1B. Groundwater Quality — Arsenic

Target: Drinking Water below the Maximum Contaminant Level (MCL)

About this indicator: Arsenic is one of three parameters selected as an indicator of groundwater quality due to its potential carcinogenic effects. The MCL for arsenic is 10 micrograms per liter (µg/L).

Influencing factors: Arsenic enters water supplies either from natural deposits in the earth or from industrial and/or agricultural pollution.

Target: Groundwater quality meets MCL drinking water quality standards (test results are below the MCL).

2010 Finding:
11 sites above MCL

Status: Eleven of the 95 sites sampled had arsenic levels above the drinking water standard (MCL of 10 µg/L). Twenty three sites had sample values between 5 to 10 µg/L. The remaining 61 locations had result values below 5 µg/L.

Maximum values for arsenic data collected for 95 (71 public water sources and 24 long-term monitoring sites) locations between 1990 and 2010 are represented in Figure 1. Maximum sample values for each site are shown in Figure 2.

Other Drinking Water Standards: The United States Environmental Protection Agency sets drinking water standards and MCL's for over 95 parameters including microorganisms, disinfectants & their byproducts, inorganic chemicals, organic chemicals and radionuclide's.

Review of the public drinking water source data for Group A water systems available from the Washington Department of Health Drinking Water Program from 2008 to 2010 found no value above the MCL for the other 92 regulated parameters.

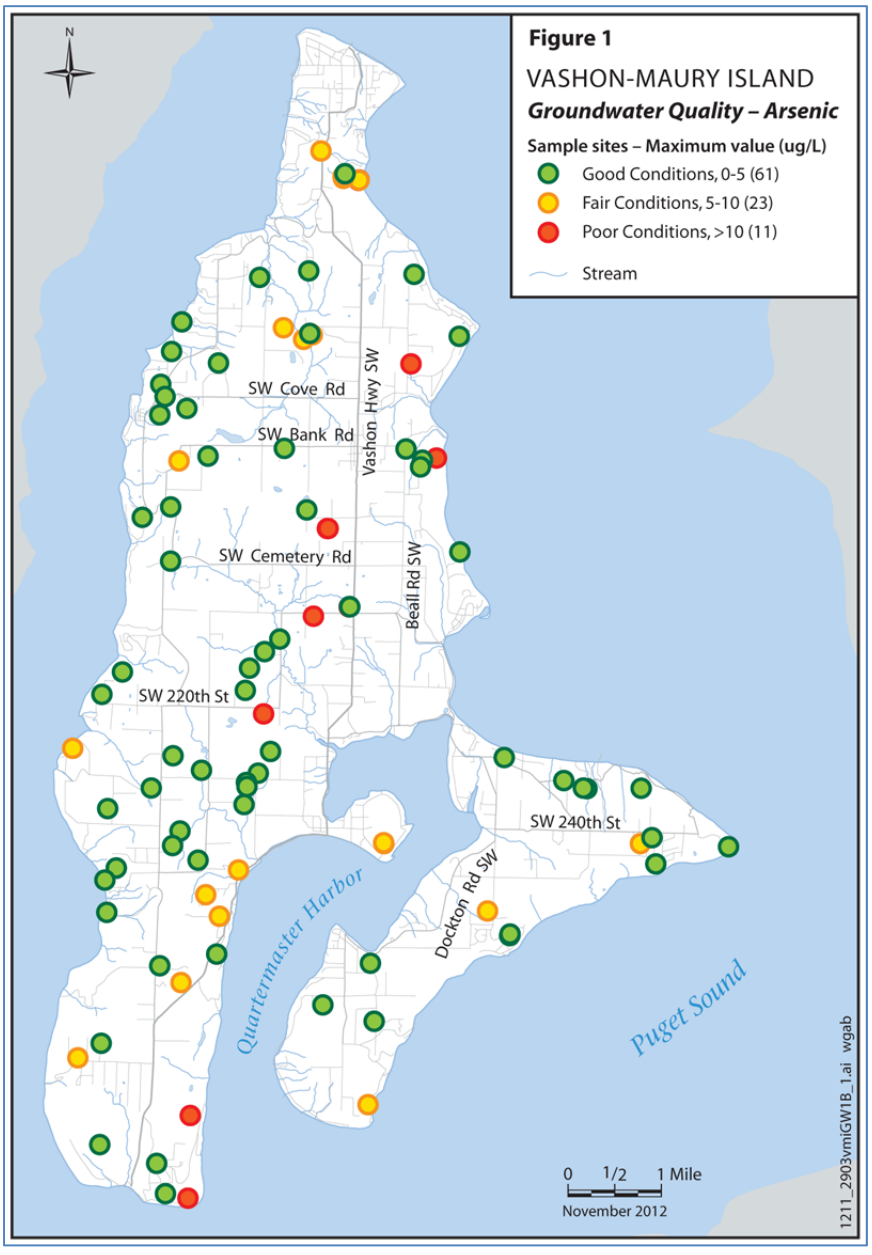


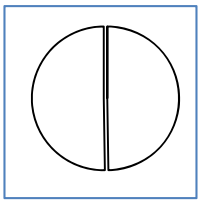
Figure 1. Maximum arsenic results from 1990 to 2010 for 95 locations. Eleven sample results are above the MCL of 10 µg/L. Twenty-three sites have results between 5 – 10 µg/L while the remaining 61 sites have result values below 5 µg/L.

Trend Target: For locations with more than 10 years of water quality samples, new data will be compared to the baseline period to evaluate changes through time. Water quality changes that would trigger further evaluation were defined in the Vashon-Maury Island Ground Water Management Plan management strategies as follows:

1. Any increase in the sampled contaminates level greater than 10% over the baseline for two or more years;
2. Any trend that increases from zero to one quarter of the MCL or reaches one half the MCL limit.

Trend Finding:

Reported arsenic data has too short a period of record to complete an analysis;



Trend Status: Baseline assessment was not done due to insufficient data. No site has more than 10 years of arsenic data. Sixteen sites have 10 years and two additional sites have eight years of data.

Recent Status: No apparent recent change in concentration in sites monitored on a regular basis, Figure 3.

Technical Notes: Arsenic in Groundwater

Data source: The data for this indicator comes from multiple sources including VMI water purveyors, King County WLRD Groundwater Protection Program, Public Health - Seattle & King County Drinking Water Program, and Washington State Department of Health Office of Drinking Water.

Collection frequency: King County has been monitoring arsenic concentrations annually on Vashon-Maury Island since 2001. Department of Health – local and state require arsenic testing of public water system sources.

Methods for analysis: Each result is compared to the drinking water standard. Baseline assessment was not done due to insufficient data. No site has more than 10 years of arsenic data. Sixteen sites have 10 years and two additional sites have eight years of data.

Data Quality and Reliability: The quality of data for this indicator is high and reliability is considered to be good though data reliability from the sources can and does vary. King County has monitored 30 locations for arsenic which is represents about 3% of the over 1000 wells on VMI. Department of Health reported arsenic data from 71 public water sources which are 35% of the island's 200 public water sources.

Data Gaps: Collection of historic monitoring data directly from the public water purveyors might expand the data set sufficiently to permit trend analysis for many of the 71 public water sources.

Data Reference:

King County - Water Resources Evaluation Project – Data Report 2005-2009.
http://www.kingcounty.gov/environment/waterandland/groundwater/management-areas/vashon-maury-island-gwma/vashon-island.aspx

Washington State Department of Health – Sentry - database of public water systems (1990-2010).
https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx

Washington Administrative Code (WAC) — 173-200 Water quality standards for groundwater

Nitrate (1A) and Chloride (1C) were selected for the other groundwater quality indicator parameters.

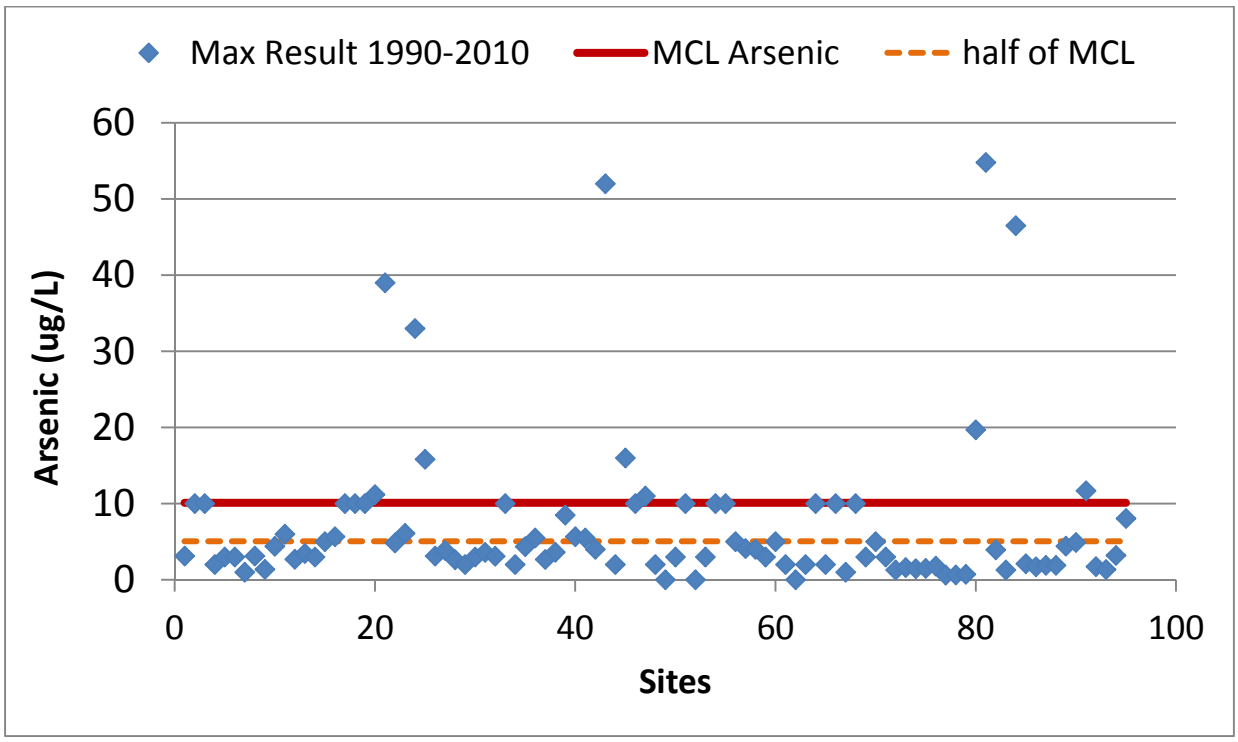


Figure 2. Maximum arsenic concentration for each site from 1990 to 2010. The maximum contaminant level (MCL) for arsenic is 10 µg/L. Eleven of 95 sites have maximum results over the MCL (above the solid red line). Twenty-three sites have data between the dashed line and solid line; sites shown as yellow circles in Figure 1.

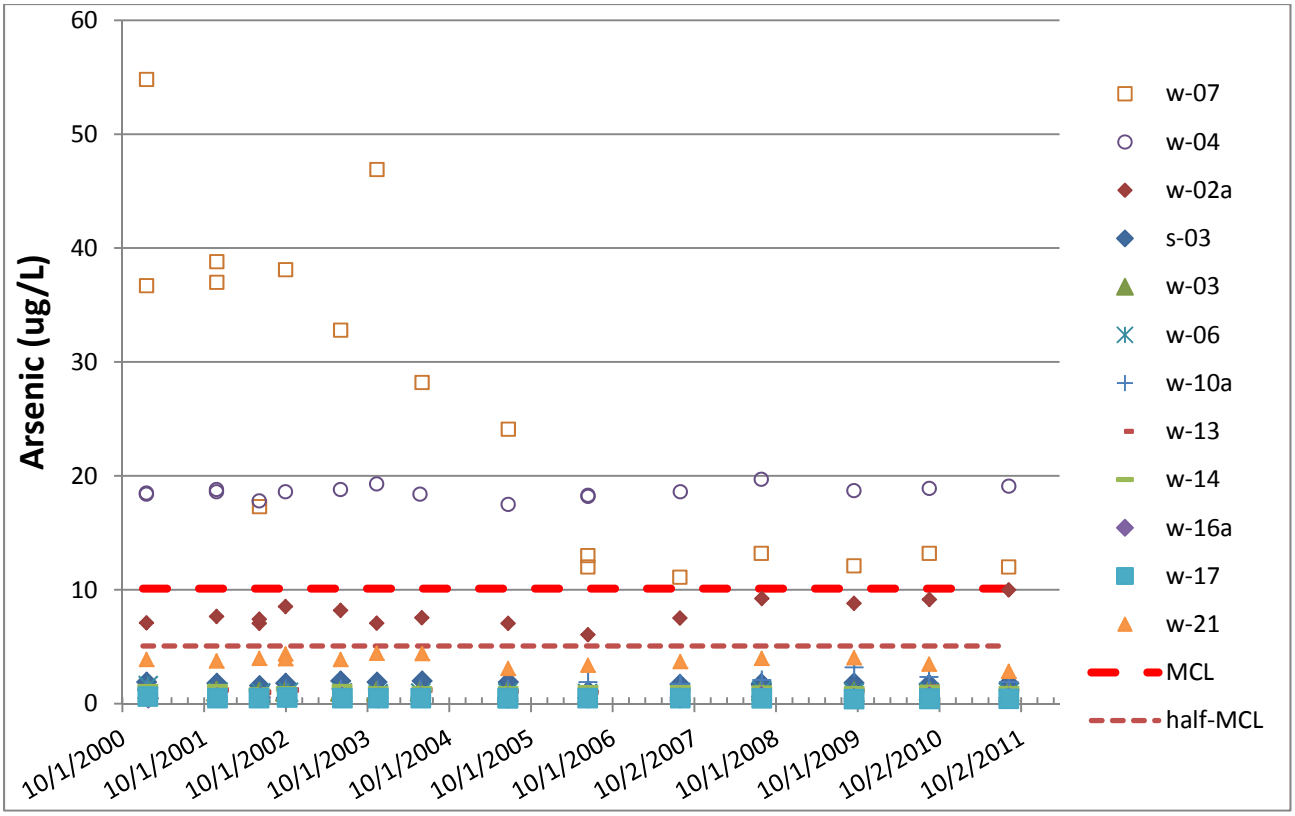


Figure 3. Arsenic concentration for 12 sites that will have baseline assessments done in near future after additional data is collected. The variability seen in site w-07 is likely a result of sampling techniques then environmental changes.

Legend

2010 Finding

Poor Conditions: Reported data are above Maximum Contaminant Level (MCL) and/or fails to meet the state standard or criteria for a given indicator; needs improvement.

Fair Conditions: On average, data fell between the standard or criteria for "poor" and "good" and may be variable.

Good Conditions: Reported data are below MCL and/or meet the state standard or criteria for a given indicator.

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No Annual Assessment

2001-2010 Status

Downward Trajectory: 2001-2010 data shows decreasing or worsening conditions

No Change: 2001-2010 data shows no change with time.

Upward Trajectory: 2001-2010 data indicate increasing or improving conditions

Insufficient Data: reported data has too few data points and/or too short a period