Phoenix-Award Winning Kendall Square Rises from Cement-Treated Brownfield Site

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The Kendall Square Redevelopment project in Cambridge, Massachusetts was named the Grand Prize winner out of ten regional Phoenix Award winners at the EPA-sponsored Brownfields 2006 Conference. The prestigious award honors individuals and groups working to transform blighted and environmentally contaminated areas into productive new uses. The Phoenix Awards™ are considered the pinnacle of achievement of excellence in brownfield redevelopment, and often are called the brownfields' equivalent of Hollywood's Oscars.

The Kendall Square redevelopment is an excellent example of how cement can be used to clean up brownfields. The Genzyme Center, located within Kendall Square, was a cornerstone to the Kendall Square project. Developers used cement-based solidification/stabilization (S/S) treatment to remediate contamination at the site. Concrete construction contributed to a high level of sustainable development of the building, which received Platinum certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED™) program.

Interior Atrium

The Genzyme Building at Kendall Square

Site Remediation

The 10-acre (4-hectares) property is located in East Cambridge next to the old Broad Canal. For nearly a century, the site was home to a manufactured gas plant (MGP), whose operations led to soil impacted with coal tar and petroleum residues. As a temporary cleanup remedy, a previous owner of the property capped the subsurface contamination with a parking lot, which remained in place for about 30 years.

Revitalization of the area surrounding the property made it attractive for redevelopment, and plans were drawn up for a $300-million development. Before work began, a thorough investigation of the site's environmental condition was necessary. It found:

- 4 acres (1.6 ha) of soil impacted with polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), from 0 to 20 feet (6 meters) below grade
- A 3-acre (1.2 ha) non-aqueous phase liquid (NAPL) plume that consisted of:
  - Dense non-aqueous phase liquid (DNAPL) present at the groundwater/clay interface at about 20 feet (6 m) below grade.
  - Light non-aqueous phase liquid (LNAPL) on the groundwater surface, at about 10 feet (3 m) below grade.

Expedited Redevelopment and Occupancy Safety

The remediation goal for the property was a permanent cleanup, in the quickest, safest, and most cost-efficient manner possible. To expedite redevelopment, the remediation designers divided the site up into parcels and matched cleanup strategies with each parcel's final activity and use. Finally, cleanup took place in phases so that construction could begin before cleanup ended.

To match cleanup with redevelopment:

- Design plans called for subsurface garages outside of the NAPL plume. Excavation and disposal was chosen as a permanent cleanup strategy for these parcels.
- While construction on the garages proceeded, workers remediated the NAPL plume using in-situ solidification/stabilization to treat contaminated soil.
- To manage risks associated with on-site S/S-treated materials, designers used engineering control, including vapor barriers, venting systems, and dewatering and water-treatment systems.

In Situ Solidification/Stabilization: The Answer to Quick and Safe Development

In Situ Solidification/Stabilization (ISS) helped meet the developer's goals of a quick, safe and cost-effective cleanup solution, while at the same time eliminating risk to human health and making way for expedited redevelopment. Here's how ISS worked:

- A mixture of portland cement, bentonite, and water was mixed and injected into the impacted soil, immobilizing free-phase NAPL in the subsurface. Soil mixing was accomplished using a 10-foot (3 m), crane-mounted auger.
- The mixed soil columns were overlapped 35%, ensuring that all impacted soil was treated.
- ISS treatment resulted in immobilization of contaminants of concern within a 20-foot (6-m) thick monolithic, solidified mass with a volume of more than 100,000 cubic yards (80,000 m^3).
- Nuisance gases generated during treatment were collected and treated to prevent atmospheric release.

Use of solidification/stabilization resulted in:

- Greatly reduced movement of NAPL by binding the contaminants within the soil matrix with a cement-based S/S additive.
- Lowered hydraulic conductivity of the treated soil by two orders of magnitude, preventing leaching of contaminants.
- Improved groundwater quality by preventing groundwater from coming into contact with source material.

A Bustling, Mixed-Use Development

The brownfield redevelopment of Kendall Square had the effect of transforming a blighted urban area into a bustling 24/7, mixed-use development. Not only did it clean up widespread contamination, it created sustainable building development. It incorporated much-needed residential property, while at the same time facilitated commercial development for the biotech Industry, creating more than 700 permanent, livable-wage jobs, with another 350 jobs expected to be created at full buildout.

Soil mixing with auger

The Genzyme Center: A Platinum-Certified Green Building

The U.S. Green Building Council issued its highest designation, LEED™ Platinum certification, to the Genzyme Center. Built of concrete, with plenty of natural light, employee-operable windows, and an abundance of interior gardens, the environmentally friendly design has increased employee recruitment, retention, and productivity.

Credits/Additional Information

Environmental Engineering and Remediation Design:
The RETEC Group, Concord, Massachusetts

Solidification/Stabilization Contractor:
Geo-Con Incorporated, Monroeville, Pennsylvania

Developer:
Lyme Properties, Wilmington, Massachusetts

Building Owner:
Genzyme Corporation, Cambridge, Massachusetts

Additional PCA publications on this project are available as:

- Solidification/Stabilization Treatment at a Former Manufactured Gas Plant Site, SP996
- Building Better Outcomes With Concrete, PL296

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An organization of cement companies to improve and extend the uses of portland cement and concrete through market development, engineering, research, education, and public affairs work.

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