



# Economical and Reusable Ground Water Treatment Solutions Developed at LLNL



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## Introduction

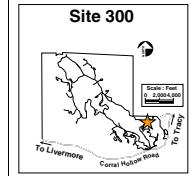
Ground water cleanup traditionally relied on large permanent treatment facilities. At Lawrence Livermore National Laboratory (LLNL), we developed treatment units that are smaller, portable, and more economical. These treatment units have allowed for aggressive ground water cleanup, increased cleanup flexibility, and reduced capital and electrical costs. Instead of becoming surplus after completion of ground water cleanup, the treatment facility is easily relocated and used at another location requiring ground water treatment.

Four types of portable ground water treatment units are in use at LLNL's Livermore Site and Site 300. These include: portable treatment units (called PTUs), miniature treatment units (MTUs), granular activated-carbon treatment units (GTUs), and solar-powered treatment units (STUs). Each of these facilities are easily relocated with a forklift. The application of each type of facility is determined by specific conditions, primarily the amount of ground water flow and contaminant concentration, as shown by the graph below. The 21 facilities in use at each site are also shown below; approximately 24 additional units are planned.

## Traditional treatment facilities

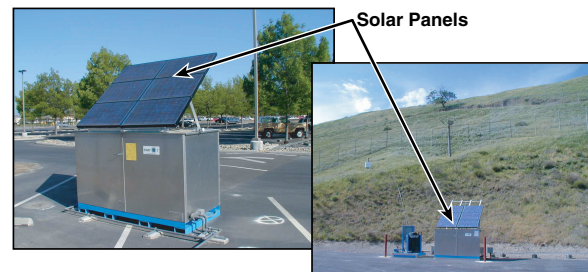
- The original LLNL ground water cleanup facilities were large and costly permanent structures.
- The permanent facilities also require expensive pipelines to transfer ground water from the extraction wells to the facilities.
- Due to the high costs of permanent facilities and space limitations, smaller, mobile, and more economical treatment units were developed.

★ Locations currently in use

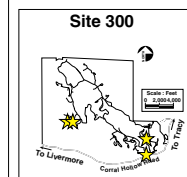
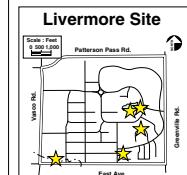


## Solar-powered treatment unit

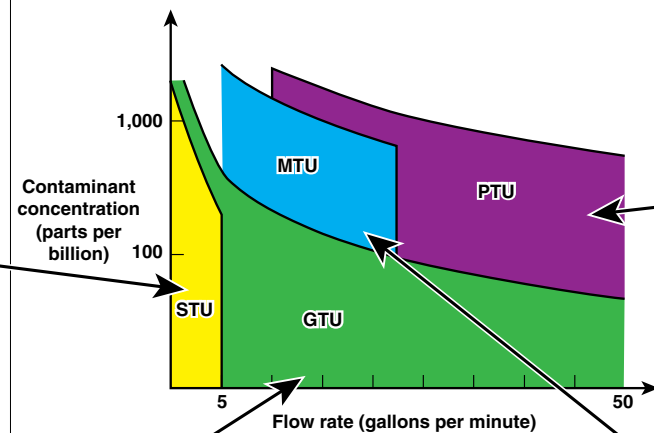
- Treats ground water flows up to about 5 gallons per minute.
- Ground water is pumped through the granular activated carbon to remove contamination.
- Uses solar panels and battery backup to operate.
- Adaptable for remote areas, or areas where electrical power is not available.
- The facility is enclosed in a 8-ft long by 4-ft wide by 4 1/2-ft high housing that is attached to a skid.



★ Locations currently in use



## How do we pick the proper treatment unit?

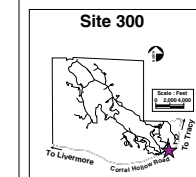
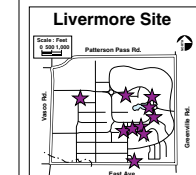


## Portable treatment unit

- Treats ground water flows up to about 45 gallons per minute.
- Uses an air stripper; the air stripper effluent vapor stream passes through granular activated carbon to remove contamination.
- The facility is housed in a 20-ft long by 8-ft wide by 8-ft high cargo-type shipping container.

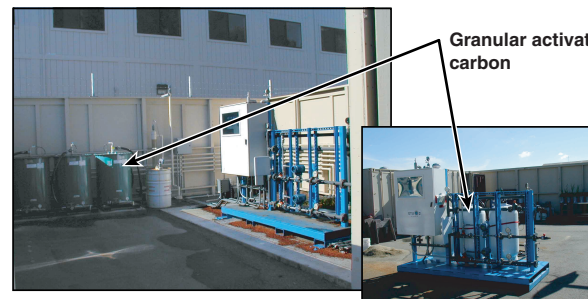


★ Locations currently in use

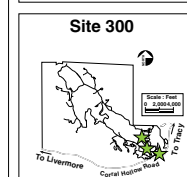
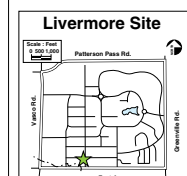


## Granular activated-carbon treatment unit

- Treats ground water flows up to about 45 gallons per minute.
- Ground water is pumped through the granular activated carbon to remove contamination.
- The facility is 9-ft long by 4-ft wide, is weather resistant and attached to a skid.



★ Locations currently in use



## Miniature treatment unit

- Treats ground water flows up to about 22 gallons per minute.
- Uses an air stripper (half the capacity of a PTU); the air stripper effluent vapor stream passes through granular activated carbon to remove contamination.
- The facility is 9-ft long by 4-ft wide, is weather resistant and attached to a skid.



★ Locations currently in use

