

Japanese Nuclear Incident – Radiation Data Measured in North Carolina

Summary of April 27, 2011:

Small, but detectable levels of Iodine-131, Cesium-134, and Cesium-137 continue to be detected in North Carolina environmental samples. Since March 21, 2011, when elevated radiation levels were first detected, 142 total samples of all media types have been analyzed. Out of this total population of samples analyzed, I-131, Cs-134, and Cs-137 were detected in 54 samples. Please see below, for the minimum, maximum and median data results for each type of media analyzed for each radioisotope detected.

Overview of increased monitoring: As a result of this event, the Radiation Protection Section (RPS) increased both the frequency and amount of samples it collects. The RPS has modified parts of its environmental sampling program as outlined below.

- Air Particulate – Continuous monitoring, collected weekly or daily, depending on location and sampling method.
- Air Radioiodine – Continuous monitoring with sample media specifically engineered to detect airborne radioactive isotopes of iodine, such as Iodine-131 (I-131). These samples are collected weekly.
- Milk – weekly sampling from both large milk processors and small dairies. Samples are collected statewide for Radiation Protection by the Dairy Protection Branch, Division of Environmental Health. Samples are also collected at dairies on a monthly basis within the nuclear power plants' Emergency Planning Zones.
- Surface Water – Both continuous and grab samples are being collected statewide and around nuclear power plants. Surface water samples are collected at least weekly.
- Drinking Water – Multiple drinking water samples from public water supplies statewide are being collected at least weekly.
- Precipitation – Multiple collections at least weekly depending on rain events at the collection sites.
- Vegetation – Multiple terrestrial vegetation samples from locations statewide are being collected at least weekly. Terrestrial vegetation is defined as any vegetation that might be eaten by livestock.
- Sewage Effluent – Sewage effluent samples from treatment plants are being collected at least every two weeks.
- Shellfish – Shellfish samples are collected every other week.

Please note that this is an ongoing response and is subject to change at any time as the state transitions from an emergency-phase response to a recovery- phase response to this event.

Summary of results to date (4/27/2011): The only non-natural radioisotopes detected thus far are Iodine-131, Cesium 134, and Cesium-137. These radioisotopes have been detected in air, milk, vegetation, precipitation, and surface water samples collected and analyzed since March 21, 2011. **[Samples of the other media types as listed above were also analyzed during this period, but only naturally occurring radioisotopes were found for these other media. No non-natural radioisotopes have been found in drinking water, sewage effluent or oyster samples.]**

A few positive samples have exceeded investigation levels set by RPS. RPS is sending these samples to an independent lab for Strontium-89 and Strontium-90 analysis. The levels of Strontium in a sample are important to know because Strontium accumulates in the bones and has a long half life (28.8 years for Sr-90). Any positive detections of Strontium isotopes will be reported in future data summaries. Please see below for trending and statistical data on samples analyzed to date. **NOTE ON UNITS:** All measurements of radioactivity are given in picocuries/cubic meter (air samples), picocuries per liter (water or milk), or picocuries per gram (vegetation). These measurements are abbreviated as pCi/m³, pCi/l and pCi/kg. One picocurie is a trillionth (10⁻¹²) of a Curie – a common unit used for radioactivity. One curie of radiation is roughly the radioactivity in one gram of Radium-226. The international unit of radioactivity is the Becquerel, which is equal to 2.7 x 10⁻¹¹ curies.

List of Counties with radioactivity detected in samples:

1. Buncombe
2. Chatham
3. Wake
4. Mecklenburg
5. Lincoln
6. Brunswick
7. New Hanover
8. Davidson
9. Sampson
10. Alamance

List of Counties where the RPS collects samples as part of its monitoring program:

1. Chatham
2. Wake
3. Lincoln
4. Harnett
5. Mecklenburg
6. Brunswick
7. New Hanover
8. Burke
9. Currituck
10. Albemarle
11. Buncombe
12. Craven
13. Davison
14. Macon
15. Orange
16. Sampson
17. Durham
18. Forsyth
19. Johnston
20. Montgomery
21. Pitt
22. Halifax
23. Carteret

- **Air Radioiodine :**
 - Total Number of Samples Analyzed: 46
 - Total Number of Samples Positive for I-131: 34.
 - Minimum Amount of I-131 Detected (non-zero results): 3.85E-03 pCi/m³ [Wake]
 - Maximum Amount of I-131 Detected: 1.87E-01 pCi/m³ [New Hanover]
 - Median of non-zero results: 7.02E-02 pCi/m³ [Chatham]
 - Average of non-zero results: 7.26E-02 pCi/m³
 - Standard Deviation of non-zero results: 4.86E-03 pCi/m³
 - RPS investigation level for I-131 is 0.1 pCi/m³, and the regulatory limit is 200 pCi/m³.
- **Milk:**
 - Total Number of Samples Analyzed: 39 Total Number of Samples Positive for I-131: 4.
 - Minimum Amount of I-131 Detected (non-zero results): 3.32E+00 pCi/l [Davidson]
 - Maximum Amount of I-131 Detected: 9.83E+00 pCi/l [Mecklenburg]
 - Median of non-zero results: 5.73+00 pCi/l [Average of Buncombe and Sampson results of 6.57 pCi/l and 4.89 pCi/l, respectively. Here the median is calculated as the average of these two sample results due to the even total population number (4 samples).]
 - Average of non-zero results: 6.15+00 pCi/l
 - Standard Deviation of non-zero results: 2.79+00 pCi/l
 - RPS investigation level for I-131 is 10 pCi/l, and the regulatory limit is 4,700 pCi/l.
- **Precipitation:**
 - Total Number of Samples Analyzed: 6
 - Total Number of Samples Positive for I-131: 5.
 - Minimum Amount of I-131 Detected (non-zero results): 6.64E+00 pCi/m² [New Hanover]
 - Maximum Amount of I-131 Detected: 1.55E+02 pCi/m² [Wake]
 - Median of non-zero results: 3.55E+01 pCi/m² [Mecklenburg]
 - Average of non-zero results: 4.87E+01 pCi/m²
 - Standard Deviation of non-zero results: 6.10E+01 pCi/m²
 - No regulatory limit for precipitation, RPS investigation level is 10,000 pCi/m².
- **Vegetation:**
 - Total Number of Samples Analyzed: 11
 - Total Number of Samples Positive for I-131: 10.
 - Minimum Amount of I-131 Detected (non-zero results): 6.60E-02 pCi/g [Alamance]
 - Maximum Amount of I-131 Detected: 2.91E-01 pCi/g [Chatham]
 - Median of non-zero results: 1.50E-01 pCi/g [Average of Wake and Sampson results of 1.43 pCi/g and 1.57 pCi/g, respectively. Here the median is calculated as the average of these two sample results due to the even total population number (10 samples).]
 - Average of non-zero results: 1.53E-01 pCi/g
 - Standard Deviation of non-zero results: 7.59E-02 pCi/g
 - Two samples detected with Cs-134: 7.77E-03 pCi/g and 2.56E-02 pCi/g
 - Three samples detected with Cs-137: 3.99E-02 pCi/g, 1.02E-02 pCi/g, and 4.77E-02 pCi/g.
 - RPS investigation level for Cs-137 is 10 pCi/g. No RPS investigation level for Cs-134 and I-131. The regulatory dose limits for I-131, Cs-134, and Cs-137 are 500 mrem for each. [The concentrations of radioactivity in pCi/g that generate the 500 mrem dose vary based on calculations involving multiple factors such as the age of the affected individual.]

- **Surface Water:**

- Total Number of Samples Analyzed: 1
- Total Number of Samples Positive for I-131: 1
- I-131 Result: 2.21E+01 pCi/l [Brunswick]
- The RPS investigation level for I-131 is 1.0 pCi/l, and the regulatory limit is 1,000 pCi/l.

Anticipated Health Effects of Exposure to Detected Radiation Levels from the Japan Incident:

None. No adverse health effects are expected due to radioactivity found in the environment from the failure of the Fukushima Daiichi reactors in Japan. Only trace levels of radioactivity have been detected to date in samples collected in North Carolina. RPS will continue to monitor and report sample results via the Internet for the duration of this event.