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Perchlorate Monitoring Results

Henderson, Nevada to the Lower Colorado River

June 2004 Report

Compiled by:
US Environmental Protection Agency, Region 9

Waste Management Division
75 Hawthorne St.
San Francisco, CA 94105

Based on Monitoring Data from

- Nevada Division of Environmental Protection
- Southern Nevada Water Authority
- Metropolitan Water District (MWD) of Southern California
- Kerr McGee Chemical Company (KMCC)

PERCHLORATE MONITORING RESULTS
HENDERSON, NEVADA TO THE LOWER COLORADO RIVER

I. EXECUTIVE SUMMARY

1. Introduction and Purpose

This report summarizing perchlorate monitoring results in Henderson, Las Vegas Wash, Lake Mead and the Lower Colorado River has been compiled to measure the effectiveness of perchlorate remediation efforts in Henderson, Nevada, and to keep interested agencies and others informed on the latest perchlorate monitoring data. It is designed to present an overview of the data so that all parties have the same information. It does not include all of the monitoring data available, just a manageable set of the most representative data. Please refer to **Appendix B: Background** for details about the perchlorate problem, applicable standards, Kerr McGee's control strategy, Pepcon's control strategy and travel times/flushing times.

This report will allow agencies to assess the effectiveness of control elements, track progress of control efforts and their downstream benefits, and more accurately predict perchlorate concentrations at downstream locations.

Several agencies have contributed data to this report, including the Nevada Division of Environmental Protection (Las Vegas Wash at North Shore Road and the Lower Colorado River at Willow Beach), Southern Nevada Water Authority (LasVegas Wash downstream of the seep, Lake Mead/Las Vegas Bay and Lake Mead/Saddle Island) and Metropolitan Water District (MWD) of Southern California (Colorado River Aqueduct). Kerr McGee Chemical Company has also contributed substantial data to this report (ground water monitoring and mass removal data at the Slurry Wall, Athens Road and the Seep Area).

This report addresses only the perchlorate releases from Kerr McGee and Pepcon in Henderson, Nevada and their impacts on Las Vegas Wash, Lake Mead and the lower Colorado River. There are many other perchlorate releases throughout the United States which have created their own separate and distinct perchlorate plumes. This report does not address any of these other releases.

2. Summary of Surface Water and Groundwater Quality Trends

- Monthly averages are presented where more than one sample per month is collected.
- Ground water and surface water concentrations show significant seasonal variability.
- Ground water concentrations are declining as a result of Kerr McGee's capture and control efforts at three locations: slurry wall on KMCC property, Athens Road about half way to Las Vegas Wash, and seep area near Las Vegas Wash. Ground water extraction wells in these three locations are removing approximately **1700 to 2000** pounds of perchlorate per day.
- Surface Water concentrations in Las Vegas Wash, Lake Mead and the Lower Colorado River

substantially.

In 2003 McGinley and Associates conducted a perchlorate modeling effort for the Nevada Division of Environmental Protection for the portion of Las Vegas Wash impacted by perchlorate releases to the Wash itself and to the Las Vegas Wash gravels. Assuming 90% or better capture of all perchlorate sources to Las Vegas Wash, the modeling predicts that perchlorate mass loading at North Shore Road will decline to 100 pounds per day or less by October 2004. This would represent about a 90% reduction from amounts of perchlorate entering Las Vegas Wash prior to any controls (initial perchlorate controls began in November 1999). In late 2003 the North Shore Road mass loading was in the 250 to 280 pounds per day range, slightly higher than predicted by the McGinley and Associates modeling. In early 2004, the mass loading has generally been in the **160 to 210** pounds per day range.

4. Monitoring Locations

There are eleven monitoring locations referenced within this report that extend from Kerr McGee's property in Henderson, Nevada to the Colorado River Aqueduct near Parker Dam on the Lower Colorado River. The monitoring locations are indicated below and are shown on the three maps in **Appendix A**.

- Groundwater on Kerr McGee Property Above Slurry Wall
- Groundwater on Kerr McGee Property Below Slurry Wall (M-100)
- Groundwater at Athens Road Wells (ART-8)
- Groundwater Below Athens Road Wells (ARP-3)
- Groundwater at Seep Area (PC-97)
- Las Vegas Wash Downstream of Seep Area (LW 5.3)
- Las Vegas Wash at North Shore Road
- Lake Mead at Las Vegas Bay (LVB 2.7/LVB 3.5)
- Lake Mead at Saddle Island (AMSWTF Raw Water)
- Colorado River Below Hoover Dam (Willow Beach)
- Colorado River at Colorado River Aqueduct at Lake Havasu

5. 2003 Perchlorate Monitoring Trends at Each Monitoring Location

The following summaries are based solely on 2003 data; they do not reflect any changes that may have occurred in 2004.

A. Mass Loading in Las Vegas Wash at North Shore Road

-Has declined about 50% in 2003 to about 275 lbs/day
-Has "leveled off" at 250-280 lbs/day in October/November/December 2003
-Further declines to about 100 lbs/day expected in 2004

J. Lake Mead at Saddle Island

-Concentrations appear to be declining in late 2003; further declines expected in 2004
-Monthly average concentrations declined to 5.9 ppb in September and 6.6 ppb in October 2003, the 2 lowest values in more than 4 years of data
-November and December monthly average peaks were both 10.5 ppb, about 35% lower than previous 3 years peaks (2000, 2001 and 2002)
-2003 annual average was 9.8 ppb, about the same as 2001 (10.4 ppb) and 2002 (9.9 ppb); lower lake levels have likely prevented decreases in annual average concentrations

K. Colorado River Below Hoover Dam (Willow Beach)

-Peak concentrations have gradually declined from about 10 ppb to about 7 ppb since seep capture began in November 1999
-Concentrations declined to 3.4 ppb in September and 3.0 ppb in October 2003; the 2 lowest values ever measured at this location
-Further declines expected in 2004

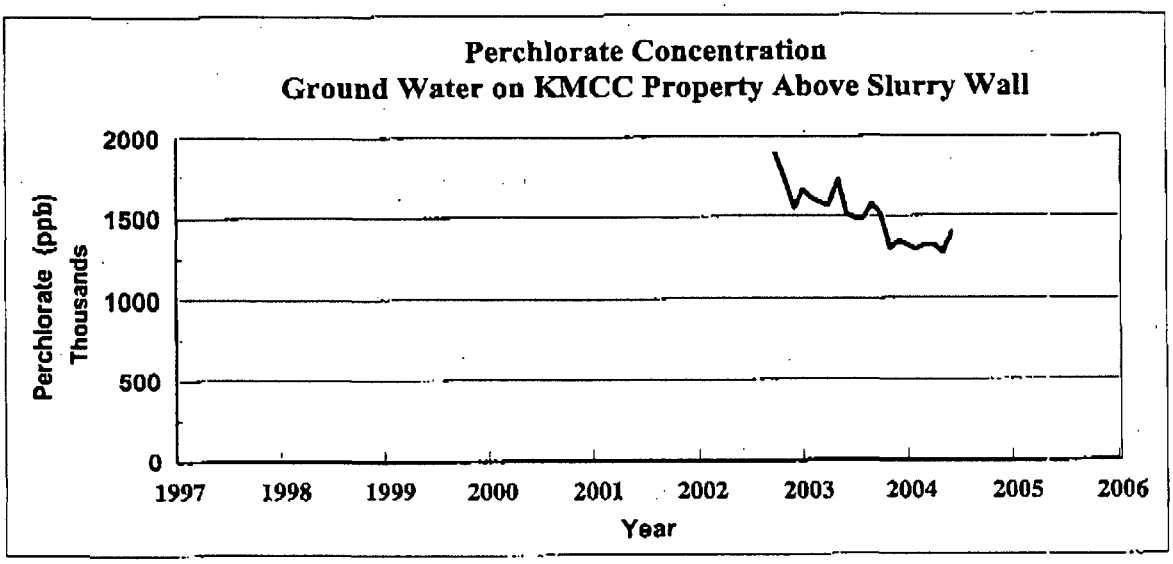
L. Colorado River at Colorado River Aqueduct

-Peak concentrations have gradually declined from 9 ppb to less than 6 ppb since seep capture began in November 1999
-Recent concentrations have ranged from non-detect (ND = 4 ppb) to 6 ppb
-Annual average concentration has declined from 6.4 ppb in 2000 to 4.8 ppb in 2003 (a 25% decrease)
-Further declines expected in 2004

November 2003	337	713	949	1999	30.0
December 2003	317	735	915	1967	30.5
January 2004	305	689	953	1947	30.2
February 2004	312	630	894	1836	26.6
March 2004	221	743	932	1895	29.4
April 2004	151	733	849	1733	26.0
May 2004	122	740	835	1697	26.3
June 2004					
July 2004					
August 2004					
Septem-ber 2004					
October 2004					
November 2004					
December 2004					

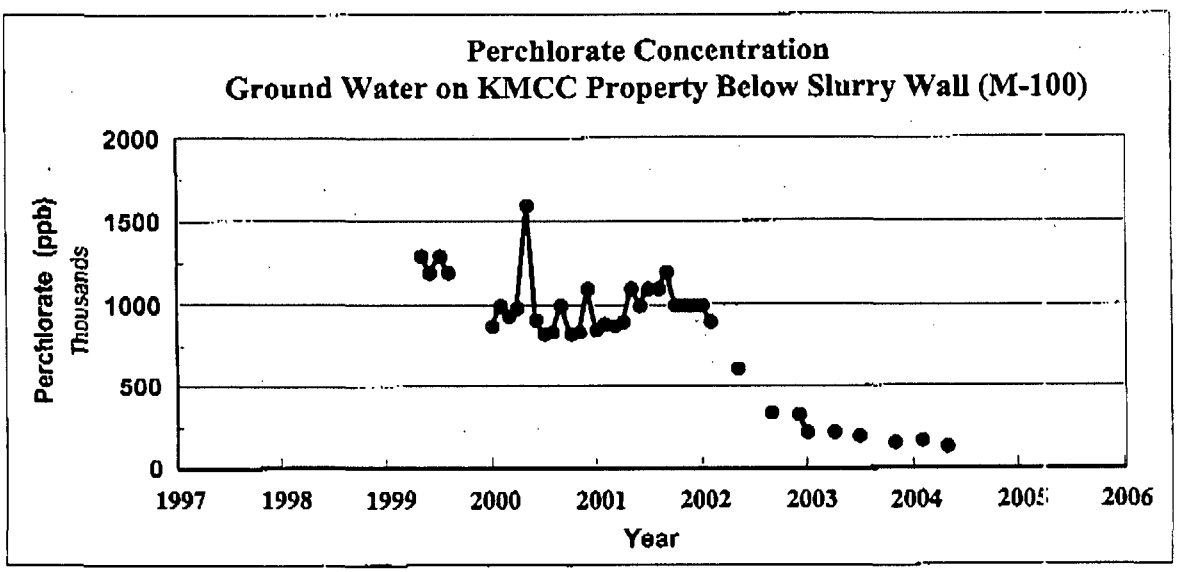
*Athens Road Extraction Wells begin full time operation on 10/22/02.
**Five new seep area extraction wells begin operation on 3/24/03.
***As expected, Seep Area mass capture began to decline in July 2003 as a result of Athens Road mass capture. These declines are expected to continue throughout 2004.

3. Groundwater on Kerr McGee Property Above Slurry Wall



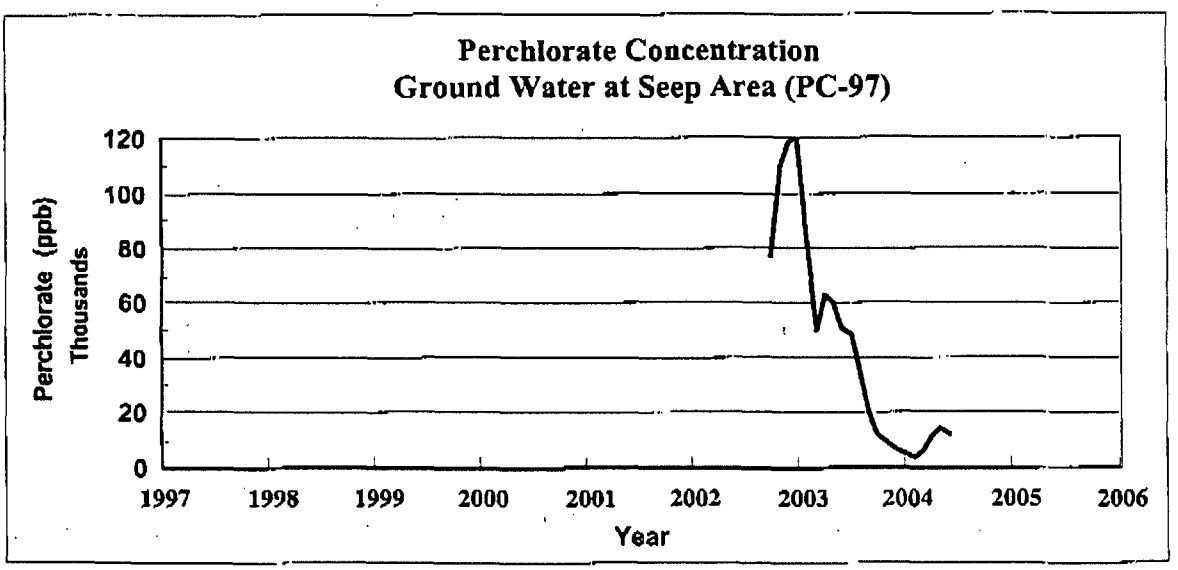
- Measures perchlorate source concentrations
- Concentrations show gradual declining trend since October 2002

4. Groundwater on Kerr McGee Property Below Slurry Wall (M-100)



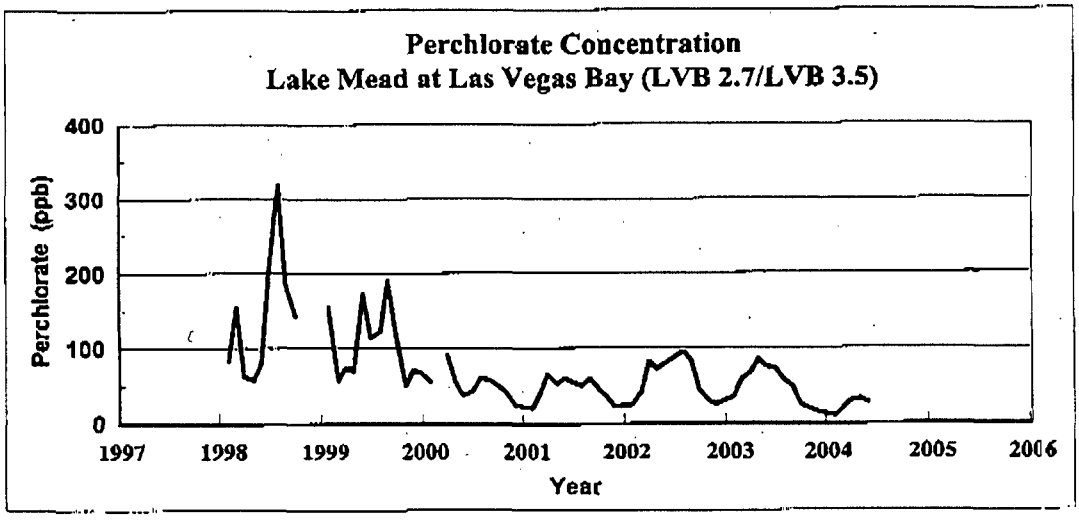
- Measures effectiveness of slurry wall/extraction well capture system.
- Extraction wells began operating in January 1999; slurry wall completed in September 2001.
- Concentrations have shown steady declining trend since September 2001

7. Groundwater at Seep Area (PC-97)



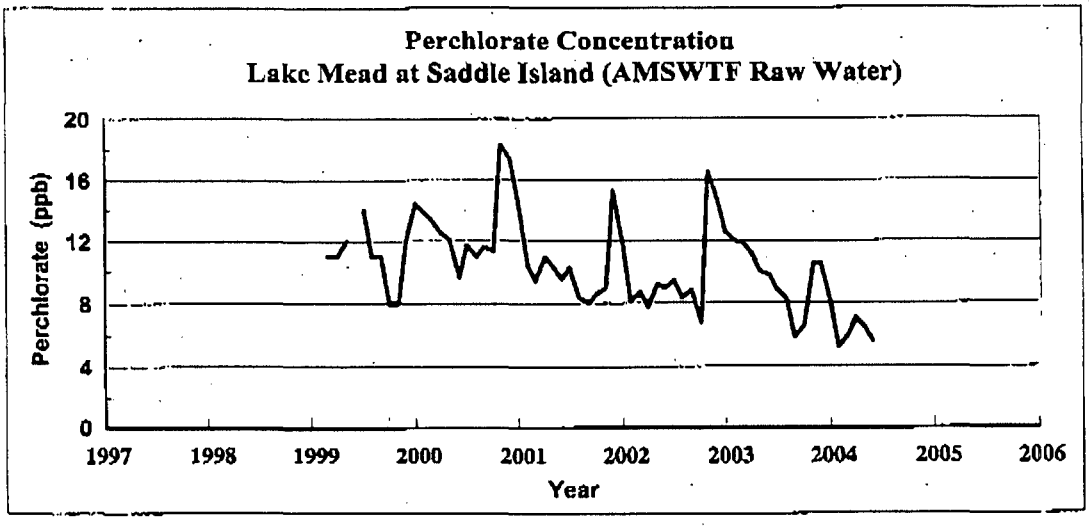
- Measures plume concentrations at seep area.
- Shows combined effect of Athens Road and seep area extraction wells.

10. Lake Mead at Las Vegas Bay (LVB 2.7/LVB 3.5)



- Measures perchlorate concentrations in Las Vegas Bay; sampling location moved to LVB 3.5 in December 2003 due to declining water levels in Lake Mead.
- Concentrations began to decline in 2000 after seep capture began in November 1999.
- Declining Lake Mead surface elevations (years 2000 to 2004) may result in increasing perchlorate concentrations.

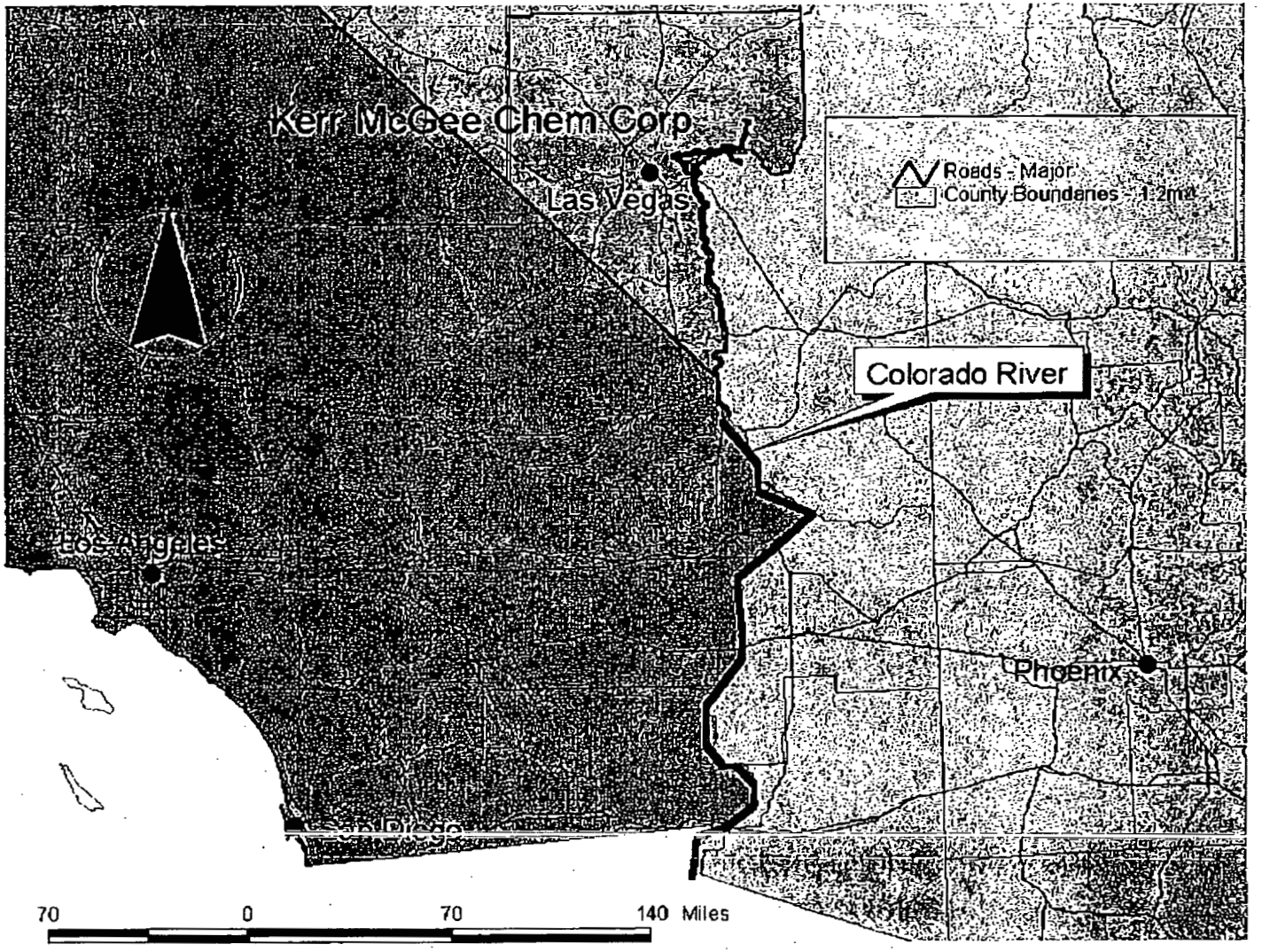
11. Lake Mead at Saddle Island (AMSWTF Raw Water)



- Measures perchlorate concentrations in Las Vegas Valley drinking water supply.
- Concentrations began to decline in 2000 after seep capture began in November 1999.
- Destratification of water in Lake Mead in November/December each year causes seasonal peaks in perchlorate concentrations; 2003 seasonal peak was about 35% lower than in previous three years.
- Declining Lake Mead surface elevations (years 2000 to 2004) may result in increasing perchlorate concentrations
- Method Detection Limit = 4 ppb.

APPENDIX A: MAPS

1. Southern California, Southern Nevada and Western Arizona



3. Lake Mead and Lower Colorado River Perchlorate Monitoring Locations

of Sciences which expects to issue their report during the last half of 2004. A decision by EPA on the reference dose isn't likely until 2005.

- EPA is not expected to adopt a drinking water standard for perchlorate (known as an MCL or Maximum Contaminant Level) for several years.
- In November 2002 the state of California proposed a Public Health Goal (PHG) for perchlorate of 2-6 ppb and adopted a final PHG of 6 ppb on March 11, 2004.
- California expects to adopt a drinking water standard for perchlorate in 2005.
- The state of Nevada uses a perchlorate "provisional cleanup level" of 18 ppb.

3. Kerr McGee Control Strategy and Current Status

- Control Strategy: capture and treat perchlorate at three locations:
  - On KMCC property where perchlorate is most concentrated,
  - At Athens Road about midway between KMCC and Las Vegas Wash where there is a narrow subsurface channel that makes effective capture possible, and
  - Near Las Vegas Wash where capture will have the most immediate impact on reducing releases to Las Vegas Wash
- Current Status:
  - On KMCC property - source control achieved in October 2001; slurry wall (1700 feet long & 60 feet deep) and 22 extraction wells captured **an average of 1050 pounds per day in 2003** ("virtually complete capture").
  - At Athens Road - 8 extraction wells began regular operation in October 2002; they captured **an average of 790 pounds per day in 2003** (an estimated 90 - 98% of the mass flow).
  - Near Las Vegas Wash - seep and 9 extraction wells capture an estimated 60 - 80% of the mass flow. **As expected, mass removal rates at this location have decreased dramatically due to perchlorate removal by the upstream wells at Athens Road (from about 700 lbs/day in April/May/June 2003 to about 150 lbs/day in June 2004).**
- Water Treatment - **total of 1000 gpm of water captured from the three locations is treated using 3 ion exchange units and a new biologically-based fluidized-bed reactor (FBR), then discharged back to LVW. The ion exchange units treat about 200 gpm of the water from the seep area and are 99+% efficient; the treated water contains 500 to 2000 ppb perchlorate. The new FBR treatment plant is undergoing startup/shakedown. It has a treatment capacity of about 1000 gpm (it is currently treating about 800 gpm), and the perchlorate concentrations in the treatment plant effluent are about 18 ppb (1000 gpm at 18 ppb equates to 0.21 pounds per day of perchlorate to Las Vegas Wash). The FBR will eventually replace the 3 remaining ion exchange treatment units.**
- Summary - engineered controls are in place and removing **1700-2000** pounds (**almost** 1 ton) per day of perchlorate from the Kerr McGee plume that flows towards Las Vegas Wash. **As of June 30, 2004, these control systems have removed more than 1280 tons of perchlorate from the environment.**

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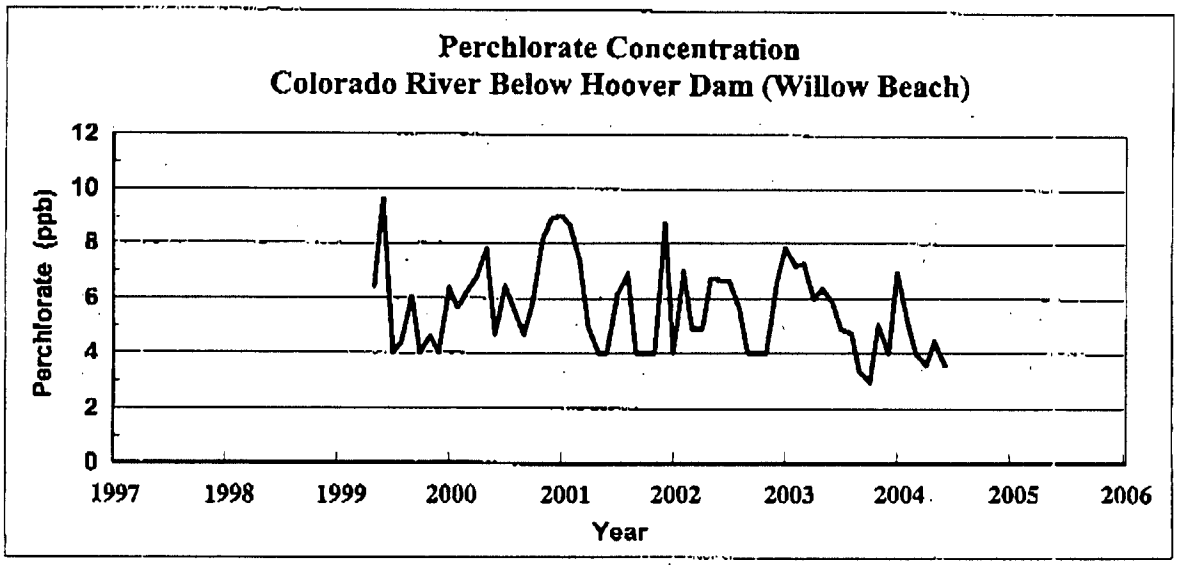
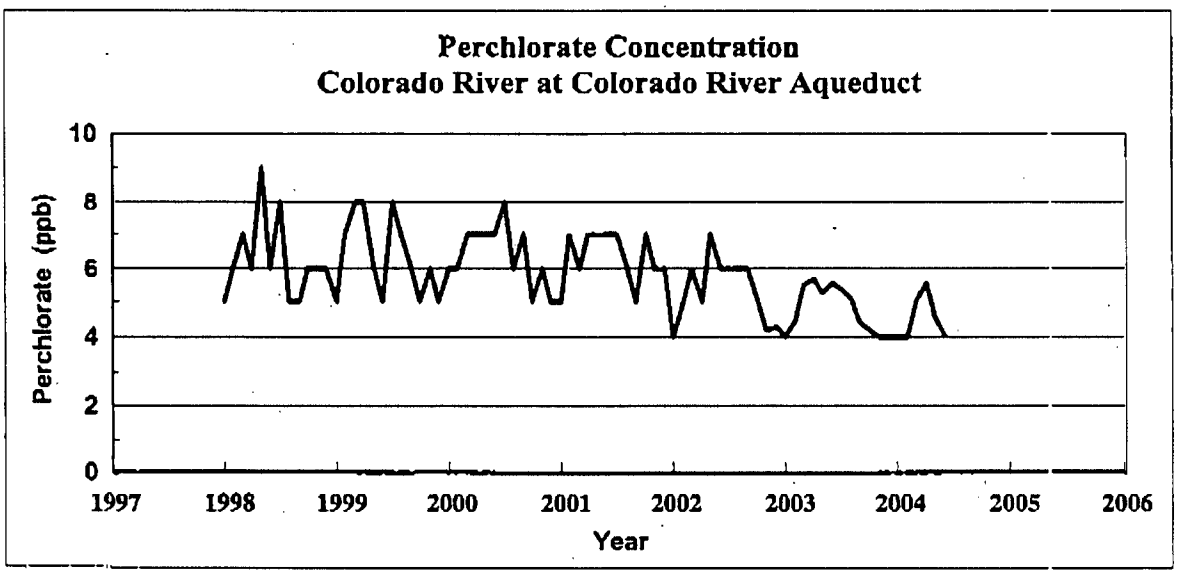
12. Colorado River Below Hoover Dam (Willow Beach)



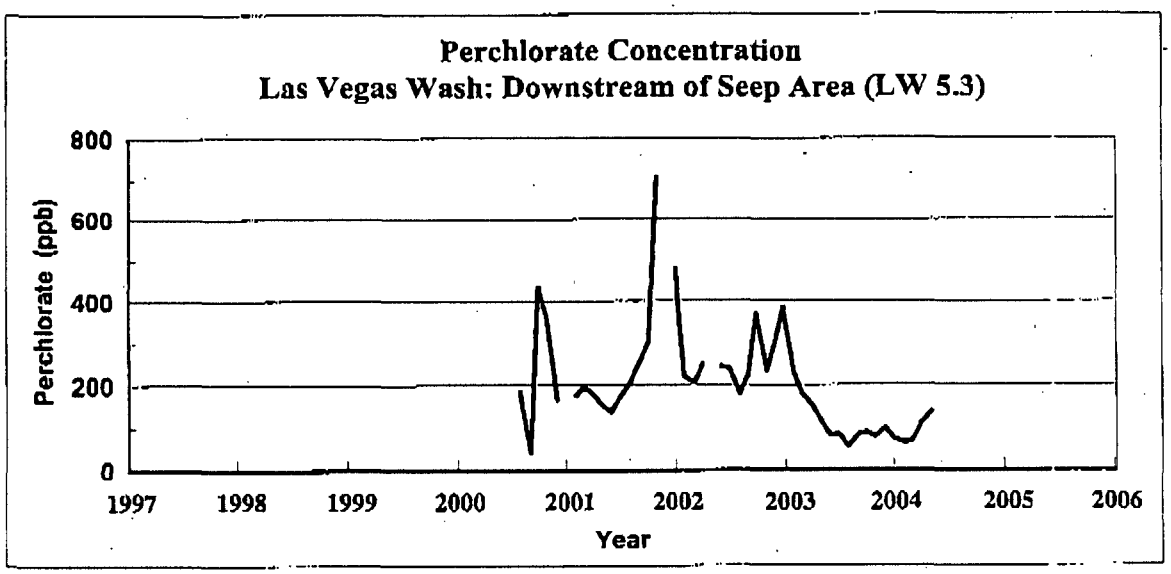
- Measures perchlorate concentrations in water entering Lower Colorado River
- Peak concentrations have shown gradual decline since seep capture began in November 1999.
- Concentrations declined to less than 4 ppb in September and October 2003.
- Method Detection Limit = 2 ppb beginning in December 2002 (MDL = 4 ppb previously)

13. Colorado River at the Colorado River Aqueduct at Lake Havasu



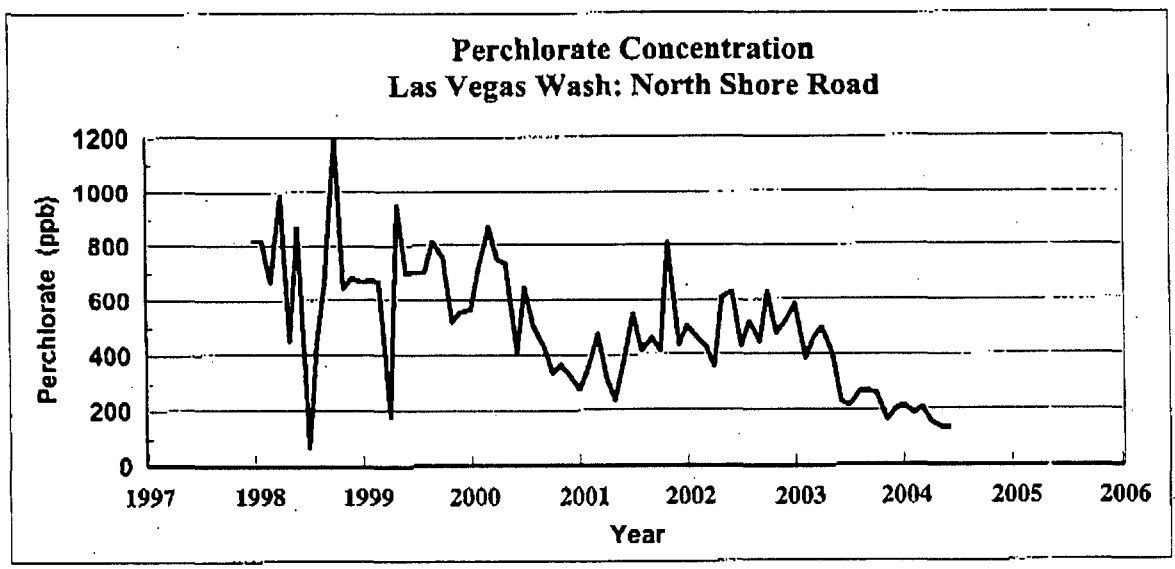
- Measures perchlorate concentrations at Southern California drinking water supply.
- Peak concentrations have shown gradual decline since seep capture began in November 1999.
- Recent concentrations have ranged from 4 to 6 ppb (4.8 ppb annual average in 2003).
- Method Detection Limit = 4 ppb.

8. Las Vegas Wash Downstream of Seep Area (LW 5.3)



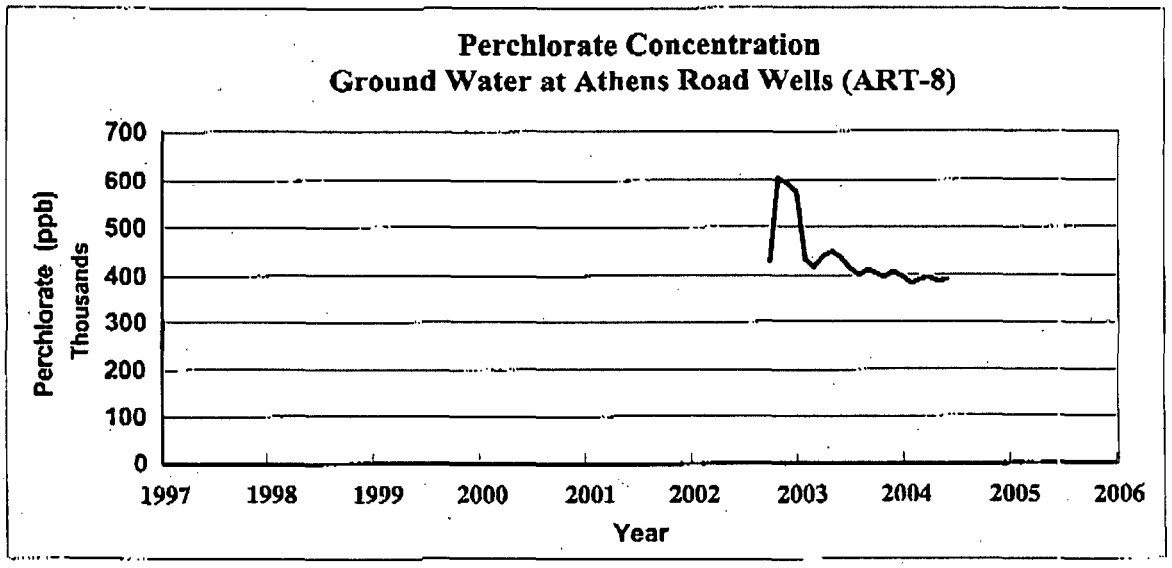
- Measures perchlorate "daylighting" from Las Vegas Wash gravels.
- Concentrations expected to decline further in 2004 **and 2005.**

9. Las Vegas Wash at North Shore Road



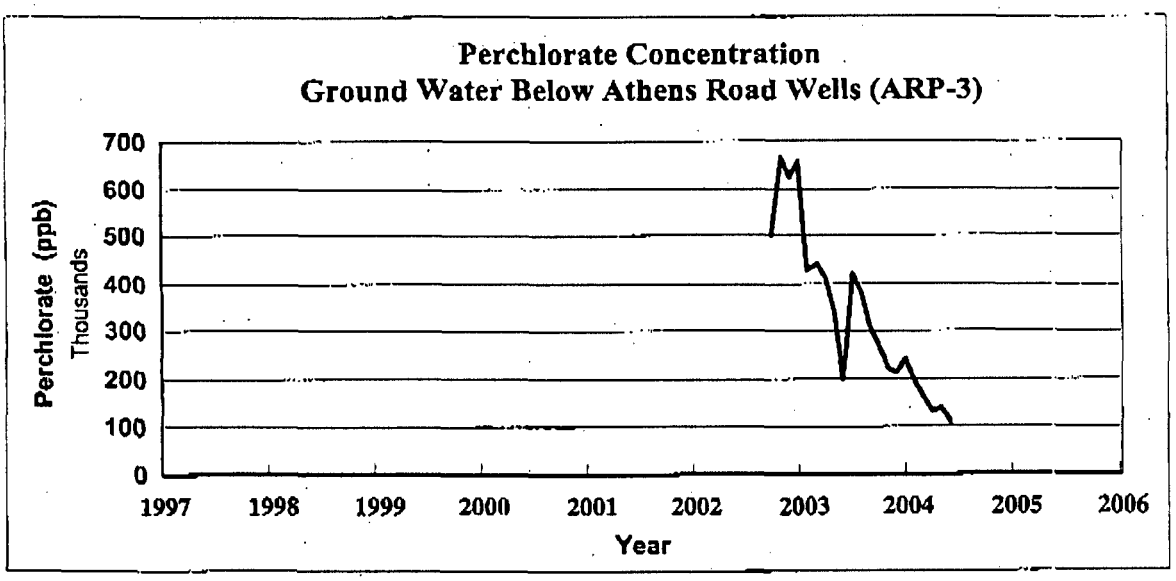
- Measures total perchlorate concentration in Las Vegas Wash entering Lake Mead.
- Concentrations declined in 2000 after seep capture began in November 1999, and declined further in 2003 after Athens Road Wells began operation.
- Further declines expected in 2004 **and 2005** as a result of Athens Road Wells (beginning in October 2002) and improved capture in the seep area (beginning in March 2003).

5. Groundwater at Athens Road Wells (ART-8)



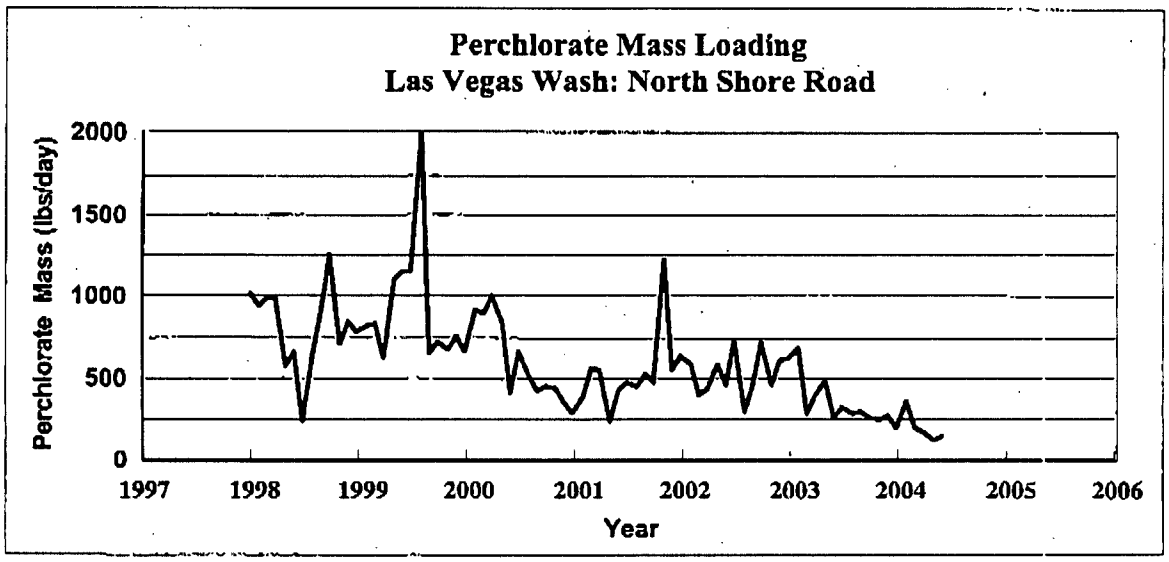
- Measures plume concentrations at Athens Road, about midway between the KMCC plant site and Las Vegas Wash
- This groundwater is being extracted and treated; the goal is "virtually complete capture."

6. Groundwater Below Athens Road Wells (ARP - 3)



- Measures effectiveness of Athens Road extraction well capture system and downstream effects.

2. Perchlorate Mass Loading in Las Vegas Wash at North Shore Road



- Measures total perchlorate load in Las Vegas Wash entering Lake Mead; measures overall effectivness of perchlorate remediation efforts in Henderson, Nevada.
- Mass loading declined in 2000 after seep capture began in November 1999, and declined further in 2003 after Athens Road Wells began operation.
- During the last seven months of 2003 mass loadings ranged from 250 to 325 lbs/day, a substantial decrease from amounts in 2002 and early 2003.
- **During the first half of 2004 mass loadings generally ranged from 160 to 210** lbs/day.
- Further declines expected in 2004 **and 2005** as a result of Athens Road Wells (beginning in October 2002) and improved capture in the seep area (beginning in March 2003).

II MONITORING DATA

1. Total Perchlorate Mass Removal by Kerr-McGee

Table 1 - Perchlorate Removed by Kerr-McGee Chemical Company, Henderson, Nevada

	1. Seep Area (near LVW) (lbs/day)	2. Athens Road Wells (midpoint) (lbs/day)	3. On Site CTL Wells (lbs/day)	4. Total (lbs/day)	Total Tons Removed per/month
October 2002*	495	331	1402	2228	34.5
November 2002	422	1001	1146	2569	38.5
December 2002	208	1164	1292	2664	41.3
January 2003	335	1074	1467	2876	44.6
February 2003	570	783	1060	2413	33.8
March 2003**	485	806	1067	2358	36.5
April 2003	713	713	1033	2460	36.9
May 2003	703	729	1148	2581	40.0
June 2003	686	907	1098	2691	40.4
July 2003***	594	755	1034	2383	36.9
August 2003	463	741	921	2125	32.9
Septem-ber 2003	416	770	937	2123	31.8
October 2003	370	769	1003	2142	33.1

B. Ground Water on Kerr McGee Property Above Slurry Wall

-Steady at 1,500,000 - 1,800,000 ppb (1500 - 1800 ppm), as expected
-Monitoring location reflects perchlorate source area; not likely to decrease for many years

C. Ground Water on Kerr McGee Property Below Slurry Wall (M-100)

-Has declined about 80% since slurry wall installed in October 2001
-Currently about 160,000 ppb (160 ppm)

D. Ground Water at Athens Road Wells (ART-8)

-Steady at 400,000 - 450,000 ppb (400 - 450 ppm), as expected
-Not likely to decrease for many years

E. Ground Water Below Athens Road Wells (ARP-3)

-Has declined 50% - 60% since Athens Road Wells began continuous operation in October 2002
-Results erratic; there could be a nearly flat gradient with low flows just below Athens Road Wells
-Currently about 220,000 ppb (220 ppm)

F. Ground Water at Seep Area (PC-97)

-Has declined about 90% since Athens Road Wells began continuous operation in October 2002
-Currently about 10,000 ppb (10 ppm)

G. Las Vegas Wash Downstream of Seep Area (LW 5.3)

-Has declined about 75% since Athens Road Wells began continuous operation in October 2002
-Currently about 80 to 90 ppb

H. Las Vegas Wash at North Shore Road

-Perchlorate concentrations have declined about 50% to 60% in 2003 to about 200 - 270 ppb
-Further declines to about 100 ppb expected in 2004

I. Lake Mead at Las Vegas Bay (LVB 2.7)

-Seasonal variation from 20 - 100 ppb; "peaks" in spring/summer; "valleys" in fall/winter
-No clear trend (except seasonal variation) during last 3 years
-On 12/16/03 sampling location moved to LVB 3.5 due to low water elevations in Lake Mead

have declined since seep capture and treatment began in November 1999, and declined further in 2003 and early 2004. Additional decreases are expected in 2004 and 2005 due to the continuing effects of more recently initiated capture at Athens Road (October 22, 2002) and seep area (March 24, 2003).

- In the last 2 years, concentrations of perchlorate at Saddle Island (AMSWTF Raw Water) in Lake Mead have ranged from 5 to 17 ppb which is within the range of the existing US EPA provisional reference dose drinking water equivalent concentration (4-18 ppb), but greater than US EPA's proposed reference dose drinking water equivalent concentration (1 ppb) and California's Public Health Goal of 6 ppb.
- Average perchlorate concentrations in Lake Mead were probably higher than expected in 2002, 2003 and 2004 because a 5 year long drought has resulted in less water entering Lake Mead and lowered the Lake level more than 85 feet since January 2000. This has resulted in about a 44% decrease in the Lake volume. If the drought continues, perchlorate concentrations in Lake Mead may not decline as much as expected, and could possibly increase.
- Peak levels of surface water concentrations at the Colorado River Aqueduct near Parker Dam have declined gradually, but steadily from 9 ppb to less than 6 ppb since seep capture began in November 1999. Gradual declines in peak levels are expected to continue as the releases to Las Vegas Wash decline further in 2004.
- In the last 2 years, concentrations of perchlorate at the Colorado River Aqueduct near Parker Dam have ranged from 4 to 6 ppb, which is at the lower end of the range of the existing US EPA provisional reference dose drinking water equivalent concentration (4-18 ppb), but greater than US EPA's proposed reference dose drinking water equivalent concentration (1 ppb). Since June 2002, all of the monthly samples have been at or below California's Public Health Goal of 6 ppb.

3. Recent Developments and Current Status

This is the fifth in a regular (probably quarterly) series of reports on the progress of the perchlorate cleanup in Henderson, Nevada. This report is a "work in progress" and is expected to evolve over time to best suit the needs of the interested parties. These are complex systems and the data at each sampling location are influenced by many factors, including 1) natural variability, 2) seasonal variability, 3) Lake Mead water levels and flow dynamics, 4) Colorado River flow dynamics, and 5) ground water flow dynamics, etc. As such, it is important to remember that one data point does not constitute a trend, and that water quality improvements will not necessarily occur in a steady, straight-line fashion.

In 2003 Kerr McGee constructed a new fluidized bed reactor (FBR), biologically based perchlorate treatment plant to replace the existing ion exchange units. The Plant Ion Exchange Units (12) have been operating since October 2002, while the Wash Ion Exchange Units (3) have been operating since November 1999. The new FBR plant is in startup/shakedown mode from December 2003 through June 2004. When fully operational (probably in July 2004), the perchlorate discharge concentration and mass from treatment plants should decrease

PERCHLORATE MONITORING RESULTS: HENDERSON, NEVADA TO THE LOWER COLORADO RIVER

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4. PEPCON's Control Strategy and Current Status

The former PEPCON perchlorate plant also has a plume of perchlorate, but it is smaller and less concentrated than the Kerr McGee plume. However, the PEPCON plume is being investigated and will be remediated.

- PEPCON conducted an In-Situ Bioremediation Pilot Study from December 2002 to April 2003; the pilot was generally successful, reducing perchlorate concentrations from about 500 ppm to less than 2 ppb.
- Nevada Division of Environmental Protection (NDEP) is requiring that PEPCON install a remediation system at the leading edge of its plume by **January 2005.**
- The next step would be to install a full scale system **at the source of the plume by May 2005.**

5. Estimated Travel Times and Flushing Times

It takes time for ground water and surface water to travel from one point to the next (travel time). Even after a source of perchlorate is reduced or eliminated, it takes time for clear water to flush out the contaminated ground water or surface water (flushing time).

- Athens Road to Las Vegas Wash - travel time is estimated to be 7 months; flushing time to reach 4 ppm is estimated to take 21 to 35 months (3 to 5 travel times)
- Las Vegas Wash Gravels - travel time is estimated to be 6 months; flushing time is estimated to take 18 to 30 months (3 to 5 travel times)
- Lake Mead - flushing time is likely to be several years; **the average residence time of Boulder Basin (the lower part of Lake Mead) is about 10 months.**
- Lower Colorado River (below Hoover Dam) - travel time estimated to be 3 months; flushing time estimated to be about 1 year; **MWD had a contractor investigate this issue - their final report of flushing time estimates was issued on March 25, 2004.**
- In late 2003 Flow Science conducted a perchlorate modeling effort for the Metropolitan Water District of Southern California to estimate how long it would take Colorado River perchlorate concentrations to reach target levels under various perchlorate control strategies and hydrological conditions. **Their final report was dated March 25, 2004.** Assuming 90% capture of all perchlorate sources to Las Vegas Wash (and based on the modeling results from the October 20, 2003 McGinley and Associates report prepared for the Nevada Division of Environmental Protection), the modeling predicts that perchlorate concentrations at the Colorado River Aqueduct intake will reach 4 ppb by mid 2004 and 2 ppb by mid to late 2005. The 2003 annual average concentration at this location was 4.8 ppb (using 4 ppb for the three non-detect values in 2003).

APPENDIX B: BACKGROUND

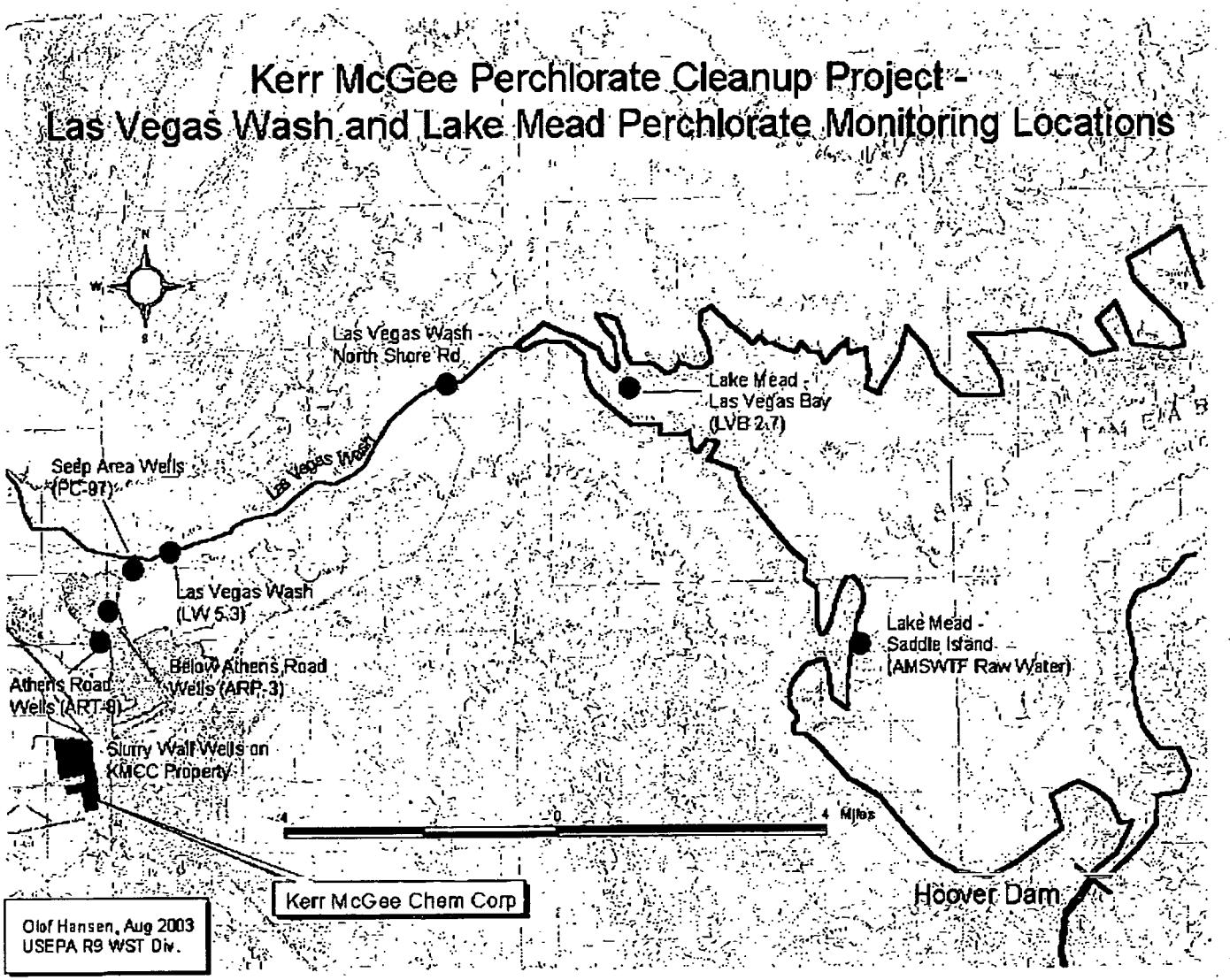
1. Discovery and Magnitude of the Perchlorate Problem

- In mid - 1997 the Metropolitan Water District of Southern California discovered perchlorate in the lower Colorado River due to a more sensitive test method, and traced the contamination to Lake Mead and the Las Vegas Wash. Ultimately, the source of the perchlorate was traced to the Kerr McGee Chemical Plant in Henderson, Nevada.
- Since 1997 the Nevada Division of Environmental Protection and the US Environmental Protection Agency have been working closely with Kerr McGee to achieve source control and reduce perchlorate releases to Las Vegas Wash as quickly as possible.
- Kerr McGee Chemical Company (KMCC) - perchlorate production was initiated in 1945; full commercial production of ammonium perchlorate began in 1951 under prior owners/operators; Kerr McGee acquired the property in 1967.
- Perchlorate contaminated ground water from the Kerr McGee plume flows north about 3 miles from KMCC to Las Vegas Wash. KMCC is the most significant source of perchlorate entering LVW; prior to controls, the KMCC plume released about 900 pounds per day (average) to Las Vegas Wash (LVW).
- These perchlorate releases to Lake Mead and the Lower Colorado River have impacted the drinking water supply of 15 to 20 million people in Arizona, southern California, southern Nevada, Tribal nations and Mexico.
- In the last 2 years, concentrations of perchlorate at Saddle Island (AMSWTF Raw Water) in Lake Mead have ranged from 5 to 17 ppb which is within the range of the existing US EPA provisional reference dose drinking water equivalent concentration (4-18 ppb), but greater than US EPA's proposed reference dose drinking water equivalent concentration (1 ppb) and California's Public Health Goal of 6 ppb.
- In the last 2 years, concentrations of perchlorate at the Colorado River Aqueduct near Parker Dam have ranged from 4 to 6 ppb, which is at the lower end of the range of the existing US EPA provisional reference dose drinking water equivalent concentration (4-18 ppb), but greater than US EPA's proposed reference dose drinking water equivalent concentration (1 ppb). Since June 2002, all of the monthly samples have been at or below California's Public Health Goal of 6 ppb.
- This report addresses only the perchlorate releases from Kerr McGee and Pepcon in Henderson, Nevada and their impacts on Las Vegas Wash, Lake Mead and the lower Colorado River. There are many other perchlorate releases throughout the United States which have created their own separate and distinct perchlorate plumes. This report does not address any of these other releases.

2. Status of Applicable Perchlorate Standards

- The current federal provisional reference dose drinking water equivalent level is 4-18 ppb; first adopted by EPA in 1992.
- In January 2002 EPA proposed a reference dose drinking water equivalent level of 1 ppb, but this reference dose is not yet final. It is currently undergoing review by the National Academy

2. Las Vegas Wash and Lake Mead Perchlorate Monitoring Locations



2004 CPEO Military List Archive

From: Lenny Siegel <lsiegel@cpeo.org>
Date: 23 Sep 2004 21:31:28 -0000
Reply: cpeo-military
Subject: [CPEO-MEF] Kerr-McGee perchlorate remediation

As a member of the ITRC (Interstate Technology Regulatory Council), on September 8, 2004 I received a series of briefings about the Kerr-McGee perchlorate cleanup in Henderson, Nevada, and the following day I took part in a bus tour of the Henderson area. The lead presenter was Todd Croft of the Nevada Department of Environmental Protection (NDEP). While I had received similar briefings in the past, this two-day interchange offered opportunities to ask penetrating questions and view the site up close. Furthermore, the cleanup is further along than reported just a few months ago.

The primary groundwater plume in Henderson emanates from the former Kerr-McGee production site northward to the Las Vegas Wash, which it enters through a surface seep as well as groundwater. Kerr-McGee, under direct oversight by NDEP, intercepts the plume at three locations: On site with a slurry wall and extraction wells; with wells mid-plume at Athens Road, which is just upstream of local sewage treatment system recharge basins; and with more extraction wells on the edge of the Wash.

The system now catches about 90% of the original perchlorate flow into the Wash. By October, 2004, it expects the residual releases to fall to about 100 pounds of perchlorate per day.

Water from all three extraction locations is pumped into a new two-stage Fluidized Bed Reactor at the former production plant. This is a rather large ex situ bioremediation system, based upon similar, but smaller and simpler systems at the Longhorn Army Ammunition Plant (TX), Aerojet-Rancho Cordova (CA), and the McGregor Naval Weapons Industrial Reserve Plant (TX). The Kerr-McGee treatment system has proven more challenging to operate, not only because the quantity of contaminant is much higher, but because high concentrations of other (naturally occurring) chemicals are present in the water.

American Pacific, owner of the plume from the nearby Pepcon Plant (site of a massive 1988 explosion), is characterizing its flow, and NDEP expects it to prevent perchlorate from that source from reaching the Las Vegas Wash. The industrial park owner is investigating other property in the area. While it's possible that other perchlorate (from Kerr-McGee or other sources) may enter the Wash in the future, NDEP does not expect the quantities to be significant in comparison to the main Kerr-McGee plume.

Perchlorate which has settled in the gravels of the Las Vegas Wash is beyond the capture systems. However, additional extraction is not planned. NDEP's modeling shows that with the current level of releases into the Wash most of those deposits will flush out within about two years, the time it would take to build a system to treat the gravels. Sampling thus far is consistent with the model.

Additional modeling, coordinated with the results of Metropolitan Water District sampling downstream in the Colorado River, suggests that downstream perchlorate concentrations will fall below 2 parts per

billion by mid-2005.

Of course, outside of Nevada there is no cleanup-oriented investigation of water originating in the Colorado River. No one is looking at the groundwater basins that have been recharged with contaminated Colorado River water.

Nevertheless, assuming that the NDEP reports and projections are accurate, the asserted success in capturing and destroying perchlorate suggests that there is unlikely to be new treatment of Colorado River water in California and Arizona. Concentrations are already below California's Public Health Goal of 6 parts per billion (ppb), they are unlikely to rise, and in fact they are likely to approach 2 ppb by the time any new treatment system could be built. Only a promulgated drinking water standard of 1 ppb would force such treatment.

Meanwhile the massive, expensive extraction and treatment system above the Las Vegas Wash is approaching full efficiency, and it is expected to operate for decades.

Lenny
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