

# SUSITNA-WATANA

## HYDROELECTRIC PROJECT

# Formal ILP Proposed Study Plan Review Ice Processes

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# Ice Processes Study Goals and Objectives

- Document the timing, progression, and physical processes of freeze-up and breakup between the Oshetna River confluence (River Mile [RM] 233.4) and tidewater (RM 0)
- Develop a modeling approach for assessing ice processes in the Susitna River
  - Calibrate the model based on existing conditions
  - Determine the changes in timing and ice-cover progression, ice thickness and extent downstream of Watana dam for project operational alternatives
  - Determine the effects of load-following on ice cover stability

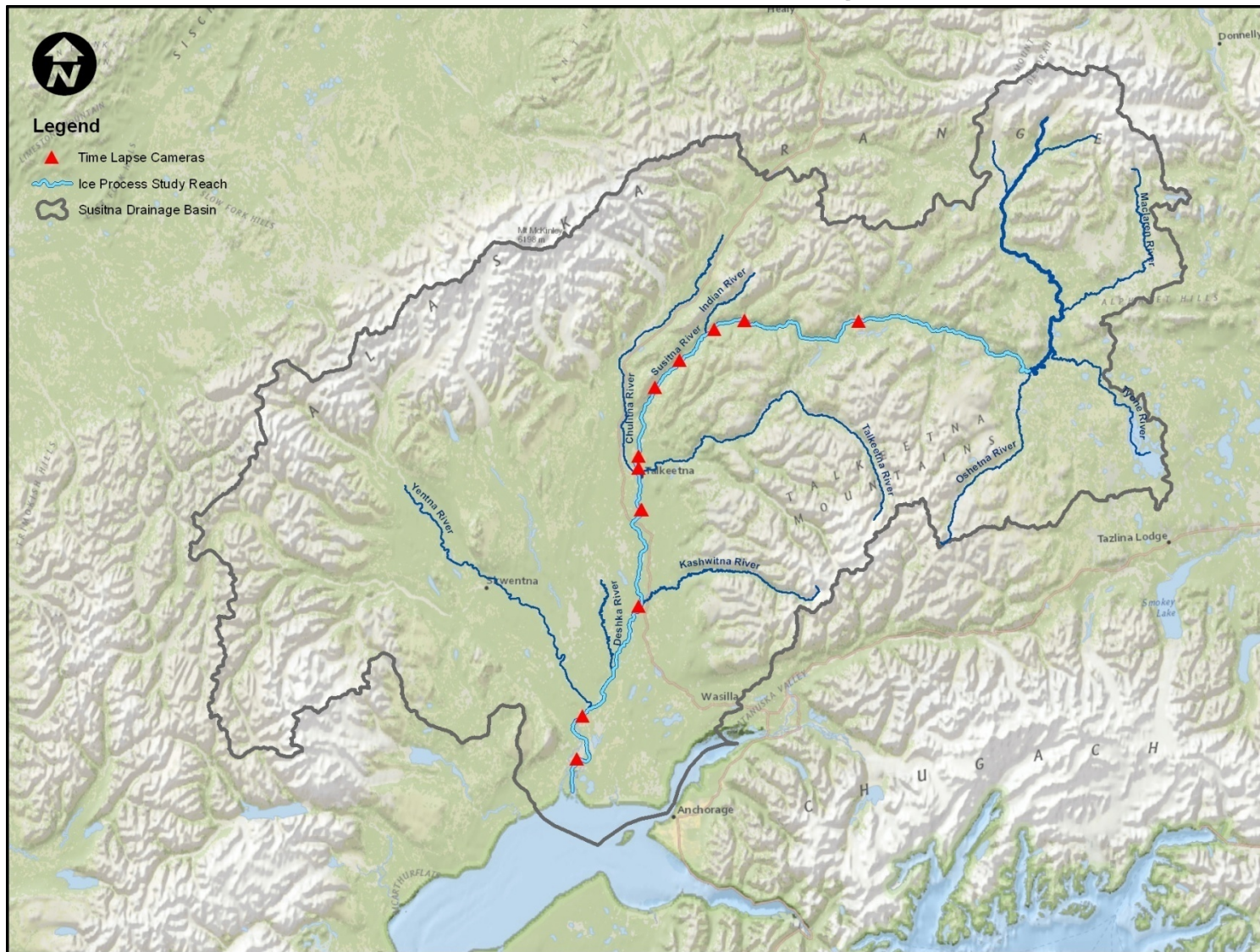


# Ice Processes Study Goals and Objectives (Cont'd)

- Provide observational and modeling data to fisheries, in-stream flow, riparian, geomorphology, and groundwater studies in order to further the understanding of how changes in the winter flow regime will affect these resources.



# Ice Processes Study Reach



# Ice Processes Study Methods

- Aerial reconnaissance and GPS mapping of ice features, including ice jams, ice bridges, frazil concentrations, and open leads during the breakup and freeze-up periods.
- Time-lapse camera monitoring of breakup and freeze-up at selected locations between tidewater and the dam site.
- Ice thickness and elevation measurements.
- Ice processes model development.



# Field Details Pending

- Update camera locations
  - Some 2012 locations now have telemetered cameras, so time-lapse cameras can be set up at additional locations.
  - Desirable camera locations may derive from 2012 fish habitat studies
- Choose ice thickness and elevation measurement locations in conjunction with flow routing study

# Model Details Pending

- Study plans did not specify a model, but CRISSP1D and River1D were mentioned.
  - Currently prefer River1D and are pursuing a partnership with University of Alberta.
  - River1D is a one-dimensional hydrodynamic and thermal model with an integrated ice processes module. 2D is also available.
- Total length of modeled reach has not been determined
- Integration of ice model with open-water flow routing and temperature models needs to be worked out

# Ice Processes Study Expected Results

- Field Studies:
  - Geodatabase of observations including bridging locations during freeze-up, ice jams during breakup, and open leads in the late winter.
  - Timelines of ice cover progression in the fall and breakup progression in the spring
  - Observations of breakup and freeze-up progression from time-lapse cameras at 10-14 locations
  - Ice elevation and thickness at selected transects



# Expected Results, Cont'd

- Modeling Results
  - Existing conditions model will reproduce ice-cover progression, thickness and elevations during observed years
  - Proposed conditions model will predict changes in ice cover progression, thickness, elevation, and decay (breakup) for operations alternatives.
  - Proposed model will also predict whether load following fluctuations will cause ice cover instability.

# Ice Processes Study Relationship to other Studies

- Observations of ice processes will feed into riparian, geomorphology, groundwater, fisheries, and in-stream flow studies. These include:
  - Ice interactions with riparian vegetation
  - Ice interactions with sloughs and side channel habitat
  - Geomorphic features related to ice jam locations
  - Open lead locations in the winter indicate groundwater upwellings

Modeled winter flow conditions will be used to evaluate effects to fish habitat



# Comments Related to Ice Not Addressed in Study Plans

- Winter recreation on river ice
- Ice effects on river transportation
- Project effects on ice safety



# Breakup 2012 at Gold Creek Bridge



Near RM136, April 19, 2012



Near RM136, April 9, 2012



Near RM136, May 5, 2012



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# Breakup, 2012



Near RM218, April 30, 2012



Near RM136, April 27, 2012



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