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Standard Guide for Integrating Sustainable Objectives into Cleanup[1]

This standard is issued under the fixed designation E2876; 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 presents a framework that allows and encourages the user to address sustainable aspects (environmental, economic and social) within cleanup projects. The user may implement this guide to integrate sustainable objectives into cleanup while working within applicable regulatory criteria.

1.2 The guide provides an overarching, consistent, transparent and scalable framework that helps the user identify and incorporate sustainable best management practices (BMPs) into site cleanup (which includes assessment and remediation), and enables the user to perform measurement of BMPs during the cleanup process. See Appendix X1 for example BMPs.

1.3 The guide is intended to encourage incremental steps to incorporate sustainable elements into cleanup projects. The user chooses whether to pursue BMP implementation alone (Section 6) or to also measure the benefits of the implemented BMPs (Sections 6 and 7). The user also chooses the phases of the cleanup to which they apply the guide.

1.4 The guide should be implemented within the existing site assessment and remediation process. The approach described in this guide should be used with other existing technical tools and policy to encourage the consideration of a more holistic approach with a broader range of cleanup options and activities than traditionally employed (NICOLE 2012(**1**))[2].

1.5 BMPs implemented under this guide should address all three aspects of sustainability: environmental, economic and social, while assuring that human health and safety as well as ecological risks are addressed. The goal of implementing BMPs is to take actions to address the sustainable objectives identified for the site.

1.6 3.1.17 defines sustainable objectives; 3.1.15.1 defines sustainable aspects; 5.3 provides detail about core elements; and Section 6 describes a process to identify, evaluate, select, and implement BMPs.

1.7 While the guide specifically applies to the cleanup phases of a project (which includes assessment and remediation phases), decisions made in the cleanup may influence reuse activities. The anticipated reuse of the site may influence cleanup activities.

1.8 This guide may not be used as a justification for elimination or reduction of cleanup actions that are required to protect human health and the environment.

1.9 The guide is composed of the following sections: Section 2 Referenced Documents, Section 3 Terminology, Section 4 Significance and Use, Section 5 Planning and Scoping; Section 6 Selection and Implementation of best management practices (BMPs); Section 7 Quantifying Site-Specific results from BMPs; and Section 8 Documentation. Fig. 1 Using the guide is provided to assist the user in navigating the guide.

1.9.1 The user may pursue either the BMP implementation section or both the BMP implementation and measurement sections.

1.9.2 The environmental portions of the guide align with the Greener Cleanup Principles released by USEPA in August 2009 (**2**).

1.9.3 When evaluating the sustainable BMPs the user should consider the short and long-term environmental, economic and social aspects, including the potential negative impacts, while ensuring protection of human health and the environment.

1.10 The guide is intended to provide an overarching framework for integrating sustainable objectives in cleanup projects. The user may choose to consider the Guide E2893 for greener cleanups along with this guide to more fully address the environmental elements of a project.

1.11 When implementing this guide, the user must comply with all applicable federal, state, and local statutes and regulations requiring or relating to protection of human health and the environment. This includes, but is not limited to, laws and regulations relating to health and safety, of the surrounding community, or on-site workers. No action taken in connection with implementing this guide should generate unacceptable human health or ecological risks.

1.11.1 CERCLA and RCRA include worker safety as part of health and safety plans following OSHA regulations.

[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.

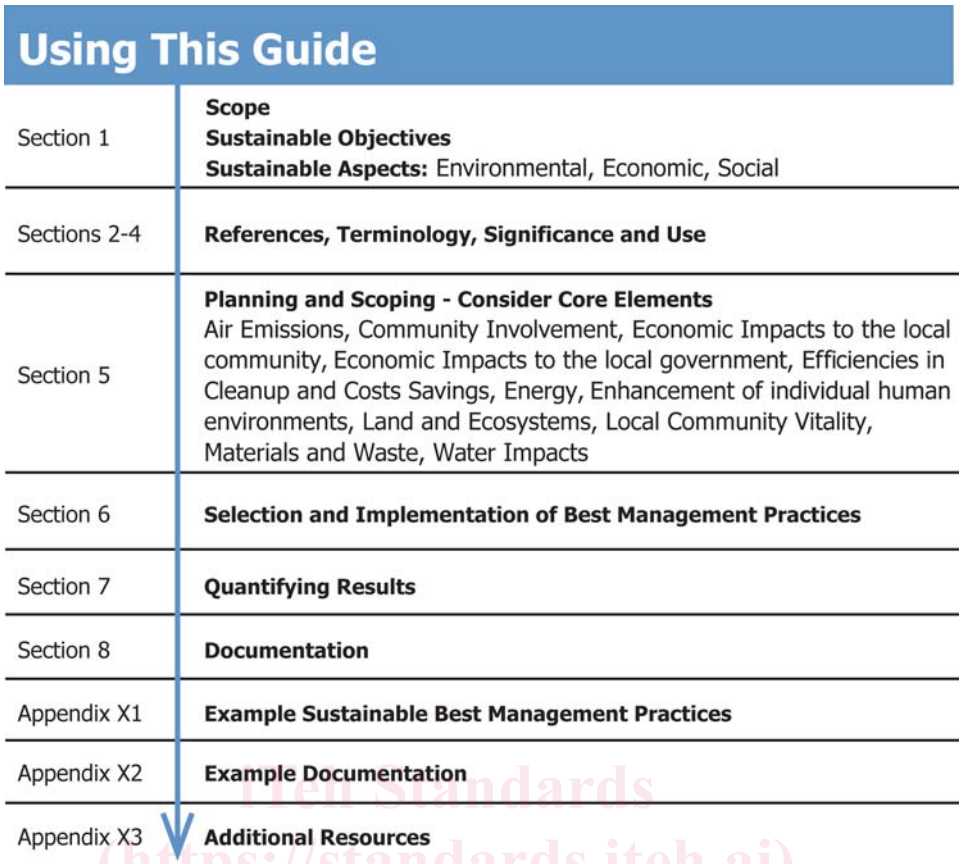

FIG. 1 Using this Guide

1.11.2 Most sites fall under specific regulatory programs that include provisions for health and safety plans following OSHA regulations. For more information see OSHA FAQ (**3**).

1.11.3 For all sites, the user must identify potential risks to the surrounding community as well as to site workers and manage those potential risks appropriately.

1.12 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

E1527 Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process

E1903 Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process

E1984 Guide for Brownfields Redevelopment (Withdrawn 2012)[4]

E2081 Guide for Risk-Based Corrective Action

E2091 Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls

E2137 Guide for Estimating Monetary Costs and Liabilities for Environmental Matters

E2348 Guide for Framework for a Consensus-based Environmental Decision-making Process

E2893 Guide for Greener Cleanups

3. Terminology

3.1 *Definitions:*

3.1.1 *Best Management Practice (BMP)*—for the purposes of this guide, an activity that, under most situations, improves one or more sustainable aspects (environmental, social, economic) of a cleanup at a specific site.

3.1.1.1 *Discussion*—For example, a BMP for the environmental aspect would reduce the environmental footprint of a cleanup activity.

3.1.2 *CERCLA*—the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 *et seq*., as amended, the primary federal statute that governs the imposition of liability for environmental cleanups. CERCLA is commonly referred to as Superfund.

3.1.3 *cleanup*—the range of activities that may occur to address releases of hazardous substances or petroleum products at a site.

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

[4] The last approved version of this historical standard is referenced on www.astm.org.

3.1.3.1 *Discussion*—In the environmental industry this term is also referred to as assessment and remediation.

3.1.4 *community engagement charrette*—a meeting or series of meetings where the user identifies the stakeholders and invites them into the discussion of actions for the site.

3.1.4.1 *Discussion*—The community engagement charrette is one option for stakeholder collaboration. The interactions between and among the user and the stakeholders (including the regulatory agency) have the intent of sharing information and options where collaboration and consensus are goals of the meetings. The user and stakeholders discuss the important aspects, issues, and preferences for the site assessment or remediation. The community engagement charrette can be a series of meetings held as the user continues to implement subsequent steps of a cleanup.

3.1.5 *economic multiplier effect*—the increased value of currency/money that is inserted into an area, city, or region (in the form of wages, purchased goods, services, and manufactures) due to the fact the currency/money circulates close to where it is first spent.

3.1.5.1 *Discussion*—For example, *(a)* $10 from a city worker's wages, buys *(b)* lunch from a corner restaurant, that pays *(c)* a cook's wages, that buy *(d)* shares in a community solar garden.

3.1.6 *hazardous substance* —a substance defined as a hazardous substance pursuant to CERCLA, 42 U.S.C. § 9601(14), as interpreted by EPA regulations and the courts.

3.1.7 *petroleum products*—those substances included within the meaning of the petroleum exclusion to CERCLA, 42 USC § 9601(14), as interpreted by the courts and EPA: "petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs *(A)* through *(F)* of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)."

3.1.8 *project team*—the group of individuals and experts brought together to implement the activities identified by this guide for a specific site. Typically, the project team includes the user (for example, environmental consultant, specialists), the state or federal regulator, site owner representative and additional experts as needed. For some sites the project team may include community stakeholders.

3.1.8.1 *Discussion*—For the purposes of this guide, multidisciplinary project teams will often be the most effective. Additional members of the team may include specific experts (for example, solar power engineers, architectural or historic preservation specialists, economists, social scientists, life-cycle analysts, risk assessors, decision-support specialists) and facilitators.

3.1.9 *RCRA*—the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 *et seq*., as amended, sometimes also known as the Solid Waste Disposal Act, the primary federal statute that, *inter alia*, establishes a framework for regulation of solid and hazardous waste and for promoting resource recovery through a federal-state partnership.

3.1.10 *reasonably anticipated future use*—future use of a site that can be predicted with a reasonably high degree of certainty given historical use, current use, local governmental planning and zoning.

3.1.10.1 *Discussion*—Other factors that may be considered in determining reasonably anticipated future use include accessibility of the site to existing infrastructure, recent development patterns, cultural factors, environmental justice, regional trends, and community acceptance.

3.1.11 *site*—the area(s) defined by the likely physical distribution of the chemical(s) of concern from a source area. A site could be an entire property or facility, a defined area or portion of a facility or property or multiple facilities or properties. One facility may contain multiple sites. Multiple sites at one facility may be addressed individually or as a group.

3.1.12 *small, non-complex site*—a site that meets the attributes in the guide for a project that is not large or potentially complex, as identified by the user.

3.1.12.1 *Discussion*—In the case of a small project of limited complexity and scope, the user may consider the following site attributes to streamline the implementation of the evaluation. If the site meets the following attributes, the site may be considered small and non-complex and use the adaptations identified in the guide, including reduced documentation. The attributes are:

3.1.12.1 *limited release complexity*—small number or well understood chemicals of concern (COCs), limited light non-aqueous phase liquids (LNAPL) and no dense non-aqueous phase liquids (DNAPL).

3.1.12.2 *small scale site (such as a service station) and well defined soil and/or groundwater impacts*—generally limited to a relatively small area.

3.1.12.3 *lower risk land use*—open space, unoccupied commercial, or industrial land use surrounding the site; low population density surrounding the site, or areas with no current complete exposure pathways (see Guide E2081 for discussion of complete exposure pathways).

3.1.13 *stakeholders*—individuals, organizations, or other entities who directly or indirectly affect, or are affected by, site releases or cleanup activities, or other interested parties. Stakeholders are site-specific and can include members of the local community (for example, residents, regular visitors, nearby businesses, economic development corporations, and downgradient groundwater users), regulatory agencies having jurisdiction over the cleanup, site owner or responsible parties, and future users of the property.

3.1.13.1 *Discussion*—The site owners may or may not be the parties responsible for the cleanup. In addition, there may be other federal, state, and local oversight entities for permitting, historic preservation, or storm water management who should be considered when determining the stakeholders for the project. In addition, there may be commercial and industrial stakeholders or interested third parties that may be affected by the cleanup activities or that can affect the cleanup. Under the guide, the user and the project team consider the ideas, potential issues, and concerns of the different stakeholders in the decision making process.

3.1.14 *surrounding area*—land area adjacent to and contiguous with a site extending to a boundary consistent with the area identified in the planning and scoping and used in selecting BMPs.

3.1.15 *sustainability*—as defined by a US Federal Executive Order under NEPA, sustainability means "to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations" (NEPA[1969] (**4**); E.O.13514 [2009] (**5**)).

3.1.15.1 *sustainable aspects*—as used in this guide, this is a collective term referring to the three key elements of sustainability: environmental, economic and social.

3.1.15.2 *sustainable core elements*—as used in this guide, these are the areas of focus within the sustainable aspects that provide direction and help define actions to be taken at a site. The sustainable core elements are listed in 5.3.

3.1.16 *sustainable development*—as defined by the Bruntland Commission (1985) (**6**), sustainable development is a pattern of development, "that meets the needs of the present without compromising the ability of future generations to meet their own needs." Also, as defined by Bromley (1999) (**7**), sustainable development is, "a present-day institutional arrangement of human actions that is guided by a vision of desired future alternative arrangements." This definition means that current and future site use and BMPs should consider intergenerational impacts and outcomes for the surrounding area.

3.1.17 *sustainable objectives*—the overarching ideas and themes used to guide the implementation of sustainability for a project. These ideas and themes generally arise from outside of the specific project (for example, municipal planning goals, corporate sustainable objectives) and are not developed exclusively for the specific project. They will apply to one or more of the sustainable aspects.

3.1.18 *TSCA*—the Toxic Substances Control Act, 15 U.S.C. § 2601 *et seq*., the primary federal statute that, *inter alia*, provides EPA with the regulatory authority to require reporting, record-keeping, and testing requirements for chemical substances and mixtures, and to establish restrictions for the manufacture, use, processing, storage, distribution in commerce, and/or disposal of certain chemicals and mixtures.

3.1.19 *user*—the party seeking to use this standard to integrate sustainable objectives into cleanup. See also 3.1.8, Project Team.

4. Significance and Use

4.1 *Flexibility*—Users may desire to incorporate sustainable aspects within the scalable framework throughout any or all phases of the cleanup, or any size of site.

4.1.1 For simplicity the term cleanup is used in the guide when referring to any of the cleanup phases, for example site assessment, remedy selection, remedy design and implementation, remedy optimization, operation, maintenance and monitoring, and closure.

4.1.2 Implementation of the guide is site-specific. The user may choose to customize the implementation of the guide for particular types of sites, for example, UST sites, dry cleaner sites, or particular phases of cleanup. Customization may be particularly relevant for groups of small, non-complex sites.

4.2 *Considerations*—The information provided in this guide provides a framework to evaluate sustainable aspects in the context of site cleanup. The guide helps users identify factors and activities they may want to consider in cleanup projects, while protecting human health and the environment.

4.3 *Sustainable Performance Criterion*—Based on the sustainable objectives identified for the site, users should implement one or more best management practices that substantially benefit each of the sustainable aspects (environmental, social and economic), see Section 6 for details. The user should demonstrate these benefits through publicly available documentation. Substantial benefits must be over and above those achieved by existing regulatory requirements, unless a regulatory agency adopts this guide for cleanup sites. In that case the regulatory agency will determine what constitutes substantial benefits under its own regulations.

4.4 *Transparency Goal*—The user should document the activities and evaluations performed while using this guide. The documentation is needed to demonstrate the sustainable benefits through public disclosure and transparency. See Section 8 for more information.

4.5 *Stakeholder Involvement*—The user should engage stakeholders as early as possible in the cleanup process. The planning and scoping phase of the project should identify the perspectives and values of the stakeholders and use that information to inform decision-making (see Guide E2348). Users should consider the input of different stakeholders, including the community, and implement BMPs favored by community members wherever possible. Consideration may include review of and integration into the community's approved Master Plan.

4.6 *Elimination of Uncertainty*—Professional judgment, interpretation, and some uncertainty are inherent in the process, even when exercised in accordance with objective scientific principles. In addition, new concepts and methods for integrating sustainable objectives into cleanup results will develop in the future.

4.7 Not every property will warrant the same level of evaluation of alternatives or approaches for integrating sustainable objectives in cleanup. The appropriate level of assessment and evaluation should be guided by the complexity of the cleanup project, the extent of impacts, the relative costs and benefits of various cleanup options and sustainable improvements, the potential limitation of resources for the cleanup, the future use of the site, other considerations associated with the site and affected community, and the regulatory requirements.

4.8 Worker health and safety issues are one of many considerations in the site cleanup decision-making process. If two approaches are equally protective of human health and the environment and fully meet regulatory requirements, then the one that is expected to provide greater worker safety should generally be preferred. Worker health and safety should not be used as a rationale for avoiding cleanup at sites.

4.9 The guide is divided into various sections for ease of use. See Fig. 1.

4.9.1 Section 5 includes information for the user about planning and scoping of the cleanup project to integrate sustainable objectives.

4.9.2 Section 6 of the guide includes steps to identify, evaluate, select and implement BMPs for a particular site.

4.9.3 Section 7 presents the evaluation and measurement of improvements for selected BMPs.

4.9.4 Section 8 presents information about documenting the activities conducted while implementing the guide.

4.9.5 Appendices include example BMPs (Appendix X1), example documentation forms (Appendix X2), and Additional Resources (Appendix X3). The example BMP list in Appendix X1 is not intended to be comprehensive, but rather to serve as a starting point for the user. This list may be added to or modified in the future as more experience is gained. The user is encouraged to consult other resources for additional BMPs that may be appropriate for a site. See also 6.2.1.

4.10 The spirit and intent of the guide promotes improvements in cleanup through integration of sustainable objectives.

4.10.1 A cleanup program, developed in conjunction with implementing BMPs following this guide, should fulfill regulatory cleanup requirements and timelines. The user should consider only cleanup approaches that will not result in unreasonable delay of cleanup.

4.10.2 The cleanup program should be consistent with reasonably anticipated future use of the site.

4.11 The user should consider the over-all affect of site cleanup in a holistic manner, including the adverse impacts of the cleanup and the consequences for the community. In order to accomplish this, during cleanup planning, the user should consider the sustainable core elements to provide direction and help define actions.

4.12 *Cost Considerations*—As with all projects, costs are an important factor. It is the prerogative of the user to determine how to evaluate and accommodate the financial implications of using the guide (see Guide E2137). The economic well-being of persons neighboring a cleanup and others within the community should be considered in the evaluation. The user should document the cost considerations. See Section 8 for information about documentation.

4.12.1 The user is encouraged to consider long-term benefits and financial savings in addition to short- and long-term costs associated with cleanups performed using this guide.

4.12.2 The user should consider advancing the benefits of persons not yet born as an alternative to those who enjoy current day, status quo benefits. Conventional economic efficiency assessment favors the latter persons. (Bromley, 1999) (**7**).

4.12.3 The user, when applicable, should evaluate short-term and long-term costs and implement appropriate financing strategies. An activity under this guide may have higher up-front capital costs (for example installation of solar panels or energy efficient insulation) but the overall long-term net costs associated with reduced energy use may result in a significantly less net cost compared to an alternative which relies on higher annual energy use.

4.12.4 This guide is intended to use environmental and community resources efficiently and to increase the short- and long-term benefits of a cleanup to its environment and community. This guide is not intended to justify the avoidance of regulatory requirements or any applicable cleanup standards.

4.13 *Regulatory Context*—Regulatory contexts where this guide is applicable include voluntary cleanups, brownfields cleanups performed in compliance with state voluntary cleanup programs, or brownfield initiatives, state-led enforcement cleanups, for example, most underground storage tank corrective actions by states paid through the American Recovery and Reinvestment Act of 2009, CERCLA removal and remedial actions, and other corrective actions required under RCRA. Users should, however, determine the regulatory context for each site and comply with all applicable laws, regulations and guidance (for example, environmental laws under CERCLA, RCRA, TSCA), including health and safety requirements under the OSHA and parallel state statutes and regulations.

4.13.1 Current state and federal cleanup processes already incorporate some greener cleanup principles or sustainable objectives (see NAS 2011) (**8**). This guide expands the evaluation and consideration of these aspects for interested users.

4.13.2 This guide provides ideas and options within a broad range of actions that integrate sustainable objectives throughout all phases of the cleanup. The guide is not, however, a stand-alone document and does not provide all the information needed to complete the cleanup process. In addition, when implementing this guide, the user must comply with all applicable state and local professional licensing requirements.

4.13.3 The use of this guide does not ensure compliance with any regulatory requirements. Additionally, users are cautioned that environmental regulators may not review or evaluate any particular aspect or results from using this guide as part of the cleanup approval process and the regulatory program.

4.14 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 and health practices and determine the applicability of regulatory limitations prior to use.

5. Planning and Scoping

5.1 *Introduction*—After a user decides to use this guide for a cleanup project, they should begin planning and scoping activities.

5.1.1 In the planning and scoping activities, the user identifies the project team and stakeholders, collects information and considers the many aspects of the cleanup project.

5.1.1.1 The user identifies the sustainable objectives (see 3.1.17) for each sustainable aspect (environmental, economic, social)

5.1.1.2 The user considers the applicable core elements in each sustainable aspect (see 3.1.15.1 and 5.3).

5.1.1.3 The user determines the cleanup activities and time horizon that may be involved in the application of the guide.

5.1.2 The user implements the activities in planning and scoping, working with the project team and stakeholders as applicable for the site.

5.1.3 Based on the information collected in planning and scoping, the user conducts the BMP selection and implementation (see Section 6 and Appendix X1).

5.1.4 Fig. 2 illustrates the connection between the sustainable aspects, core elements and BMPs.

5.2 *Information Gathering:*

5.2.1 The user ensures the cleanup is protective of human health and the environment and complies with all regulatory requirements.

5.2.2 The user identifies the current impact of the release, including COCs and impacted environmental media and the cleanup activities that are planned. This is typically achieved by analyzing sources, pathways and receptors (see Practices E1527, E1903 and Guide E2081).

5.2.3 The user identifies the relevant sustainable objectives for the specific project and site. Some users (or their clients) have corporate, municipal, regional, state or federal policies about sustainable objectives. To the extent that these exist and are applicable for the cleanup project and site, they should be identified and considered in planning and scoping. The sustainable objectives can be translated into actions (which are BMPs) through the core elements.

5.2.4 The user identifies the anticipated future use of the site, which may be continued operation of the current facility, a re-development of a property that is not currently in use, or another scenario. The use of the property before, during and after the cleanup will have important implications for the applicable core elements and potential BMPs to be implemented. For some sites, the future use is not known.

5.2.5 The user identifies what level of stakeholder collaboration is appropriate. See 5.4 for more information. The user considers the feedback and outcomes of the collaboration. Stakeholder collaboration may include a community engagement charrette (see Section 6 for more information).

5.2.6 The user considers the core elements that are applicable to the site based on the cleanup activities planned and the sustainable objectives to be integrated.

5.2.6.1 The complexity of the site may have an influence on the core elements and potential BMPs that could be practical or reasonable for a site.

5.2.6.2 Where there is interest from the community, the user and project team should consider community feedback when identifying the core elements.

5.2.6.3 The core elements are a useful tool to identify the specific areas where improvements in the cleanup project can be made that are applicable to the sustainable aspects.

5.2.6.4 The user identifies the core elements likely to be applicable to the project, so that as a group the core elements address all of the sustainable aspects. When the user considers the BMPs, the applicable core elements may be revised.

5.2.7 The user identifies the surrounding area within which the application of the guide would be used. For any project, the surrounding area is determined based on the extent of the release and the planned cleanup activities. When the user

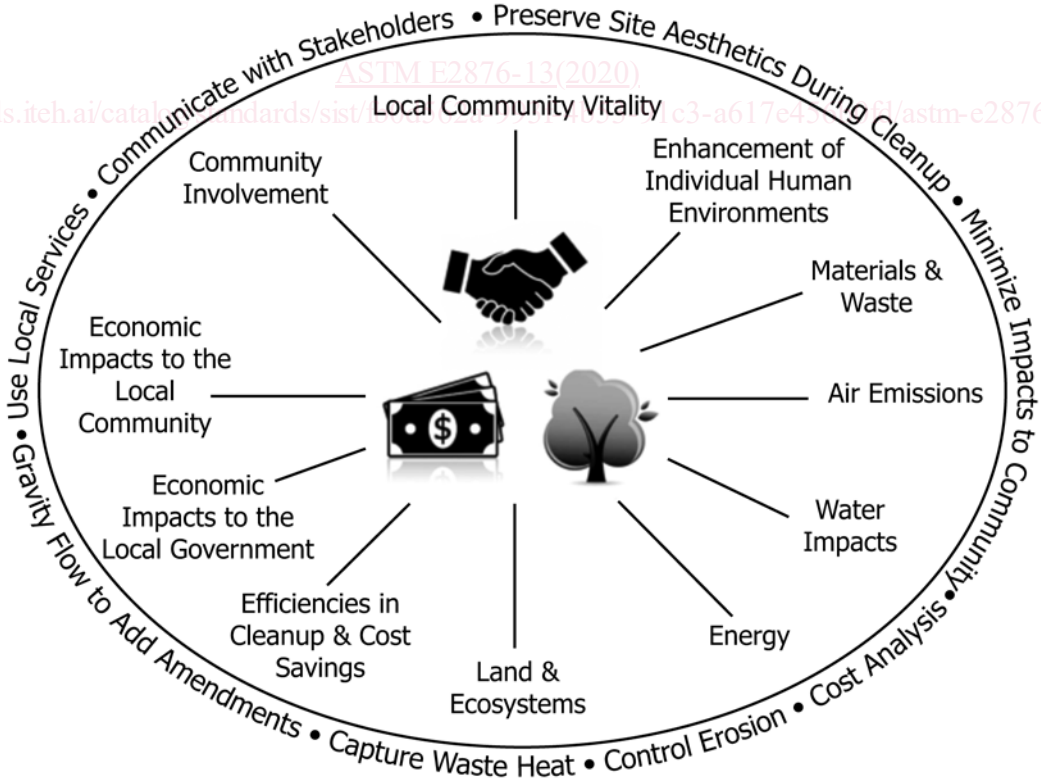

FIG. 2 Relationship Between the Sustainable Aspects (Center), Core Elements (Spokes) and BMPs (Outer Rim of Wheel)); see Appendix X1 for a more complete list of BMPs.

considers the BMPs, the definition of the surrounding area may be refined based on the specific BMPs to be implemented.

5.2.8 The user identifies the time horizon applicable to the project. Addressing some core elements and implementing some BMPs will have time factors. Some activities may be implemented throughout the life of the cleanup project; some may be specific to a particular phase of the work.

5.2.9 The user identifies the data that may be needed (see 5.5 for information about data needs) for using the guide.

5.2.10 The user should document the activities conducted under 5.2.1 through 5.2.9 and the results of the planning and scoping. See Section 8 for information about documentation.

5.3 *Sustainable Core Elements*—The following core elements are used to identify the activities within the cleanup project that could be improved by using the guide. The list is alphabetical and not hierarchical. This list includes the EPA's current five core elements for the environmental aspect (EPA 2009 (**2**)). EPA's core elements are total energy use and renewable energy use, air and atmospheric pollutants and greenhouse gas emissions, water use and impacts to water resources, materials management and waste reduction, and land management and ecosystem services. Additional core elements are included in this section to address all of the sustainable aspects. Each core element may have a primary connection to one sustainable aspect (for example, protection of water resources may be considered primarily an environmental aspect). The user is encouraged to consider the connections of the core elements across the sustainable aspects. For example, minimization of total energy use may apply as an environmental aspect and also an economic aspect.

5.3.1 *Air Emissions*—The user should attempt to reduce total air emissions of the cleanup, including emissions of air pollutants and greenhouse gases. Possible methods for reducing total air emissions may include minimizing the generation and transport of airborne chemical(s) of concern and dust, efficient use of emitting equipment (for example, vehicles), use of advanced emission controls, use of cleaner fuels or hybrid technologies, and use of non-mechanical treatment systems, such as in situ remediation. While this element addresses primarily environmental aspects, it may also have important social and economic benefits.

5.3.2 *Community Involvement*—Stakeholder participation in the decision-making process is fundamental to integrating sustainable objectives into cleanup. While this element is primarily social, it could have important economic and environmental benefits.

5.3.2.1 As a practical matter, the involvement of the community in the cleanup is a scalable activity depending on the complexity and size of the site, its cleanup activities and the interests of the community.

5.3.2.2 For small, non-complex sites, the community involvement activities could include public notices, site signage, web site information, community meetings, radio or television announcements, or distribution of fact sheets about the selection and implementation of sustainable BMPs.

5.3.2.3 At sites with complex activities, or with high level of interest on the part of the community, the level of involvement should be increased. In these circumstances, the user should identify and recruit representatives of key stakeholder groups (for example, through activities such as identifying local community groups, civic associations, chambers of commerce, homeowners associations, parks associations, clubs and contacting group leaders through personal invitations, door-to-door, letters, or phone calls). The user should encourage the active participation of the representatives in deliberative and decision-making processes, and aim for outcomes reflective of the interests of their constituent group and of the community as a whole. A wide range of activities may be used for community engagement.

5.3.2.4 At some sites community members may not be interested in participating in the cleanup. The user should proceed with the BMP selection and implementation by considering the best options that provide benefits to the sustainable aspects (environmental, economic and social). See 8.1.4, efforts taken for stakeholder collaboration and 8.2.4, making the documentation publicly available for information.

5.3.3 *Economic Impacts to the Local Community (for example, neighborhood)*—The user should identify and maximize the positive public economic impacts in the local community. One measurement of economic impacts is the economic multiplier effect. The user considers the local economy when selecting and managing contractor and supply companies. For example, consider supporting local service businesses, creating local jobs, purchasing supplies locally, and consider the fraction of the local labor pool that will be used to fill cleanup associated jobs. This element could also benefit social aspects.

5.3.4 *Economic Impacts to the Local Government (for example, city or county)*—The user should identify and maximize the positive public economic impacts and opportunities to the local government. For example, consider jobs, economic development areas, and increased grant and loan opportunities. While primarily economic, this element could benefit social aspects as well.

5.3.5 *Efficiencies in Cleanup and Cost Savings*—The user should consider the current anticipated cleanup actions for the site as a point of comparison for evaluating efficiencies and cost savings (see also 4.12). There are numerous ways to integrate sustainable objectives into the cleanup such as: reuse of resources, recycling, considering different remedial strategies for the source areas versus the diffuse contamination, retrofitting equipment, efficient operation and pump cycling, streamlining project management, and electronic reporting. Often, costs of cleanup alternatives and activities are compared as part of standard practice. The user could include this comparison of the cleanup activities across the alternative approaches, by looking at different BMPs. The comparison and follow-up documentation of the efficiencies and cost savings would provide a document that supports the use of sustainable methodologies, and the value of sustainable business practices. While this element is primarily economic, it could benefit social and environmental aspects as well.

5.3.6 *Energy*—The user should attempt to minimize conventional energy use by either reducing consumption and/or using renewable sources of energy. Possible methods may include evaluation and reduction of energy use, no idling policies on

site, use of energy efficient equipment, cycling or pulsing operation, use of onsite renewable resources (for example, wind, solar, etc.), purchase of renewable energy credits, and purchase of commercial energy from renewable resources. While this element addresses primarily environmental aspects, it may also have important social and economic benefits.

5.3.7 *Enhancement of Individual Human Environments*—Cleanup decisions can impact individuals working or living in proximity to the site, which may include cleanup personnel, and residents. The user should: choose work schedules and working hours that are compatible with community needs, make minimally invasive parking provisions for cleanup personnel, and abate noise, dust, and odor nuisances. This element may be considered under social, economic or environmental benefits, depending upon the application to the individual project.

5.3.8 *Land and Ecosystems*—The user should attempt to reduce impacts to the land and ecosystem. Possible methods may include minimizing the area requiring activity or use limitations or the removal or destruction of chemical(s) of concern. The user should limit the disturbance of vegetation, soils and habitat in the cleanup area, restore ecosystems by planting native vegetation, restore or create wetlands, preserve parkland, restore forested areas, and minimizing noise and light disturbance. While this element addresses primarily environmental aspects, it may also have important social and economic benefits.

5.3.9 *Local Community Vitality*—For the area or neighborhood immediately surrounding the site, there are numerous decisions, from the initial stage of site investigation through the final stages of post-cleanup demobilization and reuse that may impact the local community, from a human health, social and economic standpoint, often with a multiplier effect. The user should promote good relations with the community throughout the project. Examples include improved transportation and open space; preservation of other valued resources (for example, culturally or historically significant features); the choice of route for demolition and construction traffic and its impact upon noise, odors, dust, and congestion; (and the extent to which selection of the site reuse/redevelopment option, if applicable, addresses unmet community needs). Non-profit organizations in the area and public entities, such as state and local governments, are valuable resources and partners for information and input needs for the community. This element may be considered under both social and economic benefits.

5.3.10 *Materials and Waste*—The user should attempt to minimize the use of virgin materials and generation of waste throughout the cleanup. Possible methods may include using recycled and locally generated materials, reusing waste materials (for example, concrete made with coal combustion products), diverting construction and demolition debris from disposal by recycling recovered resources, and using rapidly renewable materials or certified wood products. While this element addresses primarily environmental aspects, it may also have important social and economic benefits.

5.3.11 *Water Impacts*—The user should attempt to minimize the use of water and impacts to water resources throughout the cleanup. Possible methods may include evaluation and reduction of water use in cleanup processes, use of water efficient products, water capture and reclamation for reuse, xeriscaping for revegetation, and employing BMPs for storm water, erosion, and sedimentation control. While this element addresses primarily environmental aspects, it may also have important social and economic benefits.

5.4 *Identification and Inclusion of Stakeholders:*

5.4.1 The cleanup activities may impact and involve various stakeholders. A key objective of this guide is encouraging collaborative participation with stakeholders and ensuring that the needs and preferences of stakeholders are considered. The user, working with the project team, should consider and accommodate stakeholder preferences to the extent possible, given regulatory and financial constraints, during the various phases of the cleanup. These preferences will vary greatly from site to site and the complexity of the cleanup. A small non-complex site with an underground storage tank and soil removal may not generate a large degree of stakeholder participation compared to a large former industrial facility that will be redeveloped with commercial and residential uses.

5.4.2 The user should consult all affected stakeholders and also potentially interested parties for the cleanup activities that are being designed and implemented.

5.4.3 The user should consider and address unique stakeholder groups for different phases of the cleanup process, as applicable for the site.

5.4.4 Users may choose to consult with third party organizations, for example, environmental organizations, professional organizations, non-governmental organizations, trade associations, and academic institutions, regarding potential ideas, issues, concerns, and impacts related to integrating sustainable objectives into cleanup activities and their implementation.

5.4.5 The user should identify potential issues that may need pro-active measures to reduce disturbance to stakeholders. These include off-site emissions, noise, and zoning changes, the associated level of effort required, and the possible need, resources, and time to conduct the cleanup.

5.4.6 The user should encourage stakeholders to reach a common understanding of the sustainable objectives and the core elements to be addressed during the cleanup project. For example, these objectives could be to include more recycling and waste minimization at the site or could be more significant, such as revitalization of the site for a higher value use (for example, brownfields redevelopment). Other factors that could be considered and discussed with stakeholders include the cost of various alternatives, and the positive, or negative, impacts of a cleanup on tax revenues, employment, owners, and businesses.

5.5 *Identification of Data Needs:*

5.5.1 The consideration of the core elements and identification of BMPs may require information that is beyond what is typically required for a cleanup project. In the planning and scoping activities, the user should identify these additional data needs and plan for the collection of these data.

5.5.2 Some information that should be collected is more typical of traditional cleanup projects. The user is encouraged to collect and document the data and information used in

applying this guide to support the transparency goal (see 4.4) for the application of the guide. For example:

5.5.2.1 The regulatory or voluntary program that will govern the cleanup, if applicable.

5.5.2.2 The reasonably anticipated future use of the site (for example residential, commercial, industrial, or recreational land use). Effective management or stewardship of short and long-term activities is an essential component of any cleanup project. Future obligations may include engineering controls, institutional controls, and activity and use limitations (Guide E2091), and can be accompanied by an environmental covenant, deed notice, or deed restriction.

5.5.2.3 *Project Schedule and Budget*—In some situations, it may not be feasible, given budgetary or schedule limitations, to implement an extensive evaluation of the different possible BMPs. Use of this guide should not unduly delay a cleanup, or result in the imposition of unwarranted or unjustifiable costs.

5.5.3 The user should consider available tools and data sources for information rigorous enough to meet the sustainable objectives (see NICOLE 2012) (**1**).

5.5.4 The user should consider and assemble an appropriate project team for the site.

5.5.5 The user and the project team should discuss, select and coordinate likely sources and methods for obtaining site data and other information for the project. This includes the tools required to undertake the project and the necessary engineering, technical, legal, and other professional support.

5.5.6 The user should consider the current anticipated cleanup actions of the site as a point of comparison for evaluating potentially applicable BMPs under this guide.

5.5.7 The user should apply existing guidance, as applicable, such as that provided by U.S EPA (EPA 2006) (**9**), to develop data quality objectives for determining the type, quantity, and quality of data for the application of this guide to the cleanup. The collected information should be relevant to the particular aspect evaluated and should satisfy the data quality objectives and goals for the decision.

6. Selection and Implementation of BMPs

6.1 The user considers the information collected in the planning and scoping performed under Section 5 to determine the activities they will conduct when selecting and implementing BMPs.

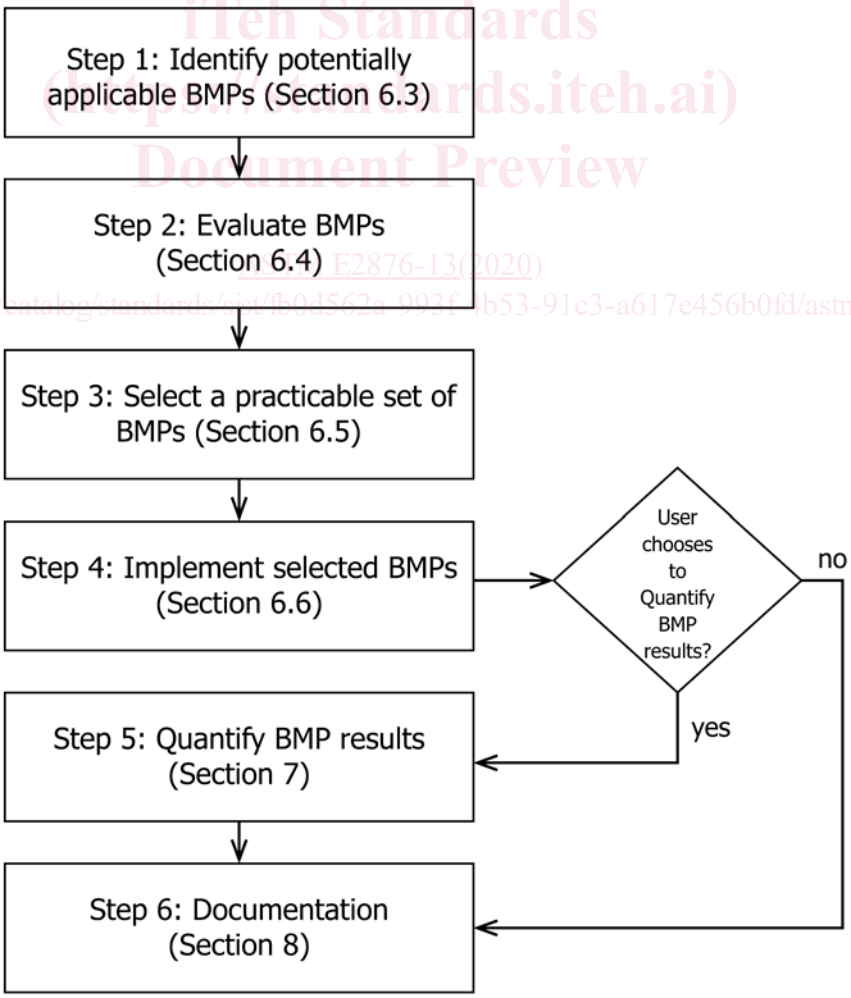

FIG. 3 BMP Selection and Implementation Process

6.2 *Considerations*—Fig. 3 depicts the BMP selection and implementation process.

6.2.1 The goal of implementing BMPs is to take actions to address the sustainable objectives identified for the site. Appendix X1 includes an example list of BMPs. The user may find the following references helpful when identifying and considering BMPs: Guide E1984-03; ITRC 2011a (**10**) and ITRC 2011b(**11**); Interorganizational Committee on Principles and Guidelines for Social Impact Assessment, 2003 (**12**); ISI, 2012; UNEP 2008 (**13**); CL:AIRE 2010 (**14**); CL:AIRE 2011 (**15**); SURF-US 2009 (**16**); Butler et al, 2011 (**17**); Havranek et al, 2010 (**18**); Holland et al, 2011 (**19**); Social Audit Network, 2009 (**20**).

6.2.2 The user selects and implements one or more BMPs that, as a group, address the sustainable objectives and substantially benefit all of the sustainable aspects (environmental, economic and social), without causing a significant negative impact to any of the individual sustainable aspects.

6.2.3 The user considers the BMPs that, individually, may address one or more core elements for the site.

6.2.4 Depending on the complexity of the site and the number of BMPs to consider, the user may choose from a range of evaluation methods (for example, comparison of advantages and disadvantages, ranking or rating systems, multi-criteria decision models) as the basis for selecting the BMPs (see USEPA 2011 (**21**), ITRC 2011b(**11**), Belton and Stewart, 2002 (**22**), Clemen 1996) (**23**).

6.2.5 The user is encouraged to consider and propose BMPs not included in Appendix X1 (see references in 6.2.1) that address the core elements for the site.

6.2.6 The BMPs may be applied independently to one phase of the cleanup, or carried through multiple phases of the cleanup, as selected by the user.

6.2.7 The user must document all of the BMPs (see 4.4) and the substantial benefits across the sustainability aspects (see 4.3).

6.2.8 The user engages stakeholders, in particular the community, prior to and during the selection of the BMPs. This will ensure that the site-specific interest and needs of stakeholders are incorporated into the decision-making processes.

6.3 *Identify Potentially Applicable BMPs.:*

6.3.1 The user confirms the phase or phases of the cleanup project for the current application of the guide.

6.3.2 The user identifies the unique technical tasks or activities needed to complete the phase or phases (for example, sampling, laboratory analyses, or equipment installation).

6.3.3 The user identifies the technical alternative(s) or approach(es) that best meet the criteria identified through the stakeholder collaboration and the regulatory and project requirements for each unique task (see Guide E2081).

6.3.4 The user confirms the core elements to be addressed for the phase or phases. BMPs should address each of the sustainable aspects (environmental, economic and social). Many BMPs actually provide benefits across multiple core elements and aspects (social, economic, and environmental). For each implemented BMP, the user should document which core elements and aspects (environmental, economic and social) are addressed and why.

6.3.4.1 Currently, state and federal cleanup regulatory authorities may not have the authority to review certain BMPs, for example those addressing social and economic aspects. However, it is recommended that all sustainability aspects are nevertheless addressed to enable a holistic application of sustainability to the project.

6.3.5 The user reviews the example list of BMPs in Appendix X1, and other resources for BMPs (for example, Holland et al. 2011 (**19**), Butler et al. 2011 (**17**)), the technical alternatives or approaches, and the core elements to identify those BMPs that could be applied.

6.3.5.1 The user may choose BMPs to cover each of the core elements (for example, a simple list of one BMP with substantial benefits for each core element for each sustainable aspect).

6.3.5.2 The user may choose BMPs that provide substantial benefits across multiple core elements and therefore cover more than one core element and sustainable aspect.

6.3.5.3 Users should select BMPs that provide benefits over and above those achieved by regulatory requirements (see 4.3 for more information).

6.3.5.4 The user is not limited in the number of potential BMPs identified. The user is encouraged to evaluate (see 6.4), select (see 6.5) and implement (see 6.6) as many BMPs as provide substantial benefits while minimizing negative impacts.

6.3.6 The user identifies the BMPs based on the planning and scoping activities and results, the scope and complexity of cleanup project, input from the project team, and comments and feedback from the community participation.

6.3.7 The list of BMPs may include BMPs that will be applicable throughout the cleanup project.

6.3.8 The user compiles the list of the potentially applicable BMPs.

6.4 *Evaluate BMPs:*

6.4.1 The user identifies a method to evaluate the BMPs identified in 6.3.

6.4.1.1 The evaluation method could be a ranking or rating system, a multi-criteria decision model (see USEPA 2011 (**21**), Belton and Stewart, 2002 (**22**), Clemen 1996 (**23**)), or another applicable method.

6.4.1.2 Detailed decision methods may not be valuable for small, non-complex sites.

6.4.2 Using the identified method, the user evaluates the BMPs. The user should consider:

6.4.2.1 *General Factors*—The implementability, potential linkages and synergies among the BMPs, advantages and disadvantages, potential negative impacts or tradeoffs among core elements, preferences of stakeholders, benefits to the community, and costs for the identified BMPs, see 4.12 for cost considerations, all may be important factors in evaluating the BMPs to be used.

6.4.2.2 *Time Horizon*—The time horizon for implementation and for the benefits to be realized for each BMP may be an important factor in evaluating the BMPs to be used.

6.4.2.3 *Surrounding Area*—The surrounding area identified for the application of BMPs may be an important factor in evaluating the BMPs to be used.

6.4.3 *Additional Considerations*—In some circumstances the large number of BMPs or implementation of BMPs, or both, may be complex. In these cases, it may be necessary to conduct a more detailed analysis of various BMP factors in order to understand potential benefits, limitations, and tradeoffs among the core elements. This analysis may be qualitative or quantitative and it identifies the key factors that guide decision making on any particular site, including, which factors have only marginal impacts on BMP selection.

6.4.4 The results of the conducted evaluations are used to identify the BMPs to implement.

6.4.5 The user documents the evaluation methods used and the results of the evaluations. See Section 8 for information about documentation.

6.5 *Select BMPs:*

6.5.1 The user selects the BMPs to implement based on the evaluation performed in 6.4. The user should identify the practicable set of BMPs for the site. The selected BMPs should substantially benefit each of the sustainable aspects without causing a significant negative impact to any of the sustainable aspects.

6.5.2 The user documents why specific BMPs were chosen and why specific BMPs were not chosen.

6.6 *Implement BMPs*—The user implements the selected BMPs.

6.6.1 If during implementation, a selected BMP is determined not to be effective, impracticable to implement, or cost prohibitive, then the user may elect not to implement that specific BMP. The user should document the rationale for not implementing a selected BMP. See Section 8 for information about documentation.

6.6.2 The user should return to the potentially applicable BMPs (see 6.3, 6.4 and 6.5) to determine if a new BMP can be identified. The user documents the information for the new BMP.

6.6.3 The user implements the BMPs during the cleanup project. The user should consider if there are specific monitoring activities that will measure the effectiveness of an implemented BMP. If specific monitoring activities are applicable, then the user should implement those activities and document them.

7. Quantifying Site-Specific Results from BMPs

7.1 The user may choose to quantify the impacts of the implemented BMPs for their individual site. Some BMPs may not include quantifiable attributes and therefore quantification may not be possible.

7.2 The user identifies the quantifiable BMPs and the attributes, benefits, and metrics for each BMP. The user should also identify measurable attributes to understand potential negative impacts (See Havranek et al., 2010 (**18**)).

7.2.1 There are many different attributes or benefits from the implementation of BMPs that could be monitored and measured. The specific measurement associated with a BMP is its metric.

7.2.2 Examples of metrics for different BMPs include percentage of local workers hired, dollars spent within local community, tons of waste reduced, amount of material recycled, volume of water saved, number of trees planted, reduction in fuel usage, reduction in greenhouse gas emissions, and percentage of renewable energy used.

7.3 The user identifies the monitoring and data collection needed for the metric for each BMP.

7.4 The user implements the monitoring and data collection for the metrics.

7.5 The user estimates the site-specific, increased benefits based on the results of the monitoring and data collection. The user should also provide any information collected about potential negative impacts.

7.5.1 Depending on the number, type and complexity of the implemented BMPs and the benefits identified, the user may choose a qualitative or quantitative analysis to understand the benefits and the potential variation in the estimation of the benefits.

7.5.2 The user should also use any data collected to provide information about potential negative impacts, or tradeoffs among the core elements, as part of the analysis.

7.6 The user prepares documentation of the estimation methods used, and the results of the increased benefits, negative impacts, or tradeoffs, (if any), from the implemented BMPs. See Section 8 for information about documentation.

8. Documentation

8.1 It is important to document the activities and evaluations performed while implementing this guide in order to demonstrate the sustainable benefits through public disclosure and transparency (see 4.4).

8.1.1 The documentation should be in a format, at a level of detail, and in plain language that is useful to the general public. In addition, in some communities it is appropriate to prepare the documentation in multiple languages.

8.1.2 The documentation should be commensurate to the work performed and the complexity of the cleanup at the site.

8.1.3 If the site meets the definition of a small non-complex site (see 3.1.12 and Appendix X2), the user should include in the documentation the applicable information for the site.

8.1.4 The documentation of the guide's implementation is made publicly available by the user. The user should consider the applicable options for publication that are relevant to the site. Some options include: inclusion with regulatory submittals, posting to a web page, using social media, or filing at a local library or community center.

8.2 The documentation should include the activities conducted and the outcomes.

8.2.1 *Information Gathering*—Each of the tasks in planning and scoping involves collecting information relevant for the application of the guide. The documentation for planning and scoping should include information for the key issues and provide the sustainable objectives, time horizon, and surrounding area for the application of the guide.

8.2.2 *Data Needed and Collected to Implement the Guide*—The documentation should include the data and information collected under 5.5.