

Susitna-Watana Hydroelectric Project
Fish Passage Feasibility Study
Information Needs, Location, and Status summary
Rev 6: September 2, 2014 (updated for September 9-11, 2014 Workshop)

This list is intended as a living document to help the Fish Passage Technical Team (FPTT) track relevant information throughout the Fish Passage Feasibility Study 9.11. This list will be updated and distributed to the FPTT when applicable.

Revision 6 (Rev 6) documents much of the information that was published in the Initial Study Report (ISR) dated June, 2014, which was submitted to FERC in the June 3, 2014 ISR Filing. Note that Table 1 was published as Table B-1 in Study Plan Section 9.11 of the ISR, and that Table 2 was published as Table C-1 in Study Plan Section 9.11, in the ISR. We will continue to utilize the Rev notations to help organize this information for future revisions. Due to the long time duration between the Rev 5 version, we have kept the Rev 5 comments in this version to assist FPTT members to recall what changed from Rev 5.

Table 1. Biological Data Needs

No.	Item	Data	Comments
B1	Target fish species for upstream and downstream passage.	Published as Information Item B1 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Added to Table B1: coho, sockeye, chum, rainbow trout, steelhead, arctic lamprey, Bering cisco. Passage facilities will require species sorting. Consider species that we do not want to pass (nuisance species). Updated appendices to reflect additional species, including periodicity and numbers. Specified which species documented in Upper River.
B2	List of other species in the system that may be accessible to any passage facilities.	Published as Information Item B2 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Changed lake trout to be considered as native species.
B3	Life stage specific periodicity	Published as Information Item B3 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Updated table headings and created a combined fish passage design table for B3, 4, 5, 6.

Table 1. Biological Data Needs

No.	Item	Data	Comments
B4	Migratory characteristics - routes, seasonal timing & duration by species & life stages	Published as Information Item B4 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Created a combined fish passage design table for B3, 4, 5, 6. Reference routes in B8 also.
B5	Estimated numbers & sizes of fish for upstream and downstream migrants	Published as Information Item B5 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Created a combined fish passage design table for B3, 4, 5, 6. Reference upper reservoir future fish community study (note this is a management decision). Consider how large numbers of potential anadromous fish could impact passage of resident fish. Intent for passage facility design is to create bookends for feasibility analysis. Later work needs to revisit this issue, and plans could consider flexibility, phased approach, etc. Provide 2 columns in the population number estimate table: best estimate of numbers (design for what is there now), and potential future fish numbers. Note potential rate of increase, as feasible.
B6	Life stage specific parameters – size, migratory behavior, swimming behavior & speed, other physical passage constraints	Published as Information Item B6 in Study Plan Section 9.11, Appendix B in the ISR .	No changes from Rev 5. Rev 5: Created a combined fish passage design table for B3, 4, 5, 6.
B7	Fish relative abundance upstream and downstream of project including tributaries	Published as Information Item B7 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Merged with B5.
B8	Locations of spawning and rearing habitats	Published as Information Item B8 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Updated B8 with new data on Chinook observation maps. Reference migration routes with B4.

Table 1. Biological Data Needs

No.	Item	Data	Comments
B9	Predators – species, abundance, location	Published as Information Item B9 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: Will be used to help compare alternatives, may be a data need. Likely a management issue. This item has been added to the management table, and will be retained here also.
B10	Existing ecological conditions – invasive species, light, temperature, flows	Published as Information Item B10 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: See Water Quality item (P1, P11).
B11	Biological performance tool (BPT)	Published as Information Item B11 in Study Plan Section 9.11, Appendix B in the ISR.	No changes from Rev 5. Rev 5: To be developed further for review at brainstorm meeting, and final mock-up by January 2, 2014. Not on current short-term critical path.
B12	Summary of Biological Information.	See new Information Item B12, posted on the FPTT FTP Site. Also see Study Plan Section 5.6 in the ISR	Previously referred to Appendix B6, which was published as Information Item B6 in Study Plan Section 9.11, Appendix B in the ISR. This new B12 addresses the influence of the reservoir on juvenile and adult migration timing, and migration routes from tributaries to the reservoir to the intake or capture location. Also see temperature model in RSP 5.6 – Water Quality Modeling Study).
B13	Influence of post-project reservoir on ice formation on juvenile and smolt migration from tributaries.	See Study Plan Section 7.6 in the ISR. Rev 5: To be determined. Is there risk of increased ice conditions that could affect downstream migration and the ability to collect fish out of tributaries?	Ongoing coordination with temperature model in RSP 5.6 recommended.

Table 1. Biological Data Needs

No.	Item	Data	Comments
B14	Influence of the reservoir on fish community and target species including the introduction and proliferation of predators (i.e. Lake Trout) in the modified reservoir environment.	See Information Item B9 above.	
B15	Risk of entrainment of non-target species into the intake or capture device under different passage alternatives	See Information Item B2 above.	
B16	Influence of seasonal and longitudinal changes in turbidity, and thermocline presence and depth on predation and migration routes (depth).	See Information Item B10 above. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	Ongoing coordination with temperature model in RSP 5.6 recommended.

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P1	Water quality & water temperature under existing conditions, main stem & tributaries	See Information Item P1 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	No change from Rev 5. Rev 5: 1980 data exists. New data is being collected. Results from field data collection and model selection in 2012 report summary, see web for report and 2 appendices (http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/2012_WaterQuality_TM.pdf). 2012-2013. Review data from Gold Creek. Note significant milestones from 2013 field season data. See current study plan (RSP 5.5 – Baseline Water Quality Study). Confirm we get velocity data in reservoir with Rob P., understand what info will be provided. Currents through reservoir, confirm data and presentation.
P2	Water quality & water temperature above & below proposed dam	See Information Item P1 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	No change from Rev 5 except goal date changed to October 30, 2014. Rev 5: Same as P1. Look for surrogate sites, similar lakes, smaller tributaries, etc. Dana S. will investigate and report on status (exists, or no data). Goal by January 2, 2014.
P3	Tailwater Rating curves at dam and expected trap location	Included in updated Information Item P3-P5 PowerPoint presentation for OS-1b and ILF-1. This supersedes information for OS-1 provided in the ISR as Information Items P3-P5.	Rev 6: New tailwater rating curve information for operational scenarios OS-1b and ILF-1 posted to FTP site on 9/2/14. Prepared by MWH for the 9/9-9/11/14 Workshop. Rev 5: Forebay rating information is in Item P5 below. 1980's data. Use to start. Updates with new survey data will likely available by December, 2013. Tailwater rating curve was submitted on April 22.

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P4	Flow duration by month, through turbines, spillways, other outlets	<p>Included in the updated Information Item P3-P5 PowerPoint presentation for OS-1b and ILF-1.</p> <p>See following two links for the TetraTech studies:</p> <p>http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/SuWa-2012-StreamFlow.pdf</p> <p>http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/SuWa-2012-StreamFlow_TM_Appendices.pdf</p>	<p>Rev 6: See flow duration curves for OS-1b and ILF-1 posted to FTP site on 9/2/14. Prepared by MWH for the 9/9-9/11/14 Workshop.</p> <p>Regarding run-of-river scenario, see the TetraTech Stream Flow Assessment Report dated February, 2013. Note that the run of river scenario by definition is flow into the reservoir equals flow out. Therefore, the pre-project flows at the dam site are what would occur in the run of river project. These data were analyzed and reported in two documents in 2013 by Tetra Tech. Much of the data in these two documents are about locations other than the dam site. Only the data at the dam site are applicable to fish passage. These data are in the Appendices at pages 28 through 40 (interpolating between Cantwell and Gold Creek curves), and in Appendices H and I. However, the data for OS-1 in Appendices H and I are no longer correct since this operating scenario has been updated for OS-1b. The updated operating scenarios are provided in a separate file in the Items P3-P5 presentation.</p> <p>Rev 5: From operations modeling. John H. provided summary of all duration flows with spreadsheet; presented May 21, 2013. Data provided for OS-1. AEA to provide feedback on other run scenarios (i.e., run of river). When can we get other runs to fill in sideboards? (note action item for AEA).</p>

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P5	Reservoir elevation duration curves by month	Included in the updated Information Item P3-P5 PowerPoint presentation for OS-1b and ILF-1.	<p>Rev 6: See reservoir elevation curves for OS-1b and ILF-1 posted to FTP site on 9/2/14. Prepared by MWH for the 9/9-9/11/14 Workshop.</p> <p>Rev 5: From operations modeling. Have data for OS-1. Could have other data for other Operational Runs, see P4 also. Submitted on Apr 22. To be posted to web.</p>
P6	Other project operations data (rule curve, expected operating restrictions)	<p>To be determined. See:</p> <p>http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/SuWa-2012-StreamFlow.pdf</p> <p>and:</p> <p>http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/SuWa-2012-StreamFlow_TM_Appendices.pdf.</p>	<p>Rev 6: New data for OS-1b and ILF-1 posted to FTP site on 9/2/14. Prepared by MWH for the 9/9-9/11/14 Workshop.</p> <p>The run of river data downstream of the dam is the pre-project flows. These are posted on the Susitna web site at link shown. The reservoir elevation does not vary. It remains at full operating pool.</p> <p>Rev 5: See P4, P5 – relates to what operational scenarios are going to be run. Need input from AEA.</p>
P7	Ice cover on river and tributaries in project area before project	<p>See Information Item P7 in Study Plan Section 9.11, Appendix C in the ISR.</p> <p>Also see Study Plan Sections 7.6 in the ISR.</p>	<p>No changes from Rev 5.</p> <p>Rev 5: Ice conditions annually Oct-May. See RSP 7.6 - Ice Processes in the Susitna River Study. Request more of an annual summary of typical seasonal ice issues, access, etc. at the tributaries of interest. Biological component to correlate with life cycle by species.</p>

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P8	Ice cover on reservoir and in river below dam	See Information Item P7 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	No changes from Rev 5. Rev 5: Dana S. search for analogous reservoirs for Kokanee, etc. Will have ice model from WQ study, Rob P. will give update on model study, see action items. Pending.
P9	Water temperatures during upstream migration period	See Information Item P1 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	No changes from Rev 5. Rev 5: See WQ Study (P1), more data will be coming. Coordinate with climate change studies. Goal is to define range potentials in the future to assure fish passage design is flexible, can be expanded, can function over range, etc. So design won't be obsolete, etc. Add this item to several items, revisit off line.
P10	Water temperatures during downstream migration period	See Information Item P1 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 5.5 and 5.6 in the ISR.	No changes from Rev 5. Rev 5: See WQ Study (P1), more data will be coming.
P11	Air temperature, wind, light, MET station info information by month (max, min, average)	See 9/2/14 posting on FTP site for wind speed.	Four years of raw hourly meteorological data from the MET station information for 2010 through 2013 was posted on the FTP site on 9/2/14 for the 9/9-9/11 Workshop. This posting has windspeed in meter/second format. These data can be analyzed for max, min, and average by month as the study continues. Can still look into air temperature. Rev 5: Estimate fetch, etc. from available data. Some data likely available in the fall of 2013.

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P12	Sediment information (transport rates, sediment gradation, sediment sources & their location)	See Information Item P13 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 6.5 and 6.6 in the ISR.	No changes from Rev 5. Rev 5: 2012 Report on Project website – Documents – 2012 Environmental Studies (http://www.susitna-watanahydro.org/wp-content/uploads/2013/03/SuWa-2012-Sediment-Report.pdf). Tributaries: modeling potential for perching and barrier potential at mouths. Model scheduled to be completed 2014. Sediment data being collected this summer. Be aware of ISR/USR, quarterly data updates. Ask Bill Fullerton to send provisional data to this group. Prioritize tributary data.
P13	River morphology trends after project operation	See Information Item P13 in Study Plan Section 9.11, Appendix C in the ISR. Also see Study Plan Sections 6.5 and 6.6 in the ISR.	No changes from Rev 5. Rev 5: Model results in 2014. Fluvial Geomorphology Modeling below Watana Dam Study (6.6) RSP (http://www.susitna-watanahydro.org/wp-content/uploads/2012/12/02-RSP-Dec2012_2of8-Sec-6-Geomorphology-v2.pdf).
P14	Topographic mapping of the project site and along river downstream. Tsusena Creek.	See Information Item P14 in Study Plan Section 9.11, Appendix C in the ISR. Additional information to be provided at the 9/9-9/11 workshop.	Rev 6: Additional information to be provided at the 9/9-9/11 workshop. Rev 5: Drawings were handed out at the site tour. Fish passage will be sketched on these sheets. Dennis D., Dana P., Dan T. – refine data needs. Request centerline profiles for any available tributaries upstream and downstream of dam. Use best available data. Check with Joetta Z, GIS. Get available cross section data – Dennis D. ????

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P15	<p>Current dam layout drawings, plans, elevations, and cross sections (include details of outlet works and spillways).</p> <p>NOTE: This is all CEII data.</p>	<p>See Information Item P15 in Study Plan Section 9.11, Appendix C in the ISR.</p> <p>Additional CEII drawings will be handed out Workshop #2.</p>	<p>Rev 6: The same CEII drawings from spring of 2013 will be provided for the 9/9-9/11 Workshop #2, with additional cross sectional data that wasn't available at that time. Note that the design is expected to change slightly based on the ongoing feasibility study underway by MWH; however, these drawings will suffice for the immediate need. New drawings will be issued following completion of the feasibility study currently in production by MWH.</p> <p>Rev 5: Fish passage will be sketched on these sheets. Prefer simplified, scale drawings with a plan, section, and elevation suitable for brainstorm sketching in 11x17 format. Any 3D drawings showing general arrangement would also be helpful.</p> <p>Data presented at this point in time, note overall dam design schedule.</p>

Table 2. Physical, Hydrologic and Engineering Information

No.	Item	Data	Comments
P16	Makeup of project components – turbines (number & type), outlet valves & gates	<p>3 x 200 MW Francis Turbines fed by individual penstocks Intake structure – Multi-level, gated Number of Levels- 6 Number of shutters per level 8 Dimensions of Shutters 25 ft. H x 22 ft. W Control Gates - 2 per intake Dimensions 18.5 ft. H x 8 ft. W Invert Elevation of Intake 1,800 ft. <u>Also Outlet facilities</u> sized to pass 50 year flood if turbines are operating: Control Structures 6 Fixed Cone Valves Diameter 78 inches Water Passage Diameter 20 feet x 2 Capacity 24,000 cubic feet per second Intakes for outlet facilities - 2 without shutters, but with trash racks and 2 gates</p>	<p>Rev 6: No change from previous information distributed, and noted in Data column. Expect some minor changes to be issued with feasibility study noted in Item P15 above.</p> <p>Rev 5: See Aled Hughes presentation from Workshop #1. Note this is CEII information. Attendees were asked to sign CEII forms for access to copies of this data.</p>

<p>P17</p>	<p>Projected operation of project turbines, gates, & valves</p>	<p>See Items P3-P5 posted 9/2/14 on FTP Site.</p> <p>Turbines will be operated in accordance with rules to be agreed with environmental stakeholders, but some load following is to be expected.</p> <p>Turbine flow at full pool and 200 MW generation will be 4544 cfs per unit.</p> <p>Turbine flow at minimum pool (1,850) and 200 MW generation will be 6,917 cfs per unit</p> <p>Shutters at power intake will be moved to accommodate draw off at chosen depths. Heated ice booms will be activated as appropriate to prevent ice buildup on trash racks etc.</p> <p>Outlet facilities will be operated as agreed with environmental stakeholders, but will be capable of passing (in conjunction with power flows, floods up to 50 year return period).</p> <p>Spillway will operate at full pool level if flood flows are above 50 year return period.</p>	<p>Rev 6: See written description in the handout for items P3, P4, and P5 for operational scenarios OS-1b and ILF-1 posted to FTP site on 9/2/14. Prepared by MWH for the 9/9-9/11/14 Workshop.</p> <p>Rev 5: Turbines operate to meet Railbelt loads and minimum flow requirements. Fixed-cone valves operate to control floods up to about the 1 in 50 year event. The gated spillway operates for floods greater than about the 1 in 50 year event. Refinements to this operation are to be determined.</p> <p>Operations data presented based on 3 turbine arrangement.</p>
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		Normal spillway operation will be by incremental gate opening selected by the operator until the water level cannot be maintained at which time the gates will be raised sequentially.	
P18	Site access or restrictions to access for operation and maintenance. Include entire project area at dam, along reservoir, and into tributaries (i.e., existing or planned access roads)	<p>Access corridors have been established westwards on the north bank of the Susitna, westwards on the south bank of the Susitna (both to the ARRC but without connection to the State highways) and also northwards to the Denali highway. Road width will be 37 ft, but bridges will be single lane. The road will be designed for movement of the transformers – approximately 200 tons.</p> <p>There will be site access to the upstream side of the dam, around the dam works, and to the quarry, most of which will be reinstated if appropriate. No roads to the reservoir area or tributaries are currently planned.</p>	<p>Rev 6: To be updated in the feasibility study currently being prepared by MWH.</p> <p>No changes from Rev 5.</p> <p>Rev 5: 3 potential corridors are still under study for access to the dam.</p>
P19	Electrical power availability	Yes	<p>No changes from Rev 5.</p> <p>Rev 5: FP Team can provide more info later on load requirements. Substation will be on hill, right abutment.</p>

P20	Amounts and types of debris expected in the reservoir	There may be occasional logs or similar organic debris. Possibly dead fauna occasionally (bears, caribou, moose etc.). During winter there will be ice. See Study Plan Section 6.5 in the ISR.	No changes from Rev 5. Rev 5: The Large Woody Debris component of the Geomorphology Study (RSP Section 6.5.4.9) will be assessing large woody debris loading in the Susitna River, including estimated input to the reservoir during project operation. Additional information can be provided as needed from Kathy Dubé.
P21	Amounts and types of debris expected below the dam	Same as P20.	No changes from Rev 5. Rev 5: Same as P20. Potential for passing from reservoir above. LWD, etc. Potential to move LWD below dam, burn management, etc.
P22	Location downstream of any barrier and trap & haul locations, stress release ponds, adult release locations, etc.	See available mapping.	No changes from Rev 5. Rev 5: Review mapping and identify any additional needs. Ask MWH dam designers for their opinions.
P23	Other data which you feel are important to fish passage		No changes from Rev 5. Rev 5: Possibility of establishing a natural fishway at Tsusena creek.
P24	Tributary flow data	See Study Plan Section 8.5 in the ISR.	No changes from Rev 5. Rev 5: Tributary stage data will be collected in 2013 field season. Rating curves to convert stage to flow will be developed in 2014 as part of RSP 8.5 Instream Flow.
P25	Tributary trap access data. Consider also for Adult release sites.	Any studies on roads, ice roads, boat access, helicopter, etc.	No changes from Rev 5. Rev 5: No roads or plans for roads exist. Understand planned roads at this point in time. This group can advise more on needs concurrent with brainstorm session.

P26	Seepage study, right abutment	See Study Plan Sections 7.5, 7.6, 7.7, 8.5, and 8.6 in the ISR.	No changes from Rev 5. Rev 5: Groundwater-related Aquatic Habitat Study (7.5) RSP - http://www.susitna-watanahydro.org/wp-content/uploads/2012/12/03-RSP-Dec2012_3of8-Sec-7-8-HydrologythroughInstreamFlowStudies-v2.pdf
P27	Glacier outburst floods	See Study Plan Sections 7.5, 7.6, 7.7, 8.5, and 8.6 in the ISR.	No changes from Rev 5. Rev 5: Glacial and Runoff Changes Study (7.7) RSP - http://www.susitna-watanahydro.org/wp-content/uploads/2012/12/03-RSP-Dec2012_3of8-Sec-7-8-HydrologythroughInstreamFlowStudies-v2.pdf
P28	Foundation condition, bank stability near ladders, etc.		No changes from Rev 5. Rev 5: Coordinate with geotechnical studies

Table 3. Management Items (Parking Lot)

No.	Item	Data	Comments
M1	Resident fish passage and sorting facilities.	Intent is for a subgroup to address this issue. For example: what should the passage group do with nuisance species (return to river, other?).	No changes from Rev 5. Rev 5: Added from B17. Consider how sorting/passage facilities should perform for resident fish.
M2	Consideration of new salmon stocks (e.g., Sockeye, chum, coho) in the Upper River if they are not currently there.	Intent is for a subgroup to address this issue.	No changes from Rev 5. Rev 5: Noted from discussion at Workshop #1.