Study Title	Study Objectives	Potential Study Methods	Relevant 2012 Components	2012 Study Titles	Purpose
Baseline Water Quality Study	1) Build upon and use, as appropriate, the historical water quality data available for the study area.	1) Summarize and use the existing water quality data in the study area. Map historical sampling locations. Create tables and plots of historical water quality parameter values. Summarize historical data with respect to current Alaska Water Quality Standards.	• Review of historical water quality monitoring data.	WQ-S1: Review of Existing Water Temperature Model Results and Data Collection Study	• Provide baseline water quality and mercury fish tissue data for the Project area; • Provide water quality input data for the Water Quality Modeling, Ice Processes, Productivity, and Instream Flow studies; and • Provide a basis for impact assessment; developing A/P measures; developing PME measures; and developing resource management / monitoring plans.
	2) Characterize surface water physical, chemical, and bacterial water quality conditions in the Susitna River within and downstream of the proposed Project area.	2a) Identify data collection locations and time periods. Develop a map and table of sampling locations. Sample systematically in the study area including upstream and downstream of and within major tributary inflows. For general sampling, sample during the early summer high flow period and during the fall low flow period. For selected locations and selected parameters, sample on a seasonal/monthly basis.2b) Collect and analyze in-situ measurements, including dissolved oxygen, pH, specific conductance, turbidity, and water temperature. Use standard techniques and conduct pre- and post-sampling calibration of in-situ instrumentation according to the manufacturers' instructions. Coordinate with the USGS to obtain water quality data from real-time gages. 2c) Collect water quality samples in a representative portion of the stream channel/water body, using methods consistent with Alaska State and EPA protocols for sampling ambient water and trace metal water quality criteria. 2d) Water quality samples will be analyzed for a list of parameters agreed to by the Water Quality Work Group, which include general parameters, total and dissolved metals, and total and fecal coliform. Water samples will be labeled with the date and time that the sample is collected and preserved (as appropriate), then stored and delivered to a State-certified water quality laboratory for analyses in accordance with maximum holding periods. A chain-of-custody record will be maintained with the samples at all times. 2e) The laboratory will report each chemical parameter analyzed with the laboratory method detection limit, reporting limit, and practical quantification limit. The laboratory will attempt to attain reporting detection limits that are at or below the applicable regulatory criteria. 2f) Water quality data will be summarized in a report/tables with respect to Alaska State Water Quality Standards and any applicable federal standards.			
	3) Document baseline mercury levels in fish tissue and compare to state criteria.	3a) Conduct a screening level study of methyl mercury concentrations in potential sport fish muscle tissue (fillets). Identify target fish species in the vicinity of Watana Reservoir and sample tissue from seven (7) adults of each species for methyl and total mercury. Coordinate with the Upper River Fish Study to assist in obtaining fish samples. 3b) Field procedures will be consistent with those outlined in applicable Alaska State and/or EPA sampling protocols. Larger fish with greater potential for bioaccumulation will be targeted. Use clean nylon nets and polyethylene-gloves. Record the species, fork length, and weight of each fish. Place fish in Teflon sheets and into zipper-closure bags and place immediately on ice for delivery to the analytical laboratory. 3c) Submit fish to a State-certified analytical laboratory for individual fish muscle tissue analysis. 3d) Report results with respect to applicable Alaska State and federal standards.			
	4) Assess the potential for mercury methylation (i.e., bioavailable form) in the newly formed reservoir and assess the potential for changes to mercury levels in fishes in the proposed reservoir.	4) Use literature to predict the potential for increased formation of methyl mercury in the newly formed reservoir, due in part to inundation and breakdown of organic matter, and conduct a literature-based pathways analysis to assess the likelihood of mercury uptake by fish under expected reservoir water quality conditions. Identify reservoir operations that minimize the potential for mercury methylation. Coordinate with the Water Quality Modeling Study.			
	5) Conduct a pilot thermal imaging assessment of a portion of the Susitna River.	5) Collect thermal imagery of a portion of the Susitna River (e.g., 10 miles of the Middle River) in the fall prior to ice cover. Ground truth the data and determine applicability and resolution of the data to identify water temperatures and thermal refugia/upwelling. Coordinate with the Instream Flow and fish studies. Determine whether or not additional thermal imaging data will be collected.			

Study Title	Study Objectives	Potential Study Methods	Relevant 2012 Components	2012 Study Titles	Purpose
Water Quality Modeling Study	1) Build upon and use, as appropriate, the historical water quality modeling results/issues for the Project.	1) Summarize and use the 1980s modeling results to guide, where applicable, the current water quality modeling analysis .	• Review of historical water temperature modeling results and 2012 water temperature and meteorological data collection.	WQ-S1: Review of Existing Water Temperature Model Results and Data Collection Study	• Model the potential Project effects on Susitna River water quality; • Provide water temperature, turbidity and other water quality parameter inputs to the Ice Processes, Productivity, and Instream Flow studies; and • Provide a basis for impact assessment; developing A/P measures; developing PME measures; and developing resource management / monitoring plans.
	Reservoir 2) Characterize expected water quality conditions in the proposed Watana Reservoir, including (but not necessarily limited to), temperature, dissolved oxygen, suspended sediment and turbidity, chlorophyll *a*, nutrients, metals, and ice formation and breakup (unless a separate ice dynamics mode is used).	**Reservoir** 2a) Develop a list of reservoir modeling parameters and potential issues, including temperature, dissolved oxygen, suspended sediment and turbidity, chlorophyll *a*, nutrients, metals, and ice formation and breakup. 2b) Select a reservoir modeling approach (specific model, input data sets) for water quality that can simulate the parameters/issues identified, incorporate a multi-level outlet, model ice/snow, and provide output in a sub-daily time-step to interface with downstream water temperature/turbidity models.2c) Develop the reservoir water quality model; collect or obtain suitable existing information to characterize reservoir geometry, topographic shading, meteorological conditions, and hydrology. Develop laboratory or literature values for input parameters, as necessary (e.g., suspended sediment settling rates, turbidity versus suspended sediment relationships, etc.). 2d) Verify the reservoir modeling results to the extent possible by comparing modeling results to empirical data sets for similar reservoirs and operations (e.g., temperature, dissolved oxygen, suspended sediment and turbidity, chlorophyll *a*, nutrients, metals, and ice formation and breakup). 2e) Apply the model to characterize conditions in the proposed reservoir and in the reservoir outflow for a range of alternative with-Project operations.2f) Provide output in a time series format suitable for use in other studies (Ice Processes, Productivity, and Instream Flow studies).			
	River Downstream of Reservoir 3) Characterize expected water quality conditions in the Susitna River from the proposed Watana Dam downstream, including (but not necessarily limited to), temperature, suspended sediment and turbidity, and ice processes (in coordination with the Ice Processes Study).	**River Downstream of Reservoir** 3a) Select a riverine modeling approach (specific model[s], input data sets, element size, etc.) that has dynamic routing and sub-daily time-step capability and can interface with the reservoir model. Coordinate with the Ice Processes Study and where/if possible use the same model. 3b) Develop the river water quality model (characterize channel geometry, topographic and vegetation shading, meteorological conditions, hydraulics, and hydrology). 3c) Calibrate and validate the model using observed water temperature, turbidity, and ice data. 3d) Apply the model to characterize conditions in the Susitna River under a range of proposed Project operations.3e) Provide output for use in other studies (Ice Processes, Productivity, and Instream Flow studies).			