Technical Assistance Services *for* Communities
Olin Chemical Superfund Site

Overview of the Olin Chemical Superfund Site

This fact sheet provides a general overview of the Olin Chemical Superfund site in Wilmington, Massachusetts, and includes the following:

- Site background
- Areas of contaminated groundwater
- Conceptual Site Model (CSM)
- Site status (as of October 2019)
- Next steps

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Site Background

The 53-acre Olin Chemical Superfund site (site) is located at 51 Eames Street in Wilmington, Massachusetts (Figure 1). From 1953 to 1986, Olin Chemical Corporation (Olin) made specialty chemicals for the rubber and plastics industry at the site (Figure 2). Wastes disposed of on the property caused groundwater contamination both on and off the Olin property. The site includes about 50 acres of Olin property and about 3 acres of impacted areas off of the Olin property. The gold line in Figure 1 shows the Olin property boundaries.

From 1986 to 2006, Olin (a potentially responsible party or PRP) conducted work under the oversight of the Massachusetts Department of Environmental Protection (MassDEP) to address wastes at the site. In 2003, the Town of Wilmington closed all five of its municipal supply wells located in the Maple Meadow Brook aquifer (Figure 3) due to the detection of a chemical called N-

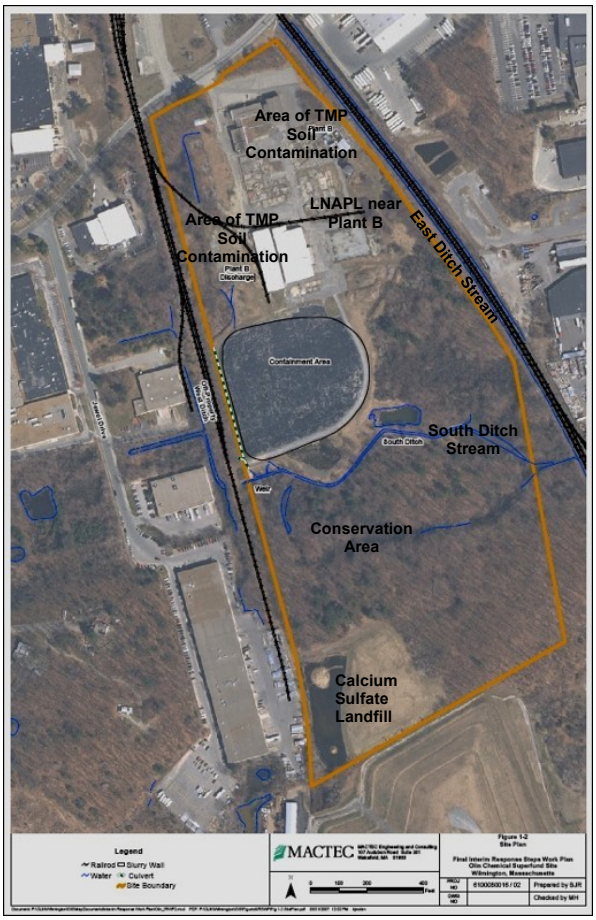

Figure 1. Site Location (modified from Figure 1-2 of the Final Interim Response Steps Work Plan, 2008).

Figure 2. Photo of the facility from 1967. Photo credit: EPA.

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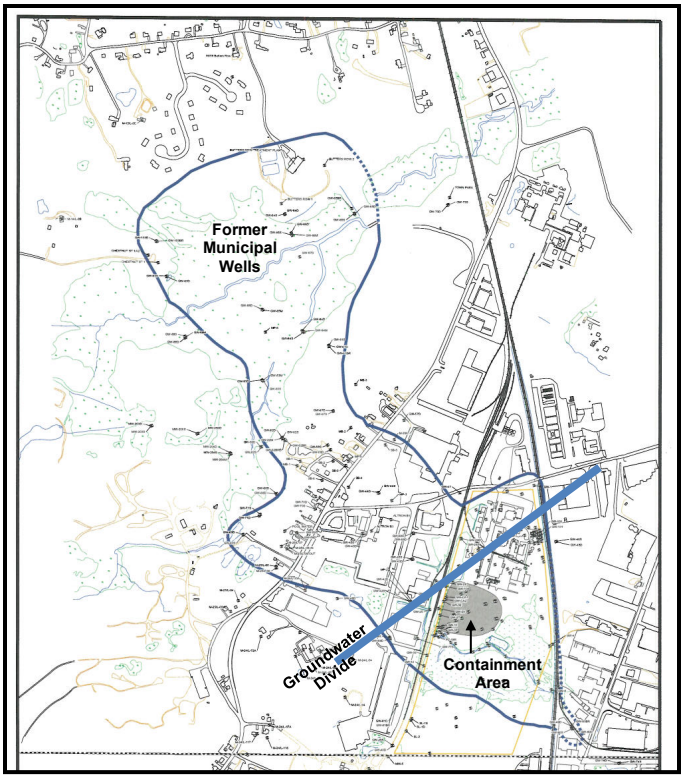

Figure 3. Approximate extent of groundwater impacts.

nitrosodimethylamine (NDMA) and other chemicals attributed to the manufacturing and disposal activities that had taken place at the site.

EPA finalized the site on the Superfund program's National Priorities List (NPL) in April 2006. Inclusion of the site on the NPL makes it eligible for characterization and cleanup under the Superfund program.

The site is currently in the characterization phase of the Superfund process. This phase identifies the extent of contamination as well as remedial alternatives to clean up the affected areas. The extent of contamination is documented in a Remedial Investigation (RI) Report. Possible cleanup alternatives are summarized in a Feasibility Study (FS) Report.

At the end of the site characterization process, EPA recommends a cleanup plan in a document called a Proposed Plan. Following a formal public comment period, which includes a public hearing, EPA will review and respond to written and verbal comments received from the public. EPA's community partners include the Wilmington Environmental Restoration Committee (WERC), an active

Definitions

An aquifer is a body of porous soil or rock that can contain or transmit groundwater.

Bedrock is the hard, solid rock below top layers of surface soil and gravel.

Chemical diffusion is one way that chemicals can move through the environment. It is the process where a chemical has a tendency to move from areas of higher concentration to areas of lower concentration. In this case, chemicals can diffuse from DAPL (see next definition) and spread in groundwater.

Dense Aqueous-Phase Liquid (DAPL) is a type of liquid that dissolves easily in water and is heavier than water. It is a mixture of chemicals and generally green in color.

Groundwater is water held underground in the soil or in pores and fractures in rock.

"Hot Spot" Groundwater contains the highest levels of NDMA (see next definition).

N-nitrosodimethylamine (NDMA) is a semi-VOC. It is a known carcinogen (cancer-causing compound) and is the primary chemical of concern in DAPL and groundwater at the site.

Overburden is underground soil and gravel located just above bedrock.

A slurry wall is an underground barrier intended to stop groundwater flow. It consists of a mixture of soil, bentonite clay and water poured into trenches as a "slurry" before it hardens.

A Technical Impracticability (TI) evaluation is a study of how feasible it is to remove groundwater contamination.

A volatile organic compound (VOC) is a chemical that evaporates easily at normal temperatures.

The water table is the top of the groundwater. Soils above the water table are not saturated with water, meaning their pores are not full of water. Soils below the water table are saturated, meaning they are full of water.

stakeholder at the site and the recipient of an EPA Technical Assistance Grant (TAG).

Following the public comment process, EPA will issue the cleanup plan in a document referred to as a Record of Decision or ROD. A ROD is a legally binding document that outlines EPA's selected cleanup plan. After EPA issues the ROD, the site will enter the remedial design phase. This phase will include negotiation with Olin and other PRPs to fund or implement the selected cleanup plan. Once the cleanup plan is implemented, the site will enter the remedial action phase. Depending on the complexity of the site, the remedial action may take many years, even decades, to complete. It is not unusual for a complex site to have more than one, or even several RODs, generally centered around operable units (OUs).

To manage investigation and cleanup of the Olin site, EPA has divided the site into three OUs:

- OU1 consists of the Olin property. This OU includes all media (soil, sediments and surface water) on the former facility property, except groundwater. OU1 also includes the established conservation area, the on-property ditch system, the Calcium Sulfate Landfill, and the Slurry Wall Containment Area.
- OU2 consists of surface water and sediments off of the Olin property. This OU includes the off-property East Ditch Stream, a small portion of the South Ditch Stream, the off-property West Ditch Stream, portions of Maple Meadow Brook Wetlands, Landfill Brook and North Pond.
- OU3 consists of all groundwater, both on and off property. This OU includes Maple Meadow Brook Aquifer, groundwater beneath the Olin property, and groundwater south and east of the Olin property. OU3 includes regular testing of around 20 private drinking water wells. Soils located below the water table are also evaluated as part of OU3.

Areas of Contaminated Groundwater

Groundwater beneath the site is located in two primary aquifers. One aquifer is the *overburden*, which is groundwater contained in the sandy material just above bedrock. The second aquifer is the *bedrock aquifer*, which consists of groundwater contained within water-bearing fractures in the bedrock. Groundwater in the bedrock aquifer is contaminated with numerous chemicals. One particular chemical, NDMA, is the most toxic and travels the furthest (Figure 4). NDMA and the other site chemicals have concentrated within a dense aqueous-phase liquid (DAPL), which has pooled up to several feet on top of the bedrock in certain parts of the site (shown in Figures 5 and 6 by the blue-green shaded areas, and in the conceptual graphic in Figure 7). EPA estimates that there are 15 to 20 million gallons of DAPL in the overburden groundwater.

Figure 4. DAPL in a glass vial after 8 years.

The DAPL pools act as a source of contamination through two distinct pathways: (1) contaminants sitting on top of bedrock can move into bedrock through a network of water-bearing fractures, in which NDMA has been detected; and (2) NDMA and other chemicals have a tendency to transfer from areas of higher concentration to areas of lower concentration through a process known as chemical diffusion (see the *Definitions* box on the previous page). This has resulted in a broad plume of NDMA and other site chemicals in the overburden aquifer, including "hot spot" groundwater above the DAPL pools where the groundwater NDMA concentrations are highest.

NDMA is toxic to the liver and is a probable human carcinogen – a cancer-causing compound. EPA does not yet have a regulatory cleanup level for NDMA in drinking water. For tap water, the Regional Screening Level (RSL) is 0.11 parts per

trillion (ppt) for NDMA, based on a one in a million lifetime excess cancer risk. Screening levels are used to determine if more evaluation is needed. They are not enforceable cleanup standards.

Conceptual Site Model (CSM)

A Conceptual Site Model (CSM) is an integral part of the cleanup process. It represents the biological, physical and chemical processes that determine the ways that contaminants move from sources through the environment. It considers movement through soil, water and air. It shows how contaminants may reach sensitive receptors such as people, animals and plants. The CSM is a comprehensive graphical and written summary of how these processes may interact and helps the project team make informed decisions about how to approach the cleanup. The CSM is typically updated as new information becomes available.

EPA concluded that the CSM developed by Olin has uncertainties and is incomplete. For example, more investigation is needed to fill data gaps in groundwater. In particular, more data are needed to determine how contaminants are moving from overburden and shallow bedrock groundwater into the deep bedrock groundwater and the full extent of groundwater contamination to the north and east of the Olin property. Additionally, more data are needed to better understand the bedrock topography (shape) and the full extent of the DAPL pooled on the bedrock surface and, in particular, whether other DAPL pools exist.

Even though there are data gaps in groundwater, EPA concluded that there is enough data on DAPL and overburden groundwater to proceed with a Feasibility Study (FS) to evaluate alternatives for OU1 and OU2 (on- and off-property soils, sediments and surface water); and to remove or contain the most significant sources of contamination for OU3 (NDMA-containing "hot spot" groundwater and the DAPL pools).

Site Status (as of October 2019)

In 2007, EPA entered into an agreement with Olin and other PRPs. Under this agreement, called an Administrative Order on Consent (AOC), the PRPs are conducting RI/FS activities. An RI Report for OU1 and OU2 (soils, sediments and surface water) was finalized in July 2015. The RI found certain discrete areas of soils and sediments on and near the Olin property that might result in unacceptable human health or ecological risks. Contaminated soils could cause unacceptable vapor intrusion risks if occupied structures are built on certain areas of the site. Contaminants in lower South Ditch Stream soils and sediments could result in unacceptable human health and ecological risks. Contaminants in South Ditch Stream surface water could result in adverse ecological impacts.

Olin submitted a draft RI Report for OU3 (groundwater) in March 2018. In a response letter dated September 25, 2018, EPA rejected the initial draft and required significant revision. Subsequently, Olin submitted a revised draft in June 2019. This June 2019 version is currently under review. Generally, the data show that site-related chemicals, most notably NDMA, chromium and ammonia, continue to impact groundwater. The highest concentrations of these chemicals are found in DAPL that has pooled on top of the bedrock. However, concentrations are still very high in deep overburden groundwater ("hot spot" groundwater), and NDMA has also been found in varying, but generally low concentrations in about a dozen private water supply wells that are screened in bedrock.

A draft combined OU1/OU2 FS report and an FS report for OU3 were submitted to EPA by Olin in March 2018. EPA's September 25, 2018 letter also disapproved these reports, requiring revisions. The FS report for OU3 was resubmitted as a draft Interim Action Feasibility Study (IAFS) Report in April 2019. The report was retitled consistent with the current focus on OU3 of an interim action to control the sources of groundwater contamination. A revised OU1/OU2 FS Report was submitted in May 2019. EPA is currently working with Olin to correct the deficiencies in these documents to

incorporate the full range of appropriate cleanup options to be considered.

At the same time, EPA's overall goal for the site remains restoration of groundwater. In order to effectively evaluate and identify the final goals and cleanup plan for groundwater, EPA required that Olin develop a work plan to fill OU3 data gaps. This data gaps work plan was submitted in August 2019 and is currently under review.

Next Steps

EPA expects to issue a Proposed Plan in late 2019, outlining EPA's preferred cleanup alternatives for an interim action at the site, which will be accompanied by a public meeting and formal hearing. Following this formal process and a minimum 30-day notice-and-comment period, EPA expects to issue an Interim Action ROD for the site in early 2020. The Interim Action ROD will address on- and off-property soils, sediments and surface water (OU1/OU2). Additionally, this ROD will address portions of groundwater (OU3) – source controls (the DAPL pools) and managing known areas of highly contaminated groundwater in the shallow aquifer.

Concurrently, EPA expects to work with Olin to finalize a work plan to fill data gaps for OU3. These gaps will require an estimated two years of additional field work to complete. Once this data is complete, EPA anticipates that the PRPs will prepare final OU3 RI and FS Reports, which will be used by EPA to issue a final ROD for OU3.

Depending on the results of the additional data collection efforts, the PRPs may also submit a technical impracticability (TI) evaluation for groundwater that EPA would have to consider in developing a final cleanup plan. The TI evaluation will determine if drinking water standards can be achieved in part or all of the aquifer. Figure 8 shows current photos of the site.

Interim Action ROD

Interim Action RODs are commonly used by EPA at sites with complex groundwater contamination issues. EPA may decide to take interim action to reduce risks at any time during investigation of a Superfund site. Interim actions are limited in scope and purpose. At the Olin Chemical Superfund site, EPA has determined that an interim action is appropriate to address known sources of groundwater contamination such as the DAPL pools and known areas of highly contaminated groundwater. The Interim Action ROD will ensure short-term protectiveness of human health and the environment until EPA signs a final ROD.

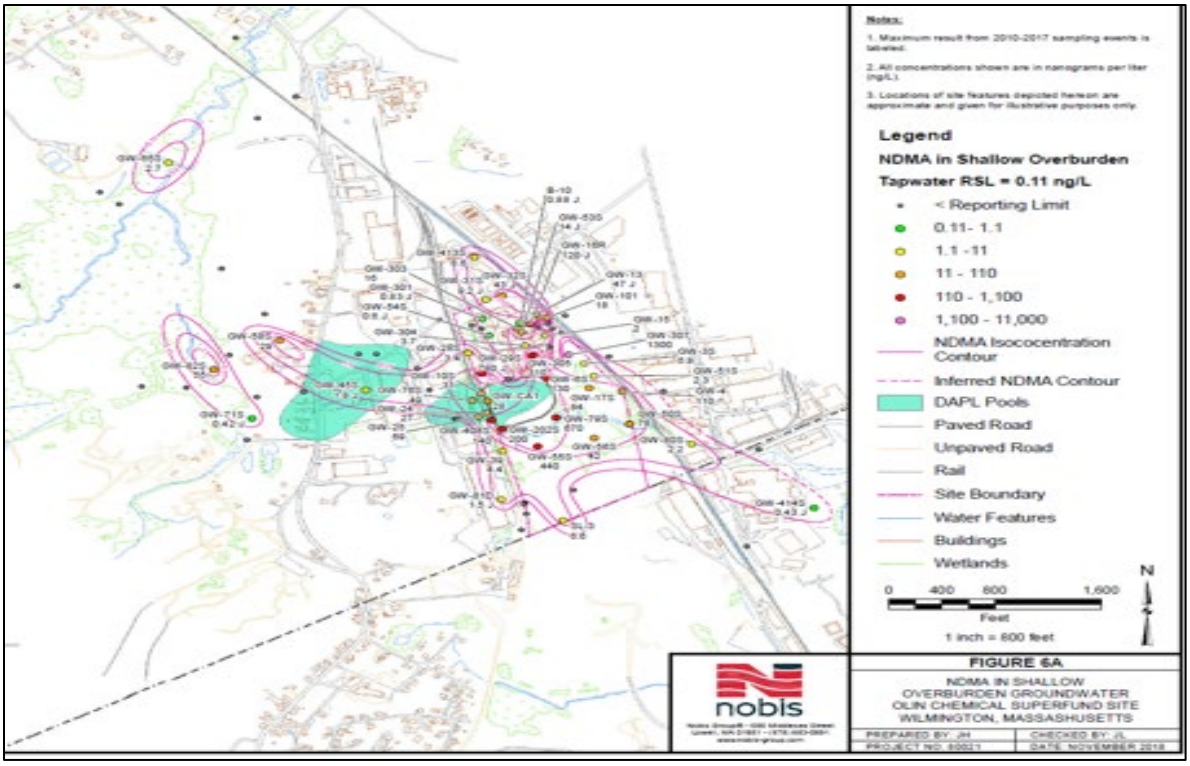

Figure 5. NDMA Concentrations in Shallow Overburden Groundwater.

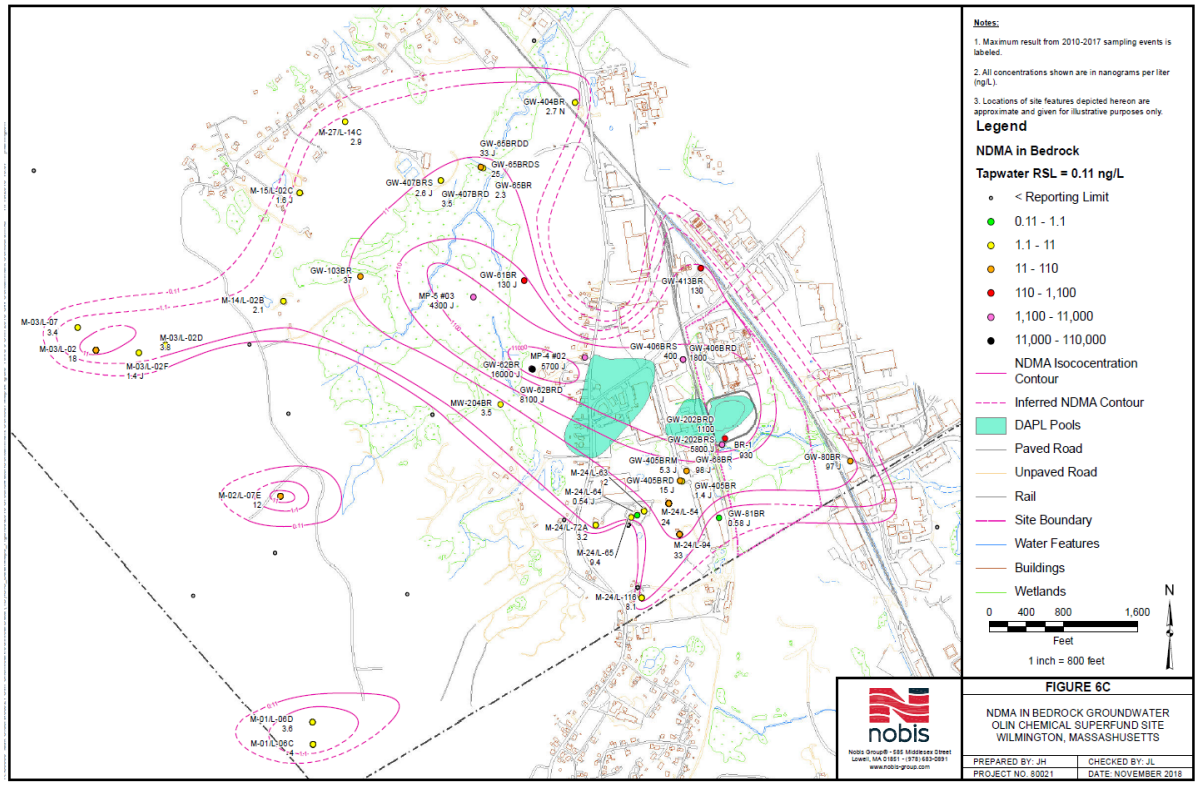

Figure 6. NDMA Concentrations in Bedrock Groundwater.

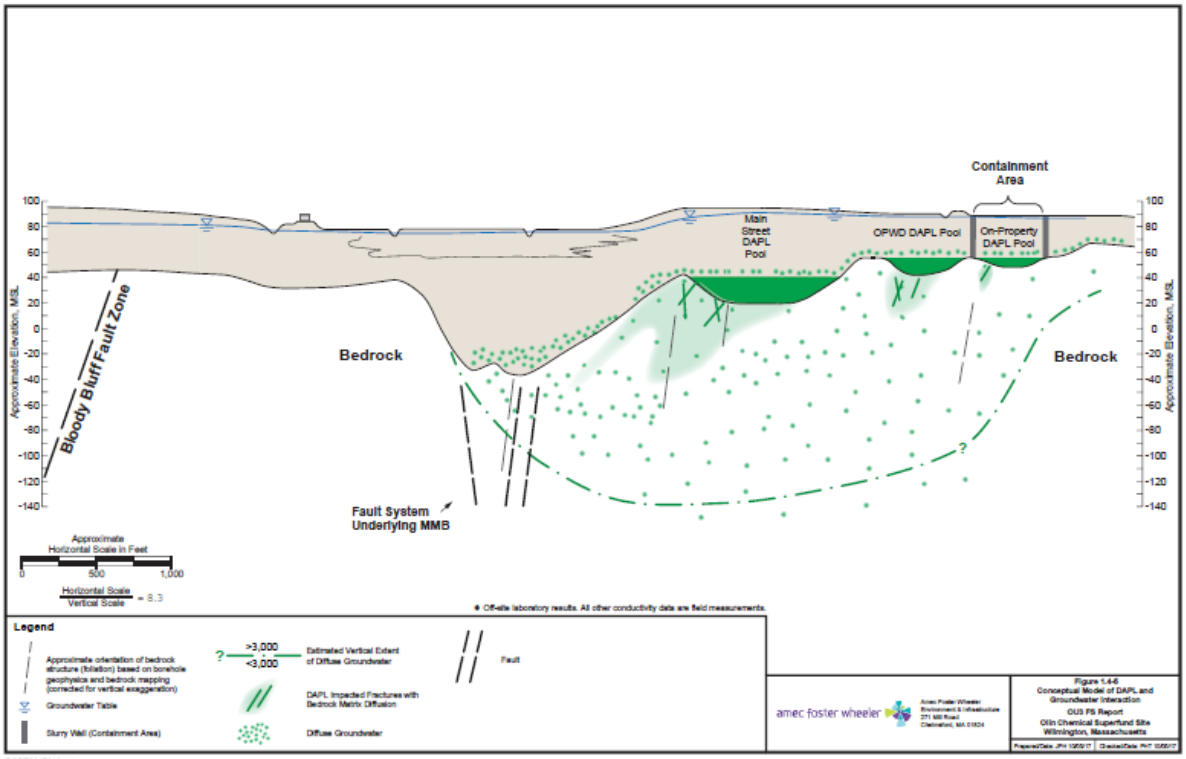

Figure 7. Conceptual Graphic of DAPL and Groundwater Interaction.

Figure 8. Current photos of the Olin Chemical Superfund site. Photo credit: EPA.

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