NATIONAL ENERGY TECHNOLOGY LABORATORY

2022 Annual Site

Environmental Report

NOVEMBER 08, 2023

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

DISCLAIMER

2022 Annual Site Environmental Report

U.S. Department of Energy

National Energy Technology Laboratory

Albany, Oregon

Anchorage, Alaska

Houston, Texas

Morgantown, West Virginia

Pittsburgh, Pennsylvania

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EXECUTIVE SUMMARY

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) develops the Annual Site Environment Report (ASER) to provide a comprehensive status of its environmental compliance in five states. This annual report verifies and documents NETL's mission to drive innovation and deliver solutions for an environmentally sustainable and prosperous energy future: ensuring affordable, abundant, and reliable energy that drives a robust economy and national security, while developing technologies to manage carbon across the full life cycle and enabling environmental sustainability for all Americans.

The Laboratory implements a wide range of energy and environmental research and development (R&D) programs that enable domestic coal, natural gas, and oil to economically power our nation's homes, industries, businesses, and transportation sources. To meet this goal, NETL applies its expertise to coal, natural gas, and oil technologies; contract and project management; analyses of energy systems; and international energy issues. In addition to research conducted on site, professional support includes R&D conducted through partnerships, cooperative research and development agreements, financial assistance, and contractual arrangements with universities and the private sector. These efforts focus a wealth of scientific and engineering skills to create commercially viable solutions to national energy and environmental problems.

Throughout 2022, NETL continued to implement its Environmental, Safety and Health (ES&H) programs at the Albany, Oregon; Anchorage, Alaska; Houston, Texas; Morgantown, West Virginia; and Pittsburgh, Pennsylvania locations. As part of these programs, NETL maintained its certification to the International Organization for Standardization (ISO) 14001:2015, Environmental Management System Series, and was certified to ISO 45001:2018, Occupational Health and Safety Management System Series. Virtual certification audits to the ISO 14001:2015 and ISO 45001:2018 standards were conducted August 15-19,2022 for Morgantown, and Pittsburgh, and September 7-8, 2022 for Albany. Certification to these standards demonstrates NETL's commitment to continual improvement, as well as conformance to its ES&H Management System.

NETL continues to demonstrate to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental stewardship. NETL's environmental operating experience and performance measure programs exist as part of its ES&H Management System. Integral to these programs are the Safety Analysis and Review System (SARS) programs, which focus on research and development activities, support operations activities, construction permits, and facility use. NETL tracks its performance measures through individual programs, such as groundwater and air quality, and through its ES&H Management System objectives and targets. NETL achieved 92% of its performance metrics in calendar year 2022. More information on each of the areas covered above, as well as details on other NETL ES&H programs, can be found in this document. This report seeks to address questions the public may have about NETL's efforts to protect the environment at its locations. Comments and concerns are always welcome and should be addressed, in writing to Jamie Brown, U.S. Department of Energy—NETL, M/S P04D, 3610 Collins Ferry Road, Box 880, Morgantown, WV 26507; or by email to Jamie.Brown@netl.doe.gov.

1.0 INTRODUCTION

1.1 SITE LOCATIONS

Part of the U.S. Department of Energy's (DOE's) national laboratory system, the National Energy Technology Laboratory (NETL) has laboratory sites in Albany, Oregon; Pittsburgh, Pennsylvania; and Morgantown, West Virginia; and program office sites in Anchorage, Alaska, and Houston, Texas.

1.2 GENERAL ENVIRONMENTAL SETTING

NETL's Arctic Energy Office is leased office space located in Anchorage, Alaska, in the south-central portion. It is located at the terminus of Cook Inlet, on a peninsula formed by the Knik Arm to the north and the Turnagain Arm to the south. The city limits span 1,961.1 square miles, encompassing the urban core, a joint military base, several outlying communities, and almost all of Chugach State Park.

The Albany site is located in Linn County, Oregon in the western portion of the state. The facility is located in the Willamette Valley, which is a structural and erosional lowland between the uplifted marine rocks of the Coast Range and the volcanic rocks of the Cascade Range. The Albany site covers approximately 42 acres, with about 248,000 square feet of building working area. The site is relatively flat, located on a higher section of town and away from floodplains. The Calapooia River is located one-half mile west of the laboratory.

The Pittsburgh site lies within Allegheny County, Pennsylvania, at the Bruceton Research Center. The site comprises 237 acres located approximately 13 miles south of Pittsburgh, in South Park Township. The facilities sit within rolling hills and steeply incised stream valleys that are tributaries of the Monongahela River. The site is a partially wooded tract, divided into two subsites (the administrative plateau and the R&D plateau) with scattered industrial and office buildings. The immediate vicinity was completely rural when the Pittsburgh site was first developed; however, the nearby population and housing densities have increased dramatically in recent years.

NETL's Houston Office is also leased office space. It is located at 1011 Highway 6 South in Houston, Texas. This program office is located within the energy corridor of Houston and serves both onshore and offshore drilling research operations. This leased office space is 2,083 square feet and has 6 enclosed offices and 3 cubicles. The office currently houses three federal employees and one contractor employee.

The Morgantown, West Virginia site lies within Monongalia County, on the northern end of the city of Morgantown. The site sits within the rolling hills of the Appalachian Plateau, about 1,000 feet east of the Monongahela River and about 10 miles west of Chestnut Ridge, the westernmost ridge of the Allegheny Mountains. The site covers approximately 135 acres, 33 of which are developed for industrial use. Two small streams border the site on the east and northeast sides. The Monongahela River is on the northwest side of the site. All surface water drains into these two streams and river. Land use immediately surrounding the Morgantown site is a combination of residential, commercial, deciduous forest, and pasture.

1.3 LABORATORY MISSION

For more than 100 years, the U.S. Department of Energy's National Energy Technology Laboratory has advanced the development of innovative technologies to ensure affordable, abundant and reliable energy that drives a robust economy and national security. Today, NETL research laboratories in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania develop advanced energy technologies and accelerate their maturation from discovery through demonstration in the United States and around the world. This approach is exemplified through impactful research partnerships with industry, academia, and other national laboratories and government organizations to enhance and further develop the Laboratory's energy research and analysis portfolios while enabling environmental sustainability for all Americans. NETL applies its technical project management expertise to productive collaborations nationwide.

NETL innovates solutions for a carbon-managed tomorrow through its world-class competencies — geological and environmental systems, materials engineering and manufacturing, energy conversion engineering, strategic systems analysis and engineering and computational science and engineering — to drive innovation and deliver solutions across the energy ecosystem.

The Lab's research portfolio supports critical domestic energy initiatives that touch the lives of virtually all Americans. Our innovations support decarbonization and responsible stewardship of our environment; create valuable products from domestic resources; and inform energy strategies that work toward achieving net-zero CO_2 emissions by mid-century while supporting a clean energy economy that creates good-paying jobs, spurs economic revitalization, advances environmental justice, remediates environmental degradation, and supports energy workers in communities across the country.

Our nation realizes an effective return on research investment when energy solutions transfer to the commercial marketplace and support economic activity and workforce development. Licensing agreements with large and small American companies bring viable solutions to market, while internships and other educational programs allow renowned researchers to interact and inspire students who will become tomorrow's scientists. Further, NETL-sponsored papers, presentations, publications, websites and conferences ensure that Laboratory breakthroughs are shared openly with decision-makers, stakeholders and other researchers around the globe.

Most importantly, all NETL's activities support the DOE mission to ensure America's security and prosperity by addressing its energy and environmental challenges through transformative science and technology solutions. NETL is committed to fostering an environment of inclusivity where diversity strengthens the organization and energy equality guides our mission.

1.4 PRIMARY OPERATIONS AND ACTIVITIES AT THE SITES

NETL is organized into six functional areas to accomplish its mission and to provide flexible, dynamic expertise and capabilities to its public and private sector customers throughout the nation. With sites in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, the Laboratory's over 1,200 employees are focused on the following areas.

OFFICE OF THE DIRECTOR

Mission: The Office of the Director has span, control and authority, including delegated authority, over the complete NETL complex. This includes responsibility and authority for delivery and execution of NETL's mission: to drive innovation and deliver solutions for an environmentally sustainable and prosperous energy future. In continuous pursuit of this mission and to sustain NETL as a world-class research and development enterprise, the Office of the Director promotes organizational direction and vigor toward sustainability, consistency, effectiveness and efficiency in research efforts and business practices:

- Promotes NETL efficiency and effectiveness by establishing and maintaining organizational standards and metrics for quality, productivity, employee development, and workforce utilization.
- Oversees the preparation, justification, and execution of NETL's institutional budget under guidance provided by the Assistant Secretary for Fossil Energy and Carbon Management and DOE's Chief Financial Officer.
- Exemplifies and promotes the highest level of safety, scientific integrity, public accountability, and social responsibility in conducting R&D programs.

Function: The Office of the Director provides management guidance and oversight for the following functional areas:

- Communications & Public Affairs
- Research & Innovation Center
- Science & Technology Strategic Plans & Programs
- Technology Development Center
- Laboratory Operations Center, including Facility Operations, Information Technology and Strategic Support
- Finance & Acquisition Center, including Accounting, Budget & Analysis and Acquisition

OFFICE OF CHIEF COUNSEL

Mission: The Office of the Chief Counsel (OCC) has broad oversight of the complete NETL legal and National Environmental Policy Act (NEPA) portfolios. Through management of the NETL Legal Division, the Office of Chief Counsel provides services in the nature of legal advice and counsel to personnel across the NETL complex, at all levels of the organization, with appropriate engagement with DOE General Counsel. Through management of the NEPA Division, the Office manages NETL compliance with the National Environmental Policy Act (NEPA) and related environmental statutes, regulations, and policies in connection with NETL's major projects.

Function: Scope of services include: interpreting state and federal statutory and regulatory requirements; oversight of drafting, review and negotiation of legal contracts, decisions and documentation which operates to bind or represent the policies of the NETL or DOE organization, provision of litigation support, processing requests for information submitted pursuant to the Privacy Act and the Freedom of Information Acts; and management of all other Legal and NEPA activities. The OCC has oversight of two divisions: Legal and Environmental Compliance.

OFFICE OF CHIEF COUNSEL - LEGAL

Mission: The Legal division is responsible for supporting the Office of Chief Counsel in its mission to provide full spectrum legal support services to the NETL organization. The organization is responsible for providing expert legal advice and support services on all matters arising within the scope of NETL activities.

Function: Provides legal advice and counsel to the NETL organization as directed by the Office of Chief Counsel on the full NETL legal portfolio. Conducts reviews and provides advice and litigation support on all legal matters involving the NETL organization, including, but not limited to the following practice areas: financial assistance; procurement; appropriations; contract negotiations; employment and labor law; patent and intellectual property; FOIA; Privacy Act; and ethics. The Chief Counsel and the attorneys in Legal represent the Laboratory and DOE and take appropriate action to protect the interests of the Laboratory and the Department in negotiations, litigation, and administrative proceedings.

OFFICE OF CHIEF COUNSEL - NATIONAL ENVIRONMENTAL POLICY ACT

Mission: The National Environmental Policy Act (NEPA) division manages NETL's compliance with NEPA and related environmental statutes, regulations, and policies in connection with activities undertaken or funded by NETL and DOE.

Function:

- Prepares NEPA analyses and related documents;
- Conducts studies of environmental issues associated with the citing, permitting and integration of power plants, carbon dioxide pipelines, transmission, and related activities;
- Works closely with NETL project sponsors (e.g., Coal, Natural Gas and Oil, Energy Technology Development and the Research and Innovation Center) and with subject-matter experts within and external to NETL on issues identified as critical to a particular project's implementation and compliance; and
- Supports NEPA compliance activities on behalf of other organizations within the Department as requested by the Offices of Fossil Energy and Carbon Management, Energy Efficiency and Renewable Energy, and Electricity Delivery and Energy Reliability.

COMMUNICATIONS & PUBLIC AFFAIRS

Mission: The mission of the Communications & Public Affairs Team is to manage all NETL-wide communications and public affairs functions in support of the Lab, the Office of Fossil Energy and Carbon Management (FECM), and the U.S. Department of Energy. The Communications & Public Affairs Team is responsible for developing and implementing an NETL communications and public affairs strategy that elevates the NETL brand. The team develops high-level messages, manages development of NETL external communication products and is responsible for the Laboratory's internal communications efforts.

Functions:

- Serves as primary liaison with the FECM Communications Office, the DOE Public Affairs Office, the news media, governmental agencies, universities, and the National Laboratory Chief Communications Officers (NLCCO) group.

- Develops, implements, and coordinates communication tools, strategies, and campaigns to increase public awareness of NETL programs, research, technologies, accomplishments, and events.
- Develops and coordinates dissemination of media plans to support NETL program areas using a variety of communications platforms targeting a wide array of strategic audiences.
- Elevates the NETL brand by managing the standardization of communications including publication standards, logos, presentation templates and guidelines.
- Provides design and message framework for NETL communications and public affairs activities.
- Provides a public online repository of non-copyrighted NETL images (Flickr) and videos (NETL YouTube).
- Manages the NETL website and analyzes its effectiveness.
- Manages NETL's social media presence.
- Manages and coordinates NETL media relations and serves as a portal for all NETL media inquiries.
- Oversees preparation of the NETL Weekly Media Report.
- Manages, edits, and publishes NETL's magazine (Edge), NETL's quarterly employee newsletter (Inside NETL) and NETL's quarterly accomplishments reports.
- Manages public relations and public inquiries.
- Plans, develops, and implements NETL's internal employee communication strategy.
- Provides multimedia product development.
- Provides technical writing and editing services.
- Manages logistics for NETL conferences, events, and exhibits.
- Provides spokesperson guidance and training for NETL staff.
- Manages NETL's Emergency Public Information (EPI) Program and provides trained staff to serve as EPI team members at all NETL research sites.
- Manages NETL crisis communication activities.

RESEARCH & INNOVATION CENTER

Mission: The Research & Innovation Center (RIC) develops, nurtures, and exercises the core technical competencies that enable NETL to be an international resource for Fossil Energy Technology Discovery, Development and Deployment. These technical core competencies, which combine world-class expertise with mission-relevant laboratory facilities, include: Computational Science & Engineering, Energy Conversion Engineering, Geological & Environmental Systems, Materials & Manufacturing Engineering, and Strategic Systems Analysis & Engineering.

Function: Through effective leverage of its technical core competencies, and in collaboration with partners from industry, academia, and other government laboratories, the RIC drives technology innovation and delivers technical solutions while advancing knowledge within the community. The RIC is responsible for safe and efficient research operations at its Albany, Morgantown, and Pittsburgh sites; and for implementation of an R&D portfolio that effectively leverages core technical competencies to exceed customer needs. Research projects effectively combine science-based large-laboratory scales, to accelerate the technology development process. Research conducted by RIC in its laboratories will typically focus on concepts with technology readiness levels (TRL) between two and four. For higher TRL-level concepts, research is coordinated with extramural partners as appropriate, to enable eventual commercial deployment more effectively. The R&ID Center is also responsible for nurturing the human capital, and designing and implementing the laboratory capabilities, necessary to assure the world-class stature of its technical core competencies.

ENERGY CONVERSION ENGINEERING

Mission: Energy Conversion Engineering maintains the human capital and mission-relevant laboratory facilities necessary to support a world class core competency in Energy Conversion Engineering at NETL, under the technical guidance of the Senior Fellows, and the direction of the Associate Laboratory Director of RIC. The capabilities maintained enable the development and evaluation of new concepts for advanced energy conversion devices and systems that exceed DOE and NETL goals for efficiency, sustainability, and affordability.

Function: Energy Conversion Engineering conceives, plans, manages, and conducts exploratory and applied research via multidisciplinary teams in the areas of thermal sciences, advanced systems integration, and reaction engineering with a focus on experiments at scales and conditions of relevance to maturing technology. They develop and maintain technical competency in these areas, by building and implementing mission-relevant, state-of-the-art laboratory facilities, and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

GEOLOGICAL & ENVIRONMENTAL SYSTEMS

Mission: Geological & Environmental Systems maintains the human capital and mission-relevant laboratory facilities necessary to support a world class core competency in Geological and Environmental Systems at NETL, under the technical guidance of the Senior Fellows, and the direction of the Associate Laboratory Director of the RIC. The capabilities maintained enable a better understanding of the behavior of engineered natural systems, and the development of the science and technologies that will enable safe, sustainable production and utilization of domestic energy resources, in support of the DOE and NETL missions.

Function: Geological & Environmental Systems conceive, plan, manage, and conduct exploratory and applied research via multidisciplinary research in the areas of geochemistry, reservoir engineering, and geo-analysis and field monitoring. They develop and maintain technical competency in these areas, by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools, and by creating and nurturing a critical mass of federal technical experts. They are responsible for providing access to this technical expertise as needed to support the organization and its customers.

MATERIALS & MANUFACTURING ENGINEERING

Mission: Materials & Manufacturing Engineering maintains the human capital and mission-relevant laboratory facilities necessary to support a world class core competency in Functional and Structural Materials at NETL, under the technical guidance of the Senior Research Fellows and the direction of the Associate Laboratory Director of RIC. The capabilities maintained enable the discovery and development of affordable, high performance materials that can endure the harsh service environments typical of advanced energy systems, in support of the DOE and NETL missions. Capabilities include the ability to translate lab-scale materials concepts to affordable industrial practice, utilizing advanced manufacturing methodologies.

Function: Materials & Manufacturing Engineering conceives, plans, manages, and conducts exploratory and applied research via multidisciplinary teams in the areas of functional materials, structural materials, and materials characterization. They are responsible for developing and maintaining technical competency in these areas, by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools, and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

STRATEGIC SYSTEMS ANALYSIS & ENGINEERING

Mission: Strategic Systems Analysis & Engineering maintains the human capital and mission-relevant laboratory facilities and expertise to drive technology advancement at NETL, under the technical guidance of the Senior Research Fellows, and the direction of the Associate Laboratory Director of the RIC. The capabilities maintained enable the utilization of models, simulations, and optimizations to guide and support NETL's existing research portfolio; provide insight on the potential of new technology ideas; identify new energy concepts; and analyze interactions between energy systems at plant, regional, national, and global scales.

Function: Strategic Systems Analysis & Engineering conceives, plans, manages, and conducts research in the areas of energy process analysis via multidisciplinary research, energy process analysis, process systems engineering research, energy systems analysis and energy markets analysis. The Directorate is responsible for developing and maintaining technical competency in these areas, by building and implementing mission-relevant, state-of-the-art laboratory facilities and simulation tools, and by creating and nurturing a critical mass of federal technical experts. They provide access to this technical expertise as needed to support the organization and its customers.

COMPUTATIONAL SCIENCE & ENGINEERING

Mission: Computational Science & Engineering maintains the human capital and mission-relevant laboratory facilities necessary to deliver a world class core competency at NETL, under the technical guidance of the Senior Research Fellows, and the direction of the Associate Laboratory Director of the RIC. In support of the DOE and NETL missions, the computing capabilities coupled with mission unique computational tools enable the effective application of high-performance computing and data analytics to enhance the NETL research effort, generating information and understanding beyond the reach of experiments alone, across time and length scales.

Function: Computational Science & Engineering conceives, plans, manages, and conducts exploratory and applied research via multi-disciplinary teams on computational materials engineering, computational device engineering and advance computing and artificial intelligence. The Directorate develops and maintain technical competency in these areas, and provide technical expertise as needed to support the organization and its customers.

RESEARCH PLANNING & DELIVERY

Mission: Research Planning and Delivery maintains and exercises the critical business functions required to effectively and efficiently plan and deliver quality, impactful and relevant research products exceeding the expectations of Fossil Energy and Carbon Management and does so under the guidance of the Senior Fellows and direction of the Associate Laboratory Director of RIC.

Function: Research Planning & Delivery manages and supports the proposal, planning, execution, and completion of research activities conducted solely by RIC or by RIC in partnership with academia, other national labs, and industry. The Directorate leverages expertise and tools within project management, business management and agreements, and administrative support.

RESEARCH PARTNERSHIPS & TECH TRANSFER

Mission: Research Partnerships & Tech Transfer nurtures relationships to advance the missions of NETL as a premier research organization while also exercising the Laboratory's intellectual property to National benefit and does so under the guidance of the Senior Fellows and in direction of the Associate Laboratory Director of RIC.

Function: Research Partnerships & Tech Transfer nurtures and manages outreach to strategic partners to i) engage in multidisciplinary, partnered research with RIC in support of FE, ii) strategic opportunities to leverage RIC's world class research staff and facilities to the most pressing technical challenges facing the Nation, and iii) pursue transfer of RIC Intellectual Property for the greatest National benefit.

SCIENCE AND TECHNOLOGY (S&T) STRATEGIC PLANS AND PROGRAMS

Mission: Develop strategic direction for programs and activities within NETL and identify future competencies required so that NETL can best utilize existing capabilities (reposition and redeploy as needed) and invest in new capabilities to sustain and grow NETL.

Function: Lead the planning and integration of current existing capabilities and develop the strategic plans with an understanding of the existing environment (technology needs, regulatory, political) and the anticipation of the future environment. This includes:

- Leading the development of the NETL Strategic Plan including identifying future competencies required;
- Defining technical capabilities to invest in for long-term strength of NETL including any budgetary requirements needed to achieve these capabilities; and
- Coordinate across NETL for a collective strategy and engagement plan for external stakeholders.

The Science and Technology Strategic Plans and Programs performs the above functions in conjunction with and through the Research and Innovation Center and the Technology Development Center. This will include Senior Fellows, IPAs, and other leads identified for: University and Laboratory Partnerships, Industrial Partnerships, and Global Partnerships. Strategic planning efforts are led and centered on NETL enduring missions in effective resource development, efficient energy conversion, and environmental sustainability.

TECHNOLOGY DEVELOPMENT CENTER

Mission: Implement national research, development, and demonstration programs in FECM and other Department of Energy programs, with industry, institutes of higher education, nonprofit organizations, small businesses, and other federal agencies and national laboratories to develop and mature technologies that will accomplish the goals and objectives of those programs.

Function: Lead integrated technical and business teams to define, solicit, negotiate, manage, and deliver federally sponsored energy research, development, and demonstration benefits to the nation. These include:

- Define project technical and budgetary requirements to achieve program goals and objectives;
- Lead program/project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives;
- Negotiate and manage projects with industry, institutions of higher education, nonprofit organizations, small businesses, and other federal agencies and national laboratories;
- Coordinate and communicate project results and accomplishments;
- Maintain a qualified and experienced workforce through training and job assignments; and
- Support DOE and NETL program planning, development, analysis, outreach, and communication efforts.

The Technical Development Center performs the above functions through four organizational elements: (1) Resource Sustainability; (2) Carbon Management; (3) Energy Efficiency & Manufacturing; and (4) Energy Delivery & Security.

RESOURCE SUSTAINABILITY

Mission: Implement national research, development, and demonstration programs in the Fossil Energy and Carbon Management's Office of Resource Sustainability to eliminate non-trivial methane emissions from the oil and gas supply chain by 2030. This effort is part of FECM's broader mission to reduce both environmental and climate impacts of fossil fuels and includes constraining the emission of all greenhouse gases. The office is working to mitigate methane emissions across the natural gas supply chain – from production to processing, transportation, storage and end use

Function: Lead integrated technical and business teams to define, solicit, negotiate, manage, and deliver federally sponsored research, development, and demonstration benefits for resource sustainability. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives;
- Lead project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives;
- Negotiate and manage projects with industry, institutions of higher education, nonprofit organizations, small businesses, and other federal agencies and national laboratories;
- Coordinate and communicate project results and accomplishments;
- Maintain a qualified and experienced workforce through training and job assignments; and
- Support DOE and NETL program planning, development, analysis, outreach, and communication efforts.

The Office of Resource Sustainability performs the above functions through technology management teams.

CARBON MANAGEMENT

Mission: Carbon Management's mission is to facilitate a just and environmentally sustainable transition toward a net-zero carbon economy. This is done by focusing on carbon dioxide's storage, containment, and capture. The goal is to address emissions associated with the power and industrial sectors, as well as legacy emissions in the atmosphere, and to seek to permanently store and/or convert carbon dioxide (CO_2) to reduce negative climate impacts.

Function: Lead integrated technical and business teams to define, solicit, negotiate, manage, and deliver federally sponsored research, development, and demonstration benefits for the carbon management program. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives;
- Lead project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives;
- Negotiate and manage projects with industry, institutions of higher education, nonprofit organizations, small businesses, and other federal agencies and national laboratories; coordinate and communicate project results and accomplishments;
- Maintain a qualified and experienced workforce through training and job assignments; and
- Support DOE and NETL program planning, development, analysis, outreach, and communication efforts.

The Carbon Management organization performs the above functions through technology development teams.

ENERGY EFFICIENCY & MANUFACTURING

Mission: Implement national projects in support of the DOE Office of Energy Efficiency & Renewable Energy (EERE) that equitably transitions America to net-zero greenhouse gas emissions economy, creates sustainable domestic manufacturing and supply chains, and develops a skilled domestic workforce capable of supporting next generation advanced energy jobs.

Function: Lead integrated technical and business teams to define, solicit, negotiate, manage, and deliver federally sponsored research, development, demonstration, and deployment benefits. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives;
- Lead project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements) and sole-source actions to access the best research capabilities in the nation that will develop and mature technologies to accomplish program goals and objectives;
- Negotiate and manage projects with industry, institutions of higher education, nonprofit organizations, small businesses, and other federal agencies and national laboratories;
- Coordinate and communicate project results and accomplishments;
- Maintain a qualified and experienced workforce through training and job assignments; and
- Support DOE and NETL program planning, development, analysis, outreach, and communication efforts.

Energy Efficiency & Manufacturing performs the above functions through technology management teams.

ENERGY DELIVERY & SECURITY

Mission: Implement national research, development, demonstration, deployment, and outreach programs, in support of the DOE Office of Electricity (OE), and the DOE Office of Cybersecurity, Energy Security, and Emergency Response (CESER) leveraging industry, institutions of higher education, nonprofit organizations, utilities, and other federal agencies and national laboratories to develop and mature technologies, and support outreach efforts, that will accomplish the goals and objectives of those programs. Support "Emergency Support Function (ESF) #12 – Energy" as emergency responders and National Special Security Events (NSSEs) representing Critical Infrastructure.

Function: Lead integrated technical and business teams to define, solicit, negotiate, manage, and deliver federally sponsored energy infrastructure technology development benefits for OE and CESER. These include:

- Defining project technical and budgetary requirements to achieve program goals and objectives;
- Lead project teams to prepare and issue competitive solicitations (e.g., Funding Opportunity Announcements) and sole-source actions to access the best capabilities in the nation that will develop and mature technologies, and support outreach efforts, to accomplish program goals and objectives;

- Negotiate and manage projects with industry, institutions of higher education, nonprofit organizations, utilities, and other federal agencies and national laboratories;
- Coordinate and communicate project results and accomplishments;
- Maintain a qualified and experienced workforce through training and job assignments;
- Support DOE and NETL program planning, development, analysis, outreach, and communication efforts.

Lead and coordinate NETL efforts in support of DOE's responsibility as the Sector Specific Agency for the energy sector, including:

- Lead Regional Coordinator (RC) and Emergency Support Function #12 (Energy) efforts in assigned regions and events, serving as regional energy advisors to support steady-state operations and preparedness efforts, and provide all-hazards analysis during ESF#12 activations; and
- Coordinate and support National Special Security Events (NSSEs) representing Critical Infrastructure.

LABORATORY OPERATIONS CENTER

Mission: To deliver an effective, efficient, and quality work environment and support services that advance the NETL mission.

Function: Responsible for development, implementation, integration, and monitoring, as well as continuous improvement, of products and services necessary to support NETL business and laboratory functions. This includes: Business Integration; Office of Career Management and Education Programs; Information Technology; Facility Operations; and Security.

BUSINESS INTEGRATION

Mission: Support the efforts of the Office of the Chief Operating Officer in assuring adherence to applicable law and policy while proactively exploring opportunities for improvement, enhanced integration of NETL operations services consistent with best practices and the NETL mission and vision.

Function: Organizational functions include, but are not limited to, Site Support Services, Strategic Planning and Enterprise Performance Assessments, Directives, Continuous Process Improvement Program, Internal Controls & Assessments, and External Audit Functions, as detailed in the following principal roles:

- Coordinate NETL's site support services program, including; contract administration, analysis and financial reporting, standard operating procedures, site support contract management system business owner and participation in the development of support service strategies;
- Facilitate the development of quantifiable, and specific measures that support the strategic plans of DOE, FE, NETL, administer strategic planning processes, ensuring long-term organizational goals are identified and documented; manage NETL's enterprise-wide performance assessment system designed to record, measure and report progress in meeting NETL objectives;

- Administering the NETL Directives Program;
- Develop and implement a Continuous Process Improvement Program which includes the utilization of internal reviews, management review of projects, departmental quality assurance management requirements and best practices;
- Conduct assessments of NETL's Internal Controls and Risk Profile to ensure accountability with requirements mandated by OMB circular A-123 and the Federal Managers Financial Integrity Act; and
- NETL external audit coordination; serving as the primary point of contact for activities, coordinating scheduling, information requests with SMEs, tracking responses and compiling a quarterly report of activities.

CAREER MANAGEMENT AND EDUCATION PROGRAMS

Mission: To inspire, attract, develop, and retain a skilled, motivated workforce to fulfil the scientific, technical, professional, and administrative functions of the laboratory, including the development of a talent pipeline via educating the next generation through STEM outreach and internship programs.

Function: Career Management and Education Programs is responsible for the development, implementation, integration, and monitoring of a comprehensive career path management program that includes the current and prospective NETL workforce. This includes:

- Strategic Human Capital Management (human capital planning, career, and talent management, recruiting strategies, training, performance management, awards and recognition, onboarding and out processing of federal staff, and implementation of human capital policies and procedures);
- Research Associate and Internship Management (undergraduate and graduate student, postgraduate, and faculty education/internship programs);
- STEM Education & Outreach (K-12 education outreach programs, Science Bowl, career education events, digital outreach, teacher workshops, and STEM education for the general public).

INFORMATION TECHNOLOGY

Mission: Maintain a comprehensive information technology and cybersecurity program that provides fully integrated, enterprise-wide systems in support of the NETL mission.

Function: Responsible for management, oversight, and delivery of integrated, secure, reliable, and quality systems to support the information technology needs of NETL. This includes:

- Serving as liaison between DOE CIO and Information Technology offices;
- Serving as the information technology liaison with Fossil Energy and Carbon Management leadership for assistance with information technology matters;
- Managing and supporting enterprise architecture;
- Information technology operations;
- Managing records management;

- Leveraging existing technology and expertise to maximize mission delivery;
- Identifying and fostering new and emerging technologies to maximize mission delivery;
- Providing information technology governance, policy, and oversight processes to ensure secure, efficient, and cost-effective use of information technology resources; and
- Ensuring acceptable risk-based cybersecurity through enhanced enterprise situational awareness, development of near real-time risk management, and combating advanced persistent threats.

FACILITY OPERATIONS

Mission: To assure safe, environmentally friendly, and reliable operations at all NETL sites consistent with the NETL mission and in accordance with applicable law, federal policy, and best practices, under direction of the Executive Director and Chief Operating Officer. The Directorate includes the following Teams at Albany, Morgantown, and Pittsburgh sites: R&D Engineering and Facility Operations; and Environmental, Safety and Health.

Function: Manage real property assets, including daycares, fitness centers and cafeterias, and facility-related operations, ensuring they are maintained in a manner that promotes operational readiness, personnel and environmental safety and health, property preservation and life-cycle cost-effectiveness, through the following competencies:

R&D Engineering: Oversee and conduct engineering design, specification development, procurement, construction, and operation through all phases of the project lifecycle of NETL's on-site innovative research facilities & related infrastructure.

Facility Operations: Oversee the planning, design and construction of all facility-related projects including buildings and structures, roads and sidewalks, utilities and services, real estate development, site-related Environment, Safety and Health (ES&H) projects, physical security systems, and provide facility operations and maintenance, grounds maintenance and janitorial services, on-site and off-site real property assets, and space utilization management.

Safety and Health: Oversee the development and maintenance of a safe and healthy work environment, including: safety analysis and review, chemical and industrial hygiene, hazard communications, chemical inventory maintenance, Occupational Safety and Health Administration (OSHA) and facilities compliance, laser and radiation safety, and ergonomics.

Environmental: Oversee and coordinate onsite environmental compliance activities, including: environmental monitoring activities; groundwater, air (ambient air and meteorological), storm water, wastewater, soil, and biota sampling; hazardous waste management and waste disposal program; waste minimization and pollution prevention awareness program; and coordinate, monitor, and evaluate NETL's performance in meeting emission requirements established at the local, state, and federal levels.

Comprehensive Emergency Management: Oversee the elements of an emergency management system, including coordination with security counterpart and providing analysis of laboratory safety and risks.

SECURITY

Mission: Establish, develop, and maintain a security operation that includes the separate programs of safeguards and security; personnel security; foreign access review and approval management; counterintelligence; controlled unclassified information management; operational security and continuity of operations.

Function: Includes oversight of onsite security program execution, such as the countermeasures implemented through the physical protective force, and access programs, such as badging and access authorization. Includes the continuity program which provides support to HQ program offices which identifies NETL personnel or facilities as devolution receivers and provides for the development of the program requirements for an NETL COOP program. Through the security programs, risk assessments are performed, levels of protection are established; and countermeasures are developed and instituted. The role of the standards issued by the Interagency Security Committee, as well as DOE Orders, are incorporated into a comprehensive threat, risk, and countermeasures program. Security programs include oversight and management of the NETL SCIF and classified operations.

FINANCE & ACQUISITION CENTER

Mission: The Finance & Acquisition Center plans, directs and coordinates NETL's CFO, procurement, and financial assistance (financial award and grant) functions, ensuring effective oversight and stewardship of the Laboratory's financial resources.

Function: The Finance & Acquisition Center performs the following major roles:

- Develops and implements the Laboratory's financial policies;
- Serves as liaison with DOE CFO and Procurement offices;
- Serves as the financial liaison with Fossil Energy and Carbon Management leadership for budget and financial assistance matters; and
- Serves as the principal advisor to the NETL Director and other senior NETL officials on matters related to the Laboratory's financial resources, procurements, and financial assistance activities.

ACCOUNTING

Mission: Accounting ensures the financial integrity of NETL's books and records, while providing effective financial management support to all customers.

Function: Accounting performs the following major roles:

- Ensures that NETL's accounting and reporting activities are accomplished in a manner consistent with applicable statutes, regulations, and other central government agency guidance;
- Establishes and interprets accounting and financial policies and general procedural requirements for general accounting and reporting activities that are applicable to all components of NETL;

- Supports the implementation of the Chief Financial Officer (CFO) Act requirements in accordance with DOE directives;
- Maintains an administrative reporting relationship with the DOE's CFO's Office, FE and other DOE related organizations on matters pertaining to Financial Reporting;
- Develops and maintains integrated accounting and financial reporting information systems, including systems documentation and training materials;
- Develops NETL's indirect rates charged for work performed for other organizations, ensuring full cost recovery;
- Develops NETL travel policy and implementation procedures consistent with HQ policies for both individual temporary duty travel and permanent change of station travel;
- Maintains liaison with audit organizations; central government agencies; and standards-setting bodies, including the Federal Accounting Standards Advisory Board;
- Serves as the liaison with, and develops financial systems policy that is consistent with the Office of Corporate Information Systems; and
- Represents NETL at various forums and on intra- and inter-agency working groups.

BUDGET & ANALYSIS

Mission: Budget & Analysis ensures the financial integrity of the Laboratory's funds control process, directs the budgetary processes, and performs financial analysis in support of strategic initiatives, while providing effective financial management support to all customers.

We accomplish this by producing, maintaining, analyzing, and forecasting accurate, impartial, and comprehensive information about the Laboratory's financial past, present, and future We communicate that information in a clear, useful, and timely manner to stakeholders inside and outside of the Laboratory, so they may make the best possible planning, financial policy, and resource allocation decision. Our goal is to ensure that budgetary decisions are equitable, implemented properly and consistently, achieving their desired ends. We provide this service in a professional and personal spirit of respect, honesty, fairness, cooperation, and goodwill. The office strives to maintain a high standard of knowledge, expertise, service, ethics, and professional integrity while providing sound counsel in the financial planning and decision-making process of the Laboratory.

Function: Budget & Analysis performs the following major roles:

- Develop annual operating budgets;
- Maintain long-range financial planning models;
- Perform ongoing maintenance of decentralized budgeting through the monitoring of these budgets with emphasis on maintaining good fiscal management with reasonable controls;
- Enforce policy decisions regarding use of funds;
- Provide reports and data to assist management in making sound fiscal decisions;
- Perform budget analyses and consult with staff/managers throughout the Laboratory;

- Respond to numerous internal and external requests for institutional data;
- Conduct numerous special studies drawing on an array of financial and non-financial information at its disposal;
- Support the Laboratory's many academic and administrative operations on financial matters;
- Ensure that all budget activities adhere to statutory and policy requirements;
- Coordinate and prepare the annual institutional budget request to the Laboratory's Executive Board;
- Provide central communications to the Laboratory about various financial and budgetary information;
- Develop budget forecasts, revisions, reports, and analyses to support Laboratory-wide resource allocation and decision-making;
- Provide financial management and budget training; and
- Develop various financial policies and procedures and monitor compliance.

ACQUISITION

Mission: Acquisition provides business and financial expertise in all areas of procurement and business management to support the mission of NETL and FE, and other government agencies as appropriate. Acquisition is divided into three teams—Procurement, Financial Assistance, and Policy & Analysis.

Function: Acquisition performs the following major roles:

- Develops and coordinates a comprehensive procurement plan to support program plans;
- Leads the development of strategic plans for internal site support contracting activities;
- Performs solicitation, evaluation, negotiation, execution and administration of contracts, financial assistance instruments, and interagency agreements for R&D, demonstration and commercialization projects, information technology, support services, construction, architect-engineer, supply requirements, and simplified acquisitions;
- Performs property-related internal control activities for property purchased through financial assistance vehicles;
- Provides business and financial expertise in all areas of procurement to other field activities within the Department and/or other governmental agencies;
- Implements and coordinates Federal acquisition policies and procedures, and contract reform;
- Maintains and enhances socioeconomic programs;
- Maintains and enhances procurement information systems;
- Negotiates and distributes provisional and final indirect cost rates on a Departmental and Federal Agency basis;

- Administers closeout of all completed instruments; and
- Coordinates unsolicited proposal review, evaluation, and communications.

ACQUISITION - PROCUREMENT TEAM

Mission: The Procurement Team has primary responsibility for the solicitation, negotiation, placement, award and administration of contracts, delivery orders, purchase orders and other instruments necessary to accomplish the NETL mission and support other agencies as appropriate.

Function: The Procurement Team performs the following major roles:

- Leads the development of strategic plans for internal site support contracting activities, including evaluation of contract structure, tenor, and other key terms;
- Solicits, negotiates, places, awards, and administers contracts, delivery orders, purchase orders and other instruments necessary to accomplish the NETL mission, and support other agencies as appropriate;
- Performs all Procurement Card administrative activities for NETL;
- Facilitates communications between internal and external customers and Acquisition, leading to a better understanding of project needs and the ability to tailor procurement techniques and instruments to best fulfill those needs and ensure consistency in operations;
- Provides business and financial expertise in all areas of procurement to other field activities within the Department and/or other governmental agencies;
- Implements and coordinates Federal acquisition policies and procedures, and contract reform; and
- Administers closeout of all completed instruments.

ACQUISITION - FINANCIAL ASSISTANCE TEAM

Mission: The Financial Assistance Team has primary responsibility responsible for the solicitation, negotiation, placement, and administration of awards primarily in support of the research, development, and demonstration activities necessary to accomplish the NETL mission, and for other agencies as appropriate.

Function: The Financial Assistance Team performs the following major roles:

- Develops and coordinates a comprehensive procurement plan to support program plans;
- Performs solicitation, evaluation, negotiation, execution and administration of financial assistance instruments and interagency agreements for R&D, demonstration, and commercialization projects;
- Facilitates communications between internal and external customers and Acquisition, leading to a better understanding of project needs and the ability to tailor procurement techniques and instruments to best fulfill those needs and ensure consistency in operations;

- Manages the resolution of contentious award terms ensuring compliance with all 2CFR, FAR, DEAR, and other DOE regulations;
- Performs property-related internal control activities for property purchased through financial assistance vehicles;
- Provides business and financial expertise in all areas of grant and award execution and administration to other field activities within the Department and/or other governmental agencies; and
- Administers closeout of all completed instruments.

ACQUISITION - POLICY AND ANALYSIS TEAM

Mission: The Policy and Analysis Team has responsibility for the implementation and coordination of Federal acquisition and assistance policies and procedures, acquisition and financial assistance reform, coordination of unsolicited proposals, maintenance and enhancement of socioeconomic programs, maintenance and enhancement of procurement information systems, performing detailed cost analysis, and the negotiation and distribution of provisional and final indirect cost rates on a Departmental and Federal Agency basis.

Function: The Policy & Analysis Team performs the following major roles:

- Implements and coordinates Federal acquisition and assistance policies and procedures;
- Performs detailed cost and price analysis on competitive proposals, recommending revision to ensure consistency with RFP or FOA terms;
- Negotiates and distributes provisional and final indirect cost rates on a Departmental and Federal Agency basis;
- Maintains and enhances Small Business engagement programs, consistent with Departmental goals and targets;
- Maintains and enhances socioeconomic programs;
- Maintains and enhances procurement information systems;
- As Unsolicited Program Manager for DOE, coordinates all unsolicited proposal reviews, evaluations, and communications.

1.5 RELEVANT DEMOGRAPHIC INFORMATION

With locations in Albany, Oregon; Morgantown, West Virginia; Pittsburgh, Pennsylvania; Anchorage, Alaska; and Houston, Texas, NETL comprises 110 buildings and 14 major research facilities, and 112 operational laboratories covering 237acres. As of December 31, 2022, NETL had 1,478 employees at its five locations – 549 were federal employees (Pittsburgh 202, Morgantown 182, Albany 46, Houston 2, Remote 117) and 929 were site-support contractors (Pittsburgh 415, Morgantown 316, Albany 81, Houston 4, Remote 113).

1.6 ACCOMPLISHMENTS

NETL achieved the following technology-related accomplishments in 2022.

AWARDS

- The Association for Women Geoscientists (AWG) – AWG focuses on supporting and encouraging women in the pursuit of meaningful educational and professional opportunities in the geosciences. Their efforts include scholarships, awards and community events. Important work toward these goals derives from their chapters and includes community outreach programs, assisting students with knowledge and materials for field work, research, and preparation of resumes and job applications, as well as raising money for local scholarships. AWG also works with other geoscience societies on common diversity, equity, inclusion, and justice goals
  - NETL researcher, Christina Lopano, who has led the development of a groundbreaking process to extract rare earth elements and critical minerals (REEs-CMs) from coal and coal byproducts will receive the Professional Excellence Award from the Association for Women Geoscientists. Lopano has been a driving force behind the development of NETL's Targeted Rare Earth Extraction (TREE) process to extract REEs-CMs from a broad range of coal and coal-processing materials and waste streams, including acid mine drainage and various ashes.
- Combined Federal Campaign (CFC) – Federal employees and retirees represent a strong, caring community through the CFC, dedicated to making a difference for those in need. Overseen by the Office of Personnel Management, the CFC offers the Federal community the opportunity to donate to thousands of participating charities.
  - Teresa Rogers names 2022 CFC Hero "Atlas" Award. A CFC hero is a person who implemented a successful CFC and went above and beyond the call of duty in service to the campaign.
- DOE Vehicle Technologies Office – Each year, VTO presents awards to individuals and teams from partner institutions for contributions to overall program efforts and to recognize research, development, demonstration and deployment achievements in specific areas.
  - The Lab's Brett Aristegui, Dan Nardozzi, Trev Hall, David Kirschner, Neil Kirschner, Erin Russell-Story and Darren Stevenson, all of whom are assigned to Technology Integration, Energy Efficiency & Manufacturing in the NETL Technology Development Center, received a 2022 Team Award at the VTO recent Annual Merit Review Plenary Session.
- Edison Award – The Edison Best New Product Awards™ is an annual competition honoring excellence in new product and service development, marketing, human-centered design, and innovation. Past winners have included Fortune 500s, small start-ups, and everything in between. The value of an Edison Award™ is powerful in terms of its ability to boost recognition and market visibility. A finalist status delivers an affirmation of superior quality — a confirmation that can reach customers in a way that marketing and advertising alone cannot.
  - Developers of NETL's Multi-Functional Sorbent Technology (MUST), a suite of sorbents that offers a practical, affordable and green approach to remove contaminants from water and manufacturing processes, received a bronze award at the Edison Awards for Engineering and Material Science. Members of the MUST team earning the Edison Awards honors are NETL's McMahan Gray, Brian Kail, Walter Wilfong, Qiuming Wang, Fan Shi and Tuo Ji, as well as Xue (Ida) Chen, global product technical leader at Dow Chemical.

- Hart Energy – The Company provides timely and targeted information to a worldwide audience that includes E&P companies, pipeline operators, refiners and finished fuel producers, service companies, the financial and investment community, engineering and automotive industries, utilities, leading NGOs and the world's major governments.
  - The U.S. Department of Energy's (DOE) produced water optimization program, PARETO, developed by NETL and Lawrence Berkeley National Laboratory (LBNL), was named a winner in Hart Energy's 2022 Special Meritorious Awards for Engineering Innovation (MEAs) for its water management capabilities.
- International sCO_2 Power Cycles Symposium – is an industrial workshop organized to advance superciritcal carbon dioxide (CO_2) power cycle technology. Researchers, industry partners, and end users meet to learn about advancements in the field.
  - Sandeep R. Pidaparti (KeyLogic), Charles W. White (KeyLogic) & Nathan T. Weiland (NETL) were recipients of Best Paper Award ("A Performance and Economic Comparison of Partial Cooling and Recompression SCO_2 Cycles for Coal-Fueled Power Generation").
- Pittsburgh Federal Executive Board Excellence in Government Awards – These awards honor area federal employees whose service demonstrates deep personal and professional commitment.
  - NETL's Carbon Capture Team received the Chairperson's Excellence in Government Gold Award and the Outstanding Small Team Gold Award. Team members are Dustin Brown, Katharina Daniels, José Figueroa, Krista Hill, Andrew Jones, Carl Laird, David Lang, Andrew O'Palko, Mariah Richardson, Zachary Roberts, Elliot Roth and Nicole Shamitko-Klingensmith. Operating as a diverse team and utilizing the individual skills of its members, the Carbon Capture Team has succeeded in soliciting and managing a project portfolio of 120 projects. Under Figueroa's supervision, the team focuses on maturing technology from early-concept development to market-ready solutions.
- Standford University – Stanford University lists the top 2% of world scientists based on composite indicator score: one list for career-long impact and another for single-year impact.
  - Current and former NETL researchers listed in the top 2% for career-long impact were David E. Alman, Sofiane Benyahia, Ray Boswell, Ronald W. Breault, Ömer N. Doğan, Yuhua Duan, Michael C. Gao, Randall S. Gemmen, Angela L. Goodman, Evan J. Granite, Jeffrey Hawk, Gordon R. Holcomb, Mehrdad Massoudi, Phuoc Tran, Henry W. Pennline, James Rawers, Harpreet Singh, Ranjani Siriwardane, D.H. Smith, and C.M. White.
  - Current and former NETL researchers listed in the top 2% for single-year impact were Ray Boswell, Ronald W. Breault, Dominic Alfonso, Yuhua Duan, Michael C. Gao, Angela L. Goodman, Evan J. Granite, Jeffrey Hawk, Gordon R. Holcomb, Douglas Kauffman, Barbara Kutchko, Ping Lu, Mehrdad Massoudi, Phuoc Tran, Harpreet Singh, Ranjani Siriwardane and Venna R. Surendar.
  - NETL is a U.S. Department of Energy national laboratory that drives innovation and delivers technological solutions for an environmentally sustainable and prosperous energy future. By leveraging its world-class talent and research facilities, NETL is ensuring affordable, abundant and reliable energy that drives a robust economy and national security, while developing technologies to manage carbon across the full life cycle, enabling environmental sustainability for all Americans.

- Technology Transfer Working Group (TTWG) – The TTWG operates to address technology transfer activities, issues, and concerns at the working level. This group does not establish policy, but works collegially under the oversight of the Technology Transfer Coordinator and in conjunction with the Technology Transfer Policy Board.
  - Leah Bower and Samantha Zhang, two NETL staff members, received Best in Class honors in the Partnering category for expediting the execution of an inter-agency agreement between the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) and NETL, which resulted in an opportunity for the Lab to tackle critical pipeline safety issues.
- TechConnect – The global research and innovation event and media leader with more than 20 years of experience connecting emerging technologies with unique funding and partnership opportunities. TechConnect actively supports student, governmental and global S&T initiatives through its event platforms and over 10,000 open-access publications. Each year TechConnect prospects, vets, and connects thousands of emerging technologies for our industry, investment, and government clients.
  - NETL researchers pitched top-ranked clean energy technologies to potential industry, investment and government prospectors and partners during the recent TechConnect World Innovation Conference and Expo, earning TechConnect National Innovation Awards for their teams. NETL's Dustin McIntyre and Andrew Bean participated in TechConnect's Innovation Challenge, which the organizer states is the largest multi-sector commercialization program for emerging deep technologies. McIntyre showcased the Lab's winning miniaturized laser-induced breakdown spectroscopy (LIBS) harsh environment sensor, which identifies elemental compositions of solids and liquids in the field, in real-time — essential for producing the nation's energy while protecting the environment. McIntyre developed the LIBS sensor with his colleagues Daniel Hartzler and Chet Bhatt. Bean presented NETL's winning Advanced Infrastructure Integrity Modeling (AIIM), which integrates big data, big data computing, and multiple machine-learning and advanced spatial models to evaluate energy infrastructure integrity, identify potential infrastructure hazards, and support infrastructure use and reuse planning. AIIM was developed through the efforts of a team of NETL researchers and scientists that includes Lucy Romeo, Andrew Bean, Jennifer Bauer, Kelly Rose, Alec Dyer, Rodrigo Duran, Madison Wenzlick, Dakota Zaengle, Isabelle Pfander, Patrick Wingo, Jake Nelson, Thomas Martin, Michael Sabbatino and Chukwuemeka Okoli.
- University of Illinois, Urbana – Champaign. Department of Chemical and Biomolecular Engineering – The department's mission is to improve the human prospect through the study and practice of chemical engineering by engaging in education, research, economic development, and service to the profession and society. Our vision is to distinguish ourselves through sterling technical and educational endeavors that help us consciously conceive new ways to benefit an increasingly complex and integrated world.
  - NETL's Charles Damianides, Ph.D., has received a 2022 Distinguished Alumni Achievement Award from the Chemical and Biomolecular Engineering Department at the University of Illinois Urbana-Champaign. "I am both honored and humbled to receive this honor and to be included in this accomplished and distinguished group of alumni who have taken the knowledge acquired at the university to make valuable contributions that address real-world issues," Damianides said.
- University of Pittsburgh Distinguished Alumni Awards – The Pitt School of Education's annual Distinguished Alumni Awards honor our outstanding alumni and students who are doing transformative work in the field of education.
  - NETL researcher, Mac Gray, to receive Distinguished Alumni Award from the University of Pittsburgh. Gray will be presented with a prestigious honor from the institution where he learned critical skills to thrive as a nationally renowned research scientist. In his letter

nominating Gray for the award, NETL Director Brian J. Anderson, Ph.D., noted that Gray has advanced innovative technologies to save lives while serving as a mentor who has inspired hundreds of students and colleagues.

- WTWH Media – The R&D 100 Awards have served as the most prestigious innovation awards program since 1963, honoring great R&D pioneers and their revolutionary ideas in science and technology. The awards not only recognize the efforts of the development team and partners – they also provide a mark of excellence known to industry, government, and consumers.
  - NuSense Technology – an innovation developed by Kevin Chen's group at Pitt together with NETL as the co-developer, was named a winner in the Analytical/Test category. NuSense Technology can function in extreme environments found in nuclear reactor cores. It also can be used to monitor structural health in critical energy production systems such as gas turbines, boiler tubes, reactor coolant pipes or core containment vessels. These measurements can provide valuable early warnings before accidents or breakdowns occur. NETL researcher Michael Buric serves on the project team. Pitt-NETL researchers co-developed four patents to support the technology. Besides Buric, NETL's Kirk Gerdes, deputy director for Research & Innovation, contributed to the efforts to develop the patents.

2.0 COMPLIANCE SUMMARY

NETL is committed to ensuring compliance with all the environmental requirements impacting its locations. This includes requirements found in (DOE) departmental directives; executive orders (E.O.s); federal, state, and local codes and regulations; acquisition letters; negotiated agreements; and consensus standards.

Standards and requirements that subject matter experts (SMEs) determine to be applicable to ES&H activities are incorporated into one or more directives, which provide the NETL policies, programs, and procedures used at the Laboratory. ES&H directives include orders and procedures. The ES&H Team also provides specific guidance through subject-related manuals. Assigned SMEs review their directives every three years and update, as appropriate.

Implementation of the standards and requirements is verified by a number of methods, including:

- A rigorous Safety Analysis and Review System (SARS) designed to review the details of a project before authorizing any significant activities to proceed. Checklists have been developed for SARS to facilitate verification of the standards and requirements covered during the review. ES&H SMEs provide support to the SARS process and ensure that all applicable ES&H standards and requirements are being addressed.
- Regular walk-through inspections of site facilities to ensure that all NETL facilities are inspected on an annual basis. Various ES&H subject matter experts visually verify that NETL follows applicable standards and requirements.
- Preparation of this ASER, which requires a complete review of compliance with all major environmental standards and requirements. Numerous SMEs participate in this effort, reviewing the past year's performance.

2.1 MAJOR ENVIRONMENTAL STATUTES

Numerous inspections and audits are performed each calendar year to verify compliance with environmental regulations, standards, and existing permits. The inspections and audits are then documented in inspection reports and audit reports, ensuring no instances of environmental noncompliance have been identified. Examples of the major environmental statutes include, but are not limited to: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Superfund Amendments and Reauthorization Act (SARA); Resource Conservation and Recovery Act (RCRA); Federal Facilities Compliance Act (FFCA); National Environmental Policy Act (NEPA); Toxic Substances Control Act (TSCA); Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); Clean Air Act (CAA); Clean Water Act (CWA); and the Atomic Energy Act of 1954 (AEA). Statutes that are addressed across all five locations are addressed below. However, if more specific compliance is appropriate, it is included in the site-specific discussions.

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

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120 (40 CFR 300-310; 43 CFR 11) requires federal facilities to comply with the provisions of the Act. More specifically, this section imposes additional regulations related to site studies and notices for the sale and other transfers of federal real property. This section of CERCLA makes all CERCLA guidelines, rules, regulations and criteria applicable to federally owned or operated facilities, including requirements for: (1) preliminary assessments for facilities at which

hazardous substances are located; (2) possible inclusion of such facilities on the National Priority List (NPL); and (3) remedial actions at these sites. However, federal facilities are not required to comply with CERCLA provisions regarding financial responsibility and removal/remediation contracts with state governments. While federal facilities that are not on the NPL may be subject to state laws concerning removal and remediation actions, these state laws and regulations may not impose provisions more stringent than those applicable to non-federal facilities. NETL did not have any CERCLA violations in 2022 at any of its sites.

2.1.2 Superfund Amendments and Reauthorization Act (SARA) and Community Right-to-Know

The Superfund Amendments and Reauthorization Act (SARA) Title III requires the reporting of hazardous chemicals that were present at a facility and exceeded certain established quantities during the preceding year. This includes gaseous, liquid, and solid chemicals designated as extremely hazardous substances in amounts greater than or equal to 500 pounds, liquids in amounts *greater than or equal to 55 gallons* or amounts greater than or equal to the Threshold Planning Quantity (TPQ). SARA Title III also requires reporting of all other *hazardous chemicals* present at the facility during the preceding calendar year in amounts equal to or greater than 10,000 pounds. NETL did not have any hazardous chemicals in excess of the reporting thresholds in 2022 at any of its sites.

2.1.3 Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. The law describes the waste management program mandated by Congress that gave EPA authority to develop the RCRA program. Under RCRA, the EPA has the authority to control hazardous waste from the "cradle-to-grave," including generation, transportation, treatment, storage and disposal of hazardous waste. Sites that produce, manage, transport, or dispose of hazardous wastes are designated as generators; transporters; or treatment, storage, and/or disposal (TSD) facilities.

At NETL, on-site hazardous waste handling is governed by NETL Procedure 436.1-02.09, RCRA Hazardous Waste Management. This procedure addresses requirements for NETL's RCRA Hazardous Waste Management Program, including: (a) general RCRA hazardous waste management; (b) identification, characterization, and classification of RCRA hazardous waste; (c) management of satellite accumulation areas (SAAs); (d) operation of designated central accumulation areas; (e) container management; (f) elementary neutralization of corrosive wastes; (g) waste collection/transportation; (h) record keeping; (i) personnel training; and (j) personal protective equipment (PPE).

All 2022 hazardous waste management activities were performed in a safe and environmentally sound manner and in compliance with Title 40 Part 262, Standards Applicable to Generators of Hazardous Waste and all applicable federal, state, and local laws and regulations, as well as, DOE/NETL policies. NETL complied with all of the recordkeeping and reporting requirements specified in 40 CFR 262 Subpart D—Recordkeeping and Reporting Applicable to Small and Large Quantity Generators.

Per 40 CFR 262.11, determinations were made as to whether waste was a hazardous waste to ensure compliance with applicable RCRA regulations. When unidentified wastes were provided for disposal, NETL sent samples to a contracted, certified laboratory to test for hazardous characteristics (i.e., toxicity, ignitability, reactivity, and corrosiveness) and to ensure proper handling. NETL did not have any RCRA violations in 2022 at any of its sites.

2.1.4 Federal Facilities Compliance Act (FFCA)

The Federal Facility Compliance Act of 1992, Pub. Law No. 102-386, became law on October 6, 1992. This law amended the waiver of sovereign immunity with respect to Resource Conservation and Recovery Act (RCRA) compliance. As a result, FFCA ensures that federal facilities are treated the same as private parties regarding compliance with RCRA. Prior to FFCA, the EPA did not have the statutory authority to issue administrative compliance orders pursuant to RCRA section 3008(a). Currently, Federal Facility Compliance Agreements are negotiated with federal facilities to bring them into compliance. In addition, under section 103 of FFCA, Congress further clarified that federal agencies are considered persons for purposes of RCRA. NETL has not had any issues regarding FFCA compliance.

2.1.5 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq., 1969) establishes federal policy for protecting the quality of the environment. The act establishes three levels of review for federal actions: environmental impact statements (EISs), environmental assessments (EAs) and categorical exclusions (CXs). Under the highest level of review, an EIS is prepared to evaluate the environmental consequences of any major federal action that might have significant impact on the quality of the human environment. The EIS must include a comparative analysis of those realistically available alternatives that would accomplish the same goals that the federal action is expected to address. Based on the EIS, a Record of Decision (ROD) is prepared to document which alternative will be pursued.

If the scope of the federal action does not clarify that an EIS is necessary, or if the potential for environmental impacts from the proposed action is uncertain, the second-tier level of review, an EA, is prepared. Based on the analysis in the EA, a determination is made that either the potential environmental impacts warrant preparation of an EIS, or the impacts are not significant, and a finding of no significant impact (FONSI) can be issued.

If the federal action does not have a significant effect on the environment, either individually or cumulatively, then the third level of review, a CX, is warranted. These types of federal actions can be excluded from an in-depth NEPA review. DOE has determined that certain classes of actions do not individually or cumulatively have a significant effect on the human environment and, therefore, can be covered by a CX. A list of the CXs and the eligibility criteria for their application are identified in DOE's NEPA implementing procedures (10 CFR 1021).

In 2015, NETL's process for issuing CX's was modified, wherein a single cumulative CX can be issued per award for the same activities conducted at multiple locations by multiple project recipients and sub-recipients. The result of this procedural change has generally led to a reduced number of CX's issued by NETL. However, it has not necessarily reduced the number of Environmental Questionnaires (EQ) evaluated to process these CX determinations. For these reasons, both CX's approved, and EQ's reviewed to support these CX determinations are included below.

NETL conducts NEPA reviews for both on-site and off-site actions proposed for funding by the federal government. These include actions planned in cooperation with other governmental organizations, educational institutions, and private industry.

The following EIS activities took place in calendar year 2022:

DOE/EIS-0512-S1: ALASKA LNG PROJECT

On April 15, 2021, the DOE Office of Fossil Energy and Carbon Management (DOE/FECM) granted a request for rehearing of a final Order issued to Alaska LNG Project LLC (Alaska LNG) for the export of liquefied natural gas (LNG) produced from Alaskan sources to non-free trade agreement countries, pursuant to the Natural Gas Act (NGA). In the Rehearing Order, DOE stated that it was granting a rehearing for the purpose of conducting two Alaska-specific environmental studies (collectively, the Alaska environmental study proceeding). On July 2, 2021, DOE announced its intent to prepare a supplemental environmental impact statement (SEIS) for the Alaska environmental study proceeding (DOE/EIS–0512–S1), consistent with NEPA. DOE announced availability of the draft SEIS on June 29, 2022; and held a virtual public meeting on July 20, 2022. A 45-day public comment period ran from July 1, 2022 to August 15, 2022. The SEIS included analysis of the potential environmental impacts associated with natural gas production on the North Slope of Alaska and a life cycle analysis (LCA) calculating the greenhouse gas (GHG) emissions for LNG exported from the proposed Alaska LNG Project. DOE anticipates the final SEIS to be available in January 2023 and the Record of Decision a few months later. NETL's NEPA Office is supporting development of the SEIS.

The following EA activities took place in calendar year 2022

DOE/EA-2070: FRONTIER OBSERVATORY FOR RESEARCH INTO GEOTHERMAL ENERGY (FORGE), MILFORD UTAH

DOE's Office of Energy Efficiency and Renewable Energy established the FORGE program to create a dedicated field laboratory site where the subsurface scientific and engineering community would develop, test and improve technologies and techniques for the creation of cost-effective and sustainable enhanced geothermal systems (EGS) in a controlled, ideal environment. There were two potential FORGE project locations, with a down-select expected in early 2018. The proposed Utah FORGE site is approximately 10 miles northeast of Milford in Beaver County, Utah, on private, State of Utah, and U.S. Bureau of Land Management (BLM) lands. DOE's proposed action is to provide cost-shared funding to the Energy and Geoscience Institute (EGI) at the University of Utah and its partners for the proposed Utah FORGE site. The project consists of multiple phases, including project planning, site characterization and preparation, and technology testing and evaluation.

Project planning and portions of the site characterization and preparation have been completed or are ongoing. If selected to continue this project, EGI will construct a geothermal observatory and supporting infrastructure to conduct field research and development activities in (EGS). The project would include one or more deep geothermal research wells, monitoring wells, groundwater wells, a modular office structure, utility tie-ins, and monitoring equipment. The Final EA and FONSI for the Utah site were issued in April 2018.

During the operational phase of FORGE, applicants will propose and be selected by a panel to test geothermal methods and equipment at the site. The FORGE site has received the first round of Research and Development project proposals, which were reviewed for compliance with the existing EA and FONSI by NETL's NEPA office. Additionally, the FORGE site conducted additional archaeological surveys within and around the perimeter of the site, in consultation with the State Historic Preservation Office (SHPO). A Supplemental Analysis memo was issued in April of 2022. No changes to the EA or FONSI were recommended as a result of the additional surveys.

DOE/EA-2128: LARGE PILOT TESTING OF LINDE-BASF ADVANCED POST-COMBUSTION CO_2 CAPTURE TECHNOLOGY

DOE proposes to provide cost-shared funding to the University of Illinois, Urbana-Champaign to design, construct, and operate a 10 MWe capture system based on the Linde/BASF advanced amine-based post-combustion carbon dioxide (CO_2) capture technology at the coal-fired City Water, Light, and Power (CWLP) Dallman Power Plant in Springfield, Illinois.

The proposed plant would be constructed on the west side of the existing CWLP facility on land currently used for equipment and materials storage. The pilot will be constructed in an area of approximately 120 feet by 425 feet (51,000 square feet). This project will use 24,000 gallons of amine compounds which will be stored on-site. The pilot will receive a slipstream from the CWLP plant and return captured CO_2 to the stack for venting. CWLP is located on a peninsula and the proposed location for the pilot unit is within approximately 75 feet of Lake Springfield, a freshwater reservoir that is used as a potable water source for the City of Springfield.

The Final EA and FONSI were released in June 2020. Subsequent to the Final EA, a Native American Tribe requested an Inadvertent Discovery Plan (IDP). An IDP was completed, and the participant completed excavation and earth-moving activities in accordance with the plan in 2022.

DOE/EA-2057: BUILDING 2 DEMOLITION, ALBANY, OR

NETL proposes to demolish Building 2 (B-2) at the Albany site. This action is proposed because the condition of the building is rapidly declining, it poses a significant safety hazard to site personnel, and there is no existing or anticipated future mission need for the building. The demolition is to eliminate the current unsafe condition of B-2 and to reduce DOE/NETL's inventory of obsolete and unused buildings. DOE/NETL is incurring annual maintenance costs for B-2, which has been secured and abandoned since the early 1990's. By demolishing B-2, total expenditures for facilities sustainment would be reduced and safety would be increased.

Since the Oregon State Historic Preservation Office (SHPO) determined that B-2 contributes to the eligibility of the Albany site for listing as a historic district, demolition of this structure would have an adverse effect (SHPO letter dated October 9, 1997). An EA was determined to be the appropriate level of analysis under DOE's NEPA Implementing Procedures. It is DOE's intention to coordinate its responsibilities for compliance with Section 106 of the National Historic Preservation Act with related activities associated with the NEPA process (e.g., public notification). As part of the decision-making process, public participation will be solicited during development of the EA. Currently, funding for the demolition of the building is not available. The EA has not commenced, and demolition was put on hold by direction of management due to the budget constraints. The NEPA office requested a thorough structural analysis to be incorporated into the EA to determine if the reconstruction of Building 2 could be considered a viable alternative in the EA. Delays occurred with the structural analysis when asbestos concerns were revealed. Asbestos mitigations were completed. The structural analysis and the report were delayed due to the pandemic situation. The report was completed September 2020; a revision to the report was made in October 2020. The Draft EA has not commenced.

DOE/EA-2134: MAKING COAL RELEVANT FOR SMALL SCALE APPLICATIONS: MODULAR GASIFICATION FOR SYNGAS/ENGINE CHP APPLICATIONS IN CHALLENGING ENVIRONMENTS

The proposed action is for DOE to provide cost-shared funding to the University of Alaska. DOE proposes to provide approximately $40 million of the project's $50 million total cost. The University's proposed project is to construct and operate a large pilot-scale modular gasification system for solid fuels, including coal and woody biomass generating a clean syngas for firing in a suitable heat engine.

The plant would be configured to co-produce several saleable products including electricity, pyrolysis liquids (oils and tars), and low-pressure steam. The initial plans were to add the pilot system to the existing combined heat and power (CHP) plant on the campus. Additionally, a small structure of approximately 180 square feet was expected to be added to the existing building with tanks of ammonium hydroxide placed outside of the building. The project team has revised their decision against siting the project at the power plant campus site.

The preliminary design phase of this project has been completed. The EA has not commenced; it was put on hold by direction of project recipient due to site selection delays. The NETL project officer informed the NEPA division that the project will no longer receive any further time extensions - the EA will not be completed. The NEPA division no longer has any further responsibilities with this project. The project will be terminated.

DOE/EA-2190: ILLINOIS STORAGE CORRIDOR CarbonSAFE

DOE proposes to provide cost-shared funding to the Illinois State Geologic Survey (ISGS) for Phase IV of the "*Illinois Storage Corridor CarbonSAFE*" project. Based on the best available projections, the Phase IV cost is estimated to be approximately $154 million, and the DOE share would be approximately $77 million. ISGS's proposed project is to construct carbon capture and storage facilities at two locations in Illinois. The two locations are approximately 225 miles apart and there will be no physical interconnection between them, but the DOE Phase IV funding will include acquisition of permits and construction of facilities needed to inject and monitor the commercial scale (50 million metric tons) injection and storage of carbon dioxide (CO_2) into geologic formations at both sites.

In Marissa, Illinois, the project would capture more than 8 million metric tons per year of CO_2 from the Prairie State Generating Company (PSGC), transport it via pipeline, and store it in the St. Peter-Knox Storage Complex in southern Illinois. The PSGC location would require construction of a CO_2 pipeline, up to 5 miles in length, and multiple Class VI-permitted injection wells, along with various monitoring wells and instrument arrays. PSGC is considering several options with respect to the CO_2 capture unit design and construction. The capture unit may be constructed under a separate DOE program; or may be constructed without Federal funds.

In Gibson City, Illinois, the project would capture 500,000 to 1.7 million metric tons per year of CO_2 from the One Earth Energy Facility, transport it via pipeline, and store it in the Mt. Simon Storage Complex in north-central Illinois. The One Earth Energy location would require construction of a CO_2 capture unit, a pipeline of up to 3.5 miles in length, and a Class VI-permitted injection well, as well as various monitoring wells and instrument arrays.

The Draft EA is in progress.

DOE/EA-2194: WYOMING CarbonSAFE

DOE's proposed action is to provide cost-shared funding to the University of Wyoming (UW) for Phase IV of the "*Wyoming CarbonSAFE*" project. Based on the best available projections, the Phase IV cost is estimated to be approximately $77 million, and the DOE share would be approximately $38.5 million. UW's proposed project is to construct carbon capture and storage facilities needed to inject and monitor commercial quantities (50 million metric tons) of carbon dioxide (CO_2) in geologic formations.

The proposed project would capture CO_2 from Dry Fork Station in Gillette Wyoming, compress the CO_2 into a supercritical fluid, transport it via pipeline to injection wells, and inject it into the Sundance Group (approximately 8,170 feet below ground level) and the Minnelusa Sandstone (approximately 9,340 feet below ground level). The project would require construction of a CO_2 capture unit, associated compression facilities, approximately 28 miles of CO_2 pipeline, and multiple Class VI-permitted injection wells, along with various monitoring wells and instrument arrays.

The Draft EA is in progress.

DOE/EA-2196: ESTABLISHING AN EARLY CO_2 STORAGE COMPLEX IN KEMPER COUNTY, MISSISSIPPI: PROJECT ECO_2S

DOE proposes to provide cost-shared funding to the Southern States Energy Board (SSEB) for Phase IV of "*Establishing an Early CO_2 Storage Complex in Kemper County, Mississippi: Project ECO_2S*." Based on the best available projections, the Phase IV cost is estimated to be approximately $77 million, and the DOE share would be approximately $38.5 million. SSEB's proposed project is to capture up to 1.7 million metric tons per year of CO_2 from Mississippi Power's Plant Ratcliffe, a natural gas combined-cycle unit in Kemper County, Mississippi. The CO_2 would be compressed to supercritical state, transported via a short connector pipeline, and stored in a series of stacked saline reservoirs. The 30,000-acre CO_2 storage complex is co-located with Plant Ratcliffe.

The proposed project would involve the construction of a Linde BASF CO_2 capture unit and associated compression equipment, piping and instrumentation; a short trunkline to pipe CO_2 from the plant to the storage complex; and multiple Class VI injection wells with associated monitoring wells and instrumentation.

The Draft EA is in progress.

DOE/EA-2197: NORTH DAKOTA CarbonSAFE; PROJECT TUNDRA

The proposed action is for DOE to provide cost-shared funding to the Energy and Environmental Research Center (EERC) for Phase IV of the "*North Dakota CarbonSAFE*" project. Based on the best available projections, the Phase IV cost is estimated to be approximately $77 million, and the DOE share would be approximately $38.5 million. EERC's proposed project is to construct carbon capture and storage facilities at Milton R. Young Station, an existing lignite-fired plant in Oliver County, North Dakota.

The proposed project would use Fluor Corporation's (Fluor) Econamine FG Plus technology to capture an average of 4 million metric tons per year of CO_2. The CO_2 would be compressed, piped via 0.25-mile trunkline to the storage complex; and injected into deep geologic reservoirs. The CO_2 storage complex is co-located on the power plant property. The proposed project would include

the construction of the CO_2 capture facility, approximately 0.25-miles of CO_2 pipeline, 3 Class VI injection wells, well pads, monitoring wells, and other associated equipment. In addition, the project would require upgrades to the existing water treatment system and two Class I injection wells to dispose of the process wastewater.

The Draft EA is in progress.

The following Categorical Exclusion and No-Cost Time Extension activities took place in calendar year 2022

These categorical exclusions (CX) and no cost time extensions were approved in 2022:

NO COST TIME EXTENSIONS GRANTED: 61

INTERNAL CXs TO NETL

Morgantown, WV Site	5	
Pittsburgh, PA Site	17	
Albany, OR Site	7	
Multiple NETL Site	2	
Total CXs	31	*[Supporting EQ's reviewed: 33]*

NETL PARTNERED PROJECTS (EXTERNAL TO MGN-PGH-ALB)

Continental U.S.	204	
Non-Continental U.S.	5	
Total CXs	209	*[Supporting EQs reviewed: 450, of these, 30 covered work in international or non-continental U.S. locations]*

GRAND TOTAL CXs FOR 2022: 240

GRAND TOTAL EQs REVIEWED FOR 2022: 483

2.1.6 Toxic Substances Control Act (TSCA)

The Toxic Substances Control Act (TSCA) of 1976 gives EPA the authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Specifically, TSCA addresses the production, importation, use, and disposal of chemicals including polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint. In most cases, TSCA compliance at NETL relates to asbestos and lead-based paint. Given the unique history (related to construction and maintenance activities) and infrastructure at each NETL facility, the activities at each site related to TSCA compliance in 2022 are addressed in the site-specific sections.

2.1.7 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires federal regulation of pesticide distribution, sale, and use. This means that all pesticides distributed or sold in the United States must be registered by EPA. However, before a pesticide can be registered, it needs to be demonstrated that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment." NETL does not typically utilize pesticides at its facilities, however, each site has a pest control subcontractor who handles specific landscaping concerns per the appropriate regulatory requirements, as needs arise. Contractors at each site must provide proof of State Commercial Applicators license for insecticide spraying, as well as submit Safety Data Sheets for all proposed chemicals to be approved prior to use.

2.1.8 Clean Air Act (CAA)

The Clean Air Act (CAA) regulates air emissions from both stationary and mobile sources. It includes establishment of National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and regulates emissions of hazardous air pollutants. Each NETL site tracks its emissions via a quarterly air emissions inventory. Specific air quality compliance requirements are addressed in the site-specific sections. While no air quality violations were identified at any of the sites in 2022, site-specific compliance is addressed in the site-specific sections.

2.1.9 Clean Water Act (CWA)

The Clean Water Act (CWA) regulates the discharge of pollutants into the waters of the United States. The regulations include setting wastewater standards for industry, as well as national water quality criteria recommendations for pollutants in surface waters. Under the CWA, it is unlawful to discharge any pollutant from a point source into navigable waters, unless a National Pollutant Discharge Elimination System (NPDES) permit was obtained. Currently only the Morgantown site holds an NPDES permit, although the Pittsburgh site is required to comply with the NPDES permit for the Bruceton Research Center which is held by CDC/NIOSH which is co-located with NETL at the BRC. The Albany site does not have an NPDES permit. Compliance with the CWA, as well as other water quality requirements is detailed under the site-specific discussions.

2.2 DOE INTERNAL ENVIRONMENTAL AND RADIATION PROTECTION ORDERS

2.2.1 DOE Order 436.1, Departmental Sustainability

NETL was in full conformance with DOE Order 436.1, Departmental Sustainability. This order addresses the requirements and responsibilities for managing sustainability and includes an emphasis on greenhouse gas reductions and achieving the goals established in applicable laws, regulations, and Executive Orders. It is the primary internal environmental protection Order within the Department.

2.2.2 DOE Order 458.1, Radiation Protection of the Public and Environment

NETL operates a compliant radiation protection program in accordance with DOE Order 458.1, Radiation Protection of the Public and Environment; however, NETL's programs are minimal when compared to other DOE national laboratories or sites administered under the control of the National Nuclear Security Administration (NNSA). The radiation protection program at NETL focuses on radiation generating devices (RGDs), sealed radioactive sources, naturally occurring radioactive materials/ technologically enhanced naturally occurring radioactive materials (NORM/ TE-NORM) and legacy radioactive materials. These are discussed, as necessary, in this document based on their location.

2.2.3 DOE Order 231.1 B, Environment, Safety, and Health Reporting

In accordance with DOE Order 231.1, Environment, Safety, and Health Reporting, NETL has established an internal directive to ensure the collection and reporting of environmental, safety, and health (ES&H) information. NETL's procedure addresses reports, required on a scheduled basis by DOE or by regulation, and are essential for evaluating NETL operations and identifying opportunities for improvement for planning purposes. NETL's internal procedure applies to all NETL employees and research associates at the NETL sites. Reports must be compiled

and submitted for the Albany, Morgantown, and Pittsburgh sites, as well as the Anchorage and Houston offices, as warranted. The directive requires that reports, documents, and other submissions listed in this procedure detail roles, responsibilities, recordkeeping, and required timelines for reporting, and are prepared and submitted in accordance with DOE Order 231.1.

2.2.4 DOE Order 435.1, Radioactive Waste Management

The objective of DOE Order 435.1, Radioactive Waste Management, is to ensure that all DOE radioactive waste is managed in a manner that protects worker and public health and safety and the environment. It requires that DOE radioactive waste management activities be systematically planned, documented, executed, and evaluated. Radioactive waste is to be managed to: (1) protect the public from exposure to radiation from radioactive materials; (2) protect the environment; (3) protect workers; and (4) comply with applicable Federal, state, and local laws and regulations. NETL ensures that such activities comply with DOE Order 435.1, as well as any other applicable Executive Orders and DOE directives.

2.3 ATOMIC ENERGY ACT OF 1954

The Atomic Energy Act of 1954 (AEA) and its amendments require Federal control of radiation source materials for the protection of the public and workers. DOE orders, EPA regulations, and Nuclear Regulatory Commission regulations are then developed based on the AEA. To fulfill its obligations, DOE has implemented radiation protection programs at its facilities that process, produce, handle, use or dispose of radiation source or other radioactive materials, which is limited based on research activities/priorities and minimal when compared to other DOE national laboratories or sites administered under the control of the National Nuclear Security Administration national laboratories.

Radiation exposure at NETL is managed based on the “as low as reasonably achievable” (ALARA) principle. Specific information is provided within each of the site-specific sections of this report, as necessary. Primary radiation exposure monitoring at the Albany, Morgantown, and Pittsburgh sites consists of personal dosimeter badges. Radiation field survey of radiation-generating devices is also completed on a semi-annual basis. Source integrity testing is completed on all sealed sources every six (6) months as well. NETL also maintains a listing of radioactive sources and their respective custodians at each site.

2.3.1 Environmental Radiological Protection Program and Dose Assessment.

The cumulative annual dose for all personnel performing all operations at the Albany, Morgantown, and Pittsburgh sites during 2022 was less than 500 millirem (roentgen equivalent man, <5 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program see Table 2.3 below. NETL does not monitor for any specific radionuclide at this time.

Table 2.3: 2022 Annual Exposure Rate		
Exposure Range (mrem)	**Count**	**TED**
No measurable exposure	92	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	0
Total Monitored:	92	0
Total Collective TED (mrem):	0	0
Total CED:		0
Total CEqD:		1585
Num Individuals with Uptake:	0	
Validation Status Errors:	0	
Warnings:	0	

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

Total Effective Dose (TED)

Committed Equivalent Dose (CED)

2.3.2 Radiological Discharges

NETL does not discharge any radiological materials to the environment.

- No doses to humans based on releases or potential releases.
- No radiological materials have been released to air or water.
- No groundwater radiological monitoring is required.

2.3.3 Clearance of Property containing Residual Radioactive Materials

No property at NETL was excessed that required a residual radioactive material clearance.

2.3.4 Unplanned Radiological Releases

NETL did not experience any unplanned radiological releases in 2022.

2.3.5 Environmental Radiological Monitoring

NETL did not conduct any environmental Radiological Monitoring in 2022.

2.3.6 Future Radiological Monitoring

NETL is not planning on conducting any radiological monitoring in the future.

2.3.7 RESRAD-BIOTA

No radiation protection at NETL requires biota. RESAD-Biota code is not used at NETL. No radionuclide air emissions (under National Emissions Standards for Hazardous Air Pollutants – NESHAPs; no reporting required).

2.4 COMPLIANCE AND/OR CLEANUP AGREEMENTS

NETL's existing cleanup agreements are with the State of Wyoming's Department of Environmental Quality (WYDEQ) and are the result of experimental R&D research that began in the 1960s. Specifically, the agreements include efforts for groundwater and surface remediation at Rock Springs Oil Shale Retort Site in Sweetwater County, Wyoming. In the 1960's and 1970's, these sites were experimental R&D field sites for in situ oil shale retorting experiments.

From 1965 to 1979, the DOE's Laramie Energy Research Center conducted in situ oil shale retorting experiments at a facility located seven miles west of the town of Rock Springs, Wyoming. After the research activities ended, DOE performed a site-wide surface reclamation in 1982. In 1997, DOE completed a site-wide groundwater characterization identifying benzene as the contaminant of concern. Based on the results of this characterization, WYDEQ is requiring groundwater remediation of benzene with a restoration goal of <5 ug/l benzene at six of the 13 retort sites (Sites 4, 5, 6, 7, 9 and 12). Beginning in 1998, a variety of groundwater remediation technologies were implemented at these six sites, including pump and treat, bioremediation, and air sparging. Once the restoration goal is reached, or WYDEQ approves groundwater remediation at each retort site. The timeline for closure of these sites will be two years after the Maximum Contaminant Level is reached. DOE will perform surface revegetation and decommissioning prior to closure of each site.

2.5 ENVIRONMENTAL VIOLATIONS CITED BY REGULATORS/ NOTICES ISSUED

Regulators cited no environmental violations in at the Albany, Morgantown, or Pittsburgh Sites.

2.6 NOTICES OF VIOLATION NOTICES OF DEFICIENCY, NOTICES OF INTENT TO SUE, AND OTHER ENFORCEMENT ACTIONS

NETL had no Notices of Violation (NOVs), no notices of deficiency, no notices of intent to sue, and no other enforcement actions.

2.7 REPORTABLE ENVIRONMENTAL OCCURRENCES THAT REQUIRE NOTIFICATION TO AN OUTSIDE REGULATORY AGENCY

The Department's Occurrence Reporting and Processing System (ORPS) provides timely notification to the DOE complex of events that could adversely affect: public or DOE worker health and safety, the environment, national security, DOE's safeguards, and security interests, functioning of DOE facilities, or the Department's reputation. NETL had ten ORPS reportable items in 2022. These are discussed in more detail in the site-specific sections.

2.8 MAJOR ISSUES, INSTANCES OF NON-COMPLIANCE, AND CORRECTIVE ACTIONS

No major issues or instances of noncompliance were reported at NETL in 2022.

NETL underwent surveillance audits for all three facilities with respect to the ISO 14001:2015 and ISO 45001:2018 standards in August of 2022 with Government and Military Certification Systems, Inc. During the April audits, NETL received twelve minor nonconformities dealing with document control, internal auditing, corrective action, and Management Review. These minor nonconformities are being addressed as part of the 2023 surveillance audits. The external auditor recertified NETL.

2.9 STATUS OF ONGOING THIRD-PARTY INSPECTIONS, SELF-ASSESSMENTS AND ENVIRONMENTAL AUDITS

External audits in 2022 by Government and Military Systems, Inc. of Washington, DC (G&MCS) included a recertification audit at all three sites on August 15-16, 2022 at the Morgantown site, on August 17-19, 2022 at the Pittsburgh site, and on September 7-8, 2022 at the Albany site. It was originally proposed to have another surveillance audit earlier in the year, but that was deemed unnecessary by the G&MCS lead auditor. Results of the audit were as follows: Eleven (11) nonconformities and nine (9) observations under the ISO 14001 certification and twelve (12) nonconformities and seven (7) observations under the ISO 45001 certification (combined 13 nonconformities and eleven (11) observations. Nonconformities were noted with the Management Review, Internal Audits, Document Control, Hazard/Risk Identification, Preventive Maintenance, Operational Control, Calibrations, Construction Safety Data Sheet Management, Incident Reports (Risk Analysis & Monitoring), Incident Reporting (Evaluating), Safety Inspector Competency, Safety Committee, and Aspects processes/systems/programs.

By maintaining its ISO 14001:2015/ISO 45001:2018 certifications and working toward continual improvements to its ES&H Management System, NETL demonstrates to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental, safety, and health stewardship.

In addition to the regular third-party certification audits, the Albany, Morgantown, and Pittsburgh sites have participated in Site Assistance Visits (SAVs) with DOE's Office of Fossil Energy and Carbon Management (FECM). These meetings provide an extra review of NETL programs and an opportunity for DOE headquarters staff to gain a better perspective on ES&H, Emergency Response, Security and Continuity of Operations (COOP) activities that occur at NETL. Recent SAVs are as follows:

- Onsite SAV at the Morgantown site on September 13-16, 2022 (with virtual support from the Albany and Pittsburgh sites)

2.10 SUMMARY OF ENVIRONMENTAL PERMITS – INDUSTRIAL HYGIENE

Under Section 112 of the Clean Air Act (CAA), Congress gave the U.S. Environmental Protection Agency (EPA) the responsibility for enforcing regulations relating to asbestos renovation and demolition activities. The CAA allows the U.S. EPA to delegate authority to State and Local Agencies. Even after the U.S. EPA delegates responsibility to a State or Local Agency, the U.S. EPA retains authority to oversee agency performance and to enforce the federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40 CFR 61, Subpart M. A 2022 Summary of Industrial Hygiene Permits (e.g., Asbestos permits, Lead notifications) per site is provided in Tables 2.10(a), NETL-Albany; 2.10(b), NETL-Pittsburgh; and 2.10(c), NETL-Morgantown.

SUMMARY OF ENVIRONMENTAL PERMITS – ALBANY

Table 2.10a: 2022 Summary of Permits – Industrial Hygiene, NETL-ALBANY

NETL-ALBANY, Asbestos Permits ***Total Asbestos Removed from NETL-ALBANY = 0 ft²***			
The Oregon Administrative Rule (OAR) 437, Division 2 (OAR 437-002-0360) has adopted by reference OSHA 29 CFR 1910.1001 (Asbestos-General Industry), and Division 3 (OAR 437-0003-0001), have adopted by reference OSHA 29 CFR 1926.1101 (Asbestos-Construction).			
Permit No. and Name	**Issue Date – Exp. Date**	**Regulatory Agency**	**Description**
NONE			
NETL-ALBANY, Lead Events			
Project			**Description**
NONE			

SUMMARY OF ENVIRONMENTAL PERMITS – PITTSBURGH

Table 2.10(b): 2022 Summary of Permits – Industrial Hygiene, NETL-PITTSBURGH			
NETL-PITTSBURGH, Asbestos Permits ***Total Asbestos Removed from NETL-PITTSBURGH = 0 ft²***			
The Pennsylvania Department of Environmental Protection (DEP) regulates the removal, collection, transportation, and disposal of asbestos materials. The Pennsylvania Department of Labor and Industry (DLI) is responsible for the enforcement of the Pennsylvania Asbestos Occupations Accreditation and Certification Act of 1990, P.L. 805, No. 194. The PA DEP's Bureau of Air Quality has adopted and enforces the federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40 CFR 61, Subpart M as referenced in PA Code 25 § 124.3. Additional regulations exist for demolition and renovation of any building containing asbestos-containing material (ACM) in Allegheny County.			
Permit No. and Name	**Issue Date – Exp. Date**	**Regulatory Agency**	**Description**
NONE			
NETL-PITTSBURGH, Lead Events ***Total Lead Removed from NETL-PITTSBURGH = 6,750 ft²***			
Permit No. and Name	**Issue Date – Exp. Date**	**Regulatory Agency**	**Description**
Bristol Environmental, Inc. (License #: C00004)	2/14 – 3/31/2022	ACHD	**B-83 CAML, Ceiling Grind** **Abrasive Blasting Project Notice & Permit** Lead Removal: ~ 6,750ft2 of surface to be blasted (paint). Waste disposed of onsite through the CHF.

SUMMARY OF ENVIRONMENTAL PERMITS – MORGANTOWN

Table 2.10(c): 2022 Summary of Permits – Industrial Hygiene, NETL-MORGANTOWN			
NETL-MORGANTOWN Asbestos Permits ***Total Asbestos Removed from NETL-MORGANTOWN = 5,900 ft²***			
The West Virginia Bureau of Public Health, Division of Air Quality, Department of Human and Health Resources (DHHR) enforces the federal National Emissions Standard for Hazardous Air Pollutants (NESHAP) for asbestos per 40 CFR 61, Subpart M.			
Permit No. and Name	**Issue Date – Exp. Date**	**Regulatory Agency**	**Description**
Neumeyer Environmental Services (License #: AC002854)	3/25 – 4/18/2022	WV DHHR Permit ID: 22-02	**B-7 Demolition** Removal of Transite Panels, Floor Tile, and Caulking ACM Removal: ~ 5,900 ft² Waste Disposed at Imperial Landfill (DEP Permit #: 100620)
N/A	February 2022	WVDHHR **EXEMPT from Notifications** (WV § 16-32-11 Section (c) & 64 CSR 63 Section 10.3)	**B-3 Room 151, Gas Cylinder Storage Room, Wall Penetrations, Encapsulation** ACM Disturbed: ≤ 3ft2 or 3 linear feet. Class III Work Activity per 40 CFR 763.92(a)(2) **ABI License #:** AI010082 AI010672

2.11 EXECUTIVE ORDER 14057

On December 8, 2021, Executive Order (E.O.) 14057, *Catalyzing Clean Energy Industries and Jobs through Federal Sustainability*, was implemented, revoking the requirements of E.O. E.O. 13834, *Efficient Federal Operations*. The purpose of E.O. 14057 is to affirm the policy of the United States that the Federal Government will lead by example to achieve a carbon-free electricity sector by 2035, with net-zero emissions by no later than 2050.

NETL will be expected to meet the following requirements:

- Reduce Scope 1, 2, and 3 greenhouse gas emissions (defined by the Federal Greenhouse Gas Accounting and Reporting Guidance), by establishing targets for fiscal year 2030 using a FY2008 baseline.
- Increase the percentage use of carbon pollution-free electricity, so that it constitutes 100 percent of facility electrical energy use on an annual basis and seek to match use on an hourly basis to achieve 50 percent 24/7 carbon pollution-free electricity, by fiscal year 2030.
- Facilitate new carbon pollution-free electricity generation and energy storage capacity by authorizing use of their real property assets (rooftops, parking structures, and adjoining land, for the development of new carbon pollution-free electricity generation and energy storage through leases, grants, permits, or other mechanisms, to the extent permitted by law.
- Acquire zero-emission light-duty vehicles by the end of fiscal year 2027. Each agency with a fleet comprising at least 20 vehicles must develop and annually update a zero-emission fleet strategy that shall include optimizing fleet size and composition; deploying zero-emission vehicle refueling infrastructure; and maximizing acquisition and deployment of zero emission light-, medium-, and heavy-duty vehicles where the General Services Administration (GSA) offers one or more zero-emission vehicle options for that vehicle class.
- Achieve net-zero emissions across its portfolio of buildings, campuses, and installations by 2045 and reduce greenhouse gas emissions by 50 percent from buildings, campuses, and installations by 2032 from 2008 levels, prioritizing improvement of energy efficiency and the elimination of onsite fossil fuel use.
- Increase facility energy efficiency and water efficiency and establish targets for fiscal year 2030 for agency-wide facility energy use intensity and potable water use intensity.
- Minimize waste, including the generation of wastes requiring treatment and disposal; advance pollution prevention; support markets for recycled products; and promote a transition to a circular economy, as defined in section 2 of the Save Our Seas 2.0 Act (Public Law 116–224), by annually diverting from landfills at least 50 percent of non-hazardous solid waste, including food and compostable material, and construction and demolition waste and debris by fiscal year 2025; and 75 percent by fiscal year 2030.
- Reduce emissions, promote environmental stewardship, support resilient supply chains, drive innovation, and incentivize markets for sustainable products and services by prioritizing products that can be reused, refurbished, or recycled; maximizing environmental benefits and cost savings through use of full lifecycle cost methodologies; purchasing products that contain recycled content, are biobased, or are energy and water efficient, in accordance with relevant statutory requirements; and, to the maximum extent practicable, purchasing sustainable products and services identified or recommended by the EPA.

The Implementing Instructions for EO 14057 issued August 2022 provides instructions to Federal agencies regarding the implementation of EO 14057 including agency planning, reporting requirements, and accountability.

Agencies must issue or revise existing agency policies, directives, and guidance, as appropriate, including employee training, to ensure alignment with the goals and requirements of the EO 14057, the implementing instructions, and further guidance issued to implement the E.O. Agencies should continue to use effective management strategies, such as environmental management systems (EMS) and energy management systems (EnMS), if they align with and support their agency needs and facilitate implementation and progress toward E.O. goals.

Visit the White House Council on Environmental Quality (CEQ) Office of Federal Sustainability (OFS) website for associated guidance and implementation resources. Additional implementing information pertinent to the goals listed above are found in the Program Area specific to the listed goal.

Additional implementing information pertinent to the goals listed above are found in the Program Area specific to the listed goal.

2.12 COVID-19 IMPACTS

From the onset of the COVID-19 pandemic, NETL has been committed to protecting its workforce and preserving the Laboratory's ability to complete its mission, while keeping its ES&H values at the forefront of the way day-to-day activities are approached.

From March 2020 through March 2022, a significant portion of the NETL workforce worked from home. Initially during the COVID-19 Pandemic, only minimum personnel reported on site to handle non-portable work, including managing ES&H compliance, facilities, security, information technology, and research and construction activities that, if stopped or paused, would lead to an unacceptable loss of key research results or significant expense. In addition, the Laboratory instituted a myriad of health, safety, and workplace operations protocols following the latest guidance provided by Federal, state and local public health agencies; the Safer Federal Workforce Task Force established by Executive Order (EO) 13991 and the DOE. Protocols included accommodations for maximum telework; increased leave flexibilities; symptom monitoring; face masks; physical distancing; cleaning and disinfection; HVAC upgrades and personal hygiene. Actionable planning to transition the Laboratory from response to recovery and a return of personnel to the sites in more significant numbers began after DOE issued its first COVID-19 Workplace Safety and Reentry Framework on December 3, 2021. DOE's Return to Workplace efforts were largely completed by March 2022 when DOE sites could return to operations similar to pre-COVID-19 Pandemic requirements with minor modifications as mandated by DOE and Federal COVID-19 Pandemic protocols. Operations after the COVID-19 Pandemic have generally been with higher focus on teleworking, with allowances for situational telework and remote work options (depending on function).

Throughout the COVID-19 Pandemic, NETL environmental activities and compliance continued as normal.

No sampling, monitoring, or inspection compliance issues were identified as being impacted due to the COVID-19 pandemic in CY2022.

2.13 ORGANIZATIONAL RESILIENCE

Organizational Resilience is defined as the ability of an organization to anticipate, prepare for, respond, and adapt to incremental change and sudden disruptions in order to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's Emergency Response Organization (ERO) meets with local emergency planning committees on a quarterly basis to review hazards-based risks to the region including high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

What's more, the NETL Continuity of Operations (COOP) Plan ensures that NETL can continue to serve the Nation if certain DOE facilities and/or staff in either the National Capital Region (NCR) or any of the three main NETL sites become otherwise unavailable. The NETL COOP Plan identifies all DOE Headquarters (HQ) and NETL Mission Essential Functions (MEFs) and Essential Supporting Activities (ESAs) the lab has a role or responsibility for supporting, regardless of the circumstance. The COOP Plan is tested and validated at a minimum annually during the Nation's yearly Eagle Horizon continuity exercise.

Additionally, NETL completed the Vulnerability and Resilience Plan (VARP) in FY 2022 per DOE 2021 Climate Adaptation and Resilience Plan. The VARP process identified gaps in current NETL processes that manage the short- and long-term effects of climate change on the mission and day to day operations. Resilience solutions that eliminate or reduce these gaps were developed.

NETL identified their Critical Building and Critical Operations Support Facility (infrastructure) at the three sites. Discussions with NETL staff, site inspections, and document reviews refined the criticality of these assets. Each asset belongs to an asset type and was assigned a rank of low, medium, or high criticality to the NETL mission.

The assets and current and predicted hazard impacts were entered into the DOE Risk Assessment Tool (RAT), which produced vulnerability matrices for both assets and asset types. As well as the RAT analysis, site- and asset-specific hazards were identified through interviews and site inspections. Existing NETL procedures to identify and prioritize projects, such as through the Investment Review Board and preparation of the Continuity of Operations (COOP) plan, were found to be robust and effective for climate change-related projects. For those hazards where hazard management gaps were identified, the Team developed 15 resilience solutions.

Three resilience solutions that were general to all three locations were developed:

- Supply chain vulnerability study
- Inspect swales and impervious surfaces around the building for necessary grade and repair
- Inspect grade to cladding distances and adjust as needed

Individual resilience solution will be listed in the associated site section.

These resilience solutions were summarized in the DOE-NETL VARP Resilience Solutions Table and Portfolio of Candidate Solutions Table.

The VARP was uploaded to the DOE Sustainability Dashboard in September 2022. The resilience solutions and portfolio were uploaded to the Dashboard Resilience Solutions Tracking module in November 2022 and NETL will track progress of these resilience solutions in the Dashboard Resilience Solutions Tracking module.

NETL will review the Solutions Tracking module and incorporate the resilience solutions into NETL's Strategic Facilities Master Plan and capital investment planning to implement the solutions in the projected timeframes in the Solutions Tracking module.

One of the Resilience Solutions identified in the FY 2022 NETL VARP is a Supply Chain Vulnerability Study. The supply chain vulnerability study will identify materials, supplies, equipment, and logistics systems that are vulnerable to climate change. The study will also develop mitigation measures to increase the resilience of NETL's supply chain. As a first step towards a supply chain vulnerability study, the VARP identified the key chemicals and gases used by NETL researchers and recommended key considerations the study should include. NETL plans to complete this study by the end of FY 2025.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

2.14 PFAS AND ADDITIONAL EMERGING CONTAMINANTS

Emerging contaminants refer to chemicals that can enter the water supply and have a detrimental effect on aquatic species and nonaquatic species (bioaccumulating up the food web). The U.S, EPA has identified a number of emerging contaminants that present unique issues and challenges to the environmental community, one of which is Per- and Polyfluoroalkyl Substances (PFAS).

These chemicals are of particular concern to the Department since they do not break down easily in the environment or the human body because of their strong carbon-fluorine bond. According to the Department's s policy statement regarding PFAS on September 16, 2021, the use of PFAS-containing Aqueous Film Forming Foam (AFFF) should be discontinued, except in cases of actual fire emergencies; fire protection personnel must use appropriate personal protective equipment to minimize exposure to PFAS; and sites may continue to store quantities of PFAS-containing FFF on site for emergencies, but disposal is suspended, and will be considered on a case-by-case basis with approval by the head of the departmental element.

In 2021, NETL provided the following information to the Department with respect to its use of PFAS.

- NETL does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds at any of its sites, as it is not required per each site's industrial wastewater or stormwater NPDES permits. However, NETL maintains and tracks all chemicals on-site using a chemical inventory management system to ensure proper disposal at the end of chemical life (recycling or hazardous waste disposal).
- NETL does not have a firefighting facility, fire department, or fire training at any of its sites.
- NETL has two AFFF systems at the Pittsburgh site for fire suppression in chemical storage buildings. These systems would only be discharged in a fire emergency (per DOE's PFAS Policy Memo).
- Drinking water supplies at each site come from public drinking water systems; groundwater and surface water sources do not provide drinking water.

2.15 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT REPORTING STATUS TABLE

The status of the Emergency Planning and Community Right-to-Know Act (EPCRA) Reporting at NETL for 2022:

EPCRA Section	Description of Reporting	Status*
EPCRA Sec. 302-303	Planning Notification	Not Required
EPCRA Sec. 304	EHS or HS Release Notification**	Not Required
EPCRA Sec. 311-312	(M)SDS/Hazardous Chemical Inventory***	Yes
EPCRA Sec. 313	TRI Reporting	Not Required

* An entry of "yes," "no," or "not required" is sufficient for "Status."

** Extremely Hazardous Substance or Hazardous Substance

*** (Material) Safety Data Sheet

3.0 COMPLIANCE BY SITE

NETL consists of three research sites and two program office sites, each focusing on different activities. Each of these sites are in different states and are subject to varying state and local environmental regulations. This document includes detailed compliance status discussions for each of the research sites. Since the Albany, Morgantown, and Pittsburgh sites include laboratory facilities, they may present a broad array of environmental concerns and regulatory requirements. A detailed discussion is provided for each of these sites in this report. The Anchorage and Houston program offices perform only administrative functions, therefore, the environmental impacts and regulatory compliance issues for these locations is discussed in less detail.

3.1 ANCHORAGE, ALASKA

3.1.1 Site Description

NETL's Arctic Energy Office promotes the research, development and deployment of energy production and conversion technology in Alaska. Activities in the Anchorage office include facilitating communication among Arctic energy stakeholders, as well as assessing Arctic energy R&D needs associated with unconventional oil and gas, remote electric power technology and tundra access.

Since 2015, the Anchorage program office has been staffed by a site support contractor employee providing technical support to the NETL's Oil & Gas Program. The contractor is responsible for support and delivery of DOE technical assistance, capacity building, energy education, and outreach to all Alaskan tribal entities.

Anchorage is Alaska's primary governmental, transportation, industry and population center. Anchorage (Photo 3.1.1) is in south-central Alaska on the northern end of the Cook Inlet and is situated between the Chugach Mountains and the tidal inlets known as Turnagain and Knick Arms. By air, Anchorage is 55 minutes from Fairbanks and 3.5 hours from Seattle. It is located 358 road miles (576 km) south of Fairbanks.

As of the most recent U.S. Census, there were 291,826 people and 105,517 households in the city of Anchorage. The population density was 171.2 per square mile, with 113,032 housing units at an average density of 66.3 per square mile. The racial makeup was 66.0% White, 8.1% Asian, 7.9% Native American, 7.6% Hispanic or Latino, 5.6% African American, 2.0% Pacific Islander, and 8.1% from two or more races.

The median household income in Anchorage was $76,495 and the per capita income was $36,145. About 7.7% of the population was below the poverty line. The major employers in Anchorage are the military, state government, federal government (civilian sector), the University of Alaska, the Anchorage School District, Ted Stevens International Airport, and Providence Health and Services.

Photo 3.1.1: City of Anchorage.

Building operations, maintenance and janitorial services are under the control of the landlord; therefore, minimal compliance assessments and ES&H inspections and investigations are required. The Anchorage office does not undertake in-house audits, external audits or subject matter reviews. However, in-house inspections and regulatory agency inspections (e.g., by the local fire marshal or municipal building inspectors) of the building and facilities may occur, with any subsequent findings assessed against the landlord. Although fire drills are not practiced, the building is equipped with a fire detection and suppression system that is tested by the landlord on an annual basis.

The lease on the above-described commercial office space expired in December of 2020 and was not renewed. The office was vacated at that time. The NETL support contractor employee and DOE Office of Indian Energy employees moved to office space in the James M. Fitzgerald United States Courthouse and Federal Building in 2021. The new space was leased under an agreement with Office of Indian Energy.

3.1.2 Environmental Compliance

Due to the nature of the work (assessment of Arctic Energy R&D need areas and coordination with Arctic Energy stakeholders) the waste management services are minimal and are provided by the landlord under the terms of the rental agreement. The city of Anchorage does not impose recycling requirements that apply to leased office space. No formal recycling program is in place at the Anchorage office; however, designated containers exist for recycling paper and plastic.

The Anchorage office is not required to implement an environmental compliance program. It does not formally implement a pollution prevention program. Anchorage staff practice affirmative procurement whenever possible (i.e., the procurement of goods containing recycled content or having less life-cycle impact on the environment). No actions were taken in 2020 to alter the facility or operations in a manner that could change the current impacts on the environment in or around the Anchorage office.

3.1.2.1 NEPA

NETL independently reviews any contract performed through or supported by the Arctic Energy Office for potential environmental impacts before the project is undertaken. The Anchorage Office does not conduct National Environmental Policy Act (NEPA) reviews for such proposed, off-site actions.

3.1.2.2 Radiation Protection

The only sources of potentially harmful radiation in the Anchorage office are Class 1 lasers, commonly found in printers and CD/DVD readers/recorders. Anchorage staff is ensured protection from these lasers through proper engineering design of the electronic devices.

3.1.2.3 Air Quality and Protection Activities

The air quality in the city of Anchorage follows all governing regulations. The Anchorage office landlord is responsible for maintaining sufficient air quality in the building and implements ventilation air filter changes on a quarterly basis. Any ozone-depleting refrigerants that may be used for air conditioning are under the control of the landlord.

Due to the nature of the work performed (assessment of Arctic Energy R&D need areas and coordination with Arctic Energy stakeholders), it is unnecessary to implement air quality monitoring, regulation or protection programs.

3.1.2.4 Water Quality and Protection Activities

The Anchorage office landlord is responsible for maintaining sewer and storm water and other related permits. The landlord tests the domestic water supply annually to ensure compliance with Safe Drinking Water Act standards.

3.1.2.5 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

NETL-Anchorage engages in minimal ES&H activities. On-site ES&H primarily focuses on affirmative procurement of office supplies and miscellaneous items. The Anchorage office does not maintain an ES&H Management System and is not covered by NETL's ES&HMS system in effect at the Albany, Morgantown, and Pittsburgh sites.

3.1.2.6 Other Major Environmental Issues and Actions

Anchorage staff is not aware of any ongoing or pending lawsuits, Notices of Violation, public accusations of regulatory violations or any environmental occurrences. No violations of compliance agreements or cleanup agreements or any unresolved compliance issues have occurred. No audits were conducted in 2020 under the sponsorship of DOE Headquarters, independent regulators or other independent third parties.

3.2 ALBANY, OREGON

3.2.1 Site Description

The Albany site focuses on technologies in scientific and engineering areas creating commercially viable solutions to national energy and environmental problems. These areas include materials performance, multi-environmental materials characterization, alloy development/manufacture, and geospatial data analysis. The work is accomplished through both in-house R&D and contracted research. There are 127 employees at the Albany site, including 46 federal employees and 81 contractor employees.

The Albany, site is located in Linn County, Oregon, in the western part of the state (Photo 3.2.1). Albany, the county seat of Linn County, is located approximately 45 miles north of Eugene, 70 miles south of Portland and 25 miles south of Salem. Geographically, the facility is located in the Willamette Valley, which is structural and erosional lowland between the uplifted marine rocks of the Coast Range and the volcanic rocks of the Cascade Range. The Albany site covers approximately 42 acres with approximately 248,000 square feet of building working area. The site is relatively flat and located on a higher section of town away from any flood plains. The Calapooia River is located west of the laboratory, flowing in a broad arcuate pattern from southeast of the laboratory west to north, emptying into the Willamette River. Land use immediately surrounding the Albany site is a combination of residential housing developments, small businesses and public-school properties.

Photo 3.2.1: Albany site.

Albany's population, per the 2022 U.S. Census, estimates 56,898 people and 20,880 households. The population density was 3,219.6 per square mile. There were 20,979 housing units at an average density of 1,198.8 per square mile listed in the most current available information. The racial makeup of the city was 85.0% White, 0.4% African American, 1.1 Native American, 2.0% Asian, 0.0% Pacific Islander, and 7.8% from two or more races. Hispanic or Latino of any race were 13.2% of the population.

The median income for a household in the city was $65,587. The per capita income for the city was $19,895. About 11.1% of the population was below the poverty line. The major employers in Albany are Samaritan Health Services, Linn Benton Community College, Greater Albany Public Schools ATI, Greater Target Distribution Center, and Linn County.

3.2.2 Major Site Activities

3.2.2.1 B-28 Electrical Vault Upgrades Design

Construction was started to upgrade the electrical infrastructure of B-28 for reliability and capacity to ensure code compliance and more effectively support current and future research capabilities.

Photo 3.2.2.1: B-28 electrical vault upgrades design.

3.2.2.2 B-28 Fire Damage Rebuild

Completed repair and restoration activities to address both fire and water damage associated with an attic fire in B-28.

Photo 3.2.2.2: B-28 Fire Damage Rebuild

3.2.2.3 B-17 East Wing Renovation

Completed the necessary demolition and construction activities to renovate and repurpose B-17 Central High Bay to provide code compliant office spaces.

Photo 3.2.2.3: B-17 East Wing Renovation.

3.2.2.4 Site Modular Office Trailer Complex Removals

Completed all demolition, disconnection, preparation, and site restoration activities for the removal of two leased modular office trailer complexes from the Albany site.

Photo 3.2.2.5: Site Modular Office Trailer Complex Removals

3.2.3 Environmental Restoration and Waste Management

3.2.3.1 CERCLA

The Albany site had no off-site remediation activities during 2022. There were no National Priorities List (NPL) sites for which the Albany site had liability under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA).

3.2.3.2 RCRA

There were no EPA compliance issues in 2022. There were no Notices of Violation, corrective actions, or best management practices associated with the inspection or operations of hazardous waste handling during 2022. There were no RCRA compliance inspections completed by the Oregon Department of Environmental Quality (DEQ) at the Albany site during 2022. There were no EPA, Region 10 inspections during 2022.

DOE Headquarters (FE-17) completed a hybrid (live and virtual) Staff Assistance Visit (SAV) in September 2022 with NETL personnel. A draft report from this assessment found no program deficiencies and noted that the program adoption of the EMS software package for management of hazardous waste inventory and documentation was a "game changer".

3.2.3.3 Federal Facilities Compliance Act (FFCA)

There were no issues identified during 2022 regarding the Federal Facilities Compliance Act at the Albany site.

3.2.3.4 NEPA

See section 2.1.2 National Environmental Policy Act (NEPA) for information on Albany NEPA requirements.

3.2.3.5 TSCA

NETL-Albany does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No spills or releases of substances regulated by the Toxic Substances Control Act (TSCA) of 1976 (with amendments, et. seq.) — including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. — were reported in 2022 at the Albany site. TSCA waste generated during 2022 included asbestos and lead-based paint debris, which was disposed of in accordance with Federal, state and local requirements.

No unplanned releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2022. All known friable asbestos-containing material (ACM) has either been removed or encapsulated. Non-friable asbestos present at the NETL-Albany site is inventoried and maintained. No samples taken in 2022 indicated that the materials contained fiber concentrations in excess of EPA or the State of Oregon clearance levels (0.01 fibers/cc). Asbestos engineering drawings based on the Albany site inventory continue to be maintained and updated.

Evaluations, tests, and sample collection are conducted by an accredited OR licensed Asbestos Building Inspector (ABI) or by a Certified Industrial Hygienist (CIH). Analysis of bulk asbestos-containing material (ACM) or presumed ACM are performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP), or the National Institute for Standards and Technology (NIST), or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally recognized round robin testing program.

When asbestos is removed as part of any remodeling or reworking in a room, building, or facility, it is

- Handled by a licensed Asbestos Abatement/Removal Contractor (AA/RC) and adheres to OSHA 29
- CFR 1910.1001 (Asbestos-General Industry), OSHA 29 CFR 1926.1101 (Asbestos-Construction),
- OSHA Instruction CPL 2-2.40, 40 CFR 61 (Subpart M, NESHAPs), and applicable state regulations
- (Oregon Administrative Rules, Division 2 (General Industry) & Division 3(Construction).

There were no projects that required a 10-day asbestos notification permit to Oregon Department of Environmental Quality in 2022.

One (1) asbestos sampling event was conducted in 2022 related to the operation/maintenance activities (none related to construction projects). Samples were collected by a licensed ABI.

Additionally, NETL tests for lead-based paint before demolition, renovation, and maintenance projects or elimination of materials through excess property or recycling. One (1) lead-based paint sampling event was conducted in 2022 related to operation/maintenance activities (none related to construction projects). The paint renovation work for the positive samples was conducted in accordance with OSHA 29 CFR 1910.1025, Lead (General Industry), and OSHA 29 CFR 1926.62, Lead (Construction).

3.2.3.6 FIFRA

No restricted-use pesticides, herbicides or defoliants were used at the Albany site during 2022. Only general-use herbicides were used for routine vegetation control along fence lines, guard rails and flower beds. Rodent control was provided via traps with commercial-use baits.

3.2.4 Radiation Protection Program

The Albany site has legacy radiological issues, which include the presence of ores that are naturally occurring radioactive materials (NORM), as well as areas that have not been completely released from radiological controls (due to configuration and inability to complete release surveys). Radiological waste generated at the Albany site is packaged for proper waste disposal as low-level radioactive waste (LLRW) in accordance with applicable regulations at the licensed regional facility in the State of Washington (U.S. Ecology), as authorized via an active site-use permit with the State of Washington's Department of Health. No LLRW disposal activities were required during 2022. There are no sealed sources at the Albany site.

Radiation monitoring performed at Albany consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via X-ray upon receipt), and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. Radiation field survey of all the site radiation-generating devices is completed on a semi-annual basis.

The cumulative annual dose for all personnel performing all operations at the Albany site during 2022 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person in the radiation monitoring program. See Table 3.2.4 ALB 2022 Annual Exposure Rate.

Table 3.2.4 ALB 2022 Annual Exposure Rate		
Exposure Range (mrem)	**Count**	**TED**
No measurable exposure	37	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	
Total Monitored:	37	
Total Collective TED (mrem):	0	0
Total CED:		0
Total CEqD:		593
Num Individuals with Uptake:	0	
Validation Status Errors:	0	
Warnings:	0	

* TED= Total Effective Dose
CED= Committed Effective Dose
CeqD= Committed Equivalent Dose

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

3.2.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information may be found in Section 2.2, DOE Internal Environmental and Radiation Protection Orders, and Section 2.3, Atomic Energy Act of 1954.

3.2.4.2 DOE Order 435.1, Radioactive Waste Management

There are no source materials located at the Albany site. X-ray generating devices are used for analytical applications at the Albany site, including scanning and transmission electron microscopes, X-ray diffraction and fluorescence instruments and a particle-size analyzer. Table 3.2.4.2 lists the X-ray radiation generating devices at the Albany site (see Photo 3.2.4.2). These devices are examined semi-annually for leaks and safety interlocks/controls to ensure employee safety. Minor amounts of legacy items remain stored in the B-28 hot cell and other controlled locations across the site awaiting disposal. The site maintains an active site-use permit with the State of Washington's Department of Health (DOH) that allows for the disposal of low-level radioactive wastes (LLRW) at the regional waste handling facility, US Ecology Washington. There were no LLRW disposal shipments in 2022.

Table 3.2.4.2: 2022 Albany X-Ray Radiation Generating Devices

Device	Quantity
X-Ray Florescence Instrument	1
X-Ray Diffraction Instrument	1
Terra Rock, and Mineral Analyzer (XRD/XRF)	1
Handheld/Portable XRF	1
Scanning Electron Microscope/Microprobe	2
Transmission Electron Microscope	1
Mail X-Ray Instrument	1
Sedigraph/Particle Analyzer	1
Ion Polisher	2

Photo 3.2.4.2: Electron Microscope at NETL Albany with specialized equipment for minerals and metals analysis.

3.2.5 Air Quality and Protection Activities

3.0.1.1 Clean Air Act

Albany's Department of Environmental Quality (OrDEQ) Air Quality section is responsible for implementing the requirements of the federal Clean Air Act, as well as

To address necessary compliance requirements, NETL's Ambient Air Quality Management Program includes protection of outdoor air quality. This includes the submission of applications for air emission permits, which can include the existing sources (boilers, generators, fuel storage tanks), as well as sources related to on-site research activities. The air quality program manager prepares permit applications, obtains permit renewals (every five years), as needed, and oversees monitoring programs and reporting. Albany has no emissions that require monitoring, reporting, or permitting based on current operations. In 2022, there was one New Source (Pre-Construction) Review for installation of a backup generator managed by the Albany site. The review determined that no permit would be needed. Operation of the Albany site does not contribute significantly to any emissions under the National Ambient Air Quality Standards (NAAQS).

3.2.5.2 National Emission Standards for Hazardous Air Pollutants

No Albany facilities or projects are regulated under the National Emission Standards for Hazardous Air Pollutants. No Albany facilities and/or projects have the potential to emit more than 10 tons per year of a single designated toxic air pollutant or more than 25 tons per year in aggregate of all toxic air pollutants, nor are any facilities or projects regulated for any of the 189 toxic air pollutants. Table 3.2.5.2 displays the estimated 2022 Air Emissions for both facility operations and R&D projects at the Albany site.

Ozone-depleting substances (ODSs) or refrigerants are used for air conditioning, refrigeration, chilling, or for protection of sensitive electrical systems. A list of existing ODSs is maintained and tracked. Units are being replaced with more environmentally friendly units on a continual basis, whenever practicable.

Table 3.2.5.2 Albany 2022 Air Emissions Inventory -Albany

Pollutant	Calculated Emissions (lbs./yr.)
Volatile Organic Compounds	23.09
Nitrogen Oxide	970.8
Carbon Monoxide	499.53
Sulfur Dioxide	94.1
Total Suspended Particulates	162.03
Particulate Matter 10 (PM_{10})	66.79
Total Organic Carbon	Not Calculated

3.2.5.3 Hydrofluorocarbon (HFC) Phasedown

The American Innovation and Manufacturing (AIM) Act of 2020 was enacted December 27, 2020. The AIM Act provides new authority to address HFCs and directs EPA to: (1) phase down the production and consumption of listed HFCs through an allowance allocation and trading program, (2) manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) facilitate the transition to next-generation technologies through sector-based restrictions. Below is a table that shows current HFC uses, replacements, procurement, and repository development at the Albany site. Planning to address how deal with the phaseout are underway. There were no issues in 2022 regarding compliance Hydrofluorocarbons (HFC) Phasedown at Albany.

Table 3.2.5.3: 2022 ALB HFC Phaseout Inventory Summary

(All Values in pounds)

Refrigerant	Amount in Equipment Dec. 31, 2021	Amount in Equipment Dec. 31, 2022	Amount in Storage Dec. 31, 2021	Amount in Storage Dec. 31, 2022	Amount purchased in 2022	Amount Removed from Equipment in 2022	Leaks in 2022
R134A-HFC	25.22	13.62	0	0	0	2.5	9.10

3.2.6 Water Quality and Protection Activities

3.2.6.1 Clean Water Act

The EPA and the Oregon Department of Environmental Quality (DEQ) have implemented water pollution control programs, including setting wastewater standards for industry and setting water quality standards for all contaminants in surface waters. These requirements are managed via permits issued to the City of Albany, which then acts as the CWA permitting authority for NETL.

3.2.6.2 Industrial Wastewater Program

NETL-Albany holds an industrial wastewater discharge permit with the City of Albany, which was issued in December 2018 on a five-year renewal cycle, with a modification of the applicable terms and conditions per City of Albany correspondence effective May 2019. Biannual monitoring is required in accordance with the permit. Table 3.2.6.2 provides the results of the 2022 monitoring, with all results within permit limits. Based on permit requirements, Albany is also required to submit a Slug Discharge Control Plan to the city, when the permit is renewed. The Slug Discharge Control Plan was updated in October 2022 to reflect an increase in chemical storage due to new equipment installation. Elementary neutralization units have been installed at several laboratory buildings (see Photos 3.2.6.2a and 3.2.6.2b) to prevent potential pH excursions from laboratories even though procedures prohibit disposition of chemicals via laboratory drains. Several industrial wastewater notifications were required for compliance monitoring and planned/unplanned industrial wastewater uses/discharges in 2022, which were completed in accordance with NETL's industrial wastewater permit. City of Albany Environmental Services personnel inspected the facility in September 2022, and issued a letter confirming compliance in October 2022.

Table 3.2.6.2: 2022 Industrial Wastewater Discharge Permit Monitoring Analysis—Albany			
Constituent	Permit Limits	Sample Date	
		01/14/2022	07/08/2022
Arsenic	1.0 mg/L	ND	0.0017 mg/L
Cadmium	0.44 mg/L	ND	ND
Chromium	2.8 mg/L	0.0012 mg/L	0.0065 mg/L
Copper	3.4 mg/L	0.0048 mg/L	0.038 mg/L
Cyanide (Total)	1.2 mg/L	ND	0.0019 mg/L
Lead	0.7 mg/L	ND	0.0088 mg/L
Mercury	0.08 mg/L	ND	0.00036 mg/L
Molybdenum	0.84 mg/L	ND	0.0015 mg/L
Nickel	1.6 mg/L	0.0022 mg/L	0.012 mg/L
Oil & Grease (Total)	300 mg/L	ND	110 mg/L
Selenium	0.72 mg/L	ND	ND
Silver	1.1 mg/L	ND	ND
Zinc	1.5 mg/L	0.067 mg/L	0.16 mg/L

Photos 3.2.6.2a and 3.2.6.2b: Elementary Neutralization System.

3.2.6.3 NPDES Permit

The Albany site does not hold a stormwater permit because regulation is augmented by the City of Albany through its stormwater program.

The City of Albany continues to work with Oregon DEQ concerning its NPDES MS4 Phase II requirements, including a Stormwater Management Plans (under discussion and litigation). NETL will be required to comply with the final permit when issued. Since NETL does not have a specific, combined outfall or discharge directly to a body of water, any NPDES permit requirements from the City of Albany would likely be limited to general protective measures.

3.2.6.4 Stormwater Management and Energy Independence and Security Act of 2007

There were no issues in 2022 regarding the Stormwater Management and Energy Independence and Security Act of 2007 at the Albany site.

3.2.6.5. Safe Drinking Water Act

There were no issues in 2022 regarding compliance with the Safe Drinking Water Act. Albany site potable water is supplied by the local water utility, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on site are filtered, with filters and plumbing maintenance performed during period scheduled preventative maintenance.

3.2.6.6. PFSA and Additional Emerging Contaminants

Based on historical information up to 2022, the Albany site is not considered to be a user of Per- and Polyfluoroalkyl Substances (PFAS). The Albany site has limited quantities of R&D chemicals considered as PFAS; it does not have any aqueous film forming foam (AFFF) systems for fire suppression; and it does not maintain fire-fighting capabilities that would utilize PFAS. As a result, the Albany site has not historically conducted sampling, analysis, tracking, and monitoring for PFAS-related compounds. Additionally, drinking water at the Albany site is provided by the local public drinking water system.

3.2.7 Other Environmental Statutes

3.2.7.1 Endangered Species Act

There were no issues at the Albany site regarding the Endangered Species Act during 2022.

3.2.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Albany site regarding impacts of invasive species during 2022.

3.2.7.3 National Historic Preservation Act

As part of its renovation efforts, the Albany site is required to ensure that the requirements of the Oregon State Historic Preservation Office (SHPO) are identified and their concurrence is obtained for the aspects of the long-term Albany Site Plan, since renovations at the site may impact the Albany Site Historic District. NETL continues to pursue an update to its Programmatic Agreement with the Oregon State Historic Preservation Office (SHPO). This update was prepared via contract and reviewed by Laboratory Operations, General Counsel, and the Chief Operating Officer in late 2016, and was presented to the Oregon SHPO in December 2016. NETL continues to meet and have discussions with representatives from the Oregon SHPO in attempts to finalize an updated agreement. In the interim, NETL continues to

work with the Oregon SHPO to provide for reviews and potential mitigations associated with all major projects accomplished at the Albany site.

3.2.7.4 Migratory Bird Treaty Act

There were no issues at the Albany site regarding the Migratory Bird Treaty Act during 2022.

3.2.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.2.8.1 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.2.8.2 E.O. 13693 GHG Reduction Targets and Sustainability Goals

See Section 4.0 ES&H Management System.

3.2.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2016)

See Section 4.0 ES&H Management System.

3.2.8.4 EO 11988 Floodplain Management

There were no issues at the Albany site regarding floodplain management in 2022.

3.2.8.5 EO 11990 Protection of Wetlands

There were no issues at the Albany site regarding protection of wetlands in 2022.

3.2.9 Executive Orders and DOE Orders

The Albany site was in full compliance with all applicable environmental Executive Orders in 2022. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance. As noted above, E.O.13834, Efficient Federal Operations, was implemented as part of NETL's ES&H management system. E.O. 13693, Planning for Federal Sustainability in the Next Decade was rescinded because of the new executive order, which is described in more detail in Section 4.0.

In addition, other executive orders that apply to NETL, but for which no specific actions were required in 2022, include E.O. 11514, Protection and Enhancement of Environmental Quality; E.O. 11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O. 11987, Exotic Organisms; E.O. 12088, Federal Compliance with Pollution Control Standards; E.O. 11988, Floodplain Management; and E.O. 11990, Protection of Wetlands; and E.O. 12898, Environmental Justice for Low Income & Minority Populations.

3.2.9.1 Executive Order 11988, Floodplain Management

There were no issues with Floodplain management at the Albany site, as there are no designated floodplains on the Albany site.

3.2.9.2 Executive Order 11990, Protection of Wetlands

There were no issues with protection of wetlands at the Albany site, as there are no designated wetlands on the Albany site.

3.2.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect: the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities, or the Department's reputation. The Albany Site had one ORPS reportable incident in 2022. On July 26, 2022, a research project unexpectedly off-gassed low levels of hydrogen sulfide gas and sulfur dioxide gas to a research laboratory location during unattended mixing of a reactant with a geological sample. The leak was detected and addressed by the researcher, with assistance from ES&H, and the project was returned to normal conditions.

3.2.10.1 Natural Resources Conservation Programs and Projects

Natural resources conservation programs and projects help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. In 2022 no issues in this area were uncovered at the Albany site.

3.2.10.2 Sustainable Resilient Remediation (SRR)

There are no hazardous waste sites suitable for Sustainable Resilient Remediation (SRR) at the Albany site in 2022.

3.2.10.3 Organizational Resilience

Organizational Resilience is defined as the ability of an organization to anticipate, prepare for, respond, and adapt to incremental change and sudden disruptions to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's Emergency Response Organization (ERO) meets with local emergency planning committees on a monthly basis to review hazards-based risks to the region including high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

What's more, the NETL COOP Plan postures the lab to perform its MEFs and ESAs under all conditions. When activated, it is designed to achieve operational capability within a predesignated time and strive to sustain operations until a return to normal activities. The plan encompasses preparedness, activation, operations, and the performance to normal operations.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

Additionally, NETL completed the Vulnerability and Resilience Plan (VARP) in FY 2022 per DOE 2021 Climate Adaptation and Resilience Plan. The VARP process identified gaps in current NETL processes that manage the short- and long-term effects of climate change on the mission and day to day operations. Resilience solutions that eliminate or reduce these gaps were developed. Six resilience solutions are specific to Albany:

- Enhanced HVAC Particulate Screening
- Back-up / alternative power
- Wind and seismic structural assessments and upgrades

- Stormwater management
- Storm shelters
- Redundant internet/data feed

NETL will review the Solutions Tracking module and incorporate the resilience solutions into NETL's Strategic Facilities Master Plan and capital investment planning to implement the solutions in the projected timeframes in the Solutions Tracking module.

3.2.11 Continuous Release Reporting

There was no continuous release reporting required at the Albany site in 2022.

3.2.12 Unplanned Releases

There were no unplanned releases at the Albany site during 2022.

3.2.13 Summary of Environmental Permits

A summary of environmental permits for the Albany site is provided in Table 3.2.13, 2022 Summary of Permits.

Table 3.2.13: 2022 Summary of Permits - ALB

Permit No. and Name	Site	Issue Date – Exp. Date	Regulatory Agency	Description
8731-02 Industrial Wastewater Discharge Permit	Albany	12/15/2018 – 12/14/2023 (updated every 5 years)	City of Albany Public Works Department	Authorization to discharge industrial wastewater to the City of Albany wastewater treatment system.
G2140 Site Use Permit	Albany	03/01/2020 – 02/28/2022 (updated annually)	State of Washington—Department of Public Health	Site-use permit to llow for low-level radioactive waste disposal at the regional disposal facility.

3.2.14 Fire Protection Management and Planning

The Albany site is 42 acres with 10 acres being vacant fields. The site has a perimeter fence with neighborhoods surrounding the property.

Fire detection systems are installed in most, but not all, site buildings. Each building with a fire detection system is equipped with visual and audible alarms, which aid in alerting employees to a fire within the building. Most but not all site buildings are also equipped with fire suppression systems to quickly extinguish any large fires within the buildings. Annual fire drills are conducted, which allow all employees to practice evacuation and accountability protocols. During a fire, employees must be cognizant of their assembly area and fire wardens so that when disaster strikes, they are able to escape safely. The site maintains a x11 emergency phone line reporting system, and, in the case of a fire, 911 would be notified immediately to initiate off-site Albany Fire Department response. The site maintains a mutual aid agreement with the Albany Fire Department.

Oregon has a very high risk for wildfire vulnerability. Wildfires often cause the worst air pollution days of the year leading to health risks for the young and elderly as well as those with respiratory ailments. More than 1.2 million people living in Oregon, or 33% of the state's population, are living in areas at elevated risk of wildfire. In 2017, more than 2,000 wildfires were reported in Oregon, burning more than 700,000 acres. Other forest fire threats include incidental fires from off site, equipment uses on the property, and illegal or uncontrolled burning (burning leaves, bon fires, etc.) where debris travels into the woods or fields ignites a fire during drought conditions. Also, misuse of fireworks from the surrounding neighborhoods could lead to fires in dry/hot summer conditions.

3.2.15 Recreational Hunting and Fishing

The Albany Site does not offer the opportunity for the public to entertain recreational hunting and fishing to control wildlife populations in a controlled setting.

3.3 PITTSBURGH, PENNSYLVANIA

3.3.1 Site Description

The Pittsburgh site (Photo 3.3.1) lies within Allegheny County, Pennsylvania, at the Bruceton Research Center. The Pittsburgh site is composed of 63 acres approximately 13 miles south of Pittsburgh in South Park Township (approximately 60 miles north of the Morgantown, West Virginia, site). NETL-Pittsburgh shares the Bruceton Research Center with CDC-NIOSH and U.S. Department of Labor, Mine Safety and Health Administration (which occupies part of the CDC-NIOSH portion of the site. The facility sits within the rolling hills and steeply incised stream valleys that are tributaries of the Monongahela River. It is a partially wooded tract, with two subsites with both industrial and office buildings. The immediate vicinity was completely rural when the Bruceton Research Center was first established, however, the nearby population and housing densities have increased dramatically in recent years.

Photo 3.3.1: Pittsburgh site.

Immediately west of the site is a low-ridge top with a road and houses. Another road with houses borders the north side of the site. The east side of the site is bordered by Lick Run, the Pleasant Hills Authority Sewage Treatment Plant, and Cochrans Mill Road. Housing development is increasing around all boundaries of the site, especially to the southwest, where new homes overlook the site. Commercial zones are found more than three quarters of a mile away, although some small businesses are located nearby. About 40% of the immediately surrounding land is forested and about 25% is pasture or fallow field. The remainder is residential.

The Pittsburgh site focuses on technologies in scientific and engineering areas that create commercially viable solutions to national energy and environmental problems. These areas include process systems engineering, decision science, functional materials, environmental sciences, and energy systems optimization. The work is accomplished through both in-house R&D and externally through funding awarded for specific research. As of December 31, 2022, there were 647 employees at the Pittsburgh site: 202 federal and 415 site-support contractors.

As of the 2022 U.S. Census estimates, Pittsburgh's population consisted of 302,898 people and 140,496 households within the city limits. The population density was 5,440.8 per square mile. There were 137,747 housing units at an average density of 2,820.39 per square mile. The racial makeup of the city was 65.4% White, 22.9% African American, 5.6% Asian, 3.5% Hispanic or Latino of any race, 0.2% Native American and 4.8% from two or more races.

The median income for a household in the city was $54,306. The per capita income for the city was $37,665. About 19.7% of the population was below the poverty line. The major employers in Pittsburgh are University of Pittsburgh and affiliated medical center, Highmark Health, and PNC Bank.

3.3.2 Major Site Activities

3.3.2.1 B-83 Machine Learning Data Center (CDAML)

The renovation of the north end of the first floor of B-83, as well as an addition to ultimately house a new machine learning data center, visualization laboratory, and necessary office, mechanical, and electrical spaces.

Photo 3.3.2.1: B-83 CDAML – Building Addition.

3.3.2.2 B-922 Conference Center Renovation

The renovation of the north end of the first floor of B-83, as well as an addition to ultimately house a new machine learning data center, visualization laboratory, and necessary office, mechanical, and electrical spaces was initated.

This project will renovate the B-922 conference rooms 101, 102, 103, 104, 106, and M-2. The north entrances, corridors, and restroom are also being renovated, as is the kitchenette M-2A.

Photo 3.3.2.2: B-922 Conference Center Renovation – Room 106.

3.3.2.3 B-901 Roof Replacement Project

This project includes providing a new single ply roofing membrane over the existing roof on B901. Existing metal roof to receive rigid insulation to fill flutes of existing surface to provide a flat surface to fully adhere a new single ply roofing membrane. Fall protection system and lighting protection system will be installed as well. Exterior metal panels have been installed. Interior framing and drywall work is near completion, Duck work and electrical work is in progress.

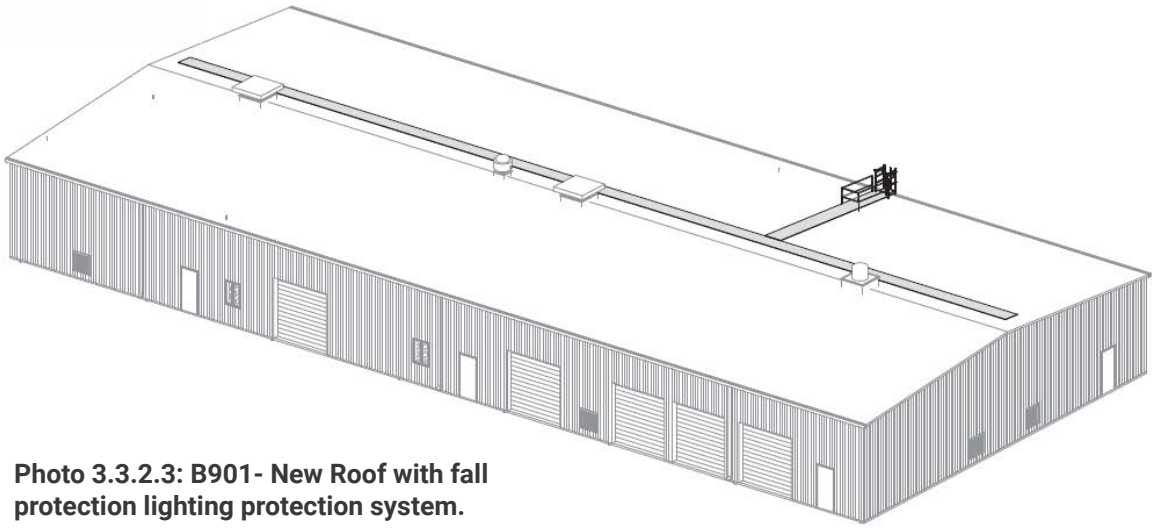

Photo 3.3.2.3: B901- New Roof with fall protection lighting protection system.

3.3.2.4 B-167 Roof Replacement Project

This project includes providing a new single ply roofing membrane over the existing roof on B167. Existing metal roof to receive rigid insulation to fill flutes of existing surface to provide a flat surface to fully adhere a new single ply roofing membrane. Fall protection system and lighting protection system will be installed as well. Efforts to complete this task were initiated.

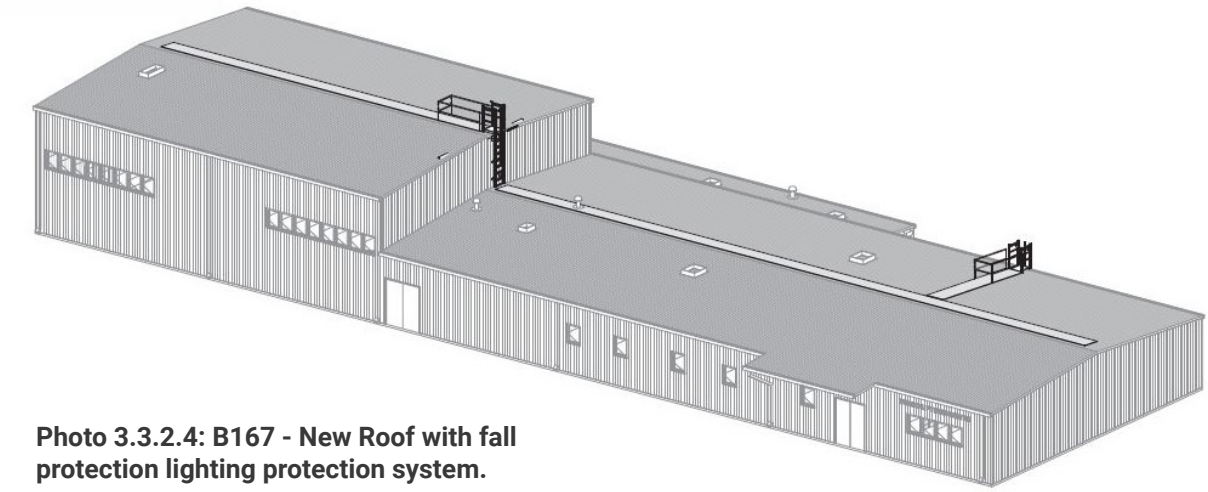

Photo 3.3.2.4: B167 - New Roof with fall protection lighting protection system.

3.3.2.5 920 Plateau Load Interrupter Switch Project

The project includes replacing the out of date 920 load interrupter switch. Effort to complete this task were initiated.

Photo 3.3.2.5: 920 Existing Switchgear.

3.3.3 Environmental Restoration and Waste Management

3.3.3.1 CERCLA

The EPA administers the CERCLA program in cooperation with the Commonwealth of Pennsylvania for the Pittsburgh site. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database had previously listed information about the NETL-Pittsburgh site based on soil and groundwater contamination prior to 1997. The Pittsburgh site had previously been listed as "undetermined" on EPA's CERCLA Section 120 List. However, a remedial action plan letter regarding this issue was never received and historical information on the Pittsburgh site indicates remediation for the areas of concern was completed in 1997. The sampling and analysis results indicated that no further soil remediation was necessary. It was also determined that exposure to media at the facility was not expected to generate adverse health effects for on-site or current receptors. NETL-Pittsburgh has continued to monitor the site on a routine basis.

Additionally, the CERCLIS database has since been retired and has been replaced with the Superfund Enterprise Management System (SEMS) database. NETL has verified that no information regarding the Pittsburgh site being listed as an NPL site is included for CY2022, nor has it been listed as an NPL site at any other time in the recent past.

3.3.3.2 RCRA

Pennsylvania Department of Environmental Protection (PADEP) is authorized to enforce the federal and state hazardous waste management requirements at the Pittsburgh site. (Diagram 3.3.3.2 details the breakdown of hazardous waste generated at the Pittsburgh site in 2022 that was either recycled or landfilled.) Hazardous waste operations personnel frequently review current waste industry newsletters and bulletins, receive information from the Alliance of Hazardous Materials Professionals, study NETL's regulatory compliance reviews, attend hazardous materials transportation training every three years, and attend hazardous waste operations training each year. There were no RCRA non-compliances in 2022.

Additionally, due to the COVID-19 pandemic restrictions, DOE Headquarters (FE-17) completed a virtual Staff Assistance Visit (SAV) in September 2022 with NETL personnel. During this SAV, the RCRA program was assessed and no additional opportunities for improvement were identified as part of this SAV.

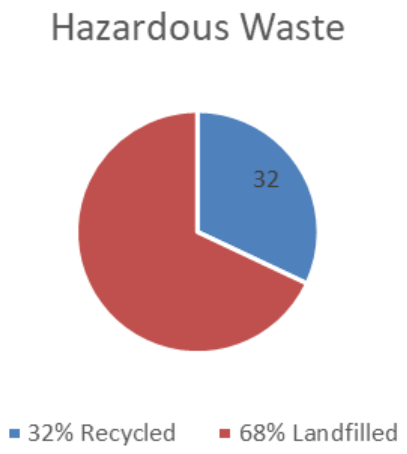

Diagram 3.3.3.2.: Pittsburgh 2022 RCRA Hazardous Waste Disposition Profile.

Due to the amount of waste generated each month, the Pittsburgh site is considered a large quantity hazardous waste generator [generating greater than 2,200 lbs. (1,000 kg) of hazardous waste or greater than 2.2 lbs. (1 kg) of acutely hazardous waste per calendar month] and has an EPA Large Quantity Generator Identification Number. While the Pittsburgh site typically generates lesser amounts of hazardous waste most months, occasionally laboratory activities result in the generation of larger quantities, exceeding the threshold for a small-quantity generator. The generator status limits hazardous waste storage is limited by permit to up to 90 days. Most of the waste is packaged and shipped in laboratory packs (lab packs) (Photos 3.3.3.3a-c) containing combinations of several different compatible chemicals within a single container.

Photo 3.3.3.3a: Lab Packs.

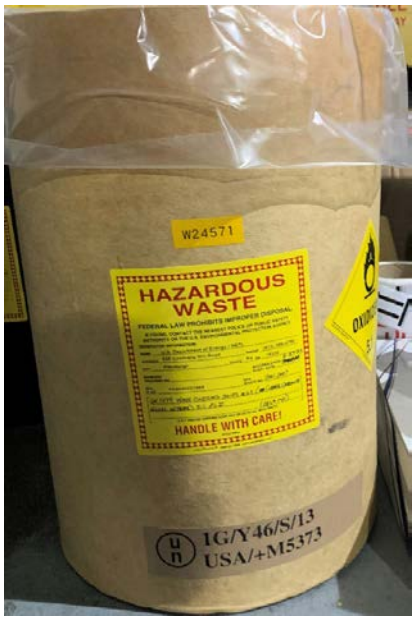

Photo 3.3.3.3b: Lab Packs.

Photo 3.3.3.3c: Inside of Lab Pack.

Hazardous waste support personnel at the Pittsburgh site are not authorized to transport hazardous waste. In 2022, the Pittsburgh site used Tradebe Environmental Services, LLC (Tradebe) to transport six (6) shipments of hazardous waste. Tradebe transported the waste to its storage and treatment facilities where small packages of similar wastes were

combined and then repackaged for more cost-effective shipment to a final disposal facility. In some cases, due to the large operational size of Tradebe, more of Pittsburgh's final waste disposition is completed at Tradebe's own facilities. NETL monitors Tradebe facilities, along with other facilities that Tradebe might use for final treatment and disposal. The number of hazardous materials and waste removed from the site in 2022 remained consistent with previous years. Pittsburgh generated 12,576 pounds of hazardous waste in 2022. (Pittsburgh also generated 5,680 pounds of universal waste.)

Pittsburgh also continued to reduce its chemical footprint, as appropriate, with the understanding that site research requires the purchase of new and sometimes uncommon chemicals. Any chemical items deemed unusable were disposed. (See Section 4.0, Environmental Objectives and Targets, for a detailed explanation of how this quantity was established.) For example, when unused and unopened chemicals are received for disposal, they are offered to other researchers for potential use. Less hazardous or nonhazardous chemicals are substituted for requested hazardous chemicals when possible. Batteries and fluorescent bulbs are sent to recyclers. Used computers and other electronics are recycled via NETL's ADP (automatic data processing) scrap contract.

At the Chemical Handling Facility (B-92), liquid wastes are managed in 55-gallon drums. The Pittsburgh site does not have a storage or treatment pond, nor does the Pittsburgh site have underground storage tanks to store petroleum or hazardous waste, or aboveground storage tanks to store hazardous waste. Liquid acids and bases are collected at satellite accumulation areas (SAAs) and are characterized and analyzed, as necessary. Waste management personnel ensure regulatory compliance by: (1) weekly walk-through inspections of the Chemical Handling Facility; (2) monthly pickups at SAAs; (3) periodic battery pickups at various locations; (4) participation in the SARS process; (5) participation in Emergency Response Organization exercises; (6) training on hazardous waste management; (7) regulatory reviews; and (8) attendance at conferences addressing hazardous waste requirements, as appropriate.

Hazardous waste generators have full responsibility for managing the waste that they generate from the moment of creation until it is transferred to the Chemical Handling Facility. Waste generators ensure that all hazardous or potentially hazardous wastes are properly contained and identified at the point of generation. Generators are held accountable for wastes that are not properly contained or identified or are otherwise mismanaged.

Tradebe waste-handling personnel inspect the containers, the labels, and the internal documentation to ensure the wastes are properly packaged and labeled and that the required documentation is complete and accurate. Waste-handling personnel are not permitted to accept or move any hazardous waste without proper packaging, labeling, and identification. The responsibility for identifying the waste rests primarily with the hazardous waste generator, which, in most cases, is the researcher generating laboratory waste.

NETL's hazardous waste manager ensures compliance with applicable regulations by overseeing the hazardous waste program. The hazardous waste manager reviews the program periodically and brings any deficiencies to the attention of the appropriate individuals or managers, and ensures the development, accuracy, and submission of the Biennial Hazardous Waste Report to the Commonwealth of Pennsylvania and any other reporting required by DOE headquarters.

NETL's hazardous waste manager, or trained designee, signs the RCRA manifests and other relevant documentation (e.g., land disposal restriction forms, waste profiles, and bills of lading). The original copies of the RCRA manifests, biennial reports, and certificates of disposal/or destruction are maintained by the hazardous waste coordinator.

3.3.3.3 SARA Title III — Emergency Planning and Community Right-to-Know Act

NETL has established targets for reducing the accumulation of hazardous chemicals on site. The intent of these targets is to avoid the unnecessary accumulation of potentially hazardous chemicals in the laboratories, while maintaining sufficient chemical stores to complete mission-related research.

To meet these targets and meet regulatory requirements, NETL maintains an active inventory of all hazardous and extremely hazardous chemicals on site, along with the Safety Data Sheets (SDS) for each substance with its Environmental Management System (EMS) (see Figure 3.3.3.3 and Photo 3.3.3.3).

Figure 3.3.3.3: NETL Environmental Management System (EMS) Home Page.

Photo 3.3.3.3: SDS Access iPad in laboratory area.

Each year, to meet SARA Title III Emergency Planning and Community Right-to-Know requirements, the Pittsburgh site submits a Tier II Emergency and Hazardous Chemical Inventory information by March 1st annually. More specifically, Section 312 of SARA Title III requires NETL-Pittsburgh to provide copies of the information to the following: Pennsylvania Department of Labor and Industry, the Allegheny County Department of Emergency Services, the South Park Local Emergency Planning Commission, the South Park Township Police, the Library Volunteer Fire Department and the Broughton Volunteer Fire Department.

NETL-Pittsburgh is not required to prepare a Toxic Release Inventory Form R (TRI Form R) because the site does not use, produce, or process any of the listed toxic materials in quantities that exceed the threshold amounts (25,000 pounds of the chemicals manufactured or processed at the facility; 10,000 pounds of the chemical used at the facility). In 2022, no toxic releases occurred that would have triggered emergency notification as required by either the Emergency Planning and Community Right-to-Know Act (EPCRA) or CERCLA.

3.3.3.4 Federal Facilities Compliance Act (FFCA)

There are no issues related to the Federal Facilities Compliance Act for the Pittsburgh site in 2022.

3.3.3.5 NEPA

See section 2.1.2 National Environmental Policy Act (NEPA) for information on Pittsburgh NEPA requirements.

3.3.3.6 TSCA

NETL-Pittsburgh does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No spills or releases of substances regulated by the Toxic Substances Control Act (TSCA) of 1976 (with amendments, et. seq.) — including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. — were reported in 2022 at the Pittsburgh site. TSCA waste generated during 2022 included asbestos and lead-based paint, which was disposed of in accordance with Federal, state and local requirements.

No unplanned releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2022. Most ACM is floor tile and floor tile mastic installed in various laboratory buildings (e.g., B-94 and B-901). The remainder of ACM is contained in roofing materials, caulking, or laboratory furniture. Asbestos remaining inside buildings are well encapsulated by the matrix material (e.g., floor tiles and laboratory tabletops). In addition, asbestos was found in some gaskets and inside some laboratory devices such as muffle and tube furnaces. All known friable asbestos-containing material (ACM) has either been removed or encapsulated. Non-friable asbestos present at the NETL-Pittsburgh site is inventoried and maintained. No samples taken in 2022 indicated that the materials contained fiber concentrations in excess of U.S. Environmental Protection Agency (EPA) or the State of Pennsylvania clearance levels of (0.01 fibers/cc). Asbestos engineering drawings based on the Pittsburgh site inventory continue to be maintained and updated.

Evaluations, tests, and sample collection are conducted by an accredited PA licensed Asbestos Building Inspector (ABI) or by a Certified Industrial Hygienist (CIH). Analysis of bulk asbestos-containing material (ACM) or presumed ACM are performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP), or the National Institute for Standards and Technology (NIST), or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally recognized round robin testing program.

When asbestos is removed as part of any remodeling or reworking in a room, building, or facility, it is handled by a licensed Asbestos Abatement/Removal Contractor (AA/RC) and adhere to OSHA 29 CFR 1910.1001 (Asbestos-General Industry), OSHA 29 CFR 1926.1101 (Asbestos-Construction), OSHA Instruction CPL 2-2.40, 40 CFR 61 (Subpart M, NESHAPs), and applicable state regulations (Allegheny County Health Department (ACHD) Article XXI, the Asbestos Occupational Accreditation and Certification Act of 1990 (P.L. 805, No. 194), the Worker and Community Right-to-Know Act of Pennsylvania (P.L. 734, No. 159, P.S. 7317), 25 PA Code § 124, 25 PA Code § 299.152, 25 PA Code § 299.232, and 25 PA Code § 299.302).

There were no construction projects that required a 10-day asbestos notification permit identified in 2022.

Fifteen (15) asbestos sampling events were conducted in 2022 related to operation/ maintenance and construction projects with eight related to preventive operation/ maintenance and seven related to construction projects. Samples were collected by a licensed ABI.

Additionally, NETL tests for lead paint before demolition, renovation, and maintenance projects or elimination of materials through excess property or recycling. Ten lead-based paint sampling events were conducted in 2022 related to operation/ maintenance and construction projects; with eight related to preventive operation/maintenance and two related to construction projects. The paint renovation work for the positive samples was conducted in accordance with OSHA 29 CFR 1910.1025, Lead (General Industry), and OSHA 29 CFR 1926.62, Lead (Construction).

In January 2022, a Motorola Radio Antenna Exclusion Zone Survey was conducted for the B-920 Rooftop. The measured Radio Frequency (RF)/Electro Magnetic Fields (EMF) did not produce more than the 1% of the Federal Communications Commission (FCC) standard limit for MPE, at two feet, well below the Personal Exposure Limits. An exclusion zone of no less than two feet around the antenna at all points is appropriate to alert employees of the potential presence of RF/EMF. Signage indicating the exclusion zone around the antenna should follow IEEE Standard C95.2-1999-*IEEE Standard for Radio-Frequency Energy and Current-Flow Symbols*.

In February – March 2022, approximately 6,750 square feet of surface was blasted (grind lead paint from the concrete ceiling and floor using handheld grinders) as part of the B-83 CDAML Future Area 1st Floor Renovations. Activities were conducted under a permit submitted to ACHD, with all waste generated properly disposed of in accordance with local, state, and Federal requirements. Personal air sampling for lead was conducted during the abatement to verify that exposure levels were below the OSHA Permissible Exposure Limits.

3.3.3.7 FIFRA

No restricted-use pesticides, herbicides, or defoliants, as regulated by FIFRA were kept on site. Only general-use pesticides were kept and used for routine insect control. A professional pest control company, Leaf Pest Control, is subcontracted to spray inside certain offices as needed, cafeteria drains, certain lunch areas, certain basement areas, and the daycare facility. Herbicides are not used for controlling weeds except in extremely limited cases. The only recurring use of an herbicide is for the fence lines, mulch beds and guard rails. No defoliants are used.

3.3.4 Radiation Protection Program

NETL maintains an inventory of on-site radiation sources and tracks each item according to isotope(s), quantity, custodian, location, status and activity. Table 3.3.4a lists the 2022 source inventory at Pittsburgh. Table 3.3.4b contains the 2022 X-ray radiation generating devices.

Table 3.3.4a: 2022 Radioactive Source Materials Inventory—Pittsburgh

Isotope	Activity/Date Determined	Source
Depleted Uranium	1427 µR/Hr (11.1 µCi) (08/19/21)	Geiger Counter: Model: 6A Serial #, 75788 Victoreen Industries
Depleted Uranium	1537 µR/Hr (11.9 µCi) (08/19/21)	Geiger Counter: Model: 6A Serial #, 7311 Victoreen Industries
N/A	1558 µR/Hr (12.1 µCi) (08/19/21)	Geiger Counter: Model: 290 Serial # 681 Victoreen Industries
N/A	1349 µR/Hr (10.5 µCi) (08/19/21)	Geiger Counter: Model: 290 Serial # 2429 Victoreen Industries
Cs137*	1177 µR/Hr (9.1 µCi) (08/19/21)	Check Source: CS137 Description: PL Yellow Spectrum Techniques for Ludlum Measurements (ID-223)
Cs137*	1272 µR/Hr (9.9 µCi) (08/19/21)	Check Source: CS137 Description: PL Yellow Spectrum Techniques for Ludlum Measurements (ID-470)

* Exempt quantity per 10 CFR 835 Appendix E: No known radiation hazard.

Table 3.3.4b: 2022 Pittsburgh X-Ray Radiation Generating Devices

Device	Quantity
Mail X-Ray Instrument	1
X-Ray Florescence Instrument	1
XRD- Aeris DY 1166	1
VersaProbe III XPS Microprobe	1
X-Ray Photoelectron Spectroscopy	3
FEI Quanta 600 ESEM	1
X-Ray Diffraction (Empyrean Series 3)	1
Gatan PIPS Model 695 (TEM)	1
FEI Quanta 450 Scanning Electron Microscope	1
X-Ray Diffractometer (Rigaku D/maX Rapid II)	1

The Pittsburgh site did not release any radiation source materials into the environment because all source materials are sealed from escape or discharge. No low-level radioactive waste (LLRW) disposal shipments were required in 2022.

Radiation monitoring performed at Pittsburgh consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via X-ray upon receipt) and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. In addition, specific radiological control areas have dosimeter badges continually displayed. All radiation-generating devices are surveyed for possible leakage on a semi-annual basis.

The cumulative annual dose for all personnel performing all operations at the Pittsburgh site during 2022 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program See Table 3.3.4c.

Table 3.3.4c: PGH 2022 Annual Exposure Rate

Exposure Range (mrem)	Count	TED
No measurable exposure	0	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	
Total Monitored: Total Collective TED (mrem):	30	0
Total CED:		0
Total CEqD: Num Individuals with Uptake:	0	59

* TED= Total Effective Dose
CED= Committed Effective Dose
CeqD= Committed Equivalent Dose

3.3.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information may be found in Section 2.2, DOE Internal Environmental and Radiation Protection Orders and Section 2.3, Atomic Energy Act of 1954. In accordance with "as low as is reasonably achievable" (ALARA) principles, NETL manages an appropriate radiation protection program for protection of the public and the environment from radiation hazards since radiation sources are low-level, sealed instrumentation sources, radiation-generating devices (RGDs), or processes that include naturally occurring radioactive materials or technologically-enhanced naturally occurring radioactive materials (NORM/TE-NORM) with minimal radiation levels.

3.3.5 Air Quality and Protection Activities

3.3.5.1 Clean Air Act

Pennsylvania's Department of Environmental Protection (PADEP) Bureau of Air Quality is responsible for implementing the requirements of the federal Clean Air Act, as well as Pennsylvania's Air Pollution Control Act. Additionally, the Allegheny County Health Department (ACHD), is authorized to administer Title V operating permits under the Clean Air Act Amendments.

To address necessary compliance requirements, NETL's Ambient Air Quality Management Program includes protection of outdoor air quality. This includes the submission of applications for air emission permits, which can include the existing sources (boilers, generators, fuel storage tanks), as well as sources related to on-site research activities. The air quality program manager prepares permit applications, obtains permit renewals (every five years), as needed, and oversees monitoring programs and reporting. During 2022 the Pittsburgh site initiated an air installation permit for the backup generator associated with the CAML project. Preliminary the ACHD said the new generator would be added to the existing air permit.

Based on Pittsburgh's existing Title V, Operating Permit, NETL reports air emissions annually. The Title V permit issued on July 7, 2021, designates NETL-Pittsburgh as a synthetic minor source. (Note: A synthetic minor source is defined as any source that has its emissions administratively limited below certain thresholds by means of a federally enforceable order, rule, or permit condition.) Additionally, no existing Pittsburgh facility or project had the potential to emit more than 100 tons per year of any designated air pollutant in CY2022.

Current regulatory requirements include an annual emissions inventory, which is submitted to the ACHD by March 15th of each year, for the preceding calendar year. NETL utilizes an air emission inventory model (AES* Online) required by both the ACHD's Bureau of Environmental Quality and PADEP's Bureau of Air Quality to calculate the emissions. The model is based on fuel usage and provides a worst-case scenario for potential emissions. The model considers the type, quantity, and total burn time of each fuel to calculate the estimated emission levels. Results of the modeling are summarized in Table 3.3.5.1.

In addition to the annual emissions inventory, NETL-Pittsburgh also submits semi-annual reports to ACHD in accordance with the Title V Operating Permit, General Condition III.15.d. The semi-annual report includes data on comfort-heat boilers, space heaters, and emergency generators. The Pittsburgh site did not receive any Notices of Violation, nor were there any unplanned air emission occurrences in 2021.

NETL-Pittsburgh's permit is effective for five years, with an expiration date of July 6, 2026. As a result, preparations for a new permit submission will be initiated in December 2025.

Table 3.3.5.1: 2022 Air Emissions Inventory—Pittsburgh

Pollutant	Calculated Emissions (lbs./yr.)
Ammonia	128.1
Benzene	0.08
Butane	8.4
Carbon Dioxide	4,300,800
Carbon Monoxide	3,361.8
Hexane	0.70
Naphthalene	0.02
Formaldehyde	3.0
Nitrogen Oxide	88
Lead	0.02
Pentane	10.4
Ethane	12.4
Methane	92
Particulate Matter, $PM_{2.5}$	1,100
Particulate Matter, PM_{10}	1,404.2
Sulfur Dioxide	24
Toluene	0.14
Arsenic	0.008
Barium	0.2
Cadmium	0.04
Chromium	0.06
Cooper	0.03
Manganese	0.02
Mercury	0.01
Molybdenum	0.04
Nickel	0.1
Vanadium	0.1
Zinc	1.2
VOC	220.1

3.3.5.2 National Emission Standards for Hazardous Air Pollutants

NETL actively participates in a program to reduce the use of Class I ozone depleting substances (ODS). The goal of the program is to recover and reclaim chlorofluorocarbon refrigerants from HVAC equipment for subsequent reuse and recycle. In recent years, the inventory of ODS-containing equipment has been steadily decreasing at the Pittsburgh site. Older ODS-containing equipment is being replaced and the use of Class I ODSs is being phased out from the HVAC equipment and replaced with environmentally friendly substitutes.

3.3.5.3 Hydrofluorocarbon (HFC) Phasedown

The American Innovation and Manufacturing (AIM) Act of 2020 was enacted on December 27, 2020. The AIM Act provides new authority to address HFCs and directs EPA to: (1) phase down the production and consumption of listed HFCs through an allowance allocation and trading program, (2) manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) facilitate the transition to next-generation technologies through sector-based restrictions. Below is a table that shows a list of all HFCs on the phaseout list at the Pittsburgh site. Plans to address how to deal with the phaseout are underway. There were no issues in 2022 regarding compliance Hydrofluorocarbons (HFC) Phasedown at Pittsburgh.

Table 3.3.5.3: 2022 PGH HFC Phaseout Inventory Summary

(All values in Pounds)

Refrigerant	Amount in Equipment Dec. 31, 2021	Amount in Equipment Dec. 31, 2022	Amount in Storage Dec. 31, 2021	Amount in Storage Dec. 31, 2022	Amount purchased in 2022	Amount Removed from equipment in 2022	Leaks in 2022
R134A-HFC	1737.41	1664.89	585.40	180.57	750	0	477.35

3.3.5.4 Meteorological Tower Data

The Pittsburgh site maintains two 30-foot meteorological towers, one is located west of B-74 and other one is west of Building 901. that the stations monitor temperature, relative humidity, precipitation, wind speed, wind direction, barometric pressure, and solar radiation. The data is collected every second, averaged over 15 minutes, and over 24 hours to provide critical meteorological information to the Emergency Response Organization (ERO) during emergency situations, to assist in employee heat stress data, and to provide meteorological information used in the models for the Air Emissions Program.

The data collected from the meteorological towers is used to provide critical meteorological information to the ERO during emergency situations, as back-up information to employee heat-stress data, and in the models used for the air emissions inventory. An example of one of the meteorological towers is shown in Photo 3.3.5.4.

Photo 3.3.5.4: Pittsburgh Meteorological Tower.

3.3.6 Water Quality and Protection Activities

The topography of the Pittsburgh site consists of rolling hills separated by the natural flow of water for the Bruceton Research Center site. As a result, surface water at the Pittsburgh site is divided into two distinct areas: the northern area and the southern area. The northern area is located north of Experimental Drive and houses the laboratory and process facilities for the DOE portion of the site. The southern area is south of Wallace Road and houses administrative, project management and contractor maintenance operations. The northern area is referred to as the "R&D Plateau," and the southern area is referred to as the "Main Plateau."

NETL-Pittsburgh's water quality program ensures that activities do not result in contamination of industrial wastewater, sanitary wastewater, or storm water discharges. ES&H staff review all on-site research projects, support activities, and construction activities for potential impacts to air, surface water, groundwater, and soil as part of the Safety Analysis and Review System (SARS) processes. Applicable federal, state, and local regulations affecting these activities are reviewed to ensure compliance before approval is given to proceed.

3.3.6.1 Industrial Wastewater

Industrial wastewater from the R&D Plateau (northern area) of the site is routed to the wastewater treatment facility (WWTF) in Building 74. This wastewater, consisting of laboratory and process wastewater from the site's R&D operations, is regulated under the Pleasant Hills Industrial Sewer Use Permit Program. The current Industrial Sewer Use Permit was issued by Pleasant Hills Authority (PHA) on December 16, 2020. Permit conditions limit the quantity and quality of effluent constituents (total cyanide, mercury, cadmium, and pH level) discharged to the PHA Treatment Plant and the Subinterceptor. As part of the permit,

wastewater analysis data for effluent discharged through the WWTF and Subinterceptor must be submitted on a semi-annual basis to the PHA's consulting engineering firm, Gannett Fleming, Inc. Table 3.3.6.1a. Industrial Sewer Use Permit Monitoring Analysis – Pittsburgh shows the results of the 2022 wastewater analysis data collected by NETL-Pittsburgh.

Although not required by the permit, as a best practice, NETL-Pittsburgh collects and analyzes monthly wastewater samples (see Table 3.3.6.1b: B-74 2022 Monthly Monitoring Results (mg/L)). An annual wastewater report of the site's industrial wastewater discharge is prepared, including the volume of wastewater discharged, the number of site employees, the type of waste discharged, and the type of pretreatment performed.

In addition to the sampling and analysis performed by NETL-Pittsburgh and CDC/NIOSH (Center for Disease Control/National Institute of Occupational Safety and Health), the PHA also conducts independent sampling and analysis of wastewater effluent from these locations. PHA uses this information to determine whether any discharges of the treated effluent exceed local limits. No industrial wastewater permit limits were exceeded in 2022.

The Main Plateau (southern area) of the Pittsburgh site does not require an industrial wastewater treatment system, since this portion of the site does not house laboratory operations - only administrative, project management and contractor maintenance operations occur in that area.

Description of Pittsburgh Wastewater Treatment Facility (WWTF)

Treatment in the WWTF begins with flow equalization, followed by pH adjustment using either caustic soda or ferric chloride. Subsequently, metals and particulates are removed by agglomeration in the flocculation tank, followed by solids separation in the plate separator (Photo 3.3.6.1). Final removal of metals and particulates occurs in a filter press. Prior to discharge to the Pleasant Hills sanitary sewer, the treated water is sent through an activated clay/activated carbon filtration system for additional removal of organics and metals. Once through the filtration system, if the effluent does not meet the necessary pH (6 to 9), it is recirculated through the system. If the pH is outside the allowable range, a diverter valve in the effluent monitoring tank opens automatically, allowing the off-specification effluent to be recirculated within the system for additional treatment. Final effluent pH adjustment occurs in a chamber inside the effluent monitoring tank prior to discharge. Once the WWTF effluent meets specification, it is routed to the Pleasant Hills Authority Sewage Treatment Plant for final treatment.

Photo 3.3.6.1: Pittsburgh Plate Separator.

Table 3.3.6.1a: 2022 Industrial Sewer Use Permit Monitoring Analysis—Pittsburgh				
Constituent	**Total Cyanide**	**Mercury**	**Cadmium**	**pH**
Permit Limit	6.4 mg/L	0.0062 mg/L	0.54 mg/L	6.0–9.0 s.u.
April 13, 2022 Sampling Date				
DOE Subinterceptor Location				
Composite	0.012	0.00017mg/l	ND	N/A
Grab #1	N/A	N/A	N/A	6.86 s.u.
Grab #2	N/A	N/A	N/A	7.55 s.u.
Grab #3	N/A	N/A	N/A	7.46 s.u.
Grab #4	N/A	N/A	N/A	7.68 s.u.
B-74 Effluent				
Composite	ND	ND	ND	N/A
Grab #1	N/A	N/A	N/A	7.03 s.u.
Grab #2	N/A	N/A	N/A	7.09 s.u.
Grab #3	N/A	N/A	N/A	7.37 s.u.
Grab #4	N/A	N/A	N/A	7.62 s.u.
October 19, 2022 Sampling Date				
DOE Subinterceptor Location				
Composite	ND	0.00011	0.0007	N/A
Grab #1	N/A	N/A	N/A	7.37 s.u.
Grab #2	N/A	N/A	N/A	7.77 s.u.
Grab #3	N/A	N/A	N/A	8.10 s.u.
Grab #4	N/A	N/A	N/A	8.32 s.u.
B-74 Effluent				
Composite	ND	ND	ND	N/A
Grab #1	N/A	N/A	N/A	7.69 s.u.
Grab #2	N/A	N/A	N/A	7.16 s.u.
Grab #3	N/A	N/A	N/A	7.32 s.u.
Grab #4	N/A	N/A	N/A	7.06 s.u.

ND = Not Detected; s.u. = standard units; N/A = Not Applicable

Table 3.3.6.1b: B-74 2022 Monthly Monitoring Results (mg/L)—Pittburgh													
Constituent	Permit Limit	Sampling Date											
		1/12/22	2/9/22	3/9/22	4/13/22	5/11/22	6/15/22	7/14/22	8/10/22	9/14/22	10/19/22	11/16/22	12/14/22
Aluminum	None	0.081	0.1300	0.140	0.083	0.083	ND	ND	0.370	0.093	0.058	0.070	0.055
Cadmium	0.061	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	None	0.003	0.003	0.004	0.004	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.32	0.035	0.034	0.035	0.017	0.020	0.013	0.010	0.042	0.016	0.027	0.019	0.026
Cyanide Total	3.21	ND	0.011	ND	ND	0.012	ND	ND	ND	ND	ND	ND	ND
TOX	None	0.035	0.077	0.055	0.076	0.048	0.052	0.024	0.094	0.032	0.037	0.062	0.082
Iron	None	1.300	1.500	1.600	1.300	1.300	0.960	0.450	0.320	0.200	1.200	3.400	3.100
Lead	None	ND	ND	0.002	ND	0.004	0.003	0.007	ND	ND	0.003	ND	ND
Mercury	0.0062	ND	ND	ND	ND	0.00014	ND	ND	0.00013	ND	ND	ND	ND
Nickel	None	0.004	0.006	0.005	0.006	0.004	0.006	ND	ND	ND	0.005	0.004	0.006
Oil and Grease	None	ND	ND	ND	1.9	ND	ND	ND	ND	ND	ND	ND	ND
pH (s.u.)	6.0-9.0	7.16*	7.77*	7.43*	7.39*	7.67*	6.67*	7.26*	7.40*	7.12*	7.19*	7.24*	7.10*
Phenolics	None	0.038	ND	ND	ND	0.009	ND	0.011	0.012	ND	0.092	ND	ND
TSS	None	ND	0.80	0.80	1.00	1.50	0.80	0.60	ND	0.50	7.9	ND	1.6
Tin	None	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloro-methane	None	0.0002	0.0015	ND	ND	ND	ND	ND	0.0054	ND	0.0011	ND	0.0016
Zinc	None	0.110	0.130	0.130	0.150	0.092	0.120	0.052	0.052	0.023	0.037	0.033	0.059

ND = not detected; s.u. = standard units; TOX = total organic halogens; TSS = total suspended solids; * = Field Measurement; NA= Not Analyzed

3.3.6.2 Sanitary Wastewater

Separate from the discharge of the treated laboratory/process wastewater, sanitary sewage from the R&D Plateau (northern area) is combined with sanitary sewage from the Center for Disease Control/National Institute for Occupational Safety and Health (CDC/NIOSH), the other major federal agency on the site. The NETL/NIOSH sub-interceptor sanitary sewer line then discharges into the South Park (PA) main sanitary line at a point close to the PHA wastewater treatment facility. CDC/NIOSH also has another sanitary sewer line that discharges directly in the South Park main sanitary line.

The NETL-Pittsburgh sanitary sewage from the Main Plateau is routed to and treated by the Clairton Municipal Sewage Treatment Plant.

3.3.6.3 Stormwater

NETL-Pittsburgh also discharges stormwater in conjunction with CDC/NIOSH since the National Pollutant Discharge Elimination System (NPDES) storm water permit for the Bruceton Research Center is held by CDC/NIOSH. The NPDES permit lists four outfalls associated with the NETL portion of the site: the North Outfall (001), the South Outfall (002), the North Outfall Extension (101), and the South Outfall Extension (102). Contaminants to the storm water effluent are regulated by the NPDES permit.

Potential stormwater discharges include: the salt-storage facility area, air-conditioning condensate (Photo 3.3.6.3), runoff from various impervious surfaces into the site storm sewers and treated acid-mine drainage from a research coal mine operated by CDC/NIOSH. The permit requires CDC/NIOSH to monitor and report discharge results for North Outfall (001) and South Outfall (002) on a quarterly basis, however, the permit does not mandate any discharge limits.

Photo 3.3.6.3: Pittsburgh Air Conditioner Condensate.

On the R&D Plateau, stormwater (surface water) runoff from the 69-acre area exits the site through the northern storm drainage system, which drains directly into nearby Lick Run. (Lick Run is a small natural stream that flows along the eastern boundary of the 238-acre Bruceton Research Center.) The stormwater discharge occurs at the NPDES-permitted North Outfall (001). Likewise, the North Outfall Extension (101) also discharges directly into the North Outfall. CDC/NIOSH performs sampling for the outfalls and issues a monthly Discharge Monitoring Report, which measures pH, flow, total suspended solids, manganese, iron, and aluminum.

Stormwater collected from the Main Plateau exits the site through a dedicated southern drainage system, which also enters Lick Run. This discharge occurs at NPDES-permitted South Outfall (002). Stormwater discharged from the southern (Main Plateau) side of the site is also regulated through the NPDES permit. The South Outfall receives stormwater from both NETL-Pittsburgh and NIOSH.

No Notices of Violation were issued with respect to the Bruceton Research Center's NPDES permit in 2022.

3.3.6.4. Safe Drinking Water Act

There were no issues in 2022 regarding compliance with the Safe Drinking Water Act. The Pittsburgh site's potable water is supplied by the local water utility, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on site are filtered, with filters and plumbing maintenance performed during period scheduled preventative maintenance.

3.3.6.4.1 PFSA and Additional Emerging Contaminants

NETL-Pittsburgh has historically maintained only limited quantities of Per- and Polyfluoroalkyl Substances (PFAS) for use in R&D operations. Additionally, the Pittsburgh site has two aqueous film forming foam (AFFF) systems for fire suppression in its chemical handling and storage areas. These systems are tested on an annual basis (by tripping the valve to ensure water flows as designed), but no foam is produced; however, the foam in the tanks is sampled and disposed, per regulation, by the laboratory conducting the analysis. The Pittsburgh site does not maintain fire-fighting capabilities that would utilize PFAS.

There were two documented historical discharges at the Pittsburgh site (1999-2000) associated with facility equipment failure and maintenance. Appropriate notifications were made at the times of the discharges and no follow up sampling and analyses has been requested by state or local regulatory agencies. While there is an active groundwater monitoring program (See Section 5.2), PFAS-related substances are not a regular analyte and have never been part of any historical sampling, nor is it part of the site's industrial wastewater permit. Drinking water at the Pittsburgh site is provided by the local public drinking water system.

Given the Department's policy memorandum regarding PFAS, in 2022, efforts continued with regard to the evaluation of the two existing AFFF systems to determine if it was possible to remove the systems entirely or to replace the contents of the systems with a more environmentally benign chemical suppressant.

On September 6, 2022, annual functional testing of an aqueous film forming foam (AFFF) system was performed in Building 64, a chemical storage facility. In preparation for the test, the AFFF tank valves were closed to prevent the foam tank from releasing the AFFF solution. The systems main valve was activated sending water through the lines as part of the functional test. After activation of the system was confirmed, the main valve was closed and the water in the lines of the system was drained through a line that discharges to the northwest exterior of the building. After the discharge, the drain water was observed to have formed a slight foam blanket that spread across the concrete surface and nearby gravel where it had been discharged. An estimated five gallons of AFFF solution may have been released containing approximately two ounces of polyfluoroalkyl substances (PFAS). Absorbent pads were used to soak up the foam solution. Subsequently a dilute soap solution was applied to the concrete area where the AFFF was released, and this was absorbed and cleaned up as well. Additionally, two inches of gravel (approximately 3 gallons) with residual foam that had migrated was then removed from an area directly off the concrete pad where some residual foam solution may have migrated from the adjacent concrete pad was removed and containerized. All absorbent materials and gravel were stored at the Chemical Handling Facility.

3.3.7 Other Environmental Statutes

3.3.7.1 Endangered Species Act

There were no issues at the Pittsburgh site regarding the Endangered Species Act in 2022.

3.3.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Pittsburgh site regarding impacts of invasive species during 2022.

3.3.7.3 National Historic Preservation Act

There were no issues at the Pittsburgh site regarding the National Historic Preservation Act in 2022.

3.3.7.4 Migratory Bird Treaty Act

There were no issues at the Pittsburgh site regarding the Migratory Bird Treaty Act in 2022.

3.3.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.3.8.1 Responsibilities for Addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.3.8.2 E.O. 13693 GHG Reduction Targets and Sustainability Goals

See Section 4.0 ES&H Management System.

3.3.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2017)

See Section 4.0 ES&H Management System.

3.3.9 Executive Orders

The Pittsburgh site was in full compliance with all applicable environmental Executive Orders in 2022. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance. As noted above, E.O. 13990, Climate Crisis; Efforts to Protect Public Health and Environmental and Restore Science, was implemented as part of NETL's ES&H Management System. This executive order is described in more detail in Section 4.0.

In addition, other executive orders that apply to NETL-Pittsburgh but required no specific actions in 2022 include E.O. 11514, Protection and Enhancement of Environmental Quality; E.O. 11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O.13112 Invasive Species; E.O. 12088, Federal Compliance with Pollution Control Standards; E.O. 11988, Floodplain Management; and E.O. 11990, Protection of Wetlands; and E.O. 12898, Environmental Justice for Low Income & Minority Populations.

3.3.9.1 Executive Order 11988, Floodplain Management

There were no issues at the Pittsburgh site regarding floodplain management in 2022.

3.3.9.2 Executive Order 11990, Protection of Wetlands

There were no issues at the Pittsburgh site regarding protection of wetlands in 2022.

3.3.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect: the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities or the Department's reputation.

The Pittsburgh site filed eight ORPS reports in 2022, described below.

- On February 5, 2022, at approximately 10:39 EST, NETL experienced an unscheduled electrical outage affecting the R&D Plateau, 900 Area, and 920 Area. Electrical service was restored to the R&D Plateau at approximately 12:30 EST. Electrical service was restored to the 900 and 920 Areas at approximately 14:15 EST. The electric utility company West Penn Power representative reported the cause of the outage as ice on the electrical distribution lines caused by a regional winter storm.
- On February 25 at approximately 05:35 EST, NETL experienced an unscheduled electrical outage affecting the R&D Plateau, 900 Area, and 920 Area. Electrical service was restored at approximately 06:30 EST. The reported cause of the outage was an electrical surge of an off-site origin that caused the B-920 air switch fuse box to open.
- On March 10, 2022, at approximately 08:05 EST NETL experienced an unscheduled electrical outage affecting the R&D Plateau and 920 Plateau. The electrical outage was caused by the failure of a cracked insulator in the 920 Plateau electrical switch that resulted in an arc flash inside the 920 Plateau electrical switch that affected the entire 25KV line back to the R&D Plateau. Utility supplied electrical service was restored to the R&D Plateau at 11:00 EST on March 10. Electrical service was not restored to the 920 Plateau until approximately 22:00 EST on March 11 with two portable generators. The 25KV Load Interrupter disconnect switch was replaced in July of 2022 until then significant repairs will be completed as soon as possible to restore utility supplied electrical service to the 920 Plateau.
- On March 23, 2022, at approximately 22:36 EDT NETL experienced a fire on the R&D Plateau in building 93, office 100. The fire resulted in the automatic fire suppression system (sprinkler system) activating and fire suppression water subsequently infiltrating into building 86, room 109. The fire was extinguished by the sprinkler system. Off-site response agency support was provided by the Broughton Fire Department and Allegheny County Fire Marshal. The cause of the fire is still under review, but no injuries were reported as a result of the incident.
- On April 12 at approximately 12:38 EDT, two chemical handling facility technicians were evaluating cylinders at the building 65 storage area. During the evaluation process the technicians attempted to remove a cap from a DOT 3-AL compressed gas cylinder (serial number AAL2611) containing a mixture of hydrogen, helium and hydrogen sulfide. The technicians found the cylinder cap was cross-threaded or corroded and during attempts to remove the cap using a cylinder valve wrench the cylinder valve was inadvertently opened. The technicians detected the odor of hydrogen sulfide and departed the cylinder storage area.
- On July 5, 2022, a laboratory furnace that had been installed in April was undergoing temperature testing up to 700 degrees Celsius when the unit began to smoke. The unit had previously been operating since April at a 400 degrees Celsius temperature limit. The unit is designed to operate at temperatures up to 1800 degrees Celsius. The incipient fire was subsequently put out by site emergency response organization personnel using a fire extinguisher. Subsequent inspection of the furnace revealed that packing material from shipment of the furnace had not been removed from the unit causing it to smolder during the higher temperature test. There were no further impacts to the building beyond laboratory 405.

- On September 6, 2022, an annual functional testing of an aqueous film forming foam (AFFF) system was performed in Building 64, a chemical storage facility. In preparation for the test, the AFFF tank valves were closed to prevent the foam tank from releasing the AFFF solution. The system's main valve was activated sending water through the lines as part of the functional test. After activation of the system was confirmed, the main valve was closed and the water in the lines of the system was drained through a line that discharges to the northwest exterior of the building. After the discharge, the drain water was observed to have formed a slight foam blanket that spread across the concrete surface and nearby gravel where it had been discharged. An estimated five gallons of AFFF solution may have been released containing approximately two ounces of polyfluoroalkyl substances (PFAS).
- On November 15, 2022, at 09:43 ETZ the Pittsburgh site experienced an unscheduled electrical outage affecting the R&D Plateau and 920 Plateau. The 900 Plateau and B-925 daycare facility were not impacted. The electrical fault from the power company resulted in a B-920 load interrupter switch to blow two fuses. In response to this issue a decision was made to close the buildings on the 920 Plateau. Electrical service was restored to the R&D Plateau at approximately 10:05 EST. Electrical service was restored to the 920 Plateau at approximately 17:00 EST.

3.3.10.1 Natural Resources Conservation Programs and Projects

In 2022 no issues in this area were uncovered at the Pittsburgh site.

3.3.10.2 Sustainable Resilient Remediation (SRR)

There are no hazardous waste sites suitable for Sustainable Resilient Remediation (SRR) at the Pittsburgh site in 2022.

3.3.10.3 Organizational Resilience

Organizational Resilience is defined as the ability of an organization to anticipate, prepare for, respond, and adapt to incremental change and sudden disruptions to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's Emergency Response Organization (ERO) meets with local emergency planning committees on a quarterly basis to review hazards-based risks to the region including high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

What's more, the NETL COOP Plan postures the lab to perform its MEFs and ESAs under all conditions. When activated, it is designed to achieve operational capability within a predesignated time and strive to sustain operations until a return to normal activities. The plan encompasses preparedness, activation, operations, and the performance to normal operations.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

Additionally, NETL completed the Vulnerability and Resilience Plan (VARP) in FY 2022 per DOE 2021 Climate Adaptation and Resilience Plan. The VARP process identified gaps in current NETL processes that manage the short- and long-term effects of climate change on the mission and day to day operations. Resilience solutions that eliminate or reduce these gaps were developed. Six resilience solutions are specific to Pittsburgh:

- Establish a redundant water supply line
- Reroute overhead distribution pipes and wiring on the Pipe Support System to underground
- Harden overhead distribution pipes and wiring on the Pipe Support System

NETL will review the Solutions Tracking module and incorporate the resilience solutions into NETL's Strategic Facilities Master Plan and capital investment planning to implement the solutions in the projected timeframes in the Solutions Tracking module.

3.3.11 Continuous Release Reporting

There was no continuous release reporting required at the Pittsburgh site in 2022.

3.3.12 Unplanned Releases

There were two unplanned environmental releases at the Pittsburgh site in 2022.

3.3.13 Summary of Environmental Permits

A summary of environmental related permits for the Pittsburgh site is provided in Table 3.3.13.

Table 3.3.13: 2022 Summary of Permits – PGH

Permit No. and Title	Issue Date/ Renewal	Regulatory Agency	Description
0296-OP21 Minor Source Operating Permit	07/07/2021 01/06/2026	Allegheny County Health Department, Air Quality Program	Establishes NETL-PGH as a minor source for particulate matter (PM), particulate matter of 10 microns or less in diameter (PM10), sulfur dioxide (SO2), volatile organic compounds (VOCs), nitrogen oxides (NOX), carbon monoxide (CO) and Hazardous Air Pollutants (HAPs), as defined in section 2101.20 of Article XXI Air Pollution Control of the Allegheny County Health Department, Rules and Regulations.
GF 47497.009 Industrial Sewer Use Permit	12/16/2020, 12/16/2025	Pleasant Hills Authority (PHA)	Establishes permission for the discharge of certain industrial wastewaters for the purposes of treatment by PHA. Includes permit requirements, general provisions, fees, reporting and local limits for certain discharge parameters. Permit was modified on May 26, 2022 to increase the amount of N,N-Dimethylacetamide waste stream that can be discharged to PHA.
PA0025844 NPDES Storm Water Discharge Permit	Responsibility for the NPDES Permit was transferred to CDC/ NIOSH effective October 1, 2015	Pennsylvania Department of Environmental Protection (PADEP)	NPDES permit for the discharge of site stormwater into the public waterways of Pennsylvania (Lick Run). If NETL becomes aware of a stormwater discharge, it must be reported to CDC NISOH and PADEP.
ID: 02-81183 SEQ#: 008A Aboveground Storage Tank Registration Permit/ Certificate	1990s, 10/04/2021 Renewal 10/04/2022	PADEP Bureau of Environmental Cleanup and Brownfields	Permit for above ground storage tank containing ferric chloride at Pittsburgh's wastewater treatment facility (B-74).
ID: 02-81183 SEQ#: 009A Aboveground Storage Tank Registration Permit/ Certificate	1990s, 10/04/2021 Renewal 10/04/2022	PADEP Bureau of Environmental Cleanup and Brownfields	Permit for above ground storage tank containing caustic soda at Pittsburgh's wastewater treatment facility (B-74).
S-1018 Certificate of Fire and Explosion Safety	05/18/2004	Allegheny County Fire Marshal	Approval for the storage and handling of flammable and/or combustible liquids in aboveground storage tank; certificate covers Ethanol Tank and Pump.
S-1102 Certificate of Fire and Explosion Safety	10/06/2006	Allegheny County Fire Marshal	Approval for the storage and handling of flammable and/or combustible liquids in aboveground storage tank; certificate covers one diesel tank and one gasoline tank.

3.3.14 Fire Protection Management and Planning

The Pittsburgh site comprises 57 acres (of the Bruceton Research Center) with 31 acres being forest/fields. The site has a perimeter fence separating it from residential neighborhoods to the north, south, and west. A railroad and stream lie on the east side of the property.

At the NETL-Pittsburgh site, Fire Alarm Control Panels (FACPs) are installed in most of the buildings on site. All FACPs are equipped with Digital Alarm Communication Transmitters (DACTs) that enable the panels to send fire alarm and trouble signals to the B-923 Security Offices for monitoring and response. Each building with a FACP is equipped with alarm and notification devices to alert personnel of a fire. Fire suppression systems are installed in most of the buildings on site to combat and/or extinguish a fire.

While NETL does not have a firefighting program, the site does have an Emergency Response Organization for on-site emergencies The site maintains an emergency phone line reporting system (by dialing ext. 11), which connects the individual reporting a fire to the security office. NETL's response to any fire - facility, project area, vehicle, wildfire, or other, would be to call the local fire department. Voluntary fire extinguisher usage is allowed, but not required. Annual fire drills are conducted, to allow all employees to practice evacuation and accountability protocols. During any hot work or fire protection outages, a trained 'fire watch' person(s) is designated to continuously monitor the area of concern and report any fires.

Pennsylvania's Department of Conservation and Natural Resources identifies danger ratings based on the National Fire Danger Rating System. Typically, Pennsylvania has a low risk for wildfire vulnerability. The main threat of a fire would be incidental fires from an off-site incident, or from equipment use on the property. In addition, illegal or uncontrolled burning (burning leaves, bonfires, etc.), where debris travels into the woods or fields can ignite fires during drought conditions, as well as misuse of fireworks from the surrounding neighborhoods under dry/hot summer conditions. NETL- Pittsburgh has wooded areas that are mowed and trimmed; there is a very low potential of fire from a lawn mowing equipment malfunction.

3.3.15 Recreational Hunting and Fishing

The Pittsburgh Site does not offer the opportunity for the public to entertain recreational hunting and fishing to control wildlife populations in a controlled setting.

3.4 HOUSTON, TEXAS

3.4.1 Site Description

The Houston program office is located at 1011 Highway 6, South, Suite 309, Houston, Texas 77077 (Photo 3.4.1). The office has no laboratory facilities but focuses on extramural research related to oil and gas. Because building and facility operations and maintenance are under the control of the landlord, the Houston office itself must comply with few regulatory requirements. The Houston office does not undertake in-house audits, external audits, or subject matter reviews. Regulatory agencies do not conduct ES&H inspections or investigations of activities. However, regulatory agency inspections (e.g., by the local fire marshal or municipal building inspectors) of the building and facilities could occur, with any subsequent findings assessed against the landlord. Four employees are employed at the Houston location; three are federal employees and one is site support contractor.

Photo 3.4.1: Houston Office.

Building occupants participate in fire drills, which are conducted according to local fire marshal requirements and in cooperation with the building management. Volunteer fire wardens conduct roll call during drills and facilitate orderly evacuations. Tornado drills are announced through a building-wide public address system and are conducted in accordance with OSHA emergency response requirements.

The City of Houston does not impose recycling requirements that would apply directly to office space leases. Nevertheless, building management has a recycling program throughout the office building complex. The landlord has a building-wide recycling plan and procedure for tenant participation.

As of the most recent U.S. Census estimates, there were 2,320,268 people and 848,340 households in the city. The population density was 3,501.5 per square mile.

The median income for a household in the city was $51,140. The per capita income for the city was $31,576. About 20.6% of the population was below the poverty line. The major employers in Houston are Walmart, Memorial Hermann Health System, H-E-B, University of Texas MD Anderson Cancer Center, McDonald's Corp., Houston Methodist, Kroger, United Airlines, Schlumberger, and Shell Oil Co.

3.4.2 Major Site Activities

NETL leases the office space under its own leasing authority. In 2019, the Houston office added three offices, cubicle space and a reception area. No activities were conducted in 2022.

3.4.3 Environmental Restoration and Waste Management

The Houston office had no off-site remediation activities, no on-site Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Amendments and Reauthorization Act (SARA) cleanups, and no spills or leaks from facilities or operations that were ongoing in 2022. No National Priorities List sites which NETL-Houston had liability under CERCLA/SARA exist. No cleanups or surveillance activities for leaks or spills or other activities that would lead to Resource Conservation and Recovery Act (RCRA) cleanups occurred in prior years.

3.4.3.1 NEPA

The Houston office does not conduct National Environmental Policy Act (NEPA) reviews for proposed off-site federal actions. These actions relate to contract awards or grants to other governmental organizations, educational institutions, and private industry.

3.4.3.2 Radiation Protection

This does not apply to the Houston office.

3.4.3.3 Ionizing Radiation Program

No ionizing radiation sources are at Houston.

3.4.3.4 Air Quality and Protection Activities

Because it is strictly a project management office implementing oil and gas programs, Houston has no air quality protection program and no emissions that require monitoring, reporting, or permits.

3.4.3.5 Water Quality and Protection Activities

The sewer use permits and storm water runoff control permits are the responsibility of the building landlord. Houston office activities in 2022 resulted in no unplanned releases, leaks, or spills that would require reporting to governmental agencies.

Potable water supplies are managed by six community public water systems and are tested to verify compliance with Safe Drinking Water Act standards. All testing has been performed by the City of Houston (municipal water authority) in compliance with the Safe Drinking Water Act standards, and the report can be reviewed at City of Houston Water Quality Report 2022.

3.5 MORGANTOWN, WEST VIRGINIA

3.5.1 Site Description

The Morgantown site (Photos 3.5.1a and 3.5.1b) lies within Monongalia County, West Virginia, on the northern end of the city of Morgantown. The location is about 70 miles south of Pittsburgh, Pennsylvania, and about 200 miles west of Washington, DC. Geographically, the Morgantown site sits within the rolling hills of the Appalachian Plateau, about 1,000 feet east of the Monongahela River and about 10 miles west of Chestnut Ridge, the westernmost ridge of the Allegheny Mountains. The site covers approximately 135 acres, 33 of which are developed as industrial use. All surface drainage goes into two small streams that border the site on the east and northeast sides. Land use immediately surrounding the Morgantown site is a combination of residential, commercial, deciduous forest, and pasture.

Photo 3.5.1a: Morgantown Site.

Photo 3.5.1b: B-39 in Morgantown.

The Morgantown site focuses on technologies in scientific and engineering areas creating commercially viable solutions to national energy and environmental problems. The areas include energy conversion devices, simulation -based engineering, in-situ materials characterization, supercomputer infrastructure, and diagnostics, sensors and controls. The work is accomplished through both in-house R&D and externally through funding awarded for specific research. As of December 31, 2022, 498 employees were employed at the Morgantown site; 182 federal employees and 316 site-support contractor employees.

Morgantown's population, per the 20220 U.S. Census estimates, was 30,277 in 11,637 households within the city limits. The racial makeup of the city was 85.7 % White, 5.0 % African American, 3.4 % Asian, 3.6 % Hispanic or Latino of any race, 0.1% Native American, and 4.5 % from two or more races.

The median household income for the Morgantown, West Virginia metro area was $36,991. About 34.1% of the population was below the poverty line. Major employers within the Morgantown area according to the Morgantown Area Partnership were West Virginia University, WVU Medicine, Monongalia County Board of Education, Monongalia General Hospital, National Energy Technology Laboratory, U.S. Centers for Disease Control, and TeleTech.

3.5.2 Major Site Activities – Morgantown

3.5.2.1 Computational Science and Engineering (CSE) Design/Building 7 Demolition

Design work continued for the new Computational Science and Engineering (CSE) building that will include a new datacenter to house the next iteration of the JOULE supercomputer. In addition, the CSE will also include visualization space to provide NETL researchers and other partners or affiliates access to advanced audio/visual systems including virtual and augmented reality systems to aid in research applications. In preparation for the construction of the CSE, the nearly 70-year-old Security building was completely demolished leaving a leveled area in which the future CSE will be sited.

Photo 3.5.2.1a.

Photo 3.5.2.1b.

3.5.2.2 Physical Access Control System Update

NETL utilizes the CCure 9000 platform for physical card access control for the Albany, Morgantown, and Pittsburgh sites. This project upgraded the CCure platform software version from v2.5 to v3.0 which introduced enhanced system features and security. It also helps NETL keep current with the latest supported version from the manufacturer for any future troubleshooting issues. In addition, the HID PIV Check software licenses were updated to ensure functionality with the newest software version so that HSPD-12 badges are capable of being imported and registered with the card access system.

Photo 3.5.2.2a: Access Control Card Reader.

Photo 3.5.2.2b: Access Control Work Station.

3.5.2.3 Security Relocation and Security Facility Design

As part of the larger Computational Science and Engineering (CSE) project, the primary Security office was relocated to Building 39 to allow Building 7 to be demolished. While the Security moves and Building 7 demolition occurred, design work to build a new dedicated security building was underway. The design intended the Security program to benefit from having a purpose built 2,400 square foot facility that will feature a hardened structure control room, training room, and emergency power to keep the security center operational in challenging conditions.

Photo 3.5.2.3a: B-7 Previous Security Building Demolition in Process.

Photo 3.5.2.3b: Site of Future Morgantown Security Building.

3.5.2.4 Building 13 Exterior and Roof Design

The design package for the renovation of Building 13 was completed. The package included specifications and drawings to remove and replace the existing metal siding and roofing and install new fall protection anchors on the roof.

Photo 3.5.2.4a.

Photo 3.5.2.4b.

3.5.2.5 Retention Pond Drain System Design

A design package for the removal and replacement of the overflow and drain system for the retention pond was completed. A sinkhole had formed on/near the roadway adjacent to the retention pond that leads to the First Energy substation entrance that was caused by a damaged and blocked overflow and drain from the pond. The design package involved dewatering and dredging the pond to allow for excavation to the standpipe and connected drainpipe for their removal and replacement.

Photo 3.5.2.5.

3.5.3 Environmental Restoration and Waste Management

3.5.3.1 CERCLA

NETL-Morgantown had no National Priorities List (NPL) sites in 2022 and has never been proposed as an NPL site. Furthermore, NETL-Morgantown has never been on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list or the West Virginia Hazardous Waste Site list (state equivalent of CERCLIS). There were no reportable releases in 2022.

3.5.3.2 SARA Title III/Emergency Planning and Community Right-to-Know Act

Superfund Amendments and Reauthorization Act (SARA) Title III requires the reporting of hazardous chemicals that were present at a facility and exceeded certain established quantities during the preceding year. This includes gaseous, liquid and solid chemicals designated as extremely hazardous substances in amounts greater than or equal to 500 pounds, liquids in amounts greater than or equal to 55 gallons or amounts greater than or equal to the Threshold Planning Quantity (TPQ). SARA Title III also requires reporting of all other hazardous chemicals present at the facility during the preceding calendar year in amounts equal to or greater than 10,000 pounds.

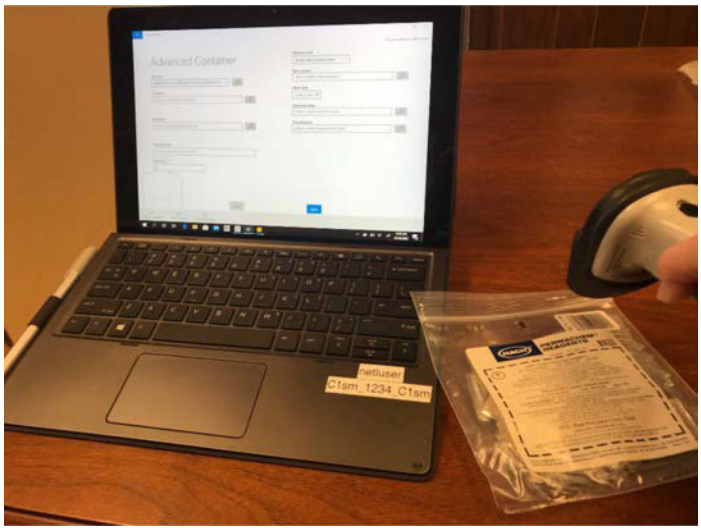

Photo 3.5.3.2: Bar Code Scanning of Chemicals.

NETL has established targets for reducing the accumulation of hazardous chemicals on site. The intent of these targets is to avoid the unnecessary accumulation of potentially hazardous chemicals in the laboratories, while maintaining sufficient chemical stores to complete mission-related research.

To meet these goals and meet regulatory requirements, NETL maintains an active inventory of all hazardous and extremely hazardous chemicals on site, along with the Safety Data Sheets (SDS) for each substance with its Environmental Management System (EMS) (see Figure 3.5.3.2).

Figure 3.5.3.2: NETL Environmental Management System (EMS) Home Page.

NETL-Morgantown submits Tier II Emergency and Hazardous Chemical Inventory information by March 1 of each year. Section 312 of SARA Title III requires NETL-Morgantown to provide copies of the information to the following: West Virginia State Emergency Response Commission, the Monongalia Emergency Centralized Communications Agency (MECCA911) and the Morgantown Fire Department. MECCA911 receives the data in its role as the Local Emergency Planning Committee and for the Morgantown Fire Department.

NETL-Morgantown does not prepare a Toxic Release Inventory Form R (TRI Form R) because the site does not use, produce or process any of the listed toxic materials in quantities that exceed the threshold amounts. In 2022, no releases occurred that would have triggered emergency notification as required by either the Emergency Planning and Community Right-to-Know Act (EPCRA) or CERCLA.

3.5.3.3 RCRA

NETL-Morgantown generates RCRA hazardous wastes from research activities, site operations, construction, etc., and therefore must comply with Title 40 CFR parts 260 through 273. In addition, NETL accumulates hazardous waste on site, and therefore, must comply with applicable requirements of 40 CFR 124, 264 through 267, and 270, as well as Section 3010 of RCRA. The Morgantown site is designated as a Large Quantity Generator (EPA ID #: WV7890031886) under the jurisdiction of the West Virginia Department of Environmental Protection (WVDEP).

NETL-Morgantown does not have an on-site program to treat hazardous waste or render it harmless; however, NETL did recycle some universal wastes. In 2022, NETL recycled batteries, fluorescent light bulbs (Photo 3.5.3.3), and various items containing mercury.

Photo 3.5.3.3: Morgantown Fluorescent Light Bulbs.

NETL-Morgantown had no RCRA non-compliances in 2022. (See Table 3.5.3.3: 2022 Hazardous Waste Generation – Morgantown for a summary of RCRA Hazardous Waste generated in 2022 in Morgantown.) Hazardous waste generated at the Morgantown site was managed by trained personnel from NETL's Hazardous Waste Program and was transported to the TSD facilities of Tradebe, Inc., located in East Chicago, IN, for ultimate disposition in accordance with regulatory requirements.

Table 3.5.3.3: 2022 Hazardous Waste Generation – Morgantown	
Waste Stream	**Qty. Generated (lbs.)**
Poison (Toxic Solids & Liquids)	13
Mercury/Mercury Compounds	20
Flammable Solids	409
Corrosive (Liquids & Solids)	137
Waste Oxidizers	15
Waste Paint (Oil Based)	243
Flammable/Combustible Liquids	601
Activated Carbon	0
Fluorescent Light Tubes (Universal Waste)	198
Batteries (Universal Waste)	1180
TOTAL	2.816

Additionally, Morgantown's management of SAAs complied with all requirements specified in 40 CFR 262.15. As a large quantity generator, Morgantown met the Preparedness, Prevention and Emergency Procedures in 40 CFR 262, Subpart M—Preparedness, Prevention, and Emergency Procedures for Large Quantity Generators. A determination was made as to when SAAs were appropriate. SAAs were identified, tracked/inventoried, and a servicing schedule (collection and transportation of wastes) for each SAA was established. The identified SAAs were labeled "Satellite Accumulation Area – Hazardous Waste". Waste generators were responsible for maintaining the SAAs and ensuring all generated hazardous waste was properly contained, stored, and identified. NETL's RPs of any project/ operation generating waste ensured compliance for all team members.

The Hazardous Waste Manager was responsible for the appropriate management of all waste at the Central Accumulation Facility prior to and during the time of pickup by the certified contracted transporter. This included ensuring all required documentation (i.e., profiles, testing documentation) was accurate, proper labeling appeared on each container, and the handling and transport of all regulated waste was accomplished in compliance with applicable DOE/ NETL polies and all other applicable regulations.

Morgantown accumulated its regulated waste in Building 33, the facility's Central Accumulation Area. Extra spill protection and containment in Building 33 was provided by an epoxy coating on the concrete floor, which drains to fully contained sumps. The building was constructed with blast abatement and spill containment features to minimize the potential risks of spark-induced ignition and the spread of contaminants in the event of an explosion or leak. Each waste class was stored in a separate room to minimize the chance that a leaked material could contact an incompatible substance and cause a reaction.

The Hazardous Waste Manager ensured weekly inspections of the building and its operations were performed and records were kept. All NETL employees take general computer-based awareness training; employees who generate hazardous waste take additional training for compliance with all applicable regulations and DOE/NETL policies. RCRA-required worker training was mandatory for all technicians who collect and handle hazardous waste.

The WVDEP Office of Environmental Enforcement conducted an inspection in 2021 (**no inspection was conducted in 2022)** and discovered no deficiencies or findings.

3.5.3.4 Federal Facilities Compliance Act (FFCA)

There were no issues related to the Federal Facilities Compliance Act for the Morgantown site in 2022.

3.5.3.5 NEPA

See section 2.1.2 National Environmental Policy Act (NEPA) for information on any NEPA requirements related to the Morgantown site in 2022.

3.5.3.6 TSCA

NETL-Morgantown does not manufacture chemicals and is not subject to sections of the Toxic Substance Control Act (TSCA) related to manufacturing. No spills or releases of substances regulated by the Toxic Substances Control Act (TSCA) of 1976 (with amendments, et. seq.) – including pesticides, polychlorinated biphenyls (PCBs), formaldehyde, methylene chloride, asbestos, etc. – were reported in 2022 at the Morgantown site. TSCA waste generated during 2022 included asbestos, lead-based paint, and assumed microbial growth which was disposed of in accordance with Federal, state and local requirements.

No unplanned releases of air pollutants covered by CERCLA or toxic release inventory (TRI) regulations occurred during 2022. Asbestiform fiber concentration air monitoring is conducted annually in Buildings 1, 2, 3, and 4 because asbestos-containing building materials were used in the construction of these facilities. All known friable asbestos-containing material (ACM) has either been removed or encapsulated. Non-friable asbestos present at the NETL-Morgantown site is inventoried and maintained. No samples taken in 2022 indicated that the materials contained fiber concentrations in excess of EPA or the State of West Virginia clearance levels (0.01 fibers/cc). Asbestos engineering drawings based on the Morgantown site inventory continue to be maintained and updated.

Evaluations, tests, and sample collection shall be conducted by an accredited WV licensed Asbestos Building Inspector (ABI) or by a Certified Industrial Hygienist (CIH). Analysis of bulk asbestos-containing material (ACM) or presumed ACM is be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP), or the National Institute for Standards and Technology (NIST), or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally recognized round robin testing program.

When asbestos is removed as part of any remodeling or reworking in a room, building or facility, it is handled by a licensed Asbestos Abatement/Removal Contractor (AA/RC) and adhere to OSHA 29 CFR 1910.1001 (Asbestos-General Industry), OSHA 29 CFR 1926.1101 (Asbestos-Construction), OSHA Instruction CPL 2-2.40, 40 CFR 61 (Subpart M, NESHAPs), and applicable state regulations (WV Code § 16-32, WV 33 CSR 1, WV 64 CSR 51, and WV CSR 63).

There was one (1) project that required a 10-day asbestos notification permit in 2022. In the B-7 Demolition Project, approximately 5,900 square feet of asbestos transite panels, floor tile, and caulking were removed and properly disposed of under WV DHHR Permit #22-02.

Seven asbestos sampling events were conducted in 2022 related to operation/maintenance activities (none related to construction projects). Samples were collected by a licensed ABI.

Additionally, NETL tests for lead paint before demolition, renovation, and maintenance projects or through the elimination of materials by excess property or recycling. Twenty-four (24) lead-based paint sampling events were conducted in 2022 related to operation/maintenance activities (none related to construction projects). The paint renovation work for the positive samples was conducted in accordance with OSHA 29 CFR 1910.1025, Lead (General Industry) and OSHA 29 CFR 1926.62, Lead (Construction).

In February 2022, B-17 Radon Monitoring & Testing were conducted in the following locations: Basement (Room 21 & East side), Ground Floor (Room G02A – control sample), and 1st Floor (South and North). The analytical method utilized was EPA-402-R-2-004. The US EPA and the Surgeon General strongly recommend acting when sample results are equal and greater than 4pCi/L of Radon. All samples were found below the 4pCi/L.

In April-June 2022, a remediation was conducted for Assumed Microbial Growth (AMG) of the B-2 Library (conducted by Panhandle Cleaning & Restoration of Morgantown/DKI of Wheeling, License #: 014743)). Locations of remediation include:

- Various locations in the Main Library
- Several areas in the B-2 Mechanical Room
- Several areas in B-2 Rooms 32, 33, and 34.

The remediation scope was based upon industry protocols as detailed in the IICRC/ANSI S-520 (Professional Standards and Protocols for Mold Remediation) and S-500 (Professional Standards and Protocols for Water Damage Restoration).

In August 2022, preventive maintenance was also conducted on the Exterior of B-5 for fallen lead-based paint chips. The impacted areas were cleaned, and any wastes generated were properly disposed of.

3.5.3.7 FIFRA

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is a United States federal law that set up the basic U.S. system of pesticide regulation to protect applicators, consumers, and the environment. No restricted-use pesticides, herbicides or defoliants, as regulated by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), were kept on site. Only general-use pesticides were kept and used for routine insect control. Professional pest control companies are subcontracted under the site support contract to spray around the base of office trailers and outside of certain buildings (for example, B-1). Herbicides are not used for weed control, except for extremely limited cases. No defoliants are used.

3.5.4 Radiation Protection Program

The radiation safety officer maintains an inventory of on-site radiation sources, tracking each item, isotope(s), quantity, custodian, location, status and activity. Table 3.5.4a lists the 2022 source inventory at Morgantown. Table 3.5.4b contains the 2022 radiation generating devices.

Table 3.5.4a: 2022 Radioactive Source Materials Inventory—Morgantown		
Isotope	**Activity/Date Determined**	**Source**
Cs-137	10 mCi (3/10)	Registration #0190/10, Geotek, Ltd (Part of Multi-sensor Core Logger in PAN 0569)
Cs-137*	1 µCi (1/14)	Serial #206, Spectrum Techniques
Cs-137*	1 µCi	Serial # 528, Spectrum Techniques

* Exempt quantity per 10 CFR 835 Appendix E: No known radiation hazard

Table 3.5.4b: 2022 Morgantown's Radiation Generating Devices	
Device	**Quantity**
X-ray photoelectron spectroscopy (Monchromator/Dual Anode X-ray Source)	2
X-Ray Diffractometer - PANalytical (X'Pert Pro)	2
Astrophysics (Mailroom X-Ray Instrument)	1
Toshiba Aquillion - CT Scanner. Model TSX-101A. SN: 1AA1312101. (Medical CT Scanner)	1
Micro CT Scanner, DynaTOM. Tescan.	1
Industrial CT Scanner (Comet X-Ray Tube) M5000 Industrial. North Star Imaging.	1
400 xCT Micro CT Scanner, Xradia	1
Olympus Innov-X-Delta XRF	1
Vanta XRF M Series Model VMR-CCC-G3U	1
PANalytical XRF. Axios.	1
Yxlon International MGC 441	1
Apreo 2 C LoVac Electron Microscope. Thermo-Fisher.	1

The Morgantown site did not release any of the radiation source materials into the environment, because all source materials are sealed from release or discharge. Four radiation source materials were sent from the Morgantown site to disposal facilities. During 2022, one low-level radioactive waste (LLRW) disposal activity occurred, which consisted of the disposal of four tritium exit sings.

Radiation monitoring performed at Morgantown consisted of whole-body thermoluminescent dosimeters and finger rings for the employees in the mail facility (mail and packages are scanned via X-ray upon receipt), and as identified in appropriate R&D Safety Analysis and Review System (SARS) packages. In addition, specific radiological control areas have dosimeter badges continually displayed. All radiation-generating devices are surveyed for possible leakage on an annual basis.

The cumulative annual dose for all personnel performing all operations at the Morgantown site during 2022 was less than 100 millirem (roentgen equivalent man, <1 millisievert), with an average annual dose of less than 10 millirem (<0.1 millisievert) per person working in the radiation monitoring program.

Table 3.5.4c MGN 2022 Annual Exposure Rate

Exposure Range (mrem)	Count	TED
No measurable exposure	25	0
Measurable < 100	0	0
100 - 250	0	0
250 -500	0	0
500 - 750	0	0
750 - 1000	0	0
1000 - 2000	0	0
2000 - 3000	0	0
3000 - 4000	0	0
4000 - 5000	0	0
5000 - 6000	0	0
6000 - 7000	0	0
7000 - 8000	0	0
8000 - 9000	0	0
9000 - 10000	0	0
10000 - 11000	0	0
11000 - 12000	0	0
>= 12000	0	0
Number with Measurable TED:	0	N/A
Total Monitored:	25	N/A
Total Collective TED (mrem):	0	0
Total CED:	N/A	0
Total CEqD:		933
Num Individuals with Uptake:	0	
Validation Status Errors:	0	N/A
Warnings:	0	N/A

* TED= Total Effective Dose
CED= Committed Effective Dose
CeqD= Committed Equivalent Dose

This table is from the REMS data summary report that is provide by Oak Ridge Institute for Science and Education

3.5.4.1 DOE Order 458.1, Radiation Protection of the Public and Environment

Additional information may be found in Section 2.2, DOE Internal Environmental and Radiation Protection Orders, and Section 2.3, Atomic Energy Act of 1954. In accordance with "as low as is reasonably achievable" (ALARA) principles, NETL manages an appropriate radiation protection program for protection of the public and the environment from radiation hazards since radiation sources are low-level, sealed instrumentation sources, radiation generating devices (RGDs), or processes that include naturally occurring radioactive materials (NORM) or technologically enhanced naturally occurring radioactive materials (TE-NORM) with minimal radiation levels.

3.5.4.2 DOE Order 435.1, Radioactive Waste Management

Use of radioactive materials at NETL Morgantown is limited to research instrumentation and geologic samples that have been identified as NORM via surveys. The 2022 source inventory is displayed in Table 3.5.4a. NETL-Morgantown does not generate or treat any radioactive material, nor does it have any temporary or permanent facility for radioactive waste disposal on-site. The radiation safety officer maintains and monitors an inventory of radiation sources. Information is retained about the item, isotope, quantity, custodian, location, status and sealed-source activity. All radioactive sources are sealed and are used in instrumentation/ equipment or as check sources.

X-ray generating devices are used for analytical applications at the Morgantown site, such as scanning and transmission electron microscopes, X-ray diffraction and fluorescence instruments, and particle-size analyzers. These devices are examined semi-annually for leaks and safety interlocks/ controls to ensure employee safety.

No radiation leakage, release, or abnormal exposure events occurred in 2022.

3.5.5 Air Quality and Protection Activities

3.5.5.1 Clean Air Act

The Ambient Air Quality Program is one of NETL's environmental protection programs. Significant requirements and responsibilities of this program are listed in Procedure 436.1-03.01, *NETL Ambient Air Quality Management*. Under this program, NETL's Federal Air Quality Manager (FAQM) ensures compliance with all federal (The Clean Air Act, including the National Emission Standards for Hazardous Air Pollutants [NESHAP]), state, and local regulations, as well as, all DOE/ NETL policies.

The FAQM also oversees monitoring programs, permitting, and reporting. Air emissions data for the site is calculated and maintained to ensure compliance with regulatory requirements. To maintain quality control, NETL subcontracts analytical work only to certified laboratories. These laboratories must submit their Quality Assurance/Quality Control (QA/QC) manuals to NETL for review. NETL submits quality control samples (duplicates, blanks, and spikes) to the laboratories to verify the quality of the analyses.

The West Virginia Division of Air Quality's (WVDAQ) Permitting Section implements West Virginia's permit program established under the State's Air Pollution Control Act. West Virginia's permit program includes review of applications, determination of permit applicability and issuance of permits for both minor and major sources. Per the WVDAQ definitions, a *source or stationary source* is defined as any governmental, institutional, commercial or industrial structure, installation, plant, building or facility that emits or has the potential to emit any regulated air pollutant under the Clean Air Act. Per WVDAQ, NETL-MGN's operations (laboratory facilities

associated with R&D activities) fall under 45CSR13. Specifically, 45CSR13B, *The Permitting of Laboratories Under 45CSR13*, provides guidance and clarification regarding any necessary permitting for construction and operation of stationary sources of air pollutants from laboratory facilities. During 2022, the Morgantown site completed a permit determination form for the installation of an emergency backup generator for Building 2. The WVDAQ determined that a permit was not needed for this activity.

WVDAQ generally evaluates air quality on a county-by-county basis, although the regional data may be aggregated into Air Quality Control Region #6, for north central West Virginia. Monitoring is performed in Monongalia County daily at several sites, and the data is made available from the WVDEP website's air-quality index and from the EPA AirNOW webpage. Although, the Morgantown site is not a significant contributor to ambient air quality issues, air emissions are estimated quarterly and in annual air emission inventories to analyze the cumulative effect of all the projects and facilities. This analysis showed that no regulatory or other environmental impact occurred during 2022. Table 3.5.5.1 displays the estimated 2022 air emissions.

Table 3.5.5.1: 2022 Air Emissions Inventory – Morgantown

Pollutant	Estimated Emissions (lbs. /yr.)
Aldehydes	0.00552
Benzene	0.00011266
Carbon Dioxide	59628.525
Carbon Monoxide	281.9069
Chlorine	0.00015
Ethylbenzene	0.00007783
Formaldehyde	0.1247
Nitrogen Oxide	80.9508
Particulate Matter (PM), Condensable	3.6645
Particulate Matter, Filterable	2.9955
Particulate Matter, Total	6.4465
Particulate Matter, PM10, Filterable	0.045
Particulate Matter, Total	0.0264
Sulfur Dioxide	0.3984
Sulfur Oxides	4.0674
Toluene	0.00371266
TOC	3.3605
VOC	6.313102
Xylene, Mixed Isomers	0.00043

3.5.5.2 National Emission Standards for Hazardous Air Pollutants

The National Emission Standards for Hazardous Air Pollutants (NESHAP) are air pollution standards issued by the United States Environmental Protection Agency (EPA). The standards, authorized by the Clean Air Act, are for pollutants not covered by the National Ambient Air Quality Standards (NAAQS) that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. There were no issues in 2022 regarding compliance with NESHAP at Morgantown.

NETL actively participates in a program to reduce the use of Class I ozone depleting substances (ODS). This goal of the program is to recover and reclaim chlorofluorocarbon refrigerants from HVAC equipment for subsequent reuse and recycle. In recent years, the inventory of ODS-containing equipment has been steadily decreasing at the Morgantown site. Older ODS-containing equipment is being replaced and the use of Class I ODSs is being phased out from the HVAC equipment and replaced with environmentally friendly substitutes.

3.5.5.3 Hydrofluorocarbon (HFC) Phasedown

The American Innovation and Manufacturing (AIM) Act of 2020 was enacted on December 27, 2020. The AIM Act provides new authority to address HFCs and directs EPA to: (1) phase down the production and consumption of listed HFCs through an allowance allocation and trading program, (2) manage these HFCs and their substitutes to maximize reclamation and minimize releases to the atmosphere from equipment, and (3) facilitate the transition to next-generation technologies through sector-based restrictions. Below is a table that shows a list of all HFCs on the phaseout list at the Morgantown site. Plans to address how deal with the phaseout are underway. There were no issues in 2022 regarding compliance with HFC phasedown at Morgantown.

Table 3.5.5.3: 2022 MGN HFC Phaseout Inventory Summary

(All values in Pounds)

Refrigerant	Amount in Equipment Dec. 31, 2021	Amount in Equipment Dec. 31, 2022	Amount in Storage Dec. 31, 2021	Amount in Storage Dec. 31, 2022	Amount purchased in 2022	Amount Removed from equipment in 2022	Leaks in 2022
R134A-HFC	985.28	985.28	181.40	181.40	0	0	0
R23	2	2	0	0	0	0	0
R125-HFS	39.44	39.44	0	0	0	0	0

3.5.5.4 Meteorological Tower Data

The Morgantown site maintains two small meteorological towers. One is located on the roof of Building 39 (Photo 3.5.5.4a) and the other is on the roof of Building 19 (Photo 3.5.5.4b). The Building 39 station monitors wind speed and direction, as well as air temperature. The data is collected every second, averaged over 15 minutes, and over 24 hours to provide critical meteorological information to the Emergency Response Organization (ERO) during emergency situations, to assist in employee heat stress data, and to provide meteorological information used in the models for the Air Emissions Program. The data collected at the Building 19 location includes air temperature, wind speed and direction, relative humidity, and total rainfall.

Photo 3.5.5.4a: B-39 Meteorological Tower.

Photo 3.5.5.4b: B-19 Rain Gauge.

3.5.6 Water Quality and Protection Activities

NETL engages in water quality and protection activities to: (1) maintain full compliance with all applicable federal, state, and local requirements; (2) prevent spills of potential pollutants into the environment; and (3) ensure the safety and protection of employees, the public, and the environment. These activities include management of surface water, industrial process water and groundwater/soil. There were no water quality issues at the Morgantown Site during 2022. More details are provided in the following subsections.

3.5.6.1 Clean Water Act

National Pollutant Discharge Elimination System (NPDES) Permit

Morgantown's Surface Water Quality Program is managed per NETL Manual 436.1-03.03, *Surface Water Quality Management*. The manual covers permitting and monitoring for storm water sewers and for construction-related disturbances that have the potential of increasing sediment loads in streams. It also includes spill prevention, hazardous waste control and emergency actions, which are addressed specifically in other procedures.

The Clean Water Act, and corresponding state water quality regulations, require facilities generating point-source discharges, or facilities or areas discharging storm water associated with industrial activities, to obtain a National Pollutant Discharge Elimination System (NPDES) permit. The WVDEP has primacy over its NPDES permitting program. NETL Morgantown (Registration No. WVG610042) is authorized to operate under WV/NPDES General Water Pollution Control Permit No. WV0111457 and subject to the provisions of Section W-1 of the General Permit.

Under the existing permit, the site is required to test their effluent quarterly to verify permit compliance; the test results are submitted to the WVDEP per the site's NPDES Permit. The Permit also requires that Storm Water Pollution Prevention Plan (SWPPP) be developed and maintained to prevent or minimize potential storm water contamination.

Morgantown has four major outfall locations (Outfall 002, 003, 005, and 010). Three of the outfalls are required to be monitored under the current permit (002, 005, and 010). Outfall 003 is not.

Outfall 002 drains stormwater from a 616,000 square foot area that contains most of the site's office buildings, research facilities, and storage areas.

- Outfall 003 receives drainage from a 42,000 square foot area that is approximately 65% impervious with the remainder consisting of the vegetated hillside next to B-17.
- Outfall 005 drains a 229,000 square foot area that includes B-19 (warehouse and machine shop), the parking lot behind B-33, and various research facilities.
- Outfall 010 drains a 3.8 million square foot area that includes four facilities, B-39 (offices), B-40 (childcare facility) and B-43 (guard shack and roof at main entrance) parking areas, offices, and a large section of undeveloped land.

The effluents from these outfalls are sampled quarterly for basic pollutants that can indicate contamination from site applications of fertilizer or leaking sewer lines (see Table 3.5.6.1a). This table displays information that is contained in the Discharge Monitoring Report (DMR) reporting form. The monitoring results are presented in Table 3.5.6.1b. If a spill were to occur, emergency response procedures would be activated immediately, and the appropriate outfalls would be monitored, as necessary, for the contaminants of concern. The permit does not have reporting limits, it utilizes benchmark monitoring concentrations, and only requires NETL to report the monitoring results. If the benchmark concentrations are exceeded additional monitoring will be required along with the review and update of the SWPPP. NETL satisfied the requirements of the permit. No permit issues were identified in 2022. (Note: WVDEP issued the latest Multi-Sector Stormwater General Permit (MSGP) for the Morgantown Site on February 25, 2021, expiring on September 12, 2024.)

Table 3.5.6.1a: 2022 NPDES Permit Storm Water Monitoring Requirements — Morgantown			
Outfall	**Pollutants of Concern**	**DMR Limits**	**Frequency**
	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months
005	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months
010	Fecal Coliform	Report Only	6 Months
	BOD	Report Only	6 Months
	COD	Report Only	6 Months
	TSS	Report Only	6 Months
	pH	Report Only	6 Months
	Total Nitrite plus Nitrate	Report Only	6 Months
	Total Ammonia Nitrogen	Report Only	6 Months
	Oil and Grease	Report Only	6 Months

BOD = Biological Oxygen Demand; COD = Chemical Oxygen Demand; TSS = total suspended solids

Table 3.5.6.1b: 2022 NPDES Storm Water Analysis Results — Morgantown												
Constituents	Outfall 002				Outfall 005				Outfall 010			
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Total Nitrite plus Nitrate (Grab)	.52 mg/L	1.27 mg/L	.63 mg/L	< 0.66 mg/L	.54 mg/L	.70 mg/L	1.07 mg/L	< 0.41 mg/L	0.75 mg/L	0.67 mg/L	0.53 mg/L	< 0.62 mg/L
Total Ammonia Nitrogen (Grab)	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L	< 0.6 mg/L
Fecal Coliform (Grab)	53.8 Cfu/ 100ml	770.1 Cfu/ 100ml	>2419.6 Cfu/ 100ml	980 Cfu/ 100ml	< 1.0 Cfu/100ml	16.0 Cfu/ 100ml	1299.7 Cfu/ 100ml	9.6 Cfu/ 100ml	98.7 Cfu/ 100ml	2419.6 Cfu/ 100ml	>2419.6 Cfu/ 100ml	4.1 Cfu/ 100ml
TSS (Grab)	38 mg/L	7 mg/L	19 mg/L	11 mg/L	10 mg/L	5 mg/L	23 mg/L	18 mg/L	10 mg/L	< 4.0 mg/L	328 mg/L	11 mg/L
BOD	< 2.0mg/L	3.8 mg/L	4.0 mg/L	< 2.0mg/L	< 2.0mg/L	4.8 mg/L	3.3 mg/L	< 2.0mg/L	< 2.0mg/L	< 2.0mg/L	4.3 mg/L	< 2.0mg/L
pH	8.4	7.41	7.80	7.71	7.7	7.78	7.77	7.93	8.2	7.74	7.72	7.73
COD	75.6 mg/L	23.1 mg/L	< 10.0 mg/L	20.9 mg/L	27 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	< 10.0 mg/L	27.4 mg/L	< 10.0 mg/L
Oil and Grease	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L	< 3.0 mg/L

ND = not detected; NS = not sampled; NR = not reported; TSS = total suspended solids

Table 3.5.6.1c: 2022 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Qtr. — Morgantown					
Parameter	**Limit**	**1st Qtr.**	**2nd Qtr.**	**3rd Qtr.**	**4th Qtr.**
Flow (MGD) Monthly Avg. Daily Max.	 0.09 0.15	 0.006 0.02	 0.004 0.025	 0.01 0.036	 0.005 0.015
BOD5 Monthly Avg. Daily Max.	 Monitor Monitor	 ND ND	 ND ND	 ND ND	 ND ND
TSS Monthly Avg. Daily Max.	 Monitor Monitor	 0.15 0.5	 0.1 0.65	 0.48 1.74	 0.13 0.39
Arsenic Monthly Avg. Daily Max.	 0.005 0.008	 < 0.00005 < 0.0002	 < 0.00003 < 0.0002	 < 0.00008 < 0.0003	 < 0.00004 < 0.0001
Cadmium Monthly Avg. Daily Max.	 Monitor Monitor	 ND ND	 ND ND	 ND ND	 ND ND
Chromium Monthly Avg. Daily Max.	 0.007 0.011	 ND ND	 ND ND	 ND ND	 ND ND
Copper Monthly Avg. Daily Max.	 0.04 0.06	 0.0007 0.002	 0.0004 0.002	 0.00008 0.003	 0.0006 0.002
Cyanide Monthly Avg. Daily Max.	 0.02 0.03	 ND ND	 ND ND	 ND ND	 ND ND
Lead Monthly Avg. Daily Max.	 0.025 0.038	 < 0.00001 < 0.0002	 < 0.00001 < 0.0002	 ND ND	 < 0.00001 < 0.0001
Mercury Monthly Avg. Daily Max.	 0.0006 0.0009	 ND ND	 < 0.00001 < 0.00004	 ND ND	 ND ND
Nickel Monthly Avg. Daily Max.	 Monitor Monitor	 0.00006 0.0002	 0.00005 0.0003	 < 0.00010 < 0.0004	 < 0.00005 < 0.0002
Silver Monthly Avg. Daily Max.	 0.011 0.017	 ND ND	 ND ND	 ND ND	 ND ND
Zinc Monthly Avg. Daily Max.	 0.1 0.15	 0.0008 0.003	 0.0002 0.00015	 0.0008 0.003	 0.0004 0.001
Iron Monthly Avg. Daily Max.	 Monitor Monitor	 0.014 0.05	 0.007 0.04	 0.011 0.04	 0.01 0.03
Manganese Monthly Avg. Daily Max.	 Monitor Monitor	 0.007 0.02	 0.005 0.03	 0.01 0.04	 0.004 0.01

Table 3.5.6.1c: 2022 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Qtr. — Morgantown					
Parameter	**Limit**	**1st Qtr.**	**2nd Qtr.**	**3rd Qtr.**	**4th Qtr.**
TOX Monthly Avg. Daily Max.	 Monitor Monitor	 0.003 0.01	 0.002 0.01	 0.007 0.02	 0.004 0.01
Organics Alachlor- 1254 All others	 Report Report	 0 0	 0 0	 0 0	 0 0
pH (s.u.) Minimum Maximum	 6 9	 6.77 8.05	 6.43 7.94	 6.51 8.08	 6.85 8.01
TDS Monthly Avg. Daily Max.	 Monitor Monitor	 80.1 267	 22 137.7	 33.4 120.2	 15.9 47.6

MGD = millions of gallons per day; NS = not sampled; ND = not detected; TSS = total suspended solids; BOD5 = biological oxygen demand for 5-day period; s.u. = standard units; TDS = total dissolved solids

Potential sources of spills of petroleum products and oils are aboveground storage tanks, oil-filled transformers and switches and 55-gallon drums stored at several locations (B-5, B-19 and B-36). Five aboveground storage tanks contain petroleum products (diesel fuel and gasoline), and one contains ethanol. All storage tanks are compliance with West Virginia's Aboveground Storage Tank regulations, and all have appropriate spill control. Two of the aboveground storage tanks are located inside the area drained by Outfall 002. One storage tank is in the drainage area of Outfall 005, and the remaining two are in the drainage area of Outfall 010. The site has 28 oil-filled transformers, all of which have been tested for polychlorinated biphenyls (PCBs). No buried, or partially buried, storage tanks exist at the Morgantown site.

An oil-water separator, Photo 3.5.6.1a, is installed inside the runoff collection system of the parking garage, but no other treatment systems are installed for storm water at the Morgantown site. Based on previous test results, the primary concern with surface water has been sediment loading. Sediment loading of surface water runoff affects Burroughs Run along the southeastern margin of the site, West Run along the northeastern margin of the site, and a small stream that traverses the northern portion of the site and empties into West Run. West Run is highly acidic from mine drainage located on the upper reaches of the drainage basin, and suburban development is increasing within the basin. Burroughs Run drains an area of significant urban and suburban development, which contributes typical urban/suburban pollution (e.g., oil, salt, pesticides, and herbicides).

Photo 3.5.6.1a: Morgantown Parking Lot Oil-Water Separator.

Protection of surface water and groundwater requires the prevention of leaks from storage tanks. Accordingly, NETL is compliant with the WVDEP's Above Ground Storage Tank Regulations. In addition, per NETL Manual 436.1-03.03, *Surface Water Quality Management*, and as required by the NPDES storm water permit, this program maintains written Spill Prevention, Control, and Countermeasures Plan (SPCC) for each site and a written operation and maintenance plan for each individual storage tank system. Each system capable of contributing to fires, explosions, emissions, or spills of hazardous materials must have a written operating plan addressing emergency prevention and actions to be taken should an emergency occur.

Aboveground storage tanks are visually inspected on a weekly basis and have their interstitial cavity checked each quarter. Visible leaks are corrected immediately. Though no visible leaks have been observed, the interstitial space of the B-36 gasoline AST has tested above the LEL, in 2022. This has been reported to DOE management. The area around the AST is currently diked and is inspected daily. The diked area around the AST is drained of rainwater only once it has been inspected to assure that there is no evidence (sheen, smell, discoloration, etc.) of petroleum products in the rainwater.

Oil-filled transformers are visually inspected daily. If leaked materials are observed, it is collected or absorbed with spill kits and disposed of per applicable regulations.

Industrial Wastewater Program

Industrial wastewater quality is managed per NETL Manual 436.1-02.04, *Industrial Wastewater System Management Program*, which is administered by the Industrial Wastewater Quality Program Manager. Industrial wastewater is conveyed from Morgantown's facility floor drains, equipment condensate lines, and laboratory sinks to the Clarifier (Photo 3.5.6.1b) and associated processes/equipment for sediment removal and pH adjustment. The site's Industrial Waste Discharge Permit (MUB 012), issued by the local utility, Morgantown Utility Board (MUB), allows for the operation and maintenance of a 16-foot diameter Lakeside Equipment Company Spirotlo Clarifier, a batch pH treatment system with a 2,632-gallon equalization lank and two 2,500-gallon neutralization tanks, a 12 x 16-foot sludge drying bed and one 12-inch tap to the Morgantown Utility Board Sanitary Sewer Collection System with a wastewater discharge

rate limit of 90,000 gallons per day. Per the 2022 permit requirements, monthly sampling is performed at a laboratory chosen from a list certified by the EPA, and Discharge Monitoring Reports (DMRs) detailing this sampling and analysis are provided to the MUB. Results of the DMRs for 2022 are provided in Table 3.5.6.1c: 2022 Wastewater Effluent Analysis (lbs./d); Pretreatment Permit, Outlet No. 01, One Sample/Month – Morgantown. The sampling point is displayed in Photo 3.5.6.1c.

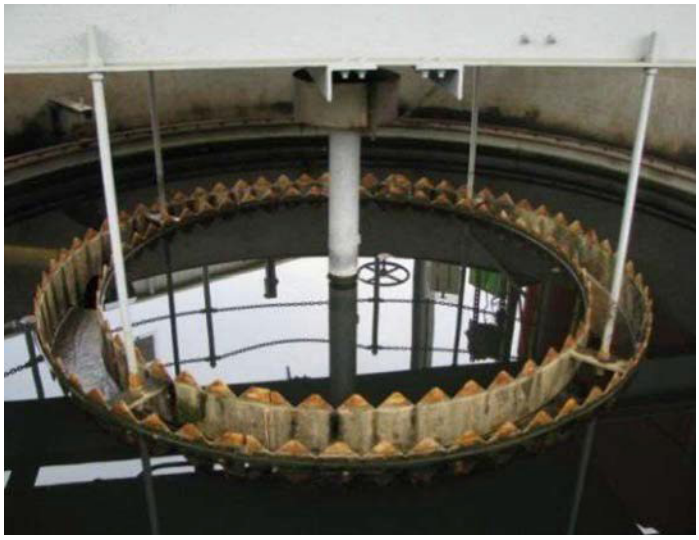

Photo 3.5.6.1b: Morgantown Clarifier.

Photo 3.5.6.1c: Morgantown Wastewater Permit Sampling Point.

3.5.6.2. Safe Drinking Water Act

There were no issues in 2022 regarding compliance with the Safe Drinking Water Act. Morgantown site potable water is supplied by the local water utility, which publishes Safe Drinking Water Act compliance reports detailing water quality testing. Drinking water fixtures on site are filtered, with filters and plumbing maintenance performed during period scheduled preventative maintenance.

3.5.6.3 PFAS and Additional Emerging Contaminants

Historically, the Morgantown site has not been a major user of per- and polyfluoroalkyl substances (PFAS). Only limited quantities of R&D chemicals considered PFAS are used on-site and there had been only one portable aqueous film forming foam (AFFF) system on-site. Similar to the other sites, the Morgantown site does not maintain fire-fighting capabilities that would utilize PFAS. Accordingly, the Morgantown site has not historically conducted sampling, analysis, tracking, and monitoring program for PFAS-related compounds. Drinking water at the Morgantown site is provided by the local public drinking water system.

3.5.7 Other Environmental Statutes

3.5.7.1 Endangered Species Act

There were no issues at the Morgantown site with regard to the Endangered Species Act.

3.5.7.2 EO 13751 Safeguarding the Nation from the Impacts of Invasive Species

There were no issues at the Morgantown site regarding impacts of invasive species during 2022.

3.5.7.3 National Historic Preservation Act

There were no issues at the Morgantown site with regard to the National Historic Preservation Act.

3.5.7.4 Migratory Bird Treaty Act

There were no issues at the Morgantown site regarding the Migratory Bird Treaty Act.

3.5.8 DOE Order 436.1, Departmental Sustainability

See Section 2.2.1.

3.5.8.1 Responsibilities for addressing Executive Orders 13423, 13514, and 13693

See Section 4.0 ES&H Management System.

3.5.8.2 E.O. 13693 GHG Reduction Targets and Sustainability Goals

See Section 4.0 ES&H Management System.

3.5.8.3 Progress on Meeting DOE Strategic Sustainability Performance Plan Goals (2017)

See Section 4.0 ES&H Management System.

3.5.9 Executive Orders

The Morgantown site was in full compliance with all applicable environmental Executive Orders in 2022. Throughout the year, numerous inspections and audits were performed and documented to ensure there were no instances of noncompliance. As noted above, E.O.13834, Efficient Federal Operations, was implemented as part of NETL's ES&H management system. E.O. 13693, Planning for Federal Sustainability in the Next Decade was revoked because of the new executive order, which is described in more detail in Section 4.0.

In addition, other executive orders that apply to NETL, but for which no specific actions were required in 2022, include E.O. 11514, Protection and Enhancement of Environmental Quality; E.O. 11738, Providing For Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans; E.O. 11987, Exotic Organisms; E.O. 12088, Federal Compliance with Pollution Control Standards; E.O. 11988, Floodplain Management; and E.O. 11990, Protection of Wetlands; and E.O. 12898, Environmental Justice for Low Income & Minority Populations.

3.5.9.1 Executive Order 11988, Floodplain Management

There were no issues with floodplain management at the Morgantown site.

3.5.9.2 Executive Order 11990, Protection of Wetlands

There were no issues with protection of wetlands at the Morgantown site.

3.5.10 Other Major Environmental Issues and Accomplishments

The Department's Occurrence Reporting Program System (ORPS) provides timely notification to the DOE complex of events that could adversely affect the public or DOE worker health and safety, the environment, national security, DOE's safeguards and security interests, functioning of DOE facilities or the Department's reputation. The Morgantown site filed two reports with the Department's ORPS in 2022.

1.) On August 11, 2022, an employee was finishing a workpiece in a lathe with a piece of 80-grit emery cloth when the individual's glove was caught in the rotating piece, pulling their right hand into the machine. A nearby employee was made aware of the incident and transported the employee to the on-site occupational health unit for initial evaluation and treatment. The employee was subsequently transported by off-site emergency medical service personnel to a local hospital for definitive evaluation and treatment. The employee was diagnosed with a right radial styloid fracture, right proximal interphalangeal fracture, right proximal phalanx fracture and right volar laceration. Surgery was conducted the next day to perform pinning of the fractures. The employee was subsequently discharged and post-surgery follow-up appointments at the employee's personal providers have been scheduled.

2.) On October 6, 2022, NETL site support contractor E2 Consulting Engineers Inc. received a citation and notification of penalty from the Occupational Safety and Health Administration (OSHA) issued as a result of an employee injury that occurred at NETL on August 11. An employee was finishing a workpiece in a lathe with a piece of 80-grit emery cloth when the individual's glove got caught in the rotating piece, pulling their right hand into the machine. The citation referenced that one or more methods of machine guarding was not provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips, and sparks as defined in Code of Federal Regulations 29 part 1910.212 (a) (1).

3.5.10.1 Sustainable Resilient Remediation (SRR)

There are no hazardous waste sites suitable for SRR at the Morgantown site in 2022.

3.5.10.2 Organizational Resilience

Organizational Resilience is defined as the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper. NETL has identified climate-related risks as they relate to national disasters, fire, medical emergencies, hazardous materials, physical assets and real property, and energy/water supplies, and developed initial response procedures. In addition, NETL's Emergency

Response Organization (ERO) Program Manager represents NETL on local emergency planning committees and is available to review hazard-based risks to a particular region, for example, high-priority impacts from high-water levels and storm damage due to weather events of increasing intensity.

What's more, the NETL COOP Plan postures the lab to perform its MEFs and ESAs under all conditions. When activated, it is designed to achieve operational capability within a predesignated time and strive to sustain operations until a return to normal activities. The plan encompasses preparedness, activation, operations, and the performance to normal operations.

NETL management strongly supports utilization of the best available science related to organizational resiliency policies and programs and will continue to update all applicable NETL orders, policies and procedures, as necessary.

Additionally, NETL completed the Vulnerability and Resilience Plan (VARP) in FY 2022 per DOE 2021 Climate Adaptation and Resilience Plan. The VARP process identified gaps in current NETL processes that manage the short- and long-term effects of climate change on the mission and day to day operations. Resilience solutions that eliminate or reduce these gaps were developed. Six resilience solutions are specific to Morgantown:

- Decentralize water heating for building heat Reroute overhead distribution pipes and wiring on the Pipe Support System to underground
- Reroute overhead distribution pipes and wiring on the Pipe Support System to underground
- Harden overhead distribution pipes and wiring on the Pipe Support System

NETL will review the Solutions Tracking module and incorporate the resilience solutions into NETL's Strategic Facilities Master Plan and capital investment planning to implement the solutions in the projected timeframes in the Solutions Tracking module.

3.5.10.3 Natural Resources Conservation Programs and Projects

Natural resources conservation programs and projects help reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. In 2022 no issues in this area were uncovered at the Morgantown site.

3.5.11 Continuous Release Reporting

No continuous release reporting was required for the Morgantown site.

3.5.12 Unplanned Releases

There were no unplanned releases at the Morgantown site.

3.5.13 Summary of Environmental Permits

A summary of environmental permits for the Morgantown site is provided in Table 3.5.13, 2022 Summary of Permits.

Table 3.5.13: 2022 Summary of Permits — MGN

Permit No. and Name	Site	Issue Date, Exp. Date	Regulatory Agency	Description
MUB 012 Industrial Waste Discharge Permit	Morgantown	09/12/2019, Modified 02/25/2021 09/12/2024	Morgantown Utility Board (MUB)	Permit allows for the operation of wastewater pretreatment facilities and discharge into MUB's sanitary sewer system. It establishes discharge limits and monitoring requirements, compliance with the Morgantown Industrial Waste Ordinance, reporting requirements, including accidental discharge reporting and testing procedures.
WV0111457 WV/NPDES General Water Pollution Control Permit	Morgantown	Old Permit: Issued 03/03/2014, Expired 03/30/2020. Permit Extended through 08/2020: Pending new permit at the state level. New Permit: Issued 09/12/2019, Expires 09/12/2024. New permit Modified 02/25/2021 Expires 09/12/2024	WV Department of Environmental Protection (WVDEP), Division of Water and Waste Management	MGN Site (NPDES Stormwater Permit Registration Number: WVG610042) is authorized to operate under WV/NPDES General Water Pollution Control Permit No. WV0111457 and subject to the provisions of Section W-1 of the General Permit. Semi-annual stormwater samples are collected and submitted as per Water Pollution Prevention Plan and Groundwater Protection Management Plan required by the permit.

3.5.14 Fire Protection Management and Planning

A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or rural area. The Morgantown site comprises 132 acres, with 86 acres being considered forest and/or field. The site has a perimeter fence separating it from other industrial sites to the west and north); there is also a railroad to the north, and neighborhoods to the east and south of the site.

West Virginia Division of Forestry links to the Wildfire Assessment System (www.wfas.net) to assess the risk of wildfires based on Fire Danger maps; these typically indicate low to moderate risk for West Virginia. The main threat of a fire would be incidental fires from an off-site incident, or from equipment use on the property. In addition, illegal or uncontrolled burning (burning leaves, bonfires, etc.), where debris travels into the woods or fields can ignite fires during drought conditions, as well as misuse of fireworks from the surrounding neighborhoods under dry/hot summer conditions. NETL-Morgantown has wooded areas that are mowed and trimmed; potential of fire from a lawn mowing equipment malfunction is very low.

Fire Alarm Control Panels (FACPs) are installed in most of the buildings on-site. All FACPs are equipped with Digital Alarm Communication Transmitters (DACTs) that enable the panels to send fire alarm and trouble signals to the Building 7 Security Office for monitoring and response. Each building with a FACP is equipped with alarm and notification devices to alert personnel of a fire. Fire suppression systems are installed in most of the buildings on-site to combat and/or extinguish a fire.

While NETL does not have a firefighting program, the site does have an Emergency Response Organization for on-site emergencies. The site maintains an emergency phone line reporting system (by dialing ext. 11), which connects the individual reporting a fire to the security office. NETL's response to any fire—facility, project area, vehicle, wildfire, or other—would be to call the local fire department. Voluntary fire extinguisher usage is allowed, but not required. Annual fire drills are conducted to allow all employees to practice evacuation and accountability protocols. During any hot work or fire protection outages, a trained fire watch person(s) is designated to continuously monitor the area of concern and report any fires.

3.5.15 Recreational Hunting and Fishing

The Morgantown site does not offer the opportunity for the public to entertain recreational hunting and fishing to control wildlife populations in a controlled setting.

4.0 ENVIRONMENTAL, SAFETY, AND HEALTH MANAGEMENT SYSTEM

The scope of ES&H Management System covers on-site operations involving employees at the Albany, Morgantown, and Pittsburgh sites, including on-site research and development activities, site maintenance and operations, construction management and verification activities, and the supporting administrative functions related to these activities and operations. Operations not owned or controlled by NETL are excluded from the ES&H Management System, such as childcare facilities and other tenant facilities/operations.

The underlying framework of the ES&H Management System is DOE's Integrated Safety Management (ISM) system, whereby ES&H accountability is integrated into individual decisions and corporate planning processes. The Department's ISM Program, ISO 14001 (Environmental), and ISO 45001 (Occupational Health and Safety) all require NETL to implement a plan-do-check-act approach to maximize the protection of the public, employees, the environment, and property. The ES&H Management System uses the same philosophy to protect the environment, both on-site and off-site, while conducting operations under NETL's control.

The Morgantown, Albany, and Pittsburgh sites are certification to the ISO 14001 and 45001standards.

Surveillance audits have continued based on prescribed audit schedules to maintain certifications, with external audits generally occurring as combined Morgantown/Pittsburgh audits and Albany audits occurring separately. A listing of historical major audits is provided in Table 4.0.

Table 4.0 Historical Major Audits

Date	Site(s)	Standard	Type	Auditor
2007	MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Nov 2009	ALB	ISO 14001:2004	Recertification	Orion Registrar
2010	ALB / MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Jun 2010	MGN / PGH	OHSAS 18001:2007	Certification	Orion Registrar
Aug 2010	ALB	OHSAS 18001:2007	Certification	Orion Registrar
Sep 2013	ALB / MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Sep 2013	ALB / MGN / PGH	OHSAS 18001:2007	Recertification	Orion Registrar
Aug 2016	MGN / PGH	ISO 14001:2004	Recertification	Orion Registrar
Aug 2016	MGN / PGH	OHSAS 18001:2007	Recertification	Orion Registrar
Sep 2016	ALB	ISO 14001:2004	Recertification	Orion Registrar
Sep 2016	ALB	OHSAS 18001:2007	Recertification	Orion Registrar
Apr 2018	MGN / PGH	ISO 14001:2015	Upgrade	Orion Registrar
Jul 2018	ALB	ISO 14001:2015	Upgrade	Orion Registrar
Aug 2019	ALB / MGN / PGH	ISO 14001:2015	Recertification	Orion Registrar
Aug 2019	ALB / MGN / PGH	ISO 45001:2018	Certification	Orion Registrar
Aug – Sep 2022	ALB / MGN / PGH	ISO 14001:2015	Recertification	Government & Military Certification Systems (G&MCS)
Aug – Sep 2022	ALB / MGN / PGH	ISO 45001:2018	Recertification	G&MCS

NETL recompeted its ISO 14001/ISO 45001 external auditor contract in 2020, with the new contract being awarded to Government & Military Certification Systems Inc. of Washington, D.C. (G&MCS). A surveillance audit was completed in October 2020 and was completed virtually due to travel restrictions associated with the COVID-19 pandemic. This audit resulted in two minor nonconformances. NETL provided corrective actions to its external auditor for the nonconformities and completed those corrective actions during 2021. Twenty observations were also noted during the audit.

External audits in 2021 returned to regular frequency using G&MCS and included three surveillance audits: A virtual audit in April 2021 at all three sites, an on-site audit in October 2021 at the Morgantown and Pittsburgh sites, and a special virtual audit concerning corrective actions at all three sites in December 2021. Results of the audits were as follows:

- The April 2021 surveillance audit identified four (4) minor nonconformities and three (3) observations.
- The October 2021 surveillance audit identified two (2) minor nonconformities and four (4) observations.
- An observation during the October 2021 audit noting that corrective actions associated with prior NETL audits were not being completed, necessitating a special audit in December 2021 to review to closure of the audit findings from October 2020 and April 2021. This special surveillance audit was completed virtually and resulted in the closing of the first six external audit findings with no further actions.

After the external auditor (G&MCS) determined that additional surveillance audits were not required during 2022, external auditing during 2022 consisted of only recertification audits in August–September 2022. These recertification audits were held as a single, combined audit of all NETL functions and were held August 15-16, 2022, at the Morgantown site; August 17-19, 2022, at the Pittsburgh site; and September 7-8, 2022, at the Albany site. Results of the audits noted:

- Eleven (11) minor nonconformities and nine (9) observations associated with NETL's ISO 14001:2015 certification.
- Twelve (12) minor nonconformities and seven (7) observations associated with NETL's ISO 45001:2018 certification.
- Thirteen (13) minor nonconformities and eleven (11) observations combined for both ISO 14001:2015 and ISO 45001:2018 (some duplicates).

The 13 minor nonconformities were associated with: Management Review, Internal Auditing Process, Document Control, Hazard Control/Risk Identification, Preventive Maintenance, Operational Control, Equipment Calibrations, Construction SDS Management, Incident Reports (Risk Analysis & Monitoring), Incident Reporting (Evaluating), Safety Inspector Competency, Safety Committee, and Significant Aspects. NETL provided corrective actions to its external auditor for the nonconformities in October 2022 and is working on those corrective actions during 2022 through 2024.

The ES&H Management System continues to ensure consideration of the environmental, safety and health impacts of day-to-day activities and minimizes these impacts, as much as possible, consistent with the mission of R&D associated with fossil energy and carbon management. The ES&H Management System, as described in NETL's directives and manuals, includes a policy

statement, top-down responsibility, personal accountability for work being performed, regulatory awareness, document control, goals, self-assessments, and continual improvement activities. By maintaining its ISO 14001/ISO 45001 certifications, NETL demonstrates to its workforce, the surrounding community, DOE, and other stakeholders that it is committed to responsible environmental, safety, and health stewardship.

4.1 ENVIRONMENTAL, SAFETY, AND HEALTH POLICY

NETL strives to minimize hazards to the public and the environment and to reduce injuries to the workforce. NETL requires consideration of potential environmental, safety and health impacts when planning and executing work at all levels. NETL's ES&H policy was updated and approved by senior management in 2005 to align with the ISO 14001:2004 version of the standard. The policy was updated again August 9, 2006, to incorporate safety and health considerations; the Albany site was also added to the scope of the management system.

NETL's ES&H policy is found in NETL Order NETL-O-440.1B, *Environment, Safety, and Health Management System* and is provided below:

1.) NETL will achieve ES&H quality by proactively, systematically, and fully integrating ES&H considerations into the planning and execution of all work so that the mission is successfully accomplished for the safety and health of the public without detriment to NETL or the environment.

2.) NETL is committed to reducing environmental, safety, and health impacts by:

- Complying with all applicable ES&H laws, regulations, and standards through rigorous regulatory compliance programs.
- Implementing pollution prevention programs to eliminate or reduce waste and implementing emissions and accident/incident reduction programs to eliminate or reduce accidents and incidents.
- Conserving energy and materials through resource management and recycling/ reuse.
- Using safety analysis and review systems to identify, control, and reduce safety and health risks and environmental impacts through engineering and administrative controls.

3.) NETL will work continually to improve environmental, safety, and health systems with the goal of improved ES&H performance, which will be measured against stated objectives and targets to demonstrate continuous improvement of ES&H systems and outcomes.

4.) NETL will communicate information to employees and seek their involvement in reducing environmental, safety, and health impacts and will communicate its policies to stakeholders and the public.

Management commitment and employee involvement are necessary to maximize oversight and improve communications. However, responsibility for effective environmental, safety and health performance rests with line management. Line management must involve workers in the planning and execution of environmental, safety, and health programs and must fully communicate information to site personnel.

NETL uses the acronym "PRISM" to illustrate its policy (see Figure 4.1). PRISM describes the incorporation of integrated safety management (ISM) into the environmental management system (ES&HMS). The PRISM graphic is used as part of NETL's ES&H management system training as a reminder of the policy. The PRISM logo was updated in 2006 to include safety and health to support NETL's ISO 45001:2018 certification.

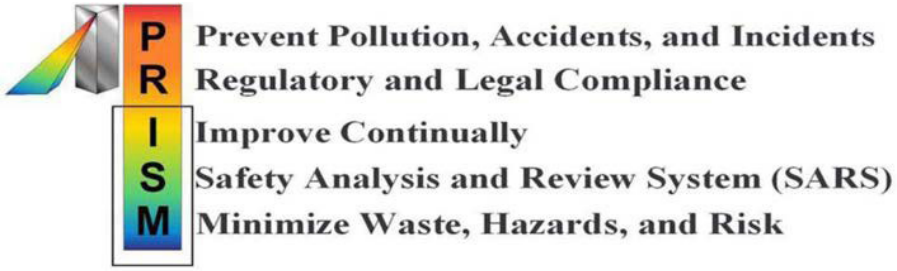

Figure 4.1: Illustration of NETL's Environmental Policy.

4.2 IDENTIFICATION OF ES&H SIGNIFICANT ASPECTS, OBJECTIVES, AND TARGETS

Significant aspects are elements of an organization's activities that can interact with the environment and are under NETL's control or influence. All research projects, operations, and facilities have been inventoried and scored based on their potential to impact the environment and natural resources, as well as whether they require compliance with specific environmental laws and regulations. The ES&H Management System Crosscutting Team—a group composed of the ES&H Management System Representative and supervisors/leads for the Environmental, Safety, and Health Team and the Engineering and Facilities Team—reviews the highest impact scores and develops the list of significant aspects. The ES&H Management System Representative then approves NETL's significant aspects.

Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2022 and Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2023 provides a listing of the ES&H significant aspects.

The ES&H crosscutting team considered, in more detail, the following significant aspects for FY2023:

- Under Waste Minimization, Pollution Prevention, and Recycling, the team determined that the recycling EMP will continue to only track the tons of nonhazardous solid waste generated and percentage recycled. Although DOE is no longer setting a target, NETL will continue to consider net-zero waste as a strategy for waste reduction; finding projects/opportunities for net-zero or additional diversion will be more challenging. Recycling construction waste will have no target and only be tracked and reported for the Site Sustainability Plan (similar to 2022). Any additional guidance associated with the new Sustainability Executive Order will likely impact this EMP.
- The team determined that the aspect for High-Performance Sustainable Building (HPSB) Implementation should remain because this aspect is based on DOE's 2019 Sustainability Report and Implementation Plan's (SRIP) target of 15% of GSF of buildings over 10,000 GSF meeting the HPSB guiding principles (GPs) in FY2022. NETL is already meeting these

GPs, which were updated in FY2020. NETL continues to annually assess and report on building conformance to sustainability metrics. Additional guidance associated with the new Sustainability Executive Order may also impact this EMP.

- For the Hazardous Materials Procurement, Consumption, and Storage aspect, the team determined that the Chemical Inventory baseline for the number of containers and pounds will be updated to the FY 2022 numbers (year-over-year reporting). The objective and target will remain as is. The team also determined that the Refrigerant Management EMP will be tracked under this aspect and will include new implementation goals for FY2022.
- EMPs associated with Electronic Stewardship will remain the same as these metrics are required to continue to be reported by E.O. 14057, ***Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability***. Additional guidance associated with the new Sustainability Executive Order may also impact this EMP.
- The Greenhouse Gas Air Emissions aspect will continue, and while there are currently no metrics in the guidance for the new Sustainability Executive Order, the order does mention tracking and reporting of these emissions. Accordingly, NETL will continue to track and report these emissions and consider any future guidance.
- For the Green Purchasing aspect, the Environmentally Preferred Products EMP will just continue to track applicable contracts and associated dollar value of said contracts using sustainable acquisition clauses in accordance with DOE's SRIP and E.O. 13834.
- The Energy and Fuel Management aspect includes Energy Use, Management of Servers and Data Centers, Renewable Energy, and Fleet Management and will remain the same for FY2023. For the Energy Use EMP, the baseline needs to be evaluated because this is now tracked on a year-to-year basis per DOE's SRIP target of 0.7% reduction per fiscal year based on FY2021 baseline. For the Management of Servers and Data Centers EMP, the objectives and targets were based upon changes through the Chief Information Officer guidance (Federal Cloud Computing Strategy and Data Center Optimization Initiative Memorandum), including using the standard PUE for data centers into new designs and construction. For the Renewable Energy EMP, NETL is still required to comply with EPAct 2005, which requires a reduction of 7.5% of total electrical energy use. NETL plans to purchase renewable energy credits (RECs) to meet this goal. For the Fleet Management EMP, the petroleum consumption target and alternative fuel consumption will remain the same (10% increase in alternative fuel use and 20% reduction in petroleum consumption relative to a FY2005 baseline).
- The Potable Water Consumption EMP under NETL's Water Usage aspect will continue to be tracked on a year-to-year basis per DOE's SRIP (0.5% reduction based on prior FY).
- For the Workplace Health and Safety aspect, the NORM ES&H Management Plan includes revising procedures/manuals, and the other targets will be updated as needed for FY2023. It is expected that the SARS packages with NORM will be identified and updated as needed during the year.
- The Safety Culture ES&H Aspect will continue and includes two existing and one new EMPs. The existing EMPs include: development and implementation of leading indicators for measuring safety performance and update of e-SARS, which houses all the R&D project information. Similar to other SARS programs, the new EMP provides for getting the Support Operations SARS packages working.

- Organization Resilience—Climate Change Adaptation aspect was adjusted during FY2022 based on DOE guidance, requiring NETL to complete a Vulnerability Assessment and Resilience Plan (VARP) that was completed in late FY2022. This aspect and its associated EMP will continue for FY2023 and will include an update to the VARP as reported in the DOE Sustainability Dashboard.
- A new Significant ES&H Aspect was also identified for Emergency Management, which includes and ES&H Management Plan for Emergency Management Planning. This EMP was identified to adjust NETL's Emergency Response Organization (ERO) due to a hybrid work environment based on input from DOE and other federal agencies by reviewing and possibly updating applicable ERO procedures/manuals.

Following the annual update and ranking of significant aspects, NETL's ES&H objectives and targets were revised and presented to the Management Review Board (MRB) for approval. The MRB is a group of senior managers led by the chief operating officer that reviews and approves ES&H objectives and targets, reviews ES&H performance, and takes appropriate action when needed to ensure ES&H programs continue to meet ES&H policy. The MRB-approved list of significant aspects is provided in Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2022) and Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2023.

Objectives are overarching for the organization, while targets are specific measurable or quantifiable criteria supporting those objectives. Performance measures are compared to targets to determine the degree of success in reaching associated objectives. Before establishing and reviewing its objectives, NETL considers regulatory and DOE requirements; technological options; financial, operational, and business requirements; and the views of interested parties. Line managers within the organization assign responsibility for objectives and targets to individuals with expertise in the respective subject areas. These individuals, known as responsible persons, develop ES&H management plans (EMPs) specifying how NETL will meet its objectives and targets.

The approved objectives and targets, as well as the actual performance data for FY2022, are presented in Table 4.3: FY2022 Environmental Management Plan Metrics for Albany, Morgantown, and Pittsburgh, and the performance data for the first quarter of FY 2023 are presented in Table 4.4. The following discussion presents the significant environmental aspects and their respective EMP results for FY2022.

4.2.1 Waste Minimization, Pollution Prevention, and Recycling

For FY2022, EMPs addressing nonhazardous waste recycling, and construction waste recycling included objectives and targets that address the requirements of E.O. 14057. As an example, the objective of the FY2022 EMP for Nonhazardous Waste Recycling was to increase diversion of nonhazardous solid waste from disposal by 50% by the end of FY2025 and 75% by fiscal year 2030. NETL recycled 42% of the nonhazardous waste stream (213,469 lbs. out of 509,275lbs.). In addition, the objective for EMP for Recycling Construction Waste is to recycle the maximum extent feasible of construction/demolition waste and divert it from landfill disposal by the end of FY2022. NETL diverted 326,000 lbs. of its construction/demolition waste.

4.2.2 Hazardous Materials Procurement, Consumption, and Storage

For FY2022, the significant aspect for addressing hazardous materials procurement, consumption, and storage focused on NETL's chemical inventory. The primary objective of the *EMP for Chemical Inventory* was to reduce and minimize the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed based on E.O. 13834. NETL had a 0.5%

increase in the number of containers (63 containers) compared to the baseline that was adjusted in FY2021. The number of containers is within the no net gain of (+/- 10%) target for FY2022. As of the 4th quarter of 2022, the chemical inventory contained 13,127 containers, weighing 13,199 pounds. The chemical inventory verifications were completed as planned as part of this EMP.

4.2.3 Sustainable Acquisition

President Biden signed Executive Order 14057 *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* on December 8, 2021. This E.O. reestablishes the federal government as a leader in sustainability. Section 604 of E.O. 14057 revokes E.O. 13834 *Efficient Federal Operations* signed May 17, 2018. *Sustainable Acquisition* refers to purchasing products with specific environmental or energy attributes and it involves not just the purchasing of goods and services, but the operation of buildings, owning or leasing fleet vehicles, and purchase/use of IT equipment.

Included in the E.O. 14057 Sustainable Acquisition and Procurement Program Area are links to, and highlights from, programs that enable agencies to meet goals including: Environmentally Preferable Purchasing (EPP), Comprehensive Procurement Guidelines (CPG), ENERGY STAR®, the Green Procurement Program (GPP), and the Federal Energy Management Program (FEMP). Under this E.O., agencies shall reduce emissions, promote environmental stewardship, support resilient supply chains, drive innovation, and incentivize markets for sustainable products and services by prioritizing products that can be reused, refurbished, or recycled; maximizing environmental benefits and cost savings through use of full lifecycle cost methodologies; purchasing products that contain recycled content, are biobased, or are energy and water efficient, in accordance with relevant statutory requirements; and, to the maximum extent practicable, purchasing sustainable products and services identified or recommended by the Environmental Protection Agency (EPA).

For FY2021, the following NETL targets were identified based on meeting and/or exceeding NETL's FY2020 achievements:

- Number of applicable contract actions w/ sustainable clauses: 223
- Value of applicable contract actions w/ sustainable clauses: $ 243,488,765.06

In FY2021, NETL achieved the following:

- Number of applicable contract actions w/ sustainable clauses: 181
- Value of applicable contract actions w/ sustainable clauses: $ 310,244,779.60

Percentage point difference of FY21 sustainable contract actions from prior FY20 year: -0.19

Percentage point difference of FY21 value of contracts with sustainable requirements from prior FY20 year: 0.27

4.2.4 Electronic Stewardship

In FY2022 the objective for the *EMP for Operation and Maintenance of Electronic Products* continued to be to enable power management, duplex printing and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. In FY2022, when exempt monitors and computers are accounted for, 100% of printers and 98.47% (1,546/1,570) of workstations have power management settings in place.

4.2.5 Water Use

To address the goals of E.O. 13834 NETL's objective was to reduce water consumption intensity relative to the baseline of 27.3 million gallons (which equates to 23.3 gallons/gross square foot [gal/gsf]) through life-cycle cost-effective measures by 2% annually through FY2021, or 36% by the end of FY2025 using a baseline of FY2007. NETL's FY2021 potable water intensity was 8.7 gal/gsf. This equates to a 11.2% decrease in potable water intensity from FY2020.

4.2.6 Energy and Fuel Use

The latest energy intensity reduction goal requires a reduction in energy intensity for subject facilities by 25% by FY2025 relative to FY2015 baseline. The FY2022 interim target was a reduction of 17.5% from the FY2015 baseline.

NETL's FY2022 energy intensity was 146,861 BTU/GSF, only a 4.4% reduction from the FY2015 baseline. The FY2022 energy intensity was also a 2.4% increase from FY2021. Analysis of FY2022 electricity and natural gas usage found several contributing factors accounting for the increased energy intensity over FY2021, even though NETL was on maximum telework status for half of FY2022 due to the coronavirus pandemic:

- NETL continues to run building HVAC systems based on CDC/ASHRAE recommendations, Guidance for Building Operations During the Covid-19 Pandemic. HVAC systems in NETL buildings were adjusted to improve ventilation by opening outdoor air dampers beyond minimum settings to reduce or eliminate HVAC recirculation, demand-controlled ventilation controls were turned off, filter efficiencies were increased as much as possible in each HVAC system, and HVAC systems ran longer hours (2 hours before and after the building is occupied).
- NETL demolished 2 office trailers in Albany, a small office building in Morgantown and the main security post in Pittsburgh in FY2022, reducing NETL's energy consuming square footage by 1.2%. Removing low energy intensity square footage such as these increased NETL's overall energy intensity.
- NETL had been commissioning the 2nd floor laboratory spaces of B-94 in FY2020. Due to the coronavirus pandemic, these laboratory spaces were not commissioned until FY2022. The 2nd floor laboratory space added another 4,700 GSF of new lab space that was previously idled, with approximately 16 fume hoods, 9 exhaust snorkels and 5 gas cabinets with a total potential lab exhaust of 19,470 cfm.

NETL's annual on-site renewable electrical energy generation equates to 0.5% of its total electric and thermal energy usage based on the EPACT 2005 double bonus for on-site renewable energy.

To meet the EPACT 2005 requirement that renewable electric account for 7.5% of total electric consumption, NETL purchased 3,500 MWh of RECs. With these RECs, NETL's renewable electric energy totaled 7.0% of NETL's FY2022 total electric and thermal consumption.

Data Centers

NETL has a data center business case with FITARA approval that outlines NETL's full data center strategy. A summary of this strategy is below.

- The Albany data center relocation to the first floor of B-1 was completed in FY2022. The new data center is fully metered and has an estimated PUE of 1.3. Data center infrastructure management (DCIM) software (Nlyte) provided by DOE HQ will be implemented in the Albany data center.
- The Morgantown data center was remodeled, and racks were consolidated into a smaller, contained space. This will significantly save on power and cooling costs. It will be metered and managed by Nlyte as well, with an estimated PUE of 1.14.
- Pittsburgh placed the construction contract for the Center for Artificial Intelligence/Machine Learning (CAML) in Building 83 in FY2021 that will combine high-performance computing, research IT equipment, and commodity enterprise IT equipment. This consolidation will eliminate the need for multiple data centers on-site. It will also be fully metered and managed with DCIM software. CAML construction will be completed in FY2024.
- All three sites are currently going through a physical to virtual migration of our applications and services. Physical servers will be virtualized and placed on shared hardware to save on power and cooling, thus reducing PUE.

Fleet

NETL's FY2022 fuel consumption and year-over-year metrics were greatly impacted by travel restrictions due to the coronavirus pandemic. These travel restrictions were in place for all of FY2021 and half of FY2022.

The current petroleum fuel target is a reduction of fleet petroleum use by 20% by FY2015 and thereafter relative to FY2005 baseline. NETL's consumption of petroleum fuel in FY2022 is 67.5% less than NETL's petroleum consumption in FY2005, which meets the goal. This reduction is due largely to the restricted travel in the first half of FY2022 due to the coronavirus pandemic. NETL's GSA-lease fleet travelled 35,640 miles more in FY2022 than in FY2021, a 39% increase in miles travelled. However, NETL notes that the FY2022 total mileage is 372,520 miles less than the miles travelled in FY2019.

The Morgantown and Pittsburgh sites operate and maintain E85 refueling infrastructure to support the alternate fuel vehicles (AFVs) in the NETL fleet. Due to supplier issues related to the supply of E85 fuel in the first half of FY2022, regular fuel was used in E85 AFVs periodically in FY2022.

NETL installed electric vehicle charging stations in Pittsburgh and Morgantown in FY2018 and currently has 4 electric vehicles (Chevrolet Bolts) that are used for inter-site travel between the Pittsburgh and Morgantown sites (130 miles round trip). Using the all-electric Chevy Bolts between sites can save NETL between $12 to $20 per round trip in fuel costs. Each round trip also saves 4 to 6 gallons of gas, reducing NETL's greenhouse gas emissions and helping to reduce fuel usage.

As the coronavirus pandemic travel restrictions were lifted in mid FY2022, NETL usage of the all-electric Chevy Bolts increased from 894 miles in FY2021 to 8,437 miles in FY2022. When NETL installed the first charging stations in FY2018, underground and electrical infrastructure were built

out to support additional charging stations in the future. In FY2022, NETL placed a construction contract to use this infrastructure and install electric vehicle charging stations in FY2023 that will double (from 6 to 12) the number of electric vehicle charging stations for GSA-leased fleet electric vehicles in Pittsburgh and Morgantown. These charging stations will also be made available to NETL employees during workplace hours.

NETL restarted the inter-site shuttle service between the Morgantown and Pittsburgh sites in mid-FY2022. The inter-site shuttle reduces individual employee trips between sites, reducing vehicle miles and fuel consumption. The inter-site shuttle also delivers small packages between the Morgantown and Pittsburgh sites reducing the cost of outside mail delivery services.

4.2.7 Air Emissions/Greenhouse Gas Emissions

NETL Scope 1 and 2 GHG Emissions were 33.8% lower in FY2022 than in the baseline year of FY2008. FY2022 Scope 3 GHG Emissions were 57.8% lower than in the baseline year of FY2008. These decreases occurred due to the implementation of numerous energy conservation measures (ECMs) throughout NETL over the past 14 years, and the purchase of RECs.

Near-term emissions will be reduced by improving/replacing the efficiency of existing campus facilities (ventilation, and air conditioning; lighting; insulation; compressors). Longer term solutions to reduce emissions are being evaluated and include decarbonizing/electrifying NETL campuses while increasing the usage of carbon pollution free electricity (CFE) by replacing natural gas-fired boilers and heaters with electric powered heat pumps and supplemental heat across NETL.

The DOE 2021 CARP identified NETL as a DOE site that will assess opportunities for climate technologies that could be deployed at their campuses and could hold on-site demonstrations for technology transfer. NETL envisions a staged approach with interim goals that reflect the increased power requirements anticipated due to new mission critical facilities coming online within the next five years, specifically the CSE in Morgantown and the CAML in Pittsburgh.

4.2.8 High-Performance Sustainable Building Implementation

In FY2022, 36.4% (4 of 11) of NETL's applicable buildings over 25,000 GSF meet the HPSB GPs. Including the bonus credit for 1 building below 25,000 GSF, 41.7% (5 of 12) of NETL's applicable buildings meet the HPSB GPs.

NETL performed a Vulnerability Assessment and Resilience Plan (VARP) in FY2022. This VARP included a review of all NETL buildings, including HPSB-compliant buildings, to meet the requirement of a new, sixth guiding principle, "Assess and Consider Climate Change Risks."

NETL will ensure the five current HPSB-compliant NETL buildings meet ongoing EISA requirements including the sixth guiding principle, "Assess and Consider Climate Change Risks," in future VARP updates.

NETL will incorporate planned building modifications into the Annual Lab Plan and 5 Year GPP Plan. NETL will continue to incorporate the planning and funding required for the buildings in the NETL HPSB Plan to meet HPSB compliance by FY2025 into the NETL EMS, Annual Lab Plan and GPP planning. Requirements to meet the CEQ's Guiding Principles for Sustainable Federal Buildings and Associated Instructions, latest version, will be written into all NETL renovation/ construction specifications.

Sustainable practices and resilience best practices identified in NETL's VARP will be included in updates to NETL's Site Facility Master Plan, maintenance procedures and construction specifications where applicable.

4.3 IMPLEMENTATION AND OPERATIONAL CONTROLS

The ES&H Management System is implemented through an organizational structure shown in Diagram 4.3. Senior-level positions include the NETL director, who serves as the ultimate authority for the ES&H Management System; chief operating officer, Laboratory Operations Center, the lead member on the MRB; the associate director for Facility Operations, who is the environmental, safety, and health steward and champion; the Albany site manager; the Morgantown site manager; and the Pittsburgh site manager, who also acts as the ES&H Management System representative. (Site-specific ES&H leads are consulted by the MRB, as necessary.) Mid-level titles and responsibilities are defined in several NETL directives that specify key components of the ES&H Management. The site managers assign employees to the functional titles and responsibilities.

NETL's ES&H Management System Organization

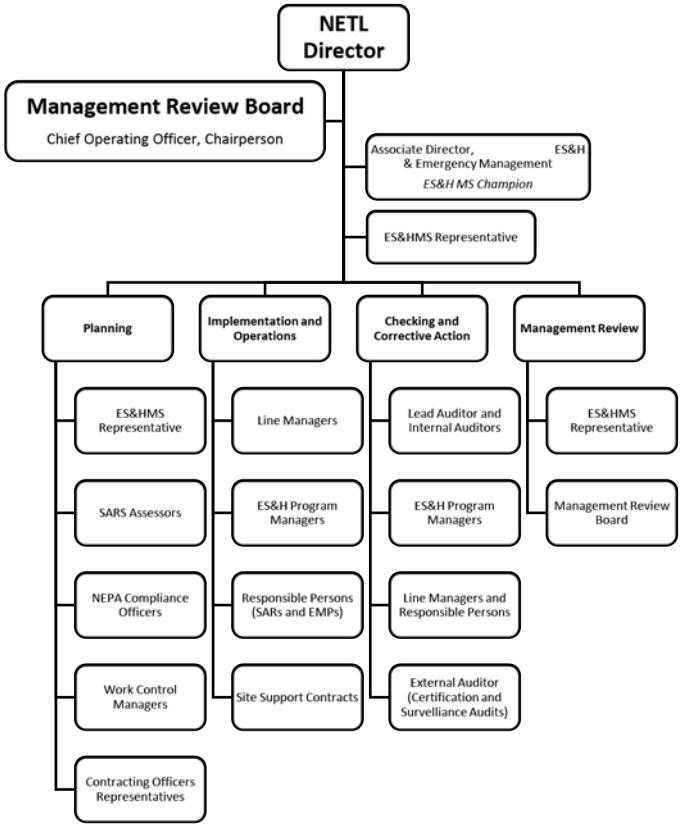

Diagram 4.3: NETL's ES&H Management System Organization.

Line managers are the primary means for NETL to achieve operational control within the ES&H Management System. Communication also occurs through the NETL intranet, which provides a secure internal website containing current versions of all NETL directives, as well as general reference information, forms, and programmatic information. The ES&H Team webpage contains a "ISO 14001:2015/ISO 45001:2018 Roadmap" that provides an overview of available information about the NETL ES&H Management System.

Another example of internal communication at NETL is the biweekly regulatory review, which promotes awareness of regulatory changes and new programs. Every two weeks, federal and state agency websites are reviewed to identify changes in environmental laws, regulations, guidance documents, compliance information and regulatory agency programs. DOE Headquarters' website is also reviewed to check for new DOE requirements and guidance. These reviews are circulated to the ES&H staff and posted on the NETL intranet homepage.

NETL also communicates information about the ES&H Management System to its employees through the NETL intranet, training, staff meetings, e-mail and posters. The training program includes general ES&H Management System training designed to make employees aware of the ES&H Management System by providing them with information about significant environmental, safety, and health aspects and the potential impacts on their work, employee roles and responsibilities and the potential consequences of not following operating procedures. In addition to the general training, program- and job-specific training is required based on an employee's job duties. The computer-based training system uses a job hazard survey to determine which training modules are necessary. Job-specific training for an employee can also be requested directly by the employee or by his/her supervisor. Each employee and his/her supervisor are responsible for ensuring that all required training is complete before beginning an assignment.

For purposes of communication with external parties, NETL maintains an external webpage (www.netl.doe.gov). The webpage includes a section on Site Environmental Quality that provides the ES&H policy and significant ES&H aspects.

NETL conducts public participation activities under the requirements of the National Environmental Policy Act (NEPA). For projects receiving federal funding, NETL is required by law to use the NEPA process to identify potential environmental impacts, consider alternatives, invite public comment or participation, plan the project with due regard for the environment, impose mitigation requirements, and make informed decisions about whether to proceed with the proposed project. The NEPA process provides a system for reviewing actions prior to a major expenditure of funds to ensure the environmental and social impacts have been identified and analyzed and will be mitigated to the extent practicable prior to committing to the project.

To effectively and efficiently implement the ES&H Management System, NETL must maintain operational control of its on-site R&D projects, facilities, operations and construction activities. This is accomplished through the Safety Analysis and Review System (SARS) process. This process requires proposed projects to be described in writing and subjected to ES&H and quality reviews by subject matter experts and technical committees. Approval must be granted before a project, operation, construction can proceed beyond the planning stage, or before a facility can operate. Included within this process is a review of the potential environmental impacts, regulatory requirements, safety and health hazards, and monitoring plans. After a project begins, annual reviews are required to ensure the project continues to follow environmental, safety, and health requirements. If the project requires changes, the SARS package must be modified, and the SARS process repeated. Other processes for operational control include:

- Environmental programs that have been established for both defined media (air, surface water, and groundwater) and likely pollution routes (spills, hazardous waste, and nonhazardous waste). Each program is described in a directive and is managed by a corresponding ES&H program manager.
- Work performed by contractors that is controlled at the NETL sites through contractual provisions and directives that define the ES&H requirements for work on NETL property, as well as for NETL-funded work at off-site locations.
- Procedure 243.1-01, *Records Management*, that details operational control through documentation. Critical documents are controlled per a defined process to ensure they can be located. They are also periodically reviewed and revised. This ensures that the current versions are readily available and obsolete documents are promptly disposed.
- Core ES&HMS documentation that is embodied primarily within NETL ES&H directives. The most recent and official hard-copy versions of NETL directives reside with the NETL directives coordinator. Electronic versions of these controlled directives are placed on the intranet for employee use and are considered official versions. Official copies of ancillary tables, lists and forms are also maintained on the intranet and are reviewed and updated as required.

4.4 SELF-ASSESSMENT PROCEDURES

NETL uses a variety of self-assessment procedures to improve its ES&H performance. This includes internal and external audits, project reviews, and inspections; independent assessments; and reporting through NETL's corrective action tracking system, the Assessment Input Information System (AIIS). Self-assessment enables NETL to make observations and to identify strengths, opportunities for improvement, and nonconformities. In some cases, findings can be corrected on-the-spot, however, if nonconformities and opportunities for improvement require additional communication, resources and time, they are tracked as preventive and corrective actions.

As noted above, NETL is subject to both internal and external audits of its ES&H Management System as required by the ISO 14001:2015 and ISO 45001:2018 standards. The auditing process is defined in NETL Manual 450.4-01.02, *ES&H Assessments Process*. An annual planning schedule is used to ensure that all sections of the ISO 14001:2015 and ISO 45001:2018 standards are appropriately audited. A total of three ES&HMS audits were performed in 2022, including two internal audits and one external recertification audit that encompassed activities at the Albany, Morgantown and Pittsburgh sites. The internal audit performed in March-April 2022 resulted in seven nonconformities and 13 opportunities for improvement (OFIs), and the internal audit performed in November-December 2022 resulted in two nonconformities and six OFIs. The external recertification audits to the ISO 14001:2015 and ISO 45001:2018 standards were conducted by an independent contracted auditor, Government and Military Certification Systems Inc. of Washington, D.C. (G&MCS), who has been NETL's external auditor since 2020. The external recertification audit was performed as a single audit at all three sites in August-September 2022 and identified 13 minor nonconformities and 11 observations combined for both ISO 14001:2015 and ISO 45001:2018 (some duplicates—with 11 nonconformities and nine observations associated with NETL's ISO 14001:2015 certification and 12 nonconformities and seven observations associated with NETL's ISO 45001:2018 certification). G&MCS determined that an additional surveillance audit originally scheduled for April 2022 was not required.

Top management's commitment to the ES&H Management System is evidenced by participation in the MRB, as well as review of a variety of ES&H assessments. Both DOE and contractor ES&H specialists participate in regular site audits, as well as facility inspections. These audits and facility inspections focus on observable conditions (e.g., compliance with Occupational Safety and Health Administration [OSHA] regulations, National Fire Protection Association [NFPA] codes, National Electric Code [NEC], and other environmental, safety, and health requirements). Findings from the audits and inspections are entered into the corrective action tracking system, AIIS, and the status of the corrective actions is provided to the office directors monthly, as well as to the MRB quarterly.

In addition, SARS assessments are performed on new and modified R&D projects, construction activities, facilities, and support operations. Similarly, annual SARS assessments are performed to ensure continued ES&H compliance for these R&D projects, facilities, and support operations. A comprehensive discussion of the SARS process can be found in Section 6.0, Quality Assurance.

To better manage ES&H programs (e.g., Water Quality Program, Air Quality Program, Electrical Safety Program, Confined Space Program, etc.), responsible program managers continually review their areas at varying frequencies to ensure compliance with both external regulatory and NETL requirements. These reviews are both formal and informal and may vary in scope and detail, allowing program managers to verify NETL directives are relevant/current and are being met. Some programmatic reviews occur more frequently or focus on monitoring results. These reviews look for any trends to identify correctable problems that can be promptly addressed.

In addition, site-support contractor employees periodically inspect higher risk areas, documenting findings and providing the results to program managers. This information provides program managers with additional opportunities to assess the effectiveness of their programs.

Examples include:

- Daily inspections — selected potential spill sources and storm water outfalls.
- Weekly inspections — hazardous waste facility, industrial wastewater discharge points.
- Quarterly inspections — discharge monitoring reports are compiled and reviewed to determine if permit limits have been exceeded.
- Semi-annual inspections — Surface water monitoring reports are compiled and reviewed.

Meaningful reviews for compliance can occur only if the program managers are aware of changing federal and state laws and regulations and DOE administrative requirements. Subject matter experts, primarily ES&H staff, are responsible for keeping NETL informed of changing laws, regulations and requirements. Part of the program manager's general job responsibilities

is to stay abreast of regulatory issues that may affect the NETL ES&H Management System and to take appropriate actions to implement these requirements. NETL has several means of maintaining awareness:

- A biweekly regulatory review covers significant changes in federal and state laws and regulations. Information is gathered from selected federal, state and other government websites and DOE's Office of Environment, Health, Safety, and Security (EHSS-1).
- Private sector publications, including "Environmental Compliance in West Virginia," a quarterly regulatory update bulletin published by Business and Legal Reports Inc.; environmental compliance updates published by the Bureau of National Affairs; and various trade journals.
- Pennsylvania Bulletin and the Pennsylvania Code, (produced by the Commonwealth of Pennsylvania) and the Code of Federal Regulations (published by the National Archives).
- Review of appropriate Oregon state regulatory websites managed by the State of Oregon Department of Consumer and Business Services (DCBS).
- NETL's library subscriptions that are relevant to regulatory documents are available electronically on the NETL intranet or in the library.
- Updated lists of hazardous or regulated chemicals, as needed.
- Websites of regulatory agencies, such as the West Virginia Department of Environmental Protection (WVDEP), the Pennsylvania Department of Environmental Protection (PADEP), and the Oregon Department of Environmental Quality(ORDEQ).
- Training classes on relevant statutes and regulations.

4.5 CORRECTIVE AND PREVENTIVE ACTION PROGRAM:

- Nonconformance with any of the appropriate regulations or standards identified during any of the self-assessment audits (or external assessments/audits) mentioned above would be documented using NETL's current Corrective and preventive Action Tracking System, AIIS.
- NETL Manual 450.4-01.04, *Corrective and Preventive Action Process*, outlines how corrective and preventive action items identified in the various assessments are captured, prioritized, assigned, analyzed for their root cause, tracked, closed, and incorporated, as appropriate, into the lessons learned and training systems. This process holds responsible persons and line management accountable for timely closure of corrective actions within their programs, organizations, or facilities, and disseminates lessons learned across appropriate organizational elements.
- After completion of an assessment, the lead assessor uses the AIIS to generate an assessment record. When a finding is entered into the system, a unique identifying number is assigned and cataloged in the database with the associated assessment record. A notification of the finding is sent electronically to the responsible person and their line manager. All corrective actions taken regarding the finding are then documented in AIIS. To ensure findings have been fully addressed, a follow up is done through the internal auditing process. Each month, several closed findings undergo verification audits

to determine if the corrective actions taken address the closed findings appropriately. Open findings are generated into a monthly report and sent out to appropriate line management to further address and complete accordingly.

- Other processes used for reporting corrective actions include: Manual 151.1-01.02, *Emergency Categorizations, Classifications, and Notifications*, a procedure used to catalog and investigate major nonconformities related to emergencies, as required by DOE; and Manual 231.1-00.02, ***Injury/Illness Reporting***, which sets forth the minimum reporting requirements for injury or illness classification investigation for NETL.

4.6 MANAGEMENT REVIEW PROCESS

Management review of the ES&H Management System ensures the ES&H policy and management system remain appropriate and effective. The ES&H Management System representative conducts review meetings regularly during the year with the MRB (see Figure 4.3: NETL ES&H Management System Organization), to allow the MRB to review current environmental, safety and health policy; objectives and targets; internal and external audits; and related issues. Changes are documented and implemented. Management involvement in the ES&HMS ensures that projects are resourced and funded with the appropriate priority. Notes from the MRB meetings are posted to the intranet.

NETL's ES&H Management System Organization

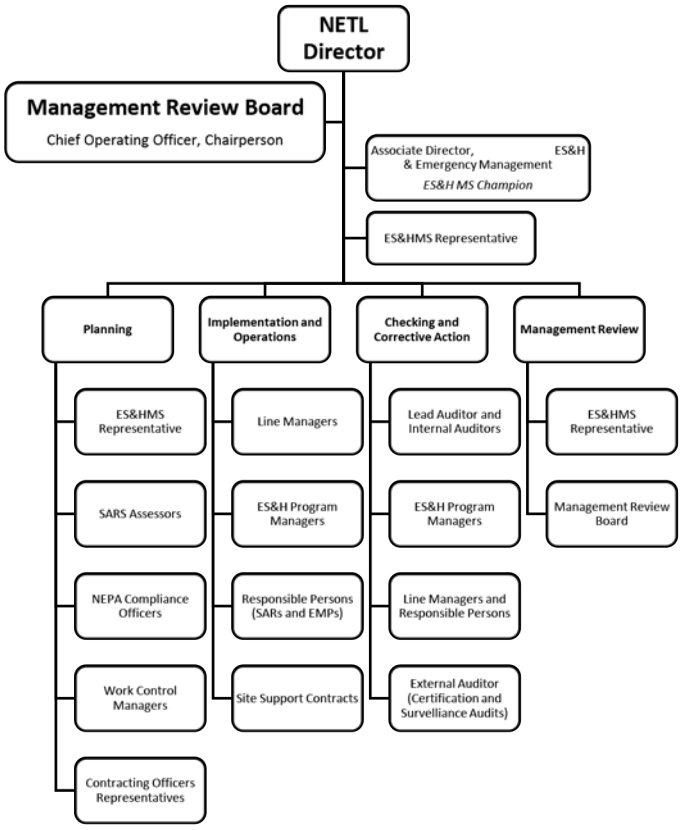

Diagram 4.3: NETL's ES&H Management System Organization.

The MRB met on February 24, 2022; August 1, 2022; and November 29, 2022. Scope of the management review process (per ISO 14001/45001, Section 9.3) includes:

- The status of actions from previous management reviews.
- Changes in:
  - External and internal issues relevant to the ES&H management system.
  - The needs and expectations of interested parties, including compliance obligations.
  - Significant environmental aspects.
  - Legal and other requirements.
  - Risks and opportunities.
- The extent to which ES&H objectives have been met.
- Information concerning ES&H performance (including trends in incidents, nonconformities and corrective actions, continual improvement, monitoring and measurement results, fulfillment of its compliance obligations, audit results, consultation and participation of workers, and risks and opportunities).
- Adequacy of resources for maintaining an effective ES&H management system.
- Relevant communication(s) with interested parties.
- Opportunities for continual improvement.

Outputs of the management review process (per ISO 14001/45001, Section 9.3) include**:**

- Conclusions on the continuing suitability, adequacy and effectiveness of the ES&H management system in achieving its intended outcomes.
- Decisions related to continual improvement opportunities.
- Decisions related to any need for changes to the ES&H management system, including resources.
- Actions, if needed, when ES&H objectives have not been achieved.
- Opportunities to improve integration of the ES&H management system with other business processes, if needed.
- Any implications for the strategic direction of the organization.

The MRB meetings are scheduled to cover all these requirements across the entire management review process, with meetings scheduled ~quarterly (transitioned from semi-annual to quarterly in 2022). Since objectives and targets are tracked by fiscal year, the first MRB meeting of the fiscal year focuses on results of aspects, objectives and targets for the prior fiscal year and ensuring that the aspects, objectives, and targets are approved for the upcoming fiscal year. The mid-year meeting of the fiscal year also reports on progress toward NETL's current fiscal year objectives and targets.

4.7 ENVIRONMENTAL OPERATING EXPERIENCE AND PERFORMANCE MANAGEMENT

NETL sets performance goals as part of the Enterprise Performance Assessment System. NETL senior management reviews these metrics quarterly. The specific performance measures that are tracked and their performance for FY2022 are contained in Table 4.7a. The upper targets and lower targets are shown for each performance metric. If the upper target is met, then the metric is considered "Met." If the metric falls between the upper and lower targets, it is treated as "Caution," which means that the performance needs to be investigated to ensure that the metric does not fall below the lower target. A metric that falls below the lower target is considered "Not Met," and is investigated to determine why the metric was not met. FY2022 performance was obtained by taking the average of the four quarters of the performance measures for the fiscal year.

Table 4.7a: Performance Management Metrics

Metric	Objective	Target	FY2022 Performance	Strategic Objective
Ensure Worker Safety	Minimal cases of work-related injuries to federal and contractor personnel (assessed quarterly).	Total Recordable Case Rate (TRC) <=1.0 Days Away/Restricted (DART) Case Rate <= 0.4	TRC = 0.53 DART = 0.23	Infrastructure Support
Energy and Sustainability	Demonstrated progress in meeting significant aspects of energy efficiency (assessed quarterly).	Achieve at least 85% energy efficiency score based on compliance with EO 13834 significant aspects.	Energy Efficiency Score = 89.5%	Infrastructure Support
Minimize Environmental Impacts	Environmental protection programs that minimize adverse impacts on the environment (assessed quarterly).	<2 Group 5 Environmental Occurrence Reports (ORPS) annually. At least 85% ES&H objectives met.	ORPS = 0 ES&H Obj. = 84.25%	Infrastructure Support

Goal setting is used at NETL to motivate and monitor performance. NETL's environmental performance and progress toward goals is tracked and reported to satisfy both internal and external requirements.

Throughout the year, trained ES&H professionals performed cross-cutting audits and inspections of the NETL ES&H programs to ensure adequate performance. The performance measures used to monitor progress include EMP objectives and targets (see Section 4.2) and institutional environmental performance measures. This includes NETL's performance measures established under the Government Performance and Results Act of 1993. These measures are tracked by fiscal year and cover performance goals and accomplishments.

NETL also reports performance metrics to DOE Headquarters concerning its Environmental Management System annually (due by January 31 of each year).

In addition to these measures, surveillance monitoring is conducted through routine reviews and inspections. Examples of the types of performance monitoring conducted through this program are presented in Table 4.7b: FY2022 Surveillance Monitoring.

Table 4.7b: FY2022 Surveillance Monitoring
Type of Surveillance
SARS Assessments
Transformer Inspections
Storage Tank Inspections
Interstitial Storage Tank Monitoring (MGN)
Back-up Generator Inspections
Chemical Handling Facility Inspections (PGH)

5.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

Two programs at NETL monitor non-radiological effluents: Industrial Wastewater Management Program and Ambient Air Quality Management.

5.1 INDUSTRIAL WASTEWATER MANAGEMENT PROGRAM

NETL's industrial wastewater quality is managed per NETL Manual 436.1-02.04, ***Industrial Wastewater System Management Program***, and is administered by the Industrial Wastewater Quality Program manager. Each site (Albany, Pittsburgh and Morgantown) has its own industrial wastewater permit that specifies the criteria for discharges to meet the permit requirements. For specific information about the industrial wastewater program at each, see the following sections 3.2.6 (Albany), 3.3.5 (Pittsburgh) and 3.5.6 (Morgantown).

5.2 AMBIENT AIR QUALITY MANAGEMENT

The requirements and responsibilities of the Ambient Air Quality program are discussed in Procedure 436.1- 03.01, *NETL Ambient Air Quality Management*. Under this program, the air quality manager (AQM) ensures compliance with all federal, state and local regulations, as well as DOE directives. The AQM also oversees monitoring programs, permitting and reporting. Additionally, historical ES&H management plans (EMPs) have been used to track various emission categories or sources where NETL can make the most improvement.

To maintain quality control, NETL subcontracts analytical work only to certified laboratories. These laboratories must submit their quality assurance/quality control (QA/QC) manuals to NETL for inspection, and NETL submits quality control samples (duplicates, blanks and spikes) to the laboratories to verify the quality of the analyses. Air emissions data for the sites are calculated and maintained to ensure compliance with regulatory requirements.

Several EMPs direct continuous improvement efforts in air-quality protection and reduce greenhouse gas (GHG) emissions. For example, one EMP tracks NETL's comprehensive GHG inventory, while another follows the execution of renewable energy generation projects and purchase renewable energy credits (to make up any differences). Another EMP addresses the reduction of energy usage/square foot (Btu/ft^2) 1% annually on a year-over-year basis. This tracks the reduction of energy intensity in buildings to achieve GHG reductions. Finally, another EMP focuses on reducing petroleum-based fuels and increasing the use of alternative fuels and renewable energy to reduce NETL's impact on ambient air quality.

6.0 GROUNDWATER PROTECTION PROGRAM

Groundwater protection at NETL is administered through Procedure 436.1-03.02, *Groundwater Quality Management*. The program covers regulatory requirements and best management practices to prevent leaks and spills, to monitor groundwater and soil, to remove contaminated soil and to address closeout actions. More detailed information is provided in NETL's Groundwater Protection Plan for each site, which documents site hydrogeology, potential pollution sources, potential contaminants to be monitored, well installation and sampling methods, a monitoring strategy and QA/QC processes. Maps of the site aquifers and wells are also included in the plan.

Photo 6.0: Morgantown Monitoring Wells.

Each site has specific reasons for monitoring its groundwater. The groundwater protection and monitoring program in Albany (initiated in 2001) is aligned with the Oregon Department of Environmental Quality (ODEQ) Voluntary Cleanup Program. Albany groundwater monitoring includes 33 wells and two piezometers. The wells were originally sampled for a broad range of contaminants, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, nitrates and PCBs. Current plans include the continued development of a conceptual site model (CSM) to document groundwater and contaminant trends. The CSM is a living document and is updated periodically. NETL will continue to assess the results of periodic monitoring, update the CSM, and plan for future remediation activities (subject to available funding).

The Pittsburgh site has 23 monitoring wells. A total of 19 wells are screened in shallow weathered bedrock; seven are in the R&D Plateau area, and 12 are in the Valley Fill area (administrative and maintenance areas). The topography, consisting of rolling hills and ridges, reflects the dendritic drainage erosion of the uplifted Allegheny Peneplain. The primary objective of the Groundwater Monitoring Program (GMP) at the Pittsburgh site is to monitor the shallow, weathered bedrock zone as the first significant aquifer or water-bearing unit beneath the Pittsburgh facilities of NETL. Contamination entering the ground from soil surface sources would be expected to impact this zone first and foremost; hence, most wells are placed in this zone. The GMP also monitors the wells screened in the deeper water-bearing zone to provide data on water quality and contaminant migration. Another goal of the monitoring program is to identify and characterize groundwater

flow and relate it to surface water flow conditions to better evaluate potential environmental effects of any groundwater contamination.

Twenty active monitoring wells exist at the Morgantown site. These wells monitor two shallow aquifers within the unconsolidated Lake Monongahela sediments and one bedrock aquifer, the Morgantown Sandstone. None of the Morgantown site aquifers are used as a source of water in the immediate area, but selected monitoring wells are sampled and tested for general water-quality parameters. Should a spill occur, containment and cleanup would commence, and the affected soil would be monitored, as necessary, for the contaminants of concern.

6.1 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES – ALBANY

In 2001, Albany initiated a groundwater protection and monitoring program in accordance with DOE requirements. The program follows the requirements of the ODEQ Voluntary Cleanup Program, with regulatory input from ODEQ. There is no formal agreement between NETL and ODEQ. Albany installed 14 monitoring wells on-site in July 2002 and sampled the wells for a broad range of contaminants, including VOCs, SVOCs, metals, nitrates, and PCBs. A selected subset of the wells was also screened for pesticides, herbicides, dioxins, and radiological constituents.

Initial periodic sampling showed potential concern over elevated levels of VOCs, metals, and radiological constituents. This necessitated continued periodic monitoring. Subsequent periodic monitoring events have shown excessive turbidity of samples directly influencing metals and radiological results. A review of sampling protocols was undertaken, and a requirement established for future collection of groundwater samples to be performed using U.S. EPA low-stress protocols. Upon implementing the enhanced sampling protocols in 2003, metal and radiological contaminant levels in groundwater were found to be at or near background levels for the Willamette Valley in Oregon.

Photo 6.1: Albany Groundwater Sampling.

VOC detections during periodic monitoring prompted Albany to further investigate areas of suspected contamination, with planning efforts starting in September 2004 and on-site work initiated in January 2005. Results from samples taken in February 2005 showed contaminants of potential concern (COPCs) were likely crossing the eastern boundary of the site and migrating toward Liberty Elementary School. After meeting with ODEQ and the Greater Albany Public School

(GAPS) District personnel, investigations were made on-site and off-site during March-December 2005. Results of the site investigation showed no concern over surface soils, subsurface soils, soil gas, or ambient air at off-site properties. The only issue identified was with elevated levels of COPCs in groundwater at depth, including trichloroethene (TCE), carbon tetrachloride, and chloroform.

ODEQ sampled residential wells within an approximate two-block radius of the site due to resident concerns voiced at town hall meetings and further reviews of the sampling results during 2006. A total of 31 residential wells were sampled, with some residential wells (including some used as drinking water) showing elevated levels of COPCs. NETL connected all owners of impacted wells that were used for drinking water (10) to city of Albany potable water supplies by December 2006. One additional owner contacted NETL concerning connection to the city of Albany potable water supplies in 2018, and this action was completed in 2019. NETL has also properly closed any wells that residents requested to be abandoned per ODEQ requirements between 2007-2009.

ODEQ requested an independent health consultation in 2006 with the Agency for Toxic Substances and Disease Registry (ATSDR) under U.S Department of Health and Human Services, Public Health Services. This consultation focused on the above-noted groundwater investigation concerns, as well as radioactive waste disposal and beryllium dust concerns, and was completed on October 25, 2006. Results concluded that current and future exposures to VOCs via contaminated groundwater are “no apparent public health hazard”, past exposures at most residences with contaminated wells are “no apparent public health hazard”, and past exposure at one residence is a public health hazard due to exposures to carbon tetrachloride and TCE. The entire health consultation can be found at: https://www.atsdr.cdc.gov/hac/pha/albanyresearchcenter/albanyresearchcenterhc10.25.06.pdf.

Additional monitoring wells have been installed over the years to enhance the groundwater investigation both on-site and off-site at Liberty Elementary School property, adjacent to the site (see Figure 6.1 for well locations). Regular periodic monitoring is performed twice per year during the wet season (March-April) and during the dry season (August-September), with sampling performed in accordance with the Albany Groundwater Monitoring Plan. Sampling is currently limited to VOCs and metals. The results of the 2020 monitoring program are presented in Tables 6.1.1-6.1.5.

NETL continues its site investigation activities, periodic monitoring, and remedial actions at the Albany site in accordance with ODEQ requirements and will evaluate and pursue actions to protect human health and the environment by eliminating risk and minimizing potential exposures. Copies of all periodic monitoring reports are provided by NETL to Oregon DEQ. A groundwater conceptual site model continues to be periodically updated for the Albany site.

Based on a review of available current and historical information, Albany is not considered to be a user of per- and polyfluoroalkyl substances (PFAS) since the site: (1) has no quantities of R&D chemicals considered as PFAS; (2) has no fixed aqueous film forming foam (AFFF) systems; and (3) does not operate its own fire department or maintain fire-fighting training facilities.

There is no history of any AFFF discharges at the site. NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Albany does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds, as it is not required per the site’s industrial wastewater permit or the Albany Groundwater Monitoring Plan. Accordingly, PFAS-related substances are not regular analytes of its active

groundwater monitoring program and have never been part of any historical sampling. Drinking water is provided by the local public drinking water system and site groundwater or surface water is not used as a drinking water source.

NETL will continue to review historical records associated with past activities, will proactively manage risks associated with PFAS-related substances, and will continue to manage chemical inventories to ensure proper management of any PFAS-related wastes. Pending budget availability, NETL will program for equipment and facility upgrades to consider environmentally friendly alternatives for R&D chemicals and facility equipment/systems. NETL does not consider PFAS compounds to be of significant environmental concern to warrant additional monitoring in water systems at the site; however, NETL will comply with any pending federal, state or DOE requirements to perform monitoring for any PFAS compounds.

6.2 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES—PITTSBURGH

The primary objective of NETL's Groundwater Monitoring Program (GMP) is to monitor the shallow, weathered bedrock zone as the first significant aquifer or water-bearing unit beneath the Pittsburgh facilities. Contamination entering the ground from soil surface sources would be expected to impact this zone first, hence, most the monitoring wells are placed in this zone. The GMP also monitors the wells screened in the deeper water-bearing zone to provide data on water quality and contaminant migration. Another objective of the monitoring program is to identify and characterize groundwater flow and relate the groundwater flow to surface-water flow conditions to better evaluate potential environmental effects of any groundwater contamination.

By properly characterizing local groundwater conditions, it is possible to ensure that potential contamination and potential contaminant migration routes have been suitably identified and investigated. This enables NETL to be cognizant of potential continuing contamination and to remediate these contamination sources, if warranted.

The Pittsburgh site (see Figure 6.2.1: Topographic Site Map – Pittsburgh) is located within the Appalachian Plateau physiographic province. The topography, consisting of rolling hills and ridges, reflects the dendritic drainage erosion of the uplifted Allegheny Peneplain.

All rocks in the area are of sedimentary origin. They are almost exclusively of Pennsylvanian or Permian Age, except for alluvium in the stream and river valleys, which is of Quaternary Age. At the Bruceton Research Center location, bedrock is of Pennsylvanian Age and belongs to the Monongahela and Conemaugh Groups. The contact is identified by the Pittsburgh Coal, which is the basal member of the Monongahela Group (see Figure 6.2.2: General Geologic Column – Pittsburgh).

The shallowest aquifer on NETL property is found in the weathered bedrock just below the rock/soil contact and occurs over most of the site, except where it is undermined. Recharge of this unit occurs where rainfall percolates downward into the weathered strata until a continuous horizon of low vertical permeability (unweathered bedrock) is encountered. A total of 19 groundwater monitoring wells are screened in shallow weathered bedrock; seven groundwater monitoring wells are in the R&D Plateau area, and 12 groundwater monitoring wells are in the Valley Fill area Figure 5.2.3: Groundwater Management Program R&D Plateau Well Locations – Pittsburgh and Figure 5.2.4: Groundwater Management Program Valley Fill Well Locations – Pittsburgh show the locations of the monitoring wells.

A deeper, water-bearing zone has been noted at the contact between the Connellsville Sandstone and the Clarksburg Clay and Limestone. A total of four wells are screened in this deeper zone (located in the R&D Plateau area). This deeper aquifer had extremely low yield in the Valley Fill area.

Four wells (two in the R&D Plateau and two in the Valley Fill area) were originally screened in the depth interval between the two aquifers, within fractured strata. These wells had extremely low yields and were subsequently abandoned. The minimal amount of groundwater occurring in this intermediate zone may be the result of leakage from the overlying shallow, weathered bedrock zone.

The Lick Run Valley, which borders the eastern edge of the Pittsburgh site, is made up of silt and sand alluvial deposits. The alluvial deposits comprise a water-bearing unit, which discharges to form the stream-base flow within Lick Run. Although shallow piezometers have been established in these deposits, the thickness of this water-bearing unit is unknown.

Most domestic water supplies for the area surrounding the Pittsburgh site are provided by the Pennsylvania American Water Company, which processes water from the Monongahela River. However, one groundwater well is listed for domestic usage within a one-mile radius of the site. This groundwater well, situated near central Bruceton, is 140 feet deep and was completed in the Monongahela Group, per the computerized PADEP Water Well Inventory. However, topographic review of the well location, based on reported longitude and latitude and the reported well depth, indicates that this well was possibly completed in the Conemaugh Group. The well is located to the north of the Pittsburgh site and it should not be affected by potential NETL groundwater impacts because groundwater is assumed to flow in a southerly direction beneath the Lick Run Valley.

A second groundwater well is located on Piney Fork Road, approximately 1½ miles south of NETL-Pittsburgh. This well was recently included in the PADEP Water Well Inventory and is associated with a landfill. The PADEP Water Well Inventory reported no other domestic groundwater wells in Jefferson Borough or South Park Township; however, the inventory does not list wells drilled prior to 1966.

The Pittsburgh site has two groundwater flow patterns. First, groundwater flowing in the shallow, weathered bedrock aquifer may percolate along the soil/bedrock interface and/or along near vertical stress relief fractures and follow the general site topography, flowing from the tops of hills on the site and generally perpendicular to ground-surface elevation contours. This flow is directed by the intervening valleys toward the Lick Run Valley, where it joins the water-bearing unit located in the valley and adds to the base flow of Lick Run itself, Photo 6.2a. Some of this flow also discharges as springs on the hillsides or in the valleys.

Photo 6.2a: Lick Run.

The second flow pattern is associated with the deeper aquifer. Groundwater in this zone generally flows east toward the Lick Run Valley, where it comingles with water of the shallow zone as it flows off the hillsides.

Groundwater monitoring (Photo 6.2b) in 2022 was performed per the NETL-Pittsburgh 2022 Groundwater Detection Monitoring Plan. The results of the NETL-Pittsburgh Groundwater Detection Monitoring Program are presented in Tables 6.2.1-6.2.4, and the results were compared against federal and state standards for groundwater. The following is a summary of the results:

- Iron exceeded PA Secondary Drinking Water MCL and Act 2 Secondary MCL standards for five wells.
- Manganese exceeded PA Secondary Drinking Water MCL for nine wells and, EPA Region III risk-based tables, and Act 2 Secondary MCL standards for six wells.
- Nickel exceeded the EPA Region III Risk Based Table for three wells. The level has been contributed in the past to the interaction of the sodium and chloride with the stainless steel well casings.
- Strontium exceeded the EPA Region III Risk Based Table for five wells.
- Well VFW-6 exceeded PA drinking water secondary MCL standards for pH.

Photo 6.2b: Pittsburgh Groundwater Monitoring.

Monthly groundwater elevation measurements to determine contaminant transport were completed in accordance with the Groundwater Protection Management Program. The elevation measurements are consistent with the general groundwater flow patterns described previously.

NETL-Pittsburgh is not considered a major user of Per- and Polyfluoroalkyl Substances (PFAS) since NETL: (1) only maintains limited quantities of R&D chemicals considered as PFAS; (2) has limited fixed aqueous film forming foam (AFFF) systems – two; and (3) does not operate its own fire department or fire-fighting training facilities.

There are only two documented historical discharges at the site in 1999-2000 associated with facility equipment failure and maintenance (no history of discharges associated with facility fires), with appropriate notifications being made at the times of the noted discharges. NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Pittsburgh does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds, as it is not required per the site's industrial wastewater or stormwater NPDES permits. While there is an active groundwater monitoring program, PFAS-related substances are not a regular analyte and have never been part of any historical sampling. Drinking water is provided by the local public drinking water system and site groundwater or surface water is not used as a drinking water source.

NETL will continue to review historical records associated with past activities, will proactively manage risks associated with PFAS-related substances, and will continue to manage chemical inventories to ensure proper management of any PFAS-related wastes. Pending budget availability, NETL will program equipment and facility upgrades to consider environmentally friendly alternatives for R&D chemicals and AFFF systems for fire protection needs. NETL does not consider PFAS compounds to be of significant environmental concern to warrant additional monitoring in water systems at the site; however, NETL will comply with any pending requirements to perform monitoring for any PFAS compounds.

6.3 GROUNDWATER AND SOIL QUALITY PROTECTION ACTIVITIES—MORGANTOWN

Morgantown's Groundwater Protection Program is controlled via NETL Procedure 436.1-03.02, *Groundwater Quality Management*, which is administered by the federal groundwater quality manager (FGQM). This procedure covers regulatory requirements for permitting, monitoring, compliance, and reporting, as well as best management practices for preventing leaks and spills, monitoring groundwater and soil quality, emergency releases, and quality control.

The procedure also ensures that the Groundwater Protection Plan (GWPP) is developed and implemented to obtain data for the purpose of determining baseline conditions of groundwater quality and quantity; demonstrating compliance with and implementation of all applicable permits, regulations and DOE orders; providing data to allow the early detection of groundwater pollution or contamination; providing a reporting mechanism for detected groundwater pollution or contamination; identifying existing and potential groundwater contamination sources and maintain surveillance of these sources; and providing data upon which decisions can be made concerning land disposal practices and the management and protection of groundwater resources. The GWPP documents the site's hydrogeology, potential sources of pollution and the associated contaminants that should be monitored, methods of well installation and sampling, a monitoring strategy and QA/QC processes related to water/soil sample analysis.

Spills and accidental discharge cleanup procedures are also addressed in the GWPP. Should a spill occur, containment and cleanup would commence, and the affected soil would be monitored or removed, as necessary.

The primary strategy for groundwater protection is spill and leak prevention. Together, the NETL Spill Prevention, Control, and Countermeasures (SPCC) Plan and the Storm Water Pollution Prevention Plan lay out the strategy for minimizing the risk of unintentional releases and quickly responding to an unintentional release to minimize environmental contamination. In addition, R&D projects are only initiated or modified after a rigorous ES&H review is conducted in accordance with the SARS directives. According to these directives, the responsible person for each project must prepare a set of written procedures documenting how the project is to be operated, how waste and feedstocks are to be safeguarded and how to contain and control unintended releases. When a leak or spill does occur, and the environment is threatened, the on-site emergency response team is activated, and the facility makes the appropriate internal and regulatory-driven notifications.

Twenty active monitoring wells exist at the Morgantown site. The locations of the wells are displayed in Figure 6.3.1: Active Monitoring Wells at the Morgantown Site. These wells monitor two shallow aquifers within the unconsolidated Lake Monongahela sediments and one bedrock aquifer, the Morgantown Sandstone. None of these aquifers is used as a source of water in the immediate area. Figure 6.3.2: Generalized Cross-Section of Aquifer Units at the Morgantown Site shows a generalized cross-section through the site and the relationship between the aquifers.

No groundwater contaminants have been consistently detected above regulatory levels at the site. Groundwater monitoring at the Morgantown site has been focused primarily on past spills and leaks and the effectiveness of the cleanup actions undertaken. The section on CERCLA Section 3.1.3.1 lists the past events and the status of the spill sites.

The only contaminants consistently found in significant amounts in the groundwater at the Morgantown site are related to the application of salts for de-icing. Sodium chloride is applied to the parking lots and roads, and calcium chloride is applied to the sidewalks and outdoor steps. Wells located near these features and near the runoff routes from these features show significantly elevated levels of chloride compared to background levels. This impact on groundwater is a problem shared with many businesses and road maintenance activities in this region, but it is considered a necessary safety practice to prevent injuries to site personnel and visitors.

The overall groundwater monitoring strategy has been to monitor any flow coming onto the site through each aquifer and to monitor the flow after it passes beneath the facilities and moves toward the springs and seeps. Groundwater monitoring at the Morgantown site from 1993 to 2002 was driven by two motivating factors. The first was the mandate of the WVDEP regarding the closure of Pond 005. The second was the mandate of DOE Order 5400.1, *General Environmental Protection Program.* Although DOE Order 5400.1 no longer exists, samples from many wells were analyzed between 1993 and 2002 for a lengthy list of analytes that included all organic compounds known to have been detected in analyses of the coal tar waste from the gasifier, the Pond 005 bottom sludge, and the sampled soils beneath Pond 005. It also included metals alleged to have been present in the Stretford solution used to remove sulfur oxides in the off-gas from the gasifier. No organic compounds were consistently detected during 10 years of sampling, and no consistent indications of contaminant concentrations above the state limits have been found. Only one analyte (cadmium), traceable to the operation of the closed pond, has been detected, but not above West Virginia groundwater regulatory limits.

After more than 15 years of monitoring, groundwater conditions are well understood. Spills and leaks in the past have not significantly degraded the groundwater on-site. The facilities and most of the underlying contaminated soils associated with spills and leaks in the past have been removed. In recent years, operations have changed greatly, and few large projects could now create significant groundwater contamination. At this point, most of the research is bench-scale and uses small quantities of chemicals and solvents. Accordingly, the groundwater analyses have been significantly curtailed. Under the new scheme, wells will be sampled each spring and fall. Wells located around the perimeter of the developed portion of the site in the two shallow aquifers will be tested to check water quality as it enters and leaves the developed area. For the deep aquifer (Morgantown Sandstone), sampling will continue for one up-gradient well and three down-gradient wells. The original list of measurements and analyzed compounds, which was presented in the annual site environmental reports of previous years, has been reduced to the list presented in this year's report. The results of the groundwater monitoring conducted during 2021 are presented in the Appendix as Table 6.3.1 through Table 6.3.6.

Morgantown is not major user of per- and polyfluoroalkyl substances (PFAS) since: (1) only maintains limited quantities of R&D chemicals considered as PFAS; (2) has limited fixed aqueous film forming foam (AFFF) systems—only one portable unit that does not contain any PFAS; and (3) does not operate its own fire department or fire-fighting training facilities.

There is no history of any AFFF discharges at the site. NETL maintains and tracks all chemicals on-site using a chemical inventory management system that ensures proper disposal at the end of chemical life, either via recycling or hazardous waste disposal. Accordingly, Morgantown does not have an active sampling, analysis, tracking, and monitoring program for PFAS-related compounds at any of its sites, as it is not required per the site's industrial wastewater permit or stormwater NPDES permits. While there is an active groundwater monitoring program, PFAS-related substances are not a regular analyte and have never been part of any historical sampling.

Drinking water is provided by the local public drinking water system and site groundwater or surface water is not used as a drinking water source.

NETL will continue to review historical records associated with past activities, will proactively manage risks associated with PFAS-related substances, and will continue to manage chemical inventories to ensure proper management of any PFAS-related wastes. Pending budget availability, NETL plans equipment and facility upgrades considering environmentally friendly alternatives for R&D chemicals and AFFF systems for fire protection needs. NETL does not consider PFAS compounds to be of significant environmental concern to warrant additional monitoring in water systems at the site; however, NETL will comply with any pending requirements to perform monitoring for any PFAS compounds.

7.0 QUALITY ASSURANCE

NETL manages a wide range of work activities, including basic and applied on-site research; contract administration for off-site research, development, and demonstration projects; design, construction, operation, modification, decommissioning, and environmental remediation of NETL facilities; and oversight functions related to these activities.

NETL's Quality Assurance (QA) Program provides the tools to ensure this work is accomplished safely while minimizing potential hazards to the public, site workers, the environment, and facilities and operations, through directives (orders and procedures), manuals, handbooks, and forms. DOE Order 414.1, Quality Assurance and DOE's Integrated Safety Management (ISM) principles (see Diagram 7.0, ISM core functions) govern NETL's QA Program.

NETL fully integrates its ISM and QA programs, ensuring line management accountability for ES&H issues. NETL implements this through work performance goals assigned to all line managers. Internal assessments and audits also ensure that line managers meet for their ES&H responsibilities.

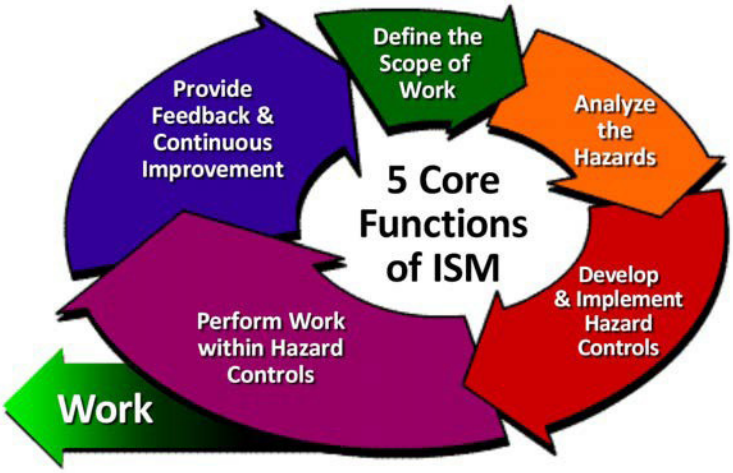

Diagram 7.0: DOE's ISM Principles.

The SARS process serves as the backbone of NETL's QA Program for ES&H. The SARS process identifies and mitigates hazards and environmental impacts highlighting the importance of its effective performance. NETL has four distinct SARS processes: R&D projects, facility construction permit, facility, and support operations.

The R&D SARS procedure, NETL Procedure 421.1-01, describes the process for a safety analysis and review of on-site R&D projects. The process identifies, analyzes, and provides the elimination, mitigation, or control of risks associated with on-site R&D projects to a degree acceptable by line management. Following the SARS review, R&D projects receive a SARS operating permit. A team comprising the project's responsible person, an ES&H representative, a project engineering representative, and the site's environmental manager conduct an annual assessment on all SARS-permitted R&D projects.

The assessment includes (1) checking for significant modifications made to the project without authorization and SARS review; (2) ES&H team inspecting the project area covering chemical hygiene, OSHA requirements and environmental compliance; (3) reviewing any non-conformance

found in the project area or in the SARS file. Records from each annual assessment become part of the project's SARS file. The team sends the findings from the annual assessment to the responsible person for correction and tracked in the corrective action tracking system.

The Construction Permit SARS manual, NETL Manual 421.1-00.04, ensures that NETL conducts construction activities in a safe and environmentally compliant manner. An approved construction permit must be issued before construction activities begin. Initially, the selected contractor develops and documents an ES&H plan. Construction activities not explicitly covered in contractor ES&H plans will receive an activity hazard analysis (AHA). Similarly, an AHA will ensure development, consideration, and mitigation of all potential environmental impacts due to construction in compliance with identified codes and standards.

The Facility SARS manual, NETL Manual 421.1-00.03, addresses on-site facilities including buildings, trailers, utilities, services, structures, roads, and walkways. It ensures the operation, maintenance, and modification of facilities comply with codes, regulations, and standards. The facility SARS focuses on identifying life safety, fire safety, and electrical safety classifications, assessing the compliance of the facility with codes and standards; documenting any deviations of the facility from codes and standards, developing mitigations to address code deviations and to establish acceptable risk levels for facility utilization when code compliance cannot be achieved without a General Plant Project. The manual also establishes the requirements for obtaining a facility use permit.

The Support Operations SARS procedure, NETL Procedure 421.1-00.02, addresses on-site support operations conducted by site support contractors. It includes construction, operations, maintenance, and renovation activities conducted by site support contractors and ensures the analysis of associated risks and their elimination, mitigation, or control to a degree acceptable by responsible line management before initiation of the project or operation. ES&H conducts an annual assessment on all SARS-permitted support operations. The annual assessment determines the continued validity of the SARS package and addresses changes in operations. Typical items reevaluated include changes in site conditions, worker training, operating procedures, and the effectiveness of controls. Findings from the annual assessment are sent by the ES&H gatekeeper to the responsible person for correction and tracked in the corrective action tracking system.

Other mechanisms for ensuring the quality of the ES&H programs include internal auditing required by ISO 14001/ISO 45001 certifications, external surveillance and certification audits related to the ISO 14001/ISO 45001 certifications, monthly focused inspections, facility inspections, internal reviews, and annual emergency response drills and exercises.

Many directives, manuals, and handbooks governing ES&H programs also contain monitoring requirements ensuring ES&H programs comply with directives and legal requirements. For example, the Fire Protection Program requires the conduct of fire protection appraisals every three years. This process will ensure the evaluation and reduction to acceptable level of hazards to life and property from fires, explosions, or related risks, as well as the evaluation of the adequacy of the local fire protection and prevention programs to minimize injury and protect DOE property. Written reports are provided to responsible management, which include recommendations for action going forward.

These activities result in findings tracked to a final resolution in the corrective action tracking system resulting in continual improvement of the ES&H programs.

APPENDIX

ACRONYM LIST

AAD	Acquisition and Assistance Division
ACHD	Allegheny County Health Department
AEA	Atomic Energy Act of 1954
AEP	American Electric Power Service Corporation
AES	American Environmental Services Inc.
AHA	Activity Hazard Analysis
AIIS	Assessment Information Input System
ALARA	As Low as Reasonably Achievable
ALB	Albany, Oregon
ANWR	Alaska National Wildlife Refuge
AQCR	Air Quality Control Region
ARRA	American Recovery and Reinvestment Act
B-	Building
BAMF	Biomass Alternative Methane Fuel
BOD	Biochemical Oxygen Demand
CO_2e	Carbon Dioxide equivalent
CAA	Clean Air Act
CBOD5	Carbonaceous Biochemical Oxygen Demand 5-day Test
CBT	Computer-Based Training
CCPI	Clean Coal Power Initiative
CCUS	Carbon Capture, Utilization, and Storage
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFC	Chlorofluorocarbon
CFO	Chief Financial Officer
CFR	U.S. Code of Federal Regulations
COD	Chemical Oxygen Demand

COPC	Contaminants of Potential Concern
CRADA	Cooperative Research and Development Agreement
CWA	Clean Water Act
CX	Categorical Exclusion
CY	Calendar Year
DMR	Discharge Monitoring Report
DOE	U.S. Department of Energy
DOEGRIT	DOE Green IT
DOT	Department of Transportation
EA	Environmental Assessment
ECM	Energy Conservation Measure
EISA	Energy Independence and Security Act
EIS	Environmental Impact Statement
EMP	ES&H Management Plan
EMS	Environmental Management System
E.O.	Executive Order
EOR	Enhanced Oil Recovery
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
EPP	Environmentally Preferred Product
ERO	Emergency Response Organization
ES&H	Environmental, Safety, and Health
ES&HMS	Environmental, Safety, and Health Management System
ESPC	Energy Savings Performance Contract
ES&H	Environmental, Safety, Security, and Health
FCOG	Facility Contractors Group
FECM	Office of Fossil Energy and Carbon Management
FEMP	Federal Emergency Management Program
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLC	Federal Laboratory Consortium

FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCFCI	Ground-Fault Circuit Interrupter
GHG	Greenhouse Gas
GIS	Geographic Information System
GMP	Groundwater Management Program
GPP	General Plant Project
GSA	U.S. General Services Administration
HAZWOPER	Hazardous Waste Operations and Emergency Training
HPSB	High-Performance and Sustainable Buildings
HVAC	Heating, Ventilation, and Air Conditioning
HQ	Headquarters
IAQ	Indoor Air Quality
ICCS	Industrial Carbon Capture and Sequestration
IGCC	Integrated Gasification Combined Cycle
ISM	Integrated Safety Management
ISO	International Organization for Standardization
LDR	Land Disposal Restriction
LED	Light-Emitting Diode
LEED	Leadership in Energy and Environmental Design
LLRW	Low-Level Radioactive Waste
MAA	Mutual Aid Agreement
MGN	Morgantown, West Virginia
MRT	Management Review Team
MSHA	Mine Safety and Health Administration
MUB	Morgantown Utility Board
NAAQS	National Ambient Air Quality Standards
NEC	National Electric Code
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory

NETL-RUA	NETL-Regional University Alliance
NFPA	National Fire Protection Association
NIMS	National Incident Command System
NIOSH	National Institute of Occupational Safety and Health
NNSA	National Nuclear Security Administration
NORM	Naturally Occurring Radioactive Material
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPRA	National Petroleum Reserve
NRC	Nuclear Regulatory Commission
ODEQ	Oregon Department of Environmental Quality
ODS	Ozone-Depleting Substance
OHSAS	Occupational Health and Safety Assessment Series
OIO	Office of Institutional Operations
ORD	Office of Research and Development
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PADEP	Pennsylvania Department of Environmental Protection
PCB	Polychlorinated Biphenyl
PGH	Pittsburgh, Pennsylvania
PHA	Pleasant Hills Authority
QA	Quality Assurance
QC	Quality Control
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
REC	Renewable Energy Credit
SARA	Superfund Amendments and Reauthorization Act
SARS	Safety Analysis and Review System
SBEUC	Simulation-Based Engineering User Center
SCC	Strategic Center for Coal

SCNGO	Strategic Center for Natural Gas and Oil
SHPO	State Historic Preservation Officer
SMS	Safety Management System
SOFC	Solid Oxide Fuel Cell
SOD	Site Operations Division
SPCC	Spill Prevention, Control, and Countermeasures Plan
SSP	Site Sustainability Plan
SVOC	Semi-Volatile Organic Compound
SWQM	Surface Water Quality Manager
TCE	Trichloroethylene
TLD	Thermo-Luminescent Dosimeter
TMDL	Total Maximum Daily Loading
TOX	Total Organic Halogens
TPH	Total Petroleum Hydrocarbons
TPQ	Threshold Planning Quantity
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage, and Disposal
TSS	Total Suspended Solids
USDA	U.S. Department of Agriculture
USGBC	U.S. Green Building Council
VOC	Volatile Organic Compound
WDEQ	Wyoming Department of Environmental Quality
WVDEP	West Virginia Department of Environmental Protection
WVU	West Virginia University
WWTF	Wastewater Treatment Facility Ciiscim iur as nonesenis venis et quam nim eserovi debit, illuptatias dolorecate cusanda volest at ea ad qui voluptis dolorum

TABLES AND FIGURES

Table 1.2.1: ES&H Programs

Affirmative Procurement Advocate/Greening Acquisition Program	Hazardous Waste Program
Air Quality Program	Hearing Conservation Program
Alarms Oversight Program	Illumination Quality Program
Asbestos and Lead Abatement Program	Inactive Waste Sites/Off-Site Remediation Program
Authority Having Jurisdiction (AHJ)/Exemptions Program	Indoor Air Quality and Ventilation Program
Assessment Information Input System (AIIS) Program	Industrial Hygiene Program
Computerized Accident/Incident Report System (CAIRS) Program (Injury/Illness Reporting)	Industrial Wastewater Quality Program
Chemical Handling Facility	Laser Safety Program
Chemical Hygiene Program	Lessons Learned Program
Chemical Inventory and Safety Data Sheet (SDS) Program	Life Safety Program
Confined Space Program	Medical Monitoring Program
Construction and Maintenance Safety Program	National Environmental Policy Act (NEPA) Compliance Program
Cryogenic Safety Program	Resource Conservation and Recovery Act (RCRA) Nonhazardous Waste Program
Directives Program	Occupational Medicine Program
Electrical Safety Program	Occurrence Reporting and Processing System (ORPS) Program
Emergency Preparedness Program/Emergency Response Program	Organization Incident Reporting Program
Environment, Safety, and Health Management System (ESHMS)—Management Review Program	OSHA Safety Program
Environmental Program	R&D Projects Program
Ergonomics Program	Radiation Safety Program
ES&H Communications Program	Records Program
ES&H Training Program	Respiratory Protection Program
Facility and Area Custodian Program	Safety & Health Program
Facility Work Authorization Program (Site Operations Division)	Superfund Amendments and Reauthorization Act (SARA) Title III Program
Facility Safety Committee Program	Safety Analysis and Review System (SARS) Program
Fire Protection Program	Soil Quality Program
Fire Warden Program	Storage Tank Program
Ground Water Quality Program	Surface Water Quality Program
Hazard Communication Program	Waste Management Oversight Program
	Waste Minimization and Pollution Prevention Program
	Water Quality Program

Table 4.1: Environmental, Safety, and Health Significant Aspects for FY2021
Waste Minimization, Pollution Prevention, and Recycling
High-Performance Sustainable Building Implementation
Hazardous Materials Procurement, Consumption, and Storage
Electronic Stewardship
Greenhouse Gas Air Emissions
Green Purchasing
Energy and Fuel Management
Water Usage
Workplace Health and Safety Issues
Organizational Resilience—Climate Change Adaptation (ON HOLD)

Table 4.2: Environmental, Safety, and Health Significant Aspects for FY2022
Waste Minimization, Pollution Prevention, and Recycling
High-Performance Sustainable Building Implementation
Hazardous Materials Procurement, Consumption, and Storage
Electronic Stewardship
Greenhouse Gas Air Emissions
Green Purchasing
Energy and Fuel Management
Water Usage
Workplace Health and Safety Issues
Organizational Resilience—Climate Change Adaptation
Refrigerant Management
Safety Culture

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Waste Minimization, Pollution Prevention, and Recycling				
Recycling	Divert nonhazardous solid waste from disposal annually. Pursue opportunities for net-zero waste or additional diversion opportunities. (E.O. 13834)		Divert/recycle non-hazardous waste produced.	922,350 lbs. out of 1,311,741 lbs. recycled in FY2021 = 70%.
			Identify opportunities to reduce nonhazardous waste in FY2021.	An opportunity was identified concerning touchless paper towel units for the restrooms. It has not been completed yet.
Recycling Construction Waste	Divert/recycle any construction/demolition waste from landfill disposal to the maximum extent feasible. (E.O. 13834)		Divert/recycle construction/demolition waste.	1,830,900 lbs. diverted/recycled during the fiscal year.
High-Performance Sustainable Building Implementation				
High-Performance Sustainable Buildings	Ensure all new construction and major renovations comply with the 2016 Guiding Principles. Make annual progress towards 100% conformance with the Guiding Principles. (E.O. 13834) Ensure at least 15% of existing facilities above 10,000 gross square feet meet the Guiding Principles by FY2021. (E.O. 13834)		Track the design packages to ensure they contain High-Performance Sustainable Building requirements.	As of the end of the fiscal year, 7 out of 46 applicable buildings (15.2%) were certified to the Guiding Principles.
			Develop a High-Performance Sustainable Building Plan as part of the Site Sustainability Plan.	The Site Sustainability Plan contains the High-Performance Sustainable Building Plan.
			Submit Site Sustainability Plan to DOE-HQ.	Site Sustainability Plan was submitted to DOE-HQ on 12/5/20.
Hazardous Materials Procurement, Consumption, and Storage				
Chemical Inventory	Reduce the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed during FY2021 using FY2020 as a baseline. (E.O. 13834)	12,514 containers	No net gain (plus or minus 10% of baseline) of chemicals (by number of containers and/or weight in pounds).	13,064 containers 21,139 pounds (4.4% increase)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Electronic Stewardship				
Purchase of Electronic Products	To revisit and ensure that processes are in place to evaluate requisitions that have been identified for EPEAT-certified electronic equipment based on the requirements of the aspect. (E.O. 13834) Inspect procurement reference for EPEAT-registered electronic products and the procurement of Energy Star- and FEMP-designated electronic equipment. (E.O. 13834)		95% of all products purchased that have EPEAT standards are EPEAT registered.	100% of products are EPEAT-registered.
			95% of specific electronic products are Energy Star- and FEMP-designated.	100% of electronic products are Energy Star and FEMP-designated.
Operation and Maintenance of Electronic Products	Enable power management, duplex printing, and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. (E.O. 13834)		Ensure that 90% of managed workstations and printers have power management settings in place.	100% or printers and 98.16% of workstations have power management settings in place.
End of Life Management of Electronic Products	Verify end-of-life management of excess/surplus electronics follow Bulletin FMR B-34 and the hierarchy established: 1. Reuse within an agency . Reuse through transfers, donations, and sales . Recycling through certified recyclers and manufacturer take-back programs using certified recyclers. (E.O. 13834)		Verify that disposition contracts are in place and being used at the PGH, MGN, and ALB sites. Provide contract no. or agreement and implementing person by the end of first quarter FY2020.	Contract between GSA and third-party recycler, Powerhouse Recycling, continues for both PGH and MGN. ALB has a separate contract which is followed and utilizes both UNICOR and the USPS to disposition ADP scrap.
			Report ultimate disposition weights on a quarterly basis.	Year-end total = 22,615 lbs.
			Verify a process is in place to determine the appropriate hierarchy for all excess/surplus electronic products.	ADP scrap is recycled in alignment with the GSA contract which is renewed annually. In addition, excess items are allocated thru GSA or OPMO-approved donations.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Greenhouse Gas Air Emissions				
GHG Emission Reporting	Track and report comprehensive GHG emission inventory for FY2021 via the DOE Sustainability Dashboard. (E.O. 13834)		Track and report GHG emission inventory via the DOE Sustainability Dashboard.	Total emissions = 36,710,999.2 lbs. CO_2e (16,652 metric tons)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Green Purchasing				
Environmentally Preferred Products	Purchase products that are: recycled, Bio Preferred, Energy Star, FEMP-designated, EPEAT, Water Sense or otherwise water efficient. (E.O. 13834)		Ensure that 95% of new contract actions for products and services are energy efficient, water efficient, bio-based content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives.	97.5% of contract actions were energy efficient, water efficient, bio-based content, environmentally preferable, non-ozone depleting, recycled content, and non-toxic, or less toxic than alternatives.
	Acquire uncoated printing and writing paper containing at least 30% post-consumer fiber. Reduce printing paper use. (E.O. 13834)		Ensure 98% of copier and printer paper shall contain a minimum of 30% recycled post-consumer fiber.	99.7% of copier and printer paper contained 30% recycled post-consumer fiber.
	Maximize site use of environmentally preferred products, including those that have recycled content, are Bio Preferred, or have the Energy Star, FEMP, or EPEAT designation in operation and maintenance, janitorial, and general office activities. Also maximize the use of sustainable products. (E.O. 13834)		Ensure that 80% of all products that can be purchased "green" under the site support and construction contracts are of environmentally preferred products.	93.6% of products purchased are "green" purchases.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Energy and Fuel Management				
Energy Use	Reduce energy usage/square foot by 1.0% in FY2021 from FY2020. (E.O. 13834)	141,060 BTU/ft^2	139,650 BTU/ft^2 (1.0%)	143,457 BTU/ft^2 1.7% increase
Management of Servers and Data Centers	Maximize efficiency of data centers through virtualization and consolidation. (E.O. 13834) Establish a power usage effectiveness (PUE) of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. (E.O. 13834)		Install dedicated smart meters in MGN, PGH, and ALB data centers to measure a monthly PUE.	Smart meters are a part of the design package for all three data centers. The MGN data center is complete. Awaiting construction for the ALB and PGH data centers.
			Identify remaining physical servers and establish a plan to virtualize into the NETL datacenter or a cloud instance.	NETL has identified remaining physical servers and has virtualized 95% of the data centers according to the plan.
			Identify a plan (consolidation, hot/cold row, reduced footprint) to optimize the PUE for the data centers.	Plans have been identified: - ALB: hot/cold aisle containment—construction phase started - MGN: contained cooling space as well as hot/cold aisles—construction phase complete - PGH: hot/cold aisle containment Also, NETL is developing a strategy for moving services to a cloud provider.
Renewable Energy	Ensure that NETL meets renewable energy on-site usage goals as defined in EPACT 2005, E.O. 13834, DOE Order 436.1, EISA 2007, and DOE SRIP. Ensure that NETL's total electrical energy consumption includes 7.5% renewable energy in FY 2021. (2,500 MWh)	7.5% of renewable energy consumption	Ensure that NETL's total electrical energy consumption includes the DOE SRIP target of 7.5% renewable energy in FY 2021 (2,500 MWh).	0.14% onsite plus RECs to meet 7.5%.
	Procure Renewable Energy Credits to meet the 7.5% renewable electric energy and clean energy goals. (E.O. 13834)		Procure RECs to meet the renewable electric energy and clean energy goals.	NETL purchased Renewable Energy Certificates (RECs) to meet this goal.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Energy and Fuel Management (cont.)				
Fleet Management	Reduce FY2021 petroleum consumption 2% from FY2020 level. (E.O. 13834)	2,356 GGE	Reduce FY 2021 fleet petroleum consumption by 2% from FY 2020 levels by increasing use of all-electric zero-emissions vehicles or plug-in hybrid vehicles in fleet and continue use of alternative fuel in fleet AFVs. Number is 2,309 GGE.	5,000 GGE 112% increase

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Water Usage				
Potable Water Consumption	Reduce potable water consumption by 0.5% from the final number for FY2020. (E.O. 13834)	9.788 gal/gsf	9.739 gal/gsf (0.5% reduction)	8.7 gal/gsf (11.2% reduction)

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Workplace Health and Safety Issues				
Naturally Occurring Radioactive Materials (NORM)	To survey, manage, and control NORM/TE-NORM that is in use or part of R&D operations to ensure the safety of individuals performing the research, control the areas/methods of use, and allow for proper disposal of wastes associated with the use of NORM or TE-NORM. Incorporate proper controls, precautions, and warnings into procedures and R&D SARS packages to ensure appropriate controls are maintained to prevent possible exposure.		Continue to track the number of surveys and items that were surveyed each quarter.	66 items were surveyed during a total of 9 surveys.
			Combine the two different radiation protection procedures into one; incorporate NORM/TE-NORM updates.	The two old procedures have been combined and updated and are awaiting approval.
			Ensure tracking of NORM/TE-NORM inventory via tracking system.	The database has been finalized to track the radioactive and NORM materials.

Table 4.3: FY2021 Environmental Management Plan Metrics				
Environmental Management Plan	Objective/ Target	Baseline	Target	Actual
Workplace Health and Safety Issues (cont.)				
Research Project-Specific Training Completion Rate Improvements	Reduce NETL lab personnel training deficiencies to more acceptable levels. Currently running between 250 and 300 since October 1st (203 = avg over the past 12 months).		No more than 100 instances of deficient project-specific training at the end of any week over the next calendar year.	240 instances on average at the end of the fiscal year.

Objective/target not met in FY2021

Objective/target partially met in FY2021

Objective/target met in FY2021

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target		Target	Actual
Waste Minimization, Pollution Prevention, and Recycling				
Recycling	Divert non-hazardous solid waste from disposal annually. (E.O. 14057)		Divert/recycle non-hazardous waste produced.	22,413 lbs. recycled out of 93,023 lbs. = 24% recycled.
	Pursue opportunities for net-zero waste or additional diversion opportunities. (E.O. 14057)		Identify opportunities to reduce non-hazardous waste in FY2022.	A quote for the touchless paper towel units has been received. The quote is being forwarded for approval.
Recycling Construction Waste	Sites are expected to continue to reduce waste sent to landfill through elimination, source reduction, and recycling, as well as maintain or increase their waste diversion rate. (2020 DOE Sustainability Report and Implementation Plan)		Divert/recycle construction/demolition waste cost effectively in FY2022.	80,000 lbs. have been diverted/recycled.
High-Performance Sustainable Building Implementation				
High-Performance Sustainable Buildings	Ensure all new construction and major renovations comply with the 2020 Guiding Principles for Sustainable Federal Buildings. (EISA 2007 "Energy Independence and Security Act 2007") Ensure at least 15% of existing facilities above 10,000 gross square feet meet the Guiding Principles by FY 2022. (EISA 2007 "Energy Independence and Security Act 2007")		Track the design packages to ensure they contain High-Performance Sustainable Building requirements.	All FY2020/2021/2022 construction/renovation projects have included High-Performance Sustainable Building Guiding Principles conformance.
			Develop a High-Performance Sustainable Building Plan as part of the Site Sustainability Plan.	The Site Sustainability Plan was submitted to DOE-HQ on December 3, 2021. It contains the HPSB Plan.
			Submit Site Sustainability Plan (SSP) to DOE-HQ.	The Site Sustainability Plan was submitted to DOE-HQ on December 3, 2021.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target		Target	Actual
Hazardous Materials Procurement, Consumption, and Storage				
Chemical Inventory	Reduce the quantity of toxic and hazardous chemicals and materials acquired, used, and disposed during FY2022 using FY2021 as a baseline. (E.O. 14057)	13,064 containers	No net gain (+/- 10% of baseline) of chemicals (by number of containers and/or weight in pounds).	12,813 containers 14,452 pounds
Electronic Stewardship				
Purchase of Electronic Products	To revisit and ensure that processes are in place to evaluate requisitions that have been identified for EPEAT-certified electronic equipment based on the requirements of the aspect. Inspect procurement reference for EPEAT-registered electronic products and the procurement of Energy Star designated electronic equipment.		95% of all products purchased that have EPEAT standards are EPEAT registered.	Purchases of electronics products for FY2022 YTD are at 99.14% purchased per EPEAT standards.
Operation and Maintenance of Electronic Products	Enable power management, duplex printing, and other energy-efficient or environmentally preferable features on all eligible DOE electronic products. (E.O. 14057)		Ensure that 90% of managed workstations and printers have power management settings in place.	100% of printers and 99.1% (1,517/1,530) of workstations have power management settings in place.

Table.4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Electronic Stewardship (cont.)				
End-of-Life Management of Electronic Products	Verify end-of-life management of excess/surplus electronics follow Bulletin FMR B-34 and the hierarchy established: 1. Reuse within an agency Reuse through transfers, donations, and sales Recycling through certified recyclers and manufacturer take-back programs using certified recyclers. (E.O. 14057)		Verify that disposition contracts are in place and being used at the PGH, MGN, and ALB sites. Provide contract no. or agreement and implementing person by the end of first quarter FY2022.	The contract between GSA and the third-party recycler, Powerhouse Recycling, continues for both PGH and MGN. ALB has a separate contract that utilizes both UNICOR and the USPS to disposition ADP scrap.
			Report ultimate disposition weights on a quarterly basis.	No scrap was received or dispositioned due to the lack of employees on-site.
			Verify a process is in place to determine the appropriate hierarchy for all excess/surplus electronic products.	ADP scrap is recycled in alignment with the GSA contract which is renewed annually. In addition, excess items are allocated thru GSA or OPMO-approved donations.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Greenhouse Gas Air Emissions				
GHG Emission Reporting	Report comprehensive GHG emission inventory for FY2022 by the end of January 2023. (DOE 2020 DOE Sustainability Report and Implementation Plan)		Report emission inventories on an annual basis for year-end (FY) wrap-up by January 31, 2023.	The data will be submitted at the end of FY2022.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Green Purchasing				
Environmentally Preferred Products	Purchase products that are: recycled, Bio Preferred, Energy Star, FEMP-designated, EPEAT, Water Sense or otherwise water efficient. (E.O. 14057)		Report the number of applicable contract actions with sustainable clauses.	23 contract actions with sustainable clauses.
			Report the value of applicable contract actions with sustainable clauses.	Value of contraction actions with sustainable clauses = $15,543,100.03

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Energy and Fuel Management				
Energy Use	Reduce energy usage/square foot by 1.0% in FY2022 from FY2021.	143,457 BTU/ft^2	142,017 BTU/ft^2 1.0% reduction	39,172 BTU/ft^2 3.5% reduction
Management of Servers and Data Centers	Maximize efficiency of data centers through virtualization and consolidation. (E.O. 14057) Establish a power usage effectiveness (PUE) of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. (E.O. 14057)		Install dedicated smart meters in MGN, PGH, and ALB data centers to measure a monthly PUE.	Smart meters are a part of the design package for all three data centers. The MGN data center is complete. Awaiting construction for ALB and PGH data centers.
			Identify remaining physical servers and complete a plan to virtualize into the NETL datacenter or a cloud instance.	NETL is 95% virtualized.
			Identify a plan (consolidation, hot/cold row, reduced footprint) to optimize the PUE for the data centers.	Plans have been identified: - ALB: hot/cold aisle containment—construction phase started - MGN: contained cooling space as well as hot/cold aisles—construction phase complete - PGH: hot/cold aisle containment Also, NETL is developing a strategy for moving services to a cloud provider.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Energy and Fuel Management (cont.)				
Renewable Energy	Ensure that NETL meets renewable energy on-site usage goals as defined in EPAct 2005 and 2020 DOE SRIP Sustainability Report and Implementation Plan (SRIP). .	7.5% of renewable energy consumption	Ensure that NETL's total electrical energy consumption includes the 2020 DOE SRIP target of 7.5% renewable energy in FY2022 (3,500 MWh).	0.14% onsite plus renewable energy credits (RECs) to meet 7.5%.
			Procure RECs to meet the 7.5% renewable electric energy and clean energy goals.	NETL will purchase RECs to meet this goal.
Fleet Management	Reduce FY 2022 petroleum consumption 2% from FY 2021 level. (2020 DOE SRIP)	5,000 GGE	Reduce FY2022 fleet petroleum consumption by 2% from FY2021 levels by increasing use of all-electric zero-emissions vehicles or plug-in hybrid vehicles in fleet and continue use of alternative fuel in fleet AFVs. Number is 4,900 GGE.	884 GGE
	Increase FY 2022 alternate fuel usage by 10% from FY 2021 level. (2020 DOE SRIP)	5,587 gallons	Increase FY 2022 alternate fuel usage by 10% from FY 2021 levels by increasing use of all-electric ZEVs or plug-in hybrid vehicles in fleet. FY 2022 Target = 5,028 gallons	1,616 gallons

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Water Usage				
Potable Water Consumption	Reduce potable water consumption by 0.5% from the final number for FY2021.	8.7 gal/gsf	8.66 gal/gsf 0.5% decrease	2.862 gal/gsf 31.6% increase

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Workplace Health and Safety Issues				
Radiation Protection Program	To survey, manage, and control radiation that is in use or part of R&D operations to ensure the safety of individuals performing the research, control the areas/methods of use, and allow for proper disposal of wastes associated with the use of NORM or TE-NORM. Also to incorporate proper controls, precautions, and warnings into procedures and R&D SARS packages to ensure appropriate controls are maintained to prevent possible exposure.		Continue to track the number of surveys and items that were surveyed each quarter. Continue to populate the radiation database with the all the radiation materials, sealed sources, and RGD.	One survey was completed, which looked at two items. The access database has been completed and the SSC IH group is populating the database.
			Combine the two different radiation protection procedures into one; incorporate NORM/TE-NORM, radiation generating devices, and non-ionizing radiation flow chart for when dosimetry is required.	Draft procedure that combined the two different radiation procedures into one is in final draft. Site manager has approved the final draft. Awaiting approval from the associate director.
			Ensure that that all personnel are properly trained.	All personnel have been trained.
			Ensure that dosimetry is worn when operating RGD.	Dosimetry has been worn in all cases when operating RGD.
			Ensure that all SARS protects that utilize RGD have the hazard properly documented in the SARS package.	RGD has been accounted for in all SARS packages reviewed this quarter.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Workplace Health and Safety Issues (cont.)				
Research Project-Specific Training Completion Rate Improvements	Reduce NETL lab personnel training deficiencies to more acceptable levels.		No more than 100 instances of deficient project-specific training at the end of any week over the next calendar year.	Only data report analyzed (the training deficiencies from 12-30-21) gave an adjusted value of 41 deficiencies.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Refrigerant Measurement				
Refrigerant Management	Establish an inventory of refrigerants at NETL and set up a tracking system for purchases, losses, recovery, recycling, and disposal.		Identify all refrigerants currently used/stored refrigerants at each site in an inventory.	Identification of all refrigerants will be completed as part of 3rd quarter inventory report.
			Develop an equipment inventory for each site/include the refrigerant amount in each piece of equipment.	Identification of all equipment containing refrigerants will be completed as part of the 3rd quarter inventory report.
			Revise the Tracking Form to ensure all necessary inputs and losses (removals and leaks) are included.	Tracking form has been revised—NETL Form 434.1-4, Refrigerant Management Recordkeeping Logbook.
			Develop an Equipment/Refrigerant Purchase Form for new (incoming)refrigerants.	Developed NETL Form 434.1-4/1, Refrigerant & Equipment Purchase.
			Generate a refrigerant inventory on a quarterly basis to ensure the inventory tracks with the needs of the Site Sustainability Plan.	Report not generated this quarter and will be submitted shortly after the 2nd quarter for the first two quarters.

Table 4.4: FY2022 Environmental Management Plan Metrics—First Quarter				
Environmental Management Plan	Objective/Target	Baseline	Target	Actual
Safety Culture				
Access and Clarity of R&D Project Safety Documentation	Improve consistency and accessibility of R&D SARS files.		Ensure eSARS documents are filed in a consistent manner.	No data available. The EMP will not start until the second quarter.
			Develop the Business System Upgrade Plan based on funding available.	No data available. The EMP will not start until the second quarter.
Leading Indicators	Improve the Safety Culture at NETL by establishing leading indicators for safety and health metrics.		Identify, develop, and implement leading indicators. Will monitor the DOE Safety Culture Improvement Panel and Measuring and Monitoring Workgroup for eventual alignment. Step 1: Identify possible leading indicators for management approval. Step 2: Information will be gathered to establish a long term data-gathering process and establish a baseline for each approved metric. Step 3: Leading indicators will be implemented and data posted to the intranet.	The leading indicators are being developed for management approval.
Organizational Resilience				
Organizational Resilience Planning	Update policies to ensure planning for and addressing the impacts of climate change.		Complete the DOE-mandated Vulnerability Assessment and Resilience Plan during FY 2022.	No data for the quarter. EMP will not be implemented until second quarter.

Objective/target not likely to be met in FY2022

Objective/target only partially met thus far in FY2022

Objective/target likely to be met in FY2022

Table 6.1.1: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7		MW-8	
	N/A	N/A	N/A	N/A	03/18	08/24	03/15	08/23	03/15	08/25	03/17	08/24	03/17	08/25	03/16	08/23
1,1,1,2-Tetrachloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NS	NS	NS	NS	0.52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	0.69	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	NS	NS	NS	NS	ND	ND	ND	ND	1.1	1.4	ND	ND	ND	ND	ND	ND
Chloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6.1.1: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7		MW-8	
	N/A	N/A	N/A	N/A	03/18	08/24	03/15	08/23	03/15	08/25	03/17	08/24	03/17	08/25	03/16	08/23
Dibromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	NS	NS	NS	NS	ND	ND	ND	ND	ND	0.82	ND	ND	ND	ND	ND	ND
Isopropylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	NS	NS	NS	NS	0.96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not detected NS = Not Sampled

Exceeds Groundwater Quality Standards

Table 6.1.2: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-9		MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
	03/16	08/24	03/16	08/24	03/16	08/25	N/A	N/A	03/15	08/23	03/16	08/24	03/15	08/23	03/17	08/25
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	0.29	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	3.5	12	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	4.7	5.2	1.2	1.5	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND

Table 6.1.2: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-9		MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
	03/16	08/24	03/16	08/24	03/16	08/25	N/A	N/A	03/15	08/23	03/16	08/24	03/15	08/23	03/17	08/25
Dibromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	0.36	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	14	25	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not detected NS= Not Sampled

Exceeds Groundwater Quality Standards

Table 6.1.3: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-17		MW-18		MW-19		MW-20		MW-21		MW-22		MW-23		MW-24	
	03/15	08/23	03/16	08/24	03/16	08/24	03/16	08/24	N/A	N/A	03/17	08/25	03/16	08/24	03/16	08/26
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Benzene	0.28	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.53	0.33	23	55	ND	ND	ND	950	NS	NS	13	6.4	2	1.5	140	150
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Chloroform	0.58	ND	3.7	9.8	ND	ND	190	110	NS	NS	3.3	1.8	4.6	2.2	27	19
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	0.57	ND	NS	NS	1.7	1.5	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND

Table 6.1.3: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date															
	MW-17		MW-18		MW-19		MW-20		MW-21		MW-22		MW-23		MW-24	
	03/15	08/23	03/16	08/24	03/16	08/24	03/16	08/24	N/A	N/A	03/17	08/25	03/16	08/24	03/16	08/26
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	0.93	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	3	5.1	ND	ND	13	8.2	NS	NS	0.85	0.76	ND	ND	8.5	0.57
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	8.3	31	36	63	ND	ND	260	140	NS	NS	5.5	5.5	1.5	1.5	69	69
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND

ND = Not detected NS= Not Sampled

Exceeds Groundwater Quality Standards

Table 6.1.4: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date													
	MW-25		MW-26		MW-27		MW-28		MW-29		MW-30		MW-31	
	03/16	08/23	03/16	08/24	03/15	08/23	03/16	08/24	03/15	08/23	03/17	08/24	03/15	08/24
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	0.27	ND	ND	ND	0.27	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.5	ND	ND	ND	120	51	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	0.5	19	13	1.2	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.5	4.7	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 6.1.4: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date													
	MW-25		MW-26		MW-27		MW-28		MW-29		MW-30		MW-31	
	03/16	08/23	03/16	08/24	03/15	08/23	03/16	08/24	03/15	08/23	03/17	08/24	03/15	08/24
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.47	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not detected NS= Not Sampled

Exceeds Groundwater Quality Standards

Table 6.1.5: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date							
	MW-100		MW-101		MW-102		MW-103	
	03/17	08/25	03/17	08/25	03/17	08/25	03/17	08/25
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	ND	0.37	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.46	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND

Table 6.1.5: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—VOC Constituents (µg/L)

Constituent	Well Number, Sample Date							
	MW-100		MW-101		MW-102		MW-103	
	03/17	08/25	03/17	08/25	03/17	08/25	03/17	08/25
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylene Dibromide	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	6.7	31	2.2	2.2	4.1	4.0	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not detected

Exceeds Groundwater Quality Standards

Table 6.1.6: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—Metals (mg/L)

Constituent	Well Number, Sample Date							
	MW-3		MW-4		MW-6		MW-13	
	03/18	08/24	03/15	08/23	03/17	08/24	03/15	08/23
Aluminum	NS	NS	NS	NS	NS	NS	NS	NS
Antimony	NS	NS	NS	NS	NS	NS	NS	NS
Arsenic	NS	NS	NS	NS	NS	NS	NS	NS
Barium	NS	NS	NS	NS	NS	NS	NS	NS
Beryllium	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium	NS	NS	NS	NS	NS	NS	NS	NS
Calcium	NS	NS	NS	NS	NS	NS	NS	NS
Chromium	NS	NS	NS	NS	NS	NS	NS	NS
Cobalt	NS	NS	NS	NS	NS	NS	NS	NS
Copper	NS	NS	NS	NS	NS	NS	NS	NS
Iron	NS	NS	NS	NS	NS	NS	NS	NS
Lead	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS
Manganese	NS	NS	NS	NS	NS	NS	NS	NS
Mercury	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	NS	NS	NS	NS	NS	NS	NS	NS
Selenium	NS	NS	NS	NS	NS	NS	NS	NS
Silver	NS	NS	NS	NS	NS	NS	NS	NS
Sodium	NS	NS	NS	NS	NS	NS	NS	NS
Thallium	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	NS	NS	NS	NS	NS	NS	NS	NS

ND = Not detected

Exceeds Groundwater Quality Standards

Table 6.1.6: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—Metals (mg/L)

Constituent	Well Number, Sample Date							
	MW-14		MW-15		MW-16		MW-17	
	03/16	08/24	03/15	08/23	03/17	08/25	03/15	08/23
Aluminum	NS	NS	NS	NS	NS	NS	NS	NS
Antimony	NS	NS	NS	NS	NS	NS	NS	NS
Arsenic	NS	NS	NS	NS	NS	NS	NS	NS
Barium	NS	NS	NS	NS	NS	NS	NS	NS
Beryllium	NS	NS	NS	NS	NS	NS	NS	NS
Cadmium	NS	NS	NS	NS	NS	NS	NS	NS
Calcium	NS	NS	NS	NS	NS	NS	NS	NS
Chromium	NS	NS	NS	NS	NS	NS	NS	NS
Cobalt	NS	NS	NS	NS	NS	NS	NS	NS
Copper	NS	NS	NS	NS	NS	NS	NS	NS
Iron	NS	NS	NS	NS	NS	NS	NS	NS
Lead	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS
Manganese	NS	NS	NS	NS	NS	NS	NS	NS
Mercury	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	NS	NS	NS	NS	NS	NS	NS	NS
Selenium	NS	NS	NS	NS	NS	NS	NS	NS
Silver	NS	NS	NS	NS	NS	NS	NS	NS
Sodium	NS	NS	NS	NS	NS	NS	NS	NS
Thallium	NS	NS	NS	NS	NS	NS	NS	NS
Vanadium	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	NS	NS	NS	NS	NS	NS	NS	NS

ND = Not detected

Exceeds Groundwater Quality Standards

Table 6.1.7: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—Metals (mg/L)						
Constituent	Well Number, Sample Date					
	MW-18		MW-19		MW-20	
	03/16	08/24	03/16	08/24	03/16	08/24
Aluminum	NS	NS	NS	NS	NS	NS
Antimony	NS	NS	NS	NS	NS	NS
Arsenic	NS	NS	NS	NS	NS	NS
Barium	NS	NS	NS	NS	NS	NS
Beryllium	NS	NS	NS	NS	NS	NS
Cadmium	NS	NS	NS	NS	NS	NS
Calcium	NS	NS	NS	NS	NS	NS
Chromium	NS	NS	NS	NS	NS	NS
Cobalt	NS	NS	NS	NS	NS	NS
Copper	NS	NS	NS	NS	NS	NS
Iron	NS	NS	NS	NS	NS	NS
Lead	NS	NS	NS	NS	NS	NS
Magnesium	NS	NS	NS	NS	NS	NS
Manganese	NS	NS	NS	NS	NS	NS
Mercury	NS	NS	NS	NS	NS	NS
Nickel	NS	NS	NS	NS	NS	NS
Potassium	NS	NS	NS	NS	NS	NS
Selenium	NS	NS	NS	NS	NS	NS
Silver	NS	NS	NS	NS	NS	NS
Sodium	NS	NS	NS	NS	NS	NS
Thallium	NS	NS	NS	NS	NS	NS
Vanadium	NS	NS	NS	NS	NS	NS
Zinc	NS	NS	NS	NS	NS	NS

ND = Not detected

Exceeds Groundwater Quality Standards

Table 6.1.7: NETL-Albany 2022 Groundwater Detection Monitoring Program: Results of Analysis—Groundwater Samples—Metals (mg/L)						
Constituent	Well Number, Sample Date					
	MW-22		MW-23		MW-24	
	03/17	08/25	03/16	08/24	03/16	08/26
Aluminum	NS	NS	NS	NS	NS	NS
Antimony	NS	NS	NS	NS	NS	NS
Arsenic	NS	NS	NS	NS	NS	NS
Barium	NS	NS	NS	NS	NS	NS
Beryllium	NS	NS	NS	NS	NS	NS
Cadmium	NS	NS	NS	NS	NS	NS
Calcium	NS	NS	NS	NS	NS	NS
Chromium	NS	NS	NS	NS	NS	NS
Cobalt	NS	NS	NS	NS	NS	NS
Copper	NS	NS	NS	NS	NS	NS
Iron	NS	NS	NS	NS	NS	NS
Lead	NS	NS	NS	NS	NS	NS
Magnesium	NS	NS	NS	NS	NS	NS
Manganese	NS	NS	NS	NS	NS	NS
Mercury	NS	NS	NS	NS	NS	NS
Nickel	NS	NS	NS	NS	NS	NS
Potassium	NS	NS	NS	NS	NS	NS
Selenium	NS	NS	NS	NS	NS	NS
Silver	NS	NS	NS	NS	NS	NS
Sodium	NS	NS	NS	NS	NS	NS
Thallium	NS	NS	NS	NS	NS	NS
Vanadium	NS	NS	NS	NS	NS	NS
Zinc	NS	NS	NS	NS	NS	NS

ND = Not detected

Exceeds Groundwater Quality Standards

Table 6.2.1: 2022 Groundwater Detection Monitoring Program Results of Analysis—Groundwater Samples Valley Fill—TPH and Contamination Indicators Constituents—Pittsburgh								
Constituent	Well Number, Sample Date							
	VFW-2		VFW-4		VFW-7		VFW-9	
	06/01/22	11/16/22	06/01/22	11/16/22	06/01/22	11/16/22	06/01/22	11/16/22
TPH-DRO (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND
pH (standard units)	7.31	7.02	6.88	6.80	7.06	6.70	7.19	6.99
Specific Conductance (uS/cm)	4,211	3,451	3,118	3,470	4,792	5,778	1,194	1,127
Temperature (^{0}C)	13.5	11.1	16.9	10.4	15.2	11.5	14.2	8.93
Constituent	Well Number, Sample Date							
	VFW-10		VFW-11		VFW-12		VFW-14	
	06/01/22	11/16/22	06/01/22	11/16/22	06/01/22	11/16/22	06/01/22	11/16/22
TPH-DRO	ND	ND	ND	ND	ND	ND	ND	ND
pH (standard units)	7.11	7.23	7.12	6.78	7.06	6.76	6.95	6.51
Specific Conductance (uS/cm)	4,076	4,099	3,772	4,680	2,231	1,793	3,108	4,189
Temperature (^{0}C)	15.6	9.9	18.5	6.4	16.9	9.7	13.0	11.3

ND = not detected

Table 6.2.2: 2022 Groundwater Detection Monitoring Program Results of Analysis—Groundwater Samples, Valley Filled Area—VOC Constituents (ug/L)—Pittsburgh				
Constituent	Well Number, Sample Date			
	VFW-2	VFW-3	VFW-10	VFW-14
	06/01/22	06/01/22	06/01/22	06/01/22
Acetone	ND	ND	ND	ND
Benzene	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
2-Butanone (MEK)	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND
Cyclohexane	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND
Cis-1,2-Dichloroethene	ND	0.84	ND	ND
Trans-1,2-Dichloroethene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
Cis-1,3-Dichloropropene	ND	ND	ND	ND
Trans-1,3-Dichloropropene	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND
Methyl acetate	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
Methylcyclohexane	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	ND	ND	ND	ND
Methyl tert-butyl ether	ND	ND	ND	ND
Styrene	ND	ND	ND	ND

Table 6.2.2: 2022 Groundwater Detection Monitoring Program Results of Analysis—Groundwater Samples, Valley Filled Area—VOC Constituents (ug/L)—Pittsburgh				
Constituent	Well Number, Sample Date			
	VFW-2	VFW-3	VFW-10	VFW-14
	06/01/22	06/01/22	06/01/22	06/01/22
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND
Tetrachloroethene (PCE)	ND	5.0	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND
Trichloroethene (TCE)	ND	0.50	ND	ND
Trichlorofluromethane	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ND	ND	ND
Toulene	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND

ND = not detected

Table 6.2.3: 2022 Groundwater Detection Monitoring Program
Results of Analysis—Groundwater Samples, Valley Filled Area
Groundwater Characteristics Constituents—Pittsburgh

Constituent	Well Number, Sample Date											
	VFW-1	VFW-2	VFW-3	VFW-4	VFW-5	VFW-6	VFW-7	VFW-9	VFW-10	VFW-11	VFW-12	VFW-14
	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22	06/01/22
Inorganics: Dissolved Metals (ug/l)												
Aluminum	ND	44	44	70	55	93	66	ND	ND	98	94	79
Boron	280	120	45	67	210	190	71	58	110	69	360	120
Calcium	8,700	250,000	210,000	430,000	250,000	350,000	410,000	92,000	220,000	520,000	260,000	340,000
Iron	ND	1,100	ND	310	120	1,300	4,800	140	ND	120	260	4,400
Magnesium	1,900	51,000	75,000	120,000	39,000	63,000	99,000	22,000	39,000	120,000	78,000	71,000
Manganese	9.6	970	220	340	7.8	480	890	33	2,200	450	150	5,900
Nickel	ND	12	120	210	56	14	ND	110	27	600	500	2.0
Potassium	1,100	6,100	5,600	5,700	4,000	11,000	4,700	1,700	14,000	1,900	1,800	2,500
Silica	5,400	7,500	4,000	5,600	8,600	4,300	5,900	3,500	5,500	3,800	4,400	6,000
Sodium	250,000	560,000	220,000	74,000	470,000	930,000	560,000	200,000	820,000	240,000	150,000	460,000
Strontium	790	2,700	890	3,700	850	1,600	6,200	230	650	1,300	3,500	1,400
Quality Parameters (mg/L)												
Chloride	32.1	817	583	1,050	1,140	1,960	1,690	389	1,360	1,370	449	1,020
Fluoride	1.38	0.570	0.185	0.148	0.680	0.634	0.0833	0.100	0.555	0.0798	0.218	0.208
Nitrate	0.0237	ND	0.999	0.151	0.975	0.696	0.0530	1.75	0.216	0.0455	0.639	ND
Sulfate	0.772	580	115	89.1	150	312	170	108	430	220	376	163
Total Dissolved Solids	600	2,400	1,300	2,000	2,300	3,700	3,200	890	3,000	2,500	1,400	2,300
Total Alkalinity	570	260	300	260	250	120	260	100	240	190	300	260

ND = not detected; NS= not sampled

	Exceeded Pennsylvania Secondary Drinking Water Maximum Contaminant Level and Act 2 Secondary Maximum Contaminant Level
	Exceeded EPA Region III Risk Based Table, Pennsylvania Secondary Drinking Water MCL and Act 2 Secondary Maximum Contaminant Level
	Exceeded Pennsylvania Secondary Drinking Water Maximum Contaminant Level

Table 6.2.4: 2022 Groundwater Detection Monitoring Program Results of Analysis—Groundwater Samples, Valley Filled Area Groundwater Contamination Indicators Constituents—Pittsburgh												
Constituent	**VFW-1**	**VFW-2**	**VFW-3**	**VFW-4**	**VFW-5**	**VFW-6**	**VFW-7**	**VFW-9**	**VFW-10**	**VFW-11**	**VFW-12**	**VFW-14**
	06/01/22	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**	**06/01/22**
pH (standard units)	7.98	7.03	6.89	6.79	7.00	7.10	6.86	6.72	7.16	6.93	6.86	6.80
Spec. Conductance (us/cm)	1.039	4.057	2.701	3.901	4.081	7.064	5.846	1.641	5.472	4.718	2.633	3.510
Temperature (^{0}C)	18.6	13.4	16.6	15.7	19.6	14.0	13.7	14.7	12.4	14.9	15.8	15.5
TOX (mg/L)	NS	NS	NS	NS	0.058	0.045	NS	0.031	NS	0.039	0.034	0.061
TOC (mg/L)	1.8	7.5	6.0	0.61	1.6	2.1	1.7	1.8	1.3	0.77	5.4	1.6

TOX = total organic halogens; TOC = total organic carbon; specific conductance unit = us/cm @ 25 C;

NS= not sampled

	Exceeded Pennsylvania Secondary Drinking Water MCL

Table 6.3.1: May 2022 Data for "A" Aquifer—Morgantown											
Parameter	UNITS	Sample Location									
		A	B	GAS-4	I	J	L	M	N	SP1-A	SP4-A
pH (field)	S.U.	6.59	5.69	5.02	6.32	4.76	5.29	3.76	4.08	5.59	6.18
Specific Conductance (field)	µmhos	0.302	0.285	0.427	0.333	1.342	1.609	1.766	1.684	0.577	0.388
Temperature (field)	deg. C	17.06	14.86	17.35	15.85	14.49	15.37	12.37	14.57	14.82	18.48
Cadmium	ug/L	NT	NT	NT	<0.21	1.7	2.0	1.4	2.7	NT	NT

Table 6.3.2: May 2022 Data for "B-C" Aquifer—Morgantown						
Parameter	UNITS	Sample Location				
		11	31	32-A	GAS-5	SP2-BC
pH (field)	S.U.	5.72	6.03	5.05	4.79	6.29
Specific Conductance (field)	µmhos	0.175	1.329	2.987	2.299	0.434
Temperature (field)	deg. C	14.39	19.82	18.78	15.02	15.03

Table 6.3.3: May 2022 Data for Morgantown Aquifer				
Parameter	UNITS	Sample Location		
		D1-M	D2-M	D4-M
pH (field)	S.U.	5.99	8.89	7.30
Specific Conductance (field)	µmhos	0.498	0.533	0.594
Temperature (field)	deg. C	17.58	15.79	14.42

Table 6.3.4: Nov 2022 Data for "A" Aquifer—Morgantown											
Parameter	UNITS	Sample Location									
		A	B	GAS-4	I	J	L	M	N	SP1-A	SP4-A
pH (field)	S.U.	6.31	6.33	5.61	5.85	4.94	5.74	3.74	4.48	6.37	6.28
Specific Conductance (field)	µmhos	0.228	0.279	0.518	0.341	1.653	2.327	1.934	2.037	0.575	0.347
Temperature (field)	deg. C	9.39	13.69	14.0	13.8	14.3	14.4	15.0	13.5	12.79	12.6
Cadmium	ug/L	NT	NT	NT	0.25	1.5	1.1	0.93	2.5	NT	NT

Table 6.3.5: Nov 2022 Data for "B-C" Aquifer—Morgantown						
Parameter	UNITS	Sample Location				
		11	31	32-A	GAS-5	SP2-BC
pH (field)	S.U.	5.99	6.78	5.20	6.24	6.44
Specific Conductance (field)	µmhos	0.194	1.370	3.621	2.271	0.421
Temperature (field)	deg. C	12.6	14.6	15.1	15.52	10.2

Table 6.3.6: Nov 2022 Data for Morgantown Aquifer				
Parameter	UNITS	Sample Location		
		D1-M	D2-M	D4-M
pH (field)	S.U.	6.35	8.54	6.31
Specific Conductance (field)	µmhos	0.433	0.535	0.755
Temperature (field)	deg. C	14.20	12.6	11.40

ND = not detected NT = not tested

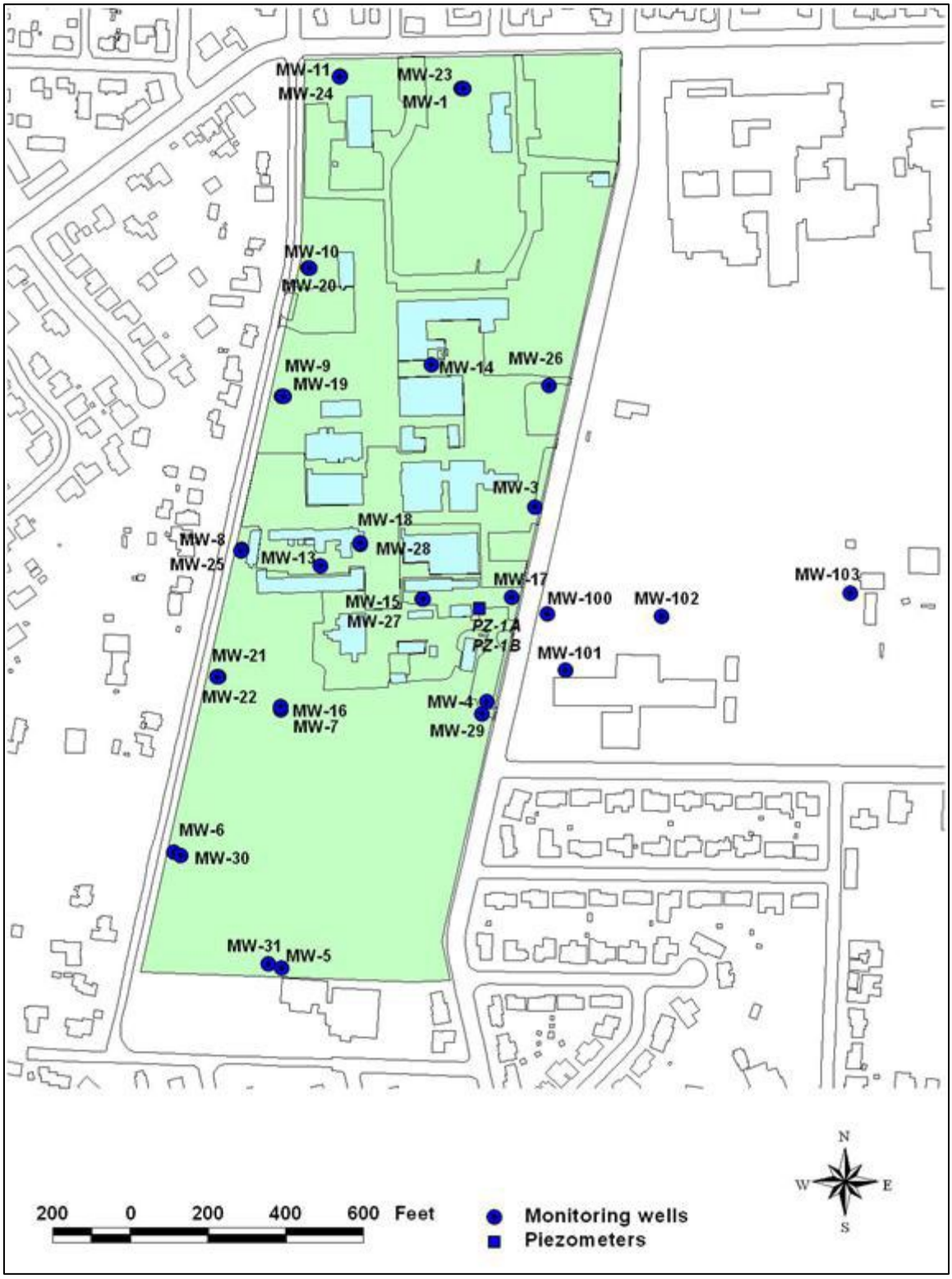

Figure 5.1: Monitoring Well Locations—Albany.

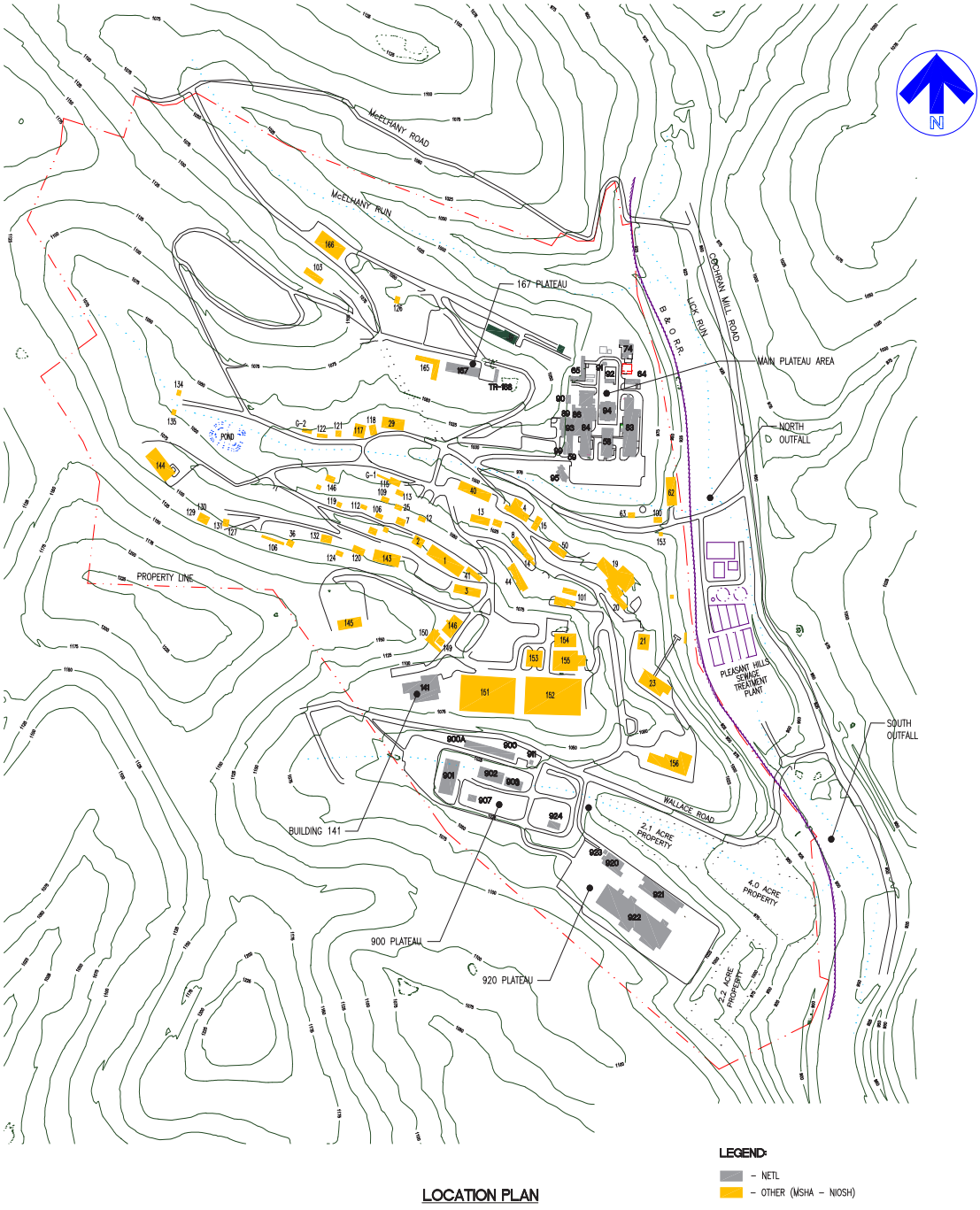

Figure 5.2.1: Topographic Site Map—Pittsburgh.

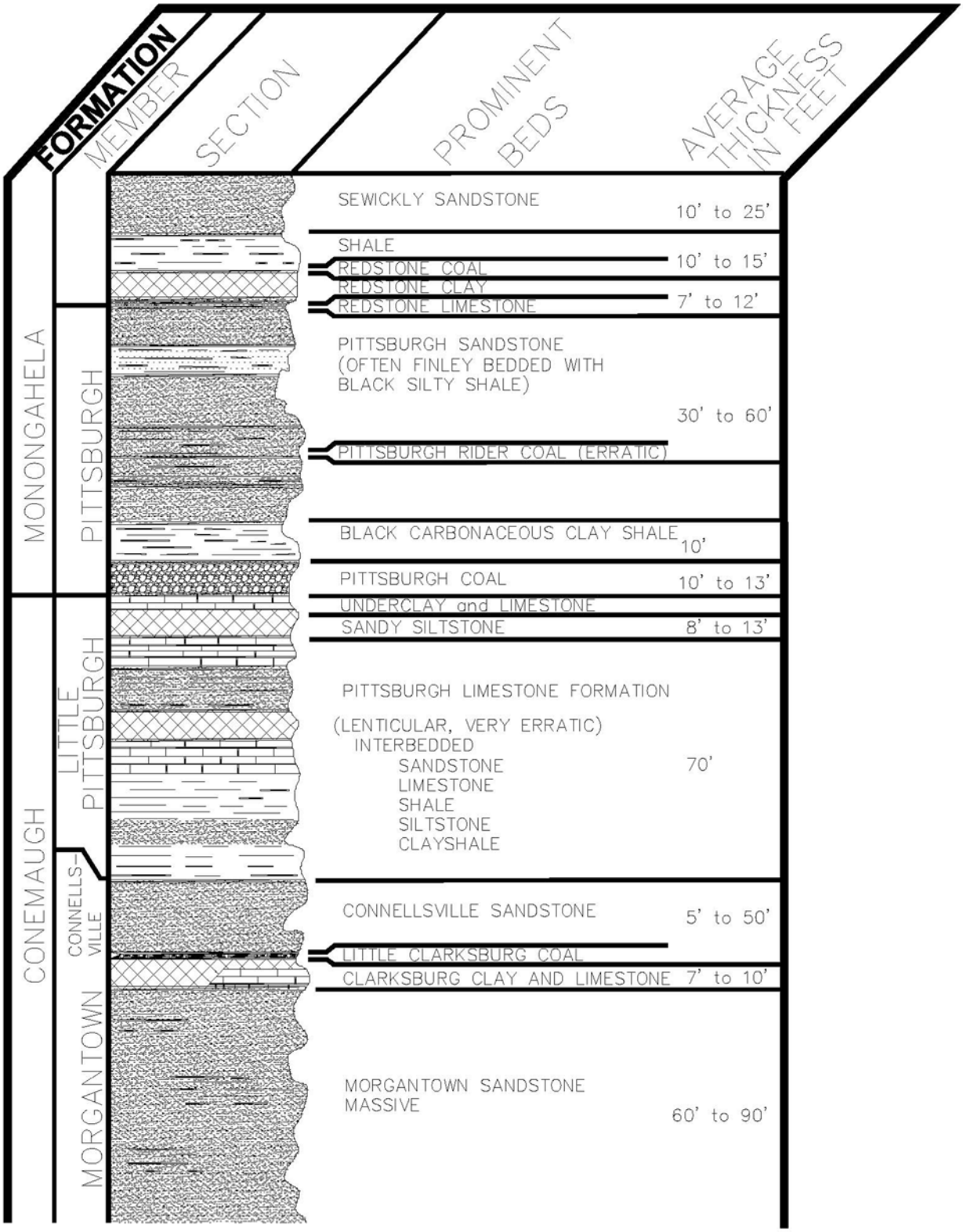

Figure 5.2.2: General Geologic Column—Pittsburgh.

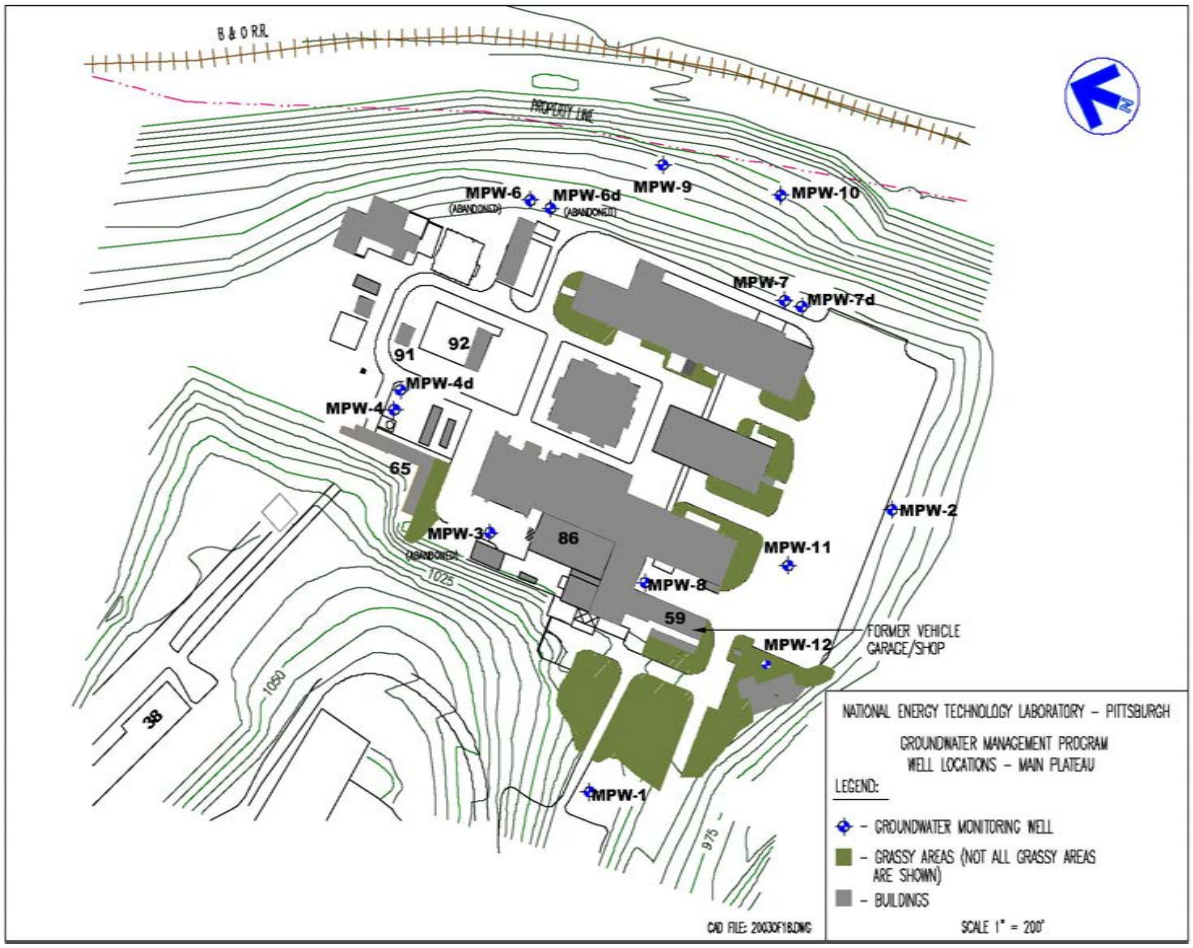

Figure 5.2.3: Groundwater Management Program R&D Plateau Well Locations—Pittsburgh.

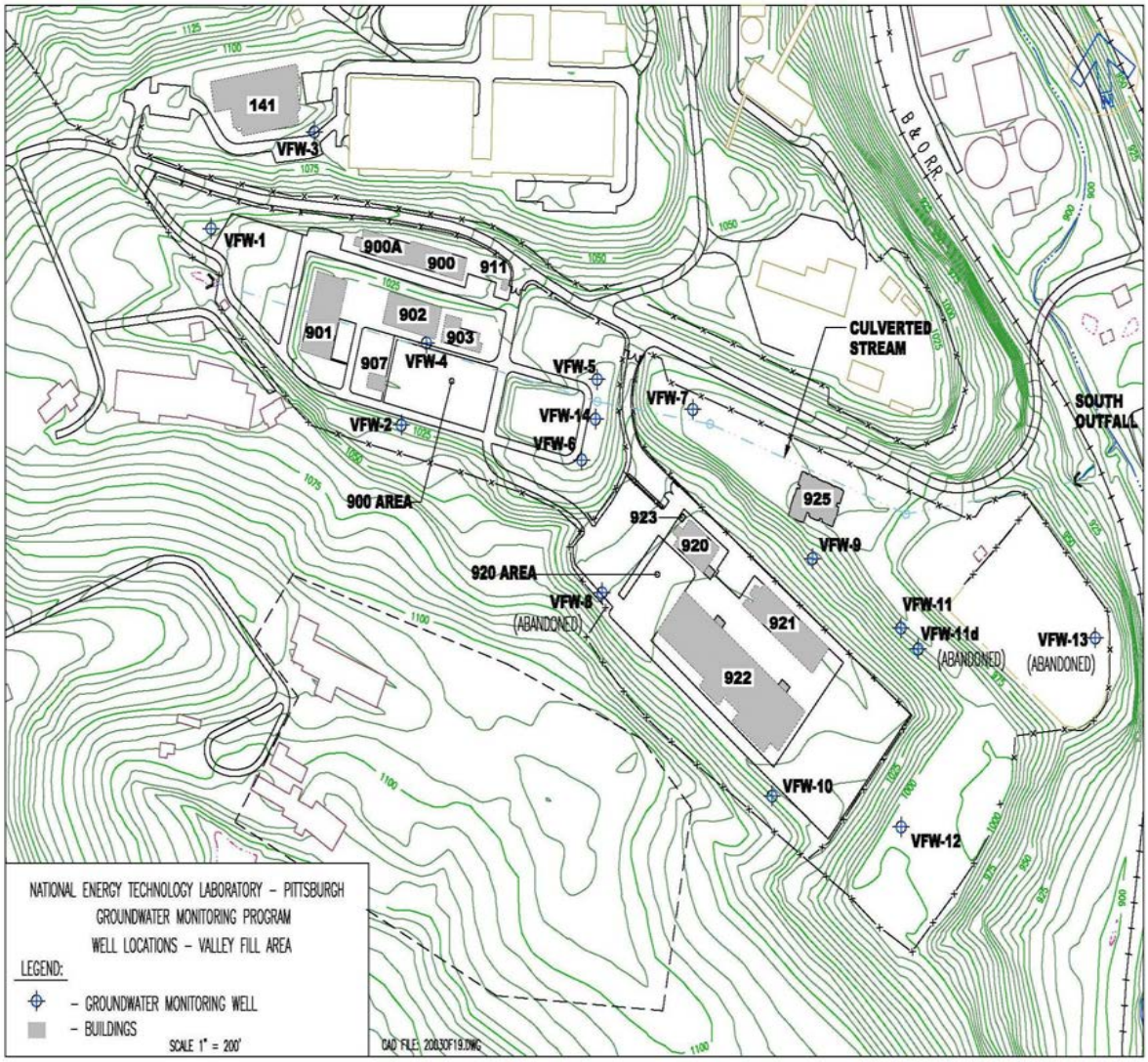

Figure 5.2.4: Groundwater Management Program Valley Fill Well Locations—Pittsburgh.

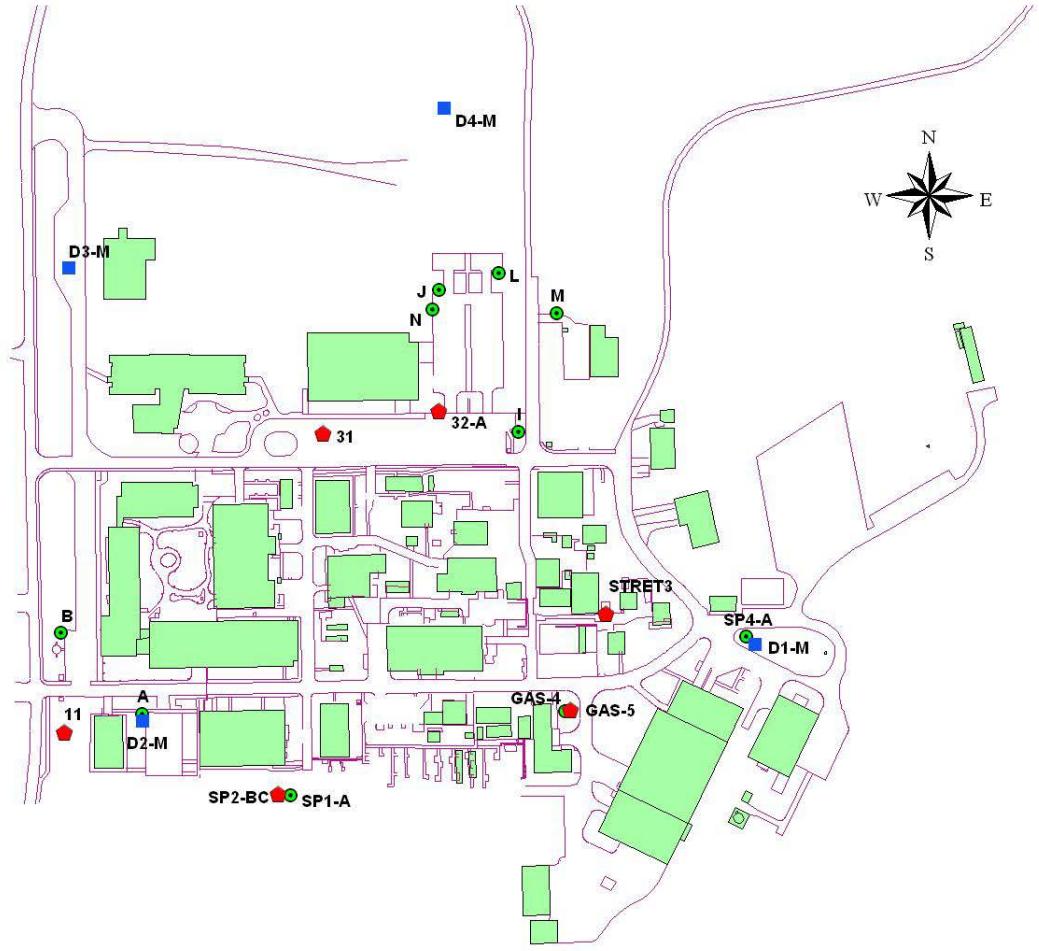

Figure 5.3.1: Active Monitoring Wells at the Morgantown Site.

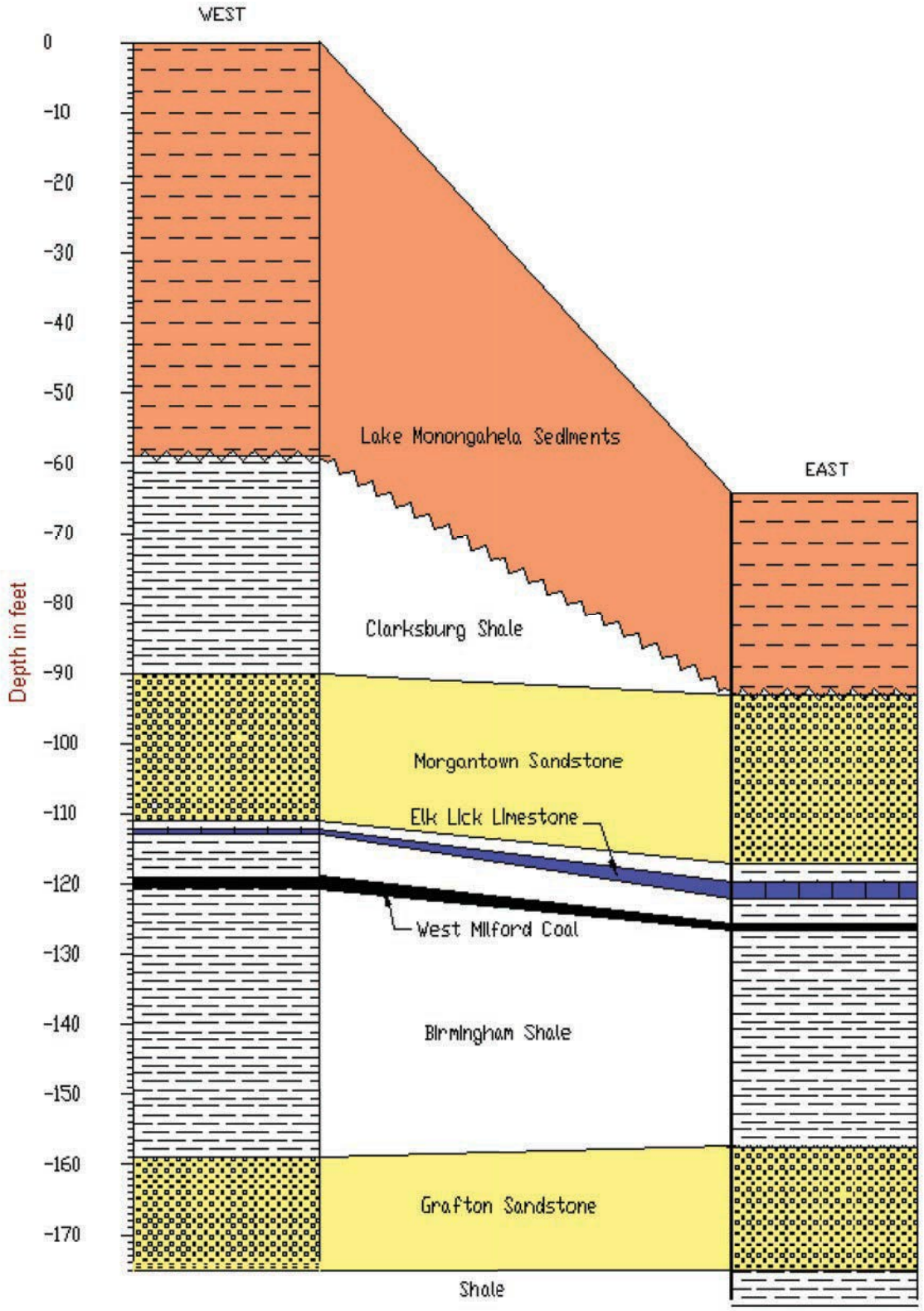

Figure 5.3.2: Generalized Cross-Section of Aquifer Units.

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