Technical Update on the Water Supply Advisory Committee

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Santa Cruz City Council Meeting

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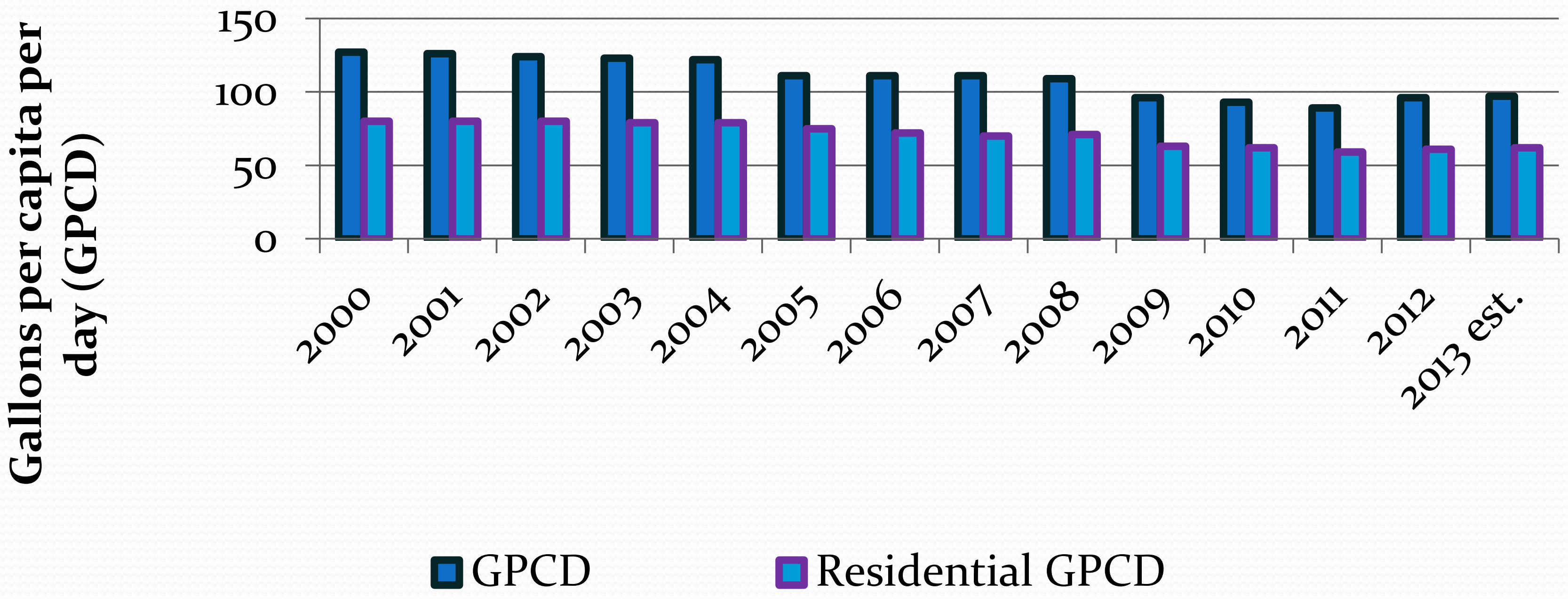
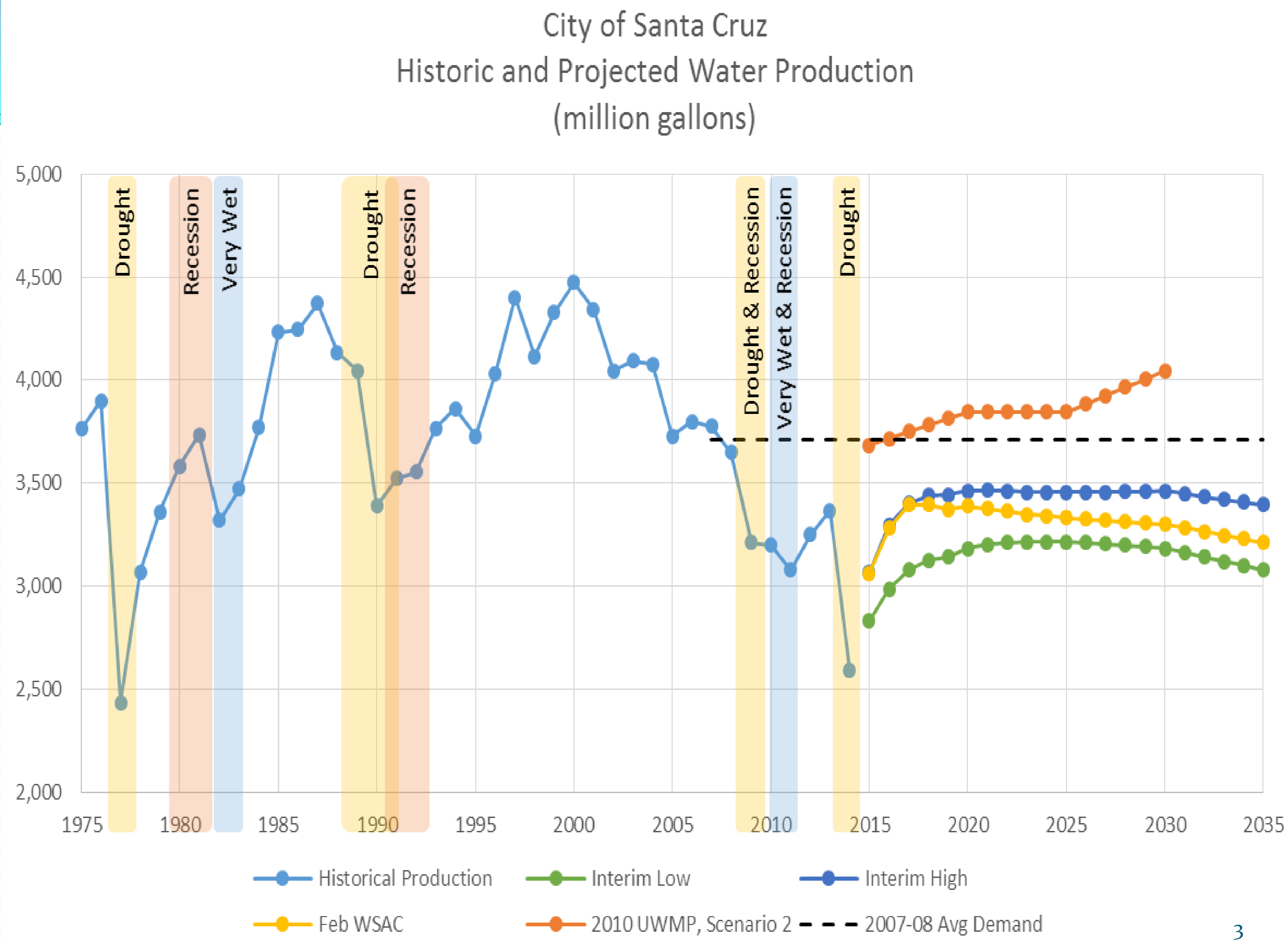
Defining the Problem – Demand Side

- Demand management has taken the City a long way
  - Revised demand forecast reflects great conservation strides
  - Opportunities for continued progress



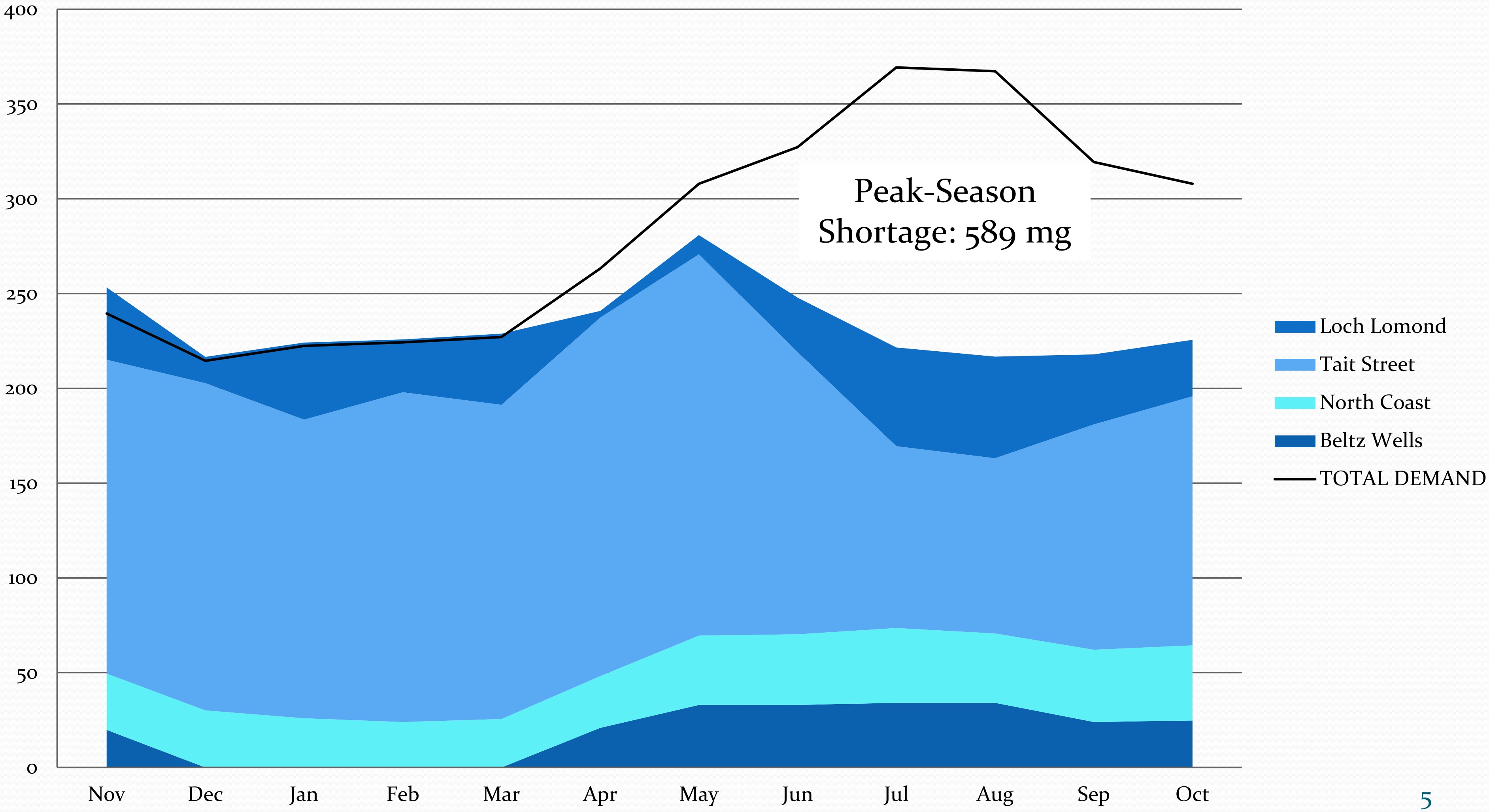


City of Santa Cruz
Historic and Projected Water Production
(million gallons)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
Drought
Recession
Very Wet
Drought
Recession
Drought & Recession
Very Wet & Recession
Drought
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
Historical Production
Interim Low
Interim High
Feb WSAC
2010 UWMP, Scenario 2
2007-08 Avg Demand

Defining the Problem – Supply Side

- Supply faces several future constraints and uncertainties
  - Fish flow requirements (DFG-5)
  - Climate change (level and seasonality of rainfall)
  - Extended droughts (8-yr scenario; Paleo events are longer)
  - Wildfire, earthquake, mudslides, and other vulnerabilities
- Action required to avoid large, frequent shortages

Monthly Source Production
1977 Hydrologic Conditions
City Proposed Flows, Interim 2020 Demands
(in millions of gallons per month)



Monthly Source Production 1977 Hydrologic Conditions – DFG-5 Flows, Interim 2020 Demands (in millions of gallons per month)

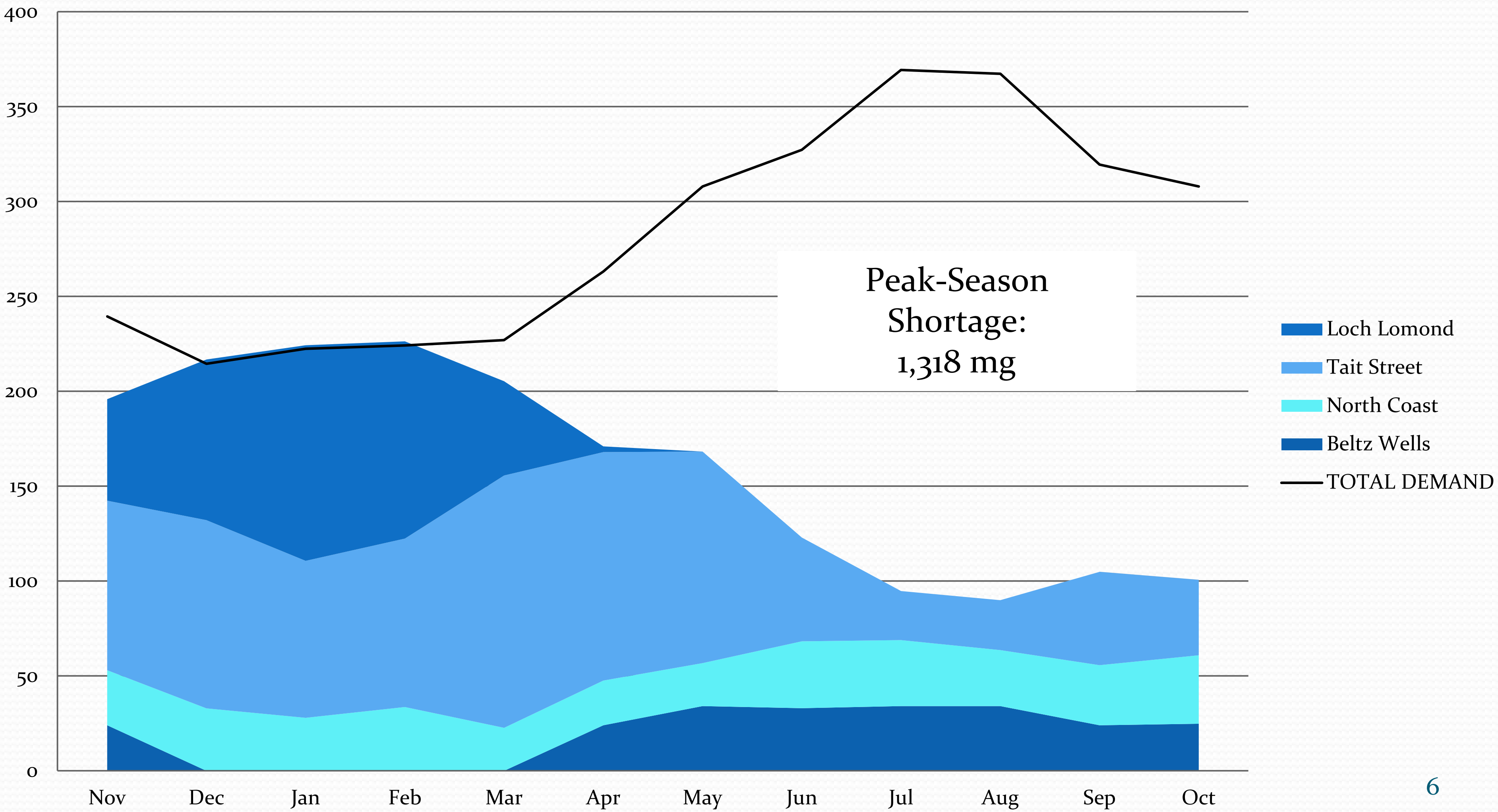


Table 1 -- <u>2020</u> Shortage Profiles: Fish Flow Requirements

FLOWS	Likelihood of Peak-Season Shortages				
	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%

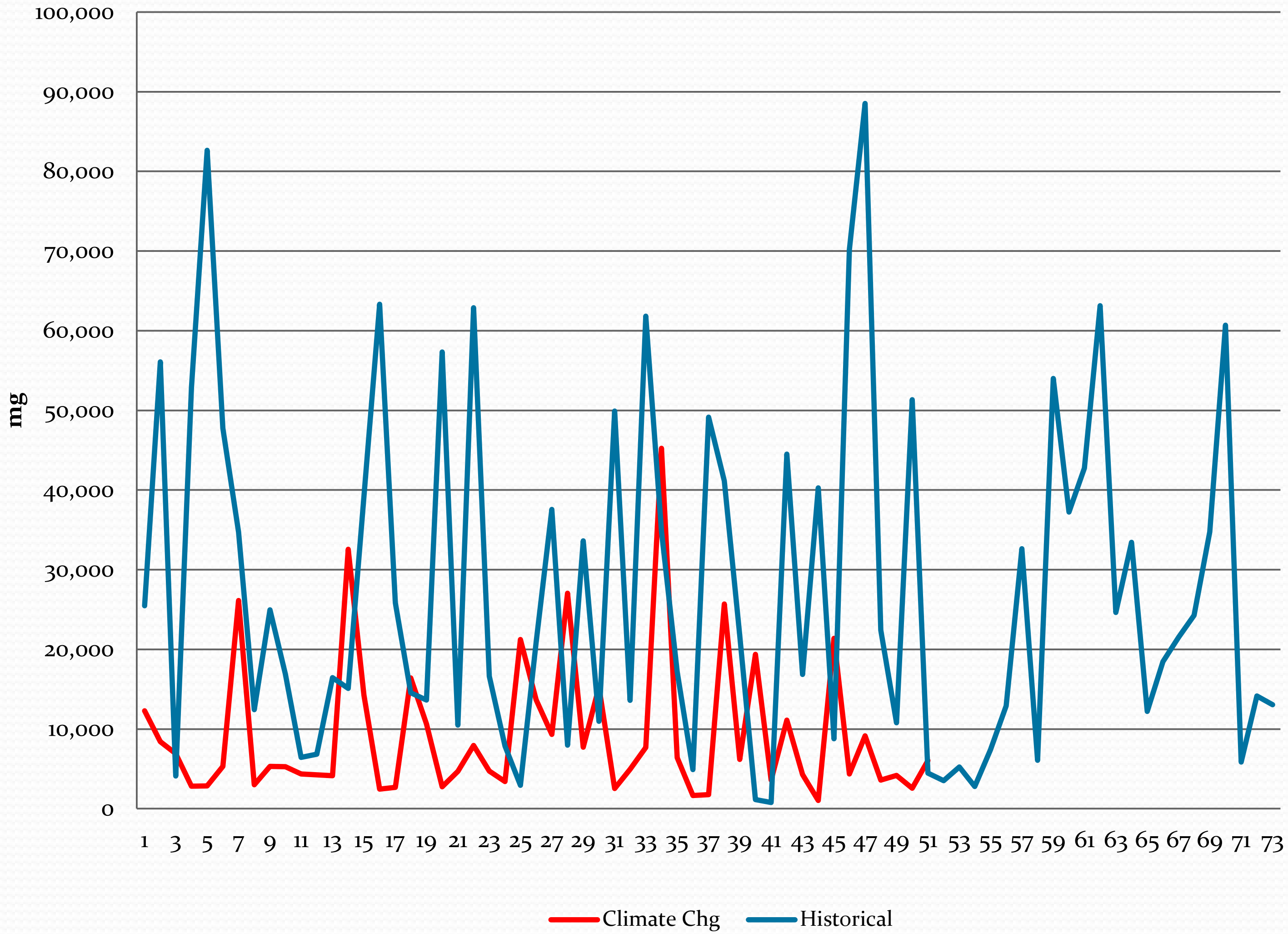
Table 2 -- <u>2035</u> Shortage Profiles: Fish Flow Requirements

FLOWS	Likelihood of Peak-Season Shortages				
	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%

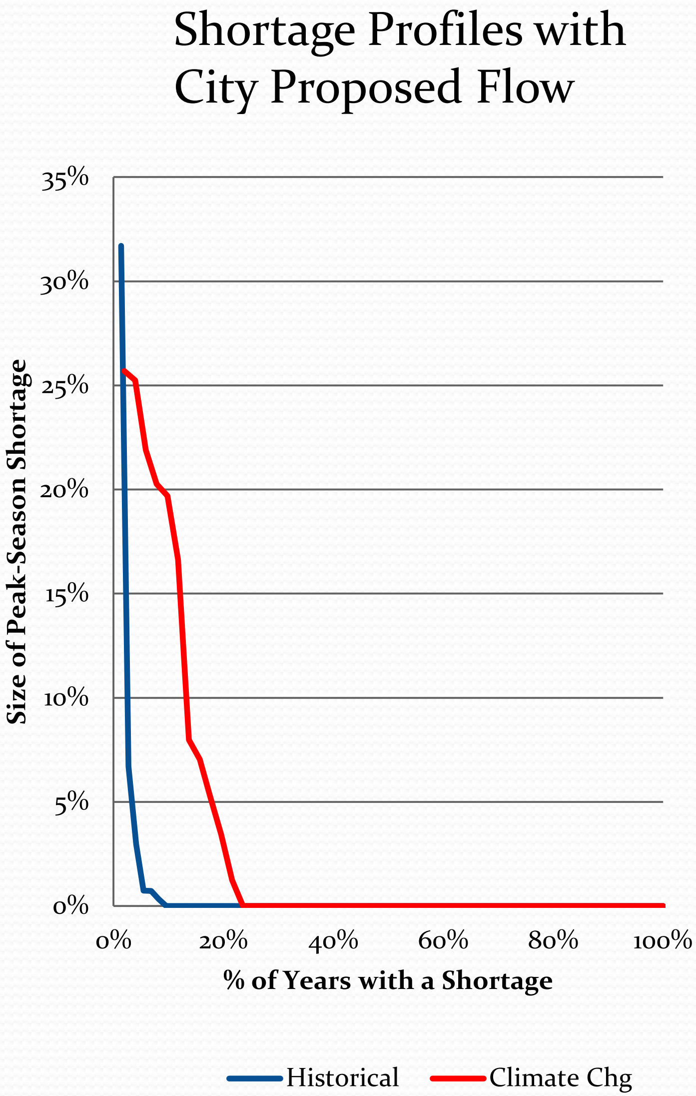
Potential Impacts of Extended Drought

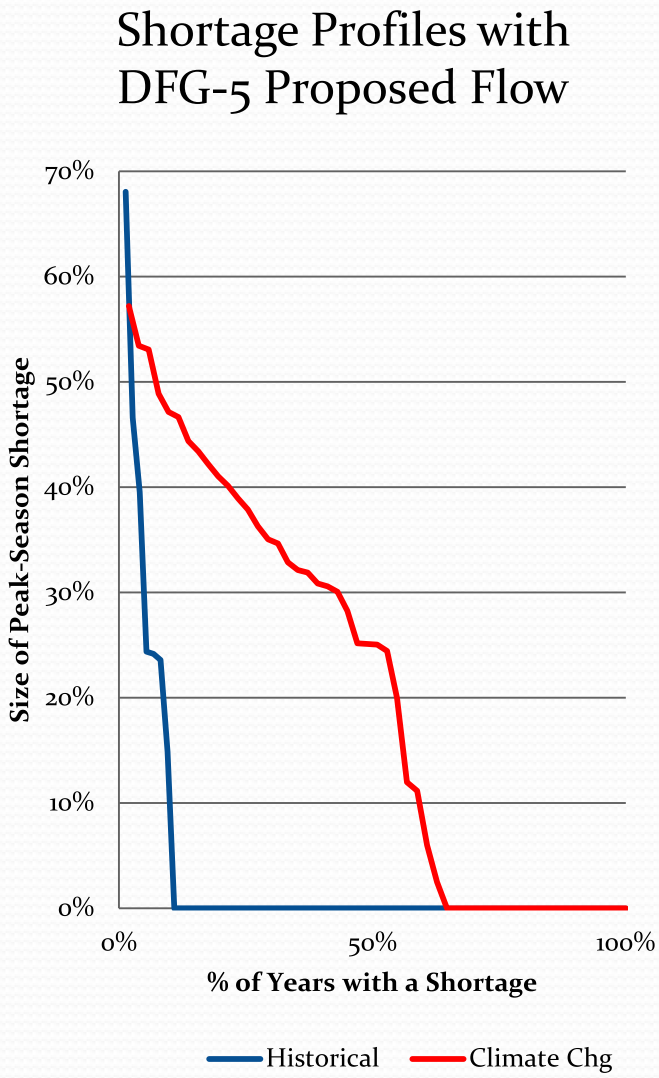
Extended drought peak-season shortage statistics		
	City Proposal	DFG-5
Total 8-year (mg)	702	5,108
Average	4%	32%
Maximum	32%	67%
Minimum	0%	6%
Years > 20%	1	6

Climate Change Impacts: Annual flows at Big Trees (at City proposed flows)



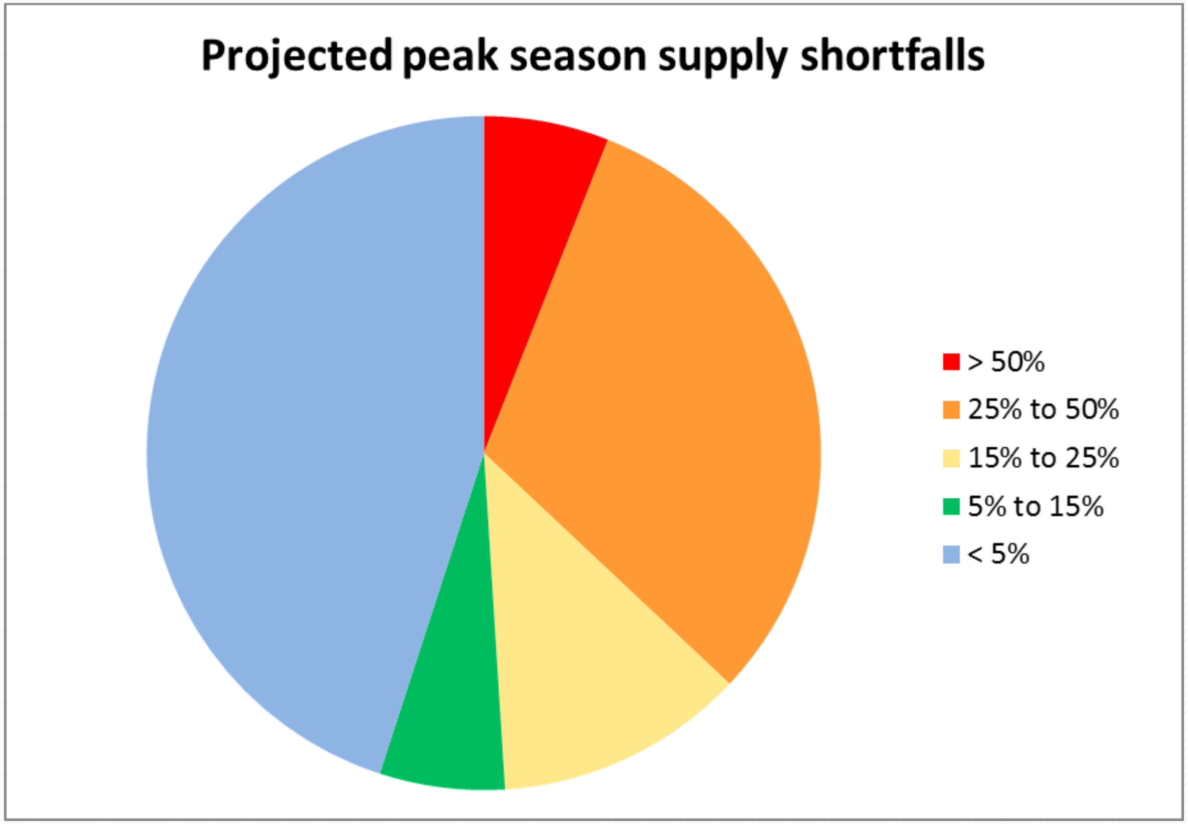
Potential Impacts of Changed Hydrology: Combining Fish Flows and Climate Change





No Action Shortage Projections

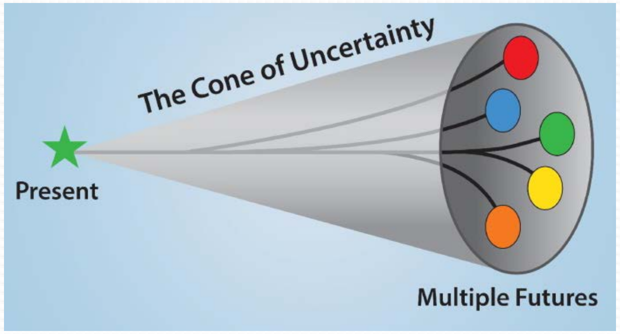
- 50/50 probability of curtailments >15% in any year
- Curtailments >25% in 37% of future years



An Array of Risks to Consider

- Water supply shortfalls and curtailments
- Wildfire in the watershed
- Seismic events
- Mudslides
- Flooding
- Fiscal (e.g., large CIP requirements)

Create Portfolios that meet the needs of an uncertain future



1. Continue to be a national leader in Conservation
   - Program C Recommended
2. Maximize the use of current resources
   - Capture & Store Winter Flows up to legal limits
   - Aquifer Storage & Recovery
3. Consider the need/costs/benefits of adding a climate independent supply
   - Desalination or Purified Recycled Water

Wide Range of Potential Solutions

- Many ideas put forward (e.g., Water Supply Convention)
  - Many individuals and organizations (local and beyond)
  - Regional and City-centric alternatives
- Conservation is a priority in any future Portfolio
  - “Program C Recommended” from draft Master Conservation Plan
  - Interest in accelerating and moving beyond Program C

Two Emerging Supply-Side Options

- Tapping winter flows, in concert with increasing storage (3 BG added storage necessary)
  - Adding to surface storage (reservoirs) appears infeasible
  - Aquifer storage has promise, but several risks and uncertainties
- Adding "drought-proof" options
  - Desal, or purified recycled water
  - Considerably enhance supply reliability, but raise issues and concerns ...

Winter Flows and Aquifer Storage

- Winter flows available under existing water rights can eliminate future shortages
  - Even under climate change and DFG-5 scenario
- Aquifers have sufficient storage capacity (3 BG)

- **But** several critical issues remain to be addressed!
  - Timing and Cost
  - Technical and institutional feasibility
- Requires a “Plan B” –> contingent agreements

Winter Flows and Aquifer Storage

<u>The big</u>

if…

Key Risks and Uncertainties: Winter Flows=>Aquifer Recharge

- Technical feasibility, timing, and cost of ASR
  - 7 – 11 years for piloting and implementation
  - Then several years to accumulate storage
- Infrastructure needs and land acquisition
- Geo-technical uncertainties (loss and quality)
- Institutional agreements with neighbors
- Rainfall dependent (does not diversify risk)

Steps: Winter Flow => Aquifer Recharge

Winter flows from San Lorenzo River (when available):

1. Captured, and treated to potable quality
2. Conveyed to Beltz, SVWD and/or SqCWD
3. Added to aquifer(s) --"in-lieu" or active recharge
   - Aquifer Storage and Recovery (ASR) wells
4. Stored in aquifer(s)
5. Reduced by hydraulic loss (hopefully 10% to 20%?)
6. Extracted in dry periods (e.g., ASR wells)
7. Conveyed to Santa Cruz in times of need
8. Treated to potable standards and distributed

Drought-Proof Options: (Purified Recycled Water, Desal)

- Recycled water or desal can eliminate future shortages
  - Absent added storage, few shortages, and none > 15%
  - Even under climate change and DFG-5 scenario
  - Diversifies against supply risks

- **But** several issues:
  - Public concern over human or environment health
  - Energy requirements
  - Cost
  - Regulatory uncertainty

Filling the Gap: Some Key Observations

1. Winter flows can fill the gap, … **BUT**
   a) Requires large volume of storage (3 BG)
   b) Need upfront years to provide the water to store
   c) Many questions about ASR viability, timing, and cost
2. Drought-proof options can fill the gap, … **BUT**
   a) Cost, energy, public acceptance pose challenges
3. A combination of above is very resilient and robust
   a) Handles interim period
   b) Provides back-up (Plan B)
   c) Diversifies against risks
4. There are no inexpensive options

Very Preliminary Capital Cost Estimates

- Cost estimates very preliminary at this stage
  - Reviewing and updating what components are required
  - Reviewing and updating costs of the components
- Winter Flows and Aquifer Storage:
  - ASR: $100 M to $240 M in capital costs
  - In-lieu: ~$200 million (more than half in CIP)
- Drought-proof supply options
  - Desal: $115 M to $140 M
  - Purified recycled water: $115 M to $160 M

Adaptive Pathways/Contingent Agreements Triggers for moving for Plan A to Plan B

- Providing sufficient time to demonstrate feasibility
- Avoiding unnecessary negative consequences
- Flexibility to adapt to changing circumstances.

Example of a Possible Trigger (ASR Option):

ASR Performance Benchmarks

- Within 4 years, at least 70% of the water injected into each pilot and/or demonstration well can be recovered during the 18 month window following injection;
- Within 7 years, at least 2 mgd for 180 days is being produced from demonstration ASR wells;
- Groundwater levels at and in the local vicinity of each ASR injection well are behaving in a manner aligned with groundwater model projections and are documented to be rising and improving aquifer conditions;
- There are no adverse effects of ASR on other public or private pumpers using the groundwater resource, on the groundwater resource or on the aquifer itself;
- Performance at any benchmark year that is within 90% of the target shall be deemed to be compliant with the required benchmark;

Trigger example, continued

Institutional Benchmarks

- The full complement of real property and rights of way required for the full scale implementation of ASR has been identified, and is obtainable without the exercise of eminent domain;
- Relevant water rights issues must be resolved or, in the event that performance benchmarks for returned flows are being met and water rights issues are determined to be resolvable within no more than an additional 2 years, the additional time may be allocated; and
- Agreements covering the terms and conditions of any regional financial participation in the aquifer recovery aspects of ASR for Scotts Valley and/or Soquel Creek water districts
- If any of these performance measures is not met, proceed to Plan B.

Evaluation Criteria for Plans A & B

- Technical Feasibility
- Time Required to Demonstrate Technical Feasibility
- Time Required to Full Scale Production
- Adaptive Flexibility
- Supply Reliability
- Supply Diversity
- Energy Profile
- Environmental Profile
- Regulatory Feasibility
- Legal Feasibility
- Administrative Feasibility
- Potential for Grant or Special Low Income Interest Rate Funding
- Political Feasibility
- Cost Metrics

- Discussion
- Questions?

Thank you!