Parallel Modeling Efforts Are Used to Analyze Regional Transmission and Local Distribution Systems

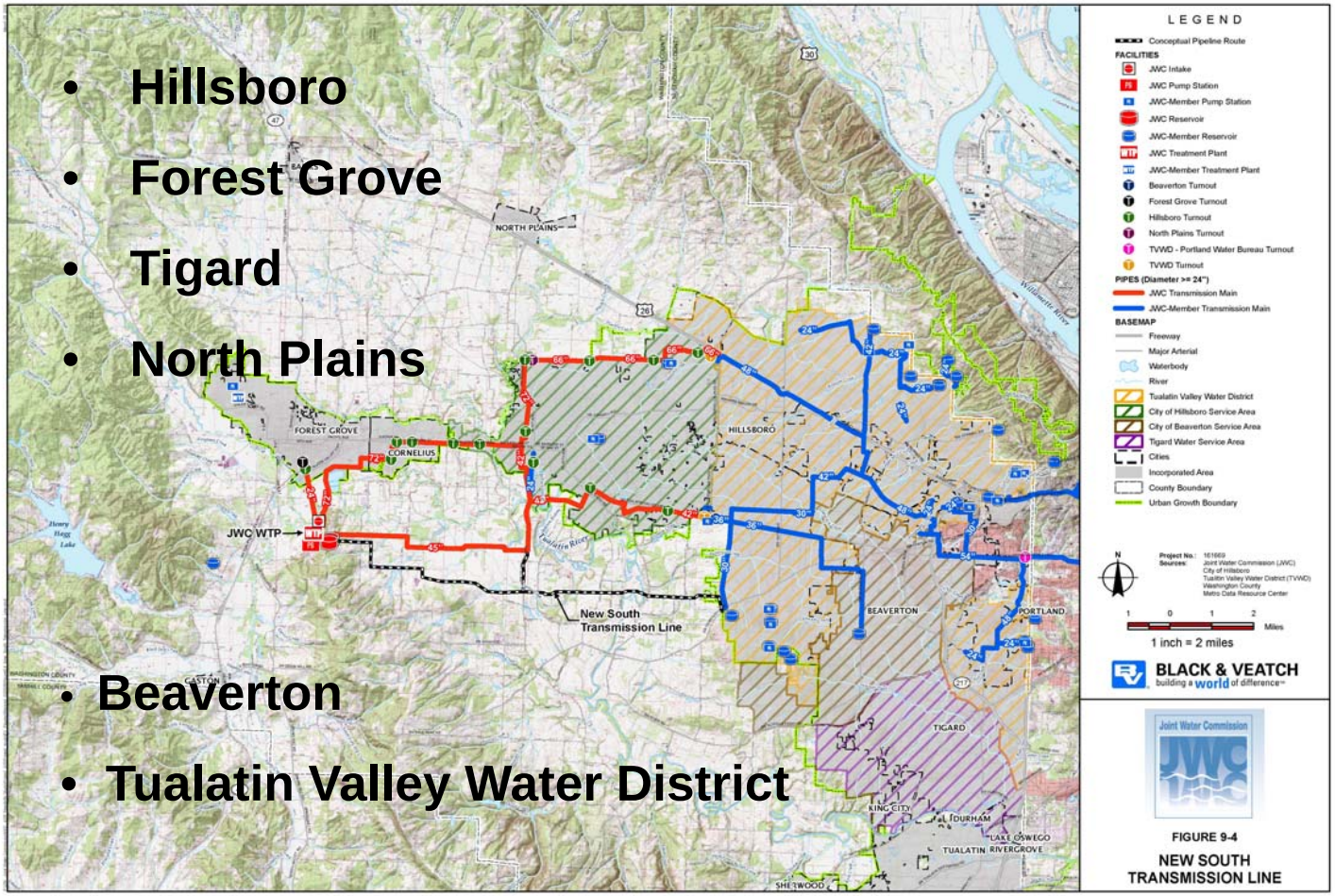
PNWS-AWWA 2010 Annual Conference

Stephen Davis, P.E. – Black & Veatch

JWC AND Hillsboro Water Master Plans

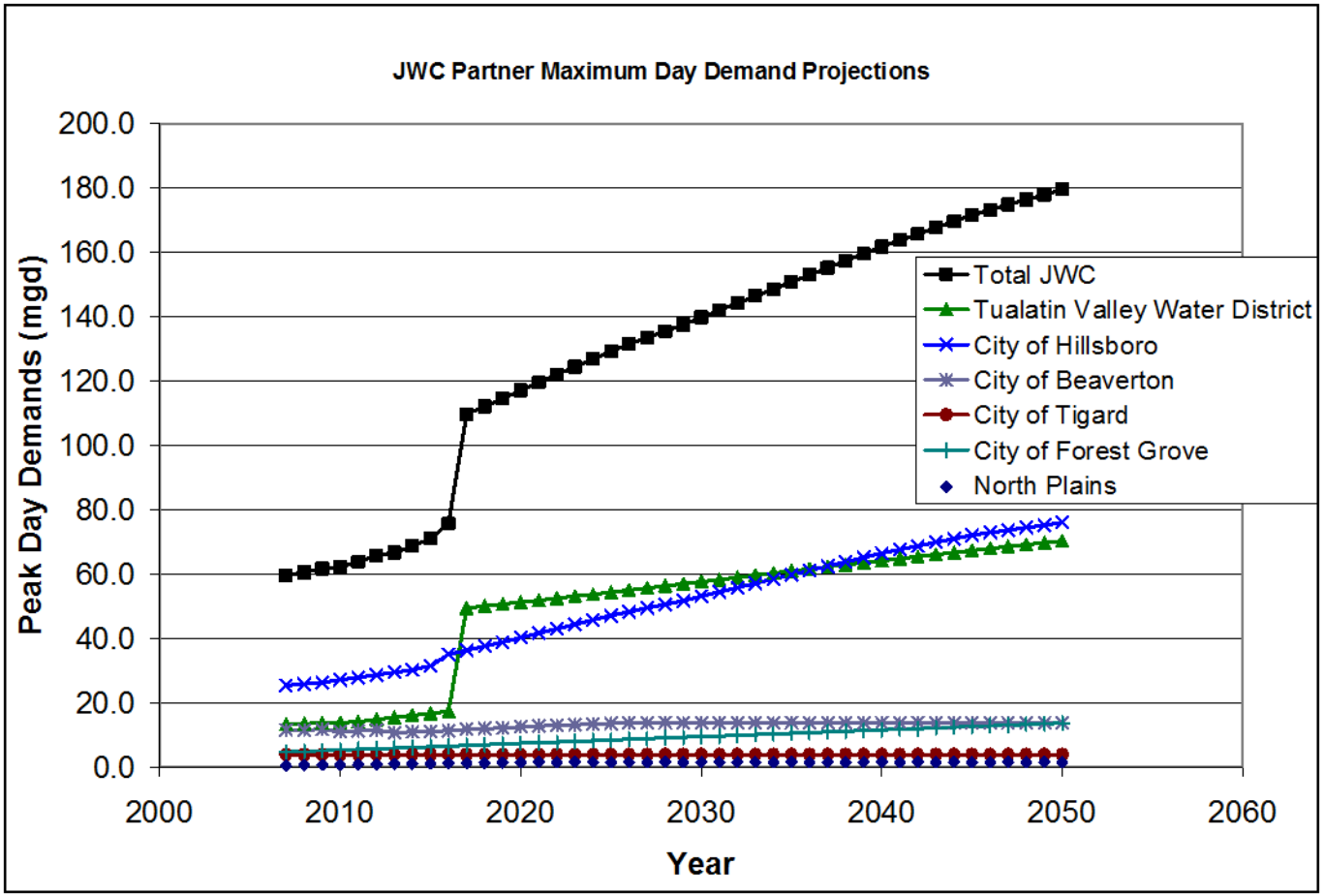
The Joint Water Commission is the largest wholesale water supplier in Washington County, serving Hillsboro and the following agencies:

- **Hillsboro**
- **Forest Grove**
- **Tigard**
- **North Plains**
- **Beaverton**
- **Tualatin Valley Water District**



JWC AND Hillsboro Water Master Plans

Significant demand growth was projected over the 40-year planning period within the JWC and member systems, including Hillsboro.

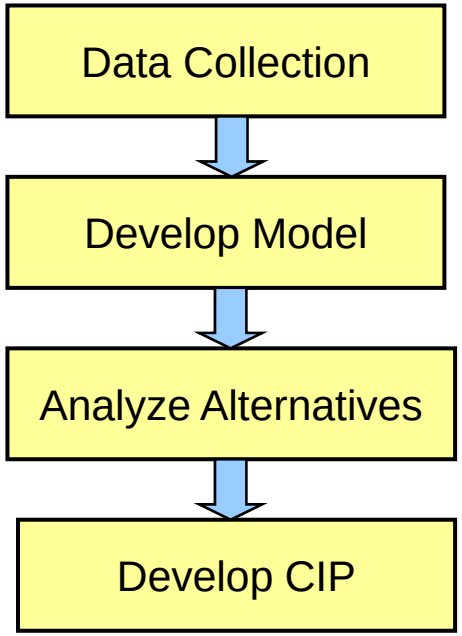


JWC AND Hillsboro Water Master Plans

The goal was to update Capital Improvement Plans of both agencies and meet projected growth and changing operating conditions in an economically efficient manner.

WORK TASKS ADDRESSED

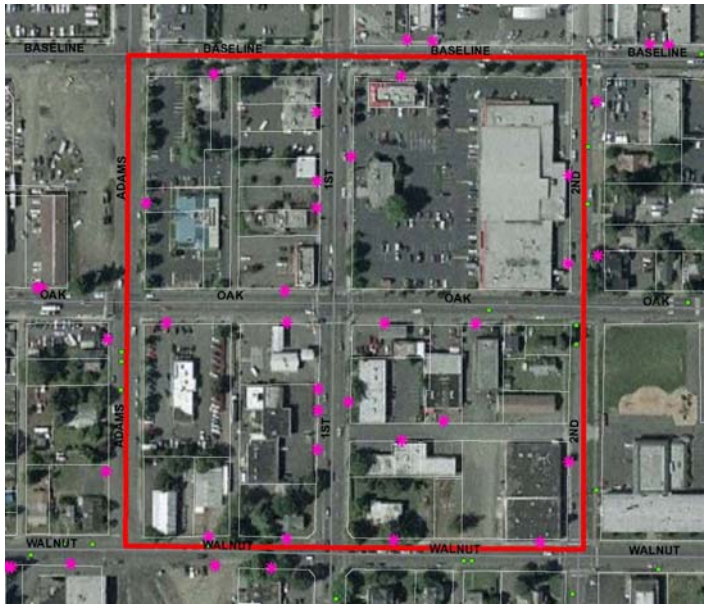
- Demand Analysis and Projection
- Model Construction and Calibration
- Analysis of Supply and Distribution Alternatives
- Development of a Phased CIP



Demand Analysis and Projection

A GIS based demand analysis for Hillsboro supported:

- Development of Demand Unit Rates for 36 Land Uses
- Demand Projections Responsive to Land Use at Buildout
- Allocation of Metered Sales Records for Accurate Model Calibration

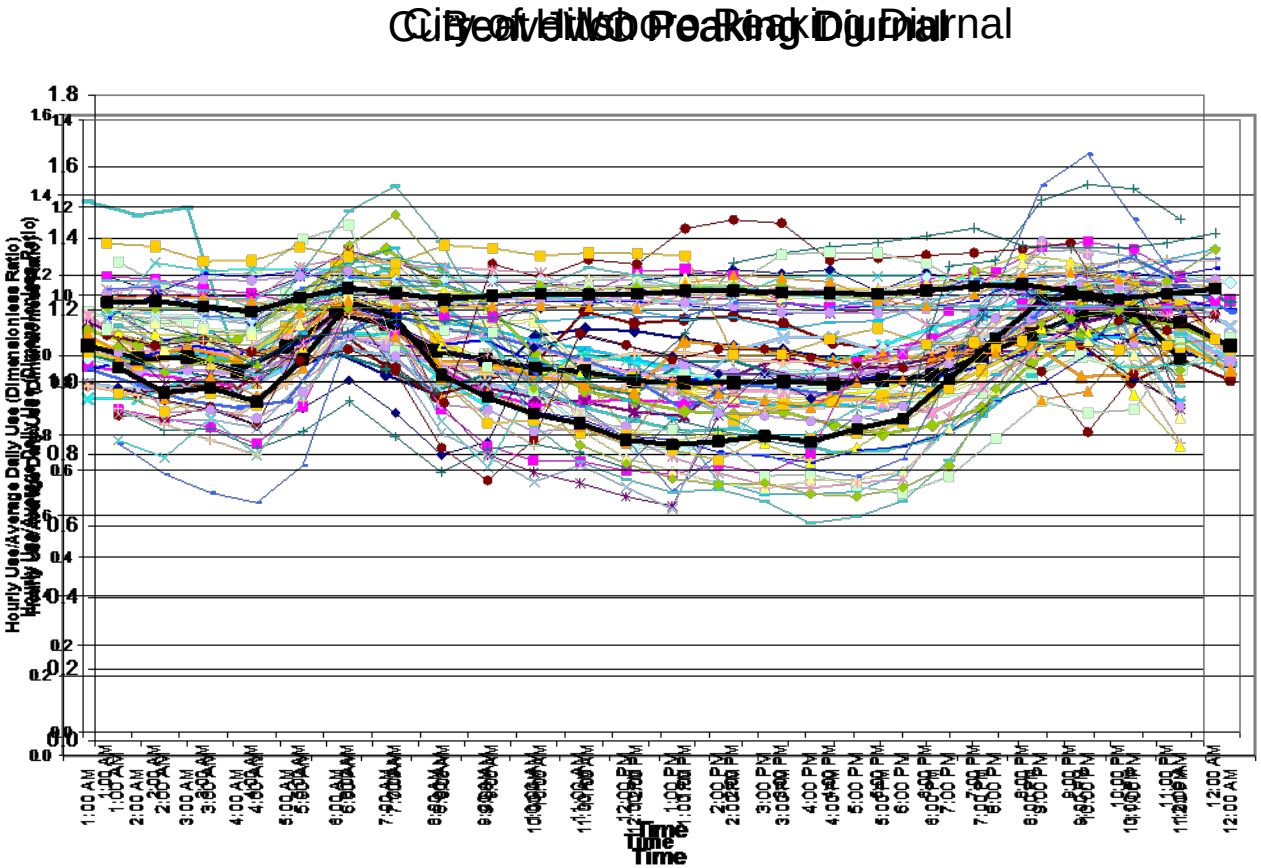


Commercial

Industrial

Demand Analysis and Projection

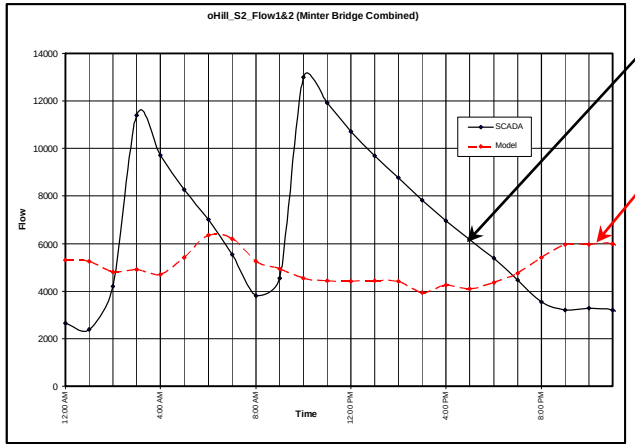
JWC demand is a composite of the seasonal and hourly patterns of its member agencies. These would change in the future and had a big effect on the sizing of all infrastructure.



Model Calibration and Hydraulic Analyses

The opportunity to link together a Regional Transmission System Model and Municipal Distribution System Model improved the calibration and hydraulic performance of both:

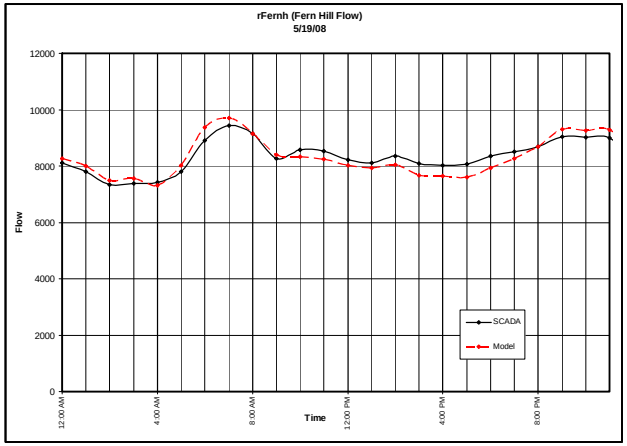
1. **Calibration of Minter Bridge Turnout in the Hillsboro Model**



SCADA Record

Calibrated Pattern

2. **Brought Fern Hill Flow Patterns into Agreement in the JWC Model**



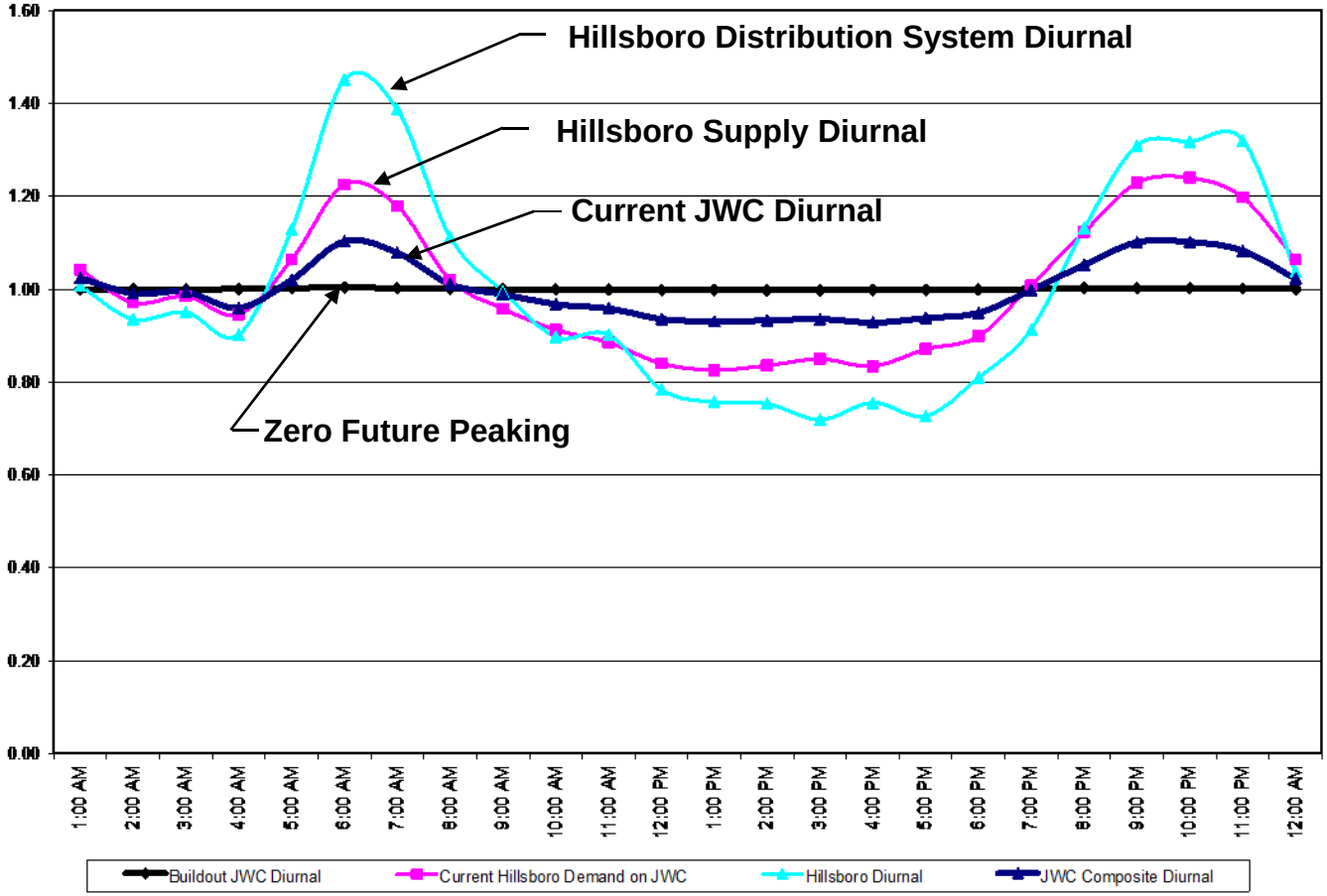
Recommended Improvements

The updated / calibrated models were utilized to analyze hydraulic performance in a coordinated manner and develop the optimum plan for:

- Modified Operations
- Improved Storage Utilization
- ASR Seasonal Supply
- Transmission System Upgrades

Recommended Improvements – Modified Operations

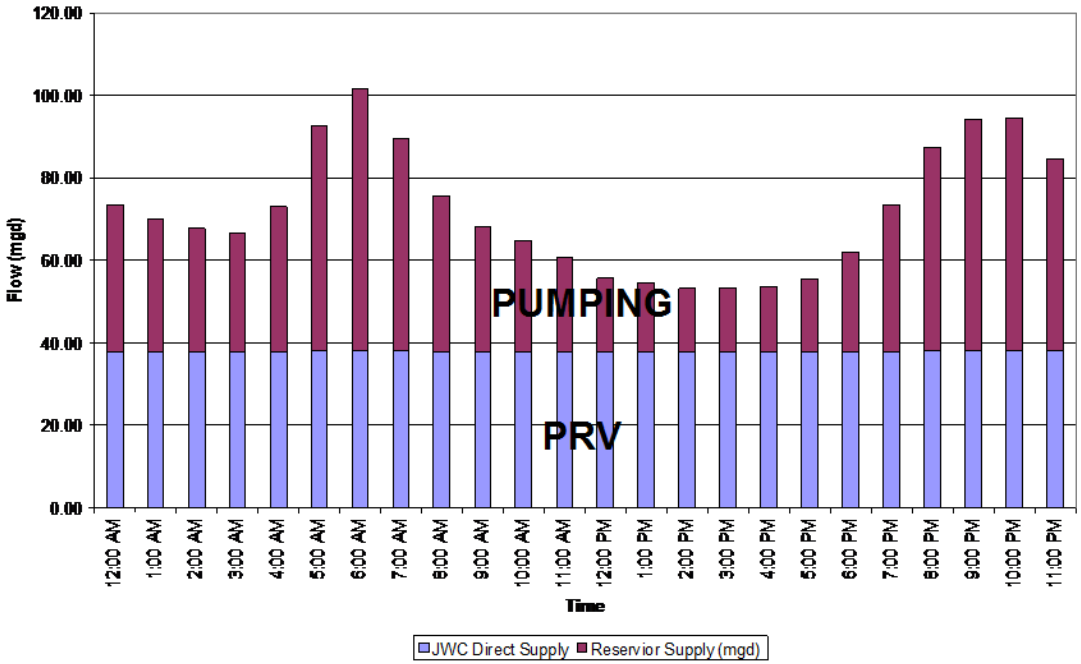
By meeting all of Hillsboro's peaking needs from local storage, the peak demand placed upon the JWC transmission system was reduced by 16 mgd or roughly 10 percent.



Recommended Improvements – Modified Operations

Shifting peaking from the JWC system required increased pumping from Hillsboro Reservoirs. The optimum setting for PRV feed versus pumped feed was a balance between:

- Minimizing pumping energy.
- Improving reservoir turnover and system hydraulics.

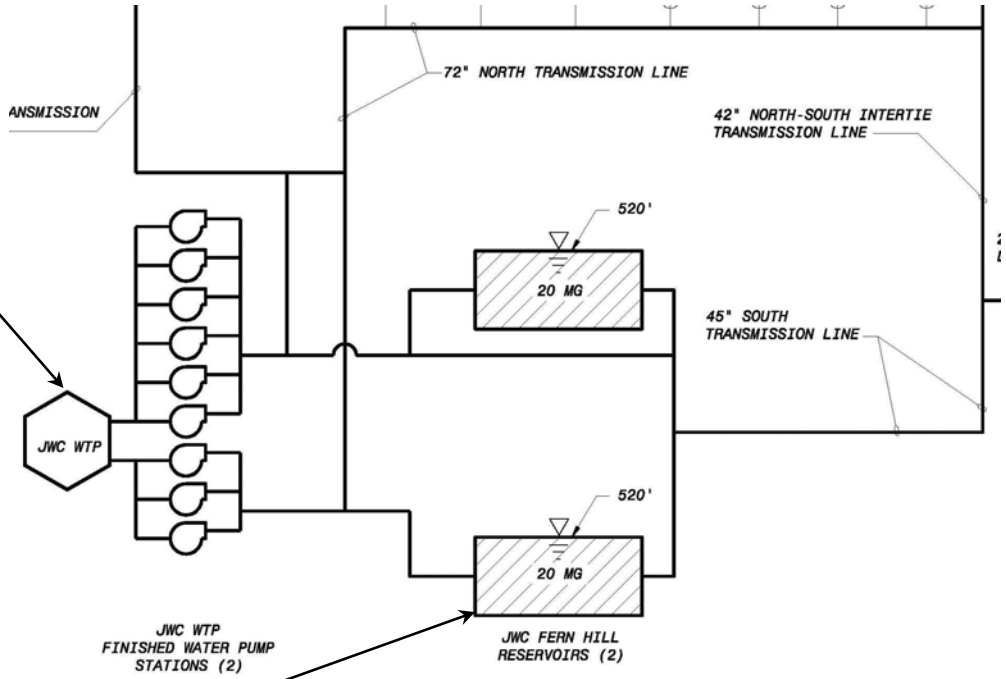


Hillsboro Buildout Supply

Improved Storage Utilization

With all peaking removed from the JWC system, the existing 40 MG Fern Hill Reservoirs were found to be sufficient.

- Only the plant clearwell is to be expanded to stabilize pumping and increase disinfectant CT.
- Limiting storage expansions will reduced water aging by half in the future.



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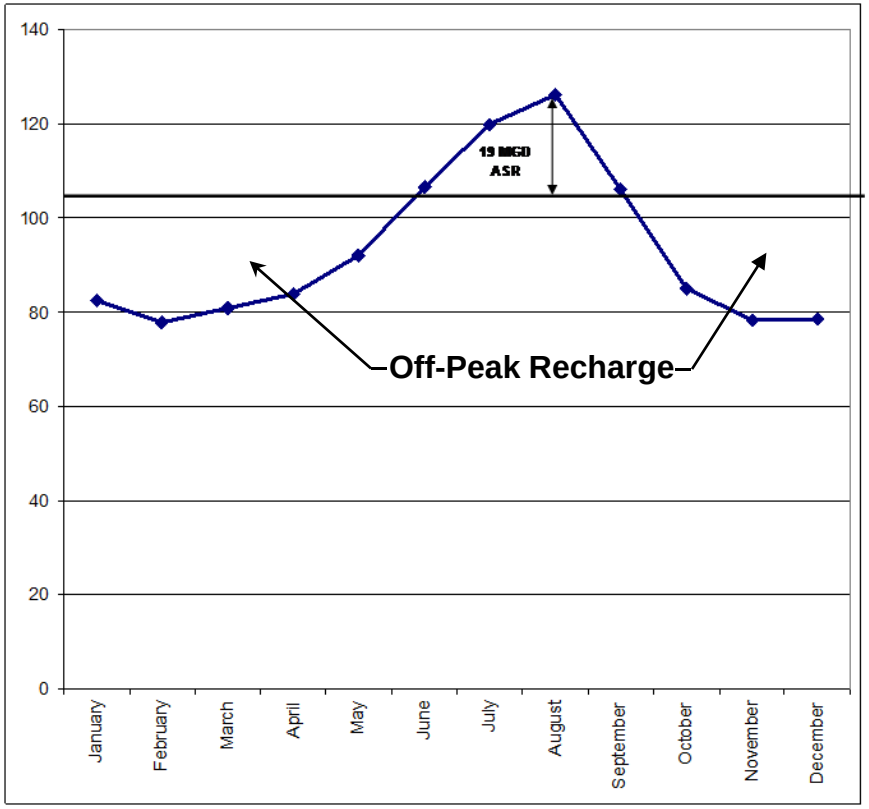
Supply Improvements and Modifications

By locating ASR wells to the east in the Tualatin Basin and shifting TVWD loads;

- Peak transmission rates can be reduced by 19 mgd.
- Plant production can be Base-Loaded year-round.
- The transmission system is fortified against line breaks.
- Loads are balanced on the North and South Transmission Mains



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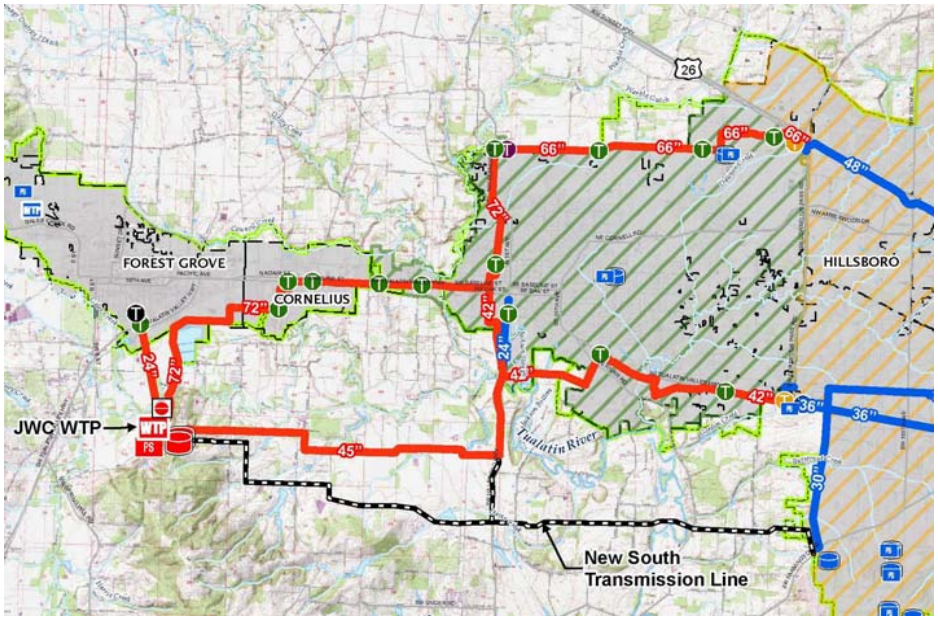
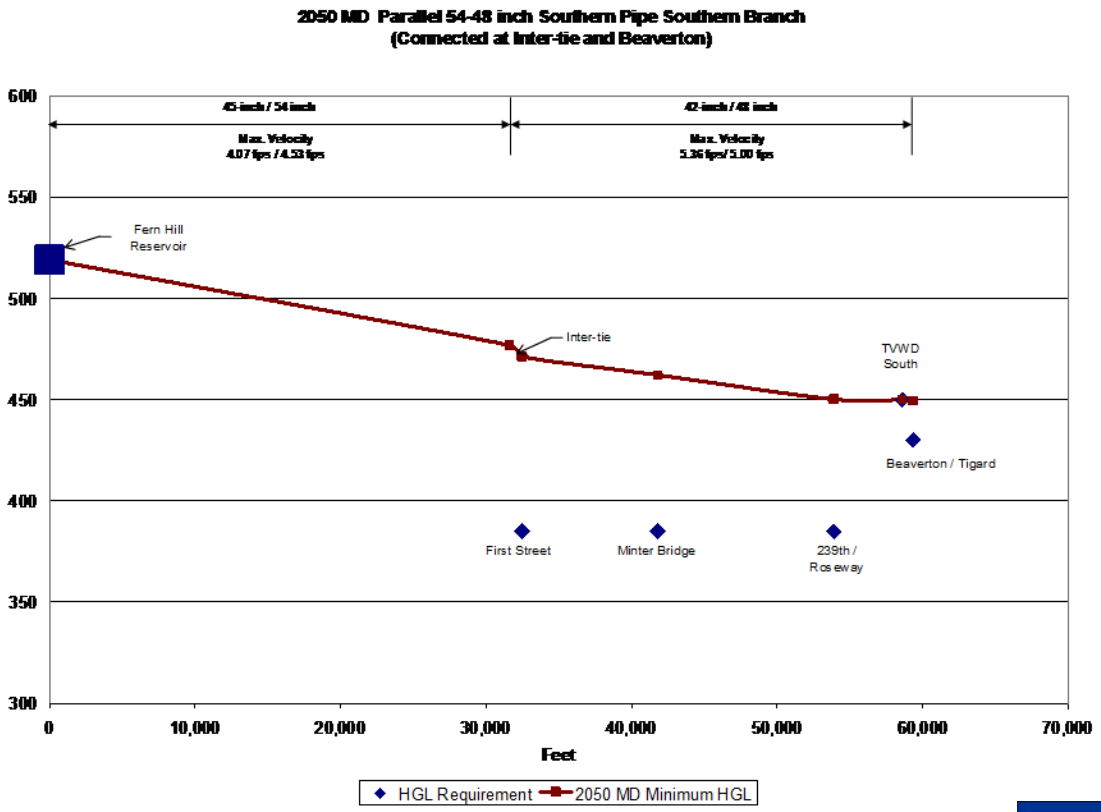


Transmission System Improvements

As a result of the above improvements and modifications, peak system capacity can be expanded from 75 mgd to 180 mgd while:

- Maintaining a Gravity Flow HGL in the JWC System.
- Delaying construction of the third 60-inch transmission main until 2038.



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Questions?