
5.0 QUALITY ASSURANCE

5.1 SAMPLE COLLECTION

EnRad Laboratories, Fisheries, and Aquatic Ecology performed the environmental sample collections as specified by approved sample collection procedures.

5.2 SAMPLE ANALYSIS

EnRad Laboratories performed the environmental sample analyses as specified by approved analysis procedures. EnRad Laboratories is located in Huntersville, North Carolina, at Duke Energy Corporation's Environmental Center.



Duke Energy Corporation's
Environmental Center

5.3 DOSIMETRY ANALYSIS

The Radiation Dosimetry and Records group performed environmental dosimetry measurements as specified by approved dosimetry analysis procedures.

5.4 LABORATORY EQUIPMENT QUALITY ASSURANCE

5.4.1 DAILY QUALITY CONTROL

EnRad Laboratories has an internal quality assurance program which monitors each type of instrumentation for reliability and accuracy. Daily quality control checks ensure that instruments are in proper working order and these checks are used to monitor instrument performance.

5.4.2 CALIBRATION VERIFICATION

National Institute of Standards and Technology (NIST) standards that represent counting geometries are analyzed as unknowns at various frequencies ranging from weekly to annually to verify that efficiency calibrations are valid. The frequency is dependent upon instrument use and performance. Investigations are performed and documented should calibration verification data fall out of limits.

5.4.3 BATCH PROCESSING

Method quality control samples are analyzed with sample analyses that are processed in batches. These include gross beta in drinking water and all tritium analyses.

5.5 DUKE ENERGY INTERCOMPARISON PROGRAM

EnRad Laboratories participated in the Duke Energy Nuclear Generation Department Intercomparison Program during 2011. Interlaboratory cross-check standards, including Marinelli beakers, air filters, air cartridges, gross beta in water, and tritium in water samples were analyzed at various times of the year. A summary of the EnRad Laboratory program results for 2011 is documented in Table 5.0-A.

5.6 ECKERT & ZIEGLER ANALYTICS CROSS CHECK PROGRAM

EnRad Laboratories participated in the Eckert & Ziegler Analytics Cross Check Program during 2011. Cross-check standards including, Marinelli beakers, air filters, tritium in water, and Iodine in milk samples were analyzed at various times of the year. A summary of the EnRad Laboratory program results for 2011 is documented in Table 5.0-B.

5.7 ERA PROFICIENCY TESTING

EnRad Laboratories performed method proficiency testing through a program administered by Environmental Resource Associates (ERA) of Arvada, CO. ERA supplied requested method proficiency samples for analysis and nuclide concentration determination. ERA reported proficiency test results to the North Carolina Department of Health and Human Services, North Carolina Public Health Drinking Water Laboratory Certification Program. A summary of these proficiency test data for 2011 is documented in Table 5.0-C.

5.8 DUKE ENERGY AUDITS

The McGuire Nuclear Station Radiological Environmental Monitoring Program was not audited by the Quality Assurance Group in 2011, but was audited in 2010. Procedure and report enhancements were identified as part of this audit (reference 6.12).

5.9 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

The McGuire Nuclear Station Radiological Environmental Monitoring Program was audited by the NRC in 2011 (reference 6.14). There were no REMP findings identified by the 2011 audit.

5.10 STATE OF NORTH CAROLINA INTERCOMPARISON PROGRAM

EnRad Laboratories routinely participates with the State of North Carolina Department of Environmental Health and Natural Resources (DEHNR) in an intercomparison program. EnRad Laboratories sends air, surface water, milk, crops, vegetation, sediment, and fish samples which have been collected to the State of North Carolina Radiation Protection Section.

5.11 TLD INTERCOMPARISON PROGRAM

5.11.1 NUCLEAR TECHNOLOGY SERVICES INTERCOMPARISON PROGRAM

Radiation Dosimetry and Records participates in a quarterly TLD intercomparison program administered by Nuclear Technology Services, Inc. of Roswell, GA. Nuclear Technology Services irradiates environmental dosimeters quarterly and sends them to the Radiation Dosimetry and Records group for analysis of the unknown estimated delivered exposure. A summary of the Nuclear Technology Services Intercomparison Report is documented in Table 5.0-D.

5.11.2 INTERNAL CROSSCHECK (DUKE ENERGY)

Radiation Dosimetry and Records participates in a quarterly TLD intracomparison program administered internally by the Dosimetry Lab. The Dosimetry Lab Staff irradiates environmental dosimeters quarterly and submits them for analysis of the unknown estimated delivered exposure. A summary of the Internal Cross Check (Duke Energy) Result is documented in Table 5.0-D.

TABLE 5.0-A

DUKE ENERGY INTERLABORATORY COMPARISON PROGRAM

2011 CROSS-CHECK RESULTS FOR ENRAD LABORATORIES

Cross-Check samples are normally analyzed a minimum of three times. A status of "3 Pass" indicates that all three analyses yielded results within the designated acceptance range. A status of "1 Pass" indicates that one analysis of the cross check was performed

If applicable, footnote explanations are included following this table.

Gamma in Water 3.5 liters

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.47 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.62 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.79 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.76 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.26 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.06 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.30 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.59 E4	3 Pass
12/12/2011	Q114GWR	Mn-54	2.31 - 4.09 E4	3.08 E4	3.25 E4	1 Pass
		Co-57	3.05 - 5.40 E4	4.06 E4	4.34 E4	1 Pass
		Co-60	2.76 - 4.89 E4	3.67 E4	3.65 E4	1 Pass
		Y-88	1.49 - 2.65 E4	1.99 E4	2.03 E4	1 Pass
		Cd-109	0.00 - 0.00 E3	0.00E+00	6.46 E3	1/1 High ⁽¹⁾
		Sn-113	1.60 - 2.84 E4	2.14 E4	2.12 E4	1 Pass
		Cs-137	2.39 - 4.23 E4	3.18 E4	3.01 E4	1 Pass

Gamma in Water 1.0 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.47 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.79 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.87 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.90 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.35 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.09 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.12 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.65 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.40 E4	3 Pass

Gamma in Water 1.0 liter, continued

12/12/2011	Q114GWR	Mn-54	2.31 - 4.09 E4	3.08 E4	3.18 E4	1 Pass
		Co-57	3.05 - 5.40 E4	4.06 E4	4.22 E4	1 Pass
		Co-60	2.76 - 4.89 E4	3.67 E4	3.63 E4	1 Pass
		Y-88	1.49 - 2.65 E4	1.99 E4	1.97 E4	1 Pass
		Cd-109	0.00 - 0.00 E3	0.00E+00	7.68 E3	1/1 High ⁽¹⁾
		Sn-113	1.60 - 2.84 E4	2.14 E4	2.09 E4	1 Pass
		Cs-137	2.39 - 4.23 E4	3.18 E4	2.94 E4	1 Pass

Gamma in Water 0.5 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.46 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.60 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.69 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.82 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.17 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.08 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	5.90 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.56 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.34 E4	3 Pass

Gamma in Water 0.25 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.51 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.76 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.85 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.93 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.25 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.09 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.11 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.65 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.38 E4	3 Pass

Gamma in Filter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/16/2011	E7882-37	Cr-51	0.96 - 2.59 E2	1.58 E2	1.39 E2	2 Pass
		Mn-54	0.80 - 1.41 E2	1.06 E2	0.93 E2	2 Pass
		Co-58	0.88 - 1.56 E2	1.17 E2	0.96 E2	2 Pass
		Fe-59	7.10 - 12.60 E1	9.47 E1	8.62 E1	2 Pass
		Co-60	1.12 - 1.98 E2	1.49 E2	1.32 E2	2 Pass
		Zn-65	1.50 - 2.66 E2	2.00 E2	1.73 E2	2 Pass
		Cs-134	1.10 - 1.94 E2	1.46 E2	1.21 E2	2 Pass
		Cs-137	0.80 - 1.41 E2	1.06 E2	0.92 E2	2 Pass
Ce-141	4.61 - 8.17 E1	6.14 E1	4.90 E1	2 Pass		

Iodine in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/23/2011	Q111LIW1	I-131	2.63 - 4.66 E3	3.51 E3	3.62 E3	3 Pass
3/23/2011	Q111LIW2	I-131	5.26 - 9.33 E2	7.01 E2	7.04 E2	3 Pass
3/23/2011	Q111LIW3	I-131	1.15 - 2.03 E2	1.53 E2	1.54 E2	3 Pass

Iodine in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
8/2/2011	Q113LIM1	I-131	1.84 - 3.26 E3	2.45 E3	2.60 E3	4 Pass
8/2/2011	Q113LIM2	I-131	1.58 - 2.80 E2	2.10 E2	2.19 E2	4 Pass
8/2/2011	Q113LIM3	I-131	2.63 - 4.66 E1	3.50 E1	3.67 E1	4 Pass

Iodine on Cartridge

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/16/2011	E7883-37	I-131	6.50 - 11.52 E1	8.66 E1	8.12 E1	2 Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
6/22/2011	Q112TWR1	H-3	2.82 - 5.00 E6	3.76 E6	3.57 E6	3 Pass
6/22/2011	Q112TWR2	H-3	4.57 - 8.11 E5	6.10 E5	5.77 E5	3 Pass
6/22/2011	Q112TWR3	H-3	3.73 - 7.63 E2	5.33 E2	5.10 E2	3 Pass
12/12/2011	Q114TWR3	H-3	6.11 - 10.84 E3	8.15 E3	7.65 E3	3 Pass
12/14/2011	Q114TWR1	H-3	0.93 - 1.66 E3	1.24 E3	1.23 E3	3 Pass
12/14/2011	Q114TWR2	H-3	3.18 - 5.64 E5	4.24 E5	4.03 E5	3 Pass

Gross Beta in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
5/23/2011	Q112ABW1	Cs-137	5.05 - 8.95 E1	6.73 E1	6.84 E1	3 Pass
5/23/2011	Q112ABW2	Cs-137	6.60 - 11.71 E1	8.80 E1	8.47 E1	3 Pass
5/23/2011	Q112ABW3	Cs-137	4.96 - 8.79 E2	6.61 E2	6.41 E2	3 Pass

Table 5.0-A Footnote Explanations

- (1) Gamma in Water, Sample ID Q114GWR, Reference Date 12/12/2011

Cd-109 was identified in the cross-check sample and reported. The cross check supplier does not include this radionuclide on the certificate of analysis for this cross-check sample. The radionuclide Cd-109 was determined to be a misidentification by the software and was determined not to be present in the cross-check sample (reference 6.16).

TABLE 5.0-B

ECKERT & ZIEGLER ANALYTICS CROSS CHECK PROGRAM

2011 CROSS-CHECK RESULTS FOR ENRAD LABORATORIES

Cross-Check samples are received, prepared, and analyzed. Results are report directly to Eckert & Ziegler Analytics.

If applicable, footnote explanations are included following this table.

Gamma in Water 3.5 liters

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8068-37	I-131	0.80 - 1.20	8.01E+01	7.96E+01	0.99	Pass
		Ce-141	0.80 - 1.20	9.15E+01	8.80E+01	0.96	Pass
		Cr-51	0.80 - 1.20	3.10E+02	3.18E+02	1.02	Pass
		Cs-134	0.80 - 1.20	1.76E+02	1.70E+02	0.97	Pass
		Cs-137	0.80 - 1.20	1.56E+02	1.57E+02	1.01	Pass
		Co-58	0.80 - 1.20	1.34E+02	1.37E+02	1.02	Pass
		Mn-54	0.80 - 1.20	2.07E+02	2.17E+02	1.05	Pass
		Fe-59	0.80 - 1.20	7.52E+01	8.34E+01	1.11	Pass
		Zn-65	0.80 - 1.20	2.47E+02	Not Reported	Not Reported	Failed ⁽¹⁾
		Co-60	0.80 - 1.20	2.15E+02	2.02E+02	0.94	Pass
12/8/2011	E8184-37	I-131	0.80 - 1.20	8.87E+01	9.46E+01	1.07	Pass
		Cr-51	0.80 - 1.20	5.66E+02	5.57E+02	0.98	Pass
		Cs-134	0.80 - 1.20	1.71E+02	1.76E+02	1.03	Pass
		Cs-137	0.80 - 1.20	2.10E+02	2.03E+02	0.97	Pass
		Co-58	0.80 - 1.20	2.21E+02	2.15E+02	0.97	Pass
		Mn-54	0.80 - 1.20	2.41E+02	2.52E+02	1.05	Pass
		Fe-59	0.80 - 1.20	1.83E+02	1.88E+02	1.03	Pass
		Zn-65	0.80 - 1.20	2.91E+02	2.97E+02	1.02	Pass
		Co-60	0.80 - 1.20	2.70E+02	2.87E+02	1.06	Pass

Gamma in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
12/8/2011	E8186-37	I-131	0.80 - 1.20	9.02E+01	9.84E+01	1.09	Pass
		Cr-51	0.80 - 1.20	5.66E+02	5.36E+02	0.95	Pass
		Cs-134	0.80 - 1.20	1.71E+02	1.59E+02	0.93	Pass
		Cs-137	0.80 - 1.20	2.10E+02	2.01E+02	0.96	Pass
		Co-58	0.80 - 1.20	2.21E+02	2.13E+02	0.96	Pass
		Mn-54	0.80 - 1.20	2.41E+02	2.45E+02	1.02	Pass
		Fe-59	0.80 - 1.20	1.83E+02	1.89E+02	1.03	Pass
		Zn-65	0.80 - 1.20	2.91E+02	2.95E+02	1.01	Pass
Co-60	0.80 - 1.20	2.70E+02	2.74E+02	1.02	Pass		

Iodine in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8065-37	I-131	0.80 - 1.20	1.01E+02	9.88E+01	0.98	Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8069-37	H-3	0.80 - 1.20	9.01E+03	9.16E+03	1.02	Pass
12/8/2011	E8185-37	H-3	0.80 - 1.20	1.09E+04	1.04E+04	0.95	Pass

Gross Beta in Air Filter

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8067-37	Cs-137	0.80 - 1.20	7.73E+01	7.60E+01	0.98	Pass
9/15/2011	E8066-37	Cs-137	0.80 - 1.20	1.94E+02	1.80E+02	0.93	Pass

Table 5.0-B Footnote Explanations

(1) Gamma in Water, Sample ID. E8068-37, Reference Date 9/15/2011

Zn-65 was identified in the cross-check sample but was not reported due to a summary report error (reference 6.17).

TABLE 5.0-C

ENVIRONMENTAL RESOURCE ASSOCIATES (ERA) QUIK™ RESPONSE PROGRAM

2011 PROFICIENCY TEST RESULTS FOR ENRAD LABORATORIES

ERA LABORATORY CODE: D242401

Proficiency test samples are received, prepared, analyzed, and reported to Environmental Resource Associates as described in the "Quik" Response instruction package within the study period. Proficiency test data are reported to ERA for evaluation. ERA reports proficiency test results to the North Carolina Department of Health and Human Services, North Carolina Public Drinking Water Laboratory Certification Program.

If applicable, footnote explanations are included following this data table.

Gamma Emitters in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Reported Value pCi/l	Proficiency Check Status
4/4/2011	RAD-85*	Ba-133	6.30 - 8.28 E1	7.53 E1	7.70 E1	Pass
		Cs-134	5.95 - 8.02 E1	7.29 E1	7.28 E1	Pass
		Cs-137	6.93 - 8.74 E1	7.70 E1	7.66 E1	Pass
		Co-60	0.799 - 1.00 E2	8.88 E1	9.41 E1	Pass
		Zn-65	0.89 - 1.18 E2	9.89 E1	1.02 E2	Pass
10/7/2011	RAD-87**	Ba-133	0.818 - 1.06 E2	9.69 E1	8.92 E1	Pass
		Cs-134	2.63 - 3.67 E1	3.34 E1	3.33 E1	Pass
		Cs-137	3.94 - 5.17 E1	4.43 E1	3.79 E1	Low ⁽¹⁾
		Co-60	1.07 - 1.33 E2	1.19 E2	1.11 E2	Pass
		Zn-65	6.89 - 9.25 E1	7.68 E1	7.95 E1	Pass
10/4/2010	Quik 122111A***	Ba-133	5.75 - 7.58 E1	6.89 E1	7.14 E1	Pass
		Cs-134	3.45 - 4.75 E1	4.32 E1	4.41 E1	Pass
		Cs-137	1.11 - 1.38 E2	1.23 E2	1.23 E2	Pass
		Co-60	4.81 - 6.13 E1	5.34 E1	6.00 E1	Pass
		Zn-65	0.918 - 1.22 E2	1.02 E2	1.24 E2	High ⁽²⁾

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Reported Value pCi/l	Proficiency Check Status
4/4/2011	RAD-85*	H-3	0.887 - 1.12 E4	1.02 E4	9.76 E3	Pass
10/7/2011	RAD-87**	H-3	1.52 - 1.91 E4	1.74 E4	1.68 E4	Pass

* ERA study period 4/4/2011 - 5/19/2011, ERA data report issue date 5/26/2011

** ERA study period 10/7/2011 - 11/21/2011, ERA data report issue date 11/29/2011

*** ERA study period 12/21/2011 - 2/23/2012, ERA data report issue date 2/23/2012

Table 5.0-C Footnote Explanations

- (1) Gamma Emitters in Water, Sample ID RAD-87, Reference Date 10/7/2011

Reported result for Cs-137 was below the acceptance range limit (reference 6.18).

- (2) Gamma Emitters in Water, Sample ID QUIK 122111A, Reference Date 10/4/2010

Sample ID QUIK 122111A originated as an evaluation sample for Sample ID RAD-87's low Cs-137 result. The reported Zn-65 result for QUIK 122111A was above the acceptance range limit (reference 6.18)

TABLE 5.0-D

2011 ENVIRONMENTAL DOSIMETER CROSS-CHECK RESULTS

Nuclear Technology Services

1st Quarter 2011						2nd Quarter 2011					
TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102178	96.3	95.1	1.26	<+/-15%	Pass	102021	15.7	14.6	7.81	<+/-15%	Pass
102194	99.4	95.1	4.50	<+/-15%	Pass	102026	15.6	14.6	6.85	<+/-15%	Pass
102234	101.4	95.1	6.65	<+/-15%	Pass	102038	16.3	14.6	11.92	<+/-15%	Pass
102162	99.7	95.1	4.88	<+/-15%	Pass	102057	14.4	14.6	-1.44	<+/-15%	Pass
102099	97.5	95.1	2.52	<+/-15%	Pass	102213	15.1	14.6	3.15	<+/-15%	Pass
Average Bias (B)			3.96			Average Bias (B)			5.66		
Standard Deviation (S)			2.10			Standard Deviation (S)			5.05		
Measure Performance B +S			6.07	<15%	Pass	Measure Performance B +S			10.70	<15%	Pass
3rd Quarter 2011						4th Quarter 2011					
TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102442	91.6	91.4	0.25	<+/-15%	Pass	101285	72.0	70.0	2.84	<+/-15%	Pass
102257	94.9	91.4	3.85	<+/-15%	Pass	100746	71.2	70.0	1.71	<+/-15%	Pass
102337	91.9	91.4	0.53	<+/-15%	Pass	100087	70.7	70.0	0.97	<+/-15%	Pass
102221	95.1	91.4	4.00	<+/-15%	Pass	101131	71.7	70.0	2.46	<+/-15%	Pass
102483	94.7	91.4	3.64	<+/-15%	Pass	101356	72.5	70.0	3.59	<+/-15%	Pass
Average Bias (B)			2.46			Average Bias (B)			2.31		
Standard Deviation (S)			1.89			Standard Deviation (S)			1.01		
Measure Performance B +S			4.35	<15%	Pass	Measure Performance B +S			3.32	<15%	Pass

Internal Crosscheck (Duke Energy)

1st Quarter 2011						2nd Quarter 2011						
TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	
102104	33.3	34.0	-2.15	<+/-15%	Pass	100104	35.6	35.0	1.71	<+/-15%	Pass	
102316	32.7	34.0	-3.85	<+/-15%	Pass	100054	34.3	35.0	-2.00	<+/-15%	Pass	
102325	32.3	34.0	-5.12	<+/-15%	Pass	102410	34.4	35.0	-1.71	<+/-15%	Pass	
102434	32.8	34.0	-3.44	<+/-15%	Pass	102363	34.6	35.0	-1.09	<+/-15%	Pass	
102009	33.6	34.0	-1.26	<+/-15%	Pass	100816	34.2	35.0	-2.20	<+/-15%	Pass	
102149	32.3	34.0	-4.97	<+/-15%	Pass	101311	32.6	35.0	-6.86	<+/-15%	Pass	
102419	31.8	34.0	-6.44	<+/-15%	Pass	100432	36.1	35.0	3.03	<+/-15%	Pass	
102160	34.8	34.0	2.47	<+/-15%	Pass	100065	33.2	35.0	-5.29	<+/-15%	Pass	
102502	32.5	34.0	-4.38	<+/-15%	Pass	100103	33.4	35.0	-4.54	<+/-15%	Pass	
102496	31.3	34.0	-7.88	<+/-15%	Pass	100097	35.1	35.0	0.23	<+/-15%	Pass	
Average Bias (B)			-3.70				Average Bias (B)			-1.87		
Standard Deviation (S)			2.90				Standard Deviation (S)			3.09		
Measure Performance B +S			6.60	<15%	Pass	Measure Performance B +S			4.96	<15%	Pass	
3rd Quarter 2011						4th Quarter 2011						
TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail	
102015	34.1	34.0	0.35	<+/-15%	Pass	102005	38.8	40.0	-3.03	<+/-15%	Pass	
102468	33.4	34.0	-1.91	<+/-15%	Pass	101364	39.2	40.0	-1.98	<+/-15%	Pass	
102008	33.0	34.0	-3.03	<+/-15%	Pass	102164	37.5	40.0	-6.15	<+/-15%	Pass	
102496	31.2	34.0	-8.21	<+/-15%	Pass	102163	38.2	40.0	-4.43	<+/-15%	Pass	
102160	33.2	34.0	-2.32	<+/-15%	Pass	101252	37.6	40.0	-6.05	<+/-15%	Pass	
102156	33.6	34.0	-1.26	<+/-15%	Pass	102104	38.5	40.0	-3.83	<+/-15%	Pass	
102064	32.9	34.0	-3.32	<+/-15%	Pass	101297	38.0	40.0	-4.98	<+/-15%	Pass	
102419	32.4	34.0	-4.79	<+/-15%	Pass	102178	39.0	40.0	-2.50	<+/-15%	Pass	
102498	33.0	34.0	-3.06	<+/-15%	Pass	101305	38.3	40.0	-4.18	<+/-15%	Pass	
102340	32.9	34.0	-3.29	<+/-15%	Pass	102243	37.9	40.0	-5.38	<+/-15%	Pass	
Average Bias (B)			-3.09				Average Bias (B)			-4.25		
Standard Deviation (S)			2.27				Standard Deviation (S)			1.44		
Measure Performance B +S			5.35	<15%	Pass	Measure Performance B +S			5.68	<15%	Pass	

6.0 REFERENCES

- 6.1 McGuire Selected License Commitment Manual
- 6.2 McGuire Technical Specifications
- 6.3 McGuire Updated Final Safety Analysis Report
- 6.4 McGuire Offsite Dose Calculation Manual
- 6.5 McGuire Annual Radiological Environmental Operating Report 1979 - 2010
- 6.6 McGuire Annual Radioactive Effluent Release Report 2011
- 6.7 Probability and Statistics in Engineering and Management Science, Hines and Montgomery, 1969, pages 287-293.
- 6.8 Practical Statistics for the Physical Sciences, Havilcek and Crain, 1988, pages 83-93.
- 6.9 Nuclear Regulatory Commission Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purposes of Evaluating Compliance with 10CFR50, Appendix I.
- 6.10 EnRad Laboratories Operating Procedures
- 6.11 RETDAS, Radiological Effluent Tracking and Dose Assessment Software, Canberra Version 3.5.1, DPC Revision #4.0
- 6.12 Radiological Effluents Controls INOS Audit 10-15(INOS)(REC)(MNS)
- 6.13 Duke Energy Corporation EnRad Laboratory Charcoal Cartridge Study, performed 2001
- 6.14 NRC Integrated Inspection Report (50-369/2011004, 50-370/2011004)
- 6.15 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-04-00134
- 6.16 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-12-00354
- 6.17 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-12-00015
- 6.18 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-11-01830
- 6.19 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, M-11-05058
- 6.20 Nuclear System Directive (NSD) 701, Records Management

APPENDIX A

ENVIRONMENTAL SAMPLING
&
ANALYSIS PROCEDURES

APPENDIX A

ENVIRONMENTAL SAMPLING AND ANALYSIS PROCEDURES

Adherence to established procedures for sampling and analysis of all environmental media at McGuire Nuclear Station was required to ensure compliance with Station Selected Licensee Commitments. Analytical procedures were employed to ensure that Selected Licensee Commitments detection capabilities were achieved.

Environmental sampling and analyses were performed by EnRad Laboratories, Dosimetry and Records, and Fisheries and Aquatic Ecology.

This appendix describes the environmental sampling frequencies and analysis procedures by media type.

I. CHANGE OF SAMPLING PROCEDURES

TLD Location 191 (Special Interest) description updated (reference 6.19).

II. DESCRIPTION OF ANALYSIS PROCEDURES

Gamma spectroscopy analyses are performed using high purity germanium gamma detectors and Canberra analytical software. Designated sample volumes are transferred to appropriate counting geometries and analyzed by gamma spectroscopy. Perishable samples such as fish and broadleaf vegetation are ground to achieve a homogeneous mixture. Soils and sediments are dried, sifted to remove foreign objects (rocks, clams, glass, etc.) then transferred to appropriate counting geometry.

Low-level iodine analyses are performed by passing a designated sample aliquot through a pre-weighed amount of ion exchange resin to remove and concentrate any iodine in the aqueous sample (milk). The resin is then dried, mixed thoroughly, and a net resin weight determined before being transferred to appropriate counting geometry and analyzed by gamma spectroscopy.

Tritium analyses are performed quarterly by using low-level environmental liquid scintillation analysis technique on a Packard 2550 liquid scintillation system or Perkin-Elmer 2900TR liquid scintillation system. Tritium samples are distilled and batch processed with a tritium spike and blank to verify instrument performance and sample preparation technique are acceptable.

Gross beta analysis is performed by concentrating a designated aliquot of sample precipitate and analyzing by Tennelec XLB Series 5 gas-flow proportional counters. Samples are batch processed with a blank to ensure sample contamination has not occurred.

III. CHANGE OF ANALYSIS PROCEDURES

No analysis procedures were changed during 2011.

IV. SAMPLING AND ANALYSIS PROCEDURES

A.1 AIRBORNE PARTICULATE AND RADIOIODINE

Airborne particulate and radioiodine samples at each of seven locations were composited continuously by means of continuous air samplers. Air particulates were collected on a particulate filter and radioiodines were collected in a charcoal cartridge positioned behind the filter in the sampler. The samplers are designed to operate at a constant flow rate (in order to compensate for any filter loading) and are set to sample approximately 2 cubic feet per minute. Filters and cartridges were collected weekly. A separate weekly gamma analysis was performed on each charcoal cartridge and air particulate. A weekly gross beta analysis was performed on each filter. The continuous composite samples were collected from the locations listed below.

Location 102	=	Amity Church Road (9.89 mi. WNW)
Location 103	=	Cottonwood (4.20 mi. NE)
Location 120	=	Site Boundary (0.46 mi. NNE)
Location 121	=	Site Boundary (0.47 mi. NE)
Location 125	=	Site Boundary (0.38 mi. SW)
Location 133	=	Cornelius (6.23 mi. ENE)
Location 195	=	Fishing Access Road (0.19 mi. N)

A.2 DRINKING WATER

Monthly composite samples were collected. A gross beta and gamma analysis was performed on monthly composites. Tritium analysis was performed on the quarterly composites. The composites were collected monthly from the locations listed below.

Location 101	=	North Mecklenburg Water Treatment Facility (3.31 mi E)
Location 119	=	Mt. Holly Municipal Water Supply (7.40 mi. SSW)
Location 132	=	Charlotte Municipal Water Supply (11.1 mi. SSE)
Location 136	=	Mooresville Municipal Water Supply (12.7 mi. NNE)
Location 194	=	East Lincoln County Water Supply (6.73 mi. NNW)

A.3 SURFACE WATER

Monthly composite samples were collected. A gamma analysis was performed on the monthly composites. Tritium analysis was performed on the quarterly composites sample. The composites were collected monthly from the locations listed below.

Location 128 = Discharge Canal Bridge (0.45 mi. NE)
Location 131 = Cowans Ford Dam (0.64 mi. WNW)
Location 135 = Plant Marshall Intake Canal (11.9 mi. N)

A.4 MILK

Biweekly grab samples were collected at one location. A gamma and low-level Iodine-131 analysis was performed on each sample. The biweekly grab samples were collected from the location listed below.

Location 141 = Lynch Dairy - Cows (14.8 mi. WNW)

A.5 BROADLEAF VEGETATION

Monthly samples were collected as available and a gamma analysis was performed on each sample. The samples were collected from the locations listed below.

Location 102 = Amity Church Road (9.89 mi. WNW)
Location 120 = Site Boundary (0.46 mi. NNE)
Location 125 = Site Boundary (0.38 mi. SW)
Location 193 = Site Boundary (0.19 mi. N)

A.6 FOOD PRODUCTS

Samples were collected monthly when available during the harvest season and a gamma analysis was performed on each. The samples were collected at the location listed below.

Location 188 = 5 mile radius Gardens (2.79 mi NNE)

A.7 FISH

Semiannual samples were collected and a gamma analysis was performed on the edible portions of each sample. Boney fish (i.e. Sunfish) were prepared whole minus the head and tail portions. The samples were collected from the locations listed below.

Location 129 = Discharge Canal Entrance to Lake Norman (0.51 mi. ENE)
Location 137 = Pinnacle Access Area (12.0 mi. N)

A.8 SHORELINE SEDIMENT

Semiannual samples were collected and a gamma analysis was performed on each following the drying and removal of rocks and clams. The samples were collected from the locations listed below.

Location 129	=	Discharge Canal Entrance to Lake Norman (0.51 mi. ENE)
Location 130	=	Highway 73 Bridge Downstream (0.52 mi. SW)
Location 137	=	Pinnacle Access Area (12.0 mi. N)

A.9 DIRECT GAMMA RADIATION (TLD)

Thermoluminescent dosimeters (TLD) were collected quarterly at forty-one locations. A gamma exposure rate was determined for each TLD. TLD locations are listed in Table 2.1-B. The TLDs were placed as indicated below.

- * An inner ring of 14 TLDs at the site boundary, one in each available meteorological sector. The site boundary locations in the N and NNW sectors are over water; however, two special interest TLD's were placed in these sectors inside the site boundary in March, 1991.
- * An outer ring of 16 TLDs, one in each meteorological sector in the 6 to 8 kilometer range.
- * The remaining TLDs were placed in special interest areas such as population centers, residential areas, schools, and control locations.

A.10 ANNUAL LAND USE CENSUS

An annual Land Use Census was conducted to identify within a distance of 8 kilometers (5.0 miles) from the station, the nearest location from the site boundary in each of the sixteen meteorological sectors, the following:

- * The Nearest Residence
- * The Nearest Garden greater than 50 square meters or 500 square feet
- * The Nearest Milk-giving Animal (cow, goat, etc.)

The census was conducted during the growing season on 5/20/2011. Results are shown in Table 3.10. No changes were made to the sampling procedures during 2011 as a result of the 2011 census.

In the environmental program, the air deposition parameters (D/Q) are used to determine air, broadleaf vegetation and milk sampling locations. McGuire's sectors with the three highest values did not change in 2011.

V. GLOBAL POSITIONING SYSTEM (GPS) ANALYSIS

The McGuire site centerline used for GPS measurements was referenced from the McGuire Nuclear Station Updated Final Safety Analysis Report (UFSAR), section 2.1.1, Site Location. Waypoint coordinates used for MNS GPS measurements were latitude 35°-25'-59"N and longitude 80°-56'-55"W. Maps and tables were generated using North American Datum (NAD) 27. Data normally reflect accuracy to within 2 to 5 meters from point of measurement. GPS field measurements were taken as close as possible to the item of interest. Distances for the locations are displayed using three significant figures.

APPENDIX B

**RADIOLOGICAL
ENVIRONMENTAL MONITORING
PROGRAM**

SUMMARY OF RESULTS

2011

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled Unit of Measurement	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Air Particulate (pCi/m ³)						102 (9.89 mi WNW)	
BETA	364	1.00E-02	1.90E-2 (312/312) 3.94E-3 - 3.53E-2	195 (0.19 mi N)	1.99E-2 (52/52) 1.06E-2 - 3.53E-2	2.00E-2 (52/52) 1.08E-2 - 3.38E-2	0
CS-134	364	5.00E-02	0.00 (0/312) 0.00 - 0.00		0.00 (0/52) 0.00 - 0.00	0.00 (0/52) 0.00 - 0.00	0
CS-137	364	6.00E-02	6.26E-3 (4/312) 3.66E-3 - 1.02E-2	120 (0.46 mi NNE)	7.06E-3 (1/52) 7.06E-3 - 7.06E-3	0.00 (0/52) 0.00 - 0.00	0
I-131	364	7.00E-02	1.55E-2 (18/312) 5.27E-3 - 3.06E-2	133 (6.23 mi ENE)	2.08E-2 (3/52) 1.03E-2 - 3.06E-2	1.54E-2 (3/52) 1.12E-2 - 1.86E-2	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean		Control Location	No. of Non-Routine Report Meas.
				Name, Distance, Direction			
Unit of Measurement	Analyses Performed	(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Air Radioiodine (pCi/m3)						102 (9.89 mi WNW)	
	CS-134 364	5.00E-02	0.00 (0/312) 0.00 - 0.00		0.00 (0/52) 0.00 - 0.00	0.00 (0/52) 0.00 - 0.00	0
	CS-137 364	6.00E-02	0.00 (0/312) 0.00 - 0.00		0.00 (0/52) 0.00 - 0.00	0.00 (0/52) 0.00 - 0.00	0
	I-131 364	7.00E-02	5.63E-2 (24/312) 1.18E-2 - 1.05E-1	120 (0.46 mi NNE)	6.00E-2 (4/52) 1.18E-2 - 1.05E-1	5.46E-2 (4/52) 1.36E-2 - 9.57E-2	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Drinking Water (pCi/liter)						136 (12.7 mi NNE)	
BALA-140	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
BETA	65	4	1.71 (52/52) 0.79 - 2.81	194 (6.73 mi NNW)	1.77 (13/13) 0.79 - 2.49	1.75 (13/13) 0.69 - 3.33	0
CO-58	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CO-60	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CS-134	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CS-137	65	18	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
FE-59	65	30	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
H-3	20	2000	750 (13/16) 169 - 1360	101 (3.31 mi E)	997 (4/4) 705 - 1360	0.00(0/0) 0.00 - 0.00	0
I-131	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
MN-54	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
NB-95	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
ZN-65	65	30	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
ZR-95	65	15	0.00 (0/52) 0.00 - 0.00		0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations		Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
			Mean (Fraction) Range		Location Code	Mean (Fraction) Range		
Surface Water (pCi/liter)							135 (11.9 mi N)	
BALA-140	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CO-58	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CO-60	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CS-134	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
CS-137	39	18	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
FE-59	39	30	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
H-3	12	2000	898 (8/8) 418 - 1990	128 (0.45 mi NE)		1191 (4/4) 841 - 1990	294 (1/4) 294 - 294	0
I-131	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
MN-54	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
NB-95	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
ZN-65	39	30	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0
ZR-95	39	15	0.00 (0/26) 0.00 - 0.00			0.00 (0/13) 0.00 - 0.00	0.00 (0/13) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Milk (pCi/liter)			NO INDICATOR LOCATION			141 (14.8 mi WNW)	
	BALA-140	26	15	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0
	CS-134	26	15	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0
	CS-137	26	18	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	0
	I-131	26	15	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	9.49 (2/26) 8.98 - 10.0	0
	LLI-131	26	1	0.00 (0/26) 0.00 - 0.00	0.00 (0/26) 0.00 - 0.00	4.80 (3/26) 0.54 - 9.23	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Broadleaf Vegetation (pCi/kg-wet)						102 (9.89 mi WNW)	
	CS-134 48	60	0.00 (0/36) 0.00 - 0.00		0.00 (0/12) 0.00 - 0.00	0.00 (0/12) 0.00 - 0.00	0
	CS-137 48	80	22.9 (1/36) 22.9 - 22.9	125 (0.38 mi SW)	22.9 (1/12) 22.9 - 22.9	0.00 (0/12) 0.00 - 0.00	0
	I-131 48	60	231 (3/36) 97.9 - 316	120 (0.46 mi NNE)	316 (1/12) 316 - 316	168 (1/12) 168 - 168	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled Unit of Measurement	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Food Products (pCi/kg-wet)						NO CONTROL LOCATION	
	CS-134	12	60	0.00 (0/12) 0.00 - 0.00		0.00 (0/12) 0.00 - 0.00	0
	CS-137	12	80	30.6 (1/12) 30.6 - 30.6	188 (2.79 mi NNE)	30.6 (1/12) 30.6 - 30.6	0
	I-131	12	60	142 (1/12) 142 - 142	188 (2.79 mi NNE)	142 (1/12) 142 - 142	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Fish (pCi/kg-wet)						137 (12.0 mi N)	
CO-58	12	130	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0
CO-60	12	130	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0
CS-134	12	130	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0
CS-137	12	150	22.3 (1/6) 22.3 - 22.3	129 (0.51 mi ENE)	22.3 (1/6) 22.3 - 22.3	0.00 (0/6) 0.00 - 0.00	0
FE-59	12	260	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0
MN-54	12	130	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0
ZN-65	12	260	0.00 (0/6) 0.00 - 0.00		0.00 (0/6) 0.00 - 0.00	0.00 (0/6) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.	
				Location Code	Mean (Fraction) Range			
Shoreline Sediment (pCi/kg-dry)						137 (12.0 mi N)		
	MN-54	6	0	0.00 (0/4) 0.00 - 0.00		0.00 (0/2) 0.00 - 0.00		
	CO-58	6	0	0.00 (0/4) 0.00 - 0.00		0.00 (0/2) 0.00 - 0.00	0	
	CO-60	6	0	0.00 (0/4) 0.00 - 0.00		0.00 (0/2) 0.00 - 0.00	0	
	CS-134	6	150	0.00 (0/4) 0.00 - 0.00		0.00 (0/2) 0.00 - 0.00	0	
	CS-137	6	180	102 (2/4) 43.6 - 161	130 (0.52 mi SW)	102 (2/2) 43.6 - 161	0.00 (0/2) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

If LLD is equal to 0.00, then the LLD is not required by Selected Licensee Commitments

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled Unit of Measurement	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Direct Radiation TLD (mR/standard quarter)	163	0.00E+00	17.2 (159/159) 9.00 - 36.0	180 (12.7 mi NNE)	26.5 (4/4) 25.0 - 29.0	175 (15.5 mi WNW) 23.5 (4/4) 22.0 - 25.0	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

**MCGUIRE
RADIOLOGICAL
ENVIRONMENTAL MONITORING
PROGRAM**

**SUMMARY OF 2011 RESULTS
EXCLUDING
RADIOACTIVITY ATTRIBUTABLE
TO FUKUSHIMA DAIICHI**

Environmental Radiological Monitoring Program Summary *

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Air Particulate (pCi/m3)						102 (9.89 mi WNW)	
BETA	336	1.00E-02	1.85E-2 (288/288) 3.94E-3 - 3.40E-2	195 (0.19 mi N)	1.95E-2 (48/48) 1.06E-2 - 3.40E-2	1.94E-2 (48/48) 1.08E-2 - 2.90E-2	0
CS-134	336	5.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0
CS-137	336	6.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0
I-131	336	7.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

* Summary does not include samples collected during Fukushima Daiichi fallout period 3/14/2011 - 4/11/2011

Environmental Radiological Monitoring Program Summary *

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean		Control Location	No. of Non-Routine Report Meas.
				Name, Distance, Direction	Mean (Fraction) Range		
Unit of Measurement	Analyses Performed	(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Air Radioiodine (pCi/m3)						102 (9.89 mi WNW)	
	CS-134 336	5.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0
	CS-137 336	6.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0
	I-131 336	7.00E-02	0.00 (0/288) 0.00 - 0.00		0.00 (0/48) 0.00 - 0.00	0.00 (0/48) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

* Summary does not include samples collected during Fukushima Daiichi fallout period 3/14/2011 - 4/11/2011

Environmental Radiological Monitoring Program Summary *

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Milk (pCi/liter)			NO INDICATOR LOCATION			141 (14.8 mi WNW)	
BALA-140	23	15	0.00 (0/0) 0.00 - 0.00		0.00 (0/0) 0.00 - 0.00	0.00 (0/23) 0.00 - 0.00	0
CS-134	23	15	0.00 (0/0) 0.00 - 0.00		0.00 (0/0) 0.00 - 0.00	0.00 (0/23) 0.00 - 0.00	0
CS-137	23	18	0.00 (0/0) 0.00 - 0.00		0.00 (0/0) 0.00 - 0.00	0.00 (0/23) 0.00 - 0.00	0
I-131	23	15	0.00 (0/0) 0.00 - 0.00		0.00 (0/0) 0.00 - 0.00	0.00 (0/23) 0.00 - 0.00	0
LLI-131	23	1	0.00 (0/0) 0.00 - 0.00		0.00 (0/0) 0.00 - 0.00	0.00 (0/23) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

* Summary does not include samples collected during Fukushima Daiichi fallout period 3/28/2011 - 4/25/2011

Environmental Radiological Monitoring Program Summary *

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations		Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
			Mean (Fraction) Range	Location Code	Mean (Fraction) Range			
Broadleaf Vegetation (pCi/kg-wet)						102 (9.89 mi WNW)		
	CS-134	44	60	0.00 (0/33) 0.00 - 0.00		0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0
	CS-137	44	80	0.00 (0/33) 0.00 - 0.00		0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0
	I-131	44	60	0.00 (0/33) 0.00 - 0.00		0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

* Summary does not include samples collected during Fukushima Daiichi fallout period 4/4/2011.

Environmental Radiological Monitoring Program Summary *

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2011 to 31-DEC-2011

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction		Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
				Location Code	Mean (Fraction) Range		
Food Products (pCi/kg-wet)				NO CONTROL LOCATION			
	CS-134	11	60	0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0.00 (0/0) 0.00 - 0.00	0
	CS-137	11	80	0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0.00 (0/0) 0.00 - 0.00	0
	I-131	11	60	0.00 (0/11) 0.00 - 0.00	0.00 (0/11) 0.00 - 0.00	0.00 (0/0) 0.00 - 0.00	0

Mean and range based upon detectable measurements only

Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)

Zero range indicates no detectable activity measurements

* Summary does not include samples collected during Fukushima Daiichi fallout period 4/4/2011.

**SUMMARY OF RADIOACTIVITY
ATTRIBUTABLE
TO
FUKUSHIMA DAIICHI
DETECTED IN
ENVIRONMENTAL MEDIA AT
DUKE ENERGY FACILITIES**

Fukushima Daiichi Radioactivity Detected in Environmental Media (2011)

Airborne Particulate

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/m ³)		Annual Concentration without Fukushima Daiichi (pCi/m ³)	
		Indicator	Control	Indicator	Control
Catawba	I-131	1.39E-2	1.04E-2	0.00	0.00
Catawba	Cs-137	3.92E-3	0.00	0.00	0.00
McGuire	I-131	2.08E-2	1.54E-2	0.00	0.00
McGuire	Cs-137	7.06E-3	0.00	0.00	0.00
Oconee	I-131	1.46E-2	2.01E-2	0.00	0.00
Oconee	Cs-134	1.44E-2	0.00	0.00	0.00
Oconee	Cs-137	8.08E-3	0.00	0.00	0.00

Airborne Radioiodine

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/m ³)		Annual Concentration without Fukushima Daiichi (pCi/m ³)	
		Indicator	Control	Indicator	Control
Catawba	I-131	5.53E-2	5.65E-2	0.00	0.00
McGuire	I-131	6.00E-2	5.46E-2	0.00	0.00
Oconee	I-131	5.05E-2	4.13E-2	0.00	0.00

Milk

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/l)		Annual Concentration without Fukushima Daiichi (pCi/l)	
		Indicator	Control	Indicator	Control
Catawba	LLI-131	NA	6.86	NA	0.00
McGuire	LLI-131	NA	4.80	NA	0.00
Oconee	LLI-131	NA	0.81	NA	0.00

Broadleaf Vegetation

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)		Annual Concentration without Fukushima Daiichi (pCi/kg)	
		Indicator	Control	Indicator	Control
Catawba	I-131	132	156	0.00	0.00
Catawba	Cs-134	12.8	0.00	0.00	0.00
Catawba	Cs-137	26.2	0.00	26.2	0.00
McGuire	I-131	316	168	0.00	0.00
McGuire	Cs-137	22.9	0.00	0.00	0.00
Oconee	I-131	398	150	0.00	0.00
Oconee	Cs-134	42.9	0.00	0.00	0.00
Oconee	Cs-137	66.8	33.5	0.00	0.00

Food Products (Crops)

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)		Annual Concentration without Fukushima Daiichi (pCi/kg)	
		Indicator	Control	Indicator	Control
McGuire	I-131	142	NA	0.00	0.00
McGuire	Cs-137	30.6	NA	0.00	0.00

APPENDIX C

**SAMPLING DEVIATIONS
&
UNAVAILABLE ANALYSES**

APPENDIX C

MCGUIRE NUCLEAR STATION SAMPLING DEVIATIONS & UNAVAILABLE ANALYSES

DEVIATION & UNAVAILABLE REASON CODES			
BF	Blown Fuse	PO	Power Outage
FZ	Sample Frozen	PS	Pump out of service / Undergoing Repair
IW	Inclement Weather	SL	Sample Loss/Lost due to Lab Accident
LC	Line Clog to Sampler	SM	Motor / Rotor Seized
OT	Other	TF	Torn Filter
PI	Power Interrupt	VN	Vandalism
PM	Preventive Maintenance	CN	Construction

C.1 SAMPLING DEVIATIONS

Air Particulate and Air Radioiodines

Location	Scheduled Collection Dates	Actual Collection Dates	Code	Description	Corrective Action Identity
120 121 195	9/26 – 10/3/2011	9/26 – 10/3/2011	PI	Power to equipment interrupted for about 1.25 hours due to site overload.	G-11-01461
120	10/31 – 11/7/2011	10/31 – 11/4/2011	BF	Power to sampling equipment interrupted due to blown fuse. Fuse replaced and normal sampling resumed 11/7/2011.	G-11-01638
133	11/7 – 11/14/2011 11/14 – 11/21/2011	11/7 – 11/14/2011 11/14 – 11/21/2011	PO	Power to equipment was interrupted due to blown transformer at substation.	G-11-01674

Drinking Water

Location	Scheduled Collection Dates	Actual Collection Dates	Code	Description	Corrective Action Identity
101 119 132 136 194	12/13 – 1/10/2011	12/13 – 1/12/2011	IW	Collection rescheduled due to inclement weather creating potentially unsafe site access conditions.	G-11-00043

Surface Water

Location	Scheduled Collection Dates	Actual Collection Dates	Code	Description	Corrective Action Identity
128 131	12/13 – 1/10/2011	12/13 – 1/12/2011	IW	Collection rescheduled due to inclement weather creating potentially unsafe site access conditions.	G-11-00043
135	12/13 – 1/10/2011	12/20 – 1/13/2011	PO, IW	Power outage at beginning of collection period. Work request 85922 written. Power restored, normal sampling resumed 12/20/2010. Collection rescheduled due to inclement weather creating potentially unsafe site access conditions.	G-10-01578 G-11-00043
135	4/4 – 5/2/2011	4/4 – 5/2/2011	PO	Estimated five day power outage during composite period. Work request 89483 written. Outage attributed to wet osprey (protected species) nest causing blown fuse. Power delivery system reconfigured to bypass nesting area. Normal sampling resumed 4/20/2011.	G-11-00740

C.2 UNAVAILABLE ANALYSES

TLD

Location	Scheduled Collection Dates	Code	Description	Corrective Action Identity
153	3/17 – 6/16/2011	VN	TLD missing. 3 rd quarter TLD placed.	Not Applicable

APPENDIX D

ANALYTICAL DEVIATIONS

No Analytical deviations were incurred for the
2011 Radiological Environmental Monitoring Program

APPENDIX E

**RADIOLOGICAL
ENVIRONMENTAL MONITORING
PROGRAM RESULTS**

This appendix includes sample analysis reports and supportive data generated from each sample medium. Appendix E is located separately from this report and is permanently archived in the Nuclear Electronic Document Library (NEDL) as described in reference 6.20.

APPENDIX F

**ERRATA TO
PREVIOUS REPORTS**

APPENDIX F

ERRATA TO THE 2011 AREOR

There are no errata to be appended to the 2011 AREOR.