

**NORTH CAROLINA
ENVIRONMENTAL
SURVEILLANCE
NETWORK**

NORTH CAROLINA ENVIRONMENTAL RADIATION SURVEILLANCE NETWORK

In the interest of public health, the Nuclear NC Radiation Protection Section (RPS) monitors ambient radiological levels in the environment statewide. This monitoring is accomplished via a statewide network of sampling sites. The 2008 results associated with each sample medium are discussed below.

Statewide air particulate is collected monthly from four separate locations using a 24-hour grab sample procedure. This involves using a high volume air sampler with an 8-inch by 10-inch glass fiber filter. The average gross beta concentration measured in 28 air particulate samples collected from three different locations during the year was 0.25 E-2 picocuries per cubic meter (pCi/m^3). [Stanly County did not collect any samples due to manpower issues.] The airborne concentrations of gross beta activity for the year are indicative of natural background and do not indicate any abnormal activities.

Milk is sampled monthly from different locations statewide. These samples are analyzed for gamma emitting radionuclides. Upon analysis of the 81 milk samples collected in 2008 from seven counties, none contained levels above investigation levels for Potassium-40 (K-40). No other gamma emitting radionuclide analysis results were reported.

Statewide precipitation is collected monthly, depending on the amount of rainfall, from three different sites using a composite sampling procedure. The average gross beta concentrations measured in 20 samples collected in 2008 was 0.6 nanocuries per square meter (nCi/m^2). Background levels have not been established. None of the tritium results exceeded the 10 nCi/m^2 investigation level.

Treated sewage effluent water is sampled monthly from three different locations. In 2008, 30 samples were collected statewide. Gross alpha and beta analyses are performed on samples as well as gamma analysis. The average concentrations were 0.33 pCi/l for gross alpha and 12.064 pCi/l for gross beta. The alpha and beta concentrations were indicative of background radiation levels. The average gamma concentrations were 41.7 pCi/l for Iodine-131 (I-131) and 100 pCi/l for K-40. The I-131 concentration was slightly above the background level but well below the investigation level for I-131 in sewage effluent.

Statewide finished water is collected monthly from nine locations. Gross alpha and gross beta analyses are routinely performed on samples. The average gross alpha and beta concentrations measured in 66 samples collected in 2008 were 0.13 pCi/l and 3.87 pCi/l respectively. These concentrations were indicative of background radiation levels.

Raw surface water is sampled monthly from seven locations. Routinely, gross alpha and beta analyses are performed on surface water samples. The average gross alpha and beta concentrations measured in 52 samples collected in 2008 were 0.17 pCi/l and 3.54 pCi/l

respectively. Average gross alpha and beta activity levels are below the average background levels for the state.

Oysters are collected four times per year routinely. The average concentration for K-40 was 0.1 pCi/g which is below the average background concentration for fish life in the state.

Note: Blanks in the tabulated data indicate the data was not available.

Air Particulate – Gross Beta, (pCi/m³)

<u>Date</u>	<u>Burke Co. (12-AP-50)</u> <u>All measurements x 10⁻²</u> <u>pCi/m³</u>		<u>Currituck Co. (27-AP-20)</u> <u>All measurements x 10⁻²</u> <u>pCi/m³</u>		<u>Stanly Co. (84-AP-10)</u> <u>All measurements x 10⁻²</u> <u>pCi/m³</u>		<u>Wake Co. (92-AP-60)</u> <u>All measurements x 10⁻²</u> <u>pCi/m³</u>	
	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January			0.64	0.13			0.74	0.12
February	1.63	0.24	0.67	0.13			0.15	0.01
March	0.31	0.02	0.16	0.01				
April			0.16	0.01				
May	0.12	0.02	0.02	0.01			0.05	0.01
June	0.12	0.02	0.06	0.01			0.04	0.01
July							0.03	0.01
August	0.15	0.01	0.06	0.01			0.06	0.01
September	0.15	0.02	0.16	0.01				
October	0.29	0.02	0.17	0.01			0.14	0.01
November	0.36	0.02	0.14	0.01			0.16	0.01
December	0.18	0.01					0.17	0.01

Statewide Milk - Gamma Isotopic, pCi/l

Date	Isotope	<u>Buncombe Co. (11-MS-10)</u> <u>All measurements in pCi/l</u>		<u>Craven Co. (25-MS-50)</u> <u>All measurements in pCi/l</u>		<u>Davidson Co. (29-MS-40)</u> <u>All measurements in pCi/l</u>		<u>Macon Co. (57-MS-60)</u> <u>All measurements in pCi/l</u>	
		Meas.	Error	Meas.	Error	Meas.	Error	Meas.	Error
January	K-40	1390.0	52.4	2030.0	81.2	1360.0	67.5	1130.0	46.5
February	K-40	2140.0	83.1	1360.0	51.8	1430.0	53.3	1680.0	71.8
March	K-40	1490.0	54.6	2070.0	82.4	1940.0	78.7		
April	K-40	1360.0	51.6	2100.0	82.4	2180.0	85.3	1910.0	77.7
May	K-40	1430.0	52.6	2230.0	86.0	1380.0	52.0	1220.0	48.0
June	K-40	1980.0	80.0	1430.0	41.0	1410.0	53.0	1410.0	50.0
July	K-40	1510.0	55.0	1390.0	52.0	2070.0	81.0	1310.0	51.0
August	K-40	1490.0	55.0	2270.0	56.0	1430.0	33.0	1250.0	49.0
September	K-40	1450.0	60.0	1510.0	61.0	1360.0	55.0		
October	K-40	1310.0	72.0	1470.0	61.0	1410.0	57.0	1160.0	51.0
November	K-40	1400.0	56.0	1490.0	61.0	1340.0	55.0	1260.0	53.0
December	K-40	1440.0	39.0	1320.0	54.0	1440.0	99.0		

Statewide Milk - Gamma Isotopic, pCi/l

Date	Isotope	<u>Orange Co. (68-MS-40)</u> <u>All measurements in pCi/l</u>		<u>Sampson Co. (82-MS-70)</u> <u>All measurements in pCi/l</u>		<u>Wake Co. (92-MS-60)</u> <u>All measurements in pCi/l</u>	
		Meas.	Error	Meas.	Error	Meas.	Error
January	K-40	2110.0	82.7	2240.0	85.2	1270.0	49.5
February	K-40	1420.0	52.9	1350.0	51.3	1970.0	79.5
March	K-40	2240.0	85.4	1280.0	49.9	2190.0	83.9
April	K-40	1450.0	53.2	2000.0	79.9	1370.0	52.0
May	K-40	1440.0	53.9	2070.0	81.7	1480.0	54.8
June	K-40	1370.0	52.0	1240.0	49.0	2170.0	84.0
July	K-40	2280.0	88.0	2080.0	82.0	1360.0	53.0
August	K-40	1420.0	53.0	1990.0	81.0	1380.0	52.0
September	K-40	2140.0	83.0	1440.0	65.0	1510.0	60.0
October	K-40	1450.0	61.0	1140.0	53.0	1270.0	53.0
November	K-40	1510.0	59.0	1110.0	49.0	1420.0	61.0
December	K-40	1480.0	62.0	1250.0	38.0	1330.0	54.0

Precipitation – Gross Beta, pCi/m²

<u>Date</u>	<u>New Hanover Co.</u> <u>(65-PP-80)</u>		<u>Wake Co.</u> <u>(92-PP-60)</u>		<u>Mecklenburg Co.</u> <u>(60-PP-20)</u>	
	<u>All measurements in nCi/m²</u>		<u>All measurements in nCi/m²</u>		<u>All measurements in nCi/m²</u>	
	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January			0.21	0.18	0.00	0.09
February	0.02	0.28	0.15	0.11	0.00	0.09
March			0.14	0.13	0.00	0.05
April			0.62	0.20	0.00	0.08
May			3.08	0.22	0.00	0.09
June	4.66	0.21	0.16	0.13	0.04	0.12
July			2.52	0.30		
August			0.51	0.18	0.10	0.08
September			0.28	0.16	0.16	0.10
October			0.27	0.16	0.09	0.10
November			0.17	0.08		
December						

Sewage Effluent, pCi/l

Date	Isotope	<u>Durham Co.</u> <u>(32-SE-20)</u>		<u>Mecklenburg Co.</u> <u>(60-SE-20)</u>		<u>Wake Co.</u> <u>(92-SE-60)</u>	
		<u>All measurements in</u> <u>pCi/l</u>		<u>All measurements in</u> <u>pCi/l</u>		<u>All measurements in</u> <u>pCi/l</u>	
		<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha	0.00	0.64	0.00	0.55	0.60	0.86
	Beta	10.64	0.79	10.88	0.81	17.76	1.00
	I-131					14.80	1.77
	K-40			136.00	23.00		
February	Alpha	0.60	0.62	0.00	0.69		
	Beta	9.49	0.89	11.07	0.85		
	K-40	55.50	11.10	73.50	11.50		
	I-131			170.00	8.46		
March	Alpha	0.25	0.50	0.72	0.55	0.78	0.62
	Beta	9.22	0.79	10.50	0.82	14.29	0.93
	K-40	47.60	11.20	167.00	23.50	73.30	11.50
	I-131			8.87	3.49	21.80	1.94
April	Alpha	0.12	0.53	0.00	0.63	0.17	0.83
	Beta	8.75	0.76	10.55	0.81	18.25	1.04
	I-131			135.00	6.99	23.30	2.30
	K-40	45.00	9.40	140.00	24.00		
May	Alpha	0.41	0.42	0.13	0.65	0.85	0.61
	Beta	9.61	0.77	9.54	0.78	19.10	1.05
	I-131	32.00	2.70	6.12	2.30	13.60	3.00
	K-40	40.50	9.90	181.00	24.00	192.00	24.00
June	Alpha	0.00	0.78	0.00	0.67	0.27	1.02
	Beta	11.9	0.88	10.30	0.90	17.30	1.04
	I-131	99.10	5.30				
	K-40	57.10	12.00	132.00	16.00	175.00	24.00
July	Alpha	0.20	0.61	0.00	0.43	0.13	0.70
	Beta	9.16	0.76	11.90	0.79	18.90	1.03
	K-40	48.80	11.00	160.00	24.00	69.50	11.00
	I-131	17.00	2.70	30.30	4.20		
August	Alpha	0.07	0.67	0.37	0.64	0.20	0.83
	Beta	9.57	0.79	12.10	0.84	18.10	1.02
	I-131			46.10	3.10	7.62	1.50
	K-40	60.90	11.00	66.80	12.00	78.50	12.00
September	Alpha	0.44	0.51	0.00	0.65	0.47	0.35
	Beta	8.34	0.74	9.53	0.77	3.47	0.62
	I-131	23.80	2.90	7.00	2.10		
	K-40						
October	Alpha	0.47	0.55	1.20	0.68	0.54	0.67
	Beta	10.40	0.79	10.20	0.79	18.70	1.04
	I-131	40.30	2.90				
	K-40						
November	Alpha			1.35	0.57		
	Beta			12.40	0.81		
	I-131						
	K-40						
December	I-131						
	K-40						

Finished Water – Gross Alpha and Beta, pCi/l

<u>Date</u>	<u>Isotope</u>	<u>Buncombe Co.</u> <u>(11-FW-10)</u>		<u>Forsyth Co.</u> <u>(34-FW-80)</u>		<u>Halifax Co.</u> <u>(42-FW-60)</u>		<u>Harnett Co.</u> <u>(43-FW-50)</u>	
		<u>All measurements in</u> <u>pCi/l</u>		<u>All measurements in</u> <u>pCi/l</u>		<u>All measurements in</u> <u>pCi/l</u>		<u>All measurements in</u> <u>pCi/l</u>	
		<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha	0.00	0.22			0.04	0.24	0.36	0.50
	Beta	0.98	0.20			2.53	0.34	3.73	0.46
February	Alpha	0.05	0.14					0.27	0.59
	Beta	0.33	0.21					3.13	0.41
March	Alpha	0.00	0.22	0.00	0.32	0.00	0.50	0.00	0.51
	Beta	0.78	0.21	0.06	0.27	2.20	0.39	3.45	0.46
April	Alpha	0.00	0.69	0.04	0.30	0.00	0.40	0.74	0.57
	Beta	2.73	1.26	2.11	0.34	2.11	0.36	2.75	0.44
May	Alpha					0.80	0.38	0.00	0.64
	Beta					3.61	0.29	2.83	0.46
June	Alpha	0.00	0.17			0.00	0.36	0.02	0.52
	Beta	0.00	0.21			1.44	0.36	3.89	0.54
July	Alpha	0.18	0.22	0.15	0.44	0.05	0.39	0.28	0.62
	Beta	0.39	0.22	2.53	0.43	1.67	0.38	4.21	0.58
August	Alpha	0.00	0.22			0.00	0.41	0.00	0.54
	Beta	0.52	0.21			2.06	0.36	4.39	0.57
September	Alpha	0.25	0.23			0.15	0.35	0.00	0.38
	Beta	0.75	0.21			1.85	0.33	4.18	0.46
October	Alpha								
	Beta								
November	Alpha								
	Beta								
December	Alpha								
	Beta								

Finished Water – Gross Alpha And Beta, pCi/l

<u>Date</u>	<u>Isotope</u>	<u>Johnston Co.</u> <u>(51-FW-70)</u> <u>All measurements in</u> <u>pCi/l</u>		<u>Mecklenburg Co.</u> <u>(60-FW-20)</u> <u>All measurements in</u> <u>pC/l</u>		<u>New Hanover Co.</u> <u>(65-FW-80)</u> <u>All measurements in</u> <u>pCi/l</u>		<u>Pitt Co.</u> <u>(74-FW-30)</u> <u>All measurements in</u> <u>Pc/l</u>	
		<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha	0.00	0.44			0.00	0.44	0.04	0.43
	Beta	7.95	0.69			4.37	0.51	4.58	0.46
February	Alpha	0.28	0.40			0.02	0.30	0.09	0.53
	Beta	6.73	0.54			3.65	0.41	3.30	0.42
March	Alpha	0.00	0.82					0.00	0.54
	Beta	6.48	0.70					3.46	0.38
April	Alpha	0.00	0.77			0.00	0.44	0.00	0.54
	Beta	9.91	0.86			2.13	0.35	3.16	0.44
May	Alpha	0.67	0.43			0.06	0.22	0.50	0.39
	Beta	5.50	0.62			3.66	0.46	2.62	0.36
June	Alpha	0.00	0.61	0.00	0.29	0.31	0.54	0.00	0.45
	Beta	6.99	0.68	1.39	0.30	2.88	0.47	2.27	0.46
July	Alpha	0.00	0.85			0.52	0.55	0.35	0.61
	Beta	5.88	0.67			3.11	0.47	3.13	0.51
August	Alpha	0.19	0.39			0.00	0.41	0.02	0.56
	Beta	6.70	0.52			3.73	0.41	3.11	0.48
September	Alpha	0.19	0.57			0.00	0.36	0.00	0.44
	Beta	6.29	0.62			3.72	0.44	4.08	0.50
October	Alpha	0.43	0.43					0.43	0.43
	Beta	4.42	0.46					3.08	0.41
November	Alpha								
	Beta								
December	Alpha								
	Beta								

Finished Water – Gross Alpha And Beta, pCi/l

		<u>Wake Co.</u> <u>(92-FW-60)</u>	
		<u>All measurements in pCi/l</u>	
<u>Date</u>	<u>Isotope</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha	0.02	0.35
	Beta	3.61	0.47
February	Alpha	0.00	0.56
	Beta	2.54	0.46
March	Alpha	0.00	0.38
	Beta	3.46	0.46
April	Alpha	0.00	0.61
	Beta	4.04	0.53
May	Alpha	0.00	0.25
	Beta	2.33	0.48
June	Alpha	0.00	0.52
	Beta	2.88	0.50
July	Alpha	0.71	0.65
	Beta	2.60	0.48
August	Alpha	0.00	0.48
	Beta	3.54	0.49
September	Alpha	0.18	0.47
	Beta	3.39	0.50
October	Alpha		
	Beta		
November	Alpha		
	Beta		
December	Alpha		
	Beta		

Surface Water – Gross Alpha And Beta, pCi/l

<u>Date</u>	<u>Isotope</u>	<u>Forsyth Co. (34-SW-80) All measurements in pCi/l</u>		<u>Harnett Co. (43-SW-50) All measurements in pCi/l</u>		<u>Johnston Co. (51-SW-70) All measurements in pCi/l</u>		<u>Montgomery Co. (62-SW-50) All measurements in pCi/l</u>	
		<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha			0.13	0.40	0.00	0.44		
	Beta			4.53	0.45	7.95	0.69		
February	Alpha			0.00	0.43	0.28	0.40		
	Beta			2.73	0.37	6.73	0.54		
March	Alpha	0.02	0.24	0.00	0.37	0.00	0.82		
	Beta	3.00	0.35	3.67	0.41	6.48	0.70		
April	Alpha	0.09	0.30	0.00	0.34	0.00	0.77		
	Beta	1.89	0.19	2.23	0.39	9.91	0.86		
May	Alpha			0.00	0.69	0.70	0.33		
	Beta			2.76	0.42	3.10	0.42		
June	Alpha			0.00	0.43	0.00	0.47	0.00	0.39
	Beta			3.32	0.46	5.45	0.57	2.17	0.30
July	Alpha	0.42	0.33	0.19	0.39	0.40	0.54	0.34	0.32
	Beta	1.78	0.33	4.05	0.52	4.80	0.54	2.40	0.33
August	Alpha			0.00	0.44	0.20	0.67	0.00	0.33
	Beta			5.09	0.53	6.21	0.63	2.45	0.31
September	Alpha					0.00	0.34	0.26	0.30
	Beta					5.64	0.49	2.78	0.30
October	Alpha					0.00	0.23		
	Beta					3.14	0.33		
November	Alpha								
	Beta								
December	Alpha								
	Beta								

Surface Water – Gross Alpha And Beta, pCi/l

<u>Date</u>	<u>Isotope</u>	<u>New Hanover Co.</u> <u>(65-SW-80)</u> <u>All measurements in</u> <u>pCi/l</u>		<u>Pitt Co.</u> <u>(74-SW-30)</u> <u>All measurements in</u> <u>pCi/l</u>		<u>Wake Co.</u> <u>(92-SW-60)</u> <u>All measurements in</u> <u>pCi/l</u>	
		<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>	<u>Meas.</u>	<u>Error</u>
January	Alpha	0.79	0.37	0.00	0.28	0.00	0.28
	Beta	4.06	0.35	4.18	0.39	3.57	0.36
February	Alpha	0.18	0.46	0.12	0.29	0.02	0.37
	Beta	3.52	0.38	3.76	0.37	3.26	0.37
March	Alpha	0.26	0.18	0.00	0.42	0.00	0.28
	Beta	2.18	0.31	3.32	0.36	3.99	0.39
April	Alpha	0.00	0.34	0.10	0.41	0.00	0.29
	Beta	1.65	0.34	2.93	0.35	2.22	0.35
May	Alpha	0.10	0.21	0.65	0.57	0.54	0.28
	Beta	1.78	0.37	1.56	0.41	2.22	0.34
June	Alpha	0.21	0.40	0.18	0.48	0.00	0.28
	Beta	3.75	0.41	2.10	0.44	2.37	0.33
July	Alpha	0.64	0.43	0.61	0.44	0.17	0.28
	Beta	3.06	0.38	3.04	0.41	1.69	0.32
August	Alpha	0.00	0.58	0.00	0.49	0.19	0.31
	Beta	3.51	0.42	3.55	0.44	2.81	0.33
September	Alpha	0.38	0.34	0.04	0.38	0.27	0.28
	Beta	3.52	0.35	3.75	0.43	2.48	0.31
October	Alpha			0.35	0.30		
	Beta			3.09	0.34		
November	Alpha						
	Beta						
December	Alpha						
	Beta						

Statewide Shellfish - Gross Alpha, Gross Beta, and Gamma, pCi/g-wet

<u>Carteret Co.</u> Morehead City			
<u>(16-SL-50)</u>			
<u>All measurements in pCi/g</u>			
<u>Date</u>	<u>Isotope</u>	<u>Meas.</u>	<u>Error</u>
February	K-40	0.941	0.070
May			
September	K-40	1.050	0.100
December			