



# **Regulations and California's Tightening Drinking Water Standards: Where Do We Draw the line?**

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**Metropolitan Water District  
of Southern California**

**Friday, October 14, 2015  
9:00 – 10:00 a.m.**

# CHROMIUM VI

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- ✘ The Department is mandated by State law to set a Chrome-6 MCL.
- ✘ On July 1, 2014 the Hexavalent Chromium MCL became effective.
- ✘ Website has been updated with a memo from Dave Mazzera and our drinking water-related regulation book has been updated and posted.
- ✘ MCL = 0.010 mg/l or 10 ug/l (notice the significant figures for rounding purposes)

# CHROMIUM VI

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- ✘ Applies to Community and NTNC systems only.
- ✘ PWS have 6 months to take an initial Chromium VI sample, by January 1, 2015.
- ✘ Grandfathering data for groundwater sources only that is less than 2 years old is allowed if monitored by an ELAP certified lab using proper laboratory analysis.
- ✘ Analytical methods – 218.6 or 218.7.

# Chromium 6 Background

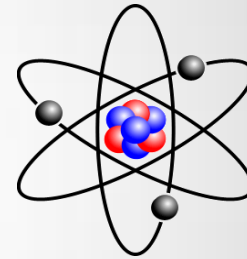
- Chromium is an inorganic chemical used in industrial manufacturing and cooling tower treatment for corrosion control.
- Chromium can enter drinking water sources through discharges from industrial, leaching from hazardous waste sites, and erosion of natural deposits.
- Chromium 6 is known to cause cancer in humans when inhaled. There is limited evidence on cancer and chromium 6 through ingestion

# Chromium 6 Regulatory Activities

- Chromium is currently regulated in drinking water as total chromium which assumes a mixture of chromium 3 (approx. 93 %) and chromium 6 (approx. 7%).
- State Senate Bill 351 requires the California Dept. Health Services to adopt a Chromium 6 standard by January 1, 2004 and OEHHA to adopt Chromium 6 PHG in early 2003.

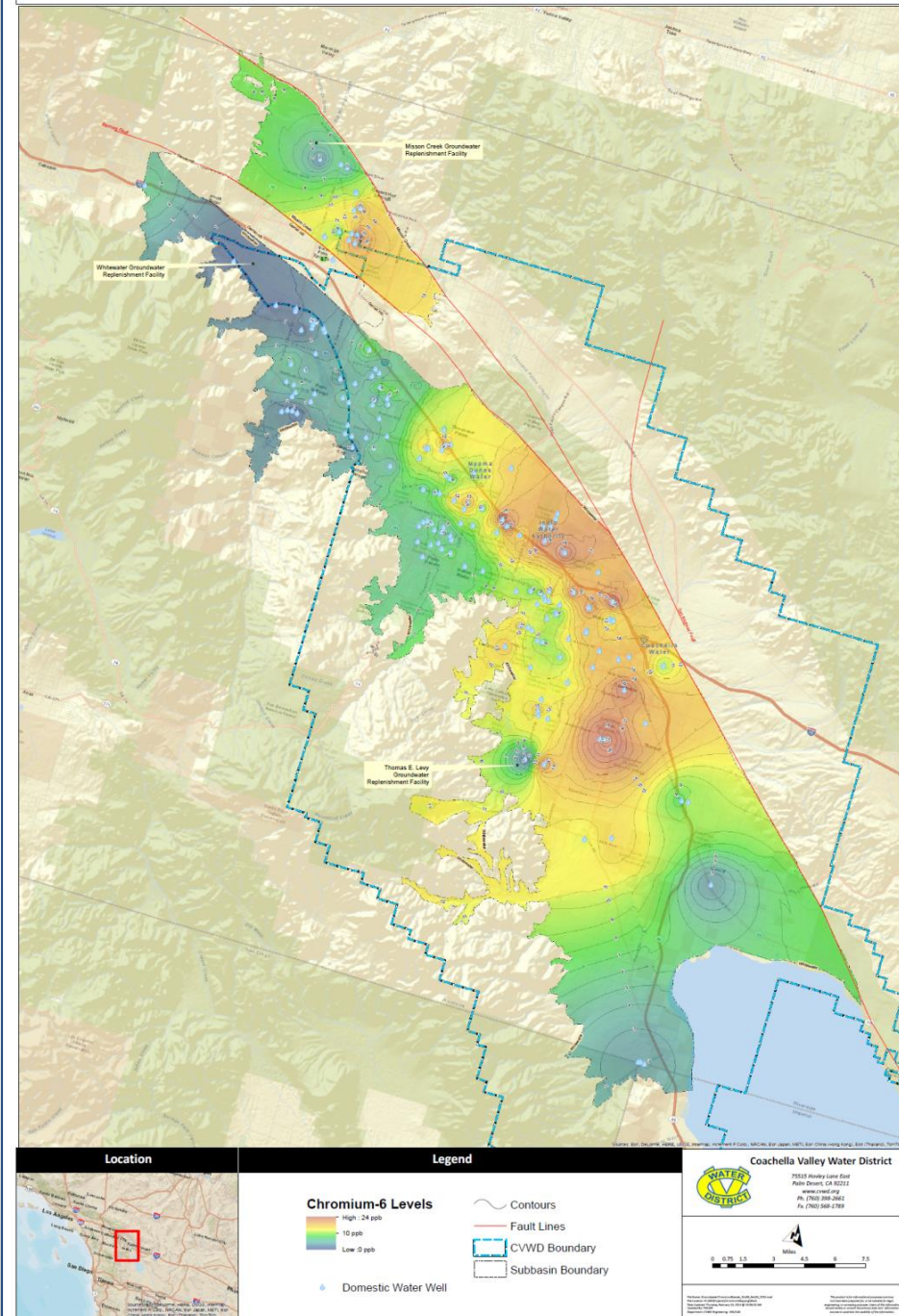
# Chromium (Cr) Background

- Chromic oxide – 9<sup>th</sup> most abundant compound in earth's crust
- Chromium-3 (Cr3) or chromium-6 (Cr6) in water
  - Mostly Cr6 in groundwater
  - Need Cr3 to produce insulin
- Cr6 Sources in Water
  - Erosion of natural sediments
  - Isolated industrial sources
- Cr6 Health Concerns
  - Carcinogen when inhaled at work
  - Listed as possible carcinogen when ingested (rodent studies)



# Coachella Valley Cr6 Occurrence

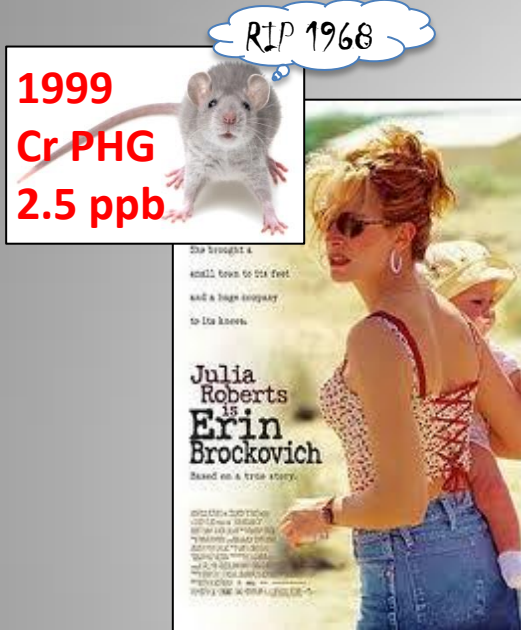
- Natural in groundwater
  - Ultra-mafic sediments
- Levels from <1 to 22 parts per billion (ppb)
- Above 10 ppb in about 100 domestic wells valley-wide
- 30 of CVWD's 100 wells (150 square mile service area)
- Cr6 below reportable levels in Colorado River water used for aquifer replenishment



# California's Path to Regulate Cr6

**1999**  
**Cr PHG**  
**2.5 ppb**

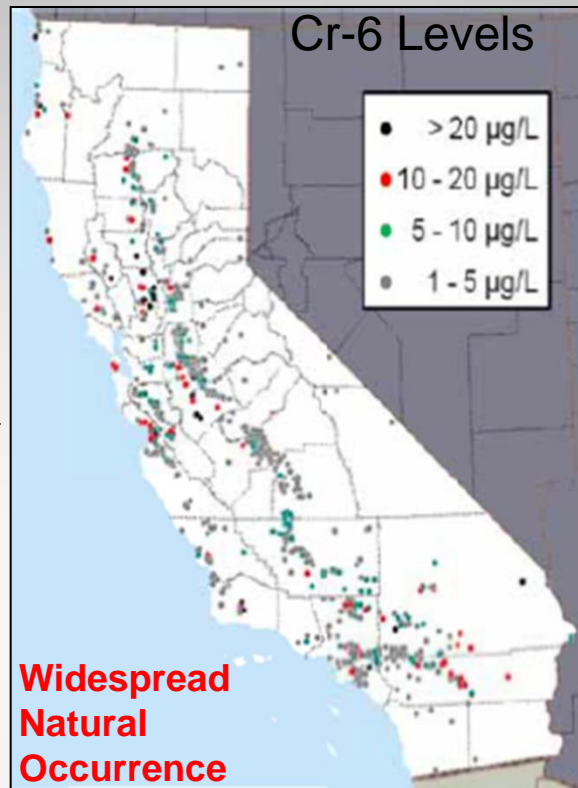
RIP 1968



The brought a small town to its feet and a huge company to its knees.

Julia Roberts  
in  
**Erin Brockovich**  
Based on a true story.

A yellow arrow points from this block to the map.



**2010**  
**Cr6**  
**PHG**  
**0.020**  
**ppb**

RIP 2008



A yellow arrow points from this image to the court order box.

April 15, 2014  
Court Order Cr6  
MCL is set at  
0.010 mg/L  
(10 ppb)



V.

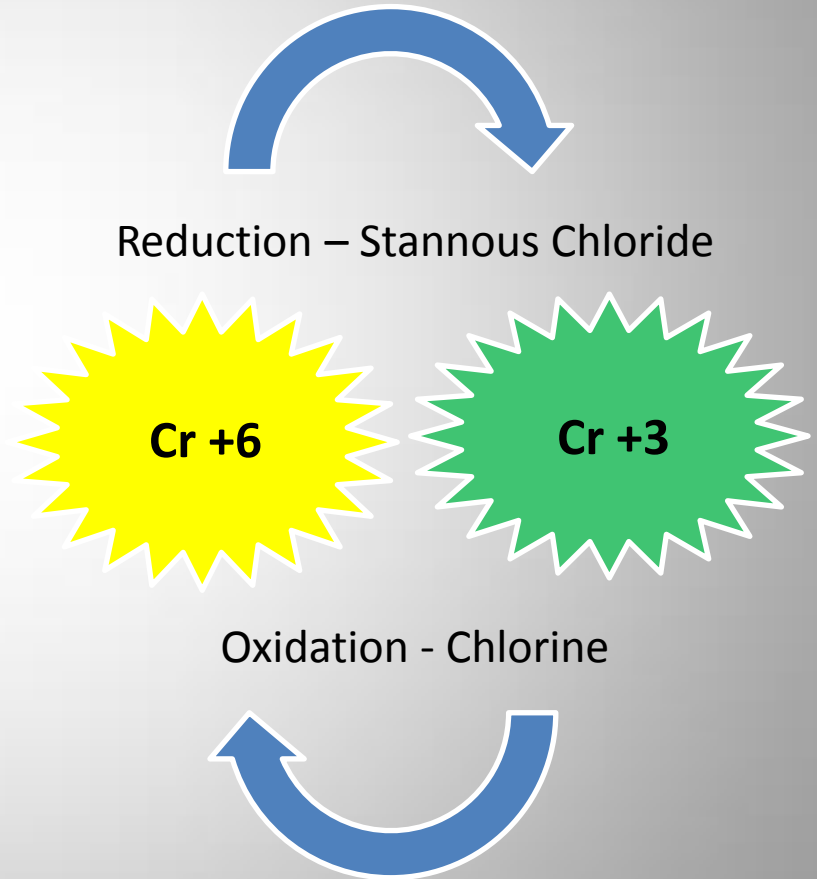




# Early “Cr6 Treatment” Work

## Cr6 Reduction

- Proved reduction of Cr6 to Cr3 was possible
- More cost effective than removing Cr
- Critical limiting factor
  - Drinking water is chlorinated to meet bacteria standards
  - Chlorine oxidizes Cr3 to Cr6
  - Can provide residual  $\text{Cl}_2$  or reduced Cr, not both



# CHROMIUM REMOVAL BEST AVAILABLE TECHNOLOGIES (BAT)

**Weak-Base Anion Exchange (WBA)**



**Strong-Base Anion Exchange with Residuals Treatment (SBA)**



**Reduction Coagulation Filtration (RCF or RCMF)**

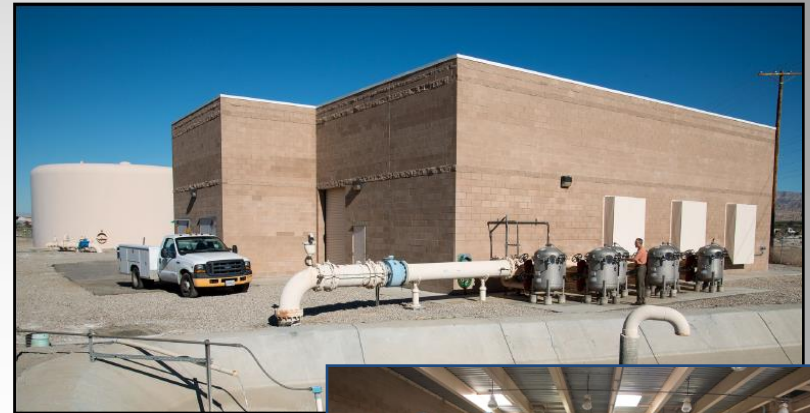


**Reverse Osmosis (RO)**

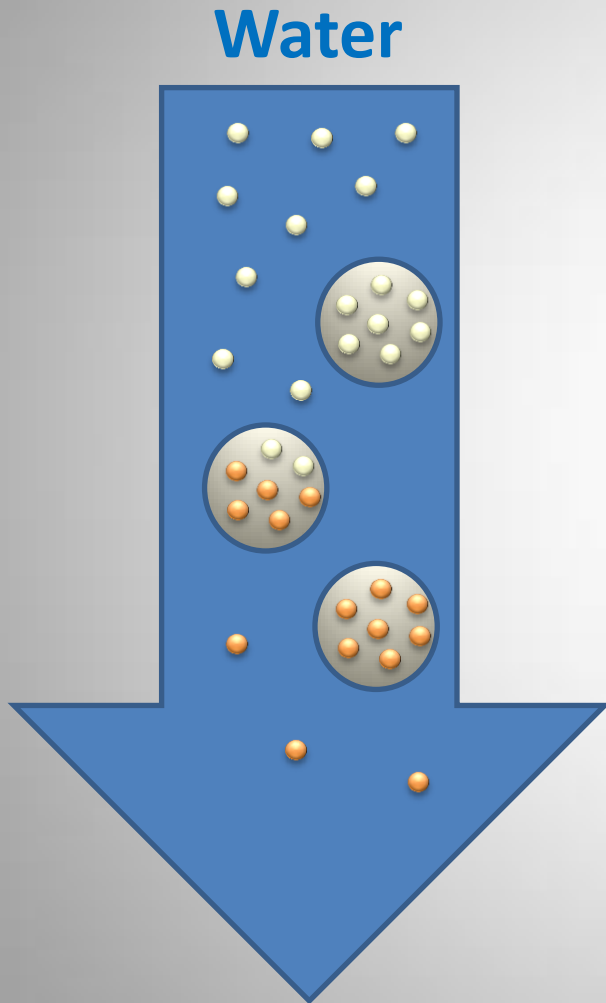


# CVWD's Cr6 Treatment Work

- 2001 – Cr6 added to pilot Arsenic removal tests
- 2006 – Two Ion Exchange treatment plants begin removing Arsenic and Cr6 (\$13 million)
- 2011 – Collaborative Water Research Foundation Cr6 pilot study (IX & RCF)
- 2012 – CVWD absorption media pilot test for Cr6
- 2013 – Second Cr6 Water Research Foundation study (RCMF & Brine)
- 2013 – Begin Source Study (draft MCL)
- 2014 – Multiple ion-exchange and brine pilot test programs (Hazen)
- 2015 – Follow-up pilot tests to finalize Facilities Basis of Design



# Cr6 Removal By Ion Exchange



## Ion Exchange

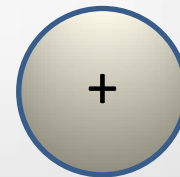
Ions of Cr6 attach to specially coated resin beads



Cr6 in water



Chloride on resin



Resin bead

# Additional Control Measure

- Must achieve “no unreasonable risk”
- Install Point Of Use Treatment – too costly and not quick enough
  - Exceeds BAT cost
- Provide bottled water – quick but too costly
  - \$1.60 gallon delivered
  - \$0.84/person/day = \$92 million/year
- What about Cr6 reduction at the tap?

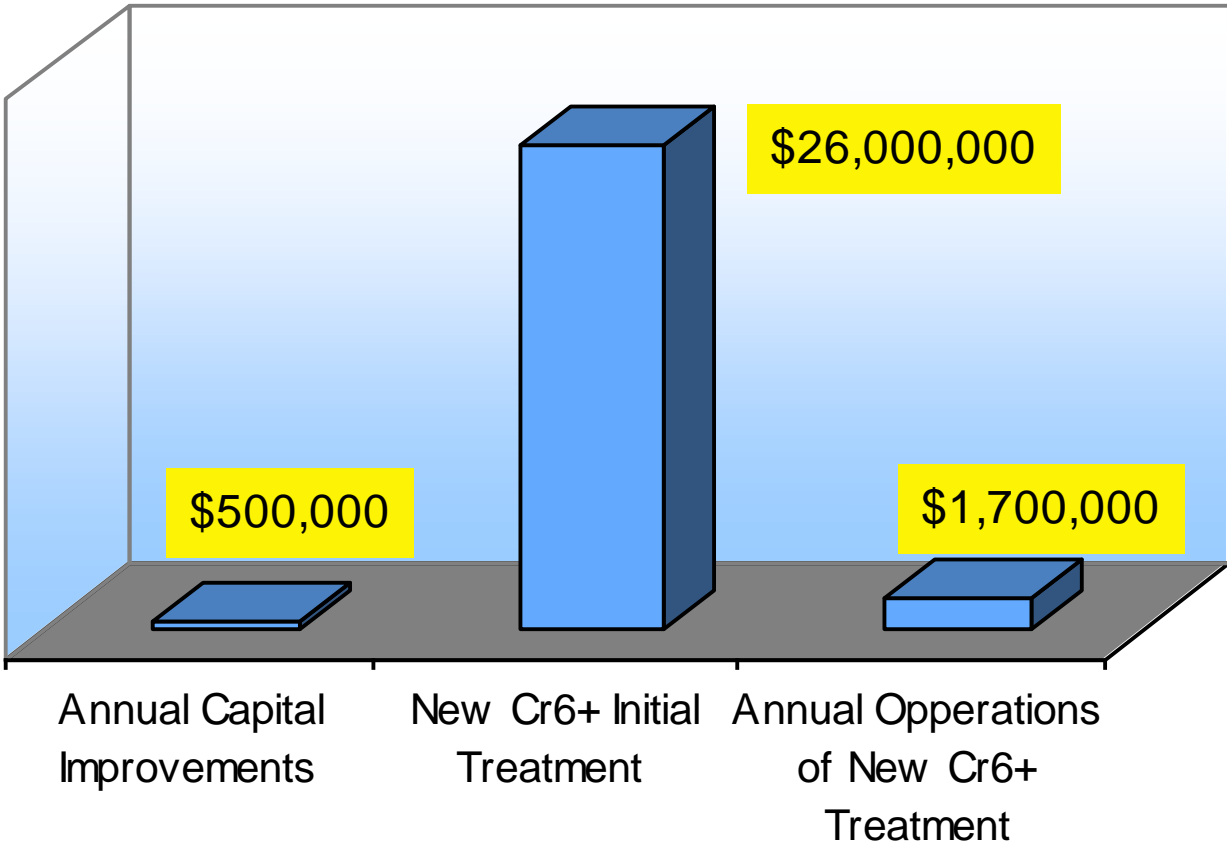


# Hexavalent Chromium (Cr-6)

- **Total chromium regulated in 1991 at 100 ppb**
- **“Erin Brockovich” increased interest in Cr-6**
- **Draft risk assessment now in late 2013**
  - Final risk assessment thereafter
    - EPA will have to then decide if regulation needs to be revised to address Cr-6 (a likely outcome)
      - Not sure if this would be part of SY3 or an “out-of-cycle” regulatory determination
- **Total and Cr-6 included in UCMR3 monitoring**
  - Relationship between the two can vary quite a bit
- **Treatment is challenging and expensive**
  - Total treatment costs for a potential Cr-6 regulation could be higher than all SDWA regulations to date

# Economic Impact of Proposed State Chromium MCL in Watsonville

## City of Watsonville Water Expenses



# Cost to City Residents

- Cost of Compliance:
  - **78% rate increase**
  - Currently, nearly 1000 water connections in jeopardy of shut off each year due to delinquency
    - This number would dramatically increase with a 78% rate increase
- Cost of Non-compliance:
  - Loss of public confidence in our drinking water system
  - Enforcement penalties unknown at this time



# Watsonville is an Economically Disadvantaged Community

## Per Capita Income

