

**REPORT ON
SEMI-ANNUAL PROGRESS REPORT
FORMER GENERAL TIME FACILITY
ATHENS, GEORGIA**

by Haley & Aldrich, Inc.
Greenville, South Carolina

for Carpenter Technology Corporation
Reading, Pennsylvania

File No. 38111-011
April 2016





HALEY & ALDRICH, INC.
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Suite 130
Greenville, SC 29601
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15 April 2016
File No. 38111-011

Georgia Environmental Protection Division
Response and Remediation Program; Release Notification Unit
2 Martin Luther King Jr. Drive, SE
Suite 1462 East
Atlanta, Georgia 30334

Attention: Allan C. Nix, P.G.

Subject: April 2016 Semi-Annual Progress Report #4
Former General Time Facility
100 Newton Bridge Road- Athens, Georgia
HSI Site Number 10355

Dear Mr. Nix:

Carpenter Technology Corporation (CTC) was accepted into the Georgia Voluntary Remediation Program (VRP) in April 2014, HSI site number 10355. Consistent with the VRP, CTC has submitted Semi-Annual Progress Reports to the EPD describing activities that have been conducted during the prior six months. This report is the fourth progress report being submitted since being approved.

As a condition of approval the Georgia Environmental Protection Division (EPD) requested that CTC conduct routine groundwater and surface water sampling. Groundwater and surface water sampling results are provided in the October Semi-Annual Progress Reports. These results continue to corroborate the conceptual site model (CSM), as well as document stable or contracting groundwater plume(s) on and off the property, no off-site vapor intrusion risks, and no adverse effects to potential ecological or human receptors in the North Oconee River. As requested, CTC continues to evaluate potential corrective actions to address the VOC levels detected in groundwater samples collected from the MW-16 well pair and has implemented a field-scale pilot test to further evaluate the efficacy of enhanced in-site bioremediation. Field activities associated with this pilot program are outlined in this report.

Georgia Environmental Protection Division

15 April 2016

Page 2

Sincerely yours,
HALEY & ALDRICH, INC.



Mark Miesfeldt
Project Manager

Attachments

Table 1 – Injection Log

Table 2 – Tabulated Monthly Summary of Hours

Figure 1 – Site Location Map

Figure 2 – Injection Points And Baseline/Post-Remediation Monitoring Wells

c: Carpenter Technology Corporation

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Introduction

The Site is located in an industrial park at 100 Newtown Bridge Road, in Athens, Georgia. A Site location map is provided as Figure 1. The Site is approximately 35 acres with a 325,000 square foot manufacturing building. Additional structures include outbuildings constructed of corrugated metal with concrete slab bases and a security building at the rear of the facility. The topography of the Site slopes gently from northwest to southeast.

The Former General Time facility was accepted into the Georgia Voluntary Remediation Program (VRP) in April 2014, HSI site number 10355.

Groundwater Remediation Plan

EPD's conditional approval specifies "monitored natural attenuation" (MNA) as the corrective action for contaminated groundwater on-site but indicates that other corrective action alternatives will have to be evaluated and implemented as well. Specifically, CTC has continued to address the high TCE concentrations in groundwater at the MW-16 well cluster.

TREATABILITY TESTING

CTC completed a bench-scale treatability study in 2012. The results of the treatability study showed that either Enhanced In-Situ Bioremediation (EISB) or In-Situ Chemical Oxidation (ISCO) could be implemented to remove dissolved phase VOCs in Site groundwater. Two microorganisms have been genetically identified to degrade cis-1, 2-DCE to vinyl chloride (VC), specifically dehalococcoides ethenogenes (DHE) and dehalobacter restrictus (DHB). These bacteria require specific conditions in order to grow and reproduce. Despite low pH conditions in Site groundwater, the baseline data show the presence of all the major daughter products from the degradation of TCE, including cis-1,2-DCE, trans-1,2-DCE and VC.

FIELD IMPLEMENTATION

The groundwater remediation plan was built on the results of an initial field scale study to evaluate the effectiveness of Enhanced In-Situ Bioremediation (EISB) in addressing the TCE hot-spot in the vicinity of the MW-16 well cluster. Initial field testing of EISB, using Regenesi's 3D micro-emulsion (3DMe), showed the efficacy of injecting biological amendments into the subsurface, however, the 3DMe substrate did not produce the desired reduction in TCE concentration that was observed in the bench-scale study. As a result the initial field testing was considered inconclusive. Consequently, CTC engaged the services of TRC Environmental Corporation to evaluate the effectiveness and efficiency of utilizing an alternative soluble and readily degradable substrate (sodium lactate) to enhance the rate of TCE dechlorination in groundwater in the vicinity of the MW-16 well cluster in June 2015. Results from the most recent semi-annual groundwater sampling event conducted in August 2015 indicate the production of TCE daughter products has increased dramatically to the point where the concentration of the daughter product cis-1, 2-DCE now exceeds the parent TCE in MW-16I. To build on these results Haley & Aldrich developed a more robust injection program to further enhance the rate of TCE dechlorination around the MW-16 well cluster.

Activities Conducted During Previous Six Months

The following activities were conducted at the Site since the submittal of Semi-Annual Progress Report #3 in October 2015:

- Haley & Aldrich executed the installation of 16 injection points laid out on 15-foot centers positioned around the MW-16 cluster to address the high TCE concentrations in groundwater.
- As part of this evaluation, baseline (pre-injection) groundwater samples were collected from existing wells MP-3, MP-7, MW-16I, and MW-16D, and new well MP-8. Performance (post-injection) groundwater samples will be collected one month following injections and every other month thereafter for two additional events.
- CTC continued to evaluate potential remediation technologies and approaches to address the groundwater impacts beneath the former manufacturing building.

The activities previously described are explained in more detail below.

INJECTION POINT INSTALLATION AND SAMPLING

Between March 1, 2016 and March 4, 2016, Haley & Aldrich, Inc. and the drilling contractor, Geo Lab of Winder, Georgia installed sixteen (16) permanent injection points (IP) at the Site. The 16 injection points were laid out in three rows in the vicinity of the MW-16 well cluster with the western most row located in the middle of the hallway east of the centrifuge room. The injection array was laid out to target groundwater beneath the former manufacturing building containing the highest concentration of site constituents of concern (COCs) and to maximize the use of monitoring and injection points installed during previous pilot programs. Before setting the injection points, the depth to water in MW-16I was measured to approximate the depth to water within the treatment zone and ensure that the screens of the injection points were placed beneath the observed water table. The depth to groundwater at MW-16I was approximately 16 feet below the slab, therefore the total depth of each injection point was set at approximately 30-ft. below ground surface (bgs).

The IPs were installed using ¾-in PVC with 10-feet of pre-packed screens advanced using 3-inch diameter casing equipped with a disposable tip. As previously stated, the IPs was advanced to a depth of 30-feet before the casing was removed. Sand was then added to the annulus extending from total depth to two feet above the screen. The sandpack was sealed by placing an additional two to three feet of bentonite above the sandpack. The remaining annulus was filled with a neat cement grout to approximately 3 ft. bgs. Slight field modifications were made to several IP locations due to proximity to walls and overhead obstructions. All injection points were finished with a flush mount cover and threaded caps. IP locations are shown on Figure 2.

Five monitoring wells (existing wells MP-3, MP-7, MW-16I, and MW-16D, and new well MP-8) were sampled prior to the in-situ injection event. In addition to the field indicator parameters (pH, temperature, specific conductance, dissolved oxygen (DO), oxidation/reduction potential (ORP), and turbidity), baseline sampling included the site-specific COCs, sulfate, total organic carbon (TOC), and ferrous iron. Post injection, these monitoring points will be monitored for the same suite of analyses, plus volatile fatty acids (VFAs). Monitoring point MP-8 was installed at the southeast corner of the injection array on March 2, 2016 to provide additional information on the efficacy of the remedial program. The baseline and post-remediation groundwater quality data will be presented in the October 2016 semi-annual progress report along with the annual site-wide sampling results.

IN-SITU SODIUM LACTATE INJECTIONS

Between March 22 and 25, 2016, Haley & Aldrich and its in-situ injection contractor, Geo Lab, conducted an in-situ injection event to stimulate biodegradation of chlorinated solvent contamination present in the subsurface. The Georgia Environmental Protection Division (EPD) was notified of this injection event on March 21, 2016. The injection event successfully emplaced 10,800 gallons of a sodium lactate and sodium bisulfite solution within the sixteen newly installed injection points. The in-situ injection program utilized 9,000 gallons of potable water, 1,800 gallons of a 60% sodium lactate solution, and 300 pounds of sodium bisulfite, an oxygen scavenger, to rapidly create anaerobic conditions and provide an organic hydrogen and carbon donor for stimulated biodegradation.

The injection event started at the most down gradient and impacted injection locations and proceeded towards the most upgradient and least impacted areas. This configuration was chosen to mitigate any plume migration due to the injection process as any contaminated groundwater would pass through a treated area. The injection event initially used a 4-injection point manifold, however to better monitor the injection activities, injections were conducted using individual dedicated pumps and separate mix tanks so that injection pressures and volumes could be regulated more precisely. Each injection point received approximately 675 gallons of the remedial solution with some limited variation due to short-circuiting of the injectate. An injection log summarizing the injection event is provided in Table 1.

CLOSING

As required in the VRP guidance a monthly summary of hours invoiced and a description of services provided since the last submittal is provided as Table 2. If you have any questions or need additional information, please do not hesitate to call Sean McGowan at 610.334.2701 or Mark Miesfeldt at 864.214.8751.

Sincerely yours,
HALEY & ALDRICH, INC.



Mark Miesfeldt
Project Manager

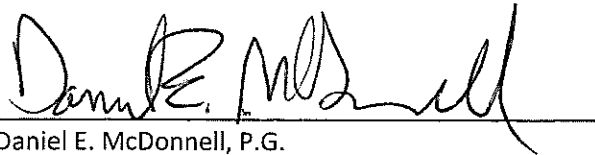


Daniel E. McDonnell, P.G.
Georgia Registration No. PG002083

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PROFESSIONAL GEOLOGIST CERTIFICATION

I certify that I am a qualified groundwater scientist who has received a post-graduate degree in the natural sciences, and have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses that enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this Semiannual Progress Report prepared for Carpenter Technology Corporation for the General Time site, located in Athens, Georgia, was prepared by myself and appropriate qualified subordinates working under my direction.



Daniel E. McDonnell, P.G.

Georgia Professional Geologist Registration No. 002083

4/14/16

Date



TABLES

INJECTION LOG

Project	Former General Time Facility	H&A File No.	38111-011
Location	Athens, Georgia	Project Manager	D. McDonnell
Client	Carpenter Technology Corporation	Field Representative	J. Yonts
Contractor	GeoLab	Date	3/22/2016 - 3/25/2016

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-2	20-30	20	30	15.75	133.3	666.67	800	3/25

Note: Concentration of sodium bisulfite decreased due to inaccuracy of scale.

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-3	20-30	24	26	18.52	129.2	645.8	775	3/24-3/25

Note: Concentration of sodium bisulfite decreased due to inaccuracy of scale.

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-4	20-30	24	32	14.58	87.5	437.5	525	3/24

Note: Daylighting occurred along the base of the wall towards the centrifuge room and in the trenches of the centrifuge room, injections terminated immediately.

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-5	20-30	20	28	18.06	108.3	541.7	650	3/24

Note: Daylighting occurred along the base of the wall towards the centrifuge room and in the trenches of the centrifuge room, injections terminated immediately.

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-6	20-30	20	30	18.75	112.5	562.5	675	3/23

Note:

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-7	20-30	15	32	18.75	112.5	562.5	675	3/22-3/23

Note: Digital meter not working correctly. Divided 2,700-gal of reagent between IP-7, IP-8, IP-10, and IP-11

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-8	20-30	20	24	18.75	112.5	562.5	675	3/22-3/23

Note: Digital meter not working correctly. Divided 2,700-gal of reagent between IP-7, IP-8, IP-10, and IP-11

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-9	20-30	22	34	20.5	133.25	666.75	800	3/23

Note: Added an additional 125-gal on reagent on 3/25. Concentration of sodium bisulfite decreased during last 125-gal of reagent due to inaccuracy of scale.

INJECTION LOG

Project	Former General Time Facility	H&A File No.	38111-011
Location	Athens, Georgia	Project Manager	D. McDonnell
Client	Carpenter Technology Corporation	Field Representative	J. Yonts
Contractor	GeoLab	Date	3/22/2016 - 3/25/2016

Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-10	20-30	15	20	18.75	112.5	562.5	675	3/22-3/23
Note: Digital meter not working correctly. Divided 2,700-gal of reagent between IP-7, IP-8, IP-10, and IP-11								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-11	20-30	20	24	20.5	133.25	666.75	800	3/22-3/23
Note: Digital meter not working correctly. Divided 2,700-gal of reagent between IP-7, IP-8, IP-10, and IP-11. Added an additional 125-gal on 3/25. Concentration of sodium bisulfite decreased during last 125-gal of reagent due to inaccuracy of scale.								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-12	20-30	22	35	18.75	112.5	562.5	675	3/23-3/24
Note: Daylighting occurred in MW-16I and existing monitoring points nearby. Corrected by securing nearby well covers.								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-13	20-30	32	34	10.42	62.5	312.5	375	3/24
Note: Daylighting occurred around the well head, injections terminated immediately.								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-14	20-30	22	34	18.75	112.5	562.5	675	3/23-3/24
Note: Daylighting occurred in MW-16I and existing monitoring points nearby. Corrected by securing nearby well covers.								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-15	20-30	24	36	18.75	112.5	562.5	675	3/24
Note:								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-16	20-30	20	34	18.75	112.5	562.5	675	3/24
Note:								
Injection Point	Injection Depth (ft)	Average Injection Pressure (psi)	Maximum Injection Pressure (psi)	Sodium Bisulfite (lbs)	Volume of Lactate (gal)	Volume of Chase Water (gal)	Total Volume of Reagents (gal)	Date of Injection
IP-17	20-30	28	40	15.75	112.5	562.5	675	3/24-3/25
Note: Concentration of sodium bisulfite decreased due to inaccuracy of scale.								

TABLE 2
TABULATED MONTHLY SUMMARY OF HOURS INVOICED BY HALEY & ALDRICH

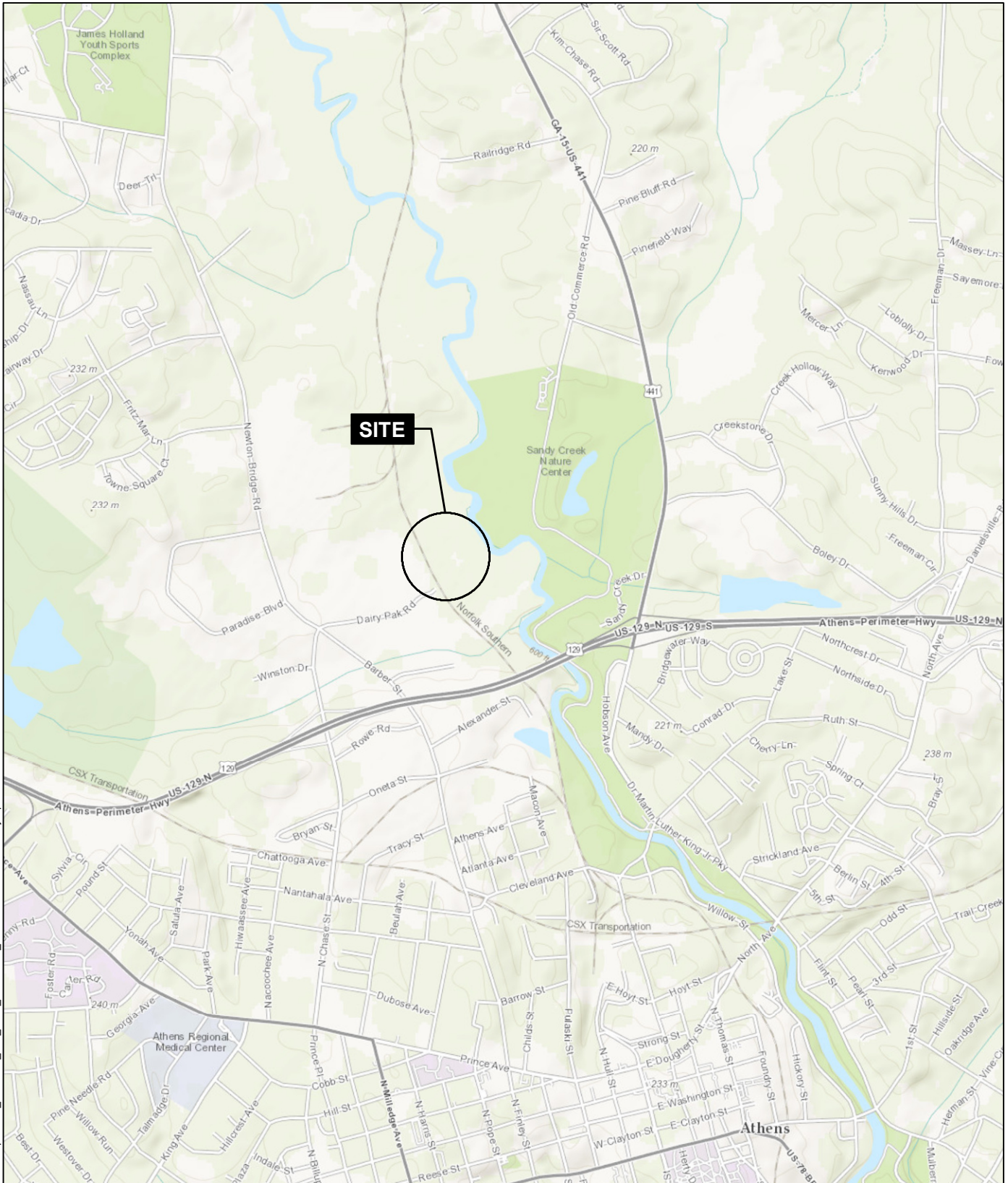
Period: September 2015 - April 2016
 General Time Corporation - Athens, GA
 Voluntary Remediation Program (HSI# 10355)

Month-Year	Hours	Type Service	Type Service	Description
September-15	5.25	PG	5.25	Project Management
	96.5	Support	96.50	Sample Collection
	15.5	Senior Geologist	15.50	Project Coordination
	1.75	Support	1.75	Report Preparation
October-15	14.0	PG	14.00	Project Management
	82.75	Support	82.75	Report Preparaton
	13.0	Senior Geologist	13.00	Report Preparation
	20.5	Administrative	20.50	Report Preparation
November-15	0.5	PG	0.50	Project Management
December-15	0.5	Support	0.50	Report Preparation
January-16	2.0	Senior Geologist	2.00	Project Coordination
	4.5	PG	4.50	Project Management
	2.25	Support	2.25	Technical
February-16	9.75	Support	3.25	Technical
	5.5	Senior Geologist	5.50	Project Coordination
	7.5	PG	7.50	Project Management
March-16	29.5	Senior Geologist	29.50	Project Coordination
	83.5	Support	80.75	Remediation
	9.5	PG	9.50	Project Management
April-16	3.5	Support	3.50	Technical
	7.0	Senior Geologist	7.00	Project Coordination
	23.25	Support	20.25	Report Preparation
	3.5	PG	3.50	Project Management

Note: This summary does not reflect time invested by Carpenter Technology and other contractors in evaluating site conditions and remedial options.

FIGURES

GIS FILE PATH: G:\38111_Carpenter\Global\GIS\Maps\2015_09\38111_000_0001_PROJECT_LOCUS.mxd — USER: ajcspe — LAST SAVED: 9/28/2015 2:45:17 PM



MAP SOURCE: ESRI
 USGS QUAD: ATHENS WEST
 SITE COORDINATES: 82°23'13"N, 33°58'50"

**HALEY
 ALDRICH**

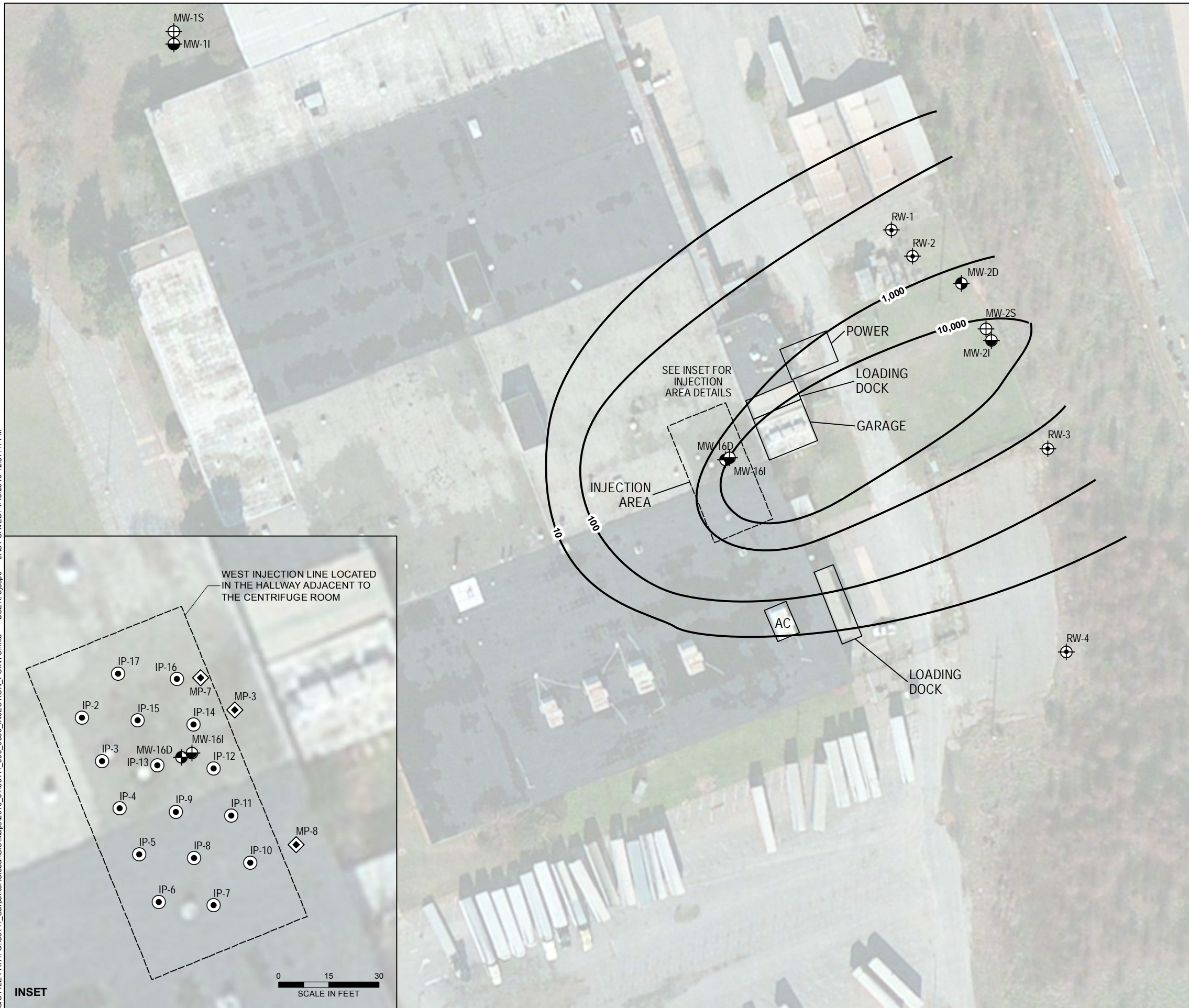
GENERAL TIME FACILITY
 ATHENS, GEORGIA

SITE LOCATION MAP








APPROXIMATE SCALE: 1 IN = 2000 FT
 OCTOBER 2015

FIGURE 1

GIS FILE PATH: G:\38111_Carpenter\Global\GIS\Maps\2016_04\38111_000_INJECTION_POINTS.mxd — USER: ajcspe — LAST SAVED: 4/13/2016 12:57:11 PM

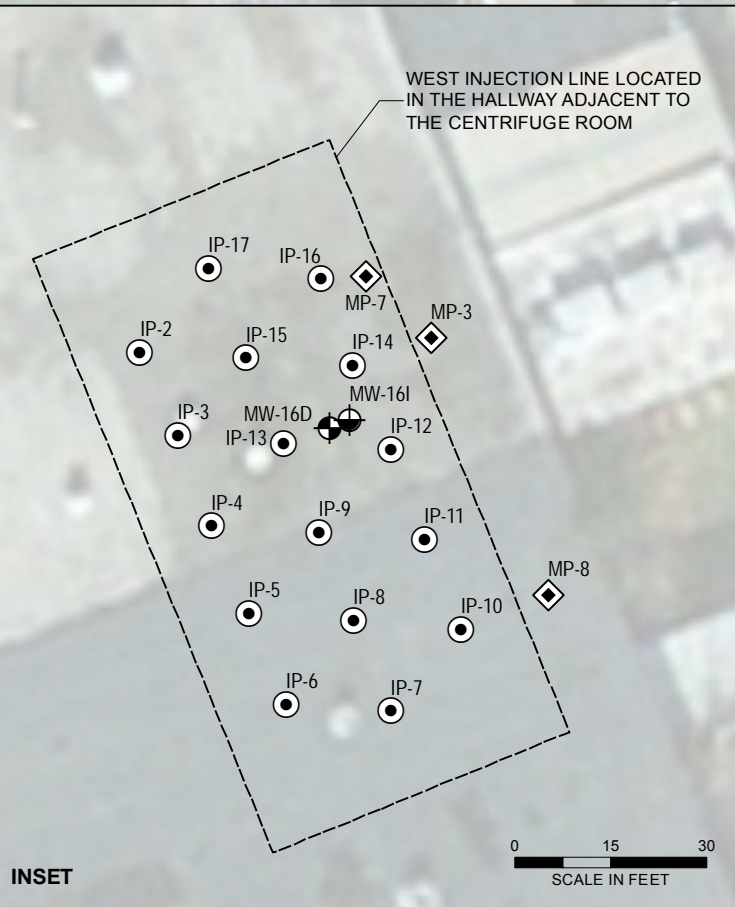


LEGEND

-  BASELINE AND POST-REMEDATION MONITORING WELL LOCATION
-  INJECTION POINT LOCATION
-  SHALLOW MONITORING WELL
-  INTERMEDIATE MONITORING WELL
-  DEEP MONITORING WELL
-  RECOVERY MONITORING WELL
-  TCE ISO-CONCENTRATION CONTOUR IN µg/L

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI



HALEY ALDRICH GENERAL TIME FACILITY
ATHENS, GEORGIA

**INJECTION POINTS AND
BASELINE POST-REMEDATION
MONITORING WELLS**

APRIL 2016

FIGURE 2