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From: Blizard, Andrea
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Attached please find the latest version of FAQ's concerning the groundwater investigation at IPEC. Please share with personnel who do not have access to a computer.

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Frequently Asked Questions

March 2006

How was the groundwater contamination found at Indian Point?

A moist hairline settlement crack was found on the southwest wall of the IP2 spent fuel pool during the excavation work for the new gantry crane. Water collected from the crack was tested for radioactivity and was found positive for radionuclides characteristic of spent fuel pool water. Once there was positive confirmation that radioactivity was leaking from the crack, Entergy began testing the existing wells on site for radioactivity. One monitoring well, MW-111, located in the IP2 transformer yard tested positive for tritium at elevated levels (~200,000 pCi/L). Other wells located near the discharge canal and in the IP3 turbine building showed small amounts of tritium, generally < 1000 pCi/L.

What is tritium?

Tritium is a radioactive isotope of hydrogen. It is formed in the upper atmosphere when cosmic rays strike Nitrogen in the air. It is also a byproduct of the fission process. Tritium is most commonly found as tritiated water. Tritium is produced commercially for use as a biological tracer and used in self-luminescent devices such as exit signs, aircraft dials and watch faces.

How is tritium measured?

Tritium in the environment is measured in units of picocuries per liter of water (pCi/L). A picocurie is 1 trillionth of a curie or about 2.2 disintegrations per minute.

Are there limits for how much tritium can be found in groundwater supplies?

There are standards established by the Environmental Protection Agency for tritium and other radioactive contaminants in drinking water supplies. The standard for tritium is 20,000 pCi/L, which the EPA estimates equates to an annual dose of 4 mrem. The dose estimate assumes that all drinking water is obtained from the same supply.

Is tritium the only radioactive isotope found in the groundwater?

No. Samples taken from three wells, one in the transformer yard and two on opposite sides of the discharge canal have tested positive for Strontium-90 and Nickel-63. (*See map on page 3 for well locations*)

In MW-111, MW-36 and MW-37, we detected elevated levels of Strontium-90 ranging from 1.17 pCi/L to 22.7 pCi/L and Nickel-63 at about 40 pCi/L. The Nickel levels are preliminary. Entergy is running confirmatory analyses to determine if these results are valid since Nickel-63 would not be expected to be found in these samples.

What is Strontium-90?

Strontium-90 is a by-product of the fission process in nuclear reactors. Large amounts of Strontium-90 were produced during the nuclear weapons tests conducted in the 1950's and 1960's that has resulted in levels of Strontium-90 being found dispersed worldwide. The New York State Department of Health reports environmental levels of Sr-90 in New York State between .7 and 1.3 pCi/L. The EPA drinking water standard is 8 pCi/L for Strontium-90.

Strontium-90 is a beta emitter with a half-life of about 29 years. It is chemically similar to calcium and tends to concentrate in the bones and teeth.

What is Nickel-63?

Nickel-63 is a radioactive isotope of nickel that is produced by neutron activation of metal components in nuclear reactors. Trace amounts of nickel-63 are present in the environment from radioactive fallout, but in much smaller amounts than Sr-90 or tritium. It is also a beta emitter with a half-life of 96 years.

Is groundwater at Indian Point used for drinking water?

No. Drinking water supplies for the local communities and for Indian Point itself come from surface water reservoirs such as the Camp Field Reservoir in Peekskill and the Croton Reservoir in Westchester County.

Has the ground water contamination at Indian Point affected any nearby water supplies?

No. Entergy has tested a number of locations nearby to determine if contamination is getting off site through the ground water. We have tested two wells at the LaFarge gypsum plant, the Trap Rock Quarry and the Algonquin outfall, all located south of Indian Point in the general direction of regional groundwater flow. All samples have come back as negative for radioactivity above background. We also tested an abandoned well in Verplanck. It was also negative for radioactivity.

What is the dose impact from this ground water contamination?

Entergy has done a bounding calculation using conservative estimates for releases of radioactivity. The dose impact from releases to the Hudson River is many times smaller than what is permitted by federal regulation, <.1% of our limits. Doses to the general public from all liquid releases are limited to 3 mrem/year whole body and 10 mrem/year to any critical organ.

How do these doses compare with other sources of radiation exposure?

As a comparison, the table to the right shows typical low dose radiation exposure associated with common activities.

The average amount of radiation in the United States is about 360 millirem per year or about 1 mrem/day.

Source / Activity	Average dose/year (or as noted)
Luggage inspection at airport	.002 mrem
Using a smoke detector (Am-241)	.008 mrem
Living within 50 miles of coal plant	.03 mrem
Living within 50 miles of nuclear plant	.01 mrem
Watching TV	1 mrem
Jet plane ride	1 mrem per 1000 miles
Building materials	4 mrem
Chest X-ray	8 -15 mrem
Cosmic radiation	30 mrem
From food (K-40 and C-14)	40 mrem
Per mammogram	138 mrem
Radon gas	200 mrem
Nuclear medicine procedure	430 mrem
Cardiac stress test (Tc-99)	600 mrem
Smoking 20 cigarettes/day	5300 mrem to lung

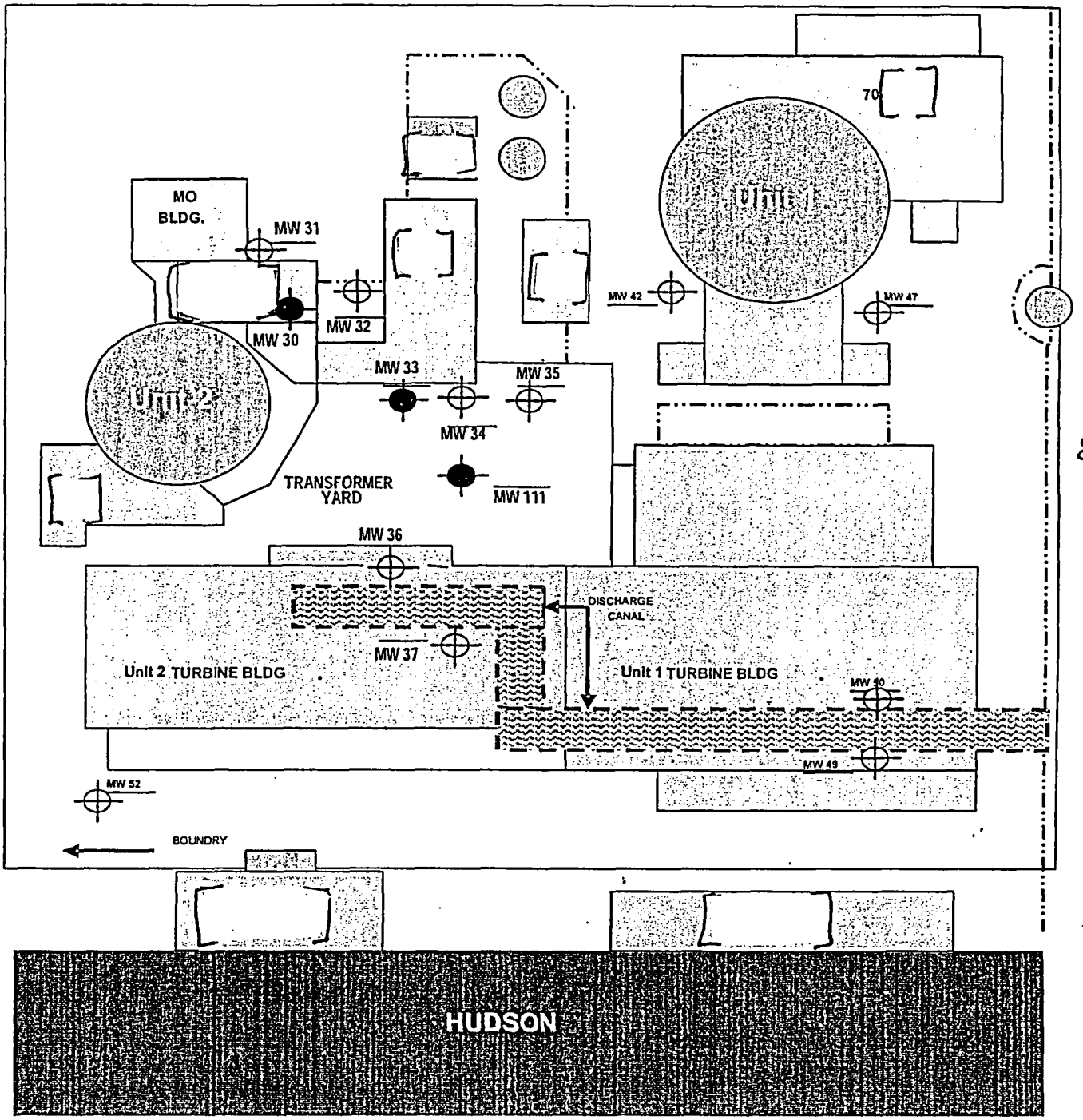
What is Entergy doing to determine the extent of the groundwater contamination?

Very shortly after finding tritium in the existing wells on site, Entergy embarked on a comprehensive program to determine the extent of contamination, characterize groundwater flow and identify the source of the leak. We hired an expert consulting firm, GZA, to advise us on installing new monitoring wells and began construction of about 25 wells located throughout the site. The first group of wells was constructed near the IP2 spent fuel pool and transformer yard. All of these wells have been developed and sampled. We are currently finishing the installation of a second group of wells that are strategically located across the site near potential sources of radioactive water.

Our hydrology firm has reviewed existing site drawings and previous groundwater studies to develop a conceptual model of how water flows on site. Additionally, Entergy has sampled the storm water drains on site and reviewed historical records. All of the wells are sampled for radioactivity after they have been drilled and developed.

Where has radioactivity been found on site?

Entergy has identified tritium at a number of sample locations on the property. The map below shows the monitoring well locations where tritium has been found above detectable levels. The concentration of tritium is highest adjacent to the IP2 spent fuel pool and in the IP2 transformer yard. No radioactivity has been found off-site.



Ex. 4

Tritium pCi/L

- > 250,000
- 100,000-250,000
- 20,000-100,000
- 1000 - 20,000
- < 1000
- Phase 2 wells

What is Entergy doing to develop monitoring wells?

We mobilized quickly to engage a nationally known firm that has experience in groundwater modeling. Entergy has been following the advice of our expert hydrologist regarding the placement, depth and sampling regime for our monitoring wells. The first few wells were installed in and near the IP2 fuel storage building while there was still excavation work for the gantry crane. One of those wells is about 200-feet deep and needed to be drilled through very hard rock formations containing marble, granite and limestone.

Two of the Phase 1 wells are located inside the IP2 turbine building which presented a number of challenges to lift a heavy drill rig past scaffolding and high voltage equipment. In some of the locations there are underground service lines that had to be avoided. We used a vacuum drilling technique to remove the first 5-7 feet of surface so that we did not endanger our workers or hit buried lines. Ground penetrating radar was employed to ensure the area was clear of hidden metal. In a couple of instances we needed to relocate the wells because we encountered obstructions. To obtain qualified environmental samples the wells must be flushed and equalized before drawing samples meaning there is a delay between drilling the bore hole, installing the well and getting samples.

Thirteen of fourteen wells in Phase 2 have already been developed.

Entergy benchmarked the timeline and techniques used at other facilities. We are proceeding at a good pace consistent with our desire to understand groundwater patterns while ensuring that we do not jeopardize worker safety.

What are we doing to find the source of the leak?

Entergy has examined the historical sampling records to get a baseline picture of groundwater quality on site. We have conducted inspections of the storm drain systems, curtains drains around IP1 and the IP2 Primary Auxiliary Building sump.

We have also engaged a specialty underwater construction firm and video inspection firm to perform a video of the IP2 spent fuel pool. The video inspection covered the accessible areas of the fuel pool above the fuel racks. In this inspection, we noted about six anomalies in the pool's stainless steel liner. We sent divers into the pool to leak test those areas on the liner using a vacuum box technique. Although the vacuum box test did not reveal any through wall leaks, we repaired the areas with an epoxy coating.

The well monitoring program is also designed to help detect the source of the leak. The wells are positioned to help determine if specific tanks, pools or sumps are potential sources.

What is a split sample?

Entergy, the Nuclear Regulatory Commission and New York State Department of Environmental Conservation have taken samples from wells on site and at off-site locations. In a split sample a single portion or aliquot of water is obtained from the well, stream, or surface water body and divided among the three parties. Each entity then analyzes the sample at their own facility to provide independent validation of the sample results. NRC, DEC and Entergy have taken split sample of monitoring wells on site, off-site locations, and the Hudson River.

Where are the samples analyzed?

Entergy can perform some of the analyses for radioactivity on site. For more sensitive tests, Entergy uses an environmentally qualified lab at Fitzpatrick or a commercial lab in Georgia. The NRC has sent their sample to Oak Ridge and the DEC uses the NYS Health Department's Wadsworth lab in Albany, N.Y.