February 11, 2009

Mr. Martin Doster
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

Subject: **Alternative Analysis Report**
Buffalo Color Site
NYSDEC Site #915184, C915230, C915231, C915232
Buffalo, New York (Erie County)

Dear Mr. Doster:

Enclosed please find two (2) copies of the Final Alternatives Analysis Report for the referenced Site. The AAR has been prepared by MACTEC Engineering and Consulting, Inc. (MACTEC) on behalf of South Buffalo Development LLC (SBD).

The enclosed AAR, at the request of the New York State Department of Environmental Conservation (NYSDEC), has been revised and replaces the prior submittal dated December 31, 2008. The enclosed AAR incorporates changes made to reflect the comments provided in your letter dated January 22, 2009 and subsequent discussions, including a meeting conducted on February 5, 2009. The enclosed report has been prepared pursuant to the Draft Brownfield Cleanup Program Guide (NYSDEC 2004).

As you know, SBD intends to remediate the Buffalo Color Site as a Volunteer in accordance with the New York Brownfield Cleanup Program (BCP). SBD and Honeywell have worked closely to develop a plan that calls for demolition of the former BCC facility and redevelopment of the Site for commercial/industrial use. SBDs demolition and redevelopment plans are contingent on acceptance of the site into the BCP, acceptance by NYSDEC of the remedy set out in the AAR, and an acceptable Brownfield Cleanup Agreement.

We believe that the proposed remedy, as described in detail in the AAR, is fully protective of human health and the environment; provides for the accelerated demolition of the abandoned chemical plant; eliminates the risks and hazards posed by the currently deteriorating infrastructure; and meshes well with SBD's and other stakeholders' schedules for accelerated redevelopment of the Site. This plan has the backing of the City of Buffalo.

South Buffalo Development LLC
333 Ganson Street • Buffalo New York 14203 • Phone: 716-856-3333 • Fax: 716-842-1630

Please contact me at (716) 856-3333 should you have any questions regarding this submittal.

Sincerely,

SOUTH BUFFALO DEVELOPMENT LLC
By its Manager SBD Holdings I, Inc.

Jon Williams
President – SBD Holdings I, Inc.

w/Atts

cc w/copy of report to:	J. Morris (Honeywell)
	C. O'Connor (NYSDOH)
	R. Fedigan (NYSDOH)
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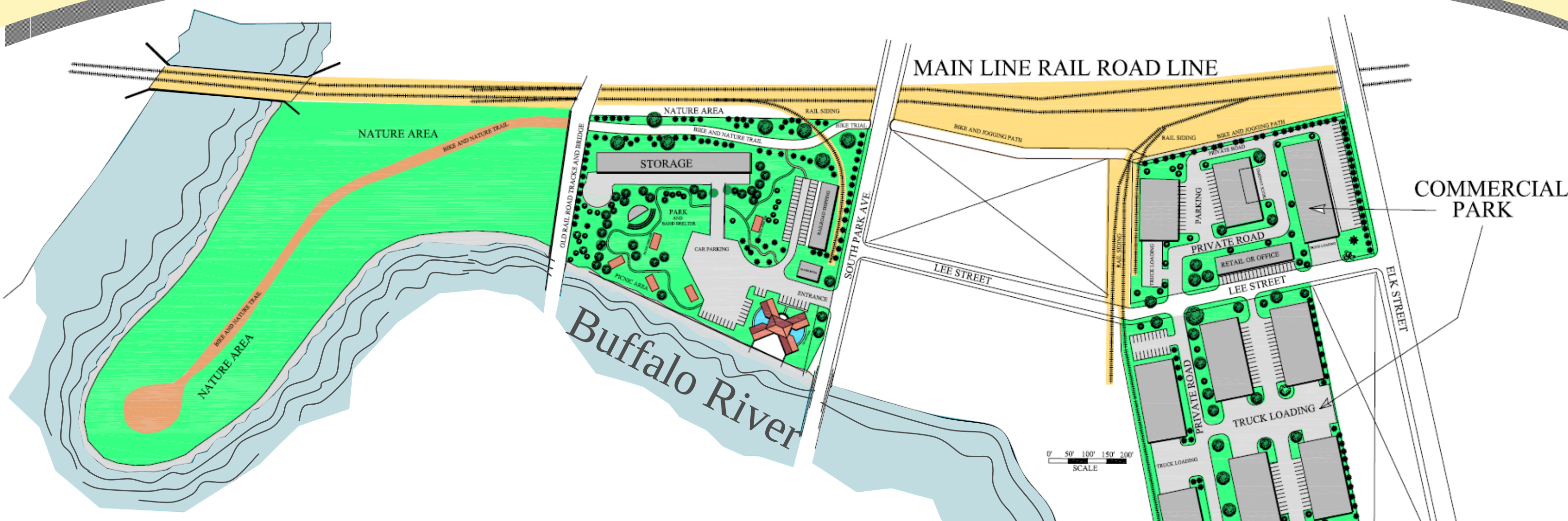
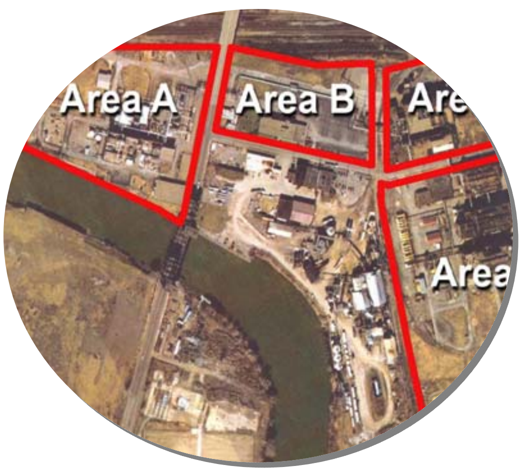
ALTERNATIVES ANALYSIS REPORT





BUFFALO COLOR CORPORATION
BUFFALO, NEW YORK

Prepared for:

South Buffalo Development LLC

Buffalo, New York

February 2009

MACTEC

PN3410070582

ALTERNATIVES ANALYSIS REPORT

FORMER BUFFALO COLOR CORPORATION SITE
BUFFALO, NEW YORK

Prepared for:
South Buffalo Development LLC
Buffalo, New York

John M. Scrabis
Senior Principal Engineer

William J. Weber, P.E.
Principal Engineer

MACTEC Engineering and Consulting, Inc.
Pittsburgh, Pennsylvania

February 11, 2009

MACTEC Project 3410070582

STATE OF NEW YORK
WILLIAM J. WEBER
No. 073863
LICENSED PROFESSIONAL ENGINEER

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EXECUTIVE SUMMARY

MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this Alternatives Analysis Report (AAR) on behalf of South Buffalo Development LLC (SBD) for the Buffalo Color Corporation (BCC) Area ABCE Site (Site). It has been prepared pursuant to the Brownfield Cleanup Program Guide (Draft) NYSDEC (2004) (Guide). It also satisfies the requirements under Honeywell International Inc.'s (Honeywell's) Administrative Consent Order No. B9-0707-05-10 (Order) with NYSDEC to prepare a Feasibility Study for the Site.

Honeywell and SBD have joined together to develop a plan to transform the former BCC Site from a derelict, aged industrial facility into a viable, commercial/industrial redevelopment. Their collective vision for this property is to sweep away the former plant infrastructure and build new, environmentally sustainable commercial/industrial buildings that will support jobs and economic stability for the region. The vision also includes substantial open space and access to the Buffalo River for the public.

SBD is submitting this AAR in support of its New York State Brownfield Cleanup Program (BCP) applications for the BCC site. SBD has executed a Letter of Intent with Honeywell that envisions SBD conducting the demolition, remediation, and redevelopment of the Site. SBD will obtain title to the available property formerly owned by BCC, although only the areas subject to environmental remediation will be included in the BCP. These Areas are designated A, B, C, and E. SBD will also obtain title to Area D but has not included that area in the BCP process since it was remediated in the 1990s. Notification will be provided by Honeywell to NYSDEC regarding transfer of the property, in accordance with Section IX.B of the Order.

SBD intends to complete the remediation and redevelopment of the Site under the Track 4 cleanup track of the BCP in the following manner.

- Execute three separate Brownfield Cleanup Agreements for the Site;
- Take title to Areas A, B, C, and E (and also Area D);
- Demolish the BCC facility;
- Remediate the Site as outlined in Section 9.0;
- Redevelop the site; and
- Perform long-term operations, maintenance and monitoring (OM&M) as necessary to support the final remedy.

Site-specific COCs were determined by comparison of contaminant levels to the potentially applicable standards, criteria, and guidance (SCGs) and to the current and future land use proposed under SBD's redevelopment scenario. The SCGs applicable to the Site and which will be used as the remediation goals for the project are as follows:

Soil: the Commercial and Protection of Groundwater Soil Cleanup Objectives (SCOs), as set forth in the relevant portions of 6 NYCRR Part 375 – Environmental Remediation Programs. This includes the NYSDEC-calculated SCOs for aniline and nitrobenzene (per NYSDEC's letter to Honeywell dated December 28, 2007).

Groundwater: Plume containment and, ultimately, a goal of attaining the NY Class GA standards, as set forth in 6 NYCRR Part 703 – Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (NYSDEC, 1999).

As set forth in this AAR, a detailed analysis of remedial alternative was performed using the evaluation criteria outlined in the Guide as well as relevant portions of DER-10 (NYSDEC, 2002). The preferred remedy for the Site consists of the following components:

- Soil – Source area removal and installation of a cover system has been selected as the preferred alternative for the Site soil. This alternative involves excavation to the water table at the location identified as a likely source of groundwater contamination on Area E (approximately 8,100 cubic yards) and off-Site disposal of contaminated soil. The cover system will use a combination of soil, pavement, and existing/new building structures to provide protection from direct contact exposure to contaminated surface soils, consistent with the presumptive remedy as identified in 6 NYCRR Part 375.

- Area A Groundwater – A downgradient hydraulic barrier wall will be installed on Area A along the Buffalo River shoreline to prevent migration of contaminated groundwater from Area A to the Buffalo River; this will include groundwater extraction as necessary to maintain hydraulic control.

- Area B Groundwater – Groundwater monitoring will be performed at Area B to verify the results of the Remedial Investigation, which indicated no significant groundwater contamination was present at that location. During 2008, groundwater monitoring at Area B will be performed in accordance with the ICM OM&M Plan. Based on the outcome of this monitoring at selected point of compliance (POC) wells, the scope and frequency of additional groundwater monitoring and/or remediation at Area B will be proposed.

- Areas C&E Groundwater – Enhanced bioremediation with monitoring for the limited chlorobenzene plumes identified at Areas C&E. At Area E, it may be advantageous to directly apply the bio-enhancement additive to the subsurface during the source area removal action. Long-term monitoring will be included for select Site and POC wells.

- Vapor Intrusion - An environmental easement will be implemented to ensure that occupied structures associated with future development at the Site are constructed such that the vapor intrusion (VI) pathway is eliminated.

- Site Sewers – Existing underground sanitary/process and storm sewer lines will be capped, removed or rehabilitated, as determined appropriate on an area-by-area basis by SBD and/or Honeywell in accordance with the project schedule.

- Use of institutional/engineering controls and environmental easements will be implemented that prohibit groundwater use, limit future land use to commercial or industrial, require elimination of the vapor intrusion pathway for all occupied structures, and require the development and implementation of a Site Management Plan.

The preferred remedy is driven by the requirements of the BCP and is consistent with SBD's proposed redevelopment approach in that it is:

- Fully protective of human health and the environment;
- Allows for the creation of significant riverfront green space and public access;
- Provides for the accelerated demolition of the abandoned chemical plant;
- Eliminates the risks and hazards posed by the currently deteriorating infrastructure; and
- Meshes well with SBD's and other stakeholders' schedules for accelerated redevelopment of the Site.

The demolition and redevelopment plans are contingent on acceptance of the Site into the BCP, the acceptance of the preferred remedy set forth in this AAR by NYSDEC, negotiation of mutually acceptable Brownfield Cleanup Agreements, and the execution of one or more agreements between SBD and Honeywell.

1 INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this Alternatives Analysis Report (AAR) on behalf of South Buffalo Development LLC (SBD) for the Buffalo Color Corporation (BCC) Area ABCE Site (Site) (Figure 1). The AAR has been prepared in accordance with the Brownfield Cleanup Program Guide (Draft) NYSDEC (2004) (Guide). It also addresses the comments raised in NYSDEC's December 16, 2008 letter to SBD.

This AAR has been submitted by SBD in support of its New York State Brownfield Cleanup Program (BCP) applications for the BCC site. SBD and Honeywell have executed a Letter of Intent that envisions SBD conducting the demolition, remediation, and redevelopment of the Site. SBD is in the process of obtaining certain property formerly owned by BCC, although the only areas subject to environmental remediation are included in the BCP. These Areas are designated A, B, C, and E (see Figure 2). SBD is also obtaining title to Area D but has not included that area in the BCP process since it was remediated in the 1990s. Notification will be provided by Honeywell to NYSDEC regarding transfer of the property, in accordance with Section IX.B of the Order.

1.1 PROPOSED REDEVELOPMENT APPROACH

The proposed remediation and redevelopment approach for the Site crafted jointly by Honeywell and SBD will utilize the Track 4 cleanup track in accordance with the BCP regulations to transform the Site from an abandoned and blighted property into viable commercial/industrial property. The goal for this Site is to remediate the Site and build new, environmentally sustainable commercial/industrial facilities that will support jobs and promote the economic stability of the region. The plan also calls for creation of substantial open space and potential access to the Buffalo River for the public. The proposed uses of the Site, as envisioned by SBD, are further discussed later in this section.

The brownfield redevelopment process allows the remediation to support the proposed uses of the Site and speeds the process of productive utilization. The remedial approach described in this AAR is fully protective of human health and the environment. While the concepts for the Site described herein include beneficial uses for the public, it is anticipated that all stakeholders will have the opportunity to provide input in the final decisions on how best to use the property.

This redevelopment vision will unfold through the administrative vehicle of the BCP. The redevelopment integrates Site demolition and remediation with the redevelopment. SBD intends to complete the remediation and redevelopment of the Site under the BCP in the following manner.

- Execute three separate Brownfield Cleanup Agreements for the Site;
- Take title to Areas A, B (portions), C, D, and E (portions);
- Demolish the BCC facility;
- Remediate the Site as outlined in Section 9.0;
- Redevelop the site; and
- Perform long-term operations, maintenance and monitoring (OM&M) as necessary to support the final remedy.

SBD's preliminary redevelopment plan is summarized below. This plan is in the conceptual stage and subject to change but the final plan, if modified, will retain the large open areas and access to the River.

Area A

Commercial uses are anticipated and may include a storage facility, although other functions are under consideration. Public access possibilities will be considered as the plans for this area are developed. A public-access greenway along the river with a possible connection to the Area D public space will be given strong consideration, as will a bike/nature trail linked to the Area D green space, and commercial offices. Logistics of public access and options for connecting Areas A and D are under active consideration and final resolution may require modification to the conceptual plan. However, all uses must be subject to NYSDEC and NYSDOH approval.

Area B

Due to the fact that roughly half of Area B, including the office building at 100 Lee Street, is under different ownership, SBD has no plans at present to develop the remaining portion of Area B. However, the space may be utilized as an access corridor between Areas A and C.

Areas C & E

These areas are targeted for use as a light industrial/commercial office park to possibly include a Transportation Logistics Center for the City of Buffalo (SBD submitted a proposal to the City for this purpose) and other light industrial/commercial uses.

Area D

Area D, which is a closed landfill, will receive enhanced landscaping and remain greenspace with access along the River. This area has an extensive shoreline along the Buffalo River and a walking and bike trail is being considered for the peninsula. However, all uses must be subject to NYSDEC and NYSDOH approval

The benefits of SBD's proposed redevelopment scenario include:

- Provides for the accelerated demolition of the abandoned manufacturing plant;
- Creates significant riverfront green space with potential public access;
- Results in creation of jobs and potentially expands the local tax base;
- Involves local government and non-government organizations (NGOs);
- Eliminates the risks and hazards posed by the currently deteriorating infrastructure;
- Improves the aesthetics and visual impact of the neighborhood; and
- Provides a potential catalyst for broader, area-wide redevelopment of the Buffalo River corridor, studies for which are underway.

Subject to the completion of satisfactory underwriting and manuscripting, SBD and Honeywell will procure standard term Pollution Legal Liability insurance for the site, assuming that Brownfield Cleanup Agreements (BCAs) are executed for the site as currently planned.

1.2 SITE DESCRIPTION

The Site is located on the south side of the City of Buffalo, Erie County, New York, in an area of heavy industrial development that dates to the mid-1800s. The physical address of the Site office building, which is located on Area B, is 100 Lee Street. The Site (not including Area D) occupies approximately 47 acres near and adjacent to the Buffalo River (Figure 1). The present layout of the four areas of the Site (Areas A, B, C, and E) are shown on Figure 2. These areas are described below.

Area A is approximately 10.2 acres and is located on the southern end of the Site. The property is fenced and is accessible by vehicle via gated entrances along South Park Avenue. It includes various former production buildings, several aboveground storage tank (AST) farms, and an office/maintenance building. It is bounded by South Park Avenue to the north, the Buffalo River to the east, an inactive rail line to the south (beyond which is Area D), and railroad tracks to the west.

Area B is approximately 5.5 acres and is located to the north of Area A. Area B is fenced and is accessible by vehicle via a gated entrance along Lee Street. Area B includes the former BCC office building, located at 100 Lee Street, and surrounding asphalt parking area which totals approximately 3 acres and is under separate ownership; this portion of Area B will not be owned or controlled by SBD. The western portion of Area B (approximately 2.5 acres) will be owned and controlled by SBD. Area B is bounded by a rail spur and Area C to the north, Lee Street to the east, South Park Avenue to the south, and railroad tracks to the west.

Area C is located on the northwestern corner of the Site. It is fenced and accessible by vehicle from gated entrances along Lee Street. Area C covers approximately 6 acres and includes the former powerhouse building and former ice house. A large AST, formerly used for storage of fuel oil, is located on the western side of the property. Area C is bounded by Elk Street to the north, Lee Street to the east, a rail spur and Area B to the south, and railroad tracks to the west.

Area E is the largest of the four areas (approximately 25.5 acres) and is located on the northeastern side of the Site. Former BCC Building 322 and surrounding property totaling about 9.1 acres is under separate ownership and will not be redeveloped by SBD. The remaining 16.4 acres of Area E will be owned and redeveloped by SBD. The western side of Area E includes various former production buildings, maintenance sheds, a former laboratory, the former wastewater treatment plant (which at one time included several surface impoundments) and a large AST farm. The eastern half of Area E is vacant, with much of it grass-covered. Area E is bounded by Elk Street to the north, Orlando Street to the east (across which is the Exxon Mobil bulk petroleum terminal), and Prenatt Street to the south.

Potable water is provided to the Site and surrounding area by the City of Buffalo. Site sewage and wastewater is conveyed off site via a network of underground sewer lines to the Buffalo Sewer Authority (BSA) wastewater treatment plant.

Regionally, the ground surface is generally flat and has a gentle slope to the west toward Lake Erie. Ground surface elevations at the site are typically about 584 to 586 feet above mean sea level (MSL). Surface runoff at the site typically is conveyed to the facility's underground storm sewer lines (Figure 3). The storm sewers discharge to the Buffalo River via two main outfalls: Outfall 006 is located on Area A and Outfall 011 runs from Area E south across PVS property. Locally, shallow groundwater is recharged by rainfall or snow-melt that does not run off to surface water. Figure 2 shows existing ground surface conditions for Area ABCE. As depicted on Figure 2, nearly 60 percent of the facility is currently covered by paved areas or existing structures.

The BCC site is situated within the Lake Erie and Niagara River drainage basin. The Buffalo River is the predominant surface drainage near the site. The river is approximately 8 miles in length and is classified as a Class C waterway suitable for secondary contact recreation. The Buffalo River generally flows from east to west and eventually drains into Lake Erie several miles west of the site, although periodic flow reversals occur due to Lake Erie seiche conditions. The Buffalo River has a reported median summer low monthly flow of 48 cubic feet per second (cfs) but, during the spring, runoff conditions reportedly may exhibit monthly flows as high as 1,200 cfs. Historically, the banks of the Buffalo River have been altered for industrial development.

Fill has been placed in several areas of the Site for this purpose. A portion of the river is presently used on a limited basis for commercial shipping. The Buffalo River is not used as a drinking water source. A Remedial Action Plan (RAP) has been developed for the river jointly by the U.S. EPA Great Lakes National Program Office, NYSDEC, the Buffalo Niagara Riverkeeper, and other governmental and non-governmental organizations to facilitate the restoration of the river. The RAP and related information is available online at http://www.bnriverkeeper.org/programs/tributary/buffalo_river/Buffalo_river.htm.

1.3 SITE HISTORY

A detailed description of Site history is provided in the RI report. Originally founded as the Schoellkopf Aniline and Dye Company (Schoellkopf) in 1879, the plant produced dyes and organic chemicals based primarily on aniline and various aniline derivatives. Beginning in 1977 until manufacturing operations ceased in 2003, the operations at BCC mainly involved production of Indigo dye, alkylanilines, anhydrides, and dye intermediates.

The plant was reorganized into the National Aniline Chemical Company in 1916. It became one of the five companies which merged to create Allied Chemical Corporation (Allied Chemical) in 1920. The existing dye-making facility and the right to produce certain dyes and intermediates were sold by Allied Chemical to BCC on July 1, 1977. At the time of the sale, the plant was divided into eight areas designated with the letters A, B, C, D, E, F, G, and H. BCC purchased the manufacturing areas A through E, while Allied Chemical retained the acid plant (sold to PVS in 1981), the research and development Area F and the parking lots on Areas G (Elk Street) and H (Smith Street).

In 2005, BCC filed for bankruptcy. During the bankruptcy proceedings, some of the facility’s production equipment was sold and removed from the site. In conjunction with the bankruptcy, the office building and former plant hospital located at 100 Lee Street on Area B and the warehouse building (Building 322) located near Elk Street on Area E, along with some of the land under and around those buildings, were sold to other parties. Agreements are in place to preserve access rights to the land for the purposes of any required environmental investigation and remediation activities. The remaining buildings and property on Areas A, B, C and E are in the process of being conveyed to SBD.

1.4 OBJECTIVE OF AAR

The objective of this AAR is to evaluate remedial alternatives and provide the basis for selection of a final remedy that will be set forth in Remedial Work Plan (RWP), as presented in Section 9 of this document, and facilitate the redevelopment of the Site. Per the Guide, the goal of the remedy selection process is to select a remedy for a site that is fully protective of public health and the environment, taking into account the current, intended and reasonably anticipated future land use of the Site. The use is determined during the application process and confirmed during the remedy selection process.

SBD has submitted three applications to NYSDEC to address the Site in the BCP. One application covers Areas A, one application covers Areas B and C, and one application covers Area E. Area D is not included in any of the Brownfield applications but will be included in the redevelopment of the Site.

1.5 DOCUMENT ORGANIZATION

This AAR Report is structured in general accordance with the guidelines presented in the Guide and, as appropriate, in NYSDEC DER-10 (NYSDEC, 2002). The sections of this AAR are outlined below.

- Section 1.0 Introduction – discusses the physical setting of the site, history of the site, proposed redevelopment approach, and purpose of the report.
- Section 2.0 Summary of Previous Activities – discusses previous investigations and interim actions at the site.
- Section 3.0 Summary of Remedial Investigation – presents the nature and extent of contamination and physical characteristics of the Site as determined during the RI field program.
- Section 4.0 Remedial Action Objectives – presents the Remedial Action Objectives (RAOs) and General Response Actions which apply to contamination at the Site and identifies the extent of contamination to be addressed through remedial action.
- Section 5.0 Identification and Screening of Technologies – identifies and screens remediation technologies to address contamination at the Site.
- Section 6.0 Development and Screening of Alternatives – presents the development and screening of remedial alternatives for each of the media requiring remediation at the Site.
- Section 7.0 Detailed Analysis of Alternatives – presents the detailed analyses of remedial action alternatives for the Site. The detailed analysis is intended to provide decision-makers with the relevant information with which to aid in selection of a site remedy.
- Section 8.0 Comparative Analysis of Alternatives – evaluates the relative performance of each remedial alternative using the same criteria by which the detailed analysis of each alternative was conducted. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another to aid in selecting a remedy for the Site.
- Section 9.0 Remedial Work Plan – provides the recommended alternatives for Site remediation and the rationale for selection of the preferred alternative.
- Section 10.0 Project Schedule – presents the anticipated schedule for remedy implementation and redevelopment.
- Section 11.0 References – presents a list of references used in the preparation of this Report.

2 SUMMARY OF PREVIOUS ACTIVITIES

Since 1984, various environmental investigations, closure of RCRA-regulated units, and implementation of interim corrective measures have been completed at the Site. The following sections discuss these previous activities.

2.1 HISTORICAL INVESTIGATIONS AND ACTIONS

The following is a chronological summary of the documented previous site investigation and RCRA closure activities:

<u>1984-1988</u>

Three former Area E surface impoundments (Lagoons 1, 2 and 3) were operated at the BCC facility beginning in the early 1970s. The lagoons reportedly received wastewater from dye manufacturing processes. The approximate locations of the former lagoons are shown on Figure 4. A RCRA Part A Permit for operation of these impoundments was filed in 1980 by BCC and the three lagoons were closed between 1984 and 1988 in accordance with closure plans approved by the NYSDEC.

The closure activities involved the removal of approximately 4,000 cubic yards of sludge and clay liner materials. Because the impoundments were not clean–closed, BCC was required to obtain a RCRA Post-Closure Permit which triggered corrective action for the entire site. Hazardous constituents were detected in the groundwater in monitoring wells located along the hydraulically-downgradient (southern) edge of the closed lagoons. A RCRA Facility Assessment (RFA) was finalized by the NYSDEC in 1991 to identify releases from identified solid waste management units (SWMUs) at the Site.

The RFA included visual site inspections performed by the NYSDEC in 1986 and by the NYSDEC and the United States Environmental Protection Agency (USEPA) in 1988. The revised RFA (April 1991) updated the status and initial investigation requirements for eight SWMUs. The final 6 NYCRR Part 373 Post Closure Permit issued to BCC on February 10, 1995 required BCC to monitor and maintain these former impoundment areas.

<u>1989</u>

A deep well was used on Area E between 1957 and 1963 for disposal of ammonium sulfate wastewater. The approximate location of the deep well is shown on Figure 4. The well was installed and used at a depth of 180 feet from 1957 to 1960. The well depth was extended to 744 feet in 1960. A closure plan was submitted to the NYSDEC in December 1988 and approved by the NYSDEC in March 1989. The well was plugged by BCC in accordance with the approved closure plan in April 1989. No further action was required by the NYSDEC.

1990

A former waste drum and container storage area located on Area E was investigated in April 1990 in accordance with a NYSDEC-approved sampling plan. The work was documented in a BCC submittal to the NYSDEC dated December 20, 1990. No further action was required by the NYSDEC under a 1995 Part 373 permit.

1995

The NYSDEC issued a RCRA Part 373 Post Closure Permit. The permit required the completion of a RCRA Facility Investigation (RFI) for the entire site. No investigation was required for the then-current 90-day hazardous waste storage area since no releases had been documented for that area. The permit also required the cleaning of Building 320 (located on Area E) prior to demolition of the building.

1997

Elemental mercury associated with a broken sewer line was encountered during installation of piping associated with the Area D treatment building on the southern side of Area A. Section 2.17.2 of the Certification Report (2000) for Area D, page 2-18, indicates that the mercury contamination was identified in 1997. The report indicates that free mercury was found in shallow soil in the vicinity of a former building foundation. According to the report, the free mercury was vacuumed up and disposed under the cap in Area D, soils with mercury were also excavated and placed under the Area D cap, and uncontaminated soils were used to backfill the area. According to the NYSDEC, the mercury appeared to result from a broken sewer pipe that was encountered approximately 6 feet below the ground surface. The NYSDEC indicates this location to be north of the treatment building and southeast of Building 85 (Figure 4).

2.2 RCRA FACILITY INVESTIGATION

A RCRA Facility Investigation (RFI) was completed in 1996-1997 and the RFI report was issued by Golder Associates (Golder) in 1997. In December 1998, an RFI addendum was issued by Golder Associates to document two supplemental investigations that addressed NYSDEC-identified data gaps. A total of 36 monitoring wells and 13 piezometers were installed during the RFI process. Approximately 160 soil samples were collected during the RFI process for field screening or laboratory testing. The RFI report (including subsequent addendums) was approved by NYSDEC via letter dated March 19, 1999.

2.3 INTERIM CORRECTIVE MEASURES

In 1999, Parsons Engineering Science completed aquifer testing at Area A and, in October 1999, issued a report titled “Pumping Test and Groundwater Modeling for Area A”. The Parsons report concluded that extraction wells could be used to maintain an inward hydraulic gradient and minimize the potential for Area A groundwater in the shallow aquifer to impact the Buffalo River.

SUMMARY OF PREVIOUS ACTIVITIES

In January of 2000, Golder issued a Corrective Measures Study (CMS) report that specified a proposed scope for the interim remedy at the Site, including the use of a groundwater extraction system at Area A. The CMS was approved by the NYSDEC in July 2000. On August 5, 2003, Conestoga Rovers Associates (CRA) issued a work plan titled "Proposed Scope of Work/Work Plan for Interim Corrective Measure, Buffalo Color Area ABCE, Buffalo, New York". The plan was approved in a letter from the NYSDEC dated January 9, 2004.

Due to Buffalo Color's financial condition, Honeywell negotiated with the NYSDEC to implement the ICM. An Order on Consent with an effective date of April 4, 2005 was entered between Honeywell and the NYSDEC for implementation of the ICM. The specified ICM scope of work included the following tasks, which were included in the approved Site remedy set forth in the CMS:

1. Area A Groundwater Extraction System (Migration Control System – MCS);
2. Area BCE Groundwater Control (passive control via existing sewer network);
3. Institutional Controls;
4. Groundwater Monitoring;
5. Repair Sheet Piling Breach (Area E) via injection grouting; and
6. Area A River Bank Erosion Control (protective mat on river bank).

In August 2005, MACTEC issued the 100 Percent Basis of Design report for the proposed ICM. The design was approved by the NYSDEC in a letter dated November 18, 2005. In April 2006, the contracts for ICM construction were issued by Honeywell. Construction began in May 2006 and, by October 2006, the sheet pile breach was repaired, the Area A river bank erosion protection mat was installed, and the Area A MCS was substantially complete. Honeywell submitted a Final Engineering Report (FER) for the ICM to NYSDEC on October 3, 2008.

Soil samples collected from the riverbank prior to placement of the erosion protection mattress at Area A indicated that levels of certain metals and SVOCs exceeded the Protection of Ecological Resources SCOs. The erosion mattress addresses the potential for erosion of impacted river bank materials to enter the river and the potential for direct contact by wildlife. Future remediation of the river under the Buffalo River RAP could require modification of the erosion mattress system. Since a hydraulic barrier wall will be part of the Area A uplands remedy, impacted soils on the river side of the new wall will likely be evaluated as part of a potential river remedy.

SUMMARY OF PREVIOUS ACTIVITIES

Startup of the Area A MCS occurred in October 2006. Shortly after startup, plugging of the discharge lines due to rapid buildup of scale prevented simultaneous pumping at all five extraction wells (EW-1 through EW-5). In late 2006 and into the Spring of 2007, MACTEC conducted various laboratory and field/operational tests involving pumping at selected extraction well locations to determine the cause of the piping scale. It was concluded that the scale buildup occurred when groundwater with widely varying chemistry and pH levels was mixed together in the discharge piping. Beginning in April 2007, continuous pumping of groundwater was initiated at extraction well EW-1, which is not affected by high-pH groundwater. This well has the highest chlorobenzene concentration of the five extraction wells; thus, the groundwater pumped from EW-1 was discharged to the on-Site treatment building (which was originally constructed to treat effluent from the Area D groundwater extraction system), where it passes through carbon filters prior to discharge to the BSA via the Area A low lift station. Operation of EW-1 has resulted in mass removal of chlorobenzene-impacted groundwater.

To address the piping scale associated with the rest of the Area A MCS, MACTEC determined that installation of dedicated HDPE discharge piping was necessary to keep the high pH groundwater at EW-3 and EW-4 separate from the groundwater extracted at other locations. Thus, installation of new HDPE piping was required to convey the groundwater from extractions wells EW-3/EW-4 and extraction well EW-5 directly to the Area A low lift station. Construction of the new HDPE piping was initiated in July 2007 and was completed in November 2007.

In December 2007, pumping was initiated at the remaining extraction wells (EW-2 through EW-5). Since that time, pumping has generally continued at all five extraction wells. Discharge from EW-1 and EW-2 is pretreated to reduce chlorobenzene levels via the on-Site treatment building prior to discharge to the Area A low-lift station. The effluent from wells EW-3, EW-4 an EW-5 is currently discharged to the low-lift station without pretreatment.

From January 2008 to April 2008, MACTEC utilized data collected via submersible transducers and operations data from the Area A MCS to evaluate the effectiveness of the extraction system at preventing migration of contaminated groundwater to the Buffalo River. The results of this study are documented in the technical report provided in Appendix A. Based on the results, MACTEC concluded that enhancement of the MCS via installation of additional extraction wells would likely be required if groundwater extraction were to be utilized as the stand-alone final remedy for the Area A shallow groundwater.

During 2008, groundwater monitoring will be conducted in accordance with the NYSDEC-approved Operations, Maintenance and Monitoring (OM&M) Work Plan (MACTEC, 2006), with results provided in a separate report to be issued to NYSDEC during the first quarter of 2009.

3 REMEDIAL INVESTIGATION RESULTS

In 2007, MACTEC completed a Remedial Investigation (RI) for the Site; the RI Report was issued on September 28, 2007. Comments regarding the RI Report were issued by NYSDEC via letters dated November 14, 2007 and December 28, 2007. Honeywell's responses to the NYSDEC comments and the revised draft RI Report were provided to NYSDEC in February 2008. The final RI report was issued to NYSDEC under separate cover. The RI activities were completed in accordance with the approved RI/FS Scope of Work (SOW) and the existing Order. The RI was designed to build off of prior studies, including the RFI conducted in the late 1990s by Golder. The following subsections summarize the information presented in the RI report.

3.1 RI METHODS

The following subsections summarize the methods used to complete the initial RI scope of work, a Supplemental Investigation, and a soil Background Study.

3.1.1 INITIAL RI SCOPE OF WORK

The initial scope of work for the RI involved the following tasks:

- Installation of 92 soil borings and 4 test pits at locations across Site and the laboratory analyses of 174 soil samples to characterize Site soils (Figure 5).
- Groundwater monitoring and laboratory analyses of groundwater samples collected from wells and piezometers located across the Site.
- Collection and laboratory analyses of two sub-slab soil vapor samples from the 100 Lee Street office building located on Area B (Figure 6).
- Collection and laboratory analyses of solid material present within the plant sanitary and storm sewers.
- Collection and laboratory analyses of effluent samples at storm sewer Outfall 006 (Area A) and Outfall 011 (Area E).

3.1.2 SUPPLEMENTAL INVESTIGATION SCOPE OF WORK

Based on the results of the initial RI work, a Supplemental Investigation (SI) Work Plan was prepared by MACTEC and approved by NYSDEC. The SI scope of work included the following tasks:

- Collection of soil samples from RI soil sample points that contained the highest reported total chromium levels to speciate between trivalent and hexavalent chromium concentrations.
- Completion of Membrane Interface Probing (MIP) at locations on Areas A, C and E (Figure 5) where part per million levels of chlorobenzene were found in Site groundwater to further evaluate the horizontal and vertical extent of volatile constituents at each location.

- Installation of six direct-push borings in the vicinity of Area A boring TB-A15 to evaluate the extent of the elevated aniline levels.

3.1.3 BACKGROUND SOIL STUDY

A Background Study was completed to determine if the concentrations of arsenic and PAHs detected in the majority of the RI site surface soil samples are consistent with local background levels. MACTEC collected 15 soil samples from off-site background locations along public rights-of-way and City-owned properties (sidewalk areas, utility easements, etc.) in the vicinity of the Buffalo Color site (Figure 7). The background soil samples were analyzed for PAHs via EPA Method 8270C and arsenic via the EPA Method 6010 series. Soil remediation levels for the Site are set forth in 6 NYCRR Part 375 Soil Cleanup Objectives.

3.2 RI RESULTS SUMMARY AND CONTAMINANT EVALUATION

The data obtained during the RI, as well as data obtained from previous investigations and studies, were used to identify the areas with Site-related contamination above the 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) and the New York Class GA standards (6 NYCRR Part 703) for groundwater. The Commercial and Protection of Groundwater SCOs were chosen for direct comparison because they are the most relevant from a risk evaluation standpoint and are appropriate for the planned restricted use scenario for the Site. Figures 1 through 19 illustrate key site feature and RI data.

3.2.1 SURFACE SOIL

The majority of RI surface soil samples (i.e., samples collected from the upper two inches of soil, in many cases immediately below surface pavement) were found to contain concentrations of arsenic and PAHs that exceeded the Commercial and Protection of Groundwater SCOs. It should be noted that most of these samples do not exceed the calculated Site-specific background values for arsenic and PAHs, even though the background values will not be used as SCOs for the Site. Other metals, such as mercury and lead, were found in certain surface soil samples at concentrations that exceeded the SCOs. No VOCs were identified in any RI unsaturated soil sample at levels that exceeded the Commercial SCOs. A limited number of surface samples (one on Area A, two on Area C, and six on Area E) were found to contain certain VOCs above the Protection of Groundwater SCOs.

3.2.2 SUBSURFACE SOIL

Many of the RI subsurface soil samples (i.e., samples collected below a depth of two inches and above the first saturated interval) were found to contain concentrations of arsenic and PAHs that exceeded the Commercial and Protection of Groundwater SCOs. These results are consistent with the prior soil sampling results, including the RFI soil data and the results of soil samples collected at Area A during the ICM construction process. Similar to the surface soil samples, many of these samples do not exceed the calculated Site-specific background values for arsenic and PAHs. Other metals, such as mercury and lead, were found in certain soil samples at concentrations that exceeded the SCOs. Although RI soil samples at various locations contained concentrations of PAHs and metals/inorganic compounds at levels that exceeded the Protection of Groundwater SCOs and have likely been present in soil for decades, these substances were not found at elevated concentrations in Site groundwater and therefore are not known or likely potential sources of groundwater contamination.

Potential sources of soil impact to the shallow aquifer by organic substances were identified at the following locations, as shown on Figure 18:

- Area A in the vicinity of boring TB-A15 (SVOCs, including aniline and nitrobenzenes); the approximate surface area of impact is 14,500 ft^2, and the average depth to saturated soil is 4 feet, which results in an approximate volume of 56,000 ft^3 (or 2,100 cubic yards) of impacted soil.

- Area E in the vicinity of the large AST farm located on the southwestern side of the parcel (benzene, chlorobenzene and other VOCs); the approximate surface area of impact is 55,000 ft^2, and the average depth to saturated soil is 4 feet, which results in an approximate volume of 220,000 ft^3 (or 8,150 cubic yards) of impacted soil.

As described in the RI report, these source areas were identified based on the presence of elevated concentrations of organic substances that are also present in the Site groundwater. Soil volumes were calculated based on distances to nearest samples that did not exhibit elevated organic concentrations and depth to the first zone of saturation.

3.2.3 SITE GROUNDWATER – SHALLOW AQUIFER

The groundwater in the shallow aquifer on the southern half of Area A contains reported concentrations of chlorobenzene and aniline at parts per million levels (Figure 16). The shallow aquifer on the northern half of Area A contains much lower (parts per billion) levels of these substances, albeit still at levels that exceed the NY Class GA standards. Lesser concentrations of other VOCs and SVOCs are also present in the shallow aquifer on the Site. Under static conditions, the shallow aquifer at Area A discharges to the Buffalo River. As noted in Section 2.3, pumping of groundwater at ICM extraction well EW-1 has occurred on a continuous basis since April 2007, and pumping at extraction wells EW-2 through EW-5 was initiated in December 2007. MACTEC utilized data collected via submersible transducers and operations data from the Area A MCS to evaluate the effectiveness of the extraction system at preventing migration of contaminated groundwater from Area A to the Buffalo River. The results of this study are documented in the technical report provided in Appendix A. Based on the results, MACTEC concluded that enhancement of the MCS via installation of additional extraction wells would likely be required if groundwater extraction were to be utilized as the stand-alone final remedy for the Area A shallow groundwater.

Based on the RI data, the floating separate-phase liquids (LNAPL) encountered on Area A in ICM extraction well EW-5 and piezometers PZ-103 and PZ-110 appear to be isolated to those locations. Comparing the analytical results for the sample of the groundwater collected at EW-5 during the RI to the levels of VOCs and SVOCs present in the LNAPL itself indicates that the material is not highly soluble, as would be expected for a heavier phase hydrocarbon such as fuel oil, which information indicates was previously stored and used in historic power generation operations in the vicinity of EW-5. MACTEC has removed several gallons of LNAPL from EW-5 via hand-bailing. Measurements made at EW-5 since April 2008 have not identified measurable LNAPL. Due to well construction and system controls (i.e. the LNAPL/water level is maintained well above the pump intake and screen via use of level controls and pump set point), there is little to no potential for LNAPL to be pumped at EW-5 via the current ICM. The plan for future monitoring and recovery of LNAPL is presented in Section 9.0 of this document. Separate-phase liquids were not identified in other nearby Area A wells and piezometers during the RI groundwater sampling event. Furthermore, no evidence of significant distribution of free-phase hydrocarbons was identified during completion of the RI test borings.

Various metals and inorganic compounds were also identified in the Shallow Aquifer on Area A at levels that exceeded the Class GA standards (Figure 16). Many of these substances are associated with regional glacial formations (such as iron, manganese, and sodium), have been identified across the entire Site (including at upgradient wells), and are likely consistent with background levels within the shallow aquifer.

Groundwater samples collected from the wells screened in the shallow aquifer at or near Area B contained concentrations of various metals and inorganic compounds at levels consistent with those found in the shallow aquifer across the site (Figure 16). Trace concentrations of aniline and naphthalene were also found in several of the wells at low part per billion (ug/L) concentrations. Concentrations of VOCs, including chlorobenzene, tetrachloroethene (PCE), and trichloroethene (TCE), were identified in the groundwater sample collected from well RFI-27 at levels that exceeded the Class GA standards. This well is located on the southwestern corner of Area B. A trace concentration of benzene was identified in the sample collected from well RFI-28, which is located near the southeastern corner of Area B. There are no known corresponding soil source areas on Area B in connection with the contaminants identified in well RFI-27 and RFI-28. Groundwater flow direction from these two locations is toward Area A.

On Area C, the RI groundwater sample collected from well RFI-20 contained an elevated level of chlorobenzene (7.7 mg/L) and lesser concentrations of other VOCs at levels that exceeded the Class GA standards (Figure 16). The groundwater sample collected from well RFI-31, which is downgradient from RFI-20, contained lower concentrations of similar VOCs. The RI soil sampling and MIP survey did not identify any existing on-Site soil source at Area C.

On Area E, the RI groundwater sampling and the MIP study have identified an area of the shallow aquifer impacted by elevated levels of chlorobenzene and other VOCs (Figure 16). The groundwater sample collected from well RFI-32, which is located immediately downgradient of the large AST farm on the southwestern corner of Area E, contained a chlorobenzene concentration of 33 mg/L. The MIP study, which included borings advanced along the BSA sewer line located in the offsite area immediately downgradient of the AST farm, and the analytical results for groundwater samples collected on the PVS Chemicals property immediately downgradient of this location, indicate that the impacted groundwater has not left the site or migrated along the adjacent BSA sewer main to any significant degree.

Groundwater samples collected from shallow wells near the locations of the former wastewater lagoons on the southeastern corner of Area E did not contain VOCs above NY Class GA standards or otherwise show evidence of groundwater impact attributable to the former lagoons (Figure 16).

A steep gradient exists in the Shallow Aquifer where groundwater moves toward the Buffalo River on the south side of Area E and on PVS Chemicals property. Figures 10 and 16 illustrate this gradient, which is steeper than at other locations. This steeper gradient exists because it coincides with the boundary between the upland till unit and the alluvial deposits that are adjacent to the river. The RFI report cross sections prepared for Area E (Appendix B) depict this geologic boundary.

During groundwater monitoring completed for the First, Second and Third Quarters of 2008, an accumulation of LNAPL was identified in well R-14. In the 1990s, well R-14 contained measurable LNAPL. The well is located on the southeastern corner of Area E in the vicinity of the capped/closed wastewater lagoons (Figure 4). This is also in the vicinity of a former oil company identified by Sanborn maps as having occupied the area in the late 1800s/early 1900s. There is no historic information to suggest that the lagoons managed appreciable quantities of oily or petroleum-impacted wastewaters.

During the Third Quarter 2008 groundwater monitoring event, LNAPL was also identified in piezometer ICM-PZ-04S, which is located offsite and to the south of the BSA sewer line (Figure 16). This piezometer was installed during the 2006 ICM construction and had not previously been found with LNAPL. The LNAPL at both locations was reported by MACTEC field personnel to exhibit characteristics of oil/petroleum hydrocarbons. Samples of the LNAPL and groundwater at these two locations were collected by MACTEC for laboratory testing during the Third Quarter 2008 groundwater monitoring event. The analytical results indicate that the substance is likely a weathered petroleum hydrocarbon. As discussed during a meeting between Honeywell, SBD, and NYSDEC representatives on August 7, 2008, additional investigation of this area will be completed as part of the remedial design process to evaluate the extent of LNAPL and determine monitoring and remedial requirements.

3.2.4 SITE GROUNDWATER – CONFINED AQUIFER

No VOCs were detected at concentrations above the Class GA standards in any confined aquifer groundwater samples (Figure 17). This includes the samples collected from wells RFI-21D and RFI-16, which are located at or downgradient of locations where significant levels of chlorobenzene and other VOCs were identified in the shallow aquifer. This supports the findings of the prior RFI study and indicates that the glaciolacustrine clay unit found throughout the site is an effective aquitard. Only very low (part per billion) levels of aniline, nitrobenzene and naphthalene were reported in several of the confined aquifer samples above the Class GA standards. The effectiveness of the aquitard is reinforced by the fact that this facility had been in operation for well over 100 years.

The transport mechanism that allowed low levels of these site related contaminants to reach the confined aquifer is not clear but may have occurred due to historic localized conditions (such as old building foundations) that allowed only limited vertical migration to occur. However, the remedial action selected for the Site will help address concerns regarding potential future vertical contaminant migration from existing areas of contamination. Concentrations of iron, sodium, and magnesium were also reported in one or more confined aquifer groundwater samples at levels that exceeded the Class GA standards; however, the available evidence suggests that the presence of these constituents is due to the condition of the regional aquifer, not Site activities.

3.2.5 INDOOR AIR

As described in the RI report, no substances for which the NYSDOH has established indoor air guidelines were identified in the subslab soil vapor samples collected from the 100 Lee Street office building. Various other substances that currently do not have applicable NYSDOH indoor air criteria were identified in the subslab vapor samples. The 100 Lee Street building and the former plant hospital are on the portion of Area B that was purchased by a third party during the Buffalo Color bankruptcy proceedings. As discussed during the meeting with NYSDEC on August 7, 2008, Honeywell has agreed, consistent with NYSDOH guidance, to collect additional subslab vapor samples at the 100 Lee Street and plant hospital buildings, as well as indoor and outdoor air samples. This assumes that property access will be granted by the current owner of the buildings.

On Area E, the warehouse located at 343 Elk Street, along with surrounding land, was purchased by a third party during the Buffalo Color bankruptcy proceedings. A BCP application for the property (1.95 acres) was submitted to NYSDEC by Shield of Armor, LLC (Shield) in December 2007. Shield submitted the BCP application as a volunteer and has an option to purchase the property. On August 13, 2008, MACTEC received an electronic copy of this BCP application from NYSDEC. The application includes a Site

Investigation Report prepared by Benchmark Environmental Engineering and Science, PLLC (Benchmark) dated November 2007.

The Benchmark investigation included collection of soil samples from nine direct-push borings advanced around the 343 Elk Street building and completion of a sub-slab vapor and indoor air investigation. The results of the soil sampling program identified concentrations of PAHs and arsenic that were consistent with the results of the Buffalo Color RI results. No VOCs were identified in the Benchmark soil samples at levels that exceeded the applicable SCOs. The sub-slab vapor and indoor air testing identified the presence of trichloroethene (TCE) at concentrations of up to 343 ug/m^3 in the sub-slab soil vapor and up to 8,200 ug/m^3 in indoor air, which indicates that mitigation is required according to the NYSDOH indoor air guidance. The source of the TCE was not identified by Benchmark. The fact that the indoor air TCE concentrations were orders of magnitude higher than the sub-slab results indicates a potential indoor source exists. A subsequent chemical inventory completed for the building by Benchmark identified at least two spray containers of a substance that contained TCE.

The Benchmark report concludes that additional sampling is required to investigate the source of the TCE in indoor air. The schedule provided in the BCP application indicates that the investigation work, preparation of a remedial work plan, and completion of remedial activities would be completed by August 2008. The current status of the BCP application for this project is not known to Honeywell. Honeywell will conduct additional evaluation of this issue to determine if further vapor intrusion investigation or mitigation is necessary-for the 343 Elk Street property. It should be noted that the current owners acquired the 343 Elk Street property with knowledge of its historic uses and had the opportunity to review the RFI and RI data for the Site prior to acquisition.

3.2.6 SITE SEWERS AND OUTFALLS

Various substances were identified in the solids samples collected from the Site process sewers (which discharge to the BSA system) and storm sewers (which discharge to the Buffalo River via Outfalls 006 and 011). Detected substances included various metals, VOCs and SVOCs. As expected, concentrations were lower in the solids samples collected from storm sewers (SED-A01 and SED-B01) than concentrations of substances reported in samples collected from the process sewer lines (SED-A02, SED-C01, SED-C03, SED-E01, and SED-E02). As requested by NYSDEC, RI Table 9 has been modified from the version provided in the previous RI report to compare (for informational purposes) the sewer sediment results to the Protection of Ecological Resources SCOs. As shown on the revised RI Table 9, a copy of which is provided in Appendix C, the results for various constituents in the storm sewer sediment samples, primarily metals, exceeded the Ecological SCOs. As described in Section 9.1.3.1, remediation of the storm sewer system will include measures to address the potential discharge of existing impacted sewer sediment to the Buffalo River.

Various substances were identified in the effluent samples collected from Outfalls 006 and 011. These substances included chlorobenzene and dichlorobenzenes, aniline, and other VOCs/SVOCs. In general, higher concentrations of VOCs and SVOCs were identified in the Outfall 006 sample as compared to the Outfall 011 sample. The presence of these substances in the effluent samples indicates that groundwater is likely infiltrating the storm sewer lines where the lines are below the water table.

3.2.7 TENTATIVELY IDENTIFIED COMPOUNDS (TICS)

As specified in the RI/FS Work Plan, identification of TICs for VOCs and SVOCs was included in the RI sample analytical program. TIC results are included on the tables and laboratory data validation reports provided in the RI Report. MACTEC has reviewed the TIC results and determined that they are consistent with the concentrations and types of contaminants identified in the Target Compound List analytes selected for the soil and groundwater samples (i.e., soil and groundwater samples with elevated levels of VOCs and SVOCs also contained corresponding levels of TICs) and/or samples with elevated organic TICs are included in the source areas identified on Areas A and E. This confirms that the remedial action specified in Section 9.0 will address the areas with organic soil and groundwater contamination.

3.2.8 CONCEPTUAL SITE MODEL

Using the data obtained during the RI, MACTEC developed a Conceptual Site Model (CSM), provided as Figure 19. The following complete or potentially complete exposure pathways currently exist or may exist with respect to the anticipated future land use of the Site for certain Site contaminants and must be addressed in this AAR:

- SOIL: direct-contact exposure to contaminated soils via dermal contact, ingestion and inhalation of particulates; potential receptors include construction workers, site workers, trespassers, and terrestrial biota.

- AIR: Inhalation of vapors due to volatilization of organic substances from contaminated soil or groundwater; potential receptors include construction workers, site workers, trespassers, and terrestrial biota.

- GROUNDWATER: Exposure to contaminated groundwater via ingestion or dermal contact; potential receptors include construction workers (inhalation and dermal contact) and site workers, trespassers and terrestrial biota (inhalation only).

- SURFACE WATER: Impact to surface water is a potentially complete exposure pathway at Area A to human and ecological receptors, where the shallow aquifer may discharge to the Buffalo River under static (non-pumping) conditions.

3.3 CONCLUSIONS AND RECOMMENDATIONS

The data obtained during completion of the RI, and data from the previous RFI and other investigations were used to develop the following conclusions and recommendations regarding the Site in the context of anticipated future land use:

- FUTURE LAND USE SCENARIOS AND REMEDY SELECTION: As described in Section 1.0, the proposed redevelopment will involve some combination of industrial, commercial and green space uses which will utilize engineering controls, environmental easements and/or deed restrictions.

- SOIL (SOURCES OF GROUNDWATER CONTAMINATION): Based on proximity to shallow groundwater that contains similar contaminants, two likely sources of soil to shallow aquifer impact have been identified above the first zone of saturation: 1) approximately 2,100 cubic yards of SVOC-impacted soils located in the central part of Area A in the vicinity of RI boring TB-A15 and 2) approximately 8,150 cubic yards of VOC-impacted soil in the vicinity of the large AST farm on the southwestern side of Area E. The remedial measures identified in the AAR, consistent with the planned future land use of the Site, are protective of human health and the environment with respect to contaminated soil that may exist below the water table.

- SOIL (DIRECT CONTACT PATHWAY): Metals (primarily arsenic and to a lesser extent mercury) and PAHs were found across the site in both surface and subsurface soil at levels that exceed the Commercial SCOs. For the direct contact pathway, surface soil samples are considered the most relevant data points. The background study completed by MACTEC suggests that the majority of the RI soil samples contained arsenic and PAHs at levels that are within the calculated Site-specific background standards. The data also suggests that the locations with levels of arsenic and PAHs within background levels are not sources of groundwater contamination. SBD will not use the background values for these substances as SCOs but rather will utilize the Commercial SCOs for protection of the direct contact pathway. The majority of the site (roughly 60%) is currently covered by pavement or buildings (which have concrete floor slabs), as shown on Figures 2 and 20. Remedial options to be evaluated in this AAR to address the soil direct contact pathway (which includes dermal contact and inhalation of particulates) include utilizing the presence of new and/or existing pavement and buildings and identifying uncovered areas that, in the context of planned future land use at the Site, require remedial action. In addition, the erosion control mat installed on the Area A riverbank as part of the ICM is an effective barrier against direct contact. Options to address unpaved or exposed areas where surface soil concentrations exceed the Commercial SCOs include use of NYSDEC presumptive remedies such as removal, capping with one foot of clean soil, or placement of new facilities or paving. Using the Commercial SCOs as cleanup objectives as shown on Figure 20, approximately 5 acres of presently exposed soil exceed the Commercial SCOs and require further consideration under a Commercial use scenario. Management of soils at depth, which may be encountered during future construction or property redevelopment activities, will be accomplished via use of soil management procedures and environmental easements and/or deed restrictions, as specified in a NYSDEC-approved Site Management Plan.

- SHALLOW AQUIFER: Groundwater is not used or planned for use at the Site or in the vicinity of the Site for drinking purposes. Thus, there is no current human exposure pathway associated with the presence of metals and inorganic compounds in the shallow aquifer at levels that exceed the Class GA standards (which are based on a potable use scenario). Potential adverse impact to the Buffalo River and ecological receptors via discharge of contaminated shallow groundwater exists at Area A, which is the only portion of the Site that abuts the river. Shallow groundwater on Areas B, C and E also flows toward the river. However, the RI data indicate the chlorobenzene plumes on Areas C and E have not migrated beyond the property boundaries. During the remedial design process, additional monitoring wells will be installed on Areas C and E, and these wells (as well as certain existing wells in Area E) will be sampled to further delineate the extent of the groundwater plumes, as described in Section 9.3.6. This

AAR focuses on identification of remedies for the shallow groundwater impacted by chlorobenzene and other organic contaminants at the following locations:

- o On Area A, where the shallow groundwater contains chorobenzene, aniline and other organic Site-related constituents at part per million levels and which, under static conditions, extends to and could possibly flow into the Buffalo River;

- o On the northwestern corner of Area C (at well RFI-20 and extending downgradient toward well RFI-31), where levels of chlorobenzene at part per million levels were identified; and

- o On the southwestern portion of Area E in a limited area around the large AST farm and well RFI-32, where levels of chlorobenzene and other organic compounds have been identified in groundwater at part per million levels and impacted soil has also been identified as described above.

- DEEP GROUNDWATER (CONFINED AQUIFER): As described in the RI report, only metals/inorganic compounds and part per billion levels of SVOCs were identified sporadically in the groundwater samples collected from the wells screened within the confined aquifer. Chlorobenzene, which in its pure state is heavier than water, was not identified in any of the confined aquifer groundwater samples at levels that exceeded the Class GA standards, indicating that the glacial clay unit is an effective aquitard. As with the shallow aquifer, groundwater within the confined aquifer is not used for potable purposes, and no such use is known or planned for the Site or properties in the vicinity. It is expected that the discharge point for the confined aquifer is likely downgradient along the Buffalo River valley to Lake Erie based on surface water elevations and the southwesterly flow direction of the confined aquifer, which mimics the flow direction of the Buffalo River drainage basin. Based on the types and levels of contaminants identified within the confined aquifer groundwater samples collected from the Site, there is no potential for adverse impact to the Buffalo River or Lake Erie. Thus, it is concluded that (i) institutional controls/environmental easements may be required to preclude on-site use of the confined aquifer; and (ii) there is no need for further study or active remediation of the confined aquifer.

- SITE SEWERS AND STORMWATER OUTFALLS: The existing Site process sewers are connected to the nearby BSA sewer lines. The RI sampling identified the presence of residual contaminants in solids within the facility process sewers (including sediments or sludges). The RI sampling data, along with the fact that sewer invert elevations along Outfalls 006 and 011 are below the water table, suggest that shallow groundwater may infiltrate portions of facility storm sewers and discharge to the Buffalo River via the outfalls, especially at Outfall 006. However, the mass of contaminants discharged to the river via groundwater infiltration is negligible given the concentrations identified in the effluent and estimated typical groundwater flow rate of 20,000 to 40,000 gallons per day per outfall (based on BCC SPDES monthly reports issued when the plant was no longer operating and thus when no non-contact cooling water was discharging to the outfalls). Even though the discharge may be negligible, this AAR identifies remedial activities associated with plugging or rehabilitating the Site underground sewer system.

- INDOOR AIR: As noted in Section 3.2.5, sampling will be completed at the 100 Lee Street office building and former plant hospital located on Area B. This additional sampling will be consistent with NYSDOH guidance and will be completed during the remedial design process. On Area E, Honeywell will attempt to obtain additional information on the status of vapor intrusion investigation and mitigation efforts being undertaken by others for the warehouse building located at 343 Elk Street. Honeywell will perform additional vapor intrusion investigation at this location. In addition, the indoor air pathway will be addressed or eliminated during construction of any future occupied structures on the Site. This requirement may be addressed via implementation of environmental easements and/or deed restrictions.

- FORMER AREA E WASTEWATER LAGOONS: As discussed in Section 2.1, the former Area E wastewater lagoons were drained, dredged and capped between 1984 and 1988 in accordance with closure plans approved by the NYSDEC. As noted in Section 7.1.2.1, groundwater samples collected from shallow wells located near the locations of the three former lagoons did not contain VOCs above NY Class GA standards or otherwise show evidence of impact related to the former lagoons. Thus, it is concluded that additional remedial measures are not necessary for the former lagoons at this time. Future groundwater monitoring events, as conducted under an approved OM&M program, will include monitoring and sampling of wells in the vicinity of the former lagoons. Requirements for cap maintenance, monitoring and future use limitations for the lagoon areas will be addressed via environmental easements and/or deed restrictions, as specified in the Site Management Plan.

4 REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) form the basis for identifying remedial technologies and developing remedial alternatives in this AAR. They have been developed with an understanding of the issues to be considered in remedy development and selection set forth in Section 4 of the Guide. This section identifies RAOs for site surface soil, subsurface soil, and groundwater. This Section also presents general response actions to address the RAOs and the extent of soil and groundwater contamination requiring remedial action.

As set forth in the Guide, Site-specific remedial objectives were developed with consideration for the frequency of contaminant detection; the chemical and toxicological properties of the Contaminants of Concern (COCs); existing or potential exposure pathways; the present and reasonably anticipated future Site land use; and existing wildlife, their habitats, and other natural resources.

4.1 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES AND REMEDIATION GOALS

Site-specific COCs were determined by comparison of contaminant levels to the potentially applicable standards, criteria, and guidance (SCGs) and to the current and future land use proposed under SBD's redevelopment scenario. The SCGs to be used for the Site consider both the identified COCs and the potential exposure pathways and receptors. The SCGs applicable to the Site and which will be used as the remediation goals for the project are as follows:

> Soil: the Commercial and Protection of Groundwater SCOs, as set forth in the relevant portions of 6 NYCRR Part 375 – Environmental Remediation Programs. This includes the NYSDEC-calculated Soil Cleanup Objectives (SCOs) for aniline and nitrobenzene (per NYSDEC's letter to Honeywell dated December 28, 2007).
>
> Groundwater: Plume containment and, ultimately, a goal of attaining the NY Class GA standards, as set forth in 6 NYCRR Part 703 – Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (NYSDEC, 1999).

4.1.1 REMEDIAL ACTION OBJECTIVES FOR SURFACE SOIL

As described in the RI report, the majority of RI surface soil samples were found to contain concentrations of arsenic and PAHs that exceed the Commercial, Industrial, and Protection of Groundwater SCOs. However, the majority of these samples do not exceed the calculated Site specific background values for arsenic and PAHs. Other metals, including mercury and lead, were detected at concentrations in surface soil samples at concentrations that exceed the SCOs. VOCs were detected in surface samples from Area A, Area C, and Area E at concentrations above the Protection of Groundwater SCOs. The Conceptual Site Model (Figure 19) identifies direct-contact (i.e., dermal contact, ingestion or inhalation of vapors) with surface soil as a potentially complete exposure pathway for construction workers, Site workers, trespassers, and terrestrial biota in the context of reasonably anticipated future land use at the Site. Similarly, the Conceptual Site

Model identified inhalation of particulates due to dispersion of contaminants as a potential exposure pathway for receptors including construction workers, site workers, trespassers, and terrestrial biota. Therefore, the following RAOs were identified for the Site surface soils:

- Protect potential current and future construction workers, Site workers, trespassers, and terrestrial biota at the Site from unacceptable risk resulting from direct-contact (via dermal contact or ingestion) with Site surface soils containing contaminants at concentrations exceeding the Site-specific background, or Commercial or Industrial SCOs, as applicable.

- Reduce the potential leaching of contaminants from Site surface soils at concentrations exceeding the Protection of Groundwater SCOs.

- Prevent potential inhalation by current or future construction workers, site workers, and trespassers, as well as terrestrial biota, of particulates due to dispersion of contaminants in Site surface soils exceeding Site-specific background or the Commercial or Industrial SCOs, as applicable.

- Reduce the potential for overland transport of contaminated soil to the Buffalo River via erosion and stormwater runoff.

4.1.2 REMEDIAL ACTION OBJECTIVE FOR SUBSURFACE SOIL

The results of the RI indicate that vadose zone subsurface soils at the Site contain concentrations of arsenic and PAHs that exceed the Commercial, Industrial, and Protection of Groundwater SCOs. However, similar to the surface soils, most of the associated sampling locations do not exceed the calculated Site-specific background values for arsenic and PAHs. Other metals, such as mercury and lead, were found in certain soil samples at concentrations that exceed the SCOs. Furthermore, two potential subsurface soil sources of groundwater impacts were identified above the upper saturated zone: 1) approximately 2,100 cubic yards of SVOC-impacted soil located in the central part of Area A in the vicinity of RI boring TB-A15; and 2) approximately 8,150 cubic yards of VOC-impacted soil in the vicinity of the large AST farm on the southwestern side of Area E. As described in the RI report, these source areas were identified based on the presence of elevated concentrations of organic substances that are also present in the Site groundwater. Soil volumes were calculated based on distances to nearest samples that did not exhibit elevated organic concentrations and depth to the first zone of saturation.

The Conceptual Site Model (Figure 19) identifies direct-contact (via dermal contact or ingestion) with subsurface soil as a potentially complete exposure pathway for construction workers, Site workers, trespassers, and terrestrial biota in the context of reasonably anticipated future land use at the Site. Similarly, the Conceptual Site Model identifies inhalation of particulates or vapors due to volatilization or dispersion of contaminants as a potential exposure pathway for receptors including construction workers, site workers, trespassers, and terrestrial biota. Therefore, the following RAOs were identified for the Site subsurface soils:

- Protect potential current and future construction workers, site workers, trespassers, and terrestrial biota at the Site from unacceptable risk resulting from direct-contact (via dermal contact, ingestion, or inhalation of vapors) with Site subsurface soils containing contaminants at concentrations exceeding the Commercial SCOs, as applicable.

- Reduce the potential leaching of contaminants from Site subsurface soils at concentrations exceeding the Protection of Groundwater SCOs.
- Prevent potential inhalation by current or future construction workers to particulates due to dispersion of contaminants in Site subsurface soils at concentrations exceeding the Commercial SCOs, as applicable.

4.1.3 REMEDIAL ACTION OBJECTIVES FOR GROUNDWATER

Groundwater is not used or planned for use at the Site or in the vicinity of the Site for drinking purposes. Therefore, no existing or reasonably anticipated future ingestion pathway is complete for groundwater in the shallow aquifer at levels that exceed the Class GA standards (which are based on a potable use scenario). However, the shallow aquifer is impacted by chlorobenzene and other organic contaminants at the following locations which will be addressed via remedial action:

- Area A, where the shallow aquifer contains chlorobenzene, aniline and other organic Site-related constituents at levels that exceed the NY Class GA Standards. The most significant portion of the plume, where VOC concentrations exceed 1 mg/L, is found on the southern portion of Area A. Under static conditions, the shallow aquifer at Area A flows toward the Buffalo River;
- The northwestern corner of Area C (at well RFI-20 and extending downgradient toward well RFI-31), where elevated (up to 7.7 mg/L) levels of chlorobenzene were identified during the RI; and
- The southwestern portion of Area E in the vicinity of the large AST farm and well RFI-32, where elevated (up to 33 mg/L) levels of chlorobenzene, as well as elevated levels of other organic compounds, were identified in the shallow aquifer and impacted soil has also been identified as described above.

The Conceptual Site Model (Figure 19) identifies direct-contact exposure to contaminated groundwater via inhalation of vapors or dermal contact as a potentially complete exposure pathway for construction workers (inhalation and dermal contact) and Site workers, trespassers and terrestrial biota (inhalation only) at the Site. Furthermore, the Conceptual Site Model identified direct-contact exposure to surface water as a potentially complete exposure pathway for construction workers and terrestrial and aquatic biota. Therefore, the following RAOs were identified for the Site groundwater:

- Protect construction workers, Site workers, visitors and terrestrial biota from inhalation of vapors associated with contaminants in the shallow aquifer exceeding the Class GA standards.
- Protect construction workers, Site workers, and visitors from dermal contact with contaminants in the shallow aquifer exceeding the Class GA standards.
- Protect construction workers, Site workers, visitors, and terrestrial and aquatic biota from direct contact with groundwater from the shallow aquifer discharging to the Buffalo River at concentrations that exceed the applicable water quality based standards of the receiving water.

4.2 IDENTIFICATION OF GENERAL RESPONSE ACTIONS AND EXTENT OF CONTAMINATION REQUIRING REMEDIAL ACTION

General response actions may include treatment, containment, excavation, disposal, environmental easements, institutional controls, or a combination of these. Like RAOs, general response actions are medium-specific. Consistent with the issues to be considered in remedy development and selection set forth in the Guide, the general response actions presented in the following subsections include those media identified as potential threats to public health and the environment.

Consistent with reasonably anticipated future land use at the Site, Site-specific RAOs have been developed to address contamination requiring remedial action in surface and subsurface soils, and shallow aquifer groundwater. The following subsections present a discussion of potential general response actions.

4.2.1 GENERAL RESPONSE ACTIONS FOR SOIL

The following general response actions are appropriate for Site-specific soil contamination requiring remediation:

- No Action
- Access Restrictions
- Containment (Covering/new development)
- In-situ Treatment
- Removal/Disposal On-Site or Off-Site
- Ex-situ Treatment

4.2.2 GENERAL RESPONSE ACTIONS FOR GROUNDWATER

These following general response actions are appropriate for site-specific groundwater contamination requiring remediation:

- No Action
- Access Restrictions
- Containment
- Collection
- In-situ Treatment
- On-Site Ex-situ Treatment
- Off-Site Treatment

4.3 EXTENT OF CONTAMINATION REQUIRING REMEDIATION

This subsection identifies, in concept, the extent of impacted media to which the RAOs and general response actions identified above, and the remedial alternatives developed in Sections 5.0 and 6.0 will apply. As outlined in Section 1.0, SBD has identified a preliminary conceptual development for the site that involves a mixture of both commercial and industrial uses.

For comparison purposes, Figures 12 through 15 identify the locations of surface soil concentrations exceeding Commercial SCOs, subsurface soil concentrations exceeding Commercial SCOs, surface soil concentrations exceeding Protection of Groundwater SCOs, and subsurface soil concentrations exceeding Protection of Groundwater SCOs, respectively, based on the RI data. Figure 20 identifies areas that are currently not covered by pavement or structural slabs that will need to be addressed to meet the Commercial use standards. The extent of soil contamination above Unrestricted Residential SCOs extends generally throughout the Site. Figure 16 identifies the distribution of groundwater concentrations in the Shallow Aquifer exceeding the NYS Class GA groundwater standards and shows the locations of greatest chlorobenzene and aniline impact.

5 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section identifies and screens potential remedial technologies. Technologies are identified for the purpose of attaining the remedial action objectives established in Subsection 4.1. Identified technologies correspond to the categories of general response actions described in Subsection 4.2.

Following identification, candidate technologies are screened based on their applicability to site- and contaminant-limiting characteristics as well as the issues to be considered in remedy development and selection set forth in Section 4.3 of the Guide. The purpose of the screening is to produce an inventory of suitable technologies that can be assembled into remedial alternatives capable of mitigating actual or potential risks at the Site. Potential technologies representing a range of general response actions (i.e., no action, limited action, containment, removal, treatment, and disposal) are considered. The result of technology screening is a list of potential remedial technologies that may be developed into candidate remedial alternatives for Site soil and groundwater.

5.1 TECHNOLOGY IDENTIFICATION

Categories of remedial technologies and specific process options were identified based on a review of literature, vendor information, performance data, and MACTEC's experience. These sources were used to generate the list of applicable remedial technologies and associated process options identified for each general response action presented in Table 1 (soil) and Table 2 (groundwater). General response actions were developed for soil (surface and subsurface) and shallow aquifer groundwater. Remedial actions for soil and groundwater were developed to meet the RAOs identified in Section 4.0.

5.2 TECHNOLOGY SCREENING

Consistent with section 4.3 of the Guide, the technology screening process reduces the number of potentially applicable technologies and process options by evaluating factors that may influence process-option effectiveness and implementability. Effectiveness and implementability are incorporated into two screening criteria: waste- and Site-limiting characteristics. Waste-limiting characteristics consider the suitability of a technology based on contaminant types, individual compound properties (e.g., volatility, solubility, specific gravity, adsorption potential, and biodegradability), and interactions that may occur between mixtures of compounds. Site-limiting characteristics consider the effect of Site-specific physical features on the implementability of a technology, such as Site topography and geology, the location of buildings and underground utilities, available space, and proximity to sensitive operations.

Tables 1 and 2 present the technology-screening process for soil and groundwater, respectively. Technologies and process options judged ineffective or not implementable based on the planned Site redevelopment and other factors were eliminated from further consideration. The technologies retained following screening represent an inventory of technologies considered most suitable for remediation of soil and groundwater, respectively, at the Site and may be used alone or integrated with other technologies to develop remedial alternatives. Bench-scale and/or pilot-scale testing may be required prior to final technology selection to confirm the effectiveness of a given technology. As shown on Tables 1 and 2, remedial alternatives retained for evaluation are:

SOIL

- No Action
- Access Restrictions (Land Use Restrictions, Fencing)
- Containment (Cover System)
- Removal (Mechanical Excavation, Off-Site Disposal)

GROUNDWATER

- No Action
- Institutional Controls (Land Use Restrictions)
- Containment (Cover System, Slurry Wall/Sheet Piling)
- Collection (Extraction Wells w/Monitoring)
- In-Situ Treatment (Enhanced Biodegradation, Oxidation/Reduction)
- On-Site Ex-Situ Treatment (Granular Activated Carbon)
- Off-Site Treatment or Disposal (Discharge to POTW)

6 DEVELOPMENT AND SCREENING OF ALTERNATIVES

The retained technologies identified in Tables 1 and 2 are considered (i) consistent with section 4.3 of the Guide; and (ii) technically feasible and applicable to the waste types and physical conditions at the Site. These medium-specific technologies were assembled into potential remedial alternatives capable of achieving the RAOs. Each of the Site-specific remedial alternatives developed in the following paragraphs incorporate technologies which address the media requiring remediation at the Site. Surface soil and subsurface soil are addressed in one set of alternatives, referred to as soil alternatives, and are described in Subsection 6.1. Shallow aquifer impacts are addressed in a second set of alternatives that are described in Subsection 6.2. Due to the limited number of alternatives developed in this Section, all developed alternatives have been retained for detailed analysis in Section 7.0. Furthermore, it should be noted that all evaluated remedial alternatives include use of institutional and engineering controls, which will be specified in a Site Management Plan, consistent with the NY BCP Track 4 approach.

6.1 SOIL ALTERNATIVES IDENTIFICATION

The retained technologies were assembled into four soil alternatives that address surface soil and subsurface soil as follows:

- Alternative S-1: No Action
- Alternative S-2: Cover System
- Alternative S-3: Cover System with Source Area Excavation
- Alternative S-4: Excavation and Off-Site Disposal of Site Soils Exceeding Unrestricted Use SCOs

These alternatives are described in the following subsections.

6.1.1 ALTERNATIVE S-1: NO ACTION

No actions would be conducted as part of this alternative. Alternative S-1 was developed as a baseline against which to compare other remedial alternatives.

6.1.2 ALTERNATIVE S-2 – COVER SYSTEM

Alternative S-2 includes the use of soil, pavement and/or existing/new structures (with appropriate soil vapor mitigation measures) as cover to provide protection from direct contact exposure to contaminated surface soils at areas not presently covered by pavement or buildings that exceed the Commercial SCOs. The cover, with proper grading, would also reduce infiltration of precipitation through contaminated soil into groundwater and promote surface drainage. Using the Commercial SCOs as cleanup objectives as shown on Figure 20, approximately 5 acres of presently exposed soil exceeds the Commercial SCOs. Consistent with the redevelopment of the Site, the cover system would be consistent with the presumptive capping remedy as identified in 6 NYCRR Part 375. To the extent retained, existing paved surfaces and building floor slabs which will be utilized as part of the cover system will be cleaned when necessary, repaired and sealed where soils exceed the cleanup objectives.

6.1.3 ALTERNATIVE S-3 – COVER SYSTEM WITH SOURCE AREA EXCAVATION

Alternative S-3 includes excavation to the water table and off-Site disposal of contaminated soil in the source area located on Area E, the approximate location of which is shown on Figure 18. This source area contains approximately 8,100 cubic yards of VOC-impacted soil located around the AST farm in the southwestern corner of this area. Approximately 15 horizontal ASTs, each with an approximate 10,000 gallon capacity, would require removal. The majority of the contents of the ASTs were removed by Honeywell contractors in 2006-2007; however, residual amounts of chemicals may remain in the tanks. RCRA Land Disposal Regulations may require the treatment of waste prior to disposal. Confirmation sampling would be conducted following excavation activities. Following removal activities, excavated areas would be backfilled with clean fill and re-graded.

Confirmation samples would be collected from the excavation sidewalls (see Section 9.2.1). Characterization samples for the removed materials would include hazardous waste characteristics, VOCs, SVOCs, and metals, and would be collected at a frequency specified by the selected waste disposal facility. Based on the characterization results, the excavated soils will be transported off-Site for proper treatment and/or disposal. If appropriate, on-Site treatment to stabilize metals or bioremediate organic compounds may also be performed.

6.1.4 ALTERNATIVE S-4 – EXCAVATION OF SITE SOILS EXCEEDING UNRESTRICTED USE SCOS

Alternative S-4 would include the demolition of existing buildings and the excavation of Site soils that exceed the Unrestricted Use SCOs. Although this alternative is not considered feasible from a technical or cost standpoint, it is evaluated per Section 4.8(2)(B) of the Guide. Under this scenario, virtually the entire Site would require excavation to the first water-bearing zone (assumed average depth of 5 feet below ground surface).

Characterization samples would include hazardous waste characteristics, VOCs, SVOCs, and metals, and would be collected for every 500 cubic yards of materials removed.

For evaluation purposes, it was assumed that half of the excavated soil would be considered hazardous waste and the other half would be considered non-hazardous. It was further assumed that the majority of soils would be suitable for direct landfill disposal.

Institutional controls for groundwater and soil vapor would be implemented.

6.2 GROUNDWATER ALTERNATIVES IDENTIFICATION

Groundwater remediation alternatives were developed for each of the four areas of the Site. The alternatives were identified based upon the characteristics of the groundwater contamination within each area as described below:

Area A

The shallow aquifer on portions of Area A contains chlorobenzene, aniline and other organic Site-related constituents at levels that exceed the NY Class GA standards. The most significant portion of the plume, where concentrations of chlorobenzene and aniline exceed 1 mg/L, is found on the southern portion of Area A and extends from the upgradient (western) property boundary to the downgradient boundary along the Buffalo River, as depicted on Figure 16. Under static (non-pumping) conditions, groundwater from the shallow aquifer at Area A flows toward the Buffalo River. On this basis, the following remedial alternatives were developed for Area A groundwater:

- Alternative GW-A-1: Hydraulic Containment via Operation of Existing ICM
- Alternative GW-A-2: Continued Operation of ICM with Hydraulic Barrier Wall
- Alternative GW-A-3: In-Situ Chemical Oxidation

Area B

The shallow aquifer at or near Area B contains concentrations of various metals and inorganic compounds at levels consistent with those found in the shallow aquifer across the Site, including upgradient locations. Concentrations of aniline and naphthalene were found above the Class GA standards in several of the wells at low part per billion (ug/L) concentrations. Concentrations of chlorobenzene, tetrachloroethene (PCE), and trichloroethene (TCE) were identified at levels that exceeded the Class GA standards in the groundwater sample collected from well RFI-27. This well is located on the southwestern corner of Area B. A trace concentration of benzene was identified in the sample collected from well RFI-28, which is located near the southeastern corner of Area B. No corresponding soil source areas were found on Area B in connection with the contaminants identified in well RFI-27 and RFI-28, and shallow groundwater flow direction at these two locations is toward Area A. On this basis, the following alternatives have been developed for Area B:

- Alternative GW-B-1: No Action
- Alternative GW-B-2: Groundwater Monitoring

Areas C and E

In the northwestern corner of Area C (at well RFI-20, and extending downgradient toward well RFI-31), up to 7.7 mg/L of chlorobenzene has been identified in the shallow aquifer. On the southwestern portion of Area E in the vicinity of the large AST farm and well RFI-32, shallow groundwater contains up to 33 mg/L of chlorobenzene, as well as elevated levels of other organic compounds, and impacted soil has also been identified in the same location, as described above. The RI data indicates that the chlorobenzene-impacted groundwater has not migrated beyond the downgradient property line at either location. On this basis, the following alternatives have been developed for shallow groundwater at both Areas C and E:

- Alternative GW-C&E-1: No Action
- Alternative GW-C&E-2: Enhanced Bioremediation with Groundwater Monitoring

It should be noted the a hydraulic barrier wall alternative was not retained for further evaluation as a remedy for Areas C and E because existing data, as detailed in the RI report, indicates that the chlorobenzene plumes have not migrated beyond the Site boundary and therefore have no potential to impact the Buffalo River. In addition, Areas C and E do not abut the river, and any downgradient hydraulic barrier wall would require placement on PVS Chemicals operating facility, making this alternative infeasible.

6.2.1 AREA A ALTERNATIVES

6.2.1.1 Alternative GW-A-1: Hydraulic Containment via Operation of Existing ICM

Alternative GW-A-1 involves the long-term operation of the existing ICM, which consists of groundwater extraction from the shallow aquifer with treatment and/or discharge to the BSA. The ICM is designed to provide hydraulic containment of the downgradient edge of the shallow aquifer in Area A and prevent it from migrating to the Buffalo River. It consists of five extraction wells (EW-1 through EW-5) with submersible pumps. As noted in the technical report provided in Appendix A, the results of the hydraulic study completed by MACTEC in early 2008 indicated that enhancement of the existing Area A extraction system via installation of additional extraction wells would likely be required if groundwater extraction were to be utilized as the stand-alone final remedy for the Area A shallow groundwater.

Institutional controls in the form of deed restrictions and/or environmental easements would be implemented to restrict future site groundwater use, thereby limiting the potential for exposure to site contaminants. Although investigations have concluded that groundwater presents minimal risk to public health and the future use of the Site will be commercial or industrial, institutional controls would be implemented to prohibit groundwater use and require vapor mitigation measures. The controls would be drafted, implemented, and enforced in cooperation with the Site owner, state, and local governments. Operation and maintenance activities would include those necessary to support the extraction system and record and field surveys, if necessary, to verify institutional controls are being maintained.

Alternative GW-A-1 would include long-term groundwater monitoring. Initially, the monitoring would be performed in accordance with the OM&M Plan. As more data is obtained, the monitoring scope and frequency may be adjusted.

6.2.1.2 Alternative GW-A-2: Continued Operation of ICM with Hydraulic Barrier Wall

Alternative GW-A-2 includes a vertical hydraulic barrier wall installed along the eastern edge of Area A bordering the Buffalo River and operation of a groundwater extraction system (most likely some variation of the existing system) as described for Alternative GW-A-1 above. The approximate extent of the wall is shown on Figure 21. The intent of the wall is to create a physical barrier between contaminated shallow aquifer groundwater in Area A and the Buffalo River. As shown on Figure 21, the wall would be “wrapped” along the southern border and a portion of the northern border as necessary to ensure hydraulic containment of impacted groundwater. The wall would have the added benefit of reducing the volume of river water extracted by the ICM and reducing the amount of water that requires pretreatment prior to discharge to the BSA sewer. The wall would be keyed into the glaciolacustrine clay layer, which acts as an aquitard separating the shallow aquifer from the confined aquifer present in the basal till and Onondaga limestone immediately below the clay. The type of wall used (sheet pile, slurry wall, etc.) would be determined based on pre-design studies. The pre-design investigation would be required to collect site specific data for wall design and installation.

Institutional controls and environmental monitoring would be implemented similar to Alternative GW-A-1.

6.2.1.3 Alternative GW-A-3: In-Situ Chemical Oxidation

Alternative GW-A-3 includes implementation of in-situ chemical oxidation and groundwater extraction. A treatability study would be conducted in support of designing an in-situ chemical oxidation program. Based on the results of the treatability study and pre-design investigation, a pilot-scale chemical oxidation test would be conducted on-Site to determine the injection point locations and spacing and confirm treatment effectiveness and parameters.

Implementation of full-scale in-situ chemical oxidation would involve injection of a chemical oxidant into the up-gradient portion of the chlorobenzene and aniline plumes at Area A. Groundwater sampling and analysis would be conducted prior to and periodically after injection to determine the reduction of contaminant concentrations. It is possible that multiple injections may be required. Continued operation of the ICM would be necessary unless and until contaminant concentrations in the Area A shallow groundwater meet the Class GA standards.

Institutional controls and environmental monitoring would be implemented similar to Alternative GW-A-1.

6.2.2 AREA B ALTERNATIVES

6.2.2.1 Alternative GW-B-1: No Action

No actions would be conducted as part of this alternative. Alternative GW-B-1 was developed as a baseline against which to compare other remedial alternatives.

6.2.2.2 Alternative GW-B-2: Groundwater Monitoring

Alternative GW-B-2 would involve completion of groundwater monitoring to verify that there is no increasing trend in groundwater contaminant levels and that no exposure pathways exist. Although investigations have concluded that groundwater at Area B presents minimal risk to public health and the future use of the Site will be commercial/industrial, institutional controls would be implemented to prohibit groundwater use at the Site and require vapor mitigation measures for structures. The controls would be drafted, implemented, and enforced in cooperation with the site owner, state, and local governments. Operation and maintenance activities would include record and field surveys, if necessary.

Groundwater sampling and analysis would be conducted to verify that contaminant concentrations are stable or decreasing. The frequency, scope and duration of the monitoring initially will be as described in the ICM OM&M Plan. As more data is obtained, adjustments to the monitoring program would be made. The results of the monitoring would be presented in Annual Reports.

6.2.3 AREAS C&E ALTERNATIVES

6.2.3.1 Alternative GW-C&E-1: No Additional Action

No additional actions would be conducted as part of this alternative. Alternative GW-C&E-1 was developed as a baseline against which to compare other remedial alternatives for Areas C&E.

6.2.3.2 Alternative GW-C&E-2: Enhanced Bioremediation and Groundwater Monitoring

Alternative GW-C&E-2 includes in-situ enhanced bioremediation of the limited chlorobenzene plumes identified at Areas C&E. A pre-design investigation, including a treatability study, would be required to collect Site-specific data related to geochemical and biological processes at the Site in order to determine the appropriate amendments for enhanced bioremediation. Based on the results of the treatability study, a pilot-scale test would be conducted on-Site to determine the injection point locations, spacing, and effectiveness. The full-scale implementation would be based upon the results of the treatability and pilot-scale tests. At Area E, it may be advantageous to directly apply the bio-enhancement additive to the subsurface during the source area removal action.

Institutional controls in the form of environmental easements and land-use restrictions would be implemented to restrict future Site use, thereby limiting the potential for exposure to Site contaminants. Institutional controls would be implemented to prohibit groundwater use at the Site, and require vapor mitigation measures for structures. The controls would be drafted, implemented, and enforced in cooperation with the Site owner, state, and local governments. Operation and maintenance activities would include record and field surveys, if necessary, to verify groundwater is not being used.

Alternative GW-C&E-2 is a long-term alternative with a monitored natural attenuation component to it. Therefore, a long-term ground water sampling and analysis program would be required. Initially, the monitoring would be performed in accordance with the ICM OM&M Plan. As more data is obtained, the monitoring scope and frequency may be adjusted. Results of long-term monitoring and evaluation of natural attenuation processes would be incorporated into Annual Reports prepared for the Site.

7 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analyses of remedial action alternatives for the Site. The detailed analysis is intended to provide decision-makers with the relevant information with which to aid in selection of a Site remedy in the context of reasonably anticipated future Site land use. The detailed description of technologies or processes used for each alternative includes, where appropriate, a discussion of limitations, assumptions, and uncertainties for each component. The descriptions provide a conceptual design of each alternative and are intended to support the comparison of alternatives presented in Section 8.0.

The detailed analysis of each alternative includes evaluation using the evaluation criteria outlined in the Guide as well as relevant portions of DER-10 (NYSDEC, 2002). The Remedy Evaluation Criteria set forth in Section 4.7 of the Guide are identified in the following paragraphs.

Compliance with New York State Standards, Criteria, and Guidance (SCGs). How the alternative would comply with applicable or relevant and appropriate federal regulations and New York State standards, criteria and guidance (SCGs). The RGs selected for this project are consistent with applicable New York State SCGs and are referred as chemical-specific SCGs. SCGs which are specific to the location of the Site are referred to as location-specific SCGs, and those specific to the proposed remedial actions are referred to as action-specific SCGs.

Overall Protection of Public Health and the Environment. How each alternative protects public health and the environment. This evaluation is based on a composite of factors assessed under other evaluation criteria, especially long- and short-term effectiveness and compliance with SCGs.

Short-term Impacts and Effectiveness. Impacts on the community, workers, and environment during the construction phase of each alternative until RAOs are met. Includes the time required to complete the remedial action.

Long-term Effectiveness and Permanence. Effectiveness of alternatives in protecting public health and the environment after RAOs are met. Includes an evaluation of the permanence of the alternative, the magnitude of residual risk, and the adequacy and reliability of controls required to manage wastes or residuals remaining at the site.

Reduction of Toxicity, Mobility, and Volume with Treatment. Reduction in toxicity, mobility, or volume of hazardous material through treatment. The irreversibility of the treatment process and the type and quantity of residuals remaining after treatment are also evaluated.

Implementability. Technical and administrative feasibility of implementing the alternative and the availability of required services and materials.

Cost Effectiveness. As agreed to by NYSDEC during a meeting between Honeywell and NYSDEC on January 11, 2008, cost effectiveness has been addressed on a qualitative basis, and numerical costs are not presented in this AAR. However, the cost effectiveness of the alternatives evaluated herein was assessed by comparing general cost ranges (i.e., low, moderate, high).

Community Acceptance. As noted in Section 1.1, the concepts for the Site described herein include beneficial uses for the public, and it is anticipated that all stakeholders will have opportunity to have input in the final decisions on how best to use the property. The likelihood of community acceptance was assessed as part of the remedy evaluation process.

Land Use. Each remedial alternative was evaluated based on compatibility with the land use under the proposed redevelopment scenario.

7.1 DETAILED EVALUATION OF SOIL ALTERNATIVES

The following soil remedial alternatives were retained in Subsection 6.1:

Alternative S-1: No Action

Alternative S-2: Cover System

Alternative S-3: Cover System with Source Area Excavation

Alternative S-4: Excavation and Off-Site Disposal of Site Soil Exceeding Unrestricted Residential SCOs

7.1.1 ALTERNATIVE S-1: NO ACTION

No actions would be conducted as part of this alternative. Alternative S-1 was developed as a baseline against which to compare other remedial alternatives.

The following paragraphs present an assessment of Alternative S-1 based upon the criteria identified previously.

Compliance with New York State SCGs. The No Action alternative does not include any actions to reduce contaminant concentrations in Site soil and, therefore, would not be in compliance with chemical-specific SCGs. Because no action would be implemented this alternative would not trigger location- or action-specific SCGs.

Overall Protection of Public Health and the Environment. SCOs for protection of public health and the environment were developed for contaminated soil. Alternative S-1 would not provide any additional protection of public health and the environment compared to present conditions.

Short-term Impacts and Effectiveness. No construction activities would be implemented for the No-Action Alternative; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.

Long-term Impacts and Effectiveness. The RAOs would not be met if the No Action Alternative were implemented at the Site. This alternative would not provide long-term effectiveness.

Reduction of Toxicity, Mobility, and Volume. Because no processes would be used to treat waste or contaminated media at the Site, no reduction of toxicity, mobility, or volume of site contaminants would be achieved through treatment. Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of site contaminants over time.

Implementability. Although no services or materials would be required to implement the No Action Alternative, obtaining regulatory agency approval for the No Action Alternative is highly unlikely.

Cost Effectiveness. There is no cost associated with the No Action alternative. Therefore, the cost category is “Low”.

Community Acceptance. Because this alternative will not result in protection of public health or the environment, the No Action alternative will likely be unacceptable to the community.

Land Use. The No Action alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from exposure to contaminants present in Site soil and groundwater.

7.1.2 ALTERNATIVE S-2 – COVER SYSTEM

The major components of Alternative S-2 are the following:

- Pre-design investigations;
- Site preparation/mobilization;
- Construction of a cover system;
- Institutional controls; and
- Long-term cover inspection and maintenance.

Pre-Design Investigations. Pre-design investigations would be conducted to provide Site-specific data for final design of the remedial actions and additional refinement of the extent of contamination. The investigations would include a surface soils sampling program to provide the necessary information to identify engineering requirements that may be necessary as part of the design, as well as develop design criteria for soil cover, paving, and/or building structures. Also, pre-design investigations would confirm the extent of the cover system.

Site Preparation and Mobilization. Site preparation and mobilization would include activities required to prepare the site for construction such as delivery and setup of site trailers, temporary utilities, and grading and relocation of on-Site soil consistent with the proposed redevelopment of the Site. Layout of the cover system would be surveyed during this period.

Construction of a Cover System. Alternative S-2 includes a cover system, designed in accordance with sound engineering design practices, over specific areas that would be integrated with the redevelopment of the Site. The primary objective of the cover system is to provide protection from direct contact exposure to contaminated soils. The cover would also promote surface drainage and reduce infiltration of precipitation through contaminated soil into groundwater. The estimated extent of area that would require placement of additional cover to achieve the RAOs is approximately 5 acres under a Commercial (Figure 20).

The cover system would be composed of a minimum of one foot of clean soil (with a demarcation layer), new buildings and structures, and/or pavement, as required under 6 NYCRR Part 375 and the Guide. Specifications for pavement design would be based on Site-specific redevelopment plans and would depend on surface loading and traffic rating. New structures would include soil vapor mitigation measures. Some additional storm water drainage structures and piping may also be required due to the increased runoff; these would be incorporated into the final redevelopment plans selected for the Site.

The Site would be minimally graded and/or a compacted gravel/fill material would be placed as necessary to facilitate redevelopment and achieve design grades and to promote positive drainage.

Institutional Controls. Because soil contaminants above Commercial SCOs would remain on-Site, institutional controls would be implemented to prevent exposure. Land-use restrictions would prohibit or control subsurface activity in the area of contamination and require use of a Site Management Plan. Land-use restrictions would be implemented through legal instruments such as deeds and/or environmental easements.

Long-Term Inspection and Maintenance. Long-term inspection and maintenance of the cover system, including areas of new cover (Figure 20) and areas of existing pavement and building floor slabs, would be conducted to identify and correct any degradation of the cover over time that may reduce its effectiveness.

The following paragraphs present an assessment of Alternative S-2 based upon the criteria identified previously.

Compliance with New York State SCGs. Alternative S-2 does not include the removal of soil with contaminant levels that exceed SCOs. Alternative S-2 complies with the relevant portions of Part 375 and the Guide and includes access and land-use restrictions to minimize exposure to contaminants at the Site, and a cover system to restrict direct exposure and reduce the leaching to groundwater of soil contaminants. Actions associated with the construction of the low-permeability cover system would comply with TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (NYSDEC, 1989) and/or New York State Department of Health Generic Community Air Monitoring Plan - June 2000 (CAMP) (NYSDOH, 2002), as applicable. All fill materials imported for use at the Site would be “clean certified” in accordance with 6 NYCRR Part 375. Implementation of this remedial alternative would utilize erosion and sediment control measures in accordance with applicable regulations.

Overall Protection of Public Health and the Environment. This alternative provides protection of public health and the environment through restricting direct exposure by establishing a cover system over areas of soil exceeding the Commercial SCOs. Furthermore, the cover system would enhance surface runoff and reduce the amount of water infiltrating through soil contamination, thereby reducing leaching of the soil contaminants to groundwater in the shallow aquifer. A demarcation layer between the soil cover and Site soils would allow for assessment of cover integrity. Institutional controls would prevent unauthorized disturbance of the cover system and establish procedures for management of Site soils that may be disturbed in the future, as well as design criteria for soil vapor management for new structures at the Site. To ensure continued protection of public health and the environment, inspection and maintenance of the cover system would be required.

Short-term Impacts and Effectiveness. Remedial construction activities are not likely to adversely affect the local community. A majority of the activity would be related/coordinated with Site redevelopment activity. An increase in truck traffic near the Site would be expected during hauling of materials for cover system construction. Truck beds would be covered to minimize the possibility of material loss onto roadways and generation of dust. Initial grading of the site may produce nuisance dust. Ambient air monitoring for respirable dust would be conducted during remedial construction and engineering controls for dust suppression can be easily implemented if action levels are exceeded.

Significant temporary impacts to the environment are not expected. A remedial Health and Safety Plan (HASP) would be developed and followed to minimize risks to workers during remedial construction.

Although most of the work should not require levels of protection greater than Level D, the HASP would outline situations when an upgrade of personal protective equipment would be necessary.

Hazards associated with heavy equipment use can be minimized by following Occupational Safety and Health Administration (OSHA) guidelines. These risks would be minimized by use of temporary fencing around the Site and proper Site security. The remedy will not rely on fencing to prevent exposure to site related constituents.

Long-term Impacts and Effectiveness. Covering is considered a control and isolation technology in the hierarchy of technologies described in the TAGM #4030 “Selection of Remedial Actions at Inactive Hazardous Waste Sites” (NYSDEC, 1990). The cover system, which would include a minimum of one foot of clean soil, pavement, and/or new structures integrated with the areas of existing pavement and building floor slabs, would provide long-term effectiveness when properly maintained.

Environmental monitoring and Site inspections would be used to assess the long-term fate and migration of Site-related chemical contamination. The final environmental monitoring program would be developed during the remedial design.

The cover system would enhance runoff and reduce the amount of infiltration. Institutional controls would prevent ingestion of groundwater on-Site and disturbance of the cover system.

Reduction of Toxicity, Mobility, and Volume. This alternative would include actions to reduce the mobility of contaminants by reducing the potential for migration of contaminants via leaching, airborne dust, etc. This alternative does not include actions to reduce the toxicity or volume of contaminated soils through treatment.

Implementability. The construction and long-term use of a cover system (coordinated with Site redevelopment) is a well-developed technology for Site closure. Construction and maintenance techniques would not be difficult to implement. Delays due to technical problems would be unlikely or minimal. Contractors to perform the services required for this alternative are available locally and several could be included in a competitive bid process.

Cost Effectiveness. The cost associated with Alternative S-2 is categorized as “Moderate”.

Community Acceptance. If used in conjunction with other alternatives, it is likely that use of a cover system as part of the final remedy will be acceptable to the community.

Land Use. Use of a cover system will be compatible with the proposed land use; SBD's redevelopment plans incorporate the use of new and existing pavement and building floor slabs, along with soil cover where appropriate.

7.1.3 ALTERNATIVE S-3 – COVER SYSTEM WITH SOURCE AREA EXCAVATION

The major components of Alternative S-3 are the following:

- Pre-design investigations;
- Site preparation/mobilization;
- Excavation and off-site disposal of source area soils;
- Construction of a cover system;
- Institutional controls; and
- Long-term cover inspection and maintenance.

<u>Pre-Design Investigations</u>. Pre-design investigations would be conducted similar to Alternative S-2.

<u>Site Preparation and Mobilization</u>. Site preparation and mobilization would be conducted similar to Alternative S-2. In addition to those components included in Alternative S-2, Alternative S-3 would require removal of ASTs, underground structures, and utilities located within the Area E source area shown on Figure 18 (i.e., the location on Area E where a potential source of soil to groundwater contamination has been identified).

<u>Excavation and Off-Site Disposal of Source Area Soils</u>. Alternative S-3 includes excavation to the water table and off-Site disposal of contaminated soil in the identified source area located at Area E. The remedial criteria for excavation/removal are described in Section 9.0. The Area E source area consists of approximately 8,100 cubic yards of VOC-impacted soil located around the AST farm in the southwestern corner of this area. RCRA Land Disposal Regulations may require the off-Site treatment of certain soils prior to final disposal. Waste characterization and confirmation sampling would be conducted during excavation activities. Depending on the characterization results for the soil that will be excavated, final disposal options will include landfilling and incineration at approved/permitted waste disposal facilities. On-Site treatment to stabilize metals or reduce levels of organic compounds may also be performed, if approved by NYSDEC. Following waste removal, excavated areas would be backfilled with clean fill and re-graded.

Construction of a Cover System. A cover system would be constructed at the Site similar to Alternative S-2. This system would include the areas of soil (with a demarcation layer), new structures and/or existing pavement and building floor slabs to form a surface barrier against contact and infiltration.

Institutional Controls. Institutional controls would be implemented similar to Alternative S-2.

Long-Term Inspection and Maintenance. Long-term cover inspection and maintenance would be implemented similar to Alternative S-2.

The following paragraphs present an assessment of Alternative S-3 based upon the criteria identified previously.

Compliance with New York State SCGs. Alternative S-3 includes the removal of soil on Area E with target VOC/SVOC levels exceeding Commercial and/or Protection of Groundwater SCOs, to the extent practicable as described further in Section 9.0. Areas of soil with contaminant levels that exceed the Commercial SCOs would remain and be controlled via the surface cover system. Alternative S-3 includes access and land-use restrictions to minimize exposure to contaminants at the Site. Actions associated with the source removal and with construction of the cover system would comply with TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (NYSDEC, 1989) and/or New York State Department of Health Generic Community Air Monitoring Plan - June 2000 (CAMP) (NYSDOH, 2002), as applicable. Fill materials imported for use as cover at the Site would be “clean certified” in accordance with 6 NYCRR Part 375 and meet the lower of the Commercial or Protection of Groundwater SCOs. Implementation of this remedial alternative would utilize erosion and sediment control measures in accordance with applicable regulations.

Transportation of contaminated and/or hazardous soils would be subject to 6 NYCRR Part 364: Waste Transporter Permits. Compliance with these requirements can be attained by contracting with a licensed hauler. The receiving facility(s), if located in the State of New York, would need to be properly permitted for handling, treatment, and/or disposal of the wastes in accordance with 6 NYCRR Part 373: Hazardous Waste Management Facilities or 6 NYCRR Part 360: Solid Waste Management Facilities, as applicable. The requirement for treatment prior to disposal would be made in accordance with these regulations and with 6 NYCRR Part 376: Land Disposal Restrictions. If out-of-State disposal facilities are used, compliance with the laws and regulations applicable to the specific locations of those facilities would be required.

Overall Protection of Public Health and the Environment. This alternative provides protection of public health and the environment through removal of contaminated soil and restricting direct exposure by installing a cover system over areas of soil exceeding the Commercial SCOs, as appropriate. Furthermore, the removal of the Area E source area and installation of the cover system would enhance surface runoff and reduce the amount of water infiltrating through soil contamination, thereby reducing leaching of the soil contaminants to groundwater. A demarcation layer between the soil cover and Site soils would allow for assessment of cover integrity. Institutional controls would prevent unauthorized disturbance of the cover system. To ensure continued protection of public health and the environment, inspection and maintenance of the cover system would be required, as would vapor intrusion mitigation measures for new structures on-Site. Because this alternative would reduce infiltration through contaminated soils, discharge of contaminated groundwater from the shallow aquifer to surface water would be reduced. Therefore, surface water quality, as well as shallow aquifer groundwater quality, would be expected to improve over time even if no active groundwater remediation measures were implemented.

Short-term Impacts and Effectiveness. Remedial construction activities are not likely to adversely affect the local community. A majority of the activity would be related/coordinated with Site redevelopment activity. An increase in truck traffic near the Site would be expected during hauling of excavated soil and materials for cover system construction. Truck loads would be covered to minimize the possibility of material loss onto roadways and generation of dust. Initial grading and excavation of source areas may produce odors, volatile organic vapors, and nuisance dust. Ambient air monitoring for organic vapors and respirable dust would be conducted during remedial construction. Engineering controls for vapor, odor, or dust suppression can be easily implemented if action levels are exceeded.

Significant temporary impacts to the environment are not expected. A remedial HASP would be followed to minimize risks to workers during remedial construction. Although most of the work should not require levels of protection greater than Level D, the HASP would outline situations when an upgrade of personal protective equipment would be necessary.

Hazards associated with heavy equipment use can be minimized by following OSHA guidelines. These risks would be minimized by use of temporary fencing around the Site and proper Site security.

Long-term Impacts and Effectiveness. Removal of source area soils is an effective way to reduce long-term impacts. Use of a cover system is considered a control and isolation technology in the hierarchy of technologies described in the TAGM #4030 “Selection of Remedial Actions at Inactive Hazardous Waste Sites” (NYSDEC, 1990). The cover would provide long-term effectiveness when properly maintained.

Environmental monitoring and Site inspections would be used to assess the long-term fate and migration of Site-related chemical contamination. The final environmental monitoring program would be developed during the remedial design.

The soil cover system would enhance runoff and reduce the amount of water infiltrating through waste material. Institutional controls would prevent ingestion of groundwater on-Site and disturbance of the cover system.

Reduction of Toxicity, Mobility, and Volume. This alternative would include action to reduce the toxicity, mobility, and volume of source materials.

Implementability. Source removal through excavation and use of a cover system, coordinated with Site redevelopment, to control exposure are proven techniques for Site closure. Construction approaches used for excavation and cover construction would not be difficult to implement. Delays due to technical problems would be unlikely or minimal. Off-Site disposal of source area soils is not anticipated to present any difficulties.

Contractors to perform the services required for this alternative are locally available and several could be included in a competitive bid process.

Cost Effectiveness. The cost associated with Alternative S-3 is categorized as “Moderate to High”. The final cost will depend in part on disposal requirements for the material excavated from Area E.

Community Acceptance. It is likely that source area excavation combined with use of a cover system as part of the final remedy will be acceptable to the community.

Land Use. Source area excavation can be performed after demolition and prior to new construction activities. Use of a cover system will be compatible with the proposed land use; SBD’s redevelopment plans require the use of pavement and building floor slabs, along with soil cover where appropriate.

7.1.4 ALTERNATIVE S-4 – EXCAVATION OF SITE SOILS EXCEEDING UNRESTRICTED SCOS

This alternative is required by Section 4.8(2)(B) of the Guide. The major components of Alternative S-4 are the following:

- Pre-design investigations;
- Site preparation/mobilization;
- Excavation and off-Site disposal of Site soils; and
- Institutional Controls.

Pre-Design Investigations. Pre-design investigations would be conducted similar to Alternative S-2 and would address the entire Site rather than specific locations.

Site Preparation and Mobilization. Site Preparation and mobilization would be conducted similar to Alternative S-2. Demolition of existing structures would need to occur prior to or in conjunction with this alternative.

Excavation and Off-site Disposal of Source Area Soils. Alternative S-4 would include the excavation of Site soils down to the water table (average assumed depth is 5 feet below existing grade) over virtually the entire Site. This would result in excavation and removal of roughly 290,000 cubic yards (in-place volume) of material and placement of a similar quantity of backfill. After excavation, clean backfill would be placed, graded, and vegetated and stormwater controls, such as retention ponds and drainage swales, would be constructed.

Characterization samples would be collected in accordance with disposal facility requirements to ensure that proper disposal occurs.

It is assumed that some of the excavated soil would be considered hazardous, with the majority considered non-hazardous. It is assumed that most soils would be suitable for direct landfill disposal.

Institutional Controls. Limited institutional controls (groundwater and soil vapor) would be implemented.

The following paragraphs present an assessment of Alternative S-4 based upon the criteria identified previously.

Compliance with New York State SCGs. Alternative S-4 includes the removal of soil at the Site to the first saturated zone and backfilling the Site to grade with clean soil. Actions would comply with TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (NYSDEC, 1989) and/or New York State Department of Health Generic Community Air Monitoring Plan - June 2000 (CAMP) (NYSDOH, 2002), as applicable. Fill materials imported for use at the Site would be “clean certified” in accordance with NYCRR Part 375. Implementation of this remedial alternative would utilize erosion and sediment control measures in accordance with applicable regulations.

Transportation of contaminated and/or hazardous soils would be subject to 6 NYCRR Part 364: Waste Transporter Permits. Compliance with these requirements can be attained by contracting with a licensed hauler. The receiving facility(s), if located in the State of New York, would need to be properly permitted for handling, treatment, and/or disposal of the wastes in accordance with 6 NYCRR Part 373: Hazardous Waste Management Facilities or 6 NYCRR Part 360: Solid Wastes Management Facilities, as applicable. The requirement for treatment prior to disposal would be made in accordance with these regulations and with 6

NYCRR Part 376: Land Disposal Restrictions. If out-of-State disposal facilities are used, compliance with the laws and regulations applicable to the specific locations of those facilities would be required.

Overall Protection of Public Health and the Environment. This alternative provides protection of public health and the environment through removal of soil with contaminant levels that exceed the Unrestricted Use SCOs. Because this alternative would remove contaminated soils exceeding the Protection of Groundwater SCOs, leaching of contamination to groundwater in the shallow aquifer, and subsequent discharge of groundwater from the shallow aquifer to surface water would be reduced or eliminated. Therefore, surface water quality, as well as groundwater quality, would be expected to improve over time even if no active groundwater remediation measures were implemented.

Short-term Impacts and Effectiveness. Remedial construction activities associated with this Alternative may adversely affect the local community. This alternative would also delay redevelopment of the Site. Due to the large volume of soil and debris that would be removed and transported from the Site, as well as the similarly large volume of backfill material that would be hauled to the Site, a significant increase in truck traffic near the Site (and the resultant noise, dust and road deterioration) would be expected during construction. Truck loads would be covered to minimize the possibility of material loss onto roadways and generation of dust. The excavation activities may produce odors, volatile organic vapors, and nuisance dust. Ambient air monitoring for organic vapors and respirable dust would be conducted during remedial construction. Engineering controls for vapor, odor, or dust suppression could be implemented if action levels are exceeded.

A remedial HASP would be followed to minimize risks to workers during remedial construction. Although most of the work should not require levels of protection greater than Level D, the HASP would outline situations when an upgrade of personal protective equipment would be necessary.

Hazards associated with heavy equipment use can be minimized by following OSHA guidelines. These risks would be minimized by use of temporary fencing around the Site and proper Site security.

Long-term Impacts and Effectiveness. Because soils at the Site down to the first saturated zone would be removed, this alternative would provide long-term effectiveness. Environmental monitoring and Site inspections would be used to assess the long-term fate and migration of Site-related chemical contamination. The final environmental monitoring program would be developed during the remedial design.

Reduction of Toxicity, Mobility, and Volume. This alternative would include action to reduce the toxicity, mobility, and volume of source materials.

Implementability. Site-wide excavation work would likely encounter numerous subsurface utility lines, old building foundations, and other subsurface structures. Delays due to technical problems are likely. Difficulties may arise due to limitation associated with the number of available trucks to haul the excavated materials, the daily capacity of disposal facilities, and the availability of suitable backfill material. The redevelopment of the Site would be delayed.

Contractors to perform the services required for this alternative are locally available and several could be included in a competitive bid process.

Cost Effectiveness. The cost associated with Alternative S-4 is categorized as “Very High”. The final cost will depend in part on disposal requirements for the excavated material.

Community Acceptance. As noted above, implementation of Alternative S-4 would result in significant disturbance to the community and delay redevelopment of the Site. Therefore, this alternative may be unacceptable to the community.

Land Use. Site-wide excavation would be performed after demolition and prior to new construction activities. This alternative would be compatible with the proposed land use, although it would delay redevelopment.

7.2 DETAILED ANALYSIS OF GROUNDWATER ALTERNATIVES

All remedial alternatives developed in Subsection 6.2 were retained for detailed analysis. The remedial alternatives include:

Area A

- Alternative GW-A-1: Continued Operation of ICM
- Alternative GW-A-2: Continued Operation of ICM with Hydraulic Barrier Wall
- Alternative GW-A-3: In-Situ Chemical Oxidation

Area B

- Alternative GW-B-1: No Action
- Alternative GW-B-2: Groundwater Monitoring

Areas C and E

- Alternative GW-C&E-1: No Additional Action

- Alternative GW-C&E-2: Enhanced Bioremediation

7.2.1 AREA A ALTERNATIVES

7.2.1.1 Alternative GW-A-1: Continued Operation of ICM

This action would consist of the following components:

- institutional controls;
- continued operation of existing ICM (with system modifications as needed to ensure adequate capture); and
- environmental monitoring.

Institutional Controls. Institutional controls in the form of deed and land-use restrictions would be implemented to restrict future Site use, thereby limiting the potential for exposure to Site contaminants in the shallow aquifer. Although investigations have concluded that groundwater presents minimal health risk to public health and the future use of the Site will be commercial/industrial, institutional controls would be implemented to prohibit groundwater use at the Site and to require vapor mitigation measures for new structures. The controls would be drafted, implemented, and enforced in cooperation with the Site owner, state, and local governments. Operation and maintenance activities would include record and field surveys, if necessary, to verify groundwater is not being used.

Continued Operation of Existing ICM. Existing groundwater extraction wells and pumps installed during the ICM would be utilized for this alternative. The ICM is designed to provide hydraulic containment of the down gradient edge of the shallow aquifer in Area A and prevent groundwater from flowing to the Buffalo River. The system consists of five extraction wells (EW-1 through EW-5) with submersible pumps (see Figure 21). Presently, water pumped from extraction wells EW-1 and EW-2 is conveyed to the on-Site treatment plant, where it passes through activated carbon filters to reduce VOC concentrations before being released to the BSA. Water discharged from wells EW-3 through EW-5 meets the BSA discharge criteria and is conveyed directly to the BSA via the Area A lift station. Routine system checks and maintenance activities are performed several times a week. Monthly monitoring is performed in accordance with the BSA discharge permit to ensure that the ICM discharge meets BSA criteria. As described in Appendix A, the evaluation of the extraction system completed by MACTEC in early 2008 indicates that modification of the current system via installation of additional extraction wells would likely be necessary if groundwater extraction is the selected remedy for Area A shallow groundwater.

Environmental Monitoring. Alternative GW-A-1 would include long-term groundwater monitoring. Initially, the monitoring would be performed in accordance with the OM&M Plan. As more data is obtained, the monitoring scope and frequency may be adjusted. Long-term monitoring activities would also include handling of the LNAPL present in EW-5 and, when necessary, at other Area A piezometers/monitoring wells. Due to its isolated occurrence and limited extent, LNAPL will be recovered through periodic hand-bailing or via use of absorbent materials placed within the wells/piezometers.

The following paragraphs present an assessment of Alternative GW-A-1 based upon the criteria identified above.

Compliance with New York State SCGs. Alternative GW-A-1 would capture impacted shallow aquifer groundwater at the down gradient edge of Area A, prevent off-site migration, and provide treatment as appropriate prior to discharging to the BSA. The alternative would comply with chemical specific SCGs for discharge and location- and action- specific SCGs. Over time, this alternative, when combined with remediation of soil using one of the alternatives described in Subsection 7.1, may achieve chemical-specific SCGs.

Overall Protection of Public Health and the Environment. Alternative GW-A-1 would provide protection of public health and the environment by reducing the volume and migration of impacted groundwater in the shallow aquifer. Groundwater extracted from wells EW-1 and EW-2 (and any new extraction wells installed within the vicinity of these wells) would be treated by carbon units in the existing treatment plant (or similar new equipment if required to facilitate redevelopment) until VOC levels are reduced to concentrations that allow discharge to BSA without pretreatment. Furthermore, institutional controls for the Site would be implemented to prevent any other extraction and/or use of groundwater. Vapor intrusion concerns for new structures would also be addressed via institutional controls.

Short-term Impacts and Effectiveness. Since the ICM has already been installed and is operating, only limited new construction activities would be implemented for Alternative GW-A-1; therefore, short-term impacts or effects on the community, workers, or the environment would be minimal.

Long-term Effectiveness and Permanence. This alternative would meet the RAOs for groundwater through a combination of mass removal of groundwater with contaminant levels above the Class GA standards, institutional controls to prevent any use of Site groundwater, use of soil vapor mitigation measures, and by addressing the flow of impacted groundwater from the shallow aquifer at Area A to the Buffalo River.

Reduction of Toxicity, Mobility, and Volume. This alternative includes the extraction and treatment of contaminated groundwater from Area A, thereby providing a reduction in the toxicity, mobility, and volume of contamination.

Implementability. Since the ICM exists and would only require modification, limited additional actions, services, or materials would be required to implement this alternative. Institutional controls such as deed restrictions or environmental easements to prohibit the use of groundwater and require soil vapor mitigation measures would be needed. However, no difficulties in implementing these restrictions are anticipated.

Cost Effectiveness. The cost associated with Alternative GW-A-1 is categorized as “Moderate”. The final cost will depend in part on the length of time required for system operation.

Community Acceptance. Continued operation of the ICM, when combined with other alternatives to form the final remedy, could be acceptable to the community.

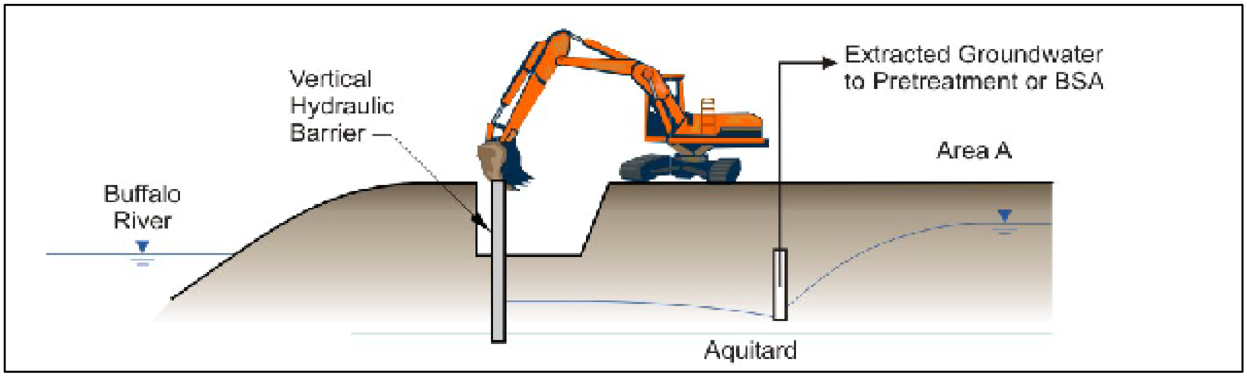
Land Use. The continued operation of the ICM will be compatible with the proposed land use under SBD’s redevelopment scenario. However, steps will need to be taken during construction and redevelopment to preserve or replace in kind the existing ICM. Discharge piping associated with the system will likely require relocation.

7.2.1.2 Alternative GW-A-2: Continued Operation of ICM with Hydraulic Barrier Wall

This action would consist of the following components:

- institutional controls;
- pre-design investigation;
- continued operation of existing ICM (with modifications as necessary);
- installation of a downgradient hydraulic barrier wall along the Buffalo River; and
- environmental monitoring.

<u>Institutional Controls.</u> Institutional controls to restrict groundwater use in Area A would be implemented as described under Alternative GW-A-1.



Alternative GW-A-2: Continued Operation of ICM with Downgradient Barrier Wall

Pre-design Investigation. A pre-design investigation would be required to collect Site specific data for the design and installation of a hydraulic barrier wall. The investigation will include completion of field investigations to define geotechnical and environmental factors that will influence wall design. Test borings and/or test pits, along with other field methods as necessary, will be used to collect the required data along the proposed wall alignment.

Continued Operation of Existing ICM. Existing groundwater wells and pumps installed during the ICM (or a similar system) would be operated for this Alternative as previously described under Alternative GW-A-1. Actual extraction volumes may be reduced due to reduction of river water captured by the extraction wells after the hydraulic barrier wall has been constructed. After construction of the wall is complete, the performance of the extraction system will be optimized and may require modification of system components and extraction locations to ensure that hydraulic control is achieved.

Installation of Hydraulic Barrier Wall. A hydraulic barrier wall would be installed along the eastern edge of Area A bordering the Buffalo River. The edges of the wall would be “wrapped” along the southern border and a portion of the northern boundary of Area A (along Area D and South Park Avenue, respectively) to provide for the sufficient containment of groundwater (Figure 21). The intent of the wall is to create a physical barrier between impacted shallow aquifer groundwater and the Buffalo River. The wall would have the added benefit of reducing the volume of river water extracted by the ICM. The wall would be toed into the glaciolacustrine clay layer, which acts as an aquitard separating the Shallow Aquifer from the Confined Aquifer present in the basal till and Onondaga limestone immediately below the clay. The final design would address contaminated soils between the proposed hydraulic barrier wall and the river and include, to the extent feasible, the restoration of the river bank to a natural vegetative river bank. The type of wall used (sheet pile, slurry wall, etc.) would be determined based on pre-design studies. For evaluation purposes, it is assumed that the wall would be approximately 1,320 feet long and extend to an average depth of 25 feet.

Environmental Monitoring. Groundwater monitoring would be conducted as described under Alternative GW-A-1.

The following paragraphs present an assessment of Alternative GW-A-2 based upon the criteria identified above.

Compliance with New York State SCGs. Alternative GW-A-2 would contain and capture contaminated groundwater, prevent off-site migration, and provide treatment prior to discharging to the BSA. The alternative would comply with chemical specific SCGs for discharge and location- and action- specific SCGs. Over time, this alternative, when combined with remediation of soil using one of the alternatives described in Subsection 7.1, may achieve chemical-specific SCGs.

Overall Protection of Public Health and the Environment. Alternative GW-A-2 would provide protection of public health and the environment by preventing contaminated groundwater in the shallow aquifer from flowing off-Site and to the Buffalo River. Groundwater extracted from wells EW-1 and EW-2 (and any new wells in the vicinity) would be treated by carbon units in the existing treatment plant until VOC levels are reduced to allow discharge to BSA without pretreatment. Furthermore, institutional controls for the Site would be implemented to prevent any other extraction and/or use of this groundwater and require appropriate soil vapor mitigation measures for new structures.

Short-term Impacts and Effectiveness. The work area would be confined to Area A, so there would be limited impacts to the community during the installation of the hydraulic barrier wall. Components of the ICM have already been installed.

Long-term Effectiveness and Permanence. This alternative would meet the RAOs for groundwater through institutional controls to prevent any use of site groundwater and appropriate soil vapor mitigation measures, and by preventing impacted groundwater in the shallow aquifer at Area A from flowing to the Buffalo River.

Reduction of Toxicity, Mobility, and Volume. This alternative includes the extraction and treatment of contaminated groundwater from Area A, thereby providing a reduction in the toxicity, mobility, and volume of Area groundwater contamination.

Implementability. Installation of a downgradient hydraulic barrier wall would likely be complicated by subsurface obstructions (concrete building foundations, subsurface utilities, etc.) known to exist at Area A. Institutional controls to prohibit the use of groundwater and require soil vapor mitigation measures would be needed; however, no difficulty in implementing these restrictions are anticipated.

Cost Effectiveness. The cost associated with Alternative GW-A-2 is categorized as "Moderate to High". The final cost will depend on various factors, including technical difficulties associated with subsurface obstructions, disposal requirements for excavated materials, and the length of time required for groundwater extraction system operation.

Community Acceptance. It is likely that Alternative GW-A-2, when combined with other alternatives to form the final remedy, will be acceptable to the community.

Land Use. Alternative GW-A-2 will likely be compatible with the proposed land use under SBD's redevelopment scenario. However, installation of the hydraulic barrier wall may delay redevelopment of Area A, and steps will need to be taken during construction and redevelopment to preserve or replace in kind the existing ICM. Discharge piping associated with the groundwater extraction system will likely require relocation.

7.2.1.3 Alternative GW-A-3: In-situ Chemical Oxidation

This action would consist of the following components:

- institutional controls;
- continued operation of the existing ICM;
- treatability study;
- pilot scale test;
- implementation of full scale chemical oxidation; and
- environmental monitoring.

<u>Institutional Controls.</u> Institutional controls to restrict groundwater use and require soil vapor mitigation measures in Area A would be implemented as described under Alternative GW-A-1.

<u>Continued Operation of Existing ICM.</u> Existing groundwater wells and pumps installed during the ICM, with some modifications that likely would include installation of additional wells, would be operated for this Alternative as previously described under Alternative GW-A-1.

<u>Treatability Study.</u> A treatability study would be conducted to determine the effectiveness of chemical oxidation on Site-specific soils/groundwater. The study would be conducted off-Site with soil/groundwater samples from the Site.

Pilot Scale Test. Based on the results of the treatability study and pre-design investigation, a pilot-scale chemical oxidation test would be conducted on-site to determine the injection point locations and spacing and confirm treatment effectiveness and parameters.

Implementation of Full-Scale Chemical Oxidation. Site soils primarily consist of sand, silt and gravel, which results in a very heterogenous material. For cost estimating purpose the conceptual model includes the injection of either hydrogen peroxide (Fenton's Reagent) or alkaline-activated/iron-activated persulfate, pending bench-scale testing. The material determined to be most effective would be injected into the up-gradient portion of the chlorobenzene and aniline plumes (i.e., source areas). Groundwater sampling and analysis would be conducted prior to and about one month after injection to determine the reduction of contaminant concentrations. It is possible that multiple injections may be required.

Environmental Monitoring. Groundwater monitoring would be conducted as described under Alternative GW-A-1. It is the intent of this alternative that portions of the plume downgradient from the chemical oxidation treatment area may be influenced by migrating oxidant, combined with natural attenuation, to achieve Class GA standards.

The following paragraphs present an assessment of Alternative GW-A-3 based upon the criteria identified above.

Compliance with New York State SCGs. Alternative GW-A-3 would include active treatment of VOCs and SVOCs in impacted groundwater in the upgradient portion of the plumes and may comply with chemical-specific SCGs for groundwater in the treated area. Additionally, Alternative GW-A-3 would rely upon continued operation of the existing ICM (with modifications as necessary) to address the off-site migration of impacted groundwater from the shallow aquifer. Implementation of chemical oxidation would be conducted in accordance with applicable regulations pertaining to underground injection, including 40 CFR Part 144 – Underground Injection Control Program.

Overall Protection of Public Health and the Environment. Alternative GW-A-3 provides protection of public health and the environment through addressing off-Site migration of impacted groundwater from the shallow aquifer to the Buffalo River, treating and discharging of extracted groundwater, and restricting groundwater use at the Site. Implementation of in-situ chemical oxidation would increase the rate at which VOC and SVOC contaminant levels are decreasing in Area A groundwater over continued operation of the existing ICM alone. However, the time period required to reduce contaminant levels in groundwater to meet the RGs is not known. Institutional controls for the Site would be implemented to prevent any other extraction and/or use of this groundwater as well as require soil vapor mitigation measures for Site structures.

Short-term Impacts and Effectiveness. The site is located in an industrial area so there would be limited impacts to the community during implementation of chemical oxidation. Implementation of the chemical oxidation at the Site with land-use restrictions would not result in short-term impacts to public health or the environment. Implementation would need to occur prior to redevelopment of Area A and therefore may delay redevelopment.

Long-term Effectiveness and Permanence. This alternative would meet the RAOs for groundwater through addressing off-site migration of impacted groundwater from the shallow aquifer, extraction and treatment of contaminated groundwater, institutional controls to prevent any use of site groundwater, and in-situ chemical oxidation to treat VOCs and SVOCs in groundwater.

Reduction of Toxicity, Mobility, and Volume. The chemical oxidation process would result in the immediate reduction of the toxicity, mobility, and volume of Site contaminants by chemical conversion of the contaminants to less toxic by products. The continued operation of the ICM, which includes groundwater extraction and treatment prior to discharge, would also result in the reduction of the toxicity, mobility, and volume of site contaminants through treatment.

Implementability. The technologies used for chemical oxidation are well developed. However, the variability of soil types present in the shallow aquifer (fill, glacial deposits, and alluvium) may limit the effectiveness of this alternative. Services or materials required to implement this Alternative are readily available. This Alternative would not be expected to interfere with other potential remedial actions at the Site. Institutional controls such as use of deed restrictions or environmental easements to prohibit the use of groundwater and require soil vapor mitigation measures would be needed; however, no difficulty in implementing groundwater use restrictions are anticipated.

Cost Effectiveness. The cost associated with Alternative GW-A-3 is categorized as “High”. The final cost will depend on the amount of injection points, volume of oxidant required, and number of applications.

Community Acceptance. It is likely that Alternative GW-A-3, when combined with other alternatives to form the final remedy, will be acceptable to the community.

Land Use. Alternative GW-A-3 will likely be compatible with the proposed land use under SBD’s redevelopment scenario. However, redevelopment of Area A would be delayed until the chemical oxidation program has been completed. As with Alternatives GW-A-1 and GW-A-2, steps will need to be taken during construction and redevelopment to preserve or replace the existing ICM. Discharge piping associated with the groundwater extraction system will likely require relocation.

7.2.2 AREA B ALTERNATIVES

7.2.2.1 Alternative GW-B-1: No Action

No actions would be conducted as part of this alternative. Alternative GW-B-1 was developed as a baseline against which to compare other remedial alternatives.

The following paragraphs present an assessment of Alternative GW-B-1 based upon the seven criteria identified above.

Compliance with New York State SCGs. Alternative GW-B-1 would not comply with Chemical-specific SCGs.

Overall Protection of Public Health and the Environment. Alternative GW-B-1 would not provide any protect public health and the environment compared to present conditions.

Short-term Impacts and Effectiveness. No construction activities would be implemented for Alternative GW-B-1; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.

Long-term Effectiveness and Permanence. The RAOs would not be met if Alternative GW-B-1 were implemented at the Site. This alternative would not provide long-term effectiveness.

Reduction of Toxicity, Mobility, and Volume. Because no processes would be used to treat waste or contaminated media at the Site, no reduction of toxicity, mobility, or volume of site contaminants would be achieved through treatment. Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of Site groundwater contaminants over time.

Implementability. Although, no services or materials would be required to implement the No-Action Alternative, obtaining approval for Alternative GW-B-1 at the Site would be difficult.

Cost Effectiveness. There is no cost associated with the No Action alternative. Therefore, the cost category is “Low”.

Community Acceptance. Because this alternative will not result in protection of public health or the environment, the No Action alternative will likely be unacceptable to the community.

Land Use. The No Action alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from potential exposure to contaminants present in Site groundwater.

7.2.2.2 Alternative GW-B-2: Groundwater Monitoring

This alternative would consist of the following components:

- institutional controls;
- environmental monitoring

Institutional Controls. Institutional controls in the form of deed restrictions and/or environmental easements would be implemented to restrict future Site use, thereby limiting the potential for exposure to site contaminants. Although investigations have concluded that groundwater presents minimal health risk to public health and the future use of the Site will be commercial/industrial, institutional controls would be implemented to prohibit groundwater use and require soil vapor mitigation measures for structures at the Site. The controls would be drafted, implemented, and enforced in cooperation with the Site owner, state, and local governments. Operation and maintenance activities would include record and field surveys, if necessary.

Environmental Monitoring. Periodic groundwater sampling and analysis would be conducted to verify that the plume is stable and contaminant concentrations in the shallow aquifer are stable or decreasing. The results of the monitoring would be presented in annual reports.

The following paragraphs present an assessment of Alternative GW-B-1 based upon the criteria identified above.

Compliance with New York State SCGs. Alternative GW-B-2, when combined with one of the remedial alternatives specified for Site soil, would, over time, likely comply with Chemical-specific SCGs through the natural attenuation process. The time to achieve SCGs is not known.

Overall Protection of Public Health and the Environment. Alternative GW-B-2 would provide protection of public health and the environment as long as institutional controls are maintained.

Short-term Impacts and Effectiveness. No short-term impacts or effects on the community, workers, or the environment would occur if Alternative GW-B 2 is implemented.

Long-term Effectiveness and Permanence. The RAOs would be met by restricting access to groundwater and, over time, due to natural attenuation of groundwater contaminants in the shallow aquifer on Area B.

Reduction of Toxicity, Mobility, and Volume. Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of site contaminants over time.

Implementability. Technologies required for monitoring are readily available and would not be difficult to implement.

Cost Effectiveness. There cost associated with the Alternative GW-B-2 is categorized as “Low to Moderate”. The actual cost will depend on the scope and length of the monitoring program.

Community Acceptance. Monitoring of groundwater at Area B will be used to confirm that human health and the environment are protected. Therefore, this alternative will likely be acceptable to the community when combined with other alternatives to form the final remedy for the Site.

Land Use. Alternative GW-B-2 is compatible with the proposed land use under SBD’s redevelopment scenario.

7.2.3 AREAS C&E ALTERNATIVES

7.2.3.1 Alternative GW-C&E-1: No Action

No additional actions would be conducted as part of this alternative. Alternative GW-C&E-1 was developed as a baseline against which to compare other remedial alternatives for Areas C&E. The following paragraphs present an assessment of Alternative GW-C&E-1 based upon the criteria identified previously.

Compliance with New York State SCGs. Alternative GW-C&E-1 would rely upon natural attenuation to comply with Chemical-specific SCGs. No location- or action-specific SCGs would be triggered as no additional actions would be taken.

Overall Protection of Public Health and the Environment. Alternative GW-C&E-1 would achieve no additional protection of public health and the environment.

Short-term Impacts and Effectiveness. No construction activities would be implemented for Alternative GW-C&E-1; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.

Long-term Effectiveness and Permanence. The RAOs would not be met if Alternative GW-C&E-1 were implemented at the Site. This alternative would not provide long-term effectiveness.

Reduction of Toxicity, Mobility, and Volume. Because no processes would be used to treat waste or contaminated media at the Site, no reduction of toxicity, mobility, or volume of Site contaminants would be achieved through treatment. Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of organic groundwater contaminants over time.

Implementability. Although no services or materials would be required to implement the No-Additional Action alternative, obtaining approval from NYSDEC for Alternative GW-C&E-1 at the Site may be difficult as it involves no additional remedial action.

Cost Effectiveness. There is no cost associated with the No Action alternative. Therefore, the cost category is “Low”.

Community Acceptance. Because this alternative will not result in protection of public health or the environment, the No Action alternative will likely be unacceptable to the community.

Land Use. The No Action alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from potential exposure to contaminants present in Site groundwater.

7.2.3.2 Alternative GW-C&E-2: Enhanced Bioremediation and Groundwater Monitoring

This action would consist of the following components:

- institutional controls;
- pre-design investigation;
- pilot-scale test;
- full-scale ORC (or similar) application; and
- environmental monitoring to ensure that plume reduction is being achieved and no off-Site migration of the plume has occurred.

<u>Institutional Controls.</u> Institutional controls in the form of deed and land-use restrictions would be implemented to restrict future site use, thereby limiting the potential for exposure to Site contaminants. Institutional controls would be implemented to prohibit groundwater use within and around the Site as well as require soil vapor mitigation measures for on-Site structures. The controls would be drafted, implemented, and enforced in cooperation with the site owner, state, and local governments. Operation and maintenance activities would include record and field surveys, if necessary.

Pre-design investigation. A pre-design investigation would be required to collect site specific data related to geochemical and biological processes at the Site required for the remedial design. Additional monitoring wells will be installed at both plume locations in order to further delineate the extent of impacted groundwater, including within the saturated fill materials on site.

Pilot Scale Test. Based on the results of the treatability study, a pilot scale test would be conducted on-site to determine the injection point locations, spacing, and effectiveness.

Implementation of Full Scale Enhanced Bioremediation. Site soils in Areas C and E primarily consist of a surface layer or granular fill, which is underlain by glacial till and a glacilacustrine clay unit, which results in a very heterogeneous material. Actual spacing and quantities of wells would be determined during the remedial design. It is assumed that Oxygen Release Compound (ORC®), a proprietary material formulation, that, when hydrated, produces a controlled release of oxygen, would be used as the in-situ enhanced biodegradation reagent. The conceptual design consists of 61 well points in Area C and 61 well points in Area E (Figure 22). A second application would occur one year after full-scale implementation, and it has been assumed that it would consist of one-half as many injection points.

Environmental Monitoring. Alternative GW-C&E-2 is a long-term alternative with a monitored natural attenuation component to it. Therefore, a long-term ground water sampling and analysis program would be required. The frequency, scope and duration of the monitoring would initially be as described in the ICM OM&M Plan. As more data is obtained, adjustments to the monitoring program would be made. Results of long-term monitoring would be incorporated into Annual Reports for the Site.

The following paragraphs present an assessment of Alternative GW-C&E-2 based upon the criteria identified above.

Compliance with New York State SCGs. Alternative GW-C&E-2 would meet chemical-specific SCGs by implementing in-situ enhanced biodegradation to reduce contaminant levels. This alternative includes access restrictions, land-use restrictions and groundwater use restrictions and soil vapor mitigation measures to minimize exposure to contaminants in the shallow aquifer.

Overall Protection of Public Health and the Environment. Alternative GW-C&E-2 provides protection of public health and the environment through implementing active groundwater treatment, restricting use of groundwater and requiring soil vapor mitigation measures for on-Site structures. Implementation of enhanced biodegradation would result in the decrease of VOC and SVOC contaminant levels at an increased rate over natural attenuation However, the time period required to reduce risks to acceptable levels is not known. Continuation of the protection of public health and the environment would also be contingent upon enforcing land-use restrictions and environmental monitoring

Short-term Impacts and Effectiveness. Little to no impact to the community would be expected during the injection of non-hazardous biological enhancements. Implementation of the enhanced bioremediation at the Site with land-use restrictions would not result in short-term impacts to public health or the environment.

Long-term Effectiveness and Permanence. This alternative would meet the RAOs for groundwater through institutional controls to prevent any use of Site groundwater and require soil vapor mitigation measures, and implementation of in-situ enhanced biodegradation to reduce groundwater contaminant levels over time.

Reduction of Toxicity, Mobility, and Volume. The enhanced biodegradation processes would be expected to result in the reduction of the toxicity, mobility, and volume of Site contaminants over time.

Implementability. The technologies used for implementation of enhanced biodegradation are well developed and would not be difficult to implement. Services and materials required to implement this alternative are readily available. This alternative would not interfere with other potential remedial actions at the Site.

Cost Effectiveness. There cost associated with Alternative GW-C&E-2 is categorized as “Moderate”. The actual cost will depend on the volume of treatment material to be injected or applied, the number of applications required, and the length and scope of groundwater monitoring.

Community Acceptance. This alternative will expedite the reduction of contaminant concentrations in shallow groundwater and, through monitoring, verify that human health and the environment is protected. Thus, it is likely that this alternative would be acceptable to the community

Land Use. Alternative GW-C&E-2 is compatible with the proposed land use under the SBD’s redevelopment scenario.

7.3 SITE SEWERS

It is recognized that Site process/sanitary and storm sewers represent potential preferential contaminant migration pathways within certain areas of the Site. It should be noted that, based on plant records and interviews with former plant personnel, it appears that no underground chemical conveyance or process piping is present at the site; all such lines are/were reportedly aboveground lines. However, as a precautionary measure, procedures for the proper management of underground piping encountered during excavation activities associated with remedy implementation or redevelopment will be addressed in the Soil Fill Management Plan, a draft copy of which is provided in Appendix D. Depending on the final redevelopment plans for the Site, existing underground storm and process sewer lines will be capped, removed or rehabilitated, as determined appropriate on an area-by-area basis by SBD. Additional information regarding how the Site sewer system will be addressed as part of the final remedy is provided in Section 9.1.3.

8 COMPARATIVE ANALYSIS OF ALTERNATIVES

The comparative analysis evaluates the relative performance of each alternative using the same criteria by which the detailed analysis of each alternative was conducted. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another to aid in selecting a remedy for the Site.

The comparative analysis includes a narrative discussion of the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectation of their relative performance, as applicable. The comparative analysis presented in this document uses a qualitative approach to comparison, with the exception of the required time to implement each alternative. For the comparison of groundwater remediation alternatives, alternatives will be compared on an area by area basis.

The comparative analysis of soil alternatives is presented in Table 3. The comparative analysis of groundwater alternatives for Area A, Area B, and Areas C&E are presented in Tables 4, 5 and 6, respectively. The Preferred Remedy has been identified based upon this comparative analysis of the remedial alternatives and is presented in Section 9.

9 REMEDIAL WORK PLAN

The goal of the remedy selection process in the BCP is to select a remedy for a site that is fully protective of public health and the environment, taking into account the current, intended and reasonably anticipated future land use of the site.

This section presents the preferred remedy which has been selected as the final remedy for the Site. The preferred remedy is driven by and consistent with the BCP and SBD's proposed redevelopment approach (as described in Subsection 1.1) in that it is:

- Fully protective of human health and the environment;
- Allows for the creation of significant riverfront green space and public access;
- Provides for the accelerated demolition of the abandoned chemical plant;
- Eliminates the risks and hazards posed by the currently deteriorating infrastructure; and
- Meshes well with SBD's and other stakeholders' schedules for accelerated redevelopment of the Site.

9.1 PLANT DEMOLITION

Prior to remedial construction, SBD will complete asbestos abatement and demolition of the existing Buffalo Color facility. The work will be completed in accordance with applicable laws and regulations and will be performed as follows:

Asbestos abatement will include:

- Preparation of an asbestos abatement health and safety plan, to include requirements for employee training and medical monitoring, list of designated personnel, respiratory protection program, PPE, site and community air monitoring, and emergency procedures;
- Implementation of jobsite security to prevent access by unauthorized personnel;
- Implementation of a decontamination program;
- Implementation of a hazard communication program;
- Obtaining all required licenses, permits and approvals;
- Designation of regulated areas, including use of warning signs as appropriate;
- Provisions for adequate exhaust ventilation;
- Removal of friable asbestos, including pipe insulation and other insulating materials;
- Removal of non-friable asbestos, including floor tile, roofing materials, and transite;
- Implementation of a final cleaning and visual inspection program;
- Off-site disposal of ACM at licensed disposal facilities; and

- Preparation of submittals and reports, as necessary, to document the asbestos abatement program.

Demolition of the existing facility will include the following:

- Preparation and implementation of a demolition health and safety plan, to include requirements for employee training and medical monitoring, list of designated personnel, respiratory protection program, PPE, fire protection, site and community air monitoring programs, and emergency procedures;
- Implementation of a decontamination program;
- Implementation of a hazard communication program;
- Obtaining all required licenses, demolition permits and other permits, and approvals;
- Meeting with the appropriate City departments to discuss the re-use of foundations and slabs (SBD acknowledges that a demolition permit is required from the City);
- Mobilization of equipment and site preparation;
- Removal and proper disposal of residual chemicals remaining in piping, tanks, pits/sumps and process vessels;
- Cleaning/rinsing of piping, tanks, pits/sumps and process vessels and proper disposal of collected rinseate;
- Removal and proper disposal of regulated materials, including PCB electrical equipment, Universal wastes, mercury-containing equipment;
- Capping/plugging of drains and sewer lines exposed during demolition;
- Demolition/removal of buildings, tanks, piping, and ancillary structures, as required;
- Backfilling to grade (after cleaning) of pits and sumps;
- Cleaning (power washing, scouring, scabbling, etc.) and, if appropriate, sealing of structural floor slabs that will remain in place;
- Implementation of dust control measures;
- Implementation of erosion and sediment control measures;
- Site restoration; and
- Preparation of reports and submittals, as necessary, to document the completion of demolition activities.

9.2 DESCRIPTION OF PREFERRED REMEDY

The Preferred Remedy for the Site consists of the following components:

- Soil – Installation of a Site-wide cover system with Area E source area excavation
- Area A Groundwater – Installation of a downgradient hydraulic barrier wall combined with optimized Site groundwater extraction system and implementation of Site cover system
- Area B Groundwater – Groundwater monitoring and implementation of Site cover system

- Areas C&E Groundwater – Enhanced bioremediation with Area E source removal, implementation of Site cover system, and groundwater monitoring

- Site Sewers – plugging, removal and/or rehabilitation if necessary to mitigate active preferential contaminant migration pathways

- Use of institutional/engineering controls and environmental easements

The following subsections provide descriptions of the specific components of the preferred remedy.

9.2.1 Soil

Alternative S-3 (Cover System with Area E Source Area Excavation) has been selected as the preferred alternative for the Site soil. This alternative includes excavation to the water table and off-Site disposal of contaminated soil at the source area located on Area E (Figure 18) combined with the use of a cover system.

The source area at Area E contains approximately 8,100 cubic yards of VOC-impacted soil located around the AST farm in the southwestern corner of this area (Figure 18). The soil in this area has been targeted for removal. The removal will occur after SBD has removed/demolished the AST tank farm, buildings and any other ancillary structures that are located within the area. Removal of foundations and underground utilities that may exist within the excavation limits will also be completed. The criteria used to identify soil to be removed from this specific location will be as follows:

- Soil will be removed down to the first zone of saturation (expected to be encountered at a depth of 4 to 5 feet below existing ground surface).

- Soil above the water table within the designated area that exhibits noticeable NAPL and/or sustained open-air photoionization detector (PID) readings above 10 parts per million will be removed.

- Locations of RI soil samples (and any additional samples collected during the remedial design process) within the designated area shown through laboratory testing to contain total concentrations of Site-specific VOCs (benzene, chlorobenzene, and related compounds) or Site-specific SVOCs (aniline, nitrobenzene and related compounds) that exceed 10 parts per million (ppm) will be removed. The 10 ppm criterion was selected based on review of the analytical results for the RI soil samples collected from borings advanced around the AST farm versus other Area E soil samples (which exhibited much lower levels, if any, of similar substances).

Confirmatory soil samples will be collected from the excavation sidewalls at a frequency of one sample for every 50 lineal feet of sidewall. The confirmatory samples will be analyzed for Target Compound List (TCL) VOCs and SVOCs. No excavation bottom samples are proposed because the excavation will extend to the water table. No saturated soil samples will be collected for confirmatory analyses. Additional samples may be required if “grossly contaminated” materials are encountered (as defined in the draft Soil Fill Management Plan provided in Appendix A).

The horizontal limits of excavation will be determined based on the above criteria. Excavation will not be performed beyond property lines. If data obtained during remedial design or source area removal indicates that soil contamination at the Area E source area extends beyond the property line, additional delineation will be necessary. Excavation may be limited by the presence of subsurface obstructions or active utility lines.

As noted in prior sections, the cover system to be utilized as part of the remedy, consistent with the redevelopment of the Site, will involve use of a combination of clean soil, pavement, or building structures to provide protection from direct contact exposure to contaminated surface soils. As identified in the RI report and illustrated on Figure 20, areas that must be covered to eliminate the direct contact pathway under a Commercial use scenario exist throughout the Site. Although certain portions of the Site surface soil may in fact meet the Commercial SCOs, it would be difficult to properly delineate and manage these areas during future redevelopment. Thus, the cover system will extend across the entire Site. The cover system will reduce infiltration of precipitation through impacted soil into groundwater and promote surface drainage. The cover system will consist of a minimum of one foot of soil, asphalt or concrete pavement (with appropriate granular subbase), or building structures, consistent with the presumptive remedy as identified in 6 NYCRR Part 375. If portions of Area A are used as natural habitat resource areas, the cover soil thickness will be increased to two feet or more and the cover material shall meet the "Protection of Ecological Resources" SCOs as described in 6NYCRR Part 375-6.7. Existing paved surfaces, including building floor slabs, asphalt parking lots, and access drives which SBD chooses to use as part of the cover system will be cleaned, rehabilitated, and maintained as necessary. Any required actions for the parking lot associated with the 100 Lee Street property (Area B) will be coordinated with the owner. A demarcation layer will be placed between existing surface soils and any new soil cover materials so the boundary between clean fill and existing Site soils can be identified in the future. Best Management Practices will be implemented to manage stormwater runoff from paved surfaces, as appropriate.

9.2.2 Groundwater

Due to the variability of shallow groundwater conditions across the Site, a multi-faceted remedy has been selected to address Site groundwater in the shallow aquifer and attain the groundwater RAOs as described in the following subsections. The long term goal of groundwater remediation is restoration of groundwater to its classified use; the short term goal is plume stabilization. In addition to the remedy components described below, the implementation of a Site-wide cover system will serve to reduce surface water infiltration and minimize the soil-to-groundwater migration pathway.

9.2.2.1 Area A Shallow Groundwater

Alternative GW-A-2 (Downgradient Hydraulic Barrier Wall with Groundwater Extraction) has been selected as the preferred alternative for Area A shallow aquifer groundwater. This alternative involves the continued operation of the Area A groundwater extraction system, with an evaluation period to identify modifications as necessary to optimize groundwater containment and accommodate redevelopment. Effluent from the groundwater extraction system will continue to be pretreated as necessary to meet the requirements of the Buffalo Sewer Authority (BSA) discharge permit. During recent correspondence with the BSA (and as documented in MACTEC's letter to NYSDEC dated April 8, 2008), BSA indicated that the effluent from the Area A groundwater extraction system, due to its location, would not be discharged to any Combined Sewer overflows (CSOs).

As described in Section 7.2.1.2, the hydraulic barrier wall would be installed along the eastern edge of Area A bordering the Buffalo River. The edges of the wall would be "wrapped" along the southern border and a portion of the northern boundary of Area A (along Area D and South Park Avenue, respectively) to provide for the sufficient containment of groundwater (Figure 21). The intent of the hydraulic barrier wall is to create a physical barrier between impacted shallow aquifer groundwater at Area A and the Buffalo River. The wall would have the added benefit of reducing the volume of river water extracted by operation of the ICM. The wall would be toed into the glaciolacustrine clay layer, which acts as an aquitard separating the Shallow Aquifer from the Confined Aquifer present in the basal till and Onondaga limestone immediately below the clay. The type of wall used (sheet pile, slurry wall, etc.) would be determined based on pre-design studies. For evaluation purposes, it is assumed that the wall would be approximately 1,320 feet long and extend to an average depth of 25 feet. Soils and wastes generated during installation of the wall will be managed in accordance with the Soil Fill Management Plan (see Section 9.2.4).

The erosion protection mattress located along the southern end of the Area A riverbank was installed as an Interim Corrective Measure (see Section 2.3). The remainder of the Area A shoreline consists of vertical concrete walls and other man-made structures. The final design will address contaminated soils located between the hydraulic barrier wall and the river and will include, to the extent feasible, the restoration of the river bank to a natural vegetative state. Opportunities to enhance the habitat along the Area A shoreline will be considered during the final design process.

The LNAPL present at EW-5 and other wells/piezometers must be monitored and controlled through periodic recovery via hand bailing or use of absorbent materials. If accumulations of LNAPL increase significantly or occur persistently at new locations within Area A, or if the LNAPL interferes with operation of the groundwater extraction system, additional investigation and/or LNAPL recovery efforts will be implemented.

9.2.2.2 Area B Shallow Groundwater

Alternative GW-B-2 (Groundwater Monitoring) has been selected as the preferred alternative for the Area B shallow aquifer groundwater. During 2008, groundwater monitoring at Area B will be performed in accordance with the ICM OM&M Plan. Based on the outcome of this monitoring period, the scope and frequency of additional groundwater monitoring at Area B will be proposed.

9.2.2.3 Area C/E Shallow Groundwater

Alternative GW-C&E-2 (Enhanced Bioremediation and Groundwater Monitoring) has been selected as the preferred alternative for the Area C and E shallow groundwater. As noted in previous Sections, Alternative GW-C&E-2 includes in-situ enhanced bioremediation of the limited chlorobenzene plumes identified at Areas C&E. A pre-design investigation, including a treatability study, would be required to collect Site-specific data related to geochemical and biological processes at the Site in order to determine the appropriate amendments for enhanced bioremediation. Based on the results of the treatability study, a pilot-scale test would be conducted on-site to determine the injection point locations, spacing, and effectiveness. The full-scale implementation would be based upon the results of the treatability and pilot-scale tests. At Area E, it may be advantageous to directly apply the bio-enhancement additive to the subsurface during the source area removal action.

The long term goal of groundwater remediation is restoration of groundwater to its classified use; the short term goal is plume stabilization. The criteria for determining success for the biotreatment process will be based on confirmation through groundwater monitoring that concentrations of COCs in the plume have been reduced and that the plume is not migrating beyond the Site. If migration beyond the Site boundary occurs, an evaluation of additional remedial alternatives will be completed.

During 2008, groundwater monitoring at Areas C and E was performed in accordance with the ICM OM&M Plan. Additional groundwater monitoring may be performed as necessary to support the predesign study and to monitor the effects of treatment. The scope and frequency of additional groundwater monitoring at Areas C and E will be assessed upon evaluation of the outcome of the treatment program.

9.2.3 Site Sewers

It is recognized that Site process/sanitary and storm sewers represent potential preferential contaminant migration pathways within certain areas of the Site. It should be noted that, based on plant records and interviews with former plant personnel, it appears that no underground chemical conveyance or process piping is present at the site; all such lines are/were reportedly aboveground lines. However, as a precautionary measure, procedures for the proper management of underground piping encountered during excavation activities associated with remedy implementation or redevelopment are addressed in the Soil Fill Management Plan, a draft copy of which is provided in Appendix D. The following subsections identify the remedial approach selected for the Site sewer system. SBD will obtain any necessary permits and approvals from the City and the BSA for these activities.

9.2.3.1 Storm Sewers

Underground storm sewer lines at the Site discharge stormwater (including water from existing building roof drains and surface runoff that is conveyed to storm sewer inlets) to the Buffalo River at Outfall 006 on Area A and at Outfall 011. These outfalls are former SPDES-permitted outfalls formerly operated by Buffalo Color. These outfalls previously also received significant volumes of non-contact cooling water (NCCW) when the Buffalo Color plant was in operation.

During the RI, sampling at Outfalls 006 and 011 indicated that groundwater likely infiltrates the storm sewer lines in areas where the lines are below the water table. At present, it has not been determined if the existing storm sewer lines and river outfalls will be preserved and reused during redevelopment of the Site. It is anticipated that SBD will evaluate the storm sewer lines and make a determination early in the redevelopment process (consistent with the schedule provided in Section 10.0) regarding which storm sewer lines/outfalls (if any) will be reused. If the lines/outfalls will be reused, then remedial measures consisting of the removal and proper disposal of sediment, followed by camera surveys where accessible/appropriate and rehabilitation of portions of the lines subject to infiltration, will be completed. If the storm sewers/outfalls will not be reused, then the associated manholes, inlets, and river outfalls will be plugged or sealed.

9.2.3.2 Sanitary Sewers

As with the storm sewers, it has not been determined if the existing sanitary lines will be preserved and reused during redevelopment of the Site, or if they will be abandoned or removed. Similar to the storm sewer system, it is anticipated that SBD will evaluate the sanitary sewer lines and make a determination early in the redevelopment process (consistent with the schedule provided in Section 10) regarding which sanitary sewer lines (if any) will be reused. Certain sewer lines may be removed during the course of remedial construction or redevelopment activities. Lines that will not be reused but left in place will be capped or plugged at inlets and where they connect with BSA sewer lines. Lines that will be reused (if any), will be flushed, camera surveyed where accessible/appropriate, and rehabilitated as necessary to prevent groundwater infiltration. Work involving the sanitary sewer lines will be coordinated with the BSA, as appropriate.

9.2.3.3 Contaminant Migration along Sewer Bedding

No evidence to indicate that sewer bedding materials are presently acting as preferential migration pathways for contaminated groundwater was found during the RI process. However, at Area A, because the underground sewer lines that connect to Outfall 006 are below the water table, the final remedy for shallow groundwater (installation of a downgradient hydraulic barrier wall combined with groundwater extraction) will designed to ensure elimination of any potential migration along the Outfall 006 bedding material. If

Outfall 006 is to remain, the hydraulic barrier wall will be sealed to the outside of the pipe to eliminate this potential migration pathway.

On Area E, the results of the soil sampling, groundwater sampling and MIP survey completed during the RI indicate that the chlorobenzene-impacted groundwater at the main AST farm has not migrated along the 36-inch diameter BSA sewer main. This sewer line runs parallel to the southern boundary of the Site, between the Site and the PVS Chemicals property (Figures 3 and 16). While it is expected that the soil and groundwater remediation to be performed at this location will minimize (if not eliminate) the potential for future migration of chlorobenzene-impacted groundwater along the 36-inch BSA sewer, it was agreed during the August 7, 2008 meeting with NYSDEC that a low-permeability collar (most likely a clay or grout collar) would be installed. Details regarding the type and location of the collar will be provided in the Remedial Design. .

9.3 GENERAL REQUIREMENTS

The following subsections describe the additional requirements, including institutional/engineering controls and environmental easements, which must be implemented as part of the preferred remedy for the Site.

9.3.1 Future Use Of Site

Environmental easements/deed notices will be implemented to ensure that the Site can be used only for commercial or industrial purposes (as the terms are defined in 6 NYCRR Part 375-1), unless the Site is subsequently remediated to meet residential use standards. The environmental easements and deed notices will be described in detail as part of the Institutional and Engineering Control Plan (which will be part of the Site Management Plan as noted below in Section 9.3.4)

9.3.2 Groundwater Use

The potable or consumptive use of groundwater (which is prohibited by City of Buffalo ordinance) will be prohibited at the Site through implementation of an environmental easement/deed notice.

9.3.3 Vapor Intrusion

An environmental easement will be implemented to ensure that occupied structures associated with future development at the Site are constructed such that the vapor intrusion (VI) pathway is eliminated. This can be accomplished through construction methods, such as installation of subslab vapor barriers and/or subgrade vapor collection systems (passive or active), or through additional characterization (conducted in accordance with NYSDEC and NYSDOH VI guidance) to ensure that the area over which the structure will reside does not present a potential VI concern.

9.3.4 Site Management Plan

A Site Management Plan must be prepared for the Site, consistent with 6 NYCRR Part 375 and the Guide. The plan will include the following components:

- Introduction, background, and summary of RI results;
- An Institutional and Engineering Control Plan;
- A Soil Fill Management Plan that specifies requirements for excavation/grading activities, stockpiling and soil staging areas, waste characterization sampling, onsite reuse criteria, soil loading and transportation, and requirements for offsite disposal ;
- Health and Safety for construction personnel, including requirements for Site and community air monitoring;
- A Quality Assurance/Quality Control Plan;
- An Operations, Maintenance and Monitoring Plan;
- Notification and reporting requirements; and
- Tables, figures and appendixes, as necessary

The Site Management Plan will be provided as a separate document later in the BCP process, consistent with the project schedule provided in Section 10. As requested by NYSDEC during the August 7, 2008 meeting, a draft Soil Fill Management Plan has been prepared, a copy of which is provided in Appendix B.

An environmental easement will be implemented that requires that any excavation or other disturbance of Site soil meets the requirements of the Site Management Plan.

9.3.5 Confined Aquifer

Based on the previous investigation data and RI data, no further investigation or remediation of the confined aquifer (i.e. the saturated unit present with the “basal” till unit and underlying Onondaga limestone) is required.

9.3.6 Additional Data To Be Obtained

The RI data adequately assesses environmental conditions at the Site. NYSDEC has requested that SBD obtain certain limited additional data. This request will be addressed as part of the remedial design process. The data to be obtained consist of the following:

- Delineation of Area C Chlorobenzene Plume: The well with the highest chlorobenzene concentration on Area C (well RFI-20) is located on the upgradient corner of the Site (Figure 16). NYSDEC has inquired if the chlorobenzene could be associated with conditions at the adjacent Honeywell Buffalo Research Laboratory. That facility conducts annual groundwater monitoring as a condition of its RCRA permit.

MACTEC obtained and reviewed a copy of a recent Groundwater Monitoring Report (Parsons, May 2007) for the laboratory site. Groundwater samples collected on the site, which were analyzed for VOCs in accordance with EPA Method 8260, did not identify detectable concentrations of chlorobenzene. Thus, it is not believed that an off-site release from this location is responsible for the Area C groundwater contamination. As part of the remedial design process, MACTEC will further evaluate the on-Site extent of the Area C chlorobenzene plume. This will include the installation of additional monitoring wells on Area C during predesign studies.

- Delineation of Area E Chlorobenzene Plume: The RI data indicates that the chlorobenzene plume on Area E is limited to the vicinity of the AST farm and has not migrated offsite. To verify this conclusion and to further evaluate the location and extent of the plume, additional monitoring wells will be installed during predesign studies. Additional test borings may also be advanced as part of the pre-design studies for the Area E source area removal, which would provide additional data on the extent of the impacted area.

- Presence of LNAPL at Area E Wells R-14 and ICM-PZ-04S: As described in Section 3.2.3, LNAPL has been identified in well R-14 and piezometer ICM-PZ-04S during 2008 quarterly groundwater monitoring activities. Samples of the LNAPL and groundwater at these two locations were collected by MACTEC for laboratory testing during the Third Quarter 2008 groundwater monitoring event. The analytical results for these samples were not available as of the date of this report and will be provided separately. Additional focused investigation of this area will be completed as part of the remedial design process to evaluate the extent of LNAPL and determine future monitoring and remedial requirements.

- Vapor Intrusion Issues (Area B and 343 Elk Street): As described in Section 3.2.5, Honeywell will attempt to collect additional vapor samples from the 100 Lee Street building, including indoor and outdoor air samples, during the remedial design process to be consistent with NYSDOH guidance. Honeywell will collect similar samples from the former Plant hospital building located on the southeastern corner of Area B. This assumes that access to these two buildings will be granted by the current owner. On Area E, SBD and Honeywell will perform additional evaluation to determine if further vapor intrusion investigation or mitigation is necessary for the 343 Elk Street property. This also assumes that access to this building will be granted by the current owner.

- PCB Soil Sampling – Area A: Two surface soil samples will be collected adjacent to the electrical buildings present on Area A for PCB laboratory analysis, in accordance with the original RI Work Plan. These samples inadvertently were not collected during the RI sampling efforts.

- Groundwater Contours for Confined Aquifer – Area E: As depicted on Figure 17 and described in the RI, data collected during the RI and during the prior RFI study indicates that a high point exists for the Confined Aquifer potentiometric surface at or near well R-07. Potential reasons for this condition include a natural anomaly, surveying error (i.e., incorrect top-of-casing elevation) or man-made conditions such as a compromised well seal. This issue will be further evaluated as part of future groundwater monitoring activities.

- Former Lagoons and Groundwater Conditions on Southeastern Portion of Area E: As part of future groundwater monitoring efforts, it was agreed that MACTEC will work with NYSDEC to identify existing monitoring wells for inclusion in the monitoring program that can be used to evaluate groundwater quality downgradient of the former Area E wastewater lagoons and where the RFI (Golder, 1997) identified aniline in groundwater. It is anticipated that monitoring wells R-08, R-09, R-11, R-13, and R-14, along with other wells as appropriate, will be included in the groundwater monitoring program for this area.

- Other Potential Source Areas: The analytical results for subsurface soil samples collected at certain RI boring locations on Areas B, C and E contained concentrations of some constituents above the

Commercial SCOs. Examples of these sample locations include Area B soil boring TB-B09 (834 mg/kg arsenic), Area C boring TB-C12 (60.2 mg/kg mercury), and Area E boring TB-E16 (470 mg/kg chlorobenzene, total SVOCs > 10,000 mg/kg). Although the RI groundwater data indicate that these substances are not present in the Site groundwater at levels of concern, NYSDEC has requested that further investigation of such sample locations be completed to determine if they represent threats to the shallow groundwater at the Site that will not be controlled via implementation of the remedy currently proposed in the AAR.

To comply with NYSDEC's request, a new round of groundwater monitoring will be completed at Areas B, C and E during the pre-design environmental studies. The groundwater monitoring program will include "shallow" monitoring wells on Areas B, C and E that were previously sampled during the RI. The list will be expanded to include the "PS"-series piezometers screened within the fill/upper water table, the new monitoring wells to be installed on Areas C and E for further delineation of the chlorobenzene plumes, and the "R" series monitoring wells on the southeastern side of Area E (as specified above). In addition, water table monitoring wells will be installed to further investigate soil samples from 4 test borings (TB-C12, TB-E15, TB-E16, and TB-E30) that NYSDEC identified as requiring further study to determine whether or not they would be considered Source Areas as defined by Part 375-1.2. The groundwater sampling and analytical methods used will be the same as those used during the prior RI sampling event, with some modifications made as appropriate to focus on specific COCs. If available, the logs of all PS wells will be submitted to NYSDEC. The complete list of wells/piezometers at Areas B, C, and E from which groundwater samples will be collected during the pre-design groundwater monitoring event is as follows:

  - Area B: RFI-18, RFI-27, RFI-28, RFI-30, RFI-35, RFI-45, PS-07, PS-08, and PS-9

  - Area C: RFI-20, RFI-31, PS-04, PS-05, PS-6, plus three new monitoring wells to further delineate the chlorobenzene plume (one of these new wells will be located approximately 100 ft. downgradient of boring TB-C12).

  - Area E: RFI-17, RFI-29, RFI-32, RFI-33, RFI-36, RFI-39, RFI-42, RFI-43, RFI-51, RFI-PZ-17, RFI-PZ-18, RFI-PZ-19, PS-01, PS-02, PS-03, PS-10, PS-11, PS-12, PS-13, R-08, R-09, R-11, R-13, R-14; three new monitoring wells installed to further delineate the Area E chlorobenzene plume; and one well downgradient of test borings TB-E15, TB-E16, and TB-E30 (one well can adequately investigate all three of these borings).

- If laboratory results from the groundwater sampling described in this section are clearly indicative of (1) concentrated solid or semi-solid substances; (2) non-aqueous phase liquids; or (3) grossly contaminated media in accordance with Part 375-1.2, then additional investigation or remediation may be proposed.

9.4 CONTINGENCY PLAN

During the course of remedial design and construction, it may be appropriate for SBD to consider alternative or additional measures to facilitate remediation of the Site consistent with the Preferred Remedial Alternative set forth herein. Those measures which SBD may, at its discretion, consider include:

- Stabilization/Grouting: During source removal work, grouting or stabilization methods may be appropriate under certain circumstances, such as to eliminate preferential migration pathways along bedding materials of underground utility lines exposed within the excavation or around building foundations that cannot be removed.

- On-Site Treatment of Soil: During remediation or construction activities, on-Site treatment of excavated soils may be appropriate to reduce concentrations of metals or organic compounds prior to off-Site disposal. Measures may include mixing or blending of additives to stabilize metals or biodegrade organic materials.

- Use of Sewer Infrastructure: It may be appropriate to utilize sections of existing sewer lines as conveyance structures for groundwater extraction piping on Area A (as part of the groundwater collection system to be used in conjunction with the hydraulic barrier wall) or as collection points for groundwater at other locations, if appropriate.

Prior to implementation of any of the above listed contingency items, a Work Plan will be prepared that details the scope and schedule for the proposed activities. The Work Plan will be submitted to NYSDEC for review and approval.

10 PROJECT SCHEDULE

Consistent with the schedule submitted by SBD as part of the BCP Applications, the following summarizes the anticipated project schedule for demolition and remedy implementation:

- Start of Timeline = The later of the date that the Brownfield Cleanup Agreements (BCAs) are executed or SBD acquires the title free and clear of liens and encumbrances to the Site.

- Months 1 through 3: Planning/Preparation
    - Prepare for Asbestos Abatement and Building Demolition
    - Prepare Site Management Plan
    - Prepare detailed Project Schedule

- Months 3 through 27: Demolition and Remedial Design
    - Complete Asbestos Abatement
    - Complete Building Demolition
    - Complete Remedial Design/Address Data Gaps

- Months 12 through 36: Implement Soil & Groundwater Remedies in Phases
    - Install Area A Hydraulic Barrier Wall
    - Hot Spot Removal – Area E
    - In-Situ Groundwater Treatment – Areas C & E
    - Install Cover System
    - Implement Environmental Easements/Deed Restrictions
    - Sewer System Remediation

- Months 27 through 63: Complete Initial Buildout/Redevelopment

In addition to the above, OM&M activities, including groundwater monitoring and maintenance of the remedial system components, will be completed in accordance with the project OM&M Plan (to be submitted as part of the Site Management Plan) and will continue as necessary into the future.

11 REFERENCES

The following is a list of significant references used in preparation of this report. Other documents, including project correspondence documents and records maintained in Buffalo Color Corporation files, were used to supplement the information obtained from the references listed below.

Golder Associates, November 1997, "Final Report on RCRA Facility Investigation, Buffalo Color Corporation, Buffalo, New York."

Golder Associates, December 1998, "Addendum to Final Report on RCRA Facility Investigation, Buffalo Color Corporation, Buffalo, New York."

Golder Associates, January 2000, "Report on Corrective Measures Study, Buffalo Color Corporation, Buffalo, New York."

MACTEC Engineering and Consulting, Inc., March 2006, "Final Operations, Maintenance & Monitoring Plan, Interim Corrective Measure, Buffalo Color Area ABCE, Buffalo, New York."

New York State Department of Environmental Conservation (NYSDEC), 1989. Technical and Administrative Guidance Memorandum HWR 89-4031: Fugitive Dust Suppression and Particulate Monitoring Program. October 1989.

New York State Department of Environmental Conservation (NYSDEC), 1990. Technical and Administrative Guidance Memorandum HWR 90-4030: Selection of Remedial Actions at Inactive Hazardous Waste Sites. May 1990.

New York State Department of Environmental Conservation, May 15, 1991, letter to G. Bolles (Buffalo Color Corp.) from Paul Counterman (NYSDEC Bureau of Hazardous Waste and Facility Management, regarding Preliminary Draft Part 373 Permit.

New York State Department of Environmental Conservation (NYSDEC), 1999. New York Codes, Rules, and Regulations, Title 6, Part 703 Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. Amended August 1999.

New York State Department of Health (NYSDOH), 2002. Generic Community Air Monitoring Plan. June 2000.

New York State Department of Environmental Conservation, December 25, 2002, "Draft DER-10 Technical Guidance for Site Investigation and Remediation."

New York State Department of Health, Center for Environmental Health, Bureau of Environmental Exposure Investigation, October 2006, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Public Comment Draft."

United States Environmental Protection Agency (USEPA), 1994. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers. (EPA 510-B-94-003; EPA 510-B-95-007; and EPA 510-R-04-002).

TABLE

Table 1 - Screening of Remedial Technologies and Process Options for Soil

General Response Action	Process Option	Applicability to: Site-Limiting Characteristics	Applicability to: Waste-Limiting Characteristics	Screening Status	Comments
No Action	Not Applicable	Not Applicable	Not Applicable	Retained.	Retained to be carried through detailed analysis of alternatives.
Access Restriction	Land Use Restrictions	None.	Would provide human exposure control. Would not reduce toxicity, mobility, or volume of contaminants.	Retained.	Viable as a component of remedial actions which do not involve removal of all contamination above RGs.
	Fencing	None.	Would provide human exposure control. Would not reduce toxicity, mobility, or volume of contaminants.	Retained.	Viable as a component of remedial actions which do not involve removal of all contamination above RGs.
Containment	Grading	Grading is not necessary; site is relatively flat.	Would not reduce toxicity, mobility or volume of contaminants.	Eliminated.	Viable only as a component of an engineered low permeability or soil cover system.
	Low-Permeability Cover System	Would require surface drainage features to prevent ponding of water on the site.	Would not reduce toxicity, mobility, or volume of contaminants. Would result in significant reduction in infiltration if clayey soils are used. Would provide human exposure control.	Retained.	Cover can be soil, pavement, or buildings.

Table 1 - Screening of Remedial Technologies and Process Options for Soil

General Response Action	Process Option	Applicability to: Site-Limiting Characteristics	Applicability to: Waste-Limiting Characteristics	Screening Status	Comments
Containment (cont.)	Cover System (single barrier)	Would be complicated by the existing buildings and structures on the site. May require some demolition of these structures.	Would reduce mobility by minimizing infiltration. Would not reduce toxicity or volume Would provide human exposure control.	Retained.	Viable in situations were it is not necessary to comply with RCRA Subtitle C. The Site is designated by NYSDEC as a non-RCRA regulated site.
In-Situ Treatment	Thermal Treatment	Would be impacted by the presence of subsurface utilities at the Site which would need to be identified and avoided.	Effectiveness limited by mixed nature of waste material including inorganics and non-volatile fraction of organics, and would likely require pretreatment of debris.	Eliminated.	
	Chemical Treatment	Would be impacted by the presence of subsurface utilities at the Site which would need to be identified and avoided. This technology not typically implemented in the vadose zone.	Would reduce toxicity, mobility, and volume of contamination.	Eliminated.	
	Vapor Extraction	Extraction well depth would be impacted by the relatively shallow groundwater table (~5 ft bgs).	Applicable for removal of VOCs; inorganic and semivolatile contamination would remain.	Eliminated.	
	Solidification/ Stabilization	Would be limited by the presence of buildings, other structures, and subsurface utilities.	May not be applicable to VOC contamination	Retained.	Could be used in limited fashion to eliminate migration pathways along sewer bedding and building foundations.

Table 1 - Screening of Remedial Technologies and Process Options for Soil

General Response Action	Process Option	Applicability to Site-Limiting Characteristics	Applicability to Waste-Limiting Characteristics	Screening Status	Comments
In-Situ Treatment (cont.)	Enhanced Biodegradation	Difficult to implement in vadose zone soils.	Pilot testing is required to design the biodegradation process. Effectiveness is uncertain since results have not been demonstrated with diverse mixed wastes, such as those present at the Site.	Eliminated.	
Ex-Situ Treatment	On-site Incineration	None.	Effectiveness limited by mixed nature of waste material including inorganics and non-volatile fraction of organics, and would likely require pretreatment of debris.	Eliminated.	
	Low Temperature Thermal Volatilization	None.	Effectiveness limited by mixed nature of waste material including inorganics and non-volatile fraction of organics, and would likely require pretreatment of debris.	Eliminated.	

Table 1 - Screening of Remedial Technologies and Process Options for Soil

General Response Action	Process Option	Applicability to Site-Limiting Characteristics	Applicability to Waste-Limiting Characteristics	Screening Status	Comments
Removal	Mechanical Excavation	Excavation of contaminated soil may be difficult due to the presence of numerous buildings and underground utilities Potential for secondary migration of contaminants via surface water during excavation.	Reduction in volume, toxicity, and mobility reliant upon final treatment or disposal option.	Retained.	
Disposal	Off-site disposal in Landfill	None.	Treatment may be based on the land disposal restrictions. Would reduce mobility of contamination. Would reduce toxicity or volume of contamination. Would minimize human exposure.	Retained.	Pretreatment may be required to comply with land disposal requirements. Some waste may be hazardous; majority of soil expected to be non-hazardous.

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Table 2 - Screening of Remedial Technologies and Process Options for Groundwater

General Response Action	Process Option	Applicability to		Screening Status	Comments
		Site-Limiting Characteristics	Waste-Limiting Characteristics		
No Action	Not Applicable	Not Applicable	Not Applicable	Retained.	Retained to be carried through detailed analysis of alternatives.
Institutional Controls	Land Use Restrictions	None.	Would provide human exposure control. Would not reduce toxicity, mobility, or volume of contaminants.	Retained.	Viable as a component of remedial actions which do not involve remediation of all contamination above RGs.
Containment	Cover System (since layer, non-RCRA)	None.	This would reduce leaching of soil contaminants to groundwater.	Retained.	Viable option as part of groundwater remedy.
	Hydraulic Barrier Wall (Slurry Wall/ Sheet Piling)	Subsurface obstructions and utilities. Potential slurry loss to river.	This would reduce off-site migration of contaminated groundwater, but would not address leaching of soil contaminants to groundwater.	Retained.	Viable option as part of groundwater remedy for Area A. Not retained for Areas C & E; plumes limited to Site and areas do not abut River
	Grading/ Diversion	None.	This alone would not prevent leaching of soil contaminants to groundwater and migration of contaminated groundwater.	Eliminated.	
Collection	Extraction Wells/Monitoring wells	None.	None.	Retained.	Viable Option for Area A.
	Collection Trench	Subsurface obstructions and utilities.	None.	Eliminated.	Less cost-effective than extraction wells
In-Situ Treatment	Enhanced Biodegradation	None.	None.	Retained.	Viable option for treatment of VOCs in Areas C & E.
	Permeable Reactive Barrier	Proximity to Buffalo River leaves little margin for confirmation sampling of downgradient monitoring wells.	Maybe less effective at treatment of chlorobenzene and aniline.	Eliminated.	Would require periodic replacement.

Table 2 - Screening of Remedial Technologies and Process Options for Groundwater

General Response Action	Process Option	Applicability to: Site-Limiting Characteristics	Applicability to: Waste-Limiting Characteristics	Screening Status	Comments
In-Situ Treatment (cont.)	Air Sparging	Would require soil vapor extraction/collection to prevent migration of vapors.	Would not effectively address SVOCs.	Eliminated.	Does not mesh with redevelopment.
	Thermal Treatment	May be complicated by existing buildings and structures.	Generally not as cost-effective for treatment of VOCs and small contaminant extents as other options.	Eliminated.	
	Oxidation/Reduction	May be complicated by existing buildings and structures.	None.	Retained.	Viable option for treatment of SVOCs and VOCs in Areas A.
On-site Ex-situ Treatment	Granular Activated Carbon	None.	None.	Retained.	Currently used as part of existing Area A system.
	Air Stripping	None.	Would not effectively address SVOCs.	Eliminated.	
Off-site Treatment or Disposal	Discharge to POTW (w/pretreatment as necessary)	None.	None.	Retained.	Currently used as part of existing Area A system.
	Discharge to Surface Water after treatment	None.	Would require greater level of pretreatment to meet surface water discharge criteria.	Eliminated.	SPDES permit would be required.
	Reinjection after treatment	This would not be compatible with the site location.	Would require greater level of pretreatment to meet surface water discharge criteria.	Eliminated.	Underground injection permit would be required.

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Table 3
Comparative Analysis of Remedial Alternative for Soil

Remedial Alternative	Compliance with New York State SCGs	Overall Protection of Human Health and the Environment	Short-term Impacts and Effectiveness	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Implementability	Cost	Community Acceptance	Land Use
S-1 No Action	No actions would be taken. Would not be in compliance with chemical-specific SCGs. Would not trigger location- or action-specific SCGs.	Soil contaminants exceed site-specific SCOs. Would not provide any additional protection of human health and the environment compared to present conditions.	No construction activities would be implemented; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.	No actions would be taken to meet RAOs.	No actions would be taken to reduce toxicity, mobility, or volume of site contaminants through treatment.	Obtaining approval for the No Action Alternative at the Site would be difficult.	Low	This alternative will not result in protection of public health or the environment, so it will likely be unacceptable to the community.	The alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from exposure to contaminants present in Site soil and groundwater.
S-2 Cover System	Would rely upon institutional controls and containment to meet Chemical-Specific SCGs for this media. A cover system would restrict direct exposure to contaminated soil and minimize leaching to groundwater. Implementation would comply with action- and location-specific SCGs.	Would provide protection of human health and the environment through restricting direct exposure and reducing leaching of the soil contaminants to groundwater. Institutional controls would prevent unauthorized disturbance of the cover system and would require long-term maintenance.	Remedial construction activities are not likely to adversely affect the local community. Dust control and air monitoring would protect both workers and the surrounding public. Significant temporary impacts to the environment are not expected.	The cover will provide long-term effectiveness if properly maintained. Institutional controls would prevent ingestion of groundwater on-site and disturbance of the cover system.	Would reduce the mobility of contaminants, but would not reduce the toxicity or volume of contaminated soils through treatment.	This alternative would not be technically difficult to implement. Services required to implement this alternative are readily available.	Moderate	If used in conjunction with other alternatives, it is likely that use of a cover system as part of the final remedy will be acceptable to the community.	Use of a cover system will be compatible with the proposed land use; SBD's redevelopment plans require the use of pavement and building floor slabs, along with soil cover where appropriate.
S-3 Cover System with Source Area Excavation	Similar to Alternative S-2, but would also include excavation and off-site treatment/disposal of Area E Source Area soils, which would likely reduce the time necessary to achieve Chemical-specific SCGs.	Similar to Alternative S-2. The excavation of source area soils would provide additional protection to human health and the environment.	Similar to Alternative S-2. However, activities associated with Source Area excavation would require the use of PPE to prevent exposure to contaminants.	The cover will provide long-term effectiveness if maintained. Institutional controls would prevent ingestion of groundwater on-site and disturbance of the cover system. Removal of source materials would reduce the time necessary to meet Chemical-specific SCGs relative to Alternative S-2.	Similar to Alternative S-2. Since this alternative includes treatment of excavated source area soils, this would meet the goal of reducing the toxicity, mobility, and volume of source materials.	This alternative would not be technically difficult to implement. Services required to implement this alternative are readily available.	Moderate to High	It is likely that source area excavation combined with use of a cover system as part of the final remedy will be acceptable to the community.	Source area excavation can be performed after demolition and prior to new construction activities. Use of a cover system will be compatible with the proposed land use; SBD's redevelopment plans require the use of pavement and building floor slabs, along with soil cover where appropriate.
S-4 Excavation of Site Soils to Unrestricted Residential SCOs	Alternative S-4 includes the removal of all soil at the Site to the groundwater table. This alternative would comply with Unrestricted Use SCOs. Implementation would comply with Action- and Location-specific SCGs.	This alternative provides protection of human health and the environment by removing all soil at the Site down to the water table and backfilling with clean soil. This would still not allow for unrestricted use of soil at the Site due to the volatile contaminants present below the water table. Risks to adjacent properties and residents would arise from increased truck traffic and generation of vapors and particulates from large-scale excavation activities.	Potential risks would be associated with building demolition. The time for implementation of Alternative S-4 is approximately 2 years. This time frame would interfere with redevelopment plans.	Because all soils at the Site, down to the water table, would be removed, this alternative would provide long-term effectiveness and permanence, allowing for unrestricted use of soil at the Site.	This alternative would include actions to reduce the toxicity, mobility, and volume of soil contaminants exceeding Unrestricted Use SCOs.	Similar to Alternative S-5. Delays due to technical problems would be likely. Susbsurface obstructions (building foundations, underground utilities) will complicate excavation activities. Off-site disposal of source area soils is not anticipated to present any difficulties. Contractors to perform the construction services required for this alternative are available and several could be included in a competitive bid process.	Very High	Would result in significant disturbance to the community and delay redevelopment of the Site. Therefore, this alternative may be unacceptable to the community.	Site-wide excavation would be performed after demolition and prior to new construction activities. This alternative would be compatible with the proposed land use, although it would delay redevelopment.

1 2 3 4 5
Unfavorable → Favorable

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Table 4
Comparative Analysis of Remedial Alternative for Area A Groundwater

Remedial Alternative	Compliance with New York State SCGs	Overall Protection of Human Health and the Environment	Short-term Impacts and Effectiveness	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Implementability	Cost	Community Acceptance	Land Use
Alternative GW-A-1: No Additional Actions - Continued Operation of ICM	Would comply with chemical-specific SCGs for discharge and location- and action- specific SCGs. Over time, this alternative may achieve chemical-specific SCGs in groundwater at Area A through flushing; however, the time frame may be long. 3	Would provide protection of human health and the environment by reducing the volume and migration of contaminated groundwater. 4	No construction activities would be implemented; therefore, no short-term impacts or effects on the community, workers, or the environment would occur. The ICM is already in operation. 4	This alternative would meet the RAOs for groundwater through institutional controls to prevent any use of site groundwater and by preventing the continued discharge of contaminated groundwater at Area A to the Buffalo River. 3	This alternative includes the extraction and treatment of contaminated groundwater from Area A, whereby providing a reduction in the toxicity, mobility, and volume of this contamination. 3	Since the ICM exists, there are no additional actions, services, or materials required to implement this alternative. Institutional controls such as permitting to prohibit the use of groundwater would be needed; however, no difficulty in implementing groundwater use restrictions are anticipated. 5	Moderate 4	It is likely that continued operation of the ICM, when combined with other alternatives to form the final remedy, will be acceptable to the community. 4	The continued operation of the ICM will be compatible with the proposed land use under SBD's redevelopment scenario. However, steps will need to be taken during construction and redevelopment to preserve the existing ICM. Discharge piping associated with the system will likely require relocation. 4
Alternative GW-A-2: Continued Operation of ICM with Downgradient Barrier Wall	Similar to Alternative GW-A-1. The downgradient barrier wall would provide additional measures to prevent discharge of contaminated groundwater to the Buffalo River. 3	Similar to Alternative GW-A-1, but would provide additional measures to prevent discharge of contaminated groundwater to the Buffalo River. 4	Similar to Alternative GW-A-1. The site is located in an industrial area so there would be limited impacts to the community during the installation of the cutoff wall. May require short-term interruption of ICM operation during construction. Site workers may be exposed to soil contaminants during installation of the wall. 3	Similar to GW-A-1, but the downgradient cutoff wall would provide additional protection, particularly in the event of extraction well failure. 4	Similar to Alternative GW-A-1, but may reduce mobility more due to the downgradient cutoff wall. 4	Subsurface obstruction (building foundations, underground utilities) will complicate construction activities. Potential exists for slurry loss to river during construction. Some demolition of existing aboveground structures will likely be required along wall alignment. 2	Moderate to High 3	It is likely that continued operation of the ICM, when combined with other alternatives to form the final remedy, will be acceptable to the community. 4	Alternative will likely be compatible with the proposed land use under SBD's redevelopment scenario. However, installation of the cutoff wall may delay redevelopment of Area A, and steps will need to be taken during construction and redevelopment to preserve the existing ICM. Discharge piping associated with the groundwater extraction system will likely require relocation 3
Alternative GW-A-3: In-Situ Chemical Oxidation	Similar to Alternative GW-A-1, but would provide for in-situ treatment to reduce the time necessary to meet Chemical-specific SCGs. 4	Similar to Alternative GW-A-1, but would include in-situ treatment to reduce groundwater contaminant levels at an increased rate. 4	Bench and pilot scale testing would be required. Short-term effectiveness would rely upon the effectiveness of the in-situ chemical oxidation, but has the potential to be similar to Alternative GW-A-1. Implementation of the chemical oxidation at the site with land-use restrictions would not result in short-term impacts to human health or the environment. The time for implementation is approximately 1 year. 4	Bench and pilot scale testing would be required. Long-term effectiveness would rely upon the effectiveness of the in-situ chemical oxidation, but has the potential to be similar to Alternative GW-A-1. 4	Similar to GW-A-1, but would also provide reagent to reduce the toxicity, mobility, and volume of site contaminants through treatment. 4	The technologies used for chemical oxidation are well developed and would not be difficult to implement. Permitting associated with injection of materials into the subsurface is not anticipated to be difficult. 3	High. 2	It is likely that Alternative GW-A-3, when combined with other alternatives to form the final remedy, will be acceptable to the community. 4	Alternative will likely be compatible with the proposed land use under SBD's redevelopment scenario. However, redevelopment of Area A would be delayed until the chemical oxidation program has been completed. teps will need to be taken during construction and redevelopment to preserve the existing ICM. Discharge piping associated with the groundwater extraction system will likely require relocation. 2

1 Unfavorable → 5 Favorable

Prepared by/Date: RTB 10/11/2007
Checked by/Date: WJW 10/19/2007
Revised by/Date: JMS 8/26/2008

Table 5
Comparative Analysis of Remedial Alternative for Area B Groundwater

Remedial Alternative	Compliance with New York State SCGs	Overall Protection of Human Health and the Environment	Short-term Impacts and Effectiveness	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Implementability	Cost	Community Acceptance	Land Use
Alternative GW-B-1: No Action	Alternative GW-B-1 would not comply with Chemical-specific SCGs.	Alternative GW-B-1 would not provide any protection of human health and the environment compared to present conditions.	No construction activities would be implemented for Alternative GW-B-1; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.	The RAOs would not be met if Alternative GW-B-1 were implemented at the Site. This alternative would not provide long-term effectiveness.	No reduction of toxicity, mobility, or volume of site contaminants would be achieved in the short term. Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of site contaminants over time.	No services or materials would be required to implement the No-Action Alternative.	Low	Because this alternative will not result in protection of public health or the environment, the No Action alternative will likely be unacceptable to the community.	The No Action alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from potential exposure to contaminants present in Site groundwater.
Alternative GW-B-2: Groundwater Monitoring	Alternative GW-B-2 would comply with Chemical-specific SCGs over the long-term through natural attenuation process. The time to achieve SCGs is not known.	Alternative GW-B-2 would provide protection of human health and the environment as long as institutional controls are maintained and monitoring demonstrates that contaminant levels are not increasing.	No short-term impacts or effects on the community, workers, or the environment would occur as Alternative GW-B-2 is implemented.	The RAOs would be met by restricting access to groundwater and over time due to natural attenuation of groundwater contaminants in Area B, although the duration of this is not known.	Natural attenuation processes would be expected to result in the reduction of the toxicity, mobility, and volume of site contaminants over time.	Technologies required for monitoring are readily available.	Low to Moderate	Monitoring of groundwater at Area B will be used to confirm that human health and the environment are protected. Therefore, this alternative will likely be acceptable to the community when combined with other alternatives to form the final remedy for the Site.	Alternative GWI-B-2 is compatible with the proposed land use under the SBD's redevelopment scenario.

1 2 3 4 5
Unfavorable → Favorable

Prepared by/Date:RTB 10/11/2007
Checked by/Date: WJW 10/19/2007
Revised by/Date: JMS 8/26/2008

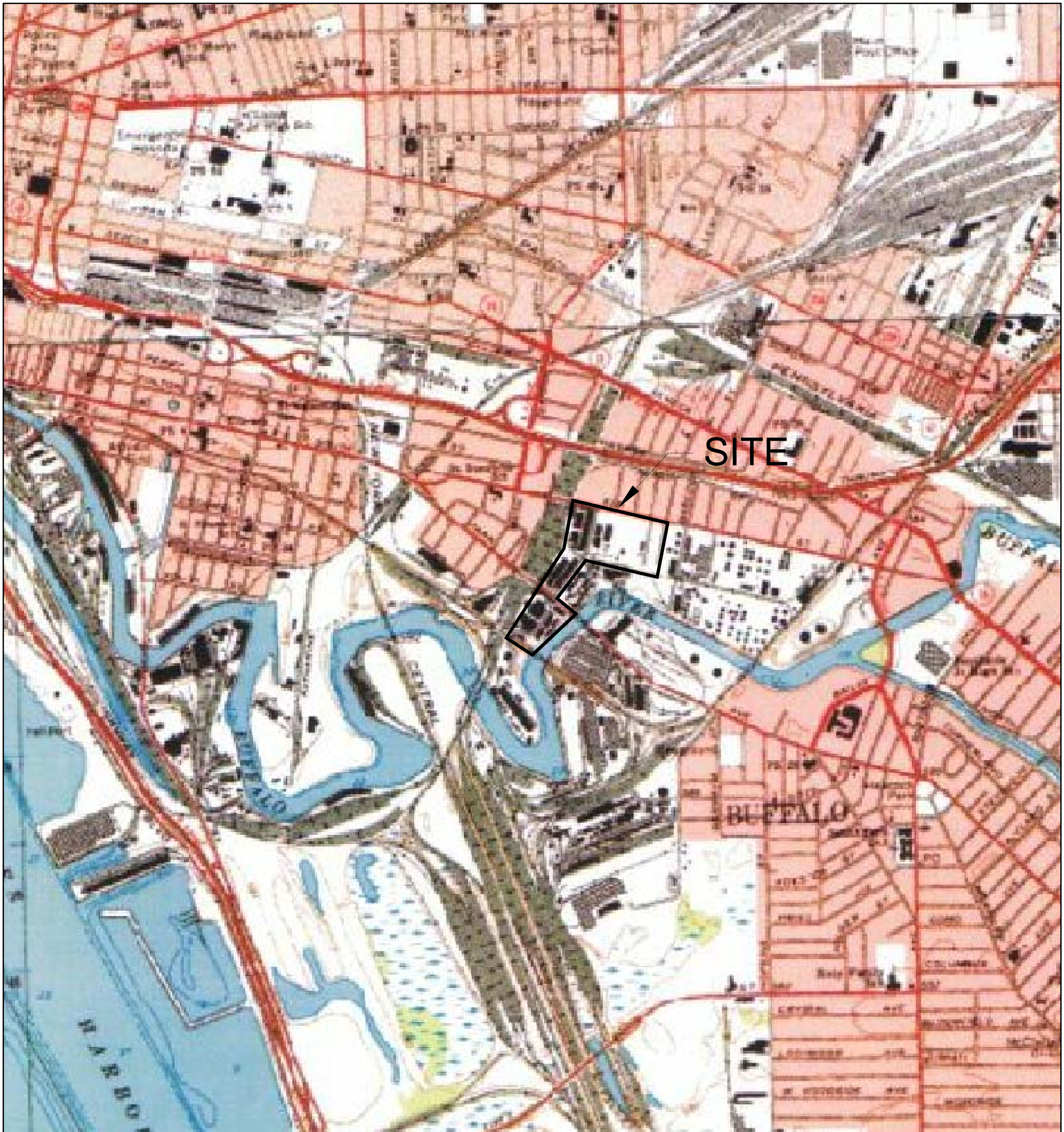
Table 6
Comparative Analysis of Remedial Alternative for Area C&E Groundwater

Remedial Alternative	Compliance with New York State SCGs	Overall Protection of Human Health and the Environment	Short-term Impacts and Effectiveness	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Implementability	Cost	Community Acceptance	Land Use
Alternative GW-C&E-1: No Additional Action	Would rely upon natural attenuation of Area C&E groundwater to comply with Chemical-specific SCGs. No location- or action-specific SCGs would be triggered as no additional actions would be taken.	Would not provide any additional protection of human health and the environment compared to present conditions.	No construction activities would be implemented for Alternative GW-C&E-1; therefore, no short-term impacts or effects on the community, workers, or the environment would occur.	The RAOs would not be met if Alternative GW-C&E-1 were implemented at the Site. This alternative would not provide long-term effectiveness.	Would rely upon natural attenuation to achieve a reduction in toxicity, mobility, and volume of contamination.	No additional services or materials would be required to implement the No Additional Action alternative.	Low	Because this alternative will not result in protection of public health or the environment, the No Action alternative will likely be unacceptable to the community.	The No Action alternative is not compatible with the proposed land use because it would not protect Site workers and visitors from potential exposure to contaminants present in Site groundwater.
Alternative GW-C&E-2: Enhanced Bioremediation with Monitored Natural Attenuation	Alternative involves use of enhanced biodegradation to achieve Chemical-specific SCGs in a shorter time period than natural attenuation.	Implementation of enhanced biodegradation would result in the decrease of contaminant levels at an increased rate over Alternative GW-C&E-1, which would rely upon natural attenuation alone.	Implementation of the enhanced bioremediation at the site with land-use restrictions would not result in short-term impacts to human health or the environment. The time for implementation of Alternative GW-C&E-2 is assumed to be approximately 1 year.	This alternative would provide long-term effectiveness as long as institutional controls are maintained. Decreases in contaminant levels due to enhanced biodegradation would occur over time. Long term groundwater monitoring would be used to ensure long-term effectiveness.	Would implement enhanced biodegradation to provide additional reduction in toxicity and volume of contamination over Alternative GW-C&E-1. Would have added benefit of treating vadose zone soils.	The technologies used for enhanced biodegradation are well developed and would not be difficult to implement. Permitting associated with injection of materials into the subsurface, if required, is not anticipated to be difficult.	Moderate	This alternative will expedite the reduction of contaminant concentrations in shallow groundwater and, through monitoring, verify that human health and the environment is protected. Thus, it is likely that this alternative would be acceptable to the community.	Alternative GW-C&E-2 is compatible with the proposed land use under the SBD's redevelopment scenario.

1 2 3 4 5
Unfavorable → Favorable

Prepared by/Date: RTB 10/11/2007
Checked by/Date: WJW 10/19/2007
Revised by/Date: JMS 8/26/2008

FIGURES



SCALE 1:24000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

BUFFALO SE
QUADRANGLE

FILE: P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 7 Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs-Alternatives Analysis Report(0-08)

PROJECT NUMBER:	3410070582
DRAWING NUMBER:	A01.DWG
DATE:	2-20-2008
DRAWN BY:	WS
APPROVED BY:	JMS

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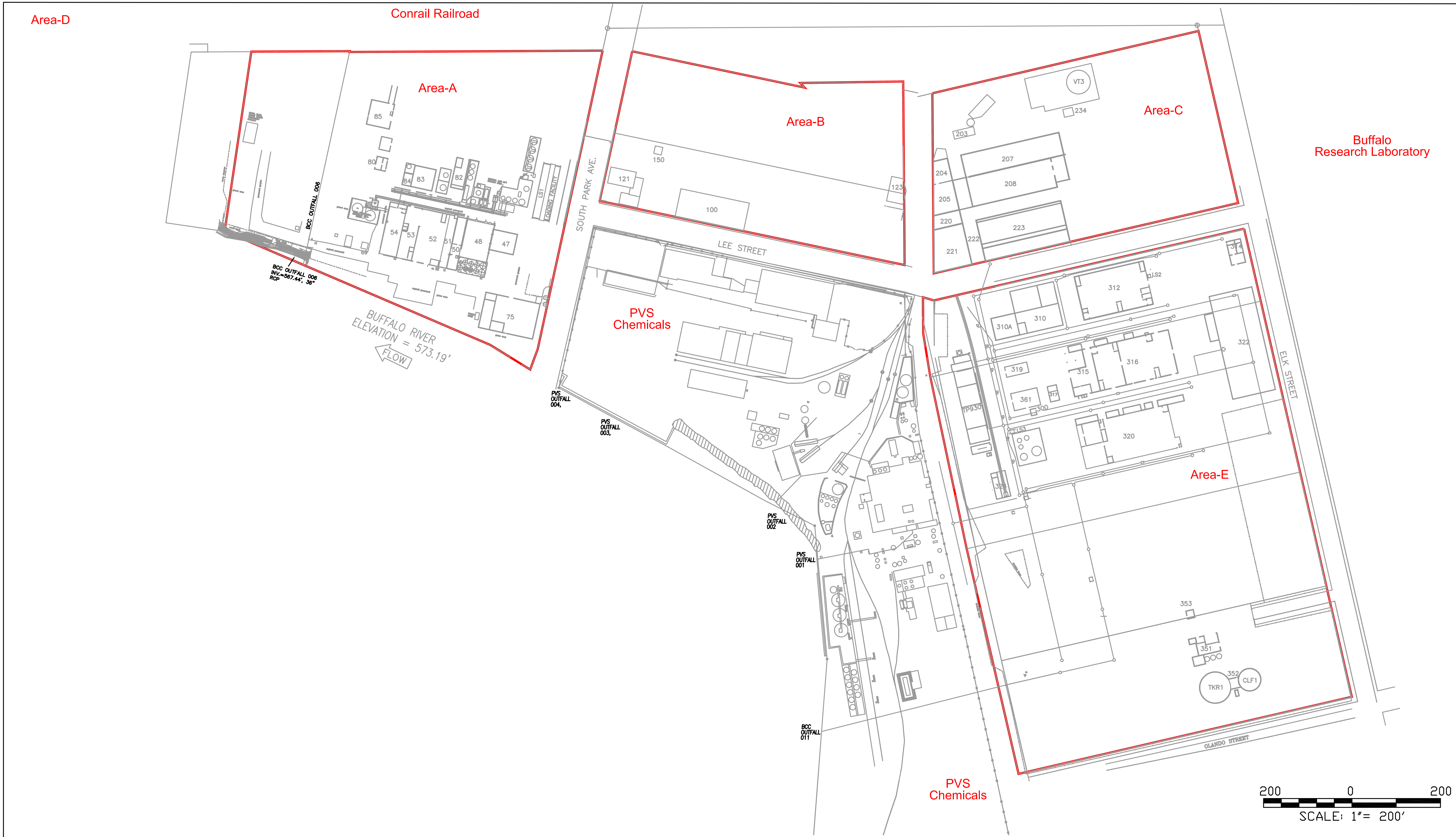
Pittsburgh, PA 15106

SITE LOCATION MAP
BUFFALO COLOR AREAS ABCE
BUFFALO, NY

FIGURE
1



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	DRAWING NUMBER:	B01.DWG
	DATE:	9–28–2007
	DRAWN BY:	WS
P:\PORJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs - Alternatives Analysis Report(8-08)	APPROVED BY:	JMS

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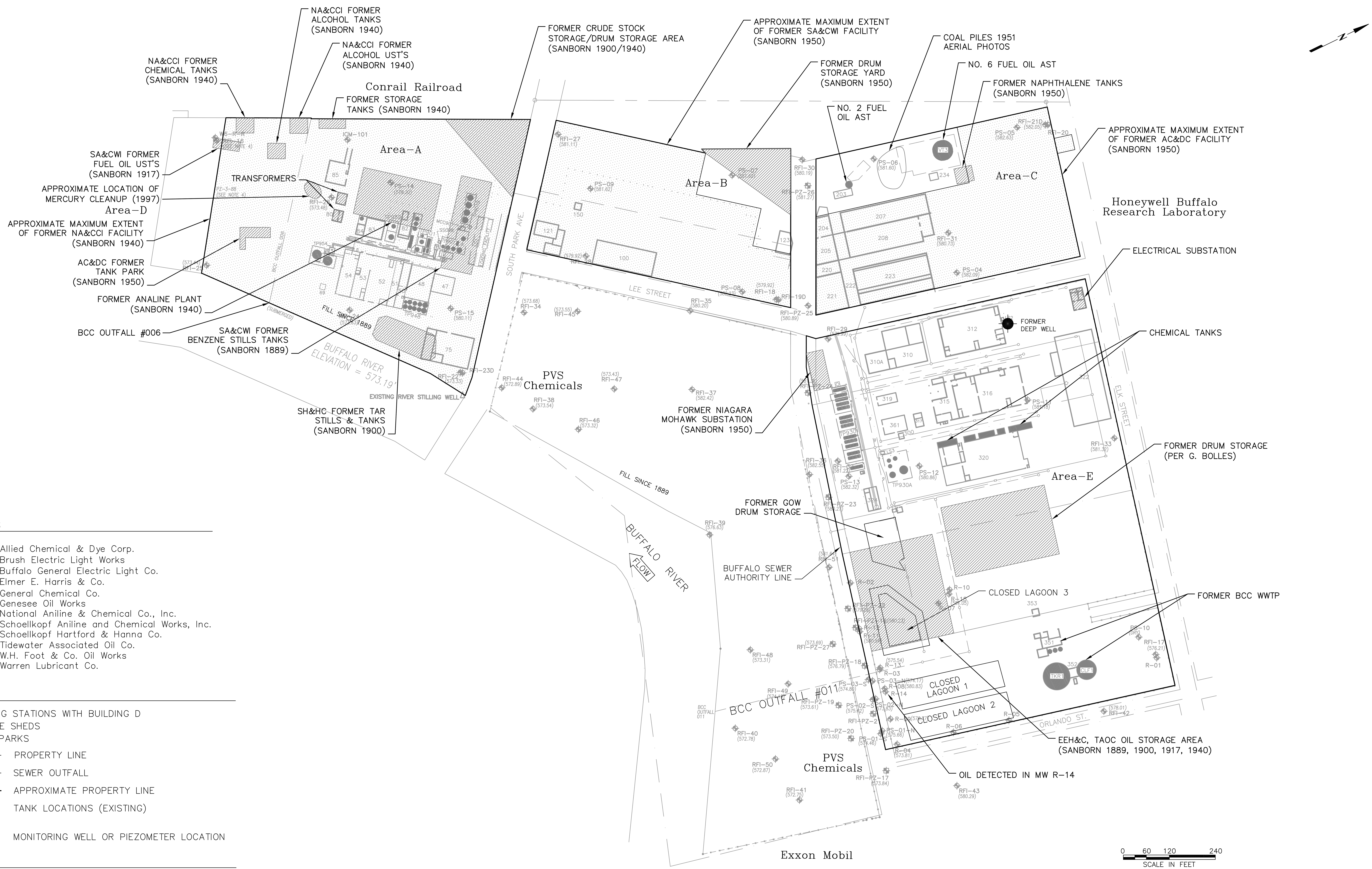
SITE LAYOUT
RI/FS - BUFFALO COLOR AREAS ABCE
HONEYWELL INTERNATIONAL, INC.
BUFFALO, NEW YORK

FIGURE
2

PROJECT NUMBER:	3410070582	MACTEC Engineering & Consulting Inc. 800 North Bell Avenue Suite 200 Pittsburgh, PA 15106	SITE SEWER SYSTEMS BUFFALO COLOR AREAS ABCE BUFFALO, NEW YORK
DRAWING NUMBER:	B01.DWG		
DATE:	9-28-2007		
DRAWN BY:	NEL		
APPROVED BY:	JMS		

FIGURE 3



ABBREVIATIONS

AC&DC	—	Allied Chemical & Dye Corp.
BELW	—	Brush Electric Light Works
BGELC	—	Buffalo General Electric Light Co.
EEH&C	—	Elmer E. Harris & Co.
GCC	—	General Chemical Co.
GOW	—	Genesee Oil Works
NA&CCI	—	National Aniline & Chemical Co., Inc.
SA&CWI	—	Schoellkopf Aniline and Chemical Works, Inc.
SH&HC	—	Schoellkopf Hartford & Hanna Co.
TAOC	—	Tidewater Associated Oil Co.
WHF&COW	—	W.H. Foot & Co. Oil Works
WLC	—	Warren Lubricant Co.

LEGEND

LS = LOADING STATIONS WITH BUILDING D
SS = SAMPLE SHEDS
TP = TANK PARKS

PROPERTY LINE
SEWER OUTFALL
APPROXIMATE PROPERTY LINE
TANK LOCATIONS (EXISTING)
MONITORING WELL OR PIEZOMETER LOCATION

NOTES:

1. DETAIL ON MAP PROVIDED BY BUFFALO COLOR CORP. AND SANBORN FIRE INSURANCE MAPS (SANBORN)

NOTE:
BASE DATA TAKEN FROM BUFFALO COLOR CORPORATION PLAN TITLED "SITE LAYOUT AREA ABCE" BY GOLDER ASSOCIATES. FILE 933-9058, DRAWING NO. 8, DATED 2/14/95.

PROJECT NUMBER:	3410070582
DRAWING NUMBER:	B02.DWG
DATE:	2–20–2008
DRAWN BY:	WS
APPROVED BY:	JMS

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AREAS OF CONCERN
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

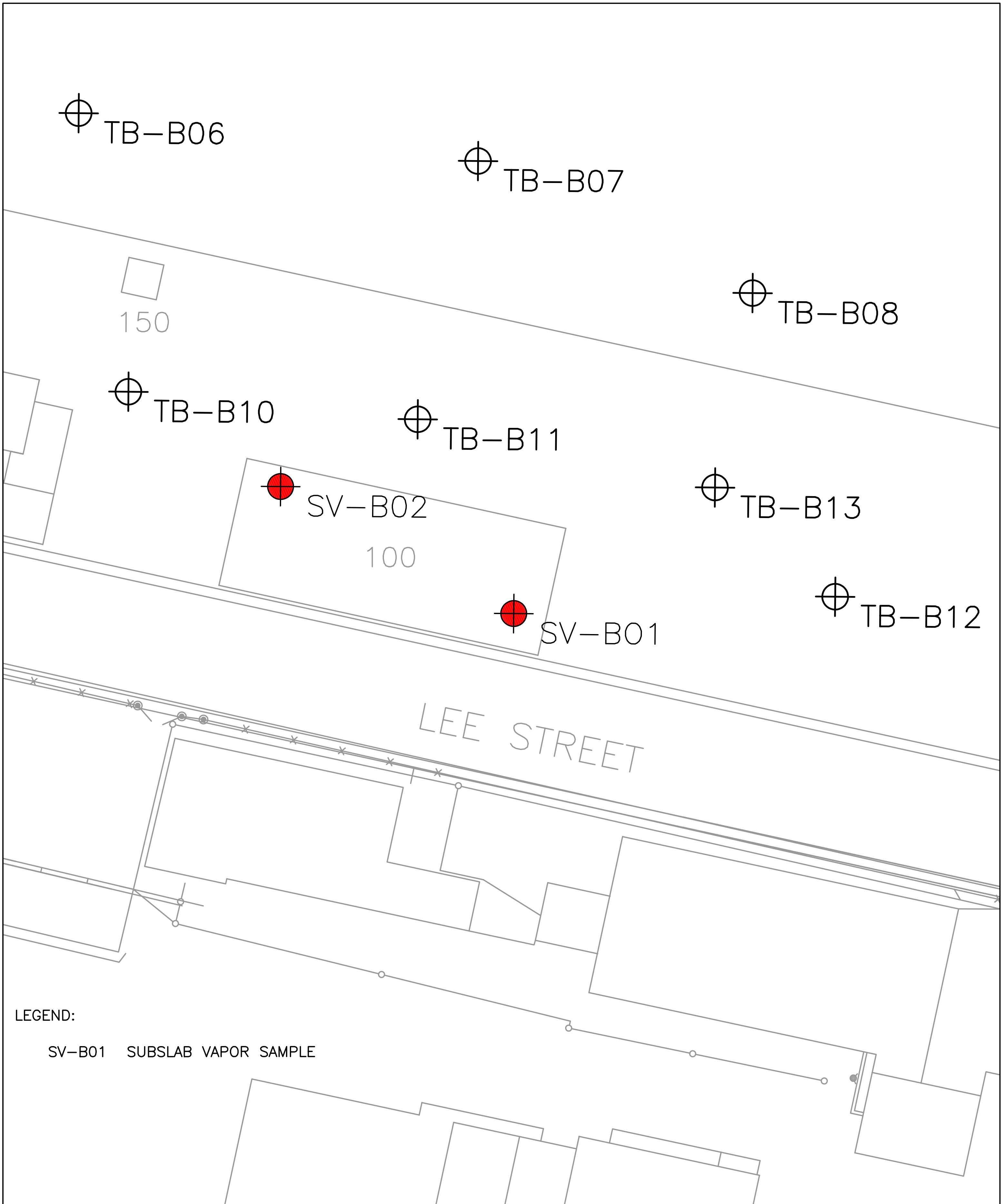
FIGURE
4

LEGEND:

- MONITORING WELL
- SOIL BORING/ SAMPLE LOCATION
- MIP CONFIRMATORY SOIL SAMPLE LOCATION
- TEST PIT LOCATION

PROJECT NUMBER:	3410070582	MACTEC Engineering & Consulting Inc. 700 North Bell Avenue Suite 200 Pittsburgh, PA 15106	SOIL SAMPLE LOCATION PLAN BUFFALO COLOR AREAS ABCE BUFFALO, NEW YORK
DRAWING NUMBER:	B01.DWG		
DATE:	2-20-2008		
DRAWN BY:	WS		
APPROVED BY:	JMS		
FILE: -			

FIGURE 5



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DATE:	2–20–2008
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SUBSLAB VAPOR SAMPLE LOCATIONS (100 LEE ST. BUILDING)
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

6

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MACTEC ENGINEERING & CONSULTING INC.	DRAWING NUMBER:	B04.DWG	
AERIAL PHOTO REFERENCED FROM GOOGLEMAPS.COM	DATE:	2-20-2008	
	DRAWN BY:	WS	
FILE: -	APPROVED BY:	JMS	

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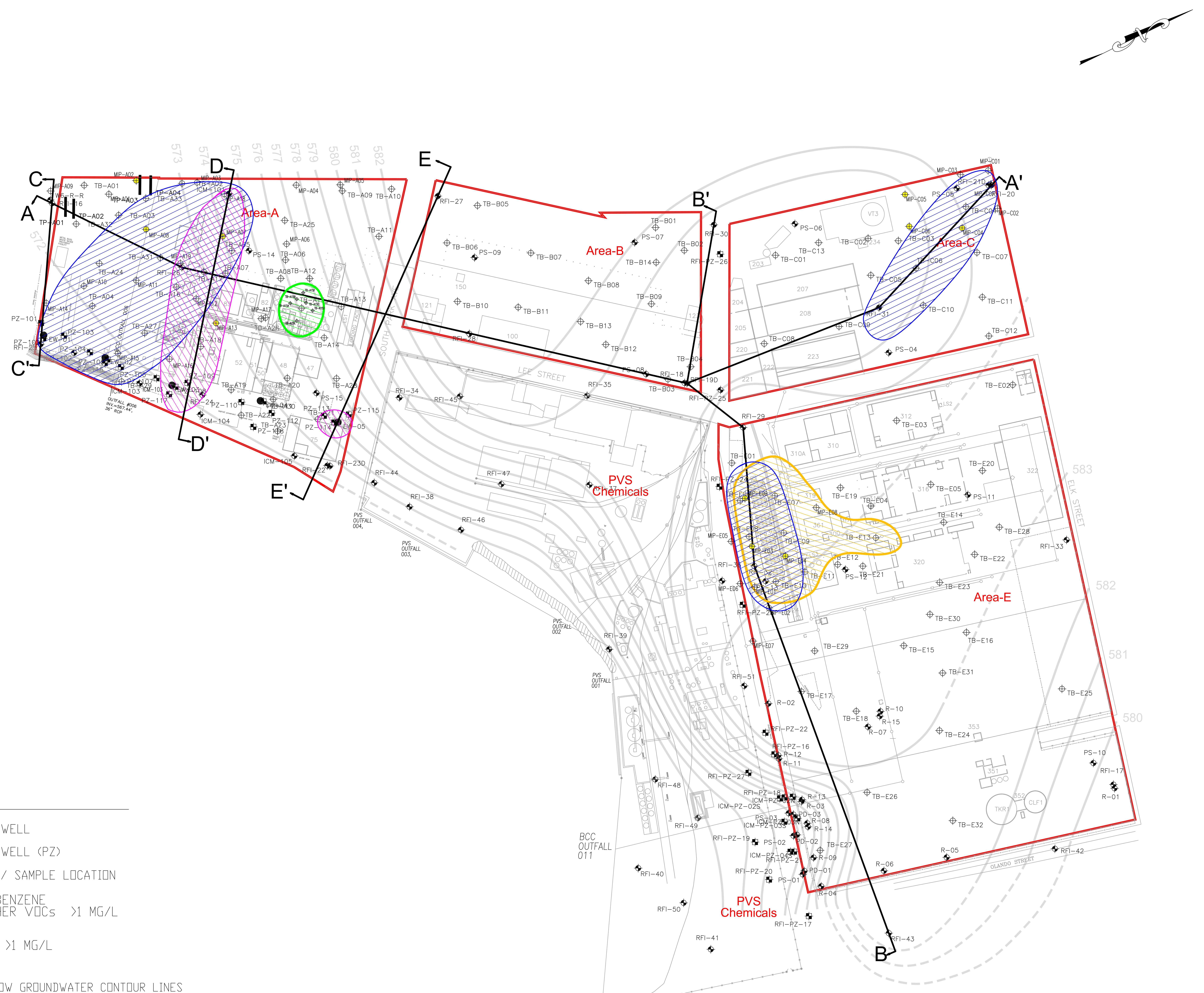
Pittsburgh, PA 15106

BACKGROUND SOIL SAMPLE LOCATION MAP
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
7



LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- SOIL BORING/ SAMPLE LOCATION
- CHLOROBENZENE AND OTHER VOCs >1 MG/L
- ANILINE >1 MG/L
- SHALLOW GROUNDWATER CONTOUR LINES
- VOC IMPACTED AREA - AREA E
  APPROXIMATE AREA = 54,000 SQ. FT
  DEPTH = 4 FEET
  VOLUME = 216,000 CUBIC FEET (8,000 CUBIC YARDS)
- ANILINE & VOC IMPACTED AREA - AREA A
  APPROXIMATE AREA = 14,500 SQ. FT
  DEPTH = 4 FEET
  VOLUME = 56,000 CUBIC FEET (2,100 CUBIC YARDS)

SCALE: 1"= 80'

RESULTS ARE INDICATED IN MG/KG	PROJECT NUMBER:	3410070582
ANY ALTERATION OF THIS DOCUMENT SHALL CONFORM TO THE EDUCATION LAW AND BE PERFORMED UNDER CONSENT OF	DRAWING NUMBER:	B05.DWG
MACTEC ENGINEERING & CONSULTING INC.	DATE:	8/25/2008
ANALYTICAL DATA CHECKED BY:	DRAWN BY:	ESW
	APPROVED BY:	JMS

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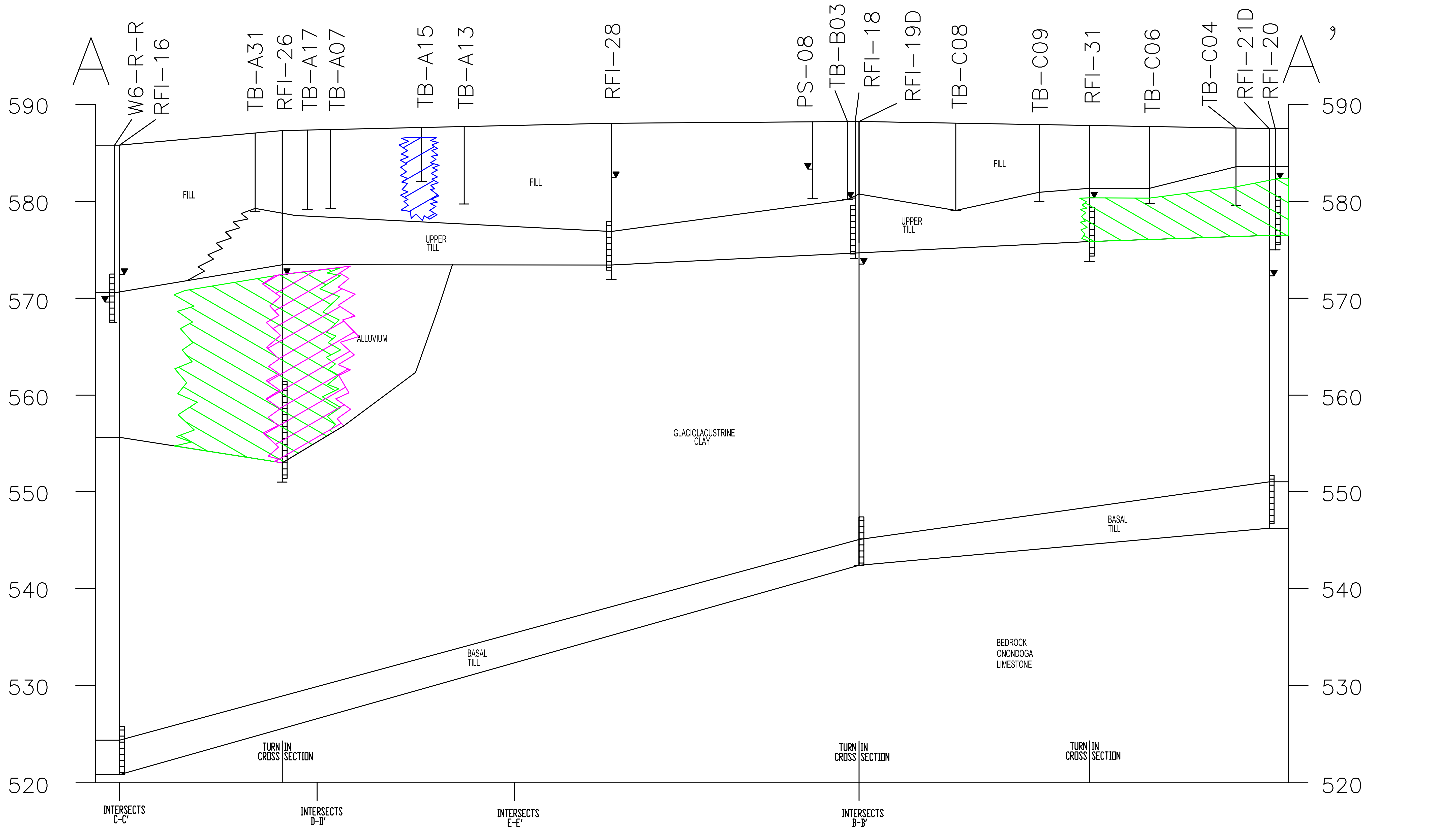
Pittsburgh, PA 15106

STRATOGRAPHIC CROSS SECTION LOCATION
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8

FILE: P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs-Alternatives Analysis Report(8-08)



▼ JANUARY 2007 WATER LEVEL

ANILINE & VOC IMPACTED SOILS

ANILINE >1 MG/L

CHLOROBENZENE & OTHER VOCS >1 MG/L

REFERENCE: RFI REPORT, GOLDER ASSOCIATES, 1997-1998	PROJECT NUMBER:	3410070582	
HORIZONTAL SCALE – 1"=200'	DRAWING NUMBER:	B03.DWG	
VERTICAL SCALE – 1"=10'	DATE:	8/25/2008	
	DRAWN BY:	ESW	
P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs-Alternatives Analysis Report\Cross-Section B(03).dwg	APPROVED BY:	JMS	

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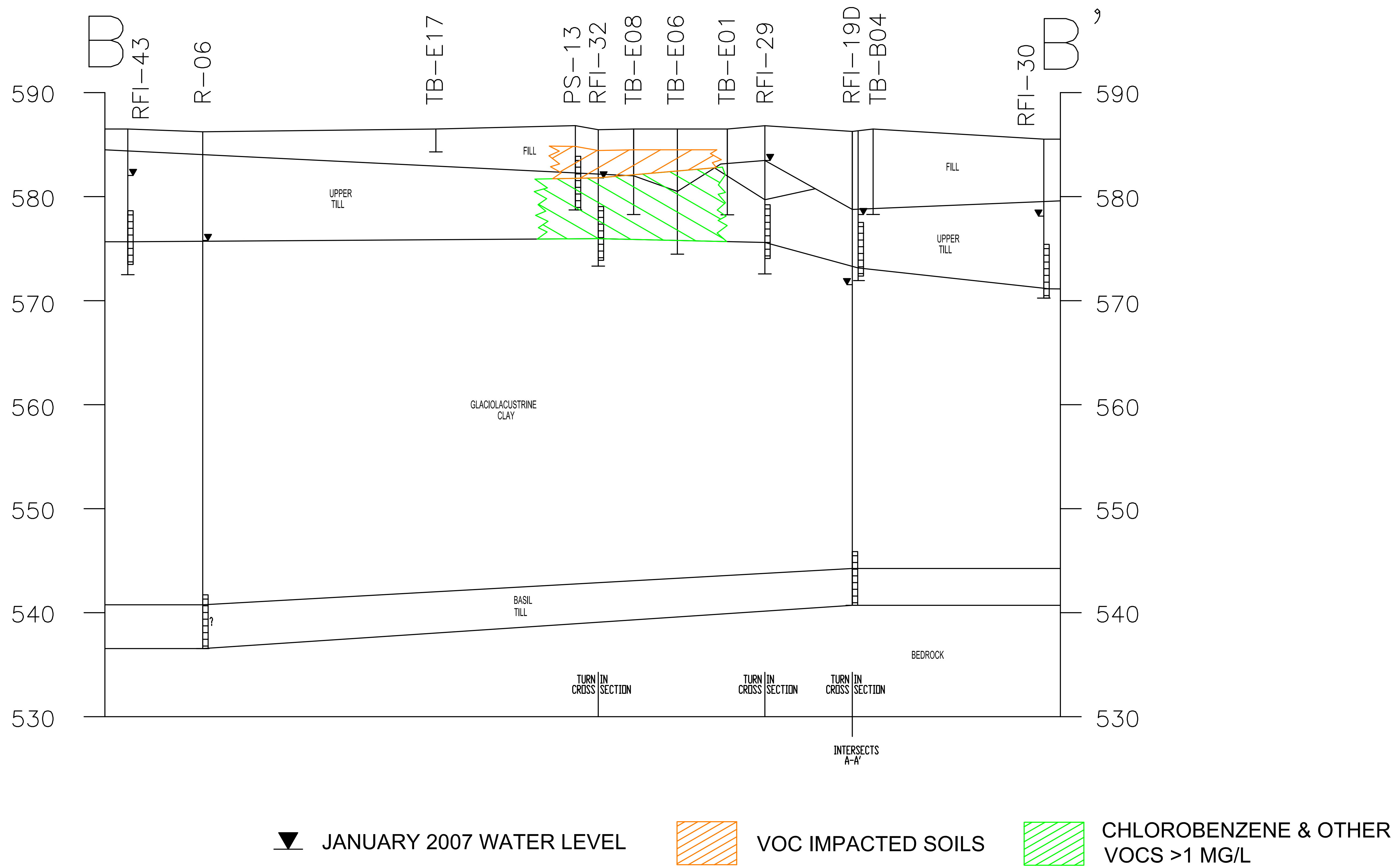
STRATIGRAPHIC CROSS SECTIONS A-A'
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8A



REFERENCE: RFI REPORT, GOLDER ASSOCIATES, 1997–1998	PROJECT NUMBER:	3410070582	
HORIZONTAL SCALE – 1"=200'	DRAWING NUMBER:	B03.DWG	
VERTICAL SCALE – 1"=10'	DATE:	8/25/2008	
	DRAWN BY:	ESW	
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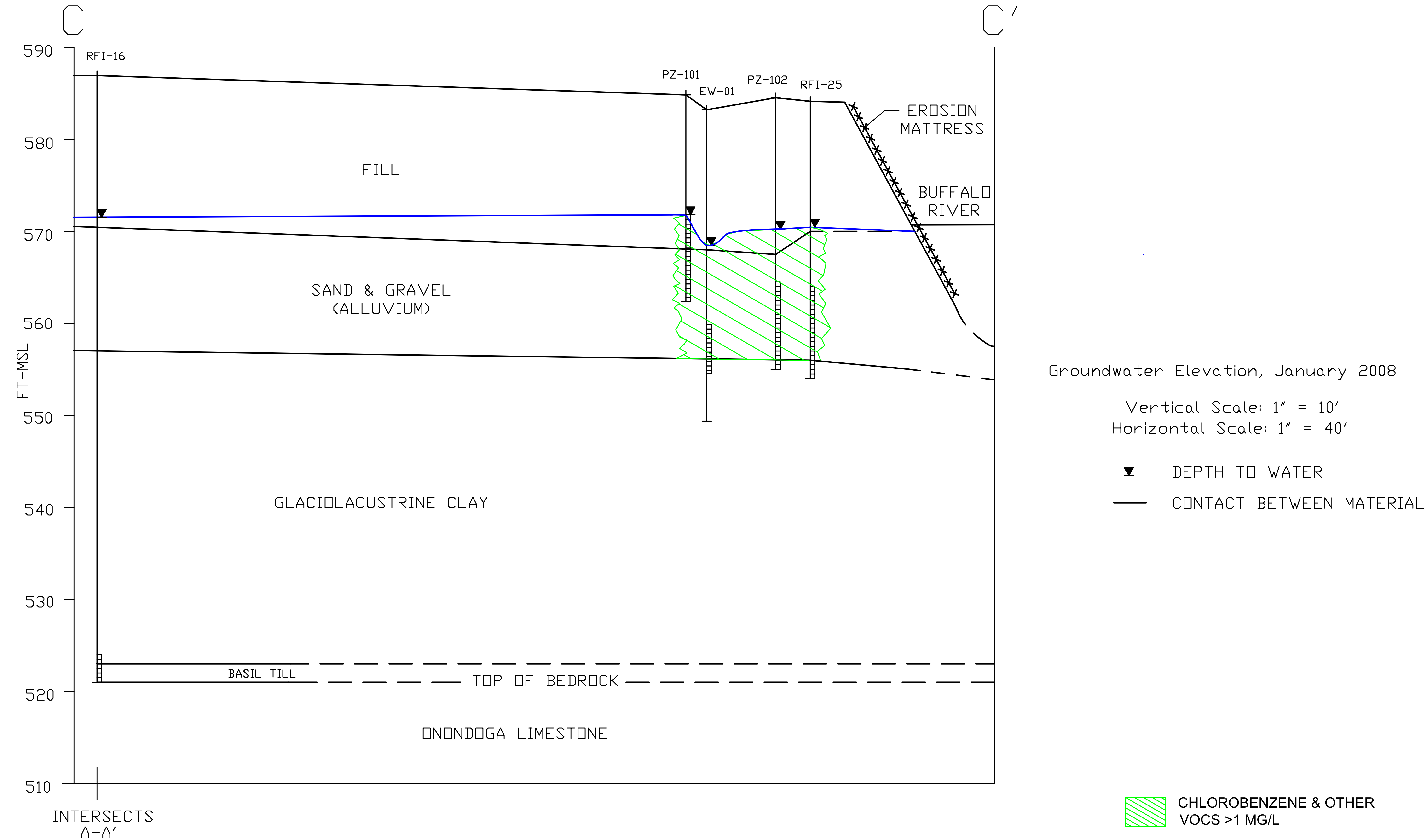
STRATIGRAPHIC CROSS SECTIONS A-A', B-B'
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8B

FILE: P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 – Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs–Alternatives Analysis Report(8–08)\Cross Section (C to G).dwg



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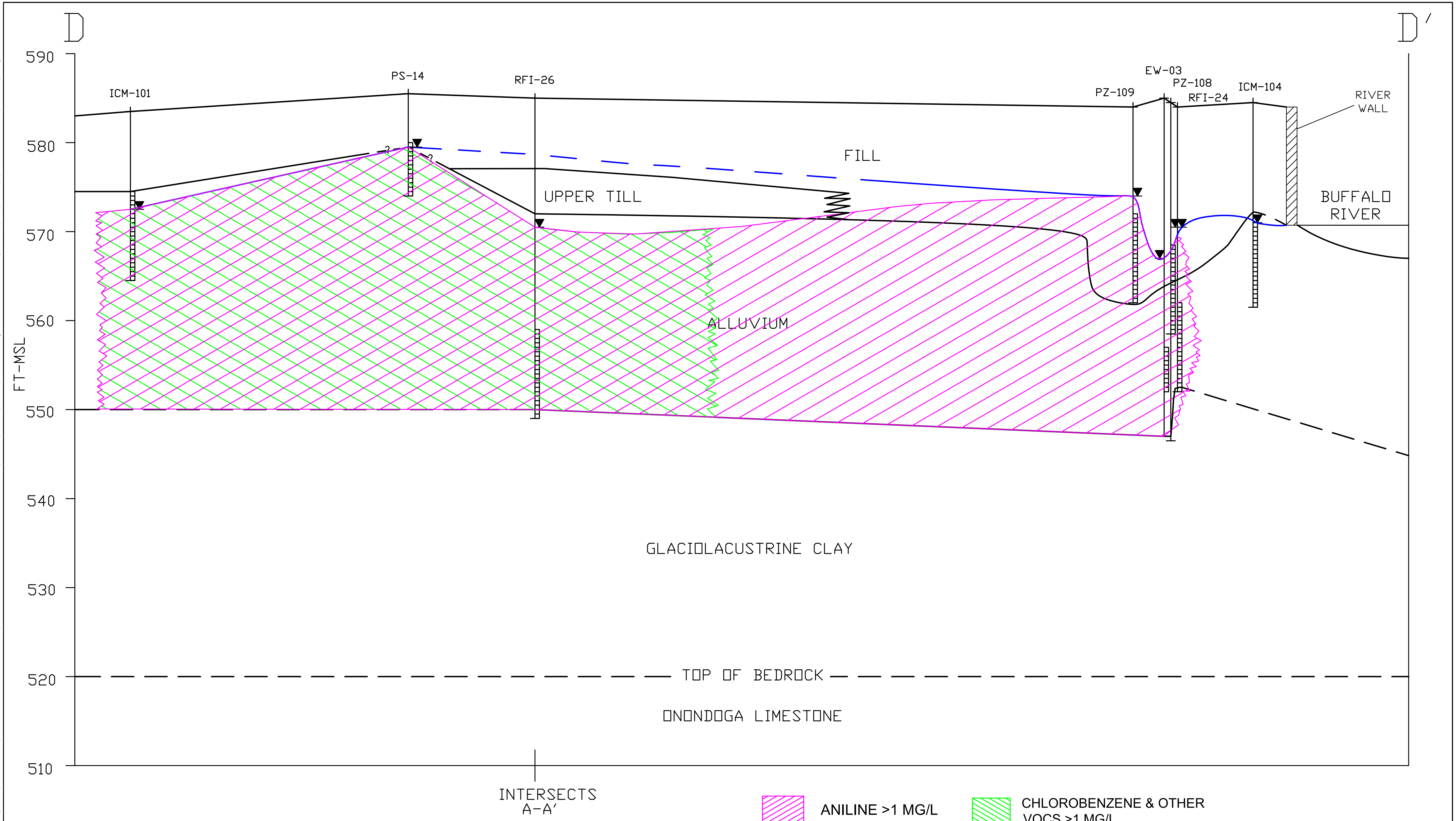
CROSS SECTION C-C'
GROUNDWATER ELEVATION JANUARY 2008
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8C



Groundwater Elevation, March 17, 2008

Vertical Scale: 1" = 10'
Horizontal Scale: 1" = 40'

▼ DEPTH TO WATER
— CONTACT BETWEEN MATERIAL

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CROSS SECTION D-D'
GROUNDWATER ELEVATION 3-17-2008
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8D

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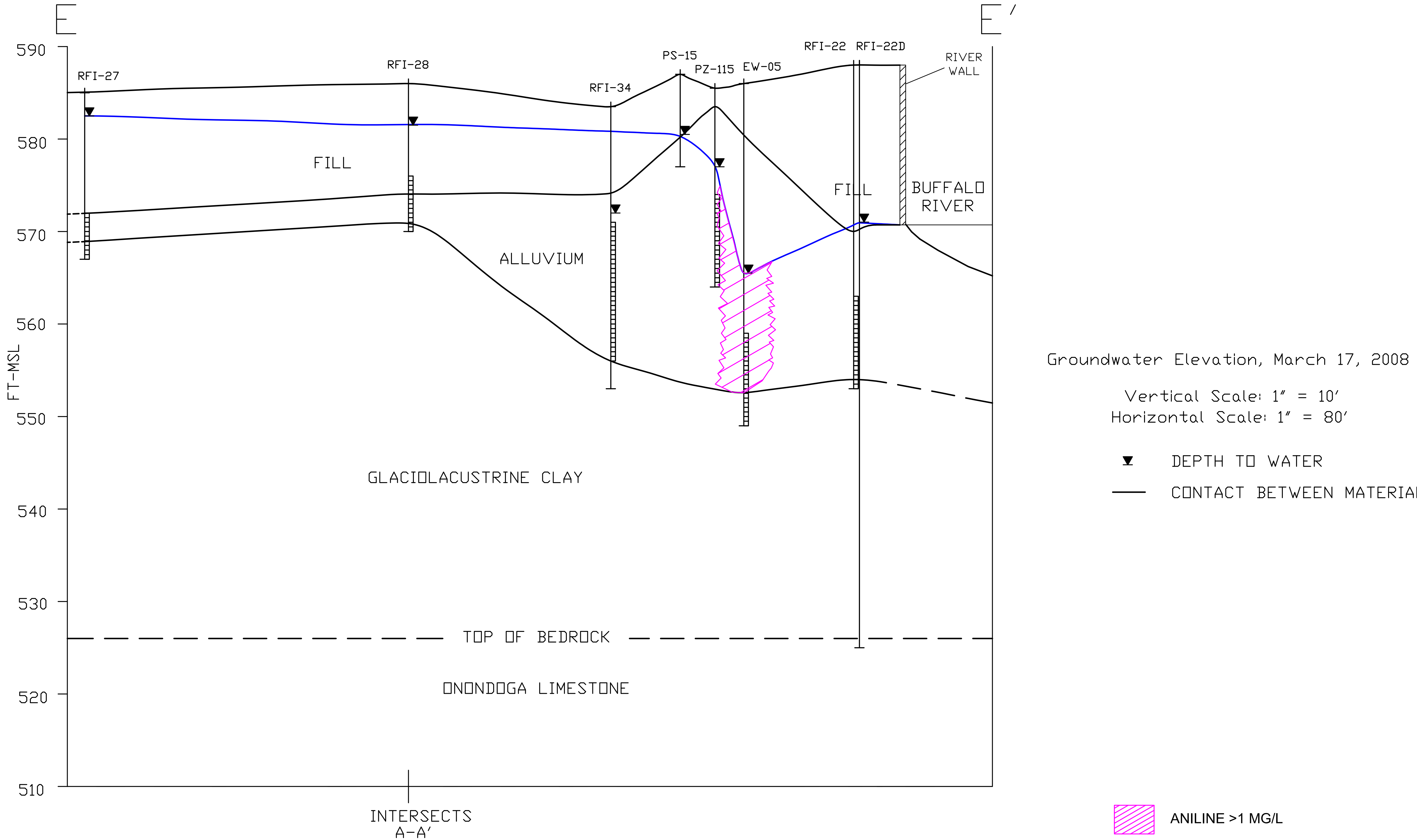

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DRAWING NUMBER:	CROSS SECTION.dwg
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CROSS SECTION E-E'
GROUNDWATER ELEVATION 3-17-2008
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
8E

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DATE:	2-20-2008
DRAWN BY:	WS
APPROVED BY:	JMS

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GROUNDWATER CONTOURS - FILL UNIT (JAN-07)
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
9

		PROJECT NUMBER:	3410070582
		DRAWING NUMBER:	B06.DWG
		DATE:	2-20-2008
		DRAWN BY:	WS
FILE: -		APPROVED BY:	JMS

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GROUNDWATER CONTOURS - SHALLOW AQUIFER (JAN-07)
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
10

LEGEND:

MONITORING WELL

PIEZOMETER

PROJECT NUMBER:	3410070582
DRAWING NUMBER:	B06.DWG
DATE:	2-20-2008
DRAWN BY:	WS
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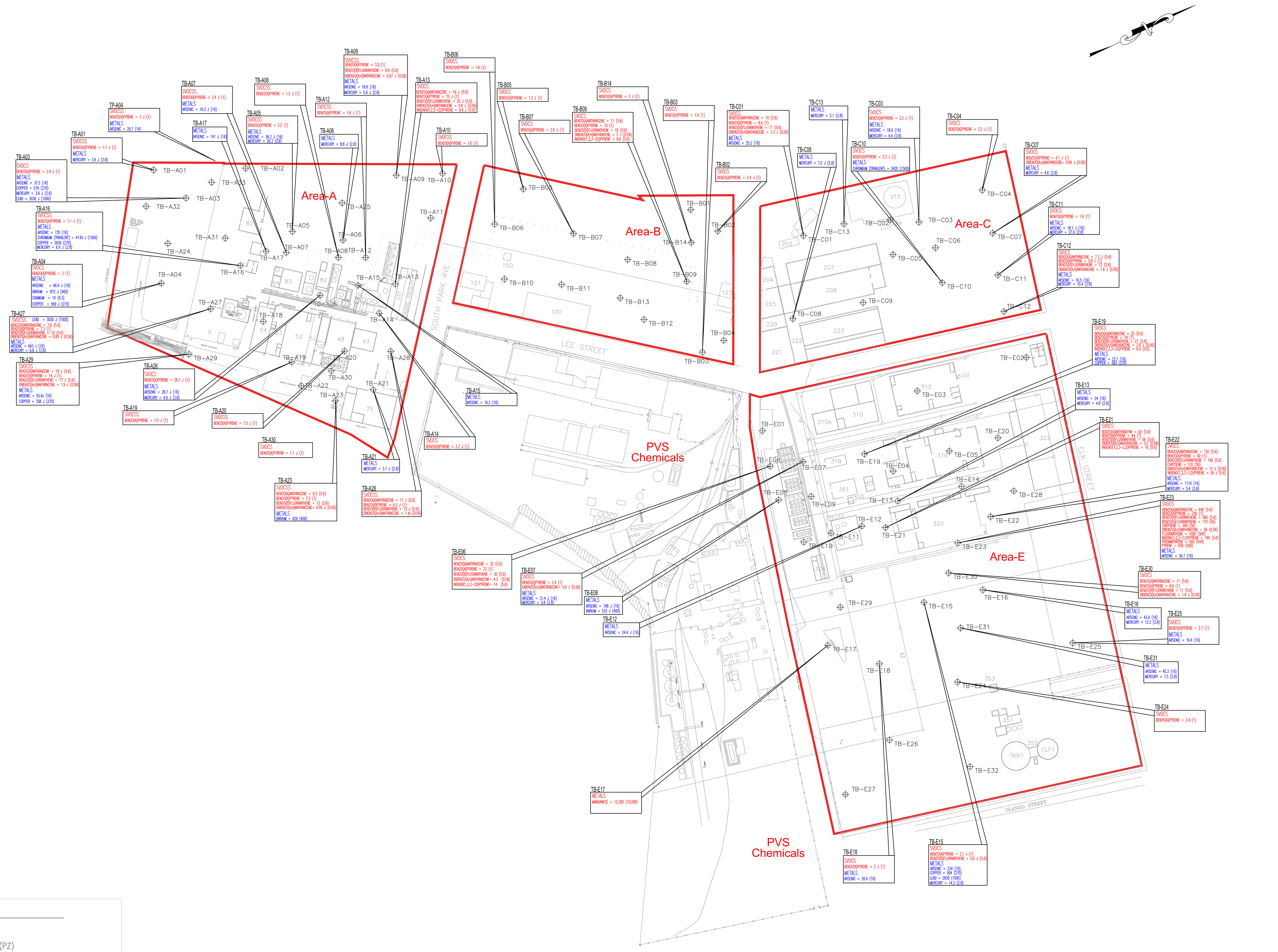
GROUNDWATER CONTOURS - CONFINED AQUIFER (JAN-07)
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
11



LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- SOIL BORING/ SUBSURFACE SAMPLE LOCATION

RESULTS IN MG/KG

( ) = PROTECTION OF GROUNDWATER SCO IN MG/KG

80 0 80
SCALE: 1"= 80'

RESULTS ARE INDICATED IN MG/KG		PROJECT NUMBER:	3410070582
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ANALYTICAL DATA CHECKED BY: NCF		DRAWN BY:	WS
FILE: P:PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD - Alternatives Analysis Report(8-08)		APPROVED BY:	JMS

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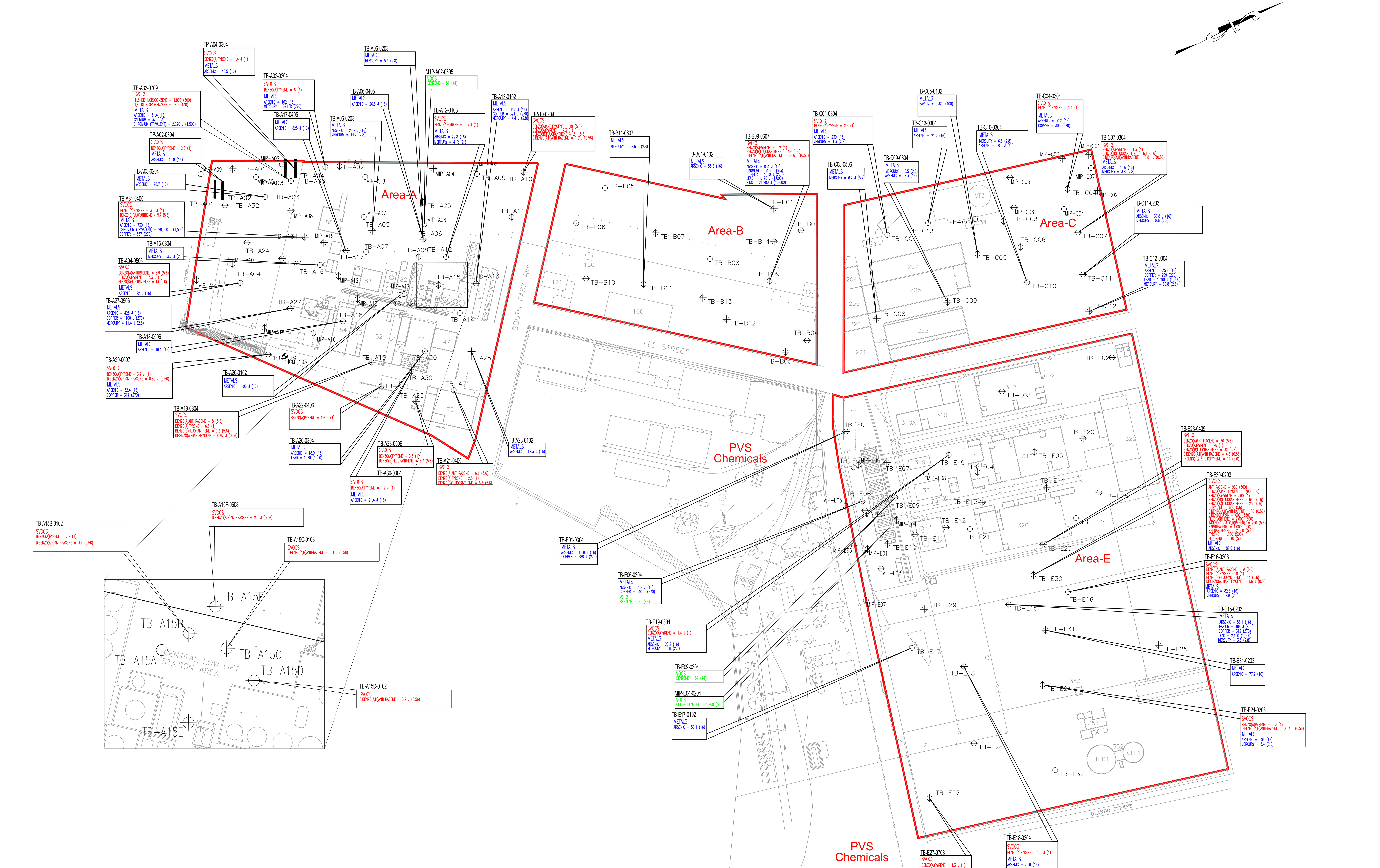
Pittsburgh, PA 15106

SURFACE SOIL SAMPLE RESULTS VS. COMMERCIAL SCOs
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
12



LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- SOIL BORING/ SUBSURFACE SAMPLE LOCATION

RESULTS IN MG/KG

( ) = PROTECTION OF GROUNDWATER SCO IN MG/KG

SCALE: 1" = 80'

RESULTS ARE INDICATED IN MG/KG	PROJECT NUMBER:	3410070582
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MACTEC ENGINEERING & CONSULTING INC.	DATE:	8/18/2008
ANALYTICAL DATA CHECKED BY:	DRAWN BY:	WS
FILE:	APPROVED BY:	JMS

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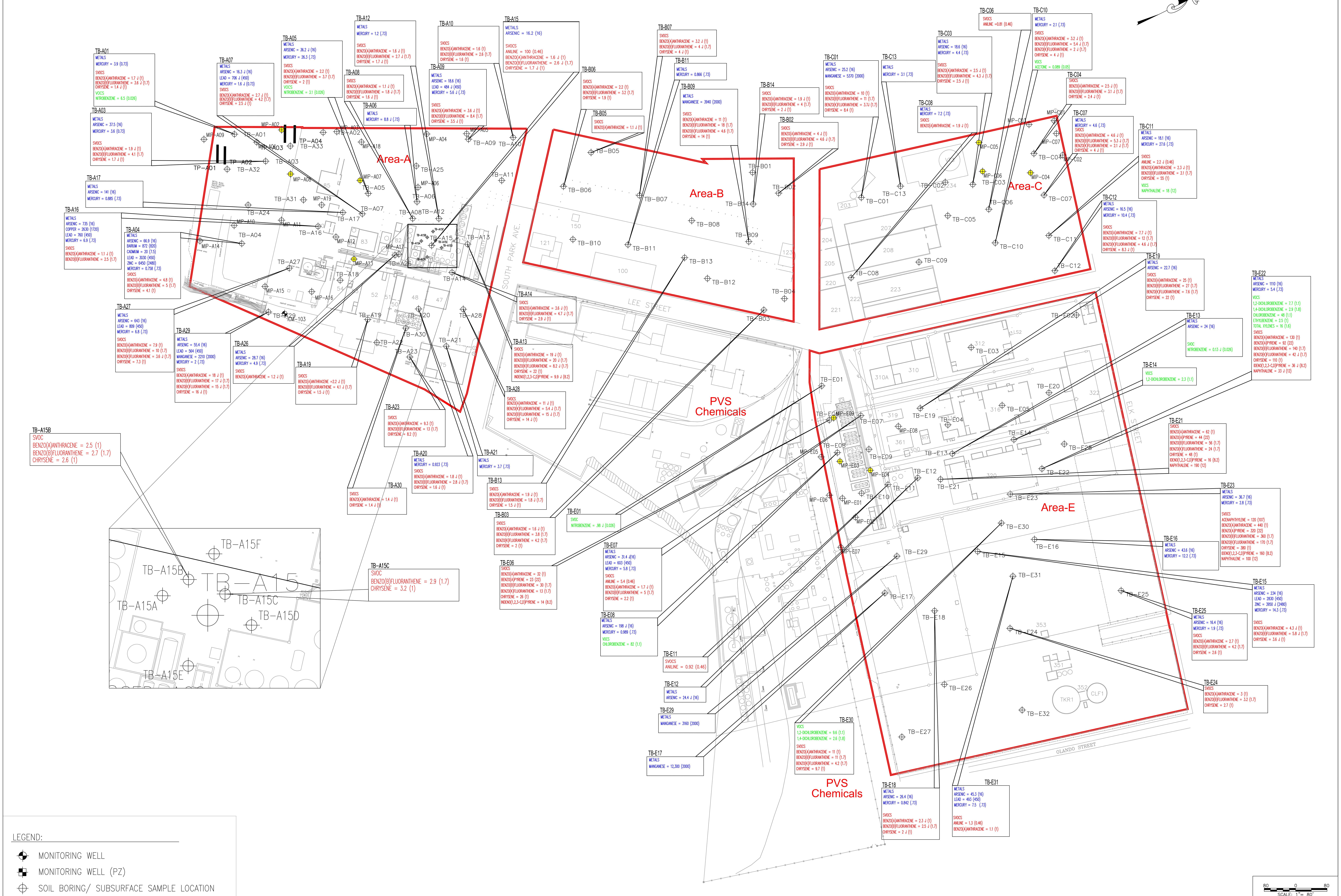
700 North Bell Avenue Suite 200
Pittsburgh, PA 15106

SUBSURFACE SOIL SAMPLE RESULTS VS. COMMERCIAL SCOs
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE 13



LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- SOIL BORING/ SUBSURFACE SAMPLE LOCATION

RESULTS IN MG/KG

( ) = PROTECTION OF GROUNDWATER SCO IN MG/KG

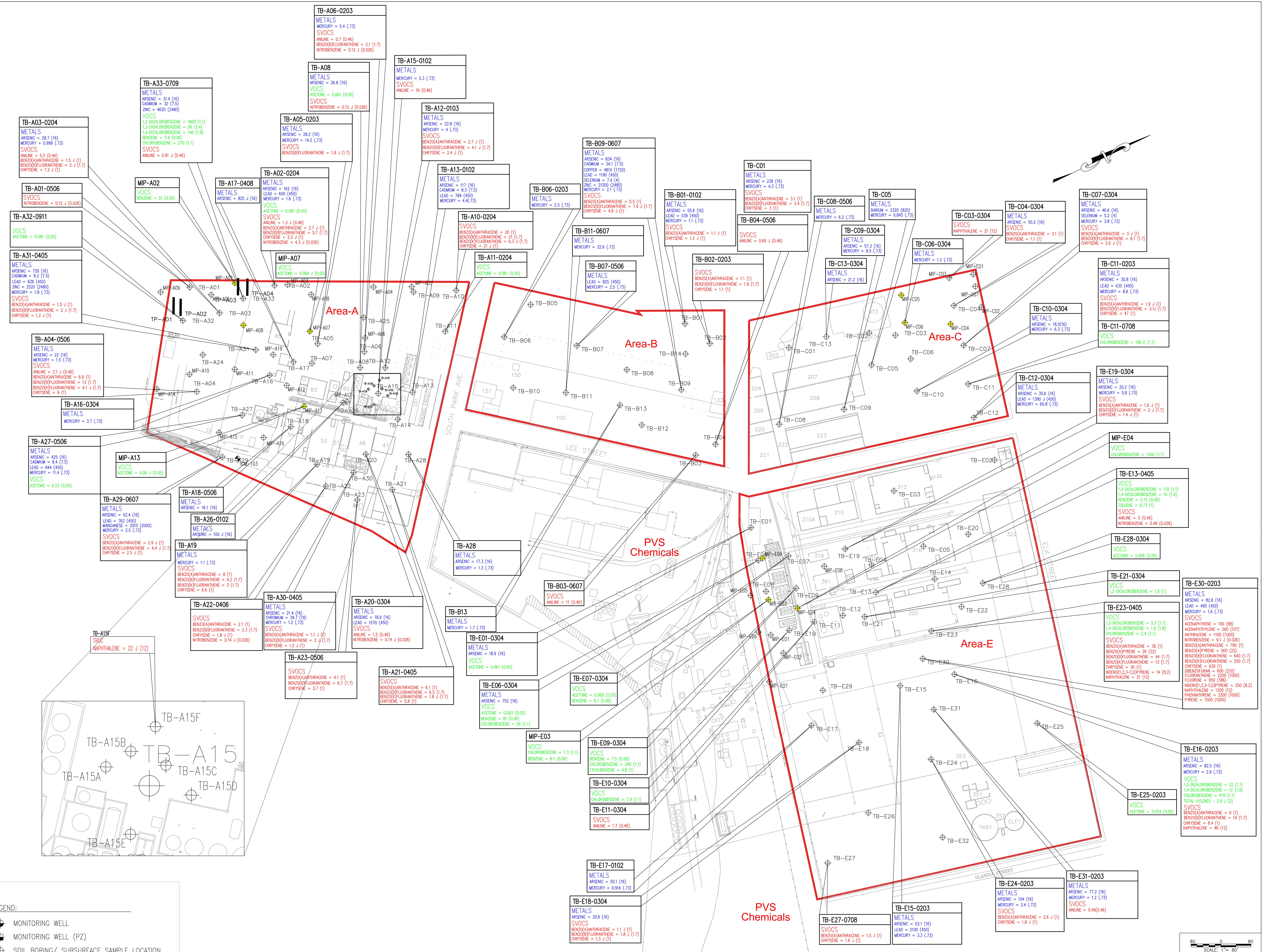
SCALE: 1" = 80'

RESULTS ARE INDICATED IN MG/KG		PROJECT NUMBER:	3410070582
ANY ALTERATION OF THIS DOCUMENT SHALL CONFORM TO THE EDUCATION LAW AND BE PERFORMED UNDER CONSENT OF MACTEC ENGINEERING & CONSULTING INC.		DRAWING NUMBER:	B05.DWG
		DATE:	2-20-2008
ANALYTICAL DATA CHECKED BY:		DRAWN BY:	WS
FILE:		APPROVED BY:	JMS

MACTEC
Engineering & Consulting Inc.
700 North Bell Avenue Suite 200
Pittsburgh, PA 15106

SURFACE SOIL SAMPLE RESULTS VS. PROTECTION OF GW SCOs
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
14



LEGEND:

MONITORING WELL

MONITORING WELL (PZ)

SOIL BORING/ SUBSURFACE SAMPLE LOCATION

RESULTS IN MG/KG

( ) = PROTECTION OF GROUNDWATER SCO IN MG/KG

RESULTS ARE INDICATED IN MG/KG		PROJECT NUMBER:	3410070582
ANY ALTERATION OF THIS DOCUMENT SHALL CONFORM TO THE EDUCATION LAW AND BE PERFORMED UNDER CONSENT OF		DRAWING NUMBER:	B05.DWG
MACTEC ENGINEERING & CONSULTING INC.		DATE:	9-28-2007
ANALYTICAL DATA CHECKED BY:		DRAWN BY:	WS
FILE: P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD - Alternatives Analysis Report(8-08)		APPROVED BY:	JMS

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SUBSURFACE SOIL SAMPLE RESULTS - PROTECTION OF GW SCO
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
15

	PROJECT NUMBER:	3410070582
	DRAWING NUMBER:	B07.DWG
	DATE:	2-20-2008
	DRAWN BY:	WS
FILE: -	APPROVED BY:	JMS

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SHALLOW AQUIFER SAMPLE RESULTS VS
NY CLASS GA STANDARDS
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
16

	PROJECT NUMBER:	3410070582	
	DRAWING NUMBER:	B06.DWG	
	DATE:	2-20-2008	
	DRAWN BY:	WS	
FILE: -	APPROVED BY:	JMS	

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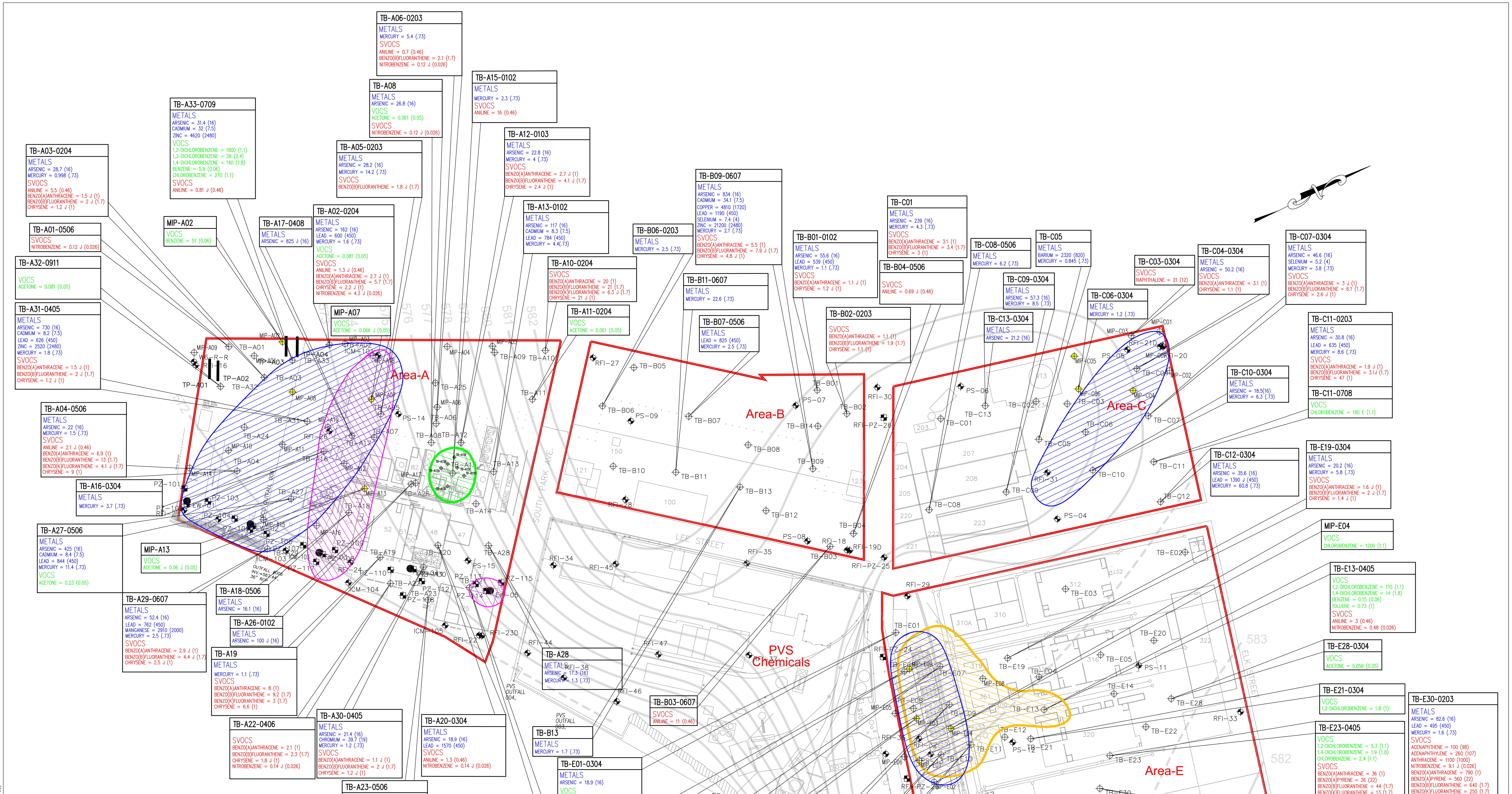
CONFINED AQUIFER SAMPLING RESULTS VS
NY CLASS GA STANDARDS
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
17

FILE: P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 - Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs-Alternatives Analysis Report(8-08)



LEGEND:

MONITORING WELL

MONITORING WELL (PZ)

SOIL BORING/ SAMPLE LOCATION

RESULTS IN MG/KG

( ) = PROTECTION OF GROUNDWATER SCO IN MG/KG

CHLOROBENZENE AND OTHER VOCs >1 MG/L

ANILINE >1 MG/L

SHALLOW GROUNDWATER CONTOUR LINES

VOC IMPACTED AREA - AREA E
APPROXIMATE AREA = 54,000 SQ. FT
DEPTH = 4 FEET
VOLUME = 216,000 CUBIC FEET (8,000 CUBIC YARDS)

ANILINE & VOC IMPACTED AREA - AREA A
APPROXIMATE AREA = 14,500 SQ. FT
DEPTH = 4 FEET
VOLUME = 56,000 CUBIC FEET (2,100 CUBIC YARDS)

SCALE: 1" = 80'

RESULTS ARE INDICATED IN MG/KG	PROJECT NUMBER:	3410070582
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	DATE:	8/25/2008
ANALYTICAL DATA CHECKED BY:	DRAWN BY:	ESW
	APPROVED BY:	JMS

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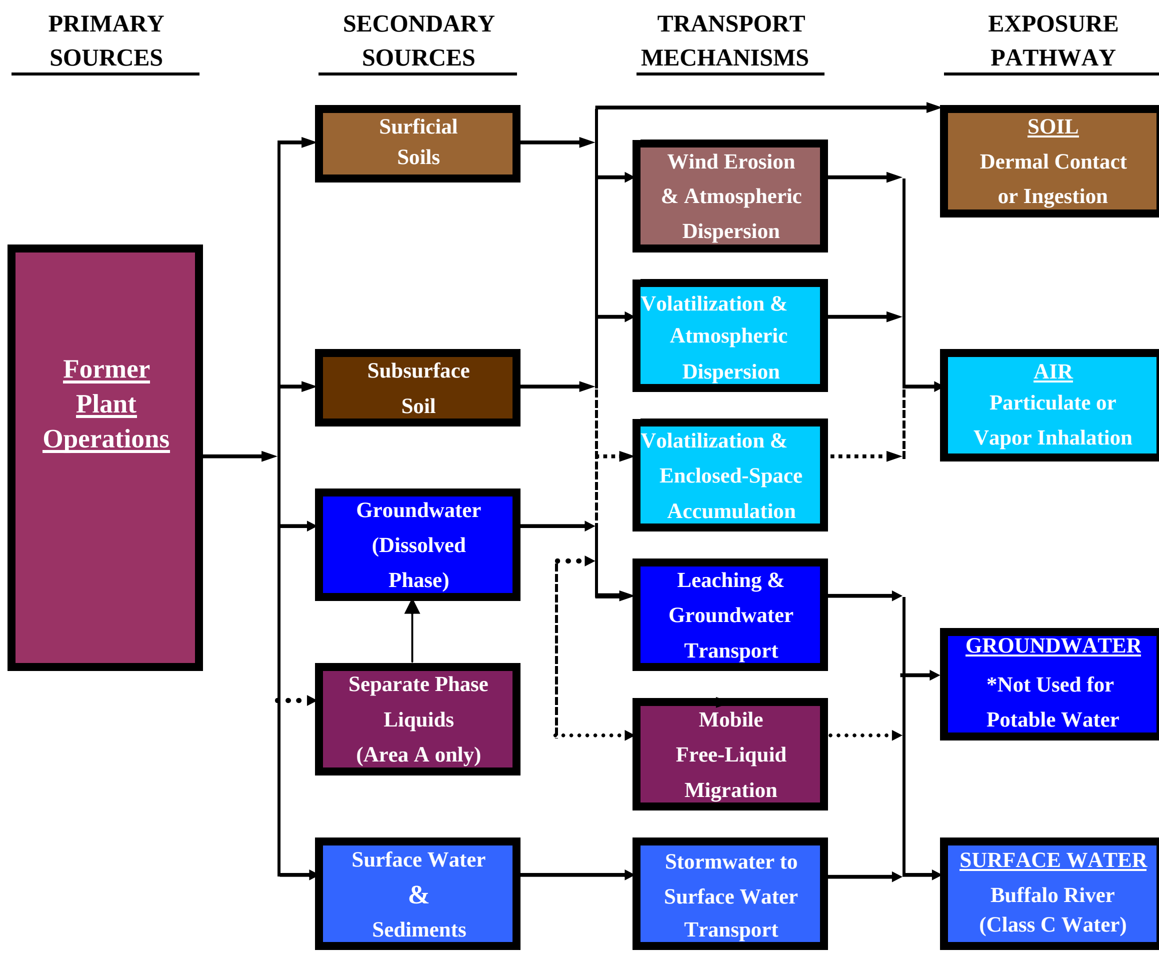
POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
18

Figure 19
Conceptual Site Model
Former Buffalo Color Site
Areas ABCE



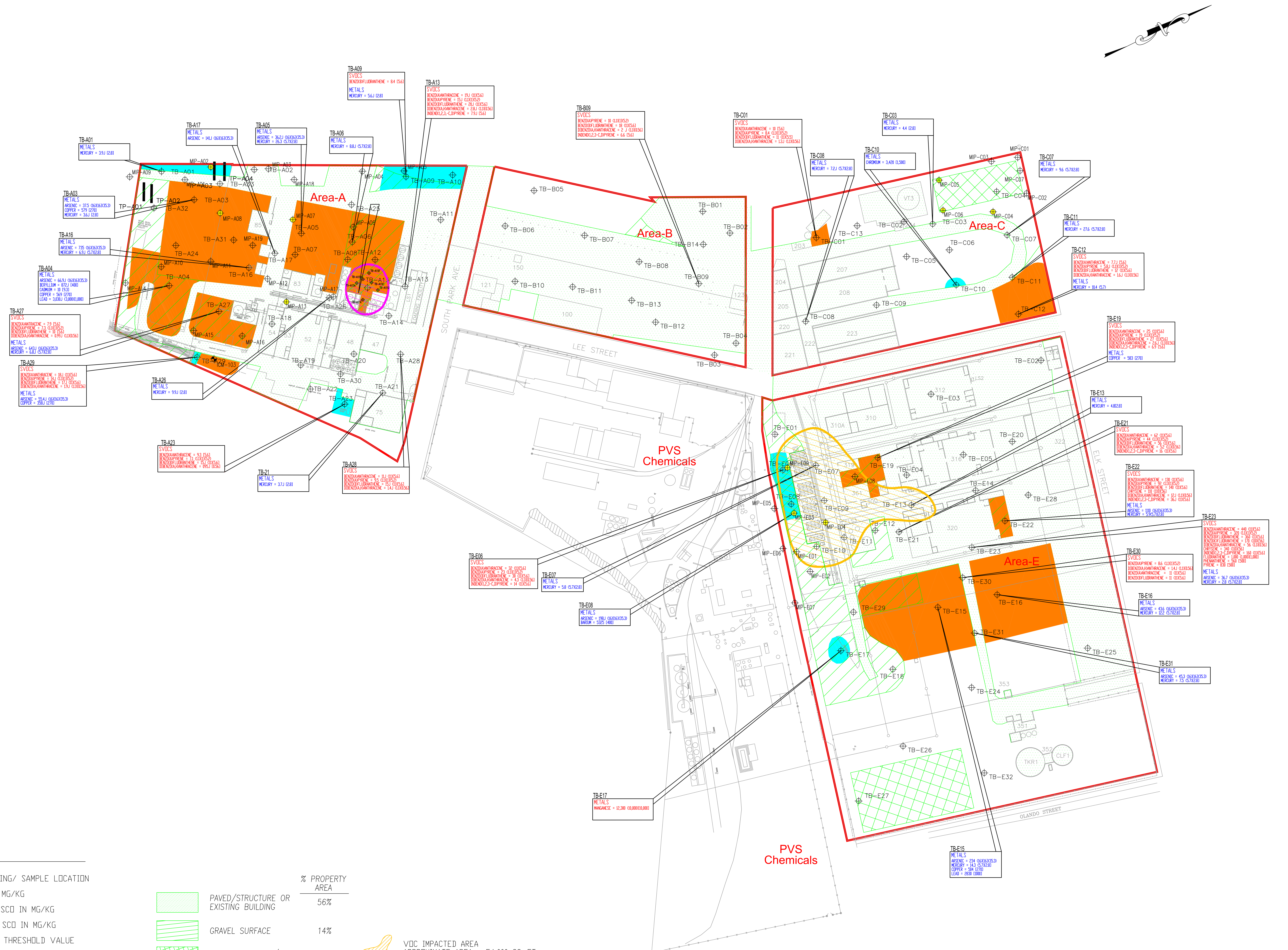
RECEPTORS: CURRENT AND FUTURE LAND USE

Exposure Route	Residents	Const. Workers	Workers & Trespassers	Terrestrial	Aquatic
	HUMANS			BIOTA	
[Soil] Ingestion		●	●	●	
Dermal Contact		●	●	●	
[Air] Inhalation		●	●	●	
[Groundwater] Ingestion					
Inhalation		●	●	●	
Dermal Contact		●			
[Surface Water] Ingestion					●
Inhalation		●			●
Dermal Contact		●		●	●

a dotted line indicates an incomplete or broken exposure pathway

- - - -► = incomplete exposure pathway

——► ● = potentially complete exposure pathway



LEGEND:

⌖ RI SOIL BORING/ SAMPLE LOCATION

RESULTS IN MG/KG

( ) INDUSTRIAL SCO IN MG/KG

[ ] COMMERCIAL SCO IN MG/KG

( ) BACKGROUND THRESHOLD VALUE

APPROX. AREA REQUIRING PLACEMENT OF 1 FT CLEAN SOIL OR PAVEMENT TO MEET INDUSTRIAL USE STANDARDS

APPROX. AREA REQUIRING PLACEMENT OF 1 FT CLEAN SOIL OR PAVEMENT TO MEET COMMERCIAL USE STANDARDS

	% PROPERTY AREA
PAVED/STRUCTURE OR EXISTING BUILDING	56%
GRAVEL SURFACE	14%
SLAB FOUNDATION/ LAGOON CLOSURE CAP	3%
TOTAL OF PROPERTY AREA	73%
GRASSED AREA	27%

VOC IMPACTED AREA
APPROXIMATE AREA = 54,000 SQ. FT
DEPTH = 4 FEET
VOLUME = 216,000 CUBIC FT (8,000 CUBIC YDS)

ANILINE & VOC IMPACTED AREA
APPROXIMATE AREA = 14,500 SQ. FT
DEPTH = 4 FEET
VOLUME = 56,000 CUBIC FT (2,100 CUBIC YDS)

80 0 80
SCALE: 1"= 80'

RESULTS ARE INDICATED IN MG/KG	PROJECT NUMBER:	3410070582
ANY ALTERATION OF THIS DOCUMENT SHALL CONFORM TO THE EDUCATION LAW AND BE PERFORMED UNDER CONSENT OF	DRAWING NUMBER:	B05.DWG
MACTEC ENGINEERING & CONSULTING INC.	DATE:	8/18/2008
ANALYTICAL DATA CHECKED BY:	DRAWN BY:	NEL
P:\PROJECTS\Honeywell\Buffalo NY\Buffalo Color Areas ABCE\3410070582 – Buffalo Color Redevelopment\CADD\FINAL\AutoCAD Figs – Alternatives Analysis Report(8-08)	APPROVED BY:	JMS

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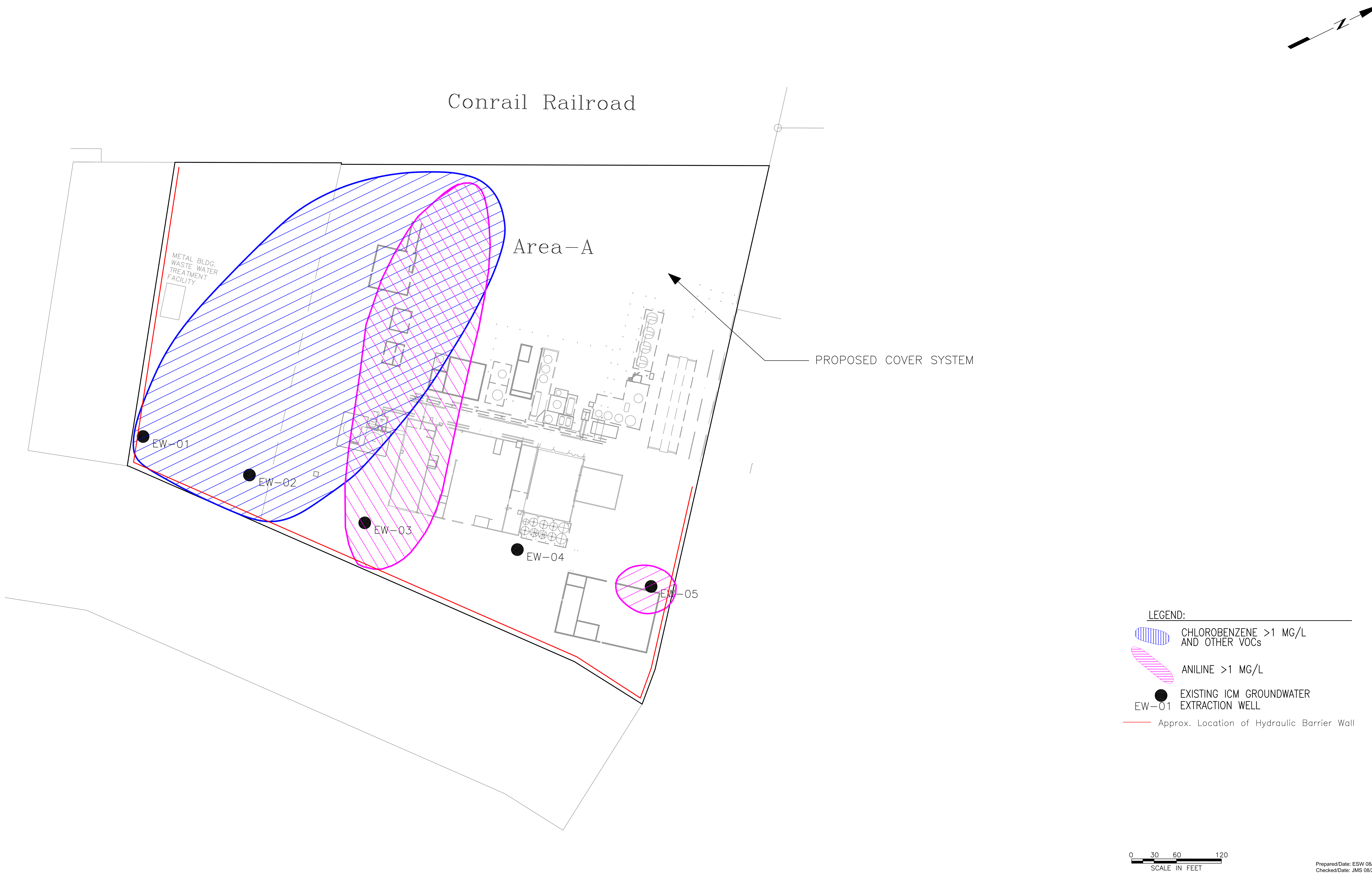
Pittsburgh, PA 15106

AREAS NOT ALREADY COVERED THAT REQUIRE DIRECT CONTACT PATHWAY ELIMINATION
BUFFALO COLOR AREAS ABCE
BUFFALO, NEW YORK

FIGURE
20



Prepared/Date: ESW 08/21/08
Checked/Date: JMS 08/21/08

NOTE:
BASE DATA TAKEN FROM BUFFALO COLOR CORPORATION PLAN
TITLED "SITE LAYOUT AREA ABCE" BY GOLDER ASSOCIATES.
FILE 933-9058, DRAWING NO. 8, DATED 2/14/95.

Feasibility Study Buffalo Color Corp. Areas ABCE Buffalo, New York Honeywell Site ID# 37745	MACTEC	Area A - Alternative GW-A-2 Continued Operation of ICM W/ Downgradient Hydralic Barrier Wall Project 3410-07-0582 Figure 21

APPENDIX A

RESULTS OF TECHNICAL EVALUATION – BUFFALO COLOR AREA A GROUNDWATER PUMPING SYSTEM

APPENDIX A
HYDROGRAPH SYNOPSIS AND TECHNICAL DISCUSSION

Date: April 28, 2008

Prepared by: Dayne Crowley, Senior Principal Hydrogeologist

This document has been prepared to review data from the groundwater extraction system ("system") located on Area A of the Buffalo Color Corporation Site ("Site"), and assess system effectiveness. MACTEC collected data regarding the performance of the Area A system through measurements of groundwater and the river and use of submersible transducers between January 2008 and April 2008. A detailed discussion of the transducer study, including a technical discussion of the results and hydrographs for each well within the study area, is provided below.

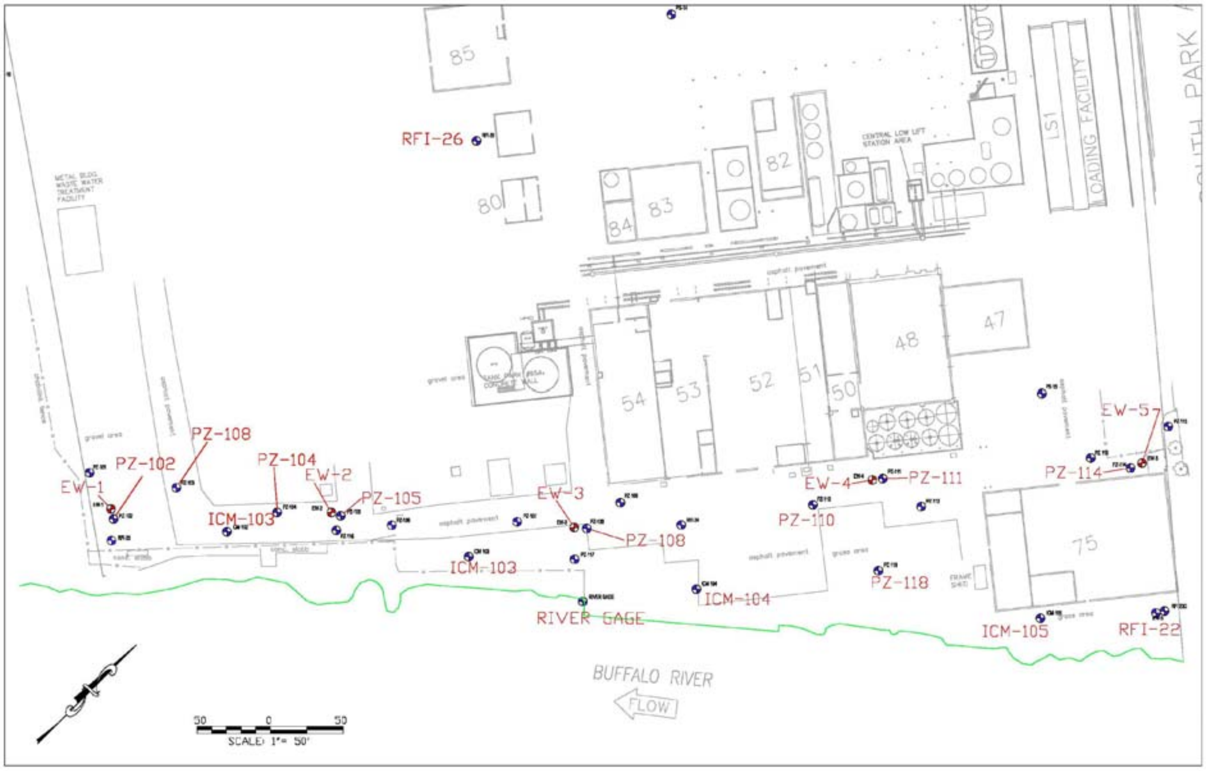
SITE CONDITIONS

As part of Interim Corrective Measures ("ICM") for the Site, a groundwater extraction system was installed at Area A of the Buffalo Color Corporation Site ("Site") in 2006 to collect shallow groundwater and prevent it from discharging to the Buffalo River. The system utilizes five extraction wells (EW-1 through EW-5) located near the river, which forms the eastern property boundary of Area A. Pumping at one well (EW-1) was initiated in April 2007. In December 2007, pumping was initiated at the remaining extraction wells (EW-2 through EW-5). Since that time, pumping has generally continued at all five extraction wells. System effluent is discharged to the Buffalo Sewer Authority ("BSA") in accordance with a BSA permit. The groundwater pumped from EW-1 and EW-2 is pretreated to reduce chlorobenzene levels via the on-Site treatment building prior to discharge to the Area A low-lift station (a concrete pit). The effluent from wells EW-3, EW-4 and EW-5 is currently discharged to the low-lift station without pretreatment. The effluent is then pumped from the low lift station via aboveground piping northward, across Area B, where it enters a BSA sewer line via a manhole near the northern side of Area B.

SYSTEM EVALUATION METHODOLOGY

On January 22, 2008, MACTEC installed submersible transducers into 15 monitoring wells/piezometers at the Buffalo Color site and installed one transducer in the Buffalo River to monitor water levels and evaluate whether extraction wells EW-1, EW-2, EW-3, EW-4, and EW-5 are effective at intercepting shallow groundwater and preventing discharge to the adjacent river. The transducers continuously collected water level and other data through April 2008. Transducers were placed in the monitoring wells located within 10 feet of the extraction wells (i.e., PZ-102 near EW-1, PZ-105 near EW-2, PZ-108 near EW-3, PZ-111 near EW-4, and PZ-114 near EW-5). Transducers were also installed in monitoring wells located within 30 feet of the Buffalo River at the midpoints between extraction wells (i.e., ICM-102 between EW-1 and EW-2, ICM-103 between EW-2 and EW-3, ICM-104 between EW-3 and EW-4, and ICM-105 between EW-4 and EW-5). Four additional wells were fitted with a transducer: monitoring well PZ-104 is located approximately 40 feet from EW-2 (toward EW-1), PZ-110 is located approximately 45 feet from EW-4 (toward EW-3), PZ-118 is located 40 feet from the river, on a line between EW-4 and the river, and RFI-22 is located 30 feet from the river on a line between EW-5 and the river. Transducers were also installed in two additional wells located at the upgradient portion of the property (i.e., RFI-26 on Area A and RFI-27 on Area B).

Area A Site Plan with Transducer Locations



Review of the boring logs for the wells selected for installation of the transducers indicated that Wells ICM-102, ICM-103, and ICM-105 and piezometers PZ-104, PZ-110, and PZ-118 are each screened with at least the upper portion of their screens open to saturated portions of the fill. The fill at the site generally extends to a depth of approximately 15 feet and is underlain by alluvium. Therefore, water levels recorded in those wells may be affected by the combined head of the two flow zones within the same water-bearing unit. The hydraulic conductivity of the fill is believed to be approximately one-half an order of magnitude greater than that of the alluvium (Parsons Engineering Science, Inc., March 1999).

Water levels and water temperature have been recorded at the wells listed above during the period between January 22, 2008 and April 9, 2008. During this period, the Buffalo River experienced ice-covered conditions from January 22 through February 5, 2008 and again between February 11 and March 3, 2008. During the entire period of data collection, the pressure transducer in the river continued to record head levels of the river, which have been included onto hydrographs produced for each monitoring well. Because ice-cover on the river produces uncertainty associated with the actual river stage, the data that represent ice-cover conditions have been marked.

Pumping in the recovery wells was decreased by elevating the control set-points on January 31 and those set-points were reset to their original depths on February 20, 2008. This later change to the set points resulted in minor increases in the pumping rates, returning to the initial rates used at the outset of the data collection period. The pumping rate in recovery well EW-2, however, varied through a period of non-pumping due to mechanical problems with the pump, which were rectified on February 28, 2008 when a replacement pump was installed in that well.

Hydrographs of the water levels and groundwater temperatures in each monitoring well have been prepared and are provided at the end of this document.

RESULTS

RFI-26 and RFI-27 are upgradient wells that were monitored during this data collection program. Water levels in RFI 26 are similar to river levels and have followed the river hydrograph closely throughout the data collection period, remaining slightly higher than the river elevation. Water levels in RFI-27 do not appear to follow river stage fluctuations and appear to respond to precipitation and snow melt events. Upon review of the boring log for RFI-27 and historic maps and aerial photographs of the Site, it appears that this well may be constructed in a backfilled, flooded basement where fluctuations of groundwater levels are the result of factors other than hydrological variations. Thus, the water levels obtained at well RFI-27 have not been used for this evaluation.

EW-1 Pumping Area

Extraction Well 1 (EW-1) is located at the southwest corner of Area A approximately 60 feet from the Buffalo River. The extraction well has been pumping groundwater with infrequent interruption since April 2007. The groundwater pump is designed to pump groundwater at a variable speed to maintain a physical water level within the well.

Groundwater elevation at EW-1 during the study period was below river level. The following wells were evaluated during this period:

- PZ-101 is located 30 feet upgradient of EW-1. The well is screened within the Alluvium and does not show any impact from EW-1 groundwater pumping based on hand measurements collected periodically.

- RFI-25 is located 20 feet downgradient of EW-1 (35 feet from the Buffalo River) and shows impact from EW-1 groundwater pumping based on hand measurements collected periodically.

- PZ-103 is located 45 feet cross-gradient of EW-1 (70 feet from the Buffalo River). The well is screened within the Alluvium. Although a transducer was not used in this well, water level measurements taken indicate that its groundwater elevation is typically higher than the river elevation. Although the water level in this well tends to be higher than the river elevation, MACTEC believes this well is affected by pumping and represents the lateral extent of the capture zone for EW-1.

- Transducer data from ICM-102 (located midway between EW-1 and EW-2) indicate that the water level in this well has generally remained higher in elevation than the elevation of the Buffalo River until about March 25. After that time, recorded water levels in that well were nearly equal with the river, suggesting the well is located at the null point of capture created by pumping in Wells EW-1 and EW-2. It is also important to note that contributions to drawdown in this area from pumping at EW-2 are not likely to have occurred prior to early March when the pump was replaced in that well.

- Transducer data from PZ-102 (located within 10 feet of EW-1) indicate that water levels in each well except PZ-102 are well below the river stage elevation. PZ-102 has only recently had recorded water levels that appear to be slightly lower than the river elevation.

EW-2 Pumping Area

Extraction Well 2 (EW-2) is located 150 feet northeast of EW-1 approximately 60-feet from the Buffalo River. The extraction well has been pumping groundwater with infrequent interruption since December 4, 2007. In February 2008, scaling of the EW-2 pump gradually reduced the pump capacity until the pump could no longer operate. On February 28, 2008, the pump in EW-2 was replaced and pumping resumed. Scaling of the EW-2 pump continues to occur. As scale builds up on the pump, the pumping rate reduces. A routine inspection and cleaning program has been implemented for the EW-2 pump, and a second pump has been acquired for quick change out during cleaning events.

Groundwater elevation at EW-2 during periods of the study when the well was pumping was below river level. The following wells were evaluated during this period:

- PZ-105 is a monitoring well that is located within 10 feet of EW-2. The well is screened within the Alluvium and partially within the fill material. The well appears to be impacted by EW-2 groundwater pumping; however, groundwater elevations varied similarly to river elevations and groundwater elevations were above river level periodically during the evaluation period.

- PZ-106 is located 40 feet cross-gradient (northeast) of EW-2. The well is screened within the Alluvium and partially within the fill material. Water level measurements were taken at the monitoring well five times during the study period and the groundwater elevation in the well was found to be above river level four out of the five times. The well does not appear to be impacted by pumping at EW-2.

- PZ-116 is located 15 feet downgradient (southeast) of EW-2 approximately 50 feet from the Buffalo River. The well is screened within the Alluvium. Although a transducer was not used in this well, water level measurements taken indicate that its groundwater elevation is typically higher than the river elevation.

- Transducer data from ICM-102 (located midway between EW-1 and EW-2) are summarized in the discussion for well EW-1.

- Transducer data from ICM-103 (located midway between EW-2 and EW-3) indicate that the water level in this well generally remained higher than the elevation of the Buffalo River until about March 20. After that time, recorded water levels in ICM-103 generally remained lower than river stage, suggesting that a reversed flow direction exists in this area. The data suggest that in the absence of pumping at EW-2, groundwater flow in the area of ICM-103 remained toward the river.

- Transducer data from PZ-104 (located approximately 40 feet from EW-2, on a line toward EW-1), indicate that the water level in this well remains higher than the level of the river. However, recent decreases in the water elevation in well PZ-104 have resulted in a difference in water elevations of approximately 0.5 feet or less. Because the well is screened into the overlying fill, it is believed that the composite groundwater elevation of the fill and the alluvium in this area indicates that the fill has not been dewatered.

- Transducer data from PZ-105 (located within 10 feet EW-2) indicate that water levels are well below the river stage elevation.

EW-3 Pumping Area

Extraction Well 3 (EW-3) is located 170 feet northeast of EW-2 approximately 50 feet from the Buffalo River. The extraction well has been pumping groundwater with infrequent interruption since December 4, 2007.

Groundwater elevation at EW-3 during the study period was below river level. The following wells were evaluated during this period:

- PZ-107 is located 40 feet cross-gradient (southwest) of EW-3. The well is screened within the Alluvium; however, 1 foot of concrete was encountered at the bottom of fill material and may be influencing water levels at this well. Water level measurements were taken at the monitoring well four times during the study period, groundwater elevation in the well was above river level three out of the four times. The well does not appear to be impacted by pumping at EW-3.

- PZ-117 is located 20 feet downgradient (southeast) of EW-3 approximately 25 feet from the Buffalo River. The well is screened within the Alluvium and partially within the fill material. Water level measurements were taken at the monitoring well four times during the study period, with the groundwater elevation in the well above river level three out of the four times. The well appears to have a minor response to pumping at EW-3.

- RFI-24 is located 75 feet cross-gradient (northeast) of EW-3. The well is screened within the Alluvium. Water level measurements taken at the monitoring well indicate that the groundwater elevation is below river level. The well appears to react to pumping.

- Transducer data from ICM-104 (located midway between EW-3 and EW-4 and 25 feet from the river) indicate that water elevation in this monitoring well remained below river stage from March 20 through the end of the study period. These data also indicate that temperature in this well appears to be significantly affected by rises in river stage when river temperatures are very low, suggesting that this well is affected by surface water back flow.

- Transducer data from ICM-103 (located midway between EW-2 and EW-3) are summarized in the discussion for well EW-2.

- Transducer data from PZ-108 (located within 10 feet EW-3) indicate that water levels are well below the river stage elevation.

EW-4 Pumping Area

Extraction Well 4 (EW-4) is located 210 feet northeast of EW-3 approximately 100 feet from the Buffalo River. The extraction well has been pumping groundwater with infrequent interruption since December 4, 2007.

Groundwater elevation at EW-4 during the study period was below river level. The following wells were evaluated during this period:

- PZ-112 is located 40 feet cross-gradient (northeast) of EW-4. The well is screened within the Alluvium. Water level measurements taken at the monitoring well indicate that the groundwater elevation is consistently above river level. The water level in the well appears to have no response to pumping.

- Transducer data from ICM-104 (located midway between EW-3 and EW-4 and 25 feet from the river) are summarized in the discussion for well EW-3.

- Transducer data from ICM-105 (located midway between EW-4 and EW-5 and 30 feet from the river) indicate that the water level in this well generally remained below river stage (with short term exceptions relating to quick drops in river stage) after early March. The magnitude of the difference between river stage and water level in this well was approximately 0.5 feet after late March, suggesting this well is located within an area of reversed flow direction from the river.

- Transducer data from PZ-118 (located on a line between EW-4 and the river and approximately 40 feet from the river) indicates that the water level in this well is not lower than river stage elevation. Review of this well’s construction suggests that the upper portion of screen is located within fill, suggesting that the fill zone has not been dewatered and the resulting water level in the well remains elevated, although apparently affected by pumping.

- Transducer data from PZ-110 (located approximately 45 feet from EW-4, on a line toward EW-3) indicates that the water level in PZ-110 remains higher than river stage. PZ-110 is screened in the fill overlying the alluvium and the water level in this well reflects a composite groundwater elevation. Based on the evaluations of water levels, the alluvium in this area has not been dewatered.

- Transducer data from PZ-111 (located within 10 feet of EW-4) indicate that water levels are well below the river stage elevation.

EW-5 Pumping Area

Extraction Well 5 (EW-5) is located 190 feet northeast of EW-4 approximately 135 feet from the Buffalo River. The extraction well has been pumping groundwater with infrequent interruption since December 4, 2007.

Groundwater elevation at EW-5 during the study period was below river level. The following wells were evaluated during this period:

- PZ-113 is located 35 feet cross-gradient (southwest) of EW-5 approximately 140 feet from the Buffalo River. The well is screened within the Upper Till Material. Although a transducer was not placed in this well, hand measurements indicate that groundwater elevations were above river level during the entire evaluation period. There appears to be no impact from pumping at EW-5.

- PZ-115 is located 30 feet upgradient (northeast) of EW-5 approximately 160 feet from the Buffalo River. The well is screened within the Upper Till Material. Although a transducer was not placed in this well, hand measurements indicate that groundwater elevations were above river level during the entire evaluation period. There appears to be no impact from pumping at EW-5.

- Transducer data from ICM-105 (located midway between EW-4 and EW-5 and 30 feet from the river) are summarized in the discussion for well EW-4.

- Transducer data from RFI-22 (located on a line between EW-5 and the river approximately 30 feet from the river) indicates that the water level in this well is generally higher than the river stage. However, from about March 23, the elevations of water in the well and the river were essentially the same, indicating that this well may be at the null point of the drawdown created by pumping EW-5.

- Transducer data from PZ-114, (located within 10 feet of EW-5) indicate that water levels are well below the river stage elevation.

CONCLUSIONS

Evaluation of the water level data collected during this project have indicated that groundwater flow at the site is controlled by the combined pumping of the five recovery wells when the pumps are operated at their designed pumping rates. However, groundwater capture of the combination of the pumping wells is inconclusive and some doubt exists whether continuous control can be maintained through all hydrological conditions that are likely to exist during a year.

Groundwater levels and gradients in the shallow overburden are influenced by the water level in the river. During most of the wet and dry seasons, the groundwater and river levels are in equilibrium and the groundwater gradients are low. During the wet/dry transition, the change in river stage occurs much more rapidly than changes in groundwater elevation, and groundwater gradients are the steepest.

These changes in hydraulic regime affect the efficiency of the groundwater capture system. When the groundwater gradients are low, complete capture can be accomplished. When the groundwater gradients are at their steepest, capture is incomplete, as the pumping wells need to effect a greater reversal of flow.

The hydraulic regime is further complicated by the composite nature of the shallow saturated zone, which near the river is made up of man-placed fill underlain by the natural alluvial deposits. The man-placed fill has a limited saturated thickness but is more permeable than the underlying native soils, and can contribute significantly to the recharge of the underlying alluvial deposits.

Recent data (collected since March 20, 2008) suggest that the wells in the vicinity of the extraction wells are within the area of hydrodynamic control (i.e., water levels lower than river stage) or the recorded water levels are influenced by water levels in the fill, resulting in composite water levels above river stage. While it is reasonable to believe that the fill may ultimately drain, resulting in water levels at those wells that are lower than river stage, it must also be noted that the river-groundwater conditions present at the end of the evaluation period were especially conducive to creating hydraulic capture. As river levels rose due to spring runoff and groundwater levels rose at a slower rate, the conditions observed at the end of the data in the attached graphs suggest that capture is complete under these conditions. The hydrographs also show that during periods when surface water stage is decreasing faster than the stages in groundwater are decreasing, incomplete capture and discharge to the river may occur.

ALTERNATIVES EVALUATION – MODIFICATION OF GROUNDWATER EXTRACTION SYSTEM

Alternatives were evaluated to achieve hydraulic control through modification of the existing system. These alternatives include:

- Pumping at higher flow rates from the existing extraction wells;
- Installation of an interceptor trench within the fill unit; and
- Installation of additional extraction wells.

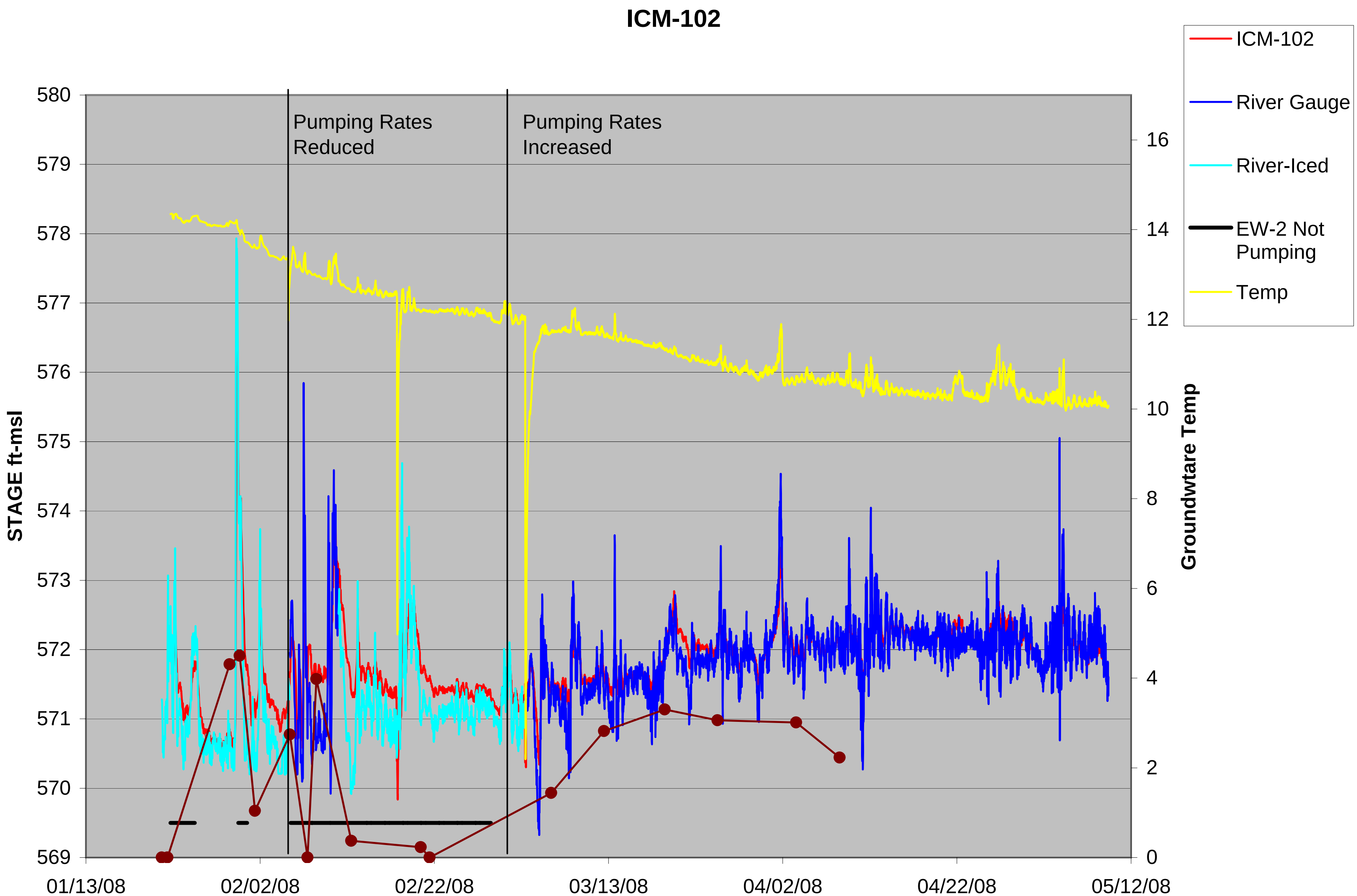
Pumping at a higher flow rate and permitting a greater amount of time to evaluate the effects may prove feasible. However, the existing drawdown and lateral capture conditions of wells appear optimum under the conditions that existed at the end of the study period (April 2008). Additional lateral benefits may be limited by pumping at significantly greater rates and may not be proportional to the increase in operating costs.

To achieve full capture under all hydraulic conditions, installing additional recovery wells between the existing extraction wells would be appropriate. The new wells should be screened across both the alluvial and fill units. This configuration will allow simultaneous withdrawal from both flow zones of the aquifer. In the short term, the fill may contribute more water than the alluvial unit, but as the fill is dewatered, most of the capture will occur in the alluvial unit. Draining of the fill will enhance capture and promote the hydrodynamic control of shallow groundwater.

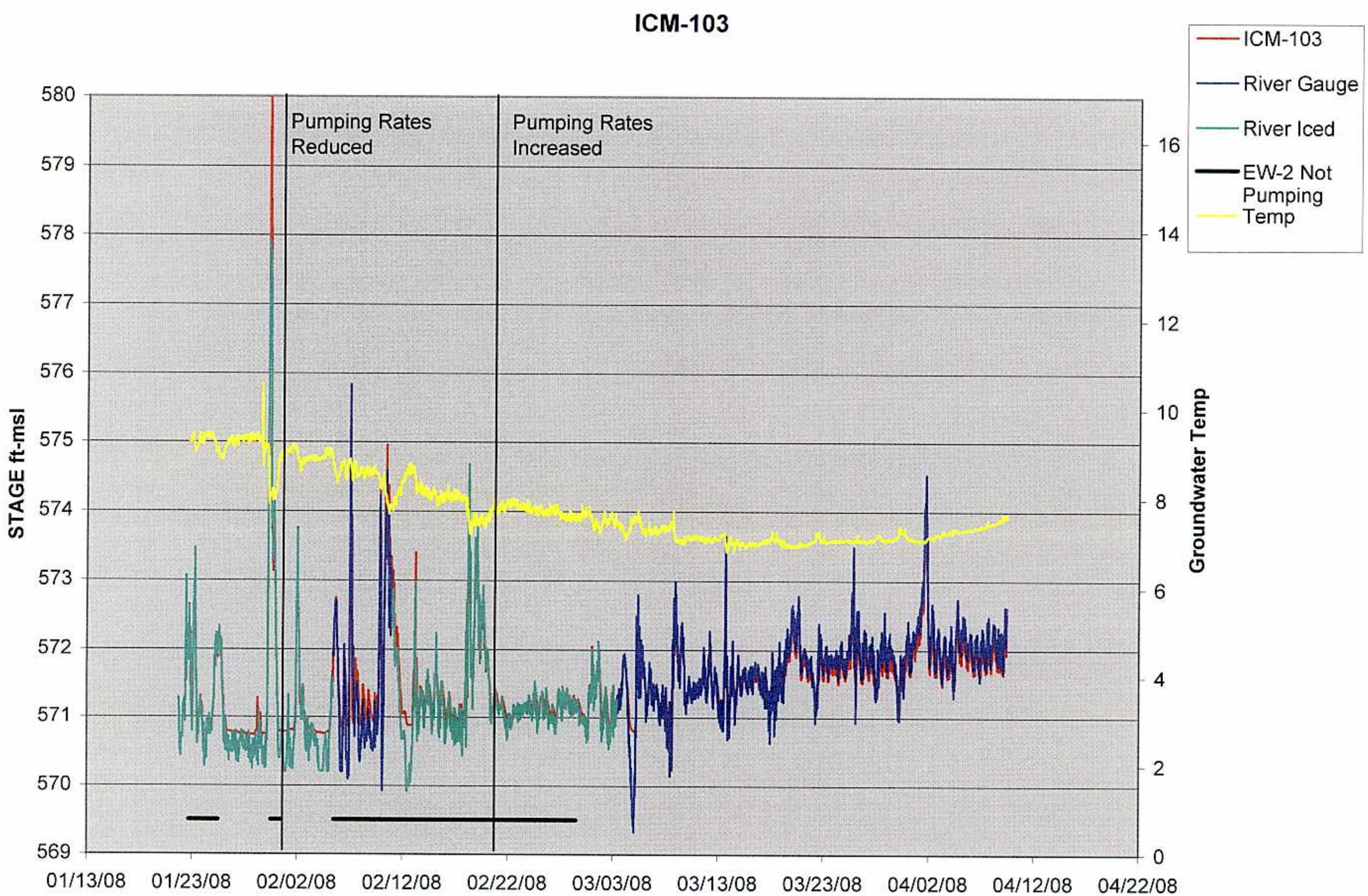
To evaluate the appropriate number of wells and estimate the water withdrawal over time, a screening level hydraulic model should be completed, using a simplified stratigraphy of clay, alluvium, and fill. The seasonal changes of the river level should be represented in the model. The existing wells should be coded into the model. Additional wells can then be added to evaluate the behavior of the system over time, under steady and transitional river levels and groundwater gradients. Extrapolating from the spacing of the present system, it appears that one additional well between every two existing pumping wells may be sufficient. However, depending on the outcome of the screening model, two new wells may be required where the spacing between the capture zones of existing extraction wells is large.

REFERENCES

Parsons Engineering Science, Inc., March 1999, “Buffalo Color Area “A”, Pumping Test Work Plan”, Prepared for AlliedSignal, Morristown, New Jersey.



ICM-102
STAGE ft-msl
Groundwtare Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
02/02/08
02/22/08
03/13/08
04/02/08
04/22/08
05/12/08
Pumping Rates Reduced
Pumping Rates Increased
ICM-102
River Gauge
River-Iced
EW-2 Not Pumping
Temp


ICM-103
ICM-103
River Gauge
River Iced
EW-2 Not Pumping
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
02/02/08
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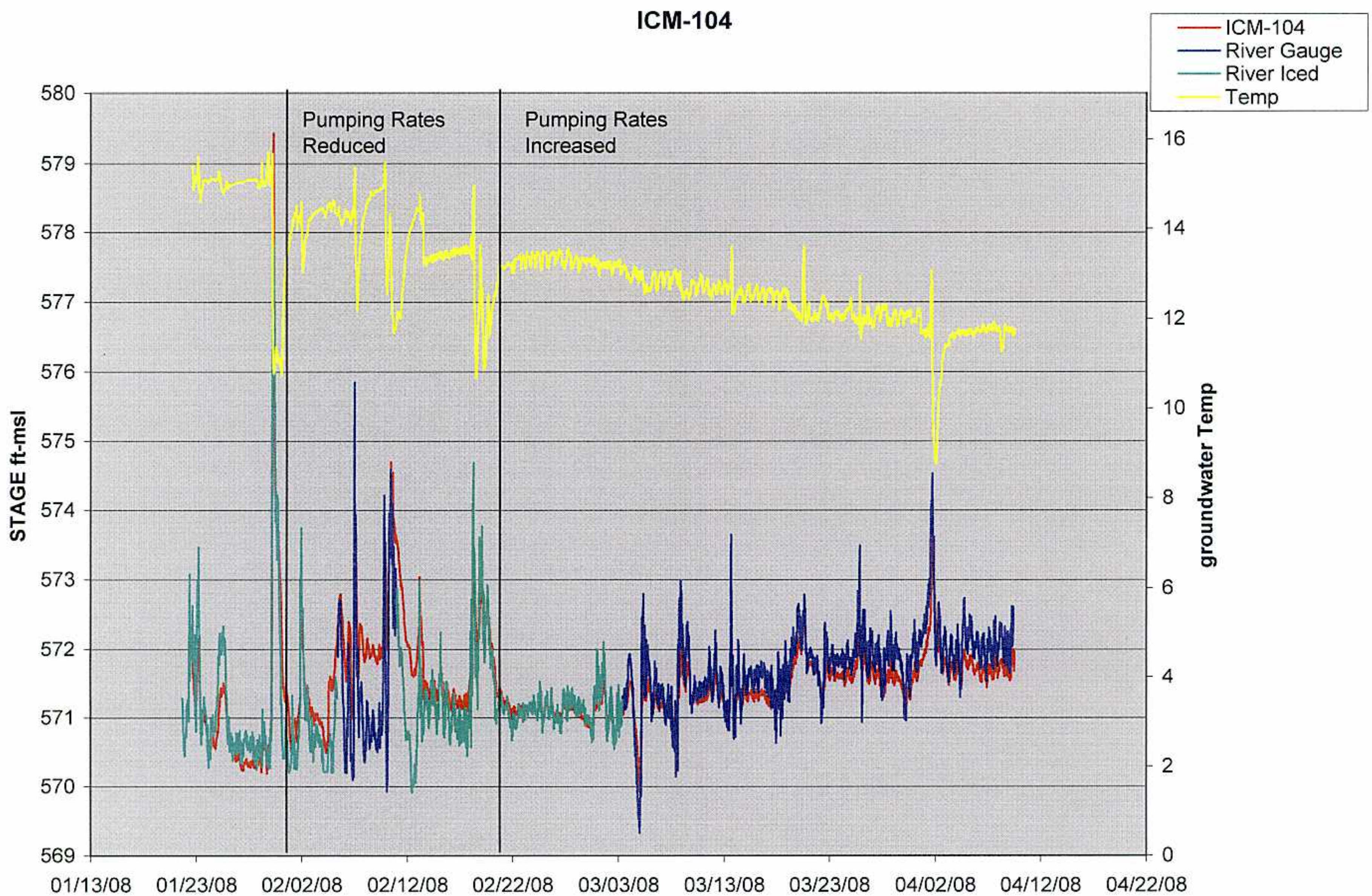
04/12/08
04/22/08



ICM-104
ICM-104
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
02/02/08
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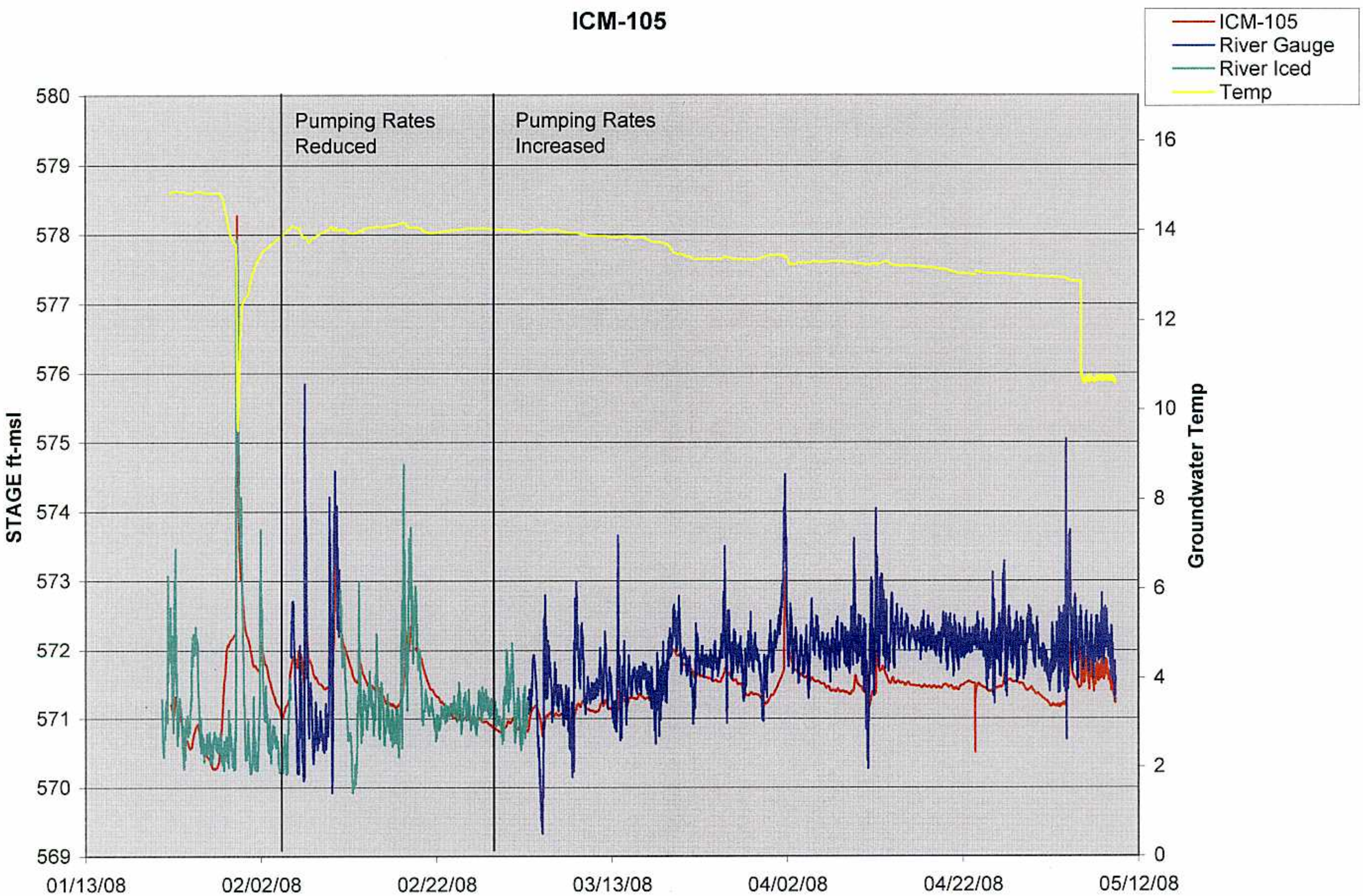
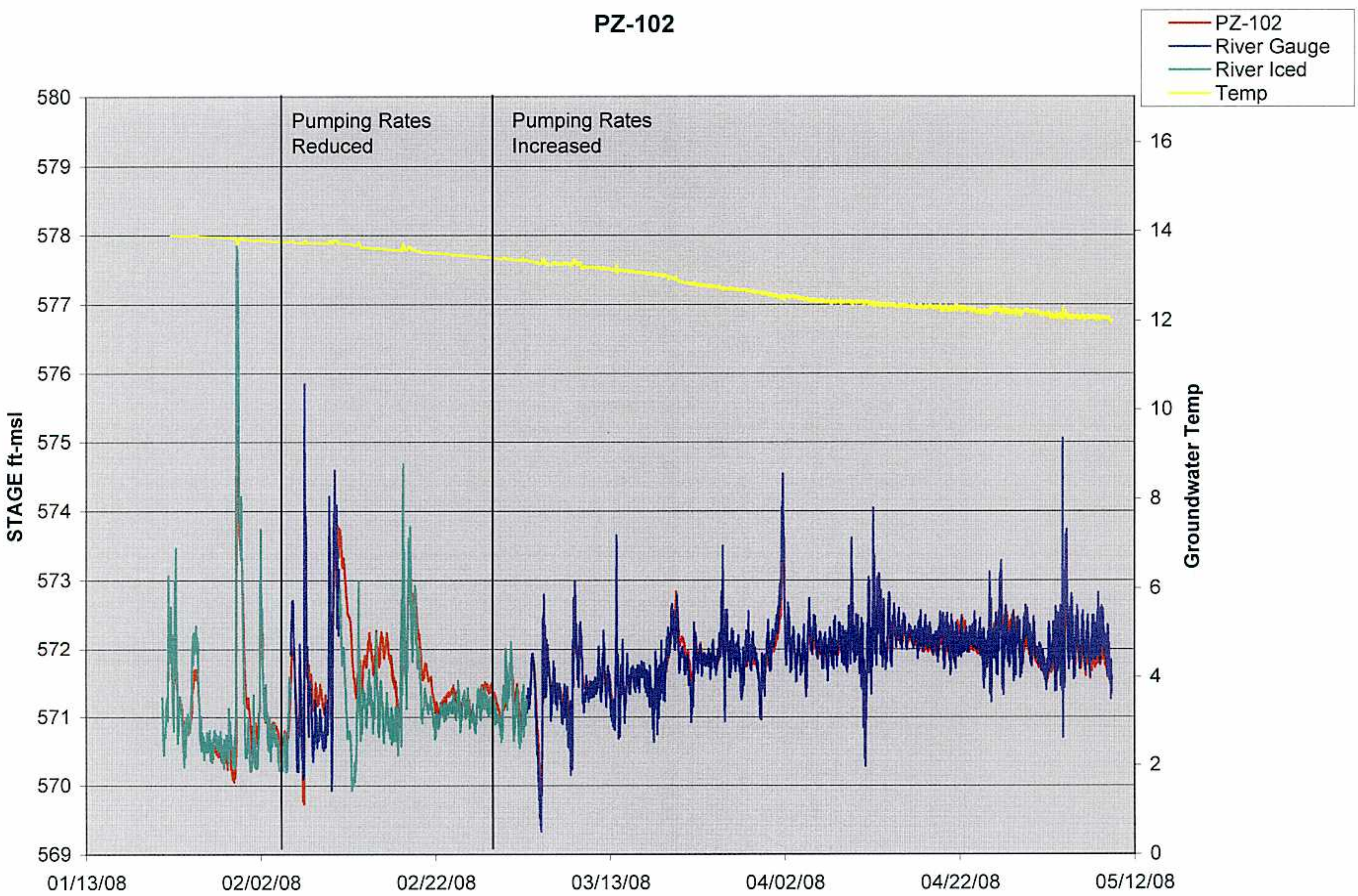
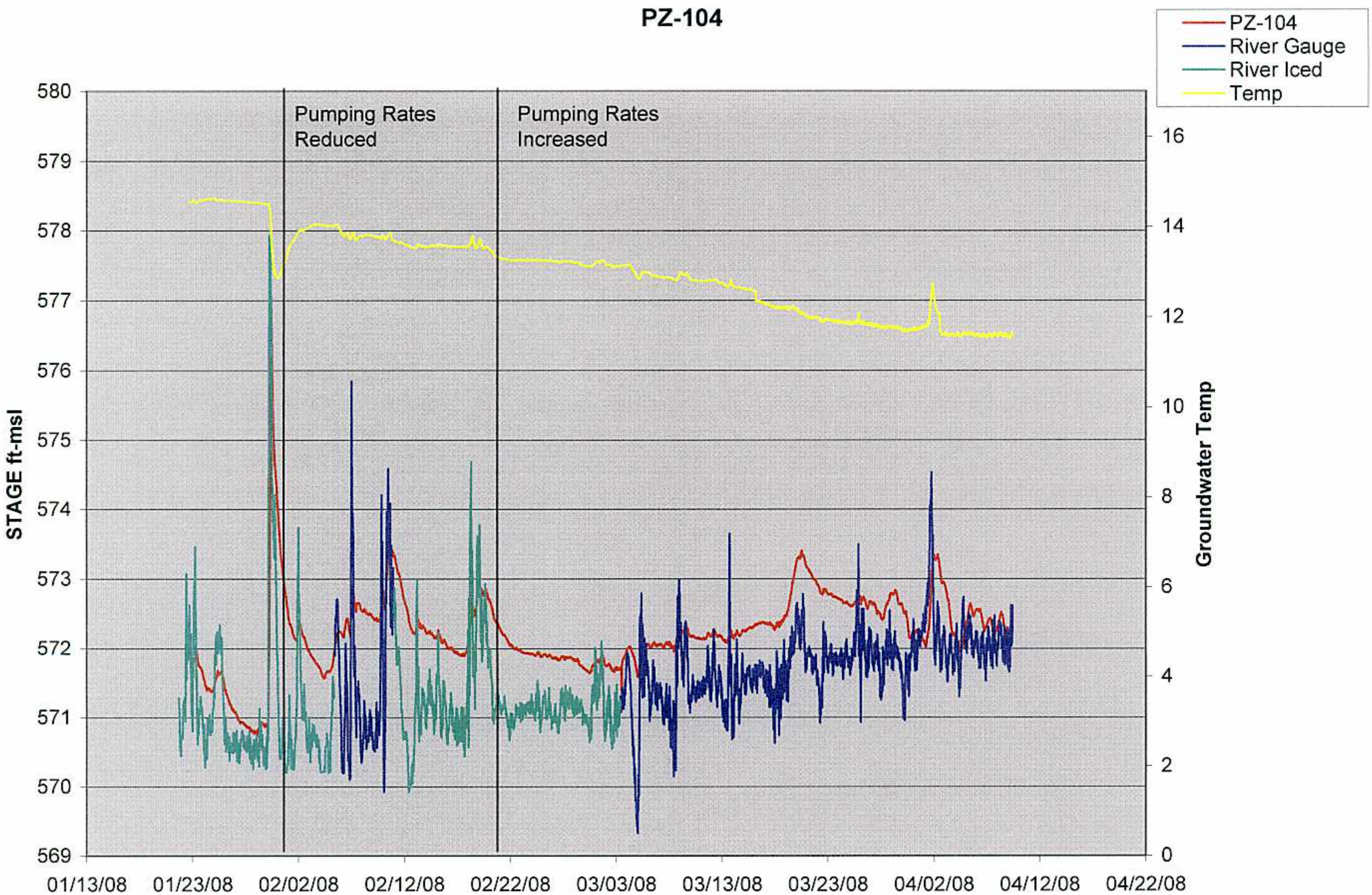
04/12/08
04/22/08



ICM-105
ICM-105
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
02/02/08
02/22/08
03/13/08
04/02/08
04/22/08
05/12/08



PZ-102
PZ-102
River Gauge
River Iced
Temp
Pumping Rates
Reduced
Pumping Rates
Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
02/02/08
02/22/08
03/13/08
04/02/08
04/22/08
05/12/08


PZ-104
PZ-104
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
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577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
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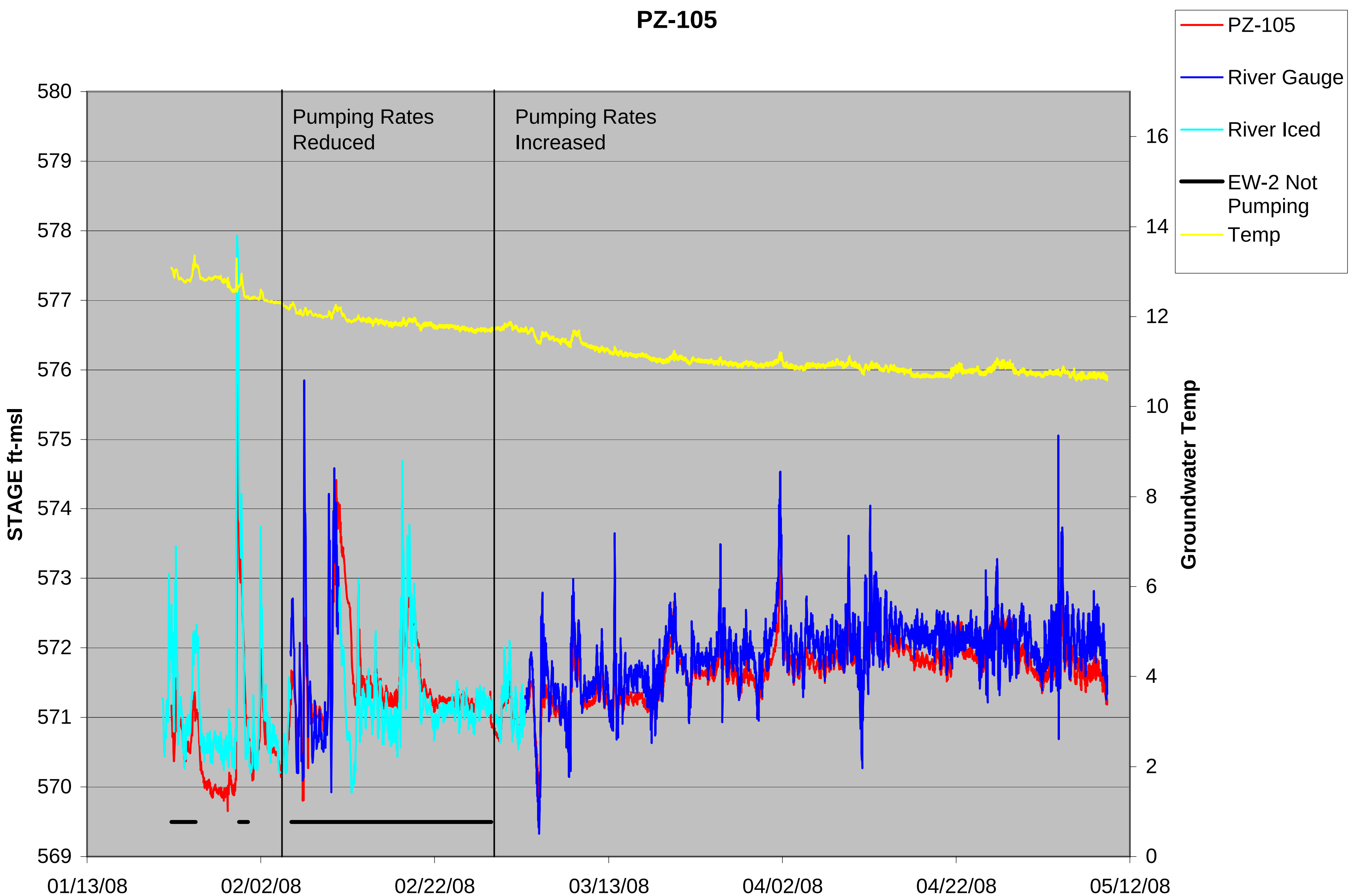
04/22/08



PZ-105
Pumping Rates
Reduced
Pumping Rates
Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
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573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
02/02/08
02/22/08
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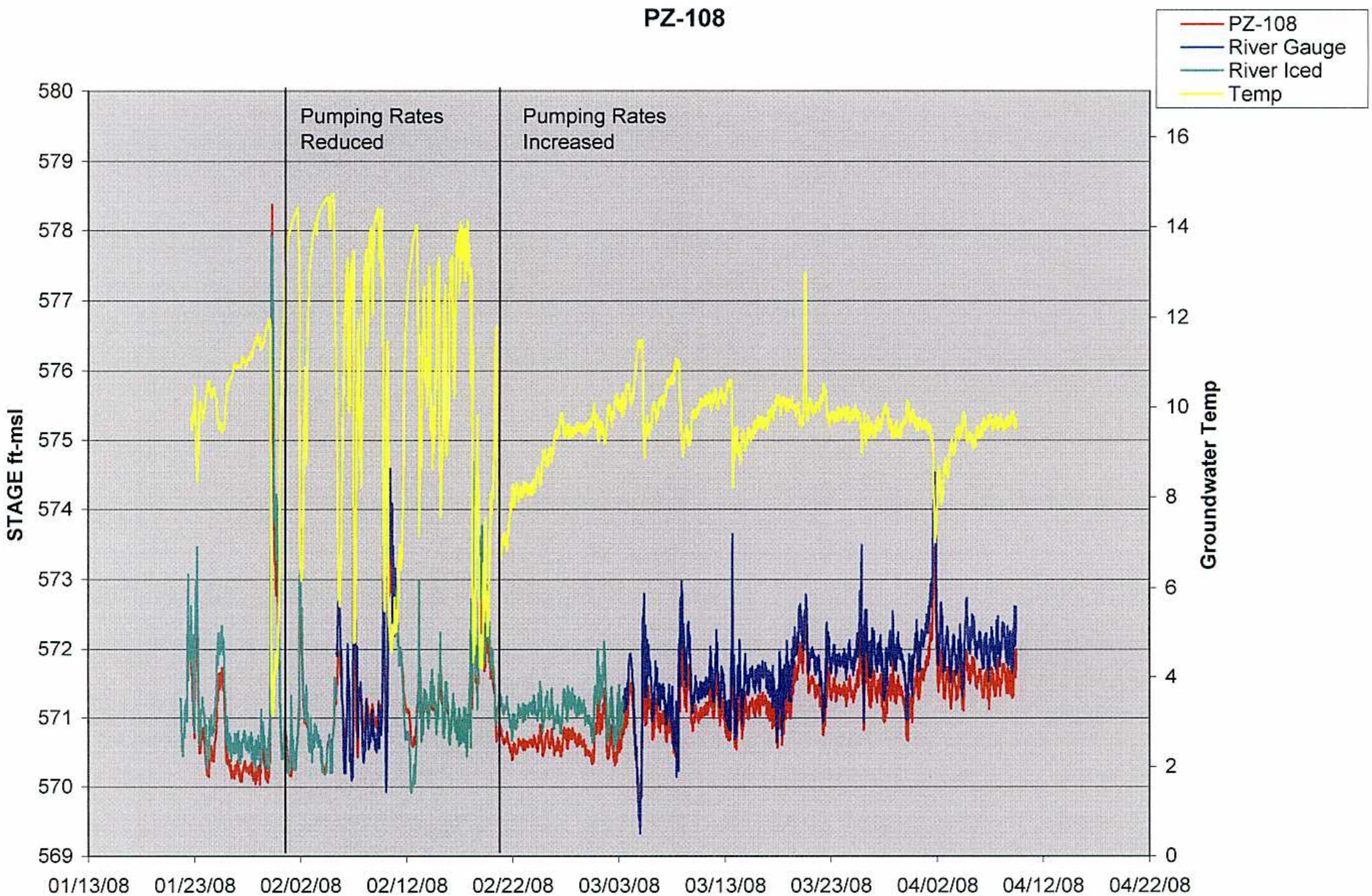
04/02/08
04/22/08
05/12/08
PZ-105
River Gauge
River Iced
EW-2 Not Pumping
Temp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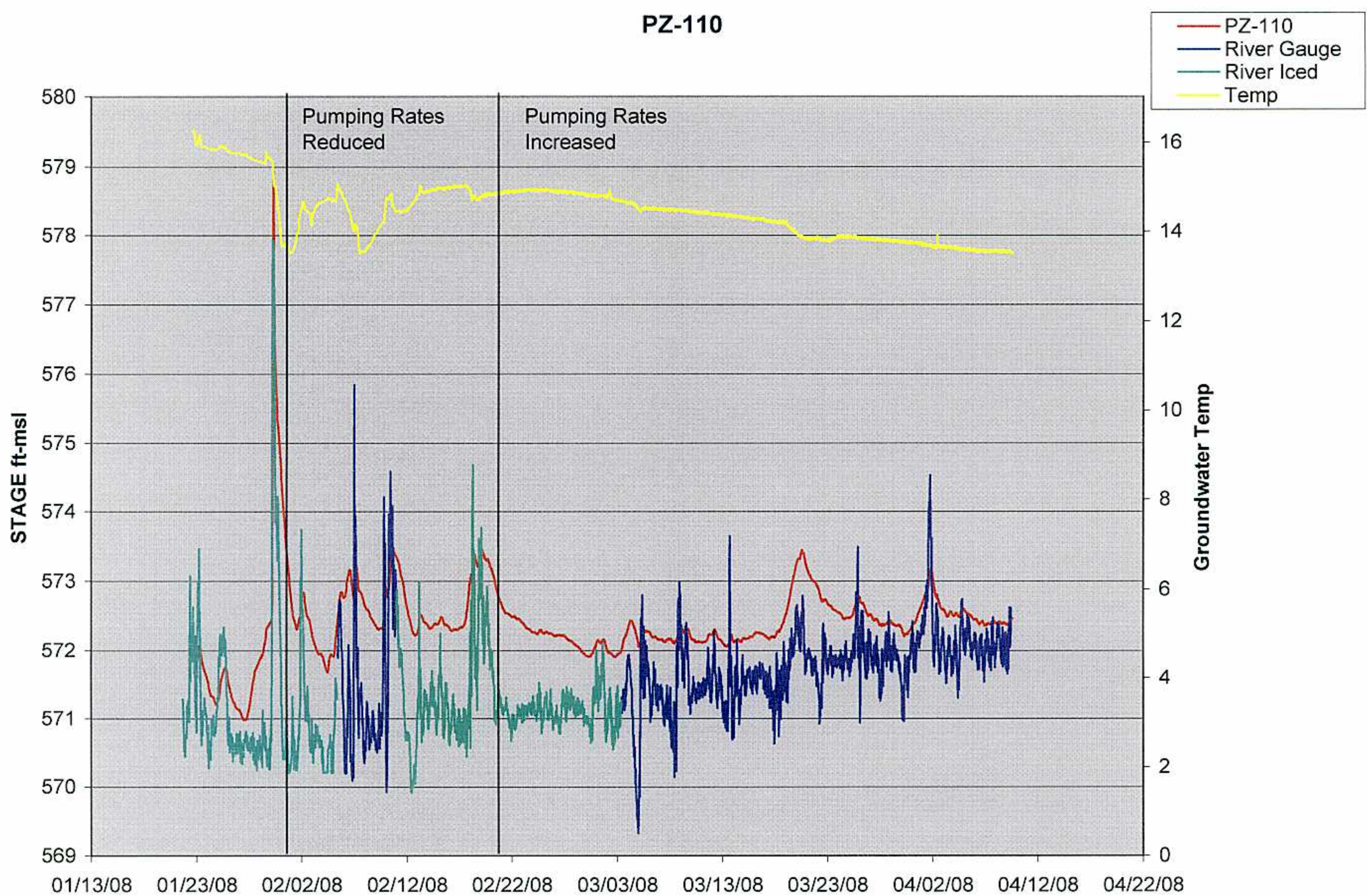
PZ-108
River Gauge
River Iced
Temp
Pumping Rates
Reduced
Pumping Rates
Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
02/02/08
02/12/08
02/22/08
03/03/08
03/13/08
03/23/08
04/02/08
04/12/08
04/22/08


PZ-110
PZ-110
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
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578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
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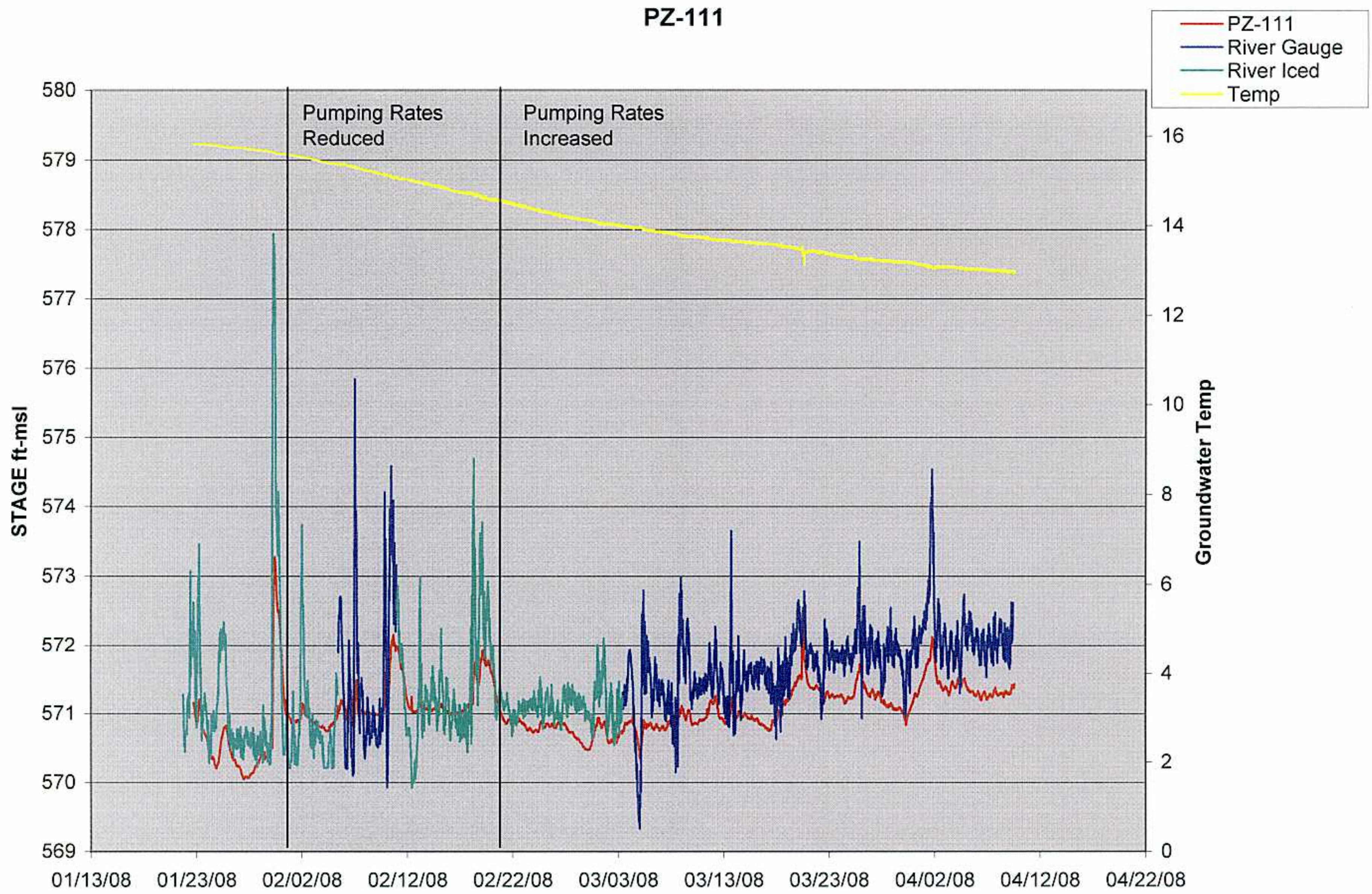
04/12/08
04/22/08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PZ-111
River Gauge
River Iced
Temp
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Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
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573
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12
10
8
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4
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01/13/08
01/23/08
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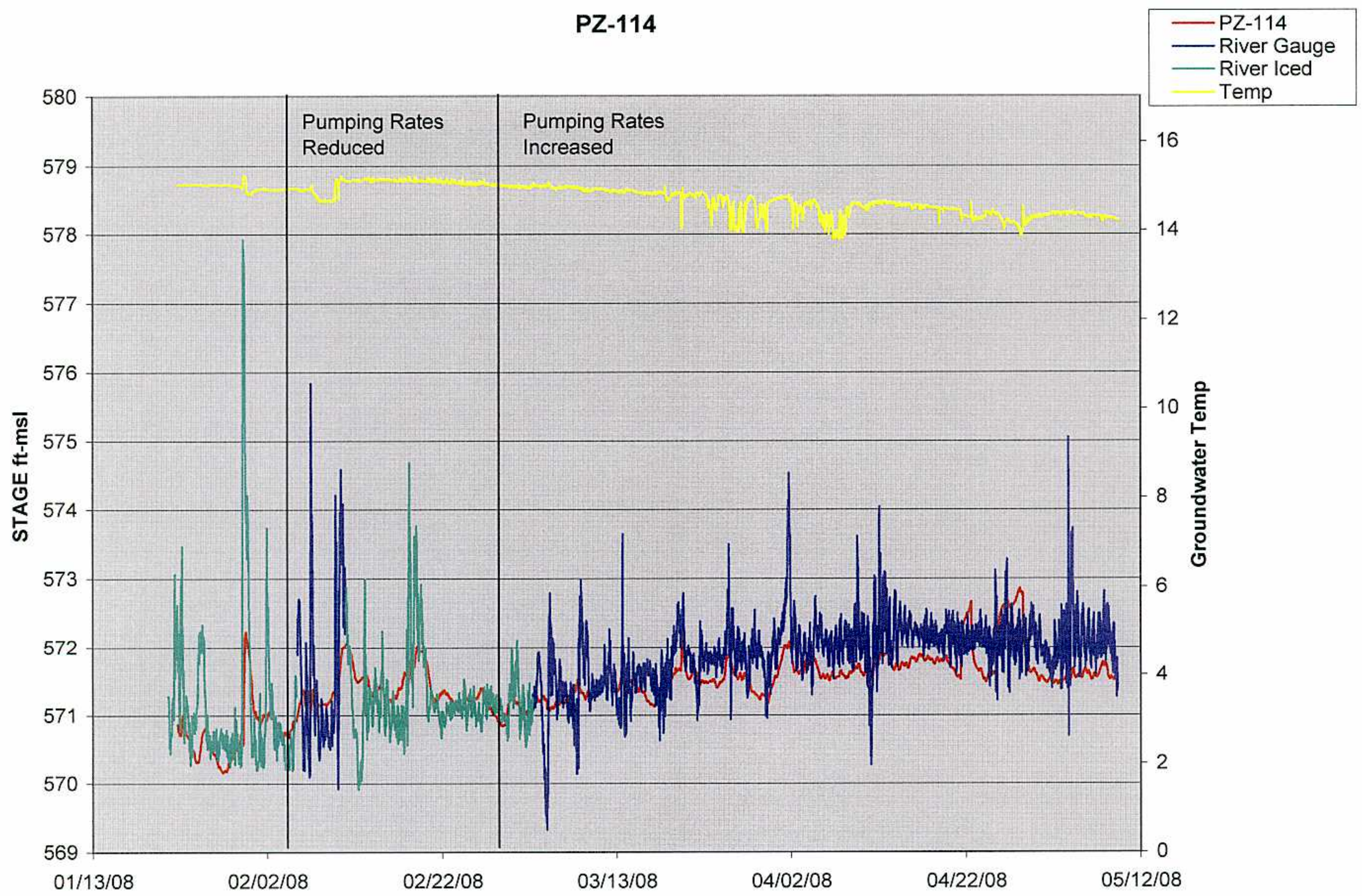
04/12/08
04/22/08



PZ-114
PZ-114
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
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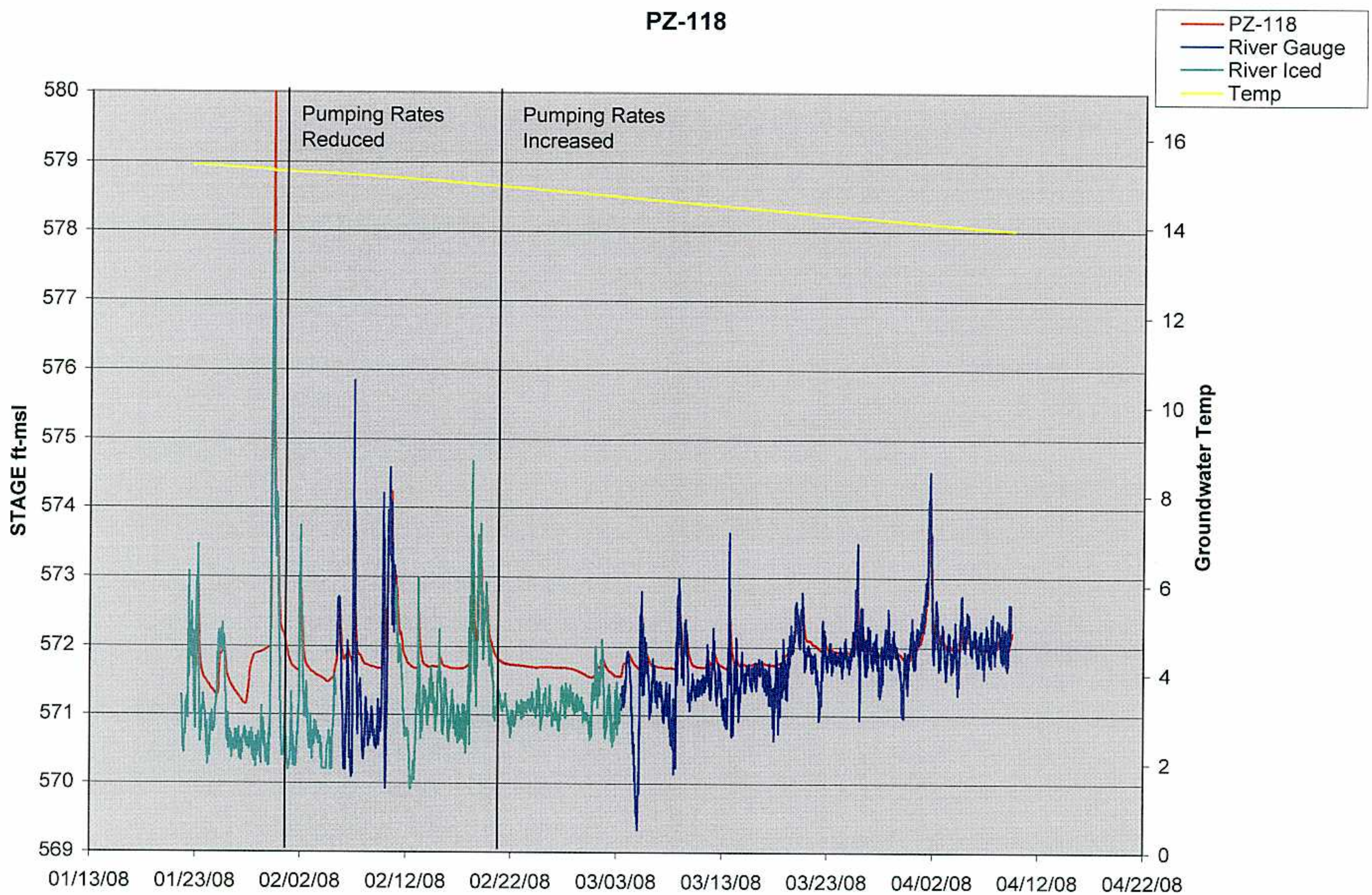
01/13/08
02/02/08
02/22/08
03/13/08
04/02/08
04/22/08
05/12/08



PZ-118
PZ-118
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
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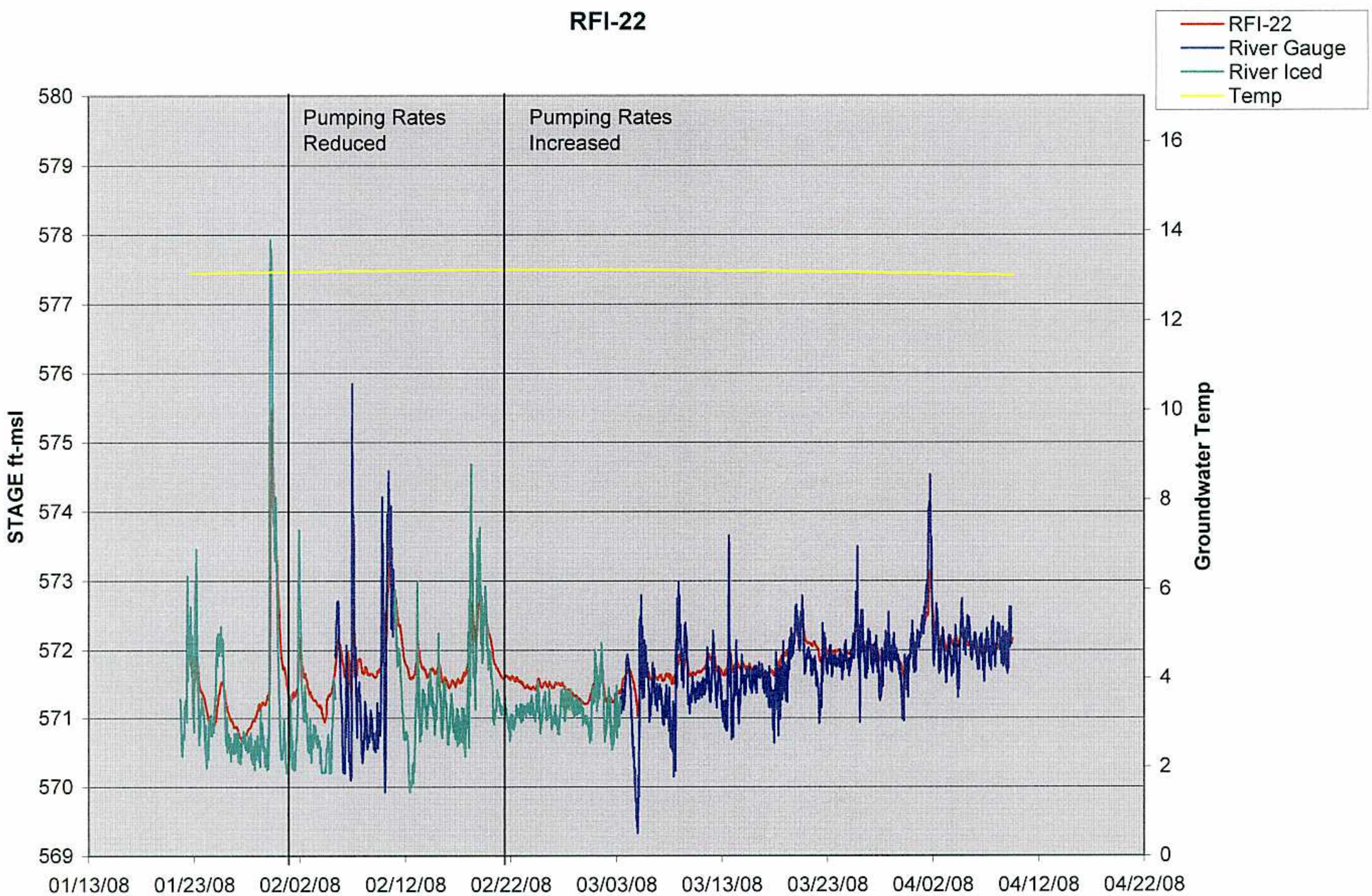
04/12/08
04/22/08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RFI-22
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
580
579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
8
6
4
2
0
01/13/08
01/23/08
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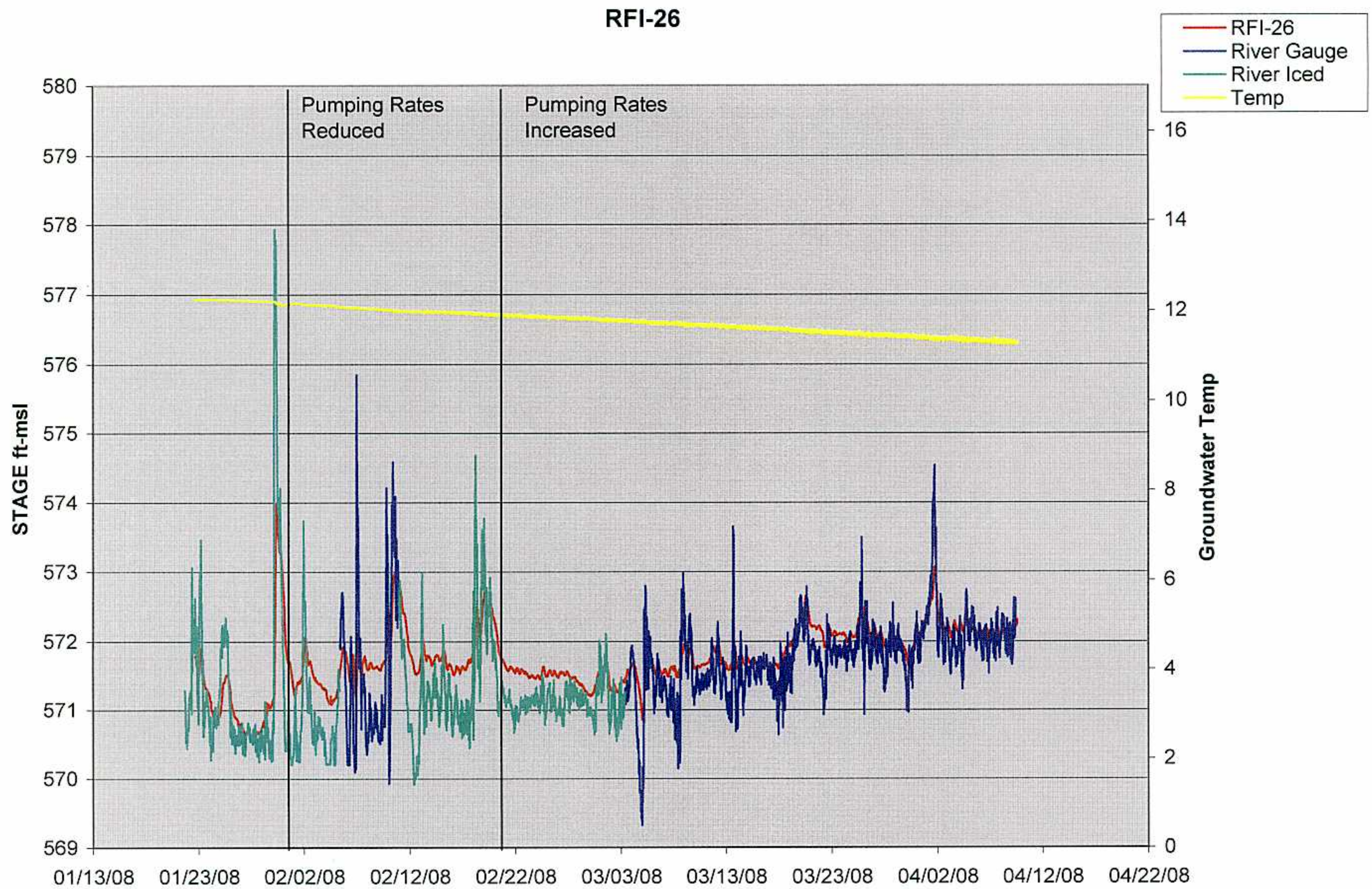
04/12/08
04/22/08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RFI-26
River Gauge
River Iced
Temp
Pumping Rates Reduced
Pumping Rates Increased
STAGE ft-msl
Groundwater Temp
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579
578
577
576
575
574
573
572
571
570
569
16
14
12
10
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6
4
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01/13/08
01/23/08
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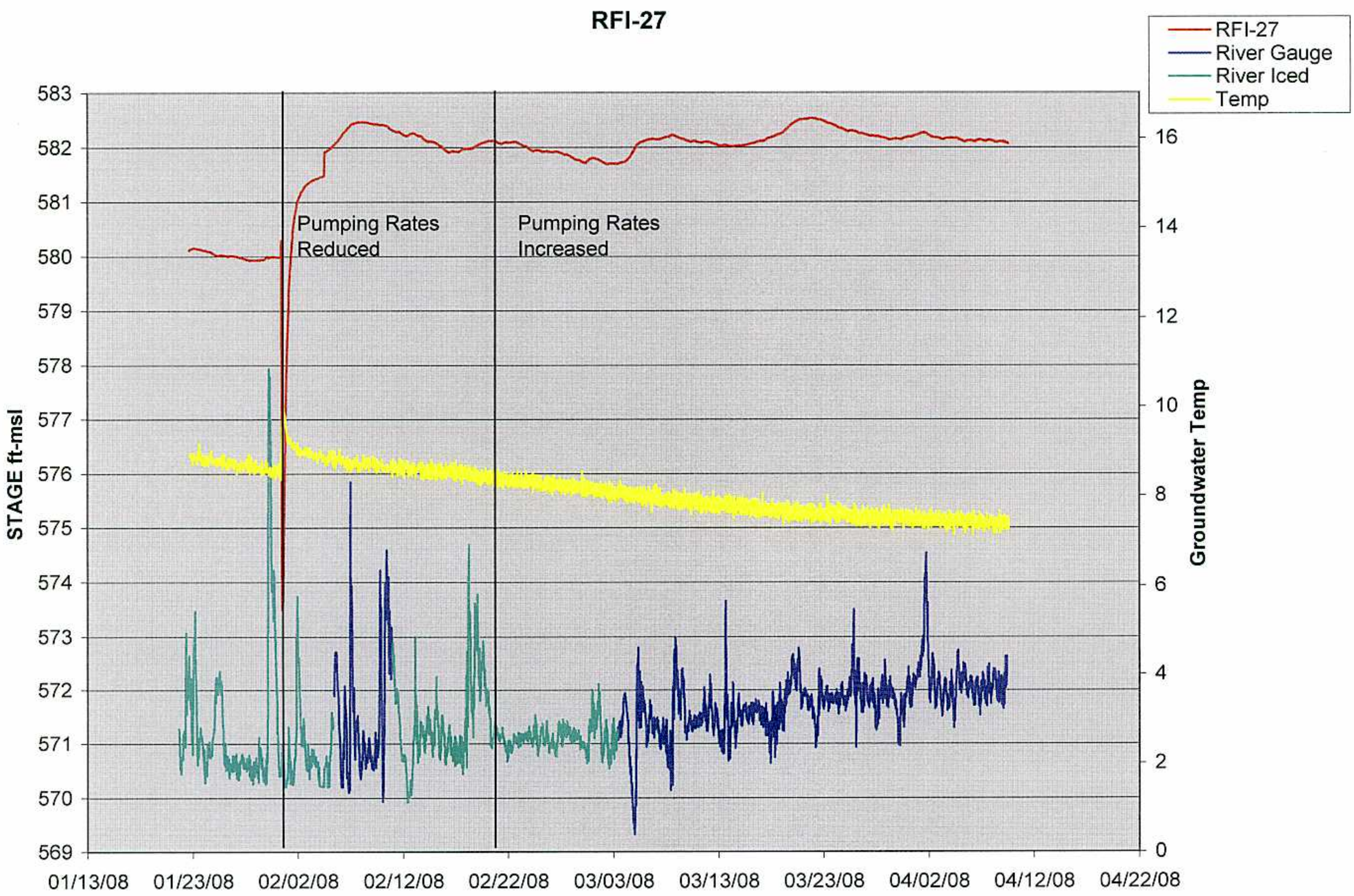
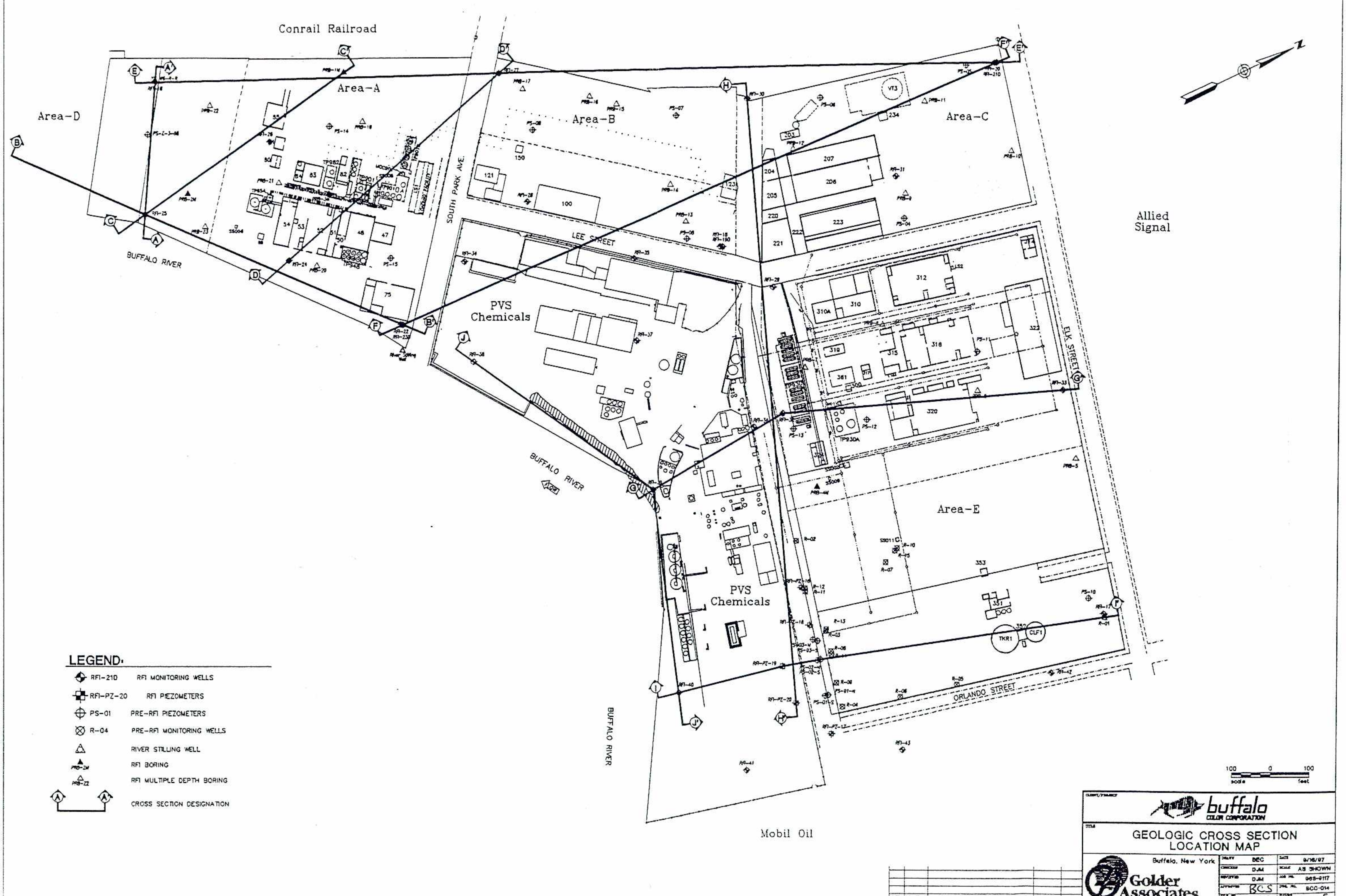
04/12/08
04/22/08



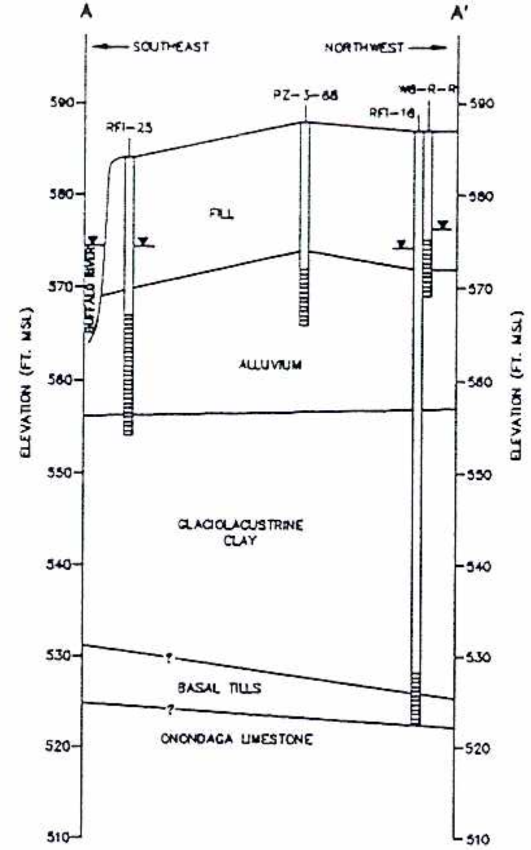
RFI-27
RFI-27
River Gauge
River Iced
Temp
583
582
581
580
579
578
577
576
575
574
573
572
571
570
569
STAGE ft-msl
16
14
12
10
8
6
4
2
0
Groundwater Temp
Pumping Rates Reduced
Pumping Rates Increased
01/13/08
01/23/08
02/02/08
02/12/08
02/22/08
03/03/08
03/13/08
03/23/08
04/02/08
04/12/08
04/22/08

APPENDIX B

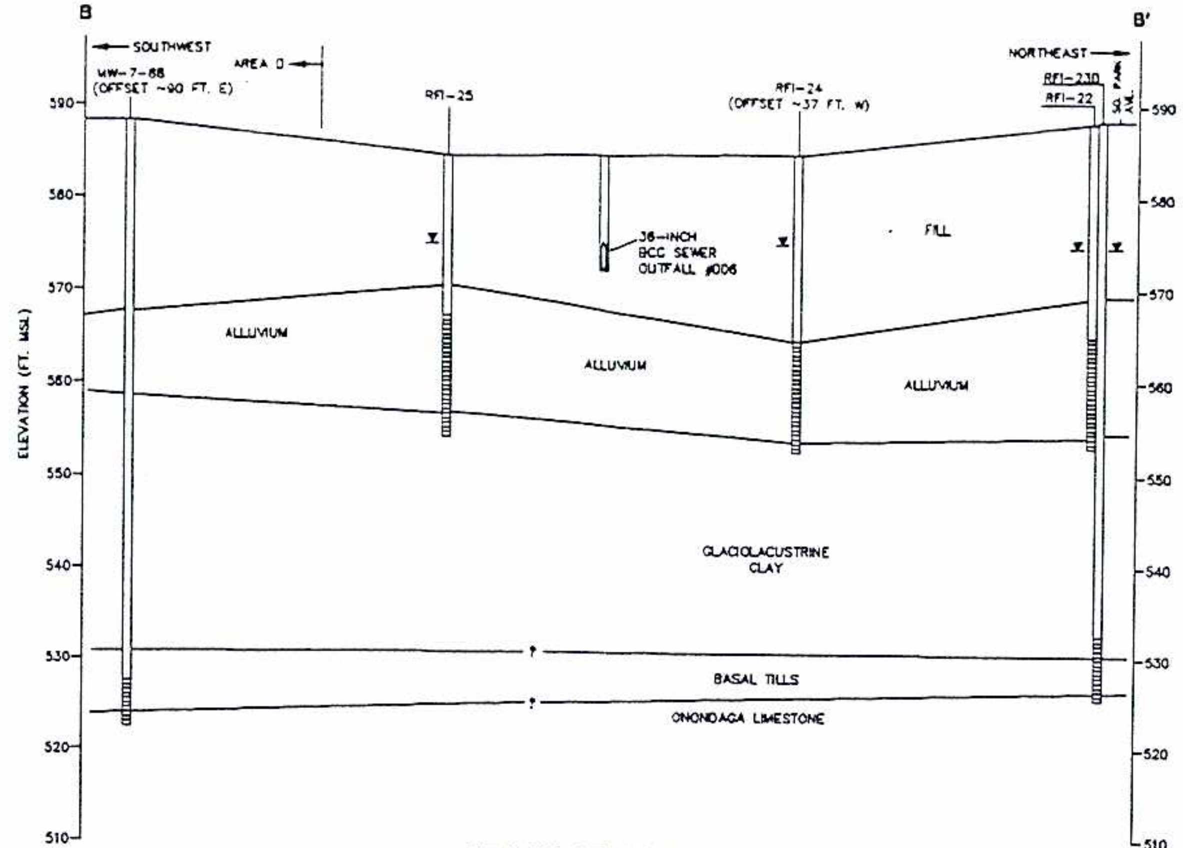
RFI CROSS SECTIONS (GOLDER)



Conrail Railroad
Area-A
Area-B
Area-C
Area-D
Area-E
SOUTH PARK AVE.
LEE STREET
ELK STREET
ORLANDO STREET
BUFFALO RIVER
BUFFALO RIVER
BUFFALO RIVER
PVS Chemicals
PVS Chemicals
Allied Signal
Mobil Oil
LEGEND
RFI-21D RFI MONITORING WELLS
RFI-PZ-20 RFI PIEZOMETERS
PS-01 PRE-RFI PIEZOMETERS
R-04 PRE-RFI MONITORING WELLS
RIVER STILLING WELL
RFI BORING
RFI MULTIPLE DEPTH BORING
CROSS SECTION DESIGNATION
100 0 100
scale feet
buffalo COLOR CORPORATION
GEOLOGIC CROSS SECTION LOCATION MAP
Buffalo, New York
Golder Associates
BEC
DJM
9/16/97
AS SHOWN
963-9117
BCC-014
5



CROSS-SECTION A-A'



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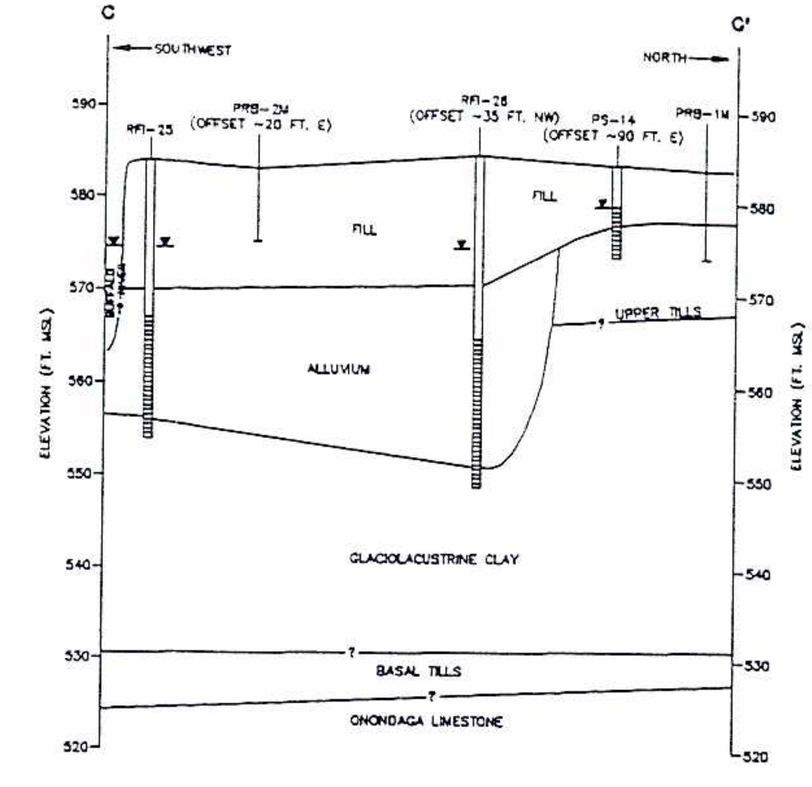
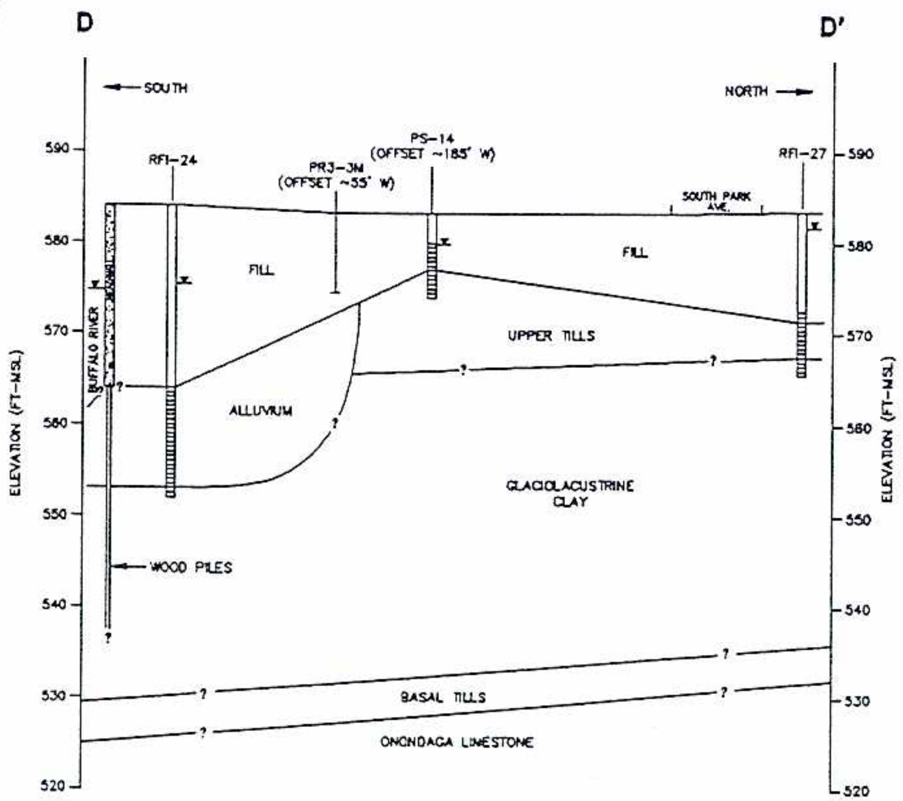
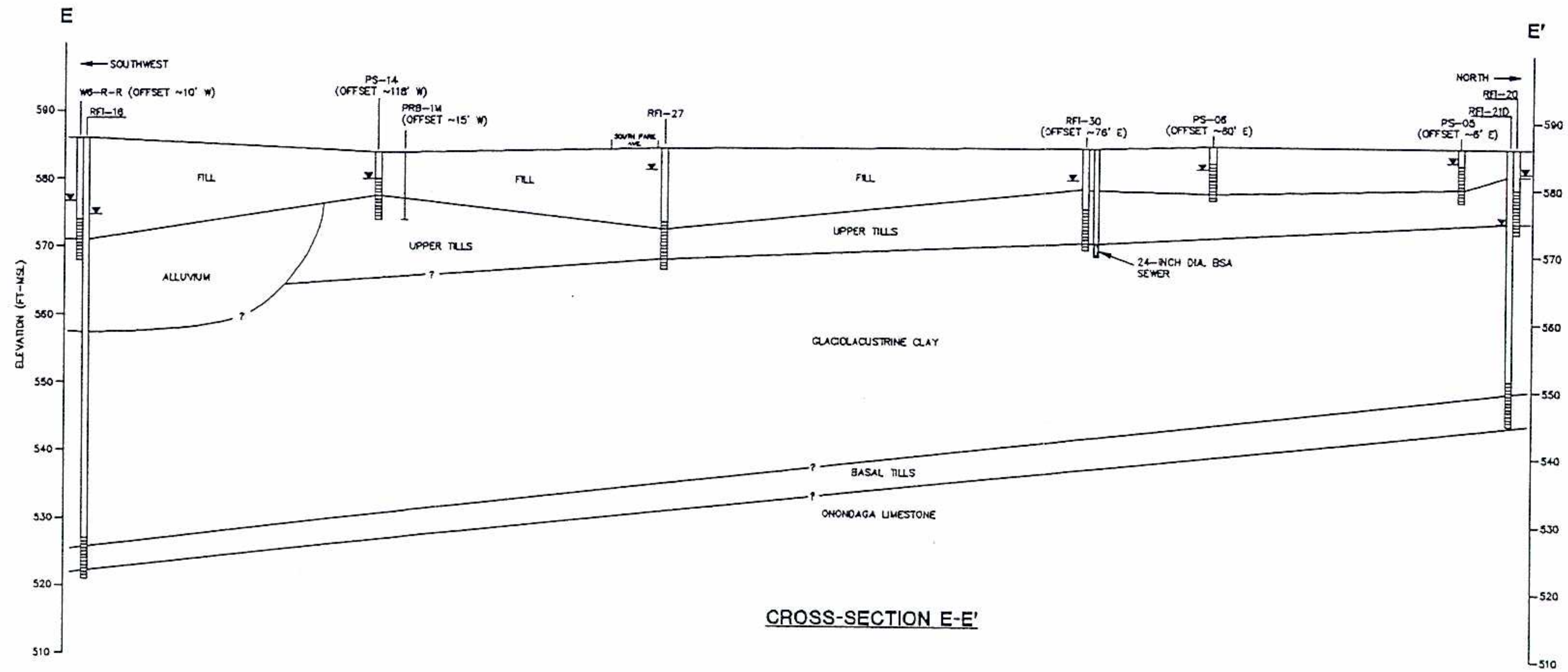


CROSS-SECTION C-C'



CROSS-SECTION D-D'



CROSS-SECTION E-E'

LEGEND

RFI-27 } WELL IDENTIFICATION
GROUND LEVEL
} WELL RISER
} WELL SCREEN/SAND PACK
▼ - WATER LEVEL

NOTES

1. WELLS/PIEZOMETERS ARE DRAWN DIAGRAMMATICALLY TO HORIZONTAL SCALE.
2. WATER LEVEL ELEVATIONS MEASURED JULY 15-16, 1997.
3. STRATIGRAPHIC CONTACTS INTERPOLATED BETWEEN BOREHOLES AND MAY VARY FROM WHAT IS SHOWN.

100 0 100
scale feet
HORIZONTAL SCALE
VERTICAL EXAGGERATION = 10x

buffalo COLOR CORPORATION

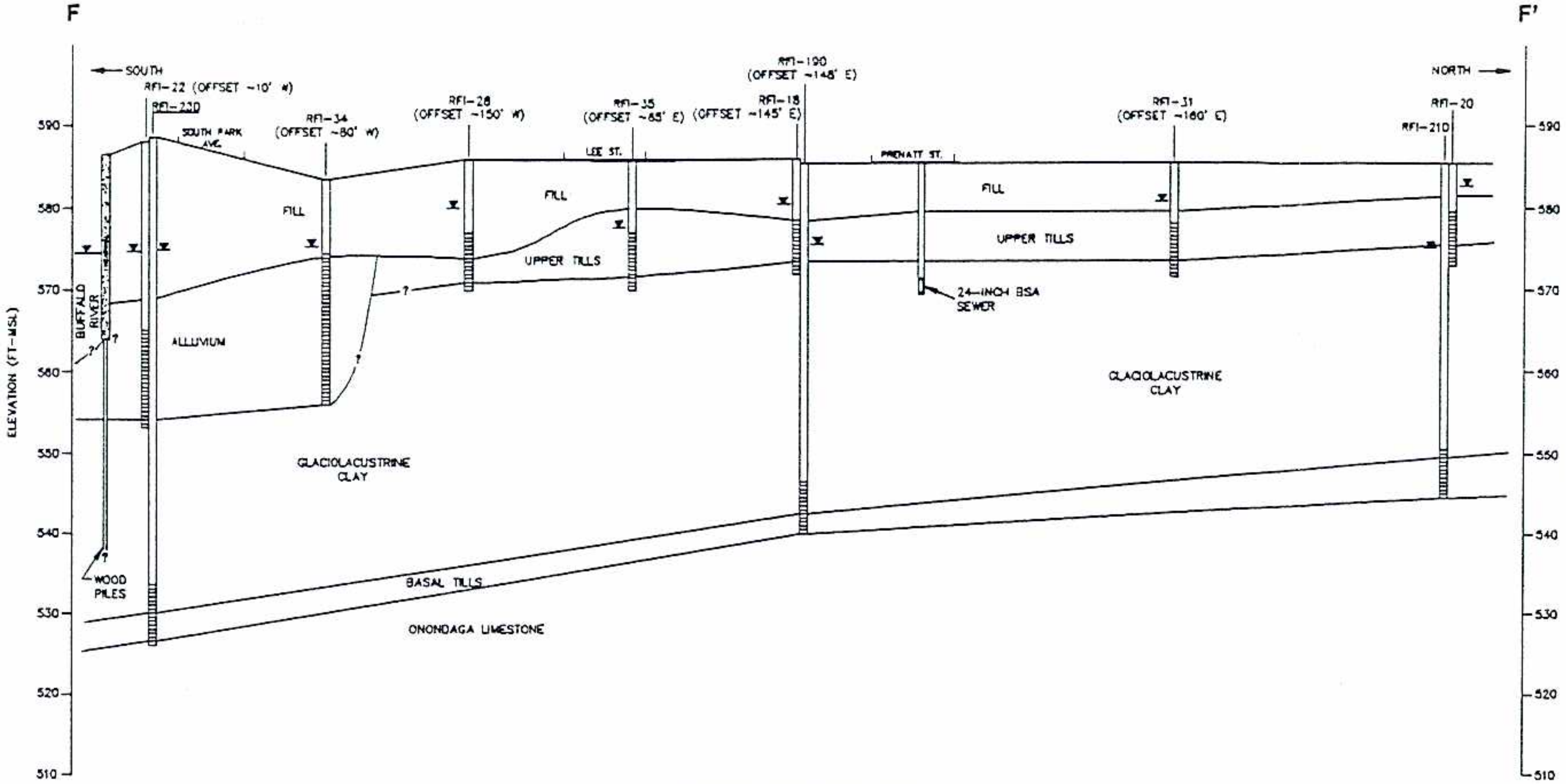
GEOLOGIC CROSS-SECTIONS
SHEET 1 OF 3

Buffalo, New York

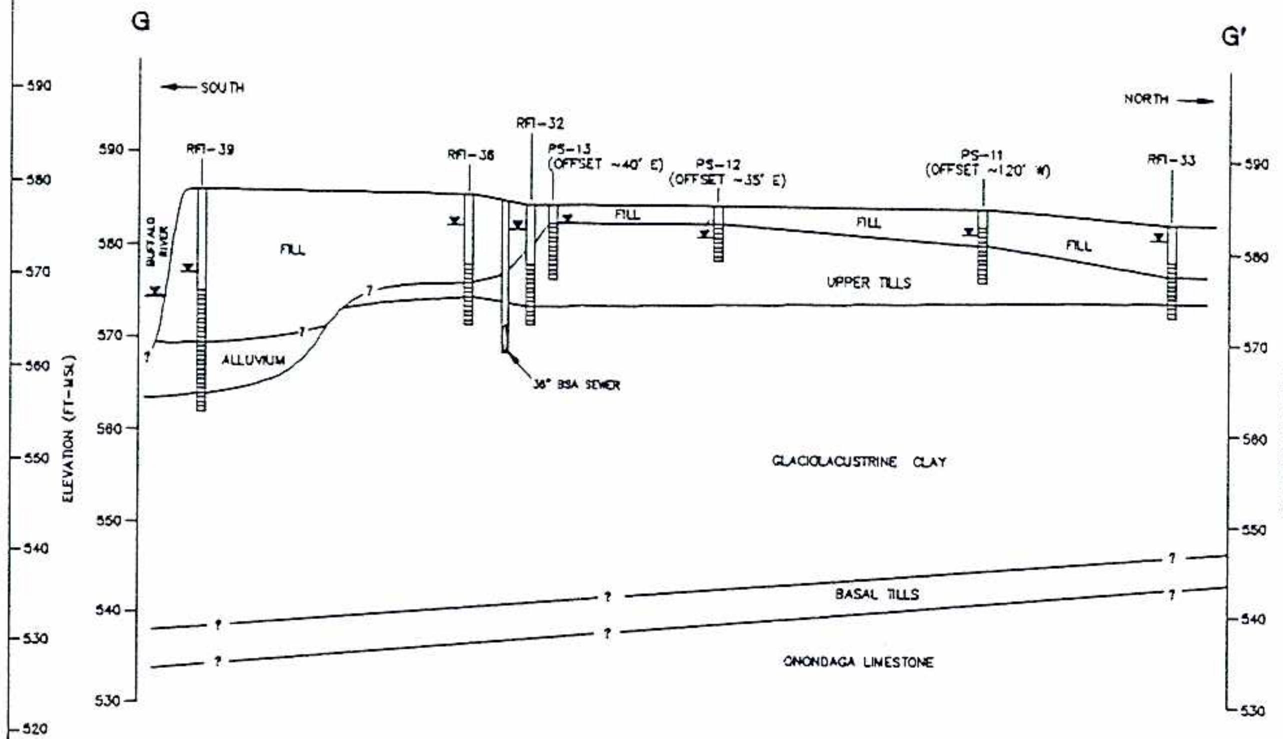
Golder Associates

DRAWN	BEC	DATE	9/16/97
CHECKED	DJM	SCALE	AS SHOWN
REVIEWED	DJM	JOB NO.	963-9117
APPROVED	BCS	DWG. NO.	BCC-013
FILE NO.	963-9117	FIGURE	6

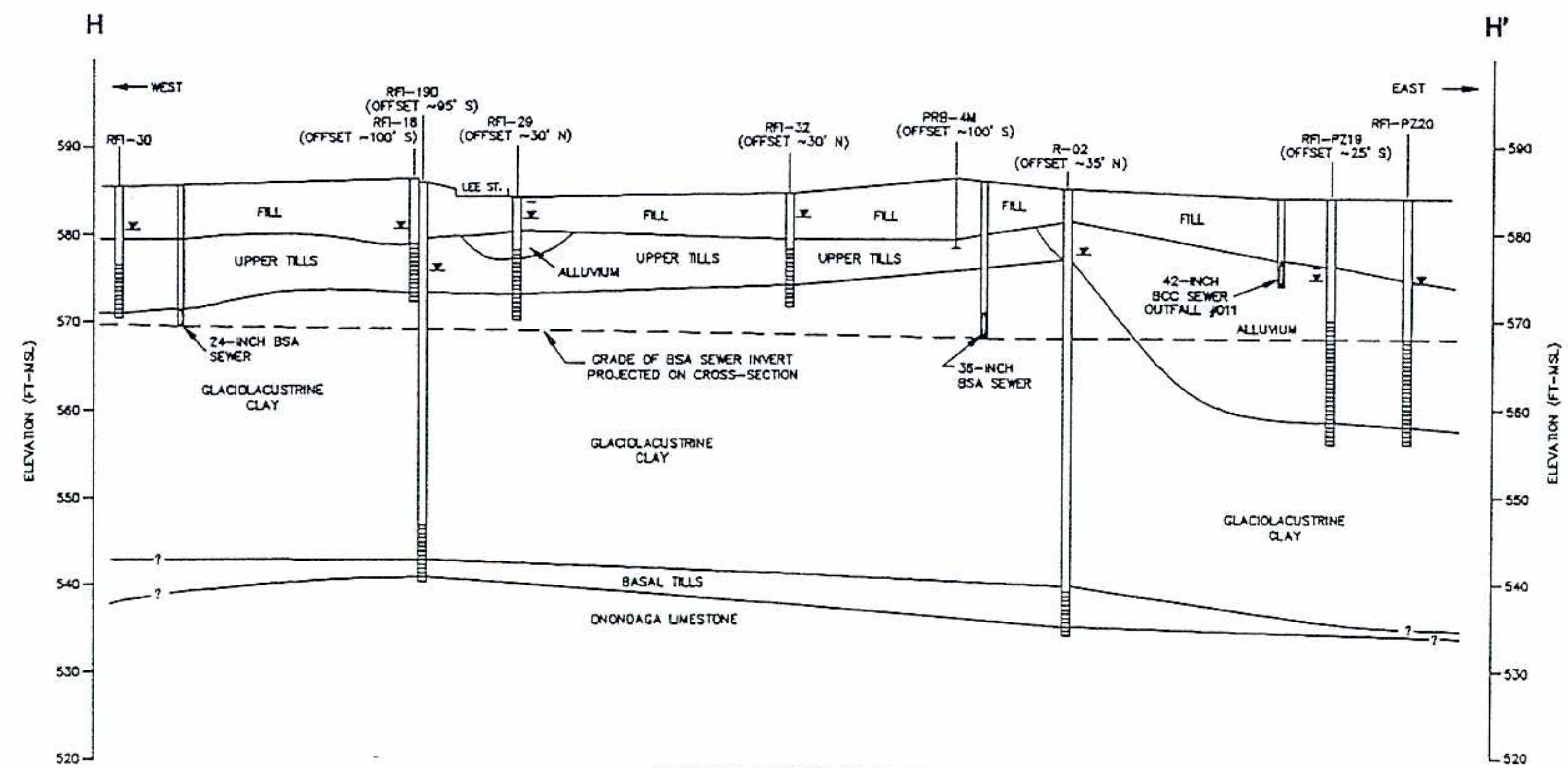
REV.	DATE	DESCRIPTION	DR.	BY	APP.	BY



CROSS-SECTION F-F'

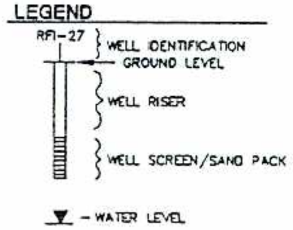


CROSS-SECTION G-G'



CROSS-SECTION H-H'

LEGEND



NOTES

1. WELLS/PIEZOMETERS ARE DRAWN DIAGRAMMATICALLY TO HORIZONTAL SCALE.
2. WATER LEVEL ELEVATIONS MEASURED JULY 15-16, 1997.
3. STRATIGRAPHIC CONTACTS INTERPOLATED BETWEEN BOREHOLES AND AND MAY VARY FROM WHAT IS SHOWN.

HORIZONTAL SCALE
VERTICAL EXAGGERATION = 10x

buffalo COLOR CORPORATION

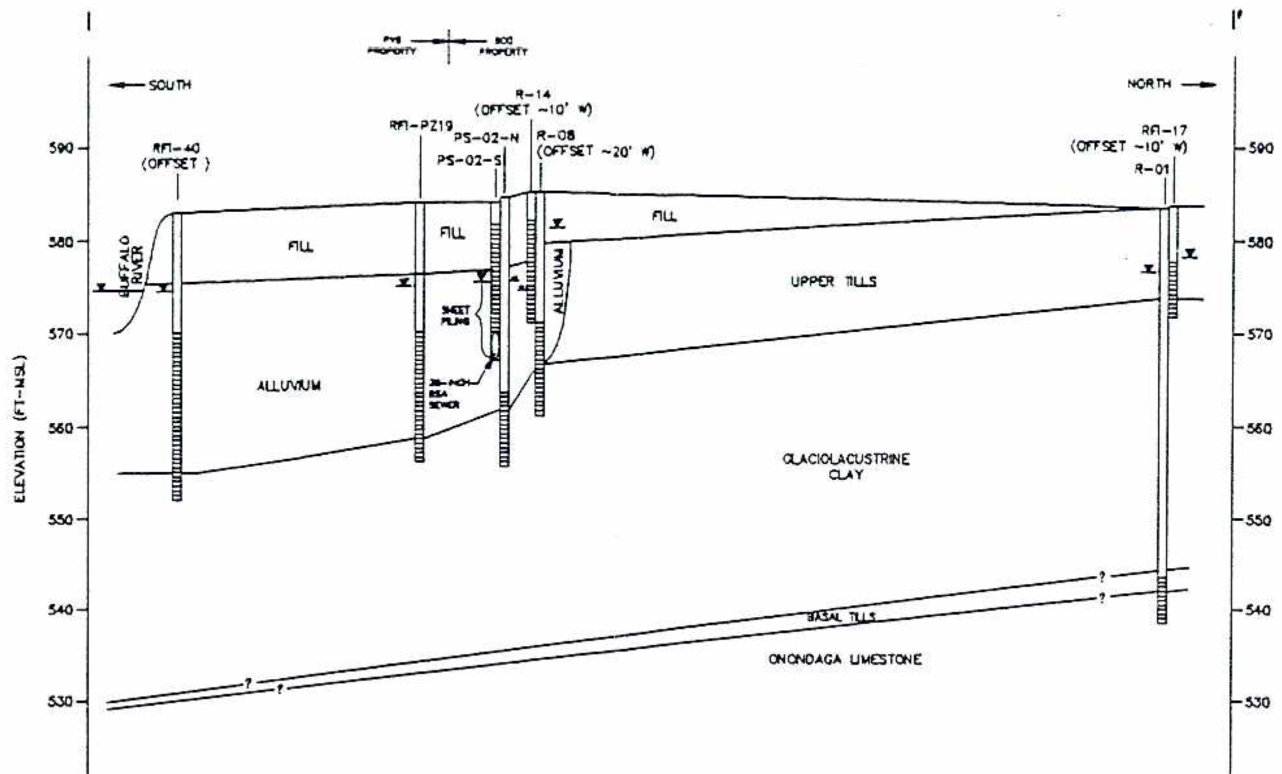
GEOLOGIC CROSS-SECTIONS
SHEET 2 OF 3

Buffalo, New York

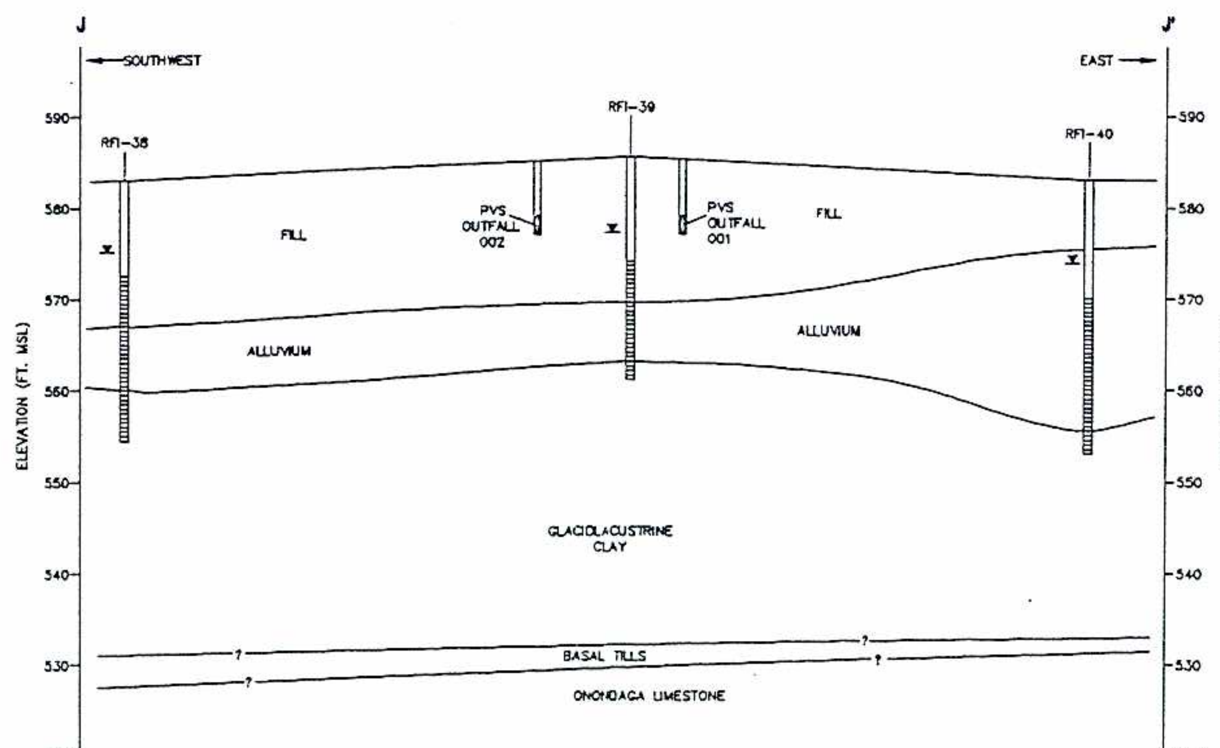
Golder Associates

DRAWN	BEC	DATE	9/16/97
CHECKED	DJM	SCALE	AS SHOWN
REVIEWED	DJM	JOB NO.	963-9117
APPROVED	BCS	DWG. NO.	BCC-012
FILE NO.	963-9117	FIGURE	7

REV.	DATE	DESCRIPTION	DR. BY	APP. BY



CROSS-SECTION I-I'



CROSS-SECTION J-J'

LEGEND

RFI-27
WELL IDENTIFICATION
GROUND LEVEL
WELL RISER
WELL SCREEN/SAND PACK
– WATER LEVEL

NOTES

1. WELLS/PIEZOMETERS ARE DRAWN DIAGRAMMATICALLY TO HORIZONTAL SCALE.
2. WATER LEVEL ELEVATIONS MEASURED JULY 15-16, 1997.
3. STRATIGRAPHIC CONTACTS INTERPOLATED BETWEEN BOREHOLES AND MAY VARY FROM WHAT IS SHOWN.

100 0 100
scale feet
HORIZONTAL SCALE
VERTICAL EXAGGERATION = 10x

buffalo COLOR CORPORATION

GEOLOGIC CROSS-SECTIONS
SHEET 3 OF 3

Buffalo, New York

Golder Associates

DRAWN	BCC	DATE	9/17/97
CHECKED	DJM	SCALE	AS SHOWN
REVIEWED	DJM	JOB NO.	963-9117
APPROVED	BCS	DWG. NO.	BCC-015
FILE NO.	963-9117	FIGURE	8

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

APPENDIX C

RI TABLE 9 (REVISED)

Table 9
Summary of Analytical Results - Sewer Solids Samples
Buffalo Color Facility - RI/FS

		Area	Area A	Area A	Area B	Area C	Area C	Area E	Area E
	Ecological	**Location**	SED-A01	SED-A02	SED-B01	SED-C01	SED-C03	SED-E01	SED-E02
	SCOs	**Sample Date**	01/24/07	01/24/07	01/24/07	01/24/07	01/24/07	01/25/07	01/25/07
		Sample ID	SED-A01-0107	SED-A02-0107	SED-B01-0107	SED-C01-0107	SED-C03-0107	SED-E01-0107	SED-E02-0107
Parameter		**Units**							
METALS									
CYANIDE	-	MG/KG	0.99 UJ	1.6 J	4.6 J	14.2 J	1.9 UJ	1.4 UJ	2 UJ
ALUMINUM	-	MG/KG	3670	1470	4830	5240	8360	1630	1920
ANTIMONY	-	MG/KG	24.8	23.2 U	28 U	21.9 U	40.4 U	25.8 U	33.1 U
ARSENIC	13	MG/KG	10.3	10	20.9	10.7	323	22.1	36.5
BARIUM	433	MG/KG	36.2	65.8	122	118	576	165	98.3
BERYLLIUM	10	MG/KG	0.34	0.54	0.46	0.36	0.6	0.34 U	0.44 U
CADMIUM	4	MG/KG	0.63	0.31 U	1.1	0.29 U	4.3	0.34 U	1.1
CALCIUM	-	MG/KG	111000	74900	208000	170000	68200	238000	33700
CHROMIUM (HEXAVALENT)	41	MG/KG	59.4	1600	131	63.1	300	297	125
COBALT	-	MG/KG	2.2	30.1	3.8	5.6	13.8	12.6	5.2
COPPER	50	MG/KG	104	249	116	39.2	383	253	412
IRON	-	MG/KG	10700 J	367000 J	55400 J	58100 J	118000 J	88800	33400
LEAD	63	MG/KG	146	119	146	50.8	675	293	141
MAGNESIUM	-	MG/KG	30400	7510	9120	9490	10600	6330	2590
MANGANESE	1,600	MG/KG	317	1100	649	585	711	481	206
MERCURY	0.18	MG/KG	1.6	0.79	4.1	0.93	0.04 U	1.1	0.14
NICKEL	30	MG/KG	9.1	5480	24.2	305	465	2060	1390
POTASSIUM	-	MG/KG	651	1820	927	863	1280	740	440
SELENIUM	3.9	MG/KG	4.7 U	6.2 U	7.5 U	5.8 U	10.8 U	6.9 U	8.8 U
SILVER	2	MG/KG	0.59 U	0.77 U	0.93 U	0.73 U	1.5	0.86 U	19
SODIUM	-	MG/KG	311	1440	2860	2000	1090	2490	1030
THALLIUM	-	MG/KG	7.1 U	20.5	11.2 U	8.8 U	16.2 U	10.3 U	13.3 U
VANADIUM	-	MG/KG	7.5	5.4	30.2	8	2860	102	194
ZINC	109	MG/KG	201	529	413	210	1790	318	487
SVOCS									
1-METHYL-2,4-DINITROBENZENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
2,4-DICHLOROPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
2,4-DIMETHYLPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
2,4-DINITROPHENOL	-	MG/KG	18 U	25 U	31 U	22 U	820 U	26 R	35 U
2,6-DINITROTOLUENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
2-CHLOROPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
2-METHYLNAPHTHALENE	-	MG/KG	3.8 U	1 J	6.4 U	4.5 U	170 U	5.4 U	0.73 J
2-METHYLPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
3,3'-DICHLOROBENZIDINE	-	MG/KG	18 U	25 U	31 U	22 U	820 U	26 U	35 U
3-NITROANILINE	-	MG/KG	18 U	25 U	31 U	22 U	820 U	26 U	35 U
4-CHLORO-3-METHYLPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
4-CHLOROANILINE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
4-METHYLPHENOL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
ACENAPHTHENE	20	MG/KG	3.8 U	1.1 J	0.66 J	4.5 U	170 U	5.4 U	1.4 J
ACENAPHTHYLENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	0.65 J
ACETOPHENONE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
ANILINE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	17 J	150
ANTHRACENE	-	MG/KG	0.41 J	2.8 J	1.7 J	0.94 J	170 U	0.54 J	3.8 J
BENZO(A)ANTHRACENE	2.6	MG/KG	2.2 J	9.1	12	3.9 J	15 J	3.9 J	12
BENZO(A)PYRENE	-	MG/KG	2.2 J	7.6	14	3.6 J	18 J	4.5 J	11
BENZO(B)FLUORANTHENE	-	MG/KG	2.8 J	11	23	5.3	27 J	8.8 J	16
BENZO(G,H,I)PERYLENE	-	MG/KG	1.4 J	5.6	11	2.5 J	14 J	2.8 J	5.8 J
BENZO(K)FLUORANTHENE	-	MG/KG	1 J	4 J	8.4	1.8 J	9 J	5.4 UJ	5.5 J
BIPHENYL	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	0.54 J
BIS(2-ETHYLHEXYL)PHTHALATE	-	MG/KG	3.8 U	0.99 J	2 J	1.2 J	170 U	2.6 J	2.9 J
BUTYLBENZYL PHTHALATE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
CAPROLACTAM	-	MG/KG	3.8 UJ	5.2 UJ	6.4 UJ	4.5 UJ	170 UJ	5.4 UJ	7.2 UJ
CARBAZOLE	-	MG/KG	0.26 J	2 J	2 J	1.1 J	170 U	3.1 J	5.4 J
CHRYSENE	-	MG/KG	2.2 J	9.9	19	4.4 J	18 J	4.4 J	13
DI-N-BUTYL PHTHALATE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
DI-N-OCTYL PHTHALATE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
DIBENZO(A,H)ANTHRACENE	-	MG/KG	0.42 J	1.6 J	2.9 J	0.72 J	170 U	0.67 J	1.4 J
DIBENZOFURAN	-	MG/KG	3.8 U	0.52 J	0.34 J	0.28 J	170 U	5.4 U	1.3 J
DIETHYL PHTHALATE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
DIMETHYL PHTHALATE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
FLUORANTHENE	-	MG/KG	5	24	43	10	35 J	6.6 J	29

J=Estimated
N=Uncertain identification
R=Rejected value based on data validation process
U=Undetected at listed detection limit

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Table 9
Summary of Analytical Results - Sewer Solids Samples
Buffalo Color Facility - RI/FS

	Ecological SCOs	**Area**	Area A	Area A	Area B	Area C	Area C	Area E	Area E
		Location	SED-A01	SED-A02	SED-B01	SED-C01	SED-C03	SED-E01	SED-E02
		Sample Date	01/24/07	01/24/07	01/24/07	01/24/07	01/24/07	01/25/07	01/25/07
		Sample ID	SED-A01-0107	SED-A02-0107	SED-B01-0107	SED-C01-0107	SED-C03-0107	SED-E01-0107	SED-E02-0107
Parameter		**Units**							
FLUORENE	30	MG/KG	3.8 U	1.2 J	0.41 J	4.5 U	170 U	5.4 U	1.8 J
HEXACHLOROBENZENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
INDENO(1,2,3-CD)PYRENE	-	MG/KG	1.3 J	4.8 J	10	2.2 J	13 J	2.4 J	5.2 J
N-NITROSODIPHENYLAMINE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.2 J	1.8 J
NAPHTHALENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
NITROBENZENE	-	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
O-NITROANANILINE	-	MG/KG	18 U	25 U	31 U	22 U	820 U	26 U	35 U
PHENANTHRENE	-	MG/KG	2.2 J	15	9.1	5.2	11 J	2 J	18
PHENOL	30	MG/KG	3.8 U	5.2 U	6.4 U	4.5 U	170 U	5.4 U	7.2 U
PYRENE	-	MG/KG	3.6 J	16	28	6.8	25 J	4.2 J	17
VOCS									
ETHANOL	-	MG/KG	2.2 U	3 U	2.1 U	2.5 U	2.2 U	3.3 U	4.3 U
1,2,4-TRIMETHYLBENZENE	-	MG/KG	0.0025 U	0.16	1.6 J	0.044	0.0061 U	0.32 U	
1,3,5-TRIMETHYLBENZENE	-	MG/KG	0.0025 U	0.082	0.25	0.023	0.0061 U	0.32 U	
BENZENE	70	MG/KG	0.0012 U	0.03	0.043	0.0059 U	0.0031 U	0.16 U	
BUTYLBENZENE	-	MG/KG	0.0025 U	0.065	0.042 U	0.018	0.0061 U	0.32 U	
ETHYLBENZENE	-	MG/KG	0.0025 U	0.013 U	0.042 U	0.012 U	0.0061 U	45	
ISOPROPYLBENZENE	-	MG/KG	0.0025 U	0.29	0.042 U	0.012 U	0.0061 U	0.32 U	
M-XYLENE	0.26	MG/KG	0.00035 J	0.28	0.042 U	0.03	0.0061 U	0.6	
NAPHTHALENE	-	MG/KG	0.0018 J	0.94	0.47	0.62	0.0032 J	1.3	
O-XYLENE	0.26	MG/KG	0.0025 U	0.61	0.042 U	0.012 U	0.0061 U	0.32 U	
TOLUENE	36	MG/KG	0.0025 U	0.017	0.042 U	0.012 U	0.0061 U	0.32 U	
XYLENES, TOTAL	0.26	MG/KG	0.0025 U	0.89	0.042 U	0.03	0.0061 U	0.6	
AROCLOR-1242	-	MG/KG	0.078 U	0.12 J	0.032 UJ	0.023 U	0.17 UJ	0.27 U	0.73 U
AROCLOR-1248	-	MG/KG	0.4 J	0.027 UJ	0.045 J	0.023 U	0.17 UJ	4.2	6.9
AROCLOR-1254	-	MG/KG	0.13 J	0.027 UJ	0.043 J	0.11	0.17 UJ	0.27 U	0.73 U
AROCLOR-1260	-	MG/KG	0.078 U	0.027 UJ	0.04 J	0.023 U	0.17 UJ	0.27 U	0.73 U
1,1,1-TRICHLOROETHANE	-	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	-	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 UJ
1,2,4-TRICHLOROBENZENE	-	MG/KG	0.006 U	0.007 U	3.7	0.002 J	0.007 J	12	2.5 J
1,2-DICHLOROBENZENE	-	MG/KG	0.006 U	0.002 J	9.8	0.05	0.015 U	110	3.3 J
1,2-DICHLOROETHANE	10	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 U
1,3-DICHLOROBENZENE	-	MG/KG	0.006 U	0.007 U	48	0.017	0.015 U	20	2.4 J
1,4-DICHLOROBENZENE	20	MG/KG	0.006 U	0.015	17	0.038	0.015 U	40	6.1
2-BUTANONE	100	MG/KG	0.3	0.036 U	0.053 UJ	0.03 U	0.031 J	0.31 J	28 UJ
ACETONE	2.2	MG/KG	0.03 U	0.052 U	0.053 U	0.03 U	0.073 U	0.042 U	28 UJ
BENZENE	70	MG/KG	0.006 U	0.004 J	0.037 J	0.006 U	0.015 U	0.016 J	5.5 U
CARBON DISULFIDE	-	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 UJ
CARBON TETRACHLORIDE	-	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 U
CHLOROBENZENE	40	MG/KG	0.006 U	0.042	5.2	0.13	0.015 U	44	43
CHLOROFORM	12	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006 U	0.015 U	0.008 UJ	5.5 U
CHLOROMETHANE	-	MG/KG	0.012 U	0.014 U	0.021 UJ	0.012 U	0.029 U	0.017 UJ	11 U
CIS-1,2-DICHLOROETHENE	-	MG/KG	0.006 U	0.007 U	0.01 UJ	0.006	0.015 U	0.008 UJ	5.5 U

J=Estimated
N=Uncertain identification
R=Rejected value based on data validation process
U=Undetected at listed detection limit

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Checked by: NF

APPENDIX D

DRAFT SOIL FILL MANAGEMENT PLAN

DRAFT SOIL FILL MANAGEMENT PLAN
Buffalo Color Corporation Site – Areas ABCE
Buffalo, New York
NYSDEC Site ID No. hw915184

This draft Soil Fill Management Plan supports the remedy set forth in the Alternatives Analysis Report (AAR) submitted to the NYSDEC by South Buffalo Development, LLC as part of its Brownfield Cleanup Program Applications for the former Buffalo Color Corporation Site (Site). This plan has been prepared in accordance with Section 5.0 of the NYSDEC Soil Management Plan template for complex sites. Upon NYSDEC acceptance of this draft plan, and as the site grading plan is developed, this plan will be finalized and become part of the larger Site Management Plan that will be prepared for the project.

Site Preparation

To facilitate redevelopment, the Site will be cleared of buildings and other aboveground structures, with the exception of those structures that will remain as part of the final remedy (such as the wastewater treatment building, piping and supports, paved areas, slabs, etc. located on Area A). Vegetation, masonry, rubbish, scrap, debris, curbs, fences, etc. will be removed and properly recycled, reused, or disposed off-site.

Pits or sumps located within floor slabs will be cleaned and inspected. If the pit or sump has a gravel bottom, or if the bottom is noticeably compromised, it will be necessary to evaluate the soil conditions under and around the base to determine if remediation is required. Pits which have been cleaned and pass the visual inspection will be backfilled to grade with clean fill.

Portions of building foundations and slabs will be left in place, as approved by the City, with the exception of those foundations and slabs that must be removed during remedy implementation or when required to facilitate redevelopment. All local permits and regulatory approvals will be obtained for the demolition work, as required.

As described in the AAR, the final remedy includes use of a surface cover system that will consist of a combination of clean soil, pavement, or buildings/structures to provide protection from direct contact exposure to contaminated surface soils. The cover system will reduce infiltration of precipitation through impacted soil into groundwater and promote surface drainage. The cover system will consist of soil (a minimum of one foot), asphalt, or concrete pavement (with appropriate granular subbase), or building structures. Existing paved surfaces, including building floor slabs, asphalt parking lots, and access drives that will be incorporated into the cover system will be cleaned, rehabilitated, and maintained as necessary. A demarcation layer will be placed between existing surface soils and any new soil cover materials so that the boundary between clean fill and existing Site soils can be identified in the future, if necessary. The demarcation layer location(s) will be identified on the base ALTA survey map or other suitable survey plan, so that periodic inspections can readily identify erosion or damage to the cover system in those areas. Best Management Practices will be implemented to manage stormwater runoff from paved surfaces, as appropriate.

Excavating and Grading Below Cover System

During Site redevelopment, excavation of existing soils may be necessary to achieve desired site grading and install new buildings or utilities. For excavation work below the cover system, a Professional Engineer’s (P.E.’s) representative with construction/remediation experience, representing the subject property owner or developer, will monitor soil/fill excavations or disturbances. The P.E. must provide a stamped/signed certification that excavation work below the cover system and subsequent repair/replacement of the cover system was conducted in a manner consistent with this Plan.

Stockpiling of Excavated Soil

Soils excavated during Site redevelopment that are potentially impacted from historical site operations will be stockpiled on the property for characterization. Specific locations for the stockpile areas will be determined during construction. Temporary stockpile areas will be lined with poly sheeting having a thickness of at least 10 mils and will be surrounded by a berm consisting of poly-covered earth, hay bales or wooden frames. Concrete curbs and slabs may also be used as part of the stockpile system provided that they are covered with the 10-mil poly sheeting. The stockpiled soil will be covered with polyethylene sheeting or spray-on dust suppression agents will be applied when soil is not being added or removed (and at a minimum at the end of each work day) to reduce the infiltration of precipitation and the migration of dust. When a temporary stockpile area is no longer needed, all used plastic liners and berm construction materials will be properly disposed.

As an alternative to temporary stockpiles, rolloff boxes (tarped and lined as necessary) may be used for on-Site accumulation of excavated materials.

The P.E.'s representative will maintain a daily record of the accumulation date(s), origination point, estimated volume (in cubic yards), date/location of on-Site reuse, sampling and characterization details, and date of off-Site transportation, as appropriate, for each separate soil stockpile.

Soils that require off-Site disposal will not be stockpiled for more than 90 days after the pile is generated. Characterization samples of the stockpiled material will be collected within two weeks (14 calendar days) after the pile has been generated; standard laboratory turnaround (approximately 3 weeks) will be used for all laboratory testing unless SBD determines that an expedited turnaround time is required. Soils identified for on-Site reuse beneath the cover system, as determined via the process described below, will not be stockpiled on-Site for more than 180 days.

Site-Specific Action Levels

This section applies to any soils excavated during the course of Site development. To evaluate such soils for potential reuse on the Site as fill, the following process will be used.

Step 1 - Determine if Excavated Material is "Grossly Contaminated": For the purposes of this project, "grossly contaminated" soil exhibits one or more of the following characteristics:

- Visual indication of non-aqueous phase liquid (NAPL);
- Visual indication of other separate phase materials of concern, such as elemental mercury; and/or
- Photoionization detector readings, as obtained in ambient air at the surface of the excavated material, of greater than 10 ppm and sustained for a minimum duration of 1 minute.

Discolored soil will not be considered "grossly contaminated" if it does not exhibit any of the above characteristics.

If excavated material is identified as "grossly contaminated", it will be characterized for off-Site disposal. Any excavated material that does not meet the definition of "grossly contaminated" will be evaluated as defined in Step 2 below.

Step 2 – Compare to Site-Specific Action Levels (SSALs): Samples of the excavated material will be sampled and characterized at a NYSDEC-approved off-Site laboratory using the procedures described in this document. The results of the characterization testing will then be screened against the SSALs. The soils will be considered to meet the SSALs if concentrations of tested constituents meet the following parameters:

- Individual VOCs ≤ Commercial SCOs
- Total SVOCs ≤ 500 ppm
- Individual PCB Aroclors ≤ Commercial SCOs
- Metals ≤ 10x Commercial SCOs

It should be noted that the SSALs are not remedial action levels or cleanup goals for the Site remedy; such criteria are provided separately in the AAR. It is further understood that the SSALs will not be used as triggers for additional remediation beyond that specified in the AAR, except as follows: If concentrations of any analyzed metal exceeds the SSAL, then TCLP testing will be completed on that sample for that metal. If the TCLP result exceeds the TCLP limit for that metal, then additional sampling in the area of excavation from which the soil originated will be proposed to determine if additional remediation is warranted. The determination of whether additional action is warranted will be made by assessing the TCLP data, as well as Site specific information. If it is determined that additional investigation is warranted, that investigation should focus on the potential for those metals to have an impact on groundwater.

If discolored soils are encountered during the field work, special attention will be given to that area to assess possible impacts upon groundwater.

If the excavated material is not "grossly contaminated" and all sample results meet the SSALs, then the excavated material can be reused on Site as structural fill placed beneath the cover system. If the excavated material does not meet the requirements of either Step 1 or Step 2, or if for any reason the material is not suitable for reuse on site, it will be taken off-Site for proper disposal.

Sampling and Characterization of Stockpiled Soil

For stockpiled soil that may be reused as fill and is not "grossly contaminated" as determined based on Step 1 above, one composite sample will be collected for every 100 cubic yards (or portion thereof) of stockpiled soil. The composite sample will be collected from five locations from each 100 cubic yard volume. PID measurements will be recorded for each of the five individual locations. One grab sample will be collected from the individual location with the highest PID measurement. If none of the five individual sample locations exhibit PID readings, one location will be selected at random. The composite sample will be analyzed by a NYSDOH ELAP-certified laboratory for Target Compound List (TCL) SVOCs, PCBs, and TAL metals plus cyanide. The grab sample will be analyzed for TCL VOCs. If off-Site disposal is expected, an additional composite sample will be collected for TCLP analysis and other characterization tests, as specified by the disposal facility.

Soil samples will be composited by placing equal portions of soil from each of the five individual sample locations into a pre-cleaned, stainless steel (or Pyrex glass) mixing bowl. The soil will be thoroughly homogenized using a stainless steel or disposable plastic scoop or trowel and transferred to pre-cleaned jars provided by the laboratory. Sample jars will then be labeled and a chain-of-custody form will be prepared.

Any stockpiled soil with TCLP/characterization results that indicate the material is hazardous waste (as defined under RCRA) will be subject to the applicable hazardous waste storage, labeling, handling, transportation and disposal regulations.

Grossly Contaminated Soil Remaining in Excavation

If “grossly contaminated” soil is visible on the excavation sidewalls, SBD may choose to expand the excavation until no further “grossly contaminated” material remains within the excavation, or SBD may develop a plan for the characterization and remediation of the material for NYSDEC approval. The plan will be based on the type and extent of material encountered.

Buried Drums or Underground Storage Tanks

Buried drums and underground storage tanks (USTs) are not known to exist on the Site. However, if buried drums or USTs are encountered during excavation activities, NYSDEC will be notified. Any USTs will be registered with NYSDEC as required per 6 NYCRR Part 375-1.8. Any buried drums and/or USTs encountered will be evaluated within the excavation via visual assessment and PID readings, provided that worker health and safety is protected. Subsequently, a Removal Plan will be prepared for NYSDEC approval. Drums and/or USTs will be excavated and removed in accordance with a site-specific Health and Safety Plan while following all applicable federal, state, and local regulations. Removed drums and underground storage tanks will be properly characterized and disposed off-site. The soil surrounding the buried drums or underground storage tanks will be considered as potentially contaminated and will be characterized in accordance with methods prescribed in this Plan.

Underground Pipes and Sewers

Inactive storm or sanitary sewer pipes that will not be reused and are encountered within the limits of an excavation will be removed and any exposed ends will be plugged/capped at the walls of the excavation. If pipes are large, the use of flowable fill may be considered. Based on Site knowledge, no underground chemical/process pipes are expected to exist; if any are encountered during grading or excavation activities, they will be cut, drained, and removed from within the excavation limits. Drained materials will be collected and properly disposed off-Site. Pipe sections left in the ground (if any) which will not be reused will be capped/plugged after draining and the potential for migration of contaminants along the pipe bedding will be assessed and mitigated via placement of impermeable collars or other barriers, as appropriate.

Requirements for Structural Fill Placed Beneath the Cover System

Excavated material, crushed asphalt or concrete from building demolition, and clean fill/borrow material brought on Site for use as structural fill beneath the Site cover system must meet the following criteria:

- All materials from on-Site sources must be shown through testing to have concentrations of constituents that are less than or equal to the SSALs.

- Material from off-Site sources intended for use as site backfill shall meet the Commercial SCOs (Protection of Public Health) or Protection of Groundwater SCOs, whichever is more stringent, except as follows:

    - The following material may be imported for use as backfill, without chemical testing, for use beneath pavement, buildings, or below the cover system provided it contains less than 10% by weight of material which would pass through a size 200 sieve and consists of:

        1. Rock or stone, consiting of virgin material from a permitted mine or quarry; or
        2. Recycled concrete or brick from a Department registered construction and demolition debris processing facility which conforms to Section 304 of the New York Department of Transportation Standard Specifications Construction and Materials Volume I (2002).

- Off-Site borrow materials intended for use on the Site which require chemical testing will be tested via collection of one composite sample per 500 cubic yards of material from each source area. The sample will be analyzed for TCL VOCs, TCL SVOCs, PCBs, and TAL metals plus cyanide. If more than 1,000 cubic yards of material are borrowed from a given off-Site source area and both samples of the first 1,000 cubic yards meet the SSALs, the sample collection frequency will be reduced to one composite for every 2,500 cubic yards of additional material from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency will be reduced to one sample per 5,000 cubic yards, provided all earlier samples met the SSALs.

Cover System Soils

The cover soil material will meet the following criteria:

- Off-Site borrow soils will be documented as having originated from locations having no evidence of disposal or release of hazardous, toxic or radioactive substances, wastes or petroleum products.

- Off-Site soils intended for use as site cover will not be defined as a solid waste in accordance with 6NYCRR Part 360-1.2(a).

- If off-Site soil intended for use as cover material is considered “virgin”, it will be further documented in writing to be native soil material from areas not having supported any known prior industrial or commercial development or agricultural use.

- Off-Site soils to be used as cover soils must not exceed the lower of the Commercial or Protection of Groundwater SCOs.

- Non-virgin soils will be tested via collection of one composite sample per 500 cubic yards of material from each source area. The sample will be analyzed for TCL VOCs, TCL SVOCs, PCBs, and TAL metals plus cyanide. If more than 1,000 cubic yards of soil are borrowed from a given off-site non-virgin soil source area and both samples of the first 1,000 cubic yards meet the specified SCOs, the sample collection frequency will be reduced to one composite for every 2,500 cubic yards of additional soils from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency will be reduced to one sample per 5,000 cubic yards, provided all earlier samples met the specified SCOs.

- The topsoil used for the final cover will be fertile, friable, natural loam surface soil, capable of sustaining plant growth, and free of clods or hard earth, plants or roots, sticks or other extraneous material harmful to plant growth.

- Grassed areas will be seeded with a sustainable perennial mixture with appropriate erosion control measures taken until the perennial grasses are established, as specified by the local soil conservation district.

- To reduce the disturbance of the surface cover material, clean soil berms will be constructed in areas where shallow-rooted trees and shrubs will be planted. The berms will be of sufficient thickness to allow the excavation of only clean fill deep enough to plant the tree or shrub root ball. The berm material will contain sufficient organic material to allow tree and/or shrub growth, and will be of sufficient strength to support trees and/or shrubs at their maximum height.

Asphalt and Concrete

Existing asphalt and concrete from buildings, roads, parking lots, etc. will be preserved and reused as part of the Site cover wherever possible. In addition, new areas of pavement and new structures will be built as part of redevelopment.

Erosion Control

Coverage will be obtained under the NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities that are classified as "Associated with Industrial Activity", Permit #GP-93-06 (Construction Storm Water General Permit). Requirements for coverage under the Construction Storm Water General Permit include the submittal of a Notice of Intent form and the development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will fulfill all permit requirements and will be prepared in accordance with the latest version of "Chapter Four: the Storm Water Management and Erosion Control Plan" in Reducing Impacts of Storm Water Runoff from New Development (NYSDEC). This Storm Water Management and Erosion Control Plan, in accordance with permit requirements, will provide the following information:

- A background discussion of the scope of the construction project.

- A statement of the storm water management objectives.

- An evaluation of post-development runoff conditions.

- A description of proposed storm water control measures.

- A description of the type and frequency of maintenance activities required to support the control measure.

The SWPPP will address issues such as erosion prevention, sedimentation control, hydraulic loading, pollutant loading, ecological protection, physical site characteristics that impact design, and site management planning. All descriptions of proposed features and structures at the Site will include a description of structure placement, supporting engineering data and calculations, construction scheduling, and references to established detailed design criteria. The SWPPP will conform to all requirements as established by applicable regulatory agencies.

Proven soil conservation practices, including Best Management Practices, will be incorporated in the construction and development plans to mitigate soil erosion, off-site sediment migration, and water pollution from erosion. The use of temporary erosion control measures such as silt fencing and/or hay bales will be placed around soil stockpiles and unvegetated soil surfaces during redevelopment activities, as specified by the local soil conservation district. These methods are described below. Stockpiles will be graded and compacted as necessary for positive surface water runoff and dust control. Stockpiles of soil will be placed a minimum of 50 feet from the property boundaries.

Temporary erosion and sedimentation control measures will be used during active demolition/construction stages. Prior to any demolition/construction activity, temporary erosion and sediment control measures will be installed and maintained until such time that permanent erosion control measures are installed and effective. The following temporary measures will be incorporated into demolition/construction activities:

- Silt fences will be placed around active demolition/construction areas

- Hay bails will be placed and staked around stockpiled soil under the plastic to create a berm

- Plastic covers will be placed on stockpiled soil to reduce rain water infiltration and dust

As sediment collects along the silt fences, hay bails, etc., they will be cleaned to maintain desired removal performance and prevent structural failure of the fence. Accumulated sediment will be removed as specified in the SWPPP. Removed sediment will be stockpiled and characterized as specified above for excavated soil. The perimeter silt fences will remain in place until demolition/construction activities in the area are completed and vegetative cover or other erosion control measures are adequately established. Silt fences will be provided and installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control.

Permanent erosion control measures will be incorporated during cover demolition/construction and during site redevelopment for long-term erosion protection. Permanent measures and facilities will be installed as early as possible during construction phases. Parking and building systems associated with redevelopment will not include dry wells or other subsurface injections/disposal piping or facilities.

The remedial construction activities will involve the installation of a cover system including a demarcation layer (e.g. geotextile) asphalt, concrete, topsoil over the entire site. Permanent erosion control measures incorporated into the construction plans to control erosion will include limiting steep slopes, routing runoff to surface water collection channels, limiting flow velocities in the collection channels to the extent practical, and lining collection channels, where appropriate. In areas where flow will be concentrated (i.e.; collection channels) the channel slopes and configuration will be designed to maintain channel stability.

Any final slopes greater than 33 percent will be reinforced, and will have a demarcation layer under the clean cover to indicate if erosion has extended to the subgrade. Following the placement of final cover soils over regraded areas, a revegetation program will be implemented to establish permanent vegetation. The areas to be grassed will be seeded in stages as construction is completed with 100 lbs/acre of seed with a sustainable perennial mixture.

In addition to the above seed mixture, mulch, mulch blankets, or synthetic fabric will be placed to prevent erosion during turf establishment. Mulch will be placed on all slopes less than 15% and a mulch blanket on all slopes greater than 15%. Synthetic erosion control fabric will be placed in drainage ditches and swales.

Dust Control

The surface of unvegetated or disturbed soil/fill areas will be wetted with water or other dust suppressive agents to control dust during demolition/construction. Any subgrade material left exposed during extended interim periods (greater than 90 days) prior to placement of final cover will be covered with a temporary cover system (i.e., tarps, spray type cover system, etc.) or planted with vegetation to control fugitive dust to the extent practicable. Particulate and VOC monitoring will be performed along the downwind occupied perimeter during subgrade excavation, grading, and handling activities in accordance with the Community Air Monitoring Plan to be provided as part of the project Health and Safety Plan.

Dust suppression techniques will be employed at the Site in accordance with applicable NYSDEC guidance. Dust suppression techniques that may be used at the Site include applying water on roadways, wetting equipment, spraying water on buckets during excavation and dumping, hauling materials in properly covered or watertight containers, covering excavated areas and material after excavation activity ceases, establishing vegetative cover immediately after placement of cover soil, and reducing the excavation size and/or number of excavations. The use of atomizing sprays is recommended so that excessively wet areas will not be created but fugitive dust will be suppressed.

Construction Water Management

Pumping of water (i.e., ground water and/or storm water) that has accumulated in an excavation, if necessary, will be done in such a manner as to prevent the migration of particulates, soil, or unsolidified concrete materials, and to prevent damage to the existing subgrade. Water pumped from the excavations may be discharged to the BSA sewer system, after BSA approval has been obtained. If the water quality is such that the BSA will not approve the discharge to a sewer, or if the water cannot be sufficiently treated so that BSA approval is obtained, it will be stored in temporary storage tanks, characterized, and transported off-Site for proper disposal. Runoff from the surface will be limited to control discharges to storm sewers or the Buffalo River.

Access Controls

Access to soil on the property will be controlled until final cover is placed to prevent direct contact with subgrade materials. As specified above, excavated material that is stockpiled on Site will be temporarily covered to limit access to that material.

Institutional Controls

As described in the AAR, the use of the property and the protocol for excavations that extend below the cover system will be addressed through environmental easements/deed restrictions. The specific language to be used in the easements/deed restrictions will be provided in the final Site Management Plan.

Maintenance

The potential for exposure to subgrade materials through erosion or damage to the cover system will be controlled via implementation of a comprehensive Operations, Maintenance and Monitoring (OM&M) Plan. The OM&M plan will be part of the final Site Management Plan. Specific requirements for inspection and repair of the cover system, as well as requirements for notification and reporting, will be included in the OM&M Plan.

Health and Safety

Site-specific Health and Safety Plans (HASPs) will be developed and implemented for all components of Site remediation and redevelopment that involve excavation or potential exposure to subgrade materials. A model HASP will be provided in the final Site Management Plan. All project HASPs will include requirements for worker training and medical monitoring, PPE and air monitoring requirements (including action levels), a Community Air Monitoring Plan, emergency/contingency procedures, and health and safety information for the specific contaminants known or suspected to exist on the Site.