island would result in significant travel times for shift workers.

As an alternative to conventional boats, air cushion vehicles (also known as hovercraft) offer a suitable alternative for water access to the island. They are capable of traveling over land, mud, water, and ice. They can operate in winds of up to 40 knots and in waves of up to 4 feet. Large commercially available models can clear obstacles up to 4 feet high and can maneuver around obstacles.

Review of the trip requirements for the proposed prison staff and visitors suggests that a fleet of three air cushion

vehicles would be appropriate. Two air cushion vehicles large enough to carry 50 passengers each could transport the staff to and from the mainland for shift changes. A small vessel capable of carrying 6 to 10 passengers could be used as a continuous shuttle providing access for visitors and movement of inmates.

Shift changes would be accomplished by the 2 larger vessels making two roundtrips to the mainland. Shift schedules would need to be staggered to permit arrival and departure on the different trips.

Air cushion vehicles are commercially available in sizes which can carry more than 50 passengers. However, there is some advantage in having two vessels available for transporting the staff. When it is necessary to take one of the vessels out of service for maintenance and repairs, the other vessel can be used for a limited period of time to meet the majority of the transportation requirements for personnel.

Air cushion vehicles can be used to transport both personnel and freight. Freight hauling schedules can be arranged around shift change schedules. The large craft would be able to provide for shipment of most of the commodities needed for operation of the prison. Any commodities which could not be shipped by air cushion vehicle could be shipped by barge.

Facilities for air cushion vehicles would be located at North Point (See Figure No. 13) and near the Port of Anchorage

on the mainland. All of the maintenance facilities would be located at the mainland terminal. Sufficient parking and waiting space would also be necessary at the mainland terminal. The facilities on Fire Island would include a terminal with parking for buses and trucks, and a ramp large enough to accommodate all three of the air cushion vehicles. An improved road would be extended from the exiting road to the new site at North Point. A dock and fuel handling facility would also be required at the North Point location.

The estimated costs for access to Fire Island by air cushion vehicles are shown in Table No. 3.

Capital Costs	
Air Cushion Vehicles (3)	$4,000,000
Mainland Facilities	300,000
Dock	500,000
Total	$4,800,000
Annual Operating Expense	
Maintenance, repairs, and fuel	$1,800,000
Barge operations	50,000
Total	$1,850,000

Table No. 3: Estimated Capital Costs and Annual Operating Expenses Using Water Access to Fire Island

Road Access

Of the three access routes considered (air, water and road) the road access offers the most advantages in terms of service to the island. Some of the more obvious advantages include:

- o Significant reduction in the construction costs for the prison (assuming that the road access is completed prior to the start of prison construction).
- o Reduction in the cost of personnel transportation.
- o Reduction in the cost of all utility services.
- o Road access will permit the shipment of all commodities by truck directly to the prison site.
- o Road access would provide dependable transportation with minor impacts from weather conditions.

Road access to Fire Island has been studied by the Alaska Department of Transportation and Public Facilities (DOT-PF) and by other organizations. In a 1983 report entitled "Preliminary Construction Cost Estimate for Fire Island Crossing" by Tan, R. of DOT-PF, a combination causeway and bridge structure extending from Point Campbell on the mainland to the island was proposed.

Construction of a causeway/bridge between the mainland and the island is technically feasible. Soil investigations indicate that such a structure can be built. However, further analysis of the soil conditions between the island and the mainland would be required before the detailed technical requirements for such a project could be established.

Point Campbell is not presently connected to the Anchorage road network. Alternative routes to make the connection include a road which might pass through or just to the north of Kincaid Park. Either of the alternative routes would require acquisition of right-of-way.

The 1983 estimated costs of road access to Fire Island included two alternatives (Ref No. 22):

- o A combination causeway and bridge: $ 103,000,000
- o A bridge $ 165,000,000

These cost estimates do not include access to Point Campbell from the present Anchorage road network. The estimated costs for construction based on 1986 prices are shown in Table No. 4.

Capital Costs	
Causeway and bridge	$ 125,000,000
Bridge	$ 200,200,000
Annual Operating Costs	
Maintenance	$ 100,000

Table No. 4: Estimated Capital Costs and Annual Operating Expenses Using Road Access to Fire Island

Although road access provides a dependable means of transportation between Fire Island and Anchorage, the capital costs are very high. It does offer a low annual operating expense and other cost savings associated with the construction and operation of the proposed prison facility. A more thorough discussion of costs is presented in Section 6 of this report.

In brief summary of the discussion of transportation, it is technically feasible to provide access to the proposed facility on Fire Island. Access may be achieved via air, water or roadway. Of these options, it appears that the least costly transportation would be achieved by the use of air cushion vehicles for both personnel and commodities transport.

3) Utilities

The proposed prison site would require utility services including:

- o Water supply
- o Wastewater disposal
- o Solid waste disposal
- o Electrical power
- o Communication services

Each of these utility service needs has been reviewed as a part of this overall study.

Water Supply

Potable water supply requirements for prisons is variable. Typical water supply requirements suggest 150 gallons per person per day. Based on a maximum inmate population of 960, the basic water supply requirement would be 144,000 gallons per day. However, taking into account the estimate of prison staff ranging from 30% to 50% of the inmate population, the maximum water supply requirement could be as much as 170,000 gallons per day.

An important question arises: Is there sufficient water available on Fire Island to sustain a demand of as much as 170,000 gallons per day. A review of the literature was conducted to answer this question and resulted in the following items of information.

Four wells were drilled to provide water for the FAA station in the southcentral portion of the island. These wells provide the only specific information on the groundwater resources. Two of the wells had to be abandoned because of high salinities and a third had to severely curtail production to hold down the chloride concentrations. The fourth well has produced at a rate of 80 gallons per minute without a salinity problem. The rate of 80 gallons per minute is equivalent to 115,200 gallons per day. All of the wells exceed the recommended standards for iron and manganese.

Groundwater on the island appears to be unconfined with a water table elevation a few feet above sea level (Ref. No. 2). Since Fire Island is surrounded by marine waters, one would expect any unconfined freshwater to exist as a lens underlain by saltwater. A theoretical depiction of this is presented in Figure No. 14 (Ref. 29).

Pumping of groundwater from such a freshwater lens would result in a drawdown of the water table and an "upconing" or rising of the freshwater-saltwater interface. The geometry of an upconing situation is illustrated in Figure No. 15 (Ref. 29).

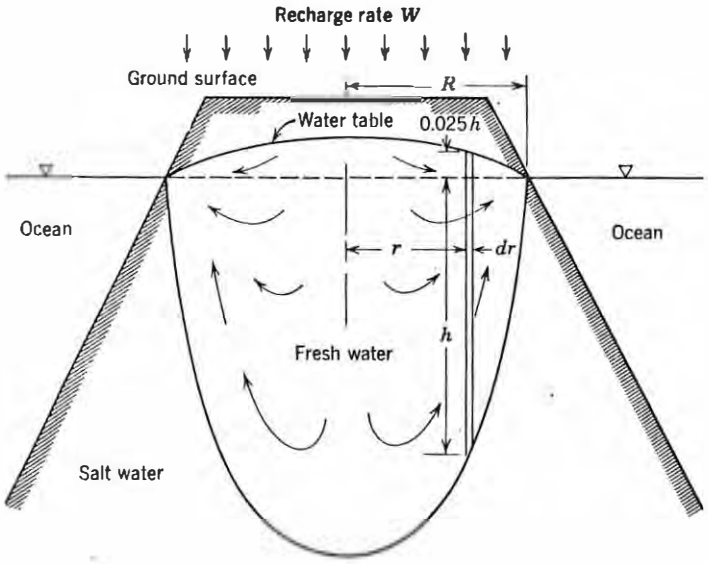


Figure No. 14: Fresh-water Lens in an Oceanic Island Under Natural Conditions

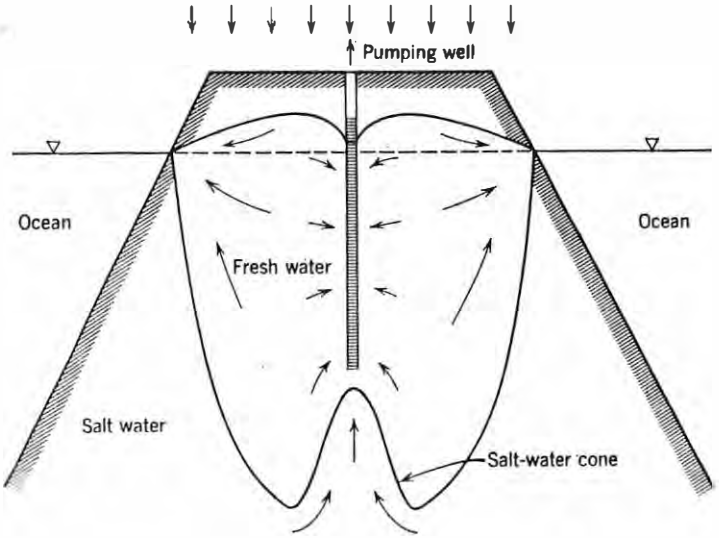


Figure No. 15: Fresh-water Lens in an Oceanic Island Under Conditions of a Pumping Well

Salinity problems will begin to occur when the groundwater production rate results in sufficient "upconing" for the saltwater interface to reach the well. Wells located near the middle of the island where the freshwater lens is thickest obviously may safely produce more water than wells located near the edge of the island.

In order to estimate the safe rate of production to avoid salinity problems, it is necessary to have more information on the aquifer characteristics than is presently available for Fire Island. It will be necessary to drill a test well to obtain this information in order to accurately predict the groundwater production potential at the site on a seasonal basis.

Lacking adequate information about the aquifer, it is probably safe to asume that a well or combination of wells may be developed to provide as a minimum the 80 gallons per minute found in the one good FAA well. This is insufficient to meet the projected freshwater needs of the proposed facility.

The water requirements of the proposed prison might be met in part from surface waters of the island. A small lake with wetland areas exists at the southwestern side of the proposed prison site. A preliminary lake survey was conducted in October 1985 by staff member of the UAA School of Engineering. Twenty four holes were drilled through the ice to determine the lake depth and volume. Three water samples were collected and analyzed for inorganic contaminants.

The preliminary survey indicated a lake volume of 28.2 million gallons. However, the lake is shallow with a maximum depth of 6.5 feet and an average depth of under 4.0 feet. As the ice depth increases in the winter months, the quality of the liquid water in the lake deteriorates. The data from the preliminary analysis of water quality are shown in Table No. 5.

Compound	Units	Sample Average	ADEC MCC*
Arsenic	mg/l	0.002	0.05
Barium	"	0.1	1.0
Cadmium	"	0.005	0.010
Chromium	"	0.05	0.05
Fluoride	"	0.06	2.4
Lead	"	0.002	0.05
Mercury	"	0.0004	0.002
Nitrate-N	"	0.10	10.0
Selenium	"	0.002	0.01
Silver	"	0.01	0.05
Turbidity	NTU	0.40	1.00
Color	Units	5	15
pH	Units	6.3	6.5-8.5

* Alaska Dept. of Environmental Conservation, Maximum Contaminant Concentrations

Table No. 5: Results of Water Quality Analysis of Samples Taken From Lake on Fire Island and Alaska Minimum Contamination Levels

It can be seen that although the lake water meets all the inorganic standards except pH, it is not a high quality water source based on significant color and turbidity.

In reviewing the information shown in Table No. 5, the reader should be aware that information required in a detailed water supply study would include average year round volume of

the lake, maximum and minimum lake volumes, freezing characteristics of the lake and year round water quality samples.

A more complete study must be conducted before a final recommendations can be made concerning the use of lake waters for the proposed prison site. The initial indication is that the lake may have some potential use as a surface water source for the prison site but that the lake water would require treatment if it is to be used as a source of potable water. The rate at which waters could be pumped from the lake on a continuous basis is not known at this time. One option is that the waters in the lake might be used to meet fire protection flow requirements for the prison.

In summary of the water supply on Fire Island, there may be insufficient groundwater (well water) to meet the demand of the proposed prison facility. A test well near the proposed prison site would have to be drilled to make that determination. Groundwater may require less treatment before use than the alternative of using surface waters from the lake near the site. The available surface water is not of high quality and will require treatment before use as potable water. It is not possible without further survey to determine the necessary level of treatment.

Given the uncertain nature of the source of water and the level of treatment that may be required, it is not possible based on a review of the literature to make an accurate estimate of the cost to provide potable water to the proposed

facility. Assuming that the source of water will be developed on the island, it is estimated that the cost of developing an adequate supply of potable water is approximately $700,000. The cost may vary depending on whether surface or groundwater is used.

An alternative to developing water supplies on Fire Island is to pipe water from the Municipality of Anchorage. That alternative might be feasible in the event that a bridge or bridge/causeway is built to connect the island with the mainland. No detailed studies have been made as to the cost of construction for such a line. It is likely that the cost would exceed $1,000,000. The estimated cost to pipe water from the mainland to the island without benefit of a bridge or a bridge/causeway exceeds $8,000,000. (Ref. No. 28)

Another alternative to providing water on the island involves bulk transport via barge. This approach might be used to make up shortfalls in the water supply available from sources located on the island. The cost for bulk transport would include potable water transfer and storage facilities at the prison site plus the costs for hauling the water from the mainland. No estimates have been made as to the magnitude of these costs. The costs are expected to vary with the amount of water transported.

Wastewater Disposal

Wastewater generated at the proposed prison site must be treated before it can be released into receiving waters.

There are two general options which might be used to accomplish this goal:

- o Pipe the wastewaters to the mainland for treatment in the existing municipal facilities.
- o Construct and operate a wastewater treatment plant at the prison site.

The first option is feasible only if road access is provided to the island via a bridge or bridge/causeway. In that event a wastewater line could be constructed. No detailed cost estimates of such a line are available. A rough order of magnitude estimate suggests that the cost would exceed $1,000,000.

If the wastewaters are kept on the island for treatment, it will be necessary to meet the secondary treatment requirements of the U.S. Environmental Protection Agency (EPA). Under existing regulations it is not possible to obtain a permit to discharge waste waters to receiving bodies (such as Cook Inlet) unless secondary treatment is provided.

A variety of treatment options are available that will meet the secondary effluent limitations of EPA. An aerated lagoon would be a desireable choice from the standpoint of ease of operation but would require much more land than other biological treatment systems. There is adequate land available on the proposed prison site to accommodate an aerated lagoon. If the treatment system is to be operated by inmates then either an extended aeration system or a rotating

biological contactor system might be good alternative choices for secondary treatment. A variety of commercially available treatment systems of this type are on the market and are capable of treating sanitary wastes from a correctional facility. However, it should be noted that if any activity is planned at the site which would produce industrial type wastes, then it would be necessary to make modifications in the commercial waste treatment processes to insure that the EPA effluent standards are met.

As long as the effluent standards are met it should be possible to obtain a discharge permit to release the treated wastewater directly into Cook Inlet. The impact on the receiving waters due to discharge from the proposed prison is expected to be low. Ample studies have been done to show that the EPA water quality standards for Cook Inlet will not be exceeded due to discharge of treated wastewaters undergoing secondary treatment processes. For these reasons, it should not be necessary to conduct extensive studies of the quality of receiving waters in Cook Inlet as a part of the permitting process.

For purposes of estimating costs, it is assumed that a "package" biological treatment system would be used for waste treatment with disposal of the treated wastewater directly into Cook Inlet. The facility would be located in an enclosed, heated building on the prison site. The estimated cost for such a system capable of handling wastewater from a prison inmate population of 960 inmates is $1,300,000.

Solid Waste Disposal

The proposed prison will generate solid wastes which must be treated in an environmentally acceptable manner. Two options are considered:

- o If road access is available, solid wastes would be transported by truck to a sanitary landfill on the mainland. This would be the least expensive method for disposing of the wastes.
- o If road access is not available, then the least expensive option is to provide for disposal of solid wastes on the island.

The choice of solid waste disposal methods will depend on the availability of land for a disposal site and the cost of the land. Land requirements for a sanitary landfill can be reduced by incineration of the solid waste prior to landfill. However, incineration systems will result in both increased capital costs and increased operating expenses. A simple economic analysis should dictate the final choice of processing methods.

It is anticipated that there should be no difficulty in providing all necessary environmental safeguards at a disposal site on the island. Hazardous wastes should not present a problem at the site since no hazardous wastes are expected to be generated at the prison site and there should be tight control over any hazardous materials brought to the site. No unusual problems are anticipated for control of leachate at

the disposal site for a facility of this size. Since the island is presently undeveloped, the typical siting objections from neighbors should be minimal. Future land use plans for the island should be considered in selecting potential sites for solid waste disposal.

Electrical Power

Electric utility load and power requirements for existing prison facilities in Alaska were reviewed. Data from the studies are found in Table No. 6.

Facility	Population	Avg. KWH/mon	Peak Load Factor
Hiland and Meadow Ck.	397	260,000	1.3
Cook Inlet Pre-trial	474	190,000	1.9

Table No. 6: Average Energy and Peak Load Factors for Selected Correctional Facilities in Alaska

A comparison of the proposed prison facility with the existing facilities shown in Table No. 6 suggests that the proposed facility would have electric power needs most similar to those of the Hiland and Meadow Creek correctional centers. The average power requirement per inmate is 1.2 KW (kilowatts). On that basis the power requirement for a population of 960 inmates at the proposed site on Fire Island would be 1.15 MW (megawatts). The annual power consumption would be 10,000,000 KWHr (kilowatt hours).

In the design of an electrical power system, it is important to account not only for the average electrical load on the system, but also for the peak load expected on the system. The information in Table No. 6 indicates an anticipated peak load factor of 1.3. That translates into a system which must be capable of sustaining a load of 1.5 MW. At the other extreme, if the proposed prison were to experience peak load factors similar to that seen at the Cook Inlet Pretrial Facility (1.9) then the electrical system would have to be capable of sustaining a load of 2.2 MW.

Electrical power can be provided to the Fire Island site in two ways:

- Power lines can be extended from the mainland grid system using road access if it is available or using a power cable submerged in the tidal waters of Cook Inlet.
- Diesel electric generating sets can be installed on the island to meet the power needs of the facility.

If road access is provided to the prison site, then the least expensive method of providing electric power is to connect the correctional facility to the existing power grid on the mainland. No detailed studies have been conducted to determine the cost of running power lines using road access. The best "rough estimate" is approximately $2,000,000. The estimate includes the "substation" which would be required at the site.

The option of using an underwater power cable is more expensive. The best estimate for an underwater cable installation is $4,000,000 including the substation. It should be noted, however, that underwater cables have relatively high maintenance expenses which can be as much as $2,000,000 in the event of a major break in the cable.

Diesel electric generator sets are commercially available in a wide range of sizes up to 4 MW capacity. For the proposed Fire Island site, it would be prudent to install at least two diesel electric systems. Redundancy offers several advantages including:

- o Backup systems which can be used during periods of maintenance and repair.
- o Improved operating efficiency for the generator sets with resultant reductions in fuel costs.

Table No. 7 provides a comparison of the three alternative systems for electrical power service to the proposed correctional facility at Fire Island. The information presented in Table No. 7 is illustrated in Figure No. 16. Note in Figure No. 16 that the electric power costs associated with direct road access are the least expensive. The option using diesel electric generators is less expensive that the underwater cable option for the first two years of operation provided that no major repairs are required on the cable. After two years of operation the high cost of fuel for the diesel system make the diesel system less attractive than

Assumptions:

Inmate population:	960	
Annual consumption:	10,000,000	KWhr/yr
Peak load factor:	1.9	(most conservative)
Peak capacity:	2.2	MW

Road Access Option:

Capital cost:	$ 2,000,000	
Purchased power:	600,000	(@ $0.06/KWhr)
Annual maintenance:	50,000	

Underwater Cable Option:

Capital cost:	$ 4,000,000	
Purchased power:	600,000	(@ $0.06/KWhr)
Annual maintenance:	550,000	

Diesel Electric Generator Option:

Capital cost:	$ 3,000,000	
Fuel cost:	1,000,000	(@ $0.10/KWhr)
Annual maintenance:	900,000	

Table No. 7: Comparison of the Estimated Capital Costs and Operating Expenses for Three Systems Which Could Be Used to Provide Electric Power to the Proposed Prison Site on Fire Island

the underwater cable. Even if major repairs costing $2,000,000 are required on the cable during the first 5 years of operation, the cable is the best choice.

A final point of interest concerning electric utility service for the island: Diesel electric generator sets provide an option for supplying a portion of the space heating needs of the correctional facility. The heat energy that can be extracted from the jacket water cooling system is roughly equivalent to the electric energy output of the generator. In addition, heat energy can be extracted from the exhaust gas

system. Waste heat used for space heating can offset the high cost of operation of diesel electric systems. Calculations of the magnitude of the potential savings due to waste heat use are outside of the scope of this project.

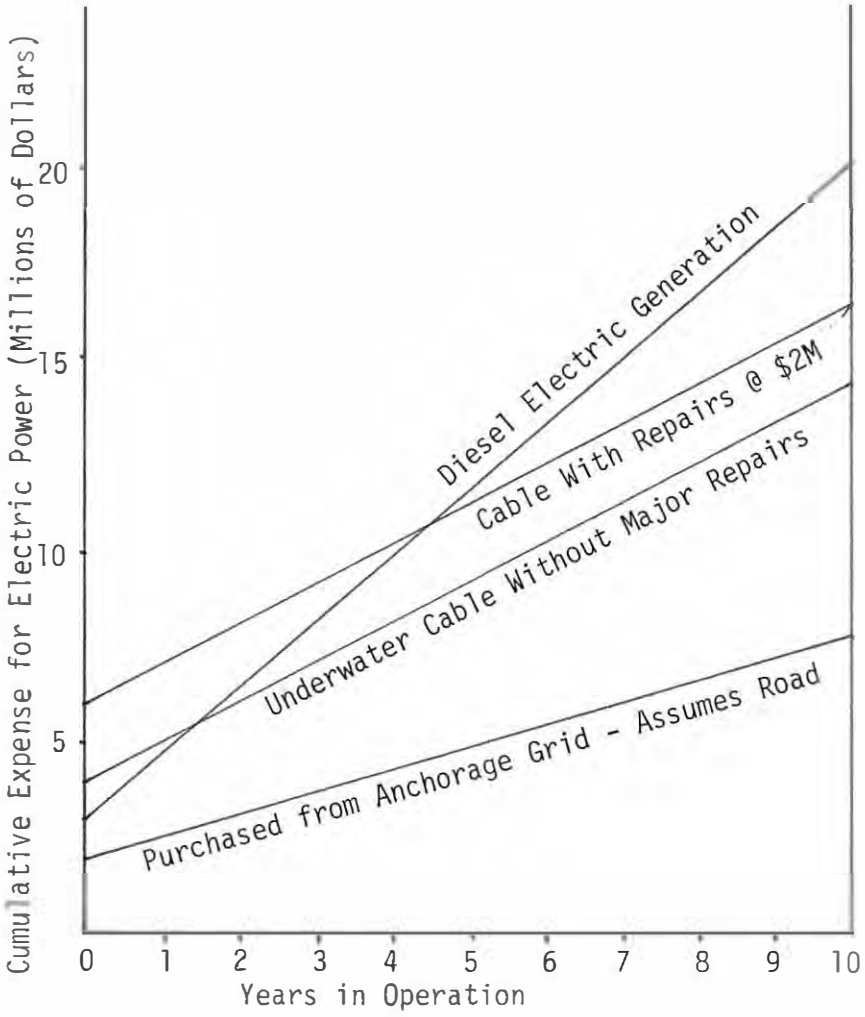


Figure No. 16: Comparison of Cumulative Electric Power Costs for Three Optional Systems to Provide Electric Power to the Proposed Prison Site.

Communication Services

There are three primary options available to provide telephone and communication service to Fire Island:

- o A microwave facility located on the island
- o An underwater communication cable with terminals at each end.
- o If road access is provided to the island, communication lines can be brought to the island along the roadway.

Each of the three options would provide a satisfactory communication link with the mainland. The decision appears to be principally one of economics.

The cost of a microwave antenna (tower and dish) and the associated signal processing equipment for installation on the island is estimated at $300,000. In addition, a transmit-receive microwave facility must be constructed on the mainland at a cost of $300,000. The mainland part of the facility cost would have to be negotiated with the Anchorage Telephone Utility.

The estimated costs associated with using an underwater cable are considerably higher than the microwave option. The estimated installed cost is $2,100,000 which includes $1,500,000 for laying a marine cable from the mainland to the island plus $600,000 for terminal equipment.

No detailed cost estimates have been made for the option of running communication lines along a road access to the

island. However, it should be noted that the terminal equipment using this option would be approximately the same as the cost for terminal equipment using marine cables ($600,000). A very rough estimate of the cost of using cables along the road access is $500,000.

A summary overview of the communication options suggests that a microwave system would be the least expensive of the three options considered. Present day communication technology using microwave systems is advanced enough to meet the expected needs of a correctional facility located on the island.

4) Environmental Considerations

Consideration of a prison at the proposed site on Fire Island should take into account environmentally related factors including:

- o Air quality
- o Noise
- o Archeological concerns
- o Wetlands

Air Quality

There are generally two types of concerns over air quality:

- o The concern that existing air quality may have a significant impact on the potential use of the island. For example, is the air quality sufficiently poor that it could be injurious to the health and welfare of individuals on Fire Island?

- o The recognition that air quality regulations at the federal, state and municipal levels must be met in the construction and operational phases for the proposed prison.

Air quality is determined by measuring levels of air pollutant materials. Typical air quality studies evaluate the ambient concentrations of the "criteria pollutants" which include carbon monoxide, ozone (oxidant), sulfur dioxide, oxides of nitrogen (NOx), hydrocarbons (HC), and total suspended particulate (TSP). Federal (EPA) standards are set for each of the criteria pollutants. The standards are referred to as air quality standards and they include both primary (human health related) standards and secondary standards (standards based on criteria other than human health criteria).

The Municipality of Anchorage has experienced air quality problems with measured levels of carbon monoxide and total suspended particulate. The levels have exceeded the federal primary air quality standards on occasion with the result that the Municipality is designated (by EPA regulations) as a "non-attainment area". As a non-attainment area, the Municipality has been required by EPA to institute programs to reduce levels of pollution such as the Inspection/Maintenance program for auto emissions. Further, due to the "non-attainment" status of the Municipality, EPA requires that any applications for air quality permits within the Municipality be carefully

reviewed with respect to federal regulations for Prevention of Significant Deterioration of Air Quality (PSD). This body of regulations (PSD) tends to complicate and delay the permitting process for some facilities.

A review of existing air quality data for the Municipality did not reveal any data which had been collected on Fire Island. Extensive air quality data have been collected for the developed portion of the Municipality. However, these are not likely to be representative of the air quality levels found on the island.

Carbon monoxide (CO) violations occur in Anchorage during the winter months (November through February) during conditions of temperature inversions and little wind. The principal source of the carbon monoxide is automotive exhaust. It is not envisioned that there would be sufficient traffic generated by the development of a prison on Fire Island to contribute either to the carbon monoxide levels of Anchorage or to the carbon monoxide levels of Fire Island. Since the CO levels occur during periods of low wind speed, it is unlikely that CO would be transported to the island from the problem areas in the Municipality. Thus, it is not anticipated that the carbon monoxide levels on the island would exceed the federal primary air quality standards.

Naturally occurring suspended particulate (TSP) from wind blown glacial dust contributes to the TSP problems of Anchorage. This source of TSP is likely to be present on Fire Island although it has not been specifically measured there.

Point sources of particulate matter such as boilers or incinerators are generally adequately controlled within Anchorage and do not contribute significantly to the TSP levels. Since any point sources which might be located on Fire Island would have to be in compliance with federal, state, and municipal regulations pertaining to particulate emissions, it is not likely that the prison facilities would have any significant impact on TSP levels.

The primary source of human caused particulate levels in Anchorage is vehicular traffic on unpaved roads and from mud carried on to the paved streets from construction sites, etc. Assuming that development of Fire Island as a prison site would include paving of the roads and streets associated with the prison traffic, the operation of a correctional facility on Fire Island should not contribute to the ambient levels of suspended particulate.

In the reviewing the information noted above, two conclusions can be reached concerning air quality at Fire Island:

- Air quality levels anticipated on the island should be well within the federal primary air quality standards. The possible exception to this may be TSP resulting from natural sources, particularly during windy conditions. In general, the air quality level is high enough that it would not be considered to be injurious to the health and welfare of individuals on the island.

- Since Fire Island lies within the boundaries of the Municipality of Anchorage which is designated as a "non-attainment area", it will be critically important to ensure that all federal, state, and municipal air quality regulations are met in the planning, construction, and operation of a prison on the island. This will require a considerable effort to apply for and obtain permits for construction and operation of the facility.

Noise

Noise levels are of some concern on Fire Island due to its proximity to the Anchorage International Airport. The concern is that noise resulting from aircraft traffic may be at high enough levels to have a significant negative impact on the island as a potential prison site.

Noise impacts for Anchorage International Airport were estimated as part of the development of the Airport Master Plan published in 1981. The methodology used was standard practice at that time, although it has since changed. The noise exposure was estimated in units of Noise Exposure Forecast (NEF) and noise exposure contours were projected for the areas around the airport. The noise exposure is based on the types of aircraft, the runways used, the time of day for aircraft operations and the number of operations. These parameters were forecast as part of the projection for aviation activity and were then used to estimate the noise impact.

To give the reader some understanding of the NEF scale it is noted that if NEF levels reach or exceed 30, then the area is thought to be too noisy for general residential use. Areas which have NEF levels in the range of 30 to 35 may still be used for residential purposes but noise reduction measures are recommended in the building construction. Typical noise reduction measures would include the installation of sealed double pane windows, added insulation in the walls and ceilings, and sound absorption materials installed in HVAC ducts.

The noise levels projected in the 1981 Airport Master Plan forecast NEF levels in the range of 30 to 35 extending to the vicinity of Fire Island. These projected values indicate that the noise levels on the island may be high enough to require special construction techniques for habitable buildings. Note that construction techniques in Alaska typically use sealed double pane windows and added insulation to reduce energy consumption. Thus, the only alterations that might be recommended for buildings in noisy areas would be some added sound absorption material installed in the heating and ventilation ducts.

A study was conducted of community reactions to many types of intrusive noise. The results of the study are shown graphically in Figure No. 17. The study results indicate that an average (mean) community response to NEF 30 is widespread complains or single threat of legal action. The mean response to NEF 35 predicts "several threats of legal action or strong appeals to local officials to stop noise". These results

suggest that if the Fire Island NEF does range from 30-35, the DOC can expect to receive continuing complaints from both inmates and prison staff concerning noise levels.

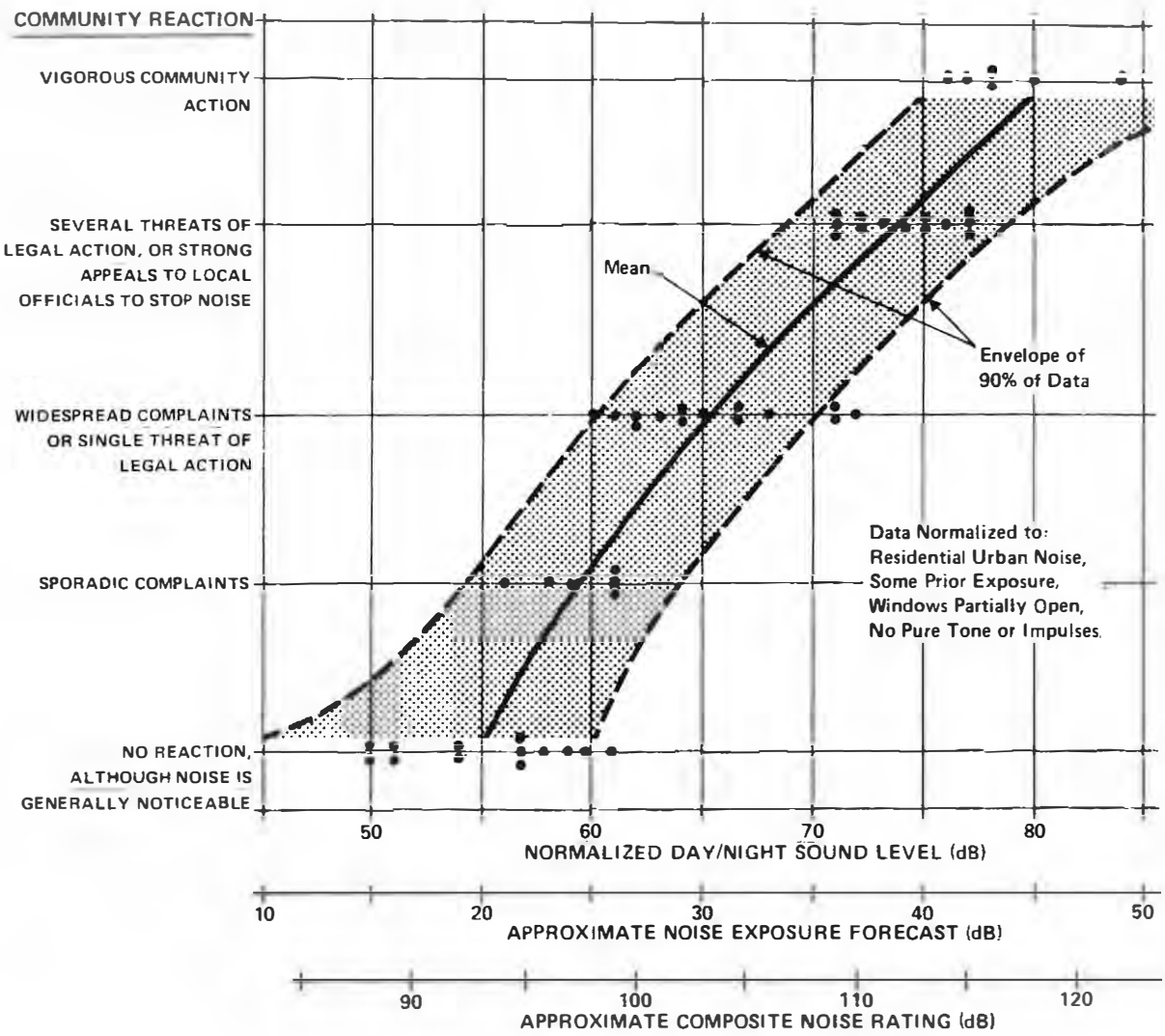


Figure No. 17: Community Reaction to Many Types of Intrusive Noise. (Ref. No. 27)

The 1981 Master Plan recommended that the airport noise levels be checked after the new north-south runway became operational. This is now being done as part of a noise compatability study for the airport (completion expected in 1987). The noise impact will be estimated in units of Day/Night Average Sound Level (Ldn) which is the current method approved by FAA. The NEF method is no longer used by FAA.

Based on the noise impact estimates included in the 1981 Airport Master Plan, the noise levels due to airport traffic are quite likely to have an impact on Fire Island. This conclusion should be verified when the new noise compatability study is completed and additional information is made available. (Ref. Nos. 25, 26). If the new study shows that airport noise levels will have a major impact on activities on Fire Island, then it is recommended that noise reduction measures be included in the design of any facilities which might be located on the island.

Archeological Considerations

An archeological investigation has not been made of the proposed site on Fire Island. It was noted in the "Fire Island Industrial Site Analysis" that there are no known archeologically significant sites on the island. However, under existing state regulations, before construction of the proposed correctional facility could be begin on Fire Island, a preliminary archeological investigation would be required.

There are several factors which can trigger a requirement for an archeological survey. Under existing federal

regulations, a survey may be required for a project which is:

- o To be carried out on federal lands; or
- o To be funded in whole or in part by federal funds.

If a project does not involve either federal lands or federal funds, then federal regulations pertaining archeological surveys would have no influence on the proposed project.

In Alaska there exists a body of state regulations pertaining to archeological surveys. Under these regulations the Alaska State Historical Preservation Officer has the responsibility and authority to oversee archeological surveys. The regulations provide that governmental bodies of the State of Alaska will cooperate in the conduct of archeological surveys for any projects which may involve a significant disruption of ground. Since the proposed correctional facility at Fire Island would involve a major construction project with new buildings, foundations, roadways, etc., the DOC is obligated under state regulations to work with the State Historical Preservation Officer in conducting archeological surveys of the area prior to any construction activities.

The conduct of an archeological survey may range from a brief (1-2 day) on site investigation of the proposed site area to a very extensive project which would take months to accomplish and large funding levels. The process appears to work as follows: (Ref. 30)

- o The DOC would a contract with a qualified archeologist to conduct an initial survey of the proposed

construction site area. The work would have to be done during a period of time when the grounds were free of snow and ice and were not frozen. Note that this places some very significant timing restraints on the preliminary survey.

- o If the preliminary survey indicates that the site is not archeologically significant, then construction work may be undertaken.
- o If the preliminary survey indicates that the site is archeologically significant, then additional excavation work may be required by the State Historical Preservation Officer. The DOC is required to work cooperatively with the Officer in conducting whatever surveys are deemed necessary by the Officer.

These state regulations apply not only to Fire Island but to any site which might be considered by the DOC as a location for a correctional facility. In view of the need to conduct preliminary site surveys when the ground is thawed and free of snow and ice, the DOC would be well advised to contact the State Historic Preservation Officer to arrange for such site surveys very early in the planning stages of the project.

Wetlands and Related Permits

The subject of "wetlands" is of significant concern for any major project proposed for Fire Island. Wetlands may be loosely defined as areas where the ground water is very close

to the surface water. The actual determination of wetlands involves a careful analysis of the soils, plant life, surface and ground waters of an area.

Wetlands come under the jurisdiction of the U.S. Army Corps of Engineers. The Corps has surveyed wetlands in the Anchorage area, however, Fire Island was not included in the survey. In order for the Corps of Engineers to conduct a wetlands survey of the areas which might be affected by the proposed project on Fire Island, a letter would have to be sent by the DOC to the Corps requesting a jurisdictional determination as to whether or not the potentially affected areas are considered to be wetlands.

Areas which are defined by the Corps of Engineers as wetlands require permits for construction and may require special design considerations for foundations, drainage, etc. As this could significantly influence the cost of the project as well as the timing of the project, it is in the best interests of DOC to file a letter requesting jurisdictional determination very early in the planning and design stages.

The proposed project site on the island is not the only area which may require permits by the U.S. Army Corps of Engineers. Under the topic of transportation it was noted that the island may be accessed by air, water, or a bridge (bridge/causeway). If either the air or water access routes are selected, it will be necessary to construct a dock on the island. The construction of docks and any dredging which

might be necessary also require permits which are issued by the Corps of Engineers. If the permit applications clearly show that the proposed activity will not have any adverse impact on fish habitats, then it is likely that the permits can be issued within 90 days of the time of application. However, if the proposed construction and dredging activities are apt to impact on the fisheries resources of Cook Inlet, then the matter may be considered sufficiently controversial that a series of public hearings would be required. This could delay any construction activities for an indefinite period of time.

Water access to Fire Island would require not only a dock facility on the island but also docking facilities on the mainland. Permits from the Corps of Engineers would be required for these construction activities. If the added dock facilities were placed near the existing Port of Anchorage facilities, then the project may be considered to have possible adverse effects on Ship Creek. This would tend to complicate the permitting process and could lead to a requirement for public hearings and associated delays.

The worst case scenario from a permitting standpoint is that the Corps of Engineers may review permit applications for dock additions on the mainland and the island and conclude that the project is of sufficient magnitude that an Environmental Impact Statement (EIS) is warranted. This decision would significantly delay the permitting process. It would also add to the cost of the project.

The alternatives of constructing a bridge or a bridge/causeway from the mainland to the island also require the issuance of permits. The U.S. Coast Guard has jurisdictional responsbility for permits involving construction of bridges while the Corps of Engineers would issue permits for construction of causeways.

It should be apparent that planning will be an important key to dealing successfully with the issues of wetlands and the permits associated with gaining access to Fire Island. Based on present knowledge of the proposed project site, it is unlikely that the prison facilities would impinge directly on wetlands. However, access to the site during construction and access for utility services to the site may impact wetlands. If the decision is made by DOC to actively pursue Fire Island as a construction site, then a wetlands jurisdictional determination should be a high priority item. In addition, permit applications for construction of access facilities through the Corps of Engineers and/or the Coast Guard are priority items.

Summary Comment

In brief review of the environmental considerations pertaining to Fire Island the following conclusions are reached:

- Air quality levels on the site are expected to meet federal standards with the possible exception of suspended particulate arising from natural sources.
- Since Anchorage is a "non-attainment" area, it will

be critically important to ensure that all federal, state, and municipal air quality regulations are met in applying for permits to construct and operate a correctional facility on the site.

- Noise levels at the site will be impacted by the proximity to the Anchorage International Airport. Pending the outcome of study currently underway, it may be necessary to incorporate noise reduction features into the design of the facilities on the island. If the NEF levels exceed 30, the DOC can expect to receive complaints from inmates regarding noise levels at Fire Island.
- No known archeological sites exist on Fire Island. However, the conclusion is reached that an archeological survey of the project site will be necessary regardless of whether the correctional facility is located at Fire Island or at some alternative site. It is necessary to conduct archeological surveys when the ground is thawed and free of snow and ice. The DOC would be well advised to contract for such site surveys very early in the planning stages of the project.
- It is unlikely that the proposed correctional facilities on Fire Island would impinge directly on wetlands. However, access to the site during construction and access for utility services to the

site may impact wetlands. If the decision is made to locate the correctional facility on Fire Island, then a wetlands jurisdictional determination should be a high priority concern. In addition, permit applications for construction of access facilities through the Corps of Engineers and/or the Coast Guard are high priority concerns.

This completes the summary of the environmental considerations which may influence the choice of Fire Island as a potential site for a correctional facility.

5) Legal Factors

The isolation of Fire Island, with its lack of a resident community, should be considered in assessing the possible legal concerns posed by placing a correctional facility on the island. In discussing these concerns, it is assumed that Fire Island would not be connected to the mainland by a bridge or a bridge/causeway. Access would be by air and water routes.

Although both mandatory and persuasive case law seem to deny the validity of such a challenge, the isolation of the facility might be cause for a consititutional challenge charging cruel and unusual punishment.

In recent history there has been no placement of a prison on an isolated island which has precipitated such a challenge. Concerns over segregation of prisoners from the public have involved the more narrow issues of segregation of single

prisoners from their peers, counsel, the press, or family and acquaintances. The cases do not suggest that a claim of cruel and unusual punishment can be effectively mounted. However, this body of case law, well summarized in 51 ALR 3d 111, especially in Sec. 12, is not necessarily definitive.

The need for prison security as an underlying justification for the island location of a correctional facility could be challenged. While courts are sympathetic to the needs of prison security, they have found in cases which treat the segregation of individual prisoners from general prison populations that isolated confinement is an unconstitutional violation of the prohibition against cruel and unusual punishment where such confinement is not necessary to maintain order. [See Palmer, Constitutional Rights of Prisoners (1977).] As stated before, however, the isolation of an entire prison population has not been dealt with in this line of cases.

The claim of cruel and unusual punishment could be raised in other ways. Such a challenge could be merged analytically with a claim that the Department of Corrections failed to rehabilitate adequately a convicted inmate.

In La Barbera v. State 598 P.2d 947 (Alaska 1979), the State Supreme Court said, in rejecting a petition of a prisoner to be located in a drug treatment program, "[I]n Abraham. ....Rust was extended to encompass a prisoner's right to a rehabilitation program under Art. I, Sec. 12 of the Alaska

Constitution and AS 33.30.020. However, our recognition of the right to rehabilitation does not imply that the court at the time sentence is pronounced has the authority to designate a particular facility for incarceration of the defendant or a particular program for his rehabilitation. It is only after a demonstrated failure to provide an appropriate rehabilitation program that judicial intervention is proper. "La Barbera at 949.

This comment could be applied to every secured right to which Alaska inmates are entitled. Religious rights (12 ALR 3d 76), right to legal assistance, right to be visited by children (15 ALR 4th 1234) and others and the availability of adequate visitation facilities could all be examined.

Additional traditional tests for cruel and unusual punishment could also be applied: "totality of circumstance" and "evolving standards of decency." With regard to these, a Ninth Circuit Federal District Court advised expert witnesses in Stickney v. List (1981, DC Nev) 519 F.Supp 617 that it had rejected the "totality of circumstances" approach and that, instead, the focus should be on whether there existed deliberate indifference on the part of court officials and whether each condition questioned, in relation to other prison conditions, was compatible with "the evolving standards of decency that mark progress of a maturing society."

In determining whether prisons and prison systems comport with "evolving standards of decency," courts have looked with

favor at nationally developed standards. In this regard, the Uniform Law Commissioner's Model Sentencing and Corrections Act provides in Sec.2-704 (Design Principles for New Facilities) that:

> Wherever feasible the location of a facility should be selected on the basis of proximity to:
>
> (i) the communities in which persons likely to be confined therein reside;
>
> (ii) areas that have community resources to support treatment programs and provide employment and educational opportunities;
>
> (iii) courts; and
>
> (iv) public transportation.

This section is an almost verbatim adoption of the proposal of the National Commission Correctional Standard 11.1 (1973). The American Corrections Association Commission on Accreditation requires new prisons to be built within fifty miles of a civilian center.

These standards, although not legal obligations, could be employed to evaluate an island facility to which access is limited.

Alaska courts fairly consistently uphold very high standards concerning the operation of correctional facilities, as is evidenced in Cleary v. Smith, [Sup. Ct. Case No. 3AN-81-5274 Civil]. The courts seem prepared to test corrections administration with regard to its securement of

established rights. Under the provisions of the Cleary decision, such matters as adequacy of health care, educational, work and recreational programs as well as the mental and physical well being of prisoners will be monitored in all Alaska prisons, without further legal activity.

A decision to build a facility on Fire Island should include consideration of the implications of modern correctional standards, the dicta of state and federal case law, and the prevailing judicial climate.

5. Estimated Construction Costs for Correctional Facilities

The Spring Creek Correctional Center

The Department of Corrections has indicated that the design of the Spring Creek Correctional Center (SCCC) shall be used as a model in preparing estimates of the costs to locate a facility on Fire Island. An estimate of the construction costs for the SCCC is shown in Table No. 8 based on 1985 dollars.

The cost estimate shown in Table No. 8 includes construction of 2 128-unit cell buildings and a single 64-unit cell building. This provides capacity for 320 inmates if each cell contains a single bed. If the beds are doubled in the cells, the capacity can be expanded to 640 inmates.

The Fire Island Correctional Facility

The assumptions for the Fire Island study included a maximum inmate capacity of 960. With two beds per cell, 960

Description		Estimate
Part One -	APS Building including sitework and warehouse	$ 15,440,734
Part Two -	One 128 Unit Cell Building	6,472,304
	Total Base Estimate	$ 21,913,038
Alt. #1:	Electronic escape detection system	$ 171,638
Alt. #2:	Motor pool	334,612
Alt. #3:	Security fencing between units	56,050
Alt. #4:	Vehicle carports	17,663
Alt. #5:	Road paving	116,016
Alt. #6:	Parking lot	232,597
Alt. #7:	64 Unit cell building	3,578,372
Alt. #8:	128 Unit cell building	6,602,978
	Total Base and All Alternates	$ 33,022,964

Table No. 8: Fair Cost Estimate for the Spring Creek Correctional Center (May 1985)

inmates can be housed in 480 cells. However, it may be necessary to provide some single cells to segregate inmates with special needs. Therefore, for cost estimating purposes, it is assumed that 960 inmates will be accommodated in 448 cells with 2 beds per cell plus 64 cells with 1 bed per cell. Thus the total number of cells required is 512. The total number of 128 unit cell buildings required is 4. This information is summarized in Table No. 9.

Maximum number of inmates	960
No. of cells with 2 beds	448
No. of cells with 1 bed	64
Total number of cells required	512
No. of 128 unit cell bldgs required	4

Table No. 9: Number of Cells and 128 Unit Cell Buildings Required to House an Inmate Population of 960.

The assumptions indicated in Table No. 9 can be used to estimate the 1985 construction costs for an expansion of the SCCC to house a total of 960 inmates. The revised cost estimates are found in Table No. 10.

An important assumption is made in the preparation of Table No. 10. It is assumed that a single APS building will be sufficient to provide for the requirements of 960 inmates. The estimates shown in Table No. 10 include increased costs for site preparation, electronic escape detection systems, security fencing, road paving, and parking lots.

There are several important points regarding Table Nos. 8 and 10:

- o Neither table includes costs for:
  - a) Acquisition of land
  - b) Acquisition of permits
  - c) Acquisition of water supply
  - d) Treatment of wastewater
  - e) On-site disposal of solid waste

f) Acquisition of/generation of electric power

g) Link to communication services

h) Pre-construction archeological site surveys

- Both tables include cost estimates based on May 1985 dollars.
- Both tables include costs for construction at Seward, Alaska.

Description		Estimate
Part One -	APS building including sitework and warehouse	$ 15,440,734
	Additional sitework required for added cell units	500,000
Part Two -	Four 128 unit cell buildings	26,281,265
Alt. #1:	Expanded electronic escape detection system	275,000
Alt. #2:	Motor pool	344,612
Alt. #3:	Security fencing between units	100,000
Alt. #4:	Vehicle carports	17,663
Alt. #5:	Road paving	150,000
Alt. #6:	Parking lot	250,000
	Total Base and All Alternatives	$ 43,359,274

Table No. 10: Estimated Construction Costs for the Spring Creek Correctional Center Expanded for a Total Inmate Capacity of 960. Inmates Would Be Housed in 4 128-Unit Cell Buildings.

No proposal has been made by the Department of Corrections to expand the capacity of SCCC to 960 inmates. The purpose of developing the information in Table No. 10 is

to provide a basis for estimating the construction costs of a 960 inmate facility which could be located at Fire Island.

From the information presented in this report, it should be apparent to the reader that the costs for transportation, utilities, and construction of the correctional facility on Fire Island are very dependent upon the mode of access to the island. If a bridge or bridge/causeway were in place at the start of construction, then construction costs would be approximately the same as the costs for SCCC (Table No. 10) with minor correction factors to account for inflation. Without direct road access, costs for both labor and materials will increase. For estimating purposes, the following assumptions are made:

- The cost estimates for the Spring Creek Correctional Center can be approximated as 50% for labor and 50% for materials.
- Without direct road access to Fire Island, labor costs to build a correctional center on the island will be 15% higher than the labor costs projected for SCCC. The increased labor costs result from the time loss involved in transporting construction crews to and from the island during the construction process.
- Without direct road access to Fire Island, material costs for construction of the correctional facility will be 30% higher than those projected for SCCC. The increased costs estimates are based on the material

handling problems associated with transporting materials to the island construction site.

- o 1986 construction costs will be 5% higher than 1985.

Based on these assumptions, the estimated construction costs for Fire Island are shown in Table No. 11.

1985 Construction costs for SCCC with 960 inmates (based on Table No. 10)		$ 43,359,274
Adjustment for inflation (5%)		2,167,964
Estimated 1986 construction costs for SCCC with 960 inmates		$ 45,527,238
With Direct Road Access to Fire Island		
Estimated 1986 construction cost at Fire Island (Same as SCCC in 1986)		$ 45,527,238
Material cost estimate (50%)	$22,763,619	
Labor cost estimate (50%)	$22,763,619	
	$45,527,238	
Without Direct Road Access to Fire Island		
Material cost estimate (Based on 30% cost increase)		$ 29,592,705
Labor cost estimate (Based on 15% cost increase)		$ 26,178,162
1986 estimated construction costs at Fire Island		$ 55,770,867

Table No. 11: Estimated Construction Costs for a 960 Inmate Correctional Facility Located on Fire Island With and Without Direct Road Access to the Island at the Time of Construction.

The estimates shown in Table No. 11 indicate that the added cost of construction of a prison on Fire Island without

direct road access at the time of construction is approximately $10,250,000 (22.5%) above the cost of construction with the direct road access.

Access to Fire Island

The estimated capital costs for alternative methods of access to the island are summarized in Table 12.

Method of Access	Ref. Table	Estimated Capital Cost
Aircraft plus barge (Assumes rental of aircraft)	No. 2, p. 27	$ 6,500,000
Air cushion vehicles plus barge	No. 3, p. 31	$ 4,800,000
Direct road access using bridge/causeway	No. 4, p. 33	$125,000,000
Direct road access using a bridge	No. 4, p. 33	$200,200,000

Table No. 12: Summary Table of the Capital Costs for Alternative Methods of Access to Fire Island

The estimates shown in Table No. 12 indicate that access to the island can be obtained at the lowest capital cost using air cushion vehicles supplemented with some barge operations. Therefore, it is assumed that air cushion vehicles would be the preferred method of access to Fire Island if direct road access were not available.

Utility Costs for Fire-Island

The estimated costs to provide utilities at the Fire Island site are subject to several unknowns. Of particular

concern is the fresh water supply. As discussed earlier in this report, it is not known whether wells drilled on the island in combination with available surface water can supply the needs of the proposed facility. For purposes of cost estimation, it will be assumed that sufficient water will be available on the island and that minimal water treatment will be required.

Wastewater generated on the island can either be piped back to the mainland (if road access is available) or it can be treated in a package plant on the island and discharged to Cook Inlet. For purposes of cost estimating, it is assumed that a package treatment plant would be constructed on the island regardless of the access route used.

If direct road access is available, then solid wastes generated at the site will be trucked to the mainland. If road access is not available, then the assumption is made that a solid waste disposal site will be constructed on the island.

Electrical power will be supplied from the Anchorage power grid system if direct road access is available. Otherwise it is assumed that power will be generated by diesel electric generators since these have the lowest initial capital cost.

It is assumed that communication services will be provided through microwave relay systems regardless of the access route to the island.

Given the many assumptions noted above, cost estimates

for construction of a correctional facility on Fire Island can now be made. The cost estimates are shown in Table No. 13.

1) Method of Access	Bridge/Causeway	Air-Cushion
2) Access Capital Cost	$125,000,000	$ 4,800,000
3) Prison Construction	45,530,000	55,770,000
4) Water Supply	700,000	700,000
5) Wastewater Treatment	1,300,000	1,300,000
6) Solid Waste Disposal	10,000	150,000
7) Electric Power	2,000,000	3,000,000
8) Communication System	600,000	600,000
Total Estimated Capital Cost	$175,140,000	$ 66,320,000
Capital Cost Less Bridge	$ 50,140,000	

Table No. 13: Comparison of Capital Construction Cost Estimates for a Correctional Facility on Fire Island Using Direct Road Access and Access By Air Cushion Vehicle.

It is important to recognize that the cost estimates shown in Table No. 13 do not include any costs for land acquisition. Further, the estimated costs are subject to a variety of unknowns and may be significantly altered by delays in obtaining the many permits required for such a project. (See discussion of Environmental Considerations beginning on page 50 of this report.)

Comparison of the data in Table No. 10 and Table No. 13 indicates that the cost to construct a 960 inmate correctional facility at Fire Island is approximately $21,000,000 greater

than the cost to construct an identical facility at SCCC. The large cost differences result principally from the lack of direct road access to Fire Island:

o Access capital costs	$ 4,800,000
o Increased construction costs	$ 10,240,000
o Utility costs on the island	$ 5,750,000
Subtotal	$ 20,790,000

If direct road access existed today, the construction cost for the proposed facility at Fire Island would be approximately the same as the cost for an identical facility at Spring Creek.

Correctional Facilities at Palmer and Goose Bay

Under the terms of the agreement between UAA and DOC for this overall study, UAA is required to compare the relative costs, benefits, and liabilities of the development and operation of correctional facilities on Fire Island with other options for development on DOC land at Goose Bay and at the Palmer Correctional Center. Figure No. 18 shows the relative locations of the two sites.

For purposes of estimating costs at these two alternative locations, the following assumptions are made:

- Labor costs for construction at both the Goose Bay site and the Palmer site would be approximately the same as for construction in either Seward (SCCC) or at Fire Island (assuming direct road access to the island).

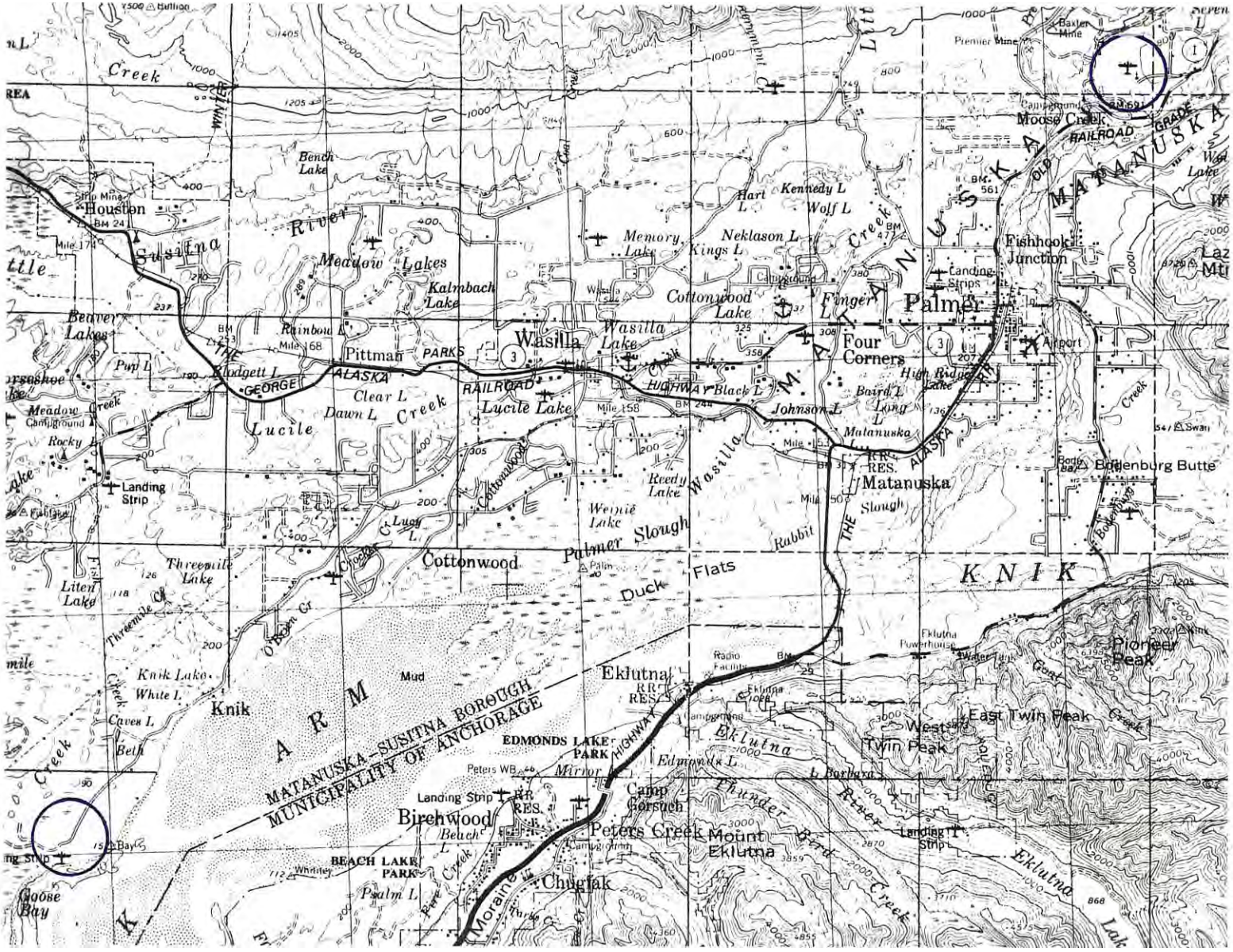


Figure No. 18: Map of Southcentral Alaska Showing the Locations of Alternative Correctional Facility Sites at Goose Bay and Palmer.

- Material costs at Palmer and at Goose Bay are expected to be approximately 10% above material costs for SCCC or for Fire Island (assuming direct road access to the island). The increased cost for materials reflects the relative remoteness of the sites at Palmer and Goose Bay.

Using the assumptions noted above regarding increased costs for labor and materials, construction cost estimates for the two alternative sites can be made. These are shown in Table No. 14.

Estimated 1986 construction cost at Fire Island assuming direct road access (See Table No. 11)		$ 45,527,238
Materials (50%)	$ 22,763,619	
Labor (50%)	$ 22,763,619	
Goose Bay Site		
Materials (10% above Fire Island)		$ 25,040,000
Labor (Same as Fire Island with direct road access)		$ 22,763,619
Subtotal		$ 47,803,619
Palmer Site		
Materials (10% above Fire Island)		$ 25,040,000
Labor (Same as Fire Island with direct road access)		$ 22,763,619
Subtotal		$ 47,803,619

Table No. 14: Estimated Construction Costs for a 960 Inmate Correctional Facility to be Located at Goose Bay or at Palmer Alaska.

The estimates shown in Table No. 14 are rough estimates at best and certainly do not have the precision of a building contractors cost estimates made from a full set of plans and job specifications. Further, these estimates do not reflect the costs at either alternative location for land acquisition, utilities or road improvements. It is noted that the land required for any expansion of existing facilities at Goose Bay and at the Palmer sites is currently owned by the Department of Corrections. Road improvements necessary for either of these two sites would be provided by the Department of Transportation.

Rough estimates of the expected costs for access, prison construction and utilities are shown in Table No. 15 for the sites at Fire Island, Palmer and Goose Bay.

1) Location	Fire Island	Palmer	Goose Bay
2) Access Capital Cost	$ 4,800,000	$ 0	$ 0
3) Prison Construction	55,770,000	47,800,000	47,800,000
4) Water Supply	700,000	500,000	500,000
5) Wastewater Treatment	1,300,000	1,300,000	1,300,000
6) Solid Waste Disposal	150,000	10,000	10,000
7) Electric Power	3,000,000	500,000	500,000
8) Communication Systems	600,000	100,000	100,000
Total Capital Cost	$66,320,000	$50,210,000	$50,210,000

Table No. 15: Comparison of Capital Construction Cost Estimates for Alternate Locations of a Correctional Facility.

It is important to recognize that the rough cost estimates shown in Table No. 15 do not include any costs for land acquisition at the Fire Island site. Further, the estimated costs are subject to a variety of unknowns and may be significantly altered by delays in obtaining permits.

The comparative estimates shown in Table No. 15 lead to the tentative conclusion that the least expensive alternative sites are at Palmer and Goose Bay.

Comparison of Operating Expense

Capital cost comparisons are important in decision making. Comparison of anticipated operating expense at alternative locations is also important. It is not possible within the scope of this project to provide a complete summary of all of the anticipated operating expenses of a large correctional facility. However, it is possible to estimate some of the anticipated expenses for selected categories in which there are apt to be major differences in expense levels due to the location of the facilities. Table No. 16 provides summary information on selected expense categories.

The annual expense estimates shown in Table No. 16 indicate that the Fire Island site would have significantly higher annual expenses than the locations at Goose Bay or Palmer. The high expense at Fire Island results from not having direct road access to the site. This is translated into high costs for access to the site and high electric power costs.

Location	Fire Island	Palmer	Goose Bay
1) Air Cushion Vehicles (Table No. 3, p. 31)	1,800,000	0	0
2) Barge Operations (Table No. 3, p. 31)	50,000	0	0
3) Electricity: Fuel Cost (Table No. 7, p. 47)	1,000,000	0	0
4) Diesel Gen. Maintenance (Table No. 7, p. 47)	900,000	0	0
5) Purchased Electricity (Table No. 7, p. 47)	0	600,000	600,000
6) Elect. Sys. Maintenance	0	50,000	50,000
Total Annual Expense	$3,750,000	$ 650,000	$ 650,000

Table No. 16: Comparison of Selected Annual Expense Items for Three Alternative Locations of a Correctional Facility

Summary Comment

This section of the report deals with estimated construction costs and operating expenses for correctional facilities at alternative sites. The construction estimates are based on the model of the Spring Creek Correctional Center planned for Seward, Alaska. The size of the planned facility has been increased to accomodate 960 inmates. Construction cost estimates have been modified to account for inflation, access problems related to Fire Island and cost factors related to the alternate site locations at Palmer and Goose Bay.

Based solely on rough estimates of construction costs, the initial conclusion is reached that the Palmer and Goose

Bay sites are equivalent. The site at Fire Island would be the most costly of the three sites. A comparison of the estimated construction costs is shown in Table No. 15, page 85.

Annual operating expenses for the three alternative sites are also compared in this section. The analysis of available data suggests that the sites at Palmer and Goose Bay would be the least expensive sites to operate. There is little difference expected in the operating costs for Palmer and Goose Bay. By comparison, the Fire Island site would be extremely expensive to operate.

6. Benefits and Liabilities of Alternative Sites

In evaluating alternative sites for correctional facilities it is important to consider factors other than those tied directly to cost. Some of the factors which should be considered include the following:

- o Access to the site
- o Utility services at the site
- o Air pollution concerns at the site
- o Noise problems at the site
- o Obtaining permits to develop the site
- o Archeological significance of the site
- o Legal considerations affecting the site

Each of these topics is briefly addressed in an attempt to compare the benefits and liabilities of the alternative sites.

Access to the Site

From the information presented in this report, it should be apparent to the reader that a key limitation of the Fire Island site is lack of access. This has a major impact on costs associated with developing that site. Assuming that air cushion vehicles would be used for access to the site, then it should be recognized that their use will result in inconvenient service. There will be delays in transporting staff, prisoners and commodities to and from the mainland. These delays will be magnified in poor weather conditions and during periods when the air cushion vehicles are out of service for maintenance and repairs. By comparison, the sites at Palmer and Goose Bay aren't that much better. Each is remote from the Anchorage bowl. Each would be limited by travel time and higher costs for delivering commodities. The Palmer and Goose Bay sites do have a slight advantage in terms of access during periods of bad weather. Roads can generally be kept open at these two sites even in very poor weather conditions.

Utility Services at the Site

It is difficult to compare utility services at the alternate sites. It has been pointed out that water supply at Fire Island is very subject to question. At this time it is not known if there is an adequate supply of fresh water on the island to meet the needs of a large correctional facility. Water supplies at Palmer and Goose Bay are not apt to be limiting. It is anticipated that sufficient fresh water is

(or can be made) available at these sites. One might view the water supply as strictly an economic matter. However, if the water supply at Fire Island proves to be inadequate, it could result in a need to curtail water use at the site with consequent disruptions to the operation of the facility.

Air Pollution

Air pollution levels at the alternative sites will influence site selection only to the extent that obtaining a permit to construct within the boundaries of the Municipality of Anchorage will be more difficult than at Palmer or Goose Bay. The reason is that the Municipality is considered to be a "non-attainment area" from an air pollution standpoint. The other sites are not. Permits to construct at Palmer and Goose Bay will involve only state and federal air pollution regulations. Permits to construct within the Municipality will involve local regulations as well.

Noise

The potential noise problems at Fire Island, due to its proximity to the heavy jet traffic of Anchorage International Airport, are not found at the Palmer and Goose Bay sites. This translates into possible lower construction costs due to avoiding added sound insula-tion in the HVAC systems at Palmer and Goose Bay. The cost difference would be relatively minor. Perhaps more important is the irritation caused by the noise and its effects on both inmates and staff. This is very

difficult to measure or to predict in its effect. Yet it may be an important consideration. There is no doubt that either the Palmer site or the Goose Bay site would be substantially less noisy than the Fire Island site.

Permits

In the discussion of wetlands and related permits (see page 59) it was noted that wetlands surveys of the sites must be carried out by the U.S. Army Corps of Engineers early in the planning stages. The existance of wetlands at either of the three alternate sites is not known. Until wetlands surveys are completed a comparison of the alternate sites (based on the concern of wetlands) cannot be made.

It is possible, however, to compare the anticipated problems related to permits at the alternative sites. If the Fire Island site is to be developed, it will require a major effort (and possibly major delays) to obtain permits for construction of the access facilities to the island. Recall that if access to the island is to be via air cushion vehicle, it will be necessary to construct a pier on the island and dredge a channel for barge access. A dock on the mainland is also required. Under the best of conditions, permits for these facilities can be obtained in 90 days. Under the worst scenario, an Environmental Impact Statement could be required with delays of up to a year or more. The sites at Palmer and at Goose Bay would avoid the need for any permits of this type.

Archeological Surveys

From the perspective of archeological surveys, none of the three alternative sites appears to enjoy an advantage. Preliminary archeological surveys would be required at each of the sites. There is no information available at this time which suggests that any of the sites is archeologically significant.

Legal Factors

There may be a minor advantage to choosing Palmer or Goose Bay from the legal perspective. As noted in the discussion of legal factors (see page 64), the Fire Island site carries with it the possibility of legal actions based on interpretations of cruel and unusual punishment. The concern stems from the isolation of the island with limited access. By comparison, the sites as Palmer and Goose Bay would less apt to result in legal challenges of this nature. With direct road access to both sites they would be considered less isolated than the Fire Island site.

Summary Comment

Review of the relative benefits and liabilities of the 3 alternate sites (Fire Island, Palmer, and Goose Bay) leads to the conclusion that the sites at Palmer and Goose Bay would be advantageous compared to the Fire Island site. The following analysis leads to the conclusion:

- Palmer and Goose Bay would be more accessible than Fire Island on a year-round basis.

- The availability of water at Fire Island is subject to question. If shortages occur at that site it could result in prison disruptions. The problem is less likely to occur at Palmer or Goose Bay.
- Air pollution in the Municipality of Anchorage will make it more difficult to obtain permits for construction of the prison than would be the case in Palmer or Goose Bay.
- The Fire Island site suffers a disadvantage due to noise from the Anchorage International Airport.
- Obtaining permits from the Corps of Engineers to construct docks and dredge the channel for barge access to Fire Island for dock facilities on the mainland may lead to significant delays in the project. Such permits would not be required at Palmer or at Goose Bay.
- The Fire Island site may be hampered by legal challenges from inmates based on its isolation. Such problems are not anticipated for the sites at Palmer or at Goose Bay.

7. Summary and Conclusions

Summary of Findings

1) Fire Island, located in Cook Inlet within the boundaries of the Municipality of Anchorage, contains a parcel of land of approximately 400 acres which is owned by the Cook Inlet Region, Inc. The land lies near the north end of the island and near an existing airplane landing strip. This is the site of a proposed prison.
2) The proposed site is sufficiently large to accomodate a correctional facility with an inmate population of 960.
3) The climatic and geophysical characteristics of the site make it suitable for construction and operation of a prison.
4) Soil conditions at the proposed site appear to acceptable for the proposed project. However, it is noted that only limited data exist concerning the presence or absence of unconsolidated soils which would present hazards in the event of a major earthquake.
5) Access to the island is a major concern and has a strong influence upon the costs for construction and operation of the proposed correction facility. This study leads to the conclusion that primary access to the island using air cushion vehicles and secondary access using barge service will result in the lowest capital costs for the proposed prison.

6) Utility services on the island raise important concerns. Available data indicate that the groundwater supply may be subject to salinity problems and may prove to be inadequate. The groundwater supply can be supplemented using treated surface waters, however, the amount of surface waters available for continuous use and the degree of treatment which may be required are unknown at this time.

7) Wastewater generated at the site can be treated using commercially available technology in "package" plants.

8) Solid wastes generated at the site can be handled as a sanitary land fill on the island.

9) Electric power needed at the site can be generated using commercially available diesel electric systems. The cost for electric power will be significantly higher than comparable costs in Anchorage, however, there is some opportunity to recover savings by using waste heat from the generator systems to provide space heating for the correctional facility.

10) Communication services to the island can best be provided using microwave relay systems.

11) Fire Island lies within the Municipality of Anchorage which is considered to be a "non-attainment" area for the air pollutants carbon monoxide and total suspended particulate. This designation may have some minor impact on the process of obtaining permits to construct

from the air pollution control authorities. Local, state and federal air pollution regulations will have to be met to obtain permits to construct the facility.

12) The proximity of Fire Island to the Anchorage International Airport results in some noise impact on the island. A study is currently underway in which the noise levels from the airport activity are being investigated. The results of the study will be available in 1987. The noise levels may require some small added cost in construction to provide additional sound absorption materials in the HVAC systems of the prison.

13) The proposed site on Fire Island has not been surveyed to determine if the area is archeologically significant. A preliminary survey of the proposed area will be required before any construction can take place. It is important to plan ahead for such surveys since they must be accomplished when the ground is thawed and is free of snow and ice. If the area is found to be archeologically significant, additional studies may be required which could delay construction.

14) It will be necessary to conduct a wetland determination study of the proposed site prior to any construction activity. Studies of this type are done by the U.S. Army Corps of Engineers and will be conducted following a written request to the Corps by DOC. If it is determined that the proposed construction activities would impact

wetlands, then special permits must be applied for by DOC and it is likely that some modifications would have to be made in the design and construction of the prison.

15) As noted, the least expensive access route to Fire Island is through the use of air cushion vehicles using barge service to handle some of the supply requirements. This alternative requires the construction of a dock at the island and one on the mainland. In addition, dredging of the channel north of the island would be required. Permits for these activities are required and could result in significant time delays if it is determined that the proposed construction activities would have a significant environmental impact on the fisheries of Cook Inlet or its tributaries. The best case scenario is a 90 day delay to obtain the required permits. The worst case scenario would be a requirement for a full Environmental Impact Statement which could result in delays of more than a year.

16) From a legal standpoint, a prison located on an island with limited access raises some points of concern. It could lead to legal challenges based on issues of cruel and unusual punishment.

17) Using the Spring Creek Correctional Center as a model, construction cost estimates were made for a 960 inmate facility on Fire Island. The estimates were based on two scenarios:

a) With direct road access to the site: $175,140,000

b) Without direct road access: $ 66,320,000

18) The construction cost estimates for the Fire Island site were compared with the estimates for sites at Palmer and at Goose Bay with the following results:

a) Construction at Palmer: $ 50,210,000

b) Construction at Goose Bay: $ 50,210,000

19) A limited study was done to compare the major differences expected in operational expenses for sites at Fire Island Palmer, and Goose Bay. The results of the study are:

a) Fire Island expense: $ 3,750,000

b) Palmer expense: $ 650,000

c) Goose Bay expense: $ 650,000

20) A study of the relative benefits and liabilities of the correctional facility sites at Fire Island, Palmer, and Goose Bay was carried out. The results of the study are presented in brief as follows:

a) Palmer and Goose Bay are apt to be more accessible than Fire Island on a year-round basis.

b) The questional water supply at Fire Island could result in prison disruptions in the event of shortages. This is not expected to happen at Goose Bay or at Palmer.

c) The air pollution problems of Anchorage may have an impact on obtaining permits to build on Fire Island. There would be no similar problem at Palmer or at Goose Bay.

d) The Fire Island site suffers a disadvantage due to noise from the Anchorage International Airport.

e) The potential difficulties of obtaining permits to construct docks and carry out dredging operations for Fire Island would not exist for the sites at Goose Bay and Palmer.

f) The potential for legal challenge associated with island based prisons does not exist at Palmer or Goose Bay.

Based on the results noted above, it appears that the Fire Island site has more potential liabilities than the sites at Palmer and Goose Bay. No special engineering or cost benefits for Fire Island were found in the study.

Conclusions

A review of the findings of this study leads to the following conclusions:

1. The proposed site on Fire Island is adequate in size, climatic conditions and geophysical characteristics to be used for a correctional facility to contain up to 960 inmates.
2. Access to the island is a major consideration which significantly raises the costs for construction and the expenses for operation of a prison on the proposed site.
3. Utility services for a correctional facility can be provided at the proposed site. The water

supply is the largest unknown factor.

4. Environmentally related permits which would be required to develop the site at Fire Island could prove to be a major problem resulting in signficant delays in construction.
5. Selection of an island as a prison site may raise some legal challenges by inmates.
6. The construction costs for a correctional facility at Fire Island would be significantly higher than comparable costs at either Palmer or Goose Bay.
7. The operational expenses for a correctional facility at Fire Island would be significantly higher than comparable expenses at Palmer or Goose Bay.
8. Fire Island does not appear to offer any special engineering or cost benefits when compared to alternative sites at Palmer and Goose Bay. The sites at Palmer and Goose Bay appear to have fewer liabilities than the site on Fire Island.

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14. U.S. Army Corps of Engineers, Alaska District, 1959, Final Report on Subsurface Conditions, Power Plant and Tower Locations Fire Island AFS, FY-60.

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FIRE ISLAND PRISON FEASIBILITY STUDY

SECTION I

CONSULTANTS

AIR CUSHION TECHNOLOGIES, INC.
n.d. Projected Costs for Fire Island Shuttle Service.

This two page report outlines the basic formula for estimating costs of air cushioned vehicles (or hovercraft) and provides two estimates relating to the proposed Fire Island shuttle service: first, start-up costs are estimated to be $1,950,000; second, annual operating costs are placed at $847,000.

DOW-SHELL GROUP, THE
1981 Feasibility of a Petrochemical Industry, Report to the State of Alaska. Anchorage, Alaska: The Dow-Shell Group, 101 West Benson Blvd.

This report presents a 10-volume study on the feasibility of a petrochemical industrial site in Alaska. Fire Island is one of six possible selection sites examined. The individual site assessments included in the study cover the topics of earthwork, ownership, access, weather, topography, water and natural gas availability and seismic and shipping considerations. The infrastructure and socioeconomic impacts of such industrial development are also explored; included are expected population increases and housing demand that would be generated by the development. U.S. Army Corps of Engineers data was the primary source in the analysis of Fire Island. The study concluded three major concerns with Fire Island as a site for this particular development. These were (1) the need to identify a long-term supply of potable water, (2) the development of a transportation tie to Anchorage, and (3) shipping hazards stemming from two potential shoal problems. Photographs and maps are included.

FARR, D.
1982 Space List and Area Calculations Long Term Correctional Center, State of Alaska. Anchorage, AK: TRA/Farr, Architecture Engineering Planning Interiors.

The report estimates the total amount of area which will be required by a long-term correctional center in South Central Alaska. The report views the center in seven separate zones and estimates the area required for each.

FARR, D.; WALKER; McGOUGH; FOLTZ; LYERIA
1982 Alternative Site Evaluation South Central Regional Long Term Facility, State of Alaska. Anchorage, AK: TRA/Farr, Architecture Engineering Planning Interiors.

This report discusses five alternative sites for a long-term correctional facility located in South Central Alaska: Palmer, Alcantra, Fishhook Road, Glenn Highway, and Church Road. The sites are evaluated for facility program, development capability, and environmental compatibility.

REBILLARD, STEVE
1983 Preliminary Site Evaluation Report for Fire Island, Project No. 183210, written communication to Rick Feller, Cook Inlet Region, Inc., Nov. 7. Gilfilian Engineering and Environmental Services.

This letter outlines the results of a field investigation of Fire Island done on September 27, 1983 to establish water and sewage drainage capabilities to support a proposed prison site. Seven test holes were dug and these are reported on in detail. No specific site problems related to topography or relief were encountered; however, there may be drainage problems and it was recommended that further investigation be done. A map is included.

SECTION II

FEDERAL/STATE/CITY REPORTS

ANCHORAGE, MUNICIPALITY OF
1982 Anchorage Coastal Resource Atlas: Volume Four, Fire Island, Alaska. Compiled, edited and coordinated by Tony Burns, Planning Division, Municipality of Anchorage, June.

The highlights of this Coastal Atlas are 15 color coded maps of Fire Island, displaying such topics as landforms, earthquake potential, ecological sensitivity and development suitability. The narrative includes the bathymetry and topography of the island, mass wasting, slope, wind, climate, and seismic hazards, soils, landcover, and wildlife and fish resources. The report is designed as a base for potential development plans and draws primarily on U.S. Army Corps studies for its data. The atlas identifies potential shoal hazards for ships, ground shaking and failure in major earthquakes as potential hazards to development, and, finally, notes that the possibility of permafrost is unlikely on the island.

BRENT, FLOYD; T. COX
1981 Fire Island Soil Survey. U.S. Department of Agriculture, Soil Conservation Service, July.

This report presents an extensive mapping of Fire Island with outlines of soil, slope, vegetation and drainage conditions. While the steep slope and peat bog areas are revealed as unsuited for building upon, the rest of the island is listed as having moderate slopes and susceptibility to moderate frost action, conditions which may be remedied using modern construction techniques. In addition, the report points out which areas are suited for sewage lagoons and trench type sanitary landfills as well as giving recommendations for individual septic systems.

CEDERSTROM, D.J.; F.W. TRAINER; R.M. WALLER
1964 Geology and Ground-Water Resources of the Anchorage Area, Alaska. Geological Survey Water Supply Paper 1773, U.S. Department of the Interior. Washington, D.C.: U.S. Government Printing Office.

Reports on well numbers 449 and 450 on Fire Island. The analysis was unable to determine whether the water-bearing beds are recharged from the mainland or whether they are isolated from the mainland and receive recharge from shallower deposits on the island.

COOK INLET REGION, INC.; and MUNICIPALITY OF ANCHORAGE
1981 Fire Island Industrial Site Analysis, April.

This extensive report examines Fire Island as a potential site for industrial development.

Part A outlines general information on Fire Island, including history, land ownership, harbor description and existing and planned road/railroad facilities.

Part B provides a detailed account of known physical and geotechnical information. Climate and meteorology along with geology, contour maps, soil-bearing data, seismic history and design data, permafrost and mass wasting along with hydrogeologic hazards are presented.

Part C is devoted to available water resources on the island. Ground water and surface water are both examined for maximum estimated availability and suitability for potable water supply.

Marine and harbor characteristics are explored in Part D. Tides, currents, ice hazards, special harbor considerations, potential dock locations and right-of-way availability are covered.

Part E outlines the island's archeology, vegetation, wildlife, fisheries, air quality and any Anchorage municipal codes and ordinances which include the island.

Finally, Part F presents a description of utility service including power, communications and water service location, size and availability.

The report includes eight maps, several figures and photographs of the island. In addition, the appendices include detailed documents relating to land ownership, soil test pits, causeway construction estimates, utility estimates and alternative water supply analysis.

JOHNSON, J. G.
1947 Tentative Projection of Alignment to Fire Island. Alaska Railroad, Anchorage, AK.

NATIONAL OCEAN SURVEY
1979 Cook Inlet: Fire Island to Goose Creek. National Oceanic and Atmospheric Administration, Washington, D.C.

SCHMOLL, HENRY R.; E. DOBROVOLNY; C. GARDNER
1981 Preliminary Geological Map of Fire Island, Municipality of Anchorage, Alaska, Open-File Report 81-552. U.S. Department of the Interior, Geological Survey.

Brief geological report on Fire Island, with map. Dune, beach, tidal, pond and peat deposits are described and identified

on the map. The report takes exception to earlier studies which described the deposits as moraine, and instead believes they are the product of subaqueous deposition in a delta. The strait between Fire Island and the mainland is described as tidal deposits that are soft, water-saturated, very unstable and treacherous even to walk upon.

TAN, RON

1983 Preliminary Construction Cost Estimate For: Fire Island Crossing. State of Alaska, Department of Transportation and Public Facilities, Central Region Project Development, Nov. 7.

This report outlines a proposed bridge betweeen Fire Island and Anchorage. It includes complete and detailed cost estimates and drawings for a 40 foot wide, 36,500 foot long bridge and estimates that the total project cost would be $165 million.

1983 Preliminary Construction Cost Estimate For: Fire Island Crossing (Alt. A). State of Alaska, Department of Transportation and Public Facilities, Central Region Project Development, Nov. 4.

This detailed cost estimate outlines a proposed causeway between Fire Island and Anchorage. The project entails filling in the embankment beginning at Sand Lake and ending at the existing road on Fire Island. The required width of this project would be 46 feet and the length, 36,500 feet. Total project cost is estimated to be $103 million.

U.S. ARMY CORPS OF ENGINEERS

1963 Report on the Rehabilitation of Wells No. 1, 2, & 3, Fire Island AFS. Anchorage, AK: U.S. Army Engineer District, April 8.

This report details the Corps of Engineers' efforts to rehabilitate Wells No. 1, 2 and 3 on Fire Island in anticipation of increased demand at the Air Force Station located on the island. Well No. 1 had to be abandoned; Well No. 2 was rehabilitated but unable to pump water in the quantities needed without saline contamination and was designated as a recharge well; Well No. 3 was designated as a good producer with no sand or saline problems, capable of producing 90 gpm with a drawdown of approximately 30 feet. Problems with Well No. 2 necessitated the drilling and testing of a new well, Well No. 4, which is covered in a separate report.

U.S. ARMY CORPS OF ENGINEERS
1963 Report on Well No. 4 - Water Supply Well, Fire Island AFS. Anchorage, AK: U.S. Army Engineer District, April 2.

This report contains a description of the drilling of Well No. 4 on Fire Island, descriptions of all tests performed, and test results. The report concludes that Well No. 4 will produce potable water at a rate of 66 gpm with a drawdown of approximately 28 feet. No sand or salinity problems were expected, but the report suggested that the saline content of the water be checked once a month.

U.S. ARMY CORPS OF ENGINEERS
1959 Final Report on Subsurface Conditions, Power Plant and Tower Locations Fire Island AFS, FY-60. Alaska District.

U.S. DEPARTMENT OF THE INTERIOR
1975, 1978 Environmental Analyses and Field Report AA4898, Bureau of Land Management.

SECTION III

MISCELLANEOUS REPORTS

AMERICAN CORRECTIONAL ASSOCIATION
1983 Design Guide for Secure Adult Facilities. College Park, MD: American Correctional Association.

This guide gives a practical overview of the latest philosophy and design criteria for modern correctional facilities.

AVILA, P.; COUTS, C.; PEDERSEN, J.; and M. WIBBENMEYER
1980 "Alternative Land Use Evaluation Study: Fire Island." Anchorage, AK: University of Alaska, Anchorage (December).

This report is intended to serve as a general guide and reference to Native Corporations and governmental agencies which have interest in the future use of Fire Island for economic investment or public use. The information presented in this document will assist these agencies in developing preliminary decisions regarding the potential use of Fire Island prior to undertaking more detailed site planning and subsequent design activities.

COOK INLET REGION, INC.
1983 Preliminary Overview of a Transportation System to Support a Correctional Facility Located on Fire Island, Prepared for the State of Alaska Adult Corrections Agency, October 21.

This report outlines a transportation system to support a 670 bed correctional facility on Fire Island. The system described is made up of a fleet of 3 air cushioned vehicles (or hovercraft) supplemented with chartered barges. The hovercraft would provide hourly service between 6 a.m. and 10 p.m. and the barges would transport materials and supplies on a quarterly basis. The estimated startup costs for the system range from $2,200,000 to $2,700,000 and the annual operation costs are estimated to be between $1,170,000 and $1,625,000.

FELLER, RICK
1983 Fire Island Ground Water Analysis, Inter-Office Memorandum from the Land Management Officer, Cook Inlet Region, Inc. to Frank Klett, Vice President, CIRI, Oct. 21.

This memo outlines the quality and quantity of the groundwater supply on Fire Island, based primarily on U.S. Army Corps of Engineer reports and the Fire Island Industrial Site Analysis

(Municipality of Anchorage, April 1981). It provides the discharge rates of all wells on the Island and a complete chemical analysis of Well No. 3. It concludes that the potential for a potable water supply, meeting or exceeding the minimums required to support a correctional facility, is available from the island's groundwater aquifers.

MARX, DON
1983 Letter from the Manager, Land Administration, Cook Inlet Region, Inc., to Kevin Bruce, Assistant Commissioner of Operations, Department of Corrections, Dec. 20.

This letter outlines problems raised in regard to the operation of air cushioned vehicles (ACV's) as a transportation mode to Fire Island in adverse weather conditions. It concludes, based on historic data and interviews with people familiar with the crossing area, that wind speed, wave action, ice packs and visibility pose no threat to the successful operation of the ACV's.

NELSON, GORDON
1983 Written communication from the Water Resources Division, Geological Survey, U.S. Department of the Interior, to Rick Feller, Cook Inlet Region, Inc., October 7.

This letter includes a history of the saline water problems on Fire Island and the pumping records of Well No. 4; rate of pumping in this well influences the amount of chloride content in the water.

WAGNER, DAVID G.; MURPHY, R.S. and BEHLKE, C.E.
ND "A Program for Cook Inlet Alaska for the Collection, Storage and Analysis of Baseline Environmental Data." Report No. lWR-7.

This report provides a general, yet comprehensive, description of the Cook Inlet System which serves as a basis for understanding the interrelated natural and man-made factors governing its future. The report summarizes existing data and outlines an approach for increasing the data base for Cook Inlet.