List of Tables

Table 2-1. BNL Pollution Prevention, Waste Reduction, and Recycling Programs, 2021 ............................................. 2-8
Table 2-2. BNL Recycled Program Summary, 2012-2021 ................................................................. 2-11
Table 2-3. Summary of BNL 2021 Environmental Restoration Activities ........................................ 2-17
Table 2-4. Summary of BNL Sampling Program Sorted by Media, 2021 .................................................... 2-20
Table 3-1. Federal, State, and Local Environmental Statutes and Regulations Applicable to BNL .................. 3-3
Table 3-2. BNL Environmental Permits ............................................................................................. 3-8
Table 3-3. Analytical Results for Wastewater Discharges to Sewage Treatment Plant Outfall 001 ........ 3-12
Table 3-4. Analytical Results for Wastewater Discharges to Outfalls 002, 005 - 008, and 010 .............. 3-17
Table 3-5. Potable Water Wells and Potable Distribution System: Analytical Results (Maximum Concentration, Minimum pH Value) ................................................................. 3-19
Table 3-6. Potable Water Wells: Analytical Results for Principal Organic Compounds, Synthetic Organic Chemicals, Pesticides, Micro-Extractables, and Perfluorinated Compounds .............................................. 3-21
Table 3-7. Applicability of EPCRA to BNL ..................................................................................... 3-25
Table 3-8. Summary of Chemical and Oil Spill Reports ........................................................................ 3-27
Table 3-9. Existing Agreements and Enforcement Actions Issued to BNL With Status ......................... 3-32
Table 4-1. Airborne Radionuclide Releases from Monitored Facilities .................................................. 4-3
Table 4-2. Gross Activity in Facility Air Particulate Filters ................................................................. 4-4
Table 4-3. Gross Activity Detected in Ambient Air Monitoring Particulate Filters ............................. 4-4
Table 4-4. Ambient Airborne Tritium Measurements in 2021 ............................................................. 4-8
Table 4-5. Central Steam Facility Fuel Use and Emissions (2012–2021) ................................................ 4-8
Table 5-1. Tritium and Gross Activity in Water at the BNL Sewage Treatment Plant (STP) ..................... 5-4
Table 5-2. Radiological Analysis of Samples from BNL On-Site Recharge Basins (2021) .................... 5-8
Table 5-3. Water Quality Data for BNL On-Site Recharge Basin Samples ........................................ 5-9
Table 5-4. Metals Analysis of Water Samples from BNL On-Site Recharge Basins ............................. 5-10
Table 5-5. Radiological Results for Surface Water Samples Collected Along the Peconic and Carmans Rivers ................................................................. 5-12
Table 5-6. Water Quality Analytical Results for Data for Surface Water Samples Collected Along the Peconic and Carmans Rivers (2021) ................................................................. 5-13
Table 5-7. Metals Analytical Results in Surface Water Samples Collected Along the Peconic and Carmans Rivers ........................................................................................................ 5-14
Table 6-1. Federal and New York State Threatened & Endangered Species, Species of Special Concern, & Species of Greatest Conservation Need ..................................................................... 6-2
Table 6-2. Radiological Analysis of Deer Tissue (2021) ................................................................. 6-10
Table 6-3. Radiological Analysis of Grassy Vegetation and Associated Soils ........................................ 6-15
Table 6-4. Precipitation Monitoring (Mercury) ............................................................................... 6-15
Table 7-1. BNL Groundwater Remediation Systems Treatment Summary for 1997 through 2021 .......... 7-8
Table 8-1. Five-Year Annual On-Site Direct Ambient Radiation Measurements (2017-2021) .............. 8-6
Table 8-2. Five-Year Annual Off-Site Direct Ambient Radiation Measurements (2017-2021) .......... 8-7
Table 8-3. Five-Year Annual Facility Area Monitoring Results (2017-2021) ...................................... 8-7
Table 8-4. Five-Year Annual Neutron Monitoring Results (2017-2021) ............................................. 8-10
Table 8-5. Maximally Exposed Off-site Individual Effective Dose Equivalent From Facilities or Routine Processes, 2021 ................................................................. 8-11
Table 8-6. Five-Year Site Dose Summary, 2021 ............................................................................... 8-14
Table 8-7. Five-Year Annual Maximally Exposed Onsite Individual Dose (2017-2021) ..................... 8-15
Table 9.1. Summary of Detections in Trip and Field Blank Samples ................................................. 9-6
Table 9.2. Summary Results of 2021 DOECAP Audits ..................................................................... 9-9
List of Figures

Figure 1-1. Major Scientific Facilities at BNL ................................................................. 1-9
Figure 1-2. Major Support and Service Facilities at BNL ............................................. 1-10
Figure 1-3. BNL Groundwater Flow Map ................................................................. 1-12
Figure 1-4. BNL Wind Rose (2021) ................................................................................. 1-13
Figure 1-5. BNL 2021 Monthly Mean Temperature versus 71-Year Monthly Average ......................................................................................................................... 1-15
Figure 1-6. BNL 2021 Annual Mean Temperature Trend (71 Years) ................................ 1-15
Figure 1-7. BNL 2021 Monthly Precipitation versus 71-Year Monthly Average ................................................................................................................................. 1-16
Figure 1-8. BNL 2021 Annual Precipitation Trend (71 Years) ................................................................................................................................. 1-16

Figure 2-1a. Hazardous Waste Generation from Routine Operations, 2011 – 2021 ................................................................................................................................. 2-5
Figure 2-1b. Mixed Waste Generation from Routine Operations, 2011 – 2021 ................................................................................................................................. 2-5
Figure 2-1c. Radioactive Waste Generation from Routine Operations, 2011 – 2021 ................................................................................................................................. 2-5
Figure 2-1d. Hazardous Waste Generation from ER and Nonroutine Operations, 2011 – 2021 ................................................................................................................................. 2-6
Figure 2-1e. Mixed Waste Generation from ER and Nonroutine Operations, 2011 – 2021 ................................................................................................................................. 2-6
Figure 2-1f. Radioactive Waste Generation from ER and Nonroutine Operations, 2011 – 2021 ................................................................................................................................. 2-6
Figure 2-2. Annual Potable Water Use, 1999 – 2021 ................................................................................. 2-13
Figure 2-3. BNL Building Energy Performance for 2021 ....................................................... 2-16

Figure 3-1. Maximum Concentrations of Copper Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-13
Figure 3-2. Maximum Concentrations of Iron Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-13
Figure 3-3. Maximum Concentrations of Lead Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-14
Figure 3-4. Maximum Concentrations of Mercury Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-14
Figure 3-5. Maximum Concentrations of Nickel Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-15
Figure 3-6. Maximum Concentrations of Silver Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-15
Figure 3-7. Maximum Concentrations of Zinc Discharged from the BNL Sewage Treatment Plant, 2016 – 2021 ................................................................................................. 3-15
Figure 3-8. Spills Trend, 2017-2021 ......................................................................................... 3-24

Figure 4-1. Air Emission Release Points Subject to Monitoring ................................................. 4-2
Figure 4-2. BNL On-Site Ambient Air Monitoring Stations ....................................................... 4-5
Figure 4-3. Airborne Gross Beta Concentration Trend Recorded at Station P7 ................................................................................................................................. 4-7
Figure 4-4. BNL Scope 3 Greenhouse Gases: Impacts of Covid-19 ................................................................................................................................. 4-9

Figure 5-1. Sampling Stations for Surface Water and Fish ................................................................................. 5-2
Figure 5-2. Schematic of BNL’s Sewage Treatment Plant (Recharge Basin Discharge) ................................................................................................................................. 5-3
Figure 5-3. BNL Recharge Basin/Outfall Locations ................................................................................. 5-5
Figure 5-4. Schematic of Potable Water Use and Flow at BNL ................................................................................. 5-6

Figure 6-1. Deer Sample Locations, 2017 – 2021 ................................................................................. 6-9
Figure 6-2. Comparison of Cs-137 Values in Deer Flesh ................................................................................. 6-12
Figure 6-3. Ten-Year Trend of Cs-137 Concentrations in Deer Flesh ................................................................................. 6-12
Figure 6-4. Vegetation and Soil Sampling Locations ................................................................................. 6-14
| Figure 1-1. | Major Scientific Facilities at BNL. | 1-12 |
| Figure 1-2. | BNL 2021 Monthly Mean Temperature versus 71-Year Monthly Average. | 1-13 |
| Figure 1-3. | BNL Groundwater Flow Map. | 1-15 |
| Figure 1-4. | BNL 2021 Annual Mean Temperature Trend (71 Years). | 1-16 |
| Figure 1-5. | BNL 2021 Monthly Mean Temperature versus 71-Year Monthly Average. | 1-15 |
| Figure 2-1a. | Hazardous Waste Generation from Routine Operations, 2011 – 2021. | 2-5 |
| Figure 2-1b. | Mixed Waste Generation from Routine Operations, 2011 – 2021. | 2-5 |
| Figure 2-1c. | Radioactive Waste Generation from Routine Operations, 2011 – 2021. | 2-5 |
| Figure 2-1d. | Hazardous Waste Generation from ER and Nonroutine Operations, 2011 – 2021. | 2-5 |
| Figure 2-1e. | Radioactive Waste Generation from ER and Nonroutine Operations, 2011 – 2021. | 2-5 |
| Figure 9-1. | Flow of Environmental Monitoring QA/QC Program Elements. | 9-2 |
| Figure 9-2. | Summary of Scores in the Radiological Proficiency Evaluation Programs. | 9-8 |
| Figure 9-3. | Summary of Scores in the Nonradiological Proficiency Evaluation Programs. | 9-8 |