Lean and Green Soil Remediation

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Sustainable soil remediation may appear to be a contradiction. Source removal and disposal is the most frequently selected soil remediation method when comparing costs but may not be the cheapest remediation method when off-site impacts and future liability costs are included. In many cases, source removal and off-site disposal is not the remediation option that has the least impact to the environment, human health, or natural and capital resources.

Currently the project costs for source removal includes only the cost of excavating, hauling and disposing of the contaminated soil at a state approved landfill and restoring the site to original grade using virgin fill and native ground cover. Community impacts such as air emissions from excavation, backfilling and hauling equipment; transfer of contamination to another site; or interference to adjacent property owners and neighbors are not part of the remediation selection process unless excavation costs exceed $500,000. Then these community and societal costs and benefits are included in the remediation selection process.

Evaluating the costs and benefits of community impacts is not easy since there is no single quantitative or qualitative guideline to use. Evaluation methods such as lifecycle or net environmental benefit analysis can quantify community and resource impacts that are not included in current FDEP templated cost proposals. The Sustainable Remediation Forum (www.sustainableremediation.org) has issued a paper that provides an in-depth discussion on calculating community costs of remediation options.

Risk Based Closure (RBCA) is an option when the soil plume is not in contact or leaching into the groundwater or surface waters, can be isolated from human or animal contact, is less than 5x the cleanup target level and future exposure is limited or controlled. The benefits and cost savings of leaving trace levels of impacted soil in place is easily quantified and is used in nearly every state to manage risk and limited resources.

Examples of impacted plumes that can remain in place with controls is dry soil containing petroleum compounds (TRPH) that are not identified by EPA Methods 8260 or 8270 and are located underneath a sidewalk, building or other impervious surface. Unless the plume is leaching into the groundwater or sewer system, leaving the soil in place with the contaminant location noted in the deed or otherwise recorded in county property records is the sustainable choice.

The plume is isolated from the environment and human contact until it is disturbed due to construction activities or acts of God such as a hurricane or flood. The closure order specifies the institutional and engineering controls to be followed to protect the environment and human health. Implementing the controls is significantly cheaper than removing and restoring man-made objects to get at the impacted soil.

When a RBCA is not an option, excavation and landfill disposal should not be the only option studied. In-situ and ex-situ options need to be studied using a lifecycle or net environmental benefit analysis to identify community and societal impacts that these remediation processes minimize or do not incur.

Phytoremediation, thermal treatment, and chemical injection can remediate impacted soil in place or on-site without the need for hauling and disposal off-site. Phytoremediation uses plants to absorb the contaminates in the soil. The oak and palm trees at former cattle vat locations are a prime example in Florida. Low levels of arsenic have been absorbed into the trees reducing the soil content to below cleanup targets. The trees can be harvested to remove the arsenic from the site; leaving the soil in place.

Terran Corporation and CES had developed patented, trademarked thermal remediation processes that use electricity to mobilize organic contaminates towards chemical or biological reagents. DC electrical systems are used to generate the electricity that heats and pushes the contaminates towards chemical reagents or zero valent ionic barriers. The reagents or barriers destroy or immobilize the contamination in-place without the cost of excavation and disposal or surface treatment systems. These systems work best in low permeable soils such as clays and limestone.

If in-situ thermal treatment is not an option, a mobile thermal treatment system developed by Clark Environmental can work. The organic contaminated soil is excavated and fed into the treatment system. After the organic contamination is destroyed, the treated soil is returned to the excavation area as fill dirt. Excess soil can be used as cover or fill dirt at off-site locations.

If on-site treatment is not an option, off-site thermal treatment is more sustainable than landfilling. The organic contamination is destroyed not transferred to another site that could leak or otherwise release the contamination into the environment.

Sustainable soil remediation is possible when including the costs of community or societal impacts in project costs. It is more than removing contaminated soil from the project site. Sustainable remediation includes minimizing all impacts to the environment during the remediation process and preventing future problems from occurring.