

## 6.1.5 RADIOLOGICAL ENVIRONMENTAL MONITORING

Radiological environmental monitoring in the vicinity of the Limerick Generating Station has been in effect since 1971. Extensive data have been collected on a wide variety of environmental media providing a comprehensive data base for assessing plant effects. The primary objectives of the Radiological Environmental Monitoring Program as outlined in the Branch Technical Position, Revision 1, (1979) on Regulatory Guide 4.8 are as follows:

- a. To provide data on measurable levels of radiation and radioactive materials in the site environs;
- b. To evaluate the relationship between quantities of radioactive material released from the plant and resultant radiation doses to individual from principal pathways of exposure.

Implementation of these objectives is accomplished by identifying significant exposure pathways, establishing baseline radiological data of media within those pathways, and continuously monitoring those media before and during plant operation to determine plant effects on man and the environment. The Limerick Radiological Environmental Monitoring Program (REMP) consists of three distinct phases: preliminary survey study, preoperational program, and operational program. The preliminary survey study was conducted from 1971 to 1977 and was originally described as the preoperational program in the Environmental Report - Construction Permit Stage (Revised). Lengthy delays in the Limerick Generating Station startup dates have resulted in the formatting of a new preoperational program. However, an extensive background radiation data base has been compiled and will provide valuable information on the natural radiological characteristics of the Limerick Generating Station environs.

The period from 1977 through 1982 has consisted of site selection and the gradual implementation of the preoperational program. Monitoring equipment has been upgraded, sampling protocols have been developed, and additional sites have been selected to conform with changing regulatory requirements. To maintain continuity, sampling has continued in a variety of media: surface water, drinking water, well water, fish and sediment. The thermoluminescent dosimeter (TLD) monitoring program has been initiated during this period and will be fully implemented during 1982. Initiation of preoperational monitoring activities will conform to the guidelines of the Branch Technical Position, Revision 1, (1979) on Regulatory Guide 4.8 will commence during the fall of 1982 and continue to fuel load. At that time the operational program that couples directly with the preoperational program will be activated.

8406270321 840423  
PDR ADOCK 05000352  
Q PDR

U. S. NUCLEAR REGULATORY COMMISSION

EXHIBIT No. 39  
Applicant ✓ Staff ✓ Intervenor ✓  
Identified ✓ Received ✓ Rejected ✓  
Date: 4-23-84  
Reporter: MEB

## LGS EROL

Details of the preliminary survey study, preoperational program, and operational program are presented in Sections 6.1.5.1, 6.1.5.2, and 6.2.2, respectively.

### 6.1.5.1 Preliminary Survey Study

A preliminary survey investigational study of the radiological environment surrounding Limerick Generating Station was conducted from 1971 to 1977. Table 6.1-34 lists the media sampled and the approximately 20,000 analyses performed on the various media during this initial seven year survey period. This survey study was used in order to prepare for a final formulated preoperational program (described in Section 6.1.5.2), which will couple directly with the operational program at the time the plant goes operational.

Data from this initial survey period will help to establish radiological baseline data for the site. The data presented in this section were obtained from the preliminary survey study period. Figures 6.1-23 through 6.1-27 present the locations of stations sampled during the preliminary study period. Table 6.1-35 keys to Figures 6.1-23 through 6.1-27, and lists the distance, direction and time period of station activities. Tables 6.1-36 through 6.1-44 present the average yearly values plus or minus two standard deviations for all analyses performed on all media sampled, along with the minimum and maximum values.

In the above tables, background radiation levels in air, precipitation, surface water, well water, milk, soil, vegetation, silt, aquatic plants, fruits, game, fish, and meat are presented. A wide range of radionuclides, both naturally occurring and manmade, were found in the LGS environs. Naturally occurring radionuclides were found at levels expected for a riverine environment. The manmade radionuclides found, primarily in the air particulates, precipitation, benthos and soil, were the fission products typically found in nuclear weapons test fallout. Ambient radiation levels were relatively low and approximately the same for all stations. It is concluded that the environment surrounding LGS has no unusual radiological characteristics.

The data from this preliminary survey study provides a fairly comprehensive set of background radiological information. These data will be generally applicable, but not to the detail desired for specific comprehensive baseline which will be compared to operational data. Therefore, the preoperational radiological monitoring program that parallels more closely the operational program was implemented during the summer of 1982. Data obtained will be placed in a data base to be used for future assessment of radiological contributions from plant operations and for any

possible modifications of the operational monitoring program, when such data so indicate.

#### 6.1.5.2 Preoperational Radiological Monitoring

The preoperational radiological monitoring program has been designed using the experience gained in the preliminary survey study, Section 6.1.5.1, and in consideration of the Branch Technical Position on Regulatory Guide 4.8 (November 1979). The program scope in general exceeds the recommendations of the Branch Technical Position on Regulatory Guide 4.8 (November 1979).

Sampling locations for the preoperational and operational radiological monitoring program have been chosen based on site meteorological data as well as on the probable influence of plant airborne and liquid effluents on the surrounding environment. Consideration has been given to neighboring population centers, drinking water consumption, surface water usage, fishing and hunting activities, local dairy farming, and agricultural activities. For comparative purposes, control locations have been established at distances beyond the expected influence of potential plant releases.

A summary of the preoperational and operational radiological monitoring program is presented in Table 6.1-45. Sampling locations are summarized in Table 6.1-46 and presented as a function of distance and sector from the plant in Figures 6.1-28 to 6.1-30. Sampling station codes are keyed to station descriptions in Sections 6.1.5.2.1 to 6.1.5.2.9. Detection capabilities for environmental sample analysis will be as shown in Table 6.1-47. Environmental sampling will be conducted using the type of equipment described in Table 6.1-48.

##### 6.1.5.2.1 Radioiodine and Particulates

One air particulate sampler will be located in the east, east-southeast, and southeast sectors (10S1, 11S1, and 14S1, respectively) as near as practicable to locations that correspond to the highest calculated offsite annual ground level D/Q. One sample will be taken from Pottstown (31D1) and one from Royersford (13C1), the two communities having the highest calculated annual average ground level D/Q. One control sample from a station between 10 and 20 miles in one of the least prevalent wind directions (SW) (22G1) and one control sample from Philadelphia (13H4), the largest city within 50 miles, will be collected. Particulate and radioiodine samples from these seven stations will be collected and analyzed weekly. Ten additional



## LGS EROL

sampling locations will be used to increase the program coverage (total of 17 stations). Particulate samples from these stations will be collected and analyzed weekly. Radioiodine samples will be collected weekly but analyzed only if necessary.

### 6.1.5.2.2 Direct Radiation

A set of dosimeters yielding four readings will be placed at all air sampling locations described for radioiodine and particulates. In addition, dosimeters will be placed as near as possible to each of three (different sector) offsite locations of highest calculated annual average ground level X/Q, NNE, N, ENE (3S1, 36S1, and 7S1, respectively). Station location arrangements conform to the Branch Technical Position on Regulatory Guide 4.8 by adhering to the "two ring philosophy" of station placement whereby a station is located in each sector near the site boundary, and in each sector 4 to 5 miles from the plant. Schools, residences, and nearby population centers are also considered in the direct radiation monitoring scheme. Two control stations located in the least prevalent wind direction (SW and NE) (22G1 and 5H1, respectively) and one station located in Philadelphia (13H3), the largest population center within 50 miles, bring the total number of direct radiation station locations to 48. All direct radiation stations will be collected and analyzed on a monthly basis.

### 6.1.5.2.3 Surface and Drinking Water

Surface water samples will be collected by automatic samplers at five locations. One sample will be taken at the Schuylkill River intake (24S1) and serve as the upstream control. One sample will be taken downstream of the discharge in an area beyond but near the mixing zone (16B2) to measure plant effects. One sample will be collected across from the plant in an area of the river not influenced by plant discharge (24S2) to augment the upstream control. One sample will be taken from the east branch of the Perkiomen River at the pumping station, which will supply makeup water during periods of low flow in the Schuylkill (10F2). A sample of untreated surface water will also be taken at a water company downstream of the plant (15F5) and serve as a control to a treated sample.

Drinking water samples will be collected at five locations, four by automatic samplers, one by composited grab sample (13H2). One control sample will be collected at an upstream water company (16F3). One sample will be collected at the nearest downstream user of Schuylkill River water for drinking purposes (16C2). One

## LGS EROL

sample each will be collected at the two other nearest major water suppliers affected by liquid plant discharges (15F4 and 15F7). One sample will also be collected at a Philadelphia water utility (13H2) that also draws Schuylkill River water for drinking. Surface water and drinking water samples will be collected and analyzed on a monthly basis.

### 6.1.6.2.4 Groundwater

There are no well water users that are potentially affected by groundwater from the Limerick site because the direction of flow on site is toward the adjacent Schuylkill River. However, samples of well water from two nearby users (11S1, 18A1) will be obtained semi-annually to ensure that no effects have occurred.

### 6.1.5.2.5 Sediments from Shoreline

Three locations will be sampled: an upstream control (33A2), the Limerick discharge area (16B2), and a downstream potential recreational area (16C4). Samples will be collected and analyzed on a semi-annual basis.

## LGS EROL

### 6.1.5.2.6 Milk

Milk samples will be collected and analyzed from three available locations within 5 km (three miles) having the highest dose potential (10B1, 5C1, 10C1) and at a control location (22F1) approximately 15 km from the plant in the least prevalent wind direction. Samples will be collected bi-weekly during the grazing season and monthly at other times. To increase program coverage, an additional nine stations have been added to the milk sampling program and will be collected monthly.

### 6.1.5.2.7 Vegetation

Broad leaf vegetation will be sampled and analyzed monthly during the growing season at a location near the site boundary in the sector with the highest annual average D/Q (11S1).

### 6.1.5.2.8 Fish

Although there are presently no commercially important species in the vicinity of the discharge, two species of recreationally important fish, sunfish and brown bullhead, will be sampled if available. Fish will be sampled semi-annually at three locations: an upstream control in an area not influenced by plant discharge (33A2), a location in the vicinity of the discharge point (16B2), and a downstream area (16C4).

### 6.1.5.2.9 Game

A sample of small game animals will be obtained and analyzed annually from the vicinity of Limerick.

EVENT GENERAL  
DESCRIPTION (1) (3)

CLASS

SYMPTOMS OR EAL'S

SHIFT RESPON

I. UNPLANNED REACTOR  
SHUTDOWN

A. CONTROLLED SHUTDOWN  
REQUIRED BY TECH  
SPEC/LCO.

UNUSUAL  
EVENT

PLANT CONDITIONS DO  
NOT COMPLY WITH  
TECH SPEC/LCO.

SHUT DOWN TH

B. SHUTDOWN OTHER  
THAN NORMAL CON-  
TROLLED SHUTDOWN  
FOR THE PURPOSE OF  
PLACING THE PLANT  
IN A SAFER CON-  
DITION OR COOL-  
DOWN RATE EXCEEDS  
TECH SPEC LIMITS.

UNUSUAL  
EVENT

VARIOUS INDICATIONS  
OF REACTOR SCRAM OR  
ABNORMAL COOLDOWN  
RATE.

VERIFY STATU  
PLANT SAFETY  
SYSTEMS.  
SHIFT TECHN  
ADVISOR ASSI