



Guidance for Preparation of the 2020 Department of Energy Annual Site Environmental Reports

March 2021



**Guidance for Preparation of the 2020
Department of Energy Annual Site Environmental Reports**

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1.0 Background

Department of Energy (DOE) field elements are responsible for the development and design of Annual Site Environmental Reports (ASERs) appropriate to their site-specific considerations while complying with DOE reporting requirements. This guidance provides recommendations for reporting that may be used to help supplement the requirements of DOE Orders (O) which were contractually applicable to DOE sites in part or all of 2020, including DOE O 231.1B, Chg 1, *Environment, Safety and Health Reporting* (11-28-2012), and DOE O 458.1, Admin Chg 4, *Radiation Protection of the Public and the Environment* (9-15-2020). It is based on lessons learned and best practices, as well as recognition of DOE corporate reporting requirements and stakeholder input. This guidance, while not mandatory, promotes consistency and uniformity in the reporting of environmental information within ASERs. Past use of this guidance has resulted in ASERs that present environmental information in a common format that is readily understandable and usable by DOE organizations, stakeholders, and the general public.

1.1 What's New in 2020 ASER Reporting

Please Note: There are no significant changes to the recommendations in the guidance provided for the 2020 ASERs: *Guidance for Preparation of the 2020 Department of Energy Annual Site Environmental Reports*. As noted in last year's guidance, changes made to the 2020 ASER guidance including updated information and minor corrective or editorial revisions were marked with a change bar (vertical line) on the side margin of the page. Minor editorial changes, such as revisions to pages numbers and punctuation errors were not marked with change bars. In the 2021 ASER guidance, notations within the guidance which were updated to reflect the reporting year of 2020 have not been marked with a change bar (e.g., changes from 2019 to 2020).

Some additional recommendations and continuing areas of emphasis to consider for 2020 ASER reporting include:

PFAS and Additional Emerging Contaminants:

- Federal and State regulatory agencies continue to develop regulatory approaches for per- and polyfluoroalkyl substances (PFAS) and emerging contaminants such as perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perchlorates, 1,4-dioxane, and other persistent contaminants that may be present at DOE sites.

The regulatory environment varies from state to state and continues to change as regulators gather evidence linking PFAS exposure with adverse human health effects. The Environmental Protection Agency (EPA) and States have begun to promulgate regulations which establish analytical measuring and monitoring procedures for these chemicals, identify treatment processes for removal in surface and groundwaters, and establish standards to protect human health and the environment.

EPA maintains a website which provides PFAS tools and resources and outlines actions that EPA is taking on the topic at: <https://www.epa.gov/pfas>. Additionally, DOE's Office of Sustainable Environmental Stewardship (AU-21) maintains an "Emerging Contaminants - PFAS" SharePoint site¹ which serves as a repository of guidance documents and information on PFAS from DOE as

¹ The DOE PFAS and Emerging Contaminants SharePoint site is not available to the public and only accessible to employees of DOE and their contractors.

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well as other Federal agencies. For access or questions about the DOE PFAS SharePoint site, please contact Ashley Ruocco (AU-21) at Ashley.Ruocco@hq.doe.gov.

The 2020 ASER, as appropriate, should include a summary of any PFAS and/or other emerging contaminants detected at your site. The summary should include, as appropriate, efforts used to determine their presence (e.g., historical review of records, database searches, locating materials/waste areas, analysis of past practices and sources, etc.), analytical methods, any associated regulatory developments, and/or recent discussions held with EPA, State regulators, or stakeholders/interested parties regarding emerging contaminants detected, progress toward setting related cleanup standards, and potential remediation technologies being considered. This information should be included in the **Compliance Summary** and **Groundwater Protection Program** chapters, and/or whichever chapter(s) that monitoring results are discussed in the 2020 ASER.

ASER Reporting in the Pandemic:

- DOE environmental compliance and regulatory activities documented in 2020 ASER could have been disrupted by the ongoing COVID-19 pandemic. Regulators and oversight organizations including DOE and EPA are keenly aware that sites may need to utilize alternative approaches to gather pertinent information needed for the 2020 ASER. For assistance with resolving pandemic related compliance issues of DOE-regulated activities (i.e. DOE O 458.1), sites should contact Dr. Josh Silverman, Director of the Office of Environmental Protection and ES&H Reporting (AU-20), at josh.silverman@hq.doe.gov, or Alicia Williamson, ASER Program Manager, at alicia.williamson@hq.doe.gov. Sites with concerns related to EPA-regulated environmental compliance and monitoring activities should refer to EPA's COVID-19 enforcement policy. The EPA policy, as well as other technical resources, issued in March 2020, can be found at <https://www.epa.gov/enforcement/covid-19-enforcement-and-compliance-resources>. Please note, the EPA enforcement guidance expired on August 31, 2020, but the EPA may apply the policy to actions or omissions which occurred while the guidance was in effect (March 2020-August 2020). Section 2.3.2 **Other Major Environmental Issues and Accomplishments** of this guidance provides more details on how sites should incorporate this information in the 2020 ASER.

Unplanned Emission Releases

- The ASER should document unplanned radiological and non-radiological emissions. Many sites have included unplanned release information as part of the ASER document for some time, but there are some inconsistencies across the complex on this topic. Sites should continue to provide this information, as required by DOE O 232.1B, DOE O 458.1 and 40 CFR Part 61, Subpart H compliance reporting. The ASER 2020 guidance provides additional details on the regulatory basis for including unplanned emissions in the ASER. Sections 2.3.4 **Unplanned Releases** and 4.4 **Unplanned Radiological Releases** describe where this information should be documented and provide recommendations on how to communicate this information within the ASER.

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Trending of Monitoring Data:

- A continued emphasis on trending of environmental monitoring data to show previous years' data as compared to 2020 data should be demonstrated. Monitoring data should indicate whether environmental releases and associated environmental impacts have improved, regressed or remained the same over time. Trending data over a minimum of five years is recommended for environmental media such as air, surface water, groundwater, soils and biota in the **Compliance Summary, Environmental Radiological Protection Program and Dose Assessment, Environmental Non-Radiological Program Information, and Groundwater Protection Program** sections of the 2020 ASER. Additionally, DOE headquarters continues to utilize trending data within the ASER to demonstrate compliance with Department and regulatory requirements and in support of environmental compliance and performance metrics.

Quality Assurance Initiatives:

- Quality Assurance (QA) practices should be discussed throughout the environmental monitoring sections of the 2020 ASER, referencing the QA chapter where appropriate, to illustrate that due diligence is being carried out in assuring that defensible data is obtained from environmental monitoring efforts. The QA chapter/section of the 2020 ASER should also summarize significant audit findings and corrective actions taken by contracted analytical laboratories and waste vendor facilities used by the site in 2020. See section 7.0 **Quality Assurance** for more suggested details.

1.2 DOE O 231.1B and DOE O 458.1 Reporting

As stated in DOE O 231.1B, the DOE ASER presents summary environmental data to:

- Characterize site environmental management performance, including effluent releases, environmental monitoring, the types and quantities of radioactive materials emitted or discharged to the environment, the estimated or calculated Total Effective Dose (TED) to a representative person or maximally exposed member(s) of the public and the calculated collective dose to members of the public from exposure to radiation sources identified under DOE O 458.1. Where it is of concern, include releases of radon and its decay products from DOE sources and the resultant individual and collective dose from these radionuclides. These need not be combined with dose estimates from other sources;
- Summarize environmental occurrences and responses reported during the calendar year;
- Confirm compliance with environmental standards and requirements;
- Highlight significant site programs and efforts, including environmental performance indicators and/or performance measures that reflect the size and extent of programs at a particular site; and
- Describe property clearance activities, including a summary of approved authorized limits, results of radiological monitoring and surveys of cleared property, types and quantities of property cleared, and independent verification program results in accordance with DOE O 458.1.

The ASER is the principal DOE document that demonstrates compliance with DOE O 458.1 requirements and is a key component of the Department's effort to keep the public informed of environmental conditions at DOE sites. ASERs should contain the most accurate and complete radiological and non-radiological monitoring data and up-to-date compliance information being reported for the Calendar Year (CY), in this case 2020. ASERs should also highlight new site programs and initiatives, compliance successes, noteworthy practices, site environmental operating experience or environmental performance measures programs and, if applicable, site assessments that occurred during CY 2020. If deemed appropriate by the site, any additional significant environmental issues, events, or noteworthy practices

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that emerge between the end of CY 2020 and the actual public distribution of the 2020 ASERs may be summarized in the transmittal memorandum releasing the 2020 ASERs to the public or as a separate attachment.

1.3 Public Information Source

The ASER serves as a key component of the Department's commitment to openness and public understanding of DOE operations. DOE sites use their ASERs, along with other public information tools, to keep the public informed about environmental monitoring and performance. When sites maintain other publicly accessible information portals that contain environmental data, these should be identified in the ASER, particularly if these sources present data that is more current than what is collected and calculated in the annual ASER. AU-20 continues to recommend the ASERs be prepared in a manner that addresses likely public concerns and solicits feedback from the public and other stakeholders on site environmental management performance and compliance. Some recent successful approaches illustrating this include the following:

- (1) A summary pamphlet targeted for the general public or non-technical reader that accompanies the ASER. Some noteworthy examples include ASER Summary Reports for Hanford, Los Alamos National Laboratory (LANL), Nevada National Security Site (NNSS), Oak Ridge Reservation (ORR), and Savannah River Site (SRS). Community involvement in preparing the summary pamphlet has produced positive results and is encouraged. The ORR and LANL sites have effectively involved local high schools and college students in the preparation of these Summary Reports in recent years. (See **Attachment V, ASER Summary Reports**).
- (2) An executive summary within the ASER that concisely highlights site operations, characterizes site environmental management performance and compliance, and describes significant environmental achievements, issues, and programs.
- (3) Site-specific Web-based approaches facilitate public outreach to, and feedback from, stakeholders on ASERs. Sites should consider providing a user-friendly Internet link on their Home Page to allow easy, direct electronic access and navigation to both current year and previous years' ASERs. Noteworthy examples of effective ASER Web-Page organization and format include: Idaho National Laboratory (INL), Lawrence Livermore National Laboratory (LLNL), ORR, and SRS. (See **Attachment V, ASER Web-Page Model Formats**).

1.4 Coordination and Production

Because most DOE Heads of Headquarters Elements² have delegated authority to DOE Heads of Field Elements (HFEs)³ to prepare, approve, and release the ASERs, HFEs should coordinate the review process and comment period as appropriate. AU-20 remains available to provide advice regarding the preparation of ASERs; however, AU-20 does not have a formal review, comment, or approval role.

² Whenever the term Heads of Headquarters Elements is used, it includes the heads of all headquarters first-tier organizations, to include Secretarial Officers, Administrator for NNSA, Administrators for the Power Administrations, and Heads of Staff Offices.

³ Whenever the term Heads of Field Elements is used, it includes Operations Offices, Field Offices, Site Offices, Service Centers, Project Offices, Regional Offices and Area Offices.

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The 2020 ASERs should be approved by HFEs, or appropriate designee, and released to the public and/or placed on the site Internet Home Page by no later than October 1, 2021⁴. The public release of the 2020 ASERs should also include a statement of DOE's commitment to environmental protection, compliance, sustainability, and the site's best efforts to ensure the validity and accuracy of the monitoring data. The notification required by DOE O 231.1B should be made electronically to Dr. Josh Silverman (Josh.Silverman@hq.doe.gov), Director, Office of Environmental Protection and ES&H Reporting (AU-20)⁵.

1.5 Distribution

Sites are encouraged to limit and optimize ASER hard copy production to support paper reduction and sustainability efforts. ASERs can be distributed via the Internet or using electronic media such as compact disks (CDs) or including a full ASER CD within an ASER Summary Report. HFEs should distribute ASERs to pertinent Heads of Headquarters Elements, the Office of Scientific and Technical Information, the EPA, State agencies, and other relevant agencies, organizations, or individuals. An electronic file of the approved 2020 ASER should be submitted to Ms. Alicia Williamson (Alicia.Williamson@hq.doe.gov), in the Office of Public Radiation Protection (AU-22). AU-22 will provide further notification and distribution within the Office of Environment, Health, Safety and Security.

1.6 Goals and Content

A chief purpose of the ASER is to document the radiological and non-radiological condition of a site's environs, the effluents and emissions released from DOE operations, and noteworthy trends with regard to these releases and environmental conditions. ASERs should accurately portray the radiological monitoring programs, non-radiological monitoring programs, and regulatory compliance information required by DOE Orders and other applicable Federal and State regulations and requirements. They should also describe the environmental impacts of DOE site operations. Where appropriate, the models and assumptions used to estimate releases and environmental conditions should be clearly documented.

ASERs are among the primary DOE reports that document compliance with the public radiation protection requirements of DOE O 458.1. Therefore, a comprehensive description of each site's radiological environmental protection program and real or potential radiological environmental impacts should be included.

DOE Field Elements are encouraged to report additional non-radiological information in the ASER, such as the Superfund Amendments and Reauthorization Act (SARA) Title III or Emergency Planning and Community Right-to-Know (EPCRA) information (see **Compliance Summary** and **Environmental Non-Radiological Program Information** sections). DOE Field Elements are also encouraged to report on progress made in achieving their environmental and sustainability goals, including environmental operating experience or performance measures programs and initiatives at their site, the measures used, and the results of those measures. This could include the site's progress on meeting the measurable environmental and sustainability goals of Executive Orders (E.O.), DOE Orders, and the objectives

⁴ DOE expects all sites to comply with the required October 1 deadline as noted in DOE O 231.1B (Attachment 2). If sites are unable to meet the aforementioned deadline as a result of extraordinary and extenuating circumstances, they should consider requesting an extension from their Program Office consistent with DOE O 251.1 exemption process and notify AU-20 within the Office of Environment, Health, Safety and Security.

⁵ DOE Order 231.1B lists this position as Chief of Health, Safety and Security. Its equivalent under the current organizational structure is Director, AU-20, Office of Environment, Health, Safety and Security.

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identified in their Environmental Management System (EMS). These measures and accomplishments should be summarized in the **Executive Summary** and detailed in the **Environmental Management System** chapter of the ASER.

Finally, to allow for public involvement and feedback on the ASER, sites are encouraged to provide a website link to a questionnaire or reader comment form on the website where the ASER is electronically posted, which solicits public input and feedback on the current and future ASERs. (See **Attachment V, ASER Public/Reader Comment Form**). If sites are distributing hard copies of the ASER, this form should be placed inside the front cover of the ASER for maximum visibility and easy public access. If sites choose to distribute compact disk (CD) versions of the ASER, a reader survey or comment form should be included in the CD mailer.

2.0 Recommended Format for Annual Site Environmental Reports

The ASERs should, to the extent possible, follow the reporting format described herein.

- Executive Summary
- Introduction
- Compliance Summary
- Environmental Management System
- Environmental Radiological Protection Program and Dose Assessment
- Environmental Non-Radiological Program Information
- Groundwater Protection Program
- Quality Assurance

DOE sites may also elect to generally format some sections of their ASERs by media, or other alternate formats, rather than by radiological and non-radiological chapters, as long as, the applicable requirements of DOE O 231.1B and DOE O 458.1 are met. These chapters may include the detailed monitoring data and results that support discussion of environmental laws and media generally included in the **Compliance Summary** chapter. Alternate formats could include chapters on: air monitoring, meteorological monitoring, surface water and groundwater monitoring, drinking water, wastewater, environmental restoration and waste management, soil monitoring, natural and cultural resources management, historic preservation, terrestrial monitoring/surveillance, ecological monitoring, wildlife and agricultural products monitoring, and groundwater monitoring. (See **Attachment V, Alternate General ASER Formats**). ASERs should also include, as appropriate, a glossary of definitions and a list(s) of acronyms, abbreviations, symbols, units of measure, tables, figures, appendices, and references.

2.1 Executive Summary

The **Executive Summary** should highlight: (1) the purpose of the ASER; (2) major site programs⁶; (3) other key initiatives, including environmental operating experience and performance measurement programs; and (4) a brief description of the site's EMS, as appropriate. Note: To streamline ASER

⁶ If the primary remaining site mission is decontamination/decommissioning (D&D) and environmental restoration (clean-up), a brief statement discussing site historical operations should be included here.

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reporting and avoid redundancy, it is not necessary for sites that currently prepare and publish an ASER Summary Report to include an Executive Summary in their full ASER.

This section should include a summary of radiological releases and doses to the public resulting from site operations, as well as a summary of non-radiological releases. DOE O 458.1 notes sites should mention the total effective dose (TED), the dose to the representative person or to the maximally exposed individual (MEI), the collective (population) dose, as well as the estimated natural background radiation dose at the site. If no radionuclides were released from the site, an affirmative/declarative statement should be included, as well. The **Executive Summary** should not simply repeat information found in the main body of the report and should be written in a manner that is understandable to the non-technical reader. This section should be concise, balanced, and targeted at an audience that may not read the entire report.

2.2 Introduction

The **Introduction** should include the following general information: (1) site location; (2) general environmental setting; (3) site mission; (4) primary operations and activities at the site; and (5) relevant demographic information.

2.3 Compliance Summary

The **Compliance Summary** should be a separate chapter in the ASER. This chapter should summarize the site CY 2020 compliance status for the following: (1) major environmental statutes and regulations; (2) DOE internal environmental, sustainability, and radiation protection Orders, including DOE O 436.1, *Departmental Sustainability*, DOE O 458.1, DOE O 231.1B, and DOE O 435.1, *Radioactive Waste Management*; (3) the Atomic Energy Act of 1954 (AEA), as amended (42 United States Code (USC) 2011 et seq.); (4) compliance and/or cleanup agreements (both in place and currently under negotiation); (5) environmental violations cited by regulators (including any fines and penalties assessed); (6) Notices of Violation (NOVs), Notices of Deficiency, Consent Orders, Notices of Intent to Sue, and other types of enforcement actions issued to the site as defined in DOE O 232.2A, *Occurrence Reporting and Processing of Operations Information* (1-17-2017); (7) any reportable environmental occurrences that require notification to an outside regulatory agency; (8) any major issues, instances of noncompliance and corrective actions; (9) the status and results of any ongoing self-assessments and/or environmental audits, including off-site sub-contracted DOE Consolidated Audit Program (DOECAP) audits; and (10) existing permits. Although not required, sites may also choose to include their compliance status with DOE O 436.1, *Departmental Sustainability*. Sites should note on January 20, 2021, E.O. 13834, *Efficient Federal Operations* (May 17, 2018) was revoked by Presidential Executive Order 13990, “*Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*,” although EO 13834 was in effect during the ASER 2020 reporting period. These items are discussed below.

Before compiling and summarizing “environmental violations” for 2020, sites should consult EPA’s Enforcement & Compliance History Online (ECHO) database at: <https://echo.epa.gov/>. This is EPA’s official record of the current compliance status for a given DOE site or particular facilities within the site. To support DOE-wide environment, safety, and health operating experience and performance measurement initiatives, the **Compliance Summary** chapter should include a discussion of compliance and/or cleanup agreements in place at the site. This discussion should include the enforceable milestones completed versus the milestones that were scheduled for completion in CY 2020 pursuant to these agreements. Additionally, the **Compliance Summary** should contain a summary table or brief narrative of applicable operating permits in effect at the site.

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When possible, quantitative information should be provided. For example, if underground storage tanks have been removed from the facility, state the number of tanks that have been removed and the number of tanks that still remain onsite. The **Compliance Summary** should not present the large volume of supporting data that are presented in other sections of the ASER, such as the **Environmental Radiological Protection Program and Dose Assessment** and **Environmental Non-Radiological Program** section (Section 4.0). Additionally, references should be made to other sections of the ASER, as appropriate, to minimize redundancy. A summary table indicating the regulator and regulation requirement, a brief description of the regulatory program, the site's compliance status and the ASER chapter or sections that provide further discussion could be included here [See **Attachment V, Compliance Summary Table** for examples from the Brookhaven National Laboratory (BNL), National Renewable Energy Laboratory (NREL), Princeton Plasma Physics Laboratory (PPPL), and West Valley Demonstration Project (WVDP)].

2.3.1 Compliance Status

The compliance status with respect to applicable major environmental statutes, DOE Directives, and Executive Orders should be discussed, including, but not limited to those noted below.

2.3.1.1 Environmental Restoration and Waste Management

- 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)

2.3.1.2 Radiation Protection

- DOE O 458.1 Radiation Protection of the Public and the Environment

This section establishes requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the AEA of 1954, as amended. The objectives of this Order are to conduct DOE radiological activities so that exposure to members of the public is maintained within the dose limits established in this Order; to control the radiological clearance of DOE real and personal property and to ensure that potential radiation exposures to members of the public are as low as is reasonably achievable. The Order also ensures that DOE sites have the capabilities, consistent with the types of radiological activities conducted, to monitor routine and non-routine radiological releases, and to assess the radiation dose to members of the public, as well as to provide protection of the environment from the effects of radiation and radioactive material.

- DOE O 435.1 Radioactive Waste Management

This section should briefly summarize site progress in achieving compliance with DOE O 435.1 and the associated DOE Manual (M) 435.1. At a minimum, information on the wastes that are managed at the site (e.g., high level, low level, transuranic) and what type of waste management the site is

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performing (e.g., generation, treatment, storage, disposal) should be included. For those sites that are authorized to manage a low-level waste (LLW) facility, there should be a table or a listing of the status of each phase of the LLW management process (e.g., performance assessment [PA], composite analysis [CA], closure plan, PA/CA maintenance program, and disposal authorization statement [DAS]), and a narrative description of the site LLW management program. Discussion of radioactive waste management activities can be included in the **Environmental Radiological Protection Program and Dose Assessment** section of the 2020 ASER.

Identification of the commercial treatment, storage, and disposal facilities (TSDFs) contracted to receive DOE waste from your site should be identified. [Use of an annual DOE Consolidated Audit Program (DOECAP) audit is often used in the determination by the Field Element Manager for their annual acceptability review of the commercial TSDF facility.] This section should also list whether or not participation in DOECAP (or similar audits) is included in each commercial TSDF contract.

Note: Management of 11e.(2) byproduct material as defined in the Atomic Energy Act and naturally occurring radioactive material is conducted under the provisions of DOE O 458.1, except where such material meets the conditions set forth in DOE M 435.1 to allow disposal in an authorized LLW disposal site.

- Atomic Energy Act of 1954 (AEA)

When reporting on AEA requirements, sites should describe how they comply with the provisions in DOE O 458.1 for the management, storage and disposal of 11e(2) byproduct material, as defined in Section 11e.(2) of the AEA, and other wastes containing uranium, thorium and their decay products, which are not subject to the requirements of 40 Code of Federal Regulations (CFR) Part 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings*. Furthermore, byproduct material that does not come from commercial and research facilities licensed by the Nuclear Regulatory Commission (NRC) or is not disposed of at DOE LLW disposal facilities must be managed in accordance with the requirements of DOE O 458.1 to protect the public from radiological airborne effluents.

2.3.1.3 Air Quality and Protection

- Clean Air Act (CAA)

This section should include a discussion of the compliance status of site air emissions, including criteria pollutants and hazardous air pollutants. This section should generally summarize air permit exceedances, NOVs, other air quality non-compliances, and any CAA compliance agreements in place at the site. Any major events that occurred at the site in CY 2020 pertaining to CAA compliance should be specifically discussed. The section should also address whether a major source of air pollutants (as defined in 40 CFR Part 70.2) is present at the site and should include information on those operations for which emissions contribute most substantially to the major source. Conversely, if the site does not have a major source, then this should be explicitly stated.

- National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 61 Subpart H, (*National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities*)

The 2020 ASERs should summarize efforts to comply with the monitoring and other requirements in NESHAP Subpart H. For example, NESHAP compliance agreement negotiations and other discussions with regulatory agencies or applications for waivers should be noted. If sites are exempted from any requirements, the reasons for the exemptions should be stated.

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Detailed reporting and discussion of site radiological Subpart H air emissions and doses should be included in the **Environmental Radiological Protection Program and Dose Assessment** section of the ASER (see **Section 4.0**, p.16 and **Attachment I, Recommended Formats for Radiological Dose and Release Reporting**). Issues concerning site compliance status with radionuclide NESHAP and NESHAP-specific radionuclide monitoring, should be discussed in the **Compliance Summary** section or chapter.

Information on Subpart H compliance for DOE sites is reported annually in the NESHAP report for radionuclides required by the EPA. Guidance for this report, entitled *Guidance for Preparation of 1990 Air Emissions Annual Report under Subpart H, 40 CFR 61.94*, was issued by the Office of Environmental Guidance in January 1991. The information provided in the 2020 ASERs should be consistent with the information reported in the 2020 site NESHAP report for the air emission of radionuclides, to demonstrate compliance with the Subpart H requirements for 2020. This report may be referenced for more information and any significant differences between the ASER and Subpart H air emissions and estimated doses reported should be clearly explained.

2.3.1.4 Water Quality and Protection

- Clean Water Act (CWA)

The CWA of 1972 created the National Pollutant Discharge Elimination System (NPDES) to protect surface waters by limiting releases of effluents into streams, reservoirs, and wetlands. Sites are encouraged to report NPDES and State Pollutant Discharge Elimination System (SPDES) data in the tabular form below and should identify the permit type, number of regulated⁷ outfalls in use at a facility, the total number of permit exceedances per outfall, the date corresponding to each exceedance, and monitoring parameters and/or constituents. Additionally, the number of samples taken, the number of compliant samples, and the facility's percent compliance for all measured samples should be provided. The exceedances, their causes, and the nature of the corrective actions should be described in summary form. Progress on implementing previous corrective actions should also be addressed.

- A summary of all CY 2020 NPDES/SPDES permit exceedances or noncompliances should be provided in the following format.

NPDES/SPDES NONCOMPLIANCES

Permit Type	Outfall	Parameter	# of Permit Exceedances	# of Samples Taken	# of Compliant Samples	Percent Compliance	Date(s) Exceeded	Description/ Solution

Using this tabular format will allow the information to be easily identified and collected from the ASERs in a consistent manner and will enable the development of DOE-wide environmental performance measures and operating experience analyses.

Any analyses or reviews to select Best Available Technology conducted to comply with DOE O 458.1 requirements should be discussed here, if they are not summarized elsewhere in the radiation protection section of the ASER.

⁷ Note: Radionuclides regulated under the AEA are not subject to CWA requirements. If the site has accepted or is using NPDES or SPDES permit values for radionuclides out of comity, the table in the text should include a footnote to indicate whether there is a formal agreement in place that establishes the basis for their use.

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- Stormwater Management and the Energy Independence and Security Act (EISA) of 2007

Although NPDES/SPDES permits regulate discharges of stormwater runoff at outfalls, stormwater management practices at DOE sites should also be considered for inclusion in the ASER. Under Section 438 of EISA, Federal agencies have requirements to reduce stormwater runoff from Federal development and redevelopment projects to protect water resources. Federal agencies can comply using a variety of stormwater management practices often referred to as "green infrastructure" or "low impact development" practices, including for example, reducing impervious surfaces, using vegetative practices, porous pavements, cisterns and green roofs. In 2009, EPA, in close coordination with other Federal agencies, developed Technical Guidance to assist Federal agencies in implementing EISA Section 438, which can be found at:

<https://www.epa.gov/sites/production/files/2015-09/documents/eisa-438.pdf>. In addition, sites should discuss their EISA and applicable stormwater management practices in this section.

- Safe Drinking Water Act (SDWA)

The SDWA of 1974 (42 USC §300f et seq.) was established to protect the quality and safety of drinking water in the United States and focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. This law authorizes EPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary, health-related standards. EPA sets standards for drinking water and oversees the states, localities, and water suppliers who implement those standards. The SDWA was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources - rivers, lakes, reservoirs, springs, and ground water wells.

The SDWA requires that each Federal agency operating or maintaining a public water system must comply with all Federal, State and local requirements regarding safe drinking water. This section should include a description or discussion of the drinking water source(s) and public water systems at the site, and any sampling, monitoring, and reporting conducted at the site to demonstrate compliance with this law.

2.3.1.5 Other Environmental Statutes and Executive Orders

This section may be used to report on activities related to other laws, regulations, and Executive Orders not addressed elsewhere, including, but not limited to the following:

- Endangered Species Act (ESA)

The ESA of 1973 (16 USC 1531–1544) protects Federally listed threatened and endangered species and their habitats from take and ensures that Federal actions do not jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.⁸

If any aspect of a DOE action may affect a listed species or designated critical habitat, consultation with the U.S. Fish and Wildlife Service is required, usually resulting in a Biological Opinion (BO).

This section should include a description or discussion of activities conducted at the site to comply with this law and the site's BO and to protect endangered or threatened species and their critical habitat. Include a statement of the maximum take allowed for each threatened or endangered species,

⁸ Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting. Critical habitat is the specific areas within the geographical area occupied by the species on which are found those physical or biological features essential to the conservation of the species.

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and the take for each species that occurred during the year. Include discussions of monitoring or other research done on threatened or endangered species at the site.

- E.O. 13751 *Safeguarding the Nation from the Impacts of Invasive Species* (December 5, 2016)

E.O. 13751, which amended E.O. 13112 *Invasive Species* (February 3, 1999), calls on Federal agencies to prevent the introduction, establishment and spread of invasive species, as well as to eradicate and control populations of invasive species that are established. This section should include, as appropriate, a description or discussion of which invasive species are present at the site and what types of activities are being conducted to address them to comply with this E.O.

- National Historic Preservation Act (NHPA)

The NHPA of 1966 (16 USC § 470), as amended, requires Federal agencies to establish programs to identify, record, and protect cultural resources and to assess the impact of proposed projects on historic or culturally important sites, structures, or objects within the area of potential effect for a proposed project. The NHPA further requires Federal agencies to assess all archaeological sites, historic buildings, and objects on such sites to determine qualification for inclusion in the National Register of Historic Places (NHRP). In addition, the NHPA requires Federal agencies to consult with State Historic Preservation Offices and the Federal Advisory Council on Historic Preservation, as appropriate, when determining if proposed actions would adversely affect properties eligible for listing on the NRHP. This section of the ASER should include a description or discussion of the site's Cultural Resources Management Plan, cultural resources review process, monitoring efforts, or other activities conducted at the site to comply with this law, including any assessments and/or surveys conducted to protect cultural resources.

- Migratory Bird Treaty Act (MBTA)

DOE's 2013 Memorandum of Understanding on Migratory Birds with the U.S. Fish and Wildlife (available at <https://www.energy.gov/sites/prod/files/2013/10/f3/Final%20DOE-FWS%20Migratory%20Bird%20MOU.pdf>) and E.O. 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, commit DOE to take certain actions to implement the MBTA. This section should include a description or discussion of activities conducted at the site to protect migratory birds, especially of public outreach efforts conducted to involve the community. Sites that report through the Council for the Conservation of Migratory Birds' Bi-Annual Survey can include accomplishments in the following five categories: policy and planning; conservation measures; partnerships; bird conservation training; and international conservation. Include a statement on the number of migratory birds of each species intentionally taken during the conduct of any program, activity, or action, including, but not limited to banding marking, scientific collection, taxidermy, and depredation control.

2.3.1.6 DOE O 436.1 *Departmental Sustainability*, and E.O. 13834 *Efficient Federal Operations*

A significant portion of the energy and environmental sustainability information required by DOE O 436 is included in the DOE Sustainability Performance Division FY 2021 DOE Site Sustainability Plan Guidance Document (August 2020)⁹ for preparation of annual Site Sustainability Plans (SSPs). Although not required, DOE sites should consider discussing their 2020 SSP goals and accomplishments in their 2020 ASER at a summary level. DOE sites may also choose to summarize, directly reference, or include information from their SSP or other existing reporting documents or

⁹ https://sustainabilitydashboard.doe.gov/PDF/Resources/FY%202021%20SSP%20Guidance_Final.pdf

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systems, into their ASERs. Specific information on each of these DOE Orders and related E.O.'s is described below.

- DOE O 436.1, *Departmental Sustainability* (May 2, 2011) describes DOE's requirements and responsibilities for implementation of its sustainability program. This includes the development and implementation of an annual SSP that identifies a site's contribution toward meeting the Department's sustainability goals. In addition, DOE sites must use their EMS as a platform for SSP implementation and programs with objectives that contribute to the Department meeting its sustainability goals.
- On January 20, 2021, E.O. 13834 was revoked by E.O. 13990 "*Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.*" All sections of E.O. 13834 were revoked except for sections 6 (Duties of Federal Chief Sustainability Officer), 7 (Duties of Heads of Agencies), and 11 (General Provisions). E.O. 13834 was in effect during the reporting period for the 2020 ASERs and as such could inform narratives. Regarding next year's reporting (2021 ASER), sites may continue to report applicable information within the ASER from this E.O., if it augments and assists with fulfillment of DOE O 436.1 requirements and *DOE Strategic Sustainability Performance Plan* goals. For reference, E.O. 13834, *Efficient Federal Operations* (May 17, 2018), required Federal agencies prioritize actions that reduce waste, cut costs, enhance the resilience of Federal infrastructure and operations, and enable more effective accomplishment of its mission. E.O. 13834 prioritized meeting energy and environmental statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment.
- A summary of site progress in meeting the *DOE Strategic Sustainability Performance Plan* goals during 2020 can be included in the ASER. These goal areas pertain to sustainable practices for facility energy efficiency, renewable energy, high-performance sustainable buildings, water use efficiency and management, pollution prevention and waste minimization, fleet management, sustainable acquisition, electronics stewardship, and greenhouse gas emissions. Summary highlights from a site's 2020 SSP could be included in their 2020 ASER to the extent this information was available and finalized in 2020.

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

EPCRA and Title III of SARA require Federal facilities that use, produce, or store extremely hazardous substances, hazardous substances, hazardous chemicals, and/or toxic chemicals in quantities that exceed specific thresholds to report these inventories and planned or accidental environmental releases to Federal, State, and local emergency planning authorities. This information should include responses to emergency situations involving these materials. The ASER should include summary information on the site-specific chemical inventory (EPCRA Tier II reporting) and toxic release inventory (TRI) and should reference the site submission to the EPA. Sites should report on activities that result in the reduction in the acquisition, use or release, and reporting of toxic chemicals pursuant to DOE O 436.1 and DOE's annual *Strategic Sustainability Performance Plan* (SSPP).

Those EPCRA reporting requirements that were completed or will be completed for CY 2020 should be indicated and discussed in this section. If the site reported under the provision, indicate "yes." If the site should have reported under the provision, but did not, indicate "no." If the site was not required to report under a provision (e.g., did not meet thresholds for any materials, did not have an extremely hazardous substance release), indicate "not required." The following short table is provided to assist DOE sites in presenting this information.

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Status of EPCRA Reporting

<i>EPCRA Section</i>	<i>Description of Reporting</i>	<i>Status*</i>
EPCRA Sec. 302-303	Planning Notification	
EPCRA Sec. 304	EHS or HS Release Notification**	
EPCRA Sec. 311-312	MSDS/Hazardous Chemical Inventory***	
EPCRA Sec. 313	TRI Reporting	

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

** Extremely Hazardous Substance or Hazardous Substance

*** Material Safety Data Sheet

- E.O. 11988, *Floodplain Management* (May 24, 1977)

E.O. 11988 requires Federal agencies to consider, evaluate, and avoid to the extent possible, adverse impacts associated with the occupancy and modification of floodplains, to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values of floodplains. This section should include, as appropriate, a description or discussion of activities conducted at the site to protect floodplains and comply with this E.O.

- E.O. 11990, *Protection of Wetlands* (May 24, 1977)

E.O. 11990 requires Federal agencies to identify potential impacts on wetlands resulting from proposed activities and to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. This section should include, as appropriate, a description or discussion of activities conducted at the site to protect wetlands and comply with this E.O.

Any other major statutes or E.O.’s applicable to the site should also be included in the **Compliance Summary** chapter. If a major statute is not applicable, it should be listed with the notation, “Not Applicable,” along with a short explanation as to why it is not applicable.

2.3.2 Other Major Environmental Issues and Accomplishments

This section should identify other significant issues and accomplishments for CY 2020. For example, issues such as lawsuits, NOVs, alleged violations, environmental occurrences, non-routine releases, unresolved compliance issues, and NEPA actions not previously presented should be addressed. This section is an appropriate place to document environmental compliance or monitoring challenges as a result of the COVID-19 pandemic public health emergency. Sites may document these experiences in a different section if that is more appropriate.

Summaries of DOE environmental audits (e.g., DOECAP audits), progress assessments, DOE program or contractor self-assessments or program appraisal findings and follow-up actions should be provided in this section. Publicly available documents that can be referenced for additional information should be cited. Recent DOE environmental initiatives, accomplishments, best practices and lessons learned that may merit reporting or discussion in the ASER include:

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Green and Sustainable Remediation (GSR)

GSR is the abatement, cleanup, or use of methods to contain, remove, or destroy contaminants while seeking to minimize the environmental, economic, and social costs of the remediation. GSR also offers opportunities to meet compliance obligations at lower overall cost and environmental impact.

GSR practices support the requirements of DOE O 436.1 and comply with DOE's commitment outlined in the DOE Sustainability Performance Division FY2021 DOE Site Sustainability Plan Guidance Document (August 2020)¹⁰ to incorporate green and sustainable remediation practices into its environmental cleanup programs.

DOE sites incorporating GSR practices during any aspect of remedial cleanup or closure activities under RCRA or CERCLA, should include a discussion of the activity in this section of the ASER. If possible, the positive impact of incorporating those GSR practices (i.e., reduced greenhouse gases by 500 metric tons of carbon dioxide equivalent) should be included. To find out more about GSR go to: https://powerpedia.energy.gov/w/index.php?title=Sustainable_remediation&redirect=no

Site Resilience

Resilience is the ability to prepare for and to withstand an extreme event, with little or no damage or to recover more quickly from an extreme event. Like many Federal agencies, the DOE is faced with the challenge of strengthening its resilience to a growing number of natural and man-made hazards. Making sites more resilient means making them capable of withstanding potentially more frequent and severe hazards and enabling them to quickly return to normal operations. DOE sites should report and discuss their 2020 resilience and climate change adaptation activities in this section of the ASER consistent with information included in the *Organizational Resilience* section of their SSP.

ASER Reporting During the COVID19 Pandemic Public Health Emergency

Facilities should report any environmental monitoring difficulties as a result of the COVID-19 pandemic in the CY2020 ASER. For assistance with resolving pandemic related compliance issues of DOE-regulated activities (i.e. DOE O 458.1), sites should contact Dr. Josh Silverman, Director of the Office of Environmental Protection and ES&H Reporting (AU-20), at josh.silverman@hq.doe.gov, or Alicia Williamson, ASER Program Manager, at alicia.williamson@hq.doe.gov. Sites with concerns related to EPA-regulated environmental compliance and monitoring activities should refer to EPA's COVID-19 enforcement policy. The EPA policy, as well as other technical resources, issued in March 2020, can be found at: <https://www.epa.gov/enforcement/covid-19-enforcement-and-compliance-resources>.

Within the 2020 ASER, sites are encouraged to provide a summary of the environmental compliance activities affected by the COVID-19 pandemic. This summary can be in a new standalone section of the ASER or be provided within the write up for specific ASER section (i.e., the **Compliance Summary** or **Other Major Environmental Issues and Accomplishment** chapters). The summary should describe the actions taken to mitigate or resolve the issue and identify any site or permit protocols invoked as a result. The discussion should provide details of the instance, including date or timeframe of occurrence, if noncompliance with Federal, State or local permits resulted, or if DOE regulatory standards for public health or the environment were compromised or exceeded. The description should include a detailed description of the cause or noncompliance, along with the actions taken to comply with regulatory

¹⁰ https://sustainabilitydashboard.doe.gov/PDF/Resources/FY%202021%20SSP%20Guidance_Final.pdf

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standards and the corrective actions taken to bring the site back into compliance at the earliest opportunity. The date the site returned to compliance, if applicable, should also be noted.

2.3.3 Continuous Release Reporting

Continuous Release Reporting under CERCLA, Section 103, requires that a non-permitted hazardous substance released in a quantity that is equal to or greater than its reportable quantity be reported to the National Response Center (55 Federal Register [FR] 30166, July 24, 1990). CERCLA Section 103(f) allows for modified reporting of releases of hazardous substances that meet certain criteria. The EPA requires all facilities that release a hazardous substance meeting the above requirement to report annually to EPA. The regulations include a requirement for an annual evaluation of releases. Summaries of this evaluation should be included in the ASER. Continuous release reporting not characterized or discussed in the **Unplanned Releases** section should be reported separately in this section.

2.3.4 Unplanned Releases

Summary information on unplanned, non-routine releases of pollutants or hazardous substances, including causes and corrective actions taken to prevent their recurrence, should be discussed here, especially as they pertain to facility operations, waste handling programs, and emergency response programs. The 2020 ASERs should discuss unplanned radiological and non-radiological releases in effluents and air emissions, whether onsite or offsite. This discussion should include releases that are reportable occurrences under DOE O 232.2A and DOE O 231.1B. Releases reported to the Headquarters Emergency Operations Center and releases reported to the Coast Guard National Response Center should be summarized. The protective action recommendations implemented (if applicable) to mitigate the effects of the occurrences should also be discussed.

Consistent with the section regarding **Unplanned Radiological Releases**, this section of the ASER should also clearly state the bases for any estimates regarding the magnitude of potential impacts of releases in terms that the non-technical reader can easily understand.

Regulatory guidance which indicates how unplanned releases should be included in the ASER can be found in DOE O 231.1B and DOE O 458.1. DOE 231.1B Attachment 2, *Reporting Annual Site Environmental Information*, states the following contributors to environmental management performance must be documented in the ASER: effluent releases and types of quantities of radioactive materials emitted or discharged to the environment; doses to members of the public from exposure to radiation sources identified under DOE O 458.1; and a summary of environmental occurrences and responses. Each of these categories of data would include planned and unplanned releases.

Sites can document this information in a table or discussion that includes the date each release occurred, the amount of material released, an explanation of the release, and corrective actions taken. Generalized statements such as “no significant offsite effects occurred” or “doses were small” should be avoided. If such descriptors are necessary, release information should be compared to known values; for example, small relative to applicable dose limits or to doses received from natural background at the site or in the United States (include the numerical value for this dose). Statements indicating concentrations are below detectable levels may also be acceptable when the ASER contains general information on detectable concentrations. This approach ensures that the ASER clearly states the bases for any scientific judgments regarding the magnitude of potential impacts of releases in terms that the non-technical reader can easily understand.

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2.3.5 Summary of Permits

This section should provide a table of the numbers and types of environmental permits in effect for the operating facilities at the site.

3.0 Environmental Management System

This section should include a summary of the defined EMS scope, objectives, performance and evaluation, and site implementation experiences, consistent with the recommendations below. DOE sites that maintain this EMS information on a publicly available website may refer readers to their website and provide highlights in this section in lieu of repeating this information in their 2020 ASER.

This section should also provide a brief description of the EMS framework used for determining conformance [i.e., International Organization for Standardization (ISO) 14001]; when the EMS was last audited to that framework; and if applicable, the date of certification to that framework.

A summary table indicating the EMS objectives, along with the status of the site's progress toward meeting these objectives, should be included here. (See **Attachment V, Environmental Management Systems and EMS Summary Table** examples for ANL, BNL, Lawrence Berkeley National Laboratory, LLNL, NNSS, PPPL, Sandia National Laboratory (SNL)-Albuquerque, SNL-California, and SRS.)

The 2020 ASERs should include a discussion which qualitatively describes the status of the site's EMS performance during calendar year 2020. Sites should list what they determined to be the significant environmental aspects of their operations in 2020 that have the potential to impact the environment (both adverse and beneficial). A summary of the site's 2020 EMS compliance report submitted via FedCenter at: <https://www.fedcenter.gov/assistance/fedrpts/ems/doe/> (login required) may be included along with the red, yellow, or green score received based on the EMS metrics listed below.

- Activities, products and services and their associated environmental aspects were evaluated for significance. The results of the analysis were documented and any necessary changes were made or are scheduled to be made.
- Documented, measurable environmental objectives are in place at relevant functions and levels, e.g., at least 80% of them had either already been accomplished or were on schedule to be met.
- Operational controls associated with identified significant environmental aspects are established, implemented, controlled, and maintained in accordance with operating criteria.
- An environmental compliance audit program was in place, audits were completed according to schedule, audit findings were documented, and corrective and preventative actions were defined/documented and on schedule for completion by an established date.
- Sustainability goals are addressed in the EMS, as applicable.

To the extent possible, sites should also describe the effectiveness of the EMS since its inception at the site. This should encompass the elements listed below.

- The benefit of the EMS on the facility or organization, including (1) reduced risk to facility/organizational mission; (2) improved fiscal efficiency and/or cost avoidance; (3) greater understanding and recognition of environmental issues at all levels of the organization; (4)

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empowerment of individuals to contribute to the betterment of the organization's environmental footprint; (5) integration of environment into organizational culture and operations; (6) integration of environment into real property asset management; (7) improved community relations; (8) improved effectiveness in overall mission; and (9) improved cooperative conservation with other groups.

- The impact of the EMS on the environment and environmental issues, including (1) improved overall compliance management; (2) personnel health and safety; (3) pollution prevention; (4) improved air and water quality; (5) improved hazardous material, hazardous waste, and solid waste management; (6) improved conservation of water, natural resources, energy in facilities, fuel in vehicles; and (7) reduced number of permits needed to operate.
- Any key EMS best practices and lessons learned in 2020.
- Any key EMS challenges or barriers to EMS implementation (including plans for resolution where appropriate) in 2020.

Other significant environmental protection programs associated with the EMS, such as site meteorology, monitoring and surveillance, groundwater protection and monitoring, environmental restoration and waste management, and effluent monitoring should also be described here. This section should briefly describe major environmental programs and initiatives (e.g., efforts to improve water quality through collaborative approaches to watershed management) with States, Tribes, local governments, industry, other Federal agencies and interested stakeholders, as appropriate.

Special environmental studies conducted, or in progress, at a particular site should be discussed here. Redundancy with information presented in the **Compliance Summary** and other sections of the ASER should be avoided. Additionally, pertinent information may be presented on other significant environmental activities at the site (e.g., environmental training programs) that are not adequately covered in other sections.

3.1 Environmental Operating Experience and Performance Measurement

Environmental operating experience and performance measurement is an integral component of an EMS. Environmental operating experience and sharing of related best practices and lessons learned are also consistent with the purpose and objectives of DOE O 210.2A, *DOE Corporate Operating Experience Program* (4-08-2011). As discussed in Section 2.3.1.6 of this document, DOE O 436.1 include multi-year environmental and sustainability goals and targets which DOE sites may also choose to summarize, directly reference, or add into their ASERs. Section 3.1 should include the site's progress on meeting these goals via the measurable environmental objectives identified in their EMS for 2020. Sustainable practices for enhancing environmental and sustainability management performance may be discussed here. This discussion may include specific objectives applicable to operations conducted at the site, the results in achieving those objectives, a comparison of recent years' performance, and objectives planned for the future.

3.2 Accomplishments, Awards and Recognition

Sites should also highlight and discuss any DOE or other Federal pollution prevention, environmental stewardship, or sustainability accomplishments, including awards or recognition received in CY 2020 (e.g., DOE Sustainability Awards, DOE GreenBuy Awards, DOE Management Awards, the President's GreenGov Awards), as well as any State or industry-sponsored environmental awards or recognition.

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4.0 Environmental Radiological Protection Program and Dose Assessment

As required by DOE O 458.1, this section should describe the radiological monitoring program at the site as well as all assessments for doses to the public and releases to the environment conducted during the year. This information should also address details on the models and assumptions used in performing the dose calculations and any new monitoring data, as appropriate. Consistent data reporting facilitates efforts to compare data from facility to facility and meaningfully aggregate the information.

4.1 Radiological Discharges and Doses

The following data should be presented in tabular form in this section.

- The TED to the representative person or to the Maximally Exposed Individual (MEI) in units of millirem (mrem)/y and millisievert (mSv)¹¹/y and collective (population) dose in units of person-rem (person-Sv)¹² in a year, total population within 50 miles (80 kilometers)¹³ and an estimated background dose.
- A comparison of the dose to the representative person or MEI with DOE, EPA or other standards and with the natural background at the site.
- Radionuclides released to air and water during the year in units of curies (Ci) and becquerels (Bq)¹⁴.
- Totals by radionuclide released and the half-life of each of the radionuclides reported should be given.
- Gaseous releases.
- Liquid releases to surface waters and soils.
- Environmental measurements of air, surface water, soil, and foodstuff should be reported in appropriate units.

Doses should be calculated following the requirements and effective standards cited in DOE O 458.1¹⁵. Where appropriate, the ASER should state that, because the doses are calculated (based on actual radionuclide(s) concentration releases rates at each site) rather than measured, they represent potential or

¹¹ Per DOE Order 458.1, radiation doses should be expressed in units of mrem followed by the Standard International unit (mSv) in parentheses. The same is true for person-rem (person-Sv).

¹² Estimates of collective dose for DOE facilities are required by DOE Order 458.1. DOE has no de minimis level for these calculations.

¹³ In certain instances, populations outside of the region of the 50 mi (80 km) radius may be affected by releases to that region. For example, in a predominately agricultural area, more foodstuffs may be grown that are assumed to be consumed by the resident population. In such cases, the difference should be assumed to be consumed outside the region, and the resulting collective (population) dose should be estimated and reported. Similarly, if a major drinking water system is located beyond the 50 mi (80 km) distance, but the input for that system receives the majority of liquid discharging from this site, it should be evaluated. In such situations, the population used to support the calculations should be described.

¹⁴ As appropriate, Ci and GBq may be used. Uranium releases should be reported in terms of both Ci (Bq, or GBq, as appropriate) and grams.

¹⁵ In particular, the total dose in terms of the dose from external exposures plus the 50-year committed effective dose from intakes of radioactive material should be calculated and reported. Where sites are using more recent dose factors than the International Commission on Radiological Protection (ICRP) 26/30-based factors, the report should clearly document the source of the dose factors [e.g., Federal Guidance Report No. 13 supplemental CD and DOE-STD-1196-2011, *Derived Concentration Technical Standard (2011)*].

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estimated, rather than actual, doses¹⁶. Data should also be presented using scientific notation (e.g., 3.2×10^{-3} for 0.0032), where appropriate. The number of significant figures should also be appropriate to the quality of these data.

Attachment I, Recommended Formats for Radiological Dose and Release Reporting in ASERs, provides a recommended format for radiological dose and release reporting. This reporting should list all significant radionuclides present at a site and their actual releases. In the reporting of atmospheric and liquid effluent releases, some radionuclides may not be applicable to certain DOE sites. If this is the case, indicate “NA” in the tables in **Attachment I**. In addition, a statement should be made confirming that all known radionuclides released in significant quantities from the site are documented in the ASER. It is noted that the format recommended in the tables in **Attachment I** is to simplify the preparation of composite summary reports and is not intended to replace site-specific-based presentations of data. Site-specific examples of recommended reporting formats from the 2017 Hanford, INL, LANL, NNSS, ORR, SRS, Waste Isolation Pilot Plant (WIPP) and WVDP ASERs are referenced in **Attachment V, Radiological Doses and Releases**.

For compliance with the radiological air emission standards in 40 CFR Part 61 Subpart H, the ASERs should report doses in terms of effective dose or effective dose equivalent, calculated using the CAP-88 or other EPA-approved air dispersion model software, and compared to the 10 mrem per year air emission DOE standard under Subpart H. This section should specifically state the version of CAP-88 used to recognize the associated dose factors (i.e., Federal Guidance Reports (FGR) 11 and 12 from the International Commission on Radiological Protection (ICRP) Publications 26/30 or FGR 13 based on Post-ICRP 60 factors). Compliance with DOE public dose limits should also be evaluated in terms of TED. Compliance with the emissions limits in subparts Q and T should be discussed for those facilities subject to the specific requirements in 40 CFR Part 61. If a facility uses another air dispersion model deemed to be more site-specific than CAP-88 to calculate potential dose for compliance with DOE requirements, that information should be included and distinguished from the NESHAP compliance dose.

The representative person or the MEI should be selected based on the requirements of DOE O 458.1, paragraph 4.e. The annual dose calculation to the representative person or the MEI should be an estimate based on a scenario and parameters that approximate an actual situation. The estimate should be reasonable but not likely to underestimate the dose. Calculation of the dose to a person spending 100 percent of his or her time at the fence line is useful for comparison purposes, but it overestimates the dose to the representative person or the MEI and biases comparative analyses. The 2020 ASERs should contain estimates based on realistic situations and should clearly describe the location of critical receptors and the scenarios used to calculate the estimated doses. For some sites this estimate will include dose from ingestion of wildlife (see Section 5.3 of this guidance for details).

For cases in which monitoring data are below minimum detectable levels, those levels should be specified and as noted in the *Environmental Radiological Monitoring* section of this guidance, should be reported consistent with guidance specified in DOE-HDBK-1216-2015, *Environmental Radiological Effluent Monitoring and Environmental Surveillance*, regarding the use of “Less-Than-Detectable-Values” for statistical analysis and data reporting. The Handbook, published March 19, 2015, can be used by all DOE elements, including the National Nuclear Security Administration (NNSA), and their contractors to

¹⁶ To demonstrate compliance with standards when sources are extremely small, the dosimetry models and evaluations are sometimes selected to be very conservative and simplistic. When this is the case, it should be so stated, and where possible, a qualitative discussion should be included that describes the level of magnitude of conservatism.

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support implementation of DOE O 458.1 and is available at: <https://www.standards.doe.gov/standards-documents/1200/1216-bhdbk-2015>.

The text associated with the tables should address the primary contributors (the radionuclides and processes creating them) to the doses and should identify the models and any pertinent assumptions used in estimating the doses, for example:

The maximum TED (or TEDE) for a member of the public was estimated to be 5 mrem (0.05 mSv) from all pathways. This was principally from Cs-137 and Sr-90 airborne emissions from [facility/process] and was calculated using CAP-88.

If more than one radionuclide is a major contributor to the dose, a pie chart representing the relative contributions would be useful. If the maximum dose through the waterborne pathway and the airborne pathway is for different individuals, the report should briefly explain why these doses are not additive.

DOE O 458.1 requires that DOE-approved dose coefficients be used to evaluate doses resulting from DOE radiological activities. The DOE approved dose coefficients can be found within DOE Standard DOE-STD-1196-2011, Appendix A (2011). The Derived Concentration Standards (DCS) standard supports the implementation of DOE O 458.1 and was developed taking into consideration the most recent biokinetic and dosimetric information presented by the ICRP. DOE sites should use the dose coefficients for the Reference Person found in Appendix A of DOE-STD-1196-2011 as the approved dose coefficients for estimating radiological doses to the public in their ASERs. The report should clearly indicate when alternative dose coefficients are used and the rationale for their use. The DCS standard is available at: <https://www.standards.doe.gov/standards-documents/1100/1196-astd-2011>.

EPA's FGR 15, *External Exposure To Radionuclides In Air, Water, And Soil* (2019) provides radionuclide-specific external dose rate coefficients for six age groups in seven exposure scenarios. FGR 15 provides external dose rate coefficients based on recommendations provided in ICRP Publications 103 and 107.¹⁷ FGR 15 is available at the EPA site at: <https://www.epa.gov/radiation/federal-guidance-report-no-15-external-exposure-radionuclides-air-water-and-soil>.

DOE continues to recommend the use of reference person dose and dose rate coefficients in DOE-STD-1196-2011, Derived Concentration Technical Standard, to demonstrate compliance with the requirements of DOE O 458.1. The effective dose rate coefficients used to generate the DCS values for air submersion in DOE-STD-1196-2011 (see Table A-3) were calculated in the manner of FGR 12 using the information in ICRP Publication 107. The values currently available in the Standard remain appropriate to demonstrate compliance with DOE O 458.1. However, users who wish to evaluate changes to the air submersion DCS value for site-specific radionuclides of concern may do so through the use of Equation 3 (Chapter 2.4 of the DCS Standard), until such time as the revised Standard is published.

DOE O 458.1 requires reporting of collective doses to the public around DOE sites as well as radiation doses to the representative person or the MEI. Estimates of doses to individuals should include multiple exposure pathways and releases from multiple sources (e.g., point and diffuse) if they contribute to the dose to the same individuals. The collective dose is the sum of the TED to all persons in a specified population received in a specified period of time. It can also be expressed as the product of the average

¹⁷ FGR 15 replaced FGR 12, however, FGR 12 and FGR 15 are still appropriate documents to use when approved to be used as DOE Approved Dose Coefficients.

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dose(s) to a specified population(s) and the number of exposed persons within each population group, if more than one. Maximum potential doses should never be used to calculate the collective dose.

4.2 Clearance of Property Containing Residual Radioactive Material

DOE's radiation protection framework and 100 mrem/year dose limit are applicable to an "all sources and all pathways" policy. In addition to air and water discharges to the environment, the clearance of property (real or personal) containing residual radioactive material is another type of "release" to the environment and is a potential contributor to the estimated dose received by the public. Specific authorized limits are used to govern the radiological clearance of sites, structures, and materials; thus, a summary of authorized limits for clearance of property should be reported. It may be desirable to discuss real property (lands and structures) and personal property (equipment and soils) separately. The information regarding clearance under authorized limits should be summarized. This guidance is not intended to be prescriptive. These recommended reporting elements should be used in a way that best fits the format and style of the ASER for each site.

The ASER should contain a summary of property clearance activities for the site, including (1) the approved authorized limit used for clearance, the basis for its derivation (i.e., dose/As Low As Reasonably Achievable [ALARA] based or DOE-approved surface activity guidelines) and its date of approval or effective date; and (2) the type of material or property (i.e., open land, structures, material and equipment, or laboratory waste), the basis for its clearance, and its expected end-use scenario (i.e., disposal, recycle, reuse). If the clearance of property is for recycle or reuse purposes, any discussion of these activities in this section may also be referenced in the pollution prevention/waste minimization section of the ASER.

With regard to personal property clearance and considering the guidance contained in the January 19, 2001, memorandum from the Secretary, *Managing the Release of Surplus and Scrap Materials*, it may be desirable to provide summary data to quantify property cleared under the authorized limits or subject to the authorized limits. Where practical, information should be provided on (1) the volume, radionuclide concentrations, and total activity of the material; (2) the maximum dose to an individual and collective dose estimates; and (3) the estimated cost savings and other benefits from the clearance or a qualitative discussion of the benefits of the clearance program. A brief discussion about any actions taken to implement the improvements to monitoring, documenting and coordinating clearance recommended in the memorandum should be included, as should the locations or methods by which interested parties could obtain more detailed data on clearance (e.g., reading rooms, records centers or other locations where certification and clearance data are publicly available). It is also recommended that DOE property clearance information be made available at surplus property sales locations and on surplus property websites.

Requirements for the development and approval of authorized limits are contained in DOE O 458.1. Guidance on the development and approval of authorized limits is provided in several supporting DOE radiation protection guidance documents which are available online at: <http://energy.gov/ehss/services/environment/radiation-protection-public-and-environment>. At that page, go to: [Policies, Standards and Guidance Related to Radiation Protection of the Public and the Environment](#) then go to: [Surface Contamination Guidelines/Radiological Clearance of Property](#).

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4.3 Addressing Radiation Protection of Biota in ASERs

4.3.1 Dose Rate Limits for Protection of Biota and Methods for Demonstrating Compliance

As part of integrating EMSs into a site's integrated safety management system, DOE elements must, as applicable, consider protection of biota. Both aquatic and terrestrial evaluations should be conducted. DOE O 458.1 requires the protection of populations of aquatic animals, terrestrial plants, and terrestrial animals in local ecosystems from adverse effects due to radiation and radioactive material released from DOE operations. DOE O 458.1 also provides a graded (tiered) approach to evaluating biota protection. The DOE Technical Standard (STD), *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE-STD-1153-2019) at: <https://www.standards.doe.gov/standards-documents/1100/1153-astd-2019> was published on February 12, 2019 and is available for use in evaluating and reporting compliance with the biota protection requirements of DOE O 458.1. This standard replaces the previous DOE-STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*.

4.3.2 The RESRAD-BIOTA Code as a Tool for Evaluating Doses to Biota

The RESRAD-BIOTA Code provides a complete spectrum of biota dose evaluation capabilities, from general screening to comprehensive receptor-specific dose estimation. The Code was principally sponsored and developed by DOE, with support from the EPA and Nuclear Regulatory Commission. The Code was released in September 2003; a User's Guide was published in January 2004. The RESRAD-BIOTA Code was designed to be consistent with the DOE graded approach to biota and the method's Biota Concentration Guides. The RESRAD-BIOTA Code is recommended as the preferred companion software tool to DOE-STD-1153-2019 for demonstrating protection of biota in the ASER.

DOE-STD-1153-2019, the RESRAD-BIOTA Code, and the RESRAD-BIOTA Code User's Guide (DOE/EH-0676; ISCORS Report 2004-02) are available at <http://resrad.evs.anl.gov/documents/>. Refer to **Attachment II, Addressing Radiation Protection of Biota In ASERs** and **Attachment V, Biota Dose Evaluations**, for specific details and site-specific examples from the INL, Pantex and WVDP biota dose evaluation summaries for demonstrating and reporting compliance with dose limits for biota in the ASER. If alternative approaches to the Standard are used to demonstrate protection of biota consistent with DOE O 458.1 paragraph 4.j.(2), this section should summarize the approach used and the results.

4.4 Unplanned Radiological Releases

DOE's radiation protection framework and 100 mrem/year dose limit are applicable to an "all sources and all pathways" policy¹⁸. DOE O 458.1 refers to all emissions in the annual dose determination, routine and non-routine emissions, that would impact members of the public subject to the 100 mrem/y standard. Sites can find information on unplanned releases in DOE O 458.1 section 4.d.3¹⁹, with use of the term

¹⁸ Estimate of public dose limits required by DOE O 458.1 do not apply to dose from radon or its decay products in the air, background radiation dose, occupational dose, medical and accident exposures.

¹⁹ 4.d.3 --- The ALARA process must be applied to all routine radiological activities. To develop an ALARA process use guidance provided in DOE Handbook DOE-HDBK-1215-2014, *Optimizing Radiation of the Public and the Environment for use with DOE O 458.1, ALARA Requirements*. Though not applicable to non-routine radiological events (for example, accidental, unplanned, or inadvertent releases or exposures), the ALARA process is applicable during recovery and remediation activities associated with a non-routine event.

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non-routine radiological event; section 4.g²⁰; and section 5.b.5²¹. Additionally, sites can find information in Attachment 1 of DOE O 458.1. Please note the Order does not provide a specific definition of unplanned releases but relevant definitions for MEI and public dose should be used for guidance. This information is required in the ASER per DOE O 231.1B and DOE O 458.1.

Doses associated with unplanned releases should be consistent with the section regarding **Unplanned Releases**, and also clearly state the bases for any estimates regarding the magnitude of potential impacts of unplanned releases. A discussion should be provided that includes the date the release(s) occurred, the amount of material released, an explanation of the release, and corrective actions taken. In the case where releases are insignificant with respect to normal release-related doses (i.e., a few percent or less), they should be reported as such. If they exceed appropriate limits, this should also be noted.

Within the 2020 ASER, sites should utilize the following language to document if there were no unplanned releases at the site during the reporting period:

- There were no unplanned releases in 2020;
- There were no unplanned releases of radionuclides during 2020; and
- There were no unplanned radiological airborne releases during CY2020.

Since sites submit 40 CFR 61, Subpart H compliance reports prior to the site ASER publication, any Subpart H reporting of unplanned releases should be included in ASER publications.²² Any Subpart H reporting of unplanned releases should be included in site ASER publications. In instances where Subpart H reporting is conservative and releases and impacts are exceedingly low relative routine emissions and doses, the ASER discussion of the unplanned release may not necessarily include all event details. Acknowledgement of a reported unplanned release should be consistent between the two environmental compliance documents.

4.5 Environmental Radiological Monitoring

Facilities are requested to provide information on the models and the assumptions used in estimating the data so that data can be consistently and usefully aggregated. The “background” radiation levels used for comparison with off-site monitoring results, and the locations at which the background levels were measured, should be clearly stated. Summaries or tables of measured concentrations or activity should follow the guidance in §8.5.2 of DOE-HDBK-1216-2015, *Environmental Radiological Effluent*

²⁰ Characterize planned and unplanned releases of liquids containing radionuclides from DOE activities, consistent with the potential for on- and off-site impacts and provide an assessment of radiological consequences as necessary to demonstrate compliance with the requirements of this Order.

²¹ Ensure that appropriate capabilities are maintained for monitoring and assessing routine and unplanned releases of radioactive materials, consistent with the types of radioactive materials released, release modes, and radiological activities conducted.

²² 40 CFR Part 61 Subpart H was written for point source emissions under routine operations. 40 CFR 61, Subpart A in 61.13 does mention *Force majeure* which relates to source testing requirements and in 61.13(3) and (4) there are written notification requirements and deadlines. Additionally, the DOE/EPA MOU (1995) states issues related to 40 CFR 61 Subparts H, I, Q, and T. Section 6, Reporting Requirements – Subpart H, section 6.b discusses minor release points (impact <0.1 mrem/y) [per 61.96(b)...<1% of standard] and states that minor release points must be listed in the annual report per 61.94 (b)(4). These regulatory requirements are indicators unplanned releases should be included in the NESHAP reporting.

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Monitoring and Environmental Surveillance (March 2015, pages 143-145), regarding the use of “Less-Than-Detectable-Values” for statistical analysis and data reporting. DOE-HDBK-1216-2015 supersedes DOE/EH--0173T, *Environmental Radiological Effluent Monitoring and Environmental Surveillance* (January 1991). DOE-HDBK-1216-2015 is available at: <https://www.standards.doe.gov/standards-documents/1200/1216-bhdbk-2015>.

4.5.1 Future Radiological Monitoring

In response to the Japanese Fukushima Daiichi nuclear power plant incident in March 2011, DOE sites may wish to discuss any efforts being made to detect potentially elevated radionuclide levels proximate to their site and surrounding communities relative to previous radiological monitoring efforts and results. Any radiological monitoring modifications made to monitoring networks to enhance detection of radiological impacts, as a result of this incident could be mentioned in the 2020 ASER noting that further discussion and analysis of this data could be included in future ASERs, as appropriate.

5.0 Environmental Non-Radiological Program Information

This section discusses the inclusion and display of non-radiological environmental monitoring information in ASERs and other environmental programs and initiatives applicable to DOE sites.

5.1 Non-Radiological Environmental Monitoring

Non-radiological monitoring data should be included to provide a comprehensive summary of the environmental impacts associated with DOE site operations and the environmental monitoring efforts underway at DOE sites. When reporting non-radiological monitoring data, detection limits should be specified, where appropriate. Examples of the types of information that should be included and discussed in this section, if the data are available, are described below.

Graphical displays of non-radioactive emissions, including any discharges to air, surface water, soils and groundwater, should be used in demonstrating compliance with applicable permit limits. For example, graphs can show that, when a permit contains both daily and annual release limits, exceeding the daily limit may not necessarily constitute a compliance problem with respect to the annual limit.

Monitoring data related to non-radiological gaseous or liquid emissions for which there are applicable standards or other meaningful bases for interpreting the results should also be included in this section.

The Federal and State regulatory limits applicable to site emissions should also be described. Where appropriate, interpretation should be made of how the environmental pollutant discharge levels (resulting from site operations) compare to relevant parameters such as background levels and applicable effluent or environmental standards.

5.2 Fire Protection Management and Planning

Due to wildfires potentially affecting DOE property and impacting certain operational activities, this section should discuss any annual fire management planning actions. Certain DOE field sites, such as LANL and INL, have initiated prescribed (controlled) fire burns on select portions of DOE property and other related fire suppression actions to reduce ground fuel levels. These controlled burns serve to provide further protection to workers, site facilities and local communities adjacent to DOE sites. Other

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sites have started select forest harvesting practices and clearing of fire break zones as further protective actions to minimize or eliminate wildfire damage.

5.3 Recreational Hunting and Fishing

Recreational hunting and fishing opportunities by the public are allowed during open seasons at certain DOE sites to control wildlife populations and provide opportunities for hunters and fisherman in a controlled setting. This section should discuss which wildlife species can be hunted (e.g., deer, elk, feral pigs, and waterfowl), the duration of the hunting season, number of permits issued, and the kill or take numbers documented during a given hunting season. The allowance of fishing activities, the duration of fishing season and species populations that inhabit DOE property rivers/streams should also be discussed. Sites that calculate maximum potential dose from ingestion of wildlife (animal or fish) caught on or near the site should clearly state which pathways are summed as part of the reported dose to the representative person or to the MEI. The calculations of dose should be presented in the *Radiological Dose Assessment* section of the ASER.

6.0 Groundwater Protection Program

This section should provide a brief description of site hydrological conditions, including cross-sections of subsurface conditions at the site. Reference to additional technical documents detailing the hydrological conditions, including groundwater flow and potential receptors, should also be provided in this section. Additionally, as mentioned in the introduction of this guidance, this section should include a summary of PFAS and/or other emerging contaminants detected due to AFFF use or operational processes. Details such as efforts conducted to determine the presence of contaminants (e.g., historical review of records, database searches, locating materials/waste areas, analysis of past practices and sources, etc.), analytical methods used for environmental samples, any associated regulatory developments, and/or recent discussions held with EPA or State regulators on the topic should also be described. Similarly, any notable discussions with local officials or community representatives may be useful to summarize.

Groundwater monitoring and public drinking water protection continue to receive emphasis at EPA and within DOE. This section should include data on facility up-gradient and down-gradient wells at RCRA hazardous waste units, DOE Radioactive Waste Management Units, RCRA or CERCLA remediation sites, and identified compliance points (i.e., points at which regulatory standards apply) to effectively track groundwater plume movement. Groundwater monitoring wells operated for other purposes should also be included. These monitoring wells would include subsurface or aquifer characterization wells (used for environmental surveillance), environmental radiological program monitoring wells, or wells operated for detection monitoring at non-RCRA and non-CERCLA facilities at the site.

To make the ASERs more meaningful, trends in the groundwater data over time should be included. Each site should prepare tables to indicate trends in groundwater plume movement over a five-year period, at a minimum. Data for the current year and for the previous five years should be displayed graphically or presented as basic statistics (such as median values and ranges) for contaminants commonly detected at the site. The real or potential impact of groundwater plume and contaminant movement on public drinking water supplies should be discussed here. The 2020 ASERs should characterize groundwater monitoring results for CY 2020 and for the five previous years if the data are available. In addition, the ASERs should highlight monitoring wells with significant changes in contamination indicator parameters above background levels. This type of information should be compiled and organized such that it is easy to locate and understand.

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A summary description of the site groundwater monitoring network should also be provided. This summary should state the various monitoring objectives (i.e., RCRA hazardous waste management unit detection monitoring, environmental surveillance monitoring, or DOE O 435.1 monitoring) and should describe the network established to meet these objectives. A series of tables could be used to summarize the number of active wells by area of the site and by purpose. The tables should address the number of wells installed or abandoned during the current year and any unique or innovative techniques use in the site groundwater monitoring network. A recommended tabular format that provides summary information on a site groundwater monitoring network is depicted in **Attachment III, Recommended Reporting Format for DOE Site-Wide Groundwater Monitoring Program (cont.)**. Site-specific examples from the 2017 BNL, Hanford and INL ASERs are referenced in **Attachment V, Site-Wide Groundwater Monitoring Program Summary Tables and Trending**.

Aerial photographs and/or maps of the reporting facility are extremely useful in depicting groundwater monitoring points and, if available, they should be included in the ASER and portrayed in a manner consistent with site security requirements. In particular, maps that show the extent of contamination and migration of groundwater contaminant plumes over time should be included to meet the needs of regulators and the interests of the public and site stakeholders. These maps should indicate the locations of the plumes with respect to site boundaries, lakes, rivers, aquifers, and relevant groundwater monitoring and drinking water wells. Foldout maps may be included, as appropriate.

7.0 Quality Assurance

The ASER should describe the measures taken to ensure the quality of radiological and non-radiological data through the implementation of a quality system for the management of environmental data as required by DOE O 414.1D, Admin Chg 1, *Quality Assurance* (5-8-2013). This discussion should generally validate site data collection and analysis programs and should present summary information from participation in inter-laboratory cross-check programs, including site results and expected results. The general implications of the results of inter-laboratory comparisons should be discussed along with any actions taken or needed to improve data quality.

In addition, the ASER should discuss the extent to which the following were used:

- The *Uniform Federal Policy (UFP) for Implementing Environmental Quality Systems* (March 2005)
- EPA QA/G-4, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (February 2006)

The UFP offers an implementation tool for meeting the environmental data quality and reporting objectives of DOE O 231.1B and DOE O 458.1.

EPA QA/G-4 provides information on how to apply systematic planning to generate performance and acceptance criteria for collecting environmental data. This guidance also provides a standard working tool for project managers to develop data quality objectives for determining the type, quantity and quality of data needed to reach defensible decisions.

ASERs should summarize major audit findings at contracted on-site/off-site commercial analytical laboratories and/or waste vendor facilities that could adversely impact DOE operations. Corrective actions taken to address major audit findings should also be noted. Contracted analytical laboratories should produce defensible, valid and reliable environmental analytical data which field management can

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use in decision-making for clean-up, remediation and on-going operations. In addition, radiological and hazardous waste disposition at waste vendor facilities should be managed in a regulatory compliant manner and in conformance with DOE procurement contract stipulations and requirements. The ASER should identify all contracted analytical laboratories and waste vendor facilities used by the site in 2020.

Examples of potential major audit findings that may impact field operations include:

For Analytical Laboratories:

- Proficiency test failures by analytes/matrices
- Not adequately following approved analytical method(s) for given analytes
- Not preserving thermal integrity of semi-volatile samples during the laboratory log-in process
- Missed sample holding times prior to analysis
- Breaks in internal laboratory sample chain-of custody
- Improper data validation/verification processes

For Treatment, Storage and Disposal Facilities

- Not treating radiological/hazardous waste within mandated regulatory timeframes
- Improper storage of incompatible wastes
- Incomplete recordkeeping of DOE waste drums
- Not adhering to internal worker safety standard operating procedures (e.g., electrical safety, noise abatement, confined space entries, operable eye washes and safety showers.)

The quality assurance section of the ASER should also discuss the extent to which DOE site contractors conducting environmental monitoring and DOE-contracted laboratories performing environmental analysis participate in the Department's Consolidated Audit Program (DOECAP), the Mixed Analyte Performance Evaluation Program (MAPEP) and the Visual Sample Plan (VSP) performance evaluation programs to ensure the quality of analytical data obtained. Any additional quality assurance protocols, guidelines, or relevant national or international consensus standards used should be discussed here, as well. This section should also identify which of the following programs bulleted below are being used at the site and how they assist in quality assurance functions and reviews. These programs are discussed below.

- **DOECAP Accreditation Program (DOECAP-AP) Assessment Reports:** DOE field element sites that have contracted for analytical services with off-site environmental laboratories should utilize, when possible, the results of third-party accreditation assessments report under the DOECAP-AP. Requiring participation in this program through contractual means provides a universal standard for commercial laboratory use and establishes quality deliverables and reliable data analysis for DOE sites. Use of third-party accreditation has recently replaced the traditional DOECAP audits beginning in FY 2019 and this has allowed for more in-depth approaches to quality control and oversight of these laboratory facilities in meeting the needs of the Department. It is important to identify the commercial laboratories used by the sites and their subcontractors in managing data analysis used for DOE site decision-making. This section should identify the laboratories used, or approved for use (i.e., Basic Ordering Agreements, approved vendors listings, etc.) and if they are contractually required to participate in the DOECAP-AP.
- **MAPEP:** Results of MAPEP for proficiency testing helps to assure field managers about the quality and reliability of environmental data for decision making. Although not a mandatory requirement of the DOECAP-AP, MAPEP can be a very useful tool in determining a commercial laboratory's analytical capabilities. This section should indicate if MAPEP participation is

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required by the DOE site or the subcontractor. Additional information on MAPEP is available at: <https://www.id.energy.gov/resl/mapep/mapep.html>.

- DOECAP TSDF Audits²³: The tracking and accountability of DOE waste streams sent off-site to commercial waste vendor facilities can be used by field managers in evaluating their risks and liabilities for potential treatment and disposal concerns. TSDF audit reports generated annually by DOECAP are one tool the Field Element Manager can use in performing their DOE O 435.1 annual acceptability reviews for these commercial sites. DOECAP reports are also used in satisfying quality assurance requirements and various contractual oversight functions such as those required by DOE O 414.1D. Additional information on DOECAP is available at: <https://www.energy.gov/ehss/environmental-policy-and-assistance/analytical-services-program>.
- VSP: The use of VSP software toolkits should also be considered by field managers regarding environmental field sampling statistical strategies for collecting data that has a proven record for cost-efficiencies in meeting Data Quality Objectives and regulatory acceptance. It is requested that the site discuss their participation or use of VSP in this section, as appropriate. Additional information on VSP is available at: <http://vsp.pnl.gov>.

(See **Attachment V, Quality Assurance**, for recommended reporting options for sites to consider from BNL, INL, NNSS and SRS.)

²³ As a result of the COVID-19 pandemic, DOECAP TSDF audits are being conducted virtually. Please contact DOECAP program manager, Steve Clark (Steve.Clark@hq.doe.gov) for additional information.

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Attachment I

Recommended Formats for Radiological Dose and Release Reporting in ASERs

The tables in **Attachment I** provide examples of formats used by AU-20 to summarize ASER radiological dose and release data. It is highly recommended that DOE sites use these formats for reporting doses, atmospheric releases, and liquid effluent releases in ASERs. Preparing data in these, or similar formats, will simplify aggregation of data across DOE and enable DOE-wide site comparisons. However, these example formats should not be used solely to replace site-specific-based presentations that contain more detailed radionuclide-specific information that are relevant to describing site-specific operations. Noteworthy site-specific examples from the 2017 Hanford, INL, LANL, NNSS, ORR, SRS, WIPP and WVDP ASERs are referenced in **Attachment V, Radiological Doses and Releases**.

The ASER should confirm that all of the types of radionuclides released from the site have been reported. If this is true, a clear statement should be made indicating that there are no known significant discharges of radioactive constituents from the site other than those reported in the tables. Such a statement would be informative to public stakeholders.

In addition, based on extensive review of past ASERs, most non-routine radiological releases typically do not significantly contribute to the overall radiological doses when compared to the doses resulting from routine DOE operations. This should also be clearly communicated in the ASER, where applicable.

Example Table 1: Site X Radiological Dose Reporting Table for Calendar Year 2020

Pathway	Dose to the Representative Person or the Maximally Exposed Individual (MEI) mrem (mSv)	% of DOE 100 mrem/yr Limit	Estimated Collective (Population) Dose person-rem (person-Sv)	Population within 80 km*	Estimated Background Radiation Population Dose person-rem (person-Sv)
Air			Average dose X population exposed	*	Pathway-specific background doses need not be estimated
Water			Average dose X population exposed	*	Pathway-specific background doses need not be estimated
Other Pathways			Average dose X population exposed	*	Pathway-specific background doses need not be estimated
All Pathways	{Note: This should be the total dose to the representative person or the MEI, but it should not be the sum of the individual pathway doses unless all the pathway-specific MEI doses are to the same receptor **}		{Note: This should normally be the sum of the average pathway-specific Population Doses}		

* Pathway-specific populations should be specified only if they are significantly different from the total population.

** Some sites sum the representative person or the MEI doses from various pathways to different receptors to bound MEI doses. In such cases, the conservative nature (overestimation of dose) should be discussed. Other unrealistic assumptions, such as assumed occupancy factors for exposures of 24 hours/day for 365 days, should be explained if they are used in establishing bounding dose estimates. Although reported doses should not underestimate likely doses, DOE prefers dose estimates to be as realistic as possible.

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Attachment I

Recommended Formats for Radiological Dose and Release Reporting in ASERs (cont.)

**Example Table 2: Site X Radiological Atmospheric Releases for Calendar Year 2020
(in Ci, Bq or GBq, as appropriate) *****

Tritium	⁸⁵ Kr	Noble Gases (T _{1/2} <40 days)	Short-Lived Fission and Activation Products (T _{1/2} <3 hr)	Fission and Activation Products (T _{1/2} >3 hr)	Total Radio-iodine	Total Radio-strontium	Total Uranium	Plutonium	Other Actinides	Other

**Example Table 3: Site X Liquid Effluent Releases of Radioactive Material for Calendar Year 2020
(in Ci, Bq or GBq, as appropriate)*****

Tritium	Fission and Activation Products (T _{1/2} >3hr)	Total Radio-iodine	Total Radio-strontium	Total Uranium	Total Plutonium	Other Actinides

*** These example tables are to assist in DOE-wide comparisons. If used, they should be presented along with more detailed site-specific-based tables. They should not replace or deter more informative site-specific reporting formats.

Please contact Alicia Williamson, AU-22, at 202-586-7272 or Alicia.Williamson@hq.doe.gov, for additional information or guidance.

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Attachment II

Addressing Radiation Protection of Biota in ASERs

Guidance for Demonstrating and Reporting Compliance with Dose Limits for Biota

DOE O 458.1 requires the protection of populations of aquatic animals, terrestrial plants, and terrestrial animals in local ecosystems from adverse effects due to radiation and radioactive material released from DOE operations. DOE O 458.1 provides a graded (tiered) approach to evaluating biota protection when actions taken to protect humans from radiation and radioactive materials are not adequate to protect biota. Compliance with DOE O 458.1, paragraph 4.j.(1), can be demonstrated in one or more of the following ways:

- (a) Use DOE-STD-1153-2019, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*.
- (b) Use an alternative approach to demonstrate that the dose rates to representative biota populations do not exceed the dose rate criteria in DOE-STD-1153-2019, Table 1.1.
- (c) Use an ecological risk assessment to demonstrate that radiation and radioactive material released from DOE operations will not adversely affect populations within the ecosystem.

DOE activities may demonstrate and document compliance in the ASER, as appropriate to each site, by meeting the following screening criteria or conducting an ecological risk assessment:

- (1) The absorbed dose to aquatic animals will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material.
- (2) The absorbed dose to terrestrial plants will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material.
- (3) The absorbed dose to terrestrial or riparian animals will not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive material.

The screening and analysis methods described below provide a means of demonstrating that the above dose rate criteria for aquatic and terrestrial biota are being achieved.

A Graded Approach for Demonstration of Protection

DOE-STD-1153-2019 provides practical screening and analysis methods for demonstrating compliance with the requirements for protection of biota. The Technical Standard provides a graded approach for demonstrating compliance with the biota dose limits and for conducting ecological assessments of radiological impact.

The graded approach consists of a three-step process that guides the user from an initial, prudently conservative set of screening values to (if needed) a more rigorous analysis using site-specific information. This process includes *data assembly*, a *general screening phase*, and an *analysis phase*. In *data assembly*, the site area to be evaluated is defined, and measured maximum or mean radionuclide concentration data are assembled for subsequent screening. In the *general screening phase*, measured

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Attachment II

Addressing Radiation Protection of Biota in ASERs (cont.)

radionuclide concentrations in environmental media are compared with the Biota Concentration Guides (BCG). Each radionuclide-specific BCG represents the limiting radionuclide concentration in environmental media that would not cause the biota dose limits to be exceeded. The *analysis phase* consists of three increasingly more detailed steps of analysis: a site-specific screening, using site-representative parameters instead of default parameters; a site-specific analysis, employing a kinetic modeling tool; and, if necessary, a site-specific biota dose assessment involving the collection and analysis of biota employing ecological risk assessment protocols. This three-phase scheme helps to ensure that the evaluation effort is commensurate with the likelihood and severity of potential environmental impacts. Implementation experience at DOE sites to date suggests that the majority of sites will likely be able to demonstrate compliance with biota dose limits using the general screening phase.

The RESRAD-BIOTA Code as a Tool for Evaluating Doses to Biota

The RESRAD-BIOTA Code (released in September 2003; User's Guide in January 2004) is the preferred companion software tool for implementing the methods contained in DOE-STD-1153-2019 and for demonstrating protection of biota in ASERs. The RESRAD-BIOTA Version 1.21 computer model developed in 2004 and the RESRAD-BIOTA for Windows developed in 2009 have also been available to evaluate compliance with biota protection requirements and implementing DOE-STD-1153-2019. The code provides a complete spectrum of analysis capabilities, from methods for general screening to comprehensive receptor-specific dose estimation. The code contains many advanced features, such as sensitivity analysis for studying parameter sensitivity; text reports and graphing capabilities for easy interpretation of data; an advanced "Organism Wizard" for configuring user-defined organisms; and capabilities to save and retrieve evaluation data and user-defined organisms.

DOE-STD-1153-2019, the RESRAD-BIOTA Code, and the RESRAD-BIOTA User's Guide (DOE/EH-0676; ISCORS Report 2004-02) can be downloaded at: <http://resrad.evs.anl.gov/documents/>. DOE-STD-1153-2019 and the RESRAD-BIOTA Code are the preferred tools for estimating and evaluating doses to biota, unless there are site-specific requirements that necessitate the use of an alternative method or model, or it is determined that such alternate approaches will provide better results. If alternative approaches to the Standard are used to demonstrate protection of biota consistent with DOE O 458.1 paragraph 4.j.(2), this section of the ASER should summarize the approach used and results.

Specific Guidance and Sample Reporting Format for ASERs

Compliance with the biota protection requirements in Section 4.j of DOE O 458.1 should be reported in the *Environmental Surveillance* section of the ASER under *Aquatic and Terrestrial Wildlife*, or comparable section. The recommended approach is to prepare a text summary section and incorporate a supporting summary table for the evaluations conducted. To demonstrate compliance with DOE biota protection requirements, the following elements should be included when reporting evaluations and conclusions: (1) reference the biota dose rate criteria being met (e.g., 1 rad/day for aquatic organisms); (2) identify the method used to demonstrate compliance with these dose rate criteria and briefly describe the process used (e.g., screening methods using DOE-STD-1153-2019 and the RESRAD-BIOTA Code, or other site-selected method); (3) describe the site areas evaluated and supporting data used in the evaluation (i.e., sources of exposure to biota for the site area evaluated, specific organism types or

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Attachment II

Addressing Radiation Protection of Biota in ASERs (cont.)

receptors used, media type and radionuclide concentration data used); (4) summarize the results (e.g., concentrations of radionuclides in environmental media are less than screening values, doses calculated are less than biota dose rate criteria); and (5) provide a conclusion (e.g., populations of biota are protected at recommended dose rates and no impacts from ionizing radiation to populations of biota are indicated). Additionally, the following areas should be highlighted as appropriate and beneficial: (1) any significant site outreach efforts or initiatives with stakeholders and local regulators; (2) integration of biota dose evaluation within the site's environmental surveillance program; and (3) site recognition of biota protection as a good business practice and as an important element of environmental stewardship. Refer to Section 7, *Documenting Your Biota Dose Evaluation Results*, in DOE-STD-1153-2019 for additional guidance.

Examples of Biota Dose Evaluation Reporting Cited from Actual ASERs

Most sites have done a good job in communicating their biota dose evaluation results in their ASERs. The INL, Pantex and WVDP biota dose evaluation summaries, as presented in their 2017 ASERs, are referenced in **Attachment V, Biota Dose Evaluations**, as noteworthy examples of how to present and summarize this information in the ASER.

Please contact Katharine McLellan, AU-22, at 202-586-0183 or Katharine.McLellan@hq.doe.gov, for additional information or guidance.

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Attachment III

Recommended Reporting Format for DOE Site-Wide Groundwater Monitoring Program

Summary of DOE Site-Wide Groundwater Monitoring Program

The Summary Table on the following page provides an example of a recommended format that sites should use to give an accounting of all active groundwater monitoring wells at the site. Active wells are those that are currently being used (i.e., samples are taken during the current calendar year). This summary table includes only monitoring wells; it does not include injection wells, production wells, extraction wells (e.g., for remediation), piezometers, drainage wells, and so forth, unless a sample is withdrawn for chemical, physical, radiological, or other analysis.

The summary table is structured according to the primary purpose (or driver) for sampling the well and includes the following broad categories.

1. Restoration – Wells that are associated with a groundwater remediation project, including subsurface investigation monitoring, and evaluation of the progress of the remediation.
2. Waste Management – Wells that are sampled to determine the impact, if any, of a waste management unit (e.g., RCRA hazardous waste, DOE low-level radioactive waste, other RCRA waste, CERCLA remediation waste) on the groundwater.
3. Surveillance – Wells that are sampled to detect possible impact of any other site operations (non-waste management units) on the groundwater and would include both radiological and non-radiological sampling data. This includes PFAS related contaminant monitoring.
4. Other – Wells that are sampled for any other purpose.

This example summary table accounts for numbers of samples taken during the calendar year at wells included in each of the four categories above (e.g., wells used for remediation, wells used for waste management). The table also accounts for analyses performed during the calendar year for all samples taken at each group of wells, corresponding to the same four categories. In addition, the table includes the percentage of all analyses performed for which the results were below the levels of detection. The final section of the table includes information on the ranges of concentrations for the most commonly detected contaminants. Noteworthy site-specific examples from the 2016 BNL, Hanford and INL ASERs are referenced in **Attachment V, Site-Wide Groundwater Monitoring Program Summary Tables and Trending**.

Please contact Alicia Williamson, AU-22, 202-586-7272 or Alicia.Williamson@hq.doe.gov, for additional information or guidance.

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Attachment III

Recommended Reporting Format for DOE Site-Wide Groundwater Monitoring Program (cont.)

Summary of CY 2020 Doe Site -Wide Groundwater Monitoring Program*

	PURPOSES FOR WHICH MONITORING WAS PERFORMED			
	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of Active Wells Monitored On-Site				
Number of Active Wells Monitored Off-Site				
Number of Samples Taken				
Number of Analyses Performed				
% of Analyses that are Non-Detects				
% of Analyses within an Acceptable Range				

Ranges of Results for Positive Detections				
Tritium				
Krypton-85				
TCE				
Heavy Metals				
VOCs				
Other Contaminants (list separately)				

* Where appropriate, a second table could be included in this section to characterize off-site groundwater monitoring.

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Attachment IV

Alternate ASER Reporting for Closure Sites

This section provides suggestions and guidance to DOE sites whose primary mission is environmental restoration with a goal of closure in the near future and to sites managed by the DOE Office of Legacy Management (LM). DOE O 231.1B and annual ASER guidance allow for sites to use a graded approach to tailor their ASERs based on the site mission, breadth of operations, active monitoring conducted (including the level of activity of remedial action systems), and the potential impact site activities may have on the public and environment proximate to the site. These alternatives include preparing a scaled-down version of the ASER and submitting equivalent documentation to DOE-HQ along with a self-declaration from the site that this documentation satisfies DOE internal reporting requirements.

Legacy or closure sites may consider preparing a scaled-down, streamlined version of the ASER that reflects the current nature and extent of site operations and monitoring programs, as they may be in a relatively static operational condition. The scaled-down ASER should summarize any relevant new information for the current year and appropriately reference the previous year's ASER for a description of unchanged or static conditions at the site.

A second option is to submit the relevant and equivalent regulatory environmental compliance and radiological protection documentation to DOE-HQ in lieu of preparing the traditional ASER. For example, NESHAP, NPDES, and other regulatory environmental reporting that may be required and appropriate to the site, may be submitted. This documentation should characterize site environmental monitoring program and results, site activities, regulatory compliance status, and compliance with DOE O 458.1.

For either alternative approach, the site or program should electronically submit the equivalent document, required by DOE O 231.1B to Dr. Josh Silverman (Josh.Silverman@hq.doe.gov), Director, AU-20, Office of Environment, Health, Safety and Security, via a transmittal memorandum from the Site Manager, Field Office Manager, or appropriate designee, by no later than October 1 of each calendar year. This memorandum should state that the site is self-declaring compliance with the radiation protection requirements of DOE O 458.1 and that the associated documentation and rationale that is forwarded with the memorandum supports this self-declaration. These alternative approaches should demonstrate compliance with the spirit of the environmental protection reporting requirements of DOE O 231.1B and the annual guidance issued to Field elements regarding the preparation of ASERs.

Regardless of the option certain sites may choose to pursue, appropriate measures should be taken to effectively communicate site environmental status to DOE-HQ and the public in the future. Specifically, sites should identify the future mechanisms that will be used to keep regulators and the public informed of site activities, closure progress, environmental activities, and monitoring results. At the appropriate juncture in the future, when environmental restoration activities are concluded at the site, the final submittal of appropriate documentation to DOE-HQ should describe the closeout condition of the site, including such information as the nature and extent of final activities at the site, the status of present and future monitoring and surveillance programs, and any pertinent institutional controls that may be implemented at the site.

Please contact Alicia Williamson, AU-22, at 202-586-7272 or Alicia.Williamson@hq.doe.gov, for additional information or guidance.

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Attachment V

Site -Specific Examples of Recommended ASER Reporting Formats

Attachment V provides examples of model reporting formats referenced from recent ASERs, including 2017 ASER publications. These examples provide recommended reporting options for sites to consider for incorporation into their respective ASERs, as appropriate. They include reporting formats for the Executive Summary, Compliance Summary Table, NPDES Exceedances, EPCRA Reporting, Environmental Management Systems and EMS Summary Tables, DOE O 436.1, E.O. 13834, Radiological Doses and Releases, Biota Dose Evaluations, Site-Wide Groundwater Monitoring Program Summary Tables and Trending, Environmental Operating Experience and Performance Measures, Quality Assurance, Alternate General ASER Formats, the ASER Public/Reader Comment Form, ASER Summary Reports, and ASER Web-Page Model Formats.

Please contact Alicia Williamson, AU-22, at 202-586-7272 or Alicia.Williamson@hq.doe.gov, for additional information or guidance.

ASER reports for each site can be accessed directly from the DOE ASER home page. The DOE ASER home page is <https://www.energy.gov/ehss/policy-guidance-reports/environment-policy-guidance-reports/annual-site-environmental-reports>.

1. **Executive Summary:**
 - Brookhaven National Laboratory
 - Hanford
 - Los Alamos National Laboratory
 - National Renewable Energy Laboratory
 - Nevada National Security Site
2. **Compliance Summary Table:**
 - Brookhaven National Laboratory
 - National Renewable Energy Laboratory
 - Princeton Plasma Physics Laboratory
 - West Valley Demonstration Project
3. **NPDES Exceedances:**
 - Nevada National Security Site
 - Oak Ridge Reservation
 - Savannah River Site
4. **EPCRA Reporting:**
 - Hanford
 - Lawrence Livermore National Laboratory
 - Sandia National Laboratory-Albuquerque

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Attachment V

Site -Specific Examples of Recommended ASER Reporting Formats (cont.)

5. Environmental Management Systems and EMS Summary Tables:

Argonne National Laboratory
Brookhaven National Laboratory
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
Nevada National Security Site
Princeton Plasma Physics Laboratory
Sandia National Laboratory-Albuquerque
Sandia National Laboratory-California
Savannah River Site

6. DOE O 436.1:

Argonne National Laboratory
Brookhaven National Laboratory
Los Alamos National Laboratory
Oak Ridge Reservation

7. E.O. 13834 Reporting:

National Renewable Energy Laboratory
Pacific Northwest National Laboratory
Waste Isolation Pilot Plant

8. Radiological Doses and Releases:

Hanford
Idaho National Laboratory
Los Alamos National Laboratory
Nevada National Security Site
Oak Ridge Reservation
Savannah River Site
Waste Isolation Pilot Plant
West Valley Demonstration Project

9. Biota Dose Evaluations:

Idaho National Laboratory
Pantex
West Valley Demonstration Project

10. Site-Wide Groundwater Monitoring Program Summary Tables and Trending:

Brookhaven National Laboratory
Hanford
Idaho National Laboratory

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Site -Specific Examples of Recommended ASER Reporting Formats (cont.)

11. Environmental Operating Experience and Performance Measures:

Argonne National Laboratory
National Renewable Energy Laboratory
Princeton Plasma Physics Laboratory
Sandia National Laboratory-California
West Valley Demonstration Project

12. Quality Assurance

Brookhaven National Laboratory
Idaho National Laboratory
Nevada National Security Site
Savannah River Site

13. Alternate General ASER Formats:

Argonne National Laboratory
Brookhaven National Laboratory
Hanford
Idaho National Laboratory
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
Nevada National Security Site
Oak Ridge Reservation
Pantex
Sandia National Laboratory- Albuquerque
Savannah River Site

14. ASER Public/Reader Comment Form:

Pacific Northwest National Laboratory
Pantex
Savannah River Site
Waste Isolation Pilot Plant
West Valley Demonstration Project

15. ASER Summary Reports:

Hanford
Los Alamos National Laboratory
Nevada National Security Site
Oak Ridge Reservation
Savannah River Site

16. ASER Web-Page Model Formats:

Idaho National Laboratory
Lawrence Livermore National Laboratory
Oak Ridge Reservation
Savannah River Site