
**SUPPLEMENTAL INVESTIGATION
WORK PLAN
NON-PUBLIC PROPERTIES STUDY AREA
HAMDEN, CONNECTICUT**

Prepared for:

**olin**
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July 2003

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1.0 INTRODUCTION

1.1 REGULATORY STATUS

The Hamden Middle School and surrounding area, located in Hamden, Connecticut (see Figure 1), is the subject of Order SRD-128 issued by the Connecticut Department of Environmental Protection (CTDEP) on July 10, 2001. The Consent Order (appendix A) separates the site into Public Properties and Non-Public Properties. The Non-Public Properties (NPP), which are the subject of this Work Plan, are defined by the Consent Order as encompassed within the areas outlined on Figure 1 and Sheets 1, 2, and 3. The Public Properties, which are also shown on Sheets 1, 2, and 3, are adjacent to the Non-Public Properties, are the responsibility of others under the Consent Order and are not subject to the scope of work described in this Work Plan.

1.2 CONCEPTUAL SITE MODEL

1.2.1 Summary of the Initial Investigation Findings

Between December 2000 and November 2002, the CTDEP conducted subsurface investigations of non-public properties in and around the Newhall Street area. During this period, the Town of Hamden compiled background information on this area as part of a Phase I environmental site assessment. In the summer of 2002, Olin conducted a voluntary Initial Investigation on portions of the Non-Public Properties. The results of the investigation is summarized in the “Initial Investigation Findings Report, Newhall Street Residential Area, Hamden Connecticut” (Report), dated December 2002.

Fill Areas

The Initial Investigation identified and described five geographically separate areas of fill within the Non-Public Properties study area: Southwest Satellite Area, Morse Street Area, Newhall Street Area, Bryden Terrace Area, and Augur Street Area (Sheet 1, blue lines). The Morse Street, Newhall Street, and Bryden Terrace Areas are contiguous with fill underlying the public properties to the north, which are the subject of investigations by others. The thickness and extent of fill was estimated by interpolation between borings, from stereoscopic inspection of historic aerial photographs, or from field

exposures of fill and/or native soils and other topographic evidence and relationships. The extent of fill correlates with historical and anecdotal descriptions and photographs of filling in the site record.

Geology and Hydrogeology

The fill directly overlies the regionally extensive and thick glacial Lake Connecticut deltaic sand deposit that underlies the southern Hamden/western New Haven area from upper Lake Whitney to Long Island Sound. The regional sand deposit pinches out against Prospect Hill to the east and Mill Rock Ridge to the north but is reportedly up to 300 feet thick under and southwest of the Southwest Satellite Area (Surficial Materials Map of Connecticut, Stone et al, 1992 and Quaternary Geologic Map of Connecticut and Long Island Sound Basin, Stone et al, 1998). Numerous borings within the Public and Non-Public Properties show that a layer of fines (silt, clay, organic matter) is present in the Bryden Terrace Area between the fill and the sand and continues under the adjacent Public Properties. Thin deposits of glacial till mantling sedimentary New Haven Arkose and basaltic West Rock Diabase bedrock underlie Prospect Hill and Mill Rock Ridge, respectively.

Shallow groundwater flow varies across the five study areas. Groundwater flow below the Bryden Terrace Area is to the west. Under the Newhall Street Area and Southwest Satellite Areas, groundwater flow is to the west-southwest and southwest, respectively. Given these flow directions, groundwater from beneath Rochford Field and Hamden Middle School flows under the Morse Street and Southwest Satellite Areas. However, because the Augur Street Area lies between the western terminus of Mill Rock Ridge and an adjacent wetland and surface watercourse, the groundwater beneath it presumably flows to the west and discharges to the wetland and watercourse.

A brief physical description of each of the fill areas follows (refer also to Sheet 1):

Southwest Satellite Area

The fill is present in three contiguous 14- to 20-foot deep elliptical, former topographic depressions. The water table is within the underlying sand about eight feet below the deepest portions of the fill.

Morse Street Area

The Morse Street Area consists of a northward sloping wedge of fill material composed mainly of sand, ash, slag, cinders, and peat up to at least 7.5 feet thick. Portions of this fill area were subject to US Environmental Protection Agency (USEPA) removal actions addressing the surficial soils up to 18 inches deep. The fill is underlain and surrounded on all sides but the north by native light brown to reddish brown sand with trace silt and gravel.

Newhall Street Area

The Newhall Street Area lies within a former, elongated north-south trending depression that originally measured up to 13 feet below the surrounding ground level. The material consists of interlayered or intermixed sand, gravel, ash, slag, cinder and peat overlying light brown to reddish brown sand with trace silt and gravel. The water table is in the underlying sand layer about 7 to 15 feet below the base of the fill.

Bryden Terrace Area

Filling at the Bryden Terrace area is contiguous to the north and northwest with the fill underlying Mill Rock Park and Rochford Field. The fill layer is thickest in the center (11 feet) and to the northwest (10.5 feet) and consists of brown to black sand with trace amounts of gravel, ash, brick, glass, wood, cinders, ceramic, concrete and asphalt. Unique to this area of fill is an underlying, native, gray to dark brown silt with trace organics, which are believed to be former wetland deposits, with the regional sand deposit underlying the silt. The water table is in the lowermost part of the fill and the upper part of the silt layer.

Augur Street Area

The fill in the Augur Street Area lies within an elongated wedge along the eastern bank of the adjacent wetland and stream. The fill primarily consists of sand and gravel with only trace amounts of wood, concrete, brick, glass and ash up to 6.5 feet thick. It overlies native brown to reddish brown sand and gravel.

Comparison with Applicable Criteria

The applicable criteria for the study area are specified in the CTDEP Remediation Standard Regulations (RSR). The Residential Direct Exposure Criteria (RDEC) and Pollutant Mobility Criteria (PMC) apply to soils at the site. The study area is classified as GAA, hence analytical results are compared to GAPMC. The RSRs also specify Groundwater Protection Criteria (GWPC), surface water protection criteria (SWPC), and groundwater volatilization criteria (GWVC).

Comparison of Fill with Criteria

Olin analyzed 58 fill samples for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and extractable total petroleum hydrocarbons (ETPH). The results show that 95% (54) of the 58 samples contain at least one analyte exceeding RDEC. With the exception of the Augur Street area, arsenic and lead are valid indicators of an area where the RDEC is exceeded as discussed below.

In their respective investigations, Olin and CTDEP analyzed 152 fill samples from the Non-Public Properties study area for arsenic and lead. Fifty-six of the samples exceed the RDEC for arsenic, and 64 exceed the RDEC for lead. Of the 152 samples, 79 exceed the RDEC for arsenic and/or lead. Although fewer samples were analyzed for additional metals, in every case where another metal exceeds RDEC, the sample also exceeds for arsenic and/or lead. Of the 37 Olin samples that exceed RDEC for organic compounds, 31 samples (84%) also exceed RDEC for arsenic or lead.

Olin and CTDEP analyzed 85 fill samples for SPLP arsenic and lead; fewer samples were analyzed for other SPLP metals. Six of the 85 samples exceed the GAPMC for arsenic,

4.0 SCHEDULE

Completion of the supplemental investigation, through the first two rounds of groundwater sampling, is estimated to take one year following receipt of a notice to proceed by CTDEP. Figure 3 provides the estimated schedule with Month 1 being the first month after the work plan and QAPP are approved by CTDEP. This schedule assumes access agreements with the Non-Public Property owners will be completed within one month. The schedule may be affected if sufficient access is not available. However, field work may begin as soon as sufficient number of access agreements and utility clearances are obtained, pending contractor availability. Installation of monitoring wells will begin as soon as possible in order to facilitate collection of the first two quarterly groundwater samples within the desired time frame. Data will be evaluated as they are received. To expedite the process, the investigation report and proposed remedial action plan will be finalized before data from the last two rounds of quarterly groundwater monitoring are received. Separate data reports for these events will be prepared within 45 days of receipt of the data. The date for submission of a monitoring plan for the site is contingent upon CTDEP approval of the RAP.

APPENDIX A – Consent Order

APPENDIX B - CTDEP Comment letter to Olin, June 10, 2003

APPENDIX C - CTDEP Appendix II Landfill Leachate Parameters