# OCTOBER 2014 SEMI-ANNUAL VOLUNTARY REMEDIATION PLAN PROGRESS REPORT

139 Brampton Road

Savannah, Chatham County, Georgia

HSI Site No. 10208

Prepared on behalf of:

**Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey**
c/o Dwight Feemster, Esq
Duffy Feemster, LLC
and
**Rheem Manufacturing Company**
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Prepared by:

**AMEC Environment & Infrastructure, Inc.**
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October 30, 2014

Project No. 6121-09-0220

October 30, 2014

Mr. Derrick Williams
Program Manager
Hazardous Sites Response Program
Georgia Environmental Protection Division
2 Martin Luther King, Jr. Drive, SE
Suite 1462 East Floyd Tower
Atlanta, Georgia 30334

Subject: **October 2014 Semi-Annual Voluntary Remediation Plan Progress Report**
**139 Brampton Road (Former Rheem Manufacturing)**
**Savannah, Chatham County, Georgia**
**HSI Site No. 10208 Tax Parcel ID#1-0720-01-002**

Dear Mr. Williams:

On behalf of Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey, and Rheem Manufacturing Company, AMEC Environment & Infrastructure, Inc. (AMEC) respectfully submits this Progress Report No.6 for the 139 Brampton Road property in Savannah, Chatham County, Georgia (HSI Site No. 10208, Tax Parcel ID#1-0720-01-002). This progress report is required by the Voluntary Remediation Program (VRP) statute and requested by the Georgia Environmental Protection Division (EPD) in its comment letter dated October 4, 2011.

This report is for the exclusive use of Mr. Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey and Rheem Manufacturing Company, and for regulatory submittal. If you have any questions and/or comments regarding the material presented in the report, please contact Mr. Chuck Ferry (404) 817-0107 or by email at chuck.ferry@amec.com.

Sincerely,

**AMEC Environment & Infrastructure, Inc.**

Tyler Boyles
Project Geologist

Charles T. Ferry, P.E.
Senior Principal Engineer

cc: Ms. Hollister A. Hill, Troutman Sanders, LLP
Mr. Scott Bates, Rheem Manufacturing Company
Mr. Dwight Feemster, Duffy & Feemster, LLC
Mr. Chuck Steffens, Rheem Manufacturing Company

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# 1.0 PROJECT SUMMARY

The 139 Brampton Road Site ("Site") is an approximately 11.1-acre parcel of land located in Savannah, Chatham County, Georgia. Historically, the Site was developed in the early 1960s for the reconditioning and manufacturing of drums. Site operations continued in a similar manner by various entities until the mid-1970s when drum reconditioning activities were reported to have stopped. However, the drum manufacturing operation continued at the Site from the mid-1970s until the early 1990s. Since 1994 the Site has been occupied by various commercial tenants for warehousing and office space.

The Georgia EPD approved a Voluntary Remediation Plan Application (VRPA) with conditions and comments presented in two letters dated October 4, 2011 and accepted the 139 Brampton Road property as a "qualifying property" in the Voluntary Remediation Program (VRP).

The subject property is commercially developed with various structures which are currently leased for warehousing of wood construction products and office space. The subject property is zoned heavy industrial and is located in close proximity to the Georgia Port Authority – Garden City Terminal Container Port in Savannah, Georgia. The property has been utilized for commercial/industrial purposes for approximately five decades.

The property has been the subject of a number of environmental assessments conducted between 1985 and 2009, which revealed the presence of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals in soil and groundwater. The property was listed on the Hazardous Site Inventory (HSI) in June 1994 as site number 10208 due to the presence of lead in soil and tetrachloroethene in groundwater.

In its October 4, 2011 VRP approval letter, EPD requested that adjacent properties, owned by McDonald Ventures LLC (to the north) and Norfolk Southern Railway Company (to the east/south), be included as additional qualifying properties based on historic sampling results. Since including these properties as qualifying properties would have been based on historic sampling results over 13 years old and would not have been based on current information as assumed in EPD's VRP approval letter, the Trustee and Rheem contacted representatives of both McDonald Ventures and Norfolk Southern to negotiate access agreements to perform additional current assessments on each of their properties and to alert them that a Uniform Environmental Covenant for their property may be needed. Additional assessments have been performed to

update conditions on these properties and the results will factor into whether one or both will be added as qualifying properties.

Results of the additional investigation on the property to the north (McDonald Ventures) was documented in the April 2013 (3rd) Semi-Annual Report. Results of additional assessment on the property to the south and east (Norfolk Southern) was documented in the April 2014 (5$^{th}$) Semi-Annual Report Period. A Soil Remediation Plan was included as Appendix E to the 5$^{th}$ report as a proposal for corrective actions to remediate impacted soils at the Site.

This Semi-Annual Voluntary Remediation Plan Progress Report No. 6 was prepared in accordance with the Voluntary Remediation Plan (VRP) for the 139 Brampton Road Site, HSI Site No. 10208/Tax Parcel ID#1-0720-01-002.

## 2.0 ACTIONS TAKEN SINCE LAST SUBMITTAL

EPD issued a letter dated June 26, 2014 reflecting its review of the five Semi-Annual Reports. Comment #4 of 4 rejected the area averaging methodology applied to the lead in soil impacts in developing the Soil Remediation Plan (SRP). Therefore, a revised SRP for the 139 Brampton Road property was subsequently submitted for EPD's review and comment on September 14, 2014, a copy of which is attached hereto. To date, no written comments have been received from EPD; however, Mr. Bill Williams with EPD has stated that EPD's approval is not necessary to proceed with execution of the revised SRP.

The objective of the revised SRP is to remove soil exceeding the Type 4 RRS for lead of 960 mg/kg. Assuming EPD's approval, the revised approach is expected to increase the previously estimated soil volume of 1870 tons by approximately 650 tons, to 2520 tons. The revised rough cost estimate to implement the revised SRP is $170,000.

No other activities have been performed since submittal of the Semi-Annual Voluntary Remediation Plan Progress Report No. 5 dated April 30, 2014.

## 3.0 SCHEDULE AND FUTURE SUBMITTALS

As required by EPD, semi-annual progress reports must be submitted to EPD by every April 30th and October 30th throughout the duration of this project. An updated milestone schedule is included as Table 1 which describes the activities yet to be performed.

The schedule shows that corrective action of the lead in soil impacts is planned to begin on December 1, 2014 in accordance with the revised Soil Remediation Plan. As such, we request any written comments from EPD regarding the revised SRP be provided before that time.

## 4.0 PROFESSIONAL ENGINEER CERTIFICATION STATEMENT

"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 who is registered with the Georgia State Board of Registration for Professional Engineers and Land Surveyors 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 direct 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."

Charles T. Ferry

Mr. Charles T. Ferry, P.E.
Georgia Registration No. 10957

GEORGIA REGISTERED No. 10957 PROFESSIONAL ENGINEER CHARLES T. FERRY

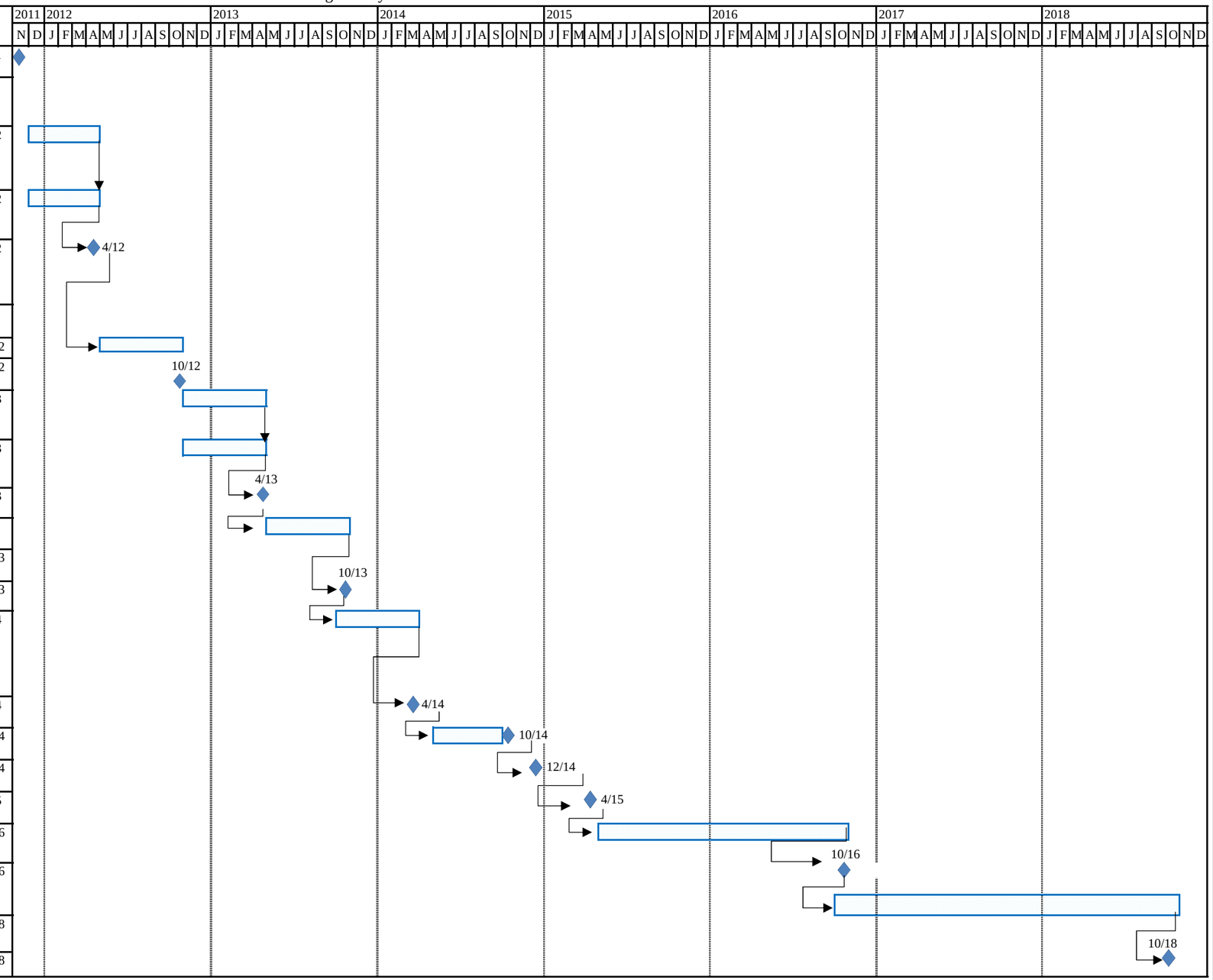
A breakdown of professional service hours with a description of the services provided is included in Appendix B.

I certify that the electronic copy is complete, identical to the paper copy, and virus free.

# GANTT SCHEDULE

# Former Rheem Manufacturing Facility - Gantt Schedule

| Item | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | Prepare milestone schedule and cost estimate for financial assurance | Complete | | 12/8/2011 |
| 2 | Execute access agreement with adjacent properties to the north, south and east and include additional qualifying parcels to the VRPA | Started | | |
| | Perform initial groundwater assessment program which will consist of sampling existing on-site wells (3 known), installation and sampling additional on-site wells and hydraulic conductivity tests. | Complete | | 4/30/2012 |
| | Perform additional soil characterization to further delineate known lead impacts and check for impacts of regulated substances listed in Table 3 of the VRPA. | Complete | | 4/30/2012 |
| | Prepare First Progress Report which will include fate and transport model, status of existing monitoring well network, revised RRS for all constituents, updated Conceptual Site Model (CSM) and milestone schedule. | Complete | | 4/30/2012 |
| 3 | Continue negotiating access agreements with adjacent properties to the north, south and east | | | |
| | Perform Vapor Intrusion Risk Evaluation | Complete | | 10/30/2012 |
| | Prepare Second Progress Report with vapor intrusion into on-site building modeling, updated CSM and milestone schedule. | Complete | | 10/30/2012 |
| 4 | Begin off-site groundwater delineation on property to the north which consisted of sampling one existing off-site well, installation and sampling of one additional off-site well. | Complete | | 4/30/2013 |
| | Begin off-site soil characterization on property to the north to delineate impacts of regulated substances. Complete horizontal delineation of on-site soil impacts. | Complete | | 4/30/2013 |
| | Prepare Third Progress Report with updated CSM and milestone schedule. | Complete | | 4/30/2013 |
| 5 | Continue negotiating access agreements with adjacent properties to the south and east | | | |
| | Perform Vapor Intrusion Risk Evaluation on McDonald Ventures property located at 155 Brampton Road | Complete | | 10/30/2013 |
| | Prepare Fourth Progress Report with updated CSM and milestone schedule | Complete | | 10/30/2013 |
| 6 | Begin off-site soil and groundwater characterization on property to the east and south to delineate impacts of regulated substances. Complete vertical delineation of soil and groundwater, update CSM, finalize VRP and provide preliminary cost estimate for soil remediation activities using | Complete | | 4/30/2014 |
| | Prepare Fifth Progress Report with updated CSM and milestone schedule | Complete | | 4/30/2014 |
| 7 | Revise Soil Remediation Plan and Prepare Sixth Progress Report with updated milestone schedule | Complete | | 10/31/2014 |
| 8 | Complete soil remediation in accordance with Soil Remediation Plan. | 1 month | 12/1/2014 | 12/31/2014 |
| | Prepare Seventh Progress Report with Soil Remediation Completion | | 10/31/2014 | 4/30/2015 |
| 9 | Complete all assessment and modeling efforts, prepare eigth and ninth Progress Reports. | 24 months | 10/30/2015 | 10/30/2016 |
| 10 | Submit Compliance Status Report to certify soil and vapor compliance and demonstrate no risk of exposure for groundwater impacts | | 10/30/2016 | 10/30/2016 |
| 11 | Assume two years of semi-annual groundwater monitoring and reporting | 24 months | 10/30/2016 | 10/30/2018 |
| | Submit Delisting request | | | 10/30/2018 |




Project: Former Rheem Manufacturing Facility
Date: 10/30/2014
AMEC Project No. 6121-09-0220

Task

Milestone

# APPENDIX A

# REVISED SOIL REMEDIATION PLAN

## ATTACHMENT E – REVISED SOIL REMEDIATION PLAN

This Soil Remediation Plan addresses corrective actions associated with the completed assessment and characterization of impacted soils at the Site and proposes activities for remediation of such soils. Refer to Attachment E-1 for figures depicting the delineation of soil impacts.

### E.1 BACKGROUND

The 139 Brampton Road Site ("Site") is an approximately 11.1-acre parcel of land located in Savannah, Chatham County, Georgia. The property is commercially developed with various structures which are currently leased for warehousing of wood construction products and for office space. Historically, the Site was developed in the early 1960s for the reconditioning and manufacturing of drums. Site operations continued in a similar manner by various entities until the mid-1970s when drum reconditioning activities were reported to have stopped. However, the drum manufacturing operation continued at the Site from the mid-1970s until the early 1990s. Since 1994 the Site has been occupied by various commercial tenants for warehousing and office space.

The property was listed on the Hazardous Site Inventory (HSI) in June 1994 as site number 10208 due to the presence of lead in soil and tetrachloroethene in groundwater.

A Voluntary Remediation Plan Application (VRPA), dated December 13, 2010, was submitted to Georgia Environmental Protection Division (EPD) to enter the Site into the Voluntary Remediation Program (VRP). The Georgia EPD approved the VRPA with conditions and comments presented in two letters dated October 4, 2011 and accepted the 139 Brampton Road property into the VRP.

### E.2 SUMMARY OF SOIL TESTING DATA

The Site has been the subject of a number of environmental assessments conducted between 1985 and 2013. Several sampling events included analysis of soil samples for metals and VOCs, with some SVOCs. Results of the previous sampling events have been compiled most comprehensively in the following submittals to EPD: December 2010 Voluntary Remediation Plan Application, April 2012 (1st) Semi-Annual Progress Report and April 2013 (3rd) Semi-Annual Progress Report.

With the exception of lead impacts to soil, there are no other constituents of concern (COCs) that exhibited concentrations exceeding the applicable non-residential risk reduction standard (RRS). As shown on Figure E-1, all COCs in soil except lead have been delineated on-Site to the Type 1 residential RRS as the established soil delineation criteria.

A site-specific Type 4 value for lead was previously calculated that evaluated direct contact risk and soil-to-groundwater leachability. The potential for leaching from soil to groundwater was addressed using total and SPLP data. A value of 960 mg/kg in soil was found to generate an SPLP value of 0.013 mg/L lead and this value was selected as representative of an acceptable soil leaching criteria for the Brampton Road Site. The Georgia Adult Lead Methodology (GALM) was previously used to estimate a direct contact RRS for lead of 1,300 mg/kg for the industrial worker. Because the soil leaching value is lower, the leaching value (960 mg/kg) is used as the Type 4 RRS for lead in soil.

Additional sampling events were specific to the analysis of lead in shallow soil samples as the only COC in soil that exceeded the Type 1 RRS on-Site. Off-site sampling for lead in soil was required to delineate the extent of lead in surface soil. In isolated areas confined to the Site, lead exceeded the site-specific Type 4 RRS of 960 mg/kg approved by EPD as the soil cleanup standard. These results are depicted on Figure E-2.

Based on the existing soil data, the shallow lead impacts have been horizontally delineated on-Site. Vertical delineation has mostly been achieved but will be completed during soil remediation.

To facilitate construction of a loading ramp, movement of some lead-impacted soil was performed by the current tenant in 2006. Soil from the eastern corner of the southernmost building was excavated to an approximate depth of 6 feet. According to the current site tenant, the excavated soil was relocated and stockpiled to the east along the existing tree line. The tenant indicated that a geofabric was placed in the bottom of the excavation, then backfilled with a combination of stone and sand and then finished with concrete. Prior testing in that area had indicated shallow impacts of lead at concentrations greater than the Type 4 RRS. To investigate whether lead in soil impacts remained after the 2006 excavation for the loading dock, one soil boring, GP-04, was advanced through the concrete loading ramp which confirmed the presence of the sandy fill and geofabric. One soil sample was collected from GP-

04 below the loading dock fill and geofabric at a depth of 7 feet that confirmed the remaining lead concentration of 6.5 mg/kg, which is well below the Type 1 and Type 4 RRS.

The soil berm is irregularly shaped and measures 200 feet long by 30 to 50 feet wide. The soil berm is surrounded by a metal reinforced silt fence to prevent runoff and is covered with vegetation. Two composite soil samples from the berm tested in 2012 (SP-1 & SP-2) indicated soil concentrations below the Type 4 RRS. The SP-2 soil sample was analyzed for lead using the Toxicity Characteristic Leaching Procedure (TCLP) and indicated non-hazardous soil.

## E.3 SOIL CORRECTIVE ACTION

The purpose of this document is to establish a corrective action approach to remediate soils exceeding applicable RRS. The lead data are summarized on Table E-1.

The objective of the soil remediation proposed herein is to remove soil exceeding the Type 4 RRS for lead of 960 mg/kg. Based on our evaluation of the existing soil data, the planned soil removal areas and soil berm are depicted on Figure E-2.

Excavated material that requires off-Site disposal will be stockpiled with appropriate cover and erosion control, placed into roll-off boxes or direct loaded onto trucks for immediate transport.

The extent of excavation will be confirmed through verification sampling to demonstrate compliance. Verification soil samples will be collected along the sidewalls at least every 25 linear feet and samples will be collected from the floor of the excavation at the rate of one sample per 500 square feet or portion thereof. Verification soil samples will also be collected from soil exposed beneath the soil berm at the rate of one sample per 500 square feet or portion thereof.

The excavation, handling, transport, and disposal of the soil and source material will be performed by methods that: (i) prevent contamination of the surrounding environment (soil, water, air), (ii) are in accordance with federal, state, and local laws, and (iii) protect personnel in the excavation area and adjacent areas.

Disposal characterization samples of the excavated material will be collected and analyzed by a qualified laboratory in accordance with the selected permitted disposal facility's requirements. The excavated impacted soil will be transported in compliance with all applicable regulations for

transporting such waste and disposed at a pre-approved disposal facility permitted to accept the designated waste.

Based on the anticipate limited depth of excavations and considering the operations of the current site tenant, the excavations will likely be backfilled with natural stone aggregate from a commercial source. However, off-site earthen fill may be used to backfill excavations outside the limits of the current tenant's operations. Off-site borrow soils used to replace excavated material will be analyzed for priority pollutants, and the results must meet HSRA notification concentrations prior to use on-Site.

This work will involve the handling of materials containing substances that are potentially detrimental to the health and safety of construction personnel. The work will be performed in compliance with applicable OSHA regulations, and in accordance with a project specific Health and Safety Plan.

## E.4 SCHEDULE AND REPORTING

As required by EPD, semi-annual progress reports must be submitted to EPD by every April 30th and October 30th throughout the duration of this project.

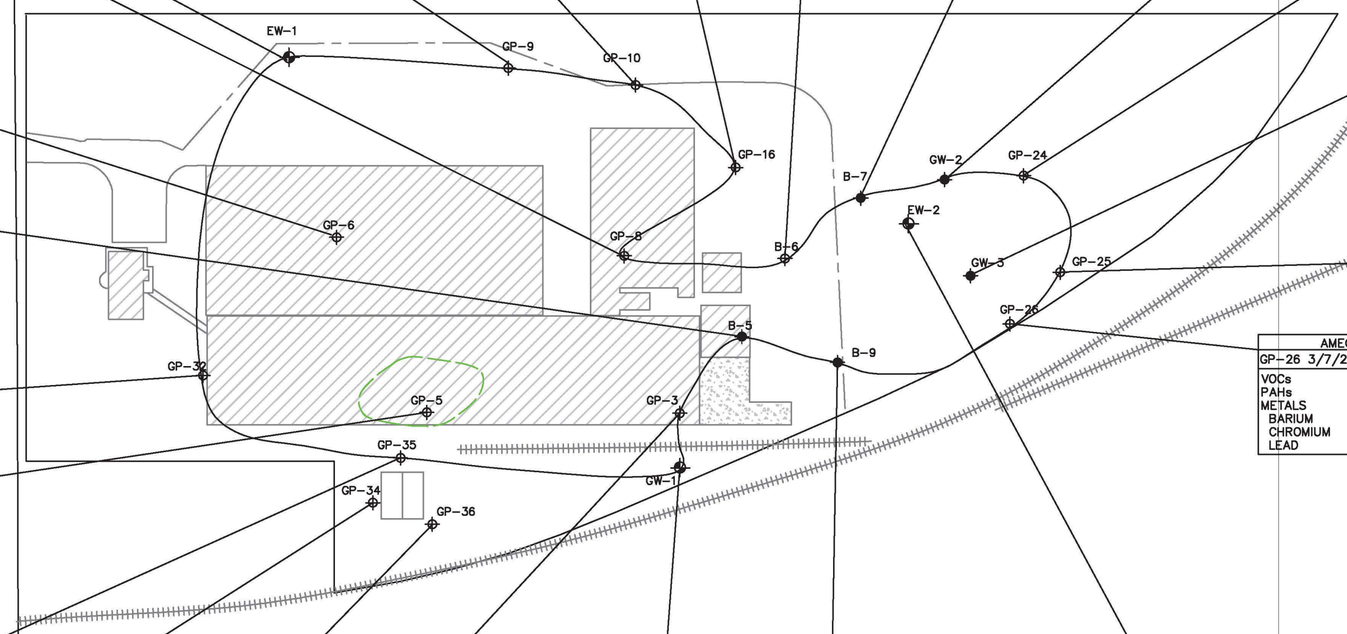
Corrective action of the lead in soil impacts will begin following receipt of EPD's comments on this document and eventual approval of a plan. We request any comments and approval of this plan as soon as feasible.

The results of the soil remediation activities will be submitted to EPD in the subsequent Semi-Annual Progress Report and will include the following:

- A summary of actions taken to characterize, eliminate, control, or minimize the potential risk of exposure to impacted soil at the Site,
- A summary of all corrective action to bring the Site into compliance with applicable soil risk reduction standards,
- A summary of all pertinent field and laboratory data used to demonstrate compliance with soil risk reduction standards, and
- Documentation of the proper characterization, transportation, and disposal of contaminated soils and/or hazardous wastes, if any.

# ATTACHMENT E – 1

# FIGURES AND TABLES




| AMEC | | |
|---|---|---|
| EW-1 3/5/2012 | | 2–4FT |
| VOCs | | BRL |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 60.8 |
| CHROMIUM | | 7.13 |
| LEAD | | <5.70 |

| AMEC | | |
|---|---|---|
| GP-09 3/6/2012 | 1–2FT | 5–6FT |
| VOCs | BRL | BRL |
| PAHS | BRL | BRL |
| METALS | | |
| BARIUM | 25.4 | 77.4 |
| CHROMIUM | 7.82 | 11.9 |
| LEAD | 27.9 | 19.9 |

| AMEC | | | |
|---|---|---|---|
| GP-10 3/6/2012 | 0–1FT | 2–3FT | 6–7FT |
| VOCs | NT | BRL | BRL |
| PAHS | NT | BRL | BRL |
| METALS | | | |
| ARSENIC | NT | 8.12 | <6.31 |
| BARIUM | NT | 40 | 31.3 |
| CHROMIUM | NT | 14.1 | 17.3 |
| LEAD | 24.3 | 16.2 | 8.62 |

| AMEC | | | |
|---|---|---|---|
| GP-16 3/6/2012 | 1–2FT | 6–7FT | DUP6–7FT |
| VOCs | BRL | BRL | BRL |
| PAHS | BRL | BRL | BRL |
| METALS | | | |
| ARSENIC | <6.18 | 8.15 | <6.15 |
| BARIUM | 28.7 | 72.6 | 43.3 |
| CHROMIUM | 9.7 | 12.2 | 12.3 |
| LEAD | 32.7 | 13.7 | 7.33 |

| DAMES & MOORE | | | | |
|---|---|---|---|---|
| B–6 11/1987 | 3–4FT | 5–6FT | 9–10FT | 13–14FT |
| VOCs | ND | NA | ND | NA |
| METALS | | | | |
| BARIUM | NA | 31 | NA | 84 |
| CHROMIUM | NA | 16 | NA | 11 |
| LEAD | NA | 5.3 | NA | 0.83 |
| NICKEL | NA | 3.3 | NA | 2.5 |

| DAMES & MOORE | | | | |
|---|---|---|---|---|
| B–7 11/1987 | 3–4FT | 5–6FT | 9–10FT | 13–14FT |
| VOCs | ND | NA | NA | ND |
| METALS | | | | |
| BARIUM | NA | 7.1 | 450 | NA |
| CADMIUM | NA | 0.012 | ND | NA |
| CHROMIUM | NA | 53 | 23 | NA |
| LEAD | NA | 5.1 | 15 | NA |
| NICKEL | NA | 12 | 8 | NA |

| GOLDER | | |
|---|---|---|
| GW–2 2/1997 3.5–5FT | | 8.5–10FT |
| VOCs | ND | ND |

| AMEC | | |
|---|---|---|
| GP–08 3/6/2012 | | 6–7FT |
| VOCs | | |
| CYCLOHEXANE | | 0.025 |
| ETHYLBENZENE | | 0.034 |
| ISOPROPYLBENZENE | | 0.055 |
| METHYLCYCLOHEXANE | | 0.085 |
| PAHs | | BRL |
| 1–METHYLNAPHTHALENE | | 1.2 |
| METALS | | |
| BARIUM | | 34.6 |
| CHROMIUM | | 7.28 |
| LEAD | | 10.8 |

| AMEC | | |
|---|---|---|
| GP–24 3/7/2012 | | 3–4FT |
| VOCs | | BRL |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 70.6 |
| CHROMIUM | | 9.05 |
| LEAD | | 21.7 |

| AMEC | | |
|---|---|---|
| GP–06 3/7/2012 | | 4–5FT |
| VOCs | | BRL |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 42.6 |
| CHROMIUM | | 8.15 |
| LEAD | | <6.02 |

| GOLDER | | | |
|---|---|---|---|
| GW–3 2/1997 | 0–5FT | 9–10.5FT | 14–15.5FT |
| VOCs | | | |
| CHLOROBENZENE | 2.4 | ND | ND |
| STYRENE | 3.8 | 0.780 | ND |
| TOLUENE | 1.0 | ND | ND |
| ETHYLBENZENE | 14.0 | 2.8 | ND |
| XYLENES | 18.0 | 4.0 | ND |

*APPROXIMATE DEPTH TO WATER 6.17ft TO 8.92ft

| DAMES & MOORE | | | | |
|---|---|---|---|---|
| B–5 11/1987 | 3–4FT | 5–6FT | 9–10FT | 14–15FT |
| VOCs | ND | NA | NA | ND |
| METALS | | | | |
| BARIUM | NA | 36 | 14 | NA |
| CADMIUM | NA | 0.051 | 0.012 | NA |
| CHROMIUM | NA | 34 | 65 | NA |
| LEAD | NA | 5.3 | 12 | NA |
| MERCURY | NA | ND | 0.04 | NA |
| NICKEL | NA | 7.5 | 12 | NA |

| AMEC | | |
|---|---|---|
| GP–25 3/7/2012 | | 3–4FT |
| VOCs | | BRL |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 34.1 |
| CHROMIUM | | 6.58 |
| LEAD | | 6.59 |

| AMEC | | |
|---|---|---|
| GP–26 3/7/2012 | | 2–3FT |
| VOCs | | BRL |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 28.8 |
| CHROMIUM | | 28.3 |
| LEAD | | 11.2 |

| AMEC | | |
|---|---|---|
| GP–32 3/19/2013 | 1FT | 1–2FT |
| VOCs | | |
| ACETONE | NT | 0.0107 |
| METALS | | |
| LEAD | 8 | NT |

| AMEC | | |
|---|---|---|
| GP–05 3/6/2012 | | 2–3FT |
| VOCs | | |
| cis 1,2 DICHLOROETHENE | | 1.8 |
| TETRACHLOROETHENE | | 5.2 |
| trans 1,2 DICHLOROETHENE | | 0.043 |
| TRICHLOROETHENE | | 2.2 |
| PAHs | | BRL |
| METALS | | |
| BARIUM | | 23 |
| CHROMIUM | | 6.07 |
| LEAD | | 6.58 |

| AMEC | | |
|---|---|---|
| GP–35 3/19/2013 | 2–3FT | DUP2–3FT |
| VOCs | | |
| ACETONE | 0.0105 | 0.0118 |

| AMEC | |
|---|---|
| GP–36 3/19/2013 | 2–3FT |
| VOCs | BRL |

| AMEC | |
|---|---|
| GP–34 3/19/2013 | 2–3FT |
| VOCs | |
| ACETONE | 0.0113 |

| AMEC | | |
|---|---|---|
| GP–03 3/5/2012 | 1–2FT | 6–7FT |
| VOCs | | |
| 1,1,1 TRICHLOROETHANE | 0.017 | <0.0052 |
| PAHS | BRL | BRL |
| METALS | | |
| ARSENIC | <6.49 | 26 |
| BARIUM | 25.8 | 21.8 |
| CHROMIUM | 6.87 | 23.9 |
| LEAD | 8.13 | 6.88 |

| DAMES & MOORE | | | |
|---|---|---|---|
| B–9 11/1987 | 5–6FT | 9–10FT | 14–15FT |
| VOCs | NA | ND | NA |
| METALS | | | |
| BARIUM | 38 | NA | 8 |
| CADMIUM | 0.016 | NA | 0.02 |
| CHROMIUM | 25 | NA | 35 |
| LEAD | 12 | NA | 3.3 |
| NICKEL | 5.2 | NA | 16 |

| GOLDER | | | | |
|---|---|---|---|---|
| GW–1 2/1997 | 4–5.5FT | 9–10.5FT | 14–15.5FT | 18–19.5FT |
| VOCs | ND | ND | ND | ND |

| AMEC | | |
|---|---|---|
| EW–2 3/6/2012 | 3–4FT | 5–6FT |
| VOCs | | |
| 1,2 DICHLOROBENZENE | 0.13 | <0.0067 |
| 1,3 DICHLOROBENZENE | 0.0074 | <0.0067 |
| 1,4 DICHLOROBENZENE | 0.018 | <0.0067 |
| 2 BUTANONE | 0.066 | <0.067 |
| ACETONE | 0.49 | <0.130 |
| BENZENE | 0.014 | 0.019 |
| CARBON DISULFIDE | 0.011 | <0.013 |
| CHLOROBENZENE | 0.096 | <0.0067 |
| ETHYLBENZENE | 11 | <0.0067 |
| ISOPROPYLBENZENE | 0.18 | <0.0067 |
| METHYLCYCLOHEXANE | 0.027 | <0.0067 |
| TOLUENE | 0.018 | <0.0067 |
| XYLENES | 3.74 | <0.0067 |
| PAHS | BRL | BRL |
| METALS | | |
| ARSENIC | <5.38 | 7.61 |
| BARIUM | 72.1 | 64 |
| CHROMIUM | 102 | 16.2 |
| LEAD | 466 | 12.5 |
| MERCURY | 0.491 | <0.132 |

SCALE IN FEET

0 100 200

LEGEND:

- SOIL BORING LOCATION (AMEC)
- SOIL BORING LOCATION (OTHERS)
- ABANDONED MONITORING WELL LOCATION
- EXISTING MONITORING WELL LOCATION
- VOCS VOLATILE ORGANIC COMPOUNDS
- SVOCS SEMI–VOLATILE ORGANIC COMPOUNDS
- ND NOT DETECTED
- NA NOT ANALYZED
- BRL BELOW LABORATORY REPORTING LIMITS
- APPROXIMATE EXTENT OF VOCs LESS THAN SOIL DELINEATION CRITERIA
- LOCATION OF VOCs GREATER THAN THE SOIL DELINEATION CONCENTRATION CRITERIA

NOTES:
RESULTS REPORTED IN MILLIGRAMS PER KILOGRAMS

© COPYRIGHT 2014 AMEC

| REV | DATE | BY | SUB | APP | DESCRIPTION |
|---|---|---|---|---|---|

DESIGNED
DRAWN TJB
CHECKED CTF
IN CHARGE CTF
DATE APRIL 2014

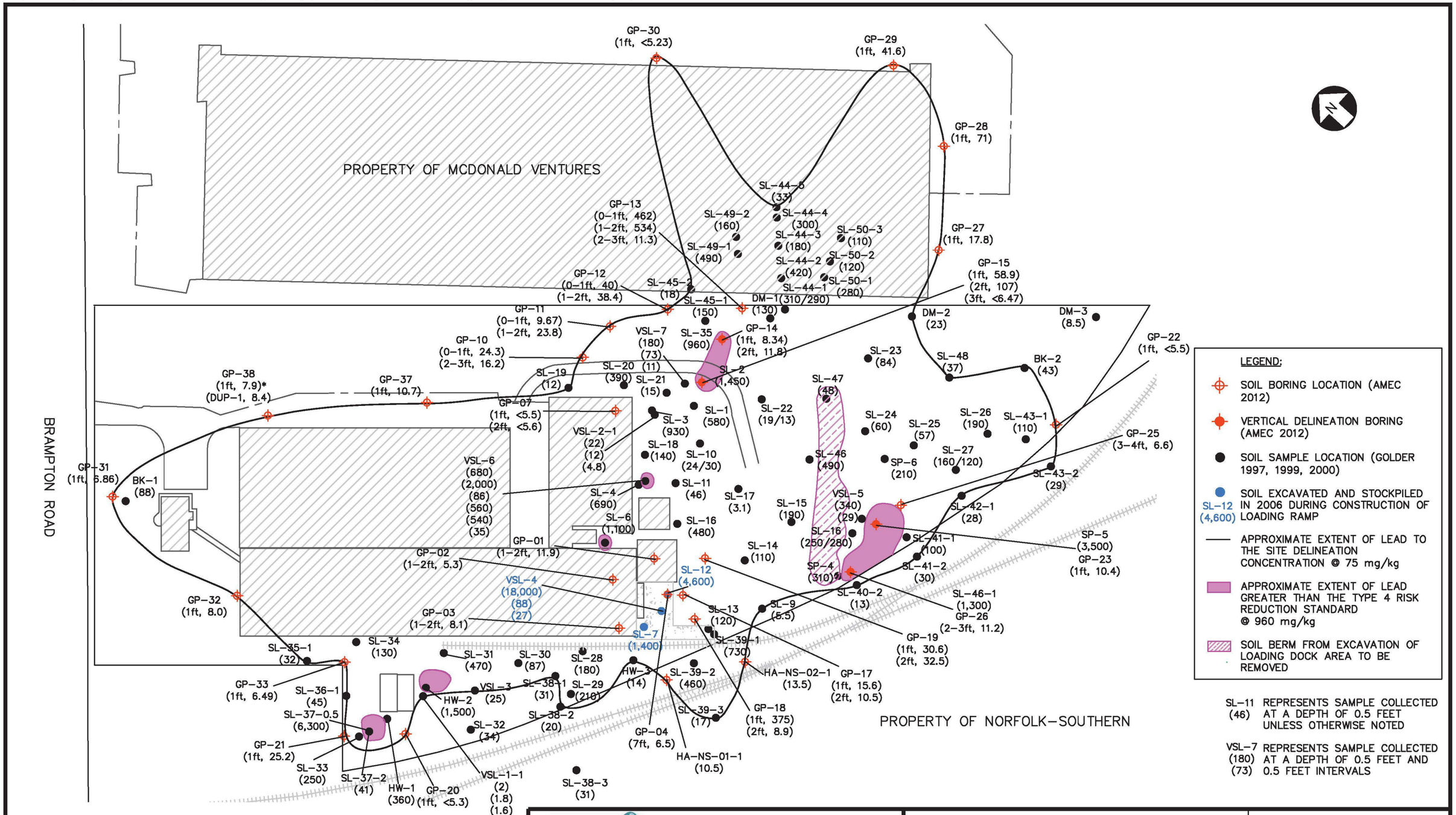
139 BRAMPTON ROAD
SAVANNAH, GEORGIA

AMEC Environment & Infrastructure
396 PLASTERS AVENUE, N.E.
ATLANTA, GEORGIA (404) 873–4761

# SUMMARY OF SOIL TEST RESULTS

SCALE: AS SHOWN
CONTRACT: 6121–09–0220
FIGURE NO.: E–1
REV
PAGE NO

M:\oldUdrive\Projects\Former Rheem Manufacturing Facility\Remediation\Rheem – Lead.dwg – Figure 1B – LEAD 07/23/2014




amec

AMEC Environment & Infrastructure
396 PLASTERS AVENUE, N.E.
ATLANTA, GEORGIA 30324 (404)873-4761

139 BRAMPTON ROAD
SAVANNAH, GEORGIA

EXTENT OF LEAD IMPACTED SOIL WITH PROPOSED REMEDIATION AREAS

| Job Number | Task | Date | Scale | Drawn By | Reviewed By | Figure |
|---|---|---|---|---|---|---|
| 6121–09–0220 | 01 | JULY 2014 | AS SHOWN | TJB | CTF | E–2 |

**Table E-1**
**Summary of Lead in Soil Data**
**Used to Calculate Mean Concentration**
**Project No. 6121-09-0220 April 2014 Remediation Plan**

| Sample ID | ample Dept | Units | SB Lead | D_SB Lead | SS Lead | D_SS Lead |
|---|---|---|---|---|---|---|
| SL-1 | 0.5 | mg/kg | 580 | 1 | 580 | 1 |
| SL-2 | 0.5 | mg/kg | 1400 | 1 | 1400 | 1 |
| SL-3 | 0.5 | mg/kg | 930 | 1 | 930 | 1 |
| SL-4 | 0.5 | mg/kg | 690 | 1 | 690 | 1 |
| SL-5 | 0.5 | mg/kg | 1100 | 1 | 1100 | 1 |
| SL-6 | 0.5 | mg/kg | 480 | 1 | 480 | 1 |
| SL-7 | 0.5 | mg/kg | 1400 | 1 | 1400 | 1 |
| SL-8 | 0.5 | mg/kg | 1300 | 1 | 1300 | 1 |
| SL-9 | 0.5 | mg/kg | 5.5 | 1 | 5.5 | 1 |
| SL-10 (dup) | 0.5 | mg/kg | 30 | 1 | 30 | 1 |
| SL-11 | 0.5 | mg/kg | 46 | 1 | 46 | 1 |
| HW-1 | 0.5 | mg/kg | 360 | 1 | 360 | 1 |
| HW-2 | 0.5 | mg/kg | 1500 | 1 | 1500 | 1 |
| HW-3 | 0.5 | mg/kg | 14 | 1 | 14 | 1 |
| SL-12 | 0.5 | mg/kg | 4600 | 1 | 4600 | 1 |
| SL-13 | 0.5 | mg/kg | 120 | 1 | 120 | 1 |
| SL-14 | 0.5 | mg/kg | 110 | 1 | 110 | 1 |
| SL-15 | 0.5 | mg/kg | 190 | 1 | 190 | 1 |
| SL-16 (dup) | 0.5 | mg/kg | 280 | 1 | 280 | 1 |
| SL-17 | 0.5 | mg/kg | 3.1 | 1 | 3.1 | 1 |
| SL-18 | 0.5 | mg/kg | 140 | 1 | 140 | 1 |
| SL-19 | 0.5 | mg/kg | 12 | 1 | 12 | 1 |
| SL-20 | 0.5 | mg/kg | 390 | 1 | 390 | 1 |
| SL-21 | 0.5 | mg/kg | 15 | 1 | 15 | 1 |
| SL-22 | 0.5 | mg/kg | 19 | 1 | 19 | 1 |
| SL-23 | 0.5 | mg/kg | 84 | 1 | 84 | 1 |
| SL-24 | 0.5 | mg/kg | 60 | 1 | 60 | 1 |
| SL-25 | 0.5 | mg/kg | 57 | 1 | 57 | 1 |
| SL-26 | 0.5 | mg/kg | 190 | 1 | 190 | 1 |
| SL-27 | 0.5 | mg/kg | 160 | 1 | 160 | 1 |
| SL-28 | 0.5 | mg/kg | 180 | 1 | 180 | 1 |
| SL-29 | 0.5 | mg/kg | 210 | 1 | 210 | 1 |
| SL-30 | 0.5 | mg/kg | 87 | 1 | 87 | 1 |
| SL-31 | 0.5 | mg/kg | 470 | 1 | 470 | 1 |
| SL-32 | 0.5 | mg/kg | 34 | 1 | 34 | 1 |
| SL-33 | 0.5 | mg/kg | 250 | 1 | 250 | 1 |
| SL-34 | 0.5 | mg/kg | 130 | 1 | 130 | 1 |
| SL-35 | 0.5 | mg/kg | 960 | 1 | 960 | 1 |
| SL-35A | 0.5 | mg/kg | 32 | 1 | 32 | 1 |
| SL-36 | 0.5 | mg/kg | 45 | 1 | 45 | 1 |
| SL-37 | 0.5 | mg/kg | 6300 | 1 | 6300 | 1 |
| SL-38 | 0.5 | mg/kg | 31 | 1 | 31 | 1 |
| SL-39 | 0.5 | mg/kg | 730 | 1 | 730 | 1 |
| SL-40 | 0.5 | mg/kg | 1300 | 1 | 1300 | 1 |

**Table E-1**
**Summary of Lead in Soil Data**
**Used to Calculate Mean Concentration**
**Project No. 6121-09-0220 April 2014 Remediation Plan**

| | | | | | | |
|---|---|---|---|---|---|---|
| SL-41 | 0.5 | mg/kg | 100 | 1 | 100 | 1 |
| SL-42 | 0.5 | mg/kg | 28 | 1 | 28 | 1 |
| SL-43 | 0.5 | mg/kg | 110 | 1 | 110 | 1 |
| SL-44 | 0.5 | mg/kg | 310 | 1 | 310 | 1 |
| SL-45 | 0.5 | mg/kg | 150 | 1 | 150 | 1 |
| SL-46 | 0.5 | mg/kg | 490 | 1 | 490 | 1 |
| SL-47 | 0.5 | mg/kg | 48 | 1 | 48 | 1 |
| SL-48 | 0.5 | mg/kg | 37 | 1 | 37 | 1 |
| SL-49 | 0.5 | mg/kg | 490 | 1 | 490 | 1 |
| SL-50 | 0.5 | mg/kg | 280 | 1 | 280 | 1 |
| SP-1 | 0.5 | mg/kg | 310 | 1 | 310 | 1 |
| SP-2 | 0.5 | mg/kg | 350 | 1 | 350 | 1 |
| SP-3 | 0.5 | mg/kg | 210 | 1 | 210 | 1 |
| SL-BK1 | 0.5 | mg/kg | 88 | 1 | 88 | 1 |
| SL-BK2 | 0.5 | mg/kg | 43 | 1 | 43 | 1 |
| VSL-1 | 0.5 | mg/kg | 2 | 1 | 2 | 1 |
| VSL-2 | 0.5 | mg/kg | 22 | 1 | 22 | 1 |
| VSL-3 | 0.5 | mg/kg | 25 | 1 | 25 | 1 |
| VSL-4 | 0.5 | mg/kg | 18000 | 1 | 18000 | 1 |
| VSL-5 | 0.5 | mg/kg | 340 | 1 | 340 | 1 |
| VSL-6 | 0.5 | mg/kg | 680 | 1 | 680 | 1 |
| VSL-7 | 0.5 | mg/kg | 180 | 1 | 180 | 1 |
| GP-07 | 1 | mg/kg | 5.46 | 0 | 5.46 | 0 |
| GP-10 | 1 | mg/kg | 24.3 | 1 | 24.3 | 1 |
| GP-11 | 1 | mg/kg | 9.67 | 1 | 9.67 | 1 |
| GP-12 | 1 | mg/kg | 40 | 1 | 40 | 1 |
| GP-13 | 1 | mg/kg | 462 | 1 | 462 | 1 |
| GP-14 | 1 | mg/kg | 8.34 | 1 | 8.34 | 1 |
| GP-15 | 1 | mg/kg | 58.9 | 1 | 58.9 | 1 |
| GP-17 | 1 | mg/kg | 15.6 | 1 | 15.6 | 1 |
| GP-18 | 1 | mg/kg | 375 | 1 | 375 | 1 |
| GP-19 | 1 | mg/kg | 30.6 | 1 | 30.6 | 1 |
| GP-20 | 1 | mg/kg | 5.35 | 0 | 5.35 | 0 |
| DUP-2 GP-21 | 1 | mg/kg | 36.4 | 1 | 36.4 | 1 |
| GP-22 | 1 | mg/kg | 5.55 | 0 | 5.55 | 0 |
| GP-27 | 1 | mg/kg | 17.8 | 1 | 17.8 | 1 |
| GP-28 | 1 | mg/kg | 71 | 1 | 71 | 1 |
| GP-29 | 1 | mg/kg | 41.6 | 1 | 41.6 | 1 |
| GP-30 | 1 | mg/kg | 5.23 | 0 | 5.23 | 0 |
| GP-31 | 1 | mg/kg | 6.86 | 1 | 6.86 | 1 |
| GP-32 | 1 | mg/kg | 8 | 1 | 8 | 1 |
| GP-33 | 1 | mg/kg | 6.49 | 1 | 6.49 | 1 |
| GP-37 | 1 | mg/kg | 10.7 | 1 | 10.7 | 1 |
| DUP-1 GP-38 | 1 | mg/kg | 8.3 | 1 | 8.3 | 1 |
| HA-NS-01 | 1 | mg/kg | 10.5 | 1 | 10.5 | 1 |

**Table E-1**
**Summary of Lead in Soil Data**
**Used to Calculate Mean Concentration**
**Project No. 6121-09-0220 April 2014 Remediation Plan**

| | | | | | | |
|---|---|---|---|---|---|---|
| HA-NS-02 | 1 | mg/kg | 13.5 | 1 | 13.5 | 1 |
| SL-37 | 1 | mg/kg | 41 | 1 | 41 | 1 |
| SL-38 | 1 | mg/kg | 20 | 1 | 20 | 1 |
| SL-39 | 1 | mg/kg | 460 | 1 | 460 | 1 |
| SL-40 | 1 | mg/kg | 13 | 1 | 13 | 1 |
| SL-41 | 1 | mg/kg | 30 | 1 | 30 | 1 |
| SL-43 | 1 | mg/kg | 29 | 1 | 29 | 1 |
| SL-44 | 1 | mg/kg | 420 | 1 | 420 | 1 |
| SL-45 | 1 | mg/kg | 18 | 1 | 18 | 1 |
| SL-49 | 1 | mg/kg | 160 | 1 | 160 | 1 |
| SL-50 | 1 | mg/kg | 120 | 1 | 120 | 1 |
| VSL-1 | 1 | mg/kg | 1.8 | 1 | 1.8 | 1 |
| VSL-2 | 1 | mg/kg | 12 | 1 | 12 | 1 |
| VSL-4 | 1 | mg/kg | 88 | 1 | 88 | 1 |
| VSL-5 | 1 | mg/kg | 29 | 1 | 29 | 1 |
| VSL-6 | 1 | mg/kg | 2000 | 1 | 2000 | 1 |
| VSL-7 | 1 | mg/kg | 73 | 1 | 73 | 1 |
| SL-38 | 1.5 | mg/kg | 31 | 1 | 31 | 1 |
| SL-39 | 1.5 | mg/kg | 17 | 1 | 17 | 1 |
| SL-44 | 1.5 | mg/kg | 180 | 1 | 180 | 1 |
| SL-50 | 1.5 | mg/kg | 110 | 1 | 110 | 1 |
| VSL-1 | 1.5 | mg/kg | 1.6 | 1 | 1.6 | 1 |
| VSL-2 | 1.5 | mg/kg | 4.8 | 1 | 4.8 | 1 |
| VSL-4 (dup) | 1.5 | mg/kg | 30 | 1 | 30 | 1 |
| VSL-6 | 1.5 | mg/kg | 86 | 1 | 86 | 1 |
| VSL-7 | 1.5 | mg/kg | 11 | 1 | 11 | 1 |
| GP-01 | 2 | mg/kg | 11.9 | 1 | 11.9 | 1 |
| GP-02 | 2 | mg/kg | 5.28 | 1 | 5.28 | 1 |
| GP-03 | 2 | mg/kg | 8.13 | 1 | 8.13 | 1 |
| GP-07 | 2 | mg/kg | 5.59 | 0 | 5.59 | 0 |
| GP-09 | 2 | mg/kg | 27.9 | 1 | 27.9 | 1 |
| GP-11 | 2 | mg/kg | 23.8 | 1 | 23.8 | 1 |
| GP-12 | 2 | mg/kg | 38.4 | 1 | 38.4 | 1 |
| GP-13 | 2 | mg/kg | 534 | 1 | 534 | 1 |
| GP-14 | 2 | mg/kg | 11.8 | 1 | 11.8 | 1 |
| GP-15 | 2 | mg/kg | 107 | 1 | 107 | 1 |
| GP-16 | 2 | mg/kg | 32.7 | 1 | 32.7 | 1 |
| GP-17 | 2 | mg/kg | 10.5 | 1 | 10.5 | 1 |
| GP-18 | 2 | mg/kg | 8.91 | 1 | 8.91 | 1 |
| GP-19 | 2 | mg/kg | 32.5 | 1 | 32.5 | 1 |
| GP-23 | 2 | mg/kg | 10.4 | 1 | 10.4 | 1 |
| SL-44 | 2 | mg/kg | 300 | 1 | 300 | 1 |
| VSL-6 | 2 | mg/kg | 560 | 1 | 560 | 1 |
| SL-44 | 2.5 | mg/kg | 33 | 1 | | |
| VSL-6 | 2.5 | mg/kg | 540 | 1 | | |

**Table E-1**
**Summary of Lead in Soil Data**
**Used to Calculate Mean Concentration**
**Project No. 6121-09-0220 April 2014 Remediation Plan**

| | | | | |
|---|---|---|---|---|
| GP-05 | 3 | mg/kg | 6.58 | 1 |
| GP-10 | 3 | mg/kg | 16.2 | 1 |
| GP-13 | 3 | mg/kg | 11.3 | 1 |
| GP-15 | 3 | mg/kg | 6.47 | 0 |
| GP-26 | 3 | mg/kg | 11.2 | 1 |
| VSL-6 | 3 | mg/kg | 35 | 1 |
| EW-01 | 4 | mg/kg | 5.7 | 0 |
| EW-2 | 4 | mg/kg | 466 | 1 |
| GP-24 | 4 | mg/kg | 21.7 | 1 |
| GP-25 | 4 | mg/kg | 6.59 | 1 |
| GP-06 | 5 | mg/kg | 6.02 | 0 |
| EW-2 | 6 | mg/kg | 12.5 | 1 |
| GP-09 | 6 | mg/kg | 19.9 | 1 |
| GP-03 | 7 | mg/kg | 6.88 | 1 |
| GP-04 | 7 | mg/kg | 6.54 | 1 |
| GP-08 | 7 | mg/kg | 10.8 | 1 |
| GP-10 | 7 | mg/kg | 8.62 | 1 |
| GP-16 | 7 | mg/kg | 13.7 | 1 |

**Table E-2**
**ProUCL Statistics for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | 3/27/2014 17:10 |
| From File | VRP April 2012 Progress Report Tables 3-21-2012_b.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**SB Lead** 0.5 to 7 feet

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 152 | Number of Distinct Observations | 132 |
| Number of Detects | 144 | Number of Non-Detects | 8 |
| Number of Distinct Detects | 124 | Number of Distinct Non-Detects | 8 |
| Minimum Detect | 1.6 | Minimum Non-Detect | 5.23 |
| Maximum Detect | 18000 | Maximum Non-Detect | 6.47 |
| Variance Detects | 2689466 | Percent Non-Detects | 5.26% |
| Mean Detects | 399.4 | SD Detects | 1640 |
| Median Detects | 41.3 | CV Detects | 4.106 |
| Skewness Detects | 9.224 | Kurtosis Detects | 95.24 |
| Mean of Logged Detects | 4.142 | SD of Logged Detects | 1.81 |

| | | |
|---|---|---|
| Normal GOF Test on Detects Only | | |
| Shapiro Wilk Test Statistic | 0.249 | Normal GOF Test on Detected Observations Only |
| 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.404 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.0738 | Detected Data Not Normal at 5% Significance Level |
| Detected Data Not Normal at 5% Significance Level | | |

| | | | |
|---|---|---|---|
| Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs | | | |
| Mean | 378.5 | Standard Error of Mean | 129.7 |
| SD | 1593 | 95% KM (BCA) UCL | 645.8 |
| 95% KM (t) UCL | 593.1 | 95% KM (Percentile Bootstrap) UCL | 614.3 |
| 95% KM (z) UCL | 591.8 | 95% KM Bootstrap t UCL | 1007 |
| 90% KM Chebyshev UCL | 767.5 | 95% KM Chebyshev UCL | 943.7 |
| 97.5% KM Chebyshev UCL | 1188 | 99% KM Chebyshev UCL | 1669 |

| | | |
|---|---|---|
| Gamma GOF Tests on Detected Observations Only | | |
| A-D Test Statistic | 8.776 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.853 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.178 | Kolmogrov-Smirnoff GOF |
| 5% K-S Critical Value | 0.0841 | Detected Data Not Gamma Distributed at 5% Significance Level |
| Detected Data Not Gamma Distributed at 5% Significance Level | | |

| | | | |
|---|---|---|---|
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 0.362 | k star (bias corrected MLE) | 0.359 |
| Theta hat (MLE) | 1103 | Theta star (bias corrected MLE) | 1112 |
| nu hat (MLE) | 104.2 | nu star (bias corrected) | 103.4 |
| MLE Mean (bias corrected) | 399.4 | MLE Sd (bias corrected) | 666.5 |

| | | | |
|---|---|---|---|
| Gamma Kaplan-Meier (KM) Statistics | | | |
| k hat (KM) | 0.0565 | nu hat (KM) | 17.16 |
| Approximate Chi Square Value (17.16, α) | 8.787 | Adjusted Chi Square Value (17.16, β) | 8.73 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 739.2 | 95% Gamma Adjusted KM-UCL (use when n<50) | 744.1 |
| Gamma (KM) may not be used when k hat (KM) is < 0.1 | | | |

**Table E-2**
**ProUCL Statistics for Data Sets with Non-Detects**

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 378.3 |
| Maximum | 18000 | Median | 36.7 |
| SD | 1598 | CV | 4.225 |
| k hat (MLE) | 0.305 | k star (bias corrected MLE) | 0.303 |
| Theta hat (MLE) | 1240 | Theta star (bias corrected MLE) | 1247 |
| nu hat (MLE) | 92.75 | nu star (bias corrected) | 92.25 |
| MLE Mean (bias corrected) | 378.3 | MLE Sd (bias corrected) | 686.8 |
| | | Adjusted Level of Significance (β) | 0.0484 |
| Approximate Chi Square Value (92.25, α) | 71.1 | Adjusted Chi Square Value (92.25, β) | 70.93 |
| 95% Gamma Approximate UCL (use when n>=50) | 490.9 | 95% Gamma Adjusted UCL (use when n<50) | 492.1 |

Lognormal GOF Test on Detected Observations Only

| | | | |
|---|---|---|---|
| Lilliefors Test Statistic | 0.0974 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.0738 | Detected Data Not Lognormal at 5% Significance Level | |

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 378.4 | Mean in Log Scale | 3.957 |
| SD in Original Scale | 1598 | SD in Log Scale | 1.93 |
| 95% t UCL (assumes normality of ROS data) | 593 | 95% Percentile Bootstrap UCL | 613.3 |
| 95% BCA Bootstrap UCL | 739.3 | 95% Bootstrap t UCL | 1042 |
| 95% H-UCL (Log ROS) | 557.5 | | |

DL/2 Statistics

| | | | |
|---|---|---|---|
| DL/2 Normal | | DL/2 Log-Transformed | |
| **Mean in Original Scale** | **378.5** | Mean in Log Scale | 3.979 |
| SD in Original Scale | 1598 | SD in Log Scale | 1.894 |
| 95% t UCL (Assumes normality) | 593.1 | 95% H-Stat UCL | 523.6 |

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

| | |
|---|---|
| 97.5% KM (Chebyshev) UCL | 1188 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

**Table E-2**
**ProUCL Statistics for Data Sets with Non-Detects**

**SS Lead** 0.5 to 2 feet

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 132 | Number of Distinct Observations | 112 |
| Number of Detects | 127 | Number of Non-Detects | 5 |
| Number of Distinct Detects | 107 | Number of Distinct Non-Detects | 5 |
| Minimum Detect | 1.6 | Minimum Non-Detect | 5.23 |
| Maximum Detect | 18000 | Maximum Non-Detect | 5.59 |
| Variance Detects | 3032580 | Percent Non-Detects | 3.79% |
| Mean Detects | 443.2 | SD Detects | 1741 |
| Median Detects | 58.9 | CV Detects | 3.929 |
| Skewness Detects | 8.684 | Kurtosis Detects | 84.27 |
| Mean of Logged Detects | 4.3 | SD of Logged Detects | 1.812 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.26 | Normal GOF Test on Detected Observations Only |
| 5% Shapiro Wilk P Value | 0 | Detected Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.4 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.0786 | Detected Data Not Normal at 5% Significance Level |

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

| | | | |
|---|---|---|---|
| Mean | 426.5 | Standard Error of Mean | 148.9 |
| SD | 1703 | 95% KM (BCA) UCL | 718.6 |
| 95% KM (t) UCL | 673.1 | 95% KM (Percentile Bootstrap) UCL | 719.8 |
| 95% KM (z) UCL | 671.3 | 95% KM Bootstrap t UCL | 1156 |
| 90% KM Chebyshev UCL | 873.1 | 95% KM Chebyshev UCL | 1075 |
| 97.5% KM Chebyshev UCL | 1356 | 99% KM Chebyshev UCL | 1908 |

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 6.95 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.851 | Detected Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.156 | Kolmogrov-Smirnoff GOF |
| 5% K-S Critical Value | 0.0887 | Detected Data Not Gamma Distributed at 5% Significance Level |

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.371 | k star (bias corrected MLE) | 0.368 |
| Theta hat (MLE) | 1194 | Theta star (bias corrected MLE) | 1205 |
| nu hat (MLE) | 94.28 | nu star (bias corrected) | 93.39 |
| MLE Mean (bias corrected) | 443.2 | MLE Sd (bias corrected) | 730.9 |

Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| k hat (KM) | 0.0627 | nu hat (KM) | 16.55 |
| Approximate Chi Square Value (16.55, α) | 8.351 | Adjusted Chi Square Value (16.55, β) | 8.287 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 845.2 | 95% Gamma Adjusted KM-UCL (use when n<50) | 851.8 |

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 426.4 |
| Maximum | 18000 | Median | 47 |
| SD | 1710 | CV | 4.01 |
| k hat (MLE) | 0.325 | k star (bias corrected MLE) | 0.323 |
| Theta hat (MLE) | 1311 | Theta star (bias corrected MLE) | 1321 |
| nu hat (MLE) | 85.84 | nu star (bias corrected) | 85.23 |
| MLE Mean (bias corrected) | 426.4 | MLE Sd (bias corrected) | 750.4 |
| | | Adjusted Level of Significance (β) | 0.0482 |
| Approximate Chi Square Value (85.23, α) | 64.95 | Adjusted Chi Square Value (85.23, β) | 64.75 |
| 95% Gamma Approximate UCL (use when n>=50) | 559.5 | 95% Gamma Adjusted UCL (use when n<50) | 561.2 |

**Table E-2**
**ProUCL Statistics for Data Sets with Non-Detects**

| | | | |
|---|---|---|---|
| Lognormal GOF Test on Detected Observations Only | | | |
| Lilliefors Test Statistic | 0.0829 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.0786 | Detected Data Not Lognormal at 5% Significance Level | |
| Detected Data appear Approximate Lognormal at 5% Significance Level | | | |
| | | | |
| Lognormal ROS Statistics Using Imputed Non-Detects | | | |
| Mean in Original Scale | 426.5 | Mean in Log Scale | 4.166 |
| SD in Original Scale | 1710 | SD in Log Scale | 1.901 |
| 95% t UCL (assumes normality of ROS data) | 673 | 95% Percentile Bootstrap UCL | 695.7 |
| 95% BCA Bootstrap UCL | 924.6 | 95% Bootstrap t UCL | 1204 |
| 95% H-UCL (Log ROS) | 662.1 | | |
| | | | |
| UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed | | | |
| KM Mean (logged) | 4.175 | 95% H-UCL (KM -Log) | 637 |
| KM SD (logged) | 1.881 | 95% Critical H Value (KM-Log) | 3.124 |
| KM Standard Error of Mean (logged) | 0.165 | | |
| | | | |
| DL/2 Statistics | | | |
| DL/2 Normal | | DL/2 Log-Transformed | |
| **Mean in Original Scale** | **426.5** | Mean in Log Scale | 4.175 |
| SD in Original Scale | 1710 | SD in Log Scale | 1.886 |
| 95% t UCL (Assumes normality) | 673 | 95% H-Stat UCL | 645 |
| DL/2 is not a recommended method, provided for comparisons and historical reasons | | | |
| | | | |
| Nonparametric Distribution Free UCL Statistics | | | |
| Detected Data appear Approximate Lognormal Distributed at 5% Significance Level | | | |
| | | | |
| Suggested UCL to Use | | | |
| 97.5% KM (Chebyshev) UCL | 1356 | | |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

# APPENDIX B

# PE SUPPORTING DOCUMENTATION

Charles T. Ferry, P.E.
Summary of Hours and Services During the 5th Semi-Annual Progress Period
139 Brampton Road
Savannah, Georgia
HSI Site No. 10832

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Summary of Hours for Voluntary Remediation Program Activities

(1) Project oversight, preparation of revised Soil Remediation Plan and Semi-Annual VRP Progress Report
4.5 hours invoiced between 7/1/14 and 10/30/14