Building Drought Tolerant Reuse Options into Water Supply Planning

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- Gary Fiske, Gary Fiske and Associates, Inc.
- City of Santa Cruz
- Water Supply Advisory Committee

Overview

1. Why did we do the WSAC process?
2. What was the WSAC process?
3. Where did we land on water supply options?
4. What shaped the final selections?
5. How has El Nino changed the dialog and reinforced the central message?

Water Supply Planning: Overview

- *N. Santa Cruz County Water Master Plan, 1980s*
- *City of Santa Cruz Water Master Plan, 1989*
- *Evaluation of Supply Alternatives, 1990s*
- *Integrated Water Plan*
  - *Water Demand Investigation, 1998*
  - *Water Conservation Plan, 2000*
  - *Water Curtailment Study, 2001*
  - *Alternative Water Supply Study, 2000*
  - *Evaluation of Regional Water Supply Alternatives, 2002*
  - *IWP EIR, 2005*

scwd2 Desalination Program

- Pilot Plant Testing, Brine Dilution Analysis, Watershed Sanitary Survey, 2005 – 2010
- Intake Studies (OGS, I&E, IFS), 2008 – 2011
- EIR, preliminary designs, 2011 – 2013

City Council Forms WSAC, 2014

scwd2 Desalination Program, 2005 – 2013

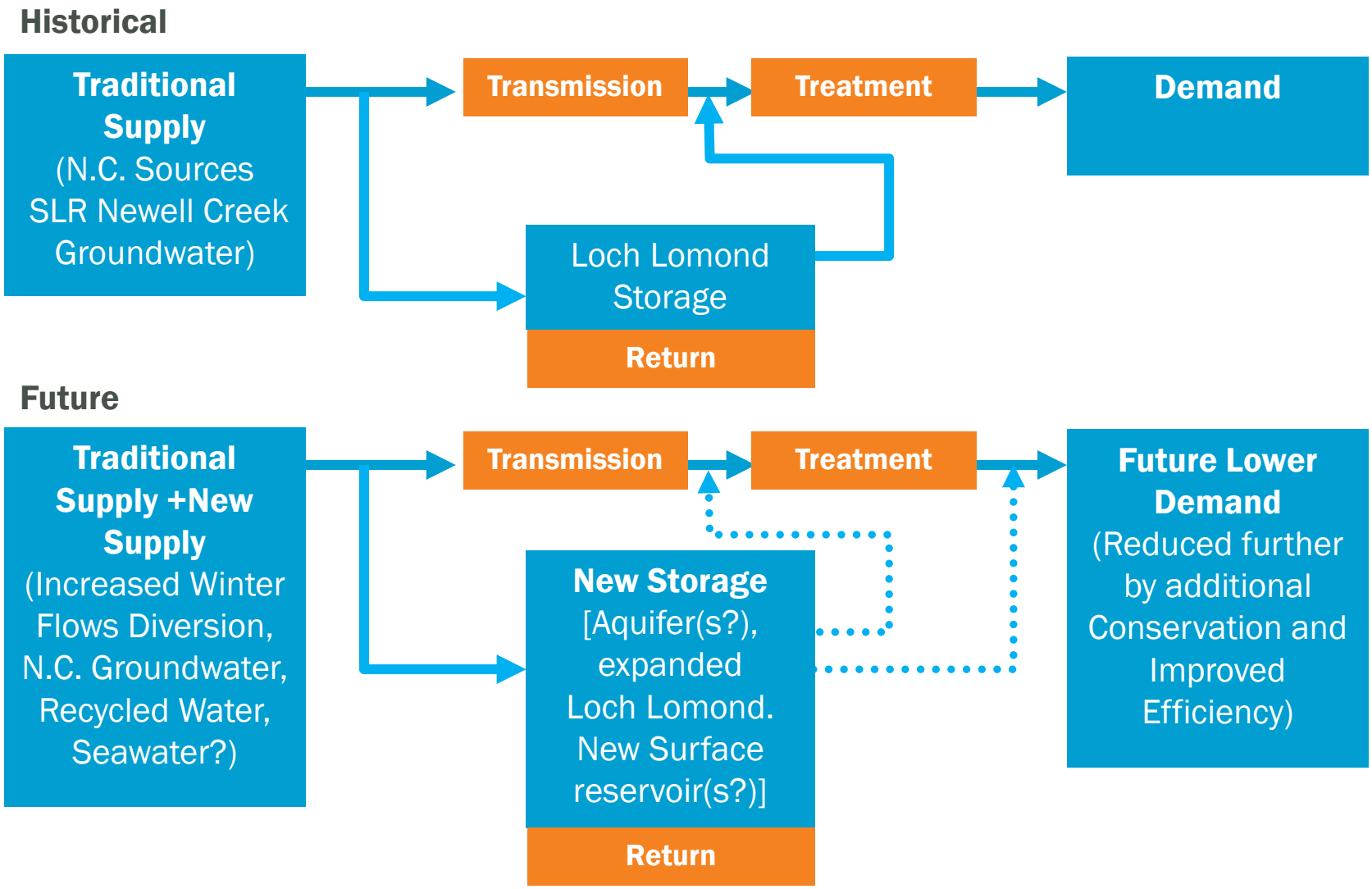
1976-1977 Critical short-duration drought

1987-1992 Longer, more-moderate drought

City Council accepts the Water Supply Advisory Committee (WSAC) Agreements and Recommendations Final Report, November 2015.

Why Does Santa Cruz Need New Supplies?

City of Santa Cruz Water Supply Flow Schematic



The Local Residents Are Very Involved in the Sustenance and Development of their Community

What's a "WSAC"?

Water Supply Advisory Committee

How Did the WSAC Process Work?

- *Representatives from a diverse range of local interest groups.*
- *Many water events.*

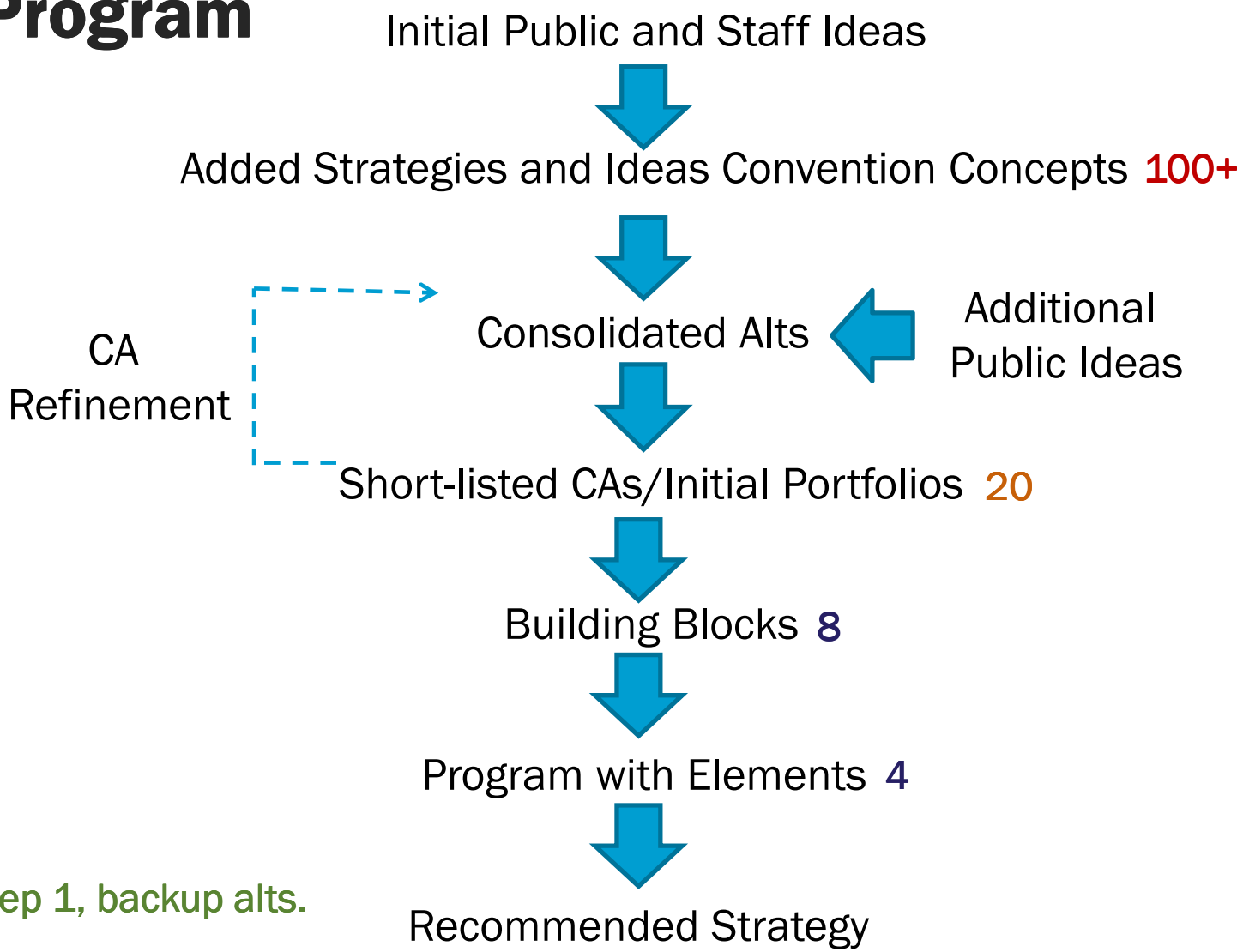
Water Convention

The Full Range of Water Supply Issues Were Discussed

- *Existing system*
- *Water supply models*
- *Demand management*
- *Treatment and storage options*
- *Water supply alternatives*

July WSAC Meeting

WASC Took a Progressive, Public-Involved Approach to Developing a Proposed Water Supply Program



2-part 1st step 1, backup alts.

WSAC Timeline

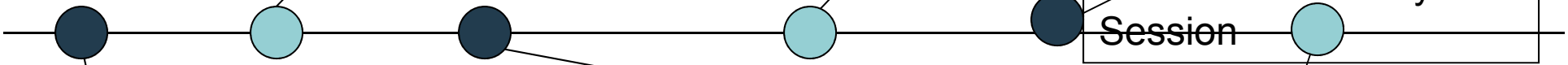
Enrichment Series

- Beyond Building Codes
- Reliability of Local Economy
- Fish Flows (NOAA)
- Climate Change
- Water Transfer Potential
- Recycled Water

June 2014 – System Tours

Oct. 2014 – Water Supply Convention

Nov. 2015 – WSAC/City Council Joint Study Session



April 2014 – October 2015

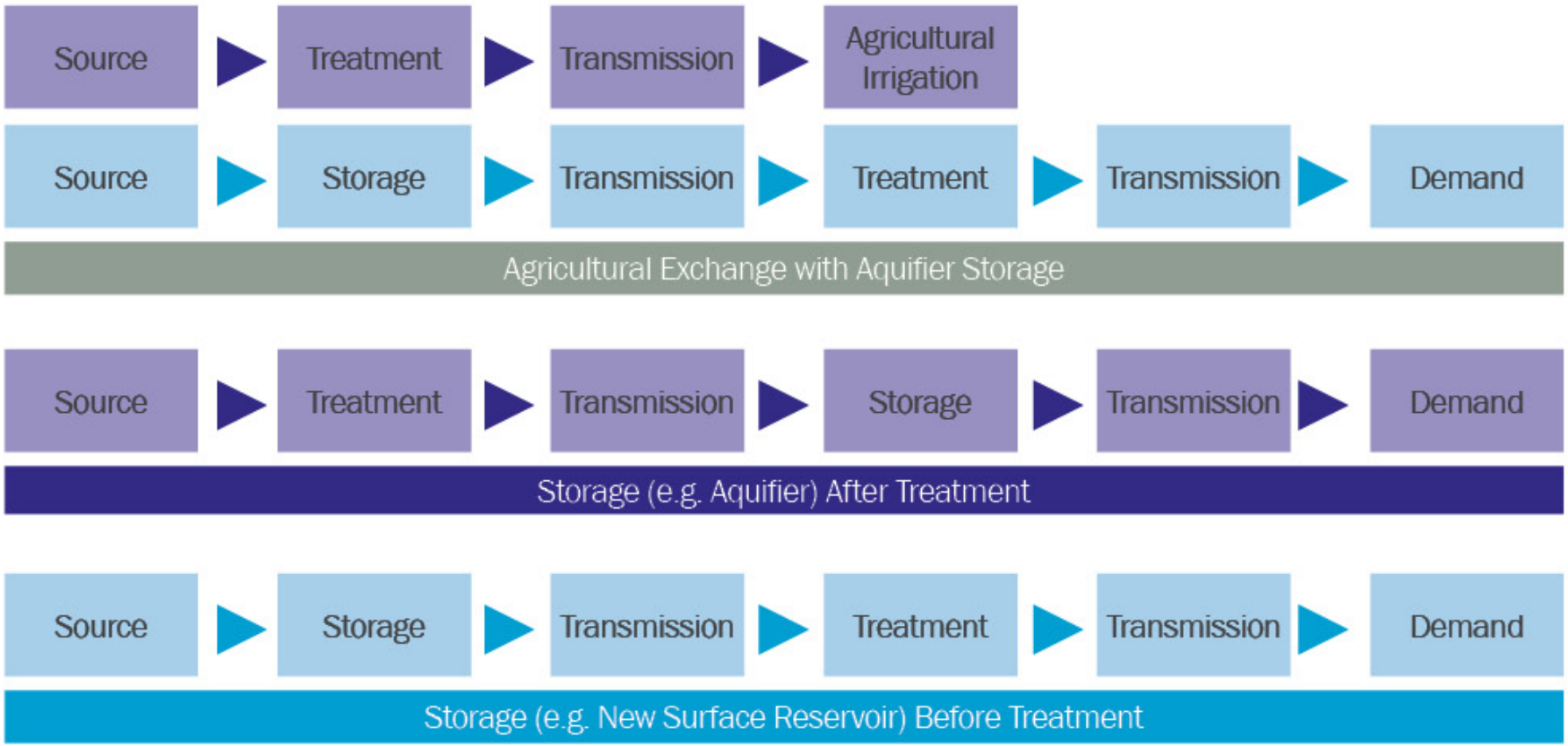
2-day Monthly Meetings

Modeling and Forecasting

- Surface and Groundwater Modeling
- Current and Future Demand Forecasting
- Conservation Potential
- Water Shortage Contingency Planning

Nov. 2015 – City Council accepts the Water Supply Advisory Committee (WSAC) Agreements and Recommendations Final Report.

Process and State of the Work—Example Components Req'd for Complete CA



Non-water Efficiency CAs

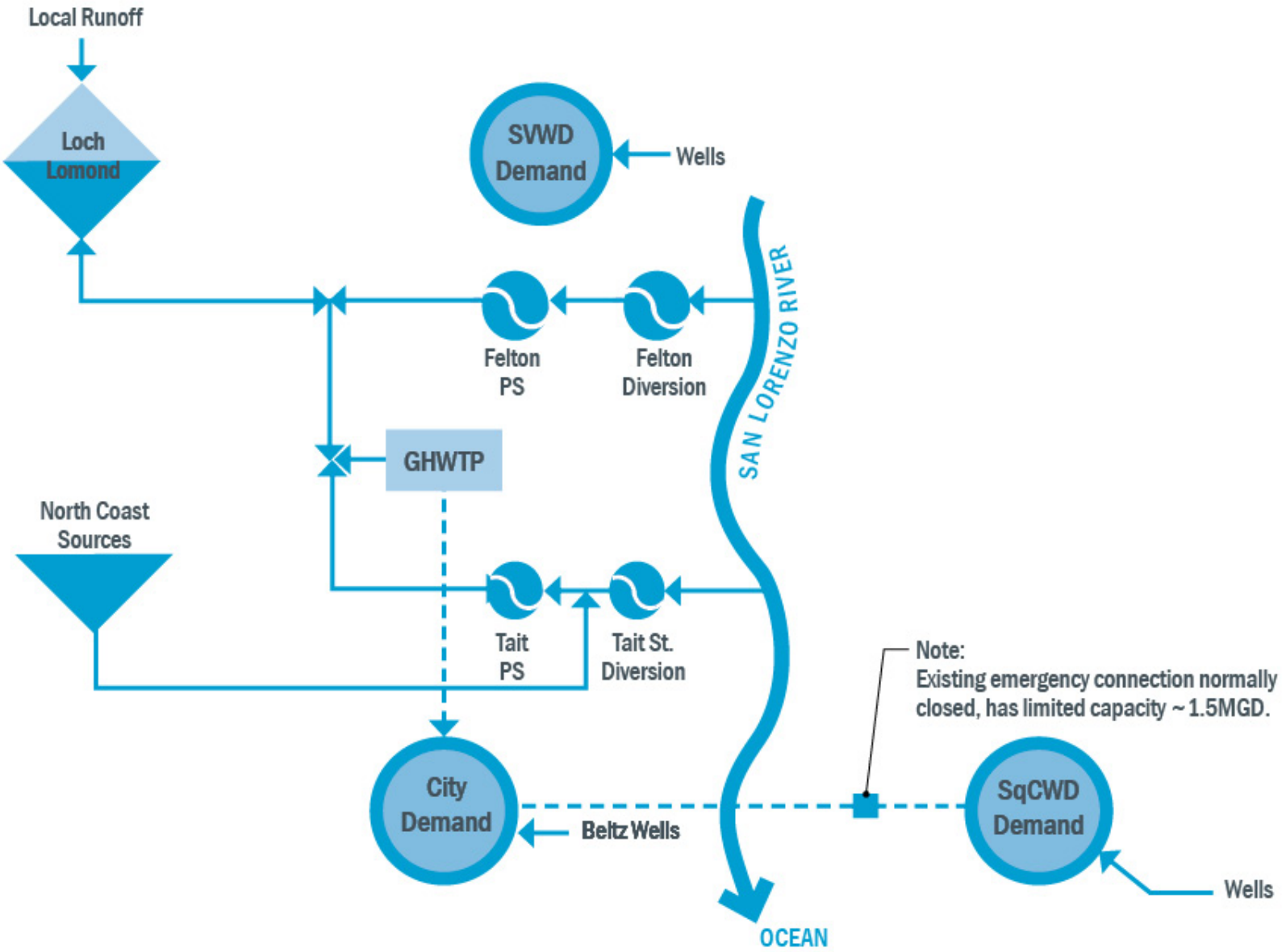
Assumptions and Caveats that Informed the Process

- Best to partner with our neighbors when possible.
- There is no simple winter flows storage solution.
- Each option has pros and cons and inherent risks.
- Nothing is cheap.
- You have to take the long view.

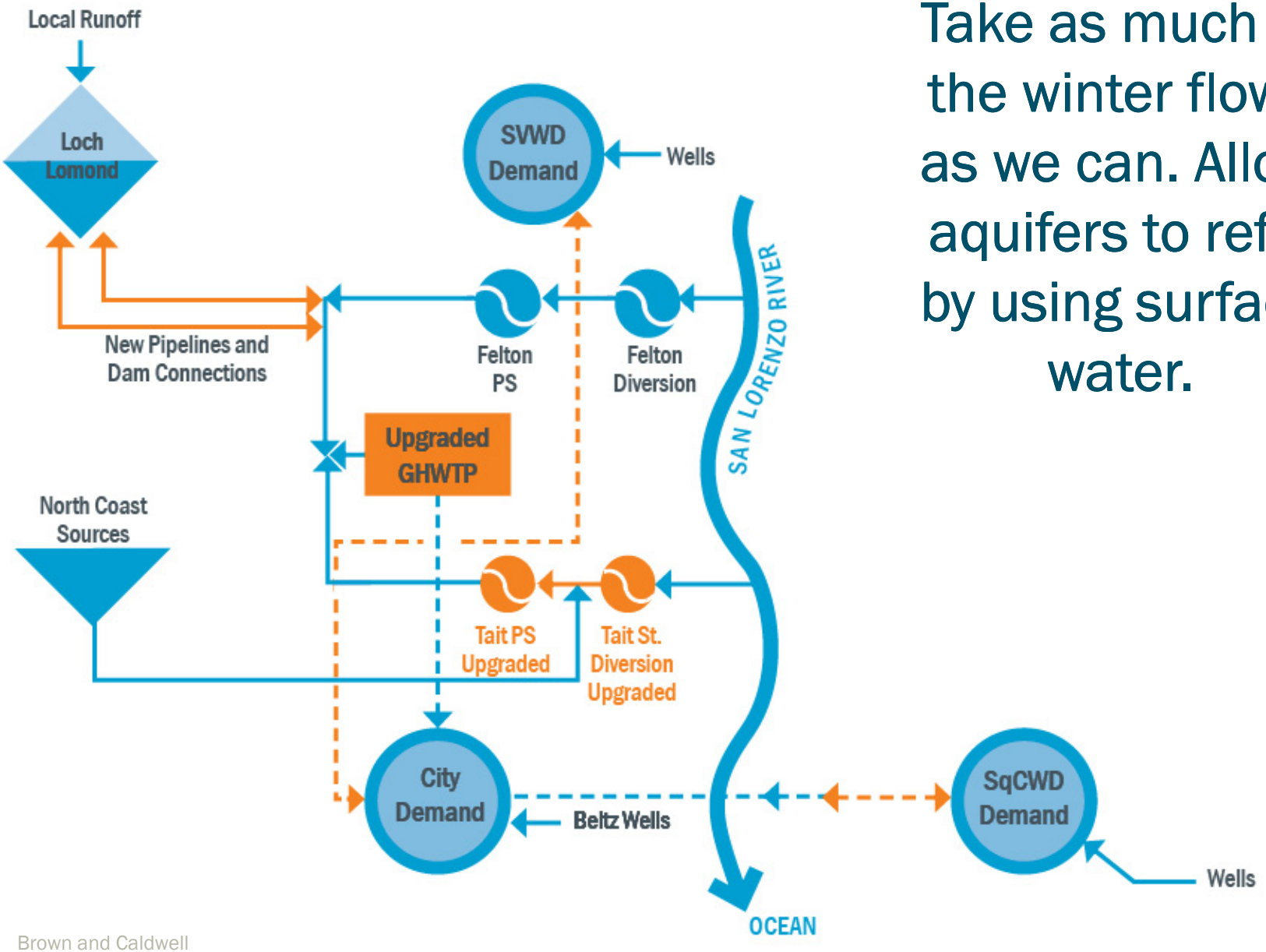
Where we're going…

A Walk through the Potential Pathways

First, a Reminder of Where We Are



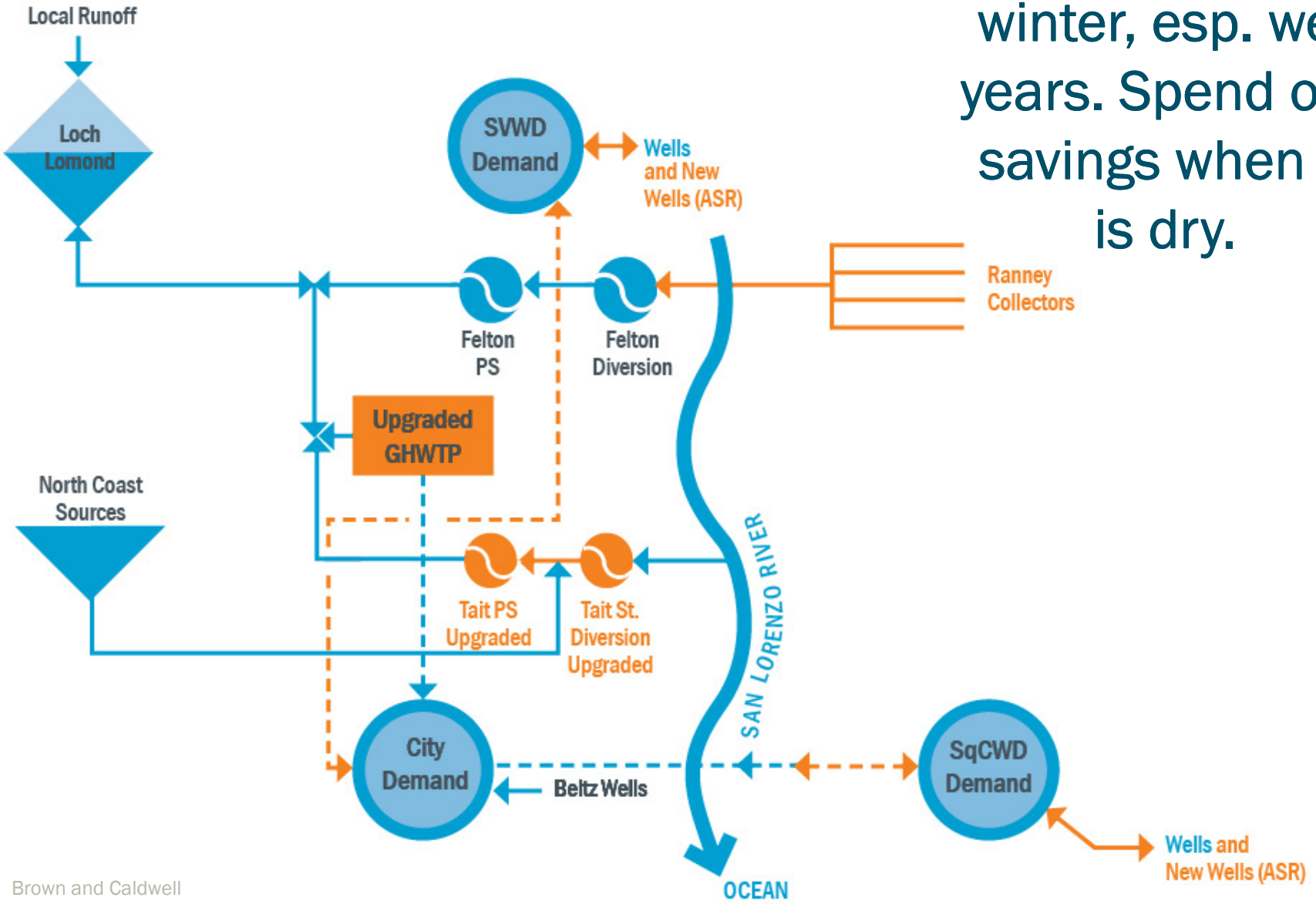
In Lieu Recharge



Take as much of the winter flows as we can. Allow aquifers to refill by using surface water.

In Lieu and ASR

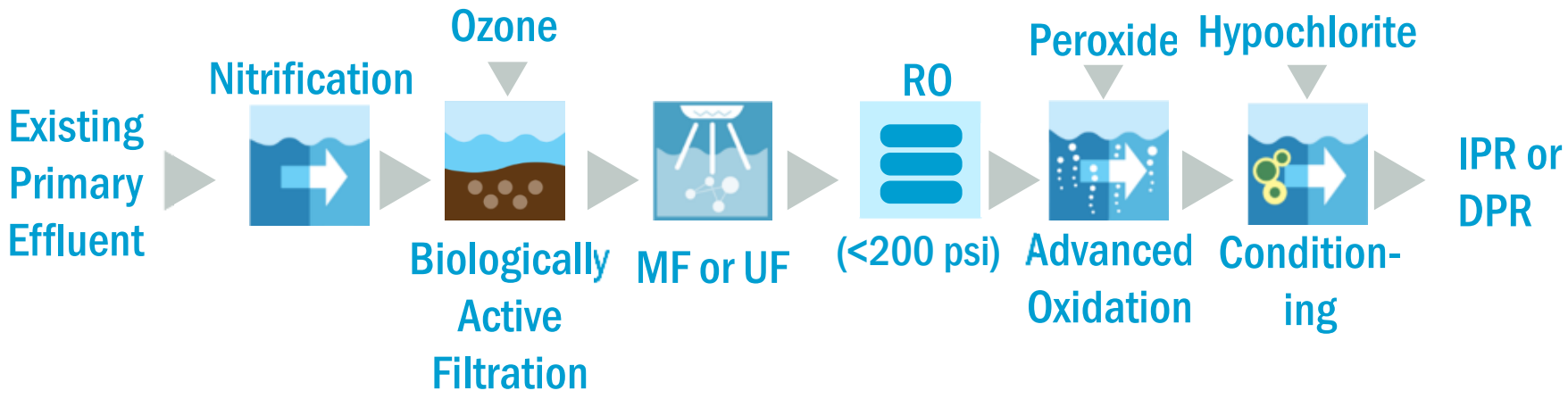
Bank water in the winter, esp. wet years. Spend our savings when it is dry.



What is Truly Drought Resilient? Reuse.

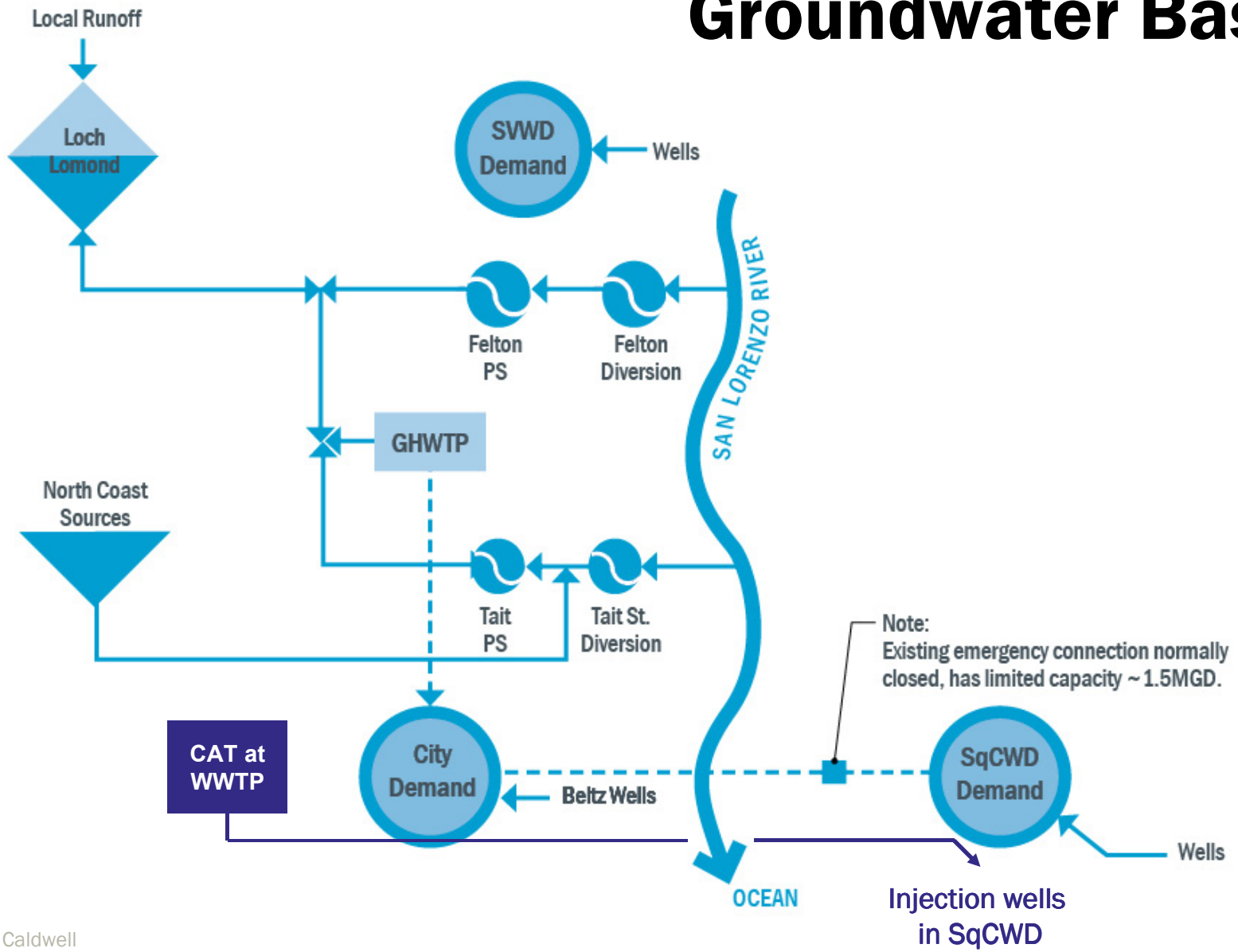
Potable reuse could be employed in a number of different ways…

Potable Reuse Conceptual Approach

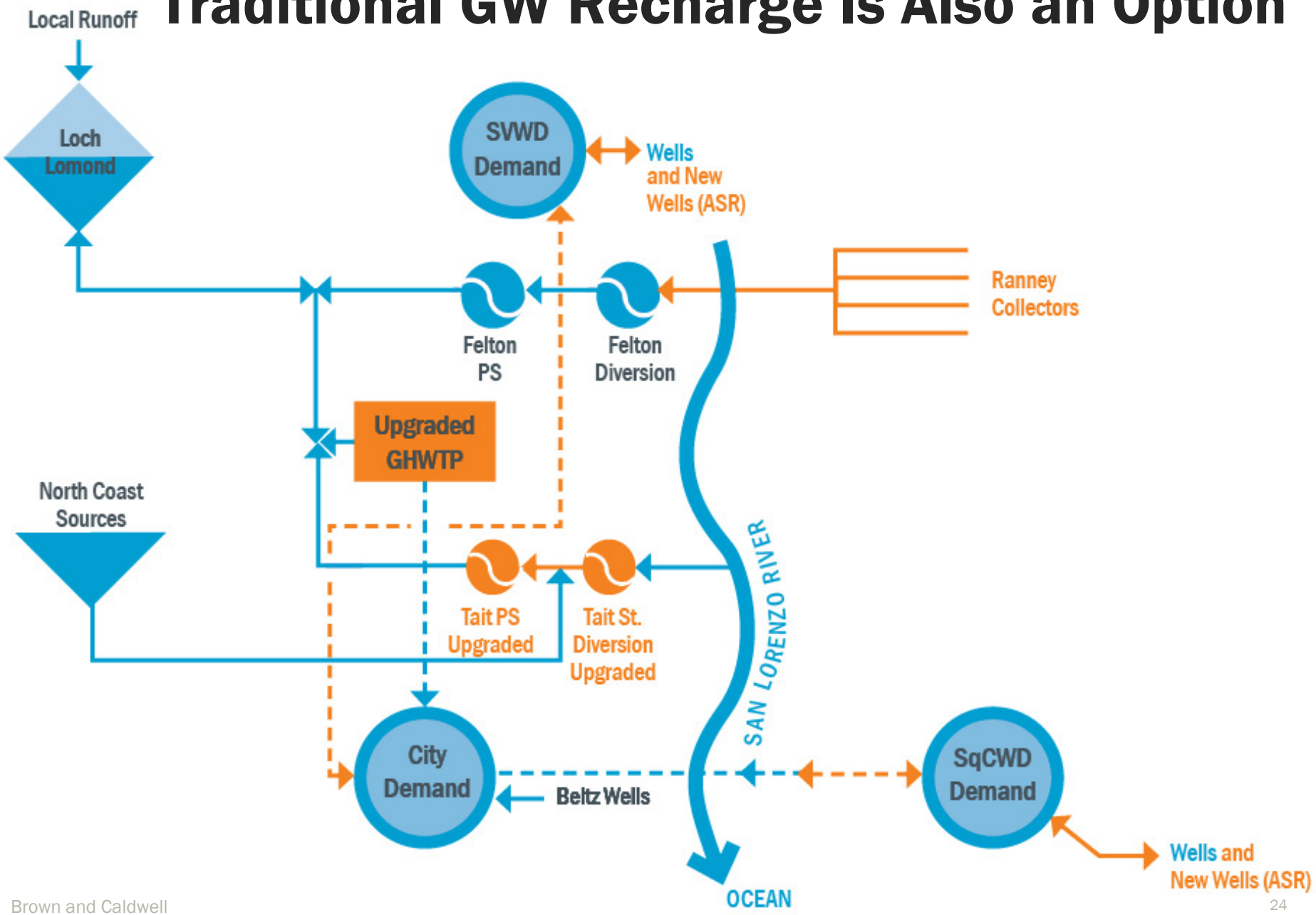


Complete advanced treatment effluent

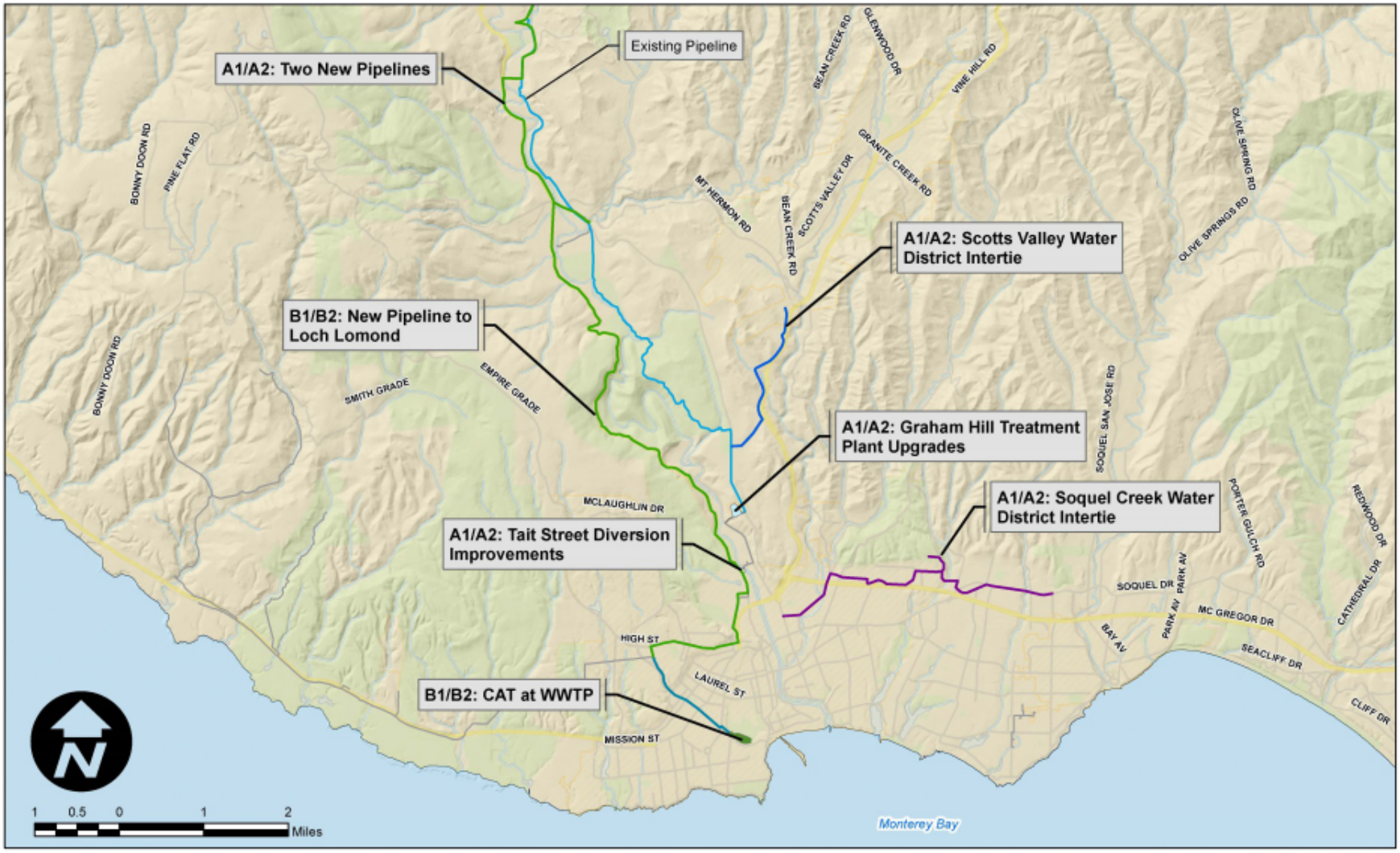
IPR Could Be Used to Protect the Local Groundwater Basin



Traditional GW Recharge Is Also an Option



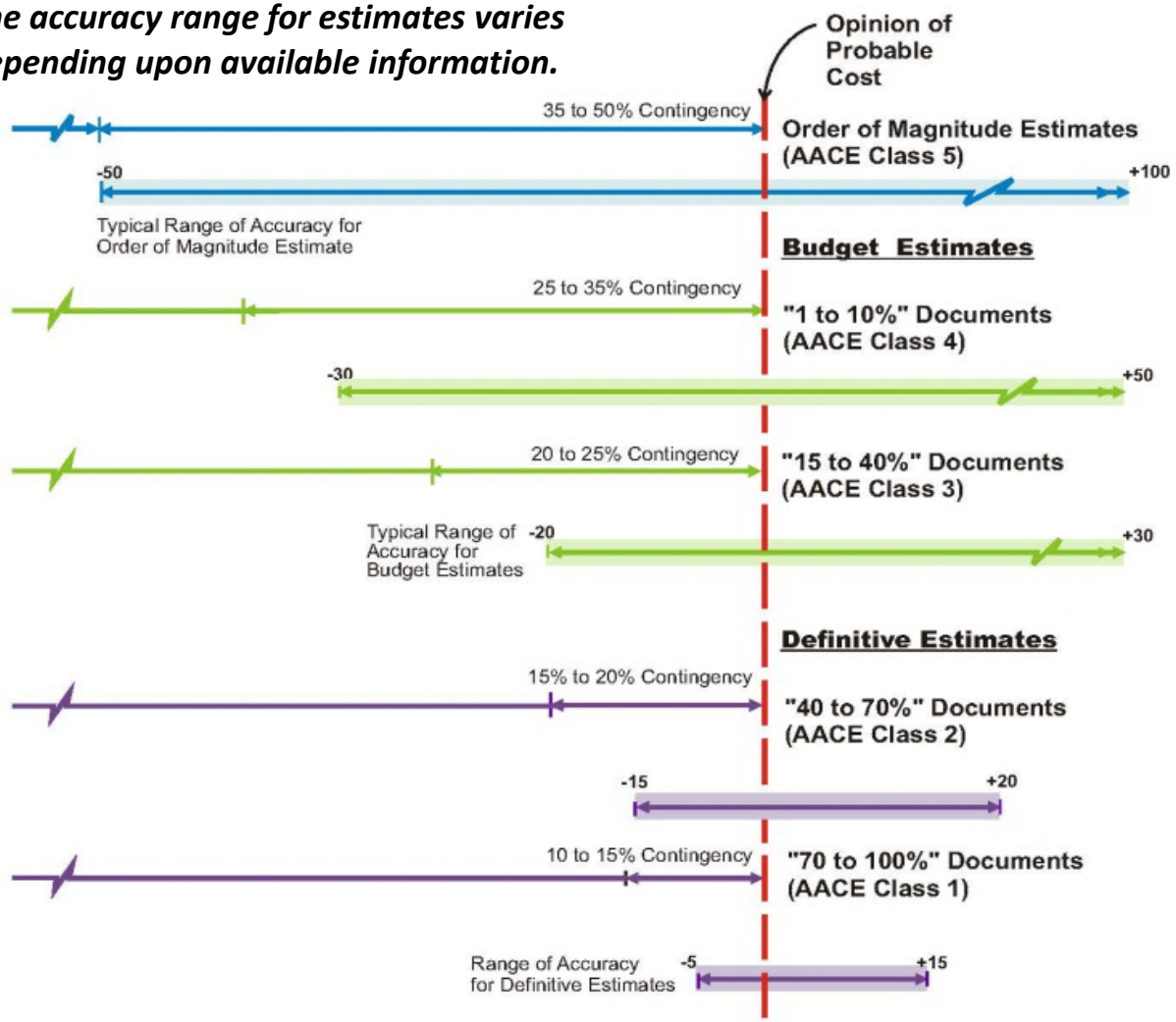
Purified Water Could Be Used to Augment Our Reservoir



With Technical Feasibility Comes the Big Question: *How Much Will It Co$t?*

Opinions of Probable Cost Were Developed w/ Typical Contingencies and Ranges of Accuracy

The accuracy range for estimates varies depending upon available information.

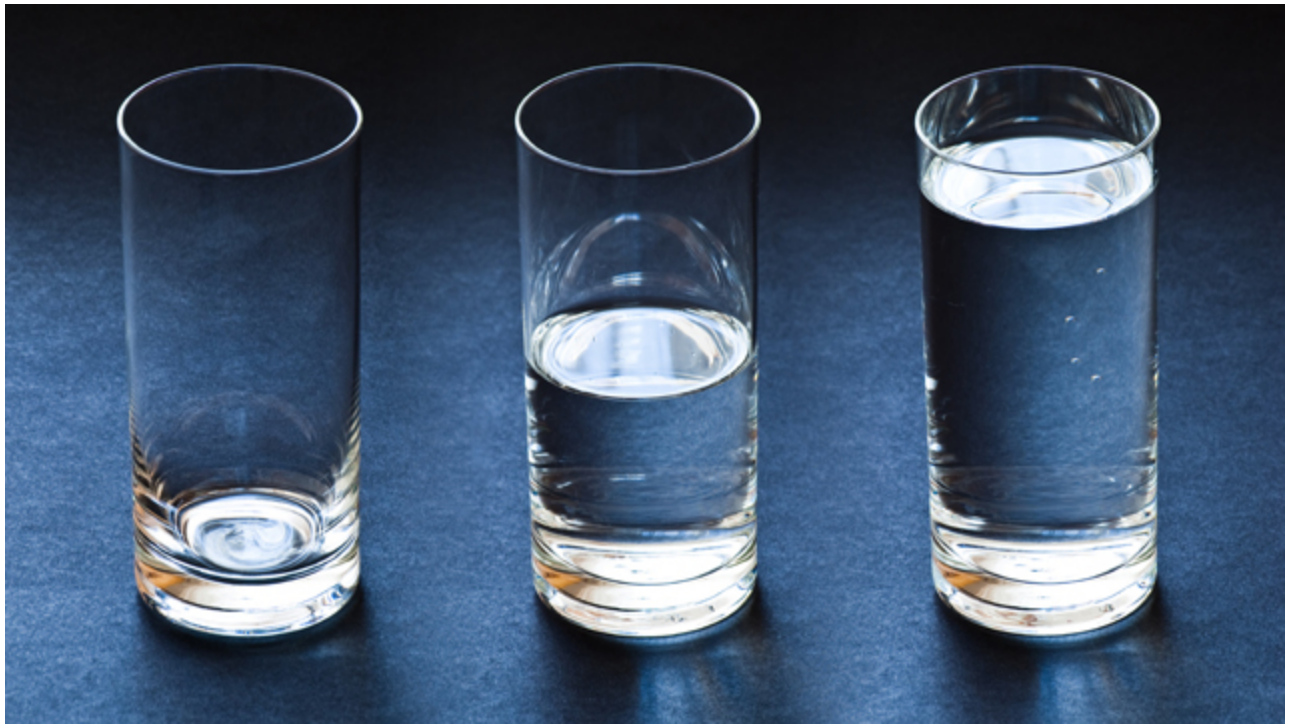


Note:

1. Contingencies shown are typical
2. Ranges of Accuracy indicated are typical values from AACE document 18R-97 (REV 02/06)

How Much Water We Could Reasonably Hope to Get

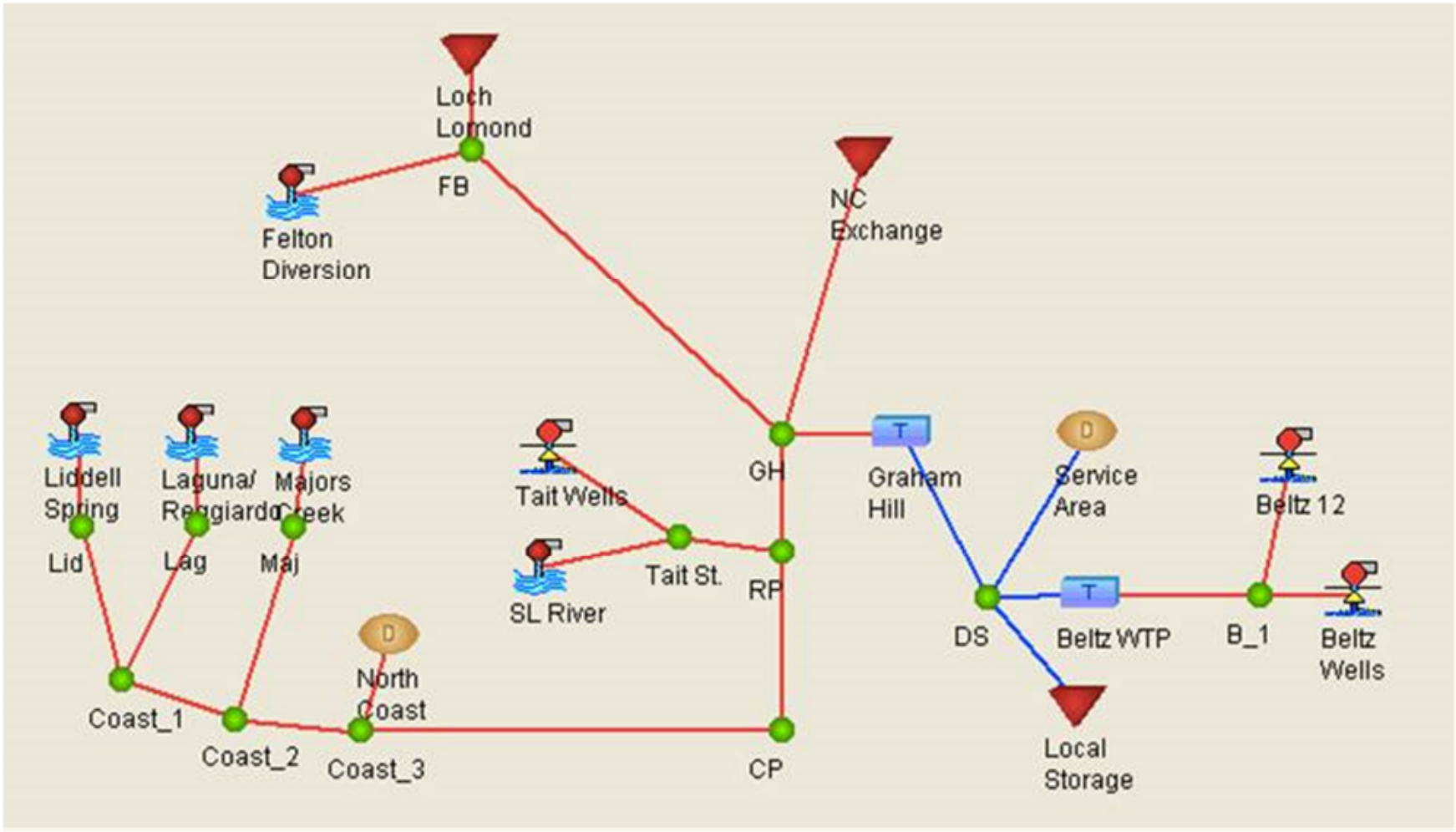
? ? ?



Confluence® Supply Model

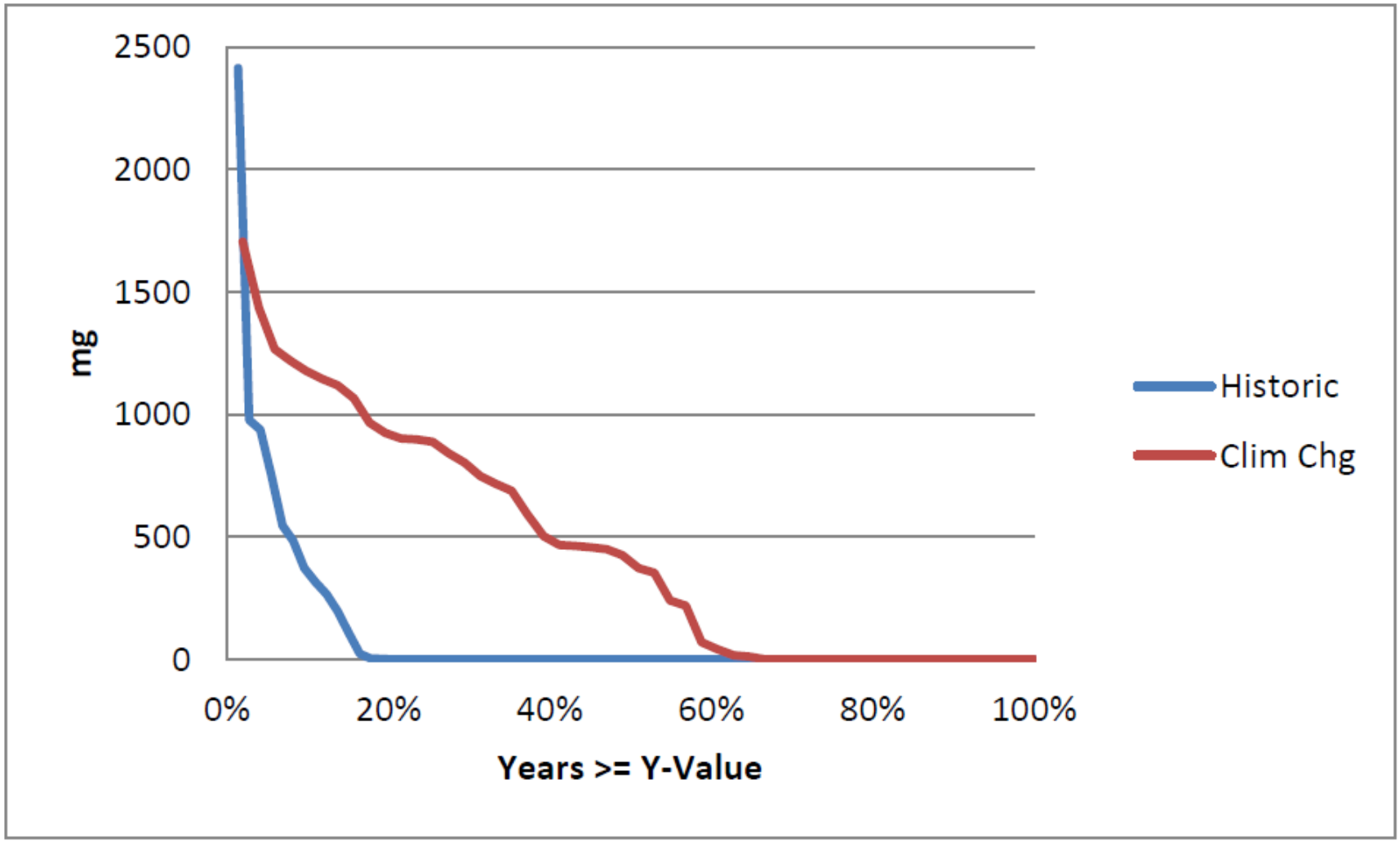
- Produces an extended period simulation model for the City of Santa Cruz water supply system.
- Uses historic or Climate change hydrologic record together with projected City water demands.
- Incorporates system operations as well as water rights and fish flows requirements.
- Estimates the statistical distribution of future water shortfalls.

Confluence® Produces an Extended Period Simulation of the Santa Cruz Water Supply System



Estimates the statistical distribution of future water shortfalls.

E.g., Ranney Collectors with Additional Storage



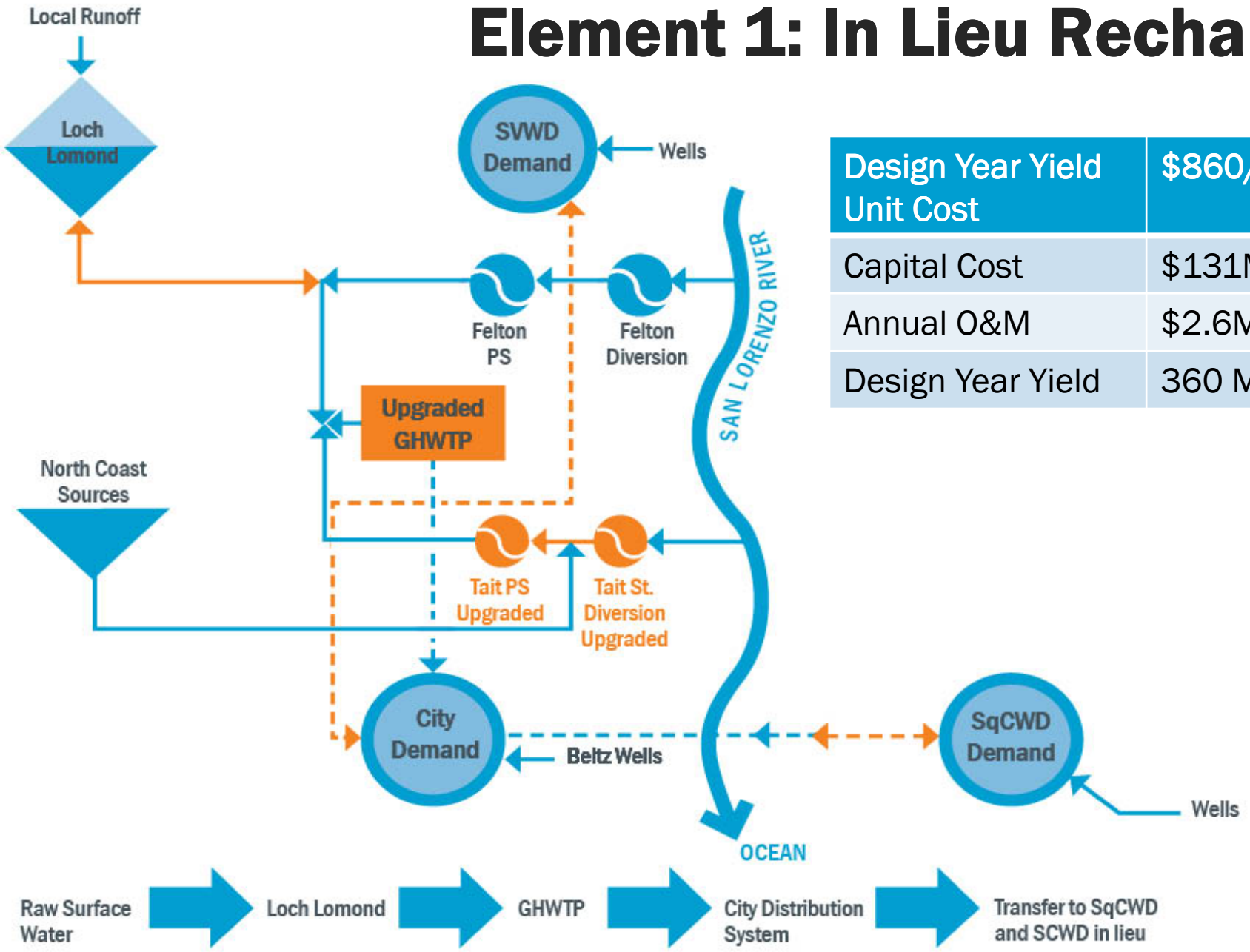
Annual Production Duration Curves of Virtual Reservoir

From Confluence® Model by Gary Fisk & Associates, Inc.

The Destination: A Portfolio and a Path

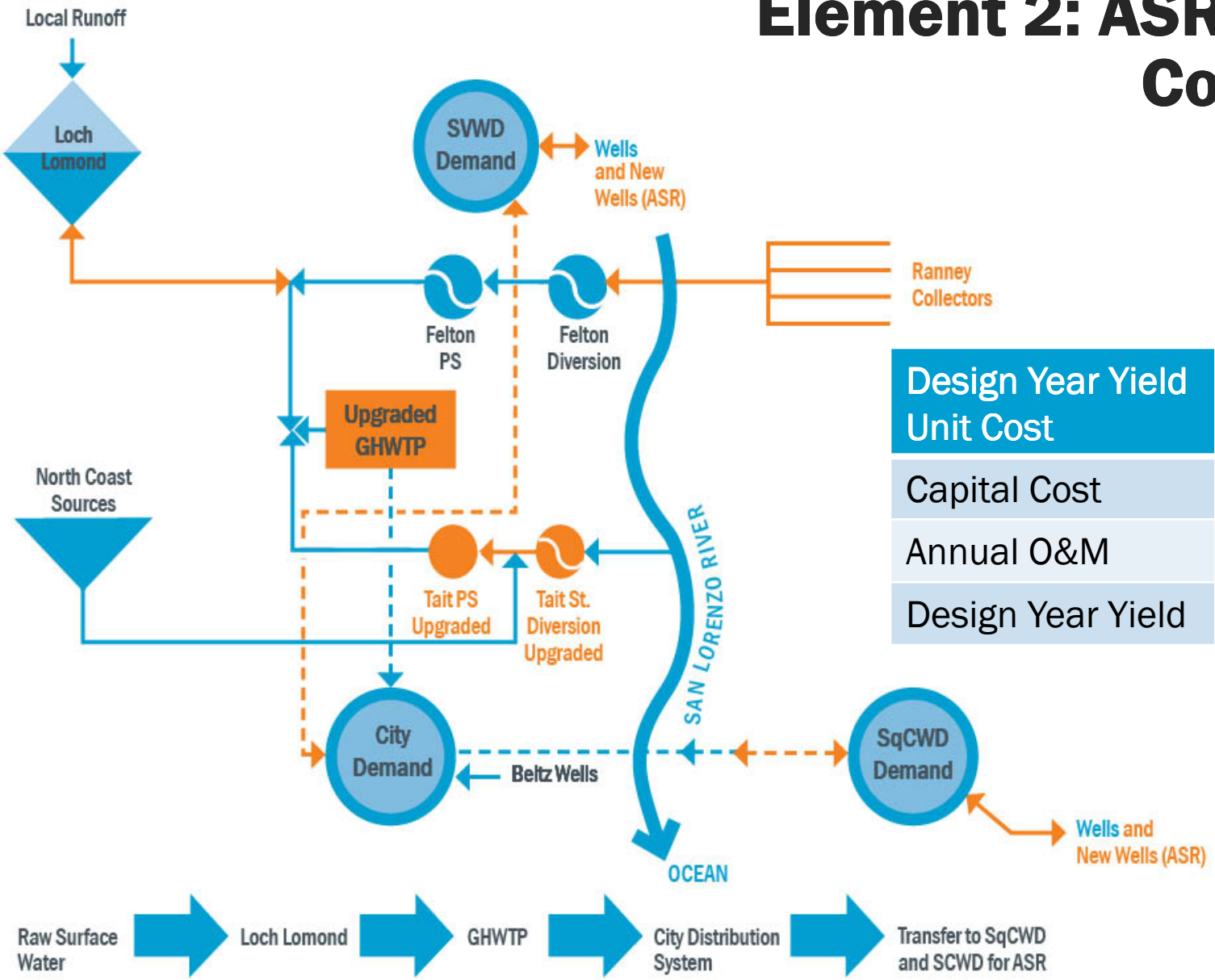
- No one plan or source is relied upon by itself for future success.
- All three components will require significant new treatment and conveyance infrastructure.
- Add/modify components
- Conservation is the overarching starting point for the final plan.

Element 1: In Lieu Recharge



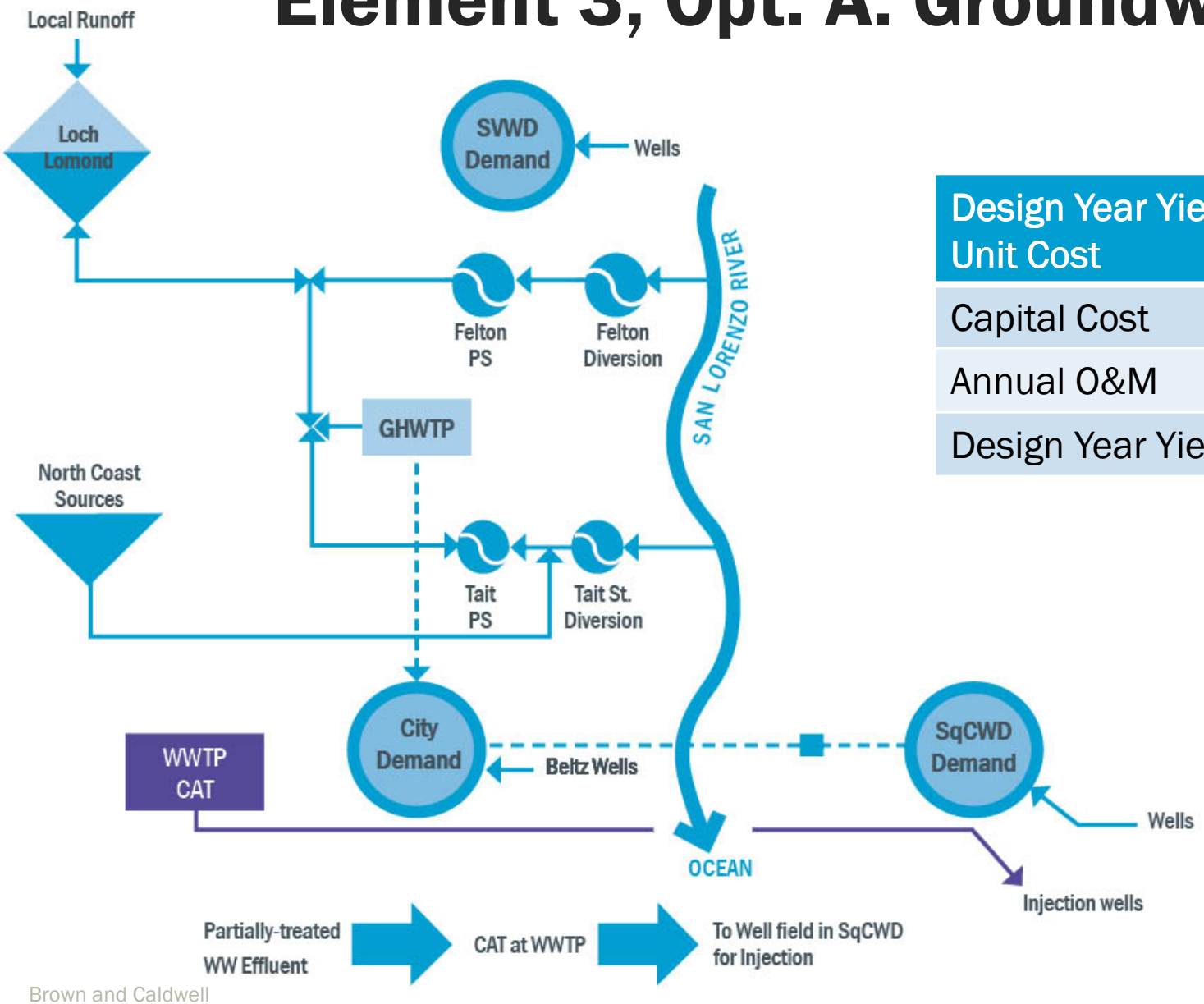
Design Year Yield Unit Cost	$860/ MG
Capital Cost	$131M
Annual O&M	$2.6M
Design Year Yield	360 MG

Element 2: ASR-In Lieu Combined



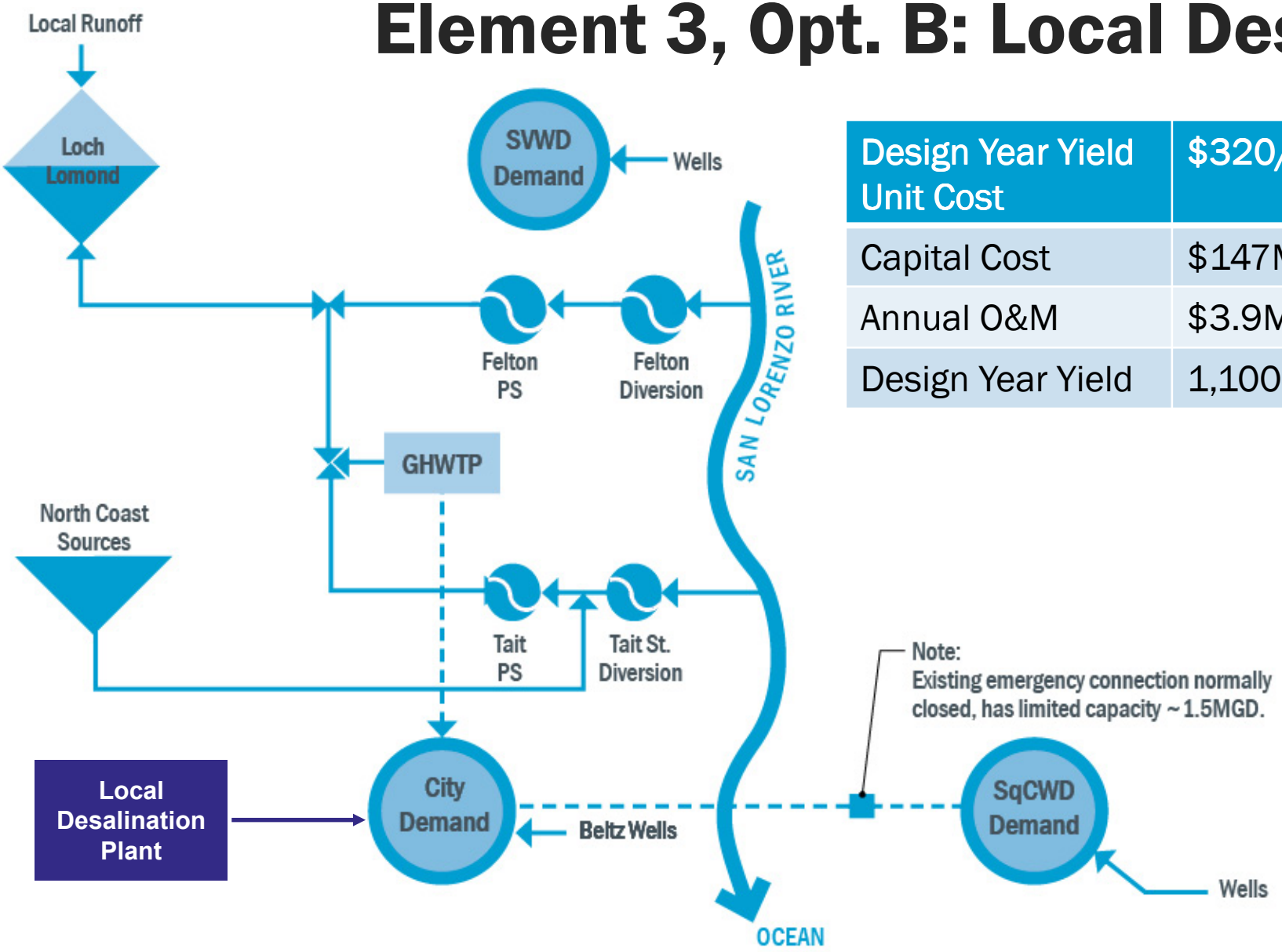
Design Year Yield Unit Cost	$1,140/ MG
Capital Cost	$159M
Annual O&M	$3.7M
Design Year Yield	360 MG

Element 3, Opt. A: Groundwater IPR



Design Year Yield Unit Cost	$280/ MG
Capital Cost	$119M
Annual O&M	$4.2M
Design Year Yield	1,100 MG

Element 3, Opt. B: Local Desal



Design Year Yield Unit Cost	$320/ MG
Capital Cost	$147M
Annual O&M	$3.9M
Design Year Yield	1,100 MG

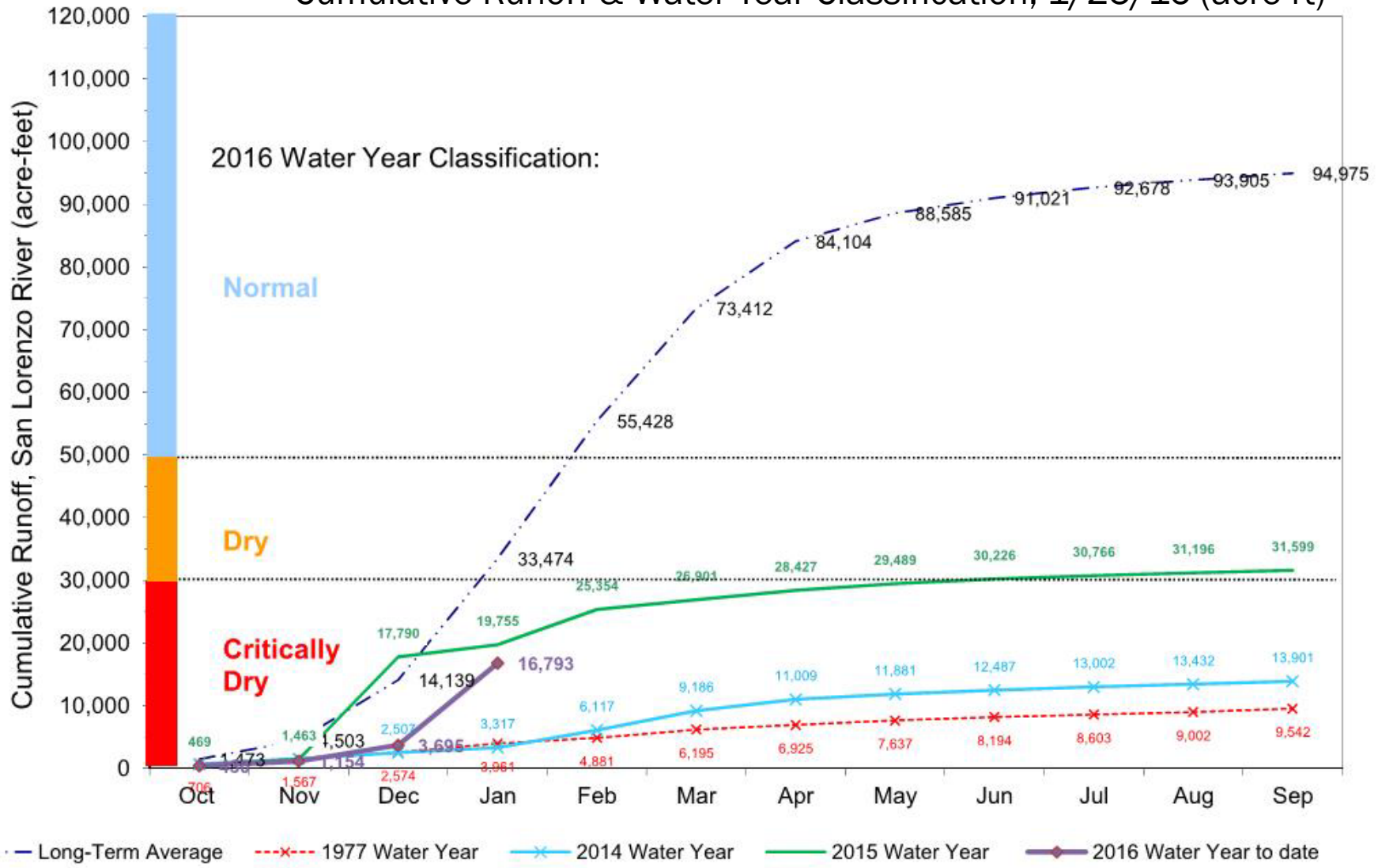
As of Fall 2015 we had developed a path forward. The public got excited about El Nino.

The water community got concerned that people would forget about the reality of drought if it was very wet this winter.

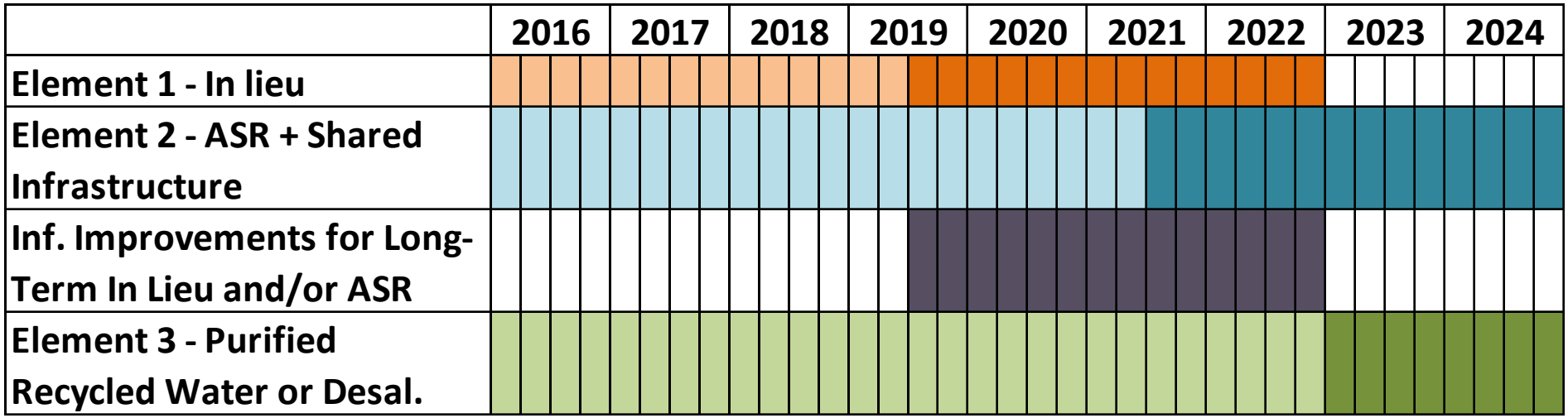
What happened?

Not Out of the Woods — El Nino Has Not Provided Much Relief *Yet*

Cumulative Runoff & Water Year Classification, 1/25/16 (acre-ft)



Schedule


2016
2017
2018
2019
2020
2021
2022
2023
2024
Element 1 - In lieu
Element 2 - ASR + Shared Infrastructure
Inf. Improvements for Long-Term In Lieu and/or ASR
Element 3 - Purified Recycled Water or Desal.


Questions?