COMMUNITY MAP

SELAWIK

66°36'N 160°00'W Elevation 25'

Prepared by the Arctic Environmental Information and Data Center, University of Alaska, for the Alaska Department of Community and Regional Affairs

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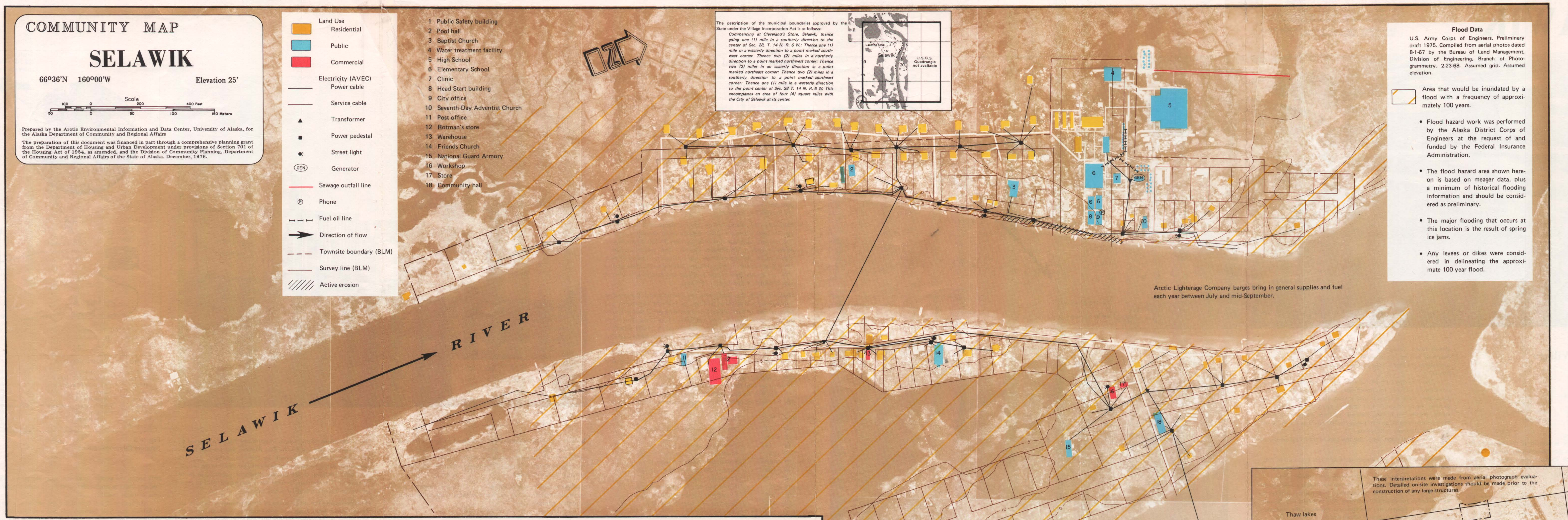
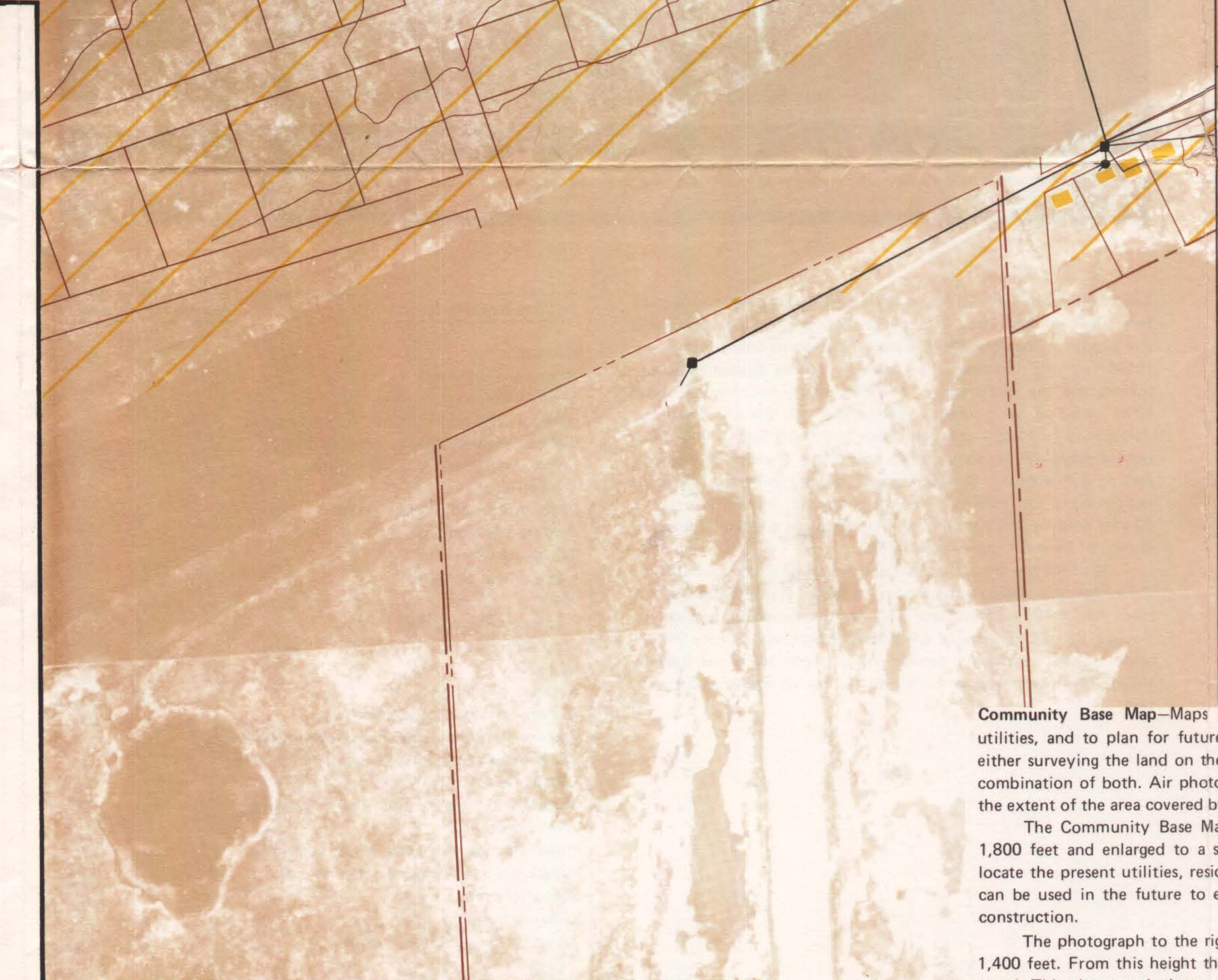


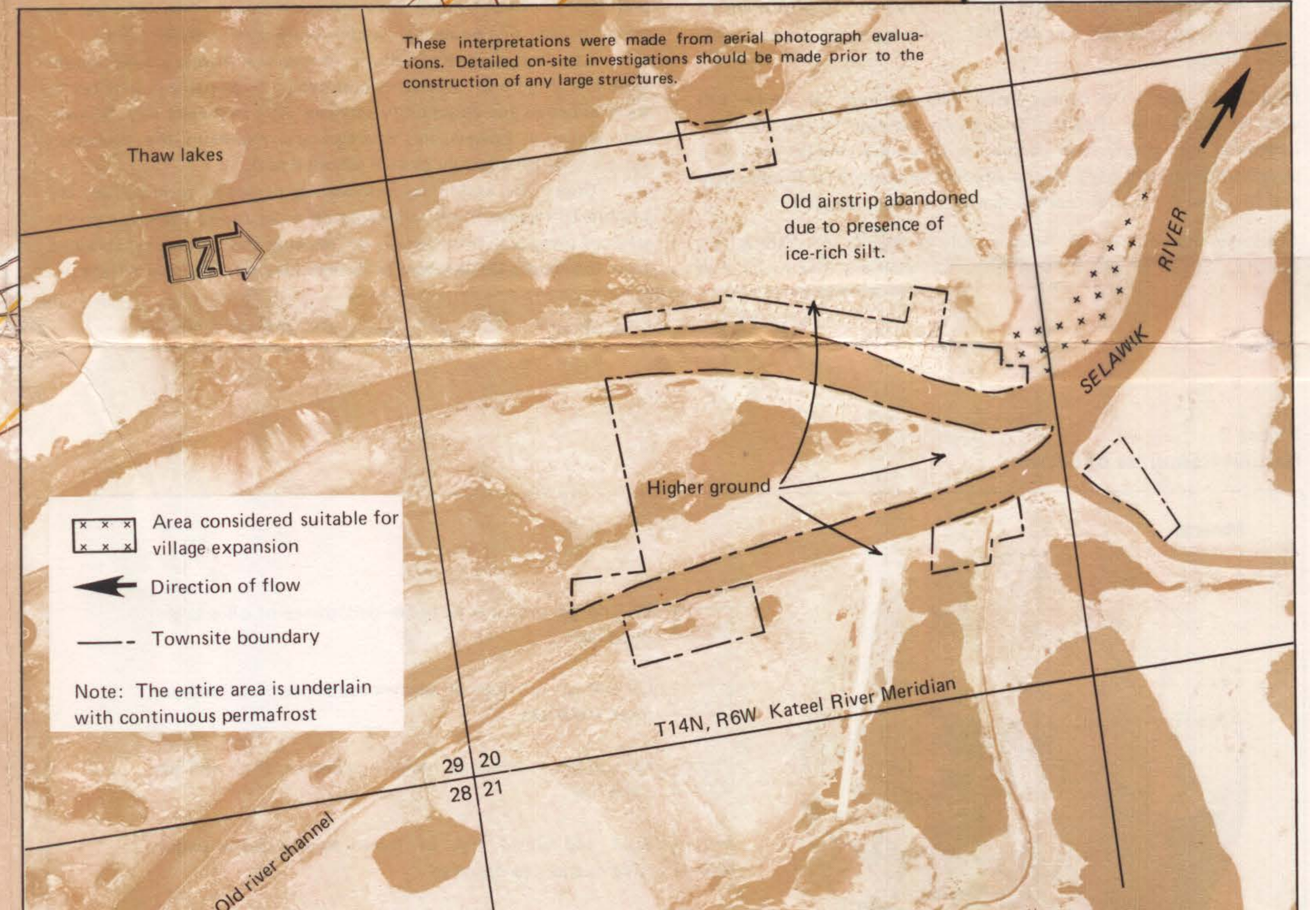
Flood Data

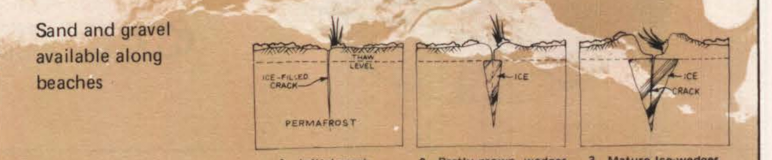
U.S. Army Corps of Engineers. Preliminary draft 1975. Compiled from aerial photos dated 8-1-67 by the Bureau of Land Management, Division of Engineering, Branch of Photogrammetry. 2-23-68. Assumed grid. Assumed elevation.

Area that would be inundated by a flood with a frequency of approximately 100 years.

- Flood hazard work was performed by the Alaska District Corps of Engineers at the request of and funded by the Federal Insurance Administration.
- The flood hazard area shown hereon is based on meager data, plus a minimum of historical flooding information and should be considered as preliminary.
- The major flooding that occurs at this location is the result of spring ice jams.
- Any levees or dikes were considered in delineating the approximate 100 year flood.







Vertical ice wedges are common in fine-grained permafrost. Intersecting wedges form the characteristic patterned ground visible in the lowlands. The above diagram shows how the wedges grow.

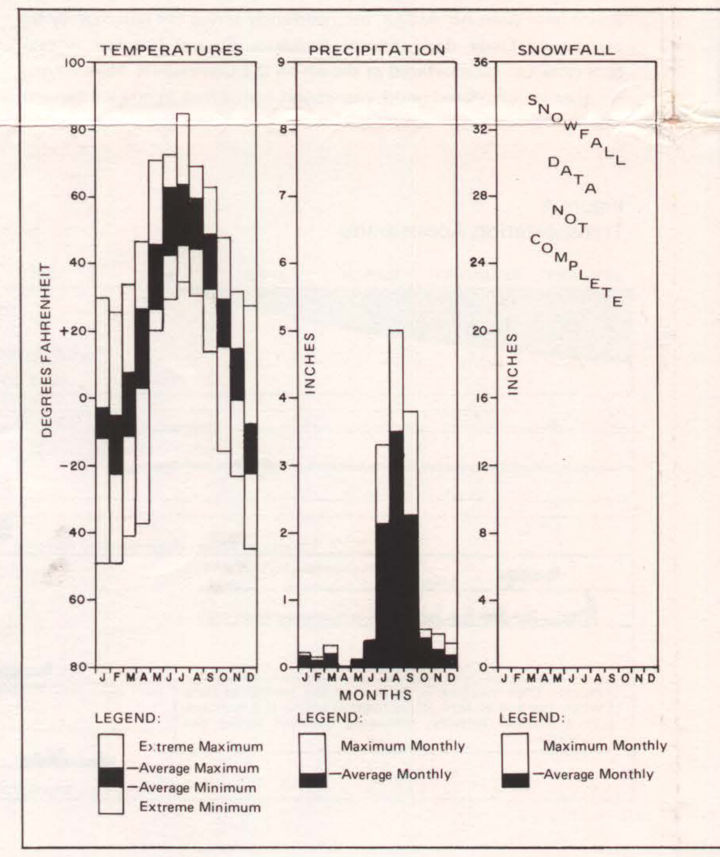
Environmental Considerations for Community Development

Community development must consider all environmental factors that affect the engineering design and location of structures, including climate, topography, soils, permafrost, erosion, and flooding.

Climate

Climatic data on winds, precipitation, temperature, and snowfall (Figure 5) allow engineers to design buildings strong enough to withstand heavy winds and deep snow, select type and thickness of insulation to reduce heat loss, and estimate fuel requirements. Climatic data are also needed to determine the type of clothing needed to protect the human body against extreme temperatures.

Chill Factor—If the air temperature is below body temperature, a person loses heat to the atmosphere. When the wind blows, the rate of heat loss increases; therefore, air temperature and wind velocity are the two environmental factors which affect body heat loss. Wind chill data (Figure 6) were developed by combining wind and temperature measurements into numbers which express equivalent chill temperatures.



Note: Selawik is located in the transitional climate zone which is characterized by long, cold winters and cool summers. Climate records for the village are short-term and may not represent long-term averages. Temperature extremes of 83°F in summer and -50°F in winter have been recorded. Precipitation is light with less than 10 inches annually, including 35 to 40 inches of snow. There are an estimated 1,037 growing degree days at Selawik, less than the 1,500 considered necessary for large-scale agriculture. Prevailing winds average 10 knots annually and are easterly in winter and westerly in summer. Additional information on climate is available at the Arctic Environmental Information and Data Center, University of Alaska.

MONTH	Temperature (°F) Means: Daily Maximum	Daily Minimum	Monthly	Extr.: Record Highest	Record Lowest	Precipitation (in inches): Mean	Greatest Daily	Greatest Monthly	Snow, Ice Pellets: Mean	Greatest Daily	Greatest Monthly	Greatest Depth on Ground	HEATING DEGREE DAYS
(a) One to three years, January 1953 to March 1955													
J	-3.8	-12.8	-8.3	28	-50	0.12	0.05	0.15	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE	NOT AVAILABLE	2272
F	-6.1	-23.6	-14.9	24	-50	0.07	0.07	0.12					2257
M	6.5	-11.9	-2.7	32	-42	0.17	0.06	0.29					2099
A	24.7	2.0	13.4	45	-38	T	T	T					1548
M	43.8	24.9	34.4	69	19	0.09	0.06	0.09					949
J	60.8	41.1	51.0	70	28	0.72	0.29	0.72					420
J	61.3	44.0	52.7	83	33	2.10	0.96	3.24					381
A	57.2	43.0	50.1	67	29	3.43	0.65	4.94					462
S	46.1	31.3	38.7	61	13	2.23	0.89	3.76					789
O	27.9	14.7	21.3	46	-17	0.38	0.13	0.51					1355
N	13.4	-0.8	6.3	30	-24	0.25	0.13	0.47					1761
D	-8.5	-23.4	-16.0	26	-45	0.17	0.09	0.32					2511
YR	26.9	10.7	18.8	83	-50	9.73	0.96	4.94					16804

Figure 5
Climatic Data Recorded at Selawik

WIND SPEED (MILES PER HOUR)	COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE" — TEMPERATURE (°F)																				
CALM	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
	EQUIVALENT CHILL TEMPERATURE																				
5	[illegible]																				
10	30	20	15	10	5	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
15	25	15	10	0	-5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	-100	-110	-115	-120
25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	-75	-80	-90	-100	-105	-115	-120	-130	-135	-145
40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	-125	-130	-140	-150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT.	LITTLE DANGER						INCREASING DANGER (Flesh may freeze within 1 min.)							GREAT DANGER (Flesh may freeze within 30 seconds)							
	DANGER OF FREEZING EXPOSED FLESH FOR PROPERLY CLOTHED PERSONS																				

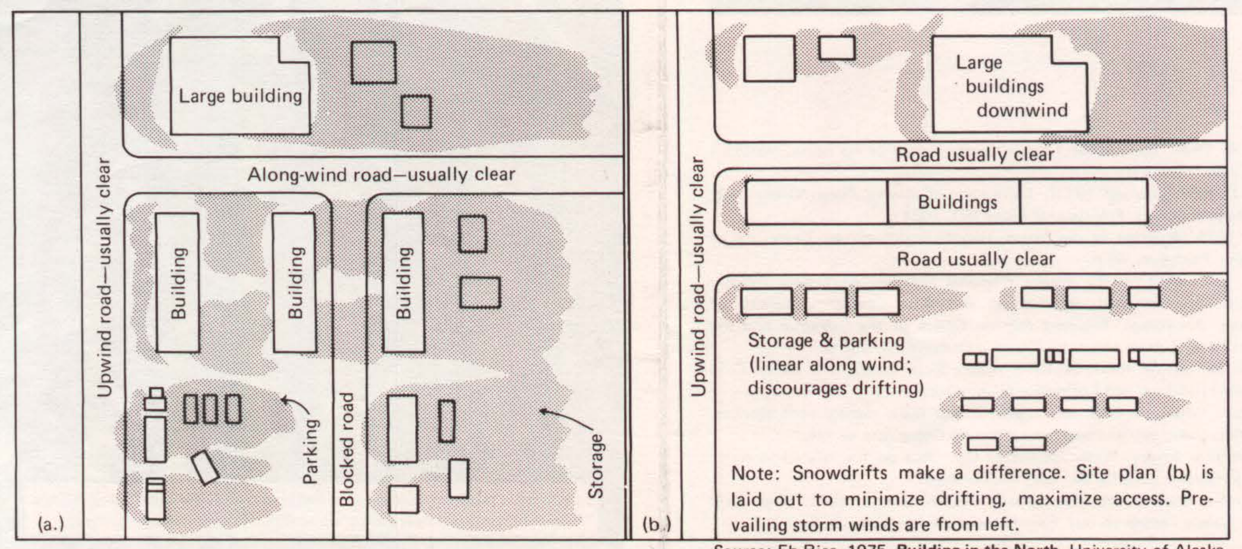
Figure 6
Wind Chill Temperatures

Snow Load—Snow load data are used in the design of structures to determine the strength needed to withstand the weight of packed snow. The U.S. Army Cold Regions Research and Engineering Laboratory has estimated local ground snow loads in pounds per square foot (psf) for many areas of Alaska. The design load selected depends on the expected use, life span, and geographic location of the building. For example, a five-year life could be selected for a temporary facility. A structure that can withstand 56 pounds of snow per square foot is considered safe for five years in Selawik. A building with a life expectancy of 25 years must be able to withstand a snow load of 77 psf; a 50-year structure should be designed for 86 psf; and buildings with an anticipated life of 100 years or more, such as hospitals and other long-lasting, permanent facilities, should be able to withstand 95 psf.

Wind Speed—Information on wind speed and direction is necessary to design and orient airports and other structures. It has been estimated that for a structure with an expected life of 10 years a structural design that could withstand extreme wind speeds of at least 77 miles per hour should be chosen; 85 miles per hour for a structure with an expected life of 25 years; 93 miles per hour for a 50-year life; and 103 miles per hour for a structure with a life expectancy of 100 years or more.

Location of buildings must also consider the direction of wind to minimize snowdrifts (Figure 7).

Figure 7
Snowdrifts and Wind Direction

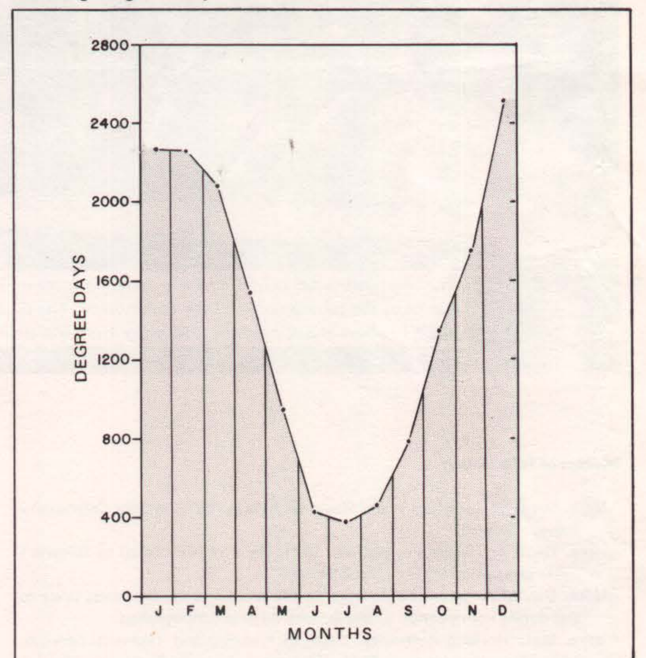


Note: Snowdrifts make a difference. Site plan (b.) is laid out to minimize drifting, maximize access. Prevailing storm winds are from left.

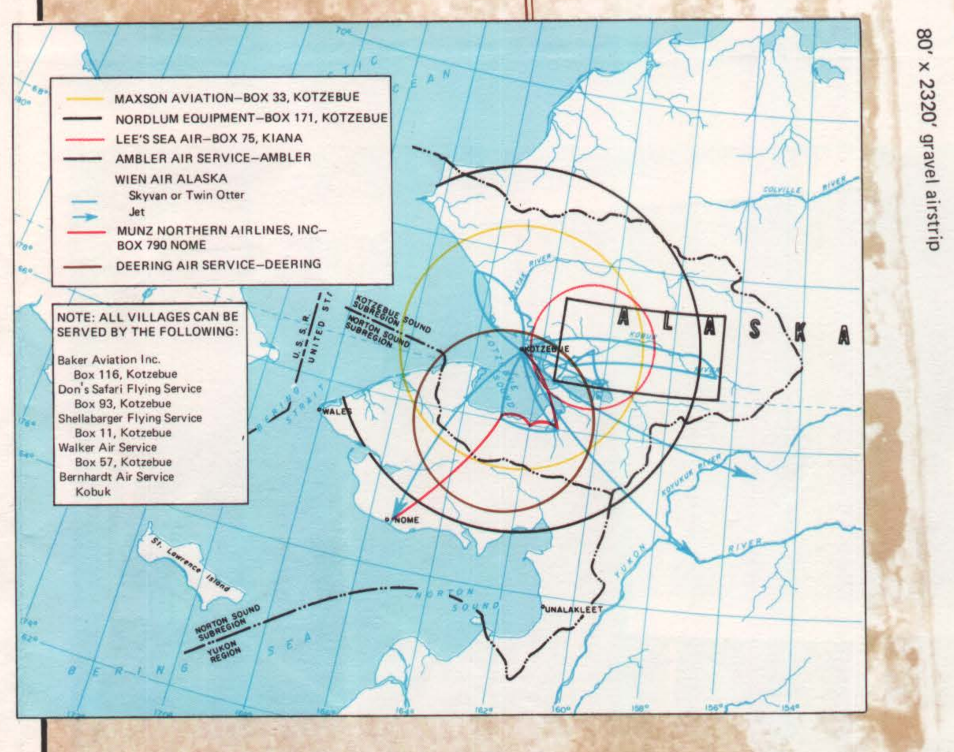
Source: Eb Rice, 1975. **Building in the North.** University of Alaska.

Heating Degree Days—Annual fuel requirements for a heated building can be calculated from heating degree days information. Structural heating usually begins when the air temperature is near 65 degrees F, the index temperature. If a particular day has a mean temperature of 50 degrees F, 15 heating degree days accumulate (65 minus 50). For the entire year the heating load is the sum of the daily degree days. The degree days for each month of the year for Selawik are shown in Figure 8. This information, combined with an inventory of types, sizes, and insulative qualities of buildings, can determine the amount of fuel required for a specific time period in the village.

Figure 8
Heating Degree Days—Selawik



A rectangular 560-square-foot home insulated with fiberglass requires about 55 gallons of fuel oil for heating during January in Selawik. This estimate is based on four-inch-thick fiberglass in the walls and floor, six inches in the ceiling, and a desired temperature of 70°F inside the home. Fuel consumption could be reduced by adding more insulation, minimizing window sizes, and by installing a subfloor to trap air between the floor and crawl space. Heaters should also be adjusted for efficient burning. Assistance in construction can be obtained from data developed by Dr. Eb Rice, University of Alaska, Fairbanks.

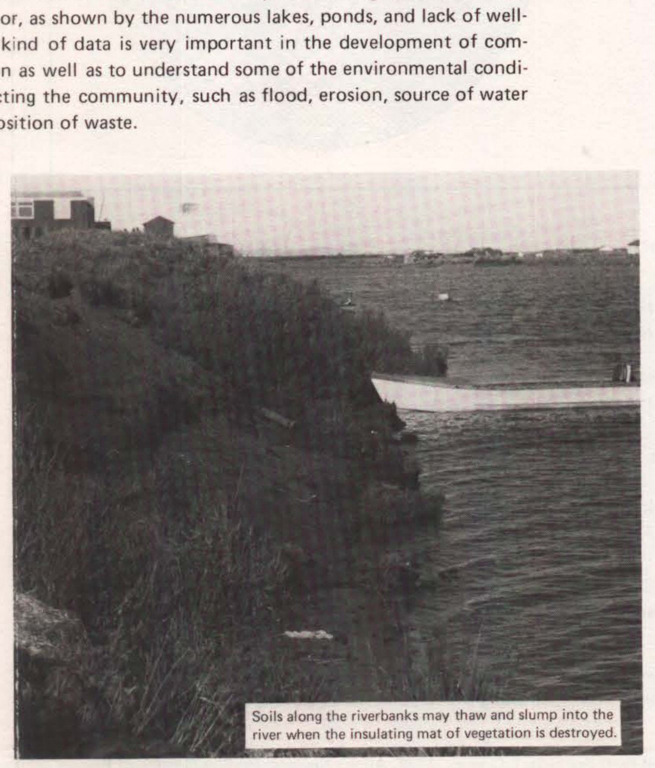


Note: This community base map has been prepared from low altitude aerial photographs which contain unavoidable distortions in scale. Property and utility information have been generalized from many sources and may contain minor inconsistencies. This map should not be construed as a survey.

Community Base Map—Maps are needed to show land use, ownership, location of utilities, and to plan for future village improvements. These maps can be prepared by either surveying the land on the ground or through enlargement of aerial photos or by a combination of both. Air photos can be taken at various heights. The height determines the extent of the area covered by the photograph.

The Community Base Map was prepared from a photograph taken at a height of 1,800 feet and enlarged to a scale of 1:2,400 (1 in. = 200 ft.). This map was used to locate the present utilities, residential development, and various community services and can be used in the future to evaluate the area for village expansion and to locate new construction.

The photograph to the right was taken at a height of 8,400 feet or one inch equals 1,400 feet. From this height the village as well as the land around it can be clearly evaluated. This photograph shows that Selawik has no roads leading into the community and that the river has changed its bed many times in the past, as reflected by the remnants of stream channels presently occupied by lakes. The terrain reflects the presence of permafrost, and the result of construction on permafrost without regard to proper engineering practices. An example is the old abandoned airstrip. The topography of the area is very flat and drainage is poor, as shown by the numerous lakes, ponds, and lack of well-established vegetation. This kind of data is very important in the development of community growth and expansion as well as to understand some of the environmental conditions that are presently affecting the community, such as flood, erosion, source of water supply, and location for disposition of waste.


Soils along the riverbanks may thaw and slump into the river when the insulating mat of vegetation is destroyed.

Topography and Soils

Selawik lies within the active floodplain of the Selawik River. Most homes are built on slightly elevated sandy silt levees bordering the river. Poorly drained deposits inland from the levees consist of frozen ice-rich silt.

Permafrost—Permafrost (permanently frozen ground) is continuous under Selawik. Polygonal ground is visible wherever the surface has not been disturbed by grading, indicating that vertical ice lenses are common in the frozen silts. A flooded abandoned runway south of town was excavated in ice-rich frozen silt, which subsequently melted and settled below the surrounding tundra. Frozen silt along the southernmost bank of the river has melted locally and slumped into the stream.

Permafrost should be protected from thawing whenever new structures and utilities are built in the village. The most common methods of protecting permafrost are to place a thick gravel pad between the structure and the frozen ground to limit heat transfer or to raise buildings on pilings to allow air circulation under the structure. Utility pipes should be properly insulated or placed in utilidors so that a minimum of heat transfers from the pipes to the adjacent ground.

Erosion and Flooding—Abandoned river channels west of the village demonstrate that the Selawik River has occupied different areas of its floodplain in the past. Future channel changes could possibly endanger the village.

The river flood hazard is high according to the U.S. Army Corps of Engineers. At least 20 percent of the village is flooded every year. Coastal flooding could also occur if high tides and storm-driven waves on Selawik Lake were experienced at the same time.

The most important thing to remember when building in the Arctic is that successful design requires site investigation and the advice of competent engineers because of the special conditions in the North. Neglecting these considerations can lead to complete failure of structures.