U. S. Department of Energy

Princeton Plasma Physics Laboratory

Environmental Monitoring Plan

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The DOE PPPL
Environmental Monitoring Plan
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1.0 INTRODUCTION

The objective of the Department of Energy Princeton Plasma Physics Laboratory's (the DOE PPPL) "Environmental Monitoring Plan" is 1) to demonstrate compliance with legal and regulatory requirements of applicable federal, state, and local agencies, 2) to confirm adherence to U. S. Department of Energy's (DOE) environmental protection policies, and 3) to document the DOE PPPL's environmental monitoring programs. Contained in this plan are five media monitored for radiological and non-radiological parameters: meteorology, air, surface water, ground water and wastewater.

The DOE PPPL prepared this plan in accordance with DOE Order 450.1, "Environmental Protection Program," effective January 15, 2003. Each section of the plan not including the Meteorological Plan is divided into two categories: effluent monitoring (mandated) and environmental surveillance (best management practices or BMP). Tables 1.1 and 1.2 present a summary of the Effluent Monitoring Program requirements and reporting and the Environmental Surveillance Program rationale, respectively. For each plan, the following items are described:

1. Rationale and design criteria for monitoring program.
2. Extent and frequency of monitoring and measurements.
3. Reference to procedures for laboratory analyses.
4. Quality assurance requirements.
5. Reference to program implementation procedures.
6. Direction for preparation and disposition of reports and/or records.

This Plan will be reviewed annually and updated every three years.

Table 1.1 The DOE PPPL Effluent Monitoring Program

Media	Radiological Program Requirement & Reporting	Non-Radiological Program Requirement & Reporting
Air	Federal regulation (40 CFR 61) National Emission Standards for Hazardous Air Pollutants (NESHAPs) Subject to annual inspection by USEPA	Clean Air Act Amendments of 1990: Title V Permitting Program DOE & the DOE PPPL received exemption based on nitrogen oxide emissions below threshold of 25 tons/year for a severe non-attainment area. Data records maintained by the DOE PPPL for review by NJDEP
Biota	None required	See Water – Surface Quarterly Chronic Toxicity Test
Meteor-ological	None required	None required
Soil	None required	See Environmental Restoration Program
Water:		
Ground	None required	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit No. 0086029 See Environmental Restoration Program
Sanitary	N.J.A.C. 7:28 – "Bureau of Radiation Protection" regulations DOE Order 5400.5 – "Radiation Protection of the Public and the Environment" Stony Brook Regional Sewerage Authority Industrial Discharge License (22-967-NC) Monthly Discharge Report – Self Reporting Form	Stony Brook Regional Sewerage Authority Industrial Discharge License (22-967-NC) Monthly Discharge Report – Self Reporting Form
Storm	None required	None required
Sump	None required	See Environmental Restoration Program
Surface	None required	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit No. 0023922 Monthly surface water discharge monitoring report (DMR) Annual Chronic Toxicity Test report

Note: All data are included in Princeton Plasma Physics Laboratory's Annual Site Environmental Reports.

Table 1.2 The DOE PPPL Environmental Surveillance Program

Media	Radiological Program Rationale	Non-Radiological Program Rationale
Air	To monitor inhalation and absorption exposure pathways: Weekly measurements: Onsite (TFTR stack and 4 locations T1-T4) Offsite (6 locations) Baseline (one location)	Monitor changes in operations and/or equipment that may affect air permitting requirements. Biennial review and revision to air inventory NEPA – ongoing review process
Biota	To monitor ingestion exposure pathway: Annual measurements	Monitor ecology of environs: Periodic observations of terrestrial and aquatic life forms.
Soil	None	None performed routinely. In case of spills on ground, samples are collected as needed.
Water:		
Ground	To monitor ingestion (drinking water *via* surface water) exposure pathway:	None, as ground water near PPPL is not used for potable water.
Sanitary	None	None
Storm/Rain Water	To measure wash out from TFTR, both on- and off-site locations. As needed - on-site (9 locations plus one duplicate) As needed – off-site (6 locations plus one baseline location)	None
Sump	To monitor ingestion (drinking water *via* surface water) exposure pathway: Monthly – D site (2 locations)	Measure quantity of ground water discharged to basin and surface water. Monthly – flow reading (4 locations)
Surface	To monitor ingestion exposure pathway: Monthly – on-site location (1) and off-site location (1) Quarterly – on-site location (1) and off-site locations (4)	Monitor water quality of discharge, Bee Brook, and other nearby surface water. Monthly – on-site location (1) and off-site location (1) Quarterly – on-site location (1) and off-site locations (4)

Note: All data are included in Princeton Plasma Physics Laboratory's Annual Site Environmental Report.

FIGURE 1.1

GENERAL SITE MAP

PRINECTON PLASMA PHYSICS LABORATORY
PLAINSBORO, NEW JERSEY

2.0 Meteorological Plan

At the Department of Energy Princeton Plasma Physics Laboratory (the DOE PPPL), meteorological data are collected for general informational purposes.

2.1 Meteorological Monitoring Program Description

2.1.1 Meteorological Tower

A 60-meter high meteorological tower was installed at the DOE PPPL in November 1983 to characterize site meteorological conditions and to fulfill a commitment made in the "Final Environmental Statement for the Tokamak Fusion Test Reactor" [ERDA75]. That commitment was to establish a program prior to deuterium-tritium (D-T) operations for continuously recording wind speed and wind direction (a 10-meter tower with instrumentation measuring wind speed, wind direction, and standard deviation of wind direction operated at the DOE PPPL from 1977-1982). Instrumentation on the existing tower monitored horizontal wind speed, horizontal wind direction, air temperature, dew point, barometric pressure, air temperature difference (ΔT) between the upper and lower levels of the tower, and the standard deviation of the horizontal wind direction. The meteorological monitoring station was designed to be consistent with the requirements of the Nuclear Regulatory Commission (NRC) Regulatory Guide 1.23 [NRC72].

The tower is located on C-site, south of the D-site motor generator (MG) Building (see Figure 3.1). It rests on a concrete base and is supported by three (3) guy wires connected to anchors located 120 feet from the tower. TRC Environmental Consultants, Inc. of Windsor, Connecticut erected the tower. Wind speed and wind directions are measured at the 10-, 30-, and 60- meter levels. Air temperature and dew point were measured at the 10-meter and 30-meter levels; standard deviation of the horizontal wind direction was measured at the 30- and 60-meter levels; ΔT was measured using the 10- and 60-meter level data.

Meteorological data collection and instrument calibrations have been terminated, because these data are not currently used or considered to be needed for projected dose calculations, emergency response, or other purposes. Based on the current and near-term projected status of DOE PPPL facilities and operations, there are no DOE orders, other regulations, nor directives that require the collection of on-site meteorological data. The tower remains in place for potential future needs, and periodic inspections are conducted to ensure tower integrity.

The models normally used to determine relative atmospheric concentration (X/Q) resulting from a release of radioactive or hazardous material generally use dispersion parameters that are based on actual

dispersion tests over “typical” terrain. This is normally relatively, flat, open terrain, which provides a minimum of mechanical turbulence. Most of the models allow for consideration of building wake effects, which will tend to create a somewhat more realistic calculation. However, the DOE PPPL site has two additional factors, which make it very difficult to accurately predict the concentration of released effluents at the site boundary using these conventional methods. The first of these is the very complex terrain at the site. The large number of buildings and the wooded areas surrounding the site tend to create significant mechanical turbulence, which has been shown to greatly increase the dispersion of effluents in the vicinity of a facility. Secondly, the site boundary is very close to the potential release points (less than 150 meters in some cases). Most of the data used in conventional dispersion models are based on measurements taken at greater distances, typically 1,000 to 10,000 meters. The data available for shorter distances are generally not adequate to accurately predict results at locations very close to the release point.

Where these types of special conditions exist, the Nuclear Regulatory Commission (NRC) Regulatory Guide 1.145 [NRC82] suggests the use of site-specific dispersion tests for a more accurate representation of the actual conditions. With this in mind, the National Oceanic and Atmospheric Administration (NOAA) was contracted by the Department of Energy, Princeton Area Office (DOE-PAO) in 1988, to conduct a series of tests to better characterize the actual dispersion conditions at the DOE PPPL. These tests, whose details and results are documented in the Final NOAA Report [St89], were performed during the period from July 28 through September 21, 1988. Three ground level release points and one release point through the TFTR stack were used with a total of about 100 receptor points. Three separate release points were used during each of the 14 test series, with each release point using a different tracer gas to determine the contribution of each point to the total concentration at a given receptor point. Each release had a duration of six hours, with samples being taken every thirty minutes, resulting in 12 samples per test. The combination of various tracer gases, receptor points, and samples gave a total of about 50,000 measurements of X/Q.

As anticipated, comparison of X/Qs obtained from tracer measurements with those calculated using standard Gaussian models reveal much greater dilutions of short term airborne effluent concentrations (by up to a factor of 16) than predicted by the models, as well as some reductions in long term airborne effluent concentrations. The results of the site-specific tests have been used to determine values of X /Q to project off-site consequences due to postulated routine and off-normal (accidental) releases of radionuclides from D-site operations and/or safe-shutdown mode for TFTR. In addition, the EPA has approved the use of tracer gas test-derived X /Qs in place of X /Qs calculated by the standard EPA computer codes for demonstrating compliance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) regulations [CFR90] for radionuclides under the Clean Air Act Amendments of 1990.

2.1.2 Rain Gage

In 1988, a rain gage was installed on D-site (see Figure 2-1 and Appendix 2-A) to collect and monitor precipitation amounts. The Belfort Instrument Company of Baltimore, MD Catalogue No. 5-780 Series Universal Recording Rain Gage is a weighing-type gage in which a weighing mechanism converts the weight of the rainfall caught by a circular opening at the top of the gage into the curvilinear movement of a recording pen. The pen makes an inked trace on a rectangular paper chart. The chart, graduated in inches of rainfall, is wrapped around a vertical cylinder, which is rotated by a chart drive. The rain falls through the 8-inch diameter collector and is caught in a bucket resting on a platform mounted to the vertical link of a 4-bar linkage, which is supported from the mechanism frame by a precision extension-spring assembly.

The accuracy of the gage is 0.33-0.5 percent of full scale (for a temperature range from -40° to +125°F. The sensitivity of the instrument is 0.05 inch of precipitation, and the chart timing accuracy is within 14 minutes per week. According to the manufacturer, the gage has been built to National Weather Service Specifications #450.2201 and #450.2203.

The rain gage charts are removed and changed by the DOE PPPL personnel once per week (usually on Monday mornings), at which time the bucket is emptied. The DOE PPPL personnel enter data from the charts onto a computer program database, and the charts are then stored. The DOE PPPL personnel perform calibration of the gage once per year, according to the calibration procedures outlined in the rain gage instruction manual [Be86].

2.2 Report Preparation and Dissemination

Rain Gage

Data from the rain gage is submitted in tabular and graphic formats to the DOE PPPL Environmental Restoration and Waste Management Division for inclusion in the “The DOE PPPL Annual Site Environmental Report.”

2.3 References – Meteorological

CFR90 Title 40, Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants."

ERDA75 Final Environmental Statement, Tokamak Fusion Test Reactor Facilities, ERDA-1544, July 1975.

NRC72 U.S. Nuclear Regulatory Commission Regulatory Guide 1.23, Meteorological Monitoring Program for Nuclear Power Plants, 1972.

NRC82 U.S. Nuclear Regulatory Commission Regulatory Guide 1.145, Atmospheric Dispersion Conditions for Potential Accident Consequence Assessments at Nuclear Power Plants, Rev. 1, 1982.

St89 Start, G.E., Dickson, C.R., Sagendorf, J.F., Ackermann, G.R., Clawson, K.L., Johnson, R. C., and Hukari, N.F., "Atmospheric Diffusion for Airflows in the Vicinity of the James Forrestal Campus, Princeton University," Final Report, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Air Resources Laboratory Field Research Division, Idaho Falls, Idaho, Vol. 1, (May 1989) and Vol.2 (June 1989), 385 pp.

3.0 Air Plan

The DOE PPPL holds operating air permits for the following equipment: four utility boilers, two above-ground fuel storage tanks, three dust collectors, and two stand-by diesel generators (Table 3.1). Figure 3.1 shows the approximate locations for the air-permitted equipment.

The DOE PPPL has no non-radiological sampling requirements under the New Jersey Bureau of Air Pollution Control regulations [NJAC7:27]. The radiological monitoring requirements are discussed in Section 6.0, "Radiological Monitoring Plan," in this plan.

In August 1995, the DOE PPPL submitted to the NJDEP a request for Annual Emission Statement Non-Applicability. To support this non-applicability request, the DOE PPPL determined the maximum annual quantity of air contaminants 1) allowed to be emitted from each permitted source, 2) emitted from all other source operations, 3) and emitted as fugitive emissions. The only regulated air contaminant that has the potential to be emitted by the DOE PPPL source operations above the air contaminant thresholds is nitrogen oxides (NO_x). The air contaminant reporting threshold for NO_x, in accordance with NJAC 7:27-21.2 is 25 tons per year. The DOE PPPL determined that its potential to emit NO_x from permitted sources operating under federally enforceable permit conditions is below this threshold. In March 1996, the NJDEP approved the DOE PPPL's request for Non-Applicability for the Annual Emission Statement.

In addition to filing the non-applicability statement request, the DOE PPPL submitted a negative declaration for the New Jersey Operating Permit Program. The Clean Air Act Amendments (CAAA) Title V – Operating Permit Program – is implemented through the State of New Jersey. The negative declaration for the DOE PPPL was submitted to NJDEP in August 1995, and was approved in March 1996, with an effective approval date of November 29, 1995. The effective approval date reflects the date that the TFTR stand-by diesel generator operating hours were reduced, which in turn, reduced the facility's potential to emit NO_x to below the 25-ton-per-year threshold.

In October 1995, the DOE PPPL requested of NJDEP a total fuel-use limit for all four boilers. NJDEP granted that request and imposed a maximum annual fuel use limitation for the C site boilers of 227,370 gallons of No. 4 fuel oil and 88.6 million cubic feet of natural gas. Previously, each boiler was limited by a specific fuel use for No. 4 fuel oil and natural gas. That arrangement did not allow the boilers to operate at maximum efficiency, because specific boilers would be restricted to burn oil during optimal environmental conditions. The DOE PPPL maintains operating records to demonstrate compliance with the fuel consumption restrictions; for instance, during CY 2001, a total of 42,983 gallons #4 fuel oil and 37 million cubic feet natural gas were consumed, which were both well below the fuel use limitations.

Table 3.1 Air Environmental Permits (Facility Id # 15952)

NJDEP Permit No.	Operating Equipment	Expiration Date
PCP960003	Boiler #2 Stack	5/4/03
PCP960004	Boiler #3 Stack	5/4/03
PCP960005	Boiler #4 Stack	5/4/03
PCP960006	Boiler #5 Stack	5/4/03
PCP9600011	AGT 25,000 gallon #4 fuel oil	10/25/04
PCP960002	D site Stand-by diesel generator	10/24/04
PCP960007	C site stand-by diesel generator	6/28/05
PCP960008	CAS Dust Collector	3/10/03
PCP960009	FED Dust Collector	7/23/03
PCP9600010	Shop Dust Collector	7/23/03
PCP9600012	AGT 15,000 gallon #1 diesel oil	10/25/03

3.1 Effluent Monitoring - Air

As indicated above, there are no requirements to monitor non-radiological air emissions. Therefore, no program at the DOE PPPL currently exists.

3.2 Environmental Surveillance – Air

To date, the DOE PPPL has not established an environmental surveillance program to monitor air emissions. The Laboratory identified the point and non-point (fugitive) emission sources. The air emission source inventory is reviewed and updated tri-annually.

3.3 Air Program – Quality Assurance

The DOE PPPL has no quality assurance plan for air monitoring as no monitoring program is required.

3.4 Air Program Implementation Procedures

The DOE PPPL has no air program implementation procedures as no monitoring program is required.

3.5 References - Air

CAA90 Clean Air Act Amendments, P. L. 101-549.

NJAC New Jersey Administrative Code, Title 7, Chapter 27, “Bureau of Air Pollution Control.”

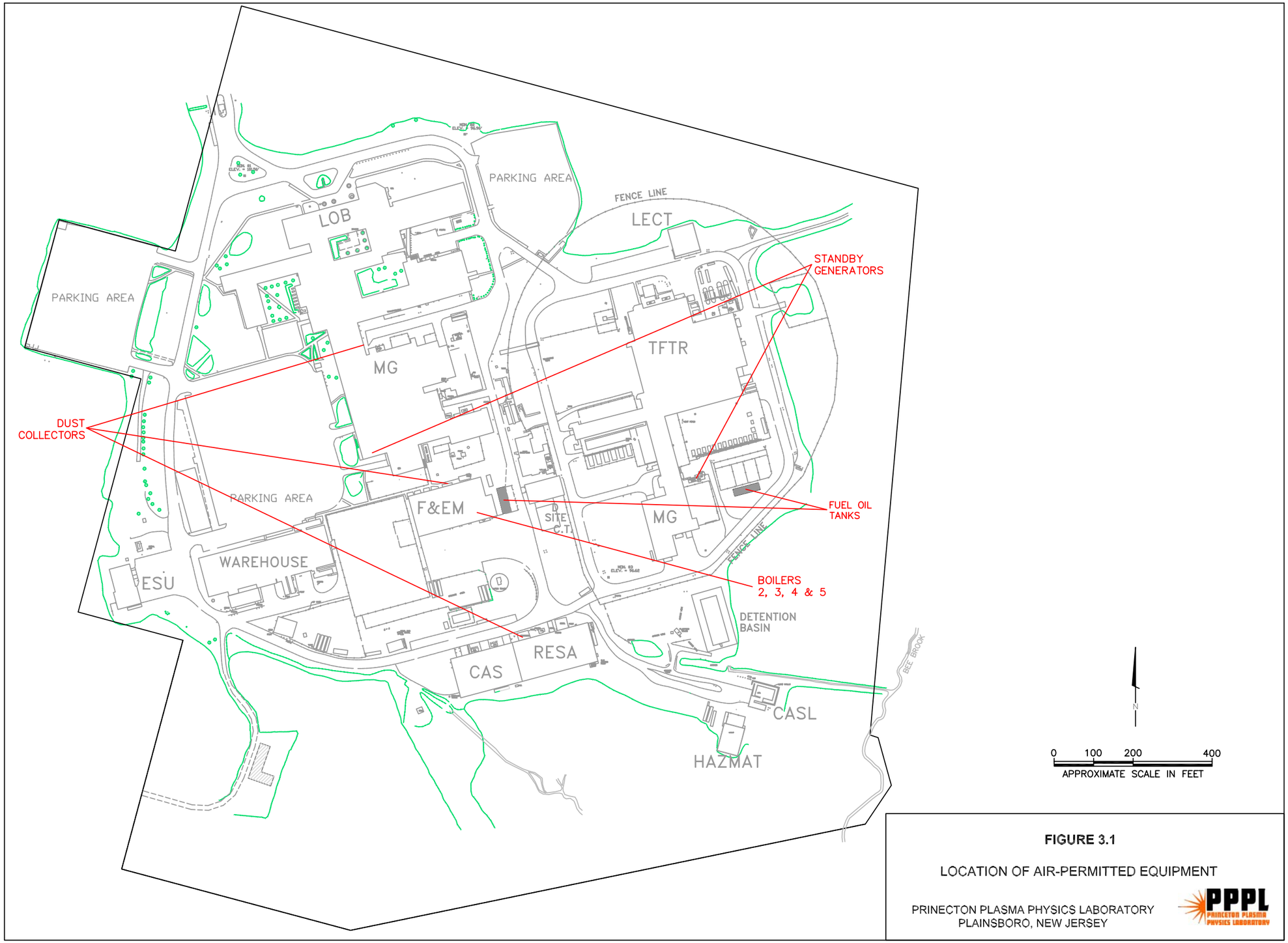


FIGURE 3.1

LOCATION OF AIR-PERMITTED EQUIPMENT

PRINECTON PLASMA PHYSICS LABORATORY
PLAINSBORO, NEW JERSEY

4.0 Water Plan

The DOE PPPL has a New Jersey Pollutant Discharge Elimination System (NJPDES) permit, number NJ0023922, for its discharge to surface water. The ground water program previously regulated under its own NJPDES permit is discussed in the next section. The sources of the discharge water at DSN001 are non-contact, equipment cooling-water, cooling tower blow-down from C-site and D-site cooling towers, boiler blow-down from Boilers 2 and 3, building sump pumps (ground water), storm-water runoff, and monthly fire-main flushing (Figures 4.1 and 4.2). The calendar year 2001 average of 250,000 gallons of water per day from the above listed sources, plus storm water, are discharged from the detention basin into Drainage ditch #5, which flows to Bee Brook, a tributary of the Millstone River. At the Delaware & Raritan Canal (D&R), DSN003 is the discharge point from the filter backwash, which discharges as the pumps turn on or on pressure differential across the screens. The entire site lies within the Raritan River watershed (Figure 4.3).

Sanitary waste water discharges to the South Brunswick sewerage treatment plant, which is part of the Stony Brook Regional Sewerage Authority (SBRSA). The liquid effluent collection tanks (LECTs) are monitored prior to each discharge. Tritium concentrations, pH, chemical oxygen demand (COD), and temperature are reported monthly to SBRSA.

4.1 Effluent Monitoring - Water

4.1.1 Regulatory and Compliance Requirements

The DOE PPPL maintains two New Jersey Pollutant Discharge Elimination System (NJPDES) permits: one to discharge to surface water (NJ0023922) and one to discharge to ground water (NJ0086029).

The DOE PPPL operates under the requirements of New Jersey Pollutant Discharge Elimination System (NJPDES) surface water discharge permit (NJ0023922). The NJDEP issued the renewed surface water permit on April 29,1999, effective date of June 1, 1999 [NJDEP99]. The NJPDES surface water permit expires on May 31, 2004.

The permitted monitoring locations are the detention basin outfall, discharge serial number 001 (DSN001), and the filter backwash discharge (DSN003) at the Delaware & Raritan Canal pump house. These two locations are designated as monthly sampling points. In June 1996, sampling at DSN002 was discontinued as it was eliminated from the permit requirements. DSN002 was located on the southwestern boundary where storm water runoff flowed to the wetlands area south of the DOE PPPL.

The DOE PPPL completed the identification of wastewater streams (industrial discharge) into the Stony Brook Regional Sewerage Authority (SBRSA) system. A site sanitary survey was completed in 1993 and updated in 1995. It is estimated that approximately 3 percent of the combined sewerage flow from the DOE PPPL is classified as industrial wastewater and 97 percent as domestic wastewater. In 2000, SBRSA renewed DOE-PPPL's discharge license requiring monthly sampling of the liquid effluent collection tank (LECT) discharge, which collects water from D site. LECT tank data (volume of discharged water, tritium concentration, pH, chemical oxygen demand (COD), and temperature) are reported monthly to SBRSA.

4.1.2 Safe Drinking Water Act (SDWA)

The DOE PPPL receives its drinking water from Elizabethtown Water Company. While Elizabethtown is responsible for providing safe drinking water, the DOE PPPL periodically tests incoming water quality. In 1994, the DOE PPPL installed a new back-flow prevention system beneath the elevated water tower. In the event of a fire or other emergency situation, the DOE PPPL can switch from Delaware & Raritan Canal water (non-potable) to potable water for its non-contact water supply.

On a quarterly frequency, the DOE PPPL inspects and pressure tests the back flow prevention equipment at both locations: the main potable water connection, where Elizabethtown water enters C-site and the new system beneath the elevated water tower. Back-flow prevention equipment prevents contamination of the potable water supply *via* a large cross-connection. On an annual basis, these systems are completely disassembled, inspected, and tested in the presence of an Elizabethtown Water Company representative. In order to maintain an uncontaminated potable water supply, other cross-connection equipment is tested annually. Inspection reports are submitted to the NJDEP annually.

4.1.2 Sampling Program

The DOE PPPL 's non-radiological effluent monitoring program for water is provided in the following table. The three sampling locations are DSN001, DSN003, and the liquid effluent collection tanks. At DSN001, an annual chronic toxicity test is also conducted. Chemical analyses are conducted by an NJDEP-certified subcontractor laboratory or by PPPL's analytical laboratory – Princeton Environmental, Analytical, and Radiological Laboratory (PEARL).

Table 4.1 The DOE PPPL Non-Radiological Effluent Monitoring Program - Water

Media:	Requirement and Data Reporting	Location Descriptions	Frequency & Parameters
Sanitary	Stony Brook Regional Sewerage Authority Industrial Discharge License (22-96-NC); Monthly Discharge Report; also, data in Annual Site Environmental Report	Liquid Effluent Collection Tank (LECT): 3 tanks (15,000 gallon capacity each) located on D site north of the Mockup Building; tanks collect from floor drains –no sanitary lines.	Temperature, chemical oxygen demand, and pH prior to release each tank.
Storm	None required		
Sump	None required		
Surface	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. 0023922; Monthly Surface Water Discharge Monitoring Report (DMR); also, data in Annual Site Environmental Report	*Monthly on-site:* DSN001 basin discharge point located south of basin at end of concrete outflow pipe.	*Monthly:* Temperature pH Chemical oxygen demand Total suspended solids Petroleum hydrocarbons Flow Chlorine-produced oxidants *Quarterly:* Phosphorus, total Tetrachloroethylene
Surface	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. 0023922; Monthly Surface Water Discharge Monitoring Report (DMR); also, data in Annual Site Environmental Report	*Monthly off -site:* DSN003 Delaware & Raritan Canal source water for DOE PPPL non-contract water; at pump house filter backwash discharge into D&R Canal.	*Monthly:* Temperature pH Chlorine-produced oxidants Petroleum hydrocarbons *Quarterly:* Total suspended solids
Surface	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. 0023922; Monthly Surface Water Discharge Monitoring Report (DMR); also, data in Annual Site Environmental Report	*Monthly off -site:* C1 Delaware & Raritan Canal source water upstream of DSN003; D&R Canal Park footbridge (mid-span).	*Quarterly:* Total suspended solids
Surface	State regulation (N.J.A.C. 7:14A) New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. 0023922; Annual Chronic Toxicity Test Report; also, data in Annual Site Environmental Report	*Annually on-site:* DSN001 basin discharge point located south of basin at end of concrete outflow pipe.	*Annually* Chronic toxicity test on Fathead minnow (*Pimephales promelas)*

4.1.3 Quality Assurance

An NJDEP-certified analytical laboratory is required to have a Quality Assurance/Quality Control Plan, which is followed to assure data validity. The required frequency for spikes, blanks, duplicates, and blind samples, sample chain-of-custody, and sample identification system are described in the Quality Assurance/Quality Control Plan of the analytical laboratory. When the DOE PPPL receives the data package, the quality assurance section of the report is checked for completeness and for compliance with holding time requirements*, i.e.,* the time and/or date that each analysis was performed does not exceed the allowable holding time. If any holding time was exceeded, then the data will be considered invalid and so reported on the Discharge Monitoring Report (DMR), noting that the holding time was exceeded. The DOE and NJDEP are notified of such occurrences.

A separate quality assurance sample is supplied by the DOE PPPL and analyzed by the subcontract laboratory. The results are compared to known values and acceptance criteria. If the results are outside the acceptance criteria, the subcontract laboratory is notified. Subcontract laboratory is expected to resolve the problem before the next round of samples are analyzed.

The DOE PPPL's Quality Assurance Division may audit the subcontractor during the course of the contract. The DOE PPPL's Environmental Compliance Head will also participate as the technical expert during audit.

4.1.4 Report Preparation and Reporting Requirements

For the NJPDES surface water discharge permit, the DOE PPPL developed procedures for the preparation of the Discharge Monitoring Reports (DMRs) (EM-OP-34). The data are received from the subcontract laboratory approximately four weeks following sample collection. For the surface water permit, each month data are transferred to the DMR forms, which contain parameter limits. The DMRs are submitted by the twenty-fifth day of the month following when the samples were collected. Flow measurements are measured in gallons per minute (GPM) for DSN003 and millions of gallons per day (MGD) for DSN001. For DSN001, flow data are downloaded from a data-logger that records flow every five minutes from the transducer mounted in the outfall chamber in the basin. Hourly and daily averages are calculated from the five-minute data and are used to calculate the daily average flow that is reported on the DMR. For DSN003, the average pump time for the filter backwash is used to calculate the flow.

For the Stony Brook Regional Sewerage Authority, a monthly self-monitoring report is submitted with the data for tritium concentration, temperature, chemical oxygen demand (COD), and pH.

In addition to monthly surface DMRs and SBRSA reports, an Annual Report for the NJDEP Physical Connection permit including quarterly inspection reports are submitted once each year (April/May), as discussed in Section, 4.1.2, "Safe Drinking Water Act."

4.2 Surveillance Monitoring – Water

4.2.1 Background Data

The DOE PPPL has a surface water program, which includes the periodic sampling of locations not required by the NJPDES permit. In general, the Laboratory is proactive in assessing possible impacts to the environment. Through the National Environmental Policy Act (NEPA) procedure at DOE PPPL, the use of chemicals, particularly hazardous materials, are monitored in order to reduce the risk of environmental impacts as well as to protect the worker. Pollution prevention and waste minimization are stressed by Laboratory management.

4.2.2 Sampling Program

Sampling stations are located in Figures 4-2 and 4-3. They include an upstream (B1) and downstream (B2) station on Bee Brook, the potable water source (E1), the Delaware & Raritan Canal (C1), the Millstone River (M1), and two upstream tributaries to the Millstone River (P1 – Cranbury Brook and P2 – Devils Brook). These stations are sampled quarterly, in February, May, August, and November. Chemical analyses are conducted by a NJDEP-certified subcontractor laboratory or by PPPL's analytical laboratory – Princeton Environmental, Analytical, and Radiological Laboratory (PEARL).

4.2.3 Quality Assurance

A NJDEP certified analytical laboratory is required to have a Quality Assurance/Quality Control Plan/Program, which is followed to assure data validity. The required frequency for spikes, blank, duplicates, and blind samples, chain-of-custody, and sample identification system are described in their plan. When the DOE PPPL receives the data package, the quality assurance section of the report is checked for completeness and for compliance with holding time requirements*, i.e.,* the time and/or date that each analysis was performed does not exceed the allowable holding time. If the sample(s) was not analyzed within the allowable time, the sample result(s) is invalid. Once each year, the DOE PPPL supplies the analytical laboratory with blind samples for analysis. Duplicates are also performed once each year. These results are checked for conformance with known values and in the case of the duplicates, with each other.

Table 4.2 Non-Radiological Surveillance Program - Water

Media: & Rationale	Frequency/Location Rationale	Location Descriptions	Parameters
Sanitary	*None*		
Storm	*None*		
Surface *To monitor water quality of the DOE PPPL discharge, Bee Brook, and other nearby surface water.*	*Quarterly* Off-site (5 locations): Bee Brook upstream, Bee Brook downstream Millstone River downstream Cranbury Brook upstream-tributary to Millstone River Devil's Brook upstream-tributary to Millstone River On-site Baseline: Elizabethtown Water Co. drinking water source at DOE PPPL	Off-site: B1 Bee Brook 100 feet upstream of discharge ditch #5 (from DOE PPPL basin). B2 Bee Brook 250 feet downstream of discharge ditch #5 (from DOE PPPL basin) M1 Millstone River at Route 1 North P1 Cranbury Brook at Davison Road, Plainsboro. P2 Devil's Brook turn right off Schalks Road north just before railroad bridge overpass; stay straight for 400 feet to small bridge over Devil's Brook. E1 Elizabethtown Water Co. at Guard Booth #6 tap	Temperature pH Chemical oxygen demand Total suspended solids Oxidation-Reduction Potential (ORP)
Surface *To monitor water quality of DOE PPPL discharge*	*Monthly —(3 locations)* On-site (1 location) basin discharge Off-site (1 location) Delaware & Raritan Canal source for DOE PPPL non-contact water.	*NJPDES locations:* DSN001 - basin discharge point located south of basin at end of concrete pipe (2-foot diameter). DSN003 – at pump house filter backwash discharge into D&R Canal. Route 1 south turn right onto Mapleton Road (Plainsboro). 1 mile to pump house on left side. C1 D&R Canal. Route 1 south turn right onto Mapleton Road (Plainsboro). 0.2 mile to D&R Canal State Park. Mid-point of foot bridge.	Oxidation-Reduction Potential (ORP)

4.3 References – Water

APHA American Public Health Association, American Water Works Association, and Water Pollution Control Federation, Standard Methods for the Examination of Water and Wastewater, 17th edition.

DOE90 Department of Energy Order 5400.1, June 29, 1990, General Environmental Protection Program.

EPA83 U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, March 1983, Environmental Monitoring and Support Laboratory, Office of Research and Development, EPA-600 4-79-020.

NJAC7 Title 7, New Jersey Administrative Code, Chapter 14A, "New Jersey Pollutant discharge Elimination System."

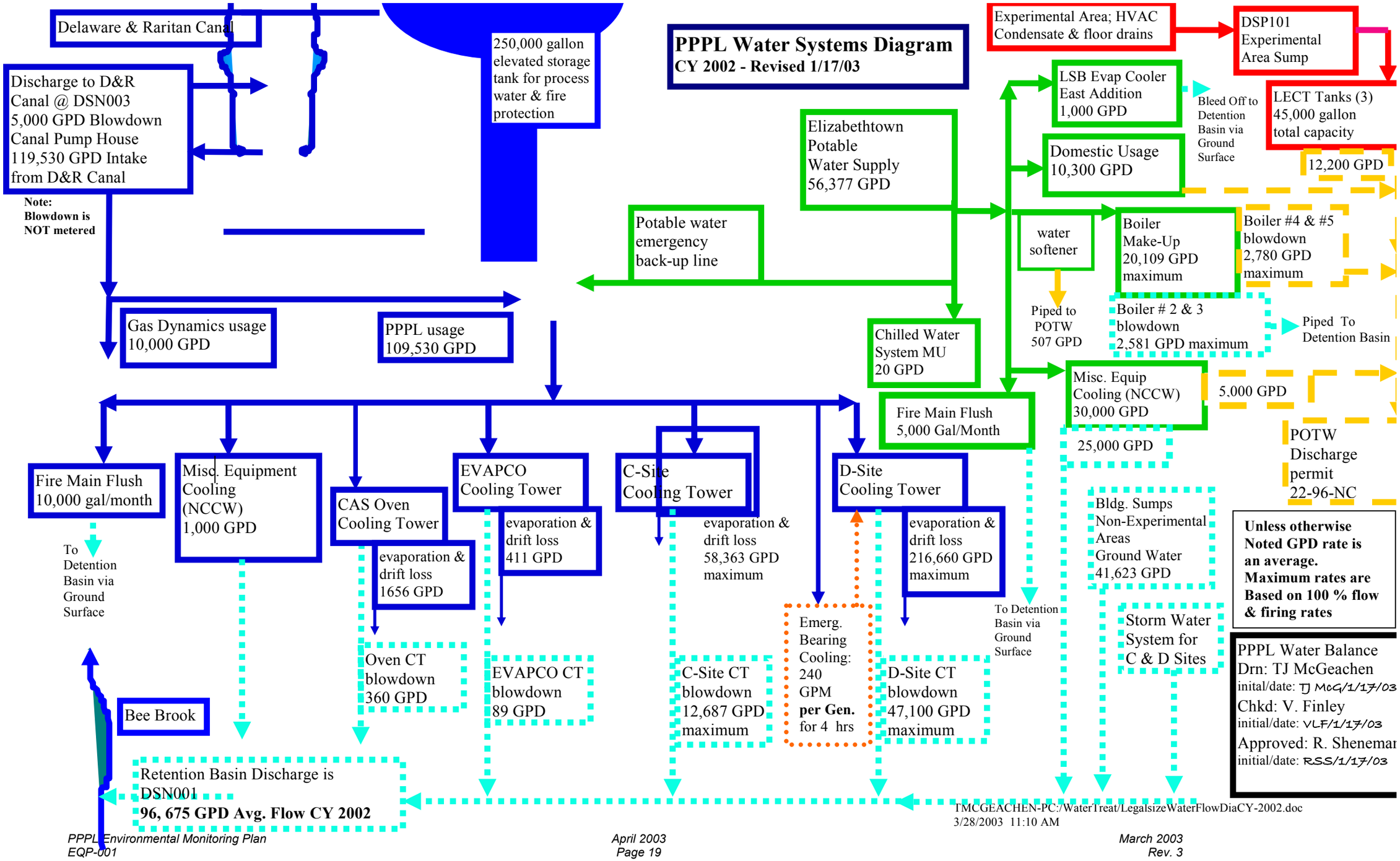
NJDEP99 New Jersey Department of Environmental Protection, New Jersey Pollutant Discharge Elimination System Permit, NJ0023922, effective June 1, 1999, expiration date May 31, 2004.

PPPL99 Princeton Plasma Physics Laboratory, "Institutional Quality Assurance Plan," date.

PPPL99 Princeton Plasma Physics Laboratory, GEN-006, "Occurrence Reporting and Processing of Operations Information, " date.

PPPL01 Princeton Plasma Physics Laboratory, EM-OP-31, "Surface Water Sampling Procedure, " August 2001.

SBRSA Stony Brook Regional Sewerage Authority, License No.22-93-NC, " 8/1/00 to 8/1/04.


PPPL Water Systems Diagram
CY 2002 - Revised 1/17/03
Delaware & Raritan Canal
Discharge to D&R Canal @ DSN003
5,000 GPD Blowdown
Canal Pump House
119,530 GPD Intake from D&R Canal
Note: Blowdown is NOT metered
250,000 gallon elevated storage tank for process water & fire protection
Experimental Area; HVAC Condensate & floor drains
DSP101 Experimental Area Sump
LSB Evap Cooler East Addition 1,000 GPD
Bleed Off to Detention Basin via Ground Surface
LECT Tanks (3) 45,000 gallon total capacity
Elizabethtown Potable Water Supply 56,377 GPD
Domestic Usage 10,300 GPD
12,200 GPD
Potable water emergency back-up line
water softener
Boiler Make-Up 20,109 GPD maximum
Boiler #4 & #5 blowdown 2,780 GPD maximum
Piped to POTW 507 GPD
Boiler # 2 & 3 blowdown 2,581 GPD maximum
Piped To Detention Basin
Gas Dynamics usage 10,000 GPD
PPPL usage 109,530 GPD
Chilled Water System MU 20 GPD
Misc. Equip Cooling (NCCW) 30,000 GPD
5,000 GPD
Fire Main Flush 5,000 Gal/Month
25,000 GPD
POTW Discharge permit 22-96-NC
Fire Main Flush 10,000 gal/month
Misc. Equipment Cooling (NCCW) 1,000 GPD
CAS Oven Cooling Tower
EVAPCO Cooling Tower
C-Site Cooling Tower
D-Site Cooling Tower
To Detention Basin via Ground Surface
evaporation & drift loss 1656 GPD
evaporation & drift loss 411 GPD
evaporation & drift loss 58,363 GPD maximum
evaporation & drift loss 216,660 GPD maximum
Bldg. Sumps Non-Experimental Areas Ground Water 41,623 GPD
Unless otherwise Noted GPD rate is an average. Maximum rates are Based on 100 % flow & firing rates
To Detention Basin via Ground Surface
Emerg. Bearing Cooling: 240 GPM per Gen. for 4 hrs
Storm Water System for C & D Sites
Oven CT blowdown 360 GPD
EVAPCO CT blowdown 89 GPD
C-Site CT blowdown 12,687 GPD maximum
D-Site CT blowdown 47,100 GPD maximum
PPPL Water Balance
Drn: TJ McGeachen
inital/date: TJ McG/1/17/03
Chkd: V. Finley
initial/date: VLF/1/17/03
Approved: R. Shenemar
initial/date: RSS/1/17/03
Bee Brook
Retention Basin Discharge is DSN001
96, 675 GPD Avg. Flow CY 2002
TMCGEACHEN-PC:/WaterTreat/LegalsizeWaterFlowDiaCY-2002.doc
3/28/2003 11:10 AM

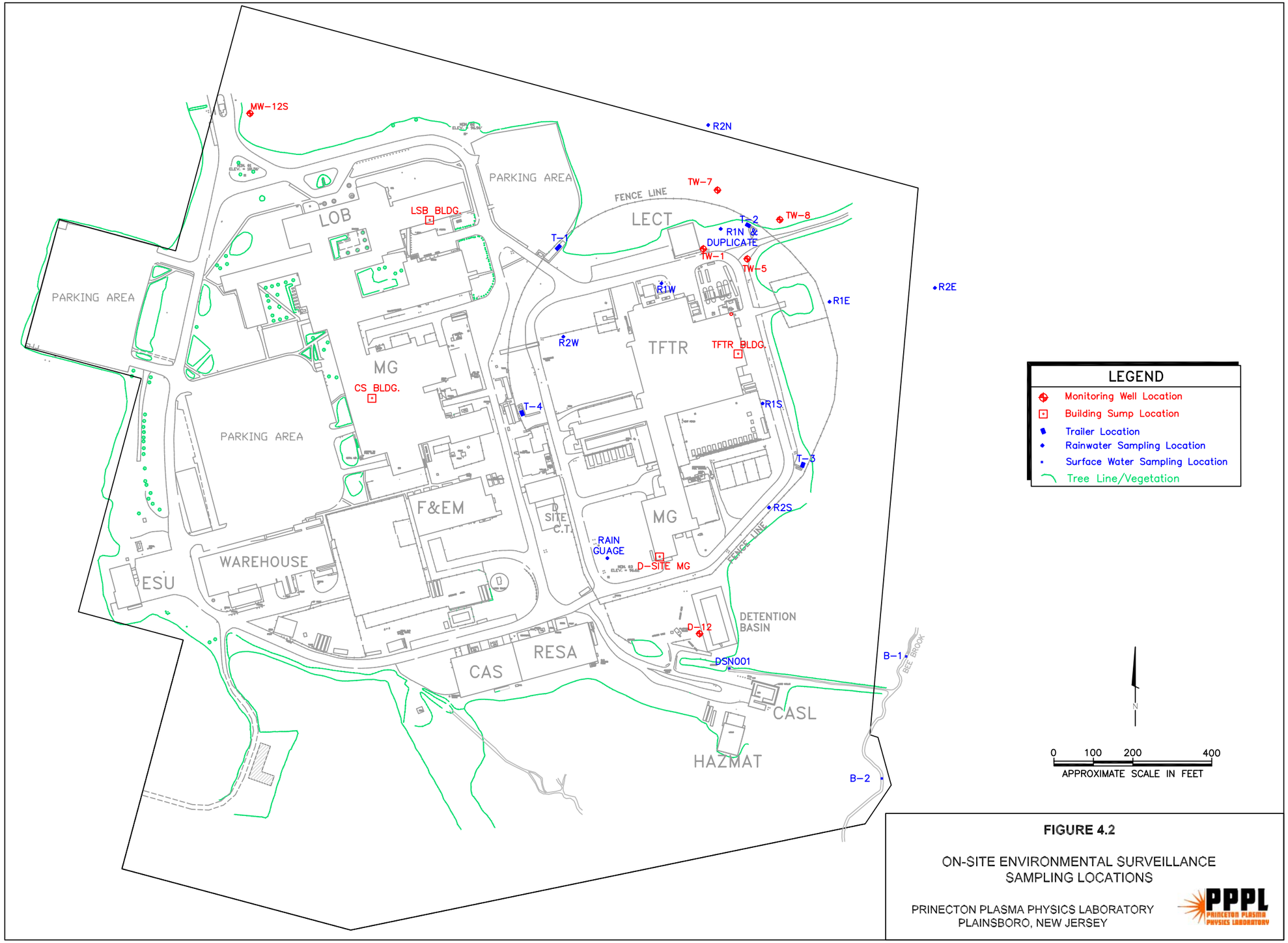


FIGURE 4.2

ON-SITE ENVIRONMENTAL SURVEILLANCE
SAMPLING LOCATIONS

PRINECTON PLASMA PHYSICS LABORATORY
PLAINSBORO, NEW JERSEY

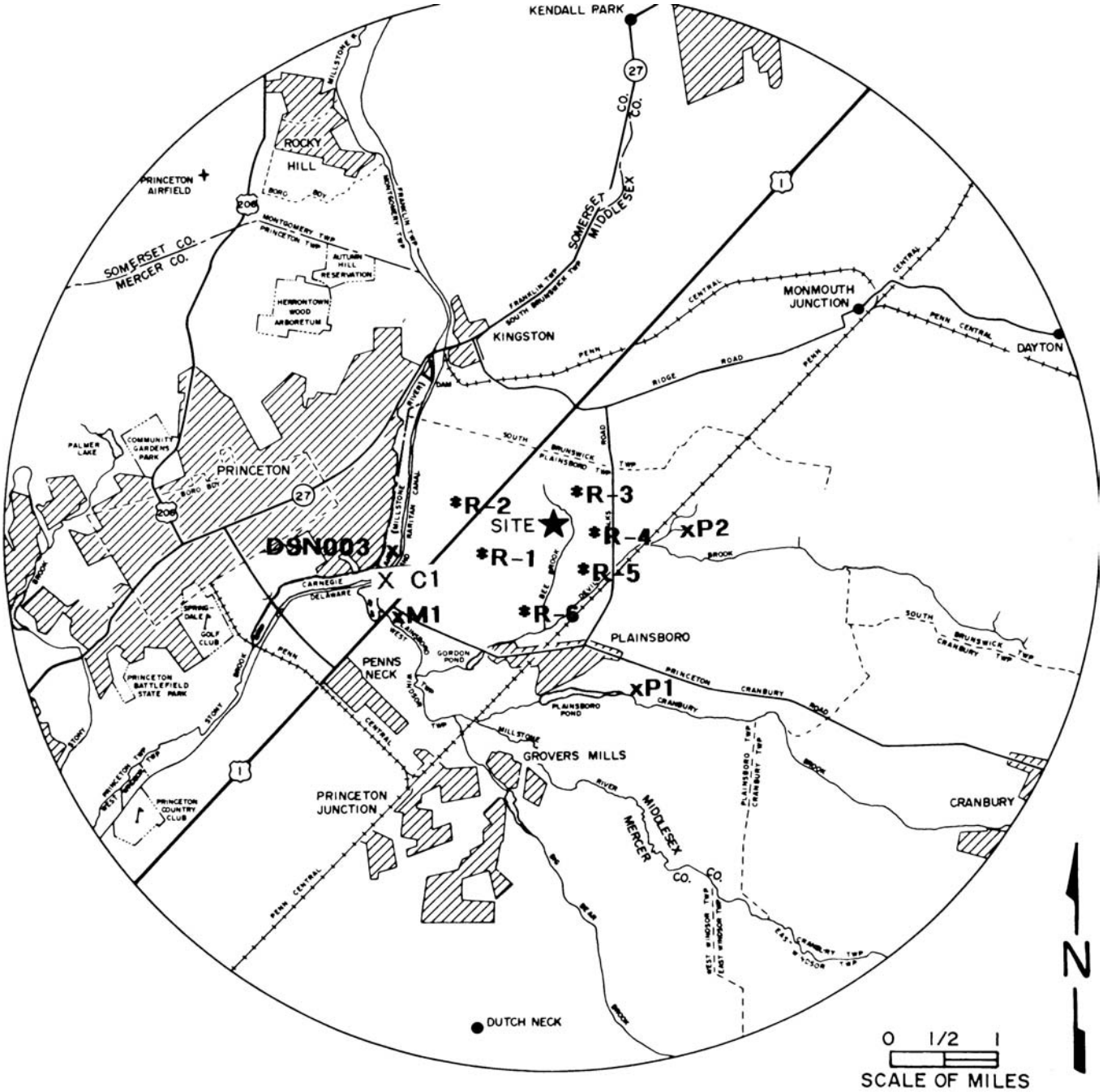


Figure 4.3 Off-site Surface and Rain Water Monitoring Locations

5.0 Ground Water Monitoring

5.1 Effluent Monitoring – Ground Water

5.1.1 *Regulatory and Compliance Requirements*

To comply with the NJPDES regulations, NJAC 7:14a *et seq*., DOE PPPL has a discharge to ground water permit (NJ0086029) for its detention basin. The original permit was issued in 1989 at which time, the basin was unlined. In 1994, DOE PPPL installed a synthetic, geo-membrane liner and modified the basin outfall. The basin operates in a flow-through mode with oil sensors located across the basin to detect if any oil is present. If oil is detected, an alarm is sent to DOE PPPL's operations center and Emergency Services investigates the situation. The basin outlet gate automatically closes. Water is retained in the basin until clean up actions are taken, and the situation returns to normal. As a condition of the NJPDES ground water permit, an Operations and Maintenance (O&M) Plan must be prepared for the detention basin; no requirements for monitoring wells or inflows are contained in the permit, unless conditions warrant a change.

In 1993, Princeton University and NJDEP signed a Memorandum of Understanding (MOU) governing soil and ground water contamination at the Forrestal Campus. The DOE PPPL and DOE-PAO are responsible for characterization and remediation of C and D site. In 1998, and DOE-PAO submitted the completed Remedial Investigation and Remedial Action Report to NJDEP [PPPL98]. Under its Environmental Restoration Program, the DOE PPPL conducts ground-water sampling for volatile organic compounds and other parameters and submits the data to the NJDEP Bureau of State Case Management.

5.1.2 *Sampling Plan – Ground Water*

Quarterly, the DOE PPPL collects ground-water samples from nine wells, two building foundation sumps, and one surface outfall. The samples are analyzed for volatile organic compounds (VOCs) plus a library search of 15 non-priority pollutant VOCs, dissolved methane, ferrous iron (Fe++), chlorides, alkalinity, sulfates, and nitrates. Field measurements include pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential (ORP), and depth to ground water.

5.1.3 *Quality Assurance*

The DOE PPPL uses a NJDEP-certified laboratory, which is required to have a Quality Assurance/Quality Control Plan. The required frequency for spikes, blanks, and duplicates, acceptance criteria, sample

chain-of-custody, and sample identification system are described in the Plan. When data are received, the quality assurance section of the report is checked for compliance with the holding times.

The DOE PPPL's Quality Assurance Division may audit the subcontract laboratory during the course of the contract. The DOE PPPL's ER/WM Division representatives participate as the technical experts during the audit.

5.2 Environmental Surveillance – Ground Water

5.2.1 Background Data

The DOE PPPL is underlain by the Stockton Formation consisting of siltstone and sandstone with minor amount of shale and clay. The Stockton Formation has minor primary permeability because of the small grain size and the presence of cementing minerals. Wells tapping the Stockton Formation produce water contained in and moving through connected zones of secondary permeability caused by fracturing and bedding planes. Building foundations for structures located on D site are about forty feet below grade and perimeter pipes drain ground water to two building sumps. These sumps almost constantly pump ground water and divert it to the on-site detention basin. Two additional sumps that pump ground water are found in the Lyman Spitzer building (LSB) and C Stellarator (CS) building basements. Water from these sumps is also discharged to the basin.

Monthly readings are taken from the lapsed-hour meters for the sump pump running times. Flow is calculated (gallons per day) based on the readings: number hours pumps operated times rated pumping capacity in gallons times number of days elapsed. Monthly and annual totals are compiled and compared to previous data.

Table 5.2 Sump Pump Discharges

Media: & Rationale	**Frequency/Location Rationale**	**Location Descriptions**	**Parameters**
Sump *To measure quantity of ground water discharged to basin and surface water.*	*Monthly* : Measure ground water flow from 4 foundation dewatering sumps that discharge to basin (surface water)	CS Building sump (Basement) D site Motor Generator (MG) Building sump (DSP- 402) Lymen Spitzer Building (LSB) sump (B001A) D-site Air Shaft sump (DSP-104)	Record hours of pump operation multiply by pump rating capacity for gallons per month

5.3 References – Ground Water

HLA98 Harding Lawson Associates, September 25, 1998, "RI/RA Report RI Phase 3 Activities Princeton Plasma Physics Laboratory, James Forrestal Campus, Plainsboro, New Jersey," 3 volumes.

NJAC New Jersey Administrative Code, Title 7, Chapter 14A, "The New Jersey Pollutant Discharge Elimination System."

Sh99 Sheneman, R. October 1999, "Princeton Plasma Physics Laboratory – Phase IV Remedial Investigation Report and Remediation Action Selection Report.'

Sh00 Sheneman, R., May 2000. "Princeton Plasma Physics Laboratory – Remedial Action Work Plan.

Sh01 Sheneman, R. August 2001. "Princeton Plasma Physics Laboratory – Remedial Action Monitoring Report."

LEGEND

- Monitoring Well Location
- Surface Water Sample Location
- Building Sump Location
- Tree Line/Vegetation

N

0 100 200 400

APPROXIMATE SCALE IN FEET

FIGURE 5.1

GROUND WATER MONITORING WELLS, SUMPS
& SURFACE WATER LOCATIONS

PRINECTON PLASMA PHYSICS LABORATORY
PLAINSBORO, NEW JERSEY

PPPL PRINCETON PLASMA PHYSICS LABORATORY

6.0 Radiological Plan

This plan presents the requirements for the Radiological Programs at the DOE PPPL. The plan, through its programs, provides confidence and assurance that the release of radioactive material at or beyond the DOE PPPL's site boundary will be within the requirements of federal, state, and local agencies' regulations and the DOE PPPL's policy on as low as reasonably achievable (ALARA).

6.1 Effluent Monitoring – Radiological

6.1.1 Regulatory and Compliance Requirements

The EMP provides information on the DOE PPPL's programs supporting ALARA. The DOE PPPL meets or exceeds management commitments to required federal regulation requirements under 40CFR 61, DOE Order 5400.1, DOE Order 5400.5, DOE/EH-0173T, DOE/EP-0023, and NJAC 7:28.

Performance of these program requirements is measured by: 1) maintaining releases at ALARA levels and 2) providing reasonable assurance that adverse conditions, such as failures, malfunctions, deficiencies, deviation, defective material and/or equipment, and non-conformances are promptly identified and corrected. At present, the DOE PPPL radiological effluent monitoring requirements are specified in DOE Order 5400.5. Radiological effluents during current and anticipated activities include tritium (HT and HTO). Monitoring of airborne effluents complies with the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) regulations in 40 CFR 61, Subpart H, airborne radioactive emissions.

6.1.2 Effluent Discharge Monitoring

Table 6.1 "The DOE PPPL Radiological Effluent Monitoring Program" describes the monitoring for air, groundwater and sanitary releases. Groundwater and sanitary data are submitted to NJDEP and Stony Brook Regional Sewerage Authority (SBRSA), respectively; all data are presented in the annual site Environmental Report.

Air samples from continuous differential atmospheric tritium samplers (DATS) located in the TFTR stack, which monitors airborne tritium releases, are analyzed weekly. These samples are prepared and analyzed for HT and HTO in accordance with PPPL Environmental, Analytical, and Radiological Laboratory (PEARL) procedures HP-RL-19, "TFTR Passive Stack Monitoring System Air Sampling."

Liquid effluent collection tank (LECT) water samples are collected prior to discharge to SBRSA. Samples are collected in accordance with TFTR Operations Procedure OP-G-49, "Liquid Effluent Collection Tank (LECT) Monitoring Procedure," and analyzed for tritium in accordance with PEARL Procedure HP-RL-12, "PEARL Tritium Distillation," and Chemical Oxygen Demand (COD) in accordance with PEARL procedure HP-LAB-01, "Chemical Oxygen Demand Program." LECTs are designed to collect water from selected D-site facility drains. Water must be tested prior to release, and monthly reports sent to SBRSA in accordance with the Industrial Discharge License No. 22-96-NC. The release limit for tritium from the DOE PPPL is 2 X 10^6 pico Curies per liter (pCi/L) and a total activity limit of 1 Curie (Ci) per year as regulated by NJDEP.

Annually, a NESHAPS report is submitted through DOE to the US Environmental Protection Agency (Region II). The DOE PPPL uses the COMPLY code to verify compliance with 40 CFR 61.

Table 6.1 The DOE PPPL Radiological Effluent Monitoring Program

Media:	***Requirement and Data Reporting***	***Location Descriptions***	***Data Description***
AIR	Federal regulation (40 CFR 61) National Emission Standards for Hazardous Air Pollutants (NESHAPs)—USEPA inspection; data in Annual Site Environmental Report.	Differential Atmospheric Tritium Samplers (DATS) located in D-site Stack.	Weekly tritium activity
BIOTA	None required		
METEORO-LOGICAL	None required	Rain gage on D site west of Motor Generator bldg.	Precipitation
SOIL	None required		
WATER:			
Ground	None required		
Sanitary	State regulation (N.J.A.C. 7:28) Bureau of Radiation Protection DOE Order 5400.5 "Radiation Protection of the Public and the Environment" Stony Brook Regional Sewerage Authority Industrial Discharge License (22-96-NC); Monthly Discharge Report; also, data in Annual Site Environmental Report	Liquid Effluent Collection Tank (LECT): 3 tanks (15,000 gallon capacity each) located on D site north of the Mockup Building; tanks collect from selected D site drains -no sanitary lines.	Tritium concentration prior to release of each tank each month. Data used to monitor quantity of tritium released to sanitary not to exceed 1 Curie/year or 2,000,000 pCi/L per release
Storm	None required		
Sump	None required		
Surface	None required		

FIGURE 6.1 - Remote Environmental Air Monitoring (REAM) Stations

6.2 Environmental Surveillance – Radiological

This sampling program is used to monitor existing or potential radiological exposure pathways to the public from operations at the DOE PPPL. The exposure pathways, which are monitored within this program, are:

1. Inhalation of potentially contaminated air, and
2. Ingestion of potentially contaminated water released into the surface water.

The samples collected within this program are designed to monitor the concentrations of radiological effluents within the environment. Tritium is the most likely radiological source of exposure to the public, and monitoring its transport is the primary objective of the radiological sample collection program.

6.2.1 Environmental Air Sampling Plan

Four air samplers are positioned along the D site fence to monitor tritium concentrations in air at the site boundary (Trailers 1 through 4, T1 to T4). Six remote environmental air monitoring stations (REAMs 1 to 6) are positioned off-site at approximately 1 kilometer (km) from the DOE PPPL, in order to monitor tritium concentrations in air at locations nearest to schools, businesses, and residences. To measure background levels of tritium, a baseline station was first established in Montgomery Township and was moved to Hopewell Township in 1995, and to Roebling in 2000.

The differential atmospheric tritium samplers (DATS) air samplers are designed to monitor the inhalation exposure flow-path of tritium originating from the DOE PPPL operations and to detect previously unknown flow-paths of tritium to the environment. DATS samples are collected and analyzed for tritiated water or tritium oxide (HTO) and elemental tritium (HT) weekly.

DATS is a continuous duty sampler used to determine the tritium concentration in air, as well as differentiating between fractions of tritium present in air moisture (H_2O, HTO) and the fraction present in the form of elemental hydrogen (H_2, HT, and T_2). Molecular sieve contained within collection traps, is used as collection medium, and during a normal week, it will absorb greater than 99 percent of the moisture from sample air. A palladium catalyst is used to convert elemental hydrogen into water, which is then collected on an additional molecular sieve trap. A carrier gas (mixture of approximately 3% hydrogen with the balance being nitrogen) is added to sample air. Hydrogen within this carrier gas is used to heat the catalyst (oxidation of hydrogen is exothermic) and carry any converted tritium to the third trap where it is collected. [Gr88]

Table 6.2 Radiological Surveillance Program – Air

Media: & Rationale	*Frequency/Location Rationale*	*Location Descriptions*	*Parameters*
AIR *To monitor inhalation and absorption exposure pathways:*	*Weekly* On-site (4 monitoring locations along the fence line of D site) *Weekly* Off-site (6 monitoring locations within a 1 mile radius of TFTR) *Weekly—* 1 location approximately 17 miles from DOE PPPL	Boundary trailers called Tritium Atmospheric Monitoring Stations (TR) 1 through 4 located on D site :TR-1 North: TR- 2 East; TR-3 South; and TR-4 West. Remote (off-site) Environmental Air Monitoring Stations (REAMS) 1 through 6. REAMS 1:B site James Forrestal Campus, next to air strip REAMS 2:NJ State Police Barracks, next to garage REAMS 3:307 College Road REAMS 4:675-685 College Road REAMS 5:700 College Road REAMS 6:800 Scudders Mill Road Baseline is located at Maple Avenue, Roebling, NJ	Tritium Tritium Tritium

6.2.2 Water Sampling Plan

Monthly, the DOE PPPL collects ground water samples from 6 wells, four of which are near the LECT area on D site. In August 1995, during the time when deuterium-tritium (D-T) experiments were conducted in TFTR, tritium concentrations in two wells (TW-1 and TW-5) located north of TFTR were found to be above baseline. An investigation found no pipes or equipment leaks. The precipitation-monitoring program with eight stations located around TFTR began in January 1996 and six off-site stations (REAMS 1 to 2, 4 to 6, and R3N instead of REAMS 3). The most likely source of tritium detected in these on-site well samples is from the atmospheric venting of tritium from TFTR operations and the resulting “washout” during precipitation. Monthly monitoring of the wells and foundation drain sumps (TFTR air shaft and D site MG sumps) will be conducted for a period of approximately one year following the completion of deconstruction and dismantlement (D&D) activities, as well as rain water monitoring (based on amount of precipitation during the month).

Quarterly, the DOE PPPL samples eight surface water stations; the NJPDES discharge locations, basin (DSN001) and Delaware & Raritan (D&R) canal pump house filter back-wash (DSN003), are also sampled monthly. The samples are analyzed by PEARL for tritium concentrations. The results are reported in the Annual Site Environmental Report (ASER).

Ground-water samples are collected monthly for two foundation sumps (D-site Air Shaft sump and D-site MG basement sump). The samples are analyzed for tritium concentrations by PEARL and the results are reported in the ASER.

Table 6.3 Radiological Surveillance Program - Water

Media & Rationale	*Frequency/Location Rationale*	*Location Descriptions*	*Parameters*
WATER:			
Ground *To monitor ingestion exposure pathway:*	*Monthly* : D-12 South of TFTR MW-12S On-site upgradient TW-1 Showed first tritium conc.increase 8/95 TW-5 elevated tritium conc. TW-7/8 Upgradient of TW-1	*Monthly — on-site:* D-12 Southwest corner of basin MW-12S East of Guard Booth #6, 59 feet from road, stick-up well. TW-1 North of Mock-up, 5 feet east of LECT TW-5 Northeast of TFTR, 97 feet north of RadWaste Building TW-7/8 North of D site fence, 147 feet north D site fence, opp. TW-2	Tritium
Ground (Sumps) *To monitor ingestion exposure pathway:*	*Monthly — D site locations (2):* Foundation dewatering sumps discharge to basin	D-site Air Shaft sump D site MG sump	Tritium
Precipitation (Rain water) *To measure out-wash from D-Site stack both on-site and off-site locations.*	*Samples collected following precipitation events.* R1 series located 225 feet from *D-Site stack* proximity to *D-Site stack.*	After rain events, on-site (9 including 1 duplicate) samples collected: R1E: in wooded area south of Rad Waste Building, next to chain-link fence. R1N: 30 feet east of LECT area and wells TW-2 and TW-10. R1N Duplicate: same as above R1W: on top of picnic table next to Tritium Group trailer R1S: between east side fence of NB transformer yard/ & perimeter road, next to light pole.	Tritium
Precipitation (Rain water) *To measure downwash from D-Site stack both on-site and off-site locations.*	*Samples collected following precipitation events.* R2 series located twice the distance from the stack or 450 feet away. Off-site (6 including 1 baseline)	R2E: in wooded area south of D-site access road, downgrade of D site. R2N: in wet, wooded area about 100 feet northwest of well TW-7. R2W: south of RF lines in open gravel area. R2S: next to south side D site fence, about 60 feet southwest of TR-3. Off-site same as REAMS (except none at REAM-3 which is too shaded) and Air Baseline above.	Tritium

Table 6.3 (continued) Radiological Surveillance Program - Water

Media & Rationale	*Frequency / Location Rationale*	*Location Descriptions*	*Parameters*
Surface *To monitor ingestion exposure pathway:*	*Quarterly — off-site (6)* Millstone River Cranbury Brook Devil's Brook Bee Brook Elizabethtown Water Co.	M-1 Millstone River at Route 1 North P-1 Cranbury Brook at Davison Road, Plainsboro (upstream-tributary to Millstone River) P-2 Devil's Brook turn right off Schalks Road north just before railroad bridge overpass; stay straight for 400 feet to small bridge over Devil's Brook B-1 Bee Brook 100 feet **upstream** of discharge ditch #5 (from DOE PPPL basin). B-2 Bee Brook 250 feet **downstream** of discharge ditch #5 (from DOE PPPL basin E-1 Elizabethtown Water Co. at Guard Booth #6 sink (drinking water source).	Tritium
	Monthly — DSN001 DSN003	*On-site:* Basin discharge. *Off-site:* Delaware & Raritan Canal pump house filter backwash discharge into D&R Canal. Route 1 south turn right at Mapleton Road (Plainsboro). 0.6 mile to pump house on left side	Tritium

6.3 References

CFR90 Code of Federal Regulations, Title 40, Part 61, "National Emission Standards for Hazardous Air Pollutants."

DOE90 Department of Energy Order 5400.1, "General Environmental Protection Program," June 29, 1990.

DOE93 Department of Energy Order 5400.5, "Radiation Protection of the Public and the Environment," January 7, 1993.

DOE/EP DOE/EP-0023, Second Edition, "A Guide for: Environmental Radiological Surveillance at US Department of Energy Installations," July 1981.

Gr88 Griesbach, O. A. and Stencel, J. R., "The DOE PPPL Differential Atmospheric Tritium System (DATS)," 22nd Midyear Topical meeting of the Health Physics Society, San Antonio, TX, Dec. 4-8, 1988, pp.374-380.

NJAC New Jersey Administrative Code, Chapter 28, "Bureau of Radiation Protection."

PPPL PPPL TFTR Operations Procedure, OP-G-49, "Liquid Effluent Collection Tank (LECT) Monitoring Procedure."

PPPL PPPL REML Operations Procedures, HP-RL-05, "Determination of Tritium Activity," and HP-RL-06,"DATS Preparation."

SBRSA Stony Brook Regional Sewerage Authority Industrial Discharge License, 22-93-NC, expires August 1, 2005.

7.0 Summary of Environmental Monitoring Plan

In previous sections of the DOE PPPL's Environmental Monitoring Plan – meteorological, air, water, ground water, and radiological plans – effluent and surveillance monitoring programs are described in detail. Tables 7.1 and 7.2 provide a brief overview of the entire program for radiological and non-radiological monitoring.

Table 7.1 Summary of the DOE PPPL's Effluent Monitoring Program

Media:	***Radiological***	***Non-Radiological***
AIR	NESHAPS — DATS (D-site stack)	None required
BIOTA	None required	
METEORO-LOGICAL	Precipitation	None required
SOIL	None required	Release of hazardous substance on soil. Also see RI/RA program
WATER:		
Ground	None required	Also see RI/RA program
Sanitary	LECT (monthly release)	LECT (monthly release)
Storm	See Meteorological	None required
Sump	None required	None required
Surface	None required	Monthly NJPDES — on-site (1 location) and off-site (2 locations) Annually — Chronic Toxicity Test (1 location)

Table 7.2 Summary of Environmental Surveillance Monitoring Program

Media:	**Radiological**	**Non-Radiological**
AIR	Boundary trailers (4) and remote (off-site) monitors (7 including 1 baseline)	Inventory and operational controls
WATER:		
Ground	Monthly — on-site (6 wells)	None
Sanitary	Prior to release of each LEC tank	None
Storm (Rain water)	On-site (8 including 1 duplicate) Off-site (6 including 1 baseline)	None
Sump	Monthly — D site locations (2)	Monthly — flow readings (4 locations)
Surface	Quarterly — on-site location (1), off-site locations (4), baseline (2) Monthly — on-site locations (1) and off-site location (1)	Quarterly — on-site location (1), off-site locations (4), and baseline (2) Monthly — on-site location (1) and off-site location (1)