Enclosure 4
2009 NEF REMP Report (ML100900468, 2009)

National Enrichment Facility

Facility Operating License SNM-2010

Annual Radiological Environmental Monitoring Program Report

January 1, 2009 through December 31, 2009

National Enrichment Facility

Facility Operating License SNM-2010

Radiological Environmental Monitoring Program Report

January 1, 2009 through December 31, 2009

Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

National Enrichment Facility
Radiological Environmental Monitoring Program Report
January 1, 2009 through December 31, 2009

INTRODUCTION

This report summarizes the results of the National Enrichment Facility Radiological Environmental Monitoring Program (REMP) conducted in the vicinity of National Enrichment Facility (NEF) during the period from January 1, 2009 to December 31, 2009. This document has been prepared in accordance with the requirements of the NEF Environmental Report section 6.1.2 (Reference 8). The REMP has been established to monitor the radiation and radioactivity released to the environment as a result of the NEF's operation. This program, initiated in September 2006, includes the collection, analysis, and evaluation of radiological data in order to assess the impact of the NEF operations on the environment and general public.

SAMPLING AND ANALYSIS

The environmental sampling media collected in the vicinity of NEF and at distant locations include air particulate filters, vegetation, soils, groundwater, domestic wastewater effluent, and onsite basin surface water and sediment. In addition, exposure measurements were obtained using environmental thermoluminescent dosimeters (TLDs) at 16 locations around the NEF site.

A full description of any discrepancies encountered with the environmental monitoring program is presented in Appendix B of this report.

LAND USE CENSUS

The NEF did not conduct a land use census in the vicinity of the NEF since operations have not yet commenced. There was less than 50kg of Uranium Hexafluoride material located on-site within the Centrifuge Assembly Building for use in centrifuge and centrifuge rig testing. Additionally some sealed sources were present during this reporting period. The latest land use census data is contained within the NEF Environmental Report (Reference 8).

RADIOLOGICAL IMPACT TO THE ENVIRONMENT

During the report period, samples collected as part of the REMP at the NEF contain detectable amounts of naturally occurring uranium. Uranium isotopes are the only radionuclides analyzed as they are the only radionuclides that could be emitted from enrichment operations. A comparison of 2009 REMP samples to baseline samples indicates that no detectable radioactivity was attributable to the NEF. Offsite ambient radiation measurements using environmental TLDs beyond the site boundary ranged between 82 and 92 millirem/year on an annualized basis. The range of ambient radiation levels observed with the TLDs is consistent

with natural background radiation levels for New Mexico as determined by the Environmental Protection Agency (EPA) and others (References 23 & 24).

RADIOLOGICAL IMPACT TO THE GENERAL PUBLIC

During the report period, there were no radiation doses to the general public as a result of the NEF's operation. There was no calculated total body dose to a maximally exposed member of the general public from radioactive effluents and ambient radiation resulting from the NEF operations for the report period since there were no detectable radioactive effluents or ambient radiation from NEF operations observed in the environment.

CONCLUSIONS

The reporting period for the Radiological Environmental Monitoring Program for the NEF resulted in the collection and analysis of hundreds of environmental samples and measurements. The data obtained was compared to the baseline radiological data to determine if NEF operations resulted in increased isotopic uranium activity in the environment.

An evaluation of direct radiation measurements and environmental sample analyses served to establish radiological data for comparison to background information for the NEF. Furthermore, radiation levels observed in 2009 were determined to be indicative of those that are normally present due to natural and man-made background radiation.

1. INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) for the report period performed by Louisiana Energy Services (LES) for the National Enrichment Facility (NEF) is discussed in this report. Since the operation of a uranium enrichment facility may result in the release of small amounts of radioactivity and low levels of radiation, the Nuclear Regulatory Commission (NRC) requires a program to be established to monitor radiation and radioactivity in the environment (Reference 1). This report summarizes the results of measurements of radiation and radioactivity in the environment in the vicinity of the NEF and at distant locations during the period September January 1, 2009 to December 31, 2009.

The Radiological Environmental Monitoring Program consists of taking radiation measurements and collecting samples from the environment, analyzing them for radioactivity content, and interpreting the results. With emphasis on the critical radiation exposure pathways to humans, samples from the aquatic, atmospheric, and terrestrial environments are collected. These samples include, but are not limited to: air particulate filters, vegetation, soils, basin sediments, basin waters, domestic wastewater and groundwater. Thermoluminescent dosimeters (TLDs) are placed in the environment to measure gamma and neutron radiation levels. The TLDs are processed and the environmental samples are analyzed to measure the very low levels of radiation and radioactivity present in the environment as a result of NEF operation and other natural and man-made sources. The NEF's environmental staff reviews these results.

In order to more fully understand how a uranium enrichment plant impacts humans and the environment, background information on radiation and radioactivity, natural and man-made sources of radiation, plant operations, radioactive effluent controls, and radiological impact on humans is provided. This information will assist the reader in understanding the radiological impact on the environment and humans from the operation of the NEF.

1.1. Radiation and Radioactivity

All matter is made of atoms. An atom is the smallest part into which matter can be broken down and still maintain all its chemical properties. Nuclear radiation is energy, in the form of waves or particles, which is given off by unstable, radioactive atoms.

Radioactive material exists naturally and has always been a part of our environment. The earth's crust, for example, contains radioactive uranium, radium, thorium, and potassium. Some radioactivity is a result of nuclear weapons testing. Examples of radioactive fallout that is normally present in environmental samples are cesium-137 and strontium-90. Some examples of radioactive materials released from a uranium enrichment facility are uranium-234, uranium-235 and uranium-238.

Radiation dose is measured in units of millirem (mrem), much like temperature is measured in degrees. A millirem is a measure of the biological effect of the energy deposited in tissue. The natural and man-made radiation dose received in one year by the average American is 300 to 400 mrem (References 2, 3, 4).

Radioactivity is measured in curies. A curie is that amount of radioactive material needed to produce 37,000,000,000 nuclear disintegrations per second. This is an extremely large amount of radioactivity in comparison to environmental radioactivity. That is why radioactivity in the environment is measured in picocuries. One picocurie is equal to one trillionth of a curie.

1.2. Sources of Radiation

Naturally occurring radioactivity has always been a part of our environment. Table 1.1-1 shows the average United States (US) sources and doses of radiation from natural and man-made sources.

Table 1.1-1, Average US Radiation Sources and Corresponding Doses

Natural Sources		Man-Made Sources	
Source	Radiation Dose (mrem/year)	Source	Radiation Dose (mrem/year)
Cosmic/cosmogenic	30	Medical/Dental x-rays	39
Internal	40	Nuclear Medicine	14
Terrestrial	30	Consumer Products	10
Radon/Thoron	200	Weapons Fallout	1
		Nuclear Power Plants	1
Approximate Total	300	Approximate Total	60

Cosmic radiation from the sun and outer space penetrates the earth's atmosphere and continuously bombards us with rays and charged particles. Some of this cosmic radiation interacts with gases and particles in the atmosphere, making them radioactive in turn. These radioactive byproducts from cosmic ray bombardment are referred to as cosmogenic radionuclides. Isotopes such as beryllium-7 and carbon-14 are formed in this way. Exposure to cosmic and cosmogenic sources of radioactivity results in about 30 mrem of radiation dose per year. Radiation from these sources is expected to show up on the NEF environmental TLD's.

Additionally, natural radioactivity is in our body and in the food we eat (about 40 millirem/yr), the ground we walk on (about 30 millirem/yr) and the air we breathe (about 200 millirem/yr). The majority of a person's annual dose results from exposure to radon and thoron in the air we breathe. These gases and their radioactive decay products arise from the decay of naturally occurring uranium, thorium and radium in the soil and building products such as brick, stone, and concrete. Radon and thoron levels vary greatly with location, primarily due to changes in the concentration of uranium and thorium in the soil. Residents at some locations in Colorado, New York, Pennsylvania, and New Jersey have a higher annual dose as a result of higher levels of radon/thoron gases in these areas. In total, these various sources of naturally occurring radiation and radioactivity contribute to a total dose of about 300 mrem per year.

In addition to natural radiation, we are normally exposed to radiation from a number of man-made sources. The single largest doses from man-made sources result from therapeutic and diagnostic applications of x-rays and radiopharmaceuticals. The annual dose to an

individual in the U.S. from medical and dental exposure is about 50 mrem. Consumer products, such as televisions and smoke detectors, contribute about 10 mrem/yr. Much smaller doses result from weapons fallout (less than 1 mrem/yr) and nuclear power plants. The typical dose to the public from uranium enrichment activities is <<1 mrem/year. Typically, the average person in the United States receives about 60 mrem per year from man-made sources.

1.3. Major Sources and Levels of Background Radiation for the NEF

The sources of radiation at the NEF site historically have been, and still are, associated with natural background radiation sources and residual man-made radioactivity from fallout associated with the atmospheric testing of nuclear weapons in the western United States and overseas in the 1950s and 1960s. Naturally occurring radioactivity includes primordial radionuclides (nuclides that existed or were created during the formation of the earth and have a sufficiently long half-life to be detected today) and their progeny, as well as nuclides that are continually produced by natural processes other than the decay of the primordial nuclides. These primordial nuclides are ubiquitous in nature, and are responsible for a large fraction of radiation exposure referred to as background exposure. The majority of primordial radionuclides are isotopes of the heavy elements and belong to the three radioactive series headed by ^{238}U (uranium series), ^{235}U (actinium series), and ^{232}Th (thorium series) (Reference 7). Alpha, beta, and gamma radiation is emitted from nuclides in these series. The relationship among the nuclides in a particular series is such that, in the absence of chemical or physical separation, the members of the series attain a state of radioactive equilibrium, wherein the decay rate of each nuclide is essentially equal to that of the nuclide that heads the series. The nuclides in each series decay eventually to a stable nuclide. For example, the decay process of the uranium series leads to a stable isotope of lead. There are also primordial radionuclides, specifically ^{40}K and ^{87}Rb, which decay directly to stable elements without going through a series of decay sequences. The primordial series of radionuclides represents a significant component of background radiation exposure to the public (Reference 7). Cosmogenic radionuclides make up another class of naturally occurring nuclides. Cosmogenic radionuclides are produced in the earth's crust by cosmic ray bombardment, but are much less important as radiation sources (Reference 7).

Naturally occurring radioactivity in soil or rock near the earth's surface belonging to the primordial series represents a significant component of background radiation exposure to the public (Reference 7). The radionuclides of primary interest are ^{40}K and the radioactive decay chains of ^{238}U and ^{232}Th. These nuclides are widely distributed in rock and soil. Soil radioactivity is largely that of the rock from which it was derived. The original concentrations may have been diminished by leaching and dilution by water and organic material added to the soil, or may have been augmented by adsorption and precipitation of nuclides from incoming water. Nevertheless, a soil layer about 0.25 m (0.8 ft) thick furnishes most of the external radiation from the ground (Reference 7). In general, typical soil and rock contents of these radionuclides indicate that the ^{232}Th series and ^{40}K each contributes an average of about 15 to 25 mrad per year to the total absorbed dose rate in air for typical situations, while the uranium series contribute about half as much. (The energy absorbed from any type of radiation per unit

mass of the absorber is defined as the absorbed dose. The unit of absorbed dose is the rad and is defined as 100 ergs per gram.)

The public exposure from naturally occurring radioactivity in soil varies with location. In the U.S., background radiation exposures in the Southwest and Pacific areas are generally higher than those in much of the Eastern and Central regions. There is also a wide variation in annual background terrestrial radiation across the State of New Mexico. The North Central region (Albuquerque area) exhibits an average annual absorbed dose in air of about 75 mrad (0.75 mGy), while the southeastern corner of the State (Carlsbad area), which includes the NEF site area in Lea County, measures annual average terrestrial absorbed dose of about 30 mrad (0.30 mGy) (Reference 7). Applying the same weighting factor, the annual average dose equivalent for the Albuquerque and Carlsbad areas are about 53 and 21 mrem (525 and 210 μSv), respectively. Some of the variation is linked to location, but factors such as moisture content of soil, the presence and amount of snow cover, the radon daughter concentration in the atmosphere, the degree of attenuation offered by housing structures, and the amount of radiation originating in construction materials may also account for variation (NCRP, 1987b).

Background radiation for the public also includes various sources of man-made radioactivity, such as fallout in the environment from weapons testing, and radiation exposures from medical treatments, x-rays, and some consumer products. All of these types of man-made sources contribute to the annual background radiation exposure received by members of the public. Of these, fallout from weapons testing should be included as an environmental radiation source for the NEF site. The two nuclides of concern with regard to public exposure from weapons testing are ^{137}Cs and ^{90}Sr due to their relative abundance, long half lives (30.2 and 29.1 years, respectively) and their ability to be incorporated into human exposure pathways, such as external direct dose and ingestion of foods. The average range of doses from weapons testing fallout to residents of New Mexico has been estimated as 100-300 mrad (1-3 mGy). Use of radiation in medicine and dentistry is also a major source of man-made background radiation exposure to the U.S. population. Although radiation exposures from medical treatments, X-rays, and some consumer products are considered to be background exposures, they would not be incurred by the public at the NEF site.

1.4. Uranium Enrichment Activities

When radioactive material is brought on site and enrichment activities are initiated, the following information (Reference 6) describes the process that will be used to enrich uranium.

The NEF, a state-of-the-art process plant, is based on a highly reliable gas centrifuge process (Figure 1.4-1). The plant is designed to separate a feed stream containing the naturally occurring proportions of uranium isotopes into a product stream - enriched in the uranium-235 (^{235}U) isotope and a tails stream - depleted in the ^{235}U isotope. The process, entirely physical in nature, takes advantage of the tendency of materials of differing density to segregate in the force field produced by a centrifuge. The chemical form of the working material of the plant, uranium hexafluoride (UF_6), does not require chemical transformations at any stage of the process. This process enriches natural UF_6, containing approximately 0.711% ^{235}U to a UF_6 product, containing ^{235}U enriched up to 5 weight percent (w/o).

The nominal capacity of the facility is 3 million separative work units (SWU) per year. The maximum gross output of the facility is slightly greater than 3 million SWU thus allowing for a production margin for centrifuge failures and occasional production losses during the operational lifetime of the facility.

The UF6 is delivered to the plant in standard Type 48Y international transit cylinders. The cylinders are connected to the plant in feed stations joined to a common manifold. Heat is then applied electrically to sublime UF6 from solid to vapor. The gas is flow controlled through a pressure control system for distribution to individual cascades at sub-atmospheric pressure.

Individual centrifuges are not able to produce the desired product and depleted UF6 concentration in a single step. They are therefore grouped together in series or parallel to form arrays known as cascades. A typical cascade hall comprises many hundreds of centrifuges. A cascade hall is made up of multiple cascades. UF6 is drawn through cascades with vacuum pumps and moved to the transport cylinders located in product and tails take-off stations where it can desublime. Highly reliable UF6 resistant pumps have been developed for transferring the process gas.

Depleted uranium material is desublimed at the Tails Low-Temperature Take-Off Station into chilled Uranium Byproduct Cylinders (UBCs), Type 48Y. The product is desublimed into 30B cylinders for shipping or Type 48Y for internal use.

The entire plant process gas system operates at sub-atmospheric pressure. This provides a high degree of safety but also means that the system is susceptible to in-leakage of air. Any in-leakage of air passes through the cascades and is preferentially directed into the product stream. A vent system is provided to remove hazardous contaminants from low levels of light gas (any gas lighter than UF6) that arise on a regular basis from background in-leakage, routine venting of UF6 cylinders, and purging of UF6 lines.

Each Plant Module, consisting of two Cascade Halls, is provided with a cooling water system to remove excess heat at key positions on the centrifuges in order to maintain optimum temperatures within the centrifuges.

The centrifuges are driven by a medium frequency Alternating Current (AC) supply system. A converter produces the medium frequency supply from the AC main supply using high efficiency switching devices for both run-up and continuous operation.

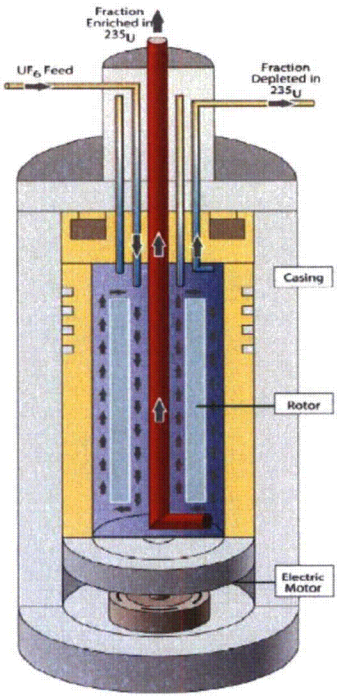

Figure 1.4-1, Typical Gas Centrifuge

1.5. Facility Structures

The Security Building serves as the primary access control point for the facility (Figure 1.5-1). It also contains the Secondary Alarm Station (duplicate control console to the Central Alarm Station).

The Separations Building Modules (SBMs) have two Cascade Halls, a UF6 Handling Area, and a Process Services Corridor. The UF6 Handling Area contains the Feed System, Product Take-off System, Tails Take-off System, and the Blending and Liquid Sampling Systems. The Process Services Corridor contains gas transport equipment, which connects the cascades to the UF6 Feed System, Product Take-off System, Tails Take-off System and Contingency Dump System.

The Centrifuge Assembly Building (CAB) is used to assemble centrifuges before the centrifuges are moved to the Separations Building and installed in the cascades.

The Technical Services Building (TSB) contains the Mechanical Electrical and Instrumentation (ME&I) Workshop, a Medical Room, the Central Alarm Station (CAS), the Control Room, and the primary Emergency Operations Center (EOC) for the facility.

The Central Utilities Building (CUB) provides a central location for the utility services for the process buildings. The CUB also contains the two standby diesel powered electric generators that provide power to protect selected equipment in the unlikely event of loss of offsite supplied power. The building also contains electrical rooms/areas, an air compressor area, battery rooms, and a Centrifuge Cooling Water System.

The Cylinder Receipt and Dispatch Building (CRDB) is used to receive, inspect, weigh and temporarily store cylinders of natural UF6 sent to the plant and ship cylinders of enriched UF6 to customers. Additionally, clean, empty product and UBCs are received, inspected, weighed, and temporarily stored prior to their being filled in the Separations Building. The CRDB also contains various laboratories and maintenance facilities necessary to safely operate and maintain the facility. Most site infrastructure facilities (i.e., laboratories for sample analysis) are located in the CRDB.

The Uranium Byproduct Cylinder (UBC) Storage Pad is a series of concrete pads designed to store up to 15,727 UBCs. A single-lined UBC Storage Pad Stormwater Retention Basin will be used specifically to retain runoff from the UBC Storage Pad during heavy rainfalls. This basin will also receive cooling tower blowdown. The unlined Site Stormwater Detention basin will receive rainfall runoff from the balance of the developed plant site. Liquid effluent from plant process systems will be discharged to the double-lined Treated Effluent Evaporative Basin provided with a leak detection system.

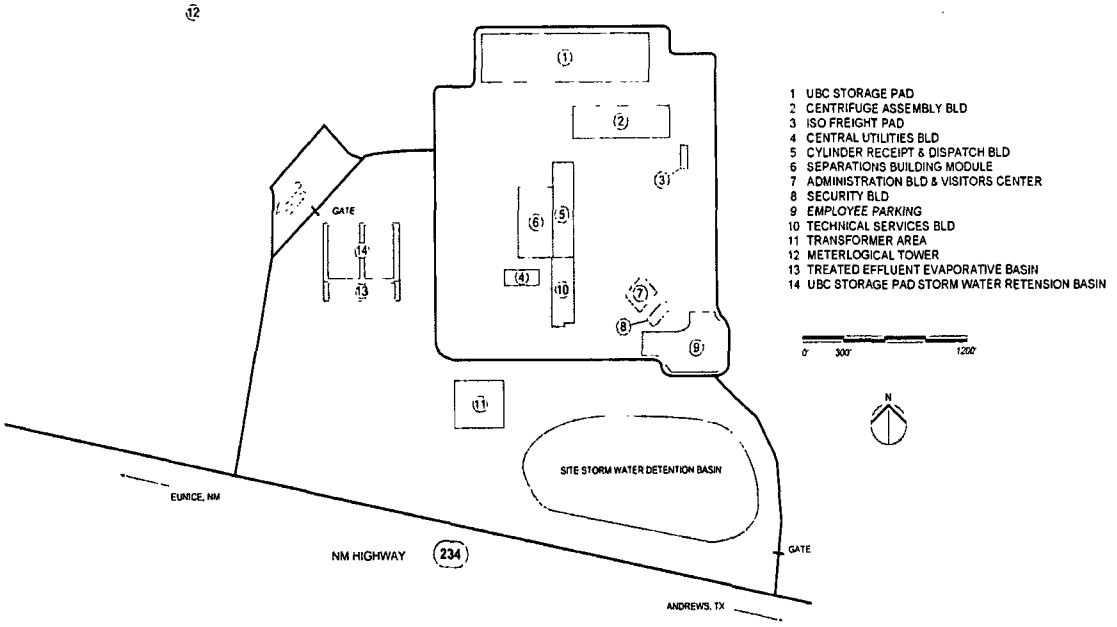

Figure 1.5-1

1.6. Radioactive Effluent Control

NEF waste streams are divided into gaseous effluents, liquid effluents, and solid wastes. Descriptions of the sources, systems, and generation rates for each waste stream are discussed in this section.

1.6.1 Gaseous Effluent Vent Systems (GEVS)

The function of the GEVS is to remove particulates containing uranium and HF from potentially contaminated process gas streams. Prefilters and high efficiency particulate air (HEPA) filters remove particulates and impregnated activated carbon filters are used for the removal of HF. The systems produce solid wastes from the periodic replacement of prefilters, HEPA filters, and impregnated activated carbon filters. The systems produce no gaseous effluents of their own, but discharge effluents from other systems after treatment to remove hazardous materials. There are two GEVS for the plant: (1) Pumped Extract GEVS and (2) the CRDB GEVS.

Note: The Heating Ventilation and Air Conditioning (HVAC) systems and Gaseous Effluent Vent Systems (GEVS) for the NEF are undergoing redesign. After these design changes are finalized the information will be included within NEF licensed basis documents in accordance with 10 CRF 70.72. Final design will be included in subsequent versions of the annual REMP report.

1.6.1.1 Functional Description

The design requirements provide a large safety margin between normal and accident conditions so that no single failure could result in the release of significant hazardous material. The amounts of UF6 in the system also preclude the release of significant quantities of

hazardous material from a single failure or multiple failures. Instrumentation is provided to detect abnormal process conditions so that the process can be returned to normal by automatic or operator actions.

These requirements and operating conditions also assure "as low as reasonably achievable" (ALARA) personnel exposure to hazardous materials and compliance with environmental and safety criteria.

1.6.1.2 Major Components for GEVS

The Pumped Extract GEVS and CRDB GEVS each consist of the following major components.

A. Duct system
B. Pre-filter(s)
C. High Efficiency Particulate Air (HEPA) Filters
D. Impregnated activated carbon filter(s)
E. Centrifugal fans
F. Monitoring and controls (HF) before and after filter trains (with temperature indicating alarms on carbon filters)
G. Automatically controlled inlet and outlet isolation dampers or valves
H. Exhaust stack
I. Monitoring and controls (alpha and HF) in exhaust stack
J. Airflow monitors and airflow blender

1.6.1.3 Pumped Extract GEVS

The Pumped Extract GEVS, a Safe-By-Design system, provides exhaust of potentially hazardous contaminants for the Separation Building Modules (SBM). The system serves all permanently connected vacuum pump and trap sets as well as temporary connections used by maintenance and sampling rigs. The Pumped Extract GEVS is located in the UF6 Handling Area of SBM-1001. The system is monitored from the Control Room.

1.6.1.3.1 Design Description

A minimum target velocity of 7 m/s (1380 ft/min) will be established in the piping system to convey particulate contaminants through the piping and minimize settling. Each section of the pipe system has an orifice plate to maintain a minimum air velocity.

The Pumped Extract GEVS piping connects to an inlet header. Off the inlet header are two parallel trains each with eight banks of filters. Each train is capable of handling 100% of the effluent during normal operations. One train is online and the other is a standby. Each bank of filters consists of a 60-65% efficient pre-filter which removes dust and protects the HEPA filter, a 99.97% efficient HEPA filter which removes uranium aerosols (mainly UO2F2 particles), a 99% efficient activated carbon filter for removal of HF, a position for an optional additional filter,

and a final 99.97% HEPA filter which removes carbon fines and any additional uranium aerosols. Manual dampers are also located at the inlet and outlet of each of the eight banks of filters for testing and to allow isolation of a bank while the unit continues to operate. Flow balancing orifices are provided on each bank to assure balanced flows across each bank.

Each filter train vents the clean gases through a variable speed centrifugal fan, which maintains the negative pressure upstream of the filter train by using input from a differential pressure controller. Finally, the clean gases are discharged through a roof top exhaust stack on the SBM. One exhaust stack is common to the operational system and the standby system. A switch between the operational and standby systems (trains) can be made using automatically controlled dampers. There are motorized and manually controlled dampers located at the inlet and outlet of each train to allow for different modes of operation of the system. The design flow rate is estimated to be 646 m^3/hr (380 cfm).

The Pumped Extract GEVS provides ventilation and hazardous contaminant removal and is connected via permanently piped locations for the following systems, equipment, and areas:

A. The UF6 Feed System, the Product Take-off System, the Tails Take-off System, the Product Blending and Sampling Vent Subsystem and Contingency Dump System.
B. All Liquid Sampling System autoclaves.
C. All discharge lines from mobile vacuum pump sets.
D. In addition, local exhausts to the Pumped Extract GEVS are provided for initial plant operations via a temporary local extract connection to remove any releases from connections or disconnections of process equipment.

If the Pumped Extract GEVS stops operating, material within the piping will not be released into the building because each of the Pumped Extract GEVS connections is piped into the top of the header to prevent entrained material from falling back into the building from the piping during system failure.
Mobile vacuum pump units that vent to the Pumped Extract GEVS are available in the UF6 Handling Area.

1.6.1.4 Cylinder Receipt and Dispatch Building (CRDB) GEVS

The CRDB GEVS provides exhaust of potentially hazardous contaminants from rooms and services within the CRDB Bunkered Area. The system is located in the CRDB's GEVS Room and is monitored from the Control Room.

1.6.1.4.1 Design Description

The GEVS serving the CRDB consists of a duct network that serves all of the UF6 processing systems and operates at negative pressure. The ductwork is connected to one filter station and vents through one fan. Both the filter station and the fan can handle 100% of the effluent.

There is no standby filter station or fan. Operations that require the GEVS to be operational will be shut down if the system shuts down. The system capacity is estimated to be 18,700 m^3/hr (11,000 cfm). A differential pressure controller controls the fan speed and maintains negative pressure in front of the filter station. Gases from the UF6 processing systems pass through an 85% efficient prefilter. The prefilter removes dust particles and thereby prolongs the useful life of the HEPA filter. Gases then flow through a 99.97% efficient HEPA filter. The HEPA filter removes uranium aerosols which consist of UO2F2 particles. Finally, the gases pass through a 99% efficient activated charcoal for removal of HF. The cleaned gases pass through the fan, which maintains the negative pressure upstream of the filter stations. The cleaned gases are then discharged through a roof top vent stack on the CRDB.

The unit will be located in a dedicated room in the CRDB. It is estimated that the filters will be changed on a yearly basis or multi-yearly basis.

If the GEVS stops operating, material within the duct will not be released into the building because each of the GEVS connections has a P-trap to catch entrained material that could otherwise fall back into the building from the ductwork during system failure.

1.6.1.5 Design and Safety Features for all GEVS

The Pumped Extract GEVS and CRDB GEVS are designed to protect plant personnel, the public, and the environment against uranium and HF exposure.

These GEVS are designed to meet all applicable NRC requirements for public and plant personnel safety and effluent control and monitoring. The system designs also comply with applicable standards of OSHA, EPA, and state and local agencies.

The systems filter contaminated gases and continuously monitor exhaust gas flow to the atmosphere. HF monitors are installed upstream and downstream of the filter trains and in the exhaust stacks to monitor the release of hazardous materials to the environment. Alpha monitors are installed in the exhaust stacks to monitor the release of hazardous materials. A fault alarm is generated in the event of a fault occurring within any of the monitors. The alarms are monitored in the Control Room.

Carbon filter replacement will be based on the remaining absorption capacity. The remaining filters will be replaced based on differential pressure readings (i.e., filter loading). There is no fixed frequency for filter replacement. The materials of construction, corrosion allowances, and fabrication specifications for the equipment and piping/ductwork used in the GEVS are compatible with UF6 and HF and are noncombustible.

The Pumped Extract GEVS is connected to standby diesel generators.

1.6.1.6 Effluent Releases

The annual discharge of uranium in routine gaseous effluent discharged from the NEF is expected to be less than 10 grams (0.35 ounces).

1.6.2 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System provides exhaust of potentially hazardous contaminants from the Centrifuge Test and Post Mortem Facilities. The system also ensures the Centrifuge Test and Post Mortem Facility is maintained at a negative pressure with respect to adjacent areas during contaminated or potentially contaminated processes. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is located in the Centrifuge Assembly Building and is monitored from the Control Room.

Potentially contaminated exhaust air comes from the Centrifuge Test and Post Mortem Facilities. The total airflow to be handled by the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is adequate to maintain a negative pressure in the room. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System consists of a duct network that serves the Centrifuge Test and Post Mortem Facilities and operates at negative pressure. The ductwork is connected to a filter station that can handle 100% of the effluent.

Operations that require the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System to be operational are manually shut down if the system shuts down. The basic filter arrangement consist of a prefilter, activated carbon filter, and HEPA filter, and is designed to remove dust/debris, HF, uranic particles, and any other hazardous material dictated by environmental requirements from the air stream while maintaining adequate air flow. After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) stack on the Centrifuge Assembly Building.

1.6.3 Liquid Effluent System

Quantities of radiologically contaminated, potentially radiologically contaminated, and non-radiologically contaminated aqueous liquid effluents are generated in a variety of operations and processes in the CRDB and in the Separations Building. The majority of all potentially radiologically contaminated aqueous liquid effluents are generated in the CRDB. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment System in the CRDB. The collected effluent is sampled and analyzed.

1.6.3.1 Effluent Sources and Generation Rates

Numerous types of aqueous and non-aqueous liquid wastes are generated in the plant. These effluents may be significantly radiologically contaminated, potentially contaminated with low amounts of contamination, or non-contaminated. Effluents include:

• Hydrolyzed uranium hexafluoride and aqueous laboratory effluent

These hydrolyzed uranium hexafluoride solutions and the aqueous effluents are generated during laboratory analysis operations and require further processing for uranium recovery.

• Degreaser Water

This is water which has been used for degreasing contaminated pump and plant components coated in Fomblin oil. The oil, which is heavier than water will be separated from the water via gravity separation, and the suspended solids filtered, prior to routing for uranium recovery. Most of the soluble uranium components dissolve in the degreaser water.

• Citric Acid

The decontamination process removes a variety of uranic material from the surfaces of components using citric acid. The citric acid tank contents comprise a suspension (a solution and solids), which are strongly uranic and need processing. The solids fall to the bottom of the citric acid tank and are separated, in the form of sludge, from the citric acid using gravity separation.

The other sources of citric acid are from the UF6 Sample Bottles cleaning rig and flexible hose decontamination cabinet. Part of the cleaning process involves rinsing them in 5- 10% by volume citric acid.

• Floor Washings

This is water which has arisen from all the active areas of the plant namely the UF6 Handling Area, Chemical Laboratories, Decontamination Workshop and Rebuild Workshop. The main constituents of this wastewater are detergents and very low levels of dissolved uranium based contaminants. This water is routed into a collection tank and monitored prior to routing for uranium recovery.

• Miscellaneous Condensates

This is water which has arisen from the production plant during the defrost cycle of the low temperature take off stations. This water is collected in a common holding tank with floor washings, monitored and pumped into the Miscellaneous Effluent Collection Tank prior to routing.

• Radiation Areas Hand Washing and Shower Water

Plant personnel generate this uncontaminated water from hand washing and showering. This water is collected and monitored and then released to the Treated Effluent Evaporative Basin.

1.6.3.2 System Description

Aqueous laboratory effluents with uranic concentrations are sampled to determine their uranic content and then pumped from the labs to the agitated Miscellaneous Effluent Collection Tank in the Liquid Effluent Collection and Treatment Room. Floor washings are sampled to determine their uranic content and then manually emptied into the tank. Condensate may be either manually transported or piped to the tank after sampling.

All water from the personnel hand washes and showers in the CRDB and the SBMs goes to the Hand Wash/Shower Monitor Tanks in the Liquid Effluent Collection and Treatment Room. Water from the personnel hand wash and shower in the Centrifuge Test and Post Mortem Areas goes to the Hand Wash / Shower Monitor Tank in the Assembled Centrifuge Storage Area of the Centrifuge Assembly Building (CAB). Since these effluents are expected to be non-contaminated, no agitation is provided in these tanks. Samples of the effluents are regularly taken to the laboratory for analysis. Lab testing determines pH, soluble uranic content, and insoluble uranic content.

Effluents containing uranium are treated in the Precipitation Treatment Tank to remove the majority of the uranium that is in solution. After the effluent is transferred to the Precipitation Treatment Tank, a precipitating agent, such as potassium hydroxide (KOH) or sodium hydroxide (NaOH), is added. The addition of the precipitating agent raises the pH of the effluent to the range of 9 to 12. This treatment renders the soluble uranium compounds insoluble and they precipitate from the solution. The tank contents are constantly agitated to provide a homogeneous solution. The precipitated compounds are then removed from the effluent by circulation through a small filter press. The material removed by the filter press is deposited in container and sent for off-site low-level radioactive waste disposal.

The clean effluent is re-circulated back to the Precipitation Treatment Tank. Depending on the characteristics of the effluent, the effluent may have to be circulated through the filter press numerous times to obtain the percent of solids removal required. A sample of the effluent is taken to determine when the correct percent solids have been removed. When it is determined that the correct amount of solids have been removed, the effluent is transferred to the Contaminated Effluent Hold Tank.

The effluent in the Contaminated Effluent Hold Tank is then transferred to the agitated Evaporator/Dryer Feed Tank. Acid is added via a small chemical addition unit to reduce the pH back down to 7 or 8. This is necessary to help minimize corrosion in the Evaporator/Dryer. From the Evaporator/Dryer Feed Tank, the effluent is pumped to the Evaporator/Dryer. The Evaporator/Dryer is an agitated thin film type that separates out the solids in the effluent. The Evaporator/Dryer is heated by steam in a jacket or from an electric coil. As the effluent enters the Evaporator/Dryer, the effluent is heated and vaporized. The Evaporator/Dryer discharges a "dry" concentrate into a container located at the bottom of the Evaporator/Dryer. Container contents are monitored for criticality, labeled, and stored in the radioactive waste storage area.

When full, the container is sent for shipment off-site to a low-level radioactive waste disposal facility. Liquid vapor exits the evaporator and is condensed in the Evaporator/Dryer Condenser.

The condensate from the Evaporator/Dryer Condenser is collected in the Distillate Tank before being transferred to one of the Treated Effluent Monitor Tanks. The effluent in these tanks is sampled and tested for pH and uranic content to ensure compliance with administrative guidelines prior to release to the double-lined Treated Effluent Evaporative Basin with leak detection. If the lab tests show the effluent does not meet administrative guidelines, the effluent can be further treated. Depending on what conditions the lab testing show, the effluent is either directed back to the Evaporator/Dryer Feed Tank for another pass through the Evaporator/Dryer, or it can be directed through the Mixed Bed Demineralizers. After either option, the effluent is transferred back to a Treated Effluent Monitor Tank where it is again tested. When the lab tests are acceptable, the effluent is released to the Treated Effluent Evaporative Basin.

The Citric Acid Tank in the Decontamination Workshop is drained to the Spent Citric Acid Collection Tank in the Liquid Effluent Collection and Treatment Room. A "sludge" remains in the bottom of the Citric Acid Tank. This "sludge" consists primarily of uranium and metal particles. This sludge is flushed out with deionized water (DI). The combination of the sludge and the DI water also goes to the Spent Citric Acid Collection Tank. The spent citric acid effluent/sludge contains the wastes from the Sample Bottle and Flexible Hose Decontamination Cabinets, which are manually transferred to the Citric Acid Tank in the Main Decontamination System. The contents of the Spent Citric Acid Collection Tank are constantly agitated to keep all solids in suspension and to provide a homogeneous solution. This is necessary to prevent build-up of uranic material in the bottom of the tank.

The Degreaser Tank in the Decontamination Workshop is drained, and the effluent is transferred to the Degreaser Water Collection Tank in the Liquid Effluent Collection and Treatment Room. A "sludge" remains in the bottom of the Degreaser Tank after the degreasing water is drained. This "sludge" consists primarily of Fomblin oil and uranium. This sludge is flushed out with DI water. The combination of the sludge and the DI water also goes to the Degreaser Water Collection Tank. The contents of the Degreaser Water Collection Tank remain agitated to keep all solids in suspension and to provide a homogeneous solution. This is necessary to prevent build-up of uranic material in the bottom of the tank. Since this effluent contains Fomblin oil, it is not possible to send the degreaser water to the Precipitation Treatment Tank for treatment. Therefore, the Fomblin oil must be removed first.

For Fomblin oil removal, the contents of the Degreaser Water Collection Tank circulate through a small centrifuge. The oil and sludge are centrifuged off, collected in a container, and sent for offsite low-level radioactive waste disposal.

1.6.3.3 System Operation

Handling and eventual disposition of the aqueous liquid effluents is accomplished in two stages, collection and treatment. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment Room in the CRDB. There are other tanks in the Liquid Effluent Collection and Treatment Room used for monitoring and treatment prior to release to the Treated Effluent Evaporative Basin.

The Spent Citric Acid Collection Tank, Degreaser Water Tank, Miscellaneous Effluent Collection Tank, and Precipitation Treatment Tank are all located in a contained area. The containment consists of a curb around all the above-mentioned tanks. The confined area is capable of containing at least one catastrophic failure of one given tank 1,325 L (350 gal), minimum. In the event of a tank failure, the effluent in the confined area is pumped out with a portable pump set.

Reduced volume, radiologically contaminated wastes that are a by-product of the treatment system, as well as contaminated non-aqueous wastes, are packaged and shipped to a licensed low-level radioactive waste disposal facility.

1.6.3.4 Effluent Discharge

Total liquid effluent from the NEF is estimated at 2,130 m^3/yr (562,631 gal/yr). The uranium source term used in this report for routine liquid effluent releases from the NEF is 2.1×10^6 Bq (56 µCi) per year and is comprised of airborne uranium particulates created due to resuspension at times when the Treated Effluent Evaporative Basin is dry. All effluents except sanitary waste are contained on the NEF site. Accordingly, all contaminated liquid effluents are treated and sent to the double-lined Treated Effluent Evaporative Basin with leak detection on the NEF site.

Decontamination, Laboratory and Miscellaneous Liquid Effluents are treated to meet the requirements of 10 CFR 20, Appendix B, Table 2 and the administrative levels recommended by Regulatory Guide 8.37. The treated effluent is discharged to the double-lined Treated Effluent Evaporative Basin, which has leak detection.

The Treated Effluent Evaporative Basin consists of two synthetic liners with soil over the top liner. The Treated Effluent Evaporative Basin will have leak detection capabilities. At the end of plant life, the sludge and soil over the top of the uppermost liner and the liner itself will be disposed of, as required, at a low-level radioactive waste repository.

Hand Wash and Shower Effluents are not treated. These effluents are discharged to the same Treated Effluent Evaporative Basin as for the Decontamination, Laboratory and Miscellaneous Effluent.

Cooling Tower Blowdown Effluent is discharged to a separate on-site basin, the UBC Storage Pad Stormwater Retention Basin. The single-lined retention basin is used for the collection and monitoring of rainwater runoff from the UBC Storage Pad and to collect cooling tower blowdown.

A third unlined basin is used for the collection and monitoring of general site stormwater runoff.

Sanitary wastewater is being sent to the City of Eunice Wastewater Treatment Plant for processing via a system of lift stations and 8-inch sewage lines. Six septic systems may be used as a backup for the NEF site sanitary sewage system. Each septic system will consist of a septic tank with one or more leach fields.

The six septic systems are capable of handling approximately 40,125 liters per day (10,600 gallons per day) based on a design number of employees of approximately 420. Based on the actual number of employees, 210, the overall system will receive approximately 20,063 liters per day (5,300 gallons per day). Total annual design discharge will be approximately 14.6 million liters per year (3.87 million gallons per year). Actual flows will be approximately 50 percent of the design values.

The septic tanks will meet manufacturer specifications. Utilizing the percolation rate of approximately 3 minutes per centimeter (8 minutes per inch) established by actual test on the site, and allowing for 76 to 114 liters (20 to 30 gallons) per person per day, each person will require 2.7 linear meters (9 linear feet) of trench utilizing a 91.4-centimeter (36-inch) wide trench filled with 61 centimeters (24 inches) of open graded crushed stone. As indicated above, although the site population during operation is expected to be 210 persons, the building facilities are designed by architectural code analysis to accommodate up to 420 persons.

Therefore, a total of approximately 975 linear meters (3,200 linear feet) of percolation drain field will be required. The combined area of the leach fields will be approximately 892 square meters (9,600 square feet).

1.6.4 Solid Waste Management

Solid waste generated at the NEF will be grouped into industrial (nonhazardous), radioactive and mixed, and hazardous waste categories. In addition, solid radioactive and mixed waste will be further segregated according to the quantity of liquid that is not readily separable from the solid material. The solid waste management systems will be a set of facilities, administrative procedures, and practices that provide for the collection, temporary storage, (no solid waste processing is planned), and disposal of categorized solid waste in accordance with regulatory requirements. All solid radioactive wastes generated will be Class A low-level wastes (LLW) a defined in 10 CFR 61.

Radioactive waste will be collected in labeled containers in each Restricted Area and transferred to the Radioactive Waste Storage Area for inspection. Suitable waste will be volume-reduced and all radioactive waste disposed of at a licensed low-level waste (LLW) disposal facility.

Hazardous wastes (e.g., spent blasting sand, empty spray paint cans, empty propane gas cylinders, solvents such as acetone and toluene, degreaser solvents, diatomaceous earth, hydrocarbon sludge, and chemicals such as methylene chloride and petroleum ether) and some mixed wastes will be generated at the NEF. These wastes will also be collected at the point of generation, transferred to the Waste Storage Area, inspected, and classified. Any mixed waste that may be processed to meet land disposal requirements may be treated in its original collection container and shipped as LLW for disposal.

1.6.4.1 Radioactive and Mixed Wastes

Solid radioactive wastes are produced in a number of plant activities and require a variety of methods for treatment and disposal. These wastes are categorized into wet solid waste and dry solid waste due to differences in storage and disposal requirements found in 40 CFR 264 and 10 CFR 61, respectively. For disposal of solid waste (radioactive waste and mixed waste), 10 CFR 61.56(a)(3) requires: "Solid waste containing liquid shall contain as little free standing and noncorrosive liquid as reasonably achievable, but in no case shall the liquid exceed 1% of the volume." For this facility, dry solid waste is waste that meets the requirement in its as-generated form and wet solid waste is waste that requires treatment prior to disposal to meet this requirement.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10CFR 61. Wastes are transported offsite for disposal by contract carriers. Transportation is in compliance with 49 CFR 107 and 49 CFR 173.

The Solid Waste Collection System is simply a group of methods and procedures applied as appropriate to the various solid wastes. Each individual waste is handled differently according to its unique combination of characteristics and constraints. Wet and dry waste handling is described separately below. (Wastes produced by waste treatment vendors are handled by the vendors and are not addressed here.)

1.6.4.1.1 Wet Solid Wastes

The wet waste portion of the Solid Waste Collection System handles all radiological, hazardous, mixed, and industrial solid wastes from the plant that do not meet the above definition of dry waste. This portion handles several types of wet waste: wet trash, oil recovery sludge, oil filters, miscellaneous oils (e.g., cutting machine oil) solvent recovery sludge, and uranic waste precipitate. The system collects, identifies, stores, and prepares these wastes for shipment.

Waste that may have reclamation or recycle value (e.g., miscellaneous oils) may be packaged and shipped to an authorized waste reclamation firm for that purpose. Wet solid wastes are segregated into radioactive, hazardous, mixed, or industrial waste categories during collection to minimize recycling and/or disposal problems. Mixed waste is that which includes both radioactive and hazardous waste. Industrial waste does not include either hazardous or radioactive waste.

The Solid Waste Collection System involves a number of manual steps. Handling of each waste type is addressed below.

1.6.4.1.1.1 Wet Trash

In this plant, trash typically consists of waste paper, packing material, clothing, rags, wipes, mop heads, and absorption media. Wet trash consists of trash that contains water, oil, or chemical solutions.

Generation of radioactive wet trash is minimized insofar as possible. Trash with radioactive contamination is collected in specially marked plastic-bag-lined drums. These drums are located throughout each Restricted Area. Wet trash is collected in separate drums from dry trash. When the drum of wet trash is full, the plastic bag is removed from the drum and sealed.

The bag is checked for leaks and excessive liquid. The exterior of the bag is monitored for contamination. If necessary, excess liquids are drained and the exterior is cleaned. The bag may be placed in a new clean plastic bag. The bag is then taken to the Radioactive Waste Storage Area where the waste is identified, labeled, and recorded.

The radioactive trash is shipped to a Control Volume Reduction Facility (CVRF) that can process wet trash. The licensed CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. The waste package is then shipped to a licensed radioactive waste disposal facility.

Trash with hazardous contamination is collected in specially marked plastic-lined drums. Wet trash is collected separately from dry trash. When full, the drum is taken to the Solid Waste Collection Room (SWCR) and the plastic bag containing wet trash is removed from the container, sealed, and the exterior is monitored for hazardous material, and cleaned if necessary. The trash is identified, labeled, and recorded. All hazardous trash is stored in the Hazardous Waste Area until it is shipped to a hazardous waste disposal facility. Different types of hazardous materials are not mixed in order to avoid accidental reactions.

Empty containers that at one time contained hazardous materials are a special type of hazardous waste, as discussed in 40 CFR 261. After such a container is emptied, it is resealed and taken to the Hazardous Waste Area for identification, labeling, and recording. The container is handled as hazardous waste and is shipped to a hazardous waste processing facility for cleaning or disposal. Alternately, the container is used to store compatible hazardous

wastes and to ship those wastes to a hazardous waste processing facility for processing and container disposal.

"Mixed" trash results from using wipes and rags with solvent on uranium-contaminated components. It is collected in appropriate containers and segregated from other trash. The waste is identified, labeled, recorded, and stored in accordance with regulations for both hazardous and radioactive wastes. Mixed waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a qualified disposal facility licensed to dispose of the particular resulting waste.

Industrial trash is collected in specially marked receptacles in all parts of the plant. The trash from Restricted Areas is collected in plastic bags and taken to the Radioactive Waste Storage Room in the CRDB for inspection to ensure that no radioactive contamination is present. The inspected trash and the trash from the Controlled Area are then taken to one of several large containers around the plant. The trash is stored in these containers until a contract carrier transports them to a properly permitted sanitary landfill.

1.6.4.1.1.2 Oil Recovery Sludge

The process for recovering used Fomblin oil generates an oily sludge that must be disposed of offsite. The sludge results from the absorption of hydrocarbons in activated carbon and diatomaceous earth. Sodium carbonate, charcoal, and celite also contribute to this sludge. A contracted radioactive waste processor will process the waste at an offsite location. Alternatively, the waste may be shipped offsite to a CVRF for volume reduction. Regulations and technology current at the time of waste production will dictate treatment methods. In either case the waste is finally disposed of at a licensed low-level radioactive waste disposal facility.

1.6.4.1.1.3 Resins

Spent resins will not be part of any routine waste stream at the NEF. Use of the Mixed-Bed Demineralizer in liquid waste treatment is a final polishing step, and the resin is expected to last the life of the plant. The demineralizer resin will be properly processed and disposed when the NEF is decommissioned.

1.6.4.1.1.4 Solvent Recovery Sludge

Solvent is used in degreasers and in the workshops. The degreasers are equipped with solvent recovery stills. The degreasers in the decontamination area and the contaminated workshop area handle radioactive components. Solids and sludge removed from these stills and degreasers are collected, labeled, and stored as mixed waste. The waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a licensed disposal facility for the particular resulting waste.

The Vacuum Pump Rebuild Workshop degreaser handles only decontaminated components, so the solids and sludge removed from this degreaser (after checking for radioactivity) are collected, labeled, and stored as hazardous waste. This hazardous waste is shipped to a licensed hazardous waste disposal facility.

1.6.4.1.1.5 Uranic Waste Precipitate

Aqueous uranic liquid waste is processed to remove most of the uranium prior to evaporation of the liquid stream in the Evaporator/Dryer. This aqueous waste is primarily from the decontamination degreaser, citric acid baths and the laboratory. The uranium is precipitated out of solution and water is removed by filter press. The remaining precipitate is collected, labeled, and stored in the radioactive waste storage area. The waste is sent to a licensed low-level radioactive waste disposal facility.

1.6.4.1.2 Dry Solid Wastes

The dry waste portion of the Solid Waste Collection and Processing System handles dry radiological, hazardous, mixed, and industrial solid wastes from the plant. These wastes include: trash (including miscellaneous combustible, non-metallic items), activated carbon, activated alumina, activated sodium fluoride, HEPA filters, scrap metal, laboratory waste and dryer concentrate. The system collects, identifies, stores, and prepares these wastes for shipment.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10 CFR 61. The Solid Waste Collection and Processing System involves a number of manual steps. Handling for each waste type is addressed below.

1.6.4.1.2.1 Activated Carbon

Activated carbon is used in a number of systems to remove uranium compounds from exhaust gases. Due to the potential hazard of airborne contamination, personnel use respiratory protection equipment during activated carbon handling to prevent inhalation of material. Spent or aged carbon is carefully removed, immediately packaged to prevent the spread of contamination and transported to the Ventilated Room in the CRDB. There the activated carbon is removed and placed in an appropriate container to preclude criticality. The contents of that container are sampled to determine the quantities of HF and ^{235}U present. The container is then sealed, monitored for external contamination, and properly labeled. It is then temporarily stored in the Waste Storage Room with radioactive waste. Depending on the mass of uranium in the carbon material, the container may be shipped directly to a low-level radioactive waste disposal facility or to a CVRF. The CVRF reduces the volume of the waste and then repackages the resulting waste for shipment to a low-level radioactive waste disposal facility.

The NEF shall comply with all limitations imposed by the burial site and the CVRF on the contained mass of ^{235}U in the carbon filter material that is shipped to their facilities by the NEF.

Carbon filters are also used in the laboratories where they can become contaminated with hazardous as well as radioactive material. The filters are handled according to their known service. Those filters that are potentially hazardous are handled as hazardous, and those potentially containing both hazardous and radioactive material are handled as mixed wastes. Each type of waste is collected, labeled, stored, and recorded, and is then shipped to an appropriately licensed facility for processing/disposing of hazardous and/or mixed waste.

1.6.4.1.2.2 Activated Alumina

Activated alumina in alumina traps is used in a number of systems to remove HF from exhaust gases. Activated alumina (Al203) as a waste is in granular form. Most activated alumina in the plant is contaminated; instrument air desiccant is not contaminated. The hold up of captured contaminants on the alumina is checked by weighing and the alumina is changed out when near capacity.

Spent or aged alumina is carefully removed in the Ventilated Room in the CRDB to prevent the spread of contamination. There the activated alumina is removed and placed in an appropriate container. The contents of a full container are sampled to determine the quantity of ^{235}U present. The container is then sealed, the exterior is monitored for contamination, and the container is properly labeled. It is stored in the Radioactive Waste Storage Room until it is shipped to a radioactive waste disposal facility. Activated alumina is also used as a desiccant in the Compressed Air System. This alumina is not radioactively contaminated, is non-hazardous and is replaced as necessary. It is disposed of in a landfill.

1.6.4.1.2.3 Activated Sodium Fluoride

Activated sodium fluoride (NaF) is used in the Contingency Dump System to remove UF6 and HF from exhaust gases. NaF adsorbs up to either 150% of its weight in UF6 or 50% of its weight in HF. The Contingency Dump System is not expected to operate except during transient conditions that occur during a power failure. The NaF is not expected to saturate during the life of the plant. However, if the system is used often and the NaF saturates, the NaF is removed by personnel wearing respirators and using special procedures for personnel protection. A plastic bag is placed over the vessel and sealed, and the vessel is turned upside down to empty the NaF. Spent contaminated NaF, if ever produced, is processed by a contractor to remove uranium so the wastes may be disposed at a licensed waste facility. It is expected that NaF will not require treatment and disposal until decommissioning.

1.6.4.1.2.4 Filter Elements

Prefilters and HEPA filters are used in several places throughout the plant to remove dust and dirt, uranium compounds, and HF. Air filters, as a waste, consist of fiberglass or cellulose filters.

Generally, only the GEVS filters are contaminated and will contain much less than 1% by weight of UO2F2. HVAC filters, instrument air filters, air cooling filters from product take-off and blending systems, and standby generator air filters are not contaminated. HF-resistant HEPA filters are composed of fiberglass.

Filters associated with the HVAC System in the Centrifuge Assembly Building are used to remove dust and dirt from incoming air to ensure the cleanliness of the centrifuge assembly operation. When removed from the housing, the filter elements are wrapped in plastic to prevent the loss of particulate matter. These filter elements are not contaminated with radioactive or hazardous materials so disposal occurs with other industrial trash.

Filters used in the GEVS, and Centrifuge Test and Post Mortem Facilities Exhaust Filtration System are used to remove HF and trace uranium compounds from the exhaust air stream. When the filters become loaded with particulate matter, they are removed from the housings and wrapped in plastic bags to prevent the spread of radioactive contamination. Due to the hazard of airborne contamination, either portable ventilation equipment or respiratory protection equipment is used during filter handling to prevent the inhalation of material by plant personnel.

The filters are taken to the Solid Waste Collection Room in the CRDB where they are sampled to determine the quantity of ^{235}U present. The exterior of the bag is monitored for contamination, and the package is properly marked and placed in storage. The filter elements are sent to a CVRF for processing and shipped to a low-level radioactive waste disposal facility.

Air filters from the non-contaminated HVAC systems, Compressed Air System and the Diesel Generators are handled as industrial waste.

1.6.4.1.2.5 Scrap Metal

Metallic wastes are generated during routine and abnormal maintenance operations. The metal may be clean, contaminated with radioactive material or hazardous material. Radioactive contamination of scrap metal is always in the form of surface contamination caused by uranium compounds adhering to the metal or accumulating in cracks and crevices. No process in this facility results in activation of any metal materials.

Clean scrap metal is collected in bins located outside the Technical Services Building. This material is transported by contract carrier to a local scrap metal vendor for disposal. Items collected outside of Restricted Areas are disposed of as industrial scrap metal unless there is reason to suspect they contain hazardous material.

Scrap metal is monitored for contamination before it leaves the site. Metal found to be contaminated is either decontaminated or disposed of as radioactive waste. When feasible, decontamination is the preferred method.

Decontamination is performed in situ for large items and in the Decontamination Workshop for regular items used in performing maintenance. Decontamination of large items should not be required until the end of plant life. Items that are not suitable for decontamination are inspected to determine the quantity of uranium present, packaged, labeled, and shipped either to a CVRF or a radioactive waste disposal facility.

Metallic items containing hazardous materials are collected at the location of the hazardous material. The items are wrapped to contain the material and taken to the Waste Storage Room.

The items are then cleaned onsite if practical. If onsite cleaning cannot be performed then the items are sent to a hazardous waste processing facility for offsite treatment or disposal.

1.6.4.1.2.6 Laboratory Waste

Small quantities of dry solid hazardous wastes are generated in laboratory activities, including small amounts of unused chemicals and materials with residual hazardous compounds. These materials are collected, sampled, and stored in the Waste Storage Room of the CRDB.

Precautions are taken when collecting, packaging, and storing to prevent accidental reactions. These materials are shipped to a hazardous waste processing facility where the wastes will be prepared for disposal.

Some of the hazardous laboratory waste may be radioactively contaminated. This waste is collected, labeled, stored, and recorded as mixed waste. This material is shipped to a licensed facility qualified to process mixed waste for ultimate disposal.

1.6.4.1.2.7 Evaporator/Dryer Concentrate

Potentially radioactive aqueous waste is evaporated in the Evaporator/Dryer to remove uranium prior to release to the dedicated double-lined Treated Effluent Evaporative Basin. The Liquid Waste Disposal (LWD) Dryer discharges dry concentrate directly into drums. These drums are checked for
^{235}U content, labeled, and stored in the radioactive waste storage area. The concentrate is shipped to a licensed low-level radioactive waste disposal facility.

1.6.4.1.2.8 Depleted UF6

The enrichment process yields depleted UF6 streams with assays ranging from 0.20 to 0.34 w/o ^{235}U. The approximate quantity and generation rate for depleted UF6 is 7,800 MT (8,600 tons) per year. This equates to approximately 625 cylinders of UF6 per year. The Uranium Byproduct Cylinders (UBCs) will be temporarily stored onsite before transfer to a processing facility and subsequent reuse or disposal. The UBCs are stored in an outdoor storage area known as the UBC Storage Pad.

The UBC Storage Pad consists of an outdoor storage area with concrete saddles on which the cylinders rest. A mobile transporter transfers cylinders from the Cylinder Receipt and Dispatch Building (CRDB) to the UBC Storage Area. Storage of UBC will be for a temporary period until shipped offsite for use or disposal.

1.7. Radiological Impact on Humans

The final step in the effluent control process is the determination of the radiological dose impact to humans and comparison with the federal dose limits to the public. As mentioned previously, the purpose of continuous radiation monitoring and periodic sampling and analysis is to measure the quantities of radioactivity being released to determine compliance with the radioactivity release limits. This is the first stage for assessing releases to the environment.

Next, in a semi-annual Radioactive Effluent Release report, calculations of the dose impact to the general public from the NEF's radioactive effluents are performed. The purpose of these calculations is to periodically assess the doses to the general public resulting from radioactive effluents to ensure that these doses are being maintained as far below the federal dose limits as is reasonably achievable. This is the second stage for assessing releases to the environment.

The types and quantities of radioactive liquid and gaseous effluents released from the NEF during each given are reported to the Nuclear Regulatory Commission semi-annually as required by 10 CFR 70.59.

These measurements of the physical and chemical nature of the effluents are used to determine how the radionuclides will interact with the environment and how they can result in radiation exposure to humans. The environmental interaction mechanisms depend upon factors such as the hydrological (water) and meteorological (atmospheric) characteristics in the area. Information on the water flow, wind speed, wind direction, and atmospheric mixing characteristics are used to estimate how radioactivity will distribute and disperse in the environment.

The most important type of information that is used to evaluate the radiological impact on humans is data on the use of the environment. Information on locations of cows, locations of residences, locations of gardens, drinking water supplies, and other usage information are utilized to estimate the amount of radiation and radioactivity received by the general public.

The radiation exposure pathway to humans is the path radioactivity takes from its release point at the NEF to its effect on man. The movement of radioactivity through the environment and its transport to humans is portrayed in Figure 1.5-1.

There are three major ways in which liquid effluents affect humans:

- external radiation from liquid effluents that deposit and accumulate on the shoreline;
- external radiation from immersion in water containing radioactive liquids; and,

- internal radiation from consumption of fish and shellfish containing radioactivity absorbed from the liquid effluents.

None of these factors are assumed to contribute dose to residents around the NEF facility.

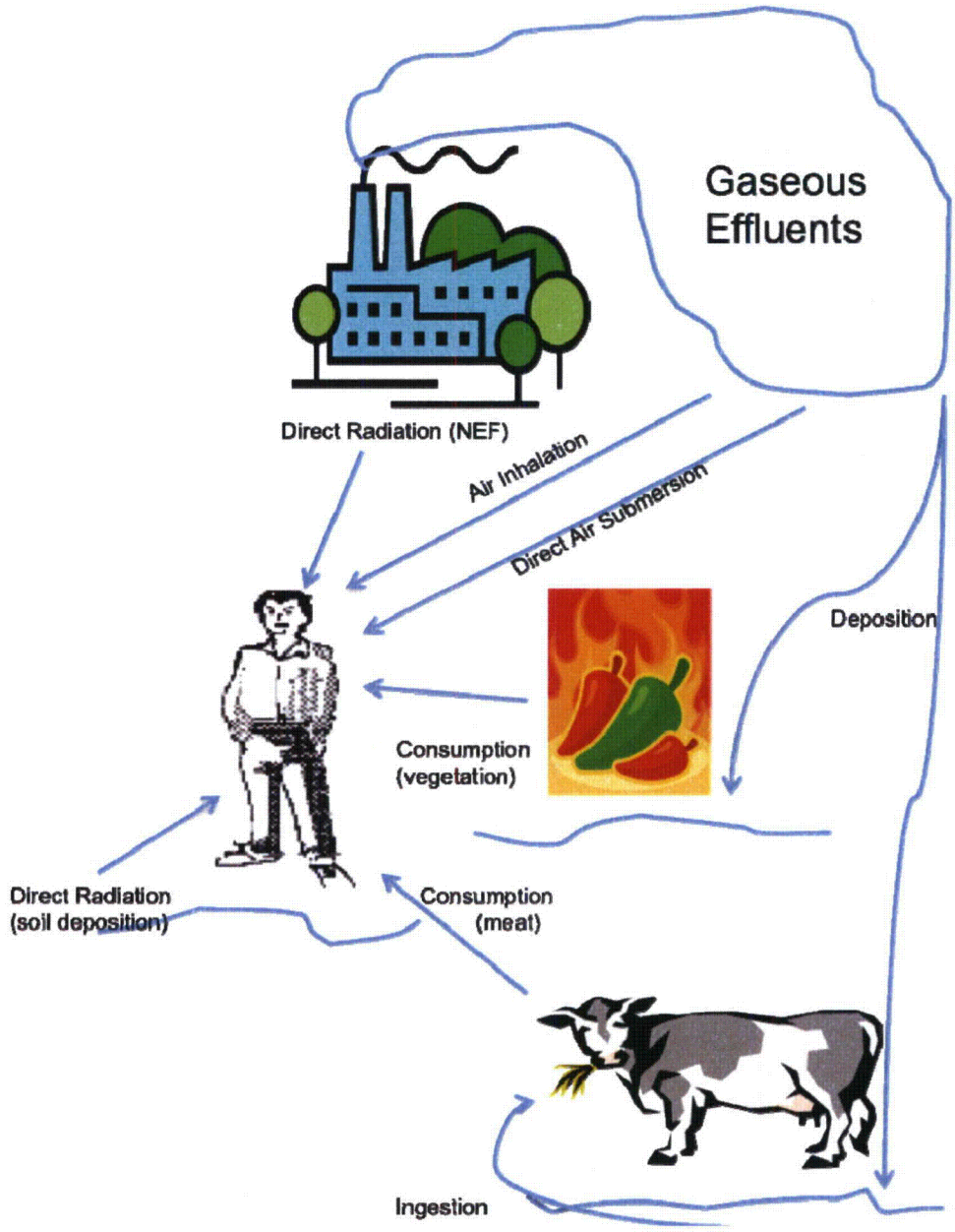

Figure 1.6-1, Radiation Exposure Pathways

There are six major ways in which gaseous effluents affect humans:

- external radiation from an airborne plume of radioactivity;
- internal radiation from inhalation of airborne radioactivity;
- external radiation from deposition of radioactive effluents on soil;
- ambient (direct) radiation from contained sources at the facility;
- internal radiation from consumption of vegetation containing radioactivity deposited on vegetation or absorbed from the soil due to ground deposition of radioactive effluents; and,
- internal radiation from consumption of milk and meat containing radioactivity deposited on forage that is eaten by cattle and other livestock.

In addition, ambient (direct) radiation emitted from contained sources of radioactivity at the NEF contributes to radiation exposure in the vicinity of the NEF. Radioactive uranium contained in the plant systems accounts for the majority of this "sky shine" radiation exposure immediately adjacent to the NEF. Smaller amounts of ambient radiation result from low-level radioactive waste stored at the site prior to shipping and disposal.

To the extent possible, the radiological dose impact on humans is based on direct measurements of radiation and radioactivity in the environment. When NEF-related activity is detected in samples that represent a plausible exposure pathway, the resulting dose from such exposure is assessed (see Appendix A). However, the operation of the NEF results in releases of only small amounts of radioactivity, and, as a result of dilution in the atmosphere, even the most sensitive radioactivity measurement and analysis techniques cannot usually detect these tiny amounts of radioactivity above that which is naturally present in the environment. Therefore, radiation doses are calculated using radioactive effluent release data and dose calculations that are based on very conservative models that tend to result in over-estimates of resulting dose.

NEF personnel perform these dose calculations based on methodology set forth by the NRC in Regulatory Guide 1.109 (Reference 17). It should be emphasized that because of the very conservative assumptions made in the computer code calculations, the maximum hypothetical dose to an individual is considerably higher than the dose that would actually be received by a real individual.

After dose calculations are performed, the results are compared to the federal dose limits for the public. The two federal agencies that are charged with the responsibility of protecting the public from radiation and radioactivity are the Nuclear Regulatory Commission (NRC) and The Environmental Protection Agency (EPA).

The NRC, in 10CFR 20.1301 (Reference 9) limits the levels of radiation to unrestricted areas resulting from the possession or use of radioactive materials such that they limit any individual to a dose of:

- less than or equal to 100 mrem per year to the total body.

Conformance to these guidelines ensures that uranium enrichment plant effluents are maintained as far below the legal limits as is reasonably achievable.

The EPA, in 40 CFR 190.10, Subpart B (Reference 18), sets forth the environmental standards for the uranium fuel cycle. During normal operation, the annual dose to any member of the public from the entire uranium fuel cycle shall be limited to:

- less than or equal to 25 mrem per year to the total body;
- less than or equal to 75 mrem per year to the thyroid; and,
- less than or equal to 25 mrem per year to any other organ.

The summary of the radiological impact for the NEF for this reporting period and comparison with the EPA dose limits and guidelines, as well as a comparison with natural/man-made radiation levels, is presented in Section 3 of this report.

The third stage of assessing releases to the environment is the Radiological Environmental Monitoring Program (REMP). The description and results of the REMP at the NEF during this reporting period is discussed in Section 2 of this report.

2. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

2.1. Monitoring Results

The Radiological Environmental Monitoring Program (REMP) at the NEF was first initiated in September 2006 and continued through 2008, in the form of a pre-operational monitoring program prior to bringing the facility on-line. In February of 2009 less than 50kg of Uranium Hexafluoride was brought onto the NEF for testing centrifuges during assembly.

Examples of radiation and radioactivity levels measured during the 2009 reporting period are:

- Airborne Radioactivity Particulate Concentration:
    - Gross Beta – 2.17E-14 µCi/ml;
    - Gross Alpha – 2.31 E-15 µCi/ml;
    - ^{234}U – 1.17E-16 µCi/ml (composite);
    - ^{235}U – 2.58E-17 µCi/ml (composite);
    - ^{238}U – 1.31E-16 µCi/ml (composite);
    - $^{Total}U$ – 2.73E-16 µCi/ml (composite).
- Ambient Radiation Thermoluminescent Dosimeters (TLDs): 82 - 92 mR/yr;
- Vegetation Radioactive Uranium Concentrations:
    - ^{234}U – 1.12E-08 µCi/g;
    - ^{235}U – 1.28E-09 µCi/g;
    - ^{238}U – 1.11E-08 µCi/g.
- Soil Radioactive Uranium Concentrations:
    - ^{234}U – 2.00E-07 µCi/g;
    - ^{235}U – 3.07E-08 µCi/g;
    - ^{238}U – 1.86E-07 µCi/g.
- Groundwater Radioactive Uranium Concentrations:
    - ^{234}U – 1.51E-08 µCi/ml;
    - ^{235}U – 7.07E-10 µCi/ml;
    - ^{238}U – 9.42E-09 µCi/ml.

- Site Stormwater Detention Basin Surface Water:
    - ^{234}U – 6.63E-10 µCi/ml;
    - ^{235}U – 7.58E-11 µCi/ml;
    - ^{238}U – 2.06E-10 µCi/ml.
- Site Stormwater Detention Basin Sediment:
    - ^{234}U – 3.26E-07 µCi/ml;
    - ^{235}U – 2.62E-08 µCi/ml;
    - ^{238}U – 2.77E-07 µCi/ml.
- Domestic Wastewater (Sewage):
    - ^{234}U – 2.59E-09 µCi/ml;
    - ^{235}U – 3.07E-10 µCi/ml;
    - ^{238}U – 2.08E-09 µCi/ml.

Information from the pre-operational phase is being used as a basis for evaluating changes in radiation and radioactivity levels in the vicinity of the plant following plant operation. Prior to initial plant startup the NEF implemented a comprehensive operational environmental monitoring program. This program (Reference 20) has provided information on radioactivity and radiation levels in the environment for the purpose of:

- demonstrating that doses to the general public and levels of radioactivity in the environment are within established limits and legal requirements;
- monitoring the transfer and long-term buildup of specific radionuclides in the environment to revise the monitoring program and environmental models in response to changing conditions;
- checking the condition of the plant's operation, the adequacy of operation in relation to the adequacy of containment, and the effectiveness of effluent treatment so as to provide a mechanism of determining unusual or unforeseen conditions and, where appropriate, to trigger special environmental monitoring studies;
- assessing the dose equivalent to the general public and the behavior of radioactivity released during the unlikely event of an accidental release; and
- determining whether or not the radiological impact on the environment and humans is significant.

The NRC requires that the NEF provide monitoring of the plant environs for radioactivity that will be released as a result of normal operations, including anticipated operational occurrences, and from postulated accidents. The NRC has established guidelines that specify an acceptable monitoring program. The NEF Radiological Environmental Monitoring Program was designed to meet and exceed these guidelines. Guidance contained in the NRC's Radiological Assessment Branch Technical Position on Environmental Monitoring (Reference 21) has been used to implement the program. In addition, the program has incorporated the provisions of an agreement made with the State of New Mexico in DP-1481 (Reference 22).

2.1.1. Pre-Operational vs. 2009 Monitoring Results Analysis

Ambient Radiation – Pre-operational data for ambient radiation consist of Thermoluminescent Dosimeter (TLD) results for 2008 only. Gaps in these data prior to 2008 are discussed in the 2008 NEF Annual REMP Report. The TLD locations for 2009 are shown in Figure 2.2-1.

At monitoring stations that were fully sampled, ambient Beta/Gamma radiation in 2009 decreased from pre-operational levels between 2 and 12 mR/yr. Monitoring location 12 saw an increase of 21 mR/yr in 2009 (Table 2.1.1-1). This location was not sampled for one quarter in 2008, resulting in a lower annualized dose for this location in 2008. Monitoring location 6 was not sampled for one quarter in 2009, resulting in a lower annualized dose for this location in 2009.

Although the difference in pre-operational and 2009 ambient radiation data was significant, ambient radiation decreased in 2009. Therefore, no dose to the public was calculated.

Table 2.1.1-1, Pre-operational vs. 2009 Ambient Radiation

TLD Location	Annualized Dose (mR/Yr)			
	Pre-Operational		2009	
	Beta/Gamma	Neutron	Beta/Gamma	Neutron
1	93	ND	85	ND
2	95	ND	89	ND
3	94	ND	92	ND
4	94	ND	90	ND
5	93	ND	86	ND
6	94	ND	62	ND
7	94	ND	82	ND
8	91	ND	86	ND
9	94	ND	86	ND
10	97	ND	86	ND
11	99	ND	87	ND
12	68	ND	89	ND
13	93	ND	85	ND
14	92	ND	87	ND

TLD Location	Annualized Dose (mR/Yr)			
	Pre-Operational		2009	
	Beta/Gamma	Neutron	Beta/Gamma	Neutron
15	89	ND	84	ND
16	92	ND	88	ND

Airborne Particulate Radiation – Pre-operational data for airborne particulate radiation consist of gross alpha, gross beta, and isotopic uranium results for 2008 only. Gaps in these data prior to 2008 are discussed in the 2008 NEF Annual REMP Report and in Appendix B. The air monitor locations for 2009 are shown in Figure 2.2-1 and Figure 2.2-2.

Gross beta radiation decreased in 2009. All other measures of airborne particulate radiation in 2009 increased, including gross alpha, isotopic, and total uranium radiation (Tables 2.1.1-2 – 2.1.1-4). However, data for $^{235/236}U$ are expected to be overestimated because in some cases, individual results were below the sample MDA (minimum detectable activity) and the sample-specific MDAs were used to calculate average (on a per air monitor basis) or total (on an annual or ^{total}Uranium basis) activities.

Although elevated, differences between pre-operational and 2009 airborne particulate radiation data were not significant, indicating no increase in radiation exposure to the public. The gross alpha; gross beta; and ^{234}U, ^{235}U, and ^{238}U activities arise from naturally occurring radionuclides such as radon decay daughter products. Thus, dose calculations were not performed.

Table 2.1.1-2, Pre-operational vs. 2009 Airborne Particulate Gross Alpha/Beta Radiation (μCi/mL)

Air Monitor	Gross Alpha		Gross Beta	
	Pre-operational	2009	Pre-operational	2009
AP2	1.22E-15	2.23E-15	1.38E-14	2.16E-14
AP3	3.22E-15	1.91E-15	5.25E-14	2.10E-14
AP4	1.37E-15	2.11E-15	1.30E-14	2.03E-14
AP5	1.74E-15	2.62E-15	1.54E-14	2.32E-14
AP6	2.27E-15	2.34E-15	6.49E-14	2.19E-14
AP7	1.82E-15	2.64E-15	1.73E-14	2.24E-14
Average	1.94E-15	2.31E-15	2.95E-14	2.17E-14

Table 2.1.1-3, Pre-operational vs. 2009 Airborne Particulate Isotopic Uranium Radiation (µCi/mL)

	^{234}U Composite (µCi/ml)		$^{235/236}$U Composite (µCi/ml)		^{238}U Composite (µCi/ml)	
Air Monitor	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
AP2	5.59E-17	9.49E-17	8.52E-18*	3.82E-17*	5.94E-17	1.21E-16
AP3	6.89E-17*	1.28E-16	9.74E-18*	2.08E-17*	9.45E-17	1.47E-16
AP4	6.19E-17	1.35E-16	9.27E-18*	1.89E-17*	7.45E-17	1.18E-16
AP5	5.05E-17	9.45E-17	7.69E-18*	1.86E-17*	4.94E-17	8.22E-17
AP6	5.37E-17	1.12E-16	9.27E-18*	1.93E-17*	5.71E-17	1.14E-16
AP7	2.36E-16	1.3E-16	4.23E-17*	2.67E-17*	3.12E-16	1.03E-16
Average	8.79E-17*	1.16E-16	1.45E-17*	2.37E-17*	1.08E-16	1.14E-16

* = Is calculated using data adjusted for MDA (minimum detectable activity). See Appendix B.

Table 2.1.1-4, Pre-operational vs. 2009 Airborne Particulate Total Uranium Radiation

Air Monitor	^{Total}U Composite (µCi/ml)	
	Pre-operational	2009
AP2	1.24E-16	2.54E-16
AP3	1.56E-16	2.96E-16
AP4	1.38E-16	2.72E-16
AP5	1.08E-16	1.95E-16
AP6	1.20E-16	2.45E-16
AP7	5.90E-16	2.60E-16
Average	2.06E-16	2.54E-16

Vegetation Radioactivity – Pre-operational data for vegetation radiation consist of isotopic uranium results for 2008 only. Gaps in data prior to 2008 are discussed in the 2008 NEF Annual REMP Report and in Appendix B. The sampling locations for 2009 are shown in Figure 2.2-2 and 2.2-3.

All measures of vegetation radiation in 2009 decreased (Table 2.1.1-5). Data for $^{235/236}$U are expected to be overestimated because in some cases, individual results were below the sample MDA (minimum detectable activity) and the sample-specific MDAs were used to calculate average isotopic uranium activities.

Although differences between pre-operational and 2009 vegetation radiation data were significant, radiation present in vegetation samples decreased. Thus, dose calculations were not performed.

Table 2.1.1-5, Pre-operational vs. 2009 Vegetation Radiation (µCi/g)

Sample location	^{234}U		$^{235/236}U$		^{238}U	
	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
On-Site North	2.39E-08	9.92E-09	9.11E-09	4.67E-09	1.17E-08	8.08E-09
On-Site Northeast	2.01E-08	9.95E-09	9.07E-09	4.23E-09	2.78E-08	8.17E-09
On-Site East	1.64E-08	1.11E-08	1.03E-08	3.43E-09	1.06E-08	1.30E-08
On-Site Southeast	1.95E-08	1.49E-08	1.23E-08	3.75E-09	3.66E-08	1.39E-08
On-Site South	2.55E-08	1.62E-08	1.20E-08	5.95E-09	4.60E-08	3.47E-08
On-Site Southwest	1.99E-08	9.07E-09	9.31E-09	2.88E-09	2.30E-08	1.08E-08
On-Site West	2.76E-08	9.91E-09	1.21E-08	5.11E-09	6.33E-08	1.60E-08
On-Site Northwest	1.32E-08	8.48E-09	1.05E-08	4.71E-09	2.29E-08	1.13E-08
Off-Site North	2.78E-08	2.21E-08	9.86E-09	5.25E-09	1.70E-08	3.10E-08
Off-Site Northeast	8.91E-09	8.65E-09	1.43E-08	4.82E-09	2.40E-08	1.53E-08
Off-Site East	2.39E-08	9.48E-09	1.43E-08	3.28E-09	1.73E-08	9.37E-09
Off-Site Southeast	2.89E-08	1.21E-08	1.24E-08	4.67E-09	4.16E-08	1.98E-08
Off-Site South	2.73E-08	1.22E-08	1.41E-08	3.30E-09	5.60E-08	2.87E-08
Off-Site Southwest	1.82E-08	6.95E-09	1.26E-08	4.87E-09	2.23E-08	9.68E-09
Off-Site West	2.48E-08	8.96E-09	1.50E-08	4.00E-09	3.29E-08	9.92E-09
Off-Site Northwest	1.96E-08	9.28E-09	9.20E-09	5.29E-09	1.47E-08	2.11E-08
Average	**2.16E-08**	**1.12E-08**	**1.17E-08**	**4.39E-09**	**2.92E-08**	**1.63E-08**

Soil Radioactivity - Pre-operational data for soil radiation consist of isotopic uranium results for 2008 only. Gaps in data prior to 2008 are discussed in the 2008 NEF Annual REMP Report and in Appendix B. The sampling locations for 2009 are shown in Figure 2.2-2 and 2.2-3.

All measures of soil radiation in 2009 decreased (Table 2.1.1-6). Data for $^{235/236}U$ are expected to be overestimated because in some cases, individual results were below the sample MDA (minimum detectable activity) and the sample-specific MDAs were used to calculate average isotopic uranium activities.

Although some differences between pre-operational and 2009 soil radiation data were significant, radiation in soil samples decreased. Thus, dose calculations were not performed.

Table 2.1.1-6, Pre-operational vs. 2009 Soil Radiation (µCi/g)

Sample location	^{234}U		$^{235/236}U$		^{238}U	
	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
On-Site North	3.58E-07	2.16E-07	7.88E-08	7.13E-08	2.19E-07	2.08E-07
On-Site Northeast	2.99E-07	2.60E-07	6.95E-08	8.12E-08	2.80E-07	2.86E-07
On-Site East	3.18E-07	2.36E-07	8.49E-08	7.47E-08	2.46E-07	2.13E-07

Sample location	^{234}U		$^{235/236}U$		^{238}U	
	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
On-Site Southeast	3.38E-07	2.31E-07	8.39E-08	7.42E-08	3.17E-07	2.36E-07
On-Site South	3.54E-07	2.37E-07	9.19E-08	6.48E-08	2.46E-07	1.78E-07
On-Site Southwest	3.51E-07	2.58E-07	9.61E-08	6.31E-08	3.03E-07	2.70E-07
On-Site West	3.94E-07	2.22E-07	8.53E-08	8.50E-08	2.44E-07	1.59E-07
On-Site Northwest	3.63E-07	2.59E-07	8.31E-08	6.00E-08	2.42E-07	1.80E-07
Off-Site North	4.96E-07	3.65E-07	1.12E-07	8.52E-08	5.40E-07	2.96E-07
Off-Site Northeast	7.68E-07	4.04E-07	8.05E-08	6.09E-08	5.70E-07	4.44E-07
Off-Site East	4.01E-07	3.80E-07	1.35E-07	9.10E-08	5.44E-07	3.81E-07
Off-Site Southeast	4.92E-07	3.82E-07	7.60E-08	7.84E-08	4.27E-07	3.31E-07
Off-Site South	2.50E-07	3.89E-07	5.93E-08	5.83E-08	3.43E-07	3.69E-07
Off-Site Southwest	4.11E-07	3.62E-07	1.16E-07	5.52E-08	3.48E-07	4.00E-07
Off-Site West	4.67E-07	3.35E-07	9.82E-08	8.19E-08	4.94E-07	3.23E-07
Off-Site Northwest	4.04E-07	3.90E-07	7.63E-08	5.34E-08	5.75E-07	3.57E-07
Average	**4.04E-07**	**3.08E-07**	**8.92E-08**	**7.12E-08**	**3.71E-07**	**2.89E-07**

Groundwater Radioactivity - Pre-operational data for groundwater radiation consist of isotopic uranium results for 2008 only. Gaps in data prior to 2008 are discussed in the 2008 NEF Annual REMP Report and in Appendix B. The sampling locations for 2009 are shown in Figure 2.2-3.

All measures of groundwater radiation in 2009 increased (Table 2.1.1-7). Data for $^{235/236}U$ are expected to be overestimated because in some cases, individual results were below the sample MDA (minimum detectable activity) and the sample-specific MDAs were used to calculate average isotopic uranium activities.

Although all uranium isotopes were elevated in groundwater in 2009, only differences between pre-operational and 2009 ^{234}U data were significant. The significant increase in ^{234}U in groundwater is due to one sample form Monitoring Well #5 taken in the third quarter of 2009. This sample was approximately 3 to 10 times greater in ^{234}U activity than previous samples collected in 2008 and 2009 (Table 2.10-1). The fourth quarter 2009 sample from monitoring well #5 displayed similar activity to previous samples. It is believed that the third quarter sample result was anomalous and this well will be closely monitored in future sampling events to verify this conclusion. Thus, dose calculations were not performed.

Table 2.1.1-7, Pre-operational vs. 2009 Groundwater Radiation (µCi/mL)

Monitoring Well	^{234}U		$^{235/236}U$		^{238}U	
	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
4	1.34E-08	1.51E-08	5.45E-10	7.07E-10	8.35E-09	9.42E-09

Monitoring Well	^{234}U		$^{235/236}U$		^{238}U	
	Pre-operational	2009	Pre-operational	2009	Pre-operational	2009
5	5.38E-10	7.59E-10	1.52E-10	1.20E-10	3.49E-10	6.03E-10
10	1.45E-08	1.58E-08	3.45E-10	3.49E-10	4.12E-09	2.82E-09
20	NS	1.69E-08	NS	5.72E-10	NS	5.99E-09
Average	**9.45E-09**	**1.21E-08**	**3.47E-10**	**4.37E-10**	**4.27E-09**	**4.71E-09**

NS = not sampled

2.2. Environmental Monitoring Locations

Sampling locations have been established by considering meteorology, population distribution, hydrology, and land use characteristics of the Eunice area. Sample locations were primarily selected on the basis of where the highest predicted environmental concentrations would occur.

The environmental sampling media collected in the vicinity of NEF during this reporting period included air particulate filters, vegetation, soil, groundwater, surface water, pond sediment, and domestic wastewater samples. The sampling locations are also displayed on the maps shown in Figures 2.2-1 to 2.2-3.

Air sampling stations are, or will be, as listed below:

- AP01, a future sample point, will be located next to the Treated Effluent Evaporative Basin (TEEB) and will begin operation upon plant startup to measure for particulate radioactivity that may be re-suspended into the air from sediment layers when the basin is dry; Note that the plant does not intend to use this basin, however, the air sampling station will be placed here in the event that the basin is needed if the plant decides to increase production.
- AP02 is located in the southwest sector of the plant along the perimeter fence;
- AP03 is located in the south sector of the plant along the perimeter fence;
- AP04 is located in the east sector of the plant along the perimeter fence;
- AP05 is located offsite to the west of the plant near a residential area;
- AP06 is located offsite to the north of the facility near a business known as the Wallach Ranch.
- AP07, a control sample station, is established at BLK A-46 Andrews County WR #2836444, an off-site location beyond 5 miles from the site, in Texas.

The six (6) environmental air samplers are intended to operate on a continuous basis with air filter retrieval for gross alpha and beta analysis on a biweekly basis (or sooner if necessitated by dust load). Each sampler is equipped with a radio telemetry unit (RTU) to record and relay

data including power status, and door opening (access) events. Accumulated flow data is gathered during the biweekly air filter exchange.

Continuous air monitors consist of a RADeCO model AVS-28A pump, a RADeCO model AVT-200 air volume totalizer, and a radio telemetry unit (RTU). Flow rate, total flow, and power status are recorded by the AVT-200. These data are then transmitted and recorded via the RTU. Sampling entails exchanging a clean 47-mm filter in the sample holder of the AVS-28A for one that has been exposed to continuous air samples for approximately two weeks. The filters are sent to an analytical laboratory for analysis.

The radiation monitoring locations for the environmental TLDs are shown in Figure 2.2-1. These TLDs are changed out quarterly.

Routine collection and analysis of soil, vegetation, groundwater, surface water, sediment, and domestic waste samples were performed by NEF personnel. The samples were shipped to an off-site laboratory for analysis.

The frequency, types, minimum number of samples, and maximum lower limits of detection (LLD) for the analytical measurements, are specified in the NEF Environmental Report.

The radiological environmental sampling locations will be reviewed annually, and modified if necessary. The accuracy of the data obtained through the NEF's Radiological Environmental Monitoring Program is ensured through a comprehensive Quality Assurance (QA) program. The NEF's QA program has been established to ensure confidence in the measurements and results of the radiological monitoring program through:

- Regular surveillances of the sampling and monitoring program;
- An periodic audit of the analytical laboratory by the sponsor companies;
- Participation in cross-check programs;
- Use of blind duplicates for comparing separate analyses of the same sample; and,
- Spiked sample analyses by the analytical laboratory.
- QA audits and inspections of the Radiological Environmental Monitoring Program are performed by the NRC and by American Nuclear Insurers (ANI).

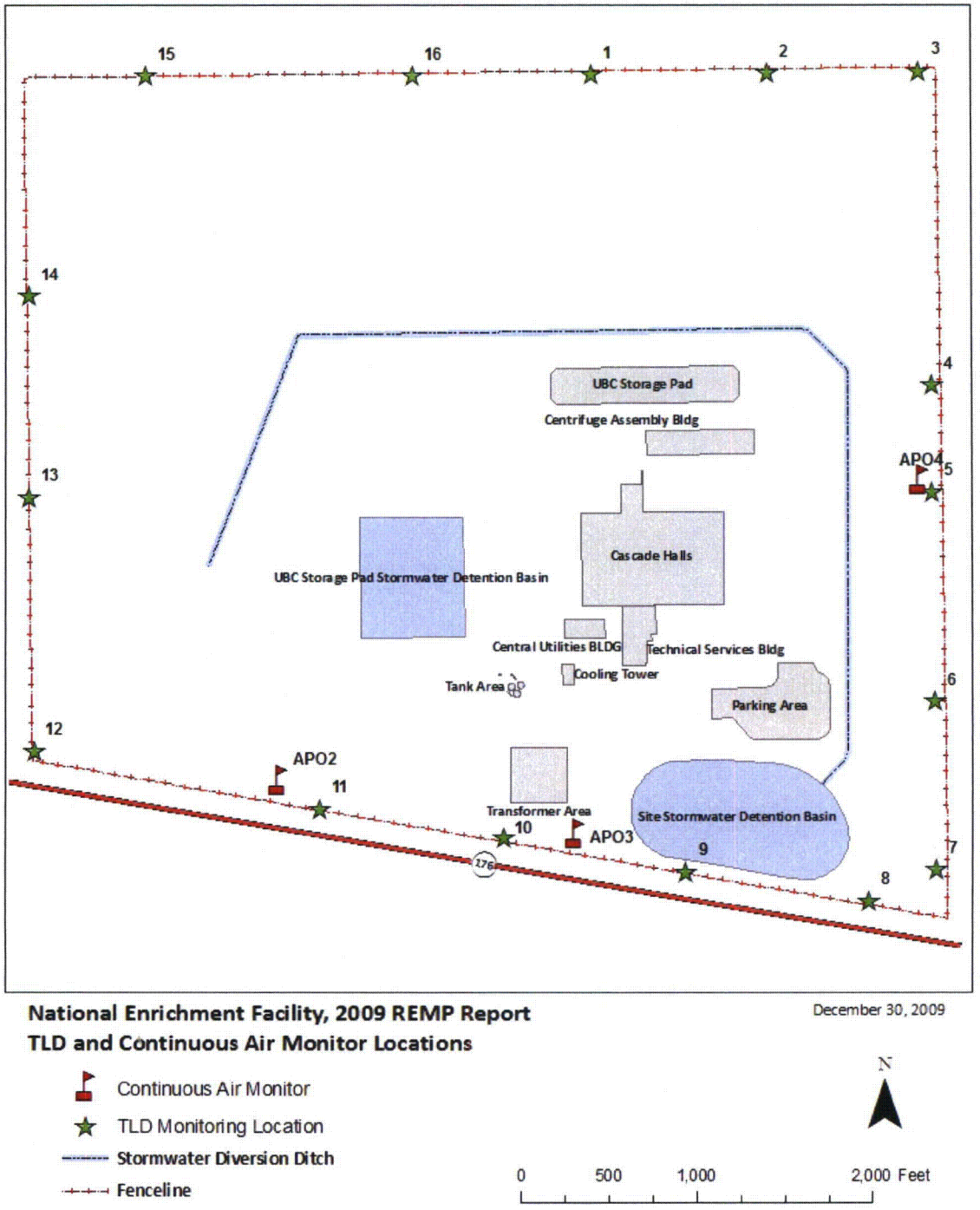

Figure 2.2-1, TLD and Continuous Air Monitor Locations

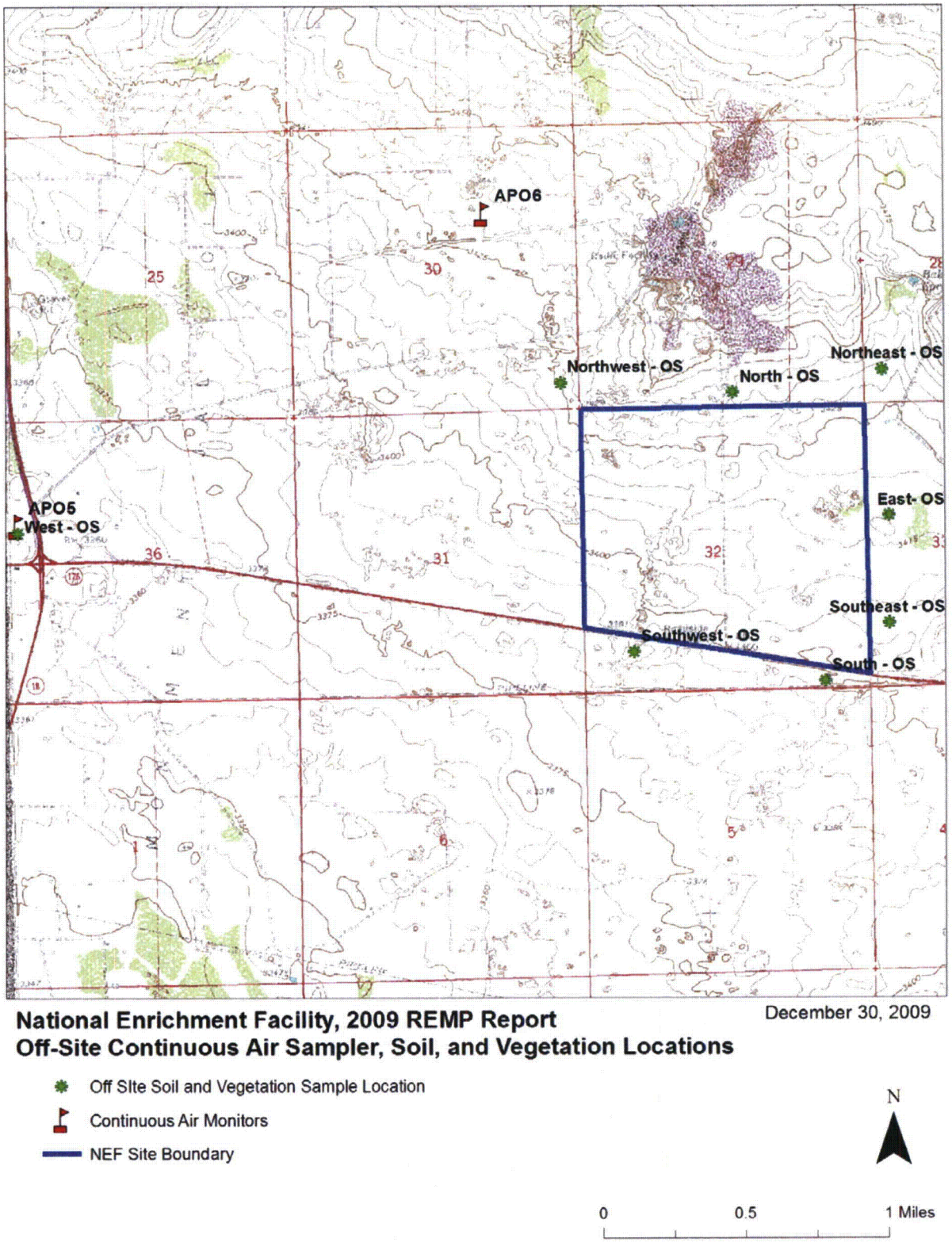

Figure 2.2-2, Offsite Continuous Air Sampler, Soil and Vegetation Sampling Locations

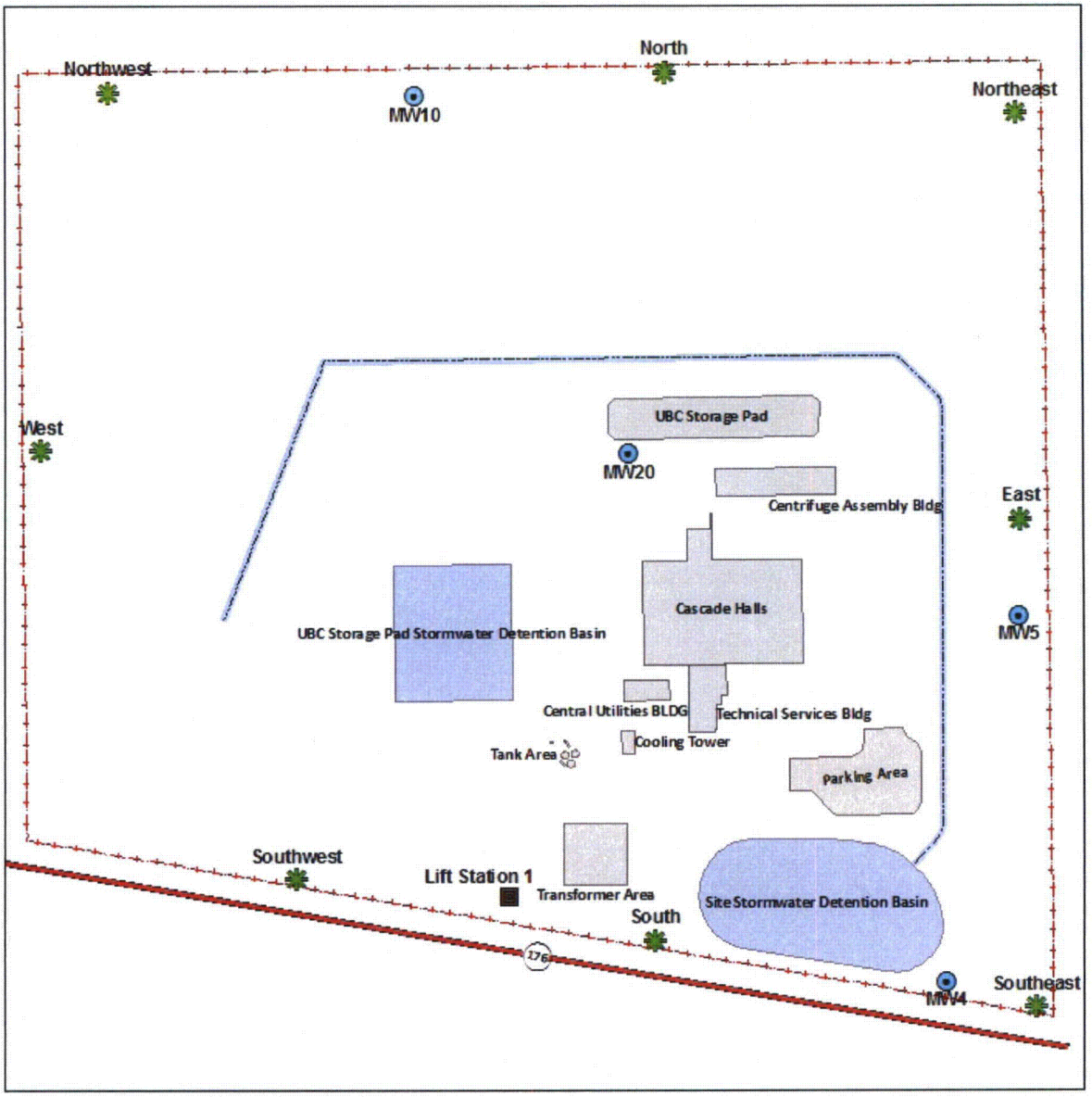

Figure 2.2-3, Monitoring Well, On-Site Soil, and On-Site Vegetation Sampling Locations

2.3. Interpretation of Radioactivity Analysis Results

Comparison of baseline data to data collected in 2009 for TLDs, continuous particulate air monitoring, soil, vegetation, and groundwater indicates that activity levels in 2009 media were either below or not statistically different than baseline data. Significant differences were determined using a one-tailed t-test.

2.4. Ambient Radiation Measurements

Ambient radiation exposure in the vicinity of the NEF is primarily measured by posting environmental thermoluminescent dosimeters (TLDs) at given monitoring locations and retrieving the TLDs after a specified time period. The NEF posts both beta/gamma and neutron environmental TLDs. The TLDs are then taken to a laboratory and processed to determine the total amount of radiation exposure received over the period. Although TLDs can be used to monitor radiation exposure for short time periods, environmental TLDs are posted for periods of three months. Such TLD monitoring yields average exposure rate measurements over a relatively long time period. The NEF environmental TLD monitoring program is based on a quarterly (three month) posting period.

The NEF 2009 ambient radiation environmental program included a TLD monitoring array consisting of sixteen (16) outdoor TLD monitoring stations located on the fence line surrounding the facility and one (1) control station. The control TLD was located inside a metal cabinet in trailer 10-5 in the NEF trailer complex for the first six (6) months of 2009 and at the off-site control continuous air monitoring location (AP07) for the final six months of 2009. At each outdoor monitoring station, two (2) TLDs are hung at chest level. The first TLD (Panasonic TLD-XBGN dosimeter) monitors beta/gamma radiation. The second TLD (Panasonic TLD-XBGN/TE dosimeter) monitors neutrons in the thermal to 4.5 MeV energy range. The control station houses one TLD to monitor gamma radiation. The TLD locations for 2009 are shown in Figure 2.2-1.

Of the 64 pairs of TLDs (16 locations * 4 quarters) posted during this reporting period, 63 pairs were retrieved and processed. Those TLDs missing from their monitoring location were lost to unknown causes and their absence is discussed in Appendix B.

Annualized results for 2009 for TLDs located along the fence line are presented in Table 2.4-1. Results are additionally corrected for the control dose, and shows side-by-side pre-operational annual doses with operational annual doses. Annualized gamma exposure rates for complete years measured at the fence line locations ranged from 82 to 92 mR/yr. Annual neutron exposure rates measured at the fence line locations were all less than the minimum detectable activity.

Quarterly gamma and neutron doses, corrected for the control dose, are reported in Table 2.4-2.

Table 2.4-1, 2009 Annualized Gamma and Neutron Doses

TLD Location	Annualized Dose (mR/Yr)	
	Beta/Gamma	Neutron
1	85	ND
2	89	ND
3	92	ND
4	90	ND
5	86	ND
6	62	ND
7	82	ND
8	86	ND
9	86	ND
10	86	ND
11	87	ND
12	89	ND
13	85	ND
14	87	ND
15	84	ND
16	88	ND

ND = not detected; NS = not sampled

Table 2.4-2, Quarterly Gamma/Neutron Doses (Corrected for Control)

TLD Location	2009 Beta/Gamma Doses per Quarter (mR)				2009 Neutron Doses per Quarter (mR)			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1	3	5	5	2	ND	ND	ND	ND
2	5	5	6	3	ND	ND	ND	ND
3	5	6	7	4	ND	ND	ND	ND
4	6	5	5	4	ND	ND	ND	ND
5	4	5	4	3	ND	ND	ND	ND
6	NS	4	4	3	ND	ND	ND	ND
7	5	4	2	1	ND	ND	ND	ND
8	5	4	4	3	ND	ND	ND	ND
9	4	4	5	3	ND	ND	ND	ND
10	3	4	5	4	ND	ND	ND	ND
11	4	4	4	5	ND	ND	ND	ND
12	7	4	6	2	ND	ND	ND	ND
13	4	4	4	3	ND	ND	ND	ND
14	7	4	5	1	ND	ND	ND	ND
15	4	3	5	2	ND	ND	ND	ND

TLD Location	2009 Beta/Gamma Doses per Quarter (mR)				2009 Neutron Doses per Quarter (mR)			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
16	5	4	5	4	ND	ND	ND	ND

ND = not detected; NS = not sampled

2.5. Air Particulate Filter Radioactivity Analyses

Airborne particulate radioactivity is sampled by drawing a stream of air through a glass fiber filter that has a very high efficiency for collecting airborne particulates. These samplers are operated continuously, and the resulting filters are collected bi-weekly for analysis. Bi-weekly filter samples are analyzed for gross alpha and gross beta radioactivity, and the filters are then composited on a quarterly basis for each location for isotopic uranium analysis. The NEF uses this technique to monitor six (6) locations (AP2 – AP7). Each of the sample locations is identified on Figure 2.2-1.

There were a few instances where power was lost during the course of the sampling period at some of the air sampling stations, resulting in lower than normal sample volumes. All of these discrepancies are noted in Appendix B.

The results of the analyses performed on these filter samples are summarized in Tables 2.5-1 – 2.5-3. The values in Table 2.5-1 are the averages of the weekly values for the sampling stations. The values in Tables 2.5-2 and 2.5-3 are the averages of the composite samples.

All air particulate filter radioactivity analysis results for 2009, including sample volumes, associated error (uncertainty), and minimum detectable activity (MDA) have been included in Appendix D.

Table 2.5-1, Air Monitoring Station Gross Alpha/Beta Activities (μCi/mL)

Air Monitor	Gross Alpha	Gross Beta
AP2	2.23E-15	2.16E-14
AP3	1.91E-15	2.10E-14
AP4	2.11E-15	2.03E-14
AP5	2.62E-15	2.32E-14
AP6	2.34E-15	2.19E-14
AP7	2.64E-15	2.24E-14
Average	2.31E-15	2.17E-14

Table 2.5-2, Isotopic Uranium Composite Sample Results (µCi/mL)

Air Monitor	Sampling Quarter	^{234}U			$^{235/236}U$			^{238}U		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP2	1	1.05E-16	4.14E-17	2.83E-17	< MDA	1.45E-17	1.91E-17	1.55E-16	5.08E-17	1.81E-17
AP3	1	1.63E-16	4.23E-17	1.81E-17	< MDA	9.22E-18	1.37E-17	1.95E-16	4.74E-17	1.35E-17
AP4	1	1.55E-16	3.96E-17	4.71E-18	< MDA	9.75E-18	1.16E-17	1.74E-16	4.29E-17	9.38E-18
AP5	1	8.53E-17	2.75E-17	1.40E-17	< MDA	6.18E-18	1.39E-17	8.80E-17	2.80E-17	1.45E-17
AP6	1	1.13E-16	3.26E-17	1.34E-17	1.24E-17	1.06E-17	9.83E-18	1.03E-16	3.04E-17	7.93E-18
AP7	1	1.03E-16	3.01E-17	9.96E-18	8.15E-18	8.23E-18	5.52E-18	1.10E-16	3.11E-17	4.46E-18
AP2	2	1.10E-16	7.05E-17	8.58E-17	< MDA	3.10E-17	5.78E-17	1.19E-16	6.75E-17	4.66E-17
AP3	2	1.10E-16	4.61E-17	2.99E-17	< MDA	1.45E-17	2.69E-17	1.37E-16	5.13E-17	1.85E-17
AP4	2	1.08E-16	4.44E-17	2.09E-17	< MDA	1.95E-17	2.20E-17	1.08E-16	4.43E-17	1.77E-17
AP5	2	9.23E-17	4.28E-17	3.09E-17	< MDA	2.36E-17	3.09E-17	1.01E-16	4.47E-17	2.90E-17
AP6	2	1.07E-16	4.05E-17	8.62E-18	< MDA	8.16E-18	1.83E-17	1.30E-16	4.51E-17	8.59E-18
AP7	2	1.76E-16	8.07E-17	4.89E-17	< MDA	4.26E-17	4.99E-17	5.50E-17	4.40E-17	4.87E-17
AP2	3	5.30E-17	3.91E-17	3.09E-17	< MDA	1.67E-17	2.21E-17	1.11E-16	5.78E-17	4.02E-17
AP3	3	1.40E-16	5.16E-17	2.36E-17	1.95E-17	1.97E-17	1.29E-17	1.50E-16	5.38E-17	2.73E-17
AP4	3	1.61E-16	5.44E-17	9.94E-18	< MDA	1.32E-17	1.23E-17	1.23E-16	4.64E-17	9.90E-18
AP5	3	9.51E-17	4.08E-17	2.44E-17	< MDA	9.29E-18	1.23E-17	5.86E-17	3.12E-17	2.01E-17
AP6	3	1.15E-16	5.09E-17	1.32E-17	< MDA	2.16E-17	3.29E-17	1.41E-16	5.77E-17	2.96E-17
AP7	3	1.16E-16	5.45E-17	3.00E-17	3.33E-17	3.14E-17	3.15E-17	1.67E-16	6.64E-17	1.48E-17
AP2	4	1.11E-16	7.53E-17	7.59E-17	5.40E-17	5.47E-17	3.58E-17	9.81E-17	6.73E-17	2.89E-17
AP3	4	9.97E-17	4.07E-17	2.28E-17	< MDA	8.94E-18	2.33E-17	1.05E-16	4.14E-17	9.29E-18
AP4	4	1.16E-16	4.69E-17	1.84E-17	< MDA	1.04E-17	2.97E-17	6.83E-17	3.58E-17	2.95E-17
AP5	4	1.06E-16	4.83E-17	3.57E-17	1.71E-17	1.99E-17	1.51E-17	8.13E-17	4.11E-17	2.47E-17
AP6	4	1.12E-16	4.36E-17	9.61E-18	1.34E-17	1.56E-17	1.19E-17	8.24E-17	3.67E-17	1.65E-17
AP7	4	1.24E-16	4.93E-17	1.90E-17	1.54E-17	1.79E-17	1.36E-17	8.15E-17	3.91E-17	2.22E-17

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; < MDA = result below MDA

Table 2.5-3, $^{Total}U$ Composite Sample Results (µCi/mL)

Air Monitor	Sampling Quarter	Result
AP2	1	2.80E-16
AP3	1	3.72E-16
AP4	1	3.40E-16
AP5	1	1.87E-16
AP6	1	2.28E-16
AP7	1	2.22E-16
AP2	2	2.87E-16
AP3	2	2.74E-16
AP4	2	2.38E-16
AP5	2	2.24E-16
AP6	2	2.55E-16
AP7	2	2.81E-16
AP2	3	1.86E-16
AP3	3	3.10E-16
AP4	3	2.97E-16
AP5	3	1.66E-16
AP6	3	2.89E-16
AP7	3	3.16E-16
AP2	4	2.63E-16
AP3	4	2.28E-16
AP4	4	2.14E-16
AP5	4	2.04E-16
AP6	4	2.08E-16
AP7	4	2.21E-16

2.6. Vegetation Radioactivity Analyses

On February 2, April 21, July 7, and October 20, 2009 eight (8) on-site vegetation samples and eight (8) off-site vegetation samples were collected and analyzed for isotopic uranium (^{234}U, $^{235/236}U$ and ^{238}U). It is assumed that the $^{235/236}U$ analyses are all ^{235}U since there is no ^{236}U in natural uranium and there is no man-made ^{236}U in natural samples. Each of the sample locations is identified on Figure 2.2-2 and 2.2-3. See Tables 2.6-1 – 2.6-4 for the sampling results.

Table 2.6-1, First Quarter 2009 Vegetation Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	9.83E-09	6.00E-09	7.09E-09	< MDA*	3.25E-09	7.88E-09	1.28E-08	6.29E-09	3.69E-09
On-Site Northeast	1.61E-08	7.25E-09	5.78E-09	< MDA*	2.56E-09	6.61E-09	1.06E-08	5.72E-09	4.86E-09
On-Site East	1.54E-08	5.95E-09	3.54E-09	< MDA	1.25E-09	3.20E-09	1.21E-08	5.18E-09	3.12E-09
On-Site Southeast	1.81E-08	7.09E-09	4.89E-09	< MDA	6.58E-10	4.50E-09	1.41E-08	6.20E-09	4.87E-09
On-Site South	1.12E-08	5.13E-09	2.80E-09	< MDA	6.08E-10	4.16E-09	2.66E-08	8.44E-09	4.17E-09
On-Site Southwest	8.36E-09	4.35E-09	1.42E-09	< MDA	1.29E-09	1.75E-09	6.07E-09	3.72E-09	2.81E-09
On-Site West	8.48E-09	4.91E-09	5.26E-09	< MDA	4.69E-10	3.77E-09	< MDA	3.52E-09	4.56E-09
On-Site Northwest	7.45E-09	4.06E-09	3.98E-09	< MDA	1.25E-09	3.67E-09	5.45E-09	3.40E-09	3.35E-09
Off-Site North	1.39E-08	5.68E-09	3.91E-09	< MDA	1.87E-09	4.82E-09	1.06E-08	4.75E-09	1.30E-09
Off-Site Northeast	1.24E-08	6.35E-09	5.89E-09	< MDA	1.76E-09	4.50E-09	2.13E-08	8.15E-09	3.63E-09
Off-Site East	< MDA	3.03E-09	4.63E-09	< MDA	1.83E-09	3.31E-09	< MDA	2.71E-09	3.58E-09
Off-Site Southeast	1.09E-08	4.65E-09	3.60E-09	< MDA	2.57E-09	3.32E-09	1.26E-08	4.89E-09	2.22E-09
Off-Site South	1.73E-08	5.11E-09	1.65E-09	1.13E-09	1.31E-09	1.02E-09	1.38E-08	4.49E-09	1.64E-09
Off-Site Southwest	9.16E-09	4.71E-09	4.89E-09	1.75E-09	2.04E-09	1.59E-09	1.32E-08	5.54E-09	4.39E-09
Off-Site West	8.72E-09	3.84E-09	2.68E-09	2.24E-09	2.03E-09	1.21E-09	9.52E-09	3.98E-09	2.36E-09
Off-Site Northwest	4.31E-09	3.51E-09	3.50E-09	< MDA	2.83E-09	4.31E-09	1.40E-08	6.41E-09	3.48E-09

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA; * = MDA above that required by NEF

Table 2.6-2, Second Quarter 2009 Vegetation Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	1.50E-08	9.21E-09	8.65E-09	< MDA*	4.36E-09	7.05E-09	2.03E-08	1.06E-08	7.42E-09
On-Site Northeast	9.97E-09	6.93E-09	5.23E-09	< MDA	3.96E-09	3.78E-09	7.87E-09	6.05E-09	3.05E-09
On-Site East	2.01E-08	1.06E-08	5.87E-09	9.13E-09	7.80E-09	7.24E-09	5.94E-08	1.93E-08	3.42E-09
On-Site Southeast	1.37E-08	8.60E-09	5.84E-09	< MDA*	3.20E-09	8.44E-09	1.05E-08	7.73E-09	8.22E-09
On-Site South	8.51E-09	7.09E-09	7.91E-09	< MDA*	3.29E-09	7.49E-09	6.53E-09	5.92E-09	3.54E-09
On-Site Southwest	1.70E-08	9.67E-09	6.76E-09	< MDA	3.09E-09	4.17E-09	1.10E-08	7.63E-09	5.75E-09

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site West	1.22E-08	7.90E-09	3.30E-09	< MDA*	4.30E-09	6.96E-09	7.28E-09	6.03E-09	3.29E-09
On-Site Northwest	1.71E-08	1.05E-08	9.85E-09	< MDA*	5.00E-09	9.41E-09	1.14E-08	8.64E-09	9.81E-09
Off-Site North	1.15E-08	7.58E-09	5.41E-09	< MDA*	4.15E-09	7.82E-09	< MDA*	6.32E-09	9.06E-09
Off-Site Northeast	1.65E-08	9.79E-09	3.72E-09	< MDA*	6.89E-09	1.02E-08	9.33E-09	7.36E-09	6.32E-09
Off-Site East	2.94E-08	1.23E-08	5.28E-09	< MDA*	6.46E-09	1.09E-08	5.05E-08	1.68E-08	6.85E-09
Off-Site Southeast	1.80E-08	9.85E-09	6.65E-09	7.31E-09	6.86E-09	7.00E-09	1.77E-08	9.81E-09	7.36E-09
Off-Site South	< MDA*	6.48E-09	9.43E-09	< MDA*	6.29E-09	9.62E-09	8.31E-09	6.41E-09	6.69E-09
Off-Site Southwest	1.72E-08	9.34E-09	7.36E-09	4.16E-09	4.84E-09	3.76E-09	1.40E-08	8.33E-09	6.75E-09
Off-Site West	< MDA*	5.44E-09	6.57E-09	< MDA	2.69E-09	3.64E-09	1.16E-08	7.39E-09	5.88E-09
Off-Site Northwest	8.09E-09	6.39E-09	7.23E-09	< MDA*	3.92E-09	7.39E-09	8.24E-09	6.36E-09	6.64E-09

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA; * = MDA above that required by NEF

Table 2.6-3, Third Quarter 2009 Vegetation Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	1.33E-08	8.98E-09	7.48E-09	< MDA	3.52E-10	4.62E-09	5.50E-09	5.56E-09	3.73E-09
On-Site Northeast	7.49E-09	6.61E-09	7.18E-09	< MDA	3.27E-09	4.43E-09	6.59E-09	5.97E-09	3.57E-09
On-Site East	1.03E-08	8.12E-09	9.16E-09	< MDA	3.46E-09	4.68E-09	1.18E-08	8.58E-09	8.41E-09
On-Site Southeast	< MDA*	6.69E-09	1.07E-08	< MDA	4.17E-10	5.47E-09	< MDA*	6.64E-09	9.82E-09
On-Site South	1.34E-08	9.50E-09	1.20E-08	< MDA*	4.80E-09	1.14E-08	1.54E-08	9.43E-09	7.16E-09
On-Site Southwest	< MDA*	7.40E-09	1.06E-08	< MDA	4.01E-09	5.41E-09	< MDA*	7.38E-09	1.13E-08
On-Site West	1.33E-08	1.01E-08	1.26E-08	< MDA*	6.49E-10	8.81E-09	< MDA*	5.47E-09	1.08E-08
On-Site Northwest	9.49E-09	7.70E-09	7.73E-09	< MDA*	6.19E-09	9.53E-09	< MDA*	5.77E-09	7.69E-09
Off-Site North	4.64E-08	1.72E-08	7.26E-09	< MDA*	7.52E-09	8.96E-09	7.40E-08	2.26E-08	8.05E-09
Off-Site Northeast	8.43E-09	7.21E-09	6.69E-09	< MDA*	3.62E-09	8.25E-09	1.94E-08	1.12E-08	8.68E-09
Off-Site East	1.81E-08	1.08E-08	8.72E-09	< MDA	3.58E-09	4.83E-09	1.99E-08	1.12E-08	6.66E-09
Off-Site Southeast	1.08E-08	7.97E-09	8.48E-09	< MDA*	7.73E-10	8.66E-09	1.40E-08	8.80E-09	5.97E-09
Off-Site South	8.94E-09	7.07E-09	7.99E-09	< MDA*	5.28E-09	6.97E-09	5.87E-09	5.52E-09	5.63E-09

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Off-Site Southwest	< MDA*	6.54E-09	7.89E-09	< MDA*	3.46E-09	1.13E-08	< MDA*	5.28E-09	6.03E-09
Off-Site West	< MDA*	4.12E-09	1.04E-08	< MDA*	4.93E-09	7.97E-09	5.56E-09	5.63E-09	3.77E-09
Off-Site Northwest	< MDA*	5.36E-09	1.26E-08	< MDA*	7.16E-09	9.48E-09	< MDA*	5.77E-09	6.88E-09

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA; * = MDA above that required by NEF

Table 2.6-4, Fourth Quarter 2009 Vegetation Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	6.58E-09	2.66E-09	6.61E-10	1.50E-09	1.36E-09	8.15E-10	5.99E-09	2.55E-09	1.31E-09
On-Site Northeast	6.24E-09	2.68E-09	1.84E-09	< MDA	1.09E-09	1.66E-09	7.37E-09	2.88E-09	1.34E-09
On-Site East	7.56E-09	3.06E-09	2.13E-09	< MDA	1.78E-09	2.40E-09	1.51E-08	4.43E-09	1.71E-09
On-Site Southeast	1.58E-08	4.54E-09	1.41E-09	1.29E-09	1.30E-09	8.72E-10	1.78E-08	4.87E-09	1.40E-09
On-Site South	2.39E-08	5.54E-09	1.22E-09	2.23E-09	1.60E-09	7.56E-10	6.21E-08	1.08E-08	1.22E-09
On-Site Southwest	8.26E-09	2.92E-09	1.44E-09	< MDA	5.77E-10	1.48E-09	1.49E-08	4.08E-09	1.19E-09
On-Site West	7.92E-09	3.13E-09	2.38E-09	< MDA	1.35E-09	2.75E-09	3.27E-08	7.09E-09	1.66E-09
On-Site Northwest	8.52E-09	3.41E-09	2.73E-09	< MDA	9.73E-10	9.29E-10	2.08E-08	5.50E-09	1.80E-09
Off-Site North	5.92E-09	2.68E-09	2.52E-09	< MDA	1.08E-09	1.96E-09	8.33E-09	3.06E-09	1.58E-09
Off-Site Northeast	5.15E-09	2.30E-09	2.00E-09	< MDA	9.53E-10	1.72E-09	5.13E-09	2.24E-09	1.58E-09
Off-Site East	5.76E-09	2.45E-09	2.18E-09	< MDA	1.20E-09	1.70E-09	4.62E-09	2.11E-09	1.55E-09
Off-Site Southeast	1.47E-08	4.09E-09	1.66E-09	2.04E-09	1.62E-09	1.81E-09	3.28E-08	6.76E-09	6.09E-10
Off-Site South	1.05E-08	3.34E-09	1.21E-09	< MDA	1.39E-09	1.80E-09	6.63E-08	1.12E-08	6.05E-10
Off-Site Southwest	3.80E-09	1.99E-09	1.52E-09	< MDA	1.17E-09	1.55E-09	9.80E-09	3.28E-09	1.51E-09
Off-Site West	7.80E-09	2.83E-09	1.44E-09	< MDA	1.13E-09	1.78E-09	1.47E-08	4.03E-09	1.19E-09
Off-Site Northwest	1.09E-08	3.66E-09	1.68E-09	< MDA	1.32E-09	2.08E-09	4.25E-08	8.51E-09	1.68E-09

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA; * = MDA above that required by NEF

2.7. Soil Radioactivity Analyses

On February 2, April 21, July 7, and October 20, 2009 eight (8) on-site soil samples and eight (8) off-site soil samples were collected and analyzed for isotopic uranium (^{234}U, $^{235/236}U$ and ^{238}U). It is assumed that the $^{235/236}U$ analyses are all ^{235}U since there is no ^{236}U in natural uranium and there is no man-made ^{236}U in natural samples. Each of the sample locations is identified on Figure 2.2-2 and 2.2-3. See Tables 2.7-1 – 2.7-4 for the sampling results.

Table 2.7-1, First Quarter 2009 Soil Sampling

	^{234}U (µCi/g)			$^{235/236}U$ (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
On-Site North	2.59E-07	1.19E-07	7.25E-08	< MDA	5.22E-08	8.04E-08	2.47E-07	1.15E-07	6.49E-08
On-Site Northeast	3.15E-07	1.34E-07	3.42E-08	< MDA	6.30E-08	7.20E-08	4.27E-07	1.59E-07	3.40E-08
On-Site East	3.94E-07	1.46E-07	8.98E-08	< MDA	3.95E-08	8.22E-08	2.34E-07	1.09E-07	7.20E-08
On-Site Southeast	3.89E-07	1.62E-07	9.32E-08	< MDA	6.21E-08	1.06E-07	2.79E-07	1.34E-07	7.69E-08
On-Site South	3.07E-07	1.37E-07	6.23E-08	4.98E-08	5.80E-08	4.50E-08	2.93E-07	1.33E-07	6.20E-08
On-Site Southwest	2.76E-07	1.24E-07	8.34E-08	< MDA	5.01E-09	6.81E-08	3.24E-07	1.34E-07	7.77E-08
On-Site West	2.34E-07	1.33E-07	1.23E-07	< MDA	4.07E-08	1.18E-07	2.28E-07	1.28E-07	9.50E-08
On-Site Northwest	3.23E-07	1.36E-07	5.79E-08	< MDA	3.13E-08	7.14E-08	1.74E-07	9.65E-08	3.37E-08
Off-Site North	3.01E-07	1.43E-07	7.03E-08	< MDA	7.62E-08	1.02E-07	2.22E-07	1.22E-07	8.20E-08
Off-Site Northeast	3.90E-07	1.47E-07	5.50E-08	7.08E-08	6.65E-08	6.78E-08	4.06E-07	1.52E-07	7.74E-08
Off-Site East	2.98E-07	1.29E-07	7.34E-08	9.00E-08	7.46E-08	4.07E-08	4.22E-07	1.56E-07	5.61E-08
Off-Site Southeast	2.82E-07	1.19E-07	5.96E-08	< MDA	6.17E-08	8.17E-08	2.11E-07	1.02E-07	7.16E-08
Off-Site South	3.22E-07	1.29E-07	5.18E-08	< MDA	5.60E-08	7.48E-08	4.17E-07	1.49E-07	6.72E-08
Off-Site Southwest	3.73E-07	1.53E-07	7.32E-08	< MDA	5.86E-08	9.03E-08	3.34E-07	1.46E-07	1.05E-07
Off-Site West	2.50E-07	1.29E-07	1.09E-07	< MDA	7.92E-08	1.14E-07	2.89E-07	1.35E-07	7.59E-08
Off-Site Northwest	3.02E-07	1.41E-07	9.27E-08	< MDA	7.95E-08	9.48E-08	2.94E-07	1.36E-07	6.53E-08

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

Table 2.7-2, Second Quarter 2009 Soil Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	1.77E-07	7.68E-08	4.36E-08	< MDA	3.62E-08	4.83E-08	1.79E-07	7.65E-08	3.33E-08
On-Site Northeast	2.68E-07	9.84E-08	6.84E-08	< MDA	3.57E-08	5.28E-08	2.85E-07	9.98E-08	4.63E-08
On-Site East	2.19E-07	7.36E-08	3.69E-08	< MDA	2.16E-08	2.85E-08	2.35E-07	7.62E-08	3.25E-08
On-Site Southeast	2.10E-07	7.65E-08	3.19E-08	< MDA	2.09E-08	3.94E-08	1.29E-07	5.78E-08	1.59E-08
On-Site South	2.21E-07	7.67E-08	3.01E-08	< MDA	3.12E-08	3.72E-08	1.64E-07	6.48E-08	3.00E-08
On-Site Southwest	2.06E-07	7.58E-08	4.48E-08	< MDA	2.49E-08	3.28E-08	2.10E-07	7.56E-08	3.11E-08
On-Site West	2.49E-07	8.86E-08	3.91E-08	< MDA	1.62E-08	3.70E-08	1.66E-07	7.00E-08	3.50E-08
On-Site Northwest	2.25E-07	8.49E-08	1.85E-08	< MDA	2.41E-08	3.90E-08	2.04E-07	8.01E-08	1.84E-08
Off-Site North	3.52E-07	1.10E-07	3.08E-08	2.47E-08	2.87E-08	2.23E-08	2.65E-07	9.22E-08	1.80E-08
Off-Site Northeast	3.73E-07	1.12E-07	2.99E-08	3.85E-08	3.61E-08	3.68E-08	3.15E-07	1.00E-07	1.74E-08
Off-Site East	3.42E-07	1.05E-07	2.94E-08	< MDA	2.76E-08	4.25E-08	1.79E-07	7.28E-08	4.14E-08
Off-Site Southeast	2.21E-07	7.91E-08	3.56E-08	< MDA	2.08E-08	3.37E-08	1.59E-07	6.49E-08	1.59E-08
Off-Site South	2.57E-07	8.88E-08	3.42E-08	< MDA	1.56E-08	2.11E-08	2.19E-07	8.07E-08	2.91E-08
Off-Site Southwest	2.35E-07	8.14E-08	1.59E-08	< MDA	2.08E-08	3.36E-08	2.05E-07	7.50E-08	1.59E-08
Off-Site West	3.71E-07	1.17E-07	4.98E-08	4.97E-08	4.38E-08	4.76E-08	3.27E-07	1.08E-07	4.96E-08
Off-Site Northwest	1.39E-07	5.89E-08	3.28E-08	< MDA	1.42E-08	4.40E-08	2.16E-07	7.50E-08	2.51E-08

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

Table 2.7-3, Third Quarter 2009 Soil Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	< MDA	6.04E-08	8.44E-08	< MDA	3.11E-08	8.98E-08	< MDA	4.28E-08	8.41E-08
On-Site Northeast	2.07E-07	1.11E-07	9.57E-08	< MDA	7.28E-08	1.04E-07	1.16E-07	8.37E-08	9.53E-08
On-Site East	1.40E-07	7.83E-08	4.69E-08	< MDA	2.54E-08	5.78E-08	8.74E-08	6.19E-08	5.47E-08
On-Site Southeast	< MDA	5.66E-08	7.41E-08	< MDA	6.75E-09	7.57E-08	8.25E-08	6.52E-08	7.37E-08
On-Site South	2.11E-07	1.05E-07	7.53E-08	< MDA	4.03E-08	3.85E-08	6.68E-08	5.70E-08	5.30E-08
On-Site Southwest	< MDA	6.47E-08	9.04E-08	< MDA	4.53E-08	4.32E-08	1.14E-07	7.90E-08	5.95E-08

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site West	< MDA	5.09E-08	7.53E-08	< MDA	3.13E-08	7.13E-08	7.25E-08	6.19E-08	5.75E-08
On-Site Northwest	1.01E-07	7.04E-08	7.10E-08	4.01E-08	4.67E-08	3.63E-08	9.17E-08	6.63E-08	6.51E-08
Off-Site North	2.92E-07	1.20E-07	6.41E-08	8.96E-08	7.06E-08	6.07E-08	3.16E-07	1.24E-07	4.90E-08
Off-Site Northeast	4.06E-07	1.55E-07	5.91E-08	< MDA	6.38E-08	7.28E-08	5.55E-07	1.86E-07	6.89E-08
Off-Site East	4.82E-07	1.65E-07	8.50E-08	1.04E-07	8.20E-08	9.27E-08	3.54E-07	1.39E-07	8.47E-08
Off-Site Southeast	4.96E-07	1.71E-07	8.43E-08	< MDA	5.25E-08	8.97E-08	4.58E-07	1.63E-07	8.40E-08
Off-Site South	4.59E-07	1.62E-07	8.20E-08	< MDA	2.90E-08	3.92E-08	4.18E-07	1.52E-07	5.40E-08
Off-Site Southwest	4.24E-07	1.50E-07	7.24E-08	< MDA	2.74E-08	3.70E-08	5.05E-07	1.65E-07	5.10E-08
Off-Site West	4.13E-07	1.54E-07	7.89E-08	< MDA	6.04E-08	8.06E-08	3.52E-07	1.41E-07	7.85E-08
Off-Site Northwest	3.28E-07	1.25E-07	6.65E-08	3.76E-08	4.37E-08	3.40E-08	4.70E-07	1.53E-07	6.10E-08

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

Table 2.7-4, Fourth Quarter 2009 Soil Sampling

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
On-Site North	3.04E-07	1.28E-07	5.45E-08	4.36E-08	5.08E-08	3.94E-08	2.91E-07	1.43E-07	6.84E-08
On-Site Northeast	2.58E-07	1.15E-07	6.16E-08	6.77E-08	6.36E-08	6.49E-08	3.15E-07	1.46E-07	7.37E-08
On-Site East	1.75E-07	8.90E-08	7.22E-08	< MDA	4.93E-08	8.41E-08	3.17E-07	1.39E-07	6.81E-08
On-Site Southeast	2.30E-07	1.14E-07	9.50E-08	< MDA	3.02E-08	4.08E-08	3.48E-07	1.35E-07	3.38E-08
On-Site South	1.94E-07	1.09E-07	1.02E-07	< MDA	3.42E-08	1.06E-07	1.76E-07	1.18E-07	3.08E-08
On-Site Southwest	4.08E-07	1.64E-07	1.06E-07	< MDA	4.83E-08	7.81E-08	3.72E-07	1.43E-07	6.62E-08
On-Site West	3.56E-07	1.39E-07	8.51E-08	< MDA	4.06E-08	6.56E-08	1.77E-07	1.36E-07	5.67E-08
On-Site Northwest	3.54E-07	1.41E-07	7.24E-08	< MDA	6.00E-08	6.85E-08	2.73E-07	1.33E-07	5.95E-08
Off-Site North	5.02E-07	1.78E-07	1.03E-07	< MDA	4.50E-08	8.48E-08	3.49E-07	1.25E-07	5.43E-08
Off-Site Northeast	4.17E-07	1.57E-07	9.09E-08	< MDA	5.32E-08	8.21E-08	3.72E-07	1.28E-07	5.24E-08
Off-Site East	3.59E-07	1.40E-07	9.22E-08	7.91E-08	6.97E-08	7.58E-08	3.67E-07	1.21E-07	5.26E-08
Off-Site Southeast	3.69E-07	1.47E-07	7.55E-08	< MDA	3.18E-08	8.37E-08	3.24E-07	1.40E-07	6.59E-08
Off-Site South	3.86E-07	1.43E-07	5.28E-08	7.96E-08	7.01E-08	7.63E-08	2.72E-07	1.01E-07	7.88E-08

Sample	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Off-Site Southwest	2.90E-07	1.27E-07	6.65E-08	< MDA	5.30E-08	7.00E-08	3.62E-07	1.54E-07	8.91E-08
Off-Site West	3.40E-07	1.39E-07	6.67E-08	8.59E-08	7.57E-08	8.23E-08	3.29E-07	9.50E-08	6.90E-08
Off-Site Northwest	5.40E-07	1.84E-07	5.97E-08	< MDA	4.53E-08	4.32E-08	3.06E-07	1.21E-07	5.53E-08

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

2.8. Surface Water Analysis

On July 6 and October 21 a surface water sample was collected from the NEF Site Stormwater Detention Basin. The sediment samples were analyzed for isotopic uranium (^{234}U, $^{235/236}$U and ^{238}U). It is assumed that the $^{235/236}$U analyses are all ^{235}U since there is no ^{236}U in natural uranium and there is no man-made ^{236}U in natural samples. The sampled basin location is identified on Figure 2.2-3. See Table 2.8-1 for the sampling results.

Table 2.8-1, 2009 Surface Water Sampling

Location	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}$U (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Pond 1	3	4.35E-10	2.98E-10	3.71E-10	8.12E-11	1.41E-10	2.65E-10	1.16E-10	1.44E-10	1.89E-10
Pond 1	4	8.92E-10	2.77E-10	1.26E-10	7.03E-11	1.00E-10	1.85E-10	2.96E-10	1.61E-10	1.76E-10

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty

2.9. Sediment Radioactivity Analyses

On April 23, July 9, and November 13, 2009 a sediment sample was collected from the NEF Site Stormwater Detention Basin. The sediment samples were analyzed for isotopic uranium (^{234}U, $^{235/236}$U and ^{238}U). It is assumed that the $^{235/236}$U analyses are all ^{235}U since there is no ^{236}U in natural uranium and there is no man-made ^{236}U in natural samples. The sampled basin location is identified on Figure 2.2-3. See Table 2.9-1 for the sampling results.

Table 2.9-1, 2009 Sediment Sampling

Location	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}$U (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Pond 1	2	3.08E-07	1.06E-07	5.60E-08	2.75E-08	3.20E-08	2.48E-08	3.68E-07	1.17E-07	4.69E-08
Pond 1	3	2.60E-07	1.29E-07	8.49E-08	< MDA	4.94E-08	4.71E-08	2.64E-07	1.29E-07	6.49E-08
Pond 1	4	4.09E-07	1.20E-07	1.82E-08	< MDA	2.35E-08	2.24E-08	1.99E-07	7.84E-08	3.09E-08

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

2.10. Groundwater Radioactivity Analyses

Four monitoring wells, identified as monitoring wells 4, 5, 10, and 20 were sampled on February 5, April 23, July 8, and November 12, 2009. Groundwater samples were analyzed for isotopic uranium (^{234}U, $^{235/236}$U and ^{238}U). It is assumed that the $^{235/236}$U analyses are all ^{235}U since there is no ^{236}U in natural uranium and there is no man-made ^{236}U in natural samples. These monitoring well locations are identified on Figure 2.2-3. See Table 2.10-1 for the sampling results.

The averages for the groundwater monitoring results are shown in Table 2.8-7. The results include data for monitoring wells 4, 5 and 10, 20.

Table 2.10-1, 2009 Groundwater Sample Results

Monitoring Well	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}$U (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
4	1	1.47E-08	2.15E-09	9.80E-11	5.90E-10	1.91E-10	9.07E-11	8.66E-09	1.32E-09	7.32E-11
5	1	4.05E-10	1.15E-10	4.23E-11	9.61E-11	5.68E-11	2.17E-11	2.69E-10	9.06E-11	3.49E-11
10	1	1.48E-08	2.09E-09	9.56E-11	5.61E-10	1.72E-10	6.85E-11	2.64E-09	4.60E-10	4.58E-11
20	1	1.56E-08	2.27E-09	1.42E-10	4.24E-10	1.55E-10	3.29E-11	5.23E-09	8.46E-10	7.92E-11
4	2	1.44E-08	2.02E-09	6.84E-11	8.37E-10	2.18E-10	6.79E-11	9.81E-09	1.41E-09	7.34E-11

Monitoring Well	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}$U (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
5	2	4.50E-10	1.21E-10	1.72E-11	< MDA*	3.60E-11	5.10E-11	3.79E-10	1.09E-10	1.71E-11
10	2	1.42E-08	1.89E-09	5.36E-11	3.65E-10	1.19E-10	4.42E-11	2.72E-09	4.35E-10	3.57E-11
20	2	1.74E-08	2.39E-09	8.76E-11	8.65E-10	2.18E-10	6.53E-11	6.24E-09	9.30E-10	5.27E-11
4	3	1.53E-08	2.62E-09	1.81E-10	6.96E-10	3.38E-10	1.71E-10	9.10E-09	1.70E-09	1.38E-10
5	3	1.99E-09	5.72E-10	1.96E-10	2.83E-10	2.14E-10	2.01E-10	1.51E-09	4.85E-10	2.43E-10
10	3	1.68E-08	2.87E-09	1.40E-10	2.24E-10	1.86E-10	1.01E-10	2.95E-09	7.40E-10	1.40E-10
20	3	1.71E-08	2.91E-09	2.11E-10	3.66E-10	2.42E-10	1.72E-10	6.06E-09	1.24E-09	2.45E-10
4	4	1.59E-08	2.26E-09	2.58E-11	7.05E-10	2.05E-10	3.18E-11	1.01E-08	1.49E-09	2.57E-11
5	4	1.90E-10	7.69E-11	1.90E-11	4.91E-11	4.33E-11	4.68E-11	2.52E-10	9.00E-11	1.89E-11
10	4	1.74E-08	2.40E-09	4.49E-11	2.46E-10	1.06E-10	2.78E-11	2.96E-09	4.97E-10	4.47E-11
20	4	1.74E-08	2.37E-09	2.19E-11	6.33E-10	1.79E-10	5.37E-11	6.44E-09	9.51E-10	4.34E-11

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA; * = MDA above that required by NEF

2.11. Domestic Wastewater

Samples of domestic waste effluent were collected on February 5, April 23, July 10, and November 13, 2009 at Lift Station 1, which is a central collection point for all domestic waste entering the NEF sewer system before being discharged off-site to the Eunice Wastewater Treatment Facility (Figure 2.2-3). See Table 2.11-1 for the sampling results.

Table 2.11-1, 2009 Domestic Wastewater Sample Results

Location	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}$U (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Lift Station #1	1	1.20E-09	3.98E-10	1.58E-10	2.19E-10	1.76E-10	1.95E-10	9.98E-10	3.56E-10	1.57E-10
Lift Station #1	2	6.54E-09	1.68E-09	4.22E-10	8.48E-10	5.62E-10	3.99E-10	6.22E-09	1.63E-09	4.56E-10

Location	Sampling Quarter	^{234}U (µCi/L)			$^{235/236}U$ (µCi/L)			^{238}U (µCi/L)		
		Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
Lift Station #1	3	9.31E-10	5.84E-10	4.33E-10	< MDA	2.00E-10	4.56E-10	< MDA	3.26E-10	4.79E-10
Lift Station #1	4	1.71E-09	3.69E-10	6.17E-11	7.98E-11	7.06E-11	7.61E-11	8.19E-10	2.25E-10	3.08E-11

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; <MDA = Result below MDA

3. SUMMARY OF RADIOLOGICAL IMPACT ON HUMANS

During operations, the radiological impact to humans from the NEF's direct radiation and gaseous releases would be estimated using two methods:

- calculations based on measurements of plant effluents; and
- calculations based on measurements of environmental samples.

The first method utilizes data from the radioactive effluents (measured at the point of release) together with conservative models to calculate the dispersion and transport of radioactivity through the environment to humans. The second method is based on actual measurements of radioactivity in the environmental samples and on dose conversion factors recommended by the NRC. The measured types and quantities of gaseous effluents released from the NEF will be reported to the NRC.

For gaseous effluents, the maximum individual dose will be calculated using the following radiation exposure pathways:

- external radiation from cloud shine and submersion in gaseous effluents;
- inhalation of airborne radioactivity; and
- external radiation from soil deposition.

Two federal agencies establish dose limits to protect the public from radiation and radioactivity. The NRC specifies a whole body dose limit of 100 mrem/yr to be received by the maximum exposed member of the general public. This limit is set forth in Section 1301, Part 20, Title 10, of the U.S. Code of Federal Regulations (10CFR20). By comparison, the EPA limits the annual whole body dose to 25 mrem/yr, which is specified in Section 10, Part 190, Title 40, of the Code of Federal Regulations (40CFR190).

3.1 RADIOLOGICAL IMPACT TO THE GENERAL PUBLIC

During the report period, there were no observed radiation doses to the general public as a result of the NEF's operation. There was no calculated total body dose to a maximally exposed member of the general public from radioactive effluents and ambient radiation resulting from the NEF operations for the report period.

This conclusion is reached from the comparison of 2009 data collected from TLDs, continuous air particulate monitoring, soil, vegetation, and groundwater to corresponding baseline data collected from 2006-2008. This comparison resulted in either lower observed uranium activity in sampled media 2009 or no statistical difference between data sets.

4. APPENDICES

Appendix A - Special Studies

NEF will perform a detailed study on drinking water supply to the NEF and in the surrounding area. This will allow NEF personnel to conduct a statistical evaluation of domestic waste isotopic uranium activity versus isotopic uranium activity in local drinking water.

Appendix B - Environmental Monitoring Program Discrepancies

Continuous Air Monitoring

Radio telemetry units report outages of the continuous air monitors. NEF environmental staff has obtained this data from the radio telemetry units for 2009. Monitoring gaps resulted either from loss of power due to inclement weather or unspecified loss of power from the utility company. None of the monitoring gaps exceeded 24 hours in length. Monitoring gaps experienced in 2009 are as follows:

AP2, AP3, AP5			
Power Outages			
Date	Time	Date	Time
5/14/2009	9:49 AM	5/14/2009	12:11 PM
5/25/2009	5:41 PM	5/26/2009	3:52 PM
6/4/2009	9:37 AM	6/4/2009	12:57 PM
7/22/2009	3:30 AM	7/22/2009	9:50 AM
7/28/2009	11:30 PM	7/29/2009	3:23 AM

AP4 and AP6			
Power Outages			
Date	Time	Date	Time
5/14/2009	9:50 AM	5/14/2009	12:11 PM
7/22/2009	3:30 AM	7/22/2009	9:50 AM
7/28/2009	11:31 PM	7/29/2009	3:22 AM
8/14/2009	1:25 PM	8/14/2009	4:44 PM

AP7			
Power Outages			
Date	Time	Date	Time
7/29/2009	12:03 PM	7/29/2009	6:10 PM
7/31/2009	1:09 AM	7/31/2009	4:27 AM
11/30/2009	12:33 PM	11/30/2009	1:00 PM

TLDs

The TLD at monitoring location #6 was lost during the first quarter of 2009. It is not known exactly, but it appears that TLD was lost during a high wind event. TLDs' attachments were reinforced prior the second quarter deployment with an additional zip-tie and cord to anchor the TLD pouch and reduce movement during wind events to prevent further loss by weather events.

Vegetation

During the drafting of the 2009 REMP it was noted that several vegetation sample analyses did not meet the stated LLD for vegetation (6.0E-09 µCi/g) required per the NEF Environmental Report. Sufficient sample volumes of vegetation were sent to the analytical laboratory to achieve required MDA. Additionally the MDA was included in the quality assurance agreement provided to the laboratory prior to sample shipment. However, the laboratory did not achieve the requested MDA on several occasions.

The laboratory was notified of the deficiency and has subsequently made appropriate internal procedural changes to meet the requested MDA in vegetation samples. The laboratory has also been instructed to contact NEF personnel if the MDA cannot be reached for any NEF environmental sample. This will afford the NEF personnel time to resample and achieve the desired MDA/LLD.

Appendix C - Planned Improvements for 2010 REMP

The following improvements are planned for the Radiological Environmental Monitoring Program in 2010.

a. It is expected that the three basins will be completed by the end of 2010. This includes the storm water detention basin that will collect runoff from rainwater from roads, parking lots and building roofs; the Uranium Byproduct Cylinder (UBC) storage pad storm water retention basin that will collect rainwater from the UBC storage pad as well as effluent from the sump in the Central Utilities Building; and the Treated Effluent Evaporative Basin, (TEEB) which is not currently planned for use, however, in the future may collect treated wastewater from the liquid effluent collection and treatment system. Liquids and sediments from these three basins will be collected and analyzed during 2010.
b. In order to more closely calculate collective dose to the population surrounding the NEF, an updated Land Use Census is planned for completion by the end of 2010.
c. The NEF will ensure that MDA/LLD is met per media by environmental contract laboratory.
d. The NEF in 2010 will institute a procedure where the contract laboratory will notify NEF personnel if the MDA cannot be met for an environmental sample. This will afford the NEF personnel time to resample and achieve the desired MDA/LLD.
e. NEF will perform a detailed study on drinking water supply to the NEF and in the surrounding area. This will allow NEF personnel to conduct a statistical evaluation of domestic waste isotopic uranium activity versus isotopic uranium activity in local drinking water.

Due to the NEF plant design not as yet finalized, there may be changes to the above plans for 2010.

Appendix D – 2009 Air Filter Sampling Results with Associated Uncertainty and MDA

Table D.1-1, Individual Air Filter Alpha and Beta Radioactivity Analyses

Air Monitor	Start Date	End Date	Sampling Quarter	Corrected Total Flow (cu ft)	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
					Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP2	1/5/2009	1/19/2009	1	39696	1.92E-15	2.97E-16	1.65E-16	2.01E-14	7.52E-16	4.53E-16
AP3	1/5/2009	1/19/2009	1	39699	1.04E-15	2.25E-16	1.67E-16	1.34E-14	6.47E-16	5.01E-16
AP4	1/5/2009	1/19/2009	1	39678	1.44E-15	2.83E-16	2.43E-16	1.75E-14	7.65E-16	5.97E-16
AP5	1/5/2009	1/19/2009	1	39668	1.58E-15	2.79E-16	2.00E-16	2.09E-14	8.01E-16	5.99E-16
AP6	1/5/2009	1/19/2009	1	39672	1.94E-15	3.10E-16	2.24E-16	1.91E-14	7.42E-16	4.58E-16
AP7	1/5/2009	1/19/2009	1	39652	1.34E-15	2.60E-16	2.01E-16	2.03E-14	7.87E-16	5.32E-16
AP2	1/19/2009	2/2/2009	1	39650	1.82E-15	2.99E-16	3.84E-17	2.99E-14	9.61E-16	4.84E-16
AP3	1/19/2009	2/2/2009	1	39637	1.58E-15	2.93E-16	2.19E-16	2.20E-14	8.61E-16	6.56E-16
AP4	1/19/2009	2/2/2009	1	39644	1.94E-15	3.10E-16	2.26E-16	2.79E-14	8.85E-16	4.60E-16
AP5	1/19/2009	2/2/2009	1	39611	2.02E-15	3.15E-16	2.02E-16	3.02E-14	9.47E-16	5.34E-16
AP6	1/19/2009	2/2/2009	1	39652	2.13E-15	3.10E-16	3.53E-17	2.86E-14	9.00E-16	4.45E-16
AP7	1/19/2009	2/3/2009	1	41312	1.76E-15	2.96E-16	2.68E-16	2.93E-14	8.94E-16	4.97E-16
AP2	2/2/2009	2/16/2009	1	39595	1.07E-15	2.29E-16	1.69E-16	1.79E-14	7.47E-16	4.65E-16
AP3	2/2/2009	2/16/2009	1	39640	1.02E-15	2.28E-16	1.97E-16	1.79E-14	7.35E-16	5.09E-16
AP4	2/2/2009	2/16/2009	1	39625	6.43E-16	1.86E-16	1.95E-16	1.81E-14	7.31E-16	5.39E-16
AP5	2/2/2009	2/16/2009	1	39666	9.31E-16	2.29E-16	2.58E-16	2.18E-14	7.91E-16	4.71E-16
AP6	2/2/2009	2/16/2009	1	39617	9.12E-16	2.11E-16	1.66E-16	1.84E-14	7.23E-16	4.55E-16
AP7	2/3/2009	2/16/2009	1	37963	5.87E-16	2.06E-16	2.91E-16	1.95E-14	7.76E-16	5.41E-16
AP2	2/16/2009	3/2/2009	1	40010	1.54E-15	2.78E-16	2.39E-16	2.01E-14	7.68E-16	5.59E-16
AP3	2/16/2009	3/2/2009	1	40002	8.39E-16	2.01E-16	1.31E-16	1.73E-14	7.32E-16	5.41E-16
AP4	2/16/2009	3/2/2009	1	39947	9.57E-16	2.31E-16	2.45E-16	1.81E-14	7.41E-16	5.54E-16
AP5	2/16/2009	3/2/2009	1	39975	1.15E-15	2.34E-16	1.65E-16	2.39E-14	8.40E-16	5.34E-16
AP6	2/16/2009	3/2/2009	1	39973	1.18E-15	2.38E-16	1.89E-16	2.03E-14	7.64E-16	4.69E-16
AP7	2/16/2009	3/2/2009	1	39705	1.62E-15	2.80E-16	2.33E-16	2.19E-14	7.82E-16	4.47E-16
AP2	3/2/2009	3/16/2009	1	39045	1.12E-15	2.55E-16	2.73E-16	2.09E-14	8.11E-16	6.12E-16
AP3	3/2/2009	3/16/2009	1	39015	1.16E-15	2.36E-16	1.33E-16	2.14E-14	7.88E-16	4.55E-16
AP4	3/2/2009	3/16/2009	1	39027	1.15E-15	2.42E-16	1.76E-16	1.99E-14	7.74E-16	5.22E-16

Air Monitor	Start Date	End Date	Sampling Quarter	Corrected Total Flow (cu ft)	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
					Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP5	3/2/2009	3/16/2009	1	38986	1.12E-15	2.33E-16	1.68E-16	2.20E-14	7.94E-16	4.72E-16
AP6	3/2/2009	3/16/2009	1	39055	1.17E-15	2.39E-16	1.69E-16	2.12E-14	7.90E-16	4.85E-16
AP7	3/2/2009	3/16/2009	1	39296	1.42E-15	2.60E-16	1.33E-16	2.14E-14	8.04E-16	5.28E-16
AP2	3/16/2009	3/31/2009	1	42004	1.16E-15	2.27E-16	1.23E-16	1.91E-14	7.23E-16	4.57E-16
AP3	3/16/2009	3/31/2009	1	42031	7.49E-16	1.90E-16	1.61E-16	1.81E-14	7.18E-16	4.72E-16
AP4	3/16/2009	3/31/2009	1	42061	1.13E-15	2.24E-16	1.23E-16	1.72E-14	6.96E-16	4.83E-16
AP5	3/16/2009	3/31/2009	1	41923	1.69E-15	2.76E-16	1.60E-16	2.13E-14	7.83E-16	5.40E-16
AP6	3/16/2009	3/31/2009	1	41925	2.04E-15	2.97E-16	1.22E-16	2.08E-14	7.85E-16	4.89E-16
AP7	3/16/2009	3/31/2009	1	41722	1.46E-15	2.56E-16	1.59E-16	1.98E-14	7.53E-16	5.20E-16
AP2	3/31/2009	4/14/2009	2	39609	8.43E-16	2.48E-16	3.43E-16	1.60E-14	6.98E-16	5.20E-16
AP3	3/31/2009	4/14/2009	2	39613	1.28E-15	2.42E-16	1.27E-16	1.42E-14	6.47E-16	4.58E-16
AP4	3/31/2009	4/14/2009	2	39621	8.90E-16	2.36E-16	2.98E-16	1.17E-14	6.09E-16	5.11E-16
AP5	3/31/2009	4/14/2009	2	39605	1.11E-15	2.35E-16	1.72E-16	1.77E-14	7.31E-16	5.02E-16
AP6	3/31/2009	4/14/2009	2	39599	8.01E-16	2.00E-16	1.67E-16	1.71E-14	7.33E-16	5.71E-16
AP7	3/31/2009	4/14/2009	2	39593	1.35E-15	2.65E-16	2.08E-16	1.83E-14	7.46E-16	4.84E-16
AP2	4/14/2009	4/27/2009	2	37600	2.13E-15	2.33E-16	1.97E-16	1.93E-14	5.33E-16	3.67E-16
AP3	4/14/2009	4/27/2009	2	NS	NS	NS	NS	NS	NS	NS
AP4	4/14/2009	4/27/2009	2	37543	2.25E-15	2.29E-16	1.82E-17	1.92E-14	5.46E-16	4.54E-16
AP5	4/14/2009	4/27/2009	2	37728	2.78E-15	2.52E-16	1.78E-17	2.00E-14	5.50E-16	3.79E-16
AP6	4/14/2009	4/27/2009	2	37672	2.59E-15	2.43E-16	1.04E-16	1.95E-14	5.42E-16	4.21E-16
AP7	4/14/2009	4/27/2009	2	38058	2.76E-15	2.58E-16	1.09E-16	2.09E-14	5.70E-16	4.46E-16
AP2	4/27/2009	5/12/2009	2	41546	3.51E-16	8.74E-17	1.70E-17	2.82E-15	2.37E-16	3.94E-16
AP3	4/27/2009	5/12/2009	2	41553	1.30E-15	1.78E-16	1.64E-16	1.48E-14	4.62E-16	4.22E-16
AP4	4/27/2009	5/12/2009	2	41638	1.56E-15	1.88E-16	1.55E-16	1.46E-14	4.54E-16	4.13E-16
AP5	4/27/2009	5/12/2009	2	41465	2.15E-15	2.18E-16	1.31E-16	1.67E-14	4.83E-16	3.59E-16
AP6	4/27/2009	5/11/2009	2	39560	1.45E-15	1.88E-16	1.42E-16	1.55E-14	4.85E-16	4.28E-16
AP7	4/27/2009	5/11/2009	2	39204	2.08E-15	2.24E-16	1.67E-16	1.69E-14	5.27E-16	5.57E-16
AP2	5/12/2009	5/26/2009	2	37484	1.91E-15	2.30E-16	2.10E-16	1.83E-14	5.55E-16	5.36E-16
AP3	5/12/2009	5/26/2009	2	37834	2.27E-15	2.39E-16	1.14E-16	1.64E-14	5.18E-16	4.93E-16
AP4	5/12/2009	5/26/2009	2	40154	5.84E-16	1.18E-16	1.02E-16	4.61E-15	2.97E-16	4.10E-16
AP5	5/12/2009	5/26/2009	2	40498	2.61E-15	2.41E-16	1.01E-16	1.99E-14	5.37E-16	4.08E-16

Air Monitor	Start Date	End Date	Sampling Quarter	Corrected Total Flow (cu ft)	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
					Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP6	5/11/2009	5/26/2009	2	42133	5.63E-16	1.22E-16	1.41E-16	4.16E-15	3.07E-16	5.39E-16
AP7	5/11/2009	5/26/2009	2	42430	2.38E-15	2.26E-16	1.51E-16	1.85E-14	5.04E-16	4.14E-16
AP2	5/26/2009	6/9/2009	2	NS	NS	NS	NS	NS	NS	NS
AP3	5/26/2009	6/9/2009	2	37065	2.17E-15	2.24E-16	1.81E-17	2.78E-14	6.46E-16	3.85E-16
AP4	5/26/2009	6/9/2009	2	39454	1.03E-15	1.52E-16	9.90E-17	1.68E-14	4.91E-16	4.03E-16
AP5	5/26/2009	6/9/2009	2	40004	2.08E-15	2.19E-16	1.04E-16	2.10E-14	5.54E-16	4.24E-16
AP6	5/26/2009	6/9/2009	2	39456	1.59E-15	1.91E-16	1.79E-17	1.91E-14	5.28E-16	4.15E-16
AP7	5/26/2009	6/9/2009	2	39802	1.79E-15	2.11E-16	1.71E-16	1.95E-14	5.36E-16	4.41E-16
AP2	6/11/2009	6/22/2009	2	31344	1.10E-15	1.88E-16	2.06E-16	1.54E-14	5.44E-16	5.48E-16
AP3	6/9/2009	6/22/2009	2	36986	1.29E-15	1.82E-16	1.47E-16	2.22E-14	5.83E-16	4.03E-16
AP4	6/9/2009	6/22/2009	2	36951	9.40E-16	1.60E-16	1.52E-16	1.45E-14	4.90E-16	4.59E-16
AP5	6/9/2009	6/22/2009	2	36737	1.31E-15	1.87E-16	1.78E-16	1.64E-14	5.39E-16	5.94E-16
AP6	6/9/2009	6/22/2009	2	36886	1.06E-15	1.79E-16	2.13E-16	1.58E-14	5.24E-16	5.45E-16
AP7	6/9/2009	6/22/2009	2	36916	1.21E-15	1.79E-16	1.17E-16	1.58E-14	5.15E-16	5.06E-16
AP2	6/22/2009	7/6/2009	2	38524	7.95E-16	1.50E-16	1.92E-16	2.01E-14	5.34E-16	3.58E-16
AP3	6/22/2009	7/6/2009	2	38528	6.73E-16	1.24E-16	1.77E-17	1.85E-14	5.27E-16	4.43E-16
AP4	6/22/2009	7/6/2009	2	38565	9.44E-16	1.67E-16	2.19E-16	1.77E-14	5.24E-16	4.71E-16
AP5	6/22/2009	7/6/2009	2	38561	1.10E-15	1.64E-16	1.07E-16	1.97E-14	5.40E-16	4.23E-16
AP6	6/22/2009	7/6/2009	2	38624	1.10E-15	1.67E-16	1.46E-16	1.98E-14	5.55E-16	4.60E-16
AP7	6/22/2009	7/6/2009	2	38567	1.35E-15	1.86E-16	1.72E-16	2.01E-14	5.51E-16	4.38E-16
AP2	7/6/2009	7/20/2009	3	39528	1.49E-15	2.67E-16	1.93E-16	1.79E-14	7.16E-16	3.75E-16
AP3	7/6/2009	7/20/2009	3	39526	1.59E-15	2.65E-16	1.23E-16	1.62E-14	6.96E-16	5.21E-16
AP4	7/6/2009	7/20/2009	3	39568	2.09E-15	3.19E-16	2.01E-16	1.62E-14	7.12E-16	5.29E-16
AP5	7/6/2009	7/20/2009	3	39680	2.78E-15	3.63E-16	1.71E-16	1.86E-14	7.44E-16	4.93E-16
AP6	7/6/2009	7/20/2009	3	39629	2.21E-15	3.23E-16	1.33E-16	1.80E-14	7.24E-16	4.29E-16
AP7	7/6/2009	7/20/2009	3	39861	3.11E-15	3.77E-16	1.93E-16	1.82E-14	7.22E-16	4.34E-16
AP2	7/20/2009	8/3/2009	3	39178	4.25E-15	4.69E-16	3.18E-16	2.35E-14	8.65E-16	5.35E-16
AP3	7/20/2009	8/3/2009	3	39186	2.92E-15	3.72E-16	2.00E-16	2.17E-14	8.12E-16	5.00E-16
AP4	7/20/2009	8/3/2009	3	39182	4.21E-15	4.63E-16	1.86E-16	2.15E-14	8.43E-16	5.57E-16
AP5	7/20/2009	8/3/2009	3	39180	4.75E-15	4.68E-16	3.60E-17	2.23E-14	8.19E-16	4.91E-16
AP6	7/20/2009	8/3/2009	3	39178	3.03E-15	3.78E-16	1.72E-16	1.54E-14	6.9[illegible]E-16	5.15E-16

Air Monitor	Start Date	End Date	Sampling Quarter	Corrected Total Flow (cu ft)	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
					Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP7	7/20/2009	8/3/2009	3	39310	3.77E-15	4.21E-16	1.33E-16	1.60E-14	7.10E-16	4.70E-16
AP2	8/3/2009	8/17/2009	3	39192	3.07E-15	3.74E-16	1.29E-16	1.81E-14	7.42E-16	5.03E-16
AP3	8/3/2009	8/17/2009	3	39212	2.47E-15	3.41E-16	1.33E-16	1.71E-14	7.23E-16	4.79E-16
AP4	8/3/2009	8/17/2009	3	38817	2.27E-15	3.24E-16	1.31E-16	1.67E-14	7.43E-16	6.08E-16
AP5	8/3/2009	8/17/2009	3	38827	3.82E-15	4.33E-16	1.80E-16	1.88E-14	7.69E-16	4.89E-16
AP6	8/3/2009	8/17/2009	3	38498	3.28E-15	4.02E-16	1.40E-16	1.86E-14	7.63E-16	4.97E-16
AP7	8/3/2009	8/17/2009	3	38545	3.69E-15	4.13E-16	1.31E-16	1.73E-14	7.22E-16	4.69E-16
AP2	8/17/2009	9/2/2009	3	45033	3.45E-15	3.79E-16	2.30E-16	2.51E-14	7.89E-16	4.54E-16
AP3	8/17/2009	9/2/2009	3	45016	2.33E-15	3.09E-16	1.16E-16	2.14E-14	7.44E-16	4.35E-16
AP4	8/17/2009	9/2/2009	3	44984	3.16E-15	3.65E-16	1.99E-16	2.33E-14	7.71E-16	4.42E-16
AP5	8/17/2009	9/2/2009	3	45078	4.05E-15	4.05E-16	1.16E-16	2.48E-14	8.05E-16	4.33E-16
AP6	8/17/2009	9/2/2009	3	45074	3.32E-15	3.72E-16	1.97E-16	2.49E-14	7.95E-16	4.24E-16
AP7	8/17/2009	9/2/2009	3	45139	3.98E-15	4.05E-16	1.97E-16	2.49E-14	8.08E-16	4.80E-16
AP2	9/2/2009	9/15/2009	3	37321	3.66E-15	4.39E-16	3.20E-16	2.65E-14	9.45E-16	6.21E-16
AP3	9/2/2009	9/15/2009	3	37330	3.13E-15	3.87E-16	1.36E-16	2.45E-14	8.77E-16	5.29E-16
AP4	9/2/2009	9/15/2009	3	37325	3.97E-15	4.66E-16	2.80E-16	2.45E-14	8.94E-16	5.87E-16
AP5	9/2/2009	9/15/2009	3	37012	4.10E-15	4.59E-16	2.44E-16	2.61E-14	9.11E-16	5.46E-16
AP6	9/2/2009	9/15/2009	3	37014	5.06E-15	5.22E-16	3.18E-16	2.76E-14	9.49E-16	5.81E-16
AP7	9/2/2009	9/15/2009	3	37014	3.80E-15	4.47E-16	3.33E-16	2.40E-14	8.69E-16	5.44E-16
AP2	9/15/2009	9/29/2009	3	39550	2.06E-15	3.16E-16	2.00E-16	2.71E-14	8.82E-16	4.71E-16
AP3	9/15/2009	9/29/2009	3	39554	1.80E-15	2.93E-16	1.70E-16	2.62E-14	8.74E-16	4.81E-16
AP4	9/15/2009	9/29/2009	3	39713	4.34E-15	4.45E-16	1.30E-16	3.12E-14	9.80E-16	5.18E-16
AP5	9/15/2009	9/29/2009	3	40034	2.46E-15	3.33E-16	1.28E-16	2.63E-14	8.80E-16	5.49E-16
AP6	9/15/2009	9/29/2009	3	40022	2.96E-15	3.77E-16	3.75E-17	3.06E-14	9.47E-16	5.16E-16
AP7	9/15/2009	9/29/2009	3	40445	3.71E-15	4.02E-16	1.24E-16	3.00E-14	9.07E-16	4.95E-16
AP2	9/29/2009	10/13/2009	4	39448	2.75E-15	3.49E-16	1.25E-16	1.83E-14	7.34E-16	4.37E-16
AP3	9/29/2009	10/13/2009	4	39442	2.48E-15	3.32E-16	1.61E-16	1.81E-14	7.29E-16	4.89E-16
AP4	9/29/2009	10/13/2009	4	39328	3.07E-15	3.87E-16	2.28E-16	1.75E-14	7.37E-16	5.06E-16
AP5	9/29/2009	10/13/2009	4	39312	2.72E-15	3.57E-16	1.32E-16	1.87E-14	7.44E-16	4.52E-16
AP6	9/29/2009	10/13/2009	4	39318	2.67E-15	3.60E-16	1.75E-16	1.90E-14	7.55E-16	4.89E-16
AP7	9/29/2009	10/13/2009	4	38895	4.09E-15	4.36E-16	1.98E-16	1.89E-14	7.54E-16	4.80E-16

Air Monitor	Start Date	End Date	Sampling Quarter	Corrected Total Flow (cu ft)	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
					Result	Uncertainty	MDA	Result	Uncertainty	MDA
AP2	10/13/2009	10/27/2009	4	39265	2.81E-15	3.67E-16	2.23E-16	1.98E-14	7.72E-16	4.99E-16
AP3	10/13/2009	10/27/2009	4	39289	2.15E-15	3.30E-16	2.65E-16	1.85E-14	7.42E-16	5.22E-16
AP4	10/13/2009	10/27/2009	4	39338	2.38E-15	3.45E-16	2.49E-16	1.73E-14	7.42E-16	5.67E-16
AP5	10/13/2009	10/27/2009	4	39399	3.63E-15	4.16E-16	2.25E-16	2.12E-14	8.19E-16	4.91E-16
AP6	10/13/2009	10/27/2009	4	39403	3.16E-15	3.90E-16	2.46E-16	2.06E-14	7.90E-16	5.09E-16
AP7	10/13/2009	10/27/2009	4	39397	3.75E-15	4.30E-16	1.40E-16	2.08E-14	8.11E-16	5.73E-16
AP2	10/27/2009	11/11/2009	4	43541	3.74E-15	4.01E-16	2.38E-16	2.43E-14	8.04E-16	5.16E-16
AP3	10/27/2009	11/11/2009	4	43519	3.49E-15	3.71E-16	3.07E-17	2.49E-14	8.06E-16	4.95E-16
AP4	10/27/2009	11/11/2009	4	43451	2.39E-15	3.16E-16	1.51E-16	2.47E-14	8.09E-16	4.51E-16
AP5	10/27/2009	11/11/2009	4	43335	4.89E-15	4.67E-16	3.03E-16	2.74E-14	8.60E-16	4.33E-16
AP6	10/27/2009	11/11/2009	4	43348	4.01E-15	4.34E-16	2.23E-16	2.76E-14	8.98E-16	5.32E-16
AP7	10/27/2009	11/11/2009	4	43339	4.15E-15	4.27E-16	2.28E-16	2.47E-14	8.21E-16	4.91E-16
AP2	11/11/2009	11/30/2009	4	52946	3.79E-15	3.64E-16	1.50E-16	3.24E-14	8.29E-16	3.95E-16
AP3	11/11/2009	11/30/2009	4	52950	3.35E-15	3.46E-16	1.71E-16	3.19E-14	8.35E-16	3.70E-16
AP4	11/11/2009	11/30/2009	4	52958	4.17E-15	3.81E-16	1.49E-16	3.16E-14	8.20E-16	3.59E-16
AP5	11/11/2009	11/30/2009	4	53310	4.47E-15	3.97E-16	1.69E-16	3.48E-14	8.62E-16	3.80E-16
AP6	11/11/2009	11/30/2009	4	53245	3.92E-15	3.82E-16	2.21E-16	3.48E-14	8.73E-16	4.04E-16
AP7	11/11/2009	11/30/2009	4	53102	4.02E-15	4.01E-16	3.14E-16	3.33E-14	8.58E-16	4.78E-16
AP2	11/30/2009	12/15/2009	4	42238	2.29E-15	3.16E-16	1.23E-16	2.58E-14	8.30E-16	4.27E-16
AP3	11/30/2009	12/15/2009	4	42257	1.55E-15	2.74E-16	2.16E-16	2.02E-14	7.47E-16	4.82E-16
AP4	11/30/2009	12/15/2009	4	42245	2.51E-15	3.30E-16	1.82E-16	2.48E-14	8.15E-16	4.75E-16
AP5	11/30/2009	12/15/2009	4	42088	2.83E-15	3.49E-16	1.57E-16	2.82E-14	8.73E-16	4.53E-16
AP6	11/30/2009	12/15/2009	4	42139	2.16E-15	3.36E-16	3.19E-16	2.89E-14	8.87E-16	4.59E-16
AP7	11/30/2009	12/15/2009	4	42293	3.10E-15	3.83E-16	2.41E-16	2.89E-14	8.92E-16	4.36E-16
AP2	12/15/2009	12/29/2009	4	39729	4.35E-15	4.66E-16	2.58E-16	3.88E-14	1.06E-15	5.52E-16
AP3	12/15/2009	12/29/2009	4	39707	3.10E-15	3.81E-16	2.20E-16	3.84E-14	1.02E-15	3.82E-16
AP4	12/15/2009	12/29/2009	4	39682	2.83E-15	3.59E-16	1.65E-16	3.94E-14	1.05E-15	4.99E-16
AP5	12/15/2009	12/29/2009	4	39652	3.28E-15	3.89E-16	1.95E-16	4.15E-14	1.07E-15	4.92E-16
AP6	12/15/2009	12/29/2009	4	39615	4.16E-15	4.31E-16	1.64E-16	4.19E-14	1.08E-15	4.62E-16
AP7	12/15/2009	12/29/2009	4	39605	3.81E-15	4.25E-16	2.24E-16	4.11E-14	1.06E-15	3.89E-16

MDA = minimum detectable activity; Uncertainty = total propagated uncertainty; NS = not sampled

5. REFERENCES

1) 10 CFR 50, Appendix A

2) Donald T. Oakley, "Natural Radiation Exposure in the United States." U. S. Environmental Protection Agency, ORP/SID 72-1, June 1972

3) National Council on Radiation Protection and Measurements, Report No. 93, "Ionizing Radiation Exposures of the Population of the United States," September 1987

4) United States Nuclear Regulatory Commission, Regulatory Guide 8.29, "Instructions Concerning Risks from Occupational Radiation Exposure," Revision 0, July 1981

5) Safety Analysis Report for the National Enrichment Facility, Revision 17, Louisiana Energy Services

6) Untied States Nuclear Regulatory Commission Fact Sheet, Uranium Enrichment, January 2008

7) National Council on Radiation Protection and Measurement, Exposure of the Population in the United States and Canada from Natural Background Radiation, NCRP Report No. 94, National Council of Radiation Protection and Measurements, 1987

8) Environmental Report for the National Enrichment Facility, Revision 11, Louisiana Energy Services

9) 10 CFR 20, Standards for Protection Against Radiation

10) United States Nuclear Regulatory Commission, Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," Revision 0, July 1993

11) 10 CFR 61, Licensing Requirements For Land Disposal of Radioactive Waste

12) 40 CFR 264, Standards for Owners And Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

13) 49 CFR 107, Hazardous Materials Program Procedures

14) 49 CFR 173, Shippers--General Requirements for Shipments and Packagings

15) 40 CFR 261, Identification and Listing of Hazardous Waste

16) Depleted Uranium Hexafluoride Management Study, Louisiana Energy Services Claiborne Enrichment Center, L.M. Lippard and L.W. Davis, October 1, 1991

17) United States Nuclear Regulatory Commission, Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I

18) 40 CFR 190, Environmental Radiation Protection Standards For Nuclear Power Operations

19) United States Nuclear Regulatory Commission, Regulatory Guide 4.1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants," Revision 1, April 1975

20) International Commission of Radiological Protection, Publication No. 43, "Principles of Monitoring for the Radiation Protection of the Population," May 1984

21) United States Nuclear Regulatory Commission, Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program," Revision 1, November 1979

22) State of New Mexico, Discharge Permit Issuance, National Enrichment Facility, Louisiana Energy Services, DP-1481, February 28, 2007

23) EPA-402-K-07-006, Radiation Risks and Reality, May 2007

24) EPA-402-F-06-061, Ionizing Radiation Fact Book, March 2007

25) Brookins, Douglas G., Environmental Geology, Volume 19, Number 1/January 1992, Background Radiation in the Albuquerque, New Mexico, U.S.A., Area