

Appendix C

BIBLIOGRAPHY

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BIBLIOGRAPHY

This bibliography is a compilation of resources related to site investigations, risk assessment, remedy selection, and other issues relevant to the Remedial Action Plan Monitoring Act Voluntary Cleanup Program. These references will be useful when preparing the remedial action plan and the remedial action report. However, it is not a comprehensive list of all available resources, and additional reference materials may be needed for some sites. In addition, weblinks are provided for many references as a convenience. Because the website addresses are subject to change, some of these links may no longer be available. For additional information, contact the author.

American Society for Testing and Materials (ASTM). Updated yearly. *Annual Book of Standards*. Philadelphia, PA.

ASTM provides standard methodologies for a large number of site investigation and remediation techniques. Descriptions of methodologies can be purchased for a fee. Listings of individual standards are available on-line under the following remediation-related headings:

- Analytical chemistry (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/mt1.htm?u+mystore+xkdj0443>)
- Environmental assessment (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en2.htm?u+mystore+xkdj0443>)
- Geotechnical engineering (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/m04.htm?u+mystore+xkdj0443>)
- Laboratory testing (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/gm3.htm?u+mystore+xkdj0443>)
- Waste management (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en5.htm?u+mystore+xkdj0443>)
- Water testing (<http://www.astm.org/cgi-bin/softcart.exe/database.cart/marketingcodes/en6.htm?u+mystore+xkdj0443>)

More information about ASTM can be found at <http://www.astm.org>.

ASTM. 1984. "STP 845 Statistics in the Environmental Sciences."

This paper discusses the development and application of mathematical and statistical techniques to environmental problems. The discussion focuses on the types of analyses available, their usefulness in various scenarios, and the evaluation process prior to application of the technique.

ASTM. 1999. *ASTM Standards on Ground Water and Vadose Zone Investigations: Drilling, Sampling, Geophysical Logging, Well Installation and Decommissioning*. 2nd ed. Philadelphia, PA.

The 75 ASTM standards provided in this book provide techniques for drilling, sampling, installation, and development of wells. New standards cover borehole geophysical logging, direct-push soil and groundwater sampling, and nitrogen laser-induced fluorescence.

ASTM. 2004. “E1912-98(2004) Standard Guide for Accelerated Site Characterization for Confirmed or Suspected Petroleum Releases.” On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1912.htm?L+mystore+izay5771+1092893869

This guide describes a process for rapid and accurate characterization of a site with a confirmed or suspected petroleum release. Users may be responsible parties, contractors, consultants, or regulators wishing to streamline and accelerate the site characterization process or to supplement incomplete characterization data.

ASTM. 2014. “E1689-95(2014)e1 Standard Guide for Developing Conceptual Site Models for Contaminated Sites.” On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1689.htm?L+mystore+izay5771+1092893042

This purpose of this guide is to assist in the development of conceptual site models for contaminated sites. The guide describes the major components of conceptual site models and provides examples and an outline for developing new site models. A conceptual site model can be used to integrate technical data from various sources, evaluate the potential risk to human health and the environment, identify data needs, support selection of background sample locations, and guide data collection activities.

ASTM. 2015. *ASTM Standards on Environmental Site Characterization*. Philadelphia, Pennsylvania.

The 183 ASTM guides and practices provided in this book provide current standards for site characterization, including those addressing characterization, sampling, and monitoring of soil, vadose zone materials, sediment, surface water, groundwater, and waste.

ASTM. 2015. “E1943-98(2015) Standard Guide for Remediation of Ground Water by Natural Attenuation at Petroleum Release Sites.” On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E1943.htm?L+mystore+izay5771+1092894228

The guide aids the user in evaluating and implementing appropriate remediation by natural attenuation at petroleum release sites, alone or in combination with other remedial actions.

ASTM. 2016. “D5092-04e1 Standard Practice for Design and Installation of Ground Water Monitoring Wells.” On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/D5092.htm?L+mystore+izay5771+1092893500

This document provides guidelines for designing and installing monitoring wells for the purposes of collecting representative groundwater data and detecting potential contamination in groundwater. Design standards and installation procedures take into consideration the hydrogeology of the intended monitoring zone and are applicable to both detection and assessment monitoring programs.

ASTM. 2017. "E2091-17 Standard Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls." On-line address: http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/REDLINE_PAGES/E2091.htm?L+mystore+izay5771

This guide provides the information needed to incorporate controls that are protective of human health and the environment into risk-based remediation programs. The guide explains the purpose of institutional controls and engineering controls and helps users identify, evaluate, implement, and maintain appropriate controls for their sites. The guide also identifies screening and balancing criteria, as well as long-term monitoring and stewardship needs.

Cherry, J.A. 1992. "Groundwater Monitoring: Some Current Deficiencies and Alternative Approaches." In *Hazardous Waste Site Investigations: Toward Better Decisions*. Lewis Publishers.

This book focuses on the development and application of innovative technologies for hazardous waste site characterization and remediation, with an emphasis on quality assurance. Innovative technologies are presented for field instrumentation, biomonitoring, surface water and groundwater sampling, chemical sensing, and radiochemical measurements and sensing.

Code of Federal Regulations (CFR), Title 40, Part 300. 2003. "National Oil and Hazardous Substances Pollution Contingency Plan." Accessible on-line at: <http://www.ecfr.gov>

This plan, commonly referred to as the National Contingency Plan (NCP), outlines federal procedures for responding to oil spills and hazardous substance releases. The NCP promotes overall coordination among the hierarchy of responders and contingency plans. It established a response headquarters and regional and national reactions teams, and it provides a system for accident reporting, emergency response, spill containment, clean up, and emergency removal actions.

Davis, T.S. 2001. *Brownfields: A Comprehensive Guide to Redeveloping Contaminated Property*. 2nd Edition. American Bar Association.

This book provides a stepwise, solution-oriented approach to redeveloping brownfields properties. Topics of discussion include finding new funding sources to finance redevelopment; resolving legal, business, financial, and political issues associated with redeveloping contaminated property; interpreting state and federal laws regarding liability for cleanup of brownfield sites; and evaluating existing state voluntary cleanup programs. The book also provides a detailed analysis of the federal brownfields legislation.

Department of Energy (DOE). 1997. "Site Conceptual Exposure Model (SCEM) Builder."

U.S. Environmental Protection Agency (EPA) guidance on the preparation of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) scoping documents requires the development of a SCEM as a planning tool for public health and ecological risk assessments. Resource Conservation and Recovery Act (RCRA) corrective actions also require risk assessments to be conducted to determine the potential impacts to public health and the environment. SCEMs are used as a planning tool during the environmental site investigation phase to allocate finite financial and personnel resources to address data gaps, identify sources of contamination, release mechanisms, exposure pathways, and human or ecological receptors. The SCEMs include a visual presentation of site conditions and provide a narrative description of the assumptions used in the model.

Driscoll, F.G. 1986. *Groundwater and Wells*. Johnson Filtration Systems, Inc.: St. Paul, Minnesota.

This book provides a comprehensive reference for developing groundwater resources, with emphasis on water well design, construction, development, and testing. Other topics of discussion include subsurface exploration, drilling methods, and aquifer properties. The book presents information on transmissivity, well yield, storage, and time and distance drawdown for confined and unconfined conditions.

Einarson, M.D. 1995. “Enviro-Core™ -- A new vibratory direct-push technology for collecting continuous soil cores.” In *Proceedings of the 9th National Outdoor Action Conference*. National Ground Water Association, Columbus, OH.

This presentation focused on the Enviro-Core™ sampling system, a patented dual-tube direct push system with a small-diameter drive casing that prevents the probe hole from collapsing between sample runs. By preventing collapse, the Enviro-Core™ sampling system eliminates the potential for cross-contamination of soil samples. The Enviro-Core™ sampling system also allows for soil gas and groundwater sampling, monitoring well installation, and retraction grouting.

Environmental Protection Agency, U.S. (EPA). 1986. “RCRA Ground-Water Monitoring Technical Enforcement Guidance Document.” OSWER Directive 9950.1. September. On-line address: <https://www.epa.gov/enforcement/rcra-ground-water-monitoring-technical-enforcement-guidance-document-tegd>

This guidance details the components of a groundwater monitoring system necessary to comply with RCRA. Discussion primarily is directed toward interim status facilities and covers site characterization; determination of well numbers and locations; well design and construction; development and implementation of groundwater sampling and analysis plans and assessment plans; and statistical analysis of groundwater monitoring data.

EPA. 1986. “Final RCRA Comprehensive Ground-Water Monitoring Evaluation (CME) Guidance Document.” OSWER Directive 9950.2. December. On-line address: <https://www.epa.gov/enforcement/guidance-rcra-comprehensive-ground-water-monitoring-evaluation-final>

This document provides guidance for understanding and completing CMEs of RCRA groundwater monitoring systems. An objective of the CME is determining whether a facility has in place a properly designed, operated, and maintained groundwater monitoring system, capable of adequately detecting and monitoring releases of contamination into groundwater.

EPA. 1988. “Operation and Maintenance Inspection [OMI] Guide (RCRA Ground-Water Monitoring Systems).” OSWER Directive 9950.3. On-line address: <https://www.epa.gov/enforcement/operation-and-maintenance-inspection-guide-rcra-ground-water-monitoring-systems>

This document provides guidance for understanding and completing OMI of RCRA groundwater monitoring systems. An objective of the OMI is determining whether monitoring wells and sampling devices are properly maintained and capable of yielding representative groundwater samples and hydrologic data.

EPA. 1988. “Guidance for Conducting Remedial Investigations and Feasibility Studies [RI/FS] Under CERCLA.” EPA/540/G-89/004. OSWER Directive 9355.3-01. October.

This guidance provides the user with an overall understanding of the RI/FS process. The RI/FS process is the Superfund method of characterizing the nature and extent of risks posed by uncontrolled hazardous waste sites and determining the most appropriate means of remediating those sites. Potential users of this guidance include EPA personnel, state agencies, potentially responsible parties, federal facility coordinators, and consultants contracted to assist with RI/FS activities.

EPA. 1989. “Interim Final RCRA Facility Investigation (RFI) Guidance.” Vol. I-IV. EPA 530/SW-89-031. OSWER Directive 9502.00-6D. May. On-line address: <https://www.epa.gov/sites/production/files/2016-01/documents/rcrav1.pdf>

The purpose of the RFI, the second phase of the RCRA corrective action program, is to collect information to characterize the nature, extent, and rate of migration of releases of hazardous waste or constituents. This information is interpreted to determine whether interim corrective measures or a corrective measures study is necessary. The RFI guidance document provides direction to regulatory agency personnel overseeing the implementation of RFIs at hazardous waste management facilities. The document also provides guidance to facility owners or operators who are developing and performing investigations based on regulatory agency determinations. The RFI Guidance is presented in 4 volumes:

- I - Development of An RFI Work Plan and General Considerations for RFIs
- II - Soil, Ground Water, and Subsurface Gas Releases
- III - Air and Surface Water Releases
- IV - Case Study Examples

EPA. 1989. “Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part A).” EPA/540/1-89/002. December. On-line address: <https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part>

RAGS Part A provides guidance on the human health evaluation activities that are conducted during the baseline risk assessment. The baseline risk assessment is an analysis of the potential adverse health effects (current or future) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases. In Superfund investigations, the results of the baseline risk assessment are used to help determine whether additional response action is necessary at the site, modify PRGs, help support selection of the "no- action" remedial alternative, when appropriate, and document the magnitude of risk at a site, and the primary causes of that risk.

Baseline risk assessments are site-specific and therefore may vary in both detail and the extent to which qualitative and quantitative analyses are used. Causes of variability include: the complexity and particular circumstances of the site; availability of applicable or relevant and appropriate requirements; and other criteria, advisories, and guidance. After an initial planning stage, there are four steps in the baseline risk assessment process: (1) data collection and analysis; (2) exposure assessment; (3) toxicity assessment; and (4) risk characterization.

EPA. 1990. “Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells.” PB90-159807. EPA/600/4-89/034. February.

This document presents field-oriented guidance and technology for use in the design, construction, and installation of groundwater monitoring wells in various hydrogeologic settings. Special attention is given

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to the criteria that influence groundwater monitoring well design and construction. Topics of discussion follow the monitoring well from the planning stage through installation, development, operation, sampling, maintenance, and abandonment.

EPA. 1991. “Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals (PRG).” Publication 9285.7-01B. On-line address: <https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part-b>

RAGS Part B provides guidance on using EPA toxicity values and exposure information to derive risk-based PRGs for a Superfund site. Initially developed at the scoping phase using readily available information, risk-based PRGs generally are modified based on site-specific data gathered during the RI/FS. This guidance does not discuss the risk management decisions that are necessary at a Superfund site. The potential users of Part B are those involved in the remedy selection and implementation process, including risk assessors, risk assessment reviewers, remedial project managers, and other decision-makers.

EPA. 1991. “Risk Assessment Guidance for Superfund [RAGS], Volume I -- Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), Interim.” Publication 9285.7-01C. October. On-line address: <https://www.epa.gov/risk/risk-assessment-guidance-superfund-rags-part-c>

RAGS Part C provides guidance for evaluations of remedial alternatives in light of human health risk. These evaluations are conducted during the FS, during selection and documentation of a remedy, and during and after remedy implementation. Part C provides general guidance to assist in site-specific risk evaluations and to maintain flexibility in the analysis and decision-making process. This guidance does not discuss the evaluation of ecological effects that takes place during remedy selection and implementation, nor does it discuss the risk management decisions that are necessary at a Superfund site. The potential users of Part C are those involved in the remedy selection and implementation process, including risk assessors, risk assessment reviewers, remedial project managers, and other decision-makers.

EPA. 1991. “Ecological Assessment of Superfund Sites: An Overview.” *ECO Update* Intermittent Bulletin. Vol. 1. No. 2. Publication 9345.0-051. December. On-line address: <https://www.epa.gov/risk/ecological-assessment-superfund-sites-overview>

This bulletin provides background on the Superfund program and the components of ecological assessments, including problem formulation, exposure assessment, ecological effects assessment, and risk characterization. The bulletin also highlights the role of the ecological assessment in the RI/FS and post-RI/FS activities, which support risk-management decision-making.

EPA. 1992. “Guidance for Data Usability in Risk Assessment.” Final. Parts A and B. Publications 9285.7-09A, -09B. PB92-963356, -963362. May.

The “Guidance for Data Usability in Risk Assessment” document is designed to provide data users with a nationally consistent basis to determine the minimum quality and quantity of environmental analytical data needed to support Superfund risk assessment decisions. This guidance is appropriate regardless of the party conducting the investigation. Part A provides guidance applicable to most remedial investigation processes. Part B is specific to radioanalytical issues and should always be used in conjunction with Part A.

EPA. 1992. “RCRA Ground-Water Monitoring: Draft Technical Guidance.” EPA/530/R-93/001. PB93-139-350. November.

This document provides guidance for implementing RCRA groundwater monitoring regulations for regulated units referred to in 40 CFR Part 264, Subpart F and the permitting standards of 40 CFR Part 270. The document also provides guidance for complying with 40 CFR Part 264, Subparts J (tank systems), K (surface impoundments), L (waste piles), N (landfills), and X (miscellaneous units).

EPA. 1993. “Guidance for Evaluating Technical Impracticability of Ground-Water Restoration.” Interim Final. OSWER 9234.2-25. EPA-540-R-93-080. September. On-line address: <https://semspub.epa.gov/work/06/9351189.pdf>

This guidance clarifies the EPA evaluation and decision-making process regarding technical impracticability of groundwater restoration at Superfund and RCRA sites. The guidance also discusses what alternative measures are necessary to ensure that the final remedy is protective of human health and the environment, should groundwater restoration be determined to be technically impractical. Topics discussed include technical data requirements, evaluation and decision-making criteria, documentation requirements, and alternative remedial strategies.

EPA. 1993. “Solid Waste Disposal Facility Criteria: Technical Manual.” EPA 530-R93017. November.

This technical manual was developed as guidance for owners and operators of solid waste landfills seeking to achieve compliance with the revised Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258). This technical manual is not a regulatory document. The technical guidance provided is not mandatory but is intended to assist the owner or operator in achieving compliance.

EPA. 1993. “Wildlife Exposure Factors Handbook.” Volumes I and II. EPA/600/R-93/187. December. On-line address: <http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default>

The “Wildlife Exposure Factors Handbook” was developed to improve wildlife exposure assessments and support risk estimate quantification. The handbook provides a convenient source of information and a consistent analytical framework for exposure and risk assessments for common wildlife species. An appendix containing a literature review database is provided in Volume II. This handbook is a companion document to the “Exposure Factors Handbook,” which contains information on quantifying human exposures.

EPA. 1994. “Using Toxicity Tests in Ecological Assessments.” *ECO Update Intermittent Bulletin*. Vol. 2. No. 1. Publication 9345.0-051. March. On-line address: <https://www.epa.gov/sites/production/files/2015-09/documents/v2no1.pdf>

This bulletin provides guidance for using toxicity tests in ecological risk assessments. Toxicity tests are used to expose test organisms to contaminated water, sediment, or soil and evaluate the effects of contamination on the survival, growth, reproduction, behavior, and attributes of these organisms. The bulletin outlines situations where toxicity tests may be appropriate, general guidelines for choosing toxicity tests, and the elements of and measurement endpoints for toxicity tests.

EPA. 1994. “Catalogue of Standard Toxicity Tests for Ecological Risk Assessment.” *ECO Update Intermittent Bulletin*. Vol. 2. No. 2. Publication 9345.0-051. March. On-line address: <https://www.epa.gov/sites/production/files/2015-09/documents/v2no2.pdf>

This bulletin serves as a companion to “Using Toxicity Tests in Ecological Risk Assessments” (*ECO Update* Vol. 2, No. 1) and consists of an annotated list of standardized aquatic, sediment, terrestrial, and microbial toxicity tests currently used at Superfund sites.

EPA. 1994. “Field Studies for Ecological Risk Assessment.” *ECO Update Intermittent Bulletin*. Vol. 2. No. 3. Publication 9345.0-051. March. On-line address: <https://www.epa.gov/sites/production/files/2015-09/documents/v2no3.pdf>

This bulletin discusses ecological field studies, or investigations and comparisons of habitats and biota in contaminated areas versus non-contaminated areas. Topics covered in this bulletin include the ecological components in a field study, the elements of field study design, field methods, and field study contributions to ecological risk assessments.

EPA. 1995. “Land Use in the CERCLA Remedy Selection Process.” OSWER Directive No. 9355.7-04. May 25. On-line address: <https://www.epa.gov/fedfac/land-use-cercla-remedy-selection-process>

This directive presents additional information for considering land use in making remedy selection decisions under CERCLA at NPL sites. EPA believes that early community involvement, with a particular focus on the community's desired future uses of property associated with the CERCLA site, should result in a more democratic decision-making process; greater community support for remedies selected as a result of this process; and more expedited, cost-effective cleanups.

EPA. 1996. “Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities.” Advance Notice of Proposed Rulemaking. Federal Register, Volume 61, Number 85. May 1. On-line address: <https://www.gpo.gov/fdsys/pkg/FR-1996-05-01/pdf/96-9707.pdf>

This notice contains highlights of some successful corrective action approaches pioneered by states and EPA regions and a description of program flexibility. EPA's objectives in improving the corrective action program included: creating a consistent, holistic approach to cleanup at RCRA facilities; establishing protective, practical cleanup expectations; shifting more of the responsibilities for achieving cleanup to those responsible for the contamination; streamlining corrective action and reducing costs; and, enhancing opportunities for timely, meaningful public participation.

EPA. 1997. “Expedited Site Assessment Tools for Underground Storage Tank [UST] Sites: A Guide for Regulators.” EPA 510-B-97-001. March. On-line address: https://clu-in.org/download/toolkit/510_b-97_001.pdf

The expedited site assessment process allows rapid characterization of UST site conditions in support of corrective action decisions. This guide provides a comprehensive description of expedited site assessment tools, including surface geophysical methods, soil gas surveys, field methods for the analysis of petroleum hydrocarbons, and direct-push technologies such as the Precision Enviro-Core™ sampling system and the Waterloo Groundwater Profiler.

EPA. 1997. “Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments - Interim Final.” June. EPA/540/R-97/006. On-line address: <https://semspub.epa.gov/work/10/500006184.pdf>

This document provides guidance to site managers and Remedial Project Managers who are legally responsible for the management of a site. It shows how to design and conduct technically defensible ecological risk assessments for the Superfund program.

EPA. 1997. “Guidance on Cumulative Risk Assessment: Part 1, Planning and Scoping.” July 3. On-line address: <https://www.epa.gov/risk/guidance-cumulative-risk-assessment-part-1-planning-and-scoping>

This guidance directs EPA offices to take into account cumulative risk issues when scoping and planning major risk assessments. Risk assessments should also consider multiple sources, effects, pathways, stressors, and populations for cumulative risk analyses in all cases for which relevant data are available. This assures a more consistent and scientifically complete approach to cumulative risk assessments and better protection of public health and the environment. As it evolves, this guidance is designed to help risk managers and risk assessors plan and document the scope of risk assessments and to consider appropriate participants (that is, technical, advisory, or stakeholder) or information sources to enrich the risk assessment.

EPA. 1998. “Guidelines for Ecological Risk Assessment.” EPA/630/R-95/002F. April. On-line address: <https://www.epa.gov/risk/guidelines-ecological-risk-assessment>

These EPA guidelines are provided to improve the quality and consistency of ecological risk assessments. As a next step in a continuing process of ecological risk guidance development, the guidelines draw from a wide range of source documents including peer-reviewed issue papers and case studies previously developed by EPA’s Risk Assessment Forum. The guidelines expand on and replace the 1992 report “Framework for Ecological Risk Assessment.” These guidelines are not regulations and do not impose any new requirement on the regulated community. Rather, the guidelines are internal guidance for EPA and inform the public and the regulated community regarding EPA’s approach to ecological risk assessment.

EPA. 1998. “Hazardous Waste Identification Final Rule for Contaminated Media.” Final Rule. Federal Register Volume 63, Number 229. November 30. On-line address: https://www.epa.gov/sites/production/files/2016-04/documents/01_12cntdin_1.pdf

As part a 1994 environmental regulatory reform initiative, EPA issued new requirements for RCRA hazardous remediation wastes treated, stored, or disposed of during cleanup actions. These requirements made five major changes:

- Make permits for treating, storing and disposing of remediation wastes faster and easier to obtain
- Provide that obtaining these permits will not subject the owner and/or operator to facility-wide corrective action
- Create a new kind of unit called a “staging pile” that allows more flexibility in storing remediation waste during cleanup
- Exclude dredged materials from RCRA Subtitle C if they are managed under an appropriate permit under the Marine Protection, Research and Sanctuaries Act or the Clean Water Act
- Make it faster and easier for states to receive authorization when they update their RCRA programs to incorporate revisions to the federal RCRA regulations.

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EPA. 1999. “Use of Monitored Natural Attenuation [MNA] at Superfund, RCRA Corrective Action, and Underground Storage Tank [UST] Sites.” Final Version. OSWER Directive 9200.4-17P. April 21. On-line address: <https://semspub.epa.gov/work/HQ/159152.pdf>

This directive clarifies the EPA policy regarding the use of MNA for the remediation of contaminated soil and groundwater at sites regulated under OSWER programs. These include programs administered under Superfund, RCRA, OUST, and the Federal Facilities Restoration and Reuse Office. The directive is intended to promote consistency in how MNA remedies are proposed, evaluated, and approved. As a policy document, it does not provide technical guidance on evaluating MNA remedies. It provides guidance to EPA staff, to the public, and to the regulated community on how EPA intends to exercise its discretion in implementing national policy on the use of MNA.

EPA. 2000. “Assessing Contractor Capabilities for Streamlined Site Investigations.” EPA 542-R-00-001. January. On-line address: <http://www.brownfieldstsc.org/pdfs/ContractorCap.pdf>

This document promotes the use of innovative methods in brownfields projects, when conducting site characterization, assessing contractors’ capabilities, or suggesting additional considerations for contractors conducting their activities. In CERCLA and RCRA investigations, innovative technologies have been demonstrated to improve project cost, schedule, and effectiveness.

EPA. 2000. “Data Quality Objectives Process for Hazardous Waste Site Investigations.” EPA/600/R-00/007. January. On-line address: https://clu-in.org/download/toolkit/thirdednew/epa_600-r-00-007.pdf

This guidance document is based upon the principles and steps developed in “Guidance for the Data Quality Objectives Process (QA/G-4),” but is specific to hazardous waste site investigations. This document is also consistent with “Data Quality Objectives Process for Superfund: Interim Final Guidance” and “Soil Screening Guidance: User’s Guide.” The document focuses on applications for CERCLA and RCRA sites, and is applicable to programs at the state and local level.

EPA. 2001. “EPA Requirements for Quality Assurance Project Plans [QAPP] (EPA QA/R-5).” EPA/240/B-01/003. March. On-line address: <https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans>

The QAPP is a tool for project managers and planners to use to document the type and quality of data needed for environmental decisions and to describe the methods for collecting and assessing those data.

EPA. 2003. “Using Dynamic Field Activities for On-Site Decision Making.” May. EPA/540/F-03/011

This Superfund document provides guidance on the use dynamic field activities, with the goal of streamlining hazardous waste site activities with real-time data and real-time decisions.

EPA. 2004. “Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action.” EPA/530/R-04/030. April. On-line address: <https://www.epa.gov/sites/production/files/2017-02/documents/gwhb041404.pdf>

This document contains the EPA's latest interpretation of policies on such topics as cleanup goals, the role of groundwater use, point of compliance, source control, and monitored natural attenuation. It emphasizes a phased, results-based approach to cleaning up contaminated groundwater.

EPA. 2004. “Risk Assessment Guidance for Superfund [RAGS], Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment Final.” EPA/540/R/99/005. July. On-line address: http://epa-prgs.ornl.gov/chemicals/help/documents/RAGS_E_EPA540R99005.pdf

This guidance is intended to assist risk assessors and others in addressing concerns resulting from the evaluation of dermal exposure risk assessment pathways. It proposes a consistent methodology for assessing the exposures from the dermal pathway for Superfund human risk assessments. RAGS Part E focuses on dermal contact with soil and water, and it does not provide guidance on quantifying dermal absorption of chemicals from exposure to vapors.

EPA. 2011. “Health Effects Assessment Summary Tables for Superfund (HEAST).” December. On-line address: <https://epa-heat.ornl.gov/>

HEAST tables are for use at both Superfund and RCRA sites. These tables provide a comprehensive listing of provisional risk assessment information relative to oral and inhalation routes of exposure for chemicals. Slope factors are calculated by EPA to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. HEAST numbers are no longer being developed; therefore, the user should use more recent data where available. HEAST tables do not contain standards.

EPA. 2015. “EPA Series: A Citizen’s Guide to Cleanup Methods.” January 2015. On-line address: <https://clu-in.org/products/citguide/>

EPA encourages the selection of innovative treatment technologies for site remedies because they have the potential to be more cost-effective and to provide better and more efficient cleanups. In addition, they are often more acceptable to surrounding communities than established treatment technologies. This document presents a broad overview of approaches for cleanup. It also refers to other citizens’ guides for specific technologies.

EPA. 2018. “Contaminated Site Clean-up Information” On-line address: <https://www.clu-in.org>

The EPA Clu-in website contains information, internet seminars, and guidance on innovative technologies for site characterization, monitoring, and remediation. It also contains case studies, and success stories for sites that have used particular innovative approaches to site cleanup.

EPA. 2018. “Brownfields Road Map to Understanding Options for Site Investigation and Cleanup, Sixth Edition.” EPA 542-R-17-003. January. On-line address: <https://www.epa.gov/brownfields/brownfields-road-map>

This document provides resources to assist in identifying and selecting site characterization and cleanup technologies for brownfields redevelopment, as well as an outline of the general steps required for the Nebraska Voluntary Cleanup Program Guidance

characterization and cleanup of a site slated for redevelopment. This document is applicable regardless whether the brownfield sites are public projects, private developments, or public-private partnerships.

EPA. 2018. 2018 Edition of the Drinking Water Standards and Health Advisories Tables.”

March. EPA 822-F-18-001 On-line address:

<https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf>

Drinking Water Standards and Health Advisory summary tables contain drinking water standards in the form of Maximum Contaminant Level Goals, Maximum Contaminant Levels (MCLs), and non-enforceable health advisories. MCLs are the maximum permissible level of a contaminant in water delivered to users of a public water system. Health Advisories (HA) provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. HAs are guidance values based on non-cancer health effects for different durations of exposure (for example, one-day, ten-day, and lifetime). They provide technical guidance to EPA regional offices, state governments, and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

EPA. 2018. “National Oil and Hazardous Substances Pollution Contingency Plan [NCP]

Overview.” April. On-line address: <https://www.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview>

This website presents an overview of the NCP, which is the federal government’s blueprint for responding to both oil spills and hazardous substance releases. The actual federal register publication contains a preamble that serves as a valuable resource in interpreting EPA’s intent behind the regulations. The NCP Overview website contains links to information on the following related topics:

- National Response Team
- Regional Response Teams
- Clean Water Act of 1972
- CERCLA of 1980
- Emergency removal actions
- Oil Pollution Act of 1990

EPA. 2018. “Regional Screening Levels (RSLs)-Generic Tables.” May. On-line address:

<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>

This website includes information about PRGs maintained by EPA. PRGs are risk-based concentrations derived from standardized equations that combine exposure information assumptions and EPA toxicity data. From this website, the user can access background information, which includes all relevant calculations, PRG tables for a range of contaminants and media, and links to other toxicological and risk assessment information.

EPA. 2018. “Institutional Controls.” June. On-line address:

<http://www.epa.gov/superfund/superfund-institutional-controls>

Institutional controls are non-engineered instruments, such as administrative or legal controls, that help minimize the potential for human exposure to contamination and protect the integrity of a remedy by limiting land or resource use. Although it is EPA's expectation that treatment or engineering controls will be used to address principle threat wastes and that groundwater will be returned to its beneficial use whenever practicable, institutional controls play an important role in remedies. Institutional controls are Nebraska Voluntary Cleanup Program Guidance

used when contamination is first discovered, when remedies are ongoing, and when residual contamination remains onsite at a level that does not allow for unrestricted use and unlimited exposure after cleanup. The NCP emphasizes that institutional controls are meant to supplement engineering controls and that institutional controls will rarely be the sole remedy at a site.

EPA. 2018. “Lead at Superfund Sites: Software and Users’ Manuals.” June. On-line address:
<https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals>

The IEUBK Model for Lead in Children allows users to predict the blood lead levels of children using information on their multimedia exposure to environmental lead. The model is based on a number of other studies, including lead biokinetics, contact rates of children with contaminated media, and data on the presence and behavior of environmental lead. The model provides a central tendency estimate and a probability distribution to characterize predicted blood lead levels. Downloads of the IEUBK Model for Lead in Children (multiple versions) and accompanying reference manuals are available at the link above.

EPA. 2018. “Superfund Soil Screening Guidance.” June. On-line address:
<https://www.epa.gov/superfund/superfund-soil-screening-guidance>

The EPA website provides guidance to help standardize and accelerate the evaluation and cleanup of contaminated soils at sites on the NPL if future residential land use is anticipated. The User's Guide provides a simple step-by-step methodology for environmental science/engineering professionals to calculate risk-based, site-specific SSLs for contaminants, which may be used to identify areas needing further investigation. The technical background document provides for the development of methodologies described in the “Soil Screening Guidance: User's Guide”, along with additional information useful for soil screening. Together, these documents define the framework and methodology to develop soil screening levels (SSL) for chemicals commonly found at Superfund sites.

EPA. 2018. “Technology Innovation Office [TIO].” June. On-line address:
<http://www.epa.gov/tio/>

TIO’s website provides information about characterization and treatment technologies for the hazardous waste remediation community. It offers technology selection tools and describes programs, organizations, and publications for a variety of stakeholders. Publication topics include:

- Remediation
- Characterization and monitoring
- Initiatives and partnerships
- Vendor
- Regulatory information

EPA. 2018. “Exposure Factors Handbook.” July. On-line address:
<https://www.epa.gov/expobox/about-exposure-factors-handbook>

The “Exposure Factors Handbook” provides a summary of the available statistical data on various factors used in assessing human exposure. The handbook is addressed to all exposure assessors, including those outside EPA, who need to obtain data on standard factors to calculate human exposure to toxic chemicals. These factors include: drinking water consumption; soil ingestion; inhalation rates; dermal factors including skin area and soil adherence factors; consumption of fruits and vegetables, fish, meats, dairy products, homegrown foods, and breast milk; human activity factors; consumer product use; and

residential characteristics. Recommended values are provided for the general population and also for various segments of the population who may have characteristics different from the general population.

EPA. 2018. “Superfund Chemical Data Matrix (SCDM).” July. On-line address:

<http://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm>

The SCDM is a source for factor and benchmark values to be used when evaluating potential NPL sites using the Hazard Ranking System (HRS). Factor values are part of the HRS mathematical equation that determines the relative threat posed by a hazardous waste site and reflect hazardous substance characteristics, such as toxicity and persistence in the environment, substance mobility, and potential for bioaccumulation. Benchmarks are environment- or health-based concentration limits developed by or used in other EPA regulatory programs. SCDM contains HRS factor and benchmark values for hazardous substances that are frequently found at sites evaluated using the HRS, as well as the physical, chemical, and radiological data used to calculate those values. The report also describes how data are selected or calculated for inclusion in SCDM.

EPA. 2018. “The SW-846 Compendium.” SW-846. July. On-line address:

<https://www.epa.gov/hw-sw846/sw-846-compendium>

SW-846 provides a unified source of information on sampling and analysis related to compliance with RCRA regulations. This manual provides methodologies for collecting and testing representative samples of waste and other materials to be monitored.

EPA. 2018. “Integrated Risk Information System (IRIS).” August. On-line address:

<https://www.epa.gov/iris/>

IRIS is a database of human health effects that may result from exposure to various substances found in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. The information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences.

EPA. 2018. “Learn About Corrective Action.” September. On-line address:

<https://www.epa.gov/hw/learn-about-corrective-action>

This website provides an overview and general resources that pertain to the cleanup of hazardous waste at RCRA corrective action sites.

EPA. 2018. “Superfund Program.” September. On-line address: <https://www.epa.gov/superfund>

This website contains information on the Superfund program’s policies and guidance on the following topics:

- Superfund remedy decisions
- Risk assessment
- Groundwater
- Remedy selection
- Reportable quantities
- Soil screening

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- Redeveloping Superfund sites
- Contract management

EPA. 2018. “Brownfields.” October. On-line address: <http://www.epa.gov/brownfields/>

Brownfields are properties for which expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. EPA encourages states and municipalities to streamline the process by which these sites can be cleaned up and returned to economic, ecologic, or recreational usefulness. This website provides links to information about brownfields tax incentive and development grants, investigation and remediation technologies and techniques, and redevelopment success stories. Discussion topics include:

- Pilots and grants
- Liability and cleanup
- Partnerships and outreach
- Workforce development
- Brownfields tax incentive
- Insurance and redevelopment
- Laws and regulations
- RCRA brownfields prevention initiative
- State voluntary cleanup programs (VCP)
- Underground storage tank (UST) initiative
- Publications

Federal Remediation Technologies Roundtable (FRTR). 2003. “FRTR Homepage.” February 12. On-line address: <http://www.frtr.gov>

The FRTR is an interagency working group seeking to build a more collaborative atmosphere among federal agencies involved in hazardous waste site remediation. Members represent agencies that develop and use these technologies, including U.S. Department of Defense, EPA, DOE, U.S. Department of the Interior, and National Aeronautics and Space Administration. In addition to remediation technology updates and FRTR meeting information, this website contains the following tools and references:

- Technology screening tools (<http://www.frtr.gov/scrntools.htm>), including the “Remediation Technologies Screening Matrix” and the “Field Sampling and Analysis Technologies Matrix”
- Technology cost and performance information (<http://www.frtr.gov/costperf.htm>)
- Publications (<http://www.frtr.gov/publib.htm>)

Freeze, R.A., and J.A. Cherry. 1979. *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall Publishing Company.

Groundwater provides a detailed and comprehensive presentation of hydrogeology, integrating chemistry, physics, geology, and calculus. Specific attention is given to transport processes, groundwater contamination, well hydraulics, aquifer yield, and analog and numerical modeling. Theoretical concepts are applied to real-world case studies. Mathematical derivations are presented in the appendices.

Interstate Technology and Regulatory Council (ITRC). 2018. On-line address:
<http://www.itrcweb.org>

This website is the homepage for ITRC, a state-led coalition of states, federal agencies, industry participants, and other stakeholders. It works to break down barriers and reduce compliance costs, making it easier to use new technologies and maximize resources. ITRC technical teams develop guidance documents and training courses to meet the information needs of regulatory staff, technology vendors, and environmental consultants. State regulators lead ITRC technical teams, which rely on broad-based participation from federal agencies, industry, academia, and other stakeholders in building collective knowledge and collaborative products. Topics for which guidance documents are available include, but are not limited to:

- Accelerated site characterization
- Dense non-aqueous phase liquids
- Diffusion samplers
- Enhanced in situ bioremediation
- In situ remediation
- In situ chemical oxidation
- Metals in soils
- Permeable reactive barriers (walls)
- Phytotechnologies
- Plasma technologies
- Policy
- Radionuclides
- Technology acceptance and reciprocity partnership
- Thermal desorption
- Unexploded ordnance
- Verification

NDEQ. 2018. “Rules and Regulations Homepage.” On-line address:
<http://www.deq.state.ne.us/RuleandR.nsf/Pages/Rules>

This Rules and Regulations website provides links to current rules and regulations under NDEQ, as well as proposed rules and regulations. Information provided includes the title name and number, the effective date of the last title revision, and a link to the title table of contents and chapter text. Current titles included on the website include Titles 114-136 and 194-200.

NDEQ. 2016. “Title 132 – Integrated Solid Waste Management Regulations.” May. On-line address: http://deq.ne.gov/RuleAndR.nsf/Title_132.xsp

Title 132 provides the Nebraska integrated solid waste management regulations. Requirements for permits, application procedures, and hearings are provided. Criteria and variances also are provided for municipal solid waste, delisted waste, industrial waste disposal areas, and land application units for repeated disposal or treatment of special wastes. Additional criteria are provided for fossil fuel combustion ash disposal areas, construction and demolition waste disposal areas, solid waste processing facilities, transfer stations, materials recovery facilities, solid waste compost sites, and other processing facilities. Financial assurance criteria, fees, rebates are discussed, as are junk accumulation, plastic container markings, and other general provisions. Appendices provide constituents for detection

monitoring, lists of hazardous inorganic and organic constituents, and concentration values at the relevant point of compliance.

NDEQ. 2009. “Risk-Based Corrective Action (RBCA) at Petroleum Release Sites: Tier 1/Tier 2 Assessments and Reports.” 01-082. May. On-line address:
<http://www.deq.state.ne.us/Publica.nsf/780613fa1854e3b906256ab60068778a/66fdec793aefc4b286256a93005b8db8?OpenDocument>

RBCA is a consistent decision-making process used to assess potential human or environmental exposure risks to petroleum releases. RBCA is also used to determine the remedial actions appropriate in response to such releases. RBCA was developed by the Leaking Underground Storage Tank/Release Assessment Section of NDEQ and is intended to apply to petroleum release sites potentially eligible for reimbursement under Nebraska Title 200, Rules and Regulations for Petroleum Release Remedial Action Reimbursement Fund; however, portions of this document may be applicable to other petroleum releases, as determined by NDEQ.

NDEQ. 2016. “Title 128 – Nebraska Hazardous Waste Regulations.” July. On-line address:
http://deq.ne.gov/RuleAndR.nsf/Title_128.xsp

Title 128 provides the Nebraska hazardous waste regulations. Criteria and variances are provided for identifying solid wastes and for identifying and listing hazardous wastes. Hazardous waste generator requirements are outlined for determination, notification, reporting, and record keeping. Requirements are provided for recyclable materials, specific hazardous wastes, large quantity generators, conditionally exempt small quantity hazardous waste generators, and transporters of hazardous waste.

NDEQ. 2006. “Title 118 – Groundwater Quality Standards and Use Classification.” March. On-line address: http://deq.ne.gov/RuleAndR.nsf/Title_118.xsp

Title 118 provides the NDEQ groundwater quality standards and use classification and defines their applicability to state groundwater and regulatory programs. The groundwater standards and classifications are intended to provide a foundation for other groundwater regulatory programs and are to be used in conjunction with such programs, where they exist.

NDEQ. 2004. “Title 115 – Rules of Practice and Procedure.” June. On-line address:
http://deq.ne.gov/RuleAndR.nsf/Title_115.xsp

Title 115 provides the NDEQ rules of practice and procedure. Rules and definitions are provided for filings and correspondence, public records availability and confidentiality, public hearings, voluntary compliance, contested cases, emergency proceedings, declaratory rulings, rule making, and variances. A copy of the Certificate of Service before the NDEQ is provided as an appendix.

Nebraska Department of Health and Human Services (NDHHS). 2011. “Title 178 – Environmental Health, Chapter 10 – Licensure Under the Water Well Standards and Contractors’ Practice Act.” June 7. On-line address: http://dhhs.ne.gov/Pages/reg_t178.aspx

Chapter 10 of Title 178 provides the Nebraska regulations governing licensure of water well and pump installation contractors and certification of water well drilling, pump installation, and water well monitoring supervisors, as administered by the NHHSS Department of Regulation and Licensure, Public Health Assurance Division. Topics covered include issuance of licenses and certificates; disciplinary

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action and other sanctions; reinstatement of licenses and certificates; and examination of applicants for licensure and certification.

NDHHS. 2014. “Title 178 – Environmental Health, Chapter 12 – *Water Well Construction, Pump Installation, and Water Well Decommissioning Standards.*” August 26. On-line address: http://dhhs.ne.gov/Pages/reg_t178.aspx

Chapter 12 of Title 178 provides the Nebraska regulations governing water well construction, pump installation and water well decommissioning standards, as administered by the NHSS Department of Regulation and Licensure, Public Health Assurance Division. Topics covered include general requirements, domestic wells, irrigation and industrial wells, dewatering wells, groundwater monitoring wells and recovery wells, observation wells, test holes, groundwater heat pump wells, installation of pumps and pumping equipment, and water well decommissioning.

Puls, R.W. and M.J. Barcelona. 1996. “Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures.” *EPA Ground Water Issue*. EPA/540/S-95/504. April.

This document provides background information on the development of low-flow groundwater sampling procedures in the support of site assessments and remedial performance monitoring objectives. This document also discusses the application of low-flow sampling procedures under a variety of hydrogeologic settings.

42 U.S. Code (USC), Chapter 82, Sections 6901 et seq. 1976. Resource Conservation and Recovery Act (RCRA). On-line address: <https://www.law.cornell.edu/uscode/text/42/chapter-82>

RCRA provided federal agencies with the authority to control hazardous waste from generation through transportation, treatment, storage, and disposal. RCRA also provided a framework for managing non-hazardous wastes. Amendments to RCRA in 1984 and 1986, respectively, required phasing out land disposal of hazardous waste and allowed EPA to address environmental issues related to the storage of petroleum products and other hazardous substances in underground storage tanks. RCRA focuses on active and future facilities. Of particular interest within the Act are Subtitles C, “Hazardous Waste Management,” and D, “State or Regional Solid Waste Plans.”

An overview of RCRA is available at <https://www.epa.gov/rcra>

42 USC, Chapter 103, Sections 9601 et seq. 1980. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). December 11. On-line address: <http://www4.law.cornell.edu/uscode/42/ch103.html>

CERCLA, commonly known as Superfund, provided federal agencies with the authority to respond directly to releases or threatened releases of hazardous substances capable of endangering human health and the environment. CERCLA also created a tax on the chemical and petroleum industries, which went to a trust fund for cleaning up abandoned, historical, or uncontrolled hazardous waste sites. The Superfund Amendments and Reauthorization Act (SARA) of 1986 reauthorized CERCLA cleanup activities and added technical requirements, enforcement authorities, site-specific amendments, and definition clarifications.

An overview of CERCLA is available at <http://www.epa.gov/superfund/policy/cercla.htm>.