Response to RIDEM Comments on
Site Investigation Report, Former Gorham Manufacturing Facility, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland Parcel C
333 Adelaide Ave., Providence, RI
Dated: November 12, 2013

Regarding the Site Investigation Report, Former Gorham Manufacturing Site, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland and Parcel C, 333 Adelaide Avenue, Providence, Rhode Island (SIR), prepared by AMEC Environment & Infrastructure, Inc. (AMEC), and dated November 12, 2013, the Department has the following comments and questions (October 17, 2014):

Comment 1. Three separate groundwater plumes of volatile organic compound (VOC) contamination have been identified on the terrestrial upland portion of the former Gorham site and have been documented through testing to be discharging to Mashapaug cove. The Department acknowledges the construction and continued operation of the groundwater extraction and treatment system on Parcel A to address the elevated concentrations of VOCs in the "former Building W" groundwater plume and the "retail building" groundwater plume, and AMEC's believe that the system is providing hydraulic containment of two VOC plumes. The third VOC plume is referred to as the "western plume" and is located on Parcel C. According to AMEC, the site data indicates that the "western plume" is undergoing biodegradation and demonstrating a trend of decreasing contaminant concentrations over time.

a. Please be advised of the requirement to continue operation of the groundwater extraction and treatment system on Parcel A, and the monitoring of the "western plume" on Parcel C, during and after the remediation of the cove sediments, at least until such time as it is determined that the upland groundwater contamination no longer poses a threat or risk to the sediments and surface water of Mashapaug cove; and

Response: *Textron acknowledges that the Parcel A Groundwater Pump and Treat System will continue to operate in accordance with the December 17, 2012 Order of Approval for that system. Groundwater monitoring and reporting for the Pump and Treat System and the monitoring well network continues to be conducted by Textron. Textron also proposes to sample a select group of monitoring wells in the Western Plume for VOCs prior to Phase II/III remedial construction, and again after construction is completed. The proposed groundwater monitoring plan will be outlined in the Remedial Action Work Plan (RAWP) and will identify a select group of wells to confirm that the Western Plume on Parcel C and C-1 has degraded to meet GW-3 criteria, consistent with Site regulatory documents.*

b. Due to the nature of the VOC contamination on Parcel A, and the potential for impacts from soil gas on nearby buildings, a determination regarding the need to continue the operation of the groundwater extraction and treatment system, and/or to implement additional or alternative groundwater treatment measures on the two Parcel A plumes, may be made independently of the status of groundwater related impacts to Mashapaug cove sediments and surface water.

Response: *Comment acknowledged.*

Comment 2. Textron's preferred Remedial Alternative for the Phase II Area is Alternative 3, removal of approximately 2 feet of impacted inner cove sediment by either Option A (dredging

via hydraulic pumping) or Option B (placement of a PortaDam between the inner and outer cove, dewatering the inner cove and mechanical excavation of the sediment). The excavated and dewatered sediment will be placed in the former Carriage House portion of the Phase III Area, under an engineered cap. After the sediment removal is completed, the remaining inner cove sediments will be capped by one foot of clean soil, followed by wetland restoration activities.

a. The SIR indicates that Textron and AMEC will rely on the expertise of qualified sediment removal contractors to propose the most effective method (Option A or Option B) to remove sediment from the Inner Cove and replace this with clean material based on site-specific conditions. Please be reminded that the sediment removal method must either be selected prior to the submittal of the Remedial Action Work Plan (RAWP), or the technical details of both methods must be completely detailed in the RAWP submitted for Department review and approval.

Response: *Comment acknowledged. Once the remedial alternative method has been selected, Textron will coordinate the review and approval of the RAWP with the Department and the USACE (permitting).*

Comment 3. Textron's preferred Remedial Alternative for the Phase III Area is Alternative 2, capping of the existing impacted soils in place and capping the excavated and dewatered sediment from the inner cove in the former Carriage House area. The proposed engineered cap will be constructed of a permeable high-visibility marker fabric, placed over the compacted surface soil and impacted sediments, overlain by 12 inches of clean imported topsoil, which will be seeded and maintained.

a. Additional pre-design sampling was performed in April 2014, to supplement the existing data and further characterize the physical properties of the top two (2) feet of sediment proposed for removal and to evaluate the leaching potential of the dewatered sediment for placement on the Phase III upland area. Based upon the results of that investigation does the dewatered sediment pose a risk of leaching and do the results require any changes to the preferred remedial alternative proposed?

Response: *The attached Table 1 presents the Synthetic Precipitation Leaching Procedure (SPLP) results for the five (5) sediment samples collected from 0-2 feet within the Inner Cove (see Attached Figure 1) in April 2014. These SPLP results indicate that the dewatered Inner Cove sediment would not pose a risk of leaching when placed on the former Carriage House area of the Phase III area and capped as proposed. Note that the samples were collected for pre-design purposes and are representative of the sediment that will be removed during the Inner Cove remediation.*

b. Please update Figure 5.2 (Proposed Phase III Cap Area), to clearly show the limits of the proposed area where the excavated inner cove sediment will be placed and capped.

Response: *Figure 5.2 has been updated to show the limits of the proposed area where excavated Inner Cove sediment will be placed and capped.*

Comment 4. Textron's proposed remedy for Parcel C is an engineered cap consistent with what is proposed for the Phase III Area, constructed of a permeable high-visibility marker fabric, placed over the compacted surface soil and overlain by 12 inches of clean imported topsoil, which will be seeded and maintained.

Response: *Agreed. Section 1.1.1 of the SIR has been updated to reflect that the engineered cap for Parcel C will be consistent with what is proposed for the Phase III Area, be constructed of a permeable high-visibility marker fabric, placed over the compacted surface soil, and overlain by 12 inches of clean imported top soil and a final vegetative layer (seeding).*

Comment 5. The SIR has several figures indicating that the general boundary between the inner cove and outer cove is approximately the narrowest point of the "neck" between the eastern and western peninsulas.

a. Please include a figure, similar to Figure 5.2 (Proposed Phase III Cap Area), clearly specifying the extent of the proposed inner cove sediment removal area.

Response: *Figures 5.1 and 5.2 have been updated to specify the approximate extent of the proposed Inner Cove sediment removal area.*

b. At one of the earlier meetings between the Department and Textron, staff from the Department's Office of Water Resources expressed interest in the possibility of including in the proposed sediment removal area several sediment sample locations that appeared to be just outside the inner/outer cove boundary, specifically SED33 and SED34. If these locations are not currently included in the proposed limits of the inner cove sediment excavation, please evaluate the possibility of including these locations.

Response: *Figures 5.1 and 5.2 have been updated to incorporate sediment sample locations SED33 and SED34 within the Inner Cove sediment removal area, in accordance with the Office of Water Resources' request expressed at the February 7, 2014 meeting.*

Comment 6. Please update the schedule provided in SIR Section 7.1.6 (Schedule for Remedy Implementation).

Response: *The Schedule for Remedy Implementation (SIR Section 7.1.6) has been updated to be consistent with the October 2, 2014 Gorham Project Schedule email. Note that this revised schedule has been prepared in order to complete the remediation construction in 2015 and assumes regulatory review times and public comment periods are not extended beyond what is shown.*

Response to RIDEM Comments on the Outer Cove Human Health Risk Assessment, submitted by AMEC November 2013.

The following comments address the November 2013 "Outer Cove" Human Health Risk Assessment (HHRA) submitted by AMEC. The AMEC HHRA updated the July 31, 2006, Supplemental Site Investigation Report (SSIR) in a "streamlined manner, essentially recalculating sediment exposure point concentrations for chemicals of potential concern for the Outer Cove Study Area (expanded from the "Outer Cove" identified in the 2006 SSIR) and using a ratio approach to calculate cancer risks for the Outer Cove Study Area." The 2006 Mashapaug Cove HHRA "evaluated potential future industrial/commercial worker and current/future trespasser exposures and risks associated with potential contact (incidental ingestion and dermal contact) with surface water and sediment of the Inner Cove and Outer Cove." By comparison, the 2013 "streamlined" update states that [and that in the future] people entering the City-owned property would no longer be trespassers, but rather site visitors."[1] From a practical perspective, therefore, future site visitors now replace the 2006 adolescent and adult "trespasser" scenario-instead of fencing people out, the park will now be a draw to individuals and families.

Response: *"Future site visitors" are the receptors to be evaluated. The exposure scenarios for the "future site visitors" are discussed in responses below.*

To address several of the following comments concerning the 2013 streamlined update of the Cove risk assessment and to provide more detail and transparency for the risk assessment update, a memorandum, ***Risk Assessment – SIR Response to Comments Supporting Information, Former Gorham Manufacturing Site, 333 Adelaide Avenue, Providence, Rhode Island,*** *has been prepared and attached to this response to comments letter. This memorandum will be referred to as the "Risk Assessment Update Memorandum" in the remainder of this letter. The memorandum provides detailed documentation of the samples used in the risk assessment, some discussion of the conceptual site model, the nature and extent of contamination, documentation of the toxicity values used in the risk assessment, assumed exposure scenario and associated parameters, and the updated risk calculations.*

Some excerpts from that Risk Assessment Update Memorandum that summarize nature and extent of contamination, the conceptual site model (CSM), and the completed, on-going, and planned remedial activities at the Site are included in the text below. This information is provided to provide additional context to the responses to comments related to the risk assessment.

The nature and extent of contamination of the Mashapaug Inner Cove and Outer Cove sediments and surface water has been characterized:

- *during the surface water and sediment investigations summarized in the 2006 Supplemental Site Investigation Report, Former Gorham Manufacturing Site, 333 Adelaide Avenue, Providence, Rhode Island (SSIR) [MACTEC, 2006] which included 2005 RIDEM sediment sampling and analysis and 2006 Textron sediment and surface water sampling and analysis,*

- *during the investigation documented in the April 2010 Data Summary Report, Mashapaug Cove Groundwater Investigation (MACTEC, 2010),*

- *and during the 2011 surface water and sediment investigations described in the 2013 SIR (AMEC, 2013).*

As discussed with RIDEM and consistent with the Work Plan Mashapaug Cove Supplemental Site Investigation, Former Gorham Manufacturing Facility, 333 Adelaide Avenue, Providence, Rhode Island (AMEC, 2011) approved by RIDEM, the 2011 surface water and sediment investigations included collection of sediment and surface water samples and specific analytical suites to complete the delineation of nature and extent of contamination and to support risk assessment activities (primarily for the Outer Cove). The analytical suite for the 2011 samples was based in large part on the results of the earlier surface water and sediment samples as well as the results of the 2010 groundwater investigation adjacent to and beneath the Cove. If the extent of contamination for a particular analyte group (e.g. VOCs, PAHs, PCBs, dioxins and furans) was determined to be adequately delineated for a given medium, the 2011 Outer Cove samples for that medium were not analyzed for that analyte group. The December 2014 Response to Comments Letter addresses specific RIDEM comments concerning the spatial coverage and numbers of samples of surface water and/or sediment that have been analyzed for various analyte groups.

The available body of information indicates that historical Site impacts to sediment are substantially greater in the Inner Cove than in the Outer Cove and Site-related contaminants in sediment and surface water have been adequately delineated.

The 2010 groundwater investigation concluded that the downgradient extent of the VOC-impacted groundwater plume is located just north of the Inner Cove/Outer Cove boundary. Therefore, VOC impacts to Outer Cove sediments and surface water (shallow groundwater discharging through the sediments and into surface water) are expected to be minimal. In addition, a groundwater pump and treat system is currently operating on Parcel A and it was designed, in part, to interrupt the groundwater migration from the uplands portion of the Site to the Cove. Therefore, with no continuing discharge to the Cove in the near future, VOC concentrations in Cove surface water and sediment are expected to decline over time. Therefore, the available data overestimate future concentrations and potential exposures.

The VOC concentrations reported for surface water samples from the Inner Cove and Outer Cove have been in the low part per billion (ug/L) range. The surface water samples have been collected at the bottom of the water column, within one foot of the sediment/surface water interface. Surface water samples collected from that close to the sediments (where VOC-impacted groundwater might be discharging and there would be minimal dilution of the groundwater) would represent very conservative estimates of potential exposure concentrations for people wading or swimming in the surface water. It would be expected that locations within the water column that are further away from the sediment/surface water interface would have VOC concentrations that are lower than those very close to the sediment/surface water interface.

A brief discussion of the Conceptual Site Model (CSM), including a discussion of the already completed, the on-going, and the planned remedial activities is useful for providing context for the updated risk assessment. The sources of contaminants and associated migration pathways with respect to the sediment and surface water of the Inner Cove and Outer Cove have been both historical and more recent.

Sources of contamination to surface water and sediment of Mashapaug Cove included reported direct discharge from facility piping (no longer taking place because the facility is no longer operating and the piping has been removed), surface runoff of impacted soil (metals, PAHs, dioxins and furans) from the upland area south of the Cove (also no longer taking place since the upland area south of the Cove has been capped and seeded and most of the remainder of the uplands area is covered by buildings and pavement), discharge of storm water from the on-site storm water settling basin (a more recent site feature) to the Inner Cove (metals and PAHs) and discharge of shallow groundwater impacted with chlorinated VOCs into and through the submerged sediments and into the surface water immediately above the sediments of the Inner Cove (the operating groundwater containment system is interrupting this migration pathway and it is expected that this migration pathway will be eliminated in the near future). Historically, it is probable that during storm events and due to storm water runoff into the Cove, there may have been disturbance and re-suspension of Inner Cove sediments (particulates) into the water column. This would result in transient suspended particulate matter containing metals, PAHs, and dioxins and furans in the surface water of the Inner Cove and possibly, by advective flow, of the Outer Cove. With the planned removal and replacement of sediments of the Inner Cove, there will be no future re-suspension of impacted sediments of the Inner Cove. Concentrations of metals, dioxins and furans, and PAHs in surface water are expected to decrease after the Inner Cove sediment remediation.

The completed, on-going, and planned remedial activities have reduced migration of Site-related contaminants to the Inner Cove and the Outer Cove surface water and sediment. It is

expected that the continued operation of the groundwater containment system and the remediation of Inner Cove sediment will eliminate Site-related contaminant exposures in the Inner Cove and further reduce Site-related contaminant exposures for the Outer Cove. In that context, the data used in the risk assessment is conservative, and is likely to overestimate potential surface water and sediment exposures for the future.

Outer Cove HHRA Comments:
Mashapaug Cove consists of two coves – the Inner and Outer Coves, with the northern border of the Outer Cove defined by the property's "approximate site boundary". The AMEC 2013 SIR summarizes "all surface water sample data" used in the HHRA in Tables 4.1, 4.2 and 4.3. These tables present data for 12 "Outer Cove" and "Outer Cove Study Area/Remainder of the Pond" surface water samples taken by AMEC in 2011 and 15 surface water samples collected by MACTEC in 2006 (described below). Of the 2011 surface water samples taken in the "Outer Cove" (SW-33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 59, and 60), none (0/12) were tested for VOCs (including vinyl chloride which was detected in 10/12 Inner Cove surface water samples), semi-volatile organic compounds (SVOCs), dioxins or furans; SVOCs, however, were infrequently detected in the "Inner Cove" surface water samples, while several dioxin/furans were detected in the limited number (N=2) of Inner Cove surface water samples taken (Table 4.1). In one "Outer Cove Study Area/Remainder of the Pond" sample (SW-11) – which is a Mashapaug Pond sample taken outside of, but near the "Outer Cove" site boundary, located central to the channel – cis-1,2-dichloroethene (10.8 ug/L, the highest concentration found anywhere in the Cove), trichloroethene (TCE), 4,4'-DDT, 1,2,3,4,6,7,8-HpCDD, and octachlorodibenzo-p-dioxin (OCDD) were detected.

In the 2006 SSIR, 15 surface water samples were taken and are shown in Table 1 (2006 SSIR). Of these, three (SW10, SW11, and SW12) were located in the "Outer Cove Study Area/Remainder of the Pond," outside of the Outer Cove's identified "site boundary" property line, and 12 were located within the Inner Cove – none were located in the Outer Cove itself. Regarding sediment data, VOCs, SVOCs, dioxins and furans were found in shallow sediment (0-1 ft) samples from the "Outer Cove Study Area", Table 4.5. However, only 4 of 22 "Outer Cove Study Area" samples (2006 and 2011 combined) were analyzed for VOCs and SVOCs, and their frequencies of detection ranged from 1 to 3 out of the 4 samples. In addition, none of the remaining 18 combined sediment samples (SED-33 through SED-48, SED-59 and SED-60) were analyzed for pesticides or PCBs; presumably these contaminants were detected at low frequencies in shallow sediment Inner Cove samples.

<u>Responses to Comments Related to Analytical Suite for Surface Water Samples:</u>
Of the 15 surface water samples reported in the 2006 SIR, the majority were collected from the Inner Cove and three samples were collected from just beyond the property boundary located at the boundary of the Outer Cove. In the 2011 supplemental investigation, additional surface water samples were collected from the "Outer Cove" itself (SED/SW-33 through SED/SW-42 and SED/SW-59 and SED/SW-60) and from the portion of the Outer Cove Study Area located just outside the property line at the border of the Outer Cove proper (SED/SW-43 through SED/SW-48). Surface water samples from 2006 and 2011 were collected one-foot above the

sediment interface to represent the greatest site-related contaminant concentrations derived from groundwater discharging up through the Cove sediment. Any surface water samples collected further above this interface would have been influenced by greater dilution with the pond water. Concentrations of VOCs in most of the surface water in the Cove would be expected to be lower than measured in those samples collected in close proximity to the sediment/surface water interface.

The analytical suite for the 2011 surface water samples from the Outer Cove Study Area was described in the work plan for that 2011 investigation and the rationale was discussed with RIDEM representatives in a meeting prior to the investigation. The analytical suite was identified based on previously collected data concerning nature and extent of contamination as well as the conceptual site model, particularly with respect to identified fate and transport mechanisms and migration pathways to Mashapaug Cove (recognizing that capping of soils has effectively eliminated migration of contamination from surficial soils via storm water runoff and/or erosion and that groundwater/surface water interaction is the primary transport mechanism from the former manufacturing site to the cove). The 2011 surface water samples from the outer Cove Study Area were not analyzed for VOCs because the concentrations of VOCs in previously collected surface water samples from the Inner Cove and the property line area were in the low parts per billion range and the 2010 groundwater investigation identified that the groundwater VOC impacts did not extend beyond the Inner Cove/Outer Cove boundary.

The VOC concentrations in the 2006 surface water samples from the Inner Cove and from just beyond the property boundary did not represent any significant health risk for the receptors evaluated in the 2006 human health risk assessment (HHRA). Since the Outer Cove Study Area is further from the impacted groundwater (source) and most of it is beyond the extent of the groundwater discharge, additional VOC analysis for surface water samples was considered un-necessary in 2011. The concentrations of total VOC concentrations in the 2006 surface water samples are identified in the attached Figure 4.13 of the 2006 SIR.

Note: A number of figures reproduced from the 2006 SIR and 2013 SIR related to risk assessment comments are attached to this response to comments letter and a list of those figures is provided as a cover sheet for those figures.

Further evaluation of the site data was conducted to assess the potential human health risks using surface water maximum VOC concentrations (the streamlined risk assessment update and the attached Risk Assessment Update Memorandum). These calculations were performed to assess a total receptor (adolescent and adult) cancer risk for surface water using the maximum detected concentrations of VOCs in surface water samples within the Mashapaug Cove (Inner and Outer) using the age-dependent adjustment factor (ADAF) for TCE and using the cancer slope factor (CSF) for vinyl chloride that includes an ADAF within it. The result was a 4 X 10^{-7} cancer risk, well below the cumulative risk limit of 1 x 10^{-5} and no single compound had risk greater than 1 x 10^{-6}. The hazard index was 0.006, well below the limit of 1. This evaluation of VOCs in surface water based on the maximum detected concentrations of VOC compounds in either the Inner Cove (nearest the groundwater source) or Outer Cove indicates that the small number of surface water samples analyzed for VOCs in the Outer Cove is not a significant uncertainty. In addition, the operating groundwater containment system will interrupt

the migration of VOCs to the surface water of the Inner and Outer Cove and surface water VOC concentrations are expected to be reduced over time because the migration pathway to the Cove will be eliminated.

In preparing these responses (including the attached Risk Assessment Update Memorandum), risk calculations were also performed for surface water risk scenarios using the shallow groundwater concentrations of VOCs at the 2010 groundwater sampling point DP-I located in Mashapaug Pond (attached Figure 3.8, 2013 SIR). This groundwater sampling point is located at the boundary of the Inner Cove and Outer Cove, and represents the northern boundary of VOC-impacted groundwater beneath Mashapaug Pond. This sample point also represents a conservative estimate of possible Outer Cove surface water VOC concentrations by not incorporating the biodegradation of the VOCs as they discharge up through the sediment nor dilution with the Pond water once the groundwater is above the sediment/surface water interface (the shallow groundwater is the source of any site-related VOCs in surface water of the Outer Cove). Using those conservative shallow groundwater VOC concentrations as hypothetical surface water exposure point concentrations and applying ADAFs as appropriate, the total receptor (adolescent and adult) cancer risk for surface water for the Outer Cove would be 2 X 10^{-8}, well below the cumulative risk limit of 1 x 10^{-5} and no single compound had risk greater than 1 x 10^{-6}. The hazard index (0.002) was well below the risk limit of 1.

Risks for surface water exposure were also calculated using the maximum detected VOC groundwater concentrations (at any depth) for groundwater sampling point location DP-I as a worst-case estimate of a surface water exposure point concentration for the Outer Cove. The total receptor (adolescent and adult) cancer risk for surface water for the Outer Cove would be 9 X 10-^{7}, well below the cumulative risk limit of 1 x 10^{-5} and no single compound had risk greater than 1 x 10^{-6}. The hazard index (0.03) was well below the risk limit of 1.

It should be noted that these risk estimates are based on surface water and groundwater data that were collected prior to initiation of groundwater extraction activities on site. Groundwater VOC concentrations are expected to decrease in the future based on plume capture upgradient of the pond. This information further supports the risk conclusions based on the available data and the conceptual site model.

There were no SVOC analyses of 2011 surface water samples because the analytical data for the 2006 surface water samples from the Inner Cove and the property boundary area indicated minimal impacts and insignificant human health risks from these compounds.

The 2011 Outer Cove Study Area surface water samples were not analyzed for dioxins and furans because dioxins and furans are very sparingly soluble, and therefore would be present in surface water in a particulate-associated form (likely suspended sediment material from the Inner Cove). The proposed remedy for the Inner Cove includes removal of sediments – and this remedy would remove the source of dioxins and furans to the water column. With the recent capping of the upland area to the south of the cove, the migration of any dioxins/furans from soils via erosion to the cove has been eliminated. After remediation of the sediments, particulate-associated dioxins and furans should be substantially reduced. The signature of dioxin and furans in sediment in the Inner Cove is similar to that in surface soil samples that

have been capped. The dioxin and furan signature in sediments outside of the Inner Cove is different than the signature from the Inner Cove sediments and is not a site-related (likely a background condition). Post-remedy surface water sampling and analysis for dioxins and furans from the Cove and from background locations in the Pond will be conducted to confirm these expectations.

Responses to Comments Related to Analytical Suite for Sediment Samples

The four Outer Cove 2006 surficial sediment samples analyzed for VOCs were SED-11, SED-13, SED-14, and SED-15. The frequently detected VOCs were acetone and carbon disulfide, neither of which are site-related parameters. Chlorinated VOCs were detected in the sediment sample SED-15, which is at the boundary of the Inner Cove and Outer Cove and at the boundary of the impacted groundwater. Chlorinated VOCs were not detected in sediment samples SED-11, SED-13, and SED-14, which is consistent with the delineated area of groundwater impact (those Outer Cove locations are beyond the area of impacted groundwater). This information supported the decision that additional VOC analysis for additional Outer Cove sediment samples was not necessary to delineate sediment VOC impacts or to evaluate risks for the Outer Cove Study Area. The attached Figures 4.17 – 4.20 of the 2006 SIR (also found in Appendix A of the 2013 SIR) show the spatial distribution of chlorinated VOCs (cis-1,2-DCE, TCE, and PCE) in sediment samples, showing impacts primarily in the Inner Cove and minimal impact in the Outer Cove.

The 2011 Outer Cove sediment samples were not analyzed for pesticides and PCBs because those parameters were not identified as site-related parameters in site soil and Inner Cove sediment based on the findings of the 2006 SIR and the associated conceptual site model. Pesticides and PCBs were infrequently detected in Inner Cove sediment samples (in most cases detected in only 1 or 2 of 22 samples). There is no identified site-related migration pathway that could result in substantial frequency of detection or concentrations of these compounds in Outer cove sediments.

The 2011 Outer Cove sediment samples were not analyzed for dioxins and furans because the information contained in the 2006 SIR report indicates that site-related dioxin and furan impacts on sediments are limited to the Inner Cove. The signature of dioxin and furans in sediment in the Inner Cove is similar to that in surface soil samples that have been capped (Phase I Area). The dioxin and furan signature in sediments outside of the Inner Cove is different than the signature from the Inner Cove and is not site-related (likely a background condition). The attached Figure 4.31 of the 2006 SIR (and Appendix A, 2013 SIR) shows the distribution of dioxin TEQ concentrations in sediment samples. Concentrations are dramatically lower in the Outer Cove Study Area relative to the concentrations in the Inner Cove. The attached Figures 4.32, 4.33, and 4.34 of the 2006 SIR (and Appendix A, 2013 SIR) show the different dioxin/furan signatures (site-impacted vs un-impacted) for sediment samples.

Comment 7: AMEC's "streamlined" HHRA equates the "trespasser receptor" with "future site visitors". Since the 2005 MACTEC SIR defines "future visitors" to include neighborhood/local

residents from "all age groups", does AMEC believe that the "streamlined" human health risk assessment presented to the Department adequately addresses behavior patterns and exposure assumptions (detailed in the 2006 SSIR- e.g., age groups, skin surface areas, exposure frequencies, lack of age-dependent adjustment factors for mutagenic carcinogens such as benzo(a)pyrene [BaP] and vinyl chloride) that would be associated with repeat site visits by young children, adolescents and adults? Please explain.

Response: *The Cove-related exposure for the original trespasser scenario remains relevant for the "site visitor scenario". Tables 8 through 11 of the 2006 HHRA (Appendix H, 2013 SIR) contain the exposure assumptions for the receptors included in the Cove risk assessment. The trespasser/site visitor exposure scenario includes children ages 7 through 18 (adolescents) and adults (assumed age 19 through 30).*

The RME exposure scenario assumes that the adolescent and adult might be exposed to surface water and sediment via wading and swimming in the Outer Cove. It has been assumed that adolescents and adults each engage in both wading and swimming on 17 days per year (once weekly mid-May through mid-September) and in wading only on 34 additional days per year (once weekly mid-May through mid-September). This scenario includes wading for each receptor on 51 days per year and swimming on 17 of those 51 days per year. For the site visitor, this exposure scenario includes a total of 1,224 wading events and 408 swimming events over a 24-year period. These frequencies of exposure are hypothetical, but likely overestimate the frequency of exposure for current and anticipated future land use.

There is no USEPA default exposure scenario for swimming and wading at an urban pond such as Mashapaug Pond. As a point of reference, the Maine Department of Environmental Protection (DEP) has a default exposure frequency for wading of 78 days per year and swimming of 40 days per year (4 days per week for 10 weeks during the summer). The Maine DEP Park Visitor exposure scenario (Maine DEP, 2013) is a more intensive land use (an active recreational park scenario that likely includes a formal, supervised wading/swimming beach area) than the Outer Cove scenario. The Maine DEP exposure parameters are located at:

http://www.maine.gov/dep/ftp/RAGS-Background-Documents/Human%20Health%20Risk%20Assessment%20Manual/

The adolescent and adult wading and swimming scenarios are appropriate for current and expected future uses of the Outer Cove. The wading and swimming exposure scenarios are expected to provide a conservative estimate of surface water and sediment exposures for boaters at the pond as well. Although a younger child might visit the Outer Cove shore line occasionally, children under the age of 7 would not be expected to be wading frequently nor would children under the age of 7 be expected to be swimmers or frequent swimmers. Given the physical environment including a steep slope down to the water, a wooded shoreline, lack of a beach and steep banks along much of the shoreline, young children are not expected to be wading or swimming in the Outer Cove. It should also be noted that the City of Providence maintains 5 public swimming pools and 11 water parks open during the summer. These would

be a more attractive option for public swimming than the Outer Cove, further supporting the conservatism of the assumed exposure scenarios to the surface water and sediment.
Wetlands requirements for the sediment remediation and restoration include wild vegetation growth up to the water's edge. This will make access difficult.

Because the USEPA published guidance for applying age-dependent adjustment factors in cancer risk calculations for sensitive age groups after the 2006 HHRA was completed, the impact of those adjustment factors on the risk calculations have been evaluated. As discussed above (response to Comment 6) for surface water exposures, the application of ADAFs for TCE in surface water and the use of the CSF for vinyl chloride (that includes an ADAF) does not change the conclusions of the 2013 HHRA update (this is documented in the attached Risk Assessment Update Memorandum. This is also applicable with respect to Benzo(a)pyrene, which is primarily associated with storm water discharges to a portion of the Inner Cove.

Comment 8: It appears that only 3 surface water samples (SW10, SW11 and SW12) were used to calculate Exposure Point Concentrations for the Outer Cove – however, no actual "Outer Cove" surface water data, except for metals, were used to evaluate human health risks for receptors during swimming or wading in the Outer Cove itself. Since samples SW10 and SW12 are clearly located in the "Remainder of the Pond" and not central to or in the "Outer Cove" itself (at locations where receptors may be exposed through dermal contact, for example) a more conservative estimate of VOC surface water concentrations, for example, could be obtained by averaging SW11 sample data with surface water samples taken centrally and closest to the transition point between the Inner and Outer Coves – i.e., SW16, SW17 and SW27. Similarly, while only 1 of 3 "Outer Cove Study Area/Remainder of the Pond" samples was tested for dioxins/furans – and this one data point appears to have been used in the analysis presented to the Department in 2006 – the uncertainty associated with relying on this one sample may be reduced by including data from other potentially relevant samples (e.g., SW27) and used in the calculation for incidental ingestion while swimming, for example. Alternatively, new samples could be taken in the "Outer Cove" to characterize current conditions and potential surface water concentrations that site visitor receptors might be exposed to through incidental ingestion while swimming or dermal contact. Please advise.

Response: *The suggested use of sample data for VOCs in surface water samples SW16, SW17, and SW27 to augment data from SW11 is a reasonable approach for refining the risk calculations. However, as discussed in the response to Comment 6 above, even using maximum detected VOC concentrations among all surface water samples (Inner Cove and Outer Cove), the risks associated with surface water exposures to VOCs are not significant (below the risk limits for cumulative exposures and for single compounds). In response to this comment, the attached Risk Assessment Update Memorandum has evaluated surface water exposures using all of the surface water samples from the Outer Cove and the area just outside the Outer Cove property boundary. Those samples are identified in Table 1 of the Risk Assessment Update Memorandum. The calculated risks (identified in Tables A-3, A-4, B-3, and B-4 and summarized in Table 10 of the Risk Assessment Update Memorandum were within RIDEM risk limits.*

The VOC surface water concentrations used in the Risk Assessment Update Memorandum are from samples collected prior to the initiation of groundwater extraction activities upgradient of the pond. Groundwater and surface water concentrations beneath and within the coves, respectively, are expected to decrease in the future as the result of plume capture upgradient of the coves. In addition, even using the shallow groundwater data (representative of groundwater potentially discharging to surface water) at groundwater location DP-I at the boundary of the Inner Cove and Outer Cove (Figure 3.8, 2013 SIR) as hypothetical surface water exposure point concentrations, the risks for VOCs in surface water are not significant. The available data and the conceptual site model support the conclusion that VOCs in surface water do not pose any significant risk.

Comment 9: The statement presented in the 2013 AMEC report (pg. 4-3) that "For surface water samples collected from the Outer Cove Study Area and the Remainder of the Pond, cis 1,2-DCE was the only chlorinated VOC that was detected" is somewhat misleading since 1) TCE was also detected at SW11, 2) none of the 12 actual "Outer Cove" surface water samples were analyzed for chlorinated VOCs, and 3) only 3 (SW10, SW11 and SW12) of 9 "Outer Cove Study Area/Remainder of the Pond" samples were analyzed for chlorinated VOCs. Interestingly, SW-11 which had the highest concentration of cis 1,2-DCE (10.8 ug/L) reported anywhere in the pond (including the Inner Cove) is located centrally (along the channel), just outside the Outer Cove's "site boundary". Also, surface water samples taken closest to the transition point between the Inner and Outer Coves – i.e., SW-16, SW-17 and SW-27 – all had detectable levels of vinyl chloride. Considering these facts – and that the majority of "Outer Cove" and "Outer Cove Study Area/Remainder of the Pond" surface water samples (SW-33 through 48, 59 and 60) were collected for the purposes of evaluating "the transfer of total and dissolved metals (PP13) from the sediment to the surface water" (AMEC; November 18, 2011) – the summary statement by AMEC on pg. 5-6 of the 2013 report (i.e., "In summary, the RME and CT ELCR…values for the Trespasser [assuming this is also meant to extend to future site visitors]…for the Outer Cove meet the Remediation Regulation risk limits") does not appear to be based on a robust data set.

Response: *The statement will be revised to read "For surface water samples collected from the Outer Cove Study Area and the Remainder of the Pond, cis 1,2-DCE and TCE were detected."*

A more robust evaluation of the risks associated with potential exposures to VOCs in surface water has been conducted using all of the VOC surface water data (maximum detected concentrations) from the Inner Cove and the Outer Cove, and also an evaluation has been done using shallow groundwater data from location DP-I at the boundary of the Inner Cove and Outer Cove (Figure 3.8, 2013 SIR) as well as the maximum detected concentrations reported for any depth from location DP-I to estimate worst case surface water concentrations (groundwater discharge is the only site-related migration pathway that would impact surface water). As discussed in the responses to Comments 6 and 8 above, a more robust evaluation of all of the available surface water data and the groundwater data beneath the Inner/Outer Cove boundary (please see the attached Risk Assessment Update Memorandum) supports the risk assessment finding that VOCs in surface water do not pose significant risks for the surface water exposure scenarios. Further, as has been discussed in previous responses, a groundwater extraction

system is operating at the site, upgradient of the Cove. With plume capture by the extraction system, concentrations of VOCs in groundwater and in surface water are expected to decrease in the future. Risks for the future would be expected to be lower than what has been calculated in the more robust evaluation that is documented in the attached Risk Assessment Update Memorandum.

Comment 10: "Outer Cove" surface water data for the carcinogen 1,4-dioxane do not exist – 1,4-dioxane has been associated with 1,1,1-trichloroethane (TCA) and other chlorinated solvents at contaminated sites. When the surface water samples were tested for 1,4-dioxane, laboratory reporting limits were given as 500 ug/L. [Note: Also, reporting limits as high as 5,000 ug/L for 1,4-dioxane were shown in the March 2014 groundwater monitoring site status report submitted by Shaw Environmental, Inc. these analyses, however, were conducted to determine compliance with a calculated on-site GB groundwater objective of 2,574 mg/L.] If additional surface water samples area taken, it would be desirable to test for 1,4-dioxane (with lower detection limits), or alternatively, use ½ the detection limit in cumulative risk calculations under the presumption that 1,4-dioxane is present along with TCE in the surface water. Another option would be to test select on-site groundwater monitoring wells (with lower detection limits) for the presence of 1,4-dioxane. Please advise.

Response: *Site investigations to date have not identified 1,4-dioxane as a substantial site-related contaminant. Based on the evaluations discussed in responses to Comments 6, 8, and 9 above, additional sampling of surface water to gather additional VOC data is not recommended. The compound 1,4-dioxane has been detected in only two groundwater samples collected from the site in the past two years: MW-234I 29.4 ug/L in 2011 and CW-1 84 ug/L in 2013. Note that within these two samples, the compound 1,1,1-TCA was detected at 7.4 ug/L and 1.2 ug/L respectively indicating that there is not a strong correlation between 1,4-dioxane and 1,1,1-TCA detections at the Gorham site. 1,4-dioxane was not detected in the Parcel A groundwater treatment system pump test using a method detection limit of 20 ug/L. A review of recent analytical reports indicate that 1,4-dioxane reporting limits vary based on concentrations of other VOCs detected within the sample. While some reporting limits for 1,4-dioxane are elevated in certain samples, others are not. This issue may best be addressed as a potential uncertainty, but the available analytical data and conceptual site model do not suggest this is a substantial uncertainty with respect to the health risk calculations. This topic will be addressed in the post-remedy surface water confirmation sampling.*

Comment 11: Limited "Outer Cove" organics sediment data (VOC, SVOC) exist. Increased confidence in contaminant distributions could be gained if additional sediment samples were taken from near-shore/relevant exposure point "Outer Cove" locations where future park visitor receptor activities (swimming, wading, canoeing) are anticipated /more likely to occur – in the past, for example, the potential for a boat/canoe launch area along the eastern shore of the Outer Cove was mentioned. If the potential for receptors to come in direct contact with shoreline sediments exists, then these areas should also be characterized. Also, please 1) clarify which surficial sediment samples (from Figure 4.9, for example) were used to calculate the mean and 95% UCL concentrations shown in Table 5.1 (Table 4.5, for example, presents a

mean As concentration of 16.4 ppm vs. 4.4 ppm shown in Table 5.1), and 2) shown the actual calculations for a traditional Method 3 risk assessment approach rather than the shorthand "ratio approach" described in footnotes (4) and (5) of Table 5.1.

Response: *As discussed in the responses to Comment 6 above, the distribution of VOCs and SVOCs detections and concentrations (2006) in surface water, sediment, and groundwater in both the Inner Cove and the Outer Cove was used in conjunction with the conceptual site model (particularly migration pathways) to evaluate the need for VOC and SVOC analysis of 2011 surface water and sediment samples. The 2006 SIR figures (Appendix A, 2013 SIR) show the distributions of VOCs and SVOCs in surface water and sediment samples. The figures in the 2006 SIR report indicate that sediment samples collected from near-shore locations (sandy soils with very little organic material) of the Outer Cove did not contain elevated concentrations of site-related parameters, but samples collected at locations with very high organic matter content and/or in the center channel (area of deposition) did have elevated levels. Overall, those figures, the data and figures from the 2010 Data Report for the Supplemental Groundwater Investigation indicate that VOCs and SVOCs concerns are more substantial within the Inner Cove and that VOCs and SVOCs concentrations and frequency of detection are generally substantially lower in the Outer Cove than in the Inner Cove.*

The attached Figures 4.21, 4.22, and 4.23 of the 2006 SIR (Appendix A, 2013 SIR) show distributions of benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene in sediment samples in the Inner Cove and Outer Cove. None of these compounds were detected in 2006 Outer Cove sediment samples. The distributions of these compounds in the Inner Cove do not suggest that these compounds should be expected in the Outer Cove sediments (the source for the Inner Cove appears to be a storm water discharge to the eastern portion of the Inner Cove).

The additional documentation of the data used to calculate EPCs and the actual risk calculations are provided in the attached Risk Assessment Update Memorandum.. The arsenic data used for the sediment risk assessment are shown in Table 2 of the Risk Assessment Update Memorandum. Figure 1 of the Risk Assessment Update Memorandum includes the locations of those samples. Arsenic concentrations in the near-shore sediment samples of the Outer Cove that were used in the risk assessment update (western shore: SED/SW-15, SED/SW-35, SED/SW-37, SED/SW-40 and SED/SW-10 and eastern shore: SED/SW-38, SED-13, SED/SW-42, and SED/SW-12) range from non-detect to 18.5 mg/kg. The mean arsenic concentration among those samples is 6.6 mg/kg. There is no reason to have concentrations outside that range, since waders and swimmers would not have opportunity for sediment contact in the area of the channel with deeper water.

Comment 12: Existing surface water and sediment data present a somewhat incomplete picture of potential contaminant distributions and exposures (during swimming/wading) that may occur in the "Outer Cove". Some of the conclusions drawn appear to be based on inferences made from small data sets or data sets that were located outside of the "Outer Cove" approximate site northern boundary (Fig 3.3, for example). As noted, past risk communication efforts were not entirely effective "in preventing direct contact recreational uses of the cove such as wading and swimming (2006 SSIR)". To increase confidence in the 2013 AMEC risk assessment

conclusions, a brief, revised report that addresses the comments contained herein would be helpful. Such an effort should 1) clearly identify all "Outer Cove" sample data used in the calculation of exposure point concentrations (currently somewhat confusing), 2) "be consistent with scientifically acceptable risk assessment practices…." (Rule 8.04, Remediation Regulations)- by using updated information /data such as age-specific adjustment factors (ADAFs) for mutagenic carcinogens, updated oral slope factor for the carcinogenic effects of TCE, for example, and 3) identify and support the use of scientifically credible exposure variables/assumptions (RME/CTE) for relevant site visitor receptor activity scenarios (USEPA RAGS Part E, 2004 Supplemental Guidance for Dermal Risk Assessment "Estimation of Dermal Exposures to Chemicals in Water/Sediment", for example).

Response: *The requested Risk Assessment Update Memorandum is attached to this response to comments letter.. That memorandum provides the documentation of the analytical data used in the risk assessment update, the exposure assessment details, the toxicity information used, and the risk calculations.*

Comment 13. Mashapaug Pond covers 114-acres and is the largest freshwater lake in Providence. (http://www.dem.ri.gov/programs/benviron/water/quality/swbpdf/mashapaug.pdf) As such- and with the school and Park Parcel attraction – it is reasonable to anticipate that site improvements will serve as a draw for teenagers, neighborhood/local residents, recreational anglers, boaters/canoers and possibly homeless people. The AMEC 2013 report states that "potentially complete future exposure pathways for humans" include incidental ingestions and dermal contact with surface water and sediment during wading and swimming activities and the potential consumption of fish or other biota from the Cove. As a site visitor could, in addition to swimming, wading, boating, or canoeing, also consume fish from the Outer Cove/ Pond, potential cumulative human health risks could be even higher if the risks from these pathways were combined together. Potential contact scenarios, coupled with RIDEM/RIDOH concerns (re: fecal coliform, cyanobacteria and PCBs/dioxin in fish) point to the need for an effective risk communication/management strategy which may include permanent well-placed signage, park patrols and/or flyers for example. Please advise.

Response: *A continuation of public notice concerning measures to be taken to address fecal coliform, blue-green algae, and Rhode Island fish consumption advisories for Mashapaug Pond is appropriate. Textron has invested in restoration of the property and would like to see it used safely. As the remedial activities are completed and maintenance of the property transitions more completely to the City of Providence, Textron will ask if the City could communicate safe usage tips for the property and the pond on a continuing basis.*

Comment 14: As was previously discussed during a telephone conversation regarding the Department's preliminary review of the SIR, post-sediment remediation activities must include plans to collect and analyze confirmatory surface water dioxin samples from the inner cove to support AMEC's conclusion that dioxin surface water human health risks will be reduced to negligible after inner cove sediment remediation is completed.

Response: *This requirement is understood.*

Response to RIDEM Comments on
Site Investigation Report, Former Gorham Manufacturing Facility, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland Parcel C
333 Adelaide Ave., Providence, RI
Dated: November 12, 2013

Response to RIDEM Comments on
Phase II and III Wetland and Perimeter Wetland Restoration Plan
Former Gorham Manufacturing Facility
333 Adelaide Ave., Providence, RI
Dated: February 6, 2014

Regarding the Phase II and III Wetland and Perimeter Wetland Restoration Plan, Former Gorham Manufacturing Facility, 333 Adelaide Avenue, Providence, Rhode Island, prepared by AMEC, and dated February 6, 2014, the Department has the following comments and questions (October 17, 2014). (please note that these comments from the Department's Freshwater Wetlands Program staff were forwarded to Textron and AMEC via email on April 10, 2014):

Comment 15: Although this project would be considered exempt under Rules 6.01 and 6.08 of the Wetlands Rules, an Army Corps permit would be needed, meaning the applicant would have to apply separately to the Army Corps.

Response: *Textron acknowledges that the remediation work will require and Textron will obtain a USACE General Permit-Category 2 or an Individual Permit under Section 404 of the Clean Water Act and will coordinate this permitting with the preparation of the draft and final RAWP.*

Comment 16: With respect to the "Phase I" work that has been completed, Wetlands would not require the applicant to replant the 50-foot area with shrubs and trees, but would like all of those areas to be clearly designated as "no cut" zones, that would be allowed to re-vegetate in a natural, wild manner free from any cutting or mowing in the future. The applicant may be allowed to replant portions of that area with plants (Smilax, Rosa, etc.) that could work to limit human access to the shore.

Response: *Textron is willing to institute a "no cut" zone along the length of the 50-foot buffer zone of the Phase I and Phase III area to allow the wetlands to naturally re-vegetate. The "no cut" zone may be defined within the Environmental Land Usage Restriction (ELUR) that will be recorded for Parcel C-1, or may be in the form of a Conservation Easement in accordance with Rhode Island General Laws § 34-39-et. seq. - Conservation and Preservation Restrictions on Real Property. Textron will coordinate this effort with RIDEM during the preparation of the draft RAWP.*

Comment 17: The applicant should provide detailed plans on the methods proposed to isolate and dewater the cove, with respect to access, timing, and plans to accommodate any aquatic wildlife encountered, for Department review, comment and approval.

Response: *The RAWP will contain detailed plans on the methods to isolate and dewater the Inner Cove, including required access, timing, and arrangements for accommodating any aquatic wildlife encountered. Textron will coordinate with the Department during the preparation of the draft RAWP.*

Response to RIDEM Comments on
Site Investigation Report, Former Gorham Manufacturing Facility, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland Parcel C
333 Adelaide Ave., Providence, RI
Dated: November 12, 2013

Table 1

Table 1
Summary of Analytical Results in Sediment - April 2014
Former Textron Facility
Providence, Rhode Island

parameter_name	Frequency of Detection	Range of Non Detects	Range of Detected Concentrations	Average of All Samples	SED-17-0002 4/15/2014	SED-17-0208 4/15/2014	SED-22-0002 4/15/2014	SED-22-0208 4/15/2014	SED-27-0208 4/15/2014	SED-49-0002 4/15/2014	SED-51-0002 4/15/2014	SED-61-0002 4/15/2014
Inorganics (mg/Kg)												
Antimony	0 / 5	2.3 : 11		2.97	2.3 U		3.6 U			11 U	9.8 U	3 U
Arsenic	5 / 5		1 - 130	38.4	1		10			38	130	13
Beryllium	1 / 5	0.23 : 1.1	1.1 - 1.1	0.419	0.23 U		0.36 U			1.1 U	1.1	0.3 U
Cadmium	2 / 5	0.47 : 0.72	3.1 - 5	1.8	0.47 U		0.72 U			3.1	5	0.61 U
Chromium	5 / 5		3.6 - 340	109.52	3.6		10			340	180	14
Copper	5 / 5		2.8 - 1600	564.76	2.8		11			1100	1600	110
Lead	4 / 5	2.3 : 2.3	4 - 810	291.03	2.3 U		4			500	810	140
Mercury	3 / 5	0.08 : 0.12	0.12 - 2.2	0.764	0.08 U		0.12 U			1.4	2.2	0.12
Nickel	5 / 5		6.4 - 340	109.38	6.4		9.5			94	340	97
Selenium	1 / 5	0.94 : 4.5	5.9 - 5.9	1.984	0.94 U		1.4 U			4.5 U	5.9	1.2 U
Silver	3 / 5	0.47 : 0.72	9.7 - 140	50.059	0.47 U		0.72 U			100	140	9.7
Thallium	0 / 5	0.94 : 4.5		1.194	0.94 U		1.4 U			4.5 U	3.9 U	1.2 U
Zinc	5 / 5		17 - 1400	519.2	19		17			990	1400	170
Percent Solid **(%)**	8 / 8		17 - 80.8	45.45	80.8	78.7	53.7	24.2	26	17	19.2	64
Total Organic Carbon (Rep1) **(%)**	4 / 5	0.01 : 0.01	1.88 - 25.2	11.297	0.01 U		1.88			15.6	13.8	25.2
Total Organic Carbon (Rep2) **(%)**	5 / 5		0.015 - 21.8	10.811	0.015		2.04			16.4	13.8	21.8
SPLP Metals (mg/L)												
Antimony	0 / 5	0.05 : 0.05		0.025	0.05 U		0.05 U			0.05 U	0.05 U	0.05 U
Arsenic	4 / 5	0.005 : 0.005	0.0101 - 0.0641	0.03156	0.005 U		0.0347			0.0101	0.0641	0.0464
Beryllium	0 / 5	0.005 : 0.005		0.0025	0.005 U		0.005 U			0.005 U	0.005 U	0.005 U
Cadmium	0 / 5	0.005 : 0.005		0.0025	0.005 U		0.005 U			0.005 U	0.005 U	0.005 U
Chromium	0 / 5	0.01 : 0.01		0.005	0.01 U		0.01 U			0.01 U	0.01 U	0.01 U
Copper	0 / 5	0.01 : 0.01		0.005	0.01 U		0.01 U			0.01 U	0.01 U	0.01 U
Lead	1 / 5	0.01 : 0.01	0.0122 - 0.0122	0.00644	0.01 U		0.01 U			0.01 U	0.01 U	0.0122
Mercury	0 / 5	0.001 : 0.001		0.0005	0.001 U		0.001 U			0.001 U	0.001 U	0.001 U
Nickel	2 / 5	0.025 : 0.025	0.0304 - 0.0569	0.02496	0.025 U		0.025 U			0.025 U	0.0569	0.0304
Selenium	0 / 5	0.01 : 0.01		0.005	0.01 U		0.01 U			0.01 U	0.01 U	0.01 U
Silver	0 / 5	0.007 : 0.007		0.0035	0.007 U		0.007 U			0.007 U	0.007 U	0.007 U
Thallium	0 / 5	0.02 : 0.02		0.01	0.02 U		0.02 U			0.02 U	0.02 U	0.02 U
Zinc	0 / 5	0.05 : 0.05		0.025	0.05 U		0.05 U			0.05 U	0.05 U	0.05 U

mg/L = milligram per liter
U = not detected, value is the reporting limits

Prepared by / Date: KJC 05/01/14
Checked by / Date: ARM 11/07/14

Response to RIDEM Comments on
Site Investigation Report, Former Gorham Manufacturing Facility, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland Parcel C
333 Adelaide Ave., Providence, RI
Dated: November 12, 2013

Figure 1

333 Adelaide Avenue Site
Providence, Rhode Island

amec

Figure 1
Phase II Pre-Design Sample Locations

Document: P:\old_Wakefield_Data\projects\TEXTRON\GORHAM\GIS\MapDocuments\SIR 2012\Cove_Investigation_11x17P.mxd PDF: P:\old_Wakefield_Data\projects\3652130034 - Textron Sediment Samp. Inner Cove\4.0 Project Deliverables\4.2 Work Plans\Figure 1 - Pre Design Phase II Samples.pdf 4/8/2014 9:20 AM brian.rod

Response to RIDEM Comments on
Site Investigation Report, Former Gorham Manufacturing Facility, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland Parcel C
333 Adelaide Ave., Providence, RI
Dated: November 12, 2013

Risk Assessment Update Memorandum

Memo

To:	**Joseph Martella, Rhode Island Department of Environmental Management**
From:	**Michael Murphy and David Heislein**
Date:	**December 17, 2014**
Subject:	**Risk Assessment – SIR Response to Comments Supporting Information Former Gorham Manufacturing Site, 333 Adelaide Avenue, Providence, Rhode Island**

Introduction

This memo contains supporting and supplemental information for the Response to Comments Letter and the Site Investigation Report Former Gorham Manufacturing Site Phase II Area – Northeast Upland, and Parcel C (SIR) (AMEC, 2014). The Response to Comments Letter responds to comments provided by Rhode Island Department of Environmental Management (RIDEM) dated October 17, 2014 and follows our meeting with RIDEM on November 13, 2014.

Outer Cove Updated Risk Calculations for Exposure to Sediment and Surface Water

As part of the November 12, 2013 *Site Investigation Report, Former Gorham Manufacturing Site, Phase II Area – Mashapaug Pond and Cove, Phase III Area – Northeast Upland and Parcel C, 333 Adelaide Avenue, Providence, Rhode Island* (SIR) (AMEC, 2013) an updated human health risk assessment for the Mashapaug Outer Cove was included in a streamlined manner. On October 17, 2014, RIDEM provided a comment letter concerning the 2013 SIR. In that comment letter, RIDEM requested a brief report that addresses the RIDEM comments on the 2013 risk assessment update and that provides additional documentation of the data used in the risk assessment, the exposure scenarios, and the incorporation of risk assessment procedures and toxicity values that have become available since the preparation of the 2006 risk assessment. This memorandum has been prepared in response to that request.

This memo provides documentation of the human health risk assessment for the Mashapaug Outer Cove sediments and surface water in a traditional Method 3-type risk assessment approach. As previously discussed in the SIR, the Mashapaug Inner Cove sediments will be removed and replaced with clean material. Therefore, with the Inner Cove sediments to be remediated, the risk assessment is focused on the Outer Cove. This risk assessment incorporates updates to scientifically acceptable risk assessment procedures (such as use of age-specific adjustment factors) and toxicity values that have been adopted by USEPA since 2006 (the date of the original Outer Cove risk assessment) as well as analytical data that have been collected since 2006). Based on this revised, conservative risk assessment, the human health risks for a site visitor to the Outer Cove meet the risk limits identified in the Remediation Regulations. With the planned remediation of the Inner Cove sediments, no further remediation of the Mashapaug Outer Cove sediments is necessary.

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BRIEF SUMMARY OF NATURE AND EXTENT OF CONTAMINATION AND THE CONCEPTUAL SITE MODEL

The nature and extent of contamination of the Mashapaug Inner Cove and Outer Cove sediments and surface water has been characterized:

- during the surface water and sediment investigations summarized in the 2006 *Supplemental Site Investigation Report*, *Former Gorham Manufacturing Site, 333 Adelaide Avenue, Providence, Rhode Island* (SSIR) [MACTEC, 2006] which included 2005 RIDEM sediment sampling and analysis and 2006 Textron sediment and surface water sampling and analysis,

- during the investigation documented in the April 2010 *Data Summary Report, Mashapaug Cove Groundwater Investigation* (MACTEC, 2010),

- and during the 2011 surface water and sediment investigations described in the 2013 SIR (AMEC, 2013).

As discussed with RIDEM and consistent with the Work Plan *Mashapaug Cove Supplemental Site Investigation, Former Gorham Manufacturing Facility, 333 Adelaide Avenue, Providence, Rhode Island* (AMEC, 2011) approved by RIDEM, the 2011 surface water and sediment investigations included collection of sediment and surface water samples and specific analytical suites to complete the delineation of nature and extent of contamination and to support risk assessment activities (primarily for the Outer Cove). The analytical suite for the 2011 samples was based in large part on the results of the earlier surface water and sediment samples as well as the results of the 2010 groundwater investigation adjacent to and beneath the Cove. If the extent of contamination for a particular analyte group (e.g. VOCs, PAHs, PCBs, dioxins and furans) was determined to be adequately delineated for a given medium, the 2011 Outer Cove samples for that medium were not analyzed for that analyte group. The December 2014 Response to Comments Letter addresses specific RIDEM comments concerning the spatial coverage and numbers of samples of surface water and/or sediment that have been analyzed for various analyte groups.

The available body of information indicates that historical Site impacts to sediment are substantially greater in the Inner Cove than in the Outer Cove and Site-related contaminants in sediment and surface water have been adequately delineated.

The 2010 groundwater investigation concluded that the downgradient extent of the VOC-impacted groundwater plume is located just north of the Inner Cove/Outer Cove boundary. Therefore, VOC impacts to Outer Cove sediments and surface water (shallow groundwater discharging through the sediments and into surface water) are expected to be minimal. In addition, a groundwater pump and treat system is currently operating on Parcel A and it was designed, in part, to interrupt the groundwater migration from the uplands portion of the Site to the Cove. Therefore, with no continuing discharge to the Cove in the near future, VOC concentrations in Cove surface water and sediment are expected to decline over time. Therefore, the available data overestimate future concentrations and potential exposures.

The VOC concentrations reported for surface water samples from the Inner Cove and Outer Cove have been in the low part per billion (ug/L) range. The surface water samples have been collected at the bottom of the water column, within one foot of the sediment/surface water

interface. Surface water samples collected from that close to the sediments (where VOC-impacted groundwater might be discharging and there would be minimal dilution of the groundwater) would represent very conservative estimates of potential exposure concentrations for people wading or swimming in the surface water. It would be expected that locations within the water column that are further away from the sediment/surface water interface would have VOC concentrations that are lower than those very close to the sediment/surface water interface.

A brief discussion of the Conceptual Site Model (CSM), including a discussion of the already completed, the on-going, and the planned remedial activities is useful for providing context for this updated risk assessment. The sources of contaminants and associated migration pathways with respect to the sediment and surface water of the Inner Cove and Outer Cove have been both historical and more recent.

Sources of contamination to surface water and sediment of Mashapaug Cove included reported direct discharge from facility piping (no longer taking place because the facility is no longer operating and the piping has been removed), surface runoff of impacted soil (metals, PAHs, dioxins and furans) from the upland area south of the Cove (also no longer taking place since the upland area south of the Cove has been capped and seeded and most of the remainder of the uplands area is covered by buildings and pavement), discharge of storm water from the on-site storm water settling basin (a more recent site feature) to the Inner Cove (metals and PAHs) and discharge of shallow groundwater impacted with chlorinated VOCs into and through the submerged sediments and into the surface water immediately above the sediments of the Inner Cove (the operating groundwater containment system is interrupting this migration pathway and it is expected that this migration pathway will be eliminated in the near future). Historically, it is probable that during storm events and due to storm water runoff into the Cove, there may have been disturbance and re-suspension of Inner Cove sediments (particulates) into the water column. This would result in transient suspended particulate matter containing metals, PAHs, and dioxins and furans in the surface water of the Inner Cove and possibly, by advective flow, of the Outer Cove. With the planned removal and replacement of sediments of the Inner Cove, there will be no future re-suspension of impacted sediments of the Inner Cove. Concentrations of metals, dioxins and furans, and PAHs in surface water are expected to decrease after the Inner Cove sediment remediation.

The completed, on-going, and planned remedial activities have reduced migration of Site-related contaminants to the Inner Cove and the Outer Cove surface water and sediment. It is expected that the continued operation of the groundwater containment system and the remediation of Inner Cove sediment will eliminate Site-related contaminant exposures in the Inner Cove and further reduce Site-related contaminant exposures for the Outer Cove. In that context, the data used in the risk assessment is conservative, and is likely to overestimate potential surface water and sediment exposures for the future.

RISK ASSESSMENT UPDATE

The following sections are included in this risk assessment update.

- Hazard Identification – identify the Chemicals of Potential Concern (COPCs) that are present in sediment and surface water, and compile the analytical data available for those compounds.

- Exposure Assessment – identify receptors and exposure points, identify exposure scenarios (route of exposure, frequency and duration of exposure), and identify exposure point concentrations for each receptor at each exposure point.

- Toxicity Assessment – identify for each compound evaluated, for direct contact (ingestion and dermal contact) with sediment and surface water, Reference Dose (RfD) and Cancer Slope Factor (CSF) values to be used in calculating hazard quotients (and hazard index values) and cancer risks.

- Risk characterization – calculate cumulative receptor non-cancer risk and cumulative receptor cancer risk for each receptor at each exposure point. Compare calculated risks to cumulative receptor risk limits (Cumulative cancer risk of 1×10^{-5} and Cumulative Non-cancer Hazard Index of 1) and compare cancer risk for each chemical to the single-chemical risk limit of 1×10^{-6}.

Hazard Identification

The sediment samples used in the risk assessment are identified in Table 1. The sediment samples selected for use in the risk assessment are from near-shore locations, representative of areas where sediment contact would be more likely. The samples selected were collected at locations with depth of water approximately 6 feet or less. In order to include as much of the available sediment data to characterize near-shore exposures, some sediment samples collected at locations with slightly more than 6 feet of water were selected for use in the risk assessment. Sediment sample locations in the deeper water of the interior of the Outer Cove were not selected, since the deeper water would minimize the likelihood of sediment contact. Locations of sediment sample used in the risk assessment are shown in Figure 1. Table 2 presents the sediment analytical data used in the risk assessment for sediment COPCs detected from the Outer Cove. COPCs were selected for sediment as part of the human health risk assessment completed in 2006 (Appendix H of the SIR).

Surface water samples used in the risk assessment are identified in Table 1. Locations of surface water samples used in the risk assessment are shown on Figure 1. In contrast to sediments, it is assumed that all of the surface water samples (not just the near-shore samples) would represent surface water that could be contacted, particularly during potential swimming activity. Table 3 presents the surface water analytical data used in the risk assessment for surface water COPCs detected in the Outer Cove. As shown in Table 3, only 3 Outer Cove surface water samples were analyzed for VOCs. The uncertainty analysis addresses this small number of samples and presents some worst-case scenarios to evaluate risks associated with VOCs in surface water. COPCs were selected for surface water as part of the human health risk assessment completed in 2006 (Appendix H of the SIR).

Exposure Assessment

The current and future site uses and exposure pathways were previously described in the 2006 HHRA (MACTEC, 2006). Previously the HHRA evaluated risks to a trespasser. However, in the future the fence surrounding the site will be removed, most of the soil in the area around the Inner and Outer Cove will have been capped and seeded, and the sediments of the Inner Cove will have been replaced. Therefore the future receptor evaluated in the risk assessment update is a site visitor. This update to the risk assessment assumes that a site visitor could potentially contact surface water and aquatic (submerged) sediment by incidental ingestion and dermal contact during wading and/or swimming. The exposure parameters for the site visitor remain

the same as the exposure parameters used for the future trespasser in the 2006 HHRA (AMEC, 2014).

It is assumed that a site visitor would include older children (ages 7 through 18) and adults (assumed ages 19 through 30). It is assumed that a site visitor may visit the Outer Cove for wading and swimming mid-May through mid-September. The exposure frequency for sediment and surface water assumes 51 days (3 times weekly for 17 weeks) of wading per year and swimming on 17 (once weekly) of those 51 days for adults/older children. The risk assessment does not evaluate children younger than 7 years of age. Given the physical environment including a steep slope down to the water, a wooded shoreline, lack of a beach and steep banks along much of the shoreline, young children are not expected to be wading or swimming in the Outer Cove. It should also be noted that the City of Providence maintains 5 public swimming pools and 11 water parks open during the summer. These would be a more attractive option for public swimming than the Outer Cove, further supporting the conservatism of the assumed exposure scenarios to the surface water and sediment. Tables 4 and 5 present the exposure parameters used for sediment and surface water for the site visitor.

The exposure frequency for wading (51 days per year) and swimming (17 days per year) are reasonable for this urban pond. As a point of reference, the Maine Department of Environmental Protection (DEP) has a default exposure frequency for wading of 78 days per year and swimming of 40 days per year (4 days per week for 10 weeks during the summer). The Maine DEP Park Visitor exposure scenario (Maine DEP, 2013) is a more intensive land use (an active recreational park scenario that likely includes a formal, supervised wading/swimming beach area) than the Outer Cove scenario. The Maine DEP exposure parameters are located at:
http://www.maine.gov/dep/ftp/RAGS-Background-Documents/Human%20Health%20Risk%20Assessment%20Manual/

Previously, in the risk assessment competed in 2006, two scenarios were evaluated, the Reasonable Maximum Exposure (RME) scenario and the Central Tendency (CT) scenario. The CT exposure is the typical or average exposure that would be expected in a population. The RME is the highest exposure that is reasonably expected to occur at a site. The more conservative (health-protective) RME scenario is included in this risk assessment update.

Consistent with USEPA guidance, a single concentration is selected as representative of the exposures for each COPC in a given medium for a given exposure point. This value, called the Exposure Point Concentration (EPC), is used in the estimates of health risks for the Outer Cove. The EPC has been identified as the lower of the 95% Upper Confidence Limit (UCL) on the mean and the maximum detected concentration. If there is an insufficient number of samples for calculation of the 95% UCL, the maximum detected concentration is used as the EPC. Table 6 presents the EPCs for COPCs in the Outer Cove sediments. Table 7 presents the EPCs for COPCs in Outer Cove surface water.

Toxicity Assessment

The purpose of the toxicity assessment is to characterize the relationship between the dose of COPCs received and the likelihood or risk of adverse health effects in the exposed population. Based on this quantitative dose-response relationship, toxicity values (e.g., slope factors, reference dose values, or reference concentrations) are derived that can be used to characterize the risk of adverse effects as a function of human exposure to an agent. These

toxicity values are used in the risk characterization process to estimate the cancer risk and non-cancer hazard at different exposure levels.

The dose-response relationship(s) for each chemical that has been selected as a COPC is presented in this section. The dose-response information may be divided into two major categories:

- Toxicity information associated with threshold (non-carcinogenic) health effects.
- Toxicity information concerning carcinogenicity, either from human epidemiologic data or from laboratory studies.

All the chemicals selected as COPCs are evaluated for potential non-carcinogenic health effects. In addition, any substance identified by USEPA as a known, probable, or possible human carcinogen is also evaluated for its potential carcinogenic effects. The classification of a chemical as a carcinogen does not preclude an evaluation of that same chemical for potential non-carcinogenic health risks, as all potentially carcinogenic chemicals may also exert non-carcinogenic health effects.

The following hierarchy of sources for dose-response values has been utilized in identifying dose-response values for this HHRA.

Tier 1- IRIS (http://www.epa.gov/iris/). In accordance with USEPA guidance, the main source of dose-response values is the USEPA Integrated Risk Information System (IRIS), which is a database established by USEPA containing all validated data on many toxic substances found at hazardous waste Sites. This database was used to identify the CSFs and RfDs applied in this risk assessment (USEPA, 2014).

Tier 2- National Center for Environmental Assessment's (NCEA's) provisional peer reviewed toxicity values (PPRTVs). NCEA's PPRTVs are developed by the Superfund Technical Support Center (STSC) for the EPA Superfund program. STSC's reassessment of HEAST toxicity values, as well as development of PPRTVs in response to Regional or Headquarters Superfund program requests, are consistent with Agency practices on toxicity value development, use the most recent scientific literature, and are supported by both internal and external peer review, providing a high level of confidence in the use of these values in the Superfund Program.

Tier 3 - Other toxicity values

- Cal EPA's toxicity values. Cal EPA develops toxicity values for both cancer and non-cancer effects. Cal EPA toxicity values are obtained on the Cal EPA website at http://www.oehha.ca.gov/risk/chemicalDB//index.asp.
- Toxicity values remaining in current versions of HEAST (1997a).

In this HHRA, most of dose-response values used are published in IRIS. For some COPCs, the required dose-response data are only available as NCEA provisional values or from CAL-EPA. These dose-response values were used in this HHRA in order to provide a more complete evaluation of potential risks. Tables 8 and 9 present the Cancer Slope Factors and Reference Doses used in the risk calculations.

USEPA has developed guidance for characterizing cancer susceptibility associated with early life exposures (e.g., young children) to potentially carcinogenic chemicals (USEPA, 2005). The approach developed by USEPA to characterize cancer risks for early life stages includes consideration of differences in physiology and exposure potential between children and adults, as well as differences in susceptibility to tumor development between children and adults. Physiological and behavioral differences are accounted for in the exposure assessment, whereby age-specific exposure parameters (e.g., body weights, ingestion rates, inhalation rates, contact frequencies) are applied to the various age groups evaluated in the risk assessment. Differences in susceptibility to tumor development are accounted for by considering the carcinogenic mode of action in accordance with the mode of action framework developed by USEPA (USEPA, 2005). CSFs for carcinogens that act with a mutagenic mode of action are assigned Age-Dependent Adjustment Factors (ADAFs) to account for early life stage susceptibility. A 10 fold adjustment is used for the first two years of life (ages 0-2). A 3 fold adjustment is used after two year through <16 years of ages. After 16 years of age no adjustment is made to the CSFs (USEPA, 2005).

This risk assessment update evaluates adolescents (ages 7-18) and adults (ages 19-30). The CSFs for the adolescent receptor have been multiplied by a factor of 2.5 to account for the mutagenic MOA. The value of 2.5 for the adolescent site visitor receptor represents a weighted average adjustment factor (9 years under age 16 and 3 years at age 16 and above):

$$\frac{(9\ years \times 3) + (3\ years \times 1)}{12\ years} = 2.5$$

As stated previously no CSF adjustment is necessary for the adult receptor.

Carcinogenic COPCs (for sediment and/or surface water) with a mutagenic mode of action identified by USEPA include: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, vinyl chloride and trichloroethene. Therefore, the CSFs for each of those COPCs (except vinyl chloride) have been adjusted for the 7 – 18 age group to account for the mutagenic mode of action. The time-weighted ADAF of 2.5 has been applied to the oral and dermal CSFs for the COPCs identified above for sediment and surface water exposures for the adolescent site visitor. The vinyl chloride CSF does not require adjustment, since the CSF incorporates the adjustment.

The oral CSF and RfD for arsenic (USEPA, IRIS) are based on exposure to arsenic in water. For most chemicals is it assumed that the bioavailability in the exposure medium used to derive the toxicity values is the same as the bioavailability in the exposure medium evaluated at the Site. However, USEPA has determined that arsenic in soil is less bioavailable than arsenic in drinking water. The Relative Bioavailability (RBA) for soil compared to drinking water is the ratio of bioavailability from soil and the bioavailability in drinking water. USEPA has compiled available estimates of the RBA of arsenic in soil. Based on the available data an upper percentile from the arsenic RBA dataset was determined to be 0.60 (USEPA, 2012). Therefore, this risk assessment will use a RBA of 60% for exposure to arsenic in sediment (analogous to soil) for both carcinogenic and non-carcinogenic endpoints.

Risk Characterization

Cancer risk and non-cancer hazard index was calculated for the site visitor (adolescent and adult separately) using the same standard EPA risk calculation equations that were used in the

original 2006 risk assessment. The receptor cancer risk was calculated as the sum of the cancer risks for the two age groups. The receptor hazard index for each age group have been considered separately (by convention, they are not additive). Risk calculations for sediment are presented in the spreadsheets in Attachments A (Tables A-1 and A-2) and B (Tables B-1 and B-2). Tables A-3, A-4, B-3, and B-4 present risks for surface water using Outer Cove surface water EPCs. Attachment A includes spreadsheets in a USEPA RAGS Part D Table 7 format and Attachment B includes risk calculation spreadsheets in the USEPA RAGS Part D Table 9 format. The risk summary for the RME scenario for the site visitor is presented in Table 10.

Calculated risks for each receptor are compared to the remedial objectives as outlined in the Remediation Regulations (RIDEM, 2011):

1. The excess lifetime cancer risk for each carcinogenic substance does not exceed 1 x 10^{-6} and the cumulative excess lifetime cancer risk (ELCR) posed by the site does not exceed 1 x 10^{-5};

2. The hazard index for each substance does not exceed a hazard index of 1 and the cumulative hazard index posed by the contaminated-site does not exceed 1 for any target organ.

The risk characterization results for the site visitor for the Outer Cove are summarized below:

- The cumulative HI (0.012) for the site visitor for exposures to surface water and sediment in the Outer Cove is below the target risk level.

- The individual chemical HI values for the site visitor for exposures to surface water and sediment in the Outer Cove are below the target risk level.

- The cumulative ELCR (4 x 10^{-6}) for the site visitor for exposures to surface water and sediment in the Outer Cover are below the target risk.

- The individual chemical cancer risk for all COPCs except benzo(a)pyrene (BaP) is below the individual chemical risk limit of 1 x 10^{-6}. For BaP in sediment (not detected in the three surface water samples tested for SVOCs), the calculated cancer risk (2 x 10^{-6}) in sediment is greater than the individual chemical risk limit of 1 x 10^{-6}. That estimated risk is based on one detection of BaP (0.862 mg/kg) in a sediment sample collected from sampling location SED/SW-12 (located just outside the northeast boundary of the Outer Cove). BaP was not detected in the other 3 sediment samples (SED/SW-10, SED/SW-13, and SED/SW-15) analyzed for BaP. The risk estimate is biased high as the result of using the single detection of BaP as the exposure point concentration. This typically applied, conservative approach does not incorporate the fact that there are three of four samples with no detected BaP. <u>This artifact of the data distribution and the conservative assumptions about frequency of exposure indicate that this cancer risk is overestimated and that the risk is below 1 x 10^{-6}.</u>

Uncertainty Analysis

Unlike some other assessments, risk assessments rely not just on measured or certain facts, but also on assumptions and estimates, and also policy decisions, in the face of limited or nonexistent data. Historically, many risk assessments have used highly conservative assumptions in the place of unavailable data, with the net result often being a substantial

overestimation of potential risks. It is important, however, to evaluate the assumptions and choices made in any risk assessment to evaluate their impact on the results and conclusions.

Benzo(a)pyrene

The calculated BaP individual cancer risk (using the maximum detected sediment concentration) of 2 x 10^{-6} exceeds the individual chemical risk limit of 1 x 10^{-6}. BaP was not detected in the only surface water sample analyzed for BaP from the Outer Cove area. Therefore the cancer risk of 2 x 10^{-6} is entirely from exposure to sediments. There were four sediment samples analyzed for BaP and BaP was detected in one of the four samples. The EPC for BaP in sediment is the maximum concentration (0.862 mg/kg) since a 95% UCL cannot be calculated with only one detection. The average concentration of BaP in sediment, using half the detection limit for non-detects, is 0.23 mg/kg. The use of the maximum concentration of BaP in sediment as the EPC results in an overestimation of the cancer risk. Using the average concentration as the EPC for BaP the individual cancer risk for a site visitor for exposure to sediment is 5 x 10^{-7}.

Volatile Organics in Surface Water

The surface water data set used in the risk assessment for the Outer Cove consists of 21 samples collected in 2006 and 2011. All surface water samples were analyzed for metals, however only three surface water samples were analyzed for volatile organic compounds (VOCs) (SW10, SW11, and SW21). To address RIDEM comments concerning the limited data set for VOCs three additional conservative risk calculations were completed for surface water using different EPCs for VOCs.

The following three data sets were used to determine EPC for VOCs:

- Maximum detected concentration for VOCs for all surface water samples collected in the Inner and Outer Cove. This includes sample data from locations closer to the groundwater source area for VOCs than the Outer Cove.

- Maximum detected concentration for VOCs collected from the temporary shallow (0-5 feet bgs) groundwater location DP-I (at the downgradient end of the groundwater VOC plume and located just north of the boundary between the Inner Cove and Outer Cove). The plume does not extend throughout the Outer Cove. Shallow groundwater at that location would be the impacted groundwater that could discharge directly to sediments and surface water. This is a worst case scenario for VOC concentrations in surface water of the Outer Cove for the shallow groundwater discharge (assuming the groundwater concentrations would be unchanged (not diluted) when the groundwater discharges to surface water).

- Maximum detected concentration for VOCs collected from the temporary groundwater location DP-I using all depths sampled. This approach is a worst-case scenario for discharge of VOC impacted groundwater to sediment and surface water at the downgradient end of the groundwater VOC plume and for the entire Outer Cove.

It should be noted that these conservative and worst case scenarios utilize data that were collected prior to operation of the groundwater containment system. That system will eliminate migration of VOC-impacted groundwater to the Mashapaug Cove. Therefore, these worst case scenarios represent groundwater and surface water conditions from the 2006 to 2011 time period. VOC concentrations have likely decreased since then (groundwater containment

system operating) and are expected to decrease further and the migration pathway to the Inner Cove will be eliminated.

The EPCs for the three different scenarios are presented in Table 12. The use of the maximum VOC concentrations detected in Inner and Outer Cove surface water represents a conservative estimate of the VOC concentrations a site visitor could be exposed to in the Outer Cove prior to installation of the groundwater containment system. Also the use of the shallow groundwater concentration at DP-I for the surface water EPC represents a conservative approach. This groundwater sampling point is located at the boundary of the Inner Cove and Outer Cove, and represents the boundary of VOC-impacted groundwater beneath Mashapaug Pond. This sample point also represents a conservative estimate of possible Outer Cove surface water VOC concentrations by not incorporating the biodegradation of the VOCs as they discharge up through the sediment and dilution with the Pond water once the groundwater is above the sediment/surface water interface.

Risk calculations were completed for a site visitor exposed to surface water using the three different EPCs for VOCs as listed above. The exposure scenario for the site visitor assumed the same exposure parameters used in the 2006 risk assessment. Risk calculations are documented in Tables A-5 through A-10 and B-5 through B-10. The risk summary for the different scenarios is presented in Table 10. For all three scenarios (and EPCs), the cumulative HI and cumulative cancer risk for the site visitor exposed to VOCs surface water are below the target risk limits. In addition the individual chemical HI and individual chemical cancer risk are below the risk limits for the three different EPC scenarios (Table 11).

Conclusions

In summary, the cumulative ELCR and HI values for the site visitor for the Mashapaug Outer Cove meet the Remediation Regulations risk limits. There are no individual HIs greater than the Remediation Regulations risk limit. One chemical (benzo(a)pyrene) has a calculated individual cancer risk greater that the Remediation Regulations risk limit for individual chemicals (1×10^{-6}). However, the risk calculation for BaP is biased high by a single detection in one sediment sample and the exposure frequency is very conservative. The cancer risk for BaP is overestimated, and the risk associated with the average concentration within the Outer Cove (a better representation of potential exposure) is below the individual chemical risk limit.

Based on this conservative risk assessment, the human health risks for a site visitor to the Mashapaug Outer Cove meet the risk limits identified in the Remediation Regulations. With the planned remediation of the Inner Cove sediments, no further remediation of the Outer Cove should be necessary.

References

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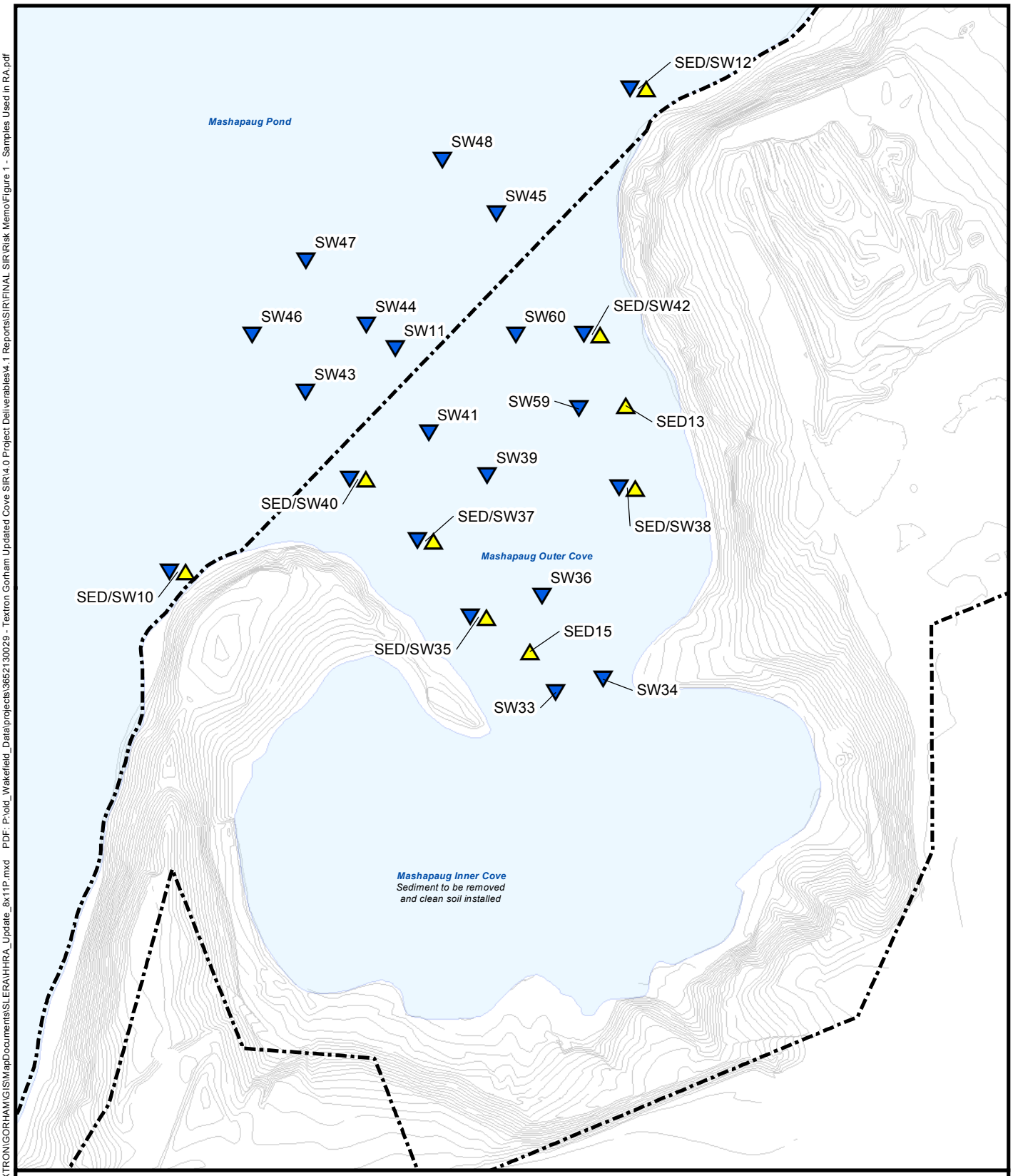
FIGURES



Legend

- Sediment Sample Location Used in Risk Update
- Surface Water Sample Location Used in Risk Update
- Sediemnt and Surface Sample Location Used in Risk Update
- Approximate Site Boundary
- Approximate Pond
- Elevation Contour

N

0 60 120 Feet

Prepared by BJR | Checked by MJM

Figure 1
Sample Locations Used for the Risk Update

333 Adelaide Avenue
Providence, Rhode Island

AMEC Environment & Infrastructure, Inc.
271 Mill Road
Chelmsford, MA 01824

LIST OF FIGURES ASSOCIATED WITH RISK ASSESSMENT COMMENTS

Figure 4.13 Concentrations of Total VOCs in Surface Water

Figure 3.8 Groundwater, Surface Water, and Sediment Sampling Locations

Figure 4.17 Concentrations of cis-1,2-Dichloroethene in Surficial Cove Sediment

Figure 4.18 Concentrations of Trichloroethene in Surficial Cove Sediment

Figure 4.19 Concentrations of Tetrachloroethene in Surficial Cove Sediment

Figure 4.20 Concentrations of Vinyl Chloride in Surficial Cove Sediment

Figure 4.31 Concentrations of Dioxin TEQ in Surficial Cove Sediment

Figure 4.32 Distribution of Dioxins and Furans in Impacted Sediment Sample SED1901

Figure 4.33 Distribution of Dioxins and Furans in Impacted Sediment Sample SED1101

Figure 4.34 Distribution of Dioxins and Furans in Impacted Sediment Sample SED1201

Figure 4.21 Concentrations of Benzo(a)pyrene in Surficial Cove Sediment

Figure 4.22 Concentrations of Benzo(a)anthracene in Surficial Cove Sediment

Figure 4.23 Concentrations of Benzo(b)fluoranthene in Surficial Cove Sediment

Mashapaug Pond

SW12, 1.5

SW11, 13.1

SW10, 2.2

SW17, 18.7

SW16, 19.7

SW20, 4.2

SW27, 22.1

SW21, 10.6

SW18, 11.3

SW19, 18.2

Mashapaug Cove

SW26, 5.5

SW22, 9.2

SW24, 13.3

SW25, 13.5

SW23, 10

Former Slag Pile
(approximate)

Legend

SED10, 2.2 - Location, Total VOCs (ug/L)

Surface Water Location

Elevation

Approximate Site Boundary

N

0 35 70

Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI

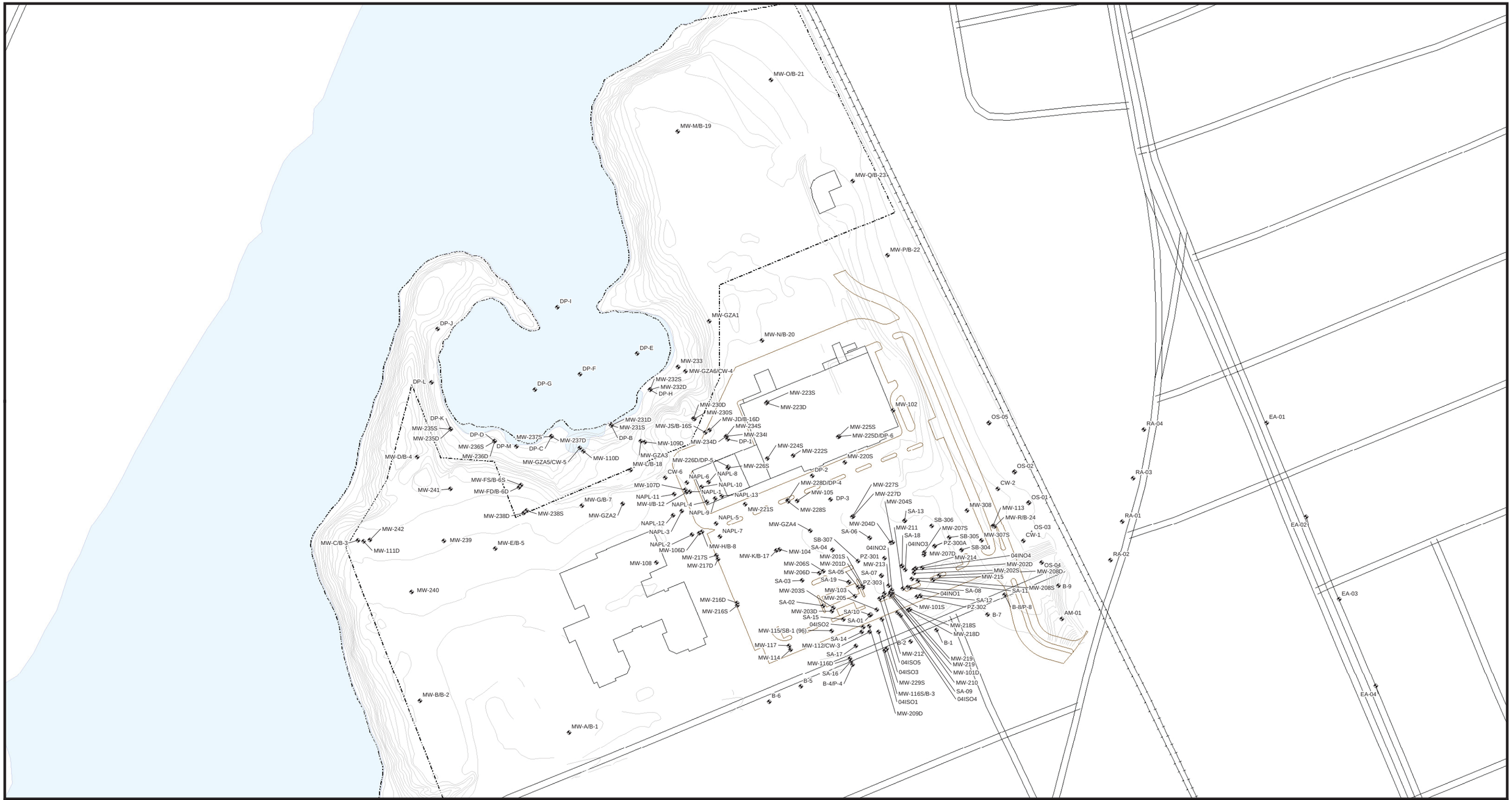
MACTEC

Concentrations of Total VOCs
in Surface Water

Project 3650-05-0041

Figure 4.13

Document: P:\W2-mfg\TEXTRON\GORHAM\GIS\MapDocuments\RiskAssessmentCove2006.mxd PDF: P:\W2-mfg\TEXTRON\GORHAM\GIS\Figures\Supplemental SI\SW_Total_VOCs.pdf 07/27/2006 1:33 PM bjroden



Legend

- Groundwater Sample Location
- Elevation Contour
- Railroad
- Pavement
- Park Parcel Boundary

0 50 100 Feet

N

Prepared by BJR | Checked by DEH

Figure 3.8
Groundwater Sample Locations

333 Adelaide Avenue
Providence, Rhode Island

AMEC Environment & Infrastructure
107 Audubon Road, Suite 301
Wakefield, MA 01880

MXD: P:\TEXTRON\GORHAM\GIS\MapDocuments\TextronGorham_DSize.mxd PDF: P:\3650050041 - Textron Gorham\3.0 Field and Site Characterization\3.8 GIS\Cove Groundwater Sediment Jan 2010\Site Plan.pdf

Mashapaug Pond

SED12 ND

SED11 ND

SED13 ND

SED14 ND

SED10 ND

SED15 296

SD-1005 16

SED17 29.8

SED16 ND

SED27 103000

SED20 ND

SD-1003 420

SD-1002 ND

SED21 ND

SED18 ND

SD-1004 ND

SED19 175000

Mashapaug Cove

SED26 ND

SED28 ND

SD-1001 ND

SED22 ND

SED24 ND

SED25 11500

SED29 ND

SED32 ND

SED23 9.1

SED30 ND

SED31 10600

Former Slag Pile (approximate)

Legend

- Size of symbol is dependent on the order of magnitude of chemical concentration
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11 87.5 Location and chemical concentration (ug/kg), ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/29/06
Checked/Date: MJM 07/30/06

Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI

MACTEC

Concentrations of cis-1,2-Dichloroethene in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.17

Document: P:\W2-mfg\TEXTRON\GORHAM\GIS\MapDocuments\RiskAssessmentCove2006.mxd PDF: P:\W2-mfg\TEXTRON\GORHAM\GIS\Figures\Supplemental SI\SedimentProportionalSymbols\Sediment_cis12DCE_Fig 4.17.pdf 07/29/2006 11:36 AM bjroden

Mashapaug Pond

SED12
ND

SED11
ND

SED13
ND

SED14
ND

SED10
ND

SED15
1470

SD-1005
210

SED17
1220

SED16
ND

SED27
15100

SED20
ND

SD-1003
ND

SD-1002
ND

SED21
ND

SED18
ND

SD-1004
5600

SED19
58400

Mashapaug Cove

SED28
ND

SED26
ND

SED22
ND

SED24
ND

SED25
276

SD-1001
ND

SED29
ND

SED31
797

SED32
ND

SED23
176

SED30
ND

Former Slag Pile (approximate)

Legend

- Size of symbol is proportional to concentration of chemical
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11
87.5
Location and chemical concentration (ug/kg), ND indicates chemical was not detected.

N

0 35 70
Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

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Concentrations of Trichloroethene in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.18

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Mashapaug Pond

SED12 ND

SED11 ND

SED13 ND

SED14 ND

SED10 ND

SED15 16.1

SD-1005 ND

SED17 8.1

SED16 ND

SED27 ND

SED20 ND

SD-1003 ND

SD-1002 ND

SD-1004 ND

SED21 ND

SED18 ND

SED19 18100

Mashapaug Cove

SED28 ND

SED26 ND

SED24 ND

SED25 ND

SD-1001 ND

SED22 ND

SED29 ND

SED31 ND

SED32 ND

SED23 1040

SED30 ND

Former Slag Pile (approximate)

Legend

- Size of symbol is dependent on the order of magnitude of chemical concentration
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11 87.5 Location and chemical concentration (ug/kg), ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/29/06
Checked/Date: MJM 07/30/06

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Concentrations of Tetrachloroethene
in Surficial Cove Sediment (0-1 or 0-2 ft)
Project 3650-05-0041 Figure 4.19

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Mashapaug Pond

SED12 ND

SED11 ND

SED13 ND

SED14 ND

SED10 ND

SED15 ND

SD-1005 ND

SED17 ND

SED20 ND

SED16 ND

SED27 5420

SD-1003 5000

SD-1002 ND

SED21 ND

SED18 ND

SD-1004 ND

SED19 148

Mashapaug Cove

SED26 ND

SED25 24800

SED28 49.9

SED29 ND

SD-1001 ND

SED22 ND

SED24 21.8

SED32 ND

SED31 11700

SED23 ND

SED30 ND

Former Slag Pile (approximate)

Legend

- Size of symbol is proportional to concentration of chemical
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11 87.5 — Location and chemical concentration (ug/kg), ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

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Concentrations of Vinyl Chloride in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.20

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Mashapaug Pond

SED12
11

SED11
265

SED13
1

SED14
94

SED10
0.9

SED15
1

SD-1005
24

SED17
115

SED16
1663

SED20
163

SED27
559

SD-1003
198

SD-1002
56

SD-1004
203

SED21
26

SED18
3622

SED19
2058

Mashapaug Cove

SED28
1835

SED26
3

SED25
1328

SD-1001
51

SED22
731

SED24
57

SED29
241

SED32
24

SED23
0.9

SED30
53

SED31
1227

Former Slag Pile (approximate)

Legend

- Size of symbol is dependent on the order of magnitude of chemical concentration
- Elevation
- Approximate Site Boundary

SED11
87.5
Location and chemical concentration (ppt), ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

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Concentrations of Dioxin TEQ in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.31

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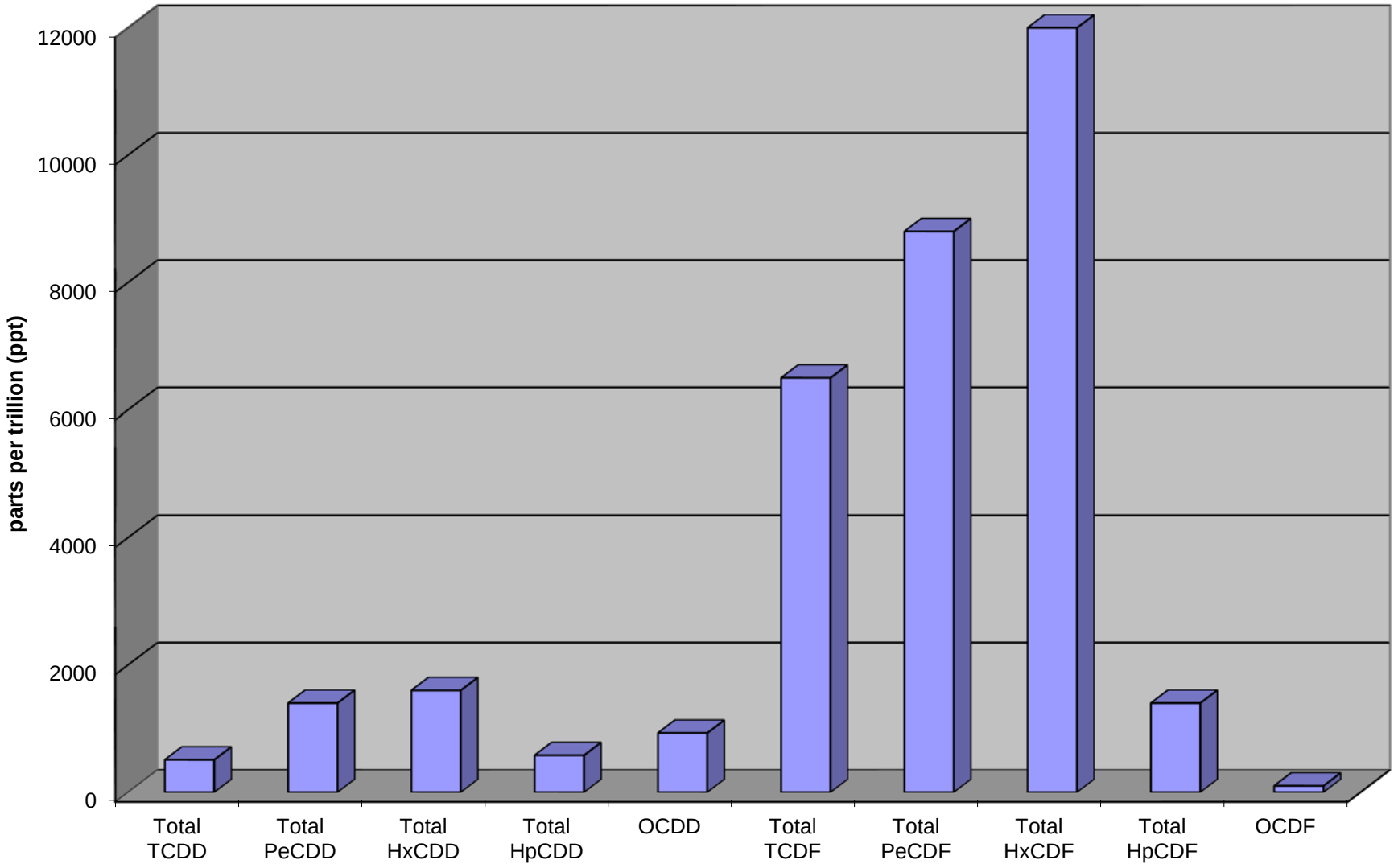
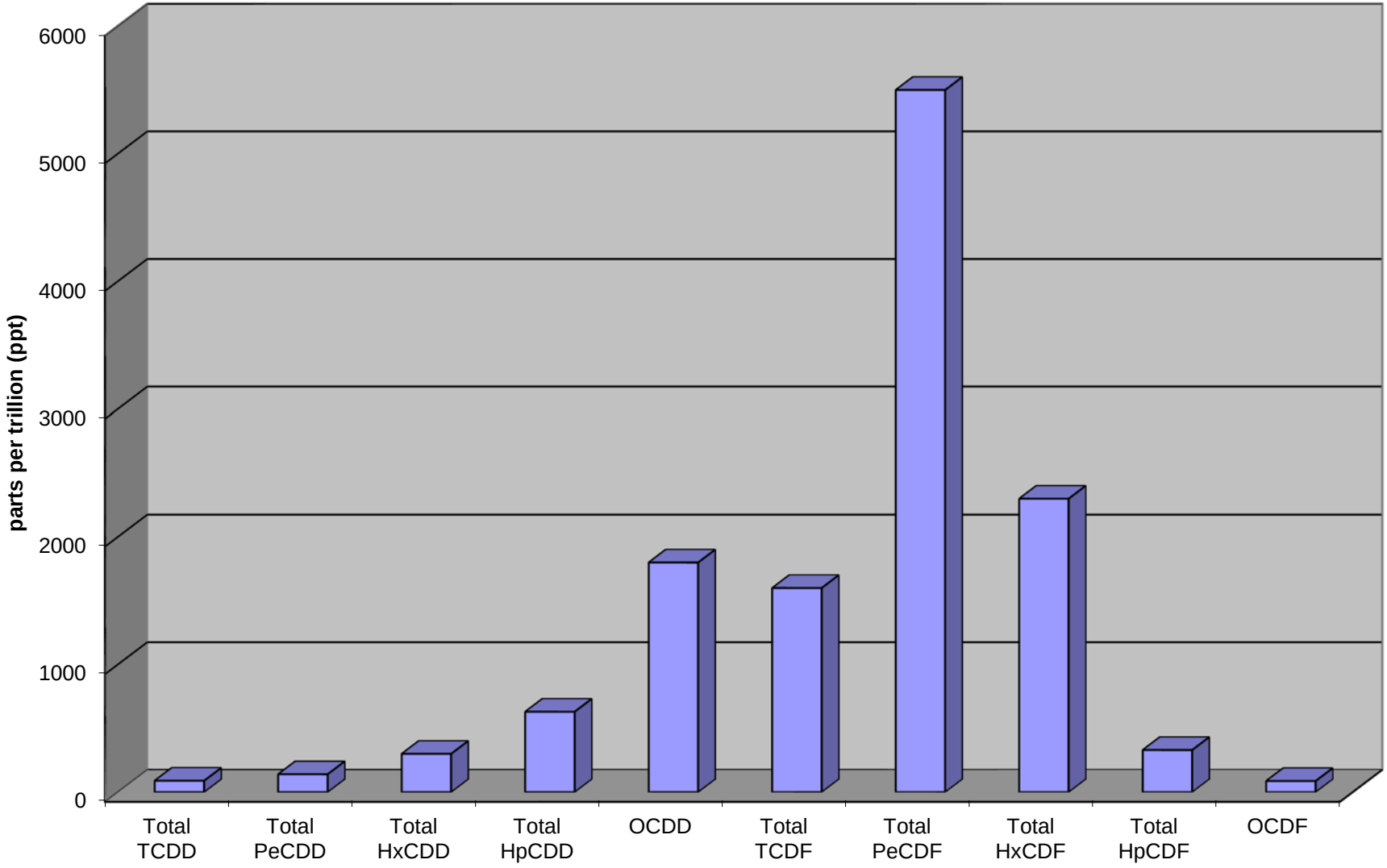
Figure 4.32
Distribution of Dioxins and Furans in Impacted Sediment Sample SED1901
Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI



P:\old_Wakefield_Data\projects\TEXTRON\GORHAM\SupplementSI 2006\
DIOXsignatureSED.xls, SED1901

7/27/2006

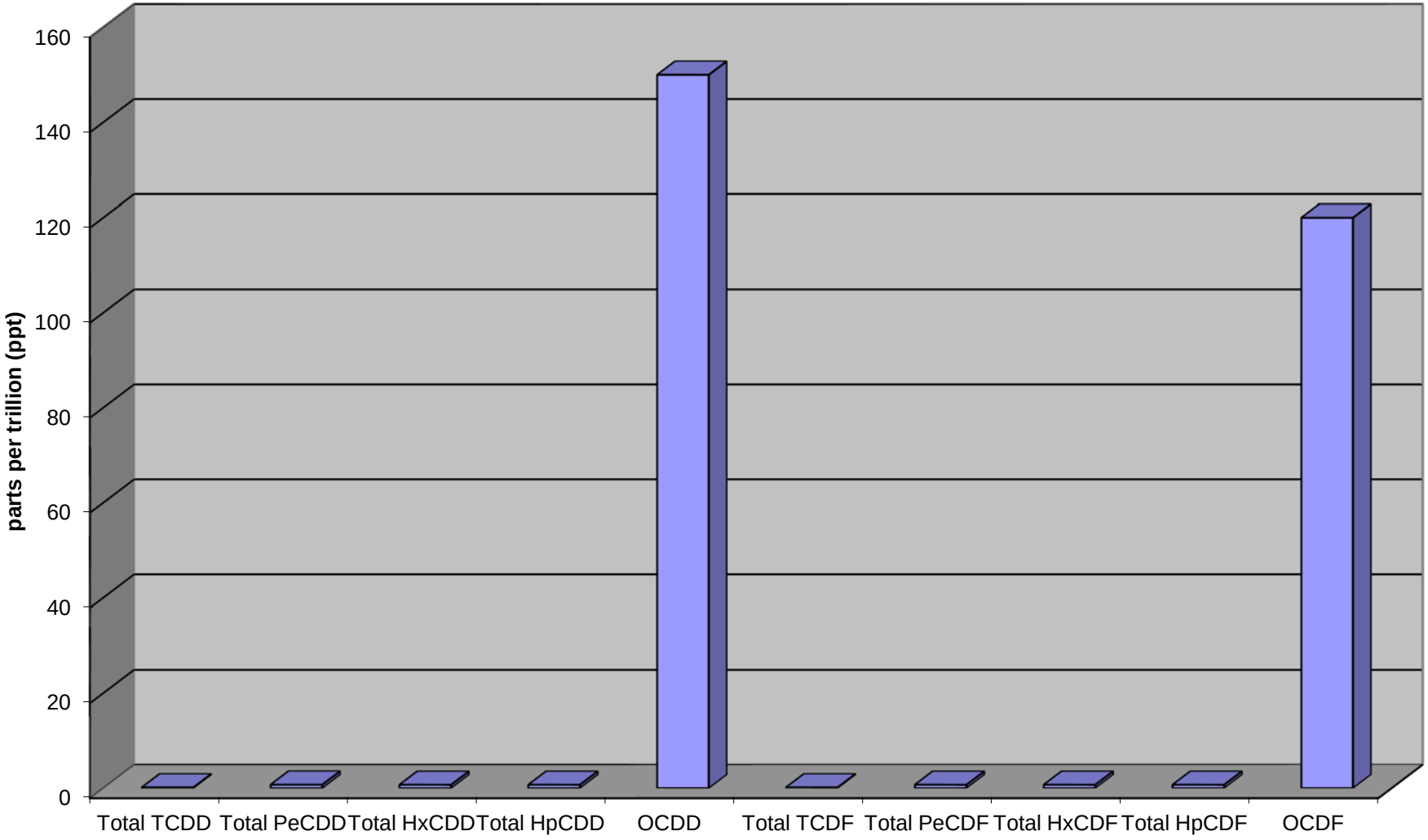
Figure 4.33
Distribution of Dioxins and Furans in Impacted Sediment Sample SED1101
Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI



P:\old_Wakefield_Data\projects\TEXTRON\GORHAM\SupplementSI 2006\
DIOXsignatureSED.xls, SED1101

7/27/2006

Figure 4.34
Distribution of Dioxins and Furans in Unimpacted Sediment Sampl SED1201
Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI



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DIOXsignatureSED.xls, SED1201

7/27/2006

Mashapaug Pond

SED12
0.862

SED11
ND

SED13
ND

SED14
ND

SED10
ND

SED15
ND

SD-1005
0.12

SED17
ND

SED20
7.87

SED16
ND

SED27
ND

SD-1003
0.24

SD-1002
0.59

SED21
ND

SED18
ND

SD-1004
0.15

SED19
0.151

Mashapaug Cove

SED28
0.993

SED26
0.273

SED22
0.102

SED24
0.0707

SED25
0.483

SD-1001
1.8

SED29
0.543

SED31
0.503

SED32
0.497

SED23
ND

SED30
0.239

Former Slag Pile (approximate)

Legend

- Size of symbol is proportional to concentration of chemical
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11 87.5 Location and chemical concentration (mg/kg), ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI

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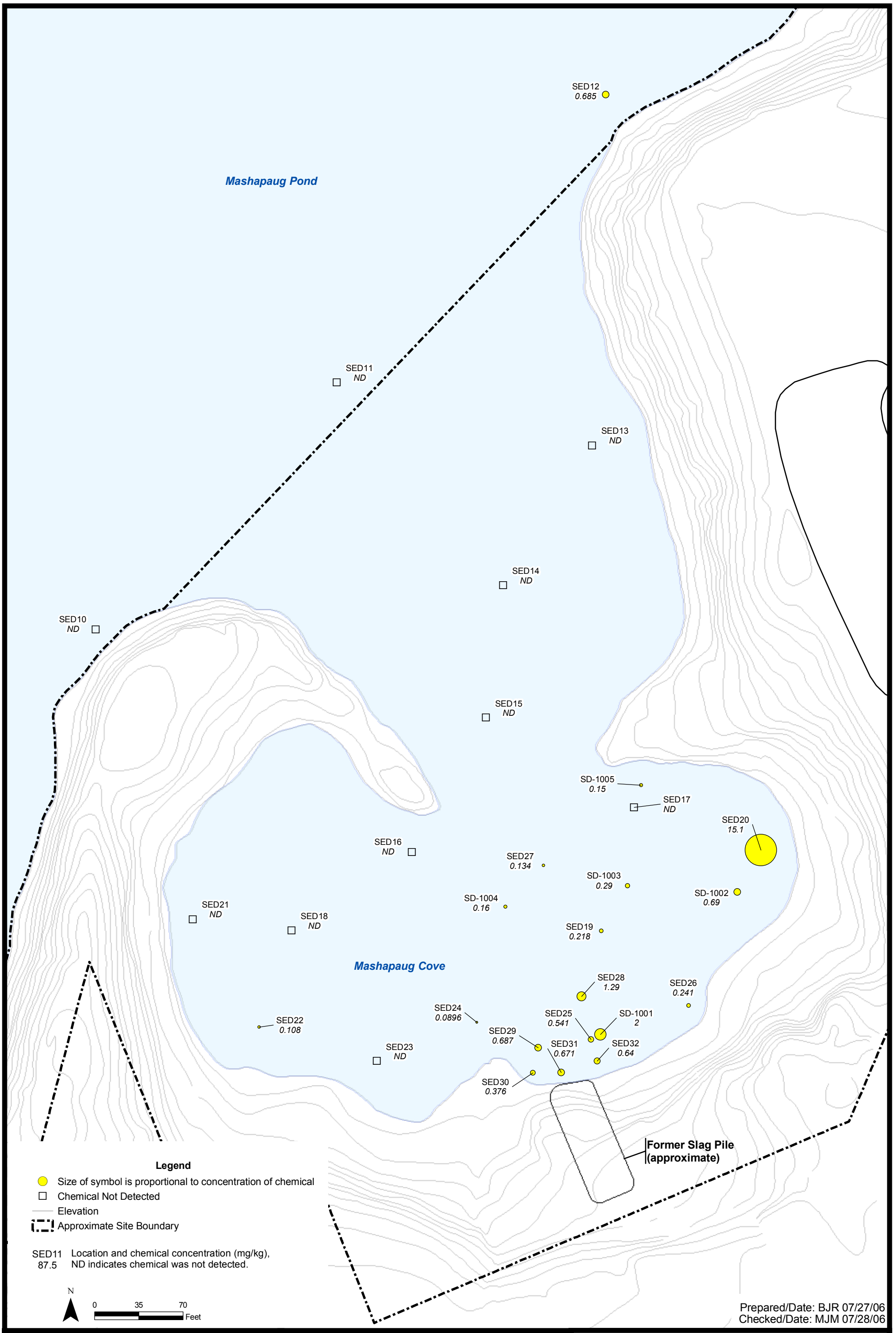
Concentrations of Benzo(a)pyrene in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.21

Document: P:\W2-mfg\TEXTRON\GORHAM\GIS\MapDocuments\RiskAssessmentCove2006.mxd PDF: P:\W2-mfg\TEXTRON\GORHAM\GIS\Figures\Supplemental SI\SedimentProportionalSymbols\Sediment_BaP_Fig 4.21.pdf 07/27/2006 4:41 PM bjroden



Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

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Concentrations of Benzo(a)anthracene in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.22

Document: P:\W2-mfg\TEXTRON\GORHAM\GIS\MapDocuments\RiskAssessmentCove2006.mxd PDF: P:\W2-mfg\TEXTRON\GORHAM\GIS\Figures\Supplemental SI\SedimentProportionalSymbols\Sediment_BaA_Fig 4.22.pdf 07/27/2006 4:43 PM bjroden

Mashapaug Pond

SED12
1.41

SED11
0.245

SED13
0.0378

SED14
ND

SED10
ND

SED15
ND

SD-1005
0.17

SED17
ND

SED20
14.8

SED16
0.201

SED27
0.285

SD-1003
0.34

SD-1004
0.25

SD-1002
0.86

SED21
ND

SED18
ND

SED19
0.32

Mashapaug Cove

SED28
1.49

SED26
0.256

SED25
0.516

SD-1001
2.9

SED22
0.114

SED24
0.0732

SED29
0.882

SED31
1.18

SED32
0.892

SED23
ND

SED30
0.433

Former Slag Pile (approximate)

Legend

- Size of symbol is proportional to concentration of chemical
- Chemical Not Detected
- Elevation
- Approximate Site Boundary

SED11 Location and chemical concentration (mg/kg),
87.5 ND indicates chemical was not detected.

N

0 35 70 Feet

Prepared/Date: BJR 07/27/06
Checked/Date: MJM 07/28/06

Supplemental Site Investigation Report
333 Adelaide Avenue
Providence, RI

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Concentrations of Benzo(b)fluoranthene in Surficial Cove Sediment (0-1 or 0-2 ft)

Project 3650-05-0041 Figure 4.23

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TABLES

Table 1
Samples Used in the Risk Assessment
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Media	Exposure Area	Location	Sample ID	Date	Depth (ft.)
Sediment	Outer Cove	SED/SW10	SED1001	6/22/2006	0 - 5.1
		SED/SW12	SED1201	6/22/2006	0 - 5.1
		SED/SW35	SED-35-01	12/16/2011	0 - 1
		SED/SW37	SED-37-01	12/15/2011	0 - 1
		SED/SW38	SED-38-01	12/13/2011	0 - 1
		SED/SW40	SED-40-01	12/16/2011	0 - 1
		SED/SW42	SED-42-01	12/14/2011	0 - 1
		SED13	SED1301	6/22/2006	0 - 0.5
		SED15	SED1501	6/22/2006	0 - 1
Surface Water	Outer Cove	SW10	SW10	6/21/2006	
		SW11	SW11	6/21/2006	
		SW12	SW12	6/21/2006	
		SW-33	SW-33	12/19/2011	
		SW-34	SW-34	12/20/2011	
		SW-35	SW-35	12/16/2011	
		SW-36	SW-36	12/14/2011	
		SW-37	SW-37	12/15/2011	
		SW-38	SW-38	12/13/2011	
		SW-39	SW-39	12/14/2011	
		SW-40	SW-40	12/16/2011	
		SW-41	SW-41	12/15/2011	
		SW-42	SW-42	12/13/2011	
		SW-43	SW-43	12/19/2011	
		SW-44	SW-44	12/15/2011	
		SW-45	SW-45	12/14/2011	
		SW-46	SW-46	12/20/2011	
		SW-47	SW-47	12/16/2011	
		SW-48	SW-48	12/14/2011	
		SW-59	SW-59	12/20/2011	
		SW-60	SW-60	12/20/2011	
Surface Water	Inner and Outer Cove VOCs	SW10	SW10	6/21/2006	
		SW11	SW11	6/21/2006	
		SW12	SW12	6/21/2006	
		SW16	SW16	6/21/2006	
		SW17	SW17	6/21/2006	
		SW18	SW18	6/21/2006	
		SW19	SW19	6/21/2006	
		SW20	SW20	6/21/2006	
		SW21	SW21	6/21/2006	
		SW22	SW22	6/21/2006	
		SW23	SW23	6/21/2006	
		SW24	SW24	6/21/2006	
		SW25	SW25	6/22/2006	
		SW26	SW26	6/21/2006	
		SW27	SW27	6/22/2006	
Ground Water	DP-I Shallow	DP-I	DP-I-0-5	12/18/2008	0-5
	DP-I Max	DP-I	DP-I-0-5	12/18/2008	0-5
		DP-I	DP-I-5-10	12/18/2008	5-10
		DP-I	DP-I-10-15	12/18/2008	10-15
		DP-I	DP-I-15-20	12/18/2008	15-20
		DP-I	DP-I-20-25	12/18/2008	20-25
		DP-I	DP-I-25-30	12/18/2008	25-30
		DP-I	DP-I-30-35	12/18/2008	30-35
		DP-I	DP-I-35-40	12/18/2008	35-40
		DP-I	DP-I-40-45	12/18/2008	40-45
		DP-I	DP-I-45-50	12/18/2008	45-50

Prepared by: LCG 12/4/2014
Checked by: BJR 12/5/2014

Table 2
Summary of Detected Parameters in Outer Cove Sediment
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples [1]	SED/SW10 SED1001 6/22/2006 0.5-1 ft	SED/SW12 SED1201 6/22/2006 0.5-1 ft	SED/SW35 SED-35-01 12/16/2011 0-1 ft	SED/SW37 SED-37-01 12/15/2011 0-1 ft	SED/SW38 SED-38-01 12/13/2011 0-1 ft	SED/SW40 SED-40-01 12/16/2011 0-1 ft	SED/SW42 SED-42-01 12/14/2011 0-1 ft	SED13 SED1301 6/22/2006 0-0.5 ft	SED15 SED1501 6/22/2006 0-1 ft
Volatile Organics (mg/kg)													
1,1,1-Trichloroethane	1 / 4	0.004 : 0.006	0.863 - 0.863	0.22	0.004 U	0.006 U						0.0045 U	0.863
1,1-Dichloroethane	1 / 4	0.004 : 0.006	0.0518 - 0.0518	0.015	0.004 U	0.006 U						0.0045 U	0.0518
1,1-Dichloroethene	1 / 4	0.004 : 0.006	0.0467 - 0.0467	0.013	0.004 U	0.006 U						0.0045 U	0.0467
Acetone	2 / 4	0.0403 : 0.0461	0.0757 - 0.105	0.056	0.0403 U	0.0757						0.105	0.0461 U
Carbon disulfide	2 / 4	0.004 : 0.006	0.0046 - 0.021	0.0077	0.004 U	0.006 U						0.0046	0.021
cis-1,2-Dichloroethene	1 / 4	0.004 : 0.006	0.296 - 0.296	0.076	0.004 U	0.006 U						0.0045 U	0.296
Tetrachloroethene	1 / 4	0.004 : 0.006	0.0161 - 0.0161	0.0058	0.004 U	0.006 U						0.0045 U	0.0161
trans-1,2-Dichloroethene	1 / 4	0.004 : 0.006	0.0053 - 0.0053	0.0031	0.004 U	0.006 U						0.0045 U	0.0053
Trichloroethene	1 / 4	0.004 : 0.006	1.47 - 1.47	0.37	0.004 U	0.006 U						0.0045 U	1.47
Semivolatile Organics (mg/kg)													
Acenaphthene	1 / 4	0.0305 : 0.0321	0.0564 - 0.0564	0.026	0.0305 U	0.0564						0.0321 U	0.0315 U
Anthracene	1 / 4	0.0305 : 0.0321	0.276 - 0.276	0.081	0.0305 U	0.276						0.0321 U	0.0315 U
Benzo(a)anthracene	1 / 4	0.0305 : 0.0321	0.685 - 0.685	0.18	0.0305 U	0.685						0.0321 U	0.0315 U
Benzo(a)pyrene	1 / 4	0.0305 : 0.0321	0.862 - 0.862	0.23	0.0305 U	0.862						0.0321 U	0.0315 U
Benzo(b)fluoranthene	2 / 4	0.0305 : 0.0315	0.0378 - 1.41	0.37	0.0305 U	1.41						0.0378	0.0315 U
Benzo(g,h,i)perylene	1 / 4	0.0305 : 0.0321	0.244 - 0.244	0.073	0.0305 U	0.244						0.0321 U	0.0315 U
Benzo(k)fluoranthene	1 / 4	0.0305 : 0.0321	0.636 - 0.636	0.17	0.0305 U	0.636						0.0321 U	0.0315 U
Chrysene	1 / 4	0.0305 : 0.0321	0.625 - 0.625	0.17	0.0305 U	0.625						0.0321 U	0.0315 U
Dibenzo(a,h)anthracene	1 / 4	0.0305 : 0.0321	0.0807 - 0.0807	0.032	0.0305 U	0.0807						0.0321 U	0.0315 U
Fluoranthene	2 / 4	0.0305 : 0.0315	0.0833 - 1.92	0.51	0.0305 U	1.92						0.0833	0.0315 U
Fluorene	1 / 4	0.0305 : 0.0321	0.107 - 0.107	0.039	0.0305 U	0.107						0.0321 U	0.0315 U
Indeno(1,2,3-cd)pyrene	1 / 4	0.0305 : 0.0321	0.259 - 0.259	0.077	0.0305 U	0.259						0.0321 U	0.0315 U
Phenanthrene	2 / 4	0.0305 : 0.0315	0.0333 - 1.14	0.30	0.0305 U	1.14						0.0333	0.0315 U
Pyrene	2 / 4	0.0305 : 0.0315	0.0513 - 1.01	0.27	0.0305 U	1.01						0.0513	0.0315 U
Pesticides (mg/kg)													
4,4'-DDD	1 / 4	0.0056 : 0.00631	0.0214 - 0.0214	0.0076	0.0056 U	0.0214						0.00631 U	0.00594 U
Dioxins/Furans (mg/kg)													
Dioxin TEQ (USEPA, 2010)	4 / 9	0.0000057 : 0.0000057	0.00000086 - 0.0000010	0.0000020	0.00000086	0.000001	0.0000057 U	0.0000057 U	0.0000057 U	0.0000057 U	0.0000057 U	0.000001	0.00000091
Inorganics (mg/kg)													
Arsenic	6 / 9	0.3 : 3	4.1 - 18.5	6.6	0.3 U	3 U	18.5	4.6	4.1	5.6	2 U	11.5	12.6
Barium	4 / 4		9.7 - 33.1	16.1	10.2	33.1						11.5	9.7
Beryllium	5 / 9	0.07 : 0.08	0.1 - 0.31	0.12	0.07 U	0.31	0.18	0.13	0.1	0.17	0.08 U	0.07 U	0.07 U
Chromium	9 / 9		1.8 - 7.6	4.2	3	7	7.6	3.5	3.7	3.2	1.8	4.7	2.9
Copper	8 / 9	2 : 2	3.1 - 12.5	5.4	4.1	12.5	5.9	3.1	6.6	4.6	2 U	5.3	5.8
Lead	3 / 9	3.9 : 6.7	6.6 - 20.7	5.8	6.5 U	20.7	8.1	3.9 U	6.6	5.4 U	4 U	6.7 U	6.6 U
Nickel	8 / 9	5.9 : 5.9	2.1 - 22.5	6.7	3.6	5.9 U	8.5	3.3	7	3.2	2.1	22.5	6.8
Zinc	9 / 9		10.5 - 41.4	23	28.1	34.7	17.4	10.5	37.8	13.1	10.7	41.4	12.6

1 - Average calculated using half the reporting limit for non detects
U - Not detected, value is reporting limit
mg/kg - milligrams per kilogram

Prepared by: LCG 12/4/14
Checked by: BJR 12/7/14

Table 3
Summary of Detected Parameters in Surface Water - Outer Cove
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Parameter	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples (1)	SW10 6/21/2006	SW11 6/21/2006	SW12 6/21/2006	SW-33 12/19/2011
Volatile Organics (mg/L)														
cis-1,2-Dichloroethene	3	/	3				0.0015	-	0.0108	0.0048	0.0022	0.0108	0.0015	
Trichloroethene	1	/	3	0.001	:	0.001	0.0023	-	0.0023	0.0011	0.001 U	0.0023	0.001 U	
Pesticides (mg/L)														
4,4'-DDT	1	/	1				0.00008	-	0.00008	0.000080		0.00008		
Dioxin (mg/L)														
Dioxin Toxicity Equivalent (USEPA, 2010)	1	/	1				0.000000012	-	0.000000012	0.000000012		0.000000012		
Metals, Total (mg/L)														
Copper	2	/	21	0.01	:	0.02	0.02	-	0.15	0.013	0.02 U	0.02 U	0.02 U	0.01 U
Zinc	11	/	21	0.025	:	0.05	0.026	-	0.059	0.025	0.05 U	0.05 U	0.05 U	0.029
Metals, Dissolved (mg/L)														
Zinc	9	/	21	0.025	:	0.05	0.025	-	0.032	0.021	0.05 U	0.05 U	0.05 U	0.025 U

1 - Average calculated using half the reporting limit for non detects.
U - Not detected, value is reporting limit

mg/L - milligrams per liter

Table 3
Summary of Detected Parameters in Surface Water - Outer Cove
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Parameter	SW-34 12/20/2011	SW-35 12/16/2011	SW-36 12/14/2011	SW-37 12/15/2011	SW-38 12/13/2011	SW-39 12/14/2011	SW-40 12/16/2011	SW-41 12/15/2011	SW-42 12/13/2011	SW-43 12/19/2011
Volatile Organics (mg/L)										
cis-1,2-Dichloroethene										
Trichloroethene										
Pesticides (mg/L)										
4,4'-DDT										
Dioxin (mg/L)										
Dioxin Toxicity Equivalent (USEPA, 2010)										
Metals, Total (mg/L)										
Copper	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.15	0.01 U	0.01 U
Zinc	0.026	0.029	0.025 U	0.029	0.025 U	0.026	0.027	0.059	0.025 U	0.025 U
Metals, Dissolved (mg/L)										
Zinc	0.025 U	0.031	0.025 U	0.028	0.025 U	0.025 U	0.028	0.031	0.025 U	0.029

1 - Average calculated using half the reporting limit for non detects.
U - Not detected, value is reporting limit

mg/L - milligrams per liter

Table 3
Summary of Detected Parameters in Surface Water - Outer Cove
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Parameter	SW-44 12/15/2011	SW-45 12/14/2011	SW-46 12/20/2011	SW-47 12/16/2011	SW-48 12/14/2011	SW-59 12/20/2011	SW-60 12/20/2011
Volatile Organics (mg/L)							
cis-1,2-Dichloroethene							
Trichloroethene							
Pesticides (mg/L)							
4,4'-DDT							
Dioxin (mg/L)							
Dioxin Toxicity Equivalent (USEPA, 2010)							
Metals, Total (mg/L)							
Copper	0.01 U	0.01 U	0.01 U	0.02	0.01 U	0.01 U	0.01 U
Zinc	0.03	0.025 U	0.033	0.037	0.025 U	0.029	0.025 U
Metals, Dissolved (mg/L)							
Zinc	0.032	0.025 U	0.025	0.025	0.025 U	0.032	0.025 U

1 - Average calculated using half the reporting limit for non detects.
U - Not detected, value is reporting limit

mg/L - milligrams per liter

Table 4
RME Values Used For Daily Intake Calculations - Sediment
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT

EXPOSURE ROUTE	RECEPTOR POPULATION	RECEPTOR AGE	EXPOSURE POINT	PARAMETER CODE	PARAMETER DEFINITION	VALUE	UNITS	RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	SITE VISITOR	ADULT	OUTER COVE	CS	CHEMICAL CONCENTRATION IN SEDIME	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)		IR-S	INGESTION RATE OF SEDIMENT	100	mg/day	USEPA, 1994[1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				FI	FRACTION INGESTED	1	unitless	Professional Judgement	
				EF	EXPOSURE FREQUENCY	51	day/yr	Professional Judgement[2]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[3,4]	
				BW	BODY WEIGHT	70	kg	USEPA, 1994	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.000001	kg/mg		
		ADOLESCENT	OUTER COVE	CS	CHEMICAL CONCENTRATION IN SEDIME	chemical-specific	mg/kg	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)		IR-S	INGESTION RATE OF SEDIMENT	100	mg/day	USEPA, 1994[1]	CS x IR-S x FI x EF x ED x CF x 1/BW x 1/AT
				FI	FRACTION INGESTED	1	unitless	Professional Judgement	
				EF	EXPOSURE FREQUENCY	51	day/yr	Professional Judgement[2]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[4]	
				BW	BODY WEIGHT	45	kg	USEPA, 1997[5]	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.000001	kg/mg		
DERMAL	SITE VISITOR	ADULT	OUTER COVE	CS	CHEMICAL CONCENTRATION IN SEDIME	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 19 and above)		AF	ADHERENCE FACTOR	0.07	mg/cm2	USEPA, 2001[7]	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
		(Wading)		AbF	ABSORPTION FACTOR	chemical-specific	unitless	USEPA, 2001[8]	
				SA	SKIN SURFACE AREA AVAILABLE FOR C	4860	cm2/day	USEPA, 1997[6]	Where DAevent =
				EV	EVENT DAY	1	unitless	Professional Judgement	CS x AF x AbF x CF
				EF	EXPOSURE FREQUENCY	51	day/yr	Professional Judgement[2]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[3,4]	
				BW	BODY WEIGHT	70	kg	USEPA, 1994	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.000001	kg/mg		
		ADOLESCENT	OUTER COVE	CS	CHEMICAL CONCENTRATION IN SEDIME	chemical-specific	mg/kg	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)		AF	ADHERENCE FACTOR	0.2	mg/cm2	USEPA, 2001[7]	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
		(Wading)		AbF	ABSORPTION FACTOR	chemical-specific	unitless	USEPA, 2001[8]	
				SA	SKIN SURFACE AREA AVAILABLE FOR C	3574	cm2/day	USEPA, 1997[6]	Where DAevent =
				EV	EVENT DAY	1	unitless	Professional Judgement	CS x AF x AbF x CF
				EF	EXPOSURE FREQUENCY	51	day/yr	Professional Judgement[2]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[4]	
				BW	BODY WEIGHT	45	kg	USEPA, 1997[5]	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.000001	kg/mg		

Table 4
RME Values Used For Daily Intake Calculations - Sediment
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT

EXPOSURE ROUTE	RECEPTOR POPULATION	RECEPTOR AGE	EXPOSURE POINT	PARAMETER CODE	PARAMETER DEFINITION	VALUE	UNITS	RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME

USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.
USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.
USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.
USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - Soil ingestion rate used because ingestion rates for sediment are not available.
2 - Receptor assumed to visit area to wade or swim 3 days per week, mid May through mid September. Wading is assumed to occur all 3 days and swimming occurs on one of those days. Sediment contact would occur during wading and swimming activites.
3 - Representing ages 19 and above of a 30-year residential exposure duration.
4 - The total RME exposure duration is 30 years, consistent with USEPA, 1994. The allocation of exposure duration for the three age groups is based on professional judgement.
5 - Values are the average of 50th percentile body weights for males and females ages 7 through 18.
6 - Values are the average of 50th percentile body surface areas (sum of areas for hands, lower legs, and feet) for males in the various age groups indicated.
7 - Values for residential exposure to soil used as conservative estimate of potential sediment adherence; sediment is submerged, so adherence is unlikely.
8 - Values are provided (Table 3-4 of USEPA, 2001) for arsenic, cadmium, chlordane, 2,4-D, DDT (used for DDD, DDE), TCDD, lindane (used for other BHC isomers), PAHs, PCBs, and pentachlorophenol. A single value is listed for all other SVOCs. No values are listed for VOCs, other pesticides, or other inorganics and, subsequently, no value will be assigned to the ABSd term for COPCs falling into those categories.

mg - milligrams
cm^2 - square centimeters
kg - kilograms

Table 5
RME Values Used For Daily Intake Calculations - Surface Water
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SURFACE WATER
EXPOSURE MEDIUM: SURFACE WATER

EXPOSURE ROUTE	RECEPTOR POPULATION	RECEPTOR AGE	EXPOSURE POINT	PARAMETER CODE	PARAMETER DEFINITION	VALUE	UNITS	RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	SITE VISITOR	ADULT	OUTER COVE	CW	CHEMICAL CONCENTRATION IN WATER	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 19 and above)		IR-W	INGESTION RATE OF WATER	0.05	l/hour	USEPA, 1988[1]	CW x IR-W x FI x ET x EF x ED x 1/BW x 1/AT
		(Swimming		FI	FRACTION INGESTED	1	unitless	Professional Judgement[2]	
		and		EF	EXPOSURE FREQUENCY	51	event/yr	Professional Judgement[3]	
		Wading)		ED	EXPOSURE DURATION	12	yr	USEPA, 1994[4,6]	
				ET	EXPOSURE TIME	1	hours/event	USEPA, 1997[5]	
				BW	BODY WEIGHT	70	kg	USEPA, 1994	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
		ADOLESCENT	OUTER COVE	CW	CHEMICAL CONCENTRATION IN WATER	chemical-specific	mg/l	EPC Table	INTAKE-INGESTION =
		(ages 7 - 18)		IR-W	INGESTION RATE OF WATER	0.05	l/hour	USEPA, 1988[1]	CW x IR-W x FI x ET x EF x ED x 1/BW x 1/AT
		(Swimming		FI	FRACTION INGESTED	1	unitless	Professional Judgement[2]	
		and		EF	EXPOSURE FREQUENCY	51	event/yr	Professional Judgement[3]	
		Wading)		ED	EXPOSURE DURATION	12	yr	USEPA, 1994[6]	
				ET	EXPOSURE TIME	1	hours/event	USEPA, 1997[5]	
				BW	BODY WEIGHT	45	kg	USEPA, 1997[7]	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
DERMAL	SITE VISITOR	ADULT	OUTER COVE	CW	CHEMICAL CONCENTRATION IN WATER	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 19 and above)		PCevent	PERMEABILITY CONSTANT PER EVENT	chemical-specific	cm	USEPA, 2001	CW x SA x PCevent x EF x ED x CF x 1/BW x 1/AT
		(Swimming		SA	SKIN SURFACE AREA AVAILABLE FOR CONTACT	9707	cm2	USEPA, 2001[8]	PCevent = PC x ET; calculated in PCevent table
		and		ET	EXPOSURE TIME	1	hr/event	USEPA, 1997[5]	
		Wading)		EF	EXPOSURE FREQUENCY	51	event/yr	Professional Judgement[3]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[4,6]	
				BW	BODY WEIGHT	70	kg	USEPA, 1994	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.001	l/cm3		
		ADOLESCENT	OUTER COVE	CW	CHEMICAL CONCENTRATION IN WATER	chemical-specific	mg/l	EPC Table	INTAKE-DERMAL =
		(ages 7 - 18)		PCevent	PERMEABILITY CONSTANT PER EVENT	chemical-specific	cm	USEPA, 2001	CW x SA x PCevent x EF x ED x CF x 1/BW x 1/AT
		(Swimming		SA	SKIN SURFACE AREA AVAILABLE FOR CONTACT	7115	cm2	USEPA, 2001[8]	PCevent = PC x ET; calculated in PCevent table
		and		ET	EXPOSURE TIME	1	hr/event	USEPA, 1997[5]	
		Wading)		EF	EXPOSURE FREQUENCY	51	event/yr	Professional Judgement[3]	
				ED	EXPOSURE DURATION	12	yr	USEPA, 1994[6]	
				BW	BODY WEIGHT	45	kg	USEPA, 1997[7]	
				AT-C	AVERAGING TIME (CANCER)	25550	day	USEPA, 1989	
				AT-N	AVERAGING TIME (NONCANCER)	4380	day	USEPA, 1989	
				CF	CONVERSION FACTOR	0.001	l/cm3		

Table 5
RME Values Used For Daily Intake Calculations - Surface Water
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SURFACE WATER
EXPOSURE MEDIUM: SURFACE WATER

EXPOSURE ROUTE	RECEPTOR POPULATION	RECEPTOR AGE	EXPOSURE POINT	PARAMETER CODE	PARAMETER DEFINITION	VALUE	UNITS	RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME

USEPA, 1988. Superfund Exposure Assessment Manual. Office of Remedial Response; EPA/540/1-88/001; Washington, D.C.
USEPA, 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)"; Office of Emergency and Remedial Response; EPA-540/1-89/002 (interim final); Washington, D.C., December.
USEPA, 1994. "Risk Updates No. 2"; USEPA Region I, Waste Management Division; August. Values from "Attachment 2" to Risk Updates No. 2.
USEPA, 1997. "Exposure Factors Handbook, Volume 1"; Office of Research and Development; EPA-600/P-95/002Fa; Washington, D.C.; August.
USEPA, 2001. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

1 - Value for swimming used
2 - 100% of daily incidental intake of surface water is attributable to incidental ingestion at the Site.
3 - Receptor assumed to visit area to wade or swim 3 days per week, mid May through mid September. Wading is assumed to occur all 3 days and swimming occurs on one of those days. Sediment contact would occur during wading and swimming activites.
4 - Representing ages 19 and above of a 30-year residential exposure duration.
5 - Recommended value for swimming exposures.
6 - The total RME exposure duration is 30 years, consistent with USEPA, 1994. The allocation of exposure duration for the three age groups is based on professional judgement.
7 - Values are the average of 50th percentile body weights for males and females ages 7 through 18.
8 - Value represents a weighted average for swimming and wading scenarios. Whole-body surface area values used for exposures during swimming (17 days); value for the adolescent is the average of 50th percentile whole-body surface areas of males ages 7 through 18 (14,197 cm^2). Surface area values used for exposure during wading (34 days) are the 50th percentile surface areas of males ages 7 though 18 for the hands, lower legs and feet (3,574 cm^2). Whole-body surface area values used for exposures during swimming (17 days); value for the adult is 19,400 cm^2. Surface area values used for exposure during wading (34 days) for the adult assume hands, lower legs and feet (4,860 cm^2).
9 - Receptor assumed to wade 1 day per week, mid May to mid September.
10 - Surface area values used for the adult assume hands, lower legs, and feet.
mg - milligrams
cm^2 - square centimeters
cm^3 - cubic centimeters
l - liter
kg - kilograms

Table 6
Exposure Point Concentrations - Outer Cove Sediment
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

COPC [1]	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples [2]	Maximum Concentration	95 %UCL [3]	EPC [4]
Volatile Organics (mg/kg)							
cis-1,2-Dichloroethene	1 / 4	0.004 : 0.006	0.296 - 0.296	0.076	0.296	NC	0.30
Tetrachloroethene	1 / 4	0.004 : 0.006	0.0161 - 0.0161	0.0058	0.0161	NC	0.016
Trichloroethene	1 / 4	0.004 : 0.006	1.47 - 1.47	0.37	1.47	NC	1.47
Semivolatile Organics (mg/kg)							
Benzo(a)anthracene	1 / 4	0.0305 : 0.0321	0.685 - 0.685	0.18	0.69	NC	0.69
Benzo(a)pyrene	1 / 4	0.0305 : 0.0321	0.862 - 0.862	0.23	0.86	NC	0.86
Benzo(b)fluoranthene	2 / 4	0.0305 : 0.0315	0.0378 - 1.41	0.37	1.41	4.6 NP[b]	1.4
Dibenzo(a,h)anthracene	1 / 4	0.0305 : 0.0321	0.0807 - 0.0807	0.032	0.081	NC	0.081
Indeno(1,2,3-cd)pyrene	1 / 4	0.0305 : 0.0321	0.259 - 0.259	0.077	0.259	NC	0.26
Dioxins/Furans (mg/kg)							
Dioxin TEQ (USEPA, 2010)	4 / 9	0.0000057 : 0.0000057	0.00000086 - 0.0000010	0.0000020	0.0000010	0.0000010 NP[a]	0.000001
Inorganics (mg/kg)							
Arsenic	6 / 9	0.3 : 3	4.1 - 18.5	6.6	18.5	10.1 NP[c]	10.1
Chromium	9 / 9		1.8 - 7.6	4.2	7.6	5.4 N[d]	5.4
Copper	8 / 9	2 : 2	3.1 - 12.5	5.4	12.5	7.2 NP[c]	7.2
Lead	3 / 9	3.9 : 6.7	6.6 - 20.7	5.8	20.7	10.5 NP[a]	10.5
Nickel	8 / 9	5.9 : 5.9	2.1 - 22.5	6.7	22.5	10.3 NP[c]	10.3

Notes:
1 - Chemicals of Potential Concern (COPC) are identified in Table 7 of Attachment H to the SIR.
2 - Average calculated using half the reporting limit for non detects.
3 - 95% UCL is calculated using ProUCL Software (v. 5.0).
4 - EPC is the the lesser value of the maximum concentration and 95 %UCL.

Prepared by: LCG 12/2/2014
Checked by: BJR 12/5/2014

Non-Parametric
NP[a] - 95% KM (t) UCL
NP[b] - 99% KM (Chebyshev) UCL
NP[c] - 95% KM (Percentile Bootstrap) UCL
Normal
N[d] - 95% Student's-t UCL

NC - Not calculated

EPC - Exposure Point Concentration
UCL - Upper Confidence Limit on the arithmetic mean
mg/kg - milligrams per kilogram

Table 7
Exposure Point Concentrations - Outer Cove Surface Water
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

COPC [1]	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples [2]	Maximum Concentration	95 %UCL [3]	EPC [4]
Volatile Organics (mg/L)							
cis-1,2-Dichloroethene	3 / 3		0.0015 - 0.0108	0.005	0.0108	NC	0.0108
Trichloroethene	1 / 3	0.001 : 0.001	0.0023 - 0.0023	0.00	0.0023	NC	0.0023
Dioxins/Furans (mg/L)							
Dioxin TEQ (USEPA, 2010)	1 / 1	0.0000057 : 0.0000057	0.00008 - 0.00008	0.00008	0.00008	NC	0.000080

Notes:
1 - Chemicals of Potential Concern (COPC) are identified in Table 8 of Attachment H to the SIR.
2 - Average calculated using half the reporting limit for NDs.
4 - EPC is the the lesser value of the maximum concentration and 95 %UCL.

Prepared by: LCG
Checked by: BJR

NC - Not Calculated

EPC - Exposure Point Concentration
UCL - Upper Confidence Limit on the arithmetic mean
mg/kg - milligrams per kilogram

TABLE 8

CANCER TOXICITY DATA -- ORAL/DERMAL

RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS

PROVIDENCE, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral Cancer Slope Factor	
	Value	Units		Value	Units		Source	Date Verified
VOLATILES								
1,1,1-Trichloroethane	NA			NA		D	IRIS	December-14
1,1-Dichloroethane	5.7E-03	(mg/kg/day) -1	100%	5.7E-03	$(mg/kg/day)^{-1}$	C	CALEPA	December-14
1,1-Dichloroethene	ND			ND		Possibly carcinogenic to humans	IRIS	December-14
1,2-Dichloroethene (cis)	ND			ND		Inadequate evidence	IRIS	December-14
1,2-Dichloroethene (trans)	ND			ND		ND	IRIS	December-14
1,2,4-Trimethylbenzene	ND	$(mg/kg/day)^{-1}$			$(mg/kg/day)^{-1}$	ND	PPRTV	December-14
Ethylbenzene	1.1E-02	$(mg/kg/day)^{-1}$	100%	1.1E-02	$(mg/kg/day)^{-1}$	D	CALEPA	December-14
Tetrachloroethene	2.1E-03	$(mg/kg/day)^{-1}$	100%	2.1E-03	$(mg/kg/day)^{-1}$	NA	IRIS	December-14
Toluene	ND			ND		Inadequate evidence	IRIS	December-14
Trichloroethene	4.6E-02	$(mg/kg/day)^{-1}$	100%	4.6E-02	$(mg/kg/day)^{-1}$	Probably carcinogenic to humans	IRIS	December-14
Vinyl Chloride (child and adult)	1.4E+00	$(mg/kg/day)^{-1}$	100%	1.4E+00	$(mg/kg/day)^{-1}$	Known carcinogen	IRIS	December-14
Xylenes (total)	NA			NA		Inadequate evidence	IRIS	December-14
SEMIVOLATILES								
Benzo(a)anthracene	7.3E-01	$(mg/kg/day)^{-1}$	89%	7.3E-01	$(mg/kg/day)^{-1}$	B2	NCEA	December-14
Benzo(a)pyrene	7.3E+00	$(mg/kg/day)^{-1}$	89%	7.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	December-14
Benzo(b)fluoranthene	7.3E-01	$(mg/kg/day)^{-1}$	89%	7.3E-01	$(mg/kg/day)^{-1}$	B2	NCEA	December-14
Dibenzo(a,h)anthracene	7.3E+00	$(mg/kg/day)^{-1}$	89%	7.3E+00	$(mg/kg/day)^{-1}$	B2	NCEA	December-14
Indeno(1,2,3-cd)pyrene	7.3E-01	$(mg/kg/day)^{-1}$	89%	7.3E-01	$(mg/kg/day)^{-1}$	B2	NCEA	December-14
INORGANICS/METALS								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	95%	1.5E+00	$(mg/kg/day)^{-1}$	A	IRIS	December-14
Chromium III	ND			ND		Inadequate evidence	IRIS	December-14
Copper	NA			NA		D	IRIS	December-14
Lead	ND			ND		B2	IRIS	December-14
Nickel	ND			ND		ND	IRIS	December-14
DIOXINS/FURANS								
2,3,7,8-tetrachlorobenzo-p-dioxin (TCDD)	1.3E+05	$(mg/kg/day)^{-1}$	70%	1.3E+05	$(mg/kg/day)^{-1}$	B2	CalEPA	December-14

TABLE 8

CANCER TOXICITY DATA -- ORAL/DERMAL

RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS

PROVIDENCE, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral Cancer Slope Factor	
	Value	Units		Value	Units		Source	Date Verified

Notes:

Prepared by/ Date: LCG 12/4/14

Checked by/ Date: BJR 12/5/14

In accordance with OSWER 9285.7-53, slope factors are identified from the following heirarchy of sources:

Tier 1:

IRIS = Integrated Risk Information System: Obtained from: http://www.epa.gov/IRIS/

Tier 2:

PPRTV = Preliminary Peer-Reviewed Toxicity Value: Obtained from: http://hhpprtv.ornl.gov/

Tier 3:

HEAST= Health Effects Assessment Summary Tables Obtained from: USEPA Solid Waste and Emergency Response, FY 1997 Update. EPA-540-R-97-036. July 1997.

CalEPA = California Environmental Protection Agency Toxicity Criteria Database Obtained from: http://www.oehha.ca.gov/risk/chemicalDB/

In addition, provisional RfDs developed by NCEA are presented for informational purposes and to be used on a case-by-case basis:

NCEA = National Center for Environmental Assessment: Obtained from USEPA RSL Table November 2014.

(1) Values obtained from RAGS Volume 1 (Part E, Supplemental Guidance for Dermal Risk Assessment, Final) (EPA, 2004)
Per this guidance, a value of 100% is used for analytes without published values.

(2) Adjusted Dermal SF = Oral SF / Oral to Dermal Adjustment Factor. Per RAGS Part E (USEPA, 2004), adjustments are only performed for chemicals that have an oral absorption efficiency of less than 50%.

[b] - Slope Factor for Benzo(a)Pyrene used for other carcinogenic PAHs, adjusted by Relative Potency Factors of 1.0 [benzo(a)pyrene,dibenz(a,h)anthracene]; 0.1 [benzo(a)anthracene, benzo(b)flouoranthene, indeno(1,2,3-c,d)pyrene]; 0.01 [benzo(k)fluoranthene]; 0.001 [chrysene].

Weight of Evidence:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

kg = kilogram

mg = milligram

NA = not listed in hierarchy sources

ND = no data available

TABLE 9
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS
PROVIDENCE, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Adjusted Dermal RfD (2)		Primary Target Organ or System / Critical Effect	Combined Uncertainty/Modifying Factors	RfD: Target Organ(s)	
		Value	Units		Value	Units			Source	Date Verified
VOLATILES										
1,1,1-Trichloroethane	chronic	2.0E+00	mg/kg/day	100%	2.0E+00	mg/kg/day	Decreased body weight	1000/1	IRIS	December-14
1,1-Dichloroethane	chronic	2.0E-01	mg/kg/day	100%	2.0E-01	mg/kg/day	kidney	3,000	PPRTV	December-14
1,1-Dichloroethene	chronic	5.0E-02	mg/kg/day	100%	5.0E-02	mg/kg/day	Liver; fatty change	100/1	IRIS	December-14
1,2-Dichloroethene (cis)	chronic	2.0E-03	mg/kg/day	100%	2.0E-03	mg/kg/day	Hematological	3,000	IRIS	December-14
1,2-Dichloroethene (trans)	chronic	2.0E-02	mg/kg/day	100%	2.0E-02	mg/kg/day	Liver; increased serum alkaline phosphatase	1,000/1	IRIS	December-14
1,2,4-Trimethylbenzene	chronic	ND			ND					
Ethylbenzene	chronic	1.0E-01	mg/kg/day	100%	1.0E-01	mg/kg/day	Liver and kidney; liver and kidney toxicity	1,000/1	IRIS	December-14
Tetrachloroethene	chronic	6.0E-03	mg/kg/day	100%	6.0E-03	mg/kg/day	Liver; hepatotoxicity	1,000/1	IRIS	December-14
Toluene	chronic	8.0E-02	mg/kg/day	100%	8.0E-02	mg/kg/day	Kidney; increased kidney weight	3,000	IRIS	December-14
Trichloroethene	chronic	5.0E-04	mg/kg/day	100%	5.0E-04	mg/kg/day	Liver and kidney		IRIS	December-14
Vinyl Chloride	chronic	3.0E-03	mg/kg/day	100%	3.0E-03	mg/kg/day	Liver; liver cell polymorphism	30/1	IRIS	December-14
Xylenes (total)	chronic	2.0E-01	mg/kg/day	100%	2.0E-01	mg/kg/day	General toxicity; increased mortality	1,000/1	IRIS	December-14
SEMIVOLATILES										
Benzo(a)anthracene	chronic	3.0E-02	mg/kg/day	89%	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	December-14
Benzo(a)pyrene	chronic	3.0E-02	mg/kg/day	89%	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	December-14
Benzo(b)fluoranthene	chronic	3.0E-02	mg/kg/day	89%	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	December-14
Dibenzo(a,h)anthracene	chronic	3.0E-02	mg/kg/day	89%	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	December-14
Indeno(1,2,3-cd)pyrene	chronic	3.0E-02	mg/kg/day	89%	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	December-14
INORGANICS/METALS										
Arsenic	chronic	3.0E-04	mg/kg/day	95%	3.0E-04	mg/kg/day	Skin; keratosis, hyperpigmentation and vascular complications	3/1	IRIS	December-14
Chromium III	chronic	1.5E+00	mg/kg/day	1.3%	2.0E-02	mg/kg/day	No effects observed	100/10	IRIS	December-14
Copper	chronic	4.0E-02	mg/kg/day	100%	4.0E-02	mg/kg/day			HEAST	December-14
Lead	chronic	ND			ND				IRIS	December-14
Nickel	chronic	2.0E-02	mg/kg/day	4%	8.0E-04	mg/kg/day	Decreased body and organ weights	300/1	IRIS	December-14
DIOXINS/FURANS										
2,3,7,8-tetrachlorobenzo-p-dioxin (TCDD)	chronic	7.0E-10	mg/kg/day	100%	7.0E-10	mg/kg/day	Decreased sperm count and motility; Increased TSH in neonates	30	IRIS	December-14

Notes:

Prepared by/ Date: LCG 12/4/14
Checked by/ Date: BJR 12/7/14

In accordance with OSWER 9285.7-53, chronic RfDs are identified from the following heirarchy of sources:
Tier 1:
IRIS = Integrated Risk Information System: Obtained from: http://www.epa.gov/IRIS/
Tier 2:
PPRTV = Preliminary Peer-Reviewed Toxicity Value: Obtained from: http://hhpprtv.ornl.gov/
Tier 3:
HEAST= Health Effects Assessment Summary Tables Obtained from: USEPA Solid Waste and Emergency Response, FY 1997 Update. EPA-540-R-97-036. July 1997.

(1) Values obtained from RAGS Volume 1 (Part E, Supplemental Guidance for Dermal Risk Assessment, Final) (EPA, 2004)
Per this guidance, a value of 100% is used for analytes without published values.
(2) Adjusted Dermal RfD = Oral RfD x Oral to Dermal Adjustment Factor. Per RAGS Part E (USEPA, 2004), adjustments are only performed for chemicals that have an oral absorption efficiency of less than 50%.

mg = milligram
kg = kilogram
NA = not listed in hierarchy sources
ND = no data available
chronic = the chronic value is used as the subchronic RfD

Per USEPA Region I "Risk Updates, No. 5", (August, 1999), Non-carcinogenic PAHs without published RfDs should be evaluated using the published RfD for a structurally similar PAH.
Surrogate (1) - Value for pyrene used as a surrogate

Table 10
Risk Summary Table
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Exposure Area / Medium	Receptor	Exposure Route	Excess Lifetime Cancer Risk	Hazard Index
Outer Cove				
Sediment	Adult Site Visitor	Incidental Ingestion	6.E-07	0.0051
		Dermal Contact	2.E-07	0.00073
	Adolescent Site Visitor	Incidental Ingestion	2.E-06	0.008
		Dermal Contact	1.E-06	0.0024
		Total Receptor Sediment Risk:	**4.E-06**	**0.01**
Surface Water	Adult Site Visitor	Incidental Ingestion	2.E-09	0.0010
		Dermal Contact	9.E-09	0.0022
	Adolescent Site Visitor	Incidental Ingestion	7.E-09	0.0016
		Dermal Contact	2.E-08	0.0025
		Total Receptor Surface Water Risk:	**4.E-08**	**0.004**
		Cumulative Receptor Risk:	**4.E-06**	**0.01**
Inner and Outer Cover - Maximum VOCs				
Surface Water	Adult Site Visitor	Incidental Ingestion	5.E-08	0.0012
		Dermal Contact	9.E-08	0.0033
	Adolescent Site Visitor	Incidental Ingestion	9.E-08	0.0019
		Dermal Contact	1.E-07	0.0037
		Total Receptor Surface Water Risk:	**4.E-07**	**0.006**
DP-I Shallow - VOCs				
Surface Water	Adult Site Visitor	Incidental Ingestion	8.E-10	0.00056
		Dermal Contact	4.E-09	0.0011
	Adolescent Site Visitor	Incidental Ingestion	3.E-09	0.0009
		Dermal Contact	1.E-08	0.0013
		Total Receptor Surface Water Risk:	**2.E-08**	**0.002**
DP-I Maximum VOCs				
Surface Water	Adult Site Visitor	Incidental Ingestion	1.E-07	0.0048
		Dermal Contact	2.E-07	0.020
	Adolescent Site Visitor	Incidental Ingestion	2.E-07	0.007
		Dermal Contact	4.E-07	0.023
		Total Receptor Surface water Risk:	**9.E-07**	**0.03**

Prepared by: LCG 12/4/2014
Checked by: BJR 12/7/2014

Table 11
Cancer Individual Analyte Risk Summary Table
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

COPC	Cancer Risk				Cumulative Receptor Risk
	Sediment		Surface Water		
	Adolescent	Adult	Adolescent	Adult	
Arsenic	7E-07	4E-07	NA	NA	1E-06
Benzo(a)anthracene	1E-07	2E-08	NA	NA	2E-07
Benzo(a)pyrene	2E-06	3E-07	NA	NA	2E-06
Benzo(b)fluoranthene	3E-07	5E-08	NA	NA	3E-07
Dibenzo(a,h)anthracene	2E-07	3E-08	NA	NA	2E-07
Dioxin TEQ (USEPA, 2010)	8E-09	5E-09	NA	NA	1E-08
Indeno(1,2,3-cd)pyrene	5E-08	9E-09	NA	NA	6E-08
Tetrachloroethene	2E-12	1E-12	NA	NA	3E-12
Trichloroethene	9E-09	2E-09	3E-08	1E-08	5E-08

COPC - Chemicals of Potential Concern
NA - Not selected as a COPC in Media

Prepared by: LCG 12/4/2014
Checked by: BJR 12/7/2014

Table 12
VOC Surface Water Exposure Point Concentrations
Risk Assessment Memorandum - SIR Response to Comments
Providence, Rhode Island

Parameter	Maximum Inner and Outer Cove Surface Water Concentration	DP-I 0-5 ft Groundwater Concentration	DP-I Maximum Groundwater Concentration
Volatile Organics (mg/L)			
1,1,1-Trichloroethane	0.0018	0.0005	0.0007
1,1-Dichloroethane	0.0014	ND	ND
1,1-Dichloroethene	ND	ND	0.0005
1,2,4-Trimethylbenzene	0.0011	NA	NA
cis-1,2-Dichloroethene	0.0108	0.007	0.009
trans-1,2-Dichloroethene	ND	ND	0.0033
Ethylbenzene	0.001	NA	NA
Tetrachloroethene	0.0012	0.0007	0.0007
Toluene	0.0043	NA	NA
Trichloroethene	0.0029	0.001	0.021
Vinyl chloride	0.0021	ND	0.0039
Xylenes, Total	0.004	NA	NA

NA - Not analyzed
ND - Not detected

Prepared by: BJR 11/25/2014
Checked by: LCG 11/25/2014

ATTACHMENT A - RISK CALCULATIONS
(RAGS PART D TABLE 7s)

TABLE A-1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT/CHILD
RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT/CHILD

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SEDIMENT	SEDIMENT	OUTER COVE	INGESTION	cis-1,2-Dichloroethene	0.296	mg/kg	NC		NC			9.2E-08	mg/kg/day	2.0E-03	mg/kg/day	5.E-05
				Tetrachloroethene	0.0161	mg/kg	8.6E-10	mg/kg/day	2.1E-03	(mg/kg/day)-1	2.E-12	5.0E-09	mg/kg/day	6.0E-03	mg/kg/day	8.E-07
				Trichloroethene	1.47	mg/kg	2.0E-07	mg/kg/day	4.6E-02	(mg/kg/day)-1	9.E-09	4.6E-07	mg/kg/day	5.0E-04	mg/kg/day	9.E-04
				Benzo(a)anthracene	0.685	mg/kg	9.1E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	7.E-08	2.1E-07	mg/kg/day	3.0E-02	mg/kg/day	7.E-06
				Benzo(a)pyrene	0.862	mg/kg	1.1E-07	mg/kg/day	7.3E+00	(mg/kg/day)-1	8.E-07	2.7E-07	mg/kg/day	3.0E-02	mg/kg/day	9.E-06
				Benzo(b)fluoranthene	1.41	mg/kg	1.9E-07	mg/kg/day	7.3E-01	(mg/kg/day)-1	1.E-07	4.4E-07	mg/kg/day	3.0E-02	mg/kg/day	1.E-05
				Dibenzo(a,h)anthracene	0.0807	mg/kg	1.1E-08	mg/kg/day	7.3E+00	(mg/kg/day)-1	8.E-08	2.5E-08	mg/kg/day	3.0E-02	mg/kg/day	8.E-07
				Indeno(1,2,3-cd)pyrene	0.259	mg/kg	3.4E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	3.E-08	8.0E-08	mg/kg/day	3.0E-02	mg/kg/day	3.E-06
				Dioxin TEQ (USEPA, 2010)	0.000001	mg/kg	5.3E-14	mg/kg/day	1.3E+05	(mg/kg/day)-1	7.E-09	3.1E-13	mg/kg/day	7.0E-10	mg/kg/day	4.E-04
				Arsenic	10.11	mg/kg	3.2E-07	mg/kg/day	1.5E+00	(mg/kg/day)-1	5.E-07	1.9E-06	mg/kg/day	3.0E-04	mg/kg/day	6.E-03
				Chromium	5.361	mg/kg	NC		NC			1.7E-06	mg/kg/day	1.5E+00	mg/kg/day	1.E-06
				Copper	7.167	mg/kg	NC		NC			2.2E-06	mg/kg/day	4.0E-02	mg/kg/day	6.E-05
				Lead	10.54	mg/kg	NC		NC			3.3E-06	mg/kg/day	NA		
				Nickel	10.3	mg/kg	NC		NC			3.2E-06	mg/kg/day	2.0E-02	mg/kg/day	2.E-04
			EXPOSURE ROUTE TOTAL								2.E-06					8.E-03
			DERMAL	cis-1,2-Dichloroethene	0.296	mg/kg	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0161	mg/kg	--		2.1E-03	(mg/kg/day)-1		--		6.0E-03	mg/kg/day	
				Trichloroethene	1.47	mg/kg	--		4.6E-02	(mg/kg/day)-1		--		5.0E-04	mg/kg/day	
				Benzo(a)anthracene	0.685	mg/kg	8.5E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	6.E-08	2.0E-07	mg/kg/day	3.0E-02	mg/kg/day	7.E-06
				Benzo(a)pyrene	0.862	mg/kg	1.1E-07	mg/kg/day	7.3E+00	(mg/kg/day)-1	8.E-07	2.5E-07	mg/kg/day	3.0E-02	mg/kg/day	8.E-06
				Benzo(b)fluoranthene	1.41	mg/kg	1.7E-07	mg/kg/day	7.3E-01	(mg/kg/day)-1	1.E-07	4.1E-07	mg/kg/day	3.0E-02	mg/kg/day	1.E-05
				Dibenzo(a,h)anthracene	0.0807	mg/kg	1.0E-08	mg/kg/day	7.3E+00	(mg/kg/day)-1	7.E-08	2.3E-08	mg/kg/day	3.0E-02	mg/kg/day	8.E-07
				Indeno(1,2,3-cd)pyrene	0.259	mg/kg	3.2E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	2.E-08	7.5E-08	mg/kg/day	3.0E-02	mg/kg/day	2.E-06
				Dioxin TEQ (USEPA, 2010)	0.000001	mg/kg	1.1E-14	mg/kg/day	1.3E+05	(mg/kg/day)-1	1.E-09	6.7E-14	mg/kg/day	7.0E-10	mg/kg/day	1.E-04
				Arsenic	10.11	mg/kg	1.2E-07	mg/kg/day	1.5E+00	(mg/kg/day)-1	2.E-07	6.7E-07	mg/kg/day	3.0E-04	mg/kg/day	2.E-03
				Chromium	5.361	mg/kg	NC		NC			--		2.0E-02	mg/kg/day	
				Copper	7.167	mg/kg	NC		NC			--		4.0E-02	mg/kg/day	
				Lead	10.54	mg/kg	NC		NC			--		NA		
				Nickel	10.3	mg/kg	NC		NC			--		8.0E-04	mg/kg/day	
			EXPOSURE ROUTE TOTAL								1.E-06					2.E-03
		EXPOSURE POINT TOTAL									3.E-06					1.E-02
	EXPOSURE MEDIUM TOTAL										3.E-06					1.E-02
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											3.E-06					**1.E-02**

NOTES:
NA - indicates that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/2/2014
Checked by: BJR 12/7/2014

TABLE A-2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SEDIMENT	SEDIMENT	OUTER COVE	INGESTION	cis-1,2-Dichloroethene	0.296	mg/kg	NC		NC			5.9E-08	mg/kg/day	2.0E-03	mg/kg/day	3.E-05
				Tetrachloroethene	0.0161	mg/kg	5.5E-10	mg/kg/day	2.1E-03	(mg/kg/day)-1	1.E-12	3.2E-09	mg/kg/day	6.0E-03	mg/kg/day	5.E-07
				Trichloroethene	1.47	mg/kg	5.0E-08	mg/kg/day	4.6E-02	(mg/kg/day)-1	2.E-09	2.9E-07	mg/kg/day	5.0E-04	mg/kg/day	6.E-04
				Benzo(a)anthracene	0.685	mg/kg	2.3E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	2.E-08	1.4E-07	mg/kg/day	3.0E-02	mg/kg/day	5.E-06
				Benzo(a)pyrene	0.862	mg/kg	2.9E-08	mg/kg/day	7.3E+00	(mg/kg/day)-1	2.E-07	1.7E-07	mg/kg/day	3.0E-02	mg/kg/day	6.E-06
				Benzo(b)fluoranthene	1.41	mg/kg	4.8E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	4.E-08	2.8E-07	mg/kg/day	3.0E-02	mg/kg/day	9.E-06
				Dibenzo(a,h)anthracene	0.0807	mg/kg	2.8E-09	mg/kg/day	7.3E+00	(mg/kg/day)-1	2.E-08	1.6E-08	mg/kg/day	3.0E-02	mg/kg/day	5.E-07
				Indeno(1,2,3-cd)pyrene	0.259	mg/kg	8.9E-09	mg/kg/day	7.3E-01	(mg/kg/day)-1	6.E-09	5.2E-08	mg/kg/day	3.0E-02	mg/kg/day	2.E-06
				Dioxin TEQ (USEPA, 2010)	0.000001	mg/kg	3.4E-14	mg/kg/day	1.3E+05	(mg/kg/day)-1	4.E-09	2.0E-13	mg/kg/day	7.0E-10	mg/kg/day	3.E-04
				Arsenic	10.11	mg/kg	2.1E-07	mg/kg/day	1.5E+00	(mg/kg/day)-1	3.E-07	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	4.E-03
				Chromium	5.361	mg/kg	NC		NC			1.1E-06	mg/kg/day	1.5E+00	mg/kg/day	7.E-07
				Copper	7.167	mg/kg	NC		NC			1.4E-06	mg/kg/day	4.0E-02	mg/kg/day	4.E-05
				Lead	10.54	mg/kg	NC		NC			2.1E-06	mg/kg/day	NA		
				Nickel	10.3	mg/kg	NC		NC			2.1E-06	mg/kg/day	2.0E-02	mg/kg/day	1.E-04
			EXPOSURE ROUTE TOTAL								6.E-07					5.E-03
			DERMAL	cis-1,2-Dichloroethene	0.296	mg/kg	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0161	mg/kg	--		2.1E-03	(mg/kg/day)-1		--		6.0E-03	mg/kg/day	
				Trichloroethene	1.47	mg/kg	--		4.6E-02	(mg/kg/day)-1		--		5.0E-04	mg/kg/day	
				Benzo(a)anthracene	0.685	mg/kg	1.0E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	8.E-09	6.0E-08	mg/kg/day	3.0E-02	mg/kg/day	2.E-06
				Benzo(a)pyrene	0.862	mg/kg	1.3E-08	mg/kg/day	7.3E+00	(mg/kg/day)-1	1.E-07	7.6E-08	mg/kg/day	3.0E-02	mg/kg/day	3.E-06
				Benzo(b)fluoranthene	1.41	mg/kg	2.1E-08	mg/kg/day	7.3E-01	(mg/kg/day)-1	2.E-08	1.2E-07	mg/kg/day	3.0E-02	mg/kg/day	4.E-06
				Dibenzo(a,h)anthracene	0.0807	mg/kg	1.2E-09	mg/kg/day	7.3E+00	(mg/kg/day)-1	9.E-09	7.1E-09	mg/kg/day	3.0E-02	mg/kg/day	2.E-07
				Indeno(1,2,3-cd)pyrene	0.259	mg/kg	3.9E-09	mg/kg/day	7.3E-01	(mg/kg/day)-1	3.E-09	2.3E-08	mg/kg/day	3.0E-02	mg/kg/day	8.E-07
				Dioxin TEQ (USEPA, 2010)	0.000001	mg/kg	3.5E-15	mg/kg/day	1.3E+05	(mg/kg/day)-1	5.E-10	2.0E-14	mg/kg/day	7.0E-10	mg/kg/day	3.E-05
				Arsenic	10.11	mg/kg	3.5E-08	mg/kg/day	1.5E+00	(mg/kg/day)-1	5.E-08	2.1E-07	mg/kg/day	3.0E-04	mg/kg/day	7.E-04
				Chromium	5.361	mg/kg	NC		NC			--		2.0E-02	mg/kg/day	
				Copper	7.167	mg/kg	NC		NC			--		4.0E-02	mg/kg/day	
				Lead	10.54	mg/kg	NC		NC			--		NA		
				Nickel	10.3	mg/kg	NC		NC			--		8.0E-04	mg/kg/day	
			EXPOSURE ROUTE TOTAL								2.E-07					7.E-04
		EXPOSURE POINT TOTAL									8.E-07					6.E-03
	EXPOSURE MEDIUM TOTAL										8.E-07					6.E-03
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											8.E-07					**6.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
NV - Not volatile; exposure route not complete for this chemical.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/2/2014
Checked by: BJR 12/7/2014

TABLE A-3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - OUTER COVE - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	OUTER COVE	INGESTION	cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			1.7E-06	mg/kg/day	2.0E-03	mg/kg/day	8.E-04
				Trichloroethene	0.0023	mg/l	1.5E-07	mg/kg/day	4.6E-02	mg/kg/day	7.E-09	3.6E-07	mg/kg/day	5.0E-04	mg/kg/day	7.E-04
			EXPOSURE ROUTE TOTAL								7.E-09					2.E-03
			DERMAL	cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Trichloroethene	0.0023	mg/l	5.3E-07	mg/kg/day	4.6E-02	mg/kg/day	2.E-08	1.2E-06	mg/kg/day	5.0E-04	mg/kg/day	2.E-03
			EXPOSURE ROUTE TOTAL								2.E-08					2.E-03
		EXPOSURE POINT TOTAL									3.E-08					4.E-03
	EXPOSURE MEDIUM TOTAL										3.E-08					4.E-03
SURFACE WATER TOTAL											**3.E-08**					**4.E-03**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											3.E-08					**4.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TABLE A-4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - OUTER COVE - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	OUTER COVE	INGESTION	cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			1.1E-06	mg/kg/day	2.0E-03	mg/kg/day	5.E-04
				Trichloroethene	0.0023	mg/l	3.9E-08	mg/kg/day	4.6E-02	mg/kg/day	2.E-09	2.3E-07	mg/kg/day	5.0E-04	mg/kg/day	5.E-04
			EXPOSURE ROUTE TOTAL								2.E-09					1.E-03
			DERMAL	cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Trichloroethene	0.0023	mg/l	1.9E-07	mg/kg/day	4.6E-02	mg/kg/day	9.E-09	1.1E-06	mg/kg/day	5.0E-04	mg/kg/day	2.E-03
			EXPOSURE ROUTE TOTAL								9.E-09					2.E-03
		EXPOSURE POINT TOTAL									1.E-08					3.E-03
	EXPOSURE MEDIUM TOTAL										1.E-08					3.E-03
SURFACE WATER TOTAL											**1.E-08**					**3.E-03**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA	**1.E-08**		**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**		**3.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TABLE A-5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - MAXIMUM INNER AND OUTER COVE SURFACE WATER - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC VALUE	EPC UNITS	CANCER RISK CALCULATIONS: INTAKE/EXPOSURE CONCENTRATION VALUE	INTAKE UNITS	CSF/UNIT RISK VALUE	CSF UNITS	CANCER RISK	NON-CANCER HAZARD CALCULATIONS: INTAKE/EXPOSURE CONCENTRATION VALUE	INTAKE UNITS	RfD/RfC (1) VALUE	RfD/RfC UNITS	HAZARD QUOTIENT
SURFACE WATER	SURFACE WATER	INNER/OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0018	mg/l	NC		NC			2.8E-07	mg/kg/day	2.0E+00	mg/kg/day	1.E-07
				1,1-Dichloroethane	0.0014	mg/l	3.7E-08	mg/kg/day	5.7E-03	mg/kg/day	2.E-10	2.2E-07	mg/kg/day	2.0E-01	mg/kg/day	1.E-06
				1,2,4-Trimethylbenzene	0.0011	mg/l	NC		NC			1.7E-07	mg/kg/day	NA		
				cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			1.7E-06	mg/kg/day	2.0E-03	mg/kg/day	8.E-04
				Ethylbenzene	0.001	mg/l	NC		NC			1.6E-07	mg/kg/day	1.0E-01	mg/kg/day	2.E-06
				Tetrachloroethene	0.0012	mg/l	3.2E-08	mg/kg/day	2.1E-03	mg/kg/day	7.E-11	1.9E-07	mg/kg/day	6.0E-03	mg/kg/day	3.E-05
				Toluene	0.0043	mg/l	NC		NC			6.7E-07	mg/kg/day	8.0E-02	mg/kg/day	8.E-06
				Trichloroethene	0.0029	mg/l	1.9E-07	mg/kg/day	4.6E-02	mg/kg/day	9.E-09	4.5E-07	mg/kg/day	5.0E-04	mg/kg/day	9.E-04
				Vinyl chloride	0.0021	mg/l	5.6E-08	mg/kg/day	1.4E+00	mg/kg/day	8.E-08	3.3E-07	mg/kg/day	3.0E-03	mg/kg/day	1.E-04
				Xylenes, Total	0.004	mg/l	NC		NC			6.2E-07	mg/kg/day	2.0E-01	mg/kg/day	3.E-06
			EXPOSURE ROUTE TOTAL								9.E-08					2.E-03
			DERMAL	1,1,1-Trichloroethane	0.0018	mg/l	NC		NC			1.1E-06	mg/kg/day	2.0E+00	mg/kg/day	5.E-07
				1,1-Dichloroethane	0.0014	mg/l	6.3E-08	mg/kg/day	5.7E-03	mg/kg/day	4.E-10	3.7E-07	mg/kg/day	2.0E-01	mg/kg/day	2.E-06
				1,2,4-Trimethylbenzene	0.0011	mg/l	NC		NC			--		NA		
				cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Ethylbenzene	0.001	mg/l	NC		NC			1.9E-06	mg/kg/day	1.0E-01	mg/kg/day	2.E-05
				Tetrachloroethene	0.0012	mg/l	4.0E-07	mg/kg/day	2.1E-03	mg/kg/day	8.E-10	2.3E-06	mg/kg/day	6.0E-03	mg/kg/day	4.E-04
				Toluene	0.0043	mg/l	NC		NC			4.9E-06	mg/kg/day	8.0E-02	mg/kg/day	6.E-05
				Trichloroethene	0.0029	mg/l	6.7E-07	mg/kg/day	4.6E-02	mg/kg/day	3.E-08	1.6E-06	mg/kg/day	5.0E-04	mg/kg/day	3.E-03
				Vinyl chloride	0.0021	mg/l	6.5E-08	mg/kg/day	1.4E+00	mg/kg/day	9.E-08	3.8E-07	mg/kg/day	3.0E-03	mg/kg/day	1.E-04
				Xylenes, Total	0.004	mg/l	NC		NC			--		2.0E-01	mg/kg/day	
			EXPOSURE ROUTE TOTAL								1.E-07					4.E-03
		EXPOSURE POINT TOTAL									2.E-07					6.E-03
	EXPOSURE MEDIUM TOTAL										2.E-07					6.E-03
SURFACE WATER TOTAL											**2.E-07**					**6.E-03**
									TOTAL RECEPTOR RISK ACROSS ALL MEDIA		**2.E-07**	**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**				**6.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TABLE A-6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - MAXIMUM INNER AND OUTER COVE SURFACE WATER - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	INNER/OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0018	mg/l	NC		NC			1.8E-07	mg/kg/day	2.0E+00	mg/kg/day	9.E-08
				1,1-Dichloroethane	0.0014	mg/l	2.4E-08	mg/kg/day	5.7E-03	mg/kg/day	1.E-10	1.4E-07	mg/kg/day	2.0E-01	mg/kg/day	7.E-07
				1,2,4-Trimethylbenzene	0.0011	mg/l	NC		NC			1.1E-07	mg/kg/day	NA		
				cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			1.1E-06	mg/kg/day	2.0E-03	mg/kg/day	5.E-04
				Ethylbenzene	0.001	mg/l	NC		NC			1.0E-07	mg/kg/day	1.0E-01	mg/kg/day	1.E-06
				Tetrachloroethene	0.0012	mg/l	2.1E-08	mg/kg/day	2.1E-03	mg/kg/day	4.E-11	1.2E-07	mg/kg/day	6.0E-03	mg/kg/day	2.E-05
				Toluene	0.0043	mg/l	NC		NC			4.3E-07	mg/kg/day	8.0E-02	mg/kg/day	5.E-06
				Trichloroethene	0.0029	mg/l	5.0E-08	mg/kg/day	4.6E-02	mg/kg/day	2.E-09	2.9E-07	mg/kg/day	5.0E-04	mg/kg/day	6.E-04
				Vinyl chloride	0.0021	mg/l	3.6E-08	mg/kg/day	1.4E+00	mg/kg/day	5.E-08	2.1E-07	mg/kg/day	3.0E-03	mg/kg/day	7.E-05
				Xylenes, Total	0.004	mg/l	NC		NC			4.0E-07	mg/kg/day	2.0E-01	mg/kg/day	2.E-06
			EXPOSURE ROUTE TOTAL								5.E-08					1.E-03
			DERMAL	1,1,1-Trichloroethane	0.0018	mg/l	NC		NC			9.4E-07	mg/kg/day	2.0E+00	mg/kg/day	5.E-07
				1,1-Dichloroethane	0.0014	mg/l	5.5E-08	mg/kg/day	5.7E-03	mg/kg/day	3.E-10	3.2E-07	mg/kg/day	2.0E-01	mg/kg/day	2.E-06
				1,2,4-Trimethylbenzene	0.0011	mg/l	NC		NC			--		NA		
				cis-1,2-Dichloroethene	0.0108	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Ethylbenzene	0.001	mg/l	NC		NC			1.7E-06	mg/kg/day	1.0E-01	mg/kg/day	2.E-05
				Tetrachloroethene	0.0012	mg/l	3.5E-07	mg/kg/day	2.1E-03	mg/kg/day	7.E-10	2.0E-06	mg/kg/day	6.0E-03	mg/kg/day	3.E-04
				Toluene	0.0043	mg/l	NC		NC			4.3E-06	mg/kg/day	8.0E-02	mg/kg/day	5.E-05
				Trichloroethene	0.0029	mg/l	2.4E-07	mg/kg/day	4.6E-02	mg/kg/day	1.E-08	1.4E-06	mg/kg/day	5.0E-04	mg/kg/day	3.E-03
				Vinyl chloride	0.0021	mg/l	5.7E-08	mg/kg/day	1.4E+00	mg/kg/day	8.E-08	3.3E-07	mg/kg/day	3.0E-03	mg/kg/day	1.E-04
				Xylenes, Total	0.004	mg/l	NC		NC			--		2.0E-01	mg/kg/day	
			EXPOSURE ROUTE TOTAL								9.E-08					3.E-03
		EXPOSURE POINT TOTAL									1.E-07					4.E-03
	EXPOSURE MEDIUM TOTAL										1.E-07					4.E-03
SURFACE WATER TOTAL											**1.E-07**					**4.E-03**
									TOTAL RECEPTOR RISK ACROSS ALL MEDIA		**1.E-07**	**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**				**4.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
NV - Not volatile; exposure route not complete for this chemical.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TABLE A-7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - SHALLOW GROUNDWATER AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC VALUE	EPC UNITS	CANCER RISK CALCULATIONS: INTAKE/EXPOSURE CONCENTRATION VALUE	INTAKE/EXPOSURE CONCENTRATION UNITS	CSF/UNIT RISK VALUE	CSF/UNIT RISK UNITS	CANCER RISK	NON-CANCER HAZARD CALCULATIONS: INTAKE/EXPOSURE CONCENTRATION VALUE	INTAKE/EXPOSURE CONCENTRATION UNITS	RfD/RfC (1) VALUE	RfD/RfC (1) UNITS	HAZARD QUOTIENT
SURFACE	SURFACE WATER	OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0005	mg/l	NC		NC			7.8E-08	mg/kg/day	2.0E+00	mg/kg/day	4.E-08
				cis-1,2-Dichloroethene	0.007	mg/l	NC		NC			1.1E-06	mg/kg/day	2.0E-03	mg/kg/day	5.E-04
				Tetrachloroethene	0.0007	mg/l	1.9E-08	mg/kg/day	2.1E-03	mg/kg/day	4.E-11	1.1E-07	mg/kg/day	6.0E-03	mg/kg/day	2.E-05
				Trichloroethene	0.001	mg/l	6.7E-08	mg/kg/day	4.6E-02	mg/kg/day	3.E-09	1.6E-07	mg/kg/day	5.0E-04	mg/kg/day	3.E-04
			EXPOSURE ROUTE TOTAL								3.E-09					9.E-04
			DERMAL	1,1,1-Trichloroethane	0.0005	mg/l	NC		NC			3.0E-07	mg/kg/day	2.0E+00	mg/kg/day	1.E-07
				cis-1,2-Dichloroethene	0.007	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0007	mg/l	2.3E-07	mg/kg/day	2.1E-03	mg/kg/day	5.E-10	1.4E-06	mg/kg/day	6.0E-03	mg/kg/day	2.E-04
				Trichloroethene	0.001	mg/l	2.3E-07	mg/kg/day	4.6E-02	mg/kg/day	1.E-08	5.4E-07	mg/kg/day	5.0E-04	mg/kg/day	1.E-03
			EXPOSURE ROUTE TOTAL								1.E-08					1.E-03
		EXPOSURE POINT TOTAL									1.E-08					2.E-03
	EXPOSURE MEDIUM TOTAL										1.E-08					2.E-03
SURFACE WATER TOTAL											**1.E-08**					**2.E-03**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											1.E-08					**2.E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: BJR 11/25/2014
Checked by: LCG 11/25/2014

TABLE A-8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - SHALLOW GROUNDWATER AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0005	mg/l	NC		NC			5.0E-08	mg/kg/day	2.0E+00	mg/kg/day	2.E-08
				cis-1,2-Dichloroethene	0.007	mg/l	NC		NC			7.0E-07	mg/kg/day	2.0E-03	mg/kg/day	3.E-04
				Tetrachloroethene	0.0007	mg/l	1.2E-08	mg/kg/day	2.1E-03	mg/kg/day	3.E-11	7.0E-08	mg/kg/day	6.0E-03	mg/kg/day	1.E-05
				Trichloroethene	0.001	mg/l	1.7E-08	mg/kg/day	4.6E-02	mg/kg/day	8.E-10	1.0E-07	mg/kg/day	5.0E-04	mg/kg/day	2.E-04
			EXPOSURE ROUTE TOTAL								8.E-10					6.E-04
			DERMAL	1,1,1-Trichloroethane	0.0005	mg/l	NC		NC			2.6E-07	mg/kg/day	2.0E+00	mg/kg/day	1.E-07
				cis-1,2-Dichloroethene	0.007	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0007	mg/l	2.0E-07	mg/kg/day	2.1E-03	mg/kg/day	4.E-10	1.2E-06	mg/kg/day	6.0E-03	mg/kg/day	2.E-04
				Trichloroethene	0.001	mg/l	8.1E-08	mg/kg/day	4.6E-02	mg/kg/day	4.E-09	4.8E-07	mg/kg/day	5.0E-04	mg/kg/day	1.E-03
			EXPOSURE ROUTE TOTAL								4.E-09					1.E-03
		EXPOSURE POINT TOTAL									5.E-09					2.E-03
	EXPOSURE MEDIUM TOTAL										5.E-09					2.E-03
SURFACE WATER TOTAL											**5.E-09**					**2.E-03**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA	**5.E-09**		**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**		**2.E-03**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
NV - Not volatile; exposure route not complete for this chemical.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/12014
Checked by: BJR 12/1/2014

TABLE A-9
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - MAXIMUM GROUNDWATER ALL DEPTHS AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0007	mg/l	NC		NC			1.1E-07	mg/kg/day	2.0E+00	mg/kg/day	5.E-08
				1,1-Dichloroethene	0.0005	mg/l	NC		NC			7.8E-08	mg/kg/day	5.0E-02	mg/kg/day	2.E-06
				cis-1,2-Dichloroethene	0.009	mg/l	NC		NC			1.4E-06	mg/kg/day	2.0E-03	mg/kg/day	7.E-04
				Tetrachloroethene	0.0007	mg/l	1.9E-08	mg/kg/day	2.1E-03	mg/kg/day	4.E-11	1.1E-07	mg/kg/day	6.0E-03	mg/kg/day	2.E-05
				1,2-Dichloroethene (trans)	0.0033	mg/l	NC		NC			5.1E-07	mg/kg/day	2.0E-02	mg/kg/day	3.E-05
				Trichloroethene	0.021	mg/l	1.4E-06	mg/kg/day	4.6E-02	mg/kg/day	6.E-08	3.3E-06	mg/kg/day	5.0E-04	mg/kg/day	7.E-03
				Vinyl chloride	0.0039	mg/l	1.0E-07	mg/kg/day	1.4E+00	mg/kg/day	1.E-07	6.1E-07	mg/kg/day	3.0E-03	mg/kg/day	2.E-04
			EXPOSURE ROUTE TOTAL								2.E-07					7.E-03
			DERMAL	1,1,1-Trichloroethane	0.0007	mg/l	NC		NC			4.2E-07	mg/kg/day	2.0E+00	mg/kg/day	2.E-07
				1,1-Dichloroethene	0.0005	mg/l	NC		NC			2.2E-07	mg/kg/day	5.0E-02	mg/kg/day	4.E-06
				cis-1,2-Dichloroethene	0.009	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0007	mg/l	2.3E-07	mg/kg/day	2.1E-03	mg/kg/day	5.E-10	1.4E-06	mg/kg/day	6.0E-03	mg/kg/day	2.E-04
				1,2-Dichloroethene (trans)	0.0033	mg/l	NC		NC			--		2.0E-02	mg/kg/day	
				Trichloroethene	0.021	mg/l	4.9E-06	mg/kg/day	4.6E-02	mg/kg/day	2.E-07	1.1E-05	mg/kg/day	5.0E-04	mg/kg/day	2.E-02
				Vinyl chloride	0.0039	mg/l	1.2E-07	mg/kg/day	1.4E+00	mg/kg/day	2.E-07	7.1E-07	mg/kg/day	3.0E-03	mg/kg/day	2.E-04
			EXPOSURE ROUTE TOTAL								4.E-07					2.E-02
		EXPOSURE POINT TOTAL									6.E-07					3.E-02
	EXPOSURE MEDIUM TOTAL										6.E-07					3.E-02
SURFACE WATER TOTAL											**6.E-07**					**3.E-02**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											6.E-07					**3.E-02**

NOTES:
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: BJR 11/25/2014
Checked by: LCG 11/25/2014

TABLE A-10
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS -- REASONABLE MAXIMUM EXPOSURE - MAXIMUM GROUNDWATER ALL DEPTHS AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	CHEMICAL	EPC		CANCER RISK CALCULATIONS					NON-CANCER HAZARD CALCULATIONS				
					VALUE	UNITS	INTAKE/EXPOSURE CONCENTRATION		CSF/UNIT RISK		CANCER RISK	INTAKE/EXPOSURE CONCENTRATION		RfD/RfC (1)		HAZARD QUOTIENT
							VALUE	UNITS	VALUE	UNITS		VALUE	UNITS	VALUE	UNITS	
SURFACE WATER	SURFACE WATER	OUTER COVE	INGESTION	1,1,1-Trichloroethane	0.0007	mg/l	NC		NC			7.0E-08	mg/kg/day	2.0E+00	mg/kg/day	3.E-08
				1,1-Dichloroethene	0.0005	mg/l	NC		NC			5.0E-08	mg/kg/day	5.0E-02	mg/kg/day	1.E-06
				cis-1,2-Dichloroethene	0.009	mg/l	NC		NC			9.0E-07	mg/kg/day	2.0E-03	mg/kg/day	4.E-04
				Tetrachloroethene	0.0007	mg/l	1.2E-08	mg/kg/day	2.1E-03	mg/kg/day	3.E-11	7.0E-08	mg/kg/day	6.0E-03	mg/kg/day	1.E-05
				1,2-Dichloroethene (trans)	0.0033	mg/l	NC		NC			3.3E-07	mg/kg/day	2.0E-02	mg/kg/day	2.E-05
				Trichloroethene	0.021	mg/l	3.6E-07	mg/kg/day	4.6E-02	mg/kg/day	2.E-08	2.1E-06	mg/kg/day	5.0E-04	mg/kg/day	4.E-03
				Vinyl chloride	0.0039	mg/l	6.7E-08	mg/kg/day	1.4E+00	mg/kg/day	9.E-08	3.9E-07	mg/kg/day	3.0E-03	mg/kg/day	1.E-04
			EXPOSURE ROUTE TOTAL								1.E-07					5.E-03
			DERMAL	1,1,1-Trichloroethane	0.0007	mg/l	NC		NC			3.7E-07	mg/kg/day	2.0E+00	mg/kg/day	2.E-07
				1,1-Dichloroethene	0.0005	mg/l	NC		NC			2.0E-07	mg/kg/day	5.0E-02	mg/kg/day	4.E-06
				cis-1,2-Dichloroethene	0.009	mg/l	NC		NC			--		2.0E-03	mg/kg/day	
				Tetrachloroethene	0.0007	mg/l	2.0E-07	mg/kg/day	2.1E-03	mg/kg/day	4.E-10	1.2E-06	mg/kg/day	6.0E-03	mg/kg/day	2.E-04
				1,2-Dichloroethene (trans)	0.0033	mg/l	NC		NC			--		2.0E-02	mg/kg/day	
				Trichloroethene	0.021	mg/l	1.7E-06	mg/kg/day	4.6E-02	mg/kg/day	8.E-08	1.0E-05	mg/kg/day	5.0E-04	mg/kg/day	2.E-02
				Vinyl chloride	0.0039	mg/l	1.1E-07	mg/kg/day	1.4E+00	mg/kg/day	1.E-07	6.2E-07	mg/kg/day	3.0E-03	mg/kg/day	2.E-04
			EXPOSURE ROUTE TOTAL								2.E-07					2.E-02
		EXPOSURE POINT TOTAL									3.E-07					3.E-02
	EXPOSURE MEDIUM TOTAL										3.E-07					3.E-02
SURFACE WATER TOTAL											**3.E-07**					**3.E-02**
											TOTAL RECEPTOR RISK ACROSS ALL MEDIA					**TOTAL RECEPTOR HAZARD ACROSS ALL MEDIA**
											3.E-07					**3.E-02**

NOTES:
(1) - Blank cells indicate that an RfD or RfC is not avalailable from the sources used to obtain dose-response data for this risk assessment.
NC - Not carcinogenic by this exposure route.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

ATTACHMENT B - RISK CALCULATIONS
(RAGS PART D TABLE 9s)

TABLE B-1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT/CHILD
RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT/CHILD

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SEDIMENT	SEDIMENT	OUTER COVE	cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	4.6E-05	NA	--	4.6E-05
			Tetrachloroethene	1.8E-12	NA	--	NA	1.8E-12	Liver	8.3E-07	NA	--	8.3E-07
			Trichloroethene	9.0E-09	NA	--	NA	9.0E-09	Liver / Kidney	9.1E-04	NA	--	9.1E-04
			Benzo(a)anthracene	6.7E-08	NA	6.2E-08	NA	1.3E-07	Kidney	7.1E-06	NA	6.6E-06	1.4E-05
			Benzo(a)pyrene	8.4E-07	NA	7.8E-07	NA	1.6E-06	Kidney	8.9E-06	NA	8.3E-06	1.7E-05
			Benzo(b)fluoranthene	1.4E-07	NA	1.3E-07	NA	2.6E-07	Kidney	1.5E-05	NA	1.4E-05	2.8E-05
			Dibenzo(a,h)anthracene	7.8E-08	NA	7.3E-08	NA	1.5E-07	Kidney	8.4E-07	NA	7.8E-07	1.6E-06
			Indeno(1,2,3-cd)pyrene	2.5E-08	NA	2.3E-08	NA	4.9E-08	Kidney	2.7E-06	NA	2.5E-06	5.2E-06
			Dioxin TEQ (USEPA, 2010)	6.9E-09	NA	1.5E-09	NA	8.4E-09	Reproductive / Endocrine	4.4E-04	NA	9.5E-05	5.4E-04
			Arsenic	4.8E-07	NA	1.7E-07	NA	6.6E-07	Skin / Hematological	6.3E-03	NA	2.2E-03	8.5E-03
			Chromium	NC	NA	NC	NA		NOAEL	1.1E-06	NA	--	1.1E-06
			Copper	NC	NA	NC	NA		Undetermined	5.6E-05	NA	--	5.6E-05
			Lead	NC	NA	NC	NA			--	NA	--	
			Nickel	NC	NA	NC	NA		General Toxicity	1.6E-04	NA	--	1.6E-04
												--	
			CHEMICAL TOTAL	1.6E-06	--	1.2E-06	--	3E-06		7.9E-03	--	2.4E-03	1E-02
			RADIONUCLIDE TOTAL										
		EXPOSURE POINT TOTAL						3E-06					1E-02
	EXPOSURE MEDIUM TOTAL							3E-06					1E-02
RECEPTOR TOTAL								**3E-06**					**1E-02**
							TOTAL RISK ACROSS ALL MEDIA	**3E-06**	**TOTAL HAZARD ACROSS ALL MEDIA**				**1E-02**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/2/2014
Checked by: BJR 12/7/2014

TOTAL GENERAL TOXICITY HI =	**1.6E-04**
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	--
	--
	--
	--
	--
	--
TOTAL KIDNEY HI =	**9.8E-04**
TOTAL LIVER HI =	**9.1E-04**
	--
	--
TOTAL NOAEL HI =	**1.0E-04**
	--
	--
	--

TABLE B-2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM - SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SEDIMENT	SEDIMENT	OUTER COVE	cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	3.0E-05	NA	--	3.0E-05
			Tetrachloroethene	1.2E-12	NA	--	NA	1.2E-12	Liver	5.4E-07	NA	--	5.4E-07
			Trichloroethene	2.3E-09	NA	--	NA	2.3E-09	Liver / Kidney	5.9E-04	NA	--	5.9E-04
			Benzo(a)anthracene	1.7E-08	NA	7.6E-09	NA	2.5E-08	Kidney	4.6E-06	NA	2.0E-06	6.6E-06
			Benzo(a)pyrene	2.2E-07	NA	9.5E-08	NA	3.1E-07	Kidney	5.7E-06	NA	2.5E-06	8.3E-06
			Benzo(b)fluoranthene	3.5E-08	NA	1.6E-08	NA	5.1E-08	Kidney	9.4E-06	NA	4.1E-06	1.4E-05
			Dibenzo(a,h)anthracene	2.0E-08	NA	8.9E-09	NA	2.9E-08	Kidney	5.4E-07	NA	2.4E-07	7.7E-07
			Indeno(1,2,3-cd)pyrene	6.5E-09	NA	2.9E-09	NA	9.3E-09	Kidney	1.7E-06	NA	7.6E-07	2.5E-06
			Dioxin TEQ (USEPA, 2010)	4.4E-09	NA	4.5E-10	NA	4.9E-09	Reproductive / Endocrine	2.9E-04	NA	2.9E-05	3.1E-04
			Arsenic	3.1E-07	NA	5.3E-08	NA	3.6E-07	Skin / Hematological	4.0E-03	NA	6.9E-04	4.7E-03
			Chromium	NC	NA	NC	NA		NOAEL	7.1E-07	NA	--	7.1E-07
			Copper	NC	NA	NC	NA		Undetermined	3.6E-05	NA	--	3.6E-05
			Lead	NC	NA	NC	NA			--	NA	--	
			Nickel	NC	NA	NC	NA		General Toxicity	1.0E-04	NA	--	1.0E-04
												--	
			CHEMICAL TOTAL	6.1E-07	--	1.8E-07	--	8E-07		5.1E-03	--	7.3E-04	6E-03
			RADIONUCLIDE TOTAL										
		EXPOSURE POINT TOTAL						8E-07					6E-03
	EXPOSURE MEDIUM TOTAL							8E-07					6E-03
RECEPTOR TOTAL								**8E-07**					**6E-03**
							TOTAL RISK ACROSS ALL MEDIA	**8E-07**	**TOTAL HAZARD ACROSS ALL MEDIA**				**6E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/2/2014
Checked by: BJR 12/7/2014

TOTAL GENERAL TOXICITY HI =	**1.0E-04**
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	--
TOTAL KIDNEY HI =	**6.2E-04**
TOTAL LIVER HI =	**5.9E-04**
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	--
TOTAL NOAEL HI =	**6.6E-05**
	--
	--
	--

TABLE B-3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - OUTER COVE - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	OUTER COVE	cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	8.4E-04	NA	--	8.4E-04
			Trichloroethene	7.0E-09	NA	2.5E-08	NA	3.2E-08	Liver / Kidney	7.1E-04	NA	2.5E-03	3.2E-03
			CHEMICAL TOTAL	7.0E-09	--	2.5E-08	--	3E-08		1.6E-03	--	2.5E-03	4E-03
		EXPOSURE POINT TOTAL						3E-08					4E-03
	EXPOSURE MEDIUM TOTAL							3E-08					4E-03
RECEPTOR TOTAL								**3E-08**					**4E-03**
								TOTAL RISK ACROSS ALL MEDIA **3E-08**					**TOTAL HAZARD ACROSS ALL MEDIA** **4E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

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	--
	--
TOTAL KIDNEY HI =	**3.2E-03**
TOTAL LIVER HI =	**3.2E-03**
	--
	--
TOTAL NOAEL HI =	**8.4E-04**
	--
	--
	--

TABLE B-4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - OUTER COVE - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	OUTER COVE	cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	5.4E-04	NA	--	5.4E-04
			Trichloroethene	1.8E-09	NA	8.6E-09	NA	1.0E-08	Liver / Kidney	4.6E-04	NA	2.2E-03	2.6E-03
			CHEMICAL TOTAL	1.8E-09	--	8.6E-09	--	1E-08		1.0E-03	--	2.2E-03	3E-03
		EXPOSURE POINT TOTAL						1E-08					3E-03
	EXPOSURE MEDIUM TOTAL							1E-08					3E-03
RECEPTOR TOTAL								**1E-08**					**3E-03**
								TOTAL RISK ACROSS ALL MEDIA **1E-08**					**TOTAL HAZARD ACROSS ALL MEDIA** **3E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

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	--
	--
	--
	--
	--
TOTAL KIDNEY HI =	**2.6E-03**
TOTAL LIVER HI =	**2.6E-03**
	--
	--
TOTAL NOAEL HI =	**5.4E-04**
	--
	--
	--

TABLE B-5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - MAXIMUM INNER AND OUTER COVE SURFACE WATER - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	INNER/OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	1.4E-07	NA	5.4E-07	6.8E-07
			1,1-Dichloroethane	2.1E-10	NA	3.6E-10	NA	5.7E-10	Undetermined	1.1E-06	NA	1.8E-06	2.9E-06
			1,2,4-Trimethylbenzene	NC	NA	NC	NA		Undetermined	--	NA	--	
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	8.4E-04	NA	--	8.4E-04
			Ethylbenzene	NC	NA	NC	NA		Liver / Kidney	1.6E-06	NA	1.9E-05	2.1E-05
			Tetrachloroethene	6.7E-11	NA	8.4E-10	NA	9.1E-10	Liver	3.1E-05	NA	3.9E-04	4.2E-04
			Toluene	NC	NA	NC	NA		Kidney	8.3E-06	NA	6.2E-05	7.0E-05
			Trichloroethene	8.9E-09	NA	3.1E-08	NA	4.0E-08	Liver / Kidney	9.0E-04	NA	3.1E-03	4.0E-03
			Vinyl chloride	7.8E-08	NA	9.2E-08	NA	1.7E-07	Liver	1.1E-04	NA	1.3E-04	2.4E-04
			Xylenes, Total	NC	NA	NC	NA		General Toxicity	3.1E-06	NA	--	3.1E-06
			CHEMICAL TOTAL	8.7E-08	--	1.2E-07	--	2E-07		1.9E-03	--	3.7E-03	6E-03
		EXPOSURE POINT TOTAL						2E-07					6E-03
	EXPOSURE MEDIUM TOTAL							2E-07					6E-03

RECEPTOR TOTAL	**2E-07**		**6E-03**
TOTAL RISK ACROSS ALL MEDIA	**2E-07**	**TOTAL HAZARD ACROSS ALL MEDIA**	**6E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TOTAL GENERAL TOXICITY HI =	**3.1E-06**
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TOTAL KIDNEY HI =	**4.1E-03**
TOTAL LIVER HI =	**4.7E-03**
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TOTAL NOAEL HI =	**8.4E-04**
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TABLE B-6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - MAXIMUM INNER AND OUTER COVE SURFACE WATER - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	INNER/OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	9.0E-08	NA	4.7E-07	5.6E-07
			1,1-Dichloroethane	1.4E-10	NA	3.1E-10	NA	4.5E-10	Undetermined	7.0E-07	NA	1.6E-06	2.3E-06
			1,2,4-Trimethylbenzene	NC	NA	NC	NA		Undetermined	--	NA	--	
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	5.4E-04	NA	--	5.4E-04
			Ethylbenzene	NC	NA	NC	NA		Liver / Kidney	1.0E-06	NA	1.7E-05	1.8E-05
			Tetrachloroethene	4.3E-11	NA	7.4E-10	NA	7.8E-10	Liver	2.0E-05	NA	3.4E-04	3.6E-04
			Toluene	NC	NA	NC	NA		Kidney	5.4E-06	NA	5.4E-05	6.0E-05
			Trichloroethene	2.3E-09	NA	1.1E-08	NA	1.3E-08	Liver / Kidney	5.8E-04	NA	2.8E-03	3.3E-03
			Vinyl chloride	5.0E-08	NA	8.0E-08	NA	1.3E-07	Liver	7.0E-05	NA	1.1E-04	1.8E-04
			Xylenes, Total	NC	NA	NC	NA		General Toxicity	2.0E-06	NA	--	2.0E-06
			CHEMICAL TOTAL	5.3E-08	--	9.2E-08	--	1E-07		1.2E-03	--	3.3E-03	4E-03
		EXPOSURE POINT TOTAL						1E-07					4E-03
	EXPOSURE MEDIUM TOTAL							1E-07					4E-03

RECEPTOR TOTAL	**1E-07**		**4E-03**
TOTAL RISK ACROSS ALL MEDIA	**1E-07**	**TOTAL HAZARD ACROSS ALL MEDIA**	**4E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

TOTAL GENERAL TOXICITY HI =	**2.0E-06**
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TOTAL KIDNEY HI =	**3.4E-03**
TOTAL LIVER HI =	**3.9E-03**
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TOTAL NOAEL HI =	**5.4E-04**
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TABLE B-7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - SHALLOW GROUNDWATER AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE	SURFACE WATER	OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	3.9E-08	NA	1.5E-07	1.9E-07
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	5.4E-04	NA	--	5.4E-04
			Tetrachloroethene	3.9E-11	NA	4.9E-10	NA	5.3E-10	Liver	1.8E-05	NA	2.3E-04	2.4E-04
			Trichloroethene	3.1E-09	NA	1.1E-08	NA	1.4E-08	Liver / Kidney	3.1E-04	NA	1.1E-03	1.4E-03
			CHEMICAL TOTAL	3.1E-09	--	1.1E-08	--	1E-08		8.7E-04	--	1.3E-03	2E-03
		EXPOSURE POINT TOTAL						1E-08					2E-03
	EXPOSURE MEDIUM TOTAL							1E-08					2E-03
RECEPTOR TOTAL								**1E-08**					**2E-03**
								TOTAL RISK ACROSS ALL MEDIA **1E-08**					**TOTAL HAZARD ACROSS ALL MEDIA** **2E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: BJR 11/25/2014
Checked by: LCG 11/25/2014

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TOTAL KIDNEY HI =	**1.4E-03**
TOTAL LIVER HI =	**1.6E-03**
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TOTAL NOAEL HI =	**5.4E-04**
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TABLE B-8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - SHALLOW GROUNDWATER AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	2.5E-08	NA	1.3E-07	1.6E-07
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	3.5E-04	NA	--	3.5E-04
			Tetrachloroethene	2.5E-11	NA	4.3E-10	NA	4.5E-10	Liver	1.2E-05	NA	2.0E-04	2.1E-04
			Trichloroethene	7.9E-10	NA	3.7E-09	NA	4.5E-09	Liver / Kidney	2.0E-04	NA	9.5E-04	1.1E-03
			CHEMICAL TOTAL	8.1E-10	--	4.2E-09	--	5E-09		5.6E-04	--	1.1E-03	2E-03
		EXPOSURE POINT TOTAL						5E-09					2E-03
	EXPOSURE MEDIUM TOTAL							5E-09					2E-03

RECEPTOR TOTAL	**5E-09**		**2E-03**
TOTAL RISK ACROSS ALL MEDIA	**5E-09**	**TOTAL HAZARD ACROSS ALL MEDIA**	**2E-03**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/12014
Checked by: BJR 12/1/2014

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TOTAL KIDNEY HI =	**1.1E-03**
TOTAL LIVER HI =	**1.4E-03**
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TOTAL NOAEL HI =	**3.5E-04**
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TABLE B-9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - MAXIMUM GROUNDWATER ALL DEPTHS AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADOLESCENT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADOLESCENT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	5.4E-08	NA	2.1E-07	2.6E-07
			1,1-Dichloroethene	NC	NA	NC	NA		Liver	1.6E-06	NA	4.5E-06	6.0E-06
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	7.0E-04	NA	--	7.0E-04
			Tetrachloroethene	3.9E-11	NA	4.9E-10	NA	5.3E-10	Liver	1.8E-05	NA	2.3E-04	2.4E-04
			1,2-Dichloroethene (trans)	NC	NA	NC	NA		Liver	2.6E-05	NA	--	2.6E-05
			Trichloroethene	6.4E-08	NA	2.2E-07	NA	2.9E-07	Liver / Kidney	6.5E-03	NA	2.3E-02	2.9E-02
			Vinyl chloride	1.5E-07	NA	1.7E-07	NA	3.2E-07	Liver	2.0E-04	NA	2.4E-04	4.4E-04
			CHEMICAL TOTAL	2.1E-07	--	3.9E-07	--	6E-07		7.5E-03	--	2.3E-02	3E-02
		EXPOSURE POINT TOTAL						6E-07					3E-02
	EXPOSURE MEDIUM TOTAL							6E-07					3E-02

RECEPTOR TOTAL	**6E-07**		**3E-02**
TOTAL RISK ACROSS ALL MEDIA	**6E-07**	**TOTAL HAZARD ACROSS ALL MEDIA**	**3E-02**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: BJR 11/25/2014
Checked by: LCG 11/25/2014

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TOTAL KIDNEY HI =	**2.9E-02**
TOTAL LIVER HI =	**3.0E-02**
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TOTAL NOAEL HI =	**7.0E-04**
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TABLE B-10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - REASONABLE MAXIMUM EXPOSURE - MAXIMUM GROUNDWATER ALL DEPTHS AT DP-I - CURRENT/FUTURE - SITE VISITOR - ADULT
RISK ASSESSMENT MEMORANDUM – SIR RESPONSE TO COMMENTS
GORHAM
PROVIDENCE, RHODE ISLAND

SCENARIO TIMEFRAME: CURRENT/FUTURE
RECEPTOR POPULATION: SITE VISITOR
RECEPTOR AGE: ADULT

MEDIUM	EXPOSURE MEDIUM	EXPOSURE POINT	CHEMICAL	CARCINOGENIC RISK (1)					NON-CARCINOGENIC HAZARD QUOTIENT (1)				
				INGESTION	INHALATION	DERMAL	EXTERNAL (RADIATION)	EXPOSURE ROUTES TOTAL	PRIMARY TARGET ORGAN	INGESTION	INHALATION	DERMAL	EXPOSURE ROUTES TOTAL
SURFACE WATER	SURFACE WATER	OUTER COVE	1,1,1-Trichloroethane	NC	NA	NC	NA		Undetermined	3.5E-08	NA	1.8E-07	2.2E-07
			1,1-Dichloroethene	NC	NA	NC	NA		Liver	1.0E-06	NA	3.9E-06	4.9E-06
			cis-1,2-Dichloroethene	NC	NA	NC	NA		Undetermined	4.5E-04	NA	--	4.5E-04
			Tetrachloroethene	2.5E-11	NA	4.3E-10	NA	4.5E-10	Liver	1.2E-05	NA	2.0E-04	2.1E-04
			1,2-Dichloroethene (trans)	NC	NA	NC	NA		Liver	1.6E-05	NA	--	1.6E-05
			Trichloroethene	1.7E-08	NA	7.9E-08	NA	9.5E-08	Liver / Kidney	4.2E-03	NA	2.0E-02	2.4E-02
			Vinyl chloride	9.3E-08	NA	1.5E-07	NA	2.4E-07	Liver	1.3E-04	NA	2.1E-04	3.4E-04
			CHEMICAL TOTAL	1.1E-07	--	2.3E-07	--	3E-07		4.8E-03	--	2.0E-02	3E-02
		EXPOSURE POINT TOTAL						3E-07					3E-02
	EXPOSURE MEDIUM TOTAL							3E-07					3E-02

RECEPTOR TOTAL	**3E-07**		**3E-02**
TOTAL RISK ACROSS ALL MEDIA	**3E-07**	**TOTAL HAZARD ACROSS ALL MEDIA**	**3E-02**

NOTES:
NC - Not carcinogenic by this exposure route.
NA - Not applicable; exposure route not applicable for this chemical/exposure medium.
-- - Not calculated; dose-response data and/or dermal absorption values are not available.

Prepared by: LCG 12/1/2014
Checked by: BJR 12/1/2014

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TOTAL KIDNEY HI =	**2.4E-02**
TOTAL LIVER HI =	**2.5E-02**
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TOTAL NOAEL HI =	**4.5E-04**
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