

June 14, 2012

## GREENWICH HIGH SCHOOL ENVIRONMENTAL TESTING UPDATE

### Site Investigation Status: April 2012 Data and Summary of Results to Date

**Highlights:** *An environmental study of the Greenwich High School campus grounds is being completed. Several rounds of study have occurred (December 2011, February 2012, and April 2012). The results of this study are discussed in this update, and tell us:*

- *Overall, the sample results from the study show some areas of environmental impacts; these impacts appear to be largely focused in areas where fill material was imported to the campus during the development of the school (in particular beneath the west parking lot and fields 2, 3 and 4).*
- *The school buildings were not built on this fill (they were built substantially on top of bedrock), thus the contamination does not appear to extend beneath the school buildings.*
- *Based on the data collected so far, the environmental impacts appear to be contained on-site (i.e., there does not appear to be migration of chemicals off the Greenwich High School campus).*
- *The sampling activities completed so far have provided a good understanding of the site, but we still need to sample under fields 3, 4, 6, and 7 to have a more complete understanding of overall site conditions.*
- *The site continues to be safe for its current use (high school and athletic fields). The study confirmed that the cleanup measures taken in the fall (when soil was removed) were protective (impacted areas were removed), and that no new impacted surface areas were found.*

#### Introduction

In mid July 2011, during the course of the excavation work for the Greenwich High School (GHS) Music Instructional Space and Auditorium (MISA) project, unexpected soil conditions were discovered in the west (or back) parking lot, adjacent to the athletic fields. This finding prompted several rounds of environmental testing, where initial test results showed levels of a class of chemicals known as polychlorinated biphenyls (or PCBs) in soil above standards set by the Connecticut Department of Energy and Environmental Protection (DEEP). An environmental study of the high school campus grounds is currently underway. Separate phases of the study were completed in December 2011, February, and April 2012, corresponding with school vacations. An additional phase of study, focused on the synthetic turf fields adjacent to the West parking lot, is scheduled to occur from late June to mid August, 2012.

Earlier Project Updates (such as this one) have been prepared summarizing the data results from the December 2011 study (Project Update dated March 6, 2012) and the February 2012 study (Project Update dated April 20, 2012). These Updates can be found on our website (*refer to page 3 of this Update for a link to our website*). This Project Update has been prepared to communicate the results of the April 2012 study, as well as to summarize the data collected thus far.

#### Who is doing the environmental study, and are regulatory agencies involved?

The Greenwich Public Schools/Board of Education and the Town of Greenwich are working in collaboration to address the environmental concerns at the Greenwich High School and complete the environmental study. The Town has hired AECOM, an environmental consulting company, to be responsible for managing the project and leading the environmental study and remediation planning efforts. AECOM has a long history of working with the Town on important engineering and environmental remediation and protection projects.

There are several regulatory agencies involved in the study and overall project. The Town of Greenwich's and the State of Connecticut's Department of Public Health (DPH) have consulted on the project, as well as the Connecticut DEEP and the Federal Environmental Protection Agency (EPA). These agencies are working together with the Town to protect human health and the environment.

#### I thought the GHS Athletic fields were cleared for use – why is there more study going on?

Shortly after environmental impacts were found near the GHS athletic fields in July 2011, the Town completed interim remedial measures necessary to make the fields safe for use this spring (2012). These measures were approved by the State DPH, DEEP and EPA. Since then, the Town

has continued to study the site to determine what the long-term remedial measures will be.

### What environmental sampling was done in April 2012?

Over the school's April 2012 break, 49 additional soil borings were completed around the fields and additional groundwater samples were collected from monitoring wells. This brings the total number of environmental samples collected at the site to the following:

- 786 soil samples
- 11 groundwater wells
- 22 groundwater samples from the installed wells
- 32 sediment samples
- 7 surface water samples

During all sampling phases, the samples collected were shipped to state certified laboratories for analyses. The analytical data were then reviewed to ensure the data are of sufficient quality for decision making purposes.

### What are the results of the environmental sampling done to date?

Samples of soil, groundwater, sediment and surface water have been collected from the Greenwich High School campus grounds. Overall, the sample results show some areas of environmental impacts; these impacts appear to be largely focused in areas where fill material was imported to the site during the development of the school (in particular beneath the west parking lot and fields 2, 3 and 4). The school buildings were not built on this fill (they were built substantially on top of bedrock), thus the contamination does not appear to extend beneath the school buildings. Based on the data collected so far, these impacts appear to be contained on-site (i.e., there does not appear to be migration of chemicals off the GHS campus). Specific results of the various media sampled are described below: **Soil:** A variety of chemicals have been discovered in the samples collected from soil, including PCBs, polycyclic aromatic hydrocarbons (called PAHs), total petroleum hydrocarbons (TPH), and metals such as arsenic and lead.

PCBs have been found in soil at the site at depth (i.e., in deep samples) beneath the west parking lot and in an area east of fields 2, 3 and 4. The area with the highest PCB concentrations appears to be limited to locations between the west parking lot and fields 2, 3, and 4, although it is noted that additional sampling beneath these fields is required (this work is scheduled for June/July 2012 once sports activities have been completed). Additional data collection is also needed beneath other areas of the site. Please note that these PCB levels are not posing any immediate health risk to site users at this time because people are not exposed to the soil this deep.

Findings for other chemicals (PAHs, TPH, and lead) have a similar distribution to PCBs. The distribution of arsenic at the site is different from the other chemicals (see Data Summary Figure discussion below) and further study and data analysis is planned, as some areas of arsenic impacts may be due to natural sources.

**Groundwater:** Groundwater data collected thus far show that groundwater is impacted in the same areas where higher levels of chemicals are found in soil. Further, chemicals associated with the site (e.g., PCBs) were not found in wells installed around the perimeter of the site – this is good news, in that it appears the impacts to groundwater are localized to the central portion of the site.

The central portion of the site continues to be the area where the highest PCB concentrations have been observed in groundwater. PCBs have been detected at a well located in a spot where some of the highest PCB levels were found in soil (a spot between Field 3 and the west parking lot).

Other organic chemicals (mostly PAHs) were found sporadically in wells located in the central portion of the site. These findings tell us that there are only limited impacts related to organic chemicals in the area where fill is observed.

The metals arsenic and barium have also been detected in groundwater at concentrations exceeding conservative screening criteria (see below for further description of these criteria). Arsenic has been found to exceed these criteria in two wells installed within the area of fill but not in wells located outside the fill area. Barium is found to occur naturally in groundwater and surface water at the site. However, wells located within the fill area have concentrations of barium that exceed criteria as well.

Additional monitoring wells will be installed during the June/July investigation across the site to complete a groundwater monitoring network. Groundwater sampling will be performed and continue into the future to provide the data needed to evaluate impacts to Site groundwater, seasonal variations in these impacts, and following remedial efforts to gauge the effectiveness of the remediation.

**Surface Water and Sediment:** After review of surface water data collected at the site, it appears no site related impacts are present; although, additional environmental study is planned. Sediment samples collected from the brook and pond contained metals, PAHs and pesticides. One sediment sample location in the pond contained a low level of PCBs. Additional sediment samples will also be collected to determine if chemicals found in the earlier investigation are related to site impacts or are associated with other “background” sources (like stormwater runoff).

### What do these results mean?

Regulatory agencies have developed conservative screening levels that are considered to be safe levels of chemicals to which we can be exposed under any circumstance. These are levels to which people could be exposed without suffering health effects, and typically include very conservative exposure assumptions; for example, that a person lives on the site for 30 years, and ingests (eats) up to 50 milligrams of soil per day from the site. As a preliminary step in evaluating the data we have so far, we compared the concentrations detected in our samples to conservative environmental screening levels available from DEEP and EPA. This comparison gives us a first look at where potential environmental issues are present.

Based on the findings to date, chemicals have been identified in samples exceeding these conservative screening criteria. Several figures showing the data compared to these levels are available on our website (*see also the text box at the end of this Update*). Eventually, we will develop site-specific screening levels, which will take into account specific characteristics of the site (for example, the number of years and amount of time during the day a person is exposed to the soil); once these are developed we will update (revisit) these data comparisons.

The regulatory agencies have also developed conservative screening levels that are considered to be safe levels of chemicals without causing effects to the environment (biological organisms and plant species). These are levels which may be present without harming the environment. These screening levels have also been used to evaluate data collected to date. In fact, while chemicals identified in sediment and surface water to date do not exceed conservative screening levels for human exposure, some

concentrations exceed these ecological criteria, thus additional study is necessary.

### What happens next?

The sampling activities completed so far have provided a good understanding of the site, but we still need to sample under fields 3, 4, 6, and 7 to have a more complete understanding of overall site conditions. This additional sampling will be completed in June/July, when sports activities are completed and there can be greater access to these fields.

Additional activities over the next months will include:

- Conducting additional sampling in June/July 2012 and evaluating these data. A Project Update will be prepared prior to this work to describe the components of the sampling program, and to notify the staff working this summer at GHS and the neighbors what to expect in terms of access to the GHS fields, the type of work involved, and the safety measures that will be taken by the environmental sampling crew.
- A Project Update will next be prepared in August to notify the GHS community about the status of the fields for access and tryouts, and the beginning of the athletic season.
- Beginning a study (called a Feasibility Study) to identify and evaluate remedial (cleanup) alternatives for the site. This study will include estimates of the overall cost for the cleanup, which is anticipated to be wrapped up by late Fall 2012.

After completing the Feasibility Study, the team will still have much work ahead, including remedial planning and design, and coordination with regulatory agencies for approvals to move forward.

**For all information requests, please contact:**

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**OR, please visit our website for further information:**

**<http://www.greenwichschools.org/>**  
**see link for "Updates for Environmental Testing at GHS"**

## Data Summary Figures – available on the Town website

Eleven data summary figures (maps, drawings) are available on our website. Seven of the figures summarize soil data for the major chemicals of concern; PCBs, PAHs, TPH, lead, arsenic, and barium. Groundwater data collected in February and April 2012 are summarized on two figures, and sediment and surface water data are summarized on two figures. All of the figures are shown on the same aerial photograph of Greenwich High School with many of the major site features labeled. Each of the figures includes a red outline showing the approximate limits of impacted fill materials that were placed on the site prior to construction of the high school. This red outline is “dashed” in Fields 3 and 4 and along the western extent because that boundary has not been clearly defined yet.

Soil data analytical results are color coded based on concentrations determined at the location. For soil, the Residential Direct Exposure Criteria (RDEC) established by the CT DEEP is typically indicated and is the conservative screening criteria used to evaluate these data. Groundwater, surface water and sediment data points highlight exceedances of conservative screening criteria. For groundwater, the data are compared to the Groundwater and Surface Water Protection Criteria (GWPC and SWPC) established by the CT DEEP. For surface water and sediments, data are compared human health and ecological risk values established by the EPA. All of the data collected to date, including that from the April 2012 investigation, are represented on the figures.

### Figures for Soil

**Exceedances of Recommended Screening Criteria for Soil** – Chemicals commonly exceeding conservative screening criteria (RDEC) include arsenic, chlordane, TPH, lead, PAHs, and PCBs. Other chemicals also exceed screening criteria, but at only one or two sample locations. Nearly all of the soil concentrations exceeding these criteria are contained within the delineated area of fill. For those exceedances outside of the fill area, there will be additional study and analysis, and potentially remediation. None of the exceedances called out on this figure represents an immediate health risk to site users at this time.

**PCB Distribution in Soil** – Nearly all of the PCB concentrations exceeding the RDEC are contained within the delineated area of fill. However, the highest concentrations of PCBs are limited to an area located between fields 2, 3, and 4 and the west parking lot. PCB-impacted areas outside the fill area appear to be isolated, and the concentrations of PCBs found outside this area are much lower than those found adjacent to the west parking lot.

**PAH Distribution in Soil** – The total PAH data presented on this figure represents the sum of concentrations of all the compounds defined as PAHs. Please note that no regulatory criteria have been established for this total result, thus the results are not comparative. PAHs are commonly found in soil within the delineated area of fill, but there are other limited (and isolated) areas of the site where PAH impacts have been found. These PAH impacts outside of the area of fill may be due to historic site use (e.g., asphalt paving, oiling of parking lots prior to paving) and further study and analysis of data are required to determine why these chemicals are present in these areas.

**TPH Distribution in Soil** - Nearly all of the TPH concentrations exceeding the RDEC are contained within the delineated area of fill. Like PCBs, most of the highest

concentrations of TPH are clustered in an area between fields 2, 3, and 4 and the west parking lot. Detections of TPH greater than the RDEC have been identified outside the delineated area of fill. These TPH impacts may be due to historic site use (e.g., asphalt paving, oiling of parking lots prior to paving, releases from vehicles) and further study and analysis of data are required to determine why these chemicals are present in these areas.

**Lead Distribution in Soil** – All but one of the sampling locations where the RDEC was exceeded for lead are contained within the delineated area of fill. The RDEC value used to evaluate the data is the lower value currently recommended by CT DEEP and not the higher value currently codified in state regulations. Lead appears to occur naturally in soil at the site, as lead was detected at low levels across the site (at concentrations below the RDEC). However, lead does appear to be a common constituent in the fill material, as concentrations consistently exceed the RDEC in the area where fill has been placed.

**Arsenic Distribution in Soil** – Arsenic is found to exceed the RDEC in soil within the delineated area of fill and also on the southern portion of the site. Other chemicals of concern (PCBs, PAHs, TPH, lead) are typically not found in soil on the southern portion of the site, and the arsenic impacts in this area are not believed to be due to the placement of fill. It is possible that arsenic south of the West Brothers Brook is naturally occurring, but additional study and data analysis are required to evaluate this possibility.

**Barium Distribution in Soil** – Barium does not exceed the RDEC in any of the soil samples collected at the site. Barium results are presented because barium has been detected in groundwater at concentrations exceeding the conservative screening criteria used to evaluate that data. Concentrations of barium appear to be elevated within the delineated area of fill and the highest concentrations of



barium are limited to this area. Thus, the fill material that was placed may be serving as the source of these groundwater impacts.

### Figures for Groundwater

#### Exceedances of Screening Criteria for Groundwater

**February 2012** – Groundwater flow at the high school site is predominantly from the northwest (field 4) towards the southeast (pond). In the February data, groundwater samples do not exceed any of the conservative screening criteria in samples collected along the northern and western extent of the property. PCBs (one well) and PAHs (three wells) only exceed conservative screening criteria in monitoring wells installed within the delineated area of fill, and don't appear to extend beyond the central portion of the site. The metals arsenic (one well) and barium (three wells) also exceed screening criteria in the central portion of the site.

#### Exceedances of Screening Criteria for Groundwater

**April 2012** – Additional monitoring wells were installed and sampled during the April 2012 investigation, along with all previously installed wells. The results from this round of sampling further confirm the results observed during the February 2012 sampling event, in that chemicals of concern are observed to exceed conservative screening criteria within the delineated area of fill in the central portion of the site. Additional monitoring wells will be installed during the June/July 2012 investigation and continued monitoring is planned for the site.

### Figures for Surface Water and Sediment

#### Exceedances of Screening Criteria for Surface Water –

Surface water samples collected to date exceed only the lowest of the ecological screening criteria for barium. None of the surface water sample analytical results exceed human health screening criteria. However, barium concentrations reported in all of the samples (both upstream and within the pond) are consistent, indicating that barium is probably naturally occurring and not due to impacts from fill placed at the site. Additional study and analysis of data will be performed to evaluate surface water conditions on the high school site.

#### Exceedances of Screening Criteria for Sediment –

Sediment samples collected to date exceed only the ecological screening criteria. None of the sediment analytical results exceed human health screening criteria. Chemicals of concern that exceed the ecological screening criteria include PAHs, metals, pesticides, and PCBs in one location only. Pesticides that exceed the screening criteria included DDT (which was widely used historically but mostly banned from use before construction of the high school), its breakdown products, and chlordane, which was used at the site. PAHs are detected in sediments, but the highest concentrations are found in the upstream and concrete-lined portion of the brook and may be due to runoff from common offsite sources. The metals arsenic, lead, and barium may be due to onsite fill but other metals which exceed screening criteria (e.g., vanadium and zinc) are not commonly detected in the fill materials and may be due to offsite sources as well.