



ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

**DUKE ENERGY CORPORATION
MCGUIRE NUCLEAR STATION
Units 1 and 2**

2006



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LIST OF ACRONYMS USED IN THIS TEXT *(in alphabetical order)*

| | |
|--------------------|--|
| BW | BiWeekly |
| C | Control |
| DEHNR | Department of Environmental Health and Natural Resources |
| DHEC | Department of Health and Environmental Control |
| EPA | Environmental Protection Agency |
| GI-LLI | Gastrointestinal – Lower Large Intestine |
| GPS | Global Positioning System |
| LLD | Lower Limit of Detection |
| M | Monthly |
| MDA | Minimum Detectable Activity |
| MNS | McGuire Nuclear Station |
| mrem | millirem |
| NIST | National Institute of Standards and Technology |
| NRC | Nuclear Regulatory Commission |
| ODCM | Offsite Dose Calculation Manual |
| pCi/kg | picocurie per kilogram |
| pCi/l | picocurie per liter |
| pCi/m ³ | picocurie per cubic meter |
| PIP | Problem Investigation Process |
| Q | Quarterly |
| REMP | Radiological Environmental Monitoring Program |
| SA | Semiannually |
| SLCs | Selected Licensee Commitments |
| SM | Semimonthly |
| TECH SPECS | Technical Specifications |
| TLD | Thermoluminescent Dosimeter |
| μCi/ml | microcurie per milliliter |
| UFSAR | Updated Final Safety Analysis Report |
| W | Weekly |

1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report describes the McGuire Nuclear Station Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2006.

Included are the identification of sampling locations, descriptions of environmental sampling and analysis procedures, comparisons of present environmental radioactivity levels and pre-operational environmental data, comparisons of doses calculated from environmental measurements and effluent data, analysis of trends in environmental radiological data as potentially affected by station operations, and a summary of environmental radiological sampling results. Quality assurance practices, sampling deviations, unavailable samples, and program changes are also discussed.

Sampling activities were conducted as prescribed by Selected Licensee Commitments (SLC's). Required analyses were performed and detection capabilities were met for all collected samples as required by SLC's. Eleven-hundred fifty-six samples were analyzed comprising 1,637 test results in order to compile data for the 2006 report. Based on the annual land use census, the current number of sampling sites for McGuire Nuclear Station is sufficient.

Concentrations observed in the environment in 2006 for station related radionuclides were generally within the ranges of concentrations observed in the past. Inspection of data showed that radioactivity concentrations in surface water, drinking water, shoreline sediment and fish are higher than the activities reported for samples collected prior to the operation of the station. Measured concentrations were not higher than expected, and all positively identified measurements were within limits as specified in SLC's.

Additionally, environmental radiological monitoring data is consistent with effluents introduced into the environment by plant operations. The total body dose estimated to the maximum exposed member of the public as calculated by environmental sampling data, excluding TLD results, was $2.67E-1$ mrem for 2006. It is therefore concluded that station operations has had no significant radiological impact on the health and safety of the public or the environment.



Vegetation Sampling

2.0 INTRODUCTION

2.1 SITE DESCRIPTION AND SAMPLE LOCATIONS

McGuire Nuclear Station (MNS) is located geographically near the center of a highly industrialized region of the Carolinas. The land is predominantly rural non-farm with a small amount of land being used for farming. The McGuire site is in northwestern Mecklenburg County, North Carolina, 17 miles north-northwest of Charlotte, North Carolina. The site is bounded to the west by the Catawba River channel and to the north by 32,510 acre Lake Norman. Lake Norman is impounded by Duke Energy Corporation's Cowans Ford Dam Hydroelectric Station. The tailwater of Cowans Ford Dam is the upper limit of Mountain Island Reservoir. Mountain Island Dam is located 15 miles downstream from the site. Lookout Shoals Hydroelectric Station is at the upper reaches of Lake Norman. Marshall Steam Station is located on the western shore of Lake Norman, approximately 16 miles upstream from the site (reference 6.3).

MNS consists of two pressurized water reactors. Each reactor unit is essentially a mirror image of the other joined by an auxiliary building housing both separate and common equipment. Each unit was designed to produce approximately 1200 gross Megawatts of electricity. Unit 1 achieved criticality August 8, 1981 and Unit 2 on May 8, 1983.

Figures 2.1-1 and 2.1-2 are maps depicting the Thermoluminescent Dosimeter (TLD) monitoring locations and the sampling locations. The location numbers shown on these maps correspond to those listed in Tables 2.1-A and 2.1-B. Figure 2.1-1 comprises all sample locations within 0.5 mile radius of MNS. Figure 2.1-2 comprises all sample locations within a ten mile radius of MNS.

2.2 SCOPE AND REQUIREMENTS OF THE REMP

An environmental monitoring program has been in effect at McGuire Nuclear Station since 1977, four years prior to operation of Unit 1 in 1981. The preoperational program provides data on the existing environmental radioactivity levels for the site and vicinity which may be used to determine whether increases in environmental levels are attributable to the station. The operational program provides surveillance and backup support of detailed effluent monitoring which is necessary to evaluate the significance, if any, of the contributions to the existing environmental radioactivity levels that result from station operation.

This monitoring program is based on NRC guidance as reflected in the Selected Licensee Commitments Manual, with regard to sample media, sampling locations, sampling frequency, and analytical sensitivity requirements. Indicator and control locations were established for comparison purposes to distinguish radioactivity of station origin from natural or other "man-made" environmental radioactivity. The environmental monitoring program also verifies projected and anticipated radionuclide concentrations in the environment and related exposures

from releases of radionuclides from McGuire Nuclear Station. This program satisfies the requirements of Section IV.B.2 of Appendix I to 10CFR50 and provides surveillance of all appropriate critical exposure pathways to man and protects vital interests of the company, public, and state and federal agencies concerned with the environment. Reporting levels for radioactivity found in environmental samples are listed in Table 2.2-A. Table 2.2-B lists the REMP analysis and frequency schedule.

The Annual Land Use Census, required by Selected Licensee Commitments, is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and that modifications to the Radiological Environmental Monitoring Program are made if required by changes in land use. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR50. Results are shown in Table 3.10.

Participation in an interlaboratory comparison program as required by Selected Licensee Commitments provides for independent checks on the precision and accuracy of measurements of radioactive material in REMP sample matrices. Such checks are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10CFR50. A summary of the results obtained as part of this comparison program are in Section 5 of this annual report.

2.3 STATISTICAL AND CALCULATIONAL METHODOLOGY

2.3.1 ESTIMATION OF THE MEAN VALUE

There was one (1) basic statistical calculation performed on the raw data resulting from the environmental sample analysis program. The calculation involved the determination of the mean value for the indicator and the control samples for each sample medium. The mean is a widely used statistic. This value was used in the reduction of the data generated by the sampling and analysis of the various media in the Radiological Environmental Monitoring Program. The following equation was used to estimate the mean (reference 6.8):

$$\bar{x} = \frac{\sum_{i=1}^N x_i}{N}$$

Where:

\bar{x} = estimate of the mean,

i = individual sample,

N = total number of samples with a net activity (or concentration),

x_i = net activity (or concentration) for sample i.

NOTE: "Net activity (or concentration)" is the activity (or concentration) determined to be present in the sample. No "Minimum Detectable Activity", "Lower Limit of Detection", "Less Than Level", or negative activities or concentrations are included in the calculation of the mean.

2.3.2 LOWER LEVEL OF DETECTION AND MINIMUM DETECTABLE ACTIVITY

The Lower Level of Detection (LLD) and Minimum Detectable Activity (MDA) are used throughout the Environmental Monitoring Program.

LLD - The LLD, as defined in the Selected Licensee Commitments Manual is the smallest concentration of radioactive material in a sample that will yield a net count, above the system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is an *a priori* lower limit of detection. The actual LLD is dependent upon the standard deviation of the background counting rate, the counting efficiency, the sample size (mass or volume), the radiochemical yield, and the radioactive decay of the sample between sample collection and counting. The "required" LLD's for each sample medium and selected radionuclides are given in the Selected Licensee Commitments and are listed in Table 2.2-C.

MDA - The MDA may be thought of as an "actual" LLD for a particular sample measurement remembering that the MDA is calculated using a sample background instead of a system background.

2.3.3 TREND IDENTIFICATION

One of the purposes of an environmental monitoring program is to determine if there is a buildup of radionuclides in the environment due to the operation of the nuclear station. Visual inspection of tabular or graphical presentations of data (including preoperational) is used to determine if a trend exists. A decrease in a particular radionuclide's concentration in an environmental medium does not indicate that reactor operations are removing radioactivity from the environment but that reactor operations are not adding that radionuclide to the environment in quantities exceeding the preoperational level and that the normal removal processes (radioactive decay, deposition, resuspension, etc.) are influencing the concentration.

Substantial increases or decreases in the amount of a particular radionuclide's release from the nuclear plant will greatly affect the resulting environmental levels; therefore, a knowledge of the release of a radionuclide from the nuclear plant is necessary to completely interpret the trends, or lack of trends, determined from the environmental data. Some factors that may affect environmental levels of radionuclides include prevailing weather conditions (periods of drought, solar cycles or heavier than normal precipitation), construction in or around either the nuclear plant or the sampling location, and addition or deletion of other sources of radioactive materials (such as the Chernobyl accident). Some of these factors may be obvious while others are sometimes unknown. Therefore, how trends are identified will include some judgment by plant personnel.

Figure 2.1-1

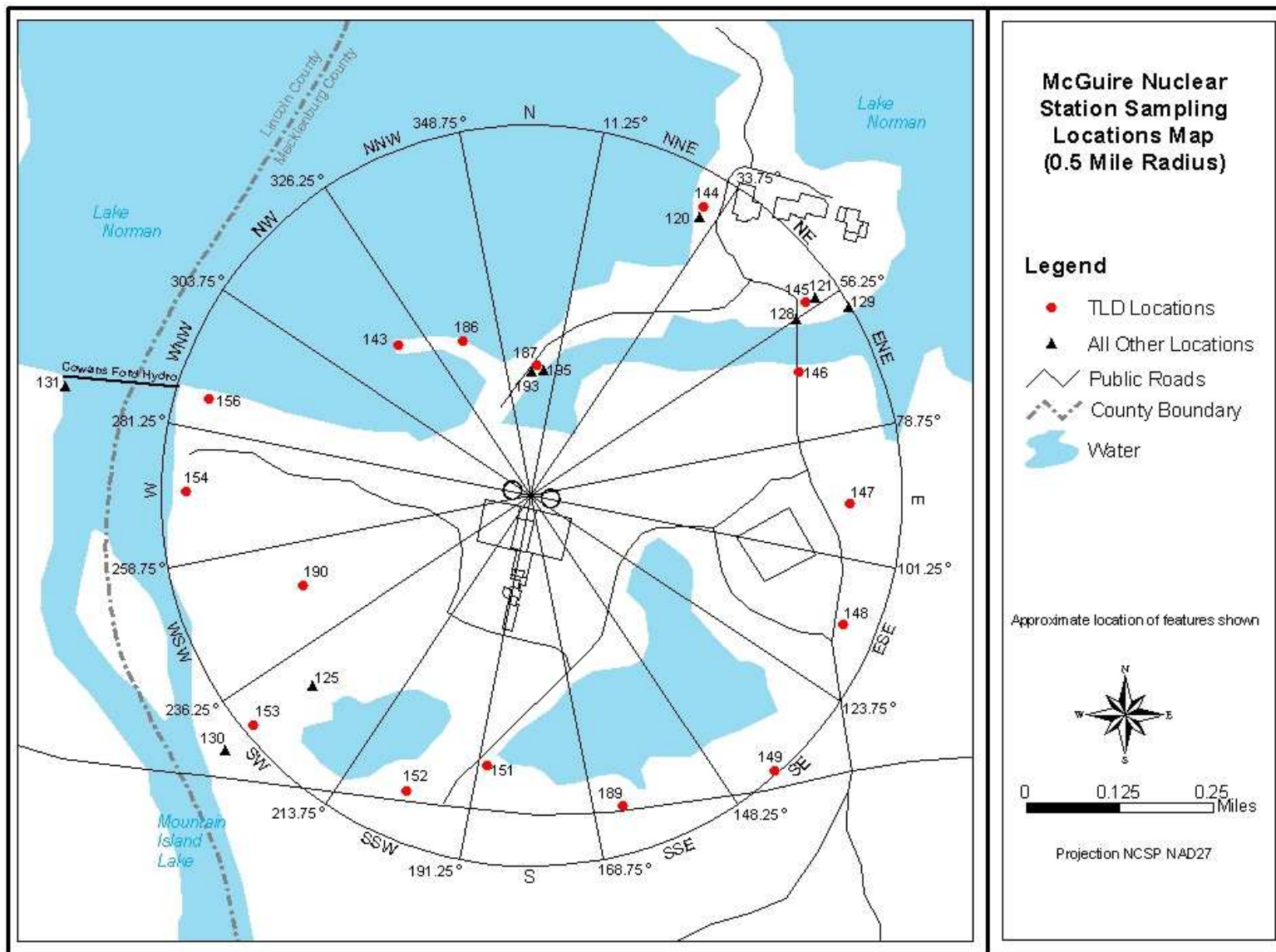


Figure 2.1-2

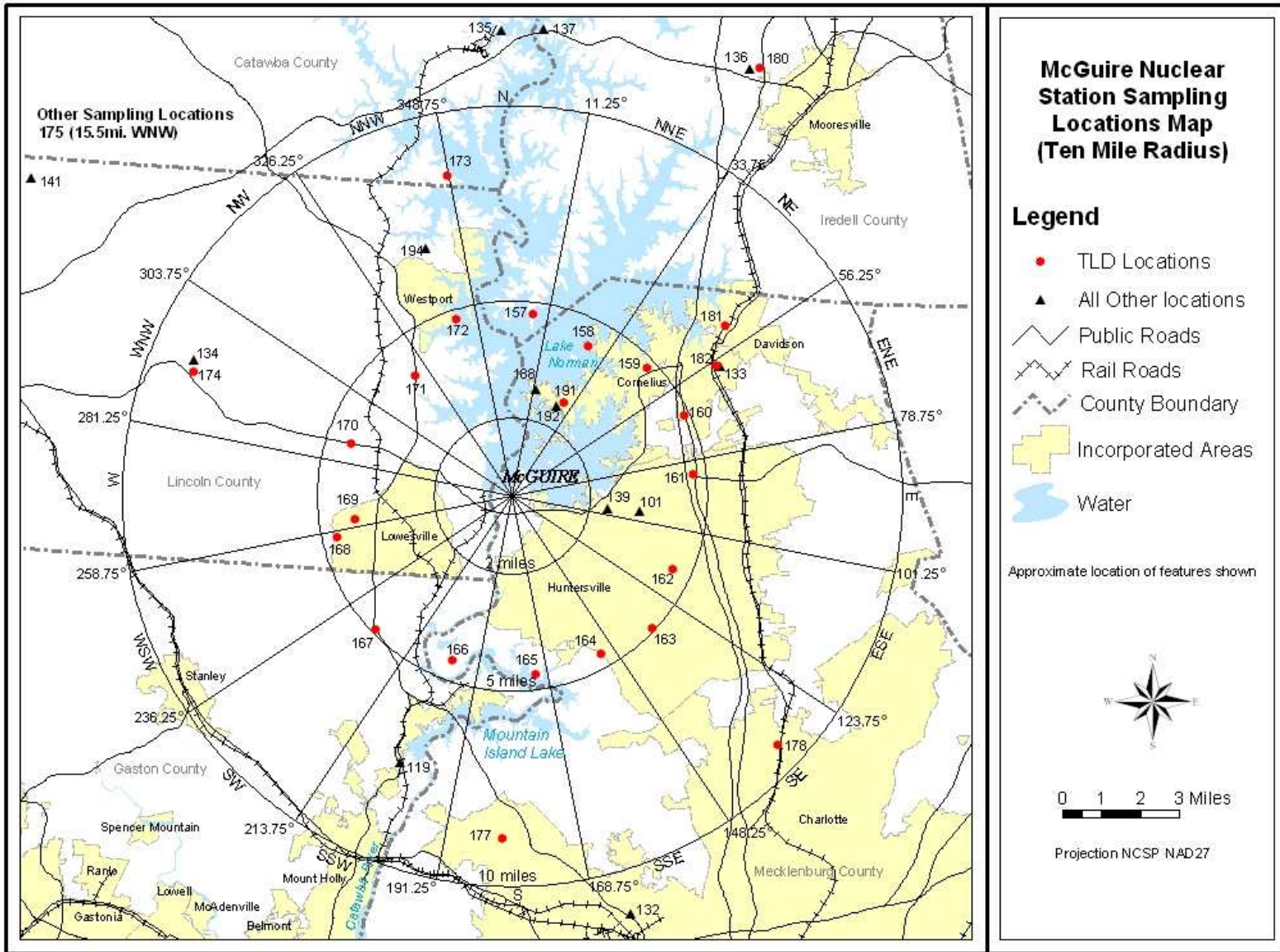


TABLE 2.1-A

**MCGUIRE RADIOLOGICAL MONITORING PROGRAM
SAMPLING LOCATIONS**

| Table 2.1-A Codes | | | |
|-------------------|----------|----|--------------|
| W | Weekly | SM | Semimonthly |
| BW | BiWeekly | Q | Quarterly |
| M | Monthly | SA | Semiannually |
| C | Control | | |

| Site # | Location Description* | Air Rad. & Part. | Surface Water | Drinking Water | Shoreline Sediment | Food Products | Fish | Milk | Broad Leaf Veg. |
|--------|--|------------------|---------------|----------------|--------------------|---------------|------|------|-----------------|
| 101 | North Mecklenburg Water Treatment Facility (3.31 mi E) | | | M | | | | | |
| 119 | Mt. Holly Municipal Water Supply (7.40 mi SSW) | | | M | | | | | |
| 120 | Site Boundary (0.46 mi NNE) | W | | | | | | | M (b) |
| 121 | Site Boundary (0.47 mi NE) | W | | | | | | | |
| 125 | Site Boundary (0.38 mi SW) | W | | | | | | | M (b) |
| 128 | Discharge Canal Bridge (0.45 mi NE) | | M | | | | | | |
| 129 | Discharge Canal Entrance to Lake Norman (0.51 mi ENE) | | | | SA | | SA | | |
| 130 | Hwy 73 Bridge Downstream (0.52 mi SW) | | | | SA | | | | |
| 131 | Cowans Ford Dam (0.64 mi WNW) | | M | | | | | | |
| 132 | Charlotte Municipal Water Supply (11.1 mi SSE) | | | M | | | | | |
| 133 | Cornelius (6.23 mi ENE) | W | | | | | | | |
| 134 C | East Lincoln Jr.High School (8.77 mi WNW) | W | | | | | | | M (b) |
| 135 C | Plant Marshall Intake Canal (11.9 mi N) | | M | | | | | | |
| 136 C | Mooreville Municipal Water Supply (12.7 mi NNE) | | | M | | | | | |
| 137 C | Pinnacle Access Area (12.0 mi N) | | | | SA | | SA | | |
| 139 | William Cook Dairy (2.49 mi E) | | | | | | | SM | |
| 141 C | Lynch Dairy-Cows (14.8 mi WNW) | | | | | | | SM | |
| 188 | 5 mile radius Gardens (2.79 mi NNE) | | | | | M (a) | | | |
| 192 | Peninsula (2.84 mi NNE) | W | | | | | | | |
| 193 | Site Boundary (0.19 mi N) | | | | | | | | M (b) |
| 194 | East Lincoln County Water Supply (6.73 mi NNW) | | | M | | | | | |
| 195 | Fishing Access Road (0.19 mi N) | W | | | | | | | |

(a) During Harvest Season

(b) When Available

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

TABLE 2.1-B

**MCGUIRE RADIOLOGICAL MONITORING PROGRAM
SAMPLING LOCATIONS**

(TLD SITES)

| Site # | Location | Distance* | Sector | Site # | Location | Distance* | Sector |
|--------|---|------------|--------|--------|---|------------|--------|
| 143 | SITE BOUNDARY | 0.27 miles | NW | 164 | HAMBRIGHT & BEATTIES FORD ROAD | 4.64 miles | SSE |
| 144 | SITE BOUNDARY | 0.46 miles | NNE | 165 | ARTHER AUTEN ROAD | 4.57 miles | S |
| 145 | SITE BOUNDARY | 0.47 miles | NE | 166 | NECK ROAD REFUGUE BOUNDARY | 4.44 miles | SSW |
| 146 | SITE BOUNDARY | 0.42 miles | ENE | 167 | LUCIA RIVERBEND HWY/ OLD FIREHOUSE | 4.87 miles | SW |
| 147 | SITE BOUNDARY | 0.44 miles | E | 168 | OLD PLANK ROAD BRIDGE | 4.60 miles | WSW |
| 148 | SITE BOUNDARY | 0.46 miles | ESE | 169 | GLOVER LANE | 4.03 miles | W |
| 149 | SITE BOUNDARY | 0.50 miles | SE | 170 | LITTLE EGYPT ROAD | 4.32 miles | WNW |
| 151 | SITE BOUNDARY | 0.37 miles | S | 171 | TRIANGLE ACE HARDWARE | 3.95 miles | NW |
| 152 | SITE BOUNDARY | 0.44 miles | SSW | 172 | LAKESHORE SOUTH RD & ISLAND VIEW COURT | 4.69 miles | NNW |
| 153 | SITE BOUNDARY | 0.47 miles | SW | 173 SI | KEISTLER STORE / GLENWOOD ROAD | 8.39 miles | NNW |
| 154 | SITE BOUNDARY | 0.45 miles | W | 174 SI | EAST LINCOLN JR. HIGH SCHOOL | 8.77 miles | WNW |
| 156 | SITE BOUNDARY | 0.44 miles | WNW | 175 C | BOGER CITY | 15.5 miles | WNW |
| 189 | SITE BOUNDARY | 0.43 miles | SSE | 177 SI | BELMARR ROAD / COULWOOD COMMUNITY | 8.77 miles | S |
| 190 | SITE BOUNDARY | 0.33 miles | WSW | 178 SI | FLORIDA STEEL CORPORATION | 9.32 miles | SE |
| 157 | THE POINTE/MOORESVILLE | 4.69 miles | N | 180 SI | MOORESVILLE WATER TREATMENT FACILITY | 12.7 miles | NNE |
| 158 | BETHEL CHURCH ROAD | 4.33 miles | NNE | 181 SI | OLD DAVIDSON WATER TREATMENT FACILITY | 7.02 miles | NE |
| 159 | HENDERSON ROAD & WEST CATAWBA AVENUE | 4.73 miles | NE | 182 SI | CORNELIUS / AIR SITE # 133 | 6.23 miles | ENE |
| 160 | ANCHORAGE MARINE SHOWROOM | 4.89 miles | ENE | 186 SI | MCGUIRE FISHING ACCESS ROAD ON PENINSULA | 0.24 miles | NNW |
| 161 | SAM FURR ROAD & HWY 21 | 4.70 miles | E | 187 SI | ENERGY EXPLORIUM / AIR SITE # 195 | 0.19 miles | N |
| 162 | RANSON ROAD | 4.53 miles | ESE | 191 SI | PENINSULA DEVELOPMENT / AIR SITE # 192 | 2.84 miles | NNE |
| 163 | MCCOY ROAD | 4.94 miles | SE | | | | |

C = Control
SI = Special Interest

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

TABLE 2.2-A

**REPORTING LEVELS FOR RADIOACTIVITY
CONCENTRATIONS IN ENVIRONMENTAL SAMPLES**

| Analysis | Water (pCi/liter) | Air Particulates or Gases (pCi/m ³) | Fish (pCi/kg-wet) | Milk (pCi/liter) | BroadLeaf Vegetation (pCi/kg-wet) |
|-----------|---------------------------|---|----------------------|---------------------|---|
| H-3 | 20,000 ^{(a),(b)} | | | | |
| Mn-54 | 1,000 | | 30,000 | | |
| Fe-59 | 400 | | 10,000 | | |
| Co-58 | 1,000 | | 30,000 | | |
| Co-60 | 300 | | 10,000 | | |
| Zn-65 | 300 | | 20,000 | | |
| Zr-Nb-95 | 400 | | | | |
| I-131 | 2 | 0.9 | | 3 | 100 |
| Cs-134 | 30 | 10 | 1,000 | 60 | 1,000 |
| Cs-137 | 50 | 20 | 2,000 | 70 | 2,000 |
| Ba-La-140 | 200 | | | 300 | |

- (a) If no drinking water pathway exists, a value of 30,000 pCi/liter may be used.
 (b) H-3 Reporting level not applicable to surface water

TABLE 2.2-B

REMP ANALYSIS FREQUENCY

| Sample Medium | Analysis Schedule | Gamma Isotopic | Tritium | Low Level I-131 | Gross Beta | TLD |
|----------------------|------------------------|-------------------|---------|--------------------|---------------|-----|
| Air Radioiodine | Weekly | X | | | | |
| Air | Weekly | X | | | X | |
| Direct Radiation | Quarterly | | | | | X |
| Surface Water | Monthly Composite | X | | | | |
| | Quarterly Composite | | X | | | |
| Drinking Water | Monthly Composite | X | | (a) | X | |
| | Quarterly Composite | | X | | | |
| Shoreline Sediment | Semiannually | X | | | | |
| Milk | Semimonthly | X | | X | | |
| Fish | Semiannually | X | | | | |
| Broadleaf Vegetation | Monthly ^(b) | X | | | | |
| Food Products | Monthly ^(b) | X | | | | |

- (a) Low-level I-131 analysis will be performed if the dose calculated for the consumption of drinking water is > 1 mrem per year. An LLD of 1 pCi/liter will be required for this analysis.
 (b) When Available

TABLE 2.2-C**MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION**

| Analysis | Water (pCi/liter) | Air Particulates or Gases (pCi/m ³) | Fish (pCi/kg-wet) | Milk (pCi/liter) | BroadLeaf Vegetation (pCi/kg-wet) | Sediment (pCi/kg-dry) |
|------------|----------------------|---|----------------------|---------------------|---|--------------------------|
| Gross Beta | 4 | 0.01 | | | | |
| H-3 | 2000 ^(a) | | | | | |
| Mn-54 | 15 | | 130 | | | |
| Fe-59 | 30 | | 260 | | | |
| Co-58, 60 | 15 | | 130 | | | |
| Zn-65 | 30 | | 260 | | | |
| Zr-Nb-95 | 15 | | | | | |
| I-131 | 1 ^(b) | 0.07 | | 1 | 60 | |
| Cs-134 | 15 | 0.05 | 130 | 15 | 60 | 150 |
| Cs-137 | 18 | 0.06 | 150 | 18 | 80 | 180 |
| Ba-La-140 | 15 | | | 15 | | |

(a) If no drinking water pathway exists, a value of 3000 pCi/liter may be used.

(b) If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

3.0 INTERPRETATION OF RESULTS

Review of 2006 REMP analysis results was performed to detect and identify changes in environmental levels as a result of station operation. The radionuclides with Selected Licensee Commitments reporting levels that indicate consistent detectable activity have been historically trended from preoperation to present. Analyses from 1977 - 1978 have been excluded since these results were much higher than the other preoperational years due to outside influences such as weapons testing. The preoperational analyses from 1981 were combined with the operational analyses from the latter part of 1981 and averaged to give one concentration for each radionuclide for that year.

The highest annual mean concentration of applicable Selected Licensee Commitments radionuclides from the indicator locations for each media type was used for trending purposes. Trending was performed by comparing annual mean concentrations to historical results. Factors evaluated include the frequency of detection and the concentration in terms of the percent of the radionuclide's SLC reporting level (Table 2.2-A). All maximum percent of reporting level values were well below the 100% action level. The highest value reached during 2006 was 7.30% for drinking water tritium at the North Mecklenburg Water Treatment Facility (Location 101). Only Selected Licensee Commitments radionuclides were detected in 2006.

Changes in sample location, analytical technique, and presentation of results must be considered when reviewing for trends. Calculation of the annual mean concentrations has been performed differently over the history of the REMP. During 1979-1986, all net results (sample minus background) positive and negative, were included in the calculation of the mean. Only positive net activity results were used to calculate the mean for the other years. All negative values were replaced with a zero for calculational and graphical purposes to properly represent environmental conditions. A change in gamma spectroscopy analysis systems in 1987 ended a period when many measurements yielded detectable low-level activity for both indicator and control location samples. It is possible that the method the previous system used to estimate net activity may have been vulnerable to false-positive results.

This section includes tables and graphs containing the highest annual mean concentrations of any effluent related radionuclide detected since the change in analysis systems in 1987. Any zero concentrations used in tables or graphs represent activity measurements less than detectable levels. Only the specific radionuclides that represent the highest dose contributors or demonstrate consistent detectable activity are shown graphically.

Data presented in Sections 3.1 through 3.9 support the conclusion that there was no significant increase in radioactivity in the environment around McGuire Nuclear Station due to station operations in 2006. Similarly, there was no significant increase in ambient background radiation levels in the surrounding areas. The 2006 land use census data, shown in Section 3.10, indicates that no program changes are required as a result of the census.

3.1 AIRBORNE RADIOIODINE AND PARTICULATES

In 2006, 364 particulate and radioiodine samples were analyzed, 312 at six indicator locations and 52 at the control location. Particulate samples were analyzed weekly for gamma and gross beta. Radioiodine samples received a weekly gamma analysis.

Gross beta analyses indicated $1.79\text{E-}2$ pCi/m³ at the location with the highest annual mean and $1.94\text{E-}2$ pCi/m³ at the control location. Detectable gamma emitting particulate activity was last observed in environmental air particulate samples in 2004 and is described in PIP G-04-00134.

No detectable I-131 activity in any environmental air radioiodine samples was found in 2006. K-40 and Be-7 that occur naturally were routinely detected in charcoal cartridges collected during the year. Cs-137 activity was not detected on any cartridges in 2006. Cs-137 detection on the charcoal cartridge was determined in 1990 to be an active constituent of the charcoal. A similar study was performed in 2001 again yielding this conclusion. Therefore,

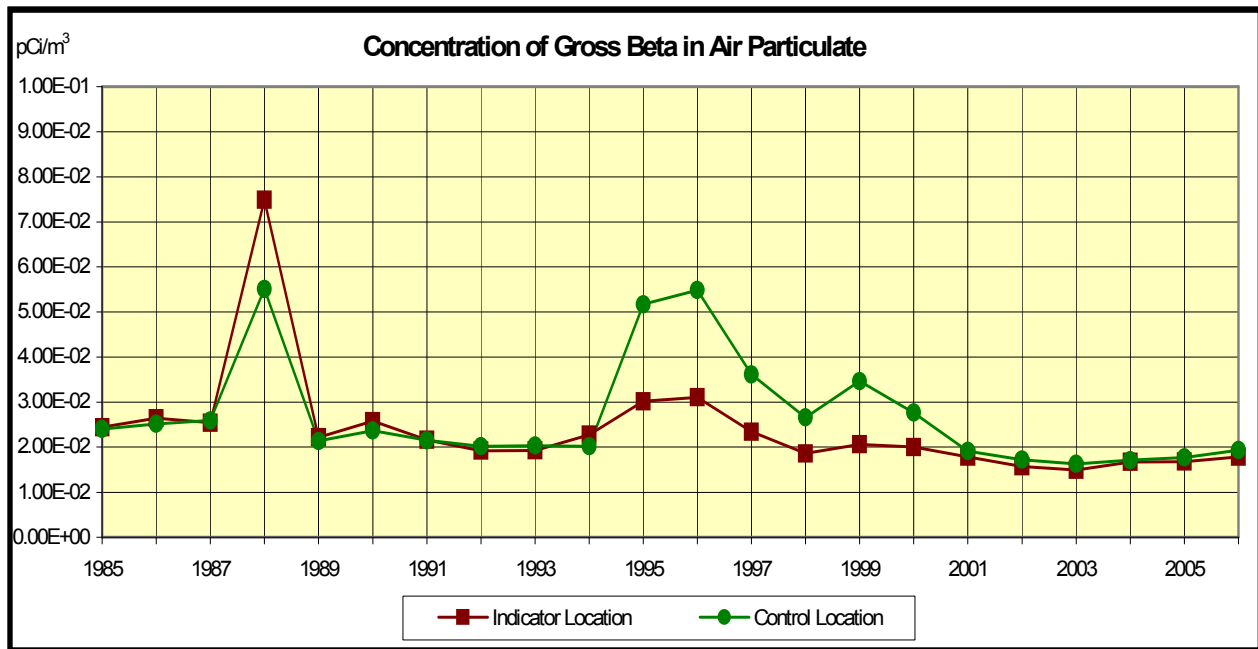


any Cs-137 activities were not used in any dose calculations in Section 4.0 of this report.

Figure 3.1 shows gross beta highest annual mean indicator and control location concentrations since 1985. There is no reporting level for gross beta. Table 3.1-A shows indicator and control location highest annual means for Cs-137 and gross beta.

Table 3.1-B gives indicator location highest annual means and control means since 1979 for I-131. Preoperational and ten year averages are also shown. No I-131 activity has been detected since 1989. Since no activity was detected in 2006, no reporting levels were approached.

Figure 3.1



There is no reporting level for Gross Beta in air particulate

Table 3.1-A Mean Concentrations of Radionuclides in Air Particulate

| YEAR | Cs-137 Indicator (pCi/m³) | Cs-137 Control (pCi/m³) | Beta Indicator (pCi/m³) | Beta Control (pCi/m³) |
|-------|---------------------------|-------------------------|-------------------------|-----------------------|
| 1979* | 4.40E-3 | 1.47E-3 | ** | ** |
| 1980* | 6.70E-3 | 4.53E-3 | ** | ** |
| 1981* | 6.16E-3 | 5.32E-3 | ** | ** |
| 1982* | 3.82E-3 | 2.29E-3 | ** | ** |
| 1983* | 2.93E-3 | 3.21E-3 | ** | ** |
| 1984 | 1.74E-3 | 8.29E-4 | ** | ** |
| 1985 | 1.86E-3 | 1.32E-3 | 2.44E-2 | 2.40E-2 |
| 1986 | 4.98E-3 | 3.03E-3 | 2.64E-2 | 2.52E-2 |
| 1987 | 1.07E-2 | 7.91E-3 | 2.54E-2 | 2.59E-2 |
| 1988 | 0.00E0 | 0.00E0 | 7.49E-2 | 5.51E-2 |
| 1989 | 0.00E0 | 0.00E0 | 2.22E-2 | 2.14E-2 |
| 1990 | 0.00E0 | 0.00E0 | 2.58E-2 | 2.37E-2 |
| 1991 | 0.00E0 | 0.00E0 | 2.16E-2 | 2.15E-2 |
| 1992 | 0.00E0 | 0.00E0 | 1.92E-2 | 2.02E-2 |
| 1993 | 0.00E0 | 0.00E0 | 1.93E-2 | 2.04E-2 |
| 1994 | 0.00E0 | 0.00E0 | 2.28E-2 | 2.02E-2 |
| 1995 | 0.00E0 | 0.00E0 | 3.02E-2 | 5.17E-2 |
| 1996 | 0.00E0 | 0.00E0 | 3.11E-2 | 5.49E-2 |
| 1997 | 0.00E0 | 0.00E0 | 2.34E-2 | 3.62E-2 |
| 1998 | 0.00E0 | 0.00E0 | 1.86E-2 | 2.66E-2 |
| 1999 | 0.00E0 | 0.00E0 | 2.06E-2 | 3.47E-2 |
| 2000 | 0.00E0 | 0.00E0 | 2.00E-2 | 2.77E-2 |
| 2001 | 0.00E0 | 0.00E0 | 1.79E-2 | 1.91E-2 |

Table 3.1-A continued

| YEAR | Cs-137 Indicator (pCi/m ³) | Cs-137 Control (pCi/m ³) | Beta Indicator (pCi/m ³) | Beta Control (pCi/m ³) |
|-----------------------|--|--------------------------------------|--------------------------------------|------------------------------------|
| 2002 | 0.00E0 | 0.00E0 | 1.57E-2 | 1.72E-2 |
| 2003 | 0.00E0 | 0.00E0 | 1.50E-2 | 1.63E-2 |
| 2004 | 0.00E0 | 0.00E0 | 1.67E-2 | 1.71E-2 |
| 2005 | 0.00E0 | 0.00E0 | 1.68E-2 | 1.77E-2 |
| Average (1996 – 2005) | NOT APPLICABLE | NOT APPLICABLE | 1.96E-2 | 2.68E-2 |
| 2006 | 0.00E0 | 0.00E0 | 1.79E-2 | 1.94E-2 |

0.00E0 = no detectable measurements

* Radioiodines and Particulates analyzed together

** Gross Beta analysis not performed

Table 3.1-B Mean Concentrations of Air Radioiodine (I-131)

| Year | Indicator Location (pCi/m ³) | Control Location (pCi/m ³) |
|-------|--|--|
| 1979* | 3.28E-3 | 1.04E-3 |
| 1980* | 2.01E-3 | 1.10E-3 |
| 1981* | 4.17E-3 | 6.27E-4 |
| 1982* | 1.42E-3 | 2.48E-3 |
| 1983* | 1.99E-3 | 2.01E-4 |
| 1984 | 3.17E-3 | 0.00E0 |
| 1985 | 3.15E-3 | 1.04E-3 |
| 1986 | 1.27E-2 | 6.10E-3 |
| 1987 | 1.07E-2 | 6.60E-3 |
| 1988 | 0.00E0 | 0.00E0 |
| 1989 | 2.18E-2 | 0.00E0 |
| 1990 | 0.00E0 | 0.00E0 |
| 1991 | 0.00E0 | 0.00E0 |
| 1992 | 0.00E0 | 0.00E0 |
| 1993 | 0.00E0 | 0.00E0 |
| 1994 | 0.00E0 | 0.00E0 |
| 1995 | 0.00E0 | 0.00E0 |
| 1996 | 0.00E0 | 0.00E0 |
| 1997 | 0.00E0 | 0.00E0 |
| 1998 | 0.00E0 | 0.00E0 |
| 1999 | 0.00E0 | 0.00E0 |
| 2000 | 0.00E0 | 0.00E0 |
| 2001 | 0.00E0 | 0.00E0 |
| 2002 | 0.00E0 | 0.00E0 |
| 2003 | 0.00E0 | 0.00E0 |
| 2004 | 0.00E0 | 0.00E0 |
| 2005 | 0.00E0 | 0.00E0 |
| 2006 | 0.00E0 | 0.00E0 |

0.00E0 = no detectable measurements

* Radioiodines and Particulates analyzed together.

3.2 DRINKING WATER

In 2006, 65 drinking water samples were analyzed for gross beta and gamma emitting radionuclides. Fifty-two samples were from the four indicator locations and 13 from the control location. Tritium (H-3) analyses were performed on 20 composite samples, 16 at indicator locations and four at the control location.

No detectable gamma activity was found in drinking water samples in 2006 and has not been detected since 1987. Gross beta analyses indicated 1.75 pCi/l at the location with the highest annual mean and 1.80 pCi/l at the control location. Tritium was detected in 14 of the 16 indicator composite samples taken in 2006 with the highest annual mean resulting in only 7.30% of the reporting level. The dose for consumption of water was less than one mrem per year, historically and for 2006; therefore low-level iodine analysis is not required.

Figure 3.2 shows tritium highest annual mean indicator and control location concentrations with comparisons to 10% of the reporting level. Table 3.2 gives indicator location highest annual means and control means since 1979 for tritium and gross beta. There is no reporting level for gross beta.

Drinking water Location 101 was added to the sampling program in 1999. Figure 3.2 shows an increase beginning in that year. There was an increase in drinking water tritium in 2006 due to silica removal from the spent fuel pools. This resulted in additional water volume being released from the plant.

Figure 3.2

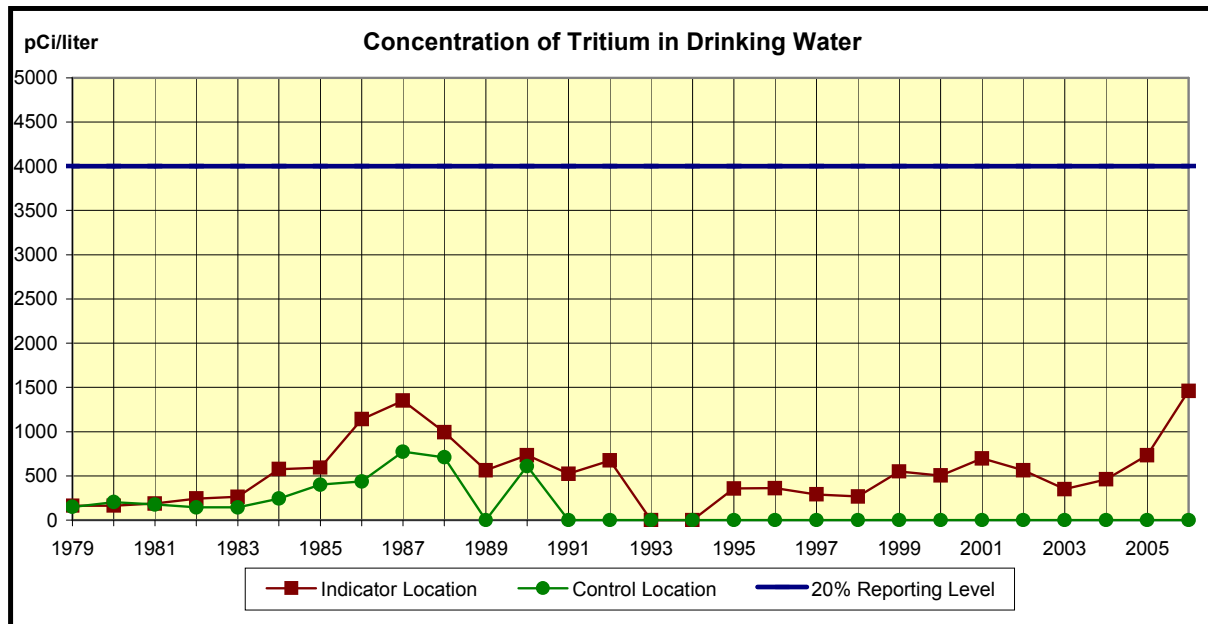


Table 3.2 Mean Concentrations of Radionuclides in Drinking Water

| YEAR | Gross Beta (pCi/l) | | Tritium (pCi/l) | |
|------|--------------------|------------------|--------------------|------------------|
| | Indicator Location | Control Location | Indicator Location | Control Location |
| 1979 | 2.40E0 | 2.03E0 | 1.65E2 | 1.50E2 |
| 1980 | 2.34E0 | 1.87E0 | 1.63E2 | 2.05E2 |
| 1981 | 2.79E0 | 2.41E0 | 1.88E2 | 1.78E2 |
| 1982 | 2.62E0 | 2.43E0 | 2.43E2 | 1.45E2 |
| 1983 | 1.80E0 | 1.87E0 | 2.65E2 | 1.45E2 |
| 1984 | 2.78E0 | 1.81E0 | 5.77E2 | 2.45E2 |
| 1985 | 1.88E0 | 1.90E0 | 5.93E2 | 4.00E2 |
| 1986 | 2.13E0 | 2.15E0 | 1.14E3 | 4.37E2 |
| 1987 | 2.30E0 | 2.00E0 | 1.35E3 | 7.75E2 |
| 1988 | 2.00E0 | 2.00E0 | 9.92E2 | 7.11E2 |
| 1989 | 2.80E0 | 2.70E0 | 5.62E2 | 0.00E0 |
| 1990 | 3.70E0 | 4.30E0 | 7.32E2 | 6.11E2 |
| 1991 | 2.40E0 | 2.50E0 | 5.22E2 | 0.00E0 |
| 1992 | 2.00E0 | 1.70E0 | 6.73E2 | 0.00E0 |
| 1993 | 2.80E0 | 2.40E0 | 0.00E0 | 0.00E0 |
| 1994 | 2.47E0 | 2.90E0 | 0.00E0 | 0.00E0 |
| 1995 | 4.20E0 | 3.30E0 | 3.58E2 | 0.00E0 |
| 1996 | 2.75E0 | 2.11E0 | 3.60E2 | 0.00E0 |
| 1997 | 2.70E0 | 2.24E0 | 2.90E2 | 0.00E0 |
| 1998 | 2.75E0 | 2.33E0 | 2.68E2 | 0.00E0 |
| 1999 | 2.48E0 | 2.17E0 | 5.49E2 | 0.00E0 |
| 2000 | 2.66E0 | 1.99E0 | 5.04E2 | 0.00E0 |
| 2001 | 2.48E0 | 2.19E0 | 6.98E2 | 0.00E0 |
| 2002 | 2.47E0 | 2.08E0 | 5.64E2 | 0.00E0 |
| 2003 | 1.81E0 | 1.52E0 | 3.51E2 | 0.00E0 |
| 2004 | 1.68E0 | 1.29E0 | 4.61E2 | 0.00E0 |
| 2005 | 1.74E0 | 1.30E0 | 7.35E2 | 0.00E0 |
| 2006 | 1.75E0 | 1.80E0 | 1.46E3 | 0.00E0 |

0.00E0 = no detectable measurements

3.3 SURFACE WATER

In 2006, 39 surface water samples were analyzed for gamma emitting radionuclides, 26 at the two indicator locations and 13 at the control location. Analyses for H-3 were performed on 12 samples, eight at indicator locations and four at the control location.

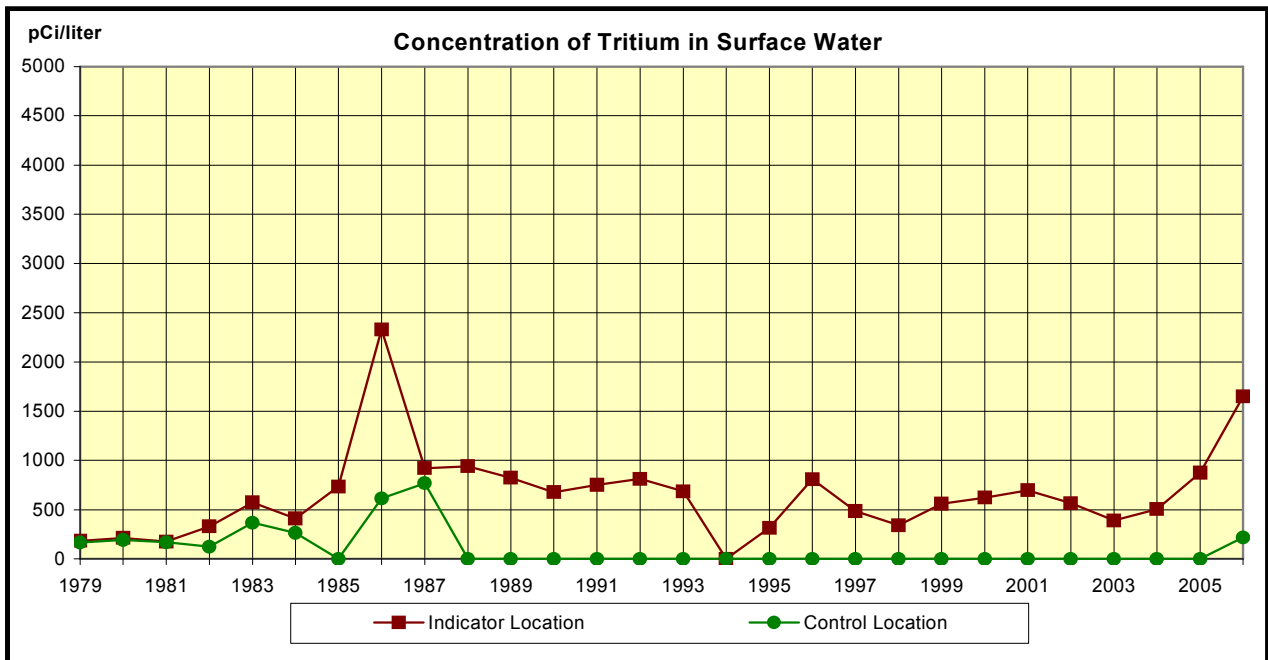


No detectable gamma activity was found in surface water samples in 2006 and has not been detected since 1988. Tritium was detected in all of the eight indicator composite samples taken in 2006. Tritium was detected in one of the control location composite samples in 2006.

Figure 3.3 shows tritium highest annual mean indicator and control location concentrations. Table 3.3 gives indicator and control location highest annual means since 1979 for tritium.

There was an increase in surface water tritium in 2006 due to silica removal from the spent fuel pools. This resulted in additional water volume being released from the plant.

Figure 3.3



There is no reporting level for tritium in surface water

Table 3.3 Mean Concentrations of Tritium in Surface Water

| YEAR | H-3 Indicator (pCi/l) | H-3 Control (pCi/l) |
|-------------|------------------------------|----------------------------|
| 1979 | 1.85E2 | 1.66E2 |
| 1980 | 2.13E2 | 1.93E2 |
| 1981 | 1.75E2 | 1.70E2 |
| 1982 | 3.30E2 | 1.23E2 |
| 1983 | 5.75E2 | 3.67E2 |
| 1984 | 4.10E2 | 2.65E2 |
| 1985 | 7.33E2 | 0.00E0 |
| 1986 | 2.33E3 | 6.13E2 |
| 1987 | 9.20E2 | 7.70E2 |
| 1988 | 9.40E2 | 0.00E0 |
| 1989 | 8.22E2 | 0.00E0 |
| 1990 | 6.77E2 | 0.00E0 |
| 1991 | 7.53E2 | 0.00E0 |
| 1992 | 8.13E2 | 0.00E0 |
| 1993 | 6.85E2 | 0.00E0 |
| 1994 | 0.00E0 | 0.00E0 |
| 1995 | 3.15E2 | 0.00E0 |
| 1996 | 8.08E2 | 0.00E0 |
| 1997 | 4.85E2 | 0.00E0 |
| 1998 | 3.40E2 | 0.00E0 |
| 1999 | 5.60E2 | 0.00E0 |
| 2000 | 6.22E2 | 0.00E0 |
| 2001 | 6.98E2 | 0.00E0 |
| 2002 | 5.65E2 | 0.00E0 |
| 2003 | 3.91E2 | 0.00E0 |
| 2004 | 5.04E2 | 0.00E0 |
| 2005 | 8.74E2 | 0.00E0 |
| 2006 | 1.65E3 | 2.19E2 |

0.00E0 = no detectable measurements

3.4 MILK

In 2006, 52 milk samples were analyzed for low level I-131 and other gamma emitting radionuclides, 26 at the indicator location and 26 at the control location.

No detectable activity was found in milk samples in 2006 other than naturally-occurring K-40. Cs-137 has not been detected in milk samples since 1990 and all other radionuclides have not been detected since 1987.

Table 3.4 gives indicator location highest annual means and control means since 1979 for Cs-137. Since no activity was detected in 2006, no reporting levels were approached.



Table 3.4 Mean Concentrations of Cs-137 in Milk

| YEAR | Cs-137 Indicator (pCi/l) | Cs-137 Control (pCi/l) |
|------|--------------------------|------------------------|
| 1979 | 2.48E1 | 6.04E0 |
| 1980 | 1.72E1 | 4.13E0 |
| 1981 | 2.04E1 | 4.15E0 |
| 1982 | 1.21E1 | 5.20E0 |
| 1983 | 2.01E1 | 2.82E0 |
| 1984 | 1.48E1 | 2.56E0 |
| 1985 | 1.42E1 | 2.72E0 |
| 1986 | 3.74E0 | 3.45E0 |
| 1987 | 5.20E0 | 8.60E0 |
| 1988 | 3.40E0 | 2.90E0 |
| 1989 | 6.00E0 | 5.60E0 |
| 1990 | 5.30E0 | 2.60E0 |
| 1991 | 0.00E0 | 0.00E0 |
| 1992 | 0.00E0 | 0.00E0 |
| 1993 | 0.00E0 | 0.00E0 |
| 1994 | 0.00E0 | 0.00E0 |
| 1995 | 0.00E0 | 0.00E0 |
| 1996 | 0.00E0 | 0.00E0 |
| 1997 | 0.00E0 | 0.00E0 |
| 1998 | 0.00E0 | 0.00E0 |
| 1999 | 0.00E0 | 0.00E0 |
| 2000 | 0.00E0 | 0.00E0 |
| 2001 | 0.00E0 | 0.00E0 |
| 2002 | 0.00E0 | 0.00E0 |
| 2003 | 0.00E0 | 0.00E0 |
| 2004 | 0.00E0 | 0.00E0 |
| 2005 | 0.00E0 | 0.00E0 |
| 2006 | 0.00E0 | 0.00E0 |

0.00E0 = no detectable measurements

3.5 BROADLEAF VEGETATION

In 2006, 48 broadleaf vegetation samples were analyzed, 36 at the three indicator locations and twelve at the control location.

One of the thirty-six samples collected at indicator locations contained detectable Cs-137 activity. Cs-137 was detected in one of the twelve samples collected at Location 120 with a concentration of 29.8 pCi/kg which is 1.49% of the reporting level. Cs-137 was not detected in any of the twelve control location samples.

No airborne Cs-137 has been released from the plant since 1998. Cs-137 attributable to past nuclear weapons testing is known to exist in many environmental media at low and highly variable levels.

Table 3.5 gives indicator and control location highest annual means since 1979 for Cs-137.

Table 3.5 Mean Concentrations of Cs-137 in Broadleaf Vegetation

| YEAR | Cs-137 Indicator (pCi/kg) | Cs-137 Control (pCi/kg) |
|------|---------------------------|-------------------------|
| 1979 | 2.19E1 | 1.93E1 |
| 1980 | 2.30E1 | 1.92E1 |
| 1981 | 3.04E1 | 2.02E1 |
| 1982 | 2.46E1 | 1.22E1 |
| 1983 | 9.07E0 | 7.85E0 |
| 1984 | 1.02E1 | 1.05E1 |
| 1985 | 8.05E0 | 2.37E-2 |
| 1986 | 4.03E1 | 1.27E1 |
| 1987 | 2.20E1 | 1.70E1 |
| 1988 | 3.90E1 | 3.40E1 |
| 1989 | 9.60E1 | 0.00E0 |
| 1990 | 4.00E1 | 0.00E0 |
| 1991 | 3.30E1 | 0.00E0 |
| 1992 | 4.90E1 | 0.00E0 |
| 1993 | 1.60E1 | 0.00E0 |
| 1994 | 0.00E0 | 0.00E0 |
| 1995 | 0.00E0 | 0.00E0 |
| 1996 | 0.00E0 | 0.00E0 |
| 1997 | 0.00E0 | 0.00E0 |
| 1998 | 0.00E0 | 2.69E1 |
| 1999 | 0.00E0 | 0.00E0 |
| 2000 | 0.00E0 | 0.00E0 |
| 2001 | 0.00E0 | 0.00E0 |
| 2002 | 0.00E0 | 0.00E0 |
| 2003 | 0.00E0 | 0.00E0 |
| 2004 | 0.00E0 | 0.00E0 |
| 2005 | 0.00E0 | 0.00E0 |
| 2006 | 2.98E1 | 0.00E0 |

0.00E0 = no detectable measurements

3.6 FOOD PRODUCTS

In 2006, 12 food products (crops) samples were analyzed, all at one indicator location. There is no control location for this media.

No detectable activity has been detected in this media since 1987. Table 3.6 shows Cs-137 indicator highest annual means with preoperational data. Since no activity was detected in 2006, no reporting levels were approached.

Table 3.6 Mean Concentrations of Cs-137 in Food Products

| YEAR | Cs-137 Indicator (pCi/kg) |
|------|---------------------------|
| 1979 | 2.19E1 |
| 1980 | 2.30E1 |
| 1981 | 3.04E1 |
| 1982 | 2.46E1 |
| 1983 | 9.07E0 |
| 1984 | 8.45E0 |
| 1985 | 7.99E0 |
| 1986 | 2.15E1 |
| 1987 | 2.90E1 |
| 1988 | 0.00E0 |
| 1989 | 0.00E0 |
| 1990 | 0.00E0 |
| 1991 | 0.00E0 |
| 1992 | 0.00E0 |
| 1993 | 0.00E0 |
| 1994 | 0.00E0 |
| 1995 | 0.00E0 |
| 1996 | 0.00E0 |
| 1997 | 0.00E0 |
| 1998 | 0.00E0 |
| 1999 | 0.00E0 |
| 2000 | 0.00E0 |
| 2001 | 0.00E0 |
| 2002 | 0.00E0 |
| 2003 | 0.00E0 |
| 2004 | 0.00E0 |
| 2005 | 0.00E0 |
| 2006 | 0.00E0 |

0.00E0 = no detectable measurements

3.7 FISH

In 2006, 12 fish samples were analyzed for gamma emitting radionuclides, six at the indicator location and six at the control location.

Figure 3.7-1 shows Cs-137 highest annual mean indicator and control location concentrations with comparisons to 5% of the reporting level. Figure 3.7-2 shows Co-60 highest annual mean indicator and control location concentrations also with comparisons to 5% of the reporting level.

Table 3.7 gives indicator location highest annual means since 1980 for all radionuclides detected since the analysis change in 1988.

Co-58 activity was not detected in 2006 in any of the indicator or control samples. Cs-137 activity was detected in two of the six indicator samples taken at Location 129 with a mean concentration of 10.8 pCi/kg which is 0.54% of the reporting level. Cs-137 was not detected in any control location samples.

All other radionuclides not shown in the table have demonstrated no detectable activity since 1986.



Figure 3.7-1

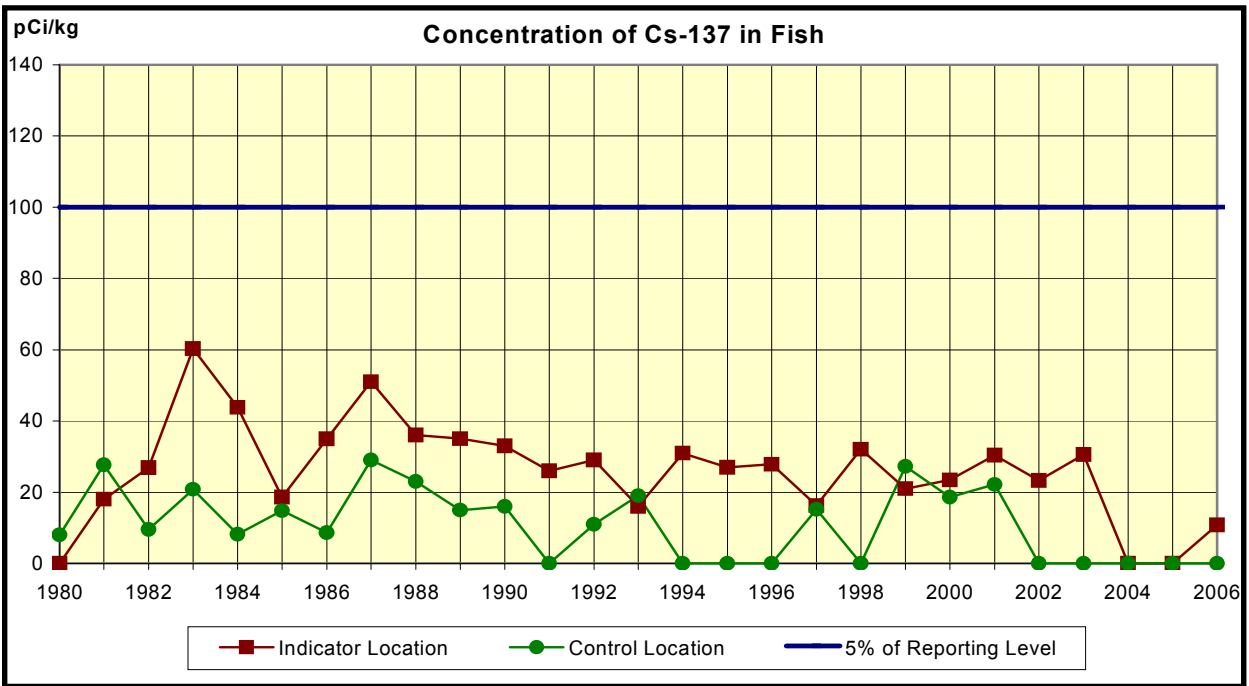


Figure 3.7-2

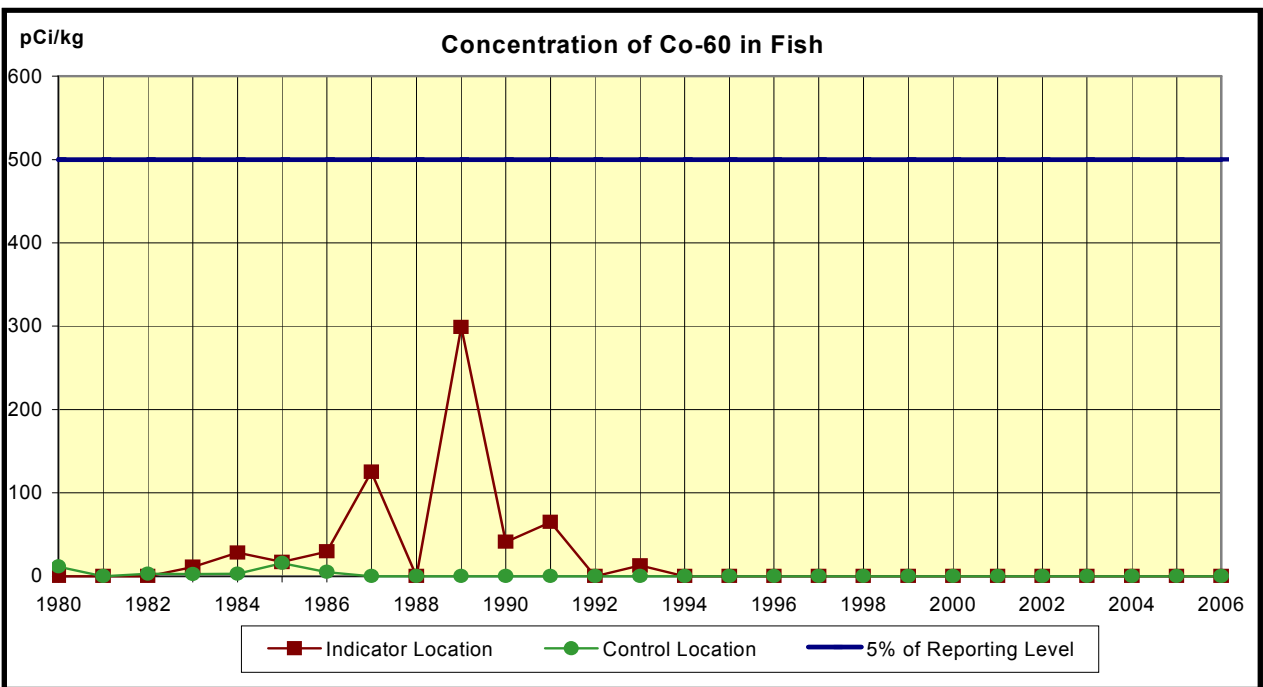


Table 3.7 Mean Concentrations of Radionuclides in Fish (pCi/kg)

| YEAR | Mn-54 Indicator | Co-58 Indicator | Co-60 Indicator | Cs-134 Indicator | Cs-137 Indicator |
|-------------|----------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|
| 1980 | -1.97E1 | 8.36E0 | -2.25E1 | -2.70E1 | -4.13E0 |
| 1981 | -2.71E0 | -2.98E0 | -2.65E0 | -1.99E0 | 1.80E1 |
| 1982 | -3.83E0 | 8.16E0 | -4.34E-1 | -8.22E-1 | 2.69E1 |
| 1983 | -2.60E0 | 2.60E1 | 1.11E1 | -1.32E0 | 6.03E1 |
| 1984 | 3.61E0 | 1.45E2 | 2.82E1 | 3.11E1 | 4.38E1 |
| 1985 | 2.53E-1 | 7.19E0 | 1.72E1 | -1.56E0 | 1.86E1 |
| 1986 | 1.03E0 | 3.17E1 | 2.96E1 | 1.67E1 | 3.49E1 |
| 1987 | 0.00E0 | 2.71E2 | 1.25E2 | 2.60E1 | 5.10E1 |
| 1988 | 1.20E1 | 7.70E1 | 0.00E0 | 2.70E1 | 3.60E1 |
| 1989 | 9.00E1 | 4.05E2 | 2.99E2 | 1.10E1 | 3.50E1 |
| 1990 | 0.00E0 | 5.60E1 | 4.10E1 | 0.00E0 | 3.30E1 |
| 1991 | 6.20E0 | 1.40E1 | 6.50E1 | 5.90E0 | 2.60E1 |
| 1992 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 2.90E1 |
| 1993 | 0.00E0 | 8.20E1 | 1.30E1 | 0.00E0 | 1.60E1 |
| 1994 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 3.10E1 |
| 1995 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 2.70E1 |
| 1996 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 2.78E1 |
| 1997 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 1.62E1 |
| 1998 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 3.21E1 |
| 1999 | 0.00E0 | 3.53E1 | 0.00E0 | 0.00E0 | 2.10E1 |
| 2000 | 0.00E0 | 4.28E1 | 0.00E0 | 0.00E0 | 2.34E1 |
| 2001 | 0.00E0 | 1.32E1 | 0.00E0 | 0.00E0 | 3.04E1 |
| 2002 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 2.33E1 |
| 2003 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 3.05E1 |
| 2004 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 |
| 2005 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 |
| 2006 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 1.08E1 |

0.00E0 = no detectable measurements

All negative values have been replaced with zeros for calculational purposes

3.8 SHORELINE SEDIMENT

In 2006, six shoreline sediment samples were analyzed, four from two indicator locations and two at the control location.

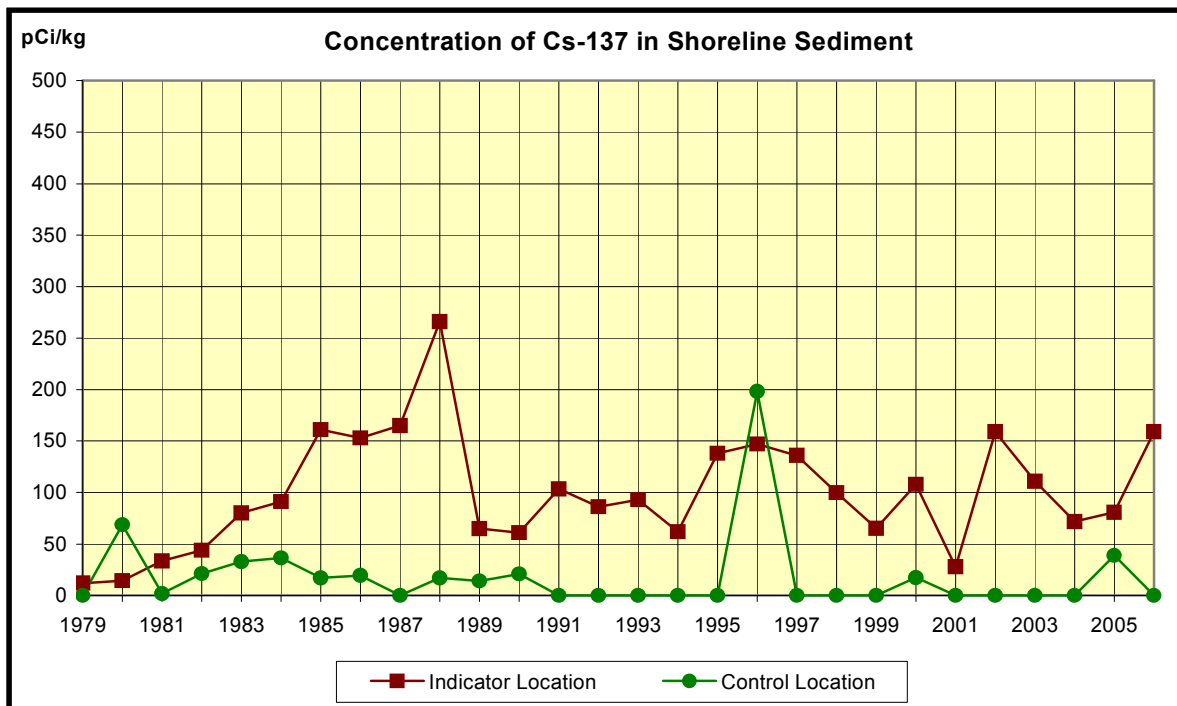
Figure 3.8-1 shows Cs-137 highest annual mean indicator and control location concentrations since 1979. Figure 3.8-2 shows Co-60 highest annual mean indicator and control location concentrations since 1979.



Cs-137 activity was detected in two of the four indicator samples taken. The shoreline sediment location with the highest annual mean was Location 130 with a mean concentration of 159 pCi/kg. Cs-137 was not detected in any control location samples.

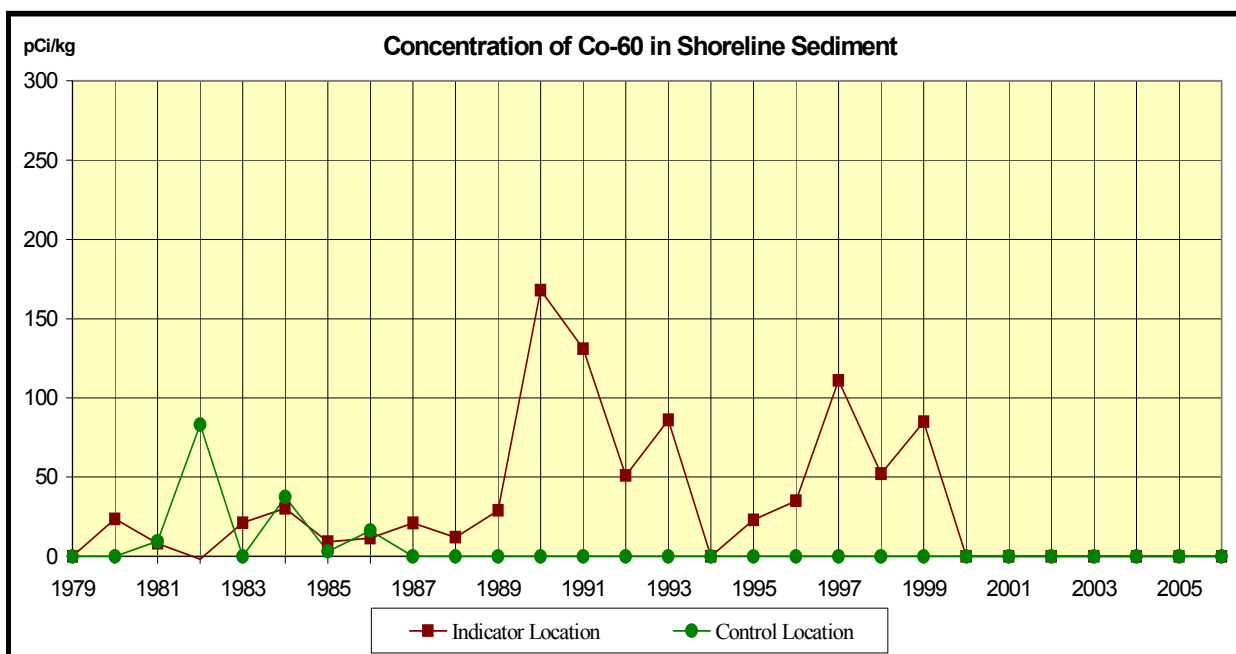
Table 3.8 gives indicator location highest annual means since 1979 for all radionuclides detected since the analysis change in 1988. There is no reporting level for shoreline sediment.

Figure 3.8-1



There is no reporting level for Cs-137 in shoreline sediment

Figure 3.8-2



There is no reporting level for Co-60 in shoreline sediment

Table 3.8 Mean Concentrations of Radionuclides in Shoreline Sediment (pCi/kg)

| YEAR | Mn-54 Indicator | Co-58 Indicator | Co-60 Indicator | Cs-134 Indicator | Cs-137 Indicator |
|------|--------------------|--------------------|--------------------|---------------------|---------------------|
| 1979 | -1.07E1 | 2.25E1 | -6.50E0 | 0.00E0 | 1.20E1 |
| 1980 | 1.06E1 | -8.74E0 | 2.36E1 | -3.53E0 | 1.44E1 |
| 1981 | 2.13E1 | 1.20E1 | 8.21E0 | 3.97E1 | 3.36E1 |
| 1982 | 5.38E1 | 1.66E1 | -1.69E0 | 7.67E1 | 4.40E1 |
| 1983 | 4.40E0 | 3.43E1 | 2.12E1 | 7.65E1 | 8.02E1 |
| 1984 | 1.19E1 | 7.11E1 | 3.04E1 | 3.34E1 | 9.13E1 |
| 1985 | 4.77E0 | 1.46E1 | 9.20E0 | 2.02E1 | 1.61E2 |
| 1986 | 1.37E1 | 1.02E1 | 1.16E1 | 6.35E1 | 1.53E2 |
| 1987 | 0.00E0 | 1.06E2 | 2.10E1 | 4.20E1 | 1.65E2 |
| 1988 | 6.50E0 | 9.20E1 | 1.20E1 | 9.10E0 | 2.66E2 |
| 1989 | 2.90E1 | 3.80E1 | 2.90E1 | 5.30E1 | 6.50E1 |
| 1990 | 3.80E1 | 2.70E1 | 1.68E2 | 0.00E0 | 6.10E1 |
| 1991 | 2.80E1 | 5.30E1 | 1.31E2 | 0.00E0 | 1.03E2 |
| 1992 | 9.40E0 | 0.00E0 | 5.10E1 | 9.20E0 | 8.60E1 |
| 1993 | 0.00E0 | 2.20E1 | 8.60E1 | 0.00E0 | 9.30E1 |
| 1994 | 4.10E1 | 0.00E0 | 0.00E0 | 0.00E0 | 8.00E1 |
| 1995 | 1.70E1 | 0.00E0 | 2.30E1 | 0.00E0 | 1.38E2 |
| 1996 | 2.90E1 | 1.78E1 | 3.50E1 | 0.00E0 | 1.47E2 |
| 1997 | 0.00E0 | 0.00E0 | 1.11E2 | 3.10E1 | 1.36E2 |
| 1998 | 0.00E0 | 0.00E0 | 5.21E1 | 0.00E0 | 9.97E1 |
| 1999 | 0.00E0 | 2.47E1 | 8.49E1 | 0.00E0 | 6.51E1 |
| 2000 | 0.00E0 | 3.04E1 | 0.00E0 | 0.00E0 | 1.08E2 |

Table 3.8 continued

| YEAR | Mn-54 Indicator | Co-58 Indicator | Co-60 Indicator | Cs-134 Indicator | Cs-137 Indicator |
|-------------|----------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|
| 2001 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 2.77E1 |
| 2002 | 2.24E1 | 0.00E0 | 0.00E0 | 0.00E0 | 1.59E2 |
| 2003 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 1.11E2 |
| 2004 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 7.17E1 |
| 2005 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 8.08E1 |
| 2006 | 0.00E0 | 0.00E0 | 0.00E0 | 0.00E0 | 1.59E2 |

3.9 DIRECT GAMMA RADIATION

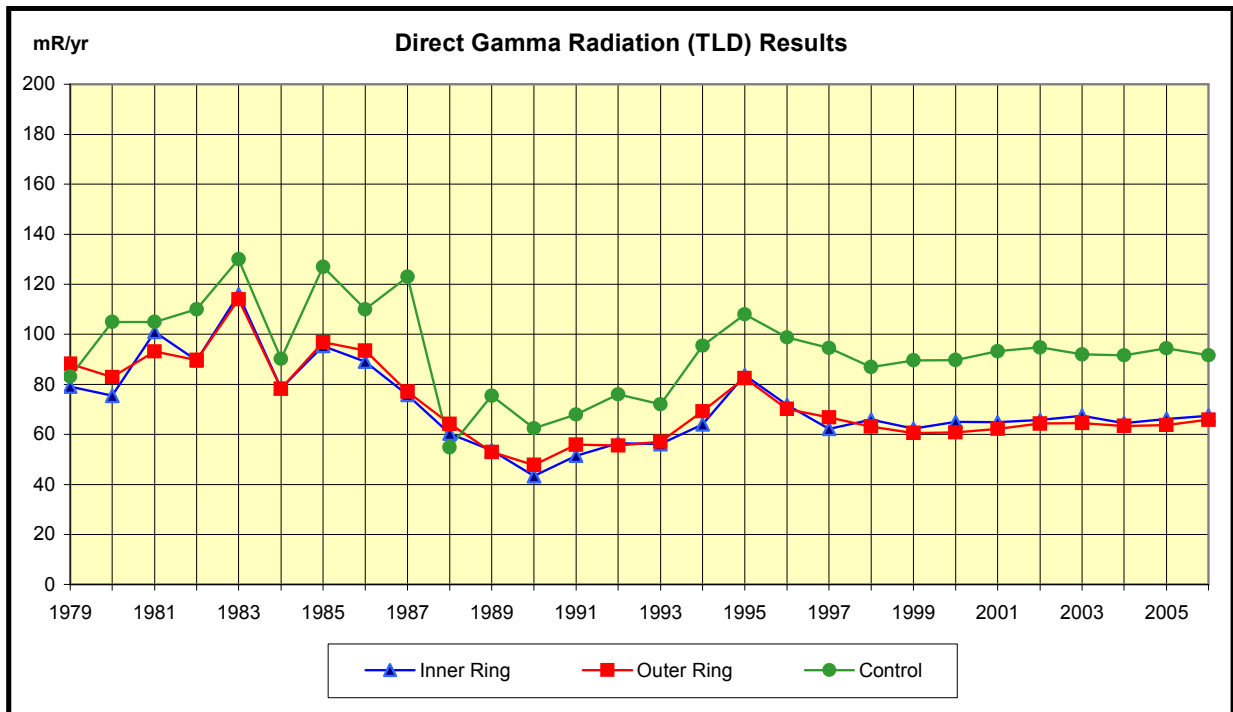
In 2006, 162 TLDs were analyzed, 158 at indicator locations, four at the control location. TLDs are collected and analyzed quarterly. The highest annual mean exposure for an indicator location was 112.4 milliroentgen. The annual mean exposure for the control location was 91.6 milliroentgen.



Figure 3.9 and Table 3.9 show TLD inner ring (site boundary), outer ring (4-5 miles), and control location annual averages in milliroentgen per year. Preoperational data and ten year rolling averages are also given. As shown in the graph, inner and outer ring averages historically compare closely, with control data somewhat higher. Inner and outer ring averages comprise a number of data points with the control average representing only one location.

The calculated total body dose from gaseous effluents for 2006 was 3.95E-1 millirem, which is 0.59% of the average inner ring TLD values. Therefore, it can be concluded that discharges from the plant had very little impact on the measured TLD values.

Figure 3.9



There is no reporting level for Direct Radiation (TLD)

Table 3.9 Direct Gamma Radiation (TLD) Results

| YEAR | Inner Ring Average (mR/yr) | Outer Ring Average (mR/yr) | Control (mR/yr) |
|------------------------------|---------------------------------------|---------------------------------------|----------------------------|
| 1979 | 7.91E1 | 8.82E1 | 8.32E1 |
| 1980 | 7.54E1* | 8.29E1* | 1.05E2 |
| 1981 | 1.01E2 | 9.31E1 | 1.05E2 |
| 1982 | 8.95E1 | 8.97E1 | 1.10E2 |
| 1983 | 1.16E2 | 1.14E2 | 1.30E2 |
| 1984 | 7.85E1 | 7.83E1 | 9.02E1 |
| 1985 | 9.54E1 | 9.69E1 | 1.27E2 |
| 1986 | 8.91E1 | 9.35E1 | 1.10E2 |
| 1987 | 7.58E1 | 7.71E1 | 1.23E2 |
| 1988 | 6.03E1 | 6.42E1 | 5.48E1 |
| 1989 | 5.37E1 | 5.30E1 | 7.55E1 |
| 1990 | 4.34E1 | 4.78E1 | 6.25E1 |
| 1991 | 5.14E1 | 5.59E1 | 6.80E1 |
| 1992 | 5.65E1 | 5.55E1 | 7.60E1 |
| 1993 | 5.61E1 | 5.71E1 | 7.20E1 |
| 1994 | 6.40E1 | 6.93E1 | 9.55E1 |
| 1995 | 8.36E1 | 8.25E1 | 1.08E2 |
| 1996 | 7.18E1 | 7.02E1 | 9.88E1 |
| 1997 | 6.22E1 | 6.68E1 | 9.45E1 |
| 1998 | 6.59E1 | 6.32E1 | 8.69E1 |
| 1999 | 6.23E1 | 6.05E1 | 8.96E1 |
| 2000 | 6.50E1 | 6.08E1 | 8.97E1 |
| 2001 | 6.51E1 | 6.22E1 | 9.33E1 |
| 2002 | 6.57E1 | 6.43E1 | 9.48E1 |
| 2003 | 6.74E1 | 6.45E1 | 9.20E1 |
| 2004 | 6.46E1 | 6.33E1 | 9.16E1 |
| 2005 | 6.62E1 | 6.34E1 | 9.44E1 |
| Average (1996 – 2005) | 6.56E1 | 6.39E1 | 9.26E1 |
| 2006 | 6.75E1 | 6.58E1 | 9.17E1 |

* Values are based on two quarters due to change in TLD locations.

3.10 LAND USE CENSUS

The land use census was conducted May 23 and May 24, 2006 as required by SLC 16.11.14. Table 3.10 summarizes census results. A map indicating identified locations is shown in Figure 3.10.

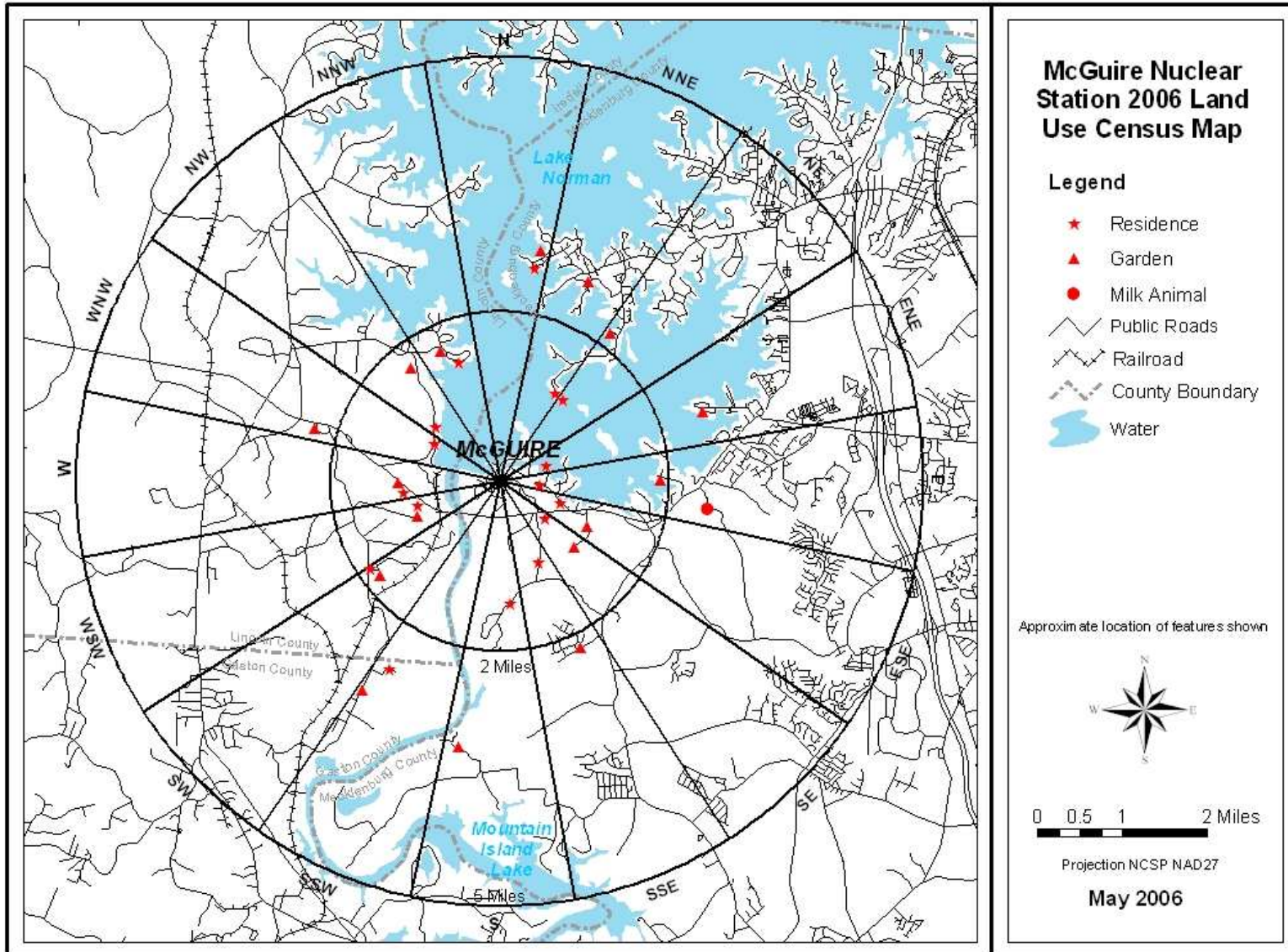
During the 2006 census, no new or closer irrigated gardens were identified. The nearest residence is located in the East sector at 0.48 miles. No environmental program changes were required as a result of the 2006 land use census.

Table 3.10 McGuire 2006 Land Use Census Results

| Sector | | Distance (Miles) | Sector | | Distance (Miles) |
|--------|----------------------------|------------------|--------|----------------------------|------------------|
| N | Nearest Residence | 2.53 | S | Nearest Residence | 1.45 |
| | Nearest Garden (irrigated) | 2.79 | | Nearest Garden | 3.19 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| NNE | Nearest Residence | 1.23 | SSW | Nearest Residence | 2.56 |
| | Nearest Garden | 2.53 | | Nearest Garden | 2.94 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| NE | Nearest Residence | 1.21 | SW | Nearest Residence | 1.85 |
| | Nearest Garden | 2.18 | | Nearest Garden | 1.89 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| ENE | Nearest Residence | 0.57 | WSW | Nearest Residence | 1.01 |
| | Nearest Garden (irrigated) | 2.54 | | Nearest Garden | 1.16 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| E | Nearest Residence | 0.48 | W | Nearest Residence | 1.15 |
| | Nearest Garden | 1.86 | | Nearest Garden | 1.15 |
| | Nearest Milk Animal (COW) | 2.48 | | Nearest Milk Animal | - |
| ESE | Nearest Residence | 0.65 | WNW | Nearest Residence | 0.88 |
| | Nearest Garden | 1.31 | | Nearest Garden | 2.14 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| SE | Nearest Residence | 0.67 | NW | Nearest Residence | 0.95 |
| | Nearest Garden | 1.18 | | Nearest Garden | 1.68 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |
| SSE | Nearest Residence | 1.06 | NNW | Nearest Residence | 1.48 |
| | Nearest Garden | 2.18 | | Nearest Garden (irrigated) | 1.69 |
| | Nearest Milk Animal | - | | Nearest Milk Animal | - |

“-“ indicates no occurrences within the 5 mile radius

Figure 3.10



4.0 EVALUATION OF DOSE

4.1 DOSE FROM ENVIRONMENTAL MEASUREMENTS

Annual doses to maximum exposed individuals were estimated based on measured concentrations of radionuclides in 2006 MNS REMP samples. The primary purpose of estimating doses based on sample results is to allow comparison to effluent program dose estimates.

Doses based on sample results were calculated using the methodology and data presented in NRC Regulatory Guide 1.109. Measured radionuclide concentrations, averaged over the entire year for a specific radionuclide, indicator location and sample type, were used to calculate REMP-based doses. Where applicable, average background concentration at the corresponding control location was subtracted. Regulatory Guide 1.109 consumption rates for the maximum exposed individual were used in the calculations. When the guide listed “NO DATA” as the dose factor for a given radionuclide and organ, a dose factor of zero was assumed.

Maximum dose estimates (Highest Annual Mean Concentration) based on drinking water, fish, and shoreline sediment sample results are reported in Table 4.1-A. The individual critical population and pathway dose calculations are reported in Table 4.1-B.

REMP-based dose estimates are not reported for airborne radioiodine or milk sample types because no radionuclides other than naturally occurring K-40 and Be-7 were detected in the samples. Dose estimates are not reported for surface water because sampled surface water is not considered to be a potable drinking water source although surface water tritium concentrations are used in calculating doses from fish. Exposure estimates based upon REMP TLD results are discussed in Section 3.9.

The maximum environmental organ dose estimate for any single sample type (other than direct radiation from gaseous effluents) collected during 2006 was 2.53E-1 mrem to the maximum exposed child bone from the consumption of broadleaf vegetation.

4.2 ESTIMATED DOSE FROM RELEASES

Throughout the year, dose estimates were calculated based on actual 2006 liquid and gaseous effluent release data. Effluent-based dose estimates were calculated using the RETDAS computer program which employs methodology and data presented in NRC Regulatory Guide 1.109. These doses are shown in Table 4.1-A along with the corresponding REMP-based dose estimates. Summaries of RETDAS dose calculations are reported in the Annual Radioactive Effluent Release Report (reference 6.6).

The effluent-based liquid release doses are summations of the dose contributions from the drinking water, fish, and shoreline pathways. The effluent-based gaseous release doses report noble gas exposure separately from iodine, particulate, and tritium exposure. For noble gas exposure there is no critical age group; as the maximum exposed individuals are assumed to receive the same doses, regardless of their age group. For iodine, particulate, and tritium exposure the effluent-based gaseous release doses are summations of the dose contributors from ground/plane, inhalation, milk and vegetation pathways.

4.3 COMPARISON OF DOSES

The environmental and effluent dose estimates given in Table 4.1-A agree reasonably well. The similarity of the doses indicate that the radioactivity levels in the environment do not differ significantly from those expected based on effluent measurements and modeling of the environmental exposure pathways. This indicates that effluent program dose estimates are both valid and reasonably conservative.

There are some differences in how effluent and environmental doses are calculated that affect the comparison. Doses calculated from environmental data are conservative because they are based on a mean that includes only samples with a net positive activity versus a mean that includes all sample results (i.e. zero results are not included in the mean). Also, airborne tritium is not measured in environmental samples but is used to calculate effluent doses.

In calculations based on liquid release pathways, drinking water and fish consumption were the predominant dose pathways based on environmental and effluent data. The maximum total organ dose based on 2006 environmental sample results was 1.76E-1 mrem to the child liver. The maximum total organ dose of 3.35E-1 mrem for liquid effluent-based estimates was to the child liver.

In calculations based on gaseous release pathways, inhalation was the predominant dose pathway for effluent samples. The maximum environmental organ dose for gaseous effluent estimates was 3.95E-1 mrem to the teen total body. The maximum environmental dose is 2.53E-1 mrem to the child bone due to ground plane pathway.

Noble gas samples are not collected as part of the REMP, preventing an analogous comparison of effluent-based noble gas exposure estimates.

The doses calculated do not exceed the 40CFR190 dose commitment limits for members of the public. Doses to members of the public attributable to the operation of MNS are being maintained well within regulatory limits.

TABLE 4.1-A

**MCGUIRE NUCLEAR STATION
2006 ENVIRONMENTAL AND EFFLUENT DOSE COMPARISON**

LIQUID RELEASE PATHWAY

| Organ | Environmental or Effluent Data | Critical Age ⁽¹⁾ | Critical Pathway ⁽²⁾ | Location | Maximum Dose ⁽³⁾ (mrem) |
|--------------|---------------------------------------|------------------------------------|--|-------------------|---|
| Skin | Environmental | Teen | Shoreline Sediment | 130 (0.52 mi SW) | 4.18E-04 |
| Skin | Effluent | Teen | Shoreline Sediment | 0.5 mi. NNE | 1.40E-03 |
| Bone | Environmental | Child | Fish | 129 (0.51 mi ENE) | 2.44E-02 |
| Bone | Effluent | Child | Fish | 0.5 mi. NNE | 5.78E-02 |
| Liver | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.76E-01 |
| Liver | Effluent | Child | Drinking Water | 0.5 mi. NNE | 3.35E-01 |
| T. Body | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.56E-01 |
| T. Body | Effluent | Child | Drinking Water | 0.5 mi. NNE | 2.82E-01 |
| Thyroid | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.53E-01 |
| Thyroid | Effluent | Child | Drinking Water | 0.5 mi. NNE | 2.72E-01 |
| Kidney | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.60E-01 |
| Kidney | Effluent | Child | Drinking Water | 0.5 mi. NNE | 2.92E-01 |
| Lung | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.56E-01 |
| Lung | Effluent | Child | Drinking Water | 0.5 mi. NNE | 2.79E-01 |
| GI-LLI | Environmental | Child | Drinking Water | 101 (3.31 mi E) | 1.53E-01 |
| GI-LLI | Effluent | Child | Drinking Water | 0.5 mi. NNE | 2.73E-01 |

- (1) Critical Age is the highest total dose (all pathways) to an age group.
- (2) Critical Pathway is the highest individual dose within the identified Critical Age group.
- (3) Maximum dose is a summation of the fish, drinking water and shoreline sediment pathways.

GASEOUS RELEASE PATHWAY**IODINE, PARTICULATE, and TRITIUM**

| Organ | Environmental or Effluent Data | Critical Age ⁽¹⁾ | Critical Pathway ⁽²⁾ | Location | Maximum Dose ⁽³⁾ (mrem) |
|--------------|---------------------------------------|------------------------------------|--|-------------------|---|
| Skin | Environmental | - | - | - | 0.00E+00 |
| Skin | Effluent | All | Ground Plane | 0.5 mi. ENE | 2.13E-05 |
| Bone | Environmental | Child | Vegetation | 120 (0.46 mi NNE) | 2.53E-01 |
| Bone | Effluent | Child | Ground Plane | 0.5 mi. ENE | 1.88E-05 |
| Liver | Environmental | Child | Vegetation | 120 (0.46 mi NNE) | 2.43E-01 |
| Liver | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |
| T. Body | Environmental | Adult | Vegetation | 120 (0.46 mi NNE) | 1.36E-01 |
| T. Body | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |
| Thyroid | Environmental | - | - | - | 0.00E+00 |
| Thyroid | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |
| Kidney | Environmental | Child | Vegetation | 120 (0.46 mi NNE) | 7.90E-02 |
| Kidney | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |
| Lung | Environmental | Child | Vegetation | 120 (0.46 mi NNE) | 2.84E-02 |
| Lung | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |
| GI-LLI | Environmental | Adult | Vegetation | 120 (0.46 mi NNE) | 4.02E-03 |
| GI-LLI | Effluent | Teen | Inhalation | 0.5 mi. ENE | 3.95E-01 |

(1) Critical Age is the highest total dose (all pathways) to an age group.

(2) Critical Pathway is the highest individual dose within the identified Critical Age group.

(3) Maximum dose is a summation of the ground/plane, inhalation, milk and vegetation pathways.

NOBLE GAS

| Air Dose | Environmental or Effluent Data | Critical Age | Critical Pathway | Location | Maximum Dose (mrad) |
|-----------------|---------------------------------------|---------------------|-------------------------|-----------------|----------------------------|
| Beta | Environmental | - | - | - | Not Sampled |
| Beta | Effluent | N/A | Noble Gas | 0.5 mi. NNE | 1.78E-02 |
| Gamma | Environmental | - | - | - | Not Sampled |
| Gamma | Effluent | N/A | Noble Gas | 0.5 mi. NNE | 4.52E-02 |

TABLE 4.1-B*Maximum Individual Dose for 2006 based on Environmental Measurements (mrem) for McGuire Nuclear Station*

| Age | Sample Medium | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Skin |
|---------------|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Infant | Airborne | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Drinking Water | 0.00E+00 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 0.00E+00 |
| | Milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | <u>TOTAL</u> | 0.00E+00 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 0.00E+00 |
| Child | Airborne | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Drinking Water | 0.00E+00 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 0.00E+00 |
| | Milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Broadleaf Vegetation | 2.53E-01 | 2.43E-01 | 3.58E-02 | 0.00E+00 | 7.90E-02 | 2.84E-02 | 1.52E-03 | 0.00E+00 |
| | Fish | 2.44E-02 | 2.51E-02 | 5.25E-03 | 1.80E-03 | 9.41E-03 | 4.54E-03 | 1.95E-03 | 0.00E+00 |
| | Shoreline Sediment | 0.00E+00 | 0.00E+00 | 7.48E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.73E-05 |
| | <u>TOTAL</u> | 2.77E-01 | 4.19E-01 | 1.92E-01 | 1.53E-01 | 2.39E-01 | 1.84E-01 | 1.54E-01 | 8.73E-05 |
| Teen | Airborne | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Drinking Water | 0.00E+00 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 0.00E+00 |
| | Milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Broadleaf Vegetation | 1.40E-01 | 1.86E-01 | 6.50E-02 | 0.00E+00 | 6.35E-02 | 2.47E-02 | 2.65E-03 | 0.00E+00 |
| | Fish | 1.94E-02 | 2.79E-02 | 1.12E-02 | 2.18E-03 | 1.09E-02 | 5.59E-03 | 2.55E-03 | 0.00E+00 |
| | Shoreline Sediment | 0.00E+00 | 0.00E+00 | 3.58E-04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.18E-04 |
| | <u>TOTAL</u> | 1.59E-01 | 2.93E-01 | 1.55E-01 | 8.11E-02 | 1.53E-01 | 1.09E-01 | 8.41E-02 | 4.18E-04 |
| Adult | Airborne | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Drinking Water | 0.00E+00 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 0.00E+00 |
| | Milk | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | Broadleaf Vegetation | 1.52E-01 | 2.08E-01 | 1.36E-01 | 0.00E+00 | 7.06E-02 | 2.35E-02 | 4.02E-03 | 0.00E+00 |
| | Fish | 1.81E-02 | 2.76E-02 | 1.90E-02 | 2.84E-03 | 1.12E-02 | 5.63E-03 | 3.32E-03 | 0.00E+00 |
| | Shoreline Sediment | 0.00E+00 | 0.00E+00 | 6.41E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.48E-05 |
| | <u>TOTAL</u> | 1.70E-01 | 3.48E-01 | 2.67E-01 | 1.15E-01 | 1.94E-01 | 1.41E-01 | 1.19E-01 | 7.48E-05 |

Note: Dose tables are provided for sample media displaying positive nuclide occurrence.

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2006 Data
Maximum Exposed Infant

Infant Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 330 l

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Water (pCi/l) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| Mn-54 | NO DATA | 1.99E-05 | 4.51E-06 | NO DATA | 4.41E-06 | NO DATA | 7.31E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 3.60E-06 | 8.98E-06 | NO DATA | NO DATA | NO DATA | 8.97E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 3.08E-05 | 5.38E-05 | 2.12E-05 | NO DATA | NO DATA | 1.59E-05 | 2.57E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-60 | NO DATA | 1.08E-05 | 2.55E-05 | NO DATA | NO DATA | NO DATA | 2.57E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 1.84E-05 | 6.31E-05 | 2.91E-05 | NO DATA | 3.06E-05 | NO DATA | 5.33E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Nb-95 | 4.20E-08 | 1.73E-08 | 1.00E-08 | NO DATA | 1.24E-08 | NO DATA | 1.46E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zr-95 | 2.06E-07 | 5.02E-08 | 3.56E-08 | NO DATA | 5.41E-08 | NO DATA | 2.50E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| I-131 | 3.59E-05 | 4.23E-05 | 1.86E-05 | 1.39E-02 | 4.94E-05 | NO DATA | 1.51E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 3.77E-04 | 7.03E-04 | 7.10E-05 | NO DATA | 1.81E-04 | 7.42E-05 | 1.91E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 5.22E-04 | 6.11E-04 | 4.33E-05 | NO DATA | 1.64E-04 | 6.64E-05 | 1.91E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BaLa-140 | 1.71E-04 | 1.71E-07 | 8.81E-06 | NO DATA | 4.06E-08 | 1.05E-07 | 4.20E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| H-3 | NO DATA | 3.08E-07 | 3.08E-07 | 3.08E-07 | 3.08E-07 | 3.08E-07 | 3.08E-07 | 101 | 1460 | 0.00E+00 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 |
| Dose Commitment (mrem) = | | | | | | | | | | 0.00E+00 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 | 1.48E-01 |

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2006 Data
Maximum Exposed Child

Child Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 510 l

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Water (pCi/l) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| Mn-54 | NO DATA | 1.07E-05 | 2.85E-06 | NO DATA | 3.00E-06 | NO DATA | 8.98E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 1.80E-06 | 5.51E-06 | NO DATA | NO DATA | NO DATA | 1.05E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 1.65E-05 | 2.67E-05 | 1.33E-05 | NO DATA | NO DATA | 7.74E-06 | 2.78E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C0-60 | NO DATA | 5.29E-06 | 1.56E-05 | NO DATA | NO DATA | NO DATA | 2.93E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 1.37E-05 | 3.65E-05 | 2.27E-05 | NO DATA | 2.30E-05 | NO DATA | 6.41E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Nb-95 | 2.25E-08 | 8.76E-09 | 6.26E-09 | NO DATA | 8.23E-09 | NO DATA | 1.62E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zr-95 | 1.16E-07 | 2.55E-08 | 2.27E-08 | NO DATA | 3.65E-08 | NO DATA | 2.66E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| I-131 | 1.72E-05 | 1.73E-05 | 9.83E-06 | 5.72E-03 | 2.84E-05 | NO DATA | 1.54E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 2.34E-04 | 3.84E-04 | 8.10E-05 | NO DATA | 1.19E-04 | 4.27E-05 | 2.07E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 3.27E-04 | 3.13E-04 | 4.62E-05 | NO DATA | 1.02E-04 | 3.67E-05 | 1.96E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BaLa-140 | 8.31E-05 | 7.28E-08 | 4.85E-06 | NO DATA | 2.37E-08 | 4.34E-08 | 4.21E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| H-3 | NO DATA | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 101 | 1460 | 0.00E+00 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 |
| Dose Commitment (mrem) = | | | | | | | | | | 0.00E+00 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 | 1.51E-01 |

McGuire Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2006 Data
Maximum Exposed Child

Child Dose from Vegetation Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

Usage (intake in one year) = 26 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Food (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| I-131 | 1.72E-05 | 1.73E-05 | 9.83E-06 | 5.72E-03 | 2.84E-05 | NO DATA | 1.54E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 2.34E-04 | 3.84E-04 | 8.10E-05 | NO DATA | 1.19E-04 | 4.27E-05 | 2.07E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 3.27E-04 | 3.13E-04 | 4.62E-05 | NO DATA | 1.02E-04 | 3.67E-05 | 1.96E-06 | 120 | 29.8 | 2.53E-01 | 2.43E-01 | 3.58E-02 | 0.00E+00 | 7.90E-02 | 2.84E-02 | 1.52E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 2.53E-01 | 2.43E-01 | 3.58E-02 | 0.00E+00 | 7.90E-02 | 2.84E-02 | 1.52E-03 |

McGuire Nuclear Station
Dose from Fish Pathway for 2006 Data
Maximum Exposed Child

Child Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 1431 pCi/l x 0.9 = 1288 pCi/kg

Usage (intake in one year) = 6.9 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Fish (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| Mn-54 | NO DATA | 1.07E-05 | 2.85E-06 | NO DATA | 3.00E-06 | NO DATA | 8.98E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 1.80E-06 | 5.51E-06 | NO DATA | NO DATA | NO DATA | 1.05E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 1.65E-05 | 2.67E-05 | 1.33E-05 | NO DATA | NO DATA | 7.74E-06 | 2.78E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C0-60 | NO DATA | 5.29E-06 | 1.56E-05 | NO DATA | NO DATA | NO DATA | 2.93E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 1.37E-05 | 3.65E-05 | 2.27E-05 | NO DATA | 2.30E-05 | NO DATA | 6.41E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 2.34E-04 | 3.84E-04 | 8.10E-05 | NO DATA | 1.19E-04 | 4.27E-05 | 2.07E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 3.27E-04 | 3.13E-04 | 4.62E-05 | NO DATA | 1.02E-04 | 3.67E-05 | 1.96E-06 | 129 | 10.80 | 2.44E-02 | 2.33E-02 | 3.44E-03 | 0.00E+00 | 7.60E-03 | 2.73E-03 | 1.46E-04 |
| H-3 | NO DATA | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 2.03E-07 | 128 | 1288 | 0.00E+00 | 1.80E-03 | 1.80E-03 | 1.80E-03 | 1.80E-03 | 1.80E-03 | 1.80E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 2.44E-02 | 2.51E-02 | 5.25E-03 | 1.80E-03 | 9.41E-03 | 4.54E-03 | 1.95E-03 |

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2006 Data
Maximum Exposed Child

Shoreline Recreation = 14 hr (in one year)
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)
 Sediment Surface Mass = 40 kg/m²

Child Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m²) x Shore Width Factor x Sediment Surface Mass (kg/m²) x Sediment Concentration (pCi/kg)

| Radionuclide | <u>External Dose Factor Standing on Contaminated Ground</u> (mrem/hr per pCi/m ²) | | Indicator Location | Sediment (pCi/kg) | <u>Dose</u> (mrem) | |
|--------------------------|--|----------|--------------------|-------------------|-----------------------|----------|
| | T. Body | Skin | | | T. Body | Skin |
| Mn-54 | 5.80E-09 | 6.80E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-58 | 7.00E-09 | 8.20E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-60 | 1.70E-08 | 2.00E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 1.20E-08 | 1.40E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 4.20E-09 | 4.90E-09 | 130 | 159 | 7.48E-05 | 8.73E-05 |
| Dose Commitment (mrem) = | | | | | 7.48E-05 | 8.73E-05 |

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2006 Data
Maximum Exposed Teen

Teen Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 510 l

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|-------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Water (pCi/l) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| | | | | | | | | | | | | | | | | |
| Mn-54 | NO DATA | 5.90E-06 | 1.17E-06 | NO DATA | 1.76E-06 | NO DATA | 1.21E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 9.72E-07 | 2.24E-06 | NO DATA | NO DATA | NO DATA | 1.34E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 5.87E-06 | 1.37E-05 | 5.29E-06 | NO DATA | NO DATA | 4.32E-06 | 3.24E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-60 | NO DATA | 2.81E-06 | 6.33E-06 | NO DATA | NO DATA | NO DATA | 3.66E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 5.76E-06 | 2.00E-05 | 9.33E-06 | NO DATA | 1.28E-05 | NO DATA | 8.47E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Nb-95 | 8.22E-09 | 4.56E-09 | 2.51E-09 | NO DATA | 4.42E-09 | NO DATA | 1.95E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zr-95 | 4.12E-08 | 1.30E-08 | 8.94E-09 | NO DATA | 1.91E-08 | NO DATA | 3.00E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| I-131 | 5.85E-06 | 8.19E-06 | 4.40E-06 | 2.39E-03 | 1.41E-05 | NO DATA | 1.62E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 8.37E-05 | 1.97E-04 | 9.14E-05 | NO DATA | 6.26E-05 | 2.39E-05 | 2.45E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 1.12E-04 | 1.49E-04 | 5.19E-05 | NO DATA | 5.07E-05 | 1.97E-05 | 2.12E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BaLa-140 | 2.84E-05 | 3.48E-08 | 1.83E-06 | NO DATA | 1.18E-08 | 2.34E-08 | 4.38E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| H-3 | NO DATA | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 101 | 1460 | 0.00E+00 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 |
| Dose Commitment (mrem)= | | | | | | | | | | 0.00E+00 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 | 7.89E-02 |

McGuire Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2006 Data
Maximum Exposed Teen

Teen Dose from Vegetation Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

Usage (intake in one year) = 42 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Food (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| I-131 | 5.85E-06 | 8.19E-06 | 4.40E-06 | 2.39E-03 | 1.41E-05 | NO DATA | 1.62E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 8.37E-05 | 1.97E-04 | 9.14E-05 | NO DATA | 6.26E-05 | 2.39E-05 | 2.45E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 1.12E-04 | 1.49E-04 | 5.19E-05 | NO DATA | 5.07E-05 | 1.97E-05 | 2.12E-06 | 120 | 29.8 | 1.40E-01 | 1.86E-01 | 6.50E-02 | 0.00E+00 | 6.35E-02 | 2.47E-02 | 2.65E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 1.40E-01 | 1.86E-01 | 6.50E-02 | 0.00E+00 | 6.35E-02 | 2.47E-02 | 2.65E-03 |

McGuire Nuclear Station
Dose from Fish Pathway for 2006 Data
Maximum Exposed Teen

Teen Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 1431 pCi/l x 0.9 = 1288 pCi/kg

Usage (intake in one year) = 16 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|----------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Location | (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| Mn-54 | NO DATA | 5.90E-06 | 1.17E-06 | NO DATA | 1.76E-06 | NO DATA | 1.21E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 9.72E-07 | 2.24E-06 | NO DATA | NO DATA | NO DATA | 1.34E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 5.87E-06 | 1.37E-05 | 5.29E-06 | NO DATA | NO DATA | 4.32E-06 | 3.24E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-60 | NO DATA | 2.81E-06 | 6.33E-06 | NO DATA | NO DATA | NO DATA | 3.66E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 5.76E-06 | 2.00E-05 | 9.33E-06 | NO DATA | 1.28E-05 | NO DATA | 8.47E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 8.37E-05 | 1.97E-04 | 9.14E-05 | NO DATA | 6.26E-05 | 2.39E-05 | 2.45E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 1.12E-04 | 1.49E-04 | 5.19E-05 | NO DATA | 5.07E-05 | 1.97E-05 | 2.12E-06 | 129 | 10.80 | 1.94E-02 | 2.57E-02 | 8.97E-03 | 0.00E+00 | 8.76E-03 | 3.40E-03 | 3.66E-04 |
| H-3 | NO DATA | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 1.06E-07 | 128 | 1288 | 0.00E+00 | 2.18E-03 | 2.18E-03 | 2.18E-03 | 2.18E-03 | 2.18E-03 | 2.18E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 1.94E-02 | 2.79E-02 | 1.12E-02 | 2.18E-03 | 1.09E-02 | 5.59E-03 | 2.55E-03 |

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2006 Data
Maximum Exposed Teen

Shoreline Recreation = 67 hr (in one year)
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)
 Sediment Surface Mass = 40 kg/m²

Teen Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m²) x Shore Width Factor x Sediment Surface Mass (kg/m²) x Sediment Concentration (pCi/kg)

| Radionuclide | External Dose Factor Standing <u>on Contaminated Ground</u> | | Indicator Location | Sediment (pCi/kg) | <u>Dose</u> | |
|--------------------------|--|----------|-----------------------|----------------------|-------------|----------|
| | (mrem/hr per pCi/m ²) | | | | (mrem) | |
| | T. Body | Skin | | | T. Body | Skin |
| Mn-54 | 5.80E-09 | 6.80E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-58 | 7.00E-09 | 8.20E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-60 | 1.70E-08 | 2.00E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 1.20E-08 | 1.40E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 4.20E-09 | 4.90E-09 | 130 | 159 | 3.58E-04 | 4.18E-04 |
| Dose Commitment (mrem) = | | | | | 3.58E-04 | 4.18E-04 |

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2006 Data
Maximum Exposed Adult

Adult Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 730 l

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator | Water (pCi/l) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| | | | | | | | | Location | | | | | | | | |
| Mn-54 | NO DATA | 4.57E-06 | 8.72E-07 | NO DATA | 1.36E-06 | NO DATA | 1.40E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 7.45E-07 | 1.67E-06 | NO DATA | NO DATA | NO DATA | 1.51E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 4.34E-06 | 1.02E-05 | 3.91E-06 | NO DATA | NO DATA | 2.85E-06 | 3.40E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-60 | NO DATA | 2.14E-06 | 4.72E-06 | NO DATA | NO DATA | NO DATA | 4.02E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 4.84E-06 | 1.54E-05 | 6.96E-06 | NO DATA | 1.03E-05 | NO DATA | 9.70E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Nb-95 | 6.22E-09 | 3.46E-09 | 1.86E-09 | NO DATA | 3.42E-09 | NO DATA | 2.10E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zr-95 | 3.04E-08 | 9.75E-09 | 6.60E-09 | NO DATA | 1.53E-08 | NO DATA | 3.09E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| I-131 | 4.16E-06 | 5.95E-06 | 3.41E-06 | 1.95E-03 | 1.02E-05 | NO DATA | 1.57E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 6.22E-05 | 1.48E-04 | 1.21E-04 | NO DATA | 4.79E-05 | 1.59E-05 | 2.59E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 7.97E-05 | 1.09E-04 | 7.14E-05 | NO DATA | 3.70E-05 | 1.23E-05 | 2.11E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BaLa-140 | 2.03E-05 | 2.55E-08 | 1.33E-06 | NO DATA | 8.67E-09 | 1.46E-08 | 4.18E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| H-3 | NO DATA | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 101 | 1460 | 0.00E+00 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 |
| Dose Commitment (mrem) = | | | | | | | | | | 0.00E+00 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 | 1.12E-01 |

McGuire Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2006 Data
Maximum Exposed Adult

Adult Dose from Vegetation (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

Usage (intake in one year) = 64 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|---------------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Indicator Location | Food (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| I-131 | 4.16E-06 | 5.95E-06 | 3.41E-06 | 1.95E-03 | 1.02E-05 | NO DATA | 1.57E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 6.22E-05 | 1.48E-04 | 1.21E-04 | NO DATA | 4.79E-05 | 1.59E-05 | 2.59E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 7.97E-05 | 1.09E-04 | 7.14E-05 | NO DATA | 3.70E-05 | 1.23E-05 | 2.11E-06 | 120 | 29.8 | 1.52E-01 | 2.08E-01 | 1.36E-01 | 0.00E+00 | 7.06E-02 | 2.35E-02 | 4.02E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 1.52E-01 | 2.08E-01 | 1.36E-01 | 0.00E+00 | 7.06E-02 | 2.35E-02 | 4.02E-03 |

McGuire Nuclear Station
Dose from Fish Pathway for 2006 Data
Maximum Exposed Adult

Adult Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 1431 pCi/l x 0.9 = 1288 pCi/kg

Usage (intake in one year) = 21 kg

| Radionuclide | <u>Ingestion Dose Factor</u> | | | | | | | <u>Highest Annual Net Mean Concentration</u> | | <u>Dose (mrem)</u> | | | | | | |
|--------------------------|------------------------------|----------|----------|----------|----------|----------|----------|--|----------|--------------------|----------|----------|----------|----------|----------|----------|
| | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI | Location | (pCi/kg) | Bone | Liver | T. Body | Thyroid | Kidney | Lung | GI-LLI |
| Mn-54 | NO DATA | 4.57E-06 | 8.72E-07 | NO DATA | 1.36E-06 | NO DATA | 1.40E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | NO DATA | 7.45E-07 | 1.67E-06 | NO DATA | NO DATA | NO DATA | 1.51E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Fe-59 | 4.34E-06 | 1.02E-05 | 3.91E-06 | NO DATA | NO DATA | 2.85E-06 | 3.40E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-60 | NO DATA | 2.14E-06 | 4.72E-06 | NO DATA | NO DATA | NO DATA | 4.02E-05 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zn-65 | 4.84E-06 | 1.54E-05 | 6.96E-06 | NO DATA | 1.03E-05 | NO DATA | 9.70E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 6.22E-05 | 1.48E-04 | 1.21E-04 | NO DATA | 4.79E-05 | 1.59E-05 | 2.59E-06 | ALL | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 7.97E-05 | 1.09E-04 | 7.14E-05 | NO DATA | 3.70E-05 | 1.23E-05 | 2.11E-06 | 129 | 10.80 | 1.81E-02 | 2.47E-02 | 1.62E-02 | 0.00E+00 | 8.39E-03 | 2.79E-03 | 4.79E-04 |
| H-3 | NO DATA | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 1.05E-07 | 128 | 1288 | 0.00E+00 | 2.84E-03 | 2.84E-03 | 2.84E-03 | 2.84E-03 | 2.84E-03 | 2.84E-03 |
| Dose Commitment (mrem) = | | | | | | | | | | 1.81E-02 | 2.76E-02 | 1.90E-02 | 2.84E-03 | 1.12E-02 | 5.63E-03 | 3.32E-03 |

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2006 Data
Maximum Exposed Adult

Shoreline Recreation = 12 hr (in one year)
 Shore Width Factor = 0.3 (lake shore - location 129)
 Shore Width Factor = 0.2 (river shoreline - location 130)
 Sediment Surface Mass = 40 kg/m²

Adult Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m²) x Shore Width Factor x Sediment Surface Mass (kg/m²) x Sediment Concentration (pCi/kg)

| Radionuclide | External Dose Factor Standing on Contaminated Ground (mrem/hr per pCi/m ²) | | Highest Annual Net Mean Concentration | | Dose (mrem) | |
|--------------------------|--|----------|--|----------------------|----------------|----------|
| | T. Body | Skin | Indicator Location | Sediment (pCi/kg) | T. Body | Skin |
| Mn-54 | 5.80E-09 | 6.80E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-58 | 7.00E-09 | 8.20E-09 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Co-60 | 1.70E-08 | 2.00E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-134 | 1.20E-08 | 1.40E-08 | ALL | 0.00 | 0.00E+00 | 0.00E+00 |
| Cs-137 | 4.20E-09 | 4.90E-09 | 130 | 159 | 6.41E-05 | 7.48E-05 |
| Dose Commitment (mrem) = | | | | | 6.41E-05 | 7.48E-05 |

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 2006. Interlaboratory cross-check standards, including, Marinelli beakers, air filters, air cartridges, gross beta on smears, and tritium in water samples were analyzed at various times of the year by the four counting laboratories in Duke Energy for this program. A summary of these Intercomparison Reports for 2006 is documented in Table 5.0-A.

5.6 DUKE ENERGY AUDITS

The McGuire Radiation Protection Section was audited by the Quality Assurance Group in 2006. There were some REMP areas for improvement identified as a result of the audit (PIP M-06-01151).

EnRad Laboratories was audited by the Quality Assurance Group in 2006. There were no REMP recommendations as a result of the audit.

5.7 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

The McGuire Nuclear Station Radiological Environmental Monitoring Program was not audited by the NRC in 2006. The program was audited in 2005 (Reference 6.12). There were no findings or issues identified by the audit.

5.8 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, water, milk, vegetation, sediment, and fish samples which have been collected to the State of North Carolina Radiation Protection Section for intercomparison analysis.

5.9 TLD INTERCOMPARISON PROGRAM

5.9.1 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-B.

5.9.2 STATE OF NORTH CAROLINA INTERCOMPARISON PROGRAM

Radiation Dosimetry and Records routinely participates in a TLD intercomparison program. The State of North Carolina Radiation Protection Section irradiates environmental dosimeters and sends them to the Radiation Dosimetry and Records group for analysis of the unknown estimated delivered exposure. A summary of the State of North Carolina Environmental Dosimetry Intercomparison Report for 2006 is documented in Table 5.0-B.

5.9.3 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-B.

TABLE 5.0-A
DUKE POWER COMPANY
INTERLABORATORY COMPARISON PROGRAM
2006 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.

Footnote explanations are included following this data 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 |
|----------------|-------------|---------|---------------------------|--------------------------|------------------------------|--------------------|
| 3/20/2006 | Q061GWS | Cr-51 | 3.02 - 5.35 E5 | 4.02 E5 | 3.88 E5 | 3 Pass |
| | | Co-57 | 1.37 - 2.42 E4 | 1.82 E4 | 1.86 E4 | 3 Pass |
| | | Co-60 | 0.76 - 1.34 E5 | 1.01 E5 | 0.95 E5 | 3 Pass |
| | | Sr-85 | 7.28 - 12.91 E4 | 9.71 E4 | 9.00 E4 | 3 Pass |
| | | Y-88 | 1.27 - 2.25 E5 | 1.69 E5 | 1.62 E5 | 3 Pass |
| | | Cd-109 | 3.72 - 6.60 E5 | 4.96 E5 | 4.97 E5 | 3 Pass |
| | | Sn-113 | 6.65 - 11.80 E4 | 8.87 E4 | 8.60 E4 | 3 Pass |
| | | Te-123M | 1.62 - 2.86 E4 | 2.15 E4 | 2.09 E4 | 3 Pass |
| | | Cs-137 | 6.30 - 11.17 E4 | 8.40 E4 | 7.69 E4 | 3 Pass |
| 5/16/2006 | Q062GWR | Cr-51 | 0.94 - 1.67 E4 | 1.26 E4 | 1.26 E4 | 3 Pass |
| | | Co-57 | 1.97 - 3.50 E2 | 2.63 E2 | 2.76 E2 | 3 Pass |
| | | Co-60 | 0.98 - 1.75 E3 | 1.31 E3 | 1.30 E3 | 3 Pass |
| | | Sr-85 | 1.39 - 2.47 E3 | 1.86 E3 | 1.82 E3 | 3 Pass |
| | | Y-88 | 2.07 - 3.66 E3 | 2.76 E3 | 2.69 E3 | 3 Pass |
| | | Cd-109 | 4.99 - 8.86 E3 | 6.66 E3 | 6.57 E3 | 3 Pass |
| | | Sn-113 | 1.06 - 1.89 E3 | 1.42 E3 | 1.25 E3 | 3 Pass |
| | | Te-123M | 2.62 - 4.64 E2 | 3.49 E2 | 3.40 E2 | 3 Pass |
| | | Cs-137 | 0.82 - 1.45 E3 | 1.09 E3 | 1.06 E3 | 3 Pass |
| 10/11/2006 | Q064GWS | Cr-51 | 7.12 - 12.62 E4 | 9.49 E4 | 9.66 E4 | 3 Pass |
| | | Mn-54 | 5.26 - 9.33 E4 | 7.02 E4 | 7.41 E4 | 3 Pass |
| | | Co-58 | 4.17 - 7.39 E4 | 5.55 E4 | 5.66 E4 | 3 Pass |
| | | Fe-59 | 1.42 - 2.53 E4 | 1.90 E4 | 2.01 E4 | 3 Pass |
| | | Co-60 | 6.57 - 11.65 E4 | 8.76 E4 | 9.26 E4 | 3 Pass |
| | | Zn-65 | 6.67 - 11.84 E4 | 8.90 E4 | 9.30 E4 | 3 Pass |
| | | Cs-134 | 4.12 - 7.30 E4 | 5.49 E4 | 5.12 E4 | 3 Pass |
| | | Cs-137 | 0.87 - 1.54 E5 | 1.16 E5 | 1.12 E5 | 3 Pass |
| | | Ce-141 | 2.40 - 4.26 E4 | 3.20 E4 | 3.30 E4 | 3 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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 3/20/2006 | Q061GWS | Cr-51 | 3.02 - 5.35 E5 | 4.02 E5 | 3.70 E5 | 3 Pass |
| | | Co-57 | 1.37 - 2.42 E4 | 1.82 E4 | 1.80 E4 | 3 Pass |
| | | Co-60 | 0.76 - 1.34 E5 | 1.01 E5 | 0.92 E5 | 3 Pass |
| | | Sr-85 | 7.28 - 12.91 E4 | 9.71 E4 | 8.73 E4 | 3 Pass |
| | | Y-88 | 1.27 - 2.25 E5 | 1.69 E5 | 1.56 E5 | 3 Pass |
| | | Cd-109 | 3.72 - 6.60 E5 | 4.96 E5 | 4.59 E5 | 3 Pass |
| | | Sn-113 | 6.65 - 11.80 E4 | 8.87 E4 | 8.27 E4 | 3 Pass |
| | | Te-123M | 1.62 - 2.86 E4 | 2.15 E4 | 2.00 E4 | 3 Pass |
| | | Cs-137 | 6.30 - 11.17 E4 | 8.40 E4 | 7.54 E4 | 3 Pass |
| 5/16/2006 | Q062GWR | Cr-51 | 0.94 - 1.67 E4 | 1.26 E4 | 1.20 E4 | 3 Pass |
| | | Co-57 | 1.97 - 3.50 E2 | 2.63 E2 | 2.64 E2 | 3 Pass |
| | | Co-60 | 0.98 - 1.75 E3 | 1.31 E3 | 1.26 E3 | 3 Pass |
| | | Sr-85 | 1.39 - 2.47 E3 | 1.86 E3 | 1.76 E3 | 3 Pass |
| | | Y-88 | 2.07 - 3.66 E3 | 2.76 E3 | 2.58 E3 | 3 Pass |
| | | Cd-109 | 4.99 - 8.86 E3 | 6.66 E3 | 6.34 E3 | 3 Pass |
| | | Sn-113 | 1.06 - 1.89 E3 | 1.42 E3 | 1.17 E3 | 3 Pass |
| | | Te-123M | 2.62 - 4.64 E2 | 3.49 E2 | 3.02 E2 | 3 Pass |
| | | Cs-137 | 0.82 - 1.45 E3 | 1.09 E3 | 0.99 E3 | 3 Pass |
| 10/11/2006 | Q064GWS | Cr-51 | 7.12 - 12.62 E4 | 9.49 E4 | 9.42 E4 | 3 Pass |
| | | Mn-54 | 5.26 - 9.33 E4 | 7.02 E4 | 7.38 E4 | 3 Pass |
| | | Co-58 | 4.17 - 7.39 E4 | 5.55 E4 | 5.63 E4 | 3 Pass |
| | | Fe-59 | 1.42 - 2.53 E4 | 1.90 E4 | 2.00 E4 | 3 Pass |
| | | Co-60 | 6.57 - 11.65 E4 | 8.76 E4 | 8.73 E4 | 3 Pass |
| | | Zn-65 | 6.67 - 11.84 E4 | 8.90 E4 | 9.26 E4 | 3 Pass |
| | | Cs-134 | 4.12 - 7.30 E4 | 5.49 E4 | 5.02 E4 | 3 Pass |
| | | Cs-137 | 0.87 - 1.54 E5 | 1.16 E5 | 1.12 E5 | 3 Pass |
| | | Ce-141 | 2.40 - 4.26 E4 | 3.20 E4 | 3.25 E4 | 3 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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 3/20/2006 | Q061GWS | Cr-51 | 3.02 - 5.35 E5 | 4.02 E5 | 3.76 E5 | 3 Pass |
| | | Co-57 | 1.37 - 2.42 E4 | 1.82 E4 | 1.70 E4 | 3 Pass |
| | | Co-60 | 0.76 - 1.34 E5 | 1.01 E5 | 0.92 E5 | 3 Pass |
| | | Sr-85 | 7.28 - 12.91 E4 | 9.71 E4 | 8.50 E4 | 3 Pass |
| | | Y-88 | 1.27 - 2.25 E5 | 1.69 E5 | 1.54 E5 | 3 Pass |
| | | Cd-109 | 3.72 - 6.60 E5 | 4.96 E5 | 4.53 E5 | 3 Pass |
| | | Sn-113 | 6.65 - 11.80 E4 | 8.87 E4 | 8.23 E4 | 3 Pass |
| | | Te-123M | 1.62 - 2.86 E4 | 2.15 E4 | 1.96 E4 | 3 Pass |
| | | Cs-137 | 6.30 - 11.17 E4 | 8.40 E4 | 7.26 E4 | 3 Pass |

Gamma in Water 0.5 liter, continued

| Reference Date | Sample I.D. | Nuclide | Acceptance Range pCi/l | Reference Value pCi/l | Mean Reported Value pCi/l | Cross Check Status |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 10/11/2006 | Q064GWS | Cr-51 | 7.12 - 12.62 E4 | 9.49 E4 | 10.13 E4 | 3 Pass |
| | | Mn-54 | 5.26 - 9.33 E4 | 7.02 E4 | 7.40 E4 | 3 Pass |
| | | Co-58 | 4.17 - 7.39 E4 | 5.55 E4 | 5.64 E4 | 3 Pass |
| | | Fe-59 | 1.42 - 2.53 E4 | 1.90 E4 | 2.08 E4 | 3 Pass |
| | | Co-60 | 6.57 - 11.65 E4 | 8.76 E4 | 8.96 E4 | 3 Pass |
| | | Zn-65 | 6.67 - 11.84 E4 | 8.90 E4 | 9.51 E4 | 3 Pass |
| | | Cs-134 | 4.12 - 7.30 E4 | 5.49 E4 | 4.97 E4 | 3 Pass |
| | | Cs-137 | 0.87 - 1.54 E5 | 1.16 E5 | 1.11 E5 | 3 Pass |
| | | Ce-141 | 2.40 - 4.26 E4 | 3.20 E4 | 3.23 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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 5/16/2006 | Q062GWR | Cr-51 | 0.94 - 1.67 E4 | 1.26 E4 | 1.20 E4 | 3 Pass |
| | | Co-57 | 1.95 - 3.55 E2 | 2.63 E2 | 2.66 E2 | 3 Pass |
| | | Co-60 | 0.98 - 1.75 E3 | 1.31 E3 | 1.34 E3 | 3 Pass |
| | | Sr-85 | 1.39 - 2.47 E3 | 1.86 E3 | 1.68 E3 | 3 Pass |
| | | Y-88 | 2.07 - 3.66 E3 | 2.76 E3 | 2.61 E3 | 3 Pass |
| | | Cd-109 | 4.66 - 9.52 E3 | 6.66 E3 | 6.60 E3 | 3 Pass |
| | | Sn-113 | 1.06 - 1.89 E3 | 1.42 E3 | 1.14 E3 | 3 Pass |
| | | Te-123M | 2.58 - 4.71 E2 | 3.49 E2 | 2.96 E2 | 3 Pass |
| | | Cs-137 | 0.82 - 1.45 E3 | 1.09 E3 | 1.00 E3 | 3 Pass |
| 10/11/2006 | Q064GWS | Cr-51 | 7.12 - 12.62 E4 | 9.49 E4 | 9.80 E4 | 3 Pass |
| | | Mn-54 | 5.26 - 9.33 E4 | 7.02 E4 | 7.50 E4 | 3 Pass |
| | | Co-58 | 4.17 - 7.39 E4 | 5.55 E4 | 5.63 E4 | 3 Pass |
| | | Fe-59 | 1.42 - 2.53 E4 | 1.90 E4 | 2.14 E4 | 3 Pass |
| | | Co-60 | 6.57 - 11.65 E4 | 8.76 E4 | 8.93 E4 | 3 Pass |
| | | Zn-65 | 6.67 - 11.84 E4 | 8.90 E4 | 9.60 E4 | 3 Pass |
| | | Cs-134 | 4.12 - 7.30 E4 | 5.49 E4 | 4.91 E4 | 3 Pass |
| | | Cs-137 | 0.87 - 1.54 E5 | 1.16 E5 | 1.12 E5 | 3 Pass |
| | | Ce-141 | 2.40 - 4.26 E4 | 3.20 E4 | 3.29 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 |
|----------------|-------------|---------|----------------------|---------------------|-------------------------|--------------------|
| 2/24/2006 | A20206-04 | Cr-51 | 7.33 - 12.99 E4 | 9.77 E4 | 9.56 E4 | 3 Pass |
| | | Mn-54 | 1.29 - 2.29 E4 | 1.72 E4 | 1.76 E4 | 3 Pass |
| | | Co-57 | Sample Contaminant | Sample Contaminant | 2.30 E2 | N/A ⁽¹⁾ |
| | | Co-58 | 1.82 - 3.23 E4 | 2.43 E4 | 2.35 E4 | 3 Pass |
| | | Fe-59 | 1.76 - 3.13 E4 | 2.35 E4 | 2.32 E4 | 3 Pass |
| | | Co-60 | 1.72 - 3.05 E4 | 2.29 E4 | 2.22 E4 | 3 Pass |
| | | Zn-65 | 2.54 - 4.51 E4 | 3.39 E4 | 3.34 E4 | 3 Pass |
| | | Cs-134 | 1.65 - 2.93 E4 | 2.20 E4 | 2.01 E4 | 3 Pass |
| | | Cs-137 | 1.19 - 2.10 E4 | 1.58 E4 | 1.47 E4 | 3 Pass |
| | | Ce-139 | Sample Contaminant | Sample Contaminant | 3.99 E2 | N/A ⁽¹⁾ |
| | | Ce-141 | 2.47 - 4.38 E4 | 3.29 E4 | 3.16 E4 | 3 Pass |
| 6/8/2006 | E4980-37 | Cr-51 | 1.41 - 3.04 E2 | 2.07 E2 | 1.98 E2 | 3 Pass |
| | | Mn-54 | 0.88 - 1.56 E2 | 1.17 E2 | 1.16 E2 | 3 Pass |
| | | Co-58 | 6.00 - 10.64 E1 | 8.00 E1 | 7.86 E1 | 3 Pass |
| | | Fe-59 | 5.63 - 9.98 E1 | 7.50 E1 | 7.73 E1 | 3 Pass |
| | | Co-60 | 0.77 - 1.37 E2 | 1.03 E2 | 1.05 E2 | 3 Pass |
| | | Zn-65 | 1.11 - 1.97 E2 | 1.48 E2 | 1.40 E2 | 3 Pass |
| | | Cd-109 | Sample Contaminant | Sample Contaminant | Too Low to Quantify | N/A ⁽¹⁾ |
| | | Cs-134 | 0.76 - 1.34 E2 | 1.01 E2 | 0.91 E2 | 3 Pass |
| | | Cs-137 | 7.05 - 12.50 E1 | 9.40 E1 | 8.72 E1 | 3 Pass |
| | | Ce-139 | Sample Contaminant | Sample Contaminant | 8.90 E0 | N/A ⁽¹⁾ |
| | | Ce-141 | 1.10 - 1.96 E2 | 1.47 E2 | 1.35 E2 | 3 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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 3/20/2006 | Q061LIW1 | I-131 | 2.42 - 4.30 E3 | 3.23 E3 | 3.31 E3 | 3 Pass |
| 3/20/2006 | Q061LIW2 | I-131 | N/A | 0.00E+00 | 0.00E+00 | 3 Pass |
| 3/20/2006 | Q061LIW3 | I-131 | 1.60 - 2.83 E3 | 2.13 E3 | 2.31 E3 | 3 Pass |

Iodine on Cartridge

| Reference Date | Sample I.D. | Nuclide | Acceptance Range pCi | Reference Value pCi | Mean Reported Value pCi | Cross Check Status |
|----------------|-------------|---------|----------------------|---------------------|-------------------------|--------------------|
| 2/24/2006 | A20207-04 | I-131 | N/A | N/A | N/A | N/A ⁽²⁾ |
| 6/8/2006 | E4981-37 | I-131 | 4.88 - 8.65 E1 | 6.50 E1 | 7.31 E1 | 3 Pass |

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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 6/8/2006 | E4982-37 | Beta | 1.27 -2.25 E2 | 1.69 E2 | 1.65 E2 | 3 Pass |

Beta Smear

| Reference Date | Sample I.D. | Nuclide | Acceptance Range dpm | Reference Value dpm | Mean Reported Value dpm | Cross Check Status |
|----------------|-------------|---------|----------------------|---------------------|-------------------------|--------------------|
| 2/24/2006 | A20204-04 | Beta | 1.18 - 2.09 E4 | 1.57 E4 | 1.59 E4 | 3 Pass |
| 11/10/2006 | A21058-04 | Beta | 1.02 - 1.81 E4 | 1.36 E4 | 1.32 E4 | 3 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 |
|----------------|-------------|---------|------------------------|-----------------------|---------------------------|--------------------|
| 3/21/2006 | Q061TWSL1 | H-3 | 1.52 - 2.70 E5 | 2.03 E5 | 1.99 E5 | 3 Pass |
| 3/21/2006 | Q061TWSL2 | H-3 | N/A | 0.00E+00 | 0.00E+00 | 3 Pass |
| 5/8/2006 | Q062TWR1 | H-3 | N/A | 0.00E+00 | 0.00E+00 | 3 Pass |
| 5/8/2006 | Q062TWR2 | H-3 | 2.70 - 4.79 E3 | 3.60 E3 | 3.59 E3 | 3 Pass |
| 5/8/2006 | Q062TWR3 | H-3 | 5.89 - 10.45 E2 | 7.86 E2 | 8.12 E2 | 3 Pass |
| 9/13/2006 | Q063TWSL1 | H-3 | 0.77 - 1.37 E5 | 1.03 E5 | 1.03 E5 | 3 Pass |
| 9/13/2006 | Q063TWSL2 | H-3 | N/A | 0.00E+00 | 0.00E+00 | 3 Pass |

Table 5.0-A Footnote Explanations

- (1) Gamma in Filter, Sample ID A20206-04, Reference Date 2/24/2006 & Gamma in Filter, Sample ID E4980-37, Reference Date 6/8/2006

Co-57, Cd-109 and Ce-139 was identified and reported for two cross-check samples. Co-57 and Ce-139 was identified in gamma filter A20206-04 and Cd-109 and Ce-139 was identified in gamma filter E4980-37. The cross check supplier does not include these radionuclides on the certificates of analysis for these two cross-check samples. These radionuclides were determined to be inherent contaminants in the cross-check samples. PIP G-06-00421 written.

- (2) Iodine on Cartridge, Sample ID A20207-04, Reference Date 2/24/2006

Cross-check A20207-04 was not analyzed in a timely manner for reporting. Cross-check data was not reported for this sample due to excessive sample decay. PIP G-06-00246 written.

TABLE 5.0-B

2006 ENVIRONMENTAL DOSIMETER CROSS-CHECK RESULTS

Nuclear Technology Services

| 1st Quarter 2006 | | | | | | 2nd Quarter 2006 | | | | | |
|---------------------------|------------------|-----------------|---------------|--------------------|-----------|---------------------------|------------------|-----------------|---------------|--------------------|-----------|
| TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail | TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail |
| 102038 | 89 | 96.9 | 8.88 | <+/-15% | Pass | 102480 | 67 | 68.5 | 2.24 | <+/-15% | Pass |
| 102055 | 89 | 92.1 | 3.48 | <+/-15% | Pass | 102481 | 67 | 68.6 | 2.39 | <+/-15% | Pass |
| 102057 | 89 | 91.7 | 3.03 | <+/-15% | Pass | 102437 | 67 | 67.7 | 1.04 | <+/-15% | Pass |
| 102303 | 89 | 91.0 | 2.25 | <+/-15% | Pass | 102395 | 67 | 69.5 | 3.73 | <+/-15% | Pass |
| 102305 | 89 | 91.6 | 2.92 | <+/-15% | Pass | 102399 | 67 | 69.8 | 4.18 | <+/-15% | Pass |
| Average Bias (B) | | | 4.11 | | | Average Bias (B) | | | 2.72 | | |
| Standard Deviation (S) | | | 2.70 | | | Standard Deviation (S) | | | 1.25 | | |
| Measure Performance B +S | | | 6.81 | <15% | Pass | Measure Performance B +S | | | 3.97 | <15% | Pass |
| 3rd Quarter 2006 | | | | | | 4th Quarter 2006 | | | | | |
| TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail | TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail |
| 102444 | 83.6 | 88.1 | 5.38 | <+/-15% | Pass | 100046 | 86.5 | 94.6 | 9.36 | <+/-15% | Pass |
| 102424 | 83.6 | 87.7 | 4.90 | <+/-15% | Pass | 100052 | 86.5 | 92.3 | 6.71 | <+/-15% | Pass |
| 102502 | 83.6 | 87.2 | 4.31 | <+/-15% | Pass | 100065 | 86.5 | 90.1 | 4.16 | <+/-15% | Pass |
| 102464 | 83.6 | 85.3 | 2.03 | <+/-15% | Pass | 100240 | 86.5 | 93.0 | 7.51 | <+/-15% | Pass |
| 102157 | 83.6 | 83.7 | 0.12 | <+/-15% | Pass | 100358 | 86.5 | 94.8 | 9.60 | <+/-15% | Pass |
| Average Bias (B) | | | 3.35 | | | Average Bias (B) | | | 7.47 | | |
| Standard Deviation (S) | | | 2.22 | | | Standard Deviation (S) | | | 2.22 | | |
| Measure Performance B +S | | | 5.56 | <15% | Pass | Measure Performance B +S | | | 9.68 | <15% | Pass |

State of North Carolina, Division of Radiation Protection

| Spring 2006 | | | | | | Fall 2006 | | | | | |
|---------------------------|------------------|-----------------|---------------|--------------------|-----------|---------------------------|------------------|-----------------|---------------|--------------------|-----------|
| TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail | TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail |
| 100246 | 55.0 | 58.8 | 6.91 | <+/-15% | Pass | | | | | <+/-15% | |
| 100243 | 55.0 | 61.6 | 12.00 | <+/-15% | Pass | | | | | <+/-15% | |
| 100241 | 55.0 | 58.0 | 5.45 | <+/-15% | Pass | | | | | <+/-15% | |
| 100240 | 55.0 | 58.2 | 5.82 | <+/-15% | Pass | | | | | <+/-15% | |
| 100239 | 55.0 | 59.6 | 8.36 | <+/-15% | Pass | | | | | <+/-15% | |
| 100236 | 55.0 | 57.2 | 4.00 | <+/-15% | Pass | | | | | <+/-15% | |
| 100232 | 55.0 | ** | | <+/-15% | | | | | | <+/-15% | |
| 100217 | 55.0 | 56.7 | 3.09 | <+/-15% | Pass | | | | | <+/-15% | |
| Average Bias (B) | | | 6.52 | | | Average Bias (B) | | | | | |
| Standard Deviation (S) | | | 2.98 | | | Standard Deviation (S) | | | | | |
| Measure Performance B +S | | | 9.50 | <15% | Pass | Measure Performance B +S | | | | <15% | |

** TLD Damaged

Internal Crosscheck (Duke Energy)

| 1st Quarter 2006 | | | | | | 2nd Quarter 2006 | | | | | |
|---------------------------|------------------|-----------------|---------------|--------------------|-----------|---------------------------|------------------|-----------------|---------------|--------------------|-----------|
| TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail | TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail |
| 102261 | 49.0 | 48.6 | -0.82 | <+/-15% | Pass | 100007 | 61.0 | 58.4 | -4.23 | <+/-15% | Pass |
| 102244 | 49.0 | 49.1 | 0.13 | <+/-15% | Pass | 100021 | 61.0 | 58.8 | -3.54 | <+/-15% | Pass |
| 102436 | 49.0 | 46.9 | -4.31 | <+/-15% | Pass | 100035 | 61.0 | 60.2 | -1.38 | <+/-15% | Pass |
| 102318 | 49.0 | 47.0 | -4.17 | <+/-15% | Pass | 100072 | 61.0 | 60.2 | -1.39 | <+/-15% | Pass |
| 102482 | 49.0 | 48.3 | -1.39 | <+/-15% | Pass | 100168 | 61.0 | 60.8 | -0.30 | <+/-15% | Pass |
| 102292 | 49.0 | 48.1 | -1.93 | <+/-15% | Pass | 100123 | 61.0 | 59.5 | -2.43 | <+/-15% | Pass |
| 102321 | 49.0 | 46.6 | -4.86 | <+/-15% | Pass | 100734 | 61.0 | 59.4 | -2.55 | <+/-15% | Pass |
| 102346 | 49.0 | 47.2 | -3.70 | <+/-15% | Pass | 100108 | 61.0 | 60.6 | -0.61 | <+/-15% | Pass |
| 102479 | 49.0 | 46.3 | -5.46 | <+/-15% | Pass | 100049 | 61.0 | 58.6 | -3.94 | <+/-15% | Pass |
| 102293 | 49.0 | 47.3 | -3.45 | <+/-15% | Pass | 100169 | 61.0 | 58.2 | -4.65 | <+/-15% | Pass |
| Average Bias (B) | | | -3.00 | | | Average Bias (B) | | | -2.50 | | |
| Standard Deviation (S) | | | 1.87 | | | Standard Deviation (S) | | | 1.55 | | |
| Measure Performance B +S | | | 4.87 | <15% | Pass | Measure Performance B +S | | | 4.05 | <15% | Pass |
| 3rd Quarter 2006 | | | | | | 4th Quarter 2006 | | | | | |
| TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail | TLD Number | Delivered (mrem) | Reported (mrem) | Bias (% diff) | Pass/Fail Criteria | Pass/Fail |
| 101281 | 61.0 | 64.6 | 5.84 | <+/-15% | Pass | 101024 | 60.0 | 62.0 | 3.28 | <+/-15% | Pass |
| 101209 | 61.0 | 62.6 | 2.60 | <+/-15% | Pass | 101190 | 60.0 | 60.3 | 0.50 | <+/-15% | Pass |
| 101203 | 61.0 | 63.3 | 3.77 | <+/-15% | Pass | 101191 | 60.0 | 60.3 | 0.51 | <+/-15% | Pass |
| 101202 | 61.0 | 63.7 | 4.36 | <+/-15% | Pass | 101195 | 60.0 | 60.8 | 1.32 | <+/-15% | Pass |
| 101369 | 61.0 | 63.8 | 4.61 | <+/-15% | Pass | 101038 | 60.0 | 62.6 | 4.27 | <+/-15% | Pass |
| 101198 | 61.0 | 65.5 | 7.40 | <+/-15% | Pass | 100026 | 60.0 | 61.9 | 3.19 | <+/-15% | Pass |
| 101177 | 61.0 | 61.6 | 0.98 | <+/-15% | Pass | 100096 | 60.0 | 60.2 | 0.32 | <+/-15% | Pass |
| 101239 | 61.0 | 62.9 | 3.13 | <+/-15% | Pass | 100522 | 60.0 | 62.5 | 4.21 | <+/-15% | Pass |
| 101259 | 61.0 | 63.7 | 4.37 | <+/-15% | Pass | 100740 | 60.0 | 60.8 | 1.36 | <+/-15% | Pass |
| 101271 | 61.0 | 63.8 | 4.63 | <+/-15% | Pass | 100759 | 60.0 | 61.8 | 3.03 | <+/-15% | Pass |
| Average Bias (B) | | | 4.17 | | | Average Bias (B) | | | 2.20 | | |
| Standard Deviation (S) | | | 1.75 | | | Standard Deviation (S) | | | 1.56 | | |
| Measure Performance B +S | | | 5.92 | <15% | Pass | Measure Performance B +S | | | 3.76 | <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 - 2005
- 6.6 McGuire Annual Radioactive Effluent Release Report 2006
- 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 NRC Integrated Inspection Report (50-369/05-02, 50-370/05-02)
- 6.13 Duke Energy Corporation EnRad Laboratory Charcoal Cartridge Study, performed 2001

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

No changes were made to the sampling procedures during 2006.

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

A methodology based on nuclide abundance was implemented for determining Mn-54 activity in the presence of naturally occurring Ac-228 interference in certain media types. The method is described in PIP G-06-00040.

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 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 134 | = | East Lincoln Jr. High School (8.77 mi. WNW) |
| Location 192 | = | Peninsula (2.84 mi. NNE) |
| 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 each dairy. A gamma and low-level Iodine-131 analysis was performed on each sample. The biweekly grab samples were collected from the locations listed below.

Location 139 = William Cook Dairy (2.49 mi. E)
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 120 = Site Boundary (0.46 mi. NNE)
Location 125 = Site Boundary (0.38 mi. SW)
Location 134 = East Lincoln Junior High School (8.77 mi. WNW)
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 from 5/23 to 5/24/2006. Results are shown in Table 3.10. No changes were made to the sampling procedures during 2006 as a result of the 2006 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 2006.

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

2006

Environmental Radiological Monitoring Program Summary

Facility: McGuire Nuclear Station

Docket No. 50-369,370

Location: Mecklenburg County, North Carolina

Report Period: 01-JAN-2006 to 31-DEC-2006

| 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) | | | | | | 134 (8.77 mi WNW) | |
| BETA | 364 | 1.00E-02 | 1.74E-2 (312/312) 6.23E-3 - 3.09E-2 | 120 (0.46 mi NNE) | 1.79E-2 (52/52) 7.64E-3 - 3.06E-2 | 1.94E-2 (52/52) 1.03E-2 - 3.27E-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 | 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 | 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 |

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-2006 to 31-DEC-2006

| 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 Radioiodine (pCi/m3) | | | | | | 134 (8.77 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 | 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 |

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-2006 to 31-DEC-2006

| Medium or Pathway Sampled | Type and Total Number of Analyses Performed | Lower Limit of Detection (LLD) | All Indicator Locations | | Location with Highest Annual Mean | | Control Location | No. of Non-Routine Report Meas. |
|----------------------------|---|--------------------------------|-----------------------------|-------------------|-----------------------------------|-----------------------------|----------------------------|---------------------------------|
| | | | Mean (Fraction) Range | Location Code | Mean (Fraction) Range | 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 | 1.72 (49/52) 0.70 - 3.50 | 119 (7.40 mi SSW) | 1.75 (12/13) 1.24 - 2.31 | 1.80 (12/13) 0.98 - 2.55 | | 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 | 907 (14/16) 182 - 2290 | 101 (3.31 mi E) | 1460 (4/4) 697 - 2290 | 0.00 (0/4) 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-2006 to 31-DEC-2006

| Medium or Pathway Sampled | Type and Total Number of Analyses Performed | 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 | 1264 (8/8) 438 - 2570 | 128 (0.45 mi NE) | 1650 (4/4) 730 - 2570 | 219 (1/4) 219 - 219 | | 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-2006 to 31-DEC-2006

| 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 | | | |
| Milk (pCi/liter) | | | | | | 141 (14.8 mi WNW) | | |
| | BALA-140 | 52 | 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 | 52 | 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 | 52 | 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 | 52 | 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 |
| | LLI-131 | 52 | 1 | 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 |

Mean and range based upon detectable measurements only

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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-2006 to 31-DEC-2006

| Medium or Pathway Sampled | Type and Total Number of | Lower Limit of Detection (LLD) | All Indicator Locations | | Location with Highest Annual Mean | | Control Location | No. of Non-Routine Report Meas. | |
|-----------------------------------|--------------------------|--------------------------------|-------------------------|----------------------------|-----------------------------------|-----------------------|----------------------------|---------------------------------|-----------------------|
| | | | Mean (Fraction) Range | | Location Code | Mean (Fraction) Range | | | Mean (Fraction) Range |
| Broadleaf Vegetation (pCi/kg-wet) | | | | | | | 134 (8.77 mi WNW) | | |
| | CS-134 | 48 | 60 | 0.00 (0/36) 0.00 - 0.00 | | | 0.00 (0/12) 0.00 - 0.00 | 0 | |
| | CS-137 | 48 | 80 | 29.8 (1/36) 29.8 - 29.8 | 120 (0.46 mi NNE) | | 29.8 (1/12) 29.8 - 29.8 | 0.00 (0/12) 0.00 - 0.00 | 0 |
| | I-131 | 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 |
| | | | | | | | | | |
| | | | | | | | | | |

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-2006 to 31-DEC-2006

| 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 | 12 | 60 | 0.00 (0/12) | 0.00 (0/12) | 0.00 (0/0) | 0 |
| | | | | 0.00 - 0.00 | 0.00 - 0.00 | 0.00 - 0.00 | |
| | CS-137 | 12 | 80 | 0.00 (0/12) | 0.00 (0/12) | 0.00 (0/0) | 0 |
| | | | | 0.00 - 0.00 | 0.00 - 0.00 | 0.00 - 0.00 | |
| | I-131 | 12 | 60 | 0.00 (0/12) | 0.00 (0/12) | 0.00 (0/0) | 0 |
| | | | | 0.00 - 0.00 | 0.00 - 0.00 | 0.00 - 0.00 | |

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-2006 to 31-DEC-2006

| Medium or Pathway Sampled | Type and Total Number of | Lower Limit of Detection (LLD) | All Indicator Locations | | Location with Highest Annual Mean | | Control Location | No. of Non-Routine Report Meas. |
|---------------------------|--------------------------|--------------------------------|-------------------------|---------------------------|-----------------------------------|---------------------------|---------------------------|---------------------------------|
| | | | Mean (Fraction) Range | | 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 | 10.8 (2/6) 10.3 - 11.3 | 129 (0.51 mi ENE) | 10.8 (2/6) 10.3 - 11.3 | 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-2006 to 31-DEC-2006

| 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 | | | |
| 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 | 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 | 0.00 (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 | 0.00 (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 | 0.00 (0/2) 0.00 - 0.00 | 0 |
| | CS-137 | 6 | 180 | 159 (2/4) 139 - 179 | 130 (0.52 mi SW) | 159 (2/2) 139 - 179 | 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-2006 to 31-DEC-2006

| 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) | | | | | | 175 (15.5 mi WNW) | |
| | 162 | 0.00E+00 | 17.4 (158/158) | 180 | 28.1 (4/4) | 22.9 (4/4) | 0 |
| | | | 10.2 - 30.6 | (12.7 mi NNE) | 24.9 - 30.6 | 21.8 - 25.3 | |

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

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 | Reason Code | Corrective Action |
|----------|----------------------------|-------------------------|-------------|--|
| 134 | 12/20-12/27/2006 | 12/20-12/21/2006 | PO | Power interrupted to sampling equipment. Work request 40801 written. Maintenance personnel indicated power loss attributable to traffic accident affecting power supply pole at Hwy 73/school road at traffic light. Retail power distributor Rutherford Electric indicated a jack was tripped on the power pole, causing the loss of power. |
| 134 | 12/27-1/2/2007 | 12/28-1/2/2007 | PO | Power interrupted to air sampling equipment from previous scheduled composite period 12/20-12/27/2007. Work request 40801 written. Power was restored to this location 12/28/2006 12:52 and normal sampling resumed. |

Drinking Water

| Location | Scheduled Collection Dates | Actual Collection Dates | Reason Code | Corrective Action |
|----------|----------------------------|-------------------------|-------------|---|
| 101 | 2/15-3/15/2006 | 2/15-3/15/2006 | OT | Water plant personnel isolated reservoir (turned off water supply) during composite period. A sign was present on the supply valve indicating that water should not be turned off. It was estimated water had been off for < 24 hours. Water flow restored and normal sampling resumed. |

Drinking Water, continued

| Location | Scheduled Collection Dates | Actual Collection Dates | Reason Code | Corrective Action |
|----------|----------------------------|-------------------------|-------------|--|
| 194 | 5/10-6/7/2006 | 6/7/2006 | PS | Sampling equipment did not operate during entire composite period for undetermined reason. Insufficient composite sample available at time of collection. A grab sample was taken. Sampling equipment confirmed operational and returned to service. Normal sampling resumed 6/7/2006. |

C.2 UNAVAILABLE ANALYSES

TLD

| Location | Scheduled Collection Dates | Reason Code | Corrective Action |
|----------|----------------------------|-------------|--|
| 166 | 9/14-12/14/2006 | VN | TLD missing. 1 st quarter 2007 TLD placed in field. |
| 168 | 9/14-12/14/2006 | VN | TLD missing. 1 st quarter 2007 TLD placed in field. |

APPENDIX D

ANALYTICAL DEVIATIONS

No Analytical deviations were incurred for the
2006 Radiological Environmental Monitoring Program

APPENDIX E

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS

This appendix includes all of the sample analysis reports generated from each sample medium for 2006. Appendix E is located separately from this report and is permanently archived at the Duke Energy Corporation Environmental Center radiological environmental master file, located at the McGuire Nuclear Station Site in Huntersville, North Carolina.