CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

PRINCIPALS & ASSOCIATES

Yee Cho, PE, LSP
Kathleen Campbell, PE, LSP, LEED AP
Jack Goodhall, PE

April 2, 2011

Ms. Lisa-Pecora Ryan
OMR Architects, Inc.
543 Massachusetts Avenue
Acton, MA 01720

RE: Supplemental Soil Testing in Landfill Area
Concord-Carlisle Regional High School
500 Walden Street
Concord, MA
CDW Project #1234.30

Dear Ms. Pecora-Ryan:

CDW Consultants, Inc. (CDW) is pleased to present a summary of supplemental soil sampling and analysis at the Concord-Carlisle Regional High School (CCHS) in Concord, MA (Figure 1 in Attachment A). The purpose of this study was to identify the potential presence of landfill related wastes in areas of proposed underground utilities. The soil data was compared with applicable regulatory standards in the Massachusetts Contingency Plan (MCP).

Summary of Previous Investigations in Landfill Area

CDW completed a Phase II – Limited Subsurface Investigation report dated October 24, 2011. Several test borings were completed at the High School based on the findings of a Phase I Site Assessment. Three (3) borings were completed in the approximate area of the former landfill. Observations during those borings indicated visual and/or analytical evidence of the landfill in two of the three boring locations (B1 and B8). Copper was identified at concentrations exceeding the applicable MCP Reportable Concentration (RC).

Based on elevated concentrations of metals in boring B8, an additional investigation was completed in that area consisting of 4 borings (B8-5, B8-6, B8-7, and B8-MW-1) with one of the borings completed as a groundwater monitoring well. Visual evidence of the landfill was observed in three of the borings including dark soils with ash, glass, metal and brick. Several additional metals were identified in soils from 0-12 feet at concentrations exceeding applicable RCs. These include cadmium, chromium, nickel, and lead. Lead was identified in three of the five borings in that area at concentrations above RCs. Groundwater sampling for soluble metals indicated two metals detected, however, these metals were below the applicable RC for GW-1 classified groundwater.

The Site was reported to the DEP on February 6, 2012 due to concentrations of cadmium, chromium, lead, copper and nickel exceeding applicable RCs.

Evidence of the former landfill was observed during a geotechnical investigation by Nobis

Engineering, Inc. in December 2011. Visual evidence including dark soils, ash, brick, glass, plastic, ceramic and metal were observed in three borings in the eastern parking lot at depths of 5-18 feet in one boring and from 5-9 feet (total depth of boring) in two borings. CDW was not on site during that investigation. For comparison, data tables are included in Attachment B.

Supplemental Subsurface Investigation in Landfill Area

On March 16, 2012, CDW completed a supplemental field sampling program of soil located within proposed areas for utilities and subsurface drainage structures. A total of 24 borings (P-1 through P-24) were advanced with a Geoprobe 6620 track-mounted drill rig by the direct push drilling method. Soil samples were obtained continuously in five foot long disposable plastic sleeves, and classified on-site. All down-hole drilling tools were decontaminated with a soap and water solution between borings. Drilling was completed by CDW's subcontractor Technical Drilling Services, Inc. (TDS) of Sterling, MA.

The borings were advanced within the historical mapped footprint of the approximated landfill in areas of proposed subsurface utilities and an athletic field. Soil samples were collected and classified in 2.5 foot increments. Eleven (11) of the borings (area of proposed detention basin and pond, to the north of the existing school building, and near the Walden Street entrance) were advanced to 10 feet below grade. The remaining 13 borings were advanced to 5 feet below grade.

Soils encountered during drilling were fill materials of varying color throughout most borings with some native sands. Evidence of the former landfill was observed primarily in the area of the proposed detention basin in the student and faculty parking lots east of the school building. There was a marked difference between landfill soils which were dark brown and black and regular fill or native soils that were light brown and tan. Darker soils with ash, brick, glass, metal and wood were observed at depths from approximately 4 feet to the final depth of the borings at 10 feet in this area. Soils in other portions of the Site were observed to be predominantly tan fine-coarse sands with some gravel. Groundwater was not encountered during drilling. Bedrock was not observed during drilling. Attachment C presents the soil boring logs.

Soil Screening and Laboratory Samples

CDW used a photoionization detector (PID) to field-screen soil samples for the presence of volatile organic compounds (VOCs) using the headspace method. The PID is an instrument used to quantify VOCs and has a detection limit of 1 part per million (ppm).

The field-screening results indicated levels of VOCs ranging from non-detect to 27.5 parts per million by volume in the samples screened. It should be noted that no olfactory evidence of VOCs was noted in the samples that exhibited readings above background, and these readings may be a result of moisture/condensation within the unit due to relatively wet weather conditions during sampling and/or organics in the samples. The PID headspace analysis results are summarized in Table 2 in Attachment B.

CDW collected and submitted one soil sample from each boring for laboratory analysis for total lead. Eight samples were analyzed for PP13 metals and four samples were analyzed for Extractable Petroleum Hydrocarbons (EPH) by the DEP Method. CDW collected one field soil sample duplicate

from P-6/S-2 for EPH and PP13 and one field soil sample duplicate from P-16/S-2 for total lead for QA/QC purposes. The soil samples were preserved by refrigeration and were delivered to the laboratory accompanied by an appropriate chain-of-custody record. CDW's subcontractor, Spectrum Analytical, Inc. (Spectrum), completed the laboratory sample analyses.

Soil Analytical Results

Proposed Underground Detention Basin and Settling Pond Area

Seven (7) borings (P-4 through P-10) were completed in this area and six soil samples were collected for laboratory analysis. Landfill soils were observed at depths of approximately 4 to at least 10 feet below grade in all borings except P-10. Lead was detected at elevated concentrations in three of the samples at depths between 4 and 7.5 feet. Ash appeared to be layered with lighter soils in boring P-5. Significantly elevated concentrations of lead were detected between approximately 4 and 7.5 feet in boring P-8 at concentrations ranging from 15,200 to 35,600 ppm. Arsenic, a metal that was not previously detected above RCs, was detected at a concentration exceeding the applicable RC in boring B-8, and will require notification to DEP.

Proposed Drain Line Areas

Fourteen (14) borings (P-1 through P-3 and P14 through P-24) were completed in these areas and 14 soil samples were submitted for laboratory analysis. Borings P-14, P-15, P19 and P20 were completed to 10 feet and the remainder were completed to 5 feet below grade. Except for the 4 foot depth in boring P-18, there was no visual or laboratory evidence of landfill materials to the final boring depths.

Proposed Athletic Field Area

Three (3) borings (P-11 through P13) were completed to a depth of 5 feet in this area and three samples were submitted for laboratory analysis. There was no visual or laboratory evidence of landfill materials in the samples collected to a depth of five (5) feet in this area.

Conclusions

Supplemental analysis of soil in a former historic landfill area was performed at the Concord-Carlisle Regional High School in Concord, MA. The investigation was performed to evaluate the potential presence of landfill soils in areas of proposed subsurface utilities, subsurface structures, and athletic fields. The soil borings were advanced in the specific areas of proposed utility excavations and to represent final depths of those excavations. The investigation verified a portion of the former landfill, however, the full lateral extent of the landfill has not been delineated.

Evidence of landfill soils were observed at depths of 4 feet or greater, and primarily in borings P-4 through P-9 in the area of the proposed detention basin and pond. Evidence of the landfill was not observed in any of the shallow (5 foot) borings, except for P-18 at a depth of 4 feet. Based on observations at depth and laboratory results, borings P-19 through P-24 and P-14 and P-15 located north of the building, in the courtyard and near the Walden Street entrance appear to be outside of the landfill footprint. Based on previous boring observations, landfill soils likely exist below 4 feet

in most or all of the boring locations east of the school building (student parking lot, field and grassy areas adjacent to building).

The identification of lead at significant concentrations warrants the delineation of confirmed boundaries of the former landfill as a preliminary measure to reduce risk and achieve regulatory closure.

Recommendations

Based on the above, CDW recommends the following:

- Based on elevated concentrations of metals in the area of proposed detention basin and settling pond, CDW recommends that these structures be relocated outside of the estimated landfill footprint.

- CDW recommends a more detailed soil investigation to delineate the boundaries of the landfill.

- Prior to any future subsurface excavations for shallow utilities within the landfill footprint, CDW recommends that a Soil Management Plan be implemented to establish procedures to be followed if landfill soils are encountered.

- Arsenic was detected as an additional compound in one boring at a concentration exceeding the applicable MCP RC. Notification to DEP is required within 120 days of knowledge of this condition.

- Additional obligations exist for assessment and/or response actions under the Massachusetts Contingency Plan. If regulatory closure cannot be achieved within one year of reporting, a Phase I/Tier Classification will be required by DEP one year after reporting, or February 6, 2013.

Limitations

The results of the testing are preliminary and indicative of conditions at the time of sampling. The findings of soil sample analysis do not represent all volumes of soil that could be generated, or all contaminants that could be found, during this project. CDW recommends that additional soil testing be performed during excavation of surplus soils to meet the sampling requirements of the ultimate soil disposal destination. If visual evidence of contaminants or subsurface structures is noted during future construction, contractors should contact an environmental professional to determine whether additional measures will be required to identify or mitigate soil or groundwater contamination.

Very truly yours,

CDW CONSULTANTS, INC.

Brian J. Miller, LSP
Project Manager

CDW CONSULTANTS, INC.

Kathleen Campbell, PE, LSP, LEED AP
Vice President

Attachment A: Figures

Figure 1 – Site Location Map
Figure 2 – Site Plan with Sampling Locations

Attachment B: Tables

Table 1 - PID Headspace Screening Results – January 12, 2012
Table 2 - PID Headspace Screening Results – March 16, 2012
Table 3 - Soil Analytical Results – PP13 Metals – January 12, 2012
Table 4 - Soil Analytical Results – Total Lead – March 16, 2012
Table 5 - Soil Analytical Results – PP13 Metals and EPH – March 16, 2012
Table 6 – Groundwater Analytical Results – Soluble PP13 Metals - January 16, 2012

Attachment C: Soil Boring Logs

Attachment D: Laboratory Reports & Chain of Custody Records