

Knolls Laboratory and Kesselring Site

**Environmental
Monitoring
Report
Calendar Year 2022**

Prepared for the U. S. Department of Energy
by Fluor Marine Propulsion, LLC

FLUOR[®]

**KNOLLS LABORATORY AND KESSELRING SITE
ENVIRONMENTAL MONITORING REPORT**

CALENDAR YEAR 2022

**Prepared for the U.S. Department of Energy by
Fluor Marine Propulsion, LLC
Knolls Laboratory
Niskayuna, New York
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LIST OF ACRONYMS

AEA	Atomic Energy Act
AIM	Architectural and Industrial Maintenance
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
AOC	Areas of Concern
ASFP	Air State Facility Permit
ASGTF	Advanced Steam Generator Test Facility
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BOD-5	Biochemical Oxygen Demand, 5-day test
CAA	Clean Air Act
CBSF	Chemical Bulk Storage Facility
CEDR	Consolidated Energy Data Report
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DCG	Derived Concentration Guide
DCS	Derived Concentration Standard
DGS	Distributed Generation Sources
DLC(s)	Decision Level Concentration(s)
DO	Dissolved Oxygen
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy – Office of Environmental Management
DOT	U.S. Department of Transportation
ECL	[New York State] Environmental Conservation Law
EHS(s)	Extremely Hazardous Substance(s)
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERA	Environmental Resource Associates
ESH	Environmental, Safety, and Health
ESHMS	ESH Management System
FFCA	Federal Facility Compliance Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FMP	Fluor Marine Propulsion, LLC
HEPA	High Efficiency Particulate Air [filters]

LIST OF ACRONYMS (continued)

HSWA	Hazardous and Solid Waste Amendments
LEPC(s)	Local Emergency Planning Committee(s)
LWWTF	Lagoon Waste Water Treatment Facility
MBAS	Methylene Blue Active Substances
MCL	Maximum Contaminant Level
MS4	Municipal Separate Storm Sewer System
MSDS(s)	Material Safety Data Sheet(s)
NATF	Nitrite-Ammonia Treatment Facility
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNL	Naval Nuclear Laboratory
NNPP	Naval Nuclear Propulsion Program
NOI	Notice of Intent
NOx	Nitrogen Oxides
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NRLFO	Naval Reactors Laboratory Field Office
NSPS	New Source Performance Standards
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PBS(F)	Petroleum Bulk Storage (Facility)
PCB(s)	Polychlorinated Biphenyl(s)
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
POTW	Publicly Owned Treatment Works
QAP	Quality Assurance Program
R&D	Research and Development
RAE	Radionuclide Air Emission
RCRA	Resource Conservation and Recovery Act
RL	Reporting Limit
SBR	Sequencing Batch Reactor
SDS(s)	Safety Data Sheet(s)
SERC	State Emergency Response Commission
SI (unit)	Standard International (unit)
SO ₂	Sulfur Dioxide
SPDES	State Pollutant Discharge Elimination System

LIST OF ACRONYMS (continued)

SPRU	Separations Process Research Unit
SPRU DP	Separations Process Research Unit Disposition Project
SSW	Site Service Water
STP	Site Treatment Plan
SWDA	Solid Waste Disposal Act
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
THM	Trihalomethane
TKN	Total Kjeldahl Nitrogen
TLD(s)	Thermoluminescent Dosimeter(s)
TOC	Total Organic Carbon
TOGS	NYS Technical and Operational Guidance Series
TRI	Toxic Release Inventory
TRU	Transuranic [waste]
TSCA	Toxic Substances Control Act
TSDf(s)	Treatment, Storage, and Disposal Facility(ies)
TSS	Total Suspended Solids
UPA	Uniform Procedures Act
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC(s)	Volatile Organic Compound(s)
WET	Whole Effluent Toxicity
WIPP	Waste Isolation Pilot Plant

COMMON ABBREVIATIONS

Bq	Becquerel
BTU(s)	British Thermal Unit(s)
C	Celsius
CFU/100ml	colony-forming units per 100 milliliters
cfs	cubic feet per second
Ci	curie
F	Fahrenheit
hr(s)	hour(s)
GPD	gallons per day
lbs/day	pounds per day
μCi	microcurie = 1×10^{-6} curie
μCi/ml	microcuries per milliliter
μg	microgram = 1×10^{-6} gram
μg/l	micrograms per liter
μmho	micromho = 1×10^{-6} /ohm
μmho/cm	micromhos per centimeter
mg	milligram = 1×10^{-3} gram
mg/l	milligrams per liter
MGD	million gallons per day
mrem	millirem = 1×10^{-3} rem
mrem/year	millirem per year
ml	milliliter = 1×10^{-3} liter
ml/l	milliliters per liter
mSv	millisievert = 100 millirem
nCi	nanocurie = 1×10^{-9} curie
NTU	Nephelometric Turbidity Units
pCi	picocurie = 1×10^{-12} curie
pCi/g	picocuries per gram
pCi/l	picocuries per liter
rem	Roentgen Equivalent Man
SCF	Standard Cubic Feet
SU	Standard [pH] Unit
TUa	Toxicity Units, acute
TUc	Toxicity Units, chronic = TUa x 10

EXECUTIVE SUMMARY

The results of the effluent and environmental monitoring programs at the Knolls Laboratory and Kesselring Site are summarized and assessed in this report. Tables 1 - 4 summarize the major elements of the environmental monitoring programs at each site. Information regarding the U.S. Department of Energy – Office of Environmental Management (DOE-EM) Decontamination and Decommissioning (D&D) work occurring at the Knolls Laboratory and Kesselring Site is included in this report, as warranted. Operations at the Knolls Laboratory and Kesselring Site, which includes current DOE-EM activities, continue to have no adverse effect on human health and the quality of the environment.

The effluent and environmental monitoring programs conducted by the Knolls Laboratory and the Kesselring Site are designed to determine the effectiveness of treatment and control methods, to provide measurement of the concentrations in effluents for comparison with applicable standards, and to assess resultant concentrations in the environment. The monitoring programs include analyses of samples of liquid and gaseous effluents for chemical constituents and radioactivity as well as environmental monitoring of air, water, sediment, and fish. Radiation measurements are also made around the perimeter of the Knolls Laboratory, the perimeter of the Kesselring Site, and at off-site background locations.

The Knolls Laboratory and the Kesselring Site environmental controls are subject to applicable Federal, State, and local regulations governing use, emission, treatment, storage, and/or disposal of solid, liquid, and gaseous materials. Some nonradiological water and air emissions are generated and treated on-site prior to discharge to the environment.

Nonradiological liquid effluents from the Knolls Laboratory and the Kesselring Site are controlled and monitored in accordance with permits issued by the New York State Department of Environmental Conservation (NYSDEC). Radiological liquid effluents are controlled and monitored in accordance with U.S. Department of Energy (DOE) requirements. Liquid effluent monitoring data show that both the Knolls Laboratory and the Kesselring Site have maintained a high degree of compliance with the New York State (NYS) and DOE requirements. At the Knolls Laboratory, sewage discharges are controlled and monitored in accordance with limitations imposed locally by the Town of Niskayuna in accordance with an Outside Users Agreement.

Nonradiological air emissions from the Knolls Laboratory and the Kesselring Site are controlled and monitored in accordance with NYSDEC and U.S. Environmental Protection Agency (EPA) air regulations. Radionuclide air emissions are regulated by the EPA under the requirements of the National Emission Standards for Hazardous Air Pollutants (NESHAP), Title 40 Code of Federal Regulations (CFR) Part 61, Subpart H. For the purposes of the radionuclide NESHAP regulations, emissions from DOE-EM operations at the Knolls Laboratory or Kesselring Site are included, when appropriate, in the overall site emissions.

Nonradiological air emission sources are not required to have exhaust stack monitoring. The use and maintenance of air emissions control equipment, fuel usage and tracking, or air source limitations such as fuel oil sulfur concentration limits, are used to demonstrate compliance. All of

the Knolls Laboratory and the Kesselring Site air emissions are within applicable Federal and State standards.

The Knolls Laboratory and the Kesselring Site operated their own landfills for facility-generated nonradiological wastes during their early histories. The Knolls Laboratory and the Kesselring Site landfill operations were terminated in 1993 and 1994, respectively. Nonhazardous solid wastes are currently disposed of off-site through local permitted facilities.

Chemicals are not manufactured at either the Knolls Laboratory or Kesselring Site but are used incidental to operations at both facilities. Those substances characterized as hazardous by Federal and State regulations are controlled through administrative procedures and personnel training. Small amounts of chemical wastes are generated and disposed of off-site by waste vendors operating under permits issued by the cognizant Federal and State regulatory agencies. Handling and storage incidental to shipment of wastes are controlled and monitored by trained personnel in compliance with applicable permits and regulations. The Knolls Laboratory and Kesselring Site strive to minimize the quantity of hazardous and solid waste that they produce. Waste avoidance, beneficial reuse, and recycling are practiced whenever practicable.

Accountability and radiation survey procedures are used at the Knolls Laboratory and the Kesselring Site for the handling, packaging, and transportation of all radioactive materials. Shipments of radioactive materials are performed in accordance with detailed written procedures to ensure compliance with all applicable regulations of the U.S. Department of Transportation (DOT), the DOE, and the U.S. Nuclear Regulatory Commission (NRC). All Knolls Laboratory and Kesselring Site generated wastes that contain radioactive constituents are regulated under the Atomic Energy Act (AEA) of 1954 and applicable DOE requirements. The volume of solid radioactive waste that requires disposal is minimized by using procedures that limit the amount of materials that become contaminated and by recycling. Radioactive wastes are shipped to government owned or licensed disposal sites. During 2022, approximately 207 cubic meters (271 cubic yards) of low-level radioactive waste were shipped from the Knolls Laboratory and the Kesselring Site for disposal.

The Knolls Laboratory and the Kesselring Site are within the DOE and EPA standards governing the release of radioactivity to the environment. The annual average concentration of Knolls Laboratory and Kesselring Site radioactivity in liquid and gaseous effluents at the boundary of each site corresponded to less than one percent of the permissible DOE radioactivity concentration standards. Radionuclide air emissions were also less than one percent of the EPA air emission standard. Radiation dose to the general public as a result of the Knolls Laboratory's and the Kesselring Site's operations was too small to be measured and, therefore, was estimated using conservative calculational techniques that provide an upper bound on the potential dose. The maximum potential annual dose to an individual off-site was less than 0.1 mrem per year. This is less than one percent of the numerical guide established by the NRC for commercial reactor sites to demonstrate that radioactive materials in effluents released to unrestricted areas are as low as reasonably achievable (ALARA). The maximum potential annual dose is also less than ten percent of the total radiation a person aboard a commercial airplane would receive from cosmic sources during one coast-to-coast flight. The estimated annual collective dose to the entire population within 80 kilometers (50 miles) of either the Knolls Laboratory or the Kesselring Site was less

than 0.1 person-rem, which corresponds to less than one thousandth of one percent of the dose received by that population from normal background radiation.

In summary, the operations and activities at the Knolls Laboratory and the Kesselring Site continue to have no adverse effect on human health or the environment.

To improve clarity in this report, the following naming conventions are used:

- Knolls Laboratory refers to the Naval Nuclear Propulsion Program (NNPP) facility in Niskayuna, New York, including DOE-EM activities.
- Kesselring Site refers to the NNPP facility in West Milton, New York, including DOE-EM activities.

**TABLE 1
KNOLLS LABORATORY RADIOLOGICAL
ENVIRONMENTAL MONITORING PROGRAM**

Media Monitored	Analysis Frequency	Routine Analysis
Liquid Effluent		
• Outfall 002	Monthly – Continuous Composite Sample	Gross Alpha, Gross Beta, H-3, Sr-90, Cs-137
• Outfall 03A • Outfall 03D • Outfall 03E	Monthly – Grab Sample	Gross Alpha, Gross Beta, Sr-90
	Monthly Grab Samples taken and combined into a Quarterly Composite for analysis	Cs-137
• Outfall 004 (Lower Level Road Ditch)	Monthly – Grab Sample	Gross Alpha, Gross Beta, Sr-90, Cs-137
• Outfall 03B • West Landfill Stream	Monthly Grab Samples taken and combined into a Quarterly Composite for analysis	Gross Alpha, Gross Beta, Sr-90, Cs-137 if Gross Beta >10 pCi/l
• Upper West Boundary Stream (Background) • Mohawk River – Incoming river water to Lower Level Pumphouse (Outfall 001) (Background)	Monthly – Grab Sample	Gross Alpha, Gross Beta, H-3, Sr-90, Cs-137
• East Boundary Stream (Upper and Lower (Outfall 006)) • Midline Stream (Outfall 005)	Monthly Grab Samples taken and combined into a Quarterly Composite for analysis	Gross Alpha, Gross Beta, Sr-90, Cs-137
• Mohawk River Bank Seepage	At least annually	If sufficient sample volume: Gross Alpha, Gross Beta, Sr-90, Cs-137
• Sanitary Effluent	Weekly – 24-hour composite sample	Gross Alpha, Gross Beta
	Quarterly Composite of weekly samples	H-3, Co-60, Sr-90, Cs-137, Uranium
Municipal Drinking Water Systems • Schenectady • Niskayuna • Latham/Colonie	Monthly Grab Samples taken and combined into a Quarterly Composite for analysis	Gross Alpha, Gross Beta; Sr-90, Cs-137 if Gross Beta >10 pCi/l
Knolls Laboratory Service Water	Monthly Grab Sample	Gross Alpha, Gross Beta, H-3, Sr-90, Cs-137

TABLE 1 (continued)
KNOLLS LABORATORY RADIOLOGICAL
ENVIRONMENTAL MONITORING PROGRAM

Media Monitored	Analysis Frequency	Routine Analysis
Mohawk River Water		
<ul style="list-style-type: none"> • 1000 feet upriver • 3000 feet downriver 	Second, Third, and Fourth Quarters	Gross Alpha, Gross Beta; Sr-90, Cs-137 if Gross Beta >10 pCi/l
<ul style="list-style-type: none"> • 2000 feet upriver • 4500 feet downriver 	Second, Third, and Fourth Quarters	Gross Alpha, Gross Beta, Sr-90, Cs-137
Mohawk River Sediment	Second, Third, and Fourth Quarters	Gross Beta, Cs-137, Uranium, Plutonium; Sr-90 on seven sediment samples in second quarter sample set only
Mohawk River Fish <ul style="list-style-type: none"> • Upriver above Lock 7 • Downriver below Outfall 002 	Annually	Sr-90, Cs-137, Plutonium
Groundwater	Annually	Gross Alpha, Gross Beta, H-3, Sr-90, Cs-137
Stack Air Effluents		
<ul style="list-style-type: none"> • Particulate Radioactivity • Radioiodine 	Weekly	Gross Alpha, Gross Beta on Filter Papers; Gamma Spectrometry on Charcoal Cartridges
<ul style="list-style-type: none"> • Krypton-85 	Continuous	Noble Gas Monitor System
Environmental Air		
<ul style="list-style-type: none"> • Particulate Radioactivity 	Weekly	Gross Alpha, Gross Beta on Filter Papers
<ul style="list-style-type: none"> • Radioiodine 	Bi-monthly	Gamma Spectrometry on Charcoal Cartridges
Environmental Radiation	Quarterly	Gamma Radiation

**TABLE 2
KNOLLS LABORATORY NONRADIOLOGICAL
ENVIRONMENTAL MONITORING PROGRAM**

Media Monitored	Analysis Frequency	Routine Analysis
Liquid Effluent		
• Outfall 002	Continuous	Flow, Temperature
	Weekly	pH, Total & Net TSS, TDS, Oil & Grease, Total & Net Total Copper (when Copper Ion Generator is in use)
	Quarterly (during calendar years ending in "1" or "6")	WET Testing
• Outfall 03B	Continuous	Flow, Temperature
	Weekly	pH, Total & Net Total Copper (when Copper Ion Generator is in use)
	Monthly	Net TSS, Oil & Grease
• Outfall 03D	Continuous	Flow, Temperature
	Weekly	pH, Total & Net Total Copper (when Copper Ion Generator is in use)
	Monthly	TSS, Oil & Grease
• Outfall 03A	Quarterly	Flow, pH, TSS, Thallium, Oil & Grease
• Outfall 03E	Quarterly	Flow, pH, TSS, Oil & Grease
• Outfall 004 • Outfall 005 • Outfall 006	Quarterly	Flow, pH, TSS, Oil & Grease, COD, Chloride, Thallium [Outfall 004 only], VOCs (EPA 601)
• East Boundary Stream, Upstream • East Boundary Stream, Downstream (Outfall 006)	Annually concurrent with landfill well sampling	Flow, Temperature, pH, DO, Specific Conductance, Chloride, VOCs (EPA 601)
• Mohawk River Upstream (Outfall 001)	Continuous	Flow, Temperature
	Weekly	pH, TSS, TDS, Total Copper (when Copper Ion Generator is in use)
• Mohawk River Upstream & Downstream	Quarterly	Chloride
• Sanitary Effluent	Daily	Flow, pH
	Weekly 24-hour composite	BOD-5, COD, TSS, Ammonia, Nitrate, Nitrite, TKN, TON, Total Nitrogen, Phosphate, Oil & Grease
	Monthly	Flow (Pump run-time based)
Groundwater		
• Landfill Wells	Annually	Field Parameters, VOCs (EPA 601)
• Land Area Wells	Annually	Field Parameters, Filtered & Unfiltered Metals, Turbidity, VOCs (EPA 601 and 602)
• Hillside and Lower Level Wells	Annually	Field Parameters, VOCs (EPA 601 and 602)
• D3-D6 Area and G1-D4 Alleyway Wells and Catch Basins	Quarterly	VOCs (EPA 8260C)

**TABLE 3
KESSELRING SITE RADIOLOGICAL
ENVIRONMENTAL MONITORING PROGRAM**

Media Monitored	Analysis Frequency	Routine Analysis
Liquid Effluent		
<ul style="list-style-type: none"> • Retention Basins • Outfalls 001, 002 	Monthly Composite Monthly Grab Sample	H-3, Co-60
<ul style="list-style-type: none"> • Glowegee Creek Water 	Quarterly	Co-60
<ul style="list-style-type: none"> • Glowegee Creek Sediment 	Quarterly	Co-60
<ul style="list-style-type: none"> • Glowegee Creek Fish 	Annually	Co-60
Groundwater	Annually	H-3, Co-60, Cs-137
Stack Air Effluents		
<ul style="list-style-type: none"> • Particulate Radioactivity 	Bi-monthly	Co-60
<ul style="list-style-type: none"> • Radioiodine 	Bi-weekly	I-131
<ul style="list-style-type: none"> • H-3/C-14 	Weekly	H-3, C-14
Environmental Air		
<ul style="list-style-type: none"> • Particulate Radioactivity 	Bi-monthly	Co-60
<ul style="list-style-type: none"> • Radioiodine 	Bi-weekly	I-131
Environmental Radiation	Quarterly	Gamma Radiation

**TABLE 4
KESSELRING SITE NONRADIOLOGICAL
ENVIRONMENTAL MONITORING PROGRAM**

Media Monitored	Analysis Frequency	Routine Analysis
Liquid Effluent		
<ul style="list-style-type: none"> Outfall 001 Outfall 002 	Daily, when discharging from Outfalls 001 and 002	Flow, Temperature, Total Residual Chlorine
	Monthly	pH, Oil & Grease, TSS, Nitrite, Total Iron, Total Phosphorus, Total Zinc, Total Boron, Total Surfactants (MBAS), Total Sulfite, Ammonia
<ul style="list-style-type: none"> Outfall 003 	Daily	Flow, Settleable Solids, pH, DO, Temperature
	Monthly	Nitrite, Available Cyanide, Ammonia, Total Surfactants (MBAS), Dissolved Copper, BOD-5, TSS, Total Phosphorus, Total Zinc, Total Copper, Total Iron, Total Boron, Total Aluminum, Butyl Benzyl Phthalate
<ul style="list-style-type: none"> Outfall 02B 	Monthly	Nitrite, Ammonia
<ul style="list-style-type: none"> Glowegee Creek Water 	Daily, when discharging from Outfalls 001 and 002	Temperature
<ul style="list-style-type: none"> Glowegee Creek Water 	Annually	Species Survey
Groundwater		
<ul style="list-style-type: none"> Hogback Road Landfill 	Annually	Field Parameters, Hardness, Total & Dissolved Metals, Chloride, Nitrate, Sulfate, Alkalinity, Ammonia, COD, TDS, TOC, VOCs (EPA 8260C)
<ul style="list-style-type: none"> Developed Area 	Annually	Field Parameters, VOCs (EPA 601 and 602)
Drinking Water System		
<ul style="list-style-type: none"> Head Tank 27B 	Annually	Disinfection Byproducts (THM, Haloacetic Acids)
<ul style="list-style-type: none"> Entry Point to the Distribution System 	Daily	Free Chlorine Residual
	Annually	Nitrates, 1,4-Dioxane, PFOA, PFOS ¹
	Every 3 years	Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cyanide, Mercury, Nickel, Selenium, Thallium, Fluoride, Sulfate, Group 1 and 2 Pesticides, Dioxin, and PCBs
	Every 9 years	Asbestos
<ul style="list-style-type: none"> Distribution System (various locations) 	Minimum three times per month	Total Coliform, Free Chlorine Residual
	Every 3 years	Lead, Copper
<ul style="list-style-type: none"> Water Source 	Every 3 years	Principal Organic Contaminants, Vinyl Chloride, and Methyl Tertiary Butyl Ether (EPA 524.2)

Note:

1. Sampling for 1,4-dioxane, Perfluorooctanesulfonic acid (PFOS), and Perfluorooctanoic Acid (PFOA) was initially performed quarterly, and later approved to be annually.

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INTRODUCTION

The Knolls Laboratory and the Kesselring Site are operated by Fluor Marine Propulsion, LLC (FMP), under contract with the DOE and are both United States Government owned facilities. The principal function at the Knolls Laboratory is research and development in the design and operation of naval nuclear propulsion plants. The Kesselring Site is dedicated primarily to the training of personnel in the operation of these plants. The Knolls Laboratory and Kesselring Site are two of four DOE sites that make up the Naval Nuclear Laboratory (NNL), which refers to the collective operations of these sites performing NNPP work and the personnel operating at these associated locations.

The Knolls Laboratory is located in the Town of Niskayuna, New York, approximately two miles (3.2 kilometers) east of the City of Schenectady (Figure 1). The Knolls Laboratory is situated on 170 acres of land on the south bank of the Mohawk River. Facilities at the Knolls Laboratory include administrative offices; machine shops; a sewage pumping station; a boiler house; oil storage facilities; cooling towers; waste storage facilities; and chemistry, physics, and metallurgical laboratories. The surrounding area is a mixture of open land, other light industry, small farms, a closed municipal landfill, a small municipal park, and suburban residential areas.

The Kesselring Site is located near West Milton, New York, approximately 17 miles (27.4 kilometers) north of the City of Schenectady, nine miles (14.5 kilometers) southwest of Saratoga Springs and 13 miles (21 kilometers) northeast of Amsterdam (Figure 1). The surrounding area is a rural, sparsely populated region of wooded lands through which flow the Glowegee Creek and several small streams that empty into the Kayaderosseras Creek. The Kesselring Site consists of 3,900 acres on which are two pressurized-water naval nuclear propulsion plants and support facilities, including administrative offices, machine shops, training facilities, equipment service buildings, chemistry laboratories, a boiler house, oil storage facilities, a cooling tower, waste storage facilities, and wastewater treatment facilities. In 2018 the S8G nuclear propulsion plant was shut down for refueling and overhaul, and in 2019 the MARF plant was shut down permanently for dismantlement at a later date. Additionally, there were two other nuclear propulsion plants operated at the Kesselring Site, the S3G plant (dismantled in 2006) and the D1G plant (currently being dismantled).

Liquid effluents are monitored at the Knolls Laboratory and the Kesselring Site for the chemical parameters listed in the applicable State Pollutant Discharge Elimination System (SPDES) permits and for radioactivity. At the Knolls Laboratory, the Outside Users Agreement with the Town of Niskayuna specifies the chemical parameters and radioactivity required to be monitored in the sanitary sewage effluent. Analyses are also performed on effluent and receiving stream water samples for select chemical parameters, some of which have State water quality standards. Additionally, fish, water, and bottom sediment samples from the receiving streams are collected periodically and analyzed for radioactivity. Nonradiological industrial air emission sources do not require continuous monitoring under the terms of current NYS air regulations due to the combustion fuels used and the very low levels of emissions from overall operations at the Knolls Laboratory and the Kesselring Site. Airborne effluents from the main radiological emission points are continuously sampled for radioactivity. Other minor radiological emission points are evaluated for their potential for release, and a periodic measurement protocol is used to confirm the low

radionuclide emissions. In addition, radiation levels around the perimeter of the Knolls Laboratory, the Kesselring Site, and at several off-site background locations are monitored with sensitive thermoluminescent dosimeters (TLDs).

The quantities of radioactivity contained in liquid and gaseous effluents during operations in 2022 at the Knolls Laboratory and the Kesselring Site were too small to have a measurable effect on normal background radioactivity. The Radiation and Radioactivity section of this report provides information on radiation and radioactivity for those who may not be familiar with radiological terms and concepts.

The use of chemically hazardous substances at the Knolls Laboratory and the Kesselring Site is strictly limited to the types and quantities essential for operations. On-site handling of hazardous waste is performed by trained personnel in accordance with applicable regulations and permits. The transportation and disposal of hazardous waste is limited to vendors operating under permits issued by the cognizant Federal and State regulatory agencies. Additionally, all Knolls Laboratory and Kesselring Site personnel receive training on the hazards of chemical substances. Other types of solid waste produced on-site, such as cafeteria waste, are disposed of at off-site permitted facilities. Paper, cardboard, glass, wood, and plastic are also segregated for recycling whenever possible. Scrap metals are recycled through local vendors. Solid radioactive wastes are packaged and shipped from the sites in accordance with all applicable DOT, DOE, and NRC regulations.

Effluent and environmental surveillance programs are conducted at both the Knolls Laboratory and the Kesselring Site in accordance with applicable DOE Orders to monitor conformance with applicable Federal and State standards and to confirm that operations have had no adverse impact on the environment or the public. Numerous programs to reduce the potential for environmental effects from operations at the Knolls Laboratory and the Kesselring Site have been implemented over the years. Additionally, both sites work to minimize the amount of hazardous waste generated annually. Knolls Laboratory and Kesselring Site policy is to minimize releases to levels that are ALARA. A summary of the year's routine monitoring data for each site is presented and assessed in this report.

Demonstration of compliance with environmental regulations is an integral part of the mission at both the Knolls Laboratory and the Kesselring Site and is necessary for each site's operations. Federal, State, and local regulatory personnel periodically perform site visits and inspections of the Knolls Laboratory and the Kesselring Site, which sometimes includes DOE-EM activities. During 2022, a total of five of these visits and/or inspections were performed. Any questions or deficiencies identified during these visits and/or inspections were immediately addressed or promptly corrected.



FIGURE 1
KNOLLS LABORATORY AND KESSELRING SITE LOCATIONS
IN RELATION TO THE SURROUNDING COMMUNITIES

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ENVIRONMENTAL PROGRAM & COMPLIANCE

ENVIRONMENTAL PROGRAM

Policy

The Knolls Laboratory and the Kesselring Site are committed to conducting operations and activities in a manner that provides and maintains safe and healthful working conditions, protects the environment and surrounding communities, and conserves natural resources. The Knolls Laboratory and the Kesselring Site are committed to environmental excellence through compliance with applicable Federal, State, and local regulations; proactive planning to integrate sound environmental, safety, and health (ESH) principles into every aspect of operations, including hazard identification and risk assessment; and a commitment to waste minimization and pollution prevention.

Objectives

The objectives of the environmental monitoring programs are to:

- Demonstrate compliance with regulatory requirements,
- Demonstrate that operations do not significantly impact the environment,
- Confirm the effectiveness of control methods in preventing increases in environmental radioactivity levels,
- Confirm that the potential radiation exposure received by a member of the public is insignificant compared to the dose received from natural background radioactivity,
- Provide accurate monitoring results to applicable Federal, State, and local officials and to the general public, and
- Maintain an accurate record of effluent releases to the environment from the Knolls Laboratory and the Kesselring Site.

Organization

The Knolls Laboratory and the Kesselring Site employ environmental staff professionals to ensure environmental responsibilities are met while also fulfilling the mission of each site. Although the Knolls Laboratory and Kesselring Site each have distinct ESH organizations, there is significant collaboration between the two sites' ESH organizations to optimize personnel expertise, establish uniform practices, and promote the sharing of best practices. These organizations are responsible for identifying, interpreting, and communicating ESH requirements to facility personnel for implementation; assisting other Knolls Laboratory and Kesselring Site organizations in meeting their ESH responsibilities; interfacing with DOE-EM ESH organizations; monitoring ESH activities for compliance; interfacing with regulatory agencies; and completing required regulatory reports.

ENVIRONMENTAL, SAFETY, AND HEALTH MANAGEMENT SYSTEM

The NNL Environmental, Safety, and Health Management System (ESHMS) documents the management processes and systems to perform work in a manner protective of employees, the public, and the environment, while ensuring regulatory compliance. Environmental performance objectives, performance targets, and deliverables are prepared and reviewed annually. The management processes and systems are used to identify, communicate, implement, assess, and update environmental programs.

ENVIRONMENTAL COMPLIANCE

Demonstration of compliance with environmental regulations is an integral part of the Knolls Laboratory and Kesselring Site missions and is necessary for successful site operations. Federal and State regulatory personnel periodically perform site visits and inspections of the Knolls Laboratory and Kesselring Site, which sometimes includes DOE-EM activities. Table 5 depicts a list of the visits and inspections that occurred in 2022.

TABLE 5
SUMMARY OF VISITS & INSPECTIONS BY REGULATORY AGENCIES

Knolls Laboratory		
Date	Purpose	Regulatory Agency
05/04/22	RCRA Inspection	EPA – Region 2
05/19/22	Annual SPDES Inspection	NYSDEC – Region 4
Kesselring Site		
Date	Purpose	Regulatory Agency
03/30/22	Drinking Water Sanitary Inspection	NYSDOH
04/26/22	Wetlands Review	USACE
12/12/22	RCRA Inspection	NYSDEC – Central Office

Note:

1. No inspections or regulatory visits were performed for DOE-EM activities in 2022.

Any questions or deficiencies identified during these visits and/or inspections were immediately addressed or promptly corrected. Over 90 periodic environmentally related reports were filed with Federal, State, and local agencies during 2022.

The Knolls Laboratory, Kesselring Site, and DOE-EM environmental permits, registrations, or agreements in effect during 2022 that were issued from regulatory agencies for specific facilities or operations are shown in Table 6. NYS General Permits for Stormwater Discharges implemented by the Knolls Laboratory or the Kesselring Site for construction projects one acre or greater or for work in wetlands or streams are not included in Table 6 if their duration was less than one year. However, the Knolls Laboratory and the Kesselring Site have included in Table 6 the Municipal Separate Storm Sewer System (MS4) Permits that cover day-to-day operations with regard to stormwater management.

**TABLE 6
KNOLLS LABORATORY, KESSELRING SITE,
AND DOE-EM ENVIRONMENTAL PERMITS**

Permit Number	Permit Type	Issuing Agency	In Compliance	Expiration Date	Other Information
KNOLLS LABORATORY					
NY0005851	SPDES	NYSDEC	Yes	7/31/25	Site Outfalls
4-4224-00024/00052	Water Withdrawal	NYSDEC	Yes	05/20/25	Initial Water Withdrawal Permit
94 3850	Sanitary	Town of Niskayuna	Yes	None	Outside Users Agreement for Sanitary Sewer Service
GP-0-15-003	SPDES	NYSDEC	Yes	04/30/17 ⁽¹⁾	MS4 General Permit Knolls Laboratory ID# NYR20A026
GP-0-20-001	SPDES	NYSDEC	Yes	01/28/25	Construction General Permit - Clean Soil Management Areas II (ID# NYR10H590), III (ID# NYR10N657), IV (ID# NYR10T230); NE Civil Utilities (ID# NYR11F131)
4-4224-00024/00001	RCRA	NYSDEC	Yes	07/29/22 ⁽²⁾	RCRA Waste (EPA ID NY6890008992)
4-4224-00024/00039 Mod 4	Air Emissions	NYSDEC	Yes	None	Heating Boilers and ASGTF
4-443417	PBSF	NYSDEC	Yes	08/23/23	Oil Storage
KAPL-2012-003	RAE	EPA Region 2	Yes	None	Bldg. D3 Ventilation Duct Removal
49-5-162	Canal	NYSCC	Yes	None	Land Easement Permit
C-OC-201800134	Use & Occupancy Permit	NYSCC	Yes	None	L4 Pump House Cooling Water Intake Screen
C-WK-202200051	Canal Work	NYSCC	Yes	12/31/22	Mohawk River Sampling
KESSELRING SITE					
NY0005843	SPDES	NYSDEC	Yes	08/31/23	Site Outfalls
GP-0-15-003	SPDES	NYSDEC	Yes	04/30/17 ⁽¹⁾	MS4 General Permit Kesselring Site ID# NYR20A027
GP-0-20-001	SPDES	NYSDEC	Yes	01/28/25	Clean Soil Management Area (ID# NYR11H979),
5-4142-00005/00090	Water Withdrawal	NYSDEC	Yes	06/11/25	Initial Water Withdrawal Permit
5-4142-00005/00049	RCRA	NYSDEC	Yes	12/12/23	RCRA Waste (EPA ID NY5890008993)
5-4142-00005/00073	Air Facility Registration	NYSDEC	Yes	04/19/26	Heating Boilers
5-000070	CBSF	NYSDEC	Yes	07/19/23	Chemical Storage

Notes for Table 6 are on page 16

**TABLE 6 (continued)
KNOLLS LABORATORY, KESSELRING SITE,
AND DOE-EM ENVIRONMENTAL PERMITS**

Permit Number	Permit Type	Issuing Agency	In Compliance	Expiration Date	Other Information
5-414506	PBSF	NYSDEC	Yes	08/17/27	Oil Storage
KAPL-788-01	RAE	EPA Region 2	Yes	None	Radiological Work Facility
A-05	Wastewater Sludge	Saratoga County Sewer District #1	Yes	09/23/25	SWTF Sludge Disposal
GR-042-4	Grease Trap Disposal	Saratoga County Sewer District #1	Yes	12/31/22	Cafeteria Grease Trap Disposal
5-4142-00005/00097	Water Quality Certification	NYSDEC	Yes	09/30/22 ⁽³⁾	Surge Suppression & Well 4
NAN-2020-00939-UDE	Nationwide	USACE	Yes	09/30/22 ⁽³⁾	Well Decommissioning
5-4142-00005/00099	Water Quality Certification	NYSDEC	Yes	09/30/22 ⁽³⁾	Well Decommissioning
5-4142-00005/00092	Water Quality Certification	NYSDEC	Yes	09/30/22 ⁽³⁾	LWWTF Gate 1 Upgrade Project
09NY09104001	Underground Injection Control	EPA Region 2	Yes	None	Underground Injection Control Site Registration
DOE-EM Activities (Including SPRU)					
4-4224-00024/00055	RCRA	NYSDEC	Yes	09/28/18 ⁽⁴⁾	RCRA Waste (EPA ID NYR000096859)

Notes:

1. NYSDEC has not issued the final MS4 permit to replace the current permit which expired on April 30, 2017. In the interim, the expired permit remains administratively in effect.
2. The Knolls Atomic Power Laboratory Part 373 Permit Renewal Application was submitted to NYSDEC on January 28, 2022. NYSDEC requested Knolls agreement to an extension of statutory review timeframes on February 16, 2022. Current permit is under State Uniform Procedures Act (UPA) extension.
3. The projects were completed and permit renewals were not needed.
4. The Separations Process Research Unit (SPRU) Resource Conservation and Recovery Act (RCRA) Corrective Action Permit remains valid as a permit renewal application was submitted to the NYSDEC on March 29, 2018 and accepted in May 2019.

A description of the Knolls Laboratory’s and the Kesselring Site’s compliance with key environmental regulations is provided in the proceeding pages. Information on DOE-EM activities’ compliance is also provided, where applicable.

Clean Water Act (CWA)

The Federal CWA and the NYS Environmental Conservation Law (ECL) regulate the chemical components and physical attributes of liquids discharged to the surface waters of the State of New York. Specifically, the Knolls Laboratory and the Kesselring Site effluent and environmental standards are established in site-specific SPDES Permits issued by NYSDEC. NYS water quality standards applicable to the Mohawk River and Glowegee Creek are given in Reference (1). NYSDEC renewed the Knolls Laboratory SPDES permit in 2020, which became effective on August 12, 2020. NYSDEC renewed the Kesselring Site SPDES permit in 2018, which became effective on September 1, 2018. Renewed permits are generally in effect for five years.

The constituents of the Knolls Laboratory sewage are regulated by an Outside Users Agreement (Reference (2)) with the Town of Niskayuna.

During 2022, the Knolls Laboratory experienced two SPDES noncompliance events as summarized in Table 7. The Kesselring Site experienced three SPDES noncompliance events as summarized in Table 8.

NYS implements the EPA Phase II Stormwater regulations under the SPDES program through two stormwater general permits applicable to the Knolls Laboratory and the Kesselring Site. The versions in effect during this reporting period were GP-0-20-001 (General Permit for Stormwater Discharges from Construction Activities) and GP-0-15-003 (Municipal Separate Storm Sewer System, or MS4). The Construction Stormwater permit requires the Knolls Laboratory, the Kesselring Site, and DOE-EM to process Notices of Intent (NOIs) to participate in the NYSDEC’s Stormwater general permitting program for sites disturbing one acre or greater of soil. Participation in this general permit also requires preparation of project-specific Stormwater Pollution Prevention Plans. The MS4 general permits are applicable to the Knolls Laboratory and Kesselring Site and participation requires preparation and management of Stormwater Management Programs for both sites. In addition to certain administrative documentation requirements listed in each permit, the SPDES general permit for construction activities requires an inspection of the project site at least once every seven days. Post-rainfall inspections are required for specific erosion and sediment control practices.

**TABLE 7
KNOLLS LABORATORY SPDES NONCOMPLIANCES**

Permit Type	Outfall	Parameter	# of Permit Exceedances	# of Samples	# of Compliant Samples	Percent Compliance	Date(s)	Description/ Solution
SPDES	002	TSS - Net	1	53	52	98%	10/13/22	See Note 1
SPDES	002	pH	1	53	52	98%	10/13/22	See Note 1

Notes:

1. On 10/13/2022 the net Total Suspended Solids (TSS) level for Outfall 002 exceeded the SPDES Permit effluent net daily maximum of 40 mg/L based on a visual observation. The maximum pH limit of 8.5 SU (Standard Units) was also exceeded at 11.8 SU. Both exceedances were due to the accidental release of a cement-based fill into a catch basin under construction while outfall flow was less than 50 gallons per minute. The release was mitigated by recovering most of the material from the storm sewer system. The outfall effluent was back in compliance with the permit limits by the end of the day.

**TABLE 8
KESSELRING SITE SPDES NONCOMPLIANCES**

Permit Type	Outfall	Parameter	# of Permit Exceedances	# of Samples	# of Compliant Samples	Percent Compliance	Date(s)	Description/ Solution
SPDES	NA	Propylene Glycol	0	0	0	NA	01/04/22	See Note 1
SPDES	001/002	Sanitary lift Station overflow	0	0	0	NA	03/15/22	See Note 2
SPDES	001/002	Unauthorized Discharge to Lagoon	0	0	0	NA	03/17/22	See Note 3

Notes:

1. On January 4, 2022, up to 120 gallons of propylene glycol was inadvertently released to the site’s wastewater system. Kesselring Site does not have SPDES authorization to discharge this material, and immediate actions were taken to isolate the propylene glycol release and collect the material for off-site disposal. Kesselring Site determined the cause of the release to be a failed relief valve and implemented actions to prevent recurrence of the failure. The event did not result in an exceedance of water quality standards or SPDES permit limits.
2. On March 15, 2022 a sanitary lift station facility overflowed. An estimated 100 gallons of sewage ran over the asphalt and into a storm drain that is connected to the site’s industrial wastewater system. The conveyance line connecting the impacted storm drain to the rest of the site’s industrial wastewater system was isolated by shutting a gate valve. A vacuum truck was used to clean up the sewage from the asphalt and the storm drain catch basin. The areas were then rinsed repeatedly and wash water was collected. Confirmatory samples were collected to ensure there were no impacts to the public waters or SPDES limits.
3. A DOE-EM contractor made an unauthorized discharge of 11,000 gallons of potentially contaminated water to the site’s industrial wastewater lagoon contrary to the site’s SPDES permit. After discovering the unauthorized release, immediate actions were taken to stop the discharge to the lagoon and prevent any discharges from the lagoon until representative samples were taken of the lagoon. All sample results from the lagoon were below detection limits except for magnesium, which was within the levels of the site’s SPDES permit application. Corrective actions were taken to prevent recurrence of any unauthorized discharges from the DOE-EM contractor work. The event did not result in an exceedance of water quality standards or SPDES permit limits..

Clean Air Act (CAA)

The Federal CAA and its amendments provide the regulatory basis for the following:

1. Protection of ambient air quality;
2. Control and reduction in the emissions of the pollutants carbon monoxide, particulate matter, and those compounds that contribute to the formation of ground-level ozone (i.e., Volatile Organic Compounds (VOCs) and nitrogen oxides (NO_x));
3. Control and reduction of pollutants likely to increase the risk of death or serious illness;
4. Control and prevention of accidental releases of regulated hazardous air pollutants or any other extremely hazardous substances;
5. Control of the principal contributors to acid rain and other forms of acid deposition (i.e., sulfur dioxide (SO₂) and NO_x);
6. Protection of stratospheric ozone; and

7. A mandated Federal permitting program (Title V) for major air emission sources.

The regulatory authority for the majority of the CAA regulations that affect the Knolls Laboratory and the Kesselring Site has been delegated by the EPA to NYSDEC. The Federal regulations which currently affect the Knolls Laboratory and the Kesselring Site that have not yet been implemented by the State, but require report submittals, recordkeeping, or operation and maintenance activity tracking are: “Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units” (40 CFR Part 60 – Subpart Dc); “National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources” (40 CFR Part 63 – Subpart JJJJJ); “National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities” (40 CFR Part 61 – Subpart H); “National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines” (40 CFR Part 63 – Subpart ZZZZ); “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines” (40 CFR Part 60 – Subpart IIII); “General Compliance Provisions for Highway, Stationary, and Nonroad Programs” (40 CFR Part 1068); and “Protection of Stratospheric Ozone” (40 CFR Part 82). For these regulations, the EPA retains regulatory authority.

The Knolls Laboratory and Kesselring Site are subject to numerous NYSDEC regulations under 6 NYCRR (New York Codes, Rules and Regulations) that govern air emissions and the operation of combustion sources at each site. The major applicable regulations include: Subpart 225-1 - Fuel Composition and Use - Sulfur Limitations, Subpart 228-2 - Commercial and Industrial Adhesives, Sealants and Primers, Part 205 - Architectural and Industrial Maintenance (AIM) Coatings, and Part 494 - Hydrofluorocarbon Standards and Reporting. These regulations were developed to either ban the usage or limit the impact of industrial pollutant and greenhouse gas emissions on the environment. Effective March 2020, 6 NYCRR Part 222 - Distributed Generation Sources (DGS) is no longer applicable to DGS located in upstate New York.

A number of air emission sources at both the Knolls Laboratory and the Kesselring Site, such as site heating boilers, are regulated under the NYSDEC Air Permitting/Registration Program (see Table 6). Both the Knolls Laboratory heating boilers and the Advanced Steam Generator Test Facility (ASGTF) water heaters are permitted under a NYSDEC Air State Facility Permit (ASFP), which was renewed in January 2010 and is still in effect. One of the two ASGTF water heaters which was procured after June 9, 1989 is also regulated by the EPA under 40 CFR Part 60 – Subpart Dc.

The ASFP for the Knolls Laboratory heating boilers has federally enforceable capping provisions that allow the heating boilers to be classified as synthetic minor sources. As such, the Knolls Laboratory does not require a Title V facility permit, which normally applies to major sources under the CAA.

In 2021, the Knolls Laboratory commenced the tracking of air emissions from Research and Development (R&D) Activities based on a change to the NYSDEC regulations under Subpart 201-1.16. Emissions data are tracked on a rolling 12-month basis and Safety Data Sheets for products emitted to the atmosphere are maintained. To date, the rolling 12-month emissions data has not

caused the Knolls Laboratory to exceed the Title V facility thresholds or the current established air emissions cap limits listed in the ASFP.

The Kesselring Site maintains a NYSDEC Air Facility Registration for three heating boilers. The facility has the potential to emit NO_x and carbon monoxide (CO) in excess of Title V thresholds, and has elected to limit its emissions under the State's cap-by-rule provisions.

During 2022 the air emission sources listed in Table 6 were operated in accordance with their permit or facility registration conditions.

Other nonradiological air emission sources that do not require State permits or registrations at the Knolls Laboratory and Kesselring Site either come under an exemption for ventilating and exhausts from laboratory operations, NESHAP minor source exemptions presently in effect, or are considered as exempt or trivial activities under NYS regulations.

The EPA, under 40 CFR Part 61 Subpart H, regulates radionuclide air emission sources at the Knolls Laboratory and the Kesselring Site. During 2022, the maximally exposed individual effective dose equivalent, calculated using the EPA computer code CAP88-PC, was less than 0.1 mrem for the Knolls Laboratory and the Kesselring Site. This is less than 1% of the 10 mrem/year EPA standard. Annual radionuclide air emission reports are provided to the EPA, as required by the regulations, and also to the NYSDEC.

Resource Conservation and Recovery Act (RCRA)

The Federal RCRA and the NYS ECL address the safe disposal of municipal and industrial solid and hazardous waste. RCRA, like most environmental legislation, encourages States to develop their own hazardous waste programs as an alternative to direct implementation of the Federal program. To this end, the EPA has delegated its authority to NYSDEC for all aspects of RCRA, with the exception of a few specific portions associated with the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA.

During 2022, the Knolls Laboratory and the Kesselring Site continued to operate as both hazardous waste generators and permitted storage facilities. In this latter instance, the Knolls Laboratory and the Kesselring Site received their original NYSDEC, 6 NYCRR Part 373, hazardous waste management permits in July 1998 and June 1995, respectively. As such, both the Knolls Laboratory and the Kesselring Site must follow specific requirements for handling and accumulation of hazardous waste under applicable NYS regulations as well as the conditions for storage of such waste under their respective State-issued hazardous waste management permits. Hazardous waste management permits are generally in effect for ten years. The Knolls Laboratory permit was first renewed on July 30, 2012. A second permit renewal application was submitted to NYSDEC on January 28, 2022. On February 18, 2022, the DOE Naval Reactors Laboratory Field Office (NRLFO) agreed with NYSDEC's request to indefinitely extend the statutory review timeframes for the application as provided under 6 NYCRR Part 621. The existing permit is currently in effect under a State Uniform Procedures Act (UPA) extension. The Kesselring Site permit was first renewed on December 13, 2013, and the Site expects to submit a second permit

renewal application to NYSDEC in June 2023. Representatives from the EPA and/or NYSDEC inspect both the Knolls Laboratory and the Kesselring Site annually for compliance.

DOE-EM personnel and contractors manage universal/hazardous/mixed waste in accordance with 6 NYCRR Parts 370-373, Part 376, and Part 374-3 regulations, as applicable, and ship waste to permitted Treatment, Storage, and Disposal Facilities (TSDFs). DOE-EM is temporarily storing mixed transuranic (TRU) waste at the Knolls Laboratory under a NYSDEC issued consent order pending issuance of a 6 NYCRR Part 373 Hazardous Waste Management Permit.

RCRA Corrective Action Program

The 1984 HSWA to RCRA expanded EPA's authority to require TSDFs to conduct corrective action for releases from a facility. Under this section of RCRA, the EPA or an authorized State must require corrective action for all releases of hazardous waste or constituents from any solid waste management unit at a TSDF seeking a permit under RCRA, regardless of the time at which the waste was placed in such units. The regulations implementing this section of RCRA define the term Solid Waste Management Unit (SWMU) to include: any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released.

NYSDEC has been granted authority by the EPA to manage their own RCRA Section 3004(u) Corrective Action Program via the NYS ECL. The Knolls Laboratory and the Kesselring Site 6 NYCRR Part 373 hazardous waste permits require each site to pursue facility characterization and corrective action, if necessary. In addition to the SWMUs included in each of the permits, NYS has also established Areas of Concern (AOC). An AOC is an area that is not at this time known to be a SWMU, where hazardous waste and/or hazardous constituents are present, or are suspected to be present as a result of a release from the facility. The term includes areas of potential or suspected contamination as well as actual contamination. Such areas may require study and a determination of what, if any, corrective action may be necessary. Areas where historical petroleum or chemical spills have been identified were reported to appropriate regulatory authorities. These areas have been remediated or will be in the future to meet NYS requirements.

The Knolls Laboratory and the Kesselring Site are performing RCRA corrective action efforts under the oversight of NYSDEC. Each site has several areas where historical releases of hazardous chemicals require sampling and potential remedial action. Reports of sample analytical results and actions taken are submitted for NYSDEC approval as they are accomplished, in accordance with established schedules.

DOE-EM performs RCRA corrective actions in accordance with DOE-EM 6 NYCRR Part 373 Permit No. 4-4224-00024/00055 (issued as #4-4224-00024/00042) under NYSDEC's authority. This permit is a Corrective Action Only permit, meaning that there are no treatment, storage, or disposal provisions included therein.

Federal Facility Compliance Act (FFCA)

The FFCA was signed into law in October 1992 as an amendment to the Solid Waste Disposal Act (SWDA). The FFCA applied certain requirements and sanctions of RCRA to Federal facilities. In short, the FFCA waives sovereign immunity for Federal facilities from all civil and administrative penalties and fines; this includes waivers for both coercive and punitive sanctions for violations of the SWDA. Relative to mixed waste, the FFCA mandated the development and Federal/State approval of Site Treatment Plans (STPs), that contain schedules for developing treatment capabilities and for treating mixed wastes subject to the Land Disposal Restrictions of 40 CFR Part 268 and 6 NYCRR Part 376.

The DOE NRLFO and the NYSDEC signed Administrative Consent Orders in October 1995 to establish commitments regarding compliance with the approved STPs for mixed wastes stored and generated at the Knolls Laboratory and the Kesselring Site. NRLFO and NYSDEC terminated the Kesselring Site's Administrative Consent Order in August 2009, because the requirements and milestones established in the Kesselring Site STP had all been completed. In compliance with the Knolls Laboratory's Order, the STP is updated annually and issued to NYSDEC by June 30 each year, as needed. The Knolls Laboratory STP has met all its milestones with the exception of the mixed TRU remote handled waste stream, which has yet to be generated.

Waste Minimization, Pollution Prevention, and Recycling Programs

The Knolls Laboratory and Kesselring Site waste minimization and pollution prevention programs promote these concepts by encouraging employees to reduce the initial use of hazardous materials, energy, water, and other resources while protecting existing resources through conservation and more efficient use. The program focuses mainly on process efficiency improvements; source reduction; inventory control; preventive maintenance; improved housekeeping; recycling; and increasing employee awareness of, and participation in, pollution prevention.

The goal of the Pollution Prevention Program is to minimize the quantity and toxicity of waste generated at its source and, if waste is generated, to ensure that the treatment and disposal method used minimizes the present and future threat to people and the environment. The program consists of the following elements:

- Control of chemical acquisitions, including type and quantity;
- Maximized use of on-hand chemicals;
- Minimized production of process wastes (Source Reduction); and
- Process evaluation and modification.

The Knolls Laboratory and the Kesselring Site ensure that pollution prevention strategies are met by reviewing chemical purchases and major construction projects to incorporate source reduction strategies for environmentally hazardous substances.

Consistent with the ESHMS, which serves as the foundation of both the Knolls Laboratory and the Kesselring Site environmental management programs, both facilities established and implemented a sustainable acquisition program.

Progress in sustainable acquisition is reported annually to the DOE via the DOE Sustainability Dashboard, formerly the Consolidated Energy Data Report (CEDR). Sustainable acquisition maximizes the amounts of material procured that contain recycled material. Environmentally preferable items reported in the Knolls Laboratory and Kesselring Site programs include, but are not limited to: paper and paper products, vehicular products (e.g., engine coolants, oils), construction (e.g., insulation, carpet, concrete, paint) and transportation products (e.g., traffic barricades, traffic cones), park and recreation products, landscaping products, non-paper office products (e.g., binders, toner cartridges, office furniture), and miscellaneous products (e.g., pallets, sorbents, and industrial drums).

The Knolls Laboratory and the Kesselring Site facilities both maintain an extensive recycling program which includes unclassified office paper, glass, tin, aluminum, newspapers, magazines, plastic, cardboard, wood, asphalt, lead/lead acid batteries, concrete, precious metals, computers, metal and plastic drums, cafeteria grease, used oil, and universal waste (e.g., light bulbs, batteries, thermostats). The facilities recycled approximately 66% of their waste streams in 2022.

DOE-EM complied with DOE Order 436.1, “Departmental Sustainability” which provides requirements and responsibilities for managing sustainability within DOE, and includes goals to reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials and to maximize the acquisition and use of environmentally preferable products in the conduct of operations.

Toxic Substances Control Act (TSCA)

The U.S. Congress enacted TSCA in 1976. TSCA authorizes EPA to secure information on all new and existing chemical substances and to control any of these substances determined to cause an unreasonable risk to public health or the environment. Unlike many other environmental laws, which generally govern discharge of substances, TSCA requires that the health and environmental effects be reviewed prior to a new chemical substance being manufactured for commercial use. TSCA, therefore, closes the gap in environmental regulations by allowing the EPA to prevent toxic chemical problems from being created rather than simply reacting to them after discharge. However, because the Knolls Laboratory and the Kesselring Site do not manufacture chemicals or materials for commercial use, a majority of the implementing TSCA regulations do not apply.

Polychlorinated biphenyls (PCBs) are regulated as a toxic substance under TSCA by means of 40 CFR Part 761. PCBs were used prior to 1979 mainly as a dielectric fluid in electrical equipment such as transformers and capacitors. PCBs were also added to certain surface coatings and other non-liquid materials due to their heat and chemical resistance. The Knolls Laboratory and the Kesselring Site have identified PCBs in materials such as small electrical transformers, fluorescent light ballasts, applied dried paints, lubricants/machine oils, and electrical cable insulation. The Knolls Laboratory and the Kesselring Site have removed all large PCB transformers from their sites and continue to remove and replace suspected PCB fluorescent light ballasts, where practical. Additionally, both the Knolls Laboratory and the Kesselring Site employ strict controls for removal, storage, and disposal of remaining PCB containing items. Similarly, DOE-EM manages PCBs in accordance with the requirements of TSCA under 40 CFR Part 761.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Federal CERCLA, or Superfund, was designed to respond to situations involving the past disposal of hazardous substances. As such, it complements RCRA, which regulates on-going hazardous waste handling and disposal.

The National Priorities List (NPL) is an important facet of CERCLA's response procedures and is updated annually to list sites warranting evaluation and/or cleanup under CERCLA. Neither the Knolls Laboratory nor the Kesselring Site are currently included on the NPL. This determination was made by EPA Region 2 in May 1994.

Emergency Planning and Community Right-to-Know Act (EPCRA)

The Federal EPCRA establishes authorities for emergency planning and preparedness, emergency release notification reporting, community right-to-know reporting, and toxic chemical release reporting. Under the provisions of this Act, covered facilities must provide the following information to State and local entities: the name of the individual who will function as a Facility Emergency Coordinator, notice that certain applicable substances (e.g., extremely hazardous substances on-site above certain threshold planning quantities) are present at that facility and, when required, report releases of those substances and other listed hazardous substances in excess of certain reportable quantities. Additionally, EPCRA requires that facilities prepare and submit, or retain on file, the information listed in the following EPCRA Sections below, which are codified under 40 CFR Parts 370 and 372:

- § 302-303 Provide initial notification to State Emergency Response Commission (SERC), Local Emergency Planning Committees (LEPCs), and local fire departments that the facility is subject to the emergency planning requirements under EPCRA.
- § 304 Facilities must immediately notify the LEPC and the SERC if there is a release to the environment of a hazardous substance that is equal to or exceeds the minimum reportable quantity set in the regulations.
- § 311 The submission of Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs) for extremely hazardous substances (EHSs) stored on-site in quantities greater than the threshold planning quantity or any substance stored on-site greater than 10,000 pounds for which a potential exposure to an employee exists. Updated SDSs are to be submitted within three months of discovery of significant new information about the hazardous chemicals/substances.
- § 312 Complete an annual Tier Two Emergency and Hazardous Chemical Inventory Report for EHSs and hazardous chemicals/substances present at each site in excess of specified quantities during the previous calendar year. The information is submitted to the SERC, LEPCs, and local fire departments for emergency planning purposes.

§ 313 Complete an annual evaluation of activities associated with the manufacturing, processing, or otherwise use of any of the listed toxic chemicals above the designated activity thresholds; and where necessary, prepare a Toxic Release Inventory (TRI) report for submittal to EPA.

The status summary of Knolls Laboratory, Kesselring Site, and DOE-EM EPCRA Reporting is shown in Tables 9 and 10. There were no EPCRA reportable releases from any of the sites in 2022 and none of the sites were required to submit TRI reports under Section 313 for the 2021 reporting year. Reports are filed in the year following the reporting year’s activities (e.g., 2021 activities are reported in 2022).

**TABLE 9
KNOLLS LABORATORY & KESSELRING SITE EPCRA REPORTING**

EPCRA Section	Description of Reporting	Status
EPCRA § 302-303	Planning Notification	No Notifications required during calendar year 2022
EPCRA § 304	Emergency Release Notification	No Reportable Releases
EPCRA § 311-312	SDS Submittal / Tier Two Emergency and Hazardous Chemical Inventory Reporting	The Kesselring Site and the Knolls Laboratory made no new SDS submittals during calendar year 2022.
		The Emergency and Hazardous Chemical Inventory (Tier Two) Reports for calendar year 2021 were filed in 2022 using E-Plan, an electronic reporting system approved for use by the New York SERC for Tier Two Reporting.
EPCRA § 313	TRI Reporting	Not Required for the 2021 reporting year

**TABLE 10
DOE-EM EPCRA REPORTING**

EPCRA Section	Description of Reporting	Status
EPCRA § 302-303	Planning Notification	No Notifications required during calendar year 2022
EPCRA § 304	Emergency Release Notification	No Reportable Releases
EPCRA § 311-312	SDS Submittal / Tier Two Emergency and Hazardous Chemical Inventory Reporting	No Notifications required for calendar year 2022
EPCRA § 313	TRI Reporting	Not Required for the 2021 reporting year

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The FIFRA gives EPA authority to regulate the field use of pesticides, which EPA implements through a State-administered registration program. Authorized Knolls Laboratory and Kesselring Site personnel applying pesticides, such as cooling tower addition chemicals, keep a daily use log for every application of a general use pesticide. Annual reports are filed and provided to NYSDEC by the certified applicator/technician for all pesticides applied during the previous year. Any such chemical applied by a subcontractor licensed commercial application business or under their guidance is recorded and reported by the subcontractor directly.

National Environmental Policy Act (NEPA)

Significant construction, renovation, demolition, decommissioning, decontamination, and remediation activities are reviewed for their impact on the environment under the NEPA requirements as provided by the DOE. Other projects or capital equipment expenditures that have the potential for creating new emissions to the environment or effect any condition of a permitted or otherwise regulated operation also receive a NEPA evaluation. Summary forms for determinations made for the applicability of the use of Categorical Exclusions for NEPA Compliance and all NEPA documentation for the NNPP Sites including the Knolls Laboratory and the Kesselring Site in New York are posted online at the U.S. DOE website located at www.energy.gov/nepa/office-nepa-policy-and-compliance.

ENVIRONMENTAL MONITORING

KNOLLS LABORATORY

SITE DESCRIPTION

The Knolls Laboratory is located in the Town of Niskayuna, New York, approximately two miles (3.2 kilometers) east of the City of Schenectady. The Knolls Laboratory is situated on 170 acres of land on the south bank of the Mohawk River. Facilities at the Knolls Laboratory include administrative offices; machine shops; a sewage pumping station; a boiler house; oil storage facilities; cooling towers; waste storage facilities; and chemistry, physics, and metallurgical laboratories. The surrounding area is a mixture of open land, other light industry, small farms, a closed municipal landfill, a small municipal park, and suburban residential areas.

The climate in the region of the Knolls Laboratory is primarily continental in character but is subject to some modification from the maritime climate that prevails in the extreme southeastern portion of NYS. Winters are usually cold and occasionally severe. Maximum temperatures during the colder winter months often are below freezing and nighttime low temperatures frequently drop to 14° Fahrenheit or lower. Sub-zero temperatures occur rather infrequently, about ten times a year. Snowfall in the area is quite variable, averaging approximately 60 inches per year. The mean annual precipitation for the region is approximately 40 inches per year. Westerly winds (W to NW) predominate, and a secondary maximum occurs about the south-southeast direction.

The Knolls Laboratory is located in the Mohawk River Valley at an elevation of approximately 330 feet above mean sea level. Monitoring wells and soil/bedrock borings in the vicinity of the Knolls Laboratory show that unconsolidated materials, consisting mainly of glacial deposits, overlie bedrock. The depth of bedrock beneath the site generally ranges between 10 and 70 feet. Rock outcrops are visible on both banks of the Mohawk River between the Rexford Bridge, approximately two miles upstream, and a point about three quarters of a mile downstream from the Knolls Laboratory. The outcrops are shales and sandstones of the Ordovician-age Schenectady Formation. These rocks are characteristically non-porous, impermeable, and form poor aquifers. The bedrock structure is relatively simple. Over 90 percent of Schenectady County is underlain by the Schenectady Formation, a series of alternating beds of shale, sandstone, and grit about 2,000 feet thick, which dip gently west and southwest. The Snake Hill formation is exposed along both sides of the Mohawk River near the dam at Lock 7, downstream from the Knolls Laboratory. This formation consists of a considerable thickness of dark gray to black, bluish, and greenish-gray shale. It is the only formation in Schenectady County that is strongly folded, having been thrust westward against and over the Schenectady Formation.

The glacial deposits consist almost entirely of glacial till. The glacial till at the Knolls Laboratory is clay rich, dense, compact, and is known locally as hardpan. The depth of the till beneath the site ranges from 0 to 70 feet. The till appears a grayish-blue color but in the upper 12-foot portion, it has been weathered to a yellowish brown color. Within the till, occasional lenses of graded material, usually fine sand, exist. The till is almost entirely impermeable except for a few lenses of sand, which are capable of transmitting water. These lenses are small in size and isolated from one another based on drilling records and on-site monitoring well performance. Overlying the till

in the eastern portion of the site are glacial lake sequences (silts and clays) and thin, discontinuous ice-contact deposits (sands and gravels). The ice-contact deposits are capable of transmitting water, but their limited extent diminishes the potential for yielding useable water volumes.

The Knolls Laboratory is located adjacent to the Mohawk River that serves as the main watercourse for the Mohawk River Drainage Basin, covering an area of 3,460 square miles. The river flows eastward to where it joins the Hudson River in Cohoes, N.Y. The average flow rate (1926–2022) of the Mohawk River is 5,970 cubic feet per second (cfs) and the lowest recorded seven-day minimum flow is 458.1 cfs during August 1995. Three small streams that receive drainage from the Knolls Laboratory are tributaries to the Mohawk River. The East Boundary Stream is located between the Knolls Laboratory closed landfill and the closed Town of Niskayuna landfill. The East Boundary Stream also receives runoff from a nearby housing development and roadway. The Midline Stream originates on site and drains the central portion of the site. The West Boundary Stream is located adjacent to the Knolls Laboratory on General Electric Global Research Center property. This stream receives some surface water runoff from a tributary ditch from the site. A fourth surface water drainage-way, located on the west side of the closed Knolls Laboratory landfill, is referred to as the West Landfill Stream. This drainage-way discharges to the Mohawk River and rarely has an observable flow. The flow in all of these streams becomes extremely low to nonexistent during the late summer/early fall. These streams are not accessible to the public, except at the point where they each meet the Mohawk River, nor are they suitable for fishing or swimming.

The groundwater within the immediate vicinity of the Knolls Laboratory is very limited due to both low porosity and permeability of the till which prohibits the development of the groundwater as a potable water supply. As such, there are no drinking water wells on site. There are no underlying principal or primary bedrock or overburden aquifers. Water for site operations involving potable and noncontact cooling use is obtained from the Schenectady and Niskayuna Municipal Water Systems. The majority of water for noncontact cooling at the Knolls Laboratory is obtained from the Mohawk River.

The Mohawk River is classified by NYSDEC as a Class A stream. The best usages of Class A waters are considered to be: a source of water for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. The Knolls Laboratory discharges water from its various operations within the concentration, mass loading, and flow limits set by the SPDES Permit, Reference (3).

LIQUID EFFLUENT MONITORING

Sources

Nonradiological: The principal sources of effluent water are:

1. *Sewage Pumping Station* - Knolls Laboratory sewage is pumped to the Town of Niskayuna Publicly Owned Treatment Works (POTW). The untreated sewage consists primarily of wastewater from restrooms, cafeteria services, and janitorial sinks. A small portion may also consist of dilute nonhazardous laboratory rinse water, dilute nonhazardous analytical waste, environmental samples, and ammoniated or phosphated process water.
2. *Cooling Towers* - Cooling water, used mainly for central air conditioning, is treated in most systems to maintain a pH range of 7.0 to 7.5 SU, to minimize scale buildup, to prevent corrosion of system materials, and to inhibit the growth of algae and slime. The P9 Cooling Tower pH is not controlled and is typically 8.8 SU. All the towers are periodically blown down to control chemistry and some are drained to prevent freezing in the winter. The water drained from the towers is discharged to the Mohawk River. Water from the P9 tower is treated to reduce pH to 7.8 SU prior to discharge.
3. *Site Boiler Plant* - Site boiler water is chemically treated, softened, and de-alkalized. Operations that result in releases are (1) periodic blowdowns to control boiler chemistry and (2) ion exchange resin regeneration effluent from the softener and the de-alkalizer systems. Water generated by the blowdown and de-alkalizer regeneration operations are neutralized and allowed to cool before being discharged to the Mohawk River.
4. *Noncontact Cooling Water* - Mohawk River water and Site Service Water ((SSW) municipal water supply) are used as noncontact cooling media for several heat exchangers and are discharged to the Mohawk River.
5. *Process Water* - Treated/untreated wastewater, primarily from the river water system, is generated on-site. Process water treatment typically consists of one or more of the following processes: sedimentation, filtration, ion exchange, activated carbon adsorption, or neutralization before being discharged to the Mohawk River.
6. *Site Drainage Water* - Stormwater and groundwater also make up a portion of the liquid effluent to the Mohawk River.

Approximate flows and chemical characteristics of the discharges to the Mohawk River (Items 2-6) were incorporated into the SPDES Permit application and Permit, Reference (3).

Radiological: Historically, the concentrations of radioactivity in liquids released from the Knolls Laboratory have always been below all applicable limits. The small volume of liquids generated from current laboratory operations that may contain radioactivity are collected for shipment off-site in an absorbed form to an approved disposal facility. This minimizes the quantities of radioactivity released from the Knolls Laboratory.

The small amounts of groundwater and stormwater that runoff from areas that were associated with the former SPRU operations contain low level residual radioactivity from operations conducted during the 1950s and 1960s and are released in the site drainage water. The principal radioactive constituents released to the Mohawk River from all sources are the longer-lived fission products strontium-90 and cesium-137.

Effluent Monitoring

Nonradiological: The Knolls Laboratory sanitary sewage is pumped to the Town of Niskayuna POTW in accordance with an Outside Users Agreement, Reference (2). The Agreement specifies the parameters and sampling frequency for the untreated sewage. The minimum sampling frequency is monthly for chemical constituents, while flow and pH measurements are required daily. Typically, a twenty-four hour flow-adjusted composite sample for chemical constituents is collected weekly. All monitoring data are averaged, with the exception of pH for which the maximum and minimum values for the month are reported, and then provided in a monthly report to the Town. The sewage pumping station is equipped with a pH alarm that shuts off the main pumps when the alarm set points are exceeded. Sewage flow is then allowed to passively overflow into a holding tank.

The Knolls Laboratory water discharged to the Mohawk River is regulated by a SPDES Permit, Reference (3). The SPDES Permit specifies the required sampling locations, parameters, and minimum sampling frequencies. The term of the permit is five years, and the NYSDEC renewed the permit in 2020, which became effective on August 12, 2020.

Liquid effluent from the Knolls Laboratory enters the Mohawk River through a submerged outfall (Outfall 002), four small surface outfalls (Outfalls 03A, 03B, 03D, and 03E), and three natural stormwater streams (Outfalls 004, 005, and 006) as shown in Figure 2.

Outfall 002 discharges noncontact cooling water, process water, stormwater, and groundwater through a submerged drain line directly to the Mohawk River. The Outfall 002 monitoring station consists of a continuous temperature monitor and a Parshall flume, which provides for the continuous measurement and recording of effluent flow rate and total flow. In addition, weekly grab and composite samples are taken at Outfall 002 and analyzed for the constituents specified in the SPDES Permit, including copper when the Copper Ion Generator is operating.

Outfalls 03B and 03D discharge Mohawk River water used for once-through noncontact cooling, municipal water used for once-through noncontact cooling, stormwater, and groundwater. The Outfalls 03B and 03D monitoring stations consist of continuous temperature and flow monitoring which provides for the continuous measurement and recording of effluent flow rates and total flows. In addition, weekly grab samples are taken at Outfalls 03B and 03D and analyzed for the constituents specified in the SPDES Permit, including copper when the Copper Ion Generator is operating. A Copper Ion Generator is used to inhibit zebra mussel attachment to noncontact cooling water system piping when the river water temperature is in excess of 50° Fahrenheit.

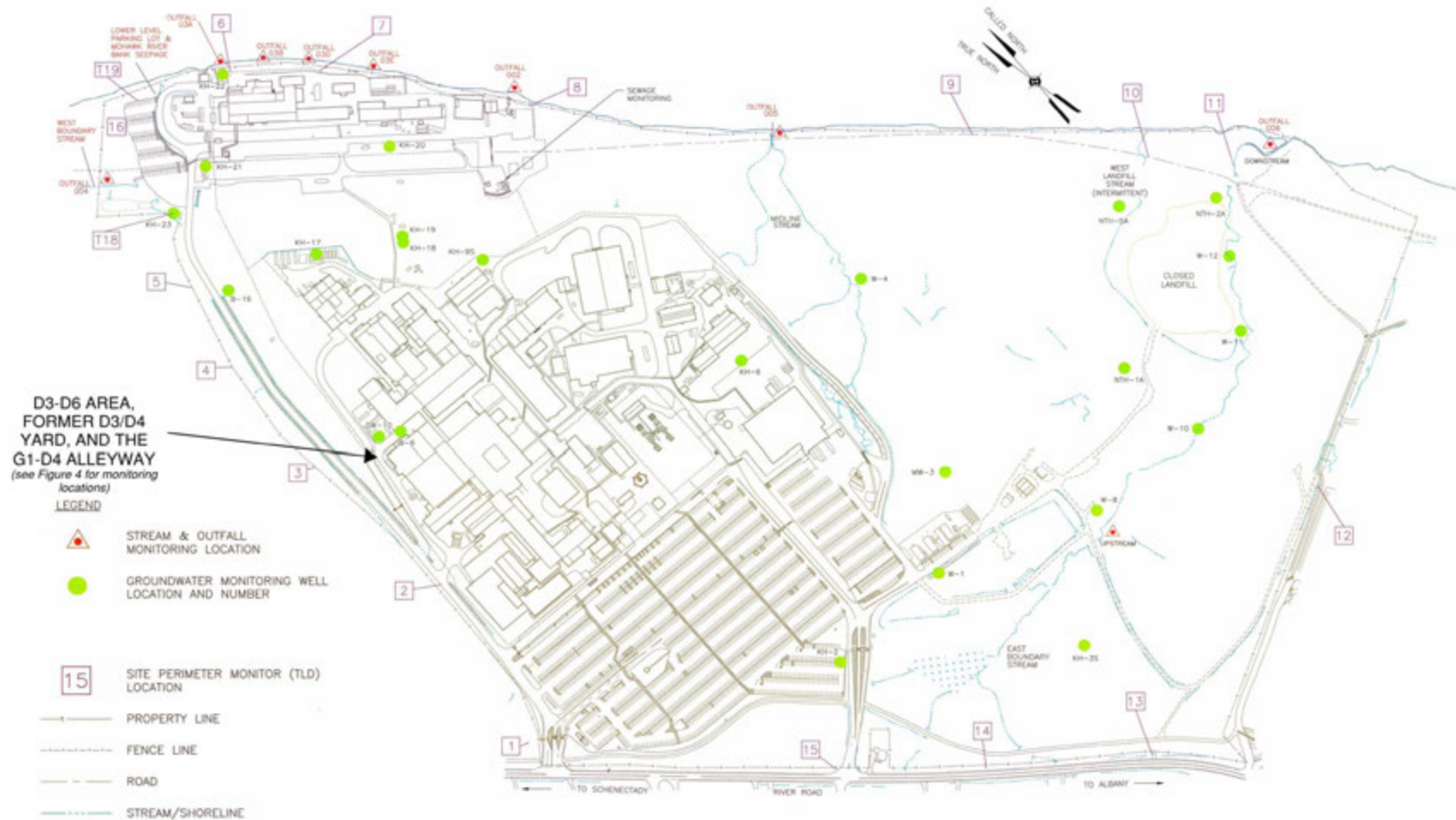


FIGURE 2
KNOLLS LABORATORY, NISKAYUNA, NEW YORK
STREAM AND OUTFALL, GROUNDWATER, AND PERIMETER TLD MONITORING LOCATIONS

The river water used for noncontact cooling must be strained to remove debris and biological life to prevent clogging of the Knolls Laboratory heat exchangers and instrumentation lines. In 2017, the Knolls Laboratory installed an inline screen (aka, Johnson screen) with a 0.79 mm screen in the Mohawk River. The Johnson screen's primary purpose is protection of biological life by filtration of biological organisms prior to entering the pump house galley. The settling tank, which removed sediment from the river water pump strainer backwash effluent, was in use up through October 2017. The discharge from the settling tank is directed to Outfall 03B. The settling tank is currently not in use; however, it could be used in the future if needed. After installation of the Johnson screen in the Mohawk River, verification monitoring to determine the efficiency of the Johnson screen was performed in 2018 per the SPDES permit. A biological entrainment reduction of 98.3% was calculated, well in excess of the 90% required by the facility's SPDES permit.

Outfalls 03A and 03E discharge only groundwater and stormwater as allowed by the SPDES Permit. These outfalls are monitored quarterly utilizing flow estimates and grab samples for pH and chemical constituent analyses. All monitoring is in accordance with the SPDES Permit.

Three Knolls Laboratory stormwater outfalls, designated as 004, 005, and 006, are commonly referred to as the West Boundary Stream, Midline Stream, and East Boundary Stream, respectively. The flows in these surface water streams are intermittent, and the streams are sampled quarterly for SPDES parameters, when possible. Additionally, the East Boundary Stream is sampled annually in accordance with the Knolls Laboratory Landfill Post-Closure Monitoring Program. The sampling location for Outfall 004 is a ditch on Knolls Laboratory property that drains to the West Boundary Stream.

The West Landfill Stream is not part of the SPDES program and was removed from the Knolls Laboratory Landfill Post-Closure Monitoring Program in September 2018.

The current SPDES permit requires Whole Effluent Toxicity (WET) testing for Outfall 002 every five years, specifically in the years ending with a "1" or a "6." WET testing was last performed in 2021. All results were in compliance with the SPDES permit limits. The next required round of WET Testing will occur in 2026.

Radiological: The Outfall 002 monitoring station includes a system for the collection of samples that are proportional to effluent flow. A monthly composite sample is prepared from the proportional samples and analyzed monthly for radioactivity. Monthly grab samples are taken at Outfalls 03A, 03B, 03D, 03E, 004, 005, 006, Upper East Boundary Stream, and West Landfill Stream. Background grab samples are also taken monthly at the Upper West Boundary Stream, Site Service Water, and Mohawk River Cooling Water Intake. Seepage samples are also collected from the Mohawk River Bank.

The sanitary sewage pumped to the Town of Niskayuna POTW is required to be sampled a minimum of quarterly for radioactivity in accordance with the Outside Users Agreement. However, weekly 24-hour composite samples typically are obtained and then composited into quarterly samples and analyzed for radioactivity.

Effluent Analyses

Nonradiological: Periodic grab and composite samples collected from Outfalls 002, 03A, 03B, 03D, 03E, 004, 005, and 006 are analyzed for the chemical constituents listed in Reference (3). Samples from various outfalls may be analyzed for additional parameters for informational purposes only and are presented in the appropriate data tables. A twenty-four hour flow adjusted composite sample of the sewage pumped to the Town of Niskayuna POTW is collected and analyzed as required by Reference (2).

Radiological: The monthly composite sample collected at the Outfall 002 is analyzed for (1) strontium-90 by radiochemical separation and subsequent beta counting, (2) cesium-137 and other gamma-emitting radionuclides by gamma spectrometry, (3) tritium by liquid scintillation counting, and (4) gross alpha and gross beta radioactivity by direct sample evaporation and subsequent alpha and beta counting. Samples from the remaining outfalls are analyzed for gross alpha and gross beta radioactivity. Analyses for strontium-90 and cesium-137 are routinely performed for Outfalls 03A, 03D, 03E, 004, 005, 006, and Mohawk River Bank Seepage. For Outfall 03B and the West Landfill Stream, analysis for strontium-90, cesium-137, and other gamma-emitting radionuclides are performed if the gross beta radioactivity exceeds 10 pCi/l.

The quarterly composite sample of the sanitary sewage effluent to the Town of Niskayuna POTW is analyzed for strontium-90, cesium-137, cobalt-60, tritium, and uranium. Weekly samples are analyzed for gross alpha and beta radioactivity.

Assessment

Nonradiological: The analytical results for the chemical constituents, flow, and pH monitored in the Knolls Laboratory sewage effluent during 2022 are summarized in Table 11. The Knolls Laboratory average effluent results show that the Knolls Laboratory has operated within all parameters specified in the Outside Users Agreement, Reference (2).

The analytical results for the chemical constituents, flow, and temperature monitored in the Knolls Laboratory liquid effluent during 2022 are summarized in Table 12. The annual average values of all parameters were within the appropriate effluent permit limits or standards where standards exist for Outfalls 002, 03A, 03B, 03D, and 03E. The limits for Outfall 002 pH and TSS were exceeded once in October of 2022 due to a small accidental release of a cement-based product from a new catch basin during construction. All data was reported to NYSDEC as appropriate in the monthly SPDES Discharge Monitoring Reports.

The Knolls Laboratory SPDES Permit designates the Mohawk River intake as Outfall 001 and requires it to be monitored for flow, pH, TSS, and copper (when the Copper Ion Generator is operating). The normal designated Outfall 001 sampling location is located in the L4 Pump House downstream of the Johnson Screen. Starting in September of 2022, backup sampling locations were used due to a clog in the sample line to the Johnson Screen location. The Knolls Laboratory SPDES permit requires composite sampling for TSS at Outfalls 001 and 002 and composite sampling for total dissolved solids (TDS) at Outfall 002. The SPDES permit requires composite sampling for total copper at Outfalls 001 and 002. The intake data is used to determine both the

net limits and appropriate pH ranges for the outfalls or for information. Data is summarized in Table 12. The Mohawk River is voluntarily monitored for chloride at two locations and TDS at Outfall 001. The data for the upstream and downstream locations are presented in Table 13.

The Knolls Laboratory SPDES Permit requires the surface water streams, West Boundary Stream, Midline Stream, and East Boundary Stream, to be monitored quarterly for five parameters, when flow exists in these streams. The analytical results for required chemical constituents, flow, and pH were within the specified limits. Additional parameters are monitored voluntarily. These results are summarized in Tables 14 and 15.

Table 7 identifies Knolls Laboratory SPDES permit noncompliances for 2022. Nonradioactive liquid effluent monitoring data are reported monthly as required in Reference (3). The monthly SPDES Discharge Monitoring Reports are available for public viewing at the Niskayuna Branch of the Schenectady County Public Library.

TABLE 11
CHEMICAL CONSTITUENTS IN KNOLLS LABORATORY SANITARY SEWAGE
EFFLUENT DISCHARGED TO THE TOWN OF NISKAYUNA
PUBLICLY OWNED TREATMENT WORKS

Knolls Laboratory Sewage Lift Station					
Parameter (Units)	Number of Samples	Value ⁽¹⁾			
		Minimum	Maximum	Average ⁽²⁾	Limit ⁽³⁾
Outside Users Agreement #94 3850 Requirements (Reference (2))					
Flow (GPD)	361 ⁽⁴⁾	827	37,741	17,482 ⁽⁵⁾	45,000
pH (SU)	706	7.0	8.8	--	6.0-9.5 ⁽⁶⁾
Biochemical Oxygen Demand (mg/l)	51 ⁽⁷⁾	86	603	312	700
Chemical Oxygen Demand (mg/l)	52	233	1470	719	1,800
Total Suspended Solids (mg/l)	52	43	875	347	1,600
Ammonia (as N, mg/l)	52	65	154	118	200
Nitrate (as N, mg/l)	52	<0.04	0.94	<0.12	4
Nitrite (as N, mg/l)	52	<0.01	0.60	<0.10	4
Total Kjeldahl Nitrogen (as N, mg/l)	52	73	182	138	250
Total Organic Nitrogen (as N, mg/l)	52	<1	53	<19	175
Total Nitrogen ⁽⁸⁾ (as N, mg/l)	52	<73.4	<182.1	<138	250
Phosphate (as P, mg/l)	52	0.3	19.8	12.8	30
Additional Parameters Monitored					
Oil & Grease ⁽⁹⁾ (mg/l)	52	5	68	12	100

Notes:

1. A value preceded by "<" is less than the reporting limit (RL)
2. Average values preceded by "<" contain at least one "less than reporting limit value" in the average calculation.
3. Limit based on Outside Users Agreement (Reference (2)). Outside Users Agreement allows for monthly averaging of data unless otherwise noted.
4. On a number of days pumping sanitary system to the Town was secured.
5. The average of the monthly flows reported to the Town of Niskayuna is used for this value.
6. pH values are not averaged and are required to be in this range.
7. Due to an analytical laboratory error, original data was lost and one sample was run outside of allowable hold time.
8. Daily average limit; calculated as the sum of Nitrate + Nitrite + Total Kjeldahl Nitrogen (TKN) concentrations.
9. This parameter is not limited by the Outside Users Agreement; however, the Town of Niskayuna sanitary code prohibits fats, waxes, grease or oils in excess of 100 mg/l.