

Reservoir Operation Modeling

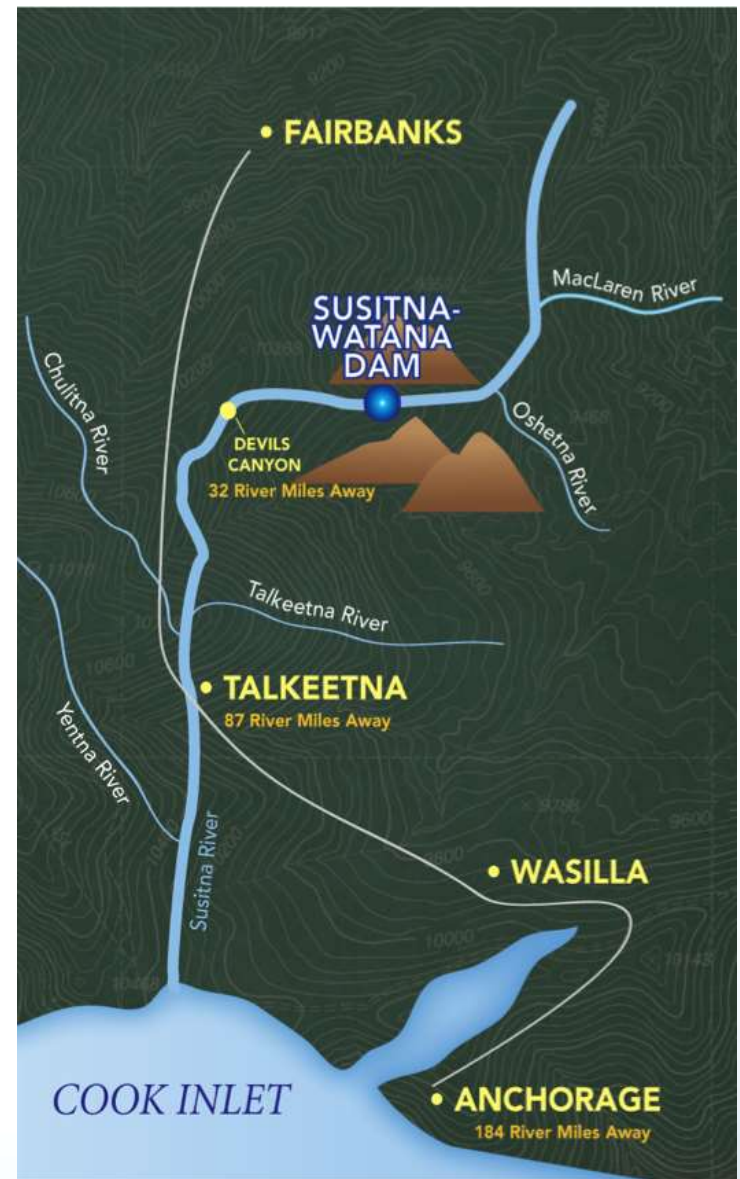
Riverine Modeling
Proof of Concept Meeting
April 15, 2014

Prepared by:  **MWH**

John Haapala, P.E.

Prepared for:
Alaska Energy Authority

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



Maximum Load Following Scenario – OS-1

- Based on the total Railbelt electricity load
- Assigns all load variability to Susitna-Watana
- Flow required to generate the same power (MW) varies with reservoir level (head)
- The objective is to provide an extreme case that maximizes load following at Watana
- Emergency operations could result in additional flow variability

Model and Hydrology

- Reservoir operation study run performed with MWH-ROM
 - Facilitates details of complex operations
 - 61 water years of daily reservoir inflows; 8,760 hours/year; 534,360 time increments; no Feb 29
- Hydrology
 - Based on historic and reconstituted daily flows at gaging stations, Oct 1949 – Sept 2010, by USGS
 - Flows between the Gold Creek and Cantwell USGS gages proportioned to the Watana Dam site based on drainage area

Minimum Flow Requirements

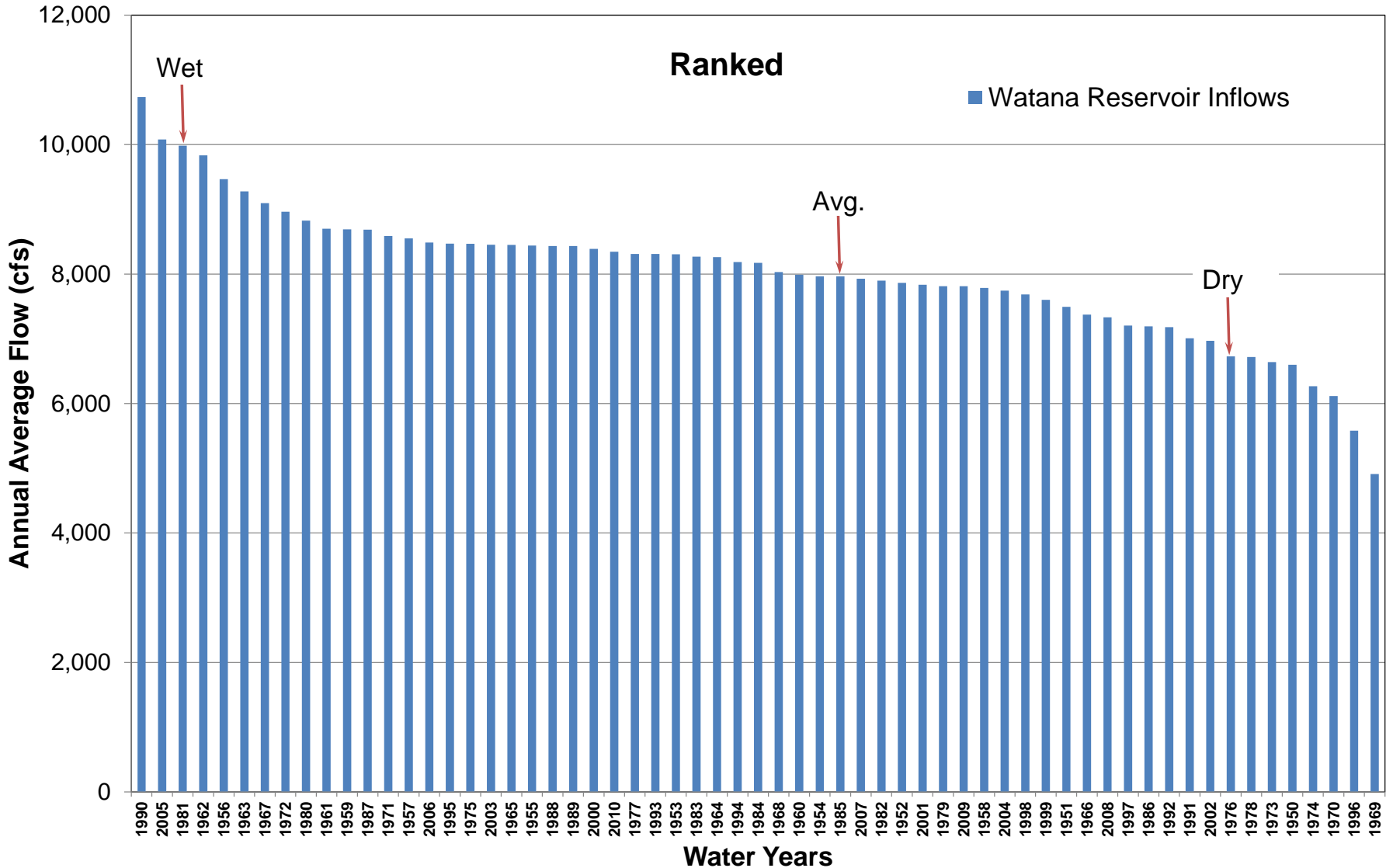
- At Gold Creek USGS gaging station, adapted from Case E-VI, 1985 License Application, Exhibit E:
 - Oct 1-14 – 6,000 cfs
 - Oct 15-21 – 5,000 cfs
 - Oct 22-28 – 4,000 cfs
 - Oct 29 – May 5 – 3,000 cfs
 - May 6-12 – 4,000 cfs
 - May 13 – June 2 – 6,000 cfs
 - June 3 – Sept 1 – 9,000 cfs
 - Sept 2-8 – 8,000 cfs
 - Sept 9-15 – 7,000 cfs
 - Sept 16-30 – 6,000 cfs
- May be limited to natural flow.

Model Additions and Updates – OS-1b

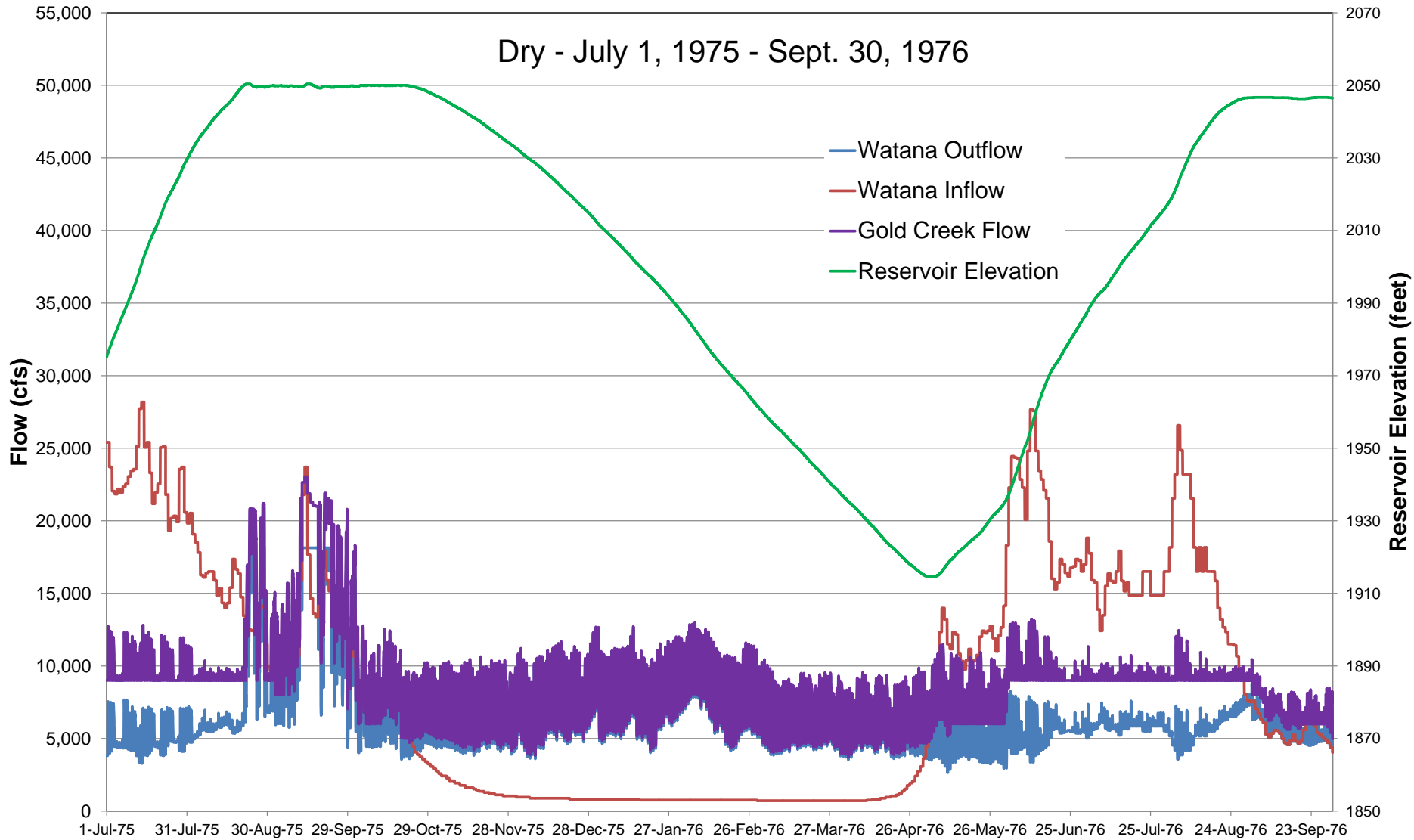
- Original OS-1 developed in September 2012, included only one year of operation
- USGS flow extension study available ~Nov 2012
- Dry water year rule curve – reduces generation in dry years
- 8 fixed-cone outlet valves each at 4,000 cfs, 32,000 cfs total.
- Updated reservoir storage-elevation data
- Potential addition – inflow forecasting



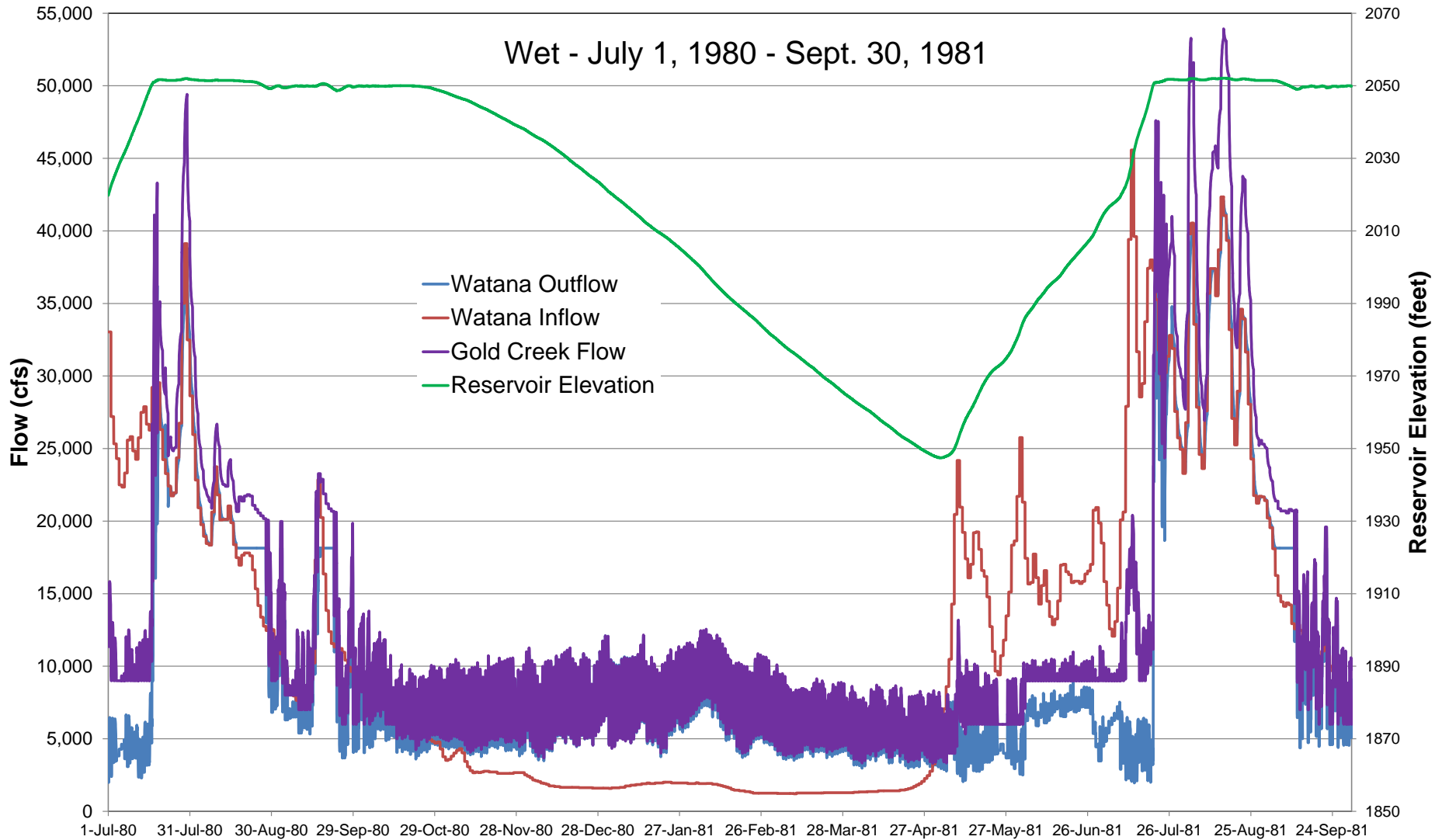
Watana Reservoir Annual Inflows



Dry – Water Year 1976



Wet – Water Year 1981



Average – Water Year 1985

