



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION I  
JOHN F. KENNEDY FEDERAL BUILDING  
BOSTON, MASSACHUSETTS 02203-0001

April 7, 1998

D. Michael Light  
ISRT Coordinator  
Solutia  
10300 Olive Boulevard  
St. Louis, Missouri 63141

Superior Records Center  
SITE: *Industri-Plan*  
REF: *7.5*  
OFF: *SDMS# 230919*



SDMS DocID 000230919

Re: EPA Comments to the voluntary SSI Report

Dear Mr. Light:

The purpose of this letter is to provide specific comments to the voluntary investigation conducted for the ISRT and summarized in the Supplemental Site Investigation (SSI) Report, dated September 1997, prepared for ISRT. Pursuant to this submittal, EPA held two meetings to discuss the contents of the SSI Report. At the first meeting held on December 19, 1997, ISRT and their contractors presented the SSI data, while EPA asked specific questions. During the second meeting held on February 3, 1998, EPA and ISRT discussed the site's geo-chemical conditions and the future evaluation of natural attenuation mechanisms at the site. During both meetings, EPA expressed the need for additional data relative to adsorption capacities for arsenic (both HBHA wetland sediments and HBHA pond sediments), ground water discharge to HBHA Pond (i.e. no bypass below or around the pond), transitions of geochemical zones from the source areas to the pond-wetland area controlling arsenic transport and transformation, and downgradient transport & transformation of sediment-associated arsenic.

EPA explained during the February 3, 1998 meeting, that insufficient data was collected to support the SSI Report conclusions and the groundwater data was not comparable to the previous GSIP Phase 1 and 2 data (e.g. different horizontal and vertical locations; different sampling techniques (bailer versus pump)). EPA suggested that if groundwater natural attenuation and geo-chemical conditions were to be monitored for direct comparison, then ISRT should establish fixed monitoring points (horizontally and vertically) within the plume and monitor the points over time. Prior to selecting the locations of these monitoring points, the plumes should be sufficiently characterized (horizontally and vertically) so the optimum locations of the monitoring points can be selected. Additional sediment data should also be collected and analyzed through certified laboratories to properly determine the sediment adsorption capabilities, as well as other fate and transport/natural attenuation mechanisms. The number of samples collected should be representative of the HBHA Pond and HBHA Wetlands.

EPA was also concerned about organic materials causing geo-chemical conditions which release, or maintain the release, of metals in groundwater. These organic materials consist to the toluene



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and benzene plumes, animal hide pile material (e.g. Western and Eastern Boston Edison ROW Number 9 Permeable Caps), buried organic sediments with high metal concentrations (e.g. Former Mishawum Lake), and organic sediments with high metal concentrations along the HBHA Pond and HBHA Wetlands. All these organic materials may be attributing to the release or re-release of metals in groundwater and surface water. Additional data needs to be collected to evaluate the geo-chemical/biological conditions associated with these contaminant releases into the environment. In addition, the extent of the metal, toluene and benzene groundwater plumes need to be fully characterized to determine their migration pathway and end point. This data will determine if the plumes by-pass the HBHA Pond.

The ecological risk assessment (ERA) issues identified in the EPA Comments on the GSIP Phase 2 report (comments dated December 13, 1996) were not addressed by the SSI report. The report does not address the data gaps identified in the GSIP Phase 2 comments and the preliminary GSIP Phase 3 approach, in relation to the information necessary for properly completing an ERA for the HBHA Pond and HBHA Wetlands. The assessment of such risks should consider the contamination associated with surface water, sediments, and pore water, and should address the potential long-term risks due to contaminant concentrations in these media as affected by the continuous discharge of contaminated groundwater (e.g. HBHA Pond). The downstream migration of contaminated sediments and surface water from the HBHA Pond and HBHA Wetland also represents an ecological risk concern that should be properly assessed and addressed.

On March 6, 1998, EPA submitted a Draft Scope of Work (SOW) outlining the additional work necessary to be implemented at the Industri-Plex Superfund Site, Woburn, MA, and complete ISRT's investigation obligations under the existing Consent Decree. The Draft SOW was also intended to establish a technical dialog between EPA and ISRT scientists, engineers, and project managers. It is hoped that this dialog will promote a productive exchange and result in a mutually acceptable SOW prior to formally disapproving ISRT's December 17, 1997, response. Currently, the following technical meetings have been scheduled to discuss the details of the Draft SOW:

Meeting: Groundwater Monitoring/Geo-Chemistry

Date: April 8, 1998

Location: Tetra-Tech NUS (Brown & Root Environmental), 55 Jonspin Road, Wilmington, MA

Time: 10:00 AM - 4:00 PM (Directions attached)

Meeting: Sediment Fate and Transport

Date: April 15, 1998

Location: US EPA, 90 Canal Street, Boston, MA (large 1st floor conference room)

Time: 9:00 AM - 12:30 PM

Meeting: Ecological Risk

Date: April 15, 1998

Location: US EPA, 90 Canal Street, Boston, MA (large 1st floor conference room)

Time: 1:30 PM - 5:00 PM

Meeting: Human Health Risk

Date: April 16, 1998

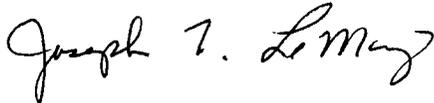
Location: US EPA, 90 Canal Street, Boston, MA (large 1st floor conference room)

Time: 9:00 AM - 12:30 PM

It is hoped that the appropriate technical personnel from each of our offices will be able to attend the above scheduled meetings. If there is some significant scheduling conflict, please contact me immediately. Please find attached EPA's specific SSI Report comments. Most of these comments were discussed with ISRT during the previously meetings.

If you should have questions regarding these comments, please contact me at (617) 573-9622.

Sincerely,



Joseph F. LeMay, P.E.  
Remedial Project Manager  
MA Superfund

cc: Larry Brill, EPA  
Dan Coughlin, EPA  
Dan Winograd, EPA  
Steve Schlang, EPA  
Anna Mayor, MADEP  
Paul Craffey, MADEP (letter)  
EPA GSIP TEAM

**SPECIFIC COMMENTS ON THE  
SUPPLEMENTAL SITE INVESTIGATION (SSI) REPORT  
DATE: SEPTEMBER 1997**

1) Page vi, para 1: The text indicates that the fate and transport mechanism "are often unique to" different areas of the site. This statement indicates that the fate and transport mechanism can not be universally applied through-out the Site, and indicates the original theory can not be applied to every area. These unique fate and transport mechanism need to be described and presented more clearly.

2) Page vi, para 3: Please explain why the source areas were not investigated for groundwater and soil geochemistry (as opposed to their vicinity).

3) Page vi, para 5: Please present for Work Element 3 and 5 the procedures for sediment sample collection and analysis. Please indicate if depositional sediment samples were targeted for sample collection. Please indicate the organic content of each sediment sample.

4) Page vii, para 1: Please identify if surface water vertical profiling was conducted in the HBHA Pond. Please present the results and profiling depths.

5) Page vii, para 4, COC Release Mechanisms in Source Areas: The historical data presented in this section of the report is not accurate. Animal hide stockpiling on the site coincided with the commencement of glue manufacturing activities in the mid 1930's. Pre-existing arsenic and lead soil contamination were already present on the site from previous chemical manufacturing operations which began in the 1850's. The glue manufacturing operation caused soil at the site to become contaminated with chromium (e.g. chromium lagoons). In addition, the animal hide residue were also contaminated with chromium (e.g. use of chromium tanned hides). In 1970's, a developer moved the animal hide residue around the site creating four, more defined, animal hide piles at the Site, as well as the animal hide residues used as fill along certain sections of the Boston Edison ROW. During the movement of animal hide residue, some contaminated soils became intermixed with animal hide residue causing some arsenic, lead and additional chromium contamination to be present in the animal hide residue. Although, the predominant contaminate associated with the animal hide residue is chromium. Therefore, these environmental conditions have been in place since the stockpiling of animal hide residue at the site, which coincides with the glue manufacturing commencement in the mid to late 1930's, not 1970's as the text suggest. This, in turn, means that these environmental conditions have been present at the site since the mid to late 1930s and releases have been occurring since then, relative to the groundwater. This of course does not take into account the releases which have occurred throughout the chemical and glue manufacturing history at the site through surface water and sediment erosion.

6) Page viii, para 1: The text suggests that "the extent to which arsenic and chromium are leached

form the metals containing soils, and the forms of arsenic and chromium present in the leachate, are controlled by the oxidation-reduction potential of the infiltration water. Specifically, more arsenic and chromium are leached, and more mobile forms are produced, by water with lower oxidation-reduction potentials." This theory was questioned in EPA's December 13, 1997 GSIP Phase 2 Comments.

7) Page viii, COC Release Mechanisms in Source Areas: At the Source Areas, the text suggests that Eh's has increased, therefore, oxidation has increased. They have also found that arsenic and chromium concentrations have generally decreased (specifically at West and East-Central Hide Piles). In addition, "the majority of the source-area arsenic is in the oxidized, less mobile arsenic V form." EPA recalls that the source areas have always illustrated higher concentrations of arsenic V, versus arsenic III. Notwithstanding, the overall groundwater concentrations of arsenic are well above the state MCP GW-2 standard of 400 ppb. The arsenic problem is not resolving itself to comply with current MADEP groundwater standards.

8) Page ix, para 1: EPA does not consider the toluene and benzene source area investigations carried out during the 1980's and 1990's to be extensive. Based upon recent toluene and benzene source area investigation conducted during November and December 1997, toluene concentrations near the East-Central Hide Pile are still high at 10-20 ppm at a depth of approximately 15-25 feet below the ground surface. The text's statement that the source has decreased significantly since the GSIP is incorrect. EPA's GSIP Phase 2 Comments indicated that these source areas needed to be investigated further to determine the extent of contamination horizontally and vertically and identify sources which may be considered for removal.

9) Page ix, para 2: Please provide the basis for groundwater discharging into the New Boston Street Drainway. The text states, "Consequently, the HBHA Pond acts as the "endpoint" for groundwater COC plumes migrating away from suspected source areas at the Site." EPA has stated in the December 13, 1996, GSIP Phase 2 Comments, that there are other source areas created by the Site, 1) Boston Edison ROW where contaminated animal hide residues were utilized as fill, and 2) the former Mishawum Lake where contaminated soil and sediments may have migrated and deposited. The text suggests that water level measurements support a groundwater model which indicate that groundwater discharges into the HBHA Pond or the New Boston Street Drainway. EPA has stated in the December 13, 1996 GSIP Phase 2 Comments that additional groundwater investigation is required to determine the migration of contaminated groundwater, groundwater flow, and ultimate groundwater flow discharge.

10) Page x, para 2: The text states, "More reducing conditions may exist, however, in limited areas of the aquifer, particularly at depth, where more of the organic matter from the source areas is present in groundwater. In these organic-material rich areas of the aquifer, arsenic and chromium attenuation appears to be limited, as the arsenic and chromium remain in solution in reduced forms instead of being oxidized and adsorbing/precipitating out with iron hydroxides." EPA interprets this to mean that in deeper portion of the aquifer with higher organic content (Aberjona River Organics) the arsenic and chromium concentrations remain in solution and do not

adsorb/precipitate out in the sediments. These arsenic and chromium solution may never discharge into the HBHA but may continue to migrate beyond the HBHA Pond along the organic rich areas of the aquifer. Please clarify.

11) Page x, para 3: The text suggests that there is little attenuation of benzene and toluene downgradient of the suspected source areas. This indicates that there is a source present upgradient causing a continuous release downgradient. Additional investigations are required for these source areas as indicated in the December 13, 1996 GSIP Phase 2 Comments.

12) Page x, para 4, Environmental Fate of COCs in groundwater discharging to the HBHA Pond: The text states, that a "major conclusion of the SSI is that these processes [sediment filtration/metabolizing] continue today to effectively remove COCs from discharging groundwater." While this process may be occurring, EPA contends that a major flaw with the GSIP and SSI is the failure to recognize the HBHA Pond as a wetland and the environmental impacts these contaminants have on the sediments and surface water of the HBHA Pond and the entire HBHA.

13) Puls p. x: Reference is made to more reducing conditions persisting in various parts of the aquifer and a suggestion is made that there is some correlation to more higher organic-material-rich areas. However, the report does not present this data or correlations. Please provide this information.

Reference is made to bio- and geochemical processes controlling removal of COC's from discharging ground water. The report provided some limited data regarding the geochemical processes, however, no data was provided for the biological processes. Please provide this data.

14) Page xi, para 1, Environmental Fate of COCs in groundwater discharging to the HBHA Pond: The text states that "the role of organic carbon in sequestering arsenic and chromium appears to be minimal." This needs to be described and presented clearer and with more detail in the report. It appears that groundwater discharged to the HBHA Pond, which is not adsorbed by iron bearing sediment or precipitated with sulfates and hydroxides, will migrate into the surface water.

15) Page xi, bullet 3: Please provide the data which suggests that "microbes in HBHA Pond sediment thrive on benzene." This was not clearly presented in the GSIP studies as suggested.

16) Page xi, para 3: A portion of the groundwater plumes (arsenic, toluene, benzene, anoxic) discharge into the HBHA Pond and impact the environment. Please provide the dimensions of the HBHA Pond. Other than the morphology of the HBHA Pond, please provide additional data supporting the statement that the sediments are retained in the pond. As stated in the December 13, 1996 GSIP Phase 2 Comments, additional investigations should be conducted to determine the migration of sediments during the high flow and storm events. At the end of the paragraph, the text states, "however, based on the detection of COCs (i.e. arsenic and chromium) on suspended solids at the outlet from the HBHA Pond, some limited downstream transport of sediment adsorbed COCs to the HBHA wetland appears to occur." This statement suggests that

a continuous release of metals is occurring from the HBHA Pond. In addition, this release is most likely significantly exacerbated during high flow and storm events.

17) Page xi, para 4: The text states that “residence times for surface water in the HBHA Pond and particularly in the HBHA wetlands appear to be too short to provide significant attenuation of any COCs that may periodically break through to surface water.” EPA interprets this statement to mean that there is a continuous release of low level metals in the surface water which migrate beyond the HBHA boundaries of Route 128 impacting other areas downgradient. These releases are exacerbated during high flow and storm events.

18) Puls p. xi: The report states that COC’s are “generally retained in the pond due to the relative quiescence of the pond bottom”, but there is no supporting information for this assertion. Indeed there is a significant body of data suggesting just the opposite with respect to downgradient transport of arsenic-laden sediment.

“Some limited downstream transport of sediment-adsorbed COC’s ... appears to occur”. This needs to be further evaluated in light of other downstream transport data (non-PRP generated), and a conceptual model developed for this transport. Action to control such transport should be included in an overall remedial design.

19) Page xii, para 1, Long-Term Environmental Fate Issues: The text states the “sediment’s capacity to attenuate arsenic discharging to the pond is estimated to be at least several hundred years. However, additional arsenic adsorption will likely be accompanied by increased pore-water concentrations of arsenic.” This increase concentration of arsenic in pore water will create an increase in the toxicity of the pore water to biota. In addition, the increased arsenic concentrations will also increase the release of arsenic to the surface water.

20) Page xii, para 1: The text states “the sediment’s capacity to adsorb benzene was calculated to be less than 1 year, assuming no biodegradation processes occur.” It appears there is an insufficient capacity for the sediments to adsorb benzene. Therefore, higher and higher concentrations of benzene will be released to the surface water.

21) Puls p. xii: The sediments capacity to attenuate arsenic is estimated to be several hundred years but it is acknowledged that increasing adsorption will result in increased pore water concentrations. This will become more of a problem as the sorption capacity is approached. In addition, conservative calculations of arsenic attenuation capacity estimate a value of attenuation capacity of 87 years, not several hundred years.

Data Gaps: Many of the areas warranting additional investigation which are outlined in the text, appear to focus on the natural attenuation of contaminants. These items include: 1) the trend toward less-reducing conditions at the source areas; 2) toluene reduction in the suspected toluene source area; and 3) mechanisms for biodegradation of benzene in HBHA Pond sediments (this is being investigated because the SSI’s initial sediment capacity evaluation indicated that the

sediments could not adsorb much more benzene). The other items relate to the migration of HBHA Pond sediments during storm events, and evaluation of a possible arsenic source south of the HBHA Pond. EPA's December 13, 1996 GSIP Phase 2 Comments requested these areas be investigated as well as numerous other items, such as the following: 1) source area investigation of the Boston Edison ROW and Former Mishawum Lake area, as well as any groundwater migration from these areas; 2) Existing sediment toxicity investigation (chemical, toxicity, benthic); Fish investigation (chemical, toxicity); 3) Benzene and Toluene Source Investigation; 4) Horizontal and vertical Extent of Benzene, Toluene, Arsenic and Chromium contaminations in the Aquifer, including bedrock elevation confirmation; 5) HBHA Pond Investigation: groundwater discharge concentrations, vertical gradients, inflow/outflow; etc...

22) Page 3, Section 2.1.1: Please explain why the source areas were not directly monitored for groundwater and soil contamination.

23) Puls p. 3: Five ground water sampling wells at the toe of the multiple source areas are insufficient to compare with prior data or make the rather sweeping conclusions which are made regarding current geochemical conditions and what those conditions are from the source areas to the assumed discharge areas.

24) DEP pg. 4, para. 1, Section 2.1.1: (a) Figure 1 does not accurately depict the surface water flow across the site and into Hall's Brook Holding Area. (b) It would be useful to show the location of former wells OW-36, OW-12 and OW-39 in Figure 1 as compared to GW-1, GW-4, and GW-5 respectively.

25) Page 4, Section 2.1.1, para 3: Please explain why unfiltered samples were not collected analyzed for COC. Please explain why low-flow groundwater sampling techniques were not implemented for the SSI.

26) Page 5, Section 2.1.1, para 1: Please explain why unfiltered samples were only analyzed for copper and zinc.

27) Page 5, Section 2.1.2, para 4: The text indicates that a laboratory column test was conducted to represent site conditions of hide pile material interfacing with underlying soils contaminated with arsenic. Please provide all analytical data of the existing site conditions which form the basis for the column test, including analytical data of the animal hide residue and the immediate and underlying soils interfacing with the animal hide residue. There appears to be some over simplifications with the laboratory column test to represent the field conditions. Such simplifications including the assumption that the underlying, interfacing soil is contaminated with arsenic. Another, is the existing impact of animal hide residue, which contains chromium, arsenic and possibly lead concentrations associated with the glue manufacturing operations and the previous developers movement and consequent mixing of the contaminated soils from the site.

28) DEP pg. 6, para. 3, Section 2.1.2: Please indicate on Figure 1 from where the samples of

the hide residue were collected for the column study.

29) Page 7, Section 2.1.2, bullet 5: The stabilization of ORP and DO do not indicate equilibration of the groundwater. Other significant stabilization monitoring parameters include turbidity and Eh. In the future, EPA's low flow groundwater procedures should be implemented.

30) Page 9-10, Section 2.1.2, Column Set-up: The set up process implemented on column prior to conducting the analysis caused 1) loss of soil from leaching arsenic-impacted soils; 2) agitation to the column to remove portions of the arsenic-impacted soil and replace with sand and glass wool, as well as repacking the column; 3) incubation of the column for five days; and 4) temperature of the column was increased from 13 - 15 °C to 21 °C and incubated for four days. It appears these activities altered the soil samples within the column to the point where they could not be considered representative of the field. Please clarify. Also, please explain why the information learned during this process was not carried over into another more representative test.

31) Page 12, Section 2.2.1, para 2: Please explain why unfiltered samples were not collected analyzed for COC.

32) Page 12, Section 2.2.1, para 3: Please explain why sample MC-1D was sent to the laboratories for arsenic species analysis, batch adsorption testing and biodegradation testing when sample MC-1D was Non-Detect for arsenic.

33) Page 15, Section 2.3.1, para 2: Please explain why a underlying sandy material sediment sample could not be collected at sampling point SED-2. Also, please explain in detail the sediment sampling and analysis procedures, including homogenization of the sample in the field. Homogenizing the samples may be inappropriate for volatile analysis.

34) Page 16, Section 2.3.2, para 2: Please explain how sediment sample from SED-1, which was spiked with additional chromium and arsenic, remain representative of the chromium and arsenic in the field.

35) Page 17, Section 2.3.2, para 3: Please explain why the initial arsenic concentrations were not measured. This initial concentrations represent unspiked soil from the well, and would have provided valuable data relative to the unspiked state.

36) DEP pg. 18, 1st Para. (Section 2.3.2): For the metal adsorption test, please clarify if the rotary tumbler was sealed air-tight (similar to what was specified for organic parameter testing) to ensure that oxygen was not entering the system. In addition, the Department questions whether centrifugation is the appropriate physical method to use in this case, both for metals and organics, because it would subject the sample to a physical force that does not exist out in the field.

37) Page 19, Section 2.3.3, para 2: What was the temperature controlled at through-out the fourteen day biodegradation test? The text suggests that groundwater vials were maintained at

ambient room temperature. This temperature does not appear to represent natural sediment /groundwater interface temperature conditions. This higher temperature may also artificially increase the amount of biodegradation.

38) DEP pg. 20, Section 2.4.2: Please give more detail on the molecular characteristics of the rhodamine dye. It is difficult to relate it to the contaminant behavior because it is not determined if the dye tends to adsorb to particulates, or if it would travel through the HBHA in a dissolved state.

39) Page 21, Section 2.5.1, para 2: In addition, the text should indicate that two surface water samples (SW-1 and SW-2) were also collected directly from the HBHA Pond at varying vertical depths. The results of this surface water vertical profiling illustrated significantly higher concentrations of total metals at depth. Please explain why vertical surface water sampling was not conducted at other surface water locations.

40) Page 22, Section 2.5.2, para 2: Please provide a comparison of the laboratory, EM, and XRF analytical results of SED-3 and SED-4.

41) DEP pg. 22, Section 2.5.2: Again, please explain the method of "homogenizing" the samples in the field.

42) Page 22, Section 2.5.2, para 3: Please explain how the groundwater samples from MC-3S, which were spiked with additional benzene, chromium and arsenic, remain representative of the benzene, chromium and arsenic concentrations in the field.

43) Page 23, Section 2.5.4, para 2: What was the temperature controlled at through-out the biodegradation test?

44) Page 23, Section 2.5.5, para 3: Please describe how the dye was released from the HBHA Pond outlet, and explain if this release would be consistent with a groundwater release within the HBHA Pond which migrated to the HBHA Pond outlet.

45) Page 25, Section 3.1.1, para 1, Benzene: According to the GSIP Phase 2 Plate 5, the OW-54C Monitoring well was situated west/southwest of OW-12. The SSI Figure 2 has the SSI GW-4 Well, which is suppose to represent the same location of OW-54C, located east/southeast of OW-12. There appears to be some discrepancy regarding whether or not GW-4 is situated at the same location as OW-54C. If the locations are different, obviously they are not directly comparable. In addition, the OW-54C Well was constructed with a 5' screen, while the SSI GW-4 well was constructed with a 10' screen. Again, these conditions do not allow for a direct comparison. The text should also mention that the benzene concentration has increased from 1992 when comparing the GW-4 benzene result of 1,000 ppb to the previous OW-54C well benzene result of 200 ppb.

This indicates that a an upgradient source is continuously releasing benzene to the aquifer.

In addition, the November 1993 groundwater data collected by Geraghty & Miller near the area of GW-4 illustrate the following benzene concentrations: Well # 93-6: 2,530 ppb (shallow), 3,230 ppb (intermediate), and 1,460 ppb (deep); and Well #93-16: 2 ppb (shallow), 358 ppb (intermediate), and 380 ppb (deep). Well # 93-6 illustrated higher concentrations while well # 93-16 illustrated concentrations a order of magnitude less.

46) Page 25, Section 3.1.1, para 2, Benzene: The source area is approximately 700' north of OW-43 and needs to be evaluated further relative to status of the benzene source in the West Hide Pile. The benzene concentrations at the site increase with depth and OW-43 was a shallow well. It is likely that a plume from the source is at a greater depth.

47) DEP pg. 25, Section 3.1.1: Please cite the contaminant level detected for benzene at GW-4 in the text in a similar manner as is done for toluene.

48) NUS Page 25 Figure 3; A comparison of the extent of benzene in groundwater to the extent of toluene in groundwater, Figure 2, indicate that the two plumes have a different shapes. A review of Figure 13, the modeled water table elevation contours, indicates that the toluene plume has spread against the interpreted groundwater gradient and resultant flow direction toward the chromium lagoons. Although, the difference in the plume shapes indicates that there may be more than one source area for toluene or a source area other than the east central hide pile.

49) Page 25, Section 3.1.1, para 3, Toluene: The previous OW-16 monitoring well was screened from 15 to 35 feet below the ground surface. The SSI GW-3 sample was collected from a depth of 23 feet. This sample is not comparable to the OW-16 monitoring well groundwater data. The data collected from OW-16 was representative of the well screen depth of 15 to 35 feet, not a specific sample depth of 23 feet. In addition, after the release of this report ISRT investigated the toluene source near the intersection of Atlantic Avenue and Commerce Way and found that high concentrations of toluene contamination in high concentrations (approximately 20 ppm) still exist at depths ranging from 15- 25 feet.

In addition, the November 1993 groundwater data collected by Geraghty & Miller near the area of GW-4 illustrate the following toluene concentrations: Well # 93-6: 2 ppb (shallow), 3 ppb (intermediate), and 166 ppb (deep); and Well #93-16: ND ppb (shallow), 30 ppb (intermediate), and 33 ppb (deep).

50) NUS Page 25; The interpretation that the decrease in toluene, GW-3, is due to remedial actions alone is not supported by the data. The short sample interval used for the micro wells and the change in sample methods could also result in a reduction in COC concentration. In addition, the potential for changes in the groundwater flow directions caused by reduced recharge after cap construction has to be evaluated. In short, the potential that GW-3 is not at the optimal location to monitor COC migration from this potential source area has to be evaluated for both the horizontal and vertical placement of the screen intake.

51) Page 26, Section 3.1.1, para 2, Toluene: Considering that GW-5 is situated cross gradient of the groundwater flow direction and is approximately 150-200' away from OW-39, EPA does not consider the results of GW-5 to be comparable to OW-39. See comment for Page 79, Section 8.0.

52) NUS Page 26; The non-detect of toluene at GW-5 may be related to the lack of source identification commented on by EPA during the GSIP Phase one and two.

53) Page 26, Section 3.1.1, para 3, Arsenic: See above comment on Section 3.1.1, para 3, Toluene. Also, the GSIP Phase 2 Report, Plate 7, illustrates OW-43 maximum and minimum concentrations of arsenic concentrations at 2,850 ppb and 60.1, respectively. Table 3 only illustrates the maximum concentrations of 2,850 ppb, and draws conclusions based upon the maximum concentration. This is inappropriate. Conversely, if the minimum concentrations were used it would illustrate arsenic concentrations were increasing. Also, OW-12 presents a minimum and maximum concentrations of arsenic at 900 ppb and 36 ppb, respectively. Again, Table 3 only illustrate the maximum concentrations, and the text does not discuss the minimum concentrations.

54) Page 27, Section 3.1.1, para 2, Chromium: See above comment on Section 3.1.1, para 3, Toluene.

55) Page 28, Section 3.1.2, para 1: The limited geochemistry data presented in Table 3 appears to be selectively utilize to present a conclusion that the Eh is increasing when compared to the GSIP data. The application of such data must be properly justified. It is interesting to note that the Eh data for the comparable GSIP wells were as follows: WP-5 = -68, OW-43 = +390, OW-16 = +310 and -59.2, and OW-54C = 136. But the text throws out the positive Eh points, indicating they were inaccurate readings, includes four Eh data points from OW-12 (i.e. -72, -91.7, -54.9, and -56.1) and one data point from OW-36 (i.e. +370). The text goes on to omit the Eh data point from OW-36, and calculates the GSIP Eh range from WP-5 (i.e. -68) and the four points from OW-12 of -56.1 to -91.7 and states that this is range is representative of the GSIP conditions and is comparable to the SSI GW data. The conclusion presented in this section appear highly unreasonable. The data could conversely be interpret to state that the arithmetic average GSIP Eh for these corresponding SSI GW wells was +192, while the average SSI GW Eh has decreased to +104.2, indicating a more oxidizing state. See comment for Page 79, Section 8.0.

56) Page 28, Section 3.1.2, para 2: The text should utilize the ammonia data from GW-3 = 422 mg/L, not GW-5 = 115 mg/L. As indicated above, discrete hydropunch groundwater data is not be directly comparable to well screen groundwater data. There is currently confirmed contamination with depth near GW-3. In addition, GSIP OW-12 monitoring well was constructed with a 40' length well screen from a screen interval (feet below land surface) of 10' - 50'. The SSI GW-4 data sample was collected from elevation point (feet below land surface) of 41'. The sample collected from the SSI GW-4 is not directly comparable to OW-12. See Comment for Page 79, Section 8.0.

57) Page 28, Section 3.1.2, para 3: Please identify the well or wells which represent the sulfide concentration of 120 mg/L. It is important to note that based upon Table 3, the GSIP 120 mg/L sulfide concentration is not associated with any of the GSIP wells (WP-5 = NA, OW-43 = <1 mg/L, OW-16 = 2 mg/L, and OW-54C = NA), although the author compares the 120 mg/L to the SSI's GW wells, as well as SSI's default wells (OW-36 = <1 mg/L, and OW-12 = 23/0.08 mg/L). The use of GSIP sulfide concentration of 120 mg/L and conclusion that the reduced sulfide indicate less hide pile leaching appears to be unreasonable and irresponsible.

58) Puls p. 28: "more arsenic and chromium are leached, and more mobile forms are produced, by water with lower Eh's." This is not accurate. Chromium is transformed from Cr(VI) to Cr(III) under reducing conditions (Eh < +300 mv S.H.E.) and precipitated as an insoluble chromium hydroxide or mixed chromium-iron hydroxide. So just the opposite happens, i.e. less mobile forms are produced. Arsenic does become more mobile under these conditions, but becomes immobile again under very strongly reduced conditions, i.e. there is a relatively narrow window of arsenic mobility.

59) Page 29, Section 3.1.2, para 2: The SSI data does not indicate that more oxidizing conditions exist. The text suggest GW-1 and GW-5 wells have increased in sulfate, GW-2 and GW-3 are relatively the same and GW-4 well has decreased. As indicated above, GW-4 can not be compared to the GSIP OW-16. The recent data collected illustrates the shallow groundwater as not being significantly impacted. Therefore, the GW-3 groundwater sample does not represent the higher contamination discovered at depth.

60) Page 29, Section 3.1.2, para 3: The SSI data does not indicate that more oxidizing conditions exist. The data presented in Table 3 indicate that the total iron concentrations are for all the SSI GW wells are similar to GSIP, excluding the GW-1 which illustrated lower concentrations of total iron of 4.21 mg/L versus WP-5 = 60 mg/L. Insufficient geochemical information is provided to evaluate ferrous iron. Although, a comparison with the GW wells (GW-2 and GW-3) and the SSI's corresponding GSIP wells (OW-43 and OW-16) illustrate similar concentrations. However, as stated above, these GSIP wells are not directly comparable to SSI wells.

61) Page 29, Section 3.1.2, para 4: The data presented in Table 3 does not provide sufficient geochemical information relative to corresponding GSIP monitoring well TOC data (WP-5 and OW-54C). Although, GW-2 and OW-43 TOC concentrations appear similar, while the GW-3 TOC concentration is less than the OW-16 TOC concentration. As stated above, these GSIP wells are not directly comparable to SSI wells. In addition, the GW-3 data does not represent contamination discovered at depth.

62) Page 31, Section 3.1.2, para 2: Please explain the discrepancy with total arsenic concentrations represented in Table 2 and Figure 4, versus the total arsenic concentrations represented in Table 3 and Figure 6.

63) Page 31, Section 3.1.2, para 3: GW-3 groundwater samples were collected from a discrete

elevation within the shallow aquifer, and was not representative of contamination located at greater depth. The percentage change of various arsenic species between GW-3 and OW-16 are not comparable.

64) Page 34, Section 3.2, bullet 1: The column test did not recreate the field conditions of the site. The soils were incubated for periods of time at 13-15°C and 21°C. The soil was agitated periodically during the column test.

65) Page 34, Section 3.2, bullet 3: Please compare this information with any speciation data from Micro Well MC-1 groundwater.

66) Page 34, Section 3.2, bullet 4: The column test evaluated changes of groundwater arsenic concentration as they pass through soils artificially in a reduced state. The test did not evaluate changes of arsenic concentrations as it passes through soils in a reduced state, and overtime as the soils reduction state is decreased. This should be included as a conclusion.

67) Puls p. 34: last bullet - this was not observed in the experiment, but rather inferred based on initiation of reducing conditions at the start of the experiment.

68) NUS Page 35: Additional micro-cluster wells should have been situated adjacent to/near the HBHA to assess the theory that the pond serves as the endpoint recipient for groundwater plumes. In addition, the possible reasons for which benzene and toluene were predominantly detected at depth within micro-cluster MC-1 should be discussed, given the fact that these contaminants are known to be LNAPLs.

69) Page 35, Section 4.1.1, para 5, Benzene: MC-1D contains a high concentration of Benzene at 14,000 ppb. This indicates a continuous release of benzene. Note: previous GW-4 well benzene = 1,000 ppb also indicate a continuous release.

In addition, the previous November 1993 benzene data collected by Geraghty & Miller, Inc., also illustrated significant benzene concentrations at the following locations: Immediately southwest/south of the South Hide Pile, Well 93-6 benzene = 3,230 ppb (deep); along Boston Edison ROW, Well 93-11 benzene = 1,420 ppb (deep), Well 93-13 benzene = 4,180 ppb (deep); immediately northeast of HBHA Pond, Well 93-21 = 7,860 ppb (deep), Well 93-22 benzene = 6,920 ppb (intermediate - no deep aquifer data was collected), Well 92-26 benzene = 4,280 ppb (intermediate - no deep aquifer data was collected), Well 93-29 benzene = 3,390 ppb (intermediate - no deep aquifer data was collected), Well 93-30 benzene = 3,760 ppb (intermediate - no deep aquifer data was collected). As indicated by MC-1D, benzene concentrations increase with depth.

70) DEP pg. 36, Para. 2, Section 4.1.1: DEP continues to believe that to resolve the issue about the potential flow of the groundwater under HBHA Pond it would be best to install additional wells. The anomaly of the groundwater level decrease between MC-1I and MC-1D,

the use of primarily old GSIP data in the groundwater model (with no new locations), and the lack of a deep versus shallow groundwater flow model (as was presented in former GSIPs), presents doubt in the conclusion that the deepest groundwater discharges into the HBHA.

71) Page 36, Section 4.1.1, para 4, Toluene: The previous November 1993 toluene data collected by Geraghty & Miller, Inc., illustrates higher concentrations of toluene at the following locations: Along the Boston Edison ROW Well 93-4 = 1,320 ppb (intermediate - no deep aquifer data), Well 93-11 = 1,420 ppb (deep - no intermediate aquifer data), Well 93-13 = 2,040 ppb (intermediate), and Well 93-14 = 1,450 ppb (deep - no intermediate aquifer data); immediately northeast of HBHA Pond Well 93-20 = 113 ppb (intermediate - no intermediate aquifer data), Well 93-21 = 131 ppb (deep), Well 93-22 = 158 ppb (shallow - no deep aquifer data), Well 93-26 = 53 ppb (shallow - no deep aquifer data), Well 93-29 = 244 ppb (no deep aquifer data).

72) Page 36, Section 4.1.1, para 4, Arsenic: The previous November 1993 arsenic data collected by Geraghty & Miller, Inc., clearly illustrates higher dissolved arsenic concentrations at the intermediate and deep portions of the aquifer. The maximum dissolved arsenic concentrations discovered along the Boston Edison ROW north and northeast of the HBHA Pond were Well 93-8 As = 2,650 ppb (intermediate); Well 93-4, As = 2,720 ppb (intermediate); Well 93-13, As = 1,760 ppb (intermediate). The maximum concentrations of dissolved arsenic adjacent to the HBHA Pond were Well 93-19, As = 2,390 ppb (deep) immediately to the north; and Well 23-26, As = 205 ppb (shallow - note no data was collected from the deep portion of the aquifer) immediately to the northeast.

In addition, the text states that “the detection of arsenic south of the HBHA Pond is likely attributable to a separate, downgradient arsenic source, including possibly desorption of arsenic from adjacent arsenic-containing wetland sediment.” Another possible scenario is that arsenic flow under or around the HBHA pond and discharges near this point. It is also interesting to note, that the statement indicates contaminated sediments could desorb arsenic and cause a release into the groundwater and/or surface water. This suggests that there may be a continuous cycle of adsorption and desorption of arsenic from contaminated sediments to the groundwater and/or surface water. This supports the need for further investigations of groundwater and the HBHA Pond and Wetland sediments and surface water.

73) NUS Page 36; The detection of arsenic south of the HBHA in MC-3 may also indicate that the HBHA is not the discharge point for all groundwater as presented in the GSIP.

74) Puls p. 36-37: Inconsistencies in data tend to be dismissed where they do not support the PRP’s hypothesis. Detection of arsenic in intermediate zones in well clusters and further downgradient needs to be further explored to determine if there are additional sources not currently part of the “conceptual site model” or if they indicate alternative flow paths.

75) DEP pg. 37, Para. 1: In the text, the detection of arsenic south of HBHA Pond is attributed to likely desorbing downgradient adjacent wetland sediments. Such a downgradient

arsenic source to groundwater is hypothetical, and should be further substantiated. As is stated in the conclusion, the source of this arsenic would need to be evaluated in the next portion of the investigation.

76) Page 37, Section 4.1.1, para 2, Chromium: The previous November 1993 chromium concentration data collected by Geraghty & Miller, Inc., illustrates higher dissolved chromium concentrations along the following areas: Boston Edison ROW Well 93-4 = 250 ppb (intermediate), Well 93-5 = 110 ppb (intermediate), and Well 93-14 = 110 ppb (intermediate); Northeast of HBHA Pond Well 93-23 = 244 ppb (shallow), Well 93-24 = 60 ppb (deep), Well 93-27 = 50 ppb (intermediate), and Well 93-29 = 50 ppb (intermediate - no deep aquifer data). MC-1 data appears consistent with November 1993 data.

77) Page 37; Section 4.1.2: The entire geochemistry analytical and/or field data is not presented in the text or the appendixes. Please provide all the data. In addition, please provide all geochemistry data collected by Geraghty & Miller, Inc., relative to the November 1993 groundwater data.

78) Page 39; Section 4.2: Please explain why groundwater elevation data for MC-1I (52.44) and MC-1D (52.38) indicate a negative gradient between the intermediate and deep groundwater levels.

79) Puls p. 39, top para: Desorption of arsenic from wetlands sediment and downgradient transport is also an issue which needs to be evaluated.

80) DEP pg. 39, Section 4.2, Para. 2: The agencies have not disputed the concept that there is significant groundwater discharge into the HBHA. The question has been whether all of the valley groundwater is discharging, or if there is some undercutting. See comment for Page 36, Para 2, Section 4.1.1.

81) DEP pg. 40, Section 4.3.1: It would be helpful to generate a comprehensive (deep, intermediate, and shallow) groundwater model since the contaminant concentrations vary significantly with depth (particularly with respect to benzene).

82) NUS Page 40; The available data for the bedrock aquifer is very limited and the role that the bedrock aquifer plays in the groundwater flow and COC distribution has to be evaluated. Other investigation in the Aberjona Valley, Wells G and H, indicate that the bedrock aquifer can play a significant role in groundwater flow in the river valley.

83) Page 41; Section 4.3.1; para 4: What was the basis for using a 17.5 inches/year uniform recharge rate from precipitation, when the annual precipitation for the area is 40-45 inches/year?

84) DEP pg. 41, Para. 4, Section 4.3.1: Please clarify the derivation of the recharge rate of 8.75 inches/year for the boundary recharge.

85) NUS, Page 42: The use of average groundwater elevations has to be further explained. For instance what is the range of the observed elevations at a well and are there high or low elevations. The low and high groundwater elevations may be due to some extreme conditions at the site and should not be included in the average. This issue has to be discussed in the report in more detail.

86) NUS Page 42: The southern boundary condition of the model has to be further explained. The SSI is not clear as to the source of data used to construct the southern model boundary.

87) Page 43; Section 4.3.2; para 1: How were the cone penetrometer results from 1993/94 factored into the model? The text states, "in this case, the outwash aquifer is assumed to be continuous along the east side of the model area, with no intrusion of bedrock/till as incorporated in the base model .." Please explain further. Did the model include the vertical upgradient contribution of the bedrock?

88) Page 44; Section 4.3.3: The simulated flows ranged from 18,300 cfd to 35,700 cfd, does not compare well with the GSIP Phase 2 Report estimate of 41,500 cfd. The simulated flow range from 18 to 59 percent when compared with the measured flows. This comparison is not considered a good match.

89) NUS, Page 44: The groundwater discharge rate predicted by the model when a low hydraulic conductivity value was assigned to the pond sediment in the HBHA should be compared to the groundwater discharge estimated generated using the seepage meters. Also, the model discharge rate through the bottom of HBHA should be compared to the observed discharge rate, (i.e. difference between inflow and outflow measured in the field). Based upon this comparison, it appears unrealistic that all the groundwater discharges into the HBHA Pond. The modeled discharge into the HBHA has to be compared to the specific discharge calculated for each of the bedrock valleys located up gradient of the HBHA. It seems possible the south boundary condition does not represent actual site conditions. This area of the site has very little data.

90) Page 45; Section 4.3.4; para 1: If model evaluates the effects of vertical gradients, then what vertical gradient data was applied to the model? If the model does not use vertical gradients, then it can only predict horizontal direction. If the model utilized surface water elevations and groundwater elevations to predict gradients, then the model may grossly overestimate the vertical gradient effects within the aquifer.

Please explain if any (not the mean) of the simulated flow path discharged beyond the HBHA Pond. Based upon Figure 24, it appears a portion of the simulated particle cloud discharges beyond the HBHA Pond.

91) Page 46, Section 4.3.5, para 2 and 3: The text is confusing. Based upon the assumptions with the simulations, for what period is surface water in the HBHA Pond discharging into the

groundwater (30 days?)? During this period, a negative gradient exist between the surface water and upper aquifer, and contaminated groundwater does not discharge into HBHA Pond.

92) Page 46, Section 4.3.6: Based upon Section 4.3.5, conclusion (bullet) 1 is not accurate. Under wet/raining conditions with surface water rise of 2 feet or more, surface water in HBHA Pond will discharge into groundwater. Allowing the opportunity for the contaminated groundwater to migrate beyond the HBHA Pond.

93) DEP pg. 46-47, Section 4.3.6: It seems that the storm simulation is not realistic, in that it portrays a rain event that raises the Holding Area by 2 feet, then assumes no rain for more than 25 days. More detail of the assumptions used for this rain event is needed, such as how many inches of rainfall correspond to a 2-foot surface water rise, how saturated the soils were at the time, and over what time period did that amount of rain fall. Depending on these details, a more "true-to-life" pattern probably should have been used with more frequent, smaller rainfall events. In addition, more analysis of these events should be done. What happens when surface water recharges groundwater: how far does the ground water recharge travel downgradient before again discharging to surface water? How large a rain event has to occur and for how long, before recharge occurs? Does recharge occur down the length of the HBHA and its wetlands down to 128?

94) NUS Page 47: If the HBHA is, as the SSI report declares, the "endpoint" for the contaminant groundwater plumes migrating from source areas at the site, it should be possible to further support this assertion with: 1) appropriate mass balance calculations considering the estimated flow of groundwater discharging into HBHA and that of surface water flowing into and out of the pond, and 2) a detailed correlative comparison of contaminants and concentrations detected in groundwater with those detected in sediments, pore water and surface water at HBHA. If the report's assertion is correct, the variation in contaminant concentrations among the sediment sample locations and depths should be fully compatible with the scenario of the HBHA being the endpoint recipient of the groundwater contaminant plumes. For example, at the SED-1 location on the northern end of HBHA, benzene was detected at a high concentration in the upper organic silt sediments (0 to 1.5 feet deep), while toluene was not detected. Also at the SED-1 location, the highest concentrations of arsenic and chromium were detected in the upper organic silt sediments, while much lower concentrations were detected in the deeper sand sediments. Such variations in contaminant distribution and concentrations should be discussed based on literature-reported fate and transport characteristics of the contaminants, and should be reconciled with the proposed scenario for groundwater plume discharge into the HBHA.

95) Page 47, Section 4.3.6, last paragraph: The text's conclusion that all contaminated groundwater discharges into the HBHA Pond needs to be determined with conclusive analytical data, not simulated groundwater flow data. The cause of the MC-3 shallow well concentration is uncertain. If the sediments surrounding the MC-3 shallow well are causing an elevation in metals concentrations in groundwater, then all the wetland sediments with high metals concentrations may be causing metal releases into groundwater and/or surface water.

96) NUS Page 48, Section 5.1.1: Appropriate sediment benchmarks should be used to assess the potential adverse effects of current and projected contaminant concentrations in sediments on the benthic community. Benchmarks should include NOAA's Effects Range-Low (ER-L) values and, in cases of unavailable ER-Ls, alternative benchmarks including the use of benchmark sediment concentrations based on equilibrium partitioning calculations from Ambient Water Quality Criteria (AWQC) values. In the case of arsenic and chromium, the ER-L values are 8.2 and 81 ppm (dry weight), respectively (Long *et al.*, 1995, Environmental Management 19:81-97). Based on the data presented on Table 11 of the SSI report, the arsenic and chromium concentrations in surface sediments (0 to 1.5 feet depth range) at all the sample locations, with exception of chromium at location SED-3, exceed and are generally much higher than the corresponding ER-L concentrations. Actually, the majority of the concentrations also significantly exceed the ER-Median values for arsenic and chromium (70 and 370 ppm dw, respectively). Concentrations in excess of the Effects Range values are a strong indicator of the potential for adverse effects on benthic organisms. This is supported by the data included in the GSIP Phases 1 and 2 reports which indicate impacts to the benthic (and fish) community in HBHA when compared to Phillips Pond. During the SSI, the highest sediment concentrations of arsenic and chromium (as well as of benzene and toluene) were detected at the sample locations within the HBHA. Similarly, the highest surface water concentrations of arsenic and chromium were also detected within the HBHA, and they exceeded the corresponding freshwater AWQC for these metals (LOEL of 48 mg/L for pentavalent As; AWQC of 190 mg/L for trivalent As; AWQC of 11 mg/L for hexavalent Cr; and AWQC of 210 mg/L for trivalent Cr, at a hardness of 100 ppm). However, other site-related contaminants exist which may also be responsible for adverse effects on the biota associated with HBHA and the downstream environment.

97) DEP pg. 48, Section 5.1.1: Contaminants of Concern (COCs) should be reviewed with respect to the wetlands/surface water environment. Exposure pathways and sensitive receptors for COCs for groundwater and wetlands can be somewhat different than for the soils. All site-related contaminants found during the soil RI should be considered as possible COCs for the GSIP.

98) Puls p. 49: Additional samples from the sand zone in the downgradient or southern end of the pond could provide additional data relative to the groundwater discharge theory.

99) Page 50, Section 5.1.1, Arsenic: The text's statement that "the similarity between the northern and southern ends of the pond during the SSI is consistent with the GSIP Phase 2 RI data" is inaccurate. The GSIP Phase 2 RI did not collect any sediment samples from the northern section of the HBHA Pond. Therefore, there is no data for a comparison, and no similarity.

100) NUS Page 50: XRF data should be supported with correlative CLP data, in order to establish the validity of using such screening data. For example, based on the data presented on page 50 and on Table 11 of the SSI report, the possibility exists that XRF may not be a reliable screening method for chromium concentrations under the particular analytical conditions involved.

101) Page 50, Section 5.1.2: XRF and laboratory metals data was collected for both SED 1 (0-1.5) and SED 3 (0-0.5) samples. The results are as follows:

	Laboratory (ppm)	XRF (ppm)	Percent Difference
SED 1 (0-1.5)			
Arsenic	1,390	1,353	2.7%
Chromium	1,060	546	48.5%
SED 3 (0-0.5)			
Arsenic	35.6	113.0	-217.4%
Chromium	26.3	106.9	-306.5%

Based upon the above information, the XRF process does not provide consistent or reliable data to make significant adsorption capacity calculations. The XRF results should not be used to calculate adsorption isotherms. Future tests should use laboratory data.

102) NUS Page 53: In general, further discussion and supporting explanations are needed in the SSI report in relation to the adsorption capacity determinations and the conclusions of attenuation potential of the sediments. In addition, it is noted that the conclusions about the capacity of contaminant adsorption and biodegradation of the sediments within HBHA were derived based on data from only one sample location (SED-1). Such determinations of contaminant adsorption and biodegradation in the HBHA sediments should involve a more representative number and distribution of sample locations, in order to account for the possibility of heterogeneous conditions within the pond. Also, the statement on page 57 referring to the "... infinite potential for the pond sediments to attenuate chromium ..." requires further clarification and support.

103) Page 54; Section 5.2: The report should also calculate Isotherms with the Freundlich Models and compare results.

104) Page 55; Section 5.2; para 1: The text interprets an arsenic  $A_m$  concentration of 3,350 mg/kg. The isotherm curve should not be infinitely extended to establish the maximum concentration to establish a conservative  $A_m$ . Utilizing the curve within the data points would be a conservative value. The conservative  $A_m$  for arsenic appears to be 2,400 mg/kg.

105) Page 55; Section 5.2; para 2: The text establishes the following equation  $A_m = 57(Fe\%)^{1.55}$  with a correlation coefficient of 0.99. Based upon this equation, the  $A_m$  value in the HBHA Pond with a 14.3% Fe is equal to 2.8 mg/kg. This value is not presented or discussed in the text. This value also significantly contradicts the arsenic isotherm  $A_m$  of 3,350 mg/kg.

106) Page 56; Section 5.2; para 3: What is the correlation coefficient ( $r^2$ ) for arsenic isotherm?

107) Page 57; Section 5.2; para 3: The text interprets an benzene  $A_m$  concentration of 19 mg/kg. The isotherm curve should not be infinitely extended to establish the maximum concentration to

establish a conservative  $A_m$ . Utilizing the curve within the data points would be a conservative value. The conservative  $A_m$  for benzene appears to be 11 mg/kg.

Likewise, the text's adjusts the isotherm curve due to volatilization losses and calculates an benzene concentration for  $A_m$  at 25. Utilizing the curve within the data points would produce a conservative  $A_m$  value at 17 mg/kg.

Also, based upon Figure 35, the original curve falls below the origin and intercepts the Solution Concentration axis at about -7 mg/L, which implies that 7 mg/L of benzene to a clean pond sediment would result in no adsorption.

What are the correlation coefficient ( $r^2$ ) for benzene isotherm?

108) NUS Page 59: The report makes reference to biodegradation processes probably taking place in the HBHA sediments. The actual occurrence of such biodegradation should be confirmed and, if it is determined to occur in relation to organic contaminants present in the discharging groundwater, the conditions under which the biodegradation processes take place (for example, pH, Eh, aerobic or anaerobic conditions) should be carefully characterized, as this information is likely to be of relevance when considering potential remedial actions at the site. The prospect of abiotic attenuation processes taking place should also be properly assessed. In addition, the SSI report (on page 59) refers to the possibility of "... biodegradation by microbial populations present in the groundwater from MC-1D ...". Such statement and its rationale are unclear, since it was at this location/depth that the highest groundwater concentrations of benzene and toluene were detected. The statements on page 59 referring to the possibility of biodegradation in the groundwater at the site should be revised and properly supported.

109) DEP pg. 59, Section 5.3: a) Para. 2: In future studies, it would be critical to incorporate headspace measurements and other similar assessment activities into the experimental design to weigh the relative importance of the various removal mechanisms for benzene and toluene .  
b) Para. 3: Please explain why critical assessment of the biological activity of the control sample was not conducted.

110) NUS Page 60, Section 5.4: The discussions of the attenuation capacities of the HBHA sediments in relation to contaminants in infiltrating groundwater should also address potential bioavailability concerns from the adsorbed contaminants and precipitates.

111) Page 60; Section 5.4; arsenic long-term calculation: Because the adsorption isotherm flattens out considerably as it approaches the 'projected' maximum, it would be better to assume a more conservative values of 2000-2500 mg/Kg for the capacity term. Beyond this number (Fig. 32) the concentration of As in the pore water increases. This results in a more conservative lifetime of 87 years, not 310 yrs. The data utilized to establish this conservative lifetime is based upon the following: The data represented for the average arsenic concentration of 120 ug/L and the Remaining Sediment Adsorption Capacity of 1,960 mg/kg appear to be inaccurate. Utilizing

the data presented in the text for MC-1 and MC-2 and incorporating the 1993 Miller groundwater data into the equation, a conservative Average Arsenic Concentration of 220 ug/L was established. Also, based upon previous comments, an Am value of 2,400 mg/kg for arsenic was considered conservative. Recalculating the Remaining Sediment Adsorption Capacity (2,400 mg/kg - 1,390 mg/kg) yields a conservative value of 1010 mg/kg. In addition, the sediment density parameter of 1.1 g/cm<sup>3</sup> references Roux Associates, 1992, as the source. According to the Roux Associates, 1992, reference, the sediment density of 1.1 g/cm<sup>3</sup> was an assumed value. Therefore, there is no real sediment density data to enhance the accuracy of the capacity calculations. There is no data to determine if this density estimate is accurate.

$$\text{Inflow Mass: } (0.48 \text{ ft}^3/\text{sec})(86,400 \text{ sec/day})(7.48 \text{ gal/ft}^3)(3.79 \text{ L/gal})(220 \text{ ug/L}) \div 1,000 \text{ mg/ug} = 258,654 \text{ mg/day}$$

$$\text{Adsorption Capacity: } (1,010 \text{ mg/kg})(1 \text{ kg}/1,000 \text{ g})(1.1 \text{ g/cm}^3)(100 \text{ cm/m})^3(7,400 \text{ m}^3) = 8,221,400,000 \text{ mg}$$

$$\text{Lifetime: } 8,221,400,000 \text{ mg} / ((258,654 \text{ mg/day})(365 \text{ days})) = 87 \text{ years}$$

112) Page 61; Uniform Distribution: Groundwater contamination is not uniformly distributed to the HBHA Pond sediments. Miller 1993 groundwater data illustrates high concentrations of contaminated arsenic being discharged to the immediate north of the pond, and another high concentration immediately northwest. The highest concentration of benzene is being discharged from the northwest. Therefore, these areas of groundwater discharge with higher concentrations are reaching the capacity of sediment to adsorb arsenic sooner, and migrating downgradient.

We also know that arsenic in the sediments are not uniformly contaminated. Previous arsenic analytical data illustrated arsenic contamination in the sediments ranging from 9,830 ppm to 1,270 ppm.

113) Puls p. 61: Assumptions are not all conservative in nature. For example, the maximum adsorption term, the limited number of samples on which the data are based, uniform adsorption, representative sampling, and uniform distribution of contaminant concentration data.

114) Puls p. 62: Under the natural attenuation guidelines, if natural attenuation is to be seriously considered at the Industri-plex site, then additional characterization (sampling, adsorption tests, etc.,) efforts will be necessary.

115) Page 62; Representative Sediment Samples: As mentioned in the text, only one sample was analyzed for adsorption capacity.

116) Page 62; No New Sediment is Added: Sediment is added to the pond, as well as released from pond.

117) Page 62; Groundwater Flow: The groundwater flow was based upon stream gage data at SW-10 (Halls Brook) at 2.79 cfs and SW-13 (HBHA Pond Outlet) at 3.27 (difference = 0.48 cfs). The GSIP Phase 2 comments questioned this figure.

118) NUS Page 64: With regards to the flow measurements at HBHA, the IP Trust should have separately considered the epilimnion and the hypolimnion, and the time span of measurements should have been expanded to detect seasonal changes. The depths at which the HBHA surface water samples were collected by the IP Trust are not specified in the SSI report. However, such sampling depths in relation to the depth of separation between the epilimnion and the hypolimnion in the pond would have probably been a determinant factor on the contaminant concentrations detected in the surface water samples.

119) Page 64; Benzene: Appendix F illustrates surface water data results from station 1, which is just downgradient of the SSI's SW-2 location. Appendix F collected 29 months of benzene surface water data, which showed minimum concentrations of benzene at < 1ppb, maximum concentrations of benzene at 5 ppb, and an average concentration of benzene at 1.3 ppb (accounting for <1 detections as 0.0 ppb). Therefore, the data does not appear consistent with Appendix F.

120) Page 65; Toluene: Appendix F illustrates surface water data results from station 1, which is just downgradient of the SSI's SW-2 location. Appendix F collected 29 months of toluene surface water data, which showed minimum concentrations of toluene at < 1ppb, maximum concentrations of toluene at 5 ppb, and an average concentration of toluene at 3.3 ppb (accounting for <1 detections as 0.0 ppb). Therefore, the data does not appear consistent with Appendix F.

121) Page 66; Arsenic: The deeper concentration of arsenic (SW1D = 52 ppb and SW-1DF = 18 ppb; SW-2D = 617 ppb and SW-2DF = 34 ppb) in the surface water are not consistent with the shallow concentrations. In addition, one of ISRT's theories regarding the source areas is that the reducing environments are diminishing causing less arsenic to be released in the groundwater. The results of the surface water data do not indicate any reduction in arsenic release from the groundwater to the surface water. Also, with the deeper samples (SW-1D and SW-2D) we see a 286% and 1820% increase in arsenic concentrations possibly due to colloidal/suspended solids, respectively. It is anticipated that these concentrations during high water level, storm events have an influence on surface water/sediment migration and deposition downgradient.

Appendix F illustrates surface water data results from station 1, which is just downgradient of the SSI's SW-2 location. Appendix F collected 29 months of total and dissolved arsenic surface water data. The total arsenic data illustrated a minimum concentrations at 6.2 ppb, maximum concentrations at 52.1 ppb, and an average concentration of toluene at 16.7 ppb. The dissolved arsenic data illustrated a minimum concentrations at 5.1 ppb, maximum concentrations at 14.8 ppb, and an average concentration at 8.9 ppb. This data present higher concentrations of dissolved arsenic, compared with the SSI's shallow and intermediate SW-2 data.

123) Puls p. 66: "...confirm that the arsenic groundwater plume is discharging to surface water at the pond" - correction = confirm that **some of the arsenic groundwater plume** is discharging to surface water at the pond

124) Page 66; Chromium: The deeper concentration of chromium (SW1D = 14.6 ppb and SW-1DF = 1(U) ppb; SW-2D = 225 ppb and SW-2DF = 5 ppb) in the surface water are not consistent with the shallow concentrations. In addition, one of ISRT's theories regarding the source areas is that the reducing environments are diminishing causing less chromium to be released in the groundwater. The results of the surface water data do not indicate any reduction in chromium release from the groundwater to the surface water. Also, with the deeper samples (SW-1D and SW-2D) we see a 1123% and 4500% increase in chromium concentrations possibly due to colloidal/suspended solids, respectively. It is anticipated that these concentrations during high water level, storm events have an influence on surface water/sediment migration and deposition downgradient.

125) NUS Page 67: Contrasting differences exist between the HBHA data for surface water benzene concentrations (Table 13) and the residence time of water in the pond (pages 67 and 68) presented in the SSI report, and the analogous data presented in the attachments to the letter of June 13, 1997, from Philip Gschwend of MIT to Joseph LeMay of EPA. See attached. However, as indicated on the referred letter, the results provided by Mr. Gschwend are unpublished and not ready for dissemination.

126) Page 67; Section 6.1.2: The report did not provide the surface water geochemical parameter data. This should be provided.

Appendix F surface water monitoring report illustrate that the Eh and dissolved metals concentrations at the HBHA Pond outlet and HBHA wetland outlet (Mishawum Road) are approximately the same values over the last two years of monitoring.

127) Page 68: The text uses a stream gage velocity from GSIP SW-13 location (HBHA Pond outlet) and utilizing this velocity as the average for the entire wetlands downgradient. This does not appear reasonable to be used as the average velocity throughout a wetland with streams, periods of open water and phragmites marsh. Why didn't they use velocity data from the other Surface Water sampling stations downgradient? In addition, the values utilized in the calculations were not "average" velocities (see below).

When was the dye test conducted? The text only uses high flow (April 1990) velocity values for SW-9 (0.02 f/s), 11 (0.01 f/s), and 13 (0.26 f/s), which were outlined in GSIP Phase 1 Table 3-12. If the low flow (July/August 1990) velocity values were used, SW-9 (0.11 f/s), SW-11 (0.06 f/s), and SW-13 (0.18 f/s), then the results would be significantly different. Also, the GSIP Phase 1 high and low surface water velocity conflict significantly with each other. It would be more appropriate to use an average velocity for each station, such as SW-9 = 0.065 f/s, SW-11 = 0.035, and SW-13 = 0.22 f/s. Using these average flow values would yield a theoretical travel time for

the HBHA Pond at 4.4 hours  $[(800\text{ft})/(.05\text{ft/s})]/3600$  and travel time for the HBHA Wetlands at 3.8 hours  $[(3000\text{ft})/(.22\text{ft/s})]/3600$ . The combined residence time of 8.2 hours does not correlate well with the estimated 15 to 16.5 hours.

128) Page 69; Section 7.1.1; Benzene: Appendix F illustrates surface water data results from station 2, which is just upgradient of Mishawum Road, near SSI's SW-4 and SW-5 locations. Appendix F collected 24 months of benzene surface water data, which showed minimum concentrations of benzene at < 1ppb, maximum concentrations of benzene at 2 ppb, and an average concentration of benzene at <1ppb (frequency of detection during 24 months: 2). Therefore, the SSI data appears to be consistent with Appendix F.

129) Page 70; Section 7.1.1; Toluene: Appendix F illustrates surface water data results from station 2, which is just upgradient of Mishawum Road, near SSI's SW-4 and SW-5 locations. Appendix F collected 24 months of toluene surface water data, which showed minimum concentrations of toluene at < 1ppb, maximum concentrations of toluene at 5 ppb, and an average concentration of toluene at <1ppb (frequency of detection during 24 months: 5). Therefore, the SSI data appears to be consistent with Appendix F.

Why wasn't the post-GSIP monitoring results utilized in the report?

130) Page 70; Section 7.1.1; Arsenic: Appendix F illustrates surface water data results from station 2, which is just upgradient of Mishawum Road, near SSI's SW-4 and SW-5 locations. Appendix F collected 24 months of total and dissolved arsenic surface water data. The total arsenic data illustrated a minimum concentrations at 5.6 ppb, maximum concentrations at 47.6 ppb, and an average concentration at 16.6 ppb. The dissolved arsenic data illustrated a minimum concentrations at 5.1 ppb, maximum concentrations at 11.8 ppb, and an average concentration of toluene at 7.7 ppb. This data consistently illustrates the presence of total and dissolved arsenic in the surface water around higher concentrations of dissolved arsenic, compared with the SSI's shallow and intermediate SW-2 data.

131) Page 71; Section 7.1.2: The text states, "the chemical data do not support a Site groundwater source to the wetlands, which is in agreement with the groundwater model." The chemical data illustrate a consistent release of total and dissolve arsenic in the surface water through-out the HBHA Pond and HBHA Wetlands. This release could be caused by groundwater discharge, sediment contamination release (desorption and suspended contaminates), or a combination of both.

132) Puls p. 71: Similarity of wetlands surface water geochemistry to shallow pond geochemistry are not conclusive of no groundwater discharge to the wetlands - what is needed is additional sampling of the wetlands at and below the interface. Vertical and horizontal transects are desperately needed to confirm the "natural attenuation hypothesis" at various scales throughout the site. This is not a trivial task and requires significant characterization.

133) Page 72; Section 7.1.2: Why wasn't SED-3 located in a depositional area, instead of adjacent to a fast moving stream?

134) DEP pg. 72, Section 7.2.1: Although toluene may never have been detected in HBHA wetland sediment previously, it has been detected in sediment in Hall's Brook, the New Boston Street Drainway (NBSD), and the Lower South Pond, so it is unlikely to be a laboratory artifact.

135) Page 73; Section 7.1.2; Chromium: In SED-4, higher concentrations of chromium were detected at deeper depths of the silt/organic sediment. Specifically, chromium at 983 ppm and 910 ppm were detected in the 1.0 - 1.5' and 1.5 - 2.0' interval, versus the 419 ppm and 397 ppm concentrations detected in the 0 - 0.5' and 0.5 - 1.0' interval.

136) Page 75; Section 7.3; Arsenic: The assumption for the capacity are not considered conservative for the same reasons as stated previously for the HBHA Pond sediment. Why are the HBHA Pond sediment (SED-1, 0.0' - 1.5') and HBHA Wetland sediment (SED-3, 0.0' - 0.5') Isotherms so vastly different?

137) Puls p. 75: Same comments as for p. 61.

138) Page 76; Section 7.3; Benzene: The plotted linear equation does not intercept the origin (zero) of either the x or y axis. The linear equation is also significantly different from the HBHA Pond sediment curve. Please explain the reason for the significant differences.

139) Page 77, Section 7.5: See previous comments on surface water residence time.

140) Page 79, Section 8.0; para 1: The GSIP and SSI did not evaluate all the "potential source areas". Other potential source areas have been discovered which are associated with the Site. These areas include the release of metals from animal hides buried along the Boston Edison Right of Way Number 9 (these areas received a permeable cap under the remedy), and metal contaminations which have deposited in the former Mishawum Lake and Aberjona River sediments. These areas need to be investigated.

141) Page 79, Section 8.0; para 2: Disagree with the SSI explanation that all metals released from the groundwater occurred after the development activities and creation of the current animal hide piles in the late 1970's. EPA believes the environmental conditions existed when the animal hides were deposited on the site in the 1930's. Precipitation, perched water (mounding), and a small portion of the hides being present in the water table were sufficient to cause the environmental conditions.

Other mechanism may exist to cause metals to release into the groundwater or surface water. Higher metals concentrations in sediments (HBHA Wetlands/Aberjona River) or former sediments (Filled in Mishawum Lake bed) may cause metals to release into the groundwater and/or surface water. The rich organic sediments may have reduced concentrations of oxygen and create

environmental conditions sufficient to release the metals.

142) Page 79; Section 8.0; para 3: Insufficient data was presented to evaluate the evolution of the environmental conditions of the source areas. The SSI Report inappropriately utilized selective data to suggest that reducing conditions are decreasing. However, other data in the report suggest the opposite, that reducing conditions are increasing. For example:

SSI Hydropunch Samples via electric pump: GW-1 = +109 mV, GW-2 = +269 mV, GW-3 = +86 mV, and GW-4 = -47 mV; [SSI Avg Eh = +104]

GSIP Directly Comparable Wells via bailer: WP-5 = -68 mV, OW-43 = 390 mV, OW-16 = 310 mV, and OW-54C = 136. [GSIP Avg. Eh = +192]

SSI Avg Eh at +104 mV indicates reducing conditions are increasing compared with GSIP Avg Eh at +162 mV. The data also illustrate that 3 of the 4 SSI hydropunch samples (GW-2, GW-3 and GW-4) had reducing conditions which increased.

143) Page 79; Section 8.0; para 3: The SSI Report compared their data with the GSIP data. Unfortunately, the data sets are not directly comparable due to different vertical and horizontal locations.

Specific Examples: Vertical:

GW-1 sample depth = ? WP-5 sampling depth 0' - 5'. Five foot vertical variation. Alternatively, OW-36 sampling depth 5' - 15'. Significant vertical variation.

GW-2 sample depth = 12'; OW-43 sampling depth = 4' - 14' near arsenic pit. Significant vertical variation. It is possible that higher groundwater arsenic concentrations from the pit may be occurring closer to the pit/groundwater interface.

GW-3 sample depth = 23'; OW-16 sampling depth = 16' - 36'. Significant vertical variation.

GW-4 sample depth = 41'; OW-54C sampling depth = 40' - 45'. Five feet vertical variation. Alternatively, OW-12 sampling depth = 10' - 50'. Significant vertical variation.

GW-5 sample depth = ?; OW-39 sampling depth = 5' - 15'. Significant vertical variation.

Horizontal:

GW-1 sample was alternatively compared with GSIP Monitoring well OW-36. However, the location of GW-1 is approximately 200' northeast of OW-36.

GW-3 hydropunch sample was compared directly to monitoring well OW-16. According to SSI Figure 2 and GSIP Phase 2 Plate 7, the location of GW-3 appears to be approximately 150' southwest of monitoring well OW-16. While according to SSI Figure 3, GW-3 is 60 feet southwest of OW-16.

GW-4 hydropunch sample was compared directly with OW-54C and alternatively with OW-12. According to SSI Figure 2, the location of GW-4 appears to be approximately 175' east of OW-54C and 100' southeast of OW-12. While according to SSI Figure 3, GW-4 is 50' south of OW-54C and 100' southwest of OW-12. [Because the text compares directly with OW-54C, assume Figure 3 distances are accurate] -

GW-5 hydropunch sample was compared directly with OW-39. According Figure 3, GW-5 is approximately 200' northwest of OW-39.

144) DEP pg. 79, Section 8: The research done in this report is a good start in further confirming the theories begun in the GSIP Phase I and II; however, it is difficult to determine how comparable the data are to data from previous studies that were derived using different sampling methods and well construction. It seems that this report is most useful in revealing needed further areas of study, but in most cases should not be used to note a progression in site conditions.

145) Page 80, Section 8.0; para 1: The limited data can not be utilized to draw sweeping conclusions, especially since the data was selectively used and non-comparable.

The SSI Report only illustrated the maximum arsenic concentration (2,850 ppb) detected at OW-43 and states that there is a significant reduction in arsenic concentrations when compared with SSI GW-2 arsenic concentrations of 32 ppb. However, the GSIP OW-43 monitoring well also had a minimum concentration of 60 ppb. The minimum concentrations is similar to the SSI GW-2 concentrations, and does not illustrate any significant reduction in arsenic concentrations. The report should use all available data available.

146) Page 80, last paragraph: The text states "GSIP data ... indicated that a benzene "hot spot" had migrated away from the potential benzene source area northeast of the South Hide Pile to an area adjacent tot eh northern end of the HBHA Pond." The data indicated benzene had migrated. However, insufficient data was collected to determine the status of benzene concentrations at the source. The text also states that "benzene concentrations at the South Hide Pile and near the

HBHA Pond appear to be generally the same today as they were during the GSIP.” This statement indicates that there is a continuous source releasing benzene to the areas.

147) Page 81; para 1: ISRT’s toluene source investigation near the East-Central Hide Pile determined that a toluene source continues to exist in the area, but its vertical location is approximately 15’ below the water table and associated with organic/animal hide material. This information refutes the SSI reports conclusions that the toluene concentrations are significantly reduced in the area. They also illustrate that the hydro-punch data are not directly comparable with monitoring well data which representative of a larger vertical zone of the aquifer. In addition, the highest concentration of toluene observed in OW-16 was a 1983 groundwater sample at 32,000 ppb. However, an early sample collected from OW-16 in 1982 revealed significantly less concentration of toluene at 950 ppb. This indicates significant variation in toluene concentrations relative to a 40 feet well screen, and/or illustrates significant sampling technique variability.

148) Page 81; para 2: The text indicates that all the groundwater flows upward. However, during precipitation events, the vertical gradients associated with the HBHA Pond may change to negative gradients causing additional groundwater contamination to migrate downgradient of the HBHA Pond.

The GSIP and the SSI report do not present sufficient groundwater chemistry data and insufficient hydrological data to determine if all the groundwater benzene, toluene and arsenic plumes discharge into the HBHA Pond. In addition, insufficient data is presented to determine the extent of the plumes.

149) Page 81; para 3: The Boston Edison ROW serves as a source area. During the 1960’s, animal hides were used as fill to create the ROW. The remedy placed a permeable cover over these areas of fill. One area is immediately north of the HBHA Pond. Comprehensive data was collected from the area in 1993. It clearly illustrated higher concentrations of dissolved arsenic (2,500 ppb range) in the ROW, discharging in the HBHA Pond. The other sources, such as the permeable cover section of the ROW along Commerce Way and the former Mishawum Lake area, need to be investigated further to evaluate there contribution.

150) Page 82, para 1: The text indicates that deeper organic material within the aquifer may serve as a migration pathway for metals in the groundwater. Hence, the text suggests that metals contamination deep within the aquifer may migrate along this organic material, possibly beyond the HBHA Pond.

151) Page 82, para 2: The text states that has been little attenuation of benzene or toluene. This would suggest that there is a continuous source of benzene and toluene upgradient.

Page 82, para 3: A recent study by MIT indicates that microbes may be releasing contaminates.

Also, EPA would not consider the deeper HBHA Pond surface water concentrations to be low (SSI: arsenic = 600 ppb; GSIP: arsenic = 5,500 ppb and 1,000 ppb (Fig. 20 - Arsenic in pore water), benzene = 1,300 ppb (Fig. 27 - Benzene in pore water)).

152) Page 82, para 5: The text concludes that biodegradation is the primary mechanism for attenuation of benzene and toluene in HBHA Pond sediment. This contradicts what was stated earlier in the report. On page 59, the same losses of benzene and toluene were discovered in both the HBHA Pond sediment sample and a control sand sample. This indicates that the reductions were due to "abiotic processes (e.g., volatilization, partitioning to sediment)".

153) Puls p. 82: Apparently, co-precipitation is not an attenuation mechanism for the wetland sediments.

154) Page 83, para 1: Based upon SSI data and the historical summary of surface water data in Appendix F, continuous releases of arsenic are occurring from HBHA Pond (Avg Total Arsenic = 17 ppb; Avg Dissolved Arsenic = 9 ppb) and continue past HBHA Wetlands/Mishawum Road (Avg Total Arsenic = 17 ppb; Avg Dissolved Arsenic = 8 ppb).

155) Page 83, para 4: The text suggests that no COCs concentrations greater than approximately 10 to 15 ug/L migrate beyond the HBHA Pond and wetlands via the surface-water pathway. Based upon Appendix F, this is incorrect. Total arsenic concentrations as great as 48 ppb have migrated beyond the HBHA Pond and wetlands.

156) Page 83, para 4: EPA conservatively estimates the sediment adsorption capacity for arsenic at 87 years. In addition, based upon Appendix F, continuous releases of contaminants are occurring the surface water and migrate downgradient beyond Mishawum Road. The SSI also points out that there is not sufficient residence time for these contaminants to precipitate out within the 4,000 feet combined length of HBHA Pond and Wetlands.

157) DEP pg. 83:

a) 1st 4 Paras.: The biodegradation argument in this report is based on previous information. It appears by this Summary that no additional data was brought forth from this study that substantiates the hypothesis that biodegradation is the most significant mechanism of benzene and toluene removal from the groundwater. The text indicates that the SSI's experimental method was not adequate to gather data to prove that thesis.

b) The theory that the sediment of the Hall's Brook Holding Area serves as a filter for all the contaminated groundwater from the site is to be seriously explored; but, then the consequences of it being a filter, and hence "loading" the sediment with contaminants, need to be adequately assessed with respect to the HBHA as a wetland, not purely as a "holding basin".

c) Para. 4: Please substantiate the statement that the foot of fine-grained sediment has accumulated in the HBHA since the 70's. There is no calculation done to show the flux of that fine sediment; for example, a mass balance calculation of how much sediment is flowing into the Pond versus how much is flowing out. In addition, as is stated in the conclusion, it is critical to

determine the dynamics of the pond during storm events. The Department agrees that this is one of the major data gaps of the report.

158) Puls p. 83: Use of such terms as “generally retained” and “limited transport” are very imprecise due to the paucity of data and the choice of words is appropriate. We need more data and more confidence in that data - data quantity alone will not suffice - we need some more organized and structured approach to the data collection (arsenic speciation, geochemistry transects in the vertical and horizontal [projected flow paths] directions) efforts.

159) Table 2. Why is 60 ug/L for arsenic a ‘U’?