HEXAVALENT CHROMIUM WORKSHOP

Alternatives for Meeting State Standards & Restoring Water Supplies

SEPTEMBER 23, 2014

Introduction
Chris Dahlstrom, General Manager

- The purposes of this Workshop are to:
  - Inform the District's customers of the current water supply conditions and availability during the prevailing drought
  - Define the new State of California regulation for Hexavalent Chromium (Cr6)
  - Explain the effect and impacts to the District's Upland groundwater supply
  - Provide an overview of the range of alternatives to remedy the constraints on groundwater production
  - Describe the recommended alternatives and costs

Consultant Work Group

Introduction of Expert Consultants

- **Hazen & Sawyer**: Specialists in water treatment and removal methodologies of Cr6 from the water supply since 1951. The consultant engineers Nicole Blute and Lynn Grijalva are experts in various centralized and well-head water treatment methods.

- **Stetson Engineers**: As the District's expert, Joe DeMaggio engaged in the modeling and analysis of the demand-side water requirements, quantifying supply shortages, developing all non-treatment alternatives, and performing hydraulic modeling and system capacity analysis of all alternatives.

- **William Brennan**: Consultant expert in water quality and regulatory activities, explored the water sampling methodology, assessment techniques, and regulatory exceptions.

- **Dudek and Associates:** Trey Driscoll provided groundwater well profiling and aquifer analysis with the lower Cr6 concentrations, and Ken Marshall and Jonathan Leech assist in the coordination, land acquisition, CEQA compliance, permitting, hazardous materials and hazardous waste handling, and other siting compliance issues.

- **Fiona Hutton & Associates:** A public affairs firm with a broad range of expertise and strategic communications, public education and issue advocacy efforts. Fiona Hutton, Ann Newton and the firm's team have extensive experience in water supply and quality issues.

Introduction

WHAT IS Cr6?

Cr6 is one of several naturally occurring forms of Chromium, an element that enters the groundwater through geological formations throughout California, including many of those located in the Santa Ynez Valley.

- ID No. 1 has always met state standards and provided safe drinking water
- New state standard for Cr6 established this year
- ID No. 1 and water districts throughout CA challenged by cost, implementation of new standard
- District must comply—key wells out of production
- Drought exacerbates situation
- ID No. 1 proactively analyzing options to meet state standards and restore water supply reliability

California & Cr6 Regulatory History

Late 90's to early 2000's Cr6 gains political attention

2000's: Cr6 Research

2001:SB 351 requires CA to set Cr6 MCL by 2004

2011: State releases Public Health Goal of 0.02 parts per billion (ppb)

2013: State proposes Draft Cr6 Maximum Contaminant Level (MCL) of 10 ppb

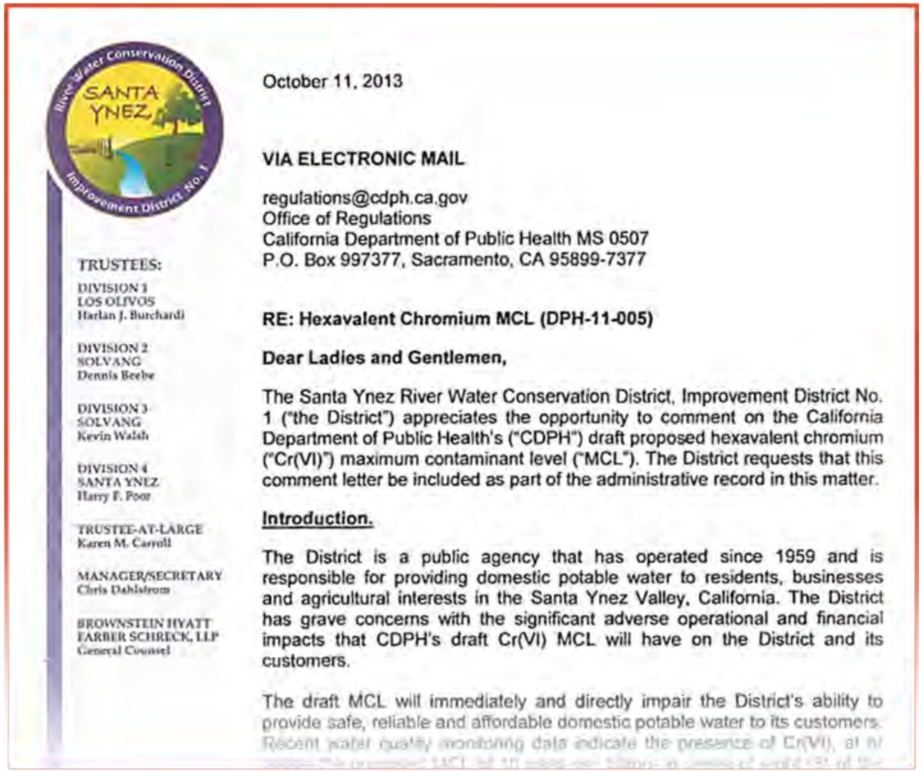
July 2014: State adopts 10 ppb Cr6 MCL

2015+ Possible Federal Cr6 MCL

<u>Total Chromium:</u>
USEPA MCL 100 ppb
CA MCL 50 ppb

ID No. 1 & Cr6

- ID No. 1 briefs Board in February 2011 on possible CDPH action; followed by monthly updates
- Court orders CDPH in 2012 to finalize an enforceable regulation for Cr6 following NRDC lawsuit



October 11, 2013

VIA ELECTRONIC MAIL

regulations@cdph.ca.gov
Office of Regulations
California Department of Public Health MS 0507
P.O. Box 997377, Sacramento, CA 95899-7377

RE: Hexavalent Chromium MCL (DPH-11-005)

Dear Ladies and Gentlemen,

The Santa Ynez River Water Conservation District, Improvement District No. 1 ("the District") appreciates the opportunity to comment on the California Department of Public Health's ("CDPH") draft proposed hexavalent chromium ("Cr(VI)") maximum contaminant level ("MCL"). The District requests that this comment letter be included as part of the administrative record in this matter.

Introduction.

The District is a public agency that has operated since 1959 and is responsible for providing domestic potable water to residents, businesses and agricultural interests in the Santa Ynez Valley, California. The District has grave concerns with the significant adverse operational and financial impacts that CDPH's draft Cr(VI) MCL will have on the District and its customers.

The draft MCL will immediately and directly impair the District's ability to provide safe, reliable and affordable domestic potable water to its customers. Recent water quality monitoring data indicate the presence of Cr(VI), at or

- District submits comments on the CDPH proposed 10 ppb MCL for Cr6
- ID No. 1 requests support from ACWA crafting a technically, financially feasible regulation that protects public health

ID No. 1 & Cr6

- District joins ACWA Chromium Work Group to engage legislators, government officials and regulatory agencies
- Consulting Work Group engaged in December 2013 to prepare for California's proposed Cr6 standards
- Full technical analysis prepared for restoring groundwater supplies—District acted early in anticipation of major impacts
- **Today: Key ID No. 1 groundwater wells out of production to comply with new state standard on Cr6 in Summer 2014**

ID No.1 Water Supplies

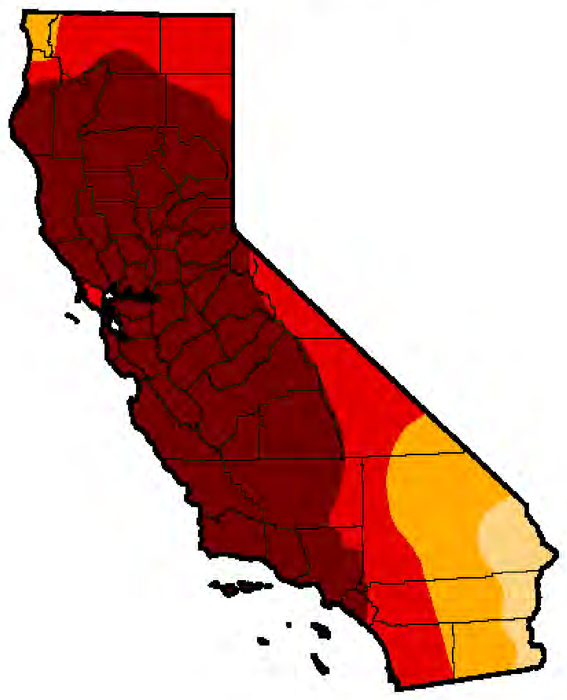
- Cachuma Project
  - **Normal** 2,651 AFY **Current WY** 1,134 AF
    43% of Normal
- S.Y. River Appropriation
  - **Normal** 3,235 AFY **Current WY** 2,655 AF
    82% of Normal
- Upland Groundwater Wells
  - **Normal** 7,591 AFY **Current WY** 2,019 AF
    32% of Normal
- State Water Project
  - **Normal** 525 AFY **Current WY** 35 AF
    0.6% of Normal

Drought and Water Supply Conditions

- ID No.1 Board Declared Water Supply Shortage on June 17, 2014
- Cachuma water at 16% Contract delivery amount
- Upland groundwater basin declining levels up to 70’ with lowering production
- No deliveries of SWP water
- Declining SY River supplies

U.S. Drought Monitor

California



September 9, 2014

(Released Thursday, Sep. 11, 2014)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	95.42	81.92	58.41
Last Week 9/2/2014	0.00	100.00	100.00	95.42	81.92	58.41
3 Months Ago 6/10/2014	0.00	100.00	100.00	100.00	76.68	24.77
Start of Calendar Year 12/31/2013	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10/1/2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 9/10/2013	0.00	100.00	97.08	92.94	11.36	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brian Fuchs
National Drought Mitigation Center

http://droughtmonitor.unl.edu/

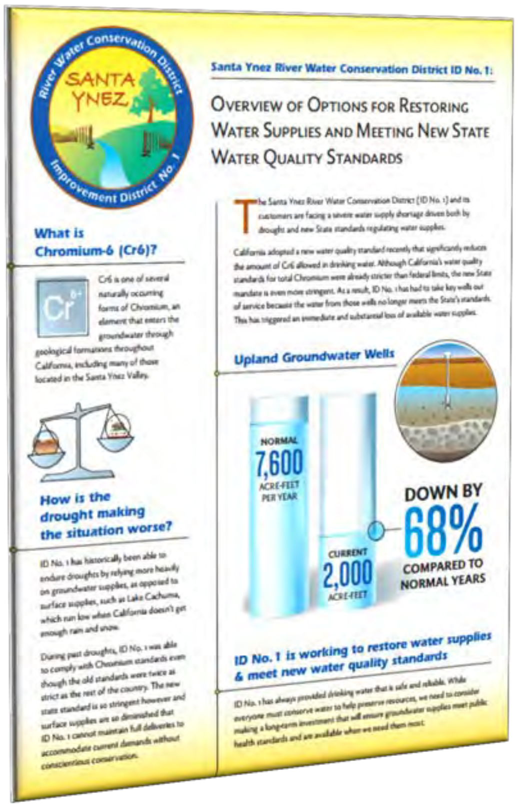
Drought & Cr6

- ID No. 1 historically endured droughts by relying on groundwater
- Drought impacts more severe because of new Cr6 standards—less groundwater available
- Cr6 standards present long-term challenge requiring long-term solution

Drought & Cr6: Future Constraints on Supplies

- Cachuma Project
  - **Current WY** **2014-15 Drought/Cr6**
    1,134 AFY 2,710 AFY
- S.Y. River Appropriation
  - **Current WY** **2014-15 Drought/Cr6**
    2,655 AFY 1,327 AFY
- Upland Groundwater Wells
  - **Current WY** **2014-15 Drought/Cr6**
    2,019 AFY 1,514 FY
- State Water Project
  - **Current WY** **2014-15 Drought/Cr6**
    35 AFY 0 AFY

Cr6 Public Education & Outreach Efforts



- Public awareness efforts throughout the state
  - Many agencies grappling with new Cr6 regs; ACWA and others engaged statewide
- ID No. 1 launched public education efforts to inform ratepayers
  - Customer Letters & Notifications
  - Media Outreach
  - Informational Materials

Santa Ynez Valley News

"ID1 declares water supply shortage emergency"

Santa Barbara News-Press

"Drought, new state standards impact your water supply"

Cr6 Workshop

Questions?

What is Chromium?

- Chromium is a naturally occurring metal found in rock, soil, and groundwater and is present throughout California
- Trivalent chromium (Cr3) is an essential human dietary nutrient
- Hexavalent chromium (Cr6) has been identified as carcinogenic by the oral route of exposure
- Active geochemical processes in the environment favor the oxidation (loss of electrons) of Cr3 in chromite to form hexavalent Cr6, the more soluble form of chromium
- Increased solubility of oxidized chromite means it can be more easily dissolved in groundwater

Santa Ynez Cr6 Occurrence

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- San Rafael Mountains provide recharge to the Santa Ynez Upland Groundwater Basin
- Franciscan Formation dominates the geology of these mountains which include a serpentinite matrix known to contain chromite which results in a continuous source of Cr6 in the groundwater of the basin
- **District Sources of Supply and Chromium Concentrations:**

Zone	Supply	Status	Capacity (gpm)	Cr6 (ppb)	Total Cr (ppb)
Zone 1	6.0 CFS Well field	Active	2200	ND*	ND
	4.0 CFS Well field	Active	1800	ND	ND
	MV	Active	5200	ND	ND
Zone 2	Well 1**	Inactive	200	36	59
	Well 2	Active	500	22 - 24	22
	Well 3**	Inactive	600	10	12
	Well 4**	Inactive	300	1.9	16
	Well 15	Active	1200	25 - 26	26
	Well 27	Active	1250	6.9 - 13	12
	Well 28	Active	750	8.7 - 9.2	9.5
Zone 3	Well 5	Active	250	0.7-1.1	1.9
	Well 6	Inactive	300	ND	ND
	Well 7	Active	900	2.1 - 10	10
	Well 24	Active	300	1.3 - 4.1	4
	Well 25	Active	950	8.4 - 9.8	8.4

*ND = non-detect. Non-detect value is 0.02 ppb for Cr6 and 0.2 ppb for Total Cr

Cr6 is one of many inorganic chemicals that California regulates in drinking water

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Maximum Contaminant Levels
Inorganic Chemicals

Chemical	*Maximum Contaminant Level, mg/L*
Aluminum	1.
Antimony	0.006
Arsenic	0.010
Asbestos	7 MFL*
Barium	1.
Beryllium	0.004
Cadmium	0.005
Chromium	0.05
Cyanide	0.15
Fluoride	2.0
Hexavalent chromium	0.010
Mercury	0.002
Nickel	0.1
Nitrate (as NO3)	45.
Nitrate+Nitrite (sum as nitrogen)	10.
Nitrite (as nitrogen)	1.
Perchlorate	0.006
Selenium	0.05
Thallium	0.002

* MFL=million fibers per liter; MCL for fibers exceeding 10 um in length.

Santa Ynez River Water Conservation District Improvement District No. 1

Constraints on Water Supply from Cr6 Concentrations

Supply	Current Cr6 Level (ppb)	Current Capacity (gpm)	Capacity Restricted by Cr6 Compliance (gpm)
6.0 CFS Well field	ND	2,260	2,260
4.0 CFS Well field	ND	1,175	1,175
Mesa Verde	ND	5,200	5,200
Well 1	36	Inactive (200)	Above MCL (200)
Well 2	22 - 24	500	Above MCL (500)
Well 3	10	Inactive (600)	At Risk (600)
Well 4	1.9	Inactive (300)	Inactive (300)
Well 5	0.7-1.1	250	250
Well 6	ND	300	300
Well 7	2.1 - 10	900	At Risk (900)
Well 15	25 - 26	1,200	Above MCL (1,200)
Well 24	1.3 - 4.1	300	300
Well 25	8.4 - 9.7	950	At Risk (950)
Well 27	6.9 - 13	1,250	Above MCL (1,250)
Well 28	8.7 - 9.2	750	At Risk (750)
Gallery Well	Not Measured	Inactive (776)	Inactive (776)
TOTAL	-	**15,035**	**9,485***

*Maximum Daily Demand (MDD) = 9,527 gpm

Alternatives

Alternative 1 – Blending

Alternative 2 – Separate Irrigation Water System

Alternative 3 – Surface Water Treatment Gallery Well

Alternative 4 – Minimize Use of Upland Wells with High Cr6

Alternative 5 – Well Treatment

Alternative 6 – Well Improvements (packers)

Alternatives

Alternative 1 – Blending Options

- 6 different possible blending strategies were identified:
  - Alt 1-1 – Blend Well 7 with Well 24 into existing 0.5 MG Zone 3 tank
  - Alt 1-2 – Blend Well 7 with Well 24 at Well 7 site
  - Alt 1-3 – Blend Well 27 with Zone 2 water then pumped into Zone 3
  - Alt 1-4 – Blend Well 28 with Zone 2 water then pumped into Zone 3
  - Alt 1-5 – Blend Well 5 with Well 25 at Well 25 site
  - Alt 1-6 – Blend Well 24 with Well 25 at Well 25 site

Alternatives

Alternative 2 – Separate Agriculture Water System

- Dedicate Wells 1,2,3,15 & Gallery Well to irrigation only

Alternative 3 – Surface Water Treatment Gallery Well

- Surface water treatment of water from the Gallery Well (not currently used)

Alternative 4 – Minimize Use of Upland Wells with High Cr6

- Use well 5, 6, and 24; add booster pumps

Alternatives

Alternative 5 – Well Treatment Location Options

- Alt 5-1 – Treat Wells 1, 2 and 15; add Well 3
- Alt 5-2 – Treat Wells 27 and 28 at Well 27 site
- Alt 5-3 – Treat Well 7 at Well 7 site
- Alt 5-4 – Treat Well 25 at Well 25 site

Alternatives

Alternative 6 – Well Improvements (packers)

- Alt 6-1 – Well 7 – block inflow from high Cr6 zone, 25% flow reduction
- Alt 6-2 – Well 25 - block inflow from high Cr6 zone, 25% flow reduction
- Alt 6-3 – Well 28 - block inflow from high Cr6 zone, 25% flow reduction
- Alt 6-4 – Well 27 - block inflow from high Cr6 zone, 25% flow reduction

Complete Options

"Complete Options" were constructed from the alternatives to provide the water supply portfolio for the District

Complete Options		Alternatives																	
		Blending						Separate Irrigation System	Gallery Well Treatment	Minimize Use of High Cr6 Wells		Well Treatment				Well Improvements (Packers)			
		1-1	1-2	1-3	1-4	1-5	1-6	2-1	3-1	4-1	4-2	5-1	5-2	5-3	5-4	6-1	6-2	6-3	6-4
	A								✔			✔	✔	✔	✔				
	B											✔	✔	✔	✔				
	C				✔							✔		✔	✔				✔
	D		✔			✔						✔	✔						
	D-P											✔	✔			✔	✔		
	D-C		✔			✔						✔	✔			✔	✔		
	E		✔		✔	✔						✔							✔
	E-P				✔							✔				✔	✔		✔
	E-C		✔		✔	✔						✔				✔	✔		✔
	F									✔									
	G		✔			✔		✔	✔ *										✔

*Gallery well is untreated and used for irrigation only

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Complete Option Evaluation

Decisions were based on:

Treatment and Distribution Analysis → Input from Consultants → Input from District → Scoring Criteria → Weighting Factors

Scoring:

0 → 10

Least favorable water quality assurance and supply reliability

Most favorable water quality assurance and supply reliability

Criteria	Definition	Weighting Factor (%)
Water Quality Compliance Assurance	The ability to meet the Cr6 MCL at each entry into the distribution system, mitigating the risk that Cr6 levels in the wells may fluctuate over time.	50
Water Production Reliability	The ability to produce a continuous and reliable supply to meet system demands.	50
Annualized Cost	Capital and O&M costs of the options, annualized over a 20 year period.	

Santa Ynez River Water Conservation District Improvement District No. 1

Water Quality Assurance

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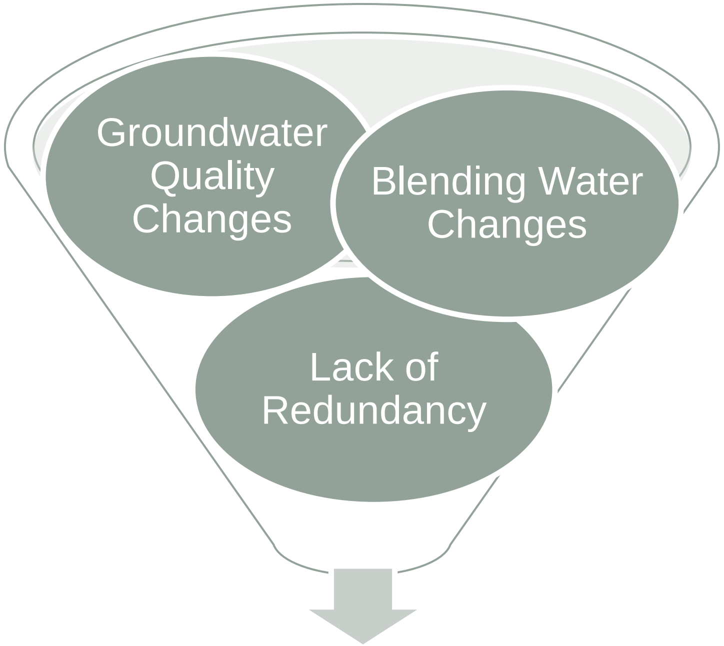
Risks to Water Quality:



Considerations:

Cr6 levels entering the distribution at each well

Possibility of Cr6 concentration increase if one well in a blended system failed

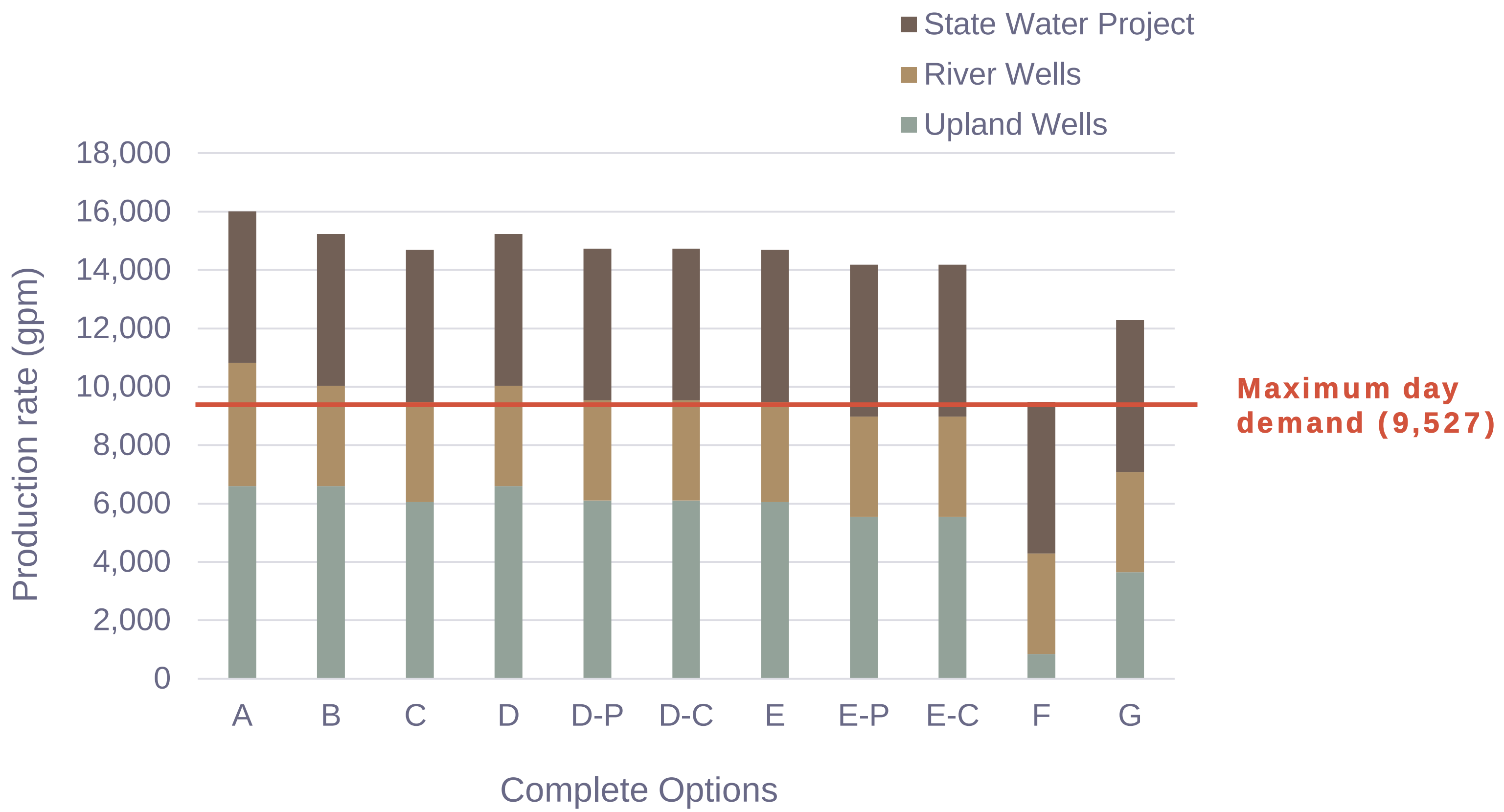
Redundancy within the system

Resilience to changing water quality in the wells

Addition of low Cr6 sources

Accommodations for the future

Complete Option Production Summary



Supply over Maximum Daily Demand provides contingency during periods of higher water demands

Water Production Reliability

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Considerations:

- Number of resources kept in use
- Complete option production compared to current production
- Ability to meet peak and average day demand requirements
- Vulnerability to regulatory driven shutdown
- Redundancy within system
- Possible reductions of water supply (packers, changing concentrations)
- Ability to use Upland wells in case of emergency

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Annualized Cost

- Twenty-year life cycle costs (amortized 5% interest)

- Annualized Capital Cost
  - Additional Piping
  - Treatment Plants
  - New Pumps
- Anticipated Annual Operation
  - Chemical Deliveries
  - Labor
  - Maintenance Services
- Energy Costs
  - Additional Pumping
  - Treatment

Complete Option Cost Summary

			Annual Cost		
Complete Option	Capital Cost		Annualized Capital Cost	O&M Cost	Total Annualized Cost
A	25,773,000		2,069,000	3,030,000	5,099,000
B	23,182,000		1,860,000	2,891,000	4,751,000
C	19,009,000		1,526,000	2,153,000	3,679,000
D	17,507,000		1,406,000	2,014,000	3,420,000
D-P	16,529,000		1,327,000	2,026,000	3,353,000
D-C	17,801,000		1,429,000	2,040,000	3,469,000
E	13,388,000		1,075,000	1,263,000	2,338,000
E-P	12,360,000		991,000	1,275,000	2,266,000
E-C	13,495,000		1,083,000	1,287,000	2,370,000
F	3,287,000		261,000	105,000	366,000
G	24,652,000		1,977,000	291,000	2,268,000
H	2,810,000		225,000	81,000	306,000

Complete Option A:
Maximum Treatment

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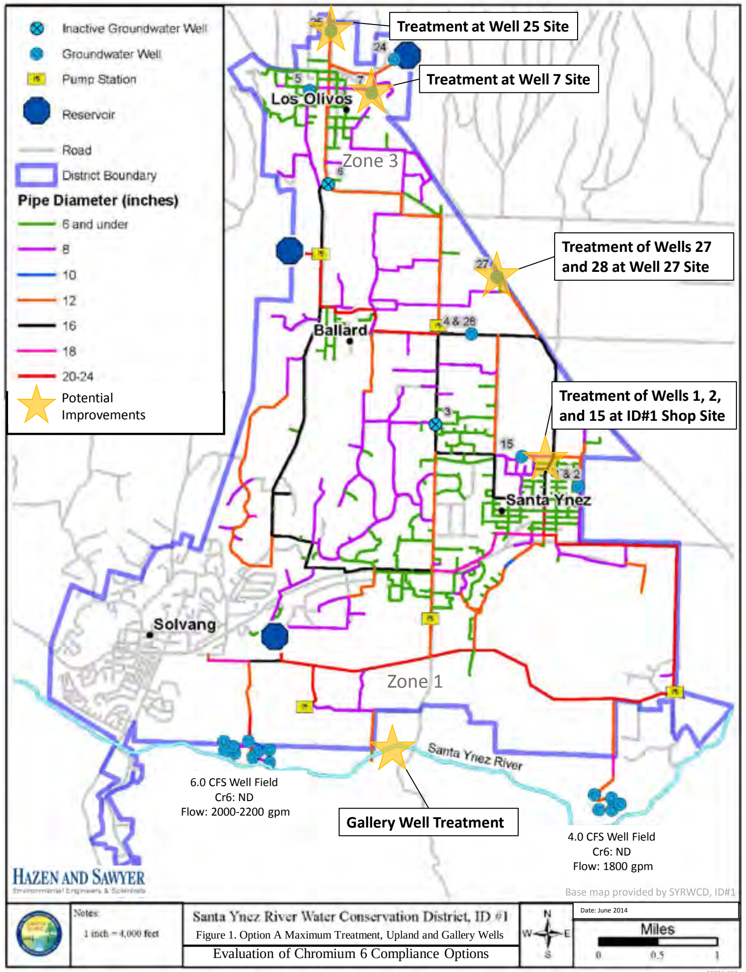
Option A is a combination of
- Five treatment plants
  - Four groundwater plants
  - One surface water plant
- All Upland wells in full production
- Reactivation of wells 1 and 3
- Activation of the Gallery Well as a potable water source



Complete Option A

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- **Water Quality Compliance Assurance**
  - All well water would be treated to achieve the target goal of 6 ppb
  - The addition of the Gallery Well provides a low Cr6 source
  - Five treatment plants provide redundancy for maintenance events
  - The plants can accommodate potentially worsening water quality in the future
  - Potential complications from constructing/running five treatment plants
    - Annualized costs account for this, all options include complicated ID#1 plant
- **Water Production Reliability**
  - All wells remain in full production in Zones 2 and 3
  - Contingency: 68% of Maximum Day Demand
  - Upland wells can produce 6,600 gpm in case of emergency
  - Total Production Capacity: 16,011 gpm
- **Scores and Cost:**

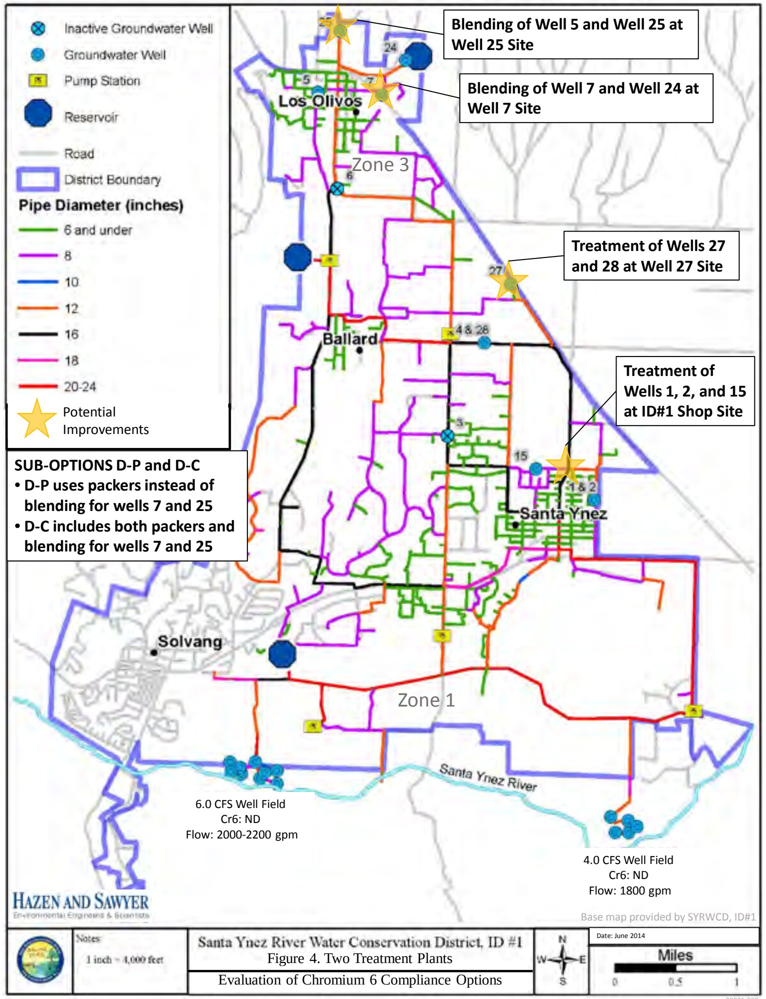
Criteria	Score (0 to 10)
Water Quality Compliance Assurance	10
Water Production Reliability	11*
Annualized Cost	$5.1M
	*Addition production from Gallery Well

Santa Ynez River Water Conservation District Improvement District No. 1

Complete Option D:
Two Treatment Plants

Option D is a combination of:

- Two groundwater treatment plants
- Reactivation of wells 1 and 3
- Blending two marginal wells with compliant water



Complete Option D

- **Water Quality Compliance Assurance**
  - Upland wells treated to achieve target goal of 6 ppb
  - Two marginal wells relying on blending are at risk of non-compliance if Cr6 concentration increases in compliant or non-compliant wells
  - 30% of Upland water is vulnerable to risk due to reliance on blending and packers and the possibility of non-compliance or flow reduction
- **Water Production Reliability**
  - Production would be the same as current production
  - Contingency: 60% of Maximum Day Demand
  - Upland wells can produce 6,600 gpm in case of emergency
  - Total Production Capacity: 15,235 gpm
- **Scores and Cost:**

Criteria	Option D
Water Quality Compliance Assurance	7
Water Production Reliability	9
Annualized Total Cost	$3.4M

Complete Option E:
Maximum Blending

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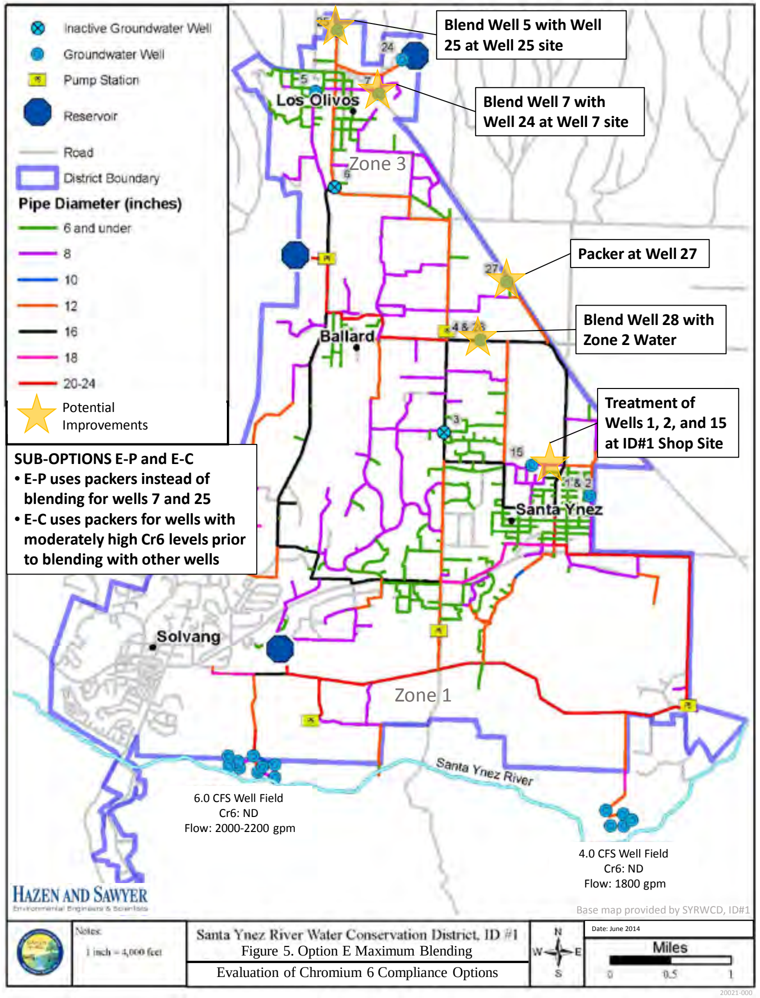
Option E is a combination of:

- One groundwater treatment plant
- Reactivation of Wells 1 and 3
- Blending three marginal wells with compliant water
- Packers on one marginal well



Complete Option E

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- Water Quality Compliance Assurance
  - Three wells treated to achieve target goal of 6 ppb
  - Three marginal wells relying on blending are at risk of non-compliance if Cr6 concentration increases in wells
  - The well with the packer is at risk if short-circuiting occurs
  - 50% of Upland Groundwater is vulnerable to risk for Cr6 compliance
- Water Production Reliability
  - Packers are estimated to reduce production by 25%
  - Contingency: 54% of Maximum Day Demand
  - If surface waters are interrupted, Upland wells would produce 6,050 gpm
  - Production rate is slightly less than current production but it is at risk of being reduced by half if Cr6 concentration increases in untreated wells
  - Total Production Capacity: 14,685 gpm
- Scores and Cost:

CRITERIA	Option E
Water Quality Compliance Assurance	4
Water Production Reliability	7
Annualized Total Cost	$2.3M

Comparison of Complete Options

Production Rates

Supply	Cr6 (ppb)	Current Capacity (gpm)	Option A Capacity (gpm)	Option D Capacity (gpm)	Option E Capacity (gpm)
6.0 CFS Well field	ND	2,260	2,260	2,260	2,260
4.0 CFS Well field	ND	1,175	1,175	1,175	1,175
Mesa Verde	ND	5,200	5,200	5,200	5,200
Well 1	36	Inactive	200	200	200
Well 2	22 - 24	500	500	500	500
Well 3	10	Inactive	Standby	Standby	Standby
Well 4	1.9	Inactive	Inactive	Inactive	Inactive
Well 15	25 - 26	1,200	1,200	1,200	1,200
Well 27	6.9 - 13	1,250	1,250	1,250	950
Well 28	8.7 - 9.2	750	750	750	500
Well 5	0.7-1.1	250	250	250	250
Well 25	8.4 - 9.7	950	950	950	950
Well 6	ND	300	300	300	300
Well 7	2.1 - 10	900	900	900	900
Well 24	1.3 - 4.1	300	300	300	300
Gallery Well	No Data	Inactive	776	Inactive	Inactive
Total from Upland wells (gpm):		6,400	6,600	6,600	6,050
Total from all sources (gpm):		**15,035**	**16,011**	**15,235**	**14,685**

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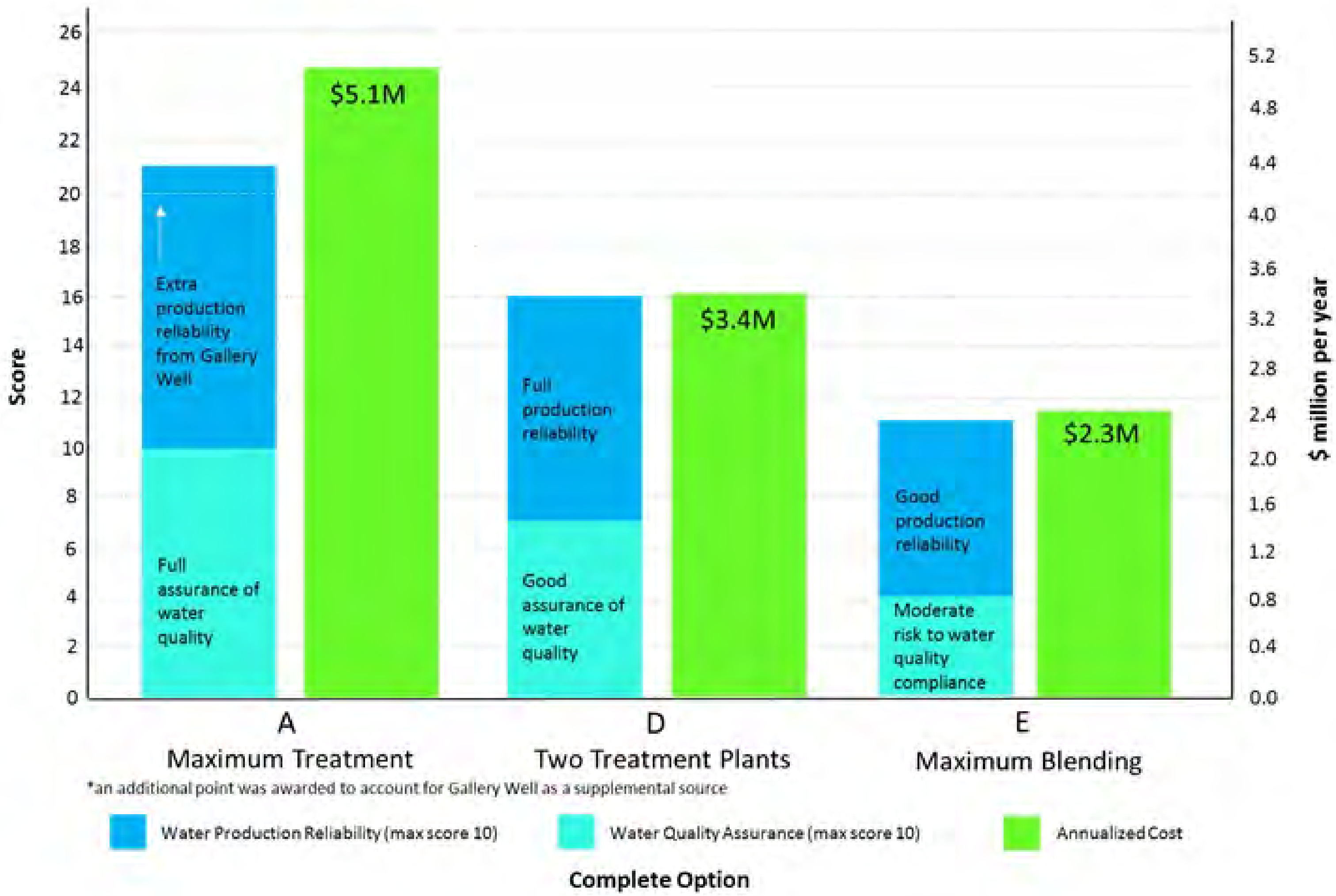
Environmental Engineers & Scientists

Comparison of Complete Options



Santa Ynez River Water Conservation District Improvement District No. 1

Next Steps

- Cr6 impacts to groundwater supplies must be remedied
- ID No. 1 staff recommends Board review and direct staff to move forward with one of the three options (A, D or E)
- Full environmental review would follow
- Selection allows staff to seek funding assistance from the State
- Board & Ratepayer involvement throughout public process

Requirements Prior to Solution Roll-Out

- Preliminary Engineering Design prepared based upon Board selection of Complete Option
- ID No. 1 conducts environmental review to satisfy the California Environmental Quality Act
- Permit applications submitted to CDFW, RWQCB, DTSC, Santa Barbara County Building & Safety
- Final design and construction bid packages prepared
- Construction launched

Thank You

Thank you for your participation tonight. For more information on Cr6 and to review the complete report, please visit www.syrwd.org.

A copy of the report is also available for viewing at the ID No. 1 office:

3622 Sagunto Street

Santa Ynez, CA 93460

Cr6 Workshop

Questions?

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Environmental Engineers & Scientists

Best Available Technologies

Four treatment strategies – All can achieve the draft MCL of 10 ppb

Weak-Base Anion Exchange (WBA)

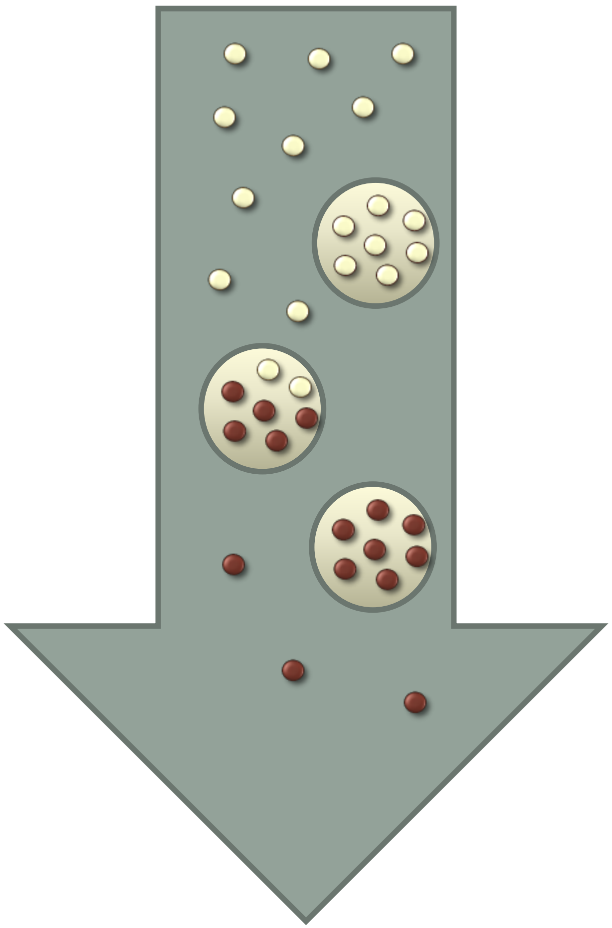
Strong-Base Anion Exchange with Residuals Treatment (SBA)

Reduction Coagulation Filtration (RCF or RCMF)

Reverse Osmosis (RO)

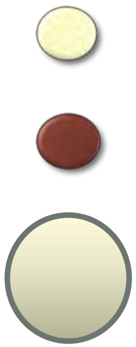
Santa Ynez River Water Conservation District Improvement District No. 1

Ion Exchange



Ion Exchange

Ions of Cr6 attach to specially coated resin beads



Cr6 in water

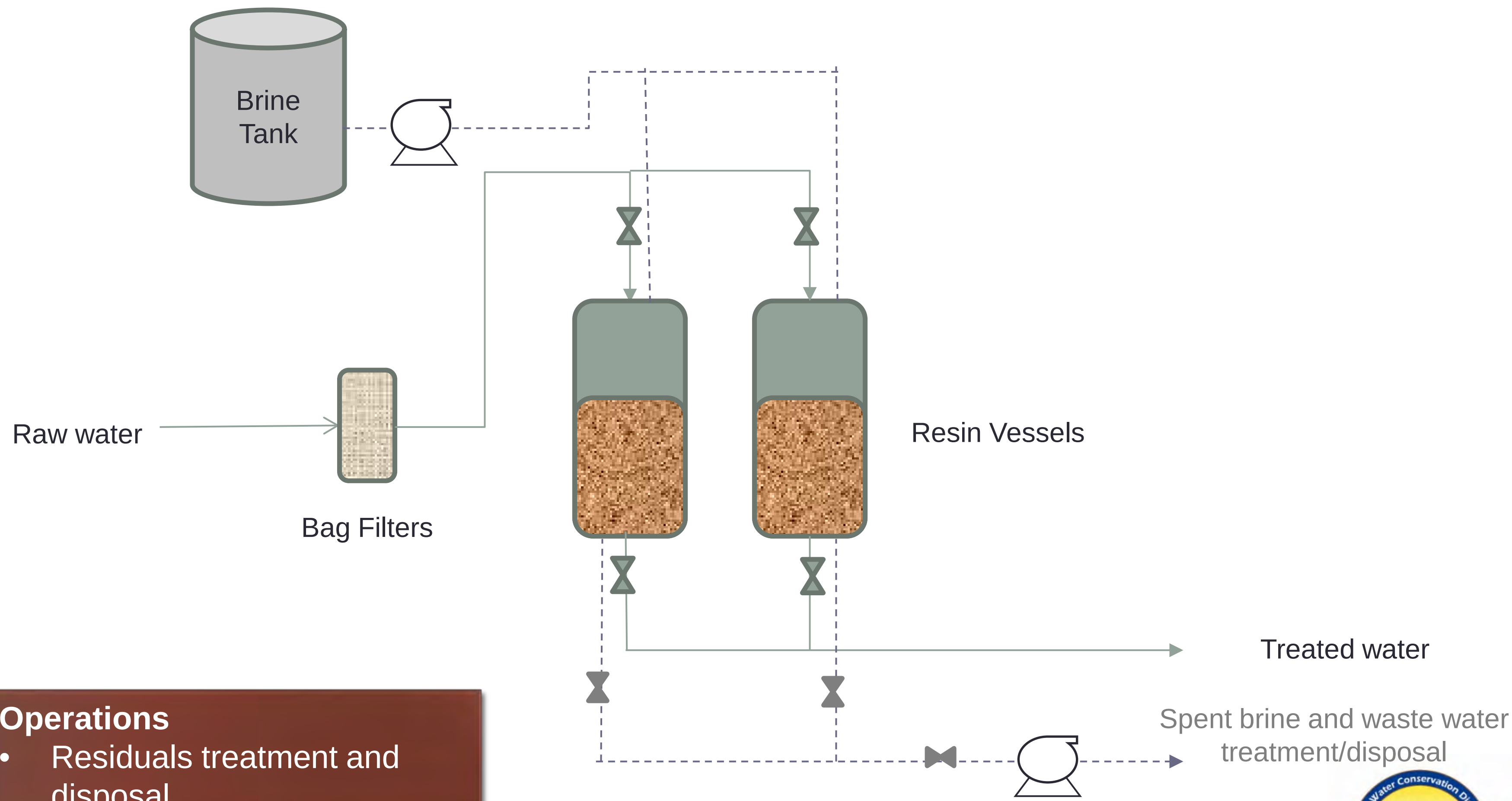
Chloride on resin

Resin bead

Regeneration of Resins

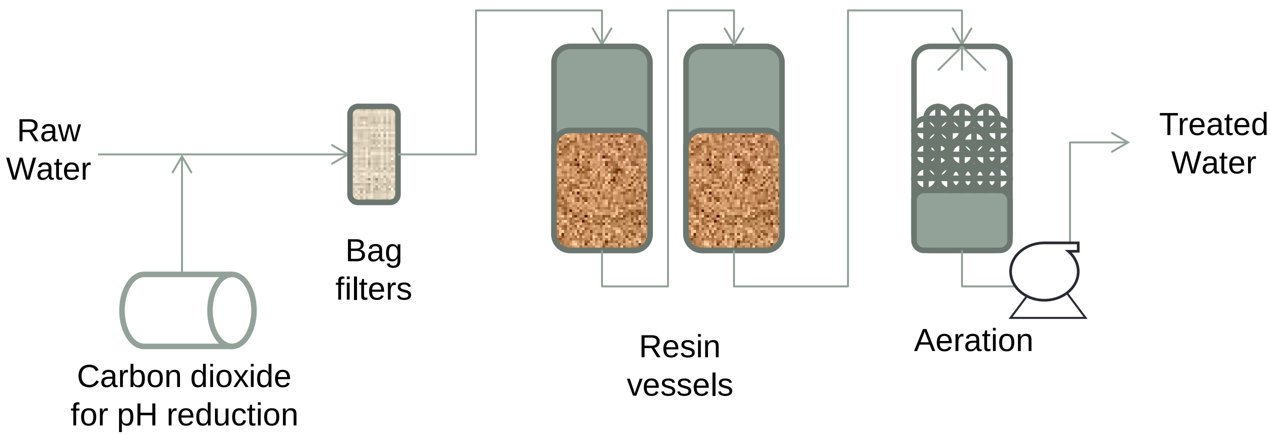
Once saturated with Cr6, a sodium chloride (salt brine) can be used to push the Cr6 off and enable the resin to capture more Cr6

Strong Base Anion Exchange (SBA)



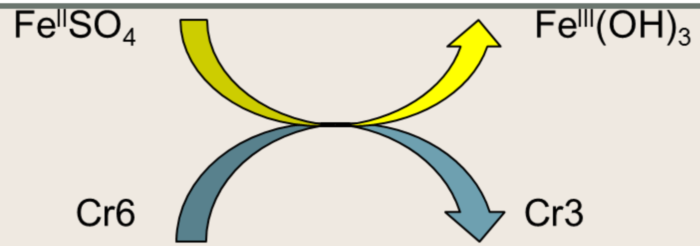
Operations
- Residuals treatment and disposal

Weak Base Anion Exchange (WBA)

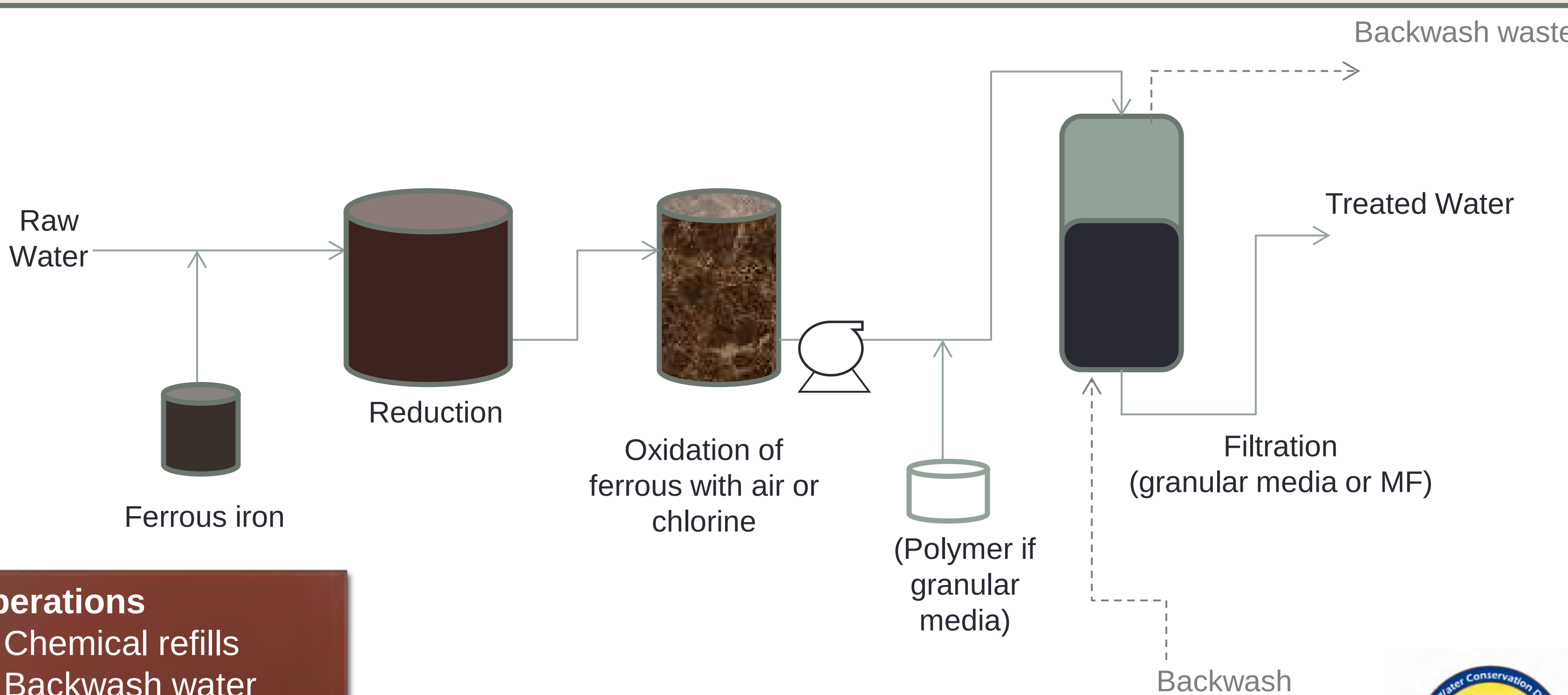


Operations
- Bag filter replacement
- Carbon dioxide refills
- Resin replacement

Reduction Coagulation Filtration (RCF or RCMF)



- Use of ferrous iron to reduce Cr6 to Cr3
- Removal of particle-bound Cr3



Operations

- Chemical refills
- Backwash water disposal
- Solids disposal

Key Deciding Factors in Technology Selection

Water Quality

Residuals Disposal

Operational Preferences and Flexibility

Cost Considerations

Treatment Plants

Costs

WBA

Annualized Treatment Cost ($/year)	$1,527,000
Interest	5%
Number of years	20
Annualized capital cost ($/year)	$382,035
Annualized Capital and O&M Cost ($/year)	$1,527,000

SBA

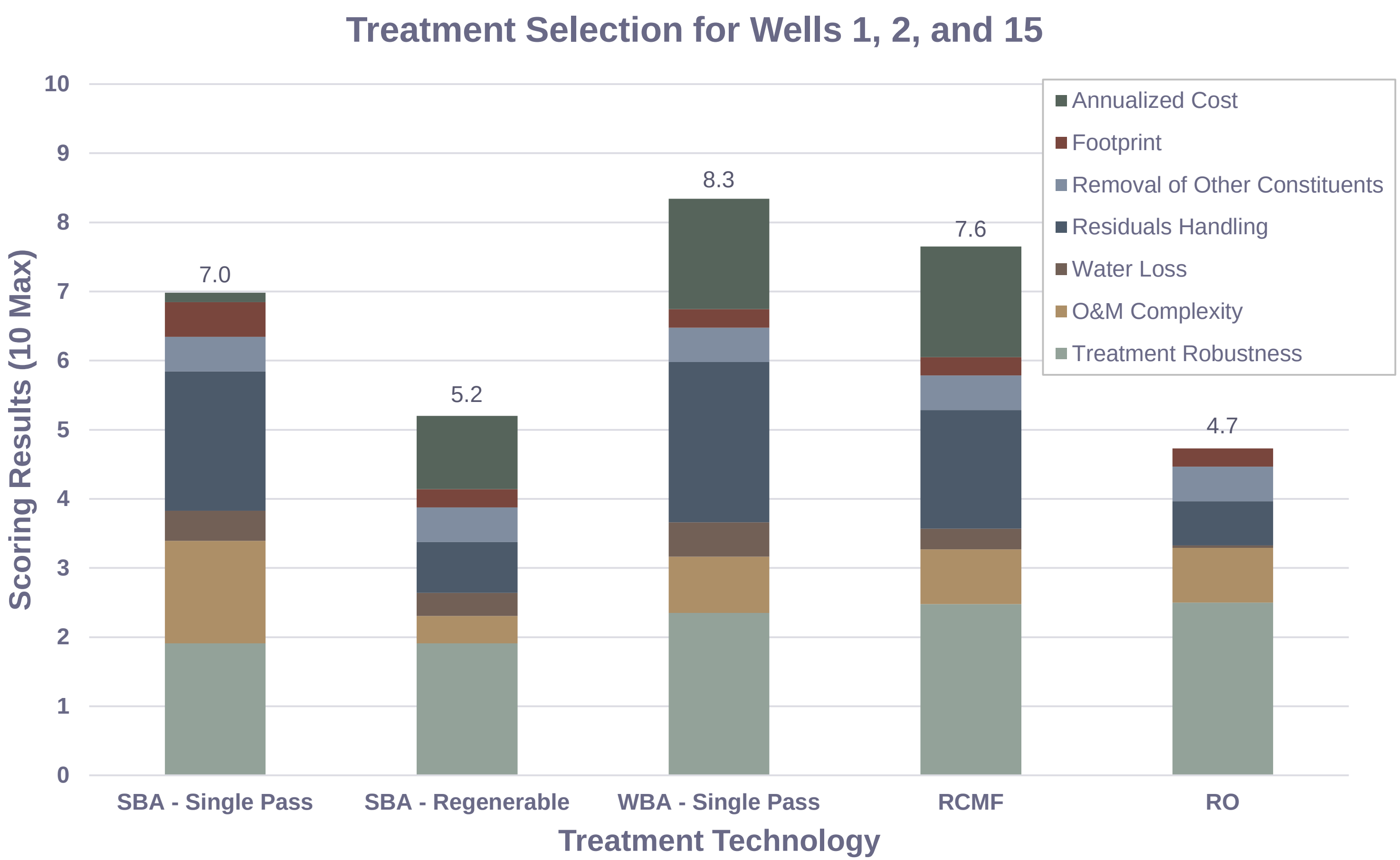
Annualized Treatment Cost ($/year)	$2,516,000
Interest	5%
Number of years	20
Annualized capital cost ($/year)	$325,740
Annualized Capital and O&M Cost ($/year)	$2,516,000

RCMF

Annualized Treatment Cost ($/year)	$1,418,000
Interest	5%
Number of years	20
Annualized capital cost ($/year)	$578,670
Annualized Capital and O&M Cost ($/year)	$1,418,000

Treatment Plants

- Scoring



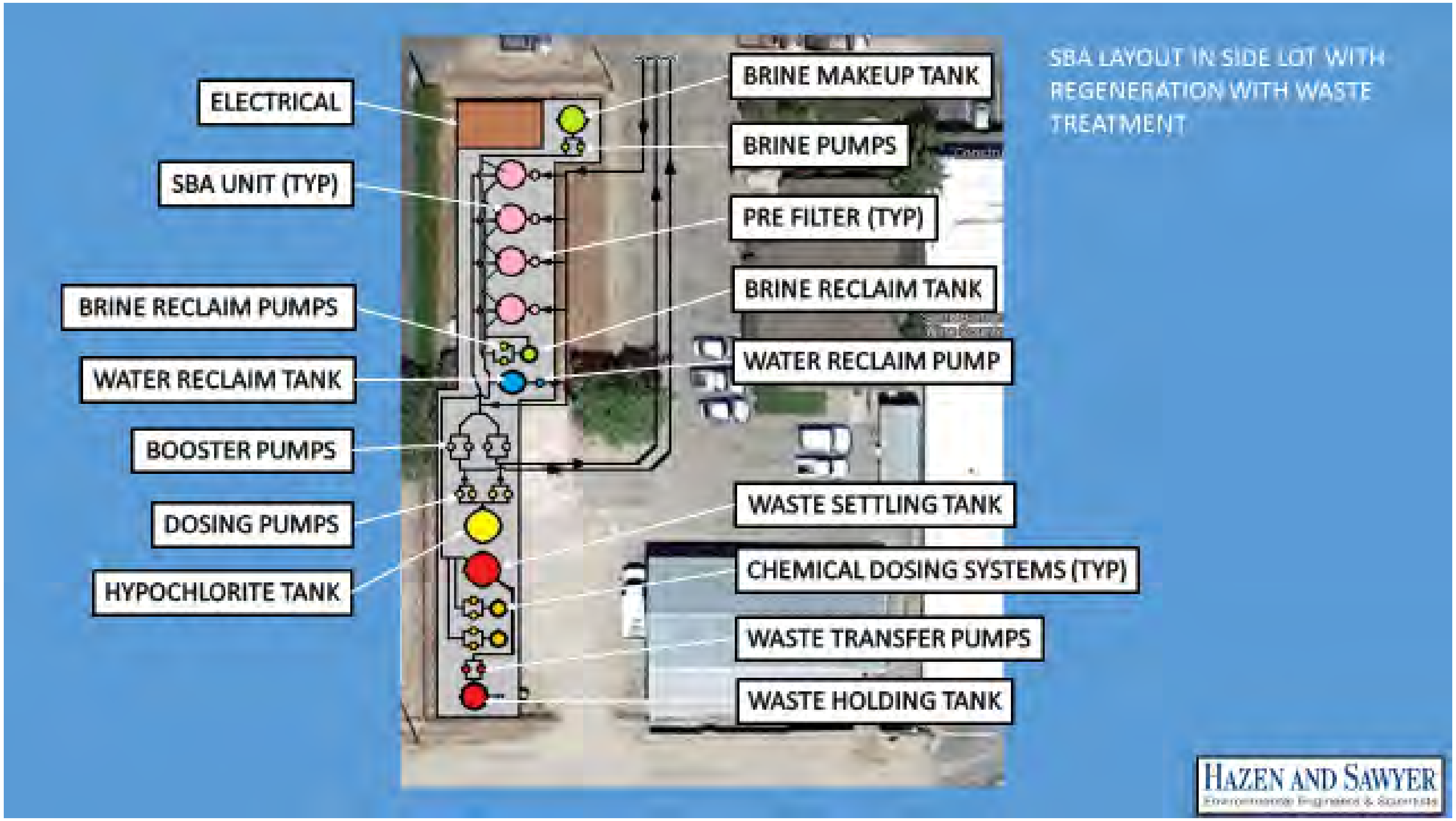
Treatment Plants

Site Plan – Improvement District #1

Treatment Plants
Site Plans

HAZEN AND SAWYER
Environmental Engineers & Scientists

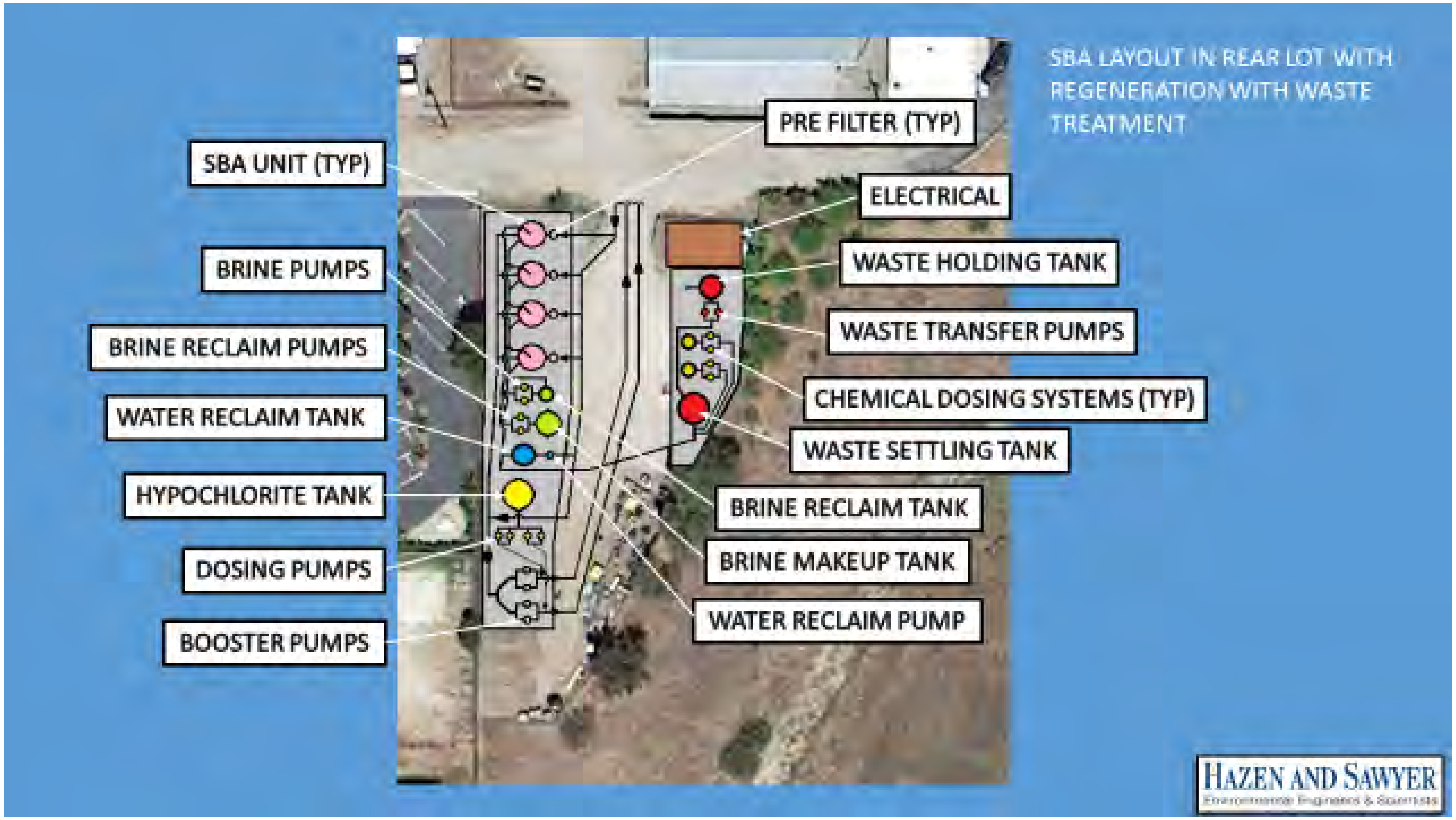
SBA with regeneration and waste treatment in side lot



Treatment Plants

Site Plans

SBA with regeneration and waste treatment in rear lot



Cr6 Workshop

Questions?