



Community Window on the Hunters Point Shipyard

What is Remediation?

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Remediation refers to the cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a contaminated site. In general, cleanup falls into one of three categories:

- **Removal:** Harmful chemicals are removed from contaminated air, soil, or water.
- **Treatment:** Contamination is treated to change harmful chemicals into less harmful ones. This can be done in the ground (known as *in situ* remediation), or the contaminated soil or groundwater can be removed, cleaned, and put back into the ground.
- **Containment:** Harmful chemicals are left in the ground, but steps are taken to prevent them from moving into clean air, soil, or water and to prevent people from coming into contact with them.

Why do we do remediation?

Remediation is about your safety. The ultimate goal for cleaning up any contaminated site is to eliminate any current or potential threat to human health and the environment from the chemicals that have been released into the soil, air, or water. Polluted areas need to be cleaned up to protect all of us.

How a polluted site is cleaned up (for example, if harmful chemicals are removed or if they are simply contained) affects decisions about how a site can be reused or redeveloped later. For example, there are different cleanup standards for land where people will live ("residential reuse") and for land where people will only work ("industrial reuse").

How do we know how to clean a site?

In order to know how to clean a site, we have to find out what is polluting it. What materials are in the ground, and how did they get there? How much of each chemical is in the ground? Is the source of the pollution still present and adding to the pollution? Is the groundwater polluted? Is the soil polluted?

We also need to learn about the physical site. It is important to ask many different questions: How deep is the groundwater? What direction is the groundwater moving? How deep is bedrock? What is the soil like?

In many cases, we need to know how a site is used now and what the future plans are for the site. Do people live on the site? Is there a school or park on the site? Is it an industrial site? How might people or local plants and animals be exposed to the pollution through the soil, air, or water?

How long does cleanup take?

Cleanup time can vary greatly, ranging from days to weeks to years. How long a cleanup takes depends on:

- Where the pollution is and how much of an area is polluted;
- The types and amounts of chemicals polluting the site;
- The cleanup method(s) selected; and
- The cost of the cleanup and the funding available.

How are contaminated sites cleaned up?

Many different methods can be used to clean a contaminated site. Common cleanup methods include:

Bioremediation: Some microbes (tiny bugs) that live in soil and groundwater eat harmful chemicals. The microbes digest the chemicals, changing them into less harmful or harmless materials. Using microbes to treat contamination is called bioremediation. In some cases, bioremediation will use microbes already living in the ground at a contaminated site; in other cases, new microbes will be injected into the ground.

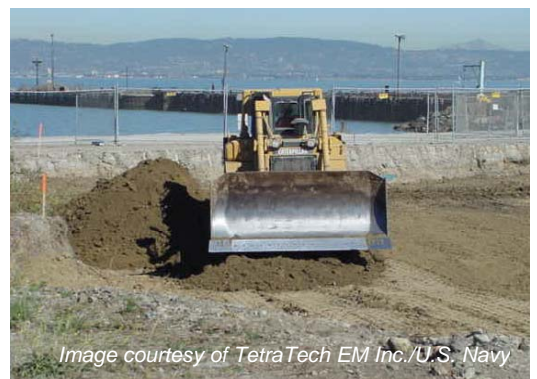


Image courtesy of TetraTech EM Inc./U.S. Navy

Soil excavation at Hunters Point Shipyard Parcel B, San Francisco, California.

Capping: Installing a cover over contaminated material is called capping. For example, a cover or “cap” is sometimes placed over a landfill. Capping is an example of containment: the contaminated materials are left in the ground, but the cap should prevent people from coming into contact with the harmful chemicals.



Image courtesy of U.S. Navy

Aerial photograph of landfill cap being installed at Hunters Point Shipyard Parcel E. San Francisco. California.

Chemical oxidation: Wells drilled into polluted ground can be used to pump chemicals known as oxidants into the ground. There are different oxidants that can be used, including hydrogen peroxide and potassium permanganate, depending on the specific conditions at a site. These oxidants mix with the pollutants and break them down into harmless chemicals. This treatment method is referred to as chemical oxidation.

Excavation: Digging up contaminated soil is called excavation. The soil is usually excavated with construction equipment such as a bulldozer or backhoe. This soil is either cleaned or disposed of in an approved landfill. Often, the space left open by the excavation is then filled with clean soil or “fill.” Excavation is an example of removal: the contaminated soil is removed from the site.

Incineration: Burning hazardous materials can destroy some chemicals that are harmful to human health or the environment. This process is called incineration.

Natural Attenuation: Natural attenuation is when nature cleans a site without humans doing anything additional to help. There are four main ways that natural attenuation occurs: 1) Bioremediation (see explanation above). 2) Chemicals stick to the soil, preventing the pollution from spreading further. 3) Pollution mixes with cleaner groundwater, diluting the pollution to safe levels. 4) Chemicals evaporate and escape to the ground surface where they are destroyed or diluted to safe levels by mixing with cleaner air.



Image courtesy of TetraTech EM Inc./U.S.

View of pipes for soil vapor extraction (SVE) study at Hunters Point Shipyard, San Francisco, California.

Pump and Treat: In pump and treat systems, groundwater is pumped from below ground to the surface. Once it has been removed from the ground, it is cleaned or “treated” to remove harmful chemicals.

Permeable Reactive Barrier: A permeable reactive barrier (PRB) is a wall built below ground to treat contaminated groundwater. The wall or “barrier” allows groundwater to flow through it. As the groundwater flows through the wall, hazardous chemicals are either trapped in the wall or react with the material in the wall to change harmful chemicals into less harmful ones.

Soil vapor extraction: When chemicals in the air evaporate they form a gas or vapor. Chemicals in soil or groundwater can also evaporate to form a gas or vapor. In the ground, these vapors can be removed from the soil above the water table by applying a vacuum to pull them out (extract) them. Removing harmful chemicals in this way is called soil vapor extraction (SVE).

Information about cleanup methods was taken from the U.S. Environmental Protection Agency’s Citizen’s Guides to Cleanup Methods factsheets available online at <http://www.clu-in.org/products/citguide/>

For More Information, Contact:

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The Community Window on the Hunters Point Shipyard Cleanup is a project of Arc Ecology funded by the San Francisco Department of the Environment.

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May 2004