EXECUTIVE SUMMARY

Brookhaven National Laboratory (BNL) is a multi-program national laboratory operated by Brookhaven Science Associates, LLC for the U.S. Department of Energy (DOE) and is located on a 5,265-acre site in Suffolk County, Long Island, New York. DOE Order 436.1 (2011), *Departmental Sustainability*, requires DOE sites to maintain an Environmental Management System (EMS). An EMS specifies requirements for conducting general surveillance monitoring to evaluate the effects, if any, of site operations. DOE Order 458.1 (2011), *Radiation Protection of the Public and Environment*, requires DOE sites to maintain surveillance monitoring for determining radiological impacts to the public and environment.

BNL has a comprehensive EMS in place, which meets the requirements of the International Organization for Standardization 14001 Standard. The Laboratory's extensive environmental monitoring program is one component of the EMS, and the BNL Environmental Monitoring Plan (EMP) describes this program in detail. The data derived from systematically monitoring the various environmental media enables the Laboratory to make informed decisions concerning the protection of human health and the environment and to be responsive to stakeholder concerns.

The Laboratory's Environmental Protection Program ensures that operations fully comply with applicable federal, state, and local environmental laws and regulations; executive orders; and DOE policies. The Laboratory monitors radiological and nonradiological aspects of ambient air quality, emissions from point sources, wastewater discharges, surface water quality, groundwater quality, precipitation, soil, flora, and fauna. Sampling is performed under one or more types of environmental monitoring: compliance, restoration, or surveillance monitoring. Compliance monitoring ensures adherence to regulatory and permit limits. Restoration monitoring measures the impact of past operations and assesses the effectiveness of remedial measures. Surveillance monitoring evaluates the impacts, if any, of current or historical operations on the various environmental media.

Air surveillance monitoring at the Laboratory involves the analysis of particulate matter collected on filters, as well as vapor chemically trapped in a collection medium. Monitoring is conducted for various airborne radionuclides (including particulates and tritiated water vapor) at both on- and off-site locations. Continuous radiological monitoring is conducted for operations that have the potential to result in a radiological dose at the site boundary in excess of 0.1 millirem per year. For facilities with emissions below that value, periodic confirmatory monitoring is conducted. Specific diffuse or nonpoint sources, arising as a result of environmental restoration activities, are monitored to protect worker and public health. BNL also measures environmental background radiation through a network of on- and off-site thermoluminescent dosimeter units.

Samples of wastewater effluent from Laboratory operations are collected at the point of discharge. Monitoring is conducted in accordance with permit requirements and includes water quality parameters—such as pH, dissolved oxygen, and temperature—as well as radiological, organic, and inorganic parameters.

The Peconic River is sampled at multiple on- and off-site locations from the point where the Peconic River enters the BNL site to an area several miles downstream of the BNL site. The Carmans River, located to the west of the BNL site, is used as a control location to determine background or ambient conditions. Collected samples are analyzed for radiological and nonradiological parameters.

The Laboratory site is included on the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) National Priorities List. The U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC) have integrated DOE's response obligations into a comprehensive Federal Facilities Agreement. In compliance with this agreement, BNL's comprehensive groundwater protection program evaluates groundwater contamination from historical operations and determines whether measures taken to protect or restore groundwater quality are effective. To comply with NYS operating permits and DOE Orders, groundwater quality is also monitored at research and support facilities where there is a potential for environmental impact to determine whether operational and engineered controls designed to protect groundwater are working effectively.

The Laboratory maintains five operable groundwater production wells to supply potable water. The supply wells and distribution system are monitored for chemical and radiological parameters to ensure that concentrations of regulated contaminants present in the domestic water system are less than the maximum contaminant levels specified by regulation.

Data from the sampling and analysis of vegetation and fauna are used to estimate bioaccumulation and potential dose via the ingestion pathway. Precipitation, soil, and sediment are analyzed for contaminants released to the atmosphere and surface water.

All environmental monitoring data must meet appropriate quality assurance requirements. BNL maintains contracts with seven contract analytical laboratories, all of which are certified by New York State for specific parameters and are subject to audits by the New York State Department of Health (NYSDOH), BNL, and/or DOE through their Laboratory Approval Program.

BNL uses the Data Quality Objective (DQO) process developed by EPA to describe the environmental monitoring matrices, sampling methods, locations, frequencies, and measured parameters, as well as the methods and procedures for data collection, analysis, maintenance, reporting, and archiving.

The EMP summarizes the "drivers" (i.e., compliance, support compliance, surveillance, and restoration), DQOs, potential sources and contaminants, extent and frequency of monitoring, analytical procedures, and quality assurance processes. The plan is reviewed and revised annually to reflect any changes made to the monitoring program from the previous year. A complete update is published triennially. Highlights of key changes for the calendar year (CY) 2015 monitoring program are described below. Full descriptions of the changes are detailed in each DQO.

CENTRAL STEAM FACILITY EMISSIONS

Any references to special conditions in the Title V permit now correspond to the condition numbers as they appear in the renewal permit that was issued on February 2, 2014. New lower NOx reasonably available control technology limits of 6 NYCRR became effective on July 1, 2014. A ledger accounting method, as described in the Description and Technical Basis Section for the DQO, notes how BNL will demonstrate ongoing compliance with the new lower NOx limits.

THERMOLUMINESCENT DOSIMTERS (TLDS)

Off-site ambient-dose TLDs are used for background measurements only. Four off-site TLDs will be re-assigned to other individuals to mount on their premises; two additional off-site TLDs will be assigned to new individuals to mount on their premises; and several off-site TLDs will be transferred from private businesses which had previously been assigned off-site TLDs to individuals to

mount on their premises. These changes are proposed in order to monitor a greater majority of the wind sectors while maintaining TLDs in currently monitored sectors.

FISH, AQUATIC VEGETATION, AND SEDIMENT

An additional question concerning the presence of sufficient water to support fish and appropriate decision rules to determine monitoring was added to this DQO.

SEWAGE TREATMENT PLANT

This DQO was updated to recognize Sewage Treatment Plant (STP) discharge from Peconic River (surface water) to recharge beds (groundwater).

PECONIC RIVER WATER QUALITY SURVEILLANCE

This DQO was updated to recognize STP discharge from Peconic River (surface water) to recharge beds (groundwater).

PECONIC RIVER POST-CLEANUP MONITORING

State Pollutant Discharge Elimination System (SPDES) authorized discharges from the STP to the Peconic River were discontinued in September 2014 and re-routed to a series of groundwater recharge basins located east and south of the STP. As a result, monitoring of the STP discharge to the Peconic River was removed from this DQO.

POTABLE WATER MONITORING

Trihalomethanes and haloacetic acid surveillance will be increased (from one to two samples per year) as a voluntary precautionary measure to ensure compliance with the Stage 2 Disinfectants & Disinfection Byproduct Rule.

CHEMICAL/ANIMAL HOLES STRONTIUM-90 (SR-90)

Two permanent shallow wells will be installed to monitor the residual Sr-90 upgradient of EW-1, and sampling frequency will be increased to semi-annual for all wells with a current annual frequency to help support a decision for possible Petition for Shutdown.

OU I SOUTH BOUNDARY (RA V REMEDIAL ACTION)

The sampling frequency in monitoring well 107-41 will be reduced from quarterly to semi-annually, as data indicate that the trailing edge of the volatile organic compound (VOC) plume is presently south of this location.

OU III NORTH STREET

The sampling frequency in well 000-472 will be increased to quarterly to evaluate if concentrations remain above the capture goal of 50 µg/L. If concentrations in this well continue to be above 50 µg/L, then a restart of extraction well NS-2 will be evaluated. Since there have been no detections of tritium above 1,000 pCi/L in any of the North Street monitoring wells since 2004, sampling for tritium will be eliminated.

OU III High Flux Beam Reactor (HFBR)

Sampling of 23 monitoring wells will be discontinued, as there is no longer a need to monitor in the vicinity of Temple Place and Brookhaven Avenue based on the attenuation of the leading edge of the plume and the limited releases of tritium being observed to migrate from underneath the HFBR in recent years. In addition, there is no longer a need to monitor upgradient of the HFBR, as groundwater flow conditions have been well established and stable in this area for some time and there is little risk of flow directions reversing in the future.

OU III Middle Road Pump and Treat System

A vertical profile will be installed between wells 121-53 and 121-45, which will be followed up by a monitoring well. The monitoring scheduled for well 104-37 will be changed to quarterly to track deeper contamination migrating to EW-17.

OU III Off-Site Post ROD

Based on the low levels of VOCs detected and the depth of the screen zone, well 000-107 will be dropped from the sampling program, but will be maintained for water level measurements.

OU III Industrial Park

One new recovery well will be added to the treatment system and three new monitoring wells that were installed in the fourth quarter of 2014 will be added to the monitoring program. The wells will be sampled quarterly for VOCs.

OU III North Street East

Since there have been no detections of tritium above 1,000 pCi/L in any of the North Street monitoring wells since 2004, sampling for tritium will be eliminated.

OU III - Building 452 Freon-11 Source Area and Groundwater Plume

The sampling frequency for wells 085-43, 085-384, and 085-388 will be reduced from quarterly to semiannually. All other monitoring wells will continue to be sampled on a quarterly basis. Temporary wells will be installed near the Building 452 source area to verify the observed contaminant reductions in the permanent wells and in several downgradient areas.

OU IV Area of Concern (AOC) 6 - Building 650 Sump Outfall Area

A new sentinel monitoring well will be installed immediately north of the National Synchrotron Light Source II (NSLS-II) building to track potential southern migration of Sr-90.

Groundwater Monitoring at the Alternating Gradient Synchrotron (AGS)

The monitoring requirements for 10 AGS area monitoring wells that are used to monitor Building 912 and a portion of the g-2 tritium plume will now be covered under this DQO.

GROUNDWATER MONITORING AT THE SEWAGE TREATMENT PLANT

The groundwater monitoring program for the STP was modified during CY 2014 in response to the planned switch from discharging STP effluents to the Peconic River to newly constructed recharge basins starting in the fall of 2014. During 2014, a new monitoring well network consisting of one upgradient and six downgradient wells was established to monitor groundwater quality near the new recharge basins.

GROUNDWATER MONITORING FOR THE G-2 TRITIUM SOURCE AREA AND PLUME

Because tritium concentrations in the groundwater downgradient of the g-2 tritium plume source area have continually remained less than 50,000 pCi/L for the past several years, the monitoring frequency will be reduced from quarterly to semiannually starting in CY 2015. Furthermore, the monitoring frequency for wells used to track the g-2 plume downgradient of Building 912 will be reduced from semiannually to annually, and the results will be tracked under the AGS monitoring program.

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