Radiological Environmental Operating Report

Photo courtesy of: Gary Parkey

Chapter 6

PROGRAM DESCRIPTION

The South Texas Project initiated a comprehensive preoperational Radiological Environmental Monitoring Program in July 1985. That program terminated on March 7, 1988, when the operational program was implemented. The data from the preoperational monitoring program forms the baseline against which operational changes are measured.

Analyses of the environmental pathways require that samples be taken from water, air, and land environments. These samples are obtained to evaluate potential radiation exposure to people. Sample types are based on established pathways and experience gained at other nuclear facilities. Sample locations were determined after considering site meteorology, site hydrology, local demography, and land use. Sampling locations are further evaluated and modified according to field and analysis experience. Table 1 at the end of this section lists the required sampling locations and frequency of collection. Additional discretionary samples were also collected.

Sampling locations consist of indicator and control stations. Indicator stations are locations on or off the site that may be influenced by plant discharges during plant operation. Control stations are located beyond the measurable influence of the South Texas Project. Although most samples analyzed are accompanied by a control sample, it should be noted that this practice is not always possible or meaningful with all sample types. Fluctuations in the concentration of radionuclides and direct radiation exposure at indicator stations are evaluated in relation to historical data and against the control stations. Indicator stations are compared with characteristics identified during the preoperational program to monitor for radiological effects from plant operation.

Two sample identification methods are used in the program. Figures 6-1 and 6-2 are maps that identify permanent sample stations. Descriptions of sample stations shown on Figure 6-1 and 6-2 are found in Table 2. Table 2 also includes supplemental sampling locations and media types that may be used for additional information. Figure 6-3 illustrates zones that may be used instead of permanent, numbered sample stations.

Photo By: Edmond Hardcastle and Aubrey Passafuma

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
DESIGNATED SAMPLE LOCATION MAP

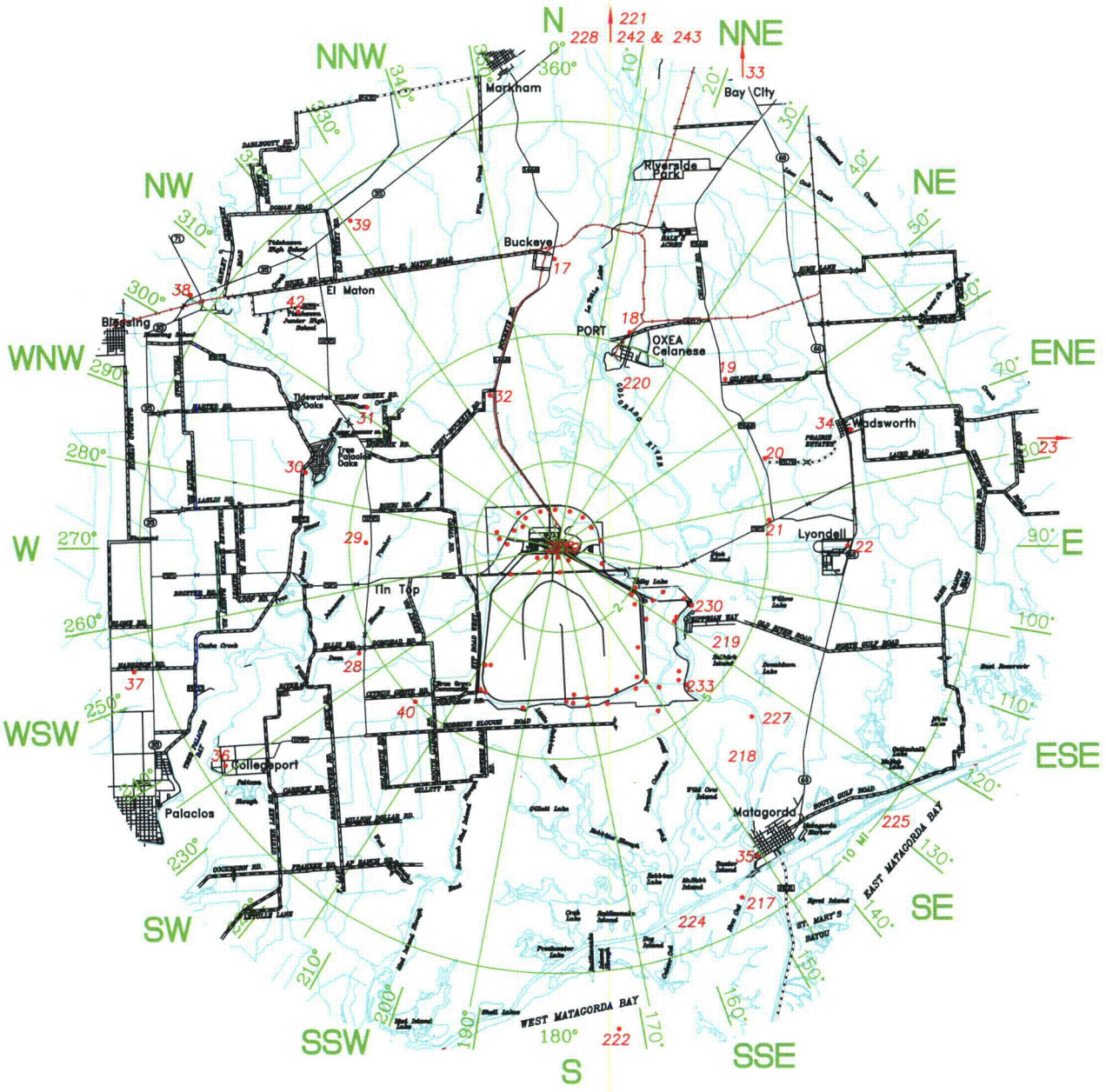


Figure 6-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
ONSITE SAMPLE LOCATION MAP

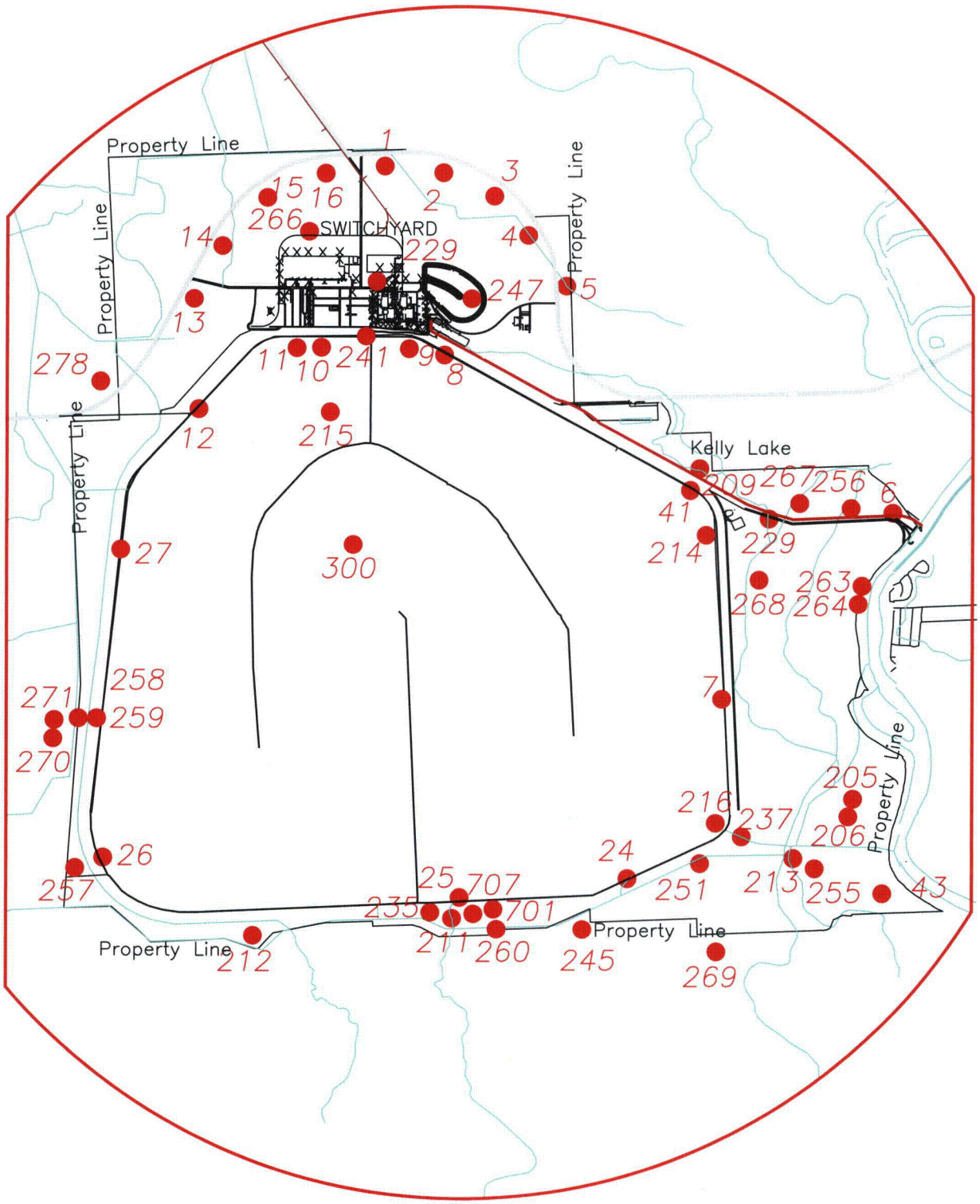
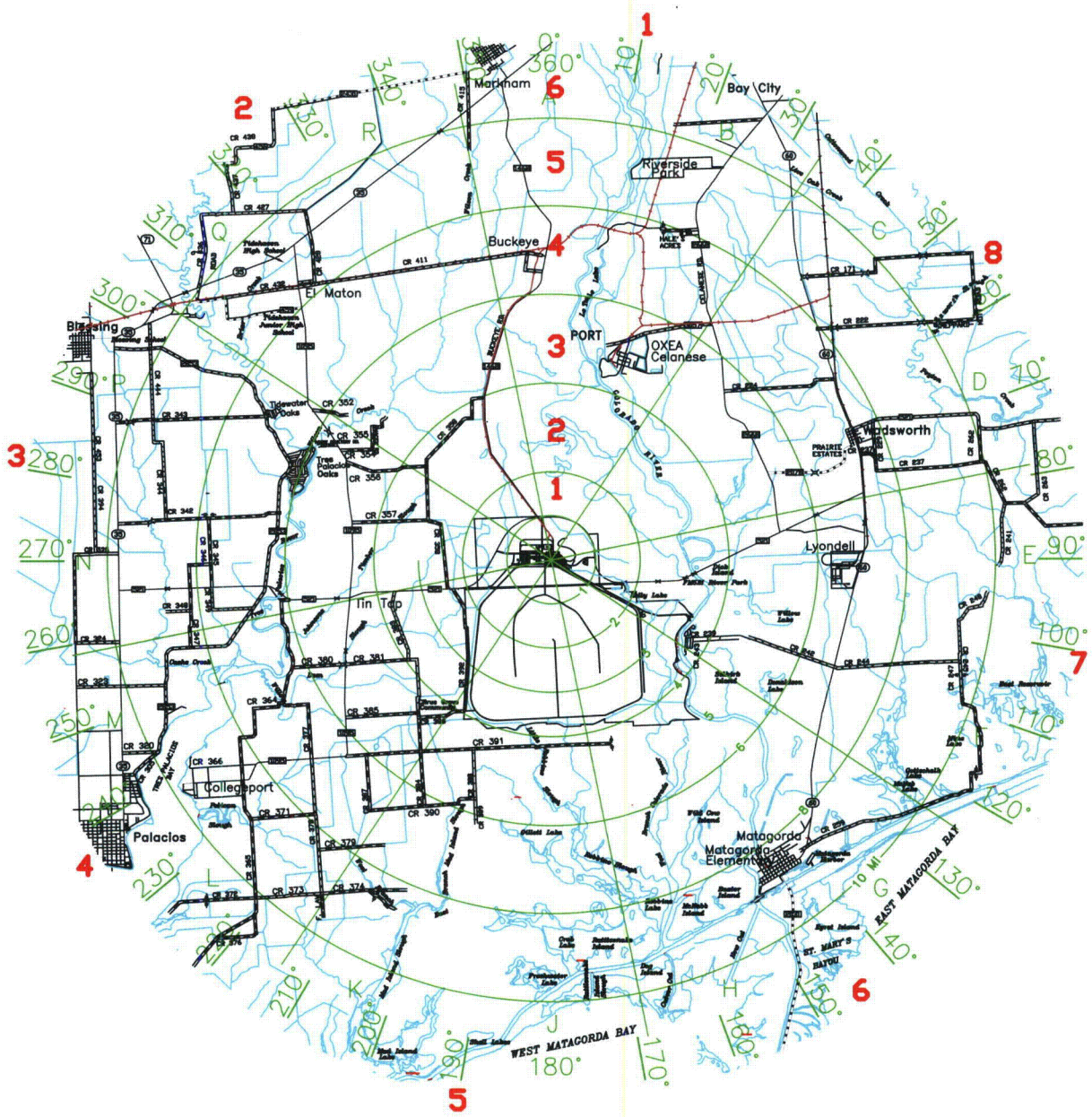


Figure 6-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ZONE LOCATION MAP



The zone station is determined in the following manner:

* The first character of the station number "Z" to identify it as a zone station.
* The second character is the direction coordinate number 1-8.
* The third character is the distance from the site number 1-6.

Figure 6-3

ANALYSIS OF RESULTS AND TRENDS

Environmental samples from areas surrounding the South Texas Project continue to indicate no radiological effects from plant operation. Analytical values from offsite indicator sample stations continue to trend with the control stations. Measurements from onsite indicator samples continued to fluctuate within normal historical ranges.

Airborne pathway

Average quarterly air particulate sample beta activity from three onsite indicator stations and a single control station have been compared historically from 2001 through 2014 (see Figure 6-4). The average of the onsite indicators trends closely with the offsite control values. The comparison illustrates that plant operations are not having an impact on air particulate activity even at the Sensitive Indicator Stations (#1, #15, and #16). These stations are located near the site boundary downwind from the plant, based on the prevailing wind direction. The beta activity measured in the air particulate samples is from naturally occurring radioactive material. Gamma analyses are performed on quarterly composites of the air particulate samples to determine if any activity is from the South Texas Project. The gamma analyses revealed no radioactivity from the South Texas Project.

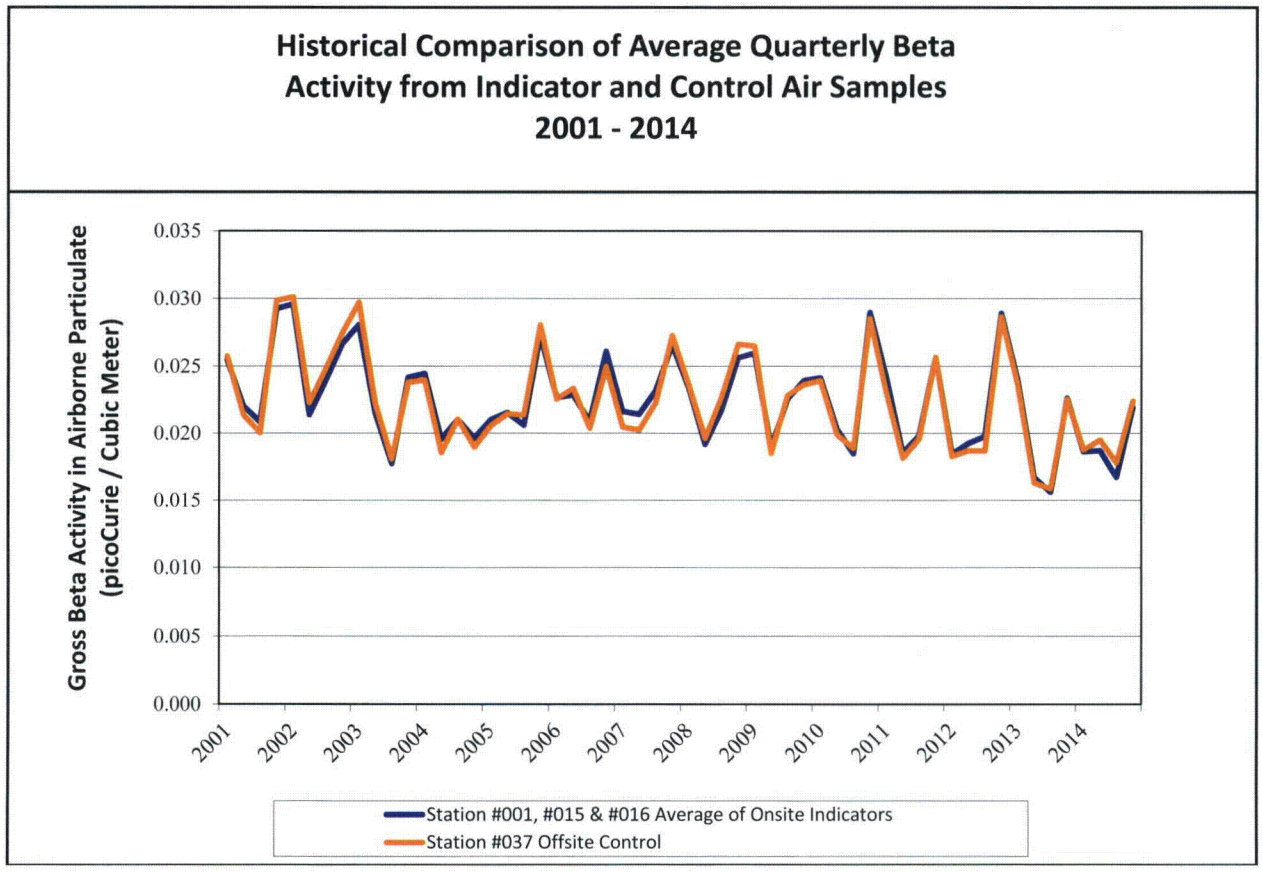


Figure 6-4

Direct exposure pathway

Direct gamma radiation is monitored in the environment by thermoluminescent dosimeters (TLDs) located at 40 sites. The natural direct gamma radiation varies according to location because of differences in the natural radioactive materials in the soil, soil moisture content, and other factors. Figure 6-5 compares the amount of direct gamma radiation measured at the plant since the fourth quarter of 2001 for three different types of stations. South Texas Project started using a vendor for offsite processing of the same device for environmental measurement of direct radiation during the third and fourth quarter of 2014. The Control Stations, Stations #23 and #37, are greater than 10 miles from the site in the minimal wind direction. The prevailing wind direction was into the NW sector. The Sensitive Indicator Stations are one mile NW, NNW, and N from the plants on FM 521 at Stations # 15, # 16 and #1 respectively. The Indicator Stations are the remainder of the required stations. The values plotted are the averages for all of the stations according to type. The average of the Control Stations is higher than the other stations because station #23 is in an area that has a slightly higher natural background radiation. The trends of Figure 6-5 clearly show that the plants are not adding to the direct radiation in the offsite environment.

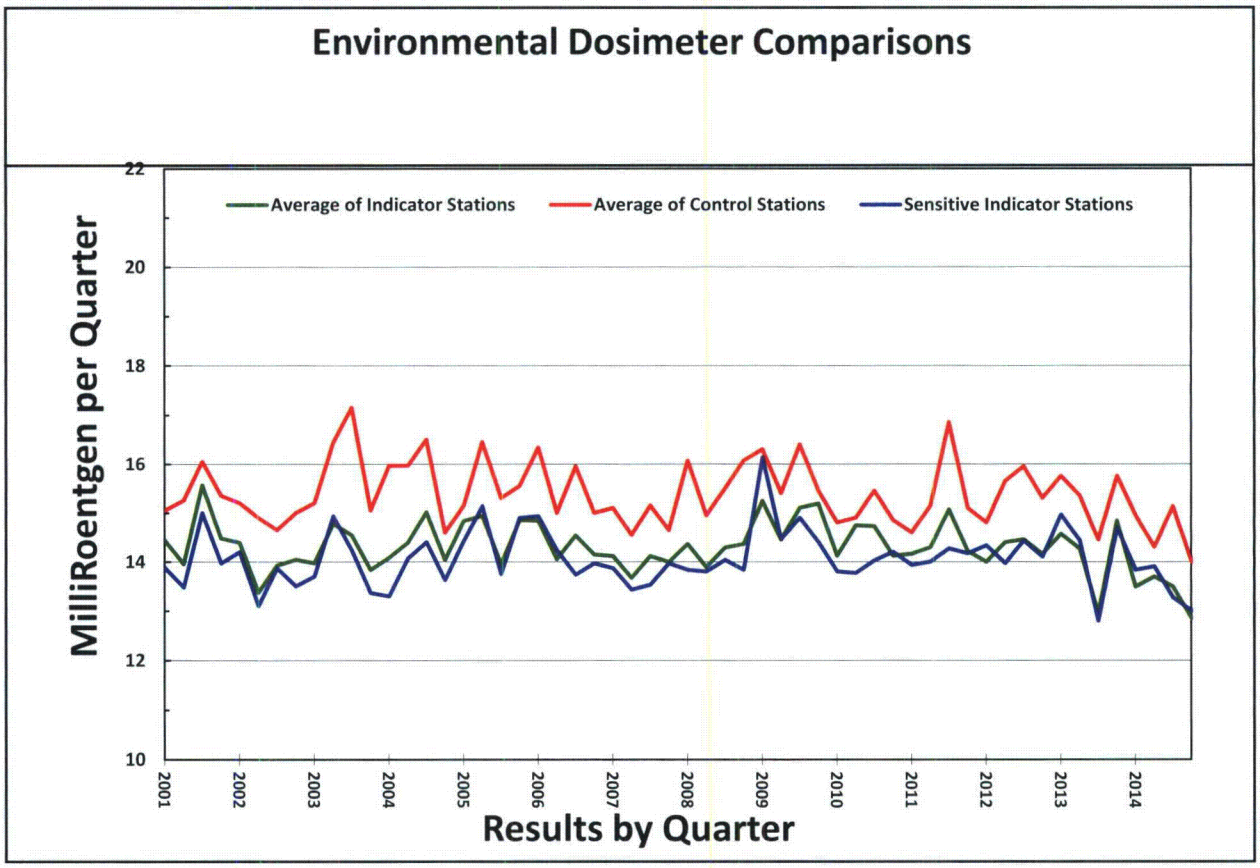


Figure 6-5

Sediment Samples

Bottom sediment samples are taken from the Main Cooling Reservoir each year. A study was performed in 2008 to locate the distribution and concentrations of cobalt-60 and cesium-137 in the Main Cooling Reservoir. Although no cobalt-60 was detected from 2007 through 2010 at Stations #215 and #216, the concentration of cobalt-60 is not uniformly distributed in the reservoir sediment and a depository of cobalt-60 still remains. Figure 6-6 shows the positive results from the plant-produced radioactive material cobalt-60. The cobalt-60 inventory in the reservoir has decreased since 1992 because of radioactive decay and equipment installed to reduce radioactive effluents. Although the total activity of cobalt-60 has decreased over time, an inventory of cobalt-60 is still in the reservoir as seen occasionally at Stations #215 and #216. In 2014, cobalt-60 was identified in five out of six samples taken, but all results were less than the reporting levels. Figure 6-7 demonstrates the calculated decline in the total amount of cobalt-60 in the reservoir.

Cesium-137 was measured in five of six bottom sediment samples from Stations #215 and #216 in the Main Cooling Reservoir. The highest measurement was 124 pCi/kg at Station #216. The highest measurement at Station #215 was 22.2 pCi/kg. Cesium-137 is often found in environmental media including soil and sediment from residual radioactive material from nuclear weapons testing fallout. Soil and sediment samples taken in 1986 and 1987 prior to operation of STP contained cesium-137 from weapons testing fallout. The preoperational average cesium-137 concentration was 118 pCi/kg when it was detected in soil and sediment samples but the highest sample measured was 383 pCi/kg. Cesium-137 activities measured at Station #216 in 2014 were slightly less than previously detected, but remained considerably less than reportable levels. In addition, the measured values at Station #215 and #216 are consistent with preoperational concentrations reduced by 25 years of radioactive decay.

Waterborne pathway

Tritium has been monitored in the shallow aquifer since 1997 on the south side of the Main Cooling Reservoir. Models used when licensing the site predicted tritium in the shallow aquifer. These models were validated with additional studies for the proposed Units 3 and 4. A site conceptual model, developed in 2008 and updated in 2014, validated the original predictions of the site hydrology study.

Tritium is a radioactive isotope of hydrogen and is produced during plant operation. Tritium produced in the reactors is a part of the water molecule. Wastewater is treated to remove impurities before release, but tritium cannot be removed because it is chemically part of the water molecule. Some of the tritium is released into the atmosphere, and the remainder is released into the Main Cooling Reservoir. The tritium escapes from the Main Cooling Reservoir by evaporation, movement into the shallow aquifer, and by percolation from the relief wells which are a part of the reservoir embankment's stabilization system. Figure 6-8 shows the amount of tritium released to the Main Cooling Reservoir each year and the amount present during the last quarter of each year.

The concentration of tritium in the Main Cooling Reservoir was relatively stable in 2014. The amount of tritium measured in the Main Cooling Reservoir was consistent with the amount released. The amount of rainfall and river makeup influences the concentration of tritium in

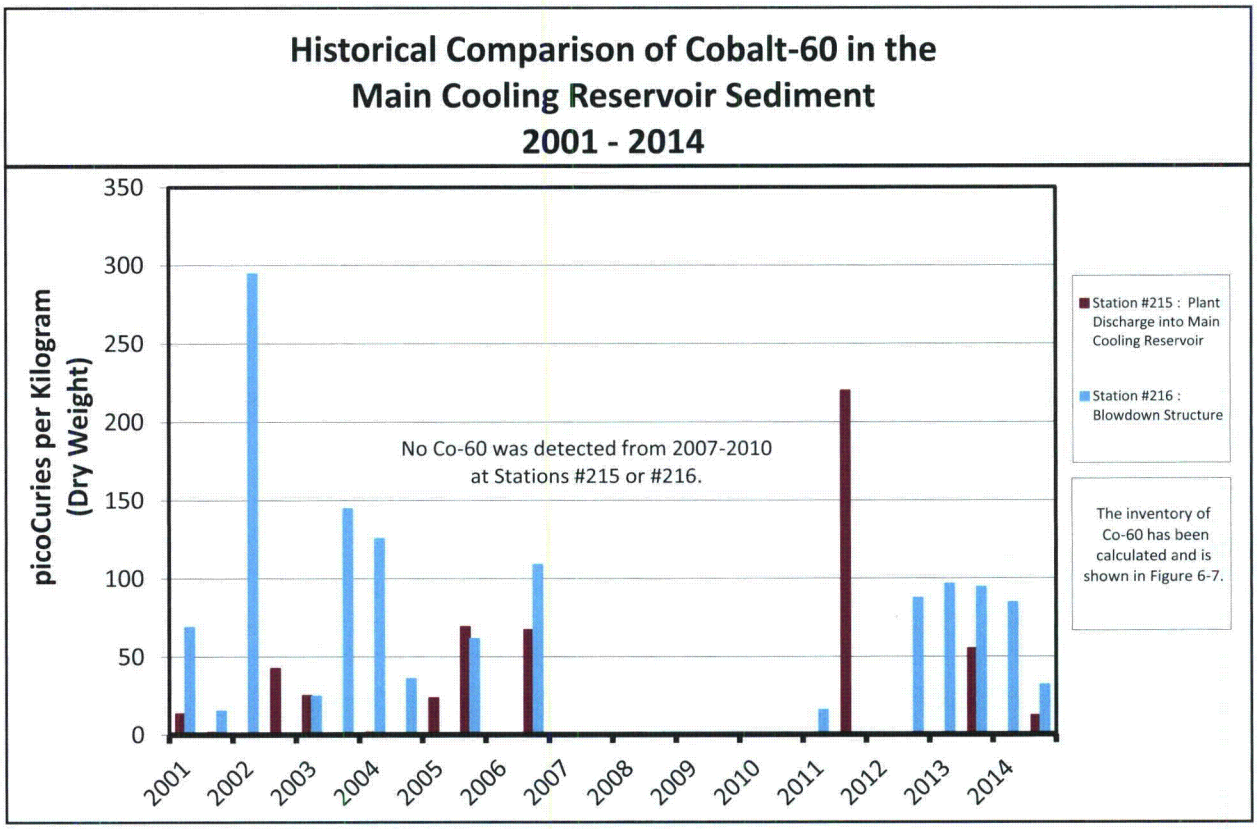


Figure 6-6

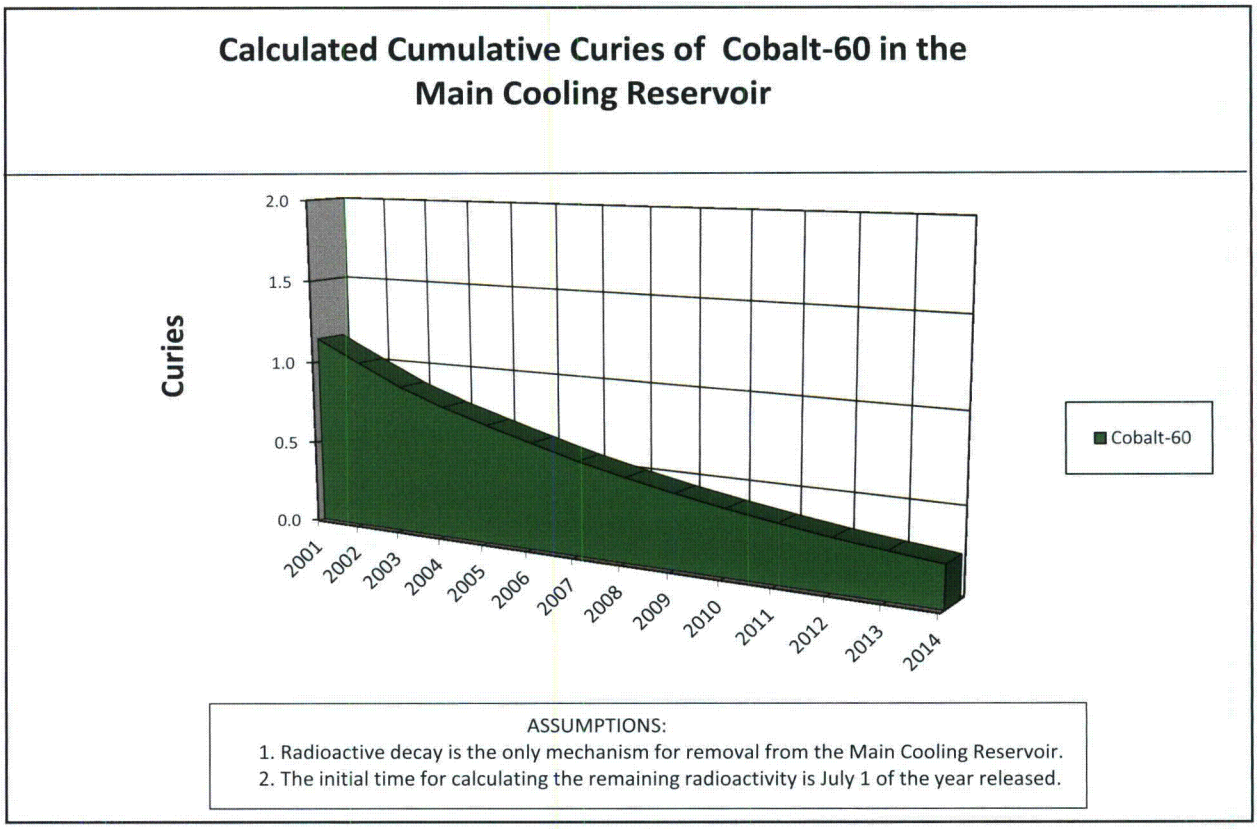


Figure 6-7

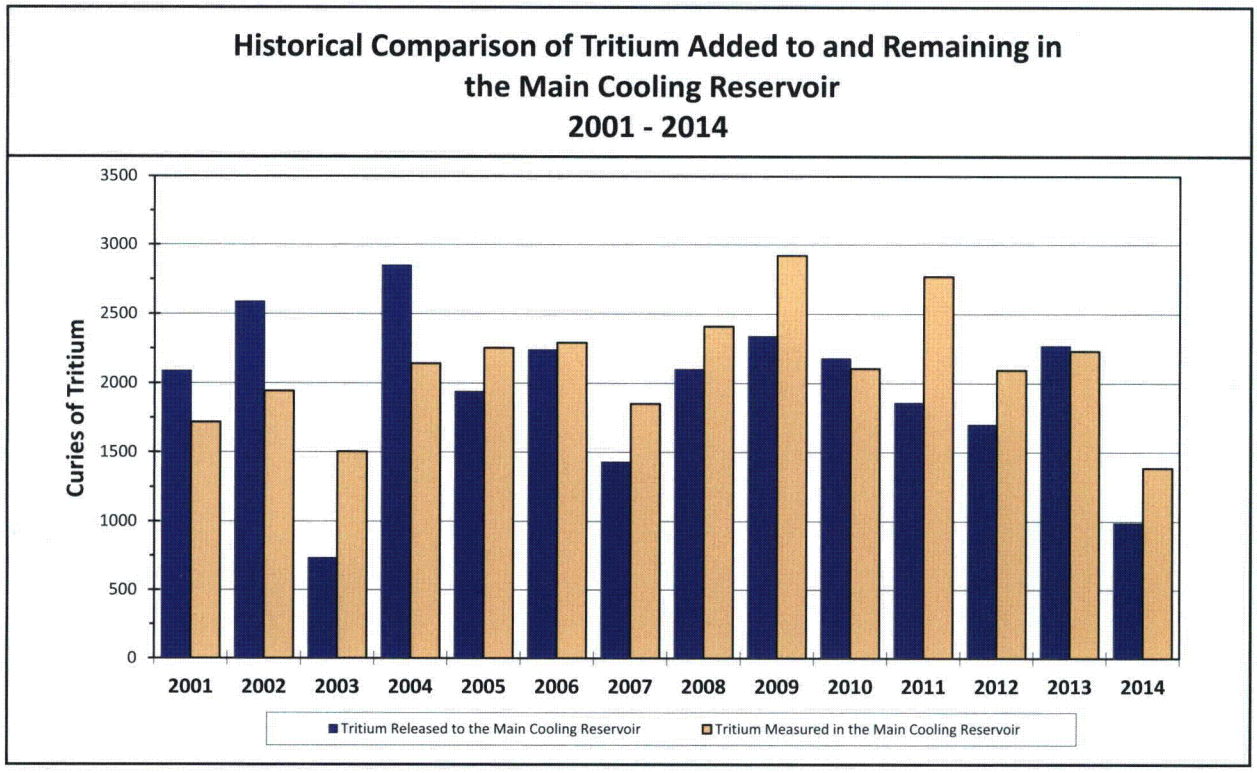


Figure 6-8

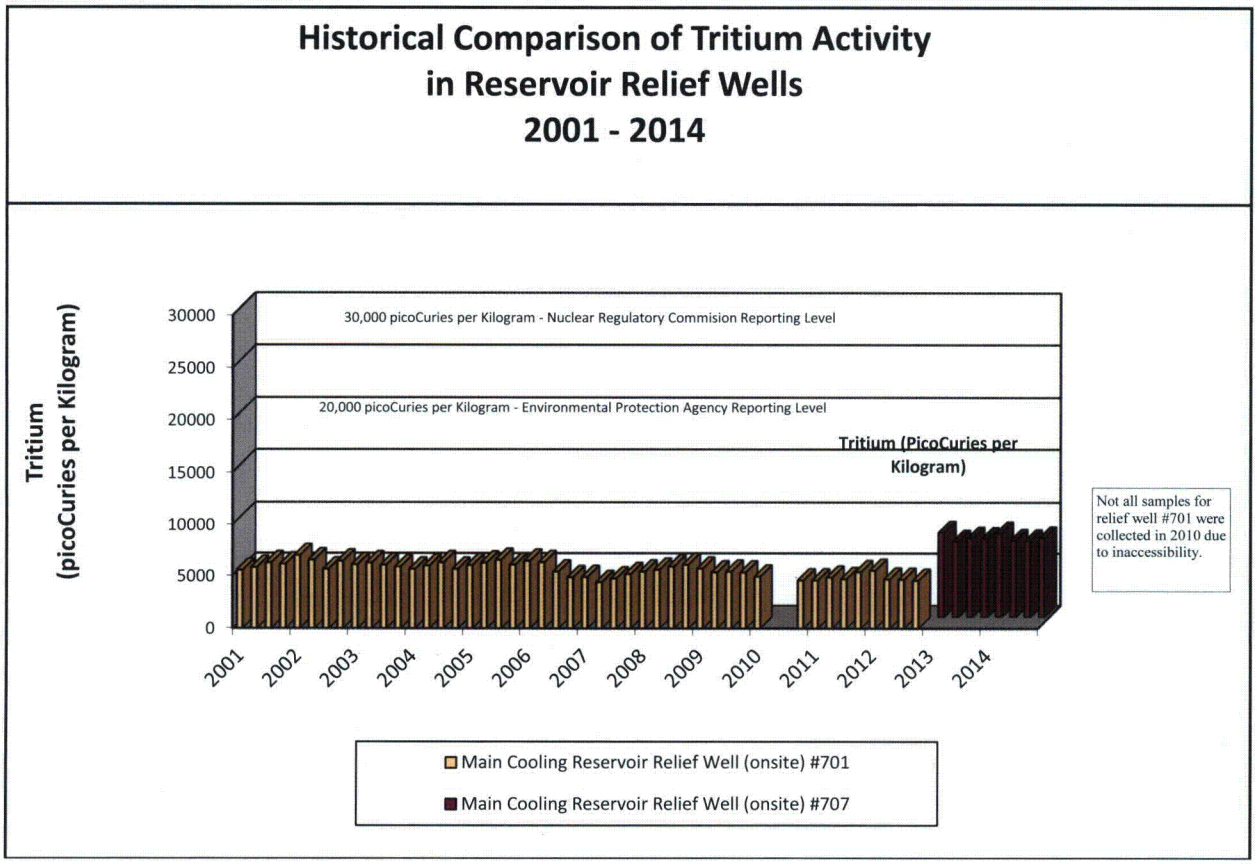


Figure 6-9

the Main Cooling Reservoir and the shallow aquifer surrounding it. Tritium enters the sloughs and ditches of the site as runoff from the relief wells that surround the reservoir. In 2014, tritium levels remained low in the relief wells as shown in Figure 6-9. Quarterly sampling of the Main Cooling Reservoir relief well # 701 has been discontinued due to the inability to collect a sample at that location. A new Main Cooling Reservoir relief well, # 707, is now used as a representative substitute for sampling the relief well water from the Main Cooling Reservoir. Station # 707 is just west of the discontinued relief well on the south side of the Main Cooling Reservoir. Due to different flow rates of water through the relief wells, the base concentration is slightly higher at relief well #707 compared to #701. The highest 2014 sample from this relief well had indicated approximately 8,100 pCi/L, which is less than required reporting levels.

The tritium concentrations in eight surface water sample points from 2001 through 2014 are shown in Figure 6-10. The specific sample point locations can be found in Table 2. Tritium levels in the onsite sloughs and ditches vary with the concentration in the reservoir and the amount of rainfall received. The average tritium concentration in the relief well, sloughs, and ditches are less than the reservoir because the water is diluted as it migrates through the reservoir relief well system. In 2014, twenty-five surface water samples tested positive for tritium. All test results were below the United States Environmental Protection Agency drinking water limit of 20,000 pCi/kg. Rainwater was collected and analyzed during 2014 to determine if the tritium from the reservoir precipitated in the local area. Tritium was not measured in any of the rainwater samples.

Tritium was identified in the shallow (i.e. ten to thirty feet deep) aquifer test wells at Station #235 approximately seventy-five yards south of the reservoir embankment base during 1999. Starting in 2000, samples were collected from the shallow aquifer well at Station #251 south of the Main Cooling Reservoir. The tritium results from these two shallow aquifer wells are shown in Figure 6-11. In 2014, the concentration of tritium at Station #235 was consistent with values over the past three years. Shallow aquifer tritium concentrations have remained near the concentrations found in the relief wells. Wells at Stations #258 and #259 on the west side of the site boundary have been sampled since 2006. Wells at Stations #270 and #271 were installed during the last quarter of 2008. The sample results are shown in Figure 6-12. The well at Station #271, located adjacent to site property on a county road easement directly west of the Main Cooling Reservoir, indicated its highest concentration in 2014 at 1,136 pCi/kg. Tritium levels were stable in 2014 with a maximum value of onsite test wells at 6,700 pCi/kg and remained below the United States Environmental Protection Agency drinking water limit (20,000 pCi/kg).

Photo By: Edmond Hardcastle and Aubrey Passafuma

Tritium has not been found in the deep aquifer that is the typical source of drinking water for the local communities and homes. These measurements follow the hydrological model described in original license basis and the updated site conceptual model discussed earlier in this report.

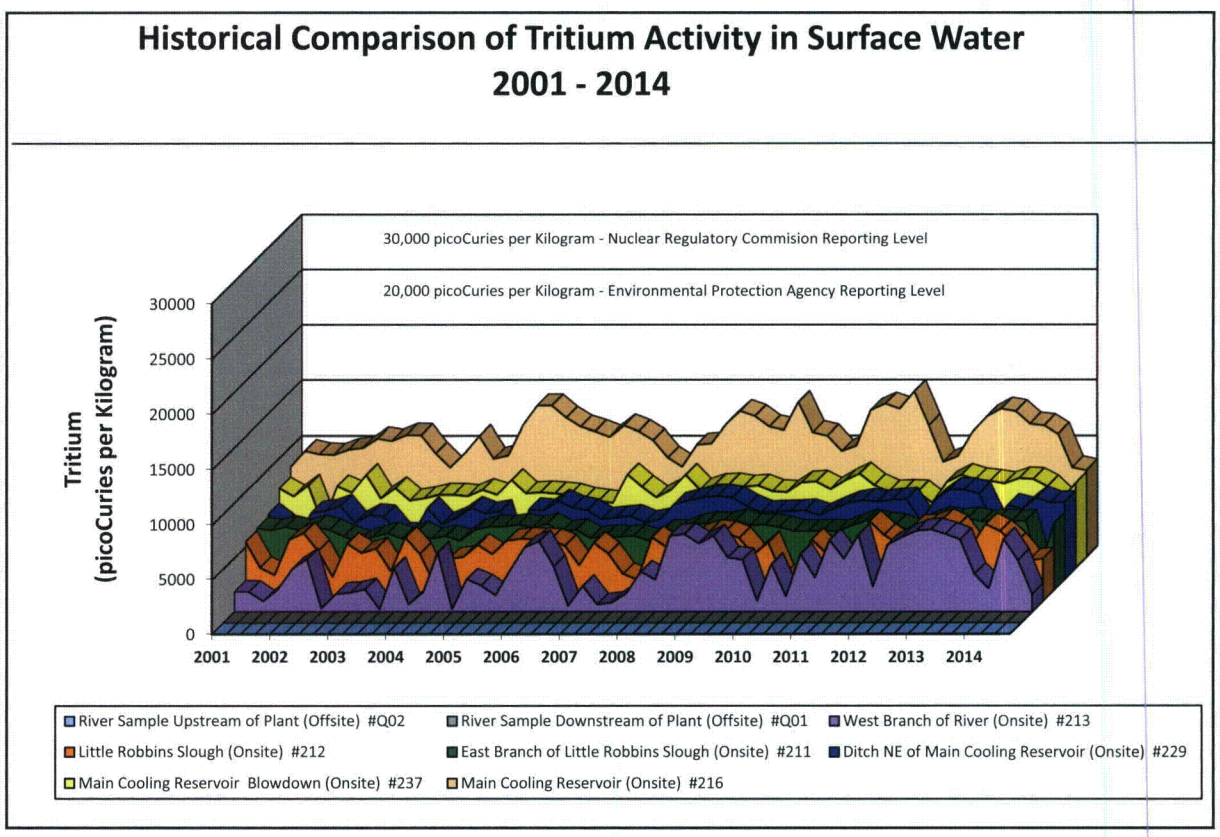


Figure 6-10

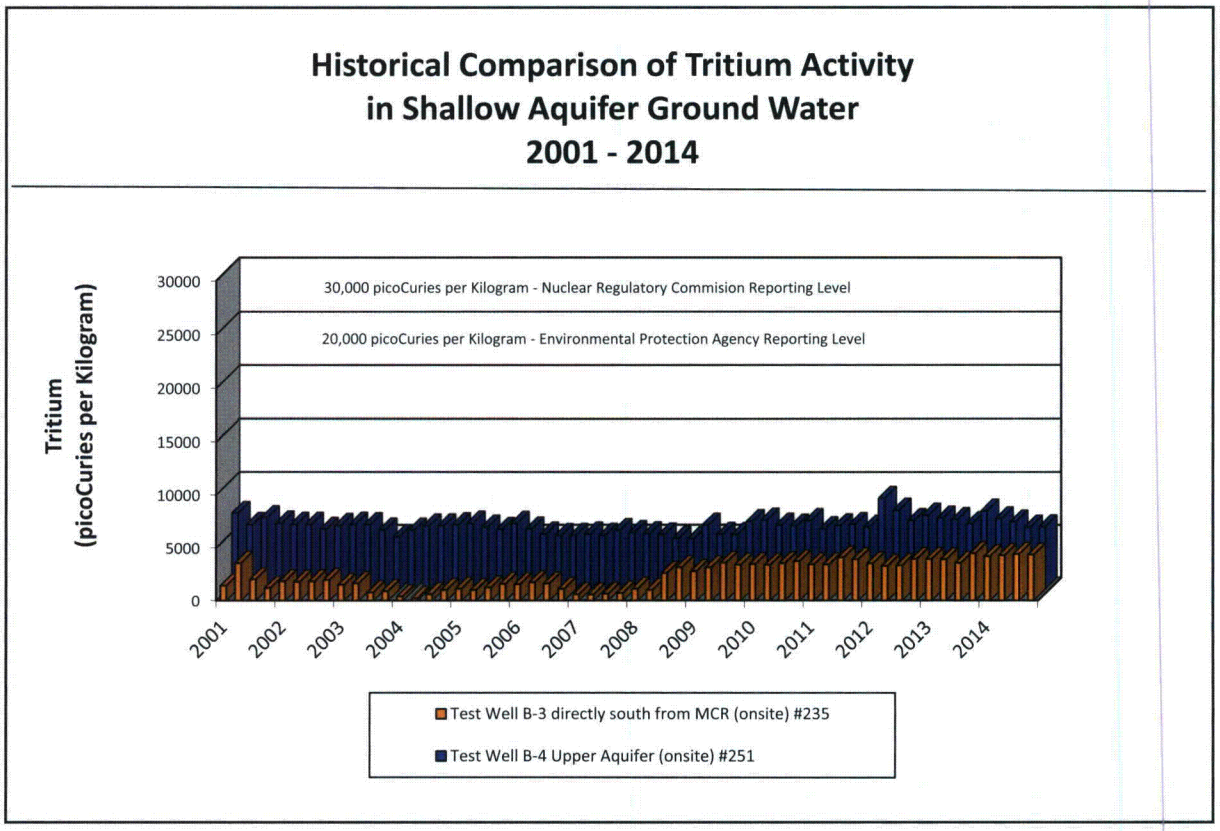


Figure 6-11

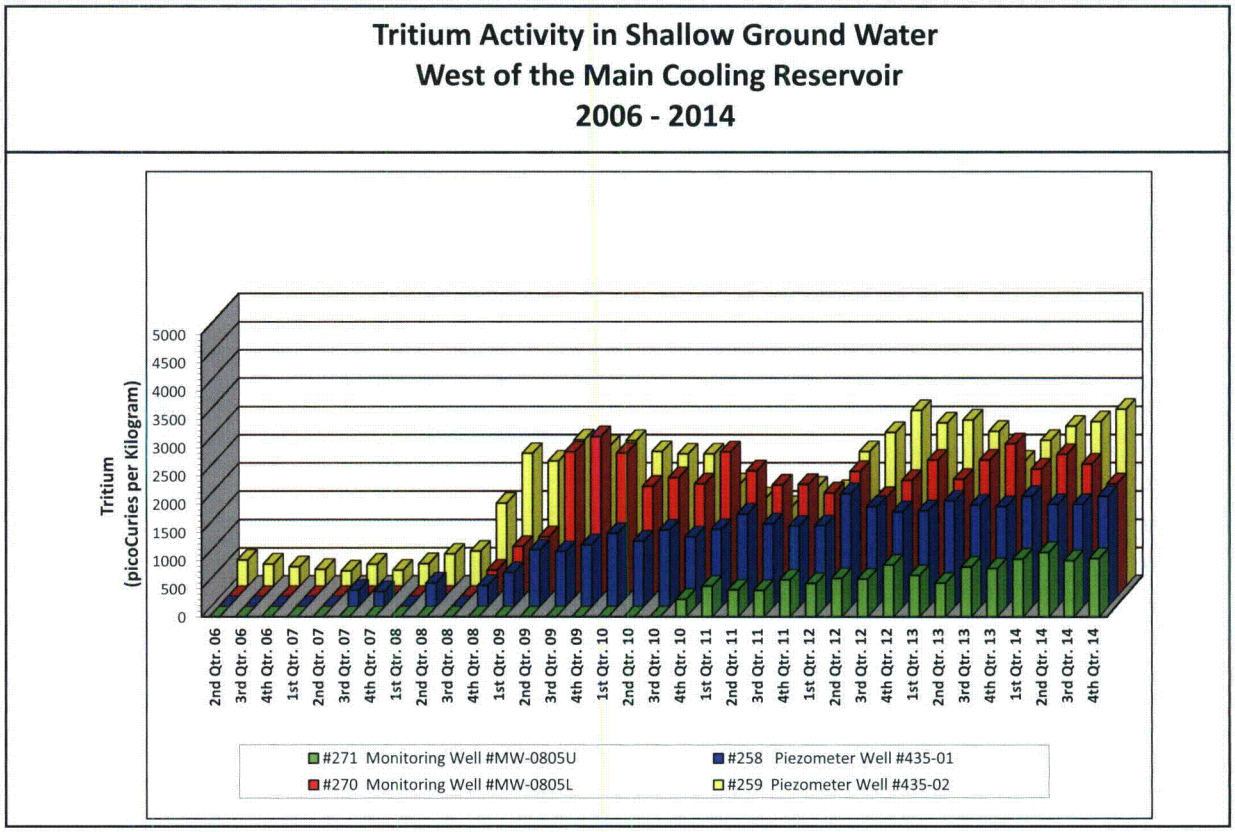


Figure 6-12

A windmill-powered ground water well, sample station # 267, indicated tritium activity at 580 pCi/kg in 2014. This onsite ground water sample station is the most distant location from the Main Cooling Reservoir that tritium has been detected. This well is not used for human consumption.

The drinking water onsite is pumped from deep aquifer wells and is tested monthly and composited quarterly to verify tritium is not present. The South Texas Project uses no water from the reservoir, shallow aquifers or other surface water for drinking. If the water with the highest tritium concentration that leaves the site (Little Robbins Slough) was used for drinking, the maximum dose to an individual would be about one millirem in a year. This dose is insignificant compared to the approximately 620 millirem the public receives a year from natural radioactivity in the environment and the radiation received from medical procedures.[4]

Other samples are collected and analyzed in addition to those required by our licensing documents or internal procedures. These samples are collected to give additional assurance that the public and the environment are protected from any adverse effects from the plant. These samples include pasture grass, sediment samples, rain water, shallow aquifer well, water from various ditches and sloughs onsite, direct radiation, and air samples near communities or other areas of interest. The results of these analyses indicate that plant operation has no health impact offsite and is well within state and federal regulations and guidelines.

[4] NCRP (2006). National Council on Radiation Protection and Measurements, Ionizing Radiation Exposure of the Population of the United States, (Bethesda, Maryland), NCRP Report No. 160.

NEI GROUNDWATER PROTECTION INITIATIVE

Nuclear industry experience involving tritium prompted the station to sample groundwater in the shallow aquifer near the plants in 2005. Some samples indicated the presence of tritium, but all were at concentrations below the Environmental Protection Agency drinking water limit of 20,000 pCi/kg.

In 2007, the Nuclear Energy Institute (NEI) established a standard for monitoring and reporting radioactive isotopes in groundwater entitled NEI Groundwater Protection Initiative, NEI 07-07. The station implemented the recommendations of this industry standard and has broadened the groundwater monitoring program to include additional samples collected near the plants. Some of the positive results of this broadened monitoring program likely reflect tritium associated with the Main Cooling Reservoir.

Sample Station	2014 Measurements (pCi/liter)	Historical High (pCi/liter)
807	740	15300
836	710	3200
801	610	1152
844	580	less than 300
808	390	2858
809	360	424
842	less than 300	less than 300
843	less than 300	less than 300
838	less than 300	less than 300

Figure 6-13

Wells near the plants are sampled semiannually, annually, or once every five years depending on the concentration of tritium anticipated and the location of the wells. Figure 6-13 contains the 2014 results along with the historical highs measured prior to 2014 for each station since sampling began in 2006. Their locations are shown in Figure 6-14.

Two wells sampled quarterly (Stations #807 and #808) are adjacent to where a pipe was broken and repaired several years ago. The tritium concentration at these two wells continued to decrease in 2014. Station # 809 tritium concentrations were also likely related to the previously referenced pipe break and subsequent repair. Station # 844 tritium had a concentration of 580 pCi/liter and the source of that tritium is likely to be influenced by the Main Cooling Reservoir. All the other wells sampled in 2014 that had detectable tritium are influenced by groundwater originating in the Main Cooling Reservoir. Their concentrations remain in the range of groundwater tritium concentrations associated with the Main Cooling Reservoir. All of the 2014 measurements of tritium in groundwater are only a small fraction of the United States Environmental Protection Agency drinking water limit (20,000 pCi/liter).

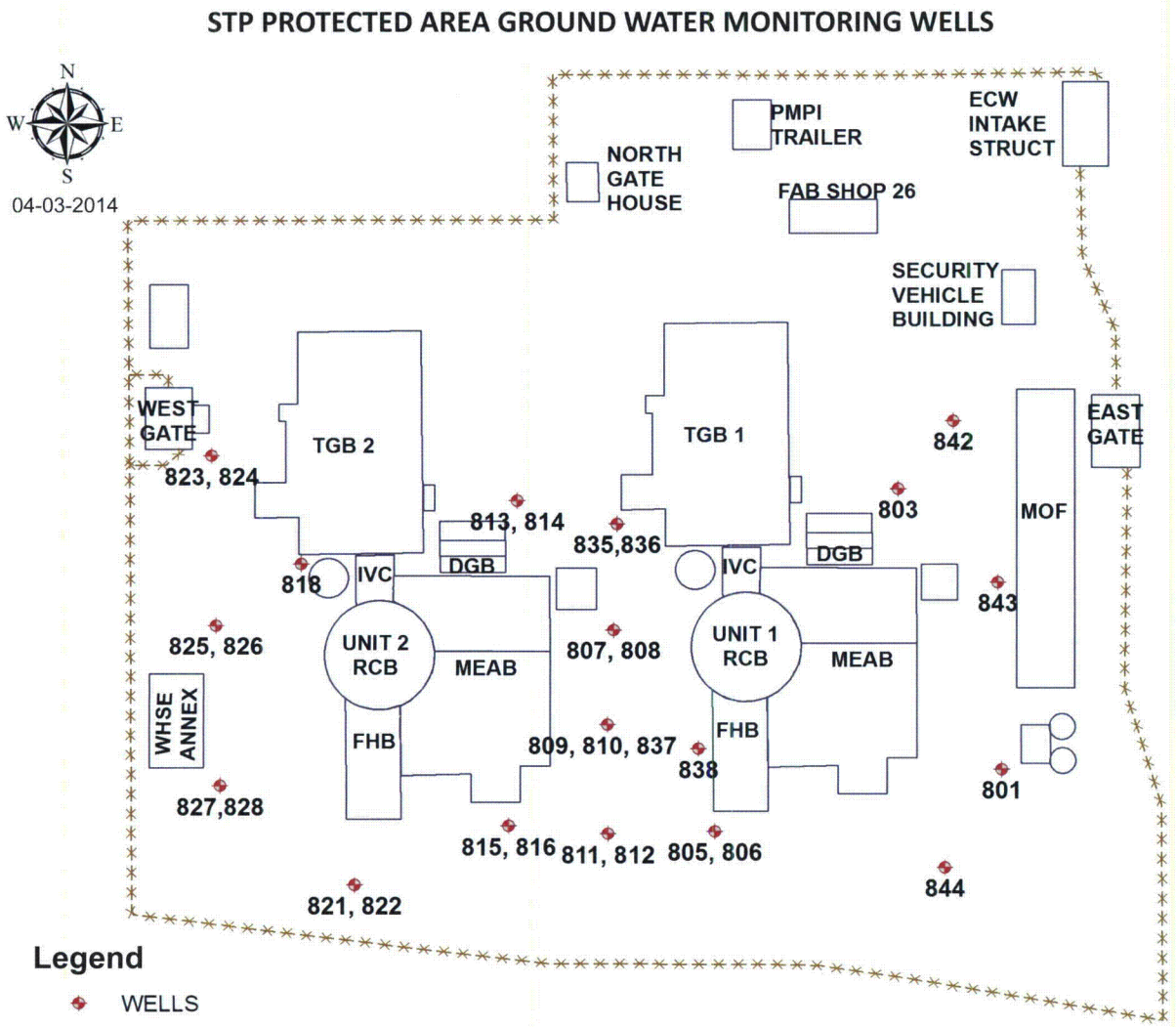


Figure 6-14

During 2012, steam traps for the auxiliary steam system that could potentially contain trace amounts of tritium were modified to re-direct the condensed steam or liquid water to the Main Cooling Reservoir. Information regarding the steam traps and subsequent response was documented in the station's Corrective Action Program. This evaluation identified no new effluent release pathways and no impact to the drinking water or the health and safety of the public.

By the end of 2014, the majority of the protected area wells had undergone a modification to enhance the protection of the structural integrity of the water well casing used for sampling the upper aquifer.

In 2014, there were three instances where water from the oily waste treatment system reached the ground on site property. No discharge occurred to groundwater that may be used as a source of drinking water. The spill material was quickly recovered and clean up completed with no impact to the environment such as the groundwater.

LAND USE CENSUS

The Annual Land Use Census is performed to determine if any changes have occurred in the location of residents and the use of the land within five miles of the South Texas Project generating units. The information is used to determine whether any changes are needed in the Radiological Environmental Monitoring Program. The census is performed by contacting area residents and local government agencies that provide the information. In addition, a survey is performed to verify the nearest residents within five miles of the South Texas Project generating units in each of 16 sectors. The results of the survey indicated no changes for 2014. The eleven sectors that have residents within five miles and the distance to the nearest residence in each sector are listed below.

SECTOR	DISTANCE (MILES)	LOCATION
ENE	4.5	CR 232 (Ryman Rd.)
ESE	3.5	Selkirk Dr.
SE	3.5	Selkirk Dr.
SW	4.5	CR 386 (Corporon Rd.)
SSW	4.5	CR (Robbins Slough Rd.)
WSW	2.5	CR 358
W	4.5	FM 1095
WNW	4.5	CR 356 (Ashby-Buckeye Road)
NW	4.5	CR 354 (Mondrik Road)
NNW	3.0	Runnells Ranch - RM 1468
N	3.0	Runnells Ranch - RM 1468

The following items of interest were noted during the census:

- ✯ No commercial dairy operates within Matagorda County.
- ✯ Two commercial fish farms continue to operate. One is two miles west of the plant near FM 521 and the second is approximately four to five miles southwest of the plant located in the area north of Robbins Slough Road and east of South Citrus Grove Road. The water supply for the ponds is not affected by the operations of the South Texas Project.
- ✯ Colorado River water from below the Bay City Dam has not been used to irrigate crops.
- ✯ There were no identified commercial vegetable farms located within the five mile zone.
- ✯ Broadleaf vegetation sampling is performed at the site boundary in the three most leeward sectors and at a control location in lieu of a garden census. The broadleaf vegetation samples collected also satisfy the collection requirement when milk samples are not available.

QUALITY ASSURANCE

Quality assurance encompasses planned and systematic actions to ensure that an item or facility will perform satisfactorily. Reviews, surveillances, and audits have determined that the programs, procedures and personnel are adequate and perform satisfactorily.

Quality audits and independent technical reviews help to determine areas that need attention. These areas are addressed in accordance with the station's Corrective Action Program.

The measurement capabilities of the Radiological Laboratory are demonstrated by participating in an interlaboratory measurement assurance program as well as performing duplicate and split sample analyses. A total of approximately 10% of the analyses performed are quality control samples consisting of interlaboratory measurement assurance program samples, duplicate samples, and split samples.

The interlaboratory measurement assurance program provides samples that are similar in matrix and size to those measured by the Radiological Environmental Monitoring Program. This program assures that equipment calibrations and sample preparation methods accurately measure radioactive material in samples. Figure 6-15 summarizes the results of the interlaboratory comparison programs.

Duplicate sampling of the environment allows the STP Nuclear Operating Company to estimate the repeatability of the sample collection, preparation, and analysis process. Splitting samples allows estimation of the precision and bias trends of the method of analysis without the added variables introduced by sampling. Generally, two samples split from the same original sample material should agree better than two separate samples collected in the same area and time period. The 2014 variances for Duplicates and Splits are shown in Figure 6-16.

Photo By: Aubrey Passafuma

PROGRAM DEVIATIONS

In addition to measurement accuracy, radiochemical measurements must meet sensitivity requirements at the Lower Level of Detection for environmental samples. Deviations from the sampling program or sensitivity requirements must be acknowledged and explained in this report. During 2014 the following samples were not collected or were unacceptable for analysis:

- ✯ Two out of thirty-six required broadleaf vegetation samples were not collected in February and March due to seasonal unavailability.

- ✯ Twelve out of two hundred sixty-five air samples were not continuously collected for the full time interval because of power or equipment failures.

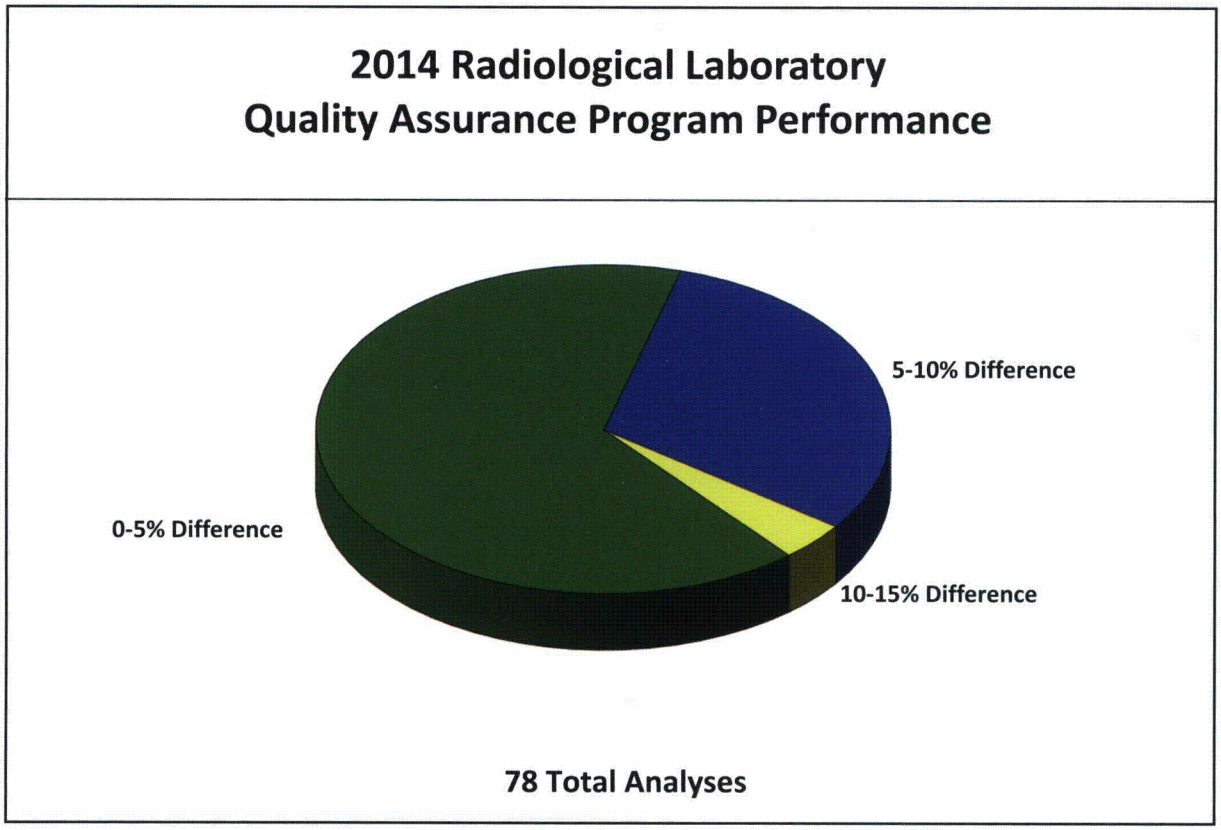


Figure 6-15

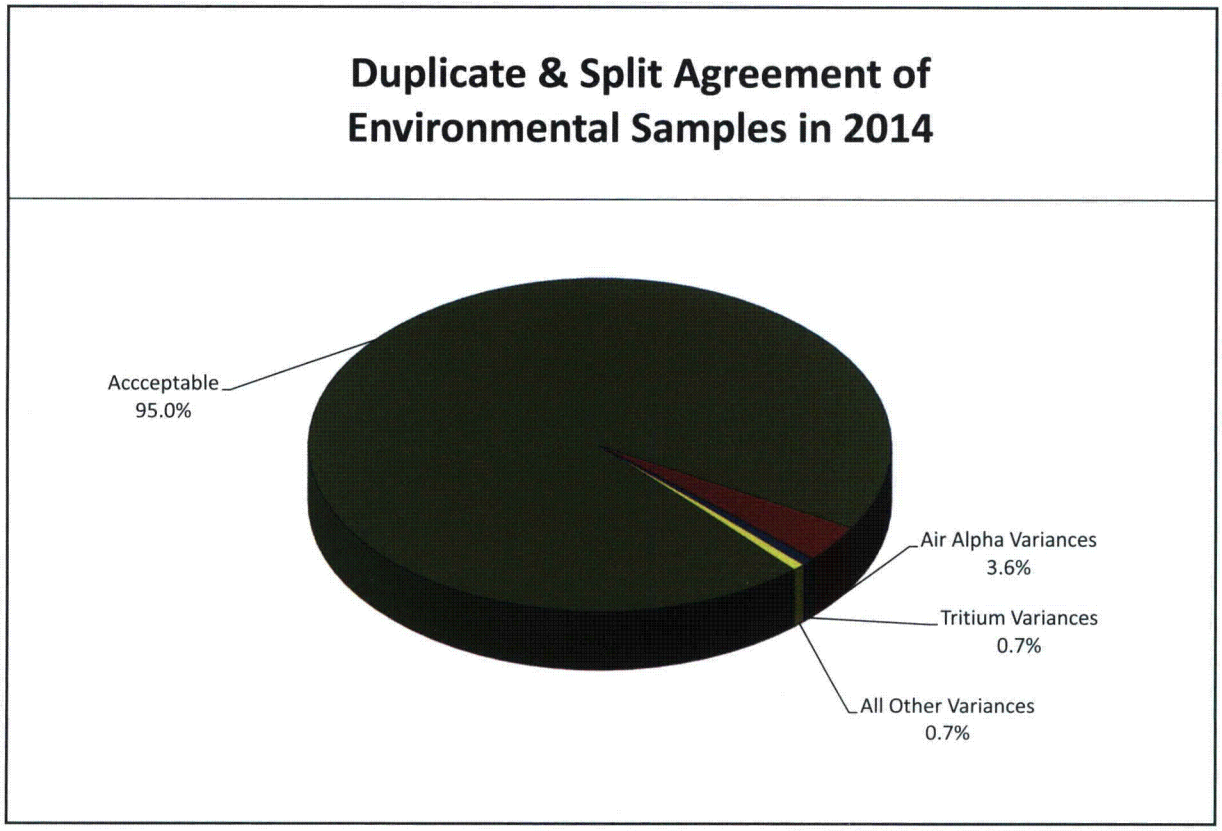


Figure 6-16

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE: **DIRECT RADIATION** — 40 TOTAL SAMPLING STATIONS

Sample Media, Number, Approximate Location and Distance of Sample Stations from Containment.	Routine Sampling Mode	Sampling and Collection Frequency	Analysis Type	Minimum Analysis Frequency
Exposure Media: TLD 16- Located in all 16 meteorological sectors, 0.2* to 4 miles. 16- Located in all 16 meteorological sectors, 2 to 7 miles. 6- Located in special interest areas (e.g. school, population centers), within 14 miles. 2- Control stations located in areas of minimal wind direction (WSW,ENE), 10-16 miles.	Continuously	Quarterly	Gamma dose	Quarterly

* The inner ring of stations in the southern sectors are located within 1 mile because of the main cooling reservoir

EXPOSURE: **AIRBORNE** — 5 TOTAL SAMPLING STATIONS

Sample Media, Number, Approximate Location, and Distance of Sample Stations from Containment.	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Charcoal and Particulate Filters 3- Located at the exclusion zone, N, NNW, NW Sectors, 1 mile. 1- Located in Bay City, 14 miles. 1- Control Station, located in a minimal wind direction (WSW), 10 miles.	Continuous sampler operations	Weekly or more frequently if required by dust loading	Radioiodine Canister: I-131 Particulate Sampler: Gross Beta Activity Gamma-Isotopic of composite (by location)	Weekly Following filter change Quarterly

MCR-STP Main Cooling Reservoir
STP- South Texas Project

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)

EXPOSURE: **WATERBORNE** — 13 TOTAL SAMPLING STATIONS

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Surface				
1- Located in MCR at the MCR blowdown structure.	Composite sample over a 1 month period (grab if not available)	Monthly	Gamma-Isotopic	Monthly
1- Located above the site on the Colorado River not influenced by plant discharge (control).			Tritium	Quarterly Composite
1- Located downstream from blow down entrance into the Colorado River.				
Ground				
5- Located in wells used to monitor tritium migration in the shallow aquifer.	Grab	Quarterly	Gamma-Isotopic & Tritium	Quarterly
Drinking Water				
1- Located on site. *	Grab	Monthly	Gross Beta & Gamma-Isotopic	Monthly
1- Located at a control station.				
			Tritium	Quarterly Composites
Sediment	Grab	Semiannually	Gamma-Isotopic	Semiannually
1- Located above the site on the Colorado River, not influenced by plant discharge.				
1- Located downstream from blowdown entrance into the Colorado River.				
1- Located in MCR.				

* No municipal water systems are affected by STP. This sample taken from deep aquifer supplying drinking water to employees while at work.

MCR-STP Main Cooling Reservoir
STP- South Texas Project

TABLE 1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (Continued)

EXPOSURE: **INGESTION** 7 TOTAL SAMPLING STATIONS

Sample Media, Number And Approximate Location of Sample Stations	Routine Sampling Mode	Nominal Collection Frequency	Analysis Type	Minimum Analysis Frequency
Milk *	Grab	Semi-monthly when animals are on pasture; monthly at other times.	Gamma-Isotopic And Low Level I-131	Semi-monthly when animals are on pasture; monthly at other times.
Broadleaf Vegetation** 2- Located at the exclusion zone, N, NW, or NNW sectors. 1- Located in a minimal wind direction.	Grab	Monthly during growing season (When available)	Gamma-Isotopic	As collected
Fish and Invertebrates (edible portions) 1- Representing commercially or recreational important species in vicinity of STP that maybe influenced by plant operation. 1- Same or analogous species in area not influenced by STP.	Grab	Sample semi-annually	Gamma-Isotopic on edible portions	As collected
1- Same or analogous species in the MCR.	Grab	At time of harvest	Gamma-Isotopic Analysis in edible portion	As collected
Agricultural Products *** Domestic Meat 1- Represents domestic stock fed on crops grown exclusively within 10 miles of the plant.	Grab	Annually	Gamma-Isotopic	As collected

* Limited source of sample in vicinity of the South Texas Project. (Attempts will be made to obtain samples when available.)

** Three different kinds of broadleaf vegetation are to be collected over the growing season, not each collection period.

*** No sample stations have been identified in the vicinity of the site. Presently no agricultural land is irrigated by water into which liquid plant wastes will be discharged. Agricultural products will be considered if these conditions change.

MCR-STP Main Cooling Reservoir
STP- South Texas Project

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

AI	AIRBORNE RADIOIODINE	MG	GOAT MILK
AP	AIRBORNE PARTICULATE	M1	BEEF MEAT
B1	RESIDENT DABBLER DUCK	M2	POULTRY MEAT
B2	RESIDENT DIVER DUCK	M3	WILD SWINE
B3	MIGRATORY DABBLER DUCK	M4	DOMESTIC SWINE
B4	MIGRATORY DIVER DUCK	M5	EGGS
B5	GOOSE	M6	GAME DEER
B6	DOVE	M7	ALLIGATOR
B7	QUAIL	M8	RABBIT
B8	PIGEON	OY	OYSTER
CC	CRUSTACEAN CRAB	R4	TURNIP
CS	CRUSTACEAN SHRIMP	SO	SOIL
DR	DIRECT RADIATION	S1	SEDIMENT - SHORELINE
F1	FISH - PISCIVOROUS	S2	SEDIMENT - BOTTOM
F2	FISH - CRUSTACEAN & INSECT FEEDERS	VB	ANY COMBINATION OF BROAD LEAF SAMPLES (L1 thru L7)
F3	FISH - PLANKIVORES & DETRITUS FEEDERS	VP	PASTURE GRASS
L1	BANANA LEAVES	WD	DRINKING WATER
L2	CANA LEAVES	WG	GROUND WATER
L4	TURNIP GREENS	WR	RAIN WATER
L5	CABBAGE	WS	SURFACE WATER
L6	COLLARD GREENS	WW	(relief) WELL WATER
L7	MUSTARD GREENS		

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR AI AP VB VP SO	1	1 mile N	FM 521
DR	2	1 mile NNE	FM 521
DR	3	1 mile NE	FM 521
DR	4	1 mile ENE	FM 521
DR	5	1 mile E	FM 521
DR AI AP SO	6	3.5 miles ESE	Site near Reservoir Makeup Pumping Facility
DR	7	3.5 miles SE	MCR Dike
DR	8	0.25 mile SSE	MCR Dike
DR	9	0.25 mile S	MCR Dike
DR	10	0.25 mile SSW	MCR Dike
DR	11	0.5 mile SW	MCR Dike
DR	12	1.5 mile WSW	MCR Dike
DR	13	1.5 mile W	FM 521
DR	14	1.5 mile WNW	FM 521
DR AI AP VB SO VP	15	1 mile NW	FM 521
DR AI AP VB SO VP	16	1 mile NNW	FM 521
DR	**17**	6.5 miles N	SE corner @ intersection of FM 1468 (Buckeye RD) and CR 306 (Brown RD)
DR AI AP SO	**18**	5.5 miles NNE	OXEA Corp. - FM 3057
DR	**19**	5.5 miles NE	FM 2668
DR	**20**	5 miles ENE	FM 2668 & FM 2078
DR	**21**	5 miles E	FM 521& FM 2668

♦This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR	**22**	7 miles E	Lyondellbasell Chemical Plant on SH 60
DR	**023***	16 miles ENE	Intersection of FM 521 and FM 2540
DR	24	4 miles SSE	MCR Dike
DR	25	4 miles S	MCR Dike
DR	26	4 miles SSW	MCR Dike
DR	27	2.5 miles SW	MCR Dike
DR	**28**	5 miles WSW	FM 1095 & Ellis Road (CR 380)
DR SO	**29**	4.5 miles W	FM 1095
DR	**30**	6 miles WNW	Tres Palacios Oaks, FM 2853
DR	**31**	5.5 miles NW	Wilson Creek Road
DR	**32**	3.5 miles NNW	FM 1468
DR AI AP SO	**33**	14 miles NNE	Microwave Tower at end of Kilowatt road in Bay City
DR	**34**	7.5 miles ENE	Wadsworth Water Supply Pump Station on Main St.
DR AI AP SO	**35**	8.5 miles SSE	Matagorda on Fisher St.
DR	**36**	9 miles WSW	College Port on FM 1095
DR AI AP VB VP SO	**037***	10 miles WSW	Palacios AEP Substation on Harrison Rd. (CR 323)
DR	**38**	10.5 miles NW	AEP Substation on SH 71 near Blessing (0.2 miles North of SH 35)
DR AI AP SO	**39**	9 miles NW	SH 35 under High Voltage lines
DR	**40**	4.5 miles SW	Citrus Grove Rd. (CR 385)
DR	41	2.0 miles ESE	MCR Dike
DR	**42**	8.5 miles NW	FM 459 at Tidehaven Intermediate School

♦This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
DR	**43**	4.5 miles SE	Site boundary just south of the spillway discharge channel
WG	205	4.0 miles SE	Piezometer Well #446A. Alternate for WG is Station Code 206
WG	206	4.0 miles SE	Piezometer Well #446
WS	209	2 miles ESE	Kelly Lake
WD	210	On Site	Approved drinking water supply from STP
WS S1 F(1, 2, or 3)	211◆	3.5 miles S	East Branch Little Robbins Slough
WS S1 F(1, 2, or 3)	212◆	4 miles S	Little Robbins Slough
WS S1	213	4 miles SE	West Branch Colorado River
F(1, 2, or 3) CC	214	2.5 miles SE	MCR at Makeup Water Discharge. Alternate for F (1, 2, or 3) in any location in the MCR
S2	215	0.5 mile SW	MCR at Circulating Water Discharge (S2 Alternate is any location in MCR)
WS S2	216	3.5 miles SSE	MCR at blowdown structure
WS S(1 OR 2) F(1, 2 or 3)	217◆	7-9 miles SSE	Mouth of Colorado River and Intracoastal Waterway (Region 1)
WS F(1, 2 OR 3)	218◆	6-9 miles SE-SSE	Colorado River between Intracoastal Waterway and station 227 (Region 2)
WS F(1, 2 OR 3)	219	3-6 miles E-SE	Colorado River between Station 227 and FM 521 (Region 3)
F(1, 2, or 3)	220	3-10 miles E-N	Colorado River between FM 521 and the LCRA Dam (Region 4)
S(1 or 2) F(1, 2 or 3) WS	221	>10 miles N-NE	Above the LCRA Dam (Region 5)
F(1, 2, or 3) CC CS OY	**222**	>10 miles	West Matagorda Bay
F(1, 2, or 3)	224	9 miles SSE	West Intracoastal Canal
F(1, 2, or 3)	225	9 miles SE	East Intracoastal Canal
WS S(1 or 2)	**227◆**	6 miles SE	West bank of Colorado River downstream of STP. Alternate for WS or S (1 or 2) is station 233

◆This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
WD	**228***	14 miles NNE	Le Tulle Park Public Water Supply on SH 35
WS S1	229	2 miles ESE	Plant Area Drainage Ditch north of reservoir that empties into Colorado River
S(1 or 2)	**230♦**	3.5 miles ESE	Colorado River at point where drainage ditch (#229) empties into it
S(1 or 2) WS	**233♦**	4.5 miles SE	Colorado River approx. 0.5 km south of the Spillway discharge channel empties into it.
WG	235	4 miles S	Well B-3 directly south from MCR
B8	236	N/A	STP Protected Area
WS	237	3.7 miles SSE	Spillway discharge channel from MCR
F(1, 2, or 3)	241	<1 mile S	MCR circulating water intake
S(1 or 2) WS	**242***	>10 miles N	Colorado River where it intersects SH 35
WS	**243***	>10 miles N	Colorado River upstream of dam at the Lower Colorado River Authority pumping station near Bay City. Alternate for WS is station 242
WG	**245**	4.5 mile SSE	Water well (windmill) located on private property approx. 1 mile south of the MCR
WS S1	246	<1 mile N	Drainage ditch originating at protected area fence north of Unit 2
WS	247	<1 mile E	Essential Cooling Pond
WS S1	248	<1 mile N	Point in drainage ditch north of protected area downstream of Unit #1 Protected Area storm drain discharge
F(1,2, or 3) CS	**249***	N/A	Control sample purchased from a local retailer
WG	251	4.0 miles SSE	Test Well B-4, upper shallow aquifer
WG	255	4.2 miles SE	Piezometer Well #415 110' deep
WG	256	2.8 miles ESE	Piezometer Well #417 100' deep
WG	257	3.9 miles SSW	Piezometer Well #421-02, 80' deep 1.1 miles down STP Road from Station Code #258 approximately 20' inside east of site boundary fence

♦This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
WG	258	2.9 miles SW	Piezometer Well #435-01, 1.5 miles down STP Road from FM 521 along east of site boundary fence
WG	259	2.9 miles SW	Piezometer Well #435-02, 1.5 miles down STP Road from FM 521 20' east of fence (site boundary) WG Alternate is station 258
WG	260	3.7 miles S	Piezometer Well #437 74' deep
WG	263	3.2 miles ESE	Piezometer Well #447 104' deep
WG	264	3.2 miles ESE	Piezometer Well #447A 46' deep
WG	266	0.7 miles NW	Piezometer Well #602A 40' deep
WG	267	2.7 miles ESE	Windmill north of Heavy Haul Road
WG	268	3.0 miles SE	Windmill east of MCR
WG	**269**	4.2 miles SSE	Windmill south of STP owner controlled area on private land
WG	**270**	2.9 miles SW	Monitor well MW-805L 49' deep. Across Rd from station # 258 & 259
WG	**271**	2.9 miles SW	Monitor well MW-805U Across Rd from station # 258 & 259
WR	272	NA	Unit 1
WR	273	NA	Unit 2
WS	278	1.8 WNW	First catfish pond NW of plant next to FM 521
S(1 or 2) WS	280	0.2 miles ESE	Beginning at Plant Area Discharge Ditch (PADD) west of the Nuclear Support Center
WS	281	0.2 miles ESE	Main Spill Gate, Located north of the beginning of the PADD (Protected Area Drainage Ditch)
WS	282	<1 mile N	Point in drainage ditch at the Protected Area storm drainage discharge pipe located West of station # 246
F(1, 2, or 3) CC S2	300	S	STP Main Cooling Reservoir
F(1, 2, or 3) S2	301-631	S	Grids located in Main Cooling Reservoir.
WW	701	4 miles S	MCR Relief Well #W-440

♦This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

TABLE 2
SAMPLE MEDIA AND LOCATION DESCRIPTIONS

MEDIA CODE	STATION CODE	VECTOR (Approximate)	LOCATION DESCRIPTION
WW	702	4 miles S	MCR Relief Well #W-500
WW	703	4 miles S	MCR Relief Well #W-505
WW	704	4 miles S	MCR Relief Well #W-404
WW	705	4 miles S	MCR Relief Well #W-497
WW	706	4 miles S	MCR Relief Well #W-522
WW	707	4 miles S	MCR Relief Well #W-455
WS	**Q01**	N/A	Quarterly composite of station #227 and/or alternate #233
WS	**Q02**	N/A	Quarterly composite of station #243 and/or alternate #242

♦This station may be used to obtain the required aquatic samples in the vicinity of STP that may be influenced by plant operations.
MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.
* Control Station

Photo By: Frank Jocobus

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

A summary of all required samples is given in Table 3. The table has been formatted to resemble a United States Nuclear Regulatory Commission industry standard. Modifications have been made for the sole purpose of reading ease. Only positive values are given in this table.

Media type is printed at the top left of each table, and the units of measurement are printed at the top right. The first column lists the type of radioactivity or specific radionuclide for which each sample was analyzed. The second column gives the total number of analyses performed and the total number of non-routine analyses for each indicated nuclide. A non-routine measurement is a sample whose measured activity is greater than the reporting levels for Radioactivity Concentrations in Environmental Samples. The "LOWER LIMIT OF DETECTION" column lists the normal measurement sensitivities achieved. The sensitivities were better than required by the United States Nuclear Regulatory Commission.

A set of statistical parameters is listed for each radionuclide in the remaining columns. The parameters contain information from the indicator locations, the location having the highest annual mean, and information from the control stations. Some sample types do not have control stations. When this is the case, "no samples" is listed in the control location column. For each of these groups of data, the following is calculated:

- The mean positive values.
- The number of positive measurements / the total number of analyses.
- The lowest and highest values for the analysis.

The data placed in Table 3 are from the samples required by the site's Offsite Dose Calculation Manual as described in Table 1. Additional thermoluminescent dosimeters were utilized each quarter for quality control purposes. The minimum samples required by Table 1 were supplemented in 2014 by thirteen direct radiation measurements, six additional surface water samples, one additional drinking water, eight additional pasture grass, twenty two additional ground water samples, four additional rain water samples, and four additional sediment samples. Fish and crustacean samples vary in number according to availability but also exceeded the minimum number required by Table 1. Also, two hundred and sixty additional air sample stations were collected from five weekly air sample stations and twenty eight additional surface water samples were collected in addition to the minimum number of samples required by Table 1 in order to strengthen the Radiological Environmental Monitoring Program.

The minimum required Radiological Environmental Monitoring Program is presented in Table 1. The table is organized by exposure pathway. Specific requirements such as location, sampling method, collection frequency, and analyses are given for each pathway.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Direct Radiation — Units: MilliRoentgen/Standard Quarter

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gamma	174/ 0	5.0E+00	1.34E+01 (164/ 164) (9.9E+00 - 1.75E+01)	1.5 miles W (#013)	1.63E+01 (6 / 6) (1.5E+01 - 1.75E+01)	1.46E+01 (10 / 10) (1.20E+01 - 1.63E+01)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Airborne Particulate & Radioiodine — Units: PicoCuries per cubic meter

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gross Beta	260/ 0	1.4E-03	1.9E-02 (208 / 208) (8.6E-03 - 3.4E-02)	14 miles NNE (#033)	2.0E-02 (52 / 52) (9.3E-03 - +3.4E-02)	2.0E-02 (52 / 52) (1.0E-02 - 3.4E-02)
Iodine-131	260/ 0	1.3E-02	--- (0 / 208)	---	---	--- (0 / 52)
Cesium-134	20/ 0	4.6E-04	--- (0 / 16)	---	---	--- (0 / 4)
Cesium-137	20/ 0	4.5E-04	--- (0 / 16)	---	---	--- (0 / 4)
Manganese-54	20/ 0	5.2E-04	--- (0 / 16)	---	---	--- (0 / 4)
Iron-59	20/ 0	2.4E-03	--- (0 / 16)	---	---	--- (0 / 4)
Cobalt-58	20/ 0	7.4E-04	--- (0 / 16)	---	---	--- (0 / 4)
Cobalt-60	20/ 0	5.4E-04	--- (0 / 16)	---	---	--- (0 / 4)
Zinc-65	20/ 0	1.4E-03	--- (0 / 16)	---	---	--- (0 / 4)
Zirconium-95	20/ 0	1.4E-03	--- (0 / 16)	---	---	--- (0 / 4)
Niobium-95	20/ 0	8.4E-04	--- (0 / 16)	---	---	--- (0 / 4)
Lanthanum-140 Barium-140	20/ 0	1.1E-02	--- (0 / 16)	---	---	--- (0 / 4)

† Number of positive measurements / total measurements at specified locations.

Photo By: Edmond Hardcastle and Aubrey Passafuma

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Surface Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	12/ 0	2.7E+02	9.8E+03 (4/ 8) (7.9E+03 - 1.2E+04)	3 miles SSE (#216)	9.8E+03 (4/ 4) (7.9E+03 - 1.2E+04)	--- (0/ 4)
Iodine-131	42/ 0	6.3E+00	--- (0/ 28)	---	---	--- (0/ 14)
Cesium-134	42/ 0	1.6E+00	--- (0/ 28)	---	---	--- (0/ 14)
Cesium-137	42/ 0	1.8E+00	--- (0/ 28)	---	---	--- (0/ 14)
Manganese-54	42/ 0	1.8E+00	--- (0/ 28)	---	---	--- (0/ 14)
Iron-59	42/ 0	4.4E+00	--- (0/ 28)	---	---	--- (0/ 14)
Cobalt-58	42/ 0	1.9E+00	--- (0/ 28)	---	---	--- (0/ 14)
Cobalt-60	42/ 0	1.8E+00	--- (0/ 28)	---	---	--- (0/ 14)
Zinc-65	42/ 0	3.9E+00	--- (0/ 28)	---	---	--- (0/ 14)
Zirconium-95	42/ 0	3.4E+00	--- (0/ 28)	---	---	--- (0/ 14)
Niobium-95	42/ 0	1.9E+00	--- (0/ 28)	---	---	--- (0/ 14)
Lanthanum-140 Barium-140	42/ 0	5.3E+00	--- (0/ 28)	---	---	--- (0/ 14)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Ground Water *(On site test well)* — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	22/ 0	2.7E+02	5.1E+03 (13/ 22) (2.6E+03 - 1.1E+04)	4.0 miles SSE (#251)	6.2E+03 (4/ 4) (5.9E+03 - 6.7E+03)	no samples
Iodine-131	22/ 0	3.6E+00	--- (0/ 22)	---	---	no samples
Cesium-134	22/ 0	2.5E+00	--- (0/ 22)	---	---	no samples
Cesium-137	22/ 0	2.7E+00	--- (0/ 22)	---	---	no samples
Manganese-54	22/ 0	2.6E+00	--- (0/ 22)	---	---	no samples
Iron-59	22/ 0	5.4E+00	--- (0/ 22)	---	---	no samples
Cobalt-58	22/ 0	2.6E+00	--- (0/ 22)	---	---	no samples
Cobalt-60	22/ 0	2.8E+00	--- (0/ 22)	---	---	no samples
Zinc-65	22/ 0	7.0E+00	--- (0/ 22)	---	---	no samples
Zirconium-95	22/ 0	4.5E+00	--- (0/ 22)	---	---	no samples
Niobium-95	22/ 0	2.8E+00	--- (0/ 22)	---	---	no samples
Lanthanum-140 Barium-140	22/ 0	4.3E+00	--- (0/ 22)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Drinking Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Gross Beta	25/ 0	4.5E-02	2.4E+00 (13 / 13) (1.2E+00 - 3.3E+00)	14 miles NNE (#228)	5.2E+00 (12 / 12) (2.3E+00 - 8.4E+00)	5.2E+00 (12 / 12) (2.3E+00 - 8.4E+00)
Hydrogen-3	8/ 0	2.7E+02	--- (0 / 4)	---	---	--- (0 / 4)
Iodine-131	25/ 0	4.7E+00	--- (0 / 13)	---	---	--- (0 / 12)
Cesium-134	25/ 0	2.5E+00	--- (0 / 13)	---	---	--- (0 / 12)
Cesium-137	25/ 0	2.6E+00	--- (0 / 13)	---	---	--- (0 / 12)
Manganese-54	25/ 0	2.6E+00	--- (0 / 13)	---	---	--- (0 / 12)
Iron-59	25/ 0	5.7E+00	--- (0 / 13)	---	---	--- (0 / 12)
Cobalt-58	25/ 0	2.6E+00	--- (0 / 13)	---	---	--- (0 / 12)
Cobalt-60	25/ 0	2.7E+00	--- (0 / 13)	---	---	--- (0 / 12)
Zinc-65	25/ 0	6.2E+00	--- (0 / 13)	---	---	--- (0 / 12)
Zirconium-95	25/ 0	4.6E+00	--- (0 / 13)	---	---	--- (0 / 12)
Niobium-95	25/ 0	2.8E+00	--- (0 / 13)	---	---	--- (0 / 12)
Lanthanum-140 Barium-140	25/ 0	5.1E+00	--- (0 / 13)	---	---	--- (0 / 12)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Rain Water — Units: PicoCuries per Kilogram

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Hydrogen-3	4/ 0	2.7E+02	--- (0 / 4)	---	---	no samples
Iodine-131	4/ 0	4.7E+00	--- (0 / 4)	---	---	no samples
Cesium-134	4/ 0	2.3E+00	--- (0 / 4)	---	---	no samples
Cesium-137	4/ 0	2.5E+00	--- (0 / 4)	---	---	no samples
Manganese-54	4/ 0	2.4E+00	--- (0 / 4)	---	---	no samples
Iron-59	4/ 0	5.0E+00	--- (0 / 4)	---	---	no samples
Cobalt-58	4/ 0	2.4E+00	--- (0 / 4)	---	---	no samples
Cobalt-60	4/ 0	2.4E+00	--- (0 / 4)	---	---	no samples
Zinc-65	4/ 0	5.3E+00	--- (0 / 4)	---	---	no samples
Zirconium-95	4/ 0	4.5E+00	--- (0 / 4)	---	---	no samples
Niobium-95	4/ 0	2.4E+00	--- (0 / 4)	---	---	no samples
Lanthanum-140 Barium-140	4/ 0	4.7E+00	--- (0 / 4)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Sediment-Shoreline — Units: PicoCuries per Kilogram dry weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	4/ 0	2.1E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cesium-137	4/ 0	2.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Manganese-54	4/ 0	2.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Iron-59	4/ 0	8.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-58	4/ 0	2.7E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-60	4/ 0	2.4E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zinc-65	4/ 0	7.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zirconium-95	4/ 0	5.0E+01	--- (0/ 2)	---	---	--- (0/ 2)
Niobium-95	4/ 0	3.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	4/ 0	2.9E+02	--- (0/ 2)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Sediment-Bottom — Units: PicoCuries per Kilogram dry weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	6/ 0	2.3E+01	--- (0/ 6)	---	---	no samples
Cesium-137	6/ 0	2.3E+01	6.9E+01 (5/ 6) (2.2E+01 - 1.2E+02)	3 miles SSE (#216)	8.0E+01 (4/ 4) (4.7E+01 - 1.2E+02)	no samples
Manganese-54	6/ 0	2.8E+01	--- (0/ 6)	---	---	no samples
Iron-59	6/ 0	1.1E+02	--- (0/ 6)	---	---	no samples
Cobalt-58	6/ 0	3.7E+01	--- (0/ 6)	---	---	no samples
Cobalt-60	6/ 0	2.4E+01	4.9E+01 (5/ 6) (1.2E+01 - 8.7E+01)	3 miles SSE (#216)	5.8E+01 (4/ 4) (3.0E+01 - 8.7E+01)	no samples
Zinc-65	6/ 0	7.5E+01	--- (0/ 6)	---	---	no samples
Zirconium-95	6/ 0	7.5E+01	--- (0/ 6)	---	---	no samples
Niobium-95	6/ 0	4.8E+01	--- (0/ 6)	---	---	no samples
Lanthanum-140 Barium-140	6/ 0	7.3E+02	--- (0/ 6)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Banana Leaves — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Iodine-131	19/ 0	1.5E+01	--- (0/ 13)	---	---	--- (0/ 6)
Cesium-134	19/ 0	1.3E+01	--- (0/ 13)	---	---	--- (0/ 6)
Cesium-137	19/ 0	1.3E+01	--- (0/ 13)	---	---	--- (0/ 6)
Manganese-54	19/ 0	1.4E+01	--- (0/ 13)	---	---	--- (0/ 6)
Iron-59	19/ 0	3.3E+01	--- (0/ 13)	---	---	--- (0/ 6)
Cobalt-58	19/ 0	1.3E+01	--- (0/ 13)	---	---	--- (0/ 6)
Cobalt-60	19/ 0	1.6E+01	--- (0/ 13)	---	---	--- (0/ 6)
Zinc-65	19/ 0	4.0E+01	--- (0/ 13)	---	---	--- (0/ 6)
Zirconium-95	19/ 0	2.2E+01	--- (0/ 13)	---	---	--- (0/ 6)
Niobium-95	19/ 0	1.4E+01	--- (0/ 13)	---	---	--- (0/ 6)
Lanthanum-140 Barium-140	19/ 0	1.8E+01	--- (0/ 13)	---	---	--- (0/ 6)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Cana Leaves — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Iodine-131	9/ 0	1.4E+01	--- (0/ 6)	---	---	--- (0/ 3)
Cesium-134	9/ 0	1.1E+01	--- (0/ 6)	---	---	--- (0/ 3)
Cesium-137	9/ 0	1.2E+01	--- (0/ 6)	---	---	--- (0/ 3)
Manganese-54	9/ 0	1.3E+01	--- (0/ 6)	---	---	--- (0/ 3)
Iron-59	9/ 0	3.1E+01	--- (0/ 6)	---	---	--- (0/ 3)
Cobalt-58	9/ 0	1.2E+01	--- (0/ 6)	---	---	--- (0/ 3)
Cobalt-60	9/ 0	1.4E+01	--- (0/ 6)	---	---	--- (0/ 3)
Zinc-65	9/ 0	3.5E+01	--- (0/ 6)	---	---	--- (0/ 3)
Zirconium-95	9/ 0	2.1E+01	--- (0/ 6)	---	---	--- (0/ 3)
Niobium-95	9/ 0	1.3E+01	--- (0/ 6)	---	---	--- (0/ 3)
Lanthanum-140 Barium-140	9/ 0	1.6E+01	--- (0/ 6)	---	---	--- (0/ 3)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Collard Greens — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Iodine-131	7/ 0	1.4E+01	--- (0/ 6)	---	---	--- (0/ 1)
Cesium-134	7/ 0	1.2E+01	--- (0/ 6)	---	---	--- (0/ 1)
Cesium-137	7/ 0	1.3E+01	--- (0/ 6)	---	---	--- (0/ 1)
Manganese-54	7/ 0	1.3E+01	--- (0/ 6)	---	---	--- (0/ 1)
Iron-59	7/ 0	2.9E+01	--- (0/ 6)	---	---	--- (0/ 1)
Cobalt-58	7/ 0	1.2E+01	--- (0/ 6)	---	---	--- (0/ 1)
Cobalt-60	7/ 0	1.5E+01	--- (0/ 6)	---	---	--- (0/ 1)
Zinc-65	7/ 0	3.5E+01	--- (0/ 6)	---	---	--- (0/ 1)
Zirconium-95	7/ 0	2.2E+01	--- (0/ 6)	---	---	--- (0/ 1)
Niobium-95	7/ 0	1.3E+01	--- (0/ 6)	---	---	--- (0/ 1)
Lanthanum-140 Barium-140	7/ 0	1.8E+01	--- (0/ 6)	---	---	--- (0/ 1)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Fish - Piscivorous — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	9/ 0	4.3E+01	--- (0/ 7)	---	---	--- (0/ 2)
Cesium-137	9/ 0	4.3E+01	--- (0/ 7)	---	---	--- (0/ 2)
Manganese-54	9/ 0	4.9E+01	--- (0/ 7)	---	---	--- (0/ 2)
Iron-59	9/ 0	1.4E+02	--- (0/ 7)	---	---	--- (0/ 2)
Cobalt-58	9/ 0	5.0E+01	--- (0/ 7)	---	---	--- (0/ 2)
Cobalt-60	9/ 0	5.1E+01	--- (0/ 7)	---	---	--- (0/ 2)
Zinc-65	9/ 0	1.1E+02	--- (0/ 7)	---	---	--- (0/ 2)
Zirconium-95	9/ 0	9.3E+01	--- (0/ 7)	---	---	--- (0/ 2)
Niobium-95	9/ 0	5.3E+01	--- (0/ 7)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	9/ 0	2.3E+02	--- (0/ 7)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Fish - Crustacean & Insect Feeders — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	2/ 0	4.1E+01	--- (0/ 2)	---	---	no samples
Cesium-137	2/ 0	3.8E+01	--- (0/ 2)	---	---	no samples
Manganese-54	2/ 0	4.3E+01	--- (0/ 2)	---	---	no samples
Iron-59	2/ 0	1.4E+02	--- (0/ 2)	---	---	no samples
Cobalt-58	2/ 0	5.0E+01	--- (0/ 2)	---	---	no samples
Cobalt-60	2/ 0	4.5E+01	--- (0/ 2)	---	---	no samples
Zinc-65	2/ 0	1.1E+02	--- (0/ 2)	---	---	no samples
Zirconium-95	2/ 0	9.6E+01	--- (0/ 2)	---	---	no samples
Niobium-95	2/ 0	5.4E+01	--- (0/ 2)	---	---	no samples
Lanthanum-140 Barium-140	2/ 0	3.7E+02	--- (0/ 2)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Crustacean Shrimp — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	4/ 0	3.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cesium-137	4/ 0	3.3E+01	--- (0/ 2)	---	---	--- (0/ 2)
Manganese-54	4/ 0	3.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Iron-59	4/ 0	7.9E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-58	4/ 0	3.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Cobalt-60	4/ 0	3.9E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zinc-65	4/ 0	8.2E+01	--- (0/ 2)	---	---	--- (0/ 2)
Zirconium-95	4/ 0	6.1E+01	--- (0/ 2)	---	---	--- (0/ 2)
Niobium-95	4/ 0	3.5E+01	--- (0/ 2)	---	---	--- (0/ 2)
Lanthanum-140 Barium-140	4/ 0	8.1E+01	--- (0/ 2)	---	---	--- (0/ 2)

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Beef Meat — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	2/0	3.4E+01	--- (0/ 2)	---	---	no samples
Cesium-137	2/0	3.5E+01	--- (0/ 2)	---	---	no samples
Manganese-54	2/0	3.4E+01	--- (0/ 2)	---	---	no samples
Iron-59	2/0	1.5E+02	--- (0/ 2)	---	---	no samples
Cobalt-58	2/0	4.8E+01	--- (0/ 2)	---	---	no samples
Cobalt-60	2/0	3.8E+01	--- (0/ 2)	---	---	no samples
Zinc-65	2/0	9.8E+01	--- (0/ 2)	---	---	no samples
Zirconium-95	2/0	9.6E+01	--- (0/ 2)	---	---	no samples
Niobium-95	2/0	5.4E+01	--- (0/ 2)	---	---	no samples
Lanthanum-140 Barium-140	2/0	6.1E+02	--- (0/ 2)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

TABLE 3

2014 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY

Medium: Wild Swine — Units: PicoCuries per Kilogram wet weight

ANALYSIS TYPE	TOTAL ANALYSES /NONROUTINE MEASUREMENTS	LOWER LIMIT OF DETECTION	INDICATOR LOCATIONS MEAN † RANGE	LOCATION WITH HIGHEST ANNUAL MEAN LOCATION INFORMATION	LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE	CONTROL LOCATIONS MEAN † RANGE
Cesium-134	1/0	3.1E+01	--- (0/ 1)	---	---	no samples
Cesium-137	1/0	2.9E+01	--- (0/ 1)	---	---	no samples
Manganese-54	1/0	3.1E+01	--- (0/ 1)	---	---	no samples
Iron-59	1/0	1.2E+02	--- (0/ 1)	---	---	no samples
Cobalt-58	1/0	3.9E+01	--- (0/ 1)	---	---	no samples
Cobalt-60	1/0	3.5E+01	--- (0/ 1)	---	---	no samples
Zinc-65	1/0	8.0E+01	--- (0/ 1)	---	---	no samples
Zirconium-95	1/0	7.5E+01	--- (0/ 1)	---	---	no samples
Niobium-95	1/0	4.2E+01	--- (0/ 1)	---	---	no samples
Lanthanum-140 Barium-140	1/0	3.5E+02	--- (0/ 1)	---	---	no samples

† Number of positive measurements / total measurements at specified locations.

Photo By: Chelsea Maxey

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