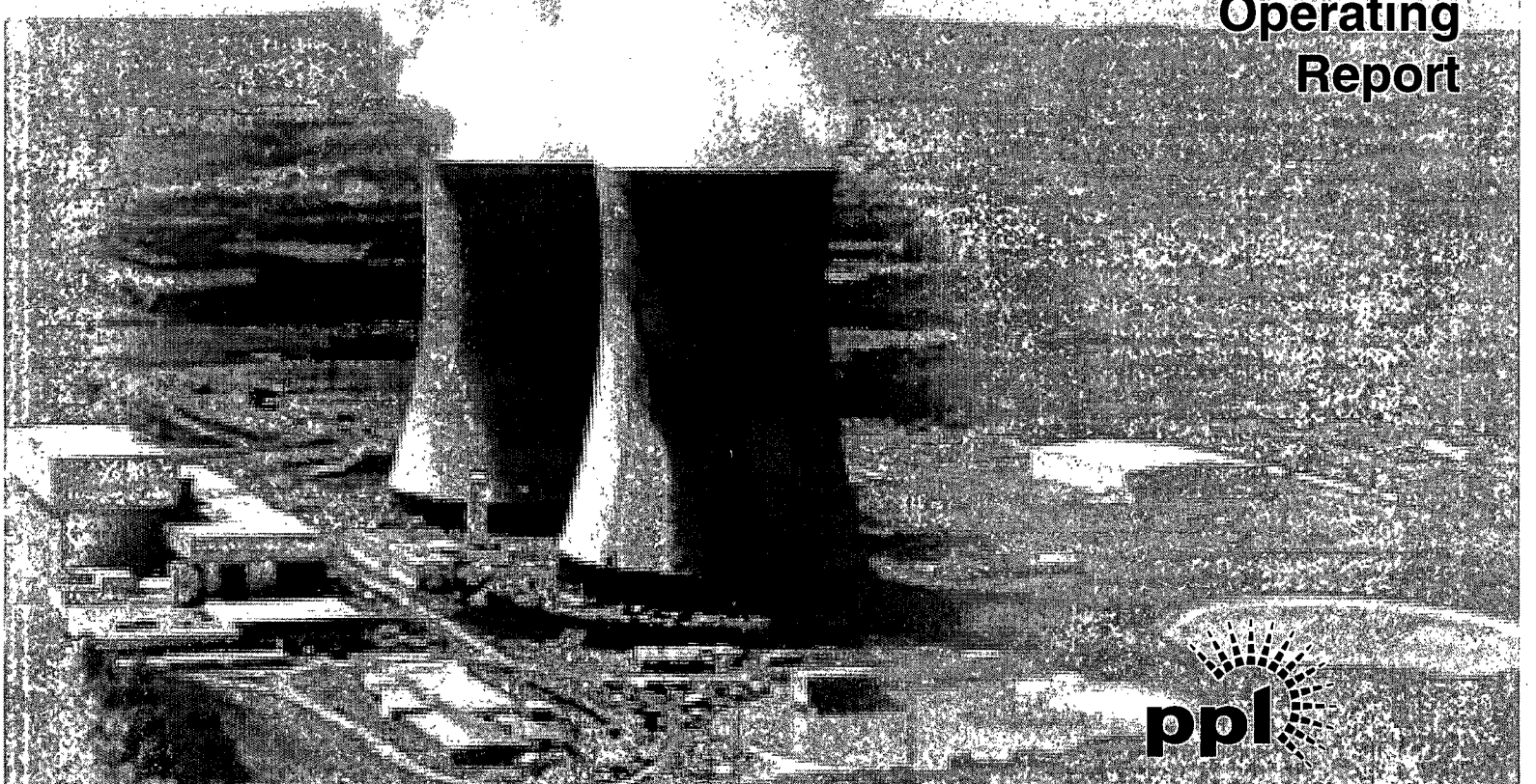
Susquehanna Steam Electric Station

Units 1 & 2

2008 ANNUAL REPORT

Annual Radiological Environmental Operating Report



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SUSQUEHANNA STEAM ELECTRIC STATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL
OPERATING REPORT **Docket Nos. 50-387**
PLA-6508 **and 50-388**

The Susquehanna Steam Electric Station Annual Radiological Environmental Operating Report is hereby submitted for the calendar year 2008 in accordance with Technical Specification 5.6.2.

Should you have any questions or require additional information, please contact Mr. Christopher K. Hoffman, Acting Manager – Nuclear Regulatory Affairs at (610) 774-4043

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SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

2008

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SUMMARY AND CONCLUSIONS

Radiological Dose Impact

This report on the Radiological Environmental Monitoring Program covers the year 2008.

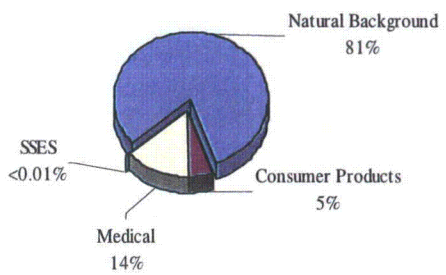
During that period, 1349 analyses were performed on 1072 samples at 42 sampling locations. Additionally, 226 TLD direct radiation measurements were performed at 57 locations around the site.

In assessing all the data gathered and comparing with SSES pre-operational data, it was concluded that the operation of SSES had no adverse radiological impact on the health and safety of the public or the environment.

The total whole body dose from both ingested radionuclides and direct radiation from SSES Operations is negligible compared to the public's exposure from natural background radiation, medical irradiation, and radiation from consumer products of more than 300 millirem/year.

The following graph compares public dose from SSES operation to that from other sources of radioactivity and radiation.

COMPARISON OF PERCENT OF AVERAGE ANNUAL PUBLIC DOSE FROM OTHER SOURCES WITH THAT FROM THE SSES



Sources for the values provided, with the exception of Susquehanna, are the following from NCRP Report #93 (1987): Tables 2.4 (Natural Background), 5.1 (Consumer Products), and 7.4 (Medical).

Ambient Gamma Radiation

Environmental direct radiation measurements were performed quarterly on and around the SSES site using thermoluminescent dosimeters (TLDs).

The maximum direct radiation dose from SSES operation to a member of the public was approximately 3.80E-02 mrem for all of 2008. This dose represents approximately 0.15% of the 25-mrem whole-body SSES Technical Requirements (TRO 3.11.3) limit for all SSES sources of radioactivity and radiation.

Aquatic Environment

Surface water samples were analyzed for concentrations of tritium, iodine-131, and gamma emitting nuclides. Drinking water samples were analyzed for concentrations of gross beta, tritium and gamma emitting nuclides. Gross beta activities detected in drinking water were consistent with those reported in previous years.

Iodine-131 activity was detected in 6 of 36 surface water samples. Evidence indicates that it is there only as the result of the discharge of medical waste to the Susquehanna or Lackawanna Rivers through sewage treatment plants upstream of the SSES. Iodine-131 was not reported to have been discharged with water released from the SSES to the Susquehanna River during 2008.

Tritium activity attributable to SSES operation was detected in the aquatic pathway to man. The maximum dose from the ingestion of tritium was estimated at the nearest downriver municipal water supplier via the drinking water pathway and near the outfall of the SSES discharge to the Susquehanna River via the fish pathway. The maximum whole body and organ doses due to tritium identified via REMP samples is approximately 7.60E-04 mrem/year. This dose is less than one-tenth of one percent of the dose guidelines stated in 10 CFR 50, Appendix I.

Fish samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were detected in fish.

Sediment samples were analyzed for concentrations of gamma emitting nuclides. Cesium-137 was observed in 1 of 6 sediment samples and attributed to non-SSES sources (residual fallout from atmospheric weapons testing). Concentrations of naturally occurring K-40, radium-226, and actinium-thorium-228 were found consistent with those detected in previous years.

Atmospheric Environment

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Cosmogenic Be-7 was detected at levels consistent with those detected in previous years.

Air iodine samples were analyzed for concentrations of iodine-131. All results were less than the MDC.

Terrestrial Environment

Soil samples were analyzed for concentrations of gamma emitting nuclides. Cesium-137 was observed in 3 of 4 soil samples and attributed to non-SSES sources (residual fallout from atmospheric weapons testing). Concentrations of naturally occurring K-40 were consistent with those detected in previous years. Concentrations of naturally occurring actinium-thorium-228 and radium-226 were consistent with those of previous years.

Cow milk samples were analyzed for concentrations of iodine-131 as well as other gamma emitting nuclides. All iodine results were less than the MDC. Concentrations of naturally occurring K-40, actinium-228, and thorium-228 were consistent with those detected in previous years. No fission or activation products were detected.

Pumpkins, green beans, and potatoes which were irrigated with Susquehanna River water downstream of the SSES were sampled. These food products were sampled during the harvest season and analyzed for concentrations of gamma emitting nuclides. Concentrations of naturally occurring K-40, actinium-228, and thorium-228 were found consistent with those in previous years. No fission or activation products were detected.

Ground Water

Ground water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Tritium was observed in 21 of 44 samples above analysis MDC's in 2008. The activity was slightly above the local background. The source of the tritium can be attributed to routine airborne effluent releases from Susquehanna operations due to recapture and washout into precipitation. This tritiated precipitation makes its way into surface water and soil where it eventually seeps into shallow ground water. No fission or activation products were detected.

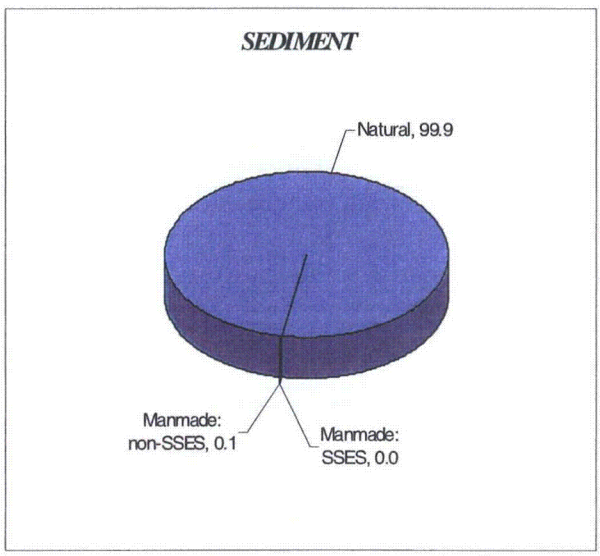
Relative Radionuclide Activity Levels in Selected Media

Some media monitored in the environment are significant for the numbers of gamma-emitting radionuclides routinely measured at levels exceeding analysis MDCs. Sediment in the aquatic pathway and soil in the terrestrial pathway are two such media.

The following graphs show the relative activity contributions for the types of gamma-emitting radionuclides reported at levels above the analysis MDCs in sediment and soil at indicator locations during 2008.

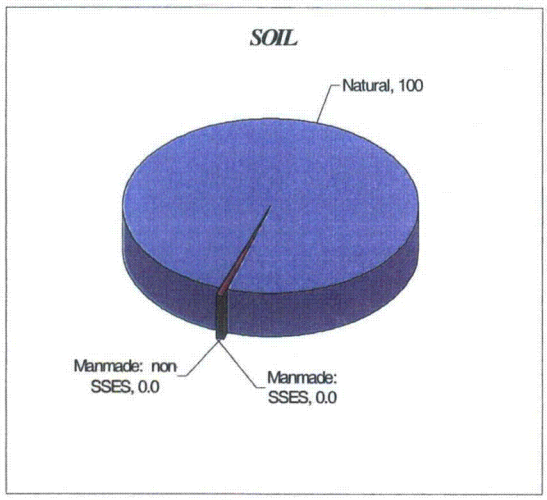
AQUATIC PATHWAY

PERCENT TOTAL GAMMA ACTIVITY



TERRESTRIAL PATHWAY

PERCENT TOTAL GAMMA ACTIVITY



Naturally occurring radionuclides accounts for over 100.0 % of the gamma-emitting activity in both sediment and soil in 2008. Man-made radionuclides of SSES origin accounted for 0.0% of the gamma-emitting activity in sediment and soil during 2008.

Radionuclides Contributing to Dose from SSES Operation

Of the three man-made radionuclides reported in the environment by the SSES REMP (i.e. H-3, I-131 and Cs-137), tritium is the only radionuclide attributable to SSES operation.

The whole body and organ dose to members of the public attributable to tritium identified in REMP blowdown samples was 7.60E-04 mrem.

Tritium was included in the dose calculation because it was identified in the REMP samples of water being discharged to the river. The concentration of tritium in the water and the volume of water discharged were used to determine the amount of tritium released. The presumed exposure pathways to the public from this radionuclide were drinking water taken from the Susquehanna River at Danville, PA, and eating fish caught near the SSES discharge to the river. These assumptions are based on the fact that tritium does not emit gamma radiation and the beta radiation emitted by tritium is not sufficiently penetrating to reach an individual on the shore.

INTRODUCTION

Radiological Environmental Monitoring Program (REMP)

The SSES is located on approximately an 1500-acre tract along the Susquehanna River, five miles northeast of Berwick in Salem Township, Luzerne County, Pennsylvania. The area around the site is primarily rural, consisting predominately of forest and agricultural lands. (More specific information on the demography, hydrology, meteorology, and land use characteristics of the area in the vicinity of the SSES can be found in the Environmental Report (Reference 1), the Final Safety Analysis Report (Reference 2), and the Final Environmental Statement (Reference 3) for the SSES.)

The SSES implements the REMP in accordance with Technical Specifications, Technical Requirements Manual and the Offsite Dose Calculation Manual, which are based on the design objectives in 10CFR Part 50 Appendix I, Sections IV.B.2, IV.B.3, and IV.C.
The REMP supplements the results of the radioactive effluent-monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation in the environment are not higher than expected on the basis of the effluent measurements and modeling of the environment in the vicinity of the SSES.

Key objectives of the SSES REMP are as follows:

- Document compliance with SSES REMP Technical Requirements radiological environmental surveillances
- Verify proper implementation of SSES radiological effluent controls
- Identify, measure, and evaluate trends of radionuclide concentrations in environmental pathways near SSES
- Assess impact of SSES Effluents on the environment and the public

PPL has maintained a Radiological Environmental Monitoring Program (REMP) in the vicinity of the Susquehanna Steam Electric Station Units 1 and 2 since April, 1972, prior to construction of both units and ten years prior to the initial operation of Unit 1 in September, 1982. The purpose of the preoperational REMP (April, 1972 to September, 1982) was to establish a baseline for radioactivity in the local environment that could be compared with the radioactivity levels observed in various environmental media throughout the operational lifetime of the SSES. This comparison facilitates assessments of the radiological impact of the SSES operation.

Potential Exposure Pathways

The three pathways through which radioactive material may reach the public from nuclear power plants are the atmospheric, terrestrial, and aquatic pathways. (Figure 1 depicts these pathways for the intake of radioactive materials.)

Mechanisms by which people may be exposed to radioactivity and radiation in the environment vary with the pathway. Three mechanisms by which a member of the public has the potential to be exposed to radioactivity or radiation from nuclear power plants such as the SSES are as follows:

- inhalation (breathing)
- ingestion (eating and drinking), and
- whole body irradiation directly from a plant or from immersion in the radioactive effluents.

REMP Scope

The scope of the SSES REMP was developed based on the NRC's Radiological Assessment Branch Technical Position on radiological environmental monitoring, as described in Revision 1, November 1979 (Reference 4). However, the REMP conducted by PPL for the SSES exceeds some of the monitoring suggested by the NRC's branch technical position, in terms of the number of monitoring locations, the frequency of certain monitoring, the types of analyses required for the samples, and the achievable analysis sensitivities.

During the operational period of the SSES, two different categories of monitoring locations, called control and indicator locations, were established to further assist in assessing the impact of station operation. Control locations are located at sites where it is considered unlikely that radiation or radioactive material from normal station operation would be detected. Indicator locations are sited where it is expected that radiation and radioactive material that might originate from the station would be most readily detectable.

Control locations for the atmospheric and terrestrial pathways are more than 10 miles from the station. Preferably, the controls also are in directions from the station less likely to be exposed to wind blowing from the station than are the indicator locations. Control locations for the aquatic pathway, the Susquehanna River, are upstream of the station's discharge to the river.

Indicator locations are selected primarily on the basis of proximity to the station, although factors such as meteorology, topography, and sampling practicality also are considered. Indicator locations for the atmospheric and terrestrial pathways are typically less than 10 miles from the station. Most often, they are within 5 miles of the station. Indicator locations in the Susquehanna River are downstream of the station's discharge. Monitoring results from indicator locations are compared with results from control locations. These comparisons are made to discern any differences in the levels and/or types of radioactive material and/or radiation that might exist between indicators and controls and that could be attributable to the station.

In 2008, the SSES REMP collected 1072 samples at 42 locations and performed 1, 349 analyses. In addition, the REMP monitors ambient radiation levels using thermoluminescent dosimeters (TLDs) at 57 indicator and control locations, resulting in 226 radiation level measurements in 2008. The media monitored and analyses performed are summarized in the table below. Figures 2 through 7 display the REMP TLDs and sampling locations in the vicinity of the SSES. Appendix C provides directions, distances, and a brief description of each of the locations in Figures 2 through 7.

REMP Monitoring Sensitivity

Detection of radiation and radioactive material from the SSES in the environment is complicated by the presence of naturally occurring radiation and radioactive materials from both terrestrial and cosmic sources. Man-made radiation and radioactive material from non-SSES sources, such as fallout from previous nuclear weapons tests and medical wastes, also can make identification of SSES radiation and radioactive material difficult. Together, this radiation and radioactive material present background levels from which an attempt is made to distinguish relatively small contributions from the SSES. This effort is further complicated by the natural variations that typically occur from both monitoring location to location and with time at the same locations.

The naturally occurring radionuclides potassium-40, beryllium-7, actinium-228, thorium-228, and tritium are routinely observed in certain environmental media. Potassium-40 has been observed in all monitored media and is routinely seen at readily detectable levels in such media as milk, fish, fruits and vegetables. Seasonal variations in beryllium-7 in air samples are regularly observed. Man-made radionuclides, such as cesium-137 left over from nuclear weapons testing are often observed as well. In addition, the radionuclide tritium, produced by both cosmic radiation interactions in the upper atmosphere as well as man-made (nuclear weapons), is another radionuclide typically observed.

SSES REMP	
Type of Monitoring	**Media Monitored**
Gross Beta Activity	Drinking Water and Air Particulates
Gamma-Emitting Radionuclide Activities	All Media
Tritium Activity	All Waters
Iodine-131 Activity	Surface Water, Air & Milk
Gamma Radiation Exposure (by TLD)	Ambient Radiation Levels

Radioactivity levels in environmental media are usually so low that their measurements, even with state-of-the-art measurement methods, typically have significant degrees of uncertainty associated with them (Reference 5). As a result, expressions are often used when referring to these measurements that convey information about the levels being measured relative to the measurement sensitivities. Terms such as "minimum detectable concentration" (MDC) are used for this purpose. The MDC is an "a priori" estimate of the capability for detecting an activity concentration by a given measurement system, procedure, and type of sample. Counting statistics of the appropriate instrument background are used to compute the MDC for each specific analysis. The formulas used to calculate MDCs may be found in procedures referenced in Appendix A.

The methods of measurement for sample radioactivity levels used by PPL's contracted REMP radioanalytical laboratories are capable of meeting the analysis sensitivity requirements found in the SSES Technical Requirements.

Exposure Pathways to Humans

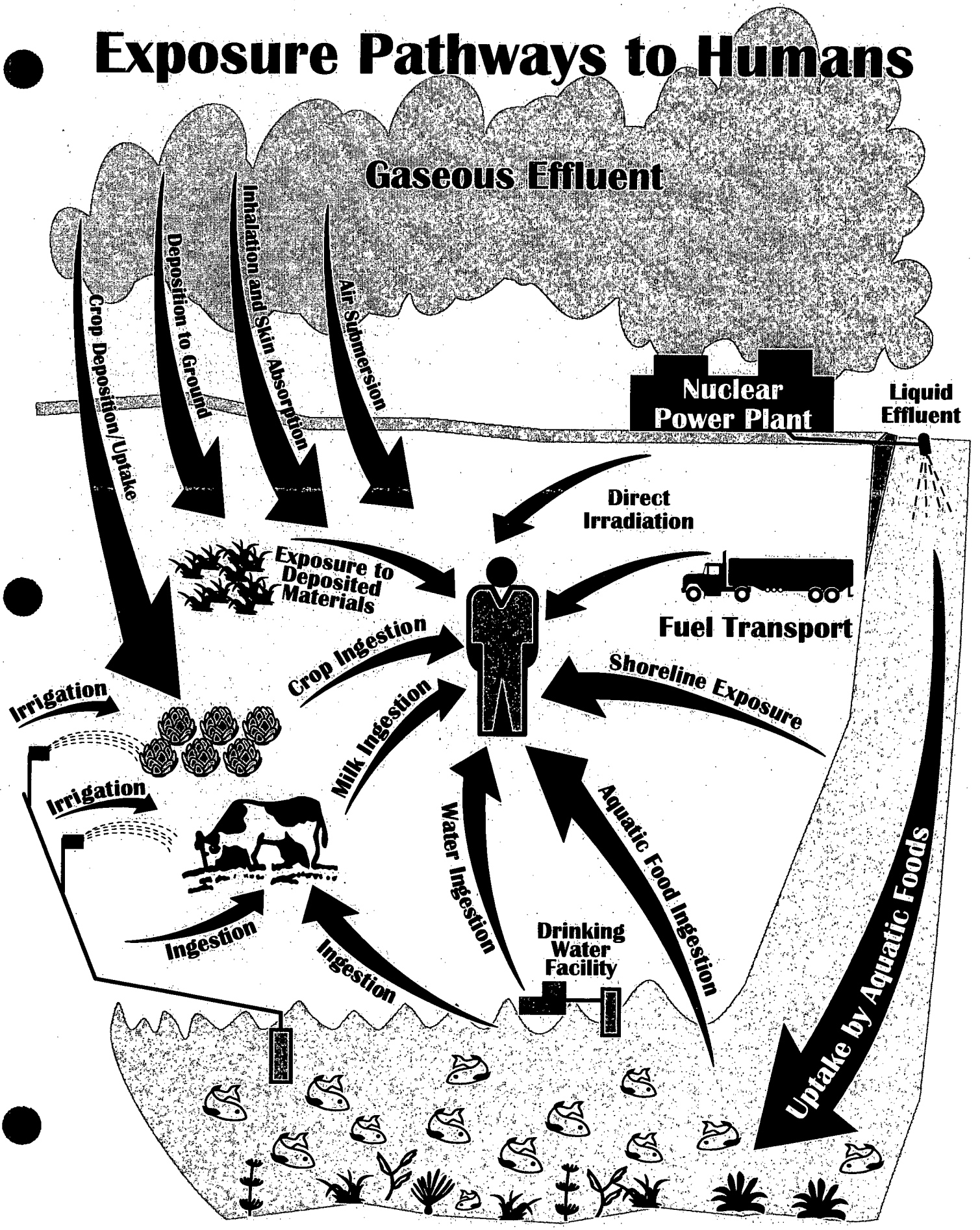


Figure 1

FIGURE 2
2008 TLD MONITORING LOCATIONS
WITHIN ONE MILE

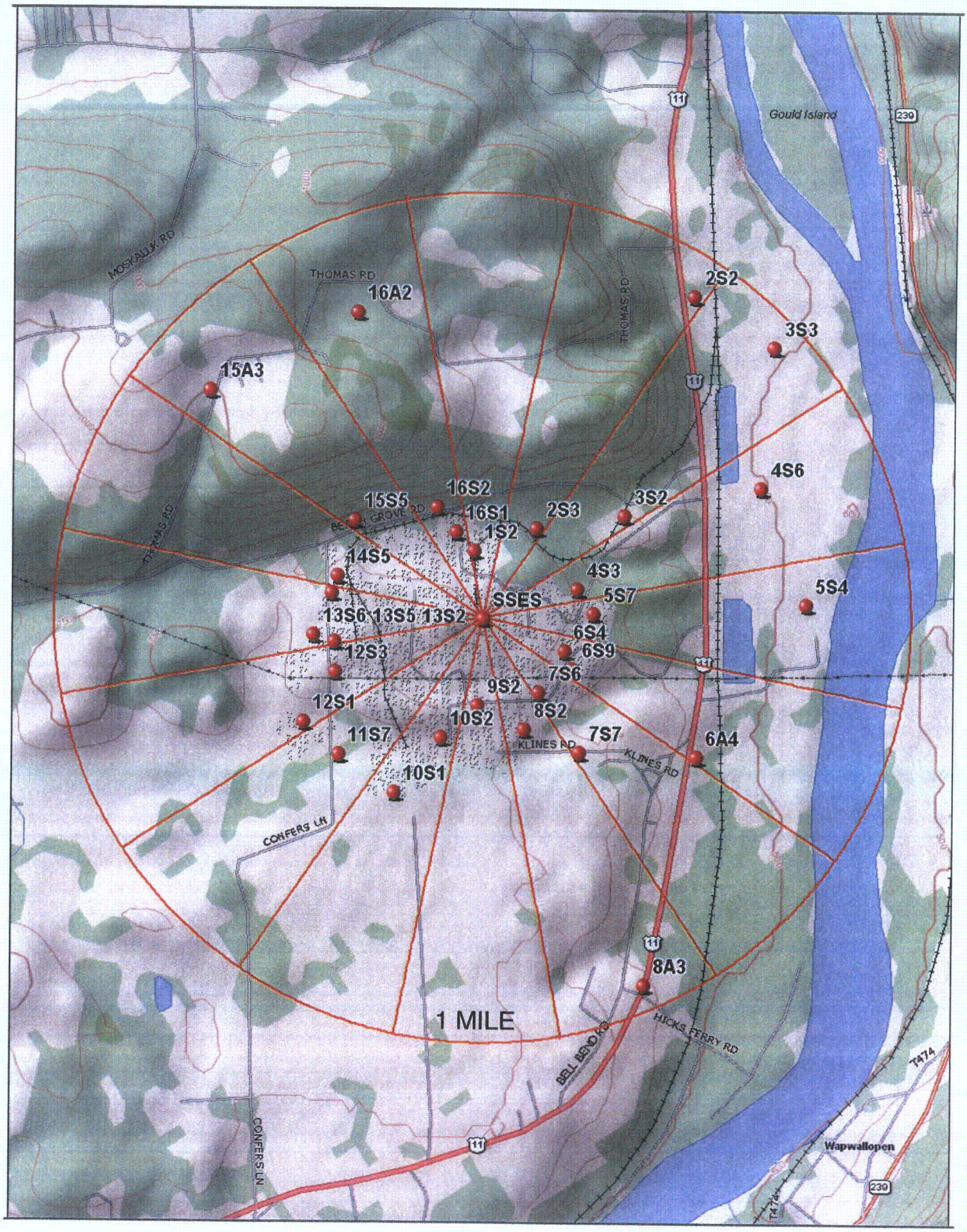


FIGURE 3
2008 TLD MONITORING LOCATIONS
FROM ONE TO FIVE MILES

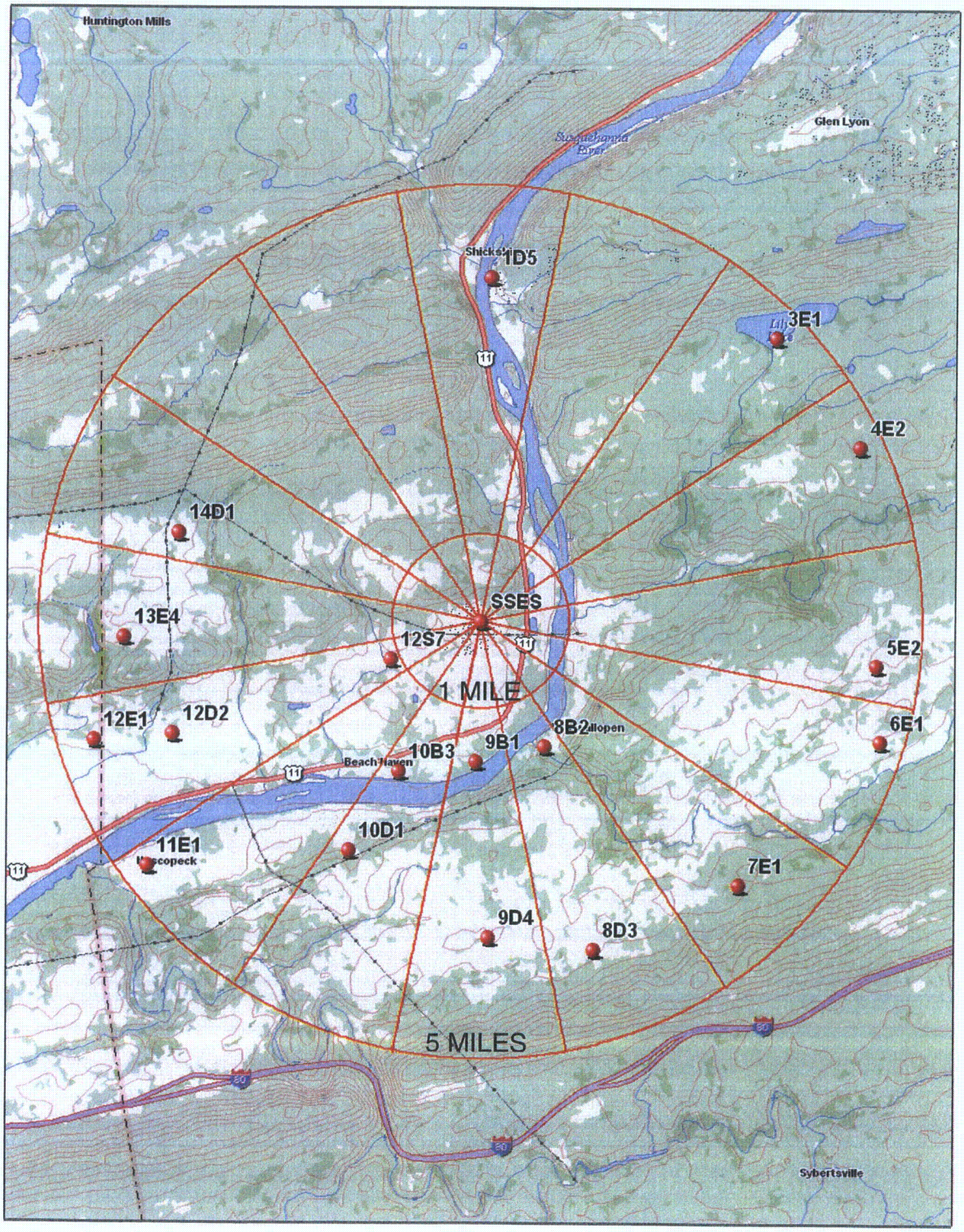


FIGURE 4
2008 TLD MONITORING LOCATIONS
GREATER THAN FIVE MILES

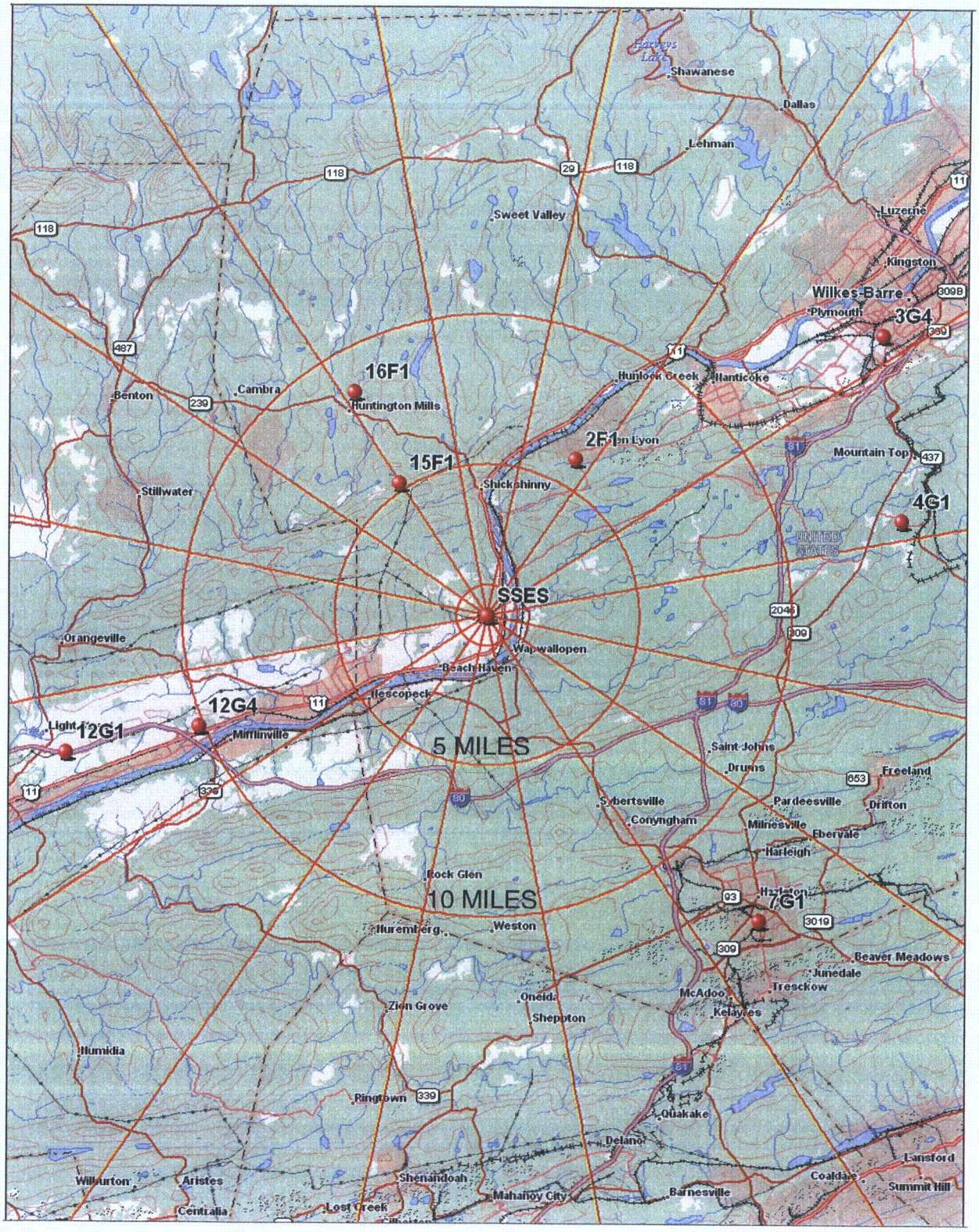


FIGURE 5
2008 ENVIRONMENTAL SAMPLING LOCATIONS WITHIN ONE MILE

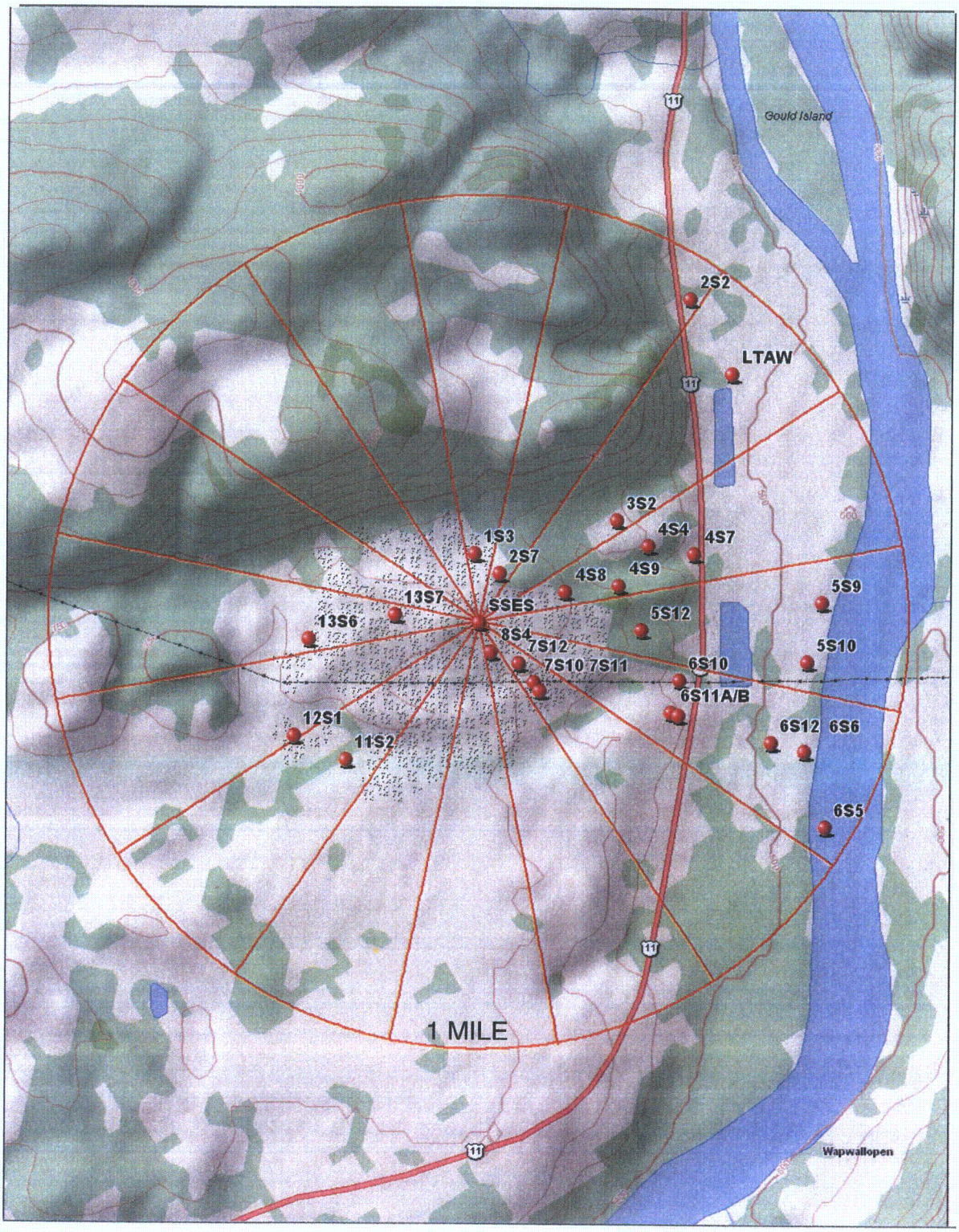


FIGURE 6
2008 ENVIRONMENTAL SAMPLING LOCATIONS
FROM ONE TO FIVE MILES

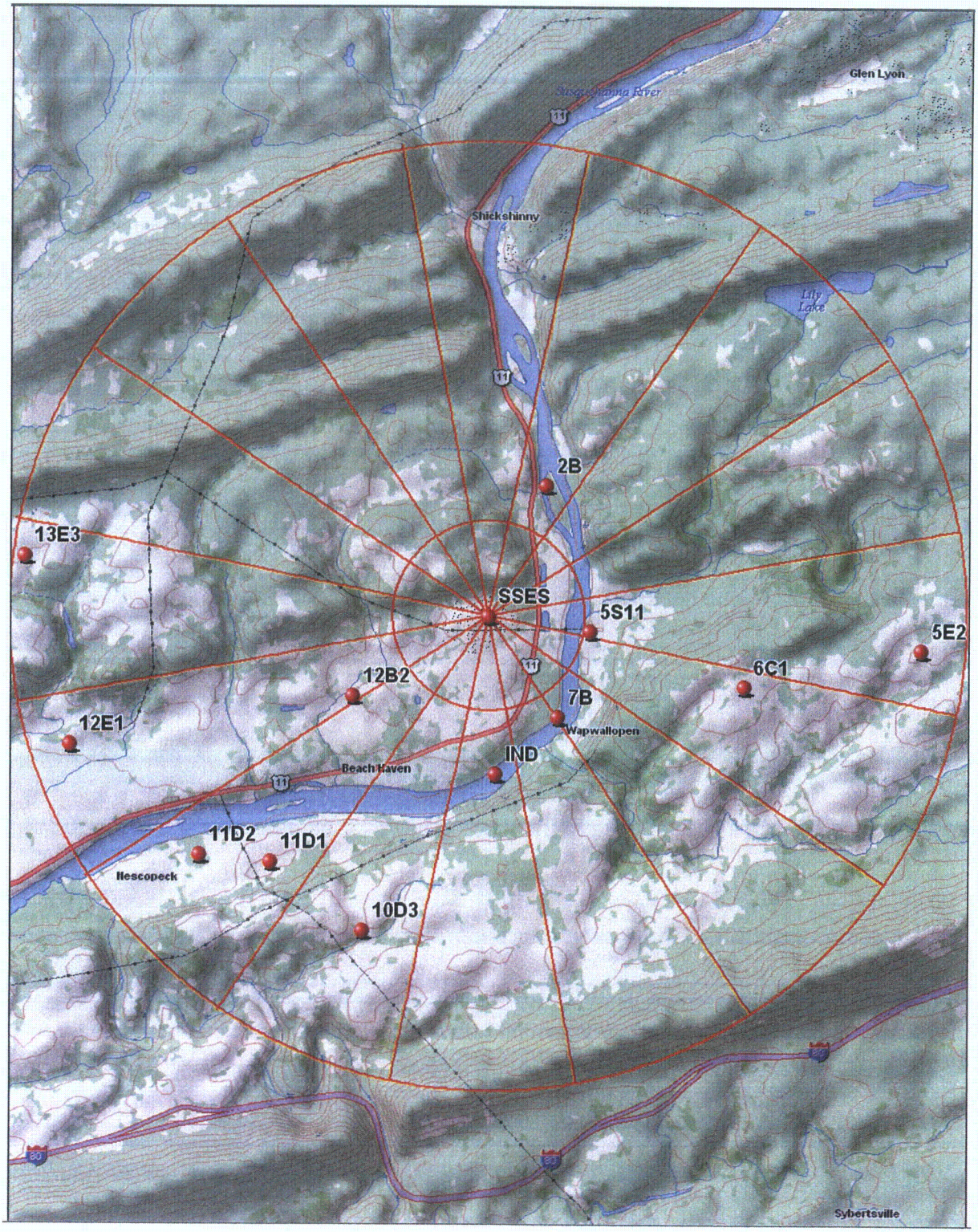
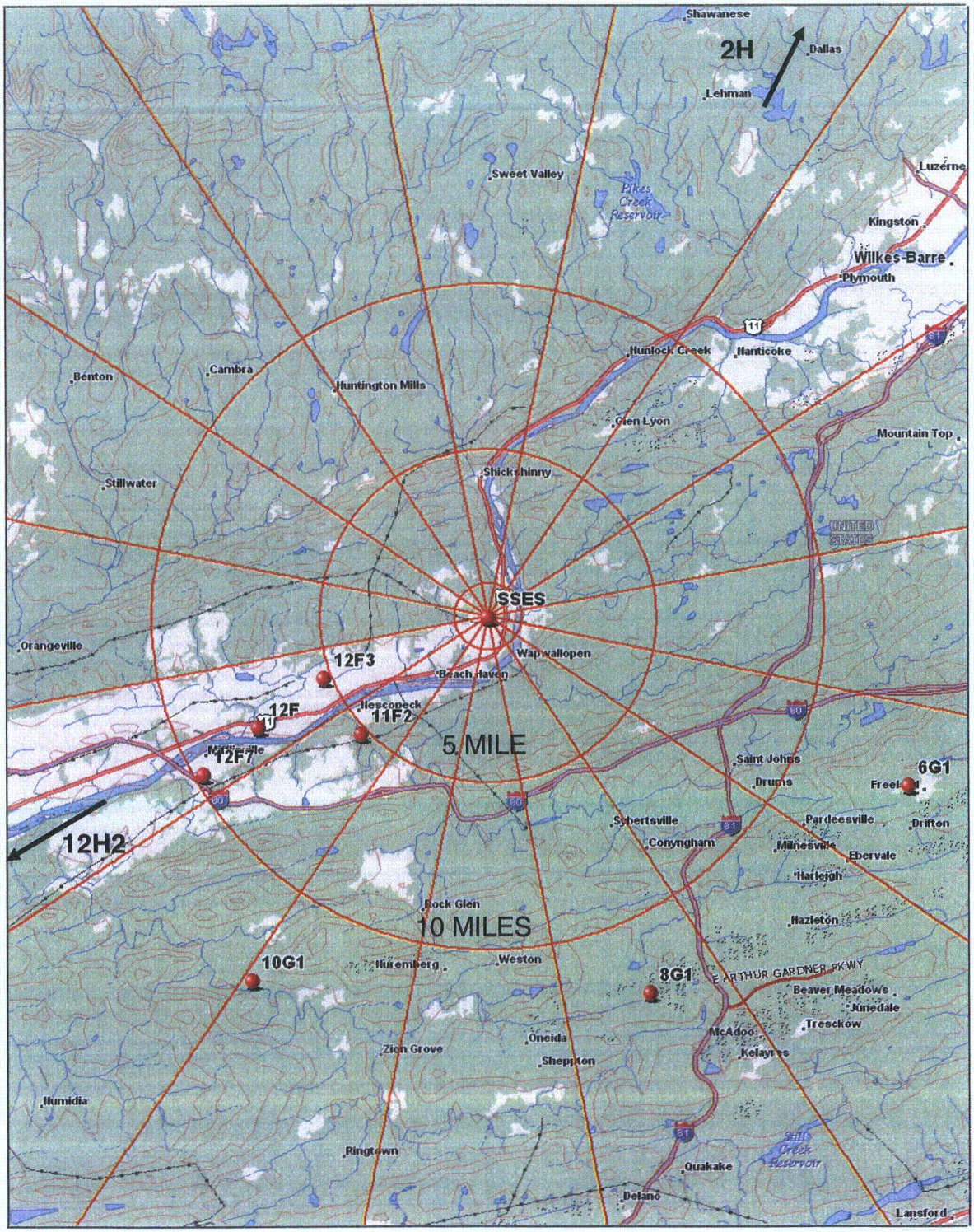


FIGURE 7
2008 ENVIRONMENTAL SAMPLING LOCATIONS
GREATER THAN FIVE MILES



AMBIENT RADIATION MONITORING

INTRODUCTION

The primary method for the SSES REMP measurement of ambient radiation levels is the use of thermoluminescent dosimeters (TLDs). The TLDs are crystals (calcium sulfate) capable of detecting and measuring low levels of radiation by absorbing a portion of the radiation's energy that is incident upon them and storing the captured energy until the TLDs are processed (read). Processing involves heating the TLDs to release their stored energy in the form of light and measuring the intensity of the light that they emit. The intensity of the emitted light is proportional to the amount of radiation to which they were exposed. Calibration of the TLD processors permits a reliable relationship to be established between the light emitted and the amount of radiation dose received by the TLDs. The result permits accurate measurements of the ambient radiation in the environment.

Environmental TLDs are continually exposed to natural radiation from the ground (terrestrial radiation) and from the sky (cosmic) radiation. In addition, they also may be exposed to man-made radiation. Most of the environmental TLD's natural radiation exposure comes from sources in the ground. These terrestrial sources vary naturally with time due to changes in soil moisture, snow cover, etc. The natural-radiation picture is complicated because the factors affecting radiation reaching the TLDs from the ground vary differently with time from one location to another due to locational differences in such factors as soil characteristics (amounts of organic matter, particle size, etc.), drainage opportunities, and exposure to sunlight. Environmental TLDs can also be affected by direct radiation (shine) from the SSES turbine buildings during operation, radwaste transfer and storage, and radioactive gaseous effluents from the SSES.

Unfortunately, TLDs do not have any inherent ability to indicate the source of the radiation to which they are exposed. The placement of numerous TLDs in the environment can facilitate decision-making about the possible radiation sources to which TLDs are exposed. However, a method for evaluating TLD data is still required. The SSES REMP relies on a statistically based approach to simultaneously compare indicator TLD data with control TLD data and operational TLD data with preoperational TLD data. This approach permits the flagging of environmental TLD doses that might have been produced by both man-made sources of radiation, as well as natural radiation sources. It also provides a means for attributing a portion of the total TLD dose to SSES operation if appropriate.

Interpretation of environmental TLD results is described in PPL Nuclear Engineering Study, EC-ENVR-1012 (Revision 0, January 1995).

Scope

Direct radiation measurements were made using Panasonic 710A readers and Panasonic UD-814 (calcium sulfate) thermoluminescent dosimeters (TLD). During 2008, the SSES REMP had 46 indicator, 6 special interest and 5 control TLD locations. Refer to Table C1 for TLD measurement locations. The TLD locations are placed on and around the SSES site as follows:

A site boundary ring (i.e. an inner ring) with at least 1 TLD in each of the 16 meteorological sectors, in the general area of the site boundary. Currently there are 30 locations. They are: (1S2, 2S2, 2S3, 3S2, 3S3, 4S3, 4S6, 5S4, 5S7, 6S4, 6S9, 7S6, 7S7, 8S2, 8A3, 9S2, 9B1, 10S1,10S2, 11S7, 12S1, 12S3, 12S7, 13S2, 13S5, 13S6, 14S5, 15S5, 16S1 and 16S2) near and within the site perimeter representing fence post doses from a SSES release.

An outer distance ring with at least 1 TLD in each of the 16 meteorological sectors, in the 3 to 9 mile range from the site. Currently there are 16 locations. They are: (1D5, 2F1, 3E1, 4E2, 5E2, 6E1, 7E1, 8D3, 9D4, 10D1, 11E1, 12D2, 13E4, 14D1, 15F1 and 16F1). These TLD's are located to measure possible exposures to close-in population.

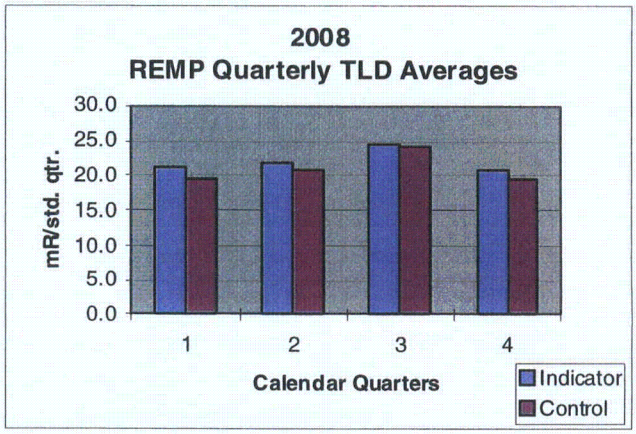
The balance of TLD locations represents the special interest areas such as population centers, schools, residences and control locations. Currently there are six special interest locations (6A4, 15A3, 16A2, 8B2, 10B3 and 12E1) and 5 control locations (3G4, 4G1, 7G1, 12G1 and 12G4).

The specific locations were determined according to the criteria presented in the NRC Branch Technical Position on Radiological Monitoring (Revision 1, November 1979).

Monitoring Results

TLDs

The TLDs were exchanged quarterly and processed by the SSES Health Physics Dosimetry Group. Average quarterly ambient gamma radiation levels measured by environmental TLDs is shown in the bar graph below.



The average environmental results for all indicator and control TLD were 21.9 +/- 9.0 and 21.0 +/- 3.5 (mR/std.qtr.), respectively.

Indicator environmental TLD results for 2008 were examined quarterly on an individual location basis and compared with both current control location results and preoperational data. Very small SSES exposure contributions were identified during 2008 at twelve onsite locations as follows: 1S2, 2S3, 6S4, 6S9, 7S6, 8S2, 9S2, 10S2, 13S2, 13S5, 13S6 and 16S2.

The highest, estimated, gamma radiation dose of 3.80 E-02 mrem for 2008 was at location 9S2. It is assumed that the occupancy time for a member of the public is no more than one hour each calendar quarter at location 9S2. This dose is approximately 0.15% of the 25 mrem whole-body SSES Technical Requirements (TRO 3.11.3) limit for all SSES sources of radioactivity and radiation.

Refer to the following for results of TLD measurements for 2008:

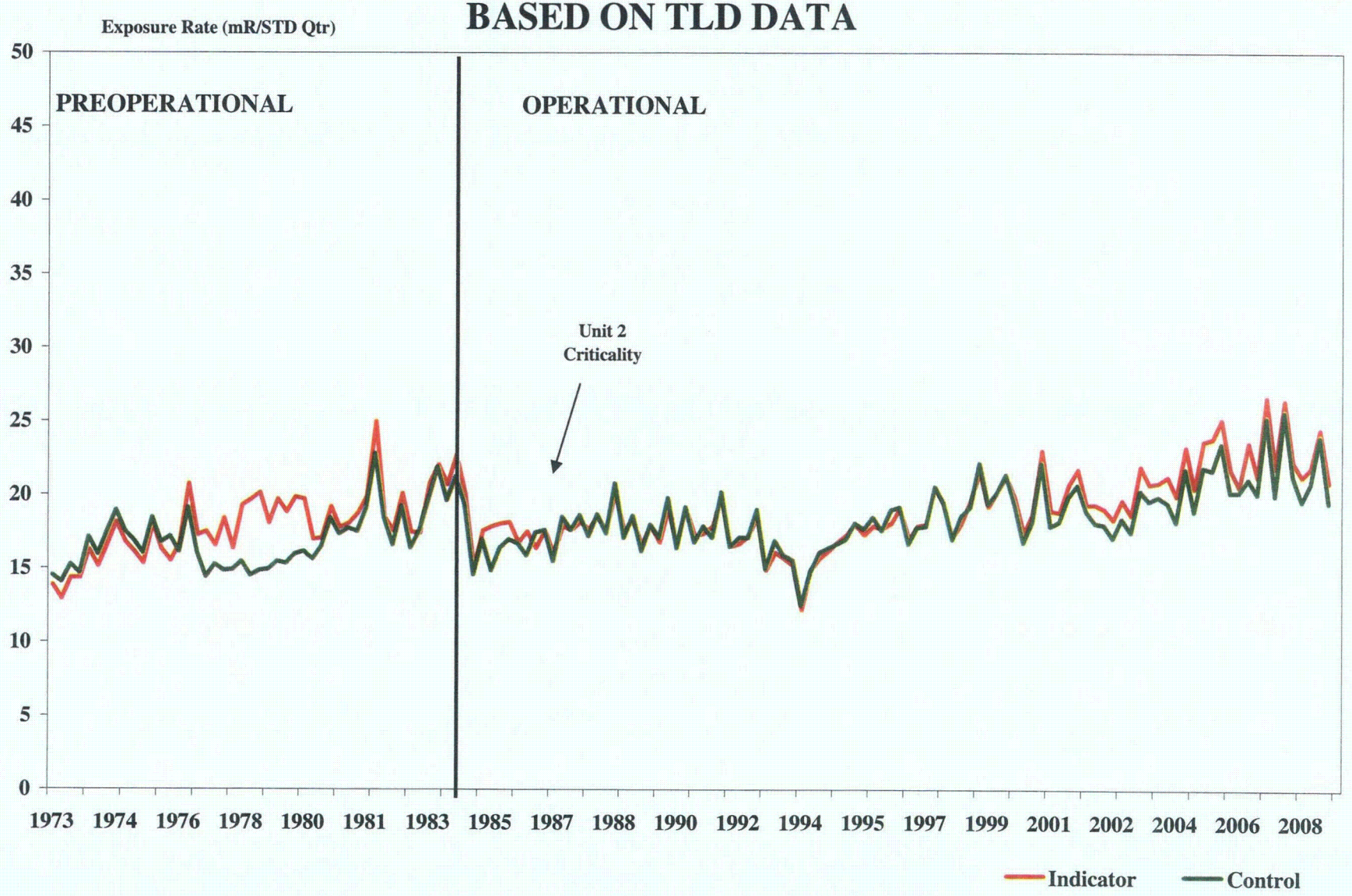
- Figure 8, trends quarterly TLD results for both preoperational and operational periods

- Appendix G, Table G Summary of Data Table, page G-3 shows the averages for TLD indicator and control locations for the entire year.

- Appendix H, Table H1, page H-3 shows a comparison of the 2008 mean indicator and control TLD results with the means for the preoperational and operational periods at the SSES.

- Appendix I, Table I-1, page I-3 through I-7 shows TLD results for all locations for each quarter of 2008.

FIGURE 8 - AMBIENT RADIATION LEVELS BASED ON TLD DATA



AQUATIC PATHWAY MONITORING

INTRODUCTION

In 2008 the SSES REMP monitored the following media in the aquatic pathway: surface water, drinking water, fish, sediment, fruits and vegetables. Some of the media (e.g., drinking water and fish) provide information that can be especially useful to the estimation of possible dose to the public from potentially ingested radioactivity, if detected. Other media, such as sediment, can be useful for trending radioactivity levels in the aquatic pathway, primarily because of their tendency to assimilate certain materials that might enter the surface water to which they are exposed. The results from monitoring all of these media provide a picture of the aquatic pathway that is clearer than that which could be obtained if one or more were not included in the REMP.

SSES Technical Requirements only require that fruit and vegetables be sampled at locations irrigated by Susquehanna River water from points downstream of the SSES discharge to the River. The land use census (Reference 11) conducted in 2008 identified three farms within 10 miles downriver of PPL Susquehanna that used Susquehanna River water for irrigation. The Zehner Farm (location 11D1, 3.3 miles SW) irrigated pumpkins. The Chapin Farm-Drake Field (location 11F2, 5.5 miles SW) irrigated green beans. The Lupini Farm – Mifflinville Field (location 12F7, 8.3 miles WSW) irrigated potatoes. A control sample of irrigated potatoes upriver from PPL Susquehanna discharge was also collected from the Chapin Farm - PPL-Parcel 25 (location 5S11, 1.1 miles East). No other fields within 10 miles downriver of Susquehanna SES were irrigated in 2008.

The aquatic pathway in the vicinity of the SSES is the Susquehanna River. Monitoring of all of the aquatic media, except drinking water, is conducted both downstream and upstream of the location from which occasional SSES low-level radioactive discharges enter the river. The upstream monitoring locations serve as controls to provide data for comparison with downstream monitoring results. The potential exists for radioactive material that might be present in SSES airborne releases to enter the Susquehanna River upstream of the plant through either direct deposition (e.g., settling or washout) or by way of runoff from deposition on land adjacent to the river. However, direct deposition and runoff are considered to be insignificant as means of entry for SSES radioactivity into the Susquehanna River when compared to liquid discharges under normal conditions.

Lake Took-a-While (LTAW), which is located in PPL's Riverlands Recreation Area adjacent to the Susquehanna River, is also considered to be part of the aquatic pathway for monitoring purposes. Although it is not in a position to receive water discharged to the river from the SSES, it does receive

storm runoff from the SSES. Storm runoff from the SSES site should not normally contain any measurable radioactivity from the plant. However, the SSES REMP, consistent with other aspects of aquatic monitoring and the REMP, in general, goes beyond its requirements by monitoring LTAW.

Scope

Surface Water

Surface water was routinely sampled from the Susquehanna River at one indicator location (6S5/Outfall Area) and one control location (6S6/River Water Intake Line) during 2008. Sampling also took place at the following additional indicator locations: the SSES discharge line to the river (2S7), Lake Took-A-While (LTAW) and the Peach Stand Pond (4S7). Additionally, a grab sample of the Susquehanna River was taken once at location 5S9 (Environmental Lab Boat Ramp) when station 6S6 malfunctioned.

Drinking Water

Drinking water samples were collected at location 12H2, the Danville Municipal Water Authority's treatment facility on the Susquehanna River, in 2008. Treated water is collected from the end of the processing flowpath, representing finished water that is suitable for drinking. This is the nearest point downstream of the SSES discharge to the River at which drinking water is obtained. No drinking water control location is sampled. For all intents and purposes, control surface water sampling location (6S6) would be suitable for comparison.

Fish

Fish were sampled from the Susquehanna River in the spring and fall of 2008, at one indicator location, IND, downstream of the SSES liquid discharge to the River and one control location, 2H, sufficiently upstream to essentially preclude the likelihood that fish caught there would spend any time below the SSES discharge. In addition, fish were also sampled in the fall from PPL's Lake Took-a-While, location LTAW. This location is not downstream of the SSES discharge. It is sampled because of its potential for receiving runoff from the SSES. LTAW is considered an indicator location.

Sediment

Sediment sampling was performed in the spring and fall at indicator locations 7B and 12F and control location 2B on the Susquehanna River.

Fruits and Vegetables

Fruits and vegetables were sampled at indicator locations 11D1, 11F2 and 12F7. Additionally a control sample of irrigated potatoes upriver from the Susquehanna discharge was collected at location 5S11. These locations were irrigated with Susquehanna River water in 2008. The edible portions are kept for analysis.

Sampling

Surface Water

Weekly water samples were collected at indicator location 6S5 for both biweekly and monthly compositing. Location 6S5 was considered a backup for location 2S7 in the event that water

could not be obtained from the automatic samplers at these locations. Routine samples for 6S5 were collected from a boat, unless river conditions prohibited boating. When this occurs, samples are collected from an alternate shoreline site located below the Susquehanna SES discharge diffuser. The shoreline samples are collected at the Wetlands Cottage area, approximately 100-150 yards down river from the 6S5 site.

Indicator location 2S7 the SSES Cooling Tower Blowdown Discharge (CTBD) line, and control location 6S6, the SSES River Water Intake structure, were time -proportionally sampled using automatic continuous samplers. The samplers were typically set to obtain 30-60 ml aliquots every 20-25 minutes. Weekly, the water obtained by these samplers was retrieved for both biweekly and monthly compositing.

The other surface water monitoring locations, LTAW and Peach Stand Pond (4S7), were grab sampled once each quarter.

Drinking Water

Treated water was time-proportionally sampled by an automatic sampler. The sampler was typically set to obtain three 12-ml aliquots every twenty minutes. Weekly, the water obtained by this sampler was retrieved for monthly compositing.

Fish

Fish were obtained by electrofishing. Electrofishing stuns the fish and allows them to float to the surface so that those of the desired species and sufficient size can be sampled. Sampled fish include recreationally important species, such as smallmouth bass, and also channel catfish and shorthead redhorse. The fish are filleted and the edible portions are kept for analysis.

Sediment

Shoreline sediment was collected to depths of four feet of water.

Fruits and Vegetables

Pumpkins, green beans and potatoes which were irrigated with river water downstream from SSES, were sampled during the harvest season.

Sample Preservation and Analysis

Surface and Drinking Water

Surface water samples were analyzed monthly for gamma-emitting radionuclides and tritium activities. One biweekly surface composite sample was analyzed for I-131 activity each month. Drinking water samples were analyzed monthly for beta, gamma-emitting radionuclides, and tritium activities.

Sediment and Fish

Fish are frozen until shipment. All samples are analyzed by gamma spectroscopy for the activities of any gamma emitting radionuclides that may be present.

Monitoring Results

Surface Water

Refer to the following for results of surface water analyses for 2008:

- Appendix G, Table G page G-3 and G-4, shows a summary of the 2008 surface water data.
- Appendix H, Tables H 3 and H 4, shows comparisons of iodine-131 and tritium monitoring results against past years data.
- Appendix I, Tables I-2 and I-3, shows specific results of tritium, gamma spectroscopic and iodine-131 analyses of surface water samples.

The Nuclear Regulatory Commission (NRC) requires that averages of the activity levels for indicator environmental monitoring locations and for control environmental monitoring locations of surface water, as well as other monitored media, be reported annually. Data from the following four surface water monitoring locations were averaged together as indicators for reporting purposes: location (6S5) on the Susquehanna River downstream of the SSES, Lake-Took-a While (LTAW) adjacent to the river, and the SSES cooling tower blowdown discharge (CTBD) line to the river (2S7), and the Peach Stand Pond (Secondary Sediment Pond).

Technically, the CTBD line is not part of the environment. The CTBD line is a below ground pipe to which the public has no access, contrary to the other environmental monitoring locations on the Susquehanna River to which the public does have access. However, currently there is no automatic composite sampling of an indicator location on the Susquehanna River, so the CTBD line from the SSES is included as an indicator monitoring location in the radiological environmental monitoring program.

Most of the water entering the Susquehanna River through the SSES CTBD line is simply water that was taken from the river upstream of the SSES, used for cooling purposes without being radioactively contaminated by SSES operation, and returned to the river. Batch discharges of relatively small volumes of slightly radioactively contaminated water are made to the river through the SSES CTBD at times throughout each year. The water is released from tanks of radioactively contaminated water on site to the CTBD and mixes with the noncontaminated water already present in the CTBD. Flow rates from the tanks containing radioactively contaminated water being discharged to the CTBD vary based on the radioactivity level of the batch release. In addition, the minimum flow rate for the returning water in the CTBD is maintained at a flow rate of 5,000 gpm or higher. These requirements are in place to ensure adequate dilution of radioactively contaminated water in the CTBD prior to entering the river.

At the point that CTBD water enters the river, additional, rapid dilution of the discharged water by the river is promoted by releasing it through a diffuser. The diffuser is a large pipe with numerous holes in it that is

positioned near the bottom of the river. CTBD discharges exit the diffuser through the many holes, enhancing the mixing of the discharge and river waters. The concentrations of contaminants are reduced significantly as the discharged water mixes with the much larger flow of river water. The mean flow rate of the Susquehanna River in 2008 was approximately 7,350,000 gpm. The CTBD average flow during 2008 was 9,653 gpm. Based on the average river flow and the average CTBD flow during 2008, liquid discharges from the SSES blowdown line were diluted by approximately a factor of 800 after entering the river. The amount of radioactively contaminated water being discharged is small. Nevertheless, sensitive analyses of the water samples can often detect the low levels of certain types of radioactivity in the CTBD water following dilution. Though the levels of radioactivity measured in the CTBD water are generally quite low, they tend to be higher than those in the river downstream of the SSES. Most radionuclides discharged from the SSES CTBD are at such low levels in the downstream river water that, even with the sensitive analyses performed, they cannot be detected.

When the radioactivity levels from the CTBD samples throughout the year are averaged with those obtained from actual downstream monitoring locations, the result is an overall indicator location average that is too high to be representative of the actual average radioactivity levels of the downstream river water. As the following discussions are reviewed, consideration should be given to this inflation of average radioactivity levels from the inclusion of CTBD (location 2S7) results in the indicator data that is averaged.

Surface Water Iodine-131

Bi-weekly (once per month) samples from surface water locations were analyzed for concentrations of iodine-131 activity (Table I-3 and Table G). The 2008 indicator values range from -0.255 to 1.95 pCi/l compared to -0.109 to 1.66 for 2007. Comparison of the 2008 mean iodine-131 activity of 0.48 pCi/l for all indicator locations to the average of the annual control mean of 0.36 pCi/l for pre-operational years suggest activity detected slightly above the average from 1979-81 (pre-operational) and the 2008 control mean.

Throughout the course of a year, iodine-131 is typically measured at levels in excess of analysis MDCs in some samples obtained from control surface water monitoring locations on the Susquehanna River upstream of the SSES as well as indicator locations downstream of the SSES. As determined by measurements of samples obtained by the SSES REMP, the mean iodine-131 activity level from the CTBD for all of 2008 was 0.74 pCi/l compared to the control mean of 0.34 pCi/l for 2008. The 2008 mean iodine-131 activity of 0.25 pCi/l at the indicator 6S5 (Outfall Area) was slightly lower than the mean iodine-131 activity of 0.34 pCi/l at the control 6S6 (River Water Intake) location.

Iodine-131 from the discharge of medical wastes into the Susquehanna River upstream of the SSES is drawn into the SSES cooling tower basins

through the SSES River Water Intake Structure. It is reasonable to assume that concentration of the already existing iodine-131 in the cooling tower basins occurs as it does for other substances found in the river. For example, the SSES routinely assumes concentration factors in the basin for calcium of four to five times the concentrations in the river water entering the basins, based on past measurements. This concentrating effect occurs because of the evaporation of the water in the basins, leaving behind most dissolved and suspended materials in the unevaporated water remaining in the basins. If a concentration factor of four for iodine-131 were to be applied to the 2008 mean iodine-131 activity level for the control samples from the Susquehanna River, a mean concentration of 1.36 pCi/liter for iodine-131 in the basin water and the water being discharged from the basins would be expected. The actual 2008 mean of 0.74 pCi/l for the CTBD mean is approximately half the expected mean.

Because iodine-131 is radioactive, unlike the calcium that has been measured, iodine-131 is removed from the water while it is in the basins through the radioactive decay process. Thus, it might be expected that the net concentration factor for iodine-131 would be somewhat less than that for calcium, considering this additional removal process. The extent to which the iodine-131 concentration factor is less than that for calcium would depend on the mean residence time for the water in the basins compared to iodine-131's radioactive half-life - the greater the ratio of the mean residence time to the half-life, the smaller the concentration factor. A mean residence time for water in the basins is expected to be about two days. This is only about one-fourth of the approximately eight-day half-life of iodine-131. Thus, radioactive decay would not be expected to reduce the concentration factor for iodine-131 by a large amount. Therefore, the difference between the 2008 mean iodine-131 activity of about 0.74 pCi/l in the CTBD and the 2008 mean iodine-131 activity for the control location of 0.34 pCi/l is most probably the result of concentration in the basins. Additional support for this assumption is that iodine-131 was not reported in water discharged from the SSES to the Susquehanna River during 2008.

Surface Water Tritium

Monthly samples from all surface water locations were analyzed for concentrations of tritium activity (Table I-2 and Table G). Tritium was detected in the indicator location above MDC. The 2008 indicator values ranged from -28.3 to 10,800 pCi/l compared to -147 to 15,300 for 2007. Comparison of the 2008 mean tritium activity of 882 pCi/l for all indicator locations to the average of the annual preoperational control mean of 171 pCi/l indicates a contribution of tritium activity from the SSES.

Refer to Figure 10 which trends tritium activity levels separately for surface water indicator and control locations from 1972 through 2008.

The much higher levels of tritium observed in the CTBD line (location 2S7), when averaged with the low levels from the downstream location

6S5 sample analysis results distort the real environmental picture. The mean tritium activity level from indicator location 6S5 for 2008 was 48.0 pCi/liter, which is greater than the mean tritium activity of 38.4 pCi/l for the control location and is below the annual preoperational control mean of 171 pCi/l.

Tritium activity levels reported for 2S7 are from the discharge line prior to dilution in the river. The highest quarterly average tritium activity reported at 2S7 during 2008 was approximately 3,852 pCi/liter for the second quarter. This is well below the NRC Reporting Levels for quarterly average activity levels of 20,000 pCi/liter when a drinking water pathway exists or 30,000 pCi/liter when no drinking water pathway exists.

The tritium activity reported in the CTBD line from location 2S7 is attributable to the SSES. Refer to the "Dose from the Aquatic Pathway" discussion at the end of this section for additional information on the projected dose to the population from tritium and other radionuclides in the aquatic pathway attributable to the SSES.

No gamma-emitting radionuclides were detected in surface water samples above MDC, with the exception of iodine-131, K-40 and Th-228.

Drinking Water

Drinking water was monitored during 2008 at the Danville Water Company's facility 26 miles WSW of the SSES on the Susquehanna River at location 12H2.

There are no known drinking water supplies in Pennsylvania on the Susquehanna River upstream of the SSES and therefore no drinking water control monitoring locations. Danville drinking water analysis results may be compared to the results for surface water control monitoring locations.

Refer to the following for results of surface water analyses for 2008:

- Figure 11 trends gross beta activity levels for drinking water location 12H2 from 1977 through 2008.
- Appendix G, Table G page G-4, 5 and G-6, shows a summary of the 2008 drinking water data.
- Appendix H, Table H 6 and H 7, shows comparisons of gross beta and tritium activity in drinking water for 2008 against past years' data.
- Appendix I, Table I-4 shows specific results of gross beta, tritium and gamma spectroscopic analyses of drinking water

Drinking Water Gross Beta

Monthly samples from the 12H2 drinking water location were analyzed for concentrations of gross beta activity (Table I-4). Beta activity was detected in the 12H2 location above MDC for 2008. The 2008 values ranged from 1.13 to 4.06 pCi/l compared to 0.93 to 5.29 for 2007.

Gross beta activity has been monitored in drinking water since 1977. Gross beta activity is typically measured at levels exceeding the MDCs in drinking

water samples. The 2008 mean gross beta activity of 3.6 pCi/l is above the mean gross beta activity of 2.5 for 2007 and slightly above the high end of the 2.5 preoperational (1977-81) values of 2.2 to 3.2 pC/l.

Drinking Water Tritium

Monthly samples from the 12H2 drinking water location were analyzed for concentrations of tritium activity (Table I-4). Tritium activity was not detected above MDC in any of the 14 drinking water samples in 2008. The 2008 values ranged from -12.1 to 99.6 pCi/l compared to -97.8 to 115 for 2007.

The 2008 mean tritium activity of 39.4 pCi/l for drinking water was higher than the mean tritium activity of 30.6 pCi/l for 2007 and is less than the preoperational (1977-81) values of 101 to 194 pCi/l. The 2008 mean tritium activity level of 39.4 pCi/l for drinking water indicates a variance not statistically different from the 2008 mean tritium activity level of 38.4 pCi/l for the surface water control location.

Drinking Water Gamma Spectroscopic

No gamma-emitting radionuclides were detected in drinking water samples above the MDC.

Fish

Refer to the following for results of fish analyses for 2008:

- Table G page G-7 and G-8 shows a summary of the 2008 fish data.
- Table H 8 page H-4 shows comparisons of potassium-40 monitoring results against past years' data.
- Table I-5 page I-11 shows specific results of gamma spectroscopic analyses of fish.

Fish Gamma Spectroscopic

Semi-annual samples from the indicator (IND) and control (2H) fish locations were analyzed for concentrations of gamma activity (Table I-5).

Three species of fish were sampled at each of one indicator location and one control location on the Susquehanna River in the spring 2008 and again in fall 2008. The species included the following: smallmouth bass, channel catfish, and shorthead redhorse. In addition, one largemouth bass was sampled from PPL's LTAW in October 2008. A total of 13 fish were collected and analyzed.

The only gamma-emitting radionuclide reported in excess of analysis MDCs in fish during 2008 was naturally occurring potassium-40. The 2008 indicator values ranged from 2,810 to 4,430 pCi/kg compared to 3,080 to 4,100 for 2007. The 2008 indicator and control means for the activity levels of potassium-40 in fish were 3700 pCi/kg and 3600 pCi/kg, respectively. Naturally occurring potassium-40 in fish is not attributable to the liquid discharges from the SSES to the Susquehanna River.

Sediment

Refer to the following for results of sediment analyses for 2008:

- Appendix G, Table G pages G-9 and G-10, shows a summary of the 2008 sediment data.

- Appendix H, Tables H 9, 10, 11 and 12, shows comparisons of potassium-40, radium-226, thorium-228, and cesium-137 monitoring results against past years' data.

- Appendix I, Table I-6 shows specific results of gamma spectroscopic analyses of sediment samples.

Sediment Gamma Spectroscopic

Semi-annual samples from all sediment locations were analyzed for concentrations of gamma activity (Table I-6). Naturally occurring potassium-40, radium-226, Ac-228, and thorium-228 were measured at activity levels above MDCs in some shoreline sediment samples in 2008. The naturally occurring radionuclides in sediment are not attributable to the liquid discharges from the SSES to the Susquehanna River.

Cesium-137 was measured at activity levels slightly above analysis MDCs in 1 of 6 shoreline sample analyses in 2008. The 2008 indicator and control means for cesium-137 activity in sediment were 14.4 pCi/kg and 69 pCi/kg, respectively. The 2008 indicator and control means are not statistically different from their respective means in 2007 of 19.3 pCi/kg and 64 pCi/kg. These samples are within the annual mean for all prior operational as well as preoperational years of station operations. Typically cesium-137 has been observed in prior operational years in the 20 to 210 pCi/kg range and reported attributable to fall out from past weapons testing. Station operations does not typically release cesium-137 in liquid effluents.

Fruits and Vegetables

Refer to the following for results of fruits and vegetables for SSES:

- Appendix G, Table G pages G-15 and G-16, shows a summary of the 2008 fruits and vegetables.

- Appendix I, Table I-12 page I-22, shows specific gamma spectroscopic analysis of fruit/vegetable samples.

Fruit /Vegetable Gamma Spectroscopic

Pumpkin, potato and green bean samples were collected in 2008. Green beans were collected from location 11F2, potatoes collected from locations 12F7 and 5S11, pumpkin collected from location 11D1 and analyzed for concentrations of gamma emitting nuclide activity (Table I-12). Potassium-40, thorium-228 and actinium-228 were the only gamma-emitting radionuclides measured in fruits and vegetables at an activity level above MDC during 2008. The average potassium-40 concentration for the indicator samples was 3,000 pCi/kg. The 2008 indicator values ranged from 1,660 to 4,600 pCi/kg compared to 2,350 to 15,000 pCi/kg for 2007.

Potassium-40, actinium-228 and thorium-228 in fruits and vegetables are not attributable to SSES operation because they are naturally occurring radionuclides.

Dose from the Aquatic Pathway

Tritium was the only radionuclide identified in 2008 by the SSES REMP in the aquatic pathway that was attributable to SSES operation and also included in the pathway to man.

The total tritium activity released from the SSES for the year was estimated based on REMP monitoring results and used in projecting maximum doses to the public. The annual mean activity level of tritium in the CTBD line (monitoring location 2S7) for 2008 was 2,305 pCi/l. The annual mean activity of tritium for control location 6S6 was 38.4 pCi/l. For the purpose of performing the dose calculation, tritium was assumed to be present continuously in the CTBD line throughout 2008 at a level equivalent to the annual mean activity of 2,305 pCi/l. The annual mean flow rate for the CTBD line was 9,653 gpm. Using the proper unit conversions and multiplying 9,653 gpm times 2,305 pCi/l yields a value of 44 curies for the estimate of tritium released from SSES during 2008. This estimate is 11 curies more than the 33 curies of tritium determined by effluent monitoring that was released to the river by the SSES in 2008.

Given the total tritium activity released, the maximum whole-body and organ doses to hypothetical exposed individuals in four age groups (adult, teenager, child, and infant) were determined according to the methodology of the Offsite Dose Calculation Manual using the RETDAS computer program. This is in accordance with SSES Technical Requirement 3.11.4.1.3.

The maximum dose obtained from the ingestion of tritium was estimated at the nearest downriver municipal water supplier via the drinking water pathway and near the outfall of the SSES discharge to the Susquehanna River via the fish pathway. The maximum whole body and organ doses (child) were each calculated as 7.60E-4 mrem as reported in the 2008 Radioactive Effluent Release Report.

FIGURE 10 - TRITIUM ACTIVITY IN SURFACE WATER

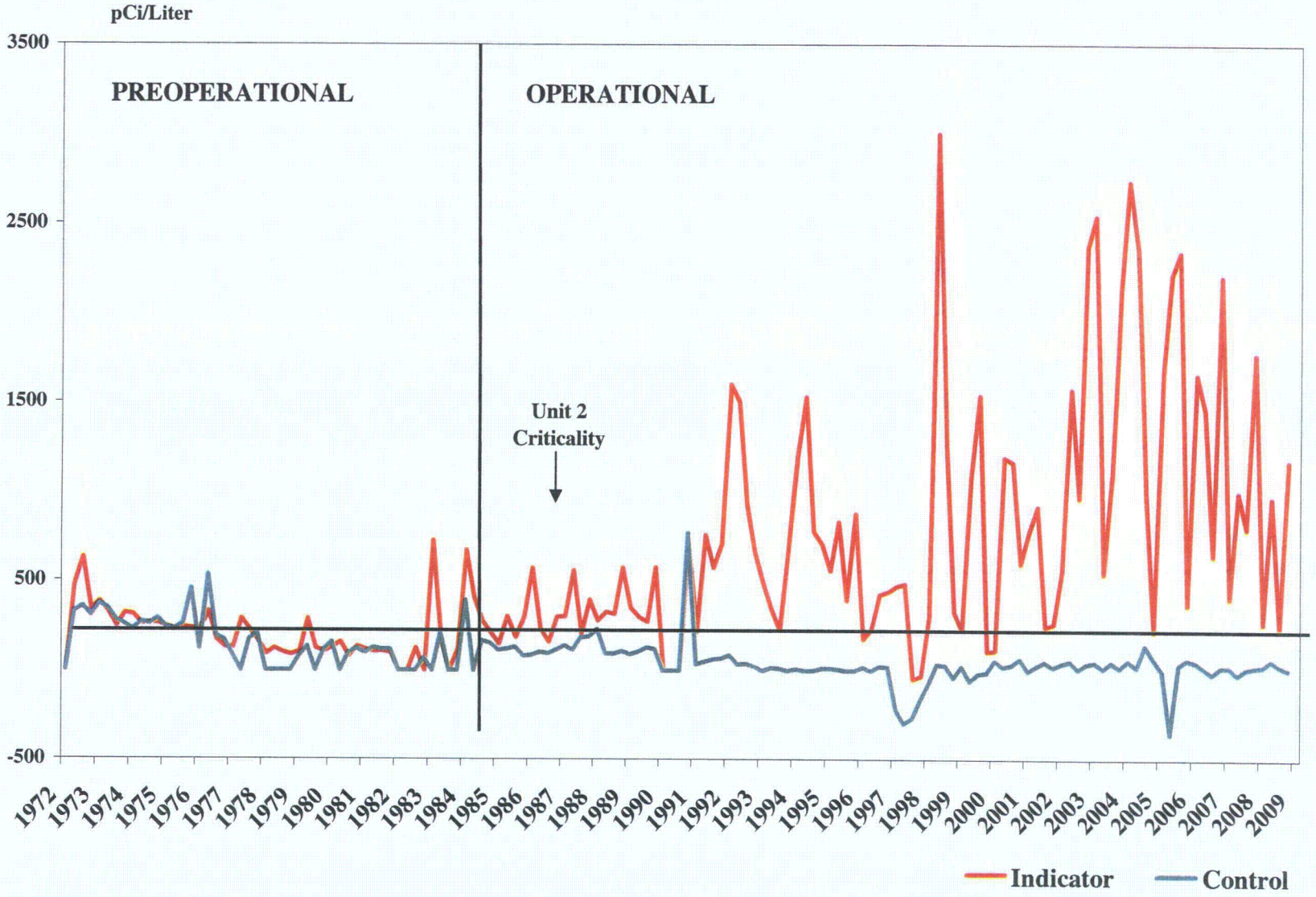
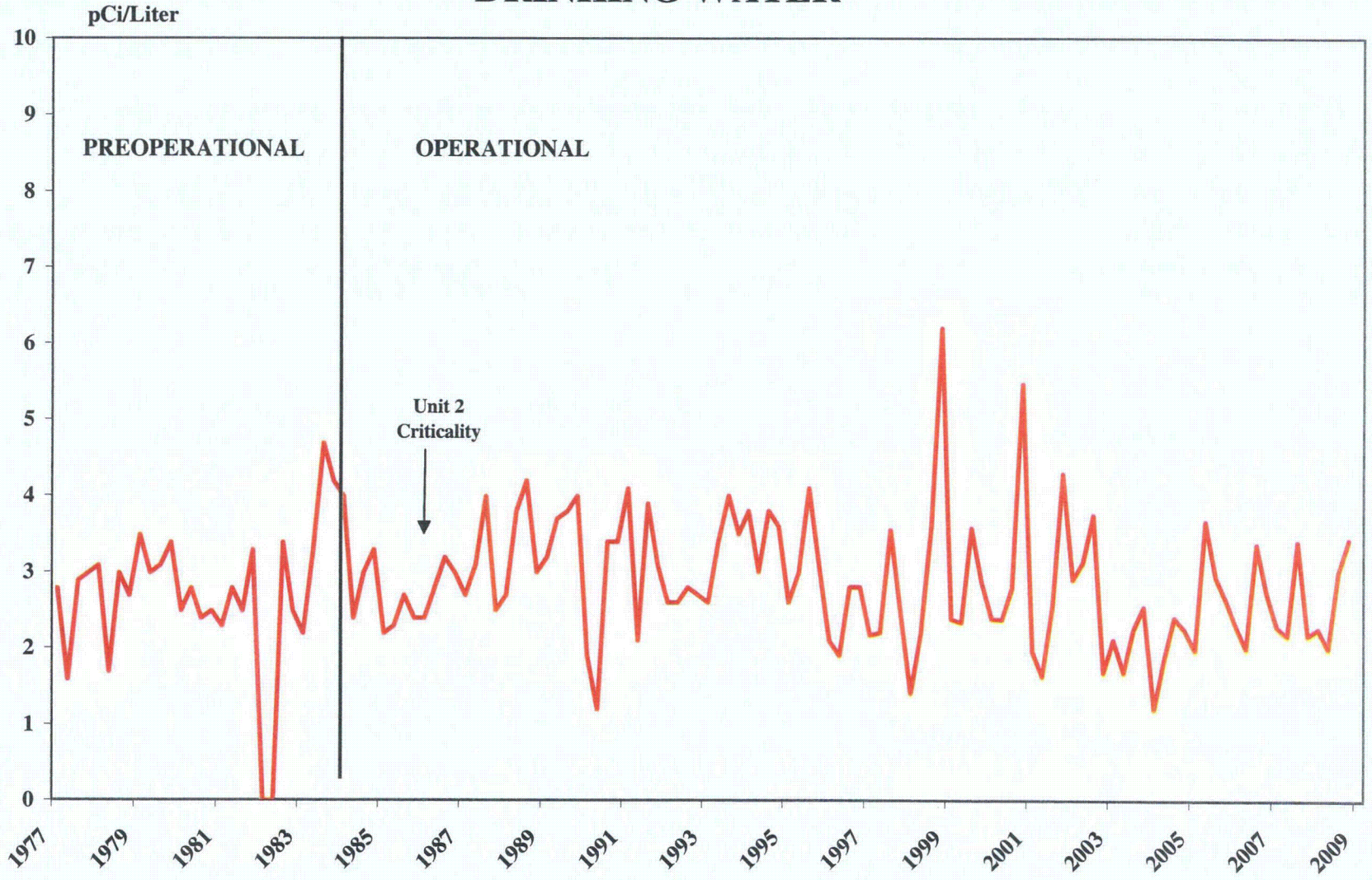


FIGURE 11 - GROSS BETA ACTIVITY IN DRINKING WATER



ATMOSPHERIC PATHWAY MONITORING

INTRODUCTION

Atmospheric monitoring by the SSES REMP involves the sampling and analysis of air. Because the air is the first medium that SSES vent releases enter in the pathway to man, it is fundamental that it be monitored. Mechanisms do exist for the transport of airborne contaminants to other media and their concentration in them. For example, airborne contaminants may move to the terrestrial environment and concentrate in milk. Concentrations of radionuclides can make the sampling and analysis of media like milk more sensitive approaches for the detection of radionuclides, such as iodine-131, in the pathway to man than the monitoring of air directly. (PPL also samples milk; refer to the Terrestrial Pathway Monitoring section of this report.) Nevertheless, the sensitivity of air monitoring can be optimized by the proper selection of sampling techniques and the choice of the proper types of analyses for the collected samples.

Scope

Air samples were collected on particulate filters and charcoal cartridges at indicator locations 3S2, 12S1, 13S6 and 12E1, and control locations 6G1 and 8G1.

Sampling and Analysis

Air

The SSES REMP monitored the air at four indicator locations and two control locations during 2008. The SSES Technical Requirements require monitoring at only a total of five sites. Monitoring is required at three locations at the SSES site boundary in different sectors with the greatest predicted sensitivities for the detection of SSES releases (3S2, 12S1, 13S6). Monitoring must be performed at the community in the vicinity of the SSES with the greatest predicted sensitivity (12E1). A control location that is expected to be unaffected by any routine SSES releases must be monitored (6G1, 8G1).

Airborne particulates were collected on glass fiber filters using low volume (typically 2.0 to 2.5 cfm sampling rates) air samplers that run continuously. Air iodine samples were collected on charcoal cartridges, placed downstream of the particulate filters.

Particulate filters and charcoal cartridges were exchanged weekly at the air monitoring sites. Sampling times were recorded on elapsed-time meters. Air sample volumes for particulate filters and charcoal cartridges were measured with dry-gas meters.

Air filters were analyzed weekly for gross beta activity, then composited quarterly and analyzed for the activities of gamma-emitting radionuclides. The charcoal cartridges were analyzed weekly for iodine-131.

Monitoring Results

Air Particulates

Refer to the following for results of air particulate analyses for 2008:

- Figure 12 trends gross beta activities separately for air particulate indicator and control locations from 1974 through 2008.
- Appendix G, Table G pages G-10, 11 and G-12, shows a summary of the 2008 air particulate data.
- Appendix H, Tables H 13 and 14 page H-5, shows comparisons of gross beta and Beryllium-8 monitoring results against past years' data.
- Appendix I, Table I-8 pages I-15 and I-16, shows specific sample results of gross beta analyses for air particulate filters.

Air Particulate Gross Beta

Weekly samples from all air particulate filter locations were analyzed for concentrations of gross beta activity (Table I-8). Gross beta activity was observed at all locations above MDC for 2008. The 2008 indicator values ranged from 6.00E-3 to 33.4E-3 pCi/m^3, compared to 5.30E-3 to 32E-3 pCi/m^3 for 2007. The 2008 mean gross beta activity of 14.9E-3 pCi/m^3 for all indicator locations compared to the average of the annual preoperational control mean of 62E-3 pCi/m^3 indicates activity detected below the preoperational control. In addition, a comparison of the 2008 indicator mean of 14.9E-3 pCi/m^3 with the 2008 control locations mean of 13.4E-3 pCi/m^3 indicates no appreciable effects from the operation of SSES.

Gross beta activity is normally measured at levels in excess of the analysis MDCs on the fiber filters. The highest gross beta activity levels that have been measured during the operational period of the SSES were obtained in 1986 following the Chernobyl accident in the former Soviet Union.

Note that prior to SSES operation, before 1982, the unusually high gross beta activities were generally attributable to fallout from atmospheric nuclear weapons tests. Typical gross beta activities measured on air particulate filters are the result of naturally occurring radionuclides associated with dust particles suspended in the sampled air. They are thus terrestrial in origin.

The SSES Technical Requirements Manual requires radionuclide analysis if any weekly gross beta result was greater than ten times the most recent years annual mean gross beta value for all air particulate sample control locations. This condition did not occur during 2008.

Air Particulate Gamma Spectroscopic

Quarterly gamma spectroscopic measurements of composited filters often show the naturally occurring radionuclide beryllium-7. Occasionally, other naturally occurring radionuclides, potassium-40, radium-226, actinium-228, and thorium-228 are also observed.

Beryllium-7 is cosmogenic in origin, being produced by the interaction of cosmic radiation with the earth's atmosphere. The other four gamma-emitting radionuclides originate from soil and rock.

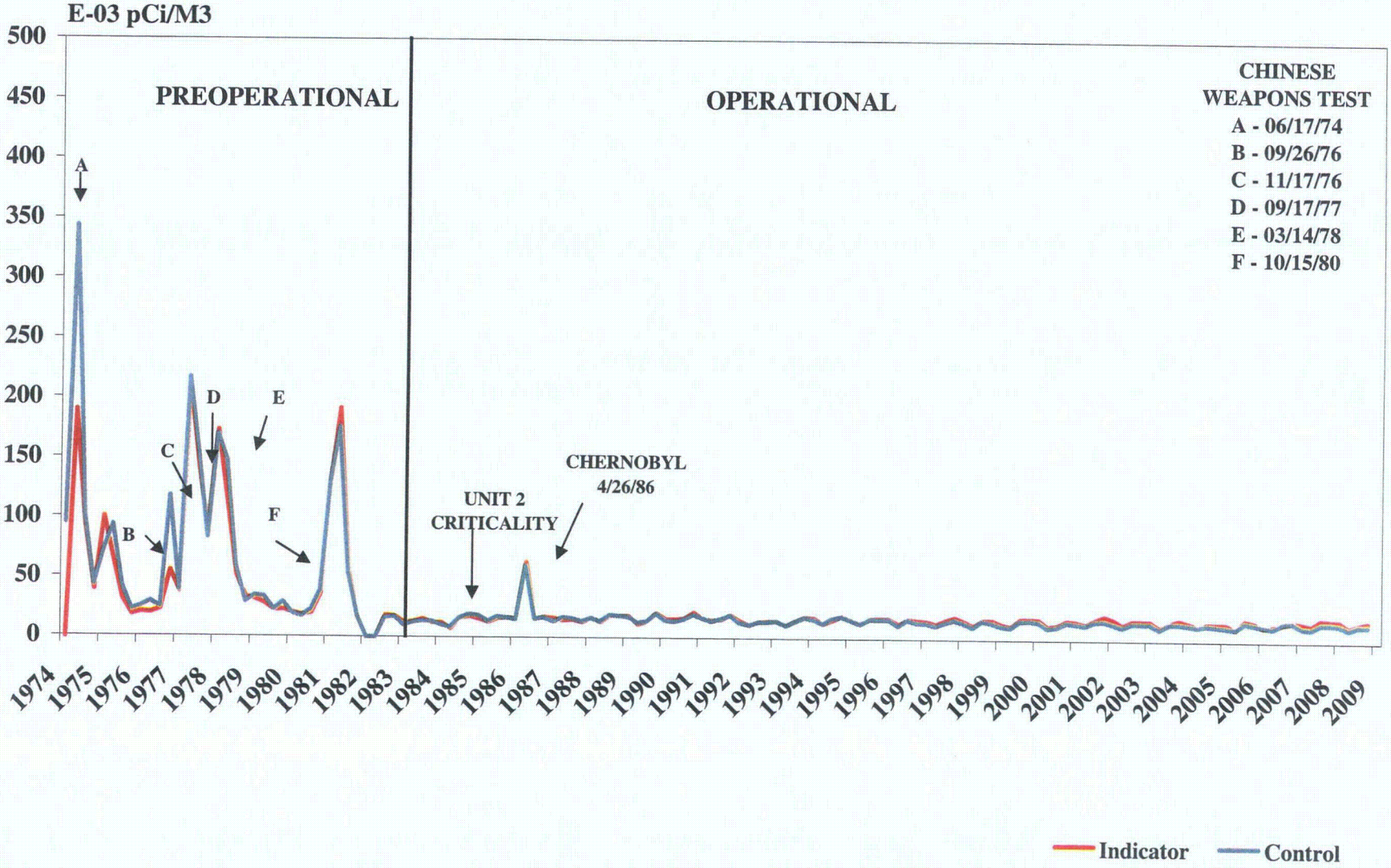
Beryllium-7 was measured above analysis MDCs for all quarterly composite samples in 2008. The 2008 indicator and control means for beryllium-7 activity were 129E-3 and 119E-3 pCi/m^3, respectively. Beryllium-7 activity levels for each 2008 calendar quarter at each monitoring location are presented in Table I-9 of Appendix I. Comparisons of 2008 beryllium-7 analysis results with previous years may be found in Table H 14 of Appendix H.

No other gamma-emitting radionuclides were reported for air in 2008. Beryllium-7 is not attributable to SSES operation.

Air Iodine

Iodine-131 has been detected infrequently from 1976, when it was first monitored, through 2008. Since operation of the SSES began in 1982, iodine-131 has only been positively detected in air samples in 1986 due to the Chernobyl accident. No iodine-131 was reported for the 2008 air monitoring results.

FIGURE 12 - GROSS BETA ACTIVITY IN AIR PARTICULATES



TERRESTRIAL PATHWAY MONITORING

INTRODUCTION

Soil and milk were monitored in the Terrestrial Pathway in 2008.

Soil can be a great accumulator of man-made radionuclides that enter it. The extent of the accumulation in the soil depends of course on the amount of the radionuclides reaching it, but it also depends on the chemical nature of those radionuclides and the particular characteristics of the soil. For example, the element cesium, and, therefore, cesium-137 can be bound very tightly to clay in soils. The amount of clay in soil can vary greatly from one location to another. In clay soils, cesium-137 may move very slowly and also may be taken up very slowly in plants as they absorb soil moisture.

Any medium, such as soil, that tends to accumulate radioactive materials can also provide more sensitivity for radionuclide detection in the environment than those media that don't. Such a medium facilitates the early identification of radionuclides in the environment, as well as awareness of changes that subsequently may occur in the environmental levels of the identified radionuclides.

The SSES REMP samples soil near two of the six REMP air-sampling stations. The purpose for soil sampling near the air sampling sites is to make it easier to correlate air sampling results with soil sampling results if any SSES related radioactive material were found in either medium. Sampling is performed at different depths near the surface to help provide information on how recently certain radioactive materials may have entered the soil. Sampling at more than one depth also may help ensure the detection of materials that move relatively quickly through the soil. Such quick-moving materials may have already passed through the topmost layer of soil at the time of sampling.

Milk was sampled at four locations in 2008. SSES Technical Requirements require that the SSES REMP sample milk at the three most sensitive monitoring locations near the SSES and one control location distant from the SSES.

No requirement exists for the SSES REMP to monitor soil. All monitoring of the terrestrial pathway that is conducted by the SSES REMP in addition to milk (and broad leaf vegetation in certain cases when milk sampling not performed) is voluntary and reflects PPL's willingness to exceed regulatory requirements to ensure that the public and the environment are protected.

Scope

Soil

Soil was sampled in September 2008 in accordance with its scheduled annual sampling frequency, at the following two REMP air sampling locations: 12S1 (indicator) and 8G1 (control).

Several soil plugs were taken at selected spots at each monitoring location. The

plugs were separated into "top" (0-2 inches) and "bottom" (2-6 inches) segments. Each set of top and bottom segments was composited to yield 2 soil samples from each location for analysis. Since there are two monitoring locations, a total of 4 soil samples were analyzed in 2008.

Milk

Milk was sampled at least monthly at the following locations in 2008: 10D2 (5E2 replaced 10D2 on 4/7/08), 10D3 13E3 and 10G1.

Milk was sampled bi-weekly from April through October when cows were more likely to be on pasture and monthly at other times. Locations 10D2, 5E2, 10D3, and 13E3 are believed to be the most sensitive indicator sites available for the detection of radionuclides released from the SSES. Location 10G1 is the control location.

Sample Preservation and Analysis

All media in the terrestrial pathway are analyzed for the activities of gamma-emitting radionuclides using gamma spectroscopy. The other analysis that is routinely performed is the radiochemical analysis for iodine-131 in milk.

Monitoring Results

Refer to the following for results of the terrestrial pathway analyses for 2008:

- Figure 13 trends iodine-131 activities separately for milk indicator and control locations from 1977 through 2008.

- Appendix G, Table G pages G-12 through G-14, shows a summary of the 2008 terrestrial monitoring results for milk and soil.

- Appendix H, Tables H-15 through H-19, pages H-6 and H-7, shows comparisons of terrestrial pathway monitoring results against past years' data.

- Appendix I, Tables I-10 and I-11 pages I-18 through I-21, shows results of specific sample analyses for terrestrial pathway media.

The only man-made radionuclides normally expected at levels in excess of analysis MDCs in the terrestrial pathway are strontium-90 and cesium-137. Both of these radionuclides are present in the environment as a residual from previous atmospheric nuclear weapons testing. Strontium-90 analyses are not now routinely performed for any media samples in the terrestrial pathway. Strontium-90 activity would be expected to be found in milk. SSES Technical Requirements do not require that milk be analyzed for strontium-90. Strontium-90 analyses may be performed at any time if the results of other milk analyses would show detectable levels of fission product activity, such as I-131, which might suggest the SSES as the source.

Cesium-137 normally has been measured in excess of analysis MDCs in most soil samples.

Certain naturally occurring radionuclides are also routinely found above analysis MDCs in terrestrial pathway media. Potassium-40, a primordial and very long-lived radionuclide, which is terrestrial in origin, is observed in all terrestrial pathway media. Other naturally occurring radionuclides often observed in soil are thorium-228 and radium-226.

Soil

Annual samples from the 12S1 and 8G1 soil locations were analyzed for concentrations of gamma emitting nuclides (Table I-11). The following gamma-emitting radionuclides are routinely measured in soil at levels exceeding analysis MDCs: naturally occurring potassium-40, radium -226, actinium-228, thorium-228 and man-made cesium-137. The 2008 analysis results were similar to those for previous years. No other gamma-emitting radionuclides were reported at levels above analysis MDCs.

The 2008 means for indicator and control location potassium-40 activity were 11,500 pCi/kg and 11,300 pCi/kg, respectively. This is not the result of SSES operation because the potassium-40 is naturally occurring.

The 2008 means for indicator and control location radium-226 activity were 1,430 pCi/kg and 2,050 pCi/kg, respectively. Radium-226 in soil is not the result of SSES operation because it is naturally occurring.

The 2008 means for indicator and control actinium-228 activity were 864 pCi/kg and 958 pCi/kg, respectively.

The 2008 means for indicator and control location thorium-228 activity were 858 pCi/kg and 711 pCi/kg, respectively. Thorium-228 in soil is not the result of SSES operation because it is naturally occurring.

The 2008 means for indicator and control location cesium-137 activity were 75 pCi/kg and 166 pCi/kg, respectively. The 2008 indicator values ranged from 60 to 89 pCi/kg, compared to 46 to 73 pCi/kg for 2007. Typically cesium-137 has been observed in preoperational control samples at 200 to 1200 pCi/kg as well as prior operational years in the 70 to 1200 pCi/kg range. The measured activities of cesium-137 were also detected in previous years at expected levels due to residual fall out from past atmospheric weapons testing and the Chernobyl event. As a general rule, it takes approximately ten half lives for a radionuclide to decay to non-detectable levels. Cesium-137 with its 30 year half life (300 years to decay to non-detectable) would still be present in samples in 2008. Cesium-137 in soil, although man-made, is not from Susquehanna station operations.

Milk

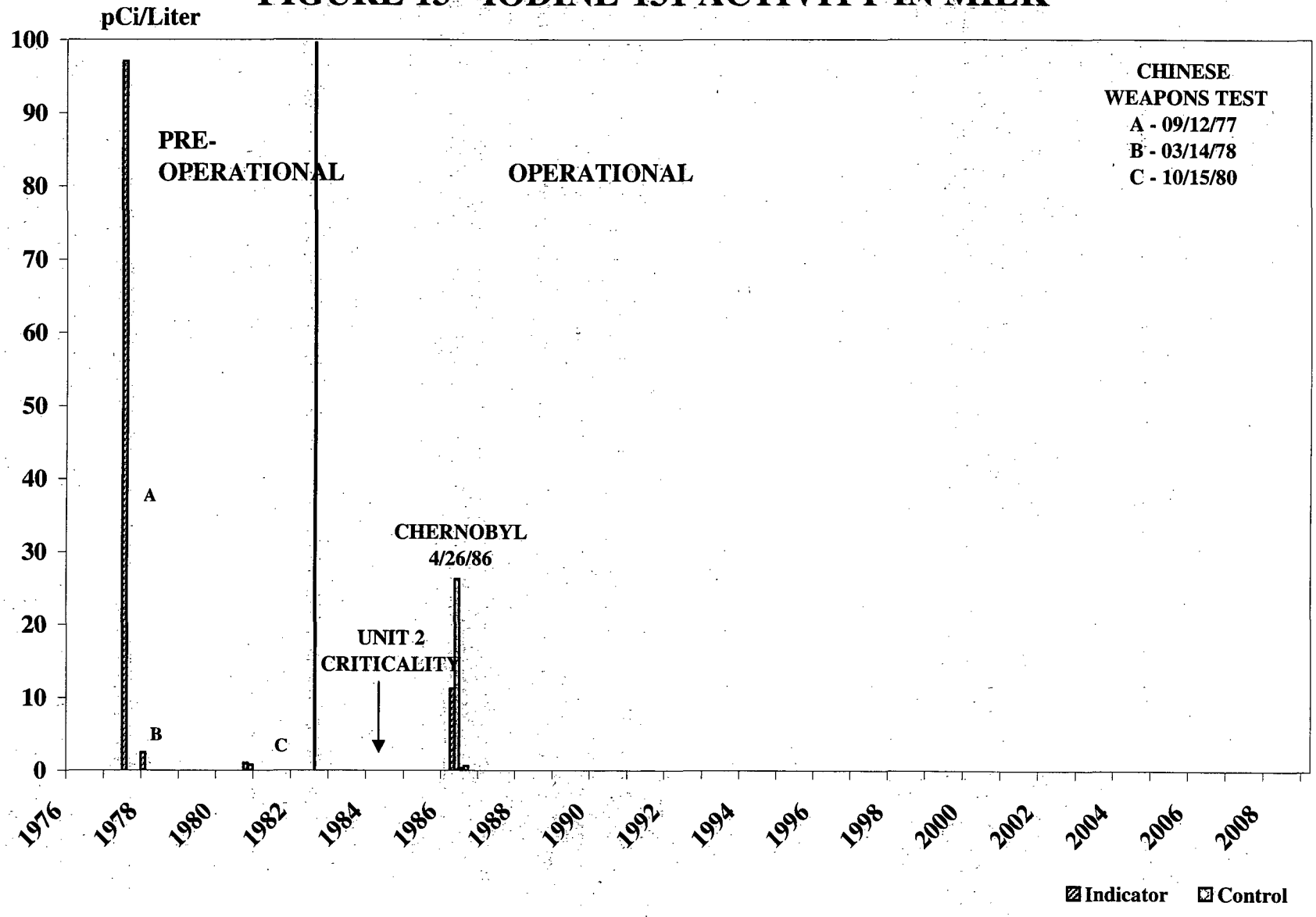
Semi-monthly or monthly samples from all milk locations were analyzed for concentrations of iodine-131 and other gamma-emitting nuclide activity (Table I-10). No detectable iodine-131 activity above MDC was observed at any location for 2008. The 2008 indicator values ranged from -0.56 to 0.56 pCi/l, compared to -0.48 to 0.58 pCi/l for 2007. Iodine-131 has been chemically separated in milk samples and counted routinely since 1977. Refer to Figure 13 which trends iodine-131 activity in milk

for indicator and control locations from 1977 through 2008.

The preoperational years 1976, 1978, and 1980 were exceptional years in the sense that iodine-131 activity was observed in excess of MDCs due to fallout from atmospheric nuclear weapons testing. Iodine-131 activity was also measured at levels exceeding MDCs in milk samples in 1986 in the vicinity of the SSES as a result of the Chernobyl incident.

With the exception of the naturally occurring potassium-40, actinium-228, and thorium-228 no gamma-emitting radionuclides were measured in excess of analysis MDCs in 2008. The 2008 means for indicator and control location potassium-40 activity were 1,290 pCi/liter and 1,300 pCi/liter, respectively. The potassium-40 activity in milk is not attributable to SSES operation because it is naturally occurring.

FIGURE 13 - IODINE-131 ACTIVITY IN MILK



GROUND WATER MONITORING

INTRODUCTION

Normal operation of the SSES does not involve the release of radioactive material to ground water directly, or indirectly through the ground. As a result, there are no effluent monitoring data to compare with REMP ground water monitoring results. Ground water could conceivably become contaminated by leakage or spills from the plant or by the washout or deposition of radioactive material that might be airborne. If deposited on the ground, precipitation/soil moisture could aid in the movement of radioactive materials through the ground to water that could conceivably be pumped for drinking purposes. No use of ground water for irrigation near the SSES has been identified.

Primary release paths for recent groundwater contamination events at other nuclear facilities have been: 1) spent fuel pool leakage; 2) leaks from liquid radwaste discharge lines and; 3) leaks from cooling tower blowdown lines. The physical location of the spent fuel pools at Susquehanna and the fuel pool leakage collection system make it highly unlikely that the fuel pools would be a radiological contamination source for groundwater. Leaks from the liquid radwaste discharge line or the cooling tower blowdown line could impact ground water, but to date, there has been no indication of any radiological impacts on groundwater due to station operations.

Scope

Ground water in the SSES vicinity was sampled quarterly at 10 indicator locations (2S2, 4S4, 6S10, 11S2, 1S3, 4S8, 4S9, 8S4, 7S10 and 13S7) and one control location (12F3) during 2008.

With the exception of location 4S4, untreated ground water was sampled. Untreated means that the water has not undergone any processing such as filtration, chlorination, or softening. At location 4S4, the SSES Learning Center, well water actually is obtained from on-site and piped to the Learning Center after treatment. This treatment would not affect tritium analysis. This sampling is performed as a check to ensure that water has not been radioactively contaminated. Sampling is performed at the Learning Center to facilitate the sample collection process.

Sample Preservation & Analysis

Ground water samples were analyzed for gamma-emitting radionuclide and tritium activities. Gamma spectrometric analyses of ground water began in 1979 and tritium analyses in 1972, both prior to SSES operation.

Monitoring Results

Tritium activity levels in ground water have typically been observed to be lower than in surface water. A noticeable decline occurred between 1992 and 1993. Fewer measurements were above the analysis sensitivities after 1993.

Gamma-emitting radionuclides in excess of MDCs have been found in only a few samples in all the years that these analyses have been performed. The naturally occurring radionuclides potassium-40 and thorium-228 have been measured above their MDCs occasionally in ground water. Potassium-40 was reported in 1979, 1981, 1985, 1991, 1992, 1993, and 1997. Thorium-228 was found in 1985 and 1986. The man-made radionuclide cesium-137 has been detected only occasionally since 1979. Its presence has always been attributed to residual fallout from previous atmospheric nuclear weapons tests.

Results for the 2008 specific ground water sample analyses may be found in Table I-7 of Appendix I. A summary of the 2008 ground water monitoring data may be located in Appendix G, pages G-6 and G-7. Comparisons of 2008 monitoring results for tritium with those of past years may be found in Table H 20 of Appendix H.

In 2008, tritium was measured above MDC, in eleven samples at indicator locations 13S7, 1S3, 4S8, 8S4, 4S9, and 7S10. The activities were slightly above the detection limit. The 2008 indicator values ranged from -19.7 to 381 pCi/l, compared to 11.3 to 146 pCi/l for 2007. The 2008 mean tritium activity levels for indicator and control monitoring locations were 136 and 25.9 pCi/l, respectively.

The only REMP monitored pathway where tritium has been identified as a result of station operations is in the surface water pathway (Susquehanna River) downstream of the site and at some groundwater monitoring locations (perimeter drains, MW-1 and MW-2 due to precipitation washout from routine airborne effluent releases.

Monitoring Wells and Precipitation

An expanded groundwater-monitoring network was initiated for the Station as part of a site-wide hydrogeological investigation in accordance with the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (GPI).

In 2008, four additional groundwater monitoring wells were installed at the PPL Susquehanna Site. The additional groundwater monitoring wells are sampled as part of the Radiological Environmental Monitoring Program to regularly assess groundwater quality and provides early detection of any inadvertent leaks or spills of radioactive materials that could reach groundwater. Groundwater is sampled quarterly and analyzed for tritium and gamma activity. Additionally, precipitation sampling was initiated in 2007and collected monthly and analyzed for tritium activity to assess the influence of station airborne tritium emissions on groundwater tritium activities.

Precipitation washout monitoring data is not used in dose calculations; however, the data does give a gross indication of tritium concentrations which makes its way into surface water and soil where it eventually seeps into shallow groundwater. The average annual tritium concentrations in precipitation, perimeter drain manholes, groundwater monitoring wells, and surface water results are detailed below in Table GW 1 and graphically in Figure 14.

Table GW 1 – 2007 and 2008 Annual Average Tritium Concentration (pCi/l) in Precipitation, Perimeter Drain, Monitoring Wells and LTAW Surface Water Data

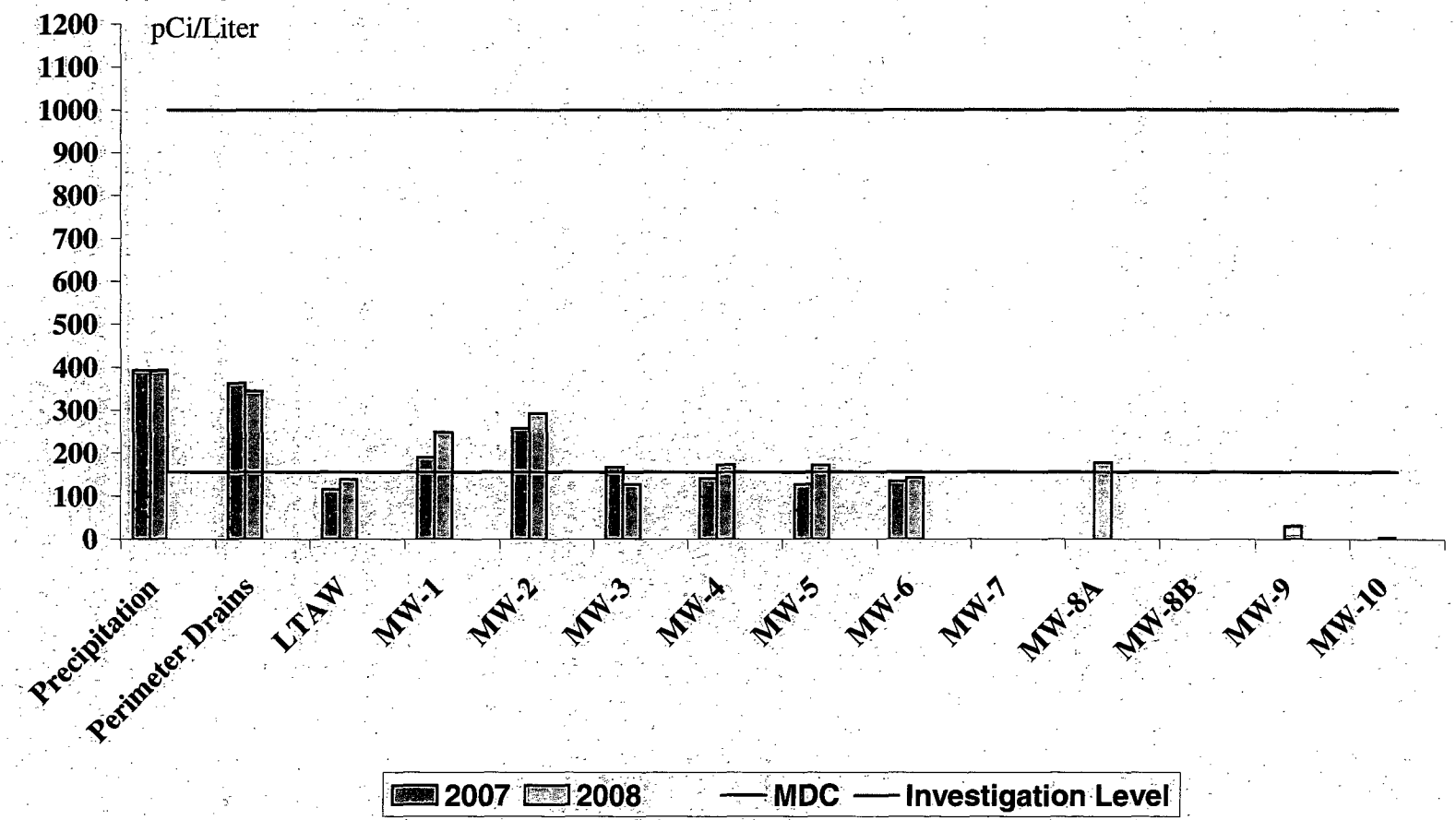
Site	2007	2008
Precip Sites 3S2,12S1,8G1 (off-site, controls)	62	92
Precip Sites 1 and 2 (on-site, East of Station Reactor Buildings)	370	370
Precip Sites 3 and 4 (on-site, West of Station Reactor Buildings)	416	414
Perimeter Drain manholes (below grade, 28')	363	344
MW-1 (43')	189	248
MW-2 (45')	257	292
MW-3 (94')	166	127
MW-4 (111')	140	172
MW-5 (36')	126	171
MW-6 (16')	134	142
MW-7 (not installed)	N/A (not installed)	N/A (not installed)
MW-8A (14')	N/A (not installed)	177
MW-8B (19')	N/A (not installed)	N/A (well dry)
MW-9 (28')	N/A (not installed)	30
MW-10 (132')	N/A (not installed)	3
LTAW: Surface Water	174	179

Precipitation will invariably become groundwater via infiltration through soil and into groundwater. The average tritium concentration in precipitation on-site was 370 pCi/l in 2007 and 2008. In 2008, the tritium in rainwater samples ranged from 24 to 1490 pCi/l. Liquid is not always present in the collection devices during dry months, thus quarterly and annual tritium averages are generally only representative of wetter months. Variations in tritium concentrations between precipitation and the Perimeter Drain System are not statistically different in 2007 and 2008 as indicated by Figure 14.

The perimeter foundation drain system is below grade (approximately 28 feet) and serves to reduce hydrostatic pressure from groundwater on the building structures. Precipitation and storm water runoff may also enter these drains via infiltration. Groundwater results from the perimeter drains, MW-1, and MW-2 have tritium concentrations that are elevated relative to background. The source of the tritium at these locations can be attributed to precipitation washout of tritium from routine airborne effluent releases. Its evident that elevated tritium levels found within sub-surface groundwater in close proximity to the station is influenced by station airborne emissions and tritiated precipitation washout. The impact of the station tritium emissions on groundwater activities is dependent on the distance from the station, groundwater depth and general dispersion conditions around the station. Variations between background and monitoring wells 3, 4, 5, 6,8A, 9 and 10 are statistically insignificant having negligible groundwater quality impact.

The pre-operational groundwater background (12F3 control) from 1980-81 was approximately 120 pCi/l and is located 5.2 miles WSW of the Susquehanna site.

FIGURE 14 - ANNUAL AVERAGE TRITIUM CONCENTRATION (pCi/l) IN PRECIPITATION, PERIMETER DRAIN, SURFACE WATER VS GROUND WATER



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13. PPL, Tritium Release REMP Calculation (RETDAS V.3.6.6) – December 2008.

APPENDIX A

2008 REMP SAMPLE COLLECTION, ANALYSIS TYPE, ANALYTICAL METHODS, PROGRAM CHANGES AND EXCEPTIONS

REMP Sample Collection, Analyses and Methods

An independent consulting group, Ecology III, working at Susquehanna's Environmental Laboratory, located approximately ¾ miles east of the SSES, collects and prepares the samples (except for TLD's which are handled by HP). Samples are brought to the laboratory, stored, and shipped to an outside independent analytical laboratory. The following table summarizes the REMP sample collection/analyses performed by Teledyne Brown Engineering, the independent radioanalytical laboratory for 2008. Note that TBE represents Teledyne Brown Engineering and E-III represents Ecology III, Inc.

TABLE A1
(Page 1 of 2)

SOURCE OF REMP DATA FOR MONITORING YEAR 2008				
Sample Medium	**Analysis**	**Analysis Frequency**	**Collection Procedure Number**	**Analytical Procedure Number**
Ambient Radiation	TLD	Quarterly	SSES, HP-TP-205	SSES,HP-TP-159 & 190
Air	Gross Beta	Weekly	E-III, Appendix 2	TBE-2008 Gross Alpha and/or Beta Activity in Various Matrices
Air	I-131	Weekly	E-III, Appendix 2	TBE-2012 Radioiodine in Various Matrices
Air	Gamma	Quarterly	E-III, Appendix 2	TBE-2007 Gamma Emitting Radioisotope Analysis
Drinking Water	Gross Beta	Monthly	E-III, Appendix 5	TBE-2008 Gross Alpha and/or Beta Activity in Various Matrices
All Waters	Tritium	Monthly (LTAW, 4S7 and Groundwater Quarterly)	E-III, Appendix 3, 4, 5, 6, 7 & 8	TBE-2010 Tritium and Carbon-14 Analysis by Liquid Scintillation
Surface & Drinking Water	Gamma	Monthly (LTAW and 4S7 Quarterly)	E-III, Appendix 3, 4, 5, 6, & 7	TBE-2007 Gamma Emitting Radioisotope Analysis

TABLE A1

(Page 2 of 2)

Sample Medium	Analysis	Analysis Frequency	Collection Procedure Number	Analytical Procedure Number
Ground Water	Gamma	Quarterly	E-III, Appendix 8	TBE-2007 Gamma Emitting Radioisotope Analysis
Surface Water (except LTAW and 4S7)	I-131	Monthly	E-III, Appendix 4, 5, 6, and 7	TBE-2012 Radioiodine in Various Matrices
Milk	Gamma	Monthly/ Semi-Monthly	E-III, Appendix 9	TBE-2007 Gamma Emitting Radioisotope Analysis
Milk	I-131	Monthly/ Semi-Monthly	E-III, Appendix 9	TBE-2012 Radioiodine in Various Matrices
Fish	Gamma	Semi-Annually (Spring/Fall)	E-III, Appendix 11	TBE-2007 gamma Emitting Radioisotope Analysis
Sediment	Gamma	Semi-Annually (Spring/Fall)	E-III, Appendix 12	TBE-2007 gamma Emitting Radioisotope Analysis
Fruits & Vegetables	Gamma	In Season (when irrigated)	E-III, Appendix 13	TBE-2007 gamma Emitting Radioisotope Analysis
Soil	Gamma	Annually	E-III, Appendix 14	TBE-2007 Gamma Emitting Radioisotope Analysis

PROGRAM CHANGES:

Direct Radiation Monitoring

Latitude/longitude readings for each TLD monitoring location recorded.

TLD at location 9B1 repositioned approximately 50 feet closer to the site within the south sector due to overgrown vegetation.

Air Monitoring

Latitude/longitude readings for each air monitoring station recorded. No other changes to the air-monitoring program implemented in 2008.

Surface Water and Drinking Water Monitoring

Recorded latitude/longitude readings for each surface water/drinking water monitoring station. No other changes to the surface water and drinking water monitoring program were implemented 2008.

Milk

Latitude/longitude readings for each milk sampling location recorded. Discontinued milk sampling location 10D2 (Ray Ryman farm) and replaced with milk sampling location 5E2 (Bloss farm).

Ground Water Monitoring

Latitude/longitude readings for each groundwater monitoring well sampling location recorded. Added monitoring wells 1S3 (MW-1), 4S8 (MW-2), 4S9 (MW-3), 8S4 (MW-4), 7S10 (MW-5), and 13S7 (MW-6) to the groundwater monitoring program in 2008. Previous sampling data from these locations documented in the 2007 Radioactive Effluent Release Report (RERR).

In October of 2008, four additional groundwater monitoring wells were installed. These new monitoring wells not formally added to the Offsite Dose Calculation Manual (ODCM) until 2009. Groundwater sampling (and corresponding results) conducted at locations not listed in the ODCM shall be documented in the 2008 Radioactive Effluent Release Report (RERR). Reference the 2008 RERR for additional data and discussion on the four additional groundwater monitoring wells.

Fruits & Vegetables

Latitude/longitude readings for each fruit and vegetable sampling location recorded. Three farms irrigated crops using Susquehanna River water downriver from Susquehanna in 2008. They are: Zehner farm (location 11D1 – pumpkins), Chapin farm – Drake field (location 11F2 – green beans), and Lupini farm – Mifflinville field (location 12F7 – potatoes).

Soil Monitoring

Latitude/longitude readings for each soil sampling location recorded. No other changes to the soil-monitoring program implemented in 2008.

Sediment Monitoring

Latitude/longitude readings for each sediment sampling location recorded. No other changes to the sediment-monitoring program implemented in 2008.

Fish Monitoring

Latitude/longitude readings for the fish sampling locations recorded. No other changes to the fish-monitoring program implemented in 2008.

PROGRAM EXCEPTIONS

The following are sampling and analysis exceptions for 2008.

TABLE A2
TRM SAMPLING DEVIATIONS
(Page 1 of 2)

Sample Type	Date	Location	Explanation
Milk	April	10D2	On April 7, 2008 required milk sample was unavailable at location 10D2 (Ray Ryman Farm). The Ryman's discontinued dairy operations since the last collection on March 10, 2008. Location 10D2 was an indicator milk location as required by TRM Table 3.11.4.1-1. Location 10D2 was replaced by 5E2 which is the next highest dose potential dairy farm who are willing to participate in the Susquehanna REMP milk sampling program. Based on review of the 2007 Meteorological Data Atmospheric Dispersion Estimates Report (rev. 3) from ABS Consulting, location 5E2 was confirmed to be the dairy farm with the highest D/Q and the owners are willing to participate in the REMP milk sampling program. Replacement sample was collected from location 5E2 at 1105 on April 7, 2008 and for the remainder of the calendar year. There are no applicable actions to prevent recurrence associated with the above condition.

TABLE A2
(Page 2 of 2)

Air (Particulate & Iodine)	July	13S6, 13S6Q, 12S1	Due to an electrical storm and loss of power, air monitoring stations 13S6 and 13S6Q were inoperative for approximately 11.2 hours on 7/17/08 and 12S1 was inoperative for approximately 4.8 hours. Valid sample volumes were collected during the affected monitoring period. Immediate corrective action taken to restore the air monitoring stations to service. Actions to prevent recurrence are not applicable.
	October	12S1	Station operations reported loss of 12kv power line on 10/28/08. Air monitoring station 12S1 was verified operational from 10/22/08 to 1036 to 1029/08 at 0938. Sample verification of operation was based on timer box reading of 167.1 hours of operation out of 168 hours during the required monitoring period. Valid sample was obtained. There are no applicable actions to prevent recurrence.
	November	3S2, 13S6, 12S1,13S6Q, 12S1, 12E1	Due to a brief loss of 12kv power line, air monitoring station 3S2 experienced loss of continuous sampling for approximately 1.9 hours and locations 13S6/13S6Q and 12S1 were without power for approximately 0.5 hours on 11/26/2008. Also location 12E1 was not operational for approximately 1.5 hours during sampling period 11/25/08 to 12/03/08 (specific date unknown) due to loss of power. Valid samples were obtained. There are no applicable actions to prevent recurrence of the condition (equipment power outage was unavoidable).

TABLE A3
(Page 1 of 3)

NON-TRM SAMPLING OCCURRENCES

Sample Type	Date	Location	Explanation
Air (Particulate & Iodine)	January	8G1	Air sample monitoring station 8G1 (redundant control location) sample pump found inoperative on 1/2/08 due to timer malfunction and was determined to be out-of-service for 2.3 hours. Corrective action taken to restore the air monitoring station to service immediately. Actions to replace the timer to prevent recurrence were taken. Valid sample collected. The backup control at location 6G1 was operational during the monitoring period 12/26/07 to 1/2/08. Actions to prevent recurrence are not applicable.
	April	6G1	Air monitoring station 6G1 timer box failed on 4/23/08 when the cabinet door was opened. No interference with the sampler operation was observed. Corrective action taken to restore the air monitoring station to service immediately. Actions to replace the timer to prevent recurrence were taken. Valid sample collected.
	August	8G1	Air sample monitoring station 8G1 (redundant control location) experienced a power outage on 8/2/08 for approximately 7.7 hours and was discovered on 8/6/08 during routine filter replacement. Air monitor resumed operation when power was restored. Valid sample collected. The backup control at location 6G1 was operational during the monitoring period 7/30/08 to 8/6/08. Actions to prevent recurrence are not applicable.
Surface Water	February	6S6	Composite water sampler (located at the river water intake structure) was found to have no sample flow due to blocked lines from turbid river conditions. Invalid sample collected for sampling period 2/12/08 to 2/22/08 (weeks 3 & 4). Grab sample collected at alternate location 5S9 to represent sampling period 2/12/08 and 2/19/08 and composited in place of 6S6 to represent February biweekly composite and weeks 3 & 4 of February monthly composite. Sample lines cleaned and the composite sampler restored to service on 2/22/08. Routine preventative maintenance performed to minimize recurrence.

TABLE A3
(Page 2 of 3)

Sample Type	Date	Location	Explanation
Surface Water	March	6S6	Composite water sampler (located at the river water intake structure) experienced degraded flow due to high river levels and turbid conditions for sampling periods 3/6/08 to 3/8/08 and 3/11/08 to 3/18/08 (weeks 2 & 3). Valid sample was collected for weeks 1 & 2 for March biweekly composite and weeks 2 & 3 for March monthly composite. Sample lines were cleaned and sampler restored to service on 3/8/08 and subsequently on 3/18/08. Routine preventative maintenance performed to minimize reccurrence.
	April	6S6	Composite water sampler (located at the river water intake structure) experienced a malfunction on 4/15/08 with volume setting (strokehold) preventing adjustment of sample volume. Valid sample collected for week 4. Corrective maintenance performed to minimize recurrence. Placed in-service on 4/18/08.
	May	2S7	Auto composite sampler (located in cooling tower blowdown line) on 5/13/08 had no collected sample available due to sample line blockage. Invalid sample discovered for sampling period 5/6/08 to 5/20/08. Grab sample collected at 2S7 to represent week 1 of May biweekly composite (5/6/08 to 5/13/08) and week 3 (5/6/08 to 5/13/08) of May monthly composite. Grab samples collected at 2S7 to represent week 2 of May biweekly composite (5/13/08 to 5/20/08) and week 4 of May monthly composite (5/13/08 to 5/20/08). Grab sample also collected at 6S6. Corrective maintenance performed and sample lines cleared to minimize recurrence. Placed in-service on 5/20/08.
	November	6S6	Discovered sampler interval timer not working on composite water sampler (located at the river water intake structure) on 12/2/08. Insufficient sample volume. Grab sample collected at 6S6 to represent week 5, November 2008 composite (11/25/08 to 12/02/08). Corrective repairs completed.

Table A3
(Page 3 of 3)

Surface Water (cont'd.)	December	6S6	Auto composite sampler (located at the river water intake structure) out-of service on 12/02/08 to 12/16/08 (biweekly composite) and 12/02/08 to 12/30/08 for December 2008 monthly composite due to failed sample interval timer. Insufficient sample volume. Grab sample collected on 12/9/08 to represent week 1 weekly and biweekly composite. Grab sample collected on 12/16/08 to represent week 2 weekly and biweekly composite. Grab sample collected on 12/23/08 to represent week 3 composite. Grab sample collected on 12/30/08 to represent week 4. Corrective repairs completed.
Ambient Radiation	1Q08 2Q08	13S2 13S5	TLDs 13S5 and 13S2 at 0.4 mile in west sector on perimeter fence were inadvertently not exchanged with replacement TLDs at that location. A redundant TLD 13S6 is located in the same sector and distance provides sufficient data. A tag, with the site identification, will be attached to each environmental TLD location as action taken to prevent recurrence.
	June	10S1, 10S2, 11S7, 12S1, 12S3, 13S2, 13S5, 13S6, 14S5, 15S5, 16S1, 16S2,1S2, 2S3, 4S3, 5S7, 6S4, 6S9, 7S6, 8S2, 9S2, APF, West Bldg	Twenty 23 duplicate TLDs were set in place next to their corresponding REMP monitoring locations between 7/8/08 to 7/15/08 to support REMP TLD exposure data obtained in support of the Unit-1 Steam Dryer transport from the reactor building 101 truck bay door to the steam dryer storage facility located on-site. The TLD results were documented in the site Corrective Action Process via ARCHEM 1070608. The transient steam dryer exposure rate measured by the 23 TLDs during the radioactive equipment movement was not significantly different compared to the REMP TLD routine daily exposure rates at the same locations.

In 2008 the SSES REMP overall performance was as follows:

Sample Collection and Analysis

1072 of 1072 samples were collected for 100 % sample collection recovery.

1349 of 1349 analyses were performed on 1045 samples for 100 % analysis data recovery.

	# of Samples Collected	# of Analyses
Primary	879 of 879	1095 of 1095
Replicate	35 of 35	56 of 56
Split/Duplicate	158	198 of 198
Total	1072 of 1072	1349 of 1349

TLD Direct Radiation Measurements

226 of 228 TLDs placed in the field were recovered and analyzed for 99 % data recovery.

Equipment Operability Trending

Table A4 below depicts trending of REMP continuous air and automatic water composite sampling equipment operability on a year by year basis. Each discrepancy was reviewed to understand the causes of the program exception. It should be noted that deviations from continuous sampling are permitted for routine maintenance or equipment malfunctions for periods not to exceed 4 hours. Occasional equipment power outages/breakdowns were unavoidable.

Table A4
EQUIPMENT OPERABILITY TRENDING
(Page 1 of 2)

Sampling Medium	Sample Location	Description	Percent (%) Operability		
			2006	2007	2008
Air Particulate & Charcoal	3S2	SSES Backup Met. Tower	100	96.1	99.9
	12S1	West Building	99.9	99.8	99.9
	13S6	Former Laydown Area, West of Confers Lane	100	100	99.9
	12E1	Berwick Hospital	100	100	99.9
	6G1	Freeland Substation	99.8	100	100

Table A4
(Page 2 of 2)

Sampling Medium	Sample Location	Description	Percent (%) Operability		
			2006	2007	2008
Air Particulate & Charcoal	8G1	PPL Sys. Facilities Cntr, Humbolt Industrial Park	100	100	99.9
Drinking Water	12H2	Danville Water Company	96	100	100
Surface Water	2S7	Cooling Tower Blowdown Discharge Line	100	98.1	96
	6S6	River Water Intake Line	99.3	96.1	87

APPENDIX B

2008 REMP MONITORING SCHEDULE (SAMPLING AND ANALYSIS)

TABLE B1
(Page 1 of 2)

Annual Analytical Schedule for the PPL Susquehanna Steam Electric Station Radiological Environmental Monitoring Program – 2008

Media	No. of Locations	Sample Freq.(a)	Analyses Required	Analysis Freq. (a)
Airborne Particulates	6	W QC	Gross Beta (b) Gamma Spectrometry	W Q
Airborne Iodine	6	W	I-131	W
Sediment	3	SA	Gamma Spectrometry	SA
Fish (3 species/location)	2 1	SA A	Gamma Spectrometry (on edible portion)	SA A
Surface Water (c)	5	W for MC	Gamma Spectrometry Tritium	M, Q LTAW & 4S7 M, Q LTAW & 4S7
		W for BWC	I-131	M
Ground Water (Well)	11	Q	Gamma Spectrometry Tritium	Q Q
Drinking Water (d)	1	W for MC	Gross Beta Gamma Spectrometry Tritium	M M M
Cow Milk	4[(e)]	M, SM[(e)]	I-131 Gamma Spectrometry	M, SM M, SM
Food Products (f) (Pumpkins, green beans and potatoes)	4	A	Gamma Spectrometry	A
Soil	2	A	Gamma Spectrometry	A
Direct Radiation	57	Q	TLD	Q

(a) W = weekly, BWC = bi-weekly composite (once per month), M = monthly, SM = semi-monthly, Q = quarterly, QC = quarterly composite , SA = semi-annually, A = annually, MC = monthly composite.

(b) If the gross beta activity were greater than 10 times the yearly mean of the control sample, gamma analysis would be performed on the individual filter. Gross beta analysis performed 24 hours or more following filter change to allow for radon and thorium daughter decay.

(c) Locations 6S6 and 2S7 are automatic composite samplers and time-proportional sampling was performed at these locations the entire year. Samples are collected weekly for bi-weekly composite and monthly composite samples. Location 5S9 was grab sampled once from the Susquehanna River at the Environmental Lab boat ramp when station 6S6 malfunctioned. Location 6S5 is a sample from the Susquehanna River downriver of the SSES discharge diffuser. Station 6S5 was grab sampled weekly. 4S7 and LTAW were grab sampled quarterly.

(d) Water from location 12H2 was retrieved weekly. Composite samples of the weekly collections at this location were made monthly (MC) for analysis. Sampling at 12H2 was performed using an automatic composite sampler (ACS) that was operated in the time-proportional mode.

(e) Locations 10D2 (replaced by 5E2), 10D3, 10G1, and 13E3 were sampled semi-monthly from April through October when cows are on pasture, monthly otherwise.

(f) Location 5S11, (PPL Susquehanna Project – Parcel 25), irrigated potatoes, Zehner Farm (11D1), irrigated pumpkins, Lupini Farm – Mifflinville field (12F7) potatoes, and Chapin farm – Drake field (11F2) – green beans using Susquehanna River water downstream of the SSES. No other fields were identified using river water downstream of the SSES in 2008.

APPENDIX C

2008
REMP MONITORING LOCATION DESCRIPTIONS

TABLE C 1
(Page 1 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2008

Less Than One Mile from the SSES - See Figure 2

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
1S2	0.2	N (41.09566° / -76.146121°)	Perimeter Fence
2S2	0.9	NNE (41.10207° / -76.141192°)	Thomas Road
2S3	0.2	NNE (41.09486° / -76.144101°)	Perimeter Fence
3S2	0.5	NE (41.09574° / -76.140086°)	SSES Backup Met Tower
3S3	0.9	NE (41.10183° / -76.133127°)	Riverlands Garden (Abandoned)
4S3	0.2	ENE (41.09322° / -76.141934°)	Post, West of SSES APF
4S6	0.7	ENE (41.09687° / -76.133807°)	Riverlands
5S4	0.8	E (41.09286° / -76.131604°)	West of Environmental Laboratory
5S7	0.3	E (41.09199° / -76.141165°)	Perimeter Fence
6S4	0.2	ESE (41.09132° / -76.142616°)	Perimeter Fence (north)
6S9	0.2	ESE (41.09067° / -76.142966°)	Perimeter Fence (south)
7S6	0.2	SE (41.0898° / -76.143449°)	Perimeter Fence
7S7	0.4	SE (41.08745° / -76.142033°)	End of Kline's Road
8S2	0.2	SSE (41.08903° / -76.144467°)	Perimeter Fence
9S2	0.2	S (41.08946° / -76.146454°)	Security Fence
10S1	0.4	SSW (41.08663° / -76.150082°)	Post - south of switching station
10S2	0.2	SSW (41.08894° / -76.147881°)	Security Fence
11S7	0.4	SW (41.08832° / -76.15297°)	SSES Access Road Gate #50
12S1	0.4	WSW (41.0887° / -76.154112°)	SSES West Building

TABLE C 1
(Page 2 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2008

Less Than One Mile from the SSES - See Figure 2

Location Code[(a)]	Distance[(a)] (miles)	Direction Latitude / Longitude	Description
12S3	0.4	WSW (41.08968° / -76.153192°)	Confer's Lane (east side)
13S2	0.4	W (41.09198° / -76.153166°)	Perimeter Fence
13S5	0.4	W (41.09179° / -76.153167°)	Perimeter Fence
13S6	0.4	W (41.09177° / -76.154073°)	Former Laydown Area - west of Confer's Lane
14S5	0.5	WNW (41.09503° / -76.153787°)	Beach Grove Road/Confer's Lane
15S5	0.4	NW (41.09576° / -76.15103°)	Perimeter Fence
16S1	0.3	NNW (41.09611° / -76.147388°)	Perimeter Fence (east)
16S2	0.3	NNW (41.09599° / -76.148922°)	Perimeter Fence (west)
6A4*	0.6	ESE (41.08791° / -76.136795°)	Restaurant (U.S. Route 11)
8A3	0.9	SSE (41.07982° / -76.139078°)	PPL Wetlands Sign (U. S. Route 11)
15A3*	0.9	NW (41.10003° / -76.1585°)	Hosler Residence
16A2*	0.8	NNW (41.1025° / -76.151595°)	Benkinney Residence

TABLE C 1
(Page 3 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2008

From One to Five Miles from the SSES - See Figure 3

Location Code[(a)]	Distance[(a)] (miles)	Direction Latitude / Longitude	Description
12S7	1.1	WSW (41.08621° / -76.165914°)	Former Kisner Property
8B2*	1.4	SSE (41.07483° / -76.130724°)	Lawall Residence
9B1	1.3	S (41.07356° / -76.147874°)	Transmission Line - east of Route 11
10B3*	1.7	SSW (41.07064° / -76.156646°)	Castek Inc.
1D5	4.0	N (41.14936° / -76.144346°)	Shickshinny/Mocanaqua Sewage Treatment Plt.
8D3	4.0	SSE (41.03824° / -76.121683°)	Mowry Residence
9D4	3.6	S (41.04015° / -76.144529°)	Country Folk Store
10D1	3.0	SSW (41.05446° / -76.175026°)	R. & C. Ryman Farm
12D2	3.7	WSW (41.07363° / -76.213306°)	Dagostin Residence
14D1	3.6	WNW (41.10706° / -76.211891°)	Moore's Hill/Mingle Inn Roads Intersection
3E1	4.7	NE (41.13953° / -76.082398°)	Webb Residence - Lilly Lake
4E2	4.7	ENE (41.12157° / -76.064115°)	Ruckles Hill/Pond Hill Roads Intersection
5E2	4.5	E (41.08539° / -76.060486°)	Bloss Farm
6E1	4.7	ESE (41.07275° / -76.059529°)	St. James Church
7E1	4.2	SE (41.04891° / -76.090309°)	Harwood Transmission Line Pole #2
11E1	4.7	SW (41.05188° / -76.218713°)	Thomas Residence
12E1*	4.7	WSW (41.0725° / -76.230331°)	Berwick Hospital
13E4	4.1	W (41.08962° / -76.223726°)	Kessler Farm

TABLE C 1
(Page 4 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2008

Greater than Five Miles from the SSES - See Figure 4

Location Code[(a)]	Distance[(a)] (miles)	Direction Latitude / Longitude	Description
2F1	5.9	NNE (41.16796° / -76.09146°)	St. Adalberts Cemetery
15F1	5.4	NW (41.15595° / -76.202506°)	Zawatski Farm
16F1	7.8	NNW (41.18985° / -76.229283°)	Hidlay Residence
3G4**	17	NE (41.23431° / -76.869061°)	Wilkes Barre Service Center
4G1**	14	ENE (41.13898° / -75.885121°)	Mountaintop - Crestwood Industrial Park
7G1**	14	SE (40.94636° / -75.974184°)	Hazleton PP&L Complex
12G1**	15	WSW (41.0262° / -76.411566°)	PPL Service Center, Bloomsburg
12G4**	10	WSW (41.03868° / -76.327731°)	Naus Residence

TABLE C 1
(Page 5 of 5)

TLD Locations for the SSES
Radiological Environmental Monitoring Program – 2008

a) All distances from the SSES to monitoring locations are measured from the standby gas treatment vent at 44200/N34117 (Pa. Grid System). The location codes are based on both distance and direction from the SSES. The letters in the location codes indicate if the monitoring locations are on site (within the site boundary) or, if they are not on site, the approximate distances of the locations from the SSES as described below:

S - on site	E - 4-5 miles
A - <1 mile	F - 5-10 miles
B - 1-2 miles	G - 10-20 miles
C - 2-3 miles	H - >20 miles
D - 3-4 miles	*- Special interest areas (other than controls)
	** - Control TLDs

The numbers preceding the letters in the location codes provide the directions of the monitoring locations from the SSES by indicating the sectors in which they are located. A total of 16 sectors (numbered 1 through 16) equally divide an imaginary circle on a map of the SSES and its vicinity, with the SSES at the center of the circle. The middle of sector 1 is directed due north (N). Moving clockwise from sector 1, the sector immediately adjacent to sector 1 is sector 2, the middle of which is directed due north, northeast (NNE). Continuing to move clockwise, the sector numbers increase to 16, which is the north, northwest sector.

The numbers following the letters in the location codes are used to differentiate sampling locations found in the same sectors at approximately the same distances from the SSES.

TABLE C 2
(Page 1 of 4)

Sampling Locations for the SSES Radiological Environmental Monitoring Program – 2008

Less Than One Mile from the SSES - See Figure 5

Location Code[(a)]	Distance[(a)] (miles)	Direction Latitude / Longitude	Description
		SURFACE WATER	
2S7	0.1	NNE (41.093540° / - 76.144773°)	Cooling Tower Blowdown Line
5S9	0.8	E (41.093292° / -76.130472°)	Environmental Lab Boat Ramp (alternate for 6S6)
6S5	0.9	ESE (41.084639° / -76.130642°)	Outfall Area
6S6*	0.8	ESE (41.088115° / -76131637°)	River Water Intake Line
LTAW	0.7	NE (41.098356° / -76.135401°)	Lake Took-A-While (on site)
4S7	0.4	ENE (41.094418° / -76.138326°)	Peach Stand Pond
		FISH	
LTAW	0.7	NE – ESE (41.098356° / -76.135401°)	Lake Took-A-While (on site)
		AIR	
12S1	0.4	WSW (41.088436° / -76.154314°)	SSES West Building
13S6	0.4	W (41.091771° / -76.153869°)	Former Laydown Area, West of Confers Lane
3S2	0.5	NE (41.095716° / -76.140207°)	Back-up Meteorological Tower
		SOIL	
12S1	0.4	WSW (41.088436° / -76.154314°)	SSES West Building

TABLE C 2
(Page 2 of 4)

Sampling Locations for the SSES
Radiological Environmental Monitoring Program – 2008

Less Than One Mile from the SSES - See Figure 5

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
GROUND WATER			
2S2	0.9	NNE (41.102243° / -76.136702°)	SSES Energy Information Center
4S4	0.5	ENE (41.095471° / -76.138798°)	SSES Learning Center
6S10	0.4	ESE (41.090511° / -76.137802°)	Sewage Treatment Plant (STP) Well
11S2	0.4	SW (41.088816° / -76.152793°)	Tower's Club (Well)
1S3	0.1	N (41.093640° / -76.146076°)	MW-1 (N of Radwaste Bldg.)
4S8	0.1	ENE (41.092306° / -76.144283°)	MW-2 (SE of E. Diesel Generator Building)
4S9	0.3	E (41.093292° / -76.130472°)	MW-3 (N of Access Processing Facility)
8S4	0.1	SSE (41.091424° / -76.145531°)	MW-4 (E of Unit 2 CST)
7S10	0.3	SE (41.089736° / -76.142783°)	MW-5 (N of S-2 Pond)
13S7	0.2	W (41.091236° / -76.149647°)	MW-6 (Laydown area behind cooling towers)
From One to Five Miles From the SSES - See Figure 6			
FISH[b]			
IND	0.9 - 1.4	ESE (41.085141° / -76.130174° to 41.075618° / -76.132682°)	At or Below the SSES Discharge Diffuser
SEDIMENT[c]			
2B*	1.6	NNE (41.112441° / -76.134758°)	Gould Island
7B	1.2	SE (41.078924° / -76.131548°)	Bell Bend
AIR			
12E1	4.7	WSW (41.072418° / -76.255396°)	Berwick Hospital
MILK			
5E2	4.5	E (41.085184° / -76.061099°)	Bloss Farm
10D3	3.5	SSW (41.045449° / -76.171899°)	Kevin & Charles Drasher
13E3	5.0	W (41.100259° / -76.24102°)	J. Dent Farm
FRUITS/VEGETABLES			
11D1	3.3	SW (41.055212° / -76.186797°)	Zehner Farm
5S11	1.1	E (41.089775° / -76.125938°)	PPL Susquehanna Project East Side Parcel 25

TABLE C 2
(Page 3 of 4)

Sampling Locations for the SSES
Radiological Environmental Monitoring Program – 2008

Greater than Five Miles from the SSES - See Figure 7

Location Code[a]	Distance[a] (miles)	Direction Latitude / Longitude	Description
DRINKING WATER			
12H2	26	WSW (40.947192° / -76.604524°)	Danville Water Co. (treated)
FISH			
2H*	30	NNE (41.459508° / -75.853096°)	Near Falls, Pa.
SEDIMENT[c]			
12F	6.9	WSW (41.041323° / -76.255396°)	Old Berwick Test Track
AIR			
6G1*	13.5	ESE (41.018989° / -75.906515°)	Freeland Substation
8G1*	12	SSE (40.928886° / -76.055092°)	PPL SFC - Humbolt Industrial Park
SOIL			
8G1*	12	SSE (40.928886° / -76.055092°)	PPL SFC - Humbolt Industrial Park
MILK			
10G1*	14	SSW (40.934847° / -76.284449°)	Davis Farm
GROUND WATER			
12F3*	5.2	WSW (41.054491° / -76.232176°)	Berwick Water Company
FRUITS/VEGETABLES			
11F2	5.5	SW (41.045741° / -76.242128°)	Chapin (Drake) Field
12F7	8.3	WSW (41.036689° / -76.286776°)	Lupini Farm - Mifflinville

TABLE C 2
(Page 4 of 4)

Sampling Locations for the SSES
Radiological Environmental Monitoring Program – 2008

a) All distances from the SSES to monitoring locations are measured from the standby gas treatment vent at 44200/N34117 (Pa. Grid System). The location codes are based on both distance and direction from the SSES. The letters in the location codes indicate if the monitoring locations are on site (within the site boundary) or, if they are not on site, the approximate distances of the locations from the SSES as described below:

S - on site	E - 4-5 miles
A - <1 mile	F - 5-10 miles
B - 1-2 miles	G - 10-20 miles
C - 2-3 miles	H - >20 miles
D - 3-4 miles	* - Control locations

The numbers preceding the letters in the location codes provide the directions of the monitoring locations from the SSES by indicating the sectors in which they are located. A total of 16 sectors (numbered 1 through 16) equally divide an imaginary circle on a map of the SSES and its vicinity, with the SSES at the center of the circle. The middle of sector 1 is directed due north (N). Moving clockwise from sector 1, the sector immediately adjacent to sector 1 is sector 2, the middle of which is directed due north, northeast (NNE). Continuing to move clockwise, the sector numbers increase to 16, which is the north, northwest sector.

The numbers following the letters in the location codes are used to differentiate sampling locations found in the same sectors at approximately the same distances from the SSES.

b) No actual location is indicated since fish are sampled from the Susquehanna River at or below the SSES discharge diffuser.

c) No permanent locations exist; samples are taken based on availability. Consequently, it is not necessary to assign a number following the letter in the location code.

APPENDIX D

2008
LAND USE CENSUS RESULTS

2008 LAND USE CENSUS RESULTS

Ecology III, Inc. conducted a Land Use Survey, during the 2008 growing season around the SSES, to comply with the Offsite Dose Calculation Manual. The purpose of the survey was to document the nearest milk animal, residence, and garden greater than 50 m^2 (approx. 500 ft^2) producing broad leaf vegetation within a distance of 8 km (approx. 5 miles) in each of the 16 meteorological sectors surrounding the SSES.

SUMMARY OF CHANGES FROM 2007 TO 2008

Since the 2007 census, there were no changes in the nearest residence, three changes in the nearest garden, and one less dairy farm within the 50 mile radius.

Residence Census:
The residence census was conducted from 18 July through 30 September 2008. Distances of the nearest residences from the Susquehanna SES in the 16 different sectors ranged from 0.5 (J.Futoma, Sector 7 and R. Panetta, Sector 6) to 2.1 miles (D. Barberi, Sector 4), with an average of approximately 1.0 miles.

There were no changes from the 2007 census.

Garden Census:
The garden census was conducted from 18 July through 29 September 2008. Distances of the nearest gardens from the Susquehanna SES in the 16 different sectors ranged from 0.6 miles (T. Scholl, Sector 7) to 4.5 miles (R. Reider, Sector 15), with an average of 2.2 miles.

Changes from the 2007 census included: Sector 5 –W. Daily replaced L. Kozlowski and W. Witts (no garden), Sector 6–B. Smith replaced L. Travelpiece (no garden), Sector 15 –R. Reider replaced D. Goff (no garden).

Dairy Animal Census:
Identified six dairy animal sites in the dairy farm census conducted from 14 through 21 July 2008. The Davis farm (sector 10) was included in the dairy census because they participated as a milk sampling control location. Cows were present at all sites; no dairy goats found.

Changes from 2007 census included one dairy farm that ceased operations between 2007 and 2008 census: R. Ryman (location 10D2) stopped milking operations and sold his dairy cows in April 2008.

Irrigation
Three farms irrigated crops using Susquehanna River water downriver from the Susquehanna SES in 2008: Zehner Farm (location 11D1, 3.3 miles SW) – irrigated

pumpkins. Chapin Farm – Drake Field (location 11F2, 5.5 miles SW) – irrigated green beans, and Lupini Farm – Mifflinville Field (12F7, 8.3 miles WSW) – irrigated potatoes. Samples of these crops were collected between 3 and 22 September 2008. A control sample of irrigated potatoes upriver from the Susquehanna SES discharge was also collected on 22 September from the Chapin Farm – Susquehanna Project East Side – Parcel 25 (location 5S11, 1.1 miles E).

No other farms irrigated because soil moisture was sufficient for the crops. Overall results of the survey are summarized below:

TABLE D1
(Page 1 of 1)
Nearest residence, garden, and dairy animal in each of the 16 meteorological sectors within a 5-mile radius of the Susquehanna Steam Electric Station, 2008 .

SECTOR	DIRECTION	NEAREST RESIDENCE	NEAREST GARDEN	NEAREST DAIRY ANIMAL
1	N	1.3 mi	3.2 mi	>5.0 mi
2	NNE	1.0 mi	2.3 mi [i]	>5.0 mi
3	NE	0.9 mi	2.6 mi	>5.0 mi
4	ENE	2.1 mi	2.4 mi [a,c,d,j]	>5.0 mi
5	E	1.4 mi	1.8 mi [a,c]	4.5 mi. [g]
6	ESE	0.5 mi	3.1 mi [a,c]	4.2 mi [g]
7	SE	0.5 mi	0.6 mi	>5.0 mi
8	SSE	0.6 mi	2.9 mi	>5.0 mi
9	S	1.0 mi	1.2 mi	>5.0 mi
10	SSW	0.9 mi	1.2 mi	3.5 mi [i]
11	SW	1.5 mi	1.9 mi	>5.0 mi
12	WSW	1.3 mi	1.3 mi	1.7 mi [i,g]
13	W	1.2 mi	1.2 mi	5.0 mi
14	WNW	0.8 mi	1.3 mi	>5.0 mi
15	NW	0.7 mi	4.5 mi	>5.0 mi
16	NNW	0.6 mi	4.0 mi	>5.0 mi

[a] Chickens raised for consumption at this location.
[b] Ducks raised for consumption at this location.*
[c] Eggs consumed from chickens at this location.
[d] Geese raised for consumption at this location.
[e] Pigs raised for consumption at this location.*
[f] Turkeys raised for consumption at this location.*
[g] Fruits/vegetables raised for consumption at this location.
[h] Rabbits raised for consumption at this location.*
[i] Beef cattle raised for consumption at this location.

[j] Goats (no milk)raised for consumption at this location.*
[k] Pheasants raised for consumption at this location.*
[l] Sheep raised for consumption at this location.*
[m] Guinea hen raised for consumption at this location.*

*No locations were identified as raising rabbits, dairy goats, pheasants, sheep, turkeys, pigs, ducks and guinea hens during 2008.

APPENDIX E

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APPENDIX F

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APPENDIX G

2008 SSES REMP SUMMARY OF DATA

The averages for indicator and control locations reported in the Summary of Data Table, which summarizes the entire year's results for the SSES REMP, were calculated using all measured values, when available, whether or not they were reported in Appendix I tables. Values below the MDCs, even zeroes and negatives, were part of the averaging process for these analysis results. When no measured results are available in these cases, "LLD" is reported.

Preferably, the averages reported in the Summary of Data table for sample media that are normally collected continuously are determined using only results from continuously collected samples. Occasionally, grab samples are taken for these media when equipment malfunctions or other anomalies preclude or otherwise perturb routine continuous sampling. These grab samples are taken to minimize the time periods when no sampling is being performed, or, in some instances, when continuous sampling is considered to be nonrepresentative.

Because grab samples are snapshots of the media over brief periods, it is preferable not to average the analysis results of these samples with those for continuously collected composite samples. However, when equipment malfunctions are protracted, relatively large periods of time could be entirely unrepresented by averages if the results from grab sample analyses are not considered.

Allowing analysis results for grab samples to be weighted equally with those representing relatively large periods of time would tend to bias the resulting averages unjustifiably towards the conditions at the times that the grabs are obtained. Averages obtained in this way might less accurately reflect the conditions for the combined period of continuous sampling and grab sampling than if only the results from continuous sampling were used. On the other hand, using weighting factors for the analysis results of grab samples derived from the actual time it takes to collect those samples would lead to the grab sample analysis results having a negligible effect on the overall average and not justifying the effort involved.

Grab samples collected in lieu of normal continuous sampling are typically obtained at regular intervals corresponding to the intervals (weekly) at which the continuously collected samples would usually be retrieved for eventual compositing. For example, grab samples are collected once a week but may be composited monthly in place of continuously collected samples that would normally be retrieved weekly and composited monthly. Since each grab sample is used to represent an entire week, albeit imperfect, it is reasonable to weight the analysis results the same. Thus, the results of one weekly grab are given approximately one-fourth the weight of the results for a monthly composite sample collected continuously for each of the four weeks in a month. Similarly, the analysis results of a composite of four weekly grab samples would carry the same weight as the analysis results for a composite of four weeks of continuously collected sample.

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Ambient Radiation (mR/std.qtr.)	TLD	226	N/A	2.20E+01 (206/206) (1.62E+01 - 4.69E+01)	9S2 0.2 MILES S	4.64E+01 (4/4) (4.59E+01 - 4.69E+01)	2.10E+01 (20/20) (1.75E+01 - 2.66E+01)	0
Surface Water (pCi/l)	H-3	49	2000	8.82E+02 (36/36) (-2.83E+01 - 1.08E+04)	2S7 0.1 MILES NNE	2.30E+03 (13/13) (8.57E+01 - 1.08E+04)	3.84E+01 (13/13) (-3.52E+01 - 1.25E+02)	0
	I-131	36	1	4.80E-01 (25/25) (-2.55E-01 - 1.95E+00)	2S7 0.1 MILES NNE	7.42E-01 (12/12) (1.95E-01 - 1.95E+00)	3.41E-01 (11/11) (-2.70E-01 - 1.44E+00)	0
	GAMMA							
	K-40	49	N/A	2.00E+01 (36/36) (-2.72E+01 - 1.90E+02)	5S9 0.8 MILES E	3.90E+01 (1/1) (3.90E+01)	1.38E+01 (13/13) (-6.21E+01 - 2.26E+02)	0
	MN-54	49	15	-9.27E-02 (36/36) (-1.76E+00 - 1.52E+00)	6S5 0.9 MILES ESE	1.37E-01 (12/12) (-1.29E+00 - 1.52E+00)	4.87E-02 (13/13) (-2.04E+00 - 1.70E+00)	0
	CO-58	49	15	-1.71E-02 (36/36) (-2.17E+00 - 2.84E+00)	4S7 0.4 MILES ENE	2.70E-01 (1/1) (2.70E-01)	-3.28E-01 (13/13) (-2.07E+00 - 2.65E+00)	0
	FE-59	49	30	6.16E-01 (36/36) (-5.90E+00 - 8.58E+00)	5S9 0.8 MILES E	4.60E+00 (1/1) (4.60E+00)	-4.30E-01 (13/13) (-7.22E+00 - 5.30E+00)	0
	CO-60	49	15	2.30E-02 (36/36) (-2.83E+00 - 1.59E+00)	6S6 0.8 MILES ESE	5.62E-01 (13/13) (-6.00E-01 - 3.00E+00)	5.62E-01 (13/13) (-6.00E-01 - 3.00E+00)	0
	ZN-65	49	30	-1.96E+00 (36/36) (-1.07E+01 - 4.88E+00)	2S7 0.1 MILES NNE	-6.63E-01 (13/13) (-7.89E+00 - 3.45E+00)	-8.07E-01 (13/13) (-5.05E+00 - 5.05E+00)	0
	NB-95	49	15	3.76E-01 (36/36) (-2.50E+00 - 1.99E+00)	4S7 0.4 MILES ENE	1.39E+00 (1/1) (1.39E+00)	3.99E-01 (13/13) (-9.74E-01 - 2.27E+00)	0
	ZR-95	49	30	4.72E-01 (36/36) (-2.42E+00 - 3.22E+00)	LTAW 0.7 MILES NE	1.15E+00 (5/5) (4.35E-01 - 3.03E+00)	2.65E-01 (13/13) (-4.22E+00 - 2.22E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Surface Water (cont) (pCi/l)	CS-134	49	15	-9.52E-01 (36/36) (-6.15E+00 - 3.65E+00)	4S7 0.4 MILES ENE	7.83E-01 (4/4) (-8.56E-01 - 2.27E+00)	-2.78E-01 (13/13) (-4.78E+00 - 6.44E+00)	0
	CS-137	49	18	-5.46E-02 (36/36) (-4.55E+00 - 3.63E+00)	4S7 0.4 MILES ENE	1.06E+00 (1/1) (1.06E+00)	-7.28E-02 (13/13) (-1.29E+00 - 7.37E-01)	0
	BA-140	49	60	3.03E-01 (36/36) (-1.41E+01 - 1.17E+01)	4S7 0.4 MILES ENE	3.68E+00 (4/4) (-7.14E-01 - 6.67E+00)	-8.01E-01 (13/13) (-1.27E+01 - 1.51E+01)	0
	LA-140	49	15	-5.85E-01 (36/36) (-1.14E+01 - 8.03E+00)	LTAW 0.7 MILES NE	2.18E+00 (5/5) (-1.38E+00 - 5.56E+00)	-8.80E-01 (13/13) (-6.16E+00 - 5.69E+00)	0
	RA-226	49	N/A	2.92E+00 (36/36) (-1.10E+02 - 1.24E+02)	4S7 0.4 MILES ENE	3.20E+01 (4/4) (-1.33E+00 - 6.90E+01)	-3.15E-01 (13/13) (-1.17E+02 - 8.86E+01)	0
	AC-228	49	N/A	4.09E-01 (36/36) (-9.23E+00 - 1.44E+01)	5S9 0.8 MILES E	3.64E+00 (1/1) (3.64E+00)	-6.70E-01 (13/13) (-9.27E+00 - 5.67E+00)	0
	TH-228	49	N/A	2.53E+00 (36/36) (-5.68E+00 - 9.40E+00)	2S7 0.1 MILES NNE	3.51E+00 (13/13) (-9.04E-01 - 9.40E+00)	1.83E+00 (13/13) (-3.62E+00 - 8.62E+00)	0
Potable Water (pCi/l)	GR-B	12	4	2.66E+00 (12/12) (1.13E+00 - 4.06E+00)	12H2 26 MILES WSW	2.66E+00 (12/12) (1.13E+00 - 4.06E+00)	Only Indicator Stations sampled for this medium.	0
	H-3	12	2000	3.94E+01 (12/12) (-1.21E+01 - 9.96E+01)	12H2 26 MILES WSW	3.94E+01 (12/12) (-1.21E+01 - 9.96E+01)		0
	GAMMA K-40	12	N/A	1.40E+01 (12/12) (-6.94E+01 - 1.73E+02)	12H2 26 MILES WSW	1.40E+01 (12/12) (-6.94E+01 - 1.73E+02)		0
	MN-54	12	15	-5.67E-02 (12/12) (-2.04E+00 - 1.58E+00)	12H2 26 MILES WSW	-5.67E-02 (12/12) (-2.04E+00 - 1.58E+00)		0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Potable Water (cont) (pCi/l)	CO-58	12	15	3.90E-01 (12/12) (-2.11E+00 - 3.59E+00)	12H2 26 MILES WSW	3.90E-01 (12/12) (-2.11E+00 - 3.59E+00)		0
	FE-59	12	30	-7.15E-01 (12/12) (-1.30E+01 - 4.10E+00)	12H2 26 MILES WSW	-7.15E-01 (12/12) (-1.30E+01 - 4.10E+00)		0
	CO-60	12	15	-3.90E-01 (12/12) (-2.83E+00 - 9.98E-01)	12H2 26 MILES WSW	-3.90E-01 (12/12) (-2.83E+00 - 9.98E-01)		0
	ZN-65	12	30	-2.44E+00 (12/12) (-7.12E+00 - 8.94E-01)	12H2 26 MILES WSW	-2.44E+00 (12/12) (-7.12E+00 - 8.94E-01)		0
	NB-95	12	15	7.30E-01 (12/12) (-2.02E+00 - 3.16E+00)	12H2 26 MILES WSW	7.30E-01 (12/12) (-2.02E+00 - 3.16E+00)		0
	ZR-95	12	30	-2.37E-01 (12/12) (-4.09E+00 - 2.09E+00)	12H2 26 MILES WSW	-2.37E-01 (12/12) (-4.09E+00 - 2.09E+00)		0
	CS-134	12	15	-8.38E-01 (12/12) (-6.45E+00 - 7.24E-01)	12H2 26 MILES WSW	-8.38E-01 (12/12) (-6.45E+00 - 7.24E-01)		0
	CS-137	12	18	-2.36E-01 (12/12) (-2.06E+00 - 8.86E-01)	12H2 26 MILES WSW	-2.36E-01 (12/12) (-2.06E+00 - 8.86E-01)		0
	BA-140	12	60	-4.82E-01 (12/12) (-1.54E+01 - 1.64E+01)	12H2 26 MILES WSW	-4.82E-01 (12/12) (-1.54E+01 - 1.64E+01)		0
	LA-140	12	15	-9.77E-01 (12/12) (-1.03E+01 - 3.41E+00)	12H2 26 MILES WSW	-9.77E-01 (12/12) (-1.03E+01 - 3.41E+00)		0
	RA-226	12	N/A	5.03E+00 (12/12) (-5.69E+01 - 3.97E+01)	12H2 26 MILES WSW	5.03E+00 (12/12) (-5.69E+01 - 3.97E+01)		0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE		CONTROL LOCATION MEAN(3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Potable Water (cont) (pCi/l)	AC-228	12	N/A	7.59E-01 (-1.28E+00 -	(12/12) 3.55E+00)	12H2 26 MILES WSW	7.59E-01 (-1.28E+00 -	(12/12) 3.55E+00)			0
	TH-228	12	N/A	2.36E+00 (-4.10E+00 -	(12/12) 1.31E+01)	12H2 26 MILES WSW	2.36E+00 (-4.10E+00 -	(12/12) 1.31E+01)			0
Ground Water (pCi/l)	H-3	44	2000	1.36E+02 (-1.97E+01 -	(40/40) 3.81E+02)	4S8 0.1 MILES ENE	2.92E+02 (1.98E+02 -	(4/4) 3.39E+02)	2.59E+01 (-1.34E+01 -	(4/4) 5.35E+01)	0
	GAMMA K-40	44	N/A	2.09E+01 (-4.46E+01 -	(40/40) 1.44E+02)	7S10 0.3 MILES SE	5.62E+01 (-1.55E-01 -	(4/4) 1.41E+02)	1.99E+01 (-2.77E+01 -	(4/4) 7.21E+01)	0
	MN-54	44	15	-8.43E-02 (-2.73E+00 -	(40/40) 3.18E+00)	7S10 0.3 MILES SE	8.68E-01 (-2.00E+00 -	(4/4) 3.18E+00)	-1.34E+00 (-2.61E+00 -	(4/4) -3.27E-01)	0
	CO-58	44	15	-4.12E-01 (-3.26E+00 -	(40/40) 2.52E+00)	13S7 0.2 MILES W	1.03E+00 (2.88E-01 -	(4/4) 2.52E+00)	3.23E-01 (-2.11E+00 -	(4/4) 2.76E+00)	0
	FE-59	44	30	1.04E+00 (-7.88E+00 -	(40/40) 1.14E+01)	7S10 0.3 MILES SE	5.02E+00 (-2.55E-01 -	(4/4) 1.08E+01)	2.42E+00 (-2.95E+00 -	(4/4) 1.42E+01)	0
	CO-60	44	15	6.64E-02 (-3.15E+00 -	(40/40) 3.30E+00)	4S4 0.5 MILES ENE	1.09E+00 (6.83E-01 -	(4/4) 2.23E+00)	-8.81E-01 (-3.32E+00 -	(4/4) 9.33E-01)	0
	ZN-65	44	30	-3.57E+00 (-1.35E+01 -	(40/40) 8.30E+00)	4S4 0.5 MILES ENE	-1.13E+00 (-3.56E+00 -	(4/4) 1.71E+00)	-2.28E+00 (-1.19E+01 -	(4/4) 5.49E+00)	0
	NB-95	44	15	5.61E-01 (-3.00E+00 -	(40/40) 7.02E+00)	7S10 0.3 MILES SE	2.05E+00 (-1.08E+00 -	(4/4) 7.02E+00)	8.20E-02 (-1.71E+00 -	(4/4) 1.74E+00)	0
	ZR-95	44	30	4.80E-02 (-4.86E+00 -	(40/40) 5.81E+00)	13S7 0.2 MILES W	2.31E+00 (-1.15E-01 -	(4/4) 4.00E+00)	-1.11E+00 (-4.74E+00 -	(4/4) 2.89E+00)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Ground Water (cont) (pCi/l)	CS-134	44	15	-3.11E-01 (40/40) (-6.80E+00 - 3.53E+00)	4S4 0.5 MILES ENE	4.77E-01 (4/4) (-1.15E+00 - 1.49E+00)	-3.48E-01 (4/4) (-8.02E+00 - 2.49E+00)	0
	CS-137	44	18	-2.45E-01 (40/40) (-4.87E+00 - 2.94E+00)	8S4 0.1 MILES SSE	1.32E+00 (4/4) (-1.48E+00 - 2.93E+00)	-1.14E+00 (4/4) (-1.84E+00 - 1.72E-01)	0
	BA-140	44	60	-9.21E-01 (40/40) (-2.42E+01 - 1.68E+01)	4S9 0.3 MILES ENE	5.94E+00 (4/4) (1.55E-01 - 1.68E+01)	-2.10E+00 (4/4) (-8.99E+00 - 4.48E+00)	0
	LA-140	44	15	6.17E-01 (40/40) (-4.21E+00 - 6.61E+00)	7S10 0.3 MILES SE	2.49E+00 (4/4) (-1.85E+00 - 6.61E+00)	-8.40E-01 (4/4) (-2.47E+00 - 1.88E+00)	0
	RA-226	44	N/A	-4.36E+00 (40/40) (-1.26E+02 - 8.56E+01)	4S8 0.1 MILES ENE	2.26E+01 (4/4) (7.03E+00 - 3.80E+01)	2.13E+00 (4/4) (-3.49E+01 - 7.22E+01)	0
	AC-228	44	N/A	2.33E+00 (40/40) (-1.07E+01 - 4.60E+01)	6S10 0.4 MILES ESE	1.16E+01 (4/4) (-4.68E+00 - 4.60E+01)	-1.35E-01 (4/4) (-2.94E+00 - 3.77E+00)	0
	TH-228	44	N/A	2.22E+00 (40/40) (-1.12E+01 - 1.24E+01)	4S4 0.5 MILES ENE	6.52E+00 (4/4) (3.75E+00 - 8.53E+00)	5.22E+00 (4/4) (-1.26E+00 - 1.55E+01)	0
Fish (pCi/kg wet)	GAMMA K-40	13	N/A	3.70E+03 (7/7) (2.81E+03 - 4.43E+03)	IND 0.9-1.4 MILES ESE	3.76E+03 (6/6) (2.81E+03 - 4.43E+03)	3.60E+03 (6/6) (2.86E+03 - 4.87E+03)	0
	MN-54	13	130	2.43E+00 (7/7) (-1.20E+01 - 1.62E+01)	LTAW 0.7 MILES NE	1.62E+01 (1/1) (1.62E+01)	8.31E+00 (6/6) (-6.11E+00 - 2.69E+01)	0
	CO-58	13	130	-2.56E+00 (7/7) (-4.30E+01 - 1.64E+01)	LTAW 0.7 MILES NE	-9.07E-01 (1/1) (-9.07E-01)	-3.73E+00 (6/6) (-2.78E+01 - 8.71E+00)	0
	FE-59	13	260	-5.52E+00 (7/7) (-2.92E+01 - 2.10E+01)	2H 30 MILES NNE	3.13E+00 (6/6) (-7.80E+01 - 9.47E+01)	3.13E+00 (6/6) (-7.80E+01 - 9.47E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Fish (cont) (pCi/kg wet)	CO-60	13	130	2.50E+00 (7/7) (-8.62E+00 - 1.44E+01)	LTAW 0.7 MILES NE	1.44E+01 (1/1) (1.44E+01)	6.21E+00 (6/6) (-1.71E+01 - 1.80E+01)	0
	ZN-65	13	260	-1.53E+01 (7/7) (-6.40E+01 - 3.54E+01)	IND 0.9-1.4 MILES ESE	-1.08E+01 (6/6) (-6.40E+01 - 3.54E+01)	-5.16E+01 (6/6) (-1.43E+02 - 8.03E+00)	0
	NB-95	13	N/A	1.72E+01 (7/7) (-3.68E+00 - 5.15E+01)	LTAW 0.7 MILES NE	2.10E+01 (1/1) (2.10E+01)	5.92E+00 (6/6) (-1.67E+01 - 2.52E+01)	0
	ZR-95	13	N/A	1.45E+01 (7/7) (-2.66E+01 - 5.36E+01)	IND 0.9-1.4 MILES ESE	2.14E+01 (6/6) (-5.56E-01 - 5.36E+01)	-1.19E+00 (6/6) (-4.31E+01 - 3.42E+01)	0
	CS-134	13	130	-4.47E+00 (7/7) (-4.02E+01 - 3.79E+01)	IND 0.9-1.4 MILES ESE	-3.53E+00 (6/6) (-4.02E+01 - 3.79E+01)	-1.71E+01 (6/6) (-6.71E+01 - -1.70E+00)	0
	CS-137	13	150	-8.52E+00 (7/7) (-3.09E+01 - 4.26E+00)	2H 30 MILES NNE	1.47E+01 (6/6) (-1.37E+00 - 3.62E+01)	1.47E+01 (6/6) (-1.37E+00 - 3.62E+01)	0
	BA-140	13	N/A	9.06E+01 (7/7) (-3.40E+02 - 5.92E+02)	LTAW 0.7 MILES NE	2.92E+02 (1/1) (2.92E+02)	1.90E+02 (6/6) (-2.63E+01 - 7.08E+02)	0
	LA-140	13	N/A	-6.15E+01 (7/7) (-2.31E+02 - 1.64E+02)	2H 30 MILES NNE	-1.01E+01 (6/6) (-6.98E+01 - 5.41E+01)	-1.01E+01 (6/6) (-6.98E+01 - 5.41E+01)	0
	RA-226	13	N/A	-1.62E+01 (7/7) (-4.60E+02 - 2.88E+02)	LTAW 0.7 MILES NE	2.88E+02 (1/1) (2.88E+02)	2.27E+02 (6/6) (-1.45E+01 - 5.54E+02)	0
	AC-228	13	N/A	-8.28E+00 (7/7) (-7.72E+01 - 4.13E+01)	IND 0.9-1.4 MILES ESE	3.20E+00 (6/6) (-3.99E+01 - 4.13E+01)	-6.83E-01 (6/6) (-1.01E+02 - 7.13E+01)	0
	TH-228	13	N/A	2.28E+01 (7/7) (-3.01E+01 - 5.54E+01)	LTAW 0.7 MILES NE	4.37E+01 (1/1) (4.37E+01)	2.44E+01 (6/6) (-5.49E+01 - 1.06E+02)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Sediment (pCi/kg dry)	GAMMA							
	BE-7	6	N/A	1.12E+02 (4/4) (3.96E+01 - 2.20E+02)	2B 1.6 MILES NNE	5.45E+02 (2/2) (3.98E+01 - 1.05E+03)	5.45E+02 (2/2) (3.98E+01 - 1.05E+03)	0
	K-40	6	N/A	9.64E+03 (4/4) (7.76E+03 - 1.27E+04)	2B 1.6 MILES NNE	1.31E+04 (2/2) (1.10E+04 - 1.51E+04)	1.31E+04 (2/2) (1.10E+04 - 1.51E+04)	0
	MN-54	6	N/A	2.90E+00 (4/4) (-1.79E+01 - 1.60E+01)	2B 1.6 MILES NNE	1.68E+01 (2/2) (5.54E-01 - 3.30E+01)	1.68E+01 (2/2) (5.54E-01 - 3.30E+01)	0
	CO-58	6	N/A	-6.98E-01 (4/4) (-1.35E+01 - 1.37E+01)	7B 1.2 MILES SE	6.04E+00 (2/2) (-1.63E+00 - 1.37E+01)	-1.39E+01 (2/2) (-2.74E+01 - -3.17E-01)	0
	FE-59	6	N/A	-9.01E+00 (4/4) (-5.08E+01 - 1.04E+01)	7B 1.2 MILES SE	1.01E+01 (2/2) (9.76E+00 - 1.04E+01)	-4.70E+00 (2/2) (-6.05E+01 - 5.11E+01)	0
	CO-60	6	N/A	1.22E+01 (4/4) (2.11E-01 - 3.46E+01)	12F 6.9 MILES WSW	1.74E+01 (2/2) (2.11E-01 - 3.46E+01)	1.17E+01 (2/2) (2.90E+00 - 2.04E+01)	0
	ZN-65	6	N/A	1.07E+01 (4/4) (-9.57E+00 - 5.13E+01)	2B 1.6 MILES NNE	4.87E+01 (2/2) (3.28E+01 - 6.45E+01)	4.87E+01 (2/2) (3.28E+01 - 6.45E+01)	0
	NB-95	6	N/A	2.49E+01 (4/4) (-6.31E+00 - 3.86E+01)	7B 1.2 MILES SE	3.50E+01 (2/2) (3.13E+01 - 3.86E+01)	2.26E+01 (2/2) (-3.35E+00 - 4.86E+01)	0
	ZR-95	6	N/A	8.63E+00 (4/4) (-2.71E+01 - 5.25E+01)	7B 1.2 MILES SE	3.15E+01 (2/2) (1.05E+01 - 5.25E+01)	2.40E+01 (2/2) (-3.75E+01 - 8.55E+01)	0
	CS-134	6	150	3.64E+00 (4/4) (-2.70E+00 - 1.48E+01)	7B 1.2 MILES SE	9.37E+00 (2/2) (3.94E+00 - 1.48E+01)	-2.12E+00 (2/2) (-6.88E+00 - 2.64E+00)	0
	CS-137	6	180	4.32E+01 (4/4) (1.44E+01 - 6.90E+01)	7B 1.2 MILES SE	6.74E+01 (2/2) (6.57E+01 - 6.90E+01)	5.34E+01 (2/2) (4.73E+01 - 5.95E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Sediment (cont) (pCi/kg dry)	BA-140	6	N/A	-1.20E+01 (4/4) (-2.21E+02 - 1.13E+02)	7B 1.2 MILES SE	9.21E+01 (2/2) (7.11E+01 - 1.13E+02)	-5.38E+01 (2/2) (-6.67E+01 - -4.09E+01)	0
	LA-140	6	N/A	-3.53E+01 (4/4) (-7.72E+01 - 1.31E+01)	12F 6.9 MILES WSW	-3.21E+01 (2/2) (-7.72E+01 - 1.31E+01)	-5.98E+01 (2/2) (-9.18E+01 - -2.77E+01)	0
	RA-226	6	N/A	1.47E+03 (4/4) (6.06E+02 - 1.84E+03)	2B 1.6 MILES NNE	2.03E+03 (2/2) (2.01E+03 - 2.05E+03)	2.03E+03 (2/2) (2.01E+03 - 2.05E+03)	0
	AC-228	6	N/A	9.02E+02 (4/4) (7.34E+02 - 1.13E+03)	2B 1.6 MILES NNE	1.18E+03 (2/2) (1.01E+03 - 1.34E+03)	1.18E+03 (2/2) (1.01E+03 - 1.34E+03)	0
	TH-228	6	N/A	8.85E+02 (4/4) (7.66E+02 - 1.02E+03)	2B 1.6 MILES NNE	1.18E+03 (2/2) (1.15E+03 - 1.21E+03)	1.18E+03 (2/2) (1.15E+03 - 1.21E+03)	0
Air Particulates (E-03 pCi/m^3)	GR-B	318	10	1.49E+01 (212/212) (6.00E+00 - 3.34E+01)	12E1 4.7 MILES WSW	1.57E+01 (53/53) (6.96E+00 - 3.34E+01)	1.34E+01 (106/106) (4.68E+00 - 2.48E+01)	0
Air Iodine (E-03 pCi/m^3)	GAMMA I-131	318	70	1.29E-01 (212/212) (-1.09E+01 - 1.40E+01)	12E1 4.7 MILES WSW	1.99E+00 (53/53) (-9.32E+00 - 1.40E+01)	1.87E+00 (106/106) (-9.11E+00 - 1.26E+01)	0
Air Particulates Quarterly Composites (E-03 pCi/m^3)	GAMMA BE-7	24	N/A	1.29E+02 (16/16) (8.63E+01 - 2.01E+02)	12E1 4.7 MILES WSW	1.40E+02 (4/4) (1.12E+02 - 1.86E+02)	1.19E+02 (8/8) (9.36E+01 - 1.64E+02)	0
	K-40	24	N/A	2.49E+00 (16/16) (-7.58E+00 - 1.55E+01)	12S1 0.4 MILES WSW	6.84E+00 (4/4) (-6.93E-01 - 1.55E+01)	2.78E+00 (8/8) (-5.80E+00 - 1.22E+01)	0
	MN-54	24	N/A	1.01E-01 (16/16) (-9.21E-01 - 1.71E+00)	12E1 4.7 MILES WSW	4.64E-01 (4/4) (-5.94E-01 - 1.71E+00)	-1.95E-01 (8/8) (-1.00E+00 - 2.89E-01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE		CONTROL LOCATION MEAN(3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Air Particulates (cont) (E-03 pCi/m^3)	CO-58	24	N/A	-2.05E-01 (-1.94E+00 -	(16/16) 2.44E+00)	12E1 4.7 MILES WSW	5.05E-01 (-4.13E-01 -	(4/4) 2.44E+00)	-2.05E-02 (-1.22E+00 -	(8/8) 1.81E+00)	0
	FE-59	24	N/A	-1.94E+00 (-7.66E+00 -	(16/16) 4.24E+00)	13S6 0.4 MILES W	-2.33E-02 (-5.13E+00 -	(4/4) 4.13E+00)	-1.97E+00 (-5.19E+00 -	(8/8) 1.72E+00)	0
	CO-60	24	N/A	-3.41E-02 (-1.14E+00 -	(16/16) 7.85E-01)	6G1 13.5 MILES ESE	3.12E-01 (-3.00E-01 -	(4/4) 9.63E-01)	8.13E-02 (-7.46E-01 -	(8/8) 9.63E-01)	0
	ZN-65	24	N/A	4.83E-01 (-9.38E-01 -	(16/16) 3.39E+00)	3S2 0.5 MILES NE	9.95E-01 (-6.60E-01 -	(4/4) 3.39E+00)	6.98E-01 (-1.42E+00 -	(8/8) 2.02E+00)	0
	NB-95	24	N/A	2.04E-02 (-1.25E+00 -	(16/16) 1.22E+00)	12E1 4.7 MILES WSW	7.58E-01 (-3.00E-02 -	(4/4) 1.22E+00)	3.14E-01 (-6.57E-01 -	(8/8) 8.76E-01)	0
	ZR-95	24	N/A	7.56E-01 (-1.55E+00 -	(16/16) 5.46E+00)	13S6 0.4 MILES W	2.25E+00 (-2.51E-02 -	(4/4) 5.46E+00)	8.54E-01 (-2.24E+00 -	(8/8) 3.88E+00)	0
	CS-134	24	50	4.59E-01 (-4.39E-01 -	(16/16) 1.27E+00)	8G1 12 MILES SSE	7.28E-01 (2.76E-01 -	(4/4) 1.36E+00)	4.77E-01 (-1.13E-01 -	(8/8) 1.36E+00)	0
	CS-137	24	60	-7.50E-02 (-7.71E-01 -	(16/16) 5.85E-01)	13S6 0.4 MILES W	1.14E-01 (-3.15E-01 -	(4/4) 5.85E-01)	-2.59E-01 (-8.34E-01 -	(8/8) 5.16E-01)	0
	BA-140	24	N/A	-1.03E+02 (-7.04E+02 -	(16/16) 4.47E+02)	8G1 12 MILES SSE	1.33E+02 (-4.55E+02 -	(4/4) 1.04E+03)	7.19E+01 (-4.55E+02 -	(8/8) 1.04E+03)	0
	LA-140	24	N/A	-6.39E+00 (-2.05E+02 -	(16/16) 2.21E+02)	8G1 12 MILES SSE	6.19E+01 (-1.42E+01 -	(4/4) 2.46E+02)	3.78E+00 (-3.47E+02 -	(8/8) 2.46E+02)	0
	RA-226	24	N/A	3.06E+00 (-5.91E+00 -	(16/16) 1.23E+01)	12E1 4.7 MILES WSW	9.11E+00 (2.65E+00 -	(4/4) 1.23E+01)	1.24E+00 (-7.45E+00 -	(8/8) 1.05E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Air Particulates (cont) (E-03 pCi/m^3)	AC-228	24	N/A	-2.59E-01 (16/16) (-3.53E+00 - 3.09E+00)	12E1 4.7 MILES WSW	2.29E-01 (4/4) (-1.83E+00 - 3.09E+00)	-4.08E-01 (8/8) (-1.38E+00 - 1.52E+00)	0
	TH-228	24	N/A	4.52E-01 (16/16) (-6.89E-01 - 1.42E+00)	8G1 12 MILES SSE	9.96E-01 (4/4) (7.86E-01 - 1.31E+00)	7.34E-01 (8/8) (2.52E-01 - 1.31E+00)	0
Milk (pCi/l)	I-131	80	1	4.78E-02 (60/60) (-5.58E-01 - 5.56E-01)	10D2 3.5 MILES SSW	9.85E-02 (3/3) (-2.25E-02 - 2.42E-01)	4.06E-02 (20/20) (-4.91E-01 - 6.50E-01)	0
	GAMMA K-40	80	N/A	1.29E+03 (60/60) (1.05E+03 - 1.57E+03)	13E3 5.0 MILES W	1.34E+03 (20/20) (1.14E+03 - 1.57E+03)	1.30E+03 (20/20) (1.11E+03 - 1.44E+03)	0
	MN-54	80	N/A	-2.03E-01 (60/60) (-3.62E+00 - 5.23E+00)	5E2 4.5 MILES E	2.66E-01 (17/17) (-2.55E+00 - 3.47E+00)	-9.17E-01 (20/20) (-3.86E+00 - 1.94E+00)	0
	CO-58	80	N/A	-3.33E-02 (60/60) (-4.48E+00 - 3.66E+00)	13E3 5.0 MILES W	1.21E-01 (20/20) (-3.43E+00 - 2.60E+00)	-8.44E-02 (20/20) (-4.06E+00 - 4.55E+00)	0
	FE-59	80	N/A	1.06E+00 (60/60) (-9.43E+00 - 1.54E+01)	5E2 4.5 MILES E	2.62E+00 (17/17) (-5.10E+00 - 1.20E+01)	-1.42E-02 (20/20) (-6.78E+00 - 9.31E+00)	0
	CO-60	80	N/A	1.30E-01 (60/60) (-4.03E+00 - 5.58E+00)	10D2 3.5 MILES SSW	1.26E+00 (3/3) (-1.09E-01 - 2.20E+00)	-2.01E-01 (20/20) (-5.69E+00 - 4.75E+00)	0
	ZN-65	80	N/A	-4.86E+00 (60/60) (-1.62E+01 - 5.97E+00)	10G1 14 MILES SSW	-2.74E+00 (20/20) (-1.19E+01 - 3.89E+00)	-2.74E+00 (20/20) (-1.19E+01 - 3.89E+00)	0
	NB-95	80	N/A	3.03E-01 (60/60) (-8.47E+00 - 3.54E+00)	5E2 4.5 MILES E	7.69E-01 (17/17) (-1.47E+00 - 3.54E+00)	6.21E-01 (20/20) (-3.67E+00 - 4.16E+00)	0
	ZR-95	80	N/A	-3.39E-02 (60/60) (-7.86E+00 - 5.66E+00)	10G1 14 MILES SSW	1.37E+00 (20/20) (-3.85E+00 - 1.17E+01)	1.37E+00 (20/20) (-3.85E+00 - 1.17E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE		LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE		CONTROL LOCATION MEAN(3) RANGE		NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Milk (cont) (pCi/l)	CS-134	80	15	-1.04E+00 (-1.68E+01 -	(60/60) 3.56E+00)	10D2 3.5 MILES SSW	3.31E-01 (-1.15E+00 -	(3/3) 1.52E+00)	-1.96E+00 (-7.42E+00 -	(20/20) 2.05E+00)	0
	CS-137	80	18	4.53E-01 (-7.16E+00 -	(60/60) 4.47E+00)	10D2 3.5 MILES SSW	1.61E+00 (-1.24E-01 -	(3/3) 3.40E+00)	4.26E-01 (-2.61E+00 -	(20/20) 3.51E+00)	0
	BA-140	80	60	2.58E-01 (-2.85E+01 -	(60/60) 3.29E+01)	10D3 3.5 MILES SSW	2.35E+00 (-1.67E+01 -	(20/20) 2.24E+01)	1.45E-01 (-2.43E+01 -	(20/20) 9.99E+00)	0
	LA-140	80	15	-4.60E-01 (-8.43E+00 -	(60/60) 7.44E+00)	5E2 4.5 MILES E	8.83E-02 (-8.43E+00 -	(17/17) 6.91E+00)	-1.03E+00 (-4.08E+00 -	(20/20) 2.72E+00)	0
	RA-226	80	N/A	-6.49E+00 (-1.33E+02 -	(60/60) 6.80E+01)	10G1 14 MILES SSW	1.79E+01 (-9.39E+01 -	(20/20) 1.42E+02)	1.79E+01 (-9.39E+01 -	(20/20) 1.42E+02)	0
	AC-228	80	N/A	-1.54E+00 (-1.29E+01 -	(60/60) 1.41E+01)	10G1 14 MILES SSW	1.25E-01 (-1.42E+01 -	(20/20) 2.60E+01)	1.25E-01 (-1.42E+01 -	(20/20) 2.60E+01)	0
	TH-228	80	N/A	4.00E+00 (-4.24E+00 -	(60/60) 2.76E+01)	13E3 5.0 MILES W	5.27E+00 (-3.10E+00 -	(20/20) 2.56E+01)	3.49E+00 (-7.95E+00 -	(20/20) 1.96E+01)	
Soil (pCi/kg dry)	K-40	4	N/A	1.15E+04 (1.10E+04 -	(2/2) 1.19E+04)	12S1 0.4 MILES WSW	1.15E+04 (1.10E+04 -	(2/2) 1.19E+04)	1.13E+04 (9.50E+03 -	(2/2) 1.30E+04)	0
	MN-54	4	N/A	7.91E+00 (2.02E+00 -	(2/2) 1.38E+01)	12S1 0.4 MILES WSW	7.91E+00 (2.02E+00 -	(2/2) 1.38E+01)	-6.23E-01 (-1.24E+00 -	(2/2) -5.42E-03)	0
	CO-58	4	N/A	1.33E+01 (1.07E+01 -	(2/2) 1.59E+01)	12S1 0.4 MILES WSW	1.33E+01 (1.07E+01 -	(2/2) 1.59E+01)	1.02E+00 (-9.67E+00 -	(2/2) 1.17E+01)	0
	FE-59	4	N/A	-1.21E+02 (-1.24E+02 -	(2/2) -1.17E+02)	8G1 12 MILES SSE	-5.32E+01 (-9.60E+01 -	(2/2) -1.04E+01)	-5.32E+01 (-9.60E+01 -	(2/2) -1.04E+01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)	LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Soil (cont) (pCi/kg dry)	CO-60 4	N/A	1.42E+01 (2/2) (1.17E+01 - 1.67E+01)	8G1 12 MILES SSE	2.47E+01 (2/2) (1.52E+01 - 3.42E+01)	2.47E+01 (2/2) (1.52E+01 - 3.42E+01)	0
	ZN-65 4	N/A	-2.16E+01 (2/2) (-3.96E+01 - -3.52E+00)	8G1 12 MILES SSE	2.71E+01 (2/2) (-1.69E+00 - 5.58E+01)	2.71E+01 (2/2) (-1.69E+00 - 5.58E+01)	0
	NB-95 4	N/A	1.03E+01 (2/2) (-3.40E+00 - 2.40E+01)	8G1 12 MILES SSE	3.59E+01 (2/2) (2.18E+01 - 4.99E+01)	3.59E+01 (2/2) (2.18E+01 - 4.99E+01)	0
	ZR-95 4	N/A	-2.24E+01 (2/2) (-2.54E+01 - -1.93E+01)	8G1 12 MILES SSE	3.78E+01 (2/2) (-1.17E+01 - 8.72E+01)	3.78E+01 (2/2) (-1.17E+01 - 8.72E+01)	0
	CS-134 4	N/A	1.31E+01 (2/2) (9.26E+00 - 1.70E+01)	12S1 0.4 MILES WSW	1.31E+01 (2/2) (9.26E+00 - 1.70E+01)	-1.35E+00 (2/2) (-1.60E+01 - 1.33E+01)	0
	CS-137 4	N/A	7.46E+01 (2/2) (6.00E+01 - 8.92E+01)	8G1 12 MILES SSE	1.66E+02 (2/2) (1.56E+02 - 1.75E+02)	1.66E+02 (2/2) (1.56E+02 - 1.75E+02)	0
	BA-140 4	N/A	-1.34E+02 (2/2) (-2.46E+02 - -2.10E+01)	8G1 12 MILES SSE	1.64E+02 (2/2) (3.65E+01 - 2.91E+02)	1.64E+02 (2/2) (3.65E+01 - 2.91E+02)	0
	LA-140 4	N/A	-8.86E+01 (2/2) (-1.16E+02 - -6.11E+01)	8G1 12 MILES SSE	1.36E+01 (2/2) (-2.94E+01 - 5.66E+01)	1.36E+01 (2/2) (-2.94E+01 - 5.66E+01)	0
	RA-226 4	N/A	1.43E+03 (2/2) (1.18E+03 - 1.67E+03)	8G1 12 MILES SSE	2.05E+03 (2/2) (1.03E+03 - 3.06E+03)	2.05E+03 (2/2) (1.03E+03 - 3.06E+03)	0
	AC-228 4	N/A	8.64E+02 (2/2) (7.57E+02 - 9.71E+02)	8G1 12 MILES SSE	9.58E+02 (2/2) (8.35E+02 - 1.08E+03)	9.58E+02 (2/2) (8.35E+02 - 1.08E+03)	0
	TH-228 4	N/A	8.58E+02 (2/2) (7.90E+02 - 9.26E+02)	12S1 0.4 MILES WSW	8.58E+02 (2/2) (7.90E+02 - 9.26E+02)	7.11E+02 (2/2) (7.10E+02 - 7.12E+02)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)	LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Food/Garden Crops (pCi/kg wet)	GAMMA						
	BE-7 4	N/A	8.00E-01 (3/3) (-3.20E+01 - 1.88E+01)	12F7 8.3 MILES WSW	1.88E+01 (1/1) (1.88E+01)	1.04E+01 (1/1) (1.04E+01)	0
	K-40 4	N/A	3.00E+03 (3/3) (1.66E+03 - 4.60E+03)	5S11 1.1 MILES E	4.65E+03 (1/1) (4.65E+03)	4.65E+03 (1/1) (4.65E+03)	0
	MN-54 4	N/A	-1.29E+00 (3/3) (-3.99E+00 - 1.15E+00)	11D1 3.3 MILES SW	1.15E+00 (1/1) (1.15E+00)	-1.68E+00 (1/1) (-1.68E+00)	0
	CO-58 4	N/A	-2.88E-01 (3/3) (-2.56E+00 - 2.38E+00)	11F2 5.5 MILES SW	2.38E+00 (1/1) (2.38E+00)	-2.59E+00 (1/1) (-2.59E+00)	0
	FE-59 4	N/A	4.19E+00 (3/3) (2.33E+00 - 7.57E+00)	5S11 1.1 MILES E	1.21E+01 (1/1) (1.21E+01)	1.21E+01 (1/1) (1.21E+01)	0
	CO-60 4	N/A	1.74E+00 (3/3) (6.48E-01 - 2.71E+00)	11F2 5.5 MILES SW	2.71E+00 (1/1) (2.71E+00)	-1.46E+00 (1/1) (-1.46E+00)	0
	ZN-65 4	N/A	-3.42E+00 (3/3) (-2.06E+01 - 1.06E+01)	11F2 5.5 MILES SW	1.06E+01 (1/1) (1.06E+01)	-2.28E+01 (1/1) (-2.28E+01)	0
	NB-95 4	N/A	1.81E+00 (3/3) (-4.17E-01 - 4.33E+00)	11D1 3.3 MILES SW	4.33E+00 (1/1) (4.33E+00)	3.19E+00 (1/1) (3.19E+00)	0
	ZR-95 4	N/A	-2.67E-02 (3/3) (-4.39E+00 - 2.70E+00)	5S11 1.1 MILES E	4.29E+00 (1/1) (4.29E+00)	4.29E+00 (1/1) (4.29E+00)	0
	I-131 4	60	8.60E+00 (3/3) (-5.81E+00 - 3.52E+01)	11F2 5.5 MILES SW	3.52E+01 (1/1) (3.52E+01)	-6.41E+00 (1/1) (-6.41E+00)	0
	CS-134 4	60	-1.99E+00 (3/3) (-4.57E+00 - -2.73E-01)	5S11 1.1 MILES E	4.48E-01 (1/1) (4.48E-01)	4.48E-01 (1/1) (4.48E-01)	0

TABLE G
SUMMARY OF DATA FOR SSES
OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM, 2008
NAME OF FACILITY: SUSQUEHANNA STEAM ELECTRIC STATION
LOCATION OF FACILITY: LUZERNE COUNTY, PENNSYLVANIA

Reporting Period: December 24, 2007 to January 21, 2009

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSIS PERFORMED(1)		LOWER LIMIT OF DETECTION (LLD)(2)	ALL INDICIATOR LOCATIONS MEAN(3) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN(3) RANGE	CONTROL LOCATION MEAN(3) RANGE	NUMBER OF NONROUTINE REPORTED MEASURMENTS (4)
Food/Garden Crops (cont) (pCi/kg wet)	CS-137	4	80	5.07E-02 (3/3) (-7.25E-01 - 6.00E-01)	12F7 8.3 MILES WSW	6.00E-01 (1/1) (6.00E-01)	-4.94E-01 (1/1) (-4.94E-01)	0
	BA-140	4	N/A	9.97E+00 (3/3) (-1.72E+01 - 3.26E+01)	11F2 5.5 MILES SW	3.26E+01 (1/1) (3.26E+01)	-2.28E+01 (1/1) (-2.28E+01)	0
	LA-140	4	N/A	1.02E+01 (3/3) (1.02E+00 - 2.59E+01)	11F2 5.5 MILES SW	2.59E+01 (1/1) (2.59E+01)	-1.94E-01 (1/1) (-1.94E-01)	0
	RA-226	4	N/A	8.50E+01 (3/3) (3.13E+01 - 1.63E+02)	11F2 5.5 MILES SW	1.63E+02 (1/1) (1.63E+02)	-2.72E+01 (1/1) (-2.72E+01)	0
	AC-228	4	N/A	3.51E+01 (3/3) (2.07E+00 - 8.66E+01)	12F7 8.3 MILES WSW	8.66E+01 (1/1) (8.66E+01)	4.56E+00 (1/1) (4.56E+00)	0
	TH-228	4	N/A	1.04E+01 (3/3) (8.81E+00 - 1.15E+01)	11D1 3.3 MILES SW	1.15E+01 (1/1) (1.15E+01)	6.58E+00 (1/1) (6.58E+00)	0

1. The total number of analyses does not include duplicates, splits, or repeated analyses.
2. The Technical Requirement LLDs are shown when applicable.
3. The mean and range are based on all available measured results. The ratio indicated in parentheses is the total number of results used to calculate the mean to the total number of samples.
4. USNRC Reporting Levels are specified in the Technical Requirements (i.e.; when Reporting Levels inTechnical Requirmenets are exceeded).

APPENDIX H

COMPARISON OF INDICATOR AND CONTROL 2008 REMP ANNUAL MEANS FOR SELECTED MEDIA ANALYSIS RESULTS WITH MEANS FROM PREOPERATIONAL AND PRIOR OPERATIONAL PERIODS

The data presented in the following tables were included if specific analysis results routinely exceeded the applicable MDCs in 2008 and/or routinely may have done so in previous years. The comparisons may be useful for observing any step changes that may occur in the environment over a long period. However, the importance attached to these comparisons should be tempered by the understanding that changes in methods of analysis, typical MDCs achieved by the analyses, and averaging methods over the years may tend to blur the picture in some cases.

AMBIENT RADIATION MONITORING

TABLE H 1

AMBIENT RADIATION LEVELS AS MEASURED BY TLDS (mR/STD QTR)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07**	**2008**	**1978-81**	**1982-07**	**2008**
Range	18.5-19.2	14.7-24.3	--	15.0-17.9	14.8-23.1	--
Mean	18.9	18.9	22.0	16.3	18.5	21.0

AQUATIC PATHWAY MONITORING

TABLE H 3

SURFACE WATER IODINE-131 ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979-81	**1982-07**	**2008**	**1979-81**	**1982-07**	**2008**
Range	0.24-0.37	0.06-1.00	--	0.29-0.43	0.03-1.0	--
Mean	0.29	0.39	0.48	0.36	0.34	0.34

TABLE H 4

SURFACE WATER TRITIUM ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07***	**2008**	**1978-81**	**1982-07***	**2008**
Range	101-122	126-2104	--	119-319	-239 -212	--
Mean	109	806	882	171	44	38.4

*1990 results were not averaged with 1982-07 data because the validity of the 1990 values is questionable in some instances. Laboratory analysis error is suspected. See the 1990 Annual Report.

TABLE H 6

DRINKING WATER GROSS BETA ACTIVITIES (pCi/l)			
Period	**Preoperational**	**Operational**	
	1977 - 81	**1982 - 07**	**2008**
Range	2.2 - 3.2	1.9 - 5.4	--
Mean	2.7	3.0	3.6

TABLE H 7

DRINKING WATER TRITIUM ACTIVITIES (pCi/l)			
Period	**Preoperational**	**Operational**	
	1977 – 81	**1982 - 07**	**2008**
Range	101 – 194	-247 - 220	--
Mean	132	58	39.4

TABLE H 8

FISH POTASSIUM-40 ACTIVITIES (pCi/g wet)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1977-81	**1982-07**	**2008**	**1977-81**	**1982-07**	**2008**
Range	2.7 - 3.5	3.1 - 5.3	--	2.8 - 3.6	3.0 - 4.2	--
Mean	3.2	3.7	3.7	3.2	3.5	3.6

TABLE H 9

SEDIMENT POTASSIUM-40 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07**	**2008**	**1978-81**	**1982-07**	**2008**
Range	8.6-10.4	7.4-13.6	--	7.5-11.0	6.2-15.7	--
Mean	9.3	11.0	9.6	7.7	11.2	13.1

TABLE H 10

SEDIMENT RADIUM-226 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07**	**2008**	**1978-81**	**1982-07**	**2008**
Range	0.5-0.7	0.5-2.4	--	0.6-1.9	0.4-2.9	--
Mean	0.6	1.6	1.5	0.7	1.7	2.0

TABLE H 11

SEDIMENT THORIUM-228 ACTIVITIES (pCi/g dry)				
Location	**Indicator**		**Control**	
Period	**1984 – 07***	**2008**	**1984 - 07***	**2008**
Range	0.9 – 3.2	--	0.8 – 3.1	--
Mean	1.3	0.9	1.4	1.2

*Th-232 was reported instead of Th-228 in 1990.

TABLE H 12

SEDIMENT CESIUM-137 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07**	**2008**	**1978-81**	**1982-07**	**2008**
Range	0.08-0.15	0.02-0.17	--	0.08-0.21	0.06-0.21	--
Mean	0.10	0.08	0.04	0.11	0.10	0.05

ATMOSPHERIC PATHWAY MONITORING

TABLE H 13

AIR PARTICULATE GROSS BETA ACTIVITIES (E-3 pCi/m^3)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07**	**2008**	**1978-81**	**1982-07**	**2008**
Range	24 - 97	13 – 28.8	--	24 - 102	12 – 27.7	--
Mean	61	16.0	15	62	15.2	13

TABLE H 14

AIR PARTICULATE BERYLLIUM-7 ACTIVITIES (E-3 pCi/m^3)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1982-07***	**2008**	**1978-81**	**1982-07***	**2008**
Range	69 - 81	50 - 137	--	59 - 85	49 - 126	--
Mean	76	97	129	72	91	119

*1990 results were not averaged with 1982-07 data because the validity of the 1990 values is questionable in some instances. Laboratory analysis error is suspected. See the 1990 Annual Report.

TERRESTRIAL PATHWAY MONITORING

TABLE H 15

SOIL POTASSIUM-40 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979&81	**1984-07**	**2008**	**1979&81**	**1984-07**	**2008**
Range	9.2 - 9.7	9.4-15.3	--	9.1-11.0	7.4-14.1	--
Mean	9.5	12.0	11.5	10.1	10.3	11.3

TABLE H 16

SOIL RADIUM-226 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979&81	**1984-07***	**2008**	**1979&81**	**1984-07***	**2008**
Range	0.8 - 1.3	0.8 – 3.1	--	0.8 - 1.2	1.0 - 2.2	--
Mean	1.1	1.6	1.4	1.0	1.8	2.0

* Radium-226 was not detected (ND) in 2002, 2003, 2004, or 2005.

TABLE H 17

SOIL THORIUM-228 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979&81	**1984-07**	**2008**	**1979&81**	**1984-07**	**2008**
Range	0.9 - 1.3	0.8 – 2.0	--	--	0.7 – 2.4	--
Mean	1.1	1.0	0.9	1.0	1.0	0.7

TABLE H 18

SOIL CESIUM-137 ACTIVITIES (pCi/g dry)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1979&81	**1982-07**	**2008**	**1979&81**	**1982-07**	**2008**
Range	0.5 - 0.7	0.02 - 0.45	--	0.2 - 1.2	0.07 - 1.2	--
Mean	0.6	0.18	0.07	0.7	0.33	0.17

TABLE H 19

MILK POTASSIUM-40 ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1978-81	**1985-07**	**2008**	**1978-81**	**1985-07**	**2008**
Range	1222-1500	1241-1422	--	1273-1500	1247-1472	--
Mean	1325	1335	1287	1390	1342	1302

TABLE H 20

GROUND WATER TRITIUM ACTIVITIES (pCi/l)						
Location	**Indicator**			**Control**		
Period	**Pre-Op**	**Operational**		**Pre-Op**	**Operational**	
	1980-81	**1982-07**	**2008**	**1980-81**	**1982-07**	**2008**
Range	94-109	-206 - +180	--	117 - 119	-206 - +260	--
Mean	101	53.5	136	118	55.2	25.9

APPENDIX I

SPECIFIC ANALYSIS RESULTS TABULATED BY MEDIA AND SAMPLING PERIOD

Results of analyses are generally reported in the following tables to two significant figures. Random uncertainties of counting are reported to the same decimal place as the result.

Calculated values for analysis results are reported with the random uncertainty of counting at two standard deviations (2S), determined by considering both the sample and background count rates. The uncertainty of an activity is influenced by the volume or mass of the sample, the background count rate, the count times, the method used to round off the value obtained to reflect its degree of significance, and other factors. The uncertainties of activities determined by gamma spectrometric analyses are also influenced by the relative concentrations of the radionuclides in the sample, the energies and intensities of the gammas emitted by those radionuclides, and the assumptions used in selecting the radionuclides to be quantitatively determined.

Results reported as less than (<) in these tables are below the minimum detectable concentrations (MDCs). The MDC is an estimate of the detection capabilities of the overall measurement method, taking into account not only the counting system, but also the characteristics of the sample being counted. When the MDC is used as the level to decide whether or not to enter a measured value into a table, there is a 50% chance that the value will be entered when the actual sample activity is equivalent to the MDC. There is only a five percent chance that a value representing a fluctuation in background activity will be entered as sample activity in such an instance.

Measured values for the activities of specific radionuclides, such as the man-made gamma-emitting radionuclides iodine-131 and cesium-137, only appear in the following tables for each specific medium when the levels that are measured exceed the MDC values for those measurements and those radionuclides are actually identified as present in the samples. Measured values for the analyses that are not radionuclide specific, such as gross alpha and beta analyses, also are presented in the tables for specific media only when the levels that are measured actually exceed the MDCs.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008

Results (1) are in mR/std. qtr (2) ± 2S(3)

Location	First Quarter 1/18/2008 to 4/29/2008	Second Quarter 4/29/2008 to 7/23/2008	Third Quarter 7/23/2008 to 10/15/2008	Fourth Quarter 10/15/2008 to 1/21/2009
ONSITE				
1S2	23.5 ± 1.9	25.5 ± 1.2	27.3 ± 3.0	24.1 ± 3.4
2S2	19.6 ± 3.5	19.6 ± 1.6	22.5 ± 2.2	17.6 ± 0.7
2S3	23.4 ± 2.4	23.5 ± 2.5	25.4 ± 2.4	22.7 ± 2.0
3S2	18.8 ± 1.7	18.5 ± 1.2	21.3 ± 2.4	17.0 ± 1.1
3S3	17.8 ± 1.5	18.4 ± 1.2	21.4 ± 1.7	17.5 ± 2.6
4S3	23.0 ± 1.9	24.3 ± 1.2	26.0 ± 3.3	22.7 ± 2.6
4S6	18.8 ± 1.1	19.0 ± 1.0	20.8 ± 2.1	18.3 ± 1.5
5S4	17.7 ± 1.3	17.0 ± 0.8	20.6 ± 1.3	16.6 ± 1.7
5S7	19.4 ± 1.3	19.6 ± 1.2	21.3 ± 1.3	19.6 ± 1.3
6S4	26.0 ± 1.7	26.3 ± 1.6	29.0 ± 2.0	25.2 ± 1.1
6S9	25.1 ± 0.4	25.8 ± 1.6	28.4 ± 2.2	25.5 ± 1.9
7S6	24.7 ± 2.2	24.7 ± 1.6	25.4 ± 3.4	23.0 ± 1.5
7S7	18.3 ± 1.9	19.3 ± 1.6	21.3 ± 1.7	17.2 ± 1.9
8S2	24.3 ± 0.6	25.0 ± 3.1	28.0 ± 2.4	26.8 ± 1.3
9S2	46.6 ± 5.4	46.9 ± 4.1	45.9 ± 4.5	46.2 ± 2.8
10S1	17.9 ± 1.1	17.4 ± 1.6	20.6 ± 1.1	17.8 ± 2.0
10S2	22.9 ± 1.5	32.7 ± 1.6	35.1 ± 1.7	33.9 ± 3.9
11S7	19.2 ± 1.7	20.8 ± 1.4	21.8 ± 1.5	18.3 ± 1.9
12S1	20.5 ± 1.1	21.4 ± 3.3	23.0 ± 2.4	19.6 ± 2.0
12S3	22.3 ± 0.6	21.7 ± 1.0	24.1 ± 3.5	21.6 ± 1.9
12S7	18.8 ± 1.5	18.7 ± 2.1	21.8 ± 3.5	17.4 ± 0.9
13S2	(4)	26.2 ± 1.4	28.0 ± 2.3	26.6 ± 4.7
13S5	25.9 ± 3.2	(4)	30.4 ± 2.8	27.0 ± 2.8
13S6	23.3 ± 1.9	26.2 ± 2.5	25.9 ± 2.4	22.8 ± 3.5
14S5	23.0 ± 2.6	22.9 ± 1.4	23.9 ± 2.8	21.7 ± 2.0
15S5	20.6 ± 1.5	21.4 ± 1.6	24.5 ± 2.5	21.2 ± 1.5
16S1	22.8 ± 0.7	24.2 ± 1.8	26.4 ± 3.5	22.3 ± 1.5
16S2	32.4 ± 2.2	24.7 ± 1.2	26.3 ± 2.0	23.7 ± 3.2

See the comments at the end of this table.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008

Results (1) are in mR/std. qtr (2) ± 2S(3)

Location	First Quarter 1/18/2008 to 4/29/2008	Second Quarter 4/29/2008 to 7/23/2008	Third Quarter 7/23/2008 to 10/15/2008	Fourth Quarter 10/15/2008 to 1/21/2009
0-1 MILE OFFSITE				
6A4	21.0 ± 1.7	20.8 ± 1.4	24.9 ± 2.4	19.6 ± 1.3
8A3	18.2 ± 1.7	17.6 ± 2.1	20.6 ± 1.3	16.8 ± 1.1
15A3	18.6 ± 0.6	18.1 ± 0.8	21.1 ± 0.9	17.1 ± 0.9
16A2	17.6 ± 1.7	17.1 ± 0.8	21.0 ± 1.5	17.7 ± 1.9
1-2 MILE OFFSITE				
8B2	17.6 ± 1.4	18.9 ± 1.3	22.2 ± 1.3	18.6 ± 1.7
9B1	17.5 ± 1.3	17.7 ± 3.1	21.3 ± 2.2	16.2 ± 0.6
10B3	18.6 ± 1.7	18.9 ± 1.0	22.3 ± 2.4	17.7 ± 1.5
2-4 MILE OFFSITE				
1D5	19.8 ± 1.8	22.2 ± 2.4	24.4 ± 2.0	19.6 ± 1.5
8D3	18.6 ± 1.4	22.3 ± 1.3	23.6 ± 0.9	18.6 ± 0.6
9D4	19.5 ± 2.5	21.2 ± 2.2	24.6 ± 2.6	19.6 ± 1.5
10D1	20.3 ± 0.7	20.4 ± 2.0	24.2 ± 2.0	18.5 ± 1.3
12D2	20.7 ± 2.0	20.3 ± 1.4	23.4 ± 2.0	18.9 ± 0.9
14D1	20.2 ± 1.5	20.1 ± 1.0	23.4 ± 2.6	19.3 ± 2.0
4-5 MILE OFFSITE				
3E1	17.2 ± 0.2	17.5 ± 1.3	21.7 ± 2.4	17.4 ± 0.7
4E2	21.4 ± 1.9	21.1 ± 1.1	23.9 ± 2.2	20.1 ± 2.2
5E2	19.0 ± 2.5	20.4 ± 2.0	22.8 ± 2.2	19.6 ± 2.6
6E1	20.6 ± 2.3	24.0 ± 1.3	26.1 ± 1.7	20.9 ± 1.9
7E1	19.7 ± 1.6	22.2 ± 4.8	23.9 ± 0.9	21.2 ± 1.9
11E1	16.6 ± 3.2	18.1 ± 2.0	22.5 ± 3.7	16.3 ± 1.1
12E1	17.8 ± 0.7	18.0 ± 1.6	21.3 ± 4.8	17.2 ± 1.5
13E4	22.0 ± 1.1	22.0 ± 1.8	24.6 ± 2.7	20.0 ± 1.1

See the comments at the end of this table.

TABLE I-1
ENVIRONMENTAL THERMOLUMINESCENT DOSIMETRY RESULTS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008

Results (1) are in mR/std. qtr (2) ± 2S(3)

Location	First Quarter 1/18/2008 to 4/29/2008	Second Quarter 4/29/2008 to 7/23/2008	Third Quarter 7/23/2008 to 10/15/2008	Fourth Quarter 10/15/2008 to 1/21/2009
5-10 MILE OFFSITE				
2F1	18.3 ± 0.9	19.8 ± 2.4	22.1 ± 1.5	18.0 ± 1.3
15F1	20.2 ± 1.5	20.7 ± 1.0	23.4 ± 3.0	19.2 ± 1.9
16F1	22.2 ± 2.4	21.7 ± 1.0	24.9 ± 2.8	20.1 ± 1.5
10-20 MILE OFFSITE				
3G4	19.9 ± 1.6	21.9 ± 2.2	25.2 ± 2.8	19.4 ± 0.7
4G1	21.4 ± 2.7	23.2 ± 4.3	26.6 ± 1.3	21.6 ± 2.0
7G1	20.4 ± 0.9	19.4 ± 1.5	22.7 ± 0.7	18.7 ± 1.9
12G1	17.5 ± 1.9	17.8 ± 0.9	21.1 ± 2.6	17.6 ± 2.0
12G4	18.6 ± 1.2	21.6 ± 3.0	24.6 ± 2.0	20.0 ± 0.9

See the comments at the end of this table.

Location				
Indicator Average (5)	21.2 ± 15.2	21.8 ± 13.9	24.4 ± 17.5	20.8 ± 14.2
Control Average (5)	19.6 ± 4.0	20.8 ± 5.9	24.0 ± 4.6	19.5 ± 3.6

Comments

(1) Individual monitor location results are normally the average of the elemental doses of six calcium elements from the two TLDs assigned to each monitoring location.

(2) A standard (std.) quarter (qtr.) is considered to be 91.25 days. Results obtained for monitoring periods of other durations are normalized by multiplying them by 91.25/x, where x is the actual duration in days of the period.

(3) Uncertainties for individual monitoring location results are two standard deviations of the elemental doses of six calcium elements from the two TLDs assigned to each monitoring location, representing the variability between the elemental doses of each of the six TLD elements.

(4) No measurement could be made at this location because the TLDs were lost, stolen, damaged or not exchanged. Refer to Appendix A of the Annual Radiological Environmental Operating Report for an explanation of program exceptions to REMP.

(5) Uncertainties associated with quarterly indicator and control averages are two standard deviations, representing the variability between the results of the individual monitoring locations.

TABLE I-2
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE		H-3	OTHER ACTIVITY		COMMENTS
6S6	12/24/2007	- 1/22/2008	< 107	K-40	226 ± 57	
2S7	12/24/2007	- 1/22/2008	< 106	TH-228	8 ± 5	
6S5	12/31/2007	- 1/22/2008	< 116			
6S6	1/22/2008	- 2/26/2008	< 130			
2S7	1/22/2008	- 2/26/2008	< 144			
6S5	1/29/2008	- 2/26/2008	< 130	K-40	190 ± 27	
4S7	2/11/2008	- 2/11/2008	168 ± 80			
LTAW	2/11/2008	- 2/11/2008	< 122			
5S9-GRAB	2/12/2008	- 2/19/2008	< 135	K-40	39 + 25	
6S6	2/26/2008	- 3/25/2008	< 125			
2S7	2/26/2008	- 3/25/2008	2100 ± 227			
6S5	3/4/2008	- 3/25/2008	< 125	K-40	99 ± 61	
6S6	3/25/2008	- 4/22/2008	125 ± 75			
2S7	3/25/2008	- 4/22/2008	10800 ± 909	TH-228	8 ± 3	
6S5	4/1/2008	- 4/22/2008	147 ± 78			
6S6	4/22/2008	- 5/27/2008	< 110			
2S7	4/22/2008	- 5/27/2008	1770 ± 194			
6S5	4/29/2008	- 5/27/2008	< 113			
4S7	5/12/2008	- 5/12/2008	518 ± 109			
LTAW	5/12/2008	- 5/12/2008	< 138			
2S7-GRAB	5/13/2008	- 5/20/2008	< 117			
6S6	5/27/2008	- 6/24/2008	< 137			
2S7	5/27/2008	- 6/24/2008	440 ± 104			
6S5	6/3/2008	- 6/24/2008	< 131			
6S6	6/24/2008	- 7/22/2008	< 111	TH-228	3 ± 2	
2S7	6/24/2008	- 7/22/2008	773 ± 114	K-40	77 ± 25	

TABLE I-2
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008

Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE		H-3	OTHER ACTIVITY		COMMENTS
6S5	7/1/2008	- 7/22/2008	< 111	TH-228	8 + 3	
6S6	7/22/2008	- 8/26/2008	< 102	RA-226	89 ± 48	
2S7	7/22/2008	- 8/26/2008	207 ± 76	TH-228	5 ± 3	
6S5	7/29/2008	- 8/26/2008	< 104			
4S7	8/11/2008		228 ± 82			
LTAW	8/11/2008		< 132			
6S6	8/26/2008	- 9/30/2008	< 90			
2S7	8/26/2008	- 9/30/2008	517 ± 86			
6S5	9/2/2008	- 9/30/2008	< 97			
LTAW	9/24/2008		163 ± 74			
4S7	9/24/2008		186 ± 72			
6S6	9/30/2008	- 10/28/2008	< 113	TH-228	9 ± 4	
2S7	9/30/2008	- 10/28/2008	3390 ± 312	TH-228	9 ± 3	
6S5	10/7/2008	- 10/28/2008	< 114	RA-226	124 ± 69	
6S6	10/28/2008	- 11/25/2008	< 127			
2S7	10/28/2008	- 12/2/2008	5730 ± 502			
6S5	11/4/2008	- 12/2/2008	< 128			
4S7	11/11/2008		189 ± 78			
LTAW	11/11/2008		195 ± 82			
6S6-GRAB	12/2/2008		< 127			
2S7	12/2/2008	- 12/30/2008	3150 ± 302			
6S6-GRAB	12/9/2008	- 12/30/2008	< 129			
6S5	12/9/2008	- 12/30/2008	137 ± 89			

TABLE I-3
IODINE-131 ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
RESULTS IN PCI/LITER ± 2S

LOCATION	COLLECTION DATE	I-131	COMMENTS
6S6	12/31/2007 - 1/15/2008	< 0.73	
2S7	12/31/2007 - 1/15/2008	< 0.56	
6S5	1/8/2008 - 1/15/2008	< 0.44	
2S7	2/5/2008 - 2/19/2008	0.88 ± 0.38	
6S5	2/12/2008 - 2/19/2008	< 0.29	
5S9-GRAB	2/12/2008 - 2/19/2008	< 0.86	
6S6	3/4/2008 - 3/18/2008	< 0.66	
2S7	3/4/2008 - 3/18/2008	< 0.70	
6S5	3/11/2008 - 3/18/2008	< 0.89	
6S6	4/1/2008 - 4/15/2008	< 0.96	
2S7	4/1/2008 - 4/15/2008	< 0.63	
6S5	4/8/2008 - 4/15/2008	< 0.74	
6S6	5/6/2008 - 5/20/2008	< 0.75	
2S7-GRAB	5/13/2008 - 5/20/2008	< 0.50	
6S5	5/13/2008 - 5/20/2008	< 0.40	
6S6	6/3/2008 - 6/17/2008	1.44 ± 0.81	
2S7	6/3/2008 - 6/17/2008	1.55 ± 0.77	
6S5	6/10/2008 - 6/17/2008	< 0.68	
6S6	7/1/2008 - 7/15/2008	< 0.88	
2S7	7/1/2008 - 7/15/2008	1.95 ± 0.75	
6S5	7/8/2008 - 7/15/2008	< 0.83	
6S6	8/5/2008 - 8/19/2008	< 0.71	
2S7	8/5/2008 - 8/19/2008	< 0.83	
6S5	8/5/2008 - 8/19/2008	< 0.94	

TABLE I-3
IODINE-131 ANALYSES OF SURFACE WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
RESULTS IN PCI/LITER ± 2S

LOCATION	COLLECTION DATE	I-131	COMMENTS
6S6	9/2/2008 - 9/16/2008	< 0.99	
2S7	9/2/2008 - 9/16/2008	< 0.97	
6S5	9/9/2008 - 9/16/2008	0.99 ± 0.44	
6S6	10/7/2008 - 10/21/2008	< 0.68	
2S7	10/7/2008 - 10/21/2008	< 0.68	
6S5	10/14/2008 - 10/21/2008	< 0.90	
6S6	11/4/2008 - 11/18/2008	< 0.85	
2S7	11/4/2008 - 11/18/2008	< 0.90	
6S5	11/11/2008 - 11/18/2008	< 0.64	
2S7	12/2/2008 - 12/16/2008	1.29 ± 0.59	
6S6	12/9/2008 - 12/16/2008	< 0.60	
6S5	12/9/2008 - 12/16/2008	< 0.63	

TABLE I-4
GROSS BETA,TRITIUM, GAMMA SPECTROSCOPIC ANALYSES OF DRINKING WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	GR-BETA	H-3	OTHER ACTIVITY		COMMENTS
12H2	12/24/2007 - 1/22/2008	< 2.0	< 107			
12H2	1/22/2008 - 2/26/2008	< 2.0	< 127			
12H2	2/26/2008 - 3/25/2008	4.06 ± 1.43	< 120	K-40	173 ± 46	
12H2	3/25/2008 - 4/22/2008	< 1.9	< 136			
12H2	4/22/2008 - 5/27/2008	< 1.9	< 109			
12H2	5/27/2008 - 6/24/2008	< 2.9	< 134			
12H2	6/24/2008 - 7/22/2008	3.4 ± 1.60	< 112			
12H2	7/22/2008 - 8/26/2008	< 3.1	< 103			
12H2	8/26/2008 - 9/30/2008	3.0 ± 1.63	< 96			
12H2	9/30/2008 - 10/28/2008	3.7 ± 1.55	< 119			
12H2	10/28/2008 - 12/2/2008	3.3 ± 1.55	< 125			
12H2	12/2/2008 - 12/30/2008	3.3 ± 1.47	< 134			

TABLE I-5
GAMMA SPECTROSCOPIC ANALYSIS OF FISH
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/kg (wet) ± 2S

LOCATION	SAMPLE TYPE	COLLECTION DATE	K-40	OTHER ACTIVITY		COMMENTS
IND	smallmouth bass	5/12/2008 - 5/12/2008	3630 ± 623			
IND	channel catfish	5/12/2008 - 5/12/2008	4040 ± 806			
IND	shorthead redhorse	5/12/2008 - 5/12/2008	2810 ± 623			
2H	smallmouth bass	5/22/2008 - 5/22/2008	4870 ± 853			
2H	channel catfish	5/22/2008 - 5/23/2008	3140 ± 792	TH-228	106 ± 58	
2H	shorthead redhorse	5/22/2008 - 5/22/2008	2860 ± 689			
IND	Smallmouth Bass	10/8/2008 - 10/8/2008	4430 ± 936			
IND	Channel Catfish	10/8/2008 - 10/8/2008	3540 ± 827			
IND	Shorthead Redhorse	10/9/2008 - 10/9/2008	4080 ± 674			
2H	Smallmouth Bass	10/15/2008 - 10/15/2008	3010 ± 833			
2H	Channel Catfish	10/15/2008 - 10/15/2008	4330 ± 697			
2H	Shorthead Redhorse	10/15/2008 - 10/15/2008	3400 ± 863			
LTAW	Largemouth Bass	10/16/2008 - 10/16/2008	3400 ± 878			

TABLE I-6
GAMMA SPECTROSCOPIC ANALYSES OF SHORELINE SEDIMENT
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/kg (dry) ± 2S

LOCATION	COLLECTION DATE	K-40	Cs-137	Ra-226	Th-228	OTHER ACTIVITY	
2B	5/9/2008	11000 ± 1120	< 57	2010 ± 1220	1150 ± 96	AC-228	1010 ± 276
7B	5/9/2008	12700 ± 1300	< 69	< 1150	1020 ± 92	AC-228	1130 ± 265
12F	5/9/2008	7760 ± 1140	< 66	< 1320	766 ± 100	AC-228	786 ± 214
2B	11/4/2008	15100 ± 1290	< 70	2050 ± 1230	1210 ± 98	AC-228	1340 ± 285
7B	11/4/2008	10300 ± 928	66 ± 41	1840 ± 735	987 ± 69	AC-228	958 ± 184
12F	11/4/2008	7780 ± 780	< 33	1620 ± 823	766 ± 68	AC-228	734 ± 183

TABLE I-7
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	
12F3	2/11/2008	< 121	TH-228	15.5 ± 7.68
2S2	2/11/2008	< 121	TH-228	12.4 ± 7.91
4S4 Treated	2/11/2008	< 117		
6S10	2/11/2008	< 119	AC-228	46.0 ± 11.5
11S2	2/11/2008	< 119		
13S7	2/20/2008	171 ± 84.1	K-40	144 ± 63.5
1S3	2/20/2008	381 ± 96.3		
4S8	2/20/2008	298 ± 85.4		
8S4	2/20/2008	178 ± 90.4	K-40	103 ± 65.7
4S9	2/21/2008	181 ± 98.1		
7S10	2/21/2008	211 ± 96.0		
12F3	5/12/2008	< 136		
2S2	5/12/2008	< 138		
4S4 Treated	5/12/2008	< 139		
6S10	5/12/2008	< 138		
11S2	5/12/2008	< 140		
13S7	5/14/2008	157 ± 79.2		
1S3	5/14/2008	255 ± 89.6		
4S8	5/14/2008	339 ± 94.9		
8S4	5/14/2008	149 ± 83.1		
4S9	5/15/2008	< 124		
7S10	5/15/2008	202 ± 93.6		

TABLE I-7
TRITIUM AND GAMMA SPECTROSCOPIC ANALYSES OF GROUND WATER
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	H-3	OTHER ACTIVITY	
12F3	8/11/2008	< 109		
2S2	8/11/2008	< 111		
4S4 Treated	8/11/2008	< 112		
6S10	8/11/2008	< 110		
11S2	8/11/2008	< 117		
13S7	8/13/2008	154 ± 77.8		
1S3	8/13/2008	223 ± 81.2		
4S8	8/13/2008	198 ± 81.5		
8S4	8/13/2008	203 ± 81.9		
4S9	8/14/2008	149 ± 75.9		
7S10	8/19/2008	< 121		
12F3	11/11/2008	< 117		
2S2	11/11/2008	< 110		
4S4 Treated	11/11/2008	150 ± 74.3		
6S10	11/11/2008	< 103		
11S2	11/11/2008	< 119		
13S7	11/12/2008	< 117		
1S3	11/12/2008	132 ± 75		
4S8	11/12/2008	332 ± 84.5		
7S10	11/12/2008	153 ± 74.8	K-40	141 ± 66
8S4	11/12/2008	156 ± 72.1		
4S9	11/13/2008	< 116		

TABLE I-8
GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
RESULTS IN E-03 PCI/CU. M. ± 2S

MONTH	COLLECTION DATE	3S2	6G1	8G1	12E1	12S1	13S6	COMMENTS
JAN	12/26/07 - 01/02/08	23.0 ± 2.71	16.8 ± 2.52	16.9 ± 2.45	20.7 ± 2.63	23.2 ± 2.71	24.4 ± 2.79	
JAN	01/02/08 - 01/09/08	23.6 ± 2.79	17.5 ± 2.65	12.6 ± 2.27	23.1 ± 2.79	19.7 ± 2.61	24.9 ± 2.87	
JAN	01/09/08 - 01/16/08	10.5 ± 2.10	10.5 ± 2.20	12.5 ± 2.32	12.9 ± 2.29	11.4 ± 2.16	12.5 ± 2.28	
JAN	01/16/08 - 01/23/08	16.7 ± 2.40	15.3 ± 2.48	15.3 ± 2.39	16.7 ± 2.45	17.2 ± 2.46	15.5 ± 2.36	
JAN	01/23/08 - 01/30/08	29.9 ± 3.17	24.8 ± 2.81	22.0 ± 2.68	26.9 ± 2.87	22.9 ± 2.63	29.4 ± 3.00	
FEB	01/30/08 - 02/06/08	17.2 ± 2.60	14.5 ± 2.37	14.5 ± 2.33	19.6 ± 2.59	13.5 ± 2.20	17.8 ± 2.50	
FEB	02/06/08 - 02/14/08	17.0 ± 2.39	13.1 ± 2.11	14.6 ± 2.17	17.1 ± 2.25	16.9 ± 2.22	15.6 ± 2.17	
FEB	02/14/08 - 02/20/08	13.5 ± 2.69	14.2 ± 2.62	14.1 ± 2.68	18.1 ± 2.79	16.6 ± 2.75	15.6 ± 2.68	
FEB	02/20/08 - 02/27/08	15.8 ± 2.52	14.4 ± 2.35	12.0 ± 2.20	14.3 ± 2.31	14.5 ± 2.35	14.3 ± 2.31	
MAR	02/27/08 - 03/05/08	11.7 ± 2.28	11.7 ± 2.23	8.1 ± 1.98	12.1 ± 2.17	11.5 ± 2.16	13.9 ± 2.30	
MAR	03/05/08 - 03/12/08	16.3 ± 2.46	15.5 ± 2.40	16.4 ± 2.43	16.7 ± 2.39	14.8 ± 2.36	14.5 ± 2.29	
MAR	03/12/08 - 03/19/08	13.0 ± 2.32	12.8 ± 2.29	13.1 ± 2.34	13.6 ± 2.31	11.9 ± 2.23	13.6 ± 2.33	
MAR	03/19/08 - 03/26/08	12.4 ± 2.28	10.8 ± 2.20	11.5 ± 2.25	16.1 ± 2.45	10.8 ± 2.17	12.7 ± 2.24	
APR	03/26/08 - 04/02/08	12.4 ± 2.25	13.1 ± 2.30	13.2 ± 2.30	16.8 ± 2.47	13.2 ± 2.27	16.1 ± 2.43	
APR	04/02/08 - 04/09/08	9.31 ± 2.15	8.48 ± 2.10	10.5 ± 2.21	8.87 ± 2.03	9.03 ± 2.11	11.1 ± 2.17	
APR	04/09/08 - 04/16/08	8.36 ± 2.04	7.83 ± 2.01	8.32 ± 2.08	9.06 ± 2.04	7.65 ± 1.97	8.41 ± 2.00	
APR	04/16/08 - 04/23/08	17.0 ± 2.73	13.4 ± 2.56	15.1 ± 2.70	18.3 ± 2.75	17.5 ± 2.71	19.3 ± 2.81	
APR	04/23/08 - 04/30/08	14.3 ± 2.40	13.5 ± 2.39	11.3 ± 2.05	13.9 ± 2.39	11.3 ± 2.25	15.1 ± 2.46	
MAY	04/30/08 - 05/07/08	17.0 ± 2.59	13.8 ± 2.41	15.4 ± 2.54	17.1 ± 2.53	12.6 ± 2.31	15.4 ± 2.44	
MAY	05/07/08 - 05/14/08	11.2 ± 2.27	9.37 ± 1.99	9.67 ± 2.10	11.6 ± 2.28	10.4 ± 2.18	9.46 ± 2.04	
MAY	05/14/08 - 05/21/08	10.0 ± 1.99	12.1 ± 2.00	11.6 ± 2.02	10.1 ± 2.02	9.64 ± 1.93	9.67 ± 1.89	
MAY	05/21/08 - 05/28/08	6.00 ± 1.88	6.30 ± 1.80	6.42 ± 1.77	7.74 ± 1.97	8.13 ± 1.97	8.60 ± 1.97	
JUN	05/28/08 - 06/04/08	10.7 ± 2.11	12.6 ± 2.22	11.6 ± 2.16	11.2 ± 2.14	11.0 ± 2.13	13.9 ± 2.30	
JUN	06/04/08 - 06/11/08	12.6 ± 2.25	11.6 ± 2.11	12.1 ± 2.14	13.8 ± 2.30	9.82 ± 2.00	12.5 ± 2.11	
JUN	06/11/08 - 06/18/08	13.0 ± 2.43	13.3 ± 2.33	13.5 ± 2.39	14.4 ± 2.55	11.3 ± 2.26	12.3 ± 2.28	
JUN	06/18/08 - 06/25/08	10.6 ± 2.17	9.76 ± 2.06	10.2 ± 2.05	11.7 ± 2.30	8.7 ± 2.02	9.52 ± 2.04	

TABLE I-8
GROSS BETA ANALYSES OF AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
RESULTS IN E-03 PCI/CU. M. ± 2S

MONTH	COLLECTION DATE	3S2	6G1	8G1	12E1	12S1	13S6	COMMENTS
JUL	06/25/08 - 07/02/08	10.0 ± 2.27	10.0 ± 2.16	11.2 ± 2.22	12.2 ± 2.38	11.8 ± 2.33	11.4 ± 2.18	
JUL	07/02/08 - 07/09/08	19.4 ± 2.70	15.8 ± 2.40	15.1 ± 2.37	18.0 ± 2.59	16.0 ± 2.48	15.3 ± 2.32	
JUL	07/09/08 - 07/16/08	12.3 ± 2.19	11.6 ± 2.13	11.8 ± 2.19	13.5 ± 2.45	13.4 ± 2.32	12.6 ± 2.17	
JUL	07/16/08 - 07/23/08	19.9 ± 2.55	19.7 ± 2.59	23.8 ± 2.77	20.2 ± 2.68	15.8 ± 2.46	24.3 ± 2.89	
JUL	07/23/08 - 07/30/08	16.6 ± 2.45	16.3 ± 2.47	15.6 ± 2.38	20.0 ± 2.70	17.3 ± 2.55	16.6 ± 2.44	
AUG	07/30/08 - 08/06/08	13.2 ± 2.30	11.8 ± 2.22	14.7 ± 2.45	14.7 ± 2.47	12.7 ± 2.32	18.0 ± 2.53	
AUG	08/06/08 - 08/13/08	8.25 ± 1.91	10.1 ± 2.03	12.5 ± 2.17	11.8 ± 2.21	10.8 ± 2.13	12.7 ± 2.17	
AUG	08/13/08 - 08/20/08	14.7 ± 2.26	15.6 ± 2.33	14.8 ± 2.25	14.7 ± 2.34	15.6 ± 2.37	15.4 ± 2.27	
AUG	08/20/08 - 08/27/08	15.7 ± 2.44	14.3 ± 2.40	12.4 ± 2.22	15.3 ± 2.50	13.2 ± 2.42	12.3 ± 2.22	
SEP	08/27/08 - 09/03/08	13.8 ± 2.45	15.3 ± 2.56	14.9 ± 2.49	15.4 ± 2.65	13.0 ± 2.48	15.8 ± 2.53	
SEP	09/03/08 - 09/10/08	15.3 ± 2.39	19.0 ± 2.58	16.0 ± 2.41	18.4 ± 2.65	15.1 ± 2.43	17.1 ± 2.43	
SEP	09/10/08 - 09/17/08	8.72 ± 1.97	7.60 ± 1.92	7.24 ± 1.85	9.64 ± 2.12	9.39 ± 2.08	7.93 ± 1.88	
SEP	09/17/08 - 09/24/08	15.1 ± 2.42	18.5 ± 2.60	18.4 ± 2.55	18.9 ± 2.70	17.0 ± 2.59	16.5 ± 2.43	
SEP	09/24/08 - 10/01/08	12.4 ± 2.05	9.46 ± 1.84	11.0 ± 1.94	13.6 ± 2.19	12.2 ± 2.07	13.5 ± 2.09	
OCT	10/01/08 - 10/08/08	12.4 ± 2.13	13.1 ± 2.14	10.7 ± 2.00	12.3 ± 2.23	12.3 ± 2.18	12.1 ± 2.08	
OCT	10/08/08 - 10/15/08	26.1 ± 2.84	22.3 ± 2.63	24.0 ± 2.72	27.3 ± 2.99	25.1 ± 2.85	23.8 ± 2.71	
OCT	10/15/08 - 10/22/08	12.5 ± 2.11	12.1 ± 2.06	12.8 ± 2.10	12.3 ± 2.17	12.9 ± 2.20	13.9 ± 2.16	
OCT	10/22/08 - 10/29/08	8.75 ± 2.17	6.77 ± 1.96	6.90 ± 1.98	9.93 ± 2.20	7.89 ± 2.02	8.11 ± 2.02	
NOV	10/29/08 - 11/05/08	23.5 ± 3.02	21.6 ± 2.77	20.4 ± 2.70	25.9 ± 2.99	22.0 ± 2.78	24.8 ± 2.99	
NOV	11/05/08 - 11/12/08	14.4 ± 2.32	10.7 ± 2.15	10.7 ± 2.15	13.9 ± 2.35	14.0 ± 2.29	14.0 ± 2.37	
NOV	11/12/08 - 11/19/08	7.91 ± 1.89	6.73 ± 1.89	4.68 ± 1.78	6.96 ± 1.93	6.49 ± 1.80	9.72 ± 2.20	
NOV	11/19/08 - 11/25/08	12.9 ± 2.30	10.2 ± 2.22	10.5 ± 2.25	14.6 ± 2.50	12.9 ± 2.27	13.1 ± 2.38	
NOV	11/25/08 - 12/03/08	14.1 ± 2.04	15.5 ± 2.18	13.5 ± 2.09	17.7 ± 2.32	13.8 ± 2.00	15.7 ± 2.07	
DEC	12/03/08 - 12/10/08	14.5 ± 2.34	13.8 ± 2.38	11.0 ± 2.27	15.6 ± 2.52	13.3 ± 2.26	15.3 ± 2.38	
DEC	12/10/08 - 12/16/08	14.8 ± 2.38	11.8 ± 2.28	11.8 ± 2.34	13.3 ± 2.41	15.4 ± 2.41	13.0 ± 2.29	
DEC	12/16/08 - 12/23/08	18.1 ± 2.51	18.4 ± 2.52	15.7 ± 2.47	17.5 ± 2.58	18.0 ± 2.48	18.4 ± 2.53	
DEC	12/23/08 - 12/30/08	29.9 ± 3.01	23.5 ± 2.76	20.2 ± 2.73	33.4 ± 3.26	26.7 ± 2.86	31.3 ± 3.08	

TABLE I-9
GAMMA SPECTROSCOPIC ANALYSES OF COMPOSITED AIR PARTICULATE FILTERS
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in E-03 pCi/Cu. M. ± 2S

LOCATION	COLLECTION DATE	Be-7	OTHER ACTIVITY
6G1	12/26/2007 - 3/26/2008	107 ± 24	
8G1	12/26/2007 - 3/26/2008	101 ± 27	
3S2	12/26/2007 - 3/26/2008	113 ± 39	
12E1	12/26/2007 - 3/26/2008	118 ± 30.0	
12S1	12/26/2007 - 3/26/2008	99 ± 24	
13S6	12/26/2007 - 3/26/2008	140 ± 30.0	
6G1	3/26/2008 - 6/25/2008	144 ± 33	
8G1	3/26/2008 - 6/25/2008	143 ± 36	
3S2	3/26/2008 - 6/25/2008	170 ± 41	
12E1	3/26/2008 - 6/25/2008	186 ± 48	
12S1	3/26/2008 - 6/25/2008	119 ± 27	
13S6	3/26/2008 - 6/25/2008	115 ± 44.6	
6G1	6/25/2008 - 10/1/2008	164 ± 32	
8G1	6/25/2008 - 10/1/2008	94 ± 40	
3S2	6/25/2008 - 10/1/2008	127 ± 28	
12E1	6/25/2008 - 10/1/2008	142 ± 36.8	
12S1	6/25/2008 - 10/1/2008	132 ± 26	
13S6	6/25/2008 - 10/1/2008	201 ± 33.7	
6G1	10/1/2008 - 12/30/2008	105 ± 20	
8G1	10/1/2008 - 12/30/2008	98 ± 21	
3S2	10/1/2008 - 12/30/2008	100 ± 25	
12E1	10/1/2008 - 12/30/2008	112 ± 20	
12S1	10/1/2008 - 12/30/2008	86 ± 22	
13S6	10/1/2008 - 12/30/2008	97 ± 21	

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY	COMMENTS
10G1	1/7/2008	< 0.4	1350 ± 131		
10D2	1/7/2008	< 0.5	1360 ± 158		
13E3	1/7/2008	< 0.4	1340 ± 183		
10D3	1/7/2008	< 0.7	1240 ± 148		
10G1	2/4/2008	< 0.8	1370 ± 134		
10D2	2/4/2008	< 0.6	1350 ± 151		
13E3	2/4/2008	< 0.9	1240 ± 131		
10D3	2/4/2008	< 0.7	1300 ± 118		
10G1	3/10/2008	< 0.4	1280 ± 146	AC-228 26.0 ± 16.9	
10D2	3/10/2008	< 0.6	1300 ± 149		
13E3	3/10/2008	< 0.6	1330 ± 181		
10D3	3/10/2008	< 0.7	1200 ± 160		
10G1	4/7/2008	< 0.5	1440 ± 143		
13E3	4/7/2008	< 0.6	1430 ± 160		
10D3	4/7/2008	< 0.7	1260 ± 143		
5E2	4/7/2008	< 0.8	1310 ± 139		
10G1	4/21/2008	< 0.7	1210 ± 157		
13E3	4/21/2008	< 0.9	1250 ± 140		
10D3	4/21/2008	< 0.7	1290 ± 115		
5E2	4/21/2008	< 0.8	1180 ± 163		
10G1	5/5/2008	< 0.5	1360 ± 138		
13E3	5/5/2008	< 0.8	1180 ± 108		
10D3	5/5/2008	< 0.4	1410 ± 154		
5E2	5/5/2008	< 0.5	1380 ± 137		
10G1	5/19/2008	< 0.4	1340 ± 127		
13E3	5/19/2008	< 0.3	1430 ± 144		
10D3	5/19/2008	< 0.4	1240 ± 117		
5E2	5/19/2008	< 0.6	1290 ± 165		

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY		COMMENTS
10G1	6/2/2008	< 0.4	1110 ± 164			
13E3	6/2/2008	< 0.7	1260 ± 166			
10D3	6/2/2008	< 0.7	1050 ± 110			
5E2	6/2/2008	< 0.6	1290 ± 135			
10G1	6/16/2008	< 0.5	1300 ± 148	TH-228	19.6 ± 9.5	
13E3	6/16/2008	< 0.5	1140 ± 126	TH-228	25.6 ± 11.0	
10D3	6/16/2008	< 0.6	1350 ± 148	TH-228	16.9 ± 9.2	
5E2	6/16/2008	< 0.4	1170 ± 147	TH-228	27.6 ± 13.4	
10G1	6/30/2008	< 0.6	1340 ± 184			
13E3	6/30/2008	< 0.4	1570 ± 186			
10D3	6/30/2008	< 0.4	1280 ± 188			
5E2	6/30/2008	< 0.6	1340 ± 160			
10G1	7/14/2008	< 0.6	1310 ± 143			
13E3	7/14/2008	< 0.6	1300 ± 162			
10D3	7/14/2008	< 0.7	1350 ± 153			
5E2	7/14/2008	< 0.8	1070 ± 127			
10G1	7/28/2008	< 0.6	1320 ± 150			
13E3	7/28/2008	< 0.7	1270 ± 120			
10D3	7/28/2008	< 0.8	1270 ± 153			
5E2	7/28/2008	< 0.8	1310 ± 152			
10G1	8/11/2008	< 0.5	1250 ± 127			
13E3	8/11/2008	< 0.7	1400 ± 139			
10D3	8/11/2008	< 0.5	1260 ± 148			
5E2	8/11/2008	< 0.7	1260 ± 160			
10G1	8/25/2008	< 0.5	1300 ± 147			
13E3	8/25/2008	< 0.5	1500 ± 170			
10D3	8/25/2008	< 0.6	1270 ± 160			
5E2	8/25/2008	< 0.7	1150 ± 137			

TABLE I-10
IODINE-131 AND GAMMA SPECTROSCOPIC ANALYSES OF MILK
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/liter ± 2S

LOCATION	COLLECTION DATE	I-131	K-40	OTHER ACTIVITY		COMMENTS
10G1	9/8/2008	< 0.7	1420 ± 140			
13E3	9/8/2008	< 0.7	1340 ± 147			
10D3	9/8/2008	< 0.8	1380 ± 143			
5E2	9/8/2008	< 0.7	1310 ± 114			
10G1	9/22/2008	< 0.8	1270 ± 119	TH-228	14.2 ± 9.0	
13E3	9/22/2008	< 0.5	1340 ± 126			
10D3	9/22/2008	< 0.6	1210 ± 123	TH-228	11.8 ± 6.9	
5E2	9/22/2008	< 0.5	1310 ± 110			
10G1	10/6/2008	< 0.5	1280 ± 56.1			
13E3	10/6/2008	< 0.6	1240 ± 53.2			
10D3	10/6/2008	< 0.5	1280 ± 62.5			
5E2	10/6/2008	< 0.6	1290 ± 64.8			
10G1	10/20/2008	< 0.8	1330 ± 78.9			
13E3	10/20/2008	< 0.7	1500 ± 111			
10D3	10/20/2008	< 0.6	1170 ± 94.2			
5E2	10/20/2008	< 0.6	1260 ± 94.7			
10G1	11/10/2008	< 0.8	1190 ± 41.6			
13E3	11/10/2008	< 0.7	1380 ± 54.8			
10D3	11/10/2008	< 0.9	1120 ± 52.6			
5E2	11/10/2008	< 0.8	1160 ± 51.4			
10G1	12/8/2008	< 0.7	1270 ± 72			
13E3	12/8/2008	< 0.6	1310 ± 90.3			
10D3	12/8/2008	< 0.7	1170 ± 66.4			
5E2	12/8/2008	< 0.8	1260 ± 91.2			

TABLE I-11
GAMMA SPECTROSCOPIC ANALYSES OF SOIL
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/kg (dry) ± 2S

LOCATION	COLLECTION DATE	K-40	Cs-137	Th-228	OTHER ACTIVITY	
8G1 TOP	9/17/2008	13000 ± 1230	156 ± 54	710 ± 113	RA-226	3060 ± 1620
					AC-228	1080 ± 285
8G1 BOT	9/17/2008	9500 ± 1290	175 ± 62	712 ± 136	AC-228	835 ± 323
12S1 TOP	9/17/2008	11000 ± 981	89 ± 45	790 ± 69	RA-226	1670 ± 832
					AC-228	757 ± 223
12S1 BOT	9/17/2008	11900 ± 1060	< 47	926 ± 75	AC-228	971 ± 198

TABLE I-12
GAMMA SPECTROSCOPIC ANALYSES OF FOOD PRODUCTS (FRUITS AND VEGETABLES)
SUSQUEHANNA STEAM ELECTRIC STATION, 2008
Results in pCi/kg (wet) ± 2S

LOCATION	SAMPLE TYPE	COLLECTION DATE	K-40	OTHER ACTIVITY
11F2	Green Beans	9/3/2008	2750 ± 257	
11D1	Pumpkin	9/22/2008	1660 ± 101	TH-228 12 ± 7
12F7	Potato	9/22/2008	4600 ± 138	AC-228 87 ± 23
5S11	Potato	9/22/2008	4650 ± 145	

TABLE I-13
TYPICAL MINIMUM DETECTABLE CONCENTRATIONS OF NUCLIDES SEARCHED FOR BUT NOT FOUND BY GAMMA SPECTROMETRY IN THE VICINITY OF SUSQUEHANNA STEAM ELECTRIC STATION, 2008

Nuclide	Fish (pCi/kg wet)	Sediment (pCi/kg dry)	Surface Water (pCi/l)	Ground Water (pCi/l)	Potable Water (pCi/l)	Air Particulate (E-3 pCi/m3)	Milk (pCi/l)	Fruit/Veg (pCi/kg wet)	Soil (pCi/kg dry)	Air Iodine (E-3 pCi/m3)
MN-54	48.1	52.1	2.6	4.6	2.6	1.5	5.4	6.1	61.2	
CO-58	54.3	48.7	2.9	4.8	3.3	2.7	5.6	6.6	64.4	
FE-59	186.5	146.3	8.3	13.2	9.1	11.5	16.9	21.6	193.5	
CO-60	45.9	52.2	2.6	4.7	2.7	1.3	5.8	6.5	59.4	
ZN-65	100.5	110.5	5.3	9.4	5.2	3.6	12.7	14.3	129.1	
NB-95	65	61.1	3.1	5.2	3.5	3.1	5.8	7.3	79.3	
RU-106	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
ZR-95	107.9	97.3	5.3	8.5	5.6	5.6	9.9	12	123.6	
I-131	1043.9	142.7	20.6	11.9	25.9	4765.4	17.1	28.2	364.5	15.9
CS-134	41.8	43.1	2.4	4.5	2.6	1.4	4.9	5.4	54.8	
CS-137	47	59.5	2.7	4.9	2.7	1.2	5.7	6.3	58.8	
BA-140	1073.6	308.5	29.2	28.2	35.9	640.6	33.2	54.6	628.1	
LA-140	292.5	91.2	9.1	9.2	11.4	217.2	9.5	17.8	206.6	
CE-141	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

APPENDIX J

PERFORMANCE SUMMARY FOR THE RADIOANALYSES OF SPIKED ENVIRONMENTAL SAMPLE MEDIA – 2008

TELEDYNE BROWN ENGINEERING

The data in the tables that follow show how well Teledyne Brown Engineering Environmental Services (TBE) performed in the analysis of radioactively spiked media. Tables J-1 through J-4 provide the performance results for TBE. In addition to the Analytics' spikes analyzed as part of PPL's REMP Laboratory Spike Program (Table J-3), TBE analyzed spikes procured independently from Analytics as part of their respective Quality Control Spike Programs (Table J-2), as well as spikes prepared as part of the following programs:

1. The Proficiency Testing Program of Environmental Resource Associates (Table J-1)

2. The Mixed Analyte Performance Evaluation Program (MAPEP) of the DOE (Table J-4)

It should be noted that program #1 above only provides spiked water for analyses. No other media are included in the spikes provided by this program. The following characteristics are important for the spiked environmental media:

1. When practical, the level of activity in, at least, some of the spiked environmental media should be within the range between required analysis sensitivities for the SSES REMP and the Reporting Levels, if applicable, of the NRC.

2. The spikes should be preserved in a manner as similar as possible to the way that actual samples of those media are prepared.

3. The variety of radionuclides with which environmental media are spiked should be as extensive as practical, including as many of the activation and fission products that could be detected in the vicinity of the SSES as reasonable.

The spiked environmental media prepared by Analytics according to the requirements of PPL's REMP Laboratory Spike Program are intended to incorporate characteristics #1, #2, and #3 to the greatest degree that is practical.

The criteria for the acceptability of the analyses results for the spikes prepared as part of the PPL REMP Laboratory Spike Program (Table J-3) has been established by PPL. They are based on criteria that were originally developed by the NRC. The NRC bases these criteria on an empirical relationship that combines prior experience and accuracy needs. As the resolution of the measurement process improves (relative measurement uncertainty becomes smaller), the criteria for determining acceptability become tighter. Conversely, as the resolution of the process becomes poorer (relative measurement uncertainty becomes bigger), the criteria are widened.

The criteria for acceptability of DOE (MAPEP) program – Table J-4 is based on control limits based on percentiles of historic data distributions.

Note that comment numbers at the extreme right side of the tables denote unacceptable results in Tables J-1 through J-4. Discussions relevant to these comment numbers follow the presentations of the data, as applicable.

TABLE J-1
ENVIRONMENTAL RESOURCE ASSOCIATES (ERA)
PROFICIENCY TESTING PROGRAM - 2008
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Control Limits	Evaluation (c)
January 2008	Quik[tm] Response	Water	Sr-89	pCi/L	37.33	19.0	11.8 - 25.2	N (1)
			Sr-90	pCi/L	40.40	42.7	31.5 - 49.0	A
			Ba-133	pCi/L	87.8	90.5	76.2 - 99.6	A
			Cs-134	pCi/L	80.67	88.9	72.9 - 97.8	A
			Cs-137	pCi/L	222.33	231	208 - 256	A
			Co-60	pCi/L	98.9	101.0	90.9 - 113	A
			Zn-65	pCi/L	352	350	315 - 408	A
			Gr-A	pCi/L	13.0	12.7	6.02 - 18.7	A
			Gr-B	pCi/L	32.7	36.2	23.8 - 43.8	A
			H-3	pCi/L	11100	11300	9840 - 12400	A
January 2008	RAD 72	Water	Sr-89	pCi/L	69.0	65.3	53.0 - 73.4	A
			Sr-90	pCi/L	35.6	41.4	30.5 - 47.6	A
			Ba-133	pCi/L	25.9	25.7	20.0 - 29.5	A
			Cs-134	pCi/L	86.5	92.6	76.0 - 102	A
			Cs-137	pCi/L	155	158	142 - 176	A
			Co-60	pCi/L	16.0	14.4	11.4 - 18.7	A
			Zn-65	pCi/L	214	204	184 - 240	A
			Gr-A	pCi/L	13.3	14.8	7.15 - 21.2	A
			Gr-B	pCi/L	21.2	22.5	13.7 - 30.6	A
			I-131	pCi/L	22.8	23.6	19.6 - 28.0	A
			H-3	pCi/L	3390	3540	3000 - 3910	A
April 2008	Rad 73	Water	Sr-89	pCi/L	65.47	60.4	48.6 - 68.2	A
			Sr-90	pCi/L	39.80	39.2	28.8 - 45.1	A
			Ba-133	pCi/L	59.63	58.3	48.3 - 64.3	A
			Cs-134	pCi/L	45.00	46.6	37.4 - 51.3	A
			Cs-137	pCi/L	97.97	102	91.8 - 115	A
			Co-60	pCi/L	75.47	76.6	68.9 - 86.7	A
			Zn-65	pCi/L	109	106	95.4 - 126	A
			Gr-A	pCi/L	41.03	50.8	26.5 - 63.7	A
			Gr-B	pCi/L	50.20	51.4	35.0 - 58.4	A
			I-131	pCi/L	26.67	28.7	23.9 - 33.6	A
			H-3	pCi/L	11633	12000	10400 - 13200	A

(1) Could find no cause for Sr-89 failure. Sample sent to outside lab for verification, but the outside laboratory was unable to confirm our numbers or ERA numbers. Studies bracketing these results, RAD 71 and RAD 72, had acceptable Sr-89 results. NCR 08-03

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

TABLE J-2
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2008	E5847-396	Milk	Sr-89	pCi/L	83.5	95.8	0.87	A
			Sr-90	pCi/L	13.9	12.9	1.08	A
	E5848-396	Milk	I-131	pCi/L	57.3	60.0	0.96	A
			Ce-141	pCi/L	229	249	0.92	A
			Cr-51	pCi/L	336	359	0.94	A
			Cs-134	pCi/L	106	125	0.85	A
			Cs-137	pCi/L	141	146	0.97	A
			Co-58	pCi/L	71.8	70.8	1.01	A
			Mn-54	pCi/L	98.1	94.2	1.04	A
			Fe-59	pCi/L	102	102	1.00	A
			Zn-65	pCi/L	135	137	0.99	A
			Co-60	pCi/L	230	236	0.97	A
	E5850A-396	AP	Ce-141	pCi	163	157	1.04	A
			Cr-51	pCi	233	227	1.03	A
			Cs-134	pCi	72.6	79.0	0.92	A
			Cs-137	pCi	98.3	92.0	1.07	A
			Co-58	pCi	46.7	44.7	1.04	A
			Mn-54	pCi	69.8	59.4	1.18	A
			Fe-59	pCi	72.2	64.5	1.12	A
			Zn-65	pCi	106	86.4	1.23	W
			Co-60	pCi	156	149	1.05	A
	E5849-396	Charcoal	I-131	pCi	65.5	60.1	1.09	A
June 2008	E5971-396	Milk	Sr-89	pCi/L	83.9	85.0	0.99	A
			Sr-90	pCi/L	14.4	15.8	0.91	A
	E5972-396	Milk	I-131	pCi/L	70.9	71.4	0.99	A
			Ce-141	pCi/L	157	174	0.90	A
			Cr-51	pCi/L	159	138	1.15	A
			Cs-134	pCi/L	69.7	76.7	0.91	A
			Cs-137	pCi/L	115	116	0.99	A
			Co-58	pCi/L	59.1	61.9	0.95	A
			Mn-54	pCi/L	139	135	1.03	A
			Fe-59	pCi/L	98.4	91.7	1.07	A
			Zn-65	pCi/L	129	127	1.02	A
			Co-60	pCi/L	101	104	0.97	A

TABLE J-2
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2008	E5974-396	AP	Ce-141	pCi	206	207	1.00	A
			Cr-51	pCi	173	164	1.05	A
			Cs-134	pCi	95.9	91.0	1.05	A
			Cs-137	pCi	142.0	138.0	1.03	A
			Co-58	pCi	72.0	73.4	0.98	A
			Mn-54	pCi	180	160.0	1.13	A
			Fe-59	pCi	108.0	109.0	0.99	A
			Zn-65	pCi	159	150	1.06	A
			Co-60	pCi	129	124	1.04	A
	E5973-396	Charcoal	I-131	pCi	73.8	84.1	0.88	A
September 2008	E6284-396	Milk	Sr-89	pCi/L	76.2	73.9	1.03	A
			Sr-90	pCi/L	12.3	11.0	1.12	A
	E6285-396	Milk	I-131	pCi/L	65.7	67.9	0.97	A
			Ce-141	pCi/L	145	161	0.90	A
			Cr-51	pCi/L	406	421	0.96	A
			Cs-134	pCi/L	196	232	0.84	A
			Cs-137	pCi/L	147	162	0.91	A
			Co-58	pCi/L	167	179	0.93	A
			Mn-54	pCi/L	165	166	0.99	A
			Fe-59	pCi/L	161	144	1.12	A
			Zn-65	pCi/L	305	319	0.96	A
			Co-60	pCi/L	218	234	0.93	A
	E6287-396	AP	Ce-141	pCi	79.5	76.3	1.04	A
			Cr-51	pCi	208	199	1.05	A
			Cs-134	pCi	106	110	0.96	A
			Cs-137	pCi	79.3	76.7	1.03	A
			Co-58	pCi	87.7	84.4	1.04	A
			Mn-54	pCi	90.3	78.6	1.15	A
			Fe-59	pCi	81.7	68.3	1.20	A
			Zn-65	pCi	144	151	0.95	A
			Co-60	pCi	111	111	1.00	A
	E6286-396	Charcoal	I-131	pCi	93.2	90.0	1.04	A
December 2008	E6415-396	Milk	Sr-89	pCi/L	98.4	91.9	1.07	A
			Sr-90	pCi/L	18.0	12.6	1.43	N (1)

TABLE J-2
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
TELEDYNE
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2008	E6416-396	Milk	I-131	pCi/L	69.2	79.9	0.87	A
			Ce-141	pCi/L	177	191	0.93	A
			Cr-51	pCi/L	231	246	0.94	A
			Cs-134	pCi/L	117	134	0.87	A
			Cs-137	pCi/L	119	120	0.99	A
			Co-58	pCi/L	104	104	1.00	A
			Mn-54	pCi/L	153	152	1.01	A
			Fe-59	pCi/L	99.6	100	1.00	A
			Zn-65	pCi/L	177	183	0.97	A
			Co-60	pCi/L	133	133	1.00	A
	E6418-396	AP	Ce-141	pCi	148	146	1.01	A
			Cr-51	pCi	202	187	1.08	A
			Cs-134	pCi	103	102	1.01	A
			Cs-137	pCi	95.4	91.2	1.05	A
			Co-58	pCi	81.4	79.2	1.03	A
			Mn-54	pCi	113	116.0	0.97	A
			Fe-59	pCi	76.5	76.4	1.00	A
			Zn-65	pCi	122	139	0.88	A
			Co-60	pCi	108	101	1.07	A
	E6417-396	Charcoal	I-131	pCi	65.8	74.1	0.89	A

(1) NCR 09-02 initiated to investigate the failure.

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable. Reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning. Reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable. Reported result falls outside the ratio limits of < 0.70 and > 1.30.

TABLE J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (a)	TBE/Analytics Ratio	
March 2008	E5870-186	Sediment	Ce-141	pCi/kg	358 ± 12	387 ± 30	1.08	
			Cr-51	pCi/kg	517 ± 17	624 ± 132	1.21	
			Cs-134	pCi/kg	180 ± 6	189 ± 12	1.05	
			Cs-137	pCi/kg	306 ± 10	348 ± 20	1.14	
			Co-58	pCi/kg	102 ± 3	116 ± 17	1.14	
			Mn-54	pCi/kg	136 ± 5	174 ± 19	1.28	(1)
			Fe-59	pCi/kg	147 ± 5	183 ± 28	1.24	
			Zn-65	pCi/kg	197 ± 7	206 ± 31	1.05	
			Co-60	pCi/kg	340 ± 11	394 ± 17	1.16	
March 2008	E5866-186	Milk	I-131	pCi/L	60.5 ± 2	48 ± 2	0.80	(2)
			Ce-141	pCi/L	293 ± 10	252 ± 14	0.86	
			Cr-51	pCi/L	423 ± 14	403 ± 62	0.95	
			Cs-134	pCi/L	148 ± 5	123 ± 5	0.83	
			Cs-137	pCi/L	172 ± 6	154 ± 10	0.90	
			Co-58	pCi/L	83.4 ± 3	83 ± 8	1.00	
			Mn-54	pCi/L	111 ± 4	110 ± 9	0.99	
			Fe-59	pCi/L	121 ± 4	119 ± 13	0.98	
			Zn-65	pCi/L	161 ± 5	164 ± 14	1.02	
			Co-60	pCi/L	278 ± 9	258 ± 8	0.93	
September 2008	E6308-186	Milk	I-131	pCi/L	100 ± 3	93 ± 3	0.93	
			Ce-141	pCi/L	207 ± 7	99 ± 11	0.48	(3)
			Cr-51	pCi/L	539 ± 18	494 ± 74	0.92	
			Cs-134	pCi/L	297 ± 10	229 ± 6	0.77	(3)
			Cs-137	pCi/L	208 ± 7	169 ± 9	0.81	
			Co-58	pCi/L	229 ± 8	165 ± 10	0.72	(3)
			Mn-54	pCi/L	213 ± 7	129 ± 8	0.61	(3)
			Fe-59	pCi/L	185 ± 6	128 ± 13	0.69	(3)
			Zn-65	pCi/L	409 ± 14	246 ± 15	0.60	(3)
			Co-60	pCi/L	300 ± 10	212 ± 7	0.71	(3)
December 2008	E6403-186	Milk	I-131	pCi/L	74 ± 2.5	65 ± 4	0.88	
			Ce-141	pCi/L	319 ± 10.6	323 ± 16	1.01	
			Cr-51	pCi/L	410 ± 13.7	476 ± 77	1.16	
			Cs-134	pCi/L	223 ± 7.4	190 ± 5	0.85	
			Cs-137	pCi/L	199 ± 6.7	191 ± 8	0.96	
			Co-58	pCi/L	173 ± 5.8	170 ± 9	0.98	
			Mn-54	pCi/L	253 ± 8.4	263 ± 10	1.04	
			Fe-59	pCi/L	167 ± 5.6	162 ± 14	0.97	
			Zn-65	pCi/L	305 ± 10.2	275 ± 16	0.90	
			Co-60	pCi/L	222 ± 7.4	209 ± 6	0.94	

(a) Counting error is two standard deviations.

(1) High Mn-54 due to interference from Ac-228. For soils that contain higher concentrations of natural Th-232 the possibility of interference increases. NCR 09-03

(2) The I-131TBEfound/Analytics known ratio is 0.75, which TBE considers acceptable. NCR 09-03

(3) Milk gamma nuclides failure attributed to inhomogeniety of milk sample; fat and curds badly separated from aqueous phase. NCR 09-03

TABLE J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (b)	TBE/Analytics Ratio (c)
December 2008	E6404-186	Ap Filter	Ce-141	pCi	185 ± 6	179 ± 5	0.97
			Cr-51	pCi	237 ± 8	241 ± 29	1.02
			Cs-134	pCi	129 ± 5	128 ± 10	0.99
			Cs-137	pCi	115 ± 4	120 ± 4	1.04
			Co-58	pCi	100 ± 4	103 ± 4	1.03
			Mn-54	pCi	146 ± 5	138 ± 15	0.95
			Fe-59	pCi	97 ± 3	97 ± 27	1.00
			Zn-65	pCi	176 ± 6	181 ± 28	1.03
			Co-60	pCi	128 ± 4	130 ± 3	1.02
	E6405-186	Ap Filter	Ce-141	pCi	198 ± 7	190 ± 4	0.96
			Cr-51	pCi	254 ± 9	233 ± 23	0.92
			Cs-134	pCi	138 ± 5	121 ± 10	0.88
			Cs-137	pCi	124 ± 4	120 ± 3	0.97
			Co-58	pCi	107 ± 4	101 ± 4	0.94
			Mn-54	pCi	157 ± 5	149 ± 16	0.95
			Fe-59	pCi	104 ± 4	95 ± 25	0.92
			Zn-65	pCi	189 ± 7	199 ± 8	1.05
			Co-60	pCi	137 ± 5	134 ± 3	0.98
	E6406-186	Ap Filter	Ce-141	pCi	191 ± 7	188 ± 5	0.98
			Cr-51	pCi	246 ± 9	242 ± 32	0.98
			Cs-134	pCi	134 ± 5	125 ± 9	0.93
			Cs-137	pCi	120 ± 4	124 ± 4	1.03
			Co-58	pCi	104 ± 4	107 ± 4	1.03
			Mn-54	pCi	152 ± 5	157 ± 15	1.03
			Fe-59	pCi	100 ± 4	104 ± 33	1.04
			Zn-65	pCi	183 ± 6	180 ± 24	0.98
			Co-60	pCi	133 ± 5	143 ± 3	1.08
March 2008	E5871-186	Water	H-3	pCi/L	4010 ± 134	3990 ± 370	1.00
September 2008	E6312-186	Water	H-3	pCi/L	996 ± 332	922 ± 116	0.93
March 2008	E5867-186	Charcoal	I-131	pCi	94.6 ± 3.2	89.9 ± 7	0.95
March 2008	E5868-186	Charcoal	I-131	pCi	82.7 ± 2.8	81.3 ± 4	0.98
March 2008	E5869-186	Charcoal	I-131	pCi	74.6 ± 2.5	72.3 ± 5	0.97

(a) Counting error is two standard deviations.

TABLE J-3
PPL REMP LABORATORY SPIKE PROGRAM
ANALYTICS ENVIRONMENTAL RADIOACTIIVTY CROSS CHECK PROGRAM - 2008
QUALITY CONTROL SPIKE PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Analytics Calculated Results (a)	TBE Results (b)	TBE/Analytics Ratio (c)
June 2008	E5930-186	Charcoal	I-131	pCi	85.0 ± 3.0	81.7 ± 7	0.96
June 2008	E5931-186	Charcoal	I-131	pCi	85.0 ± 3.0	83.1 ± 9	0.98
June 2008	E5932-186	Charcoal	I-131	pCi	84.0 ± 3.0	75.8 ± 6	0.90
September 2008	E6309-186	Charcoal	I-131	pCi	88.5 ± 3.0	103.0 ± 6	1.16
September 2008	E6310-186	Charcoal	I-131	pCi	90.0 ± 3.0	95.1 ± 6	1.06
September 2008	E6311-186	Charcoal	I-131	pCi	88.8 ± 3.0	96.3 ± 5	1.08

(a) Counting error is two standard deviations.

TABLE J-4
DOE - MAPEP
MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
January 2008	07-MaW18	Water	Cs-134	Bq/L	-0.26	not evaluated by MAPEP		A
			Cs-137	Bq/L	0.029	not evaluated by MAPEP		A
			Co-57	Bq/L	21	22.8	16.0 - 29.6	A
			Co-60	Bq/L	8.2	8.40	5.88 - 10.92	A
			H-3	Bq/L	473	472	330 - 614	A
			Mn-54	Bq/L	12	12.1	8.5 - 15.7	A
			Sr-90	Bq/L	10.70	11.4	7.98- 14.82	A
			Zn-65	Bq/L	15.6	16.3	11.4 - 21.2	A
	07-GrW18	Water	Gr-A	Bq/L	1.4	1.399	>0.0 - 2.798	A
			Gr-B	Bq/L	3.06	2.43	1.22 - 3.65	A
	07-MaS18	Soil	Cs-134	Bq/kg	790	854.0	598 - 1110	A
			Cs-137	Bq/kg	568	545	382 - 709	A
			Co-57	Bq/kg	424	421	295 - 547	A
			Co-60	Bq/kg	2.307	2.9	(1)	A
			Mn-54	Bq/kg	611	570	399 - 741	A
			K-40	Bq/kg	609	571	400 - 742	A
			Sr-90	Bq/kg	454	493.0	345 - 641	A
			Zn-65	Bq/kg	0.162	not evaluated by MAPEP		A
	07-RdF18	AP	Cs-134	Bq/sample	2.73	2.5200	1.76 - 3.28	A
			Cs-137	Bq/sample	2.88	2.7	1.89 - 3.51	A
			Co-57	Bq/sample	3.493	3.55	2.49 - 4.62	A
			Co-60	Bq/sample	1.357	1.31	0.92 - 1.70	A
			Mn-54	Bq/sample	0.006	not evaluated by MAPEP		A
			Sr-90	Bq/sample	1.61	1.548	1.084 - 2.012	A
			Zn-65	Bq/sample	2.59	2.04	1.43 - 2.65	A
	07-GrF18	AP	Gr-A	Bq/sample	0.131	0.348	>0.0 - 0.696	A
			Gr-B	Bq/sample	0.261	0.286	0.143 - 0.429	A
January 2008	07-RdV18	Vegetatio	Cs-134	Bq/sample	5.25	6.28	4.40 - 8.16	A
			Cs-137	Bq/sample	3.13	3.41	2.39 - 4.43	A
			Co-57	Bq/sample	6.837	6.89	4.82 - 8.96	A
			Co-60	Bq/sample	2.44	2.77	1.94 - 3.60	A
			Mn-54	Bq/sample	4.45	4.74	3.32 - 6.16	A
			K-40	Bq/sample	61.3	not evaluated by MAPEP		
			Sr-90	Bq/sample	1.33	1.273	0.891 - 1.655	A
			Zn-65	Bq/sample	0.085	not evaluated by MAPEP		A

TABLE J-4
DOE - MAPEP
MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES (TBE)
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Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
August 2008	08-MaW19	Water	Cs-134	Bq/L	17.1	19.5	13.7 - 25.4	A
			Cs-137	Bq/L	21.4	23.6	16.5 - 30.7	A
			Co-57	Bq/L	-0.044	not evaluated by MAPEP		A
			Co-60	Bq/L	10.8	11.6	8.1 - 15.1	A
			H-3	Bq/L	334	341	239 - 443	A
			Mn-54	Bq/L	13.0	13.7	9.6 - 17.8	A
			Sr-90	Bq/L	6.55	6.45	4.52- 8.39	A
			Zn-65	Bq/L	16.5	17.1	12.0 - 22.2	A
	08-GrW19	Water	Gr-A	Bq/L	0.0612	<0.56	(2)	A
			Gr-B	Bq/L	0.222	<1.85	(2)	A
	08-MaS19	Soil	Cs-134	Bq/kg	546	581	407 - 755	A
			Cs-137	Bq/kg	2.52	2.8	(1)	A
			Co-57	Bq/kg	340	333	233 - 433	A
			Co-60	Bq/kg	157	145.0	102 - 189	A
			Mn-54	Bq/kg	460	415	291 - 540	A
			K-40	Bq/kg	650	571	399 - 741	A
			Sr-90	Bq/kg	1.40	not evaluated by MAPEP		A
			Zn-65	Bq/kg	-1.53	not evaluated by MAPEP		A
August 2008	08-RdF19	AP	Cs-134	Bq/sample	2.46	2.6300	1.84 - 3.42	A
			Cs-137	Bq/sample	0.0063	not evaluated by MAPEP		A
			Co-57	Bq/sample	1.36	1.50	1.05 - 1.95	A
			Co-60	Bq/sample	0.0143	not evaluated by MAPEP		A
			Mn-54	Bq/sample	2.70	2.64	1.85 - 3.43	A
			Sr-90	Bq/sample	1.42	1.12	0.78 - 1.46	W
			Zn-65	Bq/sample	0.975	0.94	0.66 - 1.22	A
	08-GrF19	AP	Gr-A	Bq/sample	-0.0037	false positive test		A
			Gr-B	Bq/sample	0.540	0.525	0.263 - 0.788	A
	08-RdV19	Vegetatio	Cs-134	Bq/sample	4.36	5.5	3.9 - 7.2	W
			Cs-137	Bq/sample	-0.03	not evaluated by MAPEP		A
			Co-57	Bq/sample	6.72	7.1	5.0 - 9.2	A
			Co-60	Bq/sample	4.04	4.70	3.3 - 6.1	A
			Mn-54	Bq/sample	5.22	5.8	4.1 - 7.5	A
			K-40	Bq/sample	64.4	not evaluated by MAPEP		
			Sr-90	Bq/sample	1.62	1.9	1.3 - 2.5	A
			Zn-65	Bq/sample	6.160	6.9	4.8 - 9.0	A

(1) Reported a statistically zero result.

(2) Designed to test the Safe Drinking Water screening levels. Labs reporting values less than ref values were found to be acceptable.

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.