

Monitoring Networks for Assessing Small Stream Hydropower Potential, Cosmos Hills, Alaska



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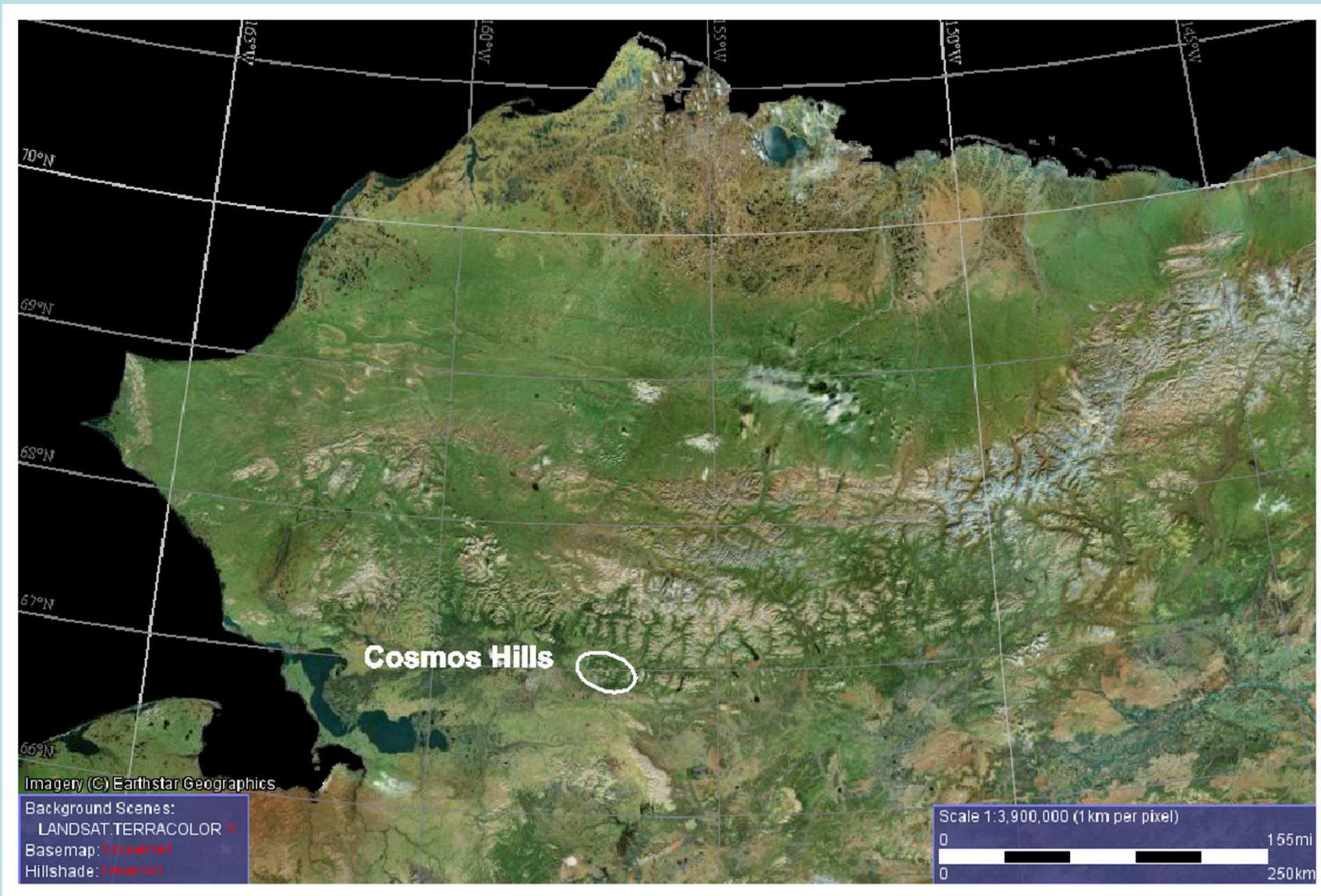
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April 6, 2011

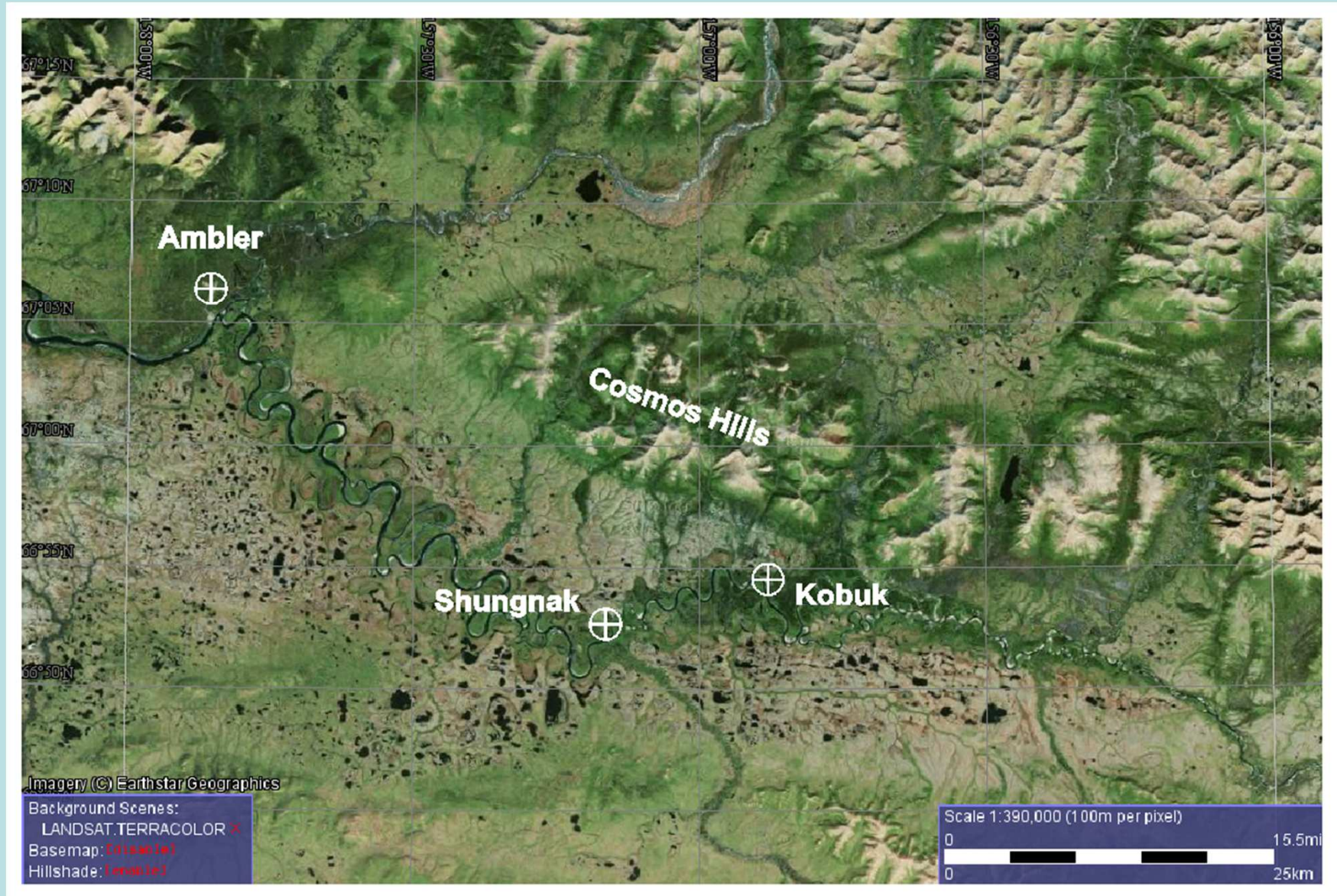
Project Partners

- **Alaska Energy Authority**
- **Alaska Village Electric Cooperative (AVEC)**
- **Nana Regional Corporation**
- **WH Pacific, Inc.**
- **GW Scientific, Inc.**
- **Engineering and Environmental Internet Solutions**
- **Brailey Hydrologic Consultants**
- **NovaGold Resources, Inc.**
- **Kobuk School**
- **Northwest Arctic Borough School District**

Project Location



Project Location



Project Background

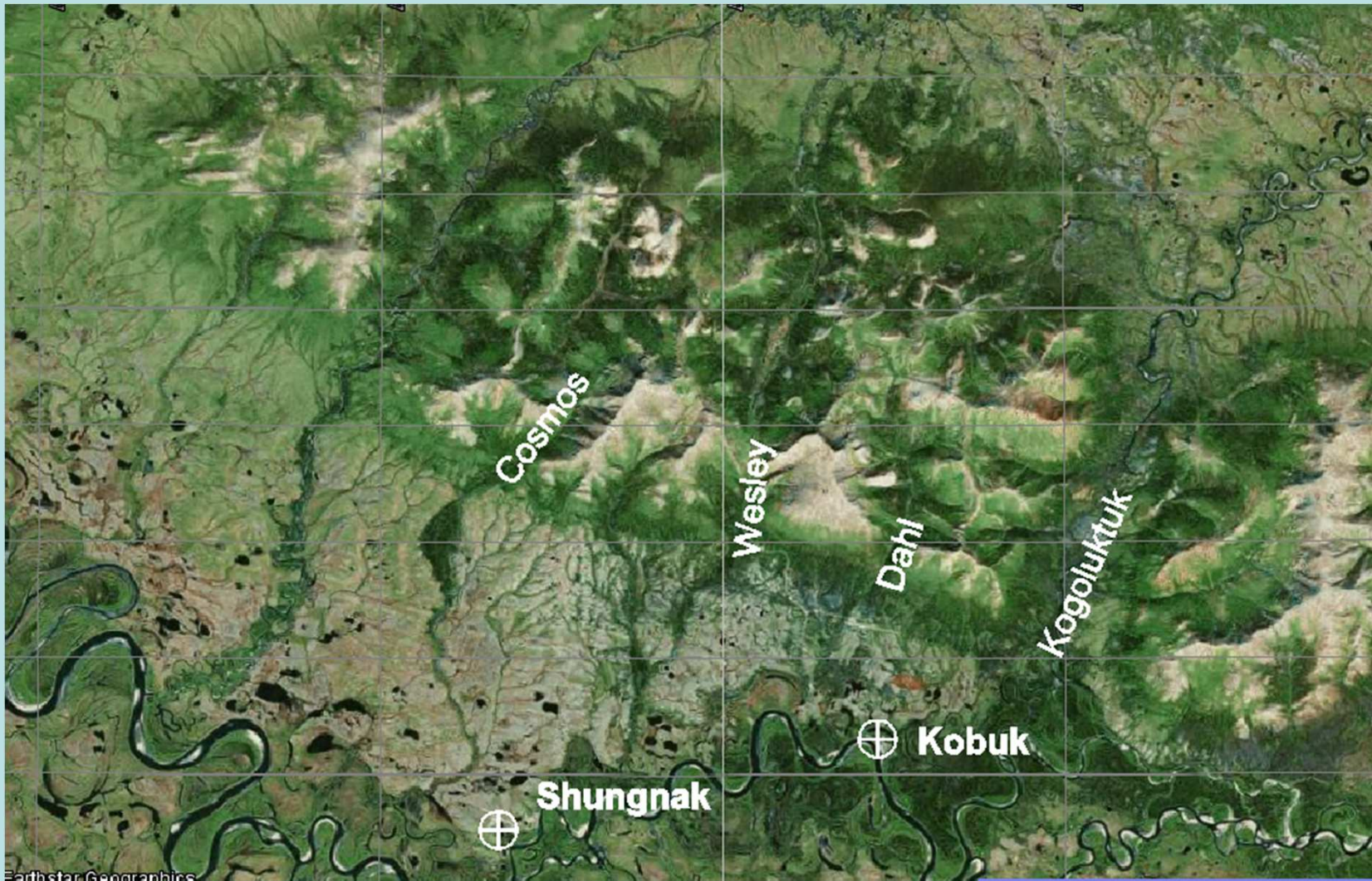
- In 2009, AVEC was awarded an AEA Renewable Energy Grant to evaluate potential hydropower resources in the upper Kobuk River Valley
- The goal of the project is to reduce diesel-fueled power generation in the villages of Ambler, Shungnak, Kobuk, and Kiana
- Due to the complex logistics of fuel delivery and the need for on-site fuel storage, these villages suffer from some of the highest electrical power costs in the nation (FY2007: \$0.53 – \$0.61/kWh)
- Seasonal run-of-river hydroelectric systems could replace diesel-fueled power generation for about 6 months per year, and could provide power for mine development in the summer months.

Ambler Mining District

- Rich Cu, Zn, Ag, Au, Pb deposits in Cosmos Hills and adjacent SW Brooks Range
- Long history of exploration
- Hydropower a potential power source



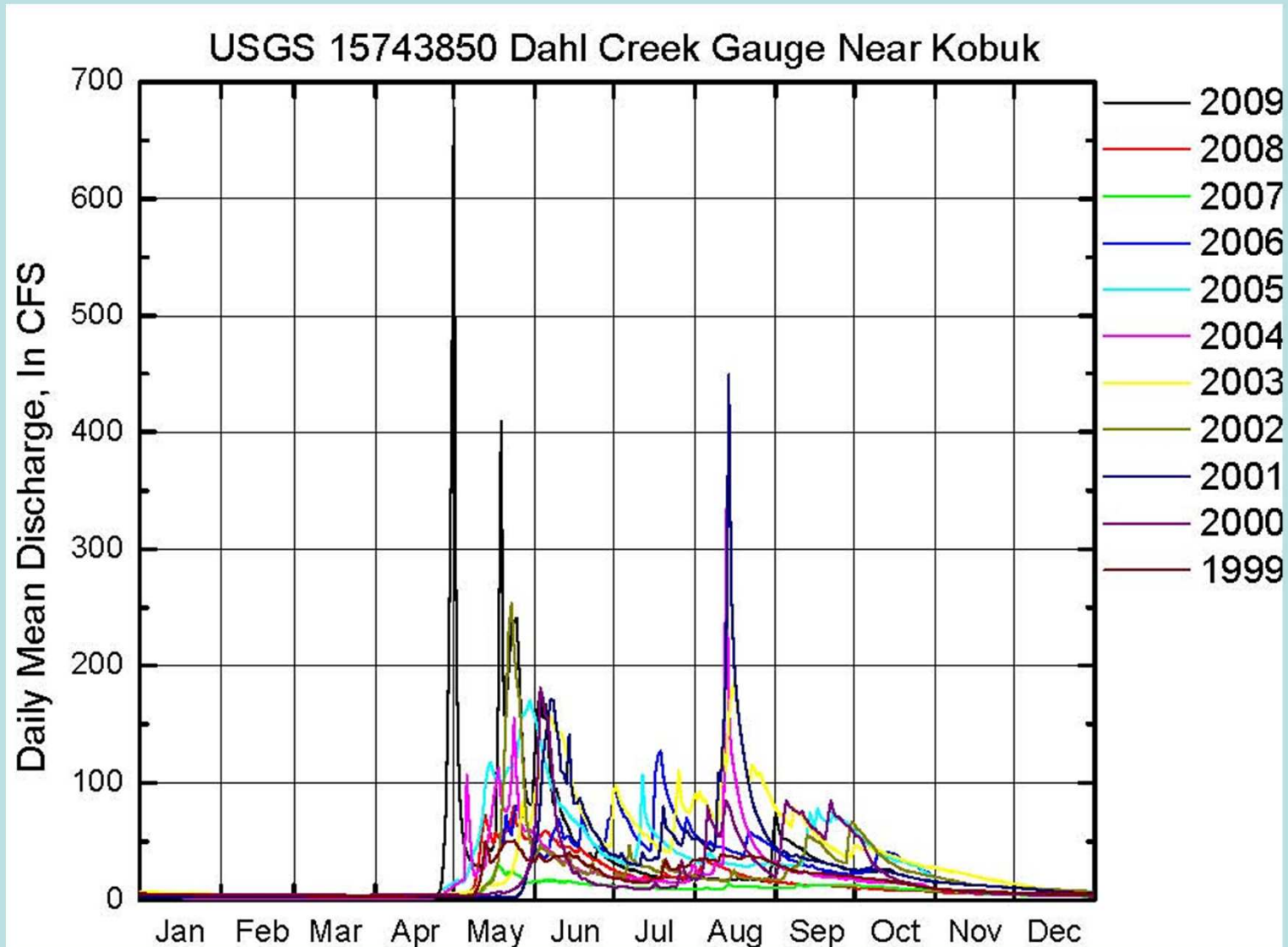
Of 12 potential hydro sites, 4 were selected for further evaluation



Preliminary run-of-river hydropower estimates

| Water-shed | Basin Area, mi² | Design Q, cfs | Net Head, ft | Installed Capacity, kW |
|-------------------|-----------------------------------|----------------------|---------------------|-------------------------------|
| Cosmos Creek | 13 | 50 | 290 | 950 |
| Wesley Creek | 6 | 25 | 300 | 480 |
| Dahl Creek | 9 | 35 | 220 | 430 |
| Kogoluktuk River | 290 | 800 | 57 | 3,200 |

Basis for design estimates: Dahl Creek USGS record



Study Objectives

- **Develop Surface Water Gauging Stations at;**
 - Cosmos Creek
 - Wesley Creek
 - Dahl Creek
 - Kogoluktuk River
- **Develop Stage/Discharge Relationships for Each Station**
- **Report Data Online for Project Efforts and Local Communities**



Bornite Valley Area

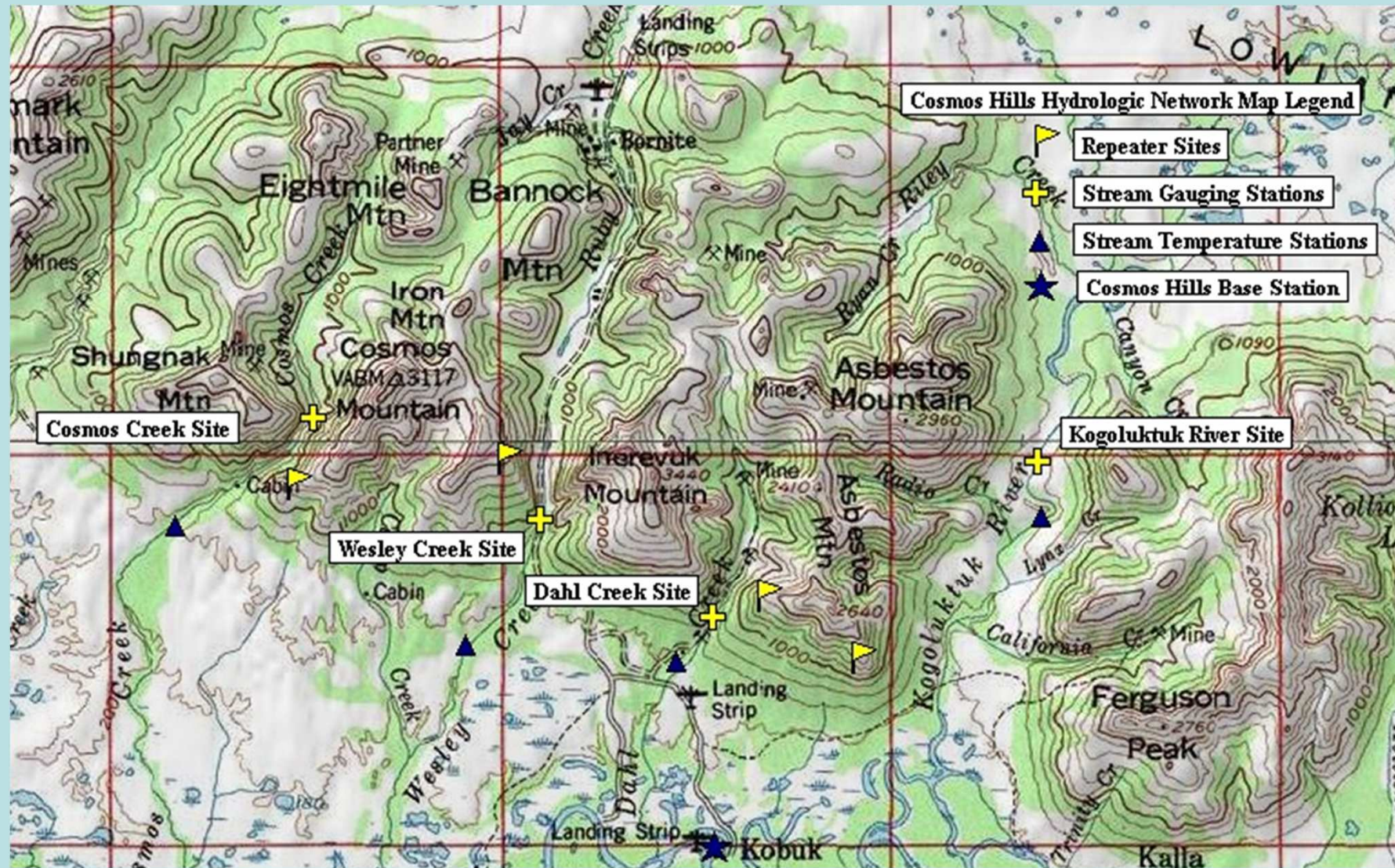
Data Collection Objectives

- **1 full season of continuous stage data**
- **Adequate IQ mmts to initiate defensible rating curves**
- **Sufficient meteorologic data to:**
 - Verify/correct PT records
 - Develop correlations with long-term weather stations so that we can address climate change
- **1 late-winter snow survey**
- **Hydrologic characterization of watersheds & gaging locations**



Kogoluktuk River

Cosmos Hills Hydrology Network



Data Collection Objectives

- **4 Stream Gaging/Met Stations**
 - Air Temperature, Relative Humidity
 - Stream Stage, Temperature
 - Summer Precipitation
 - Time Lapse Photos
 - Near-Real-Time Reporting
- **4 Repeater Sites**
 - Air Temperature
- **4 Downstream Temperature Stations**
 - Stream Temperature (Hobo Sensors)
 - Below Proposed Powerhouse Outlets
 - No Telemetry



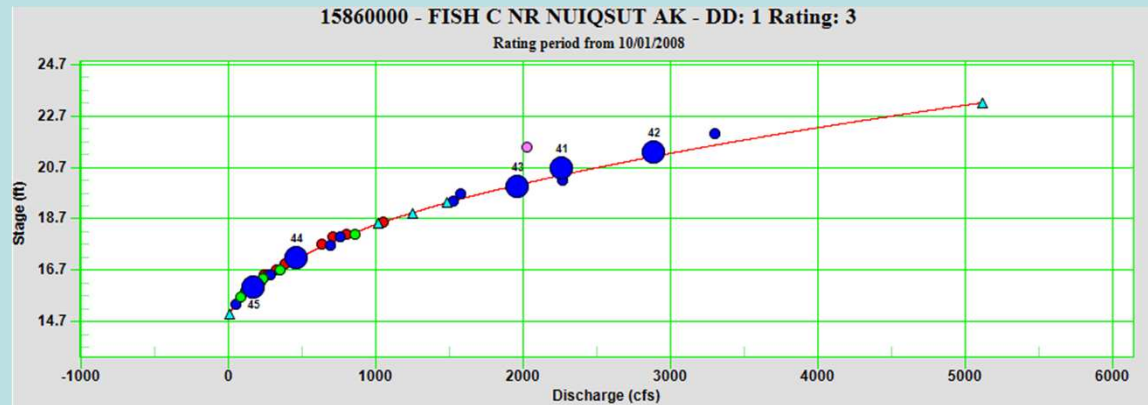
Cosmos Repeater

Discharge Measurements

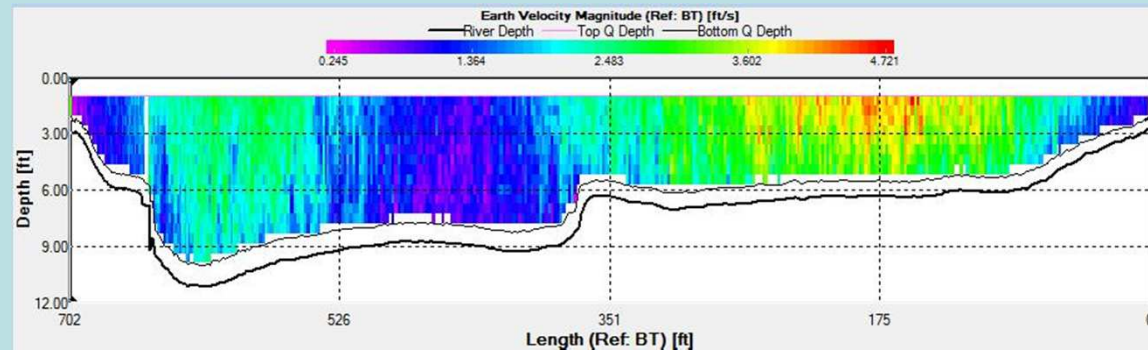
- Traditional current-meter methods (Dahl, Wesley, Cosmos)
- ADCP mmts (Kogoluktuk)
- Salt dilution for low-flow/early breakup



Rating curve development



- Example rating curve, data developed over several seasons



- Example ADCP velocity profile

Cosmos Creek Watershed



Cosmos Creek Watershed



Looking upstream towards
Cosmos Station

Stream near Cosmos Station →



Cosmos Creek Station

- **Cosmos Creek Station**
 - Battery Power
 - Solar Panel Charging
 - Radio Reporting to Base Station
 - Year-Round Operations
 - Data Acquisition System rated to -55°F
 - Flexible to Add Wind, radiation, Other Sensors
 - Camera images
 - Pressure Transducers
 - Summer Precipitation
 - Air Temperature



Cosmos River Station

Cosmos Creek Near Station



Wesley Creek Watershed

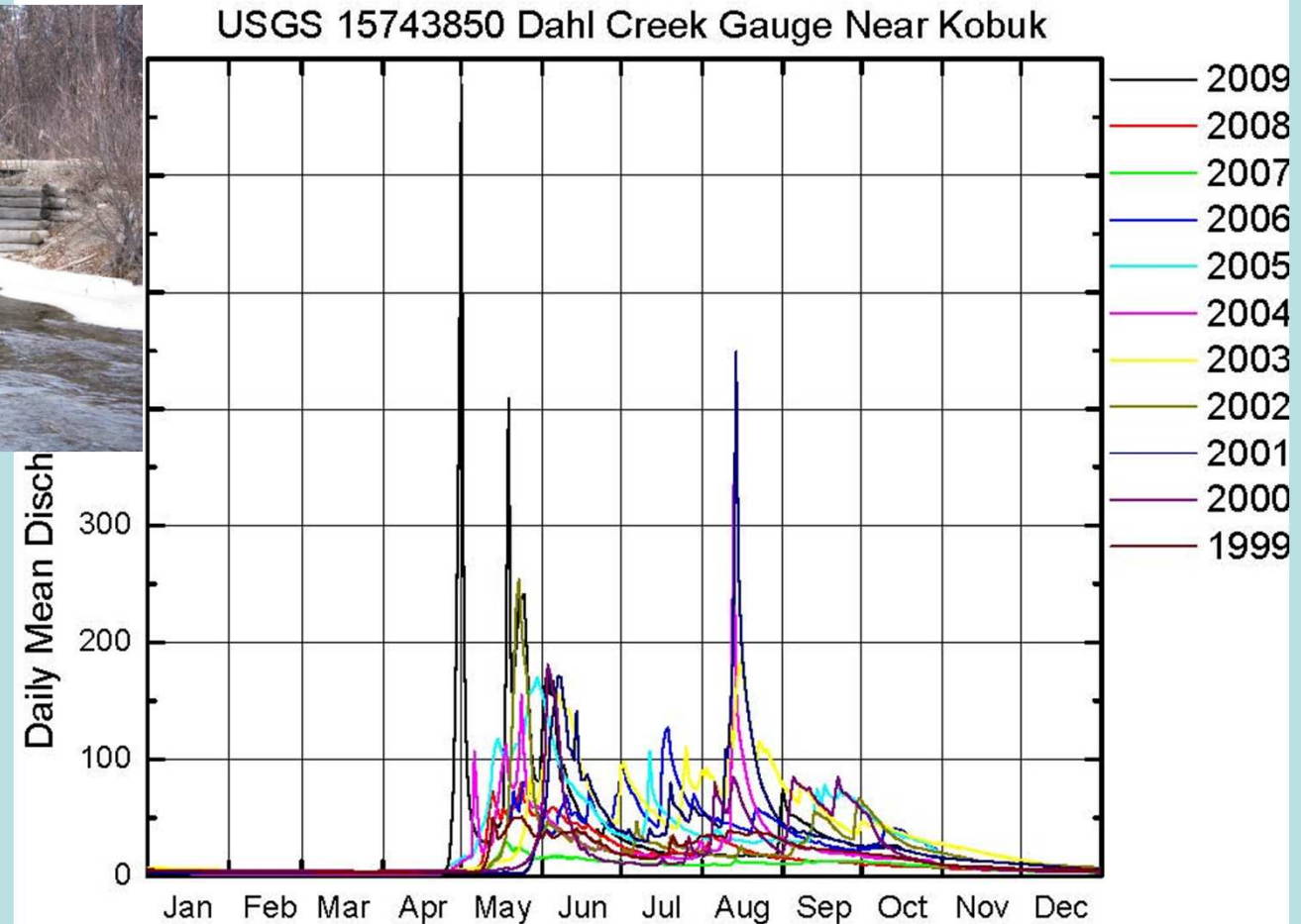
Upstream of station



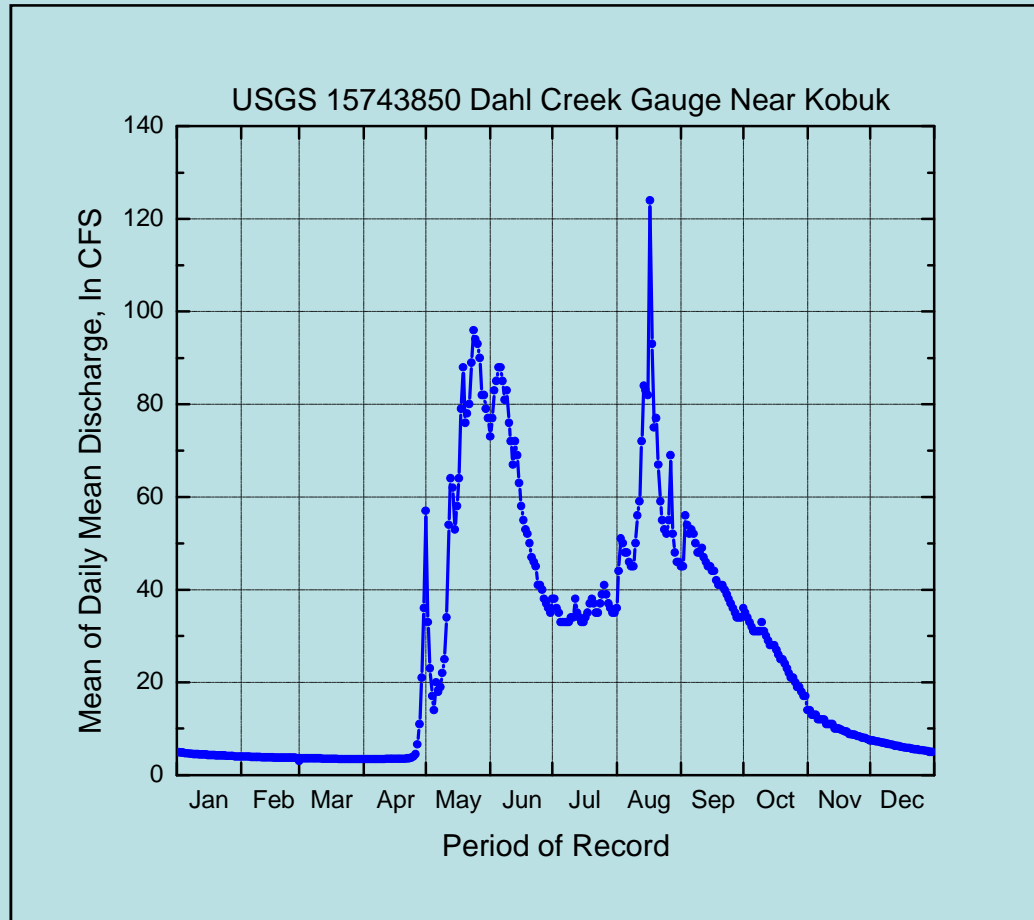
Dahl Creek Measurement Reach



Dahl Creek USGS record

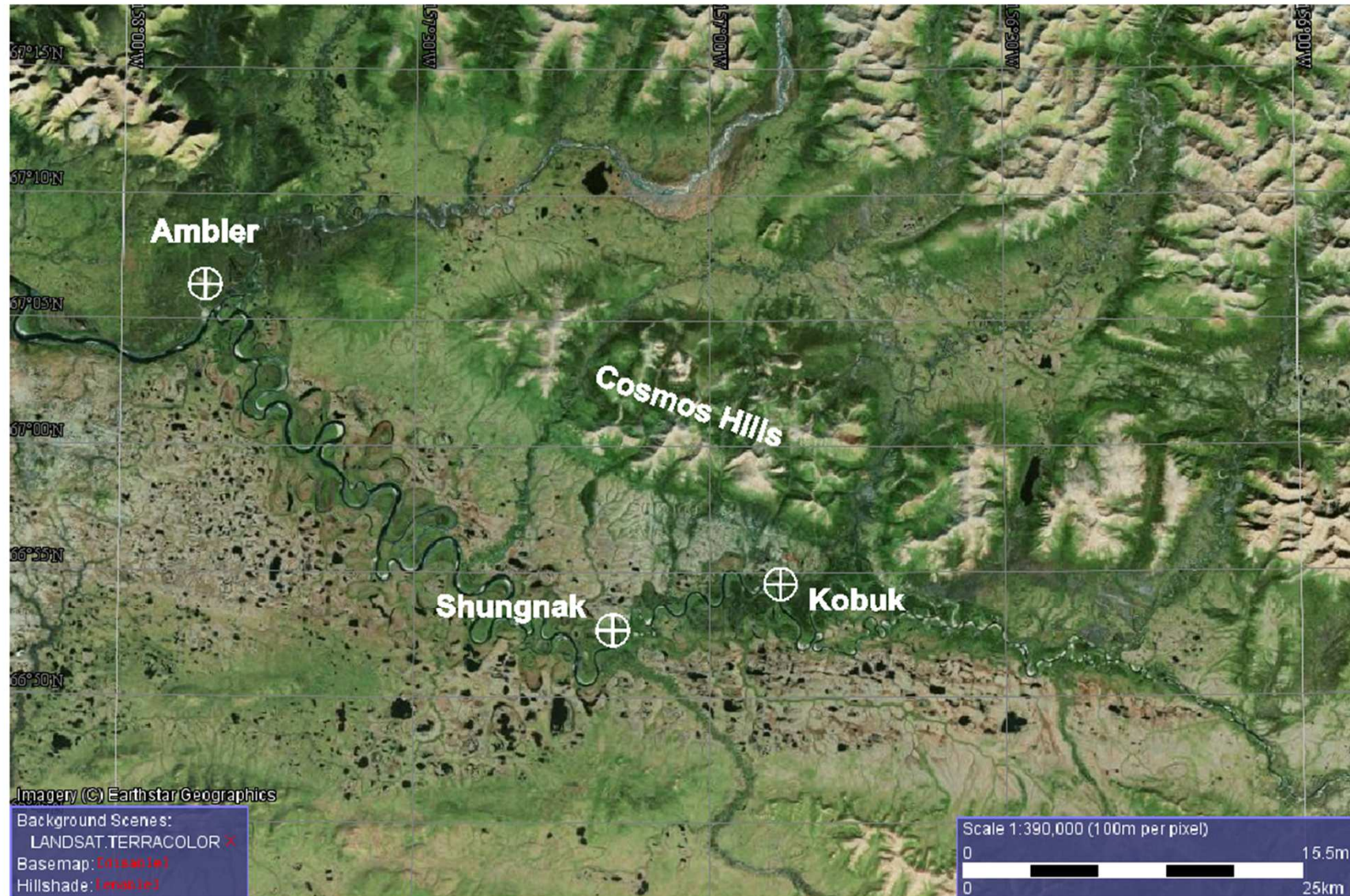


USGS Data: Mean Discharge



- **Dahl Creek USGS Station, Near Dahl Creek Airstrip**

Kogoluktuk Watershed



Kogoluktuk River Watershed



Kogoluktuk River Station



Project Benefits

- **Initial Rating Curve Development for Selected Streams in Cosmos Hills Area**
- **Supporting Information for Hydropower Evaluation, Design, Permitting Requirements**
- **Baseline Hydrology and Climate Data - Applicable to Resource Evaluations in the Kobuk Region**



Kogoluktuk River

A photograph of a creek with a corrugated metal barrel on the right bank and trees with yellowing leaves in the background. The text "Thank You!" is overlaid in the center.

Thank You!

Questions?

Dahl Creek