# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Browns Ferry** | 1 | Heather Gepford |

## *Site Description*

Browns Ferry Nuclear Plant Units 1, 2, and 3 are located on the north shore of Wheeler Lake at river mile 294 in Limestone County, Alabama. The site is approximately 10 miles southwest of Athens, Alabama, and 10 miles northwest of Decatur, Alabama. The plant site contains 840 acres owned by the United States, in the custody of the Tennessee Valley Authority.

The site had a series of wells that were installed as part of the pre-operational monitoring program. Of these wells, well number 6 was sampled routinely by grab sampling until the late 1970s at which time an automatic composite sampler was installed. In 1980-1981 eleven groundwater monitoring wells were installed for the Low Level Radioactive Waste disposal facility. TVA added six regional monitoring wells circa 1984 around the site. In 2000 three additional wells were added. In 2006 as part of a site hydrology study 34 geoprobe wells were installed. Most of these wells have been routinely sampled for tritium, the results have been used to narrow down the number of wells that need to be sampled, and the frequency of sampling is being reduced.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Tennessee River (Fresh Water) | Tennessee River (Fresh Water) | 2010-03 Scheduled |

## *Known pre 2007 Groundwater Plumes*

A low level contamination plume was identified in well R-3 in early 2001. Well R-3 is a shallow well (18 ft) and the measured activity was 792 pCi/L <0.01% of the 10 CFR 20 Limit and < 5% of the drinking water standard.

## *Source of pre 2007 Ground Water Plume*

Probably rad waste discharge piping believed to be the U2/3 discharge lines to CCW

## *Known pre 2007 Surface Water Problems*

## *Source of pre 2007 Surface Water Problems*

## *Known post 2007 Groundwater Plumes*

Analyses are performed for tritium and, for selected samples, hard-to-detect radionuclides. To date, tritium has been the only radionuclide identified in the well samples. One of the wells shows slightly elevated levels of tritium (approximately 4325 picocuries per liter (pCi/L)) due to historical spills and leakage. No levels exceeding the EPA drinking water limit of 20,000 pCi/L (corresponding to 4 millirem per year to a member of the public) have been identified in the onsite or offsite environs. A spill involving ADHR water filled a pipe trench that was determined to have some cracks in it accounts for the higher tritium found in the hydrogeological study in 2006 when 34 geoprobes were installed along the trench to monitor for groundwater contamination.

NEW SPILL :

For inclusion in the groundwater data base.

From: Gepford, Heather
Sent: Thursday, April 08, 2010 10:55 AM
To: Bonser, Brian; Wert, Leonard; Kontz, Craig; Ross, Thierry; Guthrie, Eugene; Lubinski, John
Subject: Update on Browns Ferry CST Overflow

I spoke with Paul Sawyer, the RPM at Browns Ferry, about the overflow of CST #5.



A/1

As stated in the Event Report, water was being transferred from CST #3 to CST #5, with the intent of filling the 40' tank to the 38' level. The transfer was stopped when the tank level indicated 38'. However, there was a pipe with an open valve located below the 38' level. When operators tried to close the valve, they were unsuccessful.

The tank level is currently being administratitively controlled with a control room hold card. A blind flange will be installed on the pipe later today to prevent future occurences.

Investigation has found that the pipe and valve are NOT on plant drawings and are NOT on the other four CSTs. Part of their followup is to determine when/why this pipe and valve were installed and why it is not indicated on plant drawings. They will also be reviewing the 50.75(g) files to determine if any previous CST overflows have occurred and whether that may have been the reason for installing the pipe.

A sample of the CST water was taken and analyzed, with the following results:

| | |
|---|---|
| Tritium | 2.03E-3 uCi/ml |
| Co-60 | 8.90E-5 uCi/ml |
| Co-58 | 3.22E-6 uCi/ml |
| Mn-54 | 3.40E-6 uCi/ml |
| Cs-137 | 3.50E-6 uCi/ml |

Browns Ferry has excavated all the dirt to about 6" depth, where they hit dry soil. Paul believes that the total release was significantly less than 1000 gallons. The total amount of dirt excavated was approximately 15' x 4' x 5" deep, and stored in a B-25 box. The box is currently in the breezeway, protected from the elements (a storm was coming in), and has been appropriately labelled with respect to RAM. It will ultimately be disposed of as low-level waste.

They sampled the dirt during excavation and stopped when they no longer detected any gamma emitters (using the environmental LLDs) in the sample. The final soil sample was sent to WARL for tritium analysis, as they do not have the necessary detection sensitivity and techniques for counting tritium in soil. They will also be closely monitoring their groundwater wells and keep me updated on the results.

We will be inspecting the effluent program the week of June 14; this will obviously be a high priority followup item.

Let me know if you have any other questions.

Thanks,
Heather

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Heather J. Gepford, Ph.D., CHP
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US Nuclear Regulatory Commission, Region II
61 Forsyth St. SW, Suite 23T85
Atlanta, GA 30303
Phone: 404-562-4659
Fax: 404-562-4979
Cell: 770-833-6512

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# TRITIUM DATABASE REPORT

For inclusion in the groundwater data base

From: Gepford, Heather
Sent: Thursday, April 08, 2010 11:25 AM
To: Wert, Leonard; Lubinski, John; Ross, Thierry; Kontz, Craig; Guthrie, Eugene
Cc: Bonser, Brian
Subject: CST sample results

Just to clarify, the values provided were reported in the units which the counting systems produce output. Because the limits are in terms of pCi/l, I have included those values as well.

A sample of the CST water was taken and analyzed, with the following results:

| Isotope | Activity (uCi/ml) | Activity (pCi/l) | LLD (pCi/l) | Reporting Level (pCi/l) |
|---|---|---|---|---|
| Tritium | 2.03E-3 uCi/ml | 2.03E+6 pCi/l | 2000 | 20,000 |
| Co-60 | 8.90E-5 uCi/ml | 8.90E+4 pCi/l | 15 | 300 |
| Co-58 | 3.22E-6 uCi/ml | 3.22E+3 pCi/l | 15 | 1000 |
| Mn-54 | 3.40E-6 uCi/ml | 3.40E+3 pCi/l | 15 | 1000 |
| Cs-137 | 3.50E-6 uCi/ml | 3.50E+3 pCi/l | 18 | 50 |

To give a relative idea of the magnitude of these numbers, I have provided the LLDs and reporting levels for surface/drinking water samples. If no drinking water pathway exists, the reporting level for tritium is 30,000 pCi/l. These numbers do not have a direct correlation to how much activity is in the soil, as a number of physical processes will affect the migration of the radioisotopes. In addition, no reporting level for soil is given in Browns Ferry's Offsite Dose Calculation Manual.

| ***Source of post 2007 Ground Water Plume*** |
|---|
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** |
|---|---|
| Yes | Yes, June 2006 MACTEC |

| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** |
|---|---|---|
| Yes | 89 | 34 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\BrownsFerry\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\BrownsFerry\Applicable Inspection Results |

# TRITIUM DATABASE REPORT

| | |
|---|---|
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\BrownsFerry\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\BrownsFerry\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\BrownsFerry\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Brunswick** | 2 | Adam Nielsen/George Kuzo |

## *Site Description*

The Brunswick Steam Electric Plant (BSEP) site is located in the southeastern part of North Carolina 2 1/2 miles north of Southport in Brunswick County and 16 miles south of Wilmington, North Carolina. The site consists of 1200 acres and is two miles west of the Cape Fear River where it enters into the Atlantic Ocean in about 3 miles.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cape Fear River estuary/ Atlantic Ocean (Brackish -salt water) | Cape Fear River estuary/ Atlantic Ocean (Brackish -salt water) | 2010002 |

## *Known pre 2007 Groundwater Plumes*

Auxiliary Boiler Leaks 1980

Rad Waste Leaks
In 1987 the plant discovered that a radwaste line was leaking underneath the transformer yard. The line was a concrete lined 4 inch pipe that was buried from 8 to 15 feet deep. The leak was discovered when water surfaced at grade level. Since the general location of the leak was easily determined the area was excavated and the pipe was repaired. The exact cause of the leakage was not determined. The occurrence of this leak led the utility to speculate on the integrity of the other rad waste lines. The utility generated a project to replace the unit 2 piping with stainless steel or other corrosion resistant material. This project was not worked until 1994. In 1994 the Plant Review Group determined that prior to initial design for the discharge piping that video and hydrostatic testing should be done on the existing piping. The video allowed the determination that the concrete liner in the pipe had cracks but could not determine the condition of the carbon steel pipe itself. Hydrostatic testing determined that the line had a leak rate at 15 psig of approximately 1.1 gallons per minute (approximately 1/8 inch hole diameter equivalent). Subsequently the plant rerouted all liquid rad waste releases through the unit 1 piping. It was determined that there was no economically feasible way to examine the pipe and determine the failure mechanism because of the length of the line its burial depth and routing underneath the transformer yard. The line was repaired by running a 2 inch hose through the existing piping. Hydrostatic testing was performed on all other buried lines as a result. All liquid radwaste effluents have been redirected through the repaired line until such time the integrity of the Unit 1 line is validated. The existence of the 1.1 gpm leak was evaluated with the conservative assumption that the leak started immediately after the repair in 1987. It was calculated that 0.28% of the radwaste released by the plant was lost into the ground. Of 268 Curies of tritium released it was estimated that 750 milliCuries was lost through the leak at an average concentration of 1.27E-3 µCi/ml (1.27E6 pCi/L). A consultant was contracted in July 1994 to perform a technical evaluation of the potential migration of radionuclides released to the ground water environment from this potential leakage source. As part of the assessment 12 shallow piezometers and 13 monitoring wells were installed.

The information contained in the FSAR indicated a travel rate for liquid in the soil would be approximately 7 feet/ year. This resulted in it taking 120 years for the liquid to reach the intake canal. More conservative calculations done by the consultant reduced this estimate to 21.6 years . The radionuclide concentrations were then decay corrected to 21.6 years and it was determined that after neglecting all mitigating phenomena other than decay that none of the nuclide concentrations would exceed the 10 CFR 20 limits. Calculations were performed assuming vertical migration into the Yorktown sand formation and then being transported to the site boundary 3000 feet away. ( There are no domestic wells within the 3000 ft exclusion zone of the plant.) The original calculated time to reach the site boundary was 317 years. None of the nuclides would exceed current detection limits by the time that it got there. The only nuclide that had any appreciable mobility was tritium. The longer lived nuclides such as Cs-137 and Sr-90 would be expected to be trapped in the immediate vicinity of the leak due to ion exchange in the clay. Based on the studies it was concluded that there is no potential off-site exposure pathway for tritium released from the unit 2 radwaste effluent line that could present a hazard to public health and safety or the environment.
The site currently test for tritium in ground water samples from seven (7) monitoring wells. Tritium has only been detected in two of the wells that are located on the edge of the plume and are sampling water in the plant backfill. The other wells extend into the Yorktown sand and have not had positive tritium results to date. The wells in the edge of the plume fluctuate between 36000 pCi/L and 64000 pCi/L and the source of the plume is estimated at 1.2 million pCi/L. The sample results fluctuate in response to variations in rainfall amounts, well purging and sampling techniques.

The licensee established a PM to hydrostatically test the effluent lines at 6 year intervals.

There was one event at Brunswick that resulted in a release of tritium (as well as other nuclides). On May 3, 1994, the Unit 2 Radwaste Effluent Line, a 3-inch carbon steel

pipe with concrete lining (you guessed right if you picked "buried") that transfers liquid radwaste to the Unit 2 circulating water discharge tunnel failed a pressure test indicating leakage. The licensee estimated the potential total leakage from the pipe as 158,000 gallons over a seven year period. The estimate conservatively assumed that the pipe was leaking since the last time repairs were made on the line in 1987. [1,390,000 pCi/L]

Low Level Warehouse Sump 1996 water was drained from a storage container to a overflow a drain sump with ~100gallons of slightly contaminated water 4.24 E-7 µCi/ml Co-60 and 7.97E-8 µCi/ml Cs-137 through a breach in the wall in the sump to the ground under the building.

Storm Drain Stabilization Pond
In January 1997 ANI expressed an interest in the storm drain stabilization pond with regard to insurance exposure and the likelihood of nuclide migration into the groundwater. Their concerns were that the 39 acre earth lined pond could cause migration of activity into the ground water and which could be transported off site in addition to the potential for migration of nuclides into the Yorktown sand aquifer. The pond is normally maintained at 3.5 feet depth which could exceed the artesian hydraulic head of the aquifer allowing the water from the pond to enter the aquifer. The concentration of tritium in the pond is approximately 96000 pCi/L and approximately 20 to 25 curies of tritium are released from the pond each year. In their 1/7-8/97 inspection report they recommended installation of additional monitoring wells around the pond in particular on the eastern side and into the Yorktown sand aquifer.

The licensee evaluated the ANI recommendation and initially determined that based on the studies done for the radwaste line leak that there was no need to install additional wells. In April 1997 an internal memo recommended sampling various surface water sources on an annual basis unless tritium was found in which case the recommended frequency was 3 times per year. The memo went on to recommend installing an additional monitoring well on the east side of the pond into the Yorktown sand, if tritium was detected then additional wells should be established to fully characterize the release. The well was installed on 5/29/97.

The tritium enters the pond via the overflow from the turbine building swamp coolers. It enters the water at the swamp coolers from the turbine building air. Level control on the pond is maintained by discharges to the intake canal and has been a monitored release point since the discovery of measurable tritium in the water in 1991.

Electrical Vault Man Holes
On 8/30/2006 NCR 204962 was initiated as a result of finding low level tritium activity in manhole 6 SW the activity in the manhole was 6.09E-6 µCi/ml (6000 pCi/L). The licencee determined that the activity did not meet the immediate reportability requirements in 10 CFR 50.72(2)(xi). The licensee took additional samples and was going to make a decision on voluntary reporting based on those results. A total of 6 manholes were checked, five of the manholes contained water and were sampled. Most of the samples were of a similar magnitude to the first one. One sample was anomalous in that it showed approximately 1E-3 µCi/ml and appeared to have some form of chemical contaminant. The licensee processed the sample using filtration and ion exchange media and oxidation with potassium permanganate. The sample is highly colored (orange) and it is believed that there is an interferent that is giving a false high indication. The sample was going to be sent to the Harris E&E center for further evaluation. The licencee sampled wells in the vicinity and surface water. They held a meeting on the morning of 8/31/06 to determine a supplemental sampling plan. The situation was aggravated by continuous rainfall and the imminent arrival of Tropical Storm Ernesto. On the afternoon of 8/31/06 a meeting was held to determine possible sources of the tritium. The plume under the transformer yard was not believed to be a credible source. The most likely candidate appeared to be a seal failure several years ago on a CST pump. Other buried pipes were also being considered. The manholes had been sampled before but the only analysis had been for gamma emitters. The licensee appeared to be following its groundwater plan and communication plans.

The following is additional correspondence on the matter:
Email: Brian Bonser to Ruben Hamilton 4/7/2010
Ruben,
Please add these Brunswick comments and enforcement history in to the groundwater database. Edit as necessary. This in response to a media inquiry.

Brian R. Bonser
Chief, Plant Support Branch 1
Division of Reactor Safety, Region II
U.S. Nuclear Regulatory Commission

404.562.4653

From: Nielsen, Adam
Sent: Tuesday, March 30, 2010 2:46 PM
To: OBryan, Phil
Cc: Kuzo, George; Gepford, Heather; Bonser, Brian; Musser, Randy; Hannah, Roger
Subject: SDSP enforcement timeline

I just left you a voicemail responding to the question you asked Heather. I told you wrong in that voicemail. An LIV was issued in report 2008-002 for failure to evaluate doses to the public from seepage into Nancy Creek (and other pathways) i.e. a violation for assuming release through the composite sampler into the intake canal was the only pathway to the public.

Here's a timeline of our (recent) enforcement action:

2007-003 - URI opened as part of event followup for tritium discovered in SDSP.

2008-002 - URI 2007-003-002 closed. URI 2008-002-002 opened to review evaporation pathway. LIV issued for failure to evaluate doses from various pathways (including seepage into Nancy Creek) as a result of tritum released to SDSP. Very low safety significance due to no release limits exceeded.

2008-003 - URI 2008-002-002 discussed and determined that TIA from NRR needed to resolve issue of evaporation. Included in PI&R Annual Sample section: Green Finding for tritium leakage in powerblock not being recognized as current leakage rather than from historical radwaste line breaks.

2008-005 - URI 2008-002-002 closed upon completion of TIA. Evaporation pathway is not a significant contributor to offsite dose. Minor violation for not including evaporation data in annual effluent reports.

I believe Eldan Testa had a violation for radionuclides being released into the SDSP years ago, and their response was to install the composite sampler and make the pond a permitted release point, but I could find no information on this and it's just from memory. Anyway, that was several years ago (early 1990's maybe?).

From: OBryan, Phil
Sent: Tuesday, March 30, 2010 11:20 AM
To: Kuzo, George
Cc: Nielsen, Adam
Subject: RE:

I understand the context of the statement now. Thanks.

From: Kuzo, George
Sent: Tuesday, March 30, 2010 10:02 AM
To: Nielsen, Adam
Cc: OBryan, Phil; Bonser, Brian
Subject: RE:

Absolutely true - we do not know any specific details regarding if the switch yard tritium has gotten offsite. Note studies are continuing and we have not seen any dta from the

swith yard wells

From: Nielsen, Adam
Sent: Tuesday, March 30, 2010 9:37 AM
To: OBryan, Phil; Kuzo, George; Bonser, Brian; Hannah, Roger
Cc: Musser, Randy
Subject: RE:

I believe what George meant is that the localized tritium leakage that lead to the Green finding has not contributed to any offsite tritium. This is the tritum that leaked out of the concrete storm drain piping before getting to the SDSP. They had incorrectly assumed that this tritium was from a historical leak and that was the issue that lead to the Green.

The tritium that has been collecting in the SDSP for years has contributed to the tritium in Nancy Creek (offsite). I'm sure George will write more when he gets a chance. He is working from home today, but is on AL for certain times this morning.

Call me: x4660
or George: 404 786-3315

thanks
Adam

From: OBryan, Phil
Sent: Tuesday, March 30, 2010 7:51 AM
To: Kuzo, George; Bonser, Brian; Hannah, Roger
Cc: Nielsen, Adam; Musser, Randy
Subject: RE:

The licensee is aware of the problems with the story and is planning some sort of correction (exact form of communication is undecided at this time). George, the statement below " To date there has been no indication of this issue has directly contributed to tritium to the offsite environs but additional studies are continuing." - is this accurate considering the positive samples in Nancy's Creek? Technically, this is not on the licensee's property.

One of the licensee's communications options being considered is to send letters to the neighbors of the plant and to Southport officials explaining everything. I told Mike Annacone (site VP) yesterday that it would be more appropriate to send something to the Star-News, since many more people were exposed to the bad information through the newspaper and the letters would not correct the problem. Perhaps we should consider doing this (talking to the Star-News) if the licensee doesn't. This was a front page story in the paper and it has "NRC said..." in it. I think our responsibility extends beyond the immediate vicinity of the plant.

From: Kuzo, George
Sent: Monday, March 29, 2010 2:56 PM
To: Bonser, Brian; Hannah, Roger
Cc: Nielsen, Adam; OBryan, Phil; Kuzo, George
Subject:

Roger/Brian/Phil,

Adam and I have these comments.

Roger - you may want to discuss the two article statements, offsite concentrations and findings w/ the BSEP PA individual, so he does not get blind-sided as a liar in the

press. Also, Adam is checking to see if the waypoint data for Nancy Creek is listed in either the Annual Effluent Reports/ Radiological Environmental Monitoring Report. Adam will get back to us.

Region 2 claification regarding the Starline News

The NRC R2 staff believe that w/out the proper context, two statements in the article need some clarification.

1. As part of the current monitoring program, the licensee has occasionally reported extremely low tritium concentrations (< 1000 picocuries per liter [pCi/l]) in Nancy Creek surface
water samples immediately adjacent to the onsite stablization pond. These concentrations are significantly less than limits (20,000 pCi/l) established by the EPA for drinking
water. The water is not used for potable (drinking) purposes. If the article's intent was to indicate that no detectable concentrations of tritium have been found in samples from the
deep aquifer suppling drinking water to the surrounding communities then the statement would be true.

2. Although no significant violations were identified during the most recent inspection of the groundwater protection program, a minor violation regarding the failure to adequately review
controls for the storage of radioactive liquid waste in a large number of 250 gallon storage containers within the radiologically controlled onsite area was identified. This minor issue was
addressed in a timely fashion and in accordance with NRC policy will not be documented in the upcoming NRC inspection report which will be issued in late April 2010. Also, a green
finding regarding failure to properly identify the root cause of tritium leaks from turbine building condensate routed through the storm drain piping was identified in second quarter of
calendar year 2008 (Inspection Report 05000325, 324/2008003) . Again, the licensee has addressed this finding and is currently working to characterize the quantities and location of
the tritium released. To date there has been no indication of this issue has directly contributed to tritium to the offsite environs but additional studies are continuing.

***Source of pre 2007 Ground Water Plume***

Aux boiler tube leaks, Rad Waste Line, Repaired Rad Waste Line Stabilization Pond via Turbine Building Coolers, Electrical Vaults

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

NRC Inspection Report 05000325, 324/2007003 documented initial event follow-up evaluation of onsite groundwater tritium concentrations exceeding Nuclear Energy Institute (NEI) voluntary reporting criteria. On June 13, 2007, the licensee notified local, county, and State of North Carolina authorities regarding the identification of groundwater tritium (H-3) concentrations in shallow onsite monitoring wells which exceeded recently established NEI voluntary reporting criteria. The subject wells were established to evaluate the potential movement of H-3 from the licensee's onsite storm drain stabilization pond (SDSP) to the surrounding groundwater environs and/or to onsite structures. Subject to final development of onsite groundwater monitoring wells, the NRC committed to conduct split sampling for subsequent radiological analysis of onsite and offsite surface and groundwater by the NRC, licensee, and State of North Carolina Department of Environment and Natural Resources (NCDENR) representatives.
On August 7, 2007, the NRC resident inspectors independently collected selected onsite groundwater and offsite surface water samples and submitted the samples for both tritium and gamma–emitting radionuclide analyses by the NRC vendor laboratory.

Water samples were collected from onsite groundwater monitoring wells adjacent to west edge of the SDSP, i.e, 19C [shallow, approximately (~) 20 foot (') depth], 19B (intermediate, ~ 42' depth); and from well 24A, located east of the SDSP (deep, ~ 140' depth). In addition, surface water samples were collected from offsite locations that could be potentially affected by H-3 releases from the SDSP including Nancy Creek, Log Gum Branch Creek, and the Cape Fear River. The subject samples were split with the licensee and NCDENR representatives to evaluate the licensee's proficiency and accuracy in sampling and conducting quantitative radiological-analysis of environmental samples to acceptable levels of sensitivity.
Analyses of the selected onsite and offsite water samples for gamma-emitting radionuclides by the NRC, licensee, and NCDENR did not identify any radionuclide concentrations resulting from routine reactor operations which exceeded analytical detection limits. Established radionuclide detection levels were at concentration levels significantly less than those specified within the licensee's current Offsite Dose Calculation Manual. For tritium analyses, detectable concentrations were identified only for samples collected from the shallow and an intermediate groundwater monitoring well located onsite and adjacent to the SDSP. For the reported data, licensee H-3 results were within agreement among the NRC, licensee, and NCDENR. The criteria used to compare the sample results are provided in A-5, and the results of the tritium comparisons among the NRC, licensee, and NCDENR are provided in A-6.
Licensee activities were evaluated against details and guidance documented in the following: 10 CFR Part 20 and Appendix I to 10 CFR Part 50; ODCM; RG 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials In Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants, June 1974; and RG 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations - Effluent Streams and the Environment, Rev. 1.

During the week of June 18, 2007, inspectors reviewed the licensee's preliminary investigation into the cause, extent, and migration of tritium from the onsite Storm Drain Stabilization Pond (SDSP) to the surrounding environs, its potential impact on both onsite and offsite surface and groundwater environments, and preliminary dose estimates to general members of the public. At that time, an unresolved item was identified regarding the adequacy of licensee surveys (evaluations) required by 10 CFR 20.1501(a) necessary to implement TS 5.5.4, Radioactive Effluent Controls Program, controls used to maintain doses to members of the public from releases of effluents as low as reasonably achievable (ALARA) in accordance with Appendix I to 10 CFR 50 design criteria as specified in 10 CFR 50.36a.
In March 2008, inspectors reviewed NCR 233865 and the licensee's significant adverse condition investigation report addressing the identification of water containing tritium in the area on the west side of the SDSP near the tidal marsh at Nancy's Creek and in other locations outside the SDSP dike area. The inspectors also reviewed environmental sampling results and determined that monthly surface water samples from Nancy's Creek identified either no detectable or background levels of tritium and environmental sampling of fish and invertebrate species in Nancy's Creek have identified no detectable tritium. The inspectors evaluated the licensee's preliminary dose assessments for the inhalation/ingestion pathways from evaporation of tritiated water from the SDSP and for the ingestion pathway from tidal flushing of the contaminated marsh area surrounding the SDSP to the surrounding creeks.
Using conservative assumptions, the licensee determined an upper bound for the ingestion pathway dose to an offsite individual consuming fish and invertebrates resulting from seepage of tritiated water from the SDSP to the tidal marsh. The calculation assumed the maximum measured concentration of tritium in the marsh (weekly sampling from June 2007 through March 2008 had identified activities varying from not detectable to 1.66 E+04 picocuries/liter); two six-hour marsh releases per day; no credit for radioactive decay; and no dilution. At the time of the inspection, the licensee was refining the marsh calculation to make the dose assessment more accurate.
The licensee completed the preliminary evaluation of the dose to an offsite individual from evaporation of tritiated water from the SDSP based on monthly evaporation rates from the SDSP, monthly measured SDSP tritium concentrations, and the Offsite Dose Calculation Manual methodology for ground-level gaseous effluent releases from the turbine building. This approach was used because appropriate parameters (e.g. X/Q, D/Q) specific to gaseous effluent releases from the SDSP had not been previously determined. At the time of the March 2008 inspection, the licensee was validating the dose assessment methodology.
The preliminary dose assessments determined that both the seepage (tidal marsh) and the evaporation pathways from the SDSP contributed incremental dose to the public comparable in magnitude to previously assessed liquid and gaseous effluent pathways.
In addition, the preliminary assessments were sufficient to demonstrate compliance with the requirement to maintain doses to members of the public from radioactive effluents ALARA as specified in Appendix I to 10 CFR 50 and to demonstrate that the effluent concentration limits in Appendix B to 10 CFR 20 were not exceeded.

From: Sherrill, Tom [mailto:Tom.Sherrill@pgnmail.com]
Sent: Thursday, April 15, 2010 3:17 PM
To: Nielsen, Adam
Subject: BNP Tritium Request

# TRITIUM DATABASE REPORT

Mike Millinor is off for the next 3 days as he travels to Robinson and Alicia Baker does not have Mike's files so Lee Grzeck provided these numbers from a graph that he had and Alicia will get the exact numbers to follow in the next couple of day. Hopefully this will help.

- The highest tritium concentration found in the stabilization pond 1,100,000 pCi/Li
- The highest tritium concentration found in a monitoring well 3,400,000 pCi/Li
- The total number of monitoring wells 144 monitoring wells

17 way points

92 extraction wells

Thomas Sherrill
Progress Energy
Licensing Engineer
910 457-2703
Pager 910 412-0942

| *Source of post 2007 Surface Water Problems* | |
|---|---|
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** |
| Yes, Multiple | Yes, June 1995 D'Appolona |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 144 | 92 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Brunswick\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Brunswick\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Brunswick\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Brunswick\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Brunswick\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Catawba | 3 | Wade Loo |

***Site Description***

Catawba Nuclear Station is in the north central portion of South Carolina about 6 miles north of Rock Hill, about 10 miles south southwest of Charlotte and adjacent to Lake Wylie. The 391 acre site is in York County on a peninsula bounded by Beaver Dam Creek to the north, Big Allison Creek to the south, Lake Wylie to the east and private property to the west.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Mechanical Draft Cooling Towers ( Fresh Water) | Lake Wylie (Fresh Water ) | 2010-04 Scheduled |

***Known pre 2007 Groundwater Plumes***

On 6/29/06 The east trench from the Monitor Tank building was discovered to contain approximately 1 inch of water, the water contained low levels of Co-60 Later it would be determined that some activity had penetrated the wall of the trench and was remediated by removal of the contaminated soil. The tritium activity in the water was 3,000,000 pCi/L. The trench was 100 feet long, 3 feet wide and 4 feet deep, no cracks in the bottom but cracks were found on the sides.
It was discovered that under certain circumstances a siphon could occur from one of the tanks and a vacuum breaker was installed to prevent reoccurence.

***Source of pre 2007 Ground Water Plume***

The licensee currently has five groundwater monitoring wells located near waste water retention ponds (WC system) outside the power block. Preliminary hydrological studies have been performed to determine the optimum location for additional groundwater sample points and 30 new wells are currently being constructed. Detectable levels of tritium have been identified in samples taken from the WC wells, the WZ sumps (french drain system), composite samples from an onsite wetlands area (WC discharge point), and from the Retired Steam Generator Storage Facility sump.

***Known pre 2007 Surface Water Problems***

. Monitoring for tritium contamination in groundwater is complicated by the fact that Lake Wylie has a relatively high tritium background due to routine effluent discharges from both Catawba Nuclear Station and McGuire Nuclear Station (40 miles upstream). As of January 2007, tritium concentrations in the lake range from 8,998 picoCuries per liter (pCi/L) to 16,700 pCi/L based on quarterly composite sample results and have been trending upward since plant startup. This makes it difficult to determine whether positive groundwater sample results are due to leaks in contaminated systems or simply lake water intrusion. No levels exceeding the EPA drinking water limit of 20,000 pCi/L (corresponding to 4 millirem per year to a member of the public) have been identified in the offsite environs.

# TRITIUM DATABASE REPORT

| *Source of pre 2007 Surface Water Problems* |
|---|
| Catawba is downstream of McGuire and recieves water that contains McGuires effluents. Lake Norman has a typical average tritium concentration of approximately 800 pCi/L. There are additional outfalls from McGuire Station on the Catawba river |
| *Known post 2007 Groundwater Plumes* |
| *Source of post 2007 Ground Water Plume* |
| *Known post 2007 Surface Water Problems* |
| We need to keep an eye on the tritium levels in Lake Wylie. They are currently around 17,000 pCi/L for an annual average (discharge point). This is a drinking water pathway, so the EPA limit of 4 mrem/yr (20,000 pCi/L) applies. |
| *Source of post 2007 Surface Water Problems* |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes, Duke Internal | Yes, Duke Internal |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| Yes, Duke Internal | 35 | 30 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| *Questionaires* | G:\Access Databases\Tritium Database\Catawba\Questionaire |
| *Applicable Inspection Results* | G:\Access Databases\Tritium Database\Catawba\Applicable Inspection Results |
| *Hydrologist Report* | G:\Access Databases\Tritium Database\Catawba\Hydrologist Report |
| *Reviews* | G:\Access Databases\Tritium Database\Catawba\Reviews |
| *Event Related* | G:\Access Databases\Tritium Database\Catawba\Event Related |

# TRITIUM DATABASE REPORT

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Crystal River | 4 | George Kuzo |

***Site Description***

The Crystal River site is in the northwest portion of Citrus County, Florida about 7 1/2 miles northwest of the town of Crystal River and 70 miles north of Tampa between U.S. Route 19 and the Gulf of Mexico. The site consists of 4738 acres primarily composed of marshlands and low-lying areas. Terrain gradually rises to gently rolling hills 16 miles west of the site.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Gulf of Mexico (Salt Water ) | Gulf of Mexico (Salt Water ) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

Groundwater monitoring initiatives and radionuclide concentration results for approximately 14 recently established onsite groundwater monitoring wells surrounding the power block and a percolation pond receiving contaminated liquid effluents were reviewed in detail. Initial results of samples collected from the wells associated with the power block did not identify tritium concentrations above environmental detection limits.

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 0 | 14 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| *Questionaires* | G:\Access Databases\Tritium Database\Crystal River\Questionaire |
| *Applicable Inspection Results* | G:\Access Databases\Tritium Database\Crystal River\Applicable Inspection Results |

# TRITIUM DATABASE REPORT

| | |
|---|---|
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Crystal River\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Crystal River\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Crystal River\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Farley** | 5 | Adam Nielsen |

***Site Description***

The site is located in southeast Alabama, 16.5 miles east of Dothan, Alabama; 20 miles north of the Florida border on the west side of the Chattahoochee River and across the river from Early County, Georgia. The 1850 acre site is approximately 45 percent wooded with the remainder the used for agricultural purposes.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cooling Towers | Chattahoochee River ( Fresh Water ) | 2009004 Complete |

***Known pre 2007 Groundwater Plumes***

3/8/2002 Unit 2 radioactive liquid effluent release line broke underground causing water to rise to surface and be detected near the west sitd of the Unit 2 reactor makeup water storage tank just under the first flight of stairs. The leaking pipe was repaired. The affected soil (~15' X 15 ') which registered activity with a frisker was drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germanium detector. The affected soil which registered activity on a frisker was drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germanium detector. Condition report # 2002000535....CR in description states "Based on Chemistry sample results, temperature of the water and location of the leak suspect it is SW dilution backflow into the WMT release line.
From comments section:
The sample results were as follows: Temp ~80F
pH=7.6
Specific Conductivity 210 micro-S/cm
Isotopic= 2.279 E-6 µCi/ml (long lived)
Tritium = 7.863 E-5 µCi/ml (78630 pCi/L)
Investigation revealed that the leakage did not reach the yard drain and so it was treated as a spill rather than an abnormal release

SEPARATE BUT SIMILAR EVENT Early 2000's (anecdotal) Unit 1 steam generator blowdown discharge line leaked underground allowing slightly contaminated water to seep into the ground on the south side of the suubber test building. The leak was repaired. The affected soil which registered activity with a frisker ws drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germainium detector.

# TRITIUM DATABASE REPORT

| |
|---|
| ***Source of pre 2007 Ground Water Plume*** |
| ***Known pre 2007 Surface Water Problems*** |
| ***Source of pre 2007 Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007 Ground Water Plume*** |
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 0 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Farley\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Farley\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Farley\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Farley\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Farley\Event Related |

# TRITIUM DATABASE REPORT

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Harris** | 6 | Adam Nielsen/Ruben Hamilton |

***Site Description***

SHNPP site is located in the extreme southwest corner of Wake County, NC approximately 16 miles southwest of Raleigh which is the largest population center, and approximately 15 miles northeast of Sanford, NC in Lee County. The region within a 50-mile radius of the SHNPP site contains both urban and rural areas with industry, farming, business education, research, and military interests.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Natural Draft Cooling Tower/Harris Lake ( Fresh Water) | Harris Lake ( Fresh Water ) | 2010-03 Scheduled |

***Known pre 2007 Groundwater Plumes***

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

EVENT NOTIFICATION
On April 1, 2009, the results of an ongoing hydrology study being conducted by Harris Nuclear Plant as part of the voluntary Industry Groundwater Protection Initiative revealed that a pipe leak in the buried Cooling Tower Blowdown line was releasing water containing tritium into surrounding soil. The maximum tritium activity level discovered was 2,120 pCi/L, well below maximum levels allowed by regulation. While the leak rate has not been determined, it appears to be small. The Cooling Tower Blowdown line is used for liquid effluent dilution as part of permitted, routine releases. The permitted liquid effluent release point is the discharge from the Cooling Tower Blowdown line into Harris Lake. This line is leaking upstream of the permitted release point. All leaking water is contained within the site boundary, and based on studies performed by an independent hydrologist, offsite migration is not anticipated.

Immediate corrective actions include voluntary notifications, installation of additional monitoring wells at various locations to determine groundwater flow and to check for the presence of tritium. The water containing low levels of tritium is in a localized area immediately surrounding the Cooling Tower Blowdown line.

The health and safety of the public are not affected by this event, as the activity levels discovered are significantly below maximum levels allowed by regulation. Harris Nuclear Plant is following the guidance contained in NEI 07-07 and has initiated this Event Notification as a result of our voluntary communication to State agencies in accordance with the Groundwater Protection Initiative.

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The inspectors reviewed the licensee's actions in response to ground water samples results that indicated an increase in tritium along the Cooling Tower Blowdown Line (CTBL).

b. Findings
Introduction: The inspectors identified an unresolved item associated with the leakage of radioactive liquid effluents into the ground from cracks in the CTBL. This item is unresolved pending further review and evaluation of the licensee's final dose assessment for the CTBL pathway.
Description: The inspectors reviewed with licensee representatives the licensee's vendor report regarding the assessment and evaluation of the increase in tritium identified in ground water samples wells along the CTBL as documented in AR #00309035. The licensee discharges permitted and monitored radioactive liquid effluents into the CTBL for dilution with a release point into the Harris Lake. On December 15, 2008, the licensee had observed water in Air Relief System Manhole (ARSM) Number (No.) 2 located on the

CTBL upstream from the permitted release point.
The licensee obtained water samples from ARSM No. 2 for analysis and identified tritium levels ranging from less than the detection limit to 2,120 picocuries per liter (pCi/L). As a result, the licensee conducted a hydrology report and assessment of the CTBL. From that assessment the licensee installed nine groundwater monitoring wells at various points along the CTBL and ARSM No. 2 from January 21 – March 4, 2009. At the time of the onsite inspection, the licensee had collected several monthly samples with tritium levels ranging from less than the detection limit to 2,450 pCi/L. Some wells were found to be dry. At the time of the onsite inspection the licensee was still evaluating the results of the groundwater monitoring wells. The licensee also evaluated the inside of the CTBL. The licensee identified numerous cracks and plant roots growing into the CTBL. In addition, there was approximately 3,000 feet of the CTBL (located downstream of the Cooling Tower but upstream from ARSM No. 2) that was not evaluated due to worker safety conditions (e.g., slippery conditions due to mud, low oxygen concentrations, etc.). At the time of the onsite inspection, the vendor had not submitted its final assessment and evaluation report of the CTBL to the licensee. As a result, the licensee had not evaluated and assessed the amount of radioactive liquid effluents released into the ground from cracks in the CTBL.
An unresolved item (URI) was identified regarding the significance of the CTBL leakage pathway with regard to meeting the requirements of the Offsite Dose Calculation Manual (ODCM). The ODCM states that radioactive materials released in liquid effluents to unrestricted areas are required to demonstrate compliance with 10 CFR 50 Appendix I.
The calculated annual total quantity of all radioactive materials above background to be released from each light-water-cooled nuclear power reactor to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millirems to the total body or 10 millirems to any organ. The dose commitment had not been determined due to an unevaluated release pathway where releases were occurring at a location other than designed. Specifically, radioactive liquid effluents were being released into the ground from cracks in the CTBL. In accordance with the ODCM, the liquid effluent release point is at the point of discharge from the CTBL into Harris Lake.
This item is unresolved pending NRC review and evaluation of the final dose assessment for the CTBL pathway. URI 05000400/2009003-01, Review the Cooling Tower Blowdown Line Pathway Dose Compared to Doses from All Other Pathways.

The site performed an evaluation of off site dose consequences of the leaking cooling tower blowdown line and determined that there was no credible pathway from the leak to the nearest resident without the intercession of the lake.

The following is a draft of the URI Closure:
(Closed.) URI 05000400/2009003-XX. Review the Significance of the Cooling Tower Blowdown Line Pathway Dose Compared to Doses from All Other Pathways.

□An unresolved item (URI) was identified regarding the significance of leakage from a cooling tower blowdown line (CTBL) used to transport radioactive effluents. The licensee discharges permitted and monitored radioactive liquid effluents into the CTBL for dilution prior to release into Harris Lake. On December 15, 2008, the licensee had observed water in Air Relief System Manhole (ARSM) Number (No.) 2 located on the CTBL upstream from the permitted release point. The licensee obtained water samples from ARSM No. 2 for analysis and identified tritium levels ranging from less than the detection limit to 2,120 picoCuries per liter (pCi/L). On May 1, 2009, the inspectors noted that the leakage could constitute an unanalyzed exposure pathway to a member of the public and opened the URI.

□The Offsite Dose Calculation Manual (ODCM) states that radioactive materials released in liquid effluents to unrestricted areas are required to demonstrate compliance with 10 CFR Part 50 Appendix I. Appendix I annual limits are 3 millirem to the total body or 10 millirem to any organ. In addition, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I" specifies that exposure pathways that may arise due to unique conditions at a specific site should be considered if they are likely to provide a significant contribution to the total dose. A significant pathway is considered one whose additional dose increment is equal to or greater than ten percent of the total from all pathways.

□The licensee contracted a vendor to perform an analysis of the hydrological transport properties in the vicinity of the CTBL leaks. The licensee also performed calculations of doses to hypothetical members of the public through alternate release pathways as a result of the leaking CTBL. The location of the leakage was on a peninsula projecting into Harris Lake and hydrological studies show any leakage would ultimately migrate to the lake (the permitted release location), rather than offsite. Local vegetation was analyzed and no tritium was detected, thereby showing that vegetation-human ingestion or vegetation-animal-human ingestion pathways are not significant. Although no drinking wells are located in the vicinity of the contaminated plume and the site boundary is 1.79 miles away, calculations were performed to conservatively estimate the dose to a member of the public who used the contaminated water as their primary drinking water for an entire year. The results were below 10 CFR Part 50 Appendix I annual limits. Through review of licensee documents and discussions with licensee personnel and Nuclear Reactor Regulation (NRR) staff, the inspectors determined that no new

# TRITIUM DATABASE REPORT

| |
|---|
| significant exposure pathways were created as a result of the CTBL leakage. |
| ***Source of post 2007 Ground Water Plume*** |
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 5 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Harris\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Harris\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Harris\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Harris\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Harris\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Hatch | 7 | Adam Nielsen |

***Site Description***

The site consists of 2244 acres and on the south side of Altamaha River, southeast of the intersection of the river with US Hwy No. 1. This site is located in a region of relatively flat to rolling terrain. The land is primarily wooded with a small percent being used for various agricultural purposes.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Mechanical Draft Cooling Towers/ Altamaha River (Fresh Water) | Altamaha River ( Fresh Water ) | 2010-03 Scheduled |

***Known pre 2007 Groundwater Plumes***

The licensee's tritium monitoring program was assessed during the baseline public radiation safety inspection performed at Hatch on July 17 - 21, 2006. Hatch samples several wells onsite, as well as outfalls to the river that release water from surface and subsurface drainage systems. The licensee currently samples most of it piezometer wells, and has added several more groundwater sampling wells over the years.

The main concentration of Hatch's sampling wells are located around the Unit 1 Condensate Storage Tank (CST). This tank holds radioactive water and has had historical leaks through transfer piping and valves leading off of the tank. The highest tritium concentrations found in the sampling wells around U1 CST spiked to 4E6 pCi/L in 2003, and the concentrations have been fluctuating over time. Recently, the licensee has implemented several corrective actions in an attempt to halt the CST leaks. These corrective actions are discussed in Condition Report 2006102808, and include replacement of piping and valves in the CST Pump Moat. The licensee also plans on coating the moat walls with a sealant to avoid drainage of contaminated water through the concrete.

Reports associated with abnormal liquid releases and corrective actions initiated since calendar year (CY) 1978 were reviewed and discussed with responsible licensee representatives to evaluate the potential onsite/offsite environmental impact of significant leakage/spills from onsite systems, structures, and components. One historical issue reviewed was a spill in 1986 that released several hundred thousands of gallons of spent fuel pool water to the plant's yard drain system, which ultimately drained to the swamp area east of the plant. The licensee has been sampling sludge in the swamp since this event, and levels of Cs-137 and Co-60 have substantially decreased since the spill. Only one sample point in the swamp still showed measurable levels of radioistopes (app. 1000 pCi/kg of Cs-137). The sampling of the swamp is coordinated through SNC corporate environmental staff, and sampling results are documented in an augmented radiological environmental operating report that is currently published every eight years. Site HP also conducts dose rate surveys of the swamp annually, and the chemistry department samples outfalls at the swamp for tritium on a quarterly basis.

Most onsite groundwater monitoring wells are procedurally sampled on a yearly or quarterly frequency, but due to public interest, Hatch has set administrative sampling frequencies to quarterly and weekly. From the samples gathered, Hatch has identified no tritium in offsite locations in concentrations greater than background.

At the time of the inspection, Hatch was in the process of making two outfalls monitored release points that would be added to their ODCM. These two outfalls were N008A, and N002A, which release water collected in yard surface drains and subsurface french drains. At each outfall, the licensee was installing collection tanks and composite samplers that would be used to generate weekly permits for release of the tanks to the station's discharge flumes at the river.
Future plans of the licensee concerning groundwater monitoring include ultrasonic testing of buried pipes, continued work with the site hydrologist, and the addition of 15-20 sampling wells.
Southern Company Groundwater Protection Contact: Mary Beth Lloyd (205) 992-5062

# TRITIUM DATABASE REPORT

| *Source of pre 2007 Ground Water Plume* |
|---|
| 1979 The line between the Offgas building and the Turbine Building sheared allowing a spill. 1986 Spent Fuel Pool Transfer Canal Inflatable Bladder being deflated between the pools allowed 100,000 gallons of water to escape the protected area and drain to a nearby swamp. 2005 High Tritium levels Near Unit 1 CST. 2006 High Tritium Levels found in Yard Well 1Y22-N008A |
| *Known pre 2007 Surface Water Problems* |
| In 2006, hydrological studies were performed to determine the optimum location for new groundwater sample points. Currently, the licensee maintains 40 onsite groundwater monitoring wells with samples taken at various frequencies. Analyses are performed for tritium and, for selected samples, primary gamma emitters and gross beta. To date, tritium has been the only radionuclide identified in the well samples. Historically, the primary source of leakage has been from Unit 1 condensate storage tank pumps and associated piping. While contamination levels near the tank have been high at various times in the past, no levels exceeding NRC or Environmental Protection Agency (EPA) limits have been reported in the offsite environs.<br>The licensee continues to take measurements in an onsite swamp that was contaminated during a SFP leakage event in 1986. The licensee issues supplemental environmental monitoring reports at varying frequencies (the next is due in 2008) that contain the results of these swamp measurements. To date, no contamination levels have been reported above NRC or EPA limits. |
| *Source of pre 2007 Surface Water Problems* |
| *Known post 2007 Groundwater Plumes* |
| *Source of post 2007 Ground Water Plume* |
| *Known post 2007 Surface Water Problems* |
| *Source of post 2007 Surface Water Problems* |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | Yes, 2006 MACTEC |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 40 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

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|---|---|
| *Questionaires* | G:\Access Databases\Tritium Database\Hatch\Questionaire |
| *Applicable Inspection Results* | G:\Access Databases\Tritium Database\Hatch\Applicable Inspection Results |
| *Hydrologist Report* | G:\Access Databases\Tritium Database\Hatch\Hydrologist Report |
| *Reviews* | G:\Access Databases\Tritium Database\Hatch\Reviews |

# TRITIUM DATABASE REPORT

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|---|---|
| ***Event Related*** | G:\Access Databases\Tritium Database\Hatch\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **McGuire** | 8 | Wade Loo |

***Site Description***

McGuire Nuclear Station is in northwestern Mecklenburg County, NC, 17 miles northwest of Charlotte, NC, adjacent to Lake Norman. The site is bounded to the west by the Catawba River and to the north by Lake Norman. Surrounding land is generally rural non-farm land. The site has a state licensed low level waste facility adjacent to the plant.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Lake Norman (Fresh Water ) | Catawba River and Lake Norman (Fresh Water ) | 2010002 Complete |

***Known pre 2007 Groundwater Plumes***

There were no significant ground water plumes identified

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

Lake Norman has a tritium background of 800 to 1000 pCi/L

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

Samples onsite are less than the 20000 pCi/L drinking water standard. One location was identified as having approximately 11000 pCi/L Tritium . The source was later determined to be from condensate polisher resin which had been disposed of under a state land application permit by tilling into the soil. Although the polisher resin was from a clean system low levels of tritium was trapped in the resin from the tritium that had diffused through the steam generator tubes into the secondary system.

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

A waste holding pond leaked very very low level water which would ultimately migrate to the Catawba river. During the investigation it was determined that a sampling system discharge was aligned into the wrong sump and rather than being pumped back to the waste hold up pond it was discharged into a ditch to the Catawba River. The water had been monitored and the activity had been determined to meet release criteria.

***Source of post 2007 Surface Water Problems***

Conductivity monitor effluent line aligned to discharge into the wrong valve sump.

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 55 | 8 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

# TRITIUM DATABASE REPORT

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|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\McGuire\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\McGuire\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\McGuire\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\McGuire\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\McGuire\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **North Anna** | 9 | Ruben Hamilton |

***Site Description***

The station is located in the northeastern portion of Virginia in Louisa County. The site is on a peninsula on the southern shore of the Lake Anna reservoir. The site proper covers 1075 acres and is within an exclusion area of 1855 acres of which 780 acres are covered by water from Lake Anna. The site is approximately 40 miles north-northwest of Richmond, Virginia and 70 miles southwest of Washington, DC. Plant has extensive basemat drain subsystem with 6 zones that are routinely sampled.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| North Anna Reservior ( Fresh Water ) | North Anna Reservior ( Fresh Water ) | 2009002 Complete |

***Known pre 2007 Groundwater Plumes***

Lake Anna has reached an equilibrium concentration of between 4500 and 5000 pCil/L due to normal liquid radwaste and steam generator blowdown releases. This concentration is ubiquitous in that the ground water and the lake have similar levels, as does any condensation such as condensate from air conditioning units.

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

Lake Anna has reached an equilibrium concentration of between 4500 and 5000 pCil/L due to normal liquid radwaste and steam generator blowdown releases. This concentration is ubiquitous in that the ground water and the lake have similar levels, as does any condensation such as condensate from air conditioning units.

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes, Review was done by corporate | Corporate review/Study |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| Yes, | 9 | 6 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\North Anna\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\North Anna\Applicable Inspection Results |

# TRITIUM DATABASE REPORT

| | |
|---|---|
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\North Anna\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\North Anna\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\North Anna\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Oconee** | 10 | Wade Loo |

***Site Description***

The site is located approximately 8 miles northeast of Seneca, SC in northwestern South Carolina. The land is bounded to the north and east by Lake Keowee. The land is generally wooded, rolling hills. Hartwell reservoir is south of the site and Lake Joeassee is 11 miles north of the site.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Little River arm of Lake Keowee (Fresh Water) | Little River arm of Lake Keowee (Fresh Water) | 2009002 Completed |

***Known pre 2007 Groundwater Plumes***

Tritium leakage from chemical treatment ponds (CTP)was discovered in 1992.
Groundwater has measuralble levels of tritium in all of the wells associated with the CTP. In 1995 approximately 14,000 pCi/L was measured at well A-1 which is downgradient from CTP 1 and 2. In 1996 3439 pCi/L was measured at well A-10 which is associated with CTP-3

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

_____December 16, 2009- Oconee Groundwater Monitoring Well Project Update_____
S&ME, a vendor for Duke, is in the process of drilling several new wells onsite at Oconee, to further characterize the flow of groundwater in order to determine the source of elevated levels of tritium at monitoring well GM-7 & 7R located near the 525kV switchyard.

Progress has been made at drilling the wells, and drilling activities are expected to be completed within the next couple of days. Approximately 6 wells are expected to be sampled tomorrow, 12/17/09, with quick sample results back as early as next week. However, since there may be residual drilling fluid/water in the wells, accurate results may not be obtained for approximately 14 days. In other words, if a sample pulled tomorrow comes back as below the limit, it may not still be below the limit when sampled in two weeks. Soil samples along the liquid radwaste line that runs adjacent to the switchyard have been taken, and are to be sent to Duke's environmental lab for evaluation. These samples may help narrow down the location of the leak; if it is a leak in the radwaste line that is causing the elevated levels.

The licensee is holding a meeting tomorrow morning to discuss the potential communication plan should any of the samples show tritium in excess of EPA limits. All of the existing wells as well as the new wells will be sampled again on January 25, 2010

_____December 30, 2009- Oconee Groundwater Monitoring Well Project Update_____
Installation of the new wells onsite at Oconee is nearing completion (6 out of the 17 new wells still need to be completed). Some of the newly drilled wells have been sampled and counted. One of the wells within the protected area, GM-16DR, was found to be higher than the EPA limit of 20,000 pCi/L (the measured value was ~23,300 PCi/L). This result was based on what the licensee has termed a quick count sample that will not be used for reporting or communication purposes. Also, due to suspended solids in the sample, the "quick count" may not be accurate. When recounted a second time after the sample had time to settle, the activity decreased to ~16,000 pCi/L. Samples taken at the same time from that well location were also sent to Duke's environmental lab for evaluation, with results expected back by next week. Any communication will be based on these official lab results.

The results of the soil samples that were taken along the LWD line adjacent to the switchyards did not show any appreciable activity, therefore, the licensee could not conclude that the increase in activity in well GM-7R was due to a leak in the LWD line. The location of the source of the Tritium has yet to be determined and guesses on the location would be speculation.

# TRITIUM DATABASE REPORT

_____January 28, 2010- Oconee Groundwater Monitoring Well Project Update_____

Installation of the new wells onsite at Oconee is nearing completion (1 out of the original 17 new wells still need to be completed). Quarterly sampling of the existing and new wells was completed this week. Two of the new wells did not meet the 2 week waiting period prior to sampling, and thus were not sampled along with the rest. Based on the elevated results that were previously obtained at well 16, two additional new wells in the transformer yard will be drilled, with excavation beginning next week.

Quick count results performed at Oconee show ~32,000 pCi/L at the same well location (GM-7/7R) that had previously shown increased concentrations of tritium. Official lab results that will be obtained next week are expected to be above the 20,000 pCi/L notification criteria. Therefore we should be prepared for the notification.

Notification was made 2/9/2010. It stated that samples from 2 monitoring wells exceeded the reporting threshold of 20,000 pCi/L.It emphasised that the wells were not drinking water wells but rather monitoring wells. The levels reported were 24,400 and 36,400 pci/l. It went on to state that the 52 other wells did not exceed the reporting threshold. (It did not say that they did not have tritium activity that was measurable in the water.

A 50.72 notification was also generated on 2/9/2010 to document the notification of other government agency ( the state of South Carolina.) In the EN it identified the wells as GM-7DR and GM-7R These wells are at the southern end of the 525KVswitchyard and are fairly deep and into the rock.

| *Source of post 2007 Ground Water Plume* |
|---|
| *Known post 2007 Surface Water Problems* |
| *Source of post 2007 Surface Water Problems* |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 54 | 31 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| *Questionaires* | G:\Access Databases\Tritium Database\Oconee\Questionaire |
| *Applicable Inspection Results* | G:\Access Databases\Tritium Database\Oconee\Applicable Inspection Results |
| *Hydrologist Report* | G:\Access Databases\Tritium Database\Oconee\Hydrologist Report |
| *Reviews* | G:\Access Databases\Tritium Database\Oconee\Reviews |
| *Event Related* | G:\Access Databases\Tritium Database\Oconee\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Robinson** | 11 | Adam Nielsen/Heather Gepford |

***Site Description***

The site is located due west of the dam of Lake Robinson in Western Darlington County, 5 miles NW of Hartsville, Darlington County, South Carolina. The area is primarily rural and is comprised of farmland, forestry areas, and rolling terrain made up of sand hills and water courses.

The licensee's ground water monitoring program was assessed during the baseline occupational radiation safety inspection performed on June 26-30, 2006. The inspectors interviewed the Manager-Chemistry and discussed the sites programs that address the concerns involving ground water contamination. The utility is supporting industry efforts to address the ground water contamination issues. The site plans to implement any recommendations that are derived from the NEI initiative as well as the NRC ground water taskforce. Assessment of site hydrology that were done for previous licensing action indicate that with the highly permeable sandy soil overlying relatively impermeable bed rock that the ground water flow should be toward the lake. There is little likelihood of any releases from the plant migrating away from the lake toward private property and there is no private property between the plant and the lake.

Currently the plant has 6 ground water sampling wells on site. There is a deep well associated with each unit and an artesian well approximately 0.6 miles south east of the plant. These wells are already part of the environmental sampling program and samples are periodically collected and analyzed for tritium and gamma emitters. The site also collects samples from a nearby creek at two locations, the first is a local sample at approximately 0.6 miles east south east of the site and the second is a control sample taken approximately 8 miles to the north.
None of the samples thus far have indicated higher than normal environmental levels of tritium.
The Manager Chemistry believes that the current sampling program is adequate but the utility will follow the recommendations from both the NEI or NRC Tritium taskforces

# TRITIUM DATABASE REPORT

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Lake Robinson ( Fresh Water ) | Lake Robinson ( Fresh Water ) | 2010-03 Scheduled |

| |
|---|
| ***Known pre 2007 Groundwater Plumes*** |
| N/A |
| ***Source of pre 2007 Ground Water Plume*** |
| ***Known pre 2007 Surface Water Problems*** |
| N/A |
| ***Source of pre 2007 Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007 Ground Water Plume*** |
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 9 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Robinson\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Robinson\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Robinson\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Robinson\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Robinson\Event Related |

# TRITIUM DATABASE REPORT

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Sequoyah** | 13 | Heather Gepford |

## *Site Description*

The Sequoyah Nuclear Plant is located on a site near the geographical center of Hamilton County, Tennessee, on a peninsula on the western shore of Chickamauga Lake on the Tennessee River, approximately 7.5 miles northeast of Chattanooga, Tennessee. The site is comprised of 525 acres of land owned by the United States and in the custody of the Tennessee Valley Authority. The environment is described as low population and it's mostly rural agriculture.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Chickamauga Lake ( Fresh Water ) | Chickamauga Lake ( Fresh Water ) | 2009005 Complete |

## *Known pre 2007 Groundwater Plumes*

Wells 24 - 28 were installed as suggested by ANI to prepare for tritium production efforts contracted with the DOE. Several other wells were added later after identifying tritium in the groundwater onsite.
Currently, wells 24 - 28 are being sampled along with the other monthly REMP water samples. The wells showing elevated levels (wells 21, 29 and 31) are sampled biweekly.
Tritium was first discovered in REMP well #6 in May 1998 and in non-REMP well #27 in September 2003

From analysis of the onsite wells, the licensee believes that two tritium leaks have occurred or are occurring:
1)□One leak was believed to have occurred around the Turbine Building Sump (TBS) Discharge Line that leaves the turbine building and leads out to the yard pond (see attached map). Well # 27, which is located near the alum ponds where the pipe goes into the ground, showed elevated levels of tritium (around 400 pCi/L), so the licensee excavated the section of pipe near the well. They discovered what they believed to be a leak at a section of pipe where two different materials were used at a joint. After repairing the pipe section, tritium concentrations in well 27 decreased to levels at or near their MDL (220 pCi/L). The licensee believes the leak has been stopped, and plans on reburying the pipe.
2)□A second source of tritium was determined when the licensee found elevated levels of tritium in well # 21 (9000 pCi/L). Seven additional wells were installed to bound the tritium identified on site. Of the wells installed, wells 29 and 31 showed tritium above the MDL. The highest tritium concentrations have been identified in well #31 (19,750 pCi/L). The licensee believes the source is either the spent fuel pool/transfer canal or the liquid radwaste line. From discussions with the licensee, the Steam Generator Blowdown (SGBD) line is also a candidate, although unlikely (the SGBD lines are not shown on the attached map, but run somewhat parallel to the liquid radwaste line). In an effort to locate the source of the tritium, the licensee isolated the buried radwaste from their radwaste system, and installed a temporary hose for radwaste discharges to the diffuser pond. Inspectors walked down the installed hose during a liquid release to check for leaks. The licensee has air tested the buried radwaste pipe, but data was inconclusive, so they plan on hydrotesting the pipe. Through interviews with the licensee, inspectors determined that isolating the radwaste pipe has not made tritium levels decrease substantially in well # 21 and 31. The licensee plans on further investigation efforts, including boroscopic examination of the pool/canal or coating of the canal. Plans may also include a hydro test on the SGBD line.

## *Source of pre 2007 Ground Water Plume*

The licensee has 2 identified spills in their Visual Survey Data System.
The spills occurred in 1997 and 1998.
These records are identified as 50.75(g) records.

1) One leak was believed to have occurred around the Turbine Building Sump (TBS) Discharge Line that leaves the turbine building and leads out to the yard pond (see attached map). Well # 27, which is located near the alum ponds where the pipe goes into the ground, showed elevated levels of tritium (around 400 pCi/L), so the licensee excavated the section of pipe near the well. They discovered what they believed to be a leak at a section of pipe where two different materials were used at a joint. After repairing the pipe section, tritium concentrations in well 27 decreased to levels at or near their MDL (220 pCi/L). The licensee believes the leak has been stopped, and plans on reburying the pipe.
2 A second source of tritium was determined when the licensee found elevated levels of tritium in well # 21 (9000 pCi/L). Seven additional wells were installed to bound the tritium identified on site. Of the wells installed, wells 29 and 31 showed tritium above the MDL. The highest tritium concentrations have been identified in well #31 (19,750

pCi/L). The licensee believes the source is either the spent fuel pool/transfer canal or the liquid radwaste line. From discussions with the licensee, the Steam Generator Blowdown (SGBD) line is also a candidate, although unlikely (the SGBD lines are not shown on the attached map, but run somewhat parallel to the liquid radwaste line). In an effort to locate the source of the tritium, the licensee isolated the buried radwaste from their radwaste system, and installed a temporary hose for radwaste discharges to the diffuser pond. Inspectors walked down the installed hose during a liquid release to check for leaks. The licensee has air tested the buried radwaste pipe, but data was inconclusive, so they plan on hydrotesting the pipe. Through interviews with the licensee, inspectors determined that isolating the radwaste pipe has not made tritium levels decrease substantially in well # 21 and 31. The licensee plans on further investigation efforts, including boroscopic examination of the pool/canal or coating of the canal. Plans may also include a hydro test on the SGBD line.

| |
|---|
| ***Known pre 2007 Surface Water Problems*** |
| ***Source of pre 2007 Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007 Ground Water Plume*** |
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 21 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

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|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Sequoyah\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Sequoyah\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Sequoyah\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Sequoyah\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Sequoyah\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **St.Lucie** | 12 | George Kuzo |

***Site Description***

The Saint Lucie site is located on Hutchinson Island, FL. Approximately 7 1/2 miles south of Ft. Pierce, FL. St. Lucie is a coastal plant (barrier island) with an eastern boundary of the Atlantic Ocean and a western boundary of the Indian River.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Atlantic Ocean | Atlantic Ocean | 2009-03 Resch to 2010-03 |

***Known pre 2007 Groundwater Plumes***

On July 6, 1993 , monitoring wells in the vicinity of the Unit 1 Refueling Water Storage Tank were sampled and indications were found for tritium and gamma emitters. Analysis indicated 55,000 gallons with approximately 6.5 Curies of tritium and 0.037 Curies of gamma emitters were released to the ground water table which is 14 feet below the ground surface.

***Source of pre 2007 Ground Water Plume***

2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems

a. Inspection Scope

Current licensee programs for monitoring, tracking, and documenting the results of both routine and abnormal liquid releases to onsite and offsite surface and ground water environs were reviewed and discussed in detail. Changes to the Offsite Dose Calculation Manual (ODCM) regarding recently established groundwater monitoring wells, and any abnormal liquid releases and corrective actions including the status of 10 CFR 50.75.g spill data were discussed with responsible licensee representatives. In addition, radioanalytical results from approximately 50 onsite groundwater wells initially sampled, electrical vaults, onsite ponds located within the owner controlled area were discussed in detail. All tritium and gamma-emitting radionuclide concentration results were less than detection levels of approximately 400-500 picocuries per liter (pCi/l) or below the established Offsite Dose Calculation Manual (ODCM) reporting limits with highest values of approximately 15,000 picocuries per liter (pCi/l) or less reported for monitoring well (MW)-4 and MW-6. These elevated tritium concentrations are trending downward and are believed to be the result of previous spills and leaks from U1 onsite refueling water tank and associated piping. Current capabilities and routine surveillances to minimize and rapidly identify any abnormal leaks from tanks containing liquid radioactive waste, processing lines, and spent fuel pools were reviewed and discussed in detail. In addition, the inspectors reviewed and discussed current licensee guidance for reporting any potential releases to offsite groundwater environs.

# TRITIUM DATABASE REPORT

| |
|---|
| ***Known pre 2007 Surface Water Problems*** |
| ***Source of pre 2007 Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007 Ground Water Plume*** |
| ***Known post 2007 Surface Water Problems*** |
| ***Source of post 2007 Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 20 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

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|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\St. Lucie\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\St. Lucie\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\St. Lucie\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\St. Lucie\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\St. Lucie\Event Related |

# TRITIUM DATABASE REPORT

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Summer** | 14 | Ruben Hamilton |

## *Site Description*

2.1.1 SITE LOCATION
The Virgil C. Summer Nuclear Station site is located in Fairfield County, South Carolina, approximately 15 miles Southwest of the county seat of Winnsboro and 26 miles Northwest of Columbia, the state capital. The site is in a sparsely populated rural area.
The nearest community is Jenkinsville, located approximately 3 miles Southeast of the site. The Broad River is located approximately 1 mile West of the site and flows in a southerly direction. Lake Murray is a 50,000 acre reservoir utilized for hydroelectric power generation and recreation, located 12 miles South of the site. The reactor building is located at latitude N34□17'54.1" and longitude W81□18'54.6". Universal Transverse Mercator (UTM) grid coordinates, Zone 17, for the reactor building are N3,795,086 and E470,996.

2.1.2 SITE DESCRIPTION
The exclusion area consists of a zone within approximately 1 mile of the reactor building. This area encompasses parts of the Monticello Reservoir and the Fairfield Pumped Storage Facility. SCE&G has acquired, by purchase, all land within
the site boundary. For purposes related to the operation of the nuclear facilities the plant property line is considered to coincide with the site boundary. The plant property, as defined herein, covers approximately 2,200 acres.

2.1.2.1 Exclusion Area Control
Licensees will maintain absolute ownership of all land contained within the site boundary for the Virgil C. Summer Nuclear Station. The site boundary also serves as the site exclusion area and is identified in Figure 2.1-3. SCE&G, as an owner and the manager of the nuclear station, retains the right to maintain control of both station and non-station related activities within the exclusion area. Mineral rights within this area are jointly owned by SCE&G and SCPSA, and are under the control of SCE&G as
manager of the plant.
The exclusion area for the nuclear station is not and will not be traversed by other than wholly owned land accesses. The closest primary public road, South Carolina State Highway 215, lies approximately 6,800 feet East of the Reactor Building centerline and
is outside the exclusion area.
The Broad River is approximately 6,050 feet West of the Reactor Building and is outside the exclusion area. The southern portion of the Monticello Reservoir lies within the exclusion area. The closest railroad not owned by SCE&G and SCPSA lies approximately 5,850 feet to the Southwest on the outside edge of the site boundary.
Licensees own and maintain some railroad facilities within the exclusion area. These facilities are used for receipt and shipment of carload freight to and from the Virgil C. Summer Nuclear Station in accordance with an agreement between Southern Railway
Company and the licensees. The licensees are the sole authority for control and operation of these rail facilities.
A 68' right-of-way has been granted through the exclusion area for a 115 KV transmission line owned by Duke Power Company. Terms of this agreement provide for the licensees to retain authority to determine all activities within the exclusion area.
The only other non-station related activities conducted within the exclusion area are those related to the Fairfield Pumped Storage Facility.
Personnel of the Fairfield Pump Storage Facility are limited to employees of SCE&G and therefore are subject to
administrative controls of the company. The pumped storage facility is staffed by approximately 10 people during the day shift and one operator for each night shift. The estimated time to evacuate all personnel from this facility is 10 minutes if the plant is not running and 20 minutes if the units must be shut down.
Licensees own all property within the exclusion area and has the authority to determine all activities, including exclusion or removal of personnel and property from the area. Licensees maintain the right to limit access to and control evacuation from the exclusion area. Normal evacuation of persons within the exclusions area is estimated to take no more than 20 minutes.

2.1.2.2 Boundaries for Establishing Effluent Release Limits
The site boundary is located approximately 5,350 feet South, East, and North from the Reactor Building, and is at least 5,850 feet from the Reactor Building in a westerly direction. Routine operational radiological effluent concentrations at and beyond this

area boundary are within the limits prescribed by 10 CFR 20 and 10 CFR 50 Appendix I.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Monticello Reservoir ( Fresh Water ) | Broad River (Fresh Water ) | 2009004 Complete |

***Known pre 2007 Groundwater Plumes***

None

***Source of pre 2007 Ground Water Plume***

N/A

***Known pre 2007 Surface Water Problems***

None

***Source of pre 2007 Surface Water Problems***

N/A

***Known post 2007 Groundwater Plumes***

Minor Spill at Vacuum Breaker

Groundwater Protection: The inspectors reviewed the decommissioning files for events which could have contributed to groundwater contamination. The review did not identify any significant spills or leaks. The review did identify documentation of minor events that had been remediated. The results of sampling wells distributed across the site and the site of the proposed new units identified that two locations had measurable amounts of tritium. The levels detected at these locations were a fraction of the Environmental Protection Agency (EPA) drinking water limit of 20,000 pico-curie per liter (pCi/L). The detection of tritium at these locations was readily explained. The first location was immediately adjacent to a liquid waste holding pond. The second location was approximately ½ mile from the site in the location planned for Unit 3. The source of the tritium was condensate polisher resin that had been tilled into the soil in accordance with a South Carolina land disposal permit in the mid 1990's. Although the condensate polisher resin was from a radiologically clean system, a small amount of tritium had penetrated the steam generator tubes and was entrained in the water that was trapped in the resin. The levels of tritium were near the minimum required level of detection for a shallow well sample and about a quarter of that level from a deeper sample. None of the samples taken in the sampling wells surrounding the above sampling location had elevated tritium nor did the other sampling wells on the existing plant site other than in the immediate vicinity of the liquid waste hold up pond. No other radionuclides were detected in groundwater samples from the site.

***Source of post 2007 Ground Water Plume***

Vaccum breaker

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes | Yes |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 55 | 0 |

# TRITIUM DATABASE REPORT

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Summer\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Summer\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Summer\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Summer\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Summer\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Surry** | 15 | Ruben Hamilton |

## *Site Description*

The Surry Power Station is located in Surry County, Virginia, on a point of land called Cravel Neck that juts into the James River from the south. The site comprises 840 acres south of and adjacent to the Hog Island State Waterfowl Refuge, and is bordered by the James River on either side of the peninsula. The site is at the end of route 650, 8 miles from the town of Surry, 44 miles southeast of Richmond, 38 miles east of Petersburg, 7 miles south of Colonial Williamsburg, and 4.5 miles west - northwest of Fort Eustis. The Atlantic Ocean lies 40 miles east of the site. The area within 10 miles of the site covers parts of Surry, Isle of Wight, York, and James City Counties, and parts of the Cities of Newport News and Williamsburg. Surry and Isle of Wight Counties are predominantly rural and characterized by farmland, wood tracts of land, and marshy wet lands. York and James Counties and the Cities of Newport News and Williamsburg are more urban and are characterized by recreational areas and growing population centers. The tip of the peninsula, north of the site, is very marshy and almost covered by many streams and creeks.

Surry is sited adjacent to the James River which is a tidal estuary connected to the Atlantic ocean. The river at its nearest point is 1800 feet to the north of the plant. During site characterization studies it was determined that the ground water hydraulic potential at the site varied slightly with the tides, with the maximum increase being approximately 1 foot. The surface ground level is approximately 26.5 feet above sea level. Shallow water is influenced by the presence of the brackish/ saline river. Shallow wells are not considered potable due to the high mineral content. There is some communication of water between the shallow sand layers and the discharge canal. The site at shallow depths has numerous silty sand layers a few inches thick trapped between layers of near impermeable clay. Wells tapping into these layers would be of low capacity and low quality. Seven deep wells on the site are used for drinking, three provide up to 200 gallons per minute to the plant and one provides 100 gallons per minute to the training center. They are approximately 400 ft deep. Salinity at this level is generally less than 50 ppm. The nearest residential well is 1.9 miles away. Because of the relatively close water table, the plant has a series of six subsurface drains under both containment basemats, both unit alleyways, under the main transformer yard and the spent fuel pool. These subsurface drains are monitored release points and are documented in the plant's ODCM. The subsurface drains are normally monitored after dilution from the turbine building sump and storm drain water.

The site has a series of piezometer wells around the site that provide data on hydraulic potential of the ground water. The readouts on these wells are monitored by plant engineering. When the NEI initiative was started, several years of data from these piezometer wells was provided to a hydrologist for evaluation. The evaluation determined that the subsurface drain system had created a low point in hydraulic potential and that ground water migration was generally toward the plant. It also determined that the discharge canal was probably a hydraulic high point and that the potential tended to "mound" near it. It was determined that the piezometer wells were not suited for sampling (they were backfilled with bentonite clay once the instruments were installed) and that to monitor any groundwater tritium migration that a series of approximately six wells was indicated with the locations annotated on a map of the site. These wells are anticipated to be tamper wells that allow representative sampling of multiple elevations.

# TRITIUM DATABASE REPORT

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| James River, Brackish..Not Generally Potable | James River, Brackish..Not Generally Potable | 2009002 Complete |

| *Known pre 2007 Groundwater Plumes* |
|---|
| None |
| *Source of pre 2007 Ground Water Plume* |
| *Known pre 2007 Surface Water Problems* |
| *Source of pre 2007 Surface Water Problems* |
| *Known post 2007 Groundwater Plumes* |
| In June 2006 activity was discovered in the water coming from beneath both containments and under the fuel building. Unit 1 activities were tritium 1.25E-4 µCi /ml (125,000pCi/L) and cesium-137 2.70E-8µCi/ml (27pCi/L). Unit 2 activities were tritium 3.75E-6 µCi /ml (3750 pCi/L) and cesium 137 1.35E-7µCi/ml (135pCi/L). Beneath the fuel building tritium was measured at 1.10E-4 µCi /ml (110,000pCi/L) but cesium was not detected. The results of the sampling were documented in plant issue S-2006-2762. The source(s) of the activity in the subsurface drains is currently unknown. |
| *Source of post 2007 Ground Water Plume* |
| *Known post 2007 Surface Water Problems* |
| *Source of post 2007 Surface Water Problems* |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes with Engineering Support | Yes |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| Yes | 11 | 6 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| *Questionaires* | G:\Access Databases\Tritium Database\Surry\Questionaire |
| *Applicable Inspection Results* | G:\Access Databases\Tritium Database\Surry\Applicable Inspection Results |
| *Hydrologist Report* | G:\Access Databases\Tritium Database\Surry\Hydrologist Report |
| *Reviews* | G:\Access Databases\Tritium Database\Surry\Reviews |
| *Event Related* | G:\Access Databases\Tritium Database\Surry\Event Related |

# TRITIUM DATABASE REPORT

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Turkey Point** | 16 | George Kuzo |

***Site Description***

The site comprising approximately 3300 acres, owned by FPL, lies on the west shore of Biscayne Bay which is approximately 25 miles south of Miami, 8 miles east of Florida City, and 9 miles southeast of Homestead, Florida. The area immediately surrounding the site is low and swampy and is scarcely the populated. The Miami area has experienced winds of hurricane force periodically. During the storms the plant may be subjected to flood tides of varying heights. The area is in a seismologically quiet region.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cooling Canals | Cooling Canals (Brackish -salt water) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

Cooling Canals. There is approximately 180 miles of cooling canals at the site. The concentration of tritium in the canals varies with rainfall and can get as high as 30,000 pCi/l in a dry year and down to approximately 10,000 pCi/l in a wet year. The water is saline. Although the canals are sequestered from the Atlantic Ocean, there is a still significant water exchange fraction where sea water passes through the ground to make up for evaporative losses from the canals . The salinity renders the water unfit to drink, the licensee does not allow recreational activities on the cooling canals. The original design of the canals was open to the Atlantic but it was cut off before the nuclear units went on line.

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

Tritium has been identified in various electrical vaults the source of which has been determined to be condensate from air conditioning systems

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 0 | 0 |

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| *Questionaires* | G:\Access Databases\Tritium Database\Turkey Point\Questionaire |
|---|---|

# TRITIUM DATABASE REPORT

| | |
|---|---|
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Turkey Point\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Turkey Point\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Turkey Point\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Turkey Point\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Vogtle | 17 | Adam Nielsen |

***Site Description***

In Burke County, GA on the Savannah River at river mile 151.1 directly across the river from DOE Savannah River Plant, Barnwell County, South Carolina.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Mechanical Draft Cooling Tower | Savannah River? | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

The plants 10 CFR 50.75(g) identifies 5 events which upon review do not appear to correspond to an identified plume.
1. Trace levels of activity was identified in waste water retention basin area from the 1980's and 90's. Permitted radioactive releases via the Waste Water Retention Basin, a normal plant discharge point, have resulted in trace contamination of the sludge on the basin floor. In 2005, the first of the two basins was cleaned of all sludge and the concrete bottom was cleaned. The second basin was scheduled for 2007. Past spills which have occurred around the baasins have been cleaned to environmental release criteria. Contaminated sludge and soil was removed and sent to radwaste.

2. Early 1990's West side of U2 RWST Moat. The moat surrounding the Unit 2 RWST developed a leak resulting in contamination of soil on the west side of the moat. Soil was removed and sent to radwaste. The area was returned to the environmental release criteria.

3. 1/23/1992, Spill of approximately 1 gallon of water from a nitrogen gas cylinder into a yard drain at RSB. Personnel immediately isolated the yard drain preventing offsite release and the drain was cleaned of radioactive material (CR1992023924)

4. 1994-1995, 2006 An outside Temporary Storage Tank Containing radioactive material from processing of the spray additive tanke leaked behind the alternate Radwaste building. Storm drains were dammed preventing offsite release on the material and then cleaned . Contaminated concrete was removed from the area. Trace contamination of soil is planned to be remediated during decommissioning. Traced contamination in the yard drain samples was detected during routine yard drain sampling in 2006 and determined to be from the earlier event.

***Source of pre 2007 Ground Water Plume***

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 0 | 0 |

# TRITIUM DATABASE REPORT

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Vogtle\Questionaire |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Vogtle\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Vogtle\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Vogtle\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Vogtle\Event Related |

# TRITIUM DATABASE REPORT

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Watts Bar** | 18 | Heather Gepford |

***Site Description***

The Watts Bar Nuclear Plant is located on a tract of approximately 1770 acres in Rhea County on the west bank of the Tennessee River at river mile 528. The site is approximately 1.25 miles south of the Watts Bar Dam and approximately 31 miles north-northwest of the Sequoyah Nuclear Plant. The reservation is owned by the United States and is in the custody of the Tennessee Valley Authority. The environment is described as low population and mostly rural agriculture.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Tennessee River ( Fresh Water ) | Tennessee River ( Fresh Water ) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

Groundwater monitoring: The inspectors discussed current and future programs for monitoring onsite groundwater with cognizant chemistry representatives including number and placement of monitoring wells and identification of plant systems with the most potential for contaminated leakage. The site has six onsite wells associated with the radiological environmental monitoring program (REMP) and 37 non-REMP wells that are used to monitor the onsite groundwater plume from two leaks identified in 2002. Recent well sampling data and trends were evaluated.

In addition, licensee program guidance and records regarding documentation of unintended spills of radioactive materials on owner-controlled property were discussed. The inspectors reviewed and discussed selected tritium concentration data for samples collected during the period from January 1, 2001, through September 27, 2003, from sumps located within the protected area and from ground water monitoring wells and yard holdup ponds located within the owner-controlled property boundary. Potential areas and/or equipment identified by the licensee as potential tritium source terms were toured and discussed including a leaking radioactive liquid waste discharge pipe, the Unit 1 (U1) and Unit 2 (U2) transfer canal liner, the U2 transfer canal tube bellows, and in-plant valves associated with the refueling water storage tank (RWST) equipment. Completed and planned maintenance actions regarding the waste discharge line, the U1/U2 transfer canal liner, the U2 transfer tube bellows, and the RWST valves were discussed and evaluated in detail. Inspectors monitored sample well results and trends to verify any affects on required REMP wells and offsite areas.

***Source of pre 2007 Ground Water Plume***

Rad Waste

***Known pre 2007 Surface Water Problems***

***Source of pre 2007 Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007 Ground Water Plume***

***Known post 2007 Surface Water Problems***

***Source of post 2007 Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* |
|---|---|---|
| | 43 | 0 |

# TRITIUM DATABASE REPORT

**THE PATHS ARE TO ADDITIONAL DOCUMENTATION THAT CAN BE OPENED AND PRINTED IN ITS NATIVE FORMAT (Adobe, Word, WordPerfect, Excel)**

| | |
|---|---|
| ***Questionaires*** | G:\Access Databases\Tritium Database\Watts Bar\Questionaire\Tritium Questionaire RII_Watts Bar.pdf |
| ***Applicable Inspection Results*** | G:\Access Databases\Tritium Database\Watts Bar\Applicable Inspection Results |
| ***Hydrologist Report*** | G:\Access Databases\Tritium Database\Watts Bar\Hydrologist Report |
| ***Reviews*** | G:\Access Databases\Tritium Database\Watts Bar\Reviews |
| ***Event Related*** | G:\Access Databases\Tritium Database\Watts Bar\Event Related |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Browns Ferry** | 1 | Heather Gepford |

***Site Description***

Browns Ferry Nuclear Plant Units 1, 2, and 3 are located on the north shore of Wheeler Lake at river mile 294 in Limestone County, Alabama. The site is approximately 10 miles southwest of Athens, Alabama, and 10 miles northwest of Decatur, Alabama. The plant site contains 840 acres owned by the United States, in the custody of the Tennessee Valley Authority.

The site had a series of wells that were installed as part of the pre-operational monitoring program. Of these wells, well number 6 was sampled routinely by grab sampling until the late 1970s at which time an automatic composite sampler was installed. In 1980-1981 eleven groundwater monitoring wells were installed for the Low Level Radioactive Waste disposal facility. TVA added six regional monitoring wells circa 1984 around the site. In 2000 three additional wells were added. In 2006 as part of a site hydrology study 34 geoprobe wells were installed. Most of these wells have been routinely sampled for tritium, the results have been used to narrow down the number of wells that need to be sampled, and the frequency of sampling is being reduced.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Tennessee River (Fresh Water) | Tennessee River (Fresh Water) | 2010-03 Scheduled |

***Known pre 2007 Groundwater Plumes***

A low level contamination plume was identified in well R-3 in early 2001. Well R-3 is a shallow well (18 ft) and the measured activity was 792 pCi/L <0.01% of the 10 CFR 20 Limit and < 5% of the drinking water standard.

***Source of pre 2007Ground Water Plume***

Probably rad waste discharge piping believed to be the U2/3 discharge lines to CCW

***Known pre 2007Surface Water Problems***

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

Analyses are performed for tritium and, for selected samples, hard-to-detect radionuclides. To date, tritium has been the only radionuclide identified in the well samples. One of the wells shows slightly elevated levels of tritium (approximately 4325 picocuries per liter (pCi/L)) due to historical spills and leakage. No levels exceeding the EPA drinking water limit of 20,000 pCi/L (corresponding to 4 millirem per year to a member of the public) have been identified in the onsite or offsite environs. A spill involving ADHR water filled a pipe trench that was determined to have some cracks in it accounts for the higher tritium found in the hydrogeological study in 2006 when 34 geoprobes were installed along the trench to monitor for groundwater contamination.

NEW SPILL :

For inclusion in the groundwater data base.

From: Gepford, Heather
Sent: Thursday, April 08, 2010 10:55 AM
To: Bonser, Brian; Wert, Leonard; Kontz, Craig; Ross, Thierry; Guthrie, Eugene; Lubinski, John
Subject: Update on Browns Ferry CST Overflow

# TRITIUM DATABASE REPORT 1

I spoke with Paul Sawyer, the RPM at Browns Ferry, about the overflow of CST #5.

As stated in the Event Report, water was being transferred from CST #3 to CST #5, with the intent of filling the 40' tank to the 38' level. The transfer was stopped when the tank level indicated 38'. However, there was a pipe with an open valve located below the 38' level. When operators tried to close the valve, they were unsuccessful.

The tank level is currently being administratitively controlled with a control room hold card. A blind flange will be installed on the pipe later today to prevent future occurences.

Investigation has found that the pipe and valve are NOT on plant drawings and are NOT on the other four CSTs. Part of their followup is to determine when/why this pipe and valve were installed and why it is not indicated on plant drawings. They will also be reviewing the 50.75(g) files to determine if any previous CST overflows have occurred and whether that may have been the reason for installing the pipe.

A sample of the CST water was taken and analyzed, with the following results:

| | |
|---|---|
| Tritium | 2.03E-3 uCi/ml |
| Co-60 | 8.90E-5 uCi/ml |
| Co-58 | 3.22E-6 uCi/ml |
| Mn-54 | 3.40E-6 uCi/ml |
| Cs-137 | 3.50E-6 uCi/ml |

Browns Ferry has excavated all the dirt to about 6" depth, where they hit dry soil. Paul believes that the total release was significantly less than 1000 gallons. The total amount of dirt excavated was approximately 15' x 4' x 5" deep, and stored in a B-25 box. The box is currently in the breezeway, protected from the elements (a storm was coming in), and has been appropriately labelled with respect to RAM. It will ultimately be disposed of as low-level waste.

They sampled the dirt during excavation and stopped when they no longer detected any gamma emitters (using the environmental LLDs) in the sample. The final soil sample was sent to WARL for tritium analysis, as they do not have the necessary detection sensitivity and techniques for counting tritium in soil. They will also be closely monitoring their groundwater wells and keep me updated on the results.

We will be inspecting the effluent program the week of June 14; this will obviously be a high priority followup item.

Let me know if you have any other questions.

Thanks,
Heather

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Heather J. Gepford, Ph.D., CHP
Sr. Health Physicist
US Nuclear Regulatory Commission, Region II
61 Forsyth St. SW, Suite 23T85
Atlanta, GA 30303
Phone: 404-562-4659
Fax: 404-562-4979
Cell: 770-833-6512

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# TRITIUM DATABASE REPORT 1

For inclusion in the groundwater data base

From: Gepford, Heather
Sent: Thursday, April 08, 2010 11:25 AM
To: Wert, Leonard; Lubinski, John; Ross, Thierry; Kontz, Craig; Guthrie, Eugene
Cc: Bonser, Brian
Subject: CST sample results

Just to clarify, the values provided were reported in the units which the counting systems produce output. Because the limits are in terms of pCi/l, I have included those values as well.

A sample of the CST water was taken and analyzed, with the following results:

| Isotope | Activity (uCi/ml) | Activity (pCi/l) | LLD (pCi/l) | Reporting Level (pCi/l) | |
|---|---|---|---|---|---|
| Tritium | 2.03E-3 uCi/ml | 2.03E+6 pCi/l | | 2000 | 20,000 |
| Co-60 | 8.90E-5 uCi/ml | 8.90E+4 pCi/l | | 15 | 300 |
| Co-58 | 3.22E-6 uCi/ml | 3.22E+3 pCi/l | | 15 | 1000 |
| Mn-54 | 3.40E-6 uCi/ml | 3.40E+3 pCi/l | | 15 | 1000 |
| Cs-137 | 3.50E-6 uCi/ml | 3.50E+3 pCi/l | | 18 | 50 |

To give a relative idea of the magnitude of these numbers, I have provided the LLDs and reporting levels for surface/drinking water samples. If no drinking water pathway exists, the reporting level for tritium is 30,000 pCi/l. These numbers do not have a direct correlation to how much activity is in the soil, as a number of physical processes will affect the migration of the radioisotopes. In addition, no reporting level for soil is given in Browns Ferry's Offsite Dose Calculation Manual.

# TRITIUM DATABASE REPORT 1

| | | | |
|---|---|---|---|
| ***Source of post 2007Ground Water Plume*** | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| Yes | Yes, June 2006 MACTEC | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| Yes | 89 | 34 | Browns Ferry |
| ***Questionaires*** | | | |
| G:\Access Databases\Tritium Database\BrownsFerry\Questionaire | | | |
| ***Applicable Inspection Results*** | | | |
| G:\Access Databases\Tritium Database\BrownsFerry\Applicable Inspection Results | | | |
| ***Hydrologist Report*** | | | |
| G:\Access Databases\Tritium Database\BrownsFerry\Hydrologist Report | | | |
| ***Reviews*** | | | |
| G:\Access Databases\Tritium Database\BrownsFerry\Reviews | | | |
| ***Event Related*** | | | |
| G:\Access Databases\Tritium Database\BrownsFerry\Event Related | | | |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Brunswick** | 2 | Adam Nielsen/George Kuzo |

***Site Description***

The Brunswick Steam Electric Plant (BSEP) site is located in the southeastern part of North Carolina 2 1/2 miles north of Southport in Brunswick County and 16 miles south of Wilmington, North Carolina. The site consists of 1200 acres and is two miles west of the Cape Fear River where it enters into the Atlantic Ocean in about 3 miles.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cape Fear River estuary/ Atlantic Ocean (Brackish -salt water) | Cape Fear River estuary/ Atlantic Ocean (Brackish -salt water) | 2010002 |

***Known pre 2007 Groundwater Plumes***

Auxiliary Boiler Leaks 1980

Rad Waste Leaks

In 1987 the plant discovered that a radwaste line was leaking underneath the transformer yard. The line was a concrete lined 4 inch pipe that was buried from 8 to 15 feet deep. The leak was discovered when water surfaced at grade level. Since the general location of the leak was easily determined the area was excavated and the pipe was repaired. The exact cause of the leakage was not determined. The occurrence of this leak led the utility to speculate on the integrity of the other rad waste lines. The utility generated a project to replace the unit 2 piping with stainless steel or other corrosion resistant material. This project was not worked until 1994. In 1994 the Plant Review Group determined that prior to initial design for the discharge piping that video and hydrostatic testing should be done on the existing piping. The video allowed the determination that the concrete liner in the pipe had cracks but could not determine the condition of the carbon steel pipe itself. Hydrostatic testing determined that the line had a leak rate at 15 psig of approximately 1.1 gallons per minute (approximately 1/8 inch hole diameter equivalent). Subsequently the plant rerouted all liquid rad waste releases through the unit 1 piping. It was determined that there was no economically feasible way to examine the pipe and determine the failure mechanism because of the length of the line its burial depth and routing underneath the transformer yard. The line was repaired by running a 2 inch hose through the existing piping. Hydrostatic testing was performed on all other buried lines as a result. All liquid radwaste effluents have been redirected through the repaired line until such time the integrity of the Unit 1 line is validated. The existence of the 1.1 gpm leak was evaluated with the conservative assumption that the leak started immediately after the repair in 1987. It was calculated that 0.28% of the radwaste released by the plant was lost into the ground. Of 268 Curies of tritium released it was estimated that 750 milliCuries was lost through the leak at an average concentration of 1.27E-3 µCi/ml (1.27E6 pCi/L). A consultant was contracted in July 1994 to perform a technical evaluation of the potential migration of radionuclides released to the ground water environment from this potential leakage source. As part of the assessment 12 shallow piezometers and 13 monitoring wells were installed.

The information contained in the FSAR indicated a travel rate for liquid in the soil would be approximately 7 feet/ year. This resulted in it taking 120 years for the liquid to reach the intake canal. More conservative calculations done by the consultant reduced this estimate to 21.6 years . The radionuclide concentrations were then decay corrected to 21.6 years and it was determined that after neglecting all mitigating phenomena other than decay that none of the nuclide concentrations would exceed the 10 CFR 20 limits. Calculations were performed assuming vertical migration into the Yorktown sand formation and then being transported to the site boundary 3000 feet away. ( There are no domestic wells within the 3000 ft exclusion zone of the plant.) The original calculated time to reach the site boundary was 317 years. None of the nuclides would exceed current detection limits by the time that it got there. The only nuclide that had any appreciable mobility was tritium. The longer lived nuclides such as Cs-137 and Sr-90 would be expected to be trapped in the immediate vicinity of the leak due to ion exchange in the clay. Based on the studies it was concluded that there is no potential off-site exposure pathway for tritium released from the unit 2 radwaste effluent line that could present a hazard to public health and safety or the environment.

The site currently test for tritium in ground water samples from seven (7) monitoring wells. Tritium has only been detected in two of the wells that are located on the edge of the plume and are sampling water in the plant backfill. The other wells extend into the Yorktown sand and have not had positive tritium results to date. The wells in the edge of the plume fluctuate between 36000 pCi/L and 64000 pCi/L and the source of the plume is estimated at 1.2 million pCi/L. The sample results fluctuate in response to variations in rainfall amounts, well purging and sampling techniques.

The licensee established a PM to hydrostatically test the effluent lines at 6 year intervals.

# TRITIUM DATABASE REPORT 1

There was one event at Brunswick that resulted in a release of tritium (as well as other nuclides). On May 3, 1994, the Unit 2 Radwaste Effluent Line, a 3-inch carbon steel pipe with concrete lining (you guessed right if you picked "buried") that transfers liquid radwaste to the Unit 2 circulating water discharge tunnel failed a pressure test indicating leakage. The licensee estimated the potential total leakage from the pipe as 158,000 gallons over a seven year period. The estimate conservatively assumed that the pipe was leaking since the last time repairs were made on the line in 1987. [1,390,000 pCi/L]

Low Level Warehouse Sump 1996 water was drained from a storage container to a overflow a drain sump with ~100gallons of slightly contaminated water 4.24 E-7 µCi/ml Co-60 and 7.97E-8 µCi/ml Cs-137 through a breach in the wall in the sump to the ground under the building.

Storm Drain Stabilization Pond
In January 1997 ANI expressed an interest in the storm drain stabilization pond with regard to insurance exposure and the likelihood of nuclide migration into the groundwater. Their concerns were that the 39 acre earth lined pond could cause migration of activity into the ground water and which could be transported off site in addition to the potential for migration of nuclides into the Yorktown sand aquifer. The pond is normally maintained at 3.5 feet depth which could exceed the artesian hydraulic head of the aquifer allowing the water from the pond to enter the aquifer. The concentration of tritium in the pond is approximately 96000 pCi/L and approximately 20 to 25 curies of tritium are released from the pond each year. In their 1/7-8/97 inspection report they recommended installation of additional monitoring wells around the pond in particular on the eastern side and into the Yorktown sand aquifer.

The licensee evaluated the ANI recommendation and initially determined that based on the studies done for the radwaste line leak that there was no need to install additional wells. In April 1997 an internal memo recommended sampling various surface water sources on an annual basis unless tritium was found in which case the recommended frequency was 3 times per year. The memo went on to recommend installing an additional monitoring well on the east side of the pond into the Yorktown sand, if tritium was detected then additional wells should be established to fully characterize the release. The well was installed on 5/29/97.

The tritium enters the pond via the overflow from the turbine building swamp coolers. It enters the water at the swamp coolers from the turbine building air. Level control on the pond is maintained by discharges to the intake canal and has been a monitored release point since the discovery of measurable tritium in the water in 1991.

Electrical Vault Man Holes
On 8/30/2006 NCR 204962 was initiated as a result of finding low level tritium activity in manhole 6 SW the activity in the manhole was 6.09E-6 µCi/ml (6000 pCi/L). The licencee determined that the activity did not meet the immediate reportability requirements in 10 CFR 50.72(2)(xi). The licensee took additional samples and was going to make a decision on voluntary reporting based on those results. A total of 6 manholes were checked, five of the manholes contained water and were sampled. Most of the samples were of a similar magnitude to the first one. One sample was anomalous in that it showed approximately 1E-3 µCi/ml and appeared to have some form of chemical contaminant. The licensee processed the sample using filtration and ion exchange media and oxidation with potassium permanganate. The sample is highly colored (orange) and it is believed that there is an interferent that is giving a false high indication. The sample was going to be sent to the Harris E&E center for further evaluation. The licencee sampled wells in the vicinity and surface water. They held a meeting on the morning of 8/31/06 to determine a supplemental sampling plan. The situation was aggravated by continuous rainfall and the imminent arrival of Tropical Storm Ernesto. On the afternoon of 8/31/06 a meeting was held to determine possible sources of the tritium. The plume under the transformer yard was not believed to be a credible source. The most likely candidate appeared to be a seal failure several years ago on a CST pump. Other buried pipes were also being considered. The manholes had been sampled before but the only analysis had been for gamma emitters. The licensee appeared to be following its groundwater plan and communication plans.

The following is additional correspondence on the matter:
Email: Brian Bonser to Ruben Hamilton 4/7/2010
Ruben,
Please add these Brunswick comments and enforcement history in to the groundwater database. Edit as necessary. This in response to a media inquiry.

Brian R. Bonser
Chief, Plant Support Branch 1

Division of Reactor Safety, Region II
U.S. Nuclear Regulatory Commission
404.562.4653

From: Nielsen, Adam
Sent: Tuesday, March 30, 2010 2:46 PM
To: OBryan, Phil
Cc: Kuzo, George; Gepford, Heather; Bonser, Brian; Musser, Randy; Hannah, Roger
Subject: SDSP enforcement timeline

I just left you a voicemail responding to the question you asked Heather. I told you wrong in that voicemail. An LIV was issued in report 2008-002 for failure to evaluate doses to the public from seepage into Nancy Creek (and other pathways) i.e. a violation for assuming release through the composite sampler into the intake canal was the only pathway to the public.

Here's a timeline of our (recent) enforcement action:

2007-003 - URI opened as part of event followup for tritium discovered in SDSP.

2008-002 - URI 2007-003-002 closed. URI 2008-002-002 opened to review evaporation pathway. LIV issued for failure to evaluate doses from various pathways (including seepage into Nancy Creek) as a result of tritum released to SDSP. Very low safety significance due to no release limits exceeded.

2008-003 - URI 2008-002-002 discussed and determined that TIA from NRR needed to resolve issue of evaporation. Included in PI&R Annual Sample section: Green Finding for tritium leakage in powerblock not being recognized as current leakage rather than from historical radwaste line breaks.

2008-005 - URI 2008-002-002 closed upon completion of TIA. Evaporation pathway is not a significant contributor to offsite dose. Minor violation for not including evaporation data in annual effluent reports.

I believe Eldan Testa had a violation for radionuclides being released into the SDSP years ago, and their response was to install the composite sampler and make the pond a permitted release point, but I could find no information on this and it's just from memory. Anyway, that was several years ago (early 1990's maybe?).

From: OBryan, Phil
Sent: Tuesday, March 30, 2010 11:20 AM
To: Kuzo, George
Cc: Nielsen, Adam
Subject: RE:

I understand the context of the statement now. Thanks.

From: Kuzo, George
Sent: Tuesday, March 30, 2010 10:02 AM
To: Nielsen, Adam
Cc: OBryan, Phil; Bonser, Brian

Subject: RE:

Absolutely true - we do not know any specific details regarding if the switch yard tritium has gotten offsite. Note studies are continuing and we have not seen any dta from the swith yard wells

From: Nielsen, Adam
Sent: Tuesday, March 30, 2010 9:37 AM
To: OBryan, Phil; Kuzo, George; Bonser, Brian; Hannah, Roger
Cc: Musser, Randy
Subject: RE:

I believe what George meant is that the localized tritium leakage that lead to the Green finding has not contributed to any offsite tritium. This is the tritum that leaked out of the concrete storm drain piping before getting to the SDSP. They had incorrectly assumed that this tritium was from a historical leak and that was the issue that lead to the Green.

The tritium that has been collecting in the SDSP for years has contributed to the tritium in Nancy Creek (offsite). I'm sure George will write more when he gets a chance. He is working from home today, but is on AL for certain times this morning.

Call me: x4660
or George: 404 786-3315

thanks
Adam

From: OBryan, Phil
Sent: Tuesday, March 30, 2010 7:51 AM
To: Kuzo, George; Bonser, Brian; Hannah, Roger
Cc: Nielsen, Adam; Musser, Randy
Subject: RE:

The licensee is aware of the problems with the story and is planning some sort of correction (exact form of communication is undecided at this time). George, the statement below " To date there has been no indication of this issue has directly contributed to tritium to the offsite environs but additional studies are continuing." - is this accurate considering the positive samples in Nancy's Creek? Technically, this is not on the licensee's property.

One of the licensee's communications options being considered is to send letters to the neighbors of the plant and to Southport officials explaining everything. I told Mike Annacone (site VP) yesterday that it would be more appropriate to send something to the Star-News, since many more people were exposed to the bad information through the newspaper and the letters would not correct the problem. Perhaps we should consider doing this (talking to the Star-News) if the licensee doesn't. This was a front page story in the paper and it has "NRC said..." in it. I think our responsibility extends beyond the immediate vicinity of the plant.

From: Kuzo, George
Sent: Monday, March 29, 2010 2:56 PM
To: Bonser, Brian; Hannah, Roger
Cc: Nielsen, Adam; OBryan, Phil; Kuzo, George
Subject:

Roger/Brian/Phil,

Adam and I have these comments.

Roger - you may want to discuss the two article statements, offsite concentrations and findings w/ the BSEP PA individual, so he does not get blind-sided as a liar in the press. Also, Adam is checking to see if the waypoint data for Nancy Creek is listed in either the Annual Effluent Reports/ Radiological Environmental Monitoring Report. Adam will get back to us.

Region 2 claification regarding the Starline News

The NRC R2 staff believe that w/out the proper context, two statements in the article need some clarification.

1. As part of the current monitoring program, the licensee has occasionally reported extremely low tritium concentrations (< 1000 picocuries per liter [pCi/l]) in Nancy Creek surface
water samples immediately adjacent to the onsite stablization pond. These concentrations are significantly less than limits (20,000 pCi/l) established by the EPA for drinking water. The water is not used for potable (drinking) purposes. If the article's intent was to indicate that no detectable concentrations of tritium have been found in samples from the
deep aquifer suppling drinking water to the surrounding communities then the statement would be true.

2. Although no significant violations were identified during the most recent inspection of the groundwater protection program, a minor violation regarding the failure to adequately review
controls for the storage of radioactive liquid waste in a large number of 250 gallon storage containers within the radiologically controlled onsite area was identified. This minor issue was
addressed in a timely fashion and in accordance with NRC policy will not be documented in the upcoming NRC inspection report which will be issued in late April 2010. Also, a green
finding regarding failure to properly identify the root cause of tritium leaks from turbine building condensate routed through the storm drain piping was identified in second quarter of
calendar year 2008 (Inspection Report 05000325, 324/2008003) . Again, the licensee has addressed this finding and is currently working to characterize the quantities and location of
the tritium released. To date there has been no indication of this issue has directly contributed to tritium to the offsite environs but additional studies are continuing.

***Source of pre 2007Ground Water Plume***

Aux boiler tube leaks, Rad Waste Line, Repaired Rad Waste Line Stabilization Pond via Turbine Building Coolers, Electrical Vaults

***Known pre 2007Surface Water Problems***

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007Ground Water Plume***

***Known post 2007Surface Water Problems***

NRC Inspection Report 05000325, 324/2007003 documented initial event follow-up evaluation of onsite groundwater tritium concentrations exceeding Nuclear Energy Institute (NEI) voluntary reporting criteria. On June 13, 2007, the licensee notified local, county, and State of North Carolina authorities regarding the identification of groundwater tritium (H-3) concentrations in shallow onsite monitoring wells which exceeded recently established NEI voluntary reporting criteria. The subject wells were established to evaluate the potential movement of H-3 from the licensee's onsite storm drain stabilization pond (SDSP) to the surrounding groundwater environs and/or to onsite structures. Subject to final

development of onsite groundwater monitoring wells, the NRC committed to conduct split sampling for subsequent radiological analysis of onsite and offsite surface and groundwater by the NRC, licensee, and State of North Carolina Department of Environment and Natural Resources (NCDENR) representatives.
On August 7, 2007, the NRC resident inspectors independently collected selected onsite groundwater and offsite surface water samples and submitted the samples for both tritium and gamma–emitting radionuclide analyses by the NRC vendor laboratory.
Water samples were collected from onsite groundwater monitoring wells adjacent to west edge of the SDSP, i.e, 19C [shallow, approximately (~) 20 foot (') depth], 19B (intermediate, ~ 42' depth); and from well 24A, located east of the SDSP (deep, ~ 140' depth). In addition, surface water samples were collected from offsite locations that could be potentially affected by H-3 releases from the SDSP including Nancy Creek, Log Gum Branch Creek, and the Cape Fear River. The subject samples were split with the licensee and NCDENR representatives to evaluate the licensee's proficiency and accuracy in sampling and conducting quantitative radiological-analysis of environmental samples to acceptable levels of sensitivity.
Analyses of the selected onsite and offsite water samples for gamma-emitting radionuclides by the NRC, licensee, and NCDENR did not identify any radionuclide concentrations resulting from routine reactor operations which exceeded analytical detection limits. Established radionuclide detection levels were at concentration levels significantly less than those specified within the licensee's current Offsite Dose Calculation Manual. For tritium analyses, detectable concentrations were identified only for samples collected from the shallow and an intermediate groundwater monitoring well located onsite and adjacent to the SDSP. For the reported data, licensee H-3 results were within agreement among the NRC, licensee, and NCDENR. The criteria used to compare the sample results are provided in A-5, and the results of the tritium comparisons among the NRC, licensee, and NCDENR are provided in A-6.
Licensee activities were evaluated against details and guidance documented in the following: 10 CFR Part 20 and Appendix I to 10 CFR Part 50; ODCM; RG 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials In Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants, June 1974; and RG 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations - Effluent Streams and the Environment, Rev. 1.

During the week of June 18, 2007, inspectors reviewed the licensee's preliminary investigation into the cause, extent, and migration of tritium from the onsite Storm Drain Stabilization Pond (SDSP) to the surrounding environs, its potential impact on both onsite and offsite surface and groundwater environments, and preliminary dose estimates to general members of the public. At that time, an unresolved item was identified regarding the adequacy of licensee surveys (evaluations) required by 10 CFR 20.1501(a) necessary to implement TS 5.5.4, Radioactive Effluent Controls Program, controls used to maintain doses to members of the public from releases of effluents as low as reasonably achievable (ALARA) in accordance with Appendix I to 10 CFR 50 design criteria as specified in 10 CFR 50.36a.
In March 2008, inspectors reviewed NCR 233865 and the licensee's significant adverse condition investigation report addressing the identification of water containing tritium in the area on the west side of the SDSP near the tidal marsh at Nancy's Creek and in other locations outside the SDSP dike area. The inspectors also reviewed environmental sampling results and determined that monthly surface water samples from Nancy's Creek identified either no detectable or background levels of tritium and environmental sampling of fish and invertebrate species in Nancy's Creek have identified no detectable tritium. The inspectors evaluated the licensee's preliminary dose assessments for the inhalation/ingestion pathways from evaporation of tritiated water from the SDSP and for the ingestion pathway from tidal flushing of the contaminated marsh area surrounding the SDSP to the surrounding creeks.
Using conservative assumptions, the licensee determined an upper bound for the ingestion pathway dose to an offsite individual consuming fish and invertebrates resulting from seepage of tritiated water from the SDSP to the tidal marsh. The calculation assumed the maximum measured concentration of tritium in the marsh (weekly sampling from June 2007 through March 2008 had identified activities varying from not detectable to 1.66 E+04 picocuries/liter); two six-hour marsh releases per day; no credit for radioactive decay; and no dilution. At the time of the inspection, the licensee was refining the marsh calculation to make the dose assessment more accurate.
The licensee completed the preliminary evaluation of the dose to an offsite individual from evaporation of tritiated water from the SDSP based on monthly evaporation rates from the SDSP, monthly measured SDSP tritium concentrations, and the Offsite Dose Calculation Manual methodology for ground-level gaseous effluent releases from the turbine building. This approach was used because appropriate parameters (e.g. X/Q, D/Q) specific to gaseous effluent releases from the SDSP had not been previously determined. At the time of the March 2008 inspection, the licensee was validating the dose assessment methodology.
The preliminary dose assessments determined that both the seepage (tidal marsh) and the evaporation pathways from the SDSP contributed incremental dose to the public comparable in magnitude to previously assessed liquid and gaseous effluent pathways.
In addition, the preliminary assessments were sufficient to demonstrate compliance with the requirement to maintain doses to members of the public from radioactive effluents ALARA as specified in Appendix I to 10 CFR 50 and to demonstrate that the effluent concentration limits in Appendix B to 10 CFR 20 were not exceeded.

# TRITIUM DATABASE REPORT 1

From: Sherrill, Tom [mailto:Tom.Sherrill@pgnmail.com]
Sent: Thursday, April 15, 2010 3:17 PM
To: Nielsen, Adam
Subject: BNP Tritium Request

Mike Millinor is off for the next 3 days as he travels to Robinson and Alicia Baker does not have Mike's files so Lee Grzeck provided these numbers from a graph that he had and Alicia will get the exact numbers to follow in the next couple of day. Hopefully this will help.

- The highest tritium concentration found in the stabilization pond 1,100,000 pCi/Li

- The highest tritium concentration found in a monitoring well 3,400,000 pCi/Li

- The total number of monitoring wells 144 monitoring wells

17 way points

92 extraction wells

Thomas Sherrill
Progress Energy
Licensing Engineer
910 457-2703
Pager 910 412-0942

# TRITIUM DATABASE REPORT 1

| *Source of post 2007Surface Water Problems* | | | |
|---|---|---|---|
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| Yes, Multiple | Yes, June 1995 D'Appolona | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 144 | 92 | Brunswick |

***Questionaires***

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***Applicable Inspection Results***

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***Hydrologist Report***

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***Reviews***

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***Event Related***

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# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Catawba** | 3 | Wade Loo |

| *Site Description* |
|---|
| Catawba Nuclear Station is in the north central portion of South Carolina about 6 miles north of Rock Hill, about 10 miles south southwest of Charlotte and adjacent to Lake Wylie. The 391 acre site is in York County on a peninsula bounded by Beaver Dam Creek to the north, Big Allison Creek to the south, Lake Wylie to the east and private property to the west. |

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Mechanical Draft Cooling Towers ( Fresh Water) | Lake Wylie (Fresh Water ) | 2010-04 Scheduled |

| *Known pre 2007 Groundwater Plumes* |
|---|
| On 6/29/06 The east trench from the Monitor Tank building was discovered to contain approximately 1 inch of water, the water contained low levels of Co-60 Later it would be determined that some activity had penetrated the wall of the trench and was remediated by removal of the contaminated soil. The tritium activity in the water was 3,000,000 pCi/L. The trench was 100 feet long, 3 feet wide and 4 feet deep, no cracks in the bottom but cracks were found on the sides.<br>It was discovered that under certain circumstances a siphon could occur from one of the tanks and a vacuum breaker was installed to prevent reoccurence. |

| *Source of pre 2007Ground Water Plume* |
|---|
| The licensee currently has five groundwater monitoring wells located near waste water retention ponds (WC system) outside the power block. Preliminary hydrological studies have been performed to determine the optimum location for additional groundwater sample points and 30 new wells are currently being constructed. Detectable levels of tritium have been identified in samples taken from the WC wells, the WZ sumps (french drain system), composite samples from an onsite wetlands area (WC discharge point), and from the Retired Steam Generator Storage Facility sump. |

| *Known pre 2007Surface Water Problems* |
|---|
| . Monitoring for tritium contamination in groundwater is complicated by the fact that Lake Wylie has a relatively high tritium background due to routine effluent discharges from both Catawba Nuclear Station and McGuire Nuclear Station (40 miles upstream). As of January 2007, tritium concentrations in the lake range from 8,998 picoCuries per liter (pCi/L) to 16,700 pCi/L based on quarterly composite sample results and have been trending upward since plant startup. This makes it difficult to determine whether positive groundwater sample results are due to leaks in contaminated systems or simply lake water intrusion. No levels exceeding the EPA drinking water limit of 20,000 pCi/L (corresponding to 4 millirem per year to a member of the public) have been identified in the offsite environs. |

# TRITIUM DATABASE REPORT 1

| *Source of pre 2007Surface Water Problems* |
|---|
| Catawba is downstream of McGuire and recieves water that contains McGuires effluents. Lake Norman has a typical average tritium concentration of approximately 800 pCi/ L. There are additional outfalls from McGuire Station on the Catawba river |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007Ground Water Plume*** |
| ***Known post 2007Surface Water Problems*** |
| We need to keep an eye on the tritium levels in Lake Wylie. They are currently around 17,000 pCi/L for an annual average (discharge point). This is a drinking water pathway, so the EPA limit of 4 mrem/yr (20,000 pCi/L) applies. |
| ***Source of post 2007Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes, Duke Internal | Yes, Duke Internal |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| Yes, Duke Internal | 35 | 30 | Catawba |

| ***Questionaires*** |
|---|
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| ***Applicable Inspection Results*** |
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| ***Hydrologist Report*** |
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| ***Reviews*** |
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| ***Event Related*** |
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# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Crystal River** | 4 | George Kuzo |

***Site Description***

The Crystal River site is in the northwest portion of Citrus County, Florida about 7 1/2 miles northwest of the town of Crystal River and 70 miles north of Tampa between U.S. Route 19 and the Gulf of Mexico. The site consists of 4738 acres primarily composed of marshlands and low-lying areas. Terrain gradually rises to gently rolling hills 16 miles west of the site.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Gulf of Mexico (Salt Water ) | Gulf of Mexico (Salt Water ) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

Groundwater monitoring initiatives and radionuclide concentration results for approximately 14 recently established onsite groundwater monitoring wells surrounding the power block and a percolation pond receiving contaminated liquid effluents were reviewed in detail. Initial results of samples collected from the wells associated with the power block did not identify tritium concentrations above environmental detection limits.

***Source of pre 2007Ground Water Plume***

***Known pre 2007Surface Water Problems***

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007Ground Water Plume***

***Known post 2007Surface Water Problems***

***Source of post 2007Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 0 | 14 | Crystal River |

***Questionaires***

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***Applicable Inspection Results***

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***Hydrologist Report***

| *Hydrologist Report* |
| --- |
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| ***Reviews*** |
| G:\Access Databases\Tritium Database\Crystal River\Reviews |
| ***Event Related*** |
| G:\Access Databases\Tritium Database\Crystal River\Event Related |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Farley | 5 | Adam Nielsen |

| *Site Description* |
|---|
| The site is located in southeast Alabama, 16.5 miles east of Dothan, Alabama; 20 miles north of the Florida border on the west side of the Chattahoochee River and across the river from Early County, Georgia. The 1850 acre site is approximately 45 percent wooded with the remainder the used for agricultural purposes. |

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cooling Towers | Chattahoochee River ( Fresh Water ) | 2009004 Complete |

| *Known pre 2007 Groundwater Plumes* |
|---|
| 3/8/02 Unit 2 radioactive liquid effluent release line broke underground causing water to rise to surface and be detected near the west sitd of the Unit 2 reactor makeup water storage tank just under the first flight of stairs. The leaking pipe was repaired. The affected soil (~15' X 15 ') which registered activity with a frisker was drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germanium detector. The affected soil which registered activity on a frisker was drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germanium detector. Condition report # 2002000535....CR in description states "Based on Chemistry sample results, temperature of the water and location of the leak suspect it is SW dilution backflow into the WMT release line.<br>From comments section:<br>The sample results were as follows: Temp ~80F<br>pH=7.6<br>Specific Conductivity 210 micro-S/cm<br>Isotopic= 2.279 E-6 µCi/ml (long lived)<br>Tritium = 7.863 E-5 µCi/ml (78630 pCi/L)<br>Investigation revealed that the leakage did not reach the yard drain and so it was treated as a spill rather than an abnormal release<br><br>SEPARATE BUT SIMILAR EVENT Early 2000's (anecdotal) Unit 1 steam generator blowdown discharge line leaked underground allowing slightly contaminated water to seep into the ground on the south side of the suubber test building. The leak was repaired. The affected soil which registered activity with a frisker ws drummed up for shipment to an offsite radwaste processing facility. The remaining soil only showed activity on a germainium detector. |

# TRITIUM DATABASE REPORT 1

| |
|---|
| ***Source of pre 2007Ground Water Plume*** |
| ***Known pre 2007Surface Water Problems*** |
| ***Source of pre 2007Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007Ground Water Plume*** |
| ***Known post 2007Surface Water Problems*** |
| ***Source of post 2007Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 0 | 0 | Farley |

| ***Questionaires*** |
|---|
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| ***Applicable Inspection Results*** |
| G:\Access Databases\Tritium Database\Farley\Applicable Inspection Results |
| ***Hydrologist Report*** |
| G:\Access Databases\Tritium Database\Farley\Hydrologist Report |
| ***Reviews*** |
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| ***Event Related*** |
| G:\Access Databases\Tritium Database\Farley\Event Related |

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Harris | 6 | Adam Nielsen/Ruben Hamilton |

***Site Description***

SHNPP site is located in the extreme southwest corner of Wake County, NC approximately 16 miles southwest of Raleigh which is the largest population center, and approximately 15 miles northeast of Sanford, NC in Lee County. The region within a 50-mile radius of the SHNPP site contains both urban and rural areas with industry, farming, business education, research, and military interests.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Natural Draft Cooling Tower/Harris Lake ( Fresh Water) | Harris Lake ( Fresh Water ) | 2010-03 Scheduled |

***Known pre 2007 Groundwater Plumes***

***Source of pre 2007Ground Water Plume***

***Known pre 2007Surface Water Problems***

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

EVENT NOTIFICATION
On April 1, 2009, the results of an ongoing hydrology study being conducted by Harris Nuclear Plant as part of the voluntary Industry Groundwater Protection Initiative revealed that a pipe leak in the buried Cooling Tower Blowdown line was releasing water containing tritium into surrounding soil. The maximum tritium activity level discovered was 2,120 pCi/L, well below maximum levels allowed by regulation. While the leak rate has not been determined, it appears to be small. The Cooling Tower Blowdown line is used for liquid effluent dilution as part of permitted, routine releases. The permitted liquid effluent release point is the discharge from the Cooling Tower Blowdown line into Harris Lake. This line is leaking upstream of the permitted release point. All leaking water is contained within the site boundary, and based on studies performed by an independent hydrologist, offsite migration is not anticipated.

Immediate corrective actions include voluntary notifications, installation of additional monitoring wells at various locations to determine groundwater flow and to check for the presence of tritium. The water containing low levels of tritium is in a localized area immediately surrounding the Cooling Tower Blowdown line.

The health and safety of the public are not affected by this event, as the activity levels discovered are significantly below maximum levels allowed by regulation. Harris Nuclear Plant is following the guidance contained in NEI 07-07 and has initiated this Event Notification as a result of our voluntary communication to State agencies in accordance with the Groundwater Protection Initiative.

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The inspectors reviewed the licensee's actions in response to ground water samples results that indicated an increase in tritium along the Cooling Tower Blowdown Line (CTBL).

b. Findings
Introduction: The inspectors identified an unresolved item associated with the leakage of radioactive liquid effluents into the ground from cracks in the CTBL. This item is unresolved pending further review and evaluation of the licensee's final dose assessment for the CTBL pathway.
Description: The inspectors reviewed with licensee representatives the licensee's vendor report regarding the assessment and evaluation of the increase in tritium identified in ground water samples wells along the CTBL as documented in AR #00309035. The licensee discharges permitted and monitored radioactive liquid effluents into the CTBL for dilution with a release point into the Harris Lake. On December 15, 2008, the licensee had observed water in Air Relief System Manhole (ARSM) Number (No.) 2 located on the

CTBL upstream from the permitted release point.
The licensee obtained water samples from ARSM No. 2 for analysis and identified tritium levels ranging from less than the detection limit to 2,120 picocuries per liter (pCi/L). As a result, the licensee conducted a hydrology report and assessment of the CTBL. From that assessment the licensee installed nine groundwater monitoring wells at various points along the CTBL and ARSM No. 2 from January 21 – March 4, 2009. At the time of the onsite inspection, the licensee had collected several monthly samples with tritium levels ranging from less than the detection limit to 2,450 pCi/L. Some wells were found to be dry. At the time of the onsite inspection the licensee was still evaluating the results of the groundwater monitoring wells. The licensee also evaluated the inside of the CTBL. The licensee identified numerous cracks and plant roots growing into the CTBL. In addition, there was approximately 3,000 feet of the CTBL (located downstream of the Cooling Tower but upstream from ARSM No. 2) that was not evaluated due to worker safety conditions (e.g., slippery conditions due to mud, low oxygen concentrations, etc.). At the time of the onsite inspection, the vendor had not submitted its final assessment and evaluation report of the CTBL to the licensee. As a result, the licensee had not evaluated and assessed the amount of radioactive liquid effluents released into the ground from cracks in the CTBL.
An unresolved item (URI) was identified regarding the significance of the CTBL leakage pathway with regard to meeting the requirements of the Offsite Dose Calculation Manual (ODCM). The ODCM states that radioactive materials released in liquid effluents to unrestricted areas are required to demonstrate compliance with 10 CFR 50 Appendix I. The calculated annual total quantity of all radioactive materials above background to be released from each light-water-cooled nuclear power reactor to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millirems to the total body or 10 millirems to any organ. The dose commitment had not been determined due to an unevaluated release pathway where releases were occurring at a location other than designed. Specifically, radioactive liquid effluents were being released into the ground from cracks in the CTBL. In accordance with the ODCM, the liquid effluent release point is at the point of discharge from the CTBL into Harris Lake.
This item is unresolved pending NRC review and evaluation of the final dose assessment for the CTBL pathway. URI 05000400/2009003-01, Review the Cooling Tower Blowdown Line Pathway Dose Compared to Doses from All Other Pathways.

The site performed an evaluation of off site dose consequences of the leaking cooling tower blowdown line and determined that there was no credible pathway from the leak to the nearest resident without the intercession of the lake.

The following is a draft of the URI Closure:
(Closed.) URI 05000400/2009003-XX. Review the Significance of the Cooling Tower Blowdown Line Pathway Dose Compared to Doses from All Other Pathways.

□An unresolved item (URI) was identified regarding the significance of leakage from a cooling tower blowdown line (CTBL) used to transport radioactive effluents. The licensee discharges permitted and monitored radioactive liquid effluents into the CTBL for dilution prior to release into Harris Lake. On December 15, 2008, the licensee had observed water in Air Relief System Manhole (ARSM) Number (No.) 2 located on the CTBL upstream from the permitted release point. The licensee obtained water samples from ARSM No. 2 for analysis and identified tritium levels ranging from less than the detection limit to 2,120 picoCuries per liter (pCi/L). On May 1, 2009, the inspectors noted that the leakage could constitute an unanalyzed exposure pathway to a member of the public and opened the URI.

□The Offsite Dose Calculation Manual (ODCM) states that radioactive materials released in liquid effluents to unrestricted areas are required to demonstrate compliance with 10 CFR Part 50 Appendix I. Appendix I annual limits are 3 millirem to the total body or 10 millirem to any organ. In addition, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I" specifies that exposure pathways that may arise due to unique conditions at a specific site should be considered if they are likely to provide a significant contribution to the total dose. A significant pathway is considered one whose additional dose increment is equal to or greater than ten percent of the total from all pathways.

□The licensee contracted a vendor to perform an analysis of the hydrological transport properties in the vicinity of the CTBL leaks. The licensee also performed calculations of doses to hypothetical members of the public through alternate release pathways as a result of the leaking CTBL. The location of the leakage was on a peninsula projecting into Harris Lake and hydrological studies show any leakage would ultimately migrate to the lake (the permitted release location), rather than offsite. Local vegetation was analyzed and no tritium was detected, thereby showing that vegetation-human ingestion or vegetation-animal-human ingestion pathways are not significant. Although no drinking wells are located in the vicinity of the contaminated plume and the site boundary is 1.79 miles away, calculations were performed to conservatively estimate the dose to a member of the public who used the contaminated water as their primary drinking water for an entire year. The results were below 10 CFR Part 50 Appendix I annual limits. Through review of licensee documents and discussions with licensee personnel and Nuclear Reactor Regulation (NRR) staff, the inspectors determined that no new significant exposure

pathways were created as a result of the CTBL leakage.

***Source of post 2007Ground Water Plume***

***Known post 2007Surface Water Problems***

***Source of post 2007Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 5 | 0 | Harris |

***Questionaires***

G:\Access Databases\Tritium Database\Harris\Questionaire

***Applicable Inspection Results***

G:\Access Databases\Tritium Database\Harris\Applicable Inspection Results

***Hydrologist Report***

G:\Access Databases\Tritium Database\Harris\Hydrologist Report

***Reviews***

G:\Access Databases\Tritium Database\Harris\Reviews

***Event Related***

G:\Access Databases\Tritium Database\Harris\Event Related

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Hatch | 7 | Adam Nielsen |

***Site Description***

The site consists of 2244 acres and on the south side of Altamaha River, southeast of the intersection of the river with US Hwy No. 1. This site is located in a region of relatively flat to rolling terrain. The land is primarily wooded with a small percent being used for various agricultural purposes.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Mechanical Draft Cooling Towers/ Altamaha River (Fresh Wate | Altamaha River ( Fresh Water ) | 2010-03 Scheduled |

***Known pre 2007 Groundwater Plumes***

The licensee's tritium monitoring program was assessed during the baseline public radiation safety inspection performed at Hatch on July 17 - 21, 2006. Hatch samples several wells onsite, as well as outfalls to the river that release water from surface and subsurface drainage systems. The licensee currently samples most of it piezometer wells, and has added several more groundwater sampling wells over the years.

The main concentration of Hatch's sampling wells are located around the Unit 1 Condensate Storage Tank (CST). This tank holds radioactive water and has had historical leaks through transfer piping and valves leading off of the tank. The highest tritium concentrations found in the sampling wells around U1 CST spiked to 4E6 pCi/L in 2003, and the concentrations have been fluctuating over time. Recently, the licensee has implemented several corrective actions in an attempt to halt the CST leaks. These corrective actions are discussed in Condition Report 2006102808, and include replacement of piping and valves in the CST Pump Moat. The licensee also plans on coating the moat walls with a sealant to avoid drainage of contaminated water through the concrete.

Reports associated with abnormal liquid releases and corrective actions initiated since calendar year (CY) 1978 were reviewed and discussed with responsible licensee representatives to evaluate the potential onsite/offsite environmental impact of significant leakage/spills from onsite systems, structures, and components. One historical issue reviewed was a spill in 1986 that released several hundred thousands of gallons of spent fuel pool water to the plant's yard drain system, which ultimately drained to the swamp area east of the plant. The licensee has been sampling sludge in the swamp since this event, and levels of Cs-137 and Co-60 have substantially decreased since the spill. Only one sample point in the swamp still showed measurable levels of radioistopes (app. 1000 pCi/kg of Cs-137). The sampling of the swamp is coordinated through SNC corporate environmental staff, and sampling results are documented in an augmented radiological environmental operating report that is currently published every eight years. Site HP also conducts dose rate surveys of the swamp annually, and the chemistry department samples outfalls at the swamp for tritium on a quarterly basis.

Most onsite groundwater monitoring wells are procedurally sampled on a yearly or quarterly frequency, but due to public interest, Hatch has set administrative sampling frequencies to quarterly and weekly. From the samples gathered, Hatch has identified no tritium in offsite locations in concentrations greater than background.

At the time of the inspection, Hatch was in the process of making two outfalls monitored release points that would be added to their ODCM. These two outfalls were N008A, and N002A, which release water collected in yard surface drains and subsurface french drains. At each outfall, the licensee was installing collection tanks and composite samplers that would be used to generate weekly permits for release of the tanks to the station's discharge flumes at the river.
Future plans of the licensee concerning groundwater monitoring include ultrasonic testing of buried pipes, continued work with the site hydrologist, and the addition of 15-20 sampling wells.
Southern Company Groundwater Protection Contact: Mary Beth Lloyd (205) 992-5062

# TRITIUM DATABASE REPORT 1

| *Source of pre 2007Ground Water Plume* |
| --- |
| 1979 The line between the Offgas building and the Turbine Building sheared allowing a spill. 1986 Spent Fuel Pool Transfer Canal Inflatable Bladder being deflated between the pools allowed 100,000 gallons of water to escape the protected area and drain to a nearby swamp. 2005 High Tritium levels Near Unit 1 CST. 2006 High Tritium Levels found in Yard Well 1Y22-N008A |
| ***Known pre 2007Surface Water Problems*** |
| In 2006, hydrological studies were performed to determine the optimum location for new groundwater sample points. Currently, the licensee maintains 40 onsite groundwater monitoring wells with samples taken at various frequencies. Analyses are performed for tritium and, for selected samples, primary gamma emitters and gross beta. To date, tritium has been the only radionuclide identified in the well samples. Historically, the primary source of leakage has been from Unit 1 condensate storage tank pumps and associated piping. While contamination levels near the tank have been high at various times in the past, no levels exceeding NRC or Environmental Protection Agency (EPA) limits have been reported in the offsite environs.<br>The licensee continues to take measurements in an onsite swamp that was contaminated during a SFP leakage event in 1986. The licensee issues supplemental environmental monitoring reports at varying frequencies (the next is due in 2008) that contain the results of these swamp measurements. To date, no contamination levels have been reported above NRC or EPA limits. |

# TRITIUM DATABASE REPORT 1

| | | | |
|---|---|---|---|
| ***Source of pre 2007Surface Water Problems*** | | | |
| ***Known post 2007 Groundwater Plumes*** | | | |
| ***Source of post 2007Ground Water Plume*** | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| | Yes, 2006 MACTEC | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 40 | 0 | Hatch |
| ***Questionaires*** | | | |
| G:\Access Databases\Tritium Database\Hatch\Questionaire | | | |
| ***Applicable Inspection Results*** | | | |
| G:\Access Databases\Tritium Database\Hatch\Applicable Inspection Results | | | |
| ***Hydrologist Report*** | | | |
| G:\Access Databases\Tritium Database\Hatch\Hydrologist Report | | | |
| ***Reviews*** | | | |
| G:\Access Databases\Tritium Database\Hatch\Reviews | | | |
| ***Event Related*** | | | |
| G:\Access Databases\Tritium Database\Hatch\Event Related | | | |

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **McGuire** | 8 | Wade Loo |

***Site Description***

McGuire Nuclear Station is in northwestern Mecklenburg County, NC, 17 miles northwest of Charlotte, NC, adjacent to Lake Norman. The site is bounded to the west by the Catawba River and to the north by Lake Norman. Surrounding land is generally rural non-farm land. The site has a state licensed low level waste facility adjacent to the plant.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Lake Norman (Fresh Water ) | Catawba River and Lake Norman (Fresh Water ) | 2010002 Complete |

***Known pre 2007 Groundwater Plumes***

There were no significant ground water plumes identified

***Source of pre 2007Ground Water Plume***

***Known pre 2007Surface Water Problems***

Lake Norman has a tritium background of 800 to 1000 pCi/L

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

Samples onsite are less than the 20000 pCi/L drinking water standard. One location was identified as having approximately 11000 pCi/L Tritium . The source was later determined to be from condensate polisher resin which had been disposed of under a state land application permit by tilling into the soil. Although the polisher resin was from a clean system low levels of tritium was trapped in the resin from the tritium that had diffused through the steam generator tubes into the secondary system.

***Source of post 2007Ground Water Plume***

***Known post 2007Surface Water Problems***

A waste holding pond leaked very very low level water which would ultimately migrate to the Catawba river. During the investigation it was determined that a sampling system discharge was aligned into the wrong sump and rather than being pumped back to the waste hold up pond it was discharged into a ditch to the Catawba River. The water had been monitored and the activity had been determined to meet release criteria.

***Source of post 2007Surface Water Problems***

Conductivity monitor effluent line aligned to discharge into the wrong valve sump.

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 55 | 8 | McGuire |

***Questionaires***

G:\Access Databases\Tritium Database\McGuire\Questionaire

# TRITIUM DATABASE REPORT 1

| ***Applicable Inspection Results*** |
| --- |
| G:\Access Databases\Tritium Database\McGuire\Applicable Inspection Results |
| ***Hydrologist Report*** |
| G:\Access Databases\Tritium Database\McGuire\Hydrologist Report |
| ***Reviews*** |
| G:\Access Databases\Tritium Database\McGuire\Reviews |
| ***Event Related*** |
| G:\Access Databases\Tritium Database\McGuire\Event Related |

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **North Anna** | 9 | Ruben Hamilton |

***Site Description***

The station is located in the northeastern portion of Virginia in Louisa County. The site is on a peninsula on the southern shore of the Lake Anna reservoir. The site proper covers 1075 acres and is within an exclusion area of 1855 acres of which 780 acres are covered by water from Lake Anna. The site is approximately 40 miles north-northwest of Richmond, Virginia and 70 miles southwest of Washington, DC. Plant has extensive basemat drain subsystem with 6 zones that are routinely sampled.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| North Anna Reservior ( Fresh Water ) | North Anna Reservior ( Fresh Water ) | 2009002 Complete |

***Known pre 2007 Groundwater Plumes***

Lake Anna has reached an equilibrium concentration of between 4500 and 5000 pCil/L due to normal liquid radwaste and steam generator blowdown releases. This concentration is ubiquitous in that the ground water and the lake have similar levels, as does any condensation such as condensate from air conditioning units.

***Source of pre 2007Ground Water Plume***

***Known pre 2007Surface Water Problems***

Lake Anna has reached an equilibrium concentration of between 4500 and 5000 pCil/L due to normal liquid radwaste and steam generator blowdown releases. This concentration is ubiquitous in that the ground water and the lake have similar levels, as does any condensation such as condensate from air conditioning units.

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

***Source of post 2007Ground Water Plume***

***Known post 2007Surface Water Problems***

***Source of post 2007Surface Water Problems***

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| Yes, Review was done by corporate | Corporate review/Study |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| Yes, | 9 | 6 | North Anna |

***Questionaires***

G:\Access Databases\Tritium Database\North Anna\Questionaire

***Applicable Inspection Results***

G:\Access Databases\Tritium Database\North Anna\Applicable Inspection Results

# TRITIUM DATABASE REPORT 1

| ***Hydrologist Report*** |
| --- |
| G:\Access Databases\Tritium Database\North Anna\Hydrologist Report |
| ***Reviews*** |
| G:\Access Databases\Tritium Database\North Anna\Reviews |
| ***Event Related*** |
| G:\Access Databases\Tritium Database\North Anna\Event Related |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| Oconee | 10 | Wade Loo |

***Site Description***

The site is located approximately 8 miles northeast of Seneca, SC in northwestern South Carolina. The land is bounded to the north and east by Lake Keowee. The land is generally wooded, rolling hills. Hartwell reservoir is south of the site and Lake Joeassee is 11 miles north of the site.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Little River arm of Lake Keowee (Fresh Water) | Little River arm of Lake Keowee (Fresh Water) | 2009002 Completed |

***Known pre 2007 Groundwater Plumes***

Tritium leakage from chemical treatment ponds (CTP)was discovered in 1992.
Groundwater has measuralble levels of tritium in all of the wells associated with the CTP. In 1995 approximately 14,000 pCi/L was measured at well A-1 which is downgradient from CTP 1 and 2. In 1996 3439 pCi/L was measured at well A-10 which is associated with CTP-3

***Source of pre 2007Ground Water Plume***

***Known pre 2007Surface Water Problems***

***Source of pre 2007Surface Water Problems***

***Known post 2007 Groundwater Plumes***

_____December 16, 2009- Oconee Groundwater Monitoring Well Project Update_____
S&ME, a vendor for Duke, is in the process of drilling several new wells onsite at Oconee, to further characterize the flow of groundwater in order to determine the source of elevated levels of tritium at monitoring well GM-7 & 7R located near the 525kV switchyard.

Progress has been made at drilling the wells, and drilling activities are expected to be completed within the next couple of days. Approximately 6 wells are expected to be sampled tomorrow, 12/17/09, with quick sample results back as early as next week. However, since there may be residual drilling fluid/water in the wells, accurate results may not be obtained for approximately 14 days. In other words, if a sample pulled tomorrow comes back as below the limit, it may not still be below the limit when sampled in two weeks. Soil samples along the liquid radwaste line that runs adjacent to the switchyard have been taken, and are to be sent to Duke's environmental lab for evaluation. These samples may help narrow down the location of the leak; if it is a leak in the radwaste line that is causing the elevated levels.

The licensee is holding a meeting tomorrow morning to discuss the potential communication plan should any of the samples show tritium in excess of EPA limits. All of the existing wells as well as the new wells will be sampled again on January 25, 2010

_____December 30, 2009- Oconee Groundwater Monitoring Well Project Update_____
Installation of the new wells onsite at Oconee is nearing completion (6 out of the 17 new wells still need to be completed). Some of the newly drilled wells have been sampled and counted. One of the wells within the protected area, GM-16DR, was found to be higher than the EPA limit of 20,000 pCi/L (the measured value was ~23,300 PCi/L). This result was based on what the licensee has termed a quick count sample that will not be used for reporting or communication purposes. Also, due to suspended solids in the sample, the "quick count" may not be accurate. When recounted a second time after the sample had time to settle, the activity decreased to ~16,000 pCi/L. Samples taken at the same time from that well location were also sent to Duke's environmental lab for evaluation, with results expected back by next week. Any communication will be based on these official lab results.

The results of the soil samples that were taken along the LWD line adjacent to the switchyards did not show any appreciable activity, therefore, the licensee could not conclude that the increase in activity in well GM-7R was due to a leak in the LWD line. The location of the source of the Tritium has yet to be determined and guesses on the location

would be speculation.

_____January 28, 2010- Oconee Groundwater Monitoring Well Project Update_____
Installation of the new wells onsite at Oconee is nearing completion (1 out of the original 17 new wells still need to be completed). Quarterly sampling of the existing and new wells was completed this week. Two of the new wells did not meet the 2 week waiting period prior to sampling, and thus were not sampled along with the rest. Based on the elevated results that were previously obtained at well 16, two additional new wells in the transformer yard will be drilled, with excavation beginning next week.

Quick count results performed at Oconee show ~32,000 pCi/L at the same well location (GM-7/7R) that had previously shown increased concentrations of tritium. Official lab results that will be obtained next week are expected to be above the 20,000 pCi/L notification criteria. Therefore we should be prepared for the notification.

Notification was made 2/9/2010. It stated that samples from 2 monitoring wells exceeded the reporting threshold of 20,000 pCi/L.It emphasised that the wells were not drinking water wells but rather monitoring wells. The levels reported were 24,400 and 36,400 pci/l. It went on to state that the 52 other wells did not exceed the reporting threshold. (It did not say that they did not have tritium activity that was measurable in the water.

A 50.72 notification was also generated on 2/9/2010 to document the notification of other government agency ( the state of South Carolina.) In the EN it identified the wells as GM-7DR and GM-7R These wells are at the southern end of the 525KVswitchyard and are fairly deep and into the rock.

# TRITIUM DATABASE REPORT 1

| | | | |
|---|---|---|---|
| ***Source of post 2007Ground Water Plume*** | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| | | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 54 | 31 | Oconee |
| ***Questionaires*** | | | |
| G:\Access Databases\Tritium Database\Oconee\Questionaire | | | |
| ***Applicable Inspection Results*** | | | |
| G:\Access Databases\Tritium Database\Oconee\Applicable Inspection Results | | | |
| ***Hydrologist Report*** | | | |
| G:\Access Databases\Tritium Database\Oconee\Hydrologist Report | | | |
| ***Reviews*** | | | |
| G:\Access Databases\Tritium Database\Oconee\Reviews | | | |
| ***Event Related*** | | | |
| G:\Access Databases\Tritium Database\Oconee\Event Related | | | |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Robinson** | 11 | Adam Nielsen/Heather Gepford |

***Site Description***

The site is located due west of the dam of Lake Robinson in Western Darlington County, 5 miles NW of Hartsville, Darlington County, South Carolina. The area is primarily rural and is comprised of farmland, forestry areas, and rolling terrain made up of sand hills and water courses.

The licensee's ground water monitoring program was assessed during the baseline occupational radiation safety inspection performed on June 26-30, 2006. The inspectors interviewed the Manager-Chemistry and discussed the sites programs that address the concerns involving ground water contamination. The utility is supporting industry efforts to address the ground water contamination issues. The site plans to implement any recommendations that are derived from the NEI initiative as well as the NRC ground water taskforce. Assessment of site hydrology that were done for previous licensing action indicate that with the highly permeable sandy soil overlying relatively impermeable bed rock that the ground water flow should be toward the lake. There is little likelihood of any releases from the plant migrating away from the lake toward private property and there is no private property between the plant and the lake.

Currently the plant has 6 ground water sampling wells on site. There is a deep well associated with each unit and an artesian well approximately 0.6 miles south east of the plant. These wells are already part of the environmental sampling program and samples are periodically collected and analyzed for tritium and gamma emitters. The site also collects samples from a nearby creek at two locations, the first is a local sample at approximately 0.6 miles east south east of the site and the second is a control sample taken approximately 8 miles to the north.
None of the samples thus far have indicated higher than normal environmental levels of tritium.
The Manager Chemistry believes that the current sampling program is adequate but the utility will follow the recommendations from both the NEI or NRC Tritium taskforces

# TRITIUM DATABASE REPORT 1

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Lake Robinson ( Fresh Water ) | Lake Robinson ( Fresh Water ) | 2010-03 Scheduled |

| *Known pre 2007 Groundwater Plumes* |
|---|
| N/A |
| *Source of pre 2007Ground Water Plume* |
| *Known pre 2007Surface Water Problems* |
| N/A |
| *Source of pre 2007Surface Water Problems* |
| *Known post 2007 Groundwater Plumes* |
| *Source of post 2007Ground Water Plume* |
| *Known post 2007Surface Water Problems* |
| *Source of post 2007Surface Water Problems* |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 9 | 0 | Robinson |

| *Questionaires* |
|---|
| G:\Access Databases\Tritium Database\Robinson\Questionaire |
| *Applicable Inspection Results* |
| G:\Access Databases\Tritium Database\Robinson\Applicable Inspection Results |
| *Hydrologist Report* |
| G:\Access Databases\Tritium Database\Robinson\Hydrologist Report |
| *Reviews* |
| G:\Access Databases\Tritium Database\Robinson\Reviews |

# TRITIUM DATABASE REPORT 1

| *Event Related* |
| --- |
| G:\Access Databases\Tritium Database\Robinson\Event Related |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Sequoyah** | 13 | Heather Gepford |

***Site Description***

The Sequoyah Nuclear Plant is located on a site near the geographical center of Hamilton County, Tennessee, on a peninsula on the western shore of Chickamauga Lake on the Tennessee River, approximately 7.5 miles northeast of Chattanooga, Tennessee. The site is comprised of 525 acres of land owned by the United States and in the custody of the Tennessee Valley Authority. The environment is described as low population and it's mostly rural agriculture.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Chickamauga Lake ( Fresh Water ) | Chickamauga Lake ( Fresh Water ) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

Wells 24 - 28 were installed as suggested by ANI to prepare for tritium production efforts contracted with the DOE. Several other wells were added later after identifying tritium in the groundwater onsite.
Currently, wells 24 - 28 are being sampled along with the other monthly REMP water samples. The wells showing elevated levels (wells 21, 29 and 31) are sampled biweekly.
Tritium was first discovered in REMP well #6 in May 1998 and in non-REMP well #27 in September 2003

From analysis of the onsite wells, the licensee believes that two tritium leaks have occurred or are occurring:
1)□One leak was believed to have occurred around the Turbine Building Sump (TBS) Discharge Line that leaves the turbine building and leads out to the yard pond (see attached map). Well # 27, which is located near the alum ponds where the pipe goes into the ground, showed elevated levels of tritium (around 400 pCi/L), so the licensee excavated the section of pipe near the well. They discovered what they believed to be a leak at a section of pipe where two different materials were used at a joint. After repairing the pipe section, tritium concentrations in well 27 decreased to levels at or near their MDL (220 pCi/L). The licensee believes the leak has been stopped, and plans on reburying the pipe.
2)□A second source of tritium was determined when the licensee found elevated levels of tritium in well # 21 (9000 pCi/L). Seven additional wells were installed to bound the tritium identified on site. Of the wells installed, wells 29 and 31 showed tritium above the MDL. The highest tritium concentrations have been identified in well #31 (19,750 pCi/L). The licensee believes the source is either the spent fuel pool/transfer canal or the liquid radwaste line. From discussions with the licensee, the Steam Generator Blowdown (SGBD) line is also a candidate, although unlikely (the SGBD lines are not shown on the attached map, but run somewhat parallel to the liquid radwaste line). In an effort to locate the source of the tritium, the licensee isolated the buried radwaste from their radwaste system, and installed a temporary hose for radwaste discharges to the diffuser pond. Inspectors walked down the installed hose during a liquid release to check for leaks. The licensee has air tested the buried radwaste pipe, but data was inconclusive, so they plan on hydrotesting the pipe. Through interviews with the licensee, inspectors determined that isolating the radwaste pipe has not made tritium levels decrease substantially in well # 21 and 31. The licensee plans on further investigation efforts, including boroscopic examination of the pool/canal or coating of the canal. Plans may also include a hydro test on the SGBD line.

***Source of pre 2007Ground Water Plume***

The licensee has 2 identified spills in their Visual Survey Data System.
The spills occurred in 1997 and 1998.
These records are identified as 50.75(g) records.

1) One leak was believed to have occurred around the Turbine Building Sump (TBS) Discharge Line that leaves the turbine building and leads out to the yard pond (see attached map). Well # 27, which is located near the alum ponds where the pipe goes into the ground, showed elevated levels of tritium (around 400 pCi/L), so the licensee excavated the section of pipe near the well. They discovered what they believed to be a leak at a section of pipe where two different materials were used at a joint. After repairing the pipe section, tritium concentrations in well 27 decreased to levels at or near their MDL (220 pCi/L). The licensee believes the leak has been stopped, and plans on reburying the pipe.
2 A second source of tritium was determined when the licensee found elevated levels of tritium in well # 21 (9000 pCi/L). Seven additional wells were installed to bound the tritium identified on site. Of the wells installed, wells 29 and 31 showed tritium above the MDL. The highest tritium concentrations have been identified in well #31 (19,750 pCi/L). The licensee believes the source is either the spent fuel pool/transfer canal or the liquid radwaste line. From discussions with the licensee, the Steam Generator

# TRITIUM DATABASE REPORT 1

| |
|---|
| Blowdown (SGBD) line is also a candidate, although unlikely (the SGBD lines are not shown on the attached map, but run somewhat parallel to the liquid radwaste line). In an effort to locate the source of the tritium, the licensee isolated the buried radwaste from their radwaste system, and installed a temporary hose for radwaste discharges to the diffuser pond. Inspectors walked down the installed hose during a liquid release to check for leaks. The licensee has air tested the buried radwaste pipe, but data was inconclusive, so they plan on hydrotesting the pipe. Through interviews with the licensee, inspectors determined that isolating the radwaste pipe has not made tritium levels decrease substantially in well # 21 and 31. The licensee plans on further investigation efforts, including boroscopic examination of the pool/canal or coating of the canal. Plans may also include a hydro test on the SGBD line. |

# TRITIUM DATABASE REPORT 1

| |
|---|
| ***Known pre 2007Surface Water Problems*** |
| ***Source of pre 2007Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007Ground Water Plume*** |
| ***Known post 2007Surface Water Problems*** |
| ***Source of post 2007Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 21 | 0 | Sequoyah |

| ***Questionaires*** |
|---|
| G:\Access Databases\Tritium Database\Sequoyah\Questionaire |
| ***Applicable Inspection Results*** |
| G:\Access Databases\Tritium Database\Sequoyah\Applicable Inspection Results |
| ***Hydrologist Report*** |
| G:\Access Databases\Tritium Database\Sequoyah\Hydrologist Report |
| ***Reviews*** |
| G:\Access Databases\Tritium Database\Sequoyah\Reviews |
| ***Event Related*** |
| G:\Access Databases\Tritium Database\Sequoyah\Event Related |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| St.Lucie | 12 | George Kuzo |

***Site Description***

The Saint Lucie site is located on Hutchinson Island, FL. Approximately 7 1/2 miles south of Ft. Pierce, FL. St. Lucie is a coastal plant (barrier island) with an eastern boundary of the Atlantic Ocean and a western boundary of the Indian River.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Atlantic Ocean | Atlantic Ocean | 2009-03 Resch to 2010-03 |

***Known pre 2007 Groundwater Plumes***

On July 6, 1993 , monitoring wells in the vicinity of the Unit 1 Refueling Water Storage Tank were sampled and indications were found for tritium and gamma emitters. Analysis indicated 55,000 gallons with approximately 6.5 Curies of tritium and 0.037 Curies of gamma emitters were released to the ground water table which is 14 feet below the ground surface.

***Source of pre 2007Ground Water Plume***

2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems

a. Inspection Scope

Current licensee programs for monitoring, tracking, and documenting the results of both routine and abnormal liquid releases to onsite and offsite surface and ground water environs were reviewed and discussed in detail. Changes to the Offsite Dose Calculation Manual (ODCM) regarding recently established groundwater monitoring wells, and any abnormal liquid releases and corrective actions including the status of 10 CFR 50.75.g spill data were discussed with responsible licensee representatives. In addition, radioanalytical results from approximately 50 onsite groundwater wells initially sampled, electrical vaults, onsite ponds located within the owner controlled area were discussed in detail. All tritium and gamma-emitting radionuclide concentration results were less than detection levels of approximately 400-500 picocuries per liter (pCi/l) or below the established Offsite Dose Calculation Manual (ODCM) reporting limits with highest values of approximately 15,000 picocuries per liter (pCi/l) or less reported for monitoring well (MW)-4 and MW-6. These elevated tritium concentrations are trending downward and are believed to be the result of previous spills and leaks from U1 onsite refueling water tank and associated piping. Current capabilities and routine surveillances to minimize and rapidly identify any abnormal leaks from tanks containing liquid radioactive waste, processing lines, and spent fuel pools were reviewed and discussed in detail. In addition, the inspectors reviewed and discussed current licensee guidance for reporting any potential releases to offsite groundwater environs.

# TRITIUM DATABASE REPORT 1

| | | | |
|---|---|---|---|
| ***Known pre 2007Surface Water Problems*** | | | |
| ***Source of pre 2007Surface Water Problems*** | | | |
| ***Known post 2007 Groundwater Plumes*** | | | |
| ***Source of post 2007Ground Water Plume*** | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| | | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 20 | 0 | St.Lucie |

***Questionaires***

G:\Access Databases\Tritium Database\St. Lucie\Questionaire

***Applicable Inspection Results***

G:\Access Databases\Tritium Database\St. Lucie\Applicable Inspection Results

***Hydrologist Report***

G:\Access Databases\Tritium Database\St. Lucie\Hydrologist Report

***Reviews***

G:\Access Databases\Tritium Database\St. Lucie\Reviews

***Event Related***

G:\Access Databases\Tritium Database\St. Lucie\Event Related

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Summer** | 14 | Ruben Hamilton |

## *Site Description*

2.1.1 SITE LOCATION

The Virgil C. Summer Nuclear Station site is located in Fairfield County, South Carolina, approximately 15 miles Southwest of the county seat of Winnsboro and 26 miles Northwest of Columbia, the state capital. The site is in a sparsely populated rural area.

The nearest community is Jenkinsville, located approximately 3 miles Southeast of the site. The Broad River is located approximately 1 mile West of the site and flows in a southerly direction. Lake Murray is a 50,000 acre reservoir utilized for hydroelectric power generation and recreation, located 12 miles South of the site. The reactor building is located at latitude N34□17'54.1" and longitude W81□18'54.6". Universal Transverse Mercator (UTM) grid coordinates, Zone 17, for the reactor building are N3,795,086 and E470,996.

2.1.2 SITE DESCRIPTION

The exclusion area consists of a zone within approximately 1 mile of the reactor building. This area encompasses parts of the Monticello Reservoir and the Fairfield Pumped Storage Facility. SCE&G has acquired, by purchase, all land within

the site boundary. For purposes related to the operation of the nuclear facilities the plant property line is considered to coincide with the site boundary. The plant property, as defined herein, covers approximately 2,200 acres.

2.1.2.1 Exclusion Area Control

Licensees will maintain absolute ownership of all land contained within the site boundary for the Virgil C. Summer Nuclear Station. The site boundary also serves as the site exclusion area and is identified in Figure 2.1-3. SCE&G, as an owner and the manager of the nuclear station, retains the right to maintain control of both station and non-station related activities within the exclusion area. Mineral rights within this area are jointly owned by SCE&G and SCPSA, and are under the control of SCE&G as

manager of the plant.

The exclusion area for the nuclear station is not and will not be traversed by other than wholly owned land accesses. The closest primary public road, South Carolina State Highway 215, lies approximately 6,800 feet East of the Reactor Building centerline and

is outside the exclusion area.

The Broad River is approximately 6,050 feet West of the Reactor Building and is outside the exclusion area. The southern portion of the Monticello Reservoir lies within the exclusion area. The closest railroad not owned by SCE&G and SCPSA lies approximately 5,850 feet to the Southwest on the outside edge of the site boundary.

Licensees own and maintain some railroad facilities within the exclusion area. These facilities are used for receipt and shipment of carload freight to and from the Virgil C. Summer Nuclear Station in accordance with an agreement between Southern Railway

Company and the licensees. The licensees are the sole authority for control and operation of these rail facilities.

A 68' right-of-way has been granted through the exclusion area for a 115 KV transmission line owned by Duke Power Company. Terms of this agreement provide for the licensees to retain authority to determine all activities within the exclusion area.

The only other non-station related activities conducted within the exclusion area are those related to the Fairfield Pumped Storage Facility.

Personnel of the Fairfield Pump Storage Facility are limited to employees of SCE&G and therefore are subject to

administrative controls of the company. The pumped storage facility is staffed by approximately 10 people during the day shift and one operator for each night shift. The estimated time to evacuate all personnel from this facility is 10 minutes if the plant is not running and 20 minutes if the units must be shut down.

Licensees own all property within the exclusion area and has the authority to determine all activities, including exclusion or removal of personnel and property from the area. Licensees maintain the right to limit access to and control evacuation from the exclusion area. Normal evacuation of persons within the exclusions area is estimated to take no more than 20 minutes.

2.1.2.2 Boundaries for Establishing Effluent Release Limits

The site boundary is located approximately 5,350 feet South, East, and North from the Reactor Building, and is at least 5,850 feet from the Reactor Building in a westerly

direction. Routine operational radiological effluent concentrations at and beyond this area boundary are within the limits prescribed by 10 CFR 20 and 10 CFR 50 Appendix I.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Monticello Reservoir ( Fresh Water ) | Broad River (Fresh Water ) | 2009004 Complete |

***Known pre 2007 Groundwater Plumes***

None

***Source of pre 2007Ground Water Plume***

N/A

***Known pre 2007Surface Water Problems***

None

***Source of pre 2007Surface Water Problems***

N/A

***Known post 2007 Groundwater Plumes***

Minor Spill at Vacuum Breaker

Groundwater Protection: The inspectors reviewed the decommissioning files for events which could have contributed to groundwater contamination. The review did not identify any significant spills or leaks. The review did identify documentation of minor events that had been remediated. The results of sampling wells distributed across the site and the site of the proposed new units identified that two locations had measurable amounts of tritium. The levels detected at these locations were a fraction of the Environmental Protection Agency (EPA) drinking water limit of 20,000 pico-curie per liter (pCi/L). The detection of tritium at these locations was readily explained. The first location was immediately adjacent to a liquid waste holding pond. The second location was approximately ½ mile from the site in the location planned for Unit 3. The source of the tritium was condensate polisher resin that had been tilled into the soil in accordance with a South Carolina land disposal permit in the mid 1990's. Although the condensate polisher resin was from a radiologically clean system, a small amount of tritium had penetrated the steam generator tubes and was entrained in the water that was trapped in the resin. The levels of tritium were near the minimum required level of detection for a shallow well sample and about a quarter of that level from a deeper sample. None of the samples taken in the sampling wells surrounding the above sampling location had elevated tritium nor did the other sampling wells on the existing plant site other than in the immediate vicinity of the liquid waste hold up pond. No other radionuclides were detected in groundwater samples from the site.

# TRITIUM DATABASE REPORT 1

| *Source of post 2007Ground Water Plume* | | | |
|---|---|---|---|
| Vaccum breaker | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| Yes | Yes | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 55 | 0 | Summer |
| ***Questionaires*** | | | |
| G:\Access Databases\Tritium Database\Summer\Questionaire | | | |
| ***Applicable Inspection Results*** | | | |
| G:\Access Databases\Tritium Database\Summer\Applicable Inspection Results | | | |
| ***Hydrologist Report*** | | | |
| G:\Access Databases\Tritium Database\Summer\Hydrologist Report | | | |
| ***Reviews*** | | | |
| G:\Access Databases\Tritium Database\Summer\Reviews | | | |
| ***Event Related*** | | | |
| G:\Access Databases\Tritium Database\Summer\Event Related | | | |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Surry** | 15 | Ruben Hamilton |

***Site Description***

The Surry Power Station is located in Surry County, Virginia, on a point of land called Cravel Neck that juts into the James River from the south. The site comprises 840 acres south of and adjacent to the Hog Island State Waterfowl Refuge, and is bordered by the James River on either side of the peninsula. The site is at the end of route 650, 8 miles from the town of Surry, 44 miles southeast of Richmond, 38 miles east of Petersburg, 7 miles south of Colonial Williamsburg, and 4.5 miles west - northwest of Fort Eustis. The Atlantic Ocean lies 40 miles east of the site. The area within 10 miles of the site covers parts of Surry, Isle of Wight, York, and James City Counties, and parts of the Cities of Newport News and Williamsburg. Surry and Isle of Wight Counties are predominantly rural and characterized by farmland, wood tracts of land, and marshy wet lands. York and James Counties and the Cities of Newport News and Williamsburg are more urban and are characterized by recreational areas and growing population centers. The tip of the peninsula, north of the site, is very marshy and almost covered by many streams and creeks.

Surry is sited adjacent to the James River which is a tidal estuary connected to the Atlantic ocean. The river at its nearest point is 1800 feet to the north of the plant. During site characterization studies it was determined that the ground water hydraulic potential at the site varied slightly with the tides, with the maximum increase being approximately 1 foot. The surface ground level is approximately 26.5 feet above sea level. Shallow water is influenced by the presence of the brackish/ saline river. Shallow wells are not considered potable due to the high mineral content. There is some communication of water between the shallow sand layers and the discharge canal. The site at shallow depths has numerous silty sand layers a few inches thick trapped between layers of near impermeable clay. Wells tapping into these layers would be of low capacity and low quality. Seven deep wells on the site are used for drinking, three provide up to 200 gallons per minute to the plant and one provides 100 gallons per minute to the training center. They are approximately 400 ft deep. Salinity at this level is generally less than 50 ppm. The nearest residential well is 1.9 miles away. Because of the relatively close water table, the plant has a series of six subsurface drains under both containment basemats, both unit alleyways, under the main transformer yard and the spent fuel pool. These subsurface drains are monitored release points and are documented in the plant's ODCM. The subsurface drains are normally monitored after dilution from the turbine building sump and storm drain water.

The site has a series of piezometer wells around the site that provide data on hydraulic potential of the ground water. The readouts on these wells are monitored by plant engineering. When the NEI initiative was started, several years of data from these piezometer wells was provided to a hydrologist for evaluation. The evaluation determined that the subsurface drain system had created a low point in hydraulic potential and that ground water migration was generally toward the plant. It also determined that the discharge canal was probably a hydraulic high point and that the potential tended to "mound" near it. It was determined that the piezometer wells were not suited for sampling (they were backfilled with bentonite clay once the instruments were installed) and that to monitor any groundwater tritium migration that a series of approximately six wells was indicated with the locations annotated on a map of the site. These wells are anticipated to be tamper wells that allow representative sampling of multiple elevations.

# TRITIUM DATABASE REPORT 1

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| James River, Brackish..Not Generally Potable | James River, Brackish..Not Generally Potable | 2009002 Complete |
| ***Known pre 2007 Groundwater Plumes*** | | |
| None | | |
| ***Source of pre 2007Ground Water Plume*** | | |
| ***Known pre 2007Surface Water Problems*** | | |
| ***Source of pre 2007Surface Water Problems*** | | |
| ***Known post 2007 Groundwater Plumes*** | | |
| In June 2006 activity was discovered in the water coming from beneath both containments and under the fuel building. Unit 1 activities were tritium 1.25E-4 µCi /ml (125,000pCi/L) and cesium-137 2.70E-8µCi/ml (27pCi/L). Unit 2 activities were tritium 3.75E-6 µCi /ml (3750 pCi/L) and cesium 137 1.35E-7µCi/ml (135pCi/L). Beneath the fuel building tritium was measured at 1.10E-4 µCi /ml (110,000pCi/L) but cesium was not detected. The results of the sampling were documented in plant issue S-2006-2762. The source(s) of the activity in the subsurface drains is currently unknown. | | |

# TRITIUM DATABASE REPORT 1

| *Source of post 2007Ground Water Plume* | | | |
|---|---|---|---|
| *Known post 2007Surface Water Problems* | | | |
| *Source of post 2007Surface Water Problems* | | | |
| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* | | |
| Yes with Engineering Support | Yes | | |
| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
| Yes | 11 | 6 | Surry |
| *Questionaires* | | | |
| G:\Access Databases\Tritium Database\Surry\Questionaire | | | |
| *Applicable Inspection Results* | | | |
| G:\Access Databases\Tritium Database\Surry\Applicable Inspection Results | | | |
| *Hydrologist Report* | | | |
| G:\Access Databases\Tritium Database\Surry\Hydrologist Report | | | |
| *Reviews* | | | |
| G:\Access Databases\Tritium Database\Surry\Reviews | | | |
| *Event Related* | | | |
| G:\Access Databases\Tritium Database\Surry\Event Related | | | |

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Turkey Point** | 16 | George Kuzo |

| *Site Description* |
|---|
| The site comprising approximately 3300 acres, owned by FPL, lies on the west shore of Biscayne Bay which is approximately 25 miles south of Miami, 8 miles east of Florida City, and 9 miles southeast of Homestead, Florida. The area immediately surrounding the site is low and swampy and is scarcely the populated. The Miami area has experienced winds of hurricane force periodically. During the storms the plant may be subjected to flood tides of varying heights. The area is in a seismologically quiet region. |

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Cooling Canals | Cooling Canals (Brackish -salt water) | 2009005 Complete |

| *Known pre 2007 Groundwater Plumes* |
|---|
| *Source of pre 2007Ground Water Plume* |
| *Known pre 2007Surface Water Problems* |
| Cooling Canals. There is approximately 180 miles of cooling canals at the site. The concentration of tritium in the canals varies with rainfall and can get as high as 30,000 pCi/l in a dry year and down to approximately 10,000 pCi/l in a wet year. The water is saline. Although the canals are sequestered from the Atlantic Ocean, there is a still significant water exchange fraction where sea water passes through the ground to make up for evaporative losses from the canals . The salinity renders the water unfit to drink, the licensee does not allow recreational activities on the cooling canals. The original design of the canals was open to the Atlantic but it was cut off before the nuclear units went on line. |

# TRITIUM DATABASE REPORT 1

| *Source of pre 2007Surface Water Problems* | | | |
|---|---|---|---|
| *Known post 2007 Groundwater Plumes* | | | |
| Tritium has been identified in various electrical vaults the source of which has been determined to be condensate from air conditioning systems | | | |
| *Source of post 2007Ground Water Plume* | | | |
| *Known post 2007Surface Water Problems* | | | |
| *Source of post 2007Surface Water Problems* | | | |
| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* | | |
| | | | |
| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
| | 0 | 0 | Turkey Point |
| *Questionaires* | | | |
| G:\Access Databases\Tritium Database\Turkey Point\Questionaire | | | |
| *Applicable Inspection Results* | | | |
| G:\Access Databases\Tritium Database\Turkey Point\Applicable Inspection Results | | | |
| *Hydrologist Report* | | | |
| G:\Access Databases\Tritium Database\Turkey Point\Hydrologist Report | | | |
| *Reviews* | | | |
| G:\Access Databases\Tritium Database\Turkey Point\Reviews | | | |
| *Event Related* | | | |
| G:\Access Databases\Tritium Database\Turkey Point\Event Related | | | |

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Vogtle** | 17 | Adam Nielsen |

| *Site Description* | | |
|---|---|---|
| In Burke County, GA on the Savannah River at river mile 151.1 directly across the river from DOE Savannah River Plant, Barnwell County, South Carolina. | | |
| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
| Mechanical Draft Cooling Tower | Savannah River? | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

The plants 10 CFR 50.75(g) identifies 5 events which upon review do not appear to correspond to an identified plume.

1. Trace levels of activity was identified in waste water retention basin area from the 1980's and 90's. Permitted radioactive releases via the Waste Water Retention Basin, a normal plant discharge point, have resulted in trace contamination of the sludge on the basin floor. In 2005, the first of the two basins was cleaned of all sludge and the concrete bottom was cleaned. The second basin was scheduled for 2007. Past spills which have occurred around the baasins have been cleaned to environmental release criteria. Contaminated sludge and soil was removed and sent to radwaste.

2. Early 1990's West side of U2 RWST Moat. The moat surrounding the Unit 2 RWST developed a leak resulting in contamination of soil on the west side of the moat. Soil was removed and sent to radwaste. The area was returned to the environmental release criteria.

3. 1/23/1992, Spill of approximately 1 gallon of water from a nitrogen gas cylinder into a yard drain at RSB. Personnel immediately isolated the yard drain preventing offsite release and the drain was cleaned of radioactive material (CR1992023924)

4. 1994-1995, 2006 An outside Temporary Storage Tank Containing radioactive material from processing of the spray additive tanke leaked behind the alternate Radwaste building. Storm drains were dammed preventing offsite release on the material and then cleaned . Contaminated concrete was removed from the area. Trace contamination of soil is planned to be remediated during decommissioning. Traced contamination in the yard drain samples was detected during routine yard drain sampling in 2006 and determined to be from the earlier event.

# TRITIUM DATABASE REPORT 1

| |
|---|
| ***Source of pre 2007Ground Water Plume*** |
| ***Known pre 2007Surface Water Problems*** |
| ***Source of pre 2007Surface Water Problems*** |
| ***Known post 2007 Groundwater Plumes*** |
| ***Source of post 2007Ground Water Plume*** |
| ***Known post 2007Surface Water Problems*** |
| ***Source of post 2007Surface Water Problems*** |

| *Has the FSAR been reviewed for risks to groundwater* | *Has a hydrological/geological study been performed?* |
|---|---|
| | |

| *FSAR reconcilled to Hydrogeological study* | *Number of wells* | *Number of new wells* | *Additional Documentation.Site* |
|---|---|---|---|
| | 0 | 0 | Vogtle |

| |
|---|
| ***Questionaires*** |
| G:\Access Databases\Tritium Database\Vogtle\Questionaire |
| ***Applicable Inspection Results*** |
| G:\Access Databases\Tritium Database\Vogtle\Applicable Inspection Results |
| ***Hydrologist Report*** |
| G:\Access Databases\Tritium Database\Vogtle\Hydrologist Report |
| ***Reviews*** |
| G:\Access Databases\Tritium Database\Vogtle\Reviews |
| ***Event Related*** |
| G:\Access Databases\Tritium Database\Vogtle\Event Related |

# TRITIUM DATABASE REPORT 1

# TRITIUM DATABASE REPORT 1

| *Site* | *ID* | *PSB1 Point of Contact* |
|---|---|---|
| **Watts Bar** | 18 | Heather Gepford |

***Site Description***

The Watts Bar Nuclear Plant is located on a tract of approximately 1770 acres in Rhea County on the west bank of the Tennessee River at river mile 528. The site is approximately 1.25 miles south of the Watts Bar Dam and approximately 31 miles north-northwest of the Sequoyah Nuclear Plant. The reservation is owned by the United States and is in the custody of the Tennessee Valley Authority. The environment is described as low population and mostly rural agriculture.

| *Cooling Source* | *RW Outfall* | *Report Number for TI2515/173* |
|---|---|---|
| Tennessee River ( Fresh Water ) | Tennessee River ( Fresh Water ) | 2009005 Complete |

***Known pre 2007 Groundwater Plumes***

Groundwater monitoring: The inspectors discussed current and future programs for monitoring onsite groundwater with cognizant chemistry representatives including number and placement of monitoring wells and identification of plant systems with the most potential for contaminated leakage. The site has six onsite wells associated with the radiological environmental monitoring program (REMP) and 37 non-REMP wells that are used to monitor the onsite groundwater plume from two leaks identified in 2002. Recent well sampling data and trends were evaluated.

In addition, licensee program guidance and records regarding documentation of unintended spills of radioactive materials on owner-controlled property were discussed. The inspectors reviewed and discussed selected tritium concentration data for samples collected during the period from January 1, 2001, through September 27, 2003, from sumps located within the protected area and from ground water monitoring wells and yard holdup ponds located within the owner-controlled property boundary. Potential areas and/or equipment identified by the licensee as potential tritium source terms were toured and discussed including a leaking radioactive liquid waste discharge pipe, the Unit 1 (U1) and Unit 2 (U2) transfer canal liner, the U2 transfer canal tube bellows, and in-plant valves associated with the refueling water storage tank (RWST) equipment. Completed and planned maintenance actions regarding the waste discharge line, the U1/U2 transfer canal liner, the U2 transfer tube bellows, and the RWST valves were discussed and evaluated in detail. Inspectors monitored sample well results and trends to verify any affects on required REMP wells and offsite areas.

# TRITIUM DATABASE REPORT 1

| *Source of pre 2007Ground Water Plume* | | | |
|---|---|---|---|
| Rad Waste | | | |
| ***Known pre 2007Surface Water Problems*** | | | |
| ***Source of pre 2007Surface Water Problems*** | | | |
| ***Known post 2007 Groundwater Plumes*** | | | |
| ***Source of post 2007Ground Water Plume*** | | | |
| ***Known post 2007Surface Water Problems*** | | | |
| ***Source of post 2007Surface Water Problems*** | | | |
| ***Has the FSAR been reviewed for risks to groundwater*** | ***Has a hydrological/geological study been performed?*** | | |
| | | | |
| ***FSAR reconcilled to Hydrogeological study*** | ***Number of wells*** | ***Number of new wells*** | ***Additional Documentation.Site*** |
| | 43 | 0 | Watts Bar |

***Questionaires***

G:\Access Databases\Tritium Database\Watts Bar\Questionaire\Tritium Questionaire RII_Watts Bar.pdf

***Applicable Inspection Results***

G:\Access Databases\Tritium Database\Watts Bar\Applicable Inspection Results

***Hydrologist Report***

G:\Access Databases\Tritium Database\Watts Bar\Hydrologist Report

***Reviews***

G:\Access Databases\Tritium Database\Watts Bar\Reviews

***Event Related***

G:\Access Databases\Tritium Database\Watts Bar\Event Related