

May 20, 2010

Mr. Michael Colomb
Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
185 Old Ferry Road
P.O. Box 500
Brattleboro, VT 05302-0500

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION – GROUND WATER
MONITORING INSPECTION REPORT 05000271/2010006

Dear Mr. Colomb:

On April 14, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a ground water monitoring inspection at the Vermont Yankee Nuclear Power Station. The enclosed inspection report documents the results of our inspection. The preliminary inspection results were discussed with Mr. N. Rademacher, Engineering Director, and other members of your staff, on April 14, 2010, and documented in a letter to you dated April 16, 2010. This inspection was conducted from January 25 to April 14, 2010, to assess your performance relative to the discovery of onsite ground water contamination, which was reported to the NRC on January 7, 2010. This included a review of your actions to identify and terminate the source of the leak, perform a ground water characterization based on site-specific measurements, and perform required radioactive effluent release and dose assessment calculations to determine the health and environmental impact implications. This inspection was conducted in accordance with NRC Inspection Procedure 71153, "Follow-up of Events and Notices of Enforcement Discretion." In addition, the inspectors reviewed your implementation of the Nuclear Energy Institute (NEI) 07-07, "Ground Water Protection Initiative (GPI)," in accordance with NRC Temporary Instruction (TI) 2515/173, "Review of the Implementation of the Industry Ground Water Protection Voluntary Initiative" to determine the appropriateness of your actions in response to the industry recommendations.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection involved field walkdowns, examination of selected procedures, calculations and records, and interviews with station personnel.

Based on the results of this inspection, the NRC determined that Entergy-Vermont Yankee (ENVY) appropriately evaluated the contaminated ground water with respect to off-site effluent release limits and the resulting radiological impact to public health and safety; and that ENVY complied with all applicable regulatory requirements and standards pertaining to radiological effluent monitoring, dose assessment, and radiological evaluation. No violations of NRC requirements or findings of significance were identified.

Regarding the NRC review of your GPI program, the NRC determined that, as of the end of 2009, ENVY had completed certain essential elements of the voluntary GPI, including the

establishment of three perimeter wells situated to detect contaminated ground water that could potentially flow to the Connecticut River. The results of a November 2009 ground water sample from one of these wells - GZ-3 - confirmed (in January 2010) the presence of tritium-contaminated ground water onsite. Although the perimeter wells were instrumental in identifying the recent leak and related groundwater contamination, some voluntary aspects of the GPI had not been completed within the timeframe specified by the industry initiative. These are described in detail in the enclosed inspection report.

By mid-February, ENVY identified and terminated the leak of tritiated water from an underground pipe tunnel associated with the Advanced Off-Gas (AOG) system. Although several corrective actions have been initiated by ENVY to address circumstances which contributed to the groundwater contamination, a formal root cause analysis (RCA) for this matter had not been completed by the end of the inspection. Upon ENVY's completion of its RCA, the NRC will review it to determine the appropriateness of your root cause determination, including any related corrective actions to preclude recurrence. This will be done in a separate inspection activity which will be documented in a subsequent inspection report.

In a related matter, NRC received your 2009 Radioactive Effluent Release Report dated May 12, 2010. This report documents the initial phase of the release that occurred in 2009. NRC plans to review your report as part of our normal radioactive effluents inspection scheduled for later this year.

As you are also aware, the NRC has established a Task Force to re-evaluate the current policies and threshold for response to ground water contamination incidents. Lessons learned from Vermont Yankee, including concerns raised at an April 19, 2010, public meeting in Brattleboro, Vermont, will be incorporated into the Task Force's evaluation, which will be documented in a report to be issued later this spring.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for the public inspection in the NRC Public Docket Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Darrell J. Roberts, Director
Division of Reactor Safety

Docket No. 50-271
License No. DPR-28

Enclosures: Inspection Report 05000271/2010006
w/Attachments: Supplemental Information

cc w/ encls.: Distribution via ListServ

potentially flow to the Connecticut River. The results of a November 2009 ground water sample from one of these wells - GZ-3 - confirmed (in January 2010) the presence of tritium-contaminated ground water onsite. Although the perimeter wells were instrumental in identifying the recent leak and related groundwater contamination, some voluntary aspects of the GPI had not been completed within the timeframe specified by the industry initiative. These are described in detail in the enclosed inspection report.

By mid-February, ENVY identified and terminated the leak of tritiated water from an underground pipe tunnel associated with the Advanced Off-Gas (AOG) system. Although several corrective actions have been initiated by ENVY to address circumstances which contributed to the groundwater contamination, a formal root cause analysis (RCA) for this matter had not been completed by the end of the inspection. Upon ENVY's completion of its RCA, the NRC will review it to determine the appropriateness of your root cause determination, including any related corrective actions to preclude recurrence. This will be done in a separate inspection activity which will be documented in a subsequent inspection report.

In a related matter, NRC received your 2009 Radioactive Effluent Release Report dated May 12, 2010. This report documents the initial phase of the release that occurred in 2009. NRC plans to review your report as part of our normal radioactive effluents inspection scheduled for later this year.

As you are also aware, the NRC has established a Task Force to re-evaluate the current policies and threshold for response to ground water contamination incidents. Lessons learned from Vermont Yankee, including concerns raised at an April 19, 2010, public meeting in Brattleboro, Vermont, will be incorporated into the Task Force's evaluation, which will be documented in a report to be issued later this spring.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for the public inspection in the NRC Public Docket Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,
/RA/
 Darrell J. Roberts, Director
 Division of Reactor Safety

SUNSI Review Complete: jdn* (Reviewer's Initials)

DOCUMENT NAME: G:\DRS\Plant Support Branch 2\Noggle\VYGW2010006dxb.doc

ML101400040

After declaring this document "An Official Agency Record" it will be released to the Public.

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	RI/DRS		RI/DRS		HQ/RES		HQ/NRR		RI/DRP	
NAME	JNoggle/jdn*		JWhite/prw for*		TNicholson/by email		DBeissel/by email		DJackson/by email	
DATE	05/19/10		05/18/10		05/14/10		05/14/10		05/18/10	
OFFICE	RI/DRS									
NAME	DRoberts/djr									
DATE	05/20/10									

*see prior concurrence

Distribution w/encl: (via E-mail)

S. Collins, RA (R1ORAMAIL RESOURCE)
M. Dapas, DRA (R1ORAMAIL RESOURCE)
D. Lew, DRP (R1DRPMAIL RESOURCE)
J. Clifford, DRP (R1DRPMAIL RESOURCE)
D. Roberts, DRS (R1DRSMail RESOURCE)
P. Wilson, DRS (R1DRSMail RESOURCE)
L. Trocine, RI OEDO
D. Diaz-Toro, OEDO
D. Jackson, DRP
T. Setzer, DRP
J. Heinly, DRP
B. Siemel, DRP
D. Spindler, DRP
H. Jones, DRP
A. Rancourt, DRP
D. Bearde, DRS
L. Pinkham, DRP
T. Nicholson, RES
D. Beissel, NRR
RidsNrrPMVermontYankee Resource
RidsNrrDorLI1-1 Resource
ROPreportsResource@nrc.gov
J. White, DRS
J. Noggle, DRS
D. Screnci, ORA
N. Sheehan, ORA
N. McNamara, SLO
D. Tiff, SLO

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.: 50-271

License Nos.: DPR-28

Report No.: 05000271/2010006

Licensee: Entergy Nuclear Operations, Inc.

Facility: Vermont Yankee Nuclear Power Station

Location: 320 Governor Hunt Road
Vernon, Vermont 05354-9766

Dates: January 25 – April 14, 2010

Inspectors: J. Noggle, CHP, Sr. Health Physicist, Team Leader
T. Nicholson, Sr. Technical Advisor for Radionuclide Transport
Office of Research (RES)
D. Beissel, Hydrogeologist, Office of Nuclear Reactor Regulation
(NRR)
D. Spindler, Senior Resident Inspector, Vermont Yankee
S. Rutenkroger, Senior Resident Inspector, Vermont Yankee
H. Jones, Resident Inspector, Vermont Yankee

Approved by: John R. White, Chief
Plant Support Branch 2
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000271/2010006; 01/25/2010 – 04/14/2010; Vermont Yankee Nuclear Power Station; Ground Water Protection Initiative Inspection.

The report covers the Temporary Instruction 2515/173, "Voluntary Ground Water Protection Initiative Inspection" and the event followup of a January 2010 Vermont Yankee tritium ground water contamination condition. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

No findings of significance were identified.

B. Licensee-Identified Violations

None

EXECUTIVE SUMMARY

Background:

On January 7, 2010, Entergy informed the NRC that tritium was detected in a perimeter ground water monitoring well (one of three that were installed as part of Entergy's implementation of the NEI Ground Water Protection Initiative after 2007). Entergy-Vermont Yankee (ENVY) initiated a prompt investigation to determine the extent of the condition and potential impact on health and safety. Entergy initially reported that on-site ground water in the vicinity of the Connecticut River was contaminated with tritium as high as 17,000 picocuries per liter of water.

Subsequently, Entergy initiated a multi-discipline task force to investigate the cause of the ground water contamination and to mitigate and remediate the condition. Entergy established a network of additional on-site ground water monitoring wells to characterize ground water behavior (e.g., flow, direction, and migration pathways) and to determine the highest source of ground water contamination in order to pinpoint the leak location and map the extent of the contamination plume.

On January 25, 2010, Region I initiated an inspection of this matter to examine the licensee's performance and determine if the contaminated ground water affected, or could affect, public health and safety. This inspection included the combined efforts of resident and Region-based inspectors as well as hydro geologists from NRC headquarters. The inspection included a review of the licensee's implementation of the industry's ground water protection initiative, which the NRC had previously endorsed as an acceptable approach for licensees to minimize the effects of (or the potential for) ground water contamination associated with nuclear power plants.

Status of Tritium Leak and Follow-Up Activities:

On February 12, 2010, ENVY identified and successfully terminated the source of the tritium contaminated ground water that was due to leakage from an underground Advanced Off-Gas (AOG) pipe tunnel. Two hydrogen recombiner steam trap drain line pipes inside the AOG pipe trench were found to be leaking and did not drain back into plant systems as designed. Two unsatisfactory conditions were discovered. First, the floor drain in the AOG pipe tunnel was plugged with construction debris and secondly, the addition of a system drain line modification connecting with the AOG pipe tunnel, had degraded the waterproof barrier of the AOG pipe trench, allowing rising fluid level in the AOG pipe tunnel to leak out of the drain line concrete connection with the AOG pipe tunnel and into the ground. NRC inspectors reviewed ENVY's actions to terminate the source, and planned actions to affect a permanent repair of the AOG pipe tunnel during the Spring 2010 refueling outage (RFO 28).

Although the ground water leak has been terminated and some ground water removal remediation activities have been initiated, the estimated migration of tritiated ground water to the Connecticut River from the leak is expected to continue as ground water recharges flush any residual tritium out of the ground. NRC inspectors also reviewed ENVY's remedial actions to extract contaminated ground water in the vicinity of the AOG leakage on March 25, 2010. These steps were taken to reduce the amount of contaminated ground water estimated to be released off-site, and to preclude migration of the tritium to the lower bedrock aquifer. Additional monitoring of the ground water gradient condition in the bedrock aquifer will be

necessary to confirm the licensee's efforts to prevent of any current or future ground water contaminants from reaching the public drinking water aquifer. There is no evidence that contamination of the deeper bedrock aquifer has occurred, however a long term monitoring strategy is necessary for the purpose of evaluating effectiveness of the ground water extraction activities and natural attenuation of any residual contamination from the shallow ground water contamination. The licensee is expected to continue monitoring and reporting any related abnormal liquid releases in accordance with NRC regulatory requirements.

Ground water contamination levels in the tritium plume have begun to decrease and this trend is expected to continue. ENVY has been effective in evaluating the contaminated ground water condition, including quantifying the offsite liquid release (2.79 Curies of tritium) and its dose impact (0.00035 mrem). The dose calculations have been verified to be a small fraction of the regulatory requirement of 3 mrem per year. NRC will continue to inspect the efficacy of the licensee's long-term monitoring program as part of the Reactor Oversight Process pertaining to radiological environmental and effluents inspection activities.

Status of Inspection Results:

1. Upon the initial identification an abnormal radiological effluent release affecting ground water, the licensee implemented actions that conformed to the radiological survey requirements of 10 CFR 20.1501 to ensure compliance with dose limits for individual members of the public as specified in 10 CFR 20.1302. This included: (1) promptly investigating and evaluating the radiological conditions and potential hazards affecting ground water conditions, on- and off-site; (2) annual report of the condition, and determining that the calculated hypothetical dose to the maximally exposed member of the public was well below established NRC regulatory requirements for liquid radiological release; (3) confirming, through off-site environmental sampling and analyses, that plant-related radioactivity was not distinguishable from background; and (4) initiating appropriate actions to mitigate and remediate the conditions to assure that NRC regulatory dose limits to members of the public and the environment were not exceeded. The licensee is expected to develop a site-specific long term monitoring program as additional data is collected and evaluated to verify and validate the effectiveness of expected natural attenuation of the existing ground water plume, and to ensure the timely detection of any new or additional leakage affecting ground water.
2. As a result of this ground water contamination event, ENVY has significantly enhanced its onsite ground water monitoring network, yet the NRC determined that additional actions remain to be completed in order to address the long term ground water monitoring of the existing tritium plume relative to effluent reporting requirements and to address all the objectives of the Industry Ground Water Protection Initiative. These objectives included: enhancements of existing leak detection methods; enhancements to prevent spills or leaks from reaching the ground water; preventive maintenance of equipment to minimize the potential release of radioactive material; and establishing a frequency for the review of structures, systems, and components, and work practices. In addition, ENVY had not established a site-specific ground water monitoring plan or evaluated its Final Safety Analysis Report to include if necessary, the current characterization of hydrology and geology at the site.

3. ENVY's current hydrogeological site characterization provided sufficiently detailed field observations, monitoring, and test data, all of which supported a reasonable conceptual site model of ground water flow and transport behavior to support current ground water flow effluent release determinations. This model provides a reasonable basis to support the determination that liquid effluent releases from plant structures travel east to the Connecticut River in the shallow soil overburden material. The licensee is conducting additional ground water monitoring across seasonal water table variations in order to fully understand any potential for long term contaminant migration to the underlying bedrock drinking water aquifer.
4. The licensee has estimated that, although ground water effluent has likely migrated to the Connecticut River based on tritium having been detected in nearby onsite monitoring wells, no tritium has been detected in any offsite environmental samples from the River (including fish) or any drinking water wells associated with any plant-related radioactivity. NRC inspectors' review of licensee's sample results confirmed that detectable levels of tritium were confined to onsite samples.
5. NRC inspectors determined that ENVY's initial corrective actions to prevent future leaks in this area were appropriate. These included permanent rerouting of the hydrogen recombiner steam trap drain lines in an accessible pipe vault. The licensee also cleaned all debris from the AOG pipe trench and has plans to restore the waterproof condition of this trench. In addition, the NRC inspectors determined that site remediation (by pumping tritiated ground water from the ground for recycling within the plant) was reasonable and commensurate with the low radiological risk associated with the leak.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA2 Problem Identification and Resolution

a. Inspection Scope

The status of two ground water monitoring-related condition reports was reviewed during this inspection. The inspectors evaluated whether the problems identified by these condition reports were properly characterized in the licensee's corrective action program and that applicable causes and corrective actions were identified commensurate with the safety significance of these radiological occurrences. The first, CR-VTY-2010-0069, was initiated to investigate and correct the January 2010 tritium ground water contamination condition. The second, CR-VTY-0541, was developed to capture and correct gaps in the Vermont Yankee implementation of the Nuclear Energy Institute (NEI) Ground Water Protection Initiative (GPI) 07-07, which were identified by NRC inspectors while determining the appropriateness of your actions in response to the industry recommendations.

b. Findings and Observations

After verifying positive tritium results in GZ-3 on January 7, 2010, the licensee initiated CR-VTY-2010-0069 to document an unmonitored release. The NRC was notified of the condition on January 7, 2010 (Event No. 45613). The licensee initiated a root cause investigation and this issue was pursued in accordance with procedure EN-OP-111, "Operational Decision Making Issue Process." This led to the formation of a multi-discipline VY Station tritium task force to investigate and resolve the ground water contamination issue. As part of the root cause investigation, the licensee used a failure modes analysis process that considered several potential leak sources, including buried piping; process tanks and storage pools containing radioactive liquids; sumps, storm drains and trenches; and other sources of historical spills or leaks. In parallel with this plant systems leak evaluation process, ENVY had previously sited six additional ground water monitoring wells in late-2009 and expedited their installation in 2010 following the discovery of ground water contamination. The sample results for these wells provided intelligence for locating additional ground water monitoring wells in order to pinpoint the source of the leak. In addition, during the installation of these monitoring wells, constant head flow measurements were taken to measure soil permeability and water table measurements were taken to calculate ground water flow rate and direction. The licensee's actions met regulatory requirements for determining the corresponding radioactive ground water effluent release and dose impact to the public.

Based on information obtained during the plant systems leak evaluation, the licensee eliminated certain plant components and systems from consideration as potential sources of the leakage. These included: the spent fuel pool (which is above ground and contained within the reactor building), the condensate storage tank (which is provided with a functional tell-tale leak detection system and for which associated piping was contained in an accessible pipe trench that was inspected); storm drains (samples of which were taken and found to be below detectable levels); and radwaste tanks

(particularly high contamination tanks that were contained in the radwaste processing building and visually inspected, and for which no detectable tritium contamination was measured from its nearby sentinel well, GZ-6). ENVY's actions targeted inspections of accessible process pipe vaults and trenches, and outside surface examinations based on expediency and high concentration of radioactivity contained in these plant structures.

Near the Advanced Off-Gas (AOG) building, an area of soil depression was observed, which prompted installation of ground water monitoring well GZ-10 on February 6, 2010. Within a week, the licensee performed soil excavation of the area, followed by a boroscopic examination of the inside of the AOG pipe tunnel. This remote visual exam identified two leaking recombiner steam trap drain pipes and accumulated plant process water inside the AOG pipe tunnel. On February 15, 2010, a floor drain in the AOG pipe tunnel was found blocked with original construction debris, which the licensee cleared by applying air pressure to the floor drain allowing drainage of fluid in the pipe tunnel to an adjoining AOG drain pit sump and subsequently pumped to the liquid radwaste system for reuse as designed. This action to unplug the floor drain arrested the source of leakage into the ground water. Continued soil excavation and a confirmatory pipe tunnel leak test on February 27th revealed that the leak emanated from accumulated process water in the AOG pipe tunnel leaking outside of an attached OGE-100 pipe system drain line at the concrete abutment with the AOG pipe tunnel and the AOG drain pit [see Attachment A, Figure 2]. The original AOG pipe tunnel was constructed as a water proof structure to contain pipe leakage, however, during a pipe modification in 1979, when the OGE-100 pipe system drain was installed, the waterproof barrier of the pipe tunnel was not maintained, which allowed the backed up water to leak into the ground through associated concrete joints, ultimately leading to the current ground water contamination condition. The inspectors determined that the modification change relative to a waterproof barrier did not require a safety analysis review by the licensee.

At the end of this inspection, the root cause analysis for this condition report was still under development. When the root cause analysis report is completed, the NRC will review the efficacy of Entergy's cause analysis, associated corrective actions, the extent-of-condition review, and actions taken to effectively resolve this condition.

The licensee initiated condition report CR-VTY-0541 on February 8, 2010, to assess and correct gaps in the Vermont Yankee implementation of the Nuclear Energy Institute (NEI) Industry Ground water Protection Initiative, NEI 07-07, based on findings from an NEI peer review on January 25, 2010, and the identification of gaps by NRC inspectors. This condition report properly documented the missing elements of the NEI Industry Ground Water Protection Initiative, which are covered in more detail in Section 4OA5 of this report. The licensee assigned corrective actions which were scheduled to be completed by August 2010. NRC inspectors will review the effectiveness of the licensee's corrective actions in a subsequent inspection report.

4OA3 Event Follow-up (IP 71153 – 1 sample)

.1 Ground Water Tritium Contamination

a. Inspection Scope

On January 7, 2010, ENVY notified NRC Region I that a routine quarterly ground water sample, acquired from a ground water monitoring well GZ-3, indicated the presence of tritiated water. ENVY noted that this was the first positive indication of tritium in ground water since monitoring wells were installed in November 2007, and though the source of the contaminated ground water was unknown, migration of the tritiated water to the Connecticut River was very likely.

While no plant radioactivity was actually detectable in the Connecticut River, ENVY estimated that the radiological consequence of the condition would result in a small fraction of one millirem to the maximally exposed member of the public. Subsequently, ENVY assembled a multi-discipline task force to investigate the extent and cause of the ground water contamination, assess the radiological impact to public health and safety, determine the source, effect remediation, and establish actions to prevent recurrence. From January 7 through April 14, 2010, ENVY performed systematic evaluations of potential leaking plant components and installed 20 ground water monitoring wells, in addition to the three ground water monitoring wells that were installed in November 2007 in response to the NEI Ground Water Protection Initiative.

Since January 7, 2010, the NRC closely monitored ENVY's performance and achievements with NRC resident and region-based inspection personnel. On January 25, 2010, the NRC initiated an inspection to provide regulatory oversight of ENVY's ground water investigation effort, and independently confirm the adequacy and effectiveness of the licensee's assessment of the condition relative to public health and safety.

The scope of this inspection included a review of ENVY's examination and assessment of structures, systems, and components that were potential sources of the ground water contamination; review of the site selection and installation of additional ground water monitoring wells; assessment of the quality and control of ground water sample analysis; independent verification and validation of the data, assumptions, and calculations used to assess the radiological consequence to public health and safety, and the environment; independent assessment of the investigation strategy used to determine the location of the source; independent review and assessment of ENVY's hydrogeological assessment and site conceptual model by NRC hydrogeologists; and verification of ENVY's conformance with all applicable NRC regulatory requirements.

During this inspection effort, the inspectors interviewed several ENVY technical and management personnel; reviewed data, records, technical drawings, and procedures; and conducted direct inspection and observation of licensee performance over the course of several on-site visits.

On February 12, 2010, ENVY identified and successfully terminated the source of the tritium contaminated ground water that was due to leakage from an underground Advanced Off-Gas (AOG) pipe tunnel. NRC inspectors reviewed ENVY's preliminary actions to terminate the source, and planned actions to affect a permanent repair of the affected structure during outage RFO 28. NRC inspectors also reviewed ENVY's remedial actions to extract contaminated ground water in the vicinity of the AOG leakage on March 25, 2010 to reduce the amount of contaminated ground water estimated to be released off-site, and to preclude migration of the tritium to the lower bedrock aquifer. That remedial process is continuing.

NRC inspectors reviewed ENVY's investigations, numerous site hydrology and radionuclide survey activities, measurement of ground water gradients, estimates of hydraulic and transport parameters, and determination of the extent of radionuclide release. The inspectors also reviewed the use of this information to support the calculation of radiological liquid effluent releases from the leakage via the ground water pathway and calculation of the corresponding safety impact of radiation dose to the public due to this abnormal leakage event as required by NRC regulatory requirements.

The scope of this inspection included assessment of ENVY's actions relative to its performance of actions necessary to implement the objectives of the voluntary Ground Water Protection Initiative as specified in Nuclear Energy Institute (NEI) 07-07. The inspection of this area was performed in accordance with the requirements of NRC Temporary Instruction TI-2515/173, and is reported in Section 40A5 of this report.

b. Findings and Observations

No findings of significance were identified.

During the inspection of January 25, 2010 – April 14, 2010, a significant amount of ground water monitoring and sampling data was collected from a network of onsite ground water monitoring wells. This data assisted in delineating the H-3 (tritium) plume as shown in Attachment A, Figure 1.

Sample Results

The ground water monitoring well sample results are provided in Attachment A, Table 1, and were compiled by the inspectors using data from ENVY's onsite chemistry laboratory and independent offsite contract laboratory sample measurement analyses. All results represent H-3 (tritium) as the only plant-related radionuclide detected in any of the ground water samples. Small amounts of Cobalt-60, Manganese-54, Zinc-65, and Cesium-137 were identified in soil samples taken in close proximity to the underground AOG pipe trench leak location. However, these other radionuclides were not detected in the ground water samples.

In addition to the onsite ground water sampling, ENVY conducted weekly sampling of three onsite and six offsite deep bedrock aquifer wells used as drinking water sources (including the Vernon Elementary School and the Hinsdale Town Water Supply Wells), and Connecticut River water samples in close proximity to the ground water

Enclosure

contamination impacted shoreline. In addition, two sets of fish were obtained from the Connecticut River downstream of the plant and above the Vernon Dam during February–March 2010. The radiation detection sensitivity of ENVY's contracted laboratory analytical results included lower tritium detection sensitivity (<500 pCi/L) than the onsite laboratory. The laboratory also investigated the samples for the presence of other radionuclides that require additional radiochemistry procedures (e.g. Sr-90, Ni-63, transuranics and other difficult to measure radionuclides). In all cases, no plant-related radionuclides were detected in any offsite environmental samples and any onsite or offsite drinking water samples.

NRC inspectors observed selected well sampling to determine that the licensee's sampling program was being conducted in accordance with appropriate industry well-sampling practices. ENVY employed a contract laboratory to provide duplicate sample analysis results to provide independent verification of the onsite chemistry laboratory measurement results. Both sets of ground water sample results were provided to the NRC and were used for validation comparison. In addition, the NRC reviewed ENVY laboratory quality control testing results that provided laboratory counting of calibrated tritium source quantities to levels 10% below the U.S. Environmental Protection Agency drinking water standard of 20,000 pCi/L (<2,000 pCi/L). This demonstrated the ongoing quality of laboratory counting results reported to NRC. Inspectors' comparisons of selected ENVY chemistry laboratory and corresponding contract laboratory results indicated agreement between the two sets of data. These favorable comparisons of redundant sample analysis results, coupled with the inspectors' review of quality control testing against calibrated tritium sample standards, provided NRC confidence in the licensee's ground water sampling program. In addition, NRC review of sample results obtained by an independent state agency (State of Vermont Department of Health) provided additional assurance of the licensee's sample location identification and results.

Ground Water Contamination Description

A review of the onsite ground water monitoring results defined a tritium plume, as depicted in Attachment A, Figure 1, which emanated at the AOG pipe trench leak location and extended in an easterly direction 400 feet to the Connecticut River (Vernon Pond). The tritium plume followed the ground water flow gradient and spread out to a shoreline frontage of approximately 300 feet width. The tritium plume was approximately 5 – 9 feet thick in the overburden material which was within 30 feet of the ground surface and overlay the bedrock aquifer. The existence of the plume was assumed to be recent based on an initial low-level tritium concentration first detected in the ground water monitoring well GZ-3 on November 17, 2009. This initial detection indicated the ground water contamination plume had just reached the site perimeter at that time since there had been no detectable contamination in any previous samples taken from GZ-3 or any of the other site perimeter ground water monitoring wells. Since the identification of ground water contamination in January 2010, ENVY installed additional ground water monitoring wells at various depths to determine the extent of the contamination; identify the source location; and provide ground water flow and radionuclide concentration measurements to support the calculation of the amount of

radioactivity released via the ground water pathway, and determine its dose impact on the public.

The source of the ground water contamination release was determined by samples taken from monitoring well GZ-10. The specific leak source was identified by ENVY as originating from an AOG drain line, at its connections with the AOG pipe trench and the AOG pipe vault. The leak source was terminated on February 12, 2010.

Remediation of the residual tritium in the ground water began on March 25, 2010, using a ground water extraction well (located between monitoring wells GZ-7 and GZ-21). The ENVY remediation plan is to remove approximately 300,000 gallons over a two to three month period for eventual reuse in the plant. Since that time, the tritium concentrations sampled in the ground water monitoring well closest to the leak (GZ-10) has continued to decrease and by mid-April 2010, the tritium concentrations had decreased below detectable laboratory measurement.

Hydrogeology Assessment

1.0 Conceptual Site Model (CSM)

In January 2010, the NRC determined that the licensee's subsurface CSM of the Vermont Yankee (VY) site, which had been developed in response to the NEI 07-07 Ground Water Protection Initiative (GPI), was not sufficiently detailed. The NRC found the CSM did not initially provide sufficient specificity to identify the source area for the H-3 (tritium) leak, or include fundamental definition of the ground water flow units (e.g., depths and extents), or their hydraulic relationships and parameters. Based upon hydrogeologic investigations begun in response to the tritium leak, ENVY significantly updated the CSM to account for site-specific ground water flow and transport processes, properties and conditions.

The initial detection of the tritium leak was in monitoring well GZ-3 (see Attachment A, Figure 1) located on the Connecticut River bank, but its source was not readily discernable due to an absence of monitoring wells adjacent to the plant systems, structures and components (SSCs) containing radioactive fluids, as recommended in the GPI. ENVY examined numerous candidate SSCs for possible sources and then installed a series of ground water monitoring wells to aid in identifying the tritium leak source. By February 6, 2010, monitoring well GZ-10 was installed next to the Advanced Off-Gas (AOG) building where subsurface pipes conveyed fluids carrying radionuclides. GZ-10 monitoring data helped to determine the specific leak location. The initial tritium concentration at GZ-10 was approximately 2.5 million pCi/l. The leakage was confirmed to be from an underground concrete pipe vault associated with the AOG system, as described in section 4OA2 of this report.

The updated CSM provided detailed information on the additional investigation well locations, tritium concentrations sampled over time, and water-table levels (see Attachment A, Figure 1). The updated CSM also provided vertical definition and spatial relationships for the subsurface overburden units. This information was important in determining where and at what depth to install the remediation well.

Enclosure

To investigate the vertical extent of the tritium plume, ENVY developed three deep bedrock overburden monitoring wells that terminated at the bedrock interface (i.e., GZ-13D, GZ-14D and GZ-19D). Subsequent ground water samples showed concentrations of less than 2,000 pCi/L in these deeper wells, indicating very little downward migration to the underlying bedrock interface. Due to the potential risk impact of contamination reaching the deep bedrock aquifer, additional licensee focused review indicated: The underlying gneiss bedrock aquifer was not confined, that ground water hydraulic level measurements from the three onsite and two offsite deep bedrock aquifer wells indicated an upward ground water flow gradient to the overburden unit and into the Connecticut River. Upon close inspection, the hydrographs for the Construction Office Building (COB) drinking water well in the bedrock aquifer, and for monitoring wells GZ-13D and GZ-14D in the overburden units, as well as the Connecticut River stage, showed some connectivity to the cyclical rising and falling of the Vernon Pond due to the operation of the hydroelectric dam at Vernon. These ground water gradients provided protection from contamination reaching the deeper bedrock drinking water aquifer. However, seasonal ground water gradient variations may not ensure continuing protection of the deeper aquifer in the long term.

In order to ensure sufficient monitoring of this hydraulic protection for the duration of the plume extraction and attenuation processes, and of any future leaks to the ground water, the following issues were identified by the NRC to address the remaining information gaps and technical uncertainties affecting the continued viability of ENVY's current Conceptual Site Model. These issues were discussed with ENVY, who agreed to evaluate the following actions to provide further clarity and confidence in providing accurate ground water flow and tritium contaminant transport results, and to assure protection of the drinking water aquifer beneath the site:

- An evaluation of ground water flow relationships between the overburden units and bedrock aquifer;
- An evaluation of hydraulic ground water relationships between the water table and bedrock aquifer, and the influence of the Vernon Pond water level (created by the Trans-Canada hydroelectric dam on the Connecticut River).
- Monitoring of seasonal changes to the ground water gradients, flow directions, and recharge for the overburden units and bedrock aquifers. [The Long-Term Ground Water Monitoring Program (LTGWMP) is designed to provide this information.]
- Continued mapping and evaluation of the subsurface effects of structures, systems and components (SSCs) (e.g., process pipe vaults and trenches, tanks and subsurface drains) on ground water flow directions and rates that influence the migration of the residual tritium plume and potential future releases.
- Testing and confirmation of the updated CSM using monitoring data from the LTGWMP and comparisons with numerical simulations (i.e., MODFLOW code simulations) of flow and transport scenarios.

- Identification of significant fracture zones and their connectivity in the bedrock aquifer using down-hole geophysical surveys of the three VY drinking water wells (i.e., COB, PSB, and South wells) in order to further understand the drinking water aquifer flow characteristics.
- Conduct hydraulically isolated “packer” tests in the COB well at the identified fractures zone intervals to evaluate productive fracture zones in the bedrock that could influence migration pathways. (Because the COB well is within the area of the mapped tritium plume, it was removed from drinking water production and converted to a monitoring well. To date no tritium has been detected in the COB well, but changes in the ground water gradients could potentially affect tritium migration.)

The above identified uncertainties in the hydrogeologic processes and conditions as represented in the Conceptual Site Model of the Vermont Yankee site were being evaluated and addressed by ENVY as part of their ongoing site characterization and ground water monitoring program development.

2.0 Tritium Migration

The NRC tracked the tritium plume evolution and migration pathway using monitoring data from the investigation monitoring well network as shown in Attachment A, Figure 1. Time-series trend data of tritium concentrations in monitoring wells GZ-10, 20 and 21 showed the highest concentration area (i.e., centroid) of the tritium plume had migrated from GZ-10 towards the Connecticut River. To date, tritium concentrations in monitoring well GZ-10 have dropped significantly from the original value of approximately 2.5 million pCi/l to less than detectable levels. GZ-10 is adjacent to the original detected source (i.e., leakage from an underground concrete pipe vault associated with the AOG system to the overburden unit). This plume movement was also illustrated by the tritium concentrations in GZ-14, down-gradient of the initial source, showing a consistent increase from approximately 63,000 pCi/l, initially, to above 253,000 pCi/l on April 27, 2010.

The plume follows the water table gradient and shows the effects of subsurface foundations and variability in the overburden thicknesses. Tritium concentrations in GZ-3, where the plume was first detected, had shown an increasing trend to 97,000 pCi/l sampled on April 26, 2010, indicating that the highest concentration of the leak had not yet reached the River. The highest concentration of tritium for GZ-21 (2,028,000 pCi/l on April 7, 2010) has since subsided to 864,000 pCi/L on April 27, 2010, which indicated the centroid of the plume has moved passed this monitoring well and northeast towards the Connecticut River. To better understand the plume’s behavior and to estimate concentrations down-gradient, the numerical model being developed by ENVY may provide estimated release rates and travel times to the river. The greatest potential impact on health and safety of the public would be if tritium could migrate to the bedrock aquifer. Hence, the licensee has initiated seasonal monitoring data and numerical simulations, which should help determine the conditions influencing this undesirable migration scenario.

Remediation Program

The objective of the licensee's remediation program was to prevent tritium migration to the bedrock aquifer and to minimize releases of tritium to the Connecticut River. The need for and selection of the "pump, monitor and recycle" remediation method used, was based on the updated CSM. The extraction well (EW-1A) location was selected to center on the tritium plume because of the high concentrations of tritium in GZ-7 and GZ-21 which are down-gradient of the initial source adjacent to well GZ-10. EW-1A was producing 3.5 gallons per minute with tritium concentrations initially as high as 1 million pCi/L. Because of the greatly reduced tritium concentrations in GZ-10, this remediation method appeared to be effective.

As of the end of the NRC inspection, the licensee's remediation strategy was to extract tritiated ground water using low-flow pumping to remove 300,000 gallons of the ground water over a two-to-three-month period and to process and recycle this amount of water inside the plant.

Long-Term Ground Water Monitoring Program (LTGWMP)

At the conclusion of this inspection, the site-specific LTGWMP had not been completed or fully implemented by ENVY [Refer to Section 4OA5]. The program was evolving based on their hydro-geological investigations and the current tritium remediation program. As outlined by the industry Ground Water Protection Initiative (GPI), when completed, the program should integrate information from the ground water contamination risk profile, the CSM, monitoring data, and the numerical ground water flow and transport model (i.e., MODFLOW simulations) currently under development.

The objectives of the LTGMP were: (1) to determine the efficacy of the current tritium plume remediation plan; and (2) to detect radionuclides inadvertently released from SSCs in the future. Analysis of the LTGWMP data would help determine seasonal tritium plume behavior; changes to recharge in the overburden units and bedrock aquifers; vulnerabilities to the bedrock aquifer due to ground water gradient changes. This information may be needed to accurately estimate current and potential future off-site tritiated ground water releases.

Radiological Assessment

As additional onsite ground water sampling wells were added in January 2010, and additional tritium data was collected, several revisions of offsite radiological effluent release and offsite dose calculations were provided by ENVY. The NRC staff reviewed this information. The latest version, dated May 9, 2010, represented a detailed human pathway and age-group specific dose assessment, as specified in the Vermont Yankee Offsite Dose Calculation Manual (VY ODCM). These calculations were reviewed and verified to accurately reflect use of the VY ODCM and utilize Regulatory Guide 1.109 methodology. The calculations utilized ground water flow rates derived from site specific soil permeability measurements and included a multiplication factor of 2.5 to incorporate any uncertainty and provided for conservatism in the results. The tritium ground water release used in these calculations was based on integrating ground water

Enclosure

monitoring well sample measurements within the tritium plume volume from early February 2010, when the plume had reached its maximum extent and immediately prior to terminating the leak. The calculations assumed the release of this contaminant volume over a one-year time period. These assumptions reflected reasonable assumptions of total contaminants released and transit time to the Connecticut River. ENVY's calculations result in a total tritium ground water release for this event of 2.79 Ci. The radiological impact of this quantity of tritium released to the Connecticut River was calculated for a maximum-exposed individual that was cumulatively exposed to tritium due to fish consumption withdrawn from the impacted area immediately downstream from Vermont Yankee, consumption of vegetables irrigated from the impacted area of the Connecticut River below Vernon Dam, consumption of beef meat and livestock milk from cows that drink and consume feed that was irrigated from the Connecticut River below Vernon Dam, and direct exposure from the shoreline of the same. This resultant dose calculation to a child was 0.00026 mrem in one year. In addition to the above stated exposure pathways, if there was also a direct drinking pathway from the Connecticut River down stream from the Vernon Dam, the child dose would be 0.00035 mrem in one year.

These effluent release and dose calculation results are in accordance with NRC regulatory requirements and represent a very small fraction of the 3 mrem per year liquid effluent release criteria specified in 10 CFR 50, Appendix I.

10 CFR 50.75(g) Decommissioning

Based on the current ground water contamination condition, the Vermont Yankee decommissioning records, as specified in 10 CFR 50.75(g), were reviewed to ensure the current leak condition can be incorporated in a future site decommissioning plan. These records included appropriate data documenting the original January 6, 2010, tritium plume, including a map and dose assessment information.

40A5 Other Activities

.1 (Closed) Temporary Instruction 2515/173, "Review of the Implementation of the Industry Ground Water Protection Voluntary Initiative"

a. Inspection Scope

An NRC assessment was performed of the licensee's ground water protection program to determine whether the licensee implemented the NEI Industry Ground Water Protection Initiative, dated August 2007 (ADAMS Accession Number ML072610036). Inspectors interviewed personnel, performed walk-downs of selected areas, and reviewed the following items:

- Records of the site characterization of geology and hydrology;
- Evaluations of SSCs that contain radioactive liquids and evaluations of work practices that involve licensed material for which there is a credible mechanism for the licensed material to reach the ground water;

Enclosure

- Implementation of an onsite ground water monitoring program to monitor for radioactive leakage into ground water;
- Procedures for potential remediation of leaks and spills, including consideration of the long term decommissioning impacts;
- Records of leaks and spills recorded, if any, in the licensee's decommissioning files in accordance with 10 CFR 50.75(g);
- Licensee briefings of local and state officials on the licensee's ground water protection initiative;
- Protocols for notification to the local and state officials, and to the NRC regarding detection of leaks and spills;
- Protocols or procedures for 30-day reports if an onsite ground water sample exceeds the criteria in the radiological environmental monitoring program;
- Ground water monitoring results as reported in the annual radioactive effluent controls and radioactive environmental monitoring reports;
- Licensee and industry assessments of ENVY's implementation of the ground water protection initiative.

b. Findings and Observations

No findings of significance were identified.

Implementation of the NEI 07-07 Ground water Protection Initiative (GPI) is voluntary. Under the initiative, each site was to develop an effective, technically sound ground water protection program by August 2008. The inspectors' review identified that at Vermont Yankee, not all of the objectives established in the GPI had been met. Specifically, Vermont Yankee had not implemented the following aspects of the Ground Water Protection Initiative:

- A formal site-specific ground water monitoring program and plan had not been implemented and the Final Safety Analysis Report has not been revised to include the current characterization of hydrology and geology at the site.
- The latest site-specific hydrogeological evaluation that was conducted in January 2007 identified significant knowledge gaps and this had not been fully addressed to reflect the current knowledge of ground water flow characteristics based on the January 2010 tritium leak investigation.
- The risk assessment and leak detection program for SSCs have not been updated regarding potential onsite contamination and leaks to the ground water based on the current network of ground water monitoring wells. Other missing elements included: enhancements of existing leak detection methods;

Enclosure

enhancements of SSCs to prevent spills or leaks from reaching the ground water; preventive maintenance of equipment to minimize the potential release of radioactive material; and establishing a frequency for the review of structures, systems, and components, and work practices that could result in spills or leaks.

As of a result of this inspection, ENVY issued Condition Report CR-VTY-2010-0541 to correct the indicated incomplete objectives and bring Vermont Yankee into alignment with the NEI Industry Ground Water Protection Initiative.

4OA6 Meetings, including Exit

The inspectors presented the preliminary inspection results to Mr. N. Rademacher, and other members of ENVY staff, at an exit meeting on April 14, 2010. The inspectors verified that none of the information in this report is proprietary. Two Entergy drawings, which were instrumental in providing inspectors with a visual understanding of the leak and its impact on the site, are provided in Attachment A to this report.

A-1

Attachment A

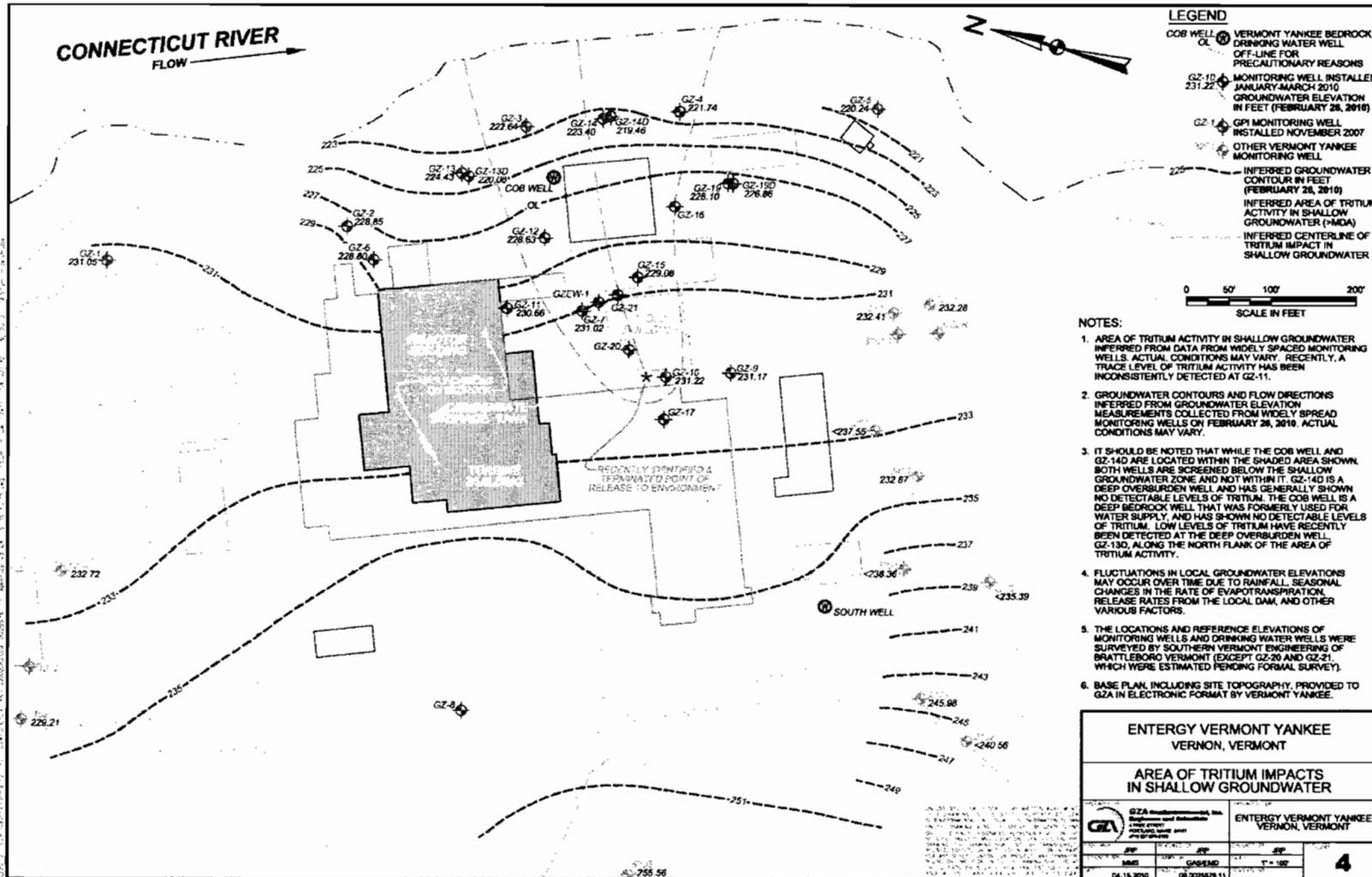
Figure 1, Vermont Yankee Tritium Plume Map*

Table 1, Vermont Yankee Ground Water Tritium Data

Figure 2, Artist's Rendition of AOG Pipe Tunnel and Ground Water Leak Locations*

* Indicates a drawing obtained from ENVY for purposes of inspection review and assessment.

Figure 1
Vermont Yankee Tritium Ground Water Plume



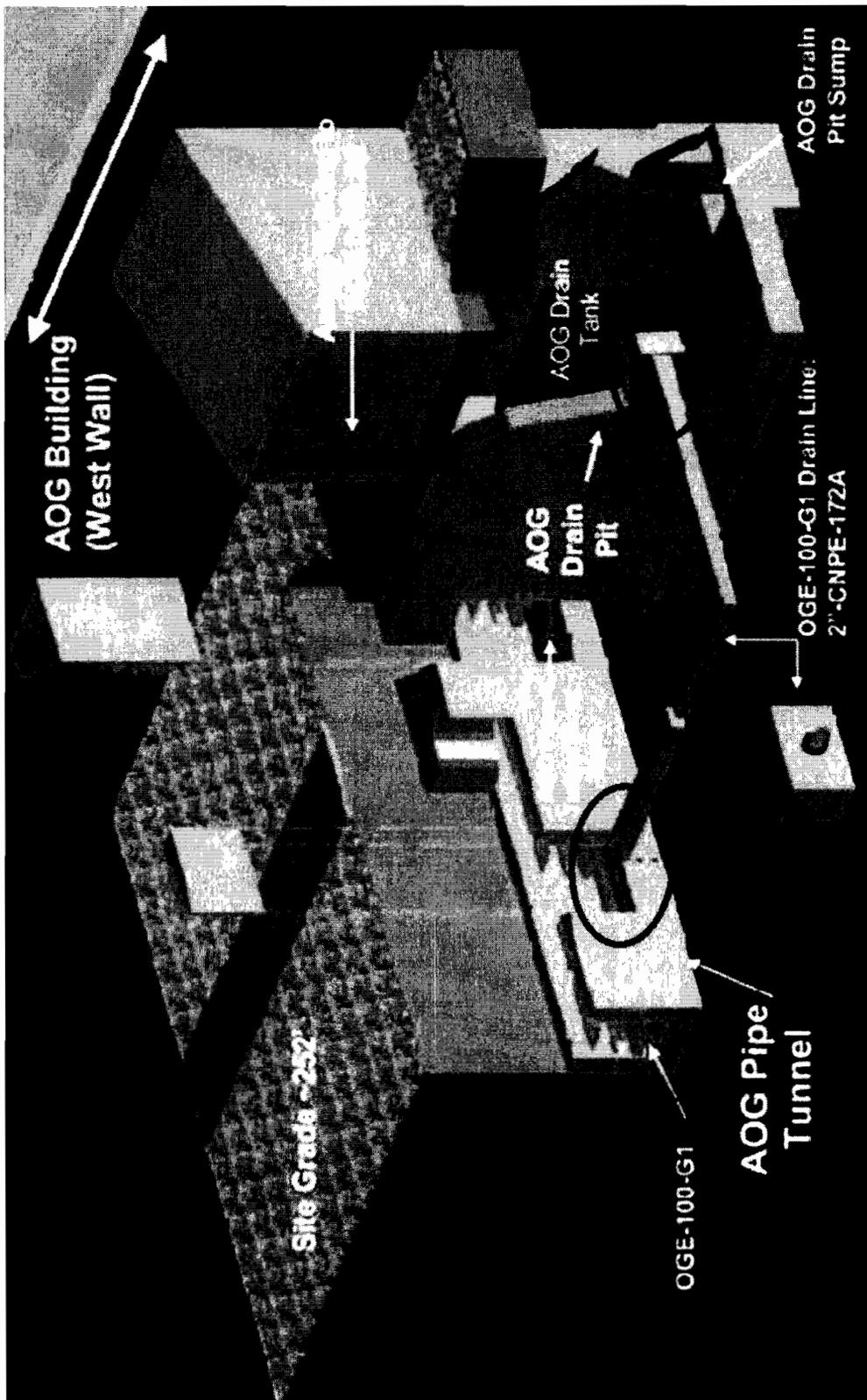
A-2

Table 1
Vermont Yankee Ground Water Monitoring Well Tritium Data

<u>Monitoring Well</u>	<u>Tritium Concentrations (pCi/L)</u>	<u>Dates</u>
GZ-1	ND	11/07 – 4/10
GZ-2	ND	2/10 – 4/10
GZ-3	ND	11/07 – 8/09
	705 – 71,000	11/09 – 4/10
GZ-4	1,500 – 7,900	1/10 – 4/10
GZ-5	ND	11/07 – 4/10
GZ-6	ND	1/10 – 4/10
GZ-7	740,000 – 1,200,000	2/10 – 4/10
GZ-9	ND	2/10 – 4/10
GZ-10	2,450,000 - <1800	2/10 – 4/10
GZ-11	ND	2/10 – 4/10
GZ-12	15,000 – 270,000	2/10 – 4/10
GZ-13	ND	2/10 – 4/10
GZ-13D	2,000 – 1,000	2/10 – 4/10
GZ-14	63,000 – 280,000	1/10 – 4/10
GZ-14D	ND – 2,300	3/10 – 4/10
GZ-15	170,000 – 760,000	2/10 – 4/10
GZ-16	ND	3/10 – 4/10
GZ-17	ND	3/10 – 4/10
GZ-19	ND	2/10 – 4/10
GZ-19D	ND	2/10 – 4/10
GZ-20	645,000 – 163,000	3/10 – 4/10
GZ-21	1,700,000 – 2,100,000	3/10 – 4/10

ND – indicates no detectable activity

Figure 2



Attachment B

Vermont Yankee Ground water Contamination Investigation Time Line

<u>Date</u>	<u>Event</u>
11/07	Ground water monitoring wells, GZ-1, GZ-3, and GZ-5 were installed along the Connecticut River as part of the NEI Ground water Protection Initiative.
1/10	Six additional ground water monitoring wells were planned for installation in 2010 as part of the NEI Ground water Protection Initiative (GZ-2, 4, 6, 7, 8 and 9).
1/6/10	ENVY/Vermont Yankee (ENVY) received a positive tritium result of an on-site ground water monitoring well. The sample was collected on 11/17/09, and the result was reported to the licensee on 1/6/10. The tritium concentration in GZ-3 was reported as 705 pCi/l.
1/7/10	<p>Based on a relatively low sample concentration result, ENVY took a confirmatory sample of GZ-3 on 1/7/10 and counted the sample in the onsite laboratory which indicated 17,000 pCi/L. GZ-3 is outside the protected area but within the owner controlled area, and about 30 feet from the Connecticut River. No detectable H-3 was found in the other ground water monitoring wells GZ-1 and GZ-5, or in a 400 ft. deep drinking water well (COB) in that proximity. Additionally no detectable activity was found in coincident river water samples.</p> <p>ENVY informed numerous State and Local government representatives in VT, NH, and MA of the discovery of the tritiated ground water condition and that the current condition had no immediate health and safety significance. Subsequently, ENVY informed the NRC relative to 10 CFR 50.72 due to notification of external government agencies.</p>
1/19/10	ENVY received a positive tritium sample from GZ-1 of 9500 pCi/L.
1/20/10	<p>ENVY determined that the GZ-1 sample taken on 1/19/10, was a false positive. ENVY reanalyzed the sample and obtained independent laboratory analysis which confirmed that activity in the sample from GZ-1 was less than minimum detectable activity. ENVY has collected a split sample for the State of Vermont, to allow independent confirmation. As a result of this error, ENVY has enhanced its sampling and analysis procedures and quality control processes to prevent recurrence and improve reliability of its reported data. ENVY reported that an independent laboratory (Teledyne-Brown) will be engaged to assure the accuracy of analytical results.</p> <p>Relative to investigation of the source, ENVY has examined the CST pipe trench and moat areas and reported that there is no indication of leakage from piping or the CST tank, and no water has been observed in the associated CST sump area.</p>

B-2

A pipe vault associated with the Advance Off-Gas (AOG) system has been examined. Standing water was observed and sampled. Analytical results are not yet available.

ENVY has continued its investigation of the pipe trench in the RadWaste Processing Building. Examination of all the piping in the trench indicated that the piping appeared in acceptable condition with no indication of degradation or leakage.

ENVY has developed a work order for the excavation of a underground pipe line that serves as a steam drain line associated with the AOG due to soil depressions observed in the vicinity.

ENVY has initiated the development of additional ground water monitoring wells to supplement ground water data supplied by GZ-1, GZ-3, and GZ-5. An additional nine wells are planned.

- 1/25/10 NRC Region I initiated an on-site inspection to review ENVY's tritium leak investigation, and to review ENVY activities relative to implementation of the industry's voluntary ground water protection initiative, described by NEI 07-07.
- 1/10 – 3/10 The following ground water monitoring wells were installed: GZ-6, GZ-14, GZ-4, GZ-2, GZ-7, GZ-9, GZ-11, GZ-10, GZ-12, GZ-13, GZ-15, GZ-14D, GZ-19, GZ-13D, GZ-19D, GZ-16, GZ-17, GZ-20, GZ-21
- 2/15/10 ENVY terminated the observed AOG leak by unplugging the pipe tunnel floor drain that allowed drainage of the pipe tunnel accumulated liquid to drain into the AOG pipe vault sump, which was subsequently pumped into the liquid radwaste system for recycling as designed.
- 2/23/10 Operations removed the COB drinking water well from service.
- 2/27/10 A leak test was performed which recreated AOG tunnel conditions. The AOG tunnel was blocked and filled with demineralized water. Demineralized water was observed flowing freely at the joint of the AOG tunnel and where the OGE-100 pipe concrete covering connects with the AOG tunnel, confirming the leak location.
- 3/4/10 ENVY identified the "B" hydrogen recombiner steam trap drains as one potential source. ENVY discovered a nickel to quarter sized hole at a recombiner steam trap drain line elbow.
- 3/9/10 A remotely operated vehicle in the AOG tunnel provided video of the recombiner steam trap drain lines 154 "A" and "B" as the source of the leakage.
- 3/15/10 ENVY is working to complete the interim reroute of the "B" steam trap drain line. They are installing a temporary modification interim reroute of the "A" and "B" steam trap drain lines. They expect to complete the "B"

B-3

steam trap drain line modification by 3/16/10, and they plan to have the entire modification completed by 3/19/10.

- 3/23/10 ENVY completed drilling extraction well EW-1. All leaking recombiner steam trap drain lines have been isolated.
- 3/25/10 The "B" recombiner is in service, and the temporary modification of the "B" steam trap drain lines has been completed. Extraction of ground water from EW-1 has begun remediating the existing tritium contaminated ground water.
- 3/29/10 Entergy is remediating ground water at approximately one gallon per minute. Approximately 1200 gallons per day has been removed from extraction well GZ-EW-1 to date.
- 4/8/10 ENVY has pumped a total of 23,000 gallons of ground water into temporary, on-site storage tanks. Ground water pumping from the first extraction well began on March 25 at a rate of about one gallon per minute. On 4/7/10, ENVY shifted the pumping equipment to a newly drilled extraction well with an increased capacity of about three gallons per minute. The temporary storage tanks hold all the water prior to, and after, initial cleaning. The demineralized and filtered water is then transferred into the plant for more filtering prior to being reused in other plant systems.

The sampling of ground water via the monitoring wells continues. The readings show a continued eastward ground water flow and, as expected, the wells further east show a gradual rise in tritium as the wells nearest where the leak occurred have greatly reduced concentration with the pumping underway and the leak stopped, the well that had shown the highest concentration is now below the minimum detectable level. The hydrologists expect all the wells to ultimately be at reduced concentration as the extraction pumping accelerates cleanup. The remediation of contaminated soil is on schedule for removal and shipping to a federally licensed disposal facility.

ATTACHMENT B
SUPPLEMENTAL INFORMATION
KEY POINTS OF CONTACT

Licensee Personnel

D. Mannai	Licensing Manager
J. DeVincentis	Licensing Manager
J. Rogers	Design Engineering Manager
S. Skibniowsky	Environmental and Effluents Chemistry Specialist
J. Hardy	Chemistry Manager
M. Shaw	Principal Hydrogeologist, GZA GeoEnvironmental, Inc.

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

None.

LIST OF DOCUMENTS REVIEWED

Procedures:

EN-CY-111, "Ground water Monitoring"
EN-CY-109, Rev. 2, "Sampling and Analysis of Ground water monitoring Wells"
EN-CY-108, Rev. 3, "Monitoring of Non-radioactive Systems"
EN-RP-113, Rev. 4, "Response to Contaminated Spills/Leaks"
OP 4605, Rev. 45, "Environmental Radiation Sampling and Analysis"
CHAD-7605-01, "Ground water Monitoring Plan"
PP-GPP-7605, "Ground water Protection Program"
EGAD-7605-01, "Ground water Contamination Risk Profile"

Condition Reports:

CR-VTY-2010-0069
CR-VTY-2010-0541

Other Documents

NEI Ground Water Protection Initiative Peer Assessment Report, January 25, 2010
Teledyne Brown Engineering Environmental Services 2008 In-House Water Blank and Spike Program tritium testing results (450 pCi/L standard)
Site Hydrogeologic Assessment in Support of ENVY GPI – Vermont Yankee, January 2007
Draft Ground water Protection Initiative Data Review – Vermont Yankee, September 2008

VYNPS Radiation Protection Department Report No. 10-001, Rev. 3, "Simplified Dose Analysis for Tritium in Well GZ Wells"
Areva NP, Inc. Document No. 47-9133403, February 26, 2010, "Pathway Dose Assessment for Vermont Yankee Ground water Release to the Connecticut River"
ENVY Document, May 9, 2010, "Pathway Dose Assessment for Vermont Yankee Ground water Release to the Connecticut River"

LIST OF ACRONYMS

AOG	Advanced Off-Gas
CFR	Code of Federal Regulations
COB	Construction Office Building
CR	Condition Report
CSM	Conceptual Site Model
CST	Condensate Storage Tank
ENVY	ENVY Vermont Yankee
LTGMP	Long Term Ground water Monitoring Program
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
PSB	Plant Services Building
RCA	Root cause analysis