



# CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT  
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

August 9, 2007  
CY 07-109

Docket No. 50-213

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555-001

Haddam Neck Plant  
Radionuclide Concentration Data Related to the EPA/NRC  
Memorandum of Understanding (MOU)

The purpose of this letter is to provide radionuclide concentration data that can be used to evaluate the conditions at the Haddam Neck Plant (HNP) in relation to the consultation trigger concentration values contained in the EPA/NRC MOU<sup>1</sup>. This information supersedes that contained in a letter to NRC dated June 6, 2007 so as to reflect additional groundwater sample data from sampling conducted in June of 2007.

All remediation and Final Status Survey activities have been completed at the HNP and CYAPCO has requested release of all areas outside of the Independent Spent Fuel Storage Installation (ISFSI) from the NRC license<sup>2</sup>. The final round of groundwater monitoring well sampling took place in early June of this year to complete the requirements of the HNP License Termination Plan (LTP). Beginning in June of 2007, at least four (4) years of groundwater monitoring will be conducted in compliance with CYAPCO's commitment to the State of Connecticut Department of Environmental Protection (CT DEP) Remediation Standards Regulations (RSRs). The compliance criteria under the CT DEP RSRs are:

- For groundwater to meet the EPA Maximum Contaminant Levels (MCLs); and
- For soil to meet the concentrations corresponding to a total effective whole body dose equivalent (TEDE) to a postulated future resident of 19 mrem/yr (adjusted downward to account for any TEDE dose due to groundwater contamination either existing or from future releases from subsurface concrete).

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<sup>1</sup> Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, dated October 2, 2002

<sup>2</sup> Letter of Intent Concerning the Phased Release of Land from the Part 50 License, CY-07-079, dated July 31, 2007.

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To correspond to the time for evaluation of radionuclide concentrations called for in the MOU which is the time of request of removal of site areas from the NRC license, the attached evaluation compares the radionuclide concentrations present in soil and groundwater to the consultation trigger concentrations contained in the EPA/NRC MOU.

In summary, for all survey units at the HNP, the average concentrations of soil and groundwater present in these areas at this time are below the trigger concentrations given in the EPA/NRC MOU. CYAPCO has requested release of the non-ISFSI areas of the Haddam Neck Plant site from the NRC license by separate correspondence.

If you should have any questions regarding this submittal, please contact me at (860) 573-5523.

Sincerely,

Gerard van Noordennen      8-9-07  
Gerard van Noordennen      Date  
Director, Regulatory Affairs and Quality Assurance

Attachment: Evaluation of Soil and Groundwater Concentrations Concerning the  
NRC/EPA MOU

cc: S. J. Collins, NRC Region 1 Administrator  
T. Smith, NRC Project Manager  
L. Kauffman, NRC Region 1  
E. L. Wilds, Jr., Director, Radiation Division, CT DEP  
E. Waterman, EPA Region 1

Attachment 1

Haddam Neck Plant

Evaluation of Soil and Groundwater Concentrations Concerning the  
NRC/EPA MOU

August 2007

## Evaluation of Soil and Groundwater Concentrations Concerning the NRC/EPA MOU

### 1. Background:

The EPA/NRC MOU (Reference 3.1) contains certain radionuclide concentrations against which the average concentrations present at a NRC licensed site at the time of license termination are to be evaluated. These concentrations are for soil and groundwater. The following provides a summary of the actual concentrations for these media at the Haddam Neck Plant (HNP).

### 2. Evaluations

#### 2.1 Soil:

Table 1 of the MOU (Reference 3.1) presents "Consultation Triggers for Residential and Commercial/Industrial Soil Contamination". As CYAPCO is seeking unrestricted release for the non-ISFSI areas of the HNP, the "Residential" values (Reference 3.1, Table 1, Column 2) are appropriate for comparison to the actual concentrations at the HNP. The MOU concentrations listed in Reference 3.1 for the radionuclides of concern at the HNP are shown in the second column of Table 1 of this attachment. The HNP License Termination Plan (LTP) (Reference 3.2) determined a conservative list of radionuclides known to be or potentially present at the HNP. The HNP final status survey activities have been performed to evaluate these radionuclides of concern. Therefore, only the radionuclides in the MOU that correspond to the HNP LTP list of radionuclides are shown in Table 1. Figure 1 shows the Monitoring Wells and Final Status Survey Areas in the Industrial Area and vicinity at the Haddam Neck Plant site.

The values in the third column of Table 1 are the maximum average concentrations allowed by survey design in any survey unit at the HNP that has passed its Final Status Survey (FSS). As all areas for which CYAPCO is seeking release from the NRC license have passed their FSS, it is known that no survey unit has an average concentration above these values. In fact, the average concentrations in all the survey units at HNP have been shown to be well below the values in the third column of Table 1. The Highest Average Sum of the Fraction Dose is 6.91 mrem/yr or 36.4 percent of the design dose or 37.1 % of the MOU trigger values for Survey Unit 9527-0006. Therefore, if the values in column three of Table 1 are below those in column 2, no further evaluation regarding the consultation trigger values is required for these radionuclides. This is the case for all radionuclides except H-3, Nb-94, Cs-137, Eu-152 and Eu-154 (values shown in bold in Table 1).

Concerning these five radionuclides, the maximum single sample tritium value detected in a FSS sample was 46.9 pCi/g (Discharge Canal Survey Unit 9106-0009), which is only 21% of the trigger concentration of 228 pCi/g. Similarly, Nb-94, Eu-152 and Eu-154 were positively detected at levels below 5% of the values in Column 3 of Table 1. Thus any Nb-94, Eu-152 and Eu-154 remaining in the site soils are no more than 30% of the NRC/EPA MOU trigger levels. Given that the highest average Cs-137 in a survey unit is 37.1 % of the MOU trigger values, it can be seen that even if all the worst case values for H-3, Nb-94, Eu-152, Eu-154 and the worst case average concentration for Cs-137 were present in the same survey unit, the sum of the fractions of the MOU trigger values would not exceed 1.

Table 1

Comparison of Maximum Allowable Average CY Soil Concentrations to MOU Trigger Concentrations

Radionuclide	EPA/NRC MOU Consultation Triggers for Residential Soil Contamination (pCi/g)	Maximum Average Soil Concentration Allowed by Final Status Survey Design at CY (pCi/g)
<b>H-3</b>	<b>228</b>	<b>313</b>
C-14	46	4.3
Mn-54	69	13.2
Fe-55	269,000	20,800
Co-60	4	2.9
Ni-63	9,480	549
Sr-90 + Daughter Radionuclides	23	1.18
<b>Nb-94</b>	<b>2</b>	<b>5.41</b>
Tc-99	25	9.58
Cs-134	16	3.55
<b>Cs-137 + Daughter Radionuclides</b>	<b>6</b>	<b>6.01</b>
<b>Eu-152</b>	<b>4</b>	<b>7.68</b>
<b>Eu-154</b>	<b>5</b>	<b>7.06</b>
Pu-238	297	22.5
Pu-239	259	20.3
Pu-241	40,600	661
Am-241	187	19.6
Cm-243	35	22

The average concentrations of all samples in each survey unit at the HNP are below the trigger concentrations listed in Table 1, Column 2 of the EPA/NRC MOU. Based

on actual measurement of average soil concentrations in individual survey units, the sum of the fractions for all the radionuclides in the survey units is below a value of one, indicating the MOU trigger for soil is not exceeded.

## **2.2 Groundwater**

The EPA/NRC MOU also has consultation trigger values for radionuclides in groundwater. These trigger concentrations correspond to the EPA Maximum Contaminant Levels (MCLs) for drinking water. CYAPCO has reported (Reference 3.4) that three radionuclides of concern are being detected in groundwater at the HNP. These three radionuclides are H-3, Sr-90 and Cs-137.

As discussed above, the MOU calls for a comparison at the time of license termination of the actual measurement groundwater concentrations to the MCLs. As CYAPCO is, at this time, requesting release of the non-ISFSI area from the NRC license, comparing to the current concentrations is appropriate.

CYAPCO has determined (Reference 3.3) that the capture zone of influence for the water supply well of the potential future resident of the HNP is 100 meters. For this evaluation, the most recent actual groundwater concentrations of detected substances of concern (i.e., H-3, Sr-90, Cs-137), as reported in Reference 3.4 in the one well exhibiting exceedance of the MCL sum-of-fractions, were averaged with other wells within a 100-meter capture zone radius (see Reference 3.3).

The results of the June 2007 sample round are shown in Table 2. Only one monitoring well exhibited a sum of the MCL fractions greater than one. This well is MW-125 with Total MCL Fraction of 1.35. Table 2 shows the MCL fractions for each well that correspond to the June 2007 groundwater concentrations. Table 2 also shows the average for the MCL fractions for the wells within the assumed 100 meter capture zone of MW-125. Figure 2 shows the wells within the capture zone of MW-125. Please note that monitoring well MW-AST-5, MW-139 and MW-140 shown in Figure 2, are being used for non-radiological substance of concern monitoring or are not part of the monitoring well network being used for compliance with NRC requirements and are therefore not a part of the wells considered for compliance with the LTP. As all other wells at the HNP are below a total MCL fraction of 1, no analysis for wells other than MW-125 is needed.

As can be seen in Table 2, a number of well locations that are in the capture zone of the two wells analyzed are multi-zone or shallow and deep wells at the same location. For conservatism where this situation exists, only the highest concentrations from a zone of the multi-zone well or from one of the wells for a well pair were used. The values used in the calculation are in bold and italics in Table 2. The results of the calculation in Table 2 are that the Total Average MCL Fraction for a well within the capture zone of MW-125 is 0.37. This total fraction is well below the MOU trigger of a Total MCL Fraction of 1 using the Sum of the Fraction methodology.

Table 2 Comparison of Monitoring Well Concentrations to the MCL

Well ID	Radio-nuclide	MCL Concentration (pCi/L)	June 2007 Concentration (pCi/L)	H-3 MCL Fraction for Wells in Capture Zone of MW-125	Sr-90 MCL Fraction for Wells in Capture Zone of MW-125	Cs-137 MCL Fraction for Wells in Capture Zone of MW-125
AT-1	All		<MDC			
MW-100D	All		<MDC			
MW-100S	All		<MDC			
MW-101D	All		<MDC			
MW-101S	All		<MDC			
MW-102D	H-3	20000	1360			
MW-102S	All		<MDC			
MW-103A	H-3	20000	1180			
MW-103B	H-3	20000	1410			
MW-103D	H-3	20000	434			
MW-103S	H-3	20000	1250			
MW-105D	H-3	20000	1340	<b>0.07</b>	<b>0</b>	<b>0</b>
MW-105S	H-3	20000	999	0.05	0	0
MW-106D	H-3	20000	1050	0.05	0	0
MW-106S	H-3	20000	809	<b>0.04</b>		<b>0</b>
	Sr-90	8	3.23		<b>0.40</b>	
MW-107D	H-3	20000	2190	<b>0.11</b>	<b>0</b>	<b>0</b>
MW-107S	H-3	20000	597	0.03	0	0
MW-108	All		<MDC			
MW-109D	H-3	20000	1760			
MW-109S	H-3	20000	1420			
	Sr-90	8	1.37			
MW-110D	H-3	20000	4910	<b>0.25</b>	<b>0</b>	<b>0</b>
MW-110S	H-3	20000	920	0.05	0	0
MW-112	All		<MDC			
MW-113	All		<MDC			
MW-117	All		<MDC			
MW-118A-3	H-3	20000	3350	0.17	0	0
MW-118A-4	H-3	20000	2780	0.14	0	0
MW-118A-5	H-3	20000	2780	<b>0.14</b>		<b>0</b>
	Sr-90	8	2.94		<b>0.37</b>	
MW-119-2	H-3	20000	1050	0.05	0	0
MW-119-4	H-3	20000	732	0.04	0	0
MW-119-5	H-3	20000	10900	0.55	0	0

Table 2 Comparison of Monitoring Well Concentrations to the MCL (continued)

Well ID	Radio-nuclide	MCL Concentration (pCi/L)	June 2007 Concentration (pCi/L)	H-3 MCL Fraction for Wells in Capture Zone of MW-125	Sr-90 MCL Fraction for Wells in Capture Zone of MW-125	Cs-137 MCL Fraction for Wells in Capture Zone of MW-125
MW-119-6	H-3	20000	14000	0.70	0	0
MW-120-1	All		<MDC			
MW-120-2	All		<MDC			
MW-120-3	All		<MDC			
MW-120-4	H-3	20000	1740			
MW-120-5	H-3	20000	1120			
MW-121A-2	All		<MDC	0	0	0
MW-121A-3	H-3	20000	518	0.03	0	0
MW-121A-4	H-3	20000	5170	0.26	0	0
MW-121A-5	H-3	20000	839	0.04	0	0
MW-122D	All	20000	516	0.03	0	0
MW-122S	H-3	20000	3040	0.15	0	0
MW-123	All		<MDC			
MW-124	H-3	20000	615			
	Sr-90	8	2.18			
MW-125	H-3	20000	3270	0.16		0
	Sr-90	8	9.52		1.19	
MW-130	H-3	20,000	677			
	Sr-90	8	1.64			
MW-131D	H-3	20,000	438			
	Sr-90	8	1.44			
MW-131S	H-3	20,000	430			
	Sr-90	8	1.73			
MW-132D	All		<MDC	0	0	0
MW-132S	All		<MDC	0	0	0
MW-133	H-3	20,000	533	0.03	0	0
MW-134	H-3	20,000	1120	0.06	0	0
MW-135	All		<MDC			
MW-136D	H-3	20,000	535			
MW-136S	H-3	20,000	667			
MW-137	H-3	20,000	3920	0.20		
	Sr-90	8	4.41		0.55	
	Cs-137	200	23.9			0.12



Table 2 Comparison of Monitoring Well Concentrations to the MCL (continued)

Well ID	Radio-nuclide	MCL Concentration (pCi/L)	June 2007 Concentration (pCi/L)	H-3 MCL Fraction for Wells in Capture Zone of MW-125	Sr-90 MCL Fraction for Wells in Capture Zone of MW-125	Cs-137 MCL Fraction for Wells in Capture Zone of MW-125
MW-138	All		<MDC			
MW-508D	All		<MDC			
MW-508S	All		<MDC			
Average MCL Fraction for Each Radionuclide				0.17	0.19	0.01
<b>Notes:</b> pCi/L - pico curies per liter MDC - Minimum Detectable Concentration				Total Average MCL Fraction for Wells in Capture Zone of MW-125		0.37

### 2.3 Summary

CYAPCO is requesting release of the non-ISFSI areas of the Haddam Neck Plant site from the NRC license. The preceding analysis shows that the actual concentrations of soil (i.e., average within survey units) and groundwater (i.e., average concentrations within a capture zone) present in these areas after completion of remediation and Final Status Surveys are below the trigger concentrations given in the EPA/NRC MOU.

### 3.0 References

- 3.1 Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, dated October 2, 2002.
- 3.2 Letter, CY-07-031, dated February 2, 2007, Haddam Neck Plant License Termination Plan, Revision 5.
- 3.3 Letter, CY-05-022, dated January 31, 2005, License Termination Plan Supplemental Information – Survey Areas Potentially Affected by Groundwater Contamination and Capture Zone Analysis.

- 3.4 Letter, CY-07-107, dated July 19, 2007, License Termination Plan (LTP) Groundwater Compliance Summary Report and June 2007 Data Summary Memorandum.

#### **4.0 Attachments**

Figure 1 – Monitoring Wells and Final Status Survey Areas

Figure 2 – Capture Zone Around MW-12







