# Native Village of Eyak

## Wind Energy Feasibility Study

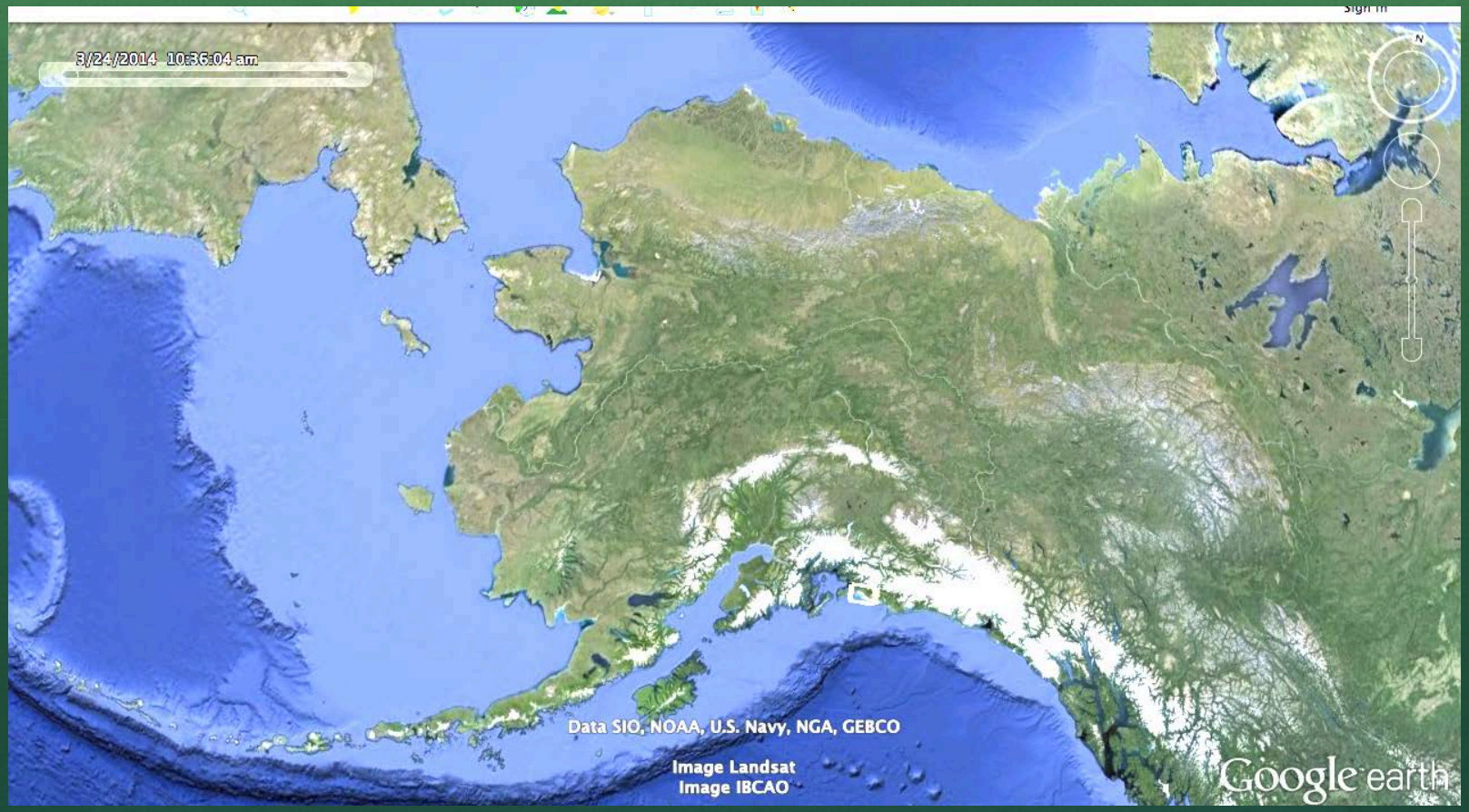
A summary of Sites evaluated for development.

John C. Whissel
Director
Department of the Environment and Natural Resources

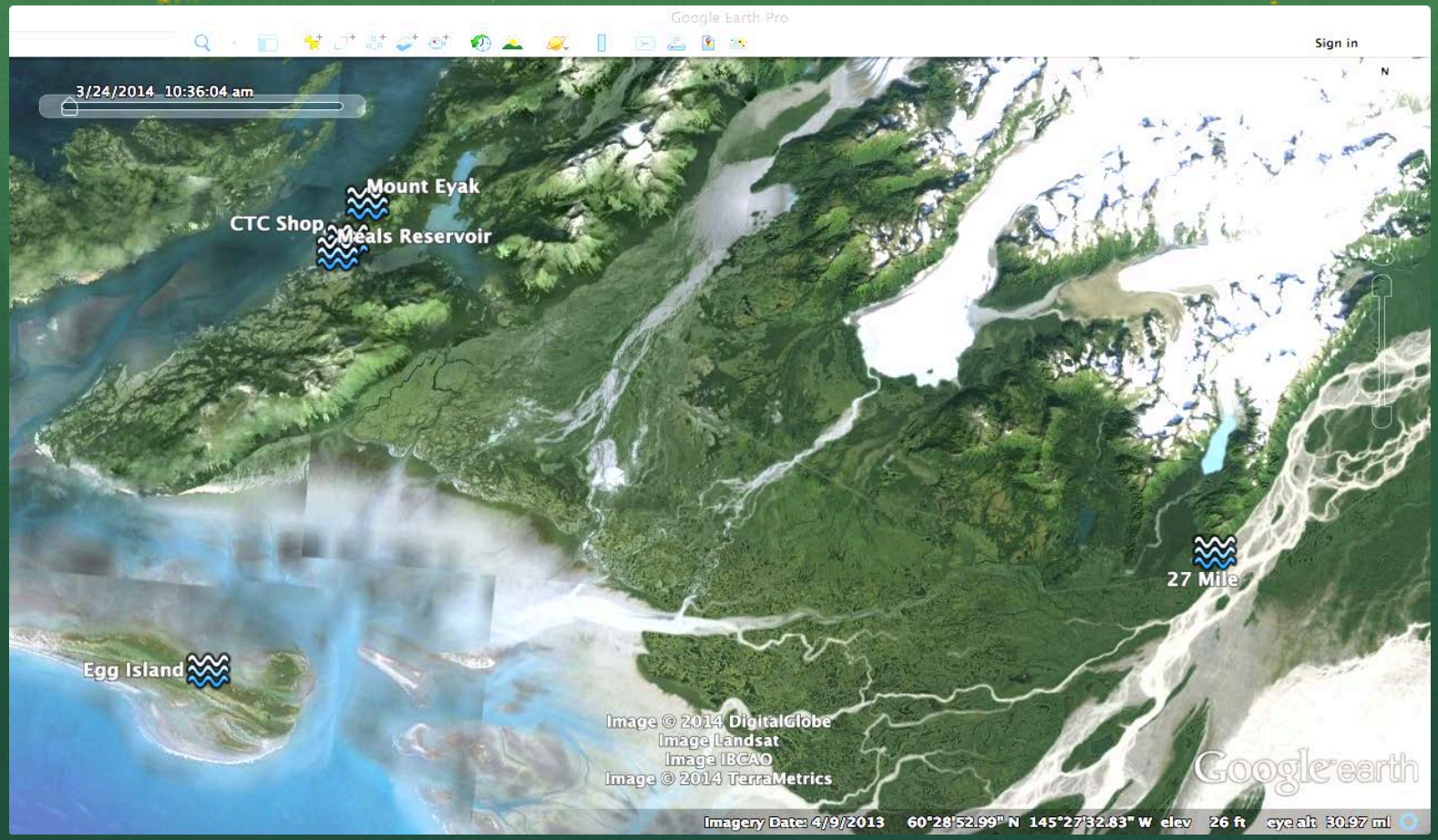
# Background

- Cordova, AK is a rural, remote, landlocked community in Southcentral Alaska, located between Prince William Sound and the Copper River Delta
- Electricity is generated by two run-of-the-river hydro power plants
- During winter months, hydro is supplemented by diesel generators.  Electricity can cost over $0.50/kwh.
- Wind increases dramatically during winter, providing the potential to offset diesel use with wind.

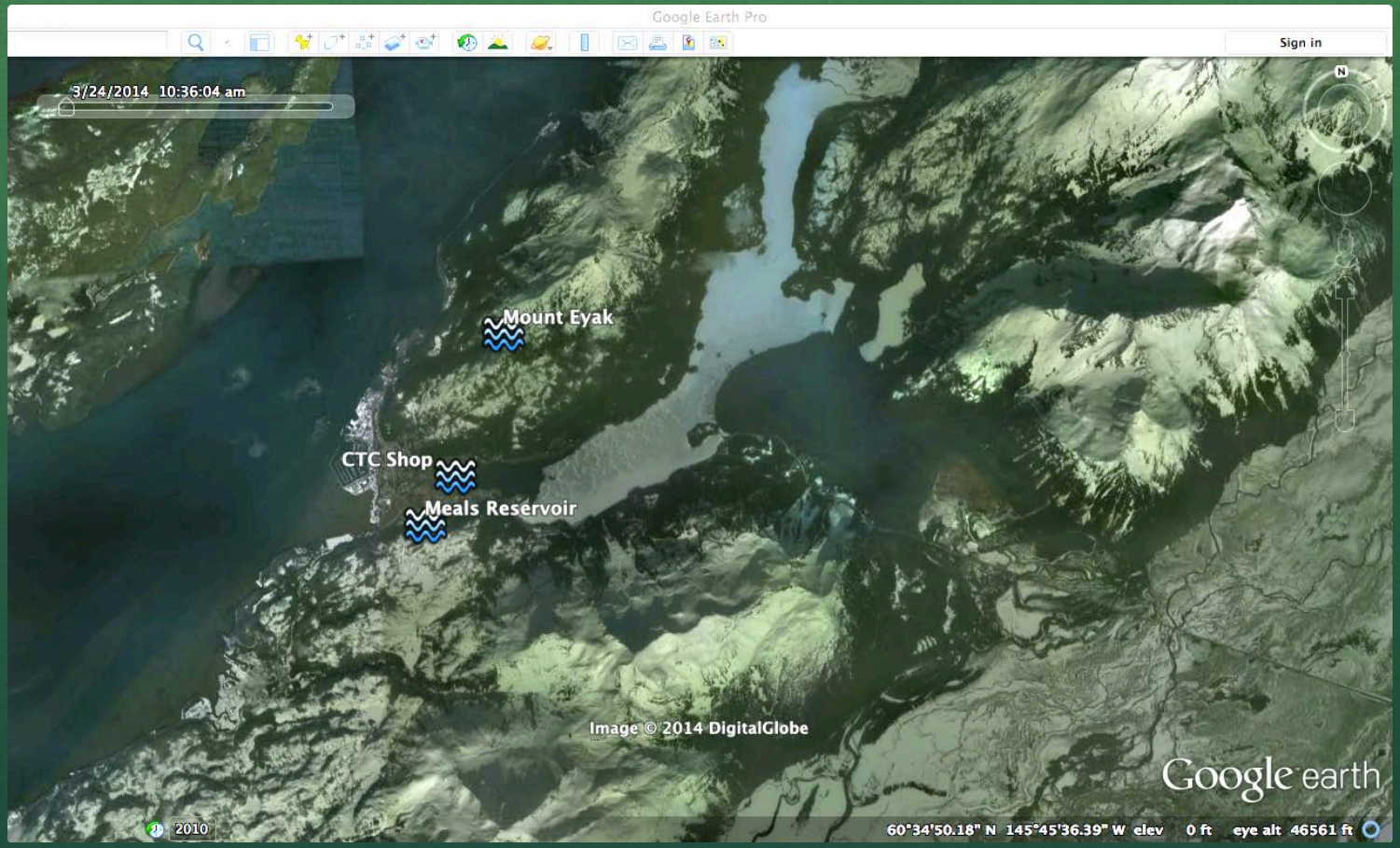
# Study Area


3/24/2014 10:36:04 am
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO
Google earth

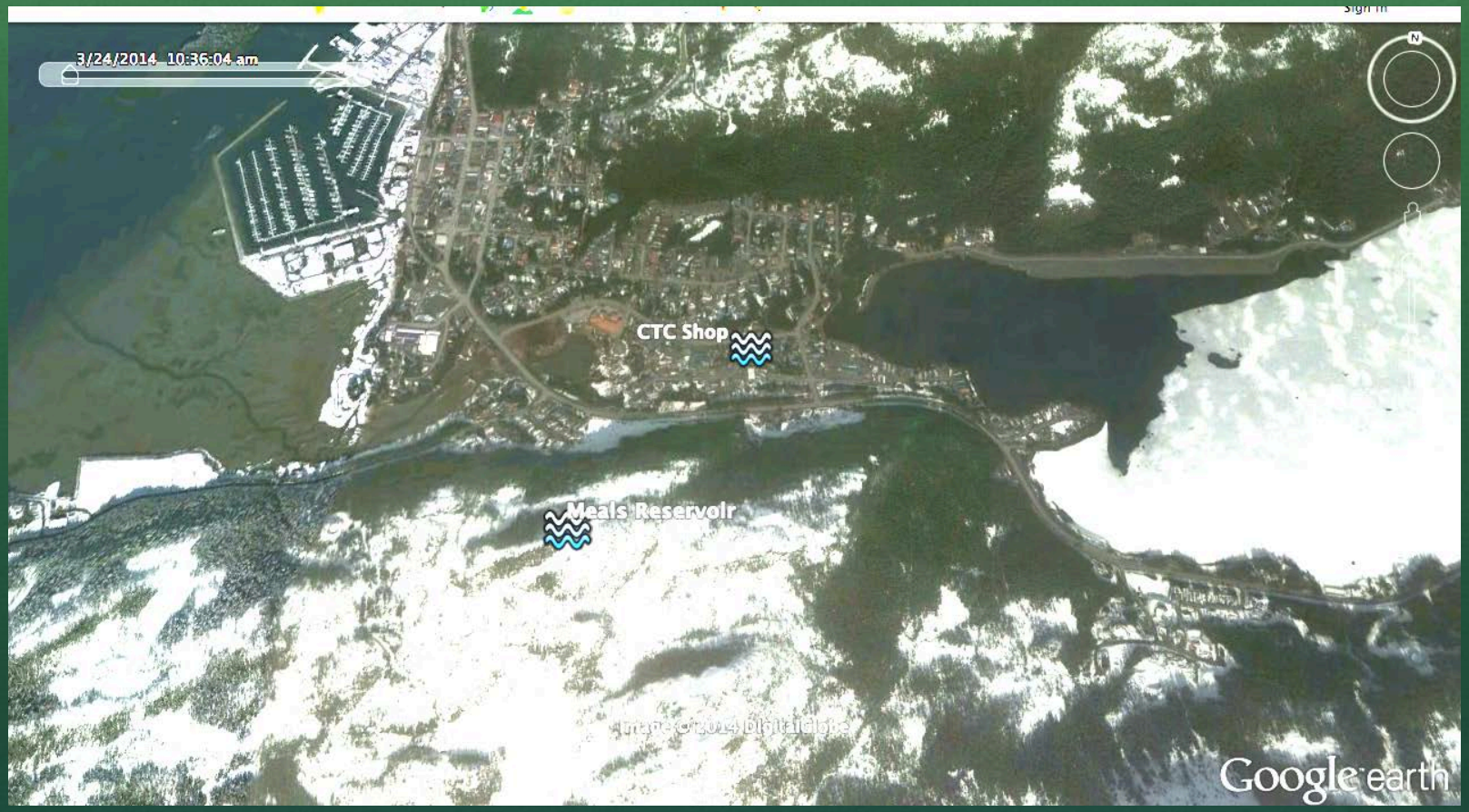
# Study Area


Google Earth Pro
Sign in
3/24/2014 10:36:04 am
N
Mount Eyak
CTC Shop
Meals Reservoir
27 Mile
Egg Island
Image © 2014 DigitalGlobe
Image Landsat
Image IBCAO
Image © 2014 TerraMetrics
Google earth
Imagery Date: 4/9/2013 60°28'52.99" N 145°27'32.83" W elev 26 ft eye alt 30.97 mi

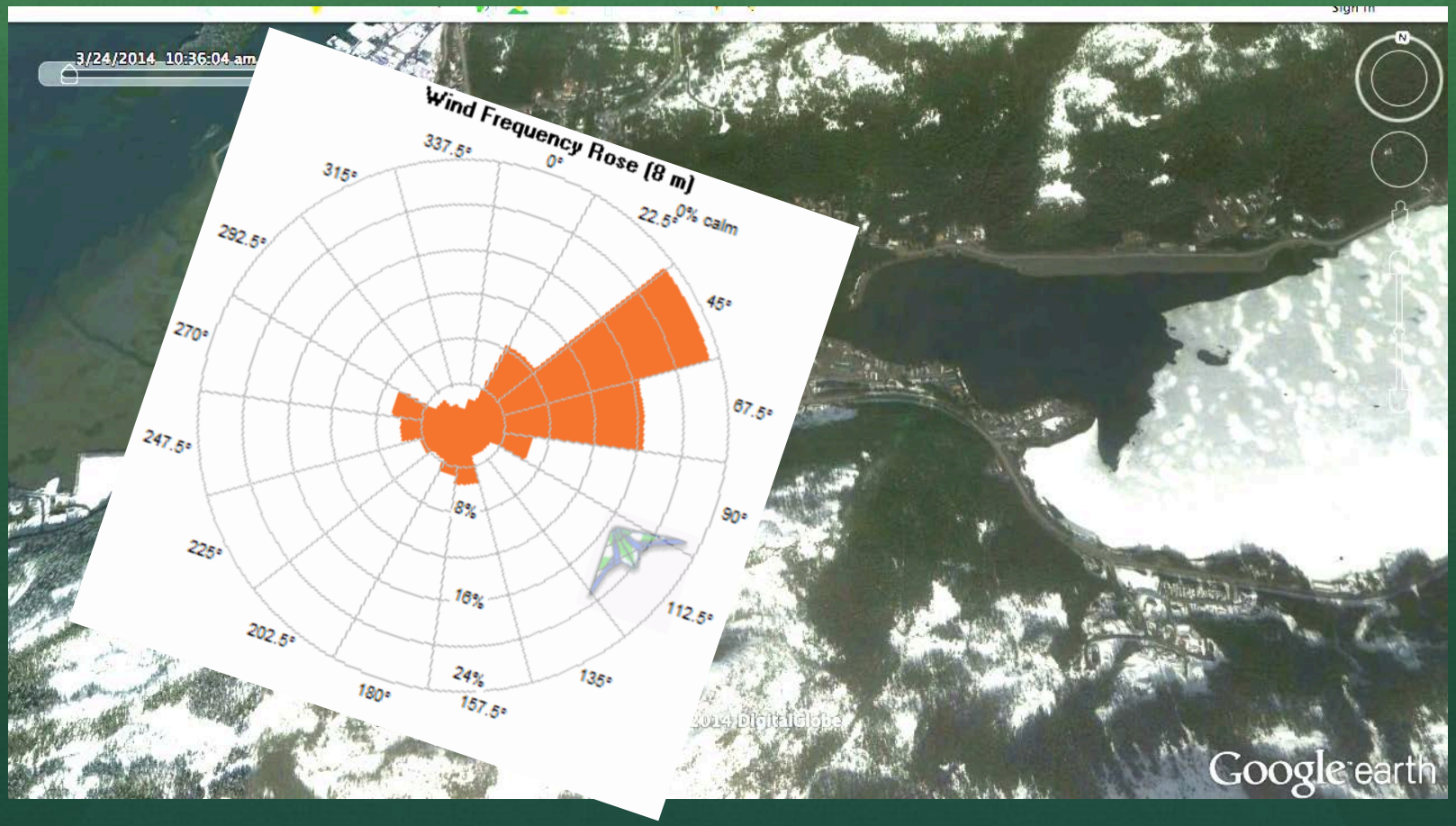
# Cordova Sites



# Meals Reservoir & CTC Shop



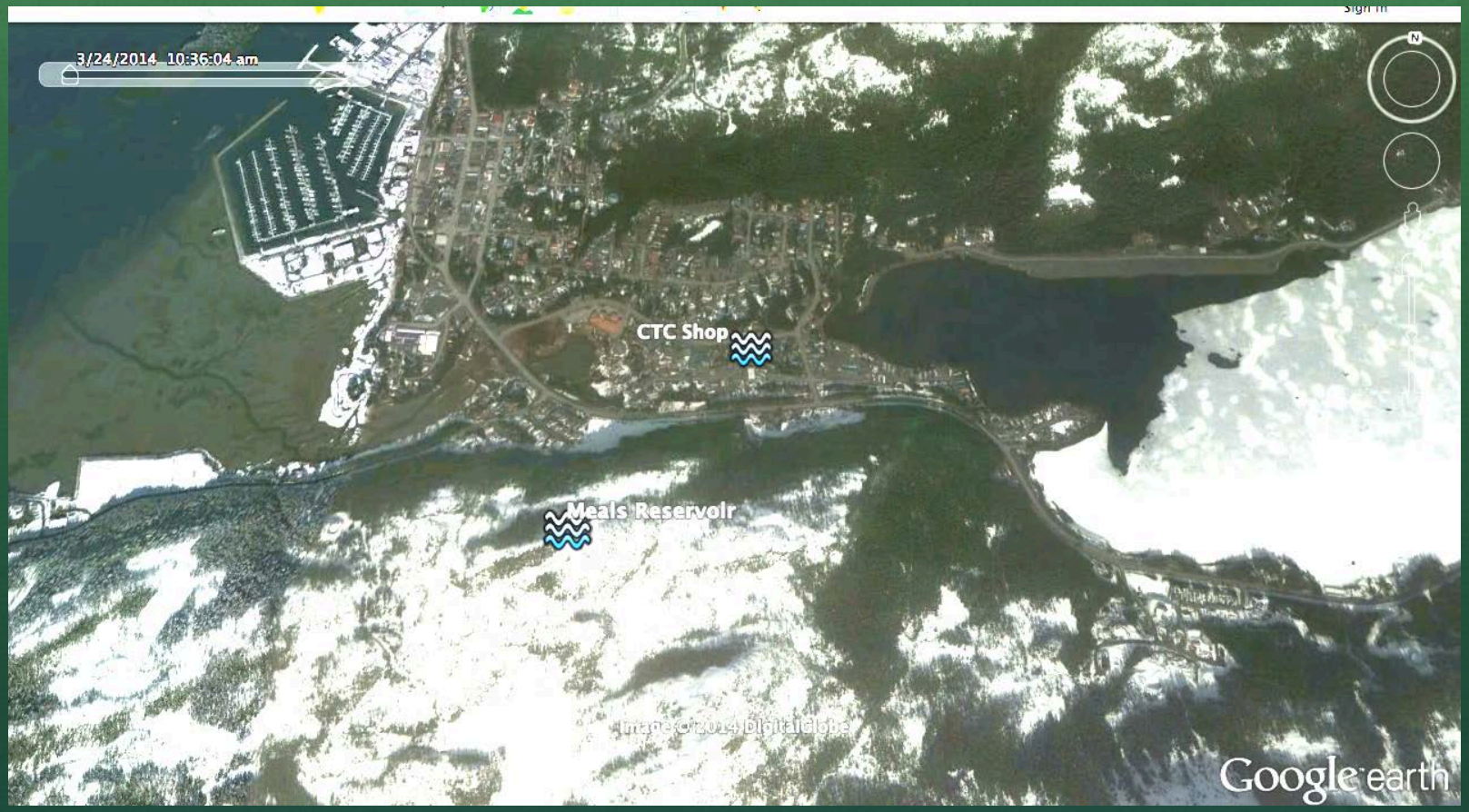
# Meals Reservoir



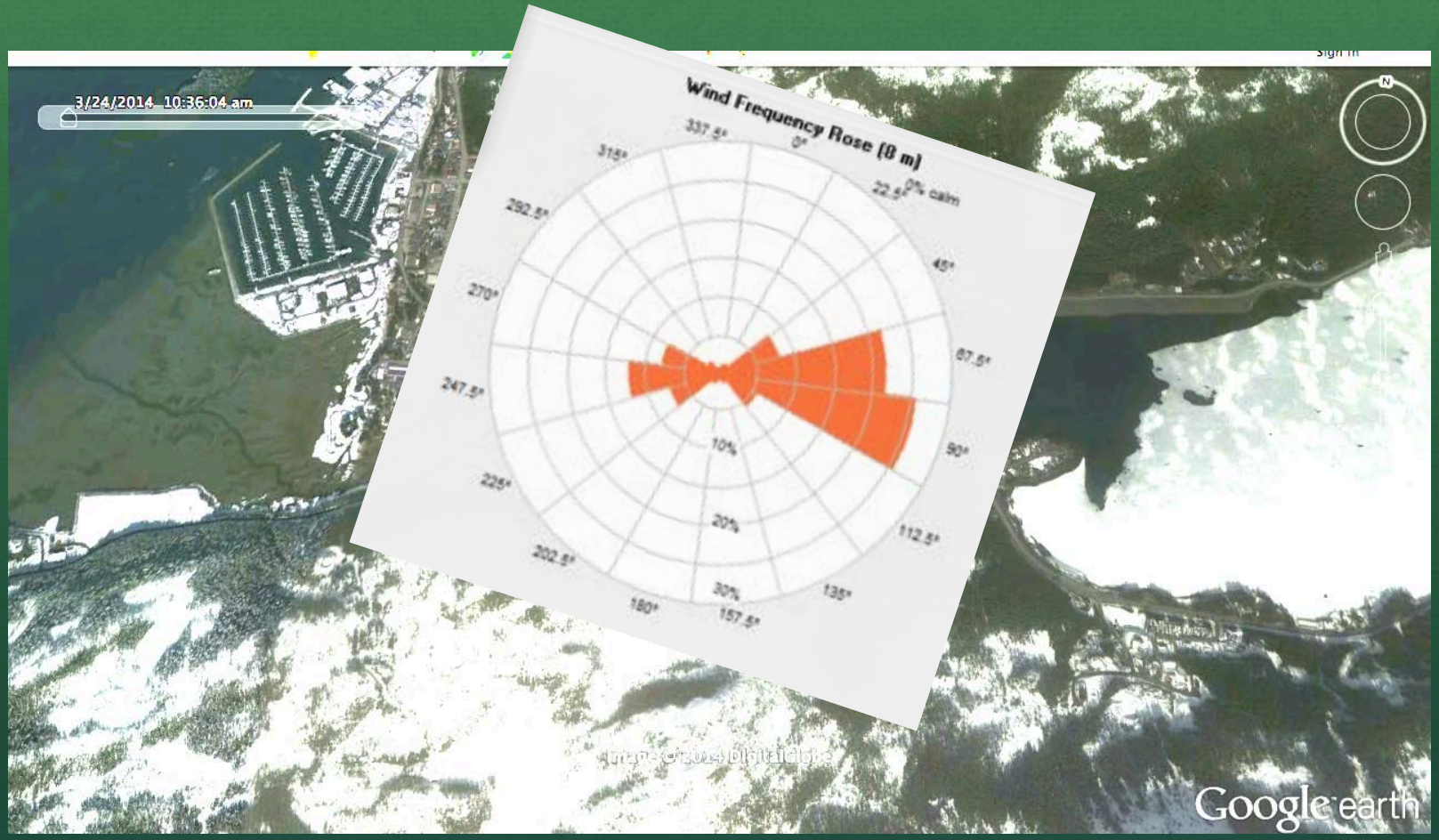
# Meals Reservoir

- Meals reservoir has excellent resources, however the site of our MET tower is adjacent to a steep dropoff, adding to turbulence.
- Other sites near the current site will be evaluated to determine the effects of the dropoff and turbulence

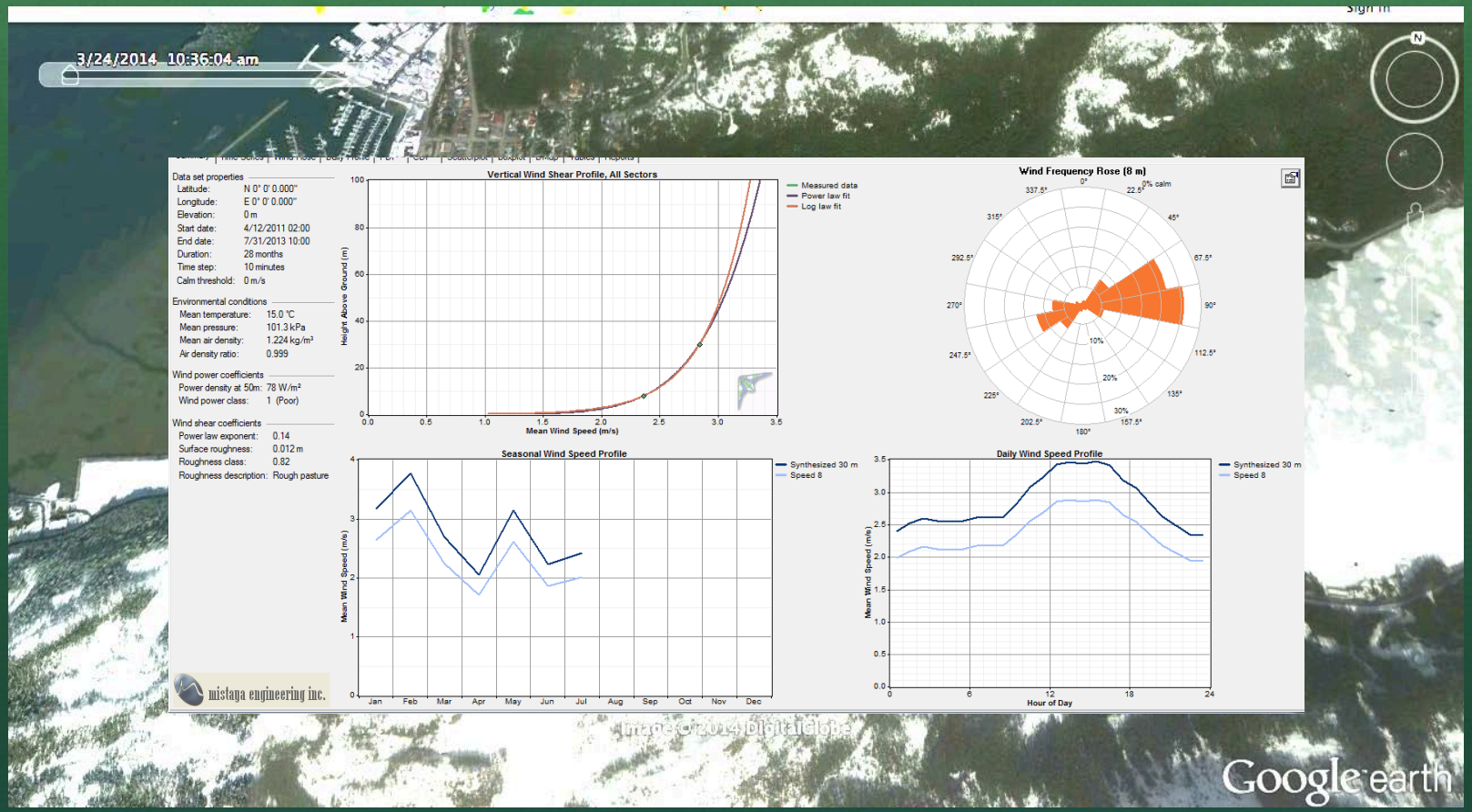
# Meals Reservoir & CTC Shop



# CTC Shop


3/24/2014 10:36:04 am
Wind Frequency Rose (8 m)
0% calm
10%
20%
30%
337.5°
0°
22.5°
45°
67.5°
90°
112.5°
135°
157.5°
180°
202.5°
225°
247.5°
270°
292.5°
315°
Image © 2014 DigitalGlobe
Google earth

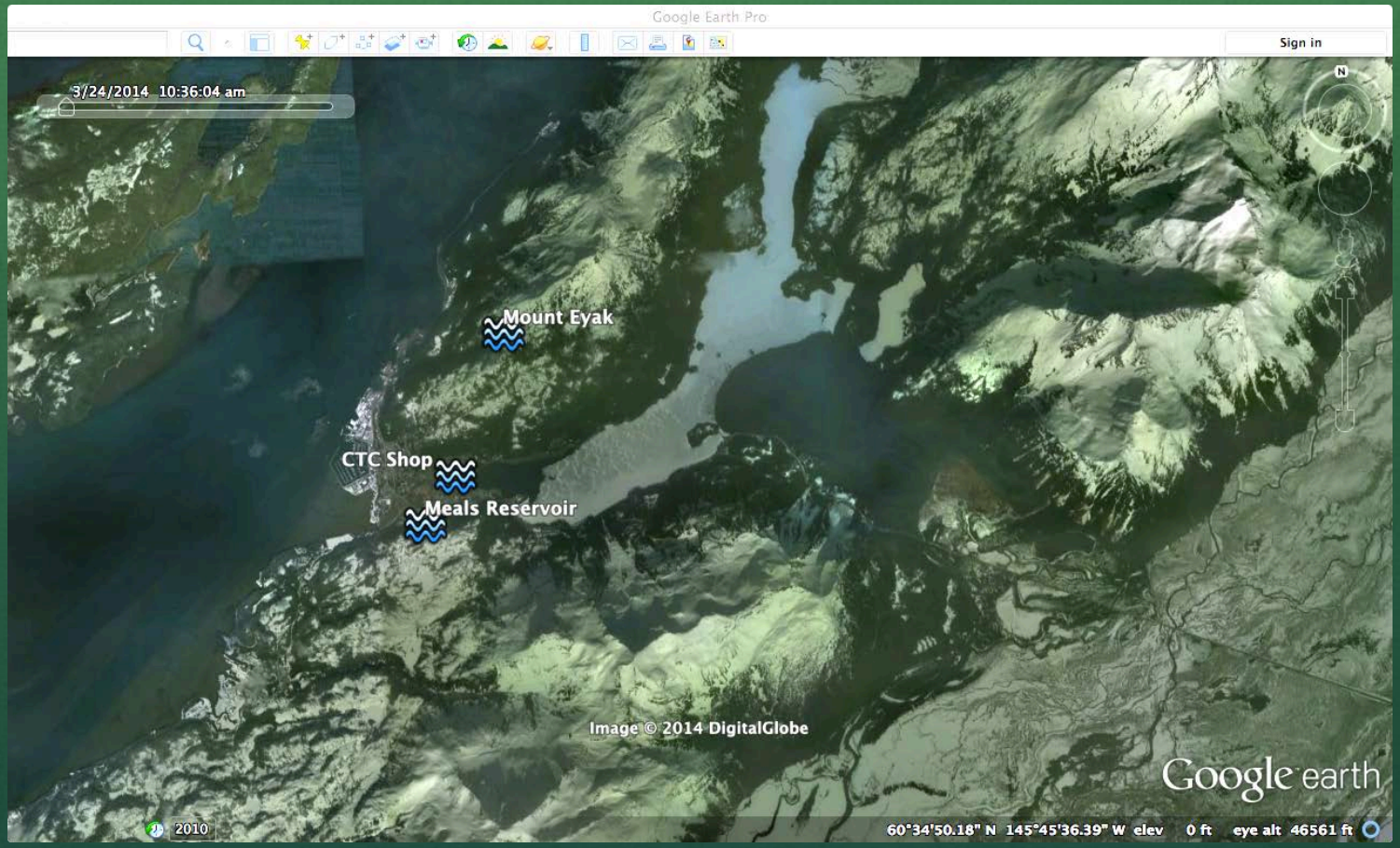
# CTC Shop


3/24/2014 10:36:04 am
Data set properties
Latitude: N 0° 0' 0.000"
Longitude: E 0° 0' 0.000"
Elevation: 0 m
Start date: 4/12/2011 02:00
End date: 7/31/2013 10:00
Duration: 28 months
Time step: 10 minutes
Calm threshold: 0 m/s
Environmental conditions
Mean temperature: 15.0 °C
Mean pressure: 101.3 kPa
Mean air density: 1.224 kg/m³
Air density ratio: 0.999
Wind power coefficients
Power density at 50m: 78 W/m²
Wind power class: 1 (Poor)
Wind shear coefficients
Power law exponent: 0.14
Surface roughness: 0.012 m
Roughness class: 0.82
Roughness description: Rough pasture
mistaya engineering inc.
Vertical Wind Shear Profile, All Sectors
Height Above Ground (m)
Mean Wind Speed (m/s)
Measured data
Power law fit
Log law fit
Wind Frequency Rose (8 m)
0% calm
Seasonal Wind Speed Profile
Mean Wind Speed (m/s)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Synthesized 30 m
Speed 8
Daily Wind Speed Profile
Mean Wind Speed (m/s)
Hour of Day
Synthesized 30 m
Speed 8
Image © 2014 DigitalGlobe
Google earth

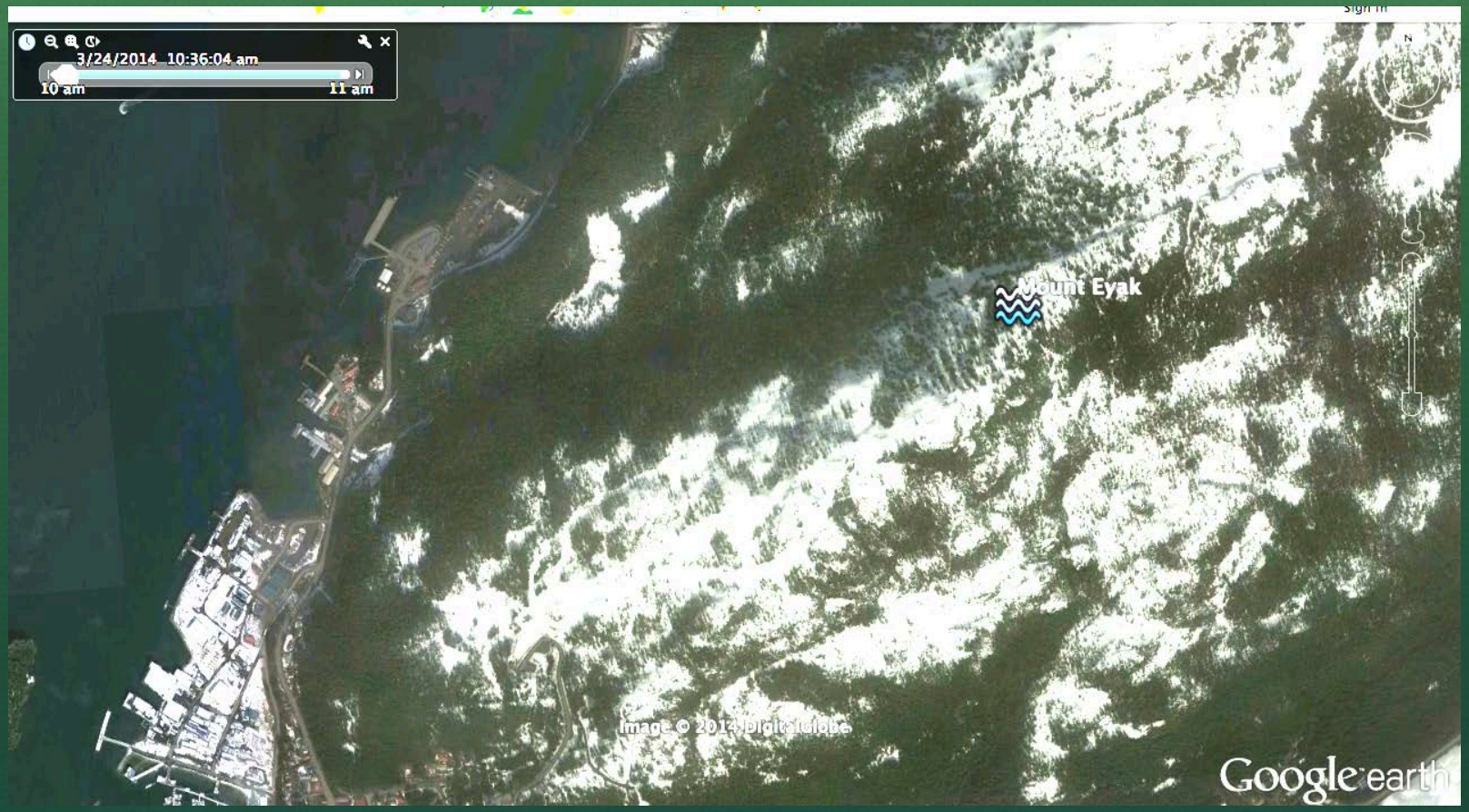
# CTC Shop

- Sensors put up because of ease of deployment
- Surprisingly good resource, but less than others.
- Limited area to develop
- Transmission system adjacent
- Bird conflict issues
- Aviation issues

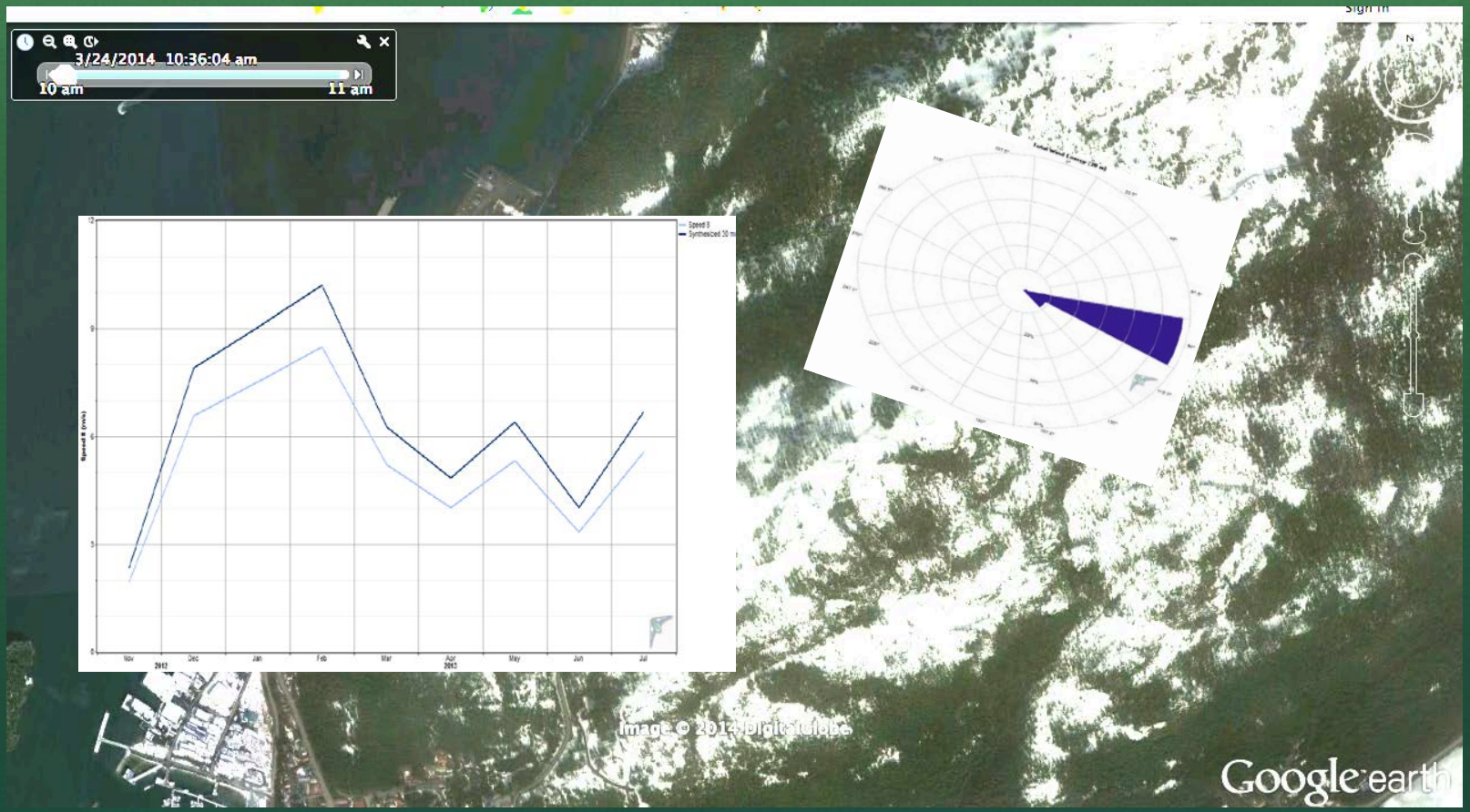
# Cordova Sites



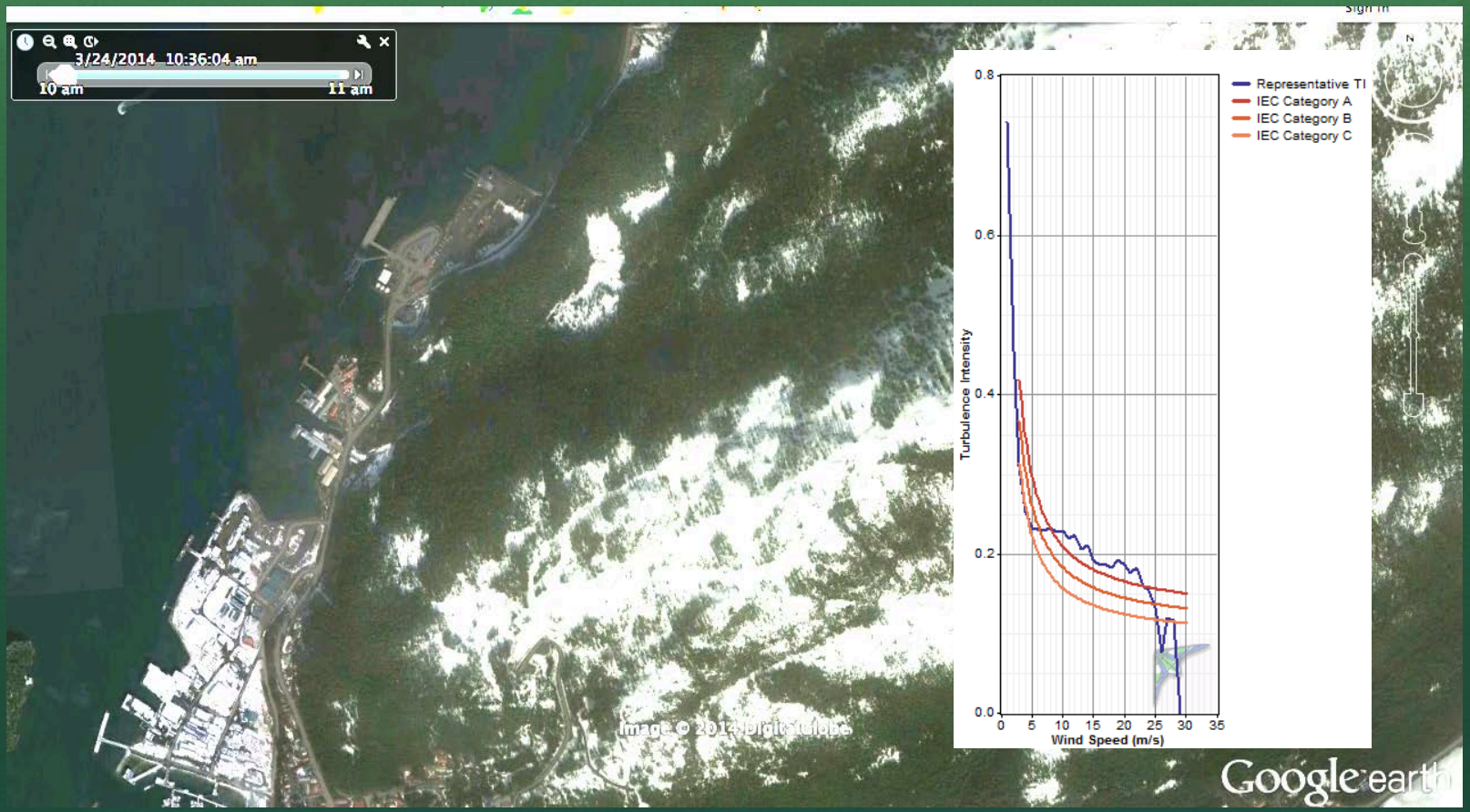
# Mount Eyak


3/24/2014 10:36:04 am
10 am
11 am
Mount Eyak
Image © 2014 DigitalGlobe
Google earth

# Mount Eyak


3/24/2014 10:36:04 am
10 am
11 am
Image © 2014 DigitalGlobe
Google earth

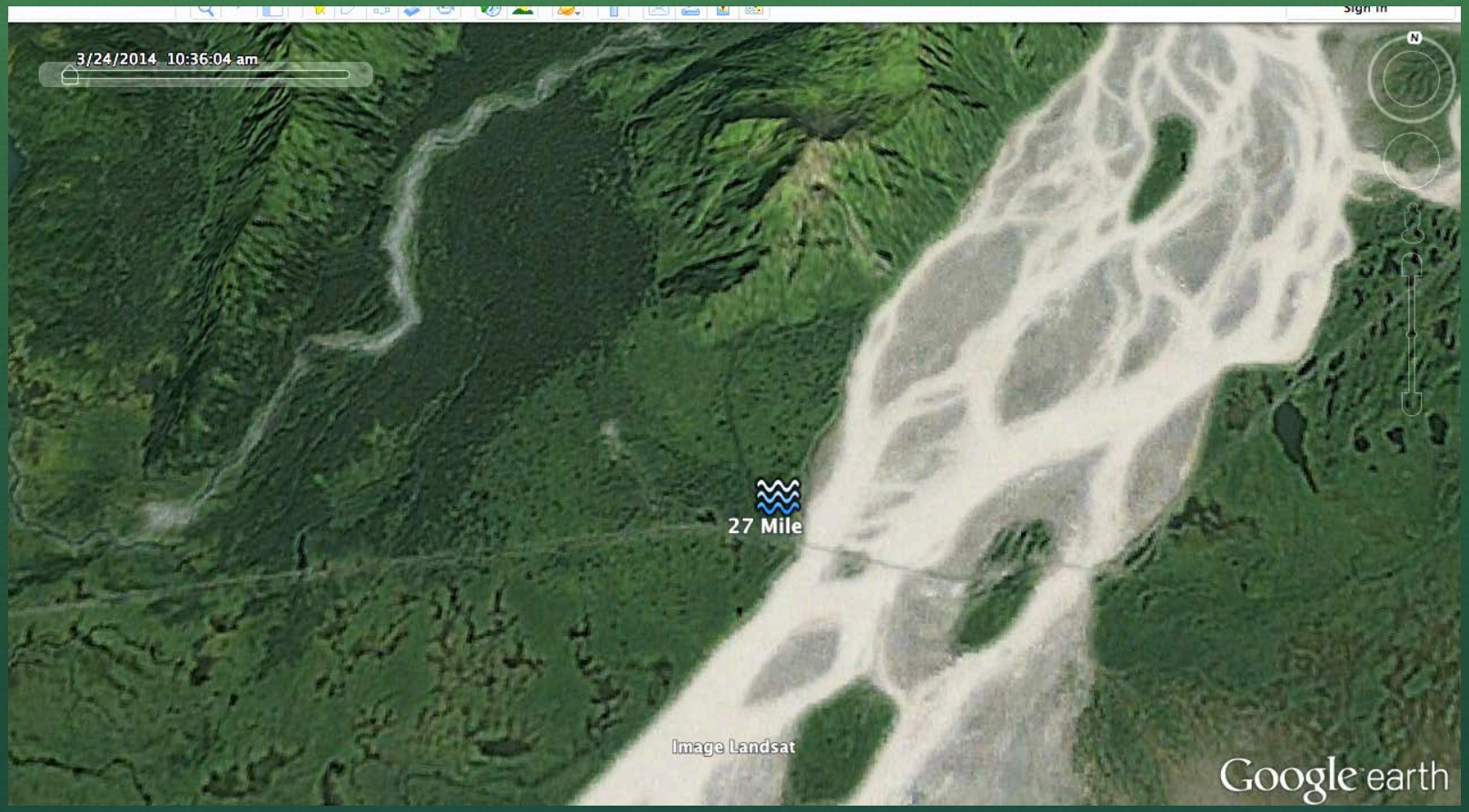
# Mount Eyak


3/24/2014 10:36:04 am
10 am
11 am
Representative TI
IEC Category A
IEC Category B
IEC Category C
Turbulence Intensity
0.0
0.2
0.4
0.6
0.8
0
5
10
15
20
25
30
35
Wind Speed (m/s)
Image © 2014 DigitalGlobe
Google earth

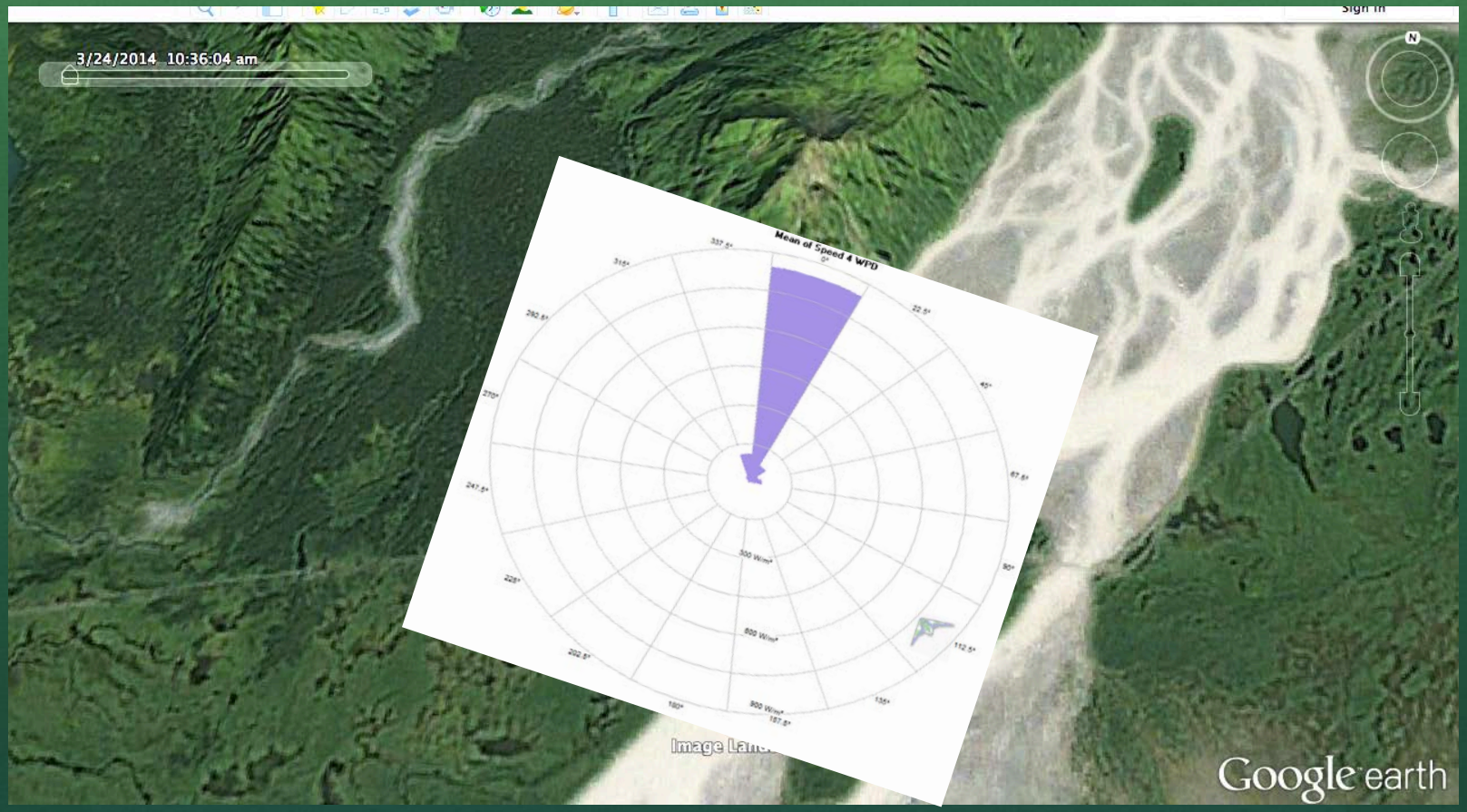
# Mount Eyak

- Excellent resource with less turbulence than other sites
- Land Ownership issues
- Limited area to develop

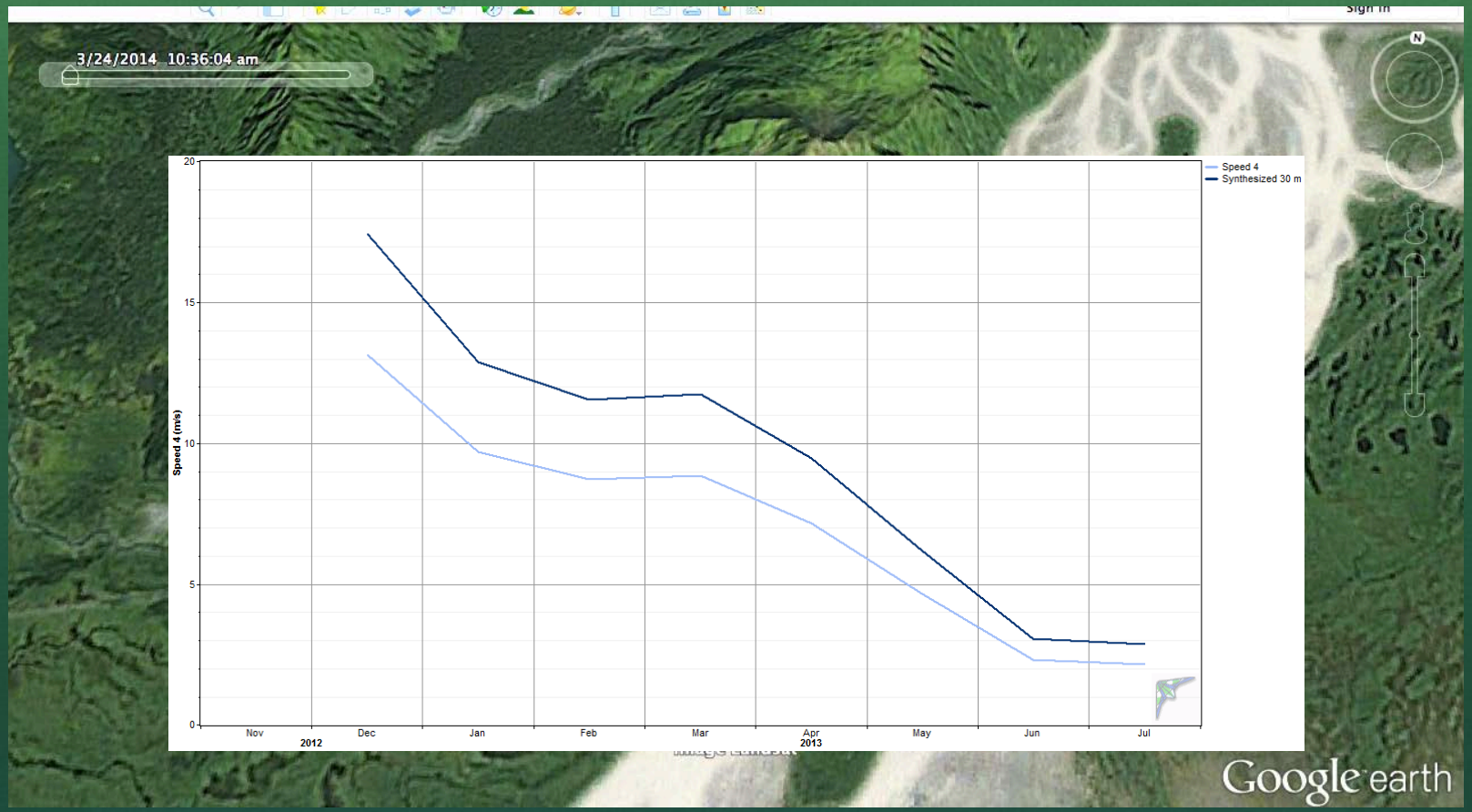
# 27 Mile



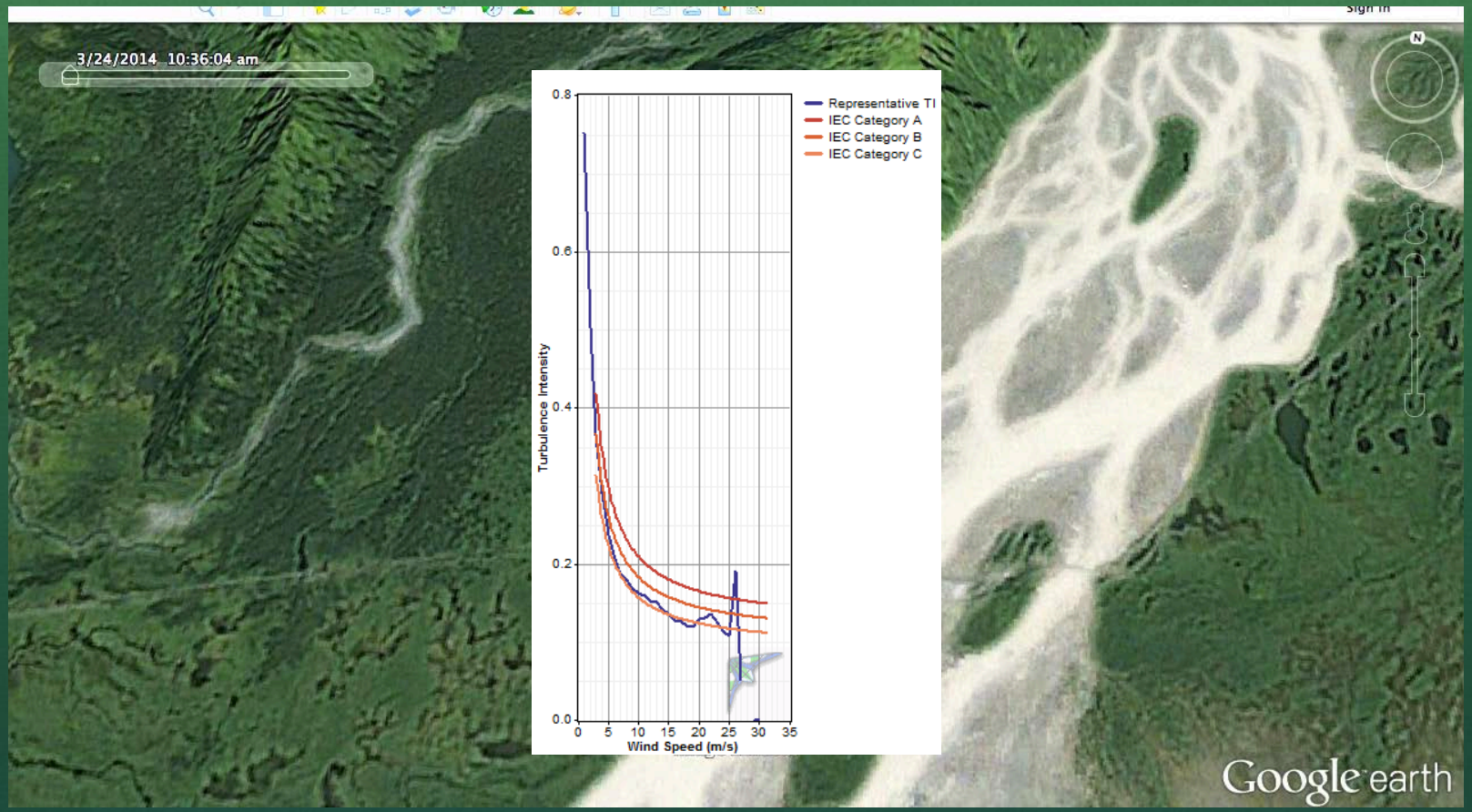
# 27 Mile



# 27 Mile


3/24/2014 10:36:04 am
Speed 4
Synthesized 30 m
Speed 4 (m/s)
20
15
10
5
0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
2012
2013
Google earth

# 27 Mile


3/24/2014 10:36:04 am
Representative TI
IEC Category A
IEC Category B
IEC Category C
Turbulence Intensity
0.0
0.2
0.4
0.6
0.8
0
5
10
15
20
25
30
35
Wind Speed (m/s)
Google earth

# 27 Mile

- 27 Mile has the greatest wind resource
- Turbulence issues
- Need to measure higher
- Land Ownership issues
- Silt (in air) very high winds, and icing may present difficulties
- No transmission lines past 14 mile.

# For 2014

- Put 50m MET tower up at Meals Reservoir
- Add additional sensors at 27 mile, or move existing sensors up the tower
- Put sensors higher up on the Mt. Eyak Tower
- Balance development cost with resource availability to determine suitability of these three sites for development.

# Thanks


- United States Department of Energy
- The Eyak Corporation
- National Renewable Energy Laboratory
- Alaska Energy Authority