

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
Bureau of Environmental Health
250 Washington Street, Boston, MA 02108-4619
Phone: 617-624-5757 Fax: 617-624-5777
TTY: 617-624-5286

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lieutenant Governor

MARYLOU SUDDERS
Secretary

MONICA BHAREL, MD, MPH
Commissioner

Tel: 617-624-6000
www.mass.gov/dph

**Tritium in Groundwater Monitoring at
Pilgrim Nuclear Power Station, Plymouth, MA
January - June 2019**

This report provides data from the ongoing monitoring of tritium in groundwater and surface water at the Pilgrim Nuclear Power Station (PNPS) located in Plymouth, MA. The history of the investigation, which began in 2010, and previous update reports, are available online¹.

Summary

- Monitoring results for January-June 2019 indicate that tritium levels do not present a health risk.
- No detectable tritium was measured in either surface water samples or in 9 of 23 routinely sampled groundwater wells. Tritium levels in the other wells were detectable and, except for Monitoring Well (MW)-216, were either stable or tended to decrease over time.
- All measured levels of tritium in groundwater are less than the US EPA drinking water standard for tritium of 20,000 pCi/L.
- On May 31, 2019, PNPS was permanently shut down for decommissioning. At this time, there are no anticipated changes to the groundwater and surface water monitoring conducted at PNPS.

Background

Entergy collects samples at 23 groundwater wells and one surface water location on-site at PNPS. The sampling intervals for the first six months of 2019 ranged from weekly to quarterly, based on past monitoring results and analysis of possible tritium pathways in groundwater. Well and surface water samples were sent to an independent analytical lab, Teledyne, with duplicate (or "split") samples provided to the Massachusetts Department of Public Health (DPH) for analysis at the Massachusetts Environmental Radiation Lab (MERL). Entergy regularly reports the Teledyne results to DPH, the Massachusetts Emergency Management Agency (MEMA), and

¹ Previous PNPS Tritium in Groundwater Investigation Updates are available here:

<https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station>

the Nuclear Regulatory Commission (NRC). Summaries of both laboratory results are then provided on the DPH website².

Results are compared to a conservative, health-protective screening level of 3,000 picocuries per liter (pCi/L), which is 1/10th the NRC-approved level of 30,000 pCi/L of tritium in non-drinking water sources, as well as to the US Environmental Protection Agency (EPA) drinking water standard for tritium of 20,000 pCi/L. As the closest municipal drinking water wells are 2.5 miles from PNPS, municipal water is not expected to be impacted by the tritium on-site at PNPS.

On May 31, 2019, PNPS was permanently shut down for decommissioning. At this time, there are no anticipated changes to the groundwater and surface water monitoring conducted at PNPS. On-site activities by Holtec (the current PNPS owner) have continued to focus on identifying sources of tritium and monitoring for new sources. Staff from the DPH Bureau of Environmental Health continue to review new monitoring information and to maintain regular contact with MEMA, NRC, and Holtec.

Results and Discussion

Groundwater monitoring results for the first six months of 2019 showed stabilization or a reduction in tritium levels at most wells; there was no detectable tritium activity in surface water samples or in nine of the 23 on-site groundwater wells that are routinely monitored².

- Figure 1 shows sampling results in 2019 for three wells where tritium levels exceeded the screening level of 3,000 pCi/L (MW-209, MW-215, and MW-216) as well as historical results for wells of interest (MW-216, MW-218, and MW-219).
- Two of the wells at which tritium levels exceeded 3,000 pCi/L during the first six months of 2019, MW-209 and MW-215, are downgradient of MW-219, where tritium levels had previously exceeded the drinking water standard of 20,000 pCi/L. Thus, elevated tritium levels were not unexpected at these wells. Entergy believes that the lower levels of tritium observed in MW-215 compared to MW-209 can be attributed to the location of MW-215 at the boundary of the tritium plume.
- Elevated tritium levels in MW-216 are consistent with the historically cyclical pattern at this well.
- Tritium levels in MW-219, which had approached or exceeded the drinking water standard of 20,000 pCi/L for several months at the end of 2018, were approximately 1,000 pCi/L or less during the first six months of 2019. The return of tritium levels in MW-219 to their more historical levels is attributed to a repair to the feedwater check valve in the steam tunnel.

² Summary tables of groundwater and surface water monitoring results are on the DPH website: <https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station#summaries---results->

In January 2019, DPH received results for three flex wells (deep wells used for emergency cooling water) that were sampled by Entergy in December 2018. No tritium was identified above the minimum detectable concentration levels in the flex wells. Although these wells are not part of the routine tritium monitoring program, they provided additional perspective on deeper on-site groundwater tritium levels. These wells are discussed in the tritium update from May 2015³.

In February, the target sampling frequency at MW-211 and MW-219 was decreased from weekly to every third week. Target sampling frequency at MW-209 was increased from quarterly to every third week following detection of elevated tritium in March. The target sampling frequency at MW-215 was maintained at once every third week. The target sampling frequency for MW-206 is also every third week, due to its location in a preferential pathway of water from seismic gaps (i.e., separation joints between different parts of a building that allow independent movement during an earthquake). Tritium levels in this well were all non-detectable for the first six months of 2019.

³ <https://www.mass.gov/files/documents/2016/07/nr/pnps-update-05-12-15.pdf>

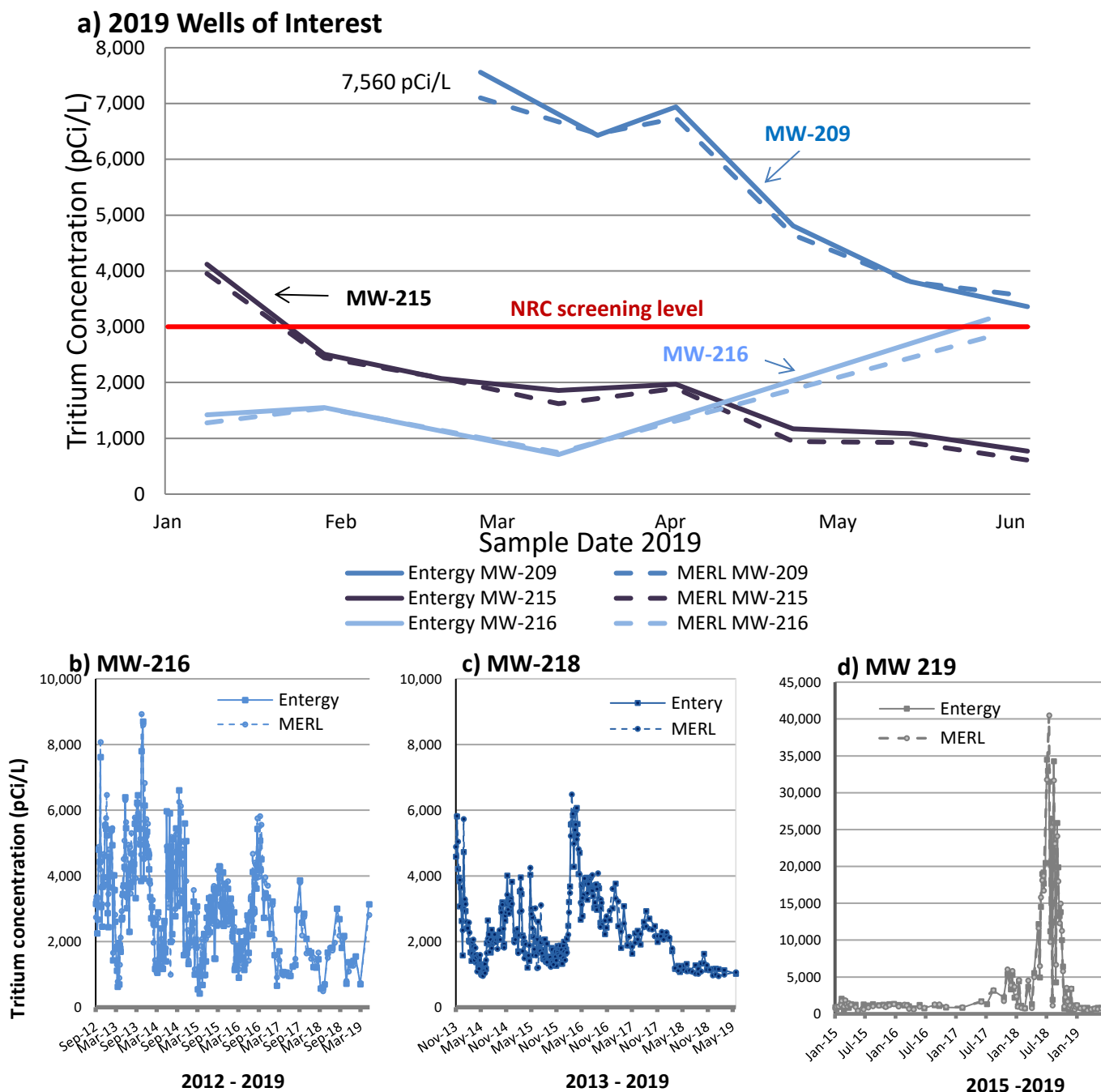


Figure 1. 2019 results for wells with tritium levels greater than 3,000 pCi/L and historical results for three wells of interest from tritium in groundwater samples collected from Pilgrim Nuclear Power Station (PNPS). Data are plotted separately based on PNPS operator (solid lines) or DPH (dotted lines) produced results. The solid red line at 3,000 pCi/L represents the screening level, which is 1/10th of the 30,000 pCi/L NRC level of concern. **a)** Results from samples collected from January through June 2019 for wells with tritium levels greater than 3,000 pCi/L (MW-209, MW-215 and MW-216) showing a maximum level of 7,560 on March 6, 2019 at MW-209. **b-d)** Historical monitoring results for MW-216, MW-218 and MW-219.

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