Wind and Hydroelectric Feasibility Study

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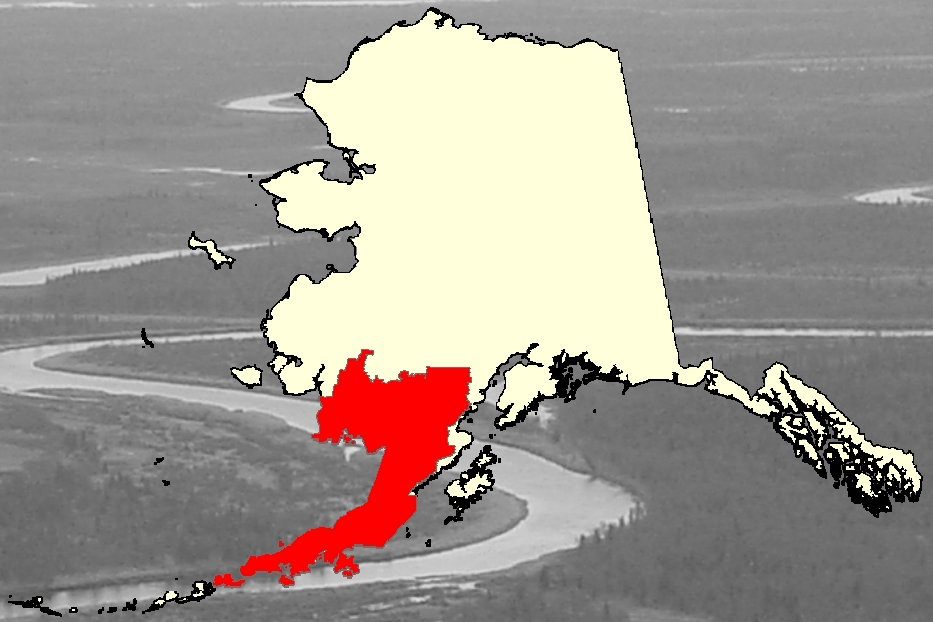
Bristol Bay Native Corporation

A Landscape of Promise

Bristol Bay Native Corporation

Invested in the Region

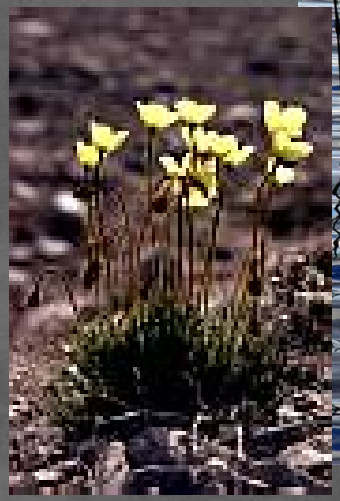
- Southwest Alaska
  - 29 communities
  - 7,800 residents
  - 10,000 brown bears
  - 55,000,000 salmon



- 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

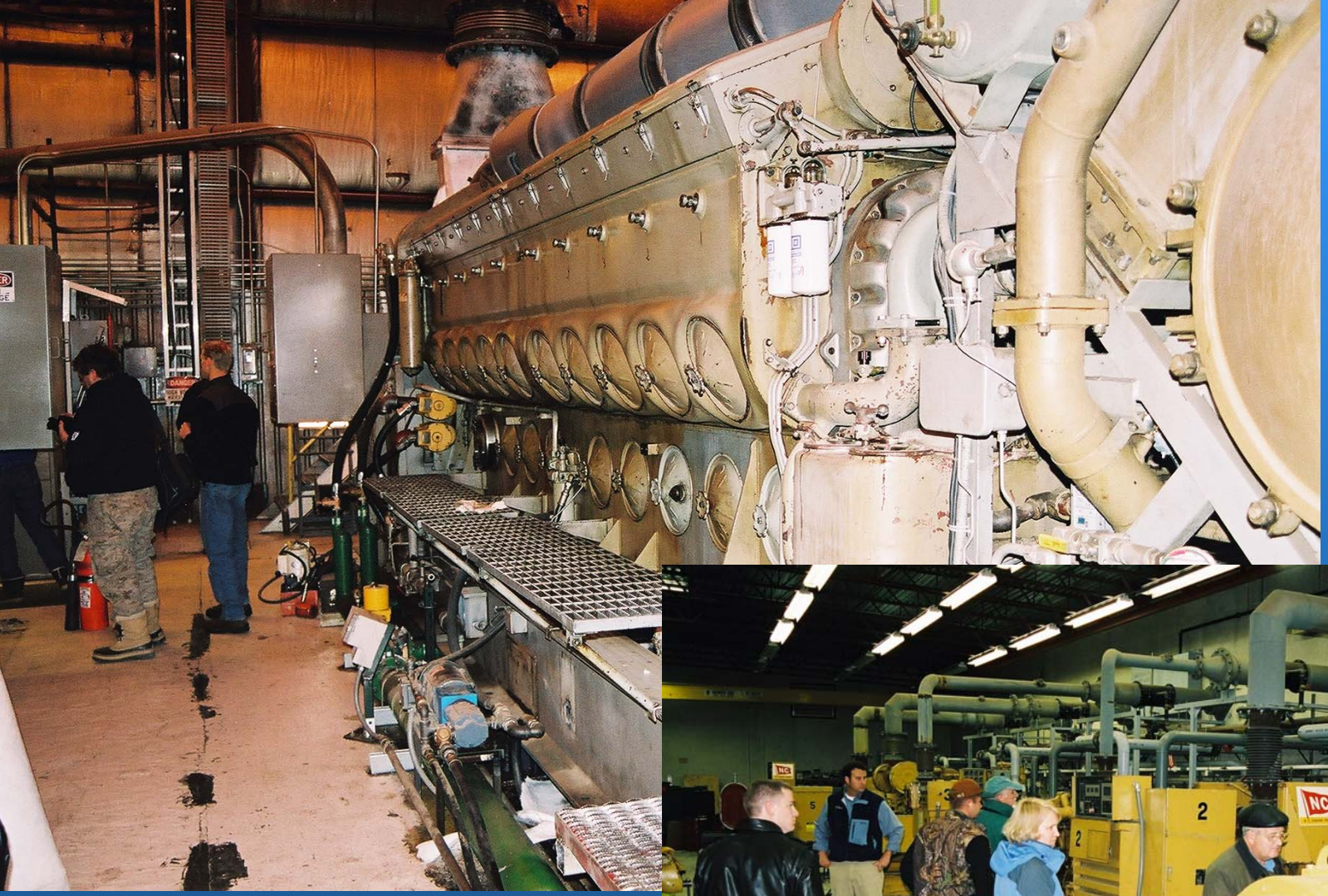
AVEC

AVEC
OCT 4

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

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
2 NRG #40 Anem, mph
3 No Sensor
4 No Sensor
5 No Sensor
6 No Sensor
7 #200P Wind Vane
8 No Sensor
9 NRG 110S Temp, F
10 No Sensor
11 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	F
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	6:50:00 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	67.5	67.5		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 TI	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
2 NRG #40 Anem, mph
3 No Sensor
4 No Sensor
5 No Sensor
6 No Sensor
7 #200P Wind Vane
8 No Sensor
9 NRG 110S Temp, F
10 No Sensor
11 No Sensor
12 No Sensor

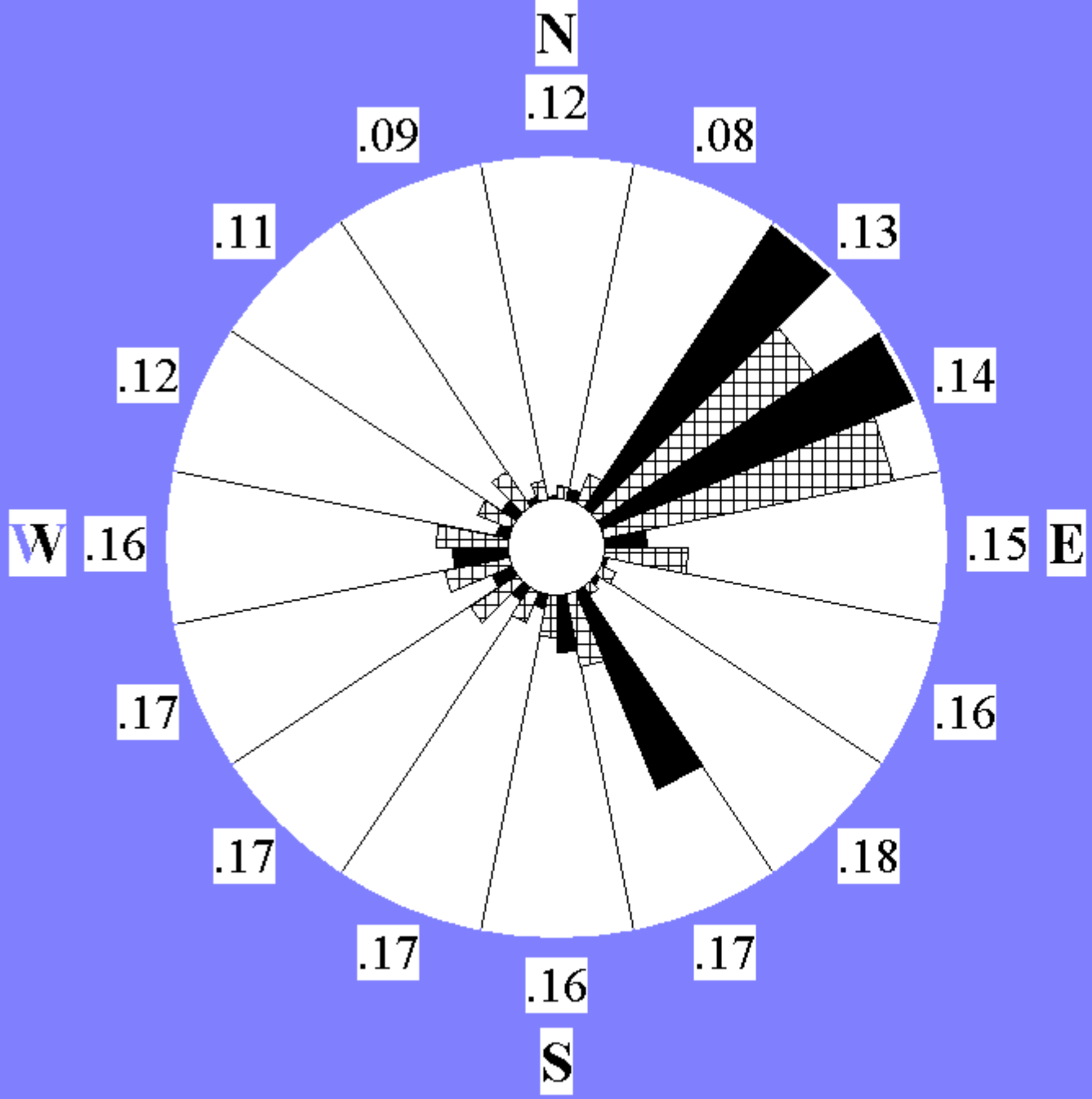
10/11/2003 to 4/30/2004

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	F
Intervals with Valid Data	29232	29232	29232	29232
Average Filtered Data	14.25	12.34	80.06	19.48
Average for All Data	14.25	12.34	80.06	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	6:50:00 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	67.5	67.5		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 TI	0.17	0.19		
Wind Speed Direction			ENE	



March 2004

Wind Rose Ch 1, 7

SITE 0064

New Stuyahok

Site Information:

Project: AVEC

Location: Near airport runway

Elevation: 227

Anemometer on channel 1:

NRG #40 Anem, mph

Height: 29.4 m

Serial #:

Vane on channel 7:

#200P Wind Vane

Height: 29.4 m

Serial #:

Outer Numbers are Average TIs for speeds greater than 10 mph

Inner Circle = 0%

Outer Circle = 30%

Percent of Total Wind Energy

Percent of Total Time

Site Information:

Project: AVEC

Location: Near airport runway and taxiway

Elevation: 227

Sensor on channel 1:

NRG #40 Anem, mph

Height: 29.4 m

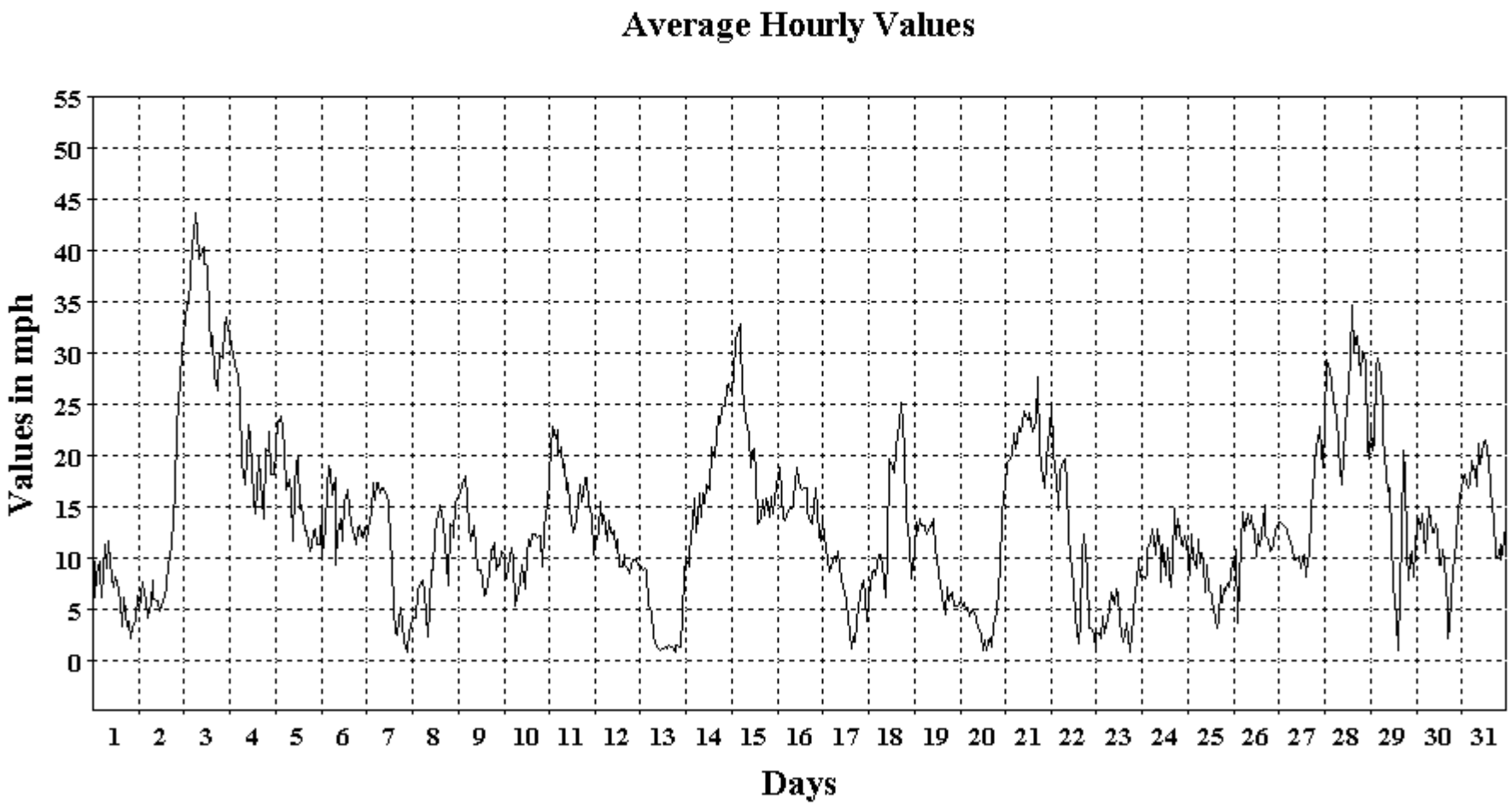
Serial #:

December 2003

Hourly Averages Graph Ch 1

SITE 0064

New Stuyahok

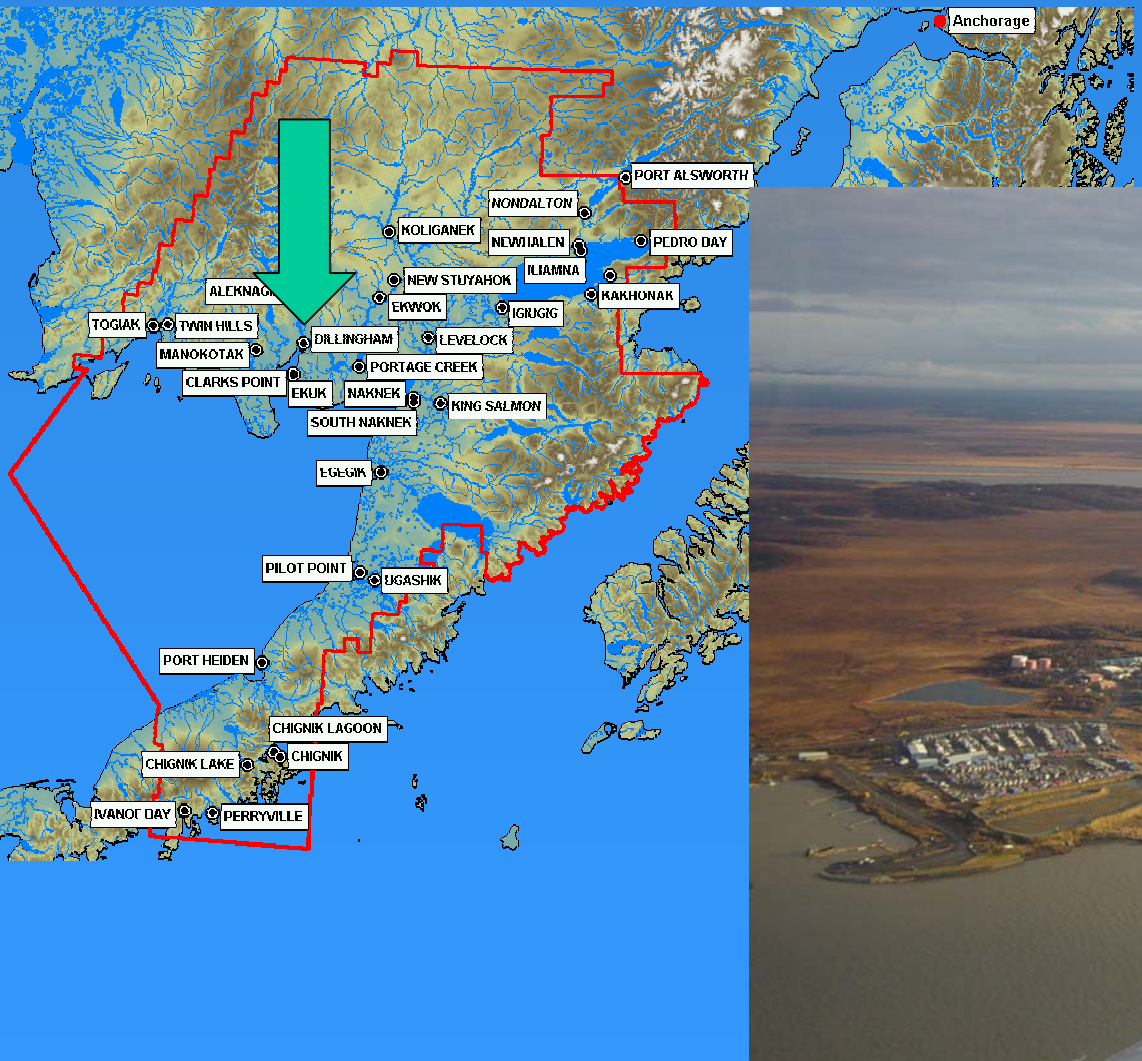


Average Value: 13.5

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

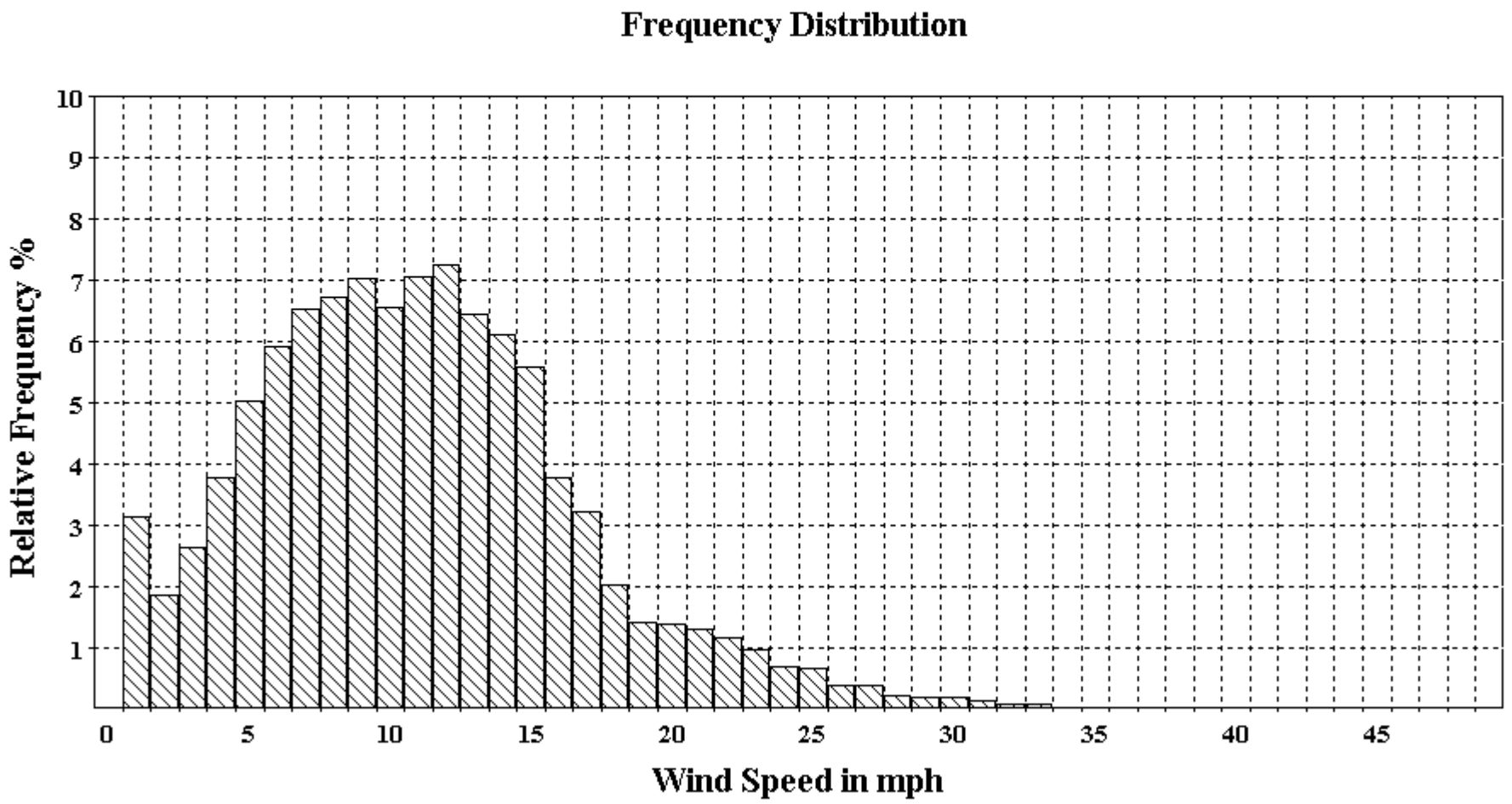
Serial #: SN:

4/22/2004 to 8/19/2004

Frequency Distribution Ch 1

SITE 2259

Dillingham - Kanakanak Hospital



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

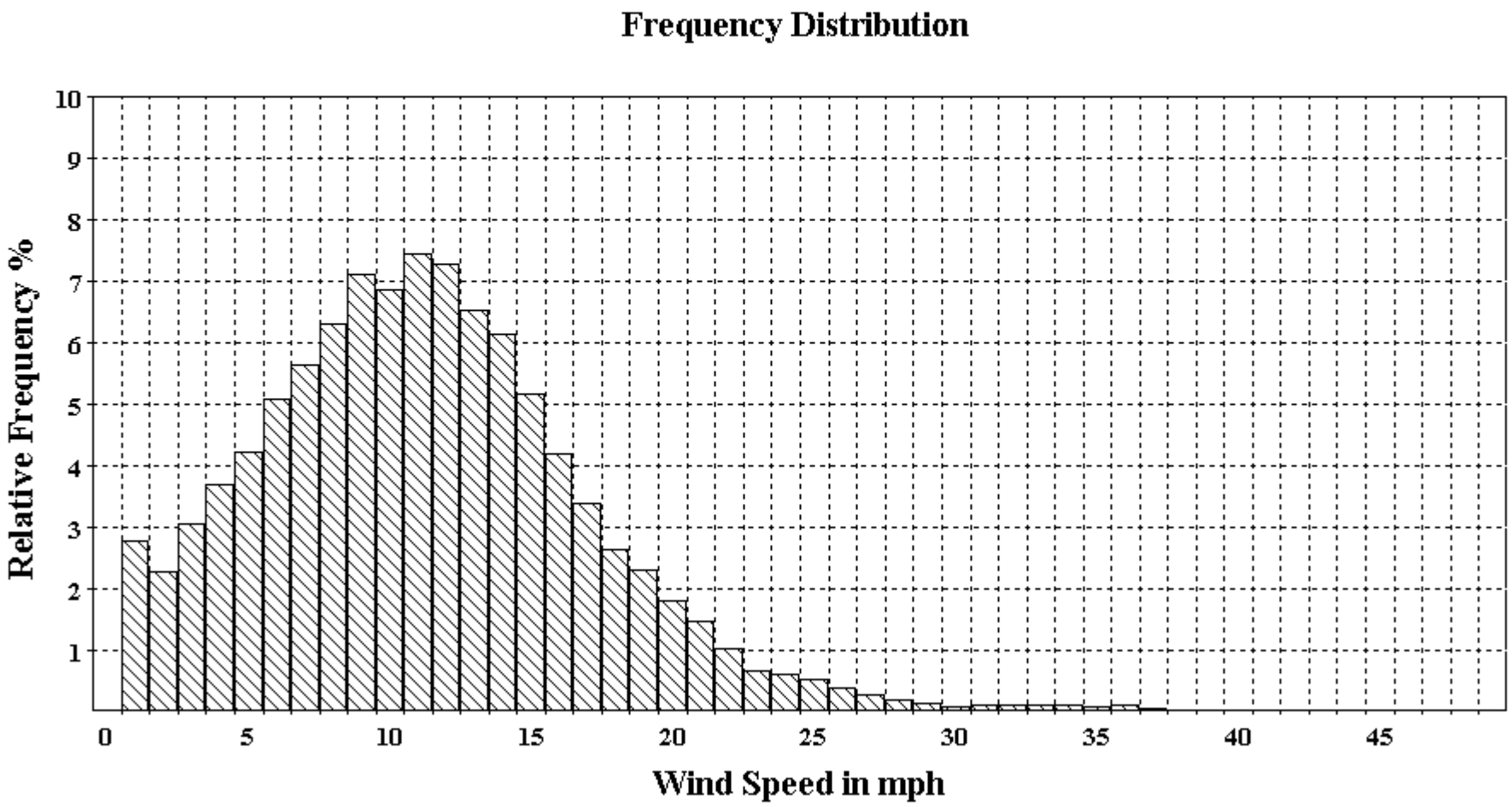
Serial #: SN:

4/22/2004 to 8/19/2004

Frequency Distribution Ch 1

SITE 2255

Dillingham - Windriver Road



Generated Friday, October 15, 2004

Total 10-minute intervals: 17280 Intervals used in calculations: 17147 Percent data used: 99.2

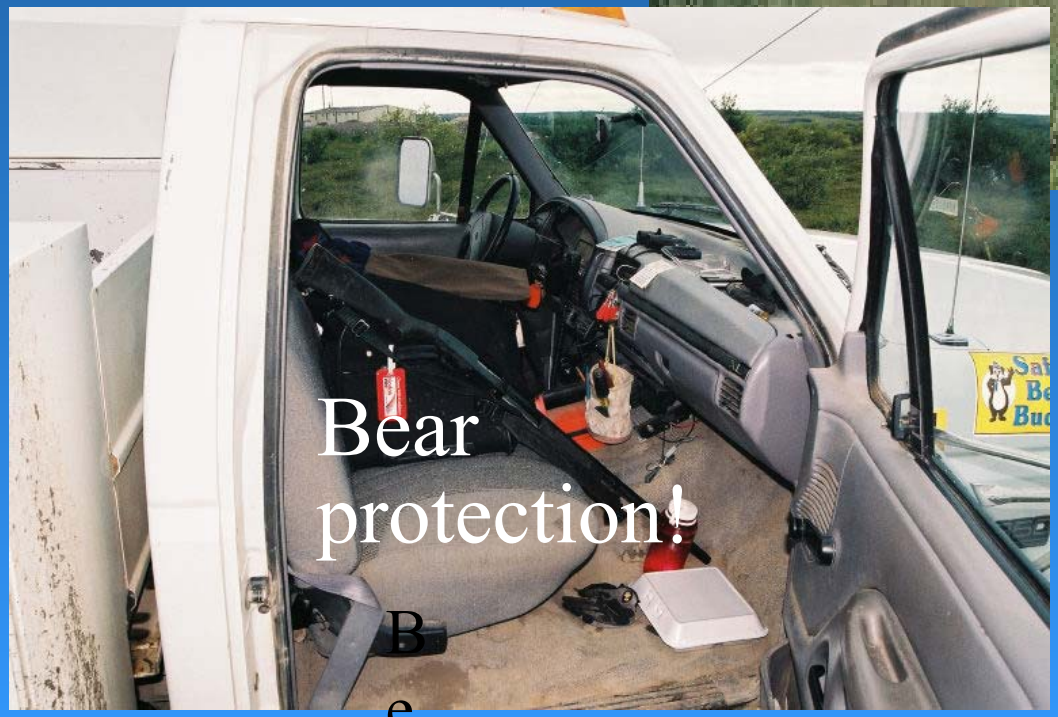
NRG Systems SDR Version 4.28

Naknek, Alaska

July 26-27, 2004

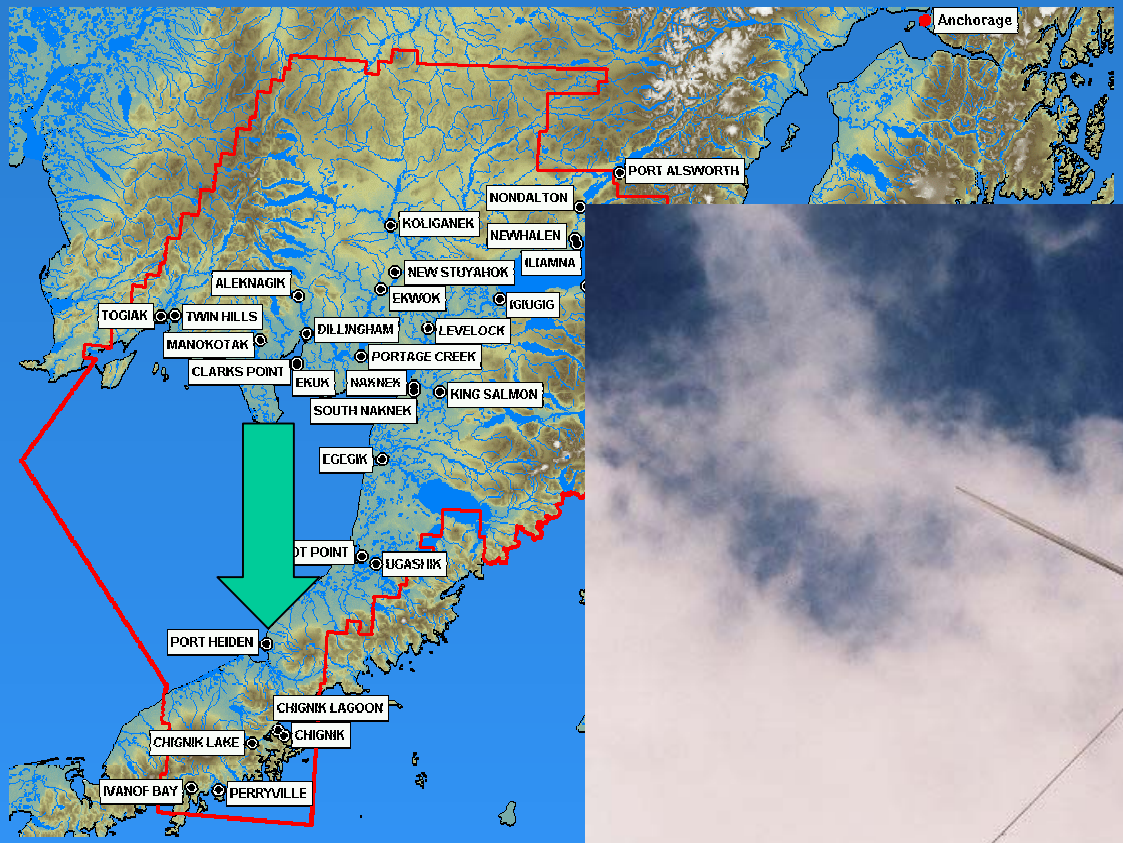
Utility: Naknek Electric Association

Another special Alaska problem…



Port Heiden, Alaska

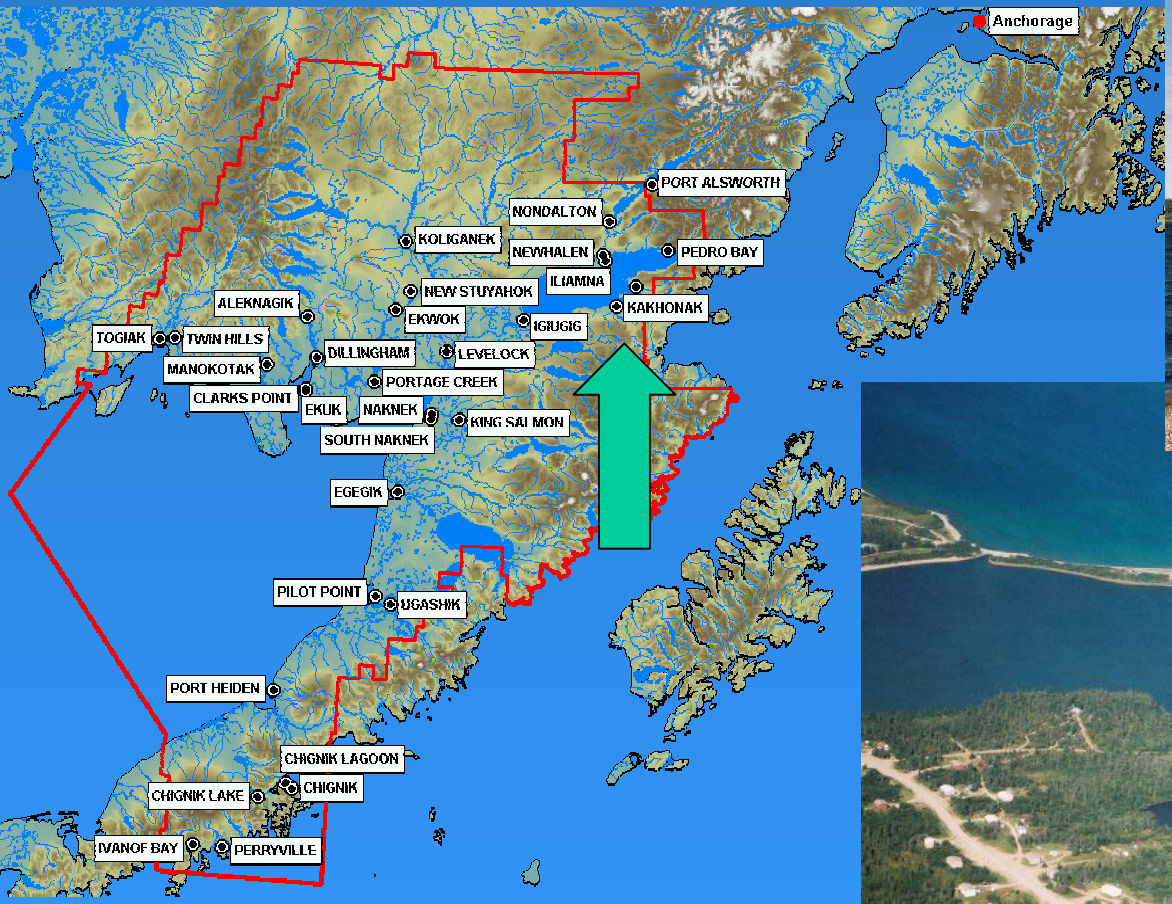
August 6, 2004



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

Kokhanok, Alaska

August 11-12, 2004

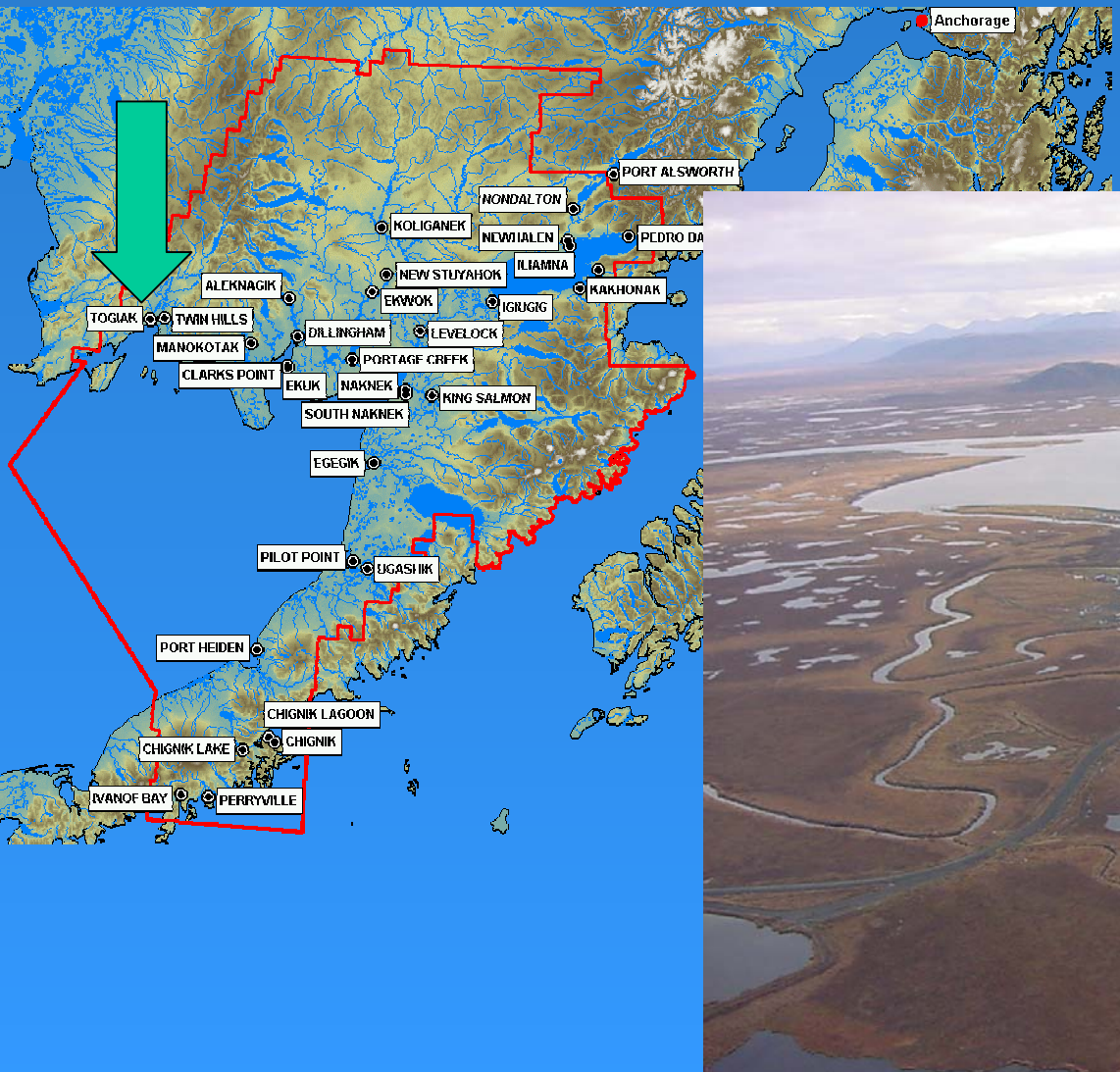


N715HL

Togiak, Alaska

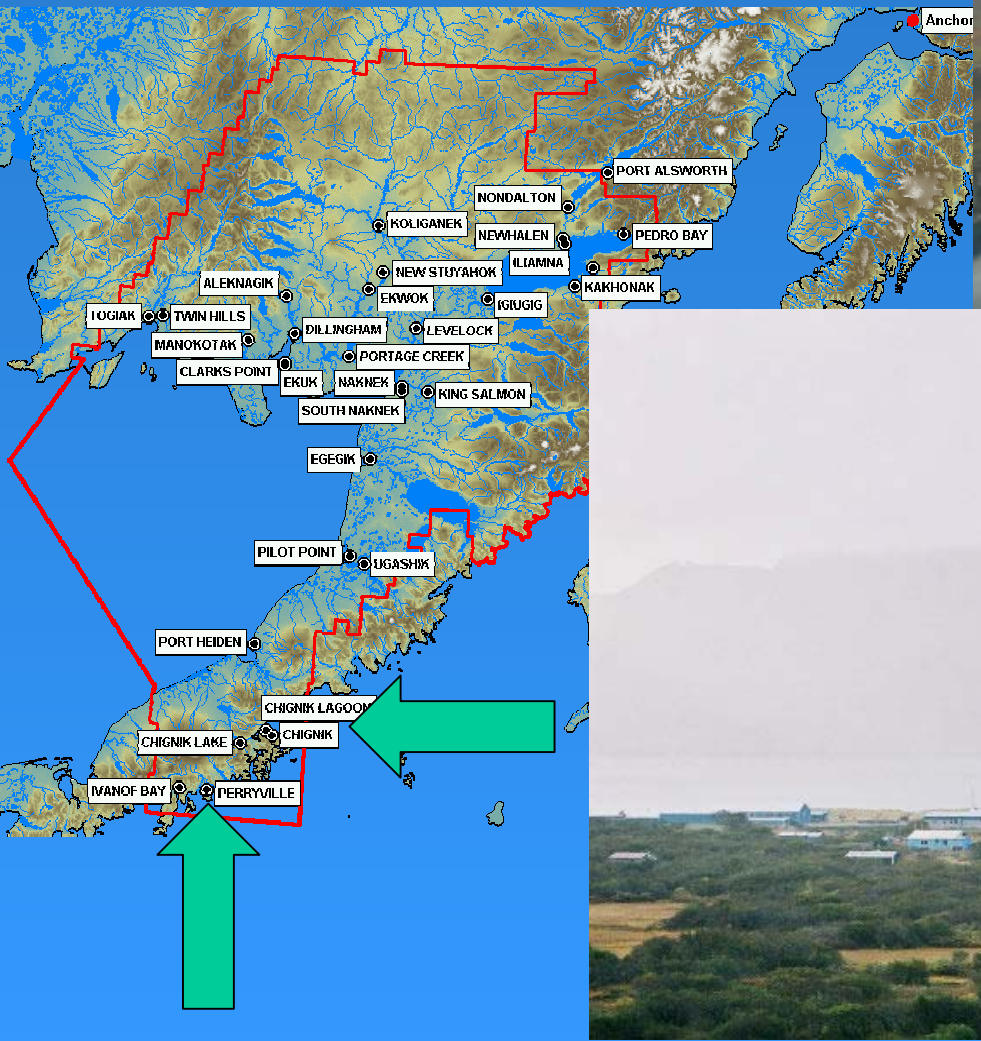
August 30-31, 2004

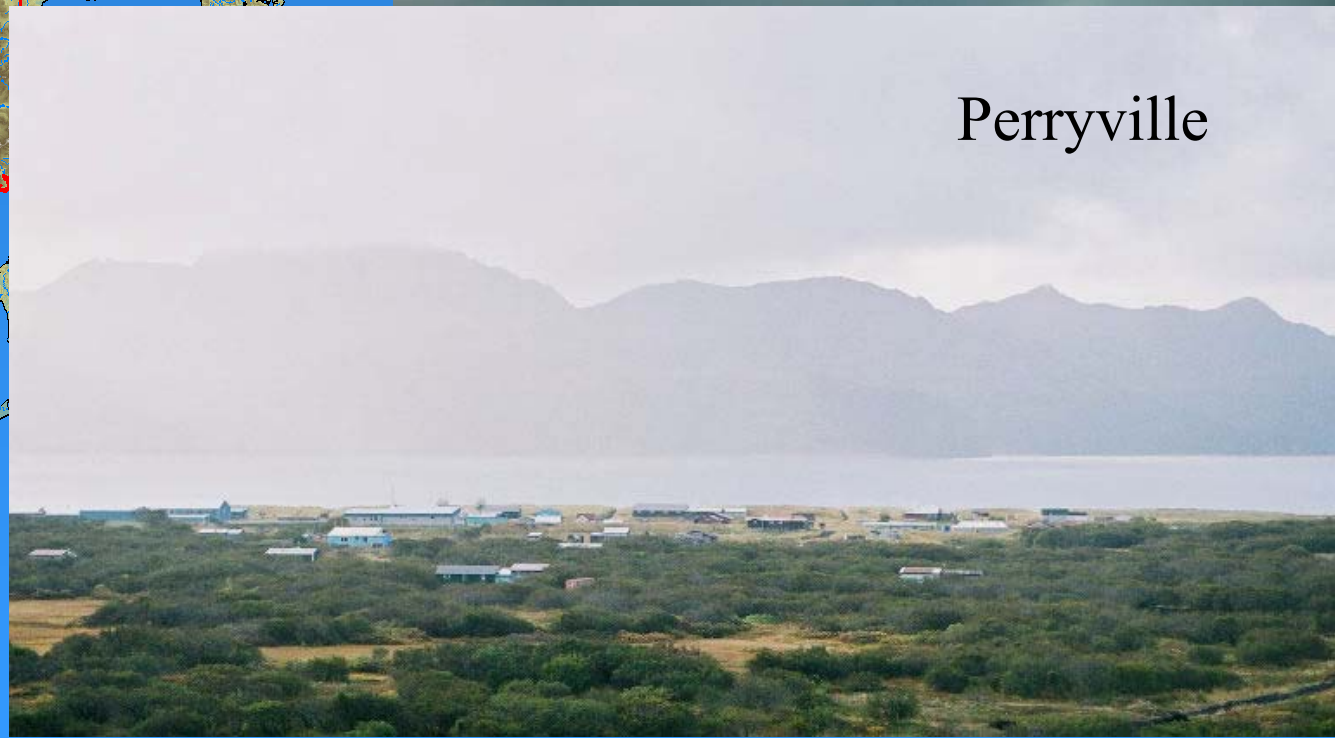
Utility: Alaska Village Electric Coop



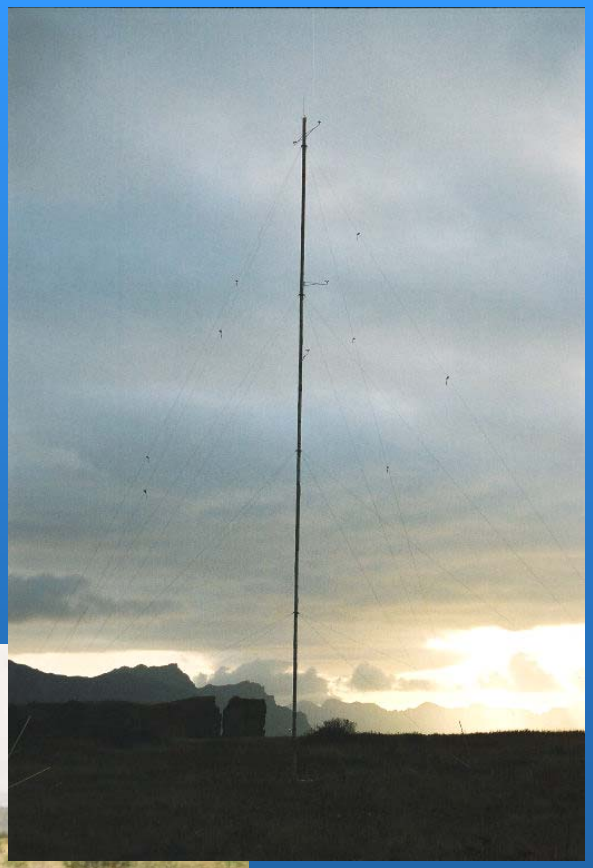
Chignik Lagoon and Perryville

October 8-10, 2004

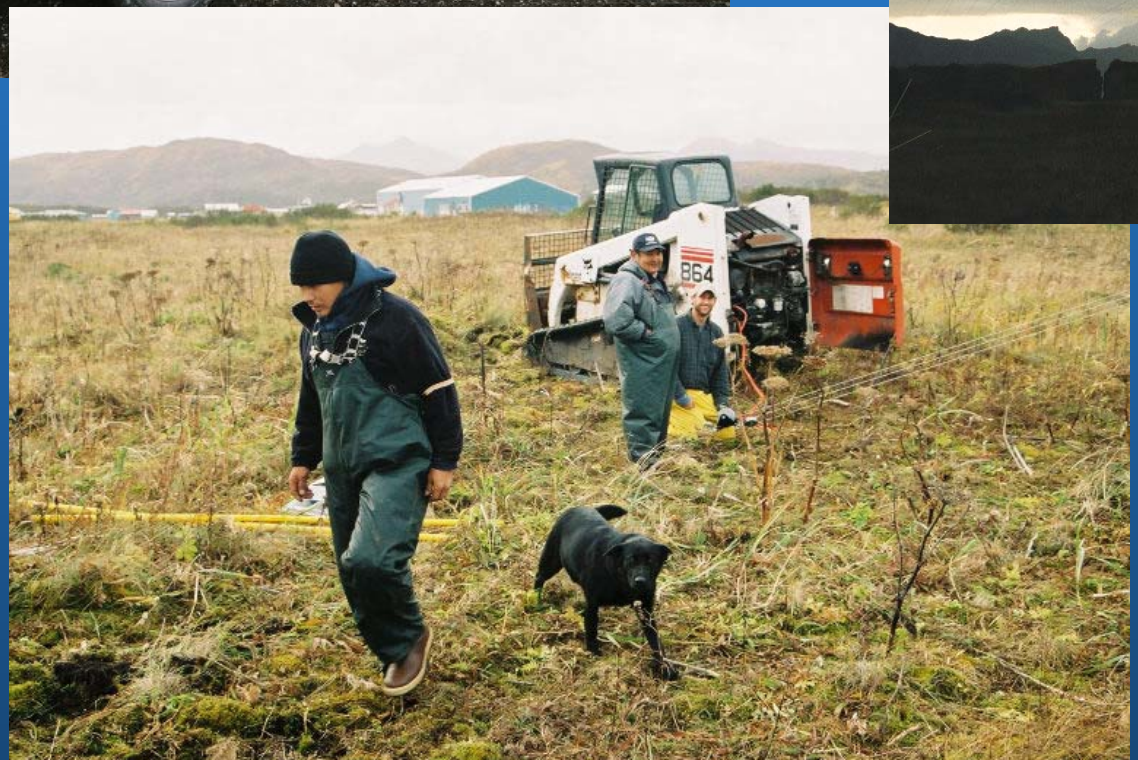




Chignik Lagoon



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

Bering Air
Bering Air

MAGELIS
Overline
Gen/ Eng. Status
System Status
Request Cap
Feeder Ctrl/ Status
24 Hour Demand
Terminal Access
10:45:19
10/02/2004
1000
900
800
700
600
500
400
300
200
100
Hour 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours Ago ---->
Diesel Load (Last 5 Min)
278 KW
On-Line Capacity
500 KW
Town Load (Last 5 Min)
347 KW
Oil Change Overdue G1
06/08/04 07:06:57 ACK
Pg 01