## FIGURES

# Susitna-Watana Hydroelectric Project (FERC No. 14241)

## **Fluvial Geomorphology Modeling Study (6.6)**

**Figures** 

**Initial Study Report** 

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO Clean, reliable energy for the next 100 years.

Prepared by

Tetra Tech and

Watershed GeoDynamics

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Figure 4.1-5: Example of complete field data form for subsurface samples.



Figure 4.1-6: Example of front and back of 2013 bank observation data sheets.



Figure 4.1-7. 2011 Matanuska-Susitna Borough LiDAR collections and 2013 ground survey point locations.



Figure 4.1-8. Example ground survey points displayed over aerial photography



Figure 4.1-9. Example ground survey points displayed over TIN derived from LiDAR point cloud.



Figure 4.2-1 Fluvial Geomorphology Model Interdependencies.



Figure 5.1-1. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model



Figure 5.1-2. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model



Figure 5.1-3. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model

### FLUVIAL GEOMORPHOLOGY MODELING BELOW WATANA DAM STUDY (6.6)



Figure 5.1-4. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model



Figure 5.1-5. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model



Figure 5.1-6. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model

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Figure 5.1-7. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model



Figure 5.1-8. Cross Section Locations for Reach Scale 1-D Sediment-Transport Model.



Figure 5.1-9. Merged Hydrographic Survey and LiDAR Survey at PRM 117.9.



Figure 5.1-10. Triangular Irregular Network (TIN) Developed to Represent the Channel and Portions of the Overbanks at FA-104.



Figure 5.1-11. One-foot Interval Contour Mapping of FA-104 Developed from the TIN (Figure 5.1-10).



Figure 5.1-12. Two-foot Interval Contour Mapping Developed from the 2013 LiDAR Survey of FA-104.



Figure 5.1-13. Extents of the SRH-2D Habitat Mesh. Note: the model contains approximately 164,000 elements and was extended upstream of the focus area to provide better prediction of the hydraulic conditions at the upstream end of the focus area and to evaluate the potential for overbank flows.



Figure 5.1-14. Geomorphic surface mapping of FA-104 Whiskers Slough.



Figure 5.1-15. Example of Habitat Areas at FA-104 Selected to Have a Fine Mesh Size (6.5 feet, 2 m). The Habitat Areas Were Identified by the Aquatic Habitat Team.

#### FLUVIAL GEOMORPHOLOGY MODELING BELOW WATANA DAM STUDY (6.6)



Figure 5.1-16. Example of SRH-2D Mesh in Habitat Area at the Mouth of Whiskers Creek (in FA-104) Selected to Have a Fine Mesh Size (2 meters).



Figure 5.1-17. SRH-2D Bed Evolution Mesh. The Mesh Contains Approximately 10,000 Elements.



Figure 5.1-18: Locations of Middle Susitna River Segment Focus Areas.



Figure 5.1-19. Predicted Depth Distribution at FA-104 for 24,000 cfs.



Figure 5.1-20. Predicted Velocity Distribution at FA-104 for 24,000 cfs.



Figure 5.1-21. Predicted Depth Distribution at FA-104 for 100,000 cfs.



Figure 5.1-22. Predicted Velocity Distribution at FA-104 for 100,000 cfs.



Figure 5.1-23. Lower Susitna River Segment Tributary Locations Relative to Geomorphic Reaches.



Figure 5.1-24. Middle Susitna River Segment Tributary Locations Relative to Geomorphic Reaches and Focus Areas.



Figure 5.1-25: Sediment samples and bank observations collected at FA-104 (Whiskers Slough).



Figure 5.1-26. GoPro image from Whiskers Slough with lights, lasers, and scale in video mode.



Figure 5.1-27. GoPro image from ESS40 with lasers and the Brinkman Q-Beam Starfire II underwater fishing light.



Figure 5.1-28. GoPro image from ESS40 with lasers and without lights



Figure 5.1-29. 2013 LiDAR priority areas and collection.

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Figure 6.1-1. Lower Susitna River Segment Bed Material Comparison.



Figure 6.1-2. Middle Susitna River Segment Bed Material Comparison.



Figure 6.1-3. Lower Susitna River Segment Screening of Coupled WSE and Flow Measurements.



Figure 6.1-4. Middle Susitna River Segment Screening of Coupled WSE and Flow Measurements.



