Baseline Reliability Assessment

Presented to

Water Supply Advisory Committee

February 12, 2015

Confluence History and Context

- Roots in power planning
- Designed specifically for water resources planning
- Has been applied to a variety of system types & sizes
- Used to help address many issues in Santa Cruz

Confluence: What it is and isn't

Confluence is:

- Planning model
- Simulation tool

Confluence can compare scenarios

Confluence isn't:

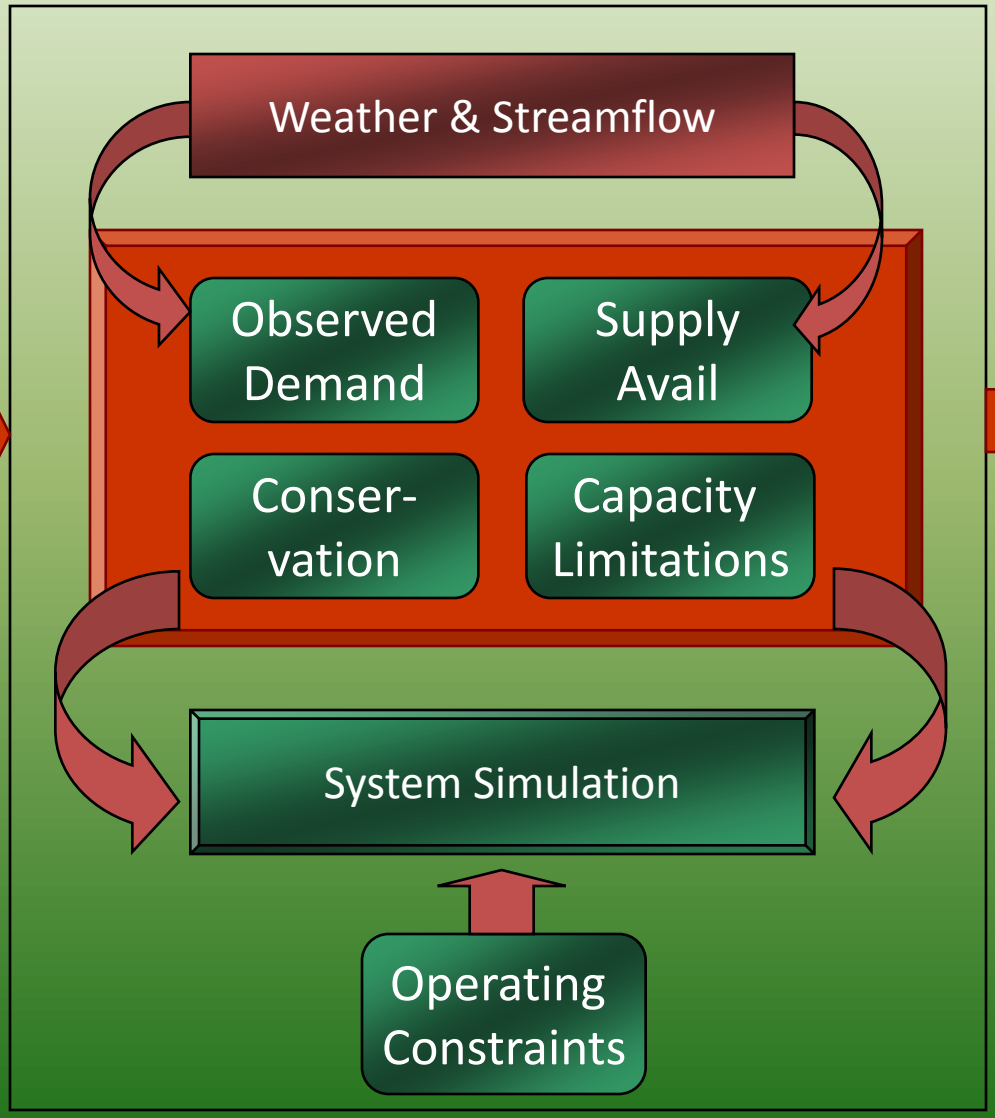
- Operations model
- Optimization tool

Confluence can't find the "best" scenario

Key Changes in Modeling Assumptions in Last Year

Modeling Parameter	Previous	Current
Demand Shape (Percent of annual demand in peak season)	64%	59%
Annual Loch Lomond Withdrawal Limit	3,200 AF	No limit
N Coast Annual Ag Demands (mg)	81.4	40
Tait Street Flow Buffer (cfs)	0	0.5
Tait Street Well Capacity (cfs)	1.78	1.29 peak 0.78 off-peak

Confluence® Model Structure



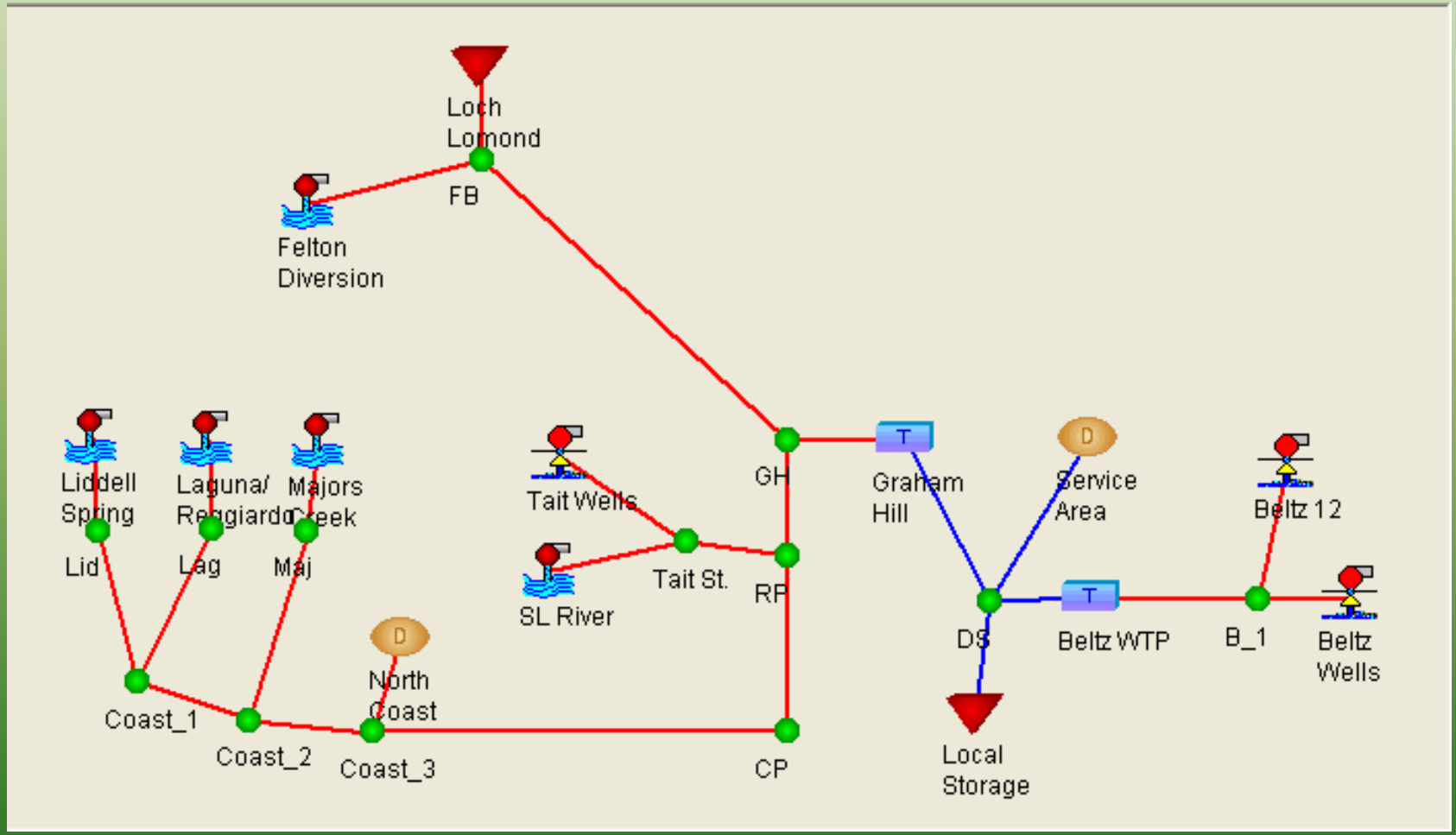
Inputs

- Demands
- System structure
- Supplies
- Conservation
- Facilities
- System operations
- Simulation Parameters

Outputs

- Reliability
- Costs & rates
- Demands
- Supply utilization
- Lake operations
- Conservation savings
- Transmission loadings
- Scenario comparisons
- Diagnostic reports

Interactive Data Map



Defining the Baseline

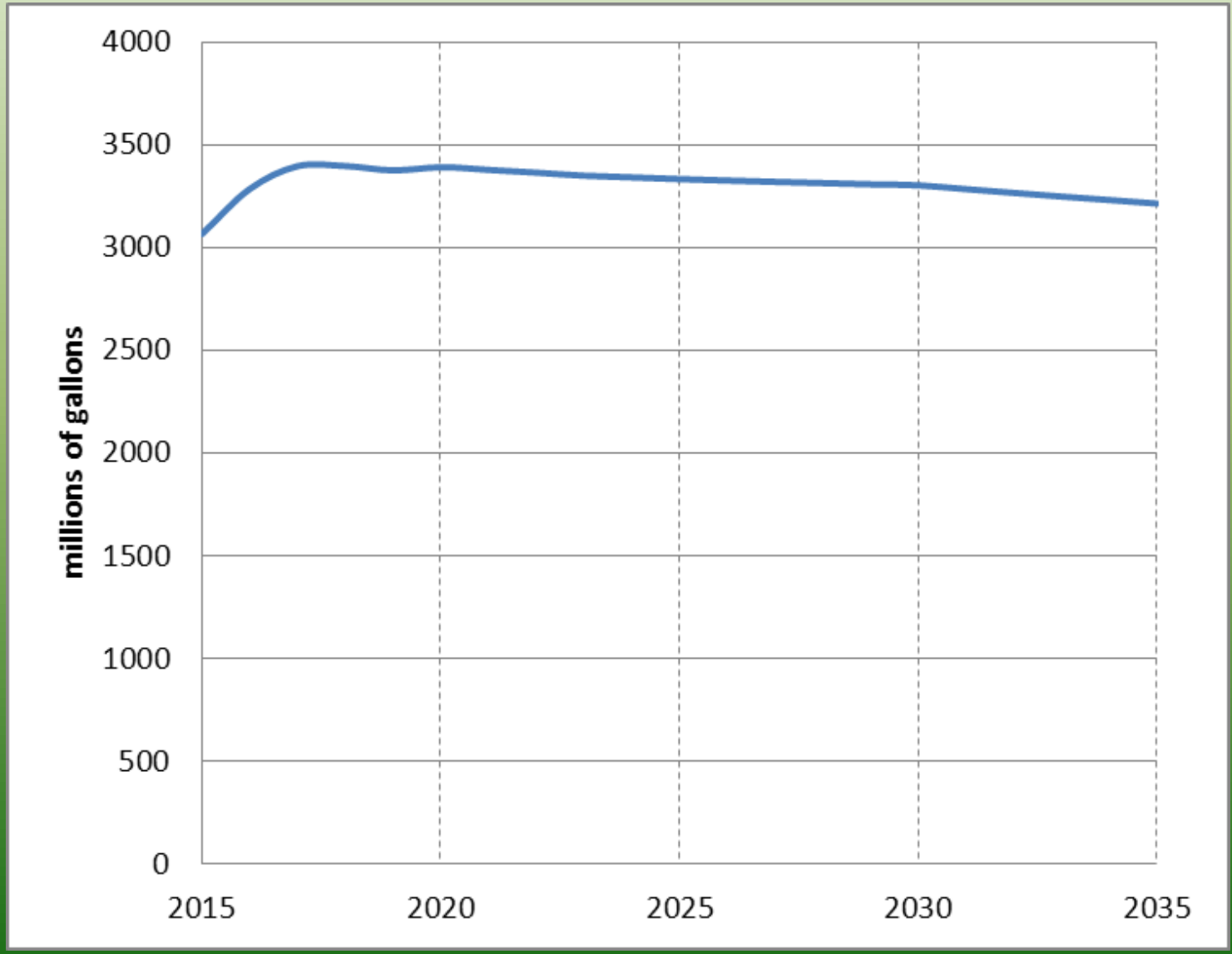
- Supplies and infrastructure
- Demand forecast
- Available streamflows

Existing Supplies

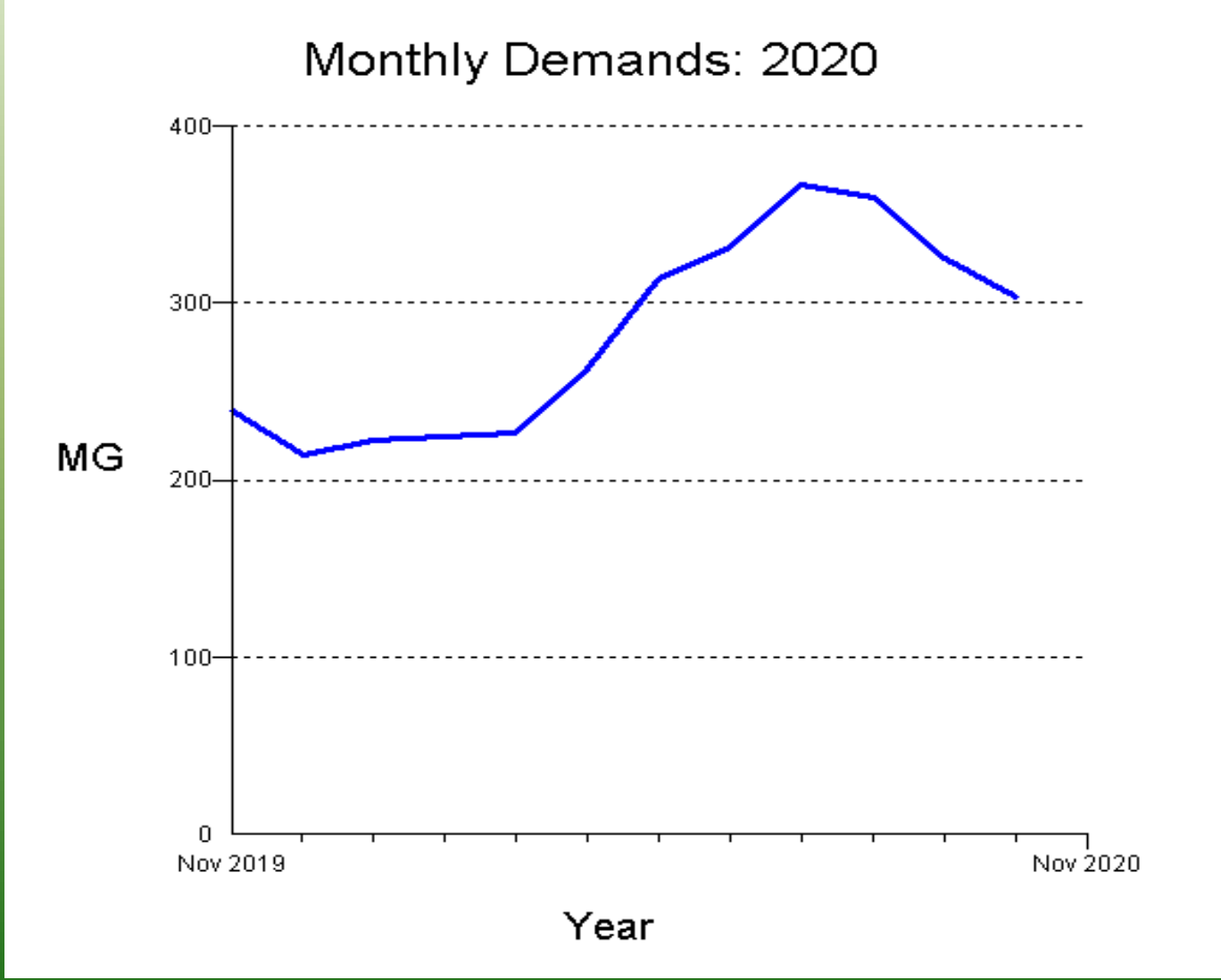
- North Coast
- San Lorenzo River (Tait Street diversion)
- Live Oak Wells
- Loch Lomond Reservoir

Also Felton diversion to Loch Lomond

Interim Annual Demand Forecast



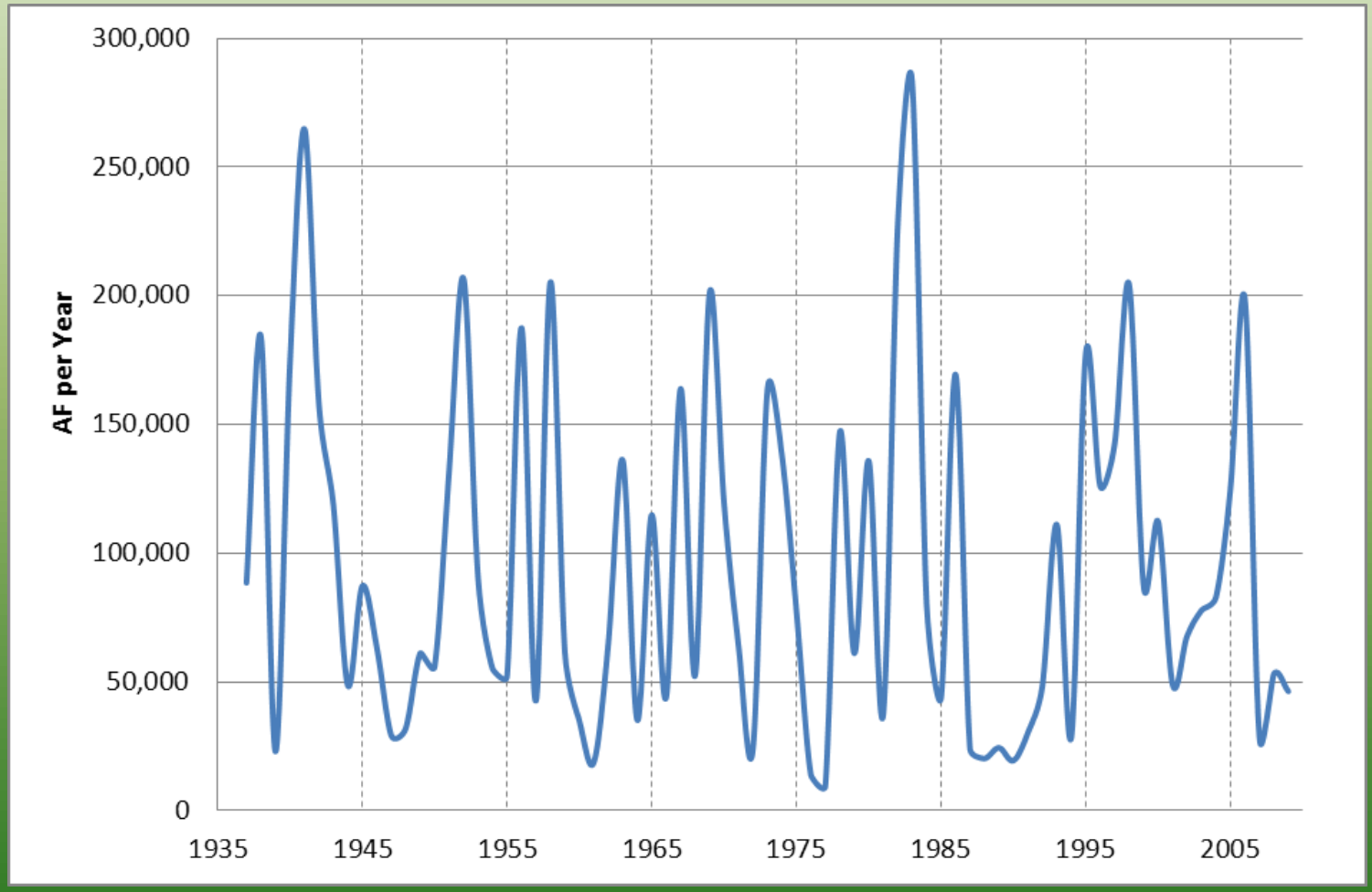
Monthly Demand Pattern



Available Streamflows

- Based on 1937-2009 historic record
  - Will add 2010-2014 when data available
  - Assumes future will look like that record
- Three alternative flow sets:
  - Natural (no HCP fish flow requirements)
  - Two proposals on table in HCP negotiations
    - City Proposed (Tier 3/2)
    - CDFW Proposed (DFG-5)

Historic Flow Record: Annual San Lorenzo River Runoff



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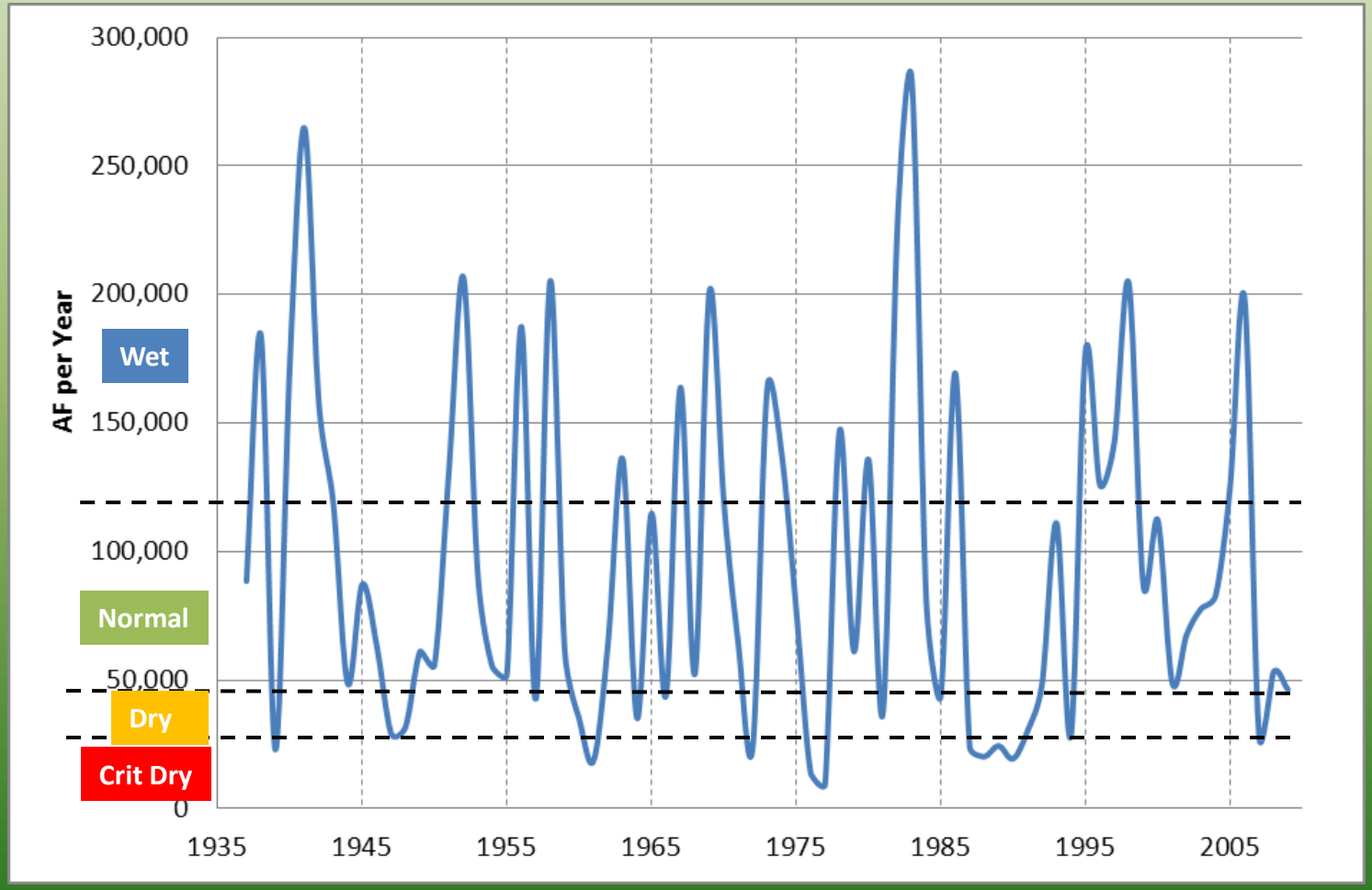


Projecting Water Supply Reliability: Key Definitions

- Shortage

  A shortage occurs when the system is unable to provide sufficient water to serve unconstrained customer demand.

- System reliability

  How often do we expect there to be future system shortages of various sizes?

Worst-Year Peak-Season Shortages

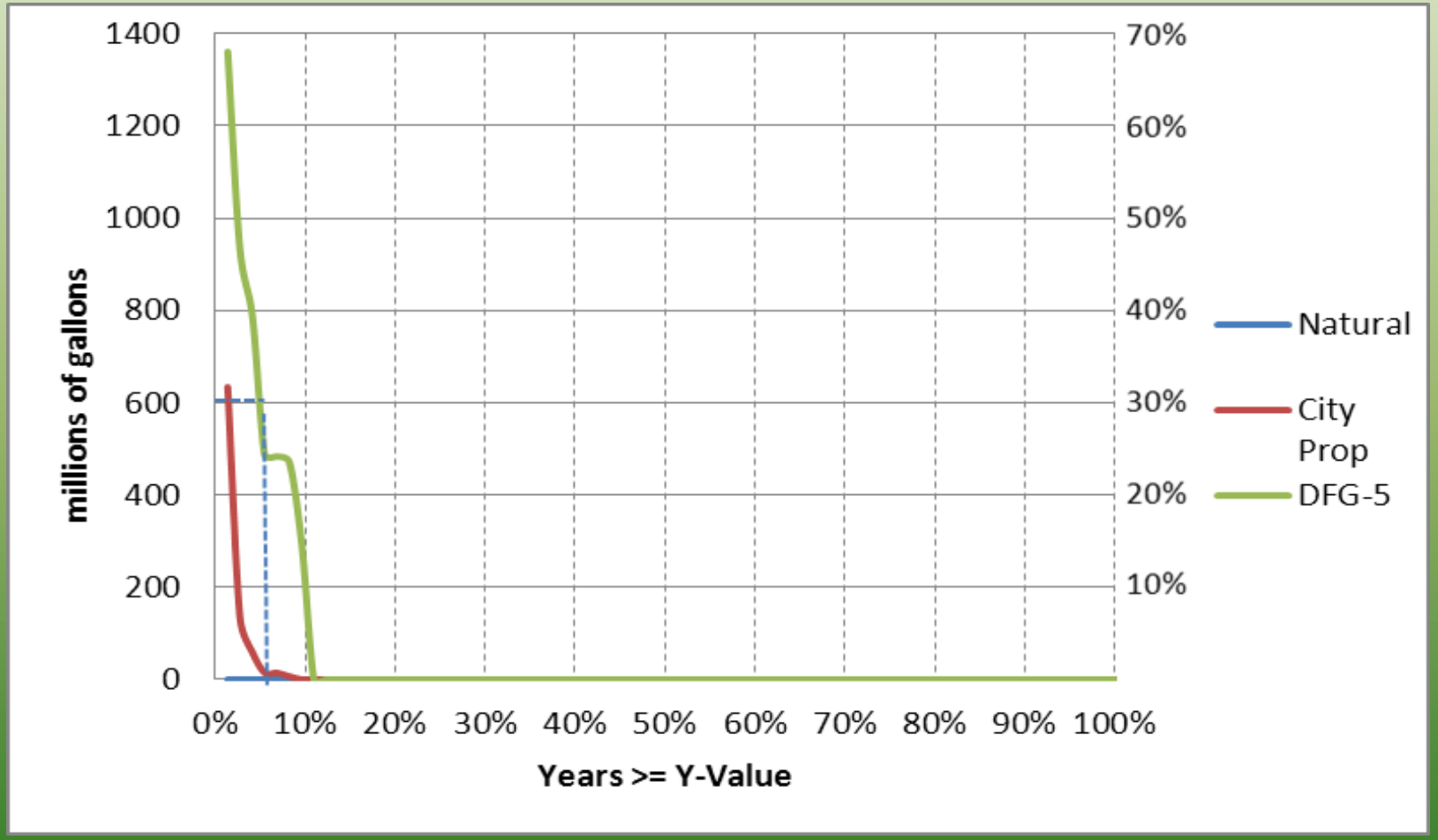
FLOWS	2020		2035	
	Volume (mg)	Percent	Volume (mg)	Percent
Natural	0	0%	0	0%
City Prop	630	32%	500	26%
DFG-5	1360	68%	1220	64%

Peak-Season Shortage Profiles

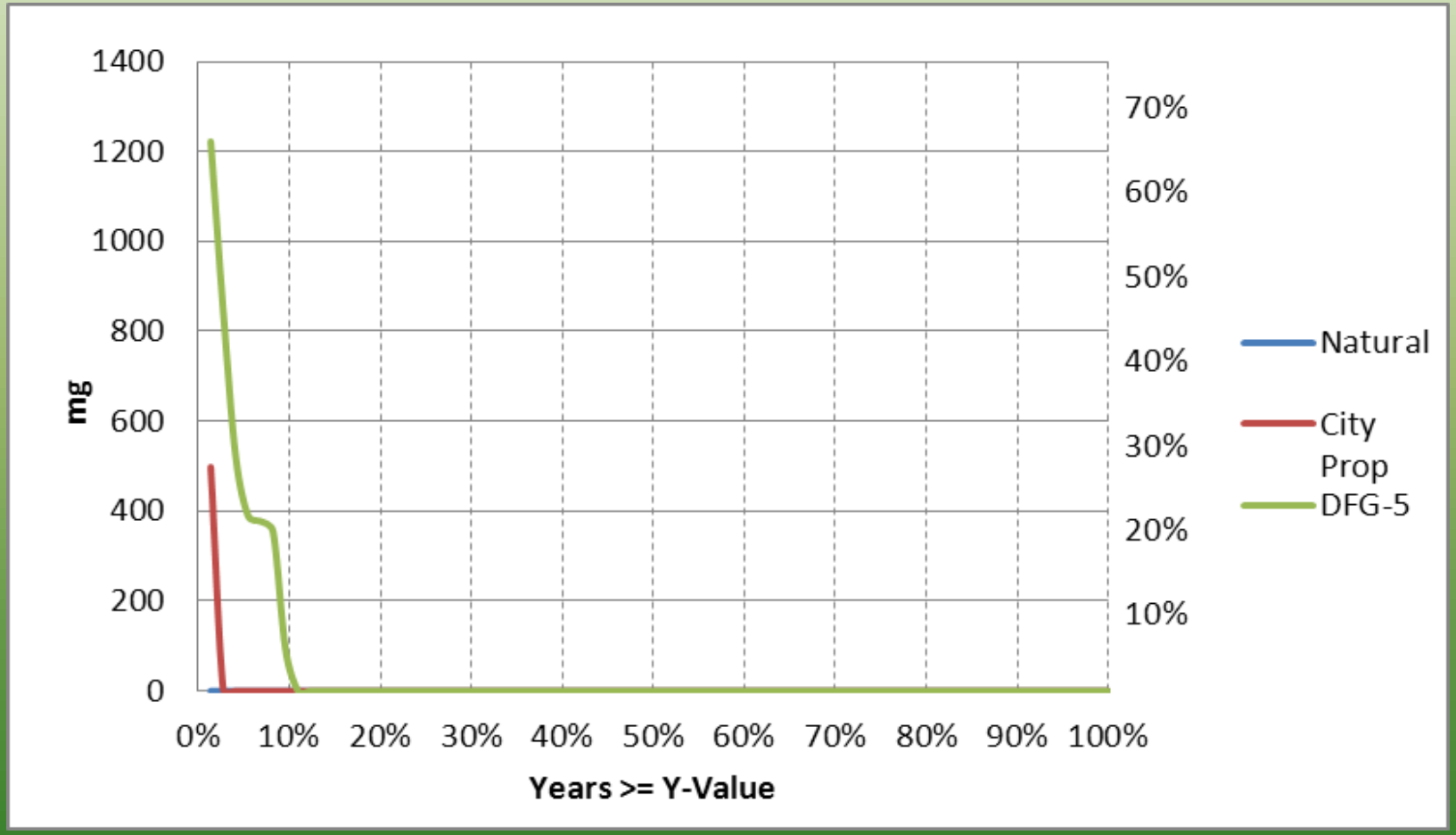
FLOWS	Likelihood of Peak-Season Shortages : 2020				
	0%	<15%	15%-25%	25%-50%	>50%
	0	<300 mg	300-500 mg	500-1000 mg	>1000 mg
Natural	100%	0%	0%	0%	0%
City Prop	92%	7%	0%	1%	0%
DFG-5	90%	1%	4%	3%	1%

FLOWS	Likelihood of Peak-Season Shortages : 2035				
	0%	<15%	15%-25%	25%-50%	>50%
	0	<285 mg	285-475 mg	475-950 mg	>950 mg
Natural	100%	0%	0%	0%	0%
City Prop	97%	1%	0%	1%	0%
DFG-5	90%	1%	4%	3%	1%

2020 Peak-Season Shortage Duration Curves

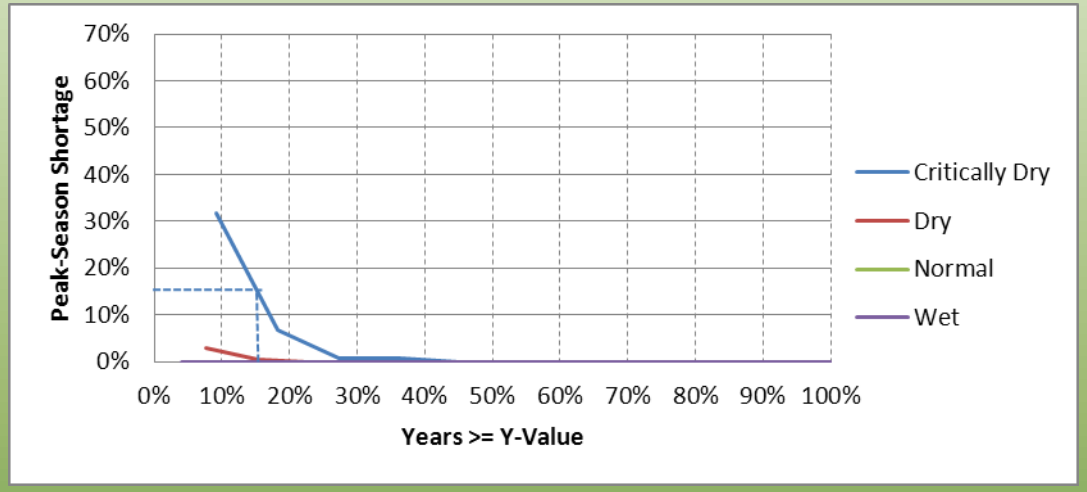


2035 Peak-Season Shortage Duration Curves

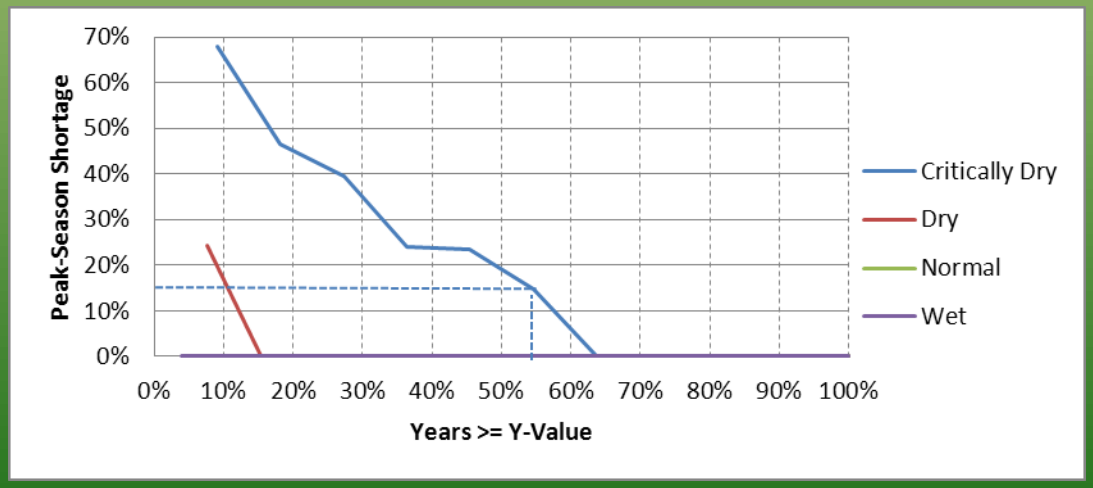


2020 Peak-Season Percent Shortage Duration Curves by Year Type

City Proposed Flows



DFG-5 Flows



The Baseline “Bottom Lines”

- Based on existing supplies and infrastructure, the latest demand forecast, and the historical flow record, the City’s water supply reliability challenges depend on the eventual outcome of HCP negotiations.
- Assuming future streamflows will look like the past, reliability problems under both HCP flow proposals occur under the driest conditions.
- Under those conditions and under both HCP flow proposals, water shortages can be significant.

Questions??