INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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November 1, 2012

Mr. Peter Cappel
AIMCO
4582 S. Ulster Street Parkway
Suite 1100
Denver, CO 80237

Re: Review of Additional Investigation Activities Report, Geophysical Survey Investigation Report, and Request for Revised RWP Approval and Technical Response to General Notice of Potential Liability Review
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, IN
VRP # 6061202

Dear Mr. Cappel:

This office has completed review of the "Additional Investigation Activities Report" which contained the "Geophysical Survey Investigation Report" as well as the "Request for Revised Remediation Work Plan (RWP) Approval and Technical Response to General Notice of Potential Liability Review". These documents were reviewed to determine consistency with the Indiana Department of Environmental Management (IDEM)'s Voluntary Remediation Program (VRP) guidelines. The documents were also evaluated against the quality control criteria found in the Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846) Third Edition, and its updates. During the review of the documents comments were generated that need to be addressed before an RWP can be approved by this office.

Additional Investigation Activities Summary Report

1. According to page six of this report, during the installation of monitoring well MMW-P-11D a private forced sewer line with an associated private lift station was encountered approximately three feet bgs. The report indicates that as-built drawings were provided by the City of Indianapolis, however the location of the line was not depicted on any site maps. Preferential pathway releases are a primary contaminant source for Michigan Plaza. As such, it is imperative that a diagram of this sewer line be provided as well as a depiction of where it discharges. IDEM also requests that the as-built drawings from the City of Indianapolis be submitted for review.

2. One of IDEM's primary concerns is that many of the monitoring wells used for delineation have been blind drilled below the water table. According to the report, downhole geophysical analysis was performed on each of the wells to clarify the geology. While geophysical analysis can provide useful supporting data, it is an indirect assessment of the geophysical conditions. Without confirmatory response data from properly logged wells, the stratigraphic interpretation of the downhole geophysical responses cannot be validated.

Geophysics alone cannot eliminate the data loss from the blind drilled wells since it is not clear if the deep wells are correctly screened at the top of till. IDEM still maintains that monitoring wells with incomplete logs are useful for screening data but may not useful for delineation or closure decisions.

Geophysical Survey Investigation Report

3. The resistivity and seismic data, included in the Geophysical Survey Investigation Report, was used to infer the subsurface geology in the area of concern. Seven resistivity profile lines were conducted as part of this investigation. Based on these seven profile lines, the report suggests that there are irregular flow paths along the top of the till layer. However these interpretations are not consistent with the data reported on the boring logs and regional bedrock maps. In general, the interpretations are geologically improbable as they often show vertical contacts between bedrock units and between the bedrock and unconsolidated materials. Furthermore, the interpreted top-of-till elevations do not match the resistivity readings or many of the logged borings along the profile lines. For example:
    - Figure 2 – Resistivity Profile Line 1: This figure depicts sand and gravel on the west side of the line from approximately 40 feet to greater than 100 feet below ground surface (bgs). The Arcadis monitoring well MW-1102, which is along this line, contained fine grained materials from 53 to 95 feet deep. Also, along the center of this line silt and clay are depicted from 20 to 100 feet bgs. Arcadis monitoring well MW-1103 shows the upper sand extending to 31 feet deep.
    - Figure 3 – Resistivity and Seismic Profile Line 2: This line depicts monitoring well MMW-14D extending into the shale bedrock with the top of till located at approximately 25 feet bgs. The log for this well shows the top of till at 36 feet with no bedrock encountered during installation. The profile line also depicts the top of till being 20 feet deep at monitoring well MW-170D. The log for this well shows the top of till at 37 feet deep, not 20 feet deep as suggested on the figure. In addition, the profile line shows the top of till at boring EB-3 to be approximately 20 feet deep, while the boring log shows the top of till at 40 feet. Finally, the top of till line for this profile shows a 'valley' in the till between EB-2 and the MW-170 nest of wells. This 'valley' is unsupported by the resistivity data on the figure.
    - Figure 5 – Resistivity Profile Line 4: This line shows a vertical channel of high resistivity directly beneath monitoring well MMW-P-02 which extends down at least 140 feet. This geophysical feature needs further explanation and confirmation.
    - Figure 6 – Resistivity Profile Line 5: The profile line shows sand and gravel extending almost 20 feet below the bottom of monitoring well MW-167D (roughly 50 feet bgs). The geologic log for this monitoring well indicates that the top of till was encountered at 33 feet bgs.
    - Figure 7 – Resistivity Profile Line 6: This line shows a very irregular top of till surface with what appears to be channel cuts. Only one monitoring well nest, MW-15S and D, intersects this profile line. According to the boring log for this well nest, the top of till was encountered at 39 feet bgs. According to the figure, the resistivity measurements show sand to at least 60 feet deep in this location.

    The interpreted top-of-till surface and suggested contaminant flow paths are unsupported by the boring log data. All of the implied stratigraphic anomalies need to be confirmed with direct geologic observations.

4. Geophysical technologies such as resistivity and seismic surveys are investigative tools which aid in the interpretations of subsurface geologic conditions. According to page three of the report "The resistivity cross-sections presented in this report are 2-dimensional representations of the general distributions of electrical resistivity in the 3-dimensional subsurface. There is no unique direct conversion from resistivity to lithology." By the very

nature of resistivity, it is imperative that the geophysical models utilized are adequately calibrated using direct measurements such as boring logs. Furthermore, the potential affects that anthropogenic features such as subsurface utilities, overhead power lines, and paved roads may have on the geophysical profiles should be taken into account. The presence of these features can greatly distort the interpretation of the geologic subsurface. It is not clear whether the potential presence of these features was investigated and how they were taken into account in the geophysical models. For example:

- Along Resistivity Profile Line 1 there are two significant dips in the till surface between electrodes 21 and 29 and electrodes 66 and 71. Overhead electrical lines are present above or nearby these apparent data anomalies. The report does not discuss the potential interference that these power lines may have had on the resistivity data in this area.
- Resistivity Profile Line 2 appears to be located atop or adjacent to a storm sewer line. The report states that "the greatest variation between predicted and actual top of till elevations is along north-south profile line 2 near Holt Road." There is no discussion of the potential effect of the anthropogenic features such as the storm sewer on the geophysical interpretations along this line.
- In the upper unit along Resistivity Profile Line 3 there are features labeled as voids. This profile lines run through a cemetery. The possible effect the nearby graves may have had on the geophysical profile is not discussed. These anthropogenic features may explain the voids that are depicted in the sand and gravel unit.
- Along Resistivity Profile Line 4 there is a pronounced dip between electrodes 31 and 35 which is located in a red colored area labeled as sand and gravel. There is also a large red anomaly in this area that appears to extend below ground surface to a depth of at least 120 feet. This anomaly is located in the general area of the sanitary sewer line encountered during the installation of monitoring well MMW-P-11D, yet there is no discussion of how this storm sewer may have affected the profile line.
- Along Resistivity Profile Line 5 there is a dip between electrodes 28 and 32 which appears to coincide with a known sewer line. This profile line also crosses a paved road however there is no discussion on how this may have effected electrode placement or how the paved surface and sub-base for the roadway were taken into account in the geophysical models.
- Resistivity Profile Line 6 is located within the Michigan Meadows Apartments Complex. The anthropogenic features related to the apartment complex were not discussed in the report nor is it clear whether they were taken into account when creating this line. For instance, pronounced dips are shown near electrodes 7 and 40 which correspond to areas where sewer lines are known to be present.

5. According to the report, seismic surveys were conducted along Resistivity Profile Lines 2 through 5. The report does not indicate why seismic surveys were only conducted along these profile lines and not Resistivity Profile Lines 1 and 7. It is also not clear how the data obtained from these seismic surveys was utilized in the interpretation of the till surface or to what extent the data was used in relation to the resistivity data. Since the actual seismic data was not included in the report an evaluation of the correlation between the data and the actual depth to till could not be conducted. A discussion of why seismic surveys were only conducted along Resistivity Profile Lines 2-5 should be provided as well as the actual seismic data collected.

<u>Response to IDEM's Request for Revised RWP Approval</u>

6. This report included composite plume maps for each compound which depict Michigan Plaza, Genuine Parts, and USEPA sampling locations. The maps appear to compile

groundwater results from both grab samples and monitoring wells from various times. IDEM attempted to validate the iso-concentration lines and noted the following inconsistencies:

- Figures 15 and 16 – Cis-1,2-DCE Distribution in Shallow and Deep Groundwater: The iso-concentrations listed on the figures for cis-1,2-DCE are >5, >10, >100, and >500 ug/L. Considering that the MCL for cis-1,2-DCE is 70 ug/L, that concentration should have been used as a baseline value. As listed, the contouring makes the plume look worse than the actual data indicates it is.
- Figure 15 – Cis-1,2-DCE Distribution in Shallow Groundwater: The figure depicts monitoring well MW-167S as being located within the >10 ug/L contour. A review of the sampling data for this well indicates that for the past two years the well has been below detection limits for cis-1,2-DCE.
- Figure 18 – Vinyl Chloride Distribution in Deep Groundwater: The figure shows monitoring well MW-167D within the >100 ug/L contour, however the most recent sampling event indicates that this well contained 16 ug/L of vinyl chloride.
- Figure 18 - Vinyl Chloride Distribution in Deep Groundwater: The figure shows that the >100 ug/L vinyl chloride plume widening around monitoring well MMW-2S, however there is no data to support this conclusion since MMW-2S does not extend into the deep aquifer.

In summary, the cis-1,2-DCE and vinyl chloride plume maps (Figures 15-18) depict unusual shapes without accessible analytical data to support them. A complete listing of each groundwater data point used to create each composite map should be provided. Furthermore, the maps should be revised to accurately depict the supporting analytical data. Without this data, the interpretation of the plume's nature and extent is unsupported.

7. IDEM has requested on several occasions that the residential properties to the west of the Plaza be investigated for vapor intrusion. To date this investigation has not been conducted. The report notes that several attempts have been made to obtain access to the property located at 3817 West Michigan however, no additional information was provided. There are additional properties besides 3817 West Michigan Street to the west of the Plaza that need to be investigated for vapor intrusion, yet there is no mention of attempts to gain access to these properties. Given that Source Area A extends farther than previous suspected it is imperative that vapor intrusion sampling be conducted immediately at the residential properties to the west of the Plaza. In addition, a detailed list of past attempts to gain access to 3817 West Michigan Street should be provided for IDEM review.

Responses to the comments discussed in this letter should be submitted to VRP within 60 days from the date of this letter. If you have any questions, please contact me at (317) 234-2513, (800) 451-6027, or at canderson@idem.in.gov.

Sincerely,

Carmen Anderson

Carmen Anderson, Senior Project Manager
Remediation Services Branch
Office of Land Quality

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