GEI Consultants

NJIT New Jersey's Science & Technology University

Geotechnical
Environmental
Water Resources
Ecological

Technical Review of Proposed Remedial Action Work Plan

Parcel C, Former Gorham Site

425 Adelaide Avenue
Providence, Rhode Island

Submitted to:
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Abbreviations and Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
EJLRI	Environmental Justice League of Rhode Island
GEI	GEI Consultants, Inc.
GZA	GZA GeoEnvironmental, Inc.
NJIT	New Jersey Institute of Technology
NYSDOH	New York State Department of Health
PAHs	Polycyclic Aromatic Hydrocarbon
PCE	Tetrachloroethylene
PM_{10}	Particulate matter of less than 10 microns
RAWP	Remedial Action Work Plan
RDEC	Residential Direct Exposure Criteria
RIDEM	Rhode Island Department of Environmental Management
TAB	Technical Assistance to Brownfield
TCA	Trichloroethane
TCE	Trichloroethylene
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
VHB	Vanasse Hangan Brustlin, Inc.
VOCs	Volatile Organic Compounds

MEASUREMENTS

ppm	parts per million
ug/m^3	micrograms per cubic meter

1. Introduction

This report was prepared by GEI Consultants, Inc. (GEI) for the New Jersey Institute of Technology (NJIT) Technical Assistance to Brownfield (TAB) Communities program. The NJIT TAB program is a technical assistance program, funded through a grant provided by the United States Environmental Protection Agency (USEPA), which is intended to serve as an independent resource to communities and nonprofits attempting to cleanup and reclaim brownfields.

The report provides a technical review of current and proposed remedial actions at Parcel C, at Adelaide Avenue, Providence, Rhode Island (Site). Approximate boundaries of Parcel C are provided in Figure 1.

Elimination of human health exposures and productive reuse of this Site is the common goal of all parties involved in this Site. This Site has a complex history of industrial operation. This operation has left an environmental impact that has taken many years to characterize. For example, an investigation was recently completed that characterized the nature and extent of the groundwater plume on the Site. A brief summary of the current Site conditions is provided in the remainder of this section.

Assessment and characterization of environmental conditions of a Site such as this takes time and resources. The same is true for the approval and implementation of a successful remedial action. GEI has not reviewed any timelines for these proposed actions but anticipates that the approval and implementation of the remedial actions will take many months to complete.

With this in mind, GEI has reviewed current Site conditions and previous environmental reports to provide a summary of potential human exposure pathways associated with the current land use. GEI has also used as reference the Remediation Regulations set forth by the Rhode Island Department of Environmental Management (RIDEM), Office of Waste Management, amended in February 2004. Section 2 provides recommendations and cost effective measures that can be currently implemented to greatly reduce or eliminate these pathways.

The proposed Remedial Action Work Plan (RAWP) was submitted in August 2010 by Vanasse Hangan Brustlin, Inc. (VHB) on behalf of the Providence Redevelopment Authority. The plan is currently under review for approval by RIDEM.

The implementation of the remedial action will heighten some existing exposure pathways and introduce new exposure pathways. All of these exposure pathways can be reduced or eliminated through proper planning and on-site coordination. Section 3 provides anticipated human exposure pathways associated with the selected remedial action. Recommendations for addressing these pathways in the text of the RAWP and during the field activities are provided in Section 3.

Post-remediation is expected to remove or reduce current exposure pathways. However, long-term effectiveness of this remediation will be based on successful operations and maintenance of the Site. Section 4 provides a discussion and recommendations for actions to be taken following the implementation of the remedial measure.

A health consultation for the Site was conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) in August 2009. This report was reviewed by GEI and many of the issues identified in that report have been included in this report. Two important developments have occurred since the release of the ATSDR report. First, a remedial action plan has been developed for the Site. This remedial action proposes a low-impact development without buildings. The ATSDR report was based on an undetermined future land use. Second, an additional investigation designed to delineate the nature and extent of the Parcel C groundwater plume has been conducted. The ATSDR report was finalized prior to the groundwater plume being refined. Section 1.2 provides some of the findings of this investigation.

1.1 Background

The Site is located between Adelaide Avenue and Mashapaug Pond in the Reservoir Triangle neighborhood of Providence, Rhode Island (Figure 1). The former Gorham Property is listed as a "State Site" by the RIDEM (Case #97-030) and a USEPA Comprehensive Environmental Response, Compensation, and Liability Information System site by the USEPA Region I (EPA ID# RID982542318).

In 1990, the City of Providence foreclosed on the former Gorham Property. Textron was declared a "Responsible Party" under RIDEM's Remediation Regulations due to its former occupation of the Site. Textron committed to complete required remedial actions in a 1994 agreement with the City of Providence.

Since the transfer of the property to the City of Providence, the property has been divided into four distinct parcels as illustrated in Figure 1:

- Parcel A – Former location of a Stop and Shop Supermarket
- Parcel B – Alvarez High School

- Parcel C – Currently undeveloped but proposed to include parking and a green space
- Parcel D – Land adjoining Mashapaug Pond that is planned to be used by the City of Providence as a walking Trail.

Parcel C is a 5-acre portion of land located in the western area of the site, adjacent to the Alvarez High School (Parcel B). Former Site buildings were associated with storage operations at Gorham Silver and not used for production or manufacturing. Portions of the Site were used as a landfill to dispose of industrial waste.

In 2001, the buildings and structures on Parcel C were demolished [EA 2005]. Currently, the Site is surrounded by a locked, chain-link fence (GZA GeoEnvironmental, Inc. [GZA 2005a]). The parcel is undeveloped and plans for future development are provided in the August 2010 RAWP prepared by VHB.

1.2 Site Soils

The property is topographically flat and at an elevation of approximately 65 feet above mean sea level. Despite years of being undeveloped, the Site is only partially vegetated. This is the likely combination of soil composition and erosion.

Heterogeneous fill underlies most of the parcel. Reports indicate that the thickness of fill ranges from 2 to 27 feet, and that the fill is in a loose to medium state with no documentation that fill materials on the parcel have ever been compacted [GZA, 2005a].

Site assessments indicate fill was deposited gradually throughout the course of industrial activities and contain casting sands, construction, demolition, and miscellaneous debris such as fire bricks, wood beams, metal debris, pipes, cloth, glass, canisters, and crushed drums [GZA, 2005a].

Site soils contain several constituents of concern above RIDEM Method I Residential Direct Exposure Criteria (RDEC). These contaminants include:

- Polyaromatic hydrocarbons (PAHs) including anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd) pyrene;
- Metals including arsenic, cadmium, chromium, copper, lead, and silver; and
- Total petroleum hydrocarbons (TPH).

Volatile organic compounds (VOCs), primarily trichloroethylene and Freon, have been detected in soil gas beneath the central and northern areas of the Site. These detections appear consistent with recent delineation of the groundwater plume. It is likely the soil gas has been affected by volatilization of this contaminated groundwater.

A 2002 investigation conducted by GZA included 28 soil screening points throughout the Site for methane. Methane was detected in three of the samples; one of the samples exceeded lower explosive limits for methane. In the adjacent parcel, Alvarez High School, methane monitors are in place to monitor this explosive hazard. It is GEI's understanding that methane has not been detected at the school.

GZA reported that pre-existing underground storage tanks have been removed, and no additional tanks have been reported in or around Parcel C [GZA 2005a]. The ATSDR report notes that no documentation exists of the current nature of the fill material (e.g. presence of buried materials), which could be a continued source of subsurface soil and groundwater contamination [ATSDR, 2009].

A 1,000-cubic yard stockpile of unknown composition exists in the center of the Site. Concrete, wood, and other construction debris have been observed in the pile. In 2005, GZA collected a single composite sample from the top 12 inches of the stockpile. PAHs and TPH were detected at elevated concentrations. The sample was also analyzed for asbestos, which was not detected. No additional characterization of the stockpile has been performed.

1.3 Site Groundwater

RIDEM has classified the groundwater as Class GB: not suitable for public or private drinking water use. No public or private wells exist within a 4-mile radius of the Site, and the nearest public water supply is the Scituate Reservoir, located approximately nine miles to the west [Mactec, 2006]. A receptor survey was not provided to GEI for review. Without a receptor survey, additional groundwater use from irrigation or supply wells in the area can not be determined.

Groundwater investigation has been conducted throughout all four parcels since 2006 and has identified four distinct groundwater plumes:

- A former Building W tetrachloroethylene (PCE) release at the south end of Parcel A.
- A release immediately south of the retail building (Parcel A) of trichloroethylene (TCE) and trichloroethane (TCA).
- A PCE release immediately south of the retail building (Parcel A).
- A PCE release on Parcel C.

Based on discussions between Textron, Inc. and RIDEM, the Parcel C groundwater plume had not been fully delineated and additional investigation was necessary in order to complete the groundwater investigational activities at the Site [Mactec, 2010]. Mactec recently completed this investigation which was reviewed for this report. Appendix A contains copies

of Figures 2 through 10 of the report. GEI has reviewed these maps but has not validated their accuracy.

As part of the investigation, three shallow monitoring wells and three deeper wells were installed along the northern property boundary in the vicinity of the PCE plume. All six wells and five existing wells in the northern portion of Parcel C were gauged for groundwater depth. The depth to groundwater was observed to be approximately 19 to 25 feet below grade in the upland areas of Parcel C and 4 feet below grade along the bank of Mashapaug pond. Groundwater flow appears to be to the north-northeast toward the pond [Mactec, 2010].

Six newly installed monitoring wells and two existing monitoring wells located on Parcel C were sampled for VOCs. One existing well, MW-236S, contained TCE above GB criteria. None of the newly installed wells exceeded published RIDEM GB criteria (Mactec, 2010).

The review of the recent data suggests that the extent of both the shallow and deep groundwater plumes for Parcel C is limited to the northern portion of the parcel. The PCE plume appears to move to the northeast and vertically downward towards Mashapaug Cove. The TCE plume, likely a degradation product of PCE, appears in the same general configuration as the PCE plume but occupies a greater area of the deeper aquifer.

2. Current Land Use

2.1 Discussion of Potential Health Impacts

Table 1 provides GEI's prioritization of potential health risks by affected population associated with current conditions.

One of the highest identified priorities is the prevention of nearby residents to be directly exposed with contaminated groundwater. Published reports have indicated that municipal water is provided to the area. However, additional exposure to groundwater from irrigation or supply wells is possible. Identifying these uses, if they exist, is of highest importance.

Of nearly equal priority is the reduction of surface soil runoff through stormwater. The Site is flat, lacks stormwater management, and is only partially vegetated; likely the result of erosion. Alvarez High School is located directly east of Parcel C and is a sensitive receptor. Figure 1 provides an aerial photograph of the school configuration to Parcel C.

The eastern property boundary of Parcel C abuts the school building, landscaped areas, and parking lots. With the exception of the perimeter fence, no substantial physical barriers exist between the school and the Site. Therefore, during storm events, it is likely that polluted soil is conveyed through overland flow onto the adjacent school property. This runoff is likely to contain polluted soil that exceeds residential direct exposure levels presenting direct exposure pathways through ingestion, inhalation, and dermal absorption. There is similar, but reduced, concern for the residential properties located south of Adelaide Avenue. The vegetated buffer along the southern Site boundary and street curbing should greatly reduce soil erosion migrating to these properties. Silt fencing and/or hay bales placed, at a minimum, along the eastern Site boundary would be cost effective and should eliminate this concern.

Since the Site is only partially vegetated it is subject to wind erosion. Migration of fugitive dust from both the stockpile and surface soils has the potential to migrate off Site. Respirable dust, in addition to contaminants contained within the dust, presents a potential health threat to off-site receptors.

Currently, Site activities are minimal, which reduces dust generation. However, even modest vehicular traffic on the Site under certain condition is likely to cause off-site dust deposition. The most affected population would be the adjacent high school, and then the residential properties located to the south. Once again, the residential properties are likely protected

from the vegetative buffer located along the southern boundary. Filter fabric applied to the existing fence is common practice and would provide an effective barrier for fugitive dust emissions.

The stockpile, located in the center of the Site, is also subject to wind erosion and stormwater runoff as discussed above. In addition, the stockpile represents a potential obstacle to future redevelopment. The composition of the stockpile is unknown and reportedly contains large pieces of construction debris and other solid waste. These materials, along with contaminated soil, may not be suitable for reuse on Site as part of the proposed RAWP. The composition of the stockpile should be further characterized prior to initiating the RAWP.

Soil erosion of the stockpile can be relatively easily addressed by placing polyethylene sheeting over the stockpile. The stockpile is currently vegetated following many years of remaining uncovered. The vegetation would have to be removed as part of an interim remedial action, prior to covering and properly securing this stockpile.

Two additional receptors have a potential for direct exposure to Site soils: construction/ utility workers and trespassers. Presumably, the construction/utility worker would have authorized access to the Site while the trespasser would not. Exposure pathways for both receptors would include dermal absorption, inhalation, and ingestion. The duration of exposure for both receptors would be limited and, therefore, a lower priority. For the trespasser, maintenance of the existing fencing and expedited repair of fence breaks can greatly reduce this exposure.

For the construction/utility worker, exposure pathways can be reduced through proper personal protective equipment and personal air monitoring. Specifications for these activities could be mandated through a soil management plan which should be established for the Site. This type of plan has been described in the RAWP to be implemented in association with a land use restriction applied as part of post-remedial measures. However, a soil management plan can be instituted at any time and could prevent unnecessary worker exposure.

For the construction/utility worker there is a potential physical risk with methane concentrations in soil gas. Sparking tools and heavy machinery have the potential to ignite when methane concentrations exceed lower explosive levels. Previous investigations have detected methane concentrations in excess of lower explosive standards. As a precaution, real-time monitoring of methane should be conducted during any intrusive activities at the Site.

Exposure to soil vapor from the documented Parcel C plume was evaluated as part of this report. It should be noted that there are three additional plumes associated with the Gorham property that were outside the scope of this assessment.

The current and planned site use does not appear to present a complete exposure pathway to the soil vapors for the Parcel C plume for the following reasons.

- The on-Site plume appears to be confined to the northern property extent, migrating to Mashapaug Pond.
- Depth to groundwater is greater than 15 feet throughout most of the Site.
- The concentrations in the soil gas are relatively minor and will attenuate as they enter the atmosphere.
- No building structures are present for these vapors to accumulate.
- The property located immediately west of the Site, Alvarez High School, is currently under negative pressure through an active sub-slab depressurization system.

Regular groundwater monitoring of this plume should be performed to ensure the above conditions remain.

2.2 Recommendations

GEI recommends the following actions be taken prior to the initiation of the remedial actions:

- A comprehensive receptor survey within a specified distance (e.g., 1/4 mile) of the Site should be performed. The survey should include supply and irrigation wells in addition to potable wells.

- The current perimeter fencing should be improved. The fence should be visually inspected and maintained on a regular and consistent basis to restrict unauthorized entry. In addition, we recommend that fence fabric be placed to restrict the off-site migration of fugitive dust.

- If migration of stormwater is occurring along the eastern boundary with Parcel B, a silt fence and/or hay bales should be installed along the property boundary to prevent contamination from moving off the Site.

- The existing stockpile should be covered with polyethylene sheeting (6 mil or greater) and properly secured to mitigate dust emissions and prevent contaminant migration. As an interim remedial measure, the stockpile should be fully characterized to assess its suitability for on-Site reuse from both geotechnical and environmental considerations.

- A soil management plan should be implemented and available for the all contractors conducting work on the Site. The plan should include appropriate personal protective equipment and air monitoring which includes respirable dust and real-time gas meter readings that include monitoring of explosive limits calibrated to detect methane.

- On-Site monitoring wells should be continually monitored to understand temporal and spatial changes in groundwater flow and contaminant migration.

3. Proposed Remedial Action Work Plan

3.1 Discussion of Potential Health Impacts Associated with the Remedial Action Work Plan

The RAWP includes remedial strategies to address RIDEM Method I exceedances detected at the Site. The proposed RAWP and future land use address many of the exposure pathways identified for the Site. Although the RAWP does not provide a timetable, the scope of the project suggests the remediation will take several months. If not properly planned, these activities could increase the likelihood of some of the complete exposure pathways identified with the current conditions and introduce new ones. Site controls and proper staging can reduce or eliminate these risks. Table 1 provides a summary of potential exposure pathways identified based on the proposed RAWP.

The RAWP states that VOCs in the groundwater exceed RIDEM's GB Groundwater Objectives. This is confirmed by the most recent groundwater sampling which indicated TCE in one existing well exceeded the standards. The RAWP further states that Textron has undertaken an in-situ treatment and groundwater monitoring program to address these exceedances. GEI was not provided any documentation that in-situ treatment has been performed on the Parcel C groundwater plume. Furthermore, the RAWP specifies that groundwater monitoring wells located within the landscaped areas will be decommissioned. The specific wells were not identified. This raises the following concerns:

- Removing monitoring wells may greatly reduce the ability to characterize the groundwater plume.
- Textron may require additional monitoring, remediation, or injection wells after implementation of the RAWP. These wells will likely disturb both the geotextile or clean fill layer as well as the Site grading.
- The groundwater remedial efforts are not being coordinated between the City and Textron.

The remedial action is focused largely on removing direct exposure to contaminated soils. The plan includes construction of an asphalt cap, 1 foot of clean soil overlying a geotextile fabric, or 2 feet of clean fill. The RAWP includes a schematic of the asphalt parking lot, landscaped and vegetative areas, and site grading following the completed remedial action. It is unclear how the final grading compares to current conditions. GEI recommends that the RAWP provide volume estimates of the amount of material that can be reused on Site and volume estimates for clean fill to meet the necessary barrier requirements.

The RAWP does not include specifications for minimal compaction rates. Compaction rates establish a standard for soil compaction to be performed during the remedial action and are critical to the long-term effectiveness of the project. As part of the discussion of compaction, specifications should be provided to determine suitable re-use of soils. This is especially important when assessing the re-use of the materials contained in the existing stockpile. Finally, the plan should include specifications for the removal of surplus regulated soil.

Current Site activities are minimal. The implementation of the RAWP will necessitate soil disturbance and heavy traffic. Without precautions, these activities will increase fugitive dust. The RAWP specifies that dust control measures include twice daily water spraying when needed during development activities. While this method may be sufficient, we recommend an additional precaution of monitoring dust concentration on the Site perimeter. Real-time monitoring of particulate matter of less than 10 microns (PM_{10}) is relatively inexpensive and can provide quantitative assurance that the dust is not migrating off Site.

Action limits and corrective measures of both dust and volatile organic concentrations should be outlined in the RAWP by a fugitive emissions control plan. A fugitive emissions control plan requires real-time monitoring for particulates (i.e. dust) and VOCs at the downwind perimeter when certain activities are in progress at contaminated sites. The plan is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities.

Portable dust monitoring stations should be established at upwind and downwind locations and relocated on a regular basis as wind direction changes. Monitoring equipment should be equipped with alarms to indicate when Site-specific action levels are exceeded. Reporting requirements to RIDEM should also be specified.

The New York State Department of Health (NYSDOH) included these recommendations for particulate measurement in their Generic Community Air Monitoring Plan (2000):

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$above the upwind level, work must be stopped and a

re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

GEI recommends that VOC concentrations are monitored in 15-minutes running averages. The NYSDOH included these recommendations for VOC measurement in their Generic Community Air Monitoring Plan (2000):

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for RIDEM personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

It is assumed that the remedial action will require segregation of clean imported soils and reused polluted soils by means of stockpiling. A description of how this is to be performed is provided in draft Soil Management Plan as an appendix to the RAWP. However, we suggest specification should be provided in the RAWP text which includes details for proper covering and placement of temporarily stockpiled regulated soils and segregation from clean fill material to prevent cross contamination. In addition, the RAWP should specify physical barriers such as filter fabric to be placed along the property perimeter to eliminate fugitive dust.

The construction activities will also increase soil erosion. The RAWP indicates the Contractor will submit an Erosion and Sediment Control Plan and Construction Stormwater Pollution Plan. The RAWP should provide minimal design details that must be included in these plans. In addition, the RAWP should specify the approval process for these plans.

Construction activities will also require trucks entering and leaving the property. Without controls, these trucks are likely to track soils off Site. The RAWP indicates that the Site Contractor will be responsible for dirt containment and traffic control. We recommend that the RAWP be amended to include specific requirements for proposed truck routes, traffic control, and vehicle anti-tracking/decontamination controls. The RAWP should include specifications for truck washing activities and disposal of rinse water. We further recommend that the RAWP include a description of the approval process for the Contractor's dirt containment and traffic control plans.

The RAWP states that the contractor will provide a health and safety plan. The RAWP provides a site-specific contingency plan. This plan provides action levels for VOCs and PM_{10} concentrations. However, the RAWP does not specify personal air monitoring. GEI recommends that personal air monitoring is specified in the RAWP for all site workers during soil disturbing activities. We further recommend that monitoring of methane concentrations be specified during all intrusive construction activities.

3.2 Recommendations

GEI recommends that the RAWP is amended to include specifications for the following activities:

- Anticipated volumes of materials that can be reused on Site and volumes of imported clean soil.
- Cross-sections providing current and future site grading. Additional stormwater management activities should be outlined in the RAWP.
- Real-time dust monitoring with established action limits and corrective actions specified and approved prior to initiating site intrusive activities.
- Filter fabric for fences and silt fencing and/or hay bales for sediment control.
- Personal air monitoring requirements for all on-site workers during intrusive activities.
- Truck anti-tracking controls, traffic control and routes.
- Stockpiling requirements to outline soil management techniques to outline soil segregation of clean and regulated soils.
- Compaction rates and minimal requirements for reuse of on-site soil. These minimal requirements should include specifications for material sizes (e.g. material less than 2 inches in length), types of materials (e.g. wood and concrete should be removed), and grain size (e.g. clay soils to not be removed).

- Identify monitoring wells to be decommissioned, evaluate appropriateness of decommissioning these wells, and include a description of post-remediation groundwater monitoring activities.

4. Future Land Use Following Remedial Action

The proposed reuse of the Site for parking and open space removes most of the potential exposure pathways. Also, the remediation is relatively straightforward, cost-effective, and requires comparatively little future operations and maintenance. However, some operations and maintenance will be required and may determine the ultimate success of the remediation. Proper planning and consideration, prior to initiation of the RAWP, will be more cost effective in the long term.

4.1 Discussion of Potential Health Impacts Associated with the Final Remedial Design

As discussed in the previous section, the remediation of the VOC plume located in the north and western portion of the Parcel is not directly addressed as part of the RAWP. Instead, it is stated that in-situ treatment and monitoring will be conducted by Textron. The scope of this treatment and monitoring is unclear. The anticipated groundwater treatment and remediation should be discussed and understood in advanced of the remedial action since it could adversely affect the final remedial design. For example, installation of injection or recovery wells through the geotextile membrane will remove the effectiveness of the barrier. The RAWP discusses the possibility of decommissioning wells but does not provide further clarification. Post-remediation monitoring will likely require all of the existing wells and may require additional wells to monitor the groundwater plume. Planning these types of activities in advance will reduce the risk of costly reverse engineering.

A second concern with the final design is stormwater management. It is assumed from review of the RAWP that stormwater would either infiltrate on site or move through sheet flow over the graded surface towards Mashapaug Cove. It was not clear if the central and southern portions of the Site would be seeded. Over time, if the Site was not compacted properly or if grading is not uniform, the upper clean fill layer and vegetation may be washed away removing the protective barrier.

A similar concern involves the asphalt parking lot. Over time, asphalt caps crack and need repair. This process is sped up if the underlying surface is not compacted properly. This further stresses the need for minimum compaction rates to be specified in the RAWP.

The RAWP provides a description of long-term management provisions which include an environmental land use restriction, annual inspections, and soil management plan. Absent from the discussion were provisions for financial assurity to fund future monitoring and maintenance activities. It is not clear whether financial assurity will be required for this Site.

Financial assurity is typically required for similar projects in Connecticut and New York to make sure that maintenance is adequately funded into the future.

The completion of the RAWP will provide access to Parcel C which is currently prevented. The productive reuse of this property would be a positive development. The RAWP indicates that perimeter fencing will still be provided around the Site. However, if the perimeter fencing is not maintained, it could provide access to Parcel D which still requires investigation and remediation.

With proper maintenance, access to Parcel D will be restricted and should not pose additional health risks. GEI recommends that the RAWP provide specifics on maintenance of perimeter fencing:

- Phone number and name of person or department for the public to contact regarding maintenance issues.
- Perimeter signs should be printed in both English and Spanish and contain contact information as well as state potential health risks.
- Timetable for addressing maintenance issues should be provided. For example, breaks in the fencing should be fixed within 14 days of initial call.

4.2 Recommendations

GEI recommends that the RAWP is amended to include specifications for the following activities:

- Design integration with future groundwater remediation efforts.
- Stormwater management.
- Funding for long-term maintenance (e.g. financial assurity).
- Maintenance of perimeter fencing including phone number and person/department for the public to contact about maintenance issues.
- The locations and types of signs around the perimeter and the requirement that they are provided in both English and Spanish.

5. Conclusions

Elimination of human health exposures and productive reuse of this Site is the common goal of all parties involved in this Site. The proposed reuse of the property, as described in the RAWP, is a positive step toward this goal. Remediation of the Site requires regulatory, financial, and technical coordination.

It is recommended that existing health concerns at the Site are addressed as an interim measure prior to the initiation of the remedial activities. These interim measures are cost-effective and protective of human health. Many of these recommendations overlap with recommendations for implementation of the RAWP.

The recommendations provided for the implementation of the RAWP and post remediation are largely clarifications or additional specifications to be stipulated in the RAWP. Project delays and added costs can be avoided by addressing these issues while remaining protective of human health.

References

ATSDR, 2006. Agency for Toxic Substances and Disease Registry, 2006. Providence High School Parcel B Health Consultation. Atlanta: US Department of Health and Human Services.

ATSDR, 2009. Agency for Toxic Substances and Disease Registry. 2009. Health Consultation, Parcel C (aka Former Gorham Site). Atlanta: US Department of Health and Human Services.

GZA GeoEnvironmental, Inc. 2002. Site investigation report-additional assessment tasks, Providence YMA-Parcel C.

GZA GeoEnvironmental, Inc. 2005a. Remedial action work plan Providence YMCA-Parcel C.

GZA GeoEnvironmental, Inc. 2005b. Addendum to remedial action work plan, Providence YMCA-Parcel C (stockpile sampling).

GZA GeoEnvironmental, Inc. 2006. Sampling and analysis plan former Gorham property-Parcel C.

Harding ESE. 2001. Remedial Action Work Plan.

Mactec Engineering and Consulting. 2006. Data Summary Report, Parcel C, Groundwater Investigation.

New York State Department of Health. 2000. Generic Community Air Monitoring Plan.

Rhode Island Department of Environmental Management, 2004. Remediation Regulations. Office of Waste Management.

Table

Table 1
Summary of Potential Human Health Risks
Parcel C, Former Gorham Manufacturing Site
425 Adelaide Avenue
Providence, Rhode Island

Potentially Exposed Population	Exposure Route, Medium, and Exposure Point	Constituents of Concern	Anticipated Priority	Notes and Recommendations
Current Land Use				
Residents	Dermal contact and inhalation to contaminated groundwater from irrigation wells.	Volatile organic compounds and metals.	**Moderate to High.** Previous investigations have indicated that potable wells are not present within four miles of the site. However, to our understanding, the existence of irrigation wells have not been identified.	**Recommendation**: We recommend a receptor survey is performed that focuses on the presence of any wells (e.g. irrigation or otherwise) within a specified radius of the property.
Residents and school children	Inhalation of constituents of concern from fugitive dust emissions from surface soils.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low**. The site contains a fence, locked gate, and warning signs that limit access. Site is partially vegetated which stabilizes the soil and reduces fugitive dust.	**Recommendation:** The fence should be visually inspected and maintained to restrict unauthorized entry. In addition, we recommend that fence fabric be placed to restrict the migration of fugitive dust off site.
	Inhalation of constituents of concern from fugitive dust emissions from 1,000 cubic yard stockpile.	Polyaromatic hydrocarbons and petroleum hydrocarbons.	**Low**. The stockpile is partially vegetated which stabilizes the soil. The stockpile is located in the center of the Site reducing the likelihood of dust migration. One composite sample was collected in 2005 that indicated elevated concentrations of polyaromatic hydrocarbons and total petroleum hydrocarbons.	**Recommendation:** We recommend the stockpile is covered with polyethylene sheeting (6 mil or greater) and properly secured to mitigate dust emissions and prevent contaminant migration. The proposed remedial action work plan indicates this stockpile will be included in site grading and placed below the clean fill. We recommend the pile is fully characterized to assess its suitability for on-Site reuse from both geotechnical and environmental considerations.
	Inhalation of organic vapors volatilized from groundwater contamination.	Volatile organic compounds and freon.	**Low**. There are currently no on-site buildings. The school adjacent to the site operates under negative pressure (sub-slab depressurization system). Groundwater migration from the site is to the north - northwest away from residential properties. Depth to groundwater is over 20 feet below grade reducing volatilization pathways.	**Recommendation**: On-site monitoring wells should be continually monitored to understand temporal and spatial changes in groundwater flow and contaminant migration.
	Direct exposure to soils washed from surface runoff.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low to Moderate**. Surface soils may migrate during storm events and wash towards Parcel B (High School).	**Recommendation:** Silt fencing along the eastern property boundary would prevent off-site stormwater migration of sediments to the school properties. This could be a temporary measure until remedial activities begin.
Industrial/ Construction Worker	Explosive hazard with methane concentrations in soil vapor.	Methane.	**Low**. One previous sample indicated that methane concentrations exceed lower explosive limits (>5 %). Methane screening data are not current.	**Recommendation:** We recommend that all construction/utility work performed on the Site include real-time gas meter readings that include monitoring of explosive limits calibrated to detect methane.
	Ingestion and inhalation with chemicals of potential concern in shallow and subsurface soil (to depths of 6 feet).	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low to Moderate**. There is a potentially complete pathway through Ingestion and inhalation of contaminated during utility installation. The physical location of the site reduces the likelihood of utility trenching activities.	A soil management plan and land use restriction for the parcel would provide guidance for industrial/construction worker operations. These activities are planned under the proposed remedial action work plan.
Trespasser	Ingestion and inhalation of chemicals of potential concern in shallow soil on the site.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low**. The 2009 Agency for Toxic Substances and Disease Registry report indicated that trespassers have occupied the site. The gate contains breaks that do not completely restrict access to the property. It is unlikely that a trespasser has occupied the Site for extended periods of time.	**Recommendation:** The fence should be visually inspected and maintained to restrict unauthorized entry.

Table 1
Summary of Potential Human Health Risks
Parcel C, Former Gorham Manufacturing Site
425 Adelaide Avenue
Providence, Rhode Island

Potentially Exposed Population	Exposure Route, Medium, and Exposure Point	Constituents of Concern	Anticipated Priority	Notes and Recommendations
During Proposed Remedial Action as described in the VHB Remedial Action Work Plan, dated August 2010				
Residents and school children	Direct exposure to soils washed from surface runoff.	Polyaromatic hydrocarbons and petroleum.	**Moderate**. Disturbance of the soil will increase erosion and sedimentation.	The Erosion and Sediment Control Plan and Construction Stormwater Pollution Plan, if adhered to, should eliminate this pathway.
	Inhalation of constituents of concern from fugitive dust emissions from surface soils.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Moderate**. Invasive activities including site grading and importation of fill will likely increase fugitive dust emissions.	**Recommendation:** We recommend perimeter dust monitoring to be performed during initiation of intrusive soil activities. In particular, monitoring of dust emissions at the parcel boundary with the school.
	Direct exposure to soils tracked off-site from construction vehicles.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Moderate.** Tracking of soils off-site from construction activities.	**Recommendation:** The Remedial Action Work Plan should specify truck routes, traffic control, and anti-tracking/decontamination procedures.
Industrial/Construction Worker	Ingestion, dermal contact, inhalation with chemicals of potential concern in shallow and subsurface soil (to depths of 6 feet).	Polyaromatic hydrocarbons, volatile organics, and metals.	**Moderate**. Ingestion and inhalation is possible during construction.	**Recommendation:** Work space monitoring should be performed. All contractors on-site should read and adhere to health and safety plans.
	Explosive hazard with methane concentrations in soil vapor.	Methane.	**Low.** One previous sample indicated that methane concentrations exceed lower explosive limits. Further delineation of methane concentrations have not been performed.	**Recommendation:** Work space monitoring for methane should be performed. All contractors on-site should read and adhere to health and safety plans.
Trespasser	Ingestion and inhalation of chemicals of potential concern in shallow soil on the Site.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low**. Construction activities can become an attractive nuisance and may increase site trespassing.	The remedial action plan includes daily shut-down procedures and off-hour access control that should be followed.
Future Land Use following planned remedial action described in VHB Remedial Action Work Plan, dated August 2010				
Residents and school children	Ingestion and exposure to chemicals of concern in sediment and surface water in Mashapaug Pond.	Volatile organic compounds, specifically trichloroethylene, freon, and vinyl chloride.	**Low**. Current remedial action plan indicates fencing will be placed around the parcel.	**Recommendation**: The fencing around the property should be regularly inspected until Parcel D is fully characterized and remediated. The remedial action plan should specify how the site perimeter controls are maintained and inspected.
	Direct exposure to soils washed from surface runoff.	Polyaromatic hydrocarbons and petroleum.	**Moderate.** Planned site grading is away from Parcel D and towards the Pond. No stormwater runoff.	Maintenance of site grading, seeding, and vegetation must continue as part of long-term maintenance.
	Inhalation of constituents of concern from fugitive dust emissions from surface soils.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low**. The remedial action includes placing an asphalt cap and placement of clean fill.	**Recommendation:** The remedial action work should specify compaction rates for the asphalt cap to ensure proper long-term function. The remedial action work plan should also provide specific detail for financial assurance and annual inspection requirements.
Industrial/Construction Worker	Ingestion, dermal contact, inhalation with chemicals of potential concern in shallow and subsurface soil (to depths of 6 feet).	Polyaromatic hydrocarbons, volatile organics, and metals.	**Moderate**. Ingestion and inhalation is possible during construction.	**Recommendation:** Work space monitoring for volatile organic vapors should be performed. All contractors on-site should read and adhere to health and safety plans.
Trespasser	Ingestion and inhalation of chemicals of potential concern in shallow soil (less than 12 inches below grade) on the site.	Polyaromatic hydrocarbons, volatile organics, and metals.	**Low**. Current remedial action plan indicates fencing will be placed around the parcel.	**Recommendation:** The fencing around the property should be regularly inspected and maintained.

Figure

SOURCES:

1. AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH ©2009, ACCESSED ON 10/07/10.
2. *FIGURE 2: GROUNDWATER, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS* FROM *DATA SUMMARY REPORT, PARCEL C GROUNDWATER INVESTIGATION, FORMER GORHAM MANUFACTURING FACILITY,* PREPARED BY MACTEC, DATE: 9/28/10.
3. *FIGURE 1: GORHAM SILVER SITE, PROVIDENCE, RHODE ISLAND,* PREPARED BY ATSDR, UNDATED.

0 250 500

SCALE, FEET

PARCEL C, FORMER GORHAM SITE
425 ADELAIDE AVENUE
PROVIDENCE, RHODE ISLAND

ENVIRONMENTAL JUSTICE LEAGUE OF RHODE ISLAND
PROVIDENCE, RHODE ISLAND

GEI Consultants

Project 091940-1000

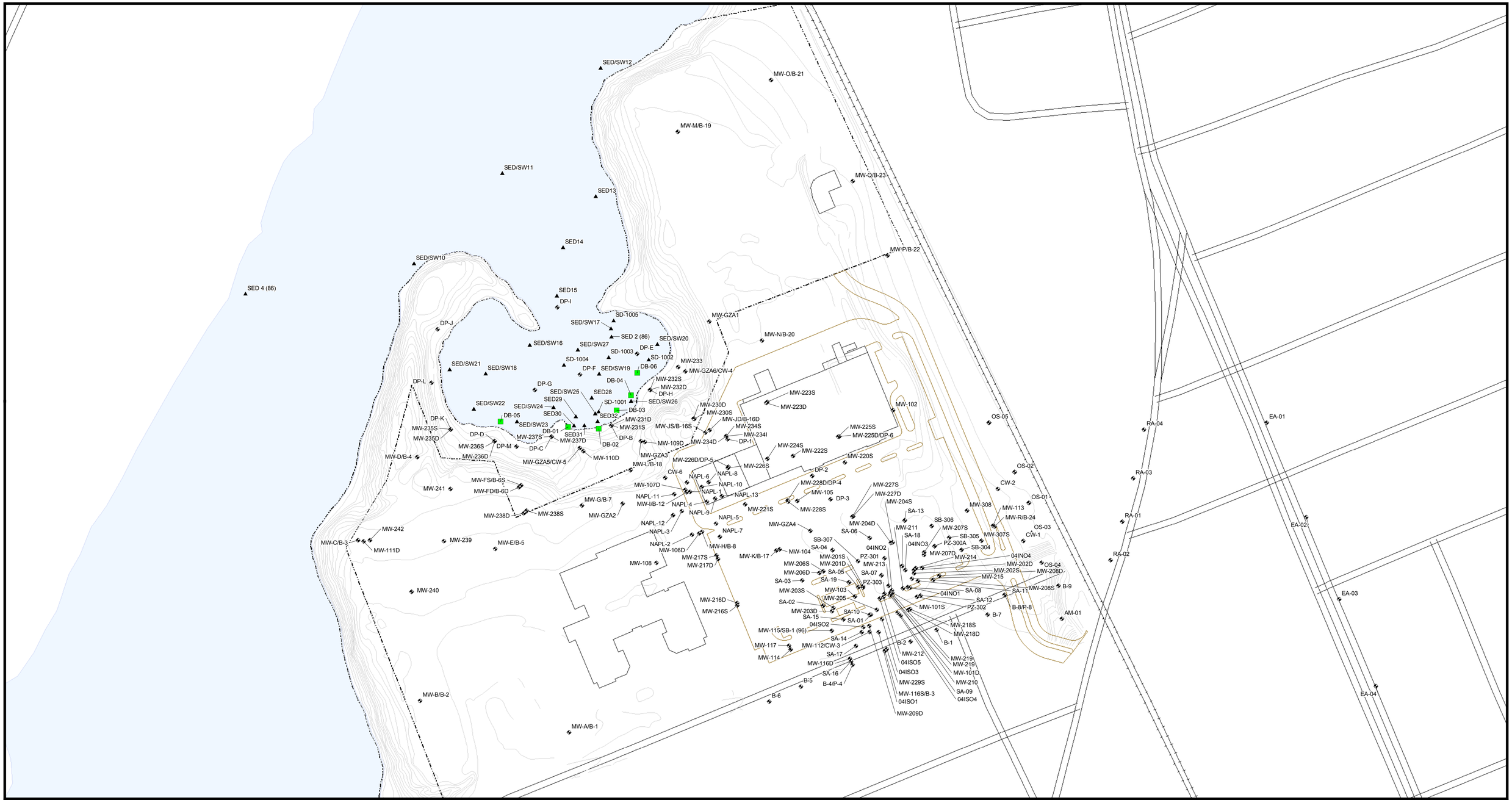
APPROXIMATE PARCEL DELINEATION OF GORHAM FACILITY

October 2010 Figure 1

I:\Project\EJL of RI\Gorham\091940\RAWP-Tech Review\Gorham-Parcel Delineation.dwg

Appendix A

Figures 2 through 10, Data Summary Report, Parcel C, Groundwater Investigation, prepared by Mactec on behalf of Textron



Legend

- Diffusion Bag Sample Point
- Sediment Sample Location
- Groundwater Sample Location
- Elevation Contour
- Railroad
- Pavement
- Park Parcel Boundary

0 50 100 Feet

N

Prepared by BJR | Checked by DEH

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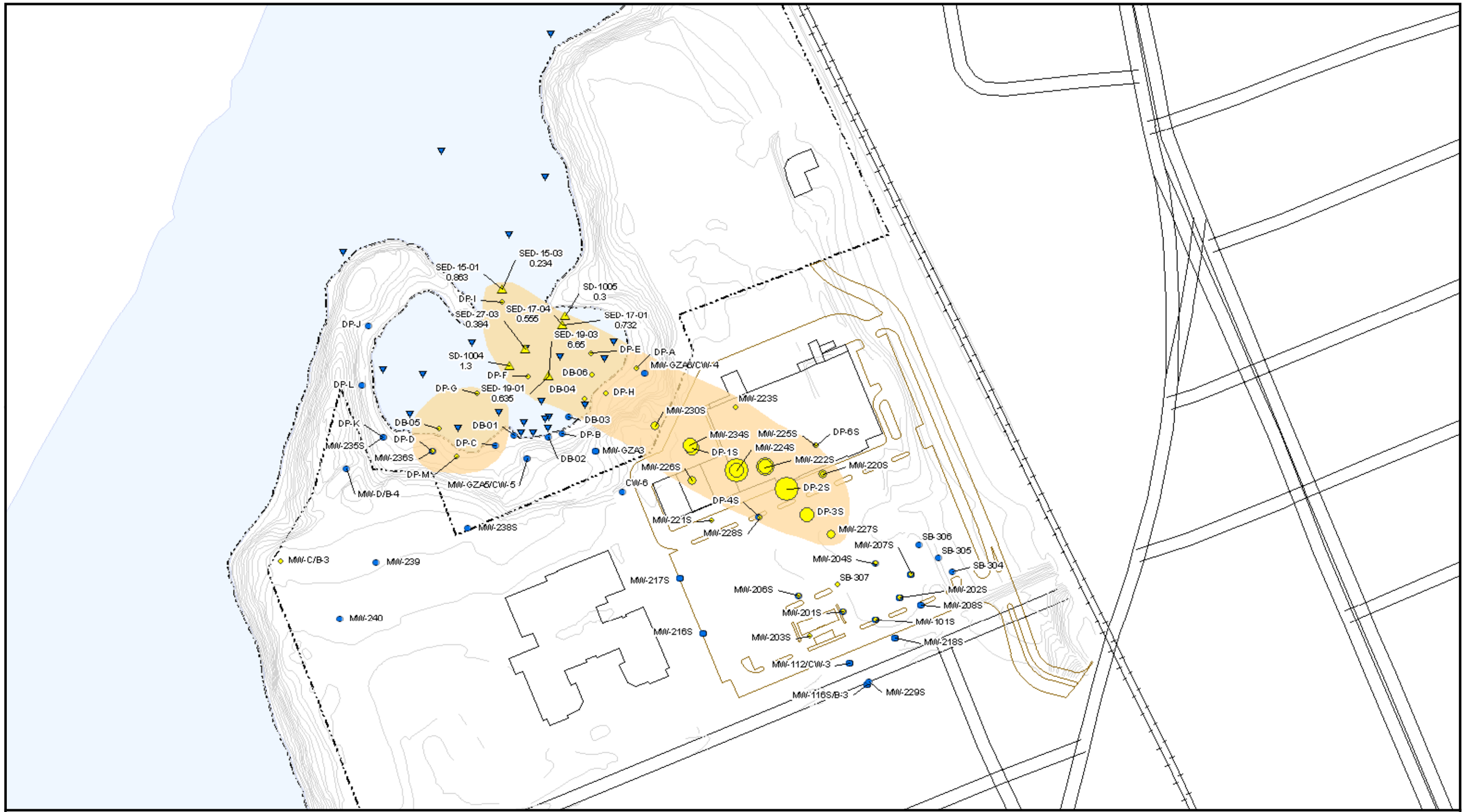
Figure 2
Groundwater, Surface Water and Sediment Sample Locations

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.



Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

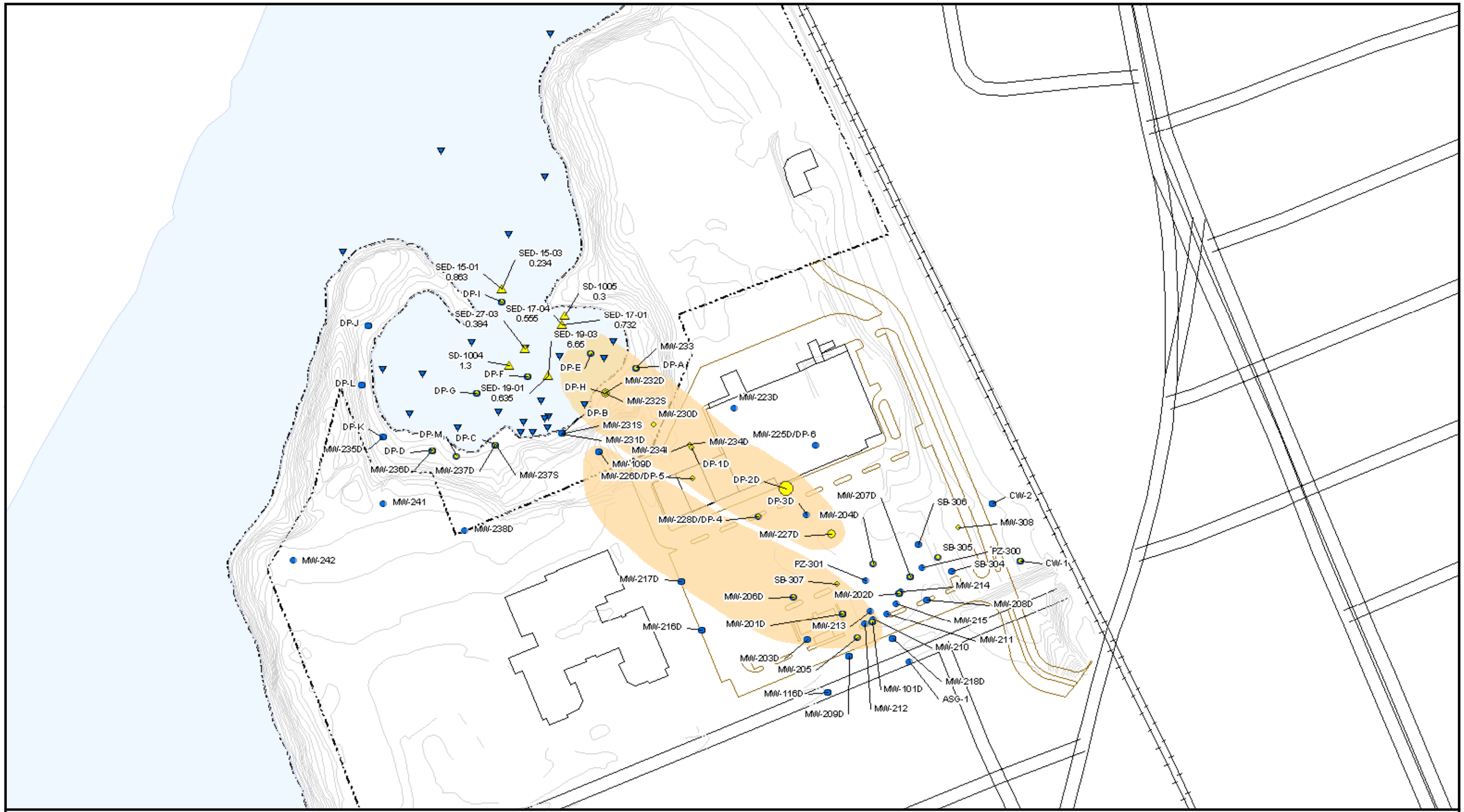
- 111TCA Detected in Sediment
- 111TCA Not Detected in Sediment
- 111TCA Not Detected in Groundwater
- Approximate Plume Boundary
- 111TCA Concentration 0 - 0.2 mg/L
- 111TCA Concentration 0.2 - 1 mg/L
- 111TCA Concentration 1 - 5 mg/L
- 111TCA Concentration 5 - 10 mg/L
- 111TCA Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 3
1,1,1-Trichloroethane (111TCA) Concentrations in Shallow Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10	Checked/Date: DEH 08/27/10

Document: P:\TEXTRON\GORHAM\GIS\MapDocuments\TextronGorhamInvestigationPublished.mxd PDF: P:\3650100157 - Textron Gorham\3.0 Field and Site Characterization\3.8 GIS\ATSDR MTG\Figure 3 - 111TCA Concentrations in Shallow Groundwater and Sediment 2006-2010.pdf 08/27/2010 7:25 AM bjroden



Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

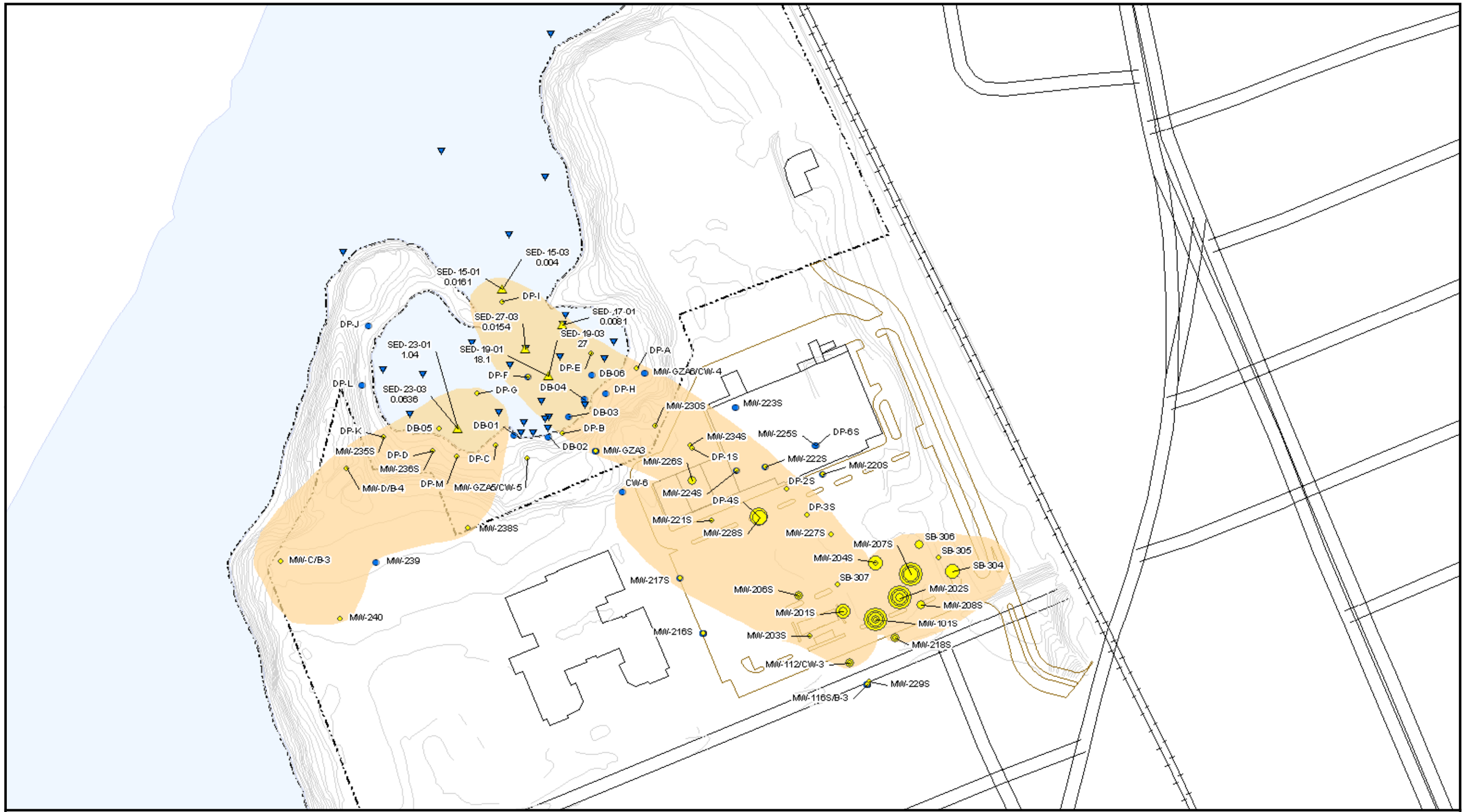
- 111TCA Detected in Sediment
- 111TCA Not Detected in Sediment
- 111TCA Not Detected in Groundwater
- Approximate Plume Boundary
- 111TCA Concentration 0 - 0.2 mg/L
- 111TCA Concentration 0.2 - 1 mg/L
- 111TCA Concentration 1 - 5 mg/L
- 111TCA Concentration 5 - 10 mg/L
- 111TCA Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 4
1,1,1-Trichloroethane (111TCA) Concentrations in Deep Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

Document: P:\TEXTRON\GORHAM\GIS\MapDocuments\TextronGorhamInvestigationPublished.mxd PDF: P:\3650100157 - Textron Gorham\3.0 Field and Site Characterization\3.8 GIS\ATSDR MTG\Figure 4 - 111TCA Concentrations in Deep Groundwater and Sediment 2006-2010.pdf 08/27/2010 7:30 AM bjroden



Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

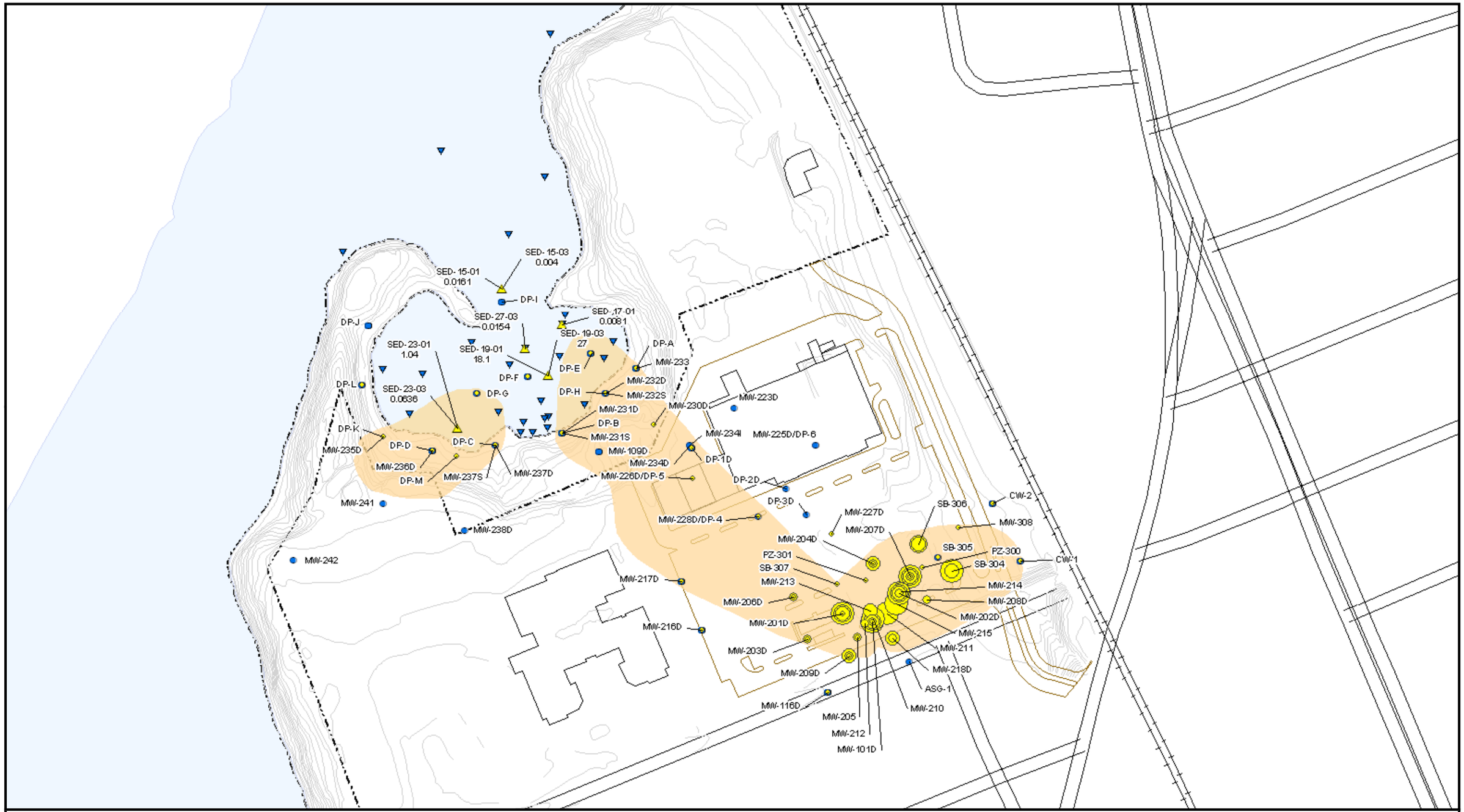
- PCE Detected in Sediment
- PCE Not Detected in Sediment
- PCE Not Detected in Groundwater
- Approximate Plume Boundary
- PCE Concentration 0 - 0.2 mg/L
- PCE Concentration 0.2 - 1 mg/L
- PCE Concentration 1 - 5 mg/L
- PCE Concentration 5 - 10 mg/L
- PCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 5
Tetrachloroethene (PCE) Concentrations in Shallow Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

Document: P:\TEXTRON\GORHAM\GIS\MapDocuments\TextronGorhamInvestigationPublished.mxd PDF: P:\3650100157 - Textron Gorham\3.0 Field and Site Characterization\3.8 GIS\ATSDR MTG\Figure 5 - PCE Concentrations in Shallow Groundwater and Sediment 2006-2010.pdf 08/27/2010 7:37 AM bjroden



Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

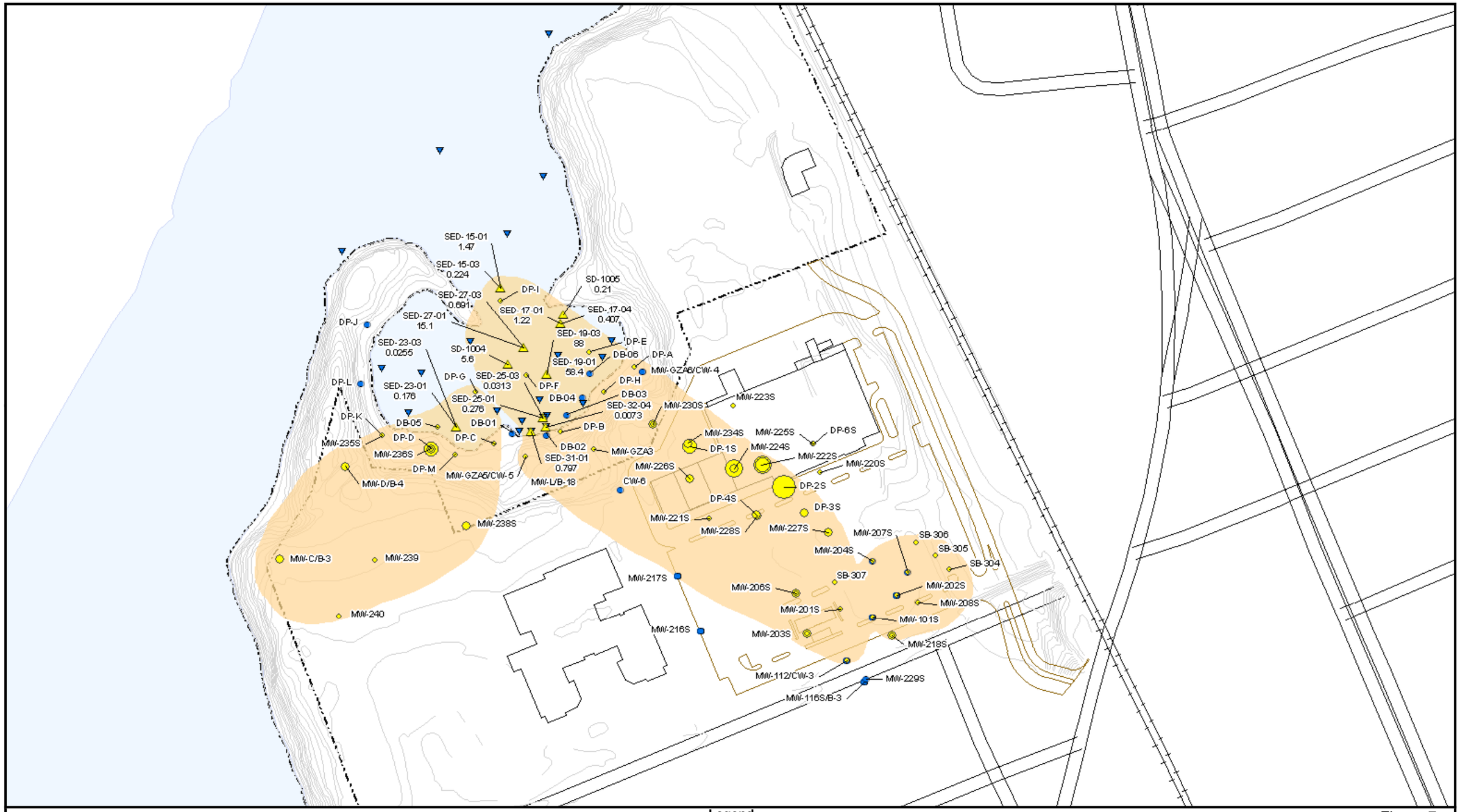
- PCE Detected in Sediment
- PCE Not Detected in Sediment
- PCE Not Detected in Groundwater
- Approximate Plume Boundary
- PCE Concentration 0 - 0.2 mg/L
- PCE Concentration 0.2 - 1 mg/L
- PCE Concentration 1 - 5 mg/L
- PCE Concentration 5 - 10 mg/L
- PCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 6
Tetrachloroethene (PCE) Concentrations in Deep Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

Document: P:\TEXTRON\GORHAM\GIS\MapDocuments\TextronGorhamInvestigationPublished.mxd PDF: P:\3650100157 - Textron Gorham\3.0 Field and Site Characterization\3.8 GIS\ATSDR MTG\Figure 6 - PCE Concentrations in Deep Groundwater and Sediment 2006-2010.pdf 08/27/2010 7:41 AM bjroden



Notes:
Data used for groundwater are all available data from 3/19/86 to 12/2/09.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

- TCE Detected in Sediment
- TCE Not Detected in Sediment
- TCE Not Detected in Groundwater
- Approximate Plume Boundary
- TCE Concentration 0 - 0.2 mg/L
- TCE Concentration 0.2 - 1 mg/L
- TCE Concentration 1 - 5 mg/L
- TCE Concentration 5 - 10 mg/L
- TCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 7
Trichloroethene (TCE) Concentrations in Shallow Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
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Prepared/Date: BJR 09/10/10 | Checked/Date: DEH 09/10/10

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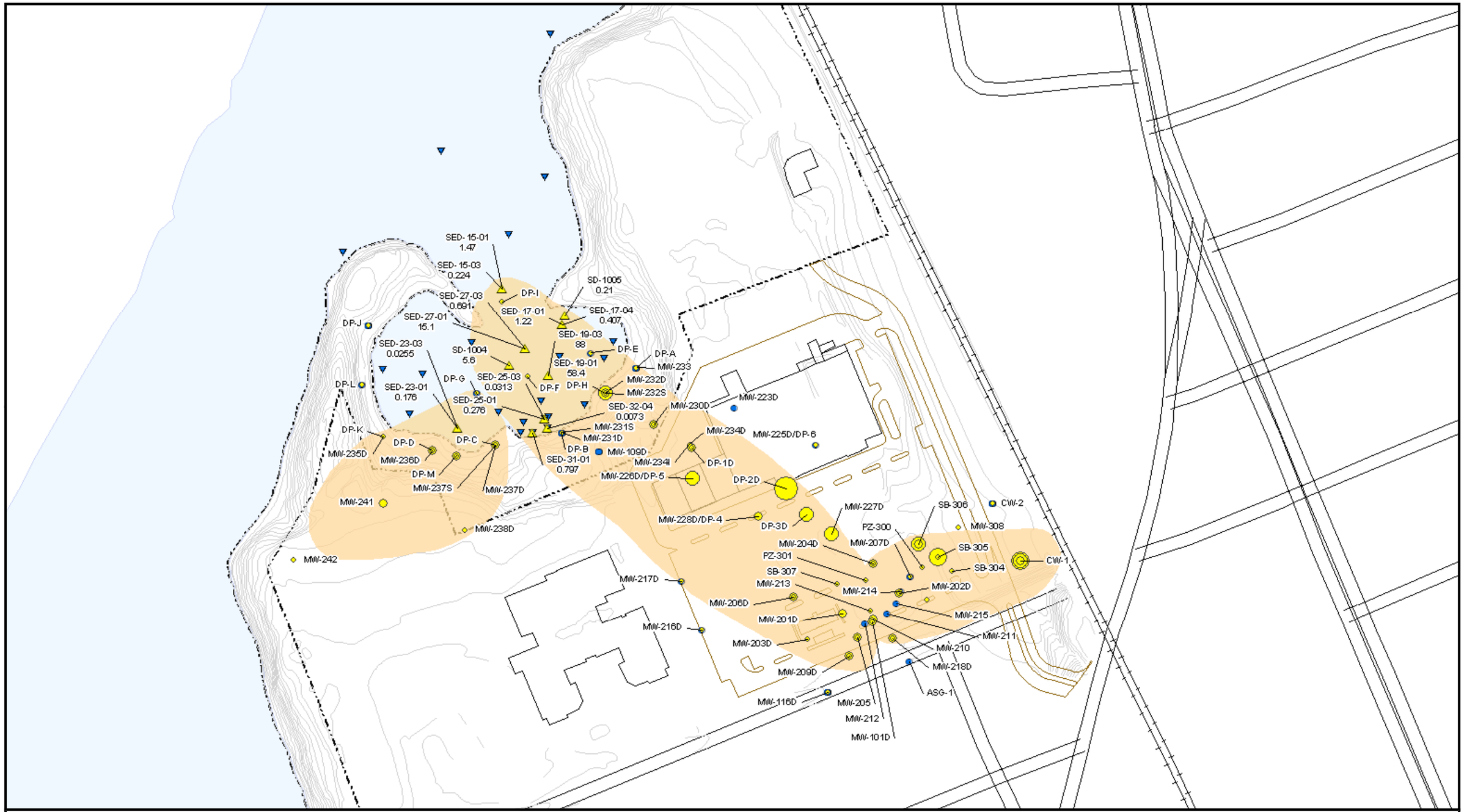

Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

- TCE Detected in Sediment
- TCE Not Detected in Sediment
- TCE Not Detected in Groundwater
- Approximate Plume Boundary
- TCE Concentration 0 - 0.2 mg/L
- TCE Concentration 0.2 - 1 mg/L
- TCE Concentration 1 - 5 mg/L
- TCE Concentration 5 - 10 mg/L
- TCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 8
Trichloroethene (TCE) Concentrations in Deep Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

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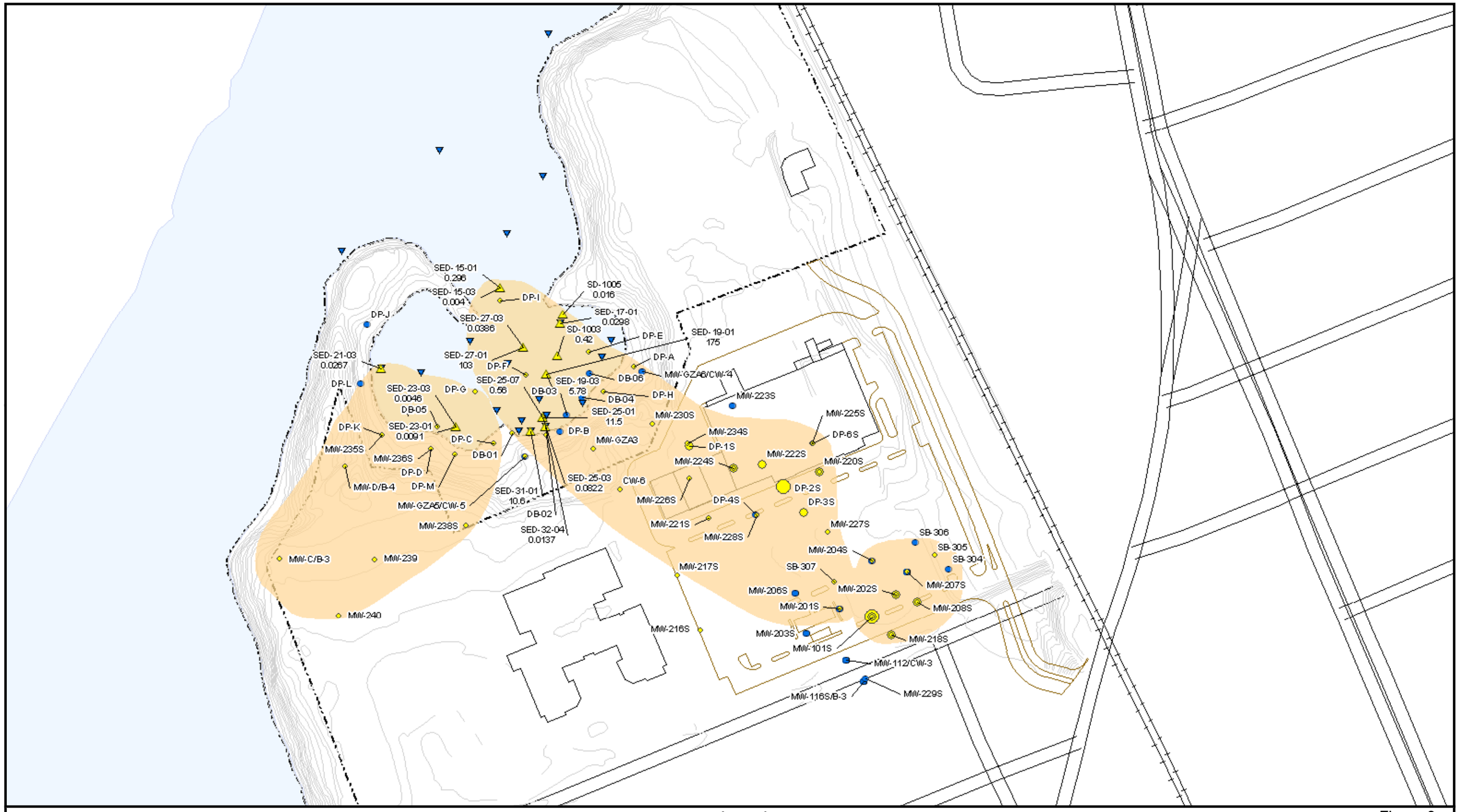

Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

- cis12DCE Detected in Sediment
- cis12DCE Not Detected in Sediment
- cis12DCE Not Detected in Groundwater
- Approximate Plume Boundary
- cis12DCE Concentration 0 - 0.2 mg/L
- cis12DCE Concentration 0.2 - 1 mg/L
- cis12DCE Concentration 1 - 5 mg/L
- cis12DCE Concentration 5 - 10 mg/L
- cis12DCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Figure 9
cis-1,2,-Dichloroethene (cis12DCE) Concentrations in Shallow Groundwater and Sediment Sampled From 2006 to 2010

333 Adelaide Avenue
Providence, Rhode Island
MACTEC, Inc.

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

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Notes:
Data used for groundwater are all available data from 1/01/06 to 8/10/10.

Data used for sediment are all available data. Some locations have multiple depths of sediment.

Concentrations for sediments are in units of mg/kg.

N

0 90 180 Feet

Legend

- cis12DCE Detected in Sediment
- cis12DCE Not Detected in Sediment
- cis12DCE Not Detected in Groundwater
- Approximate Plume Boundary
- cis12DCE Concentration 0 - 0.2 mg/L
- cis12DCE Concentration 0.2 - 1 mg/L
- cis12DCE Concentration 1 - 5 mg/L
- cis12DCE Concentration 5 - 10 mg/L
- cis12DCE Concentration Above 10 mg/L
- Elevation Contour
- Pavement
- Railroad
- Park Parcel Boundary

Prepared/Date: BJR 08/27/10 | Checked/Date: DEH 08/27/10

Figure 10
cis-1,2,-Dichloroethene (cis12DCE) Concentrations in Deep Groundwater and Sediment Sampled From 2006 to 2010

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Providence, Rhode Island
MACTEC, Inc.

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