

Environmental Cleanup Update

150 Sohier Road Property, Beverly MA | FALL 2024

This annual fact sheet provides a status of environmental investigation and treatment of the former Varian Facility at 150 Sohier Road in Beverly, Massachusetts.

Environmental Treatment System Installation Underway

In 2024, the Varian project team continued the installation of treatment systems and completed design investigations to support additional remedies at the Site.

In February 2024, a Temporary Solution Statement was submitted to the Massachusetts Department of Environmental Protection (MassDEP) and subsequently presented to the Beverly community. This statement, prepared by a Massachusetts Licensed Site Professional (LSP), indicated that the Site does not pose a human health risk, but that treatment needs to continue or be expanded to achieve a Permanent Solution. The cleanup plan that the project team has prepared will achieve this objective and lead to a Permanent Solution.

The project team is currently working to implement the environmental cleanup plan in six areas at the Site. These areas include (Figure 1):

- Building 3 Source Area
- Tozer Road
- Stream A Seep
- Building 5 Source Area
- Bedrock near Buildings 3 and 5
- PSL-10 (Open Field) Source Area

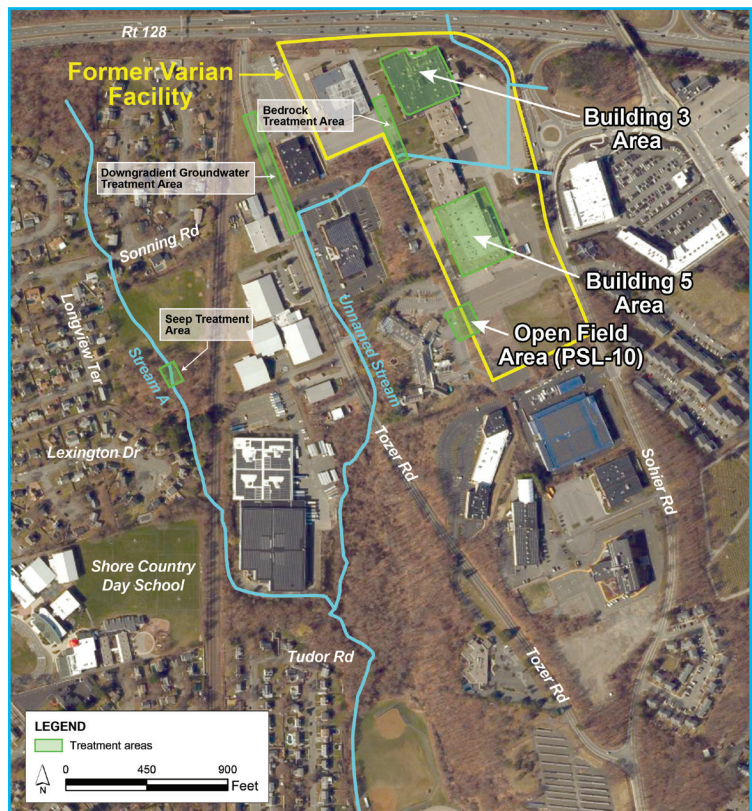


Figure 1. Site map and selected treatment areas

Site History and Overview

The former Varian Facility, located at 150 Sohier Road, is currently owned by another firm and operated as an active manufacturing facility for microwave and radar products. The 150 Sohier Road property has been used as an industrial facility since the early 1950s. Industrial solvents were released to the environment due to the chemical handling and disposal practices that were common at the time, before stricter environmental regulations were enacted. These solvents, used primarily for surface treatment, cleaning, and degreasing operations, included trichloroethene (TCE), perchloroethene (PCE), and 1,1,1-trichloroethane (TCA). Releases of these solvents occurred in three main areas: the Building 3 area, the Building 5 area, and an open field known as potential source location (PSL) 10. TCE, PCE, and TCA are heavier than water and have limited ability to dissolve in water. They also tend to evaporate easily and are referred to as volatile organic compounds or VOCs. Varian, with support from Jacobs Solutions, is investigating and cleaning up the Site in accordance with Massachusetts regulations, known as the Massachusetts Contingency Plan (MCP). The Site is listed by MassDEP as Site Number 3-0485. Site reports and other documentation can be found under "Supporting Documents" in MassDEP's data portal at <https://eeaonline.eea.state.ma.us/portal/dep/wastesite/detailviewer/3-0000485>.



Figure 2. Cleanup approach in each area

Building 3 Source Area – Thermal Treatment and Bioremediation

Groundwater below Building 3 will be treated using **thermal treatment**, followed by a **bioremediation** polish and continued operation of the **soil vapor extraction system**.

Thermal treatment involves installing heating elements into the ground below Building 3 and heating the groundwater to boiling. The heating elements are similar to the ones in a toaster, only larger. Heating the groundwater causes the volatile compounds to become vapors, which are captured by extraction wells that suck the vapors and some water to the surface for treatment using activated carbon. The activated carbon filters out the volatile compounds (in much the same way a household water filter does) and the clean vapors and water are released to the environment. The carbon containing the captured volatile compounds is recycled at a licensed off-site facility.

Following thermal treatment, **bioremediation** will continue to reduce the concentrations of volatile compounds by taking advantage of the increased temperature underground. The warm groundwater that remains after thermal treatment provides an excellent environment for microbial growth. Certain microbes “eat” compounds like TCE and PCE, and break them down into harmless elements. Bioremediation involves stimulating microbial growth by injecting amendments (such as vegetable oil or molasses) that provide food which microbes use to grow and multiply, so they can consume more volatile compounds.

Drilling and installation of the exterior underground thermal wells is nearly complete (Figure 3). An area inside the building has been prepared to accommodate the installation of additional underground heating wells. The interior drilling to install these wells will proceed following completion of the exterior drilling.



Figure 3. Drilling and installation of exterior thermal wells

Tozer Road Groundwater – Permeable Reactive and Adsorptive Barrier

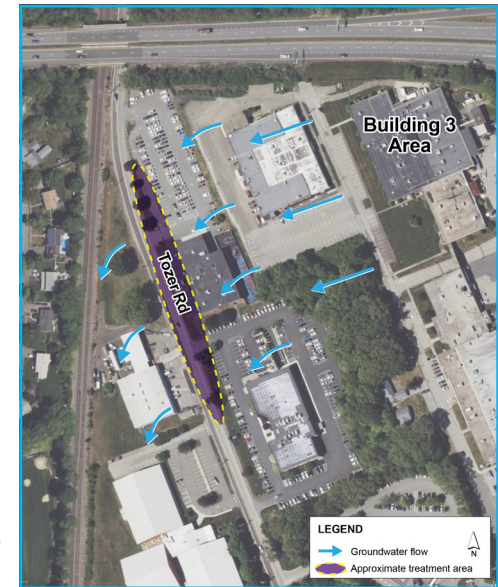
A **permeable reactive and/or adsorptive barrier** will be installed underground along Tozer Road. Tozer Road is “downgradient” or downhill from the former Varian facility. Water in the soil flows down the hill from the former Varian facility toward Tozer Road. The Tozer Road treatment barrier will allow groundwater to pass but will capture and destroy volatile compounds in groundwater that may move away from the Building 3 thermal treatment zone and other source areas (Figure 4).

The permeable barrier is not an underground wall; instead, it is a treatment zone with groundwater flowing through it. Constructing a permeable barrier involves injecting safe treatment materials at multiple locations along a line. The materials include media such as “colloidal activated carbon” and reactive material such as “zero-valent iron”.

Groundwater containing volatile compounds flows through the subsurface zone around the injection points that form the permeable treatment barrier. The volatile compounds attach to the activated carbon or react chemically with the iron which destroys them, and treated groundwater flows out the other side of the barrier.

A pre-design investigation was conducted along Tozer Road. This investigation provided data to help refine the treatment barrier design and location. Soil and groundwater sampling was completed in August 2024 and included the installation of four new monitoring wells. Follow-up groundwater sampling was also conducted in October 2024. Once the design has been finalized, the permeable barrier will be scheduled for installation.

Figure 4. Groundwater with volatile compounds will flow through the permeable barrier along Tozer Road, where the chemicals will be captured and destroyed, with treated groundwater flowing out the other side.



Stream A Seep – Permeable Adsorptive Barrier



Permeable adsorptive barriers were installed in October 2023 at two seep areas along Stream A to capture volatile compounds in seep water before it discharges to the stream. Reactive core mats containing granular activated carbon filter out the volatile compounds (like a water filter does), and the compounds stick to the carbon as the water passes through the mats. The mats are covered with stone to prevent access or damage (Figure 5). Once the upgradient treatment has been completed, the mats will be removed and the carbon filter material will be recycled off-site at a licensed facility.

A conservative risk assessment indicated that there is no significant risk to people or pets from contact with water from the stream. The seep treatment was conducted as an additional protective measure. Routine inspections are performed to assess the condition of the mats.

Figure 5. Stone covers reactive core mats along the stream

Building 5 Source Area – Bioremediation

The selected treatment technology for groundwater in the Building 5 area is **bioremediation** and continued operation of the **soil vapor extraction system**.

Concentrations of volatile compounds in groundwater beneath Building 5 are significantly lower than beneath Building 3. In addition, bioremediation has been previously successful in the Building 5 area. Therefore, use of bioremediation technology will continue and be expanded to new locations beneath the building. To address the deep groundwater, pressure injection will be used as a new application method. During the implementation of the bioremediation treatment in the Building 5 source area, the **soil vapor extraction system** will continue to operate to protect workers.

Investigation and treatment activities will be conducted simultaneously, with the first round of treatment implemented when vertical and angled wells are installed beneath the building (Figure 6). Pressure injection will be used to increase the influence or spread of the treatment. This treatment will begin once the Tozer Road permeable barrier is in place.

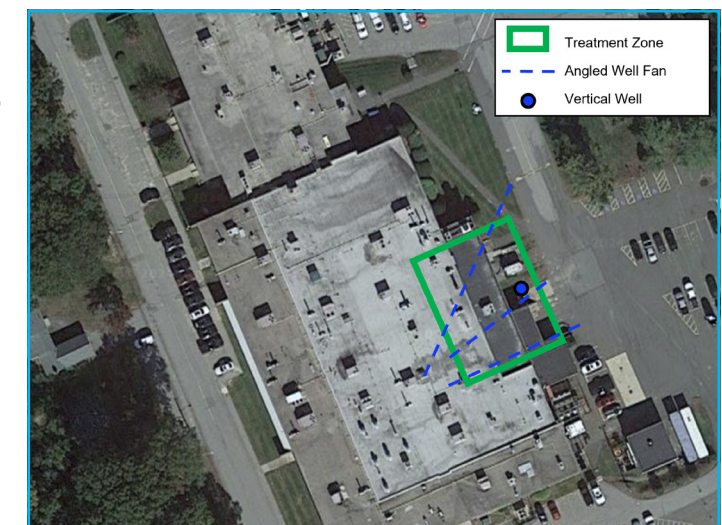


Figure 6. Treatment plan for Building 5 bioremediation

Bedrock Near Buildings 3 and 5 – Chemical Reduction



A limited bedrock treatment area has been identified along the western boundary of the property between the Building 3 and Building 5 source areas. In that area, **chemical reduction** will be implemented to treat volatile compounds in underground bedrock fractures (groundwater-containing cracks in the rock).

Chemical reduction involves injecting a mixture of emulsified vegetable oil and small particles of zero-valent iron to break down volatile compounds that are present in the fractures. Volatile compounds break down through chemical reactions with the zero-valent iron, as well as biological reactions with the emulsified vegetable oil and microorganisms naturally present below ground.

Pre-design investigations were conducted in 2024 to identify specific bedrock fractures, measure concentrations of volatile compounds within those fractures, and assess whether groundwater can flow through the fractures (**Figure 7**). These investigations determined that a portion of the bedrock fractures contain volatile compounds and are also “transmissive,” meaning that the groundwater readily flows through them. Additional geophysical testing is ongoing to confirm connections in bedrock fractures. This effort will be followed by the installation of injection wells and implementation of the chemical reduction program.

Figure 7. Pre-design drilling to gather more information about bedrock fractures

PSL-10 Source Area – Source Excavation with Permeable Treatment Zone

The selected treatment for the PSL-10 (Open Field) source area is an underground **permeable treatment zone**. Soil excavation was also identified to supplement this treatment.

Previous investigations have indicated that a relatively small shallow area of soil may be contributing volatile compounds to groundwater in this area. Under these conditions, a relatively simple and effective remedy is to excavate the soil, and then backfill the excavated area with amendments that can enhance biological and chemical breakdown of the volatile compounds remaining underground. Using a solar-powered pumping system, groundwater in the treatment area will be recirculated through the amendment backfill to provide continued groundwater cleanup. This type of permeable treatment area is referred to as a “subgrade biogeochemical reactor” (**Figure 8**).

The system design for the PSL-10 source area is essentially complete, and the contractor for the remedy installation has been selected. Construction of the treatment system began in November 2024 and treatment will start in the winter of 2025.

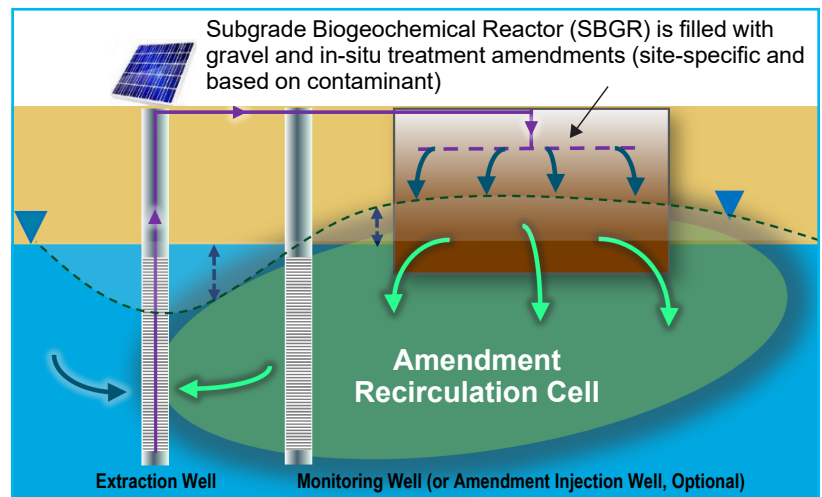


Figure 8. Diagram of a subgrade biogeochemical reactor

• *Varian is actively working with the Beverly community and MassDEP to achieve a permanent solution at the site.*

FOR MORE INFORMATION

Visit the project website: <https://beverlysitecleanup.com/>

Sign up for our mailing list: <https://beverlysitecleanup.com/more-information/>

View recent site documents: Beverly Public Library Reference Desk

Email questions: beverlysitecleanup@jacobs.com

View all site documents on the MassDEP's website:

<https://eeonline.eea.state.ma.us/portal/dep/wastesite/detailviewer/3-0000485>