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March 10, 2016

Mr. James B. Harrington, P.E.
Director, Remedial Bureau A
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7015

**Re: Bethpage Water District**
**Naval Weapons Industrial Reserve Plant, Bethpage, New York**
**Radium Sampling Program**
**BPWD 16-50**

Dear Mr. Harrington:

Together with the Bethpage Water District, we have reviewed the radium sampling results provided to our office on February 5, 2016 for the sampling program conducted by your office over the past couple of months, as well as the radium sampling data from June 2013 and the recent radium results from Bethpage Well Nos. 4-1 and 4-2.

As we informed the EPA, the Navy, Northrop Grumman (NGC) and your office at our quarterly meeting of February 2, 2016, both supply wells at Plant No. 4 were at risk of being permanently shut-down due the likely exceedence of the MCL for combined radium 226+228 of 5.0 pCi/L. Please be advised that Well No. 4-1 has now exceeded the MCL and we are awaiting the regulatory determination from the Health Department that the well must be permanently removed from service unless wellhead treatment to remove radium is provided. In addition, the viability of Well No. 4-2 is in jeopardy, both from a regulatory perspective and public health perspective, as the expectation must be that Well No. 4-2 will at some point be impacted by similar radium concentrations, especially with Well No. 4-1 out of service. The District has now lost 4 million gallons a day (MGD) in production capacity to radium contamination. My understanding is that this is the first public drinking water supply well facility lost to radium contamination in Nassau County and Long Island, another dubious and unwanted first for the Bethpage Water District.

Back in May 2013, the Bethpage Water District requested NGC provide access to nine (9) MWs to sample and test for radium, since none of the OU-2 or OU-3 investigations included any radium testing whatsoever. Since the wells were threatened and there was zero water quality information in the area for radium, the District expected the fullest support and cooperation. Instead, NGC provided access to only three of the nine wells (determined at their discretion) and the DEC did nothing to compel NGC to accommodate the District's request. To the contrary, the DEC was completely dismissive (note email attached) and attempted to superficially explain away the radium concern as an overreaction and no cause for alarm. In fact, as it has always done in the past, the DEC provided our office with information on wellhead treatment to remove radium, as that was clearly the path of least resistance for your office.

Not only was the information on wellhead treatment inappropriate, the message sent from the DEC to the District was 'sorry about your new problem and good luck with it'. And the topper, which still makes me shake my head, was what we were then told by your office – to paraphrase – 'well, we asked Grumman if they ever used radium at the Bethpage facility and they weren't aware of any, so no need to go any further'. Without a thorough and diligent investigation, that was an unacceptable response to the District, as it should have been to your office as well. To accept such a response on the face of it was a shirk in responsibility. Whether or not greater diligence by your office nearly three years ago would have saved the loss of these wells is unlikely. However, a greater understanding of the situation as early as possible would have allowed the District to better plan for the actual loss of 4.0 MGD.

From the USNRC (Nuclear Regulatory Commission) - Radium was formerly used in self-luminous paints for watches, nuclear panels, aircraft switches, clocks, and instrument dials. Clocks, watches, and instruments dating from the first half of the 20th century, often in military applications, were often painted with radioactive luminous paint. Ra-226 was used until the late 1960s in self-luminous paints for watches, aircraft switches, clocks and instrument dials. Because of its gamma emission properties, Ra-226 was also used in various industrial applications such as radiation monitoring instrument calibration facilities.

Based on our review, these were the most common uses of radium in the manufacturing process up until the late 1960s. Additionally, we performed review of available records of past land use in the vicinity of Grumman in the Bethpage area and have found very little if any other industries that would have used radium for instruments, dials and switches in aircraft and military applications. That leaves NGC. So to not think that NGC is the likely source of the radium contamination at Plant 4 is shortsighted, and to not require a proper investigation is presumptuous.

The results of the radium sampling program conducted by the DEC, when coupled with sampling performed by NGC in June 2013, as well as the review of past industrial land use in the Grumman and Bethpage area from the 1930s to the late 1960s, lead to NGC as the likely source of the radium contamination (regardless of what they say). The result of 8.59 pCi/L at the MW 15 location is compelling. Drawing a vector from that location almost directly south-southeast (regional groundwater flow direction), brings you to the RW3 location (which tested in June 2013 at 4.98 pCi/L) and the RW2 location (which tested in June 2013 at 6.80 pCi/L).

We have conducted our own investigation into the potential for wellhead treatment of Plant No. 4, and it is severely challenging to logistically impossible. Unless the radium can be completely destroyed on site (which no water treatment system manufacturer has been able to demonstrate), a removal system would create a concentrated radium waste, which could not be discharged to the sanitary system and could not be held and hauled based on current regulations. Wellhead treatment is not an option. Therefore, we urge the DEC to launch a comprehensive investigation into the source and extent of the radium contamination and not dismiss the issue as it did nearly three years ago. The Bethpage Water District has lost its plant, and with it 4.0 MGD in production. Please do what you can to prevent any further public supply wells from being lost to radium contamination.

Very truly yours,

**H2M architects + engineers**

Richard W. Humann, P.E.
President/CEO

cc: Board of Commissioners
Supt. Michael Boufis
Michael Ingham, Esq.
Andrew Cuomo, Honorable NYS Governor
Carl Marcellino, Honorable NYS Senator
Kemp Hannon, Honorable NYS Senator
Joseph Saladino, Honorable NYS Assemblyman
Michael Montesano, Honorable NYS Assemblyman
Charles Lavine, Honorable NYS Assemblyman
Charles Schumer, Honorable US Senator
Kristen Gillibrand, Honorable US Senator
Peter King, Honorable US Congressman
Steve Israel, Honorable US Congressman
Ed Mangano, Honorable Nassau County Executive
Rose Walker, Honorable Nassau Legislator
Laura Schaefer, Honorable Nassau Legislator
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Judith Enck, EPA Regional Administrator
Catherine McCabe, EPA Deputy Regional Administrator
Doug Garbarini, EPA Branch Chief
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Don Irwin, NCDH Division of Environmental Health Director

## Rich Humann

**From:** Steven Scharf <sxscharf@gw.dec.state.ny.us>
**Sent:** Tuesday, May 21, 2013 9:00 AM
**To:** Rich Humann
**Cc:** (mikebwd@optonline.net), Michael J.Boufis; Hannon, ED (AS); Joseph Defranco; Papura, Thomas; Parish, Walter; Rice, Timothy; Spitz, William; Steven Karpinski; Swartwout, John; jah20@health.state.ny.us; lora.fly@navy.mil
**Subject:** Bethpage Water District (BWD) Plant 4 Radium
**Attachments:** Report.hw130003a.2013-05-22.Radium_Treatment.pdf

Dear Mr. Humann,

This letter follows your email to Ed Hannon at Northrop Grumman Systems (NGC) regarding sampling for Radium in monitoring wells after Radium has been identified in the Bethpage Water District Plant 4 wells. Currently, NGC is not aware of any radium use at the Bethpage facility. However, Ed Hannon, as Health and Safety Manager for the NGC Bethpage facility, is looking into this through their historical records. Ed said this will take several weeks as this information is in their archives.

Please note that, based on a literature review, Radium is somewhat ubiquitous in soils and groundwater. This includes sand and sand aquifers in the Atlantic Coastal Plain. Ra-226 is a decay product of Uranium-238 and Ra-228 is a decay product off Thorium-232. The Ra-226/Ra-228 ratio in water supplies has historically been considered to be greater than unity, though some more recent data suggests it is closer to unity, on average. However, considerable variability exists due to localized geochemistry.

From the Environmental Radioactivity Eisenbud, 4th edition, data on sand aquifers in the Atlantic Coastal Plain and Piedmont Provinces from it's attached file shows Ra-226 mean/max of 1.56/25.9 pCi/l, and Ra-228 mean/max of 1.05/17.6 pCi/l in sand aquifers.

Please note that the BWD results do not show the associated uncertainties with the results. Either as a 2 sigma or Total Propagated Uncertainty (TPU). In a worst case scenario, uncertainties could be nearly as much as the results.
The results of the testing for Radium can be related to the Gaussian distribution, or bell curve. Radiation results are usually given at a 95% (2 Sigma) confidence. Which means the result is the center line of that bell curve. The 2 sigma uncertainty potentially takes the results to the edge of the curve. For example, the highest BWD Plant 4 result (3.6) has a 2 sigma uncertainty of 2.4. Therefore, the actual result may be as much as 6.0 pCi/l or as little as 1.2 pCi/l. Without knowing the uncertainty, the accuracy of the result is in question. Therefore, this uncertainty data needs to be presented and evaluated along with the analytical result(s).

There are systems available to treat drinking water contaminated with radium. There are at least a small No. of commercial service providers. See the attached PDF file for info general info on removal.

Please contact me directly if you have any questions in the interim.

Thanks,

Steve Scharf

Steven M. Scharf, P.E.
Project Engineer



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>>> Rich Humann <rhumann@h2m.com> 5/20/2013 5:48 PM >>>
Ed,

Following our discussion a few weeks ago, attached please find the analytical results for radium at Bethpage Plant 4 wells.

Also included in the letter is a request to allow the District to sample upgradient monitoring wells at its own cost and expense.

Please advise if and when NGC can provide access to the subject MWs.

Thanks

Rich

**Rich Humann, P.E.**

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