Issue/Title: Pilgrim Nuclear Power Station (PNPS): Tritium in Groundwater Monitoring Wells

Topic: PNPS Updates as of August 5, 2014

Previous Plans: Routine testing results from groundwater monitoring well samples collected during the weeks of May 12, 2014, and May 26, 2014 were reported by Entergy-GEL[1] pCi/L. Split sample results for the weeks of May 12, 2014 and May 26, 2014 were also reported by MERL. Recent results are described below and all available historical monitoring data through June 2, 2014 are also posted on MDPH's website at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/radiation/environmental-monitoring.html

Table 1[2]: Week of May 12th

Location	Date	MERL pCi/L	Entergy - GEL pCi/L
MW 201	5/12/2014	NDA(300)*	NDA(370)*
MW 202	5/12/2014	NDA(300)*	NDA(373)*
MW 202 I	5/12/2014	510	501
MW 203	5/12/2014	-	-
MW 204	5/12/2014	378	NDA(369)*
MW 205	5/12/2014	1,565	1,520
MW 206	5/12/2014	NDA(300)*	NDA(375)*
MW 207	5/12/2014	NDA(300)*	NDA(376)*
MW 208-S	5/12/2014	NDA(300)*	NDA(374)*
MW 208-I	5/12/2014	NDA(300)*	NDA(377)*
MW 209	5/12/2014	474	646
MW 210	5/12/2014	NDA(300)*	NDA(374)*
MW 211	5/12/2014	1,077	1,050
MW 212	5/12/2014	832	414
MW 213	5/12/2014	367	NDA(377)*
MW 214	5/12/2014	NDA(300)*	NDA(369)*
MW 215	5/12/2014	1,122	824
MW 216	5/12/2014	1,219	1,170
MW 217	5/12/2014	370	NDA(362)*
MW 218	5/12/2014	1,594	1,280
MW 219	5/12/2014	17,158	13,500
MW 3	5/19/2014	**	NDA(358)*
MW 4R	5/12/2014	542	NDA(373)*
SW-boat ramp	5/12/2014	NDA(300)*	NDA(368)*
SW-intake	5/12/2014	NDA(300)*	NDA(343)*

Table 2: Week of May 26th

Location	Date	MERL pCi/L	Entergy - GEL pCi/L
MW 201	6/2/2014	NDA(300)*	NDA(360)*
MW 202	5/26/2014	-	-
MW 202 I	5/26/2014	-	-
MW 203	5/26/2014	-	-
MW 204	5/26/2014	-	-
MW 205	5/26/2014	316	489
MW 206	5/26/2014	NDA(300)*	NDA(352)*
MW 207	5/26/2014	-	-
MW 208-S	5/26/2014	-	-
MW 208-I	5/26/2014	-	-
MW 209	5/26/2014	495	380
MW 210	5/26/2014	-	-
MW 211	5/26/2014	694	892
MW 212	5/26/2014	-	-
MW 213	5/26/2014	-	-
MW 214	5/26/2014	-	-
MW 215	5/26/2014	862	896
MW 216	5/26/2014	2,533	2,630
MW 217	5/26/2014	-	-
MW 218	5/26/2014	994	1,210
MW 219	5/26/2014	14,548	13,400
MW 3	5/26/2014	-	-
MW 4R	5/26/2014	-	-
SW-boat ramp	5/26/2014	-	-
SW-intake	5/26/2014	NDA(300)*	NDA(370)*

*** NDA = not detected at less than activity value listed**
**** Analysis pending**
- not analyzed this week

[1] Previous updates have reported the data from Entergy in the tables as "GEL". To enhance clarity in the presentation of results, the tables will now report Entergy results as "Entergy-GEL".

[2] PNPS screening level for tritium in groundwater monitoring wells is 3,000 pCi/L, which is 1/10th of the NRC-approved Pilgrim Offsite Dose Calculation Manual standard for tritium in non-drinking water sources. The EPA drinking water standard is 20,000 pCi/L. The nearest municipal drinking water wells are approximately 2.5 miles from the plant.

MW205 and MW206 Trends:

MW205 and MW206 have continued to indicate historically low tritium in groundwater results for the past six months. However, at the request of MDPH, weekly sampling of MW205 was initiated the week of January 27, 2014, in order to better monitor potential down-gradient migration of tritium in groundwater originating from the area of MW219 and catch basin 10 (CB-10) where higher tritium levels were detected in groundwater in December 2013.

MW205 Weekly Results:

Date*	Entergy - GEL Result (pCi/L)	MERL Result (pCi/L)
3/31/2014	502	825
4/7/2014	665	884
4/14/2014	656	NDA < 300
4/21/2014	645	NDA < 300
4/28/2014	745	477
5/5/2014	504	NDA < 300
5/12/2014	1,520	1,565
5/19/2014	951	474
5/26/2014	489	316
6/2/2014	602	NDA < 300

Entergy groundwater monitoring results for MW206 (sampled on a bi-weekly basis) showed no detectable tritium for the weeks of May 12th and May 26th. MERL split samples for the week of May 12th and May 26th also showed no detectable tritium.

New Wells Installed in Response to the Neutralization Sump Discharge Line Investigation (MW218 and MW219):

MW218 Results:

MW218 is being sampled weekly. As previously reported, the elevated tritium levels detected in MW218 are believed to be attributed to the separation in the neutralization sump discharge line discovered in April 2013, which is located up-gradient from this well.

MW218 Weekly Results

Date*	Entergy - GEL Result (pCi/L)	MERL Result (pCi/L)
3/31/2014	1,550	1,441
4/7/2014	1,600	1,814
4/14/2014	1,380	1,518
4/21/2014	1,530	1,091
4/28/2014	1,250	1,565
5/5/2014	1,440	1,180
5/12/2014	1,280	1,594
5/19/2014	1,070	982
5/26/2014	1,210	994
6/2/2014	1,120	962

MW219 Results:

MW219 is being sampled weekly. As previously reported, CB-10 is being further investigated and is the likely source of the elevated tritium in this well.

MW219 Weekly Results

Date*	Entergy - GEL Result (pCi/L)	MERL Result (pCi/L)
3/31/2014	1,720	1,503
4/7/2014	1,720	1,738
4/14/2014	3,580	4,418
4/21/2014	3,810	3,894
4/28/2014	5,670	6,274
5/5/2014	5,730	6,107
5/12/2014	13,500	17,158
5/19/2014	9,200	10,705
5/26/2014	13,400	14,548
6/2/2014	14,400	15,762

Tritium results for samples collected from MW219 for the period March through April 2014 are similar to recent historical levels in this well, e.g., ranging from about 1,720 pCi/L to 8,790 pCi/L. In May and June, levels increased to a range of 9,200 pCi/L to 14,400 pCi/L, indicating some change in potential source(s) of tritium to MW219. Entergy reported that paving activities in the area of CB-10 occurred in late April, and as a result, there has been increased surface water runoff into CB-10. Entergy therefore believes that this increased water runoff into CB-10 may be flushing residual tritium in soil down into the underlying groundwater, which in turn has impacted MW219. This theory will be further evaluated as part of Entergy's planned inspection of CB10 this summer. Entergy also reported that although a tritiated discharge occurred the week of May 5th to facilitate inspection of the neutralization sump pit, this discharge completely by-passed any underground pipes, including CB-10, in a modified permitted discharge path to the discharge canal. MDPH will continue to monitor results for MW219 and other down-gradient wells closely.

MW4R Results:

MW4R, previously sampled weekly, has consistently showed either no detected tritium or tritium slightly above the detection limit. Entergy reports that it has been placed back on a quarterly sampling schedule. The latest quarterly sample was collected during the week of May 12th and Entergy results indicated that no tritium was detected. MERL split sample results for MW4R for the week of May 12th show 542 pCi/L of tritium was detected.

Other Wells Sampled on a Weekly Basis:

MW209 and MW211 are down-gradient of the area of the neutralization sump discharge line separation and are also currently being sampled weekly.

Weekly sampling results from Entergy for MW209 for the weeks of May 12th, May 19th, May 26th, and June 2nd indicated 646 pCi/L, 727 pCi/L, 380 pCi/L, and 697 pCi/L of tritium detected, respectively. MERL split sample results for MW209 for the weeks of May 12th, May 19th, May 26th, and June 2nd were generally consistent with Entergy results.

Weekly sampling results from Entergy for MW211 for the weeks of May 12th, May 19th, May 26th, and June 2nd indicated 1,050 pCi/L, 1,070 pCi/L, 892 pCi/L, and 852 pCi/L of tritium detected, respectively. MERL split sample results for MW211 for the weeks of May 12th, May 19th, May 26th, and June 2nd were generally consistent with Entergy results.

MW216 is located just down-gradient from the end of the deep foundation on the northeast corner of the turbine and reactor buildings. Weekly sampling results from Entergy for MW216 for the weeks of May 12th, May 19th, May 26th, and June 2nd indicated 1,170 pCi/L, 1,940 pCi/L, 2,630 pCi/L, and 1,680 pCi/L of tritium detected, respectively. MERL split sample results for MW216 for the weeks of May 12th, May 19th, May 26th, and June 2nd were generally consistent with Entergy results.

Other Wells Sampled on a Bi-Weekly Basis:

Entergy results for MW201 and MW215 sampled during the weeks of May 12th and May 26th were within their typical ranges since sampling began. MERL split sample results for the weeks of May 12th and May 26th were generally consistent with Entergy results.

Wells Sampled on a Quarterly Basis:

The week of May 12th was also a comprehensive sampling round, which included monitoring wells MW202, MW202I, MW204, MW207, MW208, MW208I, MW210, MW212, MW213, MW214, MW217, and MW3. Entergy results for these wells showed no-detectable tritium or tritium just above the limits of detection (which ranged from 369 to 377 pCi//L), and the Entergy sample for MW3 is currently being analyzed by their contract laboratory. It should be noted that MW202I, which showed a slight tritium elevation on the last quarterly result, and prompted additional sampling, returned to just above detection (501 pCi/L). MERL split samples for the week of May 12th were generally consistent with Entergy results.

Surface Water Results:

As previously noted, no tritium has been detected in any surface water sample taken as part of the tritium in groundwater investigation since sampling began in 2010. Since the discovery of elevated tritium in MW219, both Entergy and MERL have expedited analysis of surface water samples at the location downstream of MW205.

Surface Water Downstream of MW205 Weekly Results

Date*	Entergy - GEL Result (pCi/L)	MERL Result (pCi/L)
3/31/2014	NDA < 367	NDA < 300
4/7/2014	NDA < 353	NDA < 300
4/14/2014	NDA < 332	NDA < 300
4/21/2014	NDA < 352	NDA < 300
4/28/2014	NDA < 316	NDA < 300
5/5/2014	NDA < 317	NDA < 300
5/12/2014	NDA < 343	NDA < 300
5/19/2014	NDA < 364	NDA < 300
5/26/2014	NDA < 370	NDA < 300
6/2/2014	NDA < 345	NDA < 300

The week of May 12th was also a comprehensive round and Entergy surface water results for the boat ramp area indicated no detectable tritium. MERL split surface water samples for the boat ramp area also indicated no detectable tritium.

Investigation Plans:

MDPH met with Entergy, MEMA, MassDEP, and NRC staff on June 2, 2014, to review the latest data and discuss Entergy's planned and ongoing investigation activities, which include the following:

- Investigation and evaluation of the appendix R duct bank, which is the electrical duct bank that exits the reactor building auxiliary bay near the neutralization sump discharge line. Water discovered in the vicinity of an electrical junction box in the reactor building auxiliary bay that connects to the Appendix R duct bank was one of the observations that led to the discovery of the neutralization sump discharge line separation in spring 2013;
- Investigation of the neutralization sump discharge sump pit;
- Further characterization of subsurface soil contamination in the area of the neutralization sump discharge line separation –specifically collection of soil

samples below the pipe and down to the water table, expected to be initiated in August.

- Inspection, investigation, cleaning, and sealing of CB-10 and CB-11 (another catch basin on the permitted discharge pathway), expected to be initiated in August;
- Determination of a final plan to replace the neutralization discharge line;
- Investigation of potential sources of tritium in MW216 including - an investigation of Junction Box 3 (JB-3), a catch basin in the area of MW216 that accepts roof drain runoff (expected to occur in August), a precipitation study to determine the role of tritium washout, an evaluation of the conductivity and dissolved oxygen in MW216, and an evaluation of water migration from inside the plant to groundwater via seismic gaps[3] between the reactor and turbine building;
- Evaluation of the frequency of groundwater monitoring well sampling going forward.

Looking Forward:

MDPH plans to have staff observe investigation activities expected to occur in August.

MDPH will continue to closely follow all investigational activities that are currently underway at PNPS, notably MW219 and MW216 results, and detailed investigation activities/plans.

[3] "Seismic gaps" are engineered spaces between two foundations that allow them to move independently in a seismic event.