Union Electric
Callaway Plant

PO Box 620
Fulton, MO 65251

April 27, 2001

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20556

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Gentlemen:

ULNRC-4464

DOCKET NUMBER 50-483
UNION ELECTRIC COMPANY
CALLAWAY PLANT
FACILITY OPERATING LICENSE NPF-30
2000 ANNUAL ENVIRONMENTAL OPERATING REPORT

Please find enclosed the 2000 Annual Environmental Operating Report for the Callaway Plant. This report is submitted in accordance with section 5.6.2 of the Technical Specification and Appendix B to the Callaway Plant Operating License.

Sincerely,

David Shafer
for Alan C. Passwater
Manager, Corporate Nuclear Services

BFH/nls

Enclosure

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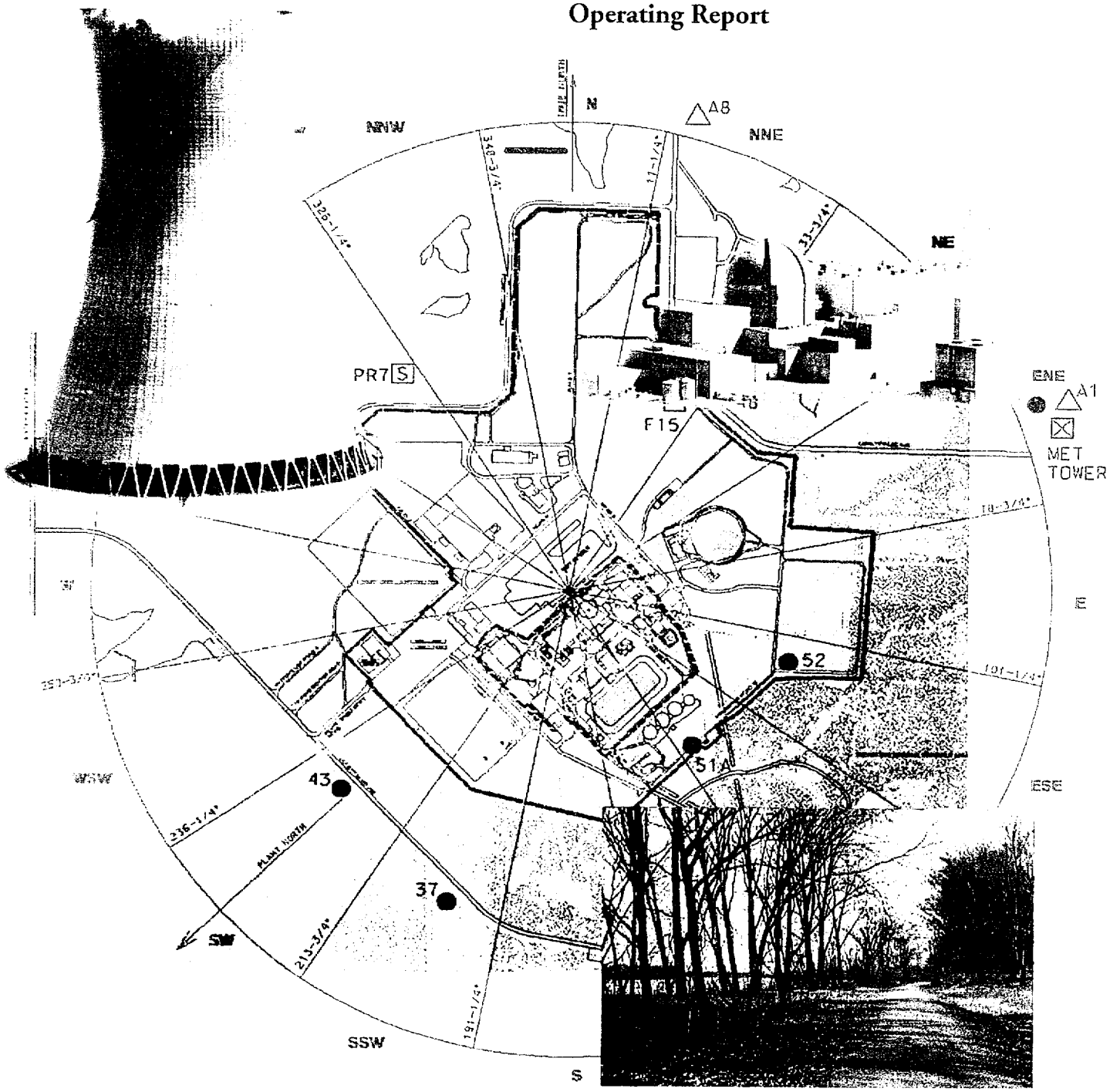
2000 Callaway Plant

Annual Radiological Environmental Operating Report



Docket no. 50-483

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1.0 Executive Summary

This Annual Radiological Environmental Operating Report describes the Union Electric Company, Callaway Plant Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2000. It is submitted in accordance with section 5.6.2 of the Callaway Plant Technical Specifications.

Section 2.0 describes the Radiological Monitoring Program. Included is the identification of sampling locations, descriptions of sampling and analysis procedures, analysis results, data interpretations and program modifications. Quality assurance results, sampling deviations, unavailable samples and program changes are also discussed.

Section 3.0 describes the Non-Radiological Monitoring Program. Included are any unusual or important events, Environmental Protection Plan non-compliance, non-routine reports and plant design and operation environmental evaluations.

During 2000 the Callaway Plant operated in compliance with the Off Site Dose Calculation Manual requirements. Comparison of results for 2000 to pre-operational data and data from previous years show no significant differences.

Results from the REMP indicate the Callaway Plant has had no significant radiological impact on the health and safety of the public or on the environment.

2.0 *Radiological Monitoring Program*

2.1 Introduction

This report presents an analysis of the results of the REMP conducted during 2000 for Union Electric Company, Callaway Plant.

The radiological environmental monitoring program began in April 1982.

The objectives of the REMP are to monitor potential critical pathways of radioeffluent to man and determine the radiological impact on the environment caused by operation of Callaway Plant.

Callaway Plant consists of one 1239 MWe pressurized water reactor, which achieved initial criticality on October 2, 1984. The plant is located on a plateau approximately ten miles southeast of the City of Fulton in Callaway County, Missouri and approximately eighty miles west of the St. Louis metropolitan area. The Missouri River flows by the site in an easterly direction approximately five miles south of the site at its closest point.

2.2 Program Design

The sample locations, frequency of sampling and sample analysis requirements originate from the Callaway Plant Off-Site Dose Calculation Manual, DNR Missouri State Operating Permit and continuation of the Callaway Plant Pre-Operational Environmental Monitoring Program.

Samples are collected from waterborne, airborne, ingestion and direct radiation pathways. The types of sample media collected are: milk, surface water, groundwater, shoreline sediment, bottom sediment, soil, wetlands, fish, vegetation, airborne particulate, airborne radioiodine and direct radiation (TLD). Indicator samples are collected from locations, which could be influenced by plant effluents. Control samples are collected at locations that are not significantly affected by plant operation.

Samples are collected by Union Electric personnel or contractors to Union Electric and shipped to Allegheny Technologies, Inc. for analysis. The data is reported monthly and summarized in the annual report. TLD's are analyzed by Union Electric personnel.

2.3 Program Description

Sample locations for the REMP are shown in Figures 1, and 2. Table I identifies the location code, description and sample type. Table II specifies the collection frequency and required analysis.

Figure I

Distant Collection Locations

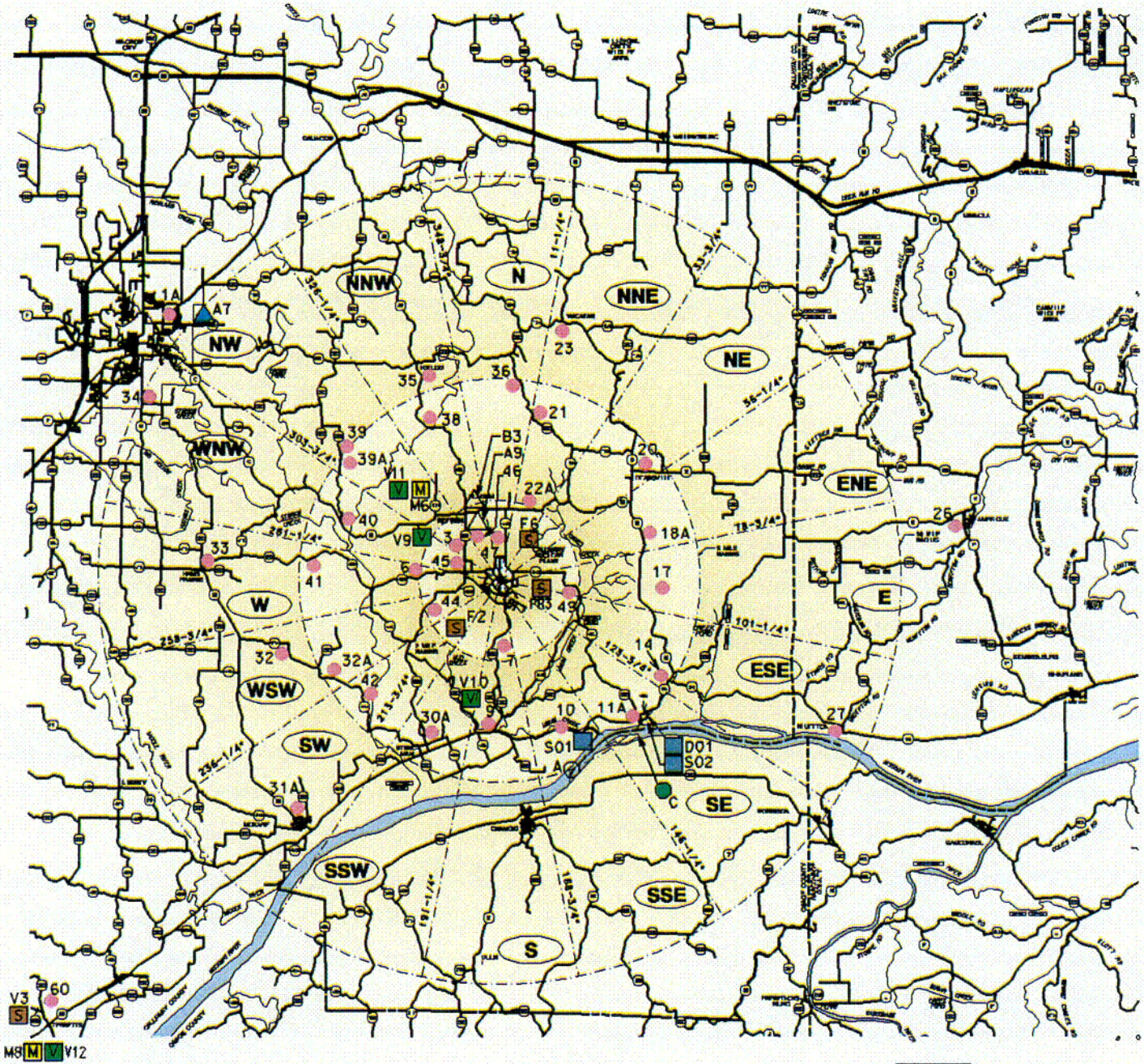

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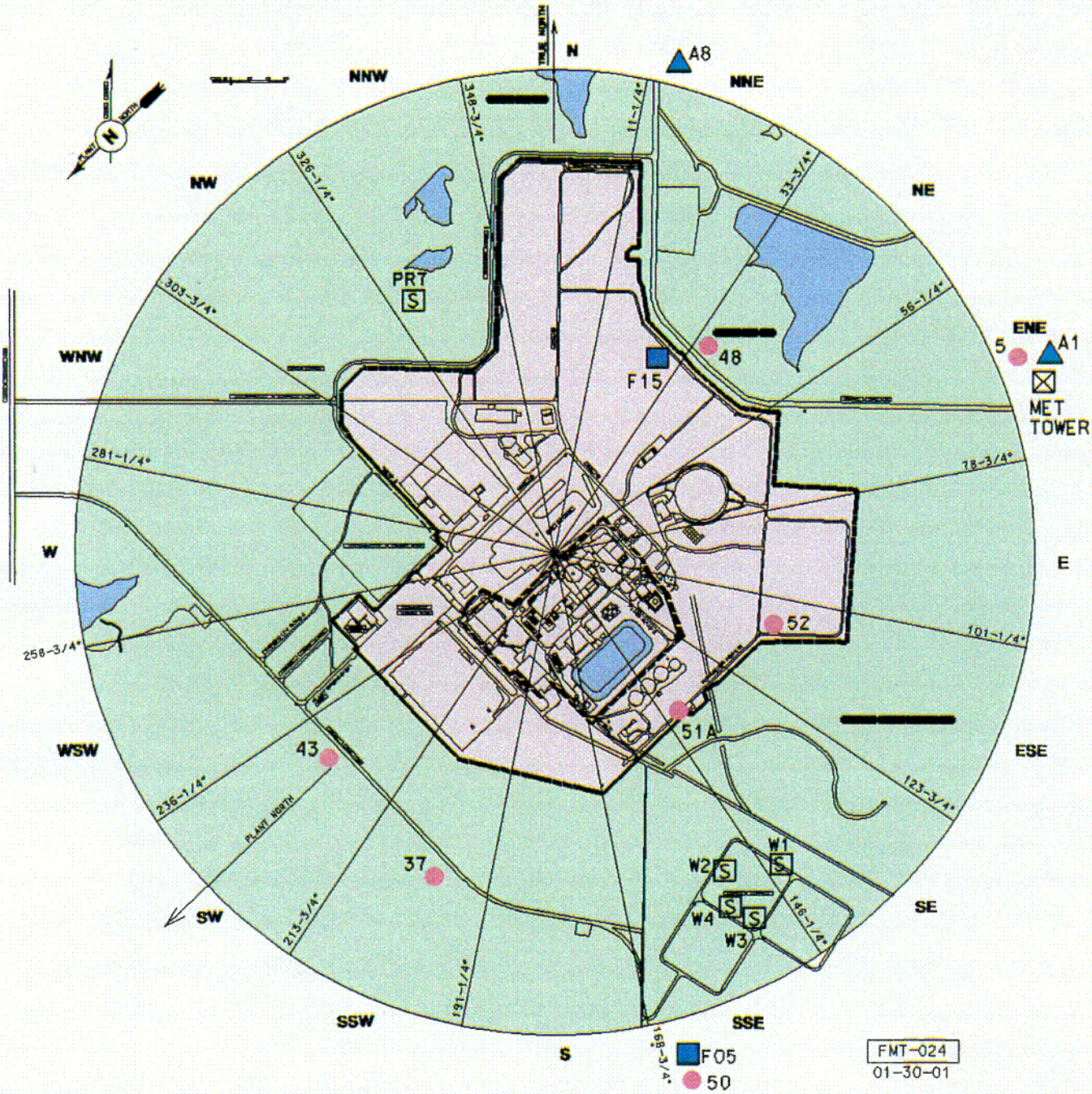
Figure II

Near Site Collection Locations



LEGEND:

- ● = TLD
- ▲ = AIR
- ■ = WATER
- V = VEGETATION
- M = MILK
- S = SOIL
- ● = FISH, SEDIMENT

C02

Table 1

Sampling Locations

Location Code	Description[1]	Sample Types[2]
1a	10.8 mi. NW, City of Fulton on Hwy Z, 0.65 mi. East of Business 54, West of Campus Apartments	IDM
3	1.2 mi. NW; 0.1 mi. West of Hwy CC on Gravel Road, 0.8 mi. South Hwy 0, Callaway Electric Cooperative Utility Pole No. 18559.	IDM
5	1.3 mi. ENE; Primary Meteorological Tower.	IDM
6	2.0 mi. W; County Road 428, 1.2 mi. West of Hwy CC, Callaway Electric Cooperative Utility Pole No. 18609.	IDM
7	1.4 mi. S; County Road 459, 2.6 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole No. 35097	IDM
9	3.8 mi. S; NW Side of the County Road 459 and Hwy 94 Junction, Callaway Electric Cooperative Utility Pole No. 06754.	IDM
10	3.9 mi. SSE; Hwy 94, 1.8 mi. East of County Road 459, Callaway Electric Cooperative Utility Pole No. 12182.	IDM
11a	4.7 mi. SE; City of Portland, Callaway Electric Cooperative Utility Pole No. 12110.	IDM
14	4.9 mi. ESE; SE Side of Intersection D and 94, Callaway Electric Cooperative Utility Pole No. 11940.	IDM
17	3.8 mi. E; County Road 4053, 0.3 mi. East of Hwy 94, Kingdom Telephone Company Pole No. 3X12.	IDM
18a	3.7 mi. ENE; East side of Hwy D, 0.5 mi. South of 0, Callaway Electric Cooperative Utility Pole No. 38579.	IDM
20	4.7 mi. NE; City of Readsville, Callaway Electric Cooperative Utility Pole No. 12830.	IDM
21	3.8 mi. NNE; County Road 155, 1.9 mi. North of Hwy 0, Callaway Electric Cooperative Utility Pole No. 19100	IDM
22a	1.9 mi. NNE; North side of Hwy O, 100 feet East of County Road 150, Callaway Electric Cooperative Utility Pole No. 31094.	IDM
23	6.6 mi. NNE; City of Yucatan, Callaway Electric Cooperative Utility Pole No. 12670	IDM
26[3]	11.7 mi. E; Town of Americus, Callaway Cooperative Utility Pole No. 11159.	IDM
27[3]	9.3 mi. ESE; Town of Bluffton, Callaway Electric Cooperative Utility Pole No. 11496.	IDM
30a	4.4 mi. SSW; City of Steedman, N side of Belgian Dr., 150 feet East of Hwy CC, Callaway Electric Cooperative Utility Pole No. 06557.	IDM
31a	7.8 mi. SW; City of Mokane, Junction Hwy C and County Road 400, 0.9 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole.	IDM
32	5.4 mi. WSW; Hwy VV, 0.6 mi. West of County Road 447, Callaway Electric Cooperative Utility Pole No. 27031.	IDM

Location Code	Description[1]	Sample Types[2]
32a	5.0 mi. WSW; County Road 447, Callaway Electric Cooperative Utility Pole No. 06354.	IDM
33	7.4 mi. W; City of Hams Prairie, SE of Hwy C and AD Junction	IDM
34	9.5 mi. WNW; NE Side of Hwy C and County Road 408 Junction.	IDM
35	5.8 mi. NNW; City of Toledo, Callaway Electric Cooperative Utility Pole No. 17684.	IDM
36	4.9 mi. N; County Road 155, 0.8 mi. South of County Road 132, Callaway Electric Cooperative Utility Pole No. 19137.	IDM
37	0.5 mi. SSW; County Road 459, 0.9 mi. South of Hwy CC, Callaway Electric Cooperative Utility Pole No. 35077.	IDM
38	4.6 mi. NNW; County Road 133, 1.5 mi. South of Hwy UU, Callaway Electric Cooperative Utility Pole No. 34708.	IDM
39	5.4 mi. NW; County Road 111, Callaway Electric Cooperative Utility Pole No. 17516.	IDM
39a	5.0 mi. NW County Road 111, Callaway Electric Cooperative Utility Pole No. 17526	IDM
40	4.2 mi. WNW; NE Side of County Road 112 and Hwy 0, Callaway Electric Cooperative Utility Pole No. 06326.	IDM
41	4.9 mi. W; Hwy AD, 2.8 mi. East of Hwy C, Callaway Electric Cooperative Utility Pole No. 18239.	IDM
42	4.4 mi. SW; County Road 447, 2.6 mi. North of County Road 463, Callaway Electric Cooperative Utility Pole No. 06326.	IDM
43	0.5 mi. SW; County Road 459, 0.7 mi. South of Hwy CC, Callaway Electric Cooperative Utility Pole No. 35073.	IDM
44	1.6 mi. WSW; Hwy CC, 1.0 mi. South of County Road 459, Callaway Electric Cooperative Utility Pole No. 18769.	IDM
45	1.0 mi. WNW; County Road 428, 0.1 mi. West of Hwy CC, Callaway Electric Cooperative Utility Pole No. 18580.	IDM
46	1.5 mi. NNW; NE Side of Hwy CC and County Road 466 Intersection, Callaway Electric Cooperative Utility Pole No. 28242.	IDM
47	1.0 mi. N; County Road 448, 0.9 mi. South of Hwy 0, Callaway Electric Cooperative Utility Pole No. 28151. IDM	IDM
48	0.4 mi. NE; County Road 448, 1.5 mi. South of Hwy 0, Plant Security Sign Post.	IDM
49	1.6 mi. E; County Road 448, Callaway Electric Cooperative Utility Pole No. 06959, Reform Wildlife Management Parking Area.	IDM

Location Code	Description[1]	Sample Types[2]
50	0.9 mi. SSE; County Road 459, 3.3 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole No. 35086.	IDM
51a	0.3 mi. SE; Owner Control Fence, SE of the Water Treatment Plant.	IDM
52	0.4 mi. ESE; Light Pole Near the East Plant Security Fence	IDM
60[3]	13.5 mi. SW; Callaway Electric Cooperative Utility Pole No. 43744 just past Tebbitts City sign.	IDM
A1	1.3 mi. ENE; Primary Meteorological Tower.	APT, AIO
A7	9.5 mi. NW; C. Bartley Farm.	APT, AIO
A8	0.9 mi. NNE; County Road 448, 0.9 miles South of Hwy 0.	APT, AIO
A9	1.9 mi. NNW; Community to Reform.	APT, AIO
B3	1.8 mi. NNW; 0.3 mi. East of the O and CC Junction, Callaway Electric Cooperative Utility Pole No. 18892.	APT, AIO
D01	5.0 mi. SE; Holzhouser Grocery Store/ Tavern (Portland, MO).	WWA
F05	.9 mi. SSE; Onsite Groundwater Monitoring Well.	WWA
F15[3]	0.4 mi. NNE; Onsite Groundwater Monitoring Well.	WWA
M6	2.6 mi. NW, Pierce's Farm (Cow's Milk) MLK	MLK
M8[3]	18.7 mi. WSW, Kissock's Farm, South of New Bloomfield, MO (Cow's Milk).	MLK
V3[3]	15.0 mi. SW; Beazley Farm, West of Tebbetts, MO.	SOL
V9	2.0 mi. WNW; Meehan Farm	FPL
V10	3.4 mi. SSW; Brandt Farm	FPL
V11	3.2 mi. NW; Hickman Farm	FPL
V12[3]	18.7 mi. WSW, Kissock's Farm, South of New Bloomfield, MO (Cow's Milk).	FPL
A[3,4]	4.9 mi. SSE; 0.6 River Miles Upstream of Discharge North Bank.	AQS, AQF
C[4]	4.9 mi. SE; 1.0 River Miles Downstream of Discharge North Bank.	AQS, AQF
S01[3]	4.7 mi. SSE; 105 feet Upstream of Discharge North Bank.	SWA
S02	4.9 mi. SE; 1.1 River Miles Downstream of Discharge North Bank.	SWA
F2	1.64 mi. SW; Callaway Plant Forest Ecology Plot F2.	SOL
F6	1.72 mi. NE; Callaway Plant Forest Ecology Plot F6.	SOL
PR3	1.02 mi. ESE; Callaway Plant Prairie Ecology Plot PR3.	SOL

Location Code	Description[1]	Sample Types[2]
PR7	0.45 mi. NNW; Callaway Plant Prairie Ecology Plant PR7.	SOL
W4	0.68 mi. SSE; Callaway Plant Wetlands, SW Bank	SOL
W2	0.60 mi. SSE; Callaway Plant Wetlands, Inlet Area	SOL
W1[3]	0.61 mi. SE; Callaway Plant Wetlands, High Ground	SOL
W3	0.72 mi. SSE; Callaway Plant Wetlands, Discharge Area	SOL

[1] Distance is measured from the centerline of the reactor.

[2] AIO = Air Iodine, APT = Air Particulate, AQF = Fish, AQS = Sediment, FPL = Leafy Green Vegetables, IDM = TLD, MLK = Milk, SOL = Soil, SWA = Surface Water, WWA = Ground Water.

[3] Control Locations.

[4] The fish collection area for location "A" is between 0.6 river miles and 3.0 river miles upstream of the plant discharge. Location "C" is between the plant discharge and 1.5 miles downstream.

Table II REMP Sample Collection Frequencies and Required Analysis[1]

Sample	Sample Type	Collection Frequency	Required Analysis
Airborne Iodine	AIO	Weekly	I-131 weekly
Air Particulate	APT	Weekly	Gross Beta weekly[2] and Gamma Isotopic of quarterly filter composite
Fish	AQF	Semiannually	Gamma Isotopic
Sediment	AQS	Semiannually	Gamma Isotopic
Leafy Green Vegetables	FPL	Monthly during the growing season	I-131, and Gamma Isotopic
TLD	IDM	Quarterly	Gamma Dose
Milk	MLK	Semimonthly when animals are on Pasture; monthly otherwise	I-131, and Gamma Isotopic
Surface Water	SWA	Monthly composite	H-3 and Gamma Isotopic
Ground Water	WWA	Quarterly Grab	H-3 and Gamma Isotopic (NPDES Requirement)

[1] Samples required by ODCM and NPDES permit. Additional sampling is performed as a continuation of the pre-operational monitoring program.

[2] If gross beta activity is greater than the established baseline activity level gamma isotopic analysis is performed on the individual sample.

2.4 Sampling Program Execution and Results

2.4.1 Program Modifications and Exceptions

During 2000 no modifications were made to the Radiological Environmental Monitoring Program requirements as described in the ODCM.

The following sample locations were modified:

- Direct radiation location IDM 4 was deleted. Location IDM 47 was identified as a better sample location.
- Direct radiation location IDM 60 was added to enhance control station monitoring.
- Milk location M5 was deleted, the farmer no longer wanted to participate.
- Vegetation location V3 was deleted, the farmer no longer wanted to participate. SOS 00-1656 documents actions taken to obtain replacement sample location V12.
- Vegetation location V11 was added to enhance vegetation sampling.

The Radiological Environmental Monitoring Program was executed as described in the ODCM with any exceptions listed in this report.

2.4.2 Detection and Reporting Limits

Table III gives the required detection limits for radiological environmental sample analysis. For each sample type, the table lists the detection level for each isotope.

The lower limit of detection (LLD) used in this report is described in NRC Regulatory Guide 4.1 Rev. 1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants" and the NRC Branch Technical Position, November 1979, "An Acceptable Radiological Environmental Monitoring Program".

Positive sample results are reported with a 2 sigma counting uncertainty (corresponding to the 95% confidence level). In cases where the activity is found to be below the sample analysis minimum detection level it is reported as Not Detected.

Aerial view of the Callaway Plant site. Included is some of the land worked by local farmers to produce feed for cattle.

Table III Detection Capabilities for Radiological Environmental Sample Analysis[1]

Analysis	Water (pCi/l)	Airborne (pCi/m^3)	Fish (pCi/kg wet)	Milk (pCi/I)	Food Products (pCi/kg wet)	Soil and Sediment (pCi/kg dry)
Gross beta	4	0.01				
H-3	3000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, -60	15		130			
Zr-Nb-95[4]	15					
I-131	1000	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[2]	15			15		

[1] This list does not mean only these nuclides will be detected and reported. Other peaks which are measurable and identifiable will be reported.

[2] Total activity, parent plus daughter activity.

2.4.3 Quality Control Program

The contractor laboratory (Allegheny Technologies, Inc.) maintains a quality control (QC) program in accordance with Regulatory Guide 4.15. The Program includes laboratory procedures designed to prevent cross-contamination and ensure accuracy and precision of analyses. QC checks include blind samples, duplicate samples, and spiked samples as necessary to verify laboratory analysis activities are being maintained at a high level of accuracy.

Allegheny Technologies, Inc. participates in the Department of Energy's Environmental Laboratory Quality Assessment Program (EML) and Mixed Analyte Performance Evaluation Program (MAPEP). The results of these crosscheck programs are presented in Section 2.6.

The Callaway Plant Personnel Dosimetry program is certified by the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST). The Environmental TLD Program has demonstrated compliance with the recommendations of Regulatory Guide 4.13. Quality control checks are performed including blanks, blind samples, daily performance checks and quarterly crosschecks.

2.4.4 Data Interpretations

Sample analysis results are evaluated to determine if the result was due to the operation of the Callaway Plant or other sources.

One evaluation method used is the indicator-control concept. Most sample types are collected at both indicator (areas potentially affected by plant operations) and control locations (areas not significantly affected by plant discharge). A possible plant effect would be indicated if the detected level at an indicator location was statistically larger than at the control location.

Another method involves determining if the result originated from weapons testing. The indicator or control sample result can be compared to established environmental levels produced from weapons testing.

Sample results can also be compared with pre-operational levels or samples collected in other parts of the country. Results can also be related to events known to have caused elevated levels of radiation in the environment.

2.4.5 Waterborne Pathway

Surface Water

Analysis

Tritium: A 60-70 ml aliquot of water is purified by distillation. A portion of the distillate is transferred to a counting vial and scintillation fluid added. The contents of the vial are thoroughly mixed and counted in a liquid scintillation counter.

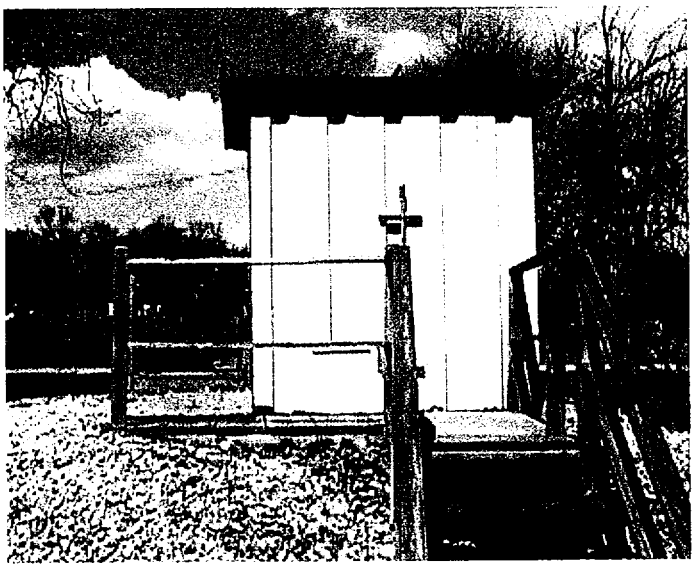
Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Monthly composite samples of surface water from the Missouri River are collected from one indicator location (SO2) and from one control location (SO1).

Results

The indicator water sampler (S02) was operational 87% of the time during 2000. Pump and sample valve failure in conjunction with extended low river levels during the year were the main factors contributing to the down time. The sampler is checked daily. Immediate action is taken to place the sampler back in service when a problem is identified.



Sampling of the Missouri River is accomplished using an automated compositor. Samples are collected on an hourly basis and mixed to make the monthly composite sample. River sampling verifies that Callaway Plant discharges meet stringent regulatory requirements.

SOS's 00-0611, 00-0888, and 00-3129 documents the operational problems and corrective actions taken.

The control water sampler (S01) was operational 97% of the time during 2000. A two-day electrical outage and a loss of nine days of samples caused the downtime in June. The samples were lost when the composite sample bottle was disposed. The composite bottle was accidentally disposed due to inadequate labeling. A permanent label was installed at the bottle location to prevent future problems. SOS 00-1823 documents this problem.

Daily grab samples were obtained during periods of inoperability and included in the monthly composite sample, with the following exception. SO2 became inoperable on 3/18 and grab samples were not obtained until 3/20 due to inadequate communications between departments. This incident was corrected by using one department to check the equipment and obtain samples and is documented in SOS 00-0611. All required monthly composite samples were collected during 2000.

Tritium was the only radionuclide detected in surface water samples collected during 2000. Four of twelve samples collected at indicator location S02 contained measurable levels of tritium with a mean concentration of 251 pCi/l. This is < 1% of the reporting limit for tritium in surface water.

The quantity of tritium measured at the indicator station is well within regulatory requirements. These results are inside the range of previous operational levels. There was no significant radiological impact on the health and safety of the public or the environment.

The gamma analysis results for surface water samples were consistent with previously accumulated data and no plant operational effects were identified.

Ground Water

Analysis

Tritium: A 60-70 ml aliquot of water is purified by distillation. A portion of the distillate is transferred to a counting vial and scintillation fluid added. The contents of the vial are thoroughly mixed and counted in a liquid scintillation counter.

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Ground water samples are collected quarterly from two sampling wells (F05 and F15) and one drinking water well (D01). The sample well samples are collected using an electric pump that is located in the well. The drinking water sample is collected from a faucet after allowing the line to flush for two minutes.

Results

The analysis results for all ground water samples were consistent with previously accumulated data and no plant operational effects were identified.

Bottom Sediment

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Bottom sediment samples are collected semi-annually from one indicator location (C) and one control location (A). The samples are taken from water at least 2 meters deep to prevent influence of bank erosion. A Ponar dredge is used to obtain the samples, consisting of the uppermost layer of sediment. Each sample is placed, without preservative, in a plastic bag and sealed.

Results

Cs-137 was detected in the October bottom sediment samples. Control station A indicated 36.6 pCi/kg dry while the indicator station C indicated 41.2 pCi/l.

The analysis results for bottom sediment samples were consistent with previously accumulated data including pre-operation and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

Shoreline Sediment

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Shoreline sediment samples are collected semi-annually in the same area as bottom sediment. The samples are collected within two feet of the edge of the water and consist of 2 six-inch diameter by two-inch deep sediment plugs. Each sample is placed in a plastic bag and sealed.

Shoreline sediment samples are collected two feet from the edge of the water in the same location as the bottom sediment samples. Sediment samples indicate there has been no impact on the environment from the Callaway Plant liquid discharge.

Results

Cs-137 was detected in the October shoreline sediment samples. Control station A indicated 93.6 pCi/kg dry while the indicator station C indicated 38.0 pCi/l.

The analysis results for bottom sediment samples were consistent with previously accumulated data including pre-operation and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

Wetlands Soil

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Wetlands soil samples are collected annually from 3 indicator locations (W2, W3, and W4) and one control location (W1). Two 6-inch square soil plugs consisting of the uppermost two-inch layer of soil are taken at each location. The samples are placed in plastic bags and sealed.

Results

Cs-137 was detected in the Wetlands soil samples. Control station W1 indicated 85 pCi/kg dry while the highest indicator station indicated 223 pCi/l.

The analysis results for Wetlands soil samples were consistent with previously accumulated data and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

2.4.6 Airborne Pathway

Airborne

Analysis

Gross Beta: The filters are analyzed approximately five days after collection to allow for decay of natural short-lived radionuclides. The glass fiber type filter is placed into a stainless steel planchet and counted for gross beta radioactivity using a proportional counter.

Iodine: Each Charcoal cartridge is placed on the germanium detector and counted. A peak of 0.36 MeV is used to calculate the concentration at counting time. The equilibrium concentration at the end of collection is then calculated. Decay correction for the time interval between sample collection and counting is then made.

Gamma Spectrometry: Filters are composited according to location and counted using a germanium detector coupled to a computer based multi-channel analyzer. The resulting spectrum is analyzed by computer and specific nuclides, if present, identified and quantified.

Sampling and Frequency

Airborne particulate samples are collected on a 47mm diameter glass fiber filter type A/E (99 percent removal efficiency at 1 micron particulate) at a volumetric rate of one and one-half cubic feet per minute at five locations. The particulate filters are collected weekly and shipped to Allegheny Technologies, Inc. for analyses.

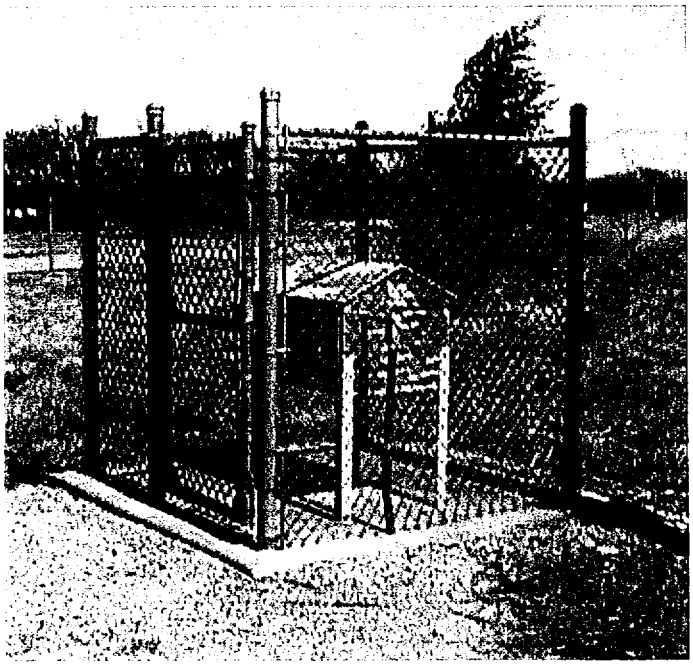
Each airborne particulate air sampler is equipped with a charcoal cartridge in-line after the particulate filter holder. The charcoal cartridge at each location is collected at the same time as the particulate filter.

All five sample locations are considered indicator locations (A1, A7, A8, A9, and B3). One indicator station (A9) is located at the community with the highest D/Q.

Results

The air stations were 100% operational during 2000 with the exception of stations A-1 and A-8.

Station A-1 was operational 98% of the year. The sampler had a pump failure during the week of 6-15 (SOS 00-1482). Insufficient sample was collected for this period to obtain the required LLD. The motor had seized due to a failure of the windings. The motor was replaced. During the week of 8-25 approximately 30 hours of sample was lost due to a blown fuse (SOS 00-2170). This was the second event for this pump and motor combination (see SOS 00-0643 on station B-3).



Airborne samples are continuously collected. Particulates are gathered on a glass fiber filter. A charcoal filter is in line after the particulate filter to collect iodines. Air samples indicate the Callaway Plant has had no impact on the surrounding environment.

The pump and motor was replaced to improve reliability. During the week of 2-24 the sampler pump flow was slightly higher then required (SOS 00-471). This did not effect the sampling capability of the pump. The pump was recalibrated to obtain the proper flow.

Station A-8 was operational 96% of the year. During the week of 3-16 the sample pump had a blown fuse and 111 hours of sample was lost (SOS 00-0643). The sample pump was repaired and returned to service. The sampler lost power during the week of 4-6 and lost 157 hours of sample (SOS 00-0916). The electric COOP was contacted and the problem was repaired. During the week of 6-28 the sampler lost power and 59 hours of sampling. The electric COOP was contacted and the problem was repaired.

Gross beta activity ranged from 0.012 to 0.057 pCi/m^3 in all samples. The average gross beta activity at all locations was 0.025 pCi/m^3. During 2000 there were 34 weekly samples with gross beta activities greater then the baseline action level of 0.037 pCi/m^3. Gamma spectral analysis was performed on these filters and no gamma emitting isotopes of plant origin was detected.

The analysis results for airborne samples were consistent with previously accumulated data and no plant operational effects were identified.

2.4.7 Ingestion Pathway

Milk

Analysis

Iodine-131: Two liters of milk containing standardized Iodine carrier is stirred with anion exchange resin for one hour. The resin is washed with NaCl and the iodine is eluted with sodium hypochlorite. Iodine in the iodate form is reduced to I_2 and the elemental iodine extracted into CCl_4, back-extracted into water, then precipitated as palladium iodide. The precipitate is counted for I-131 using a proportional counter.

Gamma Spectrometry: An aliquot of milk is placed in a standard counting container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

When available, two-gallon milk samples are collected semi-monthly during the pasture season (April through September) and monthly during the winter from one goat and one cow milk location near the Plant (M5 and M6) and one cow milk location away from the Plant (M8). Milk samples are shipped in ice to be received and analyzed by Allegheny Technologies, Inc. within eight days after collection.

Results

Milk samples were unavailable due to animals not producing milk during the following periods:

Location M8:
Samples were unavailable in September due to the cow in calf.

The analysis results for milk samples were consistent with previously accumulated data and no plant operational effects were identified.

Fish

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

The five most abundant recreational or commercial fish species are collected semi-annually from one indicator location (C) and one control location (A). Fish samples are filleted in preparation for analysis.

Results

The analysis results for fish samples were consistent with previously accumulated data and no plant operational effects were identified.

Fish are collected by Ameren UE biologists. Fish samples indicate there has been no impact on the environment due to operation of the Callaway Plant.

Vegetation

Analysis

Iodine-131: A suitable aliquot of wet (as received) sample is placed into a standard calibrated container and counted using a germanium detector coupled to a computer based, multi-channel analyzer. A peak of 0.36 MeV is used to calculate the concentration at counting time. The equilibrium concentration at the end of collection is calculated by decay correcting for the time interval between sample collection and counting.

Gamma Spectrometry: A suitable aliquot of wet (as received) sample is placed into a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Monthly, during the growing season, green leafy vegetation is collected from three indicator locations V9, V10, and V11 and from one control location V3. Station V3 was replaced in July with (V12). Vegetation samples consist of mustard greens, turnip greens, cabbage, lettuce, and spinach.

Results

Green leafy vegetation was unavailable due to lack of plant growth during the following periods:

Location V3:
January through June, farmer withdrew from program

Location V9:
February through May, September and December

Location V10:
January through April, September and December

Location V11:
August through October and December

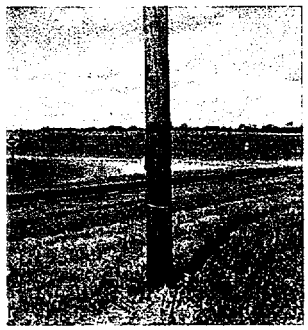
Location V12:
August, October through December

The analysis results for vegetation samples were consistent with previously accumulated data and no plant operational effects were identified.

Direct Radiation

Analysis

The Union Electric program uses the Panasonic Model UD-814 TLD and Model UD-710A automatic dosimeter reader. Each dosimeter consists of three elements of $CaSO_4$:Tm. The dosimeters are sealed in a moisture resistant plastic bag and placed inside a polypropylene mesh cylindrical holder in the environment. After exposure in the environment the dosimeters are read and the exposure for the time period is determined.



Pictured is one of the forty three dosimeter locations used to measure direct radiation. Direct radiation data indicates there has been no impact from the operation of the Callaway Plant.

Sampling and Frequency

Thermoluminescent Dosimetry (TLD) is used to determine direct radiation levels in and around the Callaway site. Forty-three dosimeters are placed in 16 sectors around the plant as specified in the ODCM. The dosimeters are read once per quarter. Three locations are designated as controls (IDM-26, IDM-27 and IDM-60).

Results

Direct Radiation data was unavailable due to vandalism during the following periods:

Location IDM-6 and IDM-23:
Second quarter

Location IDM-48:
Fourth quarter.

The analysis results for TLD samples were consistent with previously accumulated data and no plant operational effects were identified.

Soil

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multi-channel analyzer.

Sampling and Frequency

Soil samples are collected annually from four indicator locations (F2, PR3, F6, and PR7) and one control location (V3). To ensure only the most recent deposition is sampled, the uppermost two-inch layer of soil is taken at each location. Samples consist of 2 six-inch square soil plugs. The litter at the surface and the root mat is considered part of the sample. The samples are placed in plastic bags and sealed.

Results

Cs-137 was detected in the soil samples. Control station V3 indicated 208 pCi/kg dry while the highest indicator station indicated 1,012 pCi/l.

The analysis results for bottom sediment samples were consistent with previously accumulated data including pre-operation and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

2.5 Land Use Census

The 2000 Land Use Census is performed annually during the growing season within a five-mile radius of the Callaway Plant. The location of the nearest resident, milking animal and garden greater then 50 square meters is identified in each of the sixteen meteorological sectors.

The AmerenUE Real Estate Department conducted the 2000 Land Use Census during October. Information was collected by contacting residents by phone and conducting field surveys.

Results

The results of the 2000 Land Use Census are presented in Table IV. The table includes radial direction and distance from the Callaway Plant for each location. These parameters were determined using a combination of map position, aerial photography and Global Positioning System (GPS) receiver.

GPS accuracy has improved and the distances in Table IV have been updated as necessary.

Nearest Resident

The distance of the nearest resident from the plant was unchanged for 2000. The resident with the highest D/Q lives 1.8 miles from the plant in the NNW sector.

Changes were identified for the nearest residents in the following sectors: SSE, SSW, W, ENE, E and SW.

Milking Animals

There is no longer a milk location in the SW sector.

Vegetable Gardens

No volunteers with a higher average ground level D/Q then the current participants were identified.

Changes were identified for the nearest garden in the following sectors: ENE, E, ESE, SE, S, SSW, SW, WNW, WSW, NNW, NNE, NE, and SSE.

View of land near the Callaway Plant during late Winter. In the background is the Missouri River.

Table IV **2000 Land Use Census Results**

Closest Receptor in Miles[1]

Sector	Residence	Garden	Milk
N	2.2	NI	NI
NNE	2.2	2.4	NI
NE	2.3	2.5	NI
ENE	1.7	2.9	NI
E	3.5	3.8	NI
ESE	2.1	2.1	NI
SE	2.2	3.7	NI
SSE	2.5	2.5	2.5
S	2.7	2.7	NI
SSW	2.4	3.2	NI
SW	2.6	3.3	NI
WSW	1.2	2.9	NI
W	1.6	3.5	4.0
WNW	1.9	1.9	NI
NW	2.1	3.2	2.6
NNW	1.8	3.2	NI

[1] NI=None Identified

2.6 Cross-Check Results

The crosscheck results performed by the vendor laboratory during 2000 are presented in Table V. The results indicate satisfactory laboratory performance.

Table V 2000 Environmental Measurement Labratory

Quality Assessment Program Results[1]

Date	Type	Nuclide	Reported Value[2]	Reference Value[3]	Control Limits[4]	Result
Mar-00	Air Filter	Beta	2.70 ± 0.10	2.42	0.72 - 1.67	PASS
Mar-00	Air Filter	Co-57	5.90 ± 0.10	5.31	0.65 - 1.39	PASS
Mar-00	Air Filter	Co-60	5.90 ± 0.10	5.32	0.75 - 1.32	PASS
Mar-00	Air Filter	Cs-137	7.50 ± 0.10	6.10	0.73 - 1.37	PASS
Mar-00	Water	Co-60	51.00 ± 1.20	48.90	0.80 - 1.20	PASS
Mar-00	Water	Cs-137	108.60 ± 1.08	103.00	0.80 - 1.26	PASS
Mar-00	Water	Alpha	1217.00 ± 35.00	1700.00	0.61 - 1.32	PASS
Mar-00	Water	Beta	792.00 ± 25.00	690.00	0.55 - 1.54	PASS
Mar-00	Water	H-3	97.50 ± 11.60	79.4	0.71 - 1.79	PASS
Mar-00	Soil	Cs-137	324.00 ± 5.00	339.00	0.83 - 1.32	PASS
Mar-00	Soil	K-40	872.00 ± 34.00	811.00	0.78 - 1.53	PASS
Mar-00	Vegetation	Co-60	46.50 ± 2.10	52.80	0.69 - 1.46	PASS
Mar-00	Vegetation	Cs-137	1872.00 ± 46.00	1380.00	0.80 - 1.40	PASS
Mar-00	Vegetation	K-40	506.40 ± 28.00	521.00	0.79 - 1.42	PASS
Sep-00	Air Filter	Co-57	16.50 ± 0.60	14.50	0.69 - 1.37	PASS
Sep-00	Air Filter	Co-60	9.20 ± 0.40	8.43	0.79 - 1.30	PASS
Sep-00	Air Filter	Cs-137	8.80 ± 0.50	7.41	0.78- 1.35	PASS
Sep-00	Air Filter	Mn-54	50.20 ± 2.30	43.20	0.80 - 1.36	PASS
Sep-00	Air Filter	Beta	2.08 ± 0.02	1.52	0.76- 1.52	PASS
Sep-00	Water	Co-60	71.90 ± 7.20	73.70	0.80 - 1.20	PASS
Sep-00	Water	Cs-137	62.70 ± 6.30	67.00	0.80 - 1.24	PASS
Sep-00	Water	Alpha	1113.70 ± 17.90	1070.00	0.58 - 1.26	PASS
Sep-00	Water	Beta	1129.40 ± 16.70	950.00	0.56 - 1.50	PASS
Sep-00	Water	H-3	92.30 ± 8.90	91.30	0.74 - 2.29	PASS
Sep-00	Soil	Cs-137	925.70 ± 14.20	1020.00	0.80 - 1.29	PASS
Sep-00	Soil	K-40	713.60 ± 7.10	713.00	0.80 - 1.37	PASS
Sep-00	Vegetation	Co-60	29.40 ± 0.40	32.80	0.75 - 1.51	PASS
Sep-00	Vegetation	Cs-137	739.30 ± 23.00	867.00	0.80 - 1.37	PASS
Sep-00	Vegetation	K-40	597.50 ± 49.30	639.00	0.78 - 1.43	PASS

[1] Results are reported as follows: Water Bq/L, Air Filters Bq/Filter, Soil and Vegetation Bq/Kg.

[2] Results are reported as the mean of three determinations +/- 1 standard deviation.

[3] Results are mean of replicate determinations for each nuclide +/- the standard error or the mean.

[4] Control Limits are the ratio of Reported Value / Reference Value established using historic data.

Table V

2000 Mixed Analyle Performace Evaluation Program[1]

Date	Type	Nuclide	Reported Value[2]	Reference Value[3]	Control Limits[4]	Result
Jan-00	Soil	Co-57	721.10 ± 83.80	949.00	664.30 - 1233.70	PASS
Jan-00	Soil	Co-60	1264.40 ± 78.60	1180.00	826.00 - 1534.00	PASS
Jan-00	Soil	Cs-134	969.30 ± 76.90	1047.00	732.90 - 1361.10	PASS
Jan-00	Soil	Cs-137	944.00 ± 92.00	930.00	651.00 - 1209.00	PASS
Jan-00	Soil	K-40	811.70 ± 79.90	652.00	456.40 - 847.60	PASS
Jan-00	Soil	Mn-54	1103.30 ± 64.20	1023.00	716.10 - 1329.90	PASS

[1] Results are reported as follows: Water Bq/L, Soil Bq/Kg.

[2] Results are reported as the mean of three determinations +/- 1 standard deviation.

[3] Results are presented as the known values and expected laboratory percision.

[4] Control Limits are defined by MAPEP.

2.7 Data Reporting Conventions

Lower Limit of Detection

The lower limit of detection (LLD) used in this report is per NRC Regulatory Guide 4.1, Rev. 1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants", and the NRC Branch Technical Position, November 1979, "An acceptable radiological Environmental Monitoring Program". The LLD is defined as the smallest concentration of radioactivity material in a sample that will yield a net count (above 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 maximum LLDs for radiological environmental sample analysis is presented in Table III.

Data Reporting

Positive sample results are reported with a 2 sigma counting uncertainty (corresponding to the 95% confidence level). In cases where the activity is found to be below the sample analysis minimum detection activity it is reported as Not Detected (ND).

2.8 Radilogical Environmental Monitoring Program Annual Summary

The REMP Summary is presented in Table VI With the exception of a small indication of tritium in river water, there was no measurable impact on the environment due to plant operation.

Table VI

REMP Summary

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (f)[2] Range	Location With Highest Annual Mean		Control Location Mean (f)[2] Range	Number of Non-routine Reported Measurements
				Name Distance and Direction	Mean (f)[2] Range		
Waterborne Pathway							
Surface Water (pCi/l)	H-3 (24)	174	251 (4/12) (226 - 653)	S02 4.9 mi SE	251 (4/12) (226 - 653)	181 (2/12) (191 - 203)	0
	Gamma (24)	—	— (0/12)	NA	NA	— (0/12)	0
Shoreline Sediment (pCi/kg)	Gamma (4)	—	— (0/2)	NA	NA	— (0/2)	0
Airborne Pathway							
Airborne Particulate (pCi/m^3)	Gross Beta (259)	—	0.025 (259/259) (0.012 – 0.057)	B-3 1.8 mi NNW	0.026 (52/52) (.012 - 0.053)	NA —	0
	Gamma (20)	—	— (0/20)	NA	NA	NA	0
	I-131 (259)	0.070	— (0/259)	NA	NA	NA	0

Table VI

REMP Summary

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (f)[2] Range	Location With Highest Annual Mean		Control Location Mean (f)[2] Range	Number of Non-routine Reported Measurements
				Name Distance and Direction	Mean (f)[2] Range		
Ingestion Pathway							
Milk	Gamma (34)	—	(0/18)	NA	NA	— (0/16)	0
	I-131 (34)	0.2	— (0/18)	NA	NA	— (0/16)	0
Fish (pCi/kg - wet)	Gamma (20)	—	— (0/10)	NA	NA	— (0/10)	0
Vegetation (pCi/kg - wet)	Gamma (22)	—	— (0/21)	NA	NA	— (0/1)	0
	I-131 (22)	7.2	— (0/21)	NA	NA	— (0/1)	0
Direct Radiation							
Quarterly TLDs (mRem/Standard Qurarter)	Gamma (167) Does	10	15.9 (157/157) (11/20)	31a 7.8 mi SW	18.0 (4/4) (17 - 19)	14 (10/10) (11 - 18)	0

[1] The LLDs quoted is the lowest actual detection limit obtained in the various media during the reporting period. The required LLDs for radiological environmental sample analysis is found in Table III. Where all nuclides were LLD for specific media, no LLD was listed.

[2] Mean and range are based upon detectable measurements only. Fraction of detectable measurements is indicated in parentheses.

2.9 Individual Sampling Results

The REMP Individual sample results are presented in Tables VII through XVI.

The following acronyms are used in these tables:

ND = Not Detected (Result below analysis detection limit)

NA = Not Available (Circumstances discussed in body of report)

NP = Not Present (Station did not exist at this time)

The area surrounding the Callaway Plant includes the Reform Conservation Area. The 7,044 acres that comprise this area is owned by Ameren UE and managed by the Missouri Department of Conservation.

Table VII

Airborne[1]

Gross Beta in Air Particulate Filters (pCi/m³)

	A-1	B-3	A-7	A-8	A-9		A-1	B-3	A-7	A-8	A-9
01/06/00	0.035	0.043	0.038	0.041	0.042	**07/06/00**	0.023	0.023	0.023	0.019	0.017
01/13/00	0.028	0.032	0.027	0.030	0.028	**07/13/00**	0.025	0.018	0.021	0.024	0.023
01/20/00	0.036	0.034	0.025	0.031	0.033	**07/20/00**	0.023	0.023	0.021	0.020	0.019
01/27/00	0.027	0.031	0.026	0.030	0.027	**07/27/00**	0.016	0.021	0.015	0.017	0.016
02/03/00	0.043	0.040	0.031	0.044	0.041	**08/03/00**	0.022	0.024	0.022	0.022	0.018
02/10/00	0.042	0.038	0.032	0.036	0.042	**08/10/00**	0.024	0.023	0.021	0.023	0.020
02/16/00	0.036	0.041	0.032	0.036	0.031	**08/17/00**	0.028	0.031	0.028	0.029	0.021
02/24/00	0.036	0.029	0.024	0.027	0.028	**08/25/00**	0.023	0.022	0.022	0.021	0.020
03/02/00	0.019	0.018	0.016	0.014	0.015	**08/31/00**	0.033	0.031	0.029	0.025	0.025
03/09/00	0.022	0.022	0.023	0.021	0.022	**09/07/00**	0.026	0.027	0.025	0.023	0.026
03/16/00	0.020	0.022	0.017	0.022	0.024	**09/14/00**	0.014	0.015	0.015	0.014	0.013
03/23/00	0.017	0.018	0.017	0.021	0.019	**09/21/00**	0.024	0.021	0.020	0.024	0.023
03/30/00	0.014	0.018	0.014	0.015	0.015	**09/28/00**	0.016	0.026	0.017	0.016	0.014
04/06/00	0.018	0.021	0.017	0.016	0.019	**10/05/00**	0.024	0.024	0.024	0.025	0.020
04/13/00	0.019	0.019	0.016	0.015	0.020	**10/12/00**	0.016	0.018	0.018	0.018	0.016
04/20/00	0.018	0.018	0.015	0.014	0.019	**10/20/00**	0.031	0.031	0.029	0.035	0.026
04/27/00	0.019	0.019	0.019	0.017	0.020	**10/26/00**	0.053	0.041	0.043	0.052	0.041
05/05/00	0.020	0.020	0.022	0.020	0.024	**11/02/00**	0.031	0.035	0.030	0.041	0.029
05/11/00	0.017	0.017	0.019	0.017	0.018	**11/08/00**	0.018	0.019	0.018	0.021	0.016
05/18/00	0.023	0.021	0.021	0.020	0.020	**11/16/00**	0.022	0.023	0.019	0.027	0.019
05/25/00	0.017	0.018	0.017	0.017	0.016	**11/24/00**	0.025	0.029	0.026	0.030	0.028
06/01/00	0.019	0.021	0.017	0.018	0.017	**11/30/00**	0.045	0.051	0.041	0.057	0.046
06/08/00	0.021	0.017	0.014	0.015	0.015	**12/07/00**	0.023	0.027	0.023	0.028	0.023
06/15/00	<0.056	0.019	0.017	0.017	0.016	**12/14/00**	0.038	0.042	0.038	0.046	0.034
06/22/00	0.012	0.014	0.013	0.013	0.012	**12/20/00**	0.044	0.053	0.044	0.054	0.039
06/29/00	0.012	0.012	0.012	0.012	0.012	**12/28/00**	0.035	0.040	0.035	0.043	0.034

[1] Iodine-131 concentrations<0.07 pCi/m³ in all samples

Table VIII *Airborne Composites (pCi/m³)*[1]

A-1

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.079	0.076	0.068	0.056

A-7

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.068	0.076	0.068	0.039

A-8

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.076	0.077	0.066	0.067

A-9

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.070	0.070	0.059	0.046

B-3

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.075	0.071	0.065	0.059

[1] Co-58, Co-60, Zr-95, Nb-95, Cs-134, Cs-134, Cs-137, Ba-140, La-140, Ce-144 Not Detectable

Table IX

Soil (pCi/kg)[1]

	F2	F6	PR3	PR7	V3
	11/30/00	11/29/00	11/30/00	11/29/00	11/29/00
Gross Alpha	20913	13857	13175	9646	10434
Gross Beta	30255	24149	19512	20220	24283
K-40	12647	11282	11050	11698	15349
Cs-137	1012	847	600	386	208

	W1	W2	W3	W4
	11/30/00	11/30/00	11/30/00	11/30/00
Gross Alpha	14122	13372	14505	7882
Gross Beta	21434	25490	25020	17793
K-40	12858	16546	17731	9895
Cs-137	85	182	223	ND

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-pr, Cs-137, Ba-140, La-140, Not Detectable

Table X

Vegitation (pCi/kg wet)[1]

V9

	1/12/00 Cabbage	6/13/00 Cabbage	6/13/00 Lettuce	6/13/00 Mustard Greens	6/13/00 Turnip Greens	7/17/00 Cabbage
Gross Alpha	251	ND	ND	97	194	133
Gross Beta	3532	3209	3899	4225	4785	2561
K-40	3335	4177	3962	4026	4482	3585

	7/17/00 Lettuce	8/7/00 Cabbage	10/9/00 Mustard Greens	10/9/00 Cabbage	11/15/00 Cabbage	11/15/00 Mustard Greens
Gross Alpha	ND	75	ND	ND	73	65
Gross Beta	4199	2240	4073	3223	3886	4483
K-40	4269	2273	5387	4328	4390	5232

V10

	5/9/00 Lettuce	5/9/00 Mustard Greens	5/9/00 Spinach	6/13/00 Lettuce	7/11/00 Lettuce	7/11/00 Cabbage
Gross Alpha	215	150	348	164	173	ND
Gross Beta	3822	3851	5935	4887	4954	3125
K-40	3526	4368	4788	3952	5242	2377

	8/22/00 Cabbage	10/10/00 Mustard Greens
Gross Alpha	41	ND
Gross Beta	2615	3693
K-40	2601	3704

[1] Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, Not Detectable

Table X

Vegitation (pCi/kg wet)[1]

V11

	7/11/00 Cabbage
Gross Alpha	51
Gross Beta	1708
K-40	1901

V12

	9/11/00 Cabbage
Gross Alpha	351
Gross Beta	7011
K-40	5772

[1] Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, Not Detectable

Table XI

Surface Water (pCi/l)[1]

S01

	1/11/00	2/8/00	3/7/00	4/11/00	5/9/00	6/13/00
Gross Alpha	4.2	4.8	2.8	4.5	2.4	2.4
Gross Beta	7.4	13.7	5.7	7.6	8.0	7.7
H-3	ND	ND	ND	ND	ND	ND

	7/11/00	8/8/00	9/12/00	10/10/00	11/14/00	12/12/00
Gross Alpha	3.1	2.6	2.0	1.4	1.3	3.7
Gross Beta	8.0	7.8	7.2	6.2	6.9	7.7
K-40	ND	ND	191	203	ND	ND

S02

	1/11/00	2/8/00	3/7/00	4/11/00	5/9/00	6/13/00
Gross Alpha	ND	ND	3.1	2.8	2.7	2.9
Gross Beta	9.9	7.8	6.0	7.8	6.3	7.2
H-3	ND	ND	226	ND	ND	ND

	7/11/00	8/8/00	9/12/00	10/10/00	11/14/00	12/12/00
Gross Alpha	4.7	2.0	2.6	3.2	1.6	2.5
Gross Beta	9.2	7.7	7.3	6.8	7.2	6.9
H-3	ND	ND	314	403	653	ND

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140, La-140,Not Detectable

Table XII

Ground Water[1]

D01

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

F05

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

F015

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

[1] H-3, Mn-54, Fe-59, Co-58, Co-60, Zr-95, Cs-134, Cs-137, Ba-140, La-140, Not Detectable

Table XIII

Sediments (pCi/kg dry)[1]

Bottom Sediments

	A		C		
	4/19/00	10/11/00		4/19/00	10/11/00
K-40	13156	13438	**K-40**	13533	12295
Cs-137	ND	36.6	**Cs-137**	ND	41.2

Shoreline Sediments

	A		C		
	4/19/00	10/11/00		4/19/00	10/11/00
K-40	15104	14523	**K-40**	13822	14240
Cs-137	ND	93.6	**Cs-137**	ND	38.0

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Ba-140, La-140, Not Detectable

Table IXV

Fish (pCi/kg wet)[1]

A

	4/19/00	**4/19/00**	**4/19/00**	**4/19/00**	**4/19/00**
	Channel Catfish	Carp	River Carpsucker	Freshwater Drum	Grass Carp
K-40	2808	3446	2429	2961	2803

	10/11/00	**10/11/00**	**10/11/00**	**10/11/00**	**10/11/00**
	Carp	Channel Catfish	Freshwater Drum	Bigmouth Buffalo	River Carpsucker
K-40	3025	3817	3213	3509	2984

C

	4/19/00	**4/19/00**	**4/19/00**	**4/19/00**	**4/19/00**
	Channel Catfish	Freshwater Drum	Carp	River Carpsucker	Grass Carp
K-40	2808	2755	3020	2683	2960

	10/11/00	**10/11/00**	**10/11/00**	**10/11/00**	**10/11/00**
	Freshwater Drum	Carp	Bigmouth Buffalo	Channel Catfish	River Carpsucker
K-40	3348	3161	3164	3526	3565

[1] Mn-54, Fe-59, Co-58, Co-60, I-131, Cs-134, Cs-137, Not Detectable

Table XV

Milk (pCi/l)[1]

M6

	1/10/00	2/8/00	3/14/00	4/11/00	4/25/00	5/9/00
K-40	1221	1278	1241	1352	1281	1216
	5/23/00	**6/13/00**	**6/27/00**	**7/11/00**	**7/23/00**	**8/8/00**
K-40	1251	1213	1335	1387	1254	1363
	8/22/00	**9/12/00**	**9/26/00**	**10/10/00**	**11/14/00**	**12/12/00**
K-40	1215	1299	1066	1203	1280	1198

M8

	1/10/00	2/8/00	3/14/00	4/11/00	4/24/00	5/8/00
K-40	1375	1461	1341	1425	1386	1485
	5/23/00	**6/12/00**	**6/26/00**	**7/11/00**	**7/23/00**	**8/8/00**
K-40	1430	1211	1099	1020	1268	1077
	8/22/00	**9/12/00**	**9/26/00**	**10/9/00**	**11/14/00**	**12/12/00**
K-40	1196	NA	NA	1197	1251	1405

[1] I-131, Zn-65, Cs-134, Cs-137, Ba-140, La-140,Not Detectable

Table XVI

Direct Radiation (mrem)

	QTR 1	QTR 2	QTR 3	QTR 4
1a	15	16	15	17
3	18	16	17	17
5	14	13	13	14
6	18	NA	17	15
7	18	15	18	16
9	15	14	14	15
10	18	17	16	18
11a	18	16	17	17
14	16	15	15	16
17	17	16	16	17
18a	18	16	16	16
20	17	16	16	17
21	19	16	18	17
22a	16	15	15	16
23	17	NA	16	16
26	11	11	11	12
27	18	16	16	16
30a	16	15	16	15
31a	19	17	18	18
32	16	16	17	16
32a	17	16	16	17
33	15	15	17	16

	QTR 1	QTR 2	QTR 3	QTR 4
34	15	15	15	17
35	14	15	14	16
36	16	15	15	15
37	17	15	16	16
38	13	11	12	12
39	16	15	15	17
39a	18	16	17	18
40	18	16	16	18
41	17	15	17	15
42	13	13	12	15
43	16	15	15	17
44	18	16	17	17
45	15	15	20	16
46	16	15	16	16
47	17	15	17	16
48	17	17	16	NA
49	16	15	16	17
50	17	15	16	16
51a	18	18	16	18
52	16	18	15	19
60	NP	NP	16	17

3.0 *Non-Radiological Monitoring Program*

3.1 Introduction

Union Electric Company, d.b.a. AmerenUE, in accordance with federal regulations and a desire to maintain the quality of the local environment around Callaway Plant has implemented an Environmental Protection Plan, (EPP) contained in Appendix B of the Callaway Plant Operating License.

The objective of the EPP is to provide for protection of non-radiological environmental values during operation of the Callaway Plant.

This report describes the conduct of the EPP for the Callaway Plant during 2000.

3.2 Unusual or Important Events

No unusual or important events reportable under the EPP Section 4.1 were identified during 2000.

3.3 EPP Noncompliances

During 2000 there were no noncompliances with the EPP.

3.4 Nonroutine Reports

There were no nonroutine reports submitted in accordance with the EPP, Section 5.4.2 in 2000.

3.5 Plant Design and Operation Environmental Evaluations.

This section lists all changes in the plant design, operation, tests or experiments completed during 2000, which could have involved a potentially significant unreviewed environmental question in accordance with section 3.1 of

Appendix B.

During 2000, there was one plant design and operation change that could have involved a potentially significant unreviewed environmental question. The interpretations and conclusions regarding these plant design and operation changes along with a description of the changes are presented below.

Callaway Modification Package RMP-99-2011

Description of Change:

This modification consists of the construction of an additional sludge lagoon adjacent to the three existing sludge lagoons at Callaway Plant. The additional sludge lagoon will mainly be used to treat wastewater from the Water Treatment Plant clarifier blowdown. Two of the existing sludge lagoons are full and the current treatment lagoon for this wastewater is near its capacity.

The modification also includes the conversion of one of the filled lagoons into an additional polishing wetland for the sanitary treatment plant effluent. The change will allow the effluent from this polishing wetland to be recycled back to the water treatment plant for additional treatment and reuse at Callaway Plant.

Evaluation of Change:

The additional sludge pond will be constructed in the area where 16 ponds were initially planned based on two units operating for 40 years. The treatment pond was built under the authorization of a construction permit issued by the Missouri Department of Natural Resources. A storm water pollution prevention plan and Missouri State Operating Permit Water Pollution Control Program for construction or land disturbance activities managed storm water runoff during construction of the treatment pond. A copy of the Missouri State Operating Permit Water Pollution Control Program for construction or land disturbance activities was submitted to the NRC. This additional lagoon will increase the settling volume and will allow for continued treatment of outfalls that are treated by the sludge lagoon.

Currently a filled sludge lagoon is used as a polishing wetland for the effluent from the Sanitary Treatment Plant. The conversion of an additional filled treatment lagoon to a polishing wetland is expected to provide additional polishing for the water discharged from the Sanitary Treatment Plant. The change will also allow this for this outfall to be recycled for further treatment and reuse at Callaway. The recycling of water will decrease the quantity of water discharged from Callaway.

These changes will not significantly affect the concentrations, frequencies or types of effluents being discharged from the plant, and does not affect the current plant power level. Therefore, this modification did not constitute an unreviewed environmental question per Section 3.1 of appendix B to the Callaway Plant Operating License.