

RiverWare Model of El Dorado Irrigation District Project 184

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About EID and Project 184

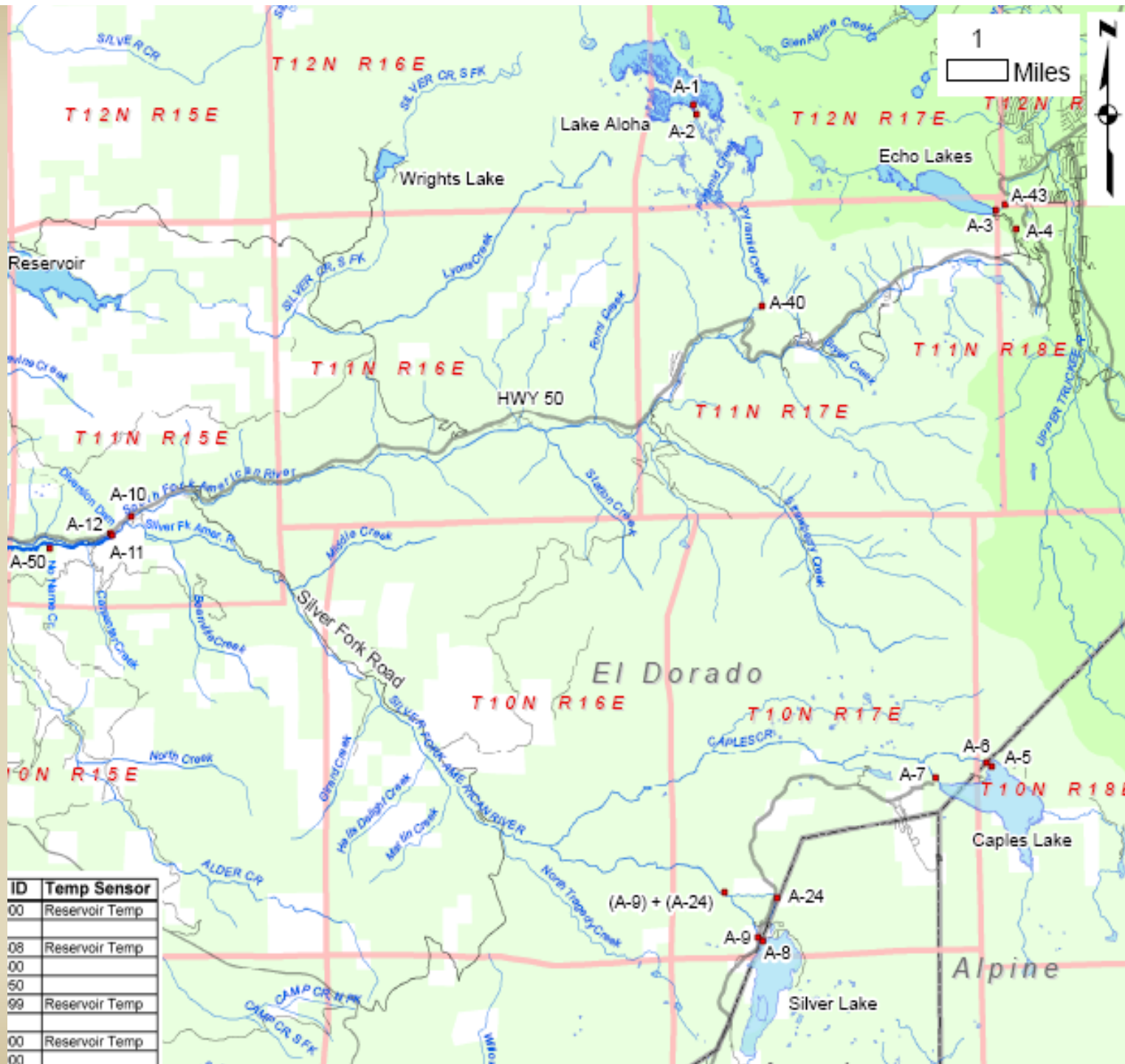
- El Dorado Irrigation District is located in Placerville, CA and serves 214 square miles in El Dorado County
- El Dorado Hydroelectric Project (Project 184) is located on the South Fork American River
 - Includes four storage reservoirs, a diversion dam, water conveyance (El Dorado Canal), and a forbay, penstock, and power house

Project 184 Details

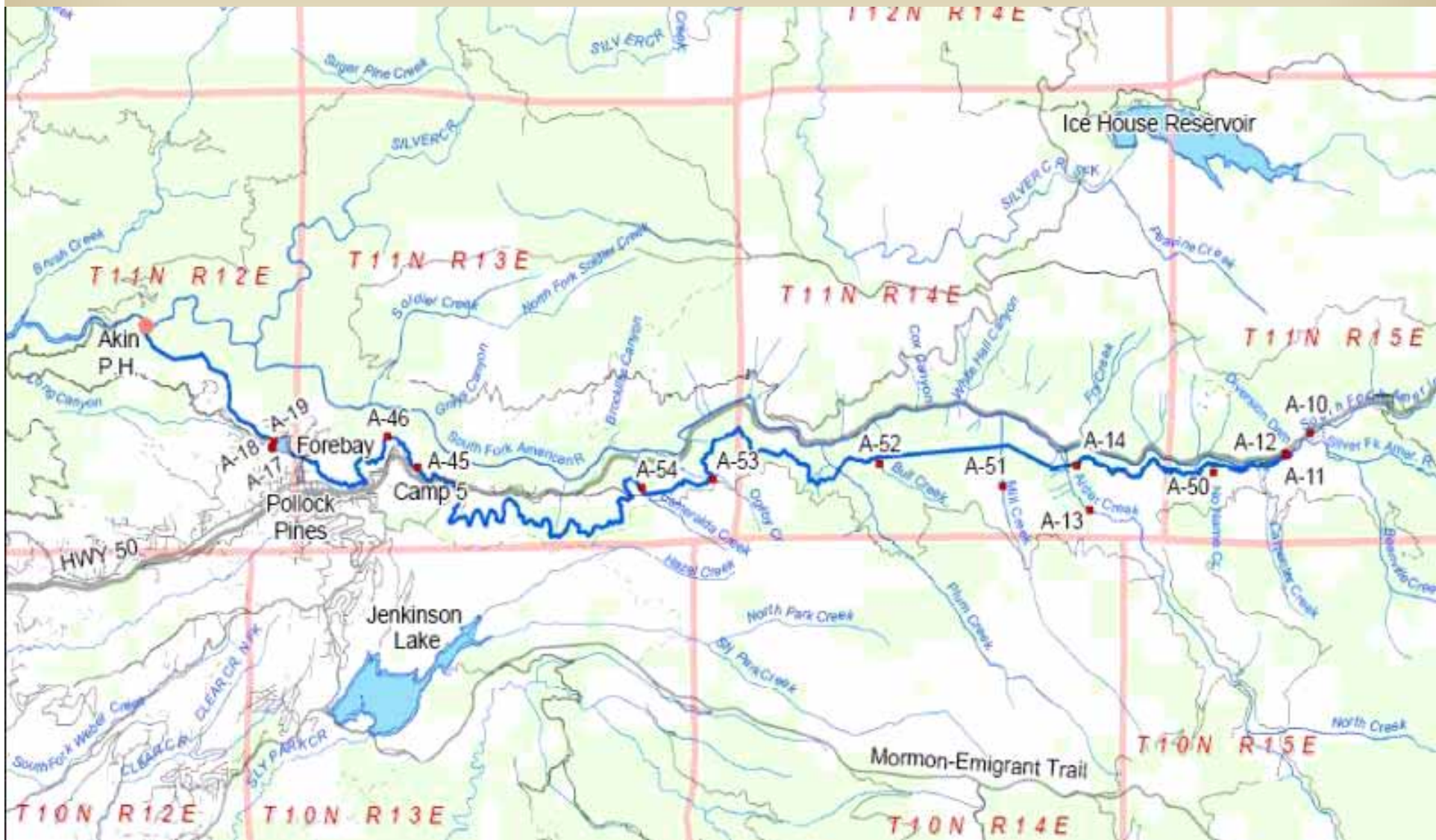
- Provides drinking water to ~100,000 people in El Dorado County - water treatment plant diverts from forbay
- 21 MW power plant delivers power to PG&E distribution system
- Includes alpine lakes providing recreational opportunities

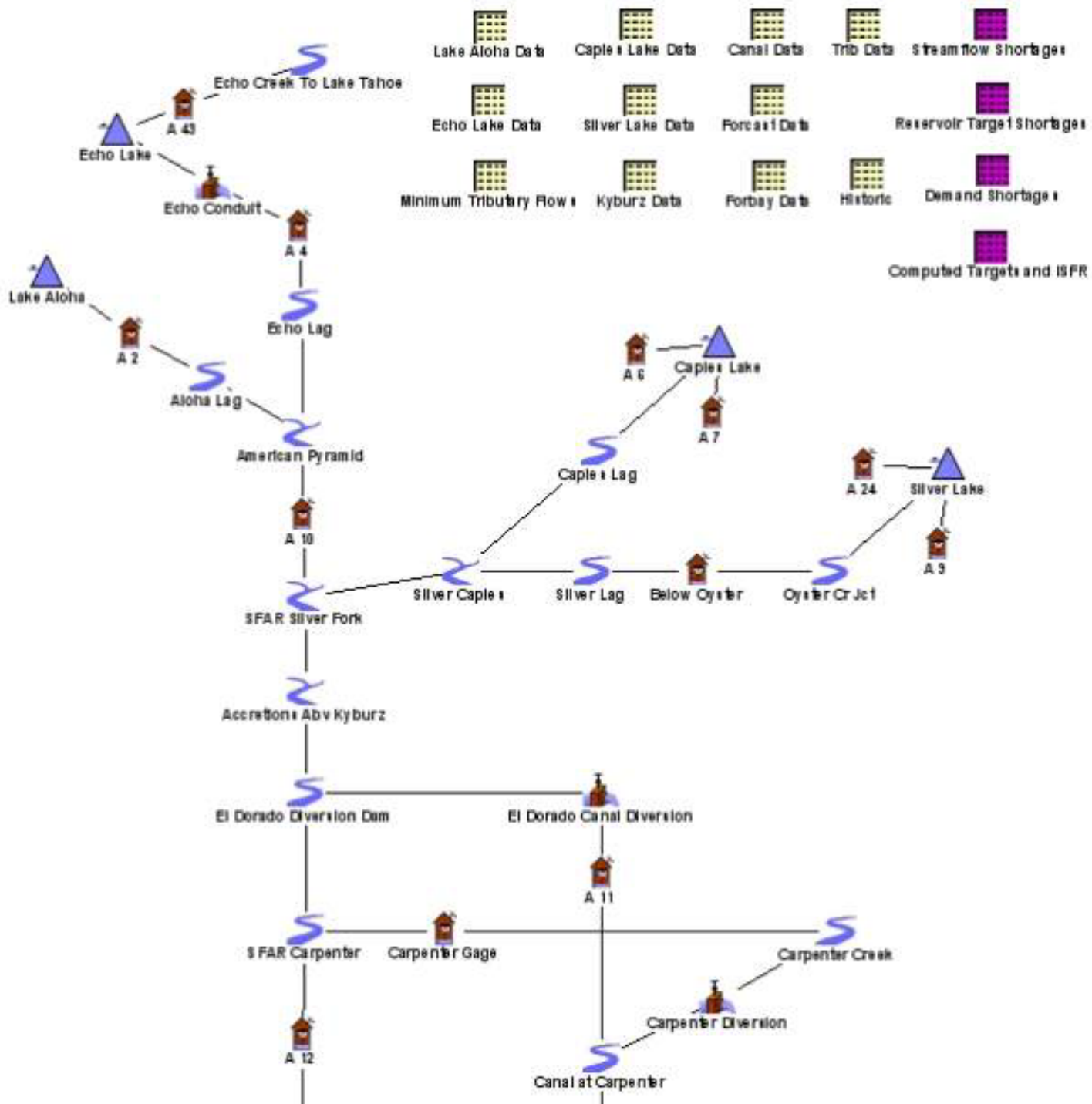
Project 184 Details

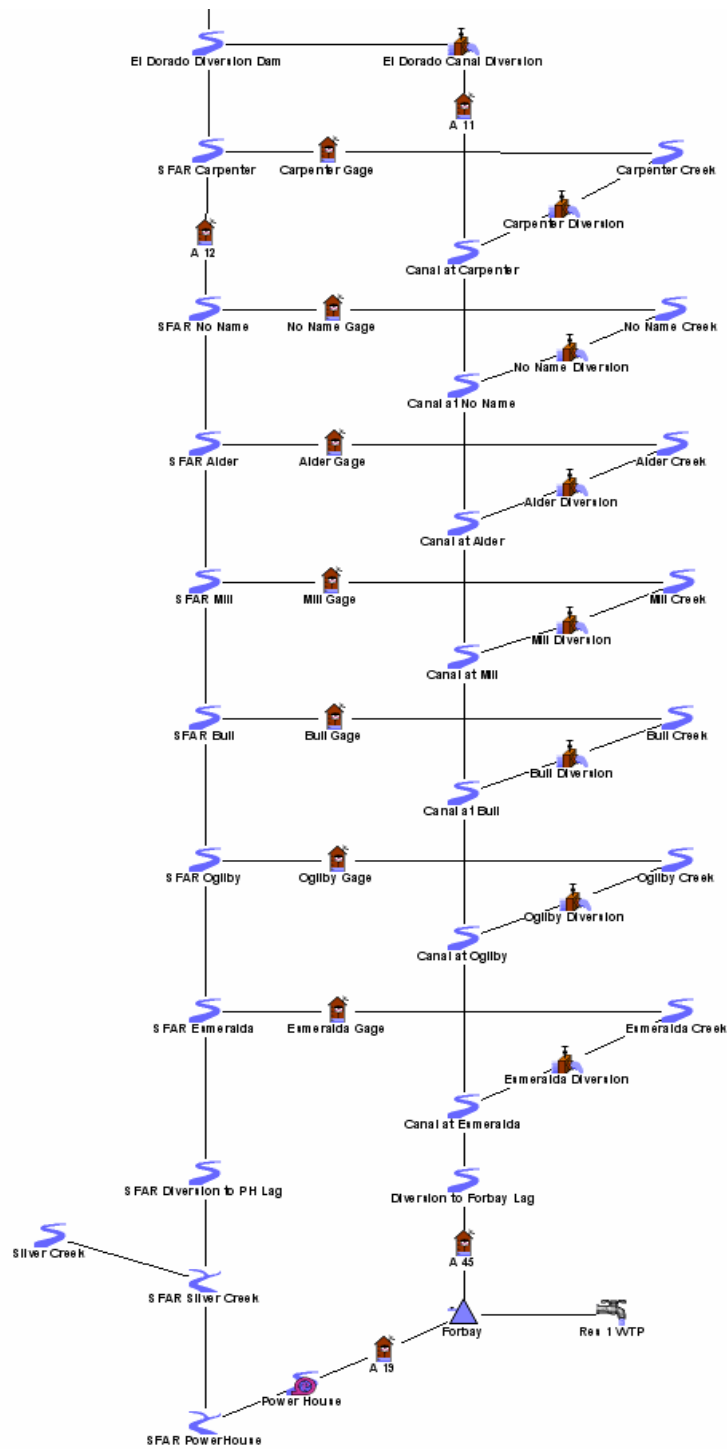
- Total reservoir storage ~38,000 AF
- 4 alpine lakes 7,000 – 8,000 feet MSL
- El Dorado Canal 22.3 miles long
- Forbay storage ~350 AF; elevation 3800 ft
- 1900 foot head drop from forbay to power house on South Fork American River
- Water treatment plant diversion from forbay (10 - 40 cfs daily) ~15,000 AF/Year



ID	Temp Sensor
00	Reservoir Temp
08	Reservoir Temp
00	
50	
99	Reservoir Temp
00	Reservoir Temp
00	







Need for a Model

- October, 2006 Project 184 FERC license re-issued (effective this spring)
 - Instream flow requirement below each dam and at A-12 gage (below diversion dam)
 - Minimum end of month storages on each reservoir
 - Flow requirements and min reservoir storages depend on month and water year type (CD, Dry, BN, AN, Wet)
 - Spring pulse flows, spill restrictions, etc.

Need for a Model

- Prior to new FERC license...
 - Similar operating requirements but were much simpler
 - System was much less restricted
 - Operations were performed “back of the envelope” style
- EID decided a model was needed to handle the additional complexity
- EID selected RiverWare as the modeling tool and selected Hydrosphere to develop and implement the model

Model Objectives

- Develop a daily operations model/tool based on new FERC requirements
- Mid-term to long term planning/forecasting tool (also daily timestep)
- Under new FERC license, operations are much more restricted
 - Want a better idea of how much water is available under new license
 - Looking to develop firmer power contracts; need to know how much water is available for power and when

Model Objectives

- Operating policies to meet FERC requirements have not yet been established
 - For example, minimum end of month storages are established but no criteria for getting there (i.e. no guide curves)
- Model will be used to analyze various operating policies and their ability to satisfy FERC requirements while maximizing consumptive use and power

How the System Works

Reservoir Release Priority

1. Meet instream flow requirement for fish
2. Meet or exceed end of month minimum storages
3. Consumptive Use (diversion from forbay for WTP)
4. Power Generation

How the System Works

- Draw from canal tributaries up to max diversion while maintaining instream flows
 - Goal is to run the canal full whenever possible (use for WTP then power)
- 4 upstream reservoirs make releases for A-12 flows and to fill El Dorado Canal
 - A-12 (below diversion dam) instream flow requirements must always be maintained
 - Reservoirs are constrained by season and water year type, drawdown restrictions, end of month minimum storages, min flows below dams, and ability to meet future A-12 flows

Policy Issues

- Minimum storages can be violated for fish flows, but how to operate the reservoirs for power above the min levels?
 - Risk of violating min storage to meet fish flows in future by choosing to generate power now
- Developed minimum guide curves
 - Above guide curves all releases are OK (fish, WTP, and power)
 - Below guide curves, release for WTP and fish
 - At or below FERC min storages, release for fish only

Operating Tools

- Combine planning/forecasting needs with operations needs in one model
 - Ease of use for river operators
- Developed SCTs for operators
 - Rules run to solve the system first, then the operators can adjust
 - All “control” slots can be either be user input or set by a rule or mixed
 - Same rules for planning and operations

Next Phase of Model Development...

- Develop forecasting tool for determining the probability of filling reservoirs based on water year type
- Questions?