## FACT SHEET

## February 2016

**California Regional Water Quality Control Board, Lahontan Region**

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Una versión en español dé datos acerca de la contaminación de nitrato en las aguas subterráneas está disponible en la página electrónica www.waterboards.ca.gov/lahontan Esta página provee la manera de comunicarse con el personal de la junta de Control de Calidad de Agua – Región Lahontan (Junta de Agua).

**California Environmental Protection Agency**

# *California Regional Water Quality Control Board, Lahontan Region*

# Barstow Groundwater Nitrate Pollution Update

### Introduction

This fact sheet describes the status of groundwater nitrate pollution investigation and cleanup activities in the Soapmine Road area east of Barstow along the Mojave River. Since 2004, the Water Board has required the city of Barstow (City) to evaluate nitrate concentrations in groundwater, ensure that no one is drinking water with nitrate above drinking water standards, eliminate pollution sources, and clean up groundwater to either background levels or to what is feasible, but in no case greater than drinking water standards.

### Nitrate Found Above Drinking Water Standards

Nitrate concentrations in some areas between the Soapmine Road and the Mojave River (Soapmine Road area) are at, or above, levels greater than the state standard for drinking water. The Water Board required the City to investigate this problem because the predominant source of pollution is the City's historic wastewater disposal on fields north of the Mojave River and northwest of the wastewater treatment plant. Other potential nitrate sources include septic tank discharges and agricultural fertilizers (see Figure 1).

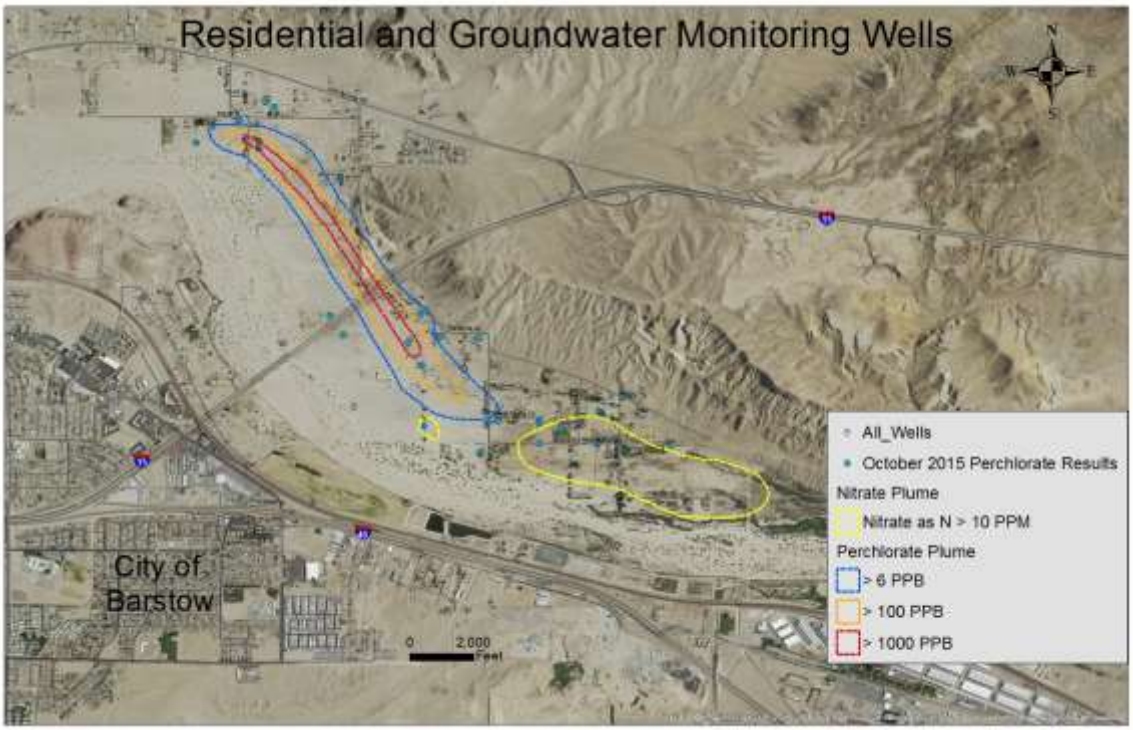
### Health Effects from Nitrate

Total nitrogen is comprised of organic nitrogen, ammonia, nitrate, and nitrite. Nitrate nitrogen is the most highly oxidized form of nitrogen found in wastewater. The California drinking water standard for "nitrate as nitrate" ($NO_3$) is 45 milligrams per liter (equivalent to parts per million or ppm). Nitrate is also reported as "nitrate as nitrogen" (N) and 10 ppm nitrate as N equals 45ppm nitrate as $NO_3$. Water with nitrate in this amount or higher is a serious health concern for infants and pregnant women. For the purposes of this fact sheet, all nitrate concentrations will be reported as nitrate as N so that concentrations can be compared to the 10 ppm value. Boiling, freezing, most types of filtering, and/or letting water stand does not reduce or remove nitrate levels. Boiling actually increases the concentration of nitrate in the water.

### Nitrate Sources

Nitrate is a type of salt containing nitrogen. Low levels of nitrate occur naturally in water. Nitrate levels that exceed water quality standards are most often due to inappropriate disposal of animal waste and human sewage, or the inappropriate application of nitrogen-based fertilizers that leach to groundwater. While these materials can safely and effectively be used on farms, they can result in nitrate pollution of ground and surface waters if they are over-applied, especially in sandy soils. Septic systems can pollute groundwater with nitrate.

**Figure 1 – Nitrate and Perchlorate Plume**



**Completed/Ongoing Activities**

- Treatment Plant Upgrades - The Water Board directed the City to upgrade its wastewater treatment facility to decrease the concentration of nitrogen in their treated wastewater by July 2010. The City completed this upgrade and improved its wastewater treatment facility between 2014 and 2015. A December 2015 report indicates the average concentration in the wastewater treatment plant effluent for the last 12 months is 3.47 mg/L for nitrate as nitrogen (N) and 7.02 mg/l for total nitrogen.

- Residential Well Sampling – Nitrogen leaching from sludge and treated wastewater applied to irrigation fields and percolation ponds has contaminated the groundwater. The Water Board ordered the City to perform quarterly sampling of all residential wells that may be affected in addition to sampling the City's monitoring wells. As of the fourth quarter 2015, nitrate in two residential drinking water wells was over the drinking water limit.

- Replacement Water - The Water Board required the City to provide bottled water to the residents within the affected area that have nitrate as N concentrations above 5 ppm. As of the fourth quarter 2015, there were eight residential wells with nitrate as N concentrations greater than 5 ppm. Although the drinking water standard for nitrate as N is 10 ppm, the Water Board required the City to provide replacement bottled water to all residents with wells showing nitrate as N concentrations greater than 5 ppm because variation between sampling events could allow the drinking water standard to be exceeded in the meantime.

- Pilot Treatment Test - The City conducted a pilot program between October 2009 and January 2010 to determine if a fluidized bed reactor treatment method would reduce the levels of nitrate in groundwater pumped from the plume prior to disposal. In this process, a biomass growth is maintained by using methanol or ethanol as a food source for bacteria to reduce nitrate by conversion to nitrogen and carbon dioxide gases and additional biomass. The test demonstrated that this technology is suitable to reduce nitrate as N concentrations to less than the drinking water standard of 10 ppm nitrate as N and a pilot test target level of 5 ppm nitrate as N.

**Recent Activities**

- The Water Board directed the City to evaluate and propose a groundwater cleanup strategy. The City submitted an initial groundwater cleanup plan in June 2010 that did not consider multiple scenarios. In January 2011, the City provided a revised plan evaluating different scenarios. In June 2011, Water Board staff told the City that the computer groundwater model was not calibrated properly, and requested revised computer models and an aquifer pump test to evaluate the pumping radius of influence and draw down effect.
- In January 2012, the City conducted an aquifer test along Webster Rd. that determined how the groundwater will respond to an extraction well pump and treat program. The test results indicated the water table in the Soapmine Road area near an extraction well could be lowered by 1.5 to 3 feet. Therefore, a pump and treat cleanup system may cause the water table to drop during the cleanup.
- In February 2012, the City submitted a revised cleanup plan that would pump from four extraction wells along Webster Road and one well along Clay River Road, treat extracted water using a fluidized bed reactor, and dispose of treated water in ponds along the south side of the Mojave River.
- In April 2013, after further negotiation with the Water Board, the City submitted a third revised cleanup plan that would pump from four extraction wells along Webster Road and three wells along Clay River Road. The Executive Officer approved this plan when issuing Clean Up and Abatement Order R6V-2013-0045-A1. However, due to perchlorate groundwater pollution upgradient of the proposed extraction system and the mixing of nitrate and perchlorate, Water Board staff and the City agreed that both constituents should be addressed simultaneously.
- In August 2014, the City submitted another revised cleanup plan to address both nitrate and perchlorate. That plan was too expensive so Water Board staff and the City are discussing a less expensive plan. In 2015, the City applied for a grant from the State Board to address the perchlorate portion of the cleanup cost.

**Next Steps**

- The City's final Remedial Action Plan is not complete at this time. The Executive Officer directed the City to (1) obtain funding and provide a new construction design by May 2016, (2) complete a final design report by May 2017, and (3) start extraction and treatment by November 2017.

**Health Related Resource**

San Bernardino County, Department of Health Services,
72 W. 3rd St., 1st Floor, San Bernardino, CA 92415
(800) 442-2283
**http://www.sbcounty.gov/dph/dehs/Depts/EnvironmentalHealth/BusinessServices/safe_drinking_water.aspx**