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MEMORANDUM

TO: Radiation Control Program
FROM: Environmental Toxicology Program
THRU: BEH Director; BEH Deputy Director
DATE: 10/26/15
SUBJECT: PNPS Tritium in Groundwater Investigation Update

PURPOSE

- This document describes the results of an on-going investigation of levels of tritium in groundwater and surface water at Pilgrim Nuclear Power Station (PNPS) in Plymouth, MA.
- A review of the most recent results from 2015 indicate a decrease or stabilization in the level of tritium in groundwater, as well as the absence of detectable levels of tritium in surface water.
- On-site efforts by the owner and operator of PNPS (Entergy) are focused on identifying the sources of tritium and monitoring for potential new sources.
- Staff from the MDPH Bureau of Environmental Health continue to review information obtained from the latest monitoring efforts and maintains regular contact with MEMA, NRC, and Entergy officials to discuss on-going investigation activities at PNPS.

INTRODUCTION

This document describes recent results associated with the ongoing investigation of tritium in groundwater and surface water at the Pilgrim Nuclear Power Station (PNPS) located in Plymouth, MA. The history of the tritium in groundwater investigation and previous investigation updates are available online[1].

Entergy collects samples at 23 groundwater monitoring wells and two surface water locations at weekly, monthly, and quarterly intervals. The sampling frequency is based on recent and historical trends of the potential groundwater sources of tritium. Once collected, Entergy sends the samples to an independent analytical lab, Teledyne Brown Engineering, Inc. (TBE), and provides a duplicate (or "split") sample to MDPH

[1] Previous PNPS Tritium in Groundwater Investigation Updates are available here: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/radiation/environmental-monitoring.html

for analysis at the Massachusetts Environmental Radiation Lab (MERL). Entergy reports the TBE results to MDPH, MEMA, and NRC officials.

Described here is an update on the results from both Entergy and MERL for sampling performed over the second and third quarters of 2015. These results are then compared to screening levels of 3,000 picocuries per liter (pCi/L), or 1/10th the NRC approved level of tritium in non-drinking water sources; as well as the US EPA drinking water standard for tritium of 20,000 pCi/L. This is a conservative, health-protective approach as the closest municipal drinking water wells are 2.5 miles from PNPS and are not expected to be impacted by on-site sources tritium.

RESULTS

Of the 23 on-site groundwater monitoring wells that are routinely monitored[2], two wells sampled during the 2nd and 3rd quarter of 2015 have levels of tritium detected above 3,000 picocuries per liter (pCi/L). No wells are above the 20,000 pCi/L Environmental Protection Agency (EPA) drinking water standard. Available data for the second and third quarters of 2015 indicate a decrease or continued stabilization in the levels of tritium in groundwater at PNPS in all monitoring wells, with the majority of testing results below the PNPS screening level of 3,000 pCi/L. Results for all groundwater wells monitored on a quarterly basis ranged from levels that are not detectable (~300 pCi/L), to approximately 1,000 pCi/L. No tritium has been detected in surface water samples collected during the 2nd or 3rd quarter of 2015.

DISCUSSION

The current monitoring results indicate a stabilization in the levels of tritium in groundwater at PNPS, with an overall decrease in tritium trends since the investigation began in 2010. The investigation is presently focused on tritium detected in wells MW-216 and MW-218.

Monitoring Well 216 appears to have cyclical fluctuations of tritium, with higher levels detected during October and early November of each year (Figure 1). Multiple potential sources of tritium are present upgradient of this well. In order to address a potential route of migration from the inside of the plant to groundwater, Entergy resealed an engineered “seismic gap” that bisects the Reactor Bay and Turbine building (Condenser Bay) during a scheduled maintenance outage in the spring of 2015. Subsequently, Entergy completed additional sealing and painting in other areas within the power block (e.g. Radwaste corridors). Condensed water from rooftop air conditioners has been previously identified as another potential groundwater source of tritium at MW-216 and at PNPS, consistent with observations at nuclear power plants in other states. However, an on-site evaluation of condensate water collected from AC units on the roof of the reactor building has yet to reveal detectable levels of tritium.

MDPH continues to monitor weekly results for MW-218 (located on the west side of the Power Block). Tritium levels in MW-218 have fluctuated between 962 pCi/L and 5,831 pCi/L since this well was installed in September 2013. This fall, Entergy worked with ERM to conduct pump tests of MW-218 with the stated goal of characterizing the groundwater flow at this well. Entergy has attributed the source of contamination in this

[2] Groundwater and surface water monitoring locations and summary tables for both quarters are available on the MDPH website: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/radiation/environmental-monitoring.html

well to residual tritium in subsurface soil that is up-gradient, and contaminated during a break in the neutralization sump discharge line in 2013.

Staff from the MDPH Bureau of Environmental Health will continue to review information obtained from the latest groundwater monitoring, and will maintain regular contact with MEMA, NRC, and Entergy to discuss on-going investigation activities at PNPS.

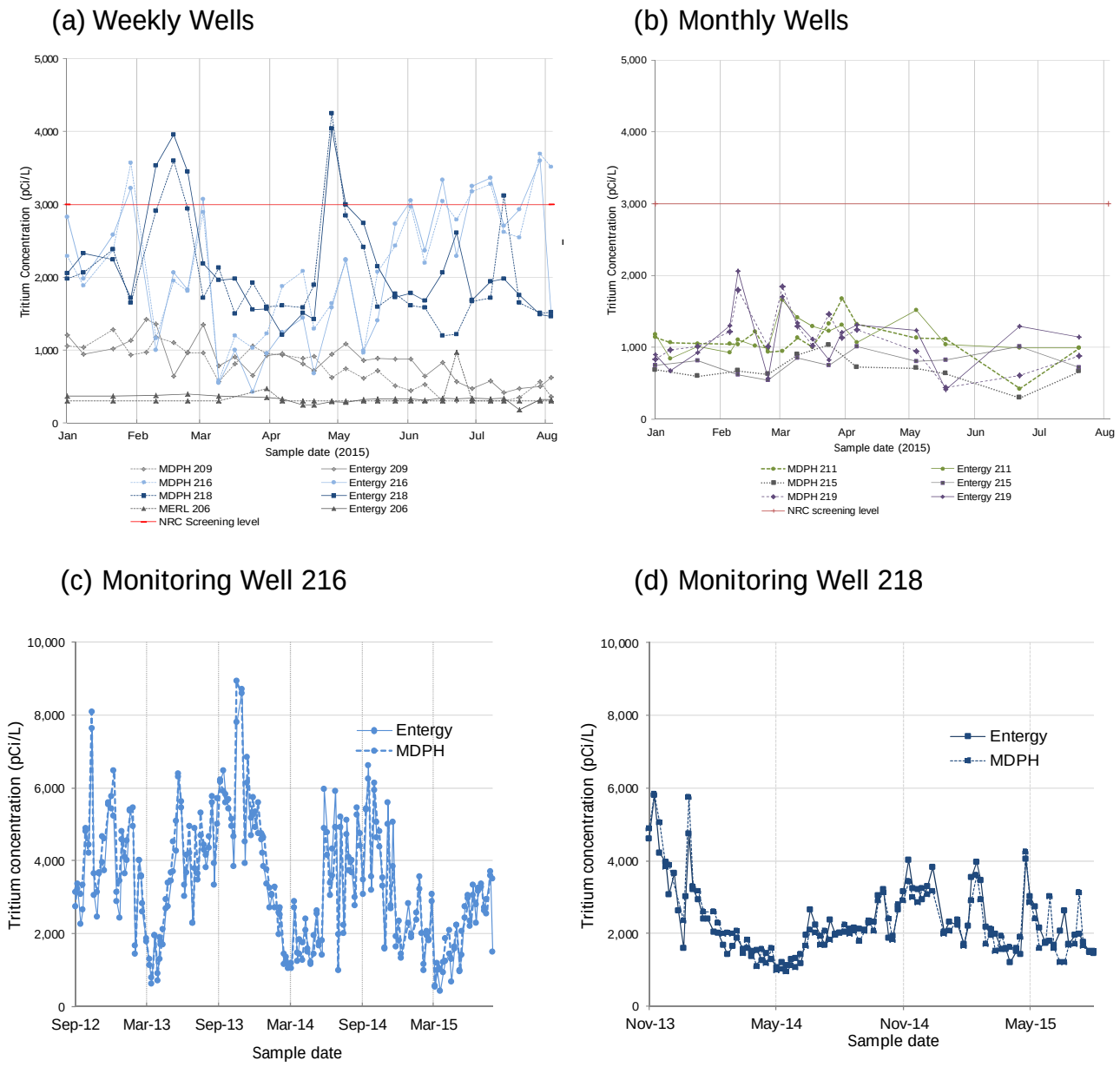

Figure 1. Current and historic analytical testing results from measuring tritium in groundwater samples collected from 4 weekly and 3 monthly monitoring wells (MW) at Pilgrim Nuclear Power Station (PNPS). Results for the 16 quarterly groundwater wells and 2 surface wells are not shown. Data are plotted separately based on PNPS operator (solid lines) or MDPH (dotted lines) produced results. The solid red line at 3000 pCi/L represents the screening level and represents 1/10th of the 30,000 pCi/L NRC determined level of concern. (a) Current results from weekly samples collected from January through July 2015 showing a maximum level of 4,247 on May 12, 2015; (b) Biweekly and monthly results from January through July 2015 (c) Historic monitoring results for MW-216 (d) Historic monitoring results for MW-218.