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National Enrichment Facility

Facility Operating License SNM-2010

Annual Radiological Environmental Monitoring Program Report

September 2006 through December 31, 2008

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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 September 2006 to December 31, 2008. 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, and groundwater. Sampling and analysis of basin sediments and surface water will commence in 2009, once all basins are established. 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, and there was no radioactive material on-site with the exception of sealed sources during this monitoring 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 the NEF once operations commence. No samples indicated any detectable radioactivity attributable to the NEF operations as the NEF has not obtained feed or produced product materials. Offsite ambient radiation measurements using environmental TLDs

beyond the site boundary ranged between 88 and 100 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 radioactive effluents or ambient radiation from NEF operations.

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 were used to determine the baseline radiological data prior to NEF Operations.

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

Based on the fact that the NEF has not received feed or produced product material, there is no significant radiological impact on the environment or on the general public due to the NEF's operation.

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 an 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 2006 to December 31, 2008.

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 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. This document constitutes the first comprehensive baseline REMP report.

In order to more fully understand how an 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.

1.0. 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 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.

1.1. 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		**MAN-MADE**	
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.

1.2. 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.

1.3. 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. 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.

Feed is received at the plant in specially designed cylinders containing up to 14 tons (12.7 MT) of UF_6. The cylinders are inspected and weighed in the Cylinder Receipt and Dispatch Building (CRDB) and transferred to the main process facility, the Separations Building. Separation operations are divided among three Separations Building Modules, each capable of handling approximately one-third of plant capacity. Each Separations Building Module is divided into two Cascade Halls, and each Cascade Hall is comprised of eight cascades. Therefore, the total plant is comprised of 48 cascades. Each Cascade Hall produces enriched UF_6 at a specified assay (w/o ^{235}U), so up to six different assays can be produced at one time.

The enrichment process, housed in the Separations Building, is comprised of four major elements: a UF_6 Feed System, a Cascade System, a Product Take-off System, and a Tails Take-off System. Other product related functions include the Product Liquid Sampling and Product Blending Systems. Supporting functions include sample analysis, equipment decontamination and rebuild, liquid effluent treatment and solid waste management.

The major equipment used in the UF_6 feed process are Solid Feed Stations. Feed cylinders are loaded into Solid Feed Stations; vented for removal of light gases, primarily air and hydrogen fluoride (HF), and heated to sublime the UF_6. The light gases and UF_6

gas generated during feed purification are routed to the Feed Purification Subsystem where the UF_6 is desublimed.

The major pieces of equipment in the Feed Purification Subsystem are UF_6 Cold Traps, a Vacuum Pump/Chemical Trap Set, and a Low Temperature Take-off Station (LTTS). The Feed Purification Subsystem removes any light gases such as air and HF from the UF_6 prior to introduction into the cascades. The UF_6 is captured in UF_6 Cold Traps and ultimately recycled as feed, while HF is captured on chemical traps.

After purification, UF_6 from the Solid Feed Stations is routed to the Cascade System. Pressure in all process lines is subatmospheric.

Gaseous UF_6 from the Solid Feed Stations is routed to the centrifuge cascades. Each centrifuge has a thin-walled, vertical, cylindrically shaped rotor that spins around a central post within an outer casing. Feed, product, and tails streams enter and leave the centrifuge through the central post. Control valves, restrictor orifices, and controllers provide uniform flow of product and tails.

Depleted UF_6 exiting the cascades is transported from the high vacuum of the centrifuge for desublimation into Uranium Byproduct Cylinders (UBCs) at subatmospheric pressure. The primary equipment of the Tails Take-off System is the vacuum pumps and the Tails Low Temperature Take-off Stations (LTTS). Chilled air flows over cylinders in the Tails LTTS to effect the desublimation. Filling of the cylinders is monitored with a load cell system, and filled cylinders are transferred to an outdoor storage area (UBC Storage Pad).

Enriched UF_6 from the cascades is desublimed in a Product Take-off System comprised of vacuum pumps, Product Low Temperature Take-off Stations (LTTS), UF_6 Cold Traps, and Vacuum Pump/Chemical Trap Sets. The pumps transport the UF_6 from the cascades to the Product LTTS at subatmospheric pressure. The heat of desublimation of the UF_6 is removed by cooling air routed through the LTTS. The product stream normally contains small amounts of light gases that may have passed through the centrifuges. Therefore, a UF_6 Cold Trap and Vacuum Pump/Trap Set are provided to vent these gases from the product cylinder. Any UF_6 captured in the cold trap is periodically transferred to another product cylinder for use as product or blending stock. Filling of the product cylinders is monitored with a load cell system, and filled cylinders are transferred to the Product Liquid Sampling System for sampling.

Sampling is performed to verify product assay level (w/o ^{235}U). The Product Liquid Sampling Autoclave is an electrically heated, closed pressure vessel used to liquefy the UF_6 and allow collection of a sample. The autoclave is fitted with a hydraulic tilting mechanism that elevates one end of the autoclave so that liquid UF_6 pours into a sampling manifold connected to the cylinder valve. After sampling, the autoclave is brought back to the horizontal position and the cylinder is indirectly cooled by water flowing through coils located on the outer shell of the autoclave.

The plant has the capability to blend enriched UF_6 from two donor cylinders of different assays into a product receiver cylinder. The Product Blending System is comprised of Blending Donor Stations for the two donor cylinders and a Blending Receiver Station for the receiver cylinder. The Donor Stations are similar to the Solid Feed Stations described earlier. The Receiver Station is similar to the Low-Temperature Take-off Stations described earlier.

Support functions, including sample analysis, equipment decontamination and rebuild, liquid effluent treatment and solid waste management are conducted in the Centrifuge Receipt and Dispatch Building (CRDB). Decontamination, primarily of pumps and valves, uses solutions of citric acid.

Sampling includes a Chemical Laboratory for verifying product UF_6 assay, and an Environmental Monitoring Laboratory. It is anticipated that the site will contract Environmental Services to an outside laboratory for the first few years of operation. Liquid effluent is collected, treated and evaporated. It is not expected that discharge to the Treated Effluent Evaporation Basin, a double-lined evaporative basin with leak detection, will be needed.

A diagram of a typical gas centrifuge (Reference 6) is shown below in Figure 1.3-1.

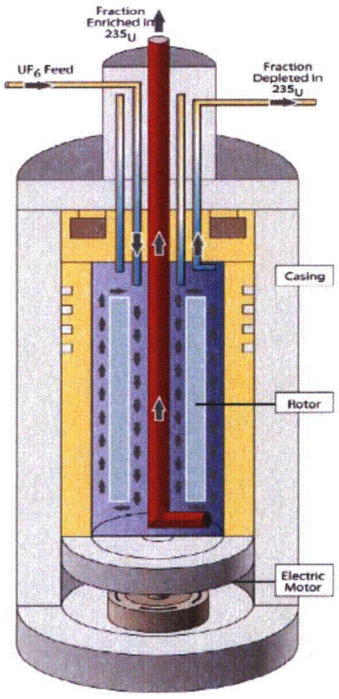


Figure 1.3-1, Typical Gas Centrifuge

1.4. Radioactive Effluent Control

The following paragraphs provide a comprehensive description of the planned NEF systems that handle gaseous and liquid effluent. The effectiveness of each system for effluent control is discussed for all systems that handle and release effluent.

1.4.1 Gaseous Effluent Vent System

The function of the Gaseous Effluent Vent System (GEVS) is to remove particulates containing uranium and hydrogen fluoride (HF) from potentially contaminated process gas streams. Pre-filters and high efficiency particulate air (HEPA) filters remove particulates and potassium carbonate impregnated activated carbon filters are used for the removal of any HF. Electrostatic filters remove oil vapor from the gaseous effluent associated with exhaust from vacuum pump/chemical trap set outlets wherever necessary.

The systems produce solid wastes from the periodic replacement of pre-filters, HEPA filters, and chemical 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) the Separations Building Gaseous Effluent Vent System and (2) the CRDB Gaseous Effluent Vent System.

1.4.1.1. Sources and Flow Rates

Potentially contaminated exhaust air comes from the rooms and services within the CRDB. Air from the Oil Recovery System is part of the Decontamination Workshop discharge. The total airflow to be handled by the GEVS for the CRDB and Separations Building are approximately 11,000 cfm (18,700 m^3/hr) and 6,474 cfm (11,000 m^3/hr), respectively.

The design requirements for the facility 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 UF_6 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 operator actions.

These requirements and operating conditions also provide assurance that personnel exposure to hazardous materials are maintained "as low as reasonably achievable" and that effluent discharges comply with environmental and safety criteria.

1.4.1.2. System Description

The GEVS for the Separations Building and the CRDB consists of the following major components:

- Duct system
- Pre-filter
- High Efficiency Particulate Air (HEPA) Filter
- Activated carbon filter (impregnated with potassium carbonate)
- Centrifugal Fan
- Monitoring and controls
- Automatically controlled inlet and outlet isolation dampers
- Discharge stack

The GEVS serving the CRDB consists of a duct network that serves all of the UF_6 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 approximately 11,000 cfm . A differential pressure controller controls the fan speed and maintains negative pressure in front of the filter station.

Gases from the UF_6 processing systems pass through an 85% efficient pre-filter. The pre-filter 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 UO_2F_2 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 the vent stack.

One Separation Building GEVS serves the entire Separations Building. It consists of a duct network that serves all of the uranium processing systems and operates at negative pressure. It is sized to handle the flow from all permanently ducted process locations, as well as up to 13 non-corrugated flexible duct exhaust points at one time. The flexible duct is used for cylinder connection/disconnection or maintenance procedures.

The ductwork is connected to two parallel filter stations. Each is capable of handling 100% of the effluent. One is online and the other is a standby. Each station consists of an 85% efficient pre-filter, a 99.97% efficient HEPA filter and a 99% efficient activated charcoal filter for removal of HF. The leg of the distribution system securing the exhaust of the vacuum pump/trap set outlets is routed through an electrostatic filter. Electrostatic filters have an

efficiency of 97%. The filter stations vent through one of two fans. Each fan is capable of handling 100% of the effluent. One fan is online, and the other is a standby. A switch between the operational and standby systems can be made using automatically controlled dampers. The system total airflow capacity is estimated to be 6,474 cfm. A differential pressure controller controls the fan speed and maintains negative pressure upstream of the filter station.

Gases from the UF_6 processing systems pass through the pre-filter which removes dust and protects the HEPA filter, then through the HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles), then through the potassium carbonate impregnated activated carbon filters which captures HF. The remaining clean gases pass through the fan, which maintains the negative pressure upstream of the filter stations. Finally, the clean gases are discharged through a roof top vent on the CRDB. One vent is common to the operational system and the standby system.

1.4.1.3. System Operation

For the CRDB GEVS and Separations Building GEVS, HF monitors and alarms are installed downstream of the filtration systems and immediately upstream of the vent stack to detect the release of hazardous materials to the environment. The alarms are monitored in the Control Room.

The units are located in a dedicated room in the CRDB. The filters will be bag-in bag-out. 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.

1.4.1.4. Effluent Releases

Under normal operating conditions, the system will not be contaminated. In the event that an abnormal situation occurs, the GEVS is designed to protect plant personnel against UF_6 and HF exposure. The GEVS is designed to meet all applicable NRC requirements for public and plant personnel safety and effluent control and monitoring. The system design also complies with all standards of OSHA, EPA, and state and local agencies.

The annual discharge of uranium in routine gaseous effluent discharged from the NEF is expected to be less than 10 grams (0.35 ounces). The environmental impacts of gaseous releases and associated doses to the public are described in detail in NEF Environmental Report, Section 4.12.1.1, Routine Gaseous Effluent.

1.4.2 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. 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. All flow rates and capacities are subject to change during final design.

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.

For the Centrifuge Test and Post Mortem Exhaust Filtration System, the minimum required filter configuration is one pre-filter, one activated filter, and one HEPA filter. Additional filters may be used provided adequate airflow remains. The pre-filter removes dust and debris, the potassium carbonate impregnated activated carbon filter removes HF, and the HEPA filter removes remaining uranic particles from the air stream. 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.

1.4.3 Liquid Effluent System

Quantities of radiologically contaminated, potentially radiologically contaminated, and non-radiologically contaminated 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 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.

1.4.3.1. 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 oil. The oil 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 UF_6 Sample Bottles cleaning rig and flexible hose decontamination cabinet. Part of the cleaning process involves rinsing them in 5-10% by volume citric acid.

- Laundry Effluent

This is water that has arisen from the washing of the plant personnel laundry including clothes and towels. The main constituents of this wastewater are detergents, bleach and very low levels of dissolved uranium based contaminants. This water is routed into a collection tank, monitored and neutralized as required. The effluent is contained and treated on the NEF site. It is expected that the NEF will outsource all laundry processing for the first few years of operation.

- Floor Washings

This is water, which has arisen from all the active areas of the plant namely the UF_6 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 evaporated or cleaned for reuse in plant systems.

1.4.3.2. 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, Separations Building, and Blending and Liquid Sampling Area 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 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.

As mentioned previously, laundry will be processed by an outside facility for the first few years of operation. Any incidental wash water will be sent to the Laundry Effluent Monitor Tanks in the Liquid Effluent Collection and Treatment Room and eventually evaporated.

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 a 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, which is cooled with water. The liquid is then sent through the evaporators again until there is no remaining liquid.

The Citric Acid Tank in the Decontamination Workshop is drained and all the effluent is transferred 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 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 oil, it is not possible to send the degreaser water to the Precipitation Treatment Tank for treatment. Therefore, the oil must be removed first.

For 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.

1.4.3.3. System Operation

Handling and eventual disposition of the liquid effluents is accomplished in two stages, collection and treatment. All liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment Room in the CRDB.

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 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.

1.4.3.4. Effluent Discharge

It is not expected that the operation of the facility will result in any process system liquid effluent. The systems will be operated in such a manner as to evaporate liquids and recover solids for disposal at an approved Low-Level Radioactive Waste Disposal site. There were no effluents discharged during this reporting period.

In the event that there is a need to discharge liquids in the future, liquid effluents will be treated to meet the requirements of 10 CFR 20, Appendix B, Table 2 (Reference 9) and the administrative levels recommended by NRC

Regulatory Guide 8.37 (Reference 10). The treated effluent may then be discharged to the double-lined Treated Effluent Evaporative Basin, which has leak detection capability.

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.

The Uranium Byproduct Cylinder (UBC), Storage Pad Stormwater Retention Basin is a single-lined retention basin used for the collection and monitoring of rainwater runoff from the UBC Storage Pad and to collect heating boiler blow down water.

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

The Environmental Report (Reference 8) lists plans for six septic systems for the NEF site, each septic system consisting of a septic tank with one or more leach fields.

However, the plant has since decided to send domestic waste to the Eunice Municipal Sewer System. Discharge to the Eunice Municipal Sewer System began in December of 2008. Additional site buildings and trailers are anticipated to be hooked up to the sewer system in a phased approach from 2008 through 2010. In addition to the sewer discharge, there are also a number of port-a-lets that collect septic and domestic wastes into tanks that are regularly pumped into trucks for processing at offsite facilities.

Total annual design discharge will be approximately 3.87 million gallons per year.

1.4.4 Solid Waste Management

Solid waste generated at the NEF will be grouped into industrial (nonhazardous), hazardous, radioactive and mixed waste categories. An effort will be made to segregate dry from wet waste to minimize any cross contamination of waste products. The solid waste management systems will be a set of facilities, administrative procedures, and practices that provide for the collection, temporary storage, and disposal of categorized solid waste in accordance with regulatory requirements. All solid radioactive wastes generated will be Class A low-level wastes (LLW) as defined in 10 CFR 61 (Reference 11).

Industrial waste, including miscellaneous trash, vehicle air filters, empty cutting oil cans, miscellaneous scrap metal, and paper will be shipped offsite for minimization and then sent to a licensed waste landfill. The NEF is expected to

produce approximately 380,400 lbs of this normal trash annually. Table 3.12-2 of the NEF Environmental Report, Estimated Annual Non-Radiological Wastes, describes normal waste streams and quantities.

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, such as, 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 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. Table 3.12-2 of the NEF Environmental Report, Estimated Annual Non-radiological Wastes, denotes hazardous waste and quantities.

1.4.4.1. 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 (Reference 12) 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 10 CFR 61. Wastes are transported offsite for disposal by contract carriers. Transportation is in compliance with 49 CFR 107 (Reference 13) and 49 CFR 173 (Reference 14).

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.

1.4.4.1.1. 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.

1.4.4.1.1.1. 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 as much 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 (Reference 15). 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.

1.4.4.1.1.2. Oil Recovery Sludge

The process for recovering used 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.

1.4.4.1.1.3. Oil Filters

Used oil filters are collected from the diesel generators and from plant vehicles. No filters are radioactively contaminated. The used filters are placed in containers and transported to the waste storage area of the CRDB. There the filters are drained completely and transferred to a drum. The drained waste oil is combined with other waste oil and handled as hazardous waste. The drum is then shipped to an offsite waste disposal contractor.

1.4.4.1.1.4. 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.

1.4.4.1.1.5. 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.

1.4.4.1.1.6. 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.

1.4.4.1.2. 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.

1.4.4.1.2.1. Trash

Trash consists of paper, wood, gloves, cloth, cardboard, and non-contaminated waste from all plant areas. Some items require special handling, and are not included in this category, notably: paints, aerosol cans, and containers in which hazardous materials are stored or transported. Trash from Restricted Areas is collected and processed separately from non-contaminated trash.

The sources of dry trash are the same for the wet trash, and dry trash is handled in much the same way as wet trash. Section 1.4.4.1.1.1, of this report, Wet Trash, describes the handling of wet trash in more detail. The only differences between wet and dry trash handling are discussed below.

Steps to remove liquids are of course unnecessary for dry trash. The dry waste portion of the Solid Waste Collection System accepts wet trash that has been dewatered, as well as dry trash.

Radioactive trash is shipped to a CVRF. The CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. Waste handled by the CVRF will be disposed of in a radioactive waste disposal facility.

Trash containing hazardous material is handled as described above in Section 1.4.4.1.1.1 regarding the wet waste portion of the Solid Waste Collection System.

Aerosol spray cans may be disposed of as trash if they are first totally discharged and then punctured. Special receptacles for spray cans used in the Separations Building are provided. Each can is inspected

for radioactive contamination to ensure total discharge and puncture before it can be included with industrial trash.

"Mixed" trash is handled as described above in Section 1.4.4.1.1.1 above. Mixed trash is generated by the use of rags and wipes, with solvent, on radioactively contaminated components.

1.4.4.1.2.2. 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.

GEVS carbon filters are discussed in Section 1.4.4.1.2.5, Filter Elements, below. 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.

1.4.4.1.2.3. 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.

1.4.4.1.2.4. Activated Sodium Fluoride

Activated sodium fluoride (NaF) is used in the Contingency Dump System to remove UF_6 and HF from exhaust gases. NaF adsorbs up to either 150% of its weight in UF_6 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.

1.4.4.1.2.5. Filter Elements

Pre-filters and HEPA filters are used in several places throughout the plant to remove dust and dirt, uranium compounds, and hydrogen fluoride. Air filters, as a waste, consist of fiberglass or cellulose filters. Generally, only the Gaseous Effluent Vent System filters are contaminated and will contain much less than 1% by weight of UO_2F_2. 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 Gaseous Effluent Vent Systems, 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 TSB where they are sampled to determine the quantity of ^{235}U present. The exterior of the bag is monitored for contamination, 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.

1.4.4.1.2.6. Scrap Metal

Metallic wastes are generated during routine and abnormal maintenance operations. The metal may be clean, contaminated with radioactive material and/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.

1.4.4.1.2.7. 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.

1.4.4.1.2.8. Evaporator/Dryer Concentrate

Potentially radioactive aqueous waste is evaporated in the Evaporator/Dryer to remove uranium. 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.

1.4.4.1.2.9. Depleted UF_6

The enrichment process yields depleted UF_6 streams with assays ranging from 0.20 to 0.34 w/o ^{235}U. The approximate quantity and

generation rate for depleted UF_6 is 8,600 tons per year. This equates to approximately 625 cylinders of UF_6 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. UBC cylinder transport between the Separations Building and the storage area is discussed in the NEF Safety Analysis Report Section 3.4.11.2, Cylinder Transport Within the Facility. Refer to the NEF Environmental Report Section 4.13.3.1, Radioactive and Mixed Waste Disposal Plan, for information regarding LES's depleted UF_6 management practices.

Storage of UBCs will be for a temporary period until shipped offsite for use or disposal. Refer to the NEF Environmental Report Section 4.13.3.1 for the range of options for UBC disposition.

The Depleted Uranium Hexafluoride Management Study (Reference 16), provides a plan for the storage of UBCs in a safe and cost-effective manner in accordance with all applicable regulations to protect the environment.

The potential environmental impacts from direct exposure are described in the NEF Environmental Report Section 4.12.2.1.3, Direct Radiation Impacts. For the purposes of the dose calculation in that section, the UBC Storage Pad has a capacity of approximately 10,000 containers. A detailed discussion on the environmental impacts associated with the storage and ultimate disposal of UBCs is provided in the NEF Environmental Report Section, 4.13.3.1.1, Uranium Byproduct Cylinder (UBC) Storage.

1.5. 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 would be 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. However, since the NEF is not yet operational, these calculations need not be performed.

The types and quantities of radioactive liquid and gaseous effluents released from the NEF during each given year will be reported to the Nuclear Regulatory Commission semi-annually as required by 10 CFR 70.59. The liquid and gaseous effluents are expected to be well below the federal release limits.

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.

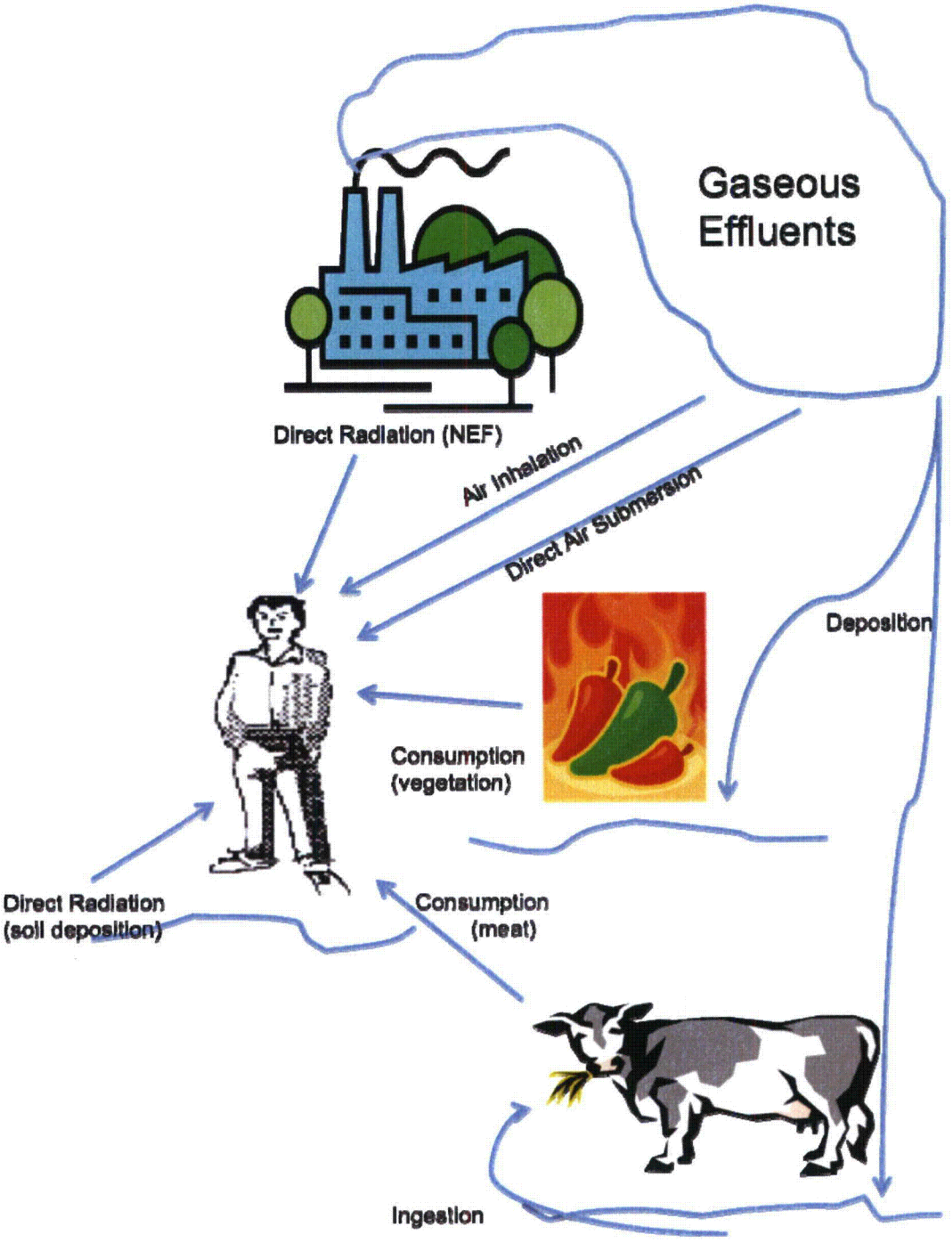


Figure 1.5-1, Radiation Exposure Pathways

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 computerized dose calculations that are based on very conservative NRC-recommended models that tend to result in over-estimates of resulting dose.

NEF personnel perform these computerized dose calculations. These computer codes use the guidelines and methodology set forth by the NRC in Regulatory Guide 1.109 (Reference 17).

NEF personnel will perform quarterly dose calculations. 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 will be 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

2.0. Pre-Operational Monitoring Results

The Radiological Environmental Monitoring Program (REMP) at the NEF was first initiated in September 2006, in the form of a pre-operational monitoring program prior to bringing the facility on-line. The NRC's intent (Reference 20) with performing a pre-operational environmental monitoring program is to:

- measure background levels and their variations in the environment in the area surrounding the licensee's station; and,
- evaluate procedures, equipment, and techniques for monitoring radiation and radioactivity in the environment.

The pre-operational program commenced in September 2006 and is still on-going. Examples of background radiation and radioactivity levels measured during this time period are as follows:

- Airborne Radioactivity Particulate Concentration:
  - Gross Beta – 2.95E-14 µCi/ml (1.09E-9 Bq/mL);
  - Gross Alpha – 1.94 E-15 µCi/ml (7.18E-11 Bq/mL);
  - ^{234}U – 4.31E-17 µCi/ml (1.60E-12 Bq/mL) (composite);
  - ^{235}U – 3.29E-18 µCi/ml (1.22E-13 Bq/mL) (composite);
  - ^{238}U – 4.15E-17 µCi/ml (1.54E-12 Bq/mL) (composite);
  - $^{Total}U$ – 8.79E-17 µCi/ml (3.25E-12 Bq/mL) (composite).
- Ambient Radiation (TLDs): 10-11.5 micro-R/hr (88 - 100 mR/yr);
- Vegetation Radioactive Uranium Concentrations:
  - ^{234}U – 2.04E-01 pCi/g (7.53E-03 Bq/g);
  - ^{235}U – 2.68E-02 pCi/g (9.91E-04 Bq/g);
  - ^{238}U – 2.91E-01 pCi/g (1.08E-02 Bq/g).
- Soil Radioactive Uranium Concentrations:
  - ^{234}U – 3.57E00 pCi/g (1.32E-01 Bq/g);
  - ^{235}U – 1.32E00 pCi/g (4.89E-02 Bq/g);
  - ^{238}U – 3.26E00 pCi/g (1.21E-01 Bq/g).

- Groundwater Radioactive Uranium Concentrations:
  - ^{234}U – 8.75E-09 µCi/ml (3.24E-04 Bq/L);
  - ^{235}U – 2.88E-10 µCi/ml (1.07E-2 Bq/L);
  - ^{238}U – 4.28E-09 µCi/ml (1.58E-01 Bq/L).

This information from the pre-operational phase will be 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 has been implementing a comprehensive operational environmental monitoring program. This program (Reference 20) will provide 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. 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 and groundwater samples. The sampling locations are also displayed on the maps shown in Figures 2.1-1 through 2.1-5.

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 resuspended 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, and;
- AP06 is located offsite to the north of the facility near a business known as the Wallach property.
- 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 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, instantaneous flow in CFM, and door opening (access) events. Accumulated flow data is gathered during the biweekly air filter exchange.

Five samplers were installed the week of September 3, 2006, and the sixth (control station, in Texas) was installed several weeks later after access agreements were reached with the landowner, University of Texas. The units were energized during the scheduled biweekly visit and sampling began as soon as power was established for each station.

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.

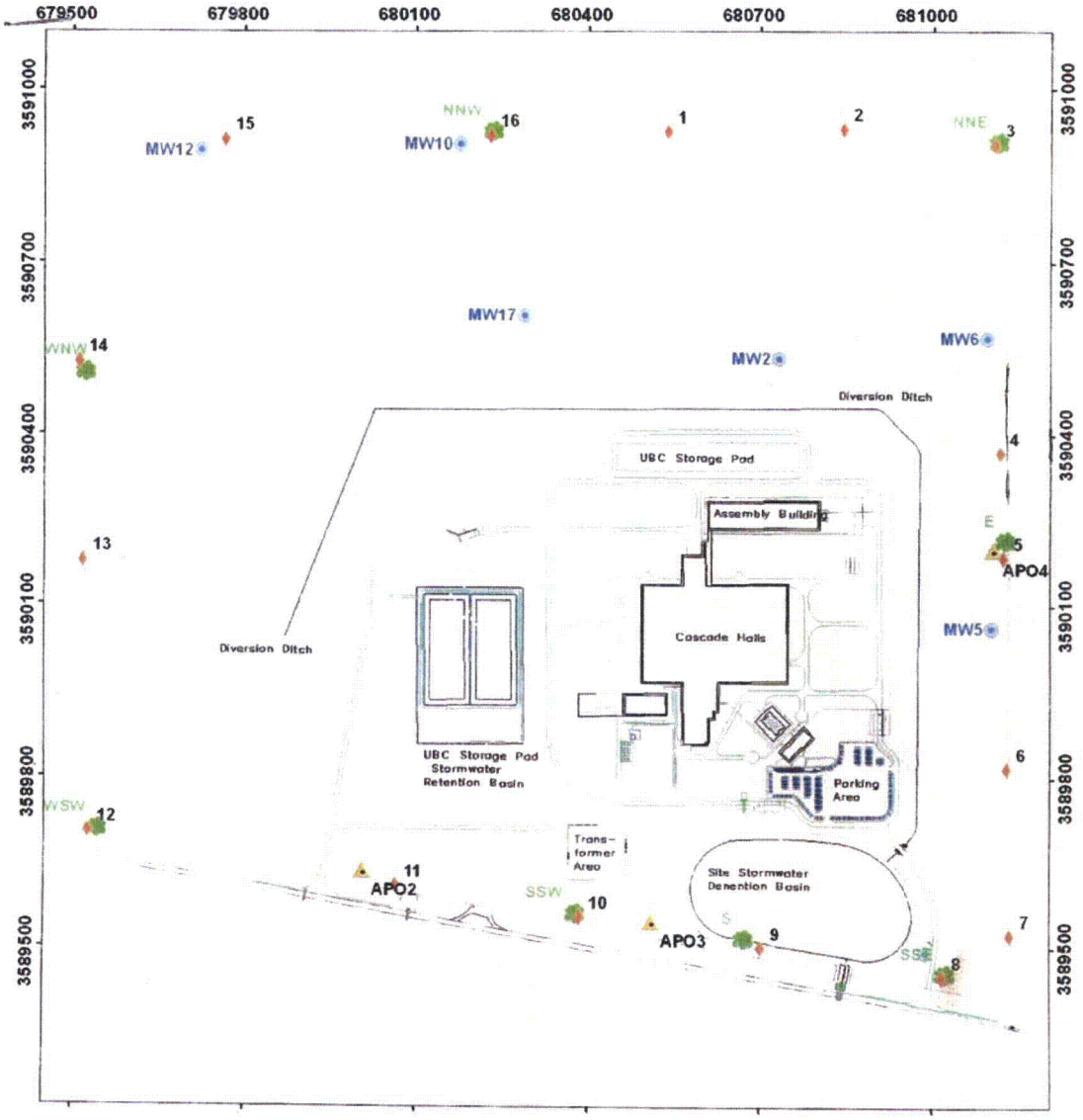
The radiation monitoring locations for the environmental TLDs are shown in Figure 2.1-6. These TLDs are changed out quarterly.

In regard to terrestrial REMP sampling, routine collection and analysis of soil samples were collected by GL Environmental, Inc. as well as Shaw Environmental personnel and sample shipment and analyses were conducted by Assaigai Analytical, Eberline Services, and Paragon Laboratory personnel.

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 annual 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).



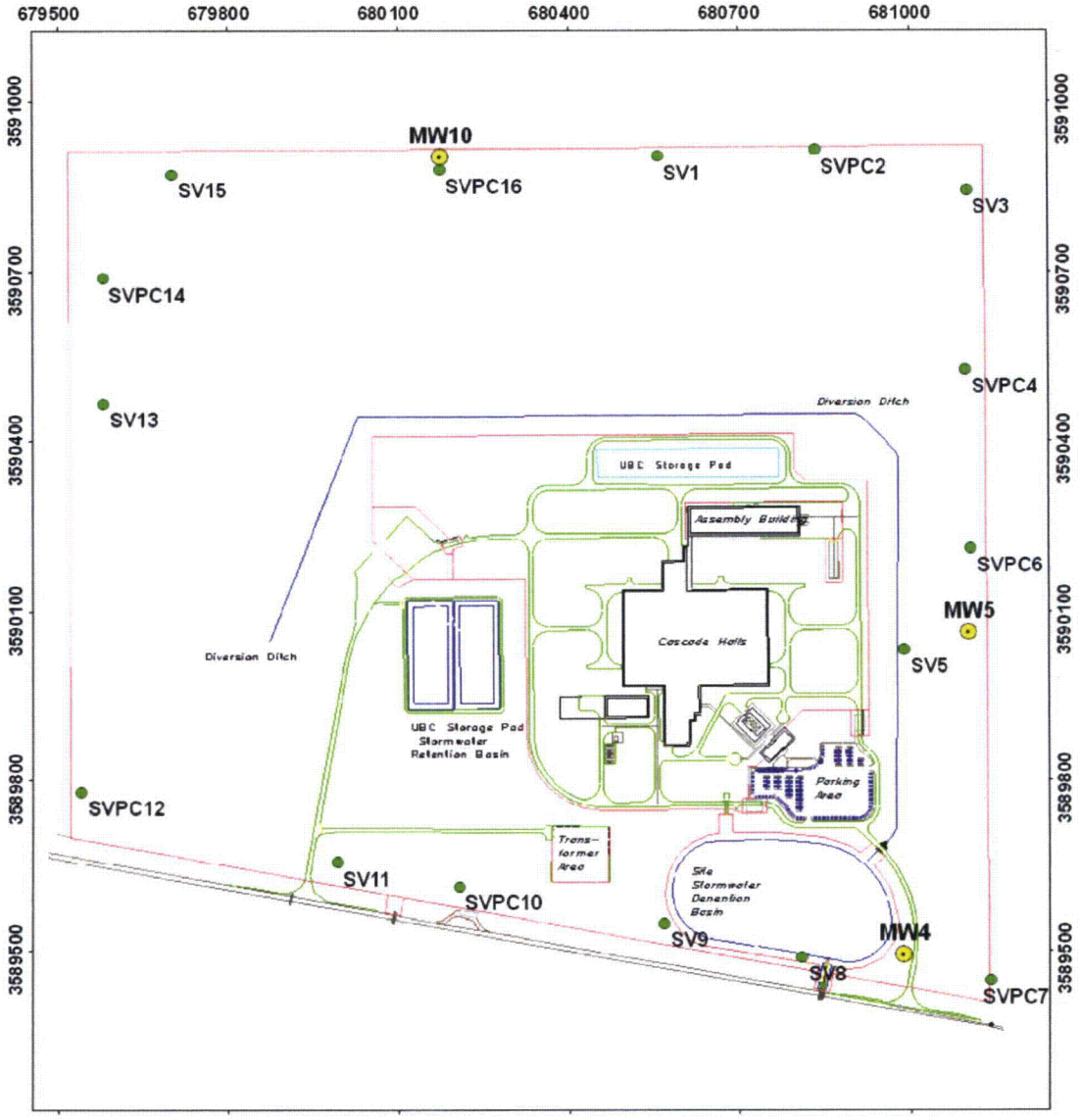
NEF Monitoring Well

Vegetation and soil sampling locations

Air samplers

Dosimeters

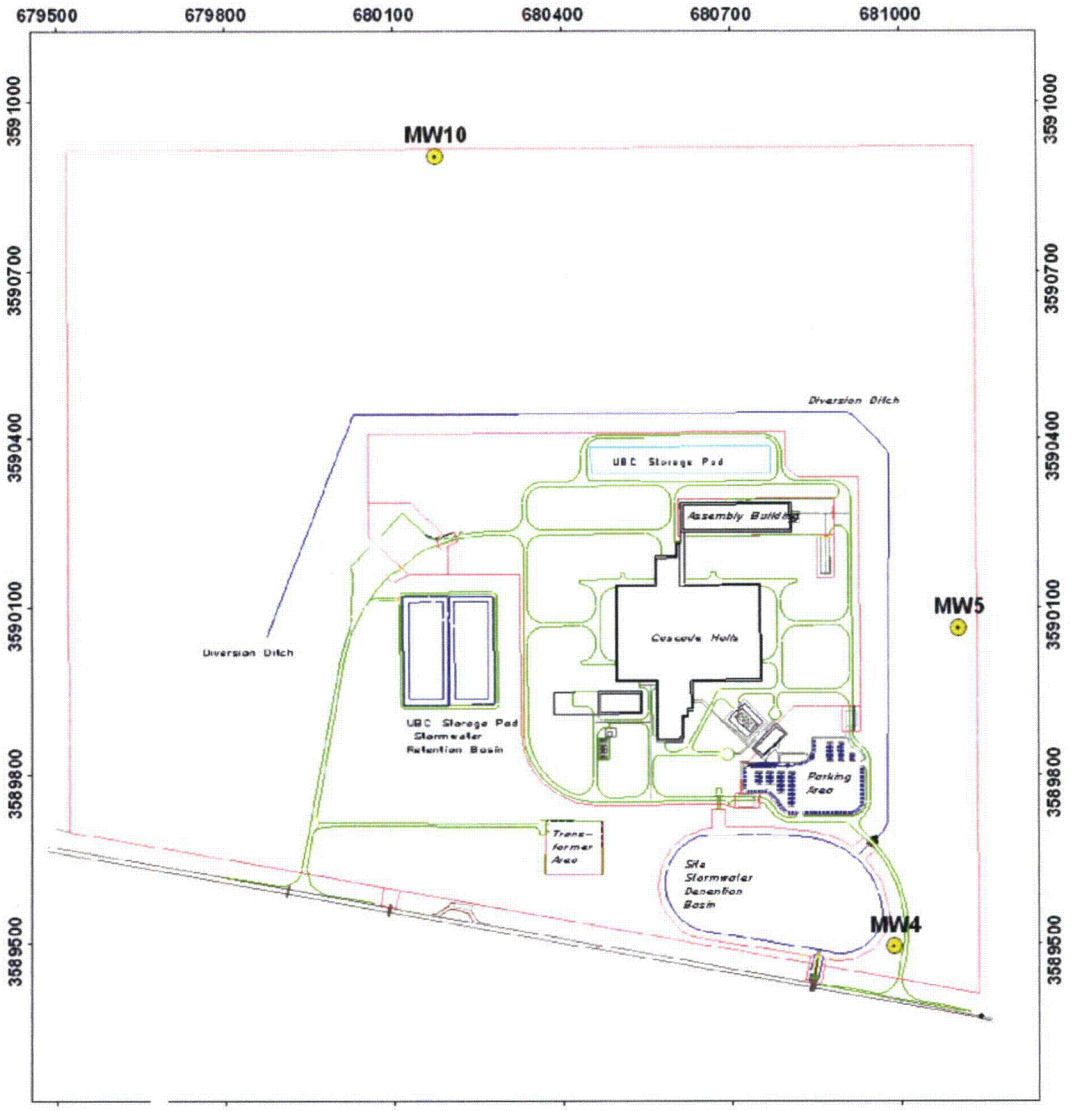
Figure 2.1-1, Groundwater, Soil and Vegetation, Air Sampler and TLD Sample Locations, 4th Quarter 2007



⊙ NEF Monitoring Well

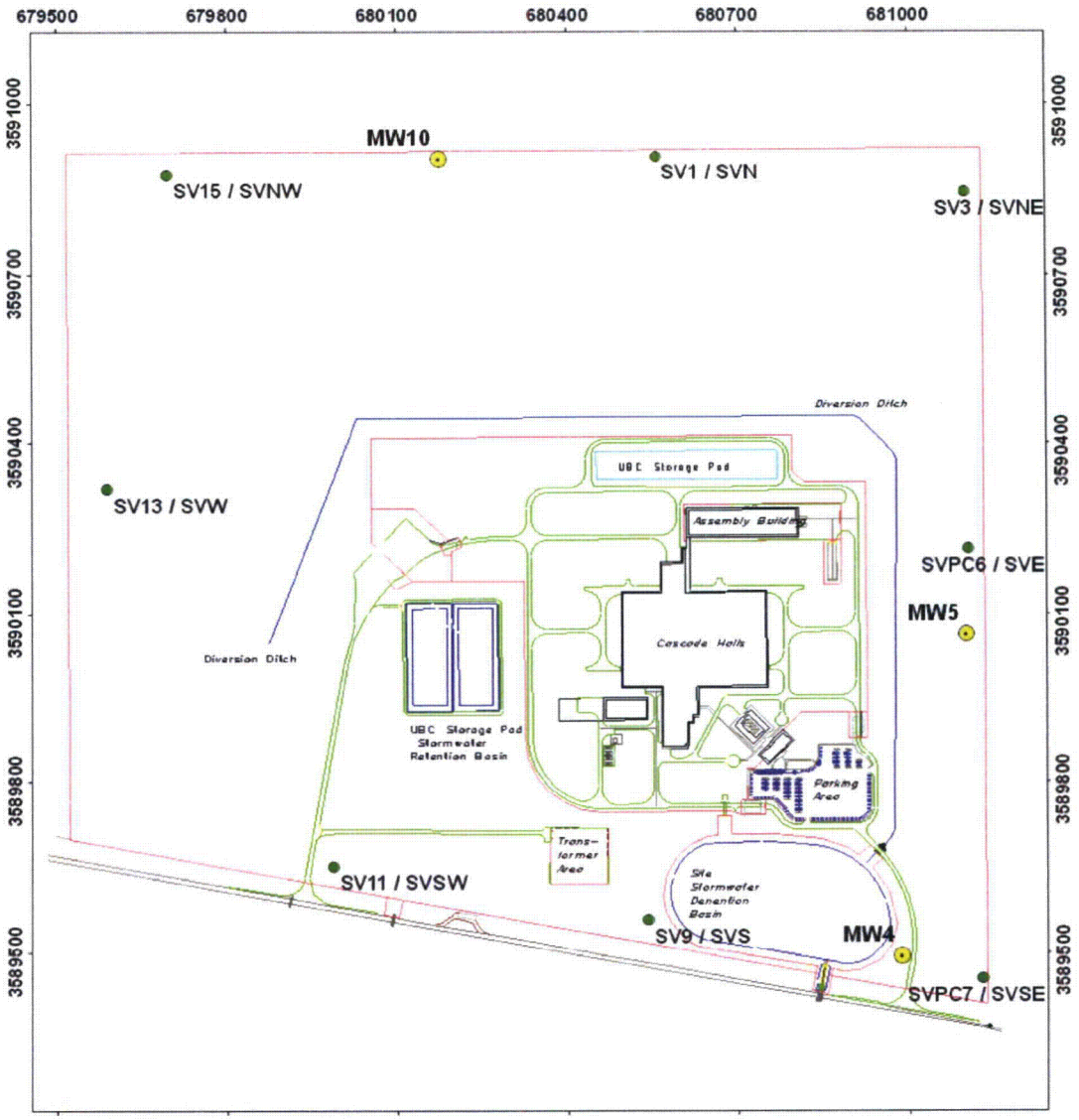
▲ Vegetation and soil sampling locations

Figure 2.1-2, Groundwater, Soil and Vegetation Sample Locations, 1st Quarter 2008



NEF Monitoring Well

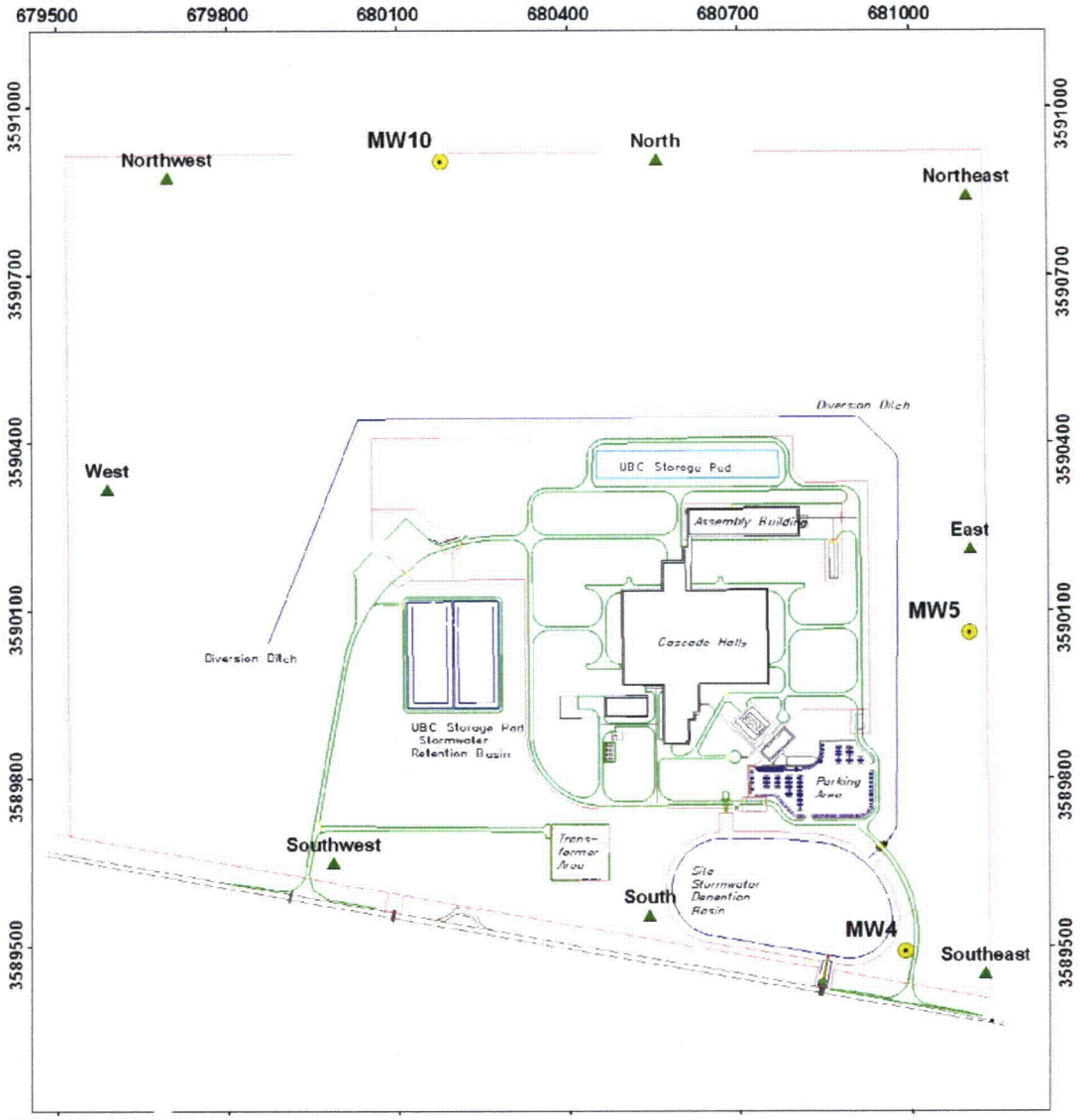
Figure 2.1-3, Groundwater Sample Locations, 2nd Quarter 2008



NEF Monitoring Well

Vegetation and soil sampling locations

Figure 2.1-4, Groundwater, Soil and Vegetation Sample Locations, 3rd Quarter 2008



NEF Monitoring Well

Vegetation and soil sampling locations

Figure 2.1-5, Groundwater, Soil and Vegetation Sample Locations, 4th Quarter 2008

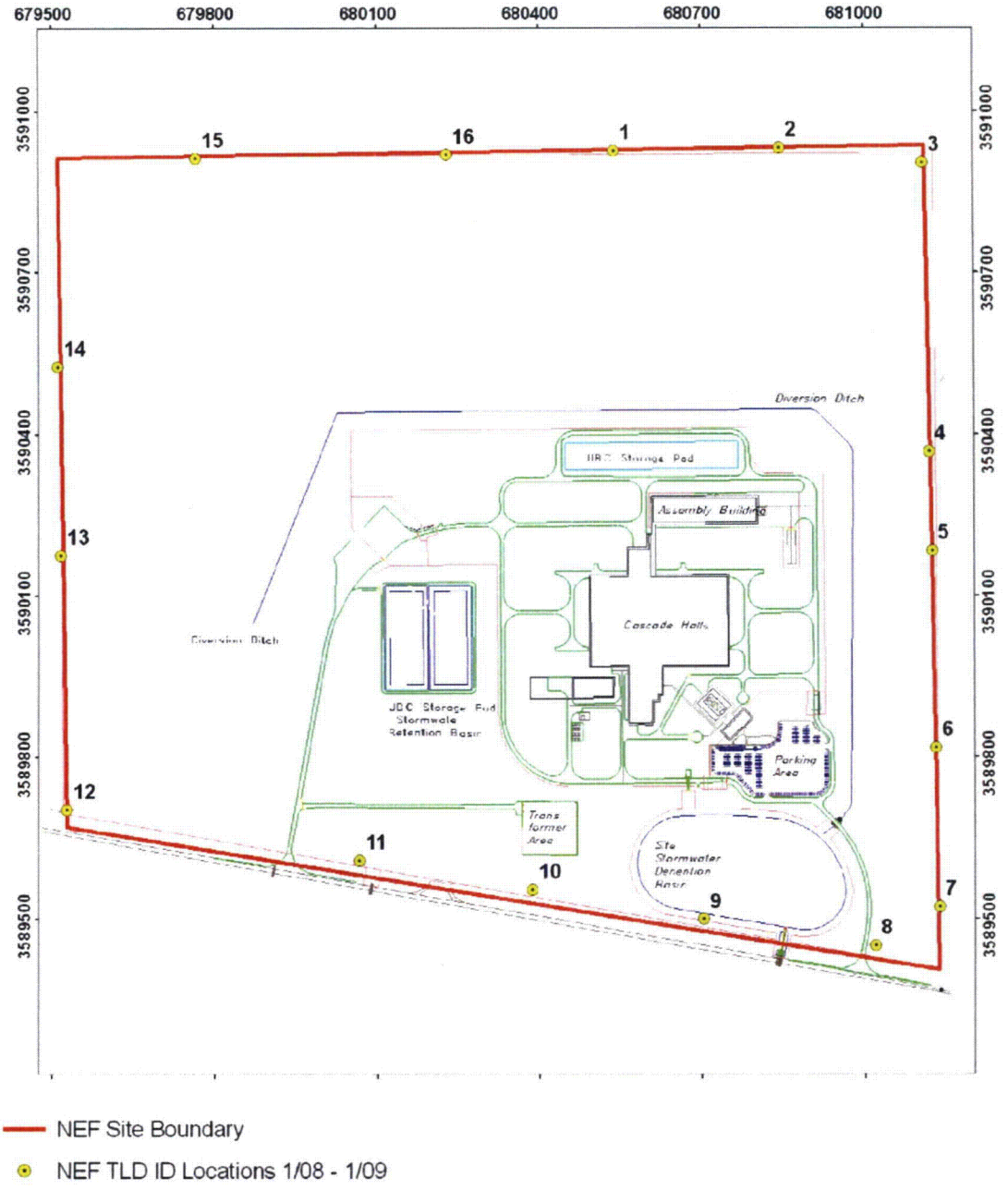


Figure 2.1-6, Ambient Radiation (TLD) Sample Locations - 2008

2.2. Interpretation of Radioactivity Analyses Results

Since all of the data is pre-operational data, no interpretation of the analyses results is required for this report. Future reports will contain analyses against the pre-operational data reported in this report.

2.3. 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 typically posted for periods of one to 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.

GL Environmental, Inc. began managing ambient radiation environmental monitoring for the first quarter of 2008. The 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 located inside a metal cabinet in trailer 10-5 in the NEF trailer complex. At each outdoor monitoring station, two (2) TLDs are hung at chest level. The first TLD (Panasonic TLD-XBGN dosimeter) monitors radiation in the beta/gamma range. 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 2008 are shown in Figure 2.1-6.

Of the 64 pairs of TLDs (16 locations * 4 quarters) posted during this reporting period, 62 pairs were retrieved and processed. Those TLDs missing from their monitoring locations were lost to unknown causes, and their absence is discussed in Appendix B. Annualized results for 2008 for TLDs located along the fence line are presented in Table 2.3-1. Results are not corrected for the control dose since future operational analyses will compare pre-operational annual doses with operational annual doses. Annualized beta/gamma exposure rates for complete years measured at the fence line locations ranged from 89 to 99 mR/yr. Annual neutron exposure rates measured at the fence line locations were all less than the minimum detectable activity, except for one, which was deemed a bad read by the TLD vendor and reported as less than minimum detectable.

Quarterly beta/gamma and neutron doses, corrected for the control dose, are reported in Table 2.3-2.

Table 2.3-1, Annualized Beta/Gamma and Neutron Doses

TLD Location	Annualized 2008 Beta/Gamma Dose (mR/year)	Annualized 2008 Neutron Dose (mR/year)
1	93	ND
2	95	ND
3	94	ND
4	94	ND
5	93	ND
6	94	ND
7	94	ND
8	91	ND
9	94	ND
10	97	ND
11	99	ND
12	68	ND
13	93	ND
14	92	ND
15	89	ND
16	92	ND

Table 2.3-2, Quarterly Beta/Gamma and Neutron Doses (Corrected for Control)

TLD Location	Beta/Gamma Dosage per Quarter (mR)				Neutron Dosage per Quarter (mR)			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1	3	8	3	3	ND	ND	ND	ND
2	2	8	4	5	ND	ND	ND	ND
3	1	5	6	6	ND	ND	ND	ND
4	2	5	6	5	ND	ND	ND	ND
5	0	7	5	5	ND	ND	ND	ND
6	1	7	4	6	ND	ND	ND	ND
7	1	7	4	6	ND	30	ND	ND
8	1	5	3	6	ND	ND	ND	ND
9	4	7	4	3	ND	ND	ND	ND
10	3	8	5	5	ND	ND	ND	ND
11	5	11	3	4	ND	ND	ND	ND
12	2	NS	3	4	ND	ND	ND	ND
13	1	9	2	5	ND	ND	ND	ND
14	3	7	2	4	ND	ND	ND	ND
15	2	5	3	3	ND	ND	ND	ND
16	2	7	4	3	ND	ND	ND	ND
Control	20	17	19	20	NA	NA	NA	NA

NA = not applicable; ND = not detected; NS = not sampled

2.4. 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. 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 2.1-1.

There were a few instances where power was lost or pumps failed 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 2.4-1 – 2.4-4. The values in Table 2.4-1 are the averages of the weekly values for the sampling stations. The values in Tables 2.4-2 – 2.4-4 are the averages of the composite samples. Since the NEF has not yet brought uranium on-site, the gross alpha, gross beta and ^{234}U, ^{235}U and ^{238}U activity arises from naturally occurring radionuclides such as radon decay daughter products.

All air particulate filter radioactivity analysis results for 2008, including sample volumes, associated error (uncertainty), and minimum detectable activity (MDA), have been included in Appendix D.

Table 2.4-1, Air Monitoring Station Gross Alpha/Beta Activities

Sample Station	Bq/ml		μCi/ml	
	Alpha	Beta	Alpha	Beta
AP2	2.62E-10	2.96E-09	7.08E-15	8.00E-14
AP3	6.61E-10	1.08E-08	1.79E-14	2.92E-13
AP4	2.46E-10	2.32E-09	7.64E-15	7.22E-14
AP5	3.65E-10	3.24E-09	9.87E-15	8.75E-14
AP6	4.70E-10	1.35E-08	1.27E-14	3.65E-13
AP7	3.82E-10	3.63E-09	1.03E-14	9.80E-14
Average	3.98E-10	6.07E-09	1.09E-14	1.66E-13

Table 2.4-2, ^{234}U Composite Sample Results

Sample Station	Bq/ml	µCi/ml
AP2	1.68E-12	4.53E-17
AP3	2.44E-12	6.59E-17
AP4	1.82E-12	4.91E-17
AP5	1.38E-12	3.74E-17
AP6	1.81E-12	4.89E-17
AP7	4.30E-12	1.16E-16
Average	2.24E-12	6.05E-17

Table 2.4-3, ^{235}U Composite Sample Results

Sample Station	Bq/ml	µCi/ml
AP2	1.73E-13	4.68E-18
AP3	1.77E-13	4.77E-18
AP4	1.52E-13	4.12E-18
AP5	1.43E-13	3.87E-18
AP6	1.31E-13	3.53E-18
AP7	3.32E-13	8.98E-18
Average	1.85E-13	4.99E-18

Table 2.4-4, ^{238}U Composite Sample Results

Sample Station	Bq/ml	µCi/ml
AP2	1.72E-12	4.65E-17
AP3	2.43E-12	6.56E-17
AP4	2.02E-12	5.47E-17
AP5	1.31E-12	3.53E-17
AP6	1.70E-12	4.60E-17
AP7	5.65E-12	1.53E-16
Average	2.47E-12	6.68E-17

Table 2.4-5, $^{Total}U$ Composite Sample Results

Sample Station	Bq/ml	µCi/ml
AP2	3.57E-12	9.65E-17
AP3	5.04E-12	1.36E-16
AP4	4.00E-12	1.08E-16
AP5	2.83E-12	7.66E-17
AP6	3.64E-12	9.84E-17
AP7	1.03E-11	2.78E-16
Average	4.89E-12	1.32E-16

2.5. Vegetation Radioactivity Analyses

During 2007, eight (8) vegetation samples (shrubs and grasses) were collected within the NEF site by Shaw Environmental. Each of the sample locations is identified in Figure 2.1-5, which corresponds to an environmental TLD location. The 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 energies of the gamma radiations from U-235 and U-236 are very close and difficult for some laboratories to discriminate one from the other. The vendor laboratory reported that the contract minimum detection limit was met for all samples reported. Each of the sample locations is identified on Figure 2.1-1. See Table 2.5-1 for the sampling results.

On March 20, 2008, sixteen (16) on-site vegetation samples and eight (8) off-site vegetation samples were collected and analyzed for isotopic uranium (^{234}U, ^{235}U and ^{238}U). Each of the sample locations is identified on Figure 2.1-2. See Table 2.5-2 for the sampling results.

On July 16, 2008, eight (8) on-site vegetation samples, as well as seven (7) off-site vegetation samples (off-site northeast was not sampled), were taken in for third quarter of 2008 and analyzed for isotopic uranium (^{234}U, ^{235}U and ^{238}U). Each of the sample locations is identified on Figure 2.1-4. See Table 2.5-3 for the sampling results.

On October 16, 2008 eight (8) on-site vegetation samples and eight (8) off-site vegetation samples were collected for the fourth quarter of 2008 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 2.1-5. See Table 2.5-4 for the sampling results.

The averages for the 2008 vegetation monitoring results are shown in Table 2.5-5. The average vegetation sample results are for the 2008 samples, when the area was sampled. It was not possible to ensure that the 2007 were representative of the same areas as the 2008 samples.

No radioactivity attributable to the NEF was detected in any of the samples collected during the reporting period, as the NEF has not yet commenced operations.

All vegetation radioactivity analysis results for 2008, including associated error (uncertainty) and minimum detectable activity (MDA), have been included in Appendix D.

Table 2.5-1, 2007 Vegetation Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
3	1.1E-04	3.0E-03	3.0E-06	8.1E-05	9.5E-05	2.6E-03
5	1.6E-04	4.4E-03	1.1E-05	3.0E-04	1.9E-04	5.0E-03
8	1.1E-03	3.0E-02	9.0E-05	2.4E-03	9.6E-04	2.6E-02
9	3.7E-04	1.0E-02	2.3E-05	6.2E-04	3.6E-04	9.7E-03
10	5.4E-04	1.5E-02	6.7E-05	1.8E-03	5.2E-04	1.4E-02
12	1.5E-04	3.9E-03	4.6E-05	1.2E-03	1.6E-04	4.4E-03
14	6.4E-04	1.7E-02	7.3E-05	2.0E-03	7.0E-04	1.9E-02
16	4.1E-04	1.1E-02	1.2E-05	3.2E-04	4.6E-04	1.2E-02

Table 2.5-2, First Quarter 2008 Vegetation Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	3.0E-02	8.1E-01	0.0E+00	0.0E+00	2.0E-02	5.4E-01
SVPC2	2.0E-02	5.4E-01	1.0E-02	2.7E-01	3.0E-02	8.1E-01
SV3	3.0E-02	8.1E-01	0.0E+00	0.0E+00	3.0E-02	8.1E-01
SVPC4	2.0E-02	5.4E-01	0.0E+00	0.0E+00	3.0E-02	8.1E-01
SV5	1.1E-01	3.0E+00	1.0E-02	2.7E-01	5.6E-01	1.5E+01
SVPC6	2.0E-02	5.4E-01	1.0E-02	2.7E-01	1.0E-02	2.7E-01
SVPC7	1.0E-02	2.7E-01	0.0E+00	0.0E+00	3.0E-02	8.1E-01
SV8	6.0E-02	1.6E+00	0.0E+00	0.0E+00	2.0E-02	5.4E-01
SV9	2.0E-02	5.4E-01	1.0E-02	2.7E-01	5.0E-02	1.4E+00
SVPC10	3.0E-02	8.1E-01	0.0E+00	0.0E+00	5.0E-02	1.4E+00

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV11	3.0E-02	8.1E-01	0.0E+00	0.0E+00	4.0E-02	1.1E+00
SVPC12	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	2.7E-01
SV13	2.0E-02	5.4E-01	0.0E+00	0.0E+00	2.0E-02	5.4E-01
SVPC14	1.2E-01	3.2E+00	2.0E-02	5.4E-01	7.9E-01	2.1E+01
SV15	1.0E-02	2.7E-01	0.0E+00	0.0E+00	4.0E-02	1.1E+00
SVPC16	2.0E-02	5.4E-01	0.0E+00	0.0E+00	5.0E-02	1.4E+00
Offsite West	4.74E-04	1.28E-02	0.00E+00	0.00E+00	2.16E-03	5.85E-02
Offsite NW	1.15E-03	3.10E-02	0.00E+00	0.00E+00	9.40E-04	2.54E-02
Offsite North	1.03E-03	2.79E-02	2.01E-04	5.44E-03	6.22E-04	1.68E-02
Offsite SW	6.22E-04	1.68E-02	7.62E-05	2.06E-03	1.21E-03	3.27E-02
Offsite South	8.21E-04	2.22E-02	5.85E-04	1.58E-02	1.11E-03	2.99E-02
Offsite SE	1.52E-03	4.10E-02	2.48E-04	6.69E-03	1.24E-03	3.34E-02
Offsite East	1.16E-03	3.13E-02	0.00E+00	0.00E+00	3.32E-04	8.98E-03
Offsite NE	5.37E-04	1.45E-02	0.00E+00	0.00E+00	1.67E-03	4.51E-02

Table 2.5-3, Third Quarter 2008 Vegetation Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	7.73E-04	2.1E-02	7.47E-05	2.0E-03	1.02E-03	2.8E-02
SV3	4.55E-04	1.2E-02	9.32E-05	2.5E-03	1.40E-03	3.8E-02
SVPC6	5.33E-04	1.4E-02	5.18E-05	1.4E-03	4.48E-04	1.2E-02
SVPC7	6.62E-04	1.8E-02	1.50E-04	4.1E-03	1.05E-03	2.9E-02
SV9	1.30E-03	3.5E-02	1.75E-04	4.7E-03	2.77E-03	7.5E-02
SV11	2.75E-04	7.4E-03	2.14E-05	5.8E-04	2.66E-04	7.2E-03
SV13	6.73E-04	1.8E-02	2.73E-04	7.4E-03	7.73E-04	2.1E-02
SV15	6.33E-04	1.7E-02	7.18E-05	1.9E-03	6.11E-04	1.7E-02
Offsite West	7.70E-04	2.1E-02	7.96E-05	2.2E-03	9.58E-04	2.6E-02
Offsite NW	3.85E-04	1.0E-02	3.19E-05	8.6E-04	2.67E-04	7.2E-03
Offsite North	1.41E-03	3.8E-02	1.30E-04	3.5E-03	6.62E-04	1.8E-02
Offsite SW	6.70E-04	1.8E-02	5.25E-05	1.4E-03	6.18E-04	1.7E-02
Offsite South	1.44E-03	3.9E-02	2.56E-04	6.9E-03	4.55E-03	1.2E-01
Offsite SE	1.13E-03	3.1E-02	1.03E-04	2.8E-03	2.91E-03	7.9E-02
Offsite East	6.29E-04	1.7E-02	1.50E-04	4.1E-03	8.44E-04	2.3E-02
Offsite NE	NS	NS	NS	NS	NS	NS

NS = Not Sampled

Table 2.5-4, Fourth Quarter 2008 Vegetation Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	1.79E-04	4.84E-03	2.23E-04	6.04E-03	2.79E-04	7.54E-03
SV3	6.70E-04	1.81E-02	-2.00E-05	-5.41E-04	4.26E-04	1.15E-02
SVPC6	1.67E-04	4.52E-03	8.21E-05	2.22E-03	7.51E-04	2.03E-02
SVPC7	1.71E-03	4.61E-02	0.00E+00	0.00E+00	1.89E-03	5.12E-02
SV9	3.17E-04	8.57E-03	1.74E-03	4.70E-02	1.94E-04	5.24E-03
SV11	2.96E-04	8.01E-03	2.38E-04	6.44E-03	8.07E-04	2.18E-02
SV13	1.65E-03	4.45E-02	2.44E-04	6.59E-03	5.51E-03	1.49E-01
SV15	4.66E-04	1.26E-02	3.59E-04	9.69E-03	1.76E-04	4.77E-03
Offsite West	7.25E-04	1.96E-02	3.74E-05	1.01E-03	5.33E-04	1.44E-02
Offsite NW	4.81E-04	1.30E-02	0.00E+00	0.00E+00	3.56E-04	9.62E-03
Offsite North	3.85E-04	1.04E-02	1.71E-04	4.61E-03	1.22E-04	3.30E-03
Offsite SW	7.59E-05	2.05E-03	5.66E-05	1.53E-03	1.39E-05	3.77E-04
Offsite South	7.73E-04	2.09E-02	1.06E-04	2.86E-03	2.74E-04	7.40E-03
Offsite SE	2.89E-04	7.80E-03	5.25E-05	1.42E-03	2.30E-04	6.21E-03
Offsite East	2.31E-04	6.23E-03	0.00E+00	0.00E+00	4.81E-04	1.30E-02
Offsite NE	1.37E-04	3.71E-03	6.29E-05	1.70E-03	1.55E-05	4.19E-04

Table 2.5-5a, 2008 Average On-Site Vegetation Sample Results

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	1.03E-02	2.79E-01	9.94E-05	2.69E-03	7.10E-03	1.92E-01
SV3	1.04E-02	2.80E-01	2.44E-05	6.60E-04	1.06E-02	2.87E-01
SVPC6	6.90E-03	1.86E-01	3.38E-03	9.13E-02	3.73E-03	1.01E-01
SVPC7	4.12E-03	1.11E-01	5.01E-05	1.35E-03	1.10E-02	2.97E-01
SV9	7.21E-03	1.95E-01	3.97E-03	1.07E-01	1.77E-02	4.77E-01
SV11	1.02E-02	2.75E-01	8.66E-05	2.34E-03	1.37E-02	3.70E-01
SV13	7.44E-03	2.01E-01	1.72E-04	4.66E-03	8.76E-03	2.37E-01
SV15	3.70E-03	1.00E-01	1.43E-04	3.88E-03	1.36E-02	3.67E-01
Average	7.53E-03	2.04E-01	9.91E-04	2.68E-02	1.08E-02	2.91E-01

Table 2.5-5b, 2008 Average Off-Site Vegetation Sample Results

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
Offsite West	1.73E-02	4.67E-01	3.01E-03	8.13E-02	1.84E-02	4.97E-01
Offsite NW	1.91E-02	5.17E-01	3.01E-03	8.15E-02	2.51E-02	6.80E-01
Offsite North	1.84E-02	4.96E-01	3.84E-03	1.04E-01	2.00E-02	5.40E-01
Offsite SW	1.34E-02	3.64E-01	3.01E-03	8.13E-02	1.39E-02	3.77E-01
Offsite South	1.32E-02	3.56E-01	2.37E-03	6.40E-02	1.27E-02	3.43E-01
Offsite SE	1.82E-02	4.92E-01	8.14E-04	2.20E-02	1.58E-02	4.27E-01
Offsite East	1.48E-02	4.01E-01	7.53E-04	2.04E-02	2.01E-02	5.44E-01
Offsite NE	2.84E-02	7.68E-01	2.62E-03	7.08E-02	2.11E-02	5.70E-01

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
Average	1.79E-02	4.83E-01	2.43E-03	6.56E-02	1.84E-02	4.97E-01

2.6. Soil Radioactivity Analyses

During 2007, eight (8) surface soil samples were collected within the NEF site by Shaw Environmental. Each of the sample locations is identified in Figure 2.1-5, which corresponds to an environmental TLD location. The 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 vendor laboratory reported that the contract minimum detection limit was met for all samples reported. Each of the sample locations is identified on Figure 2.1-1. See Table 2.6-1 for the sampling results.

On March 20, 2008, sixteen (16) on-site soil samples and eight (8) off-site soil samples were collected and analyzed for isotopic uranium (^{234}U, ^{235}U and ^{238}U). Each of the sample locations is identified on Figure 2.1-2. See Table 2.6-2 for the sampling results.

On July 16, 2008, eight (8) on-site soil samples, as well as six (6) off-site soil samples (off-site northwest and off-site southwest were not sampled), were taken for the third quarter of 2008 and analyzed for isotopic uranium (^{234}U, ^{235}U and ^{238}U). Each of the sample locations is identified on Figure 2.1-4. See Table 2.6-3 for the sampling results.

On October 16, 2008 eight (8) on-site soil samples and eight (8) off-site soil samples were collected for the fourth quarter of 2008 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 2.1-5. See Table 2.6-4 for the sampling results.

The averages for the 2008 soil monitoring results are shown in Table 2.6-5. The average soil sample results are for the 2008 samples, when the area was sampled. It was not possible to ensure that the 2007 were representative of the same areas as the 2008 samples.

No radioactivity attributable to the NEF was detected in any of the samples collected during the reporting period, as the NEF has not yet commenced operations.

All soil radioactivity analysis results for 2008, including associated error (uncertainty) and minimum detectable activity (MDA), have been included in Appendix D.

Table 2.6-1, 2007 Soil Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
3	9.5E-03	2.6E-01	1.3E-03	3.6E-02	9.1E-03	2.5E-01
5	8.0E-03	2.2E-01	3.2E-04	8.6E-03	6.2E-03	1.7E-01
8	6.3E-03	1.7E-01	-1.6E-04	-4.3E-03	7.4E-03	2.0E-01
9	6.9E-03	1.9E-01	7.7E-04	2.1E-02	5.6E-03	1.5E-01
10	6.9E-03	1.9E-01	8.2E-04	2.2E-02	7.8E-03	2.1E-01
12	5.6E-03	1.5E-01	1.8E-04	4.9E-03	5.2E-03	1.4E-01
14	5.8E-03	1.6E-01	1.0E-04	2.7E-03	6.2E-03	1.7E-01
16	8.7E-03	2.4E-01	9.2E-04	2.5E-02	1.1E-03	3.0E-02

Table 2.6-2, First Quarter 2008 Soil Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	6.1E-01	1.6E+01	4.0E-01	1.1E+01	4.1E-01	1.1E+01
SVPC2	4.4E-01	1.2E+01	3.0E-01	8.1E+00	4.0E-01	1.1E+01
SV3	2.5E-01	6.8E+00	6.0E-01	1.6E+01	2.6E-01	7.0E+00
SVPC4	3.9E-01	1.1E+01	0.0E+00	0.0E+00	2.8E-01	7.6E+00
SV5	3.8E-01	1.0E+01	3.0E-02	8.1E-01	3.1E-01	8.4E+00
SVPC6	2.7E-01	7.3E+00	2.0E-02	5.4E-01	3.4E-01	9.2E+00
SVPC7	1.9E-01	5.1E+00	2.0E-02	5.4E-01	2.2E-01	5.9E+00
SV8	2.2E-01	5.9E+00	1.0E-02	2.7E-01	2.3E-01	6.2E+00
SV9	3.8E-01	1.0E+01	3.0E-02	8.1E-01	2.5E-01	6.8E+00
SVPC10	5.0E-01	1.4E+01	2.0E-01	5.4E+00	4.4E-01	1.2E+01

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV11	4.2E-01	1.1E+01	4.0E-02	1.1E+00	4.2E-01	1.1E+01
SVPC12	4.0E-01	1.1E+01	-1.0E-02	-2.7E-01	2.7E-01	7.3E+00
SV13	4.6E-01	1.2E+01	3.0E-02	8.1E-01	3.3E-01	8.9E+00
SVPC14	6.0E-01	1.6E+01	4.0E-01	1.1E+01	3.4E-01	9.2E+00
SV15	3.9E-01	1.1E+01	1.0E-02	2.7E-01	4.6E-01	1.2E+01
SVPC16	4.4E-01	1.2E+01	2.0E-02	5.4E-01	3.4E-01	9.2E+00
Offsite West	2.33E-02	6.30E-01	4.81E-03	1.30E-01	1.94E-02	5.25E-01
Offsite NW	2.06E-02	5.57E-01	4.40E-03	1.19E-01	3.02E-02	8.16E-01
Offsite North	2.38E-02	6.42E-01	3.77E-03	1.02E-01	2.09E-02	5.65E-01
Offsite SW	1.21E-02	3.27E-01	5.48E-03	1.48E-01	2.03E-02	5.48E-01
Offsite South	1.69E-02	4.56E-01	2.61E-03	7.05E-02	1.18E-02	3.20E-01
Offsite SE	2.78E-02	7.52E-01	4.88E-04	1.32E-02	2.75E-02	7.44E-01
Offsite East	1.22E-02	3.30E-01	7.51E-04	2.03E-02	2.50E-02	6.75E-01
Offsite NE	4.44E-02	1.20E+00	2.46E-03	6.64E-02	3.29E-02	8.90E-01

Table 2.6-3, Third Quarter 2008 Soil Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	8.40E-03	2.27E-01	2.26E-03	6.12E-02	9.14E-03	2.47E-01
SV3	1.25E-02	3.37E-01	6.44E-04	1.74E-02	1.60E-02	4.32E-01
SVPC6	9.95E-03	2.69E-01	6.25E-04	1.69E-02	1.07E-02	2.88E-01
SVPC7	1.81E-02	4.89E-01	1.04E-03	2.82E-02	1.98E-02	5.35E-01

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV9	1.06E-02	2.86E-01	-2.20E-04	-5.95E-03	9.73E-03	2.63E-01
SV11	1.26E-02	3.40E-01	7.88E-04	2.13E-02	1.47E-02	3.98E-01
SV13	1.66E-02	4.48E-01	1.65E-03	4.46E-02	1.08E-02	2.93E-01
SV15	1.45E-02	3.91E-01	2.87E-03	7.75E-02	8.77E-03	2.37E-01
Offsite West	1.39E-02	3.75E-01	1.06E-03	2.86E-02	1.68E-02	4.53E-01
Offsite NW	NS	NS	NS	NS	NS	NS
Offsite North	1.31E-02	3.55E-01	3.74E-03	1.01E-01	1.71E-02	4.61E-01
Offsite SW	NS	NS	NS	NS	NS	NS
Offsite South	1.45E-02	3.91E-01	2.39E-03	6.47E-02	1.19E-02	3.22E-01
Offsite SE	1.64E-02	4.43E-01	3.45E-04	9.33E-03	1.22E-02	3.29E-01
Offsite East	1.68E-02	4.53E-01	-2.92E-04	-7.88E-03	1.65E-02	4.47E-01
Offsite NE	2.34E-02	6.33E-01	3.42E-03	9.23E-02	1.59E-02	4.29E-01

NS – not sampled

Table 2.6-4, Fourth Quarter 2008 Soil Sampling

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	8.77E-03	2.37E-01	2.13E-03	5.75E-02	1.15E-02	3.10E-01
SV3	1.14E-02	3.09E-01	1.03E-03	2.79E-02	1.25E-02	3.37E-01
SVPC6	1.54E-02	4.16E-01	3.89E-04	1.05E-02	1.48E-02	4.00E-01
SVPC7	1.24E-02	3.34E-01	3.11E-03	8.41E-02	1.25E-02	3.37E-01
SV9	1.47E-02	3.96E-01	3.74E-03	1.01E-01	1.46E-02	3.95E-01
SV11	1.08E-02	2.92E-01	1.34E-03	3.61E-02	1.52E-02	4.10E-01

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV13	1.01E-02	2.74E-01	-3.08E-04	-8.32E-03	1.25E-02	3.39E-01
SV15	1.14E-02	3.07E-01	3.39E-03	9.17E-02	1.59E-02	4.29E-01
Offsite West	1.46E-02	3.95E-01	3.16E-03	8.53E-02	1.90E-02	5.14E-01
Offsite NW	1.76E-02	4.77E-01	1.62E-03	4.39E-02	2.01E-02	5.44E-01
Offsite North	1.82E-02	4.92E-01	4.00E-03	1.08E-01	2.20E-02	5.94E-01
Offsite SW	1.48E-02	4.01E-01	5.40E-04	1.46E-02	7.59E-03	2.05E-01
Offsite South	8.21E-03	2.22E-01	2.10E-03	5.68E-02	1.43E-02	3.86E-01
Offsite SE	1.04E-02	2.82E-01	1.61E-03	4.34E-02	7.70E-03	2.08E-01
Offsite East	1.55E-02	4.19E-01	1.80E-03	4.87E-02	1.88E-02	5.09E-01
Offsite NE	1.75E-02	4.72E-01	1.98E-03	5.36E-02	1.45E-02	3.92E-01

Table 2.6-5a, 2008 Average On-Site Soil Sample Results

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
SV1	2.09E-01	5.65E+00	1.35E-01	3.64E+00	1.44E-01	3.88E+00
SV3	9.13E-02	2.47E+00	2.01E-01	5.42E+00	9.62E-02	2.60E+00
SVPC6	9.84E-02	2.66E+00	7.00E-03	1.89E-01	1.22E-01	3.29E+00
SVPC7	7.35E-02	1.99E+00	8.05E-03	2.18E-01	8.41E-02	2.27E+00
SV9	1.35E-01	3.65E+00	1.12E-02	3.02E-01	9.14E-02	2.47E+00
SV11	1.48E-01	3.99E+00	1.40E-02	3.79E-01	1.50E-01	4.05E+00
SV13	1.62E-01	4.38E+00	1.04E-02	2.82E-01	1.18E-01	3.18E+00
SV15	1.39E-01	3.75E+00	5.42E-03	1.46E-01	1.62E-01	4.37E+00

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
Average	1.32E-01	3.57E+00	4.89E-02	1.32E+00	1.21E-01	3.26E+00

Table 2.6-5b, 2008 Average Off-Site Soil Sample Results

Sample Location	^{234}U (Bq/g)	^{234}U (pCi/g)	^{235}U (Bq/g)	^{235}U (pCi/g)	^{238}U (Bq/g)	^{238}U (pCi/g)
Offsite West	1.73E-02	4.67E-01	3.01E-03	8.13E-02	1.84E-02	4.97E-01
Offsite NW	1.91E-02	5.17E-01	3.01E-03	8.15E-02	2.51E-02	6.80E-01
Offsite North	1.84E-02	4.96E-01	3.84E-03	1.04E-01	2.00E-02	5.40E-01
Offsite SW	1.34E-02	3.64E-01	3.01E-03	8.13E-02	1.39E-02	3.77E-01
Offsite South	1.32E-02	3.56E-01	2.37E-03	6.40E-02	1.27E-02	3.43E-01
Offsite SE	1.82E-02	4.92E-01	8.14E-04	2.20E-02	1.58E-02	4.27E-01
Offsite East	1.48E-02	4.01E-01	7.53E-04	2.04E-02	2.01E-02	5.44E-01
Offsite NE	2.84E-02	7.68E-01	2.62E-03	7.08E-02	2.11E-02	5.70E-01
Average	1.79E-02	4.83E-01	2.43E-03	6.56E-02	1.84E-02	4.97E-01

2.7. Sediment Radioactivity Analyses

During facility operations, the NEF will collect and analyze quarterly sediment samples from the site storm water retention basin, and the UBC Storage Pad storm water detention basin. However, since the NEF has not begun operations, sediment sampling from these basins has not yet commenced.

2.8. Groundwater Radioactivity Analyses

Two sampling events were conducted in 2007. Five (5) groundwater samples were collected on April 19, 2007 from monitoring wells 2, 6, 10, 12, and 17 by Shaw Environmental. Five (5) groundwater samples were collected at the NEF site by Shaw Environmental and GL Environmental, Inc on October 25, 2007. Samples were collected from monitoring wells 2, 6, 10, 12 and 17. The locations of each well sample are

identified on Figure 2.1-1. 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. Each of the sample locations is identified on Figure 2.1-1. See Table 2.8-1 for the sampling results. Several sample results were reported as not meeting the contract minimum detection limit.

In the fourth quarter of 2007, groundwater was collected from five (5) monitoring wells (4, 5, 6, 10 and 12) at the NEF site by SEI. The 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. Each of the sample locations is identified on Figure 2.1-1. See Table 2.8-2 for the sampling results. None of the sample results met the contract minimum detection limit.

Of the nine monitoring wells identified in DP-1481 (4 shallow and 5 deep), three monitoring wells, identified as monitoring wells 4, 5, and 10 contained an adequate volume of water and met all requirements for sampling for sample collection during 2008. 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 sampling well locations are identified on Figures 2.1-2 – 2.1-5. See Tables 2.8-3 – 2.8-6 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, since these are the only wells that were consistently sampled (4^{th} quarter 2007 – 2008).

All groundwater radioactivity analysis results for 2008, including associated error (uncertainty) and minimum detectable activity (MDA), have been included in Appendix D.

Table 2.8-1, Second Quarter 2007 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-2	2.00E-01	5.41E-09	6.90E-03	1.86E-10	8.10E-02	2.19E-09
MW-6	3.71E-01	1.00E-08	1.58E-02	4.27E-10	2.05E-01	5.54E-09
MW-10	5.70E-01	1.54E-08	1.71E-02	4.62E-10	7.80E-02	2.11E-09
MW-12	2.56E-01	6.92E-09	6.30E-03	1.70E-10	7.00E-02	1.89E-09

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-17	4.11E-01	1.11E-08	1.00E-02	2.70E-10	9.80E-02	2.65E-09

Table 2.8-2, Fourth Quarter 2007 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	1.38E-01	3.73E-09	6.50E-03	1.76E-10	1.17E-01	3.16E-09
MW-5	5.10E-03	1.38E-10	6.50E-04	1.76E-11	4.40E-03	1.19E-10
MW-6	4.01E-01	1.08E-08	1.82E-02	4.92E-10	2.31E-01	6.24E-09
MW-10	5.19E-01	1.40E-08	1.28E-02	3.46E-10	9.50E-02	2.57E-09
MW-12	2.69E-01	7.27E-09	6.20E-03	1.68E-10	7.90E-02	2.14E-09

Table 2.8-3, First Quarter 2008 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	3.66E-01	9.90E-09	2.46E-02	6.66E-10	2.38E-01	6.42E-09
MW-5	7.29E-03	1.97E-10	2.87E-03	7.76E-11	8.40E-03	2.27E-10
MW-10	5.40E-01	1.46E-08	7.18E-03	1.94E-10	2.91E-01	7.87E-09

Table 2.8-4, Second Quarter 2008 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	5.22E-01	1.41E-08	1.45E-02	3.91E-10	3.14E-01	8.49E-09
MW-5	3.17E-02	8.56E-10	1.29E-03	3.48E-11	1.34E-02	3.61E-10

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-10	5.70E-01	1.54E-08	1.38E-02	3.72E-10	1.01E-01	2.74E-09

Table 2.8-5, Third Quarter 2008 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	5.55E-01	1.50E-08	1.83E-02	4.95E-10	3.48E-01	9.41E-09
MW-5	2.86E-02	7.72E-10	1.13E-04	3.05E-12	2.17E-02	5.87E-10
MW-10	5.03E-01	1.36E-08	1.22E-02	3.30E-10	3.48E-01	9.41E-09

Table 2.8-6, Fourth Quarter 2008 Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	5.33E-01	1.44E-08	2.32E-02	6.27E-10	3.46E-01	9.36E-09
MW-5	1.21E-02	3.27E-10	1.09E-02	2.95E-10	6.77E-03	1.83E-10
MW-10	5.25E-01	1.42E-08	1.11E-02	3.00E-10	1.22E-01	3.30E-09

Table 2.8-7, Average Groundwater Sample Results

Sample Location	^{234}U (Bq/L)	^{234}U (µCi/mL)	^{235}U (Bq/L)	^{235}U (µCi/mL)	^{238}U (Bq/L)	^{238}U (µCi/mL)
MW-4	4.23E-01	1.14E-08	1.74E-02	4.71E-10	2.73E-01	7.37E-09
MW-5	1.69E-02	4.58E-10	3.17E-03	8.56E-11	1.09E-02	2.95E-10
MW-10	5.32E-01	1.44E-08	1.14E-02	3.08E-10	1.92E-01	5.18E-09
Average	3.24E-04	8.75E-09	1.07E-2	2.88E-10	1.58E-01	4.28E-09

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 will utilize data from the radioactive effluents (measured at the point of release) together with conservative models that 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).

Another useful "gauge" of radiation exposure is provided by the amount of dose a typical individual receives each year from natural and man-made (e.g., diagnostic X-rays) sources of radiation. The typical American receives 300 to 400 mrem/yr from such sources.

4. APPENDICES

Appendix A - Special Studies

Because operation have not yet commenced at the NEF, none of the samples collected as part of the radiological environmental monitoring program during this reporting period indicated any detectable radioactivity attributable to NEF operations. Therefore, no special dose analyses were performed.

Appendix B - Environmental Monitoring Program Discrepancies

Ambient Radiation Measurements – Due to severe inconsistencies in collection of TLD dosimeters, as well as calculation errors, data from 2006 through 2007 are not included in the body of this report. However, some data were obtained and the results are presented below:

TLD Location	Beta/Gamma Doses		Neutron Doses	
	Annualized 2006 Dose (mR/year)	Annualized 2007 Dose (mR/year)	Annualized 2006 Dose (mR/year)	Annualized 2007 Dose (mR/year)
1	71	112	ND	ND
2	78	99	ND	ND
3	79	70	ND	ND
4	78	113	ND	ND
5	72	65	ND	ND
6	70	99	ND	ND
7	74	67	ND	ND
8	72	119	ND	ND
9	76	122	ND	ND
10	75	119	ND	ND
11	79	126	ND	ND
12	65	110	ND	ND
13	71	124	ND	ND
14	70	108	ND	ND
15	71	121	ND	ND
16	75	124	ND	ND

Starting on 1/1/08, environmental dosimeters were consistently changed out on a quarterly basis. One Panasonic TLD-XBGN dosimeter was unreadable (station 12) during the second quarter of 2008.

Oversight of the REMP Program is managed by GL Environmental, Inc. who have offices at the site and are immediately available to respond to malfunctioning air samplers. They are also available to routinely check on TLDs around the site as well as in offsite locations and to replace them if any are found to be missing or damaged.

Air Particulate Filter Radioactivity Analyses - Radio telemetry units report outages of the continuous air monitors. The radio telemetry unit data reported to Shaw were not available when this report was generated. Therefore it was not possible to calculate the percentages of data recovery for the filters collected by Shaw (i.e., the % of time the air monitors were operating for each filter deployment period). Shaw reported the following concerning gaps in monitoring:

- air monitoring station 4 (AP04) was nonoperational from 3/19/2007 to 4/2/07
- the filter was not changed in air monitoring station 6 (AP06) from 12/21/2007 to 1/16/2008 sample period
- no power was reported at air monitoring station 3 (AP03) from 7/28/2008 to 8/18/2008
- no power was reported at air monitoring station 3 (AP03) and monitoring station 7 (AP07) from 8/18/2008 to 9/08/2008

GL Environmental, Inc. has obtained the data from the radio telemetry unit beginning in the third quarter of 2008. Monitoring gaps experienced since 9/22/2008 are as follows:

- The AVS-28A unit malfunctioned in air monitoring station 4 (AP04) from 9/22/2008 to 10/06/2008
- The filter was not replaced from air monitoring station 5 (AP05) for the monitoring period beginning 9/22/2008 and ending 10/06/2008.

Appendix C - Planned Improvements for 2009 REMP

The following improvements are planned for the Radiological Environmental Monitoring Program in 2009.

a. The meteorological (MET) tower is expected to be installed by the end of the third quarter 2009, once construction around the MET tower is completed. The tower will allow for on-site determination of meteorological conditions and will allow for better accuracy of data.
b. It is expected that the three basins will be completed by the end of 2009. 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 2009.
c. 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 the year.
d. It is also anticipated that there will be a phased tie-in of the remaining temporary office facility domestic waste to the municipal wastewater treatment facility in Eunice. As utility infrastructure supporting the site buildings is completed, the domestic waste from the buildings will also tie into the municipal sewer system.
e. The seven new wells that were recently drilled for sampling additional groundwater will be sampled and included in the groundwater sampling program for 2009.

Due to the NEF plant design not as yet finalized, there may be changes to the above plans for 2009.

Appendix D – 2008 Sampling Results with Associated Uncertainty and MDA

Table D.1-1 Air Particulate 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	1/16/2008	2/4/2008	1	51123	1.29E-15	3.92E-16	1.68E-16	1.12E-14	1.87E-15	5.60E-16
AP3	1/16/2008	2/4/2008	1	50744	1.58E-15	3.95E-16	2.07E-16	1.24E-14	2.07E-15	5.64E-16
AP4	1/16/2008	2/4/2008	1	52844	1.08E-15	2.89E-16	1.63E-16	1.06E-14	1.81E-15	5.42E-16
AP5	1/16/2008	2/4/2008	1	54290	1.49E-15	3.69E-16	1.76E-16	1.37E-14	2.29E-15	5.27E-16
AP6	1/16/2008	2/4/2008	1	52776	2.76E-15	5.79E-16	1.63E-16	1.97E-14	3.26E-15	5.43E-16
AP7	1/16/2008	2/4/2008	1	54174	2.50E-15	5.29E-16	1.76E-16	1.64E-14	2.64E-15	5.29E-16
AP2	2/4/2008	2/18/2008	1	37300	1.59E-15	4.09E-16	2.05E-16	1.12E-14	1.94E-15	6.65E-16
AP3	2/4/2008	2/18/2008	1	37755	1.21E-15	3.54E-16	2.53E-16	1.19E-14	2.07E-15	6.57E-16
AP4	2/4/2008	2/18/2008	1	39206	8.27E-16	2.68E-16	1.95E-16	7.73E-15	1.39E-15	5.84E-16
AP5	2/4/2008	2/18/2008	1	40172	1.76E-15	3.80E-16	2.38E-16	1.47E-14	2.38E-15	7.13E-16
AP6	2/4/2008	2/18/2008	1	38700	1.43E-15	3.95E-16	2.22E-16	1.82E-14	2.96E-15	7.40E-16
AP7	2/4/2008	2/18/2008	1	39107	1.85E-15	4.64E-16	2.20E-16	1.68E-14	2.93E-15	7.32E-16
AP2	2/18/2008	3/4/2008	1	45925	8.73E-16	2.70E-16	1.66E-16	7.57E-15	1.33E-15	5.40E-16
AP3	2/18/2008	3/4/2008	1	45767	1.02E-15	2.92E-16	1.67E-16	9.08E-15	1.58E-15	5.63E-16
AP4	2/18/2008	3/4/2008	1	42529	4.03E-16	1.82E-16	1.91E-16	5.08E-15	9.65E-16	5.61E-16
AP5	2/18/2008	3/4/2008	1	42905	1.38E-15	3.78E-16	2.22E-16	1.27E-14	2.16E-15	6.01E-16
AP6	2/18/2008	3/4/2008	1	41941	1.57E-15	4.10E-16	2.50E-16	2.41E-14	4.10E-15	6.83E-16
AP7	2/18/2008	3/4/2008	1	41971	1.32E-15	3.64E-16	2.73E-16	1.61E-14	2.73E-15	6.82E-16
AP2	3/4/2008	3/17/2008	1	37370	7.16E-16	2.55E-16	2.30E-16	1.05E-14	1.84E-15	6.64E-16
AP3	3/4/2008	3/17/2008	1	37900	7.30E-16	2.52E-16	2.27E-16	1.19E-14	2.07E-15	6.30E-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
AP4	3/4/2008	3/17/2008	1	36855	7.16E-16	2.56E-16	2.07E-16	9.35E-15	1.66E-15	6.47E-16
AP5	3/4/2008	3/17/2008	1	37299	9.97E-16	3.07E-16	2.05E-16	1.43E-14	2.43E-15	6.91E-16
AP6	3/4/2008	3/17/2008	1	36269	1.92E-15	4.74E-16	2.37E-16	2.97E-14	5.00E-15	7.89E-16
AP7	3/4/2008	3/17/2008	1	36638	1.33E-15	3.91E-16	2.34E-16	1.72E-14	2.87E-15	7.82E-16
AP2	3/17/2008	4/1/2008	1	43143	7.73E-16	2.65E-16	2.43E-16	1.19E-14	2.04E-15	5.97E-16
AP3	3/17/2008	4/1/2008	1	43760	6.97E-16	2.62E-16	2.40E-16	1.24E-14	2.12E-15	5.89E-16
AP4	3/17/2008	4/1/2008	1	42711	4.73E-16	2.06E-16	2.15E-16	1.04E-14	1.81E-15	6.93E-16
AP5	3/17/2008	4/1/2008	1	36828	7.24E-16	2.59E-16	2.33E-16	1.68E-14	2.85E-15	7.77E-16
AP6	3/17/2008	4/1/2008	1	41755	1.14E-15	3.43E-16	2.29E-16	2.89E-14	4.80E-15	6.86E-16
AP7	3/17/2008	4/1/2008	1	39634	1.23E-15	3.61E-16	2.17E-16	1.83E-14	3.13E-16	7.22E-16
AP2	4/1/2008	4/15/2008	2	40375	8.03E-16	2.84E-16	2.13E-16	9.19E-15	1.63E-15	7.33E-16
AP3	4/1/2008	4/15/2008	2	38151	4.16E-16	2.48E-16	1.90E-16	9.05E-15	1.60E-15	6.75E-16
AP4	4/1/2008	4/15/2008	2	39972	6.46E-16	2.63E-16	2.39E-16	6.73E-15	1.24E-15	7.16E-16
AP5	4/1/2008	4/15/2008	2	40179	7.59E-16	2.85E-16	2.61E-16	1.26E-14	2.16E-15	6.18E-16
AP6	4/1/2008	4/15/2008	2	38924	1.45E-15	3.92E-16	2.45E-16	2.26E-14	3.68E-15	7.36E-16
AP7	4/1/2008	4/15/2008	2	39660	1.04E-15	3.13E-16	2.17E-16	1.52E-14	2.65E-15	7.22E-16
AP2	4/15/2008	5/5/2008	2	57567	4.97E-16	1.82E-16	1.49E-16	8.35E-15	1.44E-15	5.14E-16
AP3	4/15/2008	5/5/2008	2	58708	4.38E-16	1.63E-16	1.63E-16	7.84E-15	1.35E-15	3.90E-16
AP4	4/15/2008	5/5/2008	2	55465	2.89E-16	1.38E-16	1.70E-16	3.68E-15	6.88E-16	4.13E-16
AP5	4/15/2008	5/5/2008	2	57776	5.78E-16	1.98E-16	1.49E-16	1.16E-14	1.98E-15	4.96E-16
AP6	4/15/2008	5/5/2008	2	53901	8.49E-16	2.48E-16	1.95E-16	2.35E-14	3.90E-15	5.31E-16
AP7	4/15/2008	5/5/2008	2	56036	7.68E-16	2.21E-16	1.53E-16	1.41E-14	2.38E-15	5.11E-16
AP2	5/5/2008	5/19/2008	2	41526	7.14E-16	3.45E-16	3.45E-16	8.76E-15	1.68E-15	8.50E-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
AP3	5/5/2008	5/19/2008	2	42075	3.86E-16	2.50E-16	3.18E-16	5.92E-15	1.20E-15	7.94E-16
AP4	5/5/2008	5/19/2008	2	41061	5.35E-16	3.02E-16	3.49E-16	5.81E-15	1.21E-15	8.60E-16
AP5	5/5/2008	5/19/2008	2	41124	1.16E-15	4.41E-16	4.18E-16	9.78E-15	1.86E-15	9.28E-16
AP6	5/5/2008	5/19/2008	2	40698	1.64E-15	5.63E-16	4.46E-16	1.78E-14	3.05E-16	9.38E-16
AP7	5/5/2008	5/19/2008	2	40647	1.36E-15	4.93E-16	3.76E-16	1.32E-14	2.35E-15	9.39E-16
AP2	5/19/2008	6/9/2008	2	60929	5.49E-16	2.35E-16	2.19E-16	8.19E-15	1.49E-15	5.80E-16
AP3	5/19/2008	6/9/2008	2	61842	3.54E-16	2.01E-16	2.32E-16	5.22E-15	1.02E-15	5.71E-16
AP4	5/19/2008	6/9/2008	2	60424	3.78E-16	2.21E-16	2.84E-16	6.76E-15	1.26E-15	6.16E-16
AP5	5/19/2008	6/9/2008	2	60205	6.49E-16	2.85E-16	3.01E-16	1.00E-14	1.74E-15	6.34E-16
AP6	5/19/2008	6/9/2008	2	58153	1.04E-15	3.61E-16	2.79E-16	1.84E-14	3.12E-15	6.57E-16
AP7	5/19/2008	6/9/2008	2	59121	8.57E-16	3.07E-16	2.26E-16	1.16E-14	2.10E-15	6.46E-16
AP2	6/9/2008	7/1/2008	2	64592	6.78E-16	2.81E-16	2.66E-16	7.41E-15	1.36E-15	5.76E-16
AP3	6/9/2008	7/1/2008	2	41788	2.18E-16	2.51E-16	3.43E-16	3.78E-15	1.23E-15	8.91E-16
AP4	6/9/2008	7/1/2008	2	59861	3.03E-16	1.75E-16	2.07E-16	6.22E-15	1.18E-15	6.38E-16
AP5	6/9/2008	7/1/2008	2	63214	7.54E-16	2.87E-16	2.42E-16	9.35E-15	1.66E-15	6.04E-16
AP6	6/9/2008	7/1/2008	2	60036	7.78E-16	2.86E-16	2.23E-16	1.34E-14	2.38E-15	6.36E-16
AP7	6/9/2008	7/1/2008	2	60706	6.30E-16	2.67E-16	2.36E-16	1.15E-14	2.04E-16	6.29E-16
AP2	7/1/2008	7/15/2008	3	41362	3.92E-16	2.31E-16	2.77E-16	5.89E-15	1.22E-15	8.31E-16
AP3	7/1/2008	7/15/2008	3	41788	3.19E-16	2.28E-16	3.43E-16	6.08E-15	1.23E-15	8.22E-16
AP4	7/1/2008	7/15/2008	3	40865	2.69E-16	2.13E-16	3.20E-16	4.78E-15	1.05E-15	8.17E-16
AP5	7/1/2008	7/15/2008	3	41910	5.24E-16	2.96E-16	3.42E-16	7.11E-15	1.41E-15	8.65E-16
AP6	7/1/2008	7/15/2008	3	41780	6.16E-16	2.97E-16	3.20E-16	1.21E-14	2.19E-15	8.45E-16
AP7	7/1/2008	7/15/2008	3	40001	3.35E-16	2.39E-16	3.58E-16	9.68E-15	1.81E-15	8.83E-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	7/15/2008	7/28/2008	3	38306	9.97E-16	4.73E-16	3.99E-16	6.86E-15	1.52E-15	1.15E-15
AP3	7/15/2008	7/28/2008	3	38709	9.86E-16	4.93E-16	4.93E-16	8.03E-15	1.70E-15	1.13E-15
AP4	7/15/2008	7/28/2008	3	37906	1.46E-15	6.04E-16	4.78E-16	7.11E-15	1.56E-15	1.16E-15
AP5	7/15/2008	7/28/2008	3	37471	1.20E-15	5.35E-16	4.58E-16	1.07E-14	2.14E-15	1.20E-15
AP6	7/15/2008	7/28/2008	3	38127	1.78E-15	6.76E-16	4.76E-16	1.88E-14	3.50E-15	1.25E-15
AP7	7/15/2008	7/28/2008	3	37121	1.08E-15	5.40E-16	5.40E-16	1.29E-14	2.52E-15	1.21E-15
AP2	7/28/2008	8/18/2008	3	62757	5.03E-16	2.89E-16	3.19E-16	7.81E-15	1.51E-15	7.30E-16
AP3	7/28/2008	8/18/2008	3	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out
AP4	7/28/2008	8/18/2008	3	62075	4.76E-16	2.77E-16	3.08E-16	6.14E-15	1.25E-15	7.23E-16
AP5	7/28/2008	8/18/2008	3	61048	6.41E-16	3.13E-16	3.13E-16	1.00E-14	1.88E-15	7.82E-16
AP6	7/28/2008	8/18/2008	3	58493	9.46E-16	3.92E-16	3.26E-16	1.29E-14	2.28E-15	8.16E-16
AP7	7/28/2008	8/18/2008	3	60575	9.14E-16	3.78E-16	3.15E-16	1.15E-14	2.05E-15	7.88E-16
AP2	8/18/2008	9/8/2008	3	61795	4.62E-16	2.63E-16	2.47E-16	8.35E-15	1.54E-15	7.72E-16
AP3	8/18/2008	9/8/2008	3	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out
AP4	8/18/2008	9/8/2008	3	30388	6.27E-16	4.40E-16	5.97E-16	9.73E-15	2.10E-15	1.41E-15
AP5	8/18/2008	9/8/2008	3	60160	2.54E-16	2.22E-16	3.33E-16	1.16E-14	2.06E-15	7.93E-16
AP6	8/18/2008	9/8/2008	3	58882	7.78E-16	3.73E-16	3.57E-16	1.88E-14	3.24E-15	8.10E-16
AP7	8/18/2008	9/8/2008	3	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out	Power Out
AP2	9/8/2008	9/22/2008	3	40258	1.02E-15	2.16E-16	1.26E-16	1.06E-14	1.63E-11	5.14E-16
AP3	9/8/2008	9/22/2008	3	40254	1.38E-15	2.63E-16	2.00E-16	2.42E-14	2.39E-11	1.51E-14
AP4	9/8/2008	9/22/2008	3	40317	8.10E-17	6.00E-17	3.47E-17	1.44E-15	8.41E-12	4.87E-16
AP5	9/8/2008	9/22/2008	3	40443	7.00E-16	1.95E-16	2.15E-16	1.17E-14	1.66E-11	4.74E-16
AP6	9/8/2008	9/22/2008	3	40378	9.02E-16	2.09E-16	1.87E-16	2.23E-14	2.22E-11	4.58E-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	9/8/2008	9/22/2008	3	40254	1.43E-15	2.66E-16	2.18E-16	2.63E-14	2.45E-11	1.30E-14
AP2	9/22/2008	10/6/2008	3	39672	9.88E-16	4.30E-16	3.15E-16	1.43E-14	3.66E-11	6.88E-16
AP3	9/22/2008	10/6/2008	3	39646	5.99E-16	3.94E-16	4.60E-16	1.38E-14	3.64E-11	7.61E-16
AP4	9/22/2008	10/6/2008	3	NA	NA	NA	NA	NA	NA	NA
AP5	9/22/2008	10/6/2008	3	NA	NA	NA	NA	NA	NA	NA
AP6	9/22/2008	10/6/2008	3	39393	0.00E+00	2.17E-16	4.51E-16	9.59E-17	1.66E-11	9.23E-16
AP7	9/22/2008	10/6/2008	3	39420	2.42E-15	6.76E-16	3.33E-16	2.16E-14	4.50E-11	7.83E-16
AP2	10/6/2008	10/22/2008	4	45104	9.71E-16	2.90E-16	1.65E-16	2.22E-14	3.10E-11	5.65E-16
AP3	10/6/2008	10/22/2008	4	45130	4.85E-16	2.44E-16	2.96E-16	1.65E-14	2.67E-11	5.36E-16
AP4	10/6/2008	10/22/2008	4	45108	9.47E-16	2.99E-16	2.39E-16	1.74E-14	2.80E-11	5.63E-16
AP5	10/6/2008	10/22/2008	4	44917	1.60E-15	3.71E-16	1.66E-16	2.43E-14	3.24E-11	5.68E-16
AP6	10/6/2008	10/22/2008	4	44913	1.73E-15	4.07E-16	2.97E-16	2.17E-12	3.05E-11	5.39E-16
AP7	10/6/2008	10/22/2008	4	45702	8.35E-16	2.75E-16	2.44E-16	2.11E-14	2.93E-11	5.22E-16
AP4	10/22/2008	11/5/2008	4	39749	2.17E-15	3.29E-16	2.28E-16	3.02E-14	2.68E-11	5.76E-16
AP5	10/22/2008	11/5/2008	4	40201	1.65E-15	2.83E-16	2.18E-16	2.17E-14	2.22E-11	5.29E-16
AP6	10/22/2008	11/5/2008	4	40205	1.41E-15	2.63E-16	2.17E-16	2.17E-14	2.21E-11	5.17E-16
AP7	10/22/2008	11/5/2008	4	39690	2.33E-15	3.37E-16	2.25E-16	3.05E-14	2.62E-11	5.10E-16
AP2	10/22/2008	11/14/2008	4	39328	1.33E-15	2.85E-16	3.27E-16	2.24E-14	2.34E-11	5.37E-16
AP3	10/22/2008	11/14/2008	4	39310	8.42E-14	2.00E-16	1.29E-16	1.87E-12	2.12E-11	5.00E-16
AP2	11/14/2008	11/24/2008	4	28696	1.44E-15	3.51E-16	4.42E-16	2.82E-14	3.03E-11	7.33E-16
AP3	11/14/2008	11/24/2008	4	28753	1.36E-15	3.15E-16	3.05E-16	2.60E-14	2.90E-11	6.89E-16
AP4	11/5/2008	11/24/2008	4	52795	8.76E-16	1.83E-16	1.32E-16	1.73E-14	1.77E-11	4.23E-16
AP5	11/5/2008	11/24/2008	4	52244	1.92E-15	2.69E-16	1.89E-16	1.83E-14	1.84E-11	4.48E-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	11/5/2008	11/24/2008	4	52256	1.26E-15	2.17E-16	1.99E-16	1.84E-14	1.78E-11	4.02E-16
AP7	11/5/2008	11/24/2008	4	52467	1.83E-15	2.79E-16	2.45E-16	1.96E-14	1.82E-11	3.49E-16
AP2	11/24/2008	12/8/2008	4	39694	1.14E-15	TBD	TBD	2.93E-14	TBD	TBD
AP3	11/24/2008	12/8/2008	4	39637	1.24E-15	TBD	TBD	2.57E-14	TBD	TBD
AP4	11/24/2008	12/8/2008	4	39570	1.12E-15	TBD	TBD	2.78E-14	TBD	TBD
AP5	11/24/2008	12/8/2008	4	39644	2.58E-15	TBD	TBD	2.62E-14	TBD	TBD
AP6	11/24/2008	12/8/2008	4	39572	2.15E-15	TBD	TBD	2.68E-14	TBD	TBD
AP7	11/24/2008	12/8/2008	4	39560	2.86E-15	TBD	TBD	3.02E-14	TBD	TBD
AP2	12/8/2008	12/23/2008	4	41382	2.70E-15	3.57E-16	2.38E-16	2.87E-14	9.00E-16	5.54E-16
AP3	12/8/2008	12/23/2008	4	24399	2.48E-15	4.29E-16	2.63E-16	2.70E-14	1.13E-15	7.59E-16
AP4	12/8/2008	12/23/2008	4	41477	2.34E-15	3.32E-16	3.66E-17	2.18E-14	8.30E-16	6.06E-16
AP5	12/8/2008	12/23/2008	4	41581	4.22E-15	4.37E-16	2.16E-16	2.92E-14	8.99E-16	4.73E-16
AP6	12/8/2008	12/23/2008	4	41628	2.72E-15	3.59E-16	2.55E-16	2.66E-14	8.56E-16	5.19E-16
AP7	12/8/2008	12/23/2008	4	41445	3.43E-15	3.98E-16	2.17E-16	2.74E-14	8.87E-16	5.15E-16
AP2	12/23/2008	1/5/2009	4	37553	2.00E-15	3.16E-16	1.79E-16	1.89E-14	7.75E-16	5.31E-16
AP3	12/23/2008	1/5/2009	4	37226	2.02E-15	3.15E-16	1.38E-16	1.90E-14	7.85E-16	5.36E-16
AP4	12/23/2008	1/5/2009	4	37568	1.20E-15	2.48E-16	1.78E-16	1.53E-14	7.23E-16	5.26E-16
AP5	12/23/2008	1/5/2009	4	37614	1.96E-15	3.15E-16	2.08E-16	2.01E-14	8.04E-16	5.67E-16
AP6	12/23/2008	1/5/2009	4	37566	1.62E-15	2.83E-16	1.74E-16	1.83E-14	7.53E-16	5.35E-16
AP7	12/23/2008	1/5/2009	4	37590	1.97E-15	3.22E-16	2.73E-16	2.03E-14	7.85E-16	4.61E-16

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; NA = Not Analyzed; TBD = To Be Determined

Table D.1-2 Air Particulate Filter Uranium Isotope Radioactivity Analyses

Air monitor	Sampling quarter	Sample volume (cu ft)	U^{234} (µCi/mL)			$U^{235/236}$ (µCi/mL)			U^{238} (µCi/mL)		
			Result	Uncertainty	MDA[2]	Result	Uncertainty	MDA[2]	Result	Uncertainty	MDA[2]
AP2	1	214961	5.02E-17	1.11E-17	4.44E-18	2.09E-18	2.44E-18	3.77E-18	4.84E-17	1.07E-17	3.77E-18
AP3	1	215926	4.69E-17	1.06E-17	3.98E-18	1.02E-18	2.48E-18	4.46E-18	4.73E-17	1.06E-17	3.98E-18
AP4	1	214145	5.17E-17	1.20E-17	5.35E-18	3.25E-18	2.59E-18	2.99E-18	5.17E-17	5.17E-17	1.20E-17
AP5	1	211494	3.20E-17	8.57E-18	4.51E-18	1.85E-18	1.99E-18	2.75E-18	3.25E-17	8.57E-18	3.61E-18
AP6	1	211441	3.20E-17	8.58E-18	4.51E-18	2.26E-18	2.66E-18	4.06E-18	3.97E-17	9.93E-18	4.51E-18
AP7	1	211524	3.29E-17	9.02E-18	5.41E-18	0.00E-00	1.90E-18	4.65E-18	2.57E-17	7.67E-18	4.96E-18
AP2	2	264989	5.01E-17	1.08E-17	3.24E-18	1.15E-18	1.84E-18	3.10E-18	4.75E-17	1.01E-17	2.16E-18
AP3	2	242564	5.12E-17	1.10E-17	3.54E-18	1.93E-18	2.75E-18	4.53E-18	5.35E-17	1.14E-17	2.75E-18
AP4	2	256783	5.20E-17	1.12E-17	5.95E-18	2.64E-18	2.60E-18	3.83E-18	4.94E-17	1.04E-17	3.35E-18
AP5	2	262498	3.85E-17	8.73E-18	3.64E-18	2.04E-18	1.78E-18	2.15E-18	3.42E-17	8.00E-18	2.55E-18
AP6	2	251712	4.02E-17	1.37E-17	1.90E-18	4.25E-18	2.54E-18	2.24E-18	5.73E-17	1.18E-17	2.65E-18
AP7	2	256170	6.63E-17	7.45E-18	1.86E-18	2.68E-18	2.35E-18	3.24E-18	2.76E-17	6.71E-18	1.86E-18
AP2	3	284254	3.88E-17	2.66E-17	2.88E-17	9.59E-18	1.36E-17	1.30E-17	5.67E-17	3.22E-17	3.15E-17
AP3	3	160464	1.61E-16	5.52E-17	2.34E-17	1.83E-17	1.94E-17	2.21E-17	1.49E-16	5.27E-17	2.09E-17
AP4	3	581572	3.93E-17	1.83E-17	1.03E-17	6.24E-18	8.25E-18	1.27E-17	7.35E-17	2.58E-17	8.76E-18
AP5	3	240898	6.32E-17	2.29E-17	4.76E-18	4.33E-18	6.16E-18	5.87E-18	8.33E-17	2.69E-17	9.48E-18
AP6	3	276993	8.28E-17	2.78E-17	1.31E-17	1.54E-17	1.25E-17	1.26E-17	9.43E-17	2.98E-17	1.13E-17
AP7	3	217460	8.12E-16	3.12E-16	1.39E-16	5.79E-17	9.05E-17	1.46E-16	1.16E-15	3.84E-16	1.67E-16
AP2	4	231756	8.47E-17	2.93E-17	2.00E-17	1.42E-17	1.25E-17	1.36E-17	8.50E-17	2.88E-17	1.49E-17
AP3	4	214454	1.09E-16	3.48E-17	2.47E-17	7.85E-18	9.12E-18	7.09E-18	1.28E-16	3.70E-17	1.14E-17
AP4	4	256266	1.05E-16	3.30E-17	1.16E-17	1.41E-17	1.34E-17	1.73E-17	1.23E-16	3.63E-17	1.16E-17
AP5	4	256201	6.80E-17	2.42E-17	1.00E-17	1.45E-17	1.35E-17	2.00E-17	4.74E-17	1.98E-17	9.98E-18

Air monitor	Sampling quarter	Sample volume (cu ft)	U^{234} (µCi/mL)			$U^{235/236}$ (µCi/mL)			U^{238} (µCi/mL)		
			Result	Uncertainty	MDA[2]	Result	Uncertainty	MDA[2]	Result	Uncertainty	MDA[2]
AP6	4	256140	5.99E-17	2.20E-17	1.55E-17	6.77E-19	4.54E-18	1.34E-17	3.70E-17	1.71E-17	1.45E-17
AP7	4	256453	3.42E-17	1.64E-17	1.52E-17	1.21E-17	1.10E-17	1.48E-17	3.68E-17	1.71E-17	1.60E-17

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 1a On-site vegetation radioactivity analyses, sampled March 12, 2008

Sample	^{234}U (µCi/g)			$^{235/236}U$ (µCi/g)			^{238}U (µCi/g)		
	Result	Uncertainty	MDA	Result	Uncertainty	MDA	Result	Uncertainty	MDA
SV1	3.00E-08	2.00E-08	1.00E-08	0.00E+00	1.00E-08	1.00E-08	2.00E-08	1.00E-08	1.00E-08
SVPC2	2.00E-08	2.00E-08	2.00E-08	1.00E-08	1.00E-08	2.00E-08	3.00E-08	2.00E-08	2.00E-08
SV3	3.00E-08	2.00E-08	1.00E-08	0.00E+00	1.00E-08	1.00E-08	3.00E-08	2.00E-08	2.00E-08
SVPC4	2.00E-08	2.00E-08	3.00E-08	0.00E+00	0.00E+00	2.00E-08	3.00E-08	2.00E-08	2.00E-08
SV5	1.10E-07	4.00E-08	2.00E-08	1.00E-08	1.00E-08	2.00E-08	5.60E-07	1.10E-07	1.00E-08
SVPC6	2.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08	1.00E-08
SVPC7	1.00E-08	1.00E-08	1.00E-08	0.00E+00	1.00E-08	2.00E-08	3.00E-08	2.00E-08	1.00E-08
SV8	6.00E-08	3.00E-08	1.00E-08	0.00E+00	1.00E-08	1.00E-08	2.00E-08	2.00E-08	1.00E-08
SV9	2.00E-08	2.00E-08	1.00E-08	0.00E+00	1.00E-08	1.00E-08	5.00E-08	2.00E-08	1.00E-08
SVPC10	3.00E-08	2.00E-08	1.00E-08	0.00E+00	1.00E-08	2.00E-08	5.00E-08	2.00E-08	1.00E-08
SV11	3.00E-08	2.00E-08	1.00E-08	0.00E+00	1.00E-08	1.00E-08	4.00E-08	2.00E-08	1.00E-08
SVPC12	0.00E+00	1.00E-08	2.00E-08	0.00E+00	0.00E+00	2.00E-08	1.00E-08	1.00E-08	2.00E-08
SV13	2.00E-08	1.00E-08	2.00E-08	0.00E+00	0.00E+00	2.00E-08	2.00E-08	1.00E-08	1.00E-08
SVPC14	1.20E-07	4.00E-08	1.00E-08	2.00E-08	2.00E-08	1.00E-08	7.90E-07	1.40E-07	1.00E-08
SV15	1.00E-08	2.00E-08	3.00E-08	0.00E+00	0.00E+00	2.00E-08	4.00E-08	2.00E-08	2.00E-08
SCPC16	2.00E-08	1.00E-08	2.00E-08	0.00E+00	1.00E-08	1.00E-08	5.00E-08	2.00E-08	1.00E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 1b On-site vegetation radioactivity analyses, sampled July 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
SV Southeast	1.79E-09	5.41E-09	2.51E-09	3.69E-09	2.64E-09	3.09E-09	2.85E-08	7.21E-09	2.01E-09
SV Southwest	7.44E-09	2.68E-09	1.48E-09	5.78E-10	8.94E-10	1.62E-09	7.20E-09	2.67E-09	1.86E-09
SV Northwest	1.71E-08	4.29E-09	1.45E-09	1.94E-09	1.50E-09	1.79E-09	1.65E-08	4.18E-09	1.27E-09
SV Northeast	1.23E-08	3.19E-09	9.98E-10	2.52E-09	1.46E-09	1.23E-09	3.78E-08	6.86E-09	8.24E-09
SV South	3.52E-08	8.32E-09	2.78E-09	4.72E-09	2.94E-09	2.90E-09	7.48E-08	1.42E-08	1.71E-09
SV East	1.44E-08	4.59E-09	2.30E-09	1.40E-09	1.63E-09	2.59E-09	1.21E-09	4.09E-09	1.53E-09
SV North	2.09E-08	4.96E-09	1.11E-09	2.02E-09	1.57E-09	1.87E-09	2.76E-09	5.96E-09	5.63E-10
SV West	1.82E-08	5.44E-09	2.43E-09	7.39E-09	1.36E-09	2.73E-09	2.09E-08	5.90E-09	2.21E-09

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 1c On-site vegetation radioactivity analyses, sampled October 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
SV Southeast	4.61E-08	2.98E-02	3.22E-08	0.00E+00	0.00E+00	1.32E-08	5.12E-08	2.96E-02	1.07E-08
SV Southwest	8.01E-09	1.18E-02	2.22E-08	6.44E-09	1.01E-02	1.63E-08	2.18E-08	1.65E-02	1.54E-08
SV Northwest	1.26E-08	1.19E-02	1.21E-08	9.69E-09	1.13E-02	8.75E-09	4.77E-09	7.46E-03	1.21E-08
SV Northeast	1.81E-08	1.39E-02	7.00E-09	-5.41E-10	1.09E-03	1.47E-08	1.15E-08	1.17E-02	1.55E-08
SV South	8.57E-09	1.18E-02	2.13E-08	1.74E-09	7.40E-03	2.14E-08	5.24E-09	8.20E-03	1.33E-08
SV East	4.52E-09	7.84E-03	1.48E-08	2.22E-09	6.91E-03	1.82E-08	2.03E-08	1.57E-02	1.63E-08
SV North	4.84E-09	9.60E-03	2.08E-08	6.04E-09	9.44E-03	1.53E-08	7.54E-09	9.34E-03	1.23E-08
SV West	4.45E-08	2.31E-02	1.45E-08	6.59E-09	9.38E-03	8.93E-09	1.49E-07	4.56E-02	1.23E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 2a Off-site vegetation radioactivity analyses, sampled March 12, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	1.28E-08	1.80E-08	3.40E-08	-8.13E-10	1.63E-09	2.21E-08	5.85E-08	3.24E-08	2.70E-08
Northwest	3.10E-08	1.94E-08	1.92E-08	0.00E+00	0.00E+00	8.66E-09	2.54E-08	1.68E-08	1.19E-08
North	2.79E-08	1.64E-08	1.20E-08	5.44E-09	7.73E-09	7.37E-09	1.68E-08	1.27E-08	1.19E-08
Southwest	1.68E-08	1.37E-08	1.37E-08	2.06E-09	6.42E-09	1.69E-08	3.27E-08	1.96E-08	1.86E-08
South	2.22E-08	1.61E-08	1.58E-08	1.58E-09	6.72E-09	1.94E-08	2.99E-08	1.86E-08	1.57E-08
Southeast	4.10E-08	2.30E-08	1.37E-08	6.69E-09	1.05E-08	1.69E-08	3.34E-08	2.12E-08	1.93E-08
East	3.13E-08	2.08E-08	1.47E-08	-6.68E-10	1.34E-09	1.82E-08	8.98E-09	1.11E-08	1.47E-08
Northeast	1.45E-08	1.24E-08	1.15E-08	-2.09E-09	2.12E-09	2.01E-08	4.51E-08	2.27E-08	1.74E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 2b Off-site vegetation radioactivity analyses, sampled July 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	2.08E-08	4.73E-09	1.33E-09	2.15E-09	1.62E-09	2.19E-09	2.59E-08	5.49E-09	1.67E-09
Northwest	1.03E-08	4.54E-09	3.39E-09	6.28E-10	1.10E-09	2.04E-09	7.21E-09	3.21E-09	2.47E-09
North	3.80E-08	8.52E-09	3.31E-09	3.52E-09	2.36E-09	1.97E-09	1.79E-08	5.23E-09	2.17E-09
Southwest	1.81E-08	4.62E-09	2.19E-09	1.42E-09	1.38E-09	2.03E-09	1.67E-08	4.32E-09	1.32E-09
South	3.88E-08	8.00E-09	2.27E-09	6.92E-09	3.02E-09	8.15E-10	1.23E-07	1.93E-08	1.31E-09
Southeast	3.05E-08	6.66E-09	2.43E-09	2.78E-09	2.02E-09	2.59E-09	7.86E-08	1.33E-08	6.09E-10
East	1.70E-08	5.57E-09	2.96E-09	4.06E-09	2.76E-09	1.22E-09	2.28E-08	6.53E-09	1.96E-09
Northeast	1.04E-08	3.88E-09	2.26E-09	6.28E-10	1.10E-09	2.04E-09	7.21E-09	3.21E-09	2.47E-09

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.2 – 2c Off-site vegetation radioactivity analyses, sampled October 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	1.96E-08	1.477E-08	1.38E-08	1.01E-09	6.654E-09	2.06E-08	1.44E-08	1.268E-08	1.38E-08
Northwest	1.30E-08	1.265E-08	1.76E-08	-1.06E-09	1.504E-09	1.69E-08	9.62E-09	1.018E-08	1.16E-08
North	1.04E-08	1.147E-08	1.75E-08	4.61E-09	8.961E-09	1.87E-08	3.30E-09	7.278E-09	1.63E-08
Southwest	2.05E-09	7.505E-09	1.97E-08	1.53E-09	6.502E-09	1.88E-08	3.77E-10	5.383E-09	1.76E-08
South	2.09E-08	1.62E-08	1.69E-08	2.86E-09	7.009E-09	1.60E-08	7.40E-09	9.797E-09	1.51E-08
Southeast	7.78E-09	9.579E-09	1.53E-08	1.42E-09	6.034E-09	1.74E-08	6.21E-09	8.213E-09	1.27E-08
East	6.23E-09	1.11E-08	2.35E-08	-2.50E-03	2.26E-09	2.05E-08	1.30E-02	1.184E-08	1.43E-08
Northeast	3.71E-09	8.19E-09	1.84E-08	1.70E-09	7.229E-09	2.09E-08	4.19E-10	5.985E-09	1.96E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 1a On-site soil radioactivity analyses, sampled March 12, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
SV1	6.10E-07	2.00E-07	9.00E-08	4.00E-08	6.00E-08	9.00E-08	4.10E-07	1.60E-07	1.00E-07
SVPC2	4.40E-07	1.60E-07	8.00E-08	3.00E-08	4.00E-08	7.00E-08	4.00E-07	1.50E-07	7.00E-08
SV3	2.50E-07	1.20E-07	1.20E-07	6.00E-08	6.00E-08	7.00E-08	2.60E-07	1.10E-07	7.00E-08
SVPC4	3.90E-07	1.50E-07	9.00E-08	0.00E+00	1.00E-08	7.00E-08	2.80E-07	1.30E-07	9.00E-08
SV5	3.80E-07	1.40E-07	5.00E-08	3.00E-08	5.00E-08	7.00E-08	3.10E-07	1.20E-07	7.00E-08
SVPC6	2.70E-07	1.20E-07	3.00E-08	2.00E-08	4.00E-08	8.00E-08	3.40E-07	1.40E-07	5.00E-08
SVPC7	1.90E-07	1.10E-07	1.20E-07	2.00E-08	3.00E-08	4.00E-08	2.20E-07	1.10E-07	8.00E-08
SV8	2.20E-07	1.40E-07	7.00E-08	1.00E-08	3.00E-08	7.00E-08	2.30E-07	1.10E-07	7.00E-08
SV9	3.80E-07	1.70E-07	7.00E-08	3.00E-08	5.00E-08	8.00E-08	2.50E-07	1.10E-07	8.00E-08

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
SVPC10	5.00E-07	1.60E-07	7.00E-08	2.00E-08	3.00E-08	4.00E-08	4.40E-07	1.60E-07	6.00E-08
SV11	4.20E-07	1.50E-07	1.20E-07	4.00E-08	5.00E-08	8.00E-08	4.20E-07	1.60E-07	1.00E-07
SVPC12	4.00E-07	1.70E-07	7.00E-08	-1.00E-08	1.00E-08	1.00E-07	2.70E-07	1.20E-07	9.00E-08
SV13	4.60E-07	2.00E-07	6.00E-08	3.00E-08	5.00E-08	5.00E-08	3.30E-07	1.50E-07	6.00E-08
SVPC14	6.00E-07	1.50E-07	1.10E-07	4.00E-08	6.00E-08	9.00E-08	3.40E-07	1.50E-07	6.00E-08
SV15	3.90E-07	1.70E-07	8.00E-08	1.00E-08	3.00E-08	1.00E-07	4.60E-07	1.70E-07	1.00E-07
SCPC16	4.40E-07	1.50E-07	8.00E-08	2.00E-08	5.00E-08	1.20E-07	3.40E-07	1.50E-07	9.00E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 1b On-site soil radioactivity analyses, sampled July 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
SV Southeast	4.89E-07	1.89E-07	7.10E-08	2.82E-08	5.49E-08	1.14E-07	5.35E-07	1.98E-07	4.14E-08
SV Southwest	3.40E-07	1.36E-07	7.59E-08	2.13E-08	4.14E-08	8.63E-08	3.98E-07	1.48E-07	6.96E-08
SV Northwest	3.91E-07	1.54E-07	8.79E-08	7.75E-08	7.02E-08	4.20E-08	2.37E-07	1.18E-07	9.27E-08
SV Northeast	3.37E-07	1.48E-07	6.54E-08	1.74E-08	3.50E-08	4.73E-08	4.32E-07	1.70E-07	7.63E-08
SV South	2.86E-07	1.37E-07	9.92E-08	-5.95E-09	8.46E-09	9.48E-08	2.63E-07	1.29E-07	7.65E-08
SV East	2.69E-07	1.36E-07	1.35E-07	1.69E-08	3.39E-08	4.58E-08	2.88E-07	1.35E-07	9.54E-08
SV North	2.27E-07	1.13E-07	8.11E-08	6.12E-08	6.18E-08	4.14E-08	2.47E-07	1.16E-07	3.34E-08
SV West	4.48E-07	1.65E-07	3.47E-08	4.46E-08	5.30E-11	7.30E-08	2.93E-07	1.30E-07	3.45E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 1c On-site soil radioactivity analyses, sampled October 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
Southeast	3.34E-07	1.493E-07	6.77E-08	8.41E-08	8.217E-08	9.78E-08	3.37E-07	1.521E-07	1.02E-07
Southwest	2.92E-07	1.313E-07	8.82E-08	3.61E-08	5.514E-08	1.02E-07	4.10E-07	1.567E-07	6.80E-08
Northwest	3.07E-07	1.614E-07	1.12E-07	9.17E-08	9.291E-08	6.22E-08	4.29E-07	1.945E-07	1.30E-07
Northeast	3.09E-07	1.386E-07	7.39E-08	2.79E-08	4.84E-08	9.11E-08	3.37E-07	1.446E-07	6.28E-08
South	3.96E-07	1.624E-07	9.16E-08	1.01E-07	8.61E-08	7.99E-08	3.95E-07	1.617E-07	9.12E-08
East	4.16E-07	1.875E-07	1.29E-07	1.05E-08	4.47E-08	1.29E-07	4.00E-07	1.825E-07	1.21E-07
North	2.37E-07	1.198E-07	1.04E-07	5.75E-08	6.384E-08	8.52E-08	3.10E-07	1.351E-07	7.65E-08
West	2.74E-07	1.552E-07	9.17E-08	-8.32E-09	1.184E-08	1.33E-07	3.39E-07	1.772E-07	1.38E-07

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 2a Off-site soil radioactivity analyses, sampled March 20, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	6.30E-07	TBD	1.17E-07	1.30E-07	TBD	1.17E-07	5.25E-07	TBD	8.67E-08
Northwest	5.57E-07	TBD	8.96E-08	1.19E-07	TBD	1.11E-07	8.16E-07	TBD	1.04E-07
North	6.42E-07	TBD	1.02E-07	1.02E-07	TBD	1.26E-07	5.65E-07	TBD	9.34E-08
Southwest	3.27E-07	TBD	9.55E-08	1.48E-07	TBD	1.18E-07	5.48E-07	TBD	1.11E-07
South	4.56E-07	TBD	1.46E-07	7.05E-08	TBD	1.39E-07	3.20E-07	TBD	9.29E-08
Southeast	7.52E-07	TBD	1.37E-07	1.32E-08	TBD	1.08E-07	7.44E-07	TBD	1.13E-07
East	3.30E-07	TBD	1.37E-07	2.03E-08	TBD	1.54E-07	6.75E-07	TBD	1.10E-07
Northeast	1.20E-06	TBD	4.86E-08	6.64E-08	TBD	6.00E-08	8.90E-07	TBD	8.27E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 2b Off-site soil radioactivity analyses, sampled July 18, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	3.70E-07	1.42E-07	7.49E-08	2.58E-08	4.04E-08	6.53E-08	4.43E-07	1.56E-07	5.27E-08
Northwest	1.77E-07	9.68E-08	7.58E-08	4.04E-08	5.01E-08	6.61E-08	3.65E-07	1.42E-07	6.25E-08
North	3.55E-07	1.55E-07	8.74E-08	1.01E-07	8.93E-08	9.69E-08	4.61E-07	1.80E-07	1.07E-07
Southwest	5.06E-07	1.81E-07	1.19E-07	9.35E-08	8.48E-08	1.20E-07	2.90E-07	1.31E-07	9.35E-08
South	3.91E-09	1.48E-07	7.05E-08	6.47E-08	6.57E-08	8.70E-08	3.22E-07	1.32E-07	6.31E-08
Southeast	4.43E-07	1.57E-07	6.21E-08	9.33E-09	2.91E-08	7.66E-08	3.29E-07	1.32E-07	5.28E-08
East	4.53E-07	1.66E-07	8.76E-08	-7.88E-09	9.71E-09	9.32E-08	4.47E-07	1.63E-07	5.77E-08
Northeast	6.33E-07	2.19E-07	9.97E-08	9.23E-08	8.37E-08	5.00E-08	4.29E-07	1.73E-07	6.89E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.3 – 2c Off-site soil radioactivity analyses, sampled October 16, 2008

	^{234}U (µCi/g)			$^{235/236}$U (µCi/g)			^{238}U (µCi/g)		
Sample	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**	**Result**	**Uncertainty**	**MDA**
West	3.95E-07	1.66E-07	8.04E-08	8.53E-08	8.33E-08	9.92E-08	5.14E-07	1.92E-07	6.83E-08
Northwest	4.77E-07	1.91E-07	1.39E-07	4.39E-08	6.71E-08	1.24E-07	5.44E-07	2.04E-07	1.24E-07
North	4.92E-07	2.02E-07	4.76E-08	1.08E-07	9.84E-08	5.87E-08	5.94E-07	2.25E-07	4.74E-08
Southwest	4.01E-07	1.65E-07	9.96E-08	1.46E-08	3.57E-08	8.12E-08	2.05E-07	1.14E-07	8.55E-08
South	2.22E-07	1.51E-07	1.25E-07	5.68E-08	8.09E-08	7.70E-08	3.86E-07	2.01E-07	1.06E-07
Southeast	2.82E-07	1.23E-07	3.18E-08	4.34E-08	5.06E-08	3.92E-08	2.08E-07	1.04E-07	5.41E-08
East	4.19E-07	1.89E-07	8.49E-08	4.87E-08	8.07E-08	1.58E-07	5.09E-07	2.10E-07	8.46E-08
Northeast	4.72E-07	1.67E-07	9.23E-08	5.36E-08	5.95E-08	8.27E-08	3.92E-07	1.49E-07	8.27E-08

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

Table D.4 – 1 Groundwater radioactivity analyses

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	9.90E-06	TBD	2.72E-07	6.66E-07	TBD	1.39E-07	6.42E-06	TBD	2.71E-07
5	1	1.97E-07	TBD	1.55E-07	7.76E-08	TBD	1.58E-07	2.27E-07	TBD	1.28E-07
10	1	1.46E-05	TBD	2.03E-07	1.94E-07	TBD	2.25E-07	7.87E-06	TBD	1.82E-07
4	2	1.41E-05	2.53E-06	3.19E-07	3.91E-07	2.59E-07	1.64E-07	8.49E-06	1.85E-06	2.25E-07
5	2	8.56E-07	3.30E-07	1.85E-07	3.48E-08	6.98E-08	9.44E-08	3.61E-07	2.10E-07	1.30E-07
10	2	1.54E-05	2.82E-06	2.35E-07	3.72E-07	2.34E-07	1.58E-07	2.74E-06	6.85E-07	2.16E-07
4	3	1.50E-05	2.21E-06	1.96E-08	4.95E-07	1.74E-07	1.07E-07	9.14E-06	1.44E-06	7.30E-08
5	3	7.72E-07	1.84E-07	5.53E-08	3.05E-09	2.05E-08	6.03E-08	5.87E-07	1.54E-07	4.03E-08
10	3	1.36E-05	1.96E-06	8.99E-08	3.30E-07	1.28E-07	5.81E-08	2.57E-06	4.58E-07	8.53E-08
4	4	1.44E-05	TBD	3.44E-07	6.27E-07	TBD	4.25E-07	9.36E-06	TBD	4.85E-07
5	4	3.27E-07	TBD	2.22E-07	2.95E-07	TBD	1.60E-07	1.83E-07	TBD	2.21E-07
10	4	1.42E-05	TBD	3.39E-07	3.00E-07	TBD	4.54E-07	3.30E-06	TBD	4.15E-07

Uncertainty = Total propagated uncertainty; MDA = Minimum Detectable Activity; TBD = To Be Determined

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