

memorandum

DATE: April 4, 2003

REPLY TO
ATTN OF: Office of Environmental Policy and Guidance (EH-41):Natoli:6-1336

SUBJECT: Guidance for the Preparation of Department of Energy (DOE) Annual Site Environmental Reports (ASERs) for Calendar Year 2002

TO: Distribution

This memorandum provides the annual guidance for reporting under DOE Order 231.1, "Environment, Safety and Health Reporting," and Order DOE 5400.5, "Radiation Protection of the Public and Environment." It updates previous guidance regarding the preparation, approval and release of the DOE ASERs, and is prepared to comply with paragraph I.1.c of DOE Manual 231.1-1 which requires the Office of Environmental Policy and Guidance (EH-41) to issue annual guidance for preparation of ASERs. EH-41 is recommending some format and content suggestions for the 2002 ASERs. These suggestions are consistent with discussions on reporting and format held at previous annual ASER workshops hosted by EH-41 and most recently conducted at the Savannah River Site in October 2002. They include:

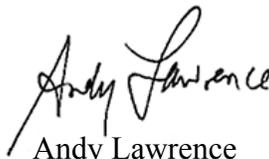
- Discussing a site's Environmental Management System (EMS) and its implementation status within the framework of the Department's Integrated Safety Management System (ISMS).
- Reporting on activities pursuant to Executive Order (E.O.) 13148, "Greening the Government Through Leadership in Environmental Management" and E.O. 13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition."
- Discussing highlights or significant accomplishments of site pollution prevention activities; including progress in meeting the Department's (Secretarial) Pollution Prevention and Energy Efficiency Goals (November 1999), efforts to phase out Ozone Depleting Substances (ODS) and any DOE or other Federal Agency Pollution Prevention recognition awards received in 2002.
- Reporting of radiological doses and releases resulting from DOE facility operations.
- Reporting on radiation protection, including discussions on:
 - authorized limits used for the control or release of real or personal property potentially containing residual radioactive material, and
 - protection of biota.

- Discussing a site's environmental performance measures program, including specific environmental performance measures applicable to operations conducted at the site.
- Reporting of DOE Site-Wide Groundwater Monitoring Program results.

These suggestions are addressed in detail in the following attachments: Attachment I, "Supplemental Guidance for the Preparation of the 2002 Annual Site Environmental Reports," Attachment II, "Suggested Formats for Radiological Dose and Release Reporting in ASERs," Attachment III, "Addressing Protection of Biota in ASERs," and Attachment IV, "Suggested Reporting Format for DOE Site-Wide Groundwater Monitoring Program." In addition, some noteworthy site-specific examples of calendar year 2001 ASER reporting formats that conform to EH-41 ASER guidance recommendations for: biota dose reporting, radiological dose and release reporting, and site-wide groundwater monitoring program reporting, are found in Attachment V and Attachment VI. Additional citations of noteworthy examples are referenced throughout Attachment II.

The ASERs provide important information needed by DOE Headquarters to assess field environmental program performance and confirm compliance with environmental standards and requirements. They are also the means by which DOE sites demonstrate compliance with the radiation protection requirements of Order DOE 5400.5. The submittal of an integrated annual summary report is, therefore, necessary to demonstrate compliance with these Orders as well as DOE Order 231.1. In addition, ASERs are an important means of conveying DOE's environmental performance to members of the public living near DOE sites and to other stakeholders. The calendar year 2002 ASERs should be prepared and made available to the public by October 1, 2003.

Thank you for your ongoing efforts and continued cooperation as we work together to maintain and improve the quality and consistency of the DOE ASERs. If you have questions regarding the attached guidance, please contact Ross Natoli of my staff (e-mail: Ross.Natoli@eh.doe.gov); telephone 202-586-1336) for more information. The attached guidance is also available via the Office of Environmental Policy and Guidance Internet Web site at <http://www.eh.doe.gov/oepa/>.



Andy Lawrence
Director
Office of Environmental Policy and Guidance

Attachments

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Supplemental Guidance for Preparation of the 2002 Annual Site Environmental Reports

Background

This guidance supplements the requirements in DOE Order 231.1, "Environment, Safety and Health Reporting" that are contractually applicable to DOE sites, and should be used in conjunction with the requirements of Order DOE 5400.5, "Radiation Protection of the Public and the Environment."

As stated in DOE Order 231.1, the purpose of the Annual Site Environmental Report (ASER) is to present summary environmental data to:

- o Characterize site environmental management performance,
- o Confirm compliance with environmental standards and requirements, and
- o Highlight significant facility programs and efforts.

Because this report is the principal document that demonstrates compliance with DOE 5400.5 requirements, and a key component of DOE's effort to keep the public informed of environmental conditions at DOE sites, ASERs should contain the most accurate and complete monitoring data, and up-to-date compliance information for calendar year (CY) 2002. The ASERs should also highlight new site programs and initiatives, compliance successes, noteworthy practices, site environmental performance measures and/or performance indicators programs, and, if applicable, site assessments that occurred during CY 2002. Significant environmental issues and events that occurred in 2003 (up to the time of public distribution of the ASERs) may be noted and summarized with the release of the ASERs.

Public Information Source

Consistent with the DOE's commitment to openness and public involvement in DOE operations, the ASERs should be prepared in a manner that addresses likely public concerns and solicits feedback from the public and other stakeholders on the site's environmental management performance and compliance. Some recent successful approaches illustrating this include:

- (1) A summary pamphlet targeted for the general public that accompanies the ASER.
- (2) An executive summary within the ASER that concisely highlights site operations, characterizes site environmental management performance and compliance, and describes significant environmental issues and programs.

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- (3) Site-specific electronic, Internet or Web-based approaches that facilitate public outreach to, and feedback from, stakeholders on ASERs. Sites should consider providing a "hot button" on their Home Page to allow easy and direct access to ASERs.

Coordination and Production

Since most DOE Headquarters (HQ) Cognizant Secretarial Officers (CSOs) have empowered the Field to prepare, approve and release the ASERs, we recommend CSOs make commitments to Field elements regarding the time frames for CSO review and comment. All significant comments should be forwarded by the CSOs directly to the appropriate Field elements within this comment period.

The Office of Environmental Policy and Guidance, EH-41, is available to provide advice regarding the preparation of the ASERs. However, EH-41 does not have a formal review and comment role for ASERs.

DOE HQ comments should be addressed and incorporated, as appropriate, into the final draft of the 2002 ASERs. The 2002 ASERs should be approved by the Heads of Field Organizations (HFOs), or appropriate designee and released to the public and/or placed on a site's Internet home page by October 1, 2003. Any additional significant environmental compliance issues, events, or noteworthy practices that emerge between the end of CY 2002 and the actual public distribution of the ASERs may be summarized in the transmittal memorandum releasing the ASERs to the public, or as a separate attachment. The public release of the 2002 ASERs should also include a statement by the HFOs, or appropriate designee, ensuring DOE's commitment to the validity and accuracy of the monitoring data.

Distribution

Upon CSO or HFO approval of the 2002 ASERs, Field elements are requested to provide **three** copies to Ross Natoli in EH-41, **one** copy to Roy Hardwick, Deputy Assistant Secretary for Office of Corporate Safety and Assurance, EH-2, **one** copy to Glenn Podonsky, Director, Office of Independent Oversight and Performance Assurance, OA-1, and distribute additional copies to relevant CSOs, the Office of Scientific and Technical Information, the Environmental Protection Agency, State agencies, and other agencies, organizations or individuals, as appropriate.

Goals and Content

A chief purpose of the ASERs is to document: the radiological and non-radiological condition of a site's environs, the effluents and emissions released from DOE operations, and 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 regulations and requirements. They should also describe the environmental impacts of DOE site operations. Where appropriate, the use of models and assumptions used to estimate releases and environmental conditions should be clearly documented.

ASERs are the primary report documenting compliance with the public protection requirements of Order DOE 5400.5. Therefore, a comprehensive description of each site's radiological environmental impacts and programs should be included. This information will be aggregated into the "Annual Summaries of Radiological Doses and Releases" report that EH-41 prepares.

For non-radiological monitoring data in the ASERs, EH-41 recommends reporting: (1) the Superfund Amendments and Reauthorization Act (SARA) Title III or Emergency Planning and Community Right-to-Know (EPCRA) information, which is needed to complete the annual progress report on compliance with E.O. 13148, "Greening the Government Through Leadership in Environmental Management" (See Environmental Non-Radiological Program Information and Compliance Summary sections); and (2) site environmental performance measures information.

DOE Field elements are encouraged to report on their environmental performance indicators and/or performance measures programs and initiatives at their site, including the measures used, and the results of those measures. These descriptions should be summarized in the Executive Summary and detailed in the Environmental Program Information chapter of the ASER.

Finally, to allow for public involvement and feedback in the ASER preparation process, sites are encouraged to attach/insert a questionnaire or reader comment form to the ASER which solicits public input on the current and future ASERs. This form should be placed inside the front cover of the ASER for maximum visibility and easy public access.

Suggested Format For Annual Site Environmental Reports

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

Attachment I

- o Executive Summary,
- o Introduction,
- o Compliance Summary,
- o Environmental Program Information,
- o Environmental Radiological Program Information,
- o Environmental Non-Radiological Program Information,
- o Site Hydrology, Groundwater Monitoring and Public Drinking Water Protection, and
- o Quality Assurance.

ASERs should also include, as appropriate, a glossary of definitions and lists of acronyms, abbreviations, symbols, units of measure, and references. Sites may modify this format as long as the applicable requirements of DOE Order 231.1 and Order DOE 5400.5 are met.

EXECUTIVE SUMMARY

The Executive Summary should highlight (1) the purpose of the ASER, (2) major site programs*, (3) other key initiatives, including environmental performance indicators and/or performance measures programs, and (4) a brief description of the site's environmental management system (EMS) and its implementation status within the framework of DOE's Integrated Safety Management System (ISMS), as appropriate. This section should include a summary of radiological releases and doses to the public resulting from site operations as well as non-radiological releases. The dose to the maximally exposed individual (MEI) as well as the estimated natural background radiation dose at the site should be mentioned here. If no radionuclides were released from the site, an affirmative/declarative statement should be made here. The Executive Summary should not simply repeat information found in the main body of the report, and should be written in a manner understandable to the general public. This section should be concise, balanced and targeted at an audience who may not read the entire report.

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

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.

COMPLIANCE SUMMARY

The Compliance Summary should be a separate chapter in the ASER. This chapter should summarize the site's CY 2002 compliance status for the following: (1) major environmental statutes and regulations; (2) environmental Executive Orders; (3) DOE internal environmental and radiation protection Orders, including Order 5400.1, "General Environmental Protection Program," Order DOE 5400.5, "Radiation Protection of the Public and Environment," DOE Order 231.1, "Environment, Safety and Health Reporting," and DOE Order 435.1, "Radioactive Waste Management;" (4) the Atomic Energy Act of 1954 (42 USC 2011 et seq.); (5) compliance and/or cleanup agreements (both in place and currently under negotiation); (6) environmental violations cited by regulators (including any fines and penalties assessed); (7) Notices of Violation, Notices of Deficiency, Notices of Intent to Sue, and other types of enforcement actions issued to the site (as defined in DOE O 232.1, "Occurrence Reporting and Processing of Operations Information"); (8) any reportable occurrences that require notification to an outside regulatory agency; (9) any major issues, instances of noncompliance and corrective actions; (10) the status and results of any ongoing self-assessments and/or environmental audits; and (11) existing permits. These items are discussed in detail below.

To support DOE-wide environment, safety and health performance indicators 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 scheduled for completion in CY 2002 pursuant to these agreements. Additionally, the Compliance Summary should contain a summary table or brief narrative of applicable permits at the site.

When possible, quantitative information should be provided. For example, if underground storage tanks (USTs) have been removed from the facility, state the number of tanks that have been removed and the number of tanks that still remain on the site.

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 and Non-Radiological Program Information sections. Additionally, references should be made to other sections of the ASER, as appropriate, to minimize redundancy.

COMPLIANCE STATUS

The compliance status with respect to applicable major environmental statutes, DOE Orders, and Executive Orders should be discussed, including, but not limited to:

Environmental Restoration and Waste Management

- o Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- o Superfund Amendments and Reauthorization Act (SARA);
- o Resource Conservation and Recovery Act (RCRA);
- o Federal Facilities Compliance Act (FFC Act);
- o National Environmental Policy Act (NEPA);
- o Toxic Substances Control Act (TSCA);
- o Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Radiation Protection

- o Order DOE 5400.5, "Radiation Protection of the Public and the Environment;"
- o DOE Order 435.1, "Radioactive Waste Management;"

This section should briefly summarize the site's progress in achieving compliance with DOE Order 435.1, and if applicable, its predecessor Order DOE 5820.2A. At a minimum, information on the wastes that are managed at the site (e.g., high level, low level, transuranic, etc.) and what type of waste management the site is performing (e.g., generation, treatment, storage, disposal, etc.) should be included. For those sites that are authorized to manage a low level waste facility, there should be a table or a listing of the status of each phase of the low level waste management process (e.g., performance assessment, composite analysis (PA/CA), closure plan, PA/CA maintenance program, disposal authorization statement, etc.) and a narrative description of the site's low level waste management program. Discussion of radioactive waste management activities can be included in the Environmental Radiological Program Information section.

- o Atomic Energy Act of 1954 (42 USC 2011 et seq.).

Air Quality and Protection

o Clean Air Act (CAA);

This section should include a discussion of the compliance status of the site's air emissions, including criteria pollutants and hazardous air pollutants. This section should generally summarize air permit exceedances, notices of violation (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 2002 pertaining to CAA compliance should be specifically discussed. An identification of a site's major sources of air pollutants that meet CAA major source definitions should be included here, as well. Additional guidance for reporting of ozone depleting substances (ODS) is provided in the Environmental Program Information section of this guidance (Attachment I, p.13).

o National Emission Standards for Hazardous Air Pollutants (NESHAPs);

The 2002 ASERs should describe the efforts to comply with the monitoring procedure requirements for the NESHAPs. For example, NESHAPs compliance agreement negotiations and other discussions with regulatory agencies, or applications for waivers should be noted. If sites are exempted from any NESHAPs requirements, the reasons for the exemptions should be stated.

Detailed reporting and discussion of the site's radiological emissions and resulting doses should be included in the Environmental Radiological Program Information section of the ASER (refer to Attachment I, p.13 and Attachment II). Issues concerning the site's compliance status with radionuclide NESHAPs and NESHAPs specific radionuclide monitoring, should be discussed in this section.

Information on NESHAPs compliance is also reported in the "Air Emissions Annual Reports" required by the EPA. Guidance for these reports, titled "Guidance for Preparation of 1990 Air Emissions Annual Report Under Subpart H, 40 CFR 61.94," was initially issued by the Office of Environmental Guidance, EH-23 (now EH-41) on January 15, 1991. The information provided in the 2002 ASERs should be consistent with the information reported in the 2002 Air Emissions Annual Report to demonstrate compliance with the NESHAPs requirements for 2002. Any significant differences between ASER and NESHAPs air emissions and doses should be clearly explained.

Water Quality and Protection

o Clean Water Act (CWA);

Sites are encouraged to report National Pollutant Discharge Elimination System (NPDES) and State Pollutant Discharge Elimination System (SPDES) data in the tabular form below identifying the permit type, number of regulated* 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 2002 NPDES/SPDES permit exceedances or non-compliances should be provided in the following format.

NPDES/SPDES NON-COMPLIANCES*

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

* Note: Radionuclides regulated under the Atomic Energy Act (AEA) are not subject to Clean Water Act (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 if there is a formal agreement in place that establishes the basis for their use.

Using this tabular format will allow the information to be easily identified and collected from the ASERs in a consistent manner, rather than having to make separate data requests annually to Field elements for site compliance history and the development and compilation of DOE-wide performance measures initiatives.

o Safe Drinking Water Act (SDWA).

Other Environmental Statutes

o Endangered Species Act (ESA);

o National Historic Preservation Act (NHPA);

- o Migratory Bird Treaty Act.

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.

Executive Orders

- o E.O. 13148, "Greening the Government Through Leadership in Environmental Management;"

E.O. 13148 supersedes E.O. 12856 "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements." However, E.O. 13148 maintains requirements for SARA Title III, Emergency Reporting and Community Right-to-Know Act (EPCRA) compliance and Toxic Release Inventory (TRI) reductions. The ASER should include summary information on the site-specific chemical inventory and toxic release inventory and should reference the site's submission to the EPA.

E.O. 13148 requires all Federal facilities to comply with EPCRA provisions (see below). Those EPCRA reporting requirements that were completed, or will be completed by your facility for CY 2002 should be indicated and discussed. If your site reported under the provision, indicate "yes." If your site should have reported under the provision, but did not, indicate "no." If your site was not required to report under a provision (e.g., did not meet the threshold, did not have an extremely hazardous substance (EHS) release, etc.), indicate "not required." A short table is provided below to assist you in presenting this information:

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 Release Notification*	
EPCRA Sec. 311-312	MSDS/Chemical Inventory**	
EPCRA Sec. 313	TRI Reporting	

* Extremely Hazardous Substance

** Material Safety Data Sheet

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

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Under DOE Notice 450.4, "Assignment of Responsibilities for Executive Order 13148" (February 5, 2001), and DOE Notice 450.9 (extension until March 1, 2003), the following additional information should be reported in ASERs. This information may be descriptive, rather than quantitative, and may be reported every few years, as appropriate, rather than annually, as the activities may occur infrequently. This information is also required under new DOE Order 450.1, "Environmental Protection Program" (January 15, 2003), and will also be included in annual reports to EPA detailing DOE's progress in implementing the requirements of E.O. 13148. The following information should be included:

- (1) The use of pollution prevention activities to achieve and maintain environmental compliance.
 - (2) The results of site environmental compliance and/or EMS audits.
 - (3) The progress in using environmentally beneficial landscaping practices, e.g., practices used after the recent wildfires at Los Alamos and Hanford; practices used after decontamination/decommissioning (D&D) activities at a site.
 - (4) A summary of site's progress in meeting the "DOE Secretarial Pollution Prevention and Energy Efficiency Goals" (November 1999) and progress of site's efforts to phase out use of Ozone Depleting Substances (ODS). Data to be reported includes reductions in hazardous waste, low-level radioactive waste, mixed waste, and transuranic waste. Accomplishment Reports are available on P2 projects that saved money and/or reduced waste. All of this data can be aggregated by site or CSO. The CY 2002 data are already available for downloading at EH's Pollution Prevention website at www.eh.doe/p2/. These data are also included in the Department's corporate annual progress report on E.O. 13148 provided to the Council on Environmental Quality (CEQ) in March 2003.
- o E.O. 13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition." A summary of your site's recycling and affirmative procurement activities should be included here. Again, the data for 2002 are already available on EH's Pollution Prevention website at www.eh.doe/p2/. These data are also included in the Department's corporate annual progress report on E.O. 13101 provided to CEQ in March, 2003.

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- E.O. 11988, "Floodplain Management;"
- E.O. 11990, "Protection of Wetlands."

Any other major statutes or Executive Orders 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," with a short explanation as to why it is not applicable.

OTHER MAJOR ENVIRONMENTAL ISSUES AND ACTIONS

This section should identify other significant issues and accomplishments for CY 2002. For example, issues such as lawsuits, alleged violations, environmental occurrences, non-routine releases and unresolved compliance issues not previously presented should be addressed.

Summaries of DOE environmental audits, progress 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.

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 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 sections should be reported separately in this section.

UNPLANNED RELEASES

Summary information on significant, non-routine releases of pollutants or hazardous substances, including causes and corrective actions taken to prevent their recurrence, should be discussed here, especially as it pertains to facility operations, waste handling programs, and emergency response programs. The 2002 ASERs should discuss unplanned radiological and non-radiological releases in effluent, such as spills and leaks, whether on-site or off-site. This

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discussion should include releases reported as unusual or off-normal occurrences under DOE Order 232.1.

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 (see page 18), this section of the ASER should also clearly state the bases for any scientific judgments regarding the magnitude of potential impacts of releases, in terms that the non-technical reader can easily understand.

A table or discussion should also be provided 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 off-site effects occurred" or "doses were small" should be avoided. If such statements are necessary, release information should be compared to known values, e.g., small relative to applicable dose limits or to doses received from natural background at the site (include the numerical value for this dose). 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.

SUMMARY OF PERMITS

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

ENVIRONMENTAL PROGRAM INFORMATION

In addition to meeting the requirements in DOE Order 231.1, this section should briefly describe the major environmental programs ongoing at the site. A description of the environmental management system (EMS) implemented at the site should be discussed here. This discussion should include key EMS elements such as: the site's environmental policy, environmental planning and analysis procedures, environmental objectives and targets, implementation and operational controls, identification of environmental aspects and impacts, performance measures, corrective action and self-assessment procedures, and the management review process. Sites should also discuss how their EMS is an integral part of their site Integrated Safety Management System (ISMS) established pursuant to DOE P 450.4, "Safety Management System Policy."

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Other significant environmental protection programs such as site meteorology, monitoring and surveillance, environmental restoration and waste management, and effluent monitoring should be described here, as well. This section should also summarize the monitoring and surveillance data in the Environmental Radiological and Non-radiological Program sections of the ASER.

Additionally, pertinent information may be presented on other significant environmental activities at the site which are not adequately covered in other sections. This may include, but is not limited to, facility environmental performance measures and/or performance indicators programs, environmental training programs, and pollution prevention/waste minimization activities.

Site pollution prevention and waste minimization highlights or significant accomplishments should be mentioned here, including Return-On-Investment (ROI) programs that have been instrumental in advancing progress in meeting the Department's (Secretarial) Pollution Prevention and Energy Efficiency Goals (November 1999). A summary of waste reduction and recycling goals that were met or exceeded in the calendar year should be indicated here, as well.

For example, a site avoided the generation of "X" pounds of waste which resulted in a savings of "Y" dollars in treatment and disposal costs.

Progress on meeting E.O. 13148 requirements to achieve ODS reductions at sites should also be discussed. This discussion may include how sites are maximizing the purchase and use of safe, cost effective and environmentally preferable alternatives to ODS, an evaluation of the present and future uses of ODS at the site, and any exemplary practices developed and used at a site. A description of a site's plan to phase out the procurement of Class I ODS* for all non-excepted uses by December 31, 2010, should be briefly discussed here, as well. In addition, a short description of a site's coordination efforts with the Department of Defense prior to off-site disposal or transfer of material containing ODS could be included here, if applicable to your site.

Sites should also highlight and discuss any DOE or other Federal Agency Pollution Prevention recognition awards received in CY 2002 (e.g., the President's Closing the Circle Award).

A discussion of a site's initiatives pursuant to the Clean Water Action Plan, including efforts to improve water quality through collaborative approaches to watershed management with States, Tribes, local governments, industry, other Federal Agencies and interested stakeholders, should be included in this section, as appropriate.

* Class I ODS are those chemicals listed in Appendix A to subpart A of 40 *CFR* Part 82 that cause or contribute significantly to harmful effects of the stratospheric ozone layer. Section 602 of the Clean Air Act directs EPA to add to the Class I list any chemical that EPA determines has an ozone depletion potential of 0.2 or greater.

Special environmental studies conducted, or in progress, at a particular site should also be discussed here. Redundancy with information presented in the Compliance Summary and other sections of the ASER should be avoided.

ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

This section describes radiological monitoring information and should address details on the models and assumptions used in performing the dose calculations, and any new monitoring data as appropriate. EH-41 will use this information in efforts to make the calculations consistent from facility to facility so that the data can be aggregated in DOE Annual Radiological Summary Reports.

RADIOLOGICAL EMISSIONS AND DOSES

The following data should be presented in tabular form:

- o Maximum Individual Dose (maximum effective dose equivalent as defined in Order DOE 5400.5) in units of millirem (mrem) and millisievert (mSv)¹, and Collective Population Dose (effective dose equivalent) in units of person-rem (person-Sv)² and Total Population within 80 kilometers (km)³.
- o A comparison of the maximum individual dose with DOE, EPA or other standards, and with the natural background at the site.
- o Radionuclides released to the air during the year in units of curies (Ci) and becquerels (Bq),

⁽¹⁾ Per Order DOE 5400.5, radiation doses should be expressed in units of mrem followed by the Standard International (SI) unit (mSv) in parentheses. The same is true for person-rem (person-Sv) and Ci (Bq).

⁽²⁾ Estimates of collective dose for DOE facilities are required by Order DOE 5400.5. DOE has no de minimis level for these calculations.

⁽³⁾ In certain instances, populations outside of the region of the 80 km radius may be affected by releases to that region. For example, in a predominantly agricultural area, more foodstuffs may be grown than 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 dose should be estimated and reported. Similarly, if a major drinking water system is located beyond the 80 km distance, but the input for that system receives the majority of liquid discharging from this site, it should be evaluated. In some situations, collective dose estimates address a specific group other than the 80km populations. In such situations, the populations used to support the calculations should be described.

Attachment I

and radionuclides released to the water in units of Ci (Bq)⁴. 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, and environmental measurements of air, surface water, soil, and foodstuff should be reported in terms of the units established by Order DOE 5400.1, Attachment II-1, Section 8d.

Doses should be calculated following the requirements in Order DOE 5400.5 and comparisons should be made to standards in effect during 2002⁵. Where appropriate, the ASER should state that, because the doses are calculated rather than measured, they represent potential or estimated rather than actual doses.⁶ Additionally, 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 the data.

Attachment II provides a suggested format for radiological dose and release reporting. This reporting should depict an accurate portrayal of all 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 II. 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 suggested in Tables 2 and 3 of Attachment II is to simplify the preparation of composite summary reports. They are not intended to replace site-specific-based presentations of data. A site-specific example from the 2001 West Valley Demonstration Project ASER is provided in **Attachment V**.

For compliance with the radiological emission standards in 40 CFR Part 61 (NESHAPs), promulgated December 15, 1989, the ASERs should report doses in terms of effective dose equivalent, calculated using the AIRDOS/CAP-88 air dispersion model, and compared to the 10 mrem per year air emission standard for DOE under Subpart H. Compliance with DOE public dose limits is also evaluated in terms of effective dose equivalent. 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 AIRDOS/CAP-88 to calculate potential dose, that information should be

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- (4) Uranium releases should be reported in terms of both Ci (Bq) and grams.
 - (5) In particular, the total dose in terms of the dose from external exposures plus the 50-year committed effective doses from intakes of radioactive material should be calculated and reported.
 - (6) To demonstrate compliance with standards when the 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 or magnitude of conservatism.

included and distinguished from the NESHAPS compliance dose.

The dose to the maximally exposed individual (MEI) should be a conservative, but realistic, estimate based on a scenario that approximates an actual situation. The estimate should be reasonable but not likely to underestimate the MEI dose. Calculation of the dose to a person spending 100% of his time at the fence line is useful for comparison purposes, but it overestimates the dose to the most exposed individual and biases comparative analyses. The 2002 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 cases in which monitoring data are below minimum detectable levels, those minimum detectable levels should be specified and, as noted in the "Environmental Radiological Monitoring" section of this guidance, should be reported consistent with DOE/EH 173-T guidance regarding the use of "less than" values.

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 effective dose equivalent 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 AIRDOS-EPA/RADRISK." 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 water borne pathway and the air borne pathway is to different individuals, the report should briefly explain why these doses are not additive.

Order DOE 5400.5 requires estimated reporting of collective doses to the public around DOE sites as well as radiation doses to MEIs. 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 should be an integration of estimates of average or representative doses to the public, not maximum potential doses.

RELEASE OF PROPERTY CONTAINING RESIDUAL RADIOACTIVE MATERIAL

DOE's radiation protection framework and dose limits are centered around an "all sources and all pathways" philosophy. In addition to air and water discharges to the environment, the release of property (real or personal) containing residual radioactive material is another type of "release" to the environment and is a potential contributor to the dose received by the public. Site-specific authorized limits are used to govern the releases of sites, structures, and materials. As such, authorized limits for releases of property should be reported. It may be desirable to discuss real property and personal property separately.

The information regarding authorized releases 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 each site's ASER. However, the ASER should contain a summary of authorized limits for the site, including (a) the approved authorized limit used for releases, the rationale for its derivation, (e.g., dose/As Low As Reasonably Achievable (ALARA)-based or DOE approved surface activity guidelines) and its date of approval or effective date; and (b) the type of material or property (e.g., open land, structures, material and equipment, or laboratory waste), the basis for its release, and its expected end-use scenario (e.g., disposal; recycle; reuse). If the release of property is for recycle or reuse purposes, any discussion of these activities in this section may be referenced in the pollution prevention/waste minimization section, as well. With regard to personal property release 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 released under the authorized limits or subject to the authorized limits. Where practical, information should be provided on (a) the volume, radionuclide concentrations, and total activity of the material; (b) the maximum dose to an individual, and collective dose estimates; and (c) the estimated cost savings and other benefits received from the release or a qualitative discussion of the benefits of the release program. The ASER should include a brief discussion on any actions taken to implement the improvements to monitoring, documenting and coordinating releases recommended in the memorandum. The ASER should also include the locations or methods by which interested parties could obtain more detailed data on releases (e.g., reading rooms, records centers or other locations where certification and release data are publicly available).

Requirements for the selection and approval of authorized limits are contained in Order DOE 5400.5. Guidance on the development and approval of authorized limits is provided in several supporting DOE guidance documents which are available on line at <http://www.eh.doe.gov/oepa/>.

ADDRESSING PROTECTION OF BIOTA IN ASERS

Dose Limits for Protection of Biota and Methods for Demonstrating Compliance

Since 1990, Order DOE 5400.5 has required that populations of aquatic organisms be protected at a dose limit of 1 rad/day. While there are no formal DOE dose limits for terrestrial biota, it is strongly recommended that ASERs demonstrate that DOE site activities are also meeting the internationally-recommended dose limits for terrestrial biota. The recently approved and final DOE Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (DOE-STD-1153-2002; July 2002)" and supporting software (the RAD-BCG Calculator, Release 2) are available for use in the evaluation and reporting of compliance with both aquatic and terrestrial biota dose limits. The Technical Standard and RAD-BCG Calculator can be downloaded from the Department's Biota Dose Assessment Committee web site at <http://homer.ornl.gov/oepa/public/bdac/>.

Addressing protection of biota in ASERs was first emphasized in ASER guidance for CY1999, which resulted in the inclusion of biota dose information in 10 percent of CY1999 ASERs received by EH-41. An interim version of the DOE Technical Standard on biota dose evaluation was made available for DOE field and program use in July 2000. The availability and application of this standardized evaluation methodology contributed to an increase of biota dose evaluation reporting in ASERs to approximately 50% for CY2000, and 50% for CY2001 reports received to date by EH-41.

DOE programs and sites not yet meeting requirements for radiological protection of the environment and biota should do so, given DOE's requirements and emerging stakeholder, national, and international attention on this topic. These points were emphasized at the October 2002 ASER and Environmental Monitoring Workshop at the Savannah River Site in presentations by EH-41 and by DOE sites that are already conducting biota dose evaluations. The recently approved and final version of the DOE Technical Standard (DOE-STD-1153-2002) provides practical screening and analysis methods and guidance for DOE programs and sites to use in demonstrating radiological protection of biota. Evaluation of doses to biota is a good business practice for DOE, and sites can benefit from communicating DOE's initiatives and leadership in this area. As such, EH-41 recommends inclusion of this information in all ASERs for CY2002. Refer to **Attachment III** and **Attachment V** for specific details and site-specific examples for demonstrating and reporting compliance with dose limits for biota in your ASER.

UNPLANNED RADIOLOGICAL RELEASES

Doses associated with unplanned releases should be reported. If the doses associated with unplanned 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.

ENVIRONMENTAL RADIOLOGICAL MONITORING

In the 2002 ASERs, facilities are requested to provide information on the models and assumptions used in reporting these data so that the data may 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 § 7.3.4 of DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance," January 1991, page 7-5, regarding the use of "less than" values in reports and averages.

ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

This section discusses the inclusion and display of non-radiological monitoring information in ASERs. When reporting non-radiological monitoring data, detection limits should be specified, where appropriate.

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. Examples of the types of information that should be included and discussed in the 2002 ASERs, if the data are available, are described below.

Graphical displays of non-radioactive emissions in addition to air and water discharges 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 be included.

The Federal and State regulatory limits applicable to the site's 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.

SITE HYDROLOGY, GROUNDWATER MONITORING AND PUBLIC DRINKING WATER PROTECTION

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 be provided here as well. 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 5-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 2002 ASERs should characterize groundwater monitoring results for CY 2002 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.

A summary description of the site's groundwater monitoring network should also be provided. This summary should state the various monitoring objectives (e.g., RCRA hazardous waste management unit detection monitoring, environmental surveillance monitoring, or DOE Order 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. They should address the number of wells installed or abandoned during the current year, and any unique or innovative techniques employed in the site's groundwater monitoring network. A suggested tabular format which provides summary information on a site's groundwater monitoring network is included as Example Table 1 in **Attachment IV**. A site-specific example from the 2001 Hanford ASER is also provided as **Attachment VI**.

Aerial photographs and/or maps of the reporting facility are extremely useful in depicting monitoring points. These should be included, if available, consistent with site security requirements. In particular, maps that show the migration of groundwater contaminant plumes over time should be included, if possible. These maps should indicate the locations of the plumes with respect to site boundaries, lakes, rivers, aquifers, monitoring wells, drinking water wells, etc. Fold-out maps may be included.

QUALITY ASSURANCE

The ASERs should describe the measures taken to ensure the quality of both radiological and non-radiological monitoring data as required in DOE 5400.1, Attachment II-1, Section 11. As stated in the Order, the overall program, including sampling, analysis, and data management, should be described for both radioactive and nonradioactive effluent and environmental monitoring. This discussion should generally validate the site's data collection and analysis programs and present summary information from participation in interlaboratory cross-check programs, listing site results and expected results. The general implications of the results of interlaboratory comparisons should be discussed along with any actions taken or needed to improve data quality. For example, if sites have been, or are considering, implementing the Interim Final "Uniform Federal Policy for Implementing Environmental Quality Systems," (November 2000), and the associated Draft "Uniform Federal Policy for Quality Assurance Project Plans," (June 2001), these plans or efforts should be discussed.

Suggested Formats for Radiological Dose and Release Reporting in ASERs

The tables below are examples of formats used by EH-41 in summarizing ASER radiological dose and release data. Use of these formats by DOE sites for reporting doses, atmospheric releases and liquid effluent releases is highly recommended. If DOE Field Offices or sites can prepare the data in these, or similar formats, it would simplify aggregation of data across DOE. EH-41 will use this information to compile DOE Annual Radiological Summary Reports. However, the formats in Example Tables 2 and 3 are provided to assist in the compilation of the DOE Annual Summary Reports for DOE-wide comparison. They 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. A site-specific example from the 2001 West Valley Demonstration Project (WVDP) ASER is provided in **Attachment V**.

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 the public and also facilitate the preparation of the DOE Annual Radiological Summary Reports.

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.

Please contact Ross Natoli (EH-412; 202-586-1336; Ross.Natoli@eh.doe.gov) for additional information or guidance.

Example Table 1: Site X Radiological Dose Reporting Table for Calendar Year 2002

Pathway	Dose to Maximally Exposed Individual		% of DOE 100 mrem/yr Limit	Estimated Population Dose		Population within 80 km*	Estimated Background Radiation Population Dose (person-rem)
	(mrem)	(mSv)		(person-rem)	(person-Sv)		
Air				Average dose X population exposed		*	Pathway specific Background doses need not be estimated
Water						*	
Other Pathways						*	
All Pathways	{Note: This should be the total dose to 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 only be specified if they are significantly different from the total population.

Example Table 2: Site X Radiological Atmospheric Releases for Calendar Year 2002 (in Curies)**

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 2002 (in Curies)**

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, and if used, should be presented along with more detailed site-specific based tables. They should not replace more informative site-specific reporting formats.

Addressing Protection of Biota in ASERs

Guidance for Demonstrating and Reporting Compliance with Dose Limits for Biota

Dose Limits for Protection of Biota

Since 1990, Order DOE 5400.5, "Radiation Protection of the Public and the Environment," has required that populations of aquatic organisms be protected using a dose limit of 1 rad/day. While there are no formal DOE dose limits for terrestrial biota (e.g., as proposed in 10 CFR Part 834 but not currently in the DOE Orders), it is strongly recommended that ASERs demonstrate that DOE site activities are also meeting the internationally-recommended dose limits for terrestrial biota.

DOE activities should demonstrate and document in the ASER, as appropriate to each site, that:

- the absorbed dose to aquatic animals will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material;
- the absorbed dose to terrestrial plants will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material; and
- the absorbed dose to terrestrial animals will not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive material.

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

A Graded Approach for Demonstration of Protection

The recently approved final DOE Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (DOE-STD-1153-2002)," 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 Technical Standard was developed by DOE through the Department's Biota Dose Assessment Committee (BDAC).

The graded approach consists of a three-step process which 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 radionuclide concentrations in environmental media are compared with the Biota Concentration Guides (BCGs). Each radionuclide-specific BCG represents the limiting radionuclide concentration in environmental media which 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 screen, using site-representative parameters instead of default parameters; a site-specific analysis, employing a kinetic modeling tool; and, where necessary, an

actual site-specific biota dose assessment within an ecological risk assessment framework, involving problem formulation, analysis, and use of risk characterization protocol consistent with the eco-risk process recommended by EPA. This three-phased scheme helps to ensure that the evaluation effort is commensurate with the likelihood and severity of potential environmental impacts. It is expected that the majority of sites will be able to demonstrate compliance with biota dose limits using the generic screening phase of the methodology.

As a companion tool to the Technical Standard, a set of electronic spreadsheets (the RAD-BCG Calculator, Release 2) is also provided. These tools are both downloadable from the BDAC web site at <http://homer.ornl.gov/oeopa/public/bdac/>. BDAC members are also available to provide technical assistance in the application of the DOE Technical Standard, or for consultation in conducting site-specific biota dose assessments where needed.

Although other biota dose assessment methods are available, the DOE Technical Standard is the preferred tool for estimating and evaluating biota doses, 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.

Specific Guidance and Sample Reporting Format for ASERs

Compliance with biota dose limits should be reported in the "Environmental Surveillance" section of the ASER under "Aquatic and Terrestrial Wildlife", or comparable section. EH-41's recommended approach is to prepare a summary section of text and to incorporate a supporting summary table for the evaluations conducted. The guidance highlighted below is intended to be illustrative, rather than prescriptive.

These recommended elements should be addressed in a way that best fits the format and style of each site's ASER: (a) reference the biota dose limits being met (e.g., 1 rad/day per Order DOE 5400.5); (b) identify the method used to demonstrate compliance with these limits, and briefly describe the process used (e.g., screening methods using DOE Technical Standard DOE-STD-1153-2002, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" or other site-selected method); (c) describe the site areas evaluated and supporting data used in the evaluation (e.g., sources of exposure to biota for the site area evaluated, specific organism types or receptors used, media type and radionuclide concentration data used); (d) summarize the results (e.g., concentrations of radionuclides in environmental media < screening values, doses calculated < biota dose limits) and (e) provide a conclusion (e.g., populations of biota are protected at recommended dose limits; or no impacts from ionizing radiation to populations of biota).

Additionally, the following areas could be highlighted as appropriate and beneficial: (a) any significant site outreach efforts or initiatives with stakeholders and local regulators; (b) integration of biota dose evaluation within your environmental surveillance program; and (c) site recognition of biota protection as a good business practice and as an important element of environmental stewardship. Refer to Module 1, Section 8, "Documenting Your Biota Dose Evaluation Results," in DOE Technical Standard DOE-STD-1153-2002 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 West Valley Demonstration Project's (WVDP) biota dose evaluation summary, as presented in its CY2001 ASER, is provided in **Attachment V** as a noteworthy example of how to present and summarize this information in your ASER.

Please contact Stephen Domotor (EH-412; 202-586-0871; Stephen.Domotor@eh.doe.gov) for additional information or guidance.

Suggested Reporting Format for DOE Site -Wide Groundwater Monitoring Program

Summary of DOE Site-Wide Groundwater Monitoring Program

The summary table below should be used 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 only includes monitoring wells. It does not include injection wells, production wells, extraction wells (e.g., for remediation), piezometers, drainage wells, etc., unless a sample is withdrawn for chemical, physical, radiological, etc., analysis.

This 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 (RCRA hazardous waste, DOE low-level radioactive waste, other RCRA waste, CERCLA remediation waste, etc.) 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;
4. Other – wells sampled for any other purpose.

It accounts for numbers of samples taken during the calendar year at wells included in each of the four categories (e.g., wells used for restoration, waste management) It also accounts for analyses performed during the calendar year for all samples taken at each group of wells, corresponding to the same four categories. The summary table includes the percentage of all analyses performed where the results are below the levels of detection. The final section of the summary table includes information on the ranges of concentrations for the most commonly detected contaminants. A site-specific example from the 2001 Hanford ASER is also provided as **Attachment VI**.

Please contact James Bachmaier (EH-412; 202-586-0341; James.Bachmaier@eh.doe.gov) for additional information or guidance.

Example Table 1:

SUMMARY OF CY 2002 DOE SITE -WIDE GROUNDWATER MONITORING PROGRAM

	PURPOSES FOR WHICH MONITORING WAS PERFORMED			
	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of Active Wells Monitored				
Number of Samples Taken				
Number of Analyses Performed				
% of Analyses that are Non-Detects				
<u>Ranges of Results for Positive Detections</u>				
Tritium				
TCE				
Heavy Metals				
VOCs				
Other Contaminants (list separately)				

Attachment V

West Valley ASER

Biota Dose and Radiological Dose and Release Reporting Examples

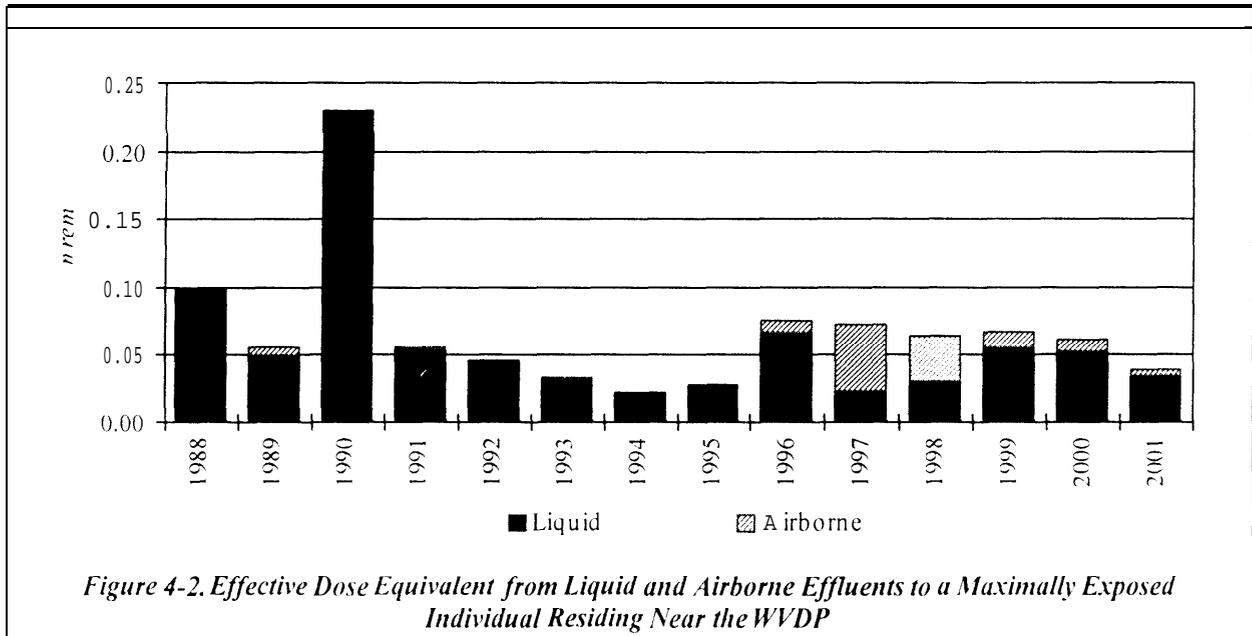


Figure 3-3 (p. 4-14) shows the collective dose to the population over the last fourteen years. (See Fig. A- 14 [p. A- 163 for a map of the population sectors.) A five-year upward trend, primarily from an increase in vitrification activities, reversed in 1998 and then in 1999 through 2001 continued down towards previtrification levels.

As with the individual dose, a slight downward trend in collective dose from treated liquid effluents, directly linked to a noticeable decrease in the volume of water treated, was noted in 2001.

The overall radioactivity represented by these data confirm the continued inconsequential addition to the natural background radiation dose that the individuals and population around the WVDP receive from Project activities.

Risk Assessment

Estimates of cancer risk from ionizing radiation have been presented by the National Council on Radiation Protection and Measurements (1987b)

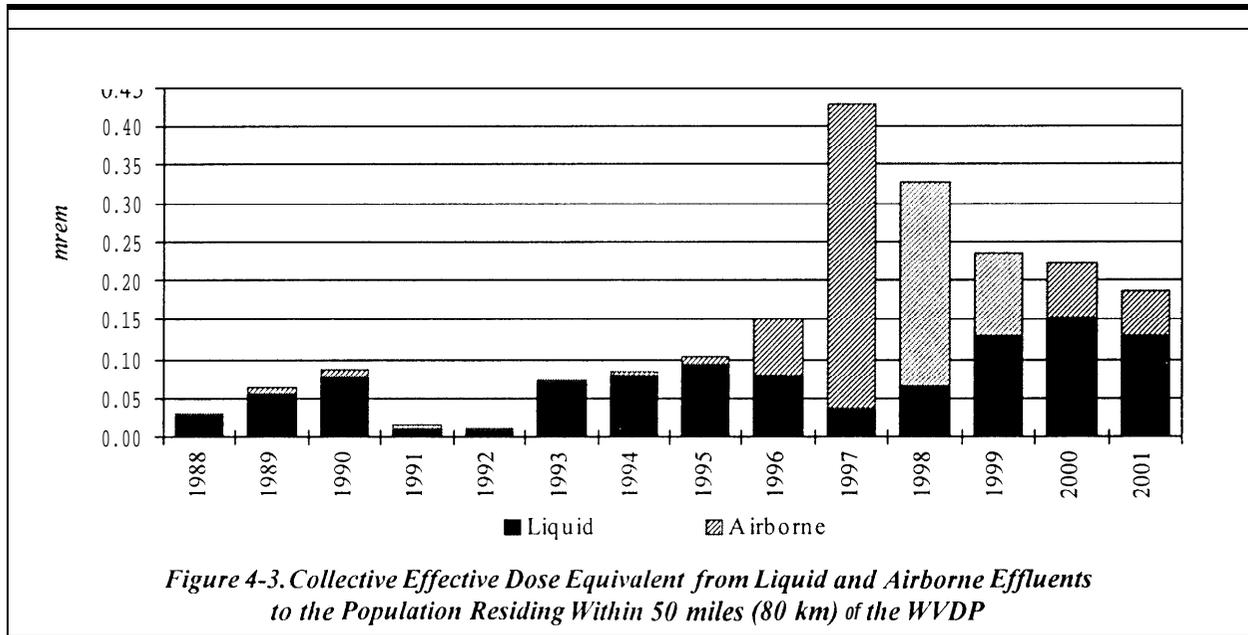
and the National Research Council's Committee on Biological Effects of Ionizing Radiation (1990).

These reports estimate that the probability of fatal cancer induction to the public, averaged over all ages, ranges from 0.0001 to 0.0005 cancer fatalities/rem. The most recent risk coefficient of 0.0005 (International Commission on Radiological Protection 1991) was used to estimate risk to a maximally exposed off-site individual. The resulting estimated risk to this hypothetical individual from airborne and waterborne releases was a 0.00000020 probability of a cancer fatality (1 chance in 50 million). This risk is well below the range of 0.00001 to 0.0001 per year considered by the International Commission on Radiological Protection in Report 26 (1977) to be a reasonable level of risk for any individual member of the public.

Dose to Biota: Aquatic and Terrestrial Wildlife

Radionuclides from both natural and man-made sources may be found in environmental media such

Chapter 4. Radiological Dose Assessment



as water, sediments, and soils. In the past, it has been assumed that if radiological controls are sufficient to protect humans, other living things are also likely to be sufficiently protected. This assumption is no longer considered adequate, since populations of plants and animals residing in or near these media or taking food or water from these media may be exposed to a greater extent than are humans. For this reason, the DOE has prepared a technical standard which provides methods and guidance to be used to evaluate doses of ionizing radiation to populations of aquatic animals, terrestrial plants, and terrestrial animals.

Methods in this draft technical standard, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (ENVR-0011, DOE, June 2000), were used in 2001 to evaluate radiation doses to aquatic and terrestrial biota within the confines of the Western New York Nuclear Service Center (WNYNSC), which includes the WVDP. Doses were assessed for compliance with the limit in DOE Order 5400.5 for aquatic animals (1 rad per day) and for compliance with the thresholds for terrestrial plants (also

1 rad per day) and for terrestrial animals (0.1 rad per day), as proposed in ENVR-00 11. Note that the absorbed dose unit (rad) is used for biota instead of the units used for indicating human risk (rem).

RAD-BCG, a calculation tool provided by the DOE for implementing ENVR-00 11, was used to compare existing radionuclide concentration data from environmental sampling with biota concentration guide (BCG) limits. Data collected from surface waters, sediments, and soils on and around the WNYNSC over a ten-year period (1991 - 2000) were used in a baseline evaluation. For a more near-term assessment, a second evaluation was completed using surface water data from 2001 and sediment data from 1997 - 2001. (See Appendices A and B for maps and descriptions of monitoring and surveillance locations. Radionuclides analyzed for each medium at each location are listed in Appendix B. See Appendix C for a listing of results from these locations in 2001.)

Concentration data for radionuclides in each medium were entered to the calculation tool. The value for

each radionuclide was automatically divided by the BCG in order to calculate a partial fraction for each nuclide for each medium. Partial fractions for each medium were added to produce a sum of fractions.

It was found that the isotopes with the highest sums of fractions – the radionuclides that contributed the largest component of both aquatic and terrestrial dose to biota – were strontium-90 and cesium-137. Per guidance in ENVR-00 11, the populations of organisms most sensitive to strontium-90 and cesium-137 in this evaluation – that is, those populations residing on the WNYNSC that were most likely to be adversely affected via the aquatic and terrestrial pathways – were determined to be populations of the raccoon (aquatic dose) and the deer mouse (terrestrial dose). As such, this study does not pertain to pathways to humans, which are addressed elsewhere in this chapter. (See Dose Assessment Methodology [p. 4-3].)

The aquatic dose limit from DOE 5400.5 may be assumed to have been met if the sum of fractions for the water medium plus that for the sediment medium is less than 1.0. Similarly, proposed dose limits for both terrestrial plants and animals may be assumed to have been met if the sum of fractions for the water medium plus that for the soil medium is less than 1.0.

In accordance with the approach described in ENVR-00 11, a general screening was first conducted using the maximum radionuclide concentrations from surface waters, sediments, and soils. Maximum radionuclide concentrations from the 10-year sampling database exceeded applicable general screening BCG limits for both aquatic and terrestrial evaluations, as did the concentrations from the 2001 surface water data and the more recent sediment data.

As recommended in ENVR-00 11, a site-specific screening was then done using estimates of aver-

age radionuclide concentrations derived from measurement series in surface waters, sediments, and soils. Average concentrations for each medium, applicable BCGs, partial fractions, and sums of fractions for the ten-year baseline study are tabulated in Table 4-3 (p. 4-16).

At the site-specific screening level for the full ten-year period, the sum of fractions for the aquatic system evaluation was 0.45 and that for the terrestrial system evaluation was 0.57. The comparable sums of fraction using the more near-term data were 0.37 and 0.57, respectively. The sum of fractions for each assessment was less than 1.0, indicating that applicable BCGs were met for both the aquatic and terrestrial evaluations. It was therefore concluded that populations of aquatic and terrestrial biota (both plants and animals) on the WNYNSC are not being exposed to doses in excess of the existing DOE dose standard for aquatic organisms and the recommended standards put forth in ENVR-00 11 for terrestrial biota.

Summary

Predictive computer modeling of airborne and waterborne releases resulted in estimated hypothetical doses to the maximally exposed individual that were orders of magnitude below all applicable EPA standards and DOE Orders, which place limitations on the release of radioactive materials and dose to individual members of the public. The collective population dose also was assessed and found to be orders of magnitude below the natural background radiation dose. Additionally, it was determined that biota at the WVDP are exposed at a fraction of the suggested maximum radiation levels.

Based on the overall dose assessment, the WVDP was found to be in compliance with applicable effluent radiological guidelines and standards during calendar year 2001. Table 4-4 (p. 4-17) provides a summary of WVDP releases and calculated doses in specified DOE format.

Table 4-3
Evaluation of Dose to Aquatic and Terrestrial Biota

Based on average radionuclide concentrations in waters, sediments, and soils from ten years of monitoring, the sum of fractions for the aquatic system evaluation was 0.45 and that for the terrestrial system evaluation was 0.57. Evaluations using more recent data – surface water data from 2001 and sediment data from 1997-2001 – resulted in aquatic and terrestrial sums of fractions of 0.37 and 0.57, respectively. Each sum of fractions was less than 1.0, indicating that applicable biota concentration guides (BCGs) were met for both the aquatic and terrestrial evaluations. The calculated sum of fractions for aquatic organisms for the near-term assessment was less than the sum of fractions calculated for the 10-year baseline. It was therefore concluded, based on both long-term and near-term results, that populations of aquatic and terrestrial biota on the WNYNSC are not being exposed to doses in excess of the existing DOE limit for aquatic organisms (U.S. Department of Energy, February 1990) and the international standards for terrestrial organisms (International Atomic Energy Agency, 1992).

Aquatic System Evaluation (Long-Term [10-Year] Data Set)

Nuclide	Water BCG* (pCi/L)	Mean Water Value (pCi/L)	Water Partial Fraction	Sediment BCG* (pCi/g)	Mean Sediment Value (pCi/g)	Sediment Partial Fraction	Water and Sediment Sum of Fractions	
Cesium-137	42.6	13.0	3.05E-01	3,120	7.00	2.24E-03	0.31	
Strontium-90	278	37.1	1.33E-01	582	1.76	3.02E-03	0.14	
All Others	NA	NA	9.00E-03	NA	NA	3.90E-04	<0.01	
Sum of Fractions (Long-Term data)			4.47E-01				5.65E-03	0.45
Sum of Fractions (Near-Term data)							0.37	

Terrestrial System Evaluation (Long-Term [10-Year] Data Set)

Nuclide	Water BCG* (pCi/L)	Mean Water Value (pCi/L)	Water Partial Fraction	Soil BCG* (pCi/g)	Mean Soil Value (pCi/g)	Soil Partial Fraction	Water and Soil Sum of Fractions	
Cesium-137	599,000	13.0	2.17E-05	20.8	5.95	2.87E-01	0.29	
Strontium-90	54,500	37.1	6.81E-04	22.5	6.26	2.78E-01	0.28	
All Others	NA	NA	1.73E-05	NA	NA	1.00E-03	<0.01	
Sum of Fractions (Long-Term data)			7.20E-04				5.66E-01	0.57
Sum of Fractions (Near-Term data)							0.57	

* The BCGs are calculated values. Except for the sums of fractions, which are rounded to two significant digits, all values are expressed to three significant digits.

Table 4-4
WVDP Radiological Dose and Release Summary

WVDP Radiological Dose Reporting Table CY 2001

Dose to the Maximally Exposed Individual		% of DOE 100-mrem limit	Estimated Population Dose		Population within 50 miles 2000 Projection (1990 census)	Estimated Natural Radiation Population Dose
0.040 <i>mrem</i>	0.00040 <i>(mSv)</i>	0.040	0.19 <i>person-rem</i>	0.0019 <i>(person-Sv)</i>	1,350,000	398,000 <i>person-rem</i>

WVDP Radiological Atmospheric Releases+ CY 2001 in Curies (Bq)

Tritium	Kr-85	Noble Gases ($T_{1/2} < 40$ dy)	Short-Lived Fission and Activation Products ($T_{1/2} < 3$ hr)	Fission and Activation Products ($T_{1/2} > 3$ hr)	Total Radioiodine	Total Radiostrontium	Total Uranium**	Total Plutonium	Total Other Actinides	Other (Rn-220)
2.66E-02 (9.83E+08)	NA	NA	NA	7.8913-0-t (2.92E+07)	5.30E-04 (1.96E+07)	3.28E-04 (1.21E+07)	3.02E-07 (1.12E+04)	1.11E-06 (3.10E+04)	2.12E-06 (7.861-t-01)	2.27E-03 (8.46-13)

WVDP Liquid Effluent Releases+ of Radionuclide Material CY 2001 in Curies (Bq)

Tritium	Fission and Activation Products ($T_{1/2} > 3$ hr)	Total Radioiodine	Total Radiostrontium	Total Uranium**	Total Plutonium	Total Other Actinides
1.20E-01 (4.43E+09)	5.76E-03 (2.13E+08)	1.55E-04 (5.73E+06)	1.37E-01 (5.09E+09)	7.52E-04 (2.78E+07)	9.27E-06 (3.43E+05)	2.35E-05 (8.70E+05)

+ The WVDP air and water releases are from point sources and controlled liquid effluent releases, respectively.

* Total uranium (grams) = 2.61E-01

** Total uranium (grams) = 4.56E+02

Note: These tables have been included to provide a standardized format for data collected from all Department of Energy sites.

Attachment VI

Hanford ASER
Groundwater Monitoring Table Examples

Table 6.1.1. Summary of Groundwater Monitoring Program by Geographic Area, Calendar Year 2001

	Hanford Site	100 Areas	200 Areas	300 Area	400 Area	600 Area^(a)
Number of wells monitored	735	218	271	41	4	201
Number of sampling events	2,095	836	810	87	37	325
Number of analyses performed	18,051	5,532	8,046	669	267	3,537
Number of results	66,153	17,548	30,948	2,427	373	14,857
Percent of non-detectable results	41	26	42	68	21	51
Number of installed wells ^(b)	58	31	23	0	0	4
Number of abandoned wells	99	3	4	2	0	90

(a) Includes the former 1100 and 3000 Areas.

(b) Does not include two wells deepened in the 200 Areas.

Table 6.1.2. Summary of Groundwater Monitoring Program by Monitoring Purpose,^(a) Calendar Year 2001

	Restoration	Waste Management	Environmental Surveillance
Number of wells monitored	220	241	450
Number of sampling events	561	636	640
Number of analyses performed	5,272	8,562	10,389
Number of results	18,114	35,918	37,040
Percent of non-detectable results	38	44	44
Number of installed wells	31	27	0
Number of abandoned wells	0	0	99

(a) Because of co-sampling between groundwater monitoring programs, the wells monitored, sampling events, analyses, results, and non-detectable results overlap between monitoring purposes.