

Safe Yield Analysis



City of St. Helena

March 22, 2011

Safe Yield Committee

- Alan Galbraith
- Tim Nieman
- John Sales

All former members of the Water and Sewer
Infrastructure Subcommittee of the GPU SC

Background

- Infrastructure Subcommittee formed in Nov. 2009
- Results presented in July 2010
 - Baseline Report (52 pages)
 - City Council / Planning Commission presentation on July 13 (81 slides)
- Recommended policy language for General Plan Update
 - Implications about water usage limits and PEIR mitigations not fully resolved
- Safe Yield Committee formed to quantify the Safe Yield as defined in the General Plan Update
 - Definition recommended by the Planning Commission and approved by City Council

Safe Annual Yield

Safe Annual Yield in General Plan Update 2030 is defined as follows:

“The safe annual yield of the St. Helena water supply system is that quantity of water which can be reliably delivered on an annual basis through most rainfall years, including a Dry Year (rainfall at 22” to 25.9”) without undue hardship on water customers through water shortage restrictions.”

We define “undue hardship” as:

- 3 or more consecutive months of Phase III water restrictions,
or
- Phase IV or V water restrictions

Safe Annual Yield

It is recognized that the safe annual yield, as so defined, could place significant hardship on water customers in a Critically Dry Year (rainfall at 21.9" or less) or in periods of two or more consecutive Dry Years.

Committee Tasks

1. Quantify Safe Annual Yield pursuant to GPU definition (supply)
2. Define method for determination, and the amount of, current baseline usage (demand)
3. Determine whether the City is currently in deficit or surplus
4. If there is a surplus, propose method for allocating surplus
5. Advise on new Emergency Phases

The Committee

- Met 7 times from January to March 2011
- Data and analysis driven process
- Used our own forecasting models - extensions of existing models by West Yost Associates (“WYA”)

Preview of Conclusions

- The estimated Safe Annual Yield of the water supply is currently 1950 AF / year.
- The estimated current total baseline usage (metered usage plus unavailable water) is 2156 AF / year.
- Current total usage exceeds the Safe Yield by 206 AF / year.
- The baseline usage and Safe Yield calculations should be updated at the beginning of each fiscal year to determine current status.
- The Council should consider the following actions:
 - Approach the City of Napa to renegotiate the trigger date for determining delivery quantities to the City. Adding a second trigger of June 30 could add approximately 75 AF / year to the Safe Yield.
 - Increase potable groundwater production capacity to allow more operational flexibility to City staff. This requires more study to fully quantify the impacts; preliminary analysis shows it would increase Safe Yield.
 - Retain West Yost to propose a new water phase emergency system that better reflects the City's water supply mix.

Preview of Conclusions

The Committee's conclusions were reviewed in discussions with City staff (John Ferons) and West Yost Associates (Jim Connell)

The Committee's findings, conclusions, and recommendations were agreed to by Mr. Ferons and Mr. Connell, given the definition of safe yield in the General Plan Update. The definition itself is a policy determination, as to which they, as professional engineers, properly formulated no opinion.

Analysis

This is a Risk Management issue

1. Understand the risks
 - a. The consequences of outcomes
 - b. The likelihood of outcomes
2. Define the City's "risk attitude"
 - a. How much risk is acceptable? This has largely been done by City Council through adoption of the Safe Yield definition
3. Choose strategies for managing the risk
 - a. Accept it
 - b. Mitigate or reduce it
 - c. Collect more information (delay decisions)

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Safe Yield Committee

City Council

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Modeling Approach

- Supply / Demand forecasting model
- Include assessments of variability and uncertainty
 - Use Monte Carlo simulation to propagate precipitation and other uncertainty through to results (Analytica[®] software)
- Evaluate where we are under *current* conditions
 - We are *not* including longer term risks such as climate change, the Napa contract post 2035, etc.
- Effect is to highlight critical decisions facing the City

Water Supply

There are three potable water sources:

1. Bell Canyon (surface water)
2. Napa Water (per Napa Agreement)
3. City Wells (ground water)

Water Supply: Bell Canyon

Models:

- Model based on analysis of West Yost Associates
- Model incorporates all of the various rules and operational assumptions to calculate inflows and outflows of Bell Canyon
 - Rules govern how much we can divert from Bell Creek from November 15 to April 15
 - State imposes mandatory bypass/release requirements to support fish

Water Supply: Napa Water

Napa Contract

- Contract in place through Dec 31, 2035
- Tier A: Required to accept and purchase 400 AF/yr
- Tier B: Required to accept and purchase additional 200 AF/yr if SWP deliveries equal or exceed 30% on April 15
- Tier C: Option (at choice of St. Helena) of additional 200 AF/yr if SWP equals or exceeds 50% on April 15

Models: Use data from past 15 years of SWP deliveries to model likelihood of receiving Tiers B and C

Water Supply: Groundwater

Potable City Wells Are Stonebridge Wells Nos. 1 & 2

Stonebridge Well No. 1 (1992): 245 GPM

Stonebridge Well No. 2 (1996): 350 GPM

Production Average, 2000-09: 446 AF / YR

Highest, 2000-09: 521 AF (2007)

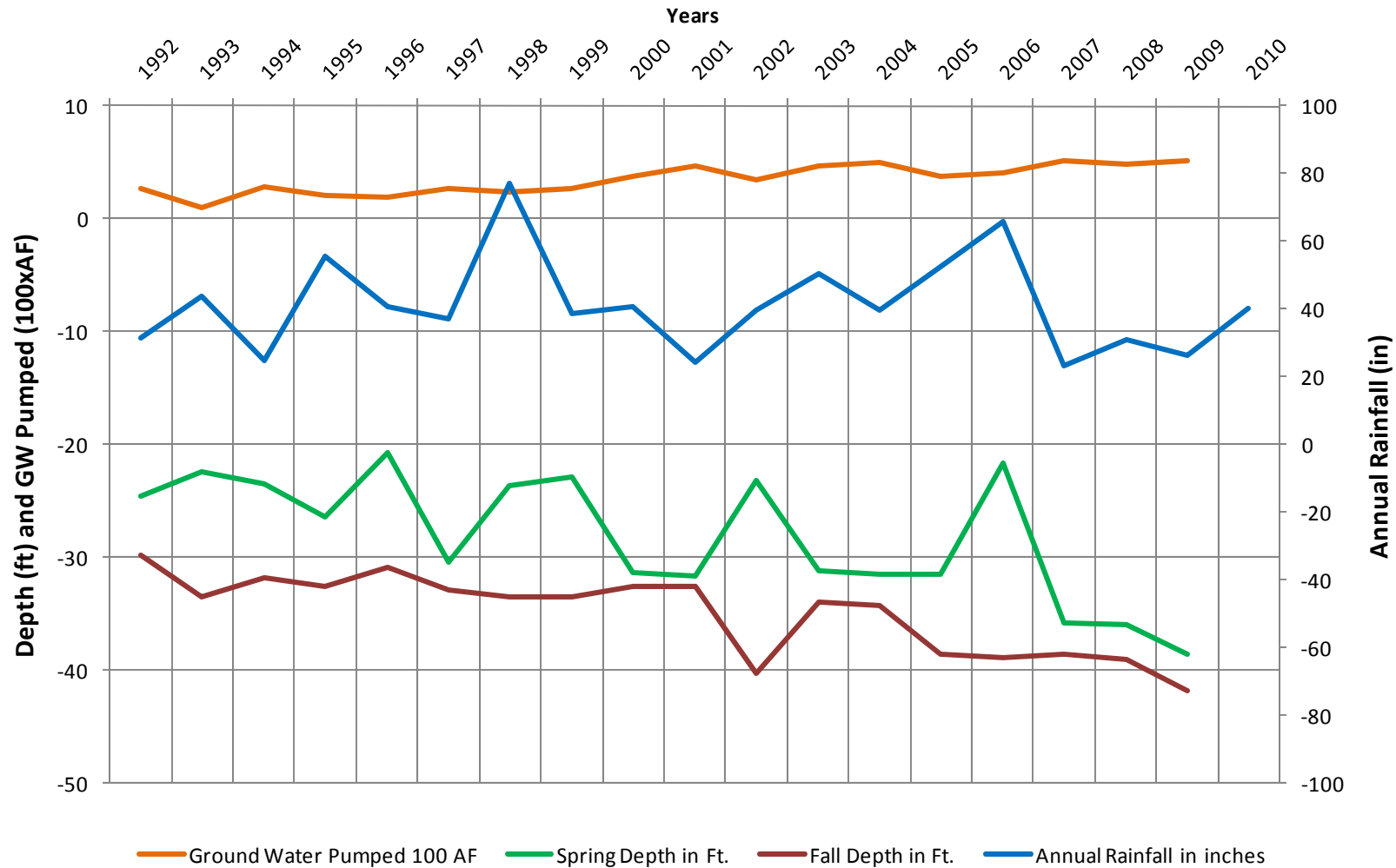
Lowest, 2000-09: 349 AF (2002)

Water Supply: Groundwater

- Overall GW use in and around St. Helena is not well known
- Groundwater system is not very well studied
- Napa County Board of Supervisors initiating multi-year monitoring effort to better understand groundwater
- Some limited evidence of aquifer limitations in area of City wells
- Ability to sustain pumping or pump more water in the future is an uncertainty
 - No clear evidence that increased production *will* harm aquifer
 - No clear evidence that increased production *will not* harm aquifer

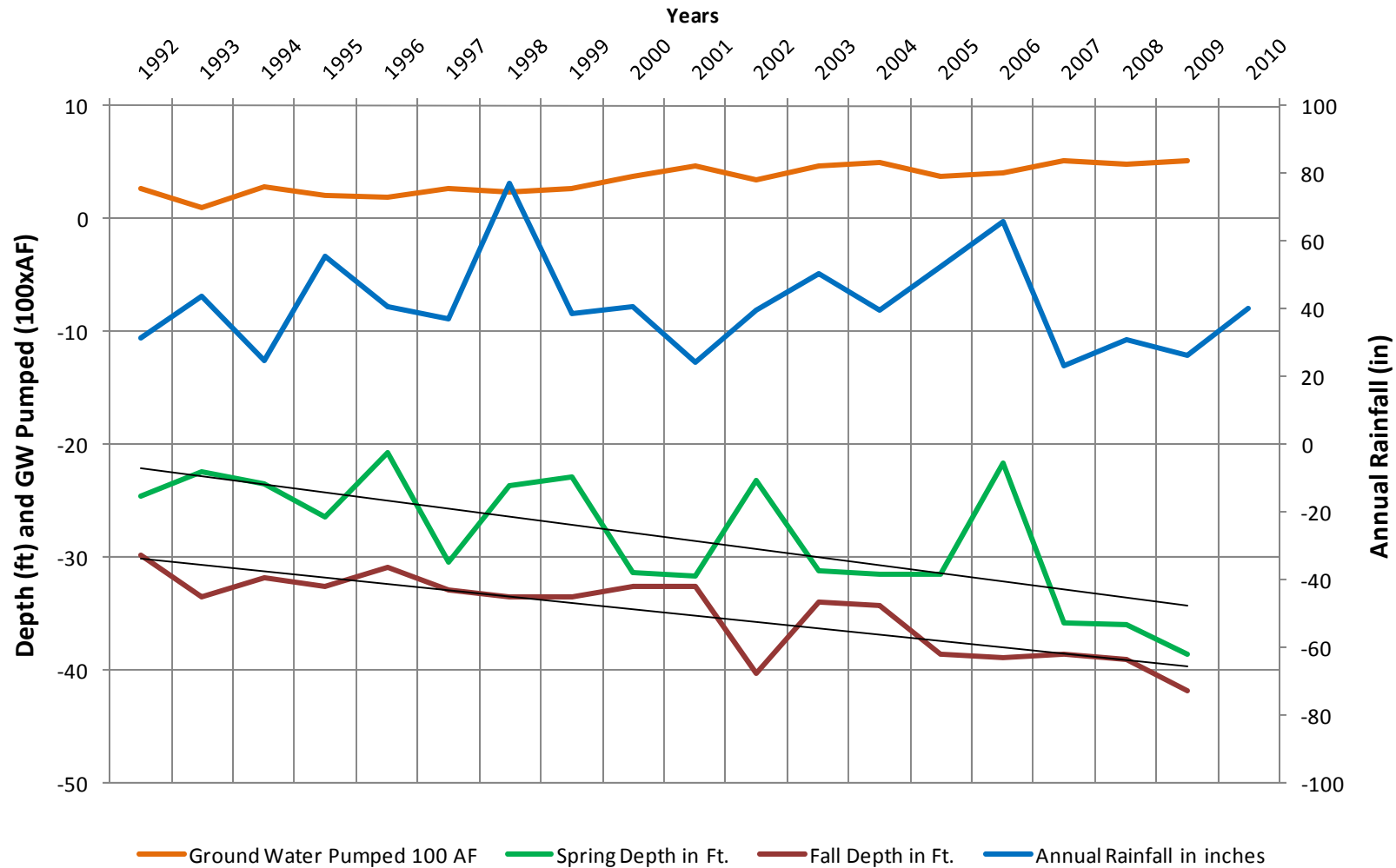
Water Supply: Groundwater

City's Stonebridge Monitoring Well



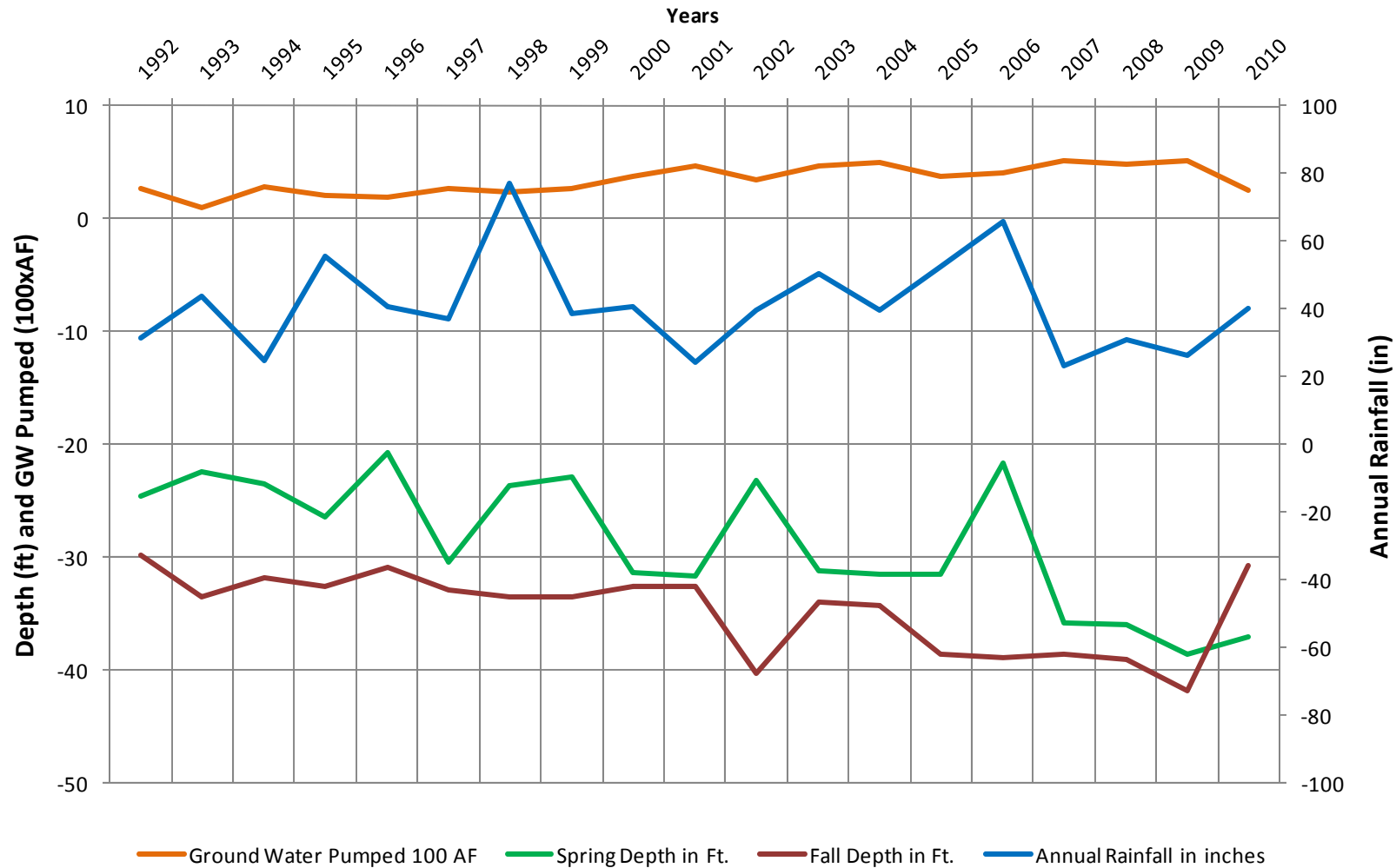
Water Supply: Groundwater

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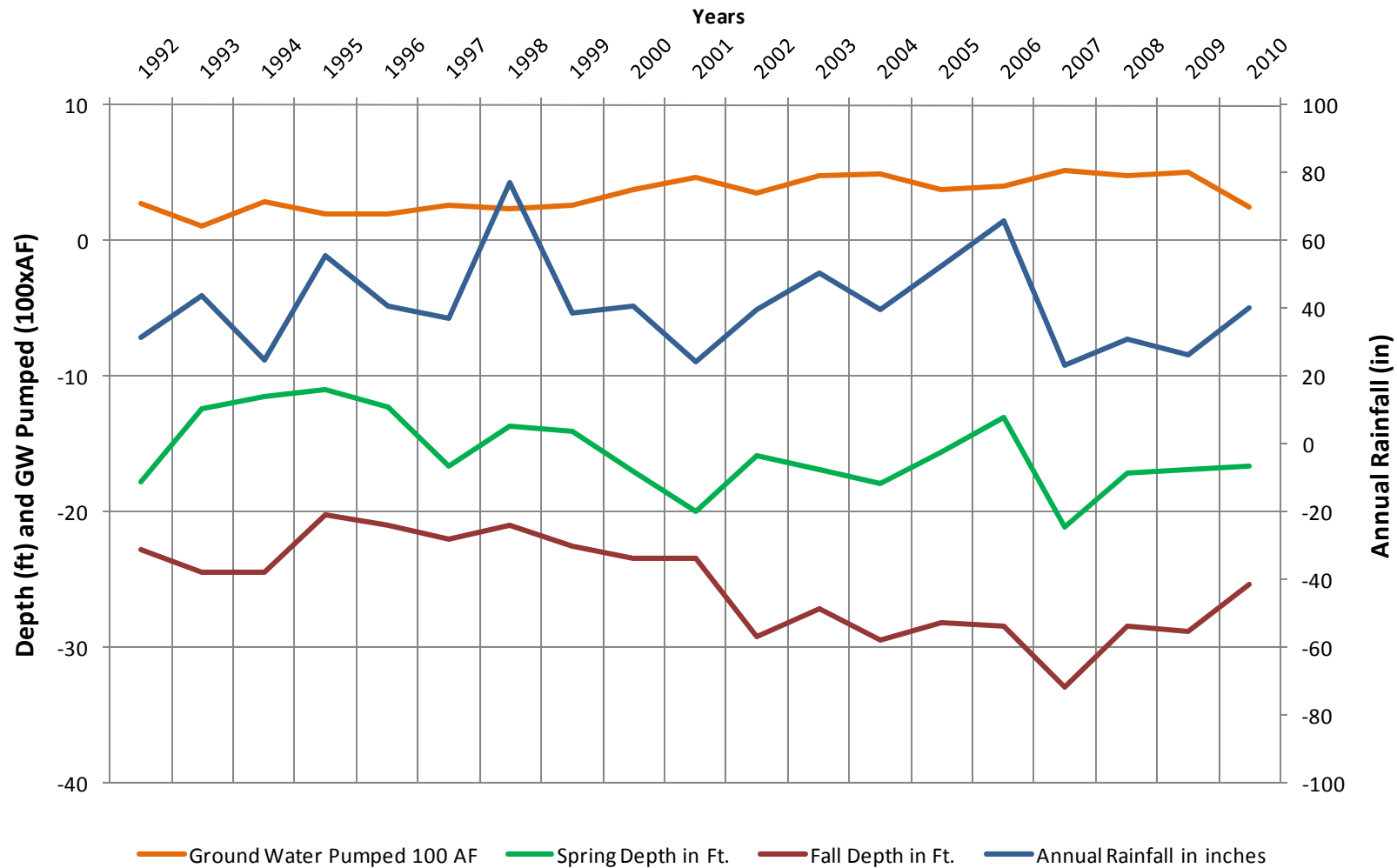
Water Supply: Groundwater

City's Stonebridge Monitoring Well



Water Supply: Groundwater

Vineyard Valley Cased Well



Water Supply: Groundwater

Models:

- Limit annual average pumping from groundwater to no more than 450 AF / year

Safe Annual Yield calculation

Model Runs:

- Supply Assumptions
 - Bell Canyon: yield varies with rainfall
 - Napa: 600 AF
 - Groundwater: 450 AF
- Precipitation Assumptions
 - Run with specific Safe Yield case
 - 10 year time period
 - 8 “Normal” rainfall years
 - 1 “Dry” year
 - 1 “Normal” year

Safe Annual Yield calculation

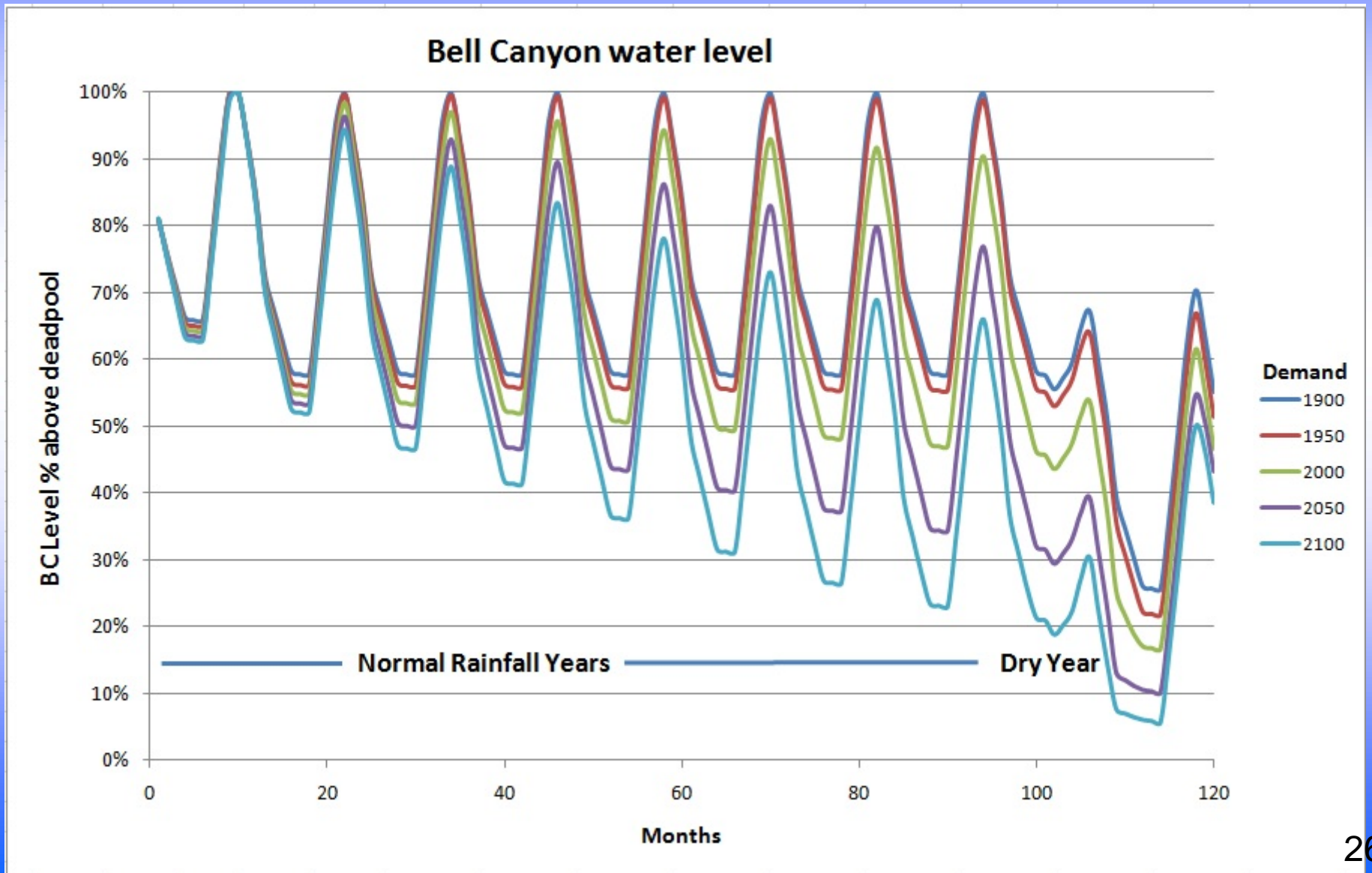
- 8 Normal Years followed by 1 Dry Year followed by 1 Normal Year

Water Emergency Phase

	 8 Normal Years						Dry Year						Normal Year																	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Total Demand (AF)	1900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2
	1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	3	3	3	2	2	2	2	2	2
	1950	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	3	3	3	2	2	2	2	2	2
	1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	3	3	3	3	2	2	2	2	2	2
	2000	0	0	0	0	0	2	2	2	2	2	0	1	1	1	1	1	1	2	2	3	4	4	4	4	2	2	2	2	2	2
	2025	1	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	2	4	4	4	5	5	5	3	2	2	2	2	2
	2050	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	3	5	5	5	5	5	5	3	2	2	2	2	2	
	2075	2	2	2	2	2	2	2	2	2	3	3	3	3	2	2	2	3	4	5	5	5	5	5	5	4	2	2	2	2	2
	2100	2	2	2	2	2	2	2	2	3	3	3	4	4	3	2	2	3	5	5	5	5	5	5	5	4	2	2	2	2	2

Safe Annual Yield calculation

- Normal Years followed by one Dry Year followed by Normal Year



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Water Usage

- Total water usage = metered usage + unavailable water
- Unavailable water is due to:
 - water that enters the distribution system but cannot be sold to customers due to loss in the distribution system
 - water lost in connection with the filtration process at the Water Treatment Plant at Bell Canyon
 - water lost in well backwashing at the Stonebridge Well Complex
- Unavailable water % is calculated for calendar year 2010 data – most reliable because it comes after meter replacement program
- Unavailable water = 15.0% of total production

Baseline Water Usage

- Baseline usage is the current average annual usage for a *typical* year
- Any given year will show variations due to:
 - Total rainfall and seasonality of rainfall
 - Temperature
 - Economic conditions
 - Water restrictions
- To avoid a skewed assessment due to natural variations, we use a 5-year rolling average to determine baseline usage
- Usage is captured by fiscal year (rainfall year)

Water Usage – by Fiscal (water) Year

Water Year	Metered Use (AF)	Metered + unavail. (AF)
2006	1853	2180
2007	2026	2384
2008	1894	2228
2009	1807	2126
2010	1581	1860

Method	Metered Use (AF)	Metered + unavail. (AF)
5-year average	1833	2156

- Current baseline usage = **2156** AF / year

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Current Supply - Demand

- Safe Yield = 1950 AF
- Baseline usage = 2156 AF
- Deficit = **206 AF**

- Safe Yield and Baseline Usage should be evaluated at the start of each fiscal year
 - Update baseline usage with new 5-year average
 - Update Safe Yield if there have been changes
- Next evaluation – July 2011 (unless supply increases in the interim)

Allocation of Surplus

- Allocation of any surplus water

Safe Yield – Baseline Usage = Surplus (Deficit)

- Allocation of Excess

- % to new uses
- % for risk mitigation for current users

- Defer this to Council when there is a surplus

Conclusions

- Under current conditions, the St. Helena potable water supply is not in balance
- Supply / usage should be reassessed on an annual (fiscal year) basis
 - Reassessment should be done any time supply is materially increased

Recommendations

- Seek an amendment to Napa contract with a second trigger date on June 30
 - SWP allocations often increased after April 15
 - This could increase Safe Yield by ~75 AF
- Consider new groundwater production well
 - Provides additional operating flexibility
 - Increases potable production *capacity* with intent to decrease total groundwater *production*
 - Would increase Safe Yield – more analysis is required to quantify the amount

Recommendations

- Retain West Yost to propose a new City water phase emergency system
 - Current system is not consistent with the City's supply mix
 - Devised when Bell Canyon provided nearly all City water
 - Devised when yields from Bell Canyon were significantly greater than today
 - Safe Yield Committee members remain available to help in this task as needed

Questions?