

CHROMIUM-6 DRINKING WATER REGULATION WORKSHOP

April 28, 2015

OUTLINE

- Chromium
- History of the Regulation
- Regulation Impact
- Occurrence in Water Supplies
- Treatment Options
- Non-Treatment Options
- Next Steps



CHROMIUM (Cr)

- Chromic oxide – 9th most abundant compound on earth's crust
- Occurs primarily as chromium-3 (CrIII; Trivalent Chromium) or chromium-6 (CrVI; Hexavalent Chromium)
 - CrIII, a required nutrient found in vegetables, fruits, meats, grains and yeast; essential to normal glucose, protein and fat metabolism in humans.
 - CrVI, found in the environment from the erosion of natural chromium deposits.

CHROMIUM (Cr)

- Some isolated industrial sources:
 - Stainless steel, leather tanning, wood preservation, textile dyes and pigments and corrosion protection.
 - Hinkley, CA
 - PG&E operates a compressor station to recompress the natural gas in their transmission pipelines.
 - CrVI was added to the water used in cooling towers to prevent rust in the machinery.
 - The contaminated water was stored in unlined ponds which entered the groundwater.

CHROMIUM REGULATION

- In 1977, the State of California set the State's Maximum Contaminant Level (MCL) for Total Chromium:
 - $0.05 \text{ mg/L} = 50 \text{ ppb}$
 - Total Chromium = CrIII + CrVI
 - Assumes Total Chromium = CrVI
- $1 \text{ ppb} = 1/1,000,000,000$
- About 1 drop in 250 – 55 gallon drums
- Equivalent to 3 seconds in 100 years

CHROMIUM REGULATION

- 1977 - US Environment Protection Agency (EPA) adopted California's Total Chromium MCL:
 - 0.05 mg/L = 50 ppb (National MCL)
- 1991 - EPA raised the Total Chromium MCL:
 - 0.1 mg/L = 100 ppb (National MCL)
- 2000 - Erin Brockovich creates attention to CrVI and prompts legislature to focus on the development of a more stringent CrVI MCL.

CHROMIUM REGULATION

- 2001 – Utility agencies in CA begin monitoring for CrVI under CA UCMR
 - UCMR – Unregulated Contaminant Monitoring Rule
 - Currently in its third round; UCMR 3
 - The EPA selects 30 contaminants to monitor.
 - The data is used to support the decision to regulate a contaminant in the interest of protecting public health.
- 2001 – California Department of Public Health (CDPH) requests that the Office of Environmental Health Hazard Assessment (OEHHA) develop a Public Health Goal (PHG) for CrVI.

CHROMIUM VI REGULATION

- Oct, 2001 – Governor signed SB-351 requiring that the CDPH adopt a MCL for CrVI by 1/1/2004.
- Nov, 2001 – OEHHA announces intent to develop PHG for CrVI.
- Aug, 2009 – OEHHA releases draft PHG at 60 ppt.
 - 1 ppt = 1 drop in 20 Olympic-sized pools.

CHROMIUM VI REGULATION

- Dec, 2010 – OEHHA releases draft PHG at 20 ppt, which is then finalized in July, 2011.
 - With an approved PHG, the CDPH could now begin on setting an MCL for CrVI as required by SB-351 (2001).
 - CDPH is mandated by law to set the MCL as close as “**practically and economically feasible**” to the State’s PHG
- Dec, 2013 - Superior Court rules in favor of NRDC/EWG and requires that CDPH set an MCL by Aug 31, 2013.
- Aug, 2013 – CDPH sets CrVI MCL at 10 ppb.

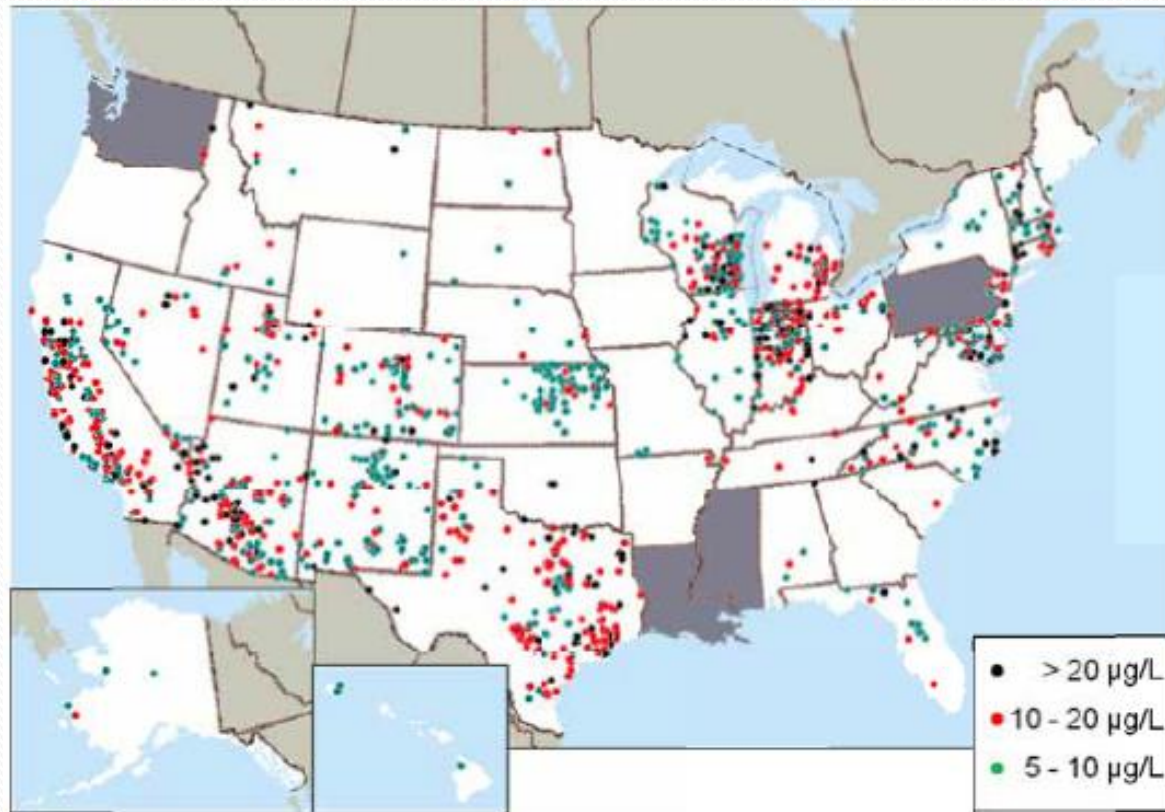
CHROMIUM VI REGULATION

- California Administrative Procedure Act allows up to one year to finalize new regulations (i.e. Aug 23, 2014)
- CDPH dismisses most of 20,000 comments received.
 - CDPH underestimated the occurrence and compliance costs of CrVI.
 - Ex: CDPH database showed that the City of Banning only had 1 sources that would exceed the MCL, when in reality there are 7 sources.
- On June 20, 2014 water agencies received a letter from the CDPH stating that the new MCL for CrVI would become effective on July 1, 2014.

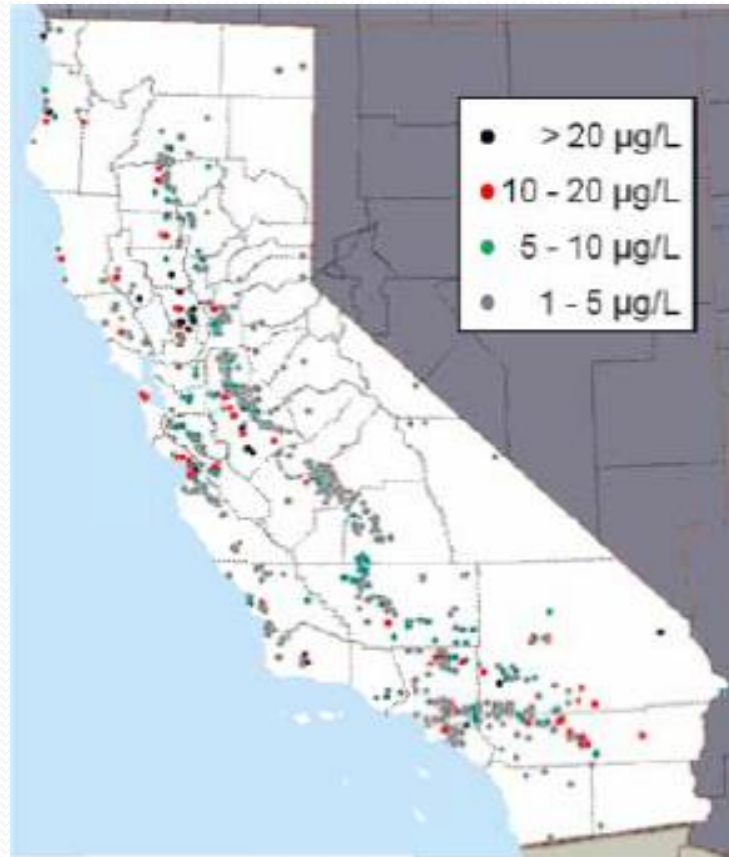
IMPACT OF NEW MCL

- Estimated Statewide Costs:
 - Capital Costs: \$4.1 Billion
 - Annual O&M Costs: \$231 Million
- Initial monitoring must begin on or before January 1, 2015.
 - Monitoring is required for each well.
- Quarterly monitoring is required when the MCL is exceeded.
 - Compliance is determined by whether a running annual average exceeds the MCL.
- It is still unclear what the State will require if sources are in non-compliance.

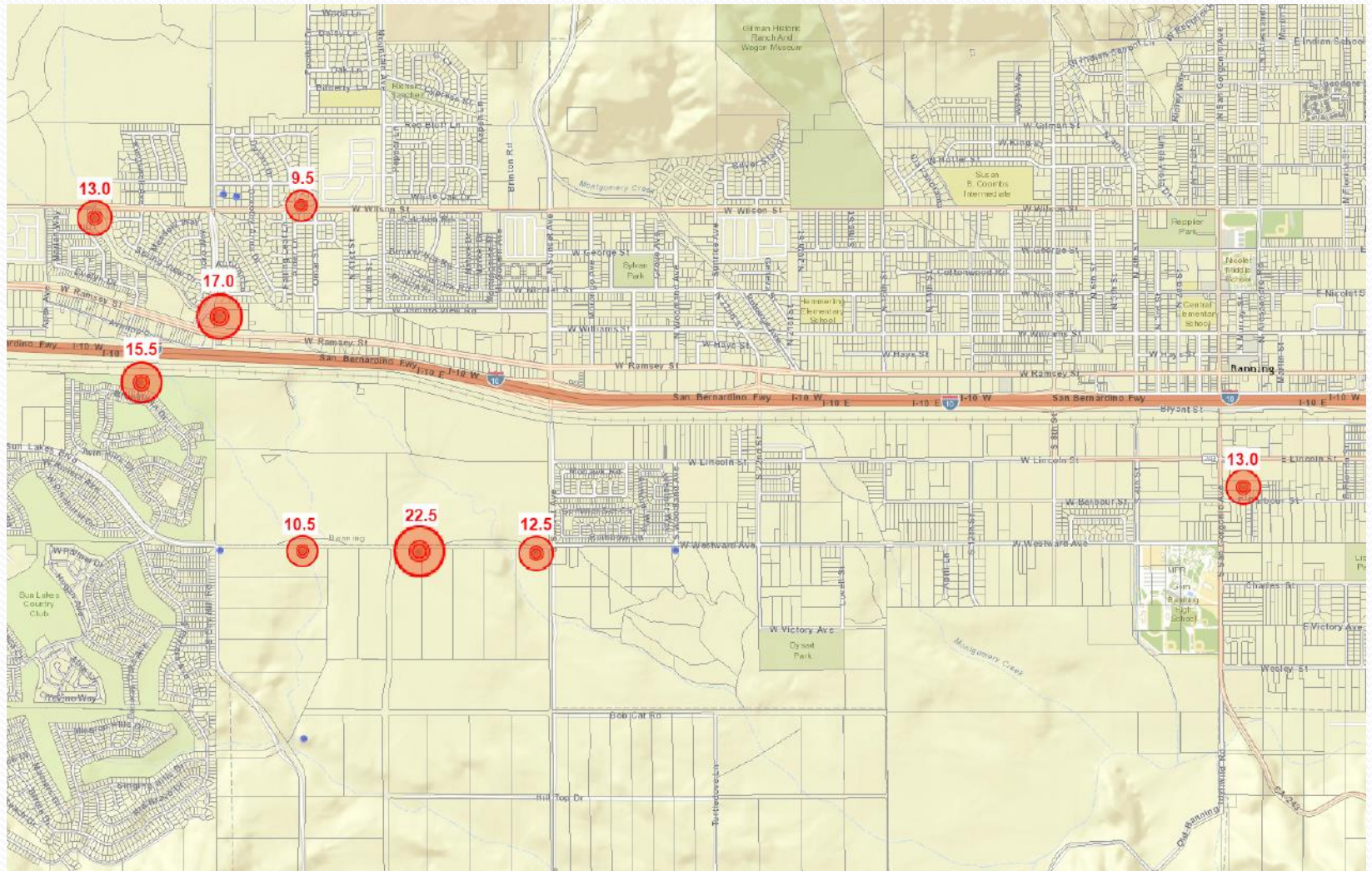
OCCURRENCE IN THE U.S.



OCCURRENCE STATE WIDE



LOCAL OCCURRENCE



MONITORING

WELLS	AVG CrVI ppb (2 Quarters)	AVG PRODUCTION AC-FT/YR (2010-2014)
C ₂	17.0	143
C ₃	15.5	660
C ₄	13	530
C ₆	13	463
M ₃	9.5	394
M ₁₀	10.5	158
M ₁₁	12.5	420
M ₁₂	22.5	236
		$\Sigma = 3,004$

- 2010-2014 City Wide Average Production = 8,500 AC-FT/YR

TREATMENT OPTIONS

BEST AVAILABLE TECHNOLOGIES

- Weak Base Anion Exchange (WBA)
- Strong Base Anion Exchange (SBA)
- Reduction Coagulation Filtration (RCF)

WEAK BASE ANION EXCHANGE (WBA)

- Reduces CrVI to CrIII.
- WBA resin is proposed to be used as disposable media.
- Resin life is dependent from site to site.
- It may be required to dispose media as hazardous waste.



STRONG BASE ANION EXCHANGE (SBA)

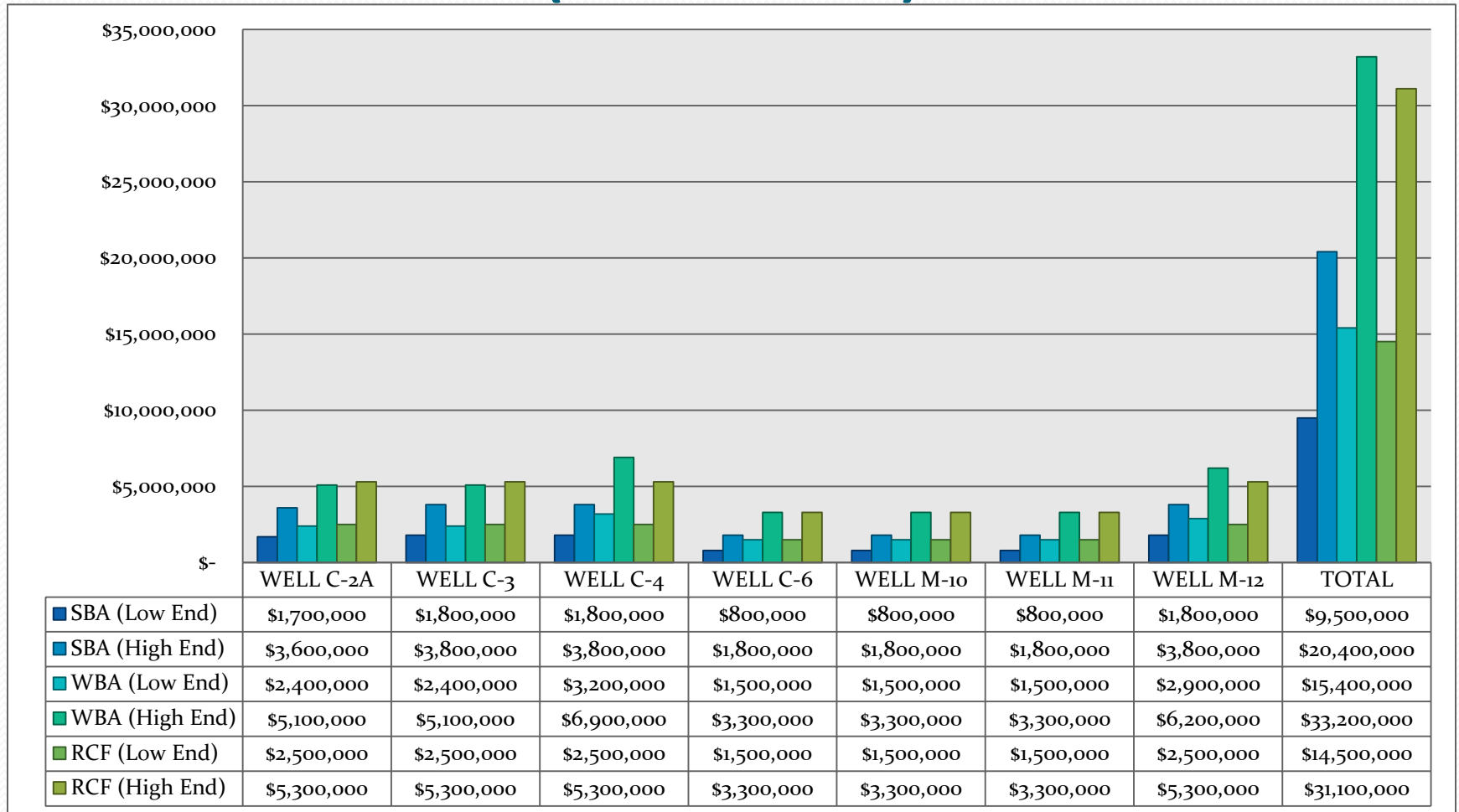
- Reduces CrVI to CrIII.
- Operated with periodic regeneration using high concentration of NaCl.
- Yields a brine waste that can require treatment to precipitate the hazardous chromium component from the brine before it can be disposed.
- Disposal of Brine can be challenging and expensive.

REDUCTION, COAGULATION, FILTRATION (RCF)

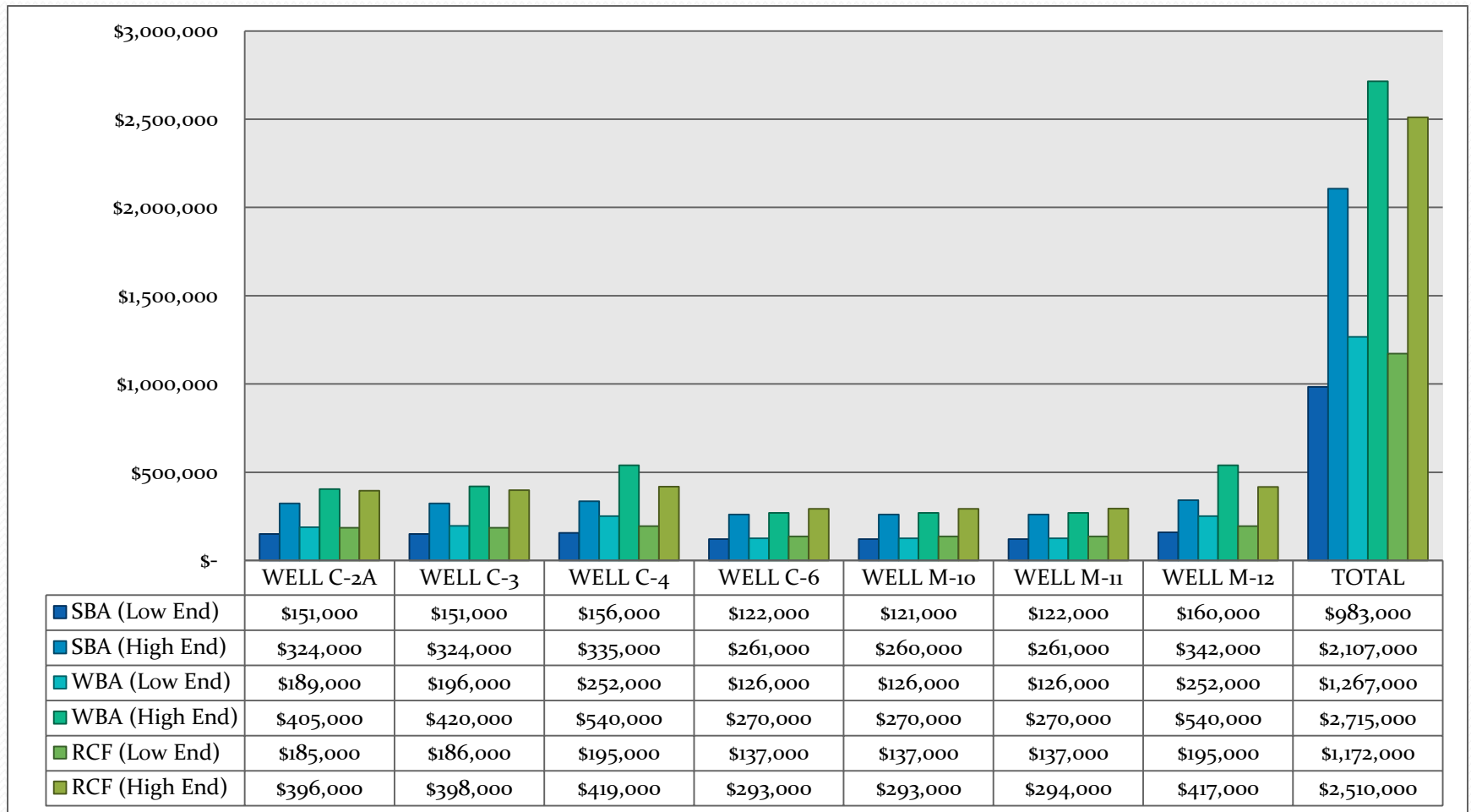
- Similar to typical coagulation/filtration processes used in water treatment.
- Added reductant used to convert CrVI to CrIII.
- Creates iron/chromium floc which is removed by filtration.
- Backwash water disposal.



TREATMENT COSTS (CAPITAL)



TREATMENT COSTS (O&M; \$/YEAR)



NON-TREATMENT OPTION

- Dynamic Well Profiling and CrVI Isolation.
 - Process of determining at which depths the highest levels of CrVI are entering the well.
 - Blank casings to reduce CrVI intrusion.
 - Possible loss of production in the well.
- Profiling cost = \$30,000 per well (\$210,000)
- Construction cost = \$200,000 per well (\$1.4 M)
- BCVWD has recently completed profiling of shared wells and has proposed to modify the well casing.

NON-TREATMENT OPTION

- Converting wells to non-potable wells.
 - Will require drilling of additional wells to make up for the loss of production.
- Cost for a new well:
 - Drill/Const/Test/Equip: \$1,500,000
 - Plus property acquisition costs.

NEXT STEPS

- Perform Dynamic Well Profiling of wells and provide information to City Council (4-6 months).
- Develop a compliance plan.
 - Treatment (12-18 months)
 - Pilot testing
- Develop funding plan.
- Initiate design, environmental and right-of-way.
 - Treatment (12-24 months)
 - Profiling/Isolation (3 months)
 - New Wells (8-12 months)
- Begin Construction.
 - Treatment (12-30 months)
 - CrVI Well Isolation (10-12 months)
 - New Wells (6-8 months)

SB-385 (Hueso)

- What it does:
 - Allows a public water system to apply for a limited period of time to achieve compliance.
 - Requires water systems to prepare and submit a compliance plan.
 - Requires that water customers be informed of compliance progress.
- What it doesn't do:
 - The bill does not delay compliance efforts.
 - The bill does not exempt any public water systems from compliance with the MCL.
 - The bill does not modify the MCL of 10 ppb.



QUESTIONS?