Brownfield Redevelopment Technical Brief

***Green Guide for Health Care* Version 2.2 Sustainable Sites Credits 3.1, 3.2, 3.3**

Overview

Across the United States, an estimated 400,000+ sites are classified as brownfields. Brownfields are sites whose prior use resulted in real or perceived site contamination, dampening prospects for site purchase and investment for fear of environmental liability. The brownfield designation is relevant for accessing funds either from the US EPA or from state or local environmental assessment or cleanup funds to defray redevelopment costs. When contamination is found on a brownfield site, the property is required to conduct site remediation to acceptable standards prior to redevelopment. Contaminants of concern may be located in surface soil, buildings, structures or their foundations, containers, subsurface soil, or groundwater aquifers. The level of remediation required reflects: 1) the type and level of contamination, and 2) the nature of development and reuse planned for the site.

The *Green Guide for Health Care* recognizes the additional effort required to develop brownfield sites and the benefits of infill construction by offering three points for brownfield remediation and redevelopment.

GGHC v2.2 Sustainable Sites Credit 3.1 directs projects to “effectively remediate site contamination” in accordance with the relevant jurisdiction’s criteria, recognizing that local standards vary from jurisdiction to jurisdiction.

GGHC v2.2 Sustainable Sites Credit 3.2 rewards projects that reach the residential standard of remediation put forward by the EPA Region 9 Preliminary Remediation Goals (PRGs). This enhanced remediation provides a consistent, measurable standard that yields a level of chemical presence often exceeding untouched greenfield sites. In addition to providing a consistent standard, residential remediation speaks to the health mission of the *Green Guide for Health Care*.

GGHC v2.2 Sustainable Sites Credit 3.3 awards a point for projects that prevent infiltration from adjacent contaminated sites. Many brownfield sites are not islands of contamination. They may be located in industrial areas adjacent to or near sites contaminated with similar or entirely different environmental challenges. However, most brownfield regulations do not take into account the possibility of a remediated site’s re-contamination from its surroundings. The *Green Guide* advocates minimizing potential future hazards to a remediated site by either selecting a brownfield site that is not located in the vicinity of other contaminated sites or by implementing preventative measures that protect the site from contamination by its neighbors.

For many projects, brownfield remediation may contribute to the site development density credit (GGHC v2.2 Sustainable Sites Credit 2) and the preservation of open space credit (GGHC v2.2 Sustainable Sites Credit 5.1) in addition to the three Brownfield Remediation credits, totaling 5 possible points. This accumulation of points reflects the relative difficulty and expense of achieving appropriate remediation.

The Challenges

The US policy developed in response to abandoned hazardous waste sites that pose immediate health hazards (referred to as Superfund sites) also established a “polluters pay principle.” This principle applied broadly to all sites where environmental contamination may be found, including low levels of contamination not thought to pose serious public health or environmental hazards. The “polluters pay principle” created fear among lenders, investors and property owners that acquiring property might result in environmental liability. Additionally, inconclusive scientific data concerning the true risks posed by

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contaminated sites and the impact of perceived contamination have aggravated fears regarding the connections between human health and environmental contamination on brownfield sites.

Appropriate remediation practices often require a substantial capital investment. Coupled with the real and perceived health risks associated with brownfield sites, the financial concerns often heighten a health care facility's reluctance to redevelop such a site.

Best Practices

Brownfield remediation is a relatively new field, though based on decades of experience from cleaning contaminated Superfund, Federal facility and other contaminated sites. New technologies and strategies are advancing rapidly, expanding the number and kinds of options available to project teams. The newness of the field and its rapid advances also pose a challenge to teams working under pressures to decide quickly which strategies make the most sense for their circumstance.

Effective brownfield remediation follows a program of research, evaluation, and weighing the relative effectiveness of different strategies.

Site Evaluation

- **Determine what contaminants are present.** Data is available on the toxicity of many chemicals, but not all. This first step requires soil samples and chemical analysis.
- **Determine the quantity of each contaminant on-site.** Most sites are contaminated with more than one chemical, creating further technical challenges in identifying and addressing potential site hazards.
- **Determine the effect of site conditions on the spread of contamination.** For example, large, coarse-grained soil, high groundwater levels, and contaminants that may migrate allow many pollutants to seep deep into the ground, possibly contaminating ground water and soils.
- **Determine who will occupy the site.** The nature of the site's use after redevelopment should inform cleanup standards where possible. Residential standards, the most stringent cleanup standards, ensure that children, the elderly, and immuno-compromised populations highly sensitive to the toxic effects of most kinds of pollutants will not be harmed. Healthy children, particularly those under 5, are sensitive to toxic exposure for biological and behavioral reasons. Their systems are still developing, and they breathe, drink, and eat more per pound of body mass than adults. In addition, children may crawl or play in areas most likely to be contaminated, thereby increasing exposures. Review US EPA risks-based cleanup goals such as Region 9 Preliminary Remediation Goals (PRGs), Region 3's Risk Based Concentration tables, California DTSC requirements, and similar resources for more information.
- **Determine the exposure pathway:** the route by which children or adults may be exposed to or contact contaminated substance. Routes of exposure may include inhalation, ingestion or dermal contact. Remediation strategies should focus on removing those exposures and may differ depending on the exposure pathway.
- **Determine whom the remediation is designed to protect.** All remediation is designed to protect the occupants on-site. However, the surface contamination from brownfields may create a "plume" that impacts groundwater or drinking water. Contaminated surface soils may erode to stormwater or nearby surface waters or become airborne when disturbed, increasing potential exposures off-site. The *Green Guide* promotes remediation strategies that recognize that pollutants should be managed on-site, where appropriate and feasible, as part of remediation activities and site reuse.
- **Determine whether to remediate the entire site or the portion of the site that will be inhabited.** This decision will be based on the type of contamination, the level of contamination, and the future use of the site.

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Levels of Remediation

- Remediation can occur on one of three levels based on the anticipated use of the site: 1) industrial, 2) commercial, 3) residential. Industrial is the least stringent standard; residential, the most stringent. Brownfield sites developed as health care facilities to the EPA Region 9 Guidelines for residential level remediation will help to ensure that patients, staff, and visitors are protected from potentially harmful exposure to toxic contaminants. However, all remediation decisions should take into account the long-term health of site occupants and their surroundings and the long-term costs of managing and monitoring sites in locations where contamination has been left in place. For example, some toxic chemicals, if capped and left undisturbed, will break down naturally without further contaminating the site while others may spread over time. In some cases, it may be more effective to clean the site to commercial standards and invest the remainder of the resources earmarked for remediation in other green strategies on-site. On the other hand, where reuse incorporates mixed use, remediation to residential standards provides the greatest site flexibility and potential for increased market value to off-set remediation investments.
- **What kind of standard applies to the site?** While EPA standards serve as a useful reference point, some localities have established stricter standards. Contact state and local environmental agencies regarding site contaminants, on-site conditions, and proposed reuse to ensure that public health and the environment are protected. The way the standard level is calculated may significantly impact the time and resources required to remediate the site.
- **How much remediation is required to make the site "safe"?** Federal, state, and local regulations determine appropriate levels of remediation by assessing the combination of contaminants on-site, site conditions, and the proposed site reuse. The project team should balance remediation efforts to produce an outcome where the overall site meets the targeted level of safety, rather than focusing all efforts on the removal of a single element if other dangerous conditions persist on-site. Use resources such as the EPA Region 9 PRG tables, the California CHSSL tables, or the EPA Region 3 Risk-Based Concentrations tables to determine which chemicals ought to be removed from the site. See the Resources section for additional information.

Remediation Strategies

Remediation strategies can be categorized into three types of activities: (1) encapsulate the hazard, (2) treat the contamination on-site, or (3) remove the contaminated soil for treatment off-site. None of these categories are appropriate for all situations, because remediation strategies must be tailored to the specific circumstances on-site. Before choosing one or several methods of site remediation, experienced environmental engineering consultants should evaluate the site, assessing the chemical composition of the contamination, the size of the contaminated area, the type of occupant destined for the future facility, and the level of contamination on neighboring sites. Regardless of site specifics, the *Green Guide* recommends either encapsulating the hazard or treating it on-site. The third possibility, removing contaminated soil from the site to be dumped in a landfill or incinerated, may be required in certain instances but poses additional challenges. It is expensive, requires intensive energy use, causes emissions associated with transportation, and results in environmental degradation both on-site and off. Soil removal also pollutes other sites (the landfill, the neighborhood surrounding the incinerator plant) and disrupts the ecological integrity of the clean site that is harvested for fill to replace the soil excavated from the brownfield.

The three main approaches to brownfield remediation:

- **Encapsulate the hazard.** This method is the most basic and least expensive remediation strategy in terms of first cost. However, the cost of monitoring, maintaining, and replacing a cap at the end of its useful life may outweigh the construction cost savings in some cases. While, paving over the hazard may create a strong enough barrier for some, less toxic pollutants, this method is not recommended for pollutants that could leach into ground water below the site or volatile pollutants such as chlorinated solvents that can vaporize and seep into buildings constructed on-site. For more information on soil vapor intrusion, visit the US EPA's website, www.epa.gov.

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- **In-situ strategies**. These strategies involve the treatment of contaminants in place, and vary in cost and effectiveness. They include soil washing, incineration, chemical stabilization, phytoremediation, vapor extraction, in-well stripping (for groundwater), biodegradation, and nonaqueous phase liquid removal.
- **Off-site removal**. These strategies require testing the soil before determining the final disposal location. Highly contaminated soils may require disposal in a hazardous waste disposal facility, whereas less contaminated soil may be deposited in a landfill as solid waste or construction and demolition debris.

Extensively contaminated sites may adopt all three methods: removing the most contaminated soils; consolidating other, less contaminated soils on site but away from primary structures; capping and covering parking lots; and, allowing natural attenuation of contamination in other areas while continuing to monitor contaminant levels.

Benefits

Health

The health benefits of brownfield remediation are largely limited to activities related to the removal or reduction of exposure to contamination discovered on-site. Examples of commonly occurring contaminants include: petroleum hydrocarbons, lead, toxic construction debris (e.g., lead, asbestos), polychlorinated biphenyls (PCBs), treated wood (creosote, cadmium/chromium/arsenic), industrial chemicals, and diesel fuel, though a broader range of contaminants may be found given the wide range of industrial sites cleaned under the brownfields program. Health benefits to the surrounding community include the removal of hazardous substances that could potentially harm the community through exposure to contaminated soil, windblown dust, contaminants leaching to area groundwater, or regional air contamination.

Ecologic

Constructing a clinic, assisted living facility or a hospital campus on the site of a remediated brownfield maintains regional habitat on the equivalent greenfield lot in the rural or suburban area where the hospital would have been located. Remediating brownfields also reduces the contaminants that compromise the water, air, and ecology surrounding the site. If redeveloped with strategies such as native plant species and constructed wetlands, the site may actually enhance the ecology native to the area and improve air quality.

Economic

Developing on brownfield sites spurs the environmental and economic benefits associated with infill development, such as mitigating sprawl and improving the regional economy while also improving the value of existing infrastructure investment in transportation and utility infrastructure, health care facilities, schools and other public services. Brownfield remediation projects also bring potential economic benefits to the development and can add value to adjoining and abutting properties. The Small Business Liability and Brownfields Redevelopment Act (or “Brownfields Law”) directs the U.S. Environmental Protection Agency to provide seed funding grants to tribal, state and local governments for site assessments, job training, revolving loan, and cleanups. These EPA funds typically go to more complex cleanups, less desirable locations, or more severe liability issues. (See “GAO Study Recommends Ways to Improve Brownfields Efforts,” *Engineering Times*, March 2005, p. 22. The GAO report, GAO-05-94 can be found at http://www.gao.gov). Frequently, state and local governments will work with building owners to redevelop brownfields, because these lands are otherwise a loss to the local tax base. Grants may be available in some cases to assist with the cost of remediation. And, at the most fundamental level, the cost of purchasing the land is often far less than the cost for similarly located land that does not require remediation.

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Under appropriate circumstances, even the cost of remediation to the residential level (GGHC v2.2 Sustainable Sites Credit 3.2) may be offset by local, state, or federal financial incentives. Moreover, infill development and brownfield remediation act as public expressions of the facility's commitment to bettering the health of patients and caregivers, the broader public health, as well as the local and regional ecology.

Case Study #1

A large hospital was planned for a contaminated site in the southwestern United States. The entire site, including the approximately 30 acres acquired by the hospital, had been involved in aircraft manufacturing; the testing and operation of a low level nuclear reactor; the invention and testing of a chemical milling process; research and production of early U.S. rockets and missiles; and, finally, the production and assembly of early space shuttle and moon landing projects. Several areas of the site soil were contaminated with various degrees of petroleum distillates and arsenic at varied depths. The site also contained varied degrees of contamination from petroleum distillates and chlorinated solvents in the underground water table. To satisfy the state water board, the hospital hired an environmental engineering firm to remediate the property. As part of the acquisition agreement, the hospital entered into a pre-purchase agreement with the federal government, the local municipality, and the engineering firm that included necessary precautions to address the environmental issues. This agreement became a model for similar transfers of federal land through local governments.

The purchase price for the property included buying the services of the engineering firm for the purpose of mitigating all known and affected contaminants, as well as the purchase of additional insurances for cost over-runs on mitigation and future liability arising from contaminants that exceeded allowable limits. The hospital hired the full time and continuous services of an environmental testing and inspection firm to identify, lab test, and report to the environmental engineering firm the presence of contaminants. Based on this testing, the engineering firm identified the soils that exceeded allowable limits and oversaw their collection and proper disposal.

The engineering firm was also charged with the on-going mitigation of the solvents in the underground water. This latter process extended for an additional number of years after the original remediation had been completed. A number of wells were drilled on-site to accommodate ongoing monitoring and mitigation of the underground water contamination via a number of wells.

Case Study #2

Johnnie Ruth-Clarke/Mercy Hospital Brownfield Project, St. Petersburg, FL

Old Mercy Hospital, located in a low-income neighborhood in St. Petersburg, was faced with perceived environmental site concerns and potentially losing its accreditation. The hospital was particularly important to the surrounding neighborhood because its residents consistently reported disproportional health problems compared to the county and the state.

As part of a neighborhood revitalization strategy, the city of St. Petersburg designated the six-acre site a brownfield in 2004. An environmental assessment found that the site had been contaminated from two sources of petroleum deposits: groundwater contamination resulting from leachate from an underground storage tank located at a nearby gas station site and an on-site deteriorated petroleum storage tank associated with the hospital's boiler. The only remaining structure on the site was an abandoned hospital structure (Mercy Hospital) that had been designated a local historical landmark in 1994.

The city led an effort to secure funding to support environmental assessments and remediation of the site:

- $100,000 from the Allegany Franciscan Foundation for a feasibility study;
- $450,000 from a Community Development Block Grant to acquire the site; and

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- $3.7 million from the US Department of Health and Human Services to build a clinic on the site.

The city remediated the site by removing the storage tanks and demolishing unsalvageable portions of the historic hospital. The historic Mercy Hospital structure on the western third of the site was renovated and combined with the Johnnie Ruth-Clarke Health Center (relocated from the basement of a neighborhood church) into a 20,000 square foot full service, federally qualified health care center. The center provides health services for up to 300 patients a day, and employs 100 doctors, technicians, and staff. A retail development has been earmarked for a portion of the site. The reuse of the remainder of the site is still under development.

The project won the US Environmental Protection Agency's 2005 Phoenix Award for Excellence in Brownfields Redevelopment for its combined success in addressing social and health issues with the project. For more information on this case study, see the Florida Brownfields Association website (http://www.floridabrownfields.org/SuccessStories/PA-JohnnieRuthCenter.htm) and Environmental Law Institute report, "Healthy People: Brownfields," September 1, 2004 (www.eli.org).

Resources

In addition to the resources noted in the Green Guide for Health Care, the following may offer additional guidance:

Brownfield Association, http://www.brownfieldAssociation.org

Brownfield Center of Carnegie Mellon University and University of Pittsburgh, http://www.ce.cmu.edu/Brownfields

California Environmental Protection Agency, "Use of California Human Health Screening Levels", January 2005. (CHHSL), http://www.calepa.ca.gov/Brownfields/SB32.htm

Center for Brownfield Initiatives at the University of New Orleans, http://www.brownfields.com

EPA Brownfield Tools and Technical Information, http://www.epa.gov/swerosps/bf/toolsandtech.htm

EPA Region 3 Risk-Based Concentrations, http://www.epa.gov/reg3hwmd/risk/

EPA Region 9 PRGs, http://www.epa.gov/region9/waste/sfund/prg/index.html

Northeast Midwest Institute, http://www.nemw.org/brownfields.htm

U.S. Occupational Safety and Health Administration (OSHA), http://www.osha.gov/SLTC/brownfields

Tech brief authored by Walt Vernon, PE, of Mazzetti & Associates with assistance from Adele Houghton, AIA, Green Guide for Health Care, and Gail Vittori, Center for Maximum Potential Building Systems. Reviewed by Ann Carroll, MPH, U.S. EPA.

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