# Executive Summary

*Photo By: Jodie Jankauskas*

# Chapter 1

# Executive Summary

**The South Texas Project continues to operate with no adverse effect on the population or the environment. The exposure for people living in the area remains at less than one millirem per year. Environmental programs at the site monitor known and predictable relationships between the operation of the South Texas Project and the surrounding area. These monitoring programs verify that the operation of the South Texas Project has no impact offsite and is well within state and federal regulations and guidelines. These programs are verified by the State of Texas through collection and analysis of samples and placement of the State's thermoluminescent dosimeters and other onsite and offsite inspections.**

This report describes the environmental monitoring programs, radiological and non-radiological, conducted at the South Texas Project during 2010. Included in this report are the Environmental Protection Plan Status, the results of the Radiological Environmental Monitoring Program, and the Land Use Census.

Non-radiological environmental monitoring is performed each year as part of the station's overall Environmental Protection Plan which is intended to provide for protection of non-radiological environmental values during station operations. Non-radiological monitoring encompasses, as a minimum, water quality, air quality, waste generation and minimization, and local aquatic and terrestrial ecological conditions. In 2010, non-radiological monitoring by the station confirmed that the South Texas Project's efforts to honor and protect local environmental conditions were successful. The South Texas Project continued to be rated by the Texas Commission on Environmental Quality as a high performer in the area of environmental compliance, continued to provide high-quality habitat areas for a variety of flora and fauna, and continued to have no indications of negative non-radiological impacts to local environmental conditions.

The environment, within a 15-mile radius of the South Texas Project, is routinely monitored for radiation and radioactivity. Sampling locations are selected using weather, land use, and water use information. Two types of sampling locations are used. The first type, control stations, are located in areas that are beyond measurable influence of the South Texas Project or any other nuclear facility. The sample results from these stations are used to explain radiation from sources other than the South Texas Project. Indicator stations are the second type of stations. The samples from these stations measure any radiation contributed to the environment that could be caused by the South Texas Project. Indicator stations are located in areas close to the South Texas Project where plant releases are monitored.

Prior to initial operation of the South Texas Project, samples were collected and analyzed to determine the amount of radioactivity present in the area. These results are used as a "pre-operational baseline." Results from the indicator stations are compared to both current control sample results and the pre-operational baseline values to determine if changes in radioactivity levels are attributable to station operations or other causes such as previous nuclear weapons testing programs and natural variations.

Radioactivity levels in the South Texas Project's environment frequently fall below the minimum detection capabilities of state-of-the-art scientific instruments. Samples with radiation levels that cannot be detected are below the Lower Limits of Detection. The United States Nuclear Regulatory Commission requires that equipment used for radiological monitoring must be able to detect specified minimum limits for certain types of samples. This ensures that radiation measurements are sufficiently sensitive to detect small changes in the environment. The United States Nuclear Regulatory Commission also

has a required reporting level. Licensed nuclear facilities must prepare a special report and increase their sampling if any measured radiation level is equal to or greater than this reporting level. No sample from the South Texas Project has ever reached or exceeded this reporting level.

Measurements made are divided into four categories or pathways based upon how the results may affect the public. Airborne, waterborne, ingestion, and direct radiation are the four pathways that are sampled. Each pathway is described below.

- The airborne pathway is sampled in areas around the South Texas Project by measuring radioactivity of iodine and particulate air filters. The 2010 airborne results were similar to pre-operational levels with only naturally occurring radioactive material unrelated to the operation of the South Texas Project detected.

- The waterborne pathway includes samples taken from surface water, ground water, and drinking water. Also included in this pathway are sediment samples taken from the Main Cooling Reservoir and the Colorado River. Tritium was the only man-made isotope consistently detected in water samples and was measured in the shallow aquifer, the Main Cooling Reservoir, ditches, and sloughs consistent with the South Texas Project operating design. The levels of tritium found were near or lower than the concentration of the Main Cooling Reservoir. Additional onsite wells have been sampled to map tritium migration. The average tritium level in the Main Cooling Reservoir increased slightly in 2010 compared to years past due to the limited makeup to the reservoir during the year. Tritium levels remain well below United States Nuclear Regulatory Commission reporting limits and within United States Environmental Protection Agency drinking water standards. Previously detected plant-related isotopes (Co-60 and Co-58) were not detected in the reservoir sediment this year at the designated sample locations. Several samples had detectable Cs-137 which is present in the environment and was detected in pre-operational concentrations. Offsite sediment samples continue to show no radioactivity from the South Texas Project. This indicates that the station produces no detectable effect offsite from this pathway. In addition a Main Cooling Reservoir bottom sediment study was performed in 2010 using 56 different locations throughout the Main Cooling Reservoir. The isotopes identified and their concentrations are discussed later in the report.

- The ingestion pathway includes broadleaf vegetation, agricultural products, and food products. Naturally occurring isotopes were detected at average environmental levels in the samples. The data indicated that there were no man-made isotopes detected in these types of samples.

- The direct exposure pathway measures environmental radiation doses using thermoluminescent dosimeters. These results are consistent with the readings from previous years and continue to show no effect from plant operations.

The South Texas Project continues to operate with no negative effect on the population or the environment. The dose for people living in the area is maintained at less than one millirem per year. Environmental programs at the site monitor known and predictable relationships between the operation of the South Texas Project and the surrounding area. These monitoring programs verify that the operation of the South Texas Project has no impact offsite and is well within state and federal regulations and guidelines. These programs are verified by the state of Texas through collection and analysis of samples, placement of the state's thermoluminescent dosimeters, and other onsite and offsite inspections.

*Photo By: Kristy Moss*

# Site and Area Description

*Photo courtesy of: STP Corporate Communicatons*

# Chapter 2

# Site and Area Description

The South Texas Project is located on 12,220 acres in Matagorda County, Texas, approximately 15 miles southwest of Bay City along the west bank of the Colorado River. The South Texas Project Electric Generating Station is owned by NRG Energy, Inc., Austin Energy, and CPS Energy as tenants in common. Houston Lighting & Power Company was the original project manager of the South Texas Project and was responsible for the engineering, design, licensing, construction, startup, and initial commercial operation of the two-unit facility. In 1997, the STP Nuclear Operating Company assumed operational control of the South Texas Project and responsibility for implementation of associated environmental programs.

The South Texas Project has two Westinghouse pressurized water reactors. The nominal net electrical capacity of each unit is 1,250 megawatts-electric (MWe). Unit 1 received a low-power testing license on August 21, 1987, obtained initial criticality on March 8, 1988, and was declared commercially operational on August 25, 1988. Unit 2 received a low-power testing license on December 16, 1988, obtained initial criticality on March 12, 1989, and was declared commercially operational on June 19, 1989. The South Texas Project initiated activities in 2008 to pursue renewal of the operating licenses for Units 1 and 2 from the Nuclear Regulatory Commission (NRC). The license renewal application was submitted to the Nuclear Regulatory Commission in October of 2010 to request authorization to operate the South Texas Project, Units 1 and 2, for an additional 20 years beyond the period specified in the current licenses. The Nuclear Regulatory Commission determined that the South Texas Project submittal was sufficient to en-

*Photo By: James Beers*

able them to undertake a review of the application. The Nuclear Regulatory Commission review process is intended to ensure that the plant's original design and current conditions and programs can allow the facility to continue operating safely beyond its original license. The combined units currently produce enough electricity to serve more than two million homes and businesses throughout Texas. With nearly 1,200 baseline employees, the STP Nuclear Operating Company is the largest employer and source of revenue for Matagorda County.

In September of 2007, NRG Energy, Inc., CPS Energy, and STP Nuclear Operating Company filed a Combined Construction and Operating License Application (COLA) with the United States Nuclear Regulatory Commission (NRC) to build and operate two additional units, Units 3 and 4, at the South Texas Project. Subsequent revisions were filed in 2008, 2009 and 2010, to reflect a change to the engineering, procurement, and construction contractor for Units 3 and 4, name changes and other changes that included additional or updated information, changes in response to recent rulemaking, minor editorial changes, etc. The facility's 12,220-acre site and 7,000-acre cooling reservoir were originally designed for four units. Nuclear energy provides long-term cost stability, promotes energy independence, and is our nation's largest source of carbon-free energy. As we work collectively to secure our state's long-term energy future, nuclear energy will continue to play an increasingly important role.

*Photo courtesy of: STP Corporate Communications*

*How the South Texas Project Works*

Fossil-fueled and nuclear-powered steam generating plants operate on the same principle. Fuel is used to produce heat to convert water into high-pressure steam. The steam is directed through a turbine to turn a generator. In a fossil fuel plant, either coal, lignite, oil or natural gas is burned in a boiler to produce the heat. In a nuclear plant, the reactor replaces the boiler and the "fissioning" or splitting of uranium atoms inside the reactor produces the heat.

The fuel for a nuclear reactor is uranium. It is formed into cylindrical ceramic pellets, each about the size of the end of your little finger. One pellet has the energy potential of about a ton of coal. Millions of these pellets are stacked in fuel rods that are arranged into assemblies that make up the core of the reactor. The use of uranium allows us to conserve natural gas, oil and coal and to avoid the associated production of greenhouse gases.

The fission process and generation of usable heat begins in a nuclear reactor when control rods in the core are withdrawn. In pressurized water reactors, like those at the South Texas Project, the fuel rods heat water circulating in sealed, stainless steel piping that passes through large heat exchangers called steam generators. The water in the reactor is under pressure to prevent boiling. This is why the South Texas Project's Units 1 and 2 reactors are called "pressurized water reactors."

This hot, pressurized water heats a separate supply of water in the steam generators to produce steam that is directed through the blades of a turbine generator to produce electricity. The steam is then fed to a condenser where a separate supply of cooling water from the reservoir turns it back into water that is then pumped back to the steam generator for reuse. A diagram of the plant water systems is shown in Figure 2-1.

**PLANT WATER SYSTEMS**

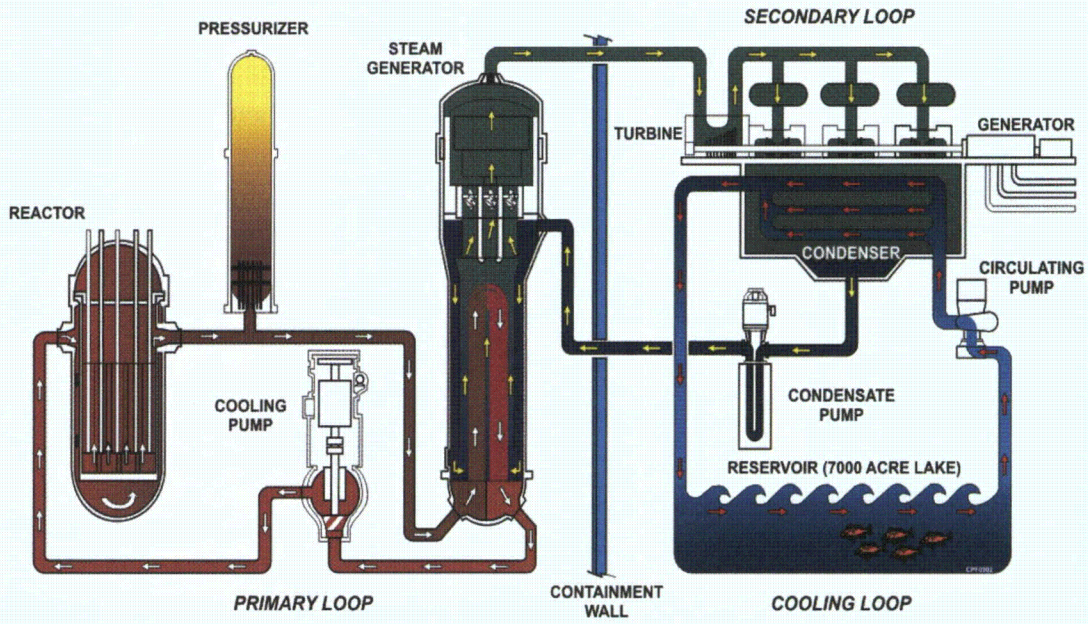


Figure 2-1

In addition to its safety systems, the South Texas Project has many built-in physical barriers that would prevent the release of radioactive materials in the unlikely event of an accident. The most visible ones are the 200-foot-tall, domed containment buildings with steel-reinforced concrete walls four feet thick. Inside each of these massive structures, two more concrete walls provide another 11 feet of shielding. The reactor vessel itself has steel walls six inches thick, and the fuel pellets inside it are sheathed in hardened metal tubes.

Nuclear energy has one of the lowest impacts on the environment. It is the most eco-efficient energy source because it produces the most electricity in relation to its minimal environmental impact. In 2009, the most recent year for which data is available, nuclear generation in the United States prevented 647.22 million metric tons of carbon dioxide, 1.99 million tons of sulfur dioxide, and 0.56 million tons of nitrogen oxide from entering the Earth's atmosphere.[1] Nuclear power plants generate more than 70 percent of all clean-air electricity in the United States.[2] Additional information on nuclear energy and the environment can be found on the website maintained by the Nuclear Energy Institute at http://www.nei.org.

*The Plant Site*

Sixty-five of the entire 12,220 acres at the South Texas Project are occupied by the two current power plants. Plant facilities include a 7,000-acre main cooling reservoir and a 47-acre essential cooling pond. Many smaller bodies of water onsite include wetlands, Kelly Lake, drainage ditches, sloughs, and depressions. Much of the land east of the cooling reservoir is leased for cattle grazing. Approximately 1,700 acres remain in a more natural state as a lowland habitat. A 110-acre wetland habitat area was established in 1996 on previously unused land located northeast of the power plants. The area surrounding the South Texas Project is characterized by coastal plain with farmland and pasture predominating. Local relief of the area is characterized by flat land, approximately 23 feet above sea level.

*The Area*

The economic base for this area primarily is agriculture-related. The chief agricultural crops in Matagorda County are livestock, grain sorghum, corn for grain, rice, cotton and hay. In addition to the agriculture industry, there is commercial fishing in the lower Colorado River, East and West Matagorda Bays, Intracoastal Waterway and the Gulf of Mexico. Currently shrimp, oysters, crab, and fin fish such as black drum are the predominant commercial fish in the county. Aquaculture farms have been developed in the area with the main crops being catfish and striped bass.

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[1]Nuclear Energy Institute. *Emissions Avoided by the U.S. Nuclear Industry (1995- 2009).* http://www.nei.org/resourcesandstats/documentlibrary/protectingtheenvironment/graphicsandcharts/emissionsavoidedbythe usnclearindustryyearly/. May 2010.

[2]Nuclear Energy Institute Fact Sheet. *Nuclear Energy and the Environment.* http//www.nei.org/keyissues/protectingtheenvironment/factsheets/nuclearenergyandtheenviroment/. August 2010.

Although the surrounding area is heavily cultivated, significant amounts of woodlands, thicket, brush, fields, marsh, and open water exist to support wildlife. The area lies in the southern region of the central flyway and is host to an abundance of migratory birds. The local estuary environments provide the necessary habitat for a variety of fish types to complete their life cycles. The area also affords opportunity for recreational hunting and fishing.

The South Texas Project is home to many species of animals. Inhabitants include American alligators, ospreys, and several hundred deer. In winter, literally hundreds of thousands of waterfowl, principally migratory geese as well as white pelicans and the common tern, have found that the plant's 7,000-acre cooling reservoir provides a good resting place during their migrations. Since 1997, a 15-mile diameter area that includes the South Texas Project has had, with one exception, the highest number of bird species nationwide in the National Audubon Society's Annual Christmas Bird Count.

The climate of the region is subtropical maritime, with continental influence. It is characterized by short, mild winters and long, hot and humid summers. Rainfall is usually abundant throughout the year with an annual average of approximately forty-two inches. The prevailing wind direction is from the south-southeast, shifting to north-northeast for short intervals during the winter months.

*Photo by: Joel Coones*

# Non-Radiological Environmental Introduction and Summary

*Photo By: Tammy Stevens*

# Chapter 3

# Non-Radiological Environmental Introduction and Summary

Non-radiological environmental conditions and performance at the South Texas Project during 2010 remained satisfactory and demonstrated that the South Texas Project continued to operate in an environmentally responsible manner during the year. The South Texas Project achieved and maintained high standards of environmental performance and compliance throughout 2010.

The South Texas Project is committed to the production of electricity in a safe, reliable, and economical manner using nuclear energy. The station's programs, policies and business plan objectives also incorporate a commitment to environmental protection and sound environmental management. The dedication of station personnel who develop, implement, support, and monitor site environmental protection programs and compliance exemplify this commitment.

The station's commitment to sound environmental management is illustrated by the following environmental successes in 2010. These achievements are in addition to continuing to support activities for the proposed new units and license renewal activities for the existing units as discussed in Chapter 2.

- ✯ Continued classification as a high performer by the Texas Commission on Environmental Quality based on the station's above-average environmental compliance record in all areas considered, including water quality, waste management, and air quality compliance;

- ✯ Achieved the lowest volume of groundwater withdrawal in a single year at the station in the last 16 years;

*Photo By: Tammy Stevens*

- ✯ Completed the initial phase of a multi-year erosion control improvement project on the Colorado River embankment in the vicinity of the station's reservoir discharge piping: and,

- ✯ Developed and submitted an application package to the Texas Commission on Environmental Quality to renew the station's federal operating permit for air emission sources.

Everyone has a responsibility to protect the environment. Commitment to environmental responsibility is an integral component of the South Texas Project operating policy and core values. This responsibility reaches further than mere compliance with laws and regulations to encompass the integration of sound environmental practices into our daily operational and business decisions. The people at the South Texas Project understand the need to balance economic, operational and environmental issues for the benefit of the station and the public. We recognize our responsibility to hold ourselves to the highest principles of environmental stewardship for station activities.

*Photo By: Tammy Stevens*

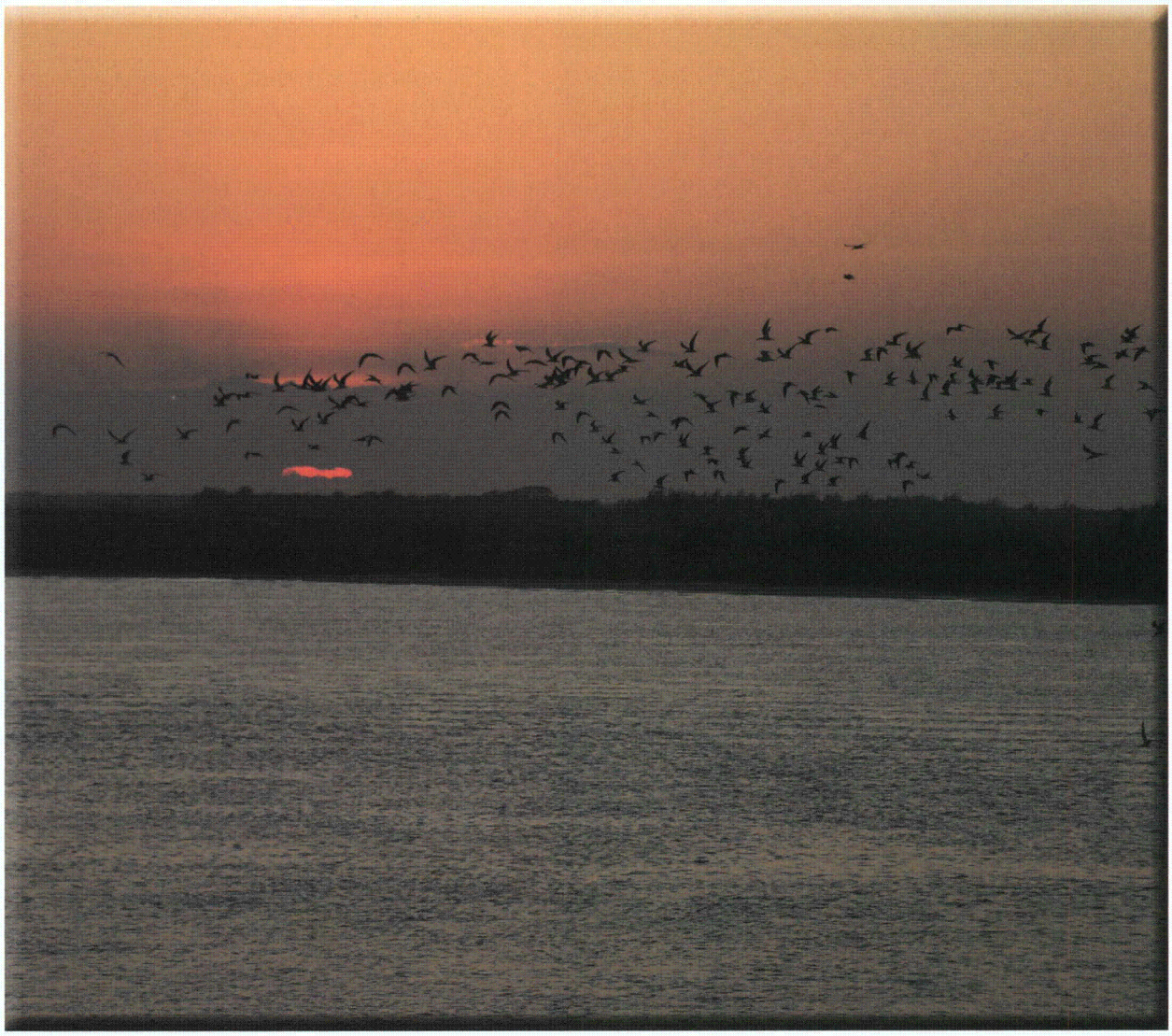

*Photo By: Tammy Stevens*

# Non-Radiological Environmental Operating Report

*Photo By: Jodie Jankauskas*

# Chapter 4

## ENVIRONMENTAL CONDITIONS

This section of the report describes the South Texas Project's non-radiological environmental program performance and environmental conditions from January 1 through December 31, 2010. The STP Nuclear Operating Company environmental staff closely monitors environmental conditions and performance at the South Texas Project. NRG Energy, Inc. provides support and technical assistance to the South Texas Project. The Texas Commission on Environmental Quality also conducted a wastewater discharge permit compliance inspection in 2010 with no findings or violations issued.

The Texas Commission on Environmental Quality classified the South Texas Project as a high performer in 2010 based on the station's above-average environmental compliance record. Facilities, such as the South Texas Project, are classified by the state as a high performer, average performer, or poor performer based on that facility's compliance history. The state's classification of the South Texas Project as a high performer was based on the station's environmental performance over the last five year period. In addition, the STP Nuclear Operating Company continued to participate in the Texas Commission on Environmental Quality CLEAN TEXAS program as a bronze-level member in 2010.


*Photo By: Barbara Carnley*

The South Texas Project, along with other local industries and organizations co-sponsored and participated in the annual Matagorda County Household Hazardous Waste Collection Day in the fall of 2010. STP Nuclear Operating Company formed an employee-led group, the STP Green Team, in 2008 to encourage and promote sustainable "green" initiatives and policies at the station and among employees. In 2010, the STP Green Team continued to promote a "Turn Off Lights" campaign for energy conservation, a program encouraging carpooling among employees, recycling of plastics and aluminum, and employee participation in community area projects such as the county's Household Hazardous Waste Collection Day. The station also continued to support various bird counts and surveys in 2010 sponsored by federal and state agencies and volunteer organizations such as the annual National Audubon Society Christmas Bird Count, the Great Texas Birding Classic, and the United States Fish and Wildlife Service Colonial Waterbird Survey.

## AQUATIC AND ECOLOGICAL MONITORING

The location of the South Texas Project falls within the Texas Land Resource Area designation as coastal prairie and can be divided into two broad ecological areas based on topography, soils, and vegetation. The bottomland lowland habitat is a swampy, marshy area that provides an important habitat for birds and other wildlife and occupies approximately 1,700 acres of the site near the Colorado River. A spoil impoundment constructed in 1972 by the United States Army Corps of Engineers is included in this area. In addition, an award-winning 110-acre wetland habitat area that attracts a variety of bird groups and other wildlife was established in 1996 on previously unused land located northeast of the power plants. The remaining area of the site offers diverse habitats for mammals and several types of birds. The South Texas Project environmental staff regularly monitor the site's environs for changing conditions. Ecological conditions onsite in 2010 remained generally unchanged and satisfactory.

*Photo courtesy of: STP Corporate Communicatons*

The South Texas Project is located on the state-sponsored Great Texas Coastal Birding Trail that spans the entire Texas Gulf Coast from Brownsville to the Louisiana border. Matagorda County, which includes the South Texas Project, consistently ranks at or near the top of the National Audubon Society's annual Christmas Bird Count for the number of species identified. Several bird species listed on the state and federal threatened or endangered species lists have been observed visiting the wetland habitat and elsewhere onsite. These include the bald eagle, peregrine falcon, wood stork, white-faced ibis, brown pelican and white-tailed hawk. Additional migratory and resident bird species such as a variety of ducks, geese, turkey and pelicans (both brown and white) have been observed during informal surveys of the site's diverse natural and man-made habitats. The summer of 2007 was the first year on record that brown pelicans were observed on site. Intensive bird nesting continues throughout the lowland habitat, particularly in a heron rookery around the perimeter of Kelly Lake. U. S. Fish and Wildlife Service biologists estimate that approximately one-third of Texas' breeding adult Gull-billed Tern population, considered to be in decline, nest on the internal dikes of the Main Cooling Reservoir at the South Texas Project. The South Texas Project continues to provide vital habitat for more than an estimated 125 different species of wintering and resident birds.

The South Texas Project continues to monitor important wildlife species to detect population changes. Informal observations by station and NRG Energy, Inc. personnel continue to indicate that the site provides high-quality habitat in which a wide range of animals live. The site continues to attract extensive wildlife populations, offering a refuge for resident species as well as seasonal migrants. The lowland habitat located between the Colorado River and the east bank of the Main Cooling Reservoir offers a significant source of water year-round. These natural resource areas, in concert with numerous additional wetland and grassland areas, offer the key ingredients necessary to sustain the extensive wildlife population at the South Texas Project.

## WATER QUALITY MANAGEMENT

Water is an essential component in electricity production, and all electric utilities must comply with extensive federal, state and local water regulations. These regulations govern virtually every aspect of business operations at the South Texas Project. Water usage, wastewater treatment onsite and certain maintenance and repair activities are regulated under the Safe Drinking Water Act, the Federal Clean Water Act, and the Texas Water Quality Act. Collectively, these acts provide for the safeguarding of public drinking water supplies and maintaining the integrity of state and federal waters. Regulating agencies that administer these requirements include the United States Army Corps of Engineers, the United States Environmental Protection Agency, the Texas Commission on Environmental Quality, the Texas General Land Office and the Lower Colorado River Authority.

*Photo By: Jodie Jankauskas*

The South Texas Project uses both surface water and groundwater for station purposes. Groundwater is pumped from deep aquifer wells to provide onsite drinking water for station personnel, to replenish the Essential Cooling Pond, and for other industrial purposes onsite. Consistent with the station's environmental principles encouraging efficient water usage and conservation, groundwater usage is carefully managed to conserve this important resource. Water from the Main Cooling Reservoir and the Essential Cooling Pond is used as cooling water for plant activities. Water from the Colorado River replenishes the Main Cooling Reservoir via intermittent pumping periods. Surface water diverted to the Main Cooling Reservoir from the Colorado River accounted for almost 98 percent of the water used at the South Texas Project in 2010. Information regarding water use in Texas can be found on the website maintained by the Texas Water Development Board at http://www.twdb.state.tx.us/.

Most of the water used by the South Texas Project is needed to condense steam and provide cooling for plant generating systems. The majority of this water is drawn from and returned to the station's Main Cooling Reservoir. The Main Cooling Reservoir is a 7,000-acre, above grade, off-channel reservoir capable of impounding 202,600 acre-feet of water at its maximum level. Reservoir makeup water is withdrawn intermittently from the adjacent Colorado River. In addition, the Essential Cooling Pond, a 47-acre, below grade, off-channel reservoir that supplies water to cool crucial plant components, is capable of impounding 388 acre-feet of water. Various water rights permits, contractual agreements, and compliance documents authorize the South Texas Project to maintain these reservoirs, impound water diverted from the Colorado River, and to circulate, divert, and use water from the reservoirs for industrial purposes to operate the plant. These permits also limit the rate of diversion from the Colorado River. The South Texas Project diverted 43,313 acre-feet in 2010 from the Colorado River for Main Cooling Reservoir fill operations while preserving adequate freshwater flow conditions for downstream bay and estuarine ecosystems. Approximately 2 percent, or 1,101 acre-feet, of the water used by the station was withdrawn from onsite groundwater sources in 2010. This was the lowest amount of groundwater usage achieved in a single year at the station in the last 16 years.

The South Texas Project and the Lower Colorado River Authority finalized an amended water rights contract for a secure water supply source to support reliable long-term operation of the station while providing flexibility to the Lower Colorado River Authority for supplying the source water. The agreement also assists the Lower Colorado River Authority to plan its future water supply strategies to help meet water demands identified in the Senate Bill 1 regional water planning process discussed later in this report. Station operations were modified accordingly in 2006 and continue to support the amended agreement and mutually-developed water delivery plan.

In 2010, the South Texas Project completed the first phase of repairs and improvements to control erosion of the river bank in the vicinity of the station's reservoir discharge pipes. Sheet piling and articulated matting was installed along approximately 700 feet of river embankment. The necessary permits to perform the work were obtained the previous year from the U. S. Army Corps of Engineers and the Texas Commission on Environmental Quality. A commercial coastal easement was obtained for the area from the Texas General Land Office in 2010. The repair and improvement activities were designed to minimize the impact on aquatic resources and the river

while providing a long term solution to stabilize the river bank and improve water quality as less of the bank is exposed to erosion. The next phase is anticipated to begin in 2012.

Existing federal and state water quality standards are implemented and enforced through the Texas Pollutant Discharge Elimination System (TPDES) permit program to restore and maintain the state's waters. Under this permit program, the South Texas Project monitors, records, and reports the types and quantities of pollutants from wastewater discharges to ensure that we meet or exceed the stringent levels set in the permit. A monthly monitoring report is submitted to the Texas Commission on Environmental Quality for wastewater discharges. In 2009, the South Texas Project applied for a renewal of this wastewater discharge permit and continued to work with the Texas Commission on Environmental Quality throughout 2010 on the renewal. Reports identifying ground and surface water use are submitted annually to the Texas Water Development Board. Reports of diversion and consumptive use are submitted to the Texas Commission on Environmental Quality. An annual groundwater use report is also submitted to the Coastal Plains Groundwater Conservation District.

Wastewater generated at the South Texas Project is processed and discharged to the onsite Main Cooling Reservoir to be re-used by the station as cooling water for plant systems. No water was discharged from the reservoir in 2010. The station continued its outstanding wastewater discharge compliance performance record in 2010. Station conditions did not require site aquatic monitoring studies be conducted in 2010, nor were any additional studies required by the United States Environmental Protection Agency or the State of Texas either by way of station discharge permits or otherwise. Wastewater discharges met state and federal water quality standards demonstrating a 100 percent compliance record for the year while conserving and maximizing efficient water usage at the station.

In addition to the wastewater discharge permit program, the Federal Clean Water Act, as amended, requires permits for storm water discharges associated with industrial activity. The South Texas Project Storm Water Pollution Prevention Plan ensures that potential pollution sources at the site are evaluated and that appropriate measures are selected and implemented to prevent or control the discharge of pollutants in storm water runoff. This plan is a working document that is revised whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the potential for the discharge of pollutants from the station. The station filed a Notice of Intent for coverage under the Multi-Sector General Permit and the Storm Water Pollution Prevention Plan was modified accordingly in 2006.

Following a severe drought in 1996, the Texas Legislature recognized the need to address a wide range of state water resource management issues. In 1997, the Texas Senate drafted legislation known as Senate Bill 1 to address these issues and to develop a comprehensive state water policy. Towards this end, this legislation required that the Texas Water Development Board create a statewide water plan that emphasizes regional planning. Sixteen planning regions were created, each tasked to prepare a regional plan for the orderly development, management and conservation of water resources. The South Texas Project was chosen to represent the electric generating utility interest for the water-planning region, Region K, encompassing the lower Colorado River Basin. Plans subsequently submitted by each planning region were incorporated into a State

*Photo By: Kristy Moss*

Water Plan in the year 2001 and again in 2006. However, water resource planning is a continuous process and the Regional and State water plans must be updated every five years. In 2009, the regional water planning group for the lower Colorado River Basin completed preparation of the *Initially Prepared Plan* for the Lower Colorado Regional Water Planning Area. In October 2010, the Texas Water Development Board approved the final version of the 2011 Region K Water Plan for subsequent review and integration into a statewide water plan. This regional plan includes water demand projections, water supply analyses, water management and conservation strategies covering the 2010 to 2060 time period for the lower Colorado River Basin. The South Texas Project continues to actively participate in the Lower Colorado Regional Water Planning Group to identify strategies to meet future water supply demand projections for the region and update the existing plan accordingly. Additional information regarding regional water planning in Texas can be found on the website maintained by the Texas Water Development Board at http://www.twdb.state.tx.us/.

Senate Bill 1 also required groundwater conservation districts to develop groundwater management plans with estimates on the availability of groundwater in the district, details of how the district would manage groundwater, and management goals for the district. The water planning and management provisions were further clarified in 2001 with the enactment of Senate Bill 2. Accordingly, the Coastal Plains Groundwater Conservation District encompassing Matagorda County was confirmed by local election in late 2001. The purpose of the District is to "…manage and protect the groundwater resources of the District." The South Texas Project was actively involved in providing review and comment on the Coastal Plains Groundwater Conservation district rules prior to their initial adoption and subsequent amendment in 2010. In 2005, the South Texas Project registered the station's onsite groundwater wells with the District and renewed the operating permit with the District in 2008. The station continues to monitor onsite groundwater usage according to the requirements of the District's rules. Additional information regarding the Coastal Plains Groundwater Conservation District can be found on their website at http://www.coastalplainsgcd.com/.

In 2007, in further recognition of the importance of water conservation to meet future demands in the state, Senate Bill 3 passed by the Texas Legislature created a stakeholder-driven process

for the development of environmental flows. Environmental flows are the amount of water necessary for a river, estuary or other freshwater system to maintain its health and productivity. The law establishes a process to develop environmental flow regime recommendations. The process tasks a team of stakeholders for each area of the state working with a science team to develop a set of recommendations to submit to the Texas Commission on Environmental Quality. The Texas Commission on Environmental Quality will then consider these recommendations, along with public input, and adopt formal environmental flow standards that must be maintained. The environmental flow standards will set flow levels at various points in rivers and streams to protect water in the rivers and estuaries along the coast. The South Texas Project has participated as an industry representative in the stakeholder committee that includes the Colorado River and Matagorda Bay since its inception in 2009. The committee has until September 2011 to make recommendations to the Texas Commission on Environmental Quality. The existing South Texas Project surface water diversion right is not impacted by this legislation.

In January 2010, the Texas Commission on Environmental Quality approved a revised Lower Colorado River Authority Water Management Plan. The Water Management Plan governs the Lower Colorado River Authority's operation of the Highland Lakes to meet the needs of water users, including the South Texas Project, throughout the lower Colorado River basin in order to improve water management strategies to address the needs of cities, industry, agriculture and the environment. The purpose of the Water Management Plan is to balance competing interests and determine how water is allocated during drought and other water supply shortages. As part of the January 2010 approval of the revised Water Management Plan, the Texas Commission on Environmental Quality directed the Lower Colorado River Authority, with participation by basin

*Photo By: Gary Parkey*

*Photo By: Breck Sacra*

stakeholders, to develop further amendments and file an application to revise the Water Management Plan no later than July of 2013. The revised plan will specify, among other things, trigger levels for the Highland Lakes that determine pro rata curtailment during a drought worse than the drought of record. The South Texas Project represents industrial firm water stakeholders in the lower basin and is an active participant on the Advisory Committee developing the proposed revisions to the plan.

In 1999, the South Texas Project developed, submitted and implemented an initial station Water Conservation Plan in accordance with state water use regulations. The purpose of the station's Water Conservation Plan is to identify and establish principles, practices, and standards to effectively conserve and efficiently use available water supplies and provide historical and projected average industrial water demand. Implementation of water conservation measures resulted in a reduction in groundwater usage in 2010 to the lowest in the last 16 years. The station revised, updated, and re-submitted the plan to the state in 2009. Annual implementation reports are submitted to the Texas Water Development Board.

The South Texas Project personnel understand that the water resources of the state are a critical natural resource requiring careful management and conservation to preserve water quality and availability. Accordingly, the station continues to explore and support efforts focusing on the efficient use of water resources and reduction of water waste.

## AIR QUALITY MANAGEMENT

Air emission sources at the South Texas Project fall under the scope of air pollution regulations promulgated under the Texas Clean Air Act and the Federal Clean Air Act and the numerous associated amendments. The purpose of these regulations is to protect air resources from pollution by controlling or abating air pollution and emissions. The South Texas Project uses small amounts of fossil fuel for backup and emergency equipment. Regulated emission sources at the South

*Photo courtesy of: STP Corporate Communicatons*

Texas Project include a fossil-fuel boiler, emergency diesel generators, fire-fighting training, and other minor maintenance equipment and activities. The station submits a report of air emissions annually to the Texas Commission on Environmental Quality.

The South Texas Project has one fossil fuel-fired auxiliary steam boiler available to furnish steam for plant use when steam is not available from the nuclear steam supply system. In addition to the auxiliary steam boiler, a number of fossil-fueled diesel generators are located onsite. These diesels are designed to provide emergency power to various plant systems or buildings in the event of a loss of power. This equipment is not normally needed for daily operations and the station does not use it to produce electricity for distribution. Routine maintenance runs are conducted to ensure availability if needed and for equipment maintenance.

In 1990, amendments to the Federal Clean Air Act mandated a permitting program to clearly define applicable air quality requirements for affected facilities such as the South Texas Project. This program is commonly known as the Title V Federal Operating Permit Program and is administered by the state. The station's Federal Operating Permit grants authority to operate identified emission sources at the station in accordance with applicable permit and regulatory requirements. The South Texas Project applied for renewal of the Federal Operating Permit for the station in 2010.

Unlike conventional electrical generating stations, nuclear power plants do not burn fossil fuel for production of electricity. Therefore, the South Texas Project produces virtually no greenhouse gases or other air pollutants that are the typical by-products of industrial production processes. The use of emissions-free nuclear power is a significant contributor to the preservation of our community's clean air resources.

*Photo By: Mark Scheuerman*

## NON-RADIOACTIVE WASTE MANAGEMENT

Solid waste management procedures for hazardous and non-hazardous wastes generated at the South Texas Project ensure that wastes are properly dispositioned in accordance with applicable federal, state, and local environmental and health regulations. By regulatory definition, solid waste includes solid, semi-solid, liquid, and gaseous waste material. The Texas Commission on Environmental Quality, which administers the Texas Solid Waste Disposal Act and also the federal Resource Conservation and Recovery Act program, is the primary agency regulating non-radioactive wastes generated at the South Texas Project. The Texas Commission on Environmental Quality regulates the collection, handling, storage, and disposal of solid wastes, including hazardous wastes. The transportation of waste materials is regulated by the United States Department of Transportation.

The South Texas Project is classified as a small quantity generator of industrial solid wastes. Texas Commission on Environmental Quality regulations require that industrial solid wastes generated at the South Texas Project be identified to the Commission. These are listed in the Texas Commission on Environmental Quality Notice of Registration for the South Texas Project. The registration is revised whenever there is a change in waste management practices at the site. Hazardous waste and Class I non-hazardous waste handling and disposal activities are summarized and documented in a waste summary report for the South Texas Project that is submitted annually to the Texas Commission on Environmental Quality.

Hazardous waste accumulation at the South Texas Project in 2010 was limited to a maximum holding period of 180 days. The Resource Conservation and Recovery Act and Texas Solid Waste Disposal Act also requires the use of proper storage and shipping containers, labels, manifests, reports, personnel training, a spill control plan, and an accident contingency plan. Plant personnel routinely inspect areas throughout the site to ensure wastes are not stored or accumulated inappropriately.

*Photo By: Mark Scheuerman*

Station policies and regulations encourage the recycling, recovery, or re-use of waste when possible to reduce the amount of waste generated or disposed of in landfills. Approximately 56 percent, or more than half, of the industrial non-


*STP Volunteers for Matagorda County Household Hazardous Waste Collection Day*

radioactive waste generated in 2010 at the South Texas Project was recycled or processed for re-use. (Reference Figure 4-1) The South Texas Project ships waste oil, grease, electrohydraulic fluid, adhesives, liquid paint, and solvent for fuel blending and thermal energy recovery. Used oil, diesel fuels, and used oil filters are sent to a recycling vendor for re-processing. Lead-acid batteries are returned, when possible, to the original manufacturer for recycling or are shipped to a registered battery recycler, thereby reducing the volume of hazardous waste that might otherwise be generated. Non-hazardous blast grit was also shipped for recycle in 2010. A site paper recycling program results in the collection of several tons of paper each year. In 2010, the station collected more than 28 tons of paper for recycling. Every ton of paper recycled saves approximately 17 or more trees, 7,000 gallons of water, and enough energy to power the average home for six months[1]. In addition, approximately 104 tons of scrap metal were also removed from the station for recycle in 2010. Recycling efforts in 2010 also included approximately 600 wooden pallets, 215 square yards of carpet and 2.5 tons of printer cartridges returned for recycling. Aluminum and plastics were also collected from employees at the station for recycling. The station continues to explore new areas where recycling may be expanded or initiated.

Non-radioactive solid waste that cannot be shipped for recycling is shipped for disposal. Municipal-type trash is transported to an offsite landfill. Successful waste minimization and source reduction efforts by employees have allowed the South Texas Project to remain classified as a small-quantity generator since 2004. Hazardous waste accounts for only a small portion of the waste generated at the South Texas Project; however, minimization and reduction of hazardous waste generation where feasible remains an important goal at the station. (Reference Figures 4-2 and 4-3)

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[1]Texas Commission on Environmental Quality. http://www.takecareoftexas.org/around-the-office/. March 2011.

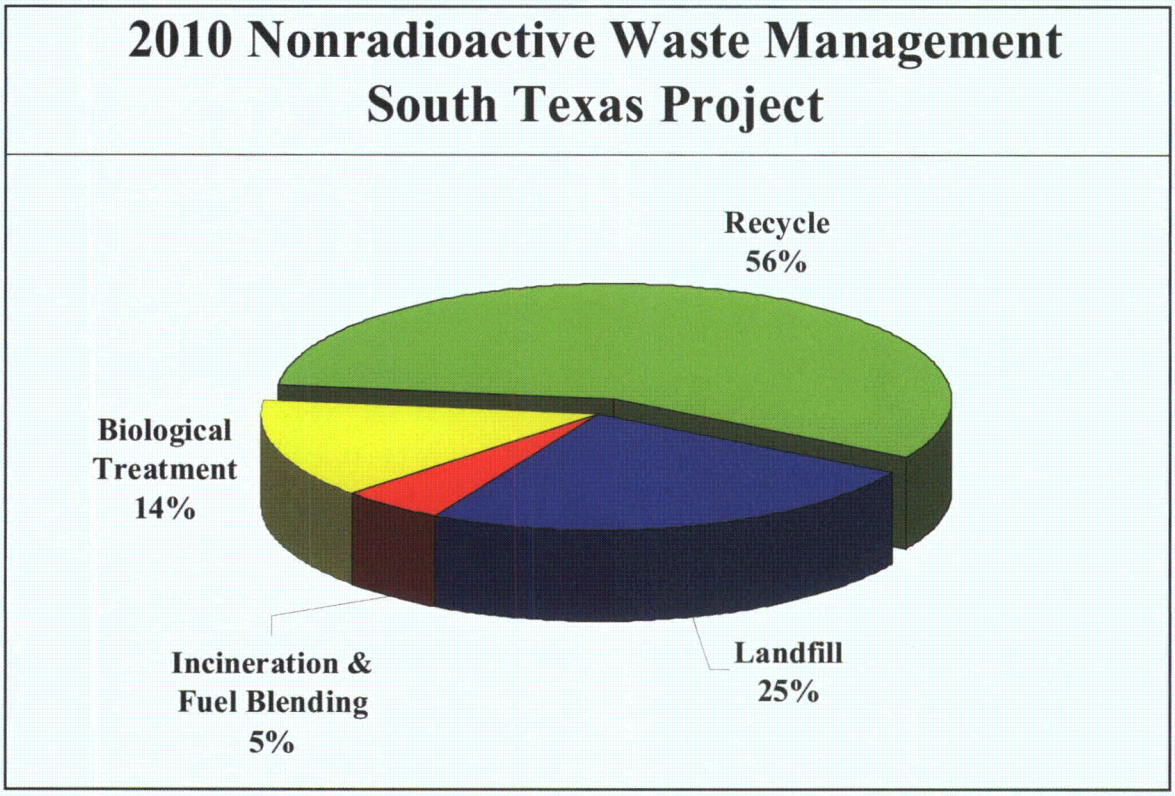



Figure 4-1

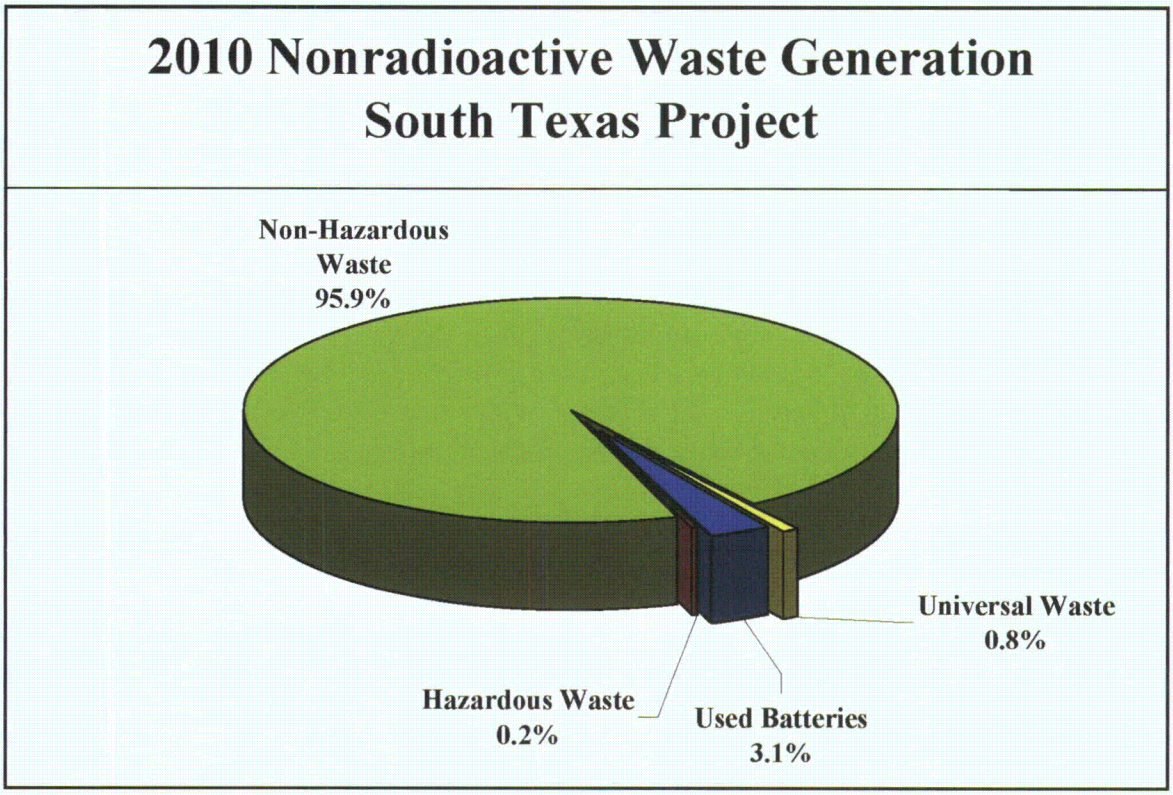



Figure 4-2

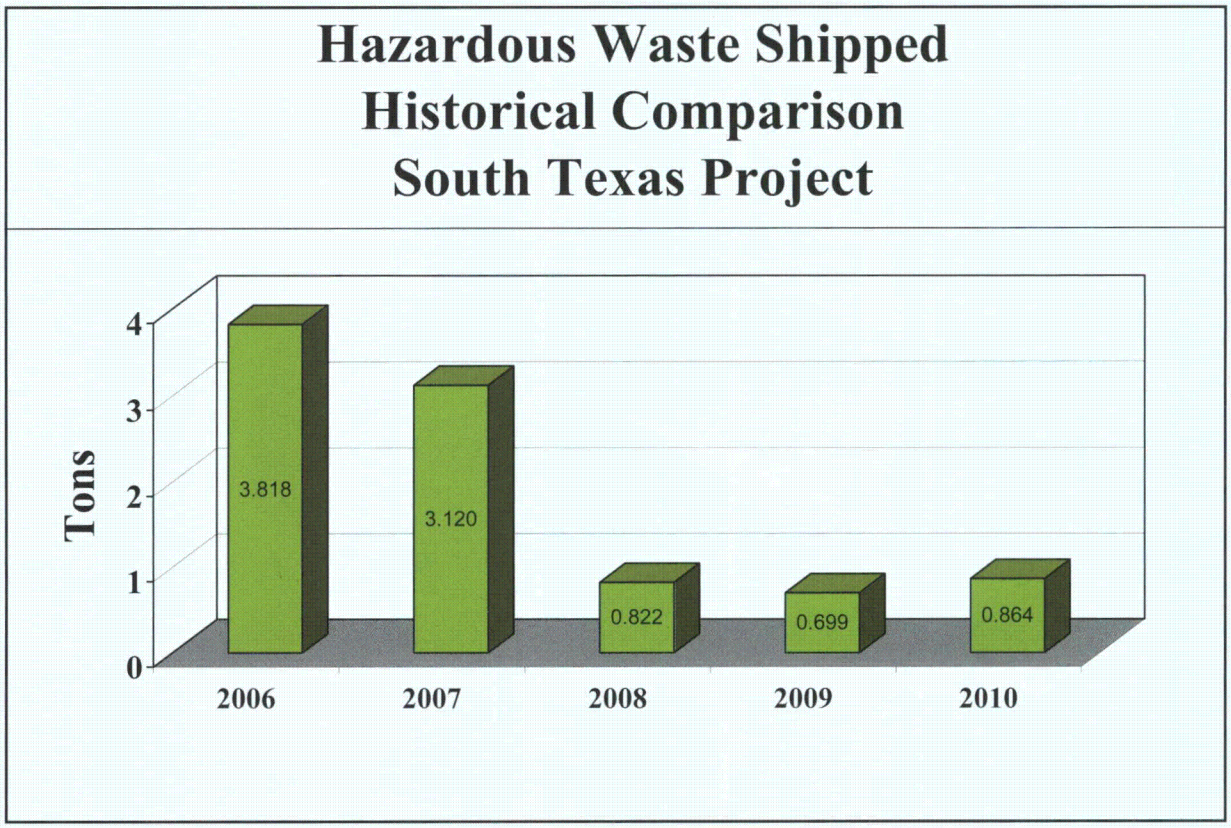



**Figure 4-3**

## CHEMICAL CONTROL AND MANAGEMENT

The station's Integrated Spill Contingency Plan for the South Texas Project Electric Generating Station, updated and re-certified in 2009, consolidates multiple federal and state requirements into one plan. The plan is implemented through standard site operating procedures and guidelines. The South Texas Project uses standard operating procedures, policies, and programs to minimize the generation of waste materials, control chemical usage and prevent spills. The South Texas Project also evaluates chemicals and products proposed for use which could come in contact with plant components. Site procedures address the evaluation, storage, use, spill control, and disposal requirements of chemicals. These guidelines assist in reducing waste generation, ensure proper packaging for disposal and mitigate the consequences of inadvertent spillage.

The South Texas Project emphasizes awareness training for spill prevention and maintains station readiness to respond should a spill occur. Spill response team members receive annual refresher training in hazardous material incident response. No significant or consequential spills occurred in 2010.

## ENVIRONMENTAL PROTECTION PLAN STATUS

The South Texas Project's Environmental Protection Plan was issued in March of 1989 to provide for the protection of non-radiological environmental values during operation of the South Texas Project. This report reviews Environmental Protection Plan non-compliances identified by the plant in 2010 and the associated corrective actions taken to prevent their recurrence. Potential nonconformities are promptly addressed, as identified, to maintain operations in an environmentally acceptable manner. The station uses its Corrective Action Program to document these conditions and track corrective actions to completion. Internal assessments, reviews and inspections are also used to document plant compliance.

This report also reviews non-routine reports submitted by plant personnel and any activities that involved a potentially significant unreviewed environmental question. A proposed change, test or experiment is considered to present an unreviewed environmental question if it concerns:

1) A matter that may result in a significant increase in any adverse environmental impact previously evaluated in the Final Environmental Statement related to the Operation of South Texas Project, Units 1 and 2 (Docket Nos. 50-498 and 50-499), environmental impact appraisals, or in any decisions of the Atomic Safety and Licensing Board; or,

2) A significant change in effluents or power level; or,

3) A matter not previously reviewed and evaluated in the documents specified in (1) above, that may have a significant adverse environmental impact.

No unreviewed environmental questions were identified in 2010.

Events that require reports to federal, state or local agencies other than the Nuclear Regulatory Commission are reported in accordance with the applicable reporting requirements. The Nuclear Regulatory Commission is provided with a copy of any such report at the time it is submitted to the cognizant agency. If a non-routine event occurs and a report is not required by another agency, then a 30-day report to the Nuclear Regulatory Commission is required by the Environmental Protection Plan. No such 30-day or other non-routine report of this type was required in 2010.

*Photo courtesy of: STP Corporate Communications*

*Photo By: Gary Parkey*

# Radiological Environmental Introduction and Summary

*Photo By: Gary Parkey*

# Chapter 5

# Radiological Environmental Introduction and Summary

The Radiological Environmental Monitoring Program is designed to evaluate the radiological impact of the South Texas Project on the environment by collecting and analyzing samples for low levels of radioactivity. Measurements of samples from the different pathways indicate that there is no effect offsite from the operation of the South Texas Project.

*Photo By: Aubrey Passafuma*

Only natural radioactive material has been identified in air samples in 2010. The measurements of direct radiation onsite and offsite indicate no dose limits were exceeded. Samples of fish and meat collected and analyzed show no plant-related isotopes are present. Water samples from the onsite drinking water supply from the deep aquifer and offsite sampling stations on the Colorado River show only natural background radioactivity.

Tritium is a radioactive isotope of hydrogen that is produced in the reactor and cannot be removed from effluents released to the Main Cooling Reservoir because it is a part of the water molecule. Due to the design of the Main Cooling Reservoir the presence of tritium in various sloughs and ditches onsite, and the shallow aquifer was expected. Tritium has been detected in these types of samples and the concentrations remain below the Environmental Protection Agency (EPA) drinking water limits.

*Photo By: Aubrey Passafuma*

In 2005, several nuclear plants discovered tritium in groundwater on site at levels exceeding the EPA drinking water limits, mainly near underground process or effluent pipes. To determine if this were the case at the South Texas Project, test wells near underground process and effluent pipes were sampled and analyzed for tritium. Although some results were positive, all results were below the EPA drinking water limits.

A sampling program was developed to monitor the tritium in the immediate area

*Photo By: Aubrey Passafuma*

around the nuclear plants for long term trending. Wells are sampled quarterly, annually, and once every five years, depending on location and the amount of tritium present. The tritium concentration remained below the EPA drinking water limits in 2010 and within the design basis of the South Texas Project.

A supplemental study was performed in 2010 in which additional bottom sediment samples from the Main Cooling Reservoir were obtained and analyzed and the results are included in chapter 6.

Analysis of the data collected from the implementation of the Radiological Environmental Monitoring Program indicates that the operation of the South Texas Project has no offsite radiological impact.

*Photo By: Gwenna Kelton*

*Photo By: Gary Parkey*

# Radiological Environmental Operating Report

*Photo By: Jodie Jankauskas*

# Chapter 6

## PROGRAM DESCRIPTION

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

Analysis of the environmental pathways require that samples be taken from water, air, and land environments. These samples are obtained to evaluate potential radiation exposure. 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 pre-operational 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 additional 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: Jodie Jankauskas*

# RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
# DESIGNATED SAMPLE LOCATION MAP

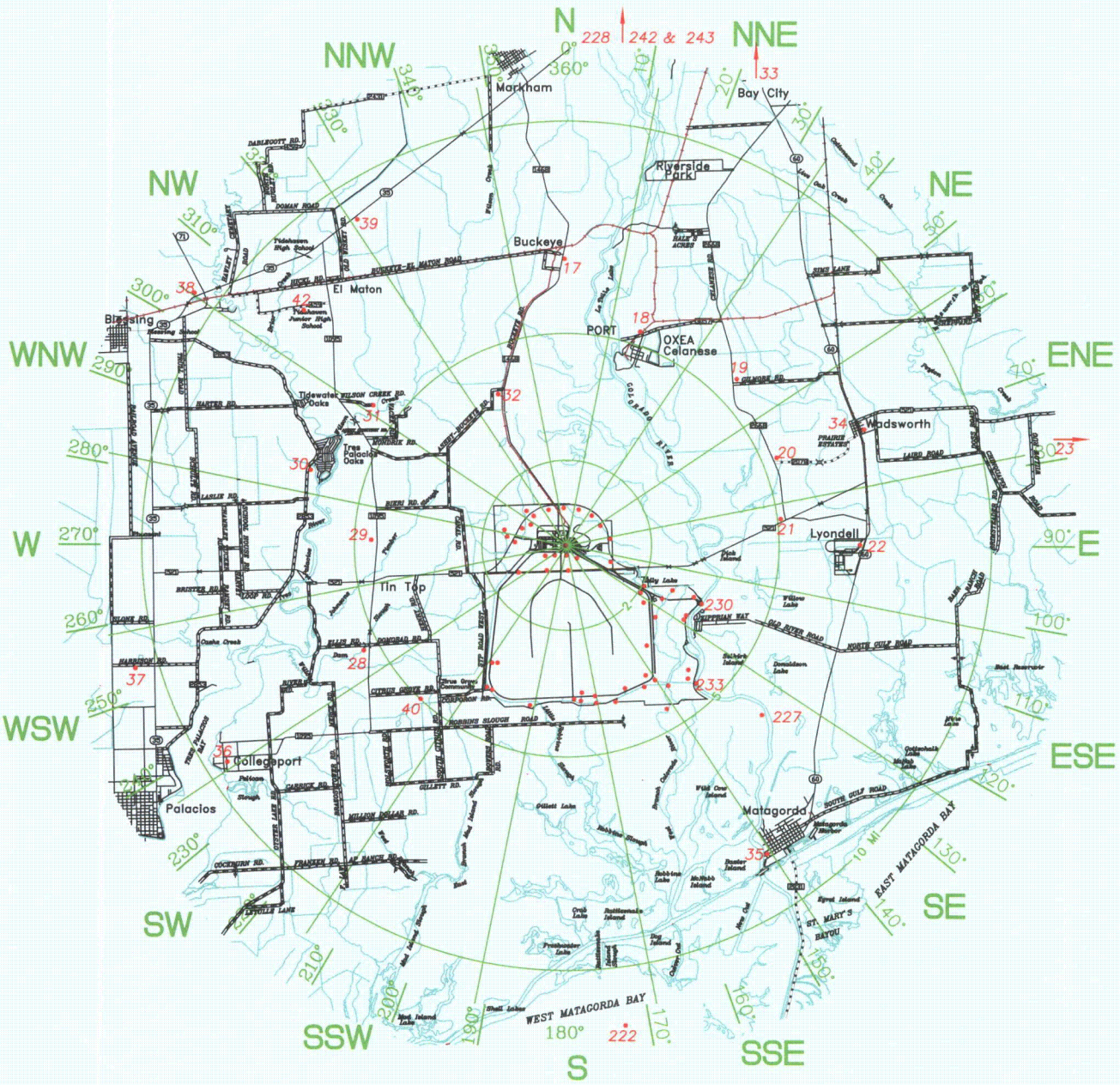



Figure 6-1

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
## ONSITE SAMPLE LOCATION MAP

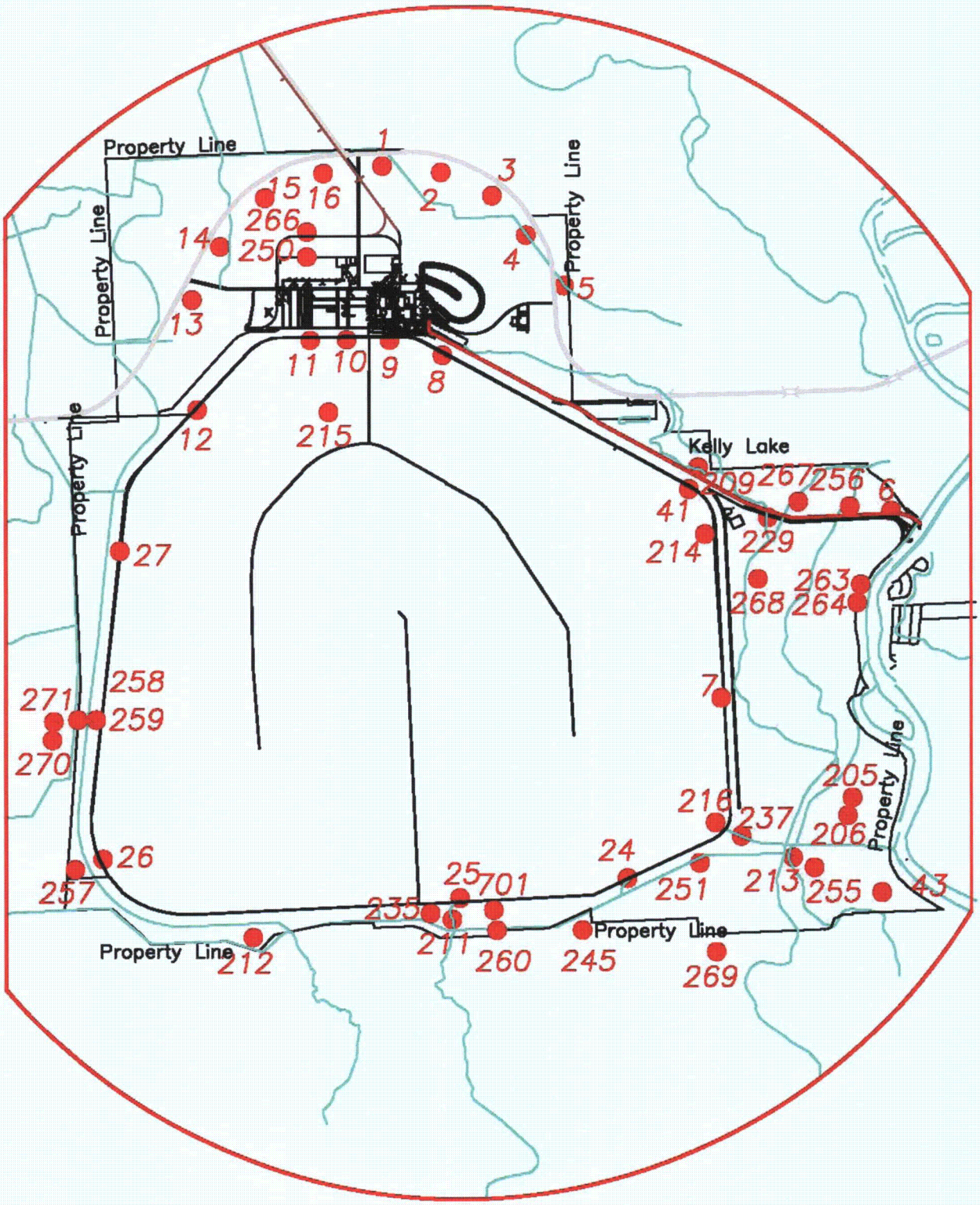
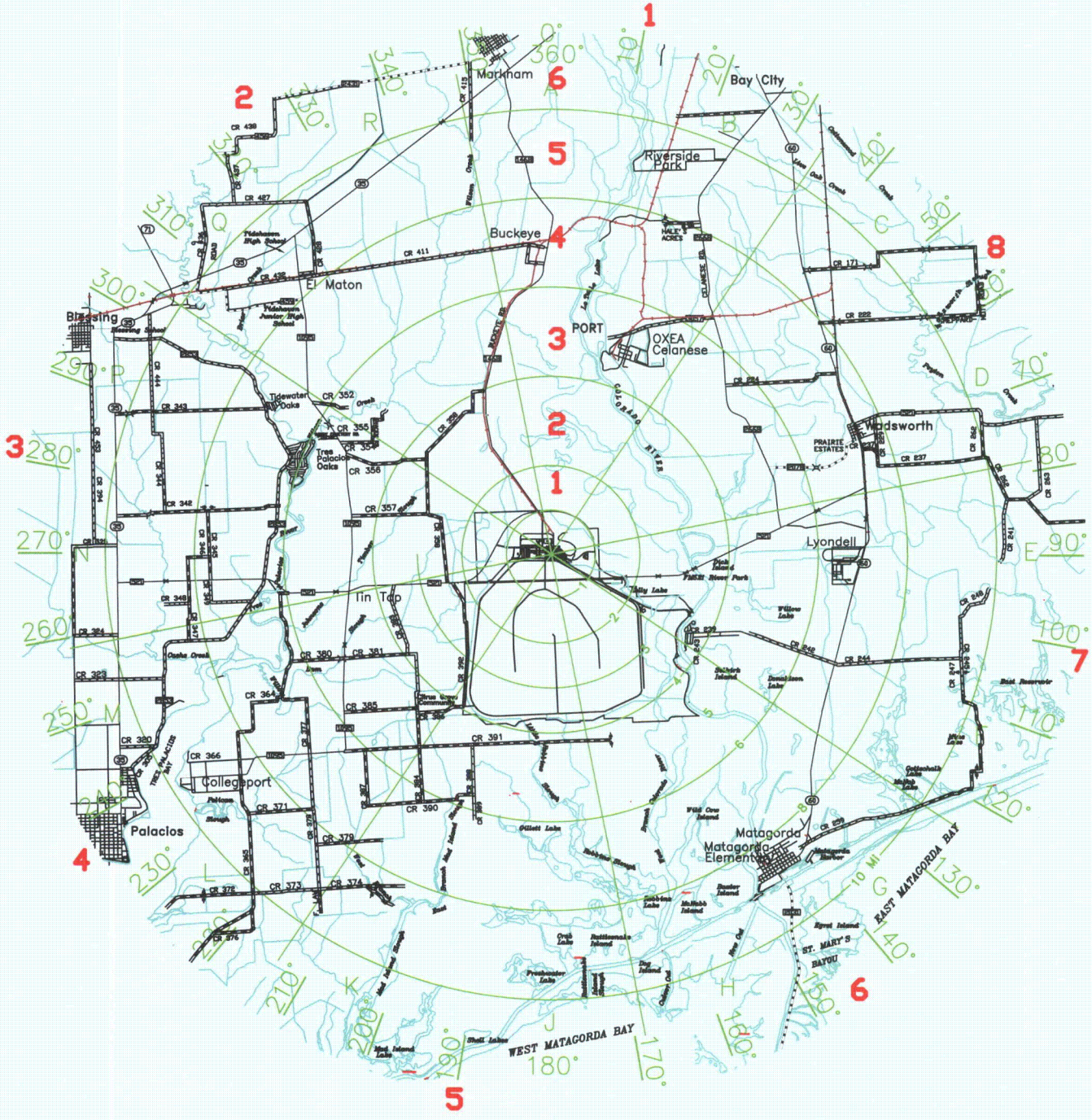



Figure 6-2

## 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. Onsite indicator samples continued to increase or decrease in measured values within their expected rates.

Average quarterly beta activity from three onsite indicator stations and a single control station for air particulate samples have been compared historically from 1988 through 2010 (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 natural radioactive material. Gamma analysis is performed on quarterly composites of the air particulate samples to determine if any activity is from the South Texas Project. The gamma analysis revealed no plant related radioactivity.

Direct gamma radiation is monitored in the environment by thermoluminescent dosimeters located at 40 sites. The natural direct gamma radiation varies according to location because of differences in the natural radioactive materials in the soil, its moisture content, and other factors. Figure 6-5 compares the amount of direct gamma radiation measured at the plant since the fourth quarter of 1985 for three different types of stations. The Control Stations, Stations #23 and #37, are greater than 10 miles from the site in the minimal wind direction. The least frequent direction into which the wind blew in 2010 was the ENE direction. The prevailing wind direction is into the NNW direction. The Sensitive Indicator Stations are one mile NW, NNW, and N from the power 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. TLD station # 9 saw an increase in direct radiation of two times higher than the normal quarterly average of 14 mR. Station # 9 is located 0.25 miles south of the units on the reservoir dike facing the temporary storage building which houses the old reactor heads located just outside Unit 2. 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 power plants are not adding to the direct radiation in the environment.

Bottom sediment samples are taken from the Main Cooling Reservoir each year. Figure 6-6 shows the positive results from two plant-produced radioactive materials, Cobalt-58 and Cobalt-60. The Cobalt-58 and Cobalt-60 inventory in the reservoir has decreased since 1992 because of radioactive decay and equipment installed to reduce radioactive effluents. The amount of Cobalt-58 has decreased below levels that can be reliably detected. In fact, no Cobalt-58 or Cobalt-60 has been detected in the reservoir bottom sediment samples at station # 215 and # 216 since 2006. Figure 6-7 demonstrates the calculated decline in the total amount of Cobalt-60 in the reservoir. A supplemental study that included 56 additional bottom sediment samples from the Main Cooling Reservoir is included in this report and shows that Co-60 was identified at low levels in many locations. The data from the study will be used to determine more representative sediment sampling stations.

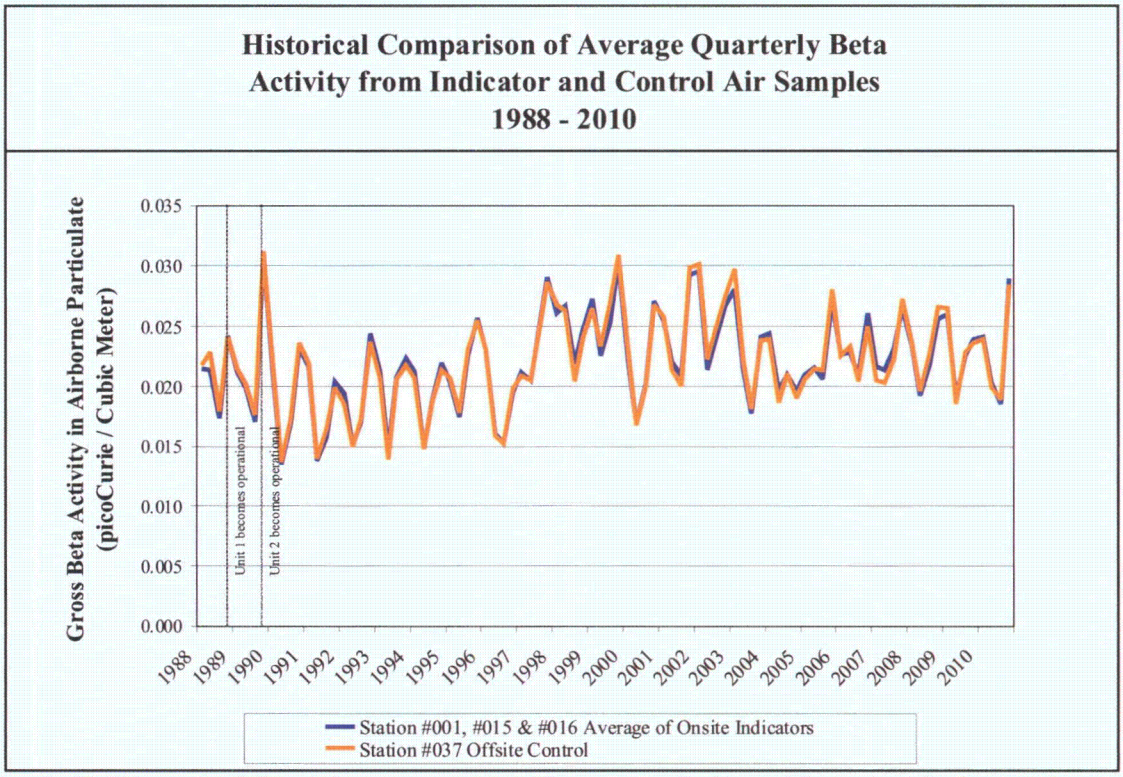



Figure 6-4

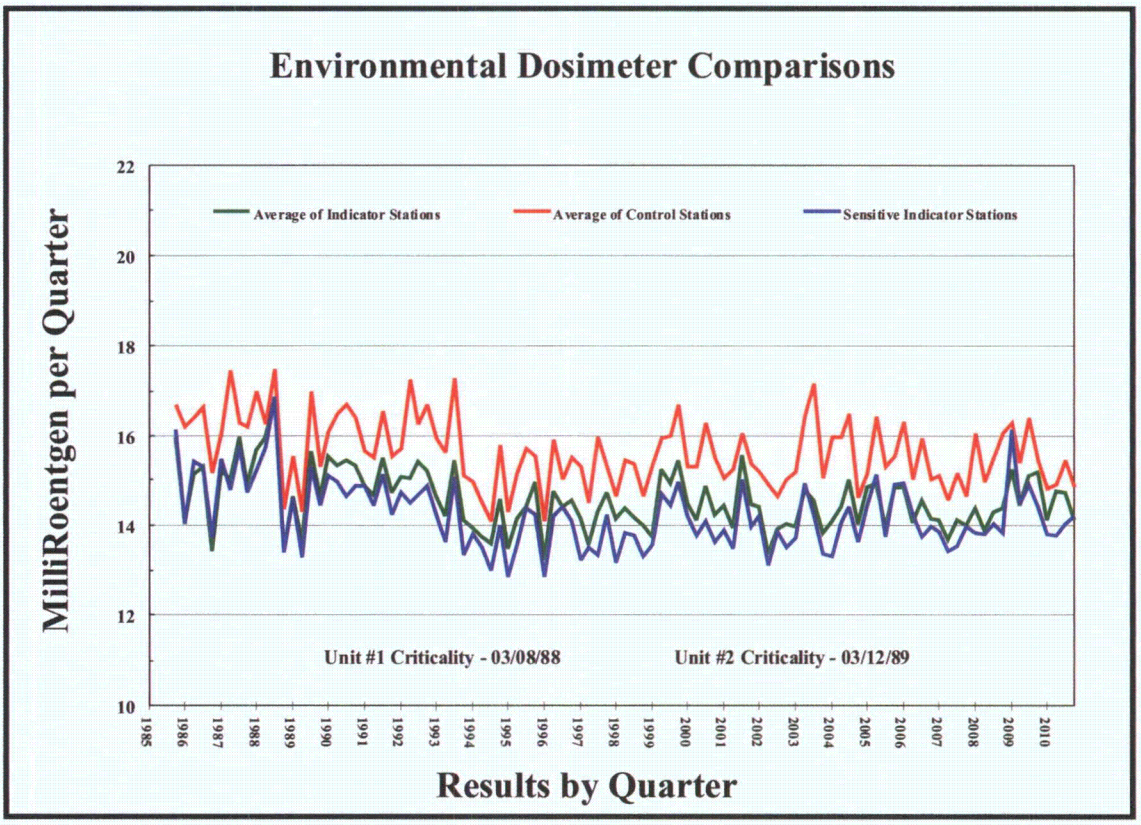



Figure 6-5

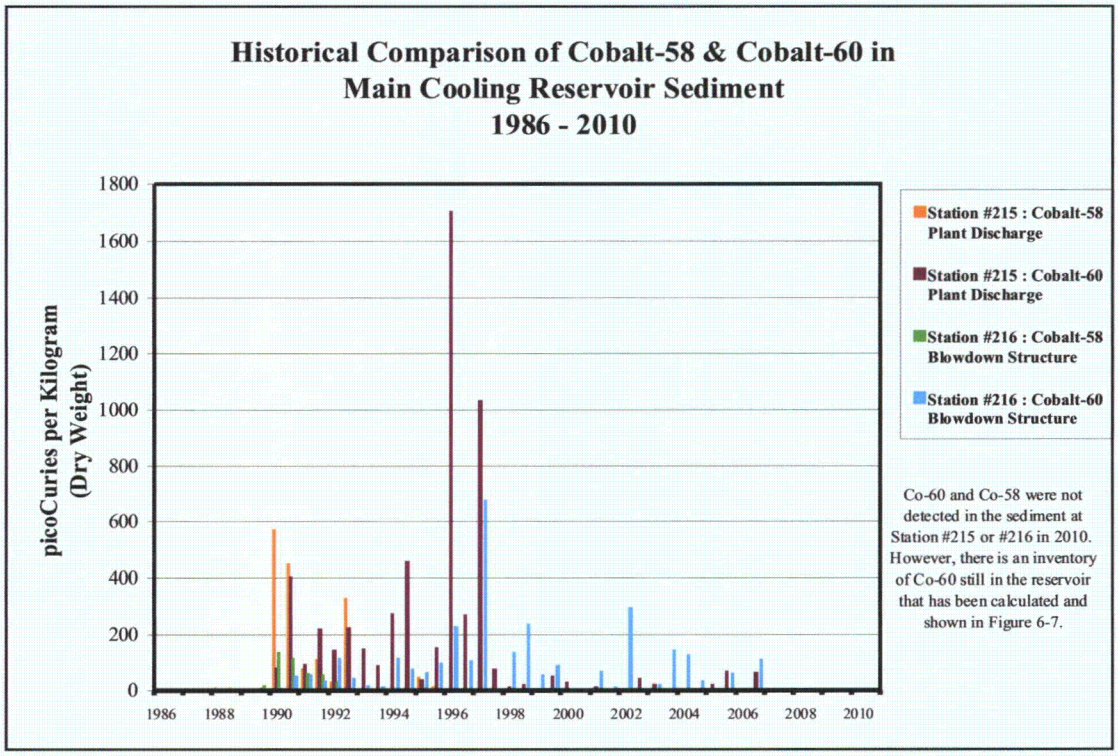



Figure 6-6

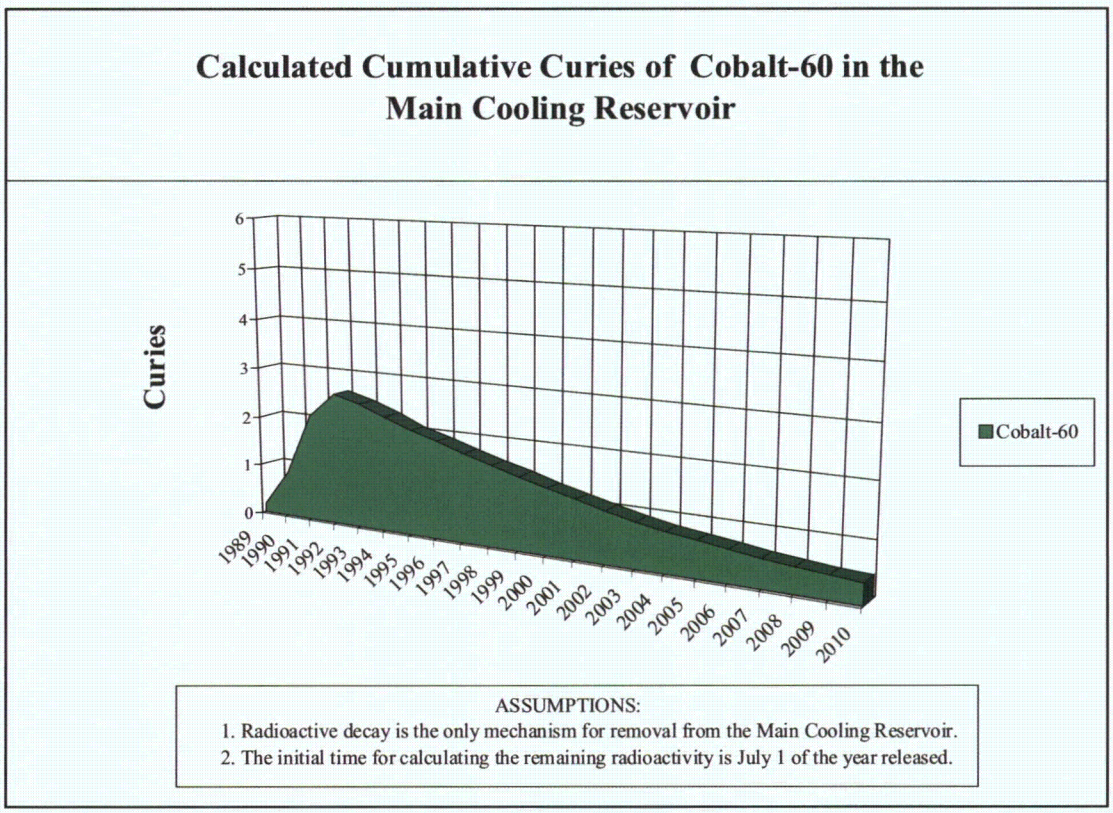



Figure 6-7

*Photo By: Aubrey Passafuma*

Cesium-137 was measured in three out of six bottom sediment samples from one of the normal sampling locations in the Main Cooling Reservoir. The highest measurement was 67.1 pCi/kg and was found at Station # 216. 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 Cs-137 from weapons testing fallout. The pre-operational average Cs-137 concentration was 118 pCi/kg when it was detected in soil and sediment samples but the highest sample measured 383 pCi/kg. The 67.1 pCi/kg measured at Station # 216 is consistent with these pre-operational concentrations reduced by 25 years of radioactive decay.

Tritium has been monitored in the shallow aquifer since 1997 on the south side of the Main Cooling Reservoir. This was predicted by models used when licensing the site and validated with additional studies for the proposed Units 3 & 4. A site conceptual model developed in 2008 to implement the Groundwater Protection Initiative validated the original predictions of the site hydrology. The models predicted that the tritium would be at the highest concentration in the shallow aquifer on the southeast side of the Main Cooling Reservoir. This prediction has shown to be true with the positive results from station #251 and station #235 which have been sampled for several years.

*Photo By: Edmond Hardcastle Jr.*

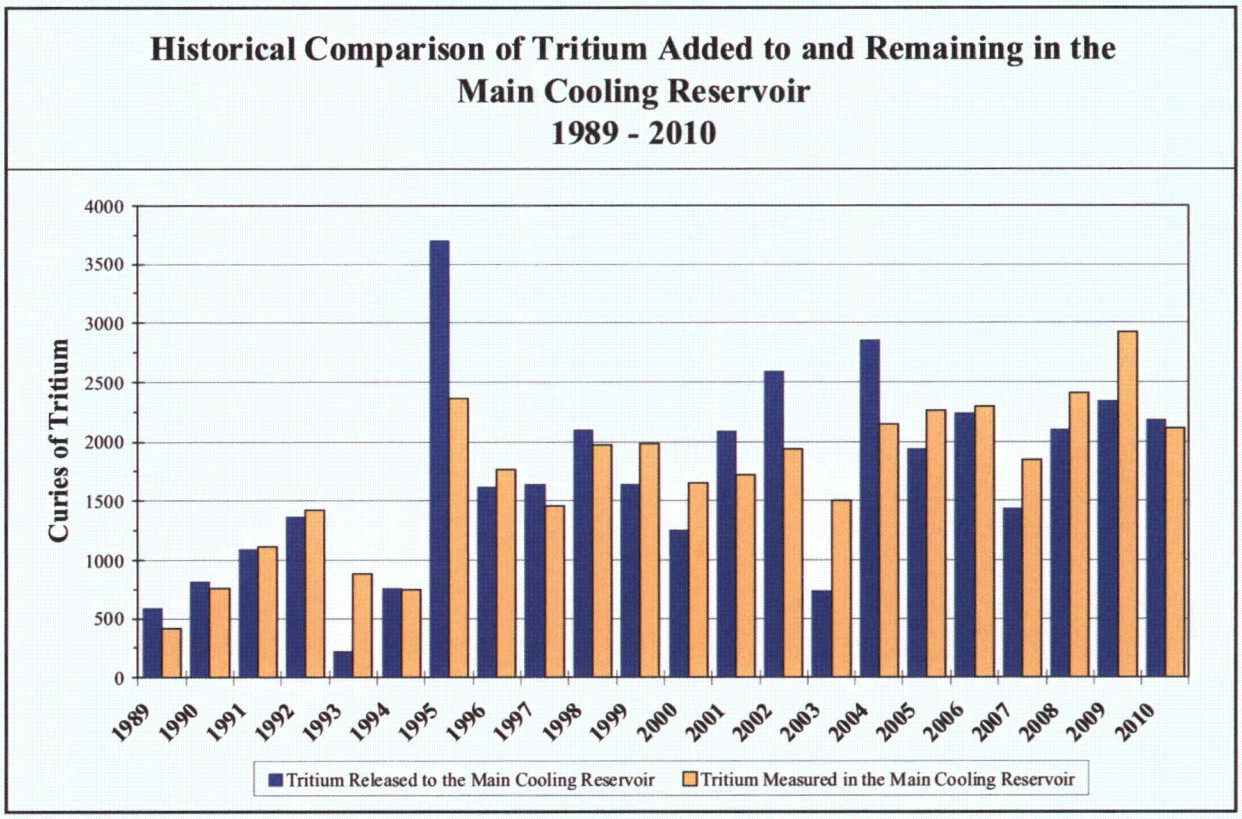



Figure 6-8

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 dike'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 stable in 2010. The amount of tritium measured in the Main Cooling Reservoir was consistent with the amount released. The amount of rainfall and river makeup normally influences the concentration of tritium in the Main Cooling Reservoir and the shallow aquifer surrounding it. The effect of the reduced rainfall when compared to the average amount of rainfall in the area has resulted in higher concentrations in the shallow aquifer wells and surface waters across the site. Tritium enters the sloughs and ditches of the site as runoff from the relief wells that surround the reservoir. In 2010 tritium levels decreased in the relief wells as shown in Figure 6-9. Not all data for relief well #701 was collected due to inaccesibility.

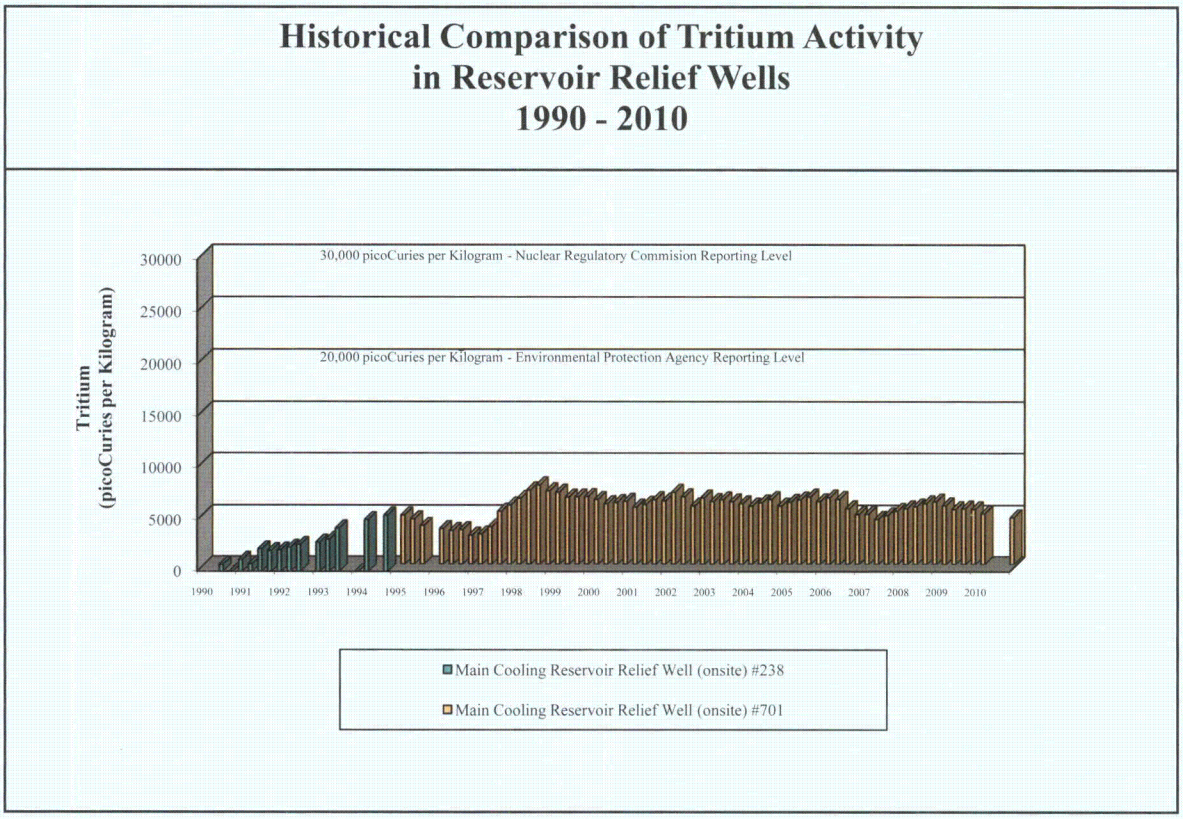



Figure 6-9

The tritium concentration in eight surface water sample points from 1988 through 2010 is 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 due to the concentration in the reservoir and the amount of rainfall received. The average tritium concentration in the relief wells, sloughs, and ditches is less than the reservoir because the water is diluted as it migrates through the reservoir relief well system. For 2010, four of the twelve required surface water samples tested positive for tritium as well as twenty one of the onsite non-required samples. All were less than the EPA drinking water limit. A drainage ditch sample from STP-controlled property on the south side of the Heavy Haul Road indicated a small amount of tritium, 495 pCi/kg. This is below the EPA drinking water limit of 20,000 pCi/kg. This ditch also drains into the west branch of the Colorado River which is sampled quarterly. Two of the fourth quarter surface water samples were greater than the 9 month average but they were still less than the EPA drinking water limit. Rainwater was collected and analyzed during 2010 to determine if the tritium from the reseivoir precipitated in the local area. Tritium was not found in any of the site boundary rainwater samples.

Tritium was identified in the shallow (ten to thirty feet deep) aquifer test well at Station #235, approximately seventy-five yards south of the reservoir embankment base during 1999. In 2010, the concentration of the well at Station #235 was higher than average but consistent with previous values as shown in Figure 6-11. In 2000, samples were collected from the shallow aquifer well at Station #251 southeast of the Main Cooling Reservoir. Samples have been

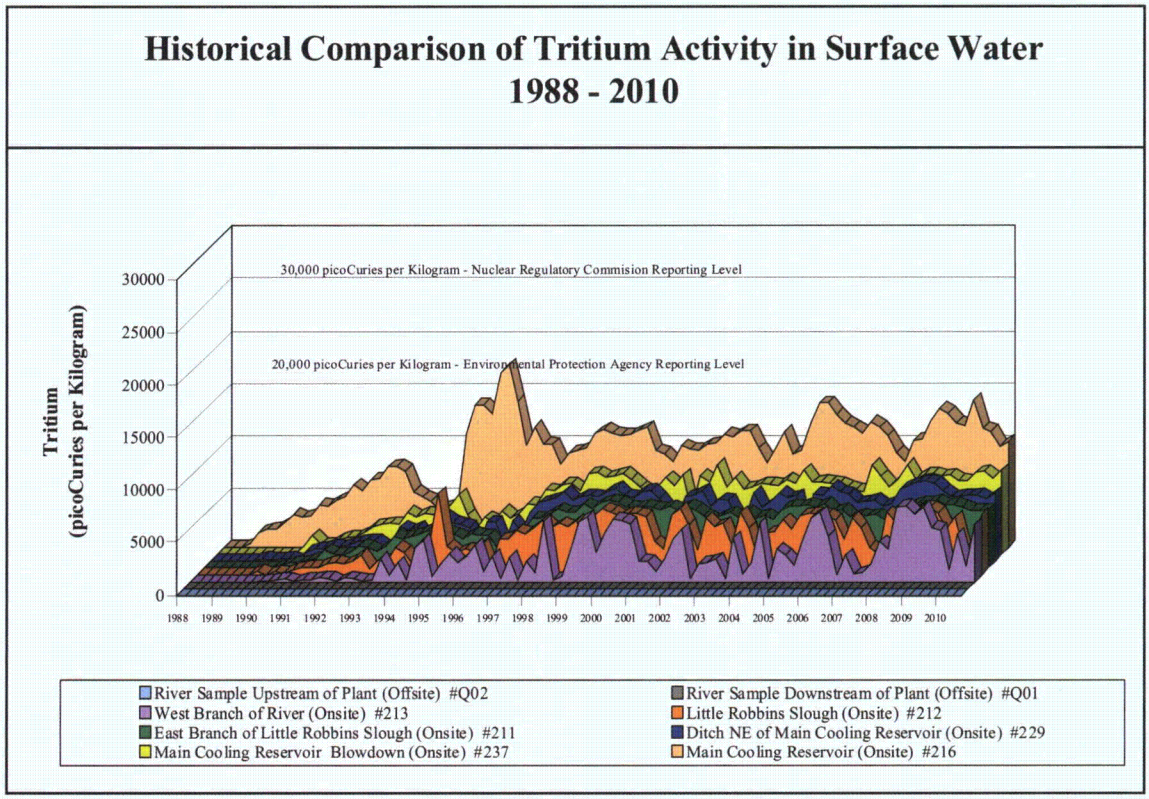



Figure 6-10

## Historical Comparison of Tritium Activity in Shallow Aquifer Ground Water 1997 - 2010

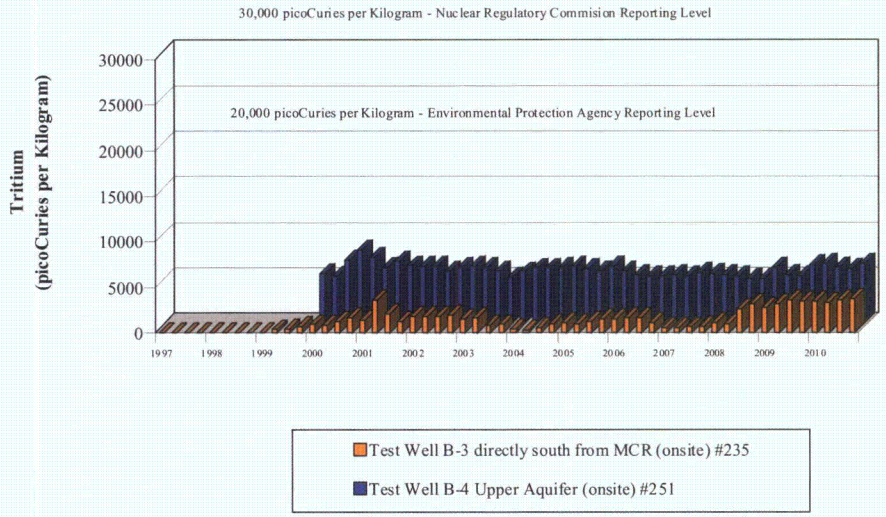



Figure 6-11

## Tritium Activity in Shallow Ground Water West of the Main Cooling Reservoir 2006 - 2010

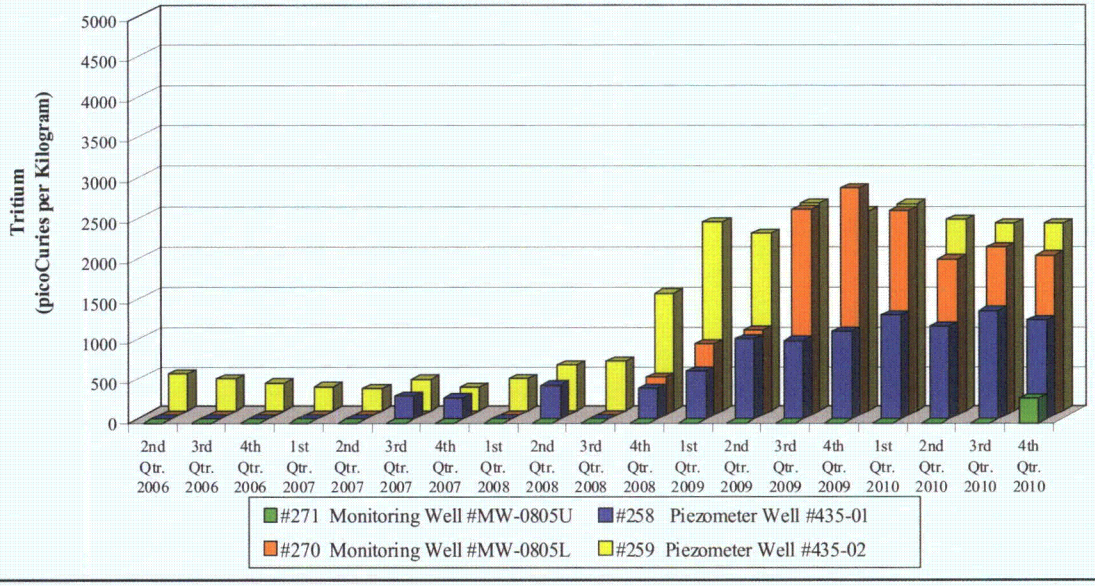



Figure 6-12

collected quarterly since then and the tritium levels have remained near that of the relief wells. The results of the analysis from these two shallow aquifer wells are shown in Figure 6-11. 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. Tritium levels were generally stable in 2010 with a peak of 2,500 pCi/kg, most likely due to the Main Cooling Reservoir water levels, but remained well below the EPA drinking water limit (20,000 pCi/kg). The well at Station #271, located adjacent to STP property on a county road easement directly west of the Main Cooling Reservoir, indicated a concentration in 2010 of 308 pCi/kg which is barely above the detection limit. This is the first year that a positive measurement has been detected at this shallow monitoring well location.

The drinking water onsite is pumped from deep aquifer wells and is tested quarterly to verify tritium is not present. No water from the reservoir, shallow aquifers or other surface water is used for drinking water at STP. If the water with the highest tritium concentration that leaves STP (Little Robbins Slough) were used for drinking, the maximum dose to an individual would be about one millirem in a year. This dose is insignificant compared to approximately 620 mrem the public receives a year from natural radioactivity in the environment and the radiation received from medical procedures (ref. National Council on Radiation Protection NCRP #160, 2009).

Other samples are collected and analyzed in addition to those required by our licensing documents or internal procedures. These samples are obtained 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, water from various ditches and sloughs onsite, and air samples near communities or other areas of interest. The results of these analyses indicate that plant related radioactive material released to the environment by plant operation has no health impact.

*Photo By: Jodie Jankauskas*

## 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. There were several changes this year in the nearest residents within five miles. A new resident was identified in the SSW sector and a closer resident was identified in the WSW sector. The location descriptions were updated in the ESE and SE sectors. The distance to the nearest residence was determined to be more accurately 3.0 miles instead of the previously estimated 3.5 miles. 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 Island |
| SE | 3.5 | Selkirk Island |
| SW | 4.5 | CR 386 (Corporon Rd) |
| SSW | 4.5 | CR 391 (Robbins Slough Rd.) |
| WSW | 2.5 | FM 521 |
| 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 – FM 1468 |
| N | 3.0 | Runnells Ranch – FM 1468 |

The following items of interest were noted during the census:

- 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.
- No commercial dairy operates within Matagorda County, and there is no source of milk within the five mile zone.
- Two commercial fish farms continue to operate. One is two miles west of the plant near FM 521, and the second is between four to five miles southwest of the plant located in the area north of Robbins Slough Road and east of South Citrus Road. The water supply, deep aquifer wells and Lower Colorado River Authority irrigation water, for the ponds is not affected by the operations of the STP power plants.
- Broadleaf vegetation sampling is performed at the site boundary in the three most frequent downwind sectors and at a control location in lieu of a garden census. The broadleaf vegetation samples taken satisfy the milk 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, surveillance, 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 and re-evaluation. Areas that need attention are addressed in accordance with the station's Corrective Action Program.

The measurement capabilities of the Radiological Laboratory are demonstrated by participating in inter-laboratory measurement assurance programs. These programs provide samples that are similar in matrix and size to those measured for the Radiological Environmental Monitoring Program.

Figure 6-13 summarizes the results of these interlaboratory comparison programs. In addition, approximately ten percent of the analyses made are quality control samples that consist of duplicate, split, and blind samples.

Radiochemical measurements must meet sensitivity requirements at the Lower Level of Detection for environmental samples and any deviations are discussed on the following section.

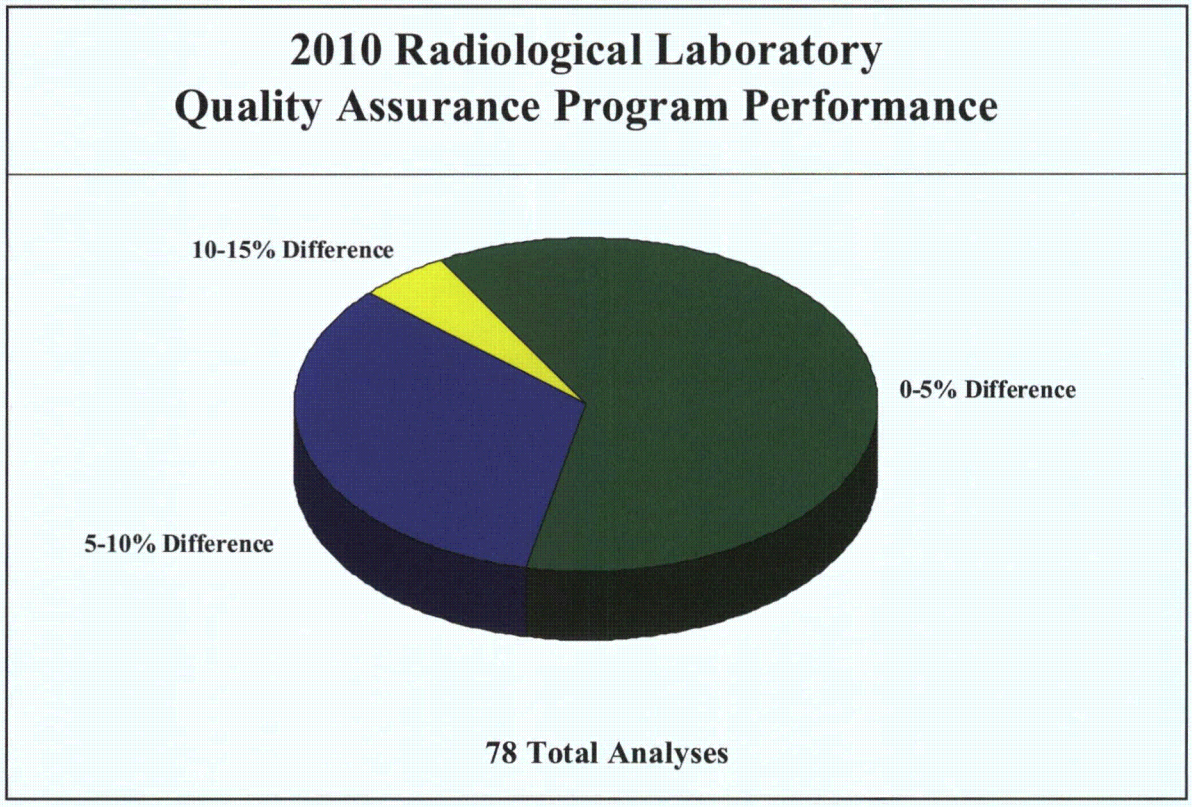



Figure 6-13

## PROGRAM DEVIATIONS

Deviations from the sampling program must be acknowledged and explained in this report. During 2010 the following samples were not collected or were unacceptable for analysis:

- Two measurements of direct radiation out of one hundred and sixty required were missed because the TLD stations were damaged by lawn mowing equipment.

- Twelve out of thirty-six required broadleaf vegetation samples were not collected due to seasonal unavailability in January, February, March, and December.

- Eight out of two hundred and sixty air samples were not continuously collected for the full time interval due to power failures. All of the air samples met the lower limit of detection requirements and are included in Table 3.

The minimum 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.

## NEI GROUNDWATER PROTECTION INITIATIVE

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

In 2007, the Nuclear Energy Institute established a standard for monitoring and reporting radioactive isotopes in groundwater titled "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 samples collected near the nuclear plants. Some of the positive results of this broadened monitoring program likely reflect tritium to be associated with the Main Cooling Reservoir. Others appear to be the result of discharges to the ground involving water previously considered non-radioactive, since only trace quantities of tritium were present.

Wells near the nuclear plants are sampled quarterly, annually or once every five years depending on the concentration of tritium and the location of the wells. Two of the wells sampled quarterly are between the two units where a pipe was broken and repaired several years ago. The concentration of well # 808, with a depth of 82 feet, has decreased since 2009 from 2,860 pCi/kg to 1,040 pCi/kg, see figure 6-14. An adjacent well, # 807 with a depth of 48 feet, has decreased from 2,200 pCi/kg to 1,500 pCi/kg since 2009. Both well concentrations continue to remain significantly below EPA limits. Five wells that had little or no detectable tritium are sampled annually to determine if there is movement of the tritium in the protected area. Three wells continue to have no detectable tritium, while the fourth well # 801 tested positive at very low levels (380 pCi/kg). Well # 801 is located on the south east side of the protected area and may be

influenced by the Main Cooling Reservoir. The fifth well, # 836, located north of wells 807 and 808, has decreased from 3220 pCi/kg in 2009 to 1580 pCi/kg in 2010 and remains significantly below EPA limits. During 2008, three additional wells were installed in the protected area east of Unit 1. This was suggested during a hydrology study due to the direction of flow of the shallow aquifer and the lack of appropriate wells to sample on the east side of the plants. The samples collected from these wells continue to indicate no detectable tritium. Several additional wells are monitored at least once every five years. Two of these wells were sampled in 2010 with low positive levels at 663 pCi/kg at well # 805 and 1,060 pCi/kg at well # 806. This is the first year that any tritium has been measured at well # 805. Well # 805 is located south of the Unit 1 Fuel Handling Building inside the protected area fence but close enough to the Main Cooling Reservoir to be influenced by the reservoir. Although the measurements are positive for these wells, they are still a small fraction of the EPA drinking water limits.

During 2010, there was an underground leak discovered at the northeast corner of the make-up demineralizer building. A sample measured 1520 pCi/kg of tritium. No plant related gamma emitting nuclides were detected. The information was recorded in the Corrective Action Program database. The evaluation revealed that there was no release via an unidentified pathway, no radioactive material was released offsite, and there was no impact to the drinking water or the health and safety of the public.

*Photo By: Jodie Jankauskas*

## STP PROTECTED AREA GROUND WATER MONITORING WELLS

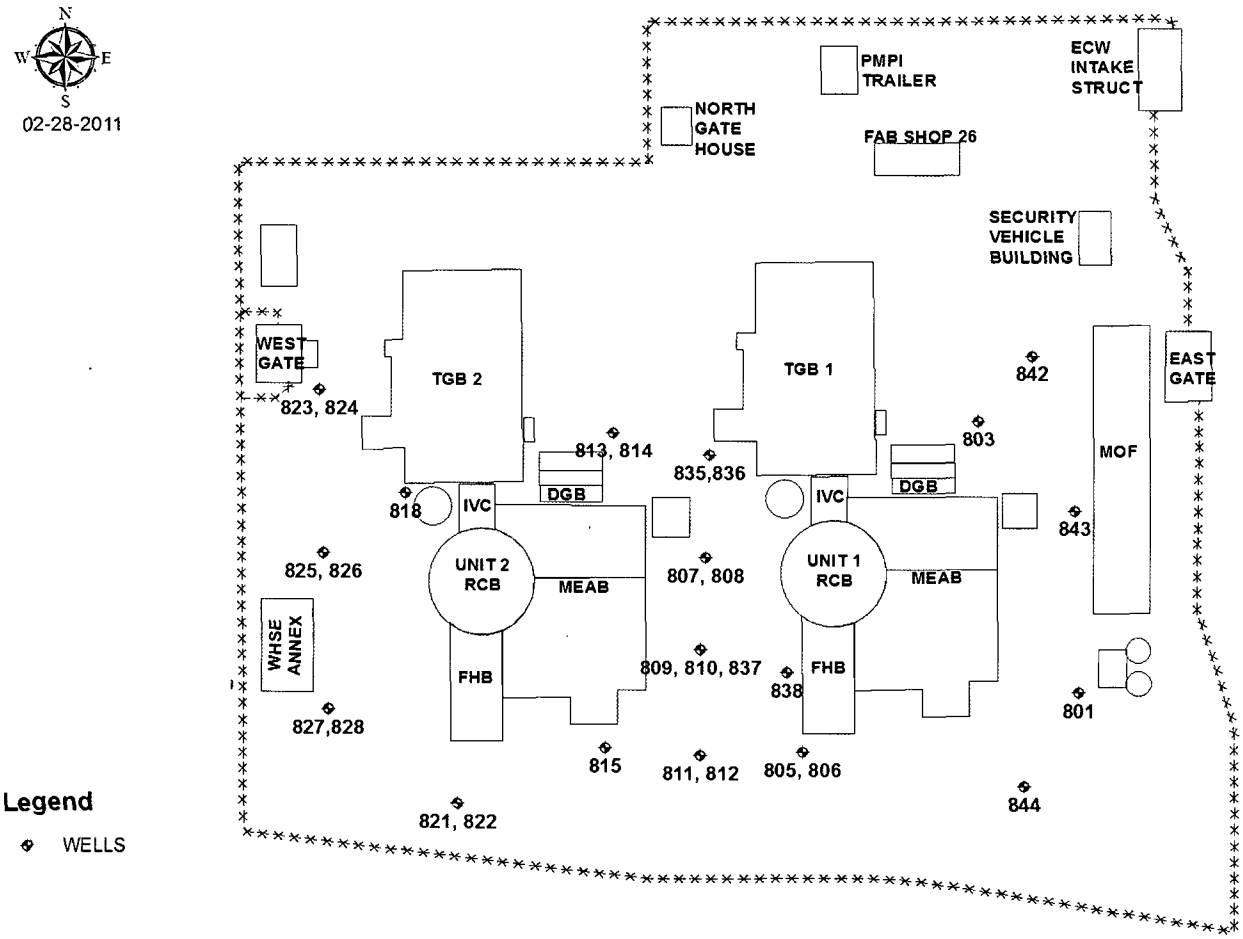



Figure 6-14

## MAIN COOLING RESERVOIR SEDIMENT STUDY

In 2010, in addition to the annual requirements, 56 supplemental bottom sediment samples were collected from different regions of the Main Cooling Reservoir. The analysis showed that approximately 70% of the sample locations contained Co-60 with the highest sample having 329 pCi/kg. No pattern in the distribution of Co-60 was deduced from these samples. Cs-137 was present in many of the samples as expected and has been discussed earlier in the report. One of the samples at station # 311 identified a fission product, Antimony-125, in a bottom sediment sample measuring 25 pCi/kg. Two additional samples were taken at this location but Antimony-125 was not present in either sample. During the previous three years, more Antimony-125 was released to the reservoir than Co-60. Figure 6-15 is a map indicating the level of Co-60 at the various sample locations.

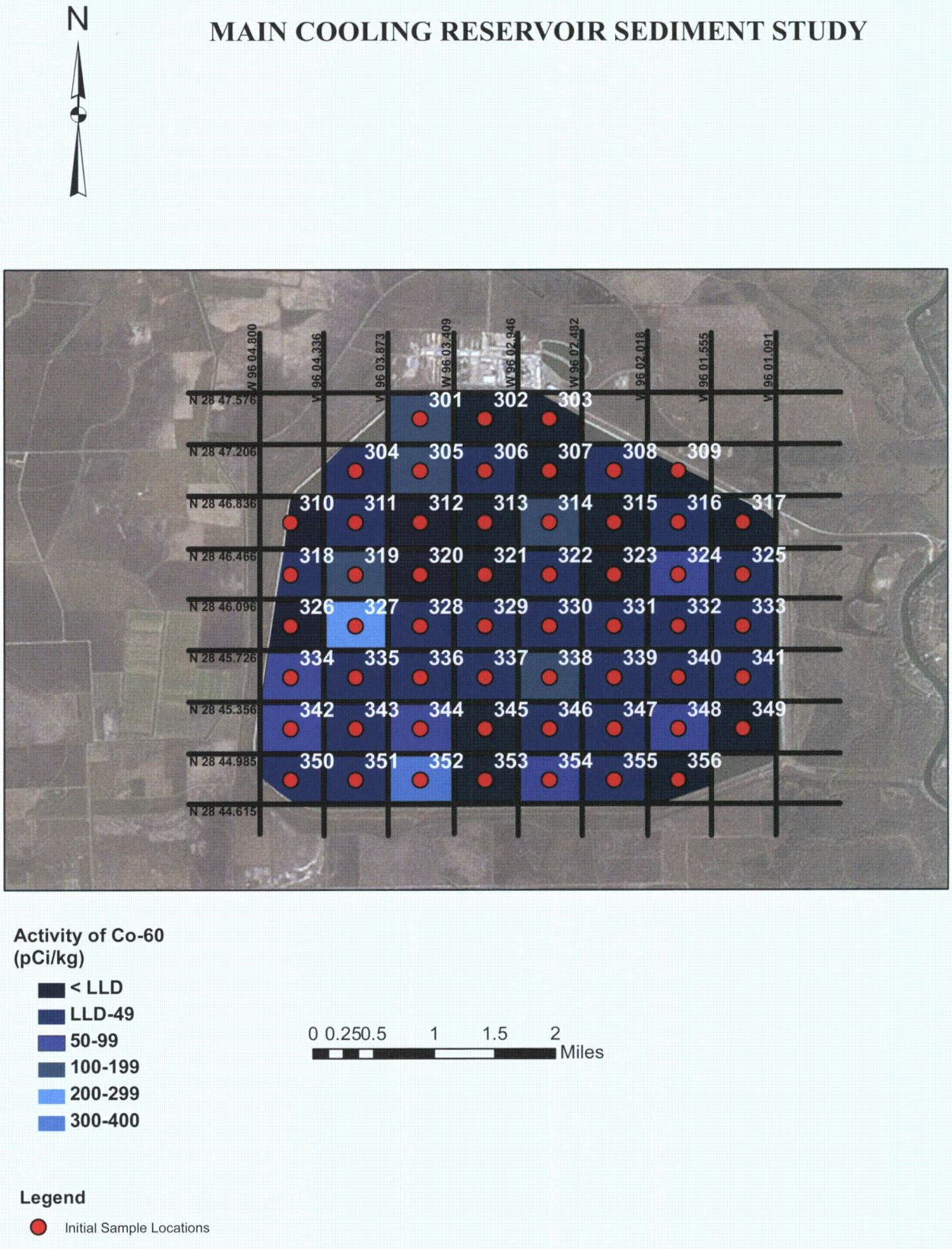

N
MAIN COOLING RESERVOIR SEDIMENT STUDY
W 96 04.800
W 96 04.336
W 96 03.873
W 96 03.409
W 96 02.946
W 96 02.482
W 96 02.018
W 96 01.555
W 96 01.091
N 28 47.576
N 28 47.206
N 28 46.836
N 28 46.466
N 28 46.096
N 28 45.726
N 28 45.356
N 28 44.985
N 28 44.615
301 302 303
304 305 306 307 308 309
310 311 312 313 314 315 316 317
318 319 320 321 322 323 324 325
326 327 328 329 330 331 332 333
334 335 336 337 338 339 340 341
342 343 344 345 346 347 348 349
350 351 352 353 354 355 356
Activity of Co-60 (pCi/kg)
< LLD
LLD-49
50-99
100-199
200-299
300-400
0 0.250.5 1 1.5 2
Miles
Legend
Initial Sample Locations

Figure 6-15

# 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<br><br>16- Located in all 16 meteorological sectors, 0.2* to 4 miles.<br><br>16- Located in all 16 meteorological sectors, 2 to 7 miles.<br><br>6- Located in special interest areas (e.g. school, population centers), within 14 miles.<br><br>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<br><br>3- Located at the exclusion zone, N, NNW, NW Sectors, 1 mile.<br><br>1- Located in Bay City, 14 miles.<br><br>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<br><br>Particulate Sampler: Gross Beta Activity<br><br>Gamma-Isotopic of composite (by location) | Weekly<br><br>Following filter change<br><br>Quarterly |

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 |

EXPOSURE: **WATERBORNE** (CONTINUED)

| Sample Media, Number And Approximate Location of Sample Stations | Routine Sampling Mode | Nominal Collection Frequency | Analysis Type | Minimum Analysis Frequency |
|---|---|---|---|---|
| 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.

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<br>* | 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**<br>2- Located at the exclusion zone, N, NW, or NNW sectors.<br>1- Located in a minimal wind direction. | Grab | Monthly during growing season (When available) | 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.

EXPOSURE: **INGESTION** (continued)

| Sample Media, Number And Approximate Location of Sample Stations | Routine Sampling Mode | Nominal Collection Frequency | Analysis Type | Minimum Analysis Frequency |
|---|---|---|---|---|
| Fish and Invertebrates (edible portions)<br>1- Representing commercially or recreational important species in vicinity of STP that maybe influenced by plant operation.<br>1- Same or analogous species in area not influenced by STP.<br>1- Same or analogous species in the MCR. | Grab | Sample semi-annually | Gamma-Isotopic on edible portions | As collected |
| Agricultural Products<br>* | Grab | At time of harvest | Gamma-Isotopic Analysis in edible portion | As collected |
| Domestic Meat<br>1- Represents domestic stock fed on crops grown exclusively within 10 miles of the plant. | Grab | Annually | Gamma-Isotopic | As collected |

* 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.

**TABLE 2**
**SAMPLE MEDIA AND LOCATION DESCRIPTIONS**

| | | | |
|---|---|---|---|
| AI | AIRBORNE RADIOIODINE | L6 | COLLARD GREENS |
| AP | AIRBORNE PARTICULATE | L7 | MUSTARD GREENS |
| B1 | RESIDENT DABBLER DUCK | M1 | BEEF MEAT |
| B2 | RESIDENT DIVER DUCK | M2 | POULTRY MEAT |
| B3 | MIGRATORY DABBLER DUCK | M3 | WILD SWINE |
| B4 | MIGRATORY DIVER DUCK | M4 | DOMESTIC SWINE |
| B5 | GOOSE | M5 | EGGS |
| B6 | DOVE | M6 | GAME DEER |
| B7 | QUAIL | M7 | ALLIGATOR |
| B8 | PIGEON | M8 | RABBIT |
| CC | CRUSTACEAN CRAB | OY | OYSTER |
| 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 BROADLEAF SAMPLES (L1 thru L7) |
| F3 | FISH - PLANKTIVORES & 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 |
| | | WW | RELIEF WELL WATER |

## TABLE 2
## SAMPLE MEDIA AND LOCATION DESCRIPTIONS

| MEDIA CODE | STATION CODE | VECTOR (Approximate) | LOCATION DESCRIPTION |
|---|---|---|---|
| **DR AI AP VB** VP SO | 001 | 1 mile N | FM 521 |
| **DR** | 002 | 1 mile NNE | FM 521 |
| **DR** | 003 | 1 mile NE | FM 521 |
| **DR** | 004 | 1 mile ENE | FM 521 |
| **DR** | 005 | 1 mile E | FM 521 |
| **DR** AI AP SO | 006 | 3.5 miles ESE | Site near Reservoir Makeup Pumping Facility |
| **DR** | 007 | 3.5 miles SE | MCR Dike |
| **DR** | 008 | 0.25 mile SSE | MCR Dike |
| **DR** | 009 | 0.25 mile S | MCR Dike |
| **DR** | 010 | 0.25 mile SSW | MCR Dike |
| **DR** | 011 | 0.5 mile SW | MCR Dike |
| **DR** | 012 | 1.5 mile WSW | MCR Dike |
| **DR** | 013 | 1.5 mile W | FM 521 |
| **DR** | 014 | 1.5 mile WNW | FM 521 |
| **DR AI AP VB** SO VP | 015 | 1 mile NW | FM 521 |
| **DR AI AP VB** SO VP | 016 | 1 mile NNW | FM 521 |
| **DR** | 017 | 6.5 miles N | Buckeye - FM 1468 |
| **DR** AI AP SO | 018 | 5.5 miles NNE | OXEA Corp. - FM 3057 |
| **DR** | 019 | 5.5 miles NE | FM 2668 |

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** | 020 | 5 miles ENE | FM 2668 & FM 2078 |
| **DR** | 021 | 5 miles E | FM 521 & FM 2668 |
| **DR** | 022 | 7 miles E | Lyondell Chemical Plant |
| **DR** | 023 * | 16 miles ENE | Intersection of FM 521 and FM 2540 |
| **DR** | 024 | 4 miles SSE | MCR Dike |
| **DR** | 025 | 4 miles S | MCR Dike |
| **DR** | 026 | 4 miles SSW | MCR Dike |
| **DR** | 027 | 2.5 miles SW | MCR Dike |
| **DR** | 028 | 5 miles WSW | FM 1095 & Ellis Road |
| **DR** SO | 029 | 4.5 miles W | FM 1095 |
| **DR** | 030 | 6 miles WNW | Tres Palacios Oaks, FM 2853 |
| **DR** | 031 | 5.5 miles NW | Wilson Creek Road |
| **DR** | 032 | 3.5 miles NNW | FM 1468 |
| **DR AI AP** SO | 033 | 14 miles NNE | Microwave Tower at end of Kilowatt Road in Bay City |
| **DR** | 034 | 7.5 miles ENE | Wadsworth Water Supply Pump Station |
| **DR** AI AP SO | 035 | 8.5 miles SSE | Matagorda |
| **DR** | 036 | 9 miles WSW | College Port |
| **DR AI AP VB** VP SO | 037* | 10 miles WSW | Palacios AEP Substation |
| DR | 038 | 10.5 miles NW | AEP Substation on TX 71 near Blessing |

*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** AI AP SO | 039 | 9 miles NW | TX 35 under High Voltage Power lines near Tidehaven High School |
| DR | 040 | 4.5 miles SW | Citrus Grove |
| **DR** | 041 | 2.0 miles ESE | MCR Dike |
| DR | 042 | 8.5 miles NW | FM 459 at Tidehaven Intermediate School |
| **DR** | 043 | 4.5 miles SE | Site boundary at blowdown outlet |
| **WG** | 205 | 4.0 miles SE | Piezometer Well #446A, 40' deep |
| WG | 206 | 4.0 miles SE | Piezometer Well #446, 78' deep |
| WS | 209 | 2 miles ESE | Kelly Lake |
| **WD** | 210 | On Site | Approved drinking water supply from STP |
| WS S1 | 211 | 3.5 miles S | Site, E. Branch Little Robbins Slough |
| WS S1 | 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 |
| **S2** | 215 | 0.5 mile SW | MCR at Circulating Water Discharge |
| **WS** S2 | 216 | 3.5 miles SSE | MCR at blowdown structure |
| F (1, 2, or 3) CC CS OY | 222 | >10 miles | West Matagorda Bay |
| **WS S(1 or 2)** | 227 | 5-6 miles SE | West bank of Colorado River downstream of STP across from channel marker #22 |
| **WD** | 228* | 14 miles NNE | Le Tulle Park public water supply |
| WS S1 | 229 | 2.3 miles ESE | Drainage ditch north of the reservoir that empties into Colorado River upstream of the reservoir makeup pumping facility |
| S(1 or 2) | 230 | 3.5 miles ESE | Colorado River at point where drainage ditch (#229) empties into it |

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 |
|---|---|---|---|
| S(1 or 2) WS | 233 | 4.5 miles SE | Colorado River where MCR blowdown discharge channel empties into it. |
| **WG** | 235 | 3.8 miles S | Well B-3 directly south from MCR |
| B8 | 236 | N/A | STP Protected Area |
| WS | 237 | 3.7 miles SSE | Blowdown discharge channel from MCR |
| **S(1 or 2)** WS | 242* | >10 miles N | Colorado River where it intersects Highway 35 |
| **WS** | 243* | >10 miles N | Colorado River upstream of Bay City Dam at the Lower Colorado River Authority pumping station |
| WG | 245 | 4.5 miles SSE | Water well approximately 60' deep located on private property about 0.5 miles south of MCR |
| WS | 247 | <1 mile E | Essential Cooling Pond |
| **F(1,2, or 3)** | 249* | N/A | Control sample purchased from a local retailer |
| SO | 250 | 0.75 miles NW | Sewage sludge land farming area |
| **WG** | 251 | 4.0 miles SSE | Test Well B-4, upper 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 Well # 258 approximately 20' inside east fence (site boundary) |
| WG | 258 | 2.9 miles SW | Piezometer Well # 435-01, 1.5 miles down STP Road from HWY 521 along east fence (site boundary) |
| **WG** | 259 | 2.9 miles SW | Piezometer Well # 435-02, 1.5 miles down STP Road from HWY 521 20' east of fence (site boundary) |
| WG | 260 | 3.7 miles S | Piezometer Well # 437, 74' deep |
| WG | 263 | 3.2 miles ESE | Piezometer Well # 447, 104' deep |

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 | 264 | 3.2 miles ESE | Piezometer Well # 447A , 46' deep |
| **WG** | 266 | 0.68 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 west of MCR |
| WG | 269 | 4.2 miles SSE | Windmill south of STP owner contolled area on private land |
| WG | 270 | 2.9 miles SW | Monitoring Well # MW-0805L, depth 49' |
| WG | 271 | 2.9 miles SW | Monitoring Well # MW-0805U, depth 33' |
| F(1, 2, or 3) CC S2 | 301-356 | S | STP Main Cooling Reservoir |
| WW | 701 | 4 miles S | MCR Relief Well # 440 |
| **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 |

MCR-STP Main Cooling Reservoir
STP- South Texas Project
Media codes typed in bold satisfy collection requirement described in Table 1.

* Control Station

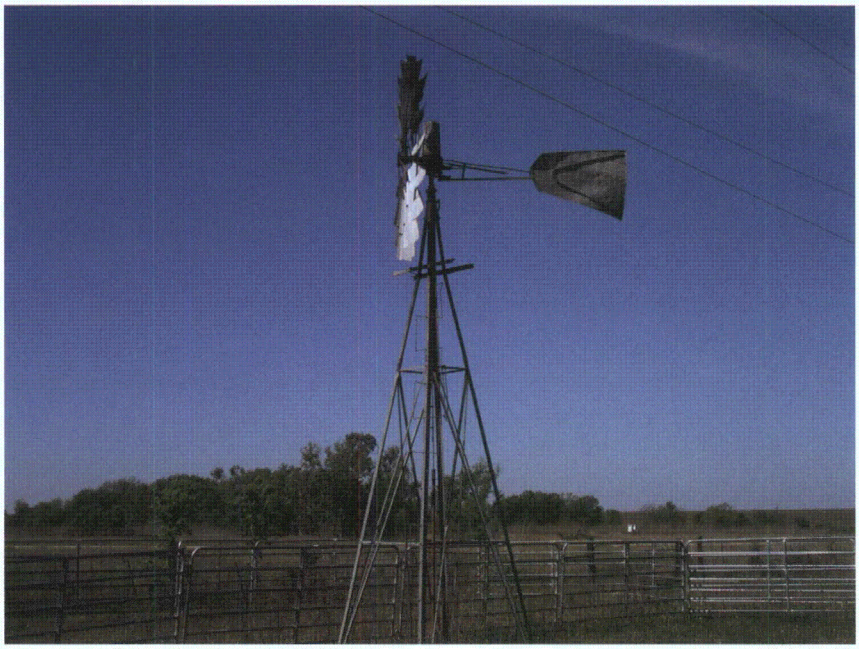


*Photo By: Aubrey Passafuma*

## 2010 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 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 the table are from the samples listed in Table 1. Additional thermoluminescent dosimeters were utilized each quarter for quality control purposes. The minimum samples required by Table 1 were supplemented in 2010 by five surface water samples, three additional ground water samples, two drinking water samples, four bottom sediment samples, and four rainwater samples. Fish and vegetation samples vary in number according to availability but also exceeded the minimum number required by Table 1.

*Photo By: Gwenna Kelton*

**TABLE 3**

**2010 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 | 172/ 0 | --- | 1.4E+01 ( 164/ 164 ) ( 1.1E+01 - 4.0E+01 ) | 0.25 miles S (#009) | 3.0E+01 ( 4 / 4) (2.5E+01 - 4.0E+01) | 1.5E+01 ( 8 / 8) ( 1.3E+01 - 1.7E+01 ) |

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

**TABLE 3**

**2010 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 | 2.3E-02 ( 208 / 208 ) ( 7.9E-03 - 4.6E-02 ) | 14 miles NNE (#033) | 2.4E-02 ( 52 / 52 ) ( 9.9E-03 - 4.3E-02 ) | 2.3E-02 ( 52 / 52 ) ( 8.3E-03 - 4.4E-02 ) |
| Iodine-131 | 260/ 0 | 1.5E-02 | --- ( 0 / 208 ) | --- | --- | --- ( 0 / 52 ) |
| Cesium-134 | 20/ 0 | 5.5E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Cesium-137 | 20/ 0 | 5.4E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Manganese-54 | 20/ 0 | 5.7E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Iron-59 | 20/ 0 | 2.2E-03 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Cobalt-58 | 20/ 0 | 8.5E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Cobalt-60 | 20/ 0 | 5.3E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Zinc-65 | 20/ 0 | 1.3E-03 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Zirconium-95 | 20/ 0 | 1.6E-03 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Niobium-95 | 20/ 0 | 9.0E-04 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |
| Lanthanum-140 Barium-140 | 20/ 0 | 6.8E-03 | --- ( 0 / 16 ) | --- | --- | --- ( 0 / 4 ) |

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

*Photo By: Paul Travis*

**TABLE 3**

**2010 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 | 1.0E+04 ( 4/ 8 ) ( 9.6E+03 - 1.1E+04 ) | 3 miles SSE (#216) | 1.0E+04 ( 4/ 4 ) ( 9.6E+03 - 1.1E+04 ) | --- ( 0/ 4 ) |
| Iodine-131 | 41/ 0 | 6.8E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Cesium-134 | 41/ 0 | 2.1E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Cesium-137 | 41/ 0 | 2.4E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Manganese-54 | 41/ 0 | 2.2E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Iron-59 | 41/ 0 | 5.0E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Cobalt-58 | 41/ 0 | 2.4E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Cobalt-60 | 41/ 0 | 2.3E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Zinc-65 | 41/ 0 | 4.5E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Zirconium-95 | 41/ 0 | 4.3E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Niobium-95 | 41/ 0 | 2.5E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |
| Lanthanum-140 Barium-140 | 41/ 0 | 5.5E+00 | --- ( 0/ 28 ) | --- | --- | --- ( 0/ 13 ) |

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

**TABLE 3**

**2010 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 | 23/ 0 | 2.7E+02 | 4.3E+03 ( 15/ 23 ) ( 2.3E+03 - 6.6E+03 ) | 4.0 miles SSE (#251) | 6.4E+03 ( 6/ 6 ) ( 6.0E+03 - 6.6E+03 ) | no samples |
| Iodine-131 | 23/ 0 | 4.3E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Cesium-134 | 23/ 0 | 2.6E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Cesium-137 | 23/ 0 | 2.8E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Manganese-54 | 23/ 0 | 2.5E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Iron-59 | 23/ 0 | 5.0E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Cobalt-58 | 23/ 0 | 2.6E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Cobalt-60 | 23/ 0 | 2.6E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Zinc-65 | 23/ 0 | 5.6E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Zirconium-95 | 23/ 0 | 4.6E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Niobium-95 | 23/ 0 | 2.8E+00 | --- ( 0/ 23 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 23/ 0 | 4.0E+00 | --- ( 0/ 23 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | 26/ 0 | 9.5E-01 | 2.0E+00 ( 13 / 13 ) ( 1.1E+00 - 2.7E+00 ) | 14 miles NNE (#228) | 3.3E+00 ( 13 / 13 ) ( 2.0E+00 - 4.8E+00 ) | 3.3E+00 ( 13 / 13 ) ( 2.0E+00 - 4.8E+00 ) |
| Hydrogen-3 | 8/ 0 | 2.7E+02 | --- ( 0 / 4 ) | --- | --- | --- ( 0 / 4 ) |
| Iodine-131 | 26/ 0 | 5.0E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Cesium-134 | 26/ 0 | 2.6E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Cesium-137 | 26/ 0 | 2.8E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Manganese-54 | 26/ 0 | 2.5E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Iron-59 | 26/ 0 | 5.0E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Cobalt-58 | 26/ 0 | 2.6E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Cobalt-60 | 26/ 0 | 2.5E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Zinc-65 | 26/ 0 | 5.5E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Zirconium-95 | 26/ 0 | 4.7E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Niobium-95 | 26/ 0 | 2.7E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |
| Lanthanum-140 Barium-140 | 26/ 0 | 4.1E+00 | --- ( 0 / 13 ) | --- | --- | --- ( 0 / 13 ) |

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

**TABLE 3**

**2010 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 | 2.6E+02 | --- ( 0 / 4 ) | --- | --- | no samples |
| Iodine-131 | 4/ 0 | 3.9E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Cesium-134 | 4/ 0 | 2.6E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Cesium-137 | 4/ 0 | 2.9E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Manganese-54 | 4/ 0 | 2.6E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Iron-59 | 4/ 0 | 4.9E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Cobalt-58 | 4/ 0 | 2.7E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Cobalt-60 | 4/ 0 | 2.8E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Zinc-65 | 4/ 0 | 5.3E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Zirconium-95 | 4/ 0 | 4.8E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Niobium-95 | 4/ 0 | 2.6E+00 | --- ( 0 / 4 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 4/ 0 | 4.2E+00 | --- ( 0 / 4 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | 1.9E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cesium-137 | 4/ 0 | 2.3E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Manganese-54 | 4/ 0 | 2.1E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Iron-59 | 4/ 0 | 7.9E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-58 | 4/ 0 | 2.9E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-60 | 4/ 0 | 2.2E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Zinc-65 | 4/ 0 | 6.0E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Zirconium-95 | 4/ 0 | 5.7E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Niobium-95 | 4/ 0 | 3.6E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Lanthanum-140 Barium-140 | 4/ 0 | 2.7E+02 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |

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

**TABLE 3**

**2010 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 | 2.4E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Cesium-137 | 6/ 0 | 2.3E+01 | 4.5E+01 ( 3/ 6 ) ( 8.4E+00 - +6.7E+01 ) | 3 miles SSE (#216) | 4.5E+01 ( 3/ 4 ) ( 8.4E+00 - +6.7E+01 ) | no samples |
| Manganese-54 | 6/ 0 | 2.2E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Iron-59 | 6/ 0 | 5.9E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Cobalt-58 | 6/ 0 | 2.6E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Cobalt-60 | 6/ 0 | 2.3E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Zinc-65 | 6/ 0 | 6.4E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Zirconium-95 | 6/ 0 | 5.1E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Niobium-95 | 6/ 0 | 3.1E+01 | --- ( 0/ 6 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 6/ 0 | 8.2E+01 | --- ( 0/ 6 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE | CONTROL LOCATIONS MEAN † RANGE |
|---|---|---|---|---|---|---|
| Iodine-131 | 9/ 0 | 3.5E+01 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Cesium-134 | 9/ 0 | 2.8E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Cesium-137 | 9/ 0 | 3.5E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Manganese-54 | 9/ 0 | 3.8E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Iron-59 | 9/ 0 | 1.5E+01 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Cobalt-58 | 9/ 0 | 4.6E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Cobalt-60 | 9/ 0 | 4.4E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Zinc-65 | 9/ 0 | 1.1E+01 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Zirconium-95 | 9/ 0 | 8.3E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Niobium-95 | 9/ 0 | 4.6E+00 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |
| Lanthanum-140 Barium-140 | 9/ 0 | 1.3E+01 | --- ( 0/ 6) | --- | --- | --- ( 0/ 3) |

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

**TABLE 3**

**2010 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 | LOCATION WITH HIGHEST ANNUAL MEAN MEAN † RANGE | CONTROL LOCATIONS MEAN † RANGE |
|---|---|---|---|---|---|---|
| Iodine-131 | 15/ 0 | 2.3E+01 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Cesium-134 | 15/ 0 | 2.6E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Cesium-137 | 15/ 0 | 3.2E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Manganese-54 | 15/ 0 | 3.4E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Iron-59 | 15/ 0 | 1.2E+01 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Cobalt-58 | 15/ 0 | 4.1E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Cobalt-60 | 15/ 0 | 4.0E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Zinc-65 | 15/ 0 | 1.0E+01 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Zirconium-95 | 15/ 0 | 7.2E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Niobium-95 | 15/ 0 | 4.0E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |
| Lanthanum-140 Barium-140 | 15/ 0 | 9.2E+00 | --- ( 0/ 10) | --- | --- | --- ( 0/ 5) |

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

**TABLE 3**

**2010 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 | 2/ 0 | 1.8E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cesium-134 | 2/ 0 | 2.9E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cesium-137 | 2/ 0 | 3.4E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Manganese-54 | 2/ 0 | 3.4E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Iron-59 | 2/ 0 | 1.1E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-58 | 2/ 0 | 3.9E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-60 | 2/ 0 | 3.7E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zinc-65 | 2/ 0 | 9.7E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zirconium-95 | 2/ 0 | 7.0E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Niobium-95 | 2/ 0 | 3.8E+00 | --- ( 0/ 2 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 2/ 0 | 7.1E+00 | --- ( 0/ 2 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | 7/ 0 | 4.1E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Cesium-137 | 7/ 0 | 4.3E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Manganese-54 | 7/ 0 | 4.1E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Iron-59 | 7/ 0 | 9.0E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-58 | 7/ 0 | 4.4E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-60 | 7/ 0 | 4.1E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Zinc-65 | 7/ 0 | 8.6E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Zirconium-95 | 7/ 0 | 7.7E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Niobium-95 | 7/ 0 | 4.3E+01 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |
| Lanthanum-140 Barium-140 | 7/ 0 | 1.0E+02 | --- ( 0/ 5 ) | --- | --- | --- ( 0/ 2 ) |

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

**TABLE 3**

**2010 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 | 3.1E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cesium-137 | 2/ 0 | 3.5E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Manganese-54 | 2/ 0 | 3.3E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Iron-59 | 2/ 0 | 8.0E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-58 | 2/ 0 | 3.9E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-60 | 2/ 0 | 3.4E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zinc-65 | 2/ 0 | 7.5E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zirconium-95 | 2/ 0 | 6.8E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Niobium-95 | 2/ 0 | 4.0E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 2/ 0 | 1.3E+02 | --- ( 0/ 2 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANALYSIS SUMMARY**

Medium: Crustacean Crab — 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 | 3.5E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cesium-137 | 2/ 0 | 3.9E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Manganese-54 | 2/ 0 | 3.8E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Iron-59 | 2/ 0 | 9.3E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-58 | 2/ 0 | 4.2E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Cobalt-60 | 2/ 0 | 3.7E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zinc-65 | 2/ 0 | 7.8E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Zirconium-95 | 2/ 0 | 7.4E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Niobium-95 | 2/ 0 | 4.3E+01 | --- ( 0/ 2 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 2/ 0 | 1.3E+02 | --- ( 0/ 2 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | MEAN † RANGE | CONTROL LOCATIONS MEAN † RANGE |
|---|---|---|---|---|---|---|
| Cesium-134 | 4/ 0 | 5.3E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cesium-137 | 4/ 0 | 5.4E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Manganese-54 | 4/ 0 | 5.2E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Iron-59 | 4/ 0 | 1.1E+02 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-58 | 4/ 0 | 5.5E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Cobalt-60 | 4/ 0 | 4.9E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Zinc-65 | 4/ 0 | 1.0E+02 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Zirconium-95 | 4/ 0 | 9.7E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Niobium-95 | 4/ 0 | 5.6E+01 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |
| Lanthanum-140 Barium-140 | 4/ 0 | 1.0E+02 | --- ( 0/ 2 ) | --- | --- | --- ( 0/ 2 ) |

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

**TABLE 3**

**2010 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 | MEAN † RANGE | CONTROL LOCATIONS MEAN † RANGE |
|---|---|---|---|---|---|---|
| Cesium-134 | 3/ 0 | 2.9E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Cesium-137 | 3/ 0 | 3.2E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Manganese-54 | 3/ 0 | 3.2E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Iron-59 | 3/ 0 | 1.1E+02 | --- ( 0/ 3 ) | --- | --- | no samples |
| Cobalt-58 | 3/ 0 | 4.2E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Cobalt-60 | 3/ 0 | 3.2E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Zinc-65 | 3/ 0 | 7.0E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Zirconium-95 | 3/ 0 | 7.6E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Niobium-95 | 3/ 0 | 4.2E+01 | --- ( 0/ 3 ) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 3/ 0 | 3.3E+02 | --- ( 0/ 3 ) | --- | --- | no samples |

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

**TABLE 3**

**2010 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 | 2/ 0 | 3.5E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Cesium-137 | 2/ 0 | 3.4E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Manganese-54 | 2/ 0 | 3.4E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Iron-59 | 2/ 0 | 7.7E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Cobalt-58 | 2/ 0 | 3.6E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Cobalt-60 | 2/ 0 | 4.0E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Zinc-65 | 2/ 0 | 6.8E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Zirconium-95 | 2/ 0 | 6.7E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Niobium-95 | 2/ 0 | 3.7E+01 | --- ( 0/ 2) | --- | --- | no samples |
| Lanthanum-140 Barium-140 | 2/ 0 | 1.1E+02 | --- ( 0/ 2) | --- | --- | no samples |

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

*Photo By: Gwenna Kelton*

*Photo By: Jodie Jankauskas*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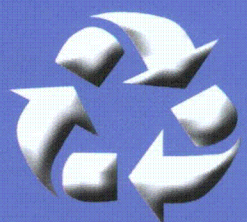

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