ALASKA LEGISLATURE COMMITTEE FILES 1981-1982 8672

1889 SRES NENANA FARM PROJECT BRIEFING 2/6/81 1889

Use of trees to be cleared from Alaska agricultural lands to develop a new wood-fiber industry: a proposal for state policy.

Mead Treadwell
Comex Alaska
December 20, 1980

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Presented to the Alaska State Senate under work conducted in conjunction with Sen. Mike Colletta, Majority Leader

Abstract:

Alaska, which plans to dedicate up to two million acres to agriculture during the rest of this century, should not continue to allow cleared trees to rot as waste. This paper proposes whole-tree, in-the-field chipping as an alternative system of land clearing for future agricultural projects. Wood chips can help cover the cost of clearing when sold to supplement coal in utility boilers. New systems have been developed by the U.S. Forest Service to segregate bark from clean chips. Segregating the chips before burning them as fuel creates higher profits since the clean chips can be sold for pulp on the world market. Finally, given the quantity of chips available with Interior Alaska's agriculture potential, there is little more government's agricultural planners may need to do to create an interior Alaska structural particleboard industry than to simply guarantee a long-term supply of the timber resource. A land clearing process which now costs the state and its farmers more than $200 an acre could be not only self-liquidating, it could also provide new permanent jobs and lower construction costs.

I. The present clearing process.

Land at Delta Junction, the state's most recent agricultural project, has been cleared with primary regard to quickly allowing grain planting on large parcels of land. For any project like Delta, virtually simultaneous clearing throughout the area is required. To get started, only immediate large-scale production can economically support the roads, equipment sales outlets, grain processing and marketing facilities modern agriculture needs.

A good team of two bulldozers can clear two acres an hour. They start by dragging a heavy chain between them, both ways through a stand of trees. The uprooted stumps, as well as trunks, roots, soil and moss are then pushed into berm rows at an edge of the field.

To cover costs of clearing Delta, the state has loaned farmers $165 per acre for 50,000 acres leveled in the past two years.

Haste, however, has made waste. Salvage, left to the individual farmer, is haphazard: some of the bigger trees are cut down ahead of the bulldozers and used in portable sawmills. A small portion of the berm piles are sources for hand-cut firewood. But huge amounts of biomass remain, posing a fire hazard.

Seven uncontrolled forest fires within the project have cost the state more than $5 million to fight during the past two years. It is not known to what extent these fires could have been limited had the berm rows been removed.

A $35,000 study conducted in 1979 by Battelle Laboratories for the State Division of Energy concluded that as a first option, the remaining Delta biomass could economically be chipped and used as a supplement to coal in existing electrical boilers in the Fairbanks area. Other options requiring greater capital investment included using the wood for small-scale power generation or for methanol or ammonia production. No action has been taken as a result of this study, which received but limited circulation.

The Battelle Study also recommended that an $800,000 Mobile Harvester and Chip Forwarder be considered for future clearing. Built by Nicholson Manufacturing, the machines can cut and chip standing timber at one acre per hour. The system is expected to provide chips at $4 to $12 a ton from standing timber, reducing the clearing cost by about $100 an acre. Stump removal costs are excluded from these savings. The state Agricultural Action Council is considering asking the legislature to purchase the machine for the Pt. MacKenzie Project, since conventional clearing costs there have risen to an estimated $185-200 an acre. Farmers will be loaned $200-240 per acre for land preparation.

before or after chipping, depending on the end use of the product. Capital cost of this sytem, which includes a feller-buncher, two grapple-skidders, a delimber/debarker, a front end loader and two chipvans is estimated at $850,000.

III. Economic constraints of a change.

Better use of agricultural land timber will require tremendous investment and a certain risk on the part of private industry. New harvesting equipment to clear land without destroying the value of the trees will cost approximately $1 million for development with the projected size of Tokchaket. A 20 ton-per-hour bark segregator system is estimated to cost $200,000 with operating costs of less than one dollar per input ton. Going the full step, with construction of a structural particleboard plant, is estimated to cost between $12 and $20 million.

Payback, on the other hand, remains an open question. Markets, small now, can be expected to grow for instate fiberboard. Construction at Susitna, for instance, will have a significant impact on the demand for plywood or a substitute. Demand already exists for wood-chips as fuel and pulp.

At present, the largest constraint on the development of a wood fiber industry is not money, it is supply. Government, as a prudent landowner, must recognize that if it wants to see development of a new industry concurrent with agriculture it must make a commitment large enough to ensure financing of plant and equipment. Such a guarantee is no different from the sales made to stimulate instate processing of petroleum resources. As well, a commitment now would help ensure the continued expansion of agriculture in years to come.

As a next step for government, it is important to balance the high costs to the state of clearing and firefighting attributable in part to the current technique of felling trees with whatever aid might be considered for a new harvest and processing method. Industrial development using a new process entails certain risks; government may decide to share in those risks for the greater good.

Industry's role must be to seek out the opportunities for wood product development with agricultural clearing. There will come a time when huge parcels of timber will only be available with large regeneration costs; the presence of agriculture is in effect a subsidy for this new industry.

IV. Conclusion

The references cited at the end of this paper are meant to be consulted. Compiled predominantly at a cost to the taxpayers, they contain the economic facts which back up the ideas contained here. Hardly another study is needed. We already know the value to utilities of burning

II. The Tokchaket Proposal.

The land at Tokchaket, the state's third major agricultural project, will be cleared near Nenana, beginning late in 1981. The project planners intend to make land clearing costs as self-liquidating as possible. Furthermore, the City of Nenana is seeking the development of a diversified wood products industry to use the wood cleared from the Tokchaket lands.

Depending upon the amount of capital invested, three graduated steps are possible to add value to a supply of wood which would otherwise be wasted:

1. Wood chips for fuel in electric boilers. Municipal and military boilers in both the Fairbanks and Anchorage areas have the ability to supplement their use of coal with wood chips with only minor additions to their loading capacity.

2. Pulp chips for export from the State. Currently, pulp chips exported from Alaska are produced after debarking larger logs brought to a stationary mill. Newly developed processes for removing bark from the clean whole-tree chips have been projected to pay for themselves in fuel sales alone. Thus a chip fuel operation which adds a "sifter" can obtain clean, marketable pulp grade chips.

3. Use of clean wood fiber for particleboard manufacture. A world-scale structural particleboard plant requires an approximate annual green wood supply of 100,000 tons. Using a conservative estimate of ten tons per cleared acre, only 10,000 acres per year of trees would be needed to support a particleboard plant. Out-of state markets, given that Alaska's current use of structural boards and plywood is much less than the output of an optimally sized plant, are yet undetermined.

The planners of the Tokchaket agricultural project will seek proposals from companies interested in clearing and making use of the timber on two contiguous townships comprising 46,080 acres. These two townships are the first stage of an agricultural development which will eventually cover 175,000 acres or more.

A first step toward saving the trees from waste is a decision on the harvesting method. Besides the two machine system mentioned above, a more traditional means of whole-tree chipping is to fell trees with a feller-buncher and "skid" them to a stationary chipper. Debarking can occur

WASHINGTON IRON WORKS

DIVISION of FORMAC INTERNATIONAL, INC.

1500 Sixth Ave. South • Seattle, Wa. 98134 • Phone (206) 623-1292 • Cable Address "FRINK"

August 22, 1980

Mr. Mead Treadwell
1131 West 5th Avenue
Anchorage, Alaska 99501

Dear Mr. Treadwell:

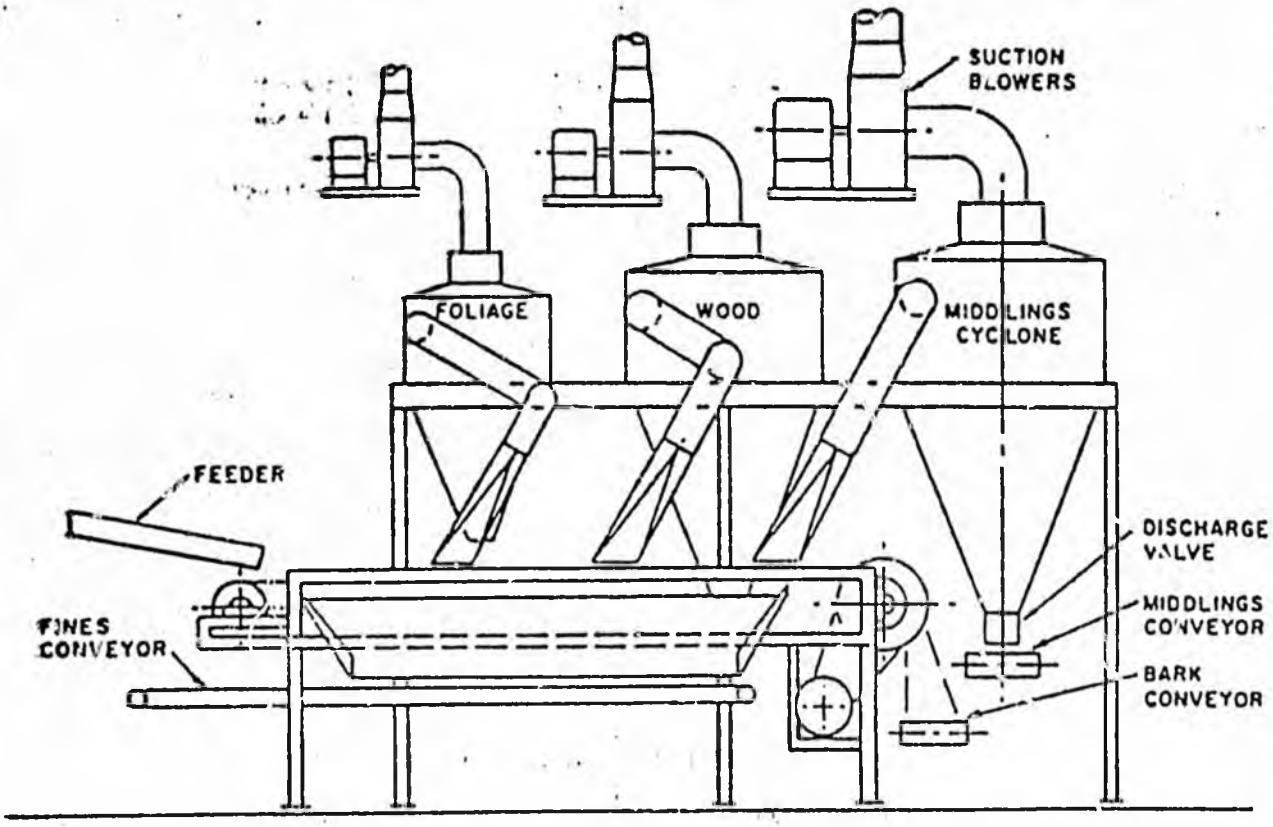
I enjoyed our conversation concerning ways to make use of the wood resource becoming available as a result of Alaska's agricultural expansion program. To slash and burn two million acres of spruce, aspen and birch would certainly be a terrible waste. The manufacture of one or more of the reconstituted wood panel products is one of the more promising approaches for making use of this valuable resource.

Waferboard or Oriented Strand Boards (OSB) would make excellent use of the aspen and birch and could use some of the spruce. These boards could replace some of the 30 million square feet of plywood now imported into Alaska.

There should also be a market for these boards along the west coast of the United States and, perhaps, elsewhere around the Pacific Rim. I'm a bit skeptical of the ability of Alaskan produced board to compete in these markets because of the high labor and material costs in Alaska. You may have a special situation, however, where normal market economics do not apply.

Fiberboard is another reconstituted wood panel product that could be produced. This category of products includes the hardboards ("Masonite"), hardboard exterior siding, and medium density fiberboard (MDF). Some of your production of these boards could probably be used locally, but most of it would have to be exported from Alaska. There is a growing market for these boards all around the Pacific Rim. The Alaskan product in these categories would also suffer from high costs just as would the structural boards

The optimum plant size for Alaska is still open to a lot of questions. We spoke of small plants, but I wonder if a large plant, centrally located at a water, rail and road junction would'nt turn out to be the most efficient approach. This plant would operate year round, would be large enough to efficiently use the latest technology and would benefit from the usual economies of size, i.e., efficient use of manpower, energy and capital. The biggest unanswered question is one of raw material availability and cost delivered at the plant site. Can you assure an



Multiple-stage vacuum airlift segregator. Developed by U.S. Forest Service. (Sturos-1)

wood chips. We already know that a system to segregate bark from whole-tree chips is feasible technically and profitable economically. We already know the costs of building a particleboard plant in Anchorage or Fairbanks and the potential markets to take up our capacity. The questions to ask now center on commitment and specifics: how many trees do we have, how do we want to harvest them, who do we want to be involved, how are we going to pay for it? Time, as well as wood, is a wastin'.

annual supply of say 100,000 tons of green wood (150 TPD plant) at a reasonable cost, for a reasonably long plant lifespan (say 10 years)?

I spoke of a 75 TPD plant size as about the smallest we would get involved with. This is true when we are dealing in remote, foreign corners of the world, but Alaska doesn't fall in this category. Your plant site is not really that remote from Seattle, your people and customs are ours, and our commercial practices are identical. I would not want to shut off our involvement just because the optimum plant size turns out to be less than 75 TPD. (I don't think it will).

Without giving any serious thought to plant costs, I can tell you that the capital equipment and process engineering for a 75 TPD MDF plant will cost about $6,500,000.00. That for a 150 TPD plant will run about $11,000,000.00. The complete, installed cost of these plants normally would be about twice the cost of the equipment and engineering. I suspect building, utility, installation and erection costs will be higher than "normal" in Alaska, so this 2x multiplier is probably on the low side. For ballpark estimating, you can use the same approximate costs for structural board plants.

I've enclosed our normal selection of sale s literature, reprints, etc., which will give you a good picture of Washington Iron Works and what we do. We also work closely with Columbia Engineering International, Ltd., in Vancouver, B.C., who are one of the foremost engineering firms in the reconstituted wood panel field. With them, we offer the full range of services in this field, from early engineering and feasibility studies, through plant and process design to and including the direct manufacture and supply of the major process equipment. Our forte is in fiberboard but we have supplied a number of waferboard plants and are well-qualified in this field also.

Mead, you are involved on a very fascinating program that has elements reaching to all levels of community and industrial planning, involving a wide range of interests and skills. I hope we can be a party in this. Please let me know if we can help in any way.

Sincerely yours,

WASHINGTON IRON WORKS
Division of Formac International, Inc.

David Rudman
General Manager
Miller Hofft Division

Enclosures
cc: J. Chryst
DR/jvn

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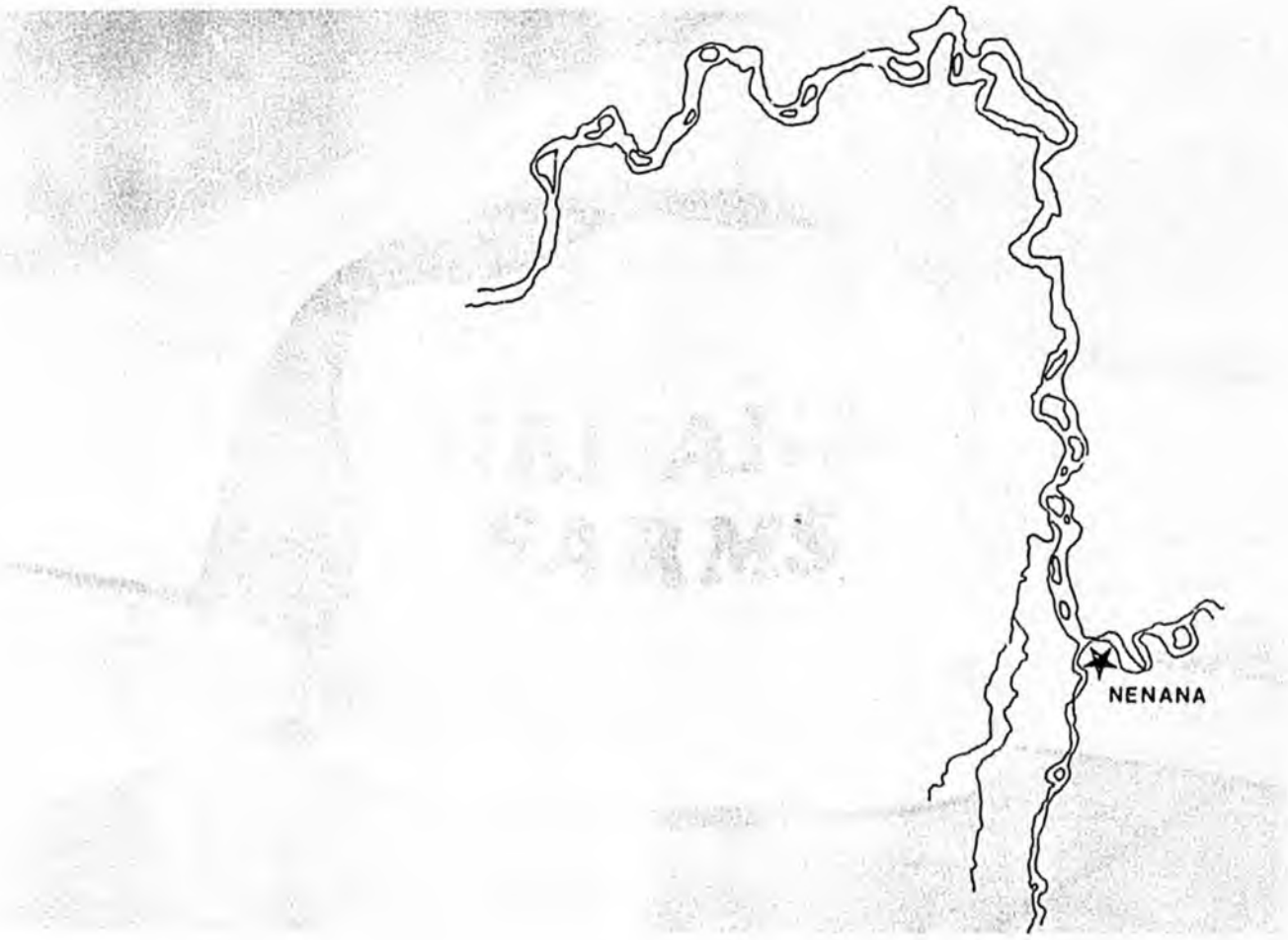
NOTE REGARDING THE FOLLOWING FRAME ON MICROFILM:

COMPLETE DOCUMENT IS AVAILABLE IN ORIGINAL FILES IN ALASKA STATE ARCHIVES. TITLE PAGE ONLY HAS BEEN FILMED.

NENANA — TOTCHAKET

UNLOCKING THE AGRICULTURAL POTENTIAL OF WESTERN ALASKA



A Report on A Seminar and Workshop on Agricultural Development.
Sponsored by THE CITY OF NENANA
December 20, 1980

JANUARY, 1981

PRELIMINARY REPORT

OF

WORK IN PROGRESS

CITY OF NENANA PROJECT No. AG-103

RESEARCH, SURVEY AND RECOMMEND
A COURSE OF ACTION TO ESTABLISH
AN ECONOMICALLY VIABLE VEGETABLE
INDUSTRY PROJECT

SUBMITTED BY

LITTLE GOLDSTREAM ASSOCIATES
3031 RIVERWOOD DRIVE
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TABLE OF CONTENTS

INTRODUCTION

This is a summary of work in progress. All computations are based on figures from prior reports. None of the numbers herein are to be considered final. Market volumes and acreage estimates should be considered only as establishing a magnitude of consideration. Any conclusions jumped to are those of the leaper and not of the author. New data is being developed that will undoubtedly change these numbers, although probably not by much. If any of the contemplated processing systems proves non-viable, the numbers could change considerably.

CONSUMPTION DATA

Dr. Wayne Burton is presently preparing a new market analysis. The only previous consumption figures are in his work Alaska's Agriculture, 1971, published by the Institute of Social, Economic and Government Research, and A. Dale Saunders' report "A Vegetable Freezing Industry for Alaska" also done in 1971. Dr. Burton's work was based on national average statistics for fresh and frozen vegetables using population trends to provide projections to 1980. His update in progress at this time will include canned vegetables as well as fresh and frozen. This work will provide an interesting comparison to his previous projections.

Dale Saunders and Charles Marsh did a fairly thorough market survey of the railbelt and concluded that Alaskan's consume considerably more frozen vegetables than their counterparts in the other 49 states. Depending on the specific vegetable, up to three times more frozen vegetables are purchased by the Alaskan consumer. The overall average frozen vegetable consumption in Alaska was 45 percent higher than the national average.

At the present time no data is available on canned vegetable consumption. Nationwide, the average citizen consumes approximately four times as many canned vegetables as frozen vegetables. Whether this holds true in Alaska remains to be seen. In later calculations in

this report, the canned vegetable consumption will be considered equal to the frozen vegetable consumption.

TABLE I

RAILBELT VEGETABLE CONSUMPTION
1980 Projections from Surveys Done in 1971
1,000 lbs.

Frozen Vegetables	Burton	Saunders & Marsh
Potatoes	12,938	8,600
Peas	814	578
Broccoli	341	618
Carrots	438	196
Cauliflower	114	366
Brussels Sprouts	69	262
Peas & Carrots	—	70
Fresh Vegetables		
Potatoes	27,186	
Broccoli	117	
Carrots	2,318	
Cauliflower	235	
Brussels Sprouts	31	
Cabbage	2,646	
Lettuce	8,366	
Radishes & Parsnips	69	
Rutabagas & Turnips	69	
Zucchini	34	
Cucumbers	1,094	
Tomatoes	4,126	

FROZEN VEGETABLE MARKET

Saunders and Marsh divided the frozen vegetable market into two segments, institutional and retail. The institutional market consumed 76 percent of the frozen potato products, 71 percent of the frozen carrots, 62 percent of the frozen peas and carrots, 53 percent of the frozen peas, and 38 percent of the frozen broccoli. Cauliflower and brussels sprouts were split nearly equally between the retail and

institutional segment. From these figures they suggested as a reasonable goal a local processing plant could capture one-half of the retail market and two-thirds of the institutional trade. In 1970 this amounted to 3.6 million pounds of frozen potato products, 328,000 pounds of peas and 582,000 pounds of other vegetables. Using population trends and allowing for changing consumption patterns, they predicted the 1980 market. In Table II, Saunder's figures for estimated market are compared with Burton's. Dr. Burton's consumption figures were categorized into institutional and retail markets using Saunder's percentage figures for each vegetable, then computed using the same market share of two-thirds of the institutional and one-half of the retail trade.

TABLE II

FROZEN VEGETABLE MARKET SHARE
Based on Two-Thirds Institutional Market
and One-Half Retail Market
1,000 lbs.

	Burton	Saunders & Marsh
Potatoes	8,043	5,400
Peas	476	700
Broccoli	191	346
Carrots	269	120
Cauliflower	66	213
Brussels Sprouts	40	152
Peas & Carrots	—	42

FRESH VEGETABLE MARKET

The seasonal nature of farming in Alaska must be considered when evaluating the possible market share available for fresh vegetables.

The percentage of the annual consumption that can be served by local farms depends on the storage qualities of the vegetables. In Table III the annual consumption is reduced by the fraction of the year that the specific vegetable can be supplied either from the field or from storage. Some vegetables may be stored longer than indicated with controlled atmosphere storage facilities, or by using vacuum coolers. At the present state of development in Alaska, however, this is a realistic assessment. The seasonal market is then reduced by one-third to give an expected market share of two-thirds the seasonal consumption. From this expected market share is subtracted what is presently grown locally to give the available market share.

TABLE III

FRESH VEGETABLE MARKET

Vegetable	Consumption 1000s lbs from Table I	Fraction of annual market based on season factors	Seasonal market 1000s lbs	Market Share based on 2/3 seasonal mkt.	Local Sold 1979 1000s lbs	Available market 1000s lbs
Potatoes	27,186	1.0	27,186	18,133	6,400 (1978)	11,733
Broccoli	117	1/6	19.5	13	*	13
Carrots	2,318	1/3	773	516	240	276
Cauliflower	235	1/6	39	26	*	26
Brussels Sprouts	31	1/6	5	3.4	*	3.4
Cabbage	2,646	1/3	882	588	400	188
Lettuce	8,366	1/4	2,092	1,395	1,360	35
Radishes & Parsnips	69	1/6	11.5	7.7	*	7.7
Rutabagas & Turnips	69	1/3	23	15	*	15
Zucchini	34	1/6	5.7	3.8	*	3.8
Cucumbers	1,094	1/4	274	183	*	183
Tomatoes	4,126	1/4	1,031	688	*	688

* undetermined

RAW PRODUCT AND ACREAGE REQUIREMENTS

As can be seen from Table II there is quite a difference of opinion as to what the vegetable market may be. However, the Table provides a magnitude to work with until the market study is completed. The new figures probably will not be higher than the highest of these two estimates. Preliminary sizing of processing lines and acreage estimates can be done with this information. Table III gives the acreage needed to supply the quantity of frozen vegetables listed in Table II. For each vegetable, the largest of the two estimates in Table II has been used as a base figure to calculate the amount of raw product needed. For potatoes the finished product was multiplied by 2.4. The adjustment factor for the other vegetables is 1.25. This allows for losses in quality grading, peeling, trimming, etc.

Yields on most crops are statistically lower in Alaska than in the United States as a whole. The Tanana Valley averages reported by the Alaska Crop and Livestock Reporting Service are considerably lower than the Matanuska Valley. This is probably due to a lack of irrigation in the interior. The U.S. average yield for each crop has been used in computing acreage. Authorities on vegetable growing in Alaska feel that the U.S. average yields are easily obtainable with proper cultural practices.

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TABLE IV

RAW PRODUCT AND ACREAGE NEEDED TO SUPPLY
FROZEN VEGETABLE MARKET SHARE 1980

Vegetable	Raw Product 1000s lbs Consumption x 1.25 Potatoes x 2.4	U.S. Ave. Yield lbs/acre	Acreage Needed
Potatoes	19,303	22,800	847
Peas [1]	901	2,380	379
Broccoli	432	6,300	69
Carrots [1]	362	26,000	14
Cauliflower	266	8,700	30
Brussels Sprouts	190	5,900	31
		TOTAL	1,370 Acres

[1] "peas and carrots" added in

TABLE V

ACREAGE NEEDED TO SUPPLY AVAILABLE
FRESH MARKET

Vegetable	Available Market 1000s lbs	U.S. Ave. Yield lbs/acre	Acreage Needed
Potatoes	11,733	22,800	515
Broccoli	13	6,300	2
Carrots	276	26,000	11
Cauliflower	26	8,700	3
Brussels Sprouts	3.4	5,900	1
Cabbage	188	21,800	9
Lettuce	35	22,700	2
Radishes & Parsnips	7.7	20,000	1
Rutabagas & Turnips	15	20,000	1
Zucchini	3.8	20,000	1
Cucumbers	183*		
Tomatoes	688*		
		TOTAL	546 Acres

* greenhouse crop

Cultivated acreage required for the listed frozen and fresh vegetables is 1914 acres. If a process equivalent to canning, such as the highly touted "retort pouch" method is proven economical, this will add acreage at least equal to that needed to supply the frozen vegetable market. Also, there are marginal and specialty crops such as snap beans and sweet corn that will require acreage. This brings the actual acres in production to 3384. For this amount of land to be in cultivation requires approximately half again as much to be in fallow for a one-third rotation. Total cropland, then, becomes 5076 acres.

Additional land should be made available for future expansion and for other uses, i.e. farmstead buildings, roads, powerlines, etc. Also, a certain percentage of any tract will be unusable due to natural factors of slope and drainage. No less than twice the actual cultivated acreage should be considered, with provisions for releasing more in the future. Total acres to implement vegetable industry, providing the processing proves economical, is 10,152 acres.

PROCESSING

For this preliminary report, no economic analysis is attempted. Sizing parameters are given based on the expected market. Key Electronics of Milton-Freewater, Oregon is developing itemized machinery specifications for a vegetable freezing line, a potato processing line, and a "retort pouch" line. Water, power and labor requirements are also

dependent on their results. Controlled atmosphere storage of potatoes for processing, as well as other vegetables for an extended fresh market is a major investment. Freezer storage of the seasonal frozen pack is another factor. Disposal of large volumes of organic waste is a significant cost. Capitalization and operating costs are all being developed at this time.

FREEZING

The main advantage to the freezing method of preservation is the high quality of the packaged product. Nationally, frozen vegetables as a percentage of total food consumption has been steadily increasing since the fifties. The major disadvantage, of course, is the necessity of refrigeration. If the Alaskan market is to be serviced year-round, then frozen storage is needed to provide a steady supply to retailers and institutional users. Some reduction in storage capacity could be effected by promoting the large wintertime frozen food sales. By inducing quantity sales, consumers would provide their own storage by "stocking up". A maximum amount of storage still would be needed for the interval between the end of the growing season and cold (0°F) winter temperatures.

Since the harvest season is usually six weeks or less, most of the vegetables must be processed during a short period of time. In sizing the capacity of the plant, the crops can be grouped into those that can wait and those that cannot. Potatoes can be stored before processing, as can carrots to a lesser degree. Peas, broccoli, cauliflower and

brussels sprouts must be processed immediately usually within six hours of harvest to maintain highest quality. In addition to these "primary" vegetables, one can think of others—spinach, turnips in stew packs, etc. These vegetables are a small percentage of the pack and individual market figures are not available to this time. When calculating line flow, enough extra capacity is included to allow for these products. To handle the vegetables that must be processed quickly, it is assumed that the plant will be operated six days a week, eight hours a day, for six weeks. In some large agricultural regions similar plants are operated 24 hours a day in the harvest season. However, since this project is operating at a fairly low level of production, it is thought that a larger capacity plant run fewer hours would be more economical. This also allows for growth capacity by increasing the hours/day of operation. This schedule is also more flexible, allowing for long (24 hour) runs on a particular vegetable depending on the vagaries of the harvest.

The sum of the anticipated market share for frozen peas, broccoli, cauliflower and brussels sprouts is 716 tons. Divided by the number of hours in 36 eight-hour days (288), we have a line capacity of 2.5 tons/hour. (Finished product). At this rate of production, the carrots can be processed in an additional seven working days.

POTATO PROCESSING

Except for the freezer unit, nearly all the equipment used in potato processing is different from that used in the vegetable line.

Potatoes must be peeled, sliced, chopped, fried, degreased and pre-cooled before freezing.

The frozen potato product line will consist of french fries and hash browns, as this comprises 98 percent of the frozen potato market. The line capacity for potatoes depends on the period of operation. The two options appear to be:

1. Fairly high production for three months following cessation of other vegetable processing, closing the plant for the winter just before Christmas.

2. Maintaining a lower level of output through the winter for approximately eight months.

The trade-offs are capitalization costs versus operating costs, and controlled environment storage of the raw product versus frozen storage of the finished product. At this point, the shorter term, larger capacity plant would seem most economical. Dividing the market share (4022 tons) by operating hours (504) in the first option gives a line capacity of eight tons/hour. (Finished product). Line capacity for the smaller system would be 3 1/2 tons/hour.

RETORT POUCH

The retort pouch is a plastic aluminum foil laminate package that

replaces the tin-plate can. The method of food preservation is essentially the same as the "tin can"—thermal destruction of harmful micro organisms and prevention of re-infection. The advantages are quicker heat transfer to the interior of the container, thus maintaining better texture, flavor and nutritional quality of the enclosed food, and energy savings in sterilization. It must be pointed out that retort pouches are competitors of canned food and not of frozen food. Frozen vegetables still maintain their quality edge. The retort pouch process is still in the developmental stage in the United States although it is used elsewhere in the world. At this time, the Food and Drug Administration has not yet given full approval for commercial production. Fortunately, Key Electrosonics has participated in the development and is supplying information on this technology.

HARVESTING

The steady supply of fresh, mature, well-handled produce to the dock of a processing plant is a complex undertaking that is planned as much as a year in advance. It is customary for the packing plant to contract with individual farmers for specific quantities on specific dates. These contracts may be detailed to variety, planting date, amount of fertilizer, and amount and timing of irrigation. The processor also might own the harvesting equipment if it is a large or specialized piece of machinery such as a pea combine. A trained crew will operate the combine in close communication with the plant manager to avoid bottlenecks. The high degree of coordination required in assuring the most efficient utilization of the harvest is not to be underestimated.

TABLE VI

RECOMMENDED TEMPERATURE, RELATIVE HUMIDITY AND APPROXIMATE STORAGE LIFE OF VARIOUS VEGETABLES

Crop	Temp. °F.	Relative Humidity %	Storage[1] Life
Beans, snap	38-42	95+	10 days
Beets, bunched	32	95+	10-14 days
topped, processing	32	98-100	8 months
Broccoli	32	95+	10-14 days
Brussels sprouts	32	95+	3-5 weeks
Cabbage, early	32	98	3-6 weeks
late	31-32	98	4-6 months
Carrots, immature, bunched	32	95+	3 weeks
immature, topped	32	98-100	1 month
mature, topped	32	98-100	6-9 months
Cauliflower	32	95+	1 month
Celery	32	95+	2-4 weeks
Collards	32	95+	10-14 days
Cucumber	50-55	95	10-14 days
Greens, various leafy	32	95+	10-14 days
Onions, dry	31-32	65-70	—
green	32	95+	1 week
Parsley	32	95+	1-2 months
Peas, garden	32	95+	7-10 days
edible podded	32	95+	3-5 days
Pepper, green	45-50	95	2 weeks
Potatoes, early	50	90	2-3 months
late	32-40	90	8 months
Radish, spring, topped	32	95+	3-4 weeks
winter	32	95	6 months
Rhubarb	32	98	2-3 weeks
Spinach	32	95+	10-14 days
Sweet corn	32	95+	4-6 days
Tomatoes, ripe	35-45	90	3-5 days

Source: Ryall and Lipton (1972).

[1]Storage Life given refers to quality rating of "good". This table is intended as a quick guide only; for details, consult Ryall and Lipton (1972).

PRODUCTION

PHYSICAL DATA

Yields and production costs are probably the most variable factors in this study. Soils data is just now being compiled by the Soil Conservation Service. The soil survey should be available in early December. Rainfall, temperature, wind and occurrence of frost data is nonexistent at this time for the precise location. In the following tables, weather data from Nenana, approximately 14 miles from the project site, is compared with Fairbanks. Years of research at the University of Alaska Agricultural Experiment at College provides a basis for predicting crop growth.

The average temperature and average rainfall for the months April through September are very similar in Fairbanks and Nenana. (Table VII and Figure I). The extremes are greater in Nenana. Figure II shows frequency of occurrence of frost. Fairbanks has a slight statistical edge at both ends of the season, but total frost-free days are essentially the same. Nenana has 1875 growing degree days and Fairbanks has 1890.

TABLE VII

AVERAGE AND EXTREME TEMPERATURES
FOR FAIRBANKS AND NENANA*
°F.

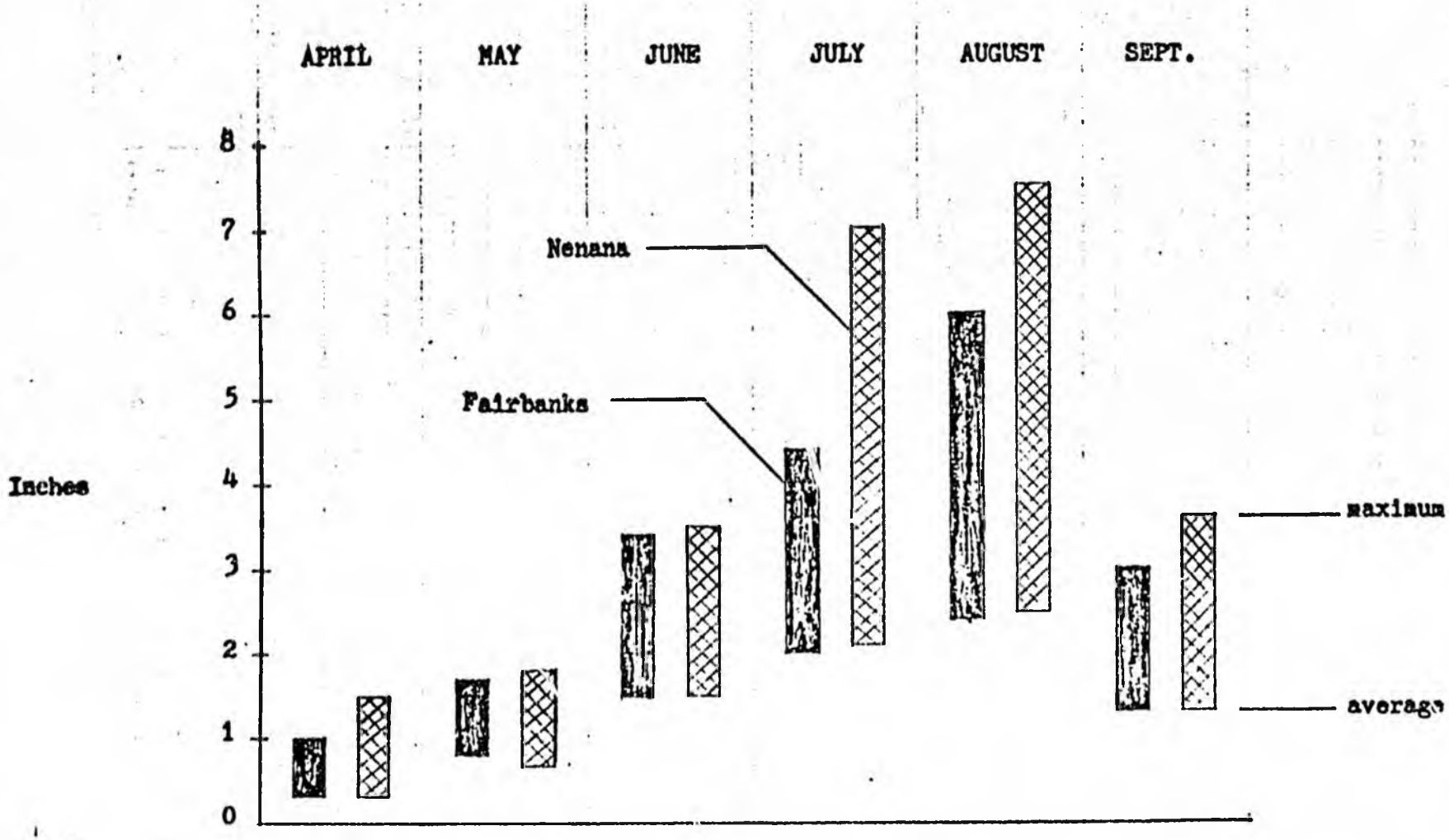
	April		May		June		July		Aug.		Sept.	
	Nenana/Fbks.											
Highest	71	65	87	83	97	96	95	88	89	86	79	80
Ave. Max.	39	40	58	59	70	71	73	73	67	67	54	55
Ave. Min.	16	18	35	36	45	47	48	49	44	45	32	33
Lowest	-33	-22	-2	-1	27	30	29	35	23	30	4	12

* from Alaska Regional Profiles-Yukon Region Arctic Environmental Information and Data Center

TABLE VIII

MEAN MONTHLY WIND SPEED AND
PREVAILING DIRECTION-SPEED IN KNOTS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
NENANA	ENE	E	ENE	NW	NW	SW	SW	SW	ENE	ENE	ENE	ENE	ENE
	5.3	4.7	9.2	5.8	5.8	9.1	4.6	4.4	9.0	5.2	4.8	4.3	5.0
FBKS	N	N	N	N	N	SW	SW	SW	N	N	N	N	N
	2.4	3.2	4.1	5.3	6.2	5.8	5.3	4.9	4.9	4.4	3.2	2.5	4.3



GROWING SEASON PRECIPITATION in FAIRBANKS and NENANA

FIGURE 1

FREQUENCY of OCCURANCE of FROST

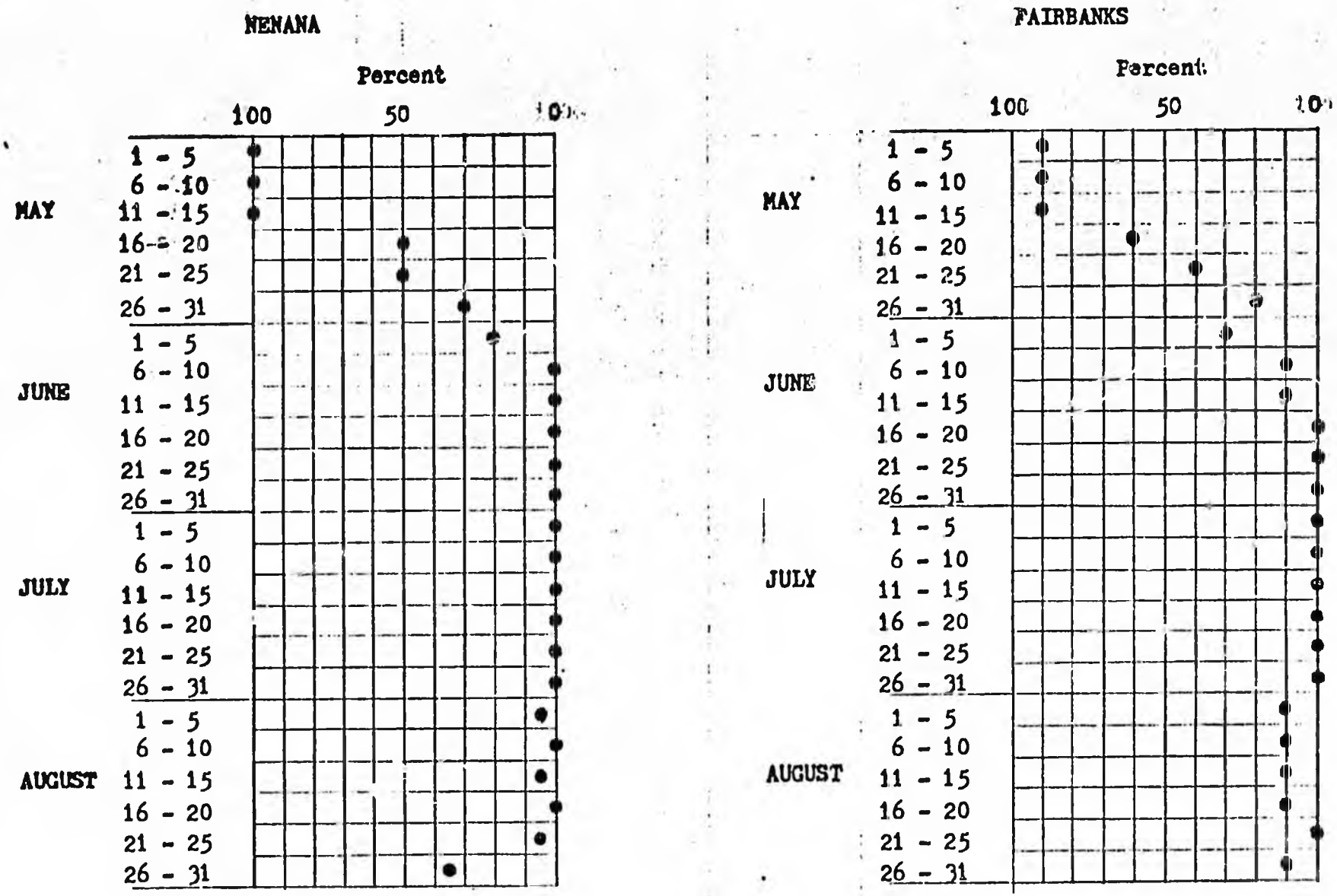


FIGURE 2

Average length of growing season in Fairbanks is 92 days, in Nenana 90 days. The wind is stronger in Nenana on the average but only in June and September during the growing season is the wind significantly stronger, 63 percent and 54 percent respectively. (Table VIII).

It should be noted that localized differences in climate are very pronounced and can be significant to the success of any agricultural project. Slight hollows may be frost pockets, slight rises with southern exposures increase the incident radiant energy absorbed, hills rising on the north side of a field provide reflection and re-radiation of long-wave energy. These microclimates can vary within one mile, and even within several hundred yards. The plots chosen for vegetable farms should be selected with this localized climate effect firmly in mind. Indeed, the difference between a successful farm and a marginal one could be totally dependent upon the original site considerations.

CROPS AND YIELDS

Vegetables to consider as market crops are listed below according to the degree of certainty of successful production. Variety selections for these vegetables will be in the final report. National average yields have been given as a basis for preliminary computations in the market and processing section. Final estimated yields should not vary too far from those figures.

Climatically well adapted

broccoli
brussels sprouts
cabbage
carrots
cauliflower
lettuce
peas
potatoes
radishes
rutabagas
spinach
turnips

Climatically adaptable if unusually good site

snap beans
summer squash

Marginal--require various aides--plastic, soil heat, etc.

sweet corn
melons
winter squash

Greenhouse crops

cucumbers
tomatoes

FARM SIZING

Here must be recognized the different cultural practices of the various crops. Some are high value, very intensively cultivated. Others, such as potatoes, are high volume, low value. The fact is, vegetable farms can be just about any size, from one-half acre part time, up to extremely large (1,000 acre) potato farms. The efficiencies of production depend on the particular situation, i.e. crops grown, investment capital available, labor availability, and philosophy.

There seems to be a tendency in Alaska to underrate the labor intensity of vegetable production. In 1975 it took an average of 29 man-hours to grow potatoes on one acre. For a 1,000 acre farm and a 100 day season, this meant 24 people working 12 hours a day on a relatively non-labor intensive crop. In a survey in New Jersey of diversified medium sized vegetables farms, the average farm had 39 cropland acres and had a labor force of seven men all season with nine at the peak. This included the owner's family as two man-units. This is simply to illustrate a point--there is at present no source of farm labor in Alaska to work on large farms. To develop a work force from the existing labor pool, or even from the ranks of the unemployed will be expensive. In the past, agricultural studies have priced the labor far below market value. In 1980, CETA workers were receiving over $6.00/hour in Nenana. An employer will have to at least equal welfare.

With these thoughts in mind, farm sizing will be left for the final report.

CROP BUDGETS

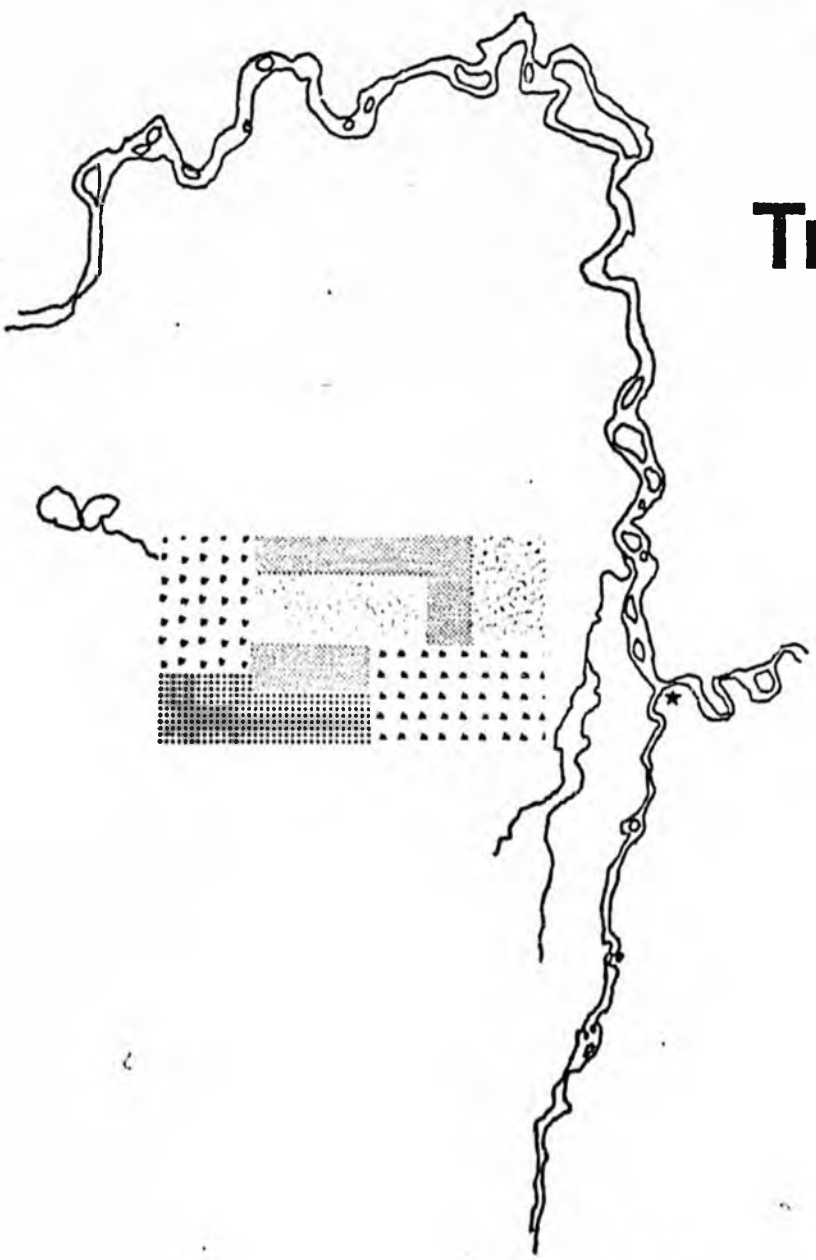
Cost of production analysis requires consideration of many factors. Crop calendars of the cultivation practices for each vegetable are needed to establish crop budgets. Efficiency factors for equipment times acreage covered in each cultivation practice give fuel, oil, maintenance and labor costs. Fertilizer, seed, insecticide, machinery

and labor expenses establish variable costs. Crop budgets are being prepared at this time. Dr. Donald Dinkel is formulating project specific inputs for the cultural requirements.

DRAFT

NENANA

Agricultural Transportation Systems



Project No. AG101

November, 1980

HDR ATC

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NENANA AGRICULTURAL TRANSPORTATION SYSTEMS

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November 1980

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Plan Sheets

*In the original draft the six drawings were enclosed in an envelope. To save cost on the additional 50 copies, the six drawings have been included at the end of the text and before the appendix.

CHAPTER I
INTRODUCTION

Transportation is an important aspect in rural development. To quote current research:

> "If rural development is to proceed in an orderly and efficient manner, adequate performance of the transportation infrastructure and regulatory structure is mandatory. Highway, water rail, and air transportation investments should be closely coordinated with those state and federal agencies directing the various rural development programs."[1]

Efficient and competative routing of goods to and from a rural center is the key in providing social and economic benefits to that area. A well designed and constructed farm to market road network is essential in any agricultural development as it will be servicing the aggregation of grain transport; machinery movement; and fertilizer, feed, seed and chemical hauling.

This draft report provides a proposed roadway network in the Nenana agricultural area starting with an initial phase of two townships expanding to several townships in future phases. Commodity routing systems in the Nenana area are examined to maintain a flexible, multi-modal system in the area. Alternative processing site locations are compared in relation to the City of Nenana, the initial phase of the project, and existing commodity routing systems.

Roadway development and construction includes an examination of soils, land ownership, parcelization and climatic conditions. Alternative roadway sections are designed based upon the location of gravel, and wet or permafrost areas. A roadway layout is proposed that takes advantage of section line easements and allows for flexibility in final parcelization. Estimated costs for construction and maintenance of this layout are also presented.

It is our understanding that the project development schedule is for land disposal in late 1981 or 1982 at the latest. In order for the transportation

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[1] Richard K. Hart, Transportation and Rural Development: Some Policy Considerations.

system to be in place, construction must occur in the 1981 construction season. For this to happen, the project planning and design must be fast tracked. Because of this, the consultant team has initiated permit procedure for field work this winter and early spring. This includes bridge-borings, site surveys, centerline surveys and borings, plus material site investigations.

CHAPTER II
OVERVIEW OF COMMODITY ROUTING SYSTEMS

There are three potential commodities being considered for the Nenana Agricultural Area. Studies to determine the viability of livestock raising and vegetable production are presently being undertaken. However, with the imminent success of the Delta Barley Project in mind, grain production must be given the major consideration. Thus, of the three (3) alternatives, grain production will be considered in this report as the primary user of any routing system established. This is due in part to the information available concerning grain production in Alaska (Delta Junction); the predominance of Class III soils in the project area, which are well suited to grain production; and the present lack of information regarding vegetable and livestock production.

This section will provide an overview of the routing systems that exist in the Nenana area. To remain within the scope of the overall report, no analysis of routing economics will be undertaken here. Rather, the focus will be on how the roadway network and processing area within the project might impact the various routing systems. It should be noted however, that the argricultural industry relies on economically competative transportation modes. Thus, every effort should be made to maintain maximum flexibility of the routing systems available to various agricultural areas in Alaska. Figure I illustrates the commodity routing systems available to various agricultural areas in Alaska. Nenana has a distinct advantage in being on all four modes of routing. This, coupled with its central location within the state, makes it a focal point for the distribution of agricultural goods both within the state and for export.

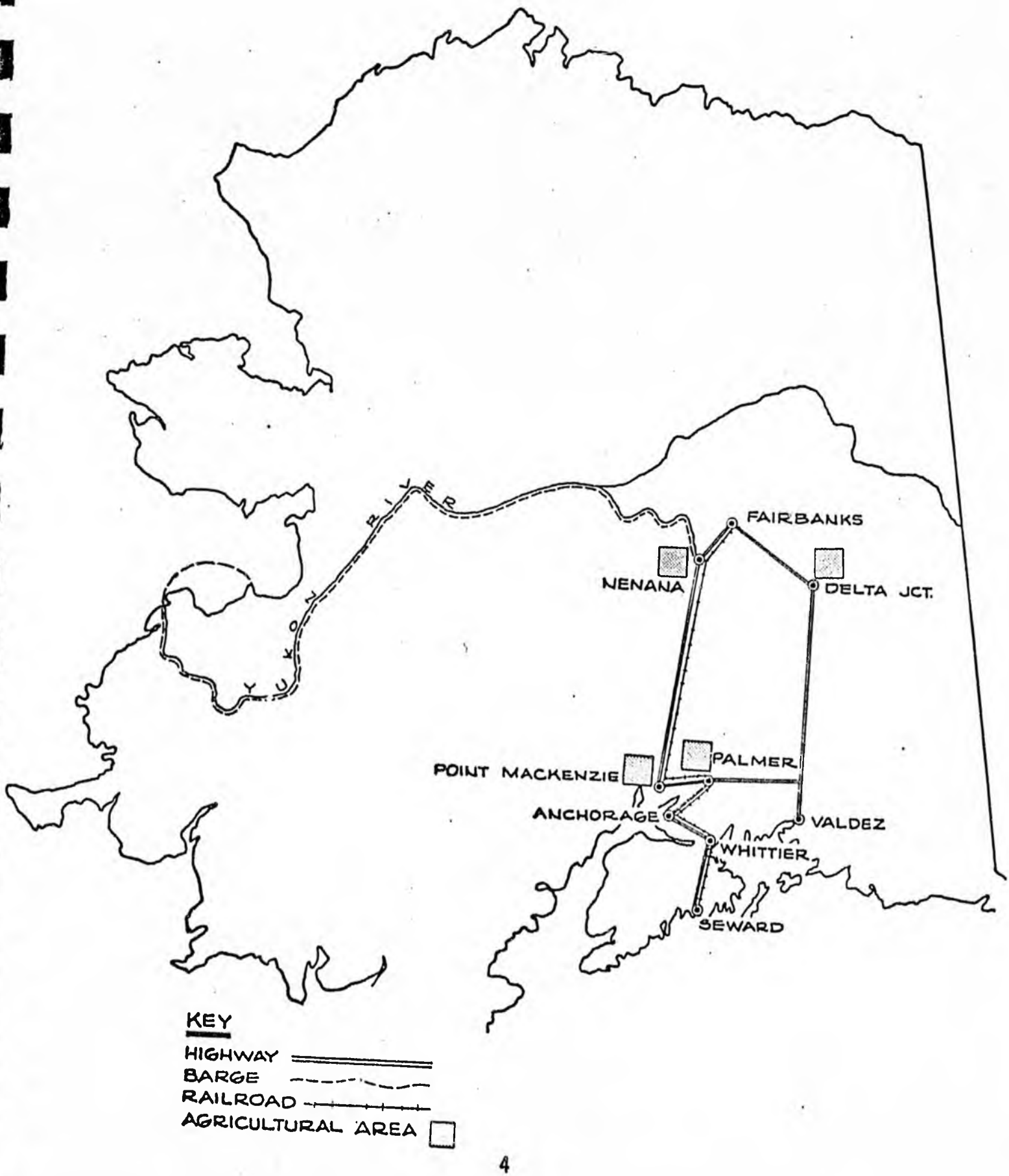
Though there are four systems available for use (air, truck, rail, and barge), raw agricultural goods generally move using the bulk facilities, low operating costs, and proximity to markets available on truck and rail modes.

1. Truck Routing

Routing agricultural commodities by truck is most efficient over short hauls and when backhaul possibilities are definite. Thus, truck routing would most likely be used in local/intra-state distribution of vegetables grown in Nenana and livestock processed there, having Fairbanks and Anchorage as the two major points of transfer. The hauling of grain by truck, while

FIGURE I

COMMODITY ROUTING SYSTEMS



possible, is not likely due to the large amount of trucks needed to haul the grain and the more economical use of rail in hauling such bulk quantities.

Starter herds for livestock would be most effectively transported by truck up the Alaskan highway. Red meat for export would be transported by truck to Fairbanks International Airport and most likely be flown to the Far East.

2. Rail Routing

Routing of agricultural commodities by rail is most efficient in bulk handling and long hauls due to its low operating costs and established routes. Currently, problems exist in the availability of equipment to handle grain. As agriculture continues to develop in Alaska basic routing necessities such as these will become economically viable and therefore these are seen as only initial or short term problems.

If fertilizer is to be brought to Nenana from plants on the Kenai the use of truck routing is most efficient. There are only two transfers required in this mode while there would be five in the rail mode. Rail would be most effective in bringing fertilizer produced in the Lower 48 to Nenana as there is a direct rail link between most ports and Nenana.

Due to high construction costs involved in establishing new rail lines ($1.4 million/mile) no additional routes are seen in the immediate future and short spurs into the agricultural area seems unlikely at this time.

3. Barge Routing

Though barge routing has low operating costs and relatively large bulk handling capacities, certain restrictions make the use of this mode unlikely in the routing of grain for export. There is potential local routing of fresh and processed vegetables, processed red meat, and some grain.

Three restrictions to barge routing of export grain are the short season available to barge operation and agriculture, the more feasible routing of grain by rail, and the difficulty in establishing a scheduled shipping route into the St. Michaels area.

4. Local Air Routing

At the present time Nenana Air Service, Inc., is the only scheduled air service based in Nenana. They fly supplies to Tanana, and offer charter services to other communities in the bush. Alaska Central Airways, Inc., uses Nenana as a flag stop on flights to Galena and Tanana. It is possible that air service could provide various bush communities with agricultural commodities grown and processed in the Nenana area (primarily vegetable and red meat).

5. Port Facilities

Currently, the Alaska Agricultural Action Council has Requestes for Proposal out to various ports in Alaska with the intention of establishing a permanent facility for the exportation of Alaskan produced grians. Appendix 1 is a copy of the RFP sent to Anchorage, Palmer, Seward, Valdez, and Whittier. Seward was to be utilized for the 1980 barley crop from Delta Junction, though due to a shortened harvest season, no grain was exported this year.

CHAPTER III
PROCESSING AREA LOCATION

Any impacts on the routing systems center on the location of a processing area as this is where the major unloading, loading and any processing and packing would take place. To maintain the flexibility desired, this processing area should be located where all routing systems are readily available, or to somehow allow for efficient routing of commodities. To that end three locational concepts were developed for the processing area and presented below. Advantages and disadvantages for each concept are identified and impacts on existing routing systems discussed. These should be addressed in making a decision on the location of the area.

1. Concept I - Processing Area in City

Figure II illustrates a possible processing area in/or adjacent to Nenana. This location is ideal from a transportation standpoint as all modes of routing are available within a corridor, meaning virtually no capital improvements to reach the area, the area is close to the residences of people who would be working in the processing area; and a source of water is close at hand for processing purposes. Impact from possible noise, smell, and air output could pollute the surrounding area and cause ice fog problems for the airport, though wind data indicates that the direction of prevailing winds might mitigate any air pollution problems within the community boundaries, a potential flood hazard exists due to the areas proximity to the rivers; and soils maps indicate heavy permafrost in some areas.

2. Concept II - Processing Area Centered in Project Area

In this concept the processing area would be located along a rail spur in the center of the project (Figure II). This would cut down the distance between the field and the processing area; reduce the area's impact on the community of Nenana; and, if the spur were to connect Nenana and Tanana, it would create another access to the Tanana area and reduce travel time for commodities traveling by barge. However, this concept would entail considerable capital expense in terms of a transportation corridor linking the

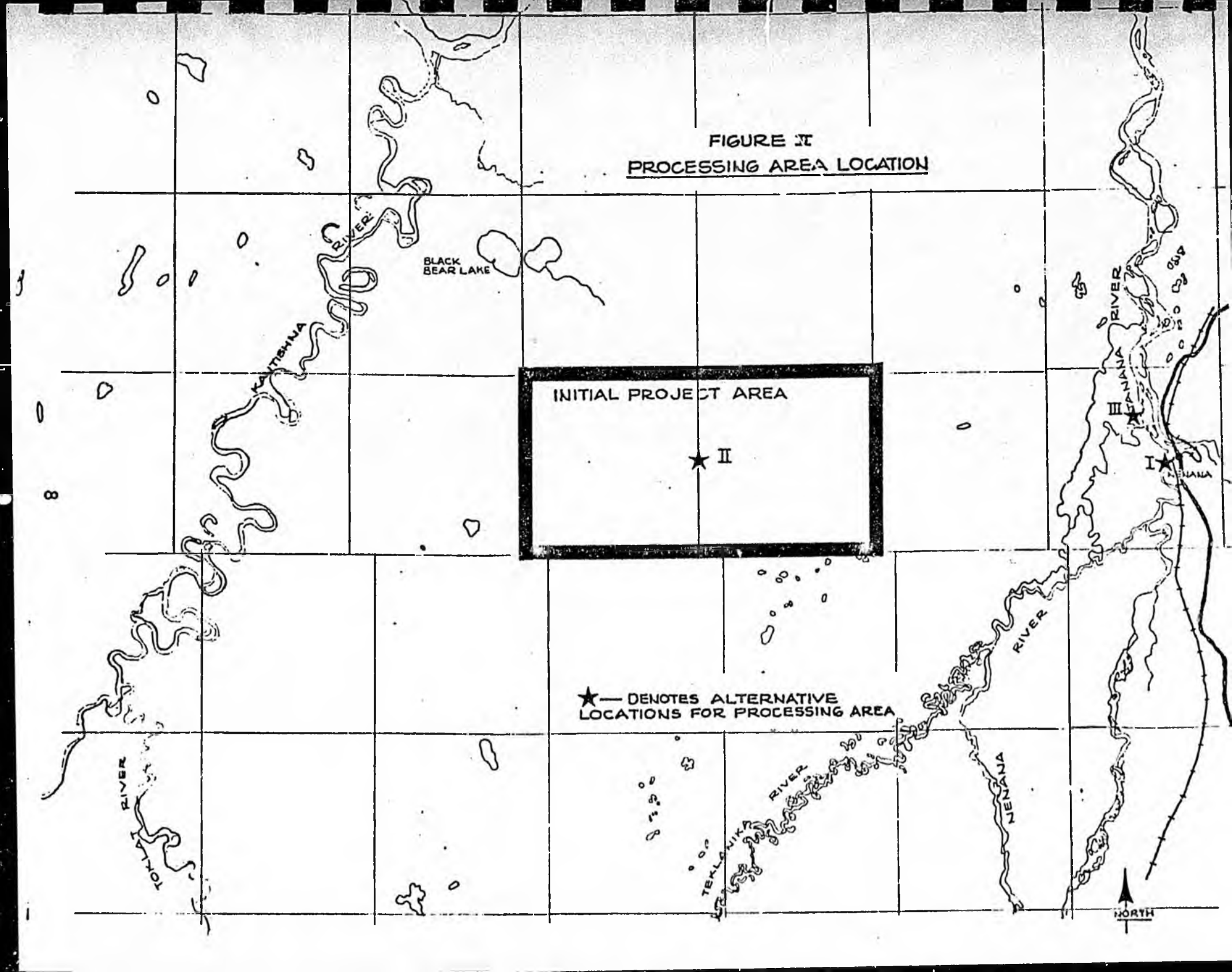


FIGURE II
PROCESSING AREA LOCATION
BLACK BEAR LAKE
KAITISHNA RIVER
INITIAL PROJECT AREA
II
III
I
TANANA RIVER
TEKLANIKA RIVER
TOKLAT RIVER
JENANA
★— DENOTES ALTERNATIVE LOCATIONS FOR PROCESSING AREA
NORTH

processing area with the existing modes; water would not be as readily available for industrial use; commodities, if shipped by barge to the final destination, would have to be handled twice (load rail/load barge); and locating the area in the center of the project would take up a considerable amount of valuable agricultural land. Workers driving to the area pose potential traffic congestion problems on the bridge and main roads and the commuting cost is the largest as this location is the furthest from Nenana.

3. Concept III - Processing Area Downstream from Nenana (Figure II)

In this concept the processing area would be located approximately a mile down the Tanana River from Nenana. Being a distance from the community would alleviate possible incompatability and pollution problems associated with being near other activities. Locating the area here would allow for only a moderate capital investment in terms of a transportation corridor. All modes of routing could still be available; though, as the major expense in linking the areas with the main rail system would be a railroad across the Tanana River, an expenditure of this magnitude is unwarranted unless the s continued on to the community of Tanana.

CHAPTER IV
PRELIMINARY ROADWAY NETWORK

Before establishing a roadway network for the project area, several factors were reviewed which affect its layout.. Soil in the area was reviewed for its agricultural capability and the location of permafrost and bogs. Land ownership was reviewed to determine location of state-patent lands and boundaries of other ownership which might affect roadway layout, (easements and rights-of-way are discussed in Chapter VII). A parcelization scheme was put together based on agricultural capability of the soil and present land ownership.

Various phases of road development are proposed linking the project area with Nenana and the Parks Highway at Rex. The initial phase would provide access from the project area to a central processing point and loading point in Nenana (as discussed in Chapter III). Other phases would continue expansion into areas adjacent to Phase One and would include the development of a road to Rex. Layout, design and estimated costs of this development are discussed in this section.

1. Soils and Parcelization

Figure III indicates the soil characteristics in the project area. Class II and III soils are highlighted and are the only soils considered adequate for agricultural production. Class IV and below are being considered for grazing purposes. Areas of permafrost and bog are also identified, as these areas must be avoided both in agricultural activities and roadway construction.

It has been recommended that Class II soils be put into parcels of 640 acres and under for purposes of vegetable production and Class III soils into parcels of 2,560 acres and over for purposes of grain production.[1] It was also assumed that several small lots (5-10 acres) would be made available to increase the population base and reduce utility costs. Figure III illustrates a possible parcelization of the initial project area based on the above information.

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[1] Interview with Bob Pollock, Agricultural Action Council, October 8, 1980.

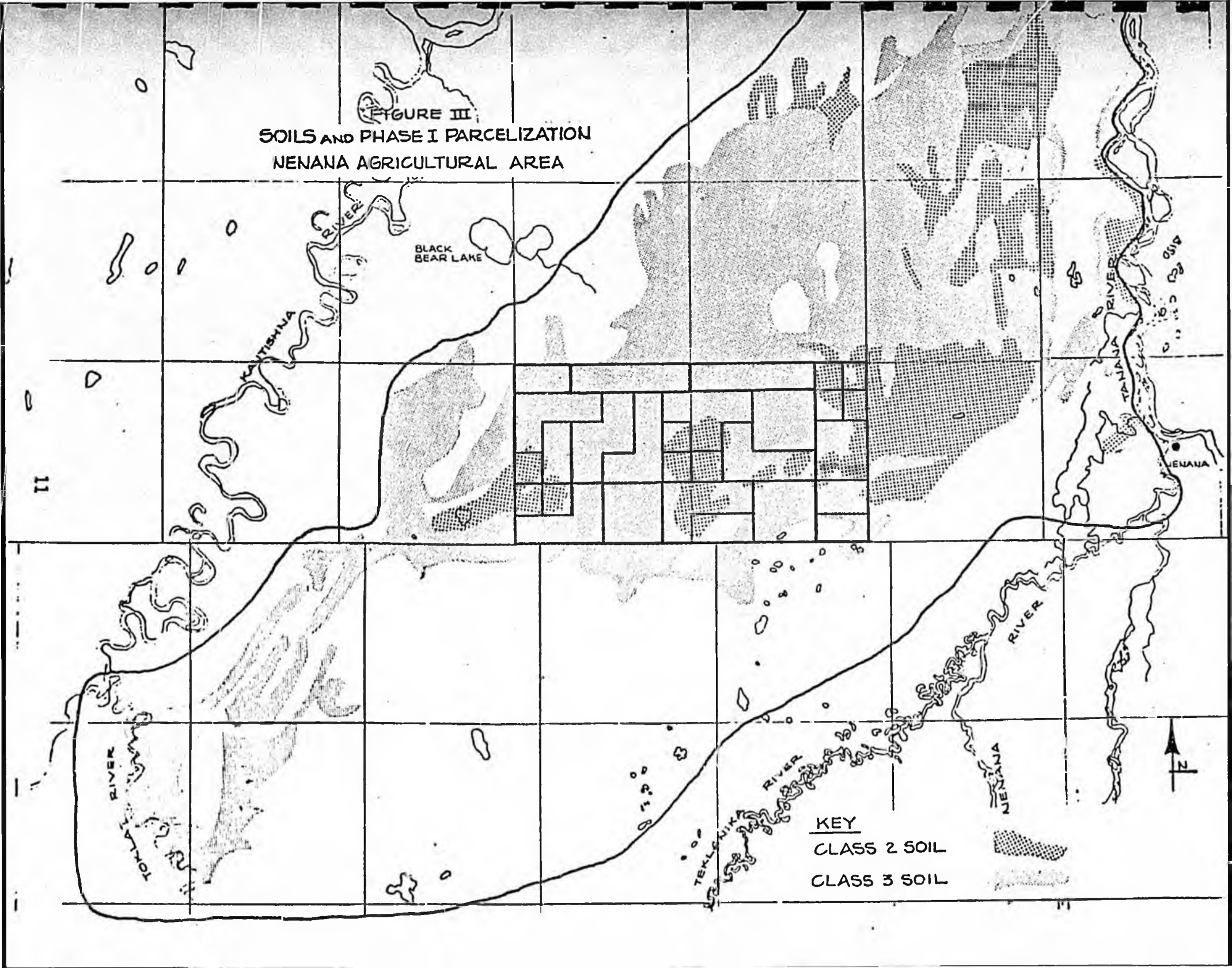
FIGURE III
SOILS AND PHASE I PARCELIZATION
NENANA AGRICULTURAL AREA
BLACK BEAR LAKE
KANTISHNA RIVER
TANANA RIVER
NENANA
TOLOVANA RIVER
TEKLANIKA RIVER
NENANA RIVER
KEY
CLASS 2 SOIL
CLASS 3 SOIL

2. Layout

Sheets 1 and 2 illustrate the proposed roadway network providing access to the initial phase of the project. This network attempted to follow section lines for two reasons: First, to take advantage of section line easements; and second, parcelization will most likely be in aliquot parts. This roadway layout is flexible in that it can be modified fairly easily once the final parcelization is made. This network also lends itself to future branching out from the initial phase in a wheel and spoke manner. Collector and feeder roads were laid out to provide access to parcels and where traffic was estimated to be primarily local.

3. Roadway Design and Estimated Costs

Preliminary soils studies indicate a more economical alternative than the standard pit borrow method of building roads may be utilized for the Nenana Agricultural Project. The combination of minimal overburden with suitable structural material directly beneath lends itself to the roadside borrow concept of construction. This method utilizes the structural material from within the right-of-way to build the road, eliminating the more expensive remote borrow-haul method. The organic over burden is stripped and stockpiled at the edge of the right-of-way for use as backfill to bring the sideslopes and ditches to grade. This method of construction will require right's-of-way in excess of the 100 foot section line easements that may be available. In areas where adequate right-of-way is not available or where pockets of unsuitable structural material exist, the pit borrow method will have to be utilized as an alternate construction method. Tables I and II show estimated 1981 cost comparisons indicating that approximately $35,000.00 per mile may be saved by utilizing the roadside borrow method of construction. Sheet 3 illustrates typical roadway sections for all types of roads in the project using both alternatives.

The proposed gravel road system within the Nenana Agricultural Project will be quite similar to the existing gravel roads that service the Delta Barley Project with respect to usage and climatic influences. State Department of Transportation figures indicate that the Fiscal Years 1979-1980 average maintenance cost per mile per year for 41.36 miles of gravel road near Delta

was $2,490.00. Assuming a 25% inflation factor from 1980 to 1982. Surface maintenance and snow removal costs for gravel roads in the Nenana Agricultural Project should average approximately $3,115.00 per mile for the Fiscal Year of 1982.

Table 1

TYPICAL CROSS SECTION QUANTITIES - PIT BORROW

			UNIT PRICE	COST/MILE
Cleared Grub	100 LF		$2,000/acre	$ 24,242.42
Unclassified Exc.	41.5 sq.ft.		$2.50/yd.	$ 20,288.89
Borrow	104.1 sq.ft.		$3.75/yd.	$ 76.340.00
Subbase "C"	10.83 sq.ft.		$19.75/yd.	$ 1,827.27
Side slopes	35.28 sq.ft.		$2.50/yd.	$ 17,248.00
Seeding	68 LF		$11.75/1,000 sq.ft.	$ 4,218.72
18" Culverts (82 LF)	1 pr. 2500 ft.		$35.00/LF	$ 6,061.44
Culvert markers	2 pr. 2500 ft.		$50.00/EA	$ 211.20
Monument cases	4/miles		$200.00/EA	$ 800.00
Open borrow pits	1 pr. 2 miles		$64.60/EA	$ 3,230.00
Road Signs	10 sq.ft/mile		$40.00/sq.ft.	$ 400.00
		Subtotal		$ 194,868.55
Dust control			$7.50/1,000 gal.	$ 550.00
Equal Employment Opportunity			N/A	$ 100.00
		Subtotal		$ 194,868.55
Contractor Engineering (5%)				$ 9,775.93
Contractor Costs		Total		$ 205,294.48
Consultant Engineering (20%)				$ 41,058.90
		Total		$ 246,353.38
Assume 25% inflation 1979-1981				$ 307,941.72
		Use		$ 310,000.00

* rounded numbers

TYPICAL CROSS SECTION QUANTITIES - ROADSIDE BORROW

			UNIT PRICE	COST/MILE
Cleared grub	200 LF		$2,000/acre	$ 48,484.85
Unclassified exc.	132 sq.ft.		$2.50/cu.yd.	$ 64,533.33
Subbase "C"	10.83 sq.ft.		$19.75/cu.yd.	$ 41,827.27
Seeding	168 LF		$11.75/1,000 sq.ft.	$ 10,422.72
18" Culvert (92 LF)	1 pr. 2500 ft.		$35.00/LF	$ 6,800.64
Culvert markers	2 pr. 2500 ft.		$50.00/EA	$ 211.20
Monument cases	4/miles		$200.00/EA	$ 800.00
Road signs	10 sq.ft./mile		$40.00/sq.ft.	$ 400.00
		Subtotal		$ 173,480.01
Dust control			$7.50/1,000 gal.	$ 550.00
Equal Employment Opportunity (EEO)			N/A	$ 100.00
		Subtotal		$ 174,130.01
Contractor Engineering (5%)				$ 8,706.50
Contractor Costs		Total		$ 182,836.51
Consultant Engineering (20%)				$ 36,567.30
		Total		$ 219,403.81
Assume 25% inflation 1979-1981				$ 274,254.76
		Use		$ 275,000.00*

* rounded numbers

CHAPTER V
STREAM CROSSINGS

The roadway network which will serve the agricultural development in the Tanana Valley will originate in Nenana. Nenana has rail, highway, and river transportation facilities, and is the logical focal point for this transportation link.

Direct access to Nenana does require a major river crossing structure over the Nenana River, as well as several other smaller structures for the West Middle and East Middle Rivers and for the Little Nenana River. Since Nenana will be the origin and destination for much of the traffic generated in this valley, the optimum cost benefit ratio for users would dictate that the river crossing be placed in close proximity to Nenana.

A reconnaissance of the Nenana River Valley upstream from its junction with the Tanana River was made by air. The general mapping of the region was reviewed and using the air reconnaissance and the mapping, it is possible to determine the general characteristics of the river in this area. For an extended distance upstream from the river junction, the Nenana River flows through a broad, flat flood plain. Generally, the stream is highly braided, with evidence of a shifting stream occuring through the years. There is evidence that the erodable nature of the river valley, coupled with periods of high stream flow, due to the source of the stream in mountainous terrain, which results in frequent shifts in the river course and in general instability of the river channel.

Although it is not clear cut, there appears to be some higher degree of stability of the river in the vicinity of its junction with the Tanana River. Because of the general development in this region, some minor bank control has been done in the past. Future development of this area would warrant additional stabilization measures in the vicinity of Nenana, and these measures would not only benefit the community, but could also serve to protect the roadway link to the Tanana Valley.

Limited geological information is available for the area. It is assumed that the river is of sufficient size for a thaw bulb to exist in the general vicinity

of the river. Generally, it is understood that unconsolidated gravels and sands which are an outwash from the mountains prevail through the area. Since these underlying materials are unconsolidated, it is anticipated that piles will be required for the foundation support. In accord with local practice and also as a general appropriate application, it is anticipated that steel H piles will be used for all foundations. Soil borings will be required at the location of the substructure units along with a geotechnical report to more accurately identify actual insitu conditions.

At the West Middle and East Middle River and at the Little Nenana River, it appears that the stream flow is minimal. Thus, there is a possibility that permafrost does exist in these locations. The presence of permafrost would be determined by future soil borings.

There is not a gaging station in the vicinity of Nenana on the Nenana River and as a result, there is limited hydrological information available. Generally, the approximate ground elevation of Nenana is 351.0 feet. A high water elevation on the Tanana River at the railroad bridge is 358 feet for a 50 year flood. The proximity of the bridge crossing to the railroad bridge justifies the use of this elevation for the high water elevation in the development of the bridge concept plan.

A tentative location for the river crossing has been set at a location approximately 3,000 feet upstream from the Tanana River. This location will permit the roadway to connect with Tenth Street, which has been extended by the City across the railroad. At this location, the river channel is relatively well defined and a crossing can be made without skewing the structure, which will optimize the structural length and result in cost savings.

The proposed structure is a three span structure with a length of 560 feet having spans of 172'-6". 215'-0". 172'-6". The superstructure consists of four steel girders using conposite action with a concrete deck. The concrete deck has a clear roadway width of 34'-0" with concrete barrier curbs.

Using a high water elevation of 358 feet, a minimum clearance of 6'-0" is indicated above high water to low steel, in conformance with the suggested clearance by AASHTO Bridge Specifications. The necessary flearance over high water, and the depth of the superstructure will elevate the roadway above the

approach roadways. The roadway elevation will be achieved by using a gradient on the aproach roadways from each direction, and with a vertical curve on the structure with its apex near the center of the structure. The vertical curve will be designed for a speed of 60 mph.

Three span bridge will require the placement of two piers in the stream flow. The velocity of the stream, heavy water volumes, and thick ice will require large massive piers. Presently, it is contemplated that these will be single shaft concrete piers with steel ice plates. Footings will be located below the stream bed sufficiently to be below anticipated scour depths, and will be supported on steel H piles.

The abutments would be concrete stub abutments supported on steel H piles. These abutments will be located on embankment and the material for the enbankment in the vicinity of these abutments should be non-frost susceptible soils to prevent frost heave.

Without specific information on water volumes, it has not been ascertained that the indicated waterway opening is sufficient to accommodate the flows. However, with low profile approach roadways, the approach roadways would be inundated during periods of flooding with flow crossing over the roadway.

With some inherent instability [illegible]eam, some stabilization of the river banks may be required upstream from the structure. It is not expected to be a major undertaking, but it will be necessary to inspect the upstream banks in the vicinity of the proposed structure to ascertain if any revetments are required.

For purposes of development of a concept, a clear span of 100 feet was assumed for the West Middle and East Middle River. These structures would consists of concrete bulb T superstructures, supported on concrete stub abutments with steel H piles. For the Little Nenana River Bridge, it was assumed that a large culvert could be used to contain the flow in this stream.

No site specific information was available in the form of surveys, geological information, or hydrological data, and these concepts for the structures were developed using aerial photographs and other undocumented data. As more specific knowledge is gained, the proposed structures may change in concept and size.

Other minor structures will be required to provide flow for drainage areas lying in the path of the proposed roadway. Presently, it is contemplated that round culverts will be adequate for this purpose.

The following is a list of total costs, including soil exploration, engineering, construction inspection, and construction cost for each of the bridges over Nenana River and its tributaries. Costs related to various items such as right-of-way, utilities, bridge embankments and inflation factors are not included in the estimate. Costs presented are to be reasonable order-of-magnitude costs for work as of Spring 1981.

	NAME	TOTAL COST
A.	Nenana River Bridge	$4,040,400
B.	Little Nenana River Bridge	$ 97,500
C.	East Middle River Bridge	$ 608,400
D.	West Middle River Bridge	$ 608,400
	TOTAL	$5,354,700

CHAPTER VI
PERMITS

Permits are required from both state and federal agencies. Use of land and environmental concerns will involve the state in all stages of the project; construction stages will also require federal permits. The application process has been divided into four (4) stages, based on anticipated work progress. A separate application for state permits will be made for each of the four (4) stages, which are:

1. Survey and Boring-Bridges
2. Survey and Boring-Road (Phase I)
3. Bridge Construction
4. Road Construction.

For state permits, Master Applications will be used (as detailed below); and, the staged application procedure will more effectively identify required state permits. Federal agencies are easier to identify, as fewer are involved; however, processing time is six (6) months or longer. Applications for federal permits should be sent by January 1, 1981.

State Permits

A Master Application has been made to the Alaska Permit Information Center in Fairbanks. The Master Application serves as a notice of intent to the state of a proposed project. The Center notifies state agencies (about 200), and they have fifteen (15) days to respond. All responses, including necessary individual department permit applications are returned to the center. The process is outlined in the attached Master Application Information Sheet, (See Appendix 2). The applicant is responsible for completion of all applications and payment of fees.

Key state departments are Fish & Game, and the Department of Environmental Conservation (DEC). State Division of Lands will be concerned about right-of-way. Fish and Game is primarily concerned with stream crossing and will issue a Title 16 Permit; first state boring work will be subject to Fish and Game requirements. DEC requires Water Quality Certification under Section 401 of Public Law 92500. The Master Application process will

identify all state agencies requiring permits for the individual stages. Agencies not responding to the Master Application within fifteen (15) days, may not later require a permit.[1]

With the state agencies, as with federal departments, preliminary review of the application prior to submission will expedite approval.

Federal Permits

Application to the Corps of Engineers is the principle step in the federal process. The Corps assures public notice of a proposed project; other agencies then respond to the Corps. Statutes that apply are:

1. "River and Harbor Act of 1899", Section 10.
2. "Clean Water Act", Section 404, covers use of fill material.
3. Permits required for use of areas defined as Wetlands.

A key agency that should review applications prior to filing is the Department of Fish and Wildlife. The Fairbanks office will work closely with applicant; recommendations will be made so that proposed project will be within Fish and Wildlife guidelines. An important part of the review will be definition of Wetlands, if any, in the project area. Time frame for the review will be 3-4 weeks and is now in progress.

The Environmental Protection Agency (EPA) and National Marine Fisheries Service will be concerned,; but, individual contact at present does not appear to be needed prior to Corps application. Their reaction and progress concerning the Corps application, should be monitored however.

The Coast Guard grants permits to cross navigable rivers under Section 9 of the "River and Harbor Act of 1899".[2] The Nenana River is classified in the Advanced Approval Category and requires no permit. However, the East and West Middle Rivers are not on this list; and, data to determine navigability is being compiled, (Appendix 4).

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[1] Section 46.35.030, Water, Etc, Conservation (See Appendix 3).

[2] Interview with Mark Millea, Aids to Navigation Section, U.S. Coast Guard, Juneau, Alaska.

No federal permits are required for preliminary survey and geotechnical work along the proposed roadway routing.

Additionally, a permit is needed to cross Alaska Railroad Terminal Reserve on the east bank of the Nenana River. The process to obtain this permit has been initiated though final results are still pending.

CHAPTER VII

LAND ACQUISITION FOR RIGHTS-OF-WAY

There are various methods available to acquire land for the roadway and utility rights-of-way in this project. The most straightforward of these methods is the use of section line easements granted through both state and federal statutes.[1] For the most part, the proposed roadway network follows section lines to take advantage of this easement. Other methods of acquiring land are included in the power of eminent domain. The uses of eminent domain and section line easements, project rights-of-way requirements, and recommendations pursuant to the acquisition of those rights-of-way are detailed below.

1. Eminent Domain

According to Title 9, Article 4, Section 9.55.240, the power of eminent domain is available for use in acquiring land for the building of the roads, telephone lines, and power lines in this project. Proceedings instituted under the power of eminent domain are accompanied by a declaration of taking. This declaration must contain items describing the authority under which the property is taken, the public use for which it is taken, a description of the property, an estimate of just compensation, etc.[2] It has been stressed that the most important item to be contained in the declaration of taking is "a statement that the property is taken by necessity for a project located in a manner which is most compatible with the greatest public good and the least private injury."[3]

The power of eminent domain could be utilized where section line easements are not already established and in the acquisition of land required beyond that granted in section line easements. This power is granted to both the state and first class cities such as Nenana.[4]

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[1] Basis for section line easements: Act of July 26, 1866, (RS 2477), (43 CFR 2822, 43 USC 932); Chapter 19 SLA, April 6, 1923; Chapter 123 SLA, March 26, 1951; Chapter 35 SLA, March 21, 1953; Taken from workbook on Section Line Easements put together by Bill Newman, Fairbanks North Star Borough, Planning Department, 1978.

[2] A.S. 09.55.430.

[3] Ibid; Interview with Bill Satterberg, Department of Law, Highways Section, October 28, 1980.

[4] A.S. 09.55.420 (a).

2. Section Line Easements

As detailed in Chapter IV, the roadway network has been laid out to take full advantage of section line easements. Following is a brief outline of the federal and state laws concerning section line easements and a method for determining which laws might apply to a certain piece of property.

(A) History[1]

The Mining Law of 1866 made an offer of free rights-of-way over unreserved public land for highway purposes. This offer became effective on April 6, 1923, when the territorial legislature passed Chapter 19. Any lands in Alaska appropriated and patented after April 6, 1923 were subject to an easement along all sections, 4 rods (66 feet) wide.

The section line easement law remained in effect until January 18, 1949. On this date the legislature accepted the compilation of Alaska law which also repealed all laws not included. The section line easement law was repealed.

On March 26, 1951, the legislature passed an easement law which dedicated a section line easement 100 feet wide along all section lines on land owned by or acquired from the territory. This was modified on March 21, 1953, to include an easement 4 rods wide along all other section lines in the territory.

To have an easement on a section line means that the section line must be surveyed under the normal rectangular system. On large areas such as State or Native selections, only the exterior boundaries are surveyed, hence there are no section line easements in these areas (until further subdivisional surveys are carried out).

Since all federal land is reserved in Alaska at this time and since the section line easement attaches only unreserved public land (at the time of survey or at the same time after survey), it is unlikely that the section line easement will have any applicability on any finalized D-2 land since the land will be reserved at the time of any survey.

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[1] Taken from Workbook on Section Line Easements put together by Bill Newman, 1978.

Land surveyed by special survey or mineral survey are not affected by section line easements since such surveys are not a part of the rectangular net.

Section line easements relate solely to highway or road use by the public. They cannot be used for powerlines or restricted private access. The date of survey and appropriation of the land must be considered in determining the presence of a section line easement.

(B) Methodology[1]

Using the date of entry and the date of survey plat approval, an analysis of section line easements would proceed as follows:

A. If date of entry predated survey plat approval there is no easement.

B If entry predated April 6, 1923 (date of enabling legislation for section line easements) there is no section line easement.

C. If survey plat approval predated April 6, 1923, but date of entry is after April 6, 1923, but before January 18, 1949, there is a section line easement.

D. If survey plat approval is during the period of January 18, 1949 and March 21, 1953, and date of entry falls within this period, there is no section line easement.

E. If survey plat approval is during the period of January 18, 1949 and March 21, 1953 and date of entry falls after March 21, 1953, there is a section line easement.

F. If the land is in state ownership, there is a section line easement.

G. If the land was disposed of by the state or territory during the period of January 18, 1949 and March 26, 1951, there is no section line easement.

H. United States Surveys (U.S.S. and Number) and Mineral Surveys (M.S. and Number) are not a part of the rectangular net of survey. If the rectangular net is later extended, it is established around these surveys. There are no section lines through a U.S.S. or M.S., therefore, no section line easements can exist on such areas.

There may be many other situations which would require evaluation and decision on a case by case basis.

3. Project Right-of-Way Requirements

Figure IV presents existing land ownership in the project area. Land in the initial phase of the project was chosen because it is state patented. The

[1] Taken from "Section Line Easement Research Technique" put together by the Fairbanks North Star Borough, Planning Department, 1979.

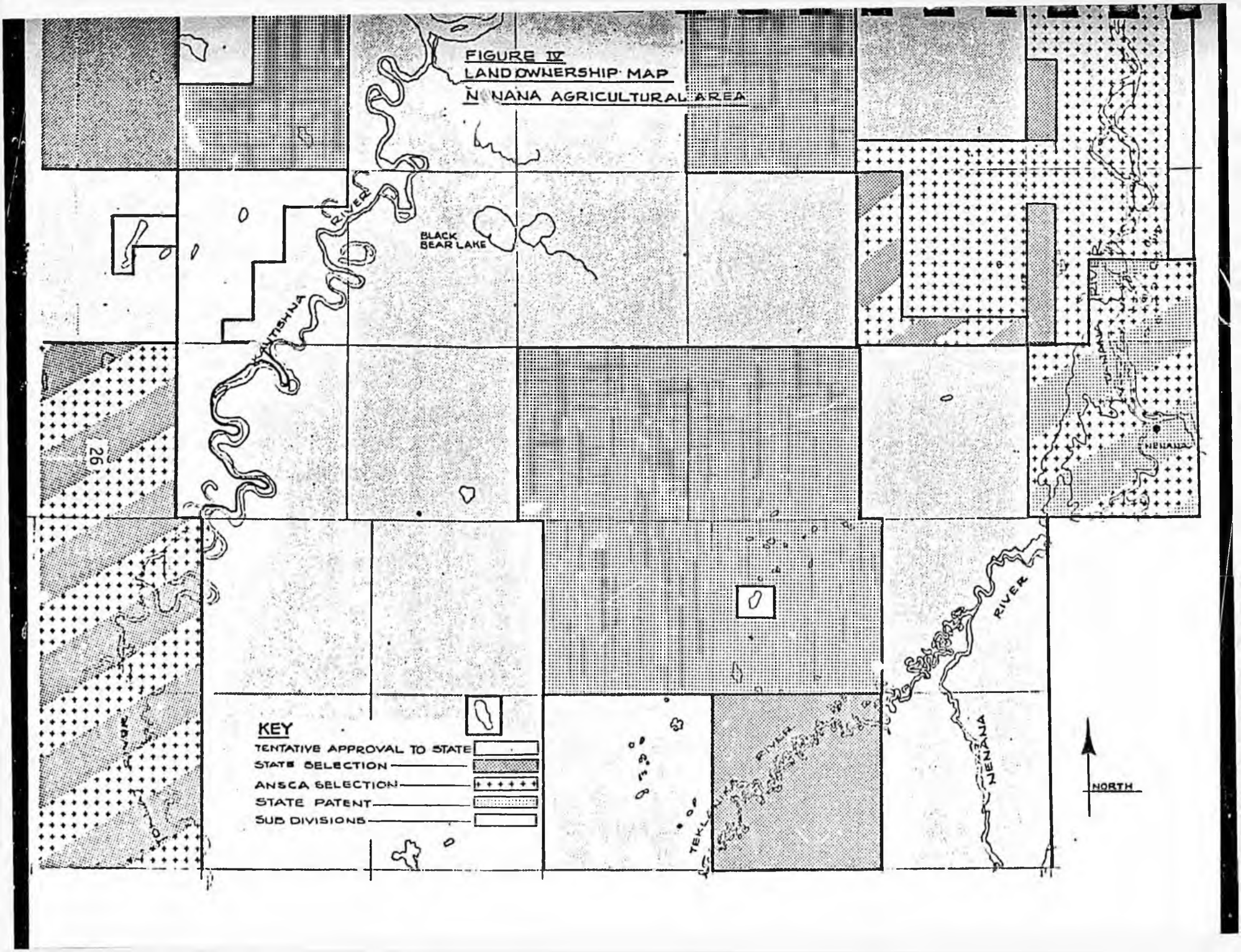
FIGURE IV
LAND OWNERSHIP MAP
N NANA AGRICULTURAL AREA
BLACK BEAR LAKE
RIVER
KUTIKHNA
KEY
TENTATIVE APPROVAL TO STATE
STATE SELECTION
ANSCA SELECTION
STATE PATENT
SUB DIVISIONS
RIVER
NENANA
NORTH

proposed roadway traverses a township which has been tentatively approved for state patent and a township including both state patent land and private property. The bridge crossing the Nenana River crosses private land along the river's west bank. Property along the east bank is currently classified as railroad terminal reserve. The entire township in which Nenana lies is being claimed for private use under the Alaska Native Claims Act. Thus, rights-of-way will have to be acquired from state, federal, and private ownership.

As discussed in Chapter IV, a right-of-way 200 feet wide is required for the main and collector roads in addition to a 30 foot utility easement on either side of the roadway easement. Within the roadway easement are 32' and 28' of traffic lanes for the main and collector roads respectively; 52-54 feet of ditch on either side of the traffic lanes; and 30-34 feet of space for storage of organics to be used in the building of slopes. Feeder roads require 150 feet of roadway easement with a 30 foot utility easement on either side. (See Sheet 4).

4. Conclusions and Recommendations

Acquiring rights-of-way can become a complex issue with the potential to slow-up or even stop a project. In the foregoing sections it was found that the proposed roadway would traverse state, federal and private property. It was also found that required rights-of-way were greater than easements available along section lines. It has been recommended that use of "blanket condemnation" for necessary right-of-way might be a way of avoiding many problems.[1] Though this is an area which definitely requires legal expertise, current Judicial paractice is that an Engineers' expertise will not be substituted for Judiciary opinion if it is clear that the Engineer has excercised his or her judgement in roadway layout.[2] This expertise and many other resources could be made available should the road be built under the umbrella of the Local Service Roads and Trails Act (LSR&T).

Development and construction of the roadway network under LSR&T appears to

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[1] Interview with Bill Satterberg, Department of Law, Highways Section, October 28, 1980.

[2] IBID.

be the most expedient approach to the acquisition of rights-of-way and many other developmental requirements discussed in this section. Under LSR&T the state can use its mechanisms and powers to acquire necessary right-of-way in accordance with AS 19.05.080-19.05.120.[1] The current revision of the act would provide funds for purchase of rights-of-way and gravel. However, this revision is yet unsigned by the governor and there remains some controversy in the legislature regarding the specific provisions for the purchase of right-of-way.[2] Until the issue is resolved however, funding for the purchase of right-of-way will have to come through some other legislative vehicle.

Construction of the roads under LSR&T would also guarantee maintenance either through the Department of Transportation and Public Facilities or local government by way of revenue sharing.[3]

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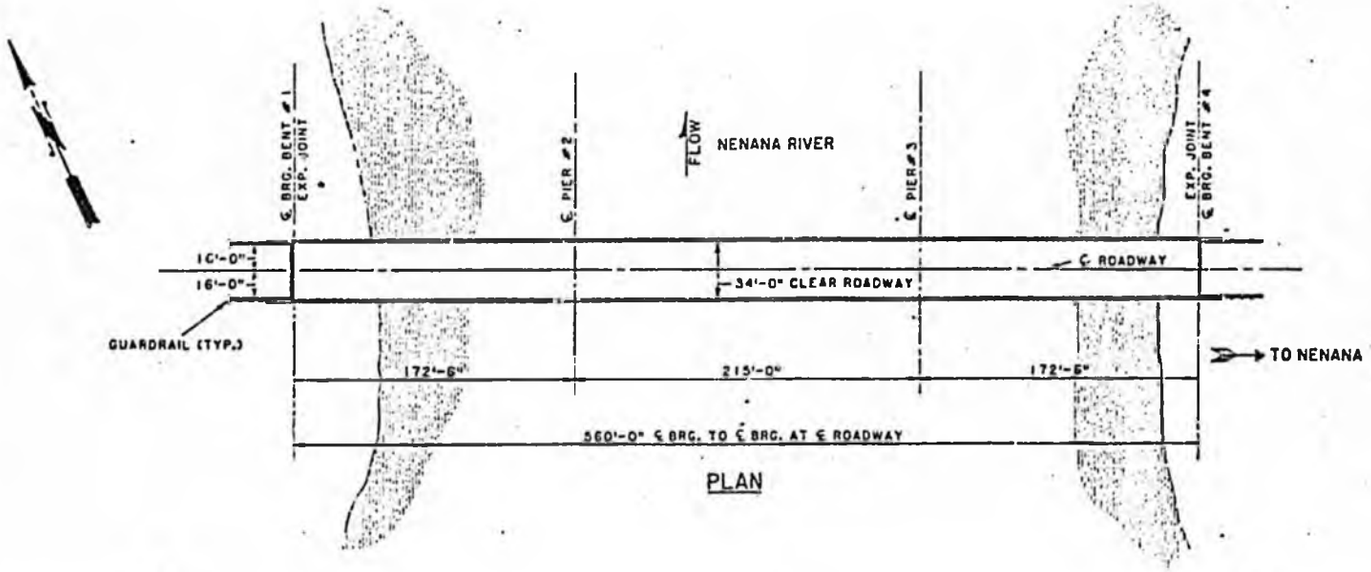
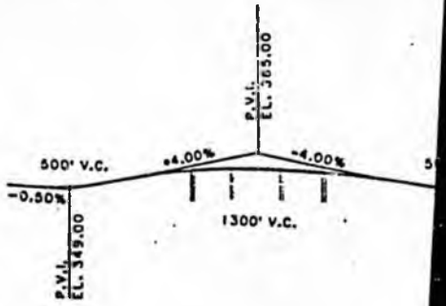
[1] AS 19.30.171.

[2] Interview with Donovan Rinkin, LSR&T Engineer, Department of Transportation and Public Facilities, November 13, 1980.

[3] AS 19.30.211.

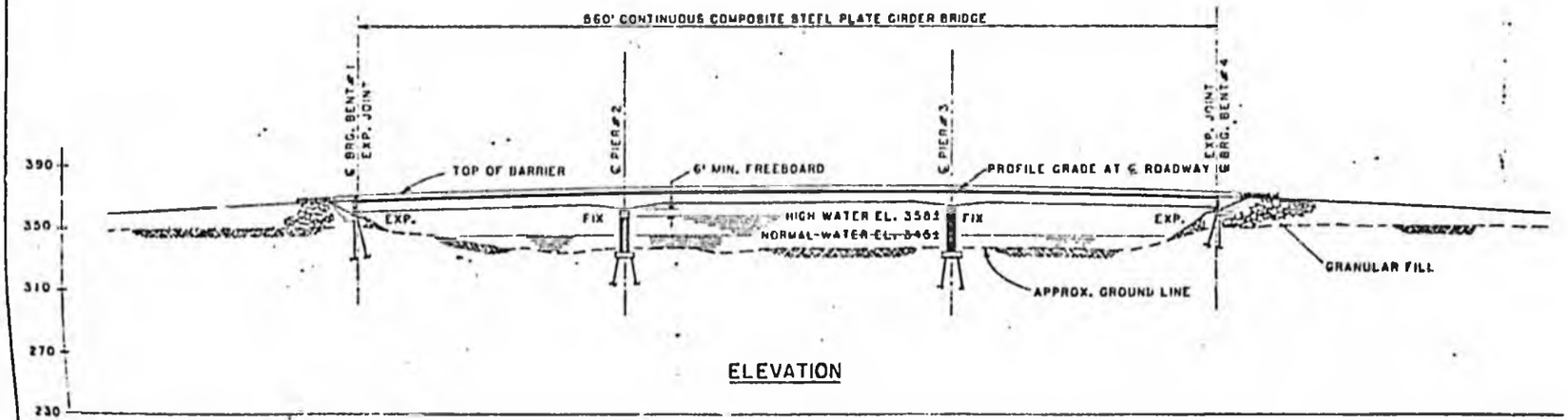


PLAN



PROFILE GRADE

NO SCALE



ELEVATION

NOTES:

LIVE LOADS: H520-44

DESIGN SPEED: 60 MPH

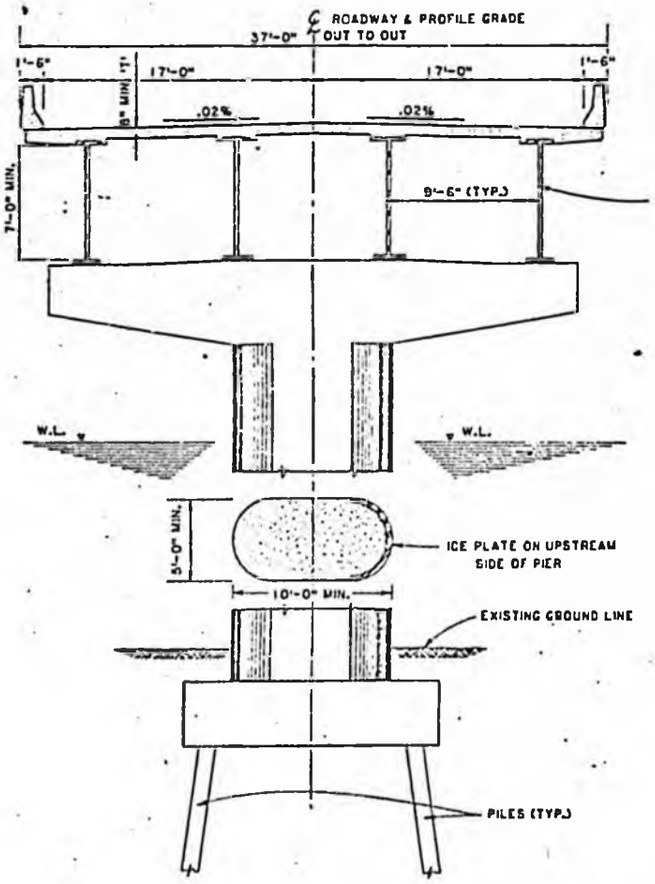
STREAM DATA: ASSUM

PRELIMINARY: NOVE

NENANA RIVER

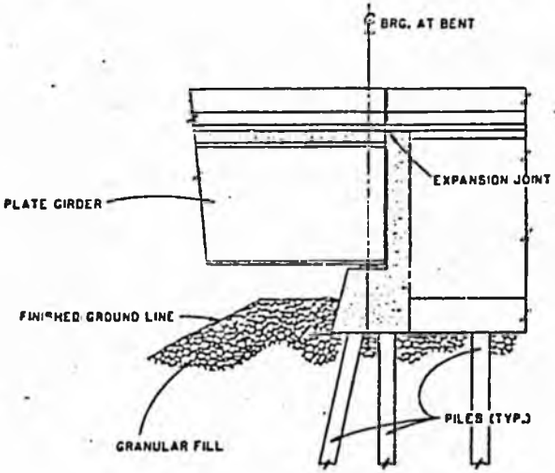
HDR

ALASKA TRANSPORTAT



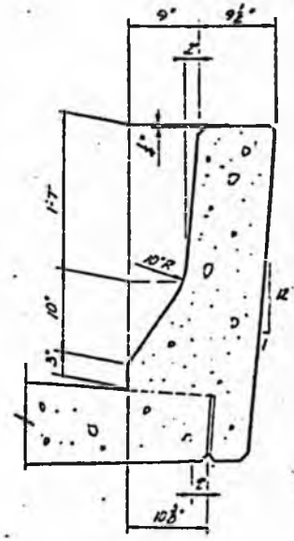
TYPICAL PIER ELEVATION

SCALE: 1/4"=1'-0"



TYPICAL BENT SECTION

SCALE: 1/4"=1'-0"



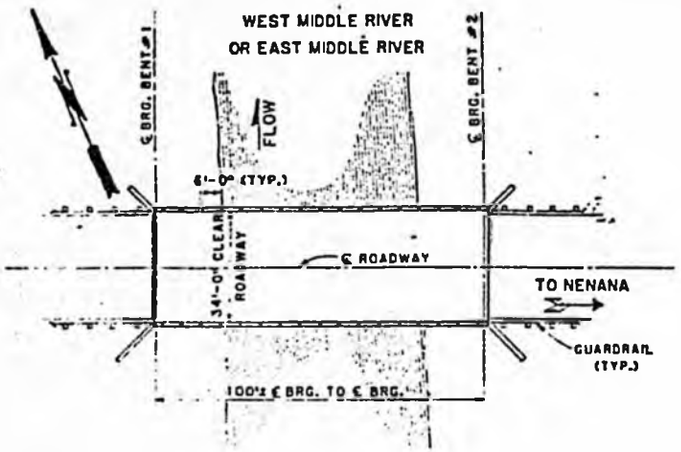
BARRIER DETAIL

SCALE: 1 1/2"=1'-0"

PRELIMINARY

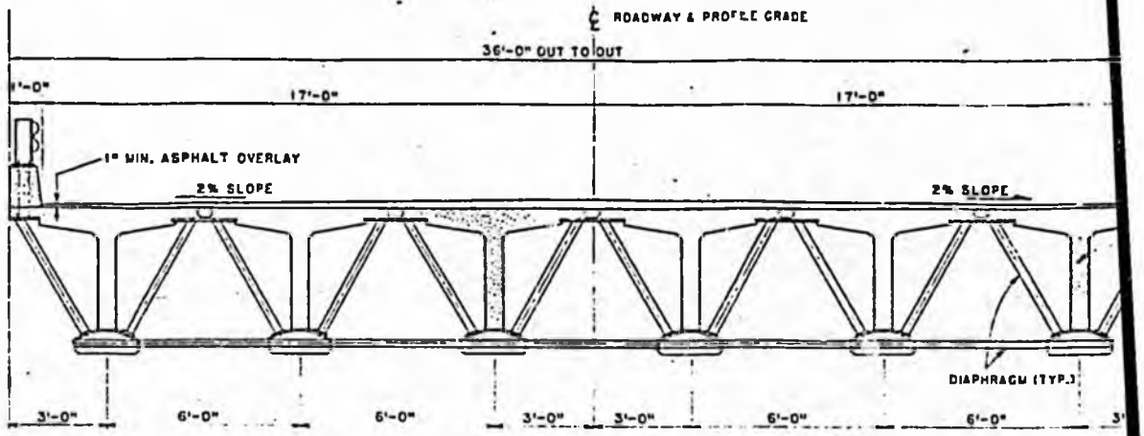
NENANA F

HDR
ALASKA TRANS



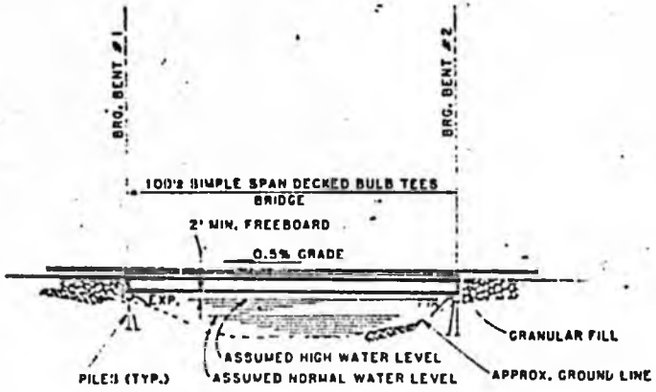
PLAN

SCALE: 1"=20'-0"



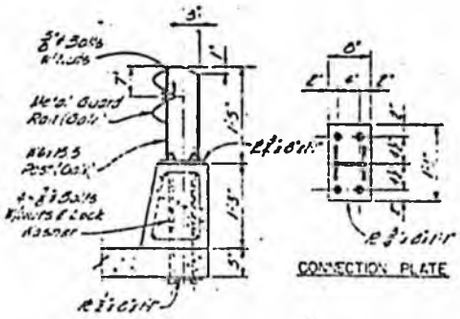
SECTION

SCALE: 1/2"=1'-0"



ELEVATION

SCALE: 1"=20'-0"



GUARD RAIL POST CONNECTION DETAIL

SCALE: 1"=1'-0"

NOTES:

LIVE LOADS: HS20-44

DESIGN SPEED: 60 MPH

STREAM DATA: ASSUMED

PRELIMINARY: NOVEMB

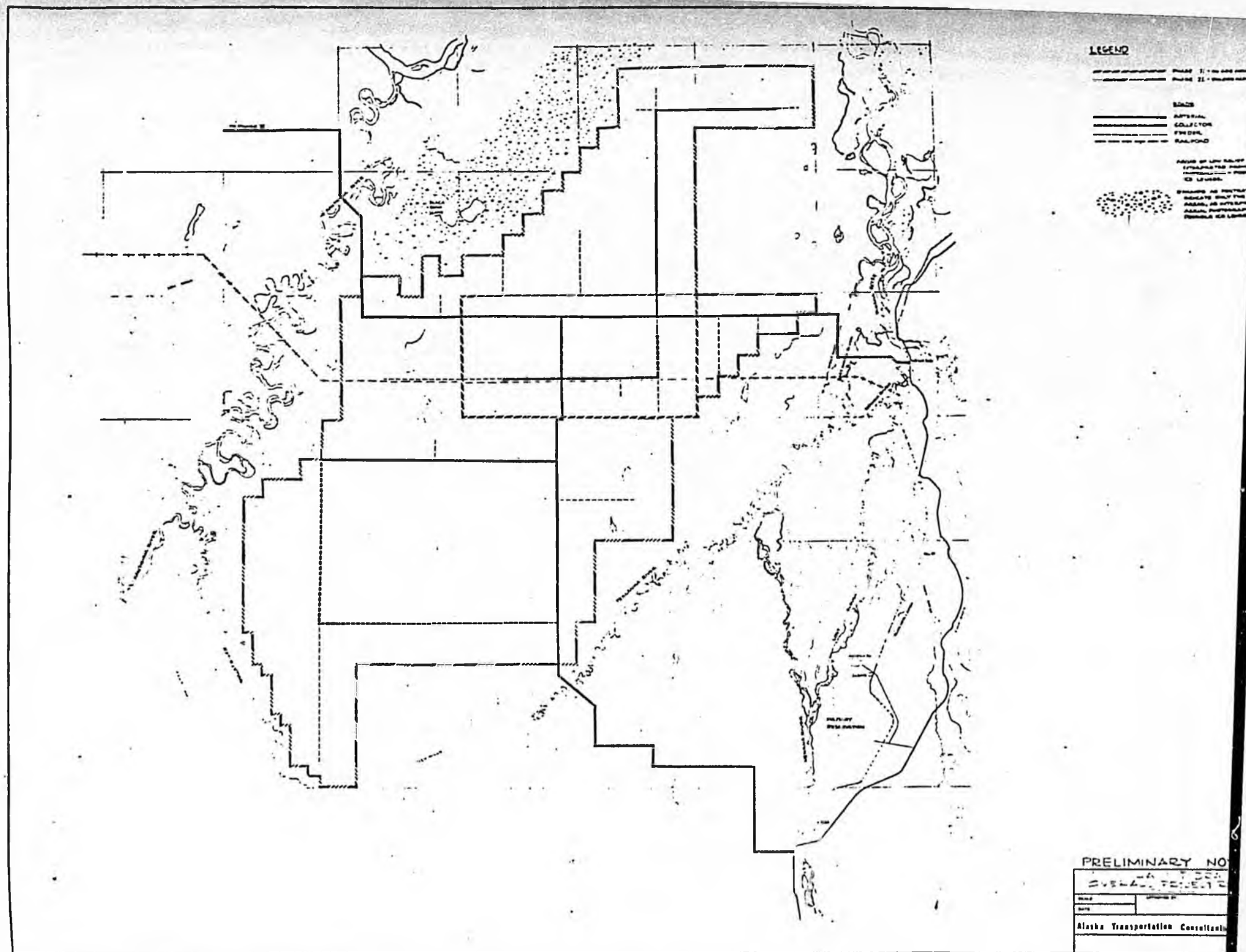
WEST MIDDLE RIVER
EAST MIDDLE RIVER

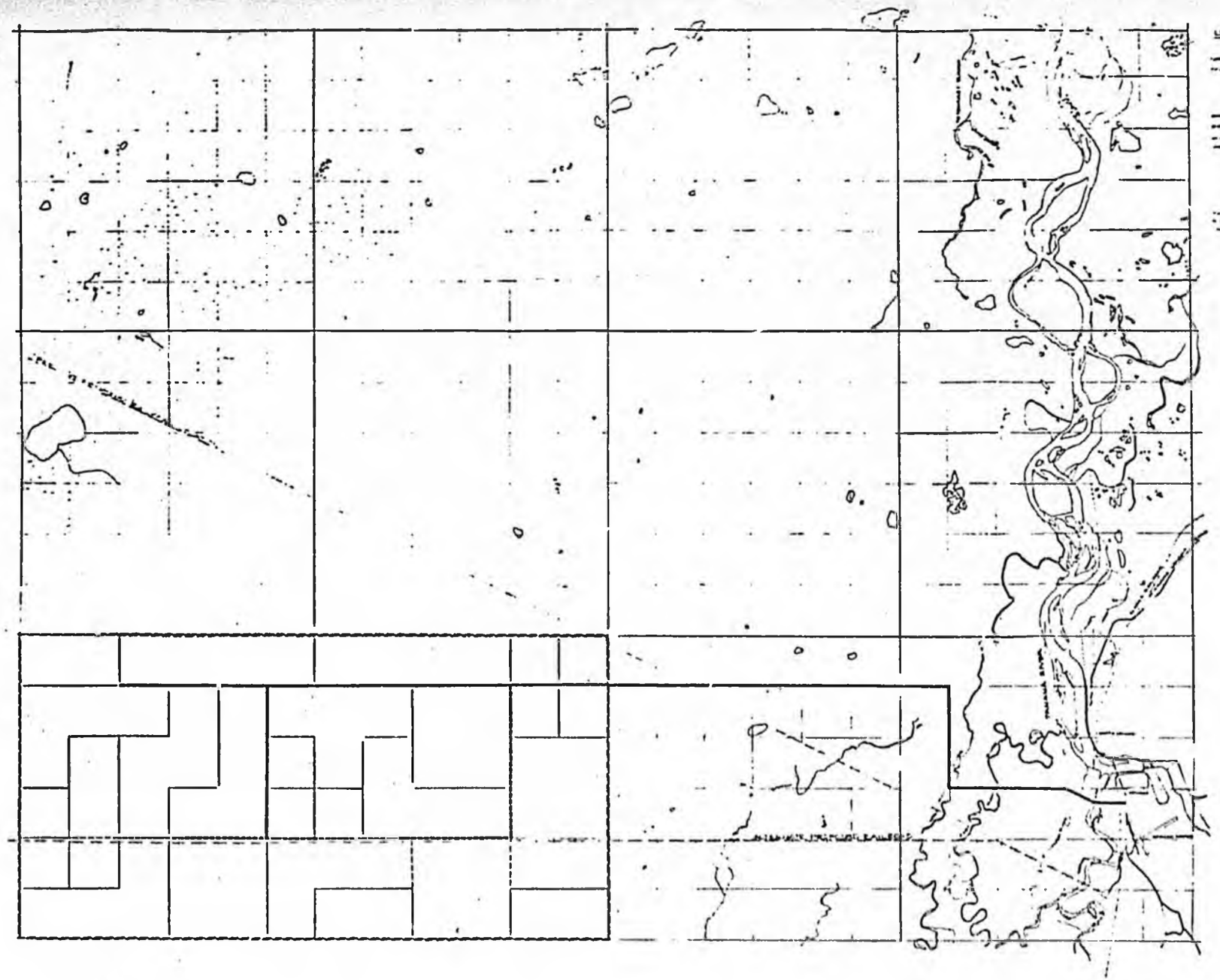
AS SHOWN

11/12/80

HDR

ALASKA TRANSPORTATION

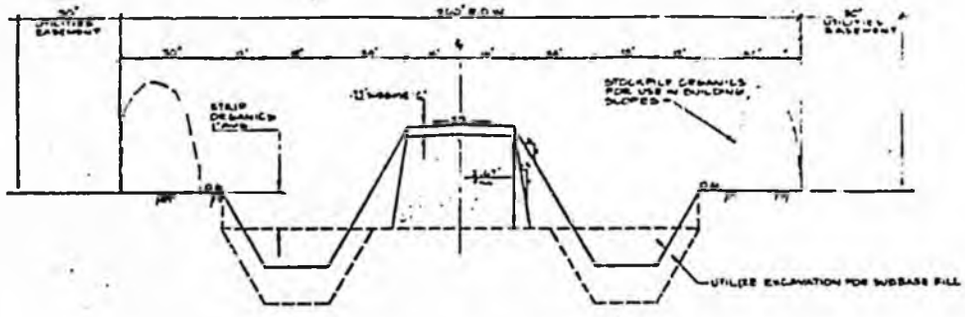

LEGEND
PRELIMINARY NO
Alaska Transportation Consultants



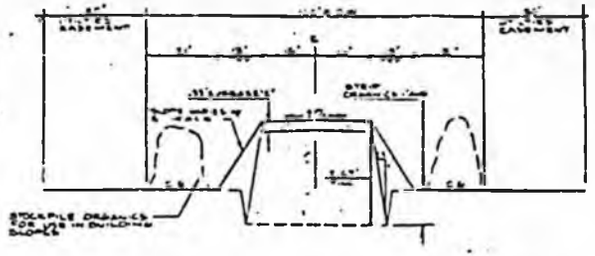
PRELIMINARY LOW

LAYOUT DRAWING
INITIAL PHASE ROADW
ALASKA

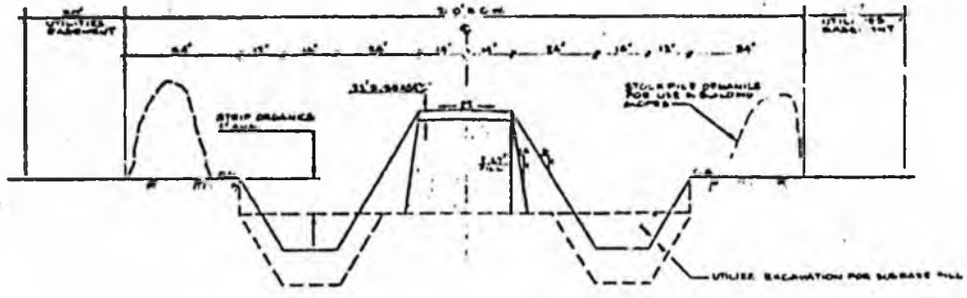
Alaska Transportation Consultants



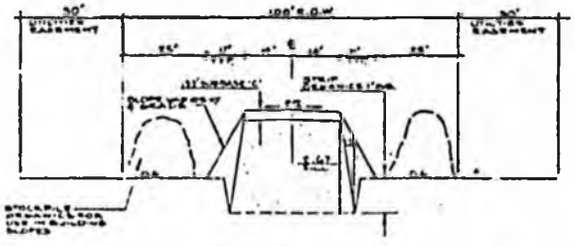
TYPICAL FARM ARTERIAL ROADSIDE BORROW



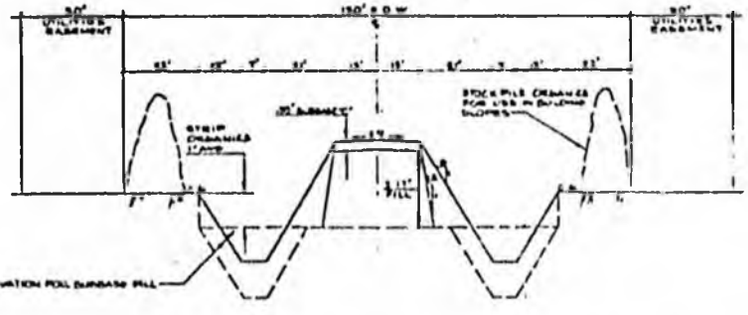
TYPICAL FARM ARTERIAL PIT BORROW



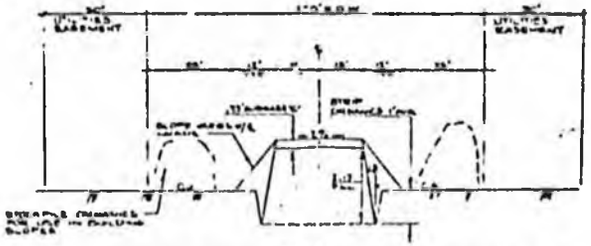
TYPICAL FARM COLLECTOR ROADSIDE BORROW



TYPICAL FARM COLLECTOR PIT BORROW



TYPICAL FARM FEEDER ROADSIDE BORROW



TYPICAL FARM FEEDER PIT BORROW

DETAIL 'A'

PRELIMINARY N

SECTION DRA
TYPICAL ROAD

Alaska Transportation Coor

APPENDIX I

REQUEST FOR PROPOSAL SENT TO VARIOUS ALASKAN PORTS

REQUEST FOR PROPOSAL

FOR

GRAIN EXPORT TERMINAL

The State of Alaska, Special Projects Office, is submitting this request for proposal. Our intention is to construct a permanent facility for the exportation of Alaskan produced grains.

The following information will be required in the proposal for our analysis:

1. Financial committment possibilities
   a. development incentive on real estate taxes
   b. direct complete or partial financing of the facility
   c. Bond issuing authority for construction costs
   d. moratorium on interest and other payments until facility becomes economically viable
2. Location
   a. acreage of proposed site
   b. availability
   c. site development cost
   d. expansion area
   e. site accessability
   f. proximity to available dock space
3. Water depth
   a. at dock
   b. in approach channel
4. Wharfage charges

5. Labor-longshoreman and facility personnel

   a. availability

   b. charges

6. When construction could be initiated

7. Competing dock users

8. Utilities

   a. sufficient electrical power available

   b. other energy forms available

9. Is port served by

   a. rail

   b. truck

   c. air

10. Any potential use of existing equipment and/or facilities

11. Distances from presen and future agricultural production areas.

   a. Delta Junction

   b. Nenana

   c. Point MacKenzie

12. Public opinion of facility

13. Safeguard from earthquake damage

14. Possibilities of using flat house facility for importing and exporting other products

See attachments for preliminary plans of this $4.2 million facility. Please return your proposal no later than ~~11-28-80~~ 12-31-80 to:

Alaska Agricultural Action Council
1514 South Cushman Room 210
Fairbanks, Alaska 99701

APPENDIX II

MASTER APPLICATION-ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
MASTER APPLICATION - INFORMATION SHEET
Environmental Procedures Act, AS 46.35

GENERAL INFORMATION

The master application serves as a notice of intent to the State of a proposed project by an applicant. This form was designed to include a broad range of State and local government interests, therefore, many of the questions may not apply to your proposed project. Please read this application before completing it. Answer all questions pertaining to your proposed project. Any missing or misleading answers may delay the processing of your application. Complete a site diagram of the project and submit it with your signed application to one of the Permit Information Centers listed below.

Alaska Permit Information Center
Department of Environmental Conservation
437 "E" Street, Second Floor
Anchorage, Alaska 99501
Telephone: (907) 279-0254

Alaska Permit Information Center
Department of Environmental Conservation
675 7th Avenue, P.O. Box 1601
Fairbanks, Alaska 99707
Telephone: (907) 452-2340

Alaska Permit Information Center
Department of Environmental Conservation
Pouch O, 3220 Hospital Drive
Juneau, Alaska 99811
Telephone: (907) 465-2615

GENERAL PROCEDURES FOR PROCESSING APPLICATIONS UNDER AS 46.35

Upon receipt of the master application in a permit center, the following steps are taken:

Master Application

Copies of the master application and the site diagram are sent for review to all State departments and any municipality where the project is located. A statement is requested regarding agency jurisdiction and any permits that may be required for the proposed project.

These agencies must respond to the permit center within 15 days. If the agencies have any jurisdiction over the project and require a permit, they will submit their individual applications to the permit center with a statement of whether a hearing is required.

Individual State & Local Permit Applications

The permit center will send the individual applications to the applicant for completion. Completed applications and required fees should be returned to the permit center.

The returned applications and fees will be sent to the proper agencies. The permit center will make the arrangements for a public hearing on the project, if a hearing is required. Within 30 days receipt of the last applications, the permit center will have a notice published once a week for three consecutive weeks. The applicant will be required to pay for the publication of these notices.

The public hearing will be held in or near the municipality where the major part of the proposed project is located. This hearing will be held within 20 to 30 days of the last publication of the notice. Members of the public and the applicant may be present. Any State agency that requires a permit for the project shall be represented at the hearing.

At the close of the hearing, the chairman will establish a date (within 90 days from the hearing date) for the final decisions on all applications on the project. The final decisions will be submitted to the Department of Environmental Conservation. They will be incorporated into one document and submitted to the applicant personally or by certified mail.