



Soil Remediation For UST Sites

Ex Situ Bioremediation: Biomounding

Ex situ bioremediation—biomounding—is a technique for removing biodegradable contaminants from excavated mounds of soil. Nutrients are added to the soil mounds, which are often several feet high, to facilitate bioremediation. Aeration conduits and irrigation systems are constructed in the mound.

Biomounding is most appropriate for shallow contamination sites that cover a large horizontal area. This is a low-maintenance technique that requires a relatively short treatment time. Biomounding also provides better control over aeration, moisture, nutrient levels, and soil texture than other methods.

Petroleum Types And Constituents

- Fresh or weathered gasoline, diesel, jet fuel, kerosene, motor oil, heavy fuel oil, lubricating oils, and crude oils
- Volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene, and xylene (BTEX); residual semivolatile organic compounds (SVOCs) such as polynuclear aromatic hydrocarbons; and nonvolatile constituents

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Advantages	<ul style="list-style-type: none"> • Degrades semivolatile organic compounds (SVOCs) and nonvolatile organic compounds • Requires low maintenance • Entails a relatively short treatment time • Enhances control and management of aeration, moisture, nutrients, and soil texture • Can use treated soil as backfill
Limitations	<ul style="list-style-type: none"> • Targets only biodegradable constituents • Must excavate soil and remove debris • Requires sufficient nutrients, moisture, active indigenous microbial population, and pH of 6-9 to degrade contaminants
System Components	<ul style="list-style-type: none"> • Plastic liner • Gravel and slotted pipe to provide air to mound • Nutrients • Blower • Soil vapor sampling probes • Irrigation system (optional) • Plastic cover (optional) • Vapor treatment equipment (optional)
Wastestream Treatment	<ul style="list-style-type: none"> • Vapor treatment options (might be needed for high concentrations of contaminants): <ul style="list-style-type: none"> • <i>Granulated activated carbon</i> • <i>Internal combustion engine</i> • <i>Catalytic oxidation unit</i> • <i>Thermal incinerator</i>
Parameters to Monitor¹	<ul style="list-style-type: none"> • Vapor concentration • Airflow rate • Soil contaminant concentration • Microbial population • Soil pH, moisture, and nutrients • Leachate analysis (optional)
Cleanup Levels and Timing²	<ul style="list-style-type: none"> • Treats ≥ 90% of biodegradable constituents • For an ideal site³, ~90% in 6 months to 18 months • For an average site⁴, ~90% in 6 months to 2 years • Longer time required to degrade heavier hydrocarbons
Costs⁵	<ul style="list-style-type: none"> • For an average site⁴, \$80,000 to \$125,000 (\$80 to \$125/cu yd) • Unit costs generally decrease as soil volume increases

¹Parameters to monitor are for performance purposes only; compliance monitoring parameters vary by state.

²Cleanup standards are determined by the state.

³An "ideal site" assumes no delays in corrective action and a relatively homogeneous, permeable subsurface.

⁴An "average site" assumes minimal delays in corrective action and a moderately heterogeneous and permeable subsurface.

⁵Costs include equipment, and operation and maintenance.