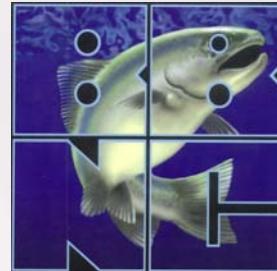




Wind and
Hydroelectric
Feasibility
Study

Tiel Smith—BBNC
Doug Vaught, PE—Consultant



Bristol
Bay
Native
Corporation

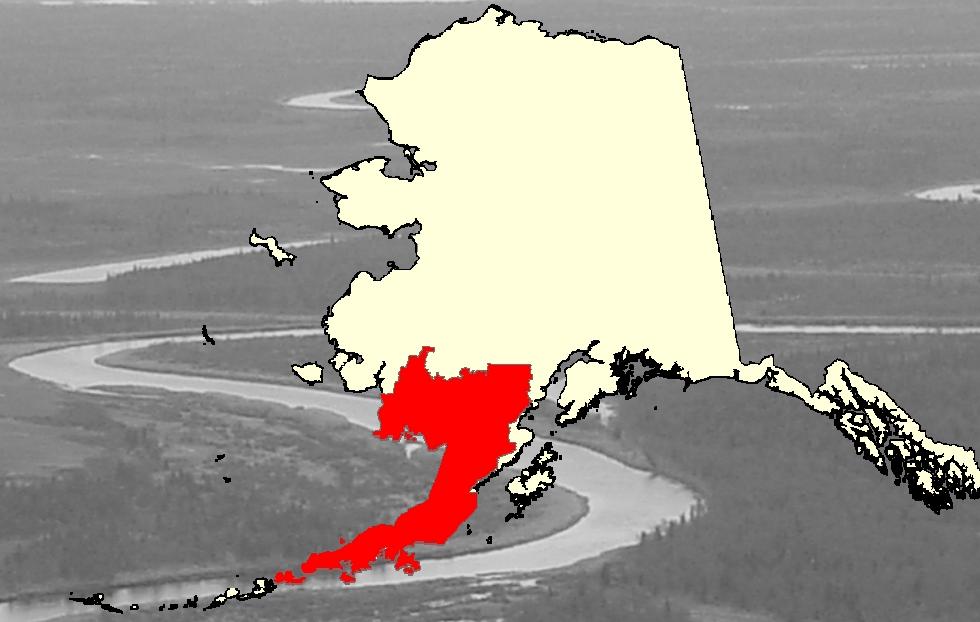
A Landscape of Promise

Bristol Bay Native Corporation

Invested in the Region



- Southwest Alaska
 - 29 communities
 - 7,800 residents
 - 10,000 brown bears
 - 55,000,000 salmon
- 40,000 square miles—about size of Ohio



- 68% Native
 - Yup'ik Eskimo
 - Athabascan
 - Aleut



- Hit hard by growth of farmed salmon—region declared economic disaster area 4 of 7 past years
- Abundance of
 - natural resources
 - wild places
 - resourceful people
 - dramatic landscapes

- Alaska Native Claims Settlement Act (ANCSA) transferred title to:
 - 3 million surface and subsurface acres to the regional and village corporations
 - 150 thousand surface acres to Native people
- Every Native with ties to BB region and alive in 1971 became a BBNC shareholder



- Elected directors duty:
 - protect and develop responsibly land entitlements
 - survey and factor in shareholder needs and concerns
 - strategically plan
- Shareholder mandate:
 - be profitable corporation
 - create dividends responsibly
 - use cultural values as guideline for economic and resource development
- Investment objective:
 - cultural heritage
 - business goals
 - resource availability



BBNC Present Priorities

“Enriching our Native way of life”

- Subsistence preservation
- Jobs/education
- Tourism potential
- Regional construction projects
- Oil and gas exploration
- Mining development
- Wind energy



BBNC's Project Objectives

- Awarded grant in September 2003
- Installed NRG meteorological towers, sensors and data loggers (planned 5-8, completed nine installs by October 2004)
- Analyze wind data from data loggers (in progress)
- Assess existing power systems in villages (in progress)
- Survey renewable energy resource possibilities in the region (in progress)
- Perform computer modeling and economic analyses to support wind power development in the region (winter 2004 – late 2005)



Feasibility Study is a Cooperative Financial and Technical Effort

- Bristol Bay Native Corporation
 - Personnel time and travel expenses for met tower installations
 - Modeling and data management
- Alaska Energy Authority
 - Purchased NRG meteorological towers/loggers
 - Pay for shipping of equipment to villages
- Alaska Village Electric Cooperative
 - Pay most labor expenses for New Stuyahok and Togiak (utility for two villages in Bristol Bay)
- Individual Villages/Local Utilities
 - Labor support and other expenses

SW Alaska Wind Workshop

October 8-9, 2003,
Dillingham, Alaska

Collaborative effort of:

- Bristol Bay Native Corp.
- Alaska Energy Authority
- NREL
- 50 participants from W. Alaska and Aleutians
- Discussed issues of wind power development in SW Alaska



Power Systems – Small Villages

- Wind-diesel hybrids
- Power quality issues at medium to high penetration – most likely to save fuel
- Wind turbines: 50-100 KW
- Designs are complex
- Workforce often not highly skilled – maybe only 2 people
- Not much equipment



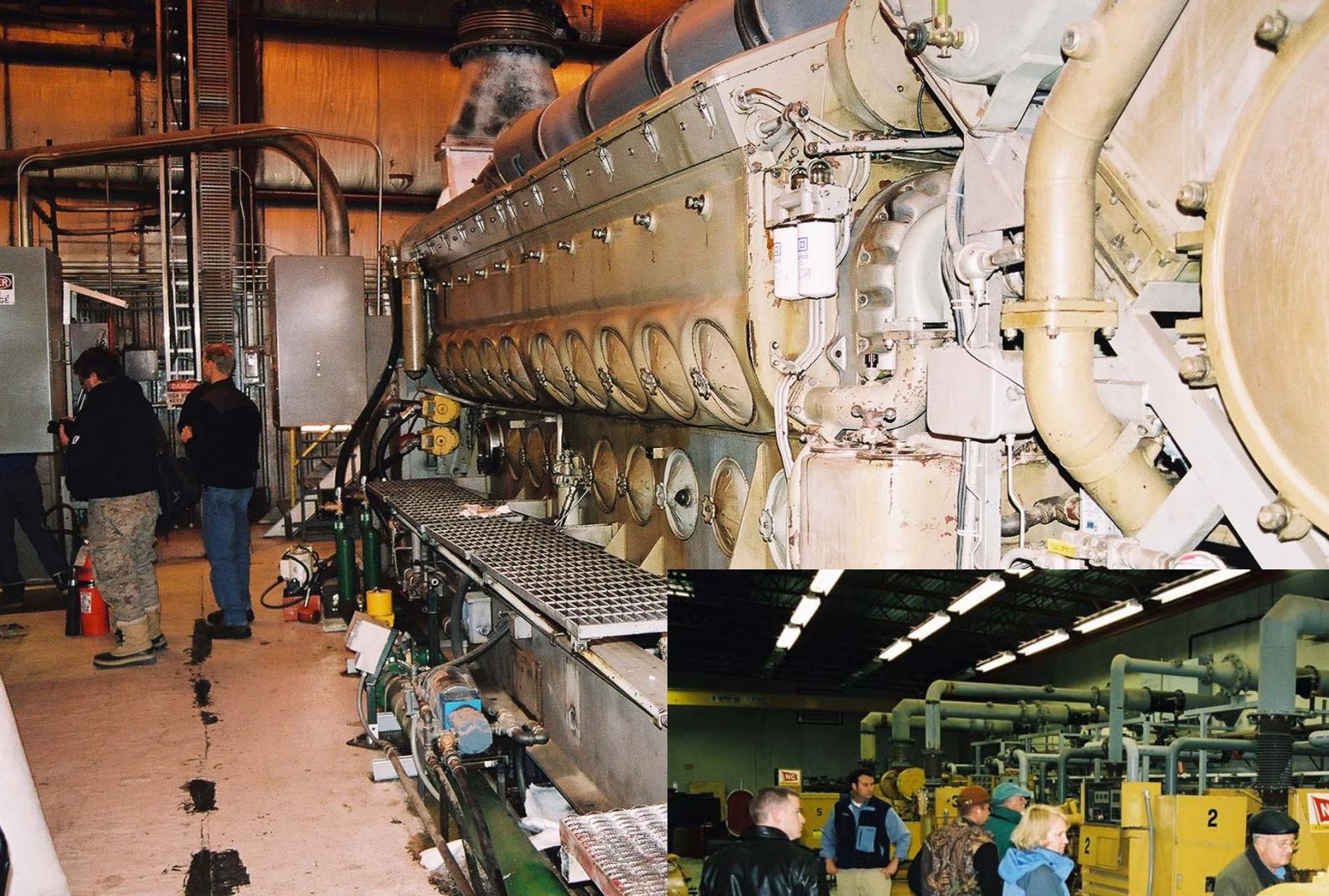


Power Systems – Hub Cities

Barrow, Bethel, Nome, Kotzebue, Dillingham, Naknek, others

- Several diesel generators – low MW range (total)
- Wind turbines: 50-225 KW – larger systems
- Fewer complex design issues – low penetration still saves lots of diesel fuel
- Highly skilled workforce
- Lots of heavy equipment





Kotzebue

St. Paul



Meteorological Towers

- Alaska Energy Authority purchased 30 met tower systems from NRG in Vermont
- 30 meter aluminum towers (typical hub height of 50-100 KW wind turbines used in Alaska)
- Wind speed measured at 30 m and 20 m levels
- Wind direction measured at 30 m level
- Temperature measured at 2 m level
- Data logger: Symphonie Internet Enabled logger – 12 channel, 10 minute data intervals, data stored in data cards, retrieved by local operators and mailed to Anchorage for download

A special problem of Alaska construction



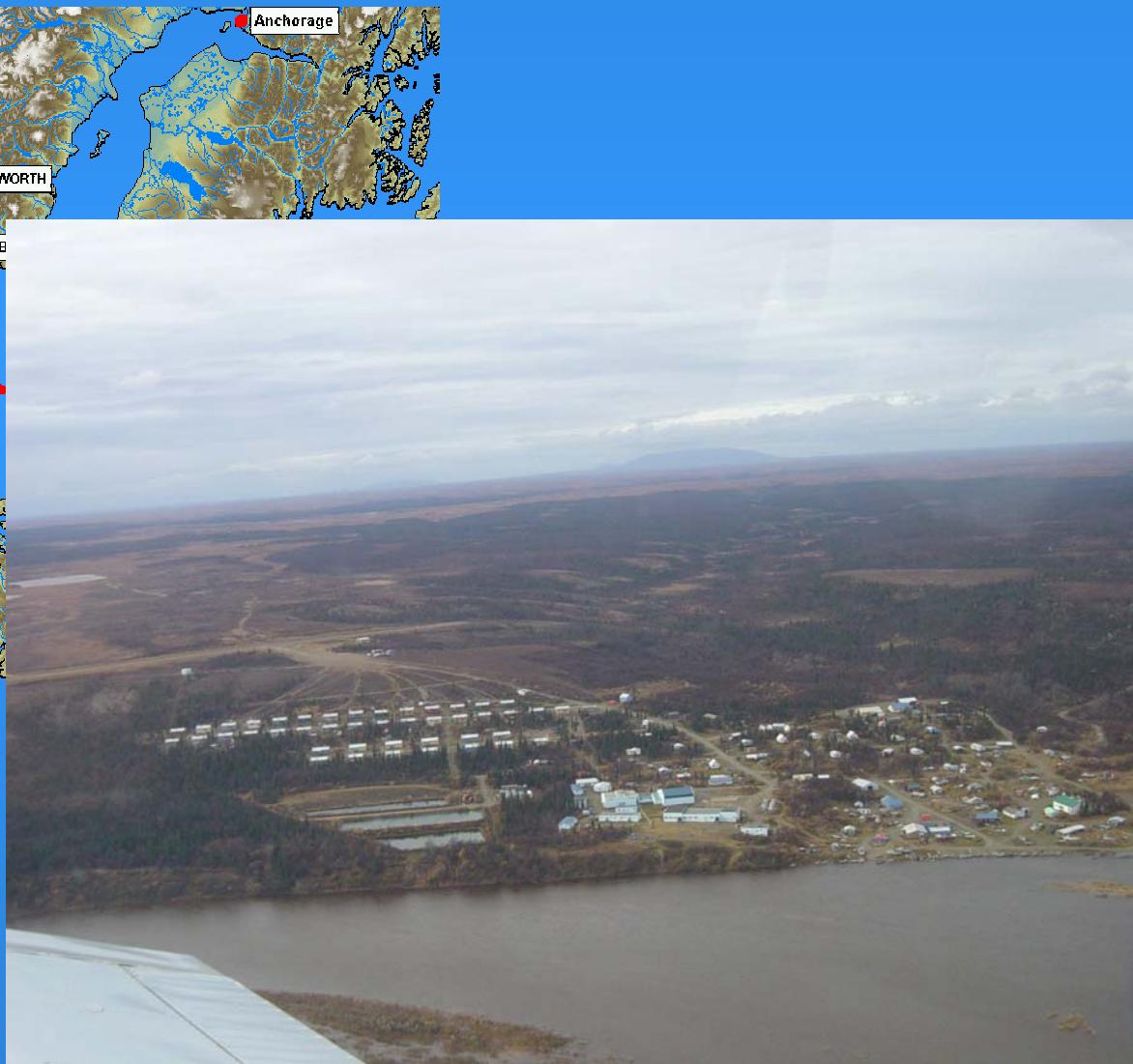
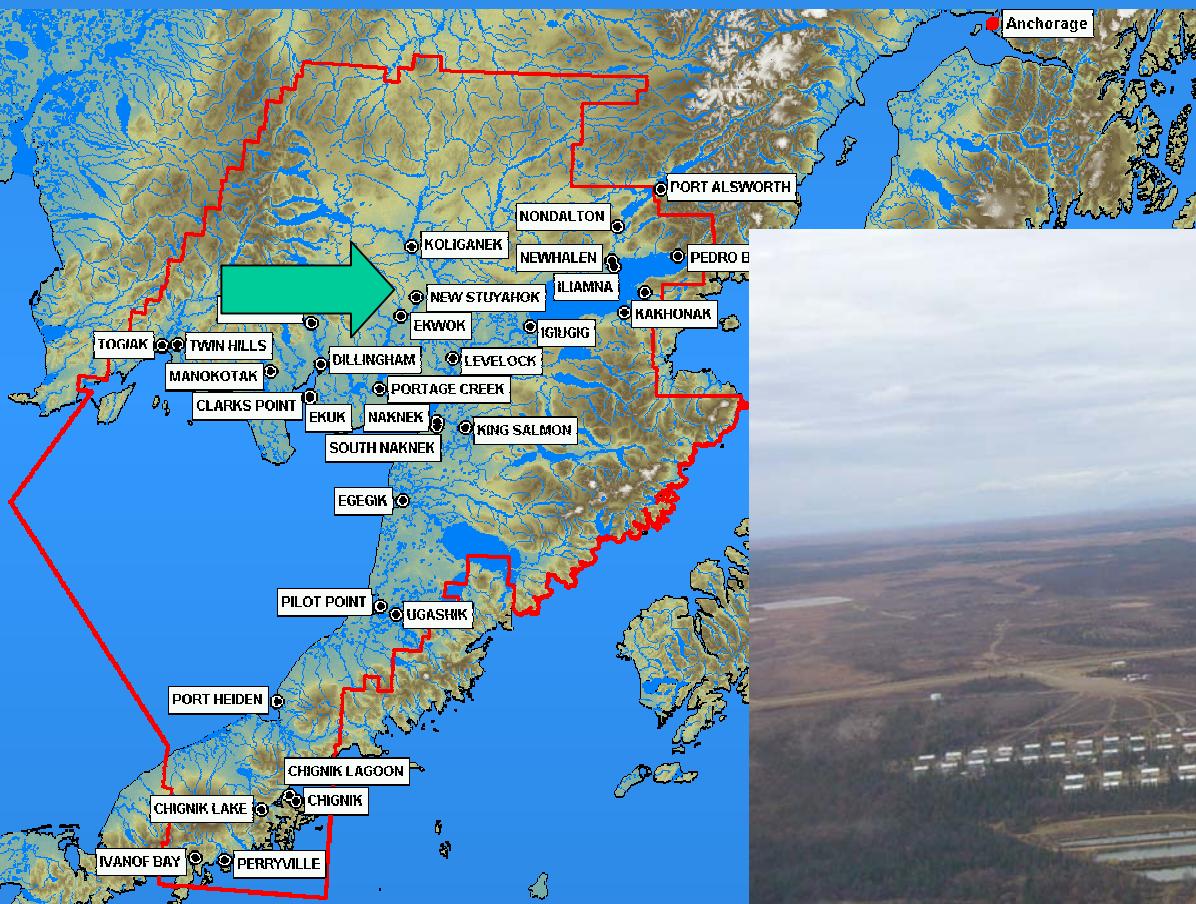
Permafrost!



New Stuyahok, Alaska

October 10, 2003

Utility: Alaska Village Electric Coop





Site Information:

Project: AVEC
 Location: Near airport runway
 Elevation: 227

Sensor Information:

1 NRG #40 Anem, mph	7 #200P Wind Vane
2 NRG #40 Anem, mph	8 No Sensor
3 No Sensor	9 NRG 110S Temp, F
4 No Sensor	10 No Sensor
5 No Sensor	11 No Sensor
6 No Sensor	12 No Sensor

10/11/2003 to 8/16/2004

Summary Report
 SITE 0064
 New Stuyahok

Channel	1	2	7	9
Height	29.4 m	19.8 m	29.4 m	4.7 m
Units	mph	mph	deg	%
Intervals with Valid Data	44712	44712	44712	44712
Average Filtered Data	12.64	10.93	99.22	31.43
Average for All Data	12.64	10.93	99.22	31.43
Min Interval Average	0.8	0.8		27.6
Date of Min Interval	10/11/2003	10/11/2003		2/6/2004
Time of Min Interval	9:10:00 AM	9:10:00 AM		7:50:00 AM
Max Interval Average	47.6	42.5		82.6
Date of Max Interval	3/9/2004	12/3/2003		7/11/2004
Time of Max Interval	12:40:00 PM	5:50:00 AM		4:10:00 PM
Average Interval SD	2.02	2.02	8.96	0.06
Min Sample	0.8	0.8		28.4
Date of Min Sample	4/13/2004	4/13/2004		2/6/2004
Time of Min Sample	9:30:00 AM	9:40:00 AM		7:50:00 AM
Max Sample	57.5	57.5		83.3
Date of Max Sample	3/9/2004	3/9/2004		7/11/2004
Time of Max Sample	1:00:00 PM	1:00:00 PM		4:10:00 PM
Average Interval II	0.18	0.21		
Wind Speed Direction			ENE	

Site Information:

Project: AVEC
 Location: Near airport runway
 Elevation: 227

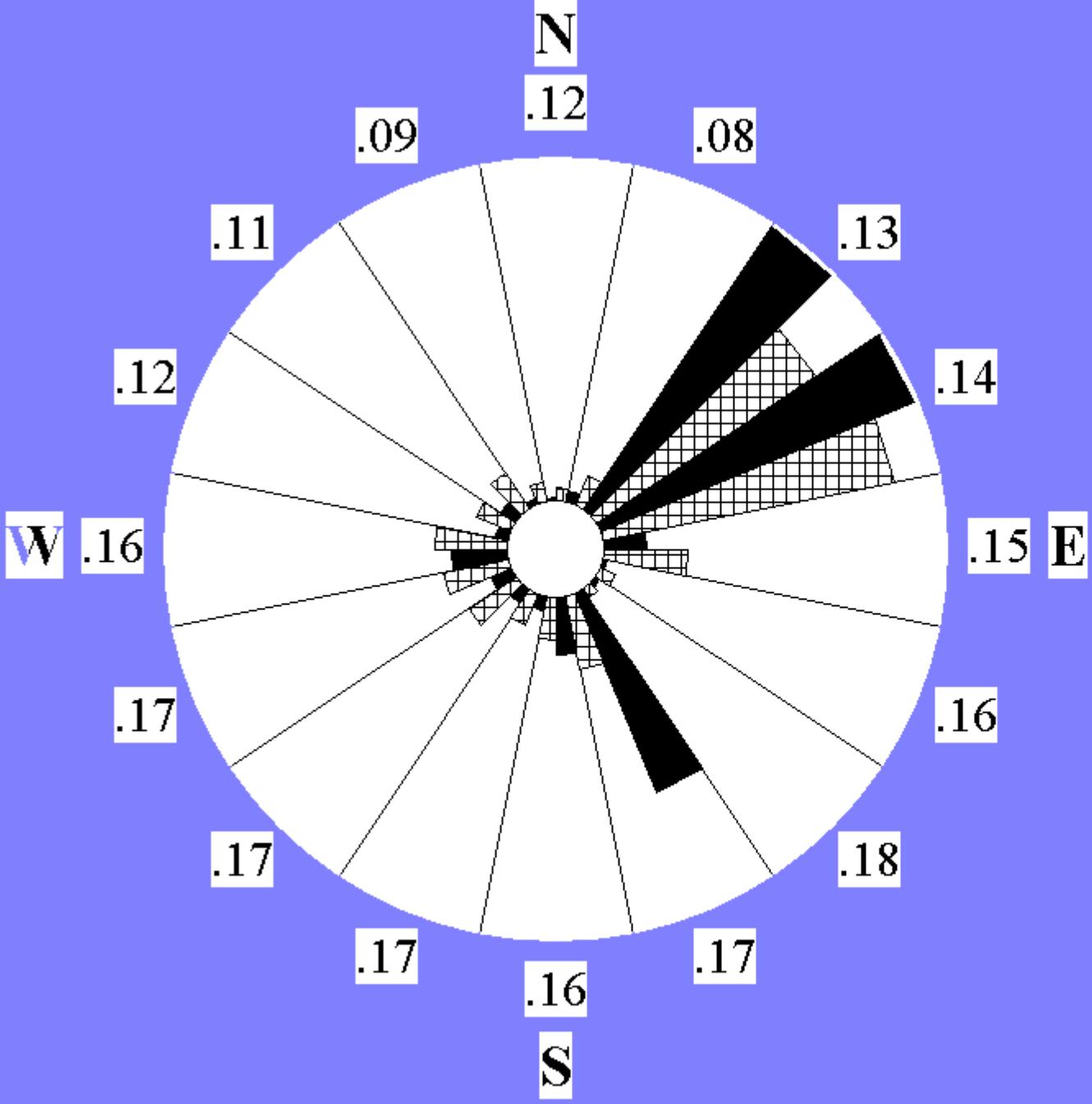
Sensor Information:

1 NRG #40 Anem, mph	7 #200P Wind Vane
2 NRG #40 Anem, mph	8 No Sensor
3 No Sensor	9 NRG 110S Temp, F
4 No Sensor	10 No Sensor
5 No Sensor	11 No Sensor
6 No Sensor	12 No Sensor

10/11/2003 to 4/30/2004

Summary Report
 SITE 0064
 New Stuyahok

Channel	1	2	7	9
Height	29.4 m	19.8 m	29.4 m	4.7 m
Units	mph	mph	deg	%
Intervals with Valid Data	29232	29232	29232	29232
Average Filtered Data	14.25	12.34	30.06	19.48
Average for All Data	14.25	12.34	30.06	19.48
Min Interval Average	0.8	0.8		27.6
Date of Min Interval	10/11/2003	10/11/2003		2/6/2004
Time of Min Interval	9:10:00 AM	9:10:00 AM		7:50:00 AM
Max Interval Average	47.6	42.5		57.4
Date of Max Interval	3/9/2004	12/3/2003		4/30/2004
Time of Max Interval	12:40:00 PM	5:50:00 AM		5:10:00 PM
Average Interval SD	2.16	2.15	7.83	0.05
Min Sample	0.8	0.8		28.4
Date of Min Sample	4/13/2004	4/13/2004		2/6/2004
Time of Min Sample	9:30:00 AM	9:40:00 AM		7:50:00 AM
Max Sample	57.5	57.5		58.1
Date of Max Sample	3/9/2004	3/9/2004		4/30/2004
Time of Max Sample	1:00:00 PM	1:00:00 PM		5:10:00 PM
Average Interval II	0.17	0.19		
Wind Speed Direction			ENE	



Site Information:

Project: AVEC

Location: Near airport runway and taxiway

Elevation: 227

Sensor on channel 1:

NRG #40 Anem, mph

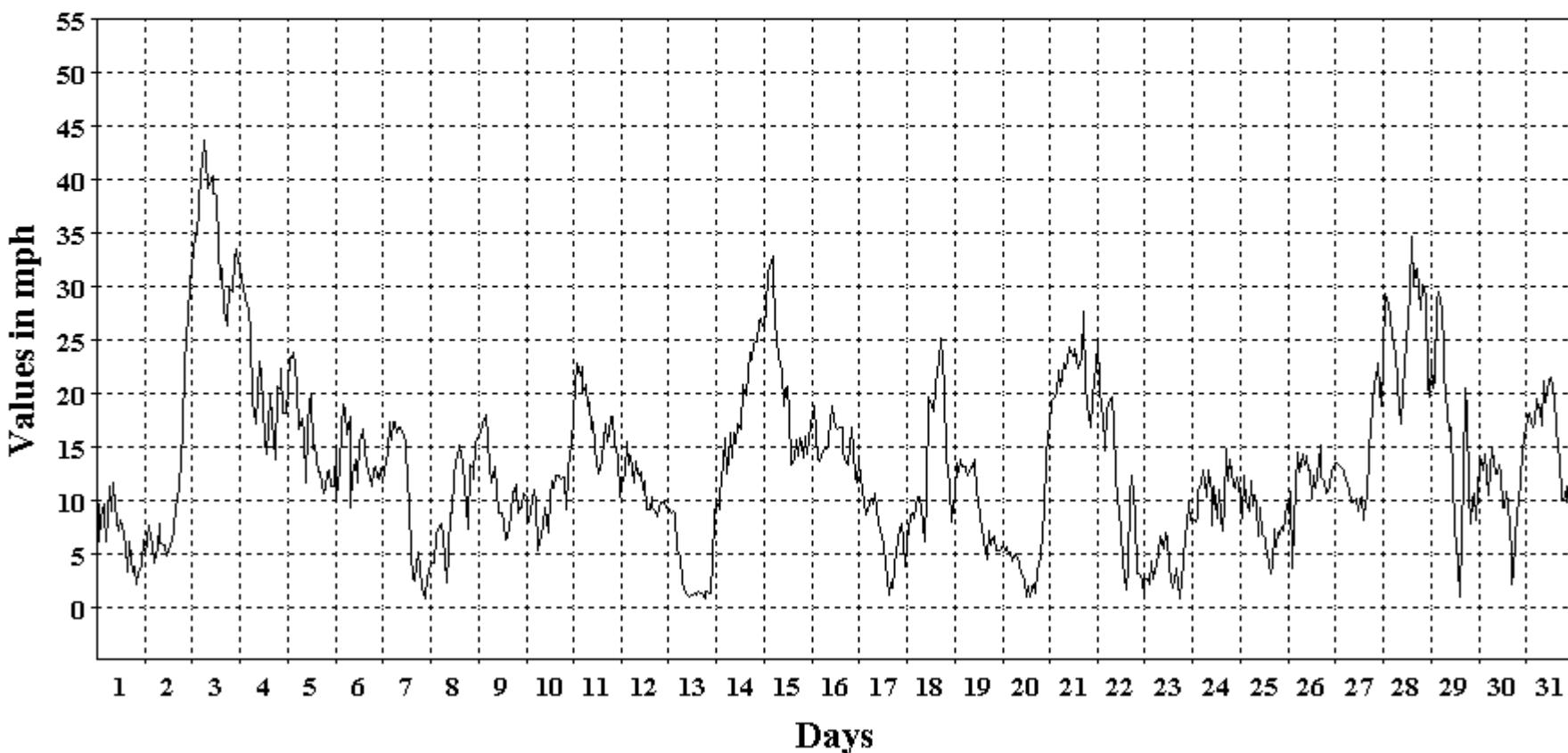
Height: 29.4 m

Serial #:

December 2003**Hourly Averages Graph Ch 1**

SITE 0064

New Stuyahok

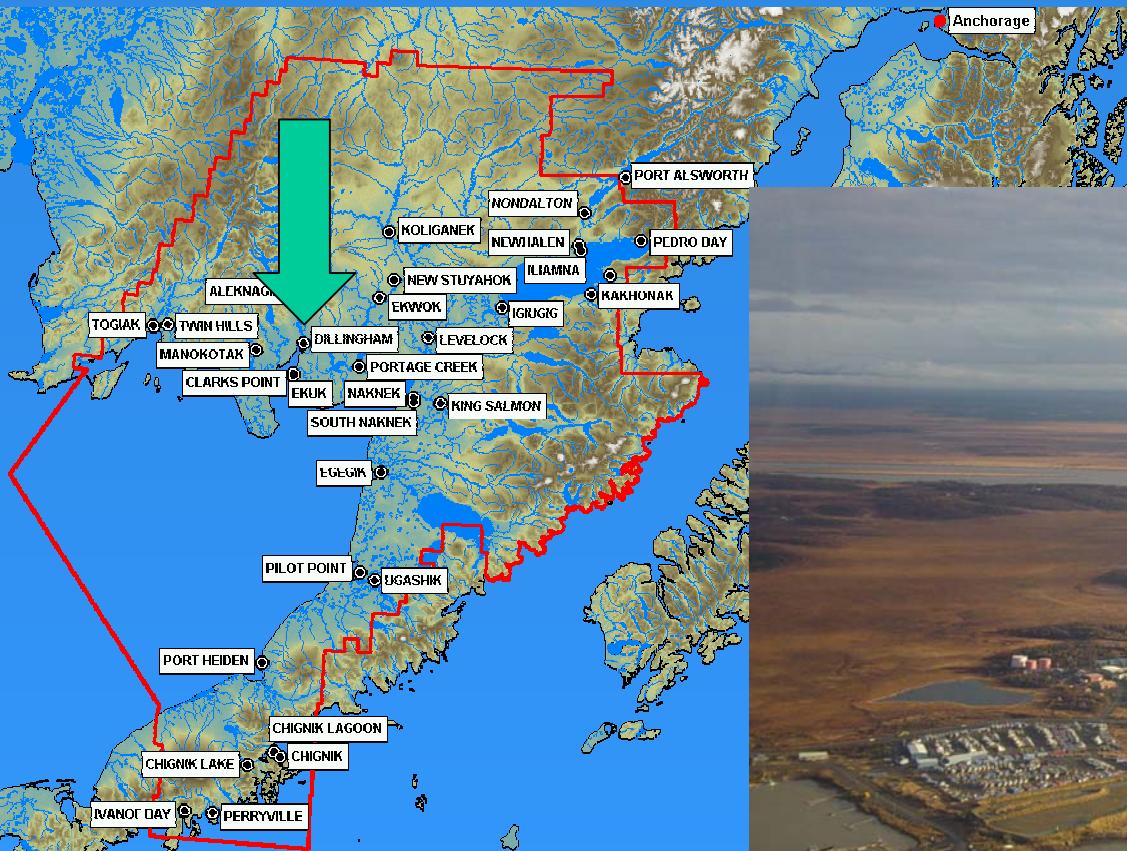
Average Hourly Values

Average Value: 13.5

Dillingham, Alaska

April 22-23, 2004

Utility: Nushagak Electric Cooperative



1st Dillingham site – Kanakanak Hospital area





Site Information:

Project: Tribal Energy Program grant
Location: Dillingham, Alaska
Elevation: 130 ft

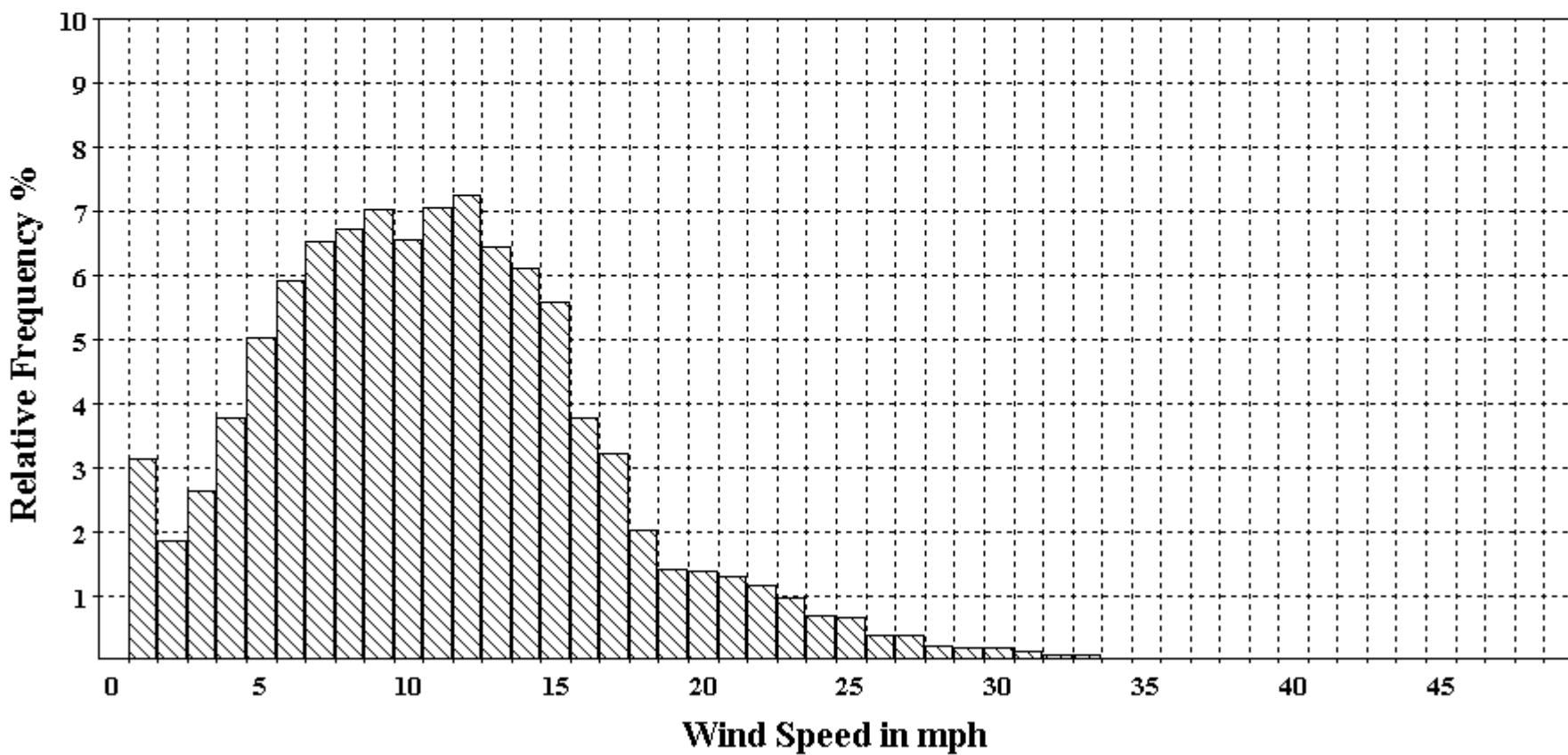
Sensor on channel 1:

NRG #40 Anem. mph
Height: 96 ft
Serial #: SN:

4/22/2004 to 8/19/2004**Frequency Distribution Ch 1**

SITE 2259

Dillingham - Kanakanak Hospital

Frequency Distribution

2nd Dillingham site - 130 ft State Communication Tower



Site Information:

Project: Tribal Energy Program grant
Location: Dillingham, Alaska
Elevation: 124 ft

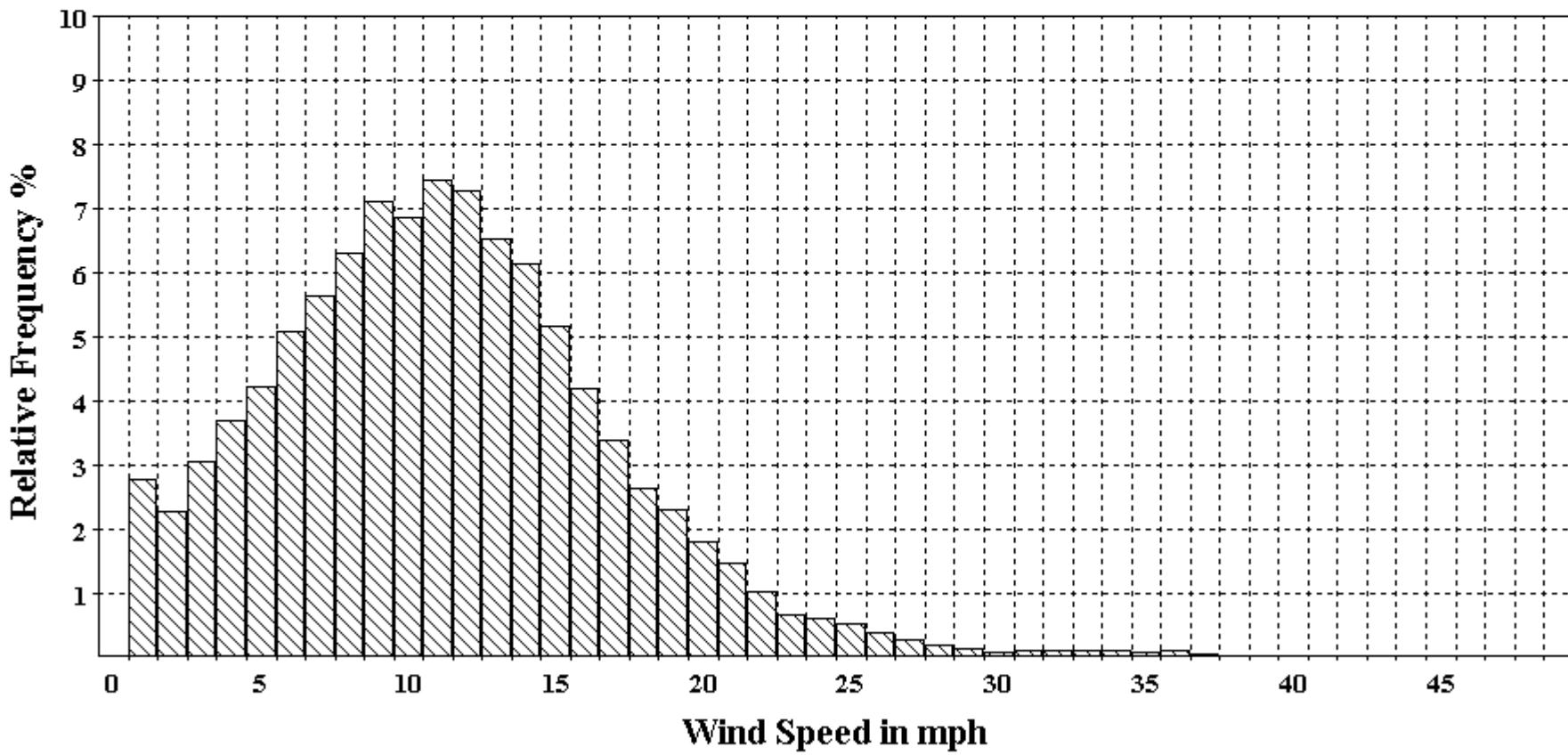
Sensor on channel 1:

NRG #40 Anem. mph
Height: ft
Serial #: SN:

4/22/2004 to 8/19/2004

Frequency Distribution Ch 1
SITE 2255
Dillingham - Windriver Road

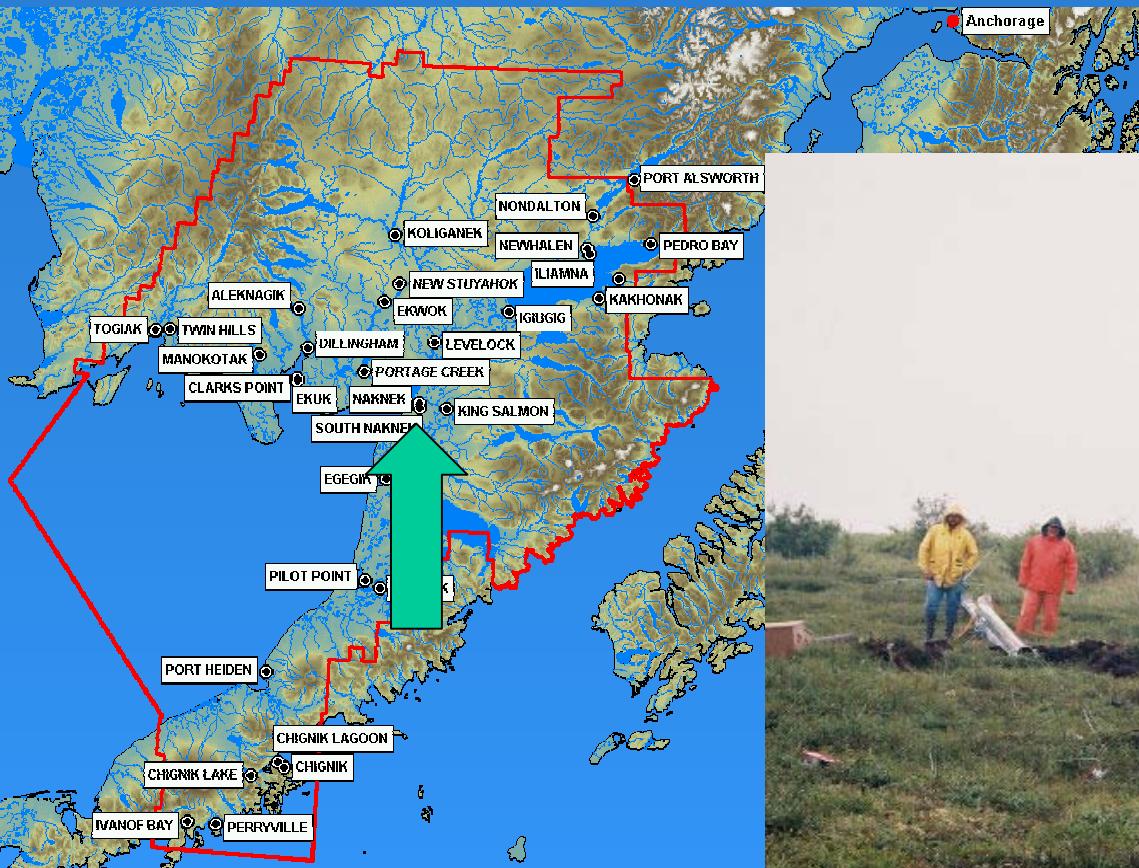
Frequency Distribution



Naknek, Alaska

July 26-27, 2004

Utility: Naknek Electric Association



Another special Alaska problem...

Bear trail!

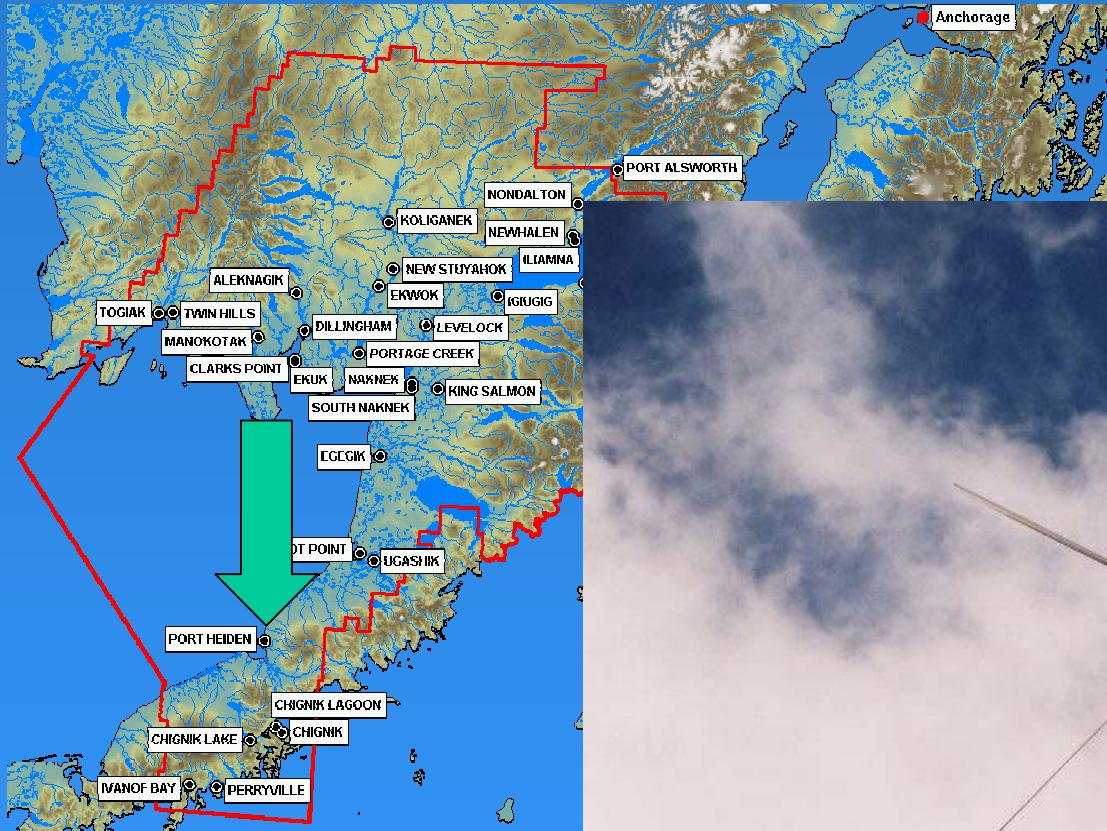
Bear!

Bear
protection!

Bear deterrent

Port Heiden, Alaska

August 6, 2004

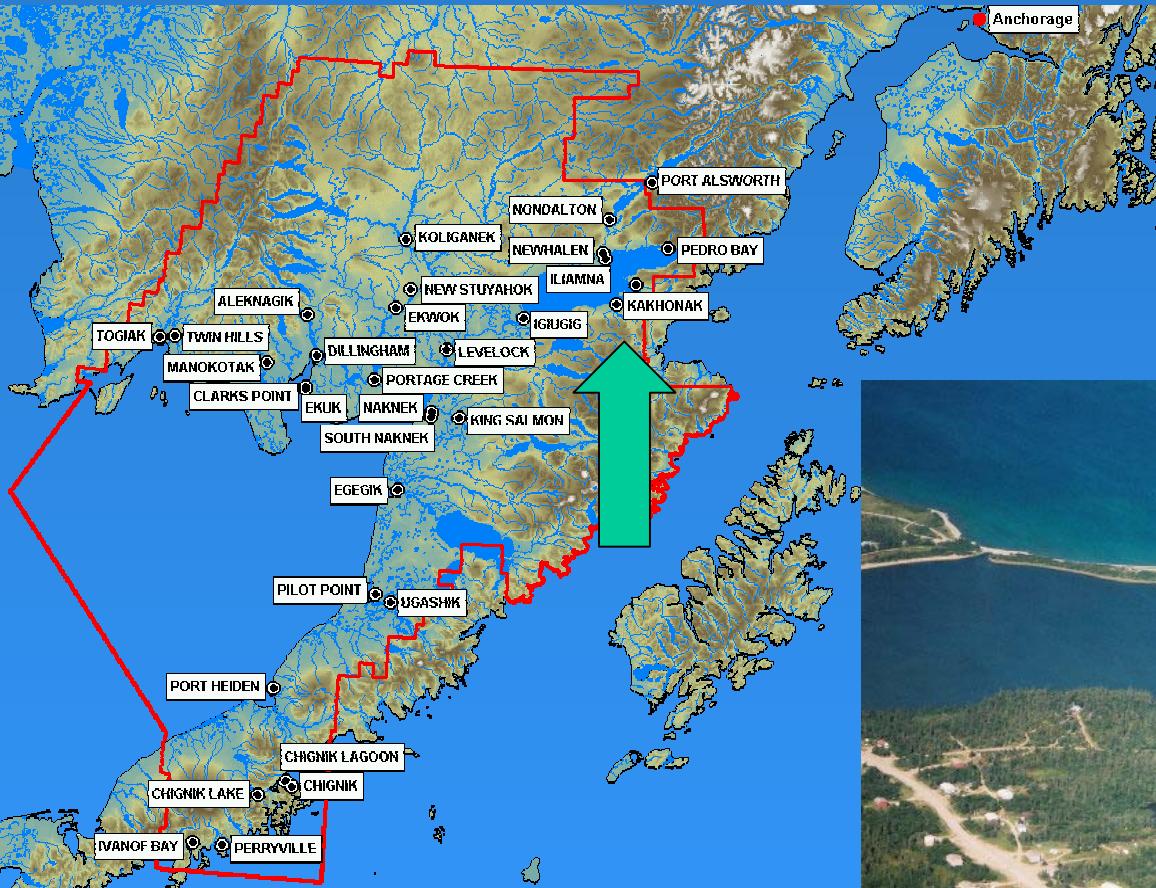


Alaska Energy Authority planning new powerplant in 2005 – looking at wind-diesel with ~100KW wind turbines



Kokhanok, Alaska

August 11-12, 2004

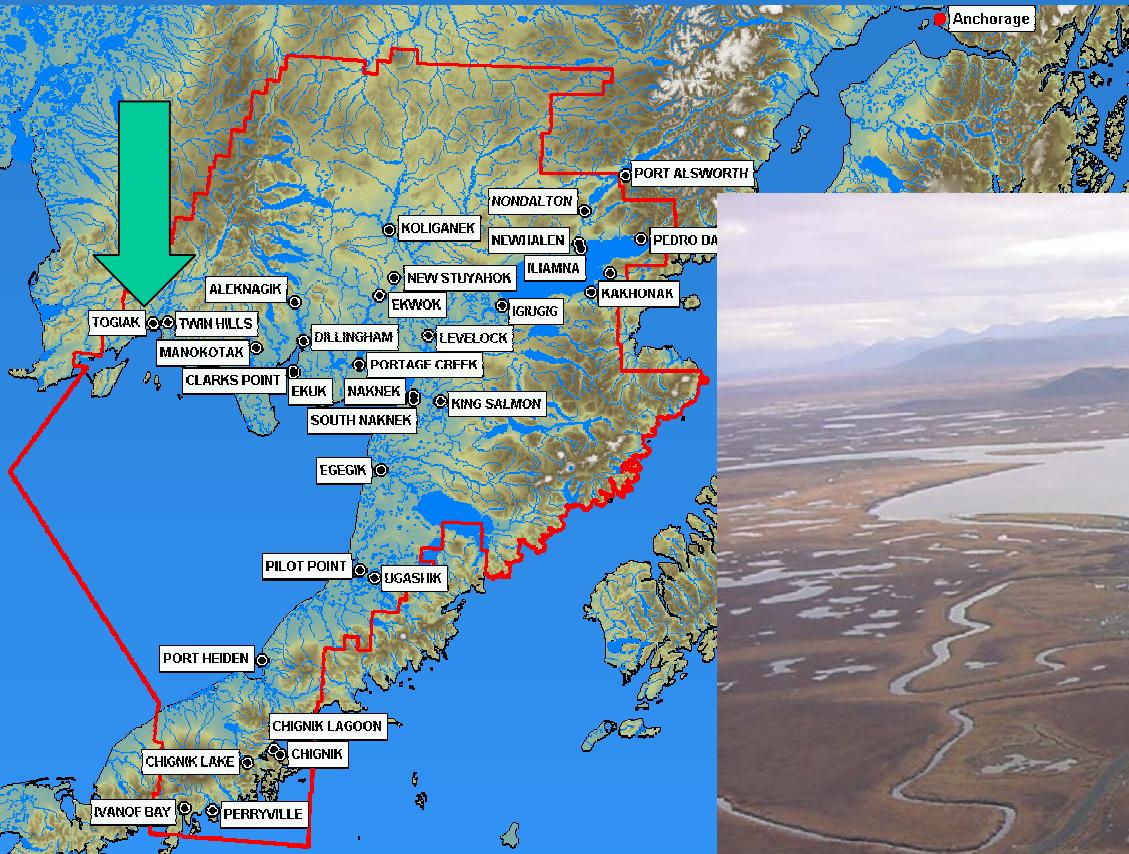




Togiak, Alaska

August 30-31, 2004

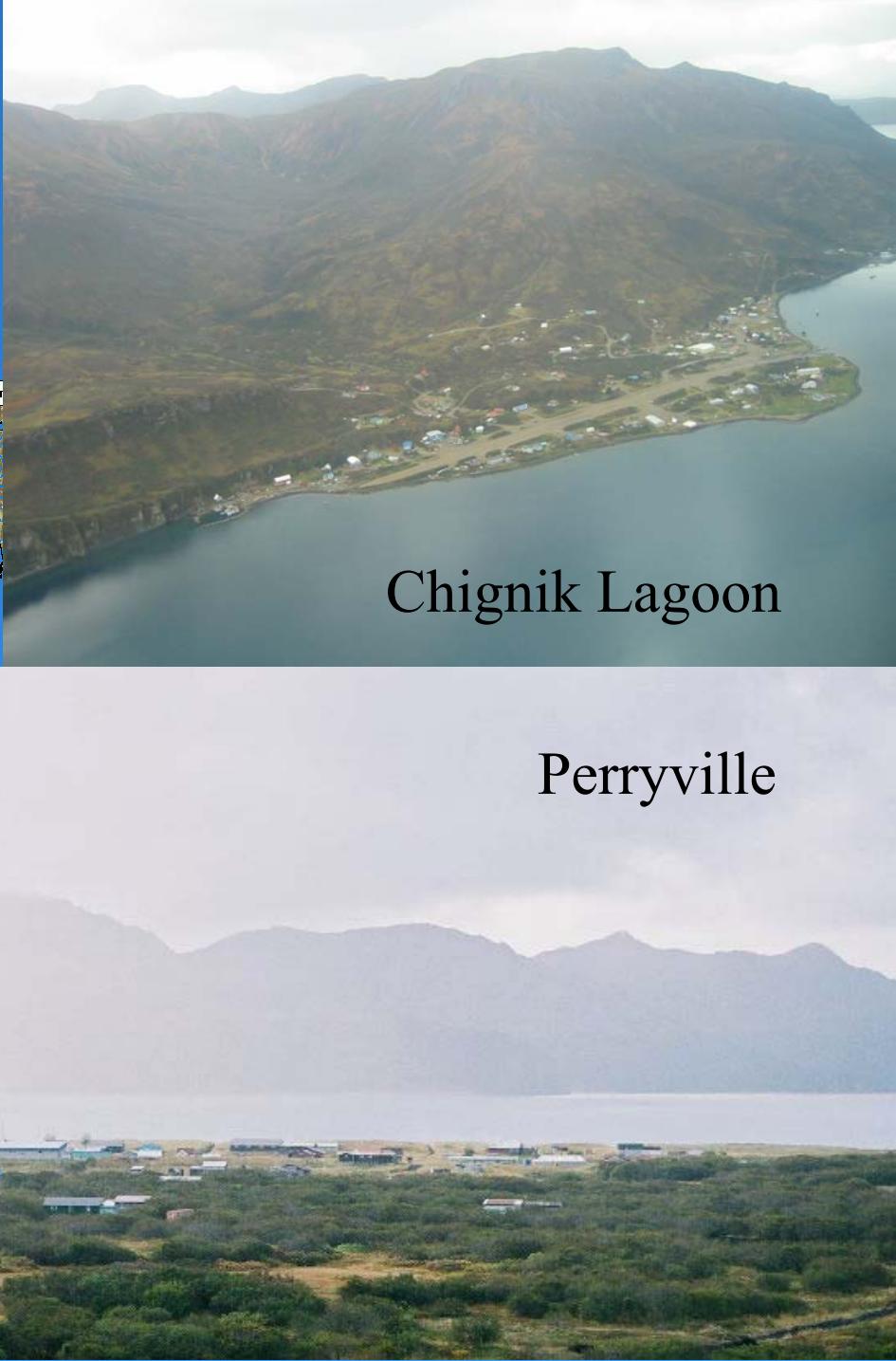
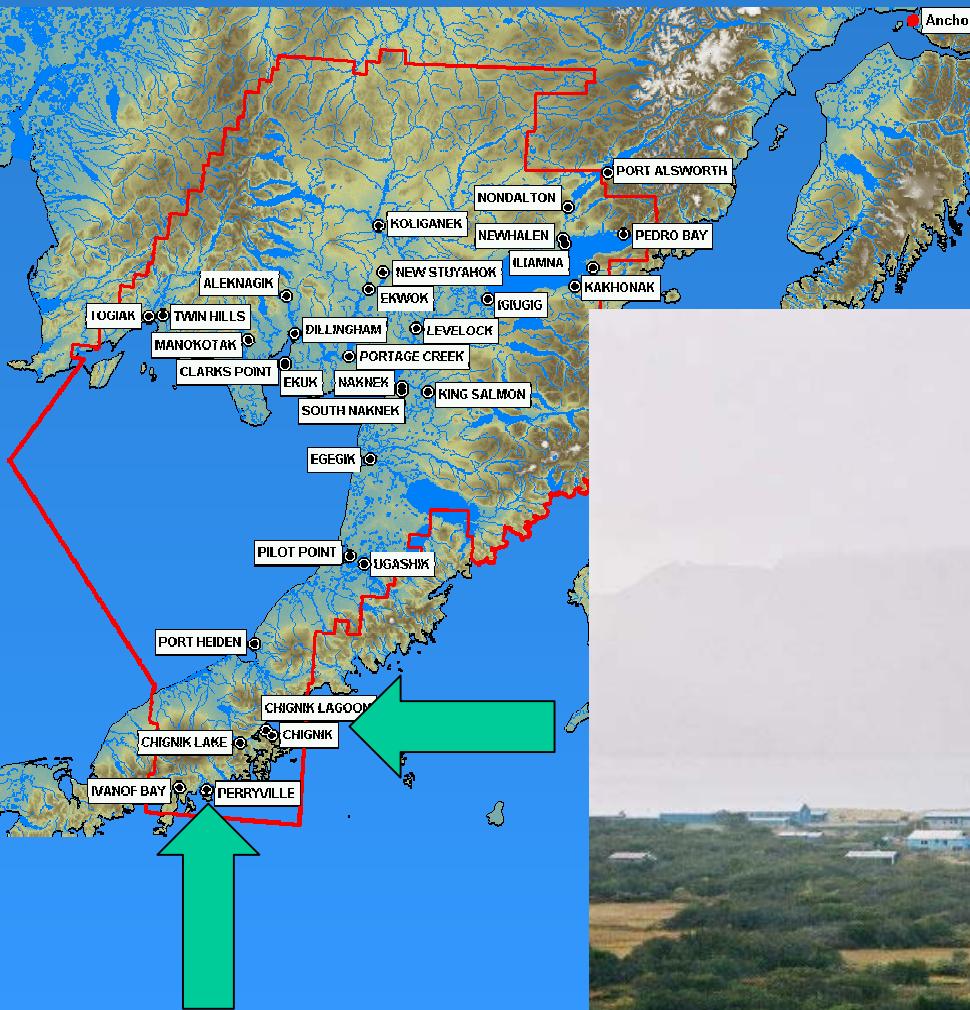
Utility: Alaska Village Electric Coop





Chignik Lagoon and Perryville

October 8-10, 2004



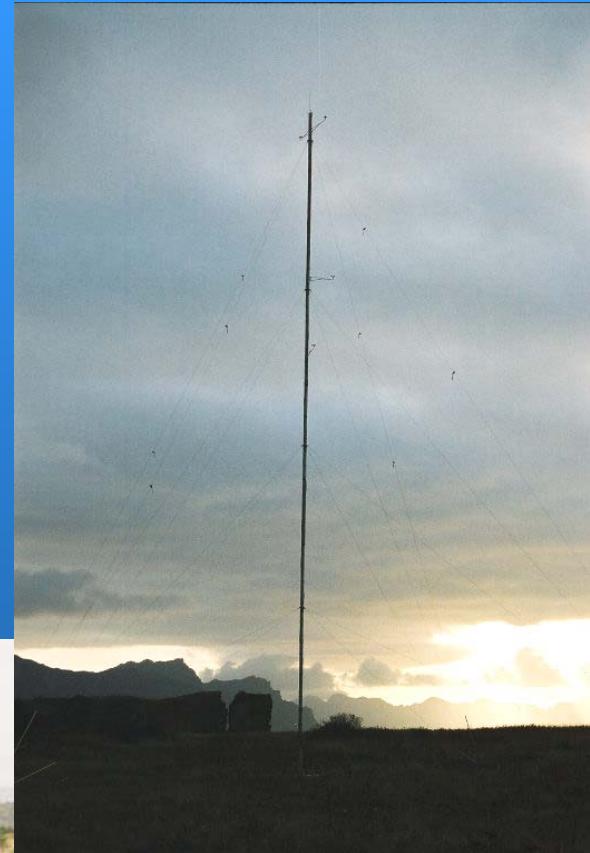


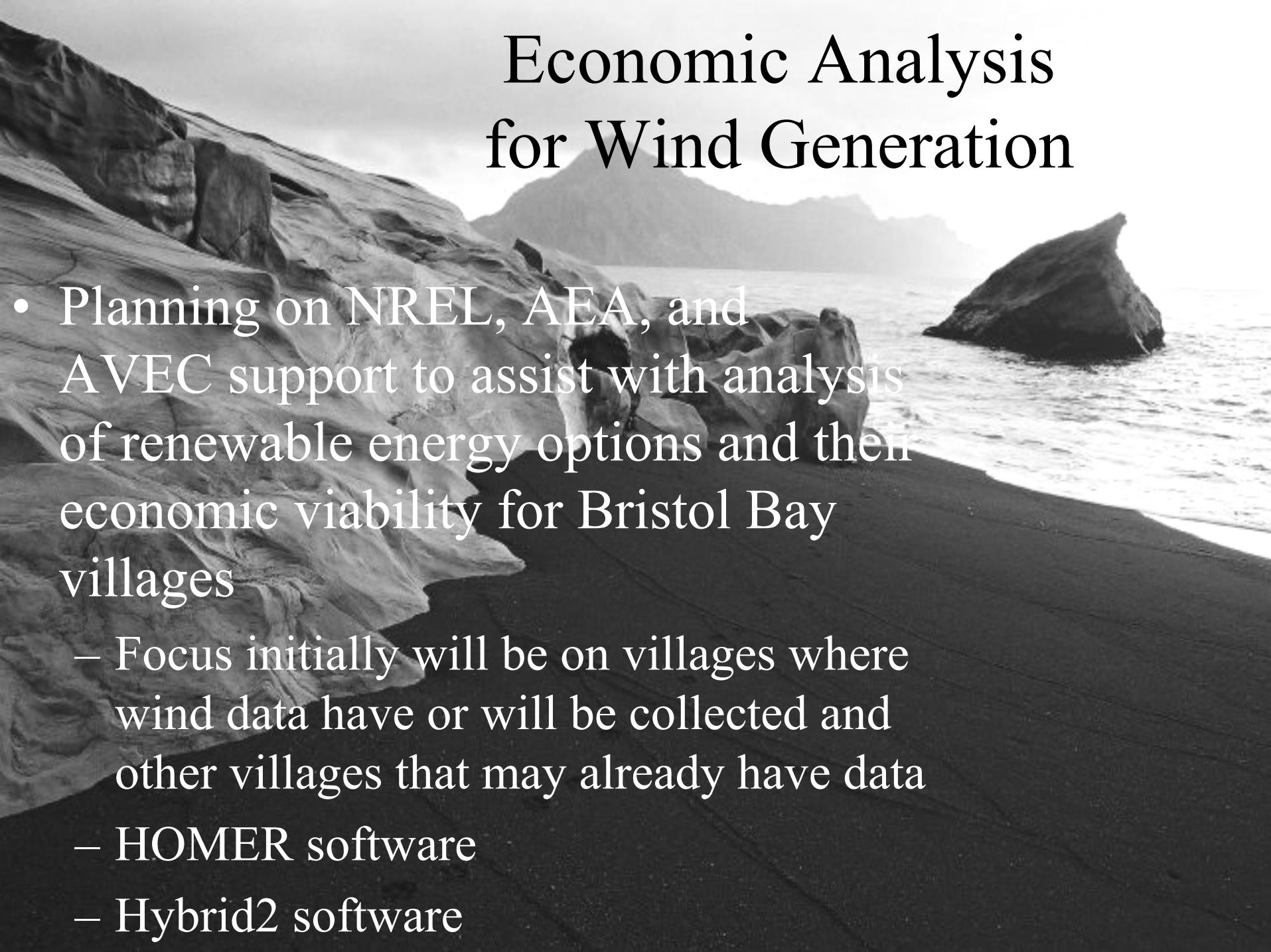
Chignik Lagoon





Perryville





Economic Analysis for Wind Generation

- Planning on NREL, AEA, and AVEC support to assist with analysis of renewable energy options and their economic viability for Bristol Bay villages
 - Focus initially will be on villages where wind data have or will be collected and other villages that may already have data
 - HOMER software
 - Hybrid2 software

Wind-Diesel Workshop

Sept 29 – Oct 2, 2004, Girdwood, Alaska
plus trip to St. Paul Island, Kotzebue, and Selawik









