Let's Talk "Green"...at LUST Sites

ASTM's New "Standard Guide for Greener Cleanups"

by Alexander Wardle, Kevin Carpenter, Tom Potter

Greener Cleanups have their origins in the 1999 Clinton Presidential Executive Order *Greening the Government Through Efficient Energy Management*. In 2007 a Bush Presidential Executive Order, *Strengthening Federal Environmental, Energy and Transportation Management*, gave further impetus to the concept of integrating sustainability- and life-cycle-assessment principles into government activities. Those ideas have been developed for site remediation practices by three key sectors: private, state, and federal.

Private industry started the ball rolling with its Sustainable Remediation Forum (SURF) in 2006; state government followed with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Greener Cleanups working group in 2007; and USEPA published its technical primer, *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites*, in 2008, followed by the *Principles for Greener Cleanup* in 2009. The "*Principles*" is the defining document for USEPA's greener cleanup policy, establishing a framework with five core elements for evaluating greener cleanup activities. The core elements are: minimize total energy use and maximize use of renewable energy; minimize air pollutants and greenhouse gas emissions; minimize water use and impacts to water resources; reduce, reuse, and recycle material and waste; and protect land and ecosystems.

In 2009 USEPA asked the ASTM International (ASTM) to initiate a task group to develop a greener cleanup standard through its consensus process. In the same period the Department of Energy, the Army, Navy, and Air Force all developed guidance and approaches to green and sustainable remediation. In 2011, the Interstate Technology and Regulatory Council (ITRC) published two documents on Green and Sustainable Remediation.

ASTM's task group, which included a broad range of stakeholders from the cleanup community, released the *Standard Guide for Greener Cleanups* E2893 in November 2013 (see resources listed at the end of the article). On December 23, 2013, Mathy Stanislaus, USEPA Assistant Administrator for the Office of Solid Waste and Emergency Response (OSWER), issued a memo to regional administrators and OSWER program directors recommending that they facilitate and encourage use of the standard to reduce the environmental footprint of cleanup activities.

What Is a "Greener Cleanup?"

A greener cleanup seeks to minimize energy use, waste generation, and other external impacts (e.g., air emissions) that might be associated with the remediation. It includes all phases of cleanup, from initial site characterization to final site closure. A greener cleanup does not require an assessment of financial cost, broader sustainability issues, or remediation objectives, which remain determined by the relevant regulatory program laws, regulations, and guidance.

How is a greener cleanup adopted for a LUST case, and what does that mean to the case management process? In a 2009 survey the top barriers the ASTSWMO workgroup identified to adopting greener cleanup methodologies included: a lack of awareness of greener cleanup practices, the potential for more costs, the absence of any regulatory authority to require greener cleanups, the lack of any incentive to promote greener cleanups, and the perception that a "greener cleanup" is "greenwashing" used to justify a less effective remedial solution.

For these reasons and others, incorporating greener cleanup methodologies is not yet part of the routine case management process. What follows is a brief review of the ASTM process and examples of how, within the normal regulatory process, the ASTM standard approach can be used to identify and select "greener cleanup" practices that are as effective as a "traditional" cleanup.

The ASTM process

The ASTM guide describes a process that can be used to select practices that minimize the environmental footprint of a cleanup project and to ensure that the activities selected are appropriate and properly documented.

The standard identifies five cleanup phases—site assessment (characterization); remedy selection; remedy design and implementation; operation and maintenance; and remedy optimization—each of which can be evaluated and optimized with regard to implementing "greener" best management practices (BMPs). In most cases, LUST sites are sufficiently small that a review of BMPs for each phase may be sufficient. Generic tools, such as the *Leaking Underground Storage Tank Footprint* calculator described in *LUSTLine* #73, may be appropriate ways of providing a program-wide quantitative assessment of remediation technologies without requiring a site-specific evaluation.

The BMP evaluation consists of five steps:

1) Review BMPs that are potentially applicable to the site conditions and cleanup phase

2) Prioritize BMPs with the greatest potential for reducing the environmental footprint (essentially based on the five "core elements" described in USEPA's 2009 *Principles for Greener Cleanup*)

3) Select BMPs from the prioritized list for implementation and provide rationale for those not implemented

4) Implement the BMPs

5) Document the work.

Figure 1. *Hollow stem auger (HSA) vs. MIPS and LIF with direct push. Note the waste drum for the HSA rig and the bucket for the direct push—a significantly different amount of waste.*

ASTM provides a list of over 150 BMPs which can be sorted by cleanup activity (e.g., sampling and analysis), remediation technology, or core element.

How Might This Process Work at a LUST Site?

Here are some examples of some practices that have been selected at LUST sites, and how they might be evaluated using the ASTM process.

Site Characterization

Traditional LUST site characterizations typically include three to five, eight- to twelve-inch diameter, hollow-stem auger boreholes with four-inch monitoring wells. Each 30-foot well typically generates four to five drums of potentially contaminated soil, requiring offsite transport and disposal. In addition, well purging during sampling requires removal of three well volumes of water and may generate 20 to 30 gallons of water, again, requiring containment and offsite disposal.

Using Table X3.1 of ASTM E2893-13, "Greener Cleanup BMPs," waste disposal options could be to "segregate drilling waste based on location and composition to reduce the volume disposed of off-site, or to "use alternative drilling methods, including direct-push technology…to minimize drill cuttings that require disposal" (Figure 1). A sampling and analysis BMP could be to select the "direct sensing, non-invasive technology."

Another best management practice could be to use "treated water" from borehole purging to manufacture the well grout. Implementation of these BMPs would reduce the environmental footprint across all five core elements discussed in the framework for both the USEPA *Principles* and the ASTM standard.

Monitoring

With regard to site monitoring, selecting ASTM's multi-port sampling systems BMP (particularly advantageous in bedrock) minimizes the number of wells installed,

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Figure 2. *A multi-level ("CMT") bedrock monitoring well with multiple groundwater elevation gauges. A single well gains the same data as five separate wells at multiple elevations.*

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which addresses the "materials and waste" and "land and ecosystems" elements (Figure 2). Selecting passive or no purge groundwater sampling addresses the core elements of water use and materials and waste. Additionally, in-situ monitoring with automated data logging addresses the core elements associated with energy, air, and water by minimizing sampling visits and volumes.

Corrective Action

As for corrective action, the opportunities for implementing green cleanup BMPs multiply, from the initial selection of remedial technologies through to onsite implementation. Tools such as the *Leaking Underground Storage Tank Footprint Calculator* described in *LUSTLine* #73 help quantify the power and fuel category of potential remedial technologies.

Particular corrective action options can be further evaluated using the ASTM BMPs. Examples of BMPs used at gasoline releases under existing regulatory procedures include phytoremediation with native or non-invasive plant varieties, passive sub-slab depressurization and one-way check valves to promote barometric pumping, and a directly wind-driven compressor operating a biosparge system to increase the dissolved oxygen at a gasoline UST spill site (Figure 3).

A Matter of Mindfulness

These brief examples show that following a "greener cleanup" approach at LUST sites using the ASTM standard guide need not be a heavy lift—alternative and effective technologies exist, their benefits can be described, technologies already used at LUST sites are applicable, and they do not require regulatory change to implement. The "greener" approaches for LUST sites are often no more expensive than traditional methods and frequently save money. The use of "greener cleanups" at LUST sites is, as with so many environmental decisions, more a matter of making mindful choices than being precluded by regulatory or cost barriers.

Figure 3. *A wind-driven compressor operating a biosparge system to increase dissolved oxygen.*

Check Your Case Files for Examples

Deborah Goldblum, with USEPA Region 3's RCRA program, has been a leading contributor to national efforts to integrate greener cleanups into remediation projects. She is interested in highlighting various applications of ASTM's *Standard Guide for Greener Cleanups*. Contact Deb at Goldblum.deborah@epa.gov if you have a project that might be a suitable candidate.

USEPA is holding a series of Greener Cleanup Standard Guide state trainings. The next will be at the USEPA Region 5 Office in Chicago on November 18, 2014; 9:30 – 4:30 Central Time. For remote access, contact Brad Bradley at Bradley.brad@epa.gov. Check USEPA's Contaminated Site Clean-Up Information (Clu-in) website (*http://www.clu-in.org/live/*) for details on other forthcoming training opportunities. ■

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References

ASTM, E2893, *Standard Guide for Greener Cleanups*, *http://www.astm.org/Standards/E2893.htm*, 2013.

Horinko Group, *The Rise and Future of Green and Sustainable Remediation*, 2014.

Interstate Technology and Regulatory Committee (ITRC), *Green and Sustainable Remediation: State of the Science and Practice*, May 2011.

Linder, S., Magnan E., Graves, K., Barnes, A., Cooper, K., and Martinson, M. It's the LUST Footprint Calculator (a la Green Remediation), *L.U.S.T.Line* Bulletin 73, June 2013.

The President, *Executive Order 13123 – Greening the Government through Efficient Energy Management*, Federal Register volume 64, No. 109, June 8, 1999.

The President, *Executive Order 13423 Strengthening Federal Environmental, Energy and Transportation Management*, Federal Register, Volume 72, No 17 2007.

USEPA, *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites*, 2008.

USEPA Office of Solid Waste and Emergency Response, Principles for Greener Cleanup, August 2009.

USEPA (Mathy Stanislaus), *Encouraging Greener Cleanup Practices through use of ASTM International's Standard Guide for Greener Cleanups*, December 2013.

Resources

ASTSWMO: *http://www.astswmo.org/Pages/Policies_and_Publications/Sustainability/Greener_Cleanups.html*

ITRC: *http://www.itrcweb.org/Team/Public?teamID=7*

USEPA: *http://www.clu-in.org/greenremediation/*

http://www.epa.gov/oswer/greenercleanups/

SURF: *http://www.sustainableremediation.org/remediation-resources/*