Golden Shores Open House and Community Meeting

Overview of Topock Remediation Project December 12, 2011

Welcome to the Open House!!

6:00 – 6:30 Open House (Agencies at tables)
6:30 – 7:00 PG&E Project Presentation
7:00 – 7:30 Question/Answer Session
7:30 – 8:00 Resume Open House

Who We Are:

- CALIFORNIA REP. Karen Baker California Department of Toxic Substances Control (DTSC) Topock Team Leader and Branch Chief
- FEDERAL REP. Pamela Innis U.S. Department of the Interior (DOI) Topock Remedial Project Manager
- ARIZONA REP. Thomas Di Domizio AZ Dept. of Environmental Quality



DTSC and DOI are here to:

- Provide information on the investigation and cleanup (corrective action) at the PG&E Topock site near Needles, California
- Listen to community concerns on the project, and provide open house forum for interactive discussion

Site location map (aerial)



PG&E Chromium Usage

1951 – 1964

- Industry standard was use of an additive containing hexavalent chromium to prevent corrosion
- Cooling water containing hexavalent chromium was discharged to Bat Cave Wash



1964 – 1985

- Cooling water treated to remove hexavalent chromium
- Cooling water discharged to ponds, well, and wash from 1971 to 1985
- Non-chromium based additive was substituted in 1985



1985 – Present

- Discontinued use of chromium
- Cooling water is pumped to doublelined evaporation ponds
- Switched to phosphate based additive



What is Chromium (Cr)?

- Exists primarily as trivalent chromium or Cr(III) and hexavalent chromium or Cr(VI)
- Chromium is widely used in industries
- Exists naturally in soil and groundwater
- Concentration in water is measured in Parts Per Billion (ppb), Parts Per Million (ppm), or Micro grams/Liter (ug/L)
- 1 ppm = 1000 ppb or ug/L



PLAY

PG&E Topock Site



Regional Groundwater Flow Direction



Groundwater Background Quality

Groundwater background is the quality of groundwater that occurs in an aquifer in the absence of pollutants added by human activity

- Metals and other elements occur naturally in the sediments and rocks through which groundwater flows
- Metals and other elements occur naturally in groundwater
- Common home experience with natural metals and elements in groundwater includes precipitation, staining, and odors in sinks and tubs related to iron, manganese, calcium, and sulfate in the water
- In some cases, naturally-occurring metals can occur at concentrations exceeding health-based standards and guidelines for drinking water

Why Conduct Background Studies and Comprehensive Site Investigations?

- Since metals are found naturally in the groundwater, we need to know what background is to determine if contamination is present.
- It is important to understand the physical and chemical nature of the groundwater and surrounding rock formation because it can affect metal concentrations
- It is also important to understand possible contamination sources and credible pathways for migration of contamination to wells or possible receptors.
- Once the background concentrations are understood, the sources of contamination can be identified.

Pathway and Environmental Assessment



Natural Chromium in Groundwater

- Both Cr (III) and Cr (VI) are known to occur naturally in groundwater in the southwest. The occurrence and concentrations depend on the physical and chemical nature of the groundwater system
- In the larger area surrounding Topock, Cr (III) and Cr (VI) have been demonstrated to occur in groundwater samples from wells unaffected by site contamination. Their occurrence in the groundwater samples is interpreted to represent natural conditions.

Groundwater Background Studies for Chromium

- Mojave Desert
 - Chromium, Chromium Isotopes and Selected Trace Elements US Geological Survey, November 2007
 - Occurrence of Hexavalent Chromium in Ground Water in the Western Mojave Desert – US Geological Survey, 2004
- Colorado River Study Unit
 - Groundwater Quality Data in the Colorado River Study Unit, 2007: Results from the California GAMA Program
- ADEQ/ADHS Health Consultations
 - Evaluation of Chromium in Groundwater Wells; Golden Shores and Topock, Mohave County, Arizona, September 7, 2005
 - Pacific Gas and Electric Background Metal Study, Golden Shores and Topock, Mohave County, Arizona, March 21, 2006
- Topock Area
 - Groundwater Background Study, Steps 3 and 4: Final Report of Results PG&E, July 23, 2008

WESTERN MOJAVE DESERT





Cr (VI)Background Concentrations

- Mojave Desert Study Conclusions (US Geologic Survey)
 - Encompassed wells between 80 and 200 miles west/southwest of the Topock site
 - Total dissolved Cr concentrations ranged from less than the 0.1 ppb detection limit to 60 ppb, and almost all the Cr present was Cr(VI).
 - Samples from wells collected under pumping conditions show that Cr(VI) concentrations within a single well vary with depth and can range from less than the 0.1 ppb detection limit to 36 ppb.
 - Water produced by wells is a mixture of water from different depths having different Cr (VI) concentrations
 - Dissolved oxygen concentrations and the redox conditions typically control Cr concentrations and speciation

Topock Project Groundwater Background Assessment

(not in presentation)

Four-Step Assessment Process

Step 1 - Selecting potential background wells

- Field reconnaissance and records search
- Collection and evaluation of location, accessibility, and construction information

Step 2 - Selecting final background wells

- Sampling of Step 1 wells
- Evaluating consistency of geochemistry to Topock site, potential for anthropogenic influences, and spatial distribution to select final list of background wells

Step 3 - Calculating background concentrations

- Collection of additional samples from final well set
- Statistical assessment and calculation of background concentrations

Step 4 - Reviewing background concentrations

- Sample independence and time trends
- Comparison with published data

Topock Project Final Background Well Set



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Topock Project Groundwater Background Assessment

- 41 wells in the region were initially identified and sampled as potential background wells. Through a rigorous evaluation process, 25 wells were selected for the final background well set.
- For the final list of 25 wells, a total of six sampling rounds from May 2005 through May 2006 were used to establish groundwater background concentrations for total and hexavalent chromium and 17 other trace metals

ble 3-1

Calculated Upper Tolerance Limits for Trace Metals

Groundwater Background Study Steps 3 and 4: Revised Final Report of Results, PG&E Topock Compressor Station and Vicinity, Needles, California

Constituent	Units	UTL ^{3,5}
Aluminum	ppb	55.8
Antimony	ppb	1.22
Arsenic	ppb	24.34
Barium	ppb	195
Beryllium	ppb	0.663
Cadmium	ppb	NA ²
Chromium	ppb	34.1
Cobalt	ppb	0.843
Copper	ppb	10.5
Hexavalent Chromium	ррь	31.8
Lead	ppb	1.914
Mercury	ppb	NA ²
Molybdenum	ppb	36.3
Nickel	ppb	10.6
Selenium	ppb	10.3
Silver	ppb	2.13
Thallium	ppb	0.908
Vanadium	ppb	59.9
Zinc	ppb	77.7

L. Outliers from GSRV-2, PGE-09S, Sanders, Topock-2, and MW-17 were ren

- and the second sec
- Any detection above the method reporting infit (WKP) used in the viewed as an exceedance of background.
- 2.05% upper confidence limit of the elevated per
- A REAL PROPERTY AND A REAL
- 11.5 ug/L, respectively.
- and the state of some owners and
- 5. Potential limitations for use of these UTLs are described in Appendix E and prior
 - background study documents such as DTSC's November 30, 2007 letter (DTSC,

Cr (VI) Results from Sampling of Final Background Well Set



CH2MHill Summary Chromium Concentrations in Arizona Wells



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ADEQ Summary of Chromium Concentrations Topock, Arizona, 2004

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July 2004 EPNG Sampling

Sample Date	Mohave Raw Water (Water Supply)				Wastewater	
	West Well		East Well		Discharge to Outfall	
	Hex.	T 1 1 0				
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
7/7/2004	11.4	12	5.67	11	15.8	19
7/7/04D	11.3	NS	5.57	NS	15.8	NS
7/8/2004	11	13	9.5	11	16	18
7/12/2004	11	13	9.6	12	13	19
7/13/2004	11	13	9.8	12	15	17
7/14/2004	11	14	9.8	12	15	18
7/15/2004	11	13	9.1	11	14	17
7/19/2004	11	13	9.2	11	16	20
7/20/2004	11	14	7.4	12	17	21
7/21/2004	13	13	11	12	16	19
7/22/2004	11	12	9.2	11	18	20
7/29/04S	NS	NS	NS	NS	20	21
Average	11.25	13	8.71	11.5	15.97	18.55

531890 531889563138

	627261 085599 528908 600488	53410
0 ppb	525809 561779 565378 525582 562640	

	States Buy	1.	a FR	87.	
	March 30, 2004 PG&E Sampling*				
Ξ)		Result	Reporting		
		(ug/L, or	Limit	14	
		ppb)	(ppb)	-	
6	Total Chromium	1.7	1		
	Total Dis. Chrom.	ND	1	70	
	Cr6	0.19J	0.2	$\geq s$	
14	Cr6 (duplicate)	0.17J	0.2		
1.	* 8/30/04 PG&E C	correspond	lence to San		

S&E Site

Results of Well-head Sampling, March 2004 Topock, Arizona Production Wells Groundwater Monitoring for Topock Project

Well Identification	Sample Date	Hexavalent Chromium μg/L	Analysis Method	Total Recoverable Chromium -unfiltered- µg/L	Analysis Method	Total Dissolve Chromiu SW 6010 μg/L
55-600187						
low production well	18-Mar-2004	8.1	SW 7199	9.6	SW 6010B	8.2
	25-Mar-2004	4.9	EPA 218.6	9.7	EPA 200.8	8.4
55-600189						
high production well	24-Mar-2004	4.4 J	EPA 218.6	7.0	EPA 200.8	4.2
	25-Mar-2004	4.9	EPA 218.6	10.5	EPA 200.8	6.4

NOTES:

- Sampling conducted by PG&E under Corrective Action program with California DTSC Well access provided by Golden Shores Water Company (well operator) Topock production wells identified by Arizona state well numbering system
- 2. Concentrations in micrograms per liter (µg/L), equivalent to parts per billion (ppb)
- 3. Hexavalent chromium analyzed by Methods SW 7199 and EPA 218.6; both methods have detection limit 0.2 ppb
- Analyses by Truesdail Laboratories, a California DHS-certified analytical laboratory J flag indicates estimated concentration based on validation review of laboratory data
- 5. The federal drinking water standard for total chromium is 100 ppb and the California drinking water standard is 50 p

* Draft 2004, Projection: Estimated extent of gw > 50ppb Cr⁶ (PG&E)

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- Aquifer an underground water-bearing layer of porous rock, sand, or gravel
- Chromium is a metallic element in the periodic table. It is odorless and tasteless. Chromium occurs in the environment primarily in two valence states, trivalent chromium (Cr III) and hexavalent chromium (Cr VI).
- Hazardous substance Under CERCLA, "hazardous substances" refer to some 800 toxic substances, including metals, organic (carbon-based) compounds, solvents, and pesticides.
- Hexavalent Chromium [Cr (VI)], also known as chromium 6, is a heavy metal that is commonly found at low levels in drinking water. It can occur naturally but can also enter drinking water sources by historic leaks from an industrial plants' waste sites. This form is relatively soluble and can move more readily through soil to groundwater.

Glossary (Continued)

(not in presentation)

- Pathway The environmental medium (i.e. air, soil, groundwater, and surface water) through which a hazardous substance may threaten targets.
- Source The origin of the contamination (i.e. contaminated soil, landfills, surface impoundments, drums, waste piles, tanks)
- Receptors A human or environmental entity (adult residents, child residents, short-term workers, long-term workers, site visitors, trespassers, subsistence users; fisheries, sensitive environments, invertebrates, plants, fish, mammals, birds, etc.)
- Trivalent Chromium [Cr (III)], which is the more common variety of chromium, occurs naturally in many vegetables, fruits, meats, grains and yeast. It is a nutritionally essential element in humans, often added to vitamins as a dietary supplement. Chromium (III) also is an abundant mineral in soils world-wide. Cr (III) has relatively low toxicity and would be a concern in drinking water only at very high levels.



GROUNDWATER Plume

- Primarily hexavalent chromium or Cr(VI)
- ~4,000 ft x 2,500 ft
- Did not migrate to AZ
- Maximum conc. Cr+6 ~19,000 ppb or 19 ppm
- California Drinking Water Standard is 50 ppb Cr(T)
- Cleanup goal for Cr(VI) is 32 ppb (green outline area)

Groundwater Regulatory Levels

- Maximum Contaminant Levels (MCL) enforceable drinking water standard
- Currently there is no MCL for Cr(VI)
- California 50 parts per billion (ppb) total chromium
- Arizona 100 ppb total chromium
- Federal standard 100 ppb total chromium

California Public Health Goal (PHG)

"PHGs are levels of contaminants in drinking water that would not be expected to pose a significant health risk to individuals consuming an average of two liters a day of that water over a 70-year lifetime." California Office of Environmental Health Hazard Assessment

- Long term risk factor
- Risk at PHG level is one potential adverse impact in a million (1/1,000,000)

California Public Health Goal

- CA PHG is 0.02 ppb for hexavalent chromium
- CA PHG is not a regulatory standard
- Used to establish regulatory MCL
- MCL not yet established

Current PG&E Cleanup

- PG&E is currently controlling groundwater plume near Colorado River
- The extraction and treatment of contaminated water will continue until final remedy
- Current cleanup has reduced the plume and diverted flow of groundwater away from the river
- Removed ~ 7,000 lbs of Cr since 2005

PG&E Chromium Treatment until final remedy





- Objective is to protect the Colorado River and to restore groundwater aquifer to comparable background
- Selected "In-situ remediation with fresh water flushing" in January 2011
- In-situ treatment is cleanup in place by adding organic reagents (e.g., ethanol, whey, lactate) to reduce Cr(VI) to Cr(III)

In-Situ Remediation with Fresh Water Flushing

(not in presentation)

- Groundwater extraction
- Addition of organic reagents
- Injection of fresh water upgradient of the plume
- Plus, institutional controls, monitoring, and mitigation of impacts to cultural, historical, and biological resources
- Cleanup takes time, ranging from 10 to 100 years



Final Groundwater Remedy Implementation planning now underway



Project Considerations

(not in presentation)

- Site is located adjacent to the Colorado River, a source of drinking water for millions of people in California and Arizona
- Colorado River water quality has not been adversely impacted by site contamination, and groundwater and river monitoring continues as does the site investigation
- Groundwater basin is designated for drinking water use by CA Regional Water Quality Control Board
- Minimize intrusion of area because it is considered sacred to several Native American Tribes

Project contact and information



Click <u>here</u> for larger image. For a close-up site location map, <u>click here.</u>

To search this site for information, insert a keyword in the box below.





Measures, which are designed to ensure that the chromium plume flows away from the Colorado River. DTSC has directed PG&E to identify and evaluate cleanup options for chromium in groundwater and to propose a Final Remedy for the Site. DTSC's goal is to quickly move forward and select an environmentally appropriate cleanup remedy. The cleanup remedy options will be evaluated in accordance with criteria set forth in the California Environmental Quality Act (CEQA), federal Resource Conservation and Recovery Act (RCRA) and the federal Comprehensive Environmental, Response ompensation, and Liability Act CERCLA), and will be reviewed by all stakeholders, including tribal

- DTSC held a Consultative Workgroup (CWG) meeting on March 17, 2010 at the Bureau of Reclamation office in Boulder City, Nevada. The next CWG meeting will be held on June 16, 2010 at the Chamber of Commerce in Bullhead City, Arizona.
- DTSC held a Topock Leadership Partnership (TLP) meeting March 1 - 2, 2010 at the Gene Pumping Facility near Parker, Arizona. The next TLP meeting is to be determined.
- DTSC participated in the Seven River Tribes meeting held on October 27-28, 2009 in Parker, Arizona.

Project Website:

http://www.dtsc-topock.com

Contacts:

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Additional Info Links

CA OEHHA Fact sheet http://oehha.ca.gov/water/phg/pdf/HexChromfacts082009.pdf

EPA Drinking Water

http://water.epa.gov/drink/contaminants/basicinformation/chromium.cfm

<u>http://water.epa.gov/drink/local/az.cfm</u>

ARIZONA - Well Owner info

- <u>http://ag.arizona.edu/rurallandscape/node/147</u>
- <u>http://ag.arizona.edu/rurallandscape/node/147</u>
- <u>http://www.azdeq.gov/environ/waste/cleanup/topock.html</u>
- http://www.wellownerhelp.org/intro.html
- <u>http://www.wellownerhelp.org/fact-natural.html</u>
- http://www.wellownerhelp.org



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