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1675 SPECTRUM DRIVE • LAWRENCEVILLE, GEORGIA 30043 • TEL (770) 962-5922 • FAX 962-7964

FIRST SEMI-ANNUAL PROGRESS REPORT BRIGHT HOUR TRUST PROPERTY 340 ARMOUR DRIVE ATLANTA, FULTON COUNTY, GEORGIA HSI #10894

SEA JOB #152-079

SUBMITTED:
DECEMBER 30, 2016

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December 30, 2016

Mr. Jason Metzger
Georgia Department of Natural Resources
Environmental Protection Division
205 Butler Street, S.E.
Floyd Towers East, Suite 1054
Atlanta, GA 30334

RE: First Semi-Annual VRP Progress Report
Bright Hour Trust Property
340 Armour Drive
Atlanta, Fulton County, Georgia
HSI #10894
SEA Job No. 152-079

Dear Mr. Metzger:

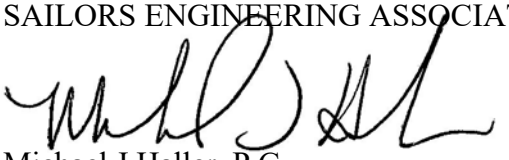
Sailors Engineering Associates, Inc. (SEA) appreciates this opportunity to submit this First Semi-Annual Progress Report for the Bright Hour Trust Property located at 340 Armour Drive, Atlanta, Fulton County Georgia (the "Property"). The purpose of this report is to provide an update of the activities and findings since our March 15, 2015 VIRP Application.

I certify, under penalty of law, that the enclosed electronic copy is complete, identical to the paper copy, and virus free.

If you have any questions or need additional information, please contact us at (770) 962-5922. We look forward to working with you on this project.

Respectfully submitted,

SAILORS ENGINEERING ASSOCIATES, INC.



Michael J Haller, P.G.
Manager, Environmental Engineering

w/enclosures
cc: Mr. James Sochovka, Key Investments, Inc and Bright Hour Trust w/enclosures

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VOLUNTARY INVESTIGATION AND REMEDIATION PLAN CERTIFICATION

"I certify under penalty of law that this report and all attachments were prepared by me or under my direct supervision in accordance with the Voluntary Remediation Program Act (O.C.G.A. Section 12-8-101, et seq.). I am a professional engineer/professional geologist who is registered with the Georgia State Board of Registration for Professional Engineers and Land Surveyors/ Georgia State Board of Registration for Professional Geologists and I have the necessary experience and am in charge of the investigation and remediation of this release of regulated substances.

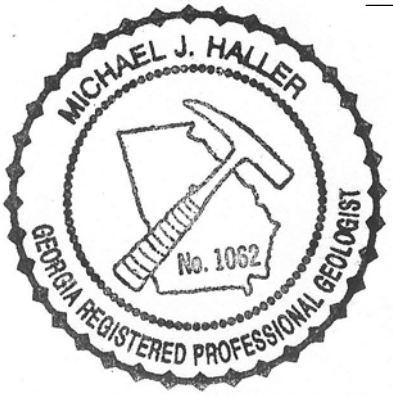
Furthermore, to document my oversight of the Voluntary Remediation Plan development, implementation of corrective action, and long term monitoring, I have attached a monthly summary of hours invoiced and description of services provided by me to the Voluntary Remediation Program participant since the previous submittal to the Georgia Environmental Protection Division.

The information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Michael J. Haller, P.G. #1062
Printed Name and GA PE/PG Number

December 30, 2016
Date

Signature and Stamp



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1.0 Introduction

1.1 Purpose

The purpose of this First Semi-Annual Voluntary Remediation Program Progress Report is to discuss the current site conditions and any actions taken since the initial Voluntary Investigation and Remediation Program (VIRP) application.

2.0 Updated Conceptual Site Model

SEA has updated Conceptual Site Model based on the findings of additional research of the Property's history. As noted in the June 27, 2016 VIRP Comment letter, the historic use of the Property has been evaluated as a potential source of a release of lead and arsenic.

Below is a timeline of the historic uses at the Property:

- Prior to 1901, the Property was undeveloped except for the rail road development along the northwestern and southeastern Property boundaries which occurred in the mid 1800's.
- The Armour Fertilizer Works then operated at the Property from the early 1900's until approximately 1958 when the Property was sold.
- Walker Hauling Company, Inc purchased the Property in 1959 and later sold the Property to Key Investments in 1963.
- Key Investments leased the Property to Walker Hauling Company, Fleet Transport Company, Maybelle Transport, Montgomery Tank Lines and Quality Carriers, Inc. and beginning in July 2007 to the current occupant USA Ready Mix, LLC.
- USTs were installed on the Property at an undetermined date and were known to be operated by Fleet Transport until they were removed in 1996;
- Releases of ferric chloride in 1992 and 1994 and sulfuric acid occurred in 1997 during railcar transfer operations.

Each prior use is discussed below. In addition to a discussion of prior uses, the use of slag as fill material at the Property is also discussed.

2.1 Armour Fertilizer Works

The Armour Fertilizer works was located in the southwestern quadrant of the Property at the intersection of the CSX Rail Road (formerly Seaboard Airline Rail Road) and the Norfolk Southern Rail Road (formerly Southern Rail Road). Armour Fertilizer Works operated at the Property and the adjoining property to the southeast (currently the LaFarge concrete plant) from the early 1900's until approximately 1958 when the property was sold. Review of aerial photographs indicates the Armour Fertilizer works plant was present at the Property in the 1938 through 1955 photographs, but had been razed by 1960. No evidence of the demolition waste could be seen in the 1960 photograph. The current grade of the Property is similar to the grade of the Property depicted in aerial photographs from the 1930s (the oldest aerial photograph reviewed), 1950s, and 1960. Further, a site figure from approximately 1901 includes notes that

suggest that the grade of the Property has not materially changed since 1901. Figure 1 attached to this report is a copy of the 1901 site sketch.

Armour Fertilizer Works manufactured phosphate fertilizers including phosphoric acid. Other products included sulfuric acid for use in the manufacture of phosphoric acid and as a separate product. Sulfuric acid was an important product during World War I and according to historic records, was in high demand up until 1918. A document titled *The Manufacture of Sulfuric Acid in the United States* (Department of the Interior Bulletin 184, 1920) list the Armour Fertilizer Works as a sulfuric acid plant which uses the chamber process. The chamber process used wood and later stone chambers lined with lead sheeting where sulfur dioxide is oxidized to sulfuric acid. The sulfur dioxide was often produced by heating sulfur or pyrite. A 1921 figure for the proposed location of rail track for the Armour Fertilizer Works identifies at least four separate buildings on the Property. While the descriptions of certain site features and buildings are legible, others are not readable due to the age of the document and copying of the original 1921 document. The buildings on the Property are labeled as "Plant" (and possibly another word before Plant which is not legible on the figure) and "Furnace House" in the northern portion of the site and "Power House" in the southern portion. To the south on the current LaFarge property, the building is labeled "Storage", with a portion of the "Storage" building labeled with "Acid" and possibly another unreadable word after acid. A copy of the 1955 aerial photograph with our sampling points is attached as Figure 2 to this report. That figure also includes the descriptions of the known site features.

The sulfuric acid produced at the facility was either shipped off site or used to produce phosphoric acid by combining the sulfuric acid with phosphate rock. According to our research, the primary wastes produced by the manufacture of phosphate fertilizer included phosphogypsum and acid mists. According to the literature reviewed, the liquids containing the phosphogypsum would be placed in lagoons and allowed to settle or were disposed of in an aquatic environment. It is unclear in the 1938 aerial photograph if any settling ponds are present. However, in the 1940 photograph, an area which could be a settling pond is visible between the "Plant" and the rail line on the north and the 1955 photograph has what appears to be a rectangular structure in the northwest portion of the Property that could be a settling pond. No gypsum material was encountered in any of the borings completed at the Property.

In the manufacture of sulfuric acid using pyrite, the burning of pyrite produced an iron rich slag with concentrations of minor impurities including arsenic. Lead was not a common byproduct of the pyrite burning process. Although it is possible that the demolition of the lead lined chambers could have resulted in a release of lead at the site, SEA did not find any evidence of demolition debris at any depth in any of the borings completed across the Property.

2.2 Fleet Transport Spill Records

According to an Environmental Data Resources (EDR) inquiry for the Property, three (3) releases associated with the transfer operations by Fleet Transport occurred between 1992 and 1997. A release of a reported 25,212.5 gallons of ferric chloride occurred on August 1, 1992. A second release of 20 gallons of ferric chloride occurred on August 15, 1994. Ferric chloride is

used in the waste water industry as a flocculant and for odor control. No additional information with regard to the ferric chloride releases was found.

According to the 2008 Phase II ESA prepared for the Property, a third release of sulfuric acid occurred in 1997 along the rail spur during transfer from a rail car to a tanker when a worker failed to close a valve on the cargo trailer. (The exact location of the third release along the rail spur is unknown.) The release was stopped when the worker noticed it and stopped loading. The release was not reported until it was discovered two days later by a supervisor and according to the report, was cleaned up by Ferguson Harbour. No additional information pertaining to the cleanup was available for our review. Testing along the rail line did detect low pH values in the shallow sample at the 2008 C-2 sample location. Figure 3 attached to this report is a 2002 aerial photograph with the 2008 and 2015 sampling points depicted. The suspected area of acid rail car release is also shown.

2.3 Former USTs

According to the 2008 Phase II report and a review of the files at the Underground Storage Tank Management Program (USTMP) offices in Atlanta, Georgia, two (2) underground storage tanks (USTs) were removed from the site in 1996 and granted no further action required (NFAR) status. Testing near the location of the former USTs was conducted in 2008 and again in 2015. Figure 4 attached to this report is a 1999 aerial photograph with the 2008 and 2015 sampling points depicted. The approximate area of the former USTs is also shown in Figure 4.

2.4 Fill Material

Fill material consisting of slag was detected at the Property along the rail line and near the western Property boundary. The slag contained levels of lead and arsenic above the Type 3 and Type 4 RRS. The source and timing of the placement of the fill material could not be determined based on our research. However, SEA did obtain information noting that the same slag fill appears to be present along the rail line both east and west of the Property and suggests that the material may be related to the construction of the rail line, and therefore, not associated with the historic onsite activities. While the fill located near the western Property boundary is not located in an area where either a current or known former rail line was located, it could have been placed there as part of the rail line construction. If pyrite was used to produce the sulfuric acid during the Armour Fertilizer Works activities, an iron rich slag would have been a by-product of the process and could be the source of at least some of the slag observed. However, the Armour Fertilizer Works activities may not be the source of the slag material because aerial photographs and figures indicate that the grade of the Property did not change significantly from 1938 until 1955 and the 1901 sketch of the property does not indicate significant deviation from the topography which currently exists.

2.5 Potential for Erosion of Metals Containing Soils

The slag fill material appears to be stable and no evidence of erosion was observed. SEA does not anticipate erosion to be a source of transport of onsite materials. The existing concrete and proposed additional areas of concrete will further prevent erosion from being a source of off-site

migration. Figure 6 – Overland Run-off Route shows the current surface water pathways at the Property.

The historic surface water pathways appear to be similar to the current conditions since the available information and historical aerial photographs indicate no material onsite topographic changes since 1901. Prior to the construction of the rail road, it is suspected that surface water pathways were generally in the northwest direction, from the current LaFarge property toward Peachtree Creek.

3.0 Vapor Intrusion Evaluation

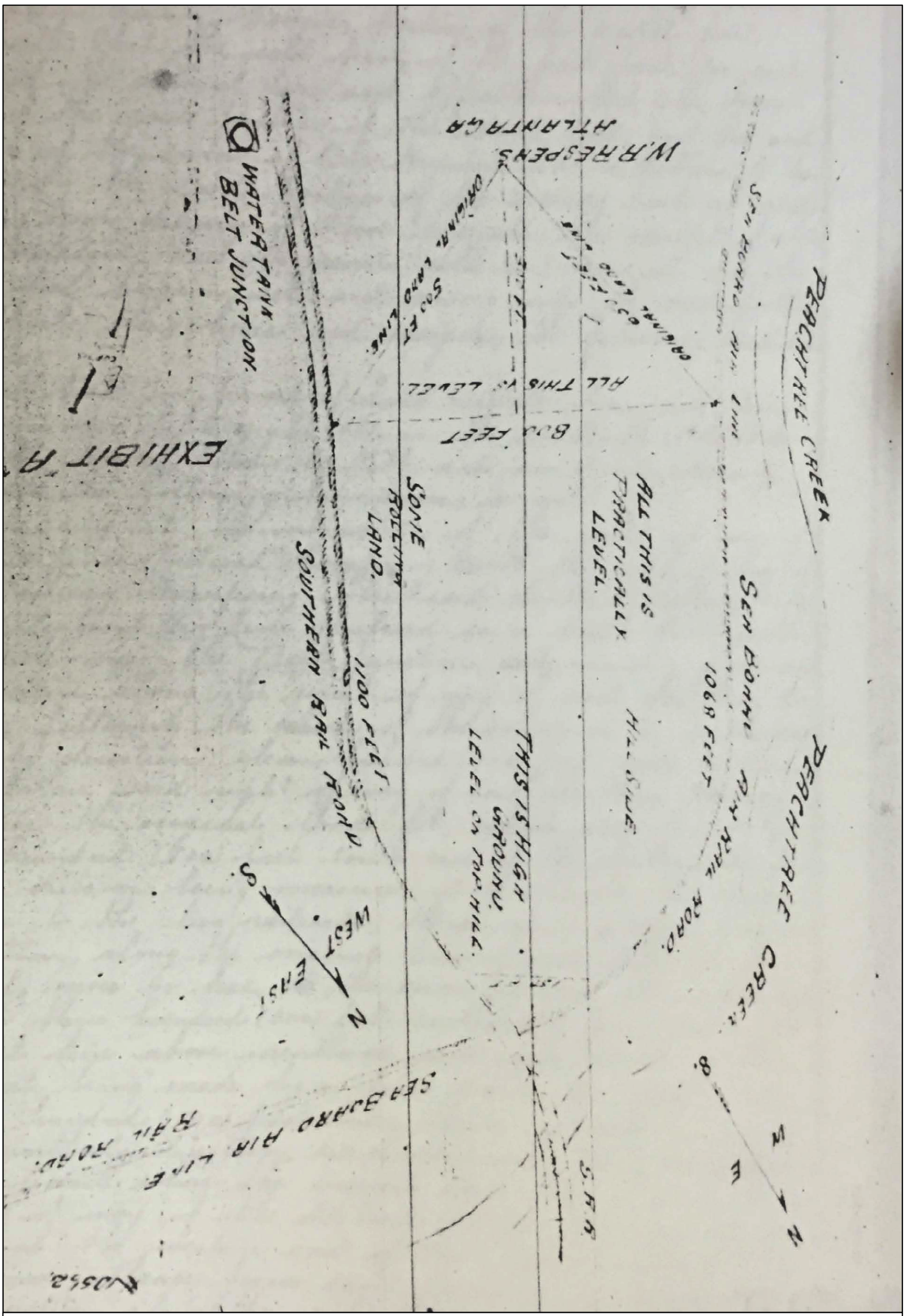
The potential for vapor intrusion to current and potential future site structures was evaluated using qualitative and modeling approaches. The current extent of volatile organic compounds (VOC) in groundwater above the default Type 3 RRS is limited to trichloroethene (TCE) in the northeast portion of the Property. No current site structures are present in this area.

In order to evaluate the potential for vapor intrusion for a theoretical future structure in this area, SEA used the USEPA Vapor Intrusion Screening Level (VISL) Calculator to determine if the TCE has the potential to exceed the EPD risk value for carcinogens of 1E-5 of a hazard quotient of 1. Using the May 2016 Regional Screening Levels in the VISL Calculator, the carcinogenic risk was calculated to be 1.8E-8 and the hazard quotient was 6.3E-3. Therefore, no material vapor risk exists under the current use of the Property. Appendix 3 includes the VISL Calculator worksheet.

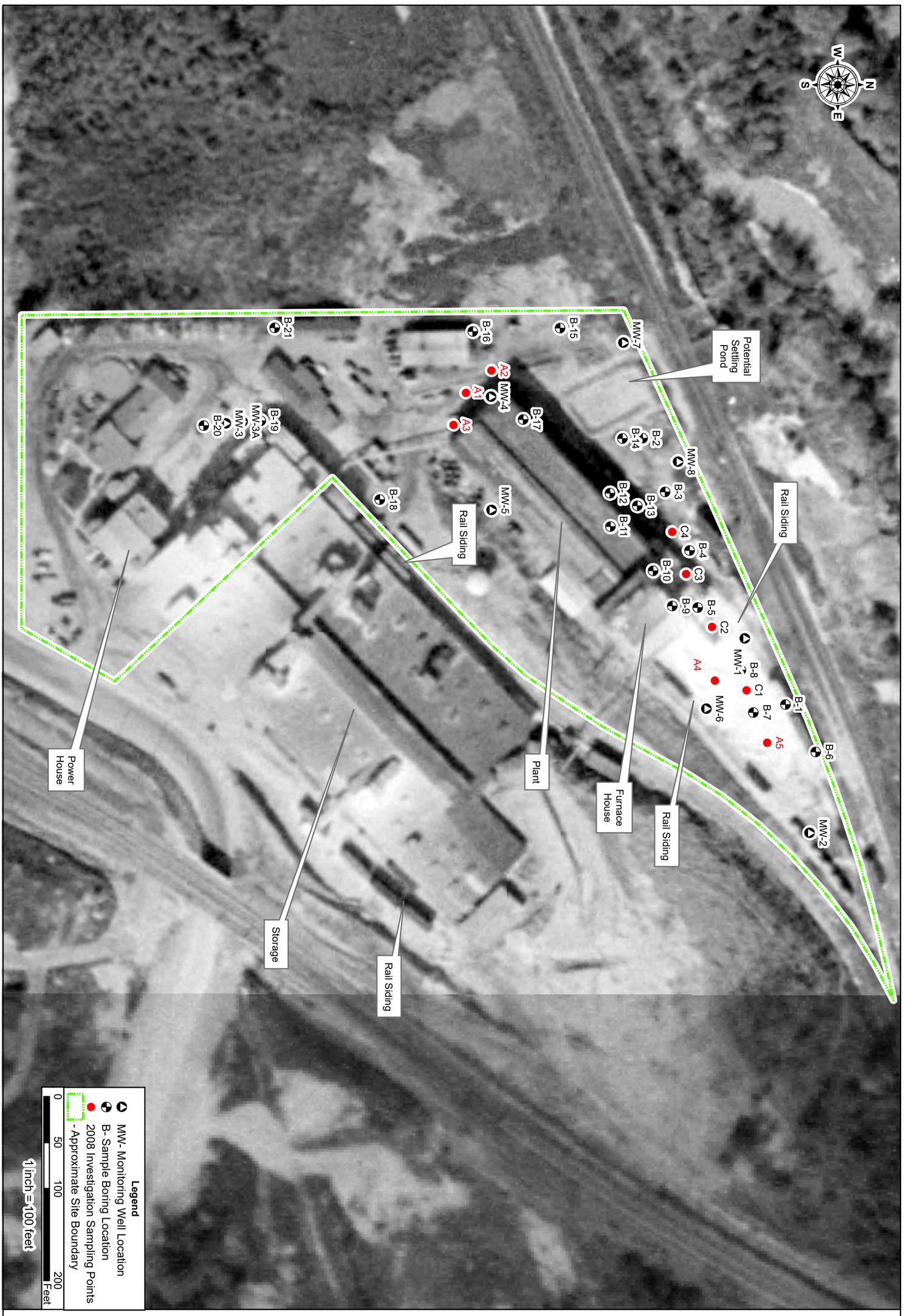
4.0 Delineation Standards and Site Risk Reduction Standards

The delineation standards for the Property have been tabulated and are presented in Table 1 attached to this report. The Risk Reduction Standards for soil selected for the Property are the Type 3 or Type 4 RRS for all site potential contaminants of concern (COCs), with the exception of arsenic, barium, lead, mercury, selenium and silver. Type 5 RRSs have been chosen for arsenic, barium, lead, mercury, selenium and silver impacts. Since the Property was not listed on the Hazardous Site Inventory for a release to groundwater, certification to a RRS for groundwater is not required. Appendix 4 includes the Type 4 RRS calculations.

Appendix 1: Figures



SEA SAILORS ENGINEERING ASSOCIATES, INC. ENVIRONMENTAL/GEOTECHNICAL 1675 SPECTRUM DRIVE LAWRENCEVILLE, GEORGIA 30043 (770) 962-5922 FAX 962-7964	1901 PROPERTY SKETCH. FIGURE 1	BRIGHT HOUR TRUST PROPERTY 340 Armour Drive Atlanta, Fulton County, Georgia Job No. 152-079 SEA-2203



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SAMPLE LOCATION PLAN ON 1955 AERIAL FIGURE 2

BRIGHT HOUR TRUST PROPERTY

340 Armour Drive
Atlanta, Fulton County, Georgia

Job No. 152-079

SEA-2203

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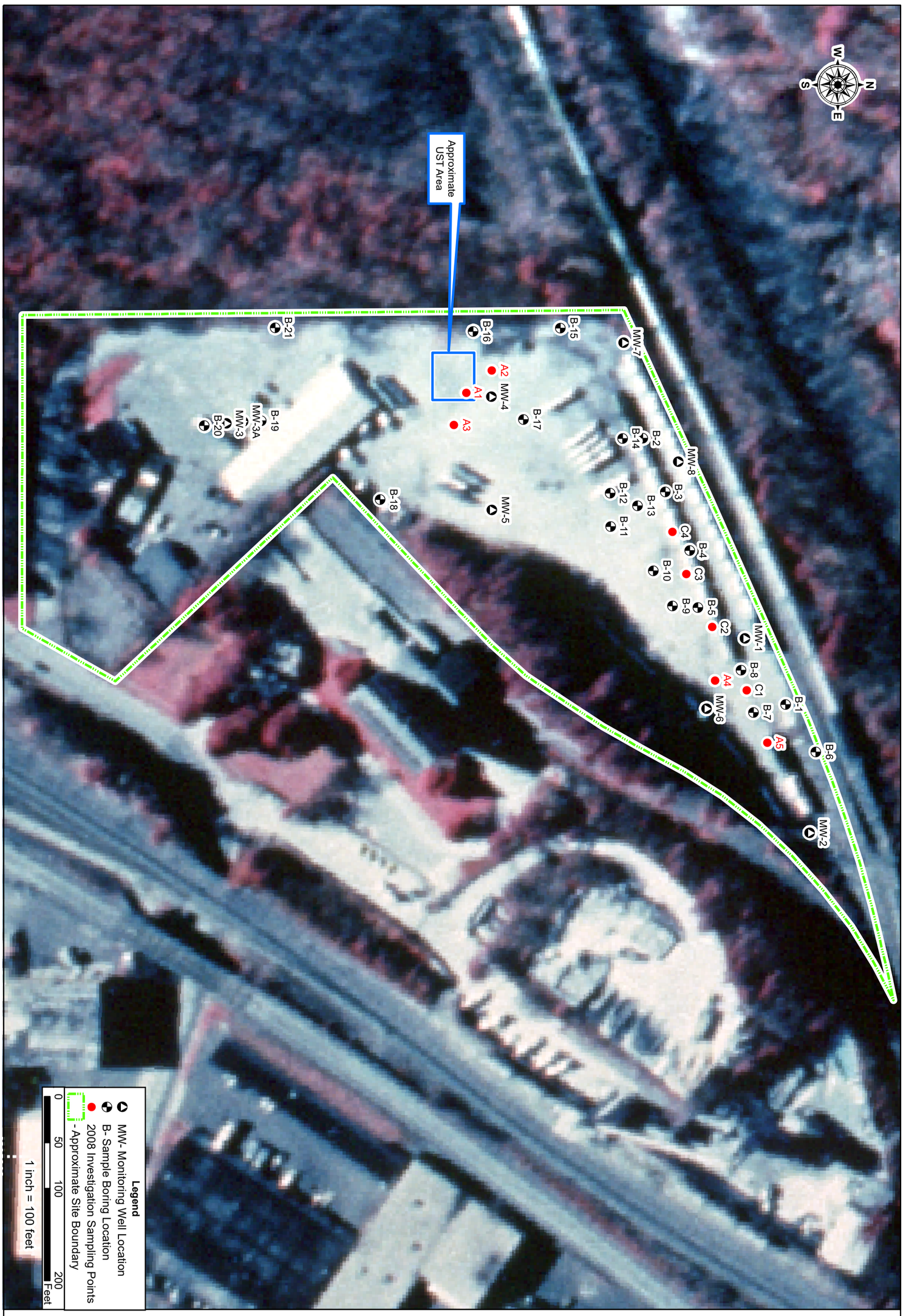
SAMPLE LOCATION PLAN ON 2002 AERIAL FIGURE 3

BRIGHT HOUR TRUST PROPERTY

340 Armour Drive
Atlanta, Fulton County, Georgia

Job No. 152-079

SEA-2203



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SAMPLE LOCATION PLAN ON 1999 AERIAL FIGURE 4

BRIGHT HOUR TRUST PROPERTY

340 Armour Drive
Atlanta, Fulton County, Georgia

Job No. 152-079

SEA-2203

N
W E
S

Area of Slag Fill

CSX RAILROAD

Arc 257.98'
Rad 10200.21'
N 62°28'55"E
257.97'

N 58°27'46"E 3.63'
TO A 1" PIPE FOUND
IPF 1.04' INSIDE R.R. R/W

S 58°37'35"W 42.40'
S 54°29'35"W 50.00'
S 48°56'35"W 50.00'
S 44°12'35"W 50.00'
S 40°00'35"W 50.00'
S 35°16'35"W 50.00'
S 28°11'35"W 50.00'
S 25°25'35"W 50.00'
S 26°35'35"W 50.00'
S 28°27'35"W 50.00'
S 31°44'35"W 50.00'
S 37°42'35"W 50.00'
S 42°35'35"W 50.00'
S 43°01'35"W 200.00'
S 47°00'00"E 201.45'
S 26°14'26"W 116.90'

BEARINGS & DISTANCES ALONG LINE CALCULATED FROM D.B. 48662, PG. 269-272

Now or Formerly
SIGNAL MOUNTAIN SALES COMPANY LLC.
DB. 48662, PG. 269-272

Now or Formerly
BROOKWOOD HILLS COMMUNITY CLUB INC.
DB. 48662, PG. 269-272

MW-1 MW-2 MW-3 MW-3A MW-4 MW-5 MW-6 MW-7 MW-8
B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10 B-11 B-12 B-13 B-14 B-15 B-16 B-17 B-18 B-19 B-20 B-21
C1 C2 C3 C4
A1 A2 A3 A4 A5

CHAIN LINK FENCE
CHAIN LINK FENCE DOWN AT THIS POINT
CONC. BARRIER WALL CLEAR 2.9'
CONC. WALL CLEAR 1.4'
50.00'
RAIL LINE NOT IN USE BUT VISABLE
THESE TRACKS IN USE
IPF 1/2" REBAR
IPS
PP
SIGN
SHED
CONC. DRIVE
32.7' BC-BC
L.L. 102
L.L. 58
APPROX. LAND LOT LINE
STEEL TRACH MARKED CORNER
S 88°18'04"W 339.65

?

NOTE: ALL INTERIOR STRUCTURES & UTILITIES NOT FIELD LOCATED AT CLIENTS REQUEST

Legend
- MW- Monitoring Well Location
- B- Sample Boring Location
- 2008 Investigation Sampling Points
- Slag Fill Line
- Approximate Site Boundary

0 50 100 200 Feet

1 inch = 100 feet

BRIGHT HOUR TRUST PROPERTY
340 Armour Drive
Atlanta, Fulton County, Georgia
Job No. 152-079

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AREA OF SLAG FILL PLAN
FIGURE 5

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OVERLAND RUN-OFF ROUTE

FIGURE 6

BRIGHT HOUR TRUST PROPERTY

340 Armour Drive
Atlanta, Fulton County, Georgia

Job No. 152-079

12/21/2016

Appendix 2: Tables

Bright Hour Trust Property
340 Armour Drive
Atlanta, Fulton County, Georgia 30324
SEA Job #152-079
HSI# 10894

Table 1 - Delineation Standards

Compound	Delineation Standard (mg/Kg)	Type 3 RRS (mg/Kg)	Type 4 RRS (mg/Kg)	Highest Detected (mg/Kg)
1,2,4-trimethylbenzene	Not Regulated under HSRA			2.6
1,3,5-trimethylbenzene	Not Regulated under HSRA			0.59
2-Methylnaphthalene	Not Regulated under HSRA			13
Acenaphthene	300	300		13
Acenaphthylene	130	130		0.65
Acetone	400	400		0.16
Anthracene	500	500		1.1
Arsenic	20	38.1		1490
Barium	1000	1000	1648	2200
Benz(a)anthracene	5	5		4.4
Benzo(a)pyrene	1.64	1.64	7.84	3.9
Benzo(b)fluoranthene	5	5	78.4	5.1
Benzo(g,h,i)perylene	5	500		3.3
Benzo(k)fluoranthene	500	5		1.9
Cadmium	2	39		31
Carbazole	Not Regulated under HSRA			0.44
Carbon Disulfide	400	400		0.015
Chromium	100	108.9		98
Chrysene	5	5		4.8
cis-1,2-Dichloroethene	7	7		0.044
Copper	100	1500		580
Dibenz(a,h)anthracene	2.047	5		0.62
Dibenzofuran	Not Regulated under HSRA			13
Ethylbenzene	70	70		0.11
Flourene	500	360		6.3
Fluoranthene	360	500		11
Indeno(1,2,3-cd)pyrene	5	5		2.5
Isopropylbenzene	21.88	21.88		0.18
Isopropyltoluene	Not Regulated under HSRA			0.41
Lead	75	400		53200
Mercury	0.5	17		172
Methylcyclohexane	Not Regulated under HSRA			0.0056
n-Propylbenzene	Not Regulated under HSRA			0.32
Naphthalene	100	100		2.6
Nickel	50	420		21
Phenanthrene	110	110		31
Pyrene	500	500		14
sec-Butylbenzene	Not Regulated under HSRA			0.61
Selenium	2	36		77
Silver	2	10		58
Tetrachloroethene	0.5	0.5		0.032
Trichhloroethene	0.5	0.5		0.19
Xylenes	1000	1000		0.14
Zinc	100	2800		790

Highlighted values exceed Type 3 or Type 4 RRS

Appendix 3: Vapor Intrusion Assessment (USEPA *OSWER VISL Calculator*)

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	19	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ
79-01-6	Trichloroethylene	1.8E-01	5.41E-02	1.8E-08	6.2E-03

Inhalation Unit Risk IUR ($ug/m^3)^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator
see note	I	2.00E-03	I	TCE

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	Atnc_GW	25
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	25
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	250
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	8

(2) **Generic Attenuation Factors:**

Source Medium of Vapors	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
	mIURTCE_R_GW	1.00E-06	mIURTCE_C_GW	0.00E+00	mIURTCE_GW	0.00E+00
	IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06	IURTCE_GW	4.10E-06

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 25 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

Appendix 4: Risk Reduction Standards Calculations

RRS Table 1
Bright Hour Trust
340 Armour Drive
Atlanta, Fulton County, Georgia
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HSI# 10894

Risk Reduction Standards Evaluation

CAS	Chemical	NC (mg/Kg)	Type1/3 GW	Type 1/3 GWx100	App3 Table 2	Carcinogenic Equ 6	Non-Carcinogenic Equ 7	Type 3 RRS >2' (mg/Kg)	Type 3 RRS <2' (mg/Kg)	Type 4 GW (mg/L)	Type 4 Cw term	Type 4 SSL	Default Type 4 RRS (mg/Kg)
7440-39-3	Barium	500	2	200	1000	NA	364690.5588	1000.0000	1000.0000	0.0015	2.0000	1648.0000	1648.0000
50-32-8	Benzo(a)pyrene	1.64	0.0002	0.02		7.8396	NA	1.6400	1.6400	0.0039	0.0039	91.7680	7.8396
205-99-2	Benzo(b)fluoranthene	5	0.0002	0.02		78.3964	NA	5.0000	5.0000	0.0391	0.0391	936.4242	78.3964

RRS Table 2
Bright Hour Trust
340 Armour Drive
Atlanta, Fulton County, Georgia
SEA Job #152-079
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Factors Summary

														RfDi=RfCi*20/70			Sfi=IUR*70/20*1000			
		MW	H'	H=H'/41	Density (g/cm^3)	Di,a	Di,w	Koc	Kd	S	VOC	VF	Inhalation RfC (mg/m^3)	Inhalation RfD - Chronic (mg/kg-day)	Oral RfD - Chronic (mg/kg-day)	IUR $(ug/m^3)^{-1}$	Inhalation Slope Factor [1/(mg/kg-day)]	Oral Slope Factor [1/(mg/kg-day)]	Carcinogen Class	Target Cancer Risk
7440-39-3	Barium	139.36		0.00E+00	3.62				4.10E+01	0.00E+00	0	NA	5.00E-04	1.43E-04	2.00E-01		0.00E+00			NA
50-32-8	Benzo(a)pyrene	252.32	1.87E-05	4.56E-07		4.76E-02	5.56E-06	5.87E+05		1.62E-03	0	NA		0.00E+00		1.10E-03	3.85E+00	7.30E+00	B	1.00E-05
205-99-2	Benzo(b)fluoranthene	252.32	2.69E-05	6.56E-07		4.76E-02	5.56E-06	5.99E+05		1.50E-03	0	NA		0.00E+00		1.10E-04	3.85E-01	7.30E-01	B	1.00E-05

RRS Table 3
Bright Hour Trust
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Atlanta, Fulton County, Georgia
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RAGS Equation 6 Non-Residential Soil - Carcinogenic Effects

		Adult	
C	chemical concentration in soil (mg/kg)		calculated
TR	target cancer risk		chemical specific
SF_o	oral cancer slope factor((mg/kg-day)$^{-1}$)		chemical specific
SF_i	inhalation cancer slope factor((mg/kg-day)$^{-1}$)		chemical specific
AT	averaging time (yr)	70	default
EF	exposure frequency (days/year)	250	default
BW	body weight (Kg)	70	default
ED	exposure duration (yr)	25	default
IR_S	daily soil ingestion rate (L/day)	50	default
IR_a	daily inhalation rate (m^3/day)	20	default
PEF	Particulate emision factor (m^3/kg)	4.63e9	default
VF	soil to air volatilization factor (m^3/kg)		from RAGS eq. 8

$$C = \frac{TR \times BW \times AT \times 365 \text{ days/year}}{EF \times ED \times [(SF_o \times 10^{-6} \text{ kg/mg} \times IR_s) + (SF_i \times IR_a \times [1/VF + 1/PEF])]}$$

Chemical	C_{adult}		SF_o	SF_i	VF	TR
Barium	NA				NA	NA
Benzo(a)pyrene	7.84E+00		7.30E+00	3.85E+00	NA	1.00E-05
Benzo(b)fluoranthene	7.84E+01		7.30E-01	3.85E-01	NA	1.00E-05

RRS Table 4
Bright Hour Trust
340 Armour Drive
Atlanta, Fulton County, Georgia
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RAGS Equation 7 Non-Residential Soil - Non-Carcinogenic Effects

Adult

C	chemical concentration in soil (mg/L)		calculated	
THI	target hazard index	1	default	
RfD_o	inhalation cancer slope factor((mg/kg-day)$^{-1}$)		chemical specific	
RfD_i	oral cancer slope factor((mg/kg-day)$^{-1}$)		chemical specific	
BW	body weight (Kg)	70	default	
AT	averaging time (yr)	25	equal to ED	
EF	exposure frequency (days/year)	250	default	
ED	exposure duration (yr)	25	default	
IR_s	soil ingestion rate (mg/day)	50	default	
IR_a	daily inhalation rate (m^3/day)	20	default	
PEF	Particulate emision factor (m^3/kg)	4.63E+09	default	
VF	soil to air volatilization factor (m^3/kg)		from RAGS eq. 8	

$$C = \frac{THI \times BW \times AT \times 365 \text{ days/year}}{EF \times ED \times [((1/RfD_o) \times 10^{-6} \text{ kg/mg} \times IR_s) + ((1/RfD_i) \times IR_a \times [1/VF + 1/PEF])]}$$

Chemical	C_{adult}		RfD_o	RfD_i	VF
Barium	3.65E+05		2.00E-01	1.43E-04	NA
Benzo(a)pyrene	NA				NA
Benzo(b)fluoranthene	NA				NA

RRS Table 5
Bright Hour Trust
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RAGS Equation 8 Soil-to-air Volatilization Factor

VF	volatilization factor (m^3/kg)		calculated
LS	length of side of contaminated area (m)	45	default
V	wind speed in mixing zone (m/s)	2.25	default
DH	diffusion height (m)	2	default
A	area of contamination (cm^2)	20,250,000.00	default
D_{ei}	effective diffusivity (cm^2/s)	$D_i \times E^{0.33}$	calculated
E	true soil porosity	0.35	default
K_{as}	soil/air partion coefficient (g soil/cm^3 air)	$(H/K_d) \times 41$	calculated
p_s	true soil density or particulate density (g/cm^3)	2.65	default
T	exposure interval (s)	7.90E+08	default
D_i	molecular diffusivity (cm^2/s)		chemical specific
H'	Henry's law constant (dimensionless)		chemical specific
H	Henry's law constant (atm-m^3/mol)	H'/41	calculated
K_d	soil-water partition coefficient (cm^3/g)	$K_{oc} \times OC$	calculated
K_{oc}	organic carbon partition coefficient (cm^3/g)		chemical specific
OC	organic carbon content of soil (fraction)	0.02	default
α			calculated

$$VF = \frac{(LS \times V \times DH)}{A} \times \frac{(3.14 \times \alpha \times T)^{1/2}}{(2 \times D_{ei} \times E \times K_{as} \times 10^{-3}\ kg/g)}$$

where:

$$\alpha\ (cm^2/s) = \frac{(D_{ei} \times E)}{E + (p_s)(1-E)/K_{as}}$$

Chemical	VF	D_{ei}	K_{as}	D_i	H'	H	K_d	K_{oc}	α
Barium	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E+01	0.00E+00	#DIV/0!
Benzo(a)pyrene	NA	3.37E-02	1.59E-09	4.76E-02	1.87E-05	4.56E-07	1.17E+04	5.87E+05	1.09E-11
Benzo(b)fluoranthene	NA	3.37E-02	2.24E-09	4.76E-02	2.69E-05	6.56E-07	1.20E+04	5.99E+05	1.53E-11

RRS Table 6
Bright Hour Trust
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Default Type 4
Soil Screening Level

SSL=Cw * Daf * [Kd + (Qw +Qa * H')/Rb]

Where:

Soil screening level	mg/Kg	SSL		Calculated
Dilution Factor	dimensionless	Daf	20	Default for <1 acre source
Target soil lechate concentration	mg/L	Cw		Chemical specific
soil water partition coefficient	L/Kg	Kd		Calculated (Koc x foc)
Fraction of organic carbon	g/g	foc	0.002	Default
organic carbon partition coefficient	L/Kg	Koc		Chemical specific
Water filled soil porosity	Lw/Ls	Qw	0.3	Default
Air filled soil porosity	La/Ls	Qa	0.13396	Default
Henry's Law constant	dimensionless	H'		Chemical specific
soil bulk density	Kg/L	Rb	1.5	Default

CAS	Compound	SSL	Cw	Kd	Koc	H'
7440-39-3	Barium	1.65E+03	2.0000	4.10E+01	0.00E+00	0.00E+00
50-32-8	Benzo(a)pyrene	9.18E+01	0.0039	1.17E+03	5.87E+05	1.87E-05
205-99-2	Benzo(b)fluoranthene	9.36E+02	0.0391	1.20E+03	5.99E+05	2.69E-05

Appendix 5: Summary of Services and Professional Hours

Bright Hour Trust Property
340 Armour Drive
Atlanta, Fulton County, Georgia 30324
SEA Job #152-079
HSI# 10894

Summary of Activities and Professional Hours
1st Semi-Annual Progress Report - December 2016

Activity	Professional Hours
Hiistoric Research	46
Vapor Modeling	2
Semi-Annual Report Preparation	24