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Standard Guide for Developing Representative Background Concentrations at Sediment Sites—Framework Overview, Including Conceptual Site Model Considerations[1]

This standard is issued under the fixed designation E3382; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide provides an overarching framework for the development of representative background concentrations for sediment at contaminated sediment sites. It is intended to inform, complement, and support (but not supersede) the requirements or guidelines established by local, state, tribal, federal, or international agencies.

1.2 Technically defensible representative background concentrations for sediment are critical for several purposes (Guide E3242) (**1**)[2]. These include sediment site delineation, establishing remedial goals, remedy selection, assessment of risks posed by representative background concentrations, and establishing appropriate post-remedial monitoring plans.

1.3 As part of the overall framework presented in this guide, Guide E3240 provides a general discussion of how Conceptual Site Model (CSM) development fits into the risk-based corrective action framework for contaminated sediment sites. However, not all elements of a CSM need to be considered when developing representative background concentrations for sediment at a sediment site; those that do are discussed in detail in Section 7 of this guide.

1.3.1 As additional data are collected and analyzed, the sediment site CSM should be updated as needed.

1.3.2 This guide is related to several other guides. Guide E3344 describes how to select appropriate background reference areas. Guide E3164 covers the sampling methodologies used in the field to obtain sediment samples (whether from the sediment site or background reference areas), and Guide E3163 discusses appropriate laboratory methodologies to use for the chemical analysis of potential contaminants of concern (PCOCs) in sediment samples. Guide E3242 describes how to evaluate candidate background data sets (including the use of statistical, geochemical, and chemical forensic methodologies) to obtain representative background data sets and then how to use these data sets to develop representative background concentrations for sediment. Relevant content contained in Guides E3163, E3164, E3242, and E3344 is summarized herein, but the individual guides should be consulted for more detailed coverage of these topics.

1.4 Representative background concentrations for sediment are typically used in contaminated sediment corrective actions performed under various regulatory programs, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Although many of the references cited in this guide are CERCLA oriented, the guide is applicable to corrective actions performed under local, state, tribal, federal, and international corrective action programs. However, this guide does not provide a detailed description of the existing background requirements or guidance for each jurisdiction. The requirements for the regulatory entity under which the corrective action is being performed should be reviewed to confirm compliance.

1.5 This guide would optimally be applied at the start of any sediment corrective action program but can be used at other points in the program as well.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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[1] This guide is under the jurisdiction of ASTM Committee E50 on Environmental Assessment, Risk Management and Corrective Action and is the direct responsibility of Subcommittee E50.04 on Corrective Action.

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[2] The boldface numbers in parentheses refer to a list of references at the end of this standard.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D7659 Guide for Strategies for Surface Sampling of Metals and Metalloids for Worker Protection

D7720 Guide for Statistically Evaluating Measurand Alarm Limits when Using Oil Analysis to Monitor Equipment and Oil for Fitness and Contamination

E178 Practice for Dealing With Outlying Observations

E1689 Guide for Developing Conceptual Site Models for Contaminated Sites

E2993 Guide for Evaluating Potential Hazard in Buildings as a Result of Methane in the Vadose Zone

E3163 Guide for Contaminated Sediment Risk-Based Corrective Action—Selection and Application of Analytical Methods and Test Procedures

E3164 Guide for Contaminated Sediment Site Risk-Based Corrective Action – Baseline, Remedy Implementation and Post-Remedy Monitoring Programs

E3240 Guide for Risk-Based Corrective Action for Contaminated Sediment Sites

E3242 Guide for Developing Representative Background Concentrations at Sediment Sites—Data Evaluation and Development Methodologies

E3248 Guide for NAPL Mobility and Migration in Sediment – Conceptual Models for Emplacement and Advection

E3282 Guide for NAPL Mobility and Migration in Sediments – Evaluation Metrics

E3300 Guide for NAPL Mobility and Migration in Sediment— Evaluating Ebullition and Associated NAPL/Contaminant Transport

E3344 Guide for Developing Representative Sediment Background Concentrations at Sediment Sites—Selection of Background Reference Areas

3. Terminology

3.1 *Definitions:*

3.1.1 *biogenic, adj*—resulting from the activity of living organisms. **(Guide E2993)**

3.1.2 *corrective action, n*—the sequence of actions that may include site assessment and investigation, risk assessment, evaluations of potential remedial action alternatives, interim remedial action, remedial action, operation and maintenance of the remedy, monitoring of progress, making "No Further Action" determinations, and completion of the remedial action. **(Guide E3240)**

3.1.3 *distribution, n—as used in statistics*, a set of all the various values that individual observations may have and the frequency of their occurrence in the sample or population. **(Guide D7720)**

3.1.4 *ebullition, n*—a process of gas (primarily methane) generation in sediments where the quantity of gas generated is sufficient for gas bubbles to nucleate, grow, fracture the sediment, and then escape into the overlying water body. **(Guide E3300)**

3.1.4.1 *Discussion*—Depending on the composition of a particular sediment, the gas bubbles generated and released by ebullition may strip constituents out of the sediment and transport these into the overlying water.

3.1.5 *non-aqueous phase liquid (NAPL), n*—chemicals that are insoluble or only slightly soluble in water that exist as a separate liquid phase in environmental media. **(Guide E3248)**

3.1.5.1 *Discussion*—NAPL may be less dense than water (light non-aqueous phase liquid [LNAPL]) or more dense than water (dense non-aqueous phase liquid [DNAPL]).

3.1.6 *oil-particle aggregate (OPA), n*—a particle formed in a surface water body resulting from the adherence to (or penetration into) an oil droplet by minerals or organic material. **(Guide E3282)**

3.1.7 *outlying observation, n*—an extreme observation in either direction that appears to deviate markedly in value from other members of the sample in which it appears. **(Practice E178)**

3.1.8 *sediment, n*—a matrix of porewater and particles including gravel, sand, silt, clay, and other natural and anthropogenic substances that have settled at the bottom of a tidal or nontidal body of water. **(Guide E3163)**

3.1.9 *sheen, n*—a silvery, rainbow, or dark rainbow film on the water surface. **(Guide E3300)**

3.1.10 *sheen blossom, n*—the emergence of NAPL transported by a gas bubble at the water surface followed by spreading of NAPL into a sheen at the air-water interface. **(Guide E3300)**

3.1.11 *upper tolerance limit (UTL), n*—the upper confidence limit (with specified confidence level) for a percentile of a distribution. **(Guide D7659)**

3.1.11.1 *Discussion*—The UTL is the value below which a specified fraction of the population will be found, with a specified level of confidence. For example, the 95/95 UTL is a value for which one would have 95% confidence that 95% of the population is below the UTL.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *anthropogenic background, n*—human-made substances present in the environment due to human activities, not specifically related to site-related releases or activities (current or historical).

3.2.1.1 *Discussion*—The definition of "anthropogenic background" varies with jurisdiction. In some jurisdictions, the regulator defines anthropogenic background as having both human-made and naturally occurring components. In this guide, the definition of anthropogenic background includes only the human-made component.

3.2.2 *background (aka "reference"), n*—substances, conditions, or locations that are not influenced by the sediment site; these are usually a combination of naturally occurring (consistently present in the environment but not influenced by human activity) and anthropogenic (influenced by human activity but not related to specific releases or activities [current or historical] at the sediment site) components.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.